GEORGIA DEPARTMENT of COMMUNITY AFFAIRS

Georgia State Amendments

to the

International Plumbing Code

(2024 Edition)

Georgia Department of Community Affairs

Community Development Division

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Revised January 1, 2026

GEORGIA STATE MINIMUM STANDARD PLUMBING CODE
(INTERNATIONAL PLUMBING CODE WITH GEORGIA STATE AMENDMENTS)

The INTERNATIONAL PLUMBING CODE, 2024 Edition, published by the International Code Council, when used in conjunction with these and any other Georgia State Amendments to the INTERNATIONAL PLUMBING CODE, 2024 EDITION, shall constitute the official *Georgia State Minimum Standard Plumbing Code.*

GEORGIA STATE AMENDMENTS

CODE REFERENCE:

(a) Replace all references to the ICC *Electrical Code* with references to the *Georgia State Minimum Standard Electrical Code* (*National Electrical Code with Georgia State Amendments*).
(b) Replace all references to the *International Energy Conservation Code (IECC)* with references to the *Georgia State Minimum Standard Energy Code (IECC with Georgia State Supplements and Amendments)*. The *Georgia State Minimum Standard Energy Code* shall be used for efficiency and coefficient of performance ratings of equipment.

APPENDICES:

Appendices are not enforceable unless they are specifically referenced in the body of the code or adopted by the Department of Community Affairs or the authority having jurisdiction.

GEORGIA STATE MINIMUM REQUIREMENTS FOR BOILERS/WATER HEATERS AND PRESSURE VESSELS

The State's minimum requirements for boilers/water heaters and pressure vessels over 200,000 BTU/h (58.61 kW), 210 degrees Fahrenheit or 120 gallons capacity shall be established by O.C.G.A. Title 25, Chapter 15 and the Rules and Regulations of the Office of Insurance and Safety Fire Commissioner.

Revise the International Plumbing Code, 2024 Edition, to read as follows:

CHAPTER 1
SCOPE AND ADMINISTRATION

*Delete Chapter 1 'Scope and Administration' entirely without substitution. Chapter 1 to remain in the Code as a reference guide for local governments to use in the development of their own *Administrative Procedures*.
(Effective January 1, 2026)

CHAPTER 2
DEFINITIONS

SECTION 202
GENERAL DEFINITIONS

*Add new definition of 'High Efficiency Plumbing Fixtures and Fittings' to read as follows:

HIGH EFFICIENCY PLUMBING FIXTURES AND FITTINGS.

Dual flush water closet. A dual flush water closet or toilet that the average flush volume of two reduced flushes and one full flush does not exceed 1.28 gallons and is listed to the WaterSense Tank-Type High Efficiency Toilet Specification.

Kitchen faucet or kitchen faucet replacement aerator. A kitchen faucet or kitchen faucet replacement aerator that allows a flow of no more than 2.0 gallons of water per minute.

Lavatory faucet or lavatory faucet replacement aerator. A lavatory faucet or lavatory faucet replacement aerator that allows a flow of no more than 1.5 gallons per minute at a pressure of 60 pounds per square inch and is listed to the WaterSense High Efficiency Lavatory Faucet Specification.

Non-water urinal. A urinal that is designed to receive and convey only liquid waste through a trap seal into the gravity drainage system without the use of water for such function.

Single flush water closet. A single flush water closet or toilet, including gravity, pressure assisted and electro-hydraulic tank types, that the average flush volume does not exceed 1.28 gallons and is listed to the WaterSense Tank-Type High Efficiency Toilet Specification.

Shower head. A shower head that allows a flow of no more than the average of 2.5 gallons of water per minute at 60 pounds per square inch of pressure.

Urinal. A urinal and associated flush valve that uses no more than 0.5 gallons of water per flush and is listed to the WaterSense Specification for Flushing Urinals.
(Effective January 1, 2026**)**

*Add new definition of 'Lavatory Faucet' to read as follows:

LAVATORY FAUCET. A faucet that discharges into a lavatory basin in a domestic or commercial installation.
(Effective January 1, 2026)

*Revise the definition of 'Plumbing Fixture' to read as follows:

PLUMBING FIXTURE. A receptacle or device that receives water, waste or both and discharges water, waste, or both into a drainage system, and that is either permanently or temporarily connected to the water distribution system of the premises and demands a supply of water therefrom; discharges wastewater, liquid-borne waste materials or sewage either directly or indirectly to the drainage system of the premises; or requires both a water supply connection and a discharge to the drainage system of the premises. The term includes a kitchen sink, utility sink, lavatory, bidet, bathtub, shower, urinal, toilet, water closet or drinking water fountain.
(Effective January 1, 2026)

*Rename and revise the definition of 'Fixture Fitting' to read as follows:

PLUMBING FIXTURE FITTING. A device that controls and directs the flow of water or conveys sanitary waste. The term includes a sink faucet, lavatory faucet, showerhead, or bath filler.

Supply fitting. A fitting that controls the volume, direction of flow or both of water and is either attached to or accessed from a fixture or is used with an open or atmospheric discharge.

Waste fitting. A combination of components that conveys the sanitary waste from the outlet of a fixture to the connection to the sanitary drainage system.
(Effective January 1, 2026)

*Add new definition of 'Pressurized Flushing Device' to read as follows:

PRESSURIZED FLUSHING DEVICE. A device that contains a valve that:

1. Is attached to a pressurized water supply pipe that is of sufficient size to deliver water at the necessary rate of flow to ensure flushing when the valve is open; and
2. Opens on actuation to allow water to flow into the fixture at a rate and in a quantity necessary for the operation of the fixture and gradually closes to avoid water hammer.

(Effective January 1, 2026)

*Under definition of 'Sewer' revise 'Public Sewer' to read as follows:

SEWER
Public sewer. That part of the drainage system of pipes installed or maintained by a city, township, county, public utility company or other public entity, on public property, in the street or in an approved dedicated easement of public or community use.
(Effective January 1, 2026)

*Add new definition of 'Toilet' to read as follows:

TOILET. A water closet.
(Effective January 1, 2026)

*Add new definition of 'Water Closet' to read as follows:

WATER CLOSET. A fixture with a water-containing receptor that receives liquid and solid body waste and on actuation conveys the waste through an exposed integral trap into a drainage system and which is also referred to as a toilet.
(Effective January 1, 2026)

*Add new definition of 'WaterSense' to read as follows:

WATERSENSE. A voluntary program of the United States Environmental Protection Agency designed to identify and promote water efficient products and practices.
(Effective January 1, 2026)

*Add new definition of 'WaterSense Listed Plumbing Fixture or Plumbing Fixture Fitting' to read as follows:

WATERSENSE LISTED PLUMBING FIXTURE OR PLUMBING FIXTURE FITTING. A plumbing fixture or plumbing fixture fitting that has been tested by an accredited third-party certifying body or laboratory in accordance with the WaterSense Program of the United States Environmental Protection Agency and has been listed (certified) by such body or laboratory as meeting the performance and efficiency requirements of the program and has been authorized by the program to use its label.
(Effective January 1, 2026)

CHAPTER 3
GENERAL REGULATIONS

*Add new Section 300 'General Applicability Standards' to read as follows:

SECTION 300
GENERAL APPLICABILITY STANDARDS

300.1 Scope. The provisions of this code shall apply to the erection, installation, alteration, repairs, relocation, replacement, addition to, use or maintenance of plumbing systems within the state of Georgia. The installation of fuel gas distribution piping and equipment, fuel-gas-fired water heaters and water heater venting systems shall be regulated by the *International Fuel Gas Code*.

300.2 Appendices. Appendices are not enforceable unless they are specifically referenced in the body of the code or adopted by the Department of Community Affairs or the authority having jurisdiction.

300.3 Intent. The purpose of this code is to provide minimum standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of plumbing equipment and systems.

300.4 Severability. If any section, subsection, sentence, clause or phrase of this code is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this code.

300.5 General. The provisions of this code shall apply to all matters affecting or relating to structures, as set forth in Section 300. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

300.6 Maintenance. All plumbing systems, materials and appurtenances, both existing and new, and all parts thereof, shall be maintained in proper operating condition in accordance with the original design in a safe and sanitary condition. All devices or safeguards required by this code shall be maintained in compliance with the code edition under which they were installed.
The owner or the owner's designated agent shall be responsible for the maintenance of plumbing systems. To determine compliance with this provision, the code official shall have the authority to require any plumbing system to be reinspected.

300.7 Material and equipment reuse. Materials, equipment and devices shall not be reused unless such elements have been reconditioned, tested, placed in good and proper working condition and approved.
(Effective January 1, 2026)

SECTION 301
GENERAL

*Add new Section 301.1.1 'Requirements for high efficiency plumbing fixtures' to read as follows:

301.1.1 Requirements for high efficiency plumbing fixtures. The installation of high efficiency plumbing fixtures shall be required in all new construction.
(Effective January 1, 2026)

*Add new Section 301.1.2 'Waiver for requirements of high efficiency plumbing fixtures' to read as follows:

301.1.2 Waiver of requirements for high efficiency plumbing fixtures. Counties and municipalities are permitted to adopt an ordinance that grants a waiver for an exemption to the requirements for the installation of high efficiency plumbing fixtures relative to new construction and to the repair or renovation of an existing building under the following conditions:

1. When the repair or renovation of the existing building does not include the replacement of the plumbing or sewage system servicing toilets, faucets, or shower heads within such existing building;
2. When such plumbing or sewerage system within such existing building, because of its capacity, design, or installation, would not function properly if the toilets, faucets, or shower heads required by this part were installed;
3. When such system is a well or gravity flow from a spring and is owned privately by an individual for use in such individual's personal residence; or

4. When units to be installed are:
    a. Specifically designed for use by persons with disabilities;
    b. Specifically designed to withstand unusual abuse or installation in a penal institution; or
    c. Toilets for juveniles.

(Effective January 1, 2026)

SECTION 305
PROTECTION OF PIPES AND PLUMBING SYSTEM COMPONENTS

*Revise Section 305.4.1 'Sewer depth' to read as follows:

305.4.1 Sewer depth. Building sewers shall be a minimum of 6 inches (152.4 mm) below grade.
(Effective January 1, 2026)

SECTION 306
TRENCHING, EXCAVATION, AND BACKFILL

*Revise Section 306.3 'Backfilling' to read as follows:

306.3 Backfilling. Loose earth free from rocks, broken concrete, frozen chunks, shall be placed in the trench in 6-inch (152.4 mm) layers and tamped in place until the crown of the pipe is covered by a minimum of 6 inches (152.4 mm) of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned. In instances where the manufacturer's installation instructions for materials are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement.
(Effective January 1, 2026)

*Add new Section 306.5 'Open trenches' to read as follows:

306.5 Open trenches. All excavations required to be made for the installation of a building sewer, building drainage system, or any part thereof within the walls of a building shall be open trench work and shall be kept open until the piping has been inspected, tested and approved.
(Effective January 1, 2026)

SECTION 311
TOILET FACILITIES FOR WORKERS

*Delete Section 311 'Toilet Facilities for Workers' entirely without substitution.
(Effective January 1, 2026)

SECTION 314
CONDENSATE DISPOSAL

*Delete Section 314 'Condensate Disposal' entirely without substitution.
(Effective January 1, 2026)

CHAPTER 4
FIXTURES, FAUCETS AND FIXTURE FITTINGS

SECTION 401
GENERAL

*Add new Section 401.4 'Prohibited locations' to read as follows:

401.4 Prohibited locations. No floor drains or other plumbing fixtures except electric water heaters shall be installed in a room containing air handling machinery when such room is used as a plenum.

Exception: Deep-seal trap floor drains consisting of a minimum 4-inch (102 mm) seal and supplied with a trap primer connected to a water distribution pipe shall be permitted.
(Effective January 1, 2026)

SECTION 403
MINIMUM PLUMBING FIXTURES

*Revise Table 403.1 'Minimum Number of Required Plumbing Fixtures[a]' to delete the requirements for 'service sink' entirely without substitution.
(Effective January 1, 2026)

*Revise Table 403.1 'Minimum Number of Required Plumbing Fixtures[a]' by adding the following requirement under the column labeled 'Other' for line number '7' descriptions:

TABLE 403.1
MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
			Male	Female	Male	Female			
7	Residential	Apartment house	1 per dwelling unit or sleeping unit		1 per dwelling unit or sleeping unit		1 per dwelling unit or sleeping unit	---	1 kitchen sink per dwelling unit; 1 automatic clothes washer connection per 20 dwelling units. Detached single-family, duplex and multi-family dwelling structures three stories or less in height shall have not less than two exterior hose bibs, sill cocks or outside hydrants with one being located on the side or rear of the structure.
		One-and two-family dwellings and lodging houses with five or fewer guestrooms	1 per dwelling unit		1 per dwelling unit		1 per dwelling unit	----	1 kitchen sink per dwelling unit, 1 automatic clothes washer connection per dwelling unit. Detached single-family, duplex and multi-family dwelling structures three stories or less in height shall have not less than two exterior hose bibs, sill cocks or outside hydrants with one being located on the side or rear of the structure

The remainder of the table remains unchanged.
(Effective January 1, 2026)

*Delete 403.1.1 ‘Fixture calculations’ Exception 2 without substitution.
(Effective January 1, 2026)

*Delete 403.2 ‘Separate facilities’ Exception 6 without substitution.
(Effective January 1, 2026)

SECTION 406
AUTOMATIC CLOTHES WASHERS

*Revise Section 406.2 ‘Waste connection’ to read as follows:

406.2 Waste connection. The waste from an automatic clothes washer shall discharge through an air break into a standpipe in accordance with Section 802.4.3 or into a laundry sink. The trap and fixture drain for an automatic clothes washer standpipe shall be a minimum of 2 inches (51 mm) in diameter. The automatic clothes washer fixture drain shall connect to a building drain, branch drain or drainage stack a minimum of 3 inches (76 mm) in diameter. Automatic clothes washers that discharge by gravity shall be permitted to drain to a waste receptor or an approved trench drain.
(Effective January 1, 2026)

SECTION 410
DRINKING FOUNTAINS

*Revise Section 410.2 ‘Small occupancies’ to read as follows:

410.2 Small occupancies. Drinking fountains shall not be required for an occupant load of 25 or fewer.
(Effective January 1, 2026)

SECTION 412
FAUCETS AND FIXTURE FITTINGS

*Revise Section 412.1 ‘Approval’ to add a new paragraph at the end of the section:

412.1 Approval. Faucets and fixture fittings shall conform to ASME A112.18.1/CSA B125.1. Faucets and fixture fittings that supply drinking water for human ingestion shall conform to the requirements of NSF 61, Section 9. Flexible water connectors exposed to continuous pressure shall conform to the requirements of Section 605.6.

High-efficiency lavatory faucets or lavatory faucet replacement aerators in private use, such as in residences and apartments, and private (nonpublic) restrooms in hotels and hospitals, shall be listed to the WaterSense High Efficiency Lavatory Faucet Specification.
(Effective January 1, 2026)

SECTION 419
LAVATORIES

*Revise Section 419.5 ‘Tempered water for public hand-washing facilities’ to read as follows:

419.5 Tempered water for public hand-washing facilities. *Tempered water* may be delivered from lavatories and group wash fixtures located in public toilet facilities provided for customers, patrons and visitors. If provided, tempered water shall be delivered through an *approved* water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.
(Effective January 1, 2026)

SECTION 421
SHOWERS

*Revise Section 421.2 ‘Water supply riser’ to read as follows:

421.2 Water supply riser. Water supply risers from the shower valve to the shower head outlet, whether exposed or concealed, shall be attached to the structure. The attachment to the structure shall be made by the use of support devices designed for use with the specific piping material or by fittings anchored with corrosion-resistant screws.
(Effective January 1, 2026)

SECTION 424
URINALS

*Revise Section 424.1 ‘Approval’ to read as follows:

424.1 Approval. Urinals shall conform to ANSI Z124.9, ASME A112.19.2/CSA B45.1, ASME A112.19.19 or CSA B45.5/IAPMO Z124. Urinals shall conform to the water consumption requirements of Section 604.4. Water-supplied urinals shall conform to the hydraulic performance requirements of ASME A112.19.2/CSA B45.1 or CSA B45.5/IAPMO Z124. High efficiency urinals with pressurized flushing devices and flush tank (gravity type) flushing devices shall be listed to the WaterSense Specification for Flushing Urinals and shall conform to ASME A112.19.2/CSA B45.1.
Non-water urinals shall conform to ASME A112.19.3/CSA B45.4 or ASME A112.19.19, CSA B45.4. Where non-water urinals are employed, they shall be cleaned and maintained in accordance with the manufacturer’s instructions after installation. Where non-water urinals are installed they shall have a properly sized water distribution line roughed-in to the urinal location at a minimum height of 56 inches (1,422 mm) to allow for the installation of an approved backflow prevention device in the event of a retrofit. Such water distribution lines shall be installed with shut-off valves located as close as possible to the distributing main to prevent the creation of dead ends. Where non-water urinals are installed, a minimum of one water supplied fixture rated at a minimum of one water supply fixture unit shall be installed upstream on the same drain line to facilitate drain line flow and rinsing.
(Effective January 1, 2026)

SECTION 425
WATER CLOSETS

*Revise Section 425.1 'Approval' to read as follows:

425.1 Approval. Water closets shall conform to the water consumption requirements of Section 604.4 and shall conform to ANSI Z124.4, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, or CSA B45.5. Water closets shall conform to the hydraulic performance requirements of ASME A112.19.2/CSA B45.1. Water closet tanks shall conform to ANSI Z124.4, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4, or CSA B45.5. Electro-hydraulic water closets shall comply with ASME A112.19.2/CSA B45.1. High-efficiency single-flush and dual-flush toilets or water closets shall conform to ASME A112.19.2/CSA B45.1 and ASME A112.19.14.
(Effective January 1, 2026)

CHAPTER 5
WATER HEATERS

SECTION 501
GENERAL

*Add new Section 501.10 'Water heaters over 200,000 BTU/h' to read as follows:

501.10 Water heaters over 200,000 BTU/h. The State's minimum requirements for boilers/water heaters and pressure vessels over 200,000 BTU/h (58.61 kW), 210 degrees Fahrenheit or 120 gallons capacity shall be established by O.C.G.A. Title 25, Chapter 15 and the Rules and Regulations of the Office of Insurance and Safety Fire Commissioner.
(Effective January 1, 2026)

SECTION 504
SAFETY DEVICES

*Revise Section 504.6 'Requirements for discharge piping' to read as follows:

504.6 Requirements for discharge piping. The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the *airgap*.
3. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
4. Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors.
5. Discharge in a manner that does not cause personal injury or structural damage.
6. Discharge to a termination point that is readily observable by the building occupants.
7. If the discharge pipe is trapped, provisions shall be made to drain the low point of the trapped portion of the discharge pipe.

8. Terminate not more than 6 inches (152 mm) above and not less than two times the discharge pipe diameter above the floor or *flood level rim* of the waste receptor.
9. Not have a threaded connection at the end of such piping.
10. Not have valves or tee fittings.
11. Be constructed of those materials listed in Section 605.4 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.
12. Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.

(Effective January 1, 2026)

SECTION 506

*Add new Section 506 'Minimum Capacities for Residential Water Heaters' to read as follows:

SECTION 506
MINIMUM CAPACITIES FOR RESIDENTIAL WATER HEATERS

506.1 General. Water heaters installed in residential occupancies shall be sized in accordance with Table 506 or the manufacturer's recommendations. The water heater must at a minimum meet the First Hour Rating (FHR) requirements of Table 506.
(Effective January 1, 2026)

*Add new Table 506 'Minimum Capacities for Residential Water Heaters' to read as follows:

TABLE 506
MINIMUM CAPACITIES FOR RESIDENTIAL WATER HEATERS[1, 2, 3]

Fuel		Gas	Elec	Gas	Elec	Gas	Elec	Gas	Elec
# of Bedrooms		1		2		3		….	
1 to 1 ½ Baths	FHR (gal)	40	40	45	45	48	48	….	….
# of Bedrooms		2		3		4		5	
2 to 2 ½ Baths	FHR (gal)	47	47	60	60	62	62	70	70
# of Bedrooms		3		4		5		6	
3 to 3 ½ Baths	FHR (gal)	60	60	67	67	70	70	72	72

FHR= First Hour Rating, 1 ga1=3.7854 L, 1 gph=1.05 mL/s

1. Tankless Water Heaters shall be sized and installed per manufacturer's recommendations.
2. Water heaters for single-family dwellings having more than six bedrooms and/or 3 ½ baths shall be sized per manufacturer's recommendations.
3. Table 506 reflects the minimum requirements for one or multiple water heating units.

(Effective January 1, 2026)

CHAPTER 6
WATER SUPPLY AND DISTRIBUTION

SECTION 604
DESIGN OF BUILDING WATER DISTRIBUTION SYSTEM

*Revise Table 604.4 'Maximum Flow Rates and Consumption for Plumbing Fixtures and Fixture Fittings' to read as follows:

TABLE 604.4
MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY[b]
Lavatory, private	1.5[f] gpm at 60 psi
Lavatory, public (metering)	0.25 gallon per metering cycle
Lavatory, public (other than metering)	0.5 gpm at 60 psi
Shower head[a]	2.5 gpm at 60[f] psi
Sink faucet	2.0[f] gpm at 60 psi
Urinal	0.5[f] gallons per flushing cycle
Water closet	1.28[c, d, e, f] gallons per flushing cycle

For SI: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. A hand-held shower spray is a shower head.
b. Consumption tolerances shall be determined from referenced standards.
c. For flushometer valves and flushometer tanks, the average flush volume shall not exceed 1.28 gallons.
d. For single flush water closets, including gravity, pressure assisted and electro-hydraulic tank types, the average flush volume shall not exceed 1.28 gallons.
e. For dual flush water closets, the average flush volume of two reduced flushes and one full flush shall not exceed 1.28 gallons.
f. See 2026 GA Amendment to Section 301.1.2 'Waiver from requirements of high efficiency plumbing fixtures.'

(Effective January 1, 2026)

SECTION 605
MATERIALS, JOINTS AND CONNECTIONS

*Revise Section 605.9 'Prohibited joints and connections' to add a new exception to Item 4. 'Saddle-type fittings' to read as follows:

605.9 Prohibited joints and connections.

4. Saddle-type fittings.

   Exception: Saddle-type fittings can be used to connect refrigerator ice makers and humidifiers to an existing residential unit water distribution system, provided that the manufacturer's installation instructions for the distribution piping do not prohibit the use of saddle fittings.

(Effective January 1, 2026)

*Revise Section 605.12.3 'Soldered joints' to read as follows:

605.12.3 Soldered joints. Solder joints shall be made in accordance with the methods of ASTM B 828 except a flux conforming to NSF 61 shall be used. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. The joint shall be soldered with a solder conforming to ASTM B 32. The joining of water supply piping shall be made with lead-free solder and fluxes. "Lead free" shall mean a chemical composition equal to or less than 0.2-percent lead.
(Effective January 1, 2026)

*Revise Section 605.13.6 'Soldered joints' to read as follows:

605.13.6 Soldered joints. Solder joints shall be made in accordance with the methods of ASTM B 828 except a flux conforming to NSF 61 shall be used. All cut tube ends shall be reamed to the full inside diameter of the tube end. All joint surfaces shall be cleaned. The joint shall be soldered with a solder conforming to ASTM B 32. The joining of water supply piping shall be made with lead-free solders and fluxes. "Lead free" shall mean a chemical composition equal to or less than 0.2-percent lead.
(Effective January 1, 2026)

SECTION 606
INSTALLATION OF THE BUILDING WATER DISTRIBUTION SYSTEM

*Revise Section 606.2 'Location of shutoff valves' to add new Location #4 to read as follows:

606.2 Location of shutoff valves.

4. Shutoff valves to water supplies for refrigerators with automatic icemakers shall have access on the same floor as said refrigerators.

(Effective January 1, 2026)

SECTION 607
HOT WATER SUPPLY SYSTEM

*Revise Section 607.1 'Where required' to read as follows:

607.1 Where required. In residential occupancies, hot water shall be supplied to plumbing fixtures and equipment utilized for bathing, washing, culinary purposes, cleansing, laundry or building maintenance. In nonresidential occupancies, hot water shall be supplied for culinary purposes, cleansing, laundry or building maintenance purposes. In nonresidential occupancies, hot water or tempered water shall be supplied for bathing and washing purposes except for hand-washing facilities. Accessible hand washing facilities regardless of the facility shall not be required to be supplied with hot water or tempered water.
(Effective January 1, 2026)

*Revise Section 607.3 ‘Thermal expansion control’ to read as follows:

607.3 Thermal expansion control. Where a storage water heater is supplied with cold water that passes through a check valve, pressure reducing valve or backflow preventer, a thermal expansion control device shall be connected to the water heater cold water supply at a point that is downstream of all check valves, pressure reducing valves, backflow preventers and shut off valves. Thermal expansion tanks shall be located a minimum of 18 inches in developed length from the cold-water inlet fitting of the water heater, shall be sized in accordance with the tank manufacturer’s instructions and shall be sized such that the pressure in the water distribution system shall not exceed that required by Section 604.8.
(Effective January 1, 2026)

SECTION 608
PROTECTION OF POTABLE WATER SUPPLY

*Revise Section 608.17.5 ‘Connections to lawn irrigation systems’ to read as follows:

608.17.5 Connections to lawn irrigation systems. The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric-type vacuum breaker, a pressure-type vacuum breaker, a double-check backflow prevention assembly or a reduced pressure principle backflow preventer. Valves shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system interconnected chemical dispensers are used in conjunction with the lawn irrigation systems, the potable water supply shall be protected against backflow by a reduced pressure principle backflow preventer.
(Effective January 1, 2026)

SECTION 610
DISINFECTION OF POTABLE WATER SYSTEM

*Revise Section 610.1 ‘General’ to read as follows:

610.1 General. New or repaired potable water systems shall be flushed and purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction. Systems that cannot be adequately flushed and purged may require disinfection in accordance with a prescribed method. In the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section, shall apply. This requirement shall apply to “on-site” or “in-plant” fabrication of a system or to a modular portion of a system.
(remainder left unchanged)
(Effective January 1, 2026)

CHAPTER 7
SANITARY DRAINAGE

SECTION 705
JOINTS

*Revise Section 705.10.2 'Solvent cementing' to read as follows:

705.10.2 Solvent cementing. Joint surfaces shall be clean and free from moisture. If a primer is required by the solvent manufacturer, a purple primer that conforms to ASTM F 656 shall be applied. Solvent cement not purple in color and conforming to ASTM D 2564, CSA B137.3, CSA B181.2 or CSA B182.1 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D 2855. Solvent-cement joints shall be permitted above or below ground.
(Effective January 1, 2026)

SECTION 706
CONNECTIONS BETWEEN DRAINAGE PIPING AND FITTINGS

*Revise Section 706.3 'Installation of fittings' to read as follows and delete the exception:

706.3 Installation of fittings. Fittings shall be installed to guide sewage and waste in the direction of flow. Change in direction shall be made by fittings installed in accordance with Table 706.3. Change in direction by combination fittings or increasers shall be installed in accordance with Table 706.3 based on the pattern of flow created by the fitting. Double sanitary tee patterns shall only be used for dry venting purposes or for fixture drains 2 inches (51mm) in diameter or smaller.

Delete Exception without replacement.
(Effective January 1, 2026)

*Delete Section 706.4 'Heel- or side-inlet quarter bends' entirely without substitution.
(Effective January 1, 2026)

SECTION 708
CLEANOUTS

*Revise Section 708.1.2 'Building sewers' to read as follows:

708.1.2 Building sewers. Building sewers shall be provided with cleanouts located not more than 100 feet (30480 mm) apart measured from the upstream entrance of the cleanout. An additional cleanout shall be provided within 10 feet (3048 mm) of the public right of way. For building sewers 8 inches (203 mm) and larger, manholes shall be provided and located at each change in direction and at intervals of not more than 400 feet (122 m). Manholes and manhole covers shall be of an approved type.
(Effective January 1, 2026)

*Revise Section 708.1.3 ‘Building drain and building sewer junction’ to read as follows:

708.1.3 Building drain and building sewer junction. There shall be a cleanout installed at or near the junction of the building drain and the building sewer. The cleanout shall be outside the building wall unless otherwise approved and shall be brought up to finished ground level. An approved two-way cleanout is allowed to be used at this location to serve as a required cleanout for both the building drain and building sewer.
(Effective January 1, 2026)

CHAPTER 9
VENTS

SECTION 903
VENT TERMINALS

*Revise Section 903.1.1 ‘Roof extension unprotected’ to read as follows:

903.1.1 Roof extension unprotected. Open vent pipes that extend through a roof shall be terminated not less than 6 inches (152.4 mm) above the roof.
(Effective January 1, 2026)

*Delete exception to Section 909.1 ‘Distance of trap from vent’ entirely without substitution.
(Effective January 1, 2026)

SECTION 913
WASTE STACK VENT

*Revise Section 913.2 ‘Stack installation’ to read as follows:

913.2 Stack installation. The waste stack shall be vertical. *Fixture* drains shall connect separately to the waste stack. The stack shall not receive the discharge of water closets or urinals.
(Effective January 1, 2026)

SECTION 914
CIRCUIT VENTING

*Revise Section 914.2 ‘Vent connection’ to read as follows:

914.2 Vent connection. The circuit vent connection shall be located between the two most upstream fixture drains. The vent shall connect to the horizontal branch and shall be installed in accordance with Section 905. The circuit vent may receive waste discharge from fixtures located within the same branch interval, provided that the wet portion remains the same size as the horizontal branch.
(Effective January 1, 2026)

CHAPTER 10
TRAPS, INTERCEPTORS AND SEPARATORS

SECTION 1002
TRAP REQUIREMENTS

*Revise first paragraph of Section 1002.1 'Fixture traps' to read as follows:

1002.1 Fixture traps. Each plumbing fixture shall be separately trapped by a water-seal trap, except as otherwise permitted by this code. The trap shall be placed as close as possible to the fixture outlet. The vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches (610 mm). The distance of a clothes washer standpipe above a trap shall conform to Section 802.4.3. A fixture shall not be double trapped. Remainder of section unchanged.
(Effective January 1, 2026)

CHAPTER 13
NONPOTABLE WATER SYSTEMS

SECTION 1304
RECLAIMED WATER SYSTEMS

*Add new Section 1304.3.2 'Connections to water supply' to read as follows:

1304.3.2 Connections to water supply. Reclaimed water provided from a reclaimed wastewater treatment facility permitted by the Environmental Protection Division may be used to supply water closets, urinals, trap primers for floor drains and floor sinks, water features and other uses approved by the Authority Having Jurisdiction, in motels, hotels, apartment and condominium buildings, and commercial, industrial, and institutional buildings, where the individual guest or occupant does not have access to plumbing. Also, other systems that may use a lesser quality of water than potable water such as water chillers, carwashes or an industrial process may be supplied with reclaimed water provided from a reclaimed wastewater treatment facility permitted by the Environmental Protection Division.
(Effective January 1, 2026)

CHAPTER 15
REFERENCED STANDARDS

*Revise Chapter 15 ‘Referenced standards’ to add the following new reference standards for WaterSense:

WATERSENSE

WaterSense
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

WaterSense: Tank-Type High Efficiency Toilet Specification
202, 420.1
WaterSense: Specification for Flushing Urinals
202, 419.1
WaterSense: High-Efficiency Lavatory Faucet Specification
202

(Effective January 1, 2026)

End of Amendments.

PREFACE

FORMATTING CHANGES TO THE 2024 INTERNATIONAL CODES

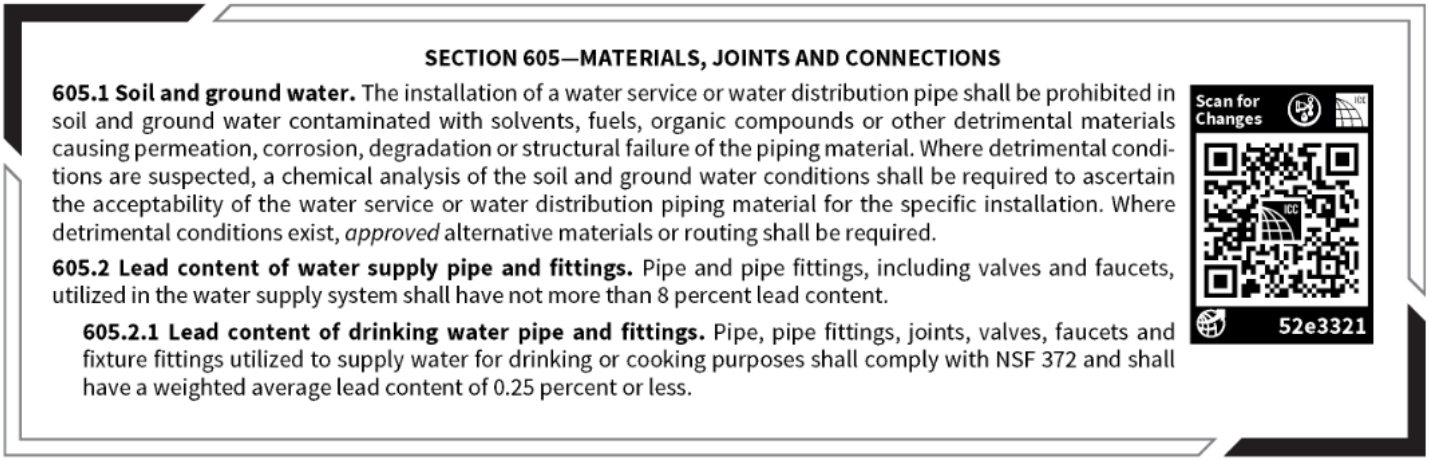
The 2024 International Codes®(I-Codes®) have undergone substantial formatting changes as part of the digital transformation strategy of the International Code Council®(ICC®) to improve the user experience. The resulting product better aligns the print and PDF versions of the I-Codes with the ICC's Digital Code content. Additional information can be found at iccsafe.org/design-updates.

Replacement of Marginal Markings with QR Codes

Through 2021, print editions of the I-Codes identified technical changes from prior code cycles with marginal markings [solid vertical lines for new text, deletion arrows (), asterisks for relocations (∗)]. The 2024 I-Code print editions replace the marginal markings with QR codes to identify code changes more precisely.

A QR code is placed at the beginning of any section that has undergone technical revision. If there is no QR code, there are no technical changes to that section.

In the following example from the 2024 International Plumbing Code®(IPC®), a QR code indicates there are changes to Section 605 from the 2021 IPC. Note that the change may occur in the main section or in one or more subsections of the main section.



SECTION 605—MATERIALS, JOINTS AND CONNECTIONS

605.1 Soil and ground water. The installation of a water service or water distribution pipe shall be prohibited in soil and ground water contaminated with solvents, fuels, organic compounds or other detrimental materials causing permeation, corrosion, degradation or structural failure of the piping material. Where detrimental conditions are suspected, a chemical analysis of the soil and ground water conditions shall be required to ascertain the acceptability of the water service or water distribution piping material for the specific installation. Where detrimental conditions exist, *approved* alternative materials or routing shall be required.

605.2 Lead content of water supply pipe and fittings. Pipe and pipe fittings, including valves and faucets, utilized in the water supply system shall have not more than 8 percent lead content.

605.2.1 Lead content of drinking water pipe and fittings. Pipe, pipe fittings, joints, valves, faucets and fixture fittings utilized to supply water for drinking or cooking purposes shall comply with NSF 372 and shall have a weighted average lead content of 0.25 percent or less.

To see the code changes, the user need only scan the QR code with a smart device. If scanning a QR code is not an option, changes can be accessed by entering the 7-digit code beneath the QR code at the end of the following URL: qr.iccsafe.org/ (in the above example, "qr.iccsafe.org/52e3321"). Those viewing the code book via PDF can click on the QR code.

All methods take the user to the appropriate section on ICC's Digital Codes website, where technical changes from the prior cycle can be viewed. Digital Codes Premium subscribers who are logged in will be automatically directed to the Premium view. All other users will be directed to the Digital Codes Basic free view. Both views show new code language in blue text along with deletion arrows for deleted text and relocation markers for relocated text.

Digital Codes Premium offers additional ways to enhance code compliance research, including revision histories, commentary by code experts and an advanced search function. A full list of features can be found at codes.iccsafe.org/premium-features.

ABOUT THE I-CODES

The 2024 I-Codes, published by the ICC, are 15 fully compatible titles, intended to establish provisions that adequately protect public health, safety and welfare; that do not unnecessarily increase construction costs; that do not restrict the use of new materials, products or methods of construction; and that do not give preferential treatment to particular types or classes of materials, products or methods of construction.

The I-Codes are updated on a 3-year cycle to allow for new construction methods and technologies to be incorporated into the codes. Alternative materials, designs and methods not specifically addressed in the I-Code can be approved by the building official where the proposed materials, designs or methods comply with the intent of the provisions of the code.

The I-Codes are used as the basis of laws and regulations in communities across the US and in other countries. They are also used in a variety of nonregulatory settings, including:

- Voluntary compliance programs.
- The insurance industry.
- Certification and credentialing for building design, construction and safety professionals.
- Certification of building and construction-related products.
- Facilities management.
- “Best practices” benchmarks for designers and builders.
- College, university and professional school textbooks and curricula.
- Reference works related to building design and construction.

Code Development Process

The code development process regularly provides an international forum for building professionals to discuss requirements for building design, construction methods, safety, performance, technological advances and new products. Proposed changes to the I-Codes, submitted by code enforcement officials, industry representatives, design professionals and other interested parties are deliberated through an open code development process in which all interested and affected parties may participate.

Openness, transparency, balance, due process and consensus are the guiding principles of both the ICC Code Development Process and OMB Circular A-119, which governs the federal government’s use of private-sector standards. The ICC process is open to anyone without cost. Remote participation is available through cdpAccess®, the ICC’s cloud-based app.

In order to ensure that organizations with a direct and material interest in the codes have a voice in the process, the ICC has developed partnerships with key industry segments that support the ICC’s important public safety mission. Some code development committee members were nominated by the following industry partners and approved by the ICC Board:

- American Gas Association (AGA)
- American Institute of Architects (AIA)
- American Society of Plumbing Engineers (ASPE)

- International Association of Fire Chiefs (IAFC)
- National Association of Home Builders (NAHB)
- National Association of State Fire Marshals (NASFM)
- National Council of Structural Engineers Association (NCSEA)
- National Multifamily Housing Council (NMHC)
- Plumbing Heating and Cooling Contractors (PHCC)
- Pool and Hot Tub Alliance (PHTA) formerly The Association of Pool and Spa Professionals (APSP)

Code development committees evaluate and make recommendations regarding proposed changes to the codes. Their recommendations are then subject to public comment and council-wide votes. The ICC's governmental members—public safety officials who have no financial or business interest in the outcome—cast the final votes on proposed changes.

The I-Codes are subject to change through future code development cycles and by any governmental entity that enacts the code into law. For more information regarding the code development process, contact the Codes and Standards Development Department of the ICC at iccsafe.org/products-and-services/i-codes/code-development/.

While the I-Code development procedure is thorough and comprehensive, the ICC, its members and those participating in the development of the codes expressly disclaim any liability resulting from the publication or use of the I-Codes, or from compliance or noncompliance with their provisions. NO WARRANTY OF ANY KIND, IMPLIED, EXPRESSED OR STATUTORY, IS GIVEN WITH RESPECT TO THE I-CODES. The ICC does not have the power or authority to police or enforce compliance with the contents of the I-Codes.

Code Development Committee Responsibilities (Letter Designations in Front of Section Numbers)

In each cycle, proposed changes are considered by the Code Development Committee assigned to a specific code or subject matter. Committee Action Hearings result in recommendations regarding a proposal to the voting membership. Where changes to a code section are not considered by that code's own committee, the code section is preceded by a bracketed letter designation identifying a different committee. Bracketed letter designations for the I-Code committees are:

[A] = Administrative Code Development Committee

[BE] = IBC—Egress Code Development Committee

[BF] = IBC—Fire Safety Code Development Committee

[BG] = IBC—General Code Development Committee

[BS] = IBC—Structural Code Development Committee

[E] = Developed under the ICC's Standard Development Process

[EB] = International Existing Building Code Development Committee

[F] = International Fire Code Development Committee

[FG] = International Fuel Gas Code Development Committee

[M] = International Mechanical Code Development Committee

[P] = International Plumbing Code Development Committee

[SP] = International Swimming Pool and Spa Code Development Committee

For the development of the 2027 edition of the I-Codes, the ICC Board of Directors approved a standing motion from the Board Committee on the Long-Term Code Development Process to revise the code development cycle to incorporate two committee action hearings for each code group. This change expands the current process from two independent 1-year cycles to a single continuous 3-year cycle. There will be two groups of code development committees and they will meet in separate years. The current groups will be reworked. With the energy provisions of the International Energy Conservation Code®(IECC®) and Chapter 11 of the International Residential Code® (IRC®) now moved to the Code Council's Standards Development Process, the reduced volume of code changes will be distributed between Groups A and B.

Code change proposals submitted for code sections that have a letter designation in front of them will be heard by the respective committee responsible for such code sections. Because different committees hold Committee Action Hearings in different years, proposals for most codes will be heard by committees in both the 2024 (Group A) and the 2025 (Group B) code development cycles. It is very important that anyone submitting code change proposals understands which code development committee is responsible for the section of the code that is the subject of the code change proposal.

Please visit the ICC website at iccsafe.org/products-and-services/i-codes/code-development/current-code-development-cycle for further information on the Code Development Committee responsibilities as it becomes available.

Coordination of the I-Codes

The coordination of technical provisions allows the I-Codes to be used as a complete set of complementary documents. Individual codes can also be used in subsets or as stand-alone documents. Some technical provisions that are relevant to more than one subject area are duplicated in multiple model codes.

Italicized Terms

Words and terms defined in Chapter 2, Definitions, are italicized where they appear in code text and the Chapter 2 definitions apply. Although care has been taken to ensure applicable terms are italicized, there may be instances where a defined term has not been italicized or where a term is italicized but the definition found in Chapter 2 is not applicable. For example, Chapter 2 of the International Building Code®(IBC®) contains a definition for “Listed” that is applicable to equipment, products and services. The term “listed” is also used in that code to refer to a list of items within the code or within a referenced document. For the latter, the Chapter 2 definition would not be applicable.

Adoption of International Code Council Codes and Standards

The International Code Council maintains a copyright in all of its codes and standards. Maintaining copyright allows the Code Council to fund its mission through sales of books in both print and digital

formats. The Code Council welcomes incorporation by reference of its codes and standards by jurisdictions that recognize and acknowledge the Code Council's copyright in the codes and standards, and further acknowledge the substantial shared value of the public/private partnership for code development between jurisdictions and the Code Council. By making its codes and standards available for incorporation by reference, the Code Council does not waive its copyright in its codes and standards.

The Code Council's codes and standards may only be adopted by incorporation by reference in an ordinance passed by the governing body of the jurisdiction. "Incorporation by reference" means that in the adopting ordinance, the governing body cites only the title, edition, relevant sections or subsections (where applicable), and publishing information of the model code or standard, and the actual text of the model code or standard is not included in the ordinance (see graphic, "Adoption of International Code Council Codes and Standards"). The Code Council does not consent to the reproduction of the text of its codes or standards in any ordinance. If the governing body enacts any changes, only the text of those changes or amendments may be included in the ordinance.

What does "incorporate by reference" mean? If a governmental agency or authority having jurisdiction (AHJ) over code adoption wishes to adopt a model code for legislative or regulatory purposes, it will enact an ordinance, regulation or law to incorporate by reference (IBR) the relevant code. The actual text of the model code is not included in the law, but the enacting law will include the full text of any changes or amendments enacted by the legislative body of the AHJ.



The Code Council also recognizes the need for jurisdictions to make laws accessible to the public. Accordingly, all I-Codes and I-Standards, along with the laws of many jurisdictions, are available to view for free at codes.iccsafe.org/codes/i-codes. These documents may also be purchased, in both digital and print versions, at shop.iccsafe.org.

To facilitate adoption, some I-Code sections contain blanks for fill-in information that needs to be supplied by the adopting jurisdiction as part of the adoption legislation. For example, the IPC contains:

Section 101.1. Insert: **[NAME OF JURISDICTION]**

Section 103.1. Insert: **[NAME OF DEPARTMENT]**

Section 114.4. Insert: **[OFFENSE, DOLLAR AMOUNT, NUMBER OF DAYS]**

Section 305.4.1. Insert: **[NUMBER OF INCHES IN TWO LOCATIONS]**

Section 903.1.1. Insert: **[NUMBER OF INCHES]**

For further information or assistance with adoption, including a sample ordinance, jurisdictions should contact the Code Council at incorporation@iccsafe.org.

For a list of frequently asked questions (FAQs) addressing a range of foundational topics about the adoption of model codes by jurisdictions and to learn more about the Code Council's code adoption resources, scan the QR code or visit iccsafe.org/code-adoption-resources.

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INTRODUCTION TO THE INTERNATIONAL PLUMBING CODE

The IPC is a model code that regulates the design and installation of plumbing systems including the plumbing fixtures in all types of buildings except for detached one- and two-family dwellings and townhouses that are not more than three stories above grade in height. The regulations for plumbing systems in one- and two-family dwellings and townhouses are covered by Chapters 25 through 33 of the International Residential Code®(IRC®). The IPC addresses general plumbing regulations, fixture requirements, water heater installations and systems for water distribution, sanitary drainage, special wastes, venting, storm drainage and medical gases. The IPC does not address fuel gas piping systems as those systems are covered by the International Fuel Gas Code®(IFGC®). The IPC also does not regulate swimming pool piping systems, process piping systems, or utility-owned piping and systems. The purpose of the IPC is to the establish the minimum acceptable level of safety to protect life and property from the potential dangers associated with supplying potable water to plumbing fixtures and outlets and the conveyance of bacteria-laden wastewater from fixtures.

The IPC is primarily a specification-oriented (prescriptive) code with some performance-oriented text. For example, Section 405.1 is a performance statement but Chapter 6 contains the prescriptive requirements that will cause Section 405.1 to be satisfied.

Where a building contains plumbing fixtures, those fixtures requiring water must be provided with an adequate supply of water for proper operation. The number of required plumbing fixtures for a building is specified by this code and is based on the anticipated maximum number of occupants for the building and the type of building occupancy. This code provides prescriptive criteria for sizing piping systems connected to those fixtures. Through the use of code-approved materials and the installation requirements specified in this code, plumbing systems will perform their intended function over the life of the building. In summary, the IPC sets forth the minimum requirements for providing

safe water to a building as well as a safe manner in which liquidborne wastes are carried away from a building.

ARRANGEMENT AND FORMAT OF THE 2024 IPC

The format of the IPC allows each chapter to be devoted to a particular subject with the exception of Chapter 3, which contains general subject matters that are not extensive enough to warrant their own independent chapter.

The following table shows how the IPC is divided. The subsequent table shows IPC requirements that are correlated with other I-Codes. The chapter synopses detail the scope and intent of the provisions of the IPC.

CHAPTER TOPICS

CHAPTERS	SUBJECTS
1, 2	Administration and Definitions
3	General Regulations
4	Fixtures, Faucets and Fixture Fittings
5	Water Heaters
6	Water Supply and Distribution
7	Sanitary Drainage
8	Indirect/Special Waste
9	Vents
10	Traps, Interceptors and Separators
11	Storm Drainage
12	Special Piping (Medical Gas)
13	Nonpotable Water Systems
14	Subsurface Graywater Soil Absorption
15	Referenced Standards
Appendices A–F	Appendices
Resource A	Plumbing Provisions Excerpted from ICC A117.1–2017 with Supplement 1

International Building Code Correlated Topics

The IPC requirements for plumbing fixtures and toilet rooms are directly correlated with the requirements of the IBC. The following table shows chapters/sections of the IPC that are correlated with the IBC:

IPC/IBC CORRELATED TOPICS

IPC	IBC	
CHAPTER/SECTION	**CHAPTER/SECTION**	**SUBJECT**
Chapters 3, 4	Chapter 29	Plumbing fixtures & facilities

Chapter 1: Scope and Administration.

Chapter 1 establishes the limits of applicability of the code and describes how the code is to be applied and enforced. The provisions of Chapter 1 establish the authority and duties of the code official appointed by the authority having jurisdiction and also establish the rights and privileges of the design professional, contractor and property owner.

Chapter 2: Definitions.

Chapter 2 is the repository of the definitions of terms used in the body of the code. The user of the code should be familiar with and consult this chapter because the definitions are essential to the correct interpretation of the code and because the user may not be aware that a term is defined.

Chapter 3: General Regulations.

The content of Chapter 3 is often referred to as “miscellaneous,” rather than general regulations. Chapter 3 contains safety requirements for the installation of all types of plumbing and non-plumbing fixtures.

Chapter 4 Fixtures, Faucets and Fixture Fittings.

Chapter 4 contains safety requirements for the installation of all types of plumbing and non-plumbing fixtures.

Chapter 5: Water Heaters.

Chapter 5 regulates the design, approval and installation of water heaters and related safety devices. The intent is to minimize the hazards associated with the installation and operation of water heaters.

Chapter 6: Water Supply and Distribution.

Chapter 6 regulates the supply of potable water from both public and individual sources to every fixture and outlet so that it remains potable. Chapter 6 also regulates the design of the water distribution system, which will allow fixtures to function properly and help prevent backflow conditions.

Chapter 7: Sanitary Drainage.

The purpose of Chapter 7 is to regulate the materials, design and installation of sanitary drainage piping systems and connections made to the system. The intent is to design and install sanitary drainage systems that will function reliably, that are neither undersized nor oversized and that are constructed from materials, fittings and connections as prescribed herein.

Chapter 8: Indirect/Special Waste.

Chapter 8 regulates drainage installations that require an indirect connection to the sanitary drainage system. Fixtures and plumbing appliances, such as those associated with food preparation or handling, health care facilities and potable liquids, must beprotected from contamination that can result from connection to the drainage system.

Chapter 9: Vents.

Chapter 9 covers the requirements for vents and venting. Venting protects every trap against the loss of its seal.

Chapter 10: Traps, Interceptors and Separators.

Chapter 10 contains design requirements and installation limitations for traps. Requirements for the design and location of various types of interceptors and separators are provided.

Chapter 11: Storm Drainage.

Chapter 11 regulates the removal of storm water. The proper installation of a storm drainage system reduces the possibility of structural collapse of a flat roof and prevents damage to the footings and foundation of the building.

Chapter 12: Special Piping and Storage Systems.

Chapter 12 contains the requirements for the design, installation, storage, handling and use of nonflammable medical gas systems, including inhalation anesthetic and vacuum piping systems, bulk oxygen storage systems and oxygen-fuel gas systems used for welding and cutting operations.

Chapter 13: Non-potable Water Systems.

Chapter 13 regulates the design and installation of non-potable water systems, including rainwater harvesting systems. The need for a reduction of potable water use in buildings has led building designers to utilize non-potable water in building applications.

Chapter 14: Subsurface Graywater Soil Absorption Systems.

Chapter 14 regulates the design and installation of subsurface graywater soil absorption systems for the disposal of on-site non-potable water such as graywater. The reduction of potable water use in buildings has led building designers in some jurisdictions to use on-site nonpotable water in building applications such as landscape irrigation.

Chapter 15: Referenced Standards.

Chapter 15 lists all of the product and installation standards and codes that are referenced throughout Chapters 1 through 14 and includes identification of the promulgators and the section numbers in which the standards and codes are referenced. As stated in Section 102.8, these standards and codes become an enforceable part of the code (to the prescribed extent of the reference) as if printed in the body of the code.

Appendix A: Plumbing Permit Fee Schedule.

Appendix A provides a format for a fee schedule.

Appendix B: Rates of Rainfall for Various Cities.

Appendix B provides specific rainfall rates for major cities in the United States.

Appendix C: Structural Safety.

Appendix C is provided to direct the user to a registered design professional for the cutting, notching and boring of structural steel members.

Appendix D: Degree Day and Design Temperatures.

Appendix D provides valuable temperature information for designers and installers of plumbing systems in areas where freezing temperatures might exist.

Appendix E: Sizing of Water Piping System.

Appendix E provides two recognized methods for sizing the water service and water distribution piping for any structure.

Appendix F: Board of Appeals.

Appendix F contains the provisions for appeal and the establishment of a board of appeals. The provisions include the application for an appeal, the makeup of the board of appeals and the conduct of the appeal process.

Resource A: Plumbing Provisions Excerpted from ICC A117.1–2017 with Supplement 1, Standard for Accessible and Usable Buildings and Facilities.

Building accessibility is a fundamental tenet in the International Codes. The codes rely on the provisions contained in ICC A117.1 for the design and construction of accessible buildings.

Accessible plumbing facilities and fixtures play a key role in making sure that all aspects of the building provide the requisite level of accessibility. ICC A117.1 is referenced in Sections 404.2 and 410.3.

RELOCATION OF TEXT OR TABLES

The following table indicates relocation of sections and tables in the 2024 edition of the IPC from the 2021 edition.

RELOCATIONS

2024 LOCATION	2021 LOCATION
104	105
104.2.3	105.1
104.2.3.6	105.2.1
104.2.2	105.3
104.2.4	105.3.1
104.2.2.4	105.3.2
104.2.3.5	105.3.2
104.7.4	105.3.3
104.9	105.4
104.9.1	105.4.1

Chapter 1: Scope and Administration

User notes:

About this chapter: Chapter 1 establishes the limits of applicability of this code and describes how the code is to be applied and enforced. Chapter 1 is in two parts: Part 1—Scope and Application (Sections 101 and 102) and Part 2—Administration and Enforcement (Sections 103–115). Section 101 identifies which buildings and structures come under its purview and references other I-Codes as applicable. Standards and codes are scoped to the extent referenced (see Section 102.8). This code is intended to be adopted as a legally enforceable document and it cannot be effective without adequate provisions for its administration and enforcement. The provisions of Chapter 1 establish the authority and duties of the code official appointed by the authority having jurisdiction and also establish the rights and privileges of the design professional, contractor and property owner.

Section 105 was revised and relocated to Section 104 for the 2024 edition. For complete information, see the Relocations table in the Preface of this code.

QR code use: A QR code is placed at the beginning of any section that has undergone technical revision. To see those revisions, scan the QR code with a smart device or enter the 7-digit code beneath the QR code at the end of the following URL: qr.iccsafe.org/ (see Formatting Changes to the 2024 International Codes for more information).

Part 1: Scope and Application

Section 101: Scope and General Requirements

[A] 101.1: Title.

These regulations shall be known as the Plumbing Code of [NAME OF JURISDICTION] hereinafter referred to as “this code.”

[A] 101.2: Scope.

The provisions of this code shall apply to the erection, installation, alteration, repairs, relocation, replacement, addition to, use or maintenance of plumbing systems within this jurisdiction. This code shall regulate nonflammable medical gas, inhalation anesthetic, vacuum piping, nonmedical oxygen systems and sanitary and condensate vacuum collection systems. The installation of fuel gas distribution piping and equipment, fuel-gas-fired water heaters and water heater venting systems shall be regulated by the International Fuel Gas Code.

> **Exception:** Detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with this code or the International Residential Code.

[A] 101.2.1: Appendices.

Provisions in the appendices shall not apply unless specifically adopted.

[A] 101.3: Purpose.

The purpose of this code is to establish minimum requirements to provide a reasonable level of safety, health, property protection and general welfare by regulating and controlling the design, construction, installation, quality of materials, location, operation and maintenance or use of plumbing equipment and systems.

[A] 101.4: Severability.

If any section, subsection, sentence, clause or phrase of this code is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this code.

Section 102: Applicability

[A] 102.1: General.

Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

[A] 102.2: Existing installations.

Plumbing systems lawfully in existence at the time of the adoption of this code shall be permitted to have their use and maintenance continued if the use, maintenance or repair is in accordance with the original design and hazard to life, health or property is not created by such plumbing system.

[A] 102.2.1: Existing buildings.

Additions, alterations, renovations or repairs related to building or structural issues shall be regulated by the International Existing Building Code.

[A] 102.3: Maintenance.

Plumbing systems, materials and appurtenances, both existing and new, and parts thereof, shall be maintained in proper operating condition in accordance with the original design in a safe and sanitary condition. Devices or safeguards required by this code shall be maintained in compliance with the edition of the code under which they were installed.

The owner or the owner’s authorized agent shall be responsible for maintenance of plumbing systems. To determine compliance with this provision, the code official shall have the authority to require any plumbing system to be reinspected.

[A] 102.4: Additions, alterations or repairs.

Additions, alterations, renovations or repairs to any plumbing system shall conform to that required for a new plumbing system without requiring the existing plumbing system to comply with all of the requirements of this code. Additions, alterations or repairs shall not cause an existing system to become unsafe, unsanitary or overloaded.

Minor additions, alterations, renovations and repairs to existing plumbing systems shall meet the provisions for new construction, unless such work is done in the same manner and arrangement as was in the existing system, is not hazardous and is approved.

[A] 102.5: Change in occupancy.

It shall be unlawful to make any change in the occupancy of any structure that will subject the structure to any special provision of this code applicable to the new occupancy without approval of the code official. The code official shall certify that such structure meets the intent of the provisions of law governing building construction for the proposed new occupancy and that such change of occupancy does not result in any hazard to the public health, safety or welfare.

[A] 102.6: Historic buildings.

The provisions of this code relating to the construction, alteration, repair, enlargement, restoration, relocation or moving of buildings or structures shall not be mandatory for existing buildings or structures identified and classified by the state or local jurisdiction as historic buildings where such buildings or structures are judged by the code official to be safe and in the public interest of health,

safety and welfare regarding any proposed construction, alteration, repair, enlargement, restoration, relocation or moving of buildings.

[A] 102.7: Moved buildings.

Except as determined by Section 102.2, plumbing systems that are a part of buildings or structures moved into or within the jurisdiction shall comply with the provisions of this code for new installations.

[A] 102.8: Referenced codes and standards.

The codes and standards referenced in this code shall be those that are listed in Chapter 15 and such codes and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections 102.8.1 and 102.8.2.

[A] 102.8.1: Conflicts.

Where conflicts occur between provisions of this code and the referenced standards, the provisions of this code shall apply.

[A] 102.8.2: Provisions in referenced codes and standards.

Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

[A] 102.9: Requirements not covered by code.

Any requirements necessary for the strength, stability or proper operation of an existing or proposed plumbing system, or for the public safety, health and general welfare, not specifically covered by this code shall be determined by the code official.

[A] 102.10: Other laws.

The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law.

[A] 102.11: Application of references.

Reference to chapter section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

Part 2: Administration and Enforcement

Section 103: Code Compliance Agency

[A] 103.1: Creation of agency.

The [INSERT NAME OF DEPARTMENT] is hereby created and the official in charge thereof shall be known as the code official. The function of the agency shall be the implementation, administration and enforcement of the provisions of this code.

[A] 103.2: Appointment.

The code official shall be appointed by the chief appointing authority of the jurisdiction.

[A] 103.3: Deputies.

In accordance with the prescribed procedures of this jurisdiction and with the concurrence of the appointing authority, the code official shall have the authority to appoint a deputy code official, other related technical officers, inspectors and other employees. Such employees shall have powers as delegated by the code official.

Section 104: Duties and Powers of the Code Official

[A] 104.1: General.

The code official is hereby authorized and directed to enforce the provisions of this code.

[A] 104.2: Determination of compliance.

The code official shall have the authority to determine compliance with this code, to render interpretations of this code and to adopt policies and procedures in order to clarify the application of its provisions. Such interpretations, policies and procedures:

1. Shall be in compliance with the intent and purpose of this code.
2. Shall not have the effect of waiving requirements specially provided for in this code.

[A] 104.2.1: Listed compliance.

Where this code or a referenced standard requires equipment, materials, products or services to be listed and a listing standard is specified, the listing shall be based on the specified standard. Where a listing standard is not specified, the listing shall be based on an approved listing criteria. Listings shall be germane to the provision requiring the listing. Installation shall be in accordance with the listing and the manufacturer’s instructions, and where required to verify compliance, the listing standard and manufacturer’s instructions shall be made available to the code official.

[A] 104.2.2: Technical assistance.

To determine compliance with this code, the code official is authorized to require the owner or owner’s authorized agent to provide a technical opinion and report.

[A] 104.2.2.1: Costs.

A technical opinion and report shall be provided without charge to the jurisdiction.

[A] 104.2.2.2: Preparer qualifications.

The technical opinion and report shall be prepared by a qualified engineer, specialist, laboratory or specialty organization acceptable to the code official. The code official is authorized to require design submittals to be prepared by, and bear the stamp of, a registered design professional.

[A] 104.2.2.3: Content.

The technical opinion and report shall analyze the properties of the design, operation or use of the building or premises and the facilities and appurtenances situated thereon, to identify and propose necessary recommendations.

[A] 104.2.2.4: Tests.

Where there is insufficient evidence of compliance with the provisions of this code, the code official shall have the authority to require tests as evidence of compliance. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized test standards, the code official shall approve the testing procedures. Such tests shall be performed by a party acceptable to the code official.

[A] 104.2.3: Alternative materials, design and methods of construction and equipment.

The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative is not specifically prohibited by this code and has been approved.

> **Exception:** Performance-based alternative materials, designs or methods of construction and equipment complying with the International Code Council Performance Code.

[A] 104.2.3.1: Approval authority.

An alternative material, design or method of construction shall be approved where the code official finds that the proposed alternative is satisfactory and complies with Sections 104.2.3 through 104.2.3.7, as applicable.

[A] 104.2.3.2: Application and disposition.

Where required, a request to use an alternative material, design or method of construction shall be submitted in writing to the code official for approval. Where the alternative material, design or method of construction is not approved, the code official shall respond in writing, stating the reasons the alternative was not approved.

[A] 104.2.3.3: Compliance with code intent.

An alternative material, design or method of construction shall comply with the intent of the provisions of this code.

[A] 104.2.3.4: Equivalency criteria.

An alternative material, design or method of construction shall, for the purpose intended, be not less than the equivalent of that prescribed in this code with respect to all of the following, as applicable:

1. Quality.
2. Strength.
3. Effectiveness.
4. Durability.
5. Safety, other than fire safety.

6. Fire safety.

[A] 104.2.3.5: Tests.

Tests conducted to demonstrate equivalency in support of an alternative material, design or method of construction application shall be of a scale that is sufficient to predict performance of the end use configuration. Tests shall be performed by a party acceptable to the code official.

[A] 104.2.3.5.1: Fire tests.

Tests conducted to demonstrate equivalent fire safety in support of an alternative material, design or method of construction application shall be of a scale that is sufficient to predict fire safety performance of the end use configuration. Tests shall be performed by a party acceptable to the code official.

[A] 104.2.3.6: Research reports.

Supporting documentation, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall comply with Sections 104.2.3.6.1 and 104.2.3.6.2.

[A] 104.2.3.6.1: Evaluation reports.

Evaluation reports shall be issued by an approved agency, and use of the evaluation report shall require approval by the code official for the installation. The alternate material, design or method of construction and product evaluated shall be within the scope of the code official's recognition of the approved agency. Criteria used for the evaluation shall be identified within the report and, where required, provided to the code official.

[A] 104.2.3.6.2: Other reports.

Reports not complying with Section 104.2.3.6.1 shall describe criteria, including but not limited to any referenced testing or analysis, used to determine compliance with code intent and justify code equivalence. The report shall be prepared by a qualified engineer, specialist, laboratory or specialty organization acceptable to the code official. The code official is authorized to require design submittals to be prepared by, and bear the stamp of, a registered design professional.

[A] 104.2.3.7: Peer review.

The code official is authorized to require submittal of a peer review report in conjunction with a request to use an alternative material, design or method of construction, prepared by a peer reviewer that is approved by the code official.

[A] 104.2.4: Modifications.

Where there are practical difficulties involved in carrying out the provisions of this code, the code official shall have the authority to grant modifications for individual cases, provided that the code official shall first find that one or more special individual reasons make the strict letter of this code impractical, and that the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, accessibility, life and fire safety or structural requirements. The details of the written request for and action granting modifications shall be recorded and entered in the files of the department of building safety.

[A] 104.2.4.1: Flood hazard areas.

The code official shall not grant modifications to any provision required in flood hazard areas as established by Section 1612.3 of the International Building Code unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section 1612 of the International Building Code inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.
5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

[A] 104.3: Applications and permits.

The code official shall receive applications, review construction documents and issue permits, inspect the premises for which such permits have been issued and enforce compliance with the provisions of this code.

104.3.1: Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas.

For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, the code official shall determine if the proposed work constitutes substantial improvement or repair of substantial damage. Where the code official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the code official shall require the building to meet the requirements of Section 1612 of the International Building Code or Section R306 of the International Residential Code, as applicable.

[A] 104.4: Right of entry.

Where it is necessary to make an inspection to enforce the provisions of this code, or where the code official has reasonable cause to believe that there exists in a structure or on any premises a condition that is contrary to or in violation of this code that makes the structure or premises unsafe, dangerous or hazardous, the code official is authorized to enter the structure or premises at all reasonable times to inspect or to perform the duties imposed by this code. If such structure or premises is occupied, the code official shall present credentials to the occupant and request entry. If such building or premises

is occupied, the code official shall present credentials to the occupant and request entry. If such structure or premises is unoccupied, the code official shall first make a reasonable effort to locate the owner, the owner's authorized agent or other person having charge or control of the structure or premises and request entry. If entry is refused, the code official shall have recourse to every remedy provided by law to secure entry.

[A] 104.4.1: Warrant.

Where the code official has first obtained a proper inspection warrant or other remedy provided by law to secure entry, an owner, the owner's authorized agent, occupant or person having charge, care or control of the structure or premises shall not fail or neglect, after a proper request is made as herein provided, to permit entry therein by the code official for the purposes of inspection and examination pursuant to this code.

[A] 104.5: Identification.

The code official shall carry proper identification when inspecting structures or premises in the performance of duties under this code.

[A] 104.6: Notices and orders.

The code official shall issue all necessary notices or orders to ensure compliance with this code. Notices of violations shall be in accordance with Section 114.

[A] 104.7: Official records.

The code official shall keep official records as required by Sections 104.7.1 through 104.7.5. Such official records shall be retained for not less than 5 years or for as long as the building or structure to which such records relate remains in existence, unless otherwise provided by other regulations.

[A] 104.7.1: Approvals.

A record of approvals shall be maintained by the code official and shall be available for public inspection during business hours in accordance with applicable laws.

[A] 104.7.2: Inspections.

The code official shall have the authority to conduct inspections, or shall accept reports of inspection by approved agencies or individuals. Reports of such inspections shall be in writing and be certified by a responsible officer of such approved agency or by the responsible individual. The code official shall keep a record of each inspection made, including notices and orders issued, showing the findings and disposition of each.

[A] 104.7.3: Code alternatives and modifications.

Application for alternative materials, design and methods of construction and equipment in accordance with Section 104.2.3; modifications in accordance with Section 104.2.4; and documentation of the final decision of the code official for either shall be in writing and shall be retained in the official records.

[A] 104.7.4: Tests.

The code official shall keep a record of tests conducted to comply with Sections 104.2.2.4 and 104.2.3.5.

[A] 104.7.5: Fees.

The code official shall keep a record of fees collected and refunded in accordance with Section 108.

[A] 104.8: Liability.

The code official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered personally liable, either civilly or criminally, and is hereby relieved from all personal liability for any damage accruing to persons or property as a result of any act or by reason of any act or omission in the discharge of official duties.

[A] 104.8.1: Legal defense.

Any suit or criminal complaint instituted against any officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code or other laws or ordinances implemented through the enforcement of this code shall be defended by the legal representative of the jurisdiction until the final termination of the proceedings. The code official or any subordinate shall not be liable for costs in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.

[A] 104.9: Approved materials and equipment.

Materials, equipment and devices approved by the code official shall be constructed and installed in accordance with such approval.

[A] 104.9.1: Material and equipment reuse.

Materials, equipment and devices shall not be reused unless such elements are in good working condition and approved.

Section 105: Permits

[A] 105.1: Where required.

Any owner, owner’s authorized agent or contractor who desires to construct, enlarge, alter, repair, move, demolish or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any plumbing system, the installation of which is regulated by this code, or to cause any such work to be performed, shall first make application to the code official and obtain the required permit for the work.

[A] 105.1.1: Annual permit.

Instead of an individual construction permit for each alteration to an already approved system or equipment or appliance installation, the code official is authorized to issue an annual permit upon application therefor to any person, firm or corporation regularly employing one or more qualified tradespersons in the building, structure or on the premises owned or operated by the applicant for the permit.

[A] 105.1.2: Annual permit records.

The person to whom an annual permit is issued shall keep a detailed record of alterations made under such annual permit. The code official shall have access to such records at all times or such records shall be filed with the code official as designated.

[A] 105.2: Exempt work.

The following work shall be exempt from the requirement for a permit:

1. The stopping of leaks in drains, water, soil, waste or vent pipe provided, however, that if any concealed trap, drainpipe, water, soil, waste or vent pipe becomes defective and it becomes necessary to remove and replace the same with new material, such work shall be considered as new work and a permit shall be obtained and inspection made as provided in this code.
2. The clearing of stoppages or the repairing of leaks in pipes, valves or fixtures, and the removal and reinstallation of water closets, provided that 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 any work to be done in violation of the provisions of this code or any other laws or ordinances of this jurisdiction.

[A] 105.3: Application for permit.

Each application for a permit, with the required fee, shall be filed with the code official on a form furnished for that purpose and shall contain a general description of the proposed work and its location. The application shall be signed by the owner or owner’s authorized agent. The permit application shall indicate the proposed occupancy of all parts of the building and of that portion of the site or lot, if any, not covered by the building or structure and shall contain such other information required by the code official.

[A] 105.3.1: Preliminary inspection.

Before a permit is issued, the code official shall be authorized to inspect and evaluate the systems, equipment, buildings, devices, premises and spaces or areas to be used.

[A] 105.3.2: Time limitation of application.

An application for a permit for any proposed work shall be deemed to have been abandoned 180 days after the date of filing, unless such application has been pursued in good faith or a permit has been issued; except that the code official shall have the authority to grant one or more extensions of time for additional periods not exceeding 180 days each. The extension shall be requested in writing and justifiable cause demonstrated.

[A] 105.4: By whom application is made.

Application for a permit shall be made by the person or agent to install all or part of any plumbing system. The applicant shall meet all qualifications established by statute, or by rules promulgated by this code, or by ordinance or by resolution. The full name and address of the applicant shall be stated in the application.

[A] 105.5: Permit issuance.

The application, construction documents and other data filed by an applicant for permit shall be reviewed by the code official. If the code official finds that the proposed work conforms to the requirements of this code and all laws and ordinances applicable thereto, and that the fees specified in Section 108.1 have been paid, a permit shall be issued to the applicant.

[A] 105.5.1: Approved construction documents.

When the code official issues the permit where construction documents are required, the construction documents shall be endorsed in writing and stamped “APPROVED.” Such approved construction documents shall not be changed, modified or altered without authorization from the code official. Work shall be done in accordance with the approved construction documents.

The code official shall have the authority to issue a permit for the construction of a part of a plumbing system before the entire construction documents for the whole system have been submitted or approved, provided that adequate information and detailed statements have been filed complying with all pertinent requirements of this code. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire plumbing system will be granted.

[A] 105.5.2: Validity.

The issuance of a permit or approval of construction documents shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or any other ordinance of the jurisdiction. A permit presuming to give authority to violate or cancel the provisions of this code shall not be valid.

The issuance of a permit based on construction documents and other data shall not prevent the code official from thereafter requiring the correction of errors in said construction documents 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.

[A] 105.5.3: Expiration.

Every permit issued by the code official under the provisions of this code shall expire by limitation and become null and void if the work authorized by such permit is not commenced within 180 days from the date of such permit, or if the work authorized by such permit is suspended or abandoned at any time after the work is commenced for a period of 180 days. Before such work can be recommenced, a new permit shall be first obtained and the fee therefor shall be one-half the amount required for a new permit for such work, provided that changes have not been made and will not be made in the original construction documents for such work, and provided further that such suspension or abandonment has not exceeded 1 year.

[A] 105.5.4: Extensions.

Any permittee holding an unexpired permit shall have the right to apply for an extension of the time within which the permittee will commence work under that permit when work is unable to be commenced within the time required by this section for good and satisfactory reasons. The code official shall extend the time for action by the permittee for a period not exceeding 180 days if there is

reasonable cause. A permit shall not be extended more than once. The fee for an extension shall be one-half the amount required for a new permit for such work.

[A] 105.5.5: Suspension or revocation of permit.

The code official shall have the authority to suspend or revoke a permit issued under the provisions of this code wherever the permit is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any ordinance or regulation or any of the provisions of this code.

[A] 105.5.6: Previous approvals.

This code shall not require changes in the construction documents, construction or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.

[A] 105.5.7: Posting of permit.

The permit or a copy shall be kept on the site of the work until the completion of the project.

Section 106: Construction Documents

[A] 106.1: Construction documents.

Construction documents, engineering calculations, diagrams and other such data shall be submitted in two or more sets, or in a digital format where allowed by the code official, with each application for a permit. The code official shall require construction documents, computations and specifications to be prepared and designed by a registered design professional where required by state law. Construction documents shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. Construction documents for buildings more than two stories in height shall indicate where penetrations will be made for pipes, fittings and components and shall indicate the materials and methods for maintaining required structural safety, fire-resistance rating and fire-blocking.

Exception: The code official shall have the authority to waive the submission of construction documents, calculations or other data if the nature of the work applied for is such that the reviewing of construction documents is not necessary to determine compliance with this code.

[A] 106.2: Retention of construction documents.

One set of approved construction documents shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws.

One set of approved construction documents shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the work authorized thereby is in progress.

Section 107: Notice of Approval

[A] 107.1: Approval.

After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the code official.

[A] 107.1.1: Revocation.

The code official is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the notice is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

Section 108: Fees

[A] 108.1: Payment of fees.

A permit shall not be valid until the fees prescribed by law have been paid. An amendment to a permit shall not be released until the additional fee, if any, has been paid.

[A] 108.2: Schedule of permit fees.

Where work requires a permit, a fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

[A] 108.3: Permit valuations.

The applicant for a permit shall provide an estimated value of the work for which the permit is being issued at time of application. Such estimated valuations shall include the total value of work, including materials and labor, for which the permit is being issued, such as electrical, gas, mechanical, plumbing equipment and permanent systems. Where, in the opinion of the building official, the valuation is underestimated, the permit shall be denied, unless the applicant can show detailed estimates acceptable to the building official. The building official shall have the authority to adjust the final valuation for permit fees.

[A] 108.4: Work commencing before permit issuance.

Any person who commences any work on a plumbing system before obtaining the necessary permits shall be subject to a fee established by the code official that shall be in addition to the required permit fees.

[A] 108.5: Related fees.

The payment of the fee for the construction, alteration, removal or demolition for work done in connection to or concurrently with the work authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law

[A] 108.6: Refunds.

The code official is authorized to establish a refund policy.

Section 109: Service

[A] 109.1: Connection of service utilities.

A person shall not make connections from a utility, source of energy, fuel, power, water system or sewer system to any building or system that is regulated by this code for which a permit is required until authorized by the code official.

[A] 109.2: Temporary connection.

The code official shall have the authority to authorize the temporary connection of the building or system to the utility, source of energy, fuel, power, water system or sewer system for the purpose of testing plumbing systems or for use under a temporary approval.

[A] 109.3: Authority to disconnect service utilities.

The code official shall have the authority to authorize disconnection of utility service to the building, structure or system regulated by this code and the referenced codes and standards in case of emergency where necessary to eliminate an immediate hazard to life or property or where such utility connection has been made without the approval required by Section 109.1 or 109.2.

The code official shall notify the serving utility, and wherever possible the owner or the owner's authorized agent and occupant of the building, structure or service system, of the decision to disconnect prior to taking such action. If not notified prior to disconnecting, the owner, the owner's authorized agent or occupant of the building, structure or service system shall be notified in writing as soon as practical thereafter.

Section 110: Temporary Uses, Equipment and Systems

[A] 110.1: General.

The code official is authorized to issue a permit for temporary uses, equipment and systems. Such permits shall be limited as to time of service, but shall not be permitted for more than 180 days. The code official is authorized to grant extensions for demonstrated cause.

[A] 110.2: Conformance.

Temporary uses, equipment and systems shall conform to requirements of this code as necessary to ensure health, safety and general welfare.

[A] 110.3: Temporary service utilities.

The code official is authorized to give permission to temporarily supply service utilities in accordance with Section 109.

[A] 110.4: Termination of approval.

The code official is authorized to terminate such permit for temporary uses, equipment or systems and to order the same to be discontinued.

Section 111: Inspections and Testing

[A] 111.1: General.

The code official is authorized to conduct such inspections as are deemed necessary to determine compliance with the provisions of this code. Construction or work for which a permit is required shall be subject to inspection by the code official, and such construction or work shall remain visible and

able to be accessed for inspection purposes until approved. Approval as a result of an inspection shall not be construed to be an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Inspections presuming to give authority to violate or cancel the provisions of this code or of other ordinances of the jurisdiction shall not be valid. It shall be the duty of the permit applicant to cause the work to remain visible and able to be accessed for inspection purposes. Neither the code official nor the jurisdiction shall be liable for expenses entailed in the removal or replacement of any material required to allow inspection.

[A] 111.2: Required inspections and testing.

The code official, upon notification from the permit holder or the permit holder's agent, shall make the following inspections and such other inspections as necessary, and shall either release that portion of the construction or shall notify the permit holder or an agent of any violations that must be corrected. The holder of the permit shall be responsible for the scheduling of such inspections.

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before any backfill is put in place.
2. Rough-in inspection shall be made after the roof, framing, fireblocking, firestopping, draft-stopping and bracing is in place and all sanitary, storm and water distribution piping is roughed-in, and prior to the installation of wall or ceiling membranes.
3. Final inspection shall be made after the building is complete, all plumbing fixtures are in place and properly connected, and the structure is ready for occupancy.

[A] 111.2.1: Other inspections.

In addition to the inspections specified in Section 111.2, the code official shall be authorized to make or require other inspections of any construction work to ascertain compliance with the provisions of this code and other laws that are enforced.

[A] 111.2.2: Inspection requests.

It shall be the duty of the holder of the permit or their duly authorized agent to notify the code official when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

[A] 111.2.3: Approval required.

Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the code official. The code official, upon notification, shall make the requested inspections and shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or his or her agent wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the code official.

[A] 111.2.4: Approved agencies.

The code official is authorized to accept reports of approved inspection agencies, provided that such agencies satisfy the requirements as to qualifications and reliability.

[A] 111.2.5: Evaluation and follow-up inspection services.

Prior to the approval of a closed, prefabricated plumbing system and the issuance of a plumbing permit, the code official shall require the submittal of an evaluation report on each prefabricated plumbing system indicating the complete details of the plumbing system, including a description of the system and its components, the basis on which the plumbing system is being evaluated, test results and similar information, and other data as necessary for the code official to determine conformance to this code.

[A] 111.2.5.1: Evaluation service.

The code official shall designate the evaluation service of an approved agency as the evaluation agency, and review such agency's evaluation report for adequacy and conformance to this code.

[A] 111.2.5.2: Follow-up inspection.

Except where ready access is provided to all plumbing systems, service equipment and accessories for complete inspection at the site without disassembly or dismantling, the code official shall conduct the frequency of in-plant inspections necessary to ensure conformance to the approved evaluation report or shall designate an independent, approved inspection agency to conduct such inspections. The inspection agency shall furnish the code official with the follow-up inspection manual and a report of inspections on request, and the plumbing system shall have an identifying label permanently affixed to the system indicating that factory inspections have been performed.

[A] 111.2.5.3: Test and inspection records.

Required test and inspection records shall be available to the code official at all times during the fabrication of the plumbing system and the erection of the building, or such records as the code official designates shall be filed.

[A] 111.3: Special inspections.

Special inspections of alternative engineered design plumbing systems shall be conducted in accordance with Sections 111.3.1 and 111.3.2.

[A] 111.3.1: Periodic inspection.

The registered design professional or designated inspector shall periodically inspect and observe the alternative engineered design to determine that the installation is in accordance with the approved construction documents. Discrepancies shall be brought to the immediate attention of the plumbing contractor for correction. Records shall be kept of all inspections.

[A] 111.3.2: Written report.

The registered design professional shall submit a final report in writing to the code official upon completion of the installation, certifying that the alternative engineered design conforms to the approved construction documents. A notice of approval for the plumbing system shall not be issued until a written certification has been submitted.

[A] 111.4: Testing.

Plumbing work and systems shall be tested as required in Section 312 and in accordance with Sections 111.4.1 through 111.4.3. Tests shall be made by the permit holder and observed by the code official.

[A] 111.4.1: New, altered, extended or repaired systems.

New plumbing systems and parts of existing systems that have been altered, extended or repaired shall be tested as prescribed herein to disclose leaks and defects, except that testing is not required in the following cases:

1. In any case that does not include addition to, replacement, alteration or relocation of any water supply, drainage or vent piping.
2. In any case where plumbing equipment is set up temporarily for exhibition purposes.

[A] 111.4.2: Equipment, material and labor for tests.

Equipment, material and labor required for testing a plumbing system or part thereof shall be furnished by the permit holder.

[A] 111.4.3: Reinspection and testing.

Where any work or installation does not pass any initial test or inspection, the necessary corrections shall be made to comply with this code. The work or installation shall then be resubmitted to the code official for inspection and testing.

Section 112: Means of Appeals

[A] 112.1: General.

In order to hear and decide appeals of orders, decisions or determinations made by the code official relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The board of appeals shall be appointed by the applicable governing authority and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business and shall render all decisions and findings in writing to the appellant with a duplicate copy to the code official.

[A] 112.2: Limitations on authority.

An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or an equivalent or better form of construction is proposed. The board shall not have authority to waive requirements of this code.

[A] 112.3: Qualifications.

The board of appeals shall consist of members who are qualified by experience and training on matters pertaining to the provisions of this code and are not employees of the jurisdiction.

[A] 112.4: Administration.

The code official shall take action without delay in accordance with the decision of the board.

Section 113: Board of Appeals

[A] 113.1: Membership of board.

The board of appeals shall consist of five members appointed by the chief appointing authority as follows: one for 5 years; one for 4 years; one for 3 years; one for 2 years; and one for 1 year. Thereafter, each new member shall serve for 5 years or until a successor has been appointed.

Section 114: Violations

[A] 114.1: Unlawful acts.

It shall be unlawful for any person, firm or corporation to erect, construct, alter, repair, remove, demolish or utilize any plumbing system, or cause same to be done, in conflict with or in violation of any of the provisions of this code.

[A] 114.2: Notice of violation.

The code official shall serve a notice of violation or order to the person responsible for the erection, installation, alteration, extension, repair, removal or demolition of plumbing work in violation of the provisions of this code, or in violation of a detail statement or the approved construction documents thereunder, or in violation of a permit or certificate issued under the provisions of this code. Such order shall direct the discontinuance of the illegal action or condition and the abatement of the violation.

[A] 114.3: Prosecution of violation.

If the notice of violation is not complied with promptly, the code official shall request the legal counsel of the jurisdiction to institute the appropriate proceeding at law or in equity to restrain, correct or abate such violation, or to require the removal or termination of the unlawful occupancy of the structure in violation of the provisions of this code or of the order or direction made pursuant thereto.

[A] 114.4: Violation penalties.

Any person who shall violate a provision of this code or shall fail to comply with any of the requirements thereof or who shall erect, install, alter or repair plumbing work in violation of the approved construction documents or directive of the code official, or of a permit or certificate issued under the provisions of this code, shall be guilty of a [SPECIFY OFFENSE], punishable by a fine of not more than [AMOUNT] dollars or by imprisonment not exceeding [NUMBER OF DAYS], or both such fine and imprisonment. Each day that a violation continues after due notice has been served shall be deemed a separate offense.

[A] 114.5: Abatement of violation.

The imposition of the penalties herein prescribed shall not preclude the legal officer of the jurisdiction from instituting appropriate action to prevent unlawful construction or to restrain, correct or abate a violation, or to prevent illegal occupancy of a building, structure or premises, or to stop an illegal act, conduct, business or utilization of the plumbing on or about any premises.

[A] 114.6: Unsafe plumbing.

Any plumbing regulated by this code that is unsafe or that constitutes a fire or health hazard, insanitary condition, or is otherwise dangerous to human life is hereby declared unsafe. Any use of plumbing regulated by this code constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, fire hazard, disaster, damage or abandonment

is hereby declared an unsafe use. Any such unsafe equipment is hereby declared to be a public nuisance and shall be abated by repair, rehabilitation, demolition or removal.

[A] 114.6.1: Authority to condemn equipment.

Where the code official determines that any plumbing, or portion thereof, regulated by this code has become hazardous to life, health or property or has become unsanitary, the code official shall order in writing that such plumbing either be removed or restored to a safe or sanitary condition. A time limit for compliance with such order shall be specified in the written notice. A person shall not use or maintain defective plumbing after receiving such notice.

Where such plumbing is to be disconnected, written notice as prescribed in Section 114.2 shall be given. In cases of immediate danger to life or property, such disconnection shall be made immediately without such notice.

[A] 114.6.2: Authority to disconnect service utilities.

The code official shall have the authority to authorize disconnection of utility service in accordance with Section 109.3.

[A] 114.6.3: Connection after order to disconnect.

A person shall not make connections from any energy, fuel, power supply or water distribution system or supply energy, fuel or water to any equipment regulated by this code that has been disconnected or ordered to be disconnected by the code official or the use of which has been ordered to be discontinued by the code official until the code official authorizes the reconnection and use of such equipment.

Where any plumbing is maintained in violation of this code, and in violation of any notice issued pursuant to the provisions of this section, the code official shall institute any appropriate action to prevent, restrain, correct or abate the violation.

Section 115: Stop Work Order

[A] 115.1: Authority.

Where the code official finds any work regulated by this code being performed in a manner contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

[A] 115.2: Issuance.

The stop work order shall be in writing and shall be given to the owner of the property, the owner’s authorized agent or the person performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.

[A] 115.3: Emergencies.

Where an emergency exists, the code official shall not be required to give a written notice prior to stopping the work.

[A] 115.4: Failure to comply.

Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction.

Chapter 2: Definitions

User notes:

About this chapter: Codes, by their very nature, are technical documents. Every word, term and punctuation mark can add to or change the meaning of a technical requirement. It is necessary to maintain a consensus on the specific meaning of each term contained in the code. Chapter 2 performs this function by stating clearly what specific terms mean for the purpose of the code.

Section 201: General

201.1: Scope.

Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings shown in this chapter.

201.2: Interchangeability.

Words stated in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural the singular.

201.3: Terms defined in other codes.

Where terms are not defined in this code and are defined in the International Building Code, International Fire Code, International Fuel Gas Code or the International Mechanical Code, such terms shall have the meanings ascribed to them as in those codes.

201.4: Terms not defined.

Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

Section 202: General Definitions

ACCEPTED ENGINEERING PRACTICE - That which conforms to accepted principles, tests or standards of nationally recognized technical or scientific authorities.

[M] ACCESS (TO) - That which enables a fixture, appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel or similar obstruction (see “Ready access”).

ACCESS COVER - A removable plate, usually secured by bolts or screws, to permit access to a pipe or pipe fitting for the purposes of inspection, repair or cleaning.

[BE] ACCESSIBLE - A site, building, facility or portion thereof that complies with Chapter 11 of the International Building Code.

ADAPTER FITTING - An approved connecting device that suitably and properly joins or adjusts pipes and fittings that do not otherwise fit together.

AIR ADMITTANCE VALVE - One-way valve designed to allow air to enter the plumbing drainage system when negative pressures develop in the piping system. The device shall close by gravity and seal the vent terminal at zero differential pressure (no-flow conditions) and under positive internal pressures. The purpose of an air admittance valve is to provide a method of allowing air to enter the plumbing drainage system without the use of a vent extended to open air and to prevent sewer gases from escaping into a building.

AIR BREAK (Drainage System) - A piping arrangement in which a drain from a fixture, appliance or device discharges indirectly into another fixture, receptacle or interceptor at a point below the flood level rim and above the trap seal.

AIR GAP (Drainage System) - The unobstructed vertical distance through the free atmosphere between the outlet of the waste pipe and the flood level rim of the receptacle into which the waste pipe is discharging.

AIR GAP (Water Distribution System) - The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture or other device and the flood level rim of the receptacle.

ALTERNATE ON-SITE NON-POTABLE WATER – Non-potable water from other than public utilities, on-site surface sources and subsurface natural freshwater sources. Examples of such water are graywater, on-site reclaimed water, collected rainwater, captured condensate and rejected water from reverse osmosis systems.

ALTERNATIVE ENGINEERED DESIGN - A plumbing system that performs in accordance with the intent of Chapters 3 through 14 and provides an equivalent level of performance for the protection of public health, safety and welfare. The system design is not specifically regulated by Chapters 3 through 14.

[BG] AMBULATORY CARE FACILITY - Buildings or portions thereof used to provide medical, surgical, psychiatric, nursing or similar care on a less than 24-hour basis to persons who are rendered incapable of self-preservation by the services provided or staff has accepted responsibility for care recipients already incapable.

ANCHORS - See “Supports.”

ANTISIPHON - A term applied to valves or mechanical devices that eliminate siphonage.

[A] APPROVED - Acceptable to the code official.

[A] APPROVED AGENCY - An established and recognized organization that is regularly engaged in conducting tests or furnishing inspection services, or furnishing product evaluation or certification where such organization has been approved by the code official.

AREA DRAIN - A receptacle designed to collect surface or storm water from an open area.

BACKFLOW - Pressure created by any means in the water distribution system, which by being in excess of the pressure in the water supply mains causes a potential backflow condition.

BACKPRESSURE, LOW HEAD - A pressure less than or equal to 4.33 psi (29.88 kPa) or the pressure exerted by a 10-foot (3048 mm) column of water.

BACKSIPHONAGE - The backflow of potentially contaminated water into the potable water system as a result of the pressure in the potable water system falling below atmospheric pressure of the plumbing fixtures, pools, tanks or vats connected to the potable water distribution piping.

WATER SUPPLY SYSTEM - The flow of water or other liquids, mixtures or substances into the distribution pipes of a potable water supply from any source except the intended source.

BACKFLOW, DRAINAGE - A reversal of flow in the drainage system.

BACKFLOW CONNECTION - Any arrangement whereby backflow is possible.

BACKFLOW PREVENTER - A backflow prevention assembly, a backflow prevention device or other means or method to prevent backflow into the potable water supply.

BACKWATER VALVE - A device or valve installed in the building drain or sewer pipe where a sewer is subject to backflow, and that prevents drainage or waste from backing up into a lower level or fixtures and causing a flooding condition.

[BS] BASE FLOOD ELEVATION - A reference point, determined in accordance with the building code, based on the depth or peak elevation of flooding, including wave height, which has a 1 percent (100-year flood) or greater chance of occurring in any given year.

BATHROOM GROUP - A group of fixtures consisting of a water closet, lavatory, bathtub or shower, including or excluding a bidet, an emergency floor drain or both. Such fixtures are located together on the same floor level.

BRANCH - Any part of the piping system except a riser, main or stack.

BRANCH INTERVAL - A vertical measurement of distance, 8 feet (2438 mm) or more in developed length, between the connections of horizontal branches to a drainage stack. Measurements are taken down the stack from the highest horizontal branch connection.

BRANCH VENT - A vent connecting one or more individual vents with a vent stack or stack vent.

[A] BUILDING - Any structure utilized or intended for supporting or sheltering any occupancy.

BUILDING DRAIN - That part of the lowest piping of a drainage system that receives the discharge from soil, waste and other drainage pipes inside and that extends 30 inches (762 mm) in developed length of pipe beyond the exterior walls of the building and conveys the drainage to the building sewer.

COMBINED - A building drain that conveys both sewage and storm water or other drainage.

SANITARY - A building drain that conveys sewage only.

STORM - A building drain that conveys storm water or other drainage, but not sewage.

BUILDING SEWER - That part of the drainage system that extends from the end of the building drain and conveys the discharge to a public sewer, private sewer, individual sewage disposal system or other point of disposal.

BUILDING SUBDRAIN - That portion of a drainage system that does not drain by gravity into the building sewer.

BUILDING TRAP - A device, fitting or assembly of fittings installed in the building drain to prevent circulation of air between the drainage system of the building and the building sewer.

CIRCUIT VENT - A vent that connects to a horizontal drainage branch and vents two traps to not more than eight traps or trapped fixtures connected into a battery.

CIRCULATING HOT WATER SYSTEM - A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixture supply and back to the water-heating equipment.

CISTERN - A small covered tank for storing water for a home or farm. Generally, this tank stores rainwater to be utilized for purposes other than in the potable water supply, and such tank is placed underground in most cases.

CLEANOUT - An access opening in the drainage system utilized for the removal of obstructions. Types of cleanouts include a removable plug or cap, and a removable fixture or fixture trap.

[A] CODE - These regulations, subsequent amendments thereto or any emergency rule or regulation that the administrative authority having jurisdiction has lawfully adopted.

[A] CODE OFFICIAL - The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

COLLECTION PIPE - Unpressurized pipe used within the collection system that drains on-site non-potable water or rainwater to a storage tank by gravity.

COMBINATION FIXTURE - A fixture combining one sink and laundry tray or a two- or three-compartment sink or laundry tray in one unit.

COMBINATION WASTE AND VENT SYSTEM - A specially designed system of waste piping embodying the horizontal wet venting of one or more sinks, lavatories, drinking fountains or floor drains by means of a common waste and vent pipe adequately sized to provide free movement of air above the flow line of the drain.

COMBINED BUILDING DRAIN - See “Building drain, combined.”

COMBINED BUILDING SEWER - See “Building sewer, combined.”

COMMON VENT - A vent connecting at the junction of two fixture drains or to a fixture branch and serving as a vent for both fixtures.

CONCEALED FOULING SURFACE - Any surface of a plumbing fixture that is not readily visible and is not scoured or cleansed with each fixture operation.

CONDUCTOR - A pipe inside the building that conveys storm water from the roof to a storm or combined building drain.

[A] CONSTRUCTION DOCUMENT - All of the written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of the project necessary for obtaining a building permit. The construction drawings shall be drawn to an appropriate scale.

CONTAMINATION - An impairment of the quality of the potable water that creates an actual hazard to the public health through poisoning or the spread of disease by sewage, industrial fluids or waste.

COPPER ALLOY - A homogenous mixture of two or more metals in which copper is the primary component, such as brass and bronze.

CRITICAL LEVEL (C-L) - An elevation (height) reference point that determines the minimum height at which a backflow preventer or vacuum breaker is installed above the flood level rim of the fixture or receptor served by the device. The critical level is the elevation level below which there is a potential for backflow to occur. If the critical level marking is not indicated on the device, the bottom of the device shall constitute the critical level.

CROSS CONNECTION - Any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other either water of unknown or questionable safety or steam, gas or chemical, whereby there exists the possibility for flow from one system to the other, with the direction of flow depending on the pressure differential between the two systems (see “Backflow”).

DEMAND RECIRCULATION WATER SYSTEM - A water distribution system where one or more pumps prime the service hot water piping with heated water upon a demand for hot water.

DEPTH OF TRAP SEAL - The depth of liquid that would have to be removed from a full trap before air could pass through the trap.

[BS] 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 shall be the elevation of the highest existing grade of the building’s perimeter plus the depth number (in feet) (mm) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).

DEVELOPED LENGTH - The length of a pipeline measured along the centerline of the pipe and fittings.

DISCHARGE PIPE - A pipe that conveys the discharge from plumbing fixtures or appliances.

DRAIN - Any pipe that carries wastewater or waterborne wastes in a building drainage system.

DRAINAGE FITTING - The type of fitting or fittings utilized in the drainage system. Drainage fittings are similar to cast-iron fittings, except that instead of having a bell and spigot, drainage fittings are recessed and tapped to eliminate ridges on the inside of the installed pipe.

DRAINAGE FIXTURE UNIT (dfu) - A measure of the probable discharge into the drainage system by various types of plumbing fixtures. The drainage fixture-unit value for a particular fixture depends on its volume rate of drainage discharge, on the time duration of a single drainage operation and on the average time between successive operations.

DRAINAGE SYSTEM - Piping within a public or private premise that conveys sewage, rainwater or other liquid waste to a point of disposal. A drainage system does not include the mains of a public sewer system or a private or public sewage treatment or disposal plant.

BUILDING GRAVITY - A drainage system that drains by gravity into the building sewer.

SANITARY - A drainage system that carries sewage and excludes storm, surface and ground water.

STORM - A drainage system that carries rainwater, surface water, subsurface water and similar liquid waste.

DRINKING FOUNTAIN - A plumbing fixture that is connected to the potable water distribution system and the drainage system. The fixture allows the user to obtain a drink directly from a stream of flowing water without the use of any accessories.

DUAL FLUSHING DEVICE - A feature that allows the user to flush a water closet with either a reduced or full volume of water, depending on bowl contents.

EFFECTIVE OPENING - The minimum cross-sectional area at the point of water supply discharge, measured or expressed in terms of the diameter of a circle or, if the opening is not circular, the diameter of a circle of equivalent cross-sectional area. For faucets and similar fittings, the effective opening shall be measured at the smallest orifice in the fitting body or in the supply piping to the fitting.

EMERGENCY FLOOR DRAIN - A floor drain that does not receive the discharge of any drain or indirect waste pipe, and that protects against damage from accidental spills, fixture overflows and leakage.

ESSENTIALLY NONTOXIC TRANSFER FLUID - Fluids having a Gosselin rating of 1, including propylene glycol; mineral oil; polydimethylsiloxane; hydrochlorofluorocarbon, chlorofluorocarbon and carbon refrigerants; and FDA-approved boiler water additives for steam boilers.

ESSENTIALLY TOXIC TRANSFER FLUID - Soil, waste or graywater and fluids having a Gosselin rating of 2 or more, including ethylene glycol, hydrocarbon oils, ammonia refrigerants and hydrazine.

EXISTING INSTALLATION - Any plumbing system regulated by this code that was legally installed prior to the effective date of this code, or for which a permit to install has been issued.

[BE] FAMILY OR ASSISTED-USE BATHING ROOM - A room separate from other bathing rooms that: is intended to be used by all persons regardless of sex, families and those needing assisted care; has an independent entrance, not more than one shower or bathtub, not more than one adult-height water closet and one adult-height lavatory; and is permitted to have one urinal, one child-height water closet and one child-height lavatory.

[BE] FAMILY OR ASSISTED-USE TOILET FACILITY - A room separate from other toilet facilities that: is intended to be used by all persons regardless of sex, families and those needing assisted care; has an independent entrance, not more than one adult-height water closet and not more than one adult-height lavatory; and is permitted to have one urinal, one child-height water closet and one child-height lavatory.

FAUCET - A valve end of a water pipe through which water is drawn from or held within the pipe.

FILL VALVE - A water supply valve, opened or closed by means of a float or similar device, utilized to supply water to a tank. An antisiphon fill valve contains an antisiphon device in the form of an approved air gap or vacuum breaker that is an integral part of the fill valve unit and that is positioned on the discharge side of the water supply control valve.

FIXTURE - See “Plumbing fixture.”

FIXTURE BRANCH - A drain serving two or more fixtures that discharges to another drain or to a stack.

FIXTURE DRAIN - The drain from the trap of a fixture to a junction with any other drain pipe.

FIXTURE FITTING:

SUPPLY FITTING - A fitting that controls the volume, direction of flow or both of water, and is either attached to or accessed from a fixture, or is used with an open or atmospheric discharge.

WASTE FITTING - A combination of components that conveys the sanitary waste from the outlet of a fixture to the connection to the sanitary drainage system.

FIXTURE SUPPLY - The water supply pipe connecting a fixture to a branch water supply pipe or directly to a main water supply pipe.

[BS] FLOOD HAZARD AREA - The greater of the following two areas:

1. The area within a flood plain 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 as otherwise legally designated.

FLOOD LEVEL RIM - The edge of the receptacle from which water overflows.

FLOW CONTROL (Vented) - A device installed upstream from the interceptor having an orifice that controls the rate of flow through the interceptor and an air intake (vent) downstream from the orifice that allows air to be drawn into the flow stream.

FLOW PRESSURE - The pressure in the water supply pipe near the faucet or water outlet while the faucet or water outlet is wide open and flowing.

FLUSH TANK - A tank designed with a fill valve and flush valve to flush the contents of the bowl or usable portion of the fixture.

FLUSHOMETER TANK - A device integrated within an air accumulator vessel that is designed to discharge a predetermined quantity of water to fixtures for flushing purposes.

FLUSHOMETER VALVE - A valve attached to a pressurized water supply pipe and designed so that when activated, the valve opens the line for direct flow into the fixture at a rate and quantity to operate the fixture properly, and then gradually closes to reseal fixture traps and avoid water hammer.

FULL-OPEN VALVE - A water control or shutoff component in the water supply system piping that, where adjusted for maximum flow, the flow path through the component’s closure member is not a restriction in the component’s through-flow area.

GRAYWATER - Waste discharged from lavatories, bathtubs, showers, clothes washers and laundry trays.

GREASE INTERCEPTOR:

- **Fats, oils, and greases (FOG) disposal system** - A plumbing appurtenance that reduces nonpetroleum fats, oils and greases in effluent by separation or mass and volume reduction.
- **Gravity** - Plumbing appurtenances of not less than 500 gallons (1893 L) capacity that are installed in the sanitary drainage system to intercept free-floating fats, oils and grease from wastewater discharge. Separation is accomplished by gravity during a retention time of not less than 30 minutes.
- **Hydromechanical** - Plumbing appurtenances that are installed in the sanitary drainage system to intercept free-floating fats, oils and grease from wastewater discharge. Continuous separation is accomplished by air entrainment, buoyancy and interior baffling.

GREASE REMOVAL DEVICE, AUTOMATIC (GRD) - A plumbing appurtenance that is installed in the sanitary drainage system to intercept free-floating fats, oils and grease from wastewater discharge. Such a device operates on a time- or event-controlled basis and has the ability to remove free-floating fats, oils and grease automatically without intervention from the user except for maintenance.

GREASE-LADEN WASTE - Effluent discharge that is produced from food processing, food preparation or other sources where grease, fats and oils enter automatic dishwater prerinse stations, sinks or other appurtenances.

GRIDDED WATER DISTRIBUTION SYSTEM - A water distribution system where every water distribution pipe is interconnected so as to provide two or more paths to each fixture supply pipe.

GROUP WASH FIXTURE - A type of 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.

HANGERS - See “Supports.”

HORIZONTAL BRANCH DRAIN - A drainage branch pipe extending laterally from a soil or waste stack or building drain, with or without vertical sections or branches, that receives the discharge from two or more fixture drains or branches and conducts the discharge to the soil or waste stack or to the building drain.

HORIZONTAL PIPE - Any pipe or fitting that makes an angle of less than 45 degrees (0.79 rad) with a horizontal plane.

HOT WATER - Water at a temperature greater than or equal to 110°F (43°C).

HOUSE TRAP - See “Building trap.”

INDIRECT WASTE PIPE - A waste pipe that does not connect directly with the drainage system, but that discharges into the drainage system through an air break or air gap into a trap, fixture, receptor or interceptor.

INDIVIDUAL SEWAGE DISPOSAL SYSTEM - A system for disposal of domestic sewage by means of a septic tank, cesspool or mechanical treatment, designed for utilization apart from a public sewer to serve a single establishment or building.

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.

INDIVIDUAL WATER SUPPLY - A water supply that serves one or more families, and that is not an approved public water supply.

INTERCEPTOR - A device designed and installed to separate and retain for removal, by automatic or manual means, deleterious, hazardous or undesirable matter from normal wastes, while permitting normal sewage or wastes to discharge into the drainage system by gravity.

JOINT:

Expansion - A loop, return bend or return offset that provides for the expansion and contraction in a piping system and is utilized in tall buildings or where there is a rapid change of temperature, as in power plants, steam rooms and similar occupancies.

Flexible - Any joint between two pipes that permits one pipe to be deflected or moved without movement or deflection of the other pipe.

Mechanical - See “Mechanical joint.”

Slip - A type of joint made by means of a washer or a special type of packing compound in which one pipe is slipped into the end of an adjacent pipe.

LEADER - An exterior drainage pipe for conveying storm water from roof or gutter drains to an approved means of disposal.

LEAD-FREE SOLDER AND FLUX - Containing not more than 0.2 percent lead.

MACERATING TOILET SYSTEM - An assembly consisting of a water closet and sump with a macerating pump that is designed to collect, grind and pump wastes from the water closet and up to two other fixtures connected to the sump.

MAIN - The principal pipe artery to which branches are connected.

MANIFOLD - See “Plumbing appurtenance.”

[M] MECHANICAL JOINT - A connection between pipes, fittings, or pipes and fittings that is not screwed, caulked, threaded, soldered, solvent cemented, brazed, welded or heat fused. A joint in which compression is applied along the centerline of the pieces being joined. In some applications, the joint is part of a coupling, fitting or adapter.

MEDICAL GAS SYSTEM - The complete system to convey medical gases for direct patient application from central supply systems (bulk tanks, manifolds and medical air compressors), with pressure and operating controls, alarm warning systems, related components and piping networks extending to station outlet valves at patient use points.

MEDICAL VACUUM SYSTEM - 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 suitable station inlets at locations where patient suction may be required.

METER - A measuring device used to collect data and indicate water usage.

NONPOTABLE WATER - Water not safe for drinking, personal or culinary utilization.

NUISANCE - Public nuisance as known in common law or in equity jurisprudence; whatever is dangerous to human life or detrimental to health; whatever structure or premises is not sufficiently ventilated, sewered, drained, cleaned or lighted, with respect to its intended occupancy; and whatever renders the air, or human food, drink or water supply unwholesome.

[A] OCCUPANCY - The purpose for which a building or portion thereof is utilized or occupied.

OFFSET - A combination of approved bends that makes two changes in direction bringing one section of the pipe out of line but into a line parallel with the other section.

ON-SITE NONPOTABLE WATER REUSE SYSTEM - A water system for the collection, treatment, storage, distribution and reuse of nonpotable water generated on-site, including but not limited to a graywater system. This definition does not include a rainwater harvesting system.

OPEN AIR - Outside the structure.

[A] PEER REVIEW - An independent and objective technical review conducted by an approved third party.

PLUMBING - The practice, materials and fixtures utilized in the installation, maintenance, extension and alteration of all piping, fixtures, plumbing appliances and plumbing appurtenances, within or adjacent to any structure, in connection with sanitary drainage or storm drainage facilities; venting systems; and public or private water supply systems.

PLUMBING APPLIANCE - Water or drain-connected devices intended to perform a special function. These devices have their operation or control dependent on one or more energized components, such as motors, controls or heating elements. Such devices are manually adjusted or controlled by the owner or operator, or are operated automatically through one or more of the following actions: a time cycle, a temperature range, a pressure range, a measured volume or weight.

PLUMBING APPURTENANCE - A manufactured device, prefabricated assembly or on-the-job assembly of component parts that is an adjunct to the basic piping system and plumbing fixtures. An appurtenance does not demand additional water supply and does not add any discharge load to a fixture or to the drainage system.

PLUMBING FIXTURE - A receptacle or device that is connected to a water supply system or discharges to a drainage system or both. Such receptacles or devices require a supply of water; or discharge liquid waste or liquid-borne solid waste; or require a supply of water and discharge waste to a drainage system.

PLUMBING SYSTEM - A system that includes the water distribution pipes; plumbing fixtures and traps; water-treating or water-using equipment; soil, waste and vent pipes; and building drains; in addition to their respective connections, devices and appurtenances within a structure or premises; and the water service, building sewer and building storm sewer serving such structure or premises.

POLLUTION - An impairment of the quality of the potable water to a degree that does not create a hazard to public health but that does adversely and unreasonably affect the aesthetic qualities of such potable water for domestic use.

POTABLE WATER - Water free from impurities present in amounts sufficient to cause disease or harmful physiological effects and conforming to the bacteriological and chemical quality requirements of the Public Health Service Drinking Water Standards or the regulations of the public health authority having jurisdiction.

[M] PRESS-CONNECT JOINT - A permanent mechanical joint incorporating an elastomeric seal or an elastomeric seal and corrosion-resistant grip ring. The joint is made with a pressing tool and jaw or ring approved by the fitting manufacturer.

PRIVATE - In the classification of plumbing fixtures, “private” applies to fixtures that are not public.

PUBLIC OR PUBLIC UTILIZATION - In the classification of plumbing fixtures, “public” applies to fixtures with unrestricted exposure to walk-in traffic.

PUBLIC SWIMMING POOL - A pool, other than a residential pool, that is intended to be used for swimming or bathing and is operated by an owner, lessee, operator, licensee or concessionaire, regardless of whether a fee is charged for use.

PUBLIC WATER MAIN - A water supply pipe for public utilization controlled by public authority.

PUSH-FIT FITTING - A mechanical fitting that joins pipes or tubes and achieves a seal by mating the pipe or tube into the fitting.

QUICK-CLOSING VALVE - A valve or faucet that closes automatically when released manually or that is controlled by a mechanical means for fast-action closing.

RAINWATER - Water from natural precipitation.

[M] READY ACCESS - That which enables a fixture, appliance or equipment to be directly reached without requiring the removal or movement of any panel or similar obstruction and without the use of a portable ladder, step stool or similar device.

RECLAIMED WATER - Non-potable water that has been derived from the treatment of wastewater by a facility or system licensed or permitted to produce water meeting the jurisdiction’s water requirements for its intended uses. Also known as “recycled water.”

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY - A backflow prevention device consisting of two independently acting check valves, internally force-loaded to a normally closed position and separated by an intermediate chamber (or zone) in which there is an automatic relief means of venting to the atmosphere, internally loaded to a normally open position between two tightly closing shutoff valves and with a means for testing for tightness of the checks and opening of the relief means.

[A] REGISTERED DESIGN PROFESSIONAL - An individual who is registered or licensed to practice their respective design profession, as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

RELIEF VALVE.

Pressure relief valve - A pressure-actuated valve held closed by a spring or other means and designed to relieve pressure automatically at the pressure at which such valve is set.

Temperature and pressure relief (T&P) valve - A combination relief valve designed to function as both a temperature relief and a pressure relief valve.

Temperature relief valve - A temperature-actuated valve designed to discharge automatically at the temperature at which such valve is set.

RELIEF VENT - A vent whose primary function is to provide circulation of air between drainage and vent systems.

RIM - An unobstructed open edge of a fixture.

RISER - See “Water pipe, riser.”

ROOF DRAIN - A drain installed to receive water collecting on the surface of a roof and to discharge such water into a leader or a conductor.

ROUGH-IN - Parts of the plumbing system that are installed prior to the installation of fixtures. This includes drainage, water supply, vent piping and the necessary fixture supports and any fixtures that are built into the structure.

SELF-CLOSING FAUCET - A faucet containing a valve that automatically closes upon deactivation of the opening means.

SEPARATOR - See “Interceptor.”

SERVICE SINK - A sink exclusively intended to be used for facilitating the cleaning of a building or tenant space.

SEWAGE - Any liquid waste containing animal or vegetable matter in suspension or solution, including liquids containing chemicals in solution.

SEWAGE EJECTOR - A device for lifting sewage by entraining the sewage in a high-velocity jet of steam, air or water.

SEWER.

Building sewer - See “Building sewer.”

Public sewer - That part of the drainage system of pipes, installed and maintained by a city, township, county, public utility company or other public entity, and located on public property, in the street or in an approved dedicated easement of public or community use.

Sanitary sewer - A sewer that carries sewage and excludes storm, surface and ground water.

Storm sewer - A sewer that conveys rainwater, surface water, subsurface water and similar liquid wastes.

SLOPE - The fall (pitch) of a line of pipe in reference to a horizontal plane. In drainage, the slope is expressed as the fall in units vertical per units horizontal (percent) for a length of pipe.

SOIL PIPE - A pipe that conveys sewage containing fecal matter to the building drain or building sewer.

SPILLPROOF VACUUM BREAKER - An assembly consisting of one check valve force-loaded closed and an air-inlet vent valve force-loaded open to atmosphere, positioned downstream of the check valve, and located between and including two tightly closing shutoff valves and a test cock.

STACK - A general term for any vertical line of soil, waste, vent or inside conductor piping that extends through not fewer than one story with or without offsets.

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

STACK VENTING - A method of venting a fixture or fixtures through the soil or waste stack.

STORM DRAIN - See “Drainage system, storm.”

STORM WATER - Natural precipitation, including snow-melt, that has contacted a surface at or below grade.

[A] STRUCTURE - That which is built or constructed.

SUBSOIL DRAIN - A drain that collects subsurface water or seepage water and conveys such water to a place of disposal.

SUMP - A tank or pit that receives sewage or liquid waste, located below the normal grade of the gravity system and that must be emptied by mechanical means.

SUMP PUMP - An automatic water pump powered by an electric motor for the removal of drainage, except raw sewage, from a sump, pit or low point.

SUMP VENT - A vent from pneumatic sewage ejectors, or similar equipment, that terminates separately to the open air.

SUPPORTS - Devices for supporting and securing pipe, fixtures and equipment.

SWIMMING POOL - A permanent or temporary structure that is intended to be used for swimming, bathing or wading and that is designed and manufactured or built to be connected to a circulation system. A swimming pool can be open to the public regardless of whether a fee is charged for its use or can be accessory to a residential setting where the pool is available only to the household and guests of the household.

TEMPERED WATER - Water having a temperature range between 85°F (29°C) and 110°F (43°C).

THIRD-PARTY CERTIFICATION AGENCY - An approved agency operating a product or material certification system that incorporates initial product testing, assessment and surveillance of a manufacturer’s quality control system.

THIRD-PARTY CERTIFIED - Certification obtained by the manufacturer indicating that the function and performance characteristics of a product or material have been determined by testing and ongoing surveillance by an approved third-party certification agency. Assertion of certification is in the form of identification in accordance with the requirements of the third-party certification agency.

TOILET FACILITY - A room or space that contains not less than one water closet and one lavatory.

Multiple-user toilet facility - A toilet facility intended to be used by multiple occupants. Such facilities have more than one water closet and one lavatory. Each water closet is located in its own compartment that is created by vertical partitions. Single-user toilet facility.A toilet facility intended to be used by a single occupant and that contains not less than one water closet and one lavatory.

TRAP - A fitting or device that provides a liquid seal to prevent the emission of sewer gases without materially affecting the flow of sewage or wastewater through the trap.

TRAP SEAL - The vertical distance between the weir and the top of the dip of the trap.

UNSTABLE GROUND - Earth that does not provide a uniform bearing for the barrel of the sewer pipe between the joints at the bottom of the pipe trench.

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

VACUUM BREAKER - A type of backflow preventer installed on openings subject to normal atmospheric pressure that prevents backflow by admitting atmospheric pressure through ports to the discharge side of the device.

VENT PIPE - See “Vent system.”

VENT STACK - A vertical vent pipe installed primarily for the purpose of providing circulation of air to and from any part of the drainage system.

VENT SYSTEM - A pipe or pipes installed to provide a flow of air to or from a drainage system, or to provide a circulation of air within such system to protect trap seals from siphonage and backpressure.

VERTICAL PIPE - Any pipe or fitting that makes an angle of 45 degrees (0.79 rad) or more with the horizontal.

WALL-HUNG WATER CLOSET - A wall-mounted water closet installed in such a way that the fixture does not touch the floor.

WASTE - The discharge from any fixture, appliance, area or appurtenance that does not contain fecal matter.

WASTE PIPE - A pipe that conveys only waste.

WASTE RECEPTOR - A floor sink, standpipe, hub drain or floor drain that receives the discharge of one or more indirect waste pipes.

WATER COOLER - A drinking fountain that incorporates a means of reducing the temperature of the water supplied to it from the potable water distribution system.

WATER DISPENSER - A plumbing fixture that is manually controlled by the user for the purpose of dispensing potable drinking water into a receptacle such as a cup, glass or bottle. Such fixture is connected to the potable water distribution system of the premises.

[M] WATER HEATER - Any heating appliance or equipment that heats potable water and supplies such water to the potable hot water distribution system.

WATER MAIN - A water supply pipe or system of pipes, installed and maintained by a city, township, county, public utility company or other public entity, on public property, in the street or in an approved dedicated easement of public or community use.

WATER OUTLET - A discharge opening through which water is supplied to a fixture, into the atmosphere (except into an open tank that is part of the water supply system), to a boiler or heating system, or to any devices or equipment that require water to operate but are not part of the plumbing system.

WATER PIPE.

Riser - A water supply pipe that extends one full story or more to convey water to branches or to a group of fixtures.

Water distribution pipe - A pipe within the structure or on the premises that conveys water from the water service pipe, or from the meter when the meter is at the structure, to the points of utilization.

Water service pipe - The pipe from the water main or other source of potable water supply, or from the meter when the meter is at the public right of way, to the water distribution system of the building served.

WATER SUPPLY SYSTEM - The water service pipe, water distribution pipes, and the necessary connecting pipes, fittings, control valves and all appurtenances in or adjacent to the structure or premises.

WATER-HAMMER ARRESTOR - A device utilized to absorb the pressure surge (water hammer) that occurs when water flow is suddenly stopped in a water supply system.

WELL.

Bored - A well constructed by boring a hole in the ground with an auger and installing a casing.

Drilled - A well constructed by making a hole in the ground with a drilling machine of any type and installing a casing and screen.

Driven - A well constructed by driving a pipe in the ground. The drive pipe is usually fitted with a well point and screen.

Dug - A well constructed by excavating a large-diameter shaft and installing a casing.

WHIRLPOOL BATHTUB - A plumbing appliance consisting of a bathtub fixture that is 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 a soil or waste stack to a vent stack for the purpose of preventing pressure changes in the stacks.

Chapter 3: General Regulations

User notes:

About this chapter: Chapter 3 covers general regulations for plumbing installations. As many of these requirements would need to be repeated in Chapters 3 through 14, placing such requirements in only one location eliminates code development coordination issues associated with the same requirement in multiple locations. These general requirements can be superseded by more specific requirements for certain applications in Chapters 3 through 14.

Section 301: General

301.1: Scope.

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

301.2: System installation.

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

301.3: Connections to drainage system.

Plumbing fixtures, drains, appurtenances and appliances used to receive or discharge liquid waste or sewage shall be directly connected to the sanitary drainage system of the building or premises, in accordance with the requirements of this code. This section shall not be construed to prevent indirect waste systems required by Chapter 8.

> **Exception:** Bathtubs, showers, lavatories, clothes washers and laundry trays shall not be required to discharge to the sanitary drainage system where such fixtures discharge to an approved system in accordance with Chapters 13 and 14.

301.4: Connections to water supply.

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

301.5: Pipe, tube and fitting sizes.

Unless otherwise indicated, the pipe, tube and fitting sizes specified in this code are expressed in nominal or standard sizes as designated in the referenced material standards.

301.6: Prohibited locations.

Plumbing systems shall not be located in an elevator shaft or in an elevator equipment room.

> **Exception:** Floor drains, sumps and sump pumps shall be permitted at the base of the shaft, provided that they are indirectly connected to the plumbing system and comply with Section 1003.4.

301.7: Conflicts.

In instances where conflicts occur between this code and the manufacturer’s installation instructions, the more restrictive provisions shall apply.

Section 302: Exclusion of Materials Detrimental to the Sewer System

302.1: Detrimental or dangerous materials.

Ashes, cinders or rags; flammable, poisonous or explosive liquids or gases; oil, grease or any other insoluble material capable of obstructing, damaging or overloading the building drainage or sewer system, or capable of interfering with the normal operation of the sewage treatment processes, shall not be deposited, by any means, into such systems.

302.2: Industrial wastes.

Waste products from manufacturing or industrial operations shall not be introduced into the public sewer until it has been determined by the code official or other authority having jurisdiction that the introduction thereof will not damage the public sewer system or interfere with the functioning of the sewage treatment plant.

Section 303: Materials

303.1: Identification.

Each length of pipe and each pipe fitting, trap, fixture, material and device utilized in a plumbing system shall bear the identification of the manufacturer and any markings required by the applicable referenced standards.

303.2: Installation of materials.

Materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved. In the absence of such installation procedures, the manufacturer’s instructions shall be followed. Where the requirements of referenced standards or manufacturer’s installation instructions do not conform to minimum provisions of this code, the provisions of this code shall apply.

303.3: Plastic pipe, fittings and components.

Plastic pipe, fittings and components shall be third-party certified as conforming to NSF 14.

303.4: Third-party certification.

Plumbing products and materials required by the code to be in compliance with a referenced standard shall be listed by a third-party certification agency as complying with the referenced standards. Products and materials shall be identified in accordance with Section 303.1.

303.5: Cast-iron soil pipe, fittings and components.

Cast-iron soil pipes and fittings, and the couplings used to join these products together, shall be third-party listed and labeled. Third-party certifiers or inspectors shall comply with the minimum inspection requirements of Annex A or Annex A1 of the ASTM and CISPI product standards indicated in the code for such products.

Section 304: Rodent-proofing

304.1: General.

Plumbing systems shall be designed and installed in accordance with Sections 304.2 through 304.4 to prevent rodents from entering structures.

304.2: Strainer plates.

Strainer plates on drain inlets shall be designed and installed so that all openings are not greater than 1/2 inch (12.7 mm) in least dimension.

304.3: Meter boxes.

Meter boxes shall be constructed in such a manner that rodents are prevented from entering a structure by way of the water service pipes connecting the meter box and the structure.

304.4: Openings for pipes.

In or on structures where openings have been made in walls, floors or ceilings for the passage of pipes, the annular space between the pipe and the sides of the opening shall be sealed with caulking materials or closed with gasketing systems compatible with the piping materials and locations.

Section 305: Protection of Pipes and Plumbing System Components

305.1: Protection against contact.

Metallic piping, except for cast iron, ductile iron and galvanized steel, shall not be placed in direct contact with steel framing members, concrete or cinder walls and floors or other masonry. Metallic piping shall not be placed in direct contact with corrosive soil. Where sheathing is used to prevent direct contact, the sheathing shall have a thickness of not less than 0.008 inch (8 mil) (0.203 mm) and the sheathing shall be made of plastic. Where sheathing protects piping that penetrates concrete or masonry walls or floors, the sheathing shall be installed in a manner that allows movement of the piping within the sheathing.

305.2: Stress and strain.

Piping in a plumbing system shall be installed so as to prevent strains and stresses that exceed the structural strength of the pipe. Where necessary, provisions shall be made to protect piping from damage resulting from expansion, contraction and structural settlement.

305.3: Pipes through foundation walls.

Any pipe that passes through a foundation wall shall be provided with a relieving arch, or a pipe sleeve pipe shall be built into the foundation wall. The sleeve shall be two pipe sizes greater than the pipe passing through the wall.

305.4: Freezing.

Water, soil and waste pipes shall not be installed outside of a building, in attics or crawl spaces, concealed in outside walls, or in any other place subjected to freezing temperatures unless adequate provision is made to protect such pipes from freezing by insulation or heat or both. Exterior water

supply system piping shall be installed not less than 6 inches (152 mm) below the frost line and not less than 12 inches (305 mm) below grade.

The 2026 Georgia Amendments say:
Building sewers shall be a minimum of 6 inches below grade.

305.4.1: Sewer depth.

Building sewers that connect to private sewage disposal systems shall be installed not less than [NUMBER] inches (mm) below finished grade at the point of septic tank connection. Building sewers shall be installed not less than [NUMBER] inches (mm) below grade.

305.5: Waterproofing of openings.

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

305.6: Protection against physical damage.

In concealed locations where piping, other than cast iron or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1 1/4 inches (32 mm) from the nearest edge of the member, the pipe shall be protected by steel shield plates. Such plates shall cover the area of the pipe where the member is notched or bored, and shall extend not less than 2 inches (51 mm) above sole plates and below top plates.

305.6.1: Shield plates.

Shield plates shall be of steel material having a thickness of not less than 0.0575 inch (1.463 mm) (No. 16 gage).

305.7: Protection of components of plumbing system.

Components of a plumbing system installed along alleyways, driveways, parking garages or other locations exposed to damage shall be recessed into the wall or otherwise protected in an approved manner.

305.8: Expansive soil.

Where expansive soil is identified under buildings in accordance with Section 1803.5.3 of the International Building Code, but not removed in accordance with Section 1808.6.3 of the International Building Code, plumbing shall be protected in accordance with Section 305.8.1 or 305.8.2.

305.8.1: Non-isolated foundations.

Under foundations with slabs that are structurally supported by a subgrade, buried plumbing shall be permitted.

305.8.2: Isolated foundations.

Under foundations with a slab or framing that structurally spans over an under-floor space that isolates the slab or framing from the effects of expansive soil swelling and shrinking in accordance with Section 1808.6.1 of the International Building Code, the plumbing shall be suspended so that plumbing, hangers and supports are isolated, by a void space, from the effects of expansive soil swelling and shrinking.

Exception: Plumbing shall be permitted to be buried where it provides drainage of an under-floor space.

To protect the void space, soil shall be sloped, benched or retained in accordance with an approved design methodology. Plumbing, hangers and supports below the slab or framing shall not be permitted to be in contact with the soil or any assemblage of materials that is in contact with soil in the active zone. A slab and plumbing shall not be permitted to be lifted as an assembly to create the void space unless the under-floor space is a crawl space with access to allow inspection of plumbing after lifting.

Exception: Plumbing shall be permitted to be buried where it provides drainage of an under-floor space.

Organic materials subject to decay shall not be used for hangers, supports and soil retention systems. Materials subject to corrosion shall not be used for hangers, supports and soil retention systems unless protected in an approved manner. Where plumbing transitions to a buried condition beyond the perimeter of the foundation, an adequately flexible expansion joint shall be provided in the plumbing system to accommodate the effects of expansive soil swelling and shrinking.

Section 306: Trenching, Excavation and Backfill

306.1: Support of piping.

Buried piping shall be supported throughout its entire length.

306.2: Trenching and bedding.

Where trenches are excavated such that the bottom of the trench forms the bed for the pipe, solid and continuous load-bearing support shall be provided between joints. Bell holes, hub holes and coupling holes shall be provided at points where the pipe is joined. Such pipe shall not be supported on blocks to grade. In instances where the material manufacturer’s installation instructions are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement.

306.2.1: Over-excavation.

Where trenches are excavated below the installation level of the pipe such that the bottom of the trench does not form the bed for the pipe, the trench shall be backfilled to the installation level of the bottom of the pipe with sand or fine gravel placed in layers not greater than 6 inches (152 mm) in depth and such backfill shall be compacted after each placement.

306.2.2: Rock removal.

Where rock is encountered in trenching, the rock shall be removed to not less than 3 inches (76 mm) below the installation level of the bottom of the pipe, and the trench shall be backfilled to the installation level of the bottom of the pipe with sand tamped in place so as to provide uniform load-bearing support for the pipe between joints. The pipe, including the joints, shall not rest on rock at any point.

306.2.3: Soft load-bearing materials.

If soft materials of poor load-bearing quality are found at the bottom of the trench, stabilization shall be achieved by over excavating not less than two pipe diameters and backfilling to the installation level of the bottom of the pipe with fine gravel, crushed stone or a concrete foundation. The concrete foundation shall be bedded with sand tamped into place so as to provide uniform load-bearing support for the pipe between joints.

306.2.4: Tracer wire.

For plastic sewer piping, an insulated copper tracer wire or other approved conductor shall be installed adjacent to and over the full length of the piping. Access shall be provided to the tracer wire or the tracer wire shall terminate at the cleanout between the building drain and building sewer. The tracer wire size shall be not less than 14 American Wire Gauge (2.5 mm2) and the insulation type shall be listed for direct burial.

306.3: Backfilling.

Backfill shall be free from discarded construction material and debris. Loose earth free from rocks, broken concrete and frozen chunks shall be placed in the trench in 6-inch (152 mm) layers and tamped in place until the crown of the pipe is covered by 12 inches (305 mm) of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned. In instances where the manufacturer’s instructions for materials are more restrictive than those prescribed by the code, the material shall be installed in accordance with the more restrictive requirement.

306.4: Tunneling.

Where pipe is to be installed by tunneling, jacking or a combination of both, the pipe shall be protected from damage during installation and from subsequent uneven loading. Where earth tunnels are used, adequate supporting structures shall be provided to prevent future settling or caving.

Section 307: Structural Safety

307.1: General.

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

307.2: Cutting, notching and boring in wood framing.

The cutting, notching and boring of structural wood framing members shall comply with Section 2308.6 of the International Building Code.

307.3: Cutting and notching in cold-formed steel framing.

The cutting and notching of holes in cold-formed steel framing members shall be in accordance with AISI S240 for structural members and AISI S220 for nonstructural members.

307.4: Penetrations of floor/ceiling assemblies and fire-resistance rated assemblies.

Penetrations of floor/ceiling assemblies and assemblies required to have a fire-resistance rating shall be protected in accordance with the International Building Code.

307.5: Alterations to trusses.

Truss members and components shall not be cut, drilled, notched, spliced or otherwise altered in any way without written concurrence and approval of a registered design professional. Alterations resulting in the addition of loads to any member (such as HVAC equipment and water heaters) shall not be permitted without verification that the truss is capable of supporting such additional loading.

307.6: Protection of footings.

Trenching installed parallel to footings and walls shall not extend into the bearing plane of a footing or wall. The upper boundary of the bearing plane is a line that extends downward, at an angle of 45 degrees (0.79 rad) from horizontal, from the outside bottom edge of the footing or wall.

307.7: Piping materials exposed in plenums.

Piping materials exposed within plenums shall comply with the provisions of the International Mechanical Code.

Section 308: Piping Support

308.1: General.

Plumbing piping shall be supported in accordance with this section.

308.2: Piping seismic supports.

Where earthquake loads are applicable in accordance with the International Building Code, plumbing piping supports, anchorage, and bracing shall be designed and installed for seismic forces in accordance with Chapter 16 of the International Building Code.

308.3: Materials.

Hangers, anchors and supports shall support the piping and the contents of the piping. Hangers and strapping material shall be of approved material that will not promote galvanic action.

308.4: Structural attachment.

Hangers and anchors shall be attached to the building construction in an approved manner.

308.5: Interval of support.

Pipe shall be supported in accordance with Table 308.5.

> **Exception:** The interval of support for piping systems designed to provide for expansion/contraction shall conform to the engineered design in accordance with Section 316.1.

TABLE 308.5 HANGER SPACING PIPING MATERIAL

TABLE 308.5 HANGER SPACING

PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING (feet)	MAXIMUM VERTICAL SPACING (feet)
Acrylonitrile butadiene styrene (ABS) pipe	4	10[b]
Aluminum tubing	10	15
Cast-iron pipe	5[a]	15
Chlorinated polyvinyl chloride (CPVC) pipe and tubing, 1 inch and smaller	3	10[b]
Chlorinated polyvinyl chloride (CPVC) pipe and tubing, 1 1/4 inches and larger	4	10[b]
Copper or copper-alloy pipe	12	10
Copper or copper-alloy tubing, 1 1/4-inch diameter and smaller	6	10
Copper or copper-alloy tubing, 1 1/2-inch diameter and larger	10	10
Cross-linked polyethylene (PEX) pipe, 1 inch and smaller	2.67 (32 inches)	10[b]
Cross-linked polyethylene (PEX) pipe, 1 1/4 inches and larger	4	10[b]
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	2.67 (32 inches)	4
Lead pipe	Continuous	4
Polyethylene/aluminum/polyethylene (PE-AL-PE) pipe	2.67 (32 inches)	4
Polyethylene of raised temperature (PE-RT) pipe, 1 inch and smaller	2.67 (32 inches)	10[b]
Polyethylene of raised temperature (PE-RT) pipe, 1 1/4 inches and larger	4	10[b]
Polypropylene (PP) pipe or tubing, 1 inch and smaller	2.67 (32 inches)	10[b]
Polypropylene (PP) pipe or tubing, 1 1/4 inches and larger	4	10[b]
Polyvinyl chloride (PVC) pipe	4	10[b]
Stainless steel drainage systems	10	10[b]
Steel pipe	12	15

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

a. The maximum horizontal spacing of cast-iron pipe hangers shall be increased to 10 feet where 10-foot lengths of pipe are installed.
b. For sizes 2 inches and smaller, a guide shall be installed midway between required vertical supports. Such guides shall prevent pipe movement in a direction perpendicular to the axis of the pipe.

308.6: Sway bracing.

Where horizontal pipes 4 inches (102 mm) and larger convey drainage or waste, and where a pipe fitting in that piping changes the flow direction greater than 45 degrees (0.79 rad), rigid bracing or other rigid support arrangements shall be installed to resist movement of the upstream pipe in the direction of pipe flow. A change of flow direction into a vertical pipe shall not require the upstream pipe to be braced.

308.7: Anchorage.

Anchorage shall be provided to restrain drainage piping from axial movement.

308.7.1: Location.

For pipe sizes greater than 4 inches (102 mm), restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two pipe sizes. Braces, blocks, rodding and other suitable methods as specified by the coupling manufacturer shall be utilized.

308.8: Expansion joint fittings.

Expansion joint fittings shall be used only where necessary to provide for expansion and contraction of the pipes. Expansion joint fittings shall be of the typical material suitable for use with the type of piping in which such fittings are installed.

308.9: Parallel water distribution systems.

Piping bundles for manifold systems shall be supported in accordance with Table 308.5. Support at changes in direction shall be in accordance with the manufacturer's instructions. Where hot water piping is bundled with cold water piping, hot water piping shall be insulated in accordance with Section 607.5.

308.10: Thermal expansion tanks.

A thermal expansion tank shall be supported in accordance with the manufacturer's instructions. Thermal expansion tanks shall not be supported by the piping that connects to such tanks.

Section 309: Flood Hazard Resistance

309.1: General.

Plumbing systems and equipment in structures erected in flood hazard areas shall be constructed in accordance with the requirements of this section and the International Building Code.

[BS] 309.2: Flood hazard.

For structures located in flood hazard areas, the following systems and equipment shall be located and installed as required by Section 1612 of the International Building Code.

1. Water service pipes.
2. Pump seals in individual water supply systems where the pump is located below the design flood elevation.
3. Covers on potable water wells shall be sealed, except where the top of the casing well or pipe sleeve is elevated to not less than 1 foot (305 mm) above the design flood elevation.
4. Sanitary drainage piping.
5. Storm drainage piping.
6. Manhole covers shall be sealed, except where elevated to or above the design flood elevation.
7. Other plumbing fixtures, faucets, fixture fittings, piping systems and equipment.
8. Water heaters.
9. Vents and vent systems.

[BS] 309.3: Coastal high-hazard areas and coastal A zones.

Structures located in coastal high-hazard areas and coastal A zones shall meet the requirements of Section 309.2. The plumbing systems, pipes and fixtures shall not be mounted on or penetrate through walls intended to break away under flood loads.

Section 310: Toilet Facilities Requirements

310.1: Light and ventilation.

Toilet facilities shall be illuminated and ventilated in accordance with the International Building Code and International Mechanical Code.

310.2: Location of fixtures and compartments.

The location of plumbing fixtures and the requirements for compartments and partitions shall be in accordance with Section 405.3.

310.3: Interior finish.

Interior finish surfaces of toilet facilities shall comply with the International Building Code.

Section 311: Toilet Facilities for Workers

311.1: General.

Toilet facilities shall be provided for construction workers, and such facilities shall be maintained in a sanitary condition. Construction worker toilet facilities of the non-sewered type shall conform to PSAI Z4.3 or to IAPMO/ISO 30500.

Section 312: Tests and Inspections

312.1: Required tests.

The permit holder shall make the applicable tests prescribed in Sections 312.2 through 312.11 to determine compliance with the provisions of this code. The permit holder shall give reasonable advance notice to the code official when the plumbing work is ready for tests. The equipment, material, power and labor necessary for the inspection and test shall be furnished by the permit holder and he or she shall be responsible for determining that the work will withstand the test pressure prescribed in the following tests. Plumbing system piping shall be tested with either water or, for piping systems other than plastic, by air. After the plumbing fixtures have been set and their traps filled with water, the entire drainage system shall be submitted to final tests. The code official shall require the removal of any cleanouts if necessary to ascertain whether the pressure has reached all parts of the system.

312.1.1: Test gauges.

Gauges used for testing shall be as follows:

1. Tests requiring a pressure of 10 pounds per square inch (psi) (69 kPa) or less shall utilize a testing gauge having increments of 0.10 psi (0.69 kPa) or less.
2. Tests requiring a pressure of greater than 10 psi (69 kPa) but less than or equal to 100 psi (689 kPa) shall utilize a testing gauge having increments of 1 psi (6.9 kPa) or less.
3. Tests requiring a pressure of greater than 100 psi (689 kPa) shall utilize a testing gauge having increments of 2 psi (14 kPa) or less.

312.2: Drainage and vent water test.

A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but sections shall not be tested with less than a 10-foot (3048 mm) head of water. In testing successive sections, not less than the upper 10 feet (3048 mm) of the next preceding section shall be tested so that no joint or pipe in the building, except the uppermost 10 feet (3048 mm) of the system, shall have been submitted to a test of less than a 10-foot (3048 mm) head of water. This pressure shall be held for not less than 15 minutes. The system shall then be tight at all points.

312.3: Drainage and vent air test.

Plastic piping shall not be tested using air. An air test shall be made by forcing air into the system until there is a uniform gauge pressure of 5 psi (34.5 kPa) or sufficient to balance a 10-inch (254 mm) column of mercury. This pressure shall be held for a test period of not less than 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperatures or the seating of gaskets shall be made prior to the beginning of the test period.

312.4: Drainage and vent vacuum test.

The portion of the drainage and vent system under test shall be evacuated of air by a vacuum-type pump to achieve a uniform gauge pressure of negative 5 pounds per square inch or a negative 10 inches of mercury column (-34 kPa). This pressure shall be held without the removal of additional air for a period of 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperatures or the seating of gaskets shall be made prior to the beginning of the test period.

312.5: Drainage and vent final test.

The final test of the completed drainage and vent systems shall be visual and in sufficient detail to determine compliance with the provisions of this code. Where a smoke test is utilized, it shall be made by filling all traps with water and then introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a 1-inch water column (248.8 Pa) shall be held for a test period of not less than 15 minutes.

312.6: Water supply system test.

Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or, for piping systems other than plastic, by an air test of not less than 50 psi (344 kPa). This pressure shall be held for not less than 15 minutes. The water utilized for tests shall be obtained from a potable source of supply. The required tests shall be performed in accordance with this section and Section 111.

312.7: Gravity sewer test.

Gravity sewer tests shall consist of plugging the end of the building sewer at the point of connection with the public sewer, filling the building sewer with water, testing with not less than a 10-foot (3048 mm) head of water and maintaining such pressure for 15 minutes.

312.8: Forced sewer test.

Forced sewer tests shall consist of plugging the end of the building sewer at the point of connection with the public sewer and applying a pressure of 5 psi (34.5 kPa) greater than the pump rating, and maintaining such pressure for 15 minutes.

312.9: Storm drainage system test.

Storm drain systems within a building shall be tested by water or air in accordance with Section 312.2 or 312.3.

312.10: Shower liner test.

Where shower floors and receptors are made watertight by the application of materials required by Section 421.5.2, the completed liner installation shall be tested. The pipe from the shower drain shall be plugged watertight for the test. The floor and receptor area shall be filled with potable water to a depth of not less than 2 inches (51 mm) measured at the threshold. Where a threshold of 2 inches (51 mm) high or greater does not exist, a temporary threshold shall be constructed to retain the test water in the lined floor or receptor area to a level not less than 2 inches (51 mm) deep measured at the threshold. The water shall be retained for a test period of not less than 15 minutes, and there shall not be evidence of leakage.

312.11: Inspection and testing of backflow prevention assemblies.

Inspection and testing shall comply with Sections 312.11.1 and 312.11.2.

312.11.1: Inspections.

Annual inspections shall be made of all backflow prevention assemblies and air gaps to determine whether the assemblies are operable and air gaps exist.

312.11.2: Testing.

Reduced pressure principle, double check, pressure vacuum breaker, reduced pressure detector fire protection, double check detector fire protection, and spill-resistant vacuum breaker backflow preventer assemblies and hose connection backflow preventers shall be tested at the time of installation, immediately after repairs or relocation and at least annually. The testing procedure shall

be performed in accordance with one of the following standards ASSE 5013, ASSE 5015, ASSE 5020, ASSE 5047, ASSE 5048, ASSE 5052, ASSE 5056, CSA B64.10 or CSA B64.10.1. Test gauges shall comply with ASSE 1064.

Section 313: Equipment Efficiencies

313.1: General.

Equipment efficiencies shall be in accordance with the International Energy Conservation Code.

Section 314: Condensate Disposal

[M] 314.1: Fuel-burning appliances.

Liquid combustion byproducts of condensing appliances shall be collected and discharged to an approved plumbing fixture or disposal area in accordance with the manufacturer's instructions. Condensate piping shall be of approved corrosion-resistant material and shall not be smaller than the drain connection on the appliance. Such piping shall maintain a horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1 percent slope).

[M] 314.1.1: Identification.

The termination of concealed condensate piping shall be marked to indicate whether the piping is connected to the primary or secondary drain.

[M] 314.2: Evaporators and cooling coils.

Condensate drain systems shall be provided for equipment and appliances containing evaporators or cooling coils. Condensate drain systems shall be designed, constructed and installed in accordance with Sections 314.2.1 through 314.2.5.

[M] 314.2.1: Condensate disposal.

Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to an approved place of disposal. Such piping shall maintain a horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1 percent slope). Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.

[M] 314.2.1.1: Condensate discharge.

Condensate drains shall not directly connect to any plumbing drain, waste or vent pipe. Condensate drains shall not discharge into a plumbing fixture other than a floor sink, floor drain, trench drain, mop sink, hub drain, standpipe, utility sink or laundry sink. Condensate drain connections to a lavatory wye branch tailpiece or to a bathtub overflow pipe shall not be considered as discharging to a plumbing fixture. Except where discharging to grade outdoors, the point of discharge of condensate drains shall be located within the same occupancy, tenant space or dwelling unit as the source of the condensate.

[M] 314.2.2: Drain pipe materials and sizes.

Components of the condensate disposal system shall be ABS, cast-iron, copper and copper-alloy, CPVC, cross-linked polyethylene, galvanized steel, PE-RT, polyethylene, polypropylene, PVC, or PVDF pipe or tubing. Components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 relative to the material type. Condensate waste and drain line size shall be not less than 3/4-inch (19.1 mm) pipe size and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with Table 314.2.2.

[M] TABLE 314.2.2 CONDENSATE DRAIN SIZING

EQUIPMENT CAPACITY	MINIMUM CONDENSATE PIPE DIAMETER (inch)
Up to 20 tons of refrigeration	3/4 inch
Over 20 tons to 40 tons of refrigeration	1 inch
Over 40 tons to 90 tons of refrigeration	1 1/4 inches
Over 90 tons to 125 tons of refrigeration	1 1/2 inches
Over 125 tons to 250 tons of refrigeration	2 inches

For SI: 1 inch = 25.4 mm, 1 ton of capacity = 3.517 kW.

[M] 314.2.3: Auxiliary and secondary drain systems.

In addition to the requirements of Section 314.2.1, where damage to any building components could occur as a result of overflow from the equipment primary condensate removal system, one of the following auxiliary protection methods shall be provided for each cooling coil or fuel-fired appliance that produces condensate:

1. An auxiliary drain pan with a separate drain shall be provided under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a depth of not less than 1 1/2 inches (38 mm), shall be not less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length, and shall be constructed of corrosion-resistant material. Galvanized sheet metal pans shall have a thickness of not less than 0.0236-inch (0.6010 mm) (No. 24 gage) galvanized sheet metal. Nonmetallic pans shall have a thickness of not less than 0.0625 inch (1.6 mm).
2. A separate overflow drain line shall be connected to the drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.
3. An auxiliary drain pan without a separate drain line shall be provided under the coils on which condensate will occur. Such pan shall be equipped with a water-level detection

device conforming to UL 508 that will shut off the equipment served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.

4. A water-level detection device conforming to UL 508 shall be provided that will shut off the equipment served in the event that the primary drain is blocked. The device shall be installed in the primary drain line, the overflow drain line or in the equipment-supplied drain pan, located at a point higher than the primary drain line connection and below the overflow rim of such pan.

Exception: Fuel-fired appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.

[M] 314.2.3.1: Water-level monitoring devices.

On down-flow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.

[M] 314.2.3.2: Appliance, equipment and insulation in pans.

Where appliances, equipment or insulation are subject to water damage when auxiliary drain pans fill such portions of the appliances, equipment and insulation shall be installed above the flood level rim of the pan. Supports located inside of the pan to support the appliance or equipment shall be water resistant and approved.

[M] 314.2.3.3: Identification.

The termination of concealed condensate piping shall be marked to indicate whether the piping is connected to the primary or secondary drain.

[M] 314.2.4: Traps.

Condensate drains shall be trapped as required by the equipment or appliance manufacturer.

[M] 314.2.4.1: Ductless mini-split system traps.

Ductless mini-split equipment that produces condensation shall be provided with an in-line check valve located in the drain line or a trap.

[M] 314.2.5: Drain line maintenance.

Condensate drain lines shall be configured to permit the clearing of blockages and performance of maintenance without requiring the drain line to be cut.

Section 315: Penetrations

315.1: Sealing of annular spaces.

The annular space between the outside of a pipe and the inside of a pipe sleeve or between the outside of a pipe and an opening in a building envelope wall, floor, or ceiling assembly penetrated by a pipe shall be sealed in an approved manner with caulking material, foam sealant or closed with a gasketing system. The caulking material, foam sealant or gasketing system shall be designed for the conditions at the penetration location and shall be compatible with the pipe, sleeve and building materials in contact with the sealing materials. Annular spaces created by pipes penetrating fire-resistance-rated assemblies or membranes of such assemblies shall be sealed or closed in accordance with Section 714 of the International Building Code.

Section 316: Alternative Engineered Design

316.1: Alternative engineered design.

The design, documentation, inspection, testing and approval of an alternative engineered design plumbing system shall comply with Sections 316.1.1 through 316.1.6.

316.1.1: Design criteria.

An alternative engineered design shall conform to 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 instructions.

316.1.2: Submittal.

The registered design professional shall indicate on the permit application that the plumbing system is an alternative engineered design. The permit and permanent permit records shall indicate that an alternative engineered design was part of the approved installation.

316.1.3: 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.

316.1.4: Construction documents.

The registered design professional shall submit to the code official two complete sets of signed and sealed construction documents for the alternative engineered design. The construction documents shall include floor plans and a riser diagram of the work. Where appropriate, the construction documents shall indicate the direction of flow, all pipe sizes, grade of horizontal piping, loading and location of fixtures and appliances.

316.1.5: Design approval.

Where the code official determines that the alternative engineered design conforms to the intent of this code, the plumbing system shall be approved. If the alternative engineered design is not approved, the code official shall notify the registered design professional in writing, stating the reasons thereof.

316.1.6: Inspection and testing.

The alternative engineered design shall be tested and inspected in accordance with the requirements of Sections 111 and 312.

Chapter 4: Fixtures, Faucets and Fixture Fittings

User notes:

About this chapter: Plumbing fixtures are required to be installed for nearly every building as toilet facilities (water closets and lavatories) are needed by the occupants of a building. Additional fixtures for washing, bathing and culinary purposes are also necessary where occupants dwell in buildings. Chapter 4 specifies the minimum number and type of plumbing fixtures for buildings based on the description of use of the building. Because fixture design and quality are paramount to ensure that plumbing fixtures operate properly, this chapter also specifies numerous product and material standards for plumbing fixtures.

Section 401: General

401.1: Scope.

This chapter shall govern the materials, design and installation of plumbing fixtures, faucets and fixture fittings in accordance with the type of occupancy, and shall provide for the minimum number of fixtures for various types of occupancies.

401.2: Prohibited fixtures and connections.

Water closets having a concealed trap seal or an unventilated space or having walls that are not thoroughly washed at each discharge in accordance with ASME A112.19.2/CSA B45.1 shall be prohibited. Any water closet that permits siphonage of the contents of the bowl back into the tank shall be prohibited. Trough urinals shall be prohibited.

401.3: Water conservation.

The maximum water flow rates and flush volume for plumbing fixtures and fixture fittings shall comply with Section 604.4.

Section 402: Fixture Materials

402.1: Quality of fixtures.

Plumbing fixtures shall be constructed of approved materials, with smooth, impervious surfaces, free from defects and concealed fouling surfaces, and shall conform to standards cited in this code. Porcelain enameled surfaces on plumbing fixtures shall be acid resistant.

402.2: Materials for specialty fixtures.

Materials for specialty fixtures not otherwise covered in this code shall be of stainless steel, soapstone, chemical stoneware or plastic, or shall be lined with lead, copper-base alloy, nickel-copper alloy, corrosion-resistant steel or other material especially suited to the application for which the fixture is intended.

402.3: Sheet copper.

Sheet copper for general applications shall conform to ASTM B152 and shall not weigh less than 12 ounces per square foot (3.7 kg/m2).

402.4: Sheet lead.

Sheet lead for pans shall not weigh less than 4 pounds per square foot (19.5 kg/m2) and shall be coated with an asphalt paint or other approved coating.

Section 403: Minimum Plumbing Facilities

403.1: Minimum number of fixtures.

Plumbing fixtures shall be provided in the minimum number as shown in Table 403.1, based on the actual use of the building or space. Uses not shown in Table 403.1 shall be considered individually by the code official. The number of occupants shall be determined by the International Building Code.

BLE 403.1 MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES[a] (See Sections 403.1.1 and 403.2)

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
			MALE	FEMALE	MALE	FEMALE			
1	Assembly	Theaters and other buildings for the performing arts and motion pictures[d]	1 per 125	1 per 65	1 per 200		—	1 per 500	1 service sink
		Nightclubs, bars, taverns, dance halls and buildings for similar purposes[d]	1 per 40	1 per 40	1 per 75		—	1 per 500	1 service sink
		Restaurants, banquet halls and food courts[d]	1 per 75	1 per 75	1 per 200		—	1 per 500	1 service sink
		Casino gaming areas	1 per 100 for the first 400 and 1 per 250 for the remainder exceeding 400	1 per 50 for the first 400 and 1 per 150 for the remainder exceeding 400	1 per 250 for the first 750 and 1 per 500 for the remainder exceeding 750		—	1 per 1,000	1 service sink
		Auditoriums without permanent seating, art galleries, exhibition halls, museums, lecture halls, libraries, arcades and gymnasiums[d]	1 per 125	1 per 65	1 per 200		—	1 per 500	1 service sink
		Passenger terminals and transportation facilities[d]	1 per 500	1 per 500	1 per 750		—	1 per 1,000	1 service sink
		Places of worship and other religious services[d]	1 per 150	1 per 75	1 per 200		—	1 per 1,000	1 service sink
		Coliseums, arenas, skating rinks, pools and tennis courts for indoor sporting events and activities[f]	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink
		Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities[f]	1 per 75 for the first 1,500 and 1 per 120 for the remainder exceeding 1,500	1 per 40 for the first 1,520 and 1 per 60 for the remainder exceeding 1,520	1 per 200	1 per 150	—	1 per 1,000	1 service sink

The 2026 Georgia Amendments say:
delete the requirements for 'service sink' entirely without substitution.

NO.	CLASSIFICATION	DESCRIPTION		WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
				MALE	FEMALE	MALE	FEMALE			
2	Business	Buildings for the transaction of business, nonmedical professional services, other services involving merchandise, office buildings, banks, light industrial and similar uses		1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50		1 per 40 for the first 80 and 1 per 80 for the remainder exceeding 80		—	1 per 100	1 service sink[e]
		Ambulatory care facilities and outpatient clinics		1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50	1 per 25 for the first 50 and 1 per 50 for the remainder exceeding 50	1 per 50		—	1 per 100	1 service sink per floor
3	Educational	Educational facilities		1 per 50		1 per 50		—	1 per 100	1 service sink
4	Factory and industrial	Structures in which occupants are engaged in work fabricating, assembly or processing of products or materials		1 per 100		1 per 100		—	1 per 400	1 service sink
		Alcohol and drug centers[b] Congregate care facilities[b] Group homes[b] Halfway houses[b] Social rehabilitation facilities[b] Foster care facilities[b]		1 per 10 care recipients		1 per 10 care recipients		1 per 8 care recipients	—	—
		Assisted living and residential board and care facilities with care recipients who receive custodial care	Sleeping units for care recipient[c]	1 per 2 sleeping units		1 per 2 sleeping units		1 per 8 sleeping units	—	—
			Dwelling units for care recipients	1 per dwelling unit		1 per dwelling unit		1 per dwelling unit	—	1 kitchen sink per dwelling unit
			Employee facilities	1 per 60 care recipient units		1 per 60 care recipient units		—	1 per 100	1 service sink per floor
			Visitor facilities	1 per 75 care recipient units.		1 per 75 care recipient units		—	—	—
		Nursing homes[b]	Sleeping units for care recipients[c]	1 per 2 care recipient sleeping units		1 per 2 care recipient sleeping units		1 per 8 care recipient sleeping units	—	—
			Employee facilities	1 per 60 care recipient units		1 per 60 care recipient sleeping units		—	1 per 100	1 service sink per floor
			Visitor facilities	1 per 75 care recipient units		1 per 75 care recipient sleeping units		—	—	—

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NO.	CLASSIFICATION	DESCRIPTION		WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
				MALE	FEMALE	MALE	FEMALE			
5	Institutional	Hospitals[b]	Sleeping units for care recipients	1 per care recipient sleeping unit		1 per care recipient sleeping unit		1 per 100 care recipient sleeping units	—	—
			Care recipient treatment areas	1 per 25 care recipient treatment rooms		1 per 50 care recipient treatment rooms		1 per 100 care recipient sleeping units	1 per 100	—
			Employee facilities	1 per 25 care recipient sleeping units or treatment rooms	1 per 35 care recipient sleeping units or treatment rooms	1 per 50 care recipient sleeping units or treatments rooms		—	1 per 100	1 service sink per floor
			Visitor facilities	1 per 75 care recipient sleeping units or treatment rooms	1 per 100 care recipient sleeping units or treatment rooms	1 per 50 care recipient sleeping units or treatment rooms		—	1 per 500	—
		Employees in hospitals and nursing homes[b]		1 per 25		1 per 35		—	1 per 100	—
		Visitors in hospitals and nursing homes		1 per 75		1 per 100		—	1 per 500	—
		Prisons[b]		1 per cell		1 per cell		1 per 15	1 per 100	1 service sink
		Reformatories, detention centers and correctional centers[b]	Cells	1 per 15		1 per 15		1 per 15	1 per 100	1 service sink
			Congregate Living Facilities	1 per 15		1 per 15		1 per 15	1 per 100	1 service sink
			Employees	1 per 25		1 per 35		—	1 per 100	—
		Adult day care and child day care		1 per 15		1 per 15		1	1 per 100	1 service sink
6	Mercantile	Retail stores, service stations, shops, salesrooms, markets and shopping centers		1 per 500		1 per 750		—	1 per 1,000	1 service sink[e]
		Hotels, motels, boarding houses (transient)		1 per dwelling or sleeping unit		1 per dwelling or sleeping unit		1 per dwelling or sleeping unit	—	1 service sink
		Dormitories, fraternities, sororities and boarding houses (not transient)		1 per 10		1 per 10		1 per 8	1 per 100	1 service sink

The 2026 Georgia Amendments say:
delete the requirements for 'service sink' entirely without substitution.

NO.	CLASSIFICATION	DESCRIPTION	WATER CLOSETS (URINALS: SEE SECTION 424.2)		LAVATORIES		BATHTUBS/ SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410)	OTHER
			MALE	FEMALE	MALE	FEMALE			
		Dormitories, fraternities, sororities and boarding houses (not transient)	1 per 10		1 per 10		1 per 8	1 per 100	1 service sink
7	Residential	Apartment house	1 per dwelling unit or sleeping unit		1 per dwelling unit or sleeping unit		1 per dwelling unit or sleeping unit	—	1 kitchen sink per dwelling unit; 1 automatic clothes washer connection per 20 dwelling units
		Congregate living facilities with 16 or fewer care recipients receiving custodial care	1 per 10		1 per 10		1 per 8	—	1 kitchen sink
		One- and two-family dwellings and lodging houses with five or fewer guestrooms	1 per dwelling unit		1 per dwelling unit		1 per dwelling unit	—	1 kitchen sink per dwelling unit; 1 automatic clothes washer connection per dwelling unit
8	Storage	Structures for the storage of goods, warehouses, storehouse and freight depots. Low and Moderate Hazard.	1 per 100		1 per 100		—	1 per 1,000	1 service sink

a. The fixtures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction of the number of persons indicated. The number of occupants shall be determined by the International Building Code.
b. Toilet facilities for employees shall be separate from facilities for inmates or care recipients.
c. A single-user toilet facility with one water closet and one lavatory serving not more than two adjacent care recipient sleeping units shall be permitted provided that each patient sleeping unit has direct access to the toilet room and provision for privacy for the toilet room user is provided.
d. The occupant load for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of facilities required.
e. For business and mercantile classifications with an occupant load of 15 or fewer, service sinks shall not be required.
f. The required number and type of plumbing fixtures for indoor and outdoor public swimming pools shall be in accordance with Section 609 of the *International Swimming Pool and Spa Code*.

a. The fixtures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction of the number of persons indicated. The number of occupants shall be determined by the International Building Code.

b. Toilet facilities for employees shall be separate from facilities for inmates or care recipients.

c. A single-user toilet facility with one water closet and one lavatory serving not more than two adjacent care recipient sleeping units shall be permitted provided that each patient sleeping unit has direct access to the toilet room and provision for privacy for the toilet room user is provided.

d. The occupant load for seasonal outdoor seating and entertainment areas shall be included when determining the minimum number of facilities required.

e. For business and mercantile classifications with an occupant load of 15 or fewer, service sinks shall not be required.

f. The required number and type of plumbing fixtures for indoor and outdoor public swimming pools shall be in accordance with Section 609 of the International Swimming Pool and Spa Code.

403.1.1: Fixture calculations.

To determine the occupant load of each sex, the total occupant load shall be divided in half. To determine the required number of fixtures, the fixture ratio or ratios for each fixture type shall be applied to the occupant load of each sex in accordance with Table 403.1. Fractional numbers resulting from applying the fixture ratios of Table 403.1 shall be rounded up to the next whole number. For calculations involving multiple occupancies, such fractional numbers for each occupancy shall first be summed and then rounded up to the next whole number.

Exceptions:

1. The total occupant load shall not be required to be divided in half where approved statistical data indicate a distribution of the sexes of other than 50 percent of each sex.
2. Where multiple-user facilities are designed to serve all genders, the minimum fixture count shall be calculated 100 percent, based on total occupant load. In such multiple-user facilities, each fixture type shall be in accordance with ICC A117.1.

403.1.2: Fixtures in single-user toilet facilities and bathing rooms.

The plumbing fixtures located in single-user toilet facilities and single-user bathing rooms, including family or assisted-use toilet facilities and bathing rooms, shall contribute toward the total number of required plumbing fixtures for a building or tenant space. The number of fixtures in single-user toilet facilities, single-user bathing rooms and family or assisted-use toilet facilities shall be deducted proportionately from the required gender ratios of Table 403.1. Single-user toilet facilities and bathing rooms, and family or assisted-use toilet facilities and bathing rooms shall be identified as being available for use by all persons regardless of their sex.

The total number of fixtures shall be based on the required number of separate facilities or based on the aggregate of any combination of single-user or multiple-user facilities.

403.1.3: Lavatory distribution.

Where two or more toilet facilities are provided for each sex, the required number of lavatories shall be distributed proportionately to the required number of male and female designated water closets.

403.2: Separate facilities.

Where plumbing fixtures are required, separate toilet facilities shall be provided for each sex.

Exceptions:

1. Separate toilet facilities shall not be required for dwelling units and sleeping units.

2. Separate toilet facilities shall not be required in structures or tenant spaces with a total occupant load, including both employees and customers, of 15 or fewer.
3. Separate toilet facilities shall not be required in mercantile occupancies in which the maximum occupant load is 100 or fewer.
4. Separate toilet facilities shall not be required in business occupancies in which the maximum occupant load is 25 or fewer.
5. Separate toilet facilities shall not be required to be designated by sex where single-user toilet rooms are provided in accordance with Section 403.1.2.
6. Separate toilet facilities shall not be required where rooms having both water closets and lavatory fixtures are designed for use by all persons regardless of sex and privacy is provided for water closets in accordance with Section 405.3.4 and for urinals in accordance with Section 405.3.5.

403.3: Employee and public toilet facilities.

For structures and tenant spaces intended for public utilization, customers, patrons and visitors shall be provided with public toilet facilities. Employees associated with structures and tenant spaces shall be provided with toilet facilities. The number of plumbing fixtures located within the required toilet facilities shall be provided in accordance with Section 403 for all users. Employee toilet facilities shall be either separate or combined employee and public toilet facilities.

Exception: Public toilet facilities shall not be required for:

1. Parking garages operated without parking attendants.
2. Structures and tenant spaces intended for quick transactions, including takeout, pickup and drop-off, having a public access area less than or equal to 300 square feet (28 m2).

403.3.1: Access.

The route to the public toilet facilities required by Section 403.3 shall not pass through kitchens, storage rooms or closets. Access to the required toilet facilities shall be from within the building or from the exterior of the building. The public shall have access to the required toilet facilities at all times that the building is occupied.

403.3.2: Prohibited location for toilet facilities.

Toilet facilities shall not open directly into a room used for the preparation of food for service to the public.

403.3.3: Location of toilet facilities in occupancies other than malls.

In occupancies other than covered and open mall buildings, the required public and employee toilet facilities shall be located not more than one story above or below the space required to be provided with toilet facilities, and the path of travel to such facilities shall not exceed a distance of 500 feet (152 m).

Exceptions:

1. The location and maximum distances of travel to required employee facilities in factory and industrial occupancies shall be permitted to exceed that required by this section, provided that the location and maximum distances of travel are approved.
2. The location and maximum distances of travel to required public and employee facilities in Group S occupancies shall be permitted to exceed that required by this section, provided that the location and maximum distances of travel are approved.

403.3.4: Location of toilet facilities in malls.

In covered and open mall buildings, the required public and employee toilet facilities shall be located not more than one story above or below the space required to be provided with toilet facilities, and the path of travel to such facilities shall not exceed a distance of 300 feet (91 m). In mall buildings, the required facilities shall be based on total square footage within a covered mall building or within the perimeter line of an open mall building, and facilities shall be installed in each individual store or in a central toilet area located in accordance with this section. The maximum distance of travel to central toilet facilities in mall buildings shall be measured from the main entrance of any store or tenant space. In mall buildings, where employees' toilet facilities are not provided in the individual store, the maximum distance of travel shall be measured from the employees' work area of the store or tenant space.

403.3.5: Pay facilities.

Where pay toilet facilities are installed, such toilet facilities shall be in excess of the required minimum facilities. Required toilet facilities shall be free of charge.

[BE] 403.3.6: Door locking.

Where a toilet facility is provided for the use of multiple occupants, the egress door for the room shall not be lockable from the inside of the room. This section does not apply to family or assisted-use toilet facilities.

Exception: The egress door of a multiple-occupant toilet room shall be permitted to be lockable from inside the room where all the following criteria are met:

1. The egress door shall be lockable from the inside of the room only by authorized personnel by the use of a key or other approved means.
2. The egress door shall be readily openable from the toilet room in accordance with International Building Code Section 1010.2.
3. The egress door shall be capable of being unlocked from outside the room with a key or other approved means.

403.4: Signage.

Required public toilet facilities shall be provided with signs that indicate whether the facility is to be used by males, by females, or by all persons regardless of sex. Signs shall be readily visible and located near the entrance to each toilet facility. Signs for accessible toilet facilities shall comply with Section 1111 of the International Building Code.

403.4.1: Directional signage.

Directional signage indicating the route to the required public toilet facilities shall be posted in a lobby, corridor, aisle or similar space, such that the sign can be readily seen from the main entrance to the building or tenant space.

403.5: Drinking fountain location.

Drinking fountains shall not be required to be located in individual tenant spaces provided that public drinking fountains are located within a distance of travel of 500 feet (152 m) of the most remote location in the tenant space and not more than one story above or below the tenant space. Where the tenant space is in a covered or open mall, such distance shall not exceed 300 feet (91 m).

403.6: Service sink location.

Service sinks shall not be required to be located in individual tenant spaces in a covered mall provided that service sinks are located within a distance of travel of 300 feet (91 m) of the most remote location in the tenant space and not more than one story above or below the tenant space. Service sinks shall be located on an accessible route.

Section 404: Accessible Plumbing Facilities

404.1: Where required.

Accessible plumbing facilities and fixtures shall be provided in accordance with Chapter 11 of the International Building Code.

404.2: Accessible fixture requirements.

Accessible plumbing fixtures shall be installed in accordance with ICC A117.1.

404.3: Exposed pipes and surfaces.

Water supply and drain pipes under accessible lavatories and sinks shall be covered or otherwise configured to protect against contact. Pipe coverings shall comply with ASME A112.18.9 or ASTM C1822.

Section 405: Installation of Fixtures

405.1: Water supply protection.

The supply lines and fittings for every plumbing fixture shall be installed so as to prevent backflow.

405.2: Access for cleaning.

Plumbing fixtures shall be installed so as to afford easy access for cleaning both the fixture and the area around the fixture.

405.3: Setting.

Fixtures shall be set level and in proper alignment with reference to adjacent walls.

405.3.1: Water closets, urinals, lavatories and bidets.

A water closet, urinal, lavatory or bidet shall not be set closer than 15 inches (381 mm) from its center to any side wall, partition, vanity or other obstruction. Where partitions or other obstructions do not separate adjacent water closets, urinals or bidets, the fixtures shall not be set closer than 30 inches (762 mm) center to center between adjacent fixtures or adjacent water closets, urinals, or bidets. There shall be not less than a 21-inch (533 mm) clearance in front of a water closet, urinal, lavatory or bidet to any wall, fixture or door. Water closet compartments shall be not less than 30 inches (762 mm) in width and not less than 60 inches (1524 mm) in depth for floor-mounted water closets and not less than 30 inches (762 mm) in width and 56 inches (1422 mm) in depth for wall-hung water closets.

> **Exception:** An accessible children's water closet shall be set not closer than 12 inches (305 mm) from its center to the required partition or to the wall on one side.

405.3.2: Public lavatories.

In employee and public toilet facilities, the required lavatory shall be located in the same room as the required water closet.

405.3.3: Location of fixtures and piping.

Piping, fixtures or equipment shall not be located in such a manner as to interfere with the normal operation of windows, doors or other means of egress openings.

405.3.4: Water closet compartment.

Each water closet utilized by the public or employees shall occupy a separate compartment with walls or partitions and a door enclosing the fixtures to ensure privacy.

> **Exceptions:**
>
> 1. Water closet compartments shall not be required in a single-occupant toilet room with a lockable door.
> 2. Toilet facilities located in child day care facilities and containing two or more water closets shall be permitted to have one water closet without an enclosing compartment.
> 3. This provision is not applicable to toilet areas located within Group I-3 housing areas.

405.3.5: Urinal partitions.

Each urinal utilized by the public or employees shall occupy a separate area with walls or partitions to provide privacy. The horizontal dimension between walls or partitions at each urinal shall be not less than 30 inches (762 mm). The walls or partitions shall begin at a height not greater than 12 inches (305 mm) from and extend not less than 60 inches (1524 mm) above the finished floor surface. The walls or partitions shall extend from the wall surface at each side of the urinal not less than 18 inches (457 mm) or to a point not less than 6 inches (152 mm) beyond the outermost front lip of the urinal measured from the finished backwall surface, whichever is greater.

> **Exceptions:**
>
> 1. Urinal partitions shall not be required in a single occupant or family/assisted-use toilet room with a lockable door.

2. Toilet facilities located in child day care facilities and containing two or more urinals shall be permitted to have one urinal without partitions.

405.4: Floor and wall drainage connections.

Connections between the drain and floor outlet plumbing fixtures shall be made with a floor flange or a waste connector and sealing gasket. The waste connector and sealing gasket joint shall comply with the joint tightness test of ASME A112.4.3 and shall be installed in accordance with the manufacturer's instructions. The flange shall be attached to the drain and anchored to the structure. Connections between the drain and wall-hung water closets shall be made with an approved extension nipple or horn adaptor. The water closet shall be bolted to the hanger with corrosion-resistant bolts or screws. Joints shall be sealed with an approved elastomeric gasket, flange-to-fixture connection complying with ASME A112.4.3 or an approved setting compound.

405.4.1: Floor flanges.

Floor flanges for water closets or similar fixtures shall be not less than 0.125 inch (3.2 mm) thick for copper alloy, 0.25 inch (6.4 mm) thick for plastic and 0.25 inch (6.4 mm) thick and not less than a 2-inch (51 mm) caulking depth for cast iron or galvanized malleable iron.

Floor flanges of hard lead shall weigh not less than 1 pound, 9 ounces (0.7 kg) and shall be composed of lead alloy with not less than 7.75 percent antimony by weight. Closet screws and bolts shall be of copper alloy. Flanges shall be secured to the building structure with corrosion-resistant screws or bolts.

405.4.2: Securing floor outlet fixtures.

Floor outlet fixtures shall be secured to the floor or floor flanges by screws or bolts of corrosion-resistant material.

405.4.3: Securing wall-hung water closet bowls.

Wall-hung water closet bowls shall be supported by a concealed metal carrier that is attached to the building structural members so that strain is not transmitted to the fixture connector or any other part of the plumbing system. The carrier shall conform to ASME A112.6.1M or ASME A112.6.2.

405.5: Plumbing fixtures with a pumped waste.

Plumbing fixtures with a pumped waste shall comply with ASME A112.3.4/CSA B45.9. The plumbing fixture with a pumped waste shall be installed in accordance with the manufacturer's instructions.

405.6: Watertight joints.

Joints formed where fixtures come in contact with walls or floors shall be sealed.

405.7: Plumbing in mental health centers.

In mental health centers, pipes or traps shall not be exposed, and fixtures shall be bolted through walls.

405.8: Design of overflows.

Where any fixture is provided with an overflow, the waste shall be designed and installed so that standing water in the fixture will not rise in the overflow when the stopper is closed, and water will not remain in the overflow when the fixture is empty.

405.8.1: Connection of overflows.

The overflow from any fixture shall discharge into the drainage system on the inlet or fixture side of the trap.

> **Exception:** The overflow from a flush tank serving a water closet or urinal shall discharge into the fixture served.

405.9: Slip-joint connections.

Slip joints shall be made with an approved elastomeric gasket and shall only be installed on the trap outlet, trap inlet and within the trap seal. Fixtures with concealed slip-joint connections shall be provided with an access panel or utility space not less than 12 inches (305 mm) in its smallest dimension or other approved arrangement so as to provide access to the slip-joint connections for inspection and repair.

405.10: Design and installation of plumbing fixtures.

Integral fixture fitting mounting surfaces on manufactured plumbing fixtures or plumbing fixtures constructed on-site shall meet the design requirements of ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4.

Section 406: Automatic Clothes Washers

406.1: Water connection.

The water supply to an automatic clothes washer shall be protected against backflow by an air gap that is integral with the machine or a backflow preventer shall be installed in accordance with Section 608. Air gaps shall comply with ASME A112.1.2 or A112.1.3.

406.2: Waste connection.

The waste from an automatic clothes washer shall discharge through an air break into a standpipe in accordance with Section 802.4.3 or into a laundry sink. The trap and fixture drain for an automatic clothes washer standpipe shall be not less than 2 inches (51 mm) in diameter. The fixture drain for the standpipe serving an automatic clothes washer shall connect to a 3-inch (76 mm) or larger diameter fixture branch or stack. Automatic clothes washers that discharge by gravity shall be permitted to drain to a waste receptor or an approved trench drain.

Section 407: Bathtubs

407.1: Approval.

Bathtubs shall conform to ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4 or CSA B45.5/IAPMO Z124.

407.2: Bathtub waste outlets and overflows.

Bathtubs shall be equipped with a waste outlet that is not less than 1 1/2 inches (38 mm) in diameter. The waste outlet shall be equipped with a watertight stopper. Where an overflow is installed in a bathtub, the piping from the overflow outlet shall be connected upstream of the fixture trap. The overflow outlet shall discharge to the trap whether the waste outlet is closed or open.

407.3: Glazing.

Windows and doors within a bathtub enclosure shall conform to the safety glazing requirements of the International Building Code.

407.4: Bathtub enclosure.

Doors in a bathtub enclosure shall conform to ASME A112.19.15.

Section 408: Bidets

408.1: Approval.

Bidets shall conform to ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4.

408.2: Water connection.

The water supply to a bidet shall be protected against backflow by an air gap or backflow preventer in accordance with Section 608.14.1, 608.14.2, 608.14.3, 608.14.5, 608.14.6 or 608.14.8.

408.3: Bidet water temperature.

The discharge water temperature from a bidet fitting shall be limited to not greater than 110°F (43°C) by a water-temperature-limiting device conforming to ASSE 1070/ASME A112.1070/CSA B125.70.

Section 409: Dishwashing Machines

409.1: Approval.

Commercial dishwashing machines shall conform to ASSE 1004 and NSF 3. Residential dishwashers shall conform to NSF 184.

409.2: Water connection.

The water supply to a dishwashing machine shall be protected against backflow by an air gap that is integral with the machine or a backflow preventer shall be installed in accordance with Section 608. Air gaps shall comply with ASME A112.1.2 or A112.1.3.

409.3: Waste connection.

The waste connection of a commercial dishwashing machine shall comply with Section 802.1.6.

409.4: Residential dishwasher waste connection.

The waste connection of a residential dishwasher shall connect directly to a wye branch fitting on the tailpiece of the kitchen sink, directly to the dishwasher connection of a food waste disposer, or through an air break to a standpipe. The waste line of a residential dishwasher shall rise and be securely fastened to the underside of the sink rim or countertop.

Section 410: Drinking Fountains

410.1: Approval.

Drinking fountains shall conform to ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4. Drinking fountains, water coolers and water dispensers shall conform to NSF 61, Section 9. Electrically operated, refrigerated drinking water coolers and water dispensers shall be listed and labeled in accordance with UL 399.

410.2: Small occupancies.

Drinking fountains shall not be required for an occupant load of 15 or fewer.

410.3: High and low drinking fountains.

Where drinking fountains are provided on an exterior site, on a floor or within a secured area, the drinking fountains shall be provided in accordance with Sections 410.3.1 and 410.3.2.

[BE] 410.3.1: Minimum number.

Not fewer than two drinking fountains shall be provided. One drinking fountain shall comply with the requirements for people who use a wheelchair and one drinking fountain shall comply with the requirements for standing persons.

Exceptions:

1. A single drinking fountain with two separate spouts that complies with the requirements for people who use a wheelchair and standing persons shall be permitted to be substituted for two separate drinking fountains.
2. Where drinking fountains are primarily for children's use, the drinking fountains for people using wheelchairs shall be permitted to comply with the children's provisions in ICC A117.1 and drinking fountains for standing children shall be permitted to provide the spout at 30 inches (762 mm) minimum above the floor.

[BE] 410.3.2: More than the minimum number.

Where more than the minimum number of drinking fountains specified in Section 410.3.1 is provided, 50 percent of the total number of drinking fountains provided shall comply with the requirements for persons who use a wheelchair and 50 percent of the total number of drinking fountains provided shall comply with the requirements for standing persons.

Exceptions:

1. Where 50 percent of the drinking fountains yields a fraction, 50 percent shall be permitted to be rounded up or down, provided that the total number of drinking fountains complying with this section equals 100 percent of the drinking fountains.
2. Where drinking fountains are primarily for children's use, drinking fountains for people using wheelchairs shall be permitted to comply with the children's provisions in ICC A117.1 and drinking fountains for standing children shall be permitted to provide the spout at 30 inches (762 mm) minimum above the floor.

410.4: Substitution.

Where restaurants provide drinking water in a container free of charge, drinking fountains shall not be required in those restaurants. In other occupancies where three or more drinking fountains are required, water dispensers shall be permitted to be substituted for not more than 50 percent of the required number of drinking fountains.

410.5: Prohibited location.

Drinking fountains, water coolers and water dispensers shall not be installed in public restrooms.

Section 411: Emergency Showers and Eyewash Stations

411.1: Approval.

Emergency showers and eyewash stations shall conform to ISEA Z358.1.

411.2: Waste connection.

Waste connections shall not be required for emergency showers and eyewash stations.

411.3: Water supply.

Where hot and cold water is supplied to an emergency shower or eyewash station, the temperature of the water supply shall only be controlled by a temperature-actuated mixing valve complying with ASSE 1071. Where water is supplied directly to an emergency shower or eyewash station from a water heater, the water heater shall comply with ASSE 1085.

Section 412: Faucets and Fixture Fittings

412.1: Approval.

Faucets and fixture fittings shall conform to ASME A112.18.1/CSA B125.1. Faucets and fixture fittings that supply drinking water for human ingestion shall conform to the requirements of NSF 61, Section 9. Flexible water connectors exposed to continuous pressure shall conform to the requirements of Section 605.6.

412.1.1: Faucets and supply fittings.

Faucets and supply fittings shall conform to the water consumption requirements of Section 604.4.

412.1.2: Waste fittings.

Waste fittings shall conform to ASME A112.18.2/CSA B125.2, ASTM F409 or to one of the standards listed in Tables 702.1 and 702.4 for aboveground drainage and vent pipe and fittings.

412.2: Hand showers.

Hand-held showers shall conform to ASME A112.18.1/CSA B125.1. Hand-held showers shall provide backflow protection in accordance with ASME A112.18.1/CSA B125.1 or shall be protected against backflow by a device complying with ASME A112.18.3 or ASSE 1014.

412.3: Individual shower valves.

Individual shower and tub-shower combination valves shall be balanced-pressure, thermostatic or combination balanced-pressure/thermostatic valves that conform to the requirements of ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1. Such valves shall be installed at the point of use. Shower control valves shall be rated for the flow rate of the installed shower head. Shower and tub-shower combination valves required by this section shall be equipped with a means to limit the maximum setting of the valve to 120°F (49°C), which shall be field adjusted in accordance with the manufacturer's instructions to provide water at a temperature not to exceed 120°F (49°C). In-line thermostatic valves shall not be utilized for compliance with this section.

412.4: Multiple (gang) showers.

Multiple (gang) showers supplied with a single, tempered water supply pipe shall have the water supply for such showers controlled by an approved automatic temperature control mixing valve that conforms to ASSE 1069 or CSA B125.3, or each shower head shall be individually controlled by a balanced-pressure, thermostatic or combination balanced-pressure/thermostatic valve that conforms to ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1 and that is installed at the point of use. Where a shower head is individually controlled, shower control valves shall be rated for the flow rate of the installed shower head. Such valves shall be equipped with a means to limit the maximum setting of the valve to 120°F (49°C), which shall be field adjusted in accordance with the manufacturer's instructions to provide water at a temperature not to exceed 120°F (49°C). Access shall be provided to an ASSE 1069 or CSA B125.3 valve.

412.5: Bathtub and whirlpool bathtub valves.

Bathtubs and whirlpool bathtub valves shall have or be supplied by a water-temperature-limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70 or by a water heater complying with ASSE 1082 or ASSE 1084, except where such valves are combination tub/shower valves in accordance with Section 412.3. The water-temperature-limiting device required by this section shall be equipped with a means to limit the maximum setting of the device to 120°F (49°C), and, where adjustable, shall be field adjusted in accordance with the manufacturer's instructions to provide hot water at a temperature not to exceed 120°F (49°C). Access shall be provided to water-temperature-limiting devices that conform to ASSE 1070/ASME A112.1070/CSA B125.70.

> **Exception:** Access shall not be required for nonadjustable water-temperature-limiting devices that conform to ASSE 1070/ASME A112.1070/CSA B125.70 and are integral with a fixture fitting, provided that the fixture fitting itself can be accessed for replacement.

412.6: Hose-connected outlets.

Faucets and fixture fittings with hose-connected outlets shall conform to ASME A112.18.3 or ASME A112.18.1/CSA B125.1.

412.7: Temperature-actuated, flow-reduction devices for individual fixture fittings.

Temperature-actuated, flow-reduction devices, where installed for individual fixture fittings, shall conform to ASSE 1062. A temperature-actuated, flow-reduction device shall be an approved method for limiting the water temperature to not greater than 120°F (49°C) at the outlet of a faucet or fixture fitting. Such devices shall not be used alone as a substitute for the balanced-pressure, thermostatic

or combination shower valves required in Section 412.3 or as a substitute for bathtub or whirlpool tub water-temperature-limiting valves required in Section 412.5.

412.8: Transfer valves.

Deck-mounted bath/shower transfer valves containing an integral atmospheric vacuum breaker shall conform to the requirements of ASME A112.18.1/CSA B125.1.

412.9: Water closet personal hygiene devices.

Personal hygiene devices integral to water closets or water closet seats shall conform to the requirements of ASME A112.4.2/CSA B45.16.

412.10: Head shampoo sink faucets.

Head shampoo sink faucets shall be supplied with hot water that is limited to not more than 120°F (49°C). Each faucet shall have integral check valves to prevent crossover flow between the hot and cold water supply connections. The means for regulating the maximum temperature shall be one of the following:

1. A limiting device conforming to ASSE 1070/ASME A112.1070/CSA B125.70.
2. A water heater conforming to ASSE 1082 or ASSE 1084.
3. A temperature-actuated, flow-reduction device conforming to ASSE 1062.

412.11: Prerinse spray valve.

Prerinse spray valves for commercial food service shall conform to ASME A112.18.1/CSA B125.1.

412.12: Electrically heated or cooled water dispensers.

Electrically heated or cooled water dispensers shall comply with ASSE 1023.

Section 413: Floor and Trench Drains

413.1: Approval.

Floor drains shall conform to ASME A112.3.1, ASME A112.6.3 or CSA B79. Trench drains shall comply with ASME A112.6.3.

413.2: Floor drains.

Floor drains shall have removable strainers. The floor drain shall be constructed so that the drain is capable of being cleaned. Access shall be provided to the drain inlet. Ready access shall be provided to floor drains.

Exception: Floor drains serving refrigerated display cases shall be provided with access.

413.3: Size of floor drains.

Floor drains shall have a drain outlet not less than 2 inches (51 mm) in diameter.

413.4: Public laundries and central washing facilities.

In public coin-operated laundries and in the central washing facilities of multiple-family dwellings, the rooms containing automatic clothes washers shall be provided with floor drains located to readily drain the entire floor area. Such drains shall have an outlet of not less than 3 inches (76 mm) in diameter.

Section 414: Floor Sinks

414.1: Approval.

Sanitary floor sinks shall conform to the requirements of ASME A112.6.7.

Section 415: Flushing Devices for Water Closets and Urinals

415.1: Flushing devices required.

Each water closet, urinal, clinical sink and any plumbing fixture that depends on trap siphonage to discharge the fixture contents to the drainage system shall be provided with a flushometer valve, flushometer tank or a flush tank designed and installed to supply water in quantity and rate of flow to flush the contents of the fixture, cleanse the fixture and refill the fixture trap.

415.1.1: Separate for each fixture.

A flushing device shall not serve more than one fixture.

415.2: Flushometer valves and tanks.

Flushometer valves and tanks shall comply with ASSE 1037/ASME A112.1037/CSA B125.37 or CSA B125.3. Vacuum breakers on flushometer valves shall conform to the performance requirements of ASSE 1001 or CSA B64.1.1. Access shall be provided to vacuum breakers. Flushometer valves shall be of the water-conservation type and shall not be used where the water pressure is lower than the minimum required for normal operation. When operated, the valve shall automatically complete the cycle of operation, opening fully and closing positively under the water supply pressure. Each flushometer valve shall be provided with a means for regulating the flow through the valve. The trap seal to the fixture shall be automatically refilled after each flushing cycle.

415.3: Flush tanks.

Flush tanks equipped for manual flushing shall be controlled by a device designed to refill the tank after each discharge and to shut off completely the water flow to the tank when the tank is filled to operational capacity. The trap seal to the fixture shall be automatically refilled after each flushing. The water supply to flush tanks equipped for automatic flushing shall be controlled with a timing device or sensor control devices.

415.3.1: Fill valves.

Flush tanks shall be equipped with an antisiphon fill valve conforming to ASSE 1002/ASME A112.1002/CSA B125.12 or CSA B125.3. The fill valve backflow preventer shall be located not less than 1 inch (25 mm) above the full opening of the overflow pipe.

415.3.2: Overflows in flush tanks.

Flush tanks shall be provided with overflows discharging to the water closet or urinal connected thereto and shall be sized to prevent flooding the tank at the maximum rate at which the tanks are supplied with water according to the manufacturer’s design conditions. The opening of the overflow pipe shall be located above the flood level rim of the water closet or urinal or above a secondary overflow in the flush tank.

415.3.3: Sheet copper.

Sheet copper utilized for flush tank linings shall conform to ASTM B152 and shall not weigh less than 10 ounces per square foot (0.03 kg/m2).

415.3.4: Access required.

All parts in a flush tank shall be provided with access for repair and replacement.

415.4: Flush pipes and fittings.

Flush pipes and fittings shall be of nonferrous material and shall conform to ASME A112.19.5/CSA B45.15.

Section 416: Food Waste Disposer Units

416.1: Approval.

Domestic food waste disposers shall conform to ASSE 1008 and shall be listed and labeled in accordance with UL 430. Commercial food waste disposers shall be listed and labeled in accordance with UL 430. Food waste disposers shall not increase the drainage fixture unit load on the sanitary drainage system.

416.2: Domestic food waste disposer waste outlets.

Domestic food waste disposers shall be connected to a drain of not less than 1 1/2 inches (38 mm) in diameter.

416.3: Commercial food waste disposer waste outlets.

Commercial food waste disposers shall be connected to a drain not less than 1 1/2 inches (38 mm) in diameter. Commercial food waste disposers shall be connected and trapped separately from any other fixtures or sink compartments.

416.4: Water supply required.

Food waste disposers shall be provided with a supply of cold water. The water supply shall be protected against backflow by an air gap or backflow preventer in accordance with Section 608.

Section 417: Garbage Can Washers

417.1: Water connection.

The water supply to a garbage can washer shall be protected against backflow by an air gap or a backflow preventer in accordance with Section 608.14.1, 608.14.2, 608.14.3, 608.14.5, 608.14.6 or 608.14.8.

417.2: Waste connection.

Garbage can washers shall be trapped separately. The receptacle receiving the waste from the washer shall have a removable basket or strainer to prevent the discharge of large particles into the drainage system.

Section 418: Laundry Trays

418.1: Approval.

Laundry trays shall conform to ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4 or CSA B45.5/IAPMO Z124.

418.2: Waste outlet.

Each compartment of a laundry tray shall be provided with a waste outlet not less than 1 1/2 inches (38 mm) in diameter and a strainer or crossbar to restrict the clear opening of the waste outlet.

Section 419: Lavatories

419.1: Approval.

Lavatories shall conform to ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4 or CSA B45.5/IAPMO Z124. Group wash fixtures shall conform to the requirements of Section 402. For determining the number of lavatories required by Table 403.1, every 20 inches (508 mm) of rim space of a group wash fixture shall be considered as one lavatory.

419.2: Cultured marble lavatories.

Cultured marble vanity tops with an integral lavatory shall conform to CSA B45.5/IAPMO Z124.

419.3: Lavatory waste outlets.

Lavatories and group wash fixtures shall have a waste outlet not less than 1 1/4 inches (32 mm) in diameter. A strainer, pop-up stopper, crossbar or other device shall be provided to restrict the clear opening of the waste outlet.

419.4: Movable lavatory systems.

Movable lavatory systems shall comply with ASME A112.19.12.

419.5: Tempered water for public hand-washing facilities.

Tempered water shall be delivered from lavatories and group wash fixtures located in public toilet facilities provided for customers, patrons and visitors. Tempered water shall be delivered through an approved water-temperature limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70.

419.6: Soap dispenser.

Soap dispensers shall be provided for public lavatories.

Section 420: Manual Food and Beverage Dispensing Equipment

420.1: Approval.

Manual food and beverage dispensing equipment shall conform to the requirements of NSF 18.

Section 421: Showers

421.1: Approval.

Prefabricated showers and shower compartments shall conform to ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4 or CSA B45.5/IAPMO Z124. Shower valves for individual showers shall conform to the requirements of Section 412.3.

421.2: Water supply riser.

Water supply risers from the shower valve to the shower head outlet, whether exposed or concealed, shall be attached to the structure. The attachment to the structure shall be made by the use of support devices designed for use with the specific piping material or by fittings anchored with screws.

421.3: Shower waste outlet.

Waste outlets serving showers shall be not less than 1 1/2 inches (38 mm) in diameter and, for other than waste outlets in bathtubs, shall have removable strainers not less than 3 inches (76 mm) in diameter with strainer openings not less than 1/4 inch (6.4 mm) in least dimension. Where each shower space is not provided with an individual waste outlet, the waste outlet shall be located and the floor pitched so that waste from one shower does not flow over the floor area serving another shower. Waste outlets shall be fastened to the waste pipe in an approved manner.

421.3.1: Waste fittings.

Waste fittings shall conform to ASME A112.18.2/CSA B125.2.

421.4: Shower compartments.

Shower compartments shall be not less than 900 square inches (0.58 m2) in interior cross-sectional area. Shower compartments shall be not less than 30 inches (762 mm) in least dimension as measured from the finished interior dimension of the compartment, exclusive of fixture valves, showerheads, soap dishes and safety grab bars or rails. Except as required in Section 404, the minimum required area and dimension shall be measured from the finished interior dimension at a height equal to the top of the threshold and at a point tangent to its centerline and shall be continued to a height not less than 70 inches (1778 mm) above the shower drain outlet.

> **Exception:** Shower compartments having not less than 25 inches (635 mm) in minimum dimension measured from the finished interior dimension of the compartment, provided that the shower compartment has not less than 1,300 square inches (0.838 m2) of cross-sectional area.

421.4.1: Floor and wall area.

Bathtub floors, shower floors, wall areas above built-in tubs that have installed shower heads and walls in shower compartments shall be constructed of smooth, corrosion-resistant and nonabsorbent waterproof materials. Wall materials shall extend to a height of not less than 6 feet (1829 mm) above the room floor level, and not less than 70 inches (1778 mm) above the drain of the tub or shower. Such walls shall form a watertight joint with each other and with either the tub or shower floor.

421.4.2: Access.

The shower compartment access and egress opening shall have a clear and unobstructed finished width of not less than 22 inches (559 mm). Shower compartments required to be designed in conformance to accessibility provisions shall comply with Section 404.1.

421.5: Shower floors or receptors.

Floor surfaces shall be constructed of impervious, noncorrosive, nonabsorbent and waterproof materials.

421.5.1: Support.

Floors or receptors under shower compartments shall be laid on, and supported by, a smooth and structurally sound base.

421.5.2: Shower lining.

Floors under shower compartments, except where prefabricated receptors have been provided, shall be lined and made watertight utilizing material complying with Sections 421.5.2.1 through 421.5.2.6. Such liners shall turn up on all sides not less than 2 inches (51 mm) above the finished threshold level. Liners shall be recessed and fastened to an approved backing so as not to occupy the space required for wall covering, and shall not be nailed or perforated at any point less than 1 inch (25 mm) above the finished threshold. Liners shall be pitched one-fourth unit vertical in 12 units horizontal (2 percent slope) and shall be sloped toward the fixture drains and be securely fastened to the waste outlet at the seepage entrance, making a watertight joint between the liner and the outlet. The completed liner shall be tested in accordance with Section 312.10.

Exceptions:

1. Floor surfaces under shower heads provided for rinsing laid directly on the ground are not required to comply with this section.
2. Where a sheet-applied, load-bearing, bonded, waterproof membrane is installed as the shower lining, the membrane shall not be required to be recessed.

421.5.2.1: PVC sheets.

Plasticized polyvinyl chloride (PVC) sheets shall meet the requirements of ASTM D4551. Sheets shall be joined by solvent welding in accordance with the manufacturer’s installation instructions.

421.5.2.2: Chlorinated polyethylene (CPE) sheets.

Non-plasticized chlorinated polyethylene sheet shall meet the requirements of ASTM D4068. The liner shall be joined in accordance with the manufacturer’s installation instructions.

421.5.2.3: Sheet lead.

Sheet lead shall weigh not less than 4 pounds per square foot (19.5 kg/m2) and shall be coated with an asphalt paint or other approved coating. The lead sheet shall be insulated from conducting substances other than the connecting drain by 15-pound (6.80 kg) asphalt felt or an equivalent. Sheet lead shall be joined by burning.

421.5.2.4: Sheet copper.

Sheet copper shall conform to ASTM B152 and shall weigh not less than 12 ounces per square foot (3.7 kg/m2). The copper sheet shall be insulated from conducting substances other than the connecting drain by 15-pound (6.80 kg) asphalt felt or an equivalent. Sheet copper shall be joined by brazing or soldering.

421.5.2.5: Sheet-applied, load-bearing, bonded, waterproof membranes.

Sheet-applied, load-bearing, bonded, waterproof membranes shall meet the requirements of ANSI A118.10 and shall be applied in accordance with the manufacturer's installation instructions.

421.5.2.6: Liquid-type, trowel-applied, load-bearing, bonded waterproof materials.

Liquid-type, trowel-applied, load-bearing, bonded waterproof materials shall meet the requirements of ANSI A118.10 and shall be applied in accordance with the manufacturer's instructions.

421.6: Glazing.

Windows and doors within a shower enclosure shall conform to the safety glazing requirements of the International Building Code.

Section 422: Sinks

422.1: Approval.

Sinks shall conform to ASME A112.19.1/CSA B45.2, ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4 or CSA B45.5/IAPMO Z124.

422.2: Sink waste outlets.

Sinks shall be provided with waste outlets having a diameter not less than 1 1/2 inches (38 mm). A strainer or crossbar shall be provided to restrict the clear opening of the waste outlet.

422.3: Movable sink systems.

Movable sink systems shall comply with ASME A112.19.12.

Section 423: Specialty Plumbing Fixtures

423.1: Water connections.

Baptisteries, ornamental and lily pools, aquariums, ornamental fountain basins, swimming pools, and similar constructions, where provided with water supplies, shall be protected against backflow in accordance with Section 608.

423.2: Approval.

Specialties requiring water and waste connections shall be submitted for approval.

423.3: Footbaths and pedicure baths.

The water supplied to specialty plumbing fixtures, such as pedicure chairs having an integral foot bathtub and footbaths, shall be limited to not greater than 120ºF (49ºC) by a water-temperature-

limiting device that conforms to ASSE 1070/ASME A112.1070/CSA B125.70 or by a water heater complying with ASSE 1082 or 1084.

Section 424: Urinals

424.1: Approval.

Urinals shall conform to ASME A112.19.2/CSA B45.1, ASME A112.19.19 or CSA B45.5/IAPMO Z124. Urinals shall conform to the water consumption requirements of Section 604.4. Water-supplied urinals shall conform to the hydraulic performance requirements of ASME A112.19.2/CSA B45.1 or CSA B45.5/IAPMO Z124.

424.2: Substitution for water closets.

In each bathroom or toilet room, urinals shall not be substituted for more than 67 percent of the required water closets for males according to Table 403.1 in assembly and educational occupancies. Urinals shall not be substituted for more than 50 percent of the required water closets for males according to Table 403.1 in all other occupancies.

Section 425: Water Closets

425.1: Approval.

Water closets shall conform to the water consumption requirements of Section 604.4 and shall conform to ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4 or CSA B45.5/IAPMO Z124.

425.1.1: Hydraulic performance.

Water closets shall conform to the hydraulic performance requirements of ASME A112.19.2/CSA B45.1.

425.1.2: Water closet tanks.

Water closet tanks shall conform to ASME A112.19.2/CSA B45.1, ASME A112.19.3/CSA B45.4 or CSA B45.5/IAPMO Z124.

425.1.3: Dual flush water closets.

Water closets equipped with a dual flushing device shall comply with ASME A112.19.14.

425.2: Water closets for public or employee toilet facilities.

Water closet bowls for public or employee toilet facilities shall be of the elongated type.

425.3: Water closet seats.

Water closets shall be equipped with seats of smooth, nonabsorbent material. Seats of water closets provided for public or employee toilet facilities shall be of the hinged open-front type. Integral water closet seats shall be of the same material as the fixture. Water closet seats shall be sized for the water closet bowl type.

425.4: Water closet connections.

A 4-inch by 3-inch (102 mm by 76 mm) closet bend shall be acceptable. Where a 3-inch (76 mm) bend is utilized on water closets, a 4-inch by 3-inch (102 mm by 76 mm) flange shall be installed to receive the fixture horn.

Section 426: Whirlpool Bathtubs

426.1: Approval.

Whirlpool bathtubs shall comply with ASME A112.19.7/CSA B45.10 and shall be listed and labeled in accordance with UL 1795.

426.2: Installation.

Whirlpool bathtubs shall be installed and tested in accordance with the manufacturer's instructions. The pump shall be located above the weir of the fixture trap.

426.3: Drain.

The pump drain and circulation piping shall be sloped to drain the water in the volute and the circulation piping when the whirlpool bathtub is empty.

426.4: Suction fittings.

Suction fittings for whirlpool bathtubs shall comply with ASME A112.19.7/CSA B45.10.

426.5: Access to pump.

Access shall be provided to circulation pumps in accordance with the fixture or pump manufacturer's installation instructions. Where the manufacturer's instructions do not specify the location and minimum size of field-fabricated access openings, an opening not less than 12 inches by 12 inches (305 mm by 305 mm) shall be installed to provide access to the circulation pump. Where pumps are located more than 2 feet (609 mm) from the access opening, an opening not less than 18 inches by 18 inches (457 mm by 457 mm) shall be installed. A door or panel shall be permitted to close the opening. In all cases, the access opening shall be unobstructed and of the size necessary to permit the removal and replacement of the circulation pump.

426.6: Whirlpool enclosure.

Doors within a whirlpool enclosure shall conform to ASME A112.19.15.

Chapter 5: Water Heaters

User notes:

About this chapter: Chapter 5 contains regulations concerning the safety of water heating units and hot water storage tanks. Heated (hot or tempered) potable water is needed for plumbing fixtures that are associated with handwashing, bathing, culinary activities and building maintenance. Heated water is commonly stored in large pressurized storage tanks that must be protected against explosion by pressure and temperature relief valves specified in this chapter. This chapter also covers the access

requirements to water heaters and hot water storage tanks to allow for the maintenance and replacement of that equipment.

Section 501: General

501.1: Scope.

The provisions of this chapter shall govern the materials, design and installation of water heaters and the related safety devices and appurtenances.

501.2: Water heater as space heater.

Where a combination potable water heating and space heating system requires water for space heating at temperatures greater than 140°F (60°C), a temperature-actuated mixing valve complying with ASSE 1017 shall be provided to limit the water supplied to the potable hot water distribution system to a temperature of 140°F (60°C) or less. The potability of the water shall be maintained throughout the system. Requirements for combination potable water heating and space heating systems shall be in accordance with the International Mechanical Code.

501.3: Drain valves.

Drain valves for emptying shall be installed at the bottom of each tank-type water heater and hot water storage tank. The drain valve inlet shall be not less than 3/4-inch (19 mm) nominal iron pipe size and the outlet shall be provided with male garden hose threads.

501.4: Location.

Water heaters and storage tanks shall be located and connected so as to provide access for observation, maintenance, servicing and replacement.

501.5: Water heater labeling.

Water heaters shall be third-party certified.

501.6: Water temperature control in piping from tankless heaters.

The temperature of water from tankless water heaters shall be not greater than 140°F (60°C) where intended for domestic uses. This provision shall not supersede the requirement for protective shower valves in accordance with Section 412.3.

501.7: Pressure marking of storage tanks.

Storage tanks and water heaters installed for domestic hot water shall have the maximum allowable working pressure clearly and indelibly stamped in the metal or marked on a plate welded thereto or otherwise permanently attached. Such markings shall be in a position with access on the outside of the tank so as to make inspection or reinspection readily possible.

501.8: Temperature controls.

Hot water supply systems shall be equipped with automatic temperature controls capable of adjustments from the lowest to the highest acceptable temperature settings for the intended temperature operating range.

501.9: Lead content.

Water heaters that are part of the potable water distribution system shall comply with NSF 372 and shall have a weighted average lead content of 0.25 percent or less.

Section 502: Installation

502.1: General.

Water heaters shall be installed in accordance with the manufacturer's instructions. Oil-fired water heaters shall conform to the requirements of this code and the International Mechanical Code. Electric water heaters shall conform to the requirements of this code and provisions of NFPA 70. Gas-fired water heaters shall conform to the requirements of the International Fuel Gas Code. Solar thermal water heating systems shall conform to the requirements of the International Mechanical Code and ICC 900/SRCC 300.

502.1.1: Elevation and protection.

Elevation of water heater ignition sources and mechanical damage protection requirements for water heaters shall be in accordance with the International Mechanical Code and the International Fuel Gas Code.

502.2: Rooms used as a plenum.

Water heaters using solid, liquid or gas fuel shall not be installed in a room containing air-handling machinery where such room is used as a plenum.

502.3: Water heaters installed in attics.

Attics containing a water heater shall be provided with an opening and unobstructed passageway large enough to allow removal of the water heater. The passageway shall be not less than 30 inches (762 mm) in height and 22 inches (559 mm) in width and not more than 20 feet (6096 mm) in length when measured along the centerline of the passageway from the opening to the water heater. The passageway shall have continuous solid flooring not less than 24 inches (610 mm) in width. A level service space not less than 30 inches (762 mm) in length and 30 inches (762 mm) in width shall be present at the front or service side of the water heater. The clear access opening dimensions shall be not less than 20 inches by 30 inches (508 mm by 762 mm) where such dimensions are large enough to allow removal of the water heater.

502.4: Seismic supports.

Where earthquake loads are applicable in accordance with the International Building Code, water heater supports shall be designed and installed for the seismic forces in accordance with the International Building Code.

502.5: Clearances for maintenance and replacement.

Appliances shall be provided with access for inspection, service, repair and replacement without disabling the function of a fire-resistance-rated assembly or removing permanent construction, other appliances or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced. A level working space not less than 30 inches in length and 30 inches in width (762 mm by 762 mm) shall be provided in front of the control side to service an appliance.

Section 503: Connections

503.1: Cold water line valve.

The cold water branch line from the main water supply line to each hot water storage tank or water heater shall be provided with a valve, located near the equipment and serving only the hot water storage tank or water heater. The valve shall not interfere or cause a disruption of the cold water supply to the remainder of the cold water system. The valve shall be provided with access on the same floor level as the water heater served.

503.2: Water circulation.

The method of connecting a circulating water heater to the tank shall provide proper circulation of water through the water heater. The pipe or tubes required for the installation of appliances that will draw from the water heater or storage tank shall comply with the provisions of this code for material and installation.

Section 504: Safety Devices

504.1: Antisiphon devices.

An approved means, such as a cold water “dip” tube with a hole at the top or a vacuum relief valve installed in the cold water supply line above the top of the heater or tank, shall be provided to prevent siphoning of any storage water heater or tank.

504.2: Vacuum relief valve.

Bottom fed water heaters and bottom fed tanks connected to water heaters shall have a vacuum relief valve installed. The vacuum relief valve shall comply with ANSI Z21.22.

504.3: Shutdown.

A means for disconnecting an electric hot water supply system from its energy supply shall be provided in accordance with NFPA 70. A separate valve shall be provided to shut off the energy fuel supply to all other types of hot water supply systems.

504.4: Relief valve.

Storage water heaters operating above atmospheric pressure shall be provided with an approved, self-closing (levered) pressure relief valve and temperature relief valve or combination thereof. The relief valve shall conform to ANSI Z21.22. The relief valve shall not be used as a means of controlling thermal expansion.

504.4.1: Installation.

Such valves shall be installed in the shell of the water heater tank. Temperature relief valves shall be located in the tank so as to be actuated by the water in the top 6 inches (152 mm) of the tank served. For installations with separate storage tanks, the approved, self-closing (levered) pressure relief valve and temperature relief valve or combination thereof conforming to ANSI Z21.22 valves shall be installed on both the storage water heater and storage tank. There shall not be a check valve or shutoff valve between a relief valve and the heater or tank served.

504.5: Relief valve approval.

Temperature and pressure relief valves, or combinations thereof, and energy cutoff devices shall bear the label of an approved agency and shall have a temperature setting of not more than 210°F (99°C) and a pressure setting not exceeding the tank or water heater manufacturer's rated working pressure or 150 psi (1035 kPa), whichever is less. The relieving capacity of each pressure relief valve and each temperature relief valve shall equal or exceed the heat input to the water heater or storage tank.

504.6: Requirements for discharge piping.

The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. Terminate not more than 6 inches (152 mm) above and not less than two times the discharge pipe diameter above the floor or flood level rim of the waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section 605.4 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.
14. Be one nominal size larger than the size of the relief valve outlet, where the relief valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.

504.7: Required pan.

Where a storage tank-type water heater or a hot water storage tank is installed in a location where water leakage from the tank will cause damage, the tank shall be installed in a pan constructed of one of the following:

1. Galvanized steel or aluminum of not less than 0.0236 inch (0.6010 mm) in thickness.
2. Plastic not less than 0.036 inch (0.9 mm) in thickness.
3. Other approved materials.

A plastic pan installed beneath a gas-fired water heater shall be constructed of material having a flame spread index of 25 or less and a smoked-developed index of 450 or less when tested in accordance with ASTM E84 or UL723.

Water heaters installed in pans shall comply with Section 314.2.3.2.

504.7.1: Pan size and drain.

The pan shall be not less than 1 1/2 inches (38 mm) in depth and shall be of sufficient size and shape to receive all dripping or condensate from the tank or water heater. The pan shall be drained by an indirect waste pipe having a diameter of not less than 3/4 inch (19 mm). Piping for safety pan drains shall be of those materials listed in Table 605.4.

504.7.2: Pan drain termination.

The pan drain shall extend full size and terminate over a suitably located indirect waste receptor or floor drain or extend to the exterior of the building and terminate not less than 6 inches (152 mm) and not more than 24 inches (610 mm) above the adjacent ground surface. Where a pan drain was not previously installed, a pan drain shall not be required for a replacement water heater installation.

Section 505: Insulation

[E] 505.1: Unfired vessel insulation.

Unfired hot water storage tanks shall be insulated to R-12.5 (h × ft2× °F)/Btu (R-2.2 m2× K/W).

Chapter 6: Water Supply and Distribution

User notes:

About this chapter: Many plumbing fixtures require a supply of potable water. Other fixtures could be supplied with non-potable water such as reclaimed water. Chapter 6 covers the requirements for water distribution piping systems to and within buildings. The regulations include the types of materials and the connection methods for such systems. The prevention of backflow of contaminated or polluted water into any potable water system is critical for protection of users of potable water. This chapter regulates the assemblies, devices and methods that are used for this purpose.

Section 601: General

601.1: Scope.

This chapter shall govern the materials, design and installation of water supply systems, both hot and cold, for utilization in connection with human occupancy and habitation and shall govern the installation of individual water supply systems.

601.2: Solar energy utilization.

Solar energy systems used for heating potable water or using an independent medium for heating potable water shall comply with the applicable requirements of this code. The use of solar energy shall not compromise the requirements for cross connection or protection of the potable water supply system required by this code.

601.3: Existing piping used for grounding.

Existing metallic water service piping used for electrical grounding shall not be replaced with nonmetallic pipe or tubing until other approved means of grounding is provided.

601.4: Tests.

The potable water distribution system shall be tested in accordance with Section 312.6.

601.5: Rehabilitation of piping systems.

Where pressure piping systems are rehabilitated using an epoxy lining system, such lining system shall comply with ASTM F2831.

Section 602: Water Required

602.1: General.

Structures equipped with plumbing fixtures and utilized for human occupancy or habitation shall be provided with a potable supply of water in the amounts and at the pressures specified in this chapter.

602.2: Potable water required.

Only potable water shall be supplied to plumbing fixtures that provide water for drinking, bathing or culinary purposes, or for the processing of food, medical or pharmaceutical products. Unless otherwise provided in this code, potable water shall be supplied to all plumbing fixtures.

602.3: Individual water supply.

Where a potable public water supply is not available, individual sources of potable water supply shall be utilized.

602.3.1: Sources.

Dependent on geological and soil conditions and the amount of rainfall, individual water supplies are of the following types: drilled well, driven well, dug well, bored well, spring, stream or cistern. Surface bodies of water and land cisterns shall not be sources of individual water supply unless properly

treated by approved means to prevent contamination. Individual water supplies shall be constructed and installed in accordance with the applicable state and local laws. Where such laws do not address all of the requirements set forth in NGWA-01, individual water supplies shall comply with NGWA-01 for those requirements not addressed by state and local laws.

602.3.2: Minimum quantity.

The combined capacity of the source and storage in an individual water supply system shall supply the fixtures with water at rates and pressures as required by this chapter.

602.3.3: Water quality.

Water from an individual water supply shall be approved as potable by the authority having jurisdiction prior to connection to the plumbing system.

602.3.4: Disinfection of system.

After construction, the individual water supply system shall be purged of deleterious matter and disinfected in accordance with Section 610.

602.3.5: Pumps.

Pumps shall be rated for the transport of potable water. Pumps in an individual water supply system shall be constructed and installed so as to prevent contamination from entering a potable water supply through the pump units. Pumps intended to supply drinking water shall conform to NSF 61. Pumps shall be sealed to the well casing or covered with a watertight seal. Pumps shall be designed to maintain a prime and installed such that ready access is provided to the pump parts of the entire assembly for repairs.

602.3.5.1: Pump enclosure.

The pump room or enclosure around a well pump shall be drained and protected from freezing by heating or other approved means. Where pumps are installed in basements, such pumps shall be mounted on a block or shelf not less than 18 inches (457 mm) above the basement floor. Well pits shall be prohibited.

Section 603: Water Service

603.1: Size of water service pipe.

The water service pipe shall be sized to supply water to the structure in the quantities and at the pressures required in this code. The water service pipe shall be not less than 3/4 inch (19.1 mm) in diameter.

603.2: Separation of water service and building sewer.

Where water service piping is located in the same trench with the building sewer, such sewer shall be constructed of materials listed in Table 702.2. Where the building sewer piping is not constructed of materials listed in Table 702.2, the water service pipe and the building sewer shall be horizontally separated by not less than 5 feet (1524 mm) of undisturbed or compacted earth. The required

separation distance shall not apply where a water service pipe crosses a sewer pipe, provided that the water service is sleeved to a point not less than 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing. The sleeve shall be of pipe materials listed in Table 605.3, 702.2 or 702.3. The required separation distance shall not apply where the bottom of the water service pipe, located within 5 feet (1524 mm) of the sewer, is not less than 12 inches (305 mm) above the highest point of the top of the building sewer.

603.2.1: Water service near sources of pollution.

Potable water service pipes shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Where soil or ground water causes contaminated conditions for piping, analysis shall be required in accordance with Section 605.1.

Section 604: Design of Building Water Distribution System

604.1: General.

The design of the water distribution system shall conform to accepted engineering practice. Methods utilized to determine pipe sizes shall be approved.

604.2: System interconnection.

At the points of interconnection between the hot and cold water supply piping systems and the individual fixtures, appliances or devices, provisions shall be made to prevent flow between such piping systems.

604.3: Water distribution system design criteria.

The water distribution system shall be designed, and pipe sizes shall be selected such that under conditions of peak demand, the capacities at the fixture supply pipe outlets shall be not less than shown in Table 604.3. The minimum flow rate and flow pressure provided to fixtures and appliances not listed in Table 604.3 shall be in accordance with the manufacturer’s installation instructions.

TABLE 604.3 WATER DISTRIBUTION SYSTEM DESIGN CRITERIA REQUIRED CAPACITY AT FIXTURE SUPPLY PIPE OUTLETS

FIXTURE SUPPLY OUTLET SERVING	FLOW RATE[a] (gpm)	FLOW PRESSURE (psi)
Bathtub, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	4	20
Bidet, thermostatic mixing valve	2	20
Combination fixture	4	8
Dishwasher, residential	2.75	8
Drinking fountain	0.75	8
Laundry tray	4	8
Lavatory, private	0.8	8
Lavatory, private, mixing valve	0.8	8
Lavatory, public	0.4	8
Shower	2.5	8
Shower, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	2.5[b]	20
Sill cock, hose bibb	5	8
Sink, residential	1.75	8
Sink, service	3	8
Urinal, valve	12	25
Water closet, blow out, flushometer valve	25	45
Water closet, flushometer tank	1.6	20
Water closet, siphonic, flushometer valve	25	35
Water closet, tank, close coupled	3	20
Water closet, tank, one piece	6	20

For SI: 1 pound per square inch = 6.895 kPa, 1 gallon per minute = 3.785 L/m.

a. For additional requirements for flow rates and quantities, see Section 604.4.
b. Where the shower mixing valve manufacturer indicates a lower flow rating for the mixing valve, the lower value shall be applied.

604.4: Maximum flow and water consumption.

The maximum water consumption flow rates and quantities for all plumbing fixtures and fixture fittings shall be in accordance with Table 604.4.

Exceptions:

1. Blowout design water closets having a water consumption not greater than 3 1/2 gallons (13 L) per flushing cycle.
2. Vegetable sprays.
3. Clinical sinks having a water consumption not greater than 4 1/2 gallons (17 L) per flushing cycle.
4. Service sinks.
5. Emergency showers.

TABLE 604.4 MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY[b]
Lavatory, private	2.2 gpm at 60 psi
Lavatory, public (metering)	0.25 gallon per metering cycle
Lavatory, public (other than metering)	0.5 gpm at 60 psi
Shower head[a, c]	2.0 gpm at 80 psi
Sink faucet	2.2 gpm at 60 psi
Urinal	1.0 gallon per flushing cycle
Water closet	1.6 gallons per flushing cycle

For SI: 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. A hand-held shower spray is a shower head.
b. Consumption tolerances shall be determined from referenced standards.
c. Shower heads shall comply with all requirements for high-efficiency showerheads in ASME A112.18.1-2020/CSA B125.1.

604.5: Size of fixture supply.

The minimum size of a fixture supply pipe shall be as shown in Table 604.5. The fixture supply pipe shall terminate not more than 30 inches (762 mm) from the point of connection to the fixture. A reduced-size flexible water connector installed between the supply pipe and the fixture shall be of an approved type. The supply pipe shall extend to the floor or wall adjacent to the fixture. The minimum size of individual distribution lines utilized in gridded or parallel water distribution systems shall be as shown in Table 604.5.

TABLE 604.5 MINIMUM SIZES OF FIXTURE WATER SUPPLY PIPES

FIXTURE	MINIMUM PIPE SIZE (inch)
Bathtubs[a] (60″ × 32″ and smaller)	1/2
Bathtubs[a] (larger than 60″ × 32″)	1/2
Bidet	3/8
Combination sink and tray	1/2
Dishwasher, domestic[a]	1/2
Drinking fountain	3/8
Hose bibbs	1/2
Kitchen sink[a]	1/2
Laundry, 1, 2 or 3 compartments[a]	1/2
Lavatory	3/8
Shower, single head[a]	1/2
Sinks, flushing rim	3/4
Sinks, service	1/2
Urinal, flush tank	1/2
Urinal, flushometer valve	3/4
Wall hydrant	1/2
Water closet, flush tank	3/8
Water closet, flushometer tank	3/8
Water closet, flushometer valve	1
Water closet, one piece[a]	1/2

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895 kPa.

a. Where the developed length of the distribution line is 50 feet or less, and the available pressure at the meter is 35 psi or greater, the minimum size of an individual distribution line supplied from a manifold and installed as part of a parallel water distribution system shall be one nominal tube size smaller than the sizes indicated.

604.6: Variable street pressures.

Where street water main pressures fluctuate, the building water distribution system shall be designed for the minimum pressure available.

604.7: Inadequate water pressure.

Wherever water pressure from the street main or other source of supply is insufficient to provide flow pressures at fixture outlets as required under Table 604.3, a water pressure booster system conforming to Section 606.5 shall be installed on the building water supply system.

604.8: Water pressure-reducing valve or regulator.

Where water pressure within a building exceeds 80 psi (552 kPa) static, an approved water pressure-reducing valve conforming to ASSE 1003 or CSA B356 with strainer shall be installed to reduce the pressure in the building water distribution piping to not greater than 80 psi (552 kPa) static.

> **Exception:** Service lines to sill cocks and outside hydrants, and main supply risers where pressure from the mains is reduced to 80 psi (552 kPa) or less at individual fixtures.

604.8.1: Valve design.

The pressure-reducing valve shall be designed to remain open to permit uninterrupted water flow in case of valve failure.

604.8.2: Repair and removal.

Water pressure-reducing valves, regulators and strainers shall be so constructed and installed as to permit repair or removal of parts without breaking a pipeline or removing the valve and strainer from the pipeline.

604.9: Water hammer.

The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. A water-hammer arrestor shall be installed where quick-closing valves are utilized. Water-hammer arrestors shall be installed in accordance with the manufacturer's instructions. Water-hammer arrestors shall conform to ASSE 1010.

604.10: Gridded and parallel water distribution system manifolds.

Hot water and cold water manifolds installed with gridded or parallel connected individual distribution lines to each fixture or fixture fitting shall be designed in accordance with Sections 604.10.1 through 604.10.3.

604.10.1: Manifold sizing.

Hot water and cold water manifolds shall be sized in accordance with Table 604.10.1. The total gallons per minute is the demand of all outlets supplied.

TABLE 604.10.1 MANIFOLD SIZING

NOMINAL SIZE INTERNAL DIAMETER (inches)	MAXIMUM DEMAND (gpm)	
	Velocity at 4 feet per second	Velocity at 8 feet per second
1/2	2	5
3/4	6	11
1	10	20
1 1/4	15	31
1 1/2	22	44

For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/m, 1 foot per second = 0.305 m/s.

604.10.2: Valves.

Individual fixture shutoff valves installed at the manifold shall be identified as to the fixture being supplied.

604.10.3: Access.

Access shall be provided to manifolds with integral factory- or field-installed valves.

604.11: Individual pressure balancing in-line valves for individual fixture fittings.

Where individual pressure balancing in-line valves for individual fixture fittings are installed, such valves shall comply with ASSE 1066. Such valves shall be installed in a location with access. The

valves shall not be utilized alone as a substitute for the balanced pressure, thermostatic or combination shower valves required in Section 412.3.

Section 605: Materials, Joints and Connections

605.1: Soil and ground water.

The installation of a water service or water distribution pipe shall be prohibited in soil and ground water contaminated with solvents, fuels, organic compounds or other detrimental materials causing permeation, corrosion, degradation or structural failure of the piping material. Where detrimental conditions are suspected, a chemical analysis of the soil and ground water conditions shall be required to ascertain the acceptability of the water service or water distribution piping material for the specific installation. Where detrimental conditions exist, approved alternative materials or routing shall be required.

605.2: Lead content of water supply pipe and fittings.

Pipe and pipe fittings, including valves and faucets, utilized in the water supply system shall have not more than 8 percent lead content.

605.2.1: Lead content of drinking water pipe and fittings.

Pipe, pipe fittings, joints, valves, faucets and fixture fittings utilized to supply water for drinking or cooking purposes shall comply with NSF 372 and shall have a weighted average lead content of 0.25 percent or less.

605.3: Water service pipe.

Water service pipe shall conform to NSF 61 and shall conform to one of the standards listed in Table 605.3. Water service pipe or tubing, installed underground and outside of the structure, shall have a working pressure rating of not less than 160 psi (1100 kPa) at 73.4ºF (23ºC). Where the water pressure exceeds 160 psi (1100 kPa), piping material shall have a working pressure rating not less than the highest available pressure. Water service piping materials not third-party certified for water distribution shall terminate at or before the full-open valve located at the entrance to the structure. Ductile iron water service piping shall be cement mortar lined in accordance with AWWA C104/A21.4.

TABLE 605.3 WATER SERVICE PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D1527; ASTM D2282
Chlorinated polyvinyl chloride (CPVC) plastic pipe	ASTM D2846; ASTM F441; ASTM F442; CSA B137.6
Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC)	ASTM F2855
Copper or copper-alloy pipe	ASTM B42; ASTM B43; ASTM B302
Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM)	ASTM B75; ASTM B88; ASTM B251; ASTM B447
Cross-linked polyethylene (PEX) plastic pipe and tubing	ASTM F876; AWWA C904; CSA B137.5
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	ASTM F1281; ASTM F2262; CSA B137.10
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F1986
Ductile iron water pipe	AWWA C115/A21.15; AWWA C151/A21.51
Galvanized steel pipe	ASTM A53
Polyethylene (PE) plastic pipe	ASTM D2239; ASTM D3035; AWWA C901; CSA B137.1
Polyethylene (PE) plastic tubing	ASTM D2737; AWWA C901; CSA B137.1
Polyethylene/aluminum/polyethylene (PE-AL-PE) pipe	ASTM F1282; CSA B137.9
Polyethylene of raised temperature (PE-RT) plastic tubing	ASTM F2769; CSA B137.18
Polypropylene (PP) plastic pipe or tubing	ASTM F2389; CSA B137.11
Polyvinyl chloride (PVC) plastic pipe	ASTM D1785; ASTM D2241; ASTM D2672; CSA B137.3
Stainless steel pipe (Type 304/304L)	ASTM A269/A269M; ASTM A312; ASTM A778
Stainless steel pipe (Type 316/316L)	ASTM A269/A269M; ASTM A312; ASTM A778
Stainless steel tubing (Type 304/304L)	ASTM A269/A269M; ASTM A312; ASTM A778
Stainless steel tubing (Type 316/316L)	ASTM A269/A269M; ASTM A312; ASTM A778

605.3.1: Dual check-valve-type backflow preventer.

Dual check-valve backflow preventers installed on the water supply system shall comply with ASSE 1024 or CSA B64.6.

605.4: Water distribution pipe.

Water distribution pipe and tubing shall conform to NSF 61 and shall conform to one of the standards listed in Table 605.4. Hot water distribution pipe and tubing shall have a pressure rating of not less than 100 psi (690 kPa) at 180ºF (82ºC).

TABLE 605.4 WATER DISTRIBUTION PIPE

MATERIAL	STANDARD
Chlorinated polyvinyl chloride (CPVC) plastic pipe and tubing	ASTM D2846; ASTM F441; ASTM F442; CSA B137.6
Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC)	ASTM F2855
Copper or copper-alloy pipe	ASTM B42; ASTM B43; ASTM B302
Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM)	ASTM B75; ASTM B88; ASTM B251; ASTM B447
Cross-linked polyethylene (PEX) plastic tubing	ASTM F876; CSA B137.5
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	ASTM F1281; ASTM F2262; CSA B137.10
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F1986
Ductile iron pipe	AWWA C115/A21.15; AWWA C151/A21.51
Galvanized steel pipe	ASTM A53
Polyethylene/aluminum/polyethylene (PE-AL-PE) composite pipe	ASTM F1282
Polyethylene of raised temperature (PE-RT) plastic tubing	ASTM F2769; CSA B137.18
Polypropylene (PP) plastic pipe or tubing	ASTM F2389; CSA B137.11
Stainless steel pipe (Type 304/304L)	ASTM A312; ASTM A778
Stainless steel pipe (Type 316/316L)	ASTM A312; ASTM A778
Stainless steel tubing (Type 304/304L)	ASTM A269/A269M; ASTM A312; ASTM A778
Stainless steel tubing (Type 316/316L)	ASTM A269/A269M; ASTM A312; ASTM A778

605.5: Fittings.

Pipe fittings shall be approved for installation with the piping material installed and shall comply with the applicable standards listed in Table 605.5. Pipe fittings utilized in water supply systems shall also comply with NSF 61. Ductile and gray iron pipe and pipe fittings utilized in water service piping systems shall be cement mortar lined in accordance with AWWA C104/A21.4.

TABLE 605.5 PIPE FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic	ASTM D2468
Cast iron	ASME B16.4
Chlorinated polyvinyl chloride (CPVC) plastic	ASSE 1061; ASTM D2846; ASTM F437; ASTM F438; ASTM F439; CSA B137.6
Copper or copper alloy	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.26; ASME B16.51; ASSE 1061; ASTM F1476; ASTM F1548; ASTM F3226
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F1986
Fittings for cross-linked polyethylene (PEX) plastic tubing	ASSE 1061; ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2098; ASTM F2159; ASTM F2434; ASTM F2735; ASTM F3347; ASTM F3348; CSA B137.5
Fittings for polyethylene of raised temperature (PE-RT) plastic tubing	ASSE 1061; ASTM D3261; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; ASTM F3347; ASTM F3348; CSA B137.18
Gray iron and ductile iron	ASTM F1476; ASTM F1548; AWWA C110/A21.10; AWWA C153/A21.53;
Insert fittings for polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX)	ASTM F1281; ASTM F1282; ASTM F1974; CSA B137.9; CSA B137.10
Malleable iron	ASME B16.3
Metal (copper alloy) insert fittings for polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX)	ASTM F1974
Polyethylene (PE) plastic pipe	ASTM D2609; ASTM D2683; ASTM D3261; ASTM F1055; CSA B137.1
Polypropylene (PP) plastic pipe or tubing	ASTM F2389; CSA B137.11
Polyvinyl chloride (PVC) plastic	ASTM D2464; ASTM D2466; ASTM D2467; CSA B137.2; CSA B137.3
Stainless steel (Type 304/304L)	ASTM A269; ASTM A312; ASTM A778; ASTM F1476; ASTM F1548; ASTM F3226
Stainless steel (Type 316/316L)	ASTM A269; ASTM A312; ASTM A778; ASTM F1476; ASTM F1548; ASTM F3226
Steel	ASME B16.9; ASME B16.11; ASME B16.28; ASTM F1476; ASTM F1548; ASTM F3226

605.5.1: Mechanically formed tee fittings.

Mechanically extracted outlets shall have a height not less than three times the thickness of the branch tube wall.

605.5.1.1: Full flow assurance.

Branch tubes shall not restrict the flow in the run tube. A dimple serving as a depth stop shall be formed in the branch tube to ensure that penetration into the collar is of the correct depth. For inspection purposes, a second dimple shall be placed 1/4 inch (6.4 mm) above the first dimple. Dimples shall be aligned with the tube run.

605.5.1.2: Brazed joints.

Mechanically formed tee fittings shall be brazed in accordance with Section 605.14.1.

605.6: Flexible water connectors.

Flexible water connectors exposed to continuous pressure shall conform to ASME A112.18.6/CSA B125.6. Access shall be provided to all flexible water connectors.

605.7: Valves.

Valves shall be compatible with the type of piping material installed in the system. Valves shall conform to one of the standards listed in Table 605.7 or shall be approved. Valves intended to supply drinking water shall meet the requirements of NSF 61.

TABLE 605.7 VALVES

MATERIAL	STANDARD
Chlorinated polyvinyl chloride (CPVC) plastic	ASME A112.4.14; ASME A112.18.1/CSA B125.1; ASTM F1970; CSA B125.3; IAPMO Z1157; MSS SP-122
Copper or copper alloy	ASME A112.4.14; ASME A112.18.1/CSA B125.1; ASME B16.34; CSA B125.3; IAPMO Z1157; MSS SP-67; MSS SP-80; MSS SP-110; MSS SP-139
Cross-linked polyethylene (PEX) plastic	ASME A112.4.14; ASME A112.18.1/CSA B125.1; CSA B125.3; IAPMO Z1157; NSF 359
Gray iron and ductile iron	AWWA C500; AWWA C504; AWWA C507; IAPMO Z1157; MSS SP-67; MSS SP-70; MSS SP-71; MSS SP-72; MSS SP-78
Polypropylene (PP) plastic	ASME A112.4.14; ASTM F2389; IAPMO Z1157
Polyvinyl chloride (PVC) plastic	ASME A112.4.14; ASTM F1970; IAPMO Z1157; MSS SP-122
Stainless steel (Type 304/304L)	ASME A112.4.14; IAPMO Z1157
Stainless steel (Type 316/316L)	ASME A112.4.14; IAPMO Z1157

605.8: Manufactured pipe nipples.

Manufactured pipe nipples shall conform to one of the standards listed in Table 605.8.

TABLE 605.8 MANUFACTURED PIPE NIPPLES

MATERIAL	STANDARD
Copper, copper alloy, and chromium-plated	ASTM B687
Steel	ASTM A733

605.9: Prohibited joints and connections.

The following types of joints and connections shall be prohibited:

1. Cement or concrete joints.
2. Joints made with fittings not approved for the specific installation.
3. Solvent-cement joints between different types of plastic pipe.
4. Saddle-type fittings.

The 2026 Georgia Amendments say: Exception: Saddle-type fittings can be used to connect refrigerator ice makers and humidifiers to an existing residential unit water distribution system, provided that the manufacturer's installation instructions for the distribution piping do not prohibit the use of saddle fittings.

605.10: ABS plastic.

Joints between ABS plastic pipe and fittings shall comply with Sections 605.10.1 through 605.10.3.

605.10.1: Mechanical joints.

Mechanical joints on water pipes shall be made with an elastomeric seal conforming to ASTM D3139. Mechanical joints shall only be installed in underground systems, unless otherwise approved. Joints shall be installed only in accordance with the manufacturer's instructions.

605.10.2: Solvent cementing.

Joint surfaces shall be clean and free from moisture. Solvent cement that conforms to ASTM D2235 shall be applied to all joint surfaces. The joint shall be made while the cement is wet. Joints shall be made in accordance with ASTM D2235. Solvent-cement joints shall be permitted above or below ground.

605.10.3: Threaded joints.

Threads shall conform to ASME B1.20.1. Where pipe is to be threaded, the pipe shall have a wall thickness of not less than Schedule 80. Pipe threads shall be made with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.

605.11: Gray iron and ductile iron joints.

Joints for gray and ductile iron pipe and fittings shall comply with AWWA C111/A21.11 and shall be installed in accordance with the manufacturer's instructions.

605.12: Copper pipe.

Joints between copper or copper-alloy pipe and fittings shall comply with Sections 605.12.1 through 605.12.5.

605.12.1: Brazed joints.

Joint surfaces shall be cleaned. An approved flux shall be applied where required. The joint shall be brazed with a filler metal conforming to AWS A5.8.

605.12.2: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.12.3: Solder joints.

Solder joints shall be made in accordance with ASTM B828. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. A flux conforming to ASTM B813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32. The joining of water supply piping shall be made with lead-free solder and fluxes. "Lead free" shall mean a chemical composition equal to or less than 0.2 percent lead. Solder and flux joining pipe or fittings intended to supply drinking water shall conform to NSF 61.

605.12.4: Threaded joints.

Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.

605.12.5: Welded joints.

Joint surfaces shall be cleaned. The joint shall be welded with an approved filler metal.

605.13: Copper tubing.

Joints between copper or copper-alloy tubing and fittings shall comply with Sections 605.13.1 through 605.13.7.

605.13.1: Brazed joints.

Joint surfaces shall be cleaned. An approved flux shall be applied where required. The joint shall be brazed with a filler metal conforming to AWS A5.8.

605.13.2: Flared joints.

Flared joints for water pipe shall be made by a tool designed for that operation.

605.13.3: Grooved and shouldered mechanical joints.

Grooved and shouldered mechanical joints shall comply with ASTM F1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed.

605.13.4: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.13.5: Press-connect joints.

Press-connect joints shall conform to one of the standards indicated in Table 605.5, and shall be installed in accordance with the manufacturer's instructions. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. The tube shall be fully inserted into the press-connect fitting. Press-connect joints shall be pressed with a tool certified by the manufacturer.

605.13.6: Solder joints.

Solder joints shall be made in accordance with the methods of ASTM B828. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. A flux conforming to ASTM B813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32. The joining of water supply piping shall be made with lead-free solder and flux. "Lead free" shall mean a chemical composition equal to or less than 0.2 percent lead. Solder and flux joining pipe or fittings intended to supply drinking water shall conform to NSF 61.

605.13.7: Push-fit fitting joints.

Push-fit fittings shall conform to ASSE 1061 and shall be installed in accordance with the manufacturer's instructions.

605.14: CPVC plastic.

Joints between CPVC plastic pipe and fittings shall comply with Sections 605.14.1 through 605.14.4.

605.14.1: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.14.2: Solvent cementing.

Joint surfaces shall be clean and free from moisture. Joints shall be made in accordance with the pipe manufacturer's installation instructions. Solvent-cement joints shall be permitted above or below ground. Where such instructions require that a primer be used, the primer shall be applied to the joint surfaces and a solvent cement orange in color and conforming to ASTM F493 shall be applied to the joint surfaces. The joint shall be made in accordance with ASTM D2855 and while the cement is fluid. Where such instructions allow for a one-step solvent cement, yellow or green in color and conforming to ASTM F493, to be used, the joint surfaces shall not require application of a primer before the solvent cement is applied. The joint shall be made in accordance with ASTM F3328 and while the cement is wet.

605.14.3: Threaded joints.

Threads shall conform to ASME B1.20.1. Where pipe is to be threaded, the pipe shall have a wall thickness of not less than Schedule 80. Pipe threads shall be made with dies specifically designed for plastic pipe. The pressure rating of threaded pipe shall be reduced by 50 percent. Thread-by-socket molded fittings shall be permitted. Approved thread lubricant or tape shall be applied on the male threads only.

605.14.4: Push-fit joints.

Push-fit joints shall conform to ASSE 1061 and shall be installed in accordance with the manufacturer's instructions.

605.15: Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC) pipe and tubing.

Joints between CPVC/AL/CPVC plastic pipe or CPVC fittings shall comply with Sections 605.15.1 and 605.15.2.

605.15.1: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.15.2: Solvent cementing.

Joint surfaces shall be clean and free from moisture, and an approved primer shall be applied. Solvent cement, orange in color and conforming to ASTM F493, shall be applied to joint surfaces. The joint shall be made while the cement is wet, and in accordance with ASTM D2855. Solvent cement joints shall be permitted above or below ground.

Exception: A primer is not required where all of the following conditions apply:

1. The solvent cement used is third-party certified as conforming to ASTM F493.
2. The solvent cement used is yellow in color.
3. The solvent cement is used only for joining 1/2-inch (12.7 mm) through 2-inch-diameter (51 mm) CPVC/AL/CPVC pipe and CPVC fittings.
4. The CPVC fittings are manufactured in accordance with ASTM D2846.
5. The joint is made in accordance with ASTM F3328.

605.16: PEX plastic.

Joints between cross-linked polyethylene plastic tubing and fittings shall comply with Sections 605.16.1 through 605.16.3.

605.16.1: Flared joints.

Flared pipe ends shall be made by a tool designed for that operation.

605.16.2: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions. Fittings for cross-linked polyethylene (PEX) plastic tubing shall comply with the applicable standards listed in Table 605.5 and shall be installed in accordance with the manufacturer's instructions. PEX tubing shall be factory marked with the appropriate standards for the fittings that the PEX manufacturer specifies for use with the tubing.

605.16.3: Push-fit joints.

Push-fit joints shall conform to ASSE 1061 and shall be installed in accordance with the manufacturer's instructions.

605.17: Steel.

Joints between galvanized steel pipe and fittings shall comply with Sections 605.17.1 through 605.17.3.

605.17.1: Threaded joints.

Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.

605.17.2: Mechanical joints.

Joints shall be made with an approved elastomeric seal. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.17.3: Grooved and shouldered mechanical joints.

Grooved and shouldered mechanical joints shall comply with ASTM F1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed.

605.18: PE plastic.

Joints between polyethylene plastic pipe or tubing and fittings shall comply with Sections 605.18.1 through 605.18.4.

605.18.1: Flared joints.

Flared joints shall be permitted where so indicated by the pipe manufacturer. Flared joints shall be made by a tool designed for that operation.

605.18.2: Heat-fusion joints.

Joint surfaces shall be clean and free from moisture. Joint surfaces shall be heated to melt temperature and joined. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM D2657.

605.18.3: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.18.4: Installation.

Polyethylene pipe shall be cut square, with a cutter designed for plastic pipe. Except where joined by heat fusion, pipe ends shall be chamfered to remove sharp edges. Kinked pipe shall not be installed. The minimum pipe bending radius shall be not less than 30 pipe diameters, or the minimum coil radius, whichever is greater. Piping shall not be bent beyond straightening of the curvature of the coil. Bends shall be prohibited within 10 pipe diameters of any fitting or valve. Stiffener inserts installed with compression-type couplings and fittings shall not extend beyond the clamp or nut of the coupling or fitting.

605.19: Polypropylene (PP) plastic.

Joints between PP plastic pipe and fittings shall comply with Section 605.19.1 or 605.19.2.

605.19.1: Heat-fusion joints.

Heat-fusion joints for polypropylene pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings, butt-fusion polypropylene fittings or electrofusion 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.

605.19.2: Mechanical and compression sleeve joints.

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

605.20: Polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX).

Joints between PE-AL-PE or PEX-AL-PEX pipe and fittings shall comply with Section 605.20.1.

605.20.1: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions. Fittings for PE-AL-PE and PEX-AL-PEX as described in ASTM F1281, ASTM F1282, ASTM F1974, CSA B137.9 and CSA B137.10 shall be installed in accordance with the manufacturer's instructions.

605.21: PVC plastic.

Joints between PVC plastic pipe and fittings shall comply with Sections 605.21.1 through 605.21.3.

605.21.1: Mechanical joints.

Mechanical joints on water pipe shall be made with an elastomeric seal conforming to ASTM D3139. Mechanical joints shall not be installed in above-ground systems unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.

605.21.2: Grooved and shouldered mechanical joints.

Grooved and shouldered mechanical joints shall comply with ASTM F1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed.

605.21.3: Solvent cementing.

Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F656 shall be applied. Solvent cement not purple in color and conforming to ASTM D2564 or CSA B137.3 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D2855. Solvent-cement joints shall be permitted above or below ground.

605.21.4: Threaded joints.

Threads shall conform to ASME B1.20.1. Where pipe is to be threaded, the pipe shall have a wall thickness of not less than Schedule 80. Pipe threads shall be made with dies specifically designed for plastic pipe. The pressure rating of threaded pipe shall be reduced by 50 percent. Thread-by-socket molded fittings shall be permitted. Approved thread lubricant or tape shall be applied on the male threads only.

605.22: Stainless steel.

Joints between stainless steel pipe and fittings shall comply with Sections 605.22.1 through 605.22.3.

605.22.1: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

605.22.2: Welded joints.

Joint surfaces shall be cleaned. The joint shall be welded autogenously or with an approved filler metal as referenced in ASTM A312.

605.22.3: Grooved and shouldered mechanical joints.

Grooved and shouldered mechanical joints shall comply with ASTM F1476, shall be made with an approved elastomeric seal and shall be installed in accordance with the manufacturer's instructions. Such joints shall be exposed or concealed.

605.23: Joints between different materials.

Joints between different piping materials shall be made with a mechanical joint of the compression or mechanical-sealing type, or shall be made in accordance with Section 605.23.1, 605.23.2 or 605.23.3. Connectors or adapters shall have an elastomeric seal conforming to ASTM F477. Joints shall be installed in accordance with the manufacturer's instructions.

605.23.1: Copper or copper-alloy tubing to galvanized steel pipe.

Joints between copper pipe or tubing and galvanized steel pipe shall be made with a copper-alloy or dielectric fitting or a dielectric union conforming to ASSE 1079. The copper tubing shall be soldered to the fitting in an approved manner, and the fitting shall be screwed to the threaded pipe

605.23.2: Plastic pipe or tubing to other piping material.

Joints between different types of plastic pipe or between plastic pipe and other piping material shall be made with approved adapters or transition fittings.

605.23.3: Stainless steel.

Joints between stainless steel and different piping materials shall be made with a mechanical joint of the compression or mechanical sealing type or a dielectric fitting or a dielectric union conforming to ASSE 1079.

605.24: PE-RT plastic.

Joints between polyethylene of raised temperature plastic tubing and fittings shall be in accordance with Section 605.24.1.

605.24.1: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions. Fittings for polyethylene of raised temperature plastic tubing shall comply with the applicable standards indicated in Table 605.5 and shall be installed in accordance with the manufacturer's instructions. Polyethylene of raised temperature plastic tubing shall be factory marked with the applicable standards for the fittings that the manufacturer of the tubing specifies for use with the tubing.

Section 606: Installation of the Building Water Distribution System

606.1: Location of full-open valves.

Full-open valves shall be installed in the following locations:

1. On the building water service pipe from the public water supply near the curb.
2. On the water distribution supply pipe at the entrance into the structure.

    2.1. In multiple-tenant buildings three stories or less in height, where a common water supply piping system is installed to supply other than one- and two-family dwellings, a main shutoff valve shall be provided for each tenant.

3. On the discharge side of every water meter.
4. On the base of every water riser pipe in occupancies other than multiple-family residential occupancies that are two stories or less in height and in one- and two-family residential occupancies.
5. On the top of every water down-feed pipe in occupancies other than one- and two-family residential occupancies.
6. On the entrance to every water supply pipe to a dwelling unit, except where supplying a single fixture equipped with individual stops.
7. On the water supply pipe to a gravity or pressurized water tank.
8. On the water supply pipe to every water heater.

606.2: Location of shutoff valves.

Shutoff valves shall be installed in the following locations:

The 2026 Georgia Amendments say: Shutoff valves to water supplies for refrigerators with automatic icemakers shall have access on the same floor as said refrigerators.

1. On the fixture supply to each plumbing fixture other than bathtubs and showers in one- and two-family residential occupancies, and other than in individual dwelling or sleeping units that are provided with unit shutoff valves in hotels, motels, boarding houses and similar occupancies.
2. On the water supply pipe to each sill cock.
3. On the water supply pipe to each appliance or mechanical equipment.

606.3: Access to valves.

Access shall be provided to all full-open valves and shutoff valves.

606.4: Valve identification.

Service and hose bibb valves shall be identified. Other valves installed in locations that are not adjacent to the fixture or appliance shall be identified, indicating the fixture or appliance served.

606.5: Water pressure booster systems.

Water pressure booster systems shall be provided as required by Sections 606.5.1 through 606.5.10.

606.5.1: Water pressure booster systems required.

Where the water pressure in the public water main or individual water supply system is insufficient to supply the minimum pressures and quantities specified in this code, the supply shall be supplemented by an elevated water tank, a hydro-pneumatic pressure booster system or a water pressure booster pump installed in accordance with Section 606.5.5.

606.5.2: Support.

Water supply tanks shall be supported in accordance with the International Building Code.

606.5.3: Covers.

Water supply tanks shall be covered to keep out unauthorized persons, dirt and vermin. The covers of gravity tanks shall be vented with a return bend vent pipe with an area not less than the area of the down-feed riser pipe, and the vent shall be screened with a corrosion-resistant screen of not less than 16 by 20 mesh per inch (630 by 787 mesh per m).

606.5.4: Overflows for water supply tanks.

A gravity or suction water supply tank shall be provided with an overflow with a diameter not less than that shown in Table 606.5.4. The overflow outlet shall discharge at a point not less than 6 inches (152 mm) above the roof or roof drain; floor or floor drain; or over an open water-supplied fixture. The overflow outlet shall be covered with a corrosion-resistant screen of not less than 16 by 20 mesh per inch (630 by 787 mesh per m) and by 1/4-inch (6.4 mm) hardware cloth or shall terminate in a horizontal angle seat check valve. Drainage from overflow pipes shall be directed so as not to freeze on roof walks.

TABLE 606.5.4 SIZES FOR OVERFLOW PIPES FOR WATER SUPPLY

MAXIMUM CAPACITY OF WATER SUPPLY LINE TO TANK (gpm)	DIAMETER OF OVERFLOW PIPE (inches)
0 – 50	2
50 – 150	2 1/2
150 – 200	3
200 – 400	4
400 – 700	5
700 – 1,000	6
Over 1,000	8

For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/m.

606.5.5: Low-pressure cutoff required on booster pumps.

A low-pressure cutoff shall be installed on all booster pumps in a water pressure booster system to prevent creation of a vacuum or negative pressure on the suction side of the pump when a positive pressure of 10 psi (68.94 kPa) or less occurs on the suction side of the pump.

606.5.6: Potable water inlet control and location.

Potable water inlets to gravity tanks shall be controlled by a fill valve or other automatic supply valve installed so as to prevent the tank from overflowing. The inlet shall be terminated so as to provide an air gap not less than 4 inches (102 mm) above the overflow.

606.5.7: Tank drain pipes.

A drain pipe with a valve shall be provided at the lowest point of each tank to permit emptying of the tank. The tank drain pipe shall discharge as required for overflow pipes and shall not be smaller in size than specified in Table 606.5.7.

TABLE 606.5.7 SIZE OF DRAIN PIPES FOR WATER

TANK CAPACITY (gallons)	DRAIN PIPE (inches)
Up to 750	1
751 to 1,500	1 1/2
1,501 to 3,000	2
3,001 to 5,000	2 1/2
5,000 to 7,500	3
Over 7,500	4

For SI: 1 inch = 25.4 mm, 1 gallon = 3.785 L.

606.5.8: Prohibited location of potable supply tanks.

Potable water gravity tanks or manholes of potable water pressure tanks shall not be located directly under any soil or waste piping or any source of contamination.

606.5.9: Pressure tanks, vacuum relief.

Water pressure tanks shall be provided with a vacuum relief valve at the top of the tank that will operate up to a maximum water pressure of 200 psi (1380 kPa) and up to a maximum temperature of 200ºF (93ºC). The size of such vacuum relief valve shall be not less than 1/2 inch (12.7 mm).

Exception: This section shall not apply to pressurized captive air diaphragm/bladder tanks.

606.5.10: Pressure relief for tanks.

Every pressure tank in a hydro-pneumatic pressure booster system shall be protected with a pressure relief valve. The pressure relief valve shall be set at a maximum pressure equal to the rating of the tank. The relief valve shall be installed on the supply pipe to the tank or on the tank. The relief valve shall discharge by gravity to a safe place of disposal.

606.6: Water supply system test.

Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested in accordance with Section 312.

Section 607: Hot Water Supply System

607.1: Where required.

In residential occupancies, hot water shall be supplied to plumbing fixtures and equipment utilized for bathing, washing, culinary purposes, cleansing, laundry or building maintenance. In nonresidential occupancies, hot water shall be supplied for culinary purposes, cleansing, laundry or building maintenance purposes. In nonresidential occupancies, hot water or tempered water shall be supplied for bathing and washing purposes.

607.1.1: Temperature limiting means.

A thermostat control for a water heater shall only serve as the temperature limiting means for the purposes of complying with the requirements of this code for maximum allowable hot or tempered water delivery temperature at fixtures where the water heater complies with ASSE 1082 or ASSE 1085.

607.1.2: Tempered water temperature control.

Tempered water shall be controlled by one the following:

1. A limiting device conforming to ASSE 1070/ASME A112.1070/CSA B125.70 and set to not greater than110ºF (43ºC).
2. A thermostatic mixing valve conforming to ASSE 1017.
3. A water heater conforming to ASSE 1082.
4. A water heater conforming to ASSE 1084.

This provision shall not supersede the requirement for protective shower valves in accordance with Section 412.3.

607.2: Hot or tempered water supply to fixtures.

The developed length of hot or tempered water piping, from the source of hot water to the fixtures that require hot or tempered water, shall not exceed 50 feet (15 240 mm). Recirculating system piping and heat-traced piping shall be considered to be sources of hot or tempered water.

607.2.1: Commercial energy provisions.

In occupancies that are required to comply with the commercial provisions of the International Energy Conservation Code, the developed length of hot or tempered water piping shall be limited in accordance with Sections C404.5.1 through C404.5.2.1 of that code.

607.2.2: Circulation systems and heat trace systems for maintaining heated water temperature in distribution systems.

For Group R2, R3 and R4 occupancies that are three stories or less in height above grade plane, the installation of heated water circulation and temperature maintenance systems shall be in accordance with Section R403.5.1 of the International Energy Conservation Code. For other than Group R2, R3 and R4 occupancies that are three stories or less in height above grade plane, the installation of heated water circulation and heat trace systems shall be in accordance with Section C404.6 of the International Energy Conservation Code.

607.2.2.1: Pump controls for hot water storage systems.

The controls on pumps that circulate water between a water heater and a storage tank for heated water shall limit operation of the pump from heating cycle startup to not greater than 5 minutes after the end of the cycle.

607.2.2.2: Demand recirculation controls for distribution systems.

A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe shall be a demand recirculation water system. Pumps shall have controls that comply with both of the following:

1. The control shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture, or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The control shall limit the temperature of the water entering the cold water piping to 104°F (40°C).

607.2.3: Piping for recirculation systems having temperature-actuated mixing valves.

Where a temperature-actuated mixing valve is used in a system with a hot water recirculating pump, the hot water or tempered water return line shall be routed to the cold water inlet pipe of the water heater and the cold water inlet pipe or the hot water return connection of the temperature-actuated mixing valve.

607.3: Thermal expansion control.

The 2026 Georgia Amendments say:
Thermal expansion tanks shall be located a minimum of 18 inches in developed length from the cold-water inlet fitting of the water heater.

Where a storage water heater is supplied with cold water that passes through a check valve, pressure reducing valve or backflow preventer, a thermal expansion control device shall be connected to the

water heater cold water supply pipe at a point that is downstream of all check valves, pressure reducing valves and backflow preventers. Thermal expansion tanks shall be sized in accordance with the tank manufacturer's instructions and shall be sized such that the pressure in the water distribution system shall not exceed that required by Section 604.8.

607.4: Flow of hot water to fixtures.

Fixture fittings, faucets and diverters shall be installed and adjusted so that the flow of hot water from the fittings corresponds to the left-hand side of the fixture fitting.

> **Exception:** Shower and tub/shower mixing valves conforming to ASSE 1016/ASME A112.1016/CSA B125.16 or ASME A112.18.1/CSA B125.1, where the flow of hot water corresponds to the markings on the device.

[E] 607.5: Insulation of piping.

For other than Group R2, R3 and R4 occupancies that are three stories or less in height above grade plane, piping to the inlet of a water heater and piping conveying water heated by a water heater shall be insulated in accordance with Section C404.4 of the International Energy Conservation Code. For Group R2, R3 and R4 occupancies that are three stories or less in height above grade plane, piping to the inlet of a water heater and piping conveying water heated by a water heater shall be insulated in accordance with Section R403.5.2 of the International Energy Conservation Code.

Section 608: Protection of Potable Water Supply

608.1: General.

A potable water supply system shall be designed, installed and maintained in such a manner so as to prevent contamination from nonpotable liquids, solids or gases being introduced into the potable water supply through cross connections or any other piping connections to the system. Backflow preventer applications shall conform to Table 608.1, except as specifically stated in Sections 608.2 through 608.17.10.

TABLE 608.1 APPLICATION OF BACKFLOW PREVENTERS

DEVICE	DEGREE OF HAZARD[a]	APPLICATION[b]	APPLICABLE STANDARDS
Backflow prevention assemblies:			
Double check backflow prevention assembly	Low hazard	Backpressure or backsiphonage Sizes 1/4"–16"	ASSE 1015; AWWA C510; CSA B64.5; CSA B64.5.1
Double check detector fire protection backflow prevention assemblies	Low hazard	Backpressure or backsiphonage Sizes 1"–16"	ASSE 1048
Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes 1/2"–2"	ASSE 1020; CSA B64.1.2
Reduced pressure principle backflow prevention assembly	High or low hazard	Backpressure or backsiphonage Sizes 1/4"–16"	ASSE 1013; AWWA C511; CSA B64.4; CSA B64.4.1
Reduced pressure detector fire protection backflow prevention assemblies	High or low hazard	Backsiphonage or backpressure (automatic sprinkler systems)	ASSE 1047
Spill-resistant vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes 1/4"–2"	ASSE 1056; CSA B64.1.3
Backflow preventer plumbing devices:			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002/ASME A112.1002/CSA B125.12; CSA B125.3
Backflow preventer for carbonated beverage machines	Low hazard	Backpressure or backsiphonage Sizes 1/4"–1/2"	ASSE 1022
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes 1/4"–3/4"	ASSE 1012; CSA B64.3
Backflow preventer with intermediate atmospheric vent and pressure-reducing valve.	Low hazard	Backpressure or backsiphonage Sizes 1/2"–3/4"	ASSE 1081
Dual-check-valve-type backflow preventer	Low hazard	Backpressure or backsiphonage Sizes 1/4"–2"	ASSE 1024; CSA B64.6
Hose connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure, backpressure or backsiphonage Sizes 1/2"–1"	ASME A112.21.3; ASSE 1052; CSA B64.2.1.1
Hose connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes 1/2", 3/4", 1"	ASME A112.21.3; ASSE 1011; CSA B64.2; CSA B64.2.1
Laboratory faucet backflow preventer	High or low hazard	Low head backpressure and backsiphonage	ASSE 1035; CSA B64.7
Pipe-applied atmospheric-type vacuum breaker	High or low hazard	Backsiphonage only Sizes 1/8"–8"	ASSE 1001; CSA B64.1.1
Vacuum breaker wall hydrants, frost-resistant, automatic-draining-type	High or low hazard	Low head backpressure or backsiphonage Sizes 3/4", 1"	ASME A112.21.3; ASSE 1019; CSA B64.2.2
Other means or methods:			
Air gap	High or low hazard	Backsiphonage or backpressure	ASME A112.1.2
Air gap fittings for use with plumbing fixtures, appliances and appurtenances	High or low hazard	Backsiphonage or backpressure	ASME A112.1.3
Barometric loop	High or low hazard	Backsiphonage only	(See Section 608.14.4)

For SI: 1 inch = 25.4 mm.

a. Low hazard—See *Pollution (Section 202)*.
   High hazard—See *Contamination (Section 202)*.
b. See *Backpressure, low head (Section 202, Backflow)*.
   See *Backsiphonage (Section 202, Backflow)*.

608.2: Plumbing fixtures.

The supply lines and fittings for plumbing fixtures shall be installed so as to prevent backflow. Plumbing fixture fittings shall provide backflow protection in accordance with ASME A112.18.1/CSA B125.1.

608.3: Devices, appurtenances, appliances and apparatus.

Devices, appurtenances, appliances and apparatus intended to serve some special function, such as sterilization, distillation, processing, cooling, or storage of ice or foods, and that connect to the water supply system, shall be provided with protection against backflow and contamination of the water supply system.

608.3.1: Special equipment, water supply protection.

The water supply for hospital fixtures shall be protected against backflow with a reduced pressure principle backflow prevention assembly, an atmospheric or spill-resistant vacuum breaker assembly, or an air gap. Vacuum breakers for bedpan washer hoses shall not be located less than 5 feet (1524 mm) above the floor. Vacuum breakers for hose connections in health care or laboratory areas shall be not less than 6 feet (1829 mm) above the floor.

608.4: Potable water handling and treatment equipment.

Water pumps, filters, softeners, tanks and other appliances and devices that handle or treat potable water to be supplied to the potable water distribution system shall be located to prevent contamination from entering the appliances and devices. Overflow, relief valve and waste discharge pipes from such appliances and devices shall terminate through an air gap.

608.5: Water service piping.

Water service piping shall be protected in accordance with Sections 603.2 and 603.2.1.

608.6: Chemicals and other substances.

Chemicals and other substances that produce either toxic conditions, taste, odor or discoloration in a potable water system shall not be introduced into, or utilized in, such systems.

608.7: Cross connection control.

Cross connections shall be prohibited, except where approved backflow prevention assemblies, backflow prevention devices or other means or methods are installed to protect the potable water supply.

608.7.1: Private water supplies.

Cross connections between a private water supply and a potable public supply shall be prohibited.

608.8: Valves and outlets prohibited below grade.

Potable water outlets and combination stop-and-waste valves shall not be installed underground or below grade. A freezeproof yard hydrant that drains the riser into the ground shall be considered as having a stop-and-waste valve below grade.

Exception: Freezeproof yard hydrants that drain the riser into the ground shall be permitted to be installed, provided that the potable water supply to such hydrants is protected in accordance with Section 608.14.2 or 608.14.5, and the hydrants and the piping from the backflow preventer to the hydrant are identified in accordance with Section 608.9.

608.9: Identification of non-potable water systems.

Where non-potable water systems are installed, the piping conveying the non-potable water shall be identified either by color marking, metal tags or tape in accordance with Sections 608.9.1 through 608.9.2.3.

608.9.1: Signage required.

Non-potable water outlets, such as hose connections, open-ended pipes and faucets, shall be identified with signage that reads as follows: “Non-potable water is utilized for [application name]. CAUTION: NONPOTABLE WATER – DO NOT DRINK.” The words shall be legibly and indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and in colors in contrast to the background on which they are applied. In addition to the required wordage, the pictograph shown in Figure 608.9.1 shall appear on the required signage.

Figure 608.9.1 PICTOGRAPH—DO NOT DRINK



608.9.2: Distribution pipe labeling and marking.

Non-potable distribution piping shall be purple in color and shall be embossed, or integrally stamped or marked, with the words: “CAUTION: NONPOTABLE WATER – DO NOT DRINK” or the piping shall be installed with a purple identification tape or wrap. Pipe identification shall include the contents of the piping system and an arrow indicating the direction of flow. Hazardous piping systems shall also contain information addressing the nature of the hazard. Pipe identification shall be repeated at intervals not exceeding 25 feet (7620 mm) and at each point where the piping passes through a wall, floor or roof. Lettering shall be readily observable within the room or space where the piping is located.

608.9.2.1: Color.

The color of the pipe identification shall be discernable and consistent throughout the building. The color purple shall be used to identify reclaimed, rain and graywater distribution systems.

608.9.2.2: Lettering size.

The size of the background color field and lettering shall comply with Table 608.9.2.2.

TABLE 608.9.2.2 SIZE OF PIPE IDENTIFICATION

PIPE DIAMETER (inches)	LENGTH BACKGROUND COLOR FIELD (inches)	SIZE OF LETTERS (inches)
3/4 to 1 1/4	8	0.5
1 1/2 to 2	8	0.75
2 1/2 to 6	12	1.25
8 to 10	24	2.5
over 10	32	3.5

For SI: 1 inch = 25.4 mm.

608.9.2.3: Identification tape.

Where used, identification tape shall be not less than 3 inches (76 mm) wide and have white or black lettering on a purple field stating “CAUTION: NONPOTABLE WATER – DO NOT DRINK.” Identification tape shall be installed on top of nonpotable rainwater distribution pipes, fastened not less than every 10 feet (3048 mm) to each pipe length and run continuously the entire length of the pipe.

608.10: Reutilization prohibited.

Water utilized for the heating or cooling of equipment or other processes shall not be returned to the potable water system. Such water shall be discharged into a drainage system through an air gap or shall be utilized for non-potable purposes.

608.11: Reuse of piping.

Piping that has been utilized for any purpose other than conveying potable water shall not be utilized for conveying potable water.

608.12: Potable water tanks.

Where in contact with potable water intended for drinking water, water tanks, coatings for the inside of tanks and liners for water tanks shall conform to NSF 61. The interior surface of a potable water tank shall not be lined, painted or repaired with any material that changes the taste, odor, color or potability of the water supply when the tank is placed in, or returned to, service.

608.13: Pumps and other appliances.

Water pumps, filters, softeners, tanks and other devices that handle or treat potable water shall be protected against contamination.

608.14: Backflow protection.

Means of protection against backflow shall be provided in accordance with Sections 608.14.1 through 608.14.9.

608.14.1: Air gap.

The minimum required air gap shall be measured vertically from the lowest end of a potable water outlet to the flood level rim of the fixture or receptacle into which such potable water outlet

discharges. Air gaps shall comply with ASME A112.1.2 and air gap fittings shall comply with ASME A112.1.3. Products that are listed and labeled to ASME A112.1.2 or ASME A112.1.3 shall be considered to be in compliance with this section.

608.14.2: Reduced pressure principle backflow prevention assemblies.

Reduced pressure principle backflow prevention assemblies shall conform to ASSE 1013, AWWA C511, CSA B64.4 or CSA B64.4.1. Reduced pressure detector assembly backflow preventers shall conform to ASSE 1047. These devices shall be permitted to be installed where subject to continuous pressure conditions. The relief opening shall discharge by air gap and shall be prevented from being submerged.

608.14.3: Backflow preventer with intermediate atmospheric vent.

Backflow preventers with intermediate atmospheric vents shall conform to ASSE 1012, ASSE 1081 or CSA B64.3. These devices shall be permitted to be installed where subject to continuous pressure conditions. The relief opening shall discharge by air gap and shall be prevented from being submerged.

608.14.4: Barometric loop.

Barometric loops shall precede the point of connection and shall extend vertically to a height of 35 feet (10 668 mm). A barometric loop shall only be utilized as an atmospheric-type or pressure-type vacuum breaker.

608.14.5: Pressure vacuum breaker assemblies.

Pressure vacuum breaker assemblies shall comply with ASSE 1020 or CSA B64.1.2. Spill-resistant vacuum breaker assemblies shall comply with ASSE 1056 or CSA B64.1.3. These assemblies shall be installed with the critical level of the assembly located not less than 12 inches (305 mm) above all downstream piping and outlets. Pressure vacuum breaker assemblies shall not be installed in locations where spillage could cause damage to the structure.

608.14.6: Atmospheric-type vacuum breakers.

Pipe-applied atmospheric-type vacuum breakers shall conform to ASSE 1001 or CSA B64.1.1. Hose-connection vacuum breakers shall conform to ASME A112.21.3, ASSE 1011, ASSE 1019, ASSE 1035, ASSE 1052, CSA B64.2, CSA B64.2.1, CSA B64.2.1.1, CSA B64.2.2 or CSA B64.7. These devices shall operate under normal atmospheric pressure when the critical level is installed at the required height.

608.14.7: Double check backflow prevention assemblies.

Double check backflow prevention assemblies shall conform to ASSE 1015, CSA B64.5, CSA B64.5.1 or AWWA C510. Double check detector fire protection backflow prevention assemblies shall conform to ASSE 1048. These assemblies shall be capable of operating under continuous pressure conditions.

608.14.8: Chemical dispenser backflow devices.

Back-flow devices for chemical dispensers shall comply with ASSE 1055 or shall be equipped with an air gap fitting.

608.14.9: Dual check backflow preventer.

Dual check backflow preventers shall conform to ASSE 1024 or CSA B64.6.

608.15: Location of backflow preventers.

Access shall be provided to backflow preventers as specified by the manufacturer's instructions.

608.15.1: Outdoor enclosures for backflow prevention devices.

Outdoor enclosures for backflow prevention devices shall comply with ASSE 1060.

608.15.2: Protection of backflow preventers.

Backflow preventers shall not be located in areas subject to freezing except where they can be removed by means of unions or are protected from freezing by heat, insulation or both.

608.15.2.1: Relief port piping.

The termination of the piping from the relief port or air gap fitting of a backflow preventer shall discharge to an approved indirect waste receptor or to the outdoors where it will not cause damage or create a nuisance. The indirect waste receptor and drainage piping shall be sized to drain the maximum discharge flow rate from the relief port as published by the backflow preventer manufacturer.

608.16: Protection of potable water outlets.

Potable water openings and outlets shall be protected against backflow in accordance with Section 608.16.1, 608.16.2, 608.16.3, 608.16.4, 608.16.4.1 or 608.16.4.2.

608.16.1: Protection by air gap.

Openings and outlets shall be protected by an air gap between the opening and the fixture flood level rim as specified in Table 608.16.1. Openings and outlets equipped for hose connection shall be protected by means other than an air gap.

TABLE 608.16.1 MINIMUM REQUIRED AIR GAPS

FIXTURE	MINIMUM AIR GAP	
	Away from a wall[a] (inches)	Close to a wall (inches)
Lavatories and other fixtures with effective openings not greater than 1/2 inch in diameter	1	1 1/2
Sinks, laundry trays, gooseneck back faucets and other fixtures with effective openings not greater than 3/4 inch in diameter	1 1/2	2 1/2
Over-rim bath fillers and other fixtures with effective openings not greater than 1 inch in diameter	2	3
Drinking water fountains, single orifice not greater than 7/16 inch in diameter or multiple orifices with a total area of 0.150 square inch (area of circle 7/16 inch in diameter)	1	1 1/2
Effective openings greater than 1 inch	Two times the diameter of the effective opening	Three times the diameter of the effective opening

For SI: 1 inch = 25.4 mm, 1 square inch = 645 mm^2.

a. Applicable where walls or obstructions are spaced from the nearest inside-edge of the spout opening a distance greater than three times the diameter of the effective opening for a single wall, or a distance greater than four times the diameter of the effective opening for two intersecting walls.

608.16.2: Protection by reduced pressure principle backflow prevention assembly.

Openings and outlets shall be protected by a reduced pressure principle backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly on potable water supplies.

608.16.3: Protection by a backflow preventer with intermediate atmospheric vent.

Openings and outlets shall be protected by a backflow preventer with an intermediate atmospheric vent.

608.16.4: Protection by a vacuum breaker.

Openings and outlets shall be protected by atmospheric-type or pressure-type vacuum breakers. The critical level of the vacuum breaker shall be set not less than 6 inches (152 mm) above the flood level rim of the fixture or device. Fill valves shall be set in accordance with Section 415.3.1. Vacuum breakers shall not be installed under exhaust hoods or similar locations that will contain toxic fumes or vapors. Pipe-applied vacuum breakers shall be installed not less than 6 inches (152 mm) above the flood level rim of the fixture, receptor or device served.

608.16.4.1: Deck-mounted and integral vacuum breakers.

Approved deck-mounted or equipment-mounted vacuum breakers and faucets with integral atmospheric vacuum breakers or spill-resistant vacuum breaker assemblies shall be installed in accordance with the manufacturer’s instructions and the requirements for labeling with the critical level not less than 1 inch (25 mm) above the flood level rim.

608.16.4.2: Hose connections.

Sill cocks, hose bibbs, wall hydrants and other openings with a hose connection shall be protected by an atmospheric-type or pressure-type vacuum breaker or a permanently attached hose connection vacuum breaker.

Exceptions:

1. This section shall not apply to water heater and boiler drain valves that are provided with hose connection threads and that are intended only for tank or vessel draining.
2. This section shall not apply to water supply valves intended for connection of clothes washing machines where backflow prevention is otherwise provided or is integral with the machine.

608.17: Connections to the potable water system.

Connections to the potable water system shall conform to Sections 608.17.1 through 608.17.10.

608.17.1: Beverage dispensers.

The water supply connection to beverage dispensers shall be protected against backflow in accordance with Sections 608.17.1.1 and 608.17.1.2.

608.17.1.1: Carbonated beverage dispensers.

The water supply connection to each carbonated beverage dispenser shall be protected against backflow by a backflow preventer conforming to ASSE 1022 or by an air gap. The portion of the backflow preventer device downstream from the second check valve of the device and the piping downstream therefrom shall not be affected by carbon dioxide gas.

608.17.1.2: Coffee machines and noncarbonated drink dispensers.

The water supply connection to each coffee machine and each noncarbonated beverage dispenser shall be protected against backflow by a backflow preventer conforming to ASSE 1022, ASSE 1024 or ASSE 1032, or protected by an air gap.

608.17.2: Connections to boilers.

The potable supply to the boiler shall be equipped with a backflow preventer with an intermediate atmospheric vent complying with ASSE 1012, ASSE 1081 or CSA B64.3. Where conditioning chemicals are introduced into the system, the potable water connection shall be protected by an air gap or a reduced pressure principle backflow preventer, complying with ASSE 1013, AWWA C511 or CSA B64.4.

608.17.3 Heat exchangers.

Heat exchangers utilizing an essentially toxic transfer fluid shall be separated from the potable water by double-wall construction. An air gap open to the atmosphere shall be provided between the two walls. Heat exchangers utilizing an essentially nontoxic transfer fluid shall be permitted to be of single-wall construction.

608.17.4: Connections to automatic sprinkler systems and standpipe systems.

The potable water supply to automatic sprinkler systems and standpipe systems shall be protected against backflow by a double check backflow prevention assembly, a double check fire protection backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly.

Exceptions:

1. Where systems are installed as a portion of the water distribution system in accordance with the requirements of this code and are not provided with a fire department connection, isolation of the water supply system shall not be required.
2. Isolation of the water distribution system is not required for deluge, preaction or dry pipe systems.

608.17.4.1: Additives or non-potable source.

Where systems under continuous pressure contain chemical additives or antifreeze, or where systems are connected to a non-potable secondary water supply, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly. Where chemical additives or antifreeze are added to only a portion of an automatic sprinkler system or standpipe system, the reduced pressure principle backflow prevention assembly or the reduced pressure principle fire protection backflow prevention assembly shall be permitted to be located so as to isolate that portion

of the system. Where systems are not under continuous pressure, the potable water supply shall be protected against backflow by an air gap or an atmospheric vacuum breaker conforming to ASSE 1001 or CSA B64.1.1.

608.17.5: Connections to lawn irrigation systems.

The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric vacuum breaker, a pressure vacuum breaker assembly or a reduced pressure principle backflow prevention assembly. Valves shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly.

608.17.6 Connections subject to backpressure.

Where a potable water connection is made to a non-potable line, fixture, tank, vat, pump or other equipment subject to high-hazard backpressure, the potable water connection shall be protected by a reduced pressure principle backflow prevention assembly.

608.17.7: Chemical dispensers.

Where chemical dispensers connect to the potable water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.14.1, 608.14.2, 608.14.5, 608.14.6, or 608.14.8.

608.17.8: Portable cleaning equipment.

Where the portable cleaning equipment connects to the water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.14.1, 608.14.2, 608.14.3, 608.14.7 or 608.14.8.

608.17.9: Dental pumping equipment.

The water supply connection to each dental pumping equipment system, the water supply system shall be protected against backflow in accordance with Section 608.14.1, 608.14.2, 608.14.5, 608.14.6 or 608.14.8.

608.17.10: Humidifiers.

The water supply connection to humidifiers that do not have internal backflow protection shall be protected against backflow by a backflow preventer conforming to ASSE 1012 or by an air gap.

608.18: Protection of individual water supplies.

An individual water supply shall be located and constructed so as to be safeguarded against contamination in accordance with Sections 608.18.1 through 608.18.8.

608.18.1: Well locations.

A potable ground water source or pump suction line shall not be located closer to potential sources of contamination than the distances shown in Table 608.18.1. In the event the underlying rock structure is limestone or fragmented shale, the local or state health department shall be consulted on well site location. The distances in Table 608.18.1 constitute minimum separation and shall be increased in

areas of creviced rock or limestone, or where the direction of movement of the ground water is from sources of contamination toward the well.

TABLE 608.18.1 DISTANCE FROM CONTAMINATION TO PRIVATE WATER SUPPLIES AND PUMP SUCTION LINES

SOURCE OF CONTAMINATION	DISTANCE (feet)
Barnyard	100
Farm silo	25
Pasture	100
Pumphouse floor drain of cast iron draining to ground surface	2
Seepage pits	50
Septic tank	25
Sewer	10
Subsurface disposal fields	50
Subsurface pits	50

For SI: 1 foot = 304.8 mm.

608.18.2: Elevation.

Well sites shall be positively drained and shall be at higher elevations than potential sources of contamination.

608.18.3: Depth.

Private potable well supplies shall not be developed from a water table less than 10 feet (3048 mm) below the ground surface.

608.18.4: Watertight casings.

Each well shall be provided with a watertight casing extending to not less than 10 feet (3048 mm) below the ground surface. Casings shall extend not less than 6 inches (152 mm) above the well platform. Casings shall be large enough to permit installation of a separate drop pipe. Casings shall be sealed at the bottom in an impermeable stratum or extend several feet (mm) into the water-bearing stratum.

608.18.5: Drilled or driven well casings.

Drilled or driven well casings shall be of steel or other approved material. Where drilled wells extend into a rock formation, the well casing shall extend to and set firmly in the formation. The annular space between the earth and the outside of the casing shall be filled with cement grout to a depth of not less than 10 feet (3048 mm) below the ground surface. In an instance of casing to rock installation, the grout shall extend to the rock surface.

608.18.6: Dug or bored well casings.

Dug or bored well casings shall be of watertight concrete, tile or galvanized or corrugated metal pipe extending to not less than 10 feet (3048 mm) below the ground surface. Where the water table is more than 10 feet (3048 mm) below the ground surface, the watertight casing shall extend below the

table surface. Well casings for dug wells or bored wells constructed with sections of concrete, tile or galvanized or corrugated metal pipe shall be surrounded by 6 inches (152 mm) of grout poured into the hole between the outside of the casing and the ground and extending not less than 10 feet (3048 mm) below the ground surface.

608.18.7: Cover.

Potable water wells shall be equipped with an overlapping watertight cover at the top of the well casing or pipe sleeve such that contaminated water or other substances are prevented from entering the well through the annular opening at the top of the well casing, wall or pipe sleeve. Covers shall extend downward not less than 2 inches (51 mm) over the outside of the well casing or wall. A dug well cover shall be provided with a pipe sleeve permitting the withdrawal of the pump suction pipe, cylinder or jet body without disturbing the cover. Where pump sections or discharge pipes enter or leave a well through the side of the casing, the circle of contact shall be watertight.

608.18.8: Drainage.

Potable water wells and springs shall be constructed such that surface drainage will be diverted away from the well or spring.

Section 609: Health Care Plumbing

609.1: Scope.

This section shall govern those aspects of health care plumbing systems that differ from plumbing systems in other structures. Health care plumbing systems shall conform to the requirements of this section in addition to the other requirements of this code. The provisions of this section shall apply to the special devices and equipment installed and maintained in the following occupancies: Group I-1, Group I-2, ambulatory care facilities, medical offices, research and testing laboratories, and Group F facilities manufacturing pharmaceutical drugs and medicines.

609.2: Water service for Group I-2, Condition 2 facilities.

Group I-2, Condition 2 facilities shall have not fewer than two water service pipes sized such that with the loss of the largest service pipe, the remaining service pipes will meet the water demand for the entire facility. Each water service shall have a shutoff valve in the building and a shutoff valve at the utility-provided point of connection to the water main or other source of potable water.

609.2.1: Tracer wire for nonmetallic piping.

An insulated tracer wire listed for the purpose or other approved conductor shall be installed adjacent to underground nonmetallic piping serving as a water service for a hospital. Access shall be provided to the tracer wire or the tracer wire shall terminate above ground at each end of the nonmetallic piping. The tracer wire size shall be not less than 18 AWG and the wire insulation type shall be suitable for direct burial.

609.3: Hot water.

Hot water shall be provided to supply all of the hospital fixture, kitchen and laundry requirements. Special fixtures and equipment shall have hot water supplied at a temperature specified by the manufacturer. The hot water system shall be installed in accordance with Section 607.

609.4: Vacuum breaker installation.

Vacuum breakers shall be installed not less than 6 inches (152 mm) above the flood level rim of the fixture or device in accordance with Section 608. The flood level rim of hose connections shall be the maximum height at which any hose is utilized.

609.5: Prohibited water closet and clinical sink supply.

Jet- or water-supplied orifices, except those supplied by the flush connections, shall not be located in or connected with a water closet bowl or clinical sink. This section shall not prohibit an approved bidet installation.

609.6: Clinical, hydrotherapeutic and radiological equipment.

Clinical, hydrotherapeutic, radiological or any equipment that is supplied with water or that discharges to the waste system shall conform to the requirements of this section and Section 608.

609.7: Condensate drain trap seal.

A water supply shall be provided for cleaning, flushing and resealing the condensate trap, and the trap shall discharge through an air gap in accordance with Section 608.

609.8: Valve leakage diverter.

Each water sterilizer filled with water through directly connected piping shall be equipped with an approved leakage diverter or bleed line on the water supply control valve to indicate and conduct any leakage of unsterile water away from the sterile zone.

Section 610: Disinfection of Potable Water System

610.1: General.

New potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. This requirement shall apply to “on-site” or “in-plant” fabrication of a system or to a modular portion of a system.

1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
2. The system or part thereof shall be filled with a water/chlorine solution containing not less than 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing not less than 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.

3. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.
4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

Section 611: Drinking Water Treatment Units

611.1: Design.

Point-of-use reverse osmosis drinking water treatment units shall comply with CSA B483.1 or NSF 58. Drinking water treatment units shall meet the requirements of CSA B483.1, NSF 42, NSF 44, NSF 53 or NSF 62.

611.2: Reverse osmosis systems.

The discharge from a reverse osmosis drinking water treatment unit shall enter the drainage system through an air gap or an air gap device that meets the requirements of CSA B483.1 or NSF 58.

611.3: Connection tubing.

The tubing to and from drinking water treatment units shall be of a size and material as recommended by the manufacturer. The tubing shall comply with NSF 14, NSF 42, NSF 44, NSF 53, NSF 58 or NSF 61.

Section 612: Solar Systems

612.1: Solar systems.

The construction, installation, alterations and repair of systems, equipment and appliances intended to utilize solar energy for space heating or cooling, domestic hot water heating, swimming pool heating or process heating shall be in accordance with the International Mechanical Code.

Section 613: Temperature Control Devices and Valves

613.1 Temperature-actuated mixing valves. Temperature-actuated mixing valves, which are installed to reduce water temperatures to defined limits, shall comply with ASSE 1017. Such valves shall be installed at the hot water source.

Chapter 7: Sanitary Drainage

User notes:

About this chapter: Chapter 7 regulates the methods and piping systems that remove water that has served a purpose such as flushing water closets, bathing, culinary activities and equipment discharges. The types of materials, drainage fitting and the connection methods are covered for these systems that begin at the receiving fixtures and end at the point of disposal for the liquid waste. A design method for a gravity flow system of vertical and horizontal piping is provided based on the probability of flows from specific fixtures. Vacuum and pumped types of liquid waste removal methods are also regulated by this chapter.

Section 701: General

701.1: Scope.

The provisions of this chapter shall govern the materials, design, construction and installation of sanitary drainage systems.

701.2: Connection to sewer required.

Sanitary drainage piping from plumbing fixtures in buildings and sanitary drainage piping systems from premises shall be connected to a public sewer. Where a public sewer is not available, the sanitary drainage piping and systems shall be connected to a private sewage disposal system in compliance with state or local requirements. Where state or local requirements do not exist for private sewage disposal systems, the sanitary drainage piping and systems shall be connected to an approved private sewage disposal system that is in accordance with the International Private Sewage Disposal Code.

> **Exception:** Sanitary drainage piping and systems that convey only the discharge from bathtubs, showers, lavatories, clothes washers and laundry trays shall not be required to connect to a public sewer or to a private sewage disposal system provided that the piping or systems are connected to a system in accordance with Chapter 13 or 14.

701.3: Separate sewer connection.

A building having plumbing fixtures installed and intended for human habitation, occupancy or use on premises abutting on a street, alley or easement in which there is a public sewer shall have a separate connection with the sewer. Where located on the same lot, multiple buildings shall not be prohibited from connecting to a common building sewer that connects to the public sewer.

701.4: Sewage treatment.

Sewage or other waste from a plumbing system that is deleterious to surface or subsurface waters shall not be discharged into the ground or into any waterway unless it has first been rendered innocuous through subjection to an approved form of treatment.

701.5: Damage to drainage system or public sewer.

Waste detrimental to the public sewer system or to the functioning of the sewage-treatment plant shall be treated and disposed of in accordance with Section 1003 as directed by the code official.

701.6: Tests.

The sanitary drainage system shall be tested in accordance with Section 312.

701.7: Engineered systems.

Engineered sanitary drainage systems shall conform to the provisions of Sections 316 and 713.

Section 702: Materials

702.1: Above-ground sanitary drainage and vent pipe.

Above-ground soil, waste and vent pipe shall conform to one of the standards listed in Table 702.1.

TABLE 702.1 ABOVE-GROUND DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy pipe	ASTM B42; ASTM B43; ASTM B302
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Galvanized steel pipe	ASTM A53
Glass pipe	ASTM C1053
Polyolefin pipe	ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200), and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1

702.2: Underground building sanitary drainage and vent pipe.

Underground building sanitary drainage and vent pipe shall conform to one of the standards listed in Table 702.2.

TABLE 702.2 UNDERGROUND BUILDING DRAINAGE AND VENT PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F714
Polyolefin pipe	ASTM F714; ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488; CSA B181.2
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Type 316L	ASME A112.3.1

For SI: 1 inch = 25.4 mm.

702.3: Building sewer pipe.

Building sewer pipe shall conform to one of the standards listed in Table 702.3.

TABLE 702.3 BUILDING SEWER PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM D2680; ASTM F628; ASTM F1488; CSA B181.1
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters, including SDR 42 (PS 20), PS 35, SDR 35 (PS 45), PS 50, PS 100, PS 140, SDR 23.5 (PS 150) and PS 200; with a solid, cellular core or composite wall	ASTM D2751; ASTM F1488
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Concrete pipe	ASTM C14; ASTM C76; CSA A257.1; CSA A257.2
Copper or copper-alloy tubing (Type K or L)	ASTM B75; ASTM B88; ASTM B251
Polyethylene (PE) plastic pipe (corrugated wall)	ASTM F2947/F2947M
Polyethylene (PE) plastic pipe (profile wall)	ASTM F2763
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F714
Polypropylene (PP) plastic pipe	ASTM F2764; CSA B182.13
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM F891; ASTM F1488
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters, including PS 25, SDR 41 (PS 28), PS 35, SDR 35 (PS 46), PS 50, PS 100, SDR 26 (PS 115), PS 140 and PS 200; with a solid, cellular core or composite wall	ASTM F891; ASTM F1488; ASTM D3034; CSA B182.2; CSA B182.4
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. and a solid, cellular core or composite wall	ASTM D2949; ASTM F1488
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1
Vitrified clay pipe	ASTM C4; ASTM C700

For SI: 1 inch = 25.4 mm.

702.4: Fittings.

Pipe fittings shall be approved for installation with the piping material and shall comply with the applicable standards listed in Table 702.4.

TABLE 702.4 PIPE FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters	ASME A112.4.4; ASTM D2661; ASTM F628; CSA B181.1
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters	ASTM D2751
Cast iron	ASME B16.4; ASME B16.12; ASTM A74; ASTM A888; CISPI 301
Copper or copper alloy	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29
Glass	ASTM C1053
Gray iron and ductile iron	AWWA C110/A21.10
Polyethylene	ASTM D2683
Polyolefin	ASTM F1412; ASTM F3371; CSA B181.3
Polyvinyl chloride (PVC) plastic in IPS diameters	ASME A112.4.4; ASTM D2665; ASTM F1866
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters	ASTM D3034
Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D.	ASTM D2949
Polyvinylidene fluoride (PVDF) plastic pipe	ASTM F1673; CSA B181.3
Stainless steel drainage systems, Types 304 and 316L	ASME A112.3.1
Steel	ASME B16.9; ASME B16.11; ASME B16.28
Vitrified clay	ASTM C700

For SI: 1 inch = 25.4 mm.

702.5: Temperature rating.

Where the wastewater temperature will be greater than 140°F (60°C), the sanitary drainage piping material shall be rated for the highest temperature of the wastewater.

702.6: Chemical waste system.

A chemical waste drainage system, including its vent system, shall be completely independent from the sanitary drainage system. Separate drainage systems for chemical waste and vent pipes shall conform to one of the standards indicated in Table 702.6. The chemical waste shall be treated in accordance with Section 803.2 before discharging to the sanitary drainage system. Chemical waste drainage system pipe and fitting materials shall be resistant to corrosion and degradation for the concentrations of chemicals involved per manufacturer recommendations.

TABLE 702.6 CHEMICAL WASTE DRAINAGE SYSTEM PIPE AND FITTINGS

MATERIAL	STANDARD
Chlorinated polyvinyl chloride (CPVC)	ASTM F2618
Borosilicate glass	ASTM C1053
High silicon iron	ASTM A518/A518M
Polyolefin	ASTM F1412, CSA B181.3
Polyvinylidene fluoride (PVDF)	ASTM F1673, CSA B181.3

702.7: Lead bends and traps.

The wall thickness of lead bends and traps shall be not less than 1/8 inch (3.2 mm).

Section 703: Building Sewer

703.1: Building sewer pipe near the water service.

The proximity of a sewer to a water service shall comply with Section 603.2.

703.2: Drainage pipe in filled ground.

Where a building sewer or building drain is installed on filled or unstable ground, the drainage pipe shall conform to one of the standards for ABS plastic pipe, cast-iron pipe, copper or copper-alloy tubing, PVC plastic pipe or polypropylene plastic pipe indicated in Table 702.3.

703.3: Sanitary and storm sewers.

Where separate systems of sanitary drainage and storm drainage are installed in the same property, the sanitary and storm building sewers or drains shall be permitted to be laid side by side in one trench.

703.4: Existing building sewers and building drains.

Where the entire sanitary drainage system of an existing building is replaced, existing building drains under concrete slabs and existing building sewers that will serve the new system shall be internally examined to verify that the piping is sloping in the correct direction, is not broken, is not obstructed and is sized for the drainage load of the new plumbing drainage system to be installed.

703.5: Cleanouts on building sewers.

Cleanouts on building sewers shall be located as indicated in Section 708.

703.6: Combined sanitary and storm public sewer.

Where the public sewer is a combined system for both sanitary and storm water, the sanitary sewer shall be connected independently to the public sewer.

Section 704: Drainage Piping Installation

704.1: Slope of horizontal drainage piping.

Horizontal drainage piping shall be installed in uniform alignment at uniform slopes. The slope of a horizontal drainage pipe shall be not less than that indicated in Table 704.1 except that where the drainage piping is upstream of a grease interceptor, the slope of the piping shall be not less than 1/4 inch per foot (2 percent slope).

TABLE 704.1 SLOPE OF HORIZONTAL DRAINAGE PIPE

SIZE (inches)	MINIMUM SLOPE (inch per foot)
2 1/2 or less	1/4[a]
3 to 6	1/8[a]
8 or larger	1/16[a]

For SI: 1 inch = 25.4 mm, 1 inch per foot = 83.33 mm/m.

a. Slopes for piping draining to a grease interceptor shall comply with Section 704.1.

704.2: Reduction in pipe size in the direction of flow.

The size of the drainage piping shall not be reduced in the direction of the flow. The following shall not be considered as a reduction in size in the direction of flow:

1. A 4-inch by 3-inch (102 mm by 76 mm) water closet flange.
2. A water closet bend fitting having a 4-inch (102 mm) inlet and a 3-inch (76 mm) outlet provided that the 4-inch leg of the fitting is upright and below, but not necessarily directly connected to, the water closet flange.
3. An offset closet flange.

704.3: Connections to offsets and bases of stacks.

Horizontal branches shall connect to the bases of stacks at a point located not less than 10 times the diameter of the drainage stack downstream from the stack. Horizontal branches shall connect to horizontal stack offsets at a point located not less than 10 times the diameter of the drainage stack downstream from the upper stack.

704.4: Future fixtures.

Drainage piping for future fixtures shall terminate with an approved cap or plug.

Section 705: Joints

705.1: General.

This section contains provisions applicable to joints specific to sanitary drainage piping.

705.2: ABS plastic.

Joints between ABS plastic pipe or fittings shall comply with Sections 705.2.1 through 705.2.3.

705.2.1: Mechanical joints.

Mechanical joints on drainage pipes shall be made with an elastomeric seal conforming to ASTM C1173, ASTM D3212 or CSA B602. Mechanical joints shall be installed only in underground systems unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.

705.2.2: Solvent cementing.

Joint surfaces shall be clean and free from moisture. Solvent cement that conforms to ASTM D2235 or CSA B181.1 shall be applied to all joint surfaces. The joint shall be made while the cement is wet. Joints shall be made in accordance with ASTM D2235, ASTM D2661, ASTM F628 or CSA B181.1. Solvent-cement joints shall be permitted above or below ground.

705.2.3: Threaded joints.

Threads shall conform to ASME B1.20.1. Schedule 80 or heavier pipe shall be permitted to be threaded with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.

705.2.4: Mechanical joints above ground.

Mechanical joint couplings used above ground to connect ABS pipe to ABS pipe shall be of the shielded type and shall be marked by the manufacturer as being recommended for the application.

705.2.5: Push-fit joints.

Push-fit DWV fittings shall be listed and labeled to ASME A112.4.4 and shall be installed in accordance with the manufacturer's instructions.

705.3: Cast iron.

Joints between cast-iron pipe or fittings shall comply with Sections 705.3.1 through 705.3.3.

705.3.1: Caulked joints.

Joints for hub and spigot pipe shall be firmly packed with oakum or hemp. Molten lead shall be poured in one operation to a depth of not less than 1 inch (25 mm). The lead shall not recede more than 1/8 inch (3.2 mm) below the rim of the hub and shall be caulked tight. Paint, varnish or other coatings shall not be permitted on the jointing material until after the joint has been tested and approved. Lead shall be run in one pouring and shall be caulked tight. Acid-resistant rope and acidproof cement shall be permitted.

705.3.2: Compression gasket joints.

Compression gaskets for hub and spigot pipe and fittings shall conform to ASTM C564 and shall be tested to ASTM C1563. Gaskets shall be compressed when the pipe is fully inserted.

705.3.3: Mechanical joint coupling.

Mechanical joint couplings for hubless pipe and fittings shall consist of an elastomeric sealing sleeve and a metallic shield that comply with CISPI 310, ASTM C1277 or ASTM C1540. The elastomeric sealing sleeve shall conform to ASTM C564 or CSA B602 and shall be provided with a center stop. Mechanical joint couplings shall be installed in accordance with the manufacturer's instructions.

705.4: Concrete joints.

Joints between concrete pipe and fittings shall be made with an elastomeric seal conforming to ASTM C443, ASTM C1173, CSA A257.3M or CSA B602.

705.5: Copper pipe.

Joints between copper or copper-alloy pipe or fittings shall comply with Sections 705.5.1 through 705.5.5.

705.5.1: Brazed joints.

Joint surfaces shall be cleaned. An approved flux shall be applied where required. The joint shall be brazed with a filler metal conforming to AWS A5.8.

705.5.2: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

705.5.3: Solder joints.

Solder joints shall be made in accordance with the methods of ASTM B828. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. A flux conforming to ASTM B813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32.

705.5.4: Threaded joints.

Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.

705.5.5: Welded joints.

Joint surfaces shall be cleaned. The joint shall be welded with an approved filler metal.

705.6: Copper tubing.

Joints between copper or copper-alloy tubing or fittings shall comply with Sections 705.6.1 through 705.6.3.

705.6.1: Brazed joints.

Joint surfaces shall be cleaned. An approved flux shall be applied where required. The joint shall be brazed with a filler metal conforming to AWS A5.8.

705.6.2: Mechanical joints.

Mechanical joints shall be installed in accordance with the manufacturer's instructions.

705.6.3: Solder joints.

Solder joints shall be made in accordance with the methods of ASTM B828. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. A flux conforming to ASTM B813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32.

705.7: Borosilicate glass joints.

Glass-to-glass connections shall be made with a bolted compression-type, 300 series stainless steel coupling with contoured acid-resistant elastomeric compression ring and a fluorocarbon polymer inner seal ring; or with caulked joints in accordance with Section 705.7.1.

705.7.1: Caulked joints.

Lead-caulked joints for hub and spigot soil pipe shall be firmly packed with oakum or hemp and filled with molten lead not less than 1 inch (25 mm) in depth and not to recede more than 1/8 inch (3.2 mm) below the rim of the hub. Paint, varnish or other coatings shall not be permitted on the jointing material until after the joint has been tested and approved. Lead shall be run in one pouring and shall be caulked tight. Acid-resistant rope and acidproof cement shall be permitted.

705.8: Steel.

Joints between galvanized steel pipe or fittings shall comply with Sections 705.8.1 and 705.8.2.

705.8.1: Threaded joints.

Threads shall conform to ASME B1.20.1. Pipe-joint compound or tape shall be applied on the male threads only.

705.8.2: Mechanical joints.

Joints shall be made with an approved elastomeric seal. Mechanical joints shall be installed in accordance with the manufacturer’s instructions.

705.9: Lead.

Joints between lead pipe or fittings shall comply with Sections 705.9.1 and 705.9.2.

705.9.1: Burned.

Burned joints shall be uniformly fused together into one continuous piece. The thickness of the joint shall be not less than the thickness of the lead being joined. The filler metal shall be of the same material as the pipe.

705.9.2: Wiped.

Joints shall be fully wiped, with an exposed surface on each side of the joint not less than 3/4 inch (19.1 mm). The joint shall be not less than 3/8 inch (9.5 mm) thick at the thickest point.

705.10: PVC plastic.

Joints between PVC plastic pipe or fittings shall comply with Sections 705.10.1 through 705.10.3.

705.10.1: Mechanical joints.

Mechanical joints on drainage pipe shall be made with an elastomeric seal conforming to ASTM C1173, ASTM D3212 or CSA B602. Mechanical joints shall not be installed in above-ground systems,

unless otherwise approved. Joints shall be installed in accordance with the manufacturer's instructions.

The 2026 Georgia Amendments say: a purple primer shall be applied.

705.10.2: Solvent cementing.

Joint surfaces shall be clean and free from moisture. A purple primer that conforms to ASTM F656 shall be applied. Solvent cement not purple in color and conforming to ASTM D2564, CSA B137.3, CSA B181.2 or CSA B182.1 shall be applied to all joint surfaces. The joint shall be made while the cement is wet and shall be in accordance with ASTM D2855. Solvent-cement joints shall be permitted above or below ground.

Exception: A primer is not required where both of the following conditions apply:

1. The solvent cement used is third-party certified as conforming to ASTM D2564.
2. The solvent cement is used only for joining PVC drain, waste and vent pipe and fittings in non-pressure applications in sizes up to and including 4 inches (102 mm) in diameter.
3. The joint is made in accordance with ASTM F3328.

705.10.3: Threaded joints.

Threads shall conform to ASME B1.20.1. Where pipe is to be threaded, the pipe shall have a wall thickness of not less than Schedule 80. Pipe threads shall be made with dies specifically designed for plastic pipe. Approved thread lubricant or tape shall be applied on the male threads only.

705.10.4: Push-fit joints.

Push-fit joints shall conform to ASME A112.4.4 and shall be installed in accordance with the manufacturer's instructions.

705.10.5: Mechanical joints above ground.

Mechanical joint couplings used above ground to connect PVC pipe to PVC pipe shall be of the shielded type and shall be marked by the manufacturer as being recommended for the application.

705.11: Vitrified clay.

Joints between vitrified clay pipe or fittings shall be made with an elastomeric seal conforming to ASTM C425, ASTM C1173 or CSA B602.

705.12: Polyethylene plastic pipe.

Joints between polyethylene plastic pipe and fittings shall be underground and shall comply with Section 705.12.1 or 705.12.2.

705.12.1: Heat-fusion joints.

Joint surfaces shall be clean and free from moisture. Joint surfaces shall be cut, heated to melting temperature and joined using tools specifically designed for the operation. Joints shall be undisturbed until cool. Joints shall be made in accordance with ASTM D2657 and the manufacturer's instructions.

705.12.2: Mechanical joints.

Mechanical joints in drainage piping shall be made with an elastomeric seal conforming to ASTM C1173, ASTM D3212 or CSA B602. Mechanical joints shall be installed in accordance with the manufacturer's instructions.

705.13: Polyolefin plastic.

Joints between polyolefin plastic pipe and fittings shall comply with Sections 705.13.1 and 705.13.2.

705.13.1: Heat-fusion joints.

Heat-fusion joints for polyolefin pipe and tubing joints shall be installed with socket-type heat-fused polyolefin fittings or electrofusion polyolefin 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 F1412 or CSA B181.3.

705.13.2: Mechanical and compression sleeve joints.

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

705.14: Polyvinylidene fluoride plastic.

Joints between polyvinylidene plastic pipe and fittings shall comply with Sections 705.14.1 and 705.14.2.

705.14.1: Heat-fusion joints.

Heat-fusion joints for polyvinylidene fluoride pipe and tubing joints shall be installed with socket-type heat-fused polyvinylidene fluoride fittings or electrofusion polyvinylidene fittings and couplings. Joint surfaces shall be clean and free from moisture. The joint shall be undisturbed until cool. Joints shall be made in accordance with ASTM F1673.

705.14.2: Mechanical and compression sleeve joints.

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

705.15: Polypropylene plastic.

The joint between polypropylene plastic pipe and fittings shall incorporate an elastomeric seal. The joint shall conform to ASTM D3212. Mechanical joints shall not be installed above ground.

705.16: Joints between different materials.

Joints between different piping materials shall be made with a mechanical joint conforming to ASTM C1173, ASTM C1460 or ASTM C1461. Connectors and adapters shall be approved for the application and such joints shall have an elastomeric seal conforming to ASTM C425, ASTM C443, ASTM C564, ASTM C1440, ASTM F477, CSA A257.3M or CSA B602, or as required in Sections 705.16.1 through 705.16.7. Joints between glass pipe and other types of materials shall be made with adapters having a TFE seal. Joints shall be installed in accordance with the manufacturer's instructions.

705.16.1: Copper pipe or tubing to cast-iron hub pipe.

Joints between copper pipe or tubing and cast-iron hub pipe shall be made with a copper or copper-alloy ferrule or compression joint. The copper pipe or tubing shall be soldered to the ferrule in an approved manner, and the ferrule shall be joined to the cast-iron hub by a caulked joint or a mechanical compression joint.

705.16.2: Copper or copper-alloy pipe or tubing to galvanized steel pipe.

Joints between copper or copper-alloy pipe or tubing and galvanized steel pipe shall be made with a copper-alloy fitting or dielectric fitting. The copper tubing shall be soldered to the fitting in an approved manner, and the fitting shall be screwed to the threaded pipe.

705.16.3: Cast-iron pipe to galvanized steel pipe.

Joints between cast iron and galvanized steel shall be made by either caulked or threaded joints or with an approved adapter fitting.

705.16.4: Plastic pipe or tubing to other piping material.

Joints between different types of plastic pipe shall be made with an approved adapter fitting, or by a solvent-cement joint only where a single joint is made between ABS and PVC pipes at the end of a building drainage pipe and the beginning of a building sewer pipe using a solvent cement complying with ASTM D3138. Joints between plastic pipe and other piping material shall be made with an approved adapter fitting. Joints between plastic pipe and cast-iron hub pipe shall be made by a caulked joint or a mechanical compression joint.

705.16.5: Lead pipe to other piping material.

Joints between lead pipe and other piping material shall be made by a wiped joint to a caulking ferrule, soldering nipple or bushing or shall be made with an approved adapter fitting.

705.16.6: Borosilicate glass to other materials.

Joints between glass pipe and other types of materials shall be made with adapters having a TFE seal and shall be installed in accordance with the manufacturer’s instructions.

705.16.7: Stainless steel drainage systems to other materials.

Joints between stainless steel drainage systems and other piping materials shall be made with approved mechanical couplings.

705.17: Drainage slip joints.

Slip joints shall comply with Section 405.9.

705.18: Caulking ferrules.

Caulking ferrules shall be of copper alloy and shall be in accordance with Table 705.18.

TABLE 705.18 CAULKING FERRULE SPECIFICATIONS

PIPE SIZES (inches)	INSIDE DIAMETER (inches)	LENGTH (inches)	MINIMUM WEIGHT EACH
2	2 1/4	4 1/2	1 pound
3	3 1/4	4 1/2	1 pound 12 ounces
4	4 1/4	4 1/2	2 pounds 8 ounces

For SI: 1 inch = 25.4 mm, 1 ounce = 28.35 g, 1 pound = 0.454 kg.

705.19: Soldering bushings.

Soldering bushings shall be of copper or copper alloy and shall be in accordance with Table 705.19.

TABLE 705.19 SOLDERING BUSHING SPECIFICATIONS

PIPE SIZES (inches)	MINIMUM WEIGHT EACH
1 1/4	6 ounces
1 1/2	8 ounces
2	14 ounces
2 1/2	1 pound 6 ounces
3	2 pounds
4	3 pounds 8 ounces

For SI: 1 inch = 25.4 mm, 1 ounce = 28.35 g, 1 pound = 0.454 kg.

705.20: Stainless steel drainage systems.

O-ring joints for stainless steel drainage systems shall be made with an approved elastomeric seal.

Section 706: Connections Between Drainage Piping and Fittings

706.1: Connections and changes in direction.

Connections and changes in direction of the sanitary drainage system shall be made with approved drainage fittings. Connections between drainage piping and fixtures shall conform to Section 405.

706.2: Obstructions.

The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type. This section shall not be applicable to tubular waste fittings used to convey vertical flow upstream of the trap seal liquid level of a fixture trap.

706.3: Installation of fittings.

Fittings shall be installed to guide sewage and waste in the direction of flow. Change in direction shall be made by fittings installed in accordance with Table 706.3. Change in direction by combination fittings, side inlets or increasers shall be installed in accordance with Table 706.3 based on the pattern of flow created by the fitting. ~~Double sanitary tee patterns shall not receive the discharge of back-to-back water closets and fixtures or appliances with pumping action discharge~~.

> ~~**Exception:** Back-to-back water closet connections to double sanitary tees shall be permitted where the horizontal developed length between the outlet of the water closet and the connection to the double sanitary tee pattern is 18 inches (457 mm) or greater~~.

The Georgia Amendments say: Double sanitary tee patterns shall only be used for dry venting purposes or for fixture drains 2 inches in diameter or smaller.

TABLE 706.3 FITTINGS FOR CHANGE IN DIRECTION

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

For SI: 1 inch = 25.4 mm.

a. The fittings shall only be permitted for a 2-inch or smaller fixture drain.
b. Three inches or larger.
c. For a limitation on double sanitary tees, see Section 706.3.

706.4: Heel- or side-inlet quarter bends.

Heel-inlet quarter bends shall be an acceptable means of connection, except where the quarter bend serves a water closet. A low-heel inlet shall not be used as a wet-vented connection. Side-inlet quarter bends shall be an acceptable means of connection for drainage, wet venting and stack venting arrangements.

Section 707: Prohibited Joints and Connections

707.1: Prohibited joints.

The following types of joints and connections shall be prohibited:

1. Cement or concrete joints.
2. Mastic or hot-pour bituminous joints.

3. Joints made with fittings not approved for the specific installation.
4. Joints between different diameter pipes made with elastomeric rolling O-rings.
5. Solvent-cement joints between different types of plastic pipe except where provided for in Section 705.16.4.
6. Saddle-type fittings.

Section 708: Cleanouts

708.1: Cleanouts required.

Cleanouts shall be provided for drainage piping in accordance with Sections 708.1.1 through 708.1.12.

708.1.1: Horizontal drains and building drains.

Horizontal drainage pipes in buildings shall have cleanouts located at intervals of not more than 100 feet (30 480 mm). Building drains shall have cleanouts located at intervals of not more than 100 feet (30 480 mm) except where manholes are used instead of cleanouts, the manholes shall be located at intervals of not more than 400 feet (122 m). The interval length shall be measured from the cleanout or manhole opening, along the developed length of the piping to the next drainage fitting providing access for cleaning, the end of the horizontal drain or the end of the building drain.

> **Exception:** Horizontal fixture drain piping serving a nonremovable trap shall not be required to have a cleanout for the section of piping between the trap and the vent connection for such trap.

708.1.2: Building sewers.

Building sewers smaller than 8 inches (203 mm) shall have cleanouts located at intervals of not more than 100 feet (30 480 mm). Building sewers 8 inches (203 mm) and larger shall have a manhole located not more than 200 feet (60 960 mm) from the junction of the building drain and building sewer and at intervals of not more than 400 feet (122 m). The interval length shall be measured from the cleanout or manhole opening, along the developed length of the piping to the next drainage fitting providing access for cleaning, a manhole or the end of the building sewer.

708.1.3: Building drain and building sewer junction.

The junction of the building drain and the building sewer shall be served by a cleanout that is located at the junction or within 10 feet (3048 mm) of the developed length of piping upstream of the junction. For the requirements of this section, the removal of the water closet shall not be required to provide cleanout access.

708.1.4: Changes of direction.

Where a horizontal drainage pipe, a building drain or a building sewer has a change of horizontal direction greater than 45 degrees (0.79 rad), a cleanout shall be installed at the change of direction. Where more than one change of horizontal direction greater than 45 degrees (0.79 rad) occurs within

40 feet (12 192 mm) of developed length of piping, the cleanout installed for the first change of direction shall serve as the cleanout for all changes in direction within that 40 feet (12 192 mm) of developed length of piping.

708.1.5: Cleanout size.

Cleanouts shall be the same size as the piping served by the cleanout, except that cleanouts for piping larger than 4 inches (102 mm) need not be larger than 4 inches (102 mm).

Exceptions:

1. A removable P-trap with slip or ground joint connections can serve as a cleanout for drain piping that is one size larger than the P-trap size.
2. Cleanouts located on stacks can be one size smaller than the stack size.
3. The size of cleanouts for cast-iron piping can be in accordance with the referenced standards for cast-iron fittings as indicated in Table 702.4.

708.1.6: Cleanout equivalent.

A fixture trap or a fixture with integral trap, removable without altering concealed piping, shall be acceptable as a cleanout equivalent.

708.1.7: Cleanout plugs.

Cleanout plugs shall be of copper-alloy, plastic or other approved materials. Cleanout plugs for borosilicate glass piping systems shall be of borosilicate glass. Copper-alloy cleanout plugs shall conform to ASTM A74 and shall be limited for use only on metallic piping systems. Plastic cleanout plugs shall conform to the referenced standards for plastic pipe fittings, as indicated in Table 702.4. Cleanout plugs shall have a raised square head, a countersunk square head or a countersunk slot head. Where a cleanout plug will have a trim cover screw installed into the plug, the plug shall be manufactured with a blind end threaded hole for such purpose.

708.1.8: Manholes.

Manholes and manhole covers shall be of an approved type. Manholes located inside of a building shall have gas-tight covers that require tools for removal.

708.1.9: Installation arrangement.

The installation arrangement of a cleanout shall enable cleaning of drainage piping only in the direction of drainage flow.

Exceptions:

1. Test tees serving as cleanouts.
2. A two-way cleanout installation that is approved for meeting the requirements of Section 708.1.3.

708.1.10: Required clearance.

Cleanouts for 6-inch (153 mm) and smaller piping shall be provided with a clearance of not less than 18 inches (457 mm) from, and perpendicular to, the face of the opening to any obstruction. Cleanouts for 8-inch (203 mm) and larger piping shall be provided with a clearance of not less than 36 inches (914 mm) from, and perpendicular to, the face of the opening to any obstruction.

708.1.11: Cleanout access.

Required cleanouts shall not be installed in concealed locations. For the purposes of this section, concealed locations include, but are not limited to, the inside of plenums, within walls, within floor/ceiling assemblies, below grade and in crawl spaces where the height from the crawl space floor to the nearest obstruction along the path from the crawl space opening to the cleanout location is less than 24 inches (610 mm). Cleanouts with openings at a finished wall shall have the face of the opening located within 1 1/2 inches (38 mm) of the finished wall surface. Cleanouts located below grade shall be extended to grade level so that the top of the cleanout plug is at or above grade. A cleanout installed in a floor or walkway that will not have a trim cover installed shall have a countersunk plug installed so the top surface of the plug is flush with the finished surface of the floor or walkway.

708.1.11.1: Cleanout plug trim covers.

Trim covers and access doors for cleanout plugs shall be designed for such purposes and shall be approved. Trim cover fasteners that thread into cleanout plugs shall be corrosion resistant. Cleanout plugs shall not be covered with mortar, plaster or any other permanent material.

708.1.11.2: Floor cleanout assemblies.

Where it is necessary to protect a cleanout plug from the loads of vehicular traffic, cleanout assemblies in accordance with ASME A112.36.2M shall be installed.

708.1.12: Prohibited use.

The use of a threaded cleanout opening to add a fixture or to extend piping shall be prohibited except where another cleanout of equal size is installed with the required access and clearance.

Section 709: Fixture Units

709.1: Values for fixtures.

Drainage fixture unit values as given in Table 709.1 designate the relative load weight of different kinds of fixtures that shall be employed in estimating the total load carried by a soil or waste pipe, and shall be used in connection with Tables 710.1(1) and 710.1(2) of sizes for soil, waste and vent pipes for which the permissible load is given in terms of fixture units.

TABLE 709.1 DRAINAGE FIXTURE UNITS FOR FIXTURES AND GROUPS

FIXTURE TYPE	DRAINAGE FIXTURE UNIT VALUE AS LOAD FACTORS	MINIMUM SIZE OF TRAP (Inches)
Automatic clothes washers, commercial[a, g]	3	2
Automatic clothes washers, residential[g]	2	2
Bathroom group as defined in Section 202 (1.6 gpf water closet)[f]	5	—
Bathroom group as defined in Section 202 (water closet flushing greater than 1.6 gpf)[f]	6	—
Bathtub[b] (with or without overhead shower or whirlpool attachments)	2	1 1/2
Bidet	1	1 1/4
Combination sink and tray	2	1 1/2
Dental lavatory	1	1 1/4
Dental unit or cuspidor	1	1 1/4
Dishwashing machine[c], domestic	2	1 1/2
Drinking fountain	1/2	1 1/4
Emergency floor drain	0	2
Floor drains[h]	2[h]	2
Floor sinks	Note h	2
Kitchen sink, domestic	2	1 1/2
Kitchen sink, domestic with food waste disposer, dishwasher or both	2	1 1/2
Laundry tray (1 or 2 compartments)	2	1 1/2
Lavatory	1	1 1/4
Shower (based on the total flow rate through showerheads and body sprays) flow rate: 5.7 gpm or less Greater than 5.7 gpm to 12.3 gpm Greater than 12.3 gpm to 25.8 gpm Greater than 25.8 gpm to 55.6 gpm	 2 3 5 6	 1 1/2 2 3 4
Service sink	2	1 1/2
Sink	2	1 1/2
Urinal	4	Note d
Urinal, 1 gallon per flush or less	2[e]	Note d
Urinal, nonwater supplied	1/2	Note d
Wash sink (circular or multiple) each set of faucets	2	1 1/2
Water closet, flushometer tank, public or private	4[e]	Note d
Water closet, private (1.6 gpf)	3[e]	Note d
Water closet, private (flushing greater than 1.6 gpf)	4[e]	Note d
Water closet, public (1.6 gpf)	4[e]	Note d
Water closet, public (flushing greater than 1.6 gpf)	6[e]	Note d

For SI: 1 inch = 25.4 mm, 1 gallon = 3.785 L, gpf = gallon per flushing cycle, 1 gallon per minute (gpm) = 3.785 L/m.

a. For traps larger than 3 inches, use Table 709.2.
b. A showerhead over a bathtub or whirlpool bathtub attachment does not increase the drainage fixture unit value.
c. See Sections 709.2 through 709.4.1 for methods of computing unit value of fixtures not listed in this table or for rating of devices with intermittent flows.
d. Trap size shall be consistent with the fixture outlet size.
e. For the purpose of computing loads on building drains and sewers, water closets and urinals shall not be rated at a lower drainage fixture unit unless the lower values are confirmed by testing.
f. For fixtures added to a bathroom group, add the dfu value of those additional fixtures to the bathroom group fixture count.
g. See Section 406.2 for sizing requirements for fixture drain, branch drain and drainage stack for an automatic clothes washer standpipe.
h. See Sections 709.4 and 709.4.1.

709.2: Fixtures not listed in Table 709.1.

Fixtures not listed in Table 709.1 shall have a drainage fixture unit load based on the outlet size of the fixture in accordance with Table 709.2. The minimum trap size for unlisted fixtures shall be the size of the drainage outlet but not less than 1 1/4 inches (32 mm).

TABLE 709.2 DRAINAGE FIXTURE UNITS FOR FIXTURE DRAINS OR TRAPS

FIXTURE DRAIN OR TRAP SIZE (inches)	DRAINAGE FIXTURE UNIT VALUE
1 1/4	1
1 1/2	2
2	3
2 1/2	4
3	5
4	6

For SI: 1 inch = 25.4 mm.

709.3: Conversion of GPM flow to DFU values.

Where discharges to a waste receptor or to a drainage system are only known in gallons per minute (liters per second) values, the drainage fixture unit values for those flows shall be computed on the basis that 1 GPM (0.06 L/s) of flow is equivalent to two drainage fixture units.

709.4: Values for indirect waste receptor.

The drainage fixture unit load of an indirect waste receptor receiving the discharge of indirectly connected fixtures shall be the sum of the drainage fixture unit values of the fixtures that discharge to the receptor, but not less than the drainage fixture unit value given for the indirect waste receptor in Table 709.1 or 709.2.

709.4.1: Clear-water waste receptors.

Where waste receptors such as floor drains, floor sinks and hub drains receive only clear-water waste from display cases, refrigerated display cases, ice bins, coolers and freezers, such receptors shall have a drainage fixture unit value of one-half.

Section 710: Drainage System Sizing

710.1: Maximum fixture unit load.

The maximum number of drainage fixture units connected to a given size of building sewer, building drain or horizontal branch of the building drain shall be determined using Table 710.1(1). The maximum number of drainage fixture units connected to a given size of horizontal branch or vertical soil or waste stack shall be determined using Table 710.1(2).

TABLE 710.1(1) BUILDING DRAINS AND SEWERS

DIAMETER OF PIPE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS CONNECTED TO ANY PORTION OF THE BUILDING DRAIN OR THE BUILDING SEWER, INCLUDING BRANCHES OF THE BUILDING DRAIN[a]			
	Slope per foot			
	1/16 inch	1/8 inch	1/4 inch	1/2 inch
1 1/4	—	—	1	1
1 1/2	—	—	3	3
2	—	—	21	26
2 1/2	—	—	24	31
3	—	36	42	50
4	—	180	216	250
5	—	390	480	575
6	—	700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	3,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

For SI: 1 inch = 25.4 mm, 1 inch per foot = 83.3 mm/m.

a. The minimum size of any building drain serving a water closet shall be 3 inches.

TABLE 710.1(2) HORIZONTAL FIXTURE BRANCHES AND STACKS (a)

DIAMETER OF PIPE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (dfu)			
	Total for horizontal branch	Stacks[b]		
		Total discharge into one branch interval	Total for stack of three branch intervals or less	Total for stack greater than three branch intervals
1 1/2	3	2	4	8
2	6	6	10	24
2 1/2	12	9	20	42
3	20	20	48	72
4	160	90	240	500
5	360	200	540	1,100
6	620	350	960	1,900
8	1,400	600	2,200	3,600
10	2,500	1,000	3,800	5,600
12	3,900	1,500	6,000	8,400
15	7,000	Note c	Note c	Note c

For SI: 1 inch = 25.4 mm.

a. Does not include branches of the building drain. Refer to Table 710.1(1).
b. Stacks shall be sized based on the total accumulated connected load at each story or branch interval. As the total accumulated connected load decreases, stacks are permitted to be reduced in size. Stack diameters shall not be reduced to less than one-half of the diameter of the largest stack size required.
c. Sizing load based on design criteria.

710.1.1: Horizontal stack offsets.

Horizontal stack offsets shall be sized as required for building drains in accordance with Table 710.1(1), except as required by Section 711.3.

710.1.2: Vertical stack offsets.

Vertical stack offsets shall be sized as required for straight stacks in accordance with Table 710.1(2), except where required to be sized as a building drain in accordance with Section 711.1.1.

710.2: Future fixtures.

Where provision is made for the future installation of fixtures, those provided for shall be considered in determining the required sizes of drain pipes.

Section 711: Offsets in Drainage Piping in Buildings of Five Stories or More

711.1: Horizontal branch connections above or below vertical stack offsets.

If a horizontal branch connects to the stack within 2 feet (610 mm) above or below a vertical stack offset, and the offset is located more than four branch intervals below the top of the stack, the offset shall be vented in accordance with Section 907.

711.1.1: Omission of vents for vertical stack offsets.

Vents for vertical offsets required by Section 711.1 shall not be required where the stack and its offset are sized as a building drain [see Table 710.1(1)].

711.2: Horizontal stack offsets.

A stack with a horizontal offset located more than four branch intervals below the top of the stack shall be vented in accordance with Section 907 and sized as follows:

1. The portion of the stack above the offset shall be sized as for a vertical stack based on the total number of drainage fixture units above the offset.
2. The offset shall be sized in accordance with Section 710.1.1.
3. The portion of the stack below the offset shall be sized as for the offset or based on the total number of drainage fixture units on the entire stack, whichever is larger [see Table 710.1(2), Column 5].

711.2.1: Omission of vents for horizontal stack offsets.

Vents for horizontal stack offsets required by Section 711.2 shall not be required where the stack and its offset are one pipe size larger than required for a building drain [see Table 710.1(1)] and the entire stack and offset are not less in cross-sectional area than that required for a straight stack plus the area of an offset vent as provided for in Section 907.

711.3: Offsets below lowest branch.

Where a vertical offset occurs in a soil or waste stack below the lowest horizontal branch, a change in diameter of the stack because of the offset shall not be required. If a horizontal offset occurs in a soil or waste stack below the lowest horizontal branch, the required diameter of the offset and the stack below it shall be determined as for a building drain in accordance with Table 710.1(1).

Section 712: Sumps and Ejectors

712.1: Building subdrains.

Building subdrains that cannot be discharged to the sewer by gravity flow shall be discharged into a tightly covered and vented sump from which the liquid shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment or other approved method. In other than existing structures, the sump shall not receive drainage from any piping within the building capable of being discharged by gravity to the building sewer.

712.2: Valves required.

A check valve and a full-open valve located on the discharge side of the check valve shall be installed in the pump or ejector discharge piping between the pump or ejector and the gravity drainage system. Access shall be provided to such valves. Such valves shall be located above the sump cover required by Section 712.1 or, where the discharge pipe from the ejector is below grade, the valves shall be accessibly located outside the sump below grade in an access pit with a removable access cover.

712.3: Sump design.

The sump pump, pit and discharge piping shall conform to the requirements of Sections 712.3.1 through 712.3.5.

712.3.1: Sump pump.

The sump pump capacity and head shall be appropriate to anticipated use requirements.

712.3.2: Sump pit.

The sump pit shall be not less than 18 inches (457 mm) in diameter and not less than 24 inches (610 mm) in depth, unless otherwise approved. The pit shall be provided with access and shall be located such that all drainage flows into the pit by gravity. The sump pit shall be constructed of tile, concrete, steel, plastic or other approved materials. The pit bottom shall be solid and provide permanent support for the pump. The sump pit shall be fitted with a gastight removable cover that is installed not more than 2 inches (51 mm) below grade or floor level. The cover shall be adequate to support anticipated loads in the area of use. The sump pit shall be vented in accordance with Chapter 9.

712.3.3: Discharge pipe and fittings.

Discharge pipe and fittings serving sump pumps and ejectors shall be constructed of materials in accordance with Sections 712.3.3.1 and 712.3.3.2.

712.3.3.1: Materials.

Pipe and fitting materials shall be constructed of copper or copper-alloy, CPVC, ductile iron, PE, or PVC.

712.3.3.2: Ratings.

Pipe and fittings shall be rated for the maximum system operating pressure and temperature. Pipe fitting materials shall be compatible with the pipe material. Where pipe and fittings are buried in the earth, they shall be suitable for burial.

712.3.4: Maximum effluent level.

The effluent level control shall be adjusted and maintained to at all times prevent the effluent in the sump from rising to within 2 inches (51 mm) of the invert of the gravity drain inlet into the sump.

712.3.5: Pump connection to the drainage system.

Pumps connected to the drainage system shall connect to a building sewer, building drain, soil stack, waste stack or horizontal branch drain. Where the discharge line connects into horizontal drainage piping, the connection shall be made through a wye fitting into the top of the drainage piping and such wye fitting shall be located not less than 10 pipe diameters from the base of any soil stack, waste stack or fixture drain.

712.4: Sewage pumps and sewage ejectors.

A sewage pump or sewage ejector shall automatically discharge the contents of the sump to the building drainage system.

712.4.1: Macerating toilet systems.

Macerating toilet systems shall comply with ASME A112.3.4/CSA B45.9 and shall be installed in accordance with the manufacturer's instructions.

712.4.2: Capacity.

A sewage pump or sewage ejector shall have the capacity and head for the application requirements. Pumps or ejectors that receive the discharge of water closets shall be capable of handling spherical solids with a diameter of up to and including 2 inches (51 mm). Other pumps or ejectors shall be capable of handling spherical solids with a diameter of up to and including 1/2 inch (13 mm). The capacity of a pump or ejector based on the diameter of the discharge pipe shall be not less than that indicated in Table 712.4.2.

Exceptions:

1. Grinder pumps or grinder ejectors that receive the discharge of water closets shall have a discharge opening of not less than 1 1/4 inches (32 mm).
2. Macerating toilet assemblies that serve single water closets shall have a discharge opening of not less than 3/4 inch (19.1 mm).

TABLE 712.4.2 MINIMUM CAPACITY OF SEWAGE PUMP OR SEWAGE EJECTOR

DIAMETER OF THE DISCHARGE PIPE (inches)	CAPACITY OF PUMP OR EJECTOR (gpm)
2	21
2 1/2	30
3	46

For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/m.

Section 713: Computerized Drainage Design

713.1: Design of drainage system.

The sizing, design and layout of the drainage system shall be permitted to be designed by approved computer design methods.

713.2: Load on drainage system.

The load shall be computed from the simultaneous or sequential discharge conditions from fixtures, appurtenances and appliances or the peak usage design condition.

713.2.1: Fixture discharge profiles.

The discharge profiles for flow rates versus time from fixtures and appliances shall be in accordance with the manufacturer’s specifications.

713.3: Selections of drainage pipe sizes.

Pipe shall be sized to prevent full-bore flow.

713.3.1: Selecting pipe wall roughness.

Pipe size calculations shall be conducted with the pipe wall roughness factor (ks), in accordance with the manufacturer’s specifications and as modified for aging roughness factors with deposits and corrosion.

713.3.2: Slope of horizontal drainage piping.

Horizontal drainage piping shall be designed and installed at slopes in accordance with Table 704.1.

Section 714: Backwater Valves

714.1: Sewage backflow.

Where plumbing fixtures are installed on a floor with a finished floor elevation below the elevation of the manhole cover of the next upstream manhole in the public sewer, such fixtures shall be protected by a backwater valve installed in the building drain, or horizontal branch serving such fixtures. Plumbing fixtures installed on a floor with a finished floor elevation above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not discharge through a backwater valve.

> **Exception:** In existing buildings, fixtures above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not be prohibited from discharging through a backwater valve.

714.2: Material.

Backwater valves shall comply with ASME A112.14.1, CSA B181.1 or CSA B181.2.

714.3: Location.

Backwater valves shall be installed so that access is provided to the working parts.

Section 715: Vacuum Drainage Systems

715.1: Scope.

Vacuum drainage systems shall be in accordance with Sections 715.2 through 715.4.

715.2: System design.

Vacuum drainage systems shall be designed in accordance with the vacuum drainage system manufacturer's instructions. The system layout, including piping layout, tank assemblies, vacuum pump assembly and other components necessary for proper function of the system shall be in accordance with the manufacturer's instructions. Plans, specifications and other data for such systems shall be submitted to the code official for review and approval prior to installation.

715.2.1: Fixtures.

Gravity-type fixtures installed in vacuum drainage systems shall comply with Chapter 4.

715.2.2: Drainage fixture units.

Drainage fixture units for gravity drainage systems that discharge into, or receive discharge from, vacuum drainage systems shall be based on the values in this chapter.

715.2.3: Water supply fixture units.

Water supply fixture units shall be based on the values in Chapter 6, except that the water supply fixture unit for a vacuum-type water closet shall be one.

715.2.4: Traps and cleanouts.

Gravity drainage fixtures shall be provided with traps and cleanouts in accordance with this chapter and Chapter 10.

715.2.5: Materials.

Vacuum drainage pipe, fitting and valve materials shall be in accordance with the vacuum drainage system manufacturer's instructions and the requirements of this chapter.

715.3: Testing and demonstrations.

After completion of the entire system installation, the system shall be subjected to a vacuum test of 19 inches (483 mm) of mercury and shall be operated to function as required by the code official and the manufacturer of the vacuum drainage system. Recorded proof of all tests shall be submitted to the code official.

715.4: Written instructions.

Written instructions for the operation, maintenance, safety and emergency procedures shall be provided to the building owner. The code official shall verify that the building owner is in receipt of such instructions.

Section 716: Replacement of Underground Building Sewers and Building Drains by Pipe-Bursting Methods

716.1: General.

This section shall govern the replacement of existing building sewer and building drain piping by pipe-bursting methods.

716.2: Applicability.

The replacement of building sewer and building drain piping by pipe-bursting methods shall be limited to gravity drainage piping of sizes 6 inches (152 mm) and smaller. The replacement piping shall be of the same nominal size as the existing piping.

716.3: Pre-installation inspection.

The existing piping sections to be replaced shall be inspected internally by a recorded video camera survey. The survey shall include notations of the position of cleanouts and the depth of connections to the existing piping.

716.4: Pipe.

The replacement pipe shall be made of high-density polyethylene (HDPE) and shall have a standard dimension ratio (SDR) of 17. The pipe shall be in compliance with ASTM F714.

716.5: Pipe fittings.

Pipe fittings to be connected to the replacement pipe shall be made of high-density polyethylene (HDPE) and shall be in compliance with ASTM D2683.

716.6: Cleanouts.

Where the existing building sewer or building drain did not have cleanouts meeting the requirements of this code, cleanout fittings shall be installed as required by this code.

716.7: Post-installation inspection.

The completed replacement piping section shall be inspected internally by a recorded video camera survey. The video survey shall be reviewed and approved by the code official prior to pressure testing of the replacement piping system.

716.8: Pressure testing.

The replacement piping system as well as the connections to the replacement piping shall be tested in accordance with Section 312.

Section 717: Relining Building Sewers and Building Drains

717.1: General.

This section shall govern the relining of existing building sewers and building drainage piping.

717.2: Applicability.

The relining of existing building sewers and building drainage piping shall be limited to gravity drainage piping 4 inches (102 mm) in diameter and larger. The relined piping shall be of the same nominal size as the existing piping.

717.3: Preinstallation requirements.

Prior to commencement of the relining installation, the existing piping sections to be relined shall be descaled and cleaned. After the cleaning process has occurred and water has been flushed through the system, the piping shall be inspected internally by a recorded video camera survey.

717.3.1: Preinstallation recorded video camera survey.

The video survey shall include verification of the project address location. The video shall include notations of the cleanout and fitting locations, and the approximate depth of the existing piping. The video shall also include notations of the length of piping at intervals not greater than 25 feet (7620 mm).

717.4: Permitting.

Prior to permit issuance, the code official shall review and evaluate the preinstallation recorded video camera survey to determine if the piping system is able to be relined in accordance with the proposed lining system manufacturer’s installation requirements and applicable referenced standards.

717.5: Prohibited applications.

Where review of the preinstallation recorded video camera survey reveals that piping systems are not installed correctly or defects exist, relining shall not be permitted. The defective portions of piping shall be exposed and repaired with pipe and fittings in accordance with this code. Defects include, but are not limited to, backgrade or insufficient slope, complete pipe wall deterioration or complete separations such as from tree root invasion or improper support.

717.6: Relining materials.

The relining materials shall be manufactured in compliance with applicable standards and certified as required in Section 303. Fold-and-form pipe reline materials shall be manufactured in compliance with ASTM F1504 or ASTM F1871.

717.7: Installation.

The installation of relining materials shall be performed in accordance with the manufacturer's installation instructions, applicable referenced standards and this code.

717.7.1: Material data report.

The installer shall record the data as required by the relining material manufacturer and applicable standards. The recorded data shall include but is not limited to the location of the project, relining material type, amount of product installed and conditions of the installation. A copy of the data report shall be provided to the code official prior to final approval.

717.8: Post-installation recorded video camera survey.

The completed, relined piping system shall be inspected internally by a recorded video camera survey after the system has been flushed and flow-tested with water. The video survey shall be submitted to the code official prior to finalization of the permit. The video survey shall be reviewed and evaluated to provide verification that no defects exist. Any defects identified shall be repaired and replaced in accordance with this code.

717.9: Certification.

A certification shall be provided in writing to the code official, from the permit holder, that the relining materials have been installed in accordance with the manufacturer’s installation instructions, the applicable standards and this code.

717.10: Approval.

Upon verification of compliance with the requirements of Sections 717.1 through 717.9, the code official shall approve the installation.

Section 718: Rehabilitation of Building Sewers and Building Drains

718.1: Cure-in-place.

Sectional cure-in-place rehabilitation of building sewer piping and sewer service lateral piping shall be in accordance with ASTM F2599. Main and lateral cure-in-place rehabilitation of building sewer and sewer service lateral pipe and their connections to the main sewer pipe shall be in accordance with

ASTM F2561. Hydrophilic rings or gaskets in cure-in-place rehabilitation of building sewer piping and sewer service laterals shall be in accordance with ASTM F3240 to ensure water tightness and elimination of ground water penetration.

Chapter 8: Indirect/Special Waste

User notes:

About this chapter: There are drainage applications in buildings where a backup of liquid waste in a drainage system could contaminate equipment and appliances. Chapter 8 covers the applications that require an indirect discharge connection to the building's drainage system. The chapter has provisions for the types of indirect connections and waste receptor configurations.

Section 801: General

801.1: Scope.

This chapter shall govern matters concerning indirect waste piping and special wastes. This chapter shall further control matters concerning food-handling establishments, sterilizers, humidifiers, clear-water waste, swimming pools, methods of providing air breaks or air gaps, and neutralizing devices for corrosive wastes.

801.2: Protection.

Devices, appurtenances, appliances and apparatus intended to serve some special function, such as sterilization, humidification, distillation, processing, cooling, or storage of ice or foods, and that discharge to the drainage system, shall be provided with protection against backflow, flooding, fouling, contamination and stoppage of the drain.

Section 802: Indirect Wastes

802.1 Where required.

Food-handling equipment, in other than dwelling units, clear-water waste, humidifiers, dishwashing machines and utensils, pots, pans and dishwashing sinks shall discharge through an indirect waste pipe as specified in Sections 802.1.1 through 802.1.7. Fixtures not required to be indirectly connected by this section and the exception to Section 301.6 shall be directly connected to the plumbing system in accordance with Chapter 7.

802.1.1: Food handling.

Equipment and fixtures utilized for the storage, preparation and handling of food shall discharge through an indirect waste pipe by means of an air gap. Each well of a multiple-compartment sink shall discharge independently to a waste receptor.

802.1.2 Floor drains in food storage areas.

Floor drains located within walk-in refrigerators or freezers in food service and food establishments shall be indirectly connected to the sanitary drainage system by means of an air gap. Where a floor drain is located within an area subject to freezing, the waste line serving the floor drain shall not be trapped and shall indirectly discharge into a waste receptor located outside of the area subject to freezing.

> **Exception:** Where protected against backflow by a backwater valve, such floor drains shall be indirectly connected to the sanitary drainage system by means of an air break or an air gap.

802.1.3: Potable clear-water waste.

Where devices and equipment, such as sterilizers and relief valves, discharge potable water to the building drainage system, the discharge shall be through an indirect waste pipe by means of an air gap.

802.1.4: Swimming pools.

Where wastewater from swimming pools, backwash from filters and water from pool deck drains discharge to the building drainage system, the discharge shall be through an indirect waste pipe by means of an air gap.

802.1.5: Non-potable clear-water waste.

Where devices and equipment such as process tanks, filters, drips and boilers discharge non-potable water to the building drainage system, the discharge shall be through an indirect waste pipe by means of an air break or an air gap.

802.1.6: Commercial dishwashing machines.

The discharge from a commercial dishwashing machine shall be through an air gap or air break into a waste receptor in accordance with Section 802.3.

802.1.7: Food utensils, dishes, pots and pans sinks.

Sinks, in other than dwelling units, used for the washing, rinsing or sanitizing of utensils, dishes, pots, pans or service ware used in the preparation, serving or eating of food shall discharge indirectly through an air gap or an air break to the drainage system.

802.2: Material, joints and connections.

The materials, joints, connections and methods utilized for the construction and installation of indirect waste piping systems shall comply with the applicable provisions of Chapter 7.

802.3: Installation.

Indirect waste piping shall discharge through an air gap or air break into a waste receptor. Waste receptors shall be trapped and vented and shall connect to the building drainage system. Indirect waste piping that exceeds 30 inches (762 mm) in developed length measured horizontally, or 54 inches (1372 mm) in total developed length, shall be trapped.

Exception: Where a waste receptor receives only clearwater waste and does not directly connect to a sanitary drainage system, the receptor shall not require a trap.

802.3.1: Air gap.

The air gap between the indirect waste pipe and the flood level rim of the waste receptor shall be not less than twice the effective opening of the indirect waste pipe.

802.3.2: Air break.

An air break shall be provided between the indirect waste pipe and the trap seal of the waste receptor.

802.4: Waste receptors.

For other than hub drains that receive only clear-water waste and standpipes, a removable strainer or basket shall cover the outlet of waste receptors. Waste receptors shall not be installed in concealed spaces. Waste receptors shall not be installed in plenums, crawl spaces, attics, interstitial spaces above ceilings and below floors. Ready access shall be provided to waste receptors.

802.4.1: Size of receptors.

A waste receptor shall be sized for the maximum discharge of all indirect waste pipes served by the receptor. Receptors shall be installed to prevent splashing or flooding.

802.4.2: Hub drains.

A hub drain shall be in the form of a hub or a pipe extending not less than 1 inch (25 mm) above a water-impervious floor.

802.4.3: Standpipes.

Standpipes shall be individually trapped. Standpipes shall extend not less than 18 inches (457 mm) but not greater than 42 inches (1067 mm) above the trap weir. Access shall be provided to standpipes and drains for rodding.

802.4.3.1: Connection of laundry tray to standpipe.

As an alternative for a laundry tray fixture connecting directly to a drainage system, a laundry tray waste line without a fixture trap shall connect to a standpipe for an automatic clothes washer drain. The standpipe shall extend not less than 30 inches (762 mm) above the weir of the standpipe trap and shall extend above the flood level rim of the laundry tray. The outlet of the laundry tray shall not be greater than 30 inches (762 mm) horizontal distance from the side of the standpipe.

Section 803: Special Wastes

803.1: Neutralizing device required for corrosive wastes.

Corrosive liquids, spent acids or other harmful chemicals that destroy or injure a drain, sewer, soil or waste pipe, or create noxious or toxic fumes or interfere with sewage treatment processes shall not be discharged into the plumbing system without being thoroughly diluted, neutralized or treated by

passing through an approved dilution or neutralizing device. Such devices shall be automatically provided with a sufficient supply of diluting water or neutralizing medium so as to make the contents non-injurious before discharge into the drainage system. The nature of the corrosive or harmful waste and the method of its treatment or dilution shall be approved prior to installation.

803.2: System design.

A chemical drainage and vent system shall be designed and installed in accordance with this code. Chemical drainage and vent systems shall be completely separated from the sanitary systems. Chemical waste shall not discharge to a sanitary drainage system until such waste has been treated in accordance with Section 803.1.

Chapter 9: Vents

User notes:

About this chapter: Chapter 9 regulates connection locations, various venting system arrangements and the sizing of piping for vent systems. The proper operation of a gravity flow drainage system (Chapter 7) depends on maintaining an air path throughout the system to prevent waste and odor “blow back” into fixtures and siphoning of the trap seal in fixture traps (Chapter 10).

Section 901: General

901.1: Scope.

The provisions of this chapter shall govern the materials, design, construction and installation of vent systems.

901.2: Trap seal protection.

The plumbing system shall be provided with a system of vent piping that will permit the admission or emission of air so that the seal of any fixture trap shall not be subjected to a pressure differential of more than 1 inch of water column (249 Pa).

901.2.1: Venting required.

Traps and trapped fixtures shall be vented in accordance with one of the venting methods specified in this chapter.

901.3: Chemical waste drainage vent systems.

The vent system for a chemical waste drainage system shall be independent of any sanitary drainage vent system. The termination of a chemical waste drainage vent system shall be through the roof to the outdoors or to an air admittance valve that complies with ASSE 1049. Air admittance valves for chemical waste drainage systems shall be constructed of one of the materials indicated in Table 702.6 and shall be tested for chemical resistance in accordance with ASTM F1412.

901.4: Use limitations.

The plumbing vent system shall not be utilized for purposes other than the venting of the plumbing system.

901.5: Tests.

The vent system shall be tested in accordance with Section 312.

901.6: Engineered systems.

Engineered venting systems shall conform to the provisions of Section 919.

Section 902: Materials

902.1: Vents.

The materials and methods utilized for the construction and installation of venting systems shall comply with the applicable provisions of Section 702.

902.1.1: Chemical waste drainage system vents.

The pipe and fitting materials for a chemical waste drainage vent system shall be in accordance with Section 702.6. The methods utilized for construction and installation of such venting system shall be in accordance with the pipe and fitting manufacturers' instructions.

902.2: Sheet copper.

Sheet copper for vent pipe flashings shall conform to ASTM B152 and shall weigh not less than 8 ounces per square foot (2.5 kg/m2).

902.3: Sheet lead.

Sheet lead for vent pipe flashings shall weigh not less than 3 pounds per square foot (15 kg/m2) for field-constructed flashings and not less than 2 1/2 pounds per square foot (12 kg/m2) for prefabricated flashings.

Section 903: Vent Terminals

903.1 Vent terminal required. The vent pipe shall terminate by extending to the outdoors through the roof or the side wall in accordance with one of the methods identified in Sections 903.1.1 through 903.1.4.

903.1.1: Roof extension unprotected.

Open vent pipes that extend through a roof shall be terminated not less than [NUMBER] inches (mm) above the roof.

903.1.2: Roof used for recreational or assembly purposes.

Where a roof is to be used as a promenade, restaurant, bar, or sunbathing deck, as an observation deck, or for similar purposes, open vent pipes shall terminate not less than 7 feet (2134 mm) above the roof.

903.1.3: Protected vent terminal.

Where an open vent pipe terminates above a sloped roof and is covered by either a roof-mounted panel (such as a solar collector or photovoltaic panel mounted over the vent opening) or a roof element (such as an architectural feature or a decorative shroud), the vent pipe shall terminate not less than 2 inches (51 mm) above the roof surface. Such roof elements shall be designed to prevent the adverse effects of snow accumulation and wind on the function of the vent. The placement of a panel over a vent pipe and the design of a roof element covering the vent pipe shall provide for an open area for the vent pipe to the outdoors that is not less than the area of the pipe, as calculated from the inside diameter of the pipe. Such vent terminals shall be protected by a method that prevents birds and rodents from entering or blocking the vent pipe opening.

903.1.4: Sidewall vent terminal.

Vent terminals extending through the wall shall terminate not less than 10 feet (3048 mm) from the lot line and 10 feet (3048 mm) above the highest adjacent grade within 10 feet (3048 mm) horizontally of the vent terminal. Vent terminals shall not terminate under the overhang of a structure with soffit vents. Sidewall vent terminals shall be protected to prevent birds and rodents from entering or blocking the vent opening.

903.2: Frost closure.

Where the 97.5 percent value for outdoor design temperature is 0°F (-18°C) or less, vent extensions through a roof or wall shall be not less than 3 inches (76 mm) in diameter. Any increase in the size of the vent shall be made not less than 1 foot (305 mm) inside the thermal envelope of the building.

903.3: Flashings.

The juncture of each vent pipe with the roof line shall be made watertight by an approved flashing.

903.4: Prohibited use.

A vent terminal shall not be used for any purpose other than a vent terminal.

903.5: Location of vent terminal.

An open vent terminal from a drainage system shall not be located directly beneath any door, openable window, or other air intake opening of the building or of an adjacent building, and any such vent terminal shall not be within 10 feet (3048 mm) horizontally of such an opening unless it is 3 feet (914 mm) or more above the top of such opening.

903.6: Extension outside a structure.

In climates where the 97.5 percent value for outside design temperature is less than 0°F (-18°C), vent pipes installed on the exterior of the structure shall be protected against freezing by insulation, heat or both.

Section 904: Outdoor Vent Extensions

904.1: Required vent extension.

The vent system serving each building drain shall have not less than one vent pipe that extends to the outdoors.

904.1.1: Installation.

The required vent shall be a dry vent that connects to the building drain or an extension of a drain that connects to the building drain. Such vent shall not be an island fixture vent as allowed by Section 916.

904.1.2: Size.

The required vent shall be sized in accordance with Section 906.2 based on the required size of the building drain.

904.2: Vent stack required.

A vent stack shall be required for every drainage stack that has five branch intervals or more.

> **Exception:** Drainage stacks installed in accordance with Section 913.

904.3: Vent termination.

Vent stacks or stack vents shall terminate outdoors to the open air or to a stack-type air admittance valve in accordance with Section 918.

904.4: Vent connection at base.

Vent stacks shall connect to the base of the drainage stack. The vent stack shall connect at or below the lowest horizontal branch. Where the vent stack connects to the building drain, the connection shall be located downstream of the drainage stack and within a distance of 10 times the diameter of the drainage stack.

904.5: Vent headers.

Stack vents and vent stacks connected into a common vent header at the top of the stacks and extending to the open air at one point shall be sized in accordance with the requirements of Section 906.1. The number of fixture units shall be the sum of all fixture units on all stacks connected thereto, and the developed length shall be the longest vent length from the intersection at the base of the most distant stack to the vent terminal in the open air, as a direct extension of one stack.

Section 905: Vent Connections and Grades

905.1: Connection.

Individual, branch and circuit vents shall connect to a vent stack, stack vent, air admittance valve or extend to the open air.

905.2: Grade.

Vent and branch vent pipes shall be so graded and connected as to drain back to the drainage pipe by gravity.

905.3: Vent connection to drainage system.

Every dry vent connecting to a horizontal drain shall connect above the centerline of the horizontal drain pipe.

905.4: Vertical rise of vent.

Every dry vent shall rise vertically to a point not less than 6 inches (152 mm) above the flood level rim of the highest trap or trapped fixture being vented.

> **Exception:** Vents for interceptors located outdoors.

905.5: Height above fixtures.

A connection between a vent pipe and a vent stack or stack vent shall be made at not less than 6 inches (152 mm) above the flood level rim of the highest fixture served by the vent. Horizontal vent pipes forming branch vents, relief vents or loop vents shall be located not less than 6 inches (152 mm) above the flood level rim of the highest fixture served.

905.6: Vent for future fixtures.

Where the drainage piping has been roughed-in for future fixtures, a rough-in connection for a vent shall be installed. The vent size shall be not less than one-half the diameter of the rough-in drain to be served. The vent rough-in shall connect to the vent system, or shall be vented by other means as provided for in this chapter. The connection shall be identified to indicate that it is a vent.

Section 906: Vent Pipe Sizing

906.1: Size of stack vents and vent stacks.

The minimum required diameter of stack vents and vent stacks shall be determined from the developed length and the total of drainage fixture units connected thereto in accordance with Table 906.1, but in no case shall the diameter be less than one-half the diameter of the drain served or less than 1 1/4 inches (32 mm).

TABLE 906.1 SIZE AND DEVELOPED LENGTH OF STACK VENTS AND VENT STACKS

DIAMETER OF SOIL OR WASTE STACK (inches)	TOTAL FIXTURE UNITS BEING VENTED (dfu)	MAXIMUM DEVELOPED LENGTH OF VENT (feet)[a] DIAMETER OF VENT (inches)										
		1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	12
1 1/4	2	30	—									
1 1/2	8	50	150	—	—	—	—	—	—	—	—	—
1 1/2	10	30	100									
2	12	—	75	200	—							
2	20	30	50	150	—	—	—	—	—	—	—	—
2 1/2	42	26	30	100	300							
3	10		42	150	360	1,040						
3	21	—	32	110	270	810	—	—	—	—	—	—
3	53		27	94	230	680						
3	102		25	86	210	620	—					
4	43	—	—	35	85	250	980	—	—	—	—	—
4	140		—	27	65	200	750					
4	320			23	55	170	640	—				
4	540	—	—	21	50	150	580	—	—	—	—	—
5	190			—	28	82	320	990				
5	490				21	63	250	760				
5	940	—	—	—	18	53	210	670	—	—	—	—
5	1,400				16	49	190	590				
6	500					33	130	400	1,000			
6	1,100	—	—	—	—	26	100	310	780	—	—	—
6	2,000					22	84	260	660			
6	2,900					20	77	240	600	—		
8	1,800	—	—	—	—	—	31	95	240	940	—	—
8	3,400					—	24	73	190	729		
8	5,600						20	62	160	610	—	
8	7,600	—	—	—	—	—	18	56	140	560	—	—
10	4,000						—	31	78	310	960	
10	7,200							24	60	240	740	
10	11,000	—	—	—	—	—	—	20	51	200	630	—
10	15,000							18	46	180	571	
12	7,300								31	120	380	940
12	13,000	—	—	—	—	—	—	—	24	94	300	720
12	20,000								20	79	250	610
12	26,000								18	72	230	500
15	15,000	—	—	—	—	—	—	—	—	40	130	310
15	25,000								—	31	96	240
15	38,000	—	—	—	—	—	—	—	—	26	81	200
15	50,000									24	74	180

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

a. The developed length shall be measured from the vent connection to the open air.

906.2: Vents other than stack vents or vent stacks.

The diameter of individual vents, branch vents, circuit vents and relief vents shall be not less than one-half the required diameter of the drain served. The required size of the drain shall be determined in accordance with Table 710.1(2). Vent pipes shall be not less than 1 1/4 inches (32 mm) in diameter. Vents exceeding 40 feet (12 192 mm) in developed length shall be increased by one nominal pipe size for the entire developed length of the vent pipe. Relief vents for soil and waste stacks in buildings having more than 10 branch intervals shall be sized in accordance with Section 908.2.

906.3: Developed length.

The developed length of individual, branch, circuit and relief vents shall be measured from the farthest point of vent connection to the drainage system to the point of connection to the vent stack, stack vent or termination outside of the building.

906.4: Multiple branch vents.

Where multiple branch vents are connected to a common branch vent, the common branch vent shall be sized in accordance with this section based on the size of the common horizontal drainage branch that is or would be required to serve the total drainage fixture unit load being vented.

906.5: Sump vents.

Sump vent sizes shall be determined in accordance with Sections 906.5.1 and 906.5.2.

906.5.1: Sewage pumps and sewage ejectors other than pneumatic.

Drainage piping below sewer level shall be vented in the same manner as that of a gravity system. Building sump vent sizes for sumps with sewage pumps or sewage ejectors, other than pneumatic, shall be determined in accordance with Table 906.5.1.

TABLE 906.5.1 SIZE AND LENGTH OF SUMP VENTS

DISCHARGE CAPACITY OF PUMP (gpm)	MAXIMUM DEVELOPED LENGTH OF VENT (feet)[a]					
	Diameter of vent (inches)					
	1 1/4	1 1/2	2	2 1/2	3	4
10	No limit[b]	No limit	No limit	No limit	No limit	No limit
20	270	No limit	No limit	No limit	No limit	No limit
40	72	160	No limit	No limit	No limit	No limit
60	31	75	270	No limit	No limit	No limit
80	16	41	150	380	No limit	No limit
100	10[c]	25	97	250	No limit	No limit
150	Not permitted	10[c]	44	110	370	No limit
200	Not permitted	Not permitted	20	60	210	No limit
250	Not permitted	Not permitted	10	36	132	No limit
300	Not permitted	Not permitted	10[c]	22	88	380
400	Not permitted	Not permitted	Not permitted	10[c]	44	210
500	Not permitted	Not permitted	Not permitted	Not permitted	24	130

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

a. Developed length plus an appropriate allowance for entrance losses and friction due to fittings, changes in direction and diameter. Suggested allowances shall be obtained from NBS Monograph 31 or other approved sources. An allowance of 50 percent of the developed length shall be assumed if a more precise value is not available.
b. Actual values greater than 500 feet.
c. Less than 10 feet.

906.5.2: Pneumatic sewage ejectors.

The air pressure relief pipe from a pneumatic sewage ejector shall be connected to an independent vent stack terminating as required for vent extensions through the roof. The relief pipe shall be sized

to relieve air pressure inside the ejector to atmospheric pressure, but shall be not less than 1 1/4 inches (32 mm) in size.

Section 907: Vents for Stack Offsets

907.1: Vent for horizontal offset of drainage stack.

Horizontal offsets of drainage stacks shall be vented where five or more branch intervals are located above the offset. The offset shall be vented by venting the upper section of the drainage stack and the lower section of the drainage stack.

907.2: Upper section.

The upper section of the drainage stack shall be vented as a separate stack with a vent stack connection installed in accordance with Section 904.4. The offset shall be considered to be the base of the stack.

907.3: Lower section.

The lower section of the drainage stack shall be vented by a yoke vent connecting between the offset and the next lower horizontal branch. The yoke vent connection shall be permitted to be a vertical extension of the drainage stack. The size of the yoke vent and connection shall be not less than the size required for the vent stack of the drainage stack.

Section 908: Relief Vents - Stacks of More than 10 Branch Intervals

908.1: Where required.

Soil and waste stacks in buildings having more than 10 branch intervals shall be provided with a relief vent at each tenth interval installed, beginning with the top floor.

908.2: Size and connection.

The size of the relief vent shall be equal to the size of the vent stack to which it connects. The lower end of each relief vent shall connect to the soil or waste stack through a wye below the horizontal branch serving the floor, and the upper end shall connect to the vent stack through a wye not less than 3 feet (914 mm) above the floor.

Section 909: Fixture Vents

909.1: Distance of trap from vent.

Each fixture trap shall have a protecting vent located so that the slope and the developed length in the fixture drain from the trap weir to the vent fitting are within the requirements set forth in Table 909.1.

Exception: The developed length of the fixture drain from the trap weir to the vent fitting for self-siphoning fixtures, such as water closets, shall not be limited.

TABLE 909.1 MAXIMUM DISTANCE OF FIXTURE TRAP FROM VENT

SIZE OF TRAP (inches)	SLOPE (inch per foot)	DISTANCE FROM TRAP (feet)
1 1/4	1/4	5
1 1/2	1/4	6
2	1/4	8
3	1/8	12
4	1/8	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 inch per foot = 83.3 mm/m.

909.2: Venting of fixture drains.

The total fall in a fixture drain due to pipe slope shall not exceed the diameter of the fixture drain, nor shall the vent connection to a fixture drain, except for water closets, be below the weir of the trap.

909.3: Crown vent.

A vent shall not be installed within two pipe diameters of the trap weir.

Section 910: Individual Vent

910.1: Individual vent permitted.

Each trap and trapped fixture is permitted to be provided with an individual vent. The individual vent shall connect to the fixture drain of the trap or trapped fixture being vented.

Section 911: Common Vent

911.1: Individual vent as common vent.

An individual vent is permitted to vent two traps or trapped fixtures as a common vent. The traps or trapped fixtures being common vented shall be located on the same floor level.

911.2: Connection at the same level.

Where the fixture drains being common vented connect at the same level, the vent connection shall be at the interconnection of the fixture drains or downstream of the interconnection.

911.3: Connection at different levels.

Where the fixture drains connect at different levels, the vent shall connect as a vertical extension of the vertical drain. The vertical drain pipe connecting the two fixture drains shall be considered to be

the vent for the lower fixture drain, and shall be sized in accordance with Table 911.3. The upper fixture shall not be a water closet.

TABLE 911.3 COMMON VENT SIZES

PIPE SIZE (inches)	MAXIMUM DISCHARGE FROM UPPER FIXTURE DRAIN (dfu)
1 1/2	1
2	4
2 1/2 to 3	6

For SI: 1 inch = 25.4 mm.

Section 912: Wet Venting

912.1: Horizontal wet vent permitted.

Any combination of fixtures within two bathroom groups located on the same floor level is permitted to be vented by a horizontal wet vent. The wet vent shall be considered to be the vent for the fixtures and shall extend from the connection of the dry vent along the direction of the flow in the drain pipe to the most downstream fixture drain connection to the horizontal branch drain. Each wet-vented fixture drain shall connect independently to the horizontal wet vent. Only the fixtures within the bathroom groups shall connect to the wet-vented horizontal branch drain. Any additional fixtures shall discharge downstream of the horizontal wet vent.

912.1.1: Vertical wet vent permitted.

Any combination of fixtures within two bathroom groups located on the same floor level is permitted to be vented by a vertical wet vent. The vertical wet vent shall be considered to be the vent for the fixtures and shall extend from the connection of the dry vent down to the lowest fixture drain connection. Each wet-vented fixture shall connect independently to the vertical wet vent. Water closet drains shall connect at the same elevation. Other fixture drains shall connect above or at the same elevation as the water closet fixture drains. The dry-vent connection to the vertical wet vent shall be an individual or common vent serving one or two fixtures.

912.2: Dry vent connection.

The required dry-vent connection for wet-vented systems shall comply with Sections 912.2.1 and 912.2.2.

912.2.1: Horizontal wet vent.

The dry-vent connection for a horizontal wet-vent system shall be an individual vent or a common vent for any bathroom group fixture, except an emergency floor drain. Where the dry-vent connects to a water closet fixture drain, the drain shall connect horizontally to the horizontal wet-vent system. Not more than one wet-vented fixture drain shall discharge upstream of the dry-vented fixture drain connection.

912.2.2: Vertical wet vent.

The dry-vent connection for a vertical wet-vent system shall be an individual vent or common vent for the most upstream fixture drain.

912.3: Size.

The dry vent serving the wet vent shall be sized based on the largest required diameter of pipe within the wet-vent system served by the dry vent. The wet vent shall be of a size not less than that specified in Table 912.3, based on the fixture unit discharge to the wet vent.

TABLE 912.3 WET VENT SIZE

WET VENT PIPE SIZE (inches)	DRAINAGE FIXTURE UNIT LOAD (dfu)
1 1/2	1
2	4
2 1/2	6
3	12

For SI: 1 inch = 25.4 mm.

Section 913: Waste Stack Vent

913.1: Waste stack vent permitted.

A waste stack shall be considered to be a vent for all of the fixtures discharging to the stack where installed in accordance with the requirements of this section.

913.2: Stack installation.

The waste stack shall be vertical, and both horizontal and vertical offsets shall be prohibited between the lowest fixture drain connection and the highest fixture drain connection. Fixture drains shall connect separately to the waste stack. The stack shall not receive the discharge of water closets or urinals.

913.3: Stack vent.

A stack vent shall be provided for the waste stack. The size of the stack vent shall be not less than the size of the waste stack. Offsets shall be permitted in the stack vent, shall be located not less than 6 inches (152 mm) above the flood level of the highest fixture and shall be in accordance with Section 905.2. The stack vent shall be permitted to connect with other stack vents and vent stacks in accordance with Section 904.5.

913.4: Waste stack size.

The waste stack shall be sized based on the total discharge to the stack and the discharge within a branch interval in accordance with Table 913.4. The waste stack shall be the same size throughout its length.

TABLE 913.4 WASTE STACK VENT SIZE

STACK SIZE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (dfu)	
	Total discharge into one branch interval	Total discharge for stack
1 1/2	1	2
2	2	4
2 1/2	No limit	8
3	No limit	24
4	No limit	50
5	No limit	75
6	No limit	100

For SI: 1 inch = 25.4 mm.

Section 914: Circuit Venting

The 2026 Georgia Amendments say:
The circuit vent may receive waste discharge from fixtures located within the same branch interval, provided that the wet portion remains the same size as the horizontal branch.

914.1: Circuit vent permitted.

Not more than 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.

914.1.1: Multiple circuit-vented branches.

Circuit-vented horizontal branch drains are permitted to be connected together. Each group of not more than eight fixtures shall be considered to be a separate circuit vent and shall conform to the requirements of this section.

914.2: Vent connection.

The circuit vent connection shall be located between the two most upstream fixture drains. The vent shall connect to the horizontal branch and shall be installed in accordance with Section 905. ~~The circuit vent pipe shall not receive the discharge of any soil or waste.~~

914.3: Slope and size of horizontal branch.

The slope of the vent section of the horizontal branch drain shall be not greater than one unit vertical in 12 units horizontal (8.3 percent slope). The entire length of the vent section of the horizontal branch drain shall be sized for the total drainage discharge to the branch.

914.3.1: Size of multiple circuit vent.

Each separate circuit-vented horizontal branch that is interconnected shall be sized independently in accordance with Section 914.3. The downstream circuit-vented horizontal branch shall be sized for the total discharge into the branch, including the upstream branches and the fixtures within the branch.

914.4: Relief vent.

A relief vent shall be provided for circuit-vented horizontal branches receiving the discharge of four or more water closets and connecting to a drainage stack that receives the discharge of soil or waste from upper horizontal branches.

914.4.1: Connection and installation.

The relief vent shall connect to the horizontal branch drain between the stack and the most downstream fixture drain of the circuit vent. The relief vent shall be installed in accordance with Section 905.

914.4.2: Fixture drain or branch.

The relief vent is permitted to be a fixture drain or fixture branch for fixtures located within the same branch interval as the circuit-vented horizontal branch. The maximum discharge to a relief vent shall be four fixture units.

914.5: Additional fixtures.

Fixtures, other than the circuit-vented fixtures, are permitted to discharge to the horizontal branch drain. Such fixtures shall be located on the same floor as the circuit-vented fixtures and shall be either individually or common vented.

Section 915: Combination Waste and Vent System

915.1: Type of fixtures.

A combination waste and vent system shall not serve fixtures other than floor drains, sinks, lavatories and drinking fountains. Combination waste and vent systems shall not receive the discharge from a clinical sink.

915.2: Installation.

The only vertical pipe of a combination waste and vent system shall be the connection between the fixture drain and the horizontal combination waste and vent pipe. The vertical distance shall not exceed 8 feet (2438 mm).

915.2.1: Slope.

The slope of a horizontal combination waste and vent pipe shall not exceed one-half unit vertical in 12 units horizontal (4 percent slope) and shall be not less than that indicated in Table 704.1.

915.2.2: Size and length.

The size of a combination waste and vent pipe shall be not less than that indicated in Table 915.2.2. The horizontal length of a combination waste and vent system shall be unlimited.

TABLE 915.2.2 SIZE OF COMBINATION WASTE AND VENT PIPE

DIAMETER PIPE (inches)	MAXIMUM NUMBER OF DRAINAGE FIXTURE UNITS (dfu)	
	Connecting to a horizontal branch or stack	Connecting to a building drain or building subdrain
2	3	4
2 1/2	6	26
3	12	31
4	20	50
5	160	250
6	360	575

For SI: 1 inch = 25.4 mm.

915.2.3: Connection.

The combination waste and vent system shall be provided with a dry vent connected at any point within the system or the system shall connect to a horizontal drain that serves vented fixtures located on the same floor. Combination waste and vent systems connecting to building drains receiving only the discharge from one or more stacks shall be provided with a dry vent. The vent connection to the combination waste and vent pipe shall extend vertically to a point not less than 6 inches (152 mm) above the flood level rim of the highest fixture being vented before offsetting horizontally.

915.2.4: Vent size.

The vent shall be sized for the total drainage fixture unit load in accordance with Section 906.2.

915.2.5: Fixture branch or drain.

The fixture branch or fixture drain shall connect to the combination waste and vent within a distance specified in Table 909.1. The combination waste and vent pipe shall be considered to be the vent for the fixture.

Section 916: Island Fixture Venting

916.1: Limitation.

Island fixture venting shall not be permitted for fixtures other than sinks and lavatories. Residential kitchen sinks with a dishwasher waste connection, a food waste disposer, or both, in combination with the kitchen sink waste, shall be permitted to be vented in accordance with this section.

916.2: Vent connection.

The island fixture vent shall connect to the fixture drain as required for an individual or common vent. The vent shall rise vertically to above the drainage outlet of the fixture being vented before offsetting horizontally or vertically downward. The vent or branch vent for multiple island fixture vents shall extend to a point not less than 6 inches (152 mm) above the highest island fixture being vented before connecting to the outside vent terminal.

916.3: Vent installation below the fixture flood level rim.

The vent located below the flood level rim of the fixture being vented shall be installed as required for drainage piping in accordance with Chapter 7, except for sizing. The vent shall be sized in accordance with Section 906.2. The lowest point of the island fixture vent shall connect full size to the drainage system. The connection shall be to a vertical drain pipe or to the top half of a horizontal drain pipe. Cleanouts shall be provided in the island fixture vent to permit rodding of all vent piping located below the flood level rim of the fixtures. Rodding in both directions shall be permitted through a cleanout.

Section 917: Single-Stack Vent System

917.1: Single-stack vent system permitted.

A drainage stack shall serve as a single-stack vent system where sized and installed in accordance with Sections 917.2 through 917.9. The drainage stack and branch piping shall be the vents for the drainage system. The drainage stack shall have a stack vent.

917.2: Stack size.

Drainage stacks shall be sized in accordance with Table 917.2. Stacks shall be uniformly sized based on the total connected drainage fixture unit load. The stack vent shall be the same size as the drainage stack. A 3-inch (76 mm) stack shall serve not more than two water closets.

TABLE 917.2 SINGLE STACK SIZE

STACK SIZE (inches)	MAXIMUM CONNECTED DRAINAGE FIXTURE UNITS		
	Stacks less than 75 feet in height	Stacks 75 feet to less than 160 feet in height	Stacks 160 feet and greater in height
3	24	NP	NP
4	225	24	NP
5	480	225	24
6	1,015	480	225
8	2,320	1,015	480
10	4,500	2,320	1,015
12	8,100	4,500	2,320
15	13,600	8,100	4,500

NP = Not permitted.

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

917.3: Branch size.

Horizontal branches connecting to a single-stack vent system shall be sized in accordance with Table 710.1(2). Not more than one water closet shall discharge into a 3-inch (76 mm) horizontal branch at a point within a developed length of 18 inches (457 mm) measured horizontally from the stack.

Where a water closet is within 18 inches (457 mm) measured horizontally from the stack and not more than one fixture with a drain size of not more than 1 1/2 inches (38 mm) connects to a 3-inch (76 mm) horizontal branch, the branch drain connection to the stack shall be made with a sanitary tee.

917.4: Length of horizontal branches.

The length of horizontal branches shall conform to the requirements of Sections 917.4.1 through 917.4.3.

917.4.1: Water closet connection.

Water closet connections shall be not greater than 4 feet (1219 mm) in developed length measured horizontally from the stack.

> **Exception:** Where the connection is made with a sanitary tee, the maximum developed length shall be 8 feet (2438 mm).

91**7.4.2: Fixture connections.**

Fixtures other than water closets shall be located not greater than 12 feet (3657 mm) in developed length, measured horizontally from the stack.

917.4.3: Vertical piping in branch.

The length of vertical piping in a fixture drain connecting to a horizontal branch shall not be considered in computing the fixture's distance in developed length measured horizontally from the stack.

917.5: Minimum vertical piping size from fixture.

The vertical portion of piping in a fixture drain to a horizontal branch shall be 2 inches (51 mm). The minimum size of the vertical portion of piping for a water-supplied urinal or standpipe shall be 3 inches (76 mm). The maximum vertical drop shall be 4 feet (1219 mm). Fixture drains that are not increased in size, or have a vertical drop in excess of 4 feet (1219 mm), shall be individually vented.

917.6: Additional venting required.

Additional venting shall be provided where more than one water closet discharges to a horizontal branch and where the distance from a fixture trap to the stack exceeds the limits in Section 917.4. Where additional venting is required, the fixture(s) shall be vented by individual vents, common vents, wet vents, circuit vents, or a combination waste and vent pipe. The dry vent extensions for the additional venting shall connect to a branch vent, vent stack, stack vent, air admittance valve, or shall terminate outdoors.

917.7: Stack offsets.

Where fixture drains are not connected below a horizontal offset in a stack, a horizontal offset shall not be required to be vented. Where horizontal branches or fixture drains are connected below a horizontal offset in a stack, the offset shall be vented in accordance with Section 907. Fixture connections shall not be made to a stack within 2 feet (610 mm) above or below a horizontal offset.

917.8: Prohibited lower connections.

Stacks greater than 2 branch intervals in height shall not receive the discharge of horizontal branches on the lower two floors. There shall not be connections to the stack between the lower two floors and a distance of not less than 10 pipe diameters downstream from the base of the single stack vented system.

917.9: Sizing building drains and sewers.

The building drain and building sewer receiving the discharge of a single stack vent system shall be sized in accordance with Table 710.1(1).

Section 918: Air Admittance Valves

918.1: General.

Vent systems utilizing air admittance valves shall comply with this section. Stack-type air admittance valves shall conform to ASSE 1050. Individual and branch-type air admittance valves shall conform to ASSE 1051.

918.2: Installation.

The valves shall be installed in accordance with the requirements of this section and the manufacturer's instructions. Air admittance valves shall be installed after the DWV testing required by Section 312.2 or 312.3 has been performed.

918.3: Where permitted.

Individual, branch and circuit vents shall be permitted to terminate with a connection to an individual or branch-type air admittance valve in accordance with Section 918.3.1. Stack vents and vent stacks shall be permitted to terminate to stack-type air admittance valves in accordance with Section 918.3.2.

918.3.1: Horizontal branches.

Individual and branch-type air admittance valves shall vent only fixtures that are on the same floor level and connect to a horizontal branch drain. Where the horizontal branch is located more than four branch intervals from the top of the stack, the horizontal branch shall be provided with a relief vent that shall connect to a vent stack or stack vent, or extend outdoors to the open air. The relief vent shall connect to the horizontal branch drain between the stack and the most downstream fixture drain connected to the horizontal branch drain. The relief vent shall be sized in accordance with Section 906.2 and installed in accordance with Section 905. The relief vent shall be permitted to serve as the vent for other fixtures.

918.3.2: Stack.

Stack-type air admittance valves shall be prohibited from serving as the vent terminal for vent stacks or stack vents that serve drainage stacks having more than six branch intervals.

918.4: Location.

Individual and branch-type air admittance valves shall be located not less than 4 inches (102 mm) above the horizontal branch drain or fixture drain being vented. Stack-type air admittance valves shall be located not less than 6 inches (152 mm) above the flood level rim of the highest fixture being vented. The air admittance valve shall be located within the maximum developed length permitted for the vent. The air admittance valve shall be installed not less than 6 inches (152 mm) above insulation materials.

918.5: Access and ventilation.

Access shall be provided to all air admittance valves. Such valves shall be installed in a location that allows air to enter the valve.

918.6: Size.

The air admittance valve shall be rated in accordance with the standard for the size of the vent to which the valve is connected.

918.7: Vent required.

Within each plumbing system, not less than one stack vent or vent stack shall extend outdoors to the open air.

918.8: Prohibited installations.

Air admittance valves shall not be installed in non-neutralized special waste systems as described in Chapter 8 except where such valves are in compliance with ASSE 1049, are constructed of materials approved in accordance with Section 702.5, and are tested for chemical resistance in accordance with ASTM F1412. Air admittance valves shall not be located in spaces utilized as supply or return air plenums. Air admittance valves shall not be used to vent sumps or tanks except where the vent system for the sump or tank has been designed by an engineer. Air admittance valves shall not be installed on outdoor vent terminals for the sole purpose of reducing clearances to gravity air intakes or mechanical air intakes.

Section 919: Engineered Vent Systems

919.1: General.

Engineered vent systems shall comply with this section and the design, submittal, approval, inspection and testing requirements of Section 316.

919.2: Individual branch fixture and individual fixture header vents.

The maximum developed length of individual fixture vents to vent branches and vent headers shall be determined in accordance with Table 919.2 for the minimum pipe diameters at the indicated vent airflow rates.

The individual vent airflow rate shall be determined in accordance with the following:

Equation 9-1 $Q_{h,b} = N_{n,b} Q_v$

For SI: $Q_{h,b} = N_{n,b} Q_v$ (0.4719L/s)

where:

$N_{n,b}$ = Number of fixtures per header (or vent *branch*) ÷ total number of fixtures connected to vent *stack*.

$Q_{h,b}$ = Vent *branch* or vent header airflow rate (cfm).

Q_v = Total vent stack airflow rate (cfm).

Q_v (gpm) = $27.8\ r_s^{2/3} (1 - r_s)\ D^{8/3}$

Q_v (cfm) = $0.134\ Q_v$(gpm)

where:

D = Drainage *stack* diameter (inches).

Q_w = Design discharge load (gpm).

r_s = Wastewater flow area to total area.

$= \frac{Q_w}{27.8\ D^{8/3}}$

Individual vent airflow rates are obtained by equally distributing $Q_{h,b}$ into one-half the total number of fixtures on the *branch* or header for more than two fixtures; for an odd number of total fixtures, decrease by one; for one fixture, apply the full value of $Q_{h,b}$.

Individual vent *developed length* shall be increased by 20 percent of the distance from the vent stack to the fixture vent connection on the vent *branch* or header.

TABLE 919.2 MINIMUM DIAMETER AND MAXIMUM LENGTH OF INDIVIDUAL BRANCH FIXTURE VENTS AND INDIVIDUAL FIXTURE HEADER VENTS FOR SMOOTH PIPES

DIAMETER OF VENT PIPE (inches)	INDIVIDUAL VENT AIRFLOW RATE (cubic feet per minute)																			
	Maximum developed length of vent (feet)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1/2	95	25	13	8	5	4	3	2	1	1	1	1	1	1	1	1	1	1	1	1
3/4	100	88	47	30	20	15	10	9	7	6	5	4	3	3	3	2	2	2	2	1
1	—	—	100	94	65	48	37	29	24	20	17	14	12	11	9	8	7	7	6	6
1 1/4	—	—	—	—	—	—	—	100	87	73	62	53	46	40	36	32	29	26	23	21
1 1/2	—	—	—	—	—	—	—	—	—	—	—	100	96	84	75	65	60	54	49	45
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100

For SI: 1 inch = 25.4 mm, 1 cubic foot per minute = 0.4719 L/s, 1 foot = 304.8 mm.

Section 920: Computerized Vent Design

920.1: Design of vent system.

The sizing, design and layout of the vent system shall be permitted to be determined by approved computer program design methods.

920.2: System capacity.

The vent system shall be based on the air capacity requirements of the drainage system under a peak load condition.

Chapter 10: Traps, Interceptors and Separators

User notes:

About this chapter: Chapter 10 regulates the design of fixture traps, methods for preventing evaporation of trap seals in traps and the required locations for interceptors and separators. The trap seal of a trap is an essential feature of a drainage system to prevent odors from the drainage piping from entering the building. The discharge of various processes, such as cooking and laundry, creates the need for equipment to retain detrimental greases and solids from entering the drainage systems.

Section 1001: General

1001.1: Scope.

This chapter shall govern the material and installation of traps, interceptors and separators.

Section 1002: Trap Requirements

1002.1: Fixture traps.

Each plumbing fixture shall be separately trapped by a liquid-seal trap, except as otherwise permitted by this code. The vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches (610 mm), and the horizontal distance shall not exceed 30 inches (762 mm) measured from the centerline of the fixture outlet to the centerline of the inlet of the trap. The height of a clothes washer standpipe above a trap shall conform to Section 802.4.3. A fixture shall not be double trapped.

Exceptions:

1. This section shall not apply to fixtures with integral traps.
2. A combination plumbing fixture is permitted to be installed on one trap, provided that one compartment is not more than 6 inches (152 mm) deeper than the other compartment and the waste outlets are not more than 30 inches (762 mm) apart.
3. Floor drains in multilevel parking structures that discharge to a building storm sewer shall not be required to be individually trapped. Where floor drains in multilevel parking structures are required to discharge to a combined building sewer system, the floor drains shall not be required to be individually trapped provided that they are connected to a main trap in accordance with Section 1103.1.
4. Where a hydromechanical grease interceptor serves a food utensil, dishes, pots and pans sink, in accordance with the manufacturer's installation instructions. The branch drain serving the interceptor shall be provided with an emergency floor drain downstream of the

interceptor connection, and the branch shall serve only the emergency floor drain and the interceptor. Where the interceptor serves a combination sink of not more than three compartments where the vertical distance from the fixture outlet to the inlet of the interceptor does not exceed 30 inches (762 mm) and the developed length of the waste pipe from the most upstream fixture outlet to the inlet of the interceptor does not exceed 60 inches (1524 mm). The food utensil, dishes, pots and pans sink shall be required to connect directly with the interceptor.

1002.2: Design of traps.

Fixture traps shall be self-scouring. Fixture traps shall not have interior partitions, except where such traps are integral with the fixture or where such traps are constructed of an approved material that is resistant to corrosion and degradation. Slip joints shall be made with an approved elastomeric gasket and shall be installed only on the trap inlet, trap outlet and within the trap seal.

1002.3: Prohibited traps.

The following types of traps are prohibited:

1. Traps that depend on moving parts to maintain the seal.
2. Bell traps.
3. Crown-vented traps.
4. Traps not integral with a fixture and that depend on interior partitions for the seal, except those traps constructed of an approved material that is resistant to corrosion and degradation.
5. “S” traps.
6. Drum traps.

Exception: Drum traps used as solids interceptors and drum traps serving chemical waste systems shall not be prohibited.

1002.4: Trap seals.

Each fixture trap shall have a liquid seal of not less than 2 inches (51 mm) and not more than 4 inches (102 mm), or deeper for special designs relating to accessible fixtures.

1002.4.1: Trap seal protection.

Trap seals of emergency floor drain traps and trap seals subject to evaporation shall be protected by one of the methods in Sections 1002.4.1.1 through 1002.4.1.5.

1002.4.1.1: Potable water-supplied trap seal primer valve.

A potable water-supplied trap seal primer valve shall supply water to the trap. Water-supplied trap seal primer valves shall conform to ASSE 1018. The discharge pipe from the trap seal primer valve shall connect to the trap above the trap seal on the inlet side of the trap.

1002.4.1.2: Reclaimed or graywater-supplied trap seal primer valve.

A reclaimed or graywater-supplied trap seal primer valve shall supply water to the trap. Water-supplied trap seal primer valves shall conform to ASSE 1018. The quality of reclaimed or graywater supplied to trap seal primer valves shall be in accordance with the requirements of the manufacturer of the trap seal primer valve. The discharge pipe from the trap seal primer valve shall connect to the trap above the trap seal, on the inlet side of the trap.

1002.4.1.3: Wastewater-supplied trap primer device.

A wastewater-supplied trap primer device shall supply water to the trap. Wastewater-supplied trap primer devices shall conform to ASSE 1044. The discharge pipe from the trap seal primer device shall connect to the trap above the trap seal on the inlet side of the trap.

1002.4.1.4: Barrier-type trap seal protection device.

A barrier-type trap seal protection device shall protect the floor drain trap seal from evaporation. Barrier-type floor drain trap seal protection devices shall conform to ASSE 1072. The devices shall be installed in accordance with the manufacturer's instructions.

1002.4.1.5: Fixture drain connection for trap priming.

A fixture drain from a lavatory or hand sink shall serve as a method of providing trap seal protection for an emergency floor drain, a trench drain, or a floor sink where such fixtures are located in the same room. A fixture drain from a drinking fountain shall serve as a method of providing trap seal protection for an emergency floor drain, a trench drain, or a floor sink where such fixtures are in the same room or in a room adjacent to the room having the drinking fountain. The fixture drain shall not be routed on or above the surface of the floor and shall connect to the floor drain, trench drain, or floor sink at a point that is below the flood level rim and above the inlet to the trap of the receiving fixture.

1002.5: Size of fixture traps.

Fixture trap size shall be sufficient to drain the fixture rapidly and not less than the size indicated in Table 709.1. A trap shall not be larger than the drainage pipe into which the trap discharges.

1002.6: Building traps.

Building (house) traps shall be prohibited.

1002.7: Trap setting and protection.

Traps shall be set level with respect to the trap seal and, where necessary, shall be protected from freezing.

1002.8: Recess for trap connection.

A recess provided for connection of the underground trap, such as one serving a bathtub in slab-type construction, shall have sides and a bottom of corrosion-resistant, insect- and verminproof construction.

1002.9: Acid-resisting traps.

Where a vitrified clay or other brittleware, acid-resisting trap is installed underground, such trap shall be embedded in concrete extending 6 inches (152 mm) beyond the bottom and sides of the trap.

1002.10: Plumbing in mental health centers.

In mental health centers, pipes and traps shall not be exposed.

Section 1003: Interceptors and Separators

1003.1: Where required.

Interceptors and separators shall be provided to prevent the discharge of oil, grease, sand and other substances harmful or hazardous to the public sewer, the private sewage system or the sewage treatment plant or processes.

1003.2: Approval.

The size, type and location of each interceptor and of each separator shall be designed and installed in accordance with the manufacturer's instructions and the requirements of this section based on the anticipated conditions of use. Wastes that do not require treatment or separation shall not be discharged into any interceptor or separator.

1003.3: Grease interceptors.

Grease interceptors shall comply with the requirements of Sections 1003.3.1 through 1003.3.8.

1003.3.1: Grease interceptors and automatic grease removal devices required.

A grease interceptor or automatic grease removal device shall be required to receive the drainage from fixtures and equipment with grease-laden waste located in food preparation areas, such as in restaurants, hotel kitchens, hospitals, school kitchens, bars, factory cafeterias and clubs. Fixtures and equipment shall include pot sinks, prerinse sinks; soup kettles or similar devices; wok stations; floor drains or sinks into which kettles are drained; automatic hood wash units and dishwashers without prerinse sinks. Grease interceptors and automatic grease removal devices shall receive waste only from fixtures and equipment that allow fats, oils or grease to be discharged. Where lack of space or other constraints prevent the installation or replacement of a grease interceptor, one or more grease interceptors shall be permitted to be installed on or above the floor and upstream of an existing grease interceptor.

1003.3.2: Food waste disposers restriction.

A food waste disposer shall not discharge to a grease interceptor.

1003.3.3: Additives to grease interceptors.

Dispensing systems that dispense interceptor performance additives to grease interceptors shall not be installed except where such systems dispense microbes for the enhancement of aerobic bioremediation of grease and other organic material, or for inhibiting growth of pathogenic organisms by anaerobic methods. Such microbial dispensing systems shall be installed only where the grease interceptor manufacturer's instructions allow such systems and the systems conform to ASME A112.14.6. Systems that discharge emulsifiers, chemicals or enzymes to grease interceptors shall be prohibited.

1003.3.4: Grease interceptors and automatic grease removal devices not required.

A grease interceptor or an automatic grease removal device shall not be required for individual dwelling units or any private living quarters.

1003.3.5: Hydromechanical grease interceptors, fats, oils and greases disposal systems and automatic grease removal devices.

Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be sized in accordance with ASME A112.14.3, ASME A112.14.4, ASME A112.14.6, CSA B481.3 or PDI G101. Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be designed and tested in accordance with ASME A112.14.3, ASME A112.14.4, CSA B481.1, PDI G101 or PDI G102. Hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be installed in accordance with the manufacturer's instructions. Where manufacturer's instructions are not provided, hydromechanical grease interceptors; fats, oils, and greases disposal systems and automatic grease removal devices shall be installed in compliance with ASME A112.14.3, ASME A112.14.4, ASME A112.14.6, CSA B481.3 or PDI G101.

1003.3.5.1: Grease interceptor capacity.

Grease interceptors shall have the grease retention capacity indicated in Table 1003.3.5.1 for the flow-through rates indicated.

TABLE 1003.3.5.1 CAPACITY OF GREASE INTERCEPTORS(a)

TOTAL FLOW-THROUGH RATING (gpm)	GREASE RETENTION CAPACITY (pounds)
4	8
6	12
7	14
9	18
10	20
12	24
14	28
15	30
18	36
20	40
25	50
35	70
50	100
75	150
100	200

For SI: 1 gallon per minute = 3.785 L/m, 1 pound = 0.454 kg.

a. For total flow-through ratings greater than 100 (gpm), double the flow-through rating to determine the grease retention capacity (pounds).

1003.3.5.2: Rate of flow controls.

Grease interceptors shall be equipped with devices to control the rate of water flow so that the water flow does not exceed the rated flow. The flow-control device shall be vented and terminate not less than 6 inches (152 mm) above the flood rim level or be installed in accordance with the manufacturer's instructions.

1003.3.6: Automatic grease removal devices.

Where automatic grease removal devices are installed, such devices shall be located downstream of each fixture or multiple fixtures in accordance with the manufacturer's instructions. The automatic grease removal device shall be sized to pretreat the measured or calculated flows for all connected fixtures or equipment. Ready access shall be provided for inspection and maintenance.

1003.3.7: Gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems.

The required capacity of gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be determined by multiplying the peak drain flow into the interceptor in gallons per minute by a retention time of 30 minutes. Gravity grease interceptors shall be designed and tested in accordance with IAPMO/ANSI Z1001. Gravity grease interceptors with fats, oils, and greases disposal systems shall be designed and tested in accordance with ASME A112.14.6 and IAPMO/ANSI Z1001. Gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be installed in accordance with manufacturer's instructions. Where manufacturer's instructions are not provided, gravity grease interceptors and gravity grease interceptors with fats, oils, and greases disposal systems shall be installed in compliance with ASME A112.14.6 and IAPMO/ANSI Z1001.

1003.3.8: Direct connection.

The discharge piping from a grease interceptor shall be directly connected to the sanitary drainage system.

1003.4: Oil separators required.

At repair garages where floor or trench drains are provided, car washing facilities, factories where oily and flammable liquid wastes are produced and hydraulic elevator pits, oil separators shall be installed into which oil-bearing, grease-bearing or flammable wastes shall be discharged before emptying into the building drainage system or other point of disposal.

> **Exception:** An oil separator is not required in hydraulic elevator pits where an approved alarm system is installed. Such alarm systems shall not terminate the operation of pumps utilized to maintain emergency operation of the elevator by firefighters.

1003.4.1: Separation of liquids.

A mixture of treated or untreated light and heavy liquids with various specific gravities shall be separated in an approved receptacle.

1003.4.2: Oil separator design.

Oil separators shall be listed and labeled, or designed in accordance with Sections 1003.4.2.1 and 1003.4.2.2.

1003.4.2.1: General design requirements.

Oil separators shall have a depth of not less than 2 feet (610 mm) below the invert of the discharge drain. The outlet opening of the separator shall have not less than an 18-inch (457 mm) water seal.

1003.4.2.2: Garages and service stations.

Where automobiles are serviced, greased, repaired or washed or where gasoline is dispensed, oil separators shall have a capacity of not less than 6 cubic feet (0.168 m3) for the first 100 square feet (9.3 m2) of area to be drained, plus 1 cubic foot (0.028 m3) for each additional 100 square feet (9.3 m2) of area to be drained into the separator. Parking garages in which servicing, repairing or washing is not conducted, and in which gasoline is not dispensed, shall not require a separator. Areas of commercial garages utilized only for storage of automobiles are not required to be drained through a separator.

1003.5: Sand interceptors in commercial establishments.

Sand and similar interceptors for heavy solids shall be designed and located so as to be provided with ready access for cleaning, and shall have a water seal of not less than 6 inches (152 mm).

1003.6: Clothes washer discharge interceptor.

Clothes washers shall discharge through an interceptor that is provided with a wire basket or similar device, removable for cleaning, that prevents passage into the drainage system of solids 1/2 inch (12.7 mm) or larger in size, string, rags, buttons or other materials detrimental to the public sewage system.

Exceptions:

1. Clothes washers in individual dwelling units shall not be required to discharge through an interceptor.
2. A single clothes washer designed for use in individual dwelling units and installed in a location other than an individual dwelling unit shall not be required to discharge through an interceptor.

1003.7: Bottling establishments.

Bottling plants shall discharge process wastes into an interceptor that will provide for the separation of broken glass or other solids before discharging waste into the drainage system.

1003.8: Slaughterhouses.

Slaughtering room and dressing room drains shall be equipped with approved separators. The separator shall prevent the discharge into the drainage system of feathers, entrails and other materials that cause clogging.

1003.9: Venting of interceptors and separators.

Interceptors and separators shall be designed so as not to become air bound. Interceptors and separators shall be vented in accordance with one of the methods in Chapter 9.

1003.10: Access and maintenance of interceptors and separators.

Access shall be provided to each interceptor and separator for service and maintenance. Interceptors and separators shall be maintained by periodic removal of accumulated grease, scum, oil, or other floating substances and solids deposited in the interceptor or separator.

Section 1004: Materials, Joints and Connections

1004.1: General.

The materials and methods utilized for the construction and installation of traps, interceptors and separators shall comply with this chapter and the applicable provisions of Chapters 4 and 7. The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow of the piping.

Chapter 11: Storm Drainage

User notes:

About this chapter: Rainfall onto buildings must be removed and directed to a location that can accommodate storm water. Chapter 11 specifies the design rainfall event for the geographic area and provides sizing methods for piping and gutter systems to convey the storm water away from the building. Included in this chapter are regulations for piping materials and subsoil drainage systems. Section 1101 General CDP 1101.1 Scope. CDP The provisions of this chapter shall govern the materials, design, construction and installation of storm drainage.

1101.2: Disposal.

Rainwater from roofs and storm water from paved areas, yards, courts and courtyards shall drain to an approved place of disposal. For one- and two-family dwellings, and where approved, storm water is permitted to discharge onto flat areas, such as streets or lawns, provided that the storm water flows away from the building.

1101.3: Prohibited drainage.

Storm water shall not be drained into sewers intended for sewage only.

1101.4: Tests.

The conductors and the building storm drain shall be tested in accordance with Section 312.

1101.5: Change in size.

The size of a drainage pipe shall not be reduced in the direction of flow.

1101.6: Fittings and connections.

Connections and changes in direction of the storm drainage system shall be made with approved drainage-type fittings in accordance with Table 706.3. The fittings shall not obstruct or retard flow in the system.

[BS] 1101.7: Roof design.

Roofs shall be designed for the maximum possible depth of water that will pond thereon as determined by the relative levels of roof deck and overflow weirs, scuppers, edges or serviceable drains in combination with the deflected structural elements. In determining the maximum possible depth of water, all primary roof drainage means shall be assumed to be blocked. The maximum possible depth of water on the roof shall include the height of the water required above the inlet of the secondary roof drainage means to achieve the required flow rate of the secondary drainage means to accommodate the design rainfall rate as required by Section 1106.

1101.8: Cleanouts required.

Cleanouts shall be installed in the storm drainage system and shall comply with the provisions of this code for sanitary drainage pipe cleanouts.

Exception: Subsurface drainage system.

1101.9: Backwater valves.

Storm drainage systems shall be provided with backwater valves as required for sanitary drainage systems in accordance with Section 714.

Section 1102: Materials

1102.1: General.

The materials and methods utilized for the construction and installation of storm drainage systems shall comply with this section and the applicable provisions of Chapter 7.

1102.2: Inside storm drainage conductors.

Inside storm drainage conductors installed above ground shall conform to one of the standards listed in Table 702.1.

1102.3: Underground building storm drain pipe.

Underground building storm drain pipe shall conform to one of the standards listed in Table 702.2.

1102.4: Building storm sewer pipe.

Building storm sewer pipe shall conform to one of the standards listed in Table 1102.4.

TABLE 1102.4 BUILDING STORM SEWER PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2661; ASTM F628; ASTM F1488; CSA B181.1; CSA B182.1
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Concrete pipe	ASTM C14; ASTM C76; CSA A257.1; CSA A257.2
Copper or copper-alloy tubing (Type K, L, M or DWV)	ASTM B75; ASTM B88; ASTM B251; ASTM B306
Polyethylene (PE) plastic pipe	ASTM F667; ASTM F2306/F2306M; ASTM F2648/F2648M; ASTM F2763; ASTM F2947/F2947M; CSA B182.8
Polypropylene (PP) pipe	ASTM F2764; ASTM F2881; CSA B182.13
Polyvinyl chloride (PVC) plastic pipe (Type DWV, SDR26, SDR35, SDR41, PS50 or PS100) in IPS diameters, including Schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D2665; ASTM D3034; ASTM F891; ASTM F1488; CSA B181.2; CSA B182.2; CSA B182.4
Stainless steel drainage systems, Type 316L	ASME A112.3.1
Vitrified clay pipe	ASTM C4; ASTM C700

1102.5: Subsoil drain pipe.

Subsoil drains shall be open-jointed, horizontally split or perforated pipe conforming to one of the standards listed in Table 1102.5.

TABLE 1102.5 SUBSOIL DRAIN PIPE

MATERIAL	STANDARD
Cast-iron pipe	ASTM A74; ASTM A888; CISPI 301
Polyethylene (PE) plastic pipe	ASTM F667; CSA B182.1; CSA B182.6; CSA B182.8
Polyvinyl chloride (PVC) plastic pipe (type sewer pipe, SDR35, PS25, PS50 or PS100)	ASTM D2729; ASTM D3034; ASTM F891; CSA B182.2; CSA B182.4
Stainless steel drainage systems, Type 316L	ASME A112.3.1
Vitrified clay pipe	ASTM C4; ASTM C700

1102.6: Roof drains.

Roof drains shall conform to ASME A112.3.1 or ASME A112.6.4. Roof drains, other than siphonic roof drains, shall be tested and rated in accordance with ASME A112.6.4 or ASPE/IAPMO Z1034.

1102.7: Fittings.

Pipe fittings shall be approved for installation with the piping material installed, and shall conform to the respective pipe standards or one of the standards listed in Table 1102.7. The fittings shall not have ledges, shoulders or reductions capable of retarding or obstructing flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type.

TABLE 1102.7 PIPE FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic	ASTM D2661; ASTM D3311; CSA B181.1
Cast iron	ASME B16.4; ASME B16.12; ASTM A74; ASTM A888; CISPI 301
Coextruded composite ABS and drain DR-PS in PS35, PS50, PS100, PS140, PS200	ASTM D2751
Coextruded composite ABS DWV Schedule 40 IPS pipe (solid or cellular core)	ASTM D2661; ASTM D3311; ASTM F628
Coextruded composite PVC DWV Schedule 40 IPS-DR, PS140, PS200 (solid or cellular core)	ASTM D2665; ASTM D3311; ASTM F891
Coextruded composite PVC sewer and drain DR-PS in PS35, PS50, PS100, PS140, PS200	ASTM D3034
Copper or copper alloy	ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29
Gray iron and ductile iron	AWWA C110/A21.10
Malleable iron	ASME B16.3
Plastic, general	ASTM F409
Polyethylene (PE) plastic pipe	ASTM F667/F667M; ASTM F2306/F2306M; ASTM F2763; ASTM F2947/F2947M
Polypropylene (PP) plastic pipe	ASTM F2764; ASTM F2881/F2881M
Polyvinyl chloride (PVC) plastic	ASTM D2665; ASTM D3311; ASTM F1866; ASTM F3202
Stainless steel drainage systems, Type 316L	ASME A112.3.1
Steel	ASME B16.9; ASME B16.11; ASME B16.28

Section 1103: Traps

1103.1: Main trap.

Leaders and storm drains connected to a combined sewer shall be trapped. Individual storm water traps shall be installed on the storm water drain branch serving each conductor, or a single trap shall be installed in the main storm drain just before its connection with the combined building sewer or the public sewer. Leaders and storm drains connected to a building storm sewer shall not be required to be trapped.

1103.2: Material.

Storm water traps shall be of the same material as the piping system to which they are attached.

1103.3: Size.

Traps for individual conductors shall be the same size as the horizontal drain to which they are connected.

1103.4: Cleanout.

A cleanout shall be installed on the building side of the trap and shall be provided with access.

Section 1104: Conductors and Connections

1104.1: Prohibited use.

Conductor pipes shall not be used as soil, waste or vent pipes, and soil, waste or vent pipes shall not be used as conductors.

1104.2: Floor drains.

Floor drains shall not be connected to a storm drain.

Section 1105: Roof Drains

1105.1: General.

Roof drains shall be installed in accordance with the manufacturer’s instructions. The inside opening for the roof drain shall not be obstructed by the roofing membrane material.

1105.2: Roof drain flow rate.

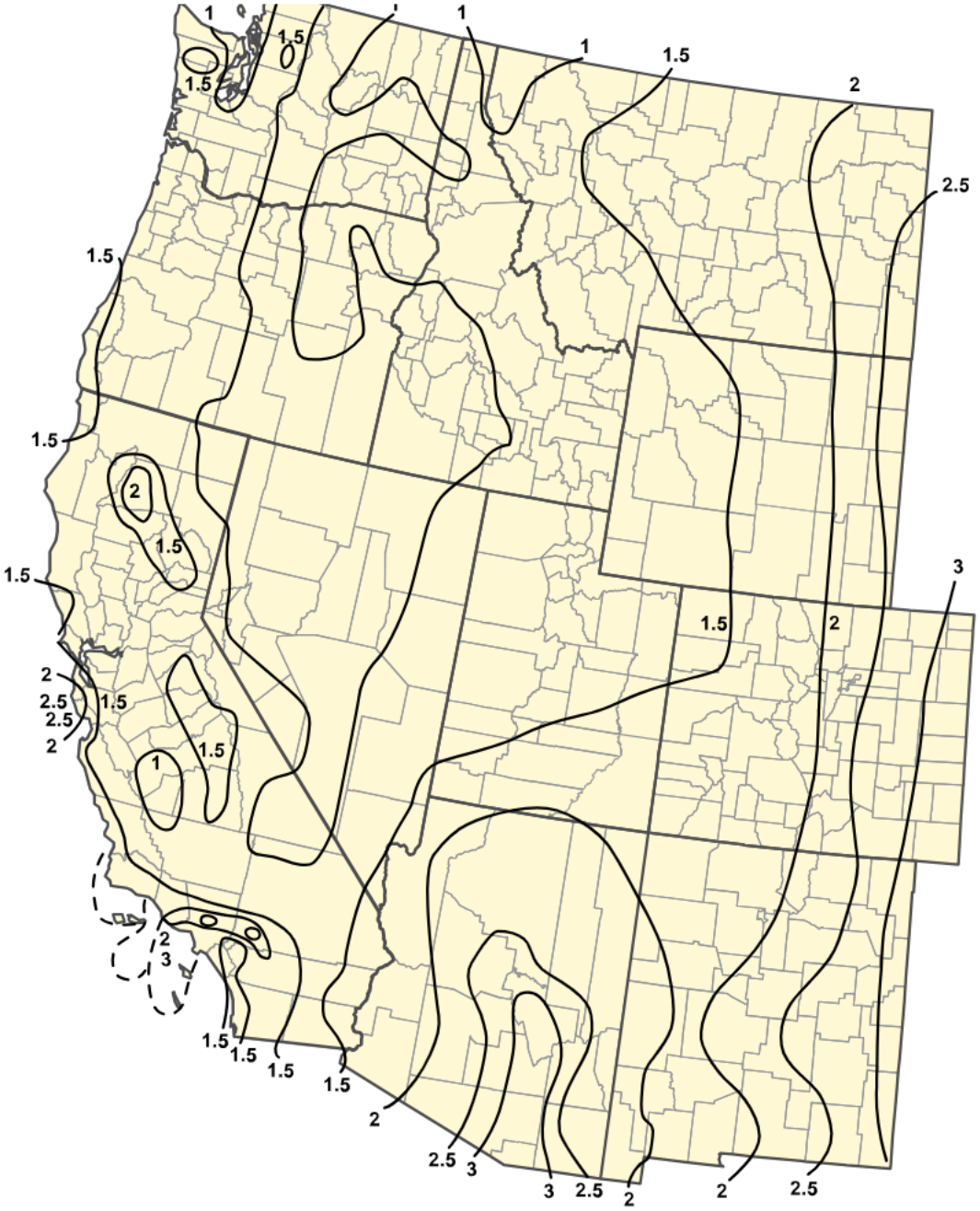
The published roof drain flow rate, based on the head of water above the roof drain, shall be used to size the storm drainage system in accordance with Section 1106. The flow rate used for sizing the storm drainage piping shall be based on the maximum anticipated ponding at the roof drain.

Section 1106: Size of Conductors, Leaders and Storm Drains

1106.1: General.

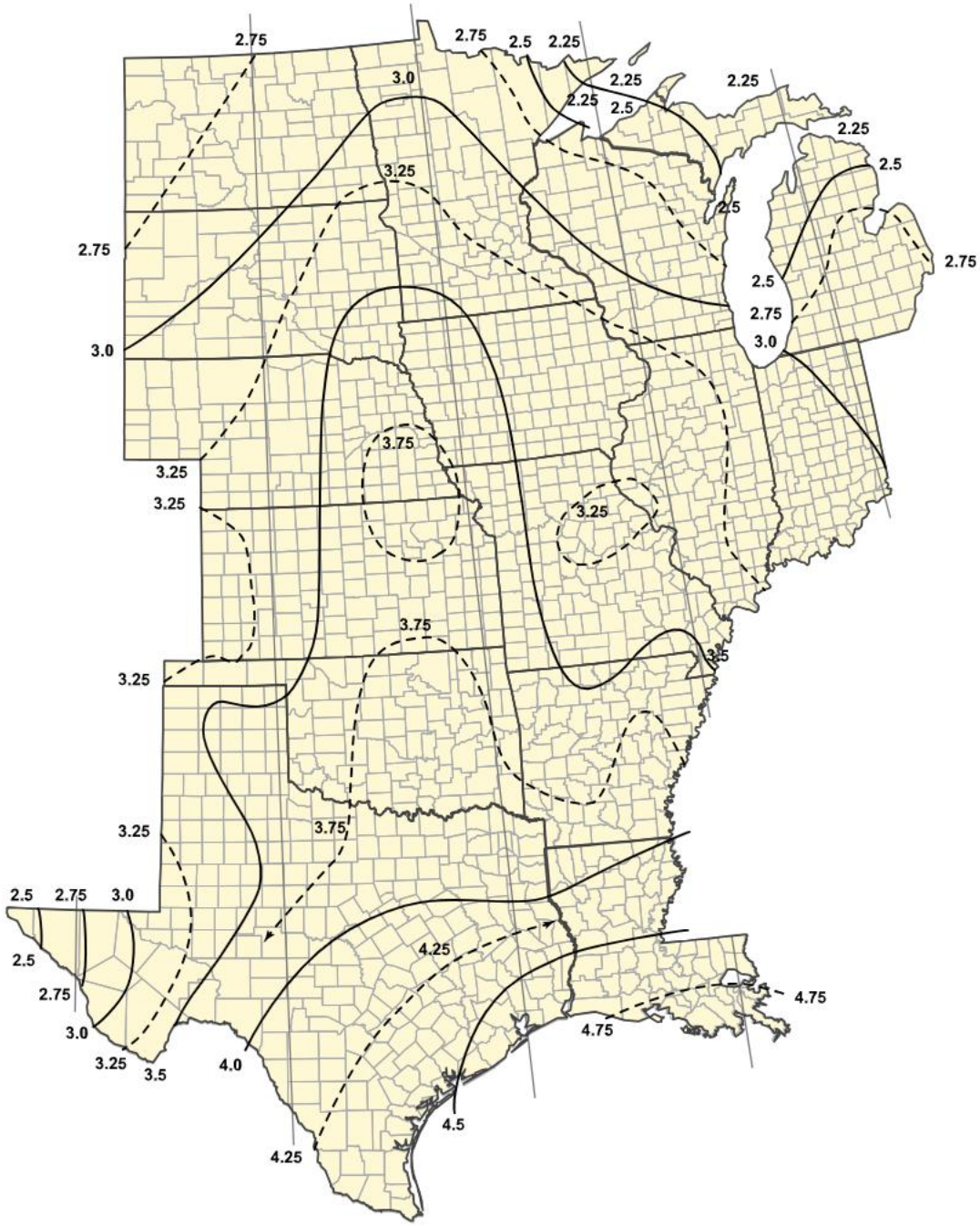
The size of the vertical conductors and leaders, building storm drains, building storm sewers and any horizontal branches of such drains or sewers shall be based on the 100-year hourly rainfall rate indicated in Figures 1106.1(1) through 1106.1(5) or on other rainfall rates determined from approved local weather data.

Figure 1106.1(1) 100-YEAR, 1-HOUR RAINFALL (INCHES) WESTERN UNITED STATES



For SI: 1 inch = 25.4 mm. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

Figure 1106.1(2) 100-YEAR, 1-HOUR RAINFALL (INCHES) CENTRAL UNITED STATES



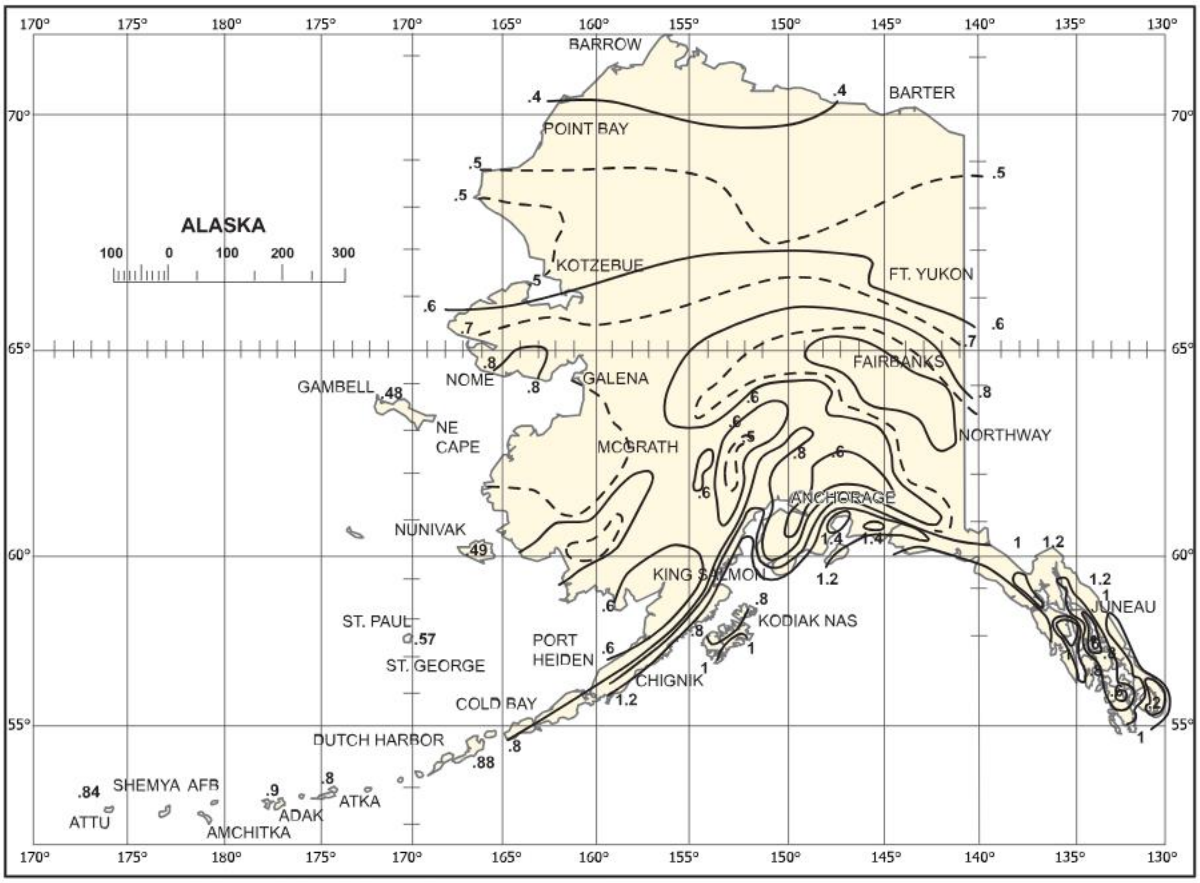
For SI: 1 inch = 25.4 mm. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

Figure 1106.1(3) 100-YEAR, 1-HOUR RAINFALL (INCHES) EASTERN UNITED STATES



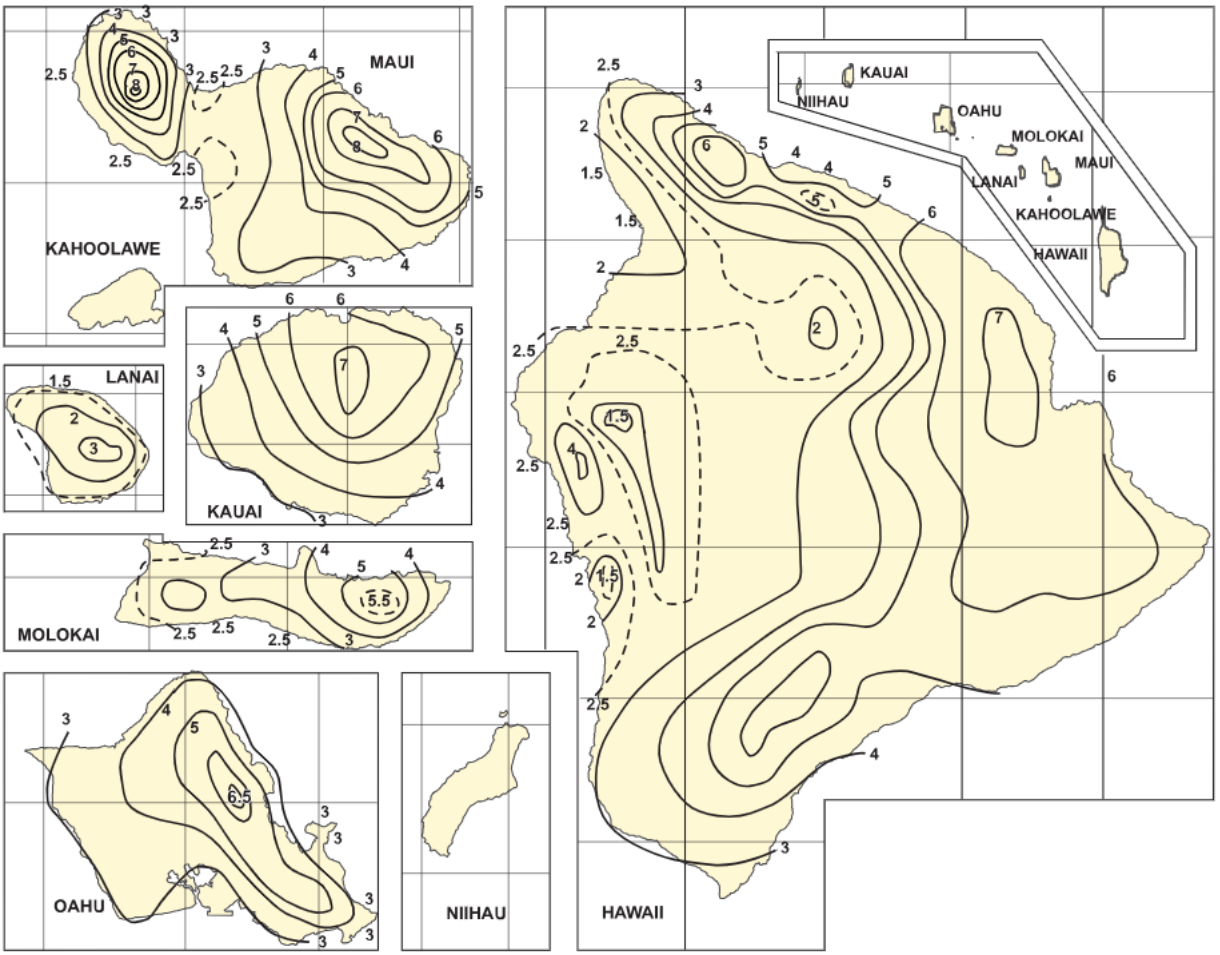
For SI: 1 inch = 25.4 mm. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

Figure 1106.1(4) 100-YEAR, 1-HOUR RAINFALL (INCHES) ALASKA



For SI: 1 inch = 25.4 mm. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

Figure 1106.1(5) 100-YEAR, 1-HOUR RAINFALL (INCHES) HAWAII



For SI: 1 inch = 25.4 mm. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

1106.2: Size of storm drain piping.

Vertical and horizontal storm drain piping shall be sized based on the flow rate through the roof drain. The flow rate, as calculated in accordance with Section 1106.2.1, shall be checked against the roof drain manufacturer's published flow rate for the specific roof drain model and size to verify that the selected roof drain will handle the anticipated flow. The flow rate in storm drain piping shall not exceed that specified in Table 1106.2.

TABLE 1106.2 STORM DRAIN PIPE SIZING

PIPE SIZE (inches)	CAPACITY (gpm)				
	VERTICAL DRAIN	SLOPE OF HORIZONTAL DRAIN			
		1/16 inch per foot	1/8 inch per foot	1/4 inch per foot	1/2 inch per foot
2	34	15	22	31	44
3	87	39	55	79	111
4	180	81	115	163	231
5	311	117	165	234	331
6	538	243	344	487	689
8	1,117	505	714	1,010	1,429
10	2,050	927	1,311	1,855	2,623
12	3,272	1,480	2,093	2,960	4,187
15	5,543	2,508	3,546	5,016	7,093

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

1106.2.1: Rainfall rate conversion method.

The rainfall rate falling on a roof surface shall be converted to a gallon per minute (L/m) flow rate in accordance with Equation 11-1.

Equation 11-1 GPM $R \times A \times 0.0104$

where:

R = Rainfall intensity in inches per hour.

A = Roof area in square feet.

1106.3: Vertical leader sizing.

Vertical leaders shall be sized based on the flow rate from horizontal gutters or the maximum flow rate through roof drains. The flow rate through vertical leaders shall not exceed that specified in Table 1106.3.

TABLE 1106.3 VERTICAL LEADER SIZING

SIZE OF LEADER (inches)	CAPACITY (gpm)
2	30
2 × 2	30
1 1/2 × 2 1/2	30
2 1/2	54
2 1/2 × 2 1/2	54
3	92
2 × 4	92
2 1/2 × 3	92
4	192
3 × 4 1/4	192
3 1/2 × 4	192
5	360
4 × 5	360
4 1/2 × 4 1/2	360
6	563
5 × 6	563
5 1/2 × 5 1/2	563
8	1208
6 × 8	1208

For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/m.

1106.4: Vertical walls.

In sizing roof drains and storm drainage piping, one-half of the area of any vertical wall that diverts rainwater to the roof shall be added to the projected roof area for inclusion in calculating the required size of vertical conductors, leaders and horizontal storm drainage piping.

1106.5: Parapet wall scuppers.

Where scuppers are used for primary roof drainage or for secondary (emergency overflow) roof drainage or both, the quantity, size, location and inlet elevation of the scuppers shall be chosen to prevent the depth of ponding water on the roof from exceeding the maximum water depth that the roof was designed for as determined by Section 1611.1 of the International Building Code. Scupper openings shall be not less than 4 inches (102 mm) in height and have a width that is equal to or greater than the circumference of a roof drain sized for the same roof area. The flow through the primary system shall not be considered when locating and sizing secondary scuppers.

1106.6: Size of roof gutters.

Horizontal gutters shall be sized based on the flow rate from the roof surface. The flow rate in horizontal gutters shall not exceed that specified in Table 1106.6.

TABLE 1106.6 HORIZONTAL GUTTER SIZING

GUTTER DIMENSIONS[a] (inches)	SLOPE (inch per foot)	CAPACITY (gpm)
1 1/2 × 2 1/2	1/4	26
1 1/2 × 2 1/2	1/2	40
4	1/8	39
2 1/4 × 3	1/4	55
2 1/4 × 3	1/2	87
5	1/8	74
4 × 2 1/2	1/4	106
3 × 3 1/2	1/2	156
6	1/8	110
3 × 5	1/4	157
3 × 5	1/2	225
8	1/16	172
8	1/8	247
4 1/2 × 6	1/4	348
4 1/2 × 6	1/2	494
10	1/16	331
10	1/8	472
5 × 8	1/4	651
4 × 10	1/2	1055

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m, 1 inch per foot = 83.3 mm/m.

a. Dimensions are width by depth for rectangular shapes. Single dimensions are diameters of a semicircle.

Section 1107: Siphonic Roof Drainage Systems

1107.1: General.

Siphonic roof drains and drainage systems shall be designed in accordance with ASME A112.6.9 and ASPE 45.

Section 1108: Secondary (Emergency) Roof Drains

1108.1: Secondary (emergency overflow) drains or scuppers.

Where roof drains are required, secondary (emergency overflow) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason. Where primary and secondary roof drains are manufactured as a single assembly, the inlet and outlet for each drain shall be independent.

1108.2: Separate systems required.

Secondary roof drain systems shall have the end point of discharge separate from the primary system. Discharge shall be above grade, in a location that would normally be observed by the building occupants or maintenance personnel.

1108.3: Sizing of secondary drains.

Secondary (emergency) roof drain systems shall be sized in accordance with Section 1106 based on the rainfall rate for which the primary system is sized. Scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1101.7. Scuppers shall have an opening dimension of not less than 4 inches (102 mm) in height and have an opening width equal to the circumference of the roof drain required for the area served. The flow through the primary system shall not be considered when sizing the secondary roof drain system.

Section 1109: Combined Sanitary and Storm Public Sewer

1109.1: General.

Where the public sewer is a combined system for both sanitary and storm water, the storm sewer shall be connected independently to the public sewer.

Section 1110: Controlled Flow Roof Drain Systems

1110.1: General.

The roof of a structure shall be designed for the storage of water where the storm drainage system is engineered for controlled flow. The controlled flow roof drain system shall be an engineered system in accordance with this section and the design, submittal, approval, inspection and testing requirements of Section 316.1. The controlled flow system shall be designed based on the required rainfall rate in accordance with Section 1106.1.

1110.2: Control devices.

The control devices shall be installed so that the rate of discharge of water per minute shall not exceed the values for continuous flow as indicated in Section 1110.1.

1110.3: Installation.

Runoff control shall be by control devices. Control devices shall be protected by strainers.

1110.4: Minimum number of roof drains.

Not less than two roof drains shall be installed in roof areas 10,000 square feet (929 m2) or less and not less than four roof drains shall be installed in roofs over 10,000 square feet (929 m2) in area.

Section 1111: Subsoil Drains

1111.1: Subsoil drains.

Subsoil drains shall be open-jointed, horizontally split or perforated pipe conforming to one of the standards listed in Table 1102.5. Such drains shall be not less than 4 inches (102 mm) in diameter. Where the building is subject to backwater, the subsoil drain shall be protected by an accessibly located backwater valve. Subsoil drains shall discharge to a trapped area drain, sump, dry well or approved location above ground. The subsoil sump shall not be required to have either a gastight cover or a vent. The sump and pumping system shall comply with Section 1113.1.

Section 1112: Building Subdrains

1112.1: Building subdrains.

Building subdrains located below the public sewer level shall discharge into a sump or receiving tank, the contents of which shall be automatically lifted and discharged into the drainage system as required for building sumps. The sump and pumping equipment shall comply with Section 1113.1.

Section 1113: Sumps and Pumping Systems

1113.1: Pumping system.

The sump pump, pit and discharge piping shall conform to Sections 1113.1.1 through 1113.1.4.

1113.1.1: Pump capacity and head.

The sump pump shall be of a capacity and head appropriate to anticipated use requirements.

1113.1.2: Sump pit.

The sump pit shall be not less than 18 inches (457 mm) in diameter and not less than 24 inches (610 mm) in depth, unless otherwise approved. The pit shall be provided with access and shall be located such that all drainage flows into the pit by gravity. The sump pit shall be constructed of tile, steel, plastic, cast iron, concrete or other approved material, with a removable cover adequate to support anticipated loads in the area of use. The pit floor shall be solid and provide permanent support for the pump.

1113.1.3: Electrical.

Electrical service outlets, where required, shall meet the requirements of NFPA 70.

1113.1.4: Piping.

Discharge piping shall meet the requirements of Section 1102.2, 1102.3 or 1102.4 and shall include a gate valve and a full flow check valve. Pipe and fittings shall be the same size as, or larger than, the pump discharge tapping.

Exception: In one- and two-family dwellings, only a check valve shall be required, located on the discharge piping from the pump or ejector.

Chapter 12: Special Piping and Storage Systems

User notes:

About this chapter: Chapter 12 specifies the standards covering the installation of nonflammable medical gas piping systems and nonmedical oxygen piping systems.

Section 1201: General

1201.1: Scope.

The provisions of this chapter shall govern the design and installation of piping and storage systems for nonflammable medical gas systems and nonmedical oxygen systems. All maintenance and operations of such systems shall be in accordance with the International Fire Code.

Section 1202: Medical Gases

[F] 1202.1: Nonflammable medical gases.

Nonflammable medical gas systems, inhalation anesthetic systems and vacuum piping systems shall be installed, tested and labeled in accordance with NFPA 99.

Exceptions:

1. This section shall not apply to portable systems or cylinder storage.
2. Vacuum system exhaust terminations shall comply with the International Mechanical Code.

Section 1203: Oxygen Systems

[F] 1203.1: Design and installation.

Nonmedical oxygen systems shall be designed and installed in accordance with NFPA 51 and NFPA 55.

Chapter 13: Non-potable Water Systems

User notes:

About this chapter: Storm water and some liquid waste from a building can be a source of nonpotable water that can be used to reduce the volume of potable water supplied to the building. Chapter 13 provides the requirements for storage, treatment and distribution of this resource. This chapter also regulates the piping systems for reclaimed water supplied by a wastewater treatment facility.

Section 1301: General

1301.1: General.

The provisions of Chapter 13 shall govern the materials, design, construction and installation of systems for the collection, storage, treatment and distribution of non-potable water. For non-potable rainwater systems, the provisions of CSA B805/ICC 805 shall be an alternative for regulating the materials, design, construction and installation of systems for rainwater collection, storage, treatment and distribution of non-potable water. The use and application of non-potable water shall comply with laws, rules and ordinances applicable in the jurisdiction.

1301.2: Water quality.

Non-potable water for each end use application shall meet the minimum water quality requirements as established for the intended application by the laws, rules and ordinances applicable in the jurisdiction. Where non-potable water from different sources is combined in a system, the system shall comply with the most stringent of the requirements of this code that are applicable to such sources.

1301.2.1: Residual disinfectants.

Where chlorine is used for disinfection, the non-potable water shall contain not more than 4 ppm (4 mg/L) of chloramines or free chlorine when tested in accordance with ASTM D1253. Where ozone is used for disinfection, the non-potable water shall not contain gas bubbles having elevated levels of ozone at the point of use.

Exception: Reclaimed water sources shall not be required to comply with these requirements.

1301.2.2: Filtration required.

Non-potable water utilized for water closet and urinal flushing applications shall be filtered by a 100-micron (0.1 mm) or finer filter.

Exception: Reclaimed water sources shall not be required to comply with these requirements.

1301.3: Signage required.

Non-potable water outlets such as hose connections, open-ended pipes and faucets shall be identified at the point of use for each outlet with signage that reads as follows: “Non-potable water is utilized for [application name]. CAUTION: NONPOTABLE WATER – DO NOT DRINK.” The words shall be legibly and indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and in colors in contrast to the background on which they are applied. In

addition to the required wordage, the pictograph shown in Figure 1301.3 shall appear on the signage required by this section.

Figure 1301.3 PICTOGRAPH—DO NOT DRINK



1301.4: Permits.

Permits shall be required for the construction, installation, alteration and repair of non-potable water systems. Construction documents, engineering calculations, diagrams and other such data pertaining to the non-potable water system shall be submitted with each permit application.

1301.5: Potable water connections.

Where a potable system is connected to a non-potable water system, the potable water supply shall be protected against backflow in accordance with Section 608.

1301.6: Components and materials.

Piping, plumbing components and materials used in collection and conveyance systems shall be of material approved by the manufacturer for the intended application.

1301.7: Insect and vermin control.

The system shall be protected to prevent the entrance of insects and vermin into storage tanks and piping systems. Screen materials shall be compatible with contacting system components and shall not accelerate the corrosion of system components.

1301.8: Freeze protection.

Where sustained freezing temperatures occur, provisions shall be made to keep storage tanks and the related piping from freezing.

1301.9: Non-potable water storage tanks

Non-potable water storage tanks shall comply with Sections 1301.9.1 through 1301.9.10.

1301.9.1: Location.

Any storage tank or portion thereof that is above grade shall be protected from direct exposure to sunlight by one of the following methods:

1. Tank construction using opaque, UV-resistant materials such as heavily tinted plastic, fiberglass, lined metal, concrete, wood, or painted to prevent algae growth.

2. Specially constructed sun barriers.

3. Installation in garages, crawl spaces or sheds.

1301.9.2: Materials.

Where collected on-site, water shall be collected in an approved tank constructed of durable, nonabsorbent and corrosion-resistant materials. The storage tank shall be constructed of materials compatible with any disinfection systems used to treat water upstream of the tank and with any systems used to maintain water quality in the tank. Wooden storage tanks that are not equipped with a makeup water source shall be provided with a flexible liner.

1301.9.3: Foundation and supports.

Storage tanks shall be supported on a firm base capable of withstanding the weight of the storage tank when filled to capacity. Storage tanks shall be supported in accordance with the International Building Code.

1301.9.3.1: Ballast.

Where the soil can become saturated, an underground storage tank shall be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold-down ballast shall meet or exceed the buoyancy force of the tank. Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the weight of the storage tank when full, consistent with the bearing capability of adjacent soil.

1301.9.3.2: Structural support.

Where installed below grade, storage tank installations shall be designed to withstand earth and surface structural loads without damage and with minimal deformation when empty or filled with water.

1301.9.4: Makeup water.

Where an uninterrupted supply is required for the intended application, potable or reclaimed water shall be provided as a source of makeup water for the storage tank. The makeup water supply shall be protected against backflow in accordance with Section 608. A full-open valve located on the makeup water supply line to the storage tank shall be provided. Inlets to the storage tank shall be controlled by fill valves or other automatic supply valves installed to prevent the tank from overflowing and to prevent the water level from dropping below a predetermined point. Where makeup water is provided, the water level shall not be permitted to drop below the source water inlet or the intake of any attached pump.

1301.9.5: Overflow.

The storage tank shall be equipped with an overflow pipe having a diameter not less than that shown in Table 606.5.4. The overflow pipe shall be protected from insects or vermin and shall discharge in a manner consistent with storm water runoff requirements of the jurisdiction. The overflow pipe shall discharge at a sufficient distance from the tank to avoid damaging the tank foundation or the adjacent property. Drainage from overflow pipes shall be directed to prevent freezing on roof walkways. The overflow drain shall not be equipped with a shutoff valve. A cleanout shall be provided on each overflow pipe in accordance with Section 708.

1301.9.6: Access.

Not less than one access opening shall be provided to allow inspection and cleaning of the tank interior. Access openings shall have an approved locking device or other approved method of securing access. Below-grade storage tanks, located outside of the building, shall be provided with a manhole either not less than 24 inches (610 mm) square or with an inside diameter not less than 24 inches (610 mm). Manholes shall extend not less than 4 inches (102 mm) above ground or shall be designed to prevent water infiltration. Finished grade shall be sloped away from the manhole to divert surface water. Manhole covers shall be secured to prevent unauthorized access. Service ports in manhole covers shall be not less than 8 inches (203 mm) in diameter and shall be not less than 4 inches (102 mm) above the finished grade level. The service port shall be secured to prevent unauthorized access.

> **Exception:** Treated-water storage tanks that are less than 800 gallons (3028 L) in volume and installed below grade shall not be required to be equipped with a manhole provided that the tank has a service port of not less than 8 inches (203 mm) in diameter.

1301.9.7: Venting.

Storage tanks shall be provided with a vent sized in accordance with Chapter 9 and based on the aggregate diameter of all tank influent pipes. The reservoir vent shall not be connected to sanitary drainage system vents. Vents shall be protected from contamination by means of an approved cap or U-bend installed with the opening directed downward. Vent outlets shall extend not less than 4 inches (102 mm) above grade or as necessary to prevent surface water from entering the storage tank. Vent openings shall be protected against the entrance of vermin and insects in accordance with the requirements of Section 1301.7.

1301.9.8: Draining of tanks.

Tanks shall be provided with a means of emptying the contents for the purpose of service or cleaning. Tanks shall be drained by using a pump or by a drain located at the lowest point in the tank. The tank drain pipe shall discharge as required for overflow pipes and shall not be smaller in size than specified in Table 606.5.7. Not less than one cleanout shall be provided on each drain pipe in accordance with Section 708.

1301.9.9: Marking and signage.

Each non-potable water storage tank shall be labeled with its rated capacity. The contents of storage tanks shall be identified with the words “CAUTION: NON-POTABLE WATER – DO NOT DRINK.” Where an opening is provided that could allow the entry of personnel, the opening shall be marked with the words, “DANGER – CONFINED SPACE.” Markings shall be indelibly printed on the tank or on a tag or sign constructed of corrosion-resistant waterproof material that is mounted on the tank. The letters of the words shall be not less than 0.5 inch (12.7 mm) in height and shall be of a color in contrast with the background on which they are applied.

1301.9.10: Storage tank tests.

Storage tanks shall be tested in accordance with the following:

Storage tanks shall be filled with water to the overflow line prior to and during inspection. Seams and joints shall be left exposed and the tank shall remain watertight without leakage for a period of 24 hours.

1. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and that there are no leaks.

2. The tank drain shall be observed for proper operation.

3. The makeup water system shall be observed for proper operation and successful automatic shutoff of the system at the refill threshold shall be verified.

1301.10: System abandonment.

If the owner of an on-site non-potable water reuse system or rainwater collection and conveyance system elects to cease use of, or fails to properly maintain such system, the system shall be abandoned and shall comply with the following:

1. All system piping connecting to a utility-provided water system shall be removed or disabled.

2. The distribution piping system shall be replaced with an approved potable water supply piping system. Where an existing potable pipe system is already in place, the fixtures shall be connected to the existing system.

3. The storage tank shall be secured from accidental access by sealing or locking tank inlets and access points, or filling with sand or equivalent.

1301.11: Trenching requirements for non-potable water piping.

Non-potable water collection and distribution piping and reclaimed water piping shall be separated from the building sewer and potable water piping underground by 5 feet (1524 mm) of undisturbed or compacted earth. Non-potable water collection and distribution piping shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. Buried non-potable water piping shall comply with the requirements of Section 306.

Exceptions:

1. The required separation distance shall not apply where the bottom of the non-potable water pipe within 5 feet (1524 mm) of the sewer is not less than 12 inches (305 mm) above the top of the highest point of the sewer and the pipe materials conform to Table 702.3.

2. The required separation distance shall not apply where the bottom of the potable water service pipe within 5 feet (1524 mm) of the non-potable water pipe is not less than 12 inches (305 mm) above the top of the highest point of the non-potable water pipe and the pipe materials comply with the requirements of Table 605.4.

3. Non-potable water pipe is permitted to be located in the same trench with a building sewer, provided that such sewer is constructed of materials that comply with the requirements of Table 702.2.

4. The required separation distance shall not apply where a non-potable water pipe crosses a sewer pipe, provided that the pipe is sleeved to not less than 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing, with pipe materials that comply with Table 702.2.

5. The required separation distance shall not apply where a potable water service pipe crosses a nonpotable water pipe, provided that the potable water service pipe is sleeved for a distance of not less than 5 feet (1524 mm) horizontally from the centerline of the non-potable pipe on both sides of such crossing, with pipe materials that comply with Table 702.2.

6. Irrigation piping located outside of a building and downstream of the backflow preventer is not required to meet the trenching requirements where non-potable water is used for outdoor applications.

1301.12: Outdoor outlet access.

Sill cocks, hose bibbs, wall hydrants, yard hydrants and other outdoor outlets supplied by non-potable water shall be located in a locked vault or shall be operable only by means of a removable key.

Section 1302: On-Site Non-potable Water Reuse Systems

1302.1: General.

The provisions of ASTM E2635 and Section 1302 shall govern the construction, installation, alteration and repair of on-site non-potable water reuse systems for the collection, storage, treatment and distribution of on-site sources of non-potable water as permitted by the jurisdiction.

1302.2: Sources.

On-site non-potable water reuse systems shall collect waste discharge from only the following sources: bathtubs, showers, lavatories, clothes washers and laundry trays. Where approved and as appropriate for the intended application, water from other non-potable sources shall be collected for reuse by on-site non-potable water reuse systems.

1302.2.1: Prohibited sources.

Wastewater containing urine or fecal matter shall not be diverted to on-site non-potable water reuse systems and shall discharge to the sanitary drainage system of the building or premises in accordance with Chapter 7. Reverse osmosis system reject water, water softener discharge water, kitchen sink wastewater, dishwasher wastewater and wastewater discharged from wet-hood scrubbers shall not be collected for reuse in an on-site non-potable water reuse system.

1302.3: Traps.

Traps serving fixtures and devices discharging wastewater to on-site non-potable water reuse systems shall comply with Section 1002.4.

1302.4: Collection pipe.

On-site non-potable water reuse systems shall utilize drainage piping approved for use in plumbing drainage systems to collect and convey untreated water for reuse. Vent piping approved for use in plumbing venting systems shall be utilized for vents in the graywater system. Collection and vent piping materials shall comply with Section 702.

1302.4.1: Installation.

Collection piping conveying untreated water for reuse shall be installed in accordance with Section 704.

1302.4.2: Joints.

Collection piping conveying untreated water for reuse shall utilize joints approved for use with the distribution piping and appropriate for the intended applications as specified in Section 705.

1302.4.3: Size.

Collection piping conveying untreated water for reuse shall be sized in accordance with drainage sizing requirements specified in Section 710.

1302.4.4: Marking.

Additional marking of collection piping conveying untreated water for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by Chapter 7.

1302.5: Filtration.

Untreated water collected for reuse shall be filtered as required for the intended end use. Filters shall be provided with access for inspection and maintenance. Filters shall utilize a pressure gauge or other approved method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves immediately upstream and downstream to allow for isolation during maintenance.

1302.6: Disinfection and treatment.

Where the intended application for non-potable water collected on-site for reuse requires disinfection or other treatment or both, it shall be disinfected as needed to ensure that the required water quality is delivered at the point of use. Non-potable water collected on-site containing untreated graywater shall be retained in collection reservoirs for not longer than 24 hours.

1302.6.1: Graywater used for fixture flushing.

Graywater used for flushing water closets and urinals shall be disinfected and treated by an on-site water reuse treatment system complying with NSF 350.

1302.7: Storage tanks.

Storage tanks utilized in on-site nonpotable water reuse systems shall comply with Sections 1301.9, 1302.7.1 and 1302.7.2.

1302.7.1: Location.

Storage tanks shall be located with a minimum horizontal distance between various elements as indicated in Table 1302.7.1.

TABLE 1302.7.1 LOCATION OF NONPOTABLE WATER REUSE STORAGE TANKS

ELEMENT	MINIMUM HORIZONTAL DISTANCE FROM STORAGE TANK (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Public water main	10
Seepage pits	5
Septic tanks	5
Streams and lakes	50
Water service	5
Water wells	50

For SI: 1 foot = 304.8 mm.

1302.7.2: Outlets.

Outlets shall be located not less than 4 inches (102 mm) above the bottom of the storage tank and shall not skim water from the surface.

1302.8: Valves.

Valves shall be supplied on on-site nonpotable water reuse systems in accordance with Sections 1302.8.1 and 1302.8.2.

1302.8.1: Bypass valve.

One three-way diverter valve listed and labeled to NSF 50 or other approved device shall be installed on collection piping upstream of each storage tank, or drain field, as applicable, to divert untreated on-site reuse sources to the sanitary sewer to allow servicing and inspection of the system. Bypass valves shall be installed downstream of fixture traps and vent connections. Bypass valves shall be marked to indicate the direction of flow, connection and storage tank or drain field connection. Bypass valves shall be provided with access that allows for removal. Two shutoff valves shall not be installed to serve as a bypass valve.

1302.8.2: Backwater valve.

One or more backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be in accordance with Section 714.

1302.9: Pumping and control system.

Mechanical equipment including pumps, valves and filters shall have access and be removable in order to perform repair, maintenance and cleaning. The minimum flow rate and flow pressure delivered by the pumping system shall be appropriate for the application and in accordance with Section 604.

1302.10: Water pressure-reducing valve or regulator.

Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the non-potable water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8.

1302.11: Distribution piping.

Distribution piping utilized in on-site non-potable water reuse systems shall comply with Sections 1302.11.1 through 1302.11.3.

> **Exception:** Irrigation piping located outside of the building and downstream of a backflow preventer.

1302.11.1: Materials, joints and connections.

Distribution piping shall conform to the standards and requirements specified in Section 605.

1302.11.2: Design.

On-site non-potable water reuse distribution piping systems shall be designed and sized in accordance with Section 604 for the intended application.

1302.11.3: Labeling and marking.

On-site non-potable water distribution piping labeling and marking shall comply with Section 608.9.

1302.12: Tests and inspections.

Tests and inspections shall be performed in accordance with Sections 1302.12.1 through 1302.12.6.

1302.12.1: Collection pipe and vent test.

Drain, waste and vent piping used for on-site water reuse systems shall be tested in accordance with Section 312.

1302.12.2: Storage tank test.

Storage tanks shall be tested in accordance with Section 1301.9.10.

1302.12.3: Water supply system test.

The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section 312.6.

1302.12.4: Inspection and testing of backflow prevention assemblies.

The testing of backflow preventers and backwater valves shall be conducted in accordance with Section 312.11.

1302.12.5: Inspection of vermin and insect protection.

Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the storage tank and piping systems in accordance with Section 1301.7.

1302.12.6: Water quality test.

The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the jurisdiction.

1302.13: Operation and maintenance manuals.

Operation and maintenance materials shall be supplied with nonpotable on-site water reuse systems in accordance with Sections 1302.13.1 through 1302.13.4.

1302.13.1: Manual.

A detailed operations and maintenance manual shall be supplied in hardcopy form with all systems.

1302.13.2: Schematics.

The manual shall include a detailed system schematic, and the locations and a list of all system components, including manufacturer and model number.

1302.13.3: Maintenance procedures.

The manual shall provide a schedule and procedures for all system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

1302.13.4: Operations procedures.

The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

Section 1303: Non-potable Rainwater Collection and Distribution Systems

1303.1: General.

The provisions of Section 1303 shall govern the construction, installation, alteration and repair of rainwater collection and conveyance systems for the collection, storage, treatment and distribution of rainwater for non-potable applications, as permitted by the jurisdiction.

1303.1.1: Fire protection systems.

The storage, treatment and distribution of non-potable water to be used for fire protection systems shall be in accordance with the International Fire Code.

1303.2: Collection surface.

Rainwater shall be collected only from above-ground impervious roofing surfaces constructed from approved materials and where approved, vehicular parking or pedestrian walking surfaces.

1303.3: Debris excluders.

Downspouts and leaders shall be connected to a debris excluder or equivalent device that is designed to remove leaves, sticks, pine needles and similar debris to prevent such from entering the storage tank.

1303.4: First-flush diverter.

First-flush diverters shall operate automatically and shall not rely on manually operated valves or devices. Diverted rainwater shall not be drained to the roof surface, and shall be discharged in a manner consistent with the storm water runoff requirements of the jurisdiction. First-flush diverters shall be provided with access for maintenance and service.

1303.5: Roof gutters and downspouts.

Gutters and downspouts shall be constructed of materials that are compatible with the collection surface and the rainwater quality for the desired end use. Joints shall be watertight.

1303.5.1: Slope.

Roof gutters, leaders and rainwater collection piping shall slope continuously toward collection inlets. Gutters and downspouts shall have a slope of not less than 1/8 inch per foot (10.4 mm/m) along their entire length, and shall not permit the collection or pooling of water at any point.

> **Exception:** Siphonic drainage systems installed in accordance with the manufacturer’s instructions shall not be required to have a slope.

1303.5.2: Size.

Gutters and downspouts shall be installed and sized in accordance with Section 1106.6 and local rainfall rates.

1303.5.3: Cleanouts.

Cleanouts shall be provided in the water conveyance system to allow access to all filters, flushes, pipes and downspouts.

1303.6: Drainage.

Water drained from the roof washer or debris excluder shall not be drained to the sanitary sewer. Such water shall be diverted from the storage tank and discharge in a location that will not cause erosion or damage to property in accordance with the International Building Code. Roof washers and debris excluders shall be provided with an automatic means of self-draining between rain events, and shall not drain onto roof surfaces.

1303.7: Collection pipe.

Rainwater collection and conveyance systems shall utilize drainage piping approved for use within plumbing drainage systems to collect and convey captured rainwater. Vent piping approved for use within plumbing venting systems shall be utilized for vents within the rainwater system. Collection and vent piping materials shall comply with Section 702.

1303.7.1 Installation.

Collection piping conveying captured rainwater shall be installed in accordance with Section 704.

1303.7.2: Joints.

Collection piping conveying captured rainwater shall utilize joints approved for use with the distribution piping and appropriate for the intended applications as specified in Section 705.

1303.7.3: Size.

Collection piping conveying captured rainwater shall be sized in accordance with drainage sizing requirements specified in Section 710.

1303.7.4: Marking.

Additional marking of collection piping conveying captured rainwater for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by Chapter 7.

1303.8: Filtration.

Collected rainwater shall be filtered as required for the intended end use. Filters shall be provided with access for inspection and maintenance. Filters shall utilize a pressure gauge or other approved method to provide indication when a filter requires servicing or replacement. Filters shall be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance.

1303.9: Disinfection.

Where the intended application for rainwater requires disinfection or other treatment or both, it shall be disinfected as needed to ensure that the required water quality is delivered at the point of use. Where chlorine is used for disinfection or treatment, water shall be tested for residual chlorine in accordance with ASTM D1253. The levels of residual chlorine shall not exceed that allowed for the **intended use in accordance with the requirements of the jurisdiction.**

1303.10: Storage tanks.

Storage tanks utilized in non-potable rainwater collection and conveyance systems shall comply with Sections 1301.9 and 1303.10.1 through 1303.10.3.

1303.10.1: Location.

Storage tanks shall be located with a minimum horizontal distance between various elements as indicated in Table 1303.10.1.

TABLE 1303.10.1 LOCATION OF RAINWATER STORAGE TANKS

ELEMENT	MINIMUM HORIZONTAL DISTANCE FROM STORAGE TANK (feet)
Critical root zone (CRZ) of protected trees	2
Lot line adjoining private lots	5
Seepage pits	5
Septic tanks	5

For SI: 1 foot = 304.8 mm.

1303.10.2: Inlets.

Storage tank inlets shall be designed to introduce collected rainwater into the tank with minimum turbulence, and shall be located and designed to avoid agitating the contents of the storage tank.

1303.10.3: Outlets.

Outlets shall be located not less than 4 inches (102 mm) above the bottom of the storage tank and shall not skim water from the surface.

1303.11: Valves.

Valves shall be supplied on rainwater collection and conveyance systems in accordance with Section 1303.11.1.

1303.11.1: Backwater valve.

Backwater valves shall be installed on each overflow and tank drain pipe. Backwater valves shall be in accordance with Section 714.

1303.12: Pumping and control system.

Mechanical equipment including pumps, valves and filters shall be provided with access that allows for removal in order to perform repair, maintenance and cleaning. The minimum flow rate and flow pressure delivered by the pumping system shall be appropriate for the application and in accordance with Section 604.

1303.13: Water pressure-reducing valve or regulator.

Where the water pressure supplied by the pumping system exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the rainwater distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8.

1303.14: Distribution piping.

Distribution piping utilized in rainwater collection and conveyance systems shall comply with Sections 1303.14.1 through 1303.14.3.

> **Exception:** Irrigation piping located outside of the building and downstream of a backflow preventer.

1303.14.1: Materials, joints and connections.

Distribution piping shall conform to the standards and requirements specified in Section 605 for non-potable water.

1303.14.2: Design.

Distribution piping systems shall be designed and sized in accordance with Section 604 for the intended application.

1303.14.3: Labeling and marking.

Non-potable rainwater distribution piping labeling and marking shall comply with Section 608.9.

1303.15: Tests and inspections.

Tests and inspections shall be performed in accordance with Sections 1303.15.1 through 1303.15.9.

1303.15.1: Roof gutter inspection and test.

Roof gutters shall be inspected to verify that the installation and slope are in accordance with Section 1303.5.1. Gutters shall be tested by pouring not less than 1 gallon (3.8 L) of water into the end of the gutter opposite the collection point. The gutter being tested shall not leak and shall not retain standing water.

1303.15.2: First-flush diverter test.

First-flush diverters shall be tested by introducing water into the collection system upstream of the diverter. Proper diversion of the first amount of water shall be in accordance with the requirements of Section 1303.4.

1303.15.3: Collection pipe and vent test.

Drain, waste and vent piping used for rainwater collection and conveyance systems shall be tested in accordance with Section 312.

1303.15.4: Storage tank test.

Storage tanks shall be tested in accordance with Section 1301.9.10.

1303.15.5: Water supply system test.

The testing of makeup water supply piping and distribution piping shall be conducted in accordance with Section 312.6.

1303.15.6: Inspection and testing of backflow prevention assemblies.

The testing of backflow preventers and backwater valves shall be conducted in accordance with Section 312.11.

1303.15.7: Inspection of vermin and insect protection.

Inlets and vents to the system shall be inspected to verify that each is protected to prevent the entrance of insects and vermin into the storage tank and piping systems in accordance with Section 1301.7.

1303.15.8: Water quality test.

The quality of the water for the intended application shall be verified at the point of use in accordance with the requirements of the jurisdiction.

1303.15.9: Collected raw rainwater quality.

ASTM E2727 shall be used to determine what, if any, site conditions impact the quality of collected raw rainwater and whether those site conditions require treatment of the raw water for the intended end use or make the water unsuitable for specific end uses.

1303.16: Operation and maintenance manuals.

Operation and maintenance manuals shall be supplied with rainwater collection and conveyance systems in accordance with Sections 1303.16.1 through 1303.16.4.

1303.16.1: Manual.

A detailed operations and maintenance manual shall be supplied in hardcopy form with all systems.

1303.16.2: Schematics.

The manual shall include a detailed system schematic, and the locations and a list of all system components, including manufacturer and model number.

1303.16.3: Maintenance procedures.

The manual shall provide a maintenance schedule and procedures for all system components requiring periodic maintenance. Consumable parts, including filters, shall be noted along with part numbers.

1303.16.4: Operations procedures.

The manual shall include system startup and shutdown procedures, as well as detailed operating procedures.

Section 1304: Reclaimed Water Systems

1304.1: General.

The provisions of this section shall govern the construction, installation, alteration and repair of systems supplying non-potable reclaimed water.

1304.2: Water pressure-reducing valve or regulator.

Where the reclaimed water pressure supplied to the building exceeds 80 psi (552 kPa) static, a pressure-reducing valve shall be installed to reduce the pressure in the reclaimed water distribution system piping to 80 psi (552 kPa) static or less. Pressure-reducing valves shall be specified and installed in accordance with Section 604.8.

1304.3: Reclaimed water systems.

The design of the reclaimed water systems shall conform to accepted engineering practice.

1304.3.1: Distribution piping.

Distribution piping shall comply with Sections 1304.3.1.1 through 1304.3.1.3.

> **Exception:** Irrigation piping located outside of the building and downstream of a backflow preventer.

1304.3.1.1: Materials, joints and connections.

Distribution piping conveying reclaimed water shall conform to standards and requirements specified in Section 605 for non-potable water.

1304.3.1.2: Design.

Distribution piping systems shall be designed and sized in accordance with Section 604 for the intended application.

1304.3.1.3: Labeling and marking.

Non-potable distribution piping labeling and marking shall comply with Section 608.9.

1304.4: Tests and inspections.

Tests and inspections shall be performed in accordance with Sections 1304.4.1 and 1304.4.2.

1304.4.1: Water supply system test.

The testing of makeup water supply piping and reclaimed water distribution piping shall be conducted in accordance with Section 312.6.

1304.4.2: Inspection and testing of backflow prevention assemblies.

The testing of backflow preventers shall be conducted in accordance with Section 312.11.

Chapter 14: Subsurface Graywater Soil Absorption Systems

User notes:

About this chapter: Chapter 14 provides regulations for disposing of non-potable water to underground landscape irrigation piping. Testing procedures are provided to assess the capability of the soil to accept the volume of flow. This chapter covers the regulations, types and material standards for the piping of these systems. Section 1401 General CDP 1401.1 Scope. CDP The provisions of this chapter shall govern the materials, design, construction and installation of subsurface graywater soil absorption systems connected to non-potable water from on-site water reuse systems.

1401.2: Materials.

Above-ground drain, waste and vent piping for subsurface graywater soil absorption systems shall conform to one of the standards listed in Table 702.1. Subsurface graywater soil absorption systems, underground building drainage and vent pipe shall conform to one of the standards listed in Table 702.2.

1401.3: Tests.

Drain, waste and vent piping for subsurface graywater soil absorption systems shall be tested in accordance with Section 312.

1401.4: Inspections.

Subsurface graywater soil absorption systems shall be inspected in accordance with Section 111.

1401.5: Disinfection.

Disinfection shall not be required for on-site non-potable water reuse for subsurface graywater soil absorption systems.

1401.6: Coloring.

On-site non-potable water reuse for subsurface graywater soil absorption systems shall not be required to be dyed.

Section 1402: System design and sizing

1402.1: Sizing.

The system shall be sized in accordance with the sum of the output of all water sources connected to the subsurface graywater soil absorption system. Where graywater collection piping is connected to subsurface landscape irrigation systems, graywater output shall be calculated according to the gallons-per-day-per-occupant number based on the type of fixtures connected. The graywater discharge shall be calculated by the following equation:

Equation 14-1 $C = A \times B$

where:

A = Number of occupants: Residential - Number of occupants shall be determined by the actual number of occupants, but not less than two occupants for one bedroom and one occupant for each additional bedroom. Commercial - Number of occupants shall be determined by the International Building Code.

B = Estimated flow demands for each occupant: Residential - 25 gallons per day (94.6 Lpd) per occupant for showers, bathtubs and lavatories and 15 gallons per day (56.7 Lpd) per occupant for clothes washers or laundry trays. Commercial - Based on type of fixture or water use records minus the discharge of fixtures other than those discharging graywater.

C = Estimated graywater discharge based on the total number of occupants.

1402.2: Percolation tests.

The permeability of the soil in the proposed absorption system shall be determined by percolation tests or permeability evaluation.

1402.2.1: Percolation tests and procedures.

Not fewer than three percolation tests in each system area shall be conducted. The holes shall be spaced uniformly in relation to the bottom depth of the proposed absorption system. More percolation tests shall be made where necessary, depending on system design.

1402.2.1.1: Percolation test hole.

The test hole shall be dug or bored. The test hole shall have vertical sides and a horizontal dimension of 4 inches to 8 inches (102 mm to 203 mm). The bottom and sides of the hole shall be scratched with a sharp-pointed instrument to expose the natural soil. Loose material shall be removed from the hole and the bottom shall be covered with 2 inches (51 mm) of gravel or coarse sand.

1402.2.1.2: Test procedure, sandy soils.

The hole shall be filled with clear water to not less than 12 inches (305 mm) above the bottom of the hole for tests in sandy soils. The time for this amount of water to seep away shall be determined, and this procedure shall be repeated if the water from the second filling of the hole seeps away in 10 minutes or less. The test shall proceed as follows: Water shall be added to a point not more than 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, water

levels shall be measured at 10-minute intervals for a period of 1 hour. Where 6 inches (152 mm) of water seeps away in less than 10 minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches (152 mm). Where 6 inches (152 mm) of water seeps away in less than 2 minutes, the test shall be stopped and a rate of less than 3 minutes per inch (7.2 s/mm) shall be reported. The final water level drop shall be used to calculate the percolation rate. Soils not meeting the requirements of this section shall be tested in accordance with Section 1402.2.1.3.

1402.2.1.3: Test procedure, other soils.

The hole shall be filled with clear water, and a minimum water depth of 12 inches (305 mm) shall be maintained above the bottom of the hole for a 4-hour period by refilling whenever necessary or by use of an automatic siphon. Water remaining in the hole after 4 hours shall not be removed. Thereafter, the soil shall be allowed to swell not less than 16 hours or more than 30 hours. Immediately after the soil swelling period, the measurements for determining the percolation rate shall be made as follows: any soil sloughed into the hole shall be removed and the water level shall be adjusted to 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, the water level shall be measured at 30-minute intervals for a period of 4 hours, unless two successive water level drops do not vary by more than 1/16 inch (1.59 mm). Not fewer than three water level drops shall be observed and recorded. The hole shall be filled with clear water to a point not more than 6 inches (152 mm) above the gravel or coarse sand whenever it becomes nearly empty. Adjustments of the water level shall not be made during the three measurement periods except to the limits of the last measured water level drop. Where the first 6 inches (152 mm) of water seeps away in less than 30 minutes, the time interval between measurements shall be 10 minutes and the test run for 1 hour. The water depth shall not exceed 5 inches (127 mm) at any time during the measurement period. The drop that occurs during the final measurement period shall be used in calculating the percolation rate.

1402.2.1.4: Mechanical test equipment.

Mechanical percolation test equipment shall be of an approved type.

1402.2.2: Permeability evaluation.

Soil shall be evaluated for estimated percolation based on structure and texture in accordance with accepted soil evaluation practices. Borings shall be made in accordance with Section 1402.2.1.1 for evaluating the soil.

1402.3: Subsurface graywater soil absorption site location.

The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any water well or reservoir on the same or adjoining lot. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in Table 1402.3. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots.

TABLE 1402.3 LOCATION OF SUBSURFACE GRAYWATER SOIL ABSORPTION SYSTEM

ELEMENT	MINIMUM HORIZONTAL DISTANCE	
	Storage tank (feet)	Absorption field (feet)
Buildings	5	2
Lot line adjoining private property	5	5
Public water main	10	10
Seepage pits	5	5
Septic tanks	0	5
Streams and lakes	50	50
Water service	5	5
Water wells	50	100

For SI: 1 foot = 304.8 mm.

Section 1403: Installation

1403.1: Installation.

Absorption systems shall be installed in accordance with Sections 1403.1.1 through 1403.1.5.

1403.1.1: Absorption area.

The total absorption area required shall be computed from the estimated daily graywater discharge and the design-loading rate based on the percolation rate for the site. The required absorption area equals the estimated graywater discharge divided by the design-loading rate from Table 1403.1.1.

TABLE 1403.1.1 DESIGN LOADING RATE

PERCOLATION RATE (minutes per inch)	DESIGN LOADING FACTOR (gallons per square foot per day)
0 to less than 10	1.2
10 to less than 30	0.8
30 to less than 45	0.72
45 to 60	0.4

For SI: 1 minute per inch = min/25.4 mm, 1 gallon per square foot = 40.7 L/m^2.

1403.1.2: Seepage trench excavations.

Seepage trench excavations shall be not less than 1 foot (305 mm) in width and not greater than 5 feet (1524 mm) in width. Trench excavations shall be spaced not less than 2 feet (610 mm) apart. The soil absorption area of a seepage trench shall be computed by using the bottom of the trench area (width) multiplied by the length of pipe. Individual seepage trenches shall be not greater than 100 feet (30 480 mm) in developed length.

1403.1.3: Seepage bed excavations.

Seepage bed excavations shall be not less than 5 feet (1524 mm) in width and have more than one distribution pipe. The absorption area of a seepage bed shall be computed by using the bottom of the trench area. Distribution piping in a seepage bed shall be uniformly spaced not greater than 5 feet (1524 mm) and not less than 3 feet (914 mm) apart, and greater than 3 feet (914 mm) and not less than 1 foot (305 mm) from the sidewall or headwall.

1403.1.4: Excavation and construction.

The bottom of a trench or bed excavation shall be level. Seepage trenches or beds shall not be excavated where the soil is so wet that such material rolled between the hands forms a soil wire. Smeared or compacted soil surfaces in the sidewalls or bottom of seepage trench or bed excavations shall be scarified to the depth of smearing or compaction and the loose material removed. Where rain falls on an open excavation, the soil shall be left until sufficiently dry so a soil wire will not form when soil from the excavation bottom is rolled between the hands. The bottom area shall then be scarified and loose material removed.

1403.1.5: Aggregate and backfill.

Not less than 6 inches (152 mm) in depth of aggregate, ranging in size from 1/2 to 2 1/2 inches (12.7 mm to 64 mm), shall be laid into the trench below the distribution piping elevation. The aggregate shall be evenly distributed not less than 2 inches (51 mm) in depth over the top of the distribution pipe. The aggregate shall be covered with approved synthetic materials or 9 inches (229 mm) of uncompacted marsh hay or straw. Building paper shall not be used to cover the aggregate. Not less than 9 inches (229 mm) of soil backfill shall be provided above the covering.

1403.2: Distribution piping.

Distribution piping shall be not less than 3 inches (76 mm) in diameter. Materials shall comply with Table 1403.2. The top of the distribution pipe shall be not less than 8 inches (203 mm) below the original surface. The slope of the distribution pipes shall be not less than 2 inches (51 mm) and not greater than 4 inches (102 mm) per 100 feet (30 480 mm).

TABLE 1403.2 DISTRIBUTION PIPE

MATERIAL	STANDARD
Polyethylene (PE) plastic pipe	ASTM F405
Polyvinyl chloride (PVC) plastic pipe	ASTM D2729
Polyvinyl chloride (PVC) plastic pipe with a 3.5-inch O.D. and solid cellular core or composite wall	ASTM F1488

For SI: 1 inch = 25.4 mm.

1403.2.1: Joints.

Joints in distribution pipe shall be made in accordance with Section 705.

Chapter 15: Referenced Standards

User notes:

About this chapter: This code contains numerous references to standards that are used to provide requirements for materials and methods of construction. Chapter 15 contains a comprehensive list of all standards that are referenced in this code. These standards, in essence, are part of this code to the extent of the reference to the standard. This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and PLUMBING, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.8.

AISI

American Iron and Steel Institute
25 Massachusetts Avenue, NW Suite 800
Washington, DC, 20001

S220-20	North American Standard for Cold-Formed Steel Nonstructural Framing	307.3
S240-20	North American Standard for Cold-Formed Steel Structural Framing, 2020	307.3

ANSI

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY, 10036

A118.10—(R2019)	Standard Specifications for Load-bearing, Bonded, Waterproof Membranes for Thin-set Ceramic Tile and Dimension Stone Installation	421.5.2.5, 421.5.2.6
ANSI Z21.22—2015 (R2020)/CSA 4.4-2015 (R2020)	Relief Valves for Hot Water Supply Systems	504.2, 504.4, 504.4.1

ASME

American Society of Mechanical Engineers

Two Park Avenue

New York, NY, 10016-5990

A112.1.2—2012(R2017)	Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water Connection Receptors) 406.1, 409.2, Table 608.1, 608.14.1
A112.1.3— 2000 (R2024)	Air Gap Fittings for Use with Plumbing Fixtures, Appliances and Appurtenances 406.1, 409.2, Table 608.1, 608.14.1, 1102.6
A112.3.1—2007 (R2017)	Stainless Steel Drainage Systems for Sanitary, DWV, Storm and Vacuum Applications Above and Below Ground 413.1, Table 702.1, Table 702.2, Table 702.3, Table 702.4, Table 1102.4, Table 1102.5, 1102.6, Table 1102.7
A112.4.1—2024	Water Heater Relief Valve Drain Tubes 504.6
A112.4.2—2021/CSA B45.16—2021	Water Closet Personal Hygiene Devices 412.9
A112.4.3— 2024	Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System 405.4
A112.4.4—2022	Plastic Push-Fit Drain, Waste, and Vent (DWV) Fittings 705.2.5
A112.4.14—2022/CSA B125.14—22	Manually or Automatically Operated Valves for Use in Plumbing Systems Table 605.7
A112.6.1M —2022	Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use 405.4.3
A112.6.2—2017 (R2022)	Framing-Affixed Supports for Off-the-Floor Water Closets with Concealed Tanks 405.4.3
A112.6.3—2022	Floor and Trench Drains 413.1

A112.6.4—2003 (R2020)	Roof, Deck, and Balcony Drains 1102.6
A112.6.7—2010 (R2024)	Sanitary Floor Sinks 414.1
A112.6.9—2005 (R2024)	Siphonic Roof Drains 1107.1
A112.14.1—2003 (R2022)	Backwater Valves 714.2
A112.14.3—2023	Grease Interceptors 1003.3.5
A112.14.4—2001 (R2022)	Grease Removal Devices 1003.3.5
A112.14.6—2010 (R2024)	FOG (Fats, Oils and Greases) Disposal Systems 1003.3, 1003.3.5, 1003.3.7
A112.18.1—2023/CSA B125.1—2023	Plumbing Supply Fittings 412.1, 412.2, 412.3, 412.4, 412.6, 412.8, Table 605.7, 607.4, 608.2
A112.18.2—2023/CSA B125.2—2023	Plumbing Waste Fittings 412.1.2, 421.3.1
A112.18.3—2002 (R2022)	Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings 412.2, 412.6
A112.18.6—2021/CSA B125.6—21	Flexible Water Connectors 605.6
A112.18.9—2011 (2017)	Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 404.3
A112.19.1—2022/CSA B45.2—2022	Enameled Cast Iron and Enameled Steel Plumbing Fixtures 407.1, 410.1, 418.1, 419.1, 421.1, 422.1

A112.19.2— 2021/CSA B45.1 —2021	Ceramic Plumbing Fixtures 401.2, 405.10, 407.1, 408.1, 410.1, 418.1, 419.1, 421.1, 422.1, 424.1, 425.1
A112.19.3—2021/CSA B45.4 —2021	Stainless Steel Plumbing Fixtures 405.9, 407.1, 408.1, 410.1, 418.1, 419.1, 421.1, 425.1
A112.19.5—2022/CSA B45.15—2022	Flush Valves and Spuds for Water Closets, Urinals, and Tanks 415.4
A112.19.7—2023/CSA B45.10—2023	Hydromassage Bathtub Systems 426.1, 426.4
A112.19.12—2024	Wall Mounted and Pedestal Mounted, Adjustable, Elevating, Tilting and Pivoting Lavatory, Sink and Shampoo Bowl Carrier Systems and Drain Waste Systems 419.4
A112.19.14—2013 (R2023)	Six-liter Water Closets Equipped with a Dual Flushing Device 425.1
A112.19.15—2012 (R2022)	Bathtub/Whirlpool Bathtubs with Pressure Sealed Doors 407.4, 426.6
A112.19.19—2021	Vitreous China Nonwater Urinals 424.1
A112.21.3—2022	Hydrants for Utility and Maintenance Use Table 608.1, 608.14.6
A112.36.2M—1991 (R2022)	Cleanouts 708.1.11.2
ASME A112.3.4—2022/CSA B45.9—2022	Macerating Toilet Systems and Waste Pumping Systems for Plumbing Fixtures 405.5, 712.4.1
ASSE 1002—2020/ASME A112.1002—2020/CSA B125.12—2020	Anti-Siphon Fill Valves for Water Closet Tanks 415.3.1, Table 608.1
ASSE 1016—2021/ASME A112.1016—2021/CSA B125.16—2021	Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations 412.3, 412.4, 607.4

ASSE 1037—2015/ASME A112.1037—2015/CSA B125.37—2015	Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures	415.2
ASSE 1070—2020/ASME A112.1070—2020/CSA B125.1070—20	Performance Requirements for Water Temperature Limiting Devices	408.3, 412.5, 412.10, 419.5, 423.3, 607.1.2
B1.20.1—2023	Pipe Threads, General Purpose (inch)	605.10.3, 605.12.4, 605.14.3, 605.17.1, 705.2.3, 705.5.4, 705.8.1, 705.10.3
B16.3—2021	Malleable Iron Threaded Fittings Classes 150 and 300	Table 1102.7
B16.4—2016	Gray Iron Threaded Fittings Classes 125 and 250	Table 605.5, Table 702.4, Table 1102.7
B16.9—2023	Factory-Made Wrought Steel Buttwelding Fittings	Table 605.5, Table 702.4, Table 1102.7
B16.11—2021	Forged Fittings, Socket-Welding and Threaded	Table 605.5, Table 702.4, Table 1102.7
B16.12—2024	Cast Iron Threaded Drainage Fittings	Table 702.4, Table 1102.7
B16.15—2023	Cast Alloy Threaded Fittings: Classes 125 and 250	Table 605.5, Table 702.4, Table 1102.7
B16.18—2023	Cast Copper Alloy Solder Joint Pressure Fittings	Table 605.5, Table 702.4, Table 1102.7
B16.22—2023	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	Table 605.5, Table 702.4, Table 1102.7
B16.23—2016	Cast Copper Alloy Solder Joint Drainage Fittings DWV	Table 702.4, Table 1102.7
B16.26—2023	Cast Copper Alloy Fittings for Flared Copper Tubes	Table 605.5, Table 702.4, Table 1102.7

B16.28—1994	Wrought Steel Buttwelding Short Radius Elbows and Returns Table 605.5, Table 702.4, Table 1102.7
B16.29—2022	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings (DWV) Table 702.4, Table 1102.7
B16.34—2023	Valves—Flanged, Threaded and Welding End Table 605.7
B16.51—2018	Copper and Copper Alloy Press-Connect Pressure Fittings Table 605.5

ASPE

American Society of Plumbing Engineers
6400 Shafer Ct., Suite 350
Rosemont, IL, 60018-4914

45—2018	Siphonic Roof Drainage 1107.1
ASPE/IAPMO Z1034—2015 (R2020)	Test Method for Evaluating Roof Drain Performance 1102.6

ASSE

ASSE International
18927 Hickory Creek Drive, Suite 220
Mokena, IL, 60448

1001—2017	Performance Requirements for Atmospheric Type Vacuum Breakers 415.2, Table 608.1, 608.14.6, 608.17.4.1
1004—2017	Performance Requirements for Commercial Dishwashing Machines 409.1
1005—1999	Performance Requirements for Water Heater Drain Valves 3/4 Inch Size 501.3

1008—2020	Performance Requirements for Plumbing Aspects of Residential Food Waste Disposer Units 413.1
1010—2004	Performance Requirements for Water Hammer Arresters 604.9
1011—2017	Performance Requirements for Hose Connection Vacuum Breakers Table 608.1, 608.14.6
1012—2009	Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent Table 608.1, 608.14.3, 608.17.2, 608.17.10
1013 —2021	Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies Table 608.1, 608.14.2, 608.17.2
1014—2020	Performance Requirements for Backflow Prevention Devices for Hand-held Showers 412.2
1015—2021	Performance Requirements for Double Check Backflow Prevention Assemblies 607.1.2, Table 608.1, 608.14.7
1017—2009	Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems 501.2, 613.1
1018—2001 (R: 2021)	Performance Requirements for Trap Seal Primer Valves; Potable Water Supplied 1002.4.1.2
1019—2011 (R2016)	Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance Table 608.1, 608.14.6
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A5.8M/A5.8—2019	Specification for Filler Metals for Brazing and Braze Welding 605.12.1, 605.13.1, 705.5.1, 705.6.1

AWWA

American Water Works Association

6666 West Quincy Avenue

Denver, CO, 80235

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CISPI

Cast Iron Soil Pipe Institute
2401 Fieldcrest Dr.
Mundelein, IL, 60060

301—21	Standard Specification for Hubless Cast-iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications Table 702.1, Table 702.2, Table 702.3, Table 702.4, Table 1102.4, Table 1102.5, Table 1102.7
310—20	Standard Specification for Coupling for Use in Connection with Hubless Cast-iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 705.3.3

CSA

CSA Group
8501 East Pleasant Valley Road
Cleveland, OH, 44131-5516

A257.1—19	Non-reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe and Fittings Table 702.3, Table 1102.4

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ASME A112.18.2—2023/CSA B125.2—23	Plumbing Waste Fittings 412.1.2, 421.3.1
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ASME A112.19.2—2023/CSA B45.1—23	Ceramic Plumbing Fixtures 401.2, 405.10, 407.1, 408.1, 410.1, 418.1, 419.1, 421.1, 422.1, 424.1, 425.1
ASME A112.19.3—2022/CSA B45.4—22	Stainless Steel Plumbing Fixtures 405.9, 407.1, 418.1, 419.1, 421.1, 425.1
ASME A112.19.5—2022/CSA B45.15—22	Flush Valves and Spuds for Water Closets, Urinals and Tanks 415.4
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ASSE 1037—2020/ASME A112.1037—2020/CSA B125.37—20	Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures 415.2
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B64.1.2—21	Pressure Vacuum Breakers, (PVB) Table 608.1, 608.14.5
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B64.2—21	Vacuum Breakers, Hose Connection Type (HCVB) Table 608.1, 608.14.6
B64.2.1—21	Hose Connection Vacuum Breakers (HCVB) with Manual Draining Feature Table 608.1, 608.14.6
B64.2.1.1—21	Hose Connection Dual Check Vacuum Breakers (HCDVB) Table 608.1, 608.14.6
B64.2.2—21	Vacuum Breakers, Hose Connection Type (HCVB) with Automatic Draining Feature Table 608.1, 608.14.6
B64.3—21	Dual Check Backflow Preventers with Atmospheric Port (DCAP) Table 608.1, 608.14.3, 608.17.2
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B481.3—12(R2017)	Sizing, Selection, Location and Installation of Grease Interceptors 1003.3.5
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CSA B805—22/ICC 805—2022	Rainwater Harvesting Systems 1301.1

IAPMO

IAPMO Group

4755 E. Philadelphia Street

Ontario, CA, 91761

ANSI/CAN/IAPMO Z1001—2021	Prefabricated Gravity Grease Interceptors 1003.3.7
ANSI/CAN/IAPMO/ISO 30500—2019	Non-sewered sanitation systems — Prefabricated integrated treatment units — General safety and performance requirements for design and testing 311.1

ASPE/IAPMO Z1034—2015(R2020)	Test Method for Evaluating Roof Drain Performance 1102.6
CSA B45.5:22/IAPMO Z124—2022	Plastic Plumbing Fixtures 407.1, 418.1, 419.1, 419.2, 421.1, 422.1, 424.1, 425.1, 425.1.2
IAPMO/ANSI Z1157—2014e1(R2019)	Ball Valves Table 605.7

ICC

International Code Council, Inc.

200 Massachusetts Avenue, NW, Suite 250

Washington, DC, 20001

CSA B805—22/ICC 805—2022	Rainwater Harvesting Systems 1301.1
IBC—24	International Building Code® 201.3, 202, 307.1, 307.2, 307.4, 308.2, 309.1, 309.2, 310.1, 310.3, 315.1, 403.1, Table 403.1, 403.1.2, 403.3.1, 403.4, 404.1, 407.3, 421.6, 502.4, 606.5.2, 1106.5, 1301.9.3, 1303.6, 1402.1
ICC 900/SRCC 300—2020	Solar Thermal System Standard 502.1
ICC A117.1—2017 with Supplement 1	Standard for Accessible and Usable Buildings and Facilities 404.2, 410.3
IEBC—24	International Existing Building Code® 102.2.1
IECC—24	International Energy Conservation Code® 313.1, 607.2.2, 607.5
IFC—24	International Fire Code® 201.3, 1201.1
IFGC—24	International Fuel Gas Code® 101.2, 201.3, 502.1, 502.1.1

IMC—24	International Mechanical Code® 201.3, 307.7, 310.1, 502.1, 502.1.1, 612.1, 1202.1
IPSDC—24	International Private Sewage Disposal Code® 701.2
IRC—24	International Residential Code® 101.2

ISEA

International Safety Equipment Association
1901 N. Moore Street, Suite 808
Arlington, VA, 22209

ANSI/ISEA Z358.1—2014	Emergency Eyewash and Shower Equipment 411.1

MSS

Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
127 Park St. NE
Vienna, VA, 22180-4602

SP-67—2022	Butterfly Valves Table 605.7
SP-70—2023	Gray Iron Gate Valves, Flanged and Threaded Ends Table 605.7
SP-71—2011	Gray Iron Swing Check Valves, Flanged and Threaded Ends Table 605.7
SP-72—2023	Ball Valves with Flanged or Butt-welding Ends for General Service Table 605.7
SP-78—2023	Cast Iron Plug Valves, Flanged and Threaded Ends Table 605.7

SP-80—2019	Bronze Gate, Globe, Angle and Check Valves Table 605.7
SP-110—2023	Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends (incl. a 2010 Errata Sheet) Table 605.7
SP-122—2023	Plastic Industrial Ball Valves Table 605.7
SP-139—2022	Copper Alloy Gate, Globe, Angle and Check Valves for Low Pressure/Low Temperature Plumbing Applications Table 605.7

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy, MA, 02169-7471

51—23	Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes 1203.1
55—23	Compressed Gases and Cryogenic Fluids Code 1203.1
70—23	National Electrical Code 502.1, 504.3, 1113.1.3
99—24	Health Care Facilities Code 1202.1

NGWA

National Ground Water Association

601 Dempsey Road

Westerville, OH, 43081

ANSI/NGWA 01—14	Water Well Construction Standard 602.3.1

NSF

NSF International

789 N. Dixboro Road P.O. Box 130140

Ann Arbor, MI, 48105

3—2019	Commercial Warewashing Equipment 409.1
14—2020	Plastic Piping System Components and Related Materials 303.3, 611.3
18—2020	Manual Food and Beverage Dispensing Equipment 426.1
42—2021	Drinking Water Treatment Units-Aesthetic Effects 611.1, 611.3
44—2017	Residential Cation Exchange Water Softeners 611.1, 611.3
50—2020	Equipment and Chemicals for Swimming Pools, Spas, Hot Tubs and Other Recreational Facilities 1302.8.1
53—2020	Drinking Water Treatment Units—Health Effects 611.1, 611.3
58—2020	Reverse Osmosis Drinking Water Treatment Systems 611.1, 611.2, 611.3
61—2020	Drinking Water System Components—Health Effects 410.1, 412.1, 605.3, 605.4, 605.5, 605.7, 605.12.3, 605.13.6, 608.12, 611.3

62—2021	Drinking Water Distillation Systems	611.1
184—2019	Residential Dishwashers	409.1
350—2020	Onsite Residential and Commercial Water Reuse Treatment Systems	1302.6.1
359—2018	Valves for Cross-linked Polyethylene (PEX) Water Distribution Tubing Systems	Table 605.7
372—2020	Drinking Water Systems Components—Lead Content	605.2.1

PDI

Plumbing and Drainage Institute

800 Turnpike Street, Suite 300

North Andover, MA, 01845

PDI-G101 (2017)	Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance	1003.3.5
PDI-G102 (2009)	Testing and Certification for Grease Interceptors with FOG Sensing and Alarm Devices	1003.3.5

PSAI

Portable Sanitation Association International

2626 E. 82nd Street, Suite 175

Bloomington, MN, 55425

ANSI/PSAI Z4.3—2016	American National Standard: for Sanitation: Non-Sewered Waste Disposal Systems: Minimum Requirements	311.1

UL	UL LLC 333 Pfingsten Road Northbrook, IL, 60062-2096	
399—2017	Drinking-Water Coolers—with Revisions through July 2020	410.1
430—2015	Waste Disposers—with Revisions through September 2021	416.1
508—2018	Industrial Control Equipment—with Revisions through July 2021	314.2.3
723-2018	Standard for Test for Surface Burning Characteristics of Building Materials	504.7
1795—2016	Hydromassage Bathtubs—With Revisions Through December 2017	426.1

Appendix A: Plumbing Permit Fee Schedule

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

User notes:

About this appendix: Appendix A provides an example of a permit fee schedule that can be used by a jurisdiction.

Code development reminder: Code change proposals to sections in this appendix will be considered by the IPC Code Development Committee during the 2024 (Group A) Code Development Cycle.

Section A101: Plumbing Permit Fee Schedule

A101.1: General.

See Table A101.1 for an example plumbing permit fee schedule.

TABLE A101.1 EXAMPLE OF PERMIT FEE SCHEDULE

Permit Issuance		
1.	For issuing each permit	$_____
2.	For issuing each supplemental permit	_____
Unit Fee Schedule		
1.	For each plumbing fixture or trap or set of fixtures on one trap (including water, drainage piping and backflow protection thereof)	_____
2.	For each building sewer and each trailer park sewer	_____
3.	Rainwater systems—per drain (inside building)	_____
4.	For each cesspool (where permitted)	_____
5.	For each private sewage disposal system	_____
6.	For each water heater and/or vent	_____
7.	For each industrial waste pretreatment interceptor including its trap and vent, excepting kitchen-type grease interceptors functioning as fixture traps	_____
8.	For installation, alteration or repair of water-piping and/or water-treating equipment, each	_____
9.	For repair or alteration of drainage or vent piping, each fixture	_____
10.	For each lawn sprinkler system on any one meter including backflow protection devices therefor	_____
11.	For atmospheric-type vacuum breakers not included in Item 2:	
	1 to 5	_____
	over 5, each	_____
12.	For each backflow protective device other than atmospheric-type vacuum breakers:	
	2 inches (51 mm) and smaller	_____
	Over 2 inches (51 mm)	_____
Other Inspections and Fees		
1.	Inspections outside of normal business hours (minimum charge 2 hours)	_____ per hour
2.	Reinspection fee assessed under provisions of Section 111.4.3	_____ each
3.	Inspections for which no fee is specifically indicated (minimum charge one-half hour)	_____ per hour
4.	Additional plan review required by changes, additions or revisions to approved plans (minimum charge one-half hour)	_____ per hour

Appendix B: Rates of Rainfall For Various Cities

This appendix is informative and is not part of the code.

User notes:

About this appendix: The design of storm water drainage systems (Chapter 11) requires determination of the design rainfall event for the geographic location of the building. Appendix B

provides a list of major cities in the United States along with the 1-hour duration, 100-year occurrence rainfall rate.

Section B101: Rates of Rainfall for Various Cities

B101.1: General.

Rates of rainfall for various United States cities are listed in Table B101.1.

TABLE B101.1 RATES OF RAINFALL FOR VARIOUS CITIES(a)

Alabama:	
Birmingham	3.8
Huntsville	3.6
Mobile	4.6
Montgomery	4.2
Alaska:	
Fairbanks	1.0
Juneau	0.6
Arizona:	
Flagstaff	2.4
Nogales	3.1
Phoenix	2.5
Yuma	1.6
Arkansas:	
Fort Smith	3.6
Little Rock	3.7
Texarkana	3.8
California:	
Barstow	1.4
Crescent City	1.5
Fresno	1.1
Los Angeles	2.1
Needles	1.6
Placerville	1.5
San Fernando	2.3
San Francisco	1.5
Yreka	1.4
Colorado:	
Craig	1.5
Denver	2.4
Durango	1.8
Grand Junction	1.7
Lamar	3.0
Pueblo	2.5
Connecticut:	
Hartford	2.7
New Haven	2.8
Putnam	2.6
Delaware:	
Georgetown	3.0
Wilmington	3.1
District of Columbia:	
Washington	3.2
Florida:	
Jacksonville	4.3
Key West	4.3
Miami	4.7
Pensacola	4.6
Tampa	4.5

Georgia:	
Atlanta	3.7
Dalton	3.4
Macon	3.9
Savannah	4.3
Thomasville	4.3
Hawaii:	
Hilo	6.2
Honolulu	3.0
Wailuku	3.0
Idaho:	
Boise	0.9
Lewiston	1.1
Pocatello	1.2
Illinois:	
Cairo	3.3
Chicago	3.0
Peoria	3.3
Rockford	3.2
Springfield	3.3
Indiana:	
Evansville	3.2
Fort Wayne	2.9
Indianapolis	3.1
Iowa:	
Davenport	3.3
Des Moines	3.4
Dubuque	3.3
Sioux City	3.6
Kansas:	
Atwood	3.3
Dodge City	3.3
Topeka	3.7
Wichita	3.7
Kentucky:	
Ashland	3.0
Lexington	3.1
Louisville	3.2
Middlesboro	3.2
Paducah	3.3
Louisiana:	
Alexandria	4.2
Lake Providence	4.0
New Orleans	4.8
Shreveport	3.9
Maine:	
Bangor	2.2
Houlton	2.1
Portland	2.4

Maryland:	
Baltimore	3.2
Hagerstown	2.8
Oakland	2.7
Salisbury	3.1
Massachusetts:	
Boston	2.5
Pittsfield	2.8
Worcester	2.7
Michigan:	
Alpena	2.5
Detroit	2.7
Grand Rapids	2.6
Lansing	2.8
Marquette	2.4
Sault Ste. Marie	2.2
Minnesota:	
Duluth	2.8
Grand Marais	2.3
Minneapolis	3.1
Moorhead	3.2
Worthington	3.5
Mississippi:	
Biloxi	4.7
Columbus	3.9
Corinth	3.6
Natchez	4.4
Vicksburg	4.1
Missouri:	
Columbia	3.2
Kansas City	3.6
Springfield	3.4
St. Louis	3.2
Montana:	
Ekalaka	2.5
Havre	1.6
Helena	1.5
Kalispell	1.2
Missoula	1.3
Nebraska:	
North Platte	3.3
Omaha	3.8
Scottsbluff	3.1
Valentine	3.2
Nevada:	
Elko	1.0
Ely	1.1
Las Vegas	1.4
Reno	1.1

New Hampshire:	
Berlin	2.5
Concord	2.5
Keene	2.4
New Jersey:	
Atlantic City	2.9
Newark	3.1
Trenton	3.1
New Mexico:	
Albuquerque	2.0
Hobbs	3.0
Raton	2.5
Roswell	2.6
Silver City	1.9
New York:	
Albany	2.5
Binghamton	2.3
Buffalo	2.3
Kingston	2.7
New York	3.0
Rochester	2.2
North Carolina:	
Asheville	4.1
Charlotte	3.7
Greensboro	3.4
Wilmington	4.2
North Dakota:	
Bismarck	2.8
Devils Lake	2.9
Fargo	3.1
Williston	2.6
Ohio:	
Cincinnati	2.9
Cleveland	2.6
Columbus	2.8
Toledo	2.8
Oklahoma:	
Altus	3.7
Boise City	3.3
Durant	3.8
Oklahoma City	3.8
Oregon:	
Baker	0.9
Coos Bay	1.5
Eugene	1.3
Portland	1.2

Pennsylvania:	
Erie	2.6
Harrisburg	2.8
Philadelphia	3.1
Pittsburgh	2.6
Scranton	2.7
Rhode Island:	
Block Island	2.75
Providence	2.6
South Carolina:	
Charleston	4.3
Columbia	4.0
Greenville	4.1
South Dakota:	
Buffalo	2.8
Huron	3.3
Pierre	3.1
Rapid City	2.9
Yankton	3.6
Tennessee:	
Chattanooga	3.5
Knoxville	3.2
Memphis	3.7
Nashville	3.3
Texas:	
Abilene	3.6
Amarillo	3.5
Brownsville	4.5
Dallas	4.0
Del Rio	4.0
El Paso	2.3
Houston	4.6
Lubbock	3.3
Odessa	3.2
Pecos	3.0
San Antonio	4.2
Utah:	
Brigham City	1.2
Roosevelt	1.3
Salt Lake City	1.3
St. George	1.7
Vermont:	
Barre	2.3
Bratteboro	2.7
Burlington	2.1
Rutland	2.5

Virginia:	
Bristol	2.7
Charlottesville	2.8
Lynchburg	3.2
Norfolk	3.4
Richmond	3.3
Washington:	
Omak	1.1
Port Angeles	1.1
Seattle	1.4
Spokane	1.0
Yakima	1.1
West Virginia:	
Charleston	2.8
Morgantown	2.7
Wisconsin:	
Ashland	2.5
Eau Claire	2.9
Green Bay	2.6
La Crosse	3.1
Madison	3.0
Milwaukee	3.0
Wyoming:	
Cheyenne	2.2
Fort Bridger	1.3
Lander	1.5
New Castle	2.5
Sheridan	1.7
Yellowstone Park	1.4

a. Rainfall rates, in inches per hour, are based on a storm of 1-hour duration and a 100-year return period. The rainfall rates shown in the appendix are derived from Figures 1106.1(1) through 1106.1(5).

Appendix C: Structural Safety

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

User notes:

About this appendix: The installation of plumbing systems frequently requires piping to pass through building framing members. Appendix C provides the regulations for limits on the sizes and locations of holes that can be drilled or punched in various types of framing members.

Code development reminder: Code change proposals to sections in this appendix will be considered by the IBC—Structural Code Development Committee during the 2025 (Group B) Code Development Cycle.

Section C101: Cutting, Notching and Boring in Structural Steel Members

[BS] C101.1: Cutting, notching and boring holes in structural steel framing.

The cutting, notching and boring of holes in structural steel framing members shall be as prescribed by the registered design professional.

Appendix D: Degree Day and Design Temperatures

This appendix is informative and is not part of the code.

User notes:

About this appendix: This code refers to the 97.5 percent winter design temperature for directing the code user to requirements for design of the plumbing system. Appendix D provides such temperatures for many major cities in the United States.

Section D101: Degree Day and Design Temperature

D101.1: General.

Degree day and design temperatures for various United States cities are listed in Table D101.1.

TABLE D101.1 DEGREE DAY AND DESIGN TEMPERATURES(a) FOR CITIES IN THE UNITED STATES

STATE	STATION[b]	HEATING DEGREE DAYS (yearly total)	DESIGN TEMPERATURES			DEGREES NORTH LATITUDE[c]
			Winter	Summer		
			97 1/2%	Dry bulb 2 1/2%	Wet bulb 21/2%	
AL	Birmingham	2,551	21	94	77	33°30′
	Huntsville	3,070	16	96	77	34°40′
	Mobile	1,560	29	93	79	30°40′
	Montgomery	2,291	25	95	79	32°20′
AK	Anchorage	10,864	-18	68	59	61°10′
	Fairbanks	14,279	-47	78	62	64°50′
	Juneau	9,075	1	70	59	58°20′
	Nome	14,171	-27	62	56	64°30′
AZ	Flagstaff	7,152	4	82	60	35°10′
	Phoenix	1,765	34	107	75	33°30′
	Tucson	1,800	32	102	71	33°10′
	Yuma	974	39	109	78	32°40′
AR	Fort Smith	3,292	17	98	79	35°20′
	Little Rock	3,219	20	96	79	34°40′
	Texarkana	2,533	23	96	79	33°30′
CA	Fresno	2,611	30	100	71	36°50′
	Long Beach	1,803	43	80	69	33°50′
	Los Angeles	2,061	43	80	69	34°00′
	Los Angeles[d]	1,349	40	89	71	34°00′
	Oakland	2,870	36	80	64	37°40′
	Sacramento	2,502	32	98	71	38°30′
	San Diego	1,458	44	80	70	32°40′
	San Francisco	3,015	38	77	64	37°40′
	San Francisco[d]	3,001	40	71	62	37°50′
CO	Alamosa	8,529	-16	82	61	37°30′
	Colorado Springs	6,423	2	88	62	38°50′
	Denver	6,283	1	91	63	39°50′
	Grand Junction	5,641	7	94	63	39°10′
	Pueblo	5,462	0	95	66	38°20′
CT	Bridgeport	5,617	9	84	74	41°10′
	Hartford	6,235	7	88	75	41°50′
	New Haven	5,897	7	84	75	41°20′
DE	Wilmington	4,930	14	89	76	39°40′
DC	Washington	4,224	17	91	77	38°50′
FL	Daytona	879	35	90	79	29°10′
	Fort Myers	442	44	92	79	26°40′
	Jacksonville	1,239	32	94	79	30°30′
	Key West	108	57	90	79	24°30′
	Miami	214	47	90	79	25°50′
	Orlando	766	38	93	78	28°30′
	Pensacola	1,463	29	93	79	30°30′
	Tallahassee	1,485	30	92	78	30°20′
	Tampa	683	40	91	79	28°00′
	West Palm Beach	253	45	91	79	26°40′

GA	Athens	2,929	22	92	77	34°00′
	Atlanta	2,961	22	92	76	33°40′
	Augusta	2,397	23	95	79	33°20′
	Columbus	2,383	24	93	78	32°30′
	Macon	2,136	25	93	78	32°40′
	Rome	3,326	22	93	78	34°20′
	Savannah	1,819	27	93	79	32°10′
HI	Hilo	0	62	83	74	19°40′
	Honolulu	0	63	86	75	21°20′
ID	Boise	5,809	10	94	66	43°30′
	Lewiston	5,542	6	93	66	46°20′
	Pocatello	7,033	-1	91	63	43°00′
IL	Chicago (Midway)	6,155	0	91	75	41°50′
	Chicago (O'Hare)	6,639	-4	89	76	42°00′
	Chicago[d]	5,882	2	91	77	41°50′
	Moline	6,408	-4	91	77	41°30′
	Peoria	6,025	-4	89	76	40°40′
	Rockford	6,830	-4	89	76	42°10′
	Springfield	5,429	2	92	77	39°50′
IN	Evansville	4,435	9	93	78	38°00′
	Fort Wayne	6,205	1	89	75	41°00′
	Indianapolis	5,699	2	90	76	39°40′
	South Bend	6,439	1	89	75	41°40′
IA	Burlington	6,114	-3	91	77	40°50′
	Des Moines	6,588	-5	91	77	41°30′
	Dubuque	7,376	-7	88	75	42°20′
	Sioux City	6,951	-7	92	77	42°20′
	Waterloo	7,320	-10	89	77	42°30′
KS	Dodge City	4,986	5	97	73	37°50′
	Goodland	6,141	0	96	70	39°20′
	Topeka	5,182	4	96	78	39°00′
	Wichita	4,620	7	98	76	37°40′
KY	Covington	5,265	6	90	75	39°00′
	Lexington	4,683	8	91	76	38°00′
	Louisville	4,660	10	93	77	38°10′
LA	Alexandria	1,921	27	94	79	31°20′
	Baton Rouge	1,560	29	93	80	30°30′
	Lake Charles	1,459	31	93	79	30°10′
	New Orleans	1,385	33	92	80	30°00′
	Shreveport	2,184	25	96	79	32°30′
ME	Caribou	9,767	-13	81	69	46°50′
	Portland	7,511	-1	84	72	43°40′
MD	Baltimore	4,654	13	91	77	39°10′
	Baltimore[d]	4,111	17	89	78	39°20′
	Frederick	5,087	12	91	77	39°20′
MA	Boston	5,634	9	88	74	42°20′
	Pittsfield	7,578	-3	84	72	42°30′
	Worcester	6,969	4	84	72	42°20′

MI	Alpena	8,506	-6	85	72	45°00′
	Detroit (City)	6,232	6	88	74	42°20′
	Escanaba[d]	8,481	-7	83	71	45°40′
	Flint	7,377	1	87	74	43°00′
	Grand Rapids	6,894	5	88	74	42°50′
	Lansing	6,909	1	87	74	42°50′
	Marquette[d]	8,393	-8	81	70	46°30′
	Muskegon	6,696	6	84	73	43°10′
	Sault Ste. Marie	9,048	-8	81	70	46°30′
MN	Duluth	10,000	-16	82	70	46°50′
	Minneapolis	8,382	-12	89	5	44°50′
	Rochester	8,295	-12	87	75	44°00′
MS	Jackson	2,239	25	95	78	32°20′
	Meridian	2,289	23	95	79	32°20′
	Vicksburg[d]	2,041	26	95	80	32°20′
MO	Columbia	5,046	4	94	77	39°00′
	Kansas City	4,711	6	96	77	39°10′
	St. Joseph	5,484	2	93	79	39°50′
	St. Louis	4,900	6	94	77	38°50′
	St. Louis[d]	4,484	8	94	77	38°40′
	Springfield	4,900	9	93	77	37°10′
MT	Billings	7,049	-10	91	66	45°50′
	Great Falls	7,750	-15	88	62	47°30′
	Helena	8,129	-16	88	62	46°40′
	Missoula	8,125	-6	88	63	46°50′
NE	Grand Island	6,530	-3	94	74	41°00′
	Lincoln[d]	5,864	-2	95	77	40°50′
	Norfolk	6,979	-4	93	77	42°00′
	North Platte	6,684	-4	94	72	41°10′
	Omaha	6,612	-3	91	77	41°20′
	Scottsbluff	6,673	-3	92	68	41°50′
NV	Elko	7,433	-2	92	62	40°50′
	Ely	7,733	-4	87	59	39°10′
	Las Vegas	2,709	28	106	70	36°10′
	Reno	6,332	10	92	62	39°30′
	Winnemucca	6,761	3	94	62	40°50′
NH	Concord	7,383	-3	87	73	43°10′
NJ	Atlantic City	4,812	13	89	77	39°30′
	Newark	4,589	14	91	76	40°40′
	Trenton[d]	4,980	14	88	76	40°10′
NM	Albuquerque	4,348	16	94	65	35°00′
	Raton	6,228	1	89	64	36°50′
	Roswell	3,793	18	98	70	33°20′
	Silver City	3,705	10	94	64	32°40′

NY	Albany	6,875	-1	88	74	42°50′
	Albany[d]	6,201	1	88	74	42°50′
	Binghamton	7,286	1	83	72	42°10′
	Buffalo	7,062	6	85	73	43°00′
	NY (Central Park)[d]	4,871	15	89	75	40°50′
	NY (Kennedy)	5,219	15	87	75	40°40′
	NY(LaGuardia)	4,811	15	89	75	40°50′
	Rochester	6,748	5	88	73	43°10′
	Schenectady[d]	6,650	1	87	74	42°50′
	Syracuse	6,756	2	87	73	43°10′
NC	Charlotte	3,181	22	93	76	35°10′
	Greensboro	3,805	18	91	76	36°10′
	Raleigh	3,393	20	92	77	35°50′
	Winston-Salem	3,595	20	91	75	36°10′
ND	Bismarck	8,851	-19	91	71	46°50′
	Devils Lake[d]	9,901	-21	88	71	48°10′
	Fargo	9,226	-18	89	74	46°50′
	Williston	9,243	-21	88	70	48°10′
OH	Akron-Canton	6,037	6	86	73	41°00′
	Cincinnati[d]	4,410	6	90	75	39°10′
	Cleveland	6,351	5	88	74	41°20′
	Columbus	5,660	5	90	75	40°00′
	Dayton	5,622	4	89	75	39°50′
	Mansfield	6,403	5	87	74	40°50′
	Sandusky[d]	5,796	6	91	74	41°30′
	Toledo	6,494	1	88	75	41°40′
	Youngstown	6,417	4	86	73	41°20′
OK	Oklahoma City	3,725	13	97	77	35°20′
	Tulsa	3,860	13	98	78	36°10′
OR	Eugene	4,726	22	89	67	44°10′
	Medford	5,008	23	94	68	42°20′
	Portland	4,635	23	85	67	45°40′
	Portland[d]	4,109	24	86	67	45°30′
	Salem	4,754	23	88	68	45°00′
PA	Allentown	5,810	9	88	75	40°40′
	Erie	6,451	9	85	74	42°10′
	Harrisburg	5,251	11	91	76	40°10′
	Philadelphia	5,144	14	90	76	39°50′
	Pittsburgh	5,987	5	86	73	40°30′
	Pittsburgh[d]	5,053	7	88	73	40°30′
	Reading[d]	4,945	13	89	75	40°20′
	Scranton	6,254	5	87	73	41°20′
	Williamsport	5,934	7	89	74	41°10′
RI	Providence	5,954	9	86	74	41°40′
SC	Charleston	2,033	27	91	80	32°50′
	Charleston[d]	1,794	28	92	80	32°50′
	Columbia	2,484	24	95	78	34°00′
SD	Huron	8,223	-14	93	75	44°30′
	Rapid City	7,345	-7	92	69	44°00′
	Sioux Falls	7,839	-11	91	75	43°40′

TN	Bristol	4,143	14	89	75	36°30′
	Chattanooga	3,254	18	93	77	35°00′
	Knoxville	3,494	19	92	76	35°50′
	Memphis	3,232	18	95	79	35°00′
	Nashville	3,578	14	94	77	36°10′
TX	Abilene	2,624	20	99	74	32°30′
	Austin	1,711	28	96	77	30°20′
	Dallas	2,363	22	100	78	32°50′
	El Paso	2,700	24	96	68	31°50′
	Houston	1,396	32	94	79	29°40′
	Midland	2,591	21	96	72	32°00′
	San Angelo	2,255	22	99	74	31°20′
	San Antonio	1,546	30	97	76	29°30′
	Waco	2,030	26	99	78	31°40′
	Wichita Falls	2,832	18	101	76	34°00′
UT	Salt Lake City	6,052	8	95	65	40°50′
VT	Burlington	8,269	-7	85	72	44°30′
VA	Lynchburg	4,166	16	90	76	37°20′
	Norfolk	3,421	22	91	78	36°50′
	Richmond	3,865	17	92	78	37°30′
	Roanoke	4,150	16	91	74	37°20′
WA	Olympia	5,236	22	83	66	47°00′
	Seattle-Tacoma	5,145	26	80	64	47°30′
	Seattle[d]	4,424	27	82	67	47°40′
	Spokane	6,655	2	90	64	47°40′
WV	Charleston	4,476	11	90	75	38°20′
	Elkins	5,675	6	84	72	38°50′
	Huntington	4,446	10	91	77	38°20′
	Parkersburg[d]	4,754	11	90	76	39°20′
WI	Green Bay	8,029	-9	85	74	44°30′
	La Crosse	7,589	-9	88	75	43°50′
	Madison	7,863	-7	88	75	43°10′
	Milwaukee	7,635	-4	87	74	43°00′
WY	Casper	7,410	-5	90	61	42°50′
	Cheyenne	7,381	-1	86	62	41°10′
	Lander	7,870	-11	88	63	42°50′
	Sheridan	7,680	-8	91	65	44°50′

a. All data were extracted from the 1985 ASHRAE Handbook—Fundamentals.
b. Design data developed from airport temperature observations unless noted.
c. Latitude is given to the nearest 10 minutes. For example, the latitude for Miami, Florida, is given as 25°50′, or 25 degrees 50 minutes.
d. Design data developed from office locations within an urban area, not from airport temperature observations.

Appendix E: Sizing of Water Piping System

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

User notes:

About this appendix: The sizing of water service and water distribution piping is not specified in Chapter 6 as it is left up to the designer of the system with the code official approving the design method. Appendix E provides several methods that could be used by a system designer.

Code development reminder: Code change proposals to sections in this appendix will be considered by the IPC Code Development Committee during the 2024 (Group A) Code Development Cycle.

Section E101: General

E101.1: Scope.

E101.1.1: Two procedures.

This appendix outlines two procedures for sizing a water piping system (see Sections E103.3 and E104.1). The design procedures are based on the minimum static pressure available from the supply source, the head changes in the system caused by friction and elevation, and the rates of flow necessary for operation of various fixtures.

E101.1.2: Variable conditions.

Because of the variable conditions encountered in hydraulic design, it is impractical to specify definite and detailed rules for sizing of the water piping system. Accordingly, other sizing or design methods conforming to good engineering practice standards are acceptable alternatives to those presented herein.

Section E102: Information Required

E102.1: Preliminary.

Obtain the necessary information regarding the minimum daily static service pressure in the area where the building is to be located. If the building supply is to be metered, obtain information regarding friction loss relative to the rate of flow for meters in the range of sizes likely to be used. Friction loss data can be obtained from most manufacturers of water meters.

E102.2: Demand load.

E102.2.1: Fixture demand.

Estimate the supply demand of the building main and the principal branches and risers of the system by totaling the corresponding demand from the applicable part of Table E103.3(3).

E102.2.2: Continuous demand.

Estimate continuous supply demands in gallons per minute (L/m) for items such as lawn sprinklers and air conditioners, and add the sum to the total demand for fixtures. The result is the estimated supply demand for the building supply.

Section E103: Selection of Pipe Size

E103.1: General.

Decide from Table 604.3 what is the desirable minimum residual pressure that should be maintained at the highest fixture in the supply system. If the highest group of fixtures contains flushometer valves, the pressure for the group should be not less than 15 pounds per square inch (psi) (103.4 kPa) flowing. For flush tank supplies, the available pressure should be not less than 8 psi (55.2 kPa) flowing, except blowout action fixtures must be not less than 25 psi (172.4 kPa) flowing.

E103.2: Pipe sizing.

E103.2.1: Pipe size selection.

Pipe sizes can be selected according to the following procedure or by other design methods conforming to acceptable engineering practice and approved by the administrative authority. The sizes selected must not be less than the minimum required by this code.

E103.2.2: Pressures and losses.

Water pipe sizing procedures are based on a system of pressure requirements and losses, the sum of which must not exceed the minimum pressure available at the supply source. These pressures are as follows:

1. Pressure required at fixture to produce required flow. See Sections 604.3 and 604.5.
2. Static pressure loss or gain (due to head) is computed at 0.433 psi per foot (9.8 kPa/m) of elevation change.

   Example: Assume that the highest fixture supply outlet is 20 feet (6096 mm) above or below the supply source. This produces a static pressure differential of 20 feet by 0.433 psi/foot (2096 mm by 9.8 kPa/m) and an 8.66 psi (59.8 kPa) loss.
3. Loss through water meter. The friction or pressure loss can be obtained from meter manufacturers.
4. Loss through taps in water main.
5. Losses through special devices such as filters, softeners, backflow prevention devices and pressure regulators. These values must be obtained from the manufacturers.

6. Loss through valves and fittings. Losses for these items are calculated by converting to equivalent length of piping and adding to the total pipe length.
7. Loss due to pipe friction can be calculated where the pipe size, the pipe length and the flow through the pipe are known. With these three items, the friction loss can be determined. For piping flow charts not included, use manufacturers' tables and velocity recommendations.
8. For the purposes of all examples, the following metric conversions are applicable:

    1 cubic foot per minute = 0.4719 L/s

    1 square foot = 0.0929 m2

    1 degree = 0.0175 rad

    1 pound per square inch = 6.895 kPa

    1 inch = 25.4 mm

    1 foot = 304.8 mm

    1 gallon per minute = 3.785 L/m

E103.3: Segmented loss method.

The size of water service mains, branch mains and risers by the segmented loss method must be determined according to water supply demand [GPM (L/m)], available water pressure [psi (kPa)] and friction loss caused by the water meter and developed length of pipe [feet (m)], including equivalent length of fittings. The design procedure is based on the following parameters:

- Calculated friction loss through each length of the pipe.
- A system of pressure losses, the sum of which must not exceed the minimum pressure available at the street main or other source of supply.
- The estimated peak demand, total pressure losses caused by difference in elevation, equipment, developed length and pressure required at most remote fixture, loss through taps in water main, losses through fittings, filters, backflow prevention devices, valves and pipe friction.

Because of the variable conditions encountered in hydraulic design, it is impractical to specify definite and detailed rules for sizing of the water piping system. Current sizing methods do not address the differences in the probability of use and flow characteristics of fixtures between types of occupancies. Creating an exact model of predicting the demand for a building is impossible and final studies assessing the impact of water conservation on demand are not yet complete. The following steps are necessary for the segmented loss method.

1. **Preliminary.** Obtain the necessary information regarding the minimum daily static service pressure in the area where the building is to be located. If the building supply is to be metered, obtain information regarding friction loss relative to the rate of flow for meters in the range of sizes to be used. Friction loss data can be obtained from manufacturers of water meters. It is essential that enough pressure be available to overcome all system losses caused by friction and elevation so that plumbing fixtures operate properly. Section 604.6 requires the water distribution system to be designed for the minimum pressure

available taking into consideration pressure fluctuations. The lowest pressure must be selected to guarantee a continuous, adequate supply of water. The lowest pressure in the public main usually occurs in the summer because of lawn sprinkling and supplying water for air-conditioning cooling towers. Future demands placed on the public main as a result of large growth or expansion should be considered. The available pressure will decrease as additional loads are placed on the public system.

2. **Demand load.** Estimate the supply demand of the building main and the principal branches and risers of the system by totaling the corresponding demand from the applicable part of Table E103.3(3). When estimating peak demand sizing methods typically use water supply fixture units (w.s.f.u.) [see Table E103.3(2)]. This numerical factor measures the load-producing effect of a single plumbing fixture of a given kind. The use of such fixture units can be applied to a single basic probability curve (or table), found in the various sizing methods [Table E103.3(3)]. The fixture units are then converted into gallons per minute (L/m) flow rate for estimating demand.

    2.1. Estimate continuous supply demand in gallons per minute (L/m) for items such as lawn sprinklers and air conditioners, and add the sum to the total demand for fixtures. The result is the estimated supply demand for the building supply. Fixture units cannot be applied to constant use fixtures such as hose bibbs, lawn sprinklers and air conditioners. These types of fixtures must be assigned the gallon per minute (L/m) value.

3. **Selection of pipe size.** This water pipe sizing procedure is based on a system of pressure requirements and losses, the sum of which must not exceed the minimum pressure available at the supply source. These pressures are as follows:

    3.1. Pressure required at the fixture to produce required flow. See Sections 604.3 and 604.5.

    3.2. Static pressure loss or gain (because of head) is computed at 0.433 psi per foot (9.8 kPa/m) of elevation change.

    3.3. Loss through a water meter. The friction or pressure loss can be obtained from the manufacturer.

    3.4. Loss through taps in water main [see Table E103.3(4)].

    3.5. Losses through special devices such as filters, softeners, backflow prevention devices and pressure regulators. These values must be obtained from the manufacturers.

    3.6. Loss through valves and fittings [see Tables E103.3(5) and E103.3(6)]. Losses for these items are calculated by converting to equivalent length of piping and adding to the total pipe length.

    3.7. Loss caused by pipe friction can be calculated where the pipe size, the pipe length and the flow through the pipe are known. With these three items, the friction loss can be determined using Figures E103.3(2) through E103.3(7). When using charts, use pipe inside diameters. For piping flow charts not included, use manufacturers' tables and

velocity recommendations. Before attempting to size any water supply system, it is necessary to gather preliminary information that includes available pressure, piping material, select design velocity, elevation differences and developed length to most remote fixture. The water supply system is divided into sections at major changes in elevation or where branches lead to fixture groups. The peak demand must be determined in each part of the hot and cold water supply system that includes the corresponding water supply fixture unit and conversion to gallons per minute (L/m) flow rate to be expected through each section. Sizing methods require the determination of the “most hydraulically remote” fixture to compute the pressure loss caused by pipe and fittings. The hydraulically remote fixture represents the most downstream fixture along the circuit of piping requiring the most available pressure to operate properly. Consideration must be given to all pressure demands and losses, such as friction caused by pipe, fittings and equipment, elevation and the residual pressure required by Table 604.3. The two most common and frequent complaints about the water supply system operation are lack of adequate pressure and noise.

TABLE E103.3(1) RECOMMENDED TABULAR ARRANGEMENT FOR USE IN SOLVING PIPE SIZING PROBLEMS

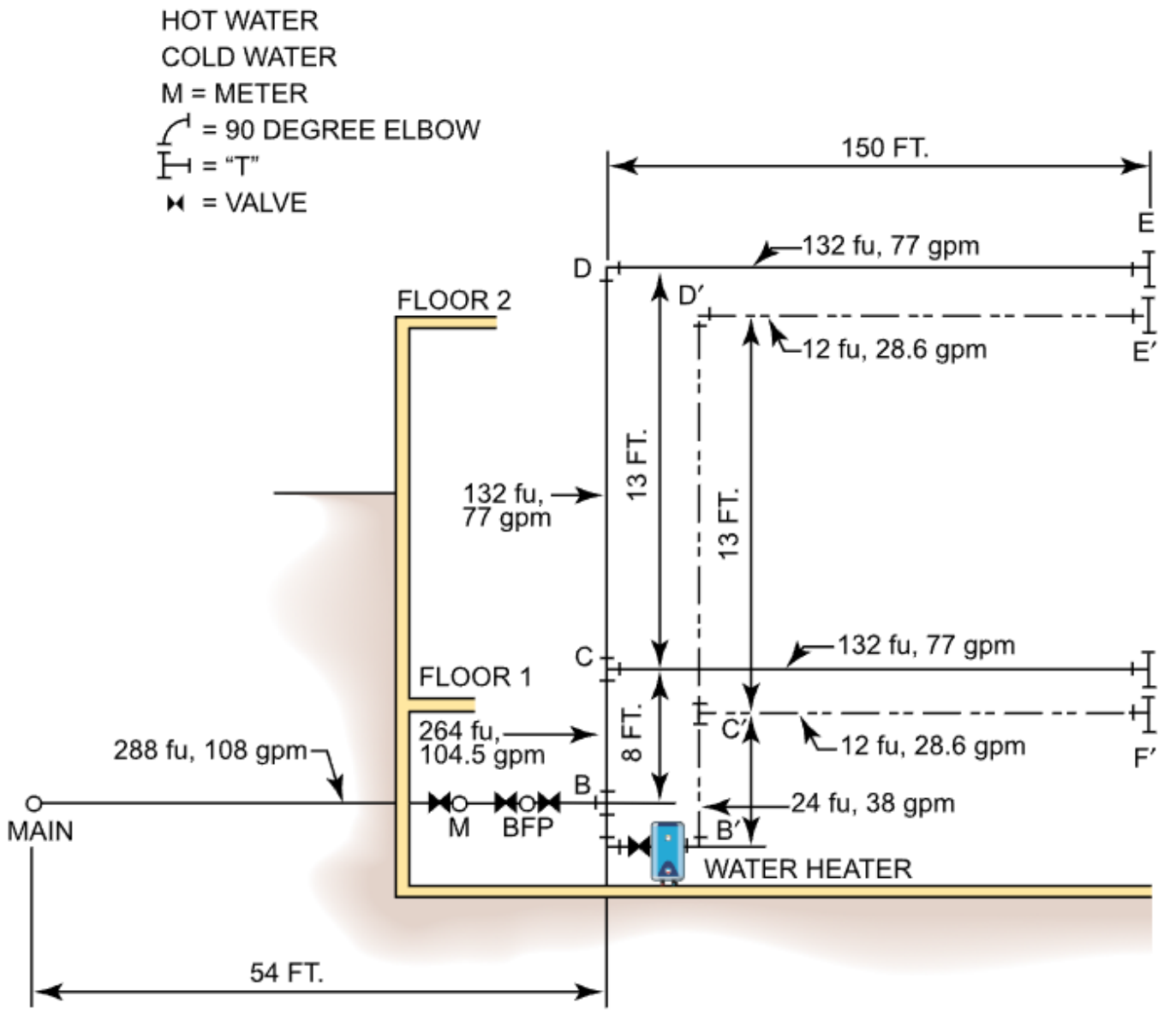
COLUMN	1		2	3	4	5	6	7	8	9	10
Line	Description		Lb per square inch (psi)	Gal. per min through section	Length of section (feet)	Trial pipe size (inches)	Equivalent length of fittings and valves (feet)	Total equivalent length col. 4 and col. 6 (100 feet)	Friction loss per 100 feet of trial size pipe (psi)	Friction loss in equivalent length col. 8 × col. 7 (psi)	Excess pressure over friction losses (psi)
A	Service and cold water distribution piping[a]	Minimum pressure available at main	55.00	—	—	—	—	—	—	—	—
B		Highest pressure required at a fixture (Table 604.3)	15.00	—	—	—	—	—	—	—	—
C		Meter loss 2" meter	11.00	—	—	—	—	—	—	—	—
D		Tap in main loss 2" tap [Table E103.3(4)]	1.61	—	—	—	—	—	—	—	—
E		Static head loss 21 × 43 psi	9.03	—	—	—	—	—	—	—	—
F		Special fixture loss backflow preventer	9.00	—	—	—	—	—	—	—	—
G		Special fixture loss—Filter	0.00	—	—	—	—	—	—	—	—
H		Special fixture loss—Other	0.00	—	—	—	—	—	—	—	—
I		Total overall losses and requirements (Sum of Lines B through H)	45.64	—	—	—	—	—	—	—	—
J		Pressure available to overcome pipe friction (Line A minus Lines B to H)	9.36	—	—	—	—	—	—	—	—
	Pipe section (from diagram) Cold water distribution piping	FU	264	—	—	—	—	—	—	—	—
		AB	288	108.0	54	2 1/2	15.00	0.69	3.2	2.21	—
		BC	264	104.5	8	2 1/2	0.5	0.20	1.9	0.26	—
		CD	132	77.0	13	2 1/2	7.00	0.20	1.9	0.38	—
		CF[b]	132	77.0	150	2 1/2	12.00	1.62	1.9	3.08	—
		DE[b]	132	77.0	150	2 1/2	12.00	1.62	1.9	3.08	—
K	Total pipe friction losses (cold)			—	—	—	—	—	—	5.93	—
L	Difference (Line J minus Line K)			—	—	—	—	—	—	—	3.43

COLUMN	1		2	3	4	5	6	7	8	9	10
Line	Description		Lb per square inch (psi)	Gal. per min through section	Length of section (feet)	Trial pipe size (inches)	Equivalent length of fittings and valves (feet)	Total equivalent length col. 4 and col. 6 (100 feet)	Friction loss per 100 feet of trial size pipe (psi)	Friction loss in equivalent length col. 8 × col. 7 (psi)	Excess pressure over friction losses (psi)
L	Difference (Line J minus Line K)			—	—	—	—	—	—	—	3.43
	Pipe section (from diagram)	A'B'	288	108.0	54	2 1/2	12.00	0.69	3.3	2.21	—
		B'C'	24	38.0	8	2	7.5	0.16	1.4	0.22	—
		C'D'	12	28.6	13	1 1/2	4.0	0.17	3.2	0.54	—
	Hot water distribution piping	C'F' [b]	12	28.6	150	1 1/2	7.00	1.57	3.2	5.02	—
		D'E' [b]	12	28.6	150	1 1/2	7.00	1.57	3.2	5.02	—
K	Total pipe friction losses (hot)			—	—	—	—	—	—	7.99	—
L	Difference (Line J minus Line K)			—	—	—	—	—	—	—	1.37

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psi = 6.895 kPa, 1 gpm = 3.785 L/m.

a. To be considered as pressure gain for fixtures below main (to consider separately, omit from "I" and add to "J").
b. To consider separately, in K use C-F only if greater loss than above.

Figure E103.3(1) EXAMPLE—SIZING



For SI: 1 foot = 304.8 mm, 1 gpm = 3.785 L/m.

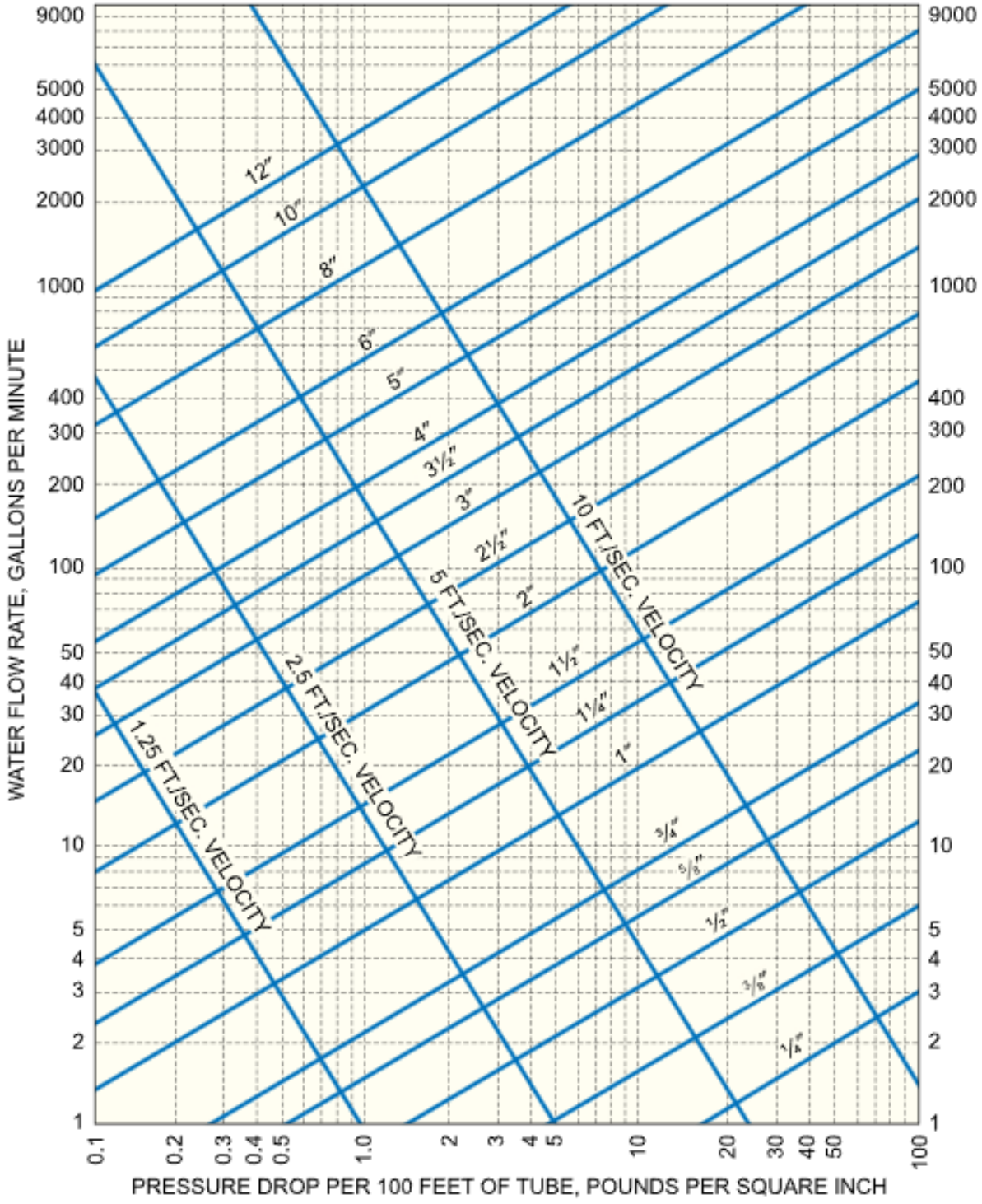
TABLE E103.3(2) LOAD VALUES ASSIGNED TO FIXTURES[a]

FIXTURE	OCCUPANCY	TYPE OF SUPPLY CONTROL	LOAD VALUES, IN WATER SUPPLY FIXTURE UNITS (wsfu)		
			Cold	Hot	Total
Bathroom group	Private	Flush tank	2.7	1.5	3.6
Bathroom group	Private	Flushometer valve	6.0	3.0	8.0
Bathtub	Private	Faucet	1.0	1.0	1.4
Bathtub	Public	Faucet	3.0	3.0	4.0
Bidet	Private	Faucet	1.5	1.5	2.0
Combination fixture	Private	Faucet	2.25	2.25	3.0
Dishwashing machine	Private	Automatic	—	1.4	1.4
Drinking fountain	Offices, etc.	3/8" valve	0.25	—	0.25
Kitchen sink	Private	Faucet	1.0	1.0	1.4
Kitchen sink	Hotel, restaurant	Faucet	3.0	3.0	4.0
Laundry trays (1 to 3)	Private	Faucet	1.0	1.0	1.4
Lavatory	Private	Faucet	0.5	0.5	0.7
Lavatory	Public	Faucet	1.5	1.5	2.0
Service sink	Offices, etc.	Faucet	2.25	2.25	3.0
Shower head	Public	Mixing valve	3.0	3.0	4.0
Shower head	Private	Mixing valve	1.0	1.0	1.4
Urinal	Public	1" flushometer valve	10.0	—	10.0
Urinal	Public	3/4" flushometer valve	5.0	—	5.0
Urinal	Public	Flush tank	3.0	—	3.0
Washing machine (8 lb)	Private	Automatic	1.0	1.0	1.4
Washing machine (8 lb)	Public	Automatic	2.25	2.25	3.0
Washing machine (15 lb)	Public	Automatic	3.0	3.0	4.0
Water closet	Private	Flushometer valve	6.0	—	6.0
Water closet	Private	Flush tank	2.2	—	2.2
Water closet	Public	Flushometer valve	10.0	—	10.0
Water closet	Public	Flush tank	5.0	—	5.0
Water closet	Public or private	Flushometer tank	2.0	—	2.0

For SI: 1 inch = 25.4 mm, 1 pound = 0.454 kg.

a. For fixtures not listed, loads should be assumed by comparing the fixture to one listed using water in similar quantities and at similar rates. The assigned loads for fixtures with both hot and cold water supplies are given for separate hot and cold water loads and for total load. The separate hot and cold water loads being three-fourths of the total load for the fixture in each case.

Figure E103.3(2) FRICTION LOSS IN SMOOTH PIPE(a) (TYPE L, ASTM B88 COPPER TUBING)



Note: Fluid velocities in excess of 5 to 8 feet/second are not usually recommended. For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gpm = 3.785 L/m, 1 psi = 6.895 kPa, 1 foot per second = 0.305 m/s.

This chart applies to smooth new copper tubing with recessed (streamline) soldered joints and to the actual sizes of types indicated on the diagram.

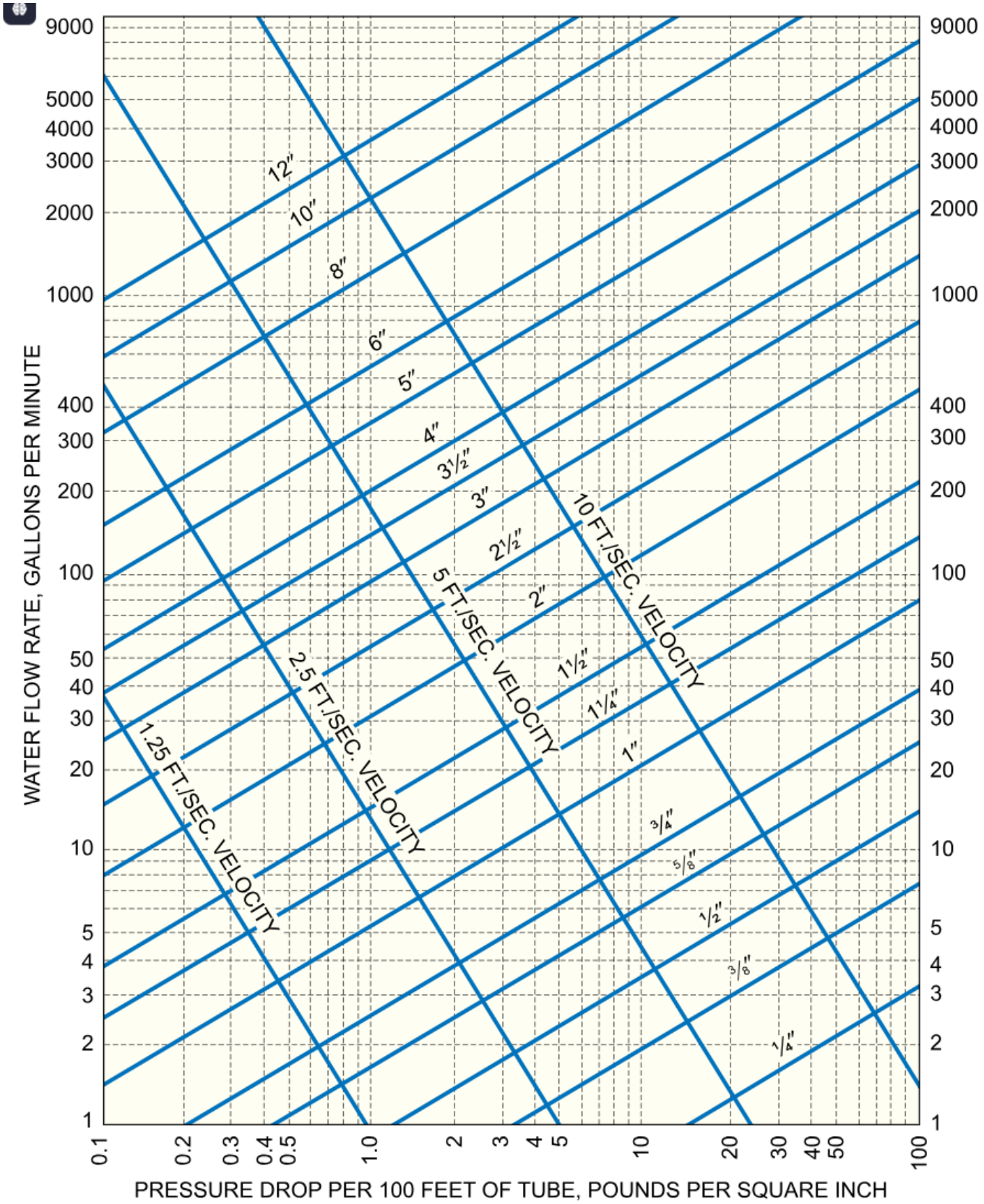
TABLE E103.3(3) TABLE FOR ESTIMATING DEMAND

SUPPLY SYSTEMS PREDOMINANTLY FOR FLUSH TANKS			SUPPLY SYSTEMS PREDOMINANTLY FOR FLUSHOMETER VALVES		
Load	Demand		Load	Demand	
(Water supply fixture units)	(Gallons per minute)	(Cubic feet per minute)	(Water supply fixture units)	(Gallons per minute)	(Cubic feet per minute)
1	3.0	0.04104	—	—	—
2	5.0	0.0684	—	—	—
3	6.5	0.86892	—	—	—
4	8.0	1.06944	—	—	—
5	9.4	1.256592	5	15.0	2.0052
6	10.7	1.430376	6	17.4	2.326032
7	11.8	1.577424	7	19.8	2.646364
8	12.8	1.711104	8	22.2	2.967696
9	13.7	1.831416	9	24.6	3.288528
10	14.6	1.951728	10	27.0	3.60936
11	15.4	2.058672	11	27.8	3.716304
12	16.0	2.13888	12	28.6	3.823248
13	16.5	2.20572	13	29.4	3.930192
14	17.0	2.27256	14	30.2	4.037136
15	17.5	2.3394	15	31.0	4.14408
16	18.0	2.90624	16	31.8	4.241024
17	18.4	2.459712	17	32.6	4.357968
18	18.8	2.513184	18	33.4	4.464912
19	19.2	2.566656	19	34.2	4.571856
20	19.6	2.620128	20	35.0	4.6788
25	21.5	2.87412	25	38.0	5.07984
30	23.3	3.114744	30	42.0	5.61356
35	24.9	3.328632	35	44.0	5.88192
40	26.3	3.515784	40	46.0	6.14928
45	27.7	3.702936	45	48.0	6.41664
50	29.1	3.890088	50	50.0	6.684
60	32.0	4.27776	60	54.0	7.21872
70	35.0	4.6788	70	58.0	7.75344
80	38.0	5.07984	80	61.2	8.181216
90	41.0	5.48088	90	64.3	8.595624
100	43.5	5.81508	100	67.5	9.0234
120	48.0	6.41664	120	73.0	9.75864
140	52.5	7.0182	140	77.0	10.29336
160	57.0	7.61976	160	81.0	10.82808
180	61.0	8.15448	180	85.5	11.42964
200	65.0	8.6892	200	90.0	12.0312
225	70.0	9.3576	225	95.5	12.76644
250	75.0	10.026	250	101.0	13.50168
275	80.0	10.6944	275	104.5	13.96956
300	85.0	11.3628	300	108.0	14.43744
400	105.0	14.0364	400	127.0	16.97736
500	124.0	16.57632	500	143.0	19.11624
750	170.0	22.7256	750	177.0	23.66136
1,000	208.0	27.80544	1,000	208.0	27.80544

SUPPLY SYSTEMS PREDOMINANTLY FOR FLUSH TANKS			SUPPLY SYSTEMS PREDOMINANTLY FOR FLUSHOMETER VALVES		
Load	Demand		Load	Demand	
(Water supply fixture units)	(Gallons per minute)	(Cubic feet per minute)	(Water supply fixture units)	(Gallons per minute)	(Cubic feet per minute)
1,000	208.0	27.80544	1,000	208.0	27.80544
1,250	239.0	31.94952	1,250	239.0	31.94952
1,500	269.0	35.95992	1,500	269.0	35.95992
1,750	297.0	39.70296	1,750	297.0	39.70296
2,000	325.0	43.446	2,000	325.0	43.446
2,500	380.0	50.7984	2,500	380.0	50.7984
3,000	433.0	57.88344	3,000	433.0	57.88344
4,000	525.0	70.182	4,000	525.0	70.182
5,000	593.0	79.27224	5,000	593.0	79.27224

For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/m, 1 cubic foot per minute = 0.28 m^3 per minute.

Figure E103.3(3) FRICTION LOSS IN SMOOTH PIPE(a) (TYPE L, ASTM B88 COPPER TUBING)



Note: Fluid velocities in excess of 5 to 8 feet/second are not usually recommended. For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gpm = 3.785 L/m, 1 psi = 6.895 kPa, 1 foot per second = 0.305 m/s.

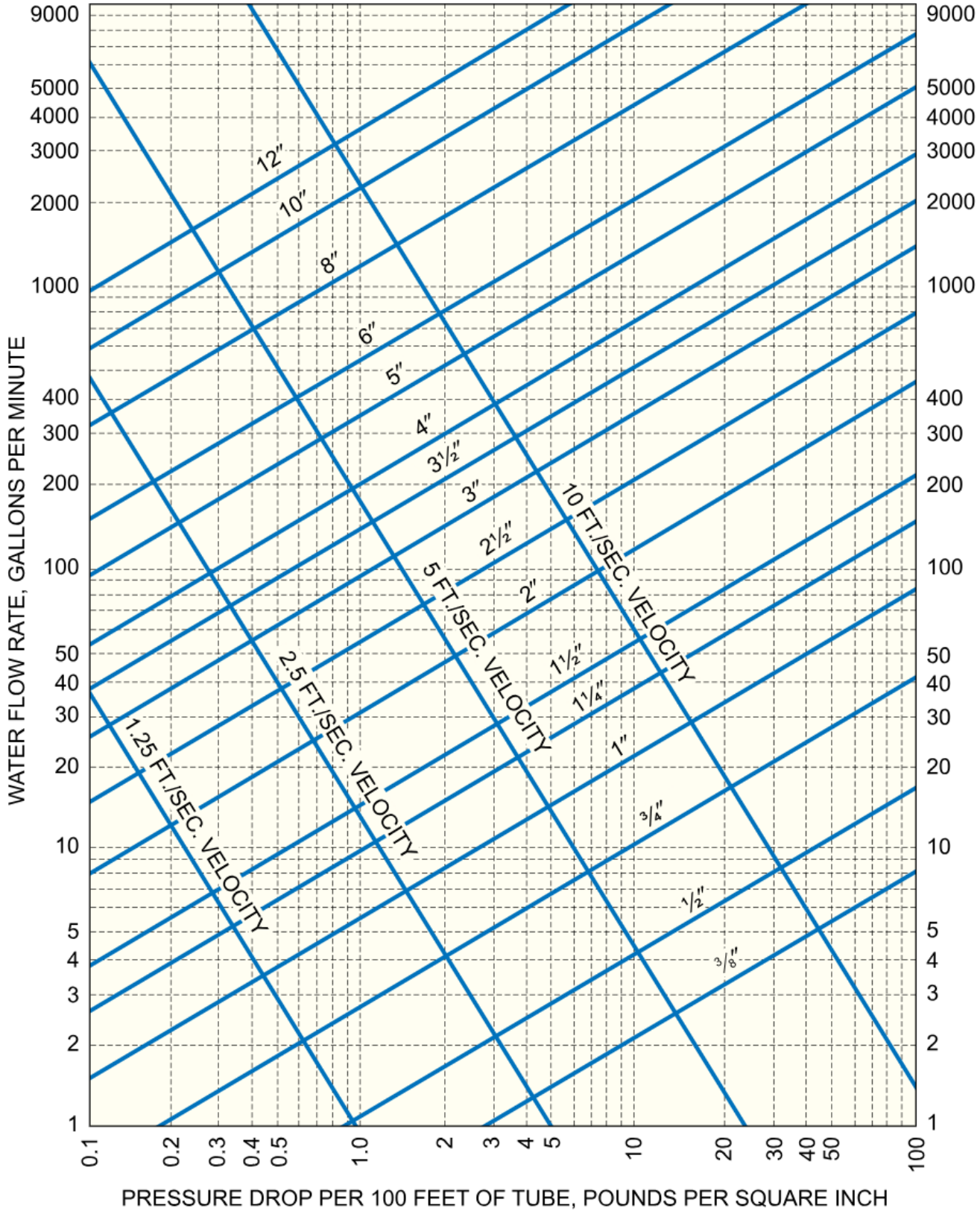
a. This chart applies to smooth new copper tubing with recessed (streamline) soldered joints and to the actual sizes of types indicated on the diagram.

TABLE E103.3(4) LOSS OF PRESSURE THROUGH TAPS AND TEES IN POUNDS PER SQUARE INCH (psi)

GALLONS PER MINUTE	SIZE OF TAP OR TEE (inches)						
	5/8	3/4	1	1 1/4	1 1/2	2	3
10	1.35	0.64	0.18	0.08	—	—	—
20	5.38	2.54	0.77	0.31	0.14	—	—
30	12.10	5.72	1.62	0.69	0.33	0.10	—
40	—	10.20	3.07	1.23	0.58	0.18	—
50	—	15.90	4.49	1.92	0.91	0.28	—
60	—	—	6.46	2.76	1.31	0.40	—
70	—	—	8.79	3.76	1.78	0.55	0.10
80	—	—	11.50	4.90	2.32	0.72	0.13
90	—	—	14.50	6.21	2.94	0.91	0.16
100	—	—	17.94	7.67	3.63	1.12	0.21
120	—	—	25.80	11.00	5.23	1.61	0.30
140	—	—	35.20	15.00	7.12	2.20	0.41
150	—	—	—	17.20	8.16	2.52	0.47
160	—	—	—	19.60	9.30	2.92	0.54
180	—	—	—	24.80	11.80	3.62	0.68
200	—	—	—	30.70	14.50	4.48	0.84
225	—	—	—	38.80	18.40	5.60	1.06
250	—	—	—	47.90	22.70	7.00	1.31
275	—	—	—	—	27.40	7.70	1.59
300	—	—	—	—	32.60	10.10	1.88

For SI: 1 inch = 25.4 mm, 1 pound per square inch = 6.895 kPa, 1 gallon per minute = 3.785 L/m.

Figure E103.3(4) FRICTION LOSS IN SMOOTH PIPEa(TYPE M, ASTM B88 COPPER TUBING)



Note: Fluid velocities in excess of 5 to 8 feet/second are not usually recommended. For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gpm = 3.785 L/m, 1 psi = 6.895 kPa, 1 foot per second = 0.305 m/s.

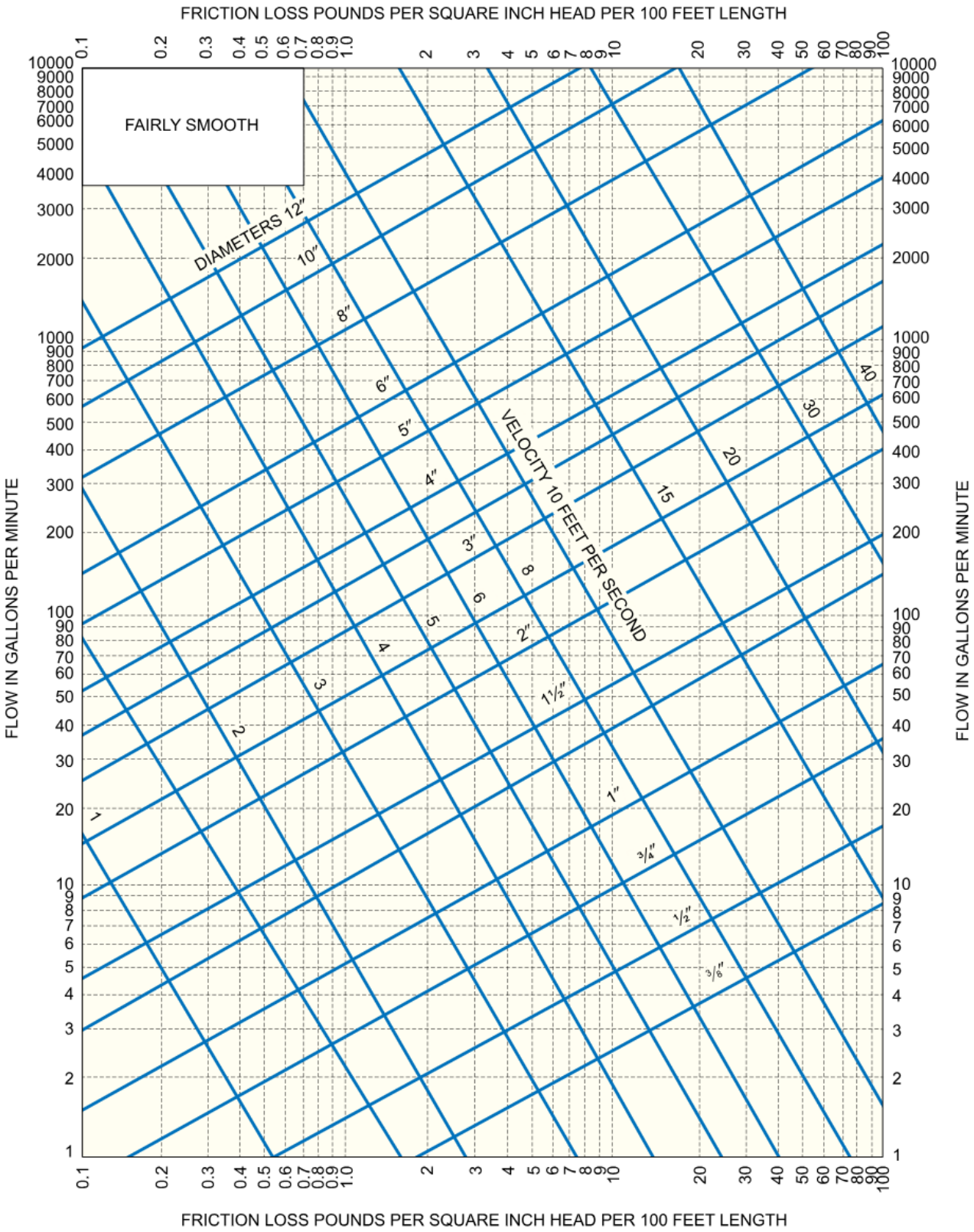
This chart applies to smooth new copper tubing with recessed (streamline) soldered joints and to the actual sizes of types indicated on the diagram.

TABLE E103.3(5) ALLOWANCE IN EQUIVALENT LENGTHS OF PIPE FOR FRICTION LOSS IN VALVES AND THREADED FITTINGS (feet)

FITTING OR VALVE	PIPE SIZE (inches)							
	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
45-degree elbow	1.2	1.5	1.8	2.4	3.0	4.0	5.0	6.0
90-degree elbow	2.0	2.5	3.0	4.0	5.0	7.0	8.0	10.0
Tee, run	0.6	0.8	0.9	1.2	1.5	2.0	2.5	3.0
Tee, branch	3.0	4.0	5.0	6.0	7.0	10.0	12.0	15.0
Gate valve	0.4	0.5	0.6	0.8	1.0	1.3	1.6	2.0
Balancing valve	0.8	1.1	1.5	1.9	2.2	3.0	3.7	4.5
Plug-type cock	0.8	1.1	1.5	1.9	2.2	3.0	3.7	4.5
Check valve, swing	5.6	8.4	11.2	14.0	16.8	22.4	28.0	33.6
Globe valve	15.0	20.0	25.0	35.0	45.0	55.0	65.0	80.0
Angle valve	8.0	12.0	15.0	18.0	22.0	28.0	34.0	40.0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

Figure E103.3(5) FRICTION LOSS IN FAIRLY SMOOTH PIPE(a)



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gpm = 3.785 L/m, 1 psi = 6.895 kPa, 1 foot per second = 0.305 m/s.

This chart applies to smooth new steel (fairly smooth) pipe and to actual diameters of standard-weight pipe.

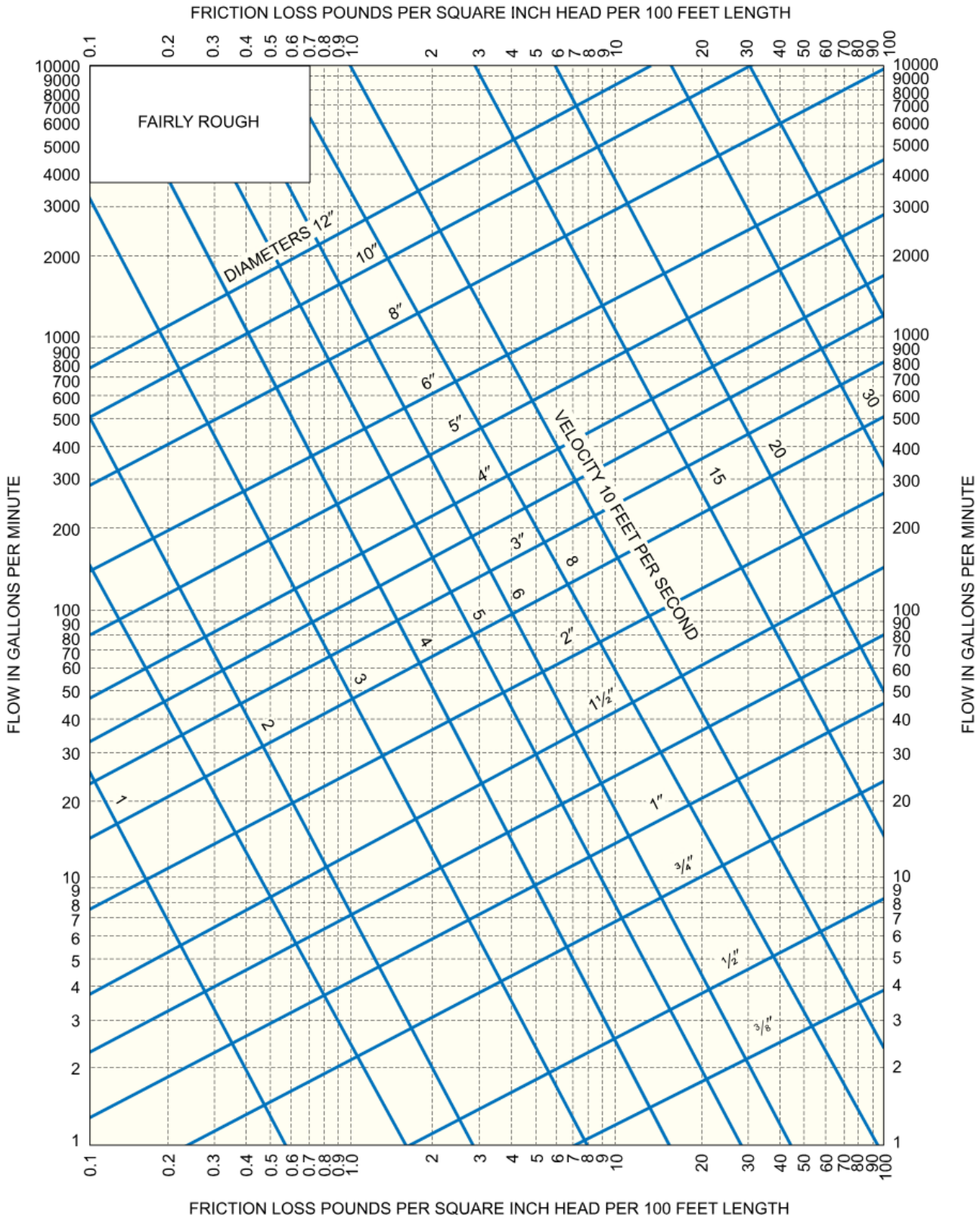
TABLE E103.3(6) PRESSURE LOSS IN FITTINGS AND VALVES EXPRESSED AS EQUIVALENT LENGTH OF TUBE[a] (feet)

NOMINAL OR STANDARD SIZE (inches)	FITTINGS				Coupling	VALVES			
	Standard Ell		90-Degree Tee			Ball	Gate	Butterfly	Check
	90 Degree	45 Degree	Side Branch	Straight Run					
3/8	0.5	—	1.5	—	—	—	—	—	1.5
1/2	1	0.5	2	—	—	—	—	—	2
5/8	1.5	0.5	2	—	—	—	—	—	2.5
3/4	2	0.5	3	—	—	—	—	—	3
1	2.5	1	4.5	—	—	0.5	—	—	4.5
1 1/4	3	1	5.5	0.5	0.5	0.5	—	—	5.5
1 1/2	4	1.5	7	0.5	0.5	0.5	—	—	6.5
2	5.5	2	9	0.5	0.5	0.5	0.5	7.5	9
2 1/2	7	2.5	12	0.5	0.5	—	1	10	11.5
3	9	3.5	15	1	1	—	1.5	15.5	14.5
3 1/2	9	3.5	14	1	1	—	2	—	12.5
4	12.5	5	21	1	1	—	2	16	18.5
5	16	6	27	1.5	1.5	—	3	11.5	23.5
6	19	7	34	2	2	—	3.5	13.5	26.5
8	29	11	50	3	3	—	5	12.5	39

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

a. Allowances are for streamlined soldered fittings and recessed threaded fittings. For threaded fittings, double the allowances shown in the table. The equivalent lengths presented above are based on a C factor of 150 in the Hazen-Williams friction loss formula. The lengths shown are rounded to the nearest half-foot.

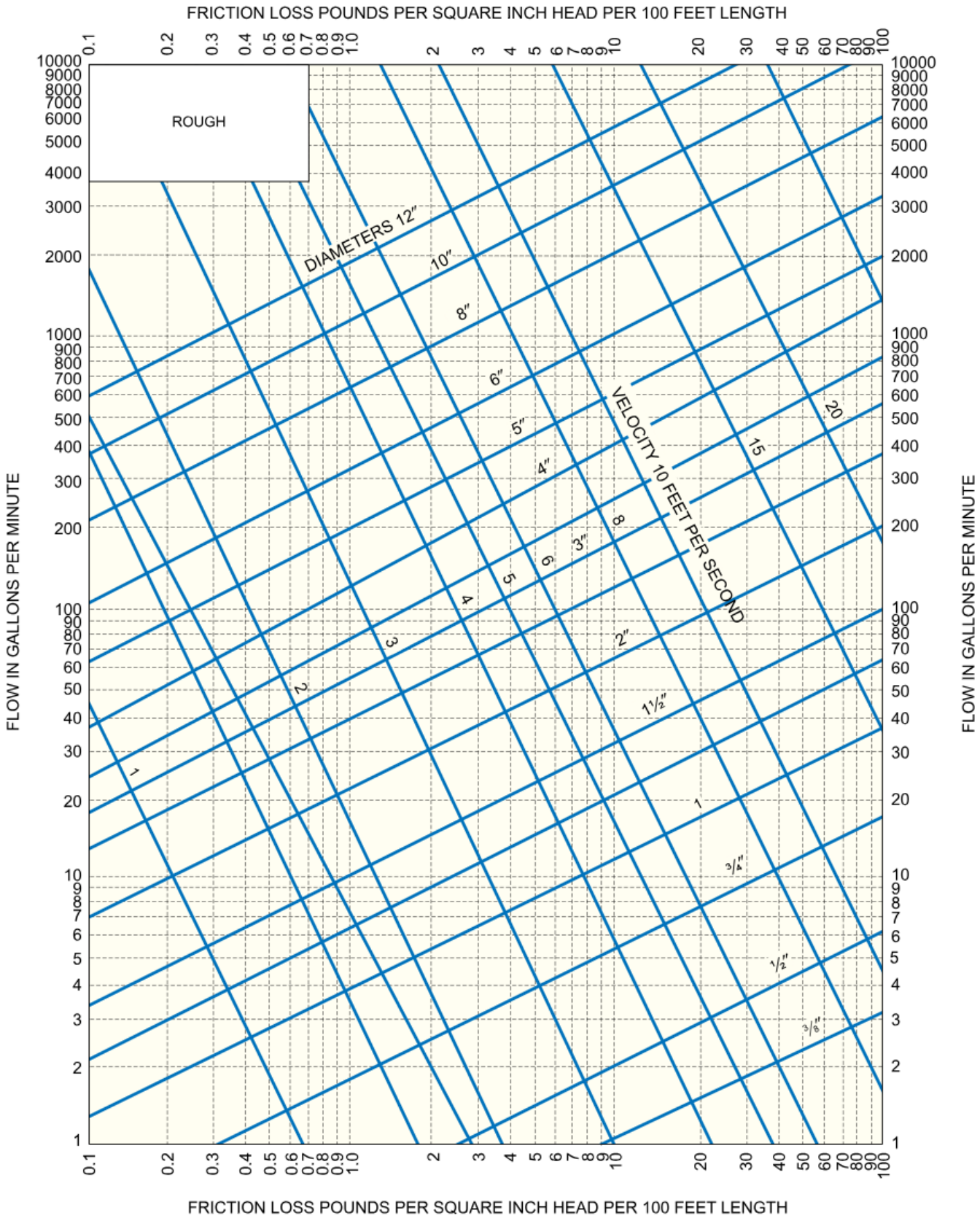
Figure E103.3(6) FRICTION LOSS IN FAIRLY ROUGH PIPE(a)



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gpm = 3.785 L/m, 1 psi = 6.895 kPa, 1 foot per second = 0.305 m/s.

This chart applies to fairly rough pipe and to actual diameters, which in general will be less than the actual diameters of the new pipe of the same kind.

Figure E103.3(7) FRICTION LOSS IN ROUGH PIPE(a)



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gpm = 3.785 L/m, 1 psi = 6.895 kPa, 1 foot per second = 0.305 m/s.

This chart applies to very rough pipe and existing pipe and to their actual diameters.

E103.3.1: Sample problem.

What size Type L copper water pipe, service and distribution will be required to serve a two-story factory building having on each floor, back-to-back, two toilet rooms each equipped with hot and cold water? The highest fixture is 21 feet (6401 mm) above the street main, which is tapped with a 2-inch (51 mm) corporation cock at which point the minimum pressure is 55 psi (379.2 kPa). In the building basement, a 2-inch (51 mm) meter with a maximum pressure drop of 11 psi (75.8 kPa) and 3-inch (76 mm) reduced pressure principle backflow preventer with a maximum pressure drop of 9 psi (621 kPa) are to be installed. The system is shown by Figure E103.3(1) . To be determined are the pipe sizes for the service main and the cold and hot water distribution pipes.

Problem Solution: A tabular arrangement such as shown in Table E103.3(1) should first be constructed. The steps to be followed are indicated by the tabular arrangement itself as they are in sequence, Columns 1 through 10 and Lines A through L.

Step 1

Columns 1 and 2: Divide the system into sections breaking at major changes in elevation or where branches lead to fixture groups. After point B [see Figure E103.3(1)], separate consideration will be given to the hot and cold water piping. Enter the sections to be considered in the service and cold water piping in Column 1 of the tabular arrangement. Column 1 of Table E103.3(1) provides a line-by-line recommended tabular arrangement for use in solving pipe sizing.

The objective in designing the water supply system is to ensure an adequate water supply and pressure to all fixtures and equipment. Column 2 provides the pounds per square inch (psi) to be considered separately from the minimum pressure available at the main. Losses to take into consideration are the following: the differences in elevation between the water supply source and the highest water supply outlet, meter pressure losses, the tap in main loss, special fixture devices such as water softeners and backflow prevention devices and the pressure required at the most remote fixture outlet. The difference in elevation can result in an increase or decrease in available pressure at the main. Where the water supply outlet is located above the source, this results in a loss in the available pressure and is subtracted from the pressure at the water source. Where the highest water supply outlet is located below the water supply source, there will be an increase in pressure that is added to the available pressure of the water source.

Column 3: According to Table E103.3(3), determine the gpm (L/m) of flow to be expected in each section of the system. These flows range from 28.6 to 108 gpm. Load values for fixtures must be determined as water supply fixture units and then converted to a gallon-per-minute (gpm) rating to determine peak demand. When calculating peak demands, the water supply fixture units are added and then converted to the gallon-per-minute rating. For continuous flow fixtures such as hose bibbs and lawn sprinkler systems, add the gallon-per-minute demand to the intermittent demand of fixtures. For example, a total of 120 water supply fixture units is converted to a demand of 48 gallons per minute. Two hose bibbs × 5 gpm demand = 10 gpm. Total gpm rating = 48.0 gpm + 10 gpm = 58.0 gpm demand.

Step 2

Line A: Enter the minimum pressure available at the main source of supply in Column 2. This is 55 psi (379.2 kPa). The local water authorities generally keep records of pressures at different times of day and year. The available pressure can be checked from nearby buildings or from fire department hydrant checks.

Line B: Determine from Table 604.3 the highest pressure required for the fixtures on the system, which is 15 psi (103.4 kPa), to operate a flushometer valve. The most remote fixture outlet is necessary to compute the pressure loss caused by pipe and fittings, and represents the most downstream fixture along the circuit of piping requiring the available pressure to operate properly as indicated by Table 604.3.

Line C: Determine the pressure loss for the meter size given or assumed. The total water flow from the main through the service as determined in Step 1 will serve to aid in the meter selected. There are three common types of water meters; the pressure losses are determined by the American Water Works Association Standards for displacement type, compound type and turbine type. The maximum pressure loss of such devices takes into consideration the meter size, safe operating capacity (gpm) and maximum rates for continuous operations (gpm). Typically, equipment imparts greater pressure losses than piping.

Line D: Select from Table E103.3(4) and enter the pressure loss for the tap size given or assumed. The loss of pressure through taps and tees in pounds per square inch (psi) is based on the total gallon-per-minute flow rate and size of the tap.

Line E: Determine the difference in elevation between the main and source of supply and the highest fixture on the system. Multiply this figure, expressed in feet, by 0.43 psi (2.9 kPa). Enter the resulting psi loss on Line E. The difference in elevation between the water supply source and the highest water supply outlet has a significant impact on the sizing of the water supply system. The difference in elevation usually results in a loss in the available pressure because the water supply outlet is generally located above the water supply source. The loss is caused by the pressure required to lift the water to the outlet. The pressure loss is subtracted from the pressure at the water source. Where the highest water supply outlet is located below the water source, there will be an increase in pressure that is added to the available pressure of the water source.

Lines F, G and H: The pressure losses through filters, backflow prevention devices or other special fixtures must be obtained from the manufacturer or estimated and entered on these lines. Equipment such as backflow prevention devices, check valves, water softeners, instantaneous or tankless water heaters, filters and strainers can impart a much greater pressure loss than the piping. The pressure losses can range from 8 psi to 30 psi.

Step 3

Line I: The sum of the pressure requirements and losses that affect the overall system (Lines B through H) is entered on this line. Summarizing the steps, all of the system losses are subtracted from the minimum water pressure. The remainder is the pressure available for friction, defined as the energy available to push the water through the pipes to each fixture. This force can be used as an average pressure loss, as long as the pressure available for friction is not exceeded. Saving a certain

amount for available water supply pressures as an area incurs growth, or because of aging of the pipe or equipment added to the system is recommended.

Step 4

Line J: Subtract Line I from Line A. This gives the pressure that remains available from overcoming friction losses in the system. This figure is a guide to the pipe size that is chosen for each section, incorporating the total friction losses to the most remote outlet (measured length is called developed length).

> **Exception:** Where the main is above the highest fixture, the resulting psi must be considered a pressure gain (static head gain) and omitted from the sums of Lines B through H and added to Line J.

The maximum friction head loss that can be tolerated in the system during peak demand is the difference between the static pressure at the highest and most remote outlet at no-flow conditions and the minimum flow pressure required at that outlet. If the losses are within the required limits, then every run of pipe will be within the required friction head loss. Static pressure loss is the most remote outlet in feet × 0.433 = loss in psi caused by elevation differences.

Step 5

Column 4: Enter the length of each section from the main to the most remote outlet (at Point E). Divide the water supply system into sections breaking at major changes in elevation or where branches lead to fixture groups.

Step 6

Column 5: When selecting a trial pipe size, the length from the water service or meter to the most remote fixture outlet must be measured to determine the developed length. However, in systems having a flushometer valve or temperature controlled shower at the topmost floors the developed length would be from the water meter to the most remote flushometer valve on the system. A rule of thumb is that size will become progressively smaller as the system extends farther from the main source of supply. The following formula is an acceptable method to determine trial pipe size:

Line J: (Pressure available to overcome pipe friction) × 100/equivalent length of run total developed length to most remote fixture × percentage factor of 1.5 (Note: a percentage factor is used only as an estimate for friction losses imposed for fittings for initial trial pipe size) = psi (average pressure drops per 100 feet of pipe).

For trial pipe size, see Figure E103.3(3) (Type L copper) based on 2.77 psi and a 108 gpm = 2 1/2 inches. To determine the equivalent length of run to the most remote outlet, the developed length is determined and added to the friction losses for fittings and valves. The developed lengths of the designated pipe sections are shown in Table E103.3.1(1) .

The equivalent length of the friction loss in fittings and valves must be added to the developed length (most remote outlet). Where the size of fittings and valves is not known, the added friction loss should be approximated. A general rule that has been used is to add 50 percent of the developed length to allow for fittings and valves. For example, the equivalent length of run equals the developed

length of run (225 ft × 1.5 = 338 ft). The total equivalent length of run for determining a trial pipe size is 338 feet.

> **Example:** 9.36 (pressure available to overcome pipe friction) × 100/338 (equivalent length of run = 225 × 1.5) = 2.77 psi (average pressure drop per 100 feet of pipe).

Step 7

Column 6: Select from Table E103.3(6) the equivalent lengths for the trial pipe size of fittings and valves on each pipe section. Enter the sum for each section in Column 6. (The number of fittings to be used in this example must be an estimate.) The equivalent length of piping is the developed length plus the equivalent lengths of pipe corresponding to friction head losses for fittings and valves. Where the size of fittings and valves is not known, the added friction head losses must be approximated. An estimate for this example is found in Table E103.3.1(2).

Step 8

Column 7: Add the figures from Column 4 and Column 6, and enter in Column 7. Express the sum in hundreds of feet.

Step 9

Column 8: Select from Figure E103.3(3) the friction loss per 100 feet (30 480 mm) of pipe for the gallon-per-minute flow in a section (Column 3) and trial pipe size (Column 5). Maximum friction head loss per 100 feet is determined on the basis of total pressure available for friction head loss and the longest equivalent length of run. The selection is based on the gallon-per-minute demand, the uniform friction head loss and the maximum design velocity. Where the size indicated by hydraulic table indicates a velocity in excess of the selected velocity, a size must be selected that produces the required velocity.

Step 10

Column 9: Multiply the figures in Columns 7 and 8 for each section and enter in Column 9.

Total friction loss is determined by multiplying the friction loss per 100 feet (30 480 mm) for each pipe section in the total developed length by the pressure loss in fittings expressed as equivalent length in feet. Note: Section C-F should be considered in the total pipe friction losses only if greater loss occurs in Section C-F than in pipe section D-E. Section C-F is not considered in the total developed length. Total friction loss in equivalent length is determined in Table E103.3.1(3).

Step 11

Line K: Enter the sum of the values in Column 9. The value is the total friction loss in equivalent length for each designated pipe section.

Step 12

Line L: Subtract Line J from Line K and enter in Column 10.

The result should always be a positive or plus figure. If it is not, repeat the operation using Columns 5, 6, 8 and 9 until a balance or near balance is obtained. If the difference between Lines J and K is a high positive number, it is an indication that the pipe sizes are too large and should be reduced, thus

saving materials. In such a case, the operations using Columns 5, 6, 8 and 9 should again be repeated.

The total friction losses are determined and subtracted from the pressure available to overcome pipe friction for trial pipe size. This number is critical as it provides a guide to whether the pipe size selected is too large and the process should be repeated to obtain an economically designed system.

Answer: The final figures entered in Column 5 become the design pipe size for the respective sections. Repeating this operation a second time using the same sketch but considering the demand for hot water, it is possible to size the hot water distribution piping. This has been worked up as a part of the overall problem in the tabular arrangement used for sizing the service and water distribution piping. Note that consideration must be given to the pressure losses from the street main to the water heater (Section A-B) in determining the hot water pipe sizes.

TABLE E103.3.1(1) SUMMATION OF DEVELOPED PIPE LENGTHS

SEGMENT	LENGTH[a] (feet)
A-B	54
B-C	8
C-D	13
D-E	150

For SI: 1 foot = 304.8 mm.

a. Total developed length = 225 feet.

TABLE E103.3.1(2) FITTING PRESSURE LOSSES EXPRESSED IN EQUIVALENT LENGTHS (formerly Table E1)

COLD WATER PIPE SECTION	FITTINGS/VALVES	PRESSURE LOSS EXPRESSED AS EQUIVALENT LENGTH OF TUBE (feet)	HOT WATER PIPE SECTION	FITTINGS/VALVES	PRESSURE LOSS EXPRESSED AS EQUIVALENT OF TUBE (feet)
A-B	(3) 2 1/2″ Gate valves	3	A-B	(3) 2 1/2″ Gate valves	3
	(1) 2 1/2″ Side branch tee	12	—	(1) 2 1/2″ Side branch tee	12
B-C	(1) 2 1/2″ Straight run tee	0.5	B-C	(1) 2″ Straight run tee	7
	—	—	—	(1) 2″ 90-degree elbow	0.5
C-F	(1) 2 1/2″ Side branch tee	12	C-F	(1) 1 1/2″ Side branch tee	7
C-D	(1) 2 1/2″ 90-degree elbow	7	C-D	(1) 1 1/2″ 90-degree elbow	4
D-E	(1) 2 1/2″ Side branch tee	12	D-E	(1) 1 1/2″ Side branch tee	7

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad.

TABLE E103.3.1(3) TOTAL FRICTION LOSS EQUIVALENT PIPING LENGTH (formerly Table E2)

PIPE SECTION	FRICTION LOSS EQUIVALENT LENGTH (feet)	
	Cold Water	Hot Water
A-B	0.69 × 3.2 = 2.21	0.69 × 3.2 = 2.21
B-C	0.085 × 3.1 = 0.26	0.16 × 1.4 = 0.22
C-D	0.20 × 1.9 = 0.38	0.17 × 3.2 = 0.54
D-E	1.62 × 1.9 = 3.08	1.57 × 3.2 = 5.02
Total pipe friction losses (Line K)	5.93	7.99

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

Section E104: Selection of Pipe Size

E104.1: Size of water service mains, branch mains and risers.

The minimum size water service pipe shall be 3/4 inch (19.1 mm). The size of water service mains, branch mains and risers shall be determined according to water supply demand [gpm (L/m)], available water pressure [psi (kPa)] and friction loss due to the water meter and developed length of pipe [feet (m)], including equivalent length of fittings. The size of each water distribution system shall be determined according to the procedure outlined in this section or by other design methods conforming to acceptable engineering practice and approved by the code official:

1. Supply load in the building water distribution system shall be determined by total load on the pipe being sized, in terms of water-supply fixture units (w.s.f.u.), as shown in Table E103.3(2). For fixtures not listed, choose a w.s.f.u. value of a fixture with similar flow characteristics.
2. Obtain the minimum daily static service pressure [psi (kPa)] available (as determined by the local water authority) at the water meter or other source of supply at the installation location. Adjust this minimum daily static pressure [psi (kPa)] for the following conditions:

    2.1. Determine the difference in elevation between the source of supply and the highest water supply outlet. Where the highest water supply outlet is located above the source of supply, deduct 0.5 psi (3.4 kPa) for each foot (0.3 m) of difference in elevation. Where the highest water supply outlet is located below the source of supply, add 0.5 psi (3.4 kPa) for each foot (0.3 m) of difference in elevation.

    2.2. Where a water pressure-reducing valve is installed in the water distribution system, the minimum daily static water pressure available is 80 percent of the minimum daily static water pressure at the source of supply or the set pressure downstream of the pressure-reducing valve, whichever is smaller.

    2.3. Deduct all pressure losses due to special equipment such as a backflow preventer, water filter and water softener. Pressure loss data for each piece of equipment shall be obtained through the manufacturer of such devices.

2.4. Deduct the pressure in excess of 8 psi (55 kPa) due to installation of the special plumbing fixture, such as temperature controlled shower and flushometer tank water closet. Using the resulting minimum available pressure, find the corresponding pressure range in Table E104.1.

3. The maximum developed length for water piping is the actual length of pipe between the source of supply and the most remote fixture, including either hot (through the water heater) or cold water branches multiplied by a factor of 1.2 to compensate for pressure loss through fittings. Select the appropriate column in Table E104.1 equal to or greater than the calculated maximum developed length.
4. To determine the size of water service pipe, meter and main distribution pipe to the building using the appropriate table, follow down the selected “maximum developed length” column to a fixture unit equal to, or greater than the total installation demand calculated by using the “combined” water supply fixture unit column of Table E103.3(2). Read the water service pipe and meter sizes in the first left-hand column and the main distribution pipe to the building in the second left-hand column on the same row.
5. To determine the size of each water distribution pipe, start at the most remote outlet on each branch (either hot or cold branch) and, working back toward the main distribution pipe to the building, add up the water supply fixture unit demand passing through each segment of the distribution system using the related hot or cold column of Table E103.3(2). Knowing demand, the size of each segment shall be read from the second left-hand column of the same table and maximum developed length column selected in Steps 1 and 2, under the same or next smaller size meter row. The size of any branch or main does not need to be larger than the size of the main distribution pipe to the building established in Step 4.

TABLE E104.1: MINIMUM SIZE OF WATER METERS, MAINS AND DISTRIBUTION PIPING BASED ON WATER SUPPLY FIXTURE UNIT VALUES (w.s.f.u.)

METER AND SERVICE PIPE (inches)	DISTRIBUTION PIPE (inches)	MAXIMUM DEVELOPMENT LENGTH (feet)									
Pressure Range 30 to 39 psi		**40**	**60**	**80**	**100**	**150**	**200**	**250**	**300**	**400**	**500**
3/4	1/2[a]	2.5	2	1.5	1.5	1	1	0.5	0.5	0	0
3/4	3/4	9.5	7.5	6	5.5	4	3.5	3	2.5	2	1.5
3/4	1	32	25	20	16.5	11	9	7.8	6.5	5.5	4.5
1	1	32	32	27	21	13.5	10	8	7	5.5	5
3/4	1 1/4	32	32	32	32	30	24	20	17	13	10.5
1	1 1/4	80	80	70	61	45	34	27	22	16	12
1 1/2	1 1/4	80	80	80	75	54	40	31	25	17.5	13
1	1 1/2	87	87	87	87	84	73	64	56	45	36
1 1/2	1 1/2	151	151	151	151	117	92	79	69	54	43
2	1 1/2	151	151	151	151	128	99	83	72	56	45
1	2	87	87	87	87	87	87	87	87	87	86
1 1/2	2	275	275	275	275	258	223	196	174	144	122
2	2	365	365	365	365	318	266	229	201	160	134
2	2 1/2	533	533	533	533	533	495	448	409	353	311
Pressure Range 40 to 49 psi		**40**	**60**	**80**	**100**	**150**	**200**	**250**	**300**	**400**	**500**
3/4	1/2[a]	3	2.5	2	1.5	1.5	1	1	0.5	0.5	0.5
3/4	3/4	9.5	9.5	8.5	7	5.5	4.5	3.5	3	2.5	2
3/4	1	32	32	32	26	18	13.5	10.5	9	7.5	6
1	1	32	32	32	32	21	15	11.5	9.5	7.5	6.5
3/4	1 1/4	32	32	32	32	32	32	32	27	21	16.5
1	1 1/4	80	80	80	80	65	52	42	35	26	20
1 1/2	1 1/4	80	80	80	80	75	59	48	39	28	21
1	1 1/2	87	87	87	87	87	87	87	78	65	55
1 1/2	1 1/2	151	151	151	151	151	130	109	93	75	63
2	1 1/2	151	151	151	151	151	139	115	98	77	64
1	2	87	87	87	87	87	87	87	87	87	87
1 1/2	2	275	275	275	275	275	275	264	238	198	169
2	2	365	365	365	365	365	349	304	270	220	185
2	2 1/2	533	533	533	533	533	533	533	528	456	403

Chart continued on next page.

Pressure Range 50 to 60 psi		40	60	80	100	150	200	250	300	400	500
3/4	1/2[a]	3	3	2.5	2	1.5	1	1	1	0.5	0.5
3/4	3/4	9.5	9.5	9.5	8.5	6.5	5	4.5	4	3	2.5
3/4	1	32	32	32	32	25	18.5	14.5	12	9.5	8
1	1	32	32	32	32	30	22	16.5	13	10	8
3/4	1 1/4	32	32	32	32	32	32	32	32	29	24
1	1 1/4	80	80	80	80	80	68	57	48	35	28
1 1/2	1 1/4	80	80	80	80	80	75	63	53	39	29
1	1 1/2	87	87	87	87	87	87	87	87	82	70
1 1/2	1 1/2	151	151	151	151	151	151	139	120	94	79
2	1 1/2	151	151	151	151	151	151	146	126	97	81
1	2	87	87	87	87	87	87	87	87	87	87
1 1/2	2	275	275	275	275	275	275	275	275	247	213
2	2	365	365	365	365	365	365	365	329	272	232
2	2 1/2	533	533	533	533	533	533	533	533	533	486
Pressure Range over 60		**40**	**60**	**80**	**100**	**150**	**200**	**250**	**300**	**400**	**500**
3/4	1/2[a]	3	3	3	2.5	2	1.5	1.5	1	1	0.5
3/4	3/4	9.5	9.5	9.5	9.5	7.5	6	5	4.5	3.5	3
3/4	1	32	32	32	32	32	24	19.5	15.5	11.5	9.5
1	1	32	32	32	32	32	28	28	17	12	9.5
3/4	1 1/4	32	32	32	32	32	32	32	32	32	30
1	1 1/4	80	80	80	80	80	80	69	60	46	36
1 1/2	1 1/4	80	80	80	80	80	80	76	65	50	38
1	1 1/2	87	87	87	87	87	87	87	87	87	84
1 1/2	1 1/2	151	151	151	151	151	151	151	144	114	94
2	1 1/2	151	151	151	151	151	151	151	151	118	97
1	2	87	87	87	87	87	87	87	87	87	87
1 1/2	2	275	275	275	275	275	275	275	275	275	252
2	2	365	368	368	368	368	368	368	368	318	273
2	2 1/2	533	533	533	533	533	533	533	533	533	533

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

a. Minimum size for building supply is 3/4-inch pipe

Section E105: Determination of Pipe Volumes

E105.1: Determining volume of piping systems.

Where required for engineering design purposes, Table E105.1 shall be used to determine the approximate internal volume of water distribution piping.

TABLE E105.1 INTERNAL VOLUME OF VARIOUS WATER DISTRIBUTION TUBING

OUNCES OF WATER PER FOOT OF TUBE									
Size Nominal, Inch	Copper Type M	Copper Type L	Copper Type K	CPVC CTS SDR 11	CPVC SCH 40	CPVC SCH 80	PE-RT SDR 9	Composite ASTM F1281	PEX CTS SDR 9
3/8	1.06	0.97	0.84	N/A	1.17	—	0.64	0.63	0.64
1/2	1.69	1.55	1.45	1.25	1.89	1.46	1.18	1.31	1.18
3/4	3.43	3.22	2.90	2.67	3.38	2.74	2.35	3.39	2.35
1	5.81	5.49	5.17	4.43	5.53	4.57	3.91	5.56	3.91
1 1/4	8.70	8.36	8.09	6.61	9.66	8.24	5.81	8.49	5.81
1 1/2	12.18	11.83	11.45	9.22	13.20	11.38	8.09	13.88	8.09
2	21.08	20.58	20.04	15.79	21.88	19.11	13.86	21.48	13.86

N/A = Not Applicable.

For SI: 1 inch = 25.4 mm, 1 ounce = 0.030 L

[A] Appendix F: Board of Appeals

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

User notes:

About this appendix: Appendix F provides criteria for board of appeals members. Also provided are procedures by which the board of appeals should conduct its business. Code development reminder: Code change proposals to this appendix will be considered by the Administrative Code Development Committee during the 2022 Group B Code Development Cycle. See explanation on page iv.

Code development reminder: Code change proposals to sections in this appendix will be considered by the Administrative Code Development Committee during the 2025 (Group B) Code Development Cycle.

[A] Section F101: General

[A] F101.1: Scope.

A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section 113. The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

[A] F101.2: Application for appeal.

Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

[A] F101.2.1: Limitation of authority.

The board shall not have authority to waive requirements of this code or interpret the administration of this code.

[A] F101.2.2: Stays of enforcement.

Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

[A] F101.3: Membership of board.

The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board members' terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

[A] F101.3.1: Qualifications.

The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

[A] F101.3.2: Alternate members.

The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

[A] F101.3.3: Vacancies.

Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

[A] F101.3.4: Chairperson.

The board shall annually select one of its members to serve as chairperson.

[A] F101.3.5: Secretary.

The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings, which shall set forth the reasons for the board's decision, the vote of each member, the absence of a member and any failure of a member to vote.

[A] F101.3.6: Conflict of member interest.

A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

[A] F101.3.7: Compensation of members.

Compensation of members shall be determined by law.

[A] F101.3.8: Removal from the board.

A member shall be removed from the board prior to the end of their term only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

[A] F101.4: Rules and procedures.

The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

[A] F101.5: Notice of meeting.

The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

[A] F101.5.1: Open hearing.

All hearings before the board shall be open to the public. The appellant, the appellant's representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

[A] F101.5.2: Quorum.

Three members of the board shall constitute a quorum.

[A] F101.5.3: Postponed hearing.

When five members are not present to hear an appeal, either the appellant or the appellant's representative shall have the right to request a postponement of the hearing.

[A] F101.6: Legal counsel.

The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction's expense in all matters arising from service within the scope of their duties.

[A] F101.7: Board decision.

The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

[A] F101.7.1: Resolution.

The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant's representative and to the code official.

[A] F101.7.2: Administration.

The code official shall take immediate action in accordance with the decision of the board.

[A] F101.8: Court review.

Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

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Content Updates - Version 2

For the complete update history of this code, please visit: https://www.iccsafe.org/contentupdates/

Section 104.3.1 line 6 now reads: building to meet the requirements of Section 1612 of the *International Building Code* or Section R306 of the *International Residen-*

Section 202 definition title **[BG] FAMILY OR ASSISTED-USE BATHING ROOM** now reads: [BE] FAMILY OR ASSISTED-USE BATHING ROOM

Section 202 definition title **[BG] FAMILY OR ASSISTED-USE TOILET FACILITY** now reads: [BE] FAMILY OR ASSISTED-USE TOILET FACILITY

TABLE 403.1, column 3, row 6, new row added now reads:

5	Institutional	Employees in hospitals and nursing homes[b]	1 per 25	1 per 35	—	1 per 100	—

TABLE 403.1 column 3, row 7, new row added now reads:

5	Institutional	Visitors in hospitals and nursing homes	1 per 75	1 per 100	—	1 per 500	—

TABLE 403.1 column 5, row 13 now reads: 1 per 25 care recipient sleeping units or treatment rooms

TABLE 403.1 column 6, row 13 now reads: 1 per 35 care recipient sleeping units or treatment rooms

TABLE 403.1column 7, row 13 now reads: 1 per 50 care recipient sleeping units or treatments rooms

TABLE 403.1 column 6, row 14 now reads: 1 per 100 care recipient sleeping rooms or treatment rooms

TABLE 403.1 column 7, row 14 now reads: 1 per 50 care recipient sleeping units or treatment rooms

Section 608.17.1.2, line 3 now reads: ASSE 1022, ASSE 1024, or ASSE 1032, or protected by an *air gap*.

Resource A: Plumbing Provisions Excerpted From: ICC A117.1–2017 with Supplement 1, Standard for Accessible and Usable Buildings and Facilities

User notes:

About this resource: Sections 404.2 and 410.3 reference ICC A117.1 for accessible plumbing facilities and fixtures. Key to these references are provisions which state, “Accessible plumbing fixtures shall be installed in accordance with ICC A117.1” (Section 404.2) and “where drinking fountains are primarily for children’s use, the drinking fountains for people using wheelchairs shall be permitted to comply with the children’s provisions in ICC A117.1 and drinking fountains for standing children shall be permitted to provide the spout at 30 inches (762 mm) minimum above the floor” (Exception 2 to Section 410.3). For user convenience and in order to ensure an accessible plumbing design, plumbing design-related excerpts from ICC A117.1—2017 have been included in this new Resource A. This resource material is not part of the IPC requirements.

ICC A117.1 is an approved American National Standard (ANS) developed in accordance with ANSI’s requirements for ANS standard development.

Resource B:

ANSI/RESNET/ISS 850-2020 Standard for the Calculation and Labeling of the Water Use Performance of One- and Two-Family Dwellings Using the Water Rating Index

User notes:

About this resource: This Standard provides a consistent, uniform methodology for evaluating, quantifying and labeling the water use performance of one- and two-family dwellings. The methodology compares the water use performance of an actual home (rated home) with the water use performance of a reference home of the same geometry, resulting in a relative Water Use Rating called the Water Rating Index (WRI). Where the water use performance of the actual home and the reference home are equal, the Water Rating Index is 100. For user convenience, the methodology of evaluating, rating and labeling the water use performance of single-family and duplex dwelling units (Standard 850) has been included in digital format as a International Plumbing Code®(IPC®) resource. This resource material is not part of the IPC requirements.

A WRI rating includes water use for: toilets, kitchen faucets, lavatory faucets, showerheads, clothes washers, dishwashers, water softeners, outdoor/landscape irrigation systems and pools/spas. There are additional factors that also influence the rating, including: excess water pressure, house size, geographic location, number of bedrooms, lot and landscape size and hot water distribution layout.

RESNET/ICC 850—2020 is an approved American National Standard (ANS) developed in accordance with ANSI's requirements for ANS standard development.

To access the 2024 IPC Resource B, scan the QR code below or enter the 7-digit code (3ef7b62) at the end of the following URL: qr.iccsafe.org/.

Chapter 1: Application and Administration

Section 101: Title

101.1: General.

This document shall be known as the standard for Accessible and Usable Buildings and Facilities, hereinafter referred to as "this standard."

Section 102: Purpose

102.1: General.

The technical criteria in Chapters 3 through 10, Sections 1102, 1103 and 1106 of this standard make sites, facilities, buildings and elements accessible to and usable by people with such physical disabilities as the inability to walk, difficulty walking, reliance on walking aids, blindness and visual impairment, deafness and hearing impairment, incoordination, reaching and manipulation disabilities, lack of stamina, difficulty interpreting and reacting to sensory information, and extremes of physical size. The intent of these sections is to allow a person with a physical disability to independently get to, enter, and use a site, facility, building or element.

Section 1104 of this standard provides criteria for Type B units. These criteria are intended to be consistent with the intent of the criteria of the U.S. Department of Housing and Urban Development (HUD) Fair Housing Accessibility Guidelines. The Type B units are intended to supplement, not replace, Accessible units or Type A units as specified in this standard.

Section 1105 of this standard provides criteria for minimal accessibility features for one and two family dwelling units and townhouses which are not covered by the U.S. Department of Housing and Urban Development (HUD) Fair Housing Accessibility Guidelines.

This standard is intended for adoption by government agencies and by organizations setting model codes to achieve uniformity in the technical design criteria in building codes and other regulations.

102.2: Applicability.

Sites, facilities, buildings, and elements required to be accessible by the scoping provisions adopted by the administrative authority shall comply with the applicable provisions of Chapters 3 through 10. Dwelling units and sleeping units shall comply with the applicable provisions of Chapter 11.

Section 103: Human Factor Provisions

103.1: General.

The technical criteria in this standard are based on body sizes and functional abilities of adults and, in those sections where specifically noted, children.

Section 104: Compliance Alternatives

104.1: General.

Nothing in this standard is intended to prevent the use of designs, products or technologies as alternatives to those prescribed by this standard, provided they result in equivalent or greater accessibility and such equivalency is approved by the administrative authority adopting this standard.

Section 105: Conventions

105.1: General.

Where specific criteria of this standard differ from the general criteria of this standard, the specific criteria shall apply.

105.2: Calculation of percentages.

Where the determination of the required size or dimension of an element or facility involves ratios or percentages, rounding down for values less than one half shall be permitted.

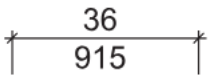
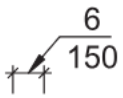
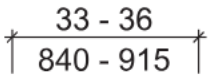
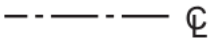
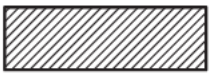
105.3: Dimension tolerances.

All dimensions are subject to conventional industry tolerances except where the requirement is a range with stated minimum and maximum end points.

105.4: Figures.

Unless specifically stated, figures included herein are provided for informational purposes only and are not considered part of the standard.

Figure 105.4 GRAPHIC CONVENTION FOR FIGURES

Convention	Description
	dimension showing English units (in inches unless otherwise specified) above the line and SI units (in millimeters unless otherwise specified) below the line
	dimension for small measurements
	dimension showing a range with minimum - maximum
min	minimum
max	maximum
>	greater than
≥	greater than or equal to
<	less than
≤	less than or equal to
	boundary of clear floor space or maneuvering clearance
	centerline
	a permitted element or its extension
	direction of travel or approach
	a wall, floor, ceiling or other element cut in section or plan
	a highlighted element in elevation or plan
	location zone of element, control or feature

105.5: Floor or floor surface.

The terms floor or floor surface refer to the finish floor surface or ground surface, as applicable.

105.6: Referenced sections.

Unless specifically stated otherwise, a reference to another section or subsection within this standard includes all subsections of the referenced section or subsection.

Section 106: Referenced Documents

106.1: General.

The documents listed in Section 106.2 shall be considered part of this standard to the prescribed extent of each such reference. Where criteria in this standard differ from those of these referenced documents, the criteria of this standard shall apply.

106.2: Documents.

106.2.1: Americans with Disabilities Act (ADA) Accessibility Guidelines for Transportation Vehicles.

36 CFR 1192 published in 56 Federal Register 45558, September 6, 1991 (United States Access Board, 1331 F Street, NW, Suite 1000, Washington, DC 20004-1111).

106.2.2: Hearing aids – Magnetic field strength in audio-frequency induction loops for hearing aids operating with an induction pickup coil.

IEC 60118.4-2014 (International Electrotechnical Commission, 3 rue de Varenbe, PO Box 131, 1211 Geneva 20, Switzerland.)

106.2.3: Manual on Uniform Traffic Control Devices.

MUTCD-2009 with Revisions 1 and 2 incorporated, May 2012 (The Federal Highway Administration, Office of Transportation Operations, Room 3408, 400 7th Street, S.W., Washington, DC 20590).

106.2.4: National Fire Alarm and Signaling Code.

NFPA 72-2016 (National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101).

106.2.5: Performance Criteria for Accessible Communications Entry Systems.

ANSI/DASMA 303-2006. (Door and Access Systems Manufacturers Association, 1300 Sumner Avenue, Cleveland, OH 44115-2851).

106.2.6: Power Assist and Low Energy Power Operated Doors.

ANSI/BHMA A156.19-2013 (Builders Hardware Manufacturers' Association, 355 Lexington Avenue, 15th Floor, New York, NY 10017).

106.2.7: Power Operated Pedestrian Doors.

ANSI/BHMA A156.10-2011 (Builders Hardware Manufacturers' Association, 355 Lexington Avenue, 15th Floor, New York, NY 10017).

106.2.8: Safety Code for Elevators and Escalators.

ASME A17.1-2016/CSA B44-16 (American Society of Mechanical Engineers International, Three Park Avenue, New York, NY 10016-5990).

106.2.9: Safety Standard for Platform Lifts and Stairway Chairlifts.

ASME A18.1-2014 (American Society of Mechanical Engineers International, Three Park Avenue, New York, NY 10016-5990).

106.2.10: Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

ASTM F 1487-01 (ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959).

106.2.11: Standard Laboratory Test Method for Determination of Forces and Motions Required to Activate Operable Parts of Operable Windows and Doors in Accessible Spaces.

AAMA 513-14 (AAMA, 1827 Walden Office Square, Suite 550, Schaumburg, IL 60173-4268).

106.2.12: Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.

ASTM F 1292-13 (ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959).

106.2.13: Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods.

ASTM E 2235-04 (2012) (ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959).

Section 107: Definitions

107.1: General.

For the purpose of this standard, the terms listed in Section 107.5 have the indicated meaning.

107.2: Terms defined in referenced documents.

Terms specifically defined in a referenced document, and not defined in this section, shall have the specified meaning from the referenced document.

107.3: Undefined terms.

The meaning of terms not specifically defined in this standard or in a referenced document shall be as defined by collegiate dictionaries in the sense that the context implies.

107.4: Interchangeability.

Words, terms and phrases used in the singular include the plural, and those used in the plural include the singular.

107.5: Defined terms.

accessible: Describes a site, building, facility or portion thereof that complies with this standard.

administrative authority: A jurisdictional body that adopts or enforces regulations and standards for the design, construction or operation of buildings and facilities.

amusement attraction: Any facility, or portion of a facility, located within an amusement park or theme park which provides amusement without the use of an amusement device. Amusement attractions include, but are not limited to, fun houses, barrels and other attractions without seats.

amusement ride: A system that moves persons through a fixed course within a defined area for the purpose of amusement.

amusement ride seat: A seat that is built-in or mechanically fastened to an amusement ride intended to be occupied by one or more passengers.

area of sport activity: That portion of a room or space where the play or practice of a sport occurs.

assembly area: A building or facility, or portion thereof, used for the purpose of entertainment, worship, educational or civic gatherings, or similar purposes. For the purposes of these requirements, assembly areas include, but are not limited to, classrooms, lecture halls, courtrooms, public meeting rooms, public hearing rooms, legislative chambers, spaces utilized for viewing motion picture projections, auditoria, theaters, playhouses, dinner theaters, concert halls, centers for the performing arts, amphitheaters, arenas, stadiums, grandstands, places of religious worship or convention centers.

assistive listening system (ALS): An amplification system utilizing transmitters, receivers and coupling devices to bypass the acoustical space between a sound source and a listener by means of induction loop, radio frequency, infrared, or direct-wired equipment.

blended transition: A raised pedestrian street crossing, depressed corner or similar connection between the pedestrian access route at the level of the sidewalk and the level of the pedestrian street crossing that has a grade of 1:20 or less.

boarding pier: A portion of a pier where a boat is temporarily secured for the purpose of embarking or disembarking.

boat launch ramp: A sloped surface designed for launching and retrieving trailered boats and other water craft to and from a body of water.

boat slip: That portion of a pier, main pier, finger pier or float where a boat is moored for the purpose of berthing, embarking, or disembarking.

catch pool: A pool or designated section of a pool used as a terminus for water slide flumes.

characters: Letters, numbers, punctuation marks and typographic symbols.

children's use: Spaces and elements specifically designed for use primarily by people 12 years old and younger.

circulation path: An exterior or interior way of passage provided for pedestrian travel, including but not limited to, walks, hallways, courtyards, elevators, platform lifts, ramps, stairways and landings.

common use: Interior or exterior circulation paths, rooms, spaces or elements that are not for public use and are made available for the shared use of two or more people.

counter slope: Any slope opposing the running slope of a curb ramp.

cross slope: The slope that is perpendicular to the direction of travel (see running slope).

curb ramp: A short ramp cutting through a curb or built up to it.

destination-oriented elevator system: An elevator system that provides lobby controls for the selection of destination floors, lobby indicators designating which elevator to board and a car indicator designating the floors at which the car will stop.

detectable warning: A standardized surface feature built in or applied to floor surfaces to warn of hazards on a circulation path.

dwelling unit: A single unit providing complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking and sanitation.

el**ement:** An architectural or mechanical component of a building, facility, space or site.

elevated play component: A play component that is approached above or below grade and that is part of a composite play structure consisting of two or more play components attached or functionally linked to create an integrated unit providing more than one play activity.

elevator car call sequential step scanning: A technology used to enter a car call by means of an up or down floor selection button.

employee work area: All or any portion of a space used only by employees and used only for work. Corridors, toilet rooms, kitchenettes and break rooms are not employee work areas.

existing building: A building erected prior to the date of adoption of this standard, or one for which a legal building permit has been issued.

existing facility: A facility completed prior to the date of adoption of this standard, or one for which a legal permit has been issued.

facility: All or any portion of a building, structure, site improvements, elements and pedestrian routes or vehicular ways located on a site.

gangway: A variable-sloped pedestrian walkway that links a fixed structure or land with a floating structure. Gangways that connect to vessels are not addressed by this document.

golf car passage: A continuous passage on which a motorized golf car can operate.

grade break: The line where two surface planes with different grades meet.

ground level play component: A play component that is approached and exited at the ground level.

habitable: A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

key surface: The surface or plane of any key or button that must be touched to activate or deactivate an operable part or a machine function or enter data.

marked crossing: A crosswalk or other identified path intended for pedestrian use in crossing a vehicular way.

operable part: A component of an element used to insert or withdraw objects, or to activate, deactivate or adjust the element.

pictogram: A pictorial symbol that represents activities, facilities or concepts.

play area: A portion of a site containing play components designed and constructed for children.

play component: An element intended to generate specific opportunities for play, socialization or learning. Play components are manufactured or natural; and are stand-alone or part of a composite play structure.

ramp: A walking surface that has a running slope steeper than 1:20.

running slope: The slope that is parallel to the direction of travel (see cross slope).

sign: An architectural element composed of displayed textual, symbolic, tactile or pictorial information.

site: A parcel of land bounded by a property line or a designated portion of a public right-of-way.

sleeping unit: A room or space in which people sleep that can also include permanent provisions for living, sleeping, eating and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units.

soft contained play structure: A play structure made up of one or more play components where the user enters a fully enclosed play environment that utilizes pliable materials, such as plastic, netting or fabric.

teeing ground: In golf, the starting place for the hole to be played.

transfer device: Equipment designed to facilitate the transfer of a person from a wheelchair or other mobility aide to and from an amusement ride seat.

transition plate: A sloping pedestrian walking surface located at the ends of a gangway.

TTY: An abbreviation for teletypewriter. Equipment that employs interactive, text-based communications through the transmission of coded signals across the standard telephone network. The term TTY also refers to devices known as text telephones and TDDs.

use zone: The ground level area beneath and immediately adjacent to a play structure or play equipment that is designated by ASTM F 1487 listed in Section 106.2.10, for unrestricted circulation around the play equipment and where it is predicted that a user would land when falling from or exiting the play equipment.

variable message signs (VMS): Electronic signs that have a message with the capacity to change by means of scrolling, streaming or paging across a background.

variable message sign (VMS) characters: Characters of an electronic sign are composed of pixels in an array. High resolution VMS characters have vertical pixel counts of 16 rows or greater. Low resolution VMS characters have vertical pixel counts of 7 to 15 rows.

vehicular way: A route provided for vehicular traffic, such as in a street, driveway or parking facility.

walk: An exterior pathway with a prepared surface for pedestrian use.

wheelchair charging area: A clear floor area where people with disabilities can recharge their wheelchair batteries.

wheelchair space: A space for a single wheelchair and its occupant.

wheelchair space locations: A space for a minimum of a single wheelchair and the associated companion seating. Wheelchair space locations can contain multiple wheelchair spaces and associated companion seating.

Chapter 3: Building Blocks

Section 301: General

301.1: Scope.

The provisions of Chapter 3 shall apply where required by the scoping provisions adopted by the administrative authority or by Chapters 4 through 11.

301.2: Overlap.

Unless otherwise specified, clear floor spaces, clearances at fixtures, maneuvering clearances at doors, and turning spaces shall be permitted to overlap.

Section 302: Floor Surfaces

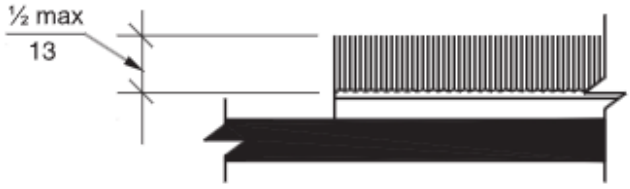
302.1: General.

Floor surfaces shall be stable, firm, and slip resistant, and shall comply with Section 302. Changes in level in floor surfaces shall comply with Section 303.

302.2: Carpet.

Carpet or carpet tile shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad. Carpet or carpet tile shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. The pile shall be 1/2 inch (13 mm) maximum in height. Exposed edges of carpet shall be fastened to the floor and shall have trim along the entire length of the exposed edge. Carpet edge trim shall comply with Section 303.

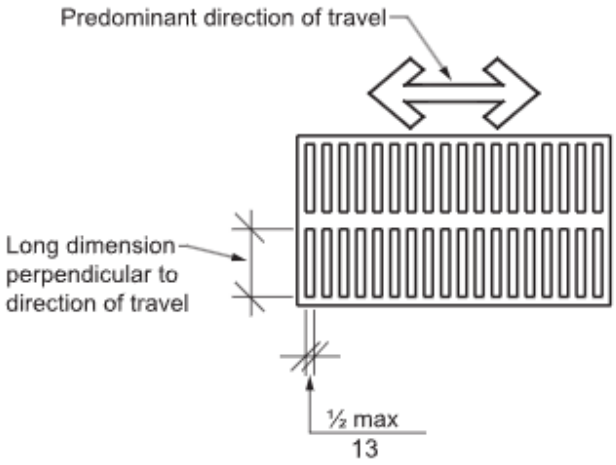
Figure 302.2 CARPET ON FLOOR SURFACES



302.3: Openings.

Openings in floor surfaces shall be of a size that does not permit the passage of a 1/2-inch (13 mm) diameter sphere, except as allowed in Sections 407.4.3, 408.4.3, 409.4.3, 410.4 and 805.10. Elongated openings shall be placed so that the long dimension is perpendicular to the predominant direction of travel.

Figure 302.3 OPENINGS IN FLOOR SURFACES



Section 303: Changes in Level

303.1: General.

Changes in level in floor surfaces shall comply with Section 303.

303.2: Vertical.

Changes in level of 1/4 inch (6.4 mm) maximum in height shall be permitted to be vertical.

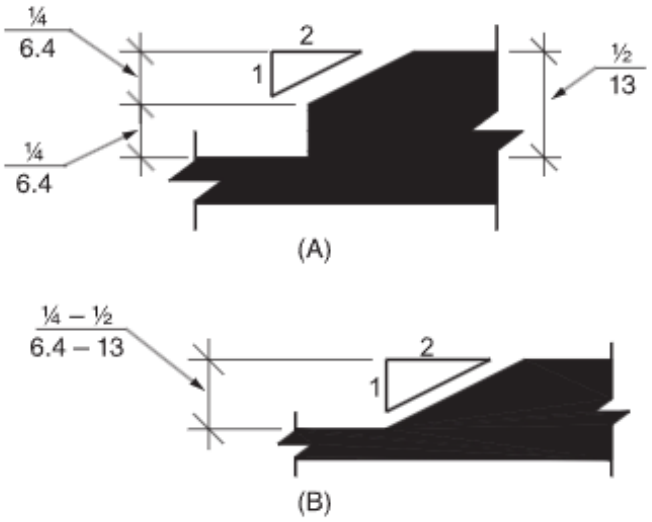
Figure 303.2 VERTICAL CHANGE IN LEVEL



303.3: Beveled.

Changes in level greater than 1/4 inch (6.4 mm) in height and not more than 1/2 inch (13 mm) maximum in height shall be beveled with a slope not steeper than 1:2.

Figure 303.3 BEVELED CHANGES IN LEVEL



303.4: Ramps.

Changes in level greater than 1/2 inch (13 mm) in height shall be by a ramp complying with Section 405 or by a curb ramp complying with Section 406.

Section 304: Turning Space

304.1: General.

A turning space shall comply with Section 304.

304.2: Floor surface.

Floor surfaces of a turning space shall comply with Section 302. Changes in level shall not be permitted within the turning space.

Exception: Slopes not steeper than 1:48 shall be permitted.

304.3: Size.

Turning spaces shall comply with Section 304.3.1 or 304.3.2.

304.3.1: Circular space.

304.3.1.1: New buildings and facilities.

In new buildings and facilities, the turning space shall be a circular space with a 67-inch (1700 mm) minimum diameter.

Figure 304.3.1.1 CIRCULAR TURNING SPACE - NEW BUILDINGS - SIZE AND OVERLAP



304.3.1.1.1: Overlap.

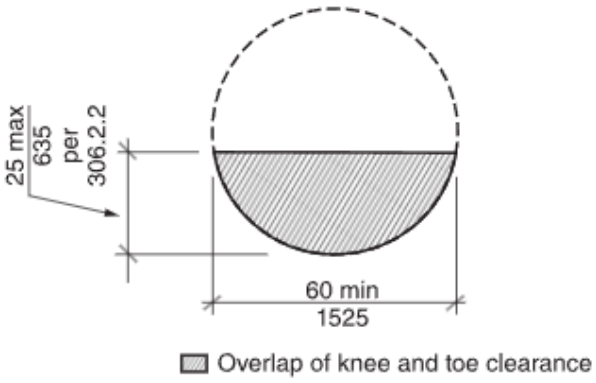
Turning spaces shall be permitted to include knee and toe clearance complying with Section 306. Where the turning space includes knee and toe clearances under an obstruction, the overlap shall comply with all of the following:

1. The depth of the overlap shall not be more than 10 inches (255 mm), and
2. The depth shall not exceed the depth of the knee and toe clearances provided, and
3. The overlap shall be permitted only within the turning circle area shown shaded in Figure 304.3.1.1.

304.3.1.2: Existing buildings and facilities.

In existing buildings and facilities, the turning space shall be a circular space with a 60-inch (1525 mm) minimum diameter.

Figure 304.3.1.2 CIRCULAR TURNING SPACE - EXISTING BUILDINGS - SIZE AND OVERLAP



304.3.1.2.1: Overlap.

Turning spaces shall be permitted to include knee and toe clearance complying with Section 306.

304.3.2: T-shaped space.

304.3.2.1: New buildings and facilities.

In new buildings and facilities, the turning space shall be a T–shaped space complying with one of the following:

1. A T-shaped space, clear of obstruction, that fits within an area 68 inches (1725 mm) wide and 60 inches (1525 mm) deep, with two arms and one base that are all 36 inches (915 mm) minimum in width. Each arm shall extend 16 inches (405 mm) minimum from each side of the base located opposite the other, and the base shall extend 24 inches (610 mm) minimum from the arms. At the intersection of each arm and the base, the interior corners shall be chamfered for 8 inches (205 mm) minimum along both the arm and along the base.
2. A T-shaped space, clear of obstruction, that fits within an area 64 inches (1625 mm) wide and 60 inches (1525 mm) deep, with two arms 38 inches (965 mm) minimum in width and a base 42 inches (1065 mm) minimum in width. Each arm shall extend 11 inches (280 mm) minimum from each side of the base, located opposite the other, and the base shall extend 22 inches (560 mm) minimum from each arm.
3. A T-shaped space, clear of obstruction, 64 inches (1625 mm) wide and 60 inches (1525 mm) deep, with two arms and one base 40 inches (1015 mm) minimum in width. Each arm shall extend 12 inches (305 mm) minimum from each side of the base and the base shall extend 20 inches (510 mm) minimum from each arm.

Figure 304.3.2.1(A) T-SHAPED TURNING SPACE - NEW BUILDINGS - OPTION 1

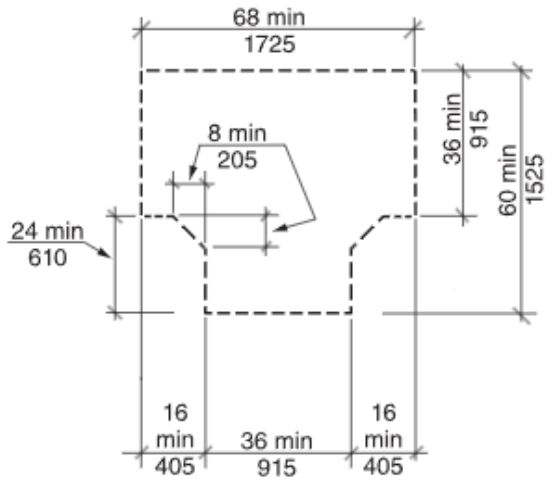


Figure 304.3.2.1(B) T-SHAPED TURNING SPACE - NEW BUILDINGS - OPTION 2

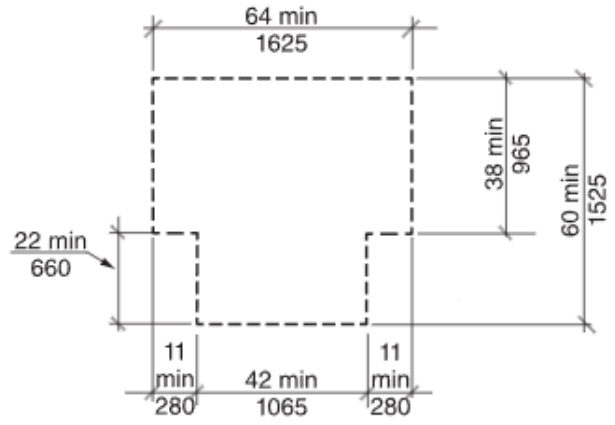
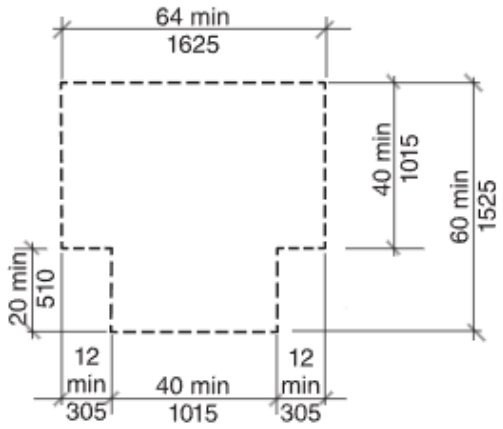


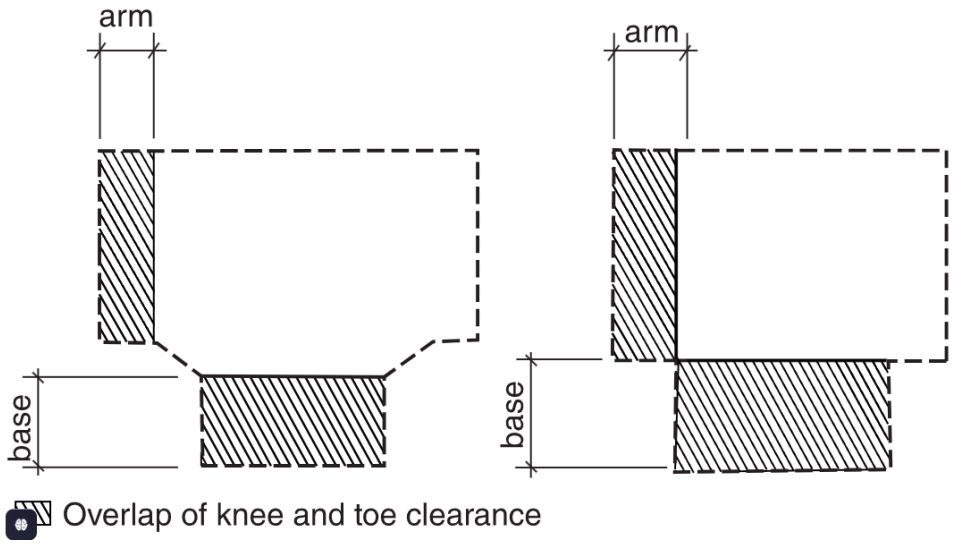
Figure 304.3.2.1(C) T-SHAPED TURNING SPACE - NEW BUILDINGS - OPTION 3



304.3.2.1.1: Overlap.

Turning spaces shall be permitted to include knee and toe clearance complying with Section 306 of either the base or one arm. For Option 1, the base or arm is the portion beyond the chamfer.

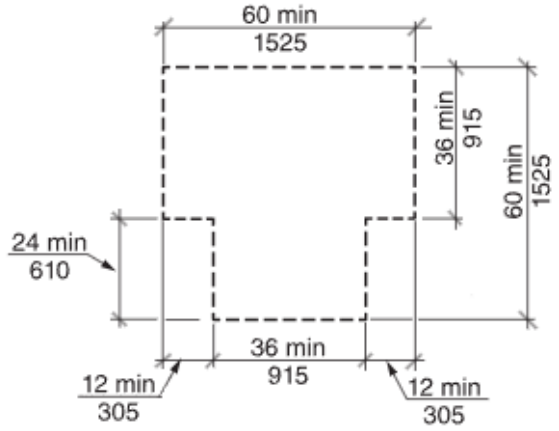
Figure 304.3.2.1.1 T-SHAPED TURNING SPACE - NEW BUILDINGS – OVERLAP



304.3.2.2: Existing buildings and facilities.

In existing buildings and facilities, the turning space shall be a T-shaped space within a 60-inch (1525 mm) minimum square, with arms and base 36 inches (915 mm) minimum in width. Each arm of the T shall be clear of obstructions 12 inches (305 mm) minimum in each direction, and the base shall be clear of obstructions 24 inches (610 mm) minimum.

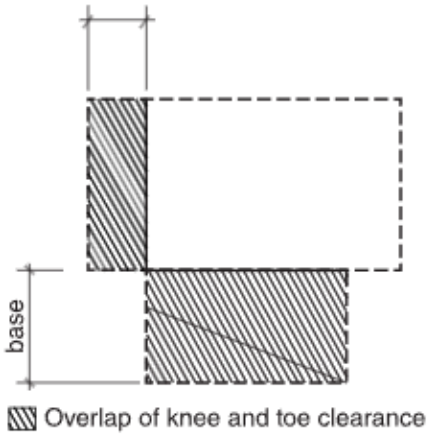
Figure 304.3.2.2 T-SHAPED TURNING SPACE – EXISTING BUILDINGS – SIZE



304.3.2.2.1: Overlap.

Turning spaces shall be permitted to include knee and toe clearance complying with Section 306 only at the end of either the base or one arm.

Figure 304.3.2.2.1 T-SHAPED TURNING SPACE - EXISTING BUILDINGS – OVERLAP



304.4: Door swing.

Unless otherwise specified, doors shall be permitted to swing into turning spaces.

Section 305: Clear Floor Space

305.1: General.

A clear floor space shall comply with Section 305.

305.2: Floor surfaces.

Floor surfaces of a clear floor space shall comply with Section 302. Changes in level shall not be permitted within the clear floor space.

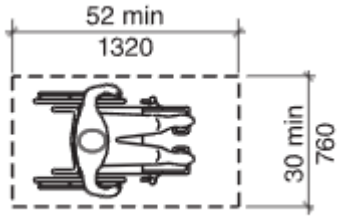
Exception: Slopes not steeper than 1:48 shall be permitted.

305.3: Size.

305.3.1: New buildings and facilities.

In new buildings and facilities, the clear floor space shall be 52 inches (1320 mm) minimum in length and 30 inches (760 mm) minimum in width.

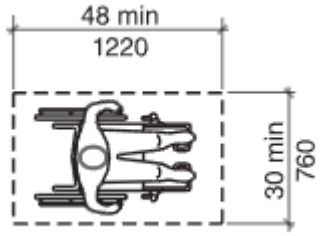
Figure 305.3.1 SIZE OF CLEAR FLOOR SPACE - NEW BUILDINGS



305.3.2: Existing buildings and facilities.

In existing buildings and facilities, the clear floor space shall be 48 inches (1220 mm) minimum in length and 30 inches (760 mm) minimum in width.

Figure 305.3.2 SIZE OF CLEAR FLOOR SPACE - EXISTING BUILDINGS



305.4: Knee and toe clearance.

Unless otherwise specified, clear floor space shall be permitted to include knee and toe clearance complying with Section 306.

305.5: Position.

Unless otherwise specified, clear floor spaces shall be positioned for either forward or parallel approach to an element.

Figure 305.5(A) POSITION OF CLEAR FLOOR SPACE – FORWARD

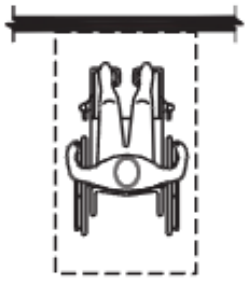
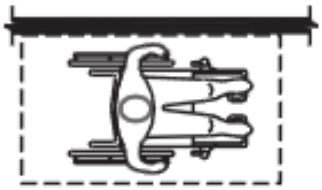


Figure 305.5(B) POSITION OF CLEAR FLOOR SPACE – PARALLEL



305.6: Approach.

One full, unobstructed side of a clear floor space shall adjoin or overlap an accessible route or adjoin another clear floor space.

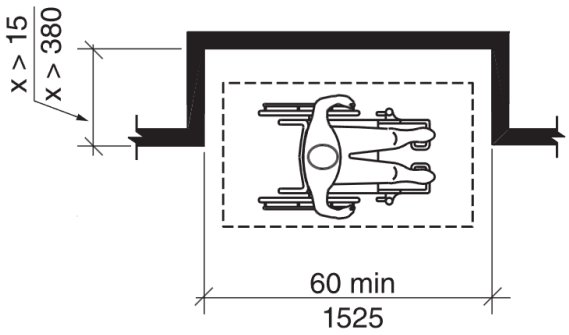
305.7: Alcoves.

If a clear floor space is in an alcove or otherwise confined on all or part of three sides, additional maneuvering clearances complying with Sections 305.7.1 and 305.7.2 shall be provided, as applicable.

305.7.1: Parallel approach.

Where a clear floor space is positioned for a parallel approach, the alcove shall be 60 inches (1525 mm) minimum in width where the depth exceeds 15 inches (380 mm).

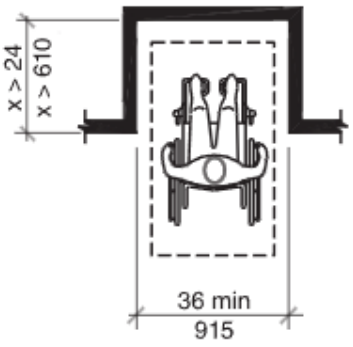
Figure 305.7.1 MANEUVERING CLEARANCE IN AN ALCOVE - PARALLEL APPROACH



305.7.2: Forward approach.

Where a clear floor space is positioned for a forward approach, the alcove shall be 36 inches (915 mm) minimum in width where the depth exceeds 24 inches (610 mm).

Figure 305.7.2 MANEUVERING CLEARANCE IN AN ALCOVE - FORWARD APPROACH



Section 306: Knee and Toe Clearance

306.1: General.

Where space beneath an element is included as part of the clear floor space at an element, clearance at an element, or a turning space, the space shall comply with Section 306. Additional space shall not be prohibited beneath an element, but shall not be considered as part of the clear floor space or turning space.

306.2: Toe clearance.

Figure 306.2(A) TOE CLEARANCE – ELEVATION

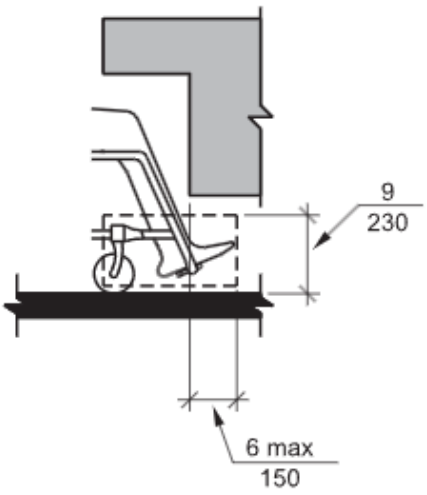
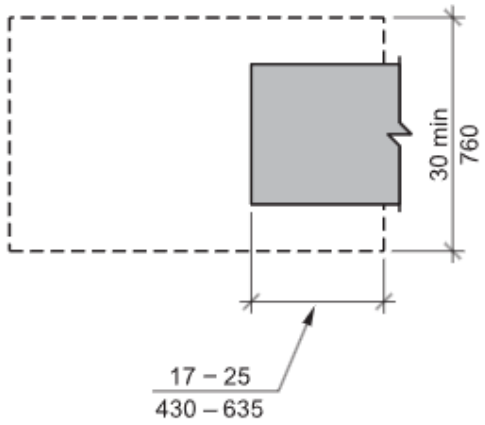


Figure 306.2(B) TOE CLEARANCE – PLAN



306.2.1: General.

Space beneath an element between the floor and 9 inches (230 mm) above the floor shall be considered toe clearance and shall comply with Section 306.2.

306.2.2: Maximum depth.

Toe clearance shall be permitted to extend 25 inches (635 mm) maximum under an element.

306.2.3: Minimum depth.

Where toe clearance is required at an element as part of a clear floor space complying with Section 305, the toe clearance shall extend 17 inches (430 mm) minimum beneath the element.

306.2.4: Additional clearance.

Space extending greater than 6 inches (150 mm) beyond the available knee clearance at 9 inches (230 mm) above the floor shall not be considered toe clearance.

306.2.5: Width.

Toe clearance shall be 30 inches (760 mm) minimum in width.

306.3: Knee clearance.

Figure 306.3(A) KNEE CLEARANCE – ELEVATION

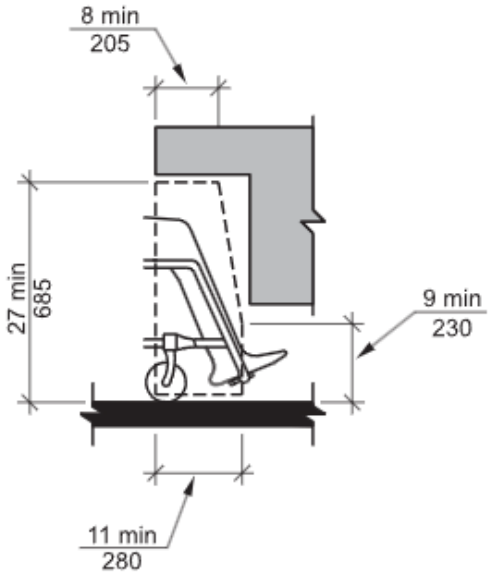
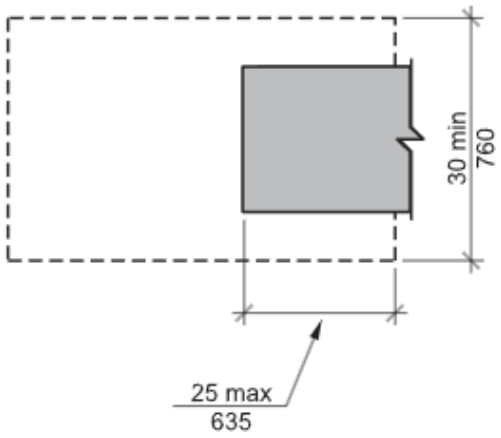


Figure 306.3(B) KNEE CLEARANCE – PLAN



306.3.1: General.

Space beneath an element between 9 inches (230 mm) and 27 inches (685 mm) above the floor shall be considered knee clearance and shall comply with Section 306.3.

306.3.2: Maximum depth.

Knee clearance shall be permitted to extend 25 inches (635 mm) maximum under an element at 9 inches (230 mm) above the floor.

306.3.3: Minimum depth.

Where knee clearance is required beneath an element as part of a clear floor space complying with Section 305, the knee clearance shall be 11 inches (280 mm) minimum in depth at 9 inches (230 mm) above the floor, and 8 inches (205 mm) minimum in depth at 27 inches (685 mm) above the floor.

306.3.4: Clearance reduction.

Between 9 inches (230 mm) and 27 inches (685 mm) above the floor, the knee clearance shall be permitted to be reduced at a rate of 1 inch (25 mm) in depth for each 6 inches (150 mm) in height.

306.3.5: Width.

Knee clearance shall be 30 inches (760 mm) minimum in width.

Section 307: Protruding Objects

307.1: General.

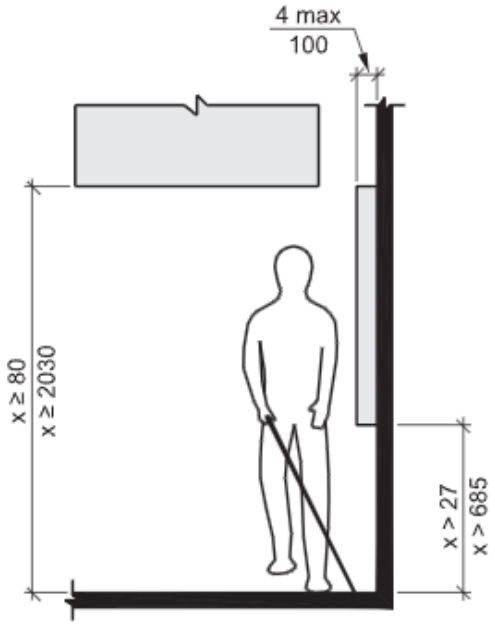
Protruding objects on circulation paths shall comply with Section 307.

307.2: Protrusion limits.

Objects with leading edges more than 27 inches (685 mm) and not more than 80 inches (2030 mm) above the floor shall protrude 4 inches (100 mm) maximum horizontally into a circulation path.

Exception: Handrails shall be permitted to protrude 4 1/2 inches (115 mm) maximum.

Figure 307.2 LIMITS OF PROTRUDING OBJECTS



307.3: Post-mounted objects.

Objects on posts or pylons shall be permitted to overhang 4 inches (100 mm) maximum where more than 27 inches (685 mm) and not more than 80 inches (2030 mm) above the floor. Objects on multiple posts or pylons where the clear distance between posts or pylons is greater than 12 inches (305 mm) shall have the lowest edge of such object either 27 inches (685 mm) maximum or 80 inches (2030 mm) minimum above the floor.

Exception: Sloping portions of handrails between the top and bottom riser of stairs and above the ramp run shall not be required to comply with this section.

Figure 307.3(A) POST-MOUNTED PROTRUDING OBJECTS

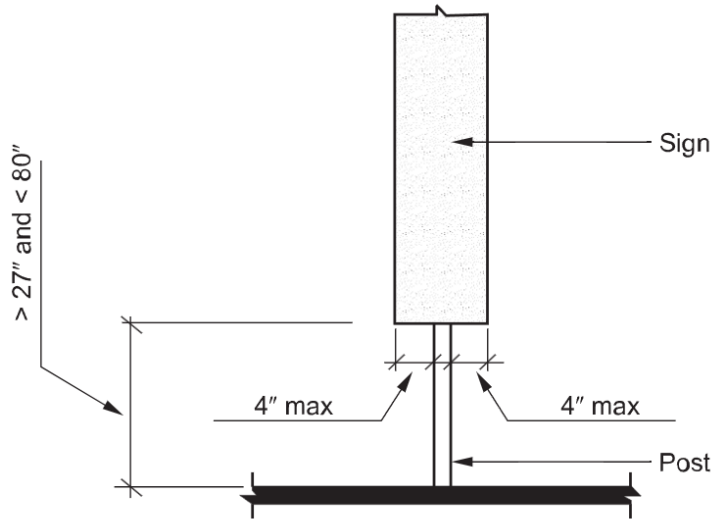
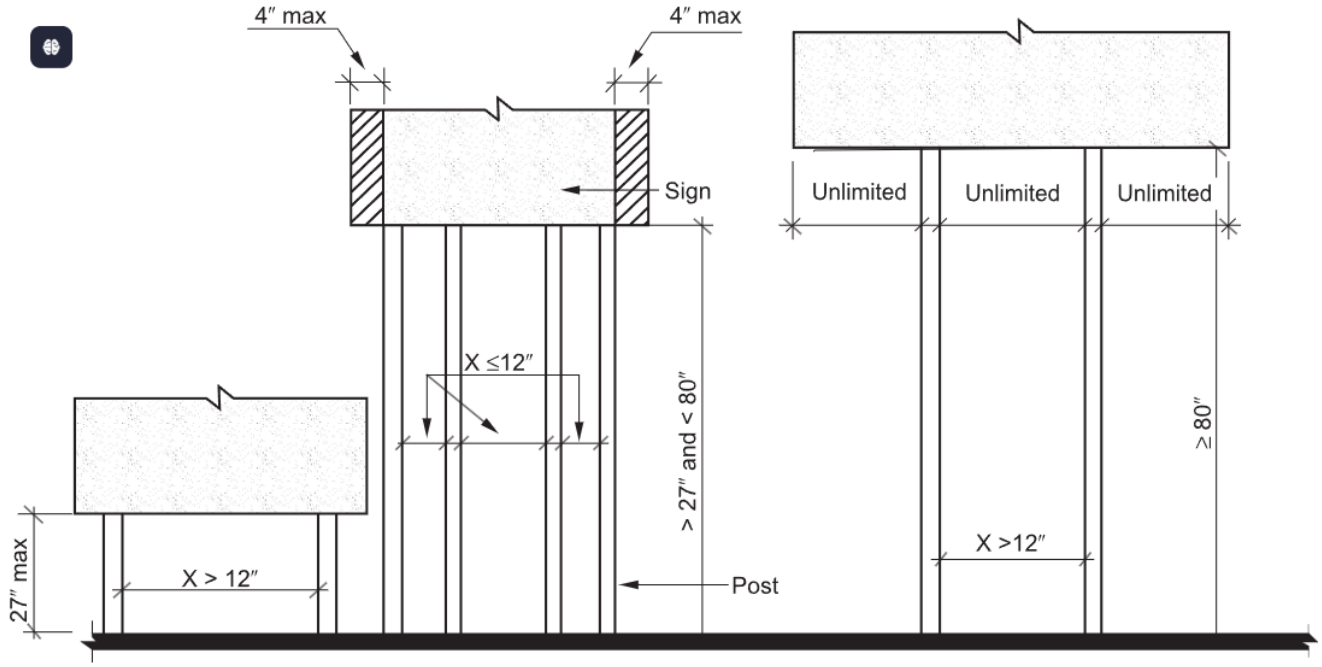


Figure 307.3(B) POST-MOUNTED PROTRUDING OBJECTS

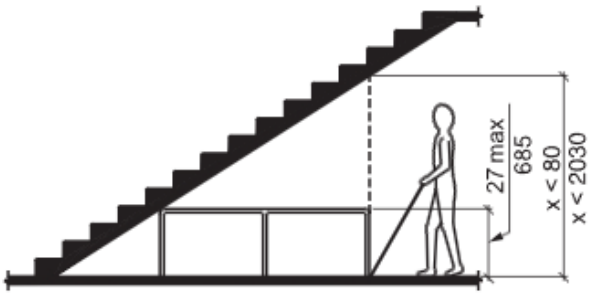


307.4: Vertical clearance.

Vertical clearance shall be 80 inches (2030 mm) minimum. Rails or other barriers shall be provided where the vertical clearance is less than 80 inches (2030 mm). The leading edge of such rails or barrier shall be located 27 inches (685 mm) maximum above the floor.

Exception: Door closers and door stops shall be permitted to be 78 inches (1980 mm) minimum above the floor.

Figure 307.4 REDUCED VERTICAL CLEARANCE



307.5: Required clear width.

Protruding objects shall not reduce the clear width required for accessible routes.

Section 308: Reach Ranges

308.1: General.

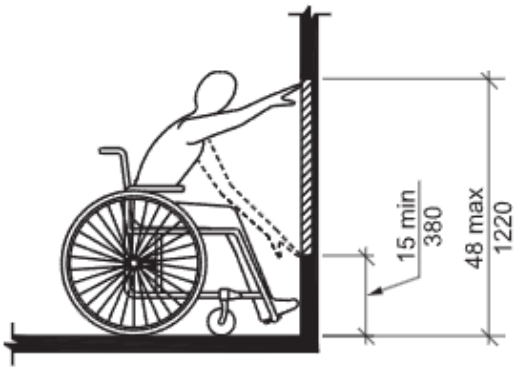
Reach ranges shall comply with Section 308.

308.2: Forward reach.

308.2.1: Unobstructed.

Where a forward reach is unobstructed, the high forward reach shall be 48 inches (1220 mm) maximum and the low forward reach shall be 15 inches (380 mm) minimum above the floor.

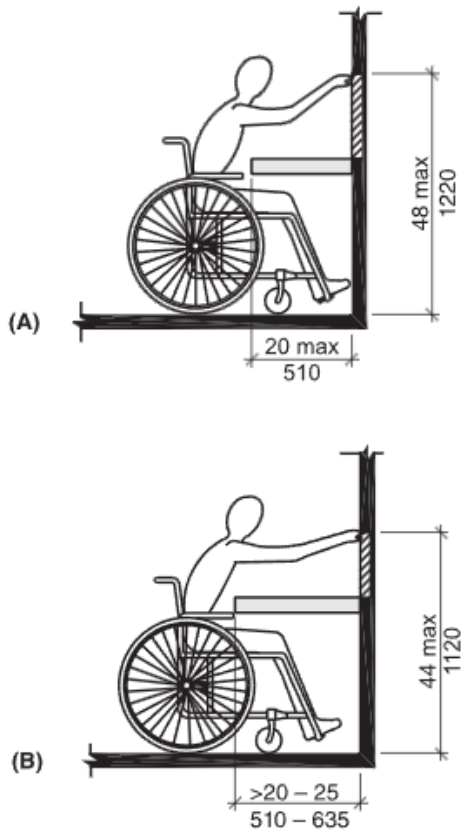
Figure 308.2.1 UNOBSTRUCTED FORWARD REACH



308.2.2: Obstructed high reach.

Where a high forward reach is over an obstruction, the clear floor space complying with Section 305 and knee and toe clearance complying with Section 306 shall extend beneath the element for a distance not less than the required reach depth over the obstruction. The high forward reach shall be 48 inches (1220 mm) maximum above the floor where the reach depth over the obstruction is 20 inches (510 mm) maximum. The high forward reach shall be 44 inches (1120 mm) maximum above the floor where the reach depth over the obstruction is greater than 20 inches (510 mm) and not more than 25 inches (635 mm) maximum.

Figure 308.2.2 OBSTRUCTED HIGH FORWARD REACH



308.3: Side reach.

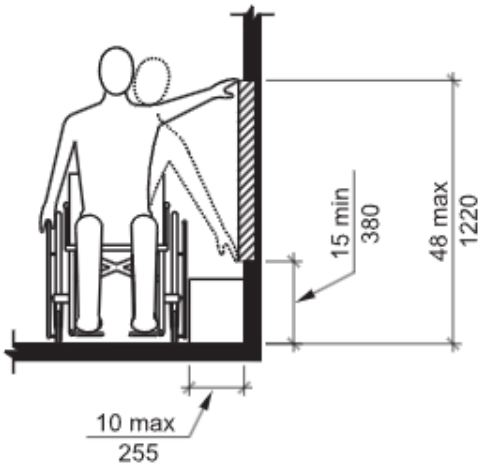
308.3.1: Unobstructed.

Where a clear floor space complying with Section 305 allows a parallel approach to an element and the edge of the clear floor space is 10 inches (255 mm) maximum from the element, the high side reach shall be 48 inches (1220 mm) maximum and the low side reach shall be 15 inches (380 mm) minimum above the floor.

Exceptions:

1. Existing elements that are not altered shall be permitted at 54 inches (1370 mm) maximum above the floor.
2. Operable parts on fuel dispensers installed on existing curbs shall be permitted at 54 inches (1370 mm) maximum above the floor.

Figure 308.3.1 UNOBSTRUCTED SIDE REACH



308.3.2: Obstructed high reach.

Where a clear floor space complying with Section 305 allows a parallel approach to an element and the high side reach is over an obstruction, the height of the obstruction shall be 34 inches (865 mm) maximum above the floor and the depth of the obstruction shall be 24 inches (610 mm) maximum. The high side reach shall be 48 inches (1220 mm) maximum above the floor for a reach depth of 10 inches (255 mm) maximum. Where the reach depth exceeds 10 inches (255 mm), the high side reach shall be 46 inches (1170 mm) maximum above the floor for a reach depth of 24 inches (610 mm) maximum.

Figure 308.3.2(A) OBSTRUCTED HIGH SIDE REACH

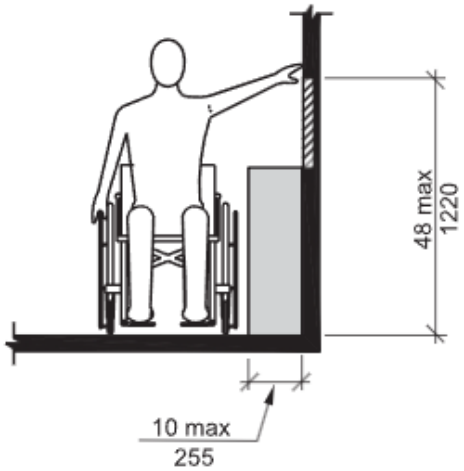
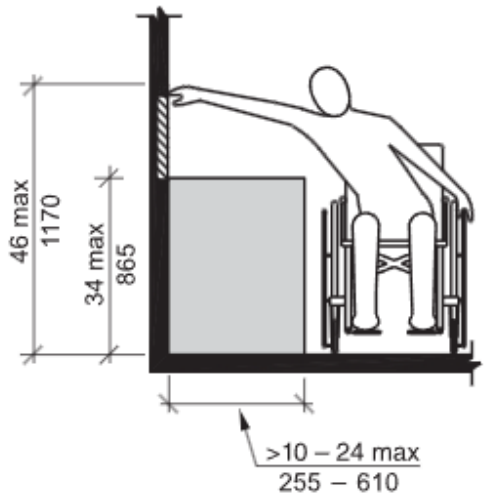


Figure 308.3.2(B) OBSTRUCTED HIGH SIDE REACH



Section 309: Operable Parts

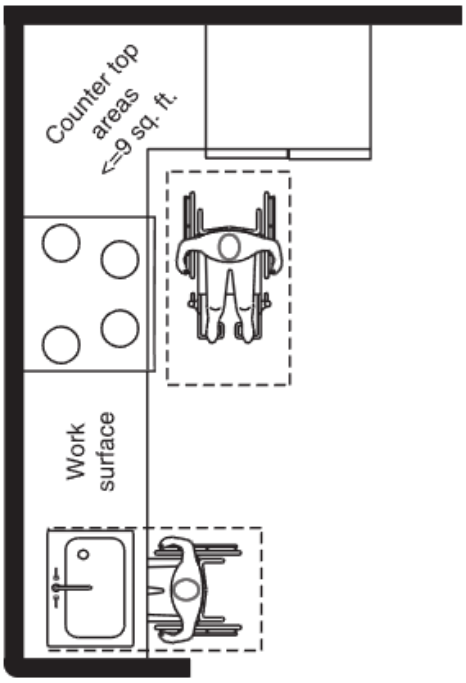
309.1: General.

Operable parts shall comply with Section 309.

Exceptions:

1. Receptacle outlets serving a dedicated use.
2. Where two or more receptacle outlets are provided in a kitchen above a length of countertop that is uninterrupted by a sink or appliance, one receptacle outlet shall not be required to comply with this section.
3. In a kitchen, where a clear floor space for a parallel approach cannot be located at a countertop in a corner between appliances, receptacle outlets over the countertop shall not be required to comply with this section provided that the countertop area does not exceed 9 square feet (0.835 m2) maximum.
4. Floor receptacle outlets.
5. HVAC diffusers.
6. Controls mounted on ceiling fans.
7. Where redundant controls other than light switches are provided for a single element, one control in each space shall not be required to comply with this section.
8. Reset buttons and shut-offs serving appliances, piping and plumbing fixtures.
9. Electrical panelboards shall not be required to comply with Section 309.4.
10. Emergency aid devices, such as fire department hose connections, valve controls, gauges, police call boxes and annunciator panels shall not be required to comply with this section provided that they are used only for emergencies by emergency personnel acting in their official capacity.

Figure 309.1 OPERABLE PARTS - EXCEPTION 3



309.2: Clear floor space.

A clear floor space complying with Section 305 shall be provided.

309.3: Height.

Operable parts shall be placed within one or more of the reach ranges specified in Section 308.

309.4: Operation.

Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5.0 pounds (22.2 N) maximum.

> **Exception:** Gas pump nozzles shall not be required to provide operable parts that have an activating force of 5.0 pounds (22.2 N) maximum.

Chapter 6: Plumbing Elements and Facilities

Section 601: General

601.1: Scope.

Plumbing elements and facilities required to be accessible by scoping provisions adopted by the administrative authority shall comply with the applicable provisions of Chapter 6.

Section 602: Drinking Fountains and Bottle Filling Stations

602.1: General.

Drinking fountains for persons using wheelchairs shall comply with Sections 602.2 and 307. Drinking fountains for persons who are standing shall comply with Section 602.3 and 307.

602.2: Drinking fountains for persons using wheelchairs.

Drinking fountains for persons using wheelchairs shall comply with Sections 602.2.1 through 602.2.5.

602.2.1: Clear floor space.

A clear floor space positioned for a forward approach to the drinking fountain shall be provided. Knee and toe space complying with Section 306 shall be provided. The clear floor space shall be centered on the drinking fountain.

> **Exception:** Drinking fountains primarily for children's use shall be permitted where a clear floor space provides a parallel approach and is centered on the drinking fountain.

Figure 602.2.1(A) CLEAR FLOOR SPACE AT WHEELCHAIR DRINKING FOUNTAINS

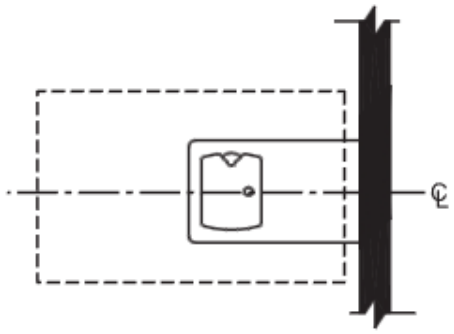
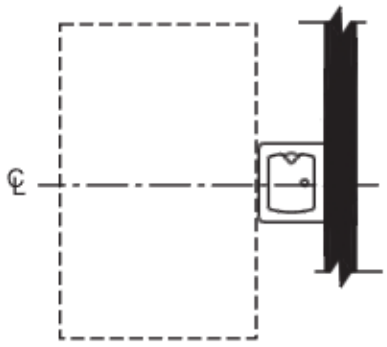


Figure 602.2.1(B) CLEAR FLOOR SPACE AT WHEELCHAIR DRINKING FOUNTAINS - PRIMARILY FOR CHILDREN'S USE – EXCEPTION



602.2.2: Operable parts.

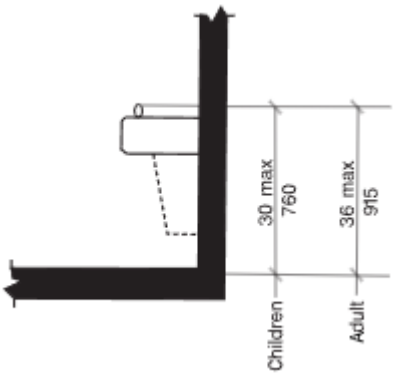
Operable parts shall comply with Section 309.

602.2.3: Spout outlet height.

Spout outlets of drinking fountains shall be 36 inches (915 mm) maximum above the floor.

Exception: At drinking fountains primarily for children's use, the spout outlet shall be 30 inches (760 mm) maximum above the floor.

Figure 602.2.3 WHEELCHAIR DRINKING FOUNTAIN SPOUT HEIGHT AND LOCATION

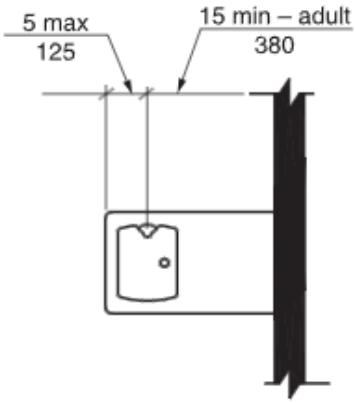


602.2.4: Spout location.

The spout shall be located 15 inches (380 mm) minimum from the vertical support and 5 inches (125 mm) maximum from the front edge of the drinking fountain, including bumpers.

Exception: At drinking fountains primarily for children’s use, the spout shall be located 3 1/2 inches (90 mm) maximum from the front edge of the drinking fountain, including bumpers.

Figure 602.2.4 WHEELCHAIR DRINKING FOUNTAIN SPOUT LOCATION



602.2.5: Water flow.

The spout shall provide a flow of water 4 inches (100 mm) minimum in height. The angle of the water stream from spouts within 3 inches (75 mm) of the front of the drinking fountain shall be 30 degrees maximum, and from spouts between 3 inches (75 mm) and 5 inches (125 mm) from the front of the drinking fountain shall be 15 degrees maximum, measured horizontally relative to the front face of the drinking fountain.

602.3: Drinking fountains for persons who are standing.

Drinking fountains for persons who are standing shall comply with Sections 602.3.1 through 602.3.4.

602.3.1: Operable parts.

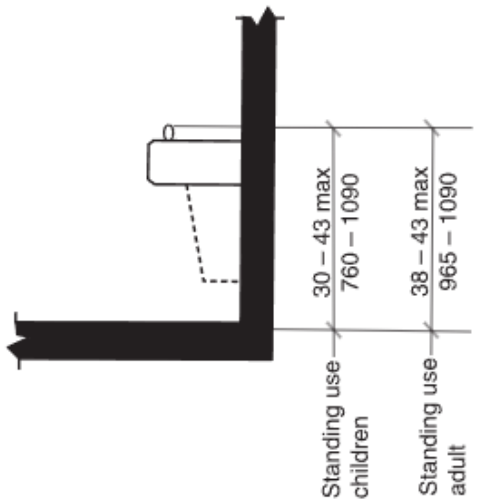
Operable parts shall comply with Sections 309.3 and 309.4.

602.3.2: Spout outlet height.

Spout outlets of drinking fountains shall be 38 inches (965 mm) minimum and 43 inches (1090 mm) maximum above the floor.

> **Exception:** Drinking fountains primarily for children's use shall be permitted where the spout outlet is 30 inches (760 mm) minimum and 43 inches (1090 mm) maximum above the floor.

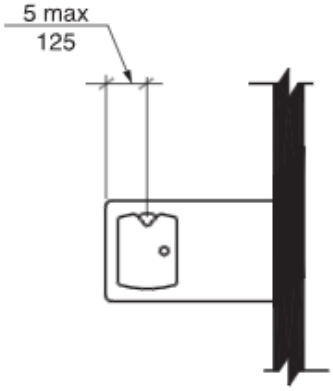
Figure 602.3.2 STANDING USE DRINKING FOUNTAIN SPOUT HEIGHT AND LOCATION



602.3.3: Spout location.

The spout shall be located 5 inches (125 mm) maximum from the front edge of the drinking fountain, including bumpers.

Figure 602.3.3 STANDING USE DRINKING FOUNTAIN SPOUT LOCATION



602.3.4: Water flow.

The spout shall provide a flow of water 4 inches (100 mm) minimum in height. The angle of the water stream from spouts within 3 inches (75 mm) of the front of the drinking fountain shall be 30 degrees maximum, and from spouts between 3 inches (75 mm) and 5 inches (125 mm) from the front of the drinking fountain shall be 15 degrees maximum, measured horizontally relative to the front face of the drinking fountain.

602.4: Bottle filling stations.

Bottle filling stations shall comply with Sections 602.4.1 and 602.4.2.

> **Exception:** Where bottle filling stations are part of the drinking fountain for persons who are standing, the bottle filling station is not required to comply with this section provided a bottle filling station is located at the drinking fountain for persons using wheelchairs.

602.4.1: Clear floor space.

A clear floor space positioned for a forward or side approach shall be provided.

602.4.2: Controls.

Controls for bottle filling stations shall be hand operated or automatic. Hand operated controls shall comply with Section 309.

Section 603: Toilet and Bathing Rooms

603.1: General.

Toilet and bathing rooms shall comply with Section 603.

603.2: Clearances.

603.2.1: Turning space.

A turning space shall be provided within the room. The required turning space shall not be provided within a toilet compartment.

603.2.2: Door swing.

Doors shall not swing into the clear floor space or clearance for any fixture.

> **Exceptions:**
>
> 1. Doors to a toilet or bathing room for a single occupant, accessed only through a private office and not for common use or public use shall be permitted to swing into the clear floor space, provided the swing of the door can be reversed to comply with Section 603.2.2.
> 2. Where the room is for individual use and a clear floor space complying with Section 305.3 is provided within the room beyond the arc of the door swing, the door shall not be required to comply with Section 603.2.2.

603.3: Mirrors.

Where mirrors are located above lavatories, a mirror shall be located over the lavatory complying with Section 606 and shall be mounted with the bottom edge of the reflecting surface 40 inches (1015

mm) maximum above the floor. Where mirrors are located above counters that do not contain lavatories, the mirror shall be mounted with the bottom edge of the reflecting surface 40 inches (1015 mm) maximum above the floor.

> **Exception:** Other than within Accessible dwelling or sleeping units, mirrors shall not be required over the lavatories or counters if a mirror is located within the same toilet or bathing room and mounted with the bottom edge of the reflecting surface 35 inches (890 mm) maximum above the floor.

603.4: Coat hooks and shelves.

Coat hooks shall be located within one of the reach ranges specified in Section 308. Shelves shall be 40 inches (1015 mm) minimum and 48 inches (1220 mm) maximum above the floor.

603.5: Diaper changing tables.

Diaper changing tables shall comply with Sections 309 and 902

603.6: Operable parts.

Operable parts on towel dispensers and hand dryers serving lavatories complying with Section 606 shall comply with Table 603.6.

TABLE 603.6 MAXIMUM REACH DEPTH AND HEIGHT

Maximum Reach Depth	0.5 inch (13 mm)	2 inches (51 mm)	5 inches (125 mm)	6 inches (150 mm)	9 inches (230 mm)	11 inches (280 mm)
Maximum Reach Height	48 inches (1220 mm)	46 inches (1170 mm)	42 inches (1065 mm)	40 inches (1015 mm)	36 inches (915 mm)	34 inches (865 mm)

Section 604: Water Closets and Toilet Compartments

604.1: General.

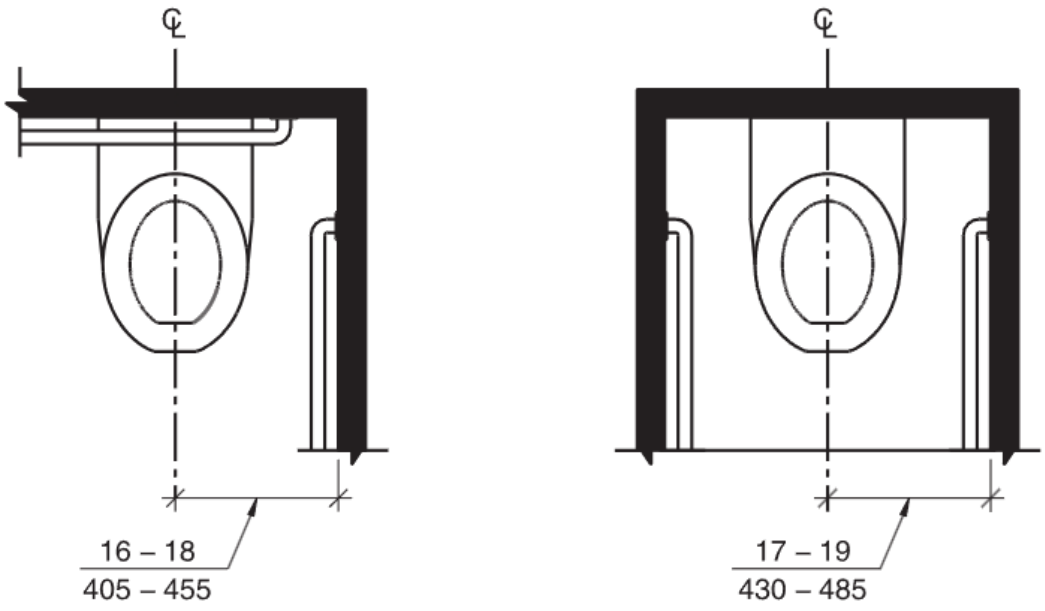
Water closets and toilet compartments shall comply with Section 604. Compartments containing more than one plumbing fixture shall comply with Section 603. Wheelchair accessible compartments shall comply with Section 604.9. Ambulatory accessible compartments shall comply with Section 604.10.

> **Exception:** Water closets and toilet compartments primarily for children’s use shall be permitted to comply with Section 604.11 as applicable.

604.2: Location.

The water closet shall be located with a wall or partition to the rear and to one side. The centerline of the water closet shall be 16 inches (405 mm) minimum and 18 inches (455 mm) maximum from the side wall or partition. Water closets located in ambulatory accessible toilet compartments specified in Section 604.10 shall have the centerline of the water closet 17 inches (430 mm) minimum and 19 inches (485 mm) maximum from the side wall or partition.

Figure 604.2 WATER CLOSET LOCATION

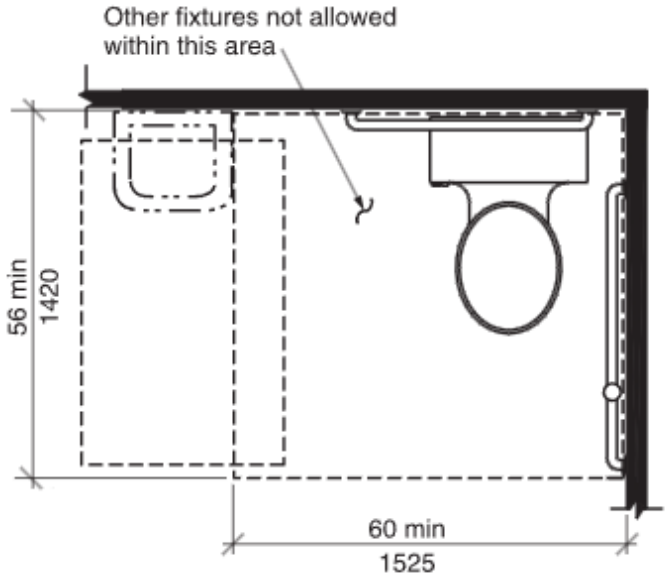


(A) Accessible Water Closets

(B) Ambulatory Accessible Water Closets

604.3: Clearance.

Figure 604.3 SIZE OF CLEARANCE FOR WATER CLOSET



604.3.1: Clearance width.

Clearance around a water closet shall be 60 inches (1525 mm) minimum in width, measured perpendicular from the sidewall.

604.3.2: Clearance depth.

Clearance around the water closet shall be 56 inches (1420 mm) minimum in depth, measured perpendicular from the rear wall.

604.3.3: Clearance overlap.

The required clearance around the water closet shall be permitted to overlap the water closet, associated grab bars, paper dispensers, sanitary napkin receptacles, coat hooks, shelves, accessible routes, clear floor space at other fixtures and the turning space. No other fixtures or obstructions shall be within the required water closet clearance.

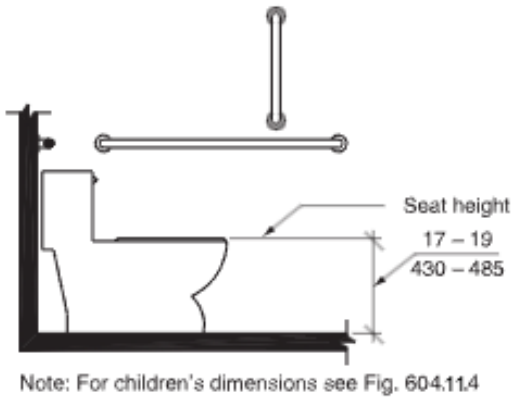
604.4: Height.

The height of water closet seats shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum above the floor, measured to the top of the seat. Seats shall not be sprung to return to a lifted position.

Exceptions:

1. A water closet which is adjustable in height by the user is permitted provided that at least one adjustment setting provides a seat within the range specified in this section.
2. A water closet in a toilet room for a single occupant, accessed only through a private office and not for common use or public use, shall not be required to comply with this section.

Figure 604.4 WATER CLOSET SEAT HEIGHT



Note: For children's dimensions see Fig. 604.11.4

604.5: Grab bars.

Grab bars for water closets shall comply with Section 609 and shall be provided in accordance with Sections 604.5.1 and 604.5.2. Grab bars shall be provided on the rear wall and on the side wall closest to the water closet.

Exceptions:

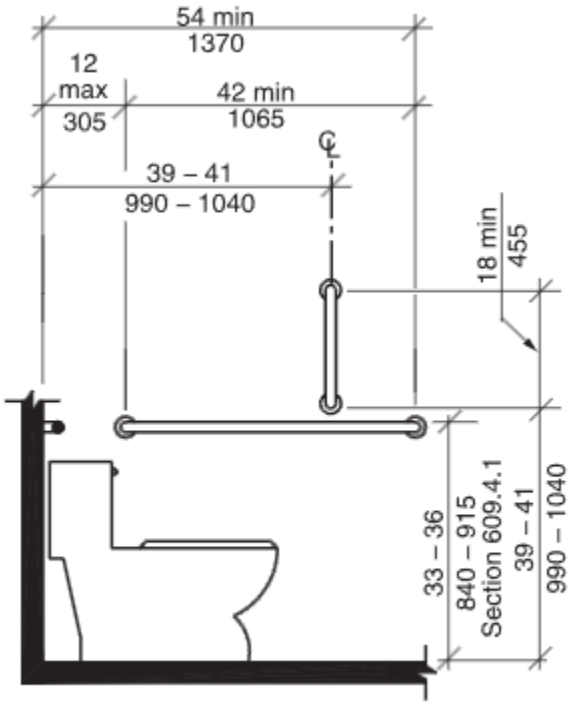
1. Grab bars shall not be required to be installed in a toilet room for a single occupant, accessed only through a private office and not for common use or public use, provided reinforcement has been installed in walls and located so as to permit the installation of grab bars complying with Section 604.5.

2. In detention or correction facilities, grab bars shall not be required to be installed in housing or holding cells or rooms that are specially designed without protrusions for purposes of suicide prevention.

604.5.1: Fixed side-wall grab bars.

Fixed side-wall grab bars shall include a horizontal bar complying with Section 604.5.1.1 and a vertical grab bar complying with Section 604.5.1.2. The vertical grab bar at water closets primarily for children's use shall comply with Section 609.4.2.

Figure 604.5.1 SIDE-WALL GRAB BAR FOR WATER CLOSET



Note: For children's dimensions see Fig. 609.4.2.

604.5.1.1: Horizontal grab bar.

A horizontal grab bar 42 inches (1065 mm) minimum in length shall be located 12 inches (305 mm) maximum from the rear wall and extend 54 inches (1370 mm) minimum from the rear wall.

604.5.1.2: Vertical grab bar.

A vertical grab bar 18 inches (455 mm) minimum in length shall be mounted with the bottom of the bar located 39 inches (990 mm) minimum and 41 inches (1040 mm) maximum above the floor, and with the center line of the bar located 39 inches (990 mm) minimum and 41 inches (1040 mm) maximum from the rear wall.

604.5.2: Rear-wall grab bars.

The fixed rear-wall grab bar shall:

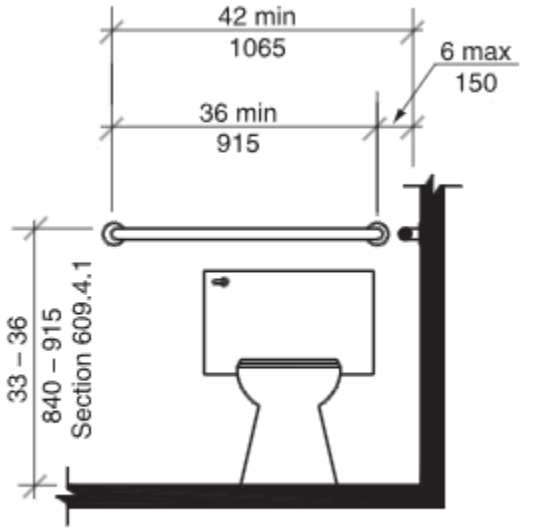
1. Be 36 inches (915 mm) minimum in length,
2. Be located 6 inches maximum (150 mm) from the side wall, and

3. Extend 42 inches (1065 mm) minimum from the side wall.

Exceptions:

1. The rear grab bar shall be permitted to be 24 inches (610 mm) minimum in length, centered on the water closet, where wall space does not permit a grab bar 36 inches (915 mm) minimum in length due to the location of a recessed fixture adjacent to the water closet.
2. Where an administrative authority requires flush controls for flush valves to be located in a position that conflicts with the location of the rear grab bar, that grab bar shall be permitted to be split or shifted to the open side of the toilet area.

Figure 604.5.2 REAR-WALL GRAB BAR FOR WATER CLOSET



Note: For children's dimensions see Fig. 609.4.2.

604.6: Flush controls.

Flush controls shall be hand operated or automatic. Hand operated flush controls shall comply with Section 309. Flush controls shall be located on the open side of the water closet.

Exception: In ambulatory accessible toilet compartments complying with Section 604.10, flush controls shall be permitted to be located on either side of the water closet.

604.7: Dispensers.

Toilet paper dispensers shall comply with Sections 309.4 and 609.3. Dispensers shall not be of a type that control delivery or do not allow continuous paper flow.

604.7.1: Location.

Where the dispenser is located above the grab bar, the outlet of the dispenser shall be located within an area 24 inches (610 mm) minimum and 36 inches (915 mm) maximum from the rear wall. Where the dispenser is located below the grab bar, the outlet of the dispenser shall be located within an area 24 inches (610 mm) minimum and 42 inches (1063 mm) maximum from the rear wall. The outlet of the dispenser shall be located 18 inches (455 mm) minimum and 48 inches (1220 mm) maximum above the floor.

Exception: Toilet paper dispensers that accommodate a maximum of 2 toilet paper rolls of not more than 5-inch (125 mm) diameter each shall be permitted to be located 7 inches (180 mm) minimum and 9 inches (230 mm) maximum in front the of the water closet measured to the centerline of the dispenser. The outlet of the dispenser shall be 15 inches (380 mm) minimum and 48 inches (1220 mm) maximum above the floor.

Figure 604.7.1(A) DISPENSER OUTLET LOCATION - PROTRUDING DISPENSER BELOW GRAB BAR

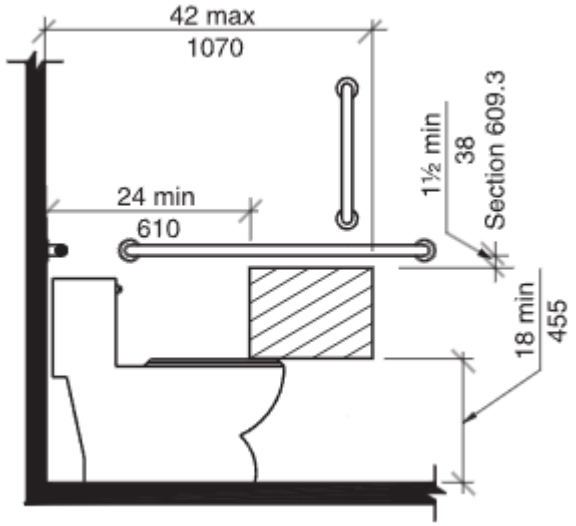


Figure 604.7.1(B) DISPENSER OUTLET LOCATION - PROTRUDING DISPENSER ABOVE GRAB BAR

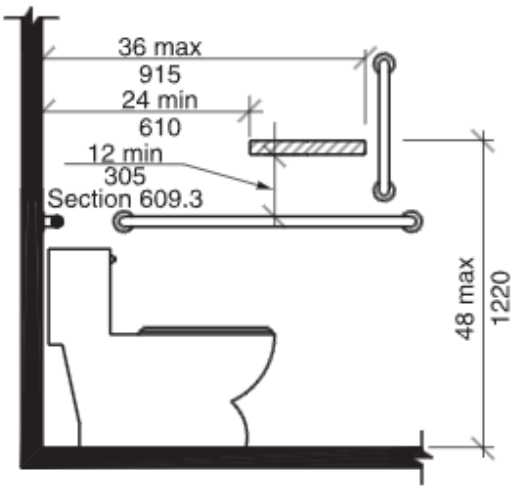
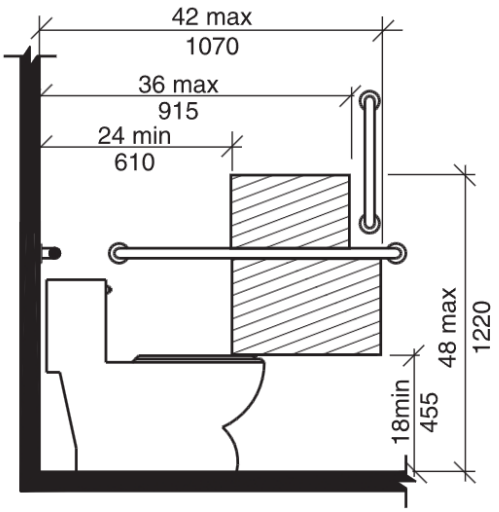
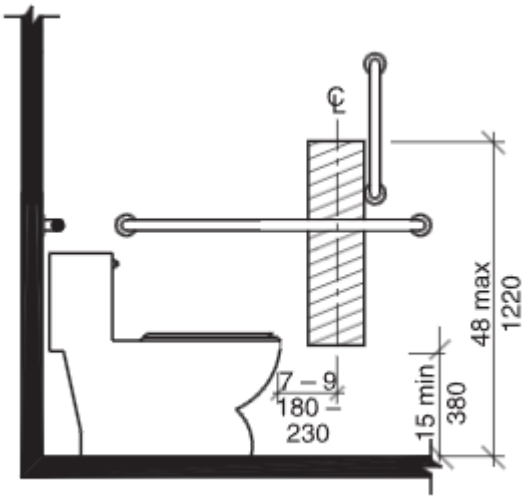


Figure 604.7.1(C) DISPENSER OUTLET LOCATION - RECESSED DISPENSER



Note: For children's dimensions see Fig. 604.11.7 dispenser outlet location.

Figure 604.7.1(D) DISPENSER OUTLET LOCATION - DISPENSER IN FRONT OF WATER CLOSET – EXCEPTION



604.8: Coat hooks and shelves.

Coat hooks provided within toilet compartments shall be 48 inches (1220 mm) maximum above the floor. Shelves shall be 40 inches (1015 mm) minimum and 48 inches (1220 mm) maximum above the floor.

604.9: Wheelchair accessible toilet compartments.

604.9.1: General.

Wheelchair accessible toilet compartments shall comply with Section 604.9.

604.9.2: Size.

Wheelchair accessible toilet compartments shall comply with Section 604.9.2.1, 604.9.2.2 or 604.9.2.3, as applicable.

Figure 604.9.2(A) WHEELCHAIR TOILET COMPARTMENTS - WALL HUNG CLOSET, ADULT

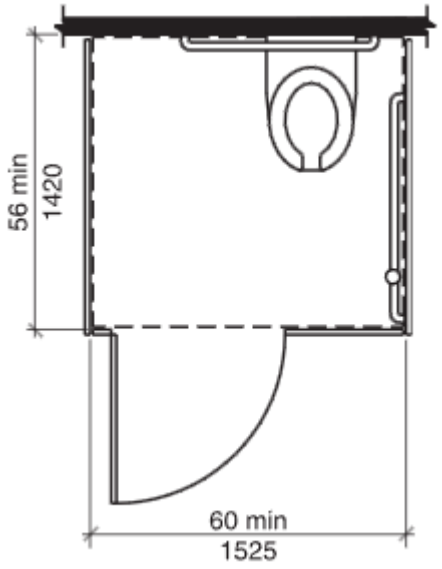
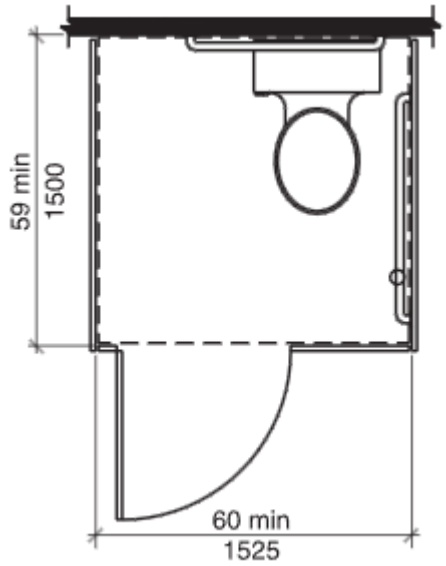


Figure 604.9.2(B) WHEELCHAIR TOILET COMPARTMENTS - FLOOR MOUNTED WATER CLOSET, ADULT - WALL HUNG AND FLOOR MOUNTED WATER CLOSET, CHILDREN



604.9.2.1: Minimum area.

The minimum area of a wheelchair accessible toilet compartment shall be 60 inches (1525 mm) minimum in width measured perpendicular to the side wall, and 56 inches (1420 mm) minimum in depth for wall hung water closets, and 59 inches (1500 mm) minimum in depth for floor mounted water closets measured perpendicular to the rear wall.

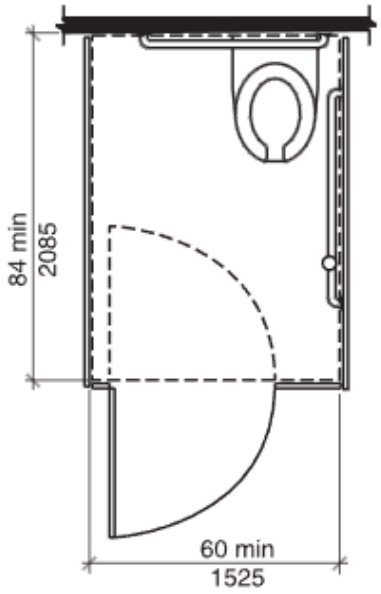
604.9.2.2: Compartment for children's use.

The minimum area of a wheelchair accessible toilet compartment primarily for children's use shall be 60 inches (1525 mm) minimum in width measured perpendicular to the side wall, and 59 inches (1500 mm) minimum in depth for wall hung and floor mounted water closets measured perpendicular to the rear wall.

604.9.2.3: Alternate wheelchair accessible toilet compartments.

Where an alternate wheelchair accessible toilet compartment is provided, the minimum area of the compartment shall be 60 inches (1525 mm) minimum in width, measured perpendicular to the side wall, and 84 inches (2135 mm) minimum in depth, measured perpendicular to the rear wall.

Figure 604.9.2.3 WHEELCHAIR TOILET COMPARTMENTS - ALTERNATE WHEELCHAIR TOILET COMPARTMENT



604.9.3: Doors.

Wheelchair accessible toilet compartment doors, including door hardware, shall comply with Section 404. The door shall be self-closing. A door pull complying with Section 404.2.6 shall be placed on both sides of the door near the latch. Wheelchair accessible toilet compartment doors shall not swing into the required minimum area of the compartment.

Exceptions:

1. Outside of the compartment, where the approach is to the latch side of the wheelchair accessible toilet compartment, door clearance between the door side of the compartment and any obstruction shall be 42 inches (1065 mm) minimum.
2. Within the wheelchair accessible toilet compartment, maneuvering clearances at the door shall not be required to comply with Section 404.
3. In an alternate wheelchair accessible toilet compartment, the door shall be permitted to swing into the stall where a clear floor space complying with Section 305.3 is provided within the stall beyond the arc of the door swing.

Figure 604.9.3(A) WHEELCHAIR TOILET COMPARTMENT DOORS - DOOR SWINGING INTO THE WHEELCHAIR TOILET COMPARTMENT

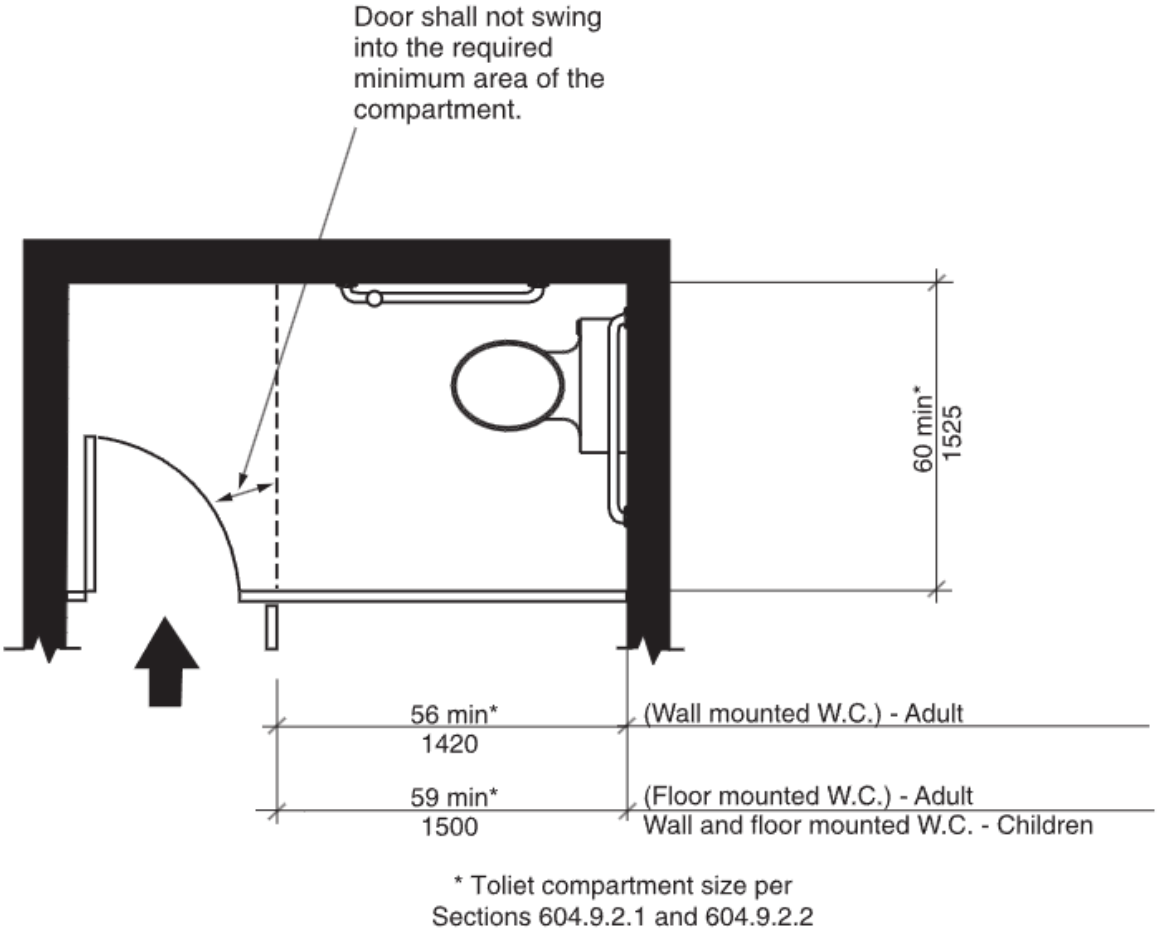
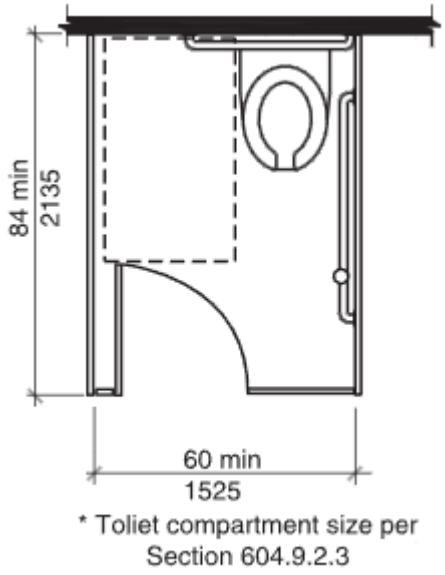


Figure 604.9.3(B) WHEELCHAIR TOILET COMPARTMENT DOORS - EXCEPTION 3 - ALTERNATE WHEELCHAIR COMPARTMENT



604.9.3.1: Door opening location.

The farthest edge of the wheelchair accessible toilet compartment door opening shall be located in the front wall or partition or in the side wall or partition as required by Table 604.9.3.1.

Figure 604.9.3.1(A) WHEELCHAIR TOILET COMPARTMENT DOOR OPENING LOCATION - DOOR SWINGING IN ON FRONT WALL OF PARTITION

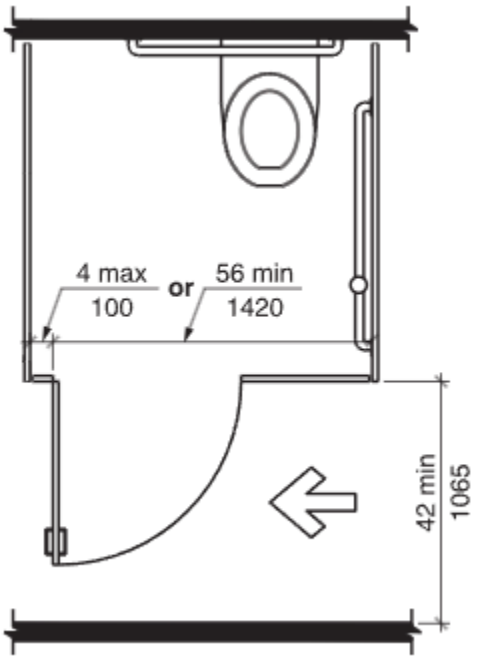


Figure 604.9.3.1(B) WHEELCHAIR TOILET COMPARTMENT DOOR OPENING LOCATION - DOOR SWINGING IN ON SIDE WALL OF PARTITIONS

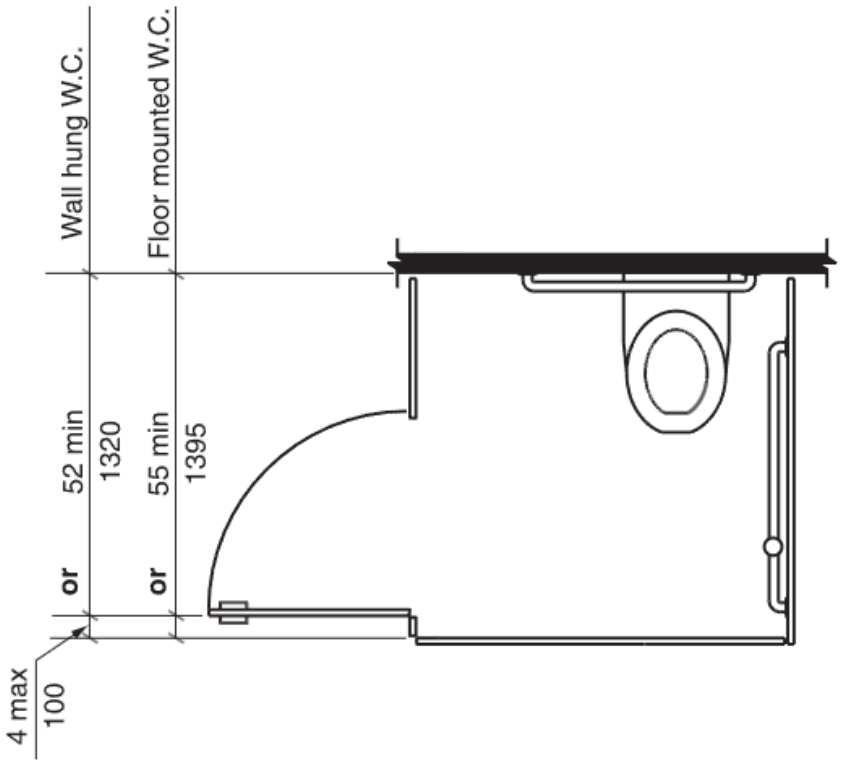


TABLE 604.9.3.1 DOOR OPENING LOCATION Door Opening Location

Door Opening Location	Measured From	Dimension
Front Wall or Partition	From the side wall or partition closest to the water closet	56 inches (1420 mm) minimum
	or	
	From the side wall or partition farthest from the water closet	4 inches (100 mm) maximum
Side Wall or Partition Wall-Hung Water Closet	From the rear wall	52 inches (1320 mm) minimum
	or	
	From the front wall or partition	4 inches (100 mm) maximum
Side Wall or Partition Floor-Mounted Water Closet	From the rear wall	55 inches (1395 mm) minimum
	or	
	From the front wall or partition	4 inches (100 mm) maximum

604.9.4: Approach.

Wheelchair accessible toilet compartments shall be arranged for left-hand or right-hand approach to the water closet.

604.9.5: Toe clearance.

Toe clearance for wheelchair accessible toilet compartments primarily for children's use shall comply with Section 604.9.5.2. Toe clearance for other wheelchair accessible toilet compartments shall comply with Section 604.9.5.1.

Figure 604.9.5(A) TOE CLEARANCE – ELEVATION

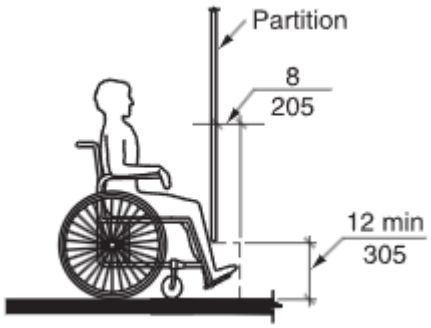
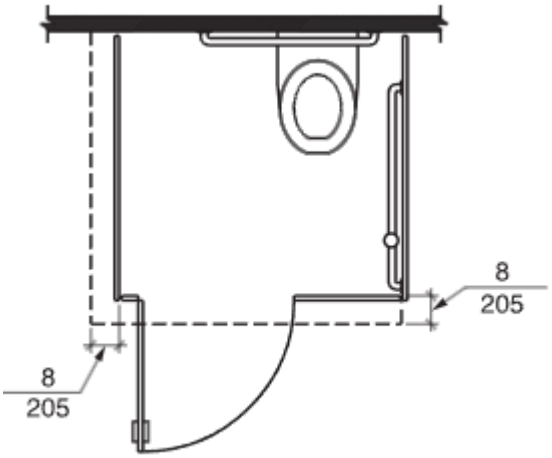


Figure 604.9.5(B) TOE CLEARANCE – PLAN



604.9.5.1: Toe clearance at wheelchair accessible toilet compartments.

The front partition and at least one side partition of wheelchair accessible toilet compartments shall provide a toe clearance of 12 inches (305 mm) minimum above the floor and extending 8 inches (205 mm) beyond the compartment side face of the partition, exclusive of partition support members.

Exceptions:

1. Toe clearance at the front partition is not required in a wheelchair accessible toilet compartment greater than 64 inches (1625 mm) in depth with a wall-hung water closet, or greater than 67 inches (1700 mm) in depth with a floor-mounted water closet.
2. Toe clearance at the side partition is not required in a wheelchair accessible toilet compartment greater than 68 inches (1725 mm) in width.

604.9.5.2: Toe clearance at wheelchair accessible toilet compartments for children's use.

The front partition and at least one side partition of wheelchair accessible toilet compartments primarily for children's use shall provide a toe clearance of 12 inches (305 mm) minimum above the floor and extending 8 inches (205 mm) beyond the wheelchair accessible toilet compartment side face of the partition, exclusive of partition support members.

Exceptions:

1. Toe clearance at the front partition is not required in a wheelchair accessible toilet compartment greater than 67 inches (1700 mm) in depth.
2. Toe clearance at the side partition is not required in a wheelchair accessible toilet compartment greater than 68 inches (1725 mm) in width.

604.9.6: Grab bars.

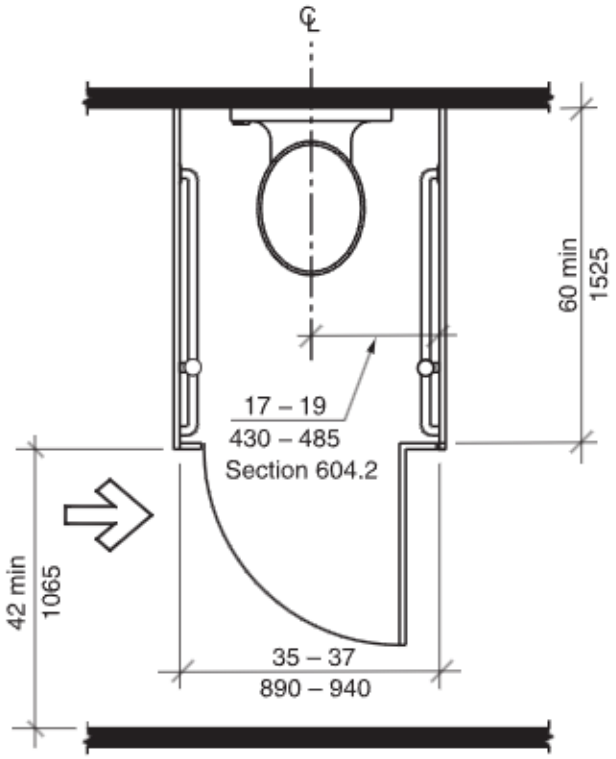
Grab bars shall comply with Section 609. Side wall grab bars complying with Section 604.5.1 located on the wall closest to the water closet, and a rear wall grab bar complying with Section 604.5.2, shall be provided.

604.10: Ambulatory accessible toilet compartments.

604.10.1: General.

Ambulatory accessible toilet compartments shall comply with Section 604.10.

Figure 604.10.1 AMBULATORY COMPARTMENT



604.10.2: Size.

The minimum area of an ambulatory accessible toilet compartment shall be 60 inches (1525 mm) minimum in depth and a width of 35 inches (890 mm) minimum and 37 inches (940 mm) maximum.

604.10.3: Doors.

Ambulatory accessible toilet compartment doors, including door hardware, shall comply with Section 404. The door shall be self-closing. A door pull complying with Section 404.2.6 shall be placed on both sides of the door near the latch. Compartment doors shall not swing into the required minimum area of the compartment.

Exceptions:

1. Outside of the ambulatory accessible toilet compartment, where the approach is to the latch side of the compartment door, clearance between the door side of the compartment and any obstruction shall be 42 inches (1065 mm) minimum.
2. Within the ambulatory accessible toilet compartment, maneuvering clearances at the door shall not be required to comply with Section 404.

604.10.4: Grab bars.

Grab bars shall comply with Section 609. Side wall grab bars complying with Section 604.5.1 shall be provided on both sides of the compartment.

604.11: Water closets and toilet compartments for children's use.

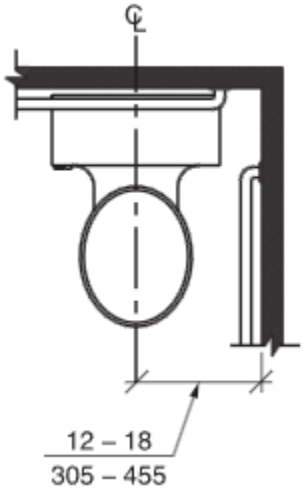
604.11.1: General.

Water closets and wheelchair and ambulatory accessible toilet compartments primarily for children's use shall comply with Section 604.11.

604.11.2: Location.

The water closet shall be located with a wall or partition to the rear and to one side. The centerline of the water closet shall be 12 inches (305 mm) minimum and 18 inches (455 mm) maximum from the side wall or partition. Water closets located in ambulatory accessible toilet compartments specified in Section 604.10 shall be located as specified in Section 604.2.

Figure 604.11.2 CHILDREN'S WATER CLOSET LOCATION



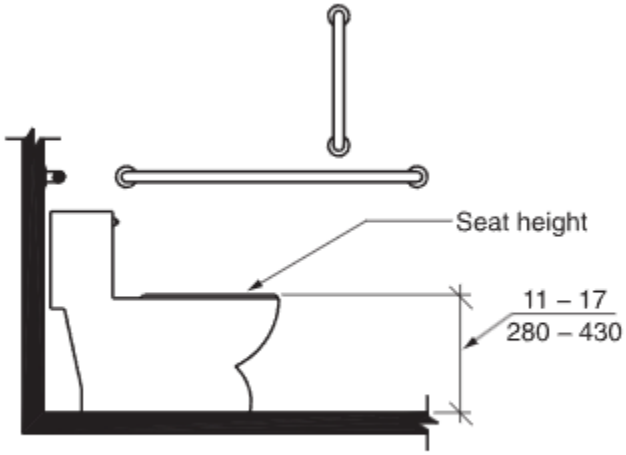
604.11.3: Clearance.

A clearance around the water closet complying with Section 604.3 shall be provided.

604.11.4: Height.

The height of water closet seats shall be 11 inches (280 mm) minimum and 17 inches (430 mm) maximum above the floor, measured to the top of the seat. Seats shall not be sprung to return to a lifted position.

Figure 604.11.4 CHILDREN'S WATER CLOSET HEIGHT



Note: For adult dimensions see Fig. 604.4.

604.11.5: Grab bars.

Grab bars for water closets shall comply with Section 604.5.

604.11.6: Flush controls.

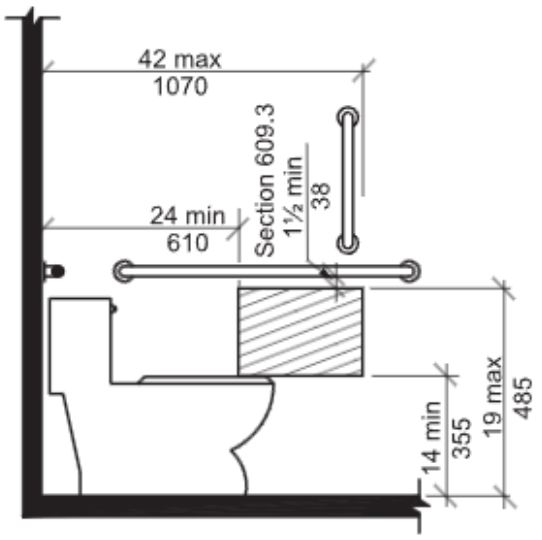
Flush controls shall be hand operated or automatic. Hand operated flush controls shall comply with Sections 309.2 and 309.4 and shall be installed 36 inches (915 mm) maximum above the floor. Flush controls shall be located on the open side of the water closet.

> **Exception:** In ambulatory accessible toilet compartments complying with Section 604.10, flush controls shall be permitted to be located on either side of the water closet.

604.11.7: Dispensers.

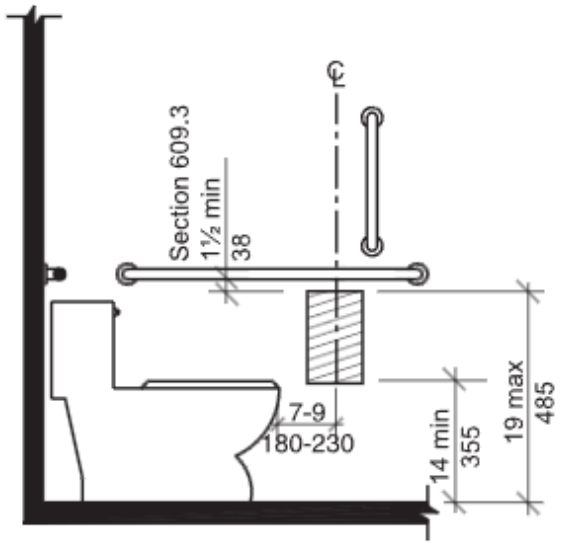
Toilet paper dispensers shall comply with Section 309.4. Dispensers shall not be of a type that control delivery or do not allow continuous paper flow.

Figure 604.11.7(A) CHILDREN'S DISPENSER OUTLET – LOCATION



Note: For adult dimensions see Fig. 604.7.

Figure 604.11.7(B) CHILDREN'S DISPENSER OUTLET – EXCEPTION



604.11.7.1: Location.

The outlet of toilet paper dispensers shall be located within an area 24 inches (610 mm) minimum and 42 inches (1065 mm) maximum from the rear wall. The outlet of the dispenser shall be 14 inches (355 mm) minimum and 19 inches (485 mm) maximum above the floor.

> **Exception:** Toilet paper dispensers that accommodate a maximum of 2 toilet paper rolls of not more than 5-inch diameter each shall be permitted to be located 7 inches minimum and 9 inches maximum in front of the of the water closet measured to the centerline of the dispenser. The outlet of the dispenser shall be 14 inches (355 mm) minimum and 19 inches (485 mm) maximum above the floor.

604.11.8: Toilet compartments.

Wheelchair and ambulatory accessible toilet compartments shall comply with Sections 604.9 and 604.10, as applicable.

Section 605: Urinals

605.1: General.

Urinals shall comply with Section 605.

605.2: Height and depth.

Urinals shall be of the stall type or shall be of the wall hung type with the rim at 17 inches (430 mm) maximum above the floor. Urinals shall be 13 1/2 inches (345 mm) minimum in depth measured from the outer face of the urinal rim to the finished wall surface.

Figure 605.2(A) HEIGHT AND DEPTH OF URINAL - WALL HUNG TYPE

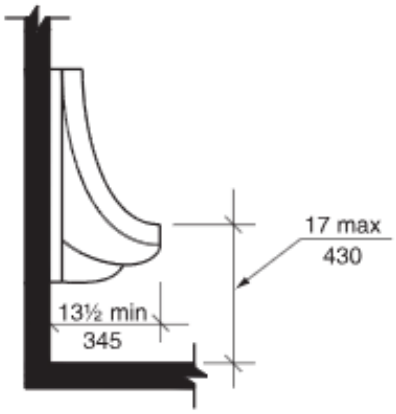
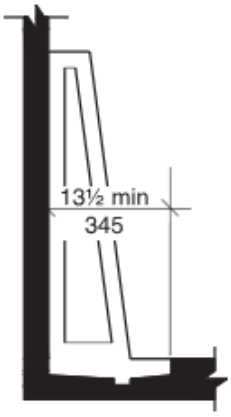


Figure 605.2(B) HEIGHT AND DEPTH OF URINAL - STALL TYPE



605.3: Clear floor space.

A clear floor space positioned for forward approach shall be provided.

605.4: Flush controls.

Flush controls shall be hand operated or automatic. Hand operated flush controls shall comply with Section 309.

Section 606: Lavatories and Sinks

606.1: General.

Lavatories and sinks shall comply with Section 606.

606.2: Clear floor space.

A clear floor space complying with Section 305.3, positioned for forward approach, shall be provided. Knee and toe clearance complying with Section 306 shall be provided. The dip of the overflow shall not be considered in determining knee and toe clearances.

Exceptions:

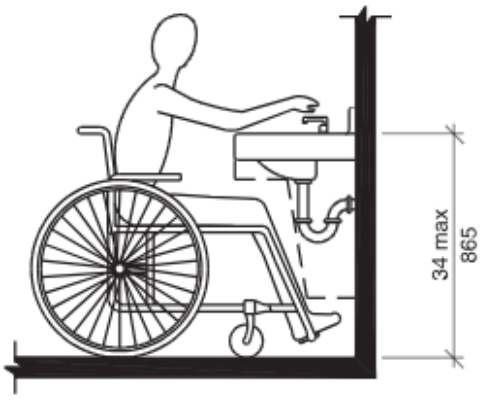
1. A clear floor space providing a parallel approach shall be permitted at a kitchen sink in a space where a cook top or conventional range is not provided.
2. The requirement for knee and toe clearance shall not apply to a lavatory in a toilet or bathing facility for a single occupant, accessed only through a private office and not for common use or public use.
3. A knee clearance of 24 inches (610 mm) minimum above the floor shall be permitted at lavatories and sinks used primarily by children ages 6 through 12 where the higher of the rim or counter surface is 31 inches (785 mm) maximum above the floor.
4. A clear floor space providing a parallel approach shall be permitted at lavatories and sinks used primarily by children ages 5 and younger.
5. The requirement for knee and toe clearance shall not apply to more than one bowl of a multi-bowl sink.
6. A clear floor space providing a parallel approach shall be permitted at wet bars.

606.3: Height.

The front of lavatories and sinks shall be 34 inches (865 mm) maximum above the floor, measured to the higher of the rim or counter surface.

Exception: A lavatory in a toilet or bathing facility for a single occupant, accessed only through a private office and not for common use or public use, shall not be required to comply with Section 606.3.

Figure 606.3 HEIGHT OF LAVATORIES AND SINKS



606.4 Faucets.

Faucets shall comply with Section 309. Hand-operated metering faucets shall remain open for 10 seconds minimum.

> **Exception:** Automatic faucets shall not be required to comply with Section 309 provided that the reach depth to activate the faucets and the reach depth to the water flow is 11 inches (280 mm) maximum.

606.5: Lavatories with enhanced reach range.

Where enhanced reach range is required at lavatories, faucets and soap dispenser controls shall have a reach depth of 11 inches (280 mm) maximum. Water and soap outlets shall be provided with a reach depth of 11 inches (280 mm) maximum. The lavatory shall be 34 inches (865 mm) maximum above the floor, measured to the higher of the rim or counter surface.

> **Exceptions:**
>
> 1. Enhanced reach range faucets shall not be required on lavatories provided with automatic faucets where the reach depth to activate the faucets and the reach depth to the water outlet is 11 inches (280 mm) maximum.
> 2. Enhanced reach range soap dispensers shall not be required on lavatories provided with automatic dispensers where the reach depth to activate the soap dispensers and the reach depth to the soap outlet is 11 inches (280 mm) maximum.

606.6 Exposed pipes and surfaces.

Water supply and drainpipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks.

Section 607: Bathtubs

607.1: General.

Bathtubs shall comply with Section 607.

607.2: Clearance.

A clearance in front of bathtubs extending the length of the bathtub and 30 inches (760 mm) minimum in depth shall be provided. Where a permanent seat is provided at the head end of the bathtub, the clearance shall extend 12 inches (305 mm) minimum beyond the wall at the head end of the bathtub.

Figure 607.2(A) CLEARANCE FOR BATHTUBS WITH REMOVABLE IN TUB SEATS

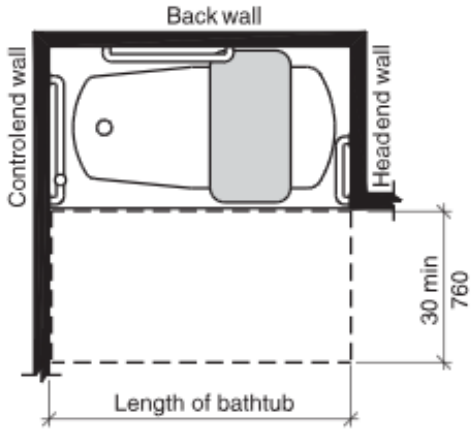
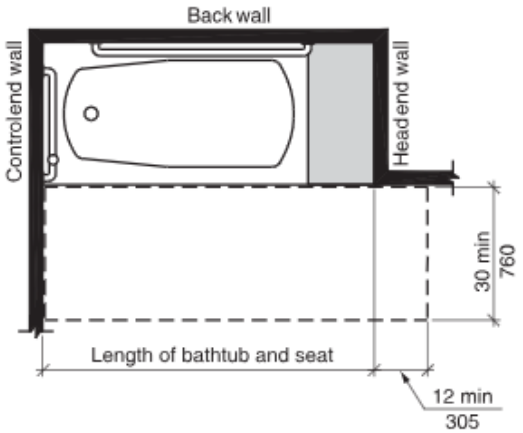


Figure 607.2(B) CLEARANCE FOR BATHTUBS WITH SEAT AT HEAD END OF TUB



607.3: Seat.

A permanent seat at the head end of the bathtub or a removable in-tub seat shall be provided. Seats shall comply with Section 610.

607.4: Grab bars.

Grab bars shall comply with Section 609 and shall be provided in accordance with Section 607.4.1 or 607.4.2.

Exception: Grab bars shall not be required to be installed in a bathing facility for a single occupant accessed only through a private office and not for common use or public use, provided reinforcement has been installed in walls and located so as to permit the installation of grab bars complying with Section 607.4.

607.4.1: Bathtubs with permanent seats.

For bathtubs with permanent seats, grab bars complying with Section 607.4.1 shall be provided.

Figure 607.4.1(A) GRAB BARS FOR BATHTUBS WITH SEAT AT HEAD END OF TUB – ELEVATION

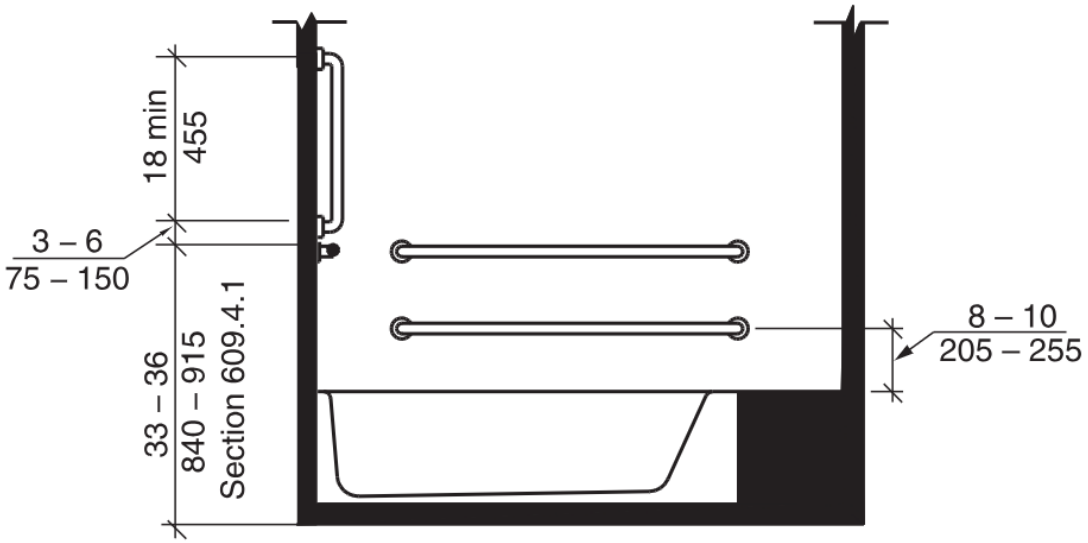
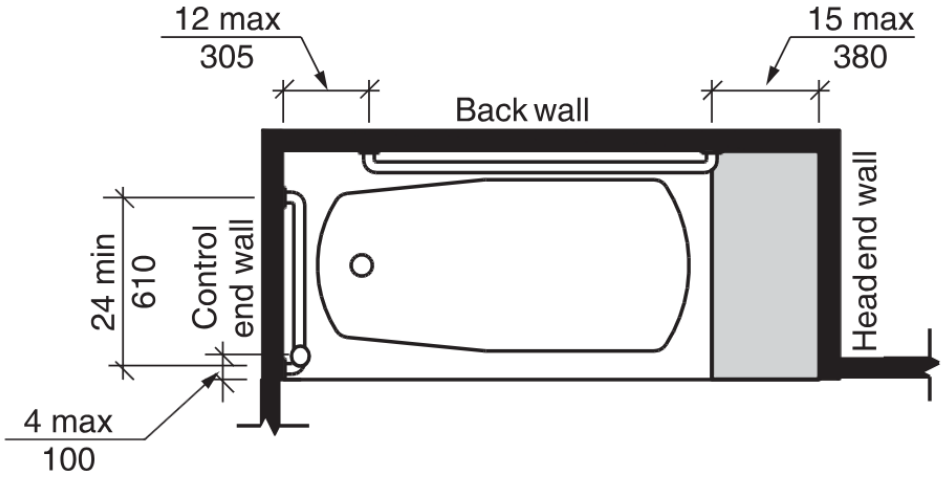


Figure 607.4.1(B) GRAB BARS FOR BATHTUBS WITH SEAT AT HEAD END OF TUB – PLAN



607.4.1.1: Back wall.

Two horizontal grab bars shall be provided on the back wall, one complying with Section 609.4 and the other located 8 inches (205 mm) minimum and 10 inches (255 mm) maximum above the rim of the bathtub. Each grab bar shall be located 15 inches (380 mm) maximum from the head end wall and extend to 12 inches (305 mm) maximum from the control end wall.

607.4.1.2: Control end wall.

Control end wall grab bars shall comply with Section 607.4.1.2.

> **Exception:** An L-shaped continuous grab bar of equivalent dimensions and positioning shall be permitted to serve the function of separate vertical and horizontal grab bars.

607.4.1.2.1: Horizontal grab bar.

A horizontal grab bar 24 inches (610 mm) minimum in length shall be provided on the control end wall beginning near the front edge of the bathtub and extending toward the inside corner of the bathtub.

607.4.1.2.2: Vertical grab bar.

A vertical grab bar 18 inches (455 mm) minimum in length shall be provided on the control end wall 3 inches (75 mm) minimum and 6 inches (150 mm) maximum above the horizontal grab bar, and 4 inches (100 mm) maximum inward from the front edge of the bathtub.

607.4.2: Bathtubs with removable seats.

For bathtubs with removable seats, grab bars complying with Section 607.4.2 shall be provided.

Figure 607.4.2(A) GRAB BARS FOR BATHTUBS WITH REMOVABLE SEATS – ELEVATION

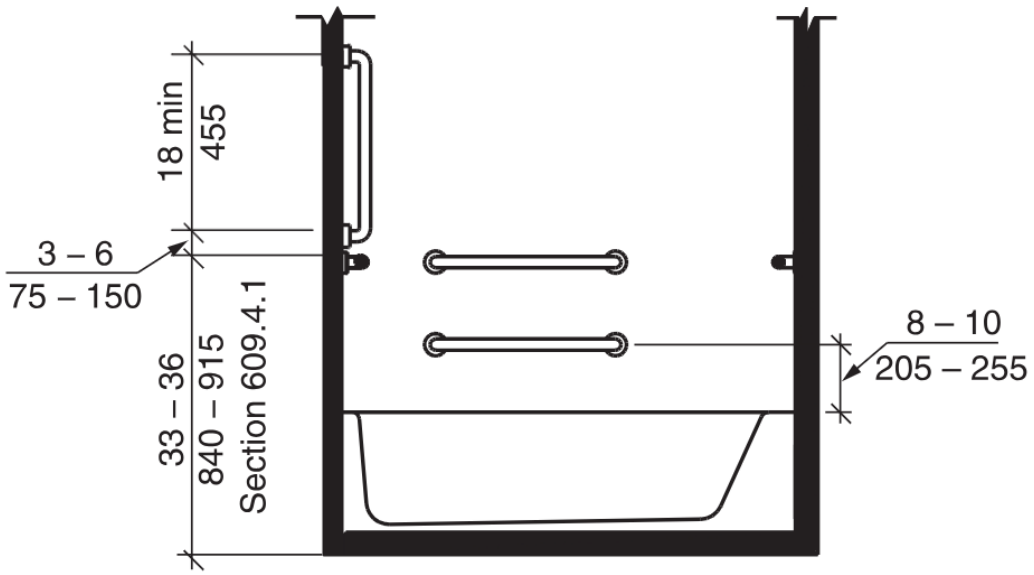
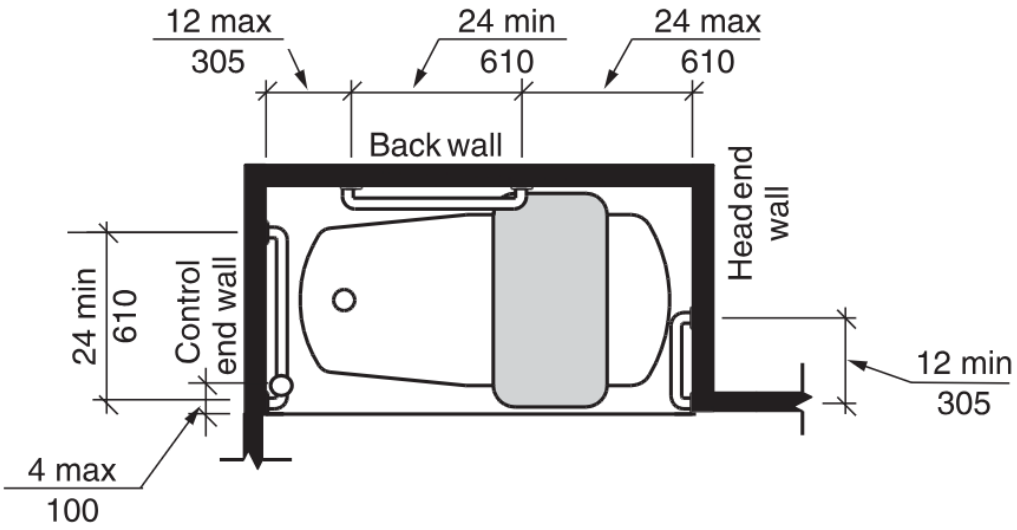


Figure 607.4.2(B) GRAB BARS FOR BATHTUBS WITH REMOVABLE SEATS – PLAN



607.4.2.1: Back wall.

Two horizontal grab bars shall be provided on the back wall, one complying with Section 609.4 and the other located 8 inches (205 mm) minimum and 10 inches (255 mm) maximum above the rim of the bathtub. Each grab bar shall be 24 inches (610 mm) minimum in length, located 24 inches (610 mm) maximum from the head end wall and extend to 12 inches (305 mm) maximum from the control end wall.

607.4.2.2: Control end wall.

Control end wall grab bars shall comply with Section 607.4.1.2.

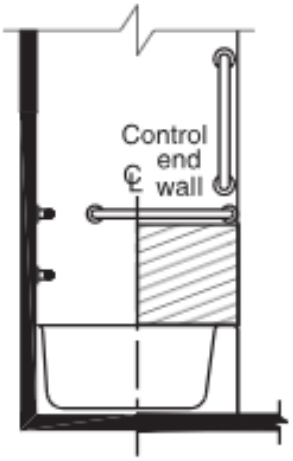
607.4.2.3: Head end wall.

A horizontal grab bar 12 inches (305 mm) minimum in length shall be provided on the head end wall at the front edge of the bathtub.

607.5: Controls.

Controls, other than drain stoppers, shall be provided on an end wall, located between the bathtub rim and grab bar, and between the open side of the bathtub and the centerline of the width of the bathtub. Controls shall comply with Section 309.4.

Figure 607.5 LOCATION OF BATHTUB CONTROLS



607.6: Hand shower.

A hand shower with a hose 59 inches (1500 mm) minimum in length, that can be used as both a fixed shower head and as a hand shower, shall be provided. The hand shower shall have a control with a nonpositive shut-off feature. Where provided, an adjustable-height hand shower mounted on a vertical bar shall be installed so as to not obstruct the use of grab bars.

607.7: Bathtub enclosures.

Enclosures for bathtubs shall not obstruct controls, faucets, shower and spray units or obstruct transfer from wheelchairs onto bathtub seats or into bathtubs. Enclosures on bathtubs shall not have tracks installed on the rim of the bathtub.

607.8: Water temperature.

Bathtubs shall deliver water that is 120°F (49°C) maximum.

Section 608: Shower Compartments

608.1: General.

Shower compartments shall comply with Section 608.

608.2: Size, clearance and seat.

Shower compartments shall have sizes, clearances and seats complying with Section 608.2.

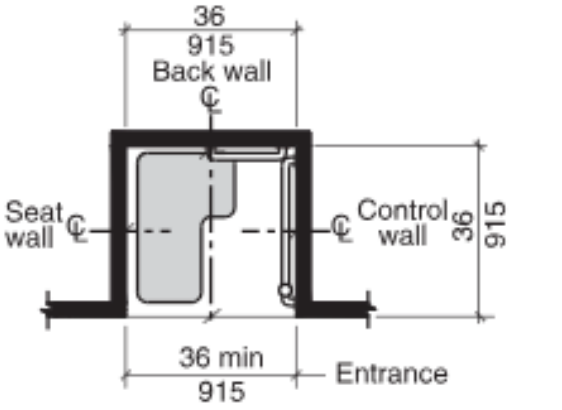
608.2.1: Transfer-type shower compartments.

Transfer-type shower compartments shall comply with Section 608.2.1.

608.2.1.1: Size.

Transfer-type shower compartments shall have a clear inside dimension of 36 inches (915 mm) in width and 36 inches (915 mm) in depth, measured at the center point of opposing sides. An entry 36 inches (915 mm) minimum in width shall be provided.

Figure 608.2.1.1 TRANSFER-TYPE SHOWER COMPARTMENT SIZE



Note: Inside finished dimensions measured at the center points of opposing sides.

608.2.1.2: Clearance.

Figure 608.2.1.2(A) TRANSFER-TYPE SHOWER COMPARTMENT CLEARANCES - NEW BUILDINGS - OPTION 1

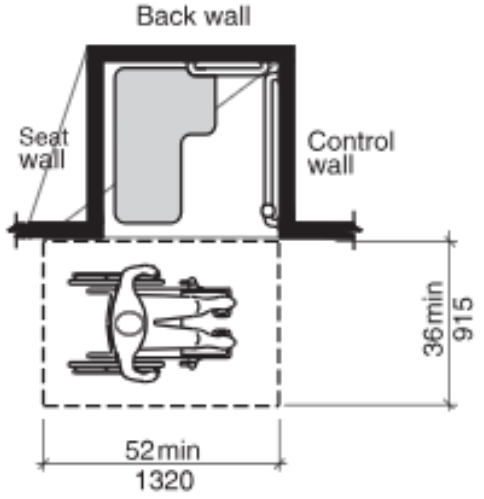


Figure 608.2.1.2(B) TRANSFER-TYPE SHOWER COMPARTMENT CLEARANCES - NEW BUILDINGS - OPTION 2

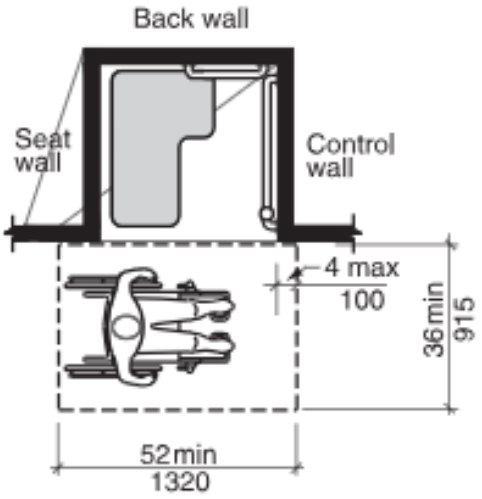
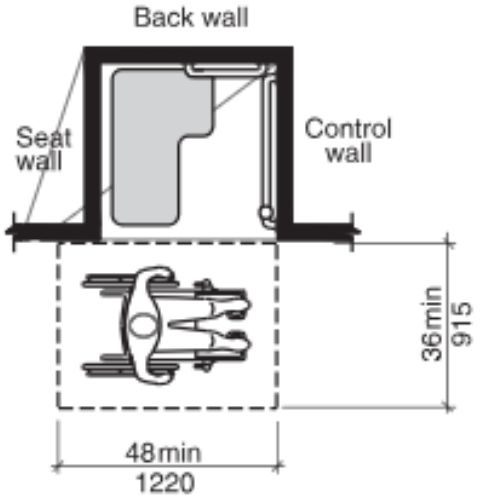


Figure 608.2.1.2(C) TRANSFER-TYPE SHOWER COMPARTMENT CLEARANCES - EXISTING BUILDINGS



608.2.1.2.1: New buildings and facilities.

In new buildings and facilities, a clearance of 52 inches (1320 mm) minimum in length and 36 inches (915 mm) minimum in depth shall be provided adjacent to the open face of the compartment. The length of the clear floor space shall be measured perpendicular from either the control wall or from 4 inches (100 mm) behind the control wall.

608.2.1.2.2: Existing buildings and facilities.

In existing buildings and facilities, a clearance of 48 inches (1220 mm) minimum in length measured perpendicular from the control wall, and 36 inches (915 mm) minimum in depth shall be provided adjacent to the open face of the compartment.

608.2.1.3: Seat.

A folding or non-folding seat complying with Section 610 shall be provided on the wall opposite the control wall.

> **Exception:** A seat is not required to be installed in a shower for a single occupant, accessed only through a private office and not for common use or public use, provided reinforcement has been installed in walls and located so as to permit the installation of a shower seat.

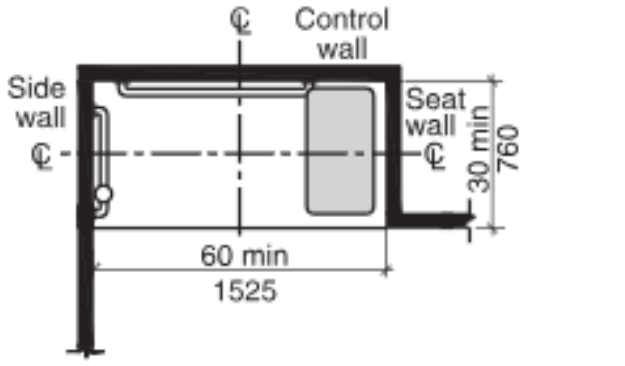
608.2.2: Standard roll-in-type shower compartments.

Standard roll-in-type shower compartments shall comply with Section 608.2.2.

608.2.2.1: Size.

Standard roll-in-type shower compartments shall have a clear inside dimension of 60 inches (1525 mm) minimum in width and 30 inches (760 mm) minimum in depth, measured at the center point of opposing sides. An entry 60 inches (1525 mm) minimum in width shall be provided.

Figure 608.2.2.1 STANDARD ROLL-IN-TYPE SHOWER COMPARTMENT SIZE



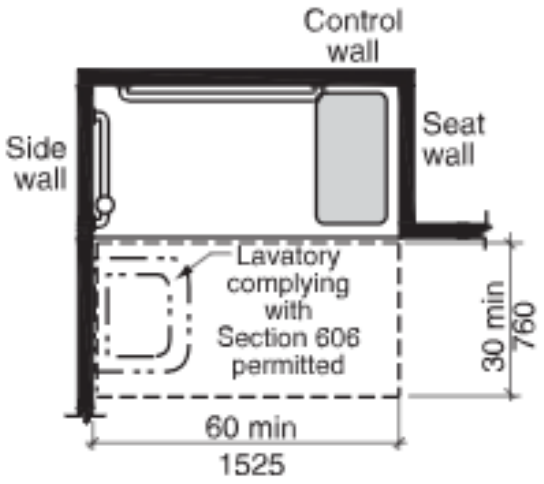
Note: Inside finished dimensions measured at the center points of opposing sides.

608.2.2.2: Clearance.

A clearance of 60 inches (1525 mm) minimum in length adjacent to the 60-inch (1525 mm) width of the open face of the shower compartment, and 30 inches (760 mm) minimum in depth, shall be provided.

> **Exception:** A lavatory complying with Section 606 shall be permitted at the end of the clearance opposite the seat.

Figure 608.2.2.2 STANDARD ROLL-IN-TYPE SHOWER COMPARTMENT CLEARANCE



608.2.2.3: Seat.

A folding seat complying with Section 610 shall be provided on an end wall.

Exceptions:

1. A seat is not required to be installed in a shower for a single occupant accessed only through a private office and not for common use or public use, provided reinforcement has been installed in walls and located so as to permit the installation of a shower seat.
2. A fixed seat shall be permitted where the seat does not overlap the minimum clear inside dimension required by Section 608.2.2.1.

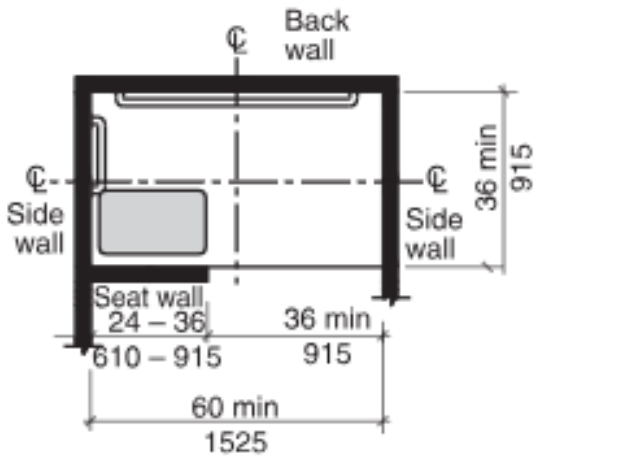
608.2.3: Alternate roll-in-type shower compartments.

Alternate roll-in-type shower compartments shall comply with Section 608.2.3.

608.2.3.1: Size.

Alternate roll-in shower compartments shall have a clear inside dimension of 60 inches (1525 mm) minimum in width, and 36 inches (915 mm) in depth, measured at the center point of opposing sides. An entry 36 inches (915) mm) minimum in width shall be provided at one end of the 60-inch (1525 mm) width of the compartment. A seat wall, 24 inches (610 mm) minimum and 36 inches (915 mm) maximum in length, shall be provided on the entry side of the compartment.

Figure 608.2.3.1 ALTERNATE ROLL-IN-TYPE SHOWER COMPARTMENT SIZE



Note: Inside finished dimensions measured at the center points of opposing sides.

608.2.3.2: Seat.

A folding seat complying with Section 610 shall be provided on the seat wall opposite the back wall.

> **Exception:** A seat is not required to be installed in a shower for a single occupant, accessed only through a private office and not for common use or public use, provided reinforcement has been installed in walls and located so as to permit the installation of a shower seat.

608.3: Grab bars.

Grab bars shall comply with Section 609 and shall be provided in accordance with Section 608.3. Where multiple grab bars are used, required horizontal grab bars shall be installed at the same height above the floor.

> **Exception:** Grab bars shall not be required to be installed in a shower for a single occupant, accessed only through a private office and not for common use or public use, provided reinforcement has been installed in walls and located so as to permit the installation of grab bars complying with Section 608.3.

608.3.1: Transfer-type showers.

Grab bars for transfer type showers shall comply with Section 608.3.1.

Figure 608.3.1(A) GRAB BARS IN TRANSFER-TYPE SHOWER – ELEVATION

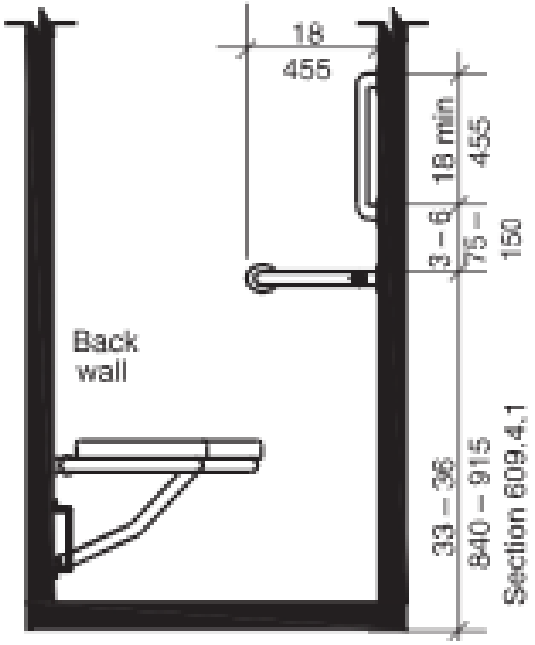
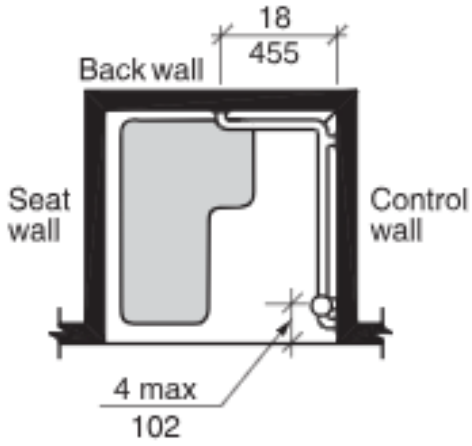


Figure 608.3.1(B) GRAB BARS IN TRANSFER-TYPE SHOWER – PLAN



608.3.1.1: Horizontal grab bars.

Horizontal grab bars shall be provided across the control wall and on the back wall to a point 18 inches (455 mm) from the control wall.

608.3.1.2: Vertical grab bar.

A vertical grab bar 18 inches (455 mm) minimum in length shall be provided on the control end wall 3 inches (75 mm) minimum and 6 inches (150 mm) maximum above the horizontal grab bar, and 4 inches (100 mm) maximum inward from the front edge of the shower.

608.3.2: Standard roll-in-type showers.

Grab bars in standard roll-in showers shall comply with Sections 608.3.2.1 through 608.3.2.3.

Figure 608.3.2(A) RAB BARS IN STANDARD ROLL-IN-TYPE SHOWER – ELEVATION

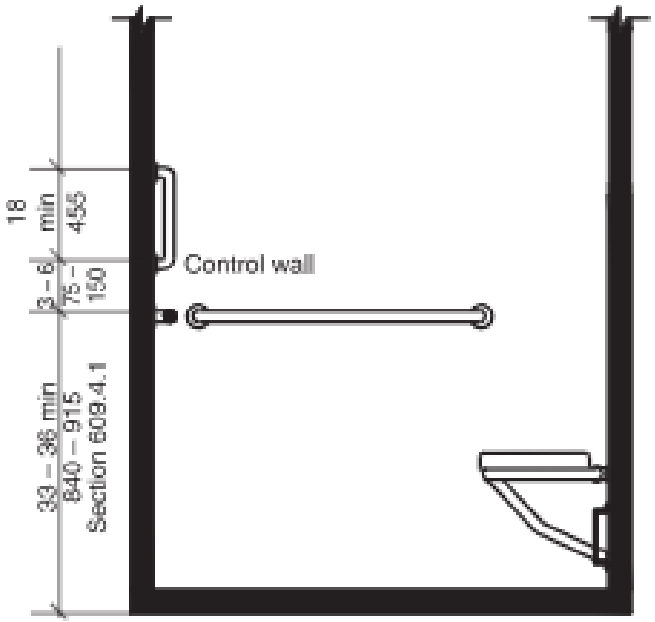
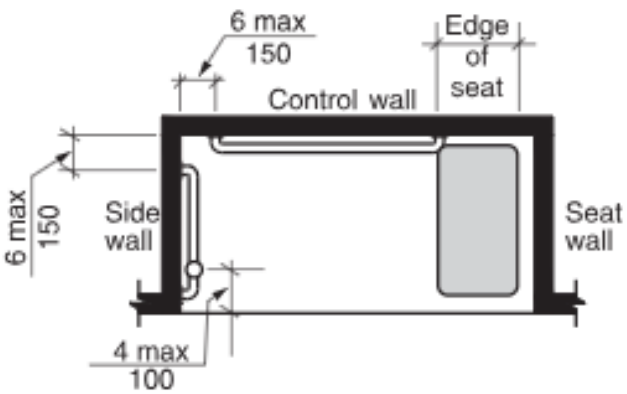


Figure 608.3.2(B) GRAB BARS IN STANDARD ROLL-IN-TYPE SHOWER – PLAN



608.3.2.1: Back-wall grab bar.

In standard roll-in type showers, a grab bar shall be provided on the back wall beginning at the edge of the seat. The grab bars shall not be provided above the seat. The back-wall grab bar shall extend the length of the wall and extend within 6 inches (150 mm) maximum from the adjacent side wall opposite the seat.

Exceptions:

1. The back wall grab bar shall not be required to exceed 48 inches (1220 mm) in length.
2. The back-wall grab bar is not required to extend within 6 inches (150 mm) of the adjacent side wall opposite the seat if it would require the grab bar length to exceed 48 inches (1220 mm) in length.

608.3.2.2: Side-wall grab bars.

Where a side wall is provided opposite the seat within 72 inches (1830 mm) of the seat wall, a grab bar shall be provided on the side-wall opposite the seat. The side wall grab bar shall extend the length of the wall and extend within 6 inches (150 mm) maximum from the adjacent back wall.

Exception: The side-wall grab bar shall not be required to exceed 30 inches (760 mm) in length.

608.3.2.3: Vertical grab bar.

Where a side wall is provided opposite the seat within 72 inches (1830 mm) of the seat wall a vertical grab bar shall be provided. A vertical grab bar 18 inches (455 mm) minimum in length shall be provided on the end wall 3 inches (75 mm) minimum and 6 inches (150 mm) maximum above the horizontal grab bar, and 4 inches (100 mm) maximum inward from the front edge of the shower.

608.3.3: Alternate roll-in-type showers.

In alternate roll-in type showers, grab bars shall be provided on the back wall and the side wall adjacent to the seat. Grab bars shall not be provided above the seat. Grab bars shall be 6 inches (150 mm) maximum from the adjacent wall.

Figure 608.3.3(A) GRAB BARS IN ALTERNATE ROLL-IN-TYPE SHOWER – ELEVATION

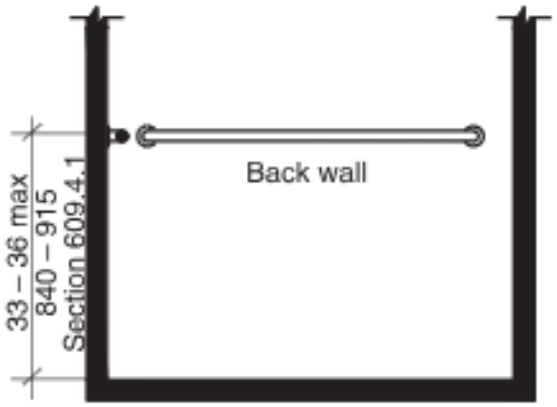
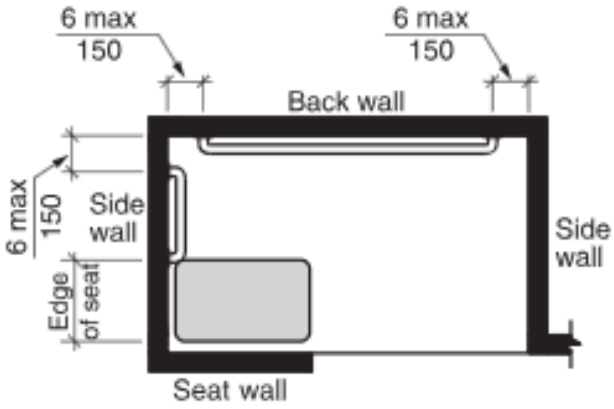


Figure 608.3.3(B) GRAB BARS IN ALTERNATE ROLL-IN-TYPE SHOWER – PLAN



608.4: Controls and hand showers.

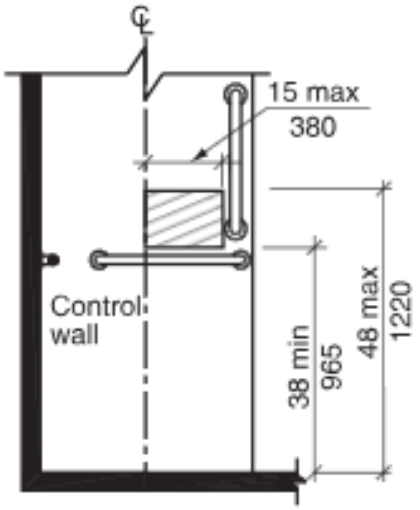
Controls and hand showers shall comply with Sections 608.4 and 309.4.

608.4.1: Transfer-type showers.

In transfer-type showers, the controls and hand shower shall be located:

1. On the control wall opposite the seat.
2. At a height of 38 inches (965 mm) minimum and 48 inches (1220 mm) maximum above the shower floor, and
3. 15 inches (380 mm) maximum, from the centerline of the control wall toward the shower opening.

Figure 608.4.1 TRANSFER-TYPE SHOWER CONTROLS AND HAND SHOWER LOCATION

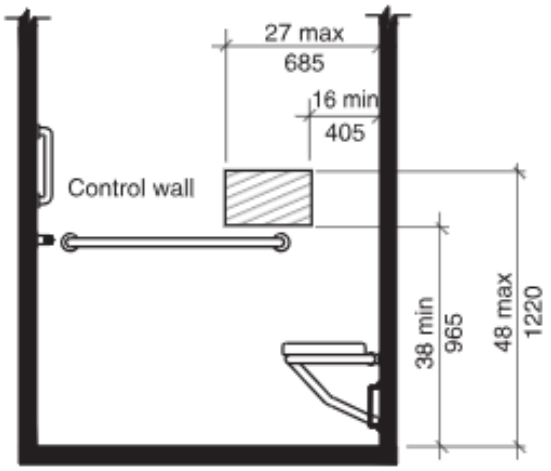


608.4.2 Standard roll-in showers.

In standard roll-in showers, the controls and hand shower shall not be located above the seat. Controls and hand showers shall be located according to the following:

1. On the back wall,
2. At a height of 38 inches (965 mm) minimum and 48 inches (1220 mm) maximum above the shower floor, and
3. 16 inches (405 mm) minimum and 27 inches (685 mm) maximum from the wall behind the seat.

Figure 608.4.2 STANDARD ROLL-IN-TYPE SHOWER CONTROLS AND HAND SHOWER LOCATION



608.4.3: Alternate roll-in showers.

In alternate roll-in showers, the controls and hand shower shall be located:

1. At a height of 38 inches (965 mm) minimum and 48 inches (1220 mm) maximum above the shower floor, and
2. Where the controls and hand shower are located on the side wall adjacent to the seat, the controls and hand shower shall be 16 inches (405 mm) minimum and 27 inches (685 mm) maximum from the wall behind the seat wall, or
3. Where the controls and hand shower are located on the back wall opposite the seat, the controls and hand shower shall be located within 15 inches (380 mm) maximum from the centerline of the seat toward the transfer space.

Figure 608.4.3(A) ALTERNATE ROLL-IN-TYPE SHOWER CONTROLS AND HAND SHOWER LOCATION - SIDE WALL – ELEVATION

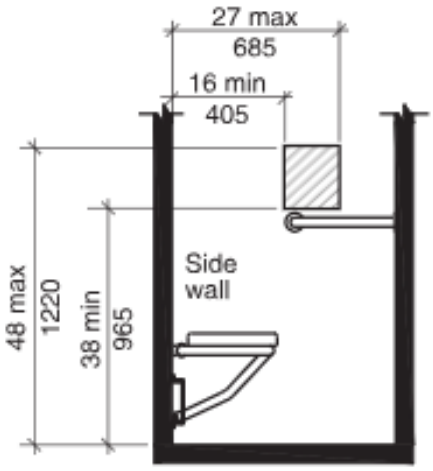
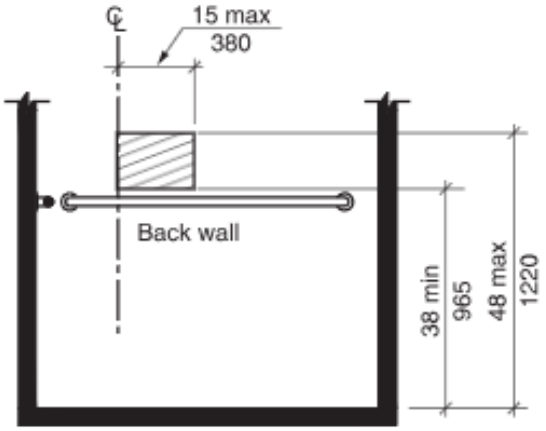


Figure 608.4.3(B) ALTERNATE ROLL-IN-TYPE SHOWER CONTROLS AND HAND SHOWER LOCATION - BACK WALL – ELEVATION



608.5: Hand showers.

A hand shower with a hose 59 inches (1500 mm) minimum in length, that can be used both as a fixed shower head and as a hand shower, shall be provided. The hand shower shall have a control with a nonpositive shut-off feature. Where provided, an adjustable-height hand shower mounted on a vertical bar shall be installed so as to not obstruct the use of grab bars. A means to hold the hand shower wand while in the on or off position shall be located at a height of 38 inches (965 mm) minimum and 48 inches (1220 mm) maximum above the shower finish floor.

Exception: In other than Accessible units and Type A units, a fixed shower head located 48 inches (1220 mm) maximum above the shower floor shall be permitted in lieu of a hand shower.

608.6: Thresholds.

Thresholds in roll-in-type shower compartments shall be 1/2 inch (13 mm) maximum in height in accordance with Section 303. In transfer-type shower compartments, thresholds 1/2 inch (13 mm) maximum in height shall be beveled, rounded, or vertical.

Exception: In existing facilities, in transfer-type shower compartments where provision of a threshold 1/2 inch (13 mm) in height would disturb the structural reinforcement of the floor slab, a threshold 2 inches (51 mm) maximum in height shall be permitted.

608.7: Shower enclosures.

Shower compartment enclosures for shower compartments shall not obstruct controls or obstruct transfer from wheelchairs onto shower seats.

608.8: Water temperature.

Showers shall deliver water that is 120°F (49°C) maximum.

Section 609: Grab Bars

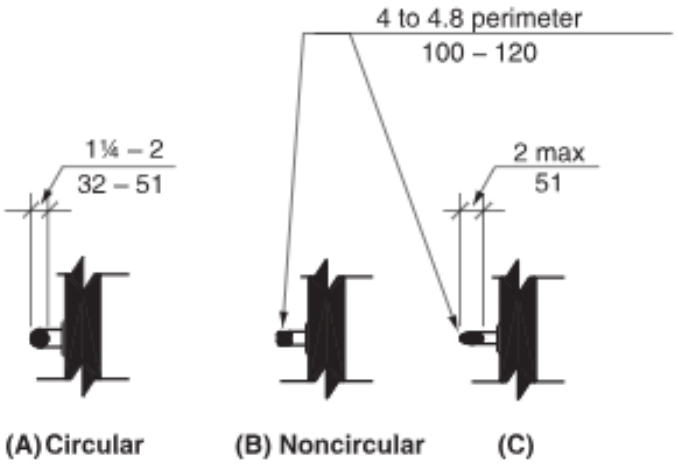
609.1: General.

Grab bars in toilet or bathing facilities shall comply with Section 609.

609.2: Cross section.

Grab bars shall have a cross section complying with Section 609.2.1 or 609.2.2.

Figure 609.2 SIZE OF GRAB BARS



609.2.1: Circular cross section.

Grab bars with a circular cross section shall have an outside diameter of 1 1/4 inch (32 mm) minimum and 2 inches (51 mm) maximum.

609.2.2: Noncircular cross section.

Grab bars with a noncircular cross section shall have a cross section dimension of 2 inches (51 mm) maximum, and a perimeter dimension of 4 inches (100 mm) minimum and 4.8 inches (120 mm) maximum.

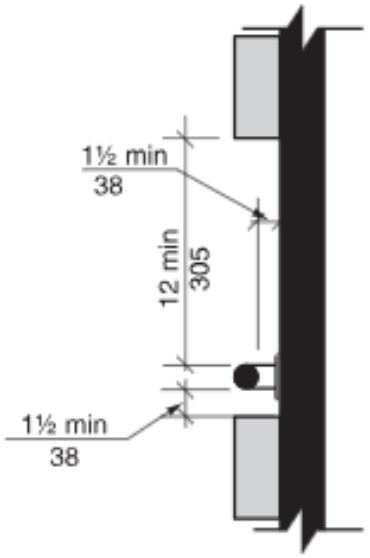
609.3: Spacing.

The space between the wall and the grab bar shall be 1 1/2 inches (38 mm). The space between the grab bar and projecting objects below and at the ends of the grab bar shall be 1 1/2 inches (38 mm) minimum. The space between the grab bar and projecting objects above the grab bar shall be 12 inches (305 mm) minimum.

Exceptions:

1. The space between the grab bars and shower controls, shower fittings, and other grab bars above the grab bar shall be permitted to be 1 1/2 inches (38 mm) minimum.
2. Recessed dispensers projecting from the wall 1/4 inch (6.4 mm) maximum measured from the face of the dispenser and complying with Section 604.7 shall be permitted within the 12-inch (305 mm) space above and the 1 1/2-inch (38 mm) spaces below and at the ends of the grab bar.

Figure 609.3 SPACING OF GRAB BARS



609.4: Position of grab bars.

609.4.1: General.

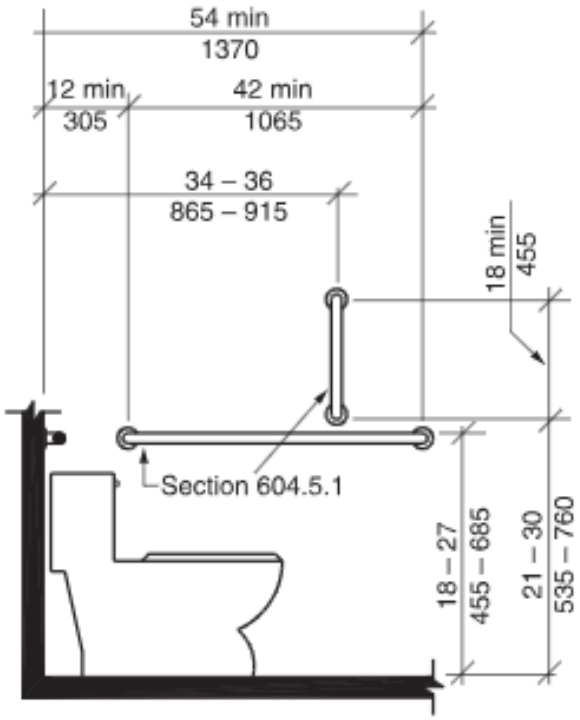
Grab bars shall be installed in a horizontal position, 33 inches (840 mm) minimum and 36 inches (915 mm) maximum above the floor measured to the top of the gripping surface or shall be installed as required by Items 1 through 3.

1. The lower grab bar on the back wall of a bathtub shall comply with Section 607.4.1.1 or 607.4.2.1.
2. Vertical grab bars shall comply with Sections 604.5.1.2, 607.4.1.2.2, 607.4.2.2 and 608.3.1.2.
3. Grab bars at water closets primarily for children's use shall comply with Section 609.4.2.

609.4.2: Position of children's grab bars.

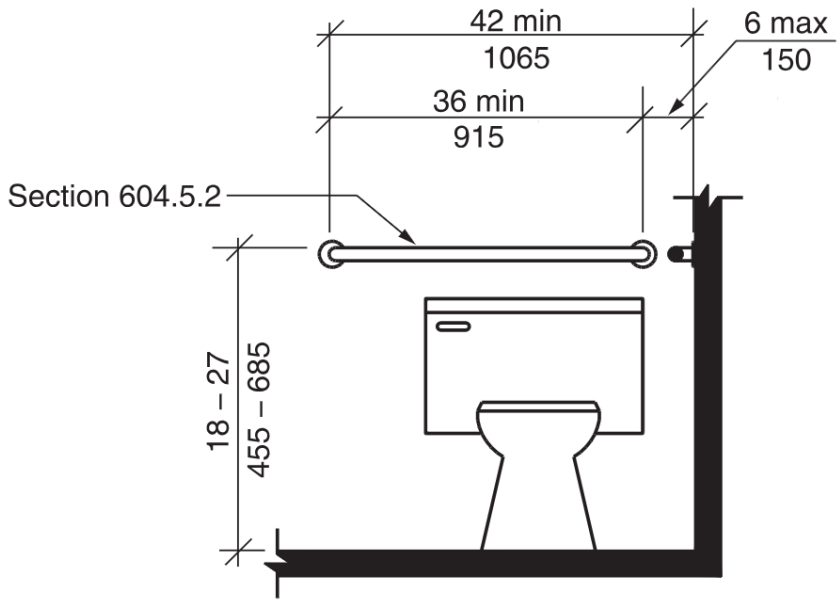
At water closets primarily for children's use complying with Section 604.11, grab bars shall be installed in a horizontal position 18 inches (455 mm) minimum and 27 inches (685 mm) maximum above the floor measured to the top of the gripping surface. A vertical grab bar shall be mounted with the bottom of the bar located between 21 inches (535 mm) minimum and 30 inches (760 mm) maximum above the floor and with the centerline of the bar located between 34 inches (865 mm) minimum and 36 inches (915 mm) maximum from the rear wall.

Figure 609.4.2(A) POSITIONS OF CHILDREN'S GRAB BARS - SIDE-WALL VIEW



Note: For adult dimensions see Fig. 604.5.1.

Figure 609.4.2(B) POSITIONS OF CHILDREN'S GRAB BARS - REAR-WALL VIEW



Note: For adult dimensions see Fig. 604.5.2

609.5: Surface hazards.

Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements. Edges shall be rounded.

609.6: Fittings.

Grab bars shall not rotate within their fittings.

609.7: Installation and configuration.

Grab bars shall be installed in any manner that provides a gripping surface at the locations specified in this standard and does not obstruct the clear floor space. Horizontal and vertical grab bars shall be permitted to be separate bars, a single piece bar, or combination thereof.

609.8: Structural strength.

Allowable stresses shall not be exceeded for materials used where a vertical or horizontal force of 250 pounds (1112 N) is applied at any point on the grab bar, fastener mounting device, or supporting structure.

Section 610: Seats

610.1: General.

Seats in bathtubs and shower compartments shall comply with Section 610.

610.2: Bathtub seats.

The height of bathtub seats shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum above the bathroom floor, measured to the top of the seat. Removable in-tub seats shall be 15 inches (380 mm) minimum and 16 inches (405 mm) maximum in depth. Removable in-tub seats shall be capable of secure placement. Permanent seats shall be 15 inches (380 mm) minimum in depth and shall extend from the back wall to or beyond the outer edge of the bathtub. Permanent seats shall be positioned at the head end of the bathtub.

Figure 610.2(A) BATHTUB SEATS - REMOVABLE IN-TUB SEATS

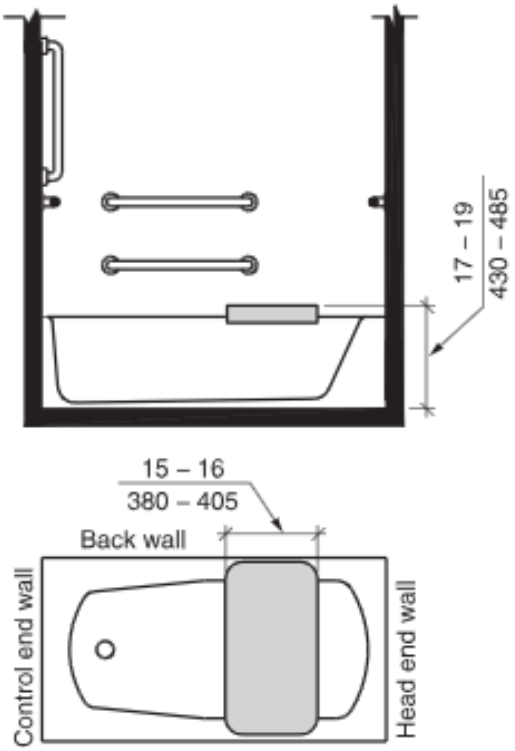
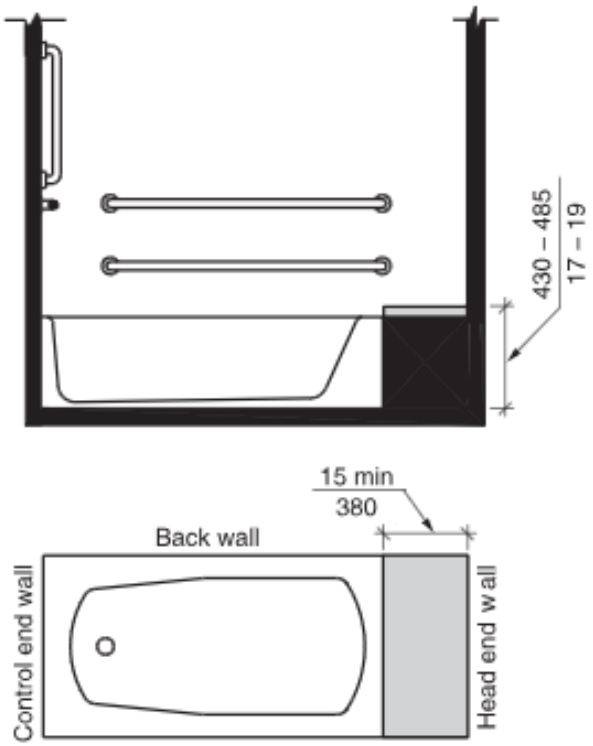


Figure 610.2(B) BATHTUB SEATS - SEAT PROVIDED AT HEAD END OF TUB



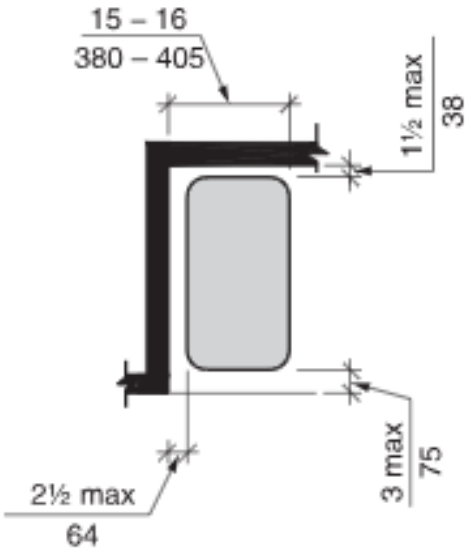
610.3: Shower compartment seats.

The height of shower compartment seats shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum above the bathroom floor, measured to the top of the seat. In transfer-type and alternate roll-in-type showers, the seat shall extend along the seat wall to a point within 3 inches (75 mm) of the compartment entry. In standard roll-in-type showers, the seat shall extend from the control wall to a point within 3 inches (75 mm) of the compartment entry. Seats shall comply with Section 610.3.1 or 610.3.2.

610.3.1: Rectangular seats.

The rear edge of a rectangular seat shall be 2 1/2 inches (64 mm) maximum and the front edge 15 inches (380 mm) minimum and 16 inches (405 mm) maximum from the seat wall. The side edge of the seat shall be 1 1/2 inches (38 mm) maximum from the back wall of a transfer-type shower and 1 1/2 inches (38 mm) maximum from the control wall of a roll-in-type shower.

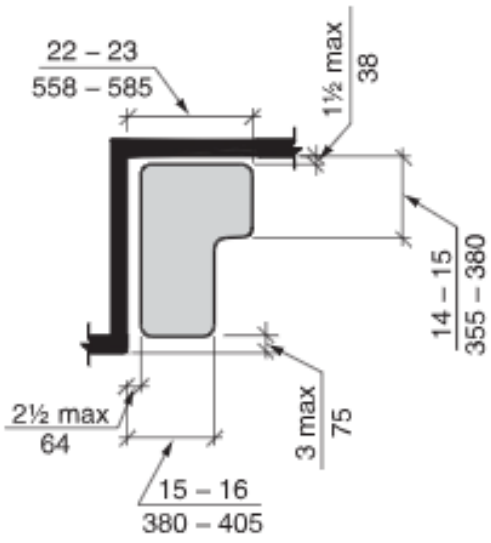
Figure 610.3.1 RECTANGULAR SHOWER COMPARTMENT SEATS



610.3.2: L-shaped seats.

The rear edge of an L-shaped seat shall be 2 1/2 inches (64 mm) maximum and the front edge 15 inches (380 mm) minimum and 16 inches (405 mm) maximum from the seat wall. The rear edge of the “L” portion of the seat shall be 1 1/2 inches (38 mm) maximum from the wall and the front edge shall be 14 inches (355 mm) minimum and 15 inches (380 mm) maximum from the wall. The end of the “L” shall be 22 inches (560 mm) minimum and 23 inches (585 mm) maximum from the main seat wall.

Figure 610.3.2 L-SHAPED SHOWER COMPARTMENT SEATS



610.4: Structural strength.

Allowable stresses shall not be exceeded for materials used where a vertical or horizontal force of 250 pounds (1112 N) is applied at any point on the seat, fastener mounting device, or supporting structure.

Section 611: Washing Machines and Clothes Dryers

611.1: General.

Washing machines and clothes dryers shall comply with Section 611.

611.2: Clear floor space.

A clear floor space positioned for parallel approach shall be provided. For top loading machines, the clear floor space shall be centered on the appliance. For front loading machines, the centerline of the clear floor space shall be offset 24 inches (610 mm) maximum from the centerline of the door opening.

Figure 611.2(A) CLEAR FLOOR SPACE - TOP LOADING

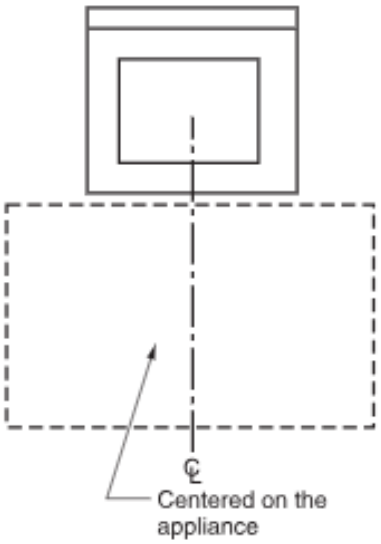
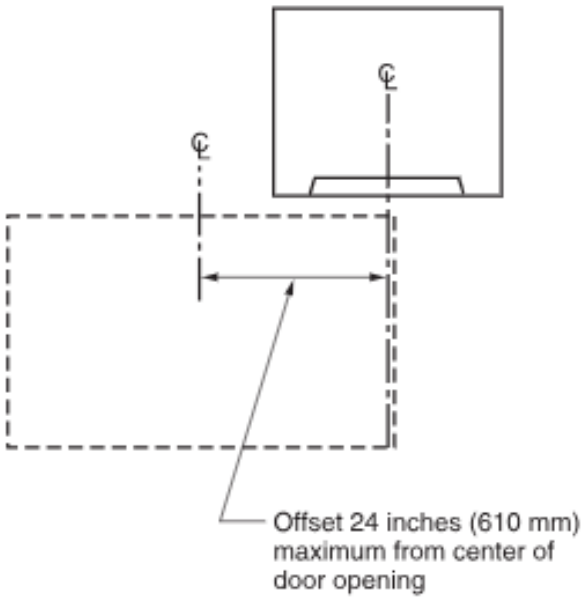


Figure 611.2(B) CLEAR FLOOR SPACE - FRONT LOADING



611.3: Operable parts.

Operable parts, including doors, lint screens, detergent and bleach compartments, shall comply with Sections 308 and 309.

> **Exception:** The height of the obstruction in Section 308.3.2 shall be permitted to be 36 inches (915 mm) maximum above the floor.

611.4: Height.

Top loading machines shall have the door to the laundry compartment 36 inches (915 mm) maximum above the floor. Front loading machines shall have the bottom of the opening to the laundry compartment 15 inches (380 mm) minimum and 36 inches (915 mm) maximum above the floor.

Figure 611.4(A) HEIGHT OF LAUNDRY EQUIPMENT - TOP LOADING

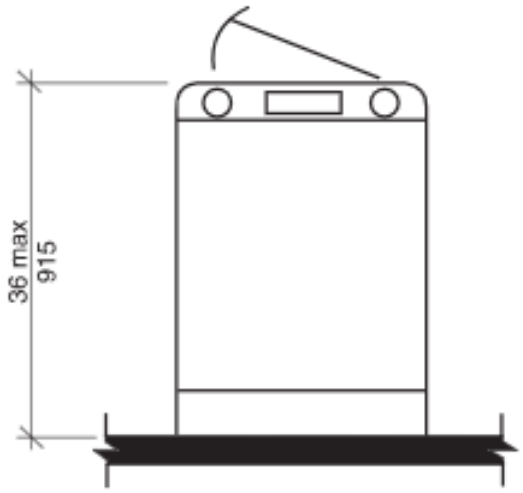
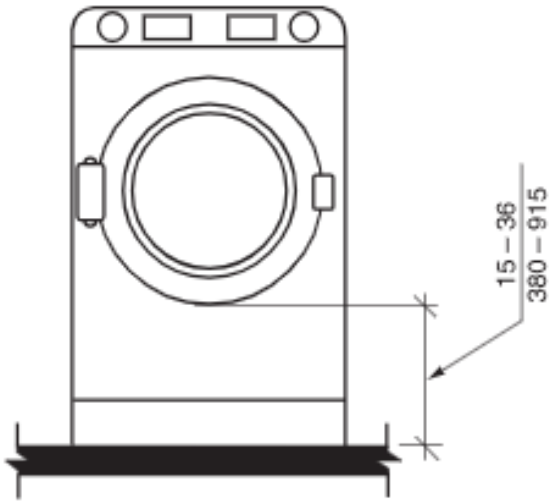


Figure 611.4(B) HEIGHT OF LAUNDRY EQUIPMENT - FRONT LOADING



Section 612: Saunas and Steam Rooms

612.1: General.

Saunas and steam rooms shall comply with Section 612.

612.2: Bench.

Where seating is provided in saunas and steam rooms, at least one bench shall comply with Section 903. Doors shall not swing into the clear floor space required by Section 903.2.

Exception: Where the room is for individual use and a clear floor space complying with Section 305.3 is provided within the room beyond the arc of the door swing, the door shall not be required to comply with this section.

612.3: Turning space.

A turning space shall be provided within saunas and steam rooms.

Chapter 8: Special Rooms and Spaces

Section 801: General

801.1: Scope.

Special rooms and spaces required to be accessible by the scoping provisions adopted by the administrative authority shall comply with the applicable provisions of Chapter 8.

Section 804: Kitchens

804.1: General.

Kitchens shall comply with Section 804.

804.2: Clearance.

Where a pass-through kitchen is provided, clearances shall comply with Section 804.2.1. Where a U-shaped kitchen is provided, clearances shall comply with Section 804.2.2. Kitchens where a cook top or conventional range is not provided shall comply with Section 804.2.3.

804.2.1: Pass-through kitchens.

In pass-through kitchens where counters, appliances or cabinets are on two opposing sides, or where counters, appliances or cabinets are opposite a parallel wall, clearance between all opposing base cabinets, countertops, appliances, or walls within kitchen work areas shall be 40 inches (1015 mm) minimum. Pass-through kitchens shall have two entries.

Figure 804.2.1(A) PASS-THROUGH KITCHEN CLEARANCE

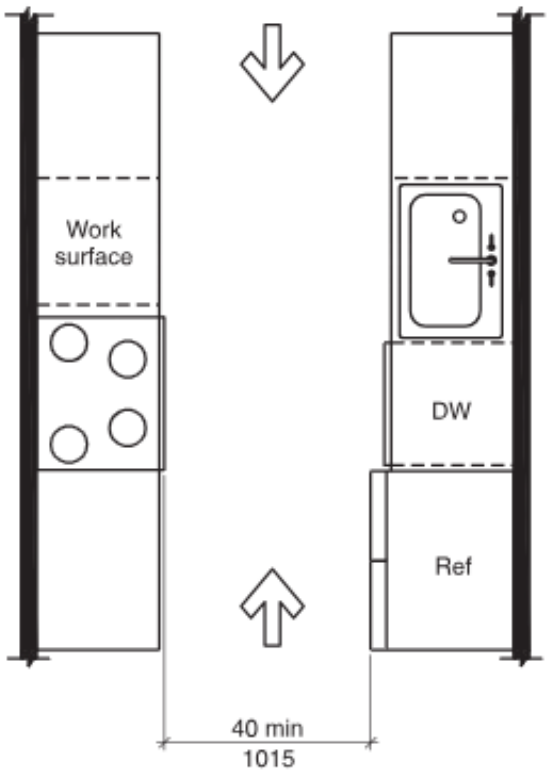
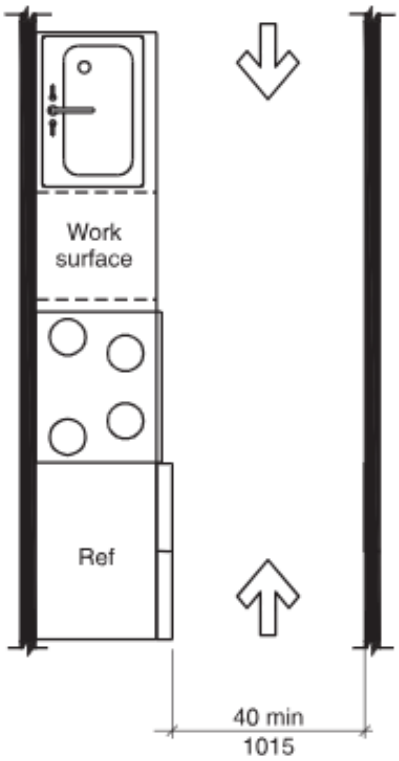


Figure 804.2.1(B) PASS-THROUGH KITCHEN CLEARANCE



804.2.2: U-shaped kitchens.

In kitchens enclosed on three contiguous sides, clearance between all opposing base cabinets, countertops, appliances, or walls within kitchen work areas shall be 60 inches (1525 mm) minimum.

Exception: U-shaped kitchens with an island complying with Section 804.2.1.

Figure 804.2.2(A) U-SHAPED KITCHEN CLEARANCE

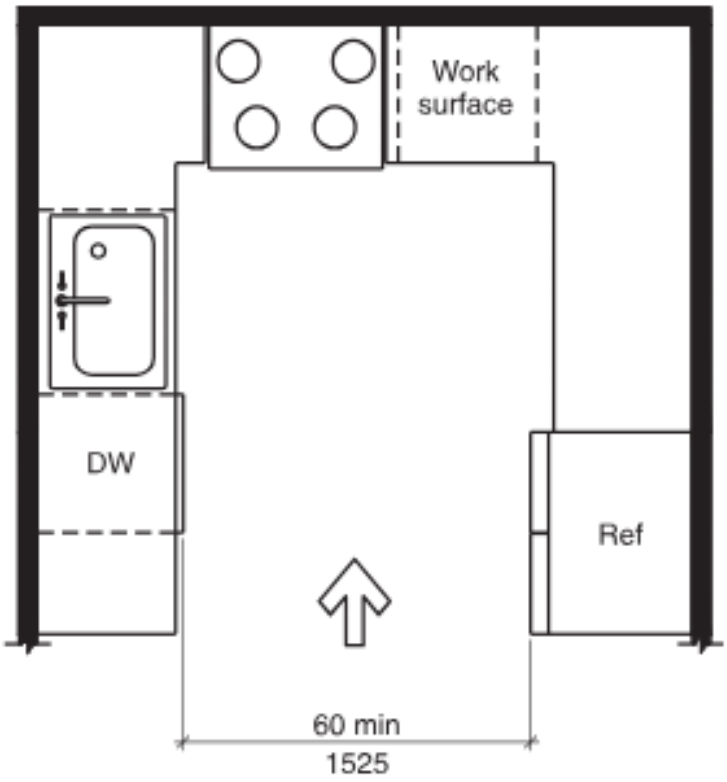


Figure 804.2.2(B) U-SHAPED KITCHEN CLEARANCE

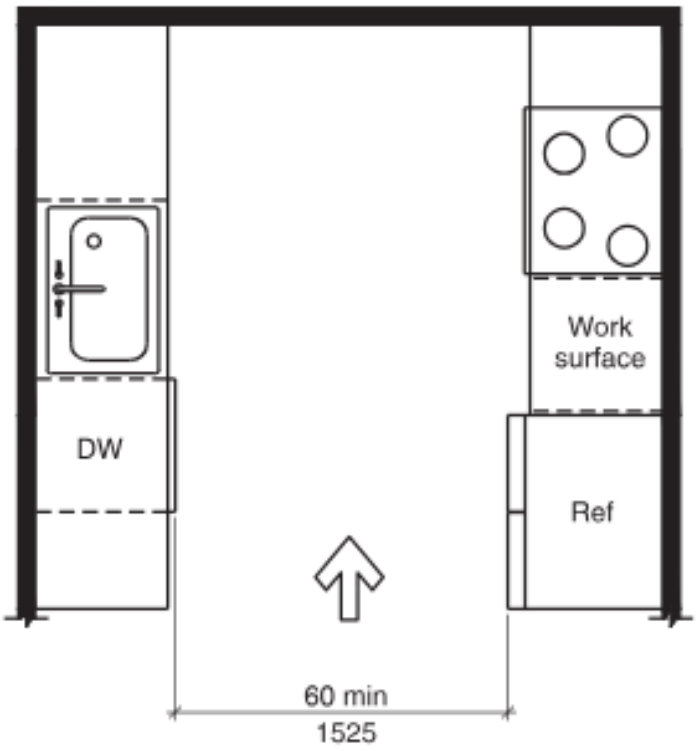
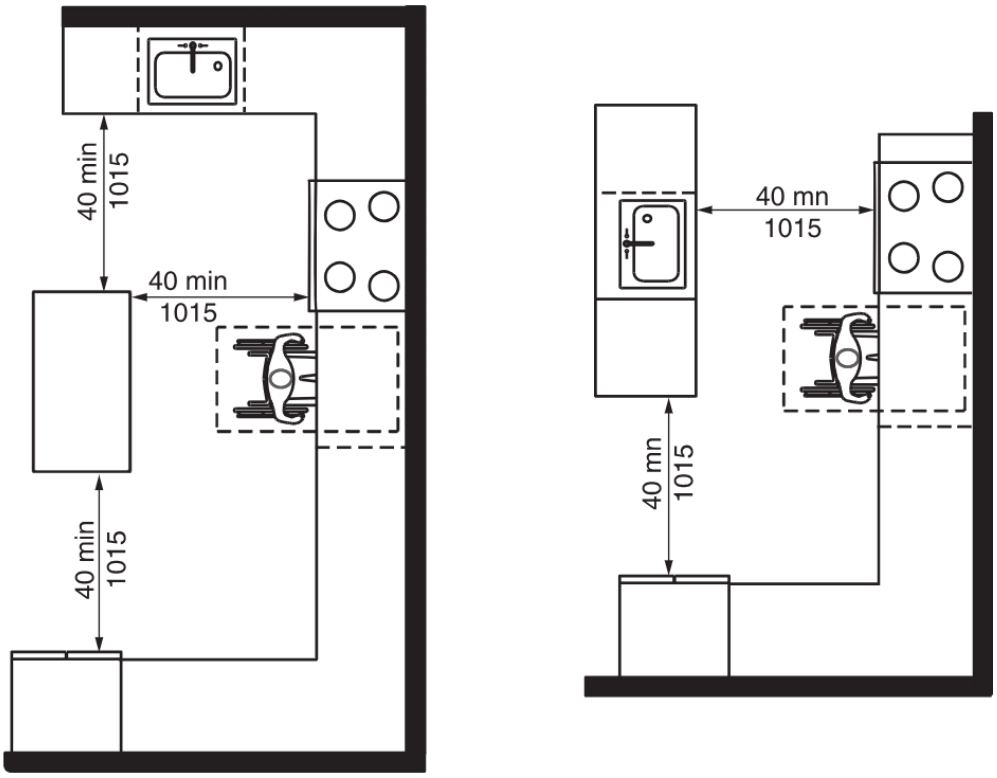


Figure 804.2.2(C) U-SHAPED KITCHEN CLEARANCE – EXCEPTION



804.2.3: Spaces where a cook top or conventional range is not provided.

In a kitchen space where a cooktop or conventional range is not provided, clearance between all opposing base cabinets, countertops, appliances and walls within kitchen work areas shall be 40-inch (1015 mm) minimum.

804.3: Work surface.

At least one accessible work surface 30 inches minimum in length shall be provided in accordance with Section 902. The work surface shall be located in accordance with Section 804.5.5.2 or 804.5.5.3.

> **Exception:** Spaces that do not provide a cooktop or conventional range shall not be required to provide an accessible work surface.

804.4: Sinks.

The sink shall comply with Section 606.

804.5: Appliances.

Where provided, kitchen appliances shall comply with Section 804.5.

804.5.1: Clear floor space.

A clear floor space shall be provided at each kitchen appliance.

804.5.2: Operable parts.

All appliance controls shall comply with Section 309.

> **Exceptions:**
>
> 1. Appliance doors and door latching devices shall not be required to comply with Section 309.4.
> 2. Bottom-hinged appliance doors, when in the open position, shall not be required to comply with Section 309.3.

804.5.3: Dishwasher.

A clear floor space positioned adjacent to the dishwasher door, shall be provided. The dishwasher door in the open position shall not obstruct the clear floor space for the dishwasher or an adjacent sink.

804.5.4: Cooktop.

Cooktops shall comply with Section 804.5.4.

804.5.4.1: Approach.

A clear floor space, positioned for a parallel or forward approach to the cooktop, shall be provided.

804.5.4.2: Forward approach.

Where the clear floor space is positioned for a forward approach, knee and toe clearance complying with Section 306 shall be provided. The underside of the cooktop shall be insulated or otherwise configured to prevent burns, abrasions, or electrical shock.

804.5.4.3: Parallel approach.

Where the clear floor space is positioned for a parallel approach, the clear floor space shall be centered on the appliance.

804.5.4.4: Controls.

The location of controls shall not require reaching across burners.

804.5.5: Oven.

Ovens shall comply with Section 804.5.5.

804.5.5.1: Clear floor space.

A clear floor space shall be provided. The oven door in the open position shall not obstruct the clear floor space for the oven.

804.5.5.2: Side-hinged door ovens.

Side-hinged door ovens shall have a work surface complying with Section 804.3 positioned adjacent to the latch side of the oven door.

804.5.5.3: Bottom-hinged door ovens.

Bottom-hinged door ovens shall have a work surface complying with Section 804.3 positioned adjacent to one side of the door.

804.5.5.4: Controls.

The location of controls shall not require reaching across burners.

804.5.6: Refrigerator/freezer.

Combination refrigerators and freezers shall have at least 50 percent of the freezer compartment shelves, including the bottom of the freezer, 54 inches (1370 mm) maximum above the floor when the shelves are installed at the maximum heights possible in the compartment. A clear floor space, positioned for a parallel approach to the refrigerator/freezer, shall be provided. The centerline of the clear floor space shall be offset 24 inches (610 mm) maximum from the centerline of the appliance.

Chapter 11: Dwelling Units and Sleeping Units

Section 1101: General

1101.1: Scoping.

Dwelling units and sleeping units required by the scoping provisions adopted by the administrative authority to be Accessible units, Type A units, Type B units, Type C (Visitable) units or units with accessible communication features shall comply with the applicable provisions of Chapter 11.

Section 1102: Accessible Units

1102.1: General.

Accessible units shall comply with Section 1102.

1102.2: Primary entrance.

The primary entrance shall be on an accessible route from public and common areas. The primary entrance shall not be to a bedroom unless it is the only entrance.

1102.3: Accessible route.

Accessible routes within Accessible units shall comply with Section 1102.3.

1102.3.1: Location.

At least one accessible route shall connect all spaces and elements that are a part of the unit. Accessible routes shall coincide with or be located in the same area as a general circulation path.

> **Exception:** An accessible route is not required to unfinished attics and unfinished basements that are part of the unit.

1102.3.2: Turning space.

All rooms served by an accessible route shall provide a turning space.

> **Exceptions:**
>
> 1. A turning space shall not be required in toilet rooms and bathrooms that are not required to comply with Section 1102.11.2.
> 2. A turning space is not required within closets or pantries that are 48 inches (1220 mm) maximum in depth.

1102.3.3: Components.

Accessible routes shall consist of one or more of the following elements: walking surfaces with a slope not steeper than 1:20, doors and doorways, ramps, elevators, and platform lifts.

1102.4: Walking surfaces.

Walking surfaces that are part of an accessible route shall comply with Section 403.

1102.5: Doors and doorways.

The primary entrance door to the unit, and all other doorways intended for user passage, shall comply with Section 404.

Exceptions:

1. Existing doors to hospital patient sleeping rooms shall be exempt from the requirement for space at the latch side provided the door is 44 inches (1120 mm) minimum in width.
2. In toilet rooms and bathrooms not required to comply with Section 1102.11.2, maneuvering clearances required by Section 404.2.3 shall not be required on the toilet room or bathroom side of the door.
3. A turning space between doors in a series as required by Section 404.2.5 is not required.
4. Storm and screen doors shall not be required to comply with Section 404.2.5.
5. Communicating doors between individual sleeping units shall not be required to comply with Section 404.2.5.
6. At other than the primary entrance door, where exterior space dimensions of balconies are less than the required maneuvering clearance, door maneuvering clearance is not required on the exterior side of the door.
7. The maneuvering clearances required by Section 404 shall not be required within a closet or pantry complying with Exception 2 of Section 1102.3.2.

1102.6: Ramps.

Ramps shall comply with Section 405.

1102.7: Elevators.

Elevators within the unit shall comply with Section 407, 408, or 409.

1102.8: Platform lifts.

Platform lifts within the unit shall comply with Section 410.

1102.9: Operable parts.

Lighting controls, electrical panelboards, electrical switches and receptacle outlets, environmental controls, appliance controls, plumbing fixture controls and user controls for security or intercom systems shall comply with Section 309.

1102.10: Laundry equipment.

Washing machines and clothes dryers shall comply with Section 611.

1102.11: Toilet and bathing facilities.

At least one toilet and bathing facility shall comply with Section 1102.11.2. All other toilet and bathing facilities shall comply with Section 1102.11.1

1102.11.1: Grab bars and shower seat reinforcement.

At fixtures in toilet and bathing facilities not required to comply with Section 1102.11.2, reinforcement in accordance with Section 1104.11.1 shall be provided.

Exception: Reinforcement is not required where Type B units are not provided in the structure.

1102.11.2: Toilet and bathing facility.

At least one toilet and bathing facility shall comply with Section 603. At least one lavatory, one water closet and either a bathtub or shower within the unit shall comply with Sections 604 through 610. These toilet and bathing fixtures shall be in a single toilet/bathing area, such that travel between fixtures does not require travel through other parts of the unit.

1102.11.2.1: Vanity countertop space.

If vanity countertop space is provided in dwelling or sleeping units not required to be Accessible units within the same facility, equivalent vanity countertop space, in terms of size and proximity to the lavatory, shall also be provided in Accessible units.

1102.11.2.2: Mirrors.

Mirrors above lavatories required to comply with Section 606 shall have the bottom edge of the reflecting surface 40 inches (1015 mm) maximum above the floor.

1102.12: Kitchens.

Kitchens shall comply with Section 804.

1102.13: Windows.

Operable windows shall comply with Section 506.1.

Exceptions:

1. Windows in kitchens shall not be required to comply with Section 1102.13.
2. Windows in bathrooms shall not be required to comply with Section 1102.13.

1102.14: Storage facilities.

Where storage facilities are provided, at least one of each type shall comply with Section 905.

Exception: Kitchen cabinets shall not be required to comply with Section 1102.14.

1102.15: Beds.

In at least one sleeping area, a minimum of five percent, but not less than one bed shall comply with Section 1102.15.

1102.15.1: Clear floor space.

A clear floor space shall be provided on both sides of the bed. The clear floor space shall be positioned for parallel approach to the side of the bed.

Exception: Where a single clear floor space positioned for parallel approach is provided between two beds, a clear floor space shall not be required on both sides of the bed.

1102.15.2: Bed frames.

At least one bed shall be provided with an open bed frame.

1102.15.3: Bed height.

At least one bed shall measure 17 to 23 inches (430 to 585 mm) high from the floor to the top of the uncompressed mattress.

1102.15.4: Wheelchair charging area.

The clear floor space required by Section 1102.15.1 shall also serve as a wheelchair charging area complying with Section 906.

Section 1103: Type A Units

1103.1: General.

Type A units shall comply with Section 1103.

1103.2: Primary entrance.

The primary entrance shall be on an accessible route from public and common areas. The primary entrance shall not be to a bedroom unless it is the only entrance.

1103.3: Accessible route.

Accessible routes within Type A units shall comply with Section 1103.3.

1103.3.1: Location.

At least one accessible route shall connect all spaces and elements that are a part of the unit. Accessible routes shall coincide with or be located in the same area as a general circulation path.

> **Exception:** An accessible route is not required to unfinished attics and unfinished basements that are part of the unit.

1103.3.2: Turning space.

All rooms served by an accessible route shall provide a turning space.

> **Exceptions:**
>
> 1. A turning space is not required in toilet rooms and bathrooms that are not required to comply with Section 1103.11.2.
> 2. A turning space is not required within closets or pantries that are 48 inches (1220 mm) maximum in depth.

1103.3.3: Components.

Accessible routes shall consist of one or more of the following elements: walking surfaces with a slope not steeper than 1:20, doors and doorways, ramps, elevators, and platform lifts.

1103.4: Walking surfaces.

Walking surfaces that are part of an accessible route shall comply with Section 403.

1103.5: Doors and doorways.

The primary entrance door to the unit, and all other doorways intended for user passage, shall comply with Section 404.

Exceptions:

1. Thresholds at exterior sliding doors shall be permitted to be 3/4 inch (19 mm) maximum in height, provided they are beveled with a slope not greater than 1:2.
2. In toilet rooms and bathrooms not required to comply with Section 1103.11.2, maneuvering clearances required by Section 404.2.3 shall not be required on the toilet room or bathroom side of the door.
3. A turning space between doors in a series as required by Section 404.2.5 is not required.
4. Storm and screen doors shall not be required to comply with Section 404.2.5.
5. Communicating doors between individual sleeping units shall not be required to comply with Section 404.2.5.
6. At other than the primary entrance door, where exterior space dimensions of balconies are less than the required maneuvering clearance, door maneuvering clearance is not required on the exterior side of the door.
7. The maneuvering clearances required by Section 404 shall not be required within a closet or pantry complying with Exception 2 of Section 1103.3.2.

1103.6: Ramps.

Ramps shall comply with Section 405.

1103.7: Elevators.

Elevators within the unit shall comply with Section 407, 408, or 409.

1103.8: Platform lifts.

Platform lifts within the unit shall comply with Section 410.

1103.9: Operable parts.

Lighting controls, electrical panelboards, electrical switches and receptacle outlets, environmental controls, appliance controls, plumbing fixture controls, and user controls for security or intercom systems shall comply with Section 309.

1103.10: Laundry equipment.

Washing machines and clothes dryers shall comply with Section 611.

1103.11: Toilet and bathing facilities.

At least one toilet and bathing facility shall comply with Section 1103.11.2. All toilet and bathing facilities shall comply with Section 1103.11.1.

1103.11.1: Grab bar and shower seat reinforcement.

Reinforcement shall be provided for the future installation of grab bars complying with Section 604.5 at water closets; grab bars complying with Section 607.4 at bathtubs; and for grab bars and shower seats complying with Sections 608.3, 608.2.1.3, 608.2.2.3 and 608.2.3.2 at shower compartments.

Exceptions:

1. At fixtures not required to comply with Section 1103.11.2, reinforcement in accordance with Section 1104.11.1 shall be permitted.
2. Reinforcement is not required in a room containing only a lavatory and a water closet, provided the room does not contain the only lavatory or water closet on the accessible level of the dwelling unit.
3. Reinforcement for the water closet side wall vertical grab bar component required by Section 604.5 is not required.
4. Where the lavatory overlaps the water closet clearance in accordance with the exception to Section 1103.11.2.4.4 reinforcement at the water closet rear wall for a 24-inch (610 mm) minimum length grab bar, centered on the water closet, shall be provided.

1103.11.2: General.

At least one toilet and bathing facility shall comply with Section 1103.11.2. At least one lavatory, one water closet and either a bathtub or shower within the unit shall comply with Section 1103.11.2. These toilet and bathing fixtures shall be in a single toilet/bathing area, such that travel between fixtures does not require travel through other parts of the unit.

1103.11.2.1: Doors.

Doors shall not swing into the clear floor space or clearance for any fixture.

Exception: Where a clear floor space is provided within the room beyond the arc of the door swing.

1103.11.2.2: Lavatory.

Lavatories shall comply with Section 606.

Exception: Cabinetry shall be permitted under the lavatory, provided the following criteria are met:

1. The cabinetry can be removed without removal or replacement of the lavatory;
2. The floor finish extends under the cabinetry; and
3. The walls behind and surrounding the cabinetry are finished.

1103.11.2.3: Mirrors.

Mirrors above lavatories required to comply with Section 1103.11.2.2 shall have the bottom edge of the reflecting surface 40 inches (1015 mm) maximum above the floor.

1103.11.2.4: Water closet.

Water closets shall comply with Section 1103.11.2.4.

Figure 1103.11.2.4(A) WATER CLOSETS IN TYPE A UNITS - WATER CLOSET LOCATION

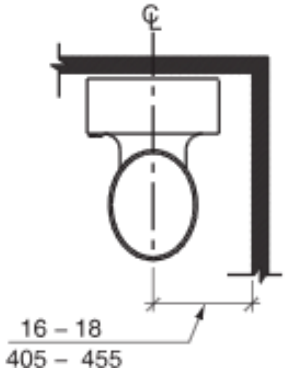


Figure 1103.11.2.4(B) WATER CLOSETS IN TYPE A UNITS - MINIMUM CLEARANCE

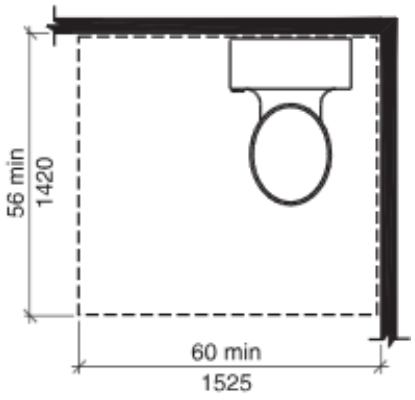


Figure 1103.11.2.4(C) WATER CLOSETS IN TYPE A UNITS - CLEARANCE WITH LAVATORY (OVERLAP EXCEPTION)

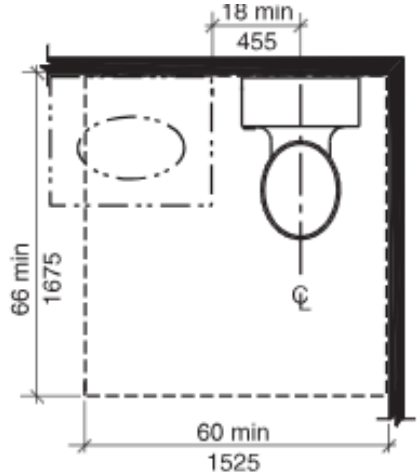
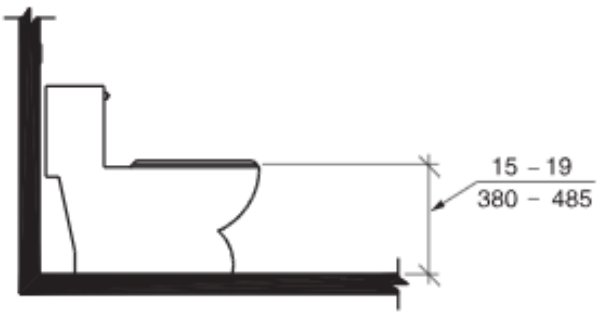


Figure 1103.11.2.4(D) WATER CLOSETS IN TYPE A UNITS - WATER CLOSET SEAT HEIGHT



1103.11.2.4.1: Location.

The water closet shall be positioned with a wall to the rear and to one side. The centerline of the water closet shall be 16 inches (405 mm) minimum and 18 inches (455 mm) maximum from the sidewall.

1103.11.2.4.2: Clearance width.

Clearance around the water closet shall be 60 inches (1525 mm) minimum in width, measured perpendicularly from the side wall.

1103.11.2.4.3: Clearance depth.

Clearance around the water closet shall be 56 inches (1420 mm) minimum in depth, measured perpendicularly from the rear wall.

1103.11.2.4.4: Clearance overlap.

The required clearance around the water closet shall be permitted to overlap the water closet, associated grab bars, paper dispensers, coat hooks, shelves, accessible routes, clear floor space required at other fixtures, and the wheelchair turning space. No other fixtures or obstructions shall be located within the required water closet clearance.

> **Exception:** A lavatory measuring 24 inches (610 mm) maximum in depth and complying with Section 1103.11.2.2 shall be permitted on the rear wall 18 inches (455 mm) minimum from the centerline of the water closet to the side edge of the lavatory where the clearance at the water closet is 66 inches (1675 mm) minimum measured perpendicular from the rear wall.

1103.11.2.4.5: Height.

The top of the water closet seat shall be 15 inches (380 mm) minimum and 19 inches (485 mm) maximum above the floor, measured to the top of the seat.

1103.11.2.4.6: Flush controls.

Flush controls shall be hand-operated or automatic. Hand operated flush controls shall comply with Section 309. Hand-operated flush controls shall be located on the open side of the water closet.

1103.11.2.5: Bathing fixtures.

The bathing fixture shall be a bathtub complying with Section 1103.11.2.5.1 or a shower compartment complying with Section 1103.11.2.5.2.

1103.11.2.5.1: Bathtub.

Bathtubs shall comply with Section 607.

> **Exception:** Countertops and cabinetry shall be permitted at one end of the clearance, provided the following criteria are met:
>
> 1. The countertop and cabinetry can be removed;
> 2. The floor finish extends under the countertop and cabinetry; and
> 3. The walls behind and surrounding the countertop and cabinetry are finished.

Figure 1103.11.2.5.1(A) CLEARANCE FOR BATHTUBS IN TYPE A UNITS WITH REMOVABLE SEAT

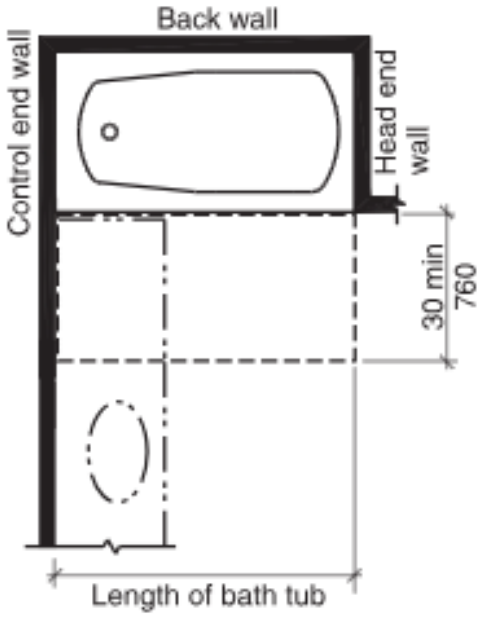
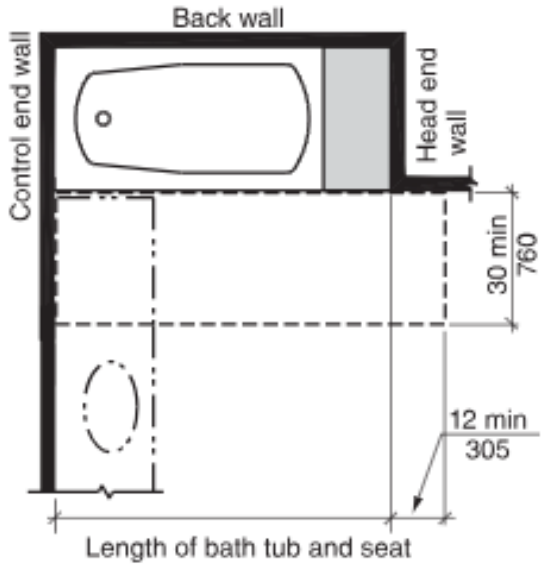


Figure 1103.11.2.5.1(B) CLEARANCE FOR BATHTUBS IN TYPE A UNITS WITH PERMANENT SEAT



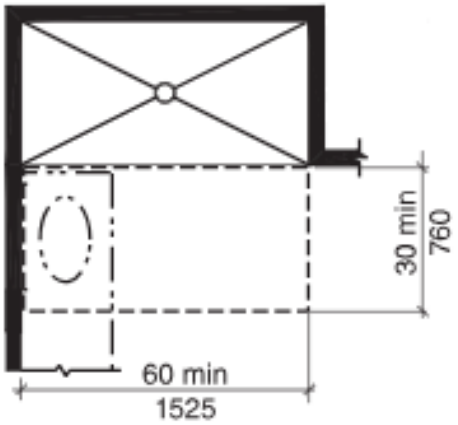
1103.11.2.5.2: Shower.

Showers shall comply with Section 608.

Exception: At standard roll-in shower compartments complying with Section 608.2.2, lavatories, countertops and cabinetry shall be permitted at one end of the clearance, provided the following criteria are met:

1. The countertop and cabinetry can be removed;
2. The floor finish extends under the countertop and cabinetry; and
3. The walls behind and surrounding the countertop and cabinetry are finished.

Figure 1103.11.2.5.2 STANDARD ROLL-IN-TYPE SHOWER COMPARTMENT IN TYPE A UNITS



1103.12: Kitchens.

Kitchens shall comply with Section 1103.12.

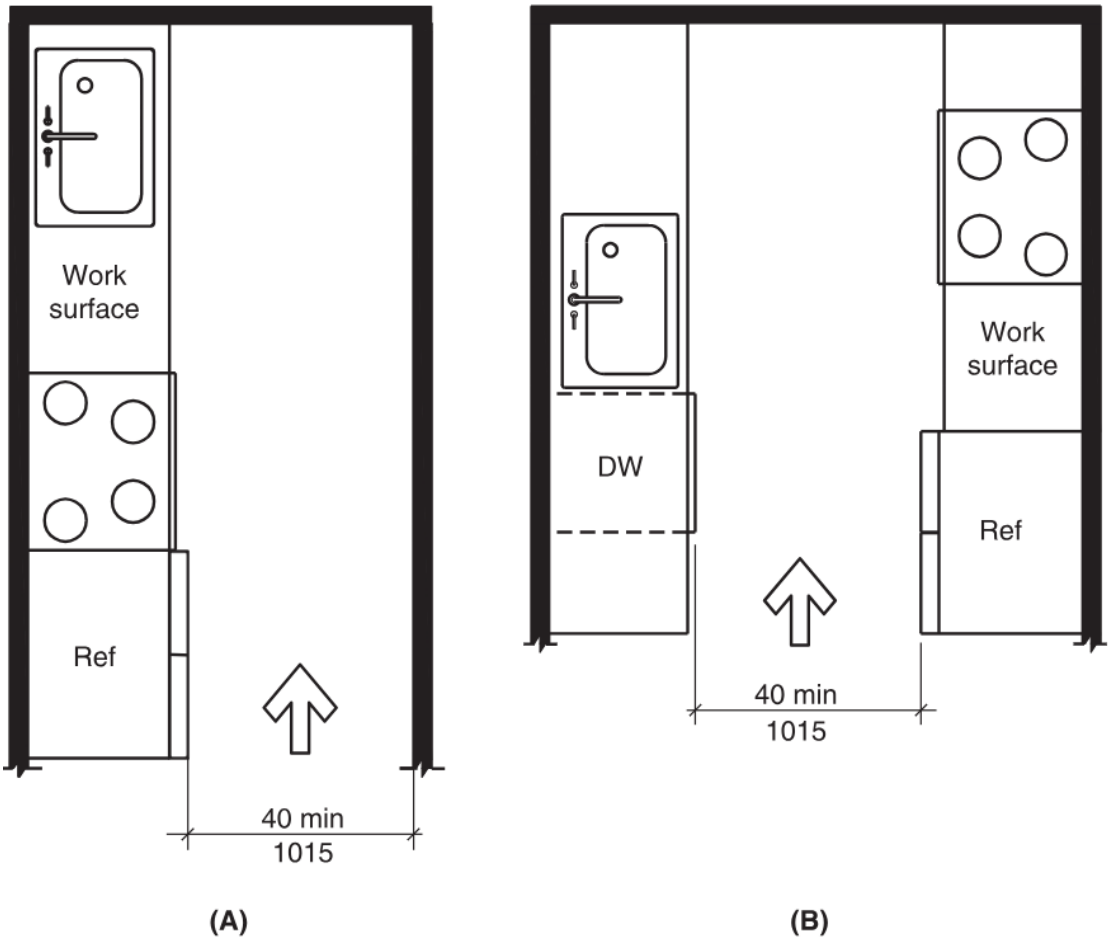
1103.12.1: Clearance.

Clearance complying with Section 1103.12.1 shall be provided.

1103.12.1.1: Minimum clearance.

Clearance between all opposing base cabinets, countertops, appliances, or walls within kitchen work areas shall be 40 inches (1015 mm) minimum.

Figure 1103.12.1.1 MINIMUM KITCHEN CLEARANCE IN TYPE A UNITS



1103.12.1.2: U-shaped kitchens.

In kitchens with counters, appliances, or cabinets on three contiguous sides, clearance between all opposing base cabinets, countertops, appliances, or walls within kitchen work areas shall be 60 inches (1525 mm) minimum.

Exception: U-shaped kitchens with an island complying with Section 1103.12.1.1.

Figure 1103.12.1.2(A) U-SHAPED KITCHEN CLEARANCE IN TYPE A UNITS

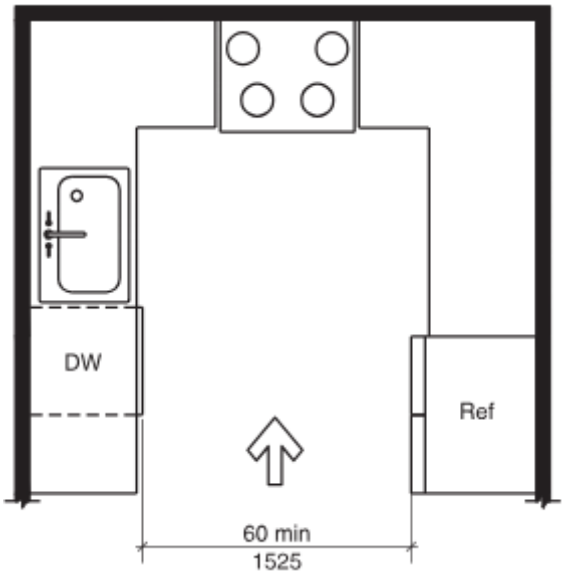
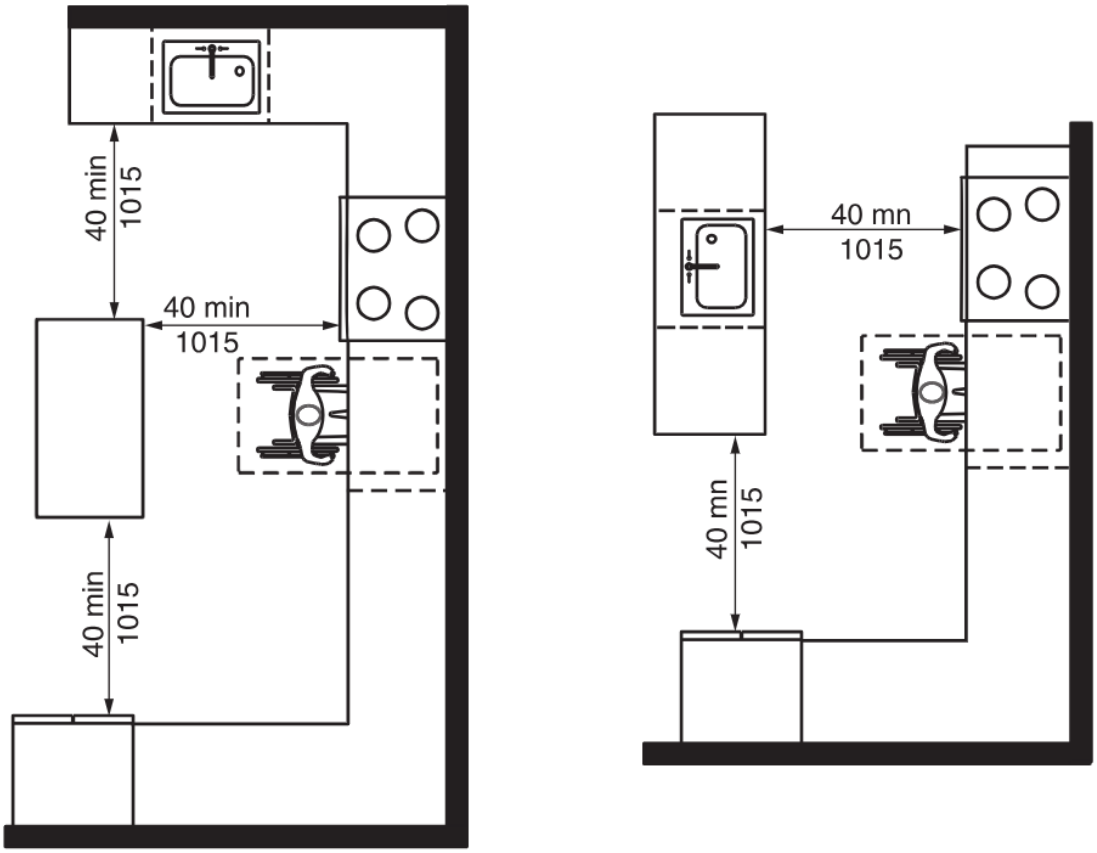


Figure 1103.12.1.2(B) U-SHAPED KITCHEN CLEARANCE IN TYPE A UNITS EXCEPTION



1103.12.2: Clear floor space.

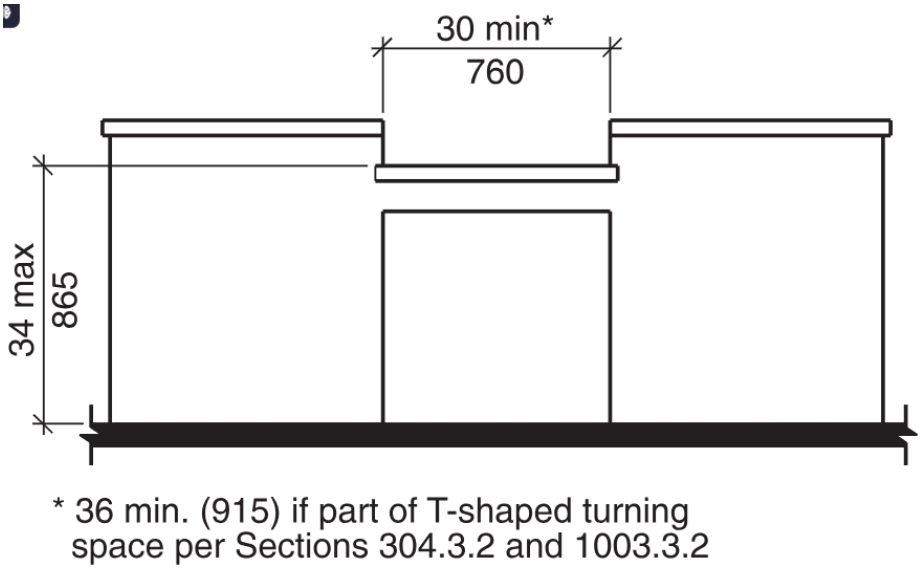
Clear floor spaces required by Sections 1103.12.3 through 1103.12.5 shall comply with Section 305.

1103.12.3: Work surface.

At least one section of counter shall provide an accessible work surface 30 inches (760 mm) minimum in length complying with Section 1103.12.3.

> **Exception:** Spaces that do not provide a cooktop or conventional range shall not be required to provide an accessible work surface.

Figure 1103.12.3 WORK SURFACE IN KITCHEN FOR TYPE A UNITS



1103.12.3.1: Clear floor space.

A clear floor space, positioned for a forward approach to the work surface, shall be provided. Knee and toe clearance complying with Section 306 shall be provided.

> **Exception:** Cabinetry shall be permitted under the work surface, provided the following criteria are met:
>
> 1. The cabinetry can be removed without removal or replacement of the work surface,
> 2. The floor finish extends under the cabinetry, and
> 3. The walls behind and surrounding the cabinetry are finished.

1103.12.3.2: Height.

The work surface shall be 34 inches (865 mm) maximum above the floor.

Exception: A counter that is adjustable to provide a work surface at variable heights 29 inches (735 mm) minimum and 36 inches (915 mm) maximum above the floor, or that can be relocated within that range without cutting the counter or damaging adjacent cabinets, walls, doors, and structural elements, shall be permitted.

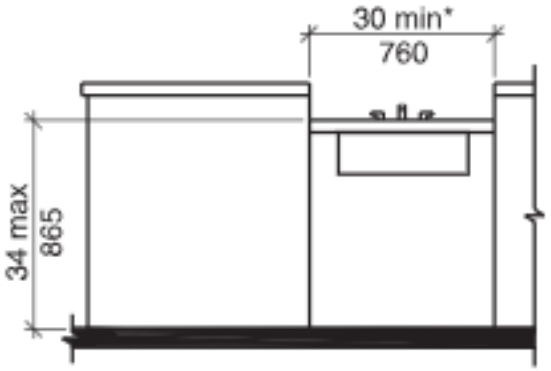
1103.12.3.3: Exposed surfaces.

There shall be no sharp or abrasive surfaces under the exposed portions of work surface counters.

1103.12.4: Sink.

Sinks shall comply with Section 1103.12.4.

Figure 1103.12.4 KITCHEN SINK FOR TYPE A UNITS



* 36 in. (915 mm) min. if part of T-shaped turning space in accordance with Sections 304.3.2 and 1003.3.2

1103.12.4.1: Clear floor space.

A clear floor space, positioned for a forward approach to the sink, shall be provided. Knee and toe clearance complying with Section 306 shall be provided.

Exceptions:

1. The requirement for knee and toe clearance shall not apply to more than one bowl of a multi-bowl sink.
2. Cabinetry shall be permitted to be added under the sink, provided the following criteria are met:

   2.1. The cabinetry can be removed without removal or replacement of the sink,

   2.2. The floor finish extends under the cabinetry, and

   2.3. The walls behind and surrounding the cabinetry are finished.

3. A clear floor space providing a parallel approach and centered on the sink shall be permitted at a kitchen sink in a space where a cook top or conventional range is not provided.
4. A clear floor space providing a parallel approach and centered on the sink shall be permitted at wet bars.

1103.12.4.2: Height.

The front of the sink shall be 34 inches (865 mm) maximum above the floor, measured to the higher of the rim or counter surface.

> **Exception:** A sink and counter that is adjustable to variable heights 29 inches (735 mm) minimum and 36 inches (915 mm) maximum above the floor, or that can be relocated within that range without cutting the counter or damaging adjacent cabinets, walls, doors and structural elements, provided rough-in plumbing permits connections of supply and drain pipes for sinks mounted at the height of 29 inches (735 mm), shall be permitted.

1103.12.4.3: Faucets.

Faucets shall comply with Section 309.

1103.12.4.4: Exposed pipes and surfaces.

Water supply and drain pipes under sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under sinks.

1103.12.5: Appliances.

Where provided, kitchen appliances shall comply with Section 1103.12.5.

1103.12.5.1: Operable parts.

All appliance controls shall comply with Section 1103.9.

> **Exceptions:**
>
> 1. Appliance doors and door latching devices shall not be required to comply with Section 309.4.
> 2. Bottom-hinged appliance doors, when in the open position, shall not be required to comply with Section 309.3.

1103.12.5.2: Clear floor space.

A clear floor space, positioned for a parallel or forward approach, shall be provided at each kitchen appliance.

1103.12.5.3: Dishwasher.

A clear floor space, positioned adjacent to the dishwasher door, shall be provided. The dishwasher door in the open position shall not obstruct the clear floor space for the dishwasher or an adjacent sink.

1103.12.5.4: Cooktop.

Cooktops shall comply with Section 1103.12.5.4.

1103.12.5.4.1: Approach.

A clear floor space, positioned for a parallel or forward approach to the cooktop, shall be provided.

1103.12.5.4.2: Forward approach.

Where the clear floor space is positioned for a forward approach, knee and toe clearance complying with Section 306 shall be provided. The underside of the cooktop shall be insulated or otherwise configured to protect from burns, abrasions or electrical shock.

1103.12.5.4.3: Parallel approach.

Where the clear floor space is positioned for a parallel approach, the clear floor space shall be centered on the appliance.

1103.12.5.4.4: Controls.

The location of controls shall not require reaching across burners.

1103.12.5.5: Oven.

Ovens shall comply with Section 1103.12.5.5.

1103.12.5.5.1: Clear floor space.

A clear floor space shall be provided. The oven door in the open position shall not obstruct the clear floor space for the oven.

1103.12.5.5.2: Side-hinged door ovens.

Side-hinged door ovens shall have a countertop positioned adjacent to the latch side of the oven door.

1103.12.5.5.3: Bottom-hinged door ovens.

Bottom-hinged door ovens shall have a countertop positioned adjacent to one side of the door.

1103.12.5.5.4: Controls.

The location of controls shall not require reaching across burners.

1103.12.5.6: Refrigerator/freezer.

Combination refrigerators and freezers shall have at least 50 percent of the freezer compartment shelves, including the bottom of the freezer 54 inches (1370 mm) maximum above the floor when the shelves are installed at the maximum heights possible in the compartment. A clear floor space, positioned for a parallel approach to the refrigerator/freezer, shall be provided. The centerline of the clear floor space shall be offset 24 inches (610 mm) maximum from the centerline of the appliance.

1103.13: Windows.

Operable windows shall comply with Section 1103.13.

Exceptions:

1. Windows in kitchens shall not be required to comply with Section 1103.13.
2. Windows in bathrooms shall not be required to comply with Section 1103.13.

1103.13.1: Natural ventilation.

Operable windows required to provide natural ventilation shall comply with Sections 309.2 and 309.3.

1103.13.2: Emergency escape.

Operable windows required to provide an emergency escape and rescue opening shall comply with Section 309.2.

1103.14: Storage facilities.

Where storage facilities are provided, at least one of each type shall comply with Section 905.

Exception: Kitchen cabinets shall not be required to comply with Section 1103.14.

Section 1104: Type B Units

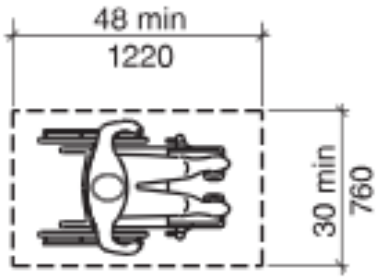
1104.1: General.

Type B units shall comply with Section 1104.

1104.1.1: Clear floor space.

For Type B units, clear floor spaces shall be 48 inches (1220 mm) minimum in length and 30 inches (760 mm) minimum in width.

Figure 1104.1.1 CLEAR FLOOR SPACE FOR TYPE B UNITS



1104.1.2: Mailboxes.

Mailboxes serving Type B units shall be permitted an unobstructed side reach range at 54 inches (1370 mm) maximum above the floor.

1104.2: Primary entrance.

The primary entrance shall be on an accessible route from public and common areas. The primary entrance shall not be to a bedroom unless it is the only entrance.

1104.3: Accessible route.

Accessible routes within Type B units shall comply with Section 1104.3.

1104.3.1: Location.

At least one accessible route shall connect all spaces and elements that are a part of the unit. Accessible routes shall coincide with or be located in the same area as a general circulation path.

Exceptions:

1. An accessible route is not required to unfinished attics and unfinished basements that are part of the unit.
2. One of the following is not required to be on an accessible route:

   2.1. A raised floor area in a portion of a living, dining, or sleeping room; or

   2.2. A sunken floor area in a portion of a living, dining, or sleeping room; or

   2.3. A mezzanine that does not have plumbing fixtures or an enclosed habitable space.

1104.3.2: Components.

Accessible routes shall consist of one or more of the following elements: walking surfaces with a slope not steeper than 1:20, doors and doorways, ramps, elevators, and platform lifts.

1104.4: Walking surfaces.

Walking surfaces that are part of an accessible route shall comply with Section 1104.4.

1104.4.1: Clear width.

The clear width of an accessible route shall comply with Section 403.5.

Exceptions:

1. The clear width shall be permitted to be reduced to 32 inches (815 mm) minimum for a length of 24 inches (610 mm) maximum provided the reduced width segments are separated by segments that are 48 inches (1220 mm) minimum in length and 36 inches (915 mm) minimum in width.
2. Where an accessible route makes a 180-degree turn around an object that is less than 48 inches (1220 mm) in width, clear widths shall be 42 inches (1065 mm) minimum approaching the turn, 48 inches (1220 mm) minimum during the turn and 42 (1065 mm) inches minimum leaving the turn.
3. Where an accessible route makes a 180-degree turn around an object that is less than 48 inches (1220 mm) in width, the clear width approaching the turn and leaving the turn shall be 36 inches (915 mm) minimum provided the clear width during the turn is 60 inches (1525 mm) minimum.

4. Where an accessible route makes a 90-degree turn the clear widths approaching the turn and leaving the turn shall be 36 inches (915 mm) minimum.
5. An accessible route with a clear width less than 60 inches (1525 mm) shall provide passing spaces at intervals of 200 feet (61 m) maximum. Passing spaces shall be either a 60-inch (1525 mm) minimum by 60-inch (1525 mm) minimum space, or an intersection of two walking surfaces that provide a T-shaped turning space complying with Section 304.3.2.2, provided the base and arms of the T-shaped space extend 48 inches (1220 mm) minimum beyond the intersection.

1104.4.2: Changes in level.

Changes in level shall comply with Section 303.

> **Exception:** Where exterior deck, patio or balcony surface materials are impervious, the finished exterior impervious surface shall be 4 inches (100 mm) maximum below the floor level of the adjacent interior spaces of the unit.

1104.5: Doors and doorways.

Doors and doorways shall comply with Section 1104.5.

1104.5.1: Primary entrance door.

The primary entrance door to the unit shall comply with Section 404.

> **Exceptions:**
>
> 1. Storm and screen doors serving individual dwelling or sleeping units shall not be required to comply with Section 404.2.5.
> 2. For the maneuvering clearance at swinging doors for the front approach direction on the push side, the dimension perpendicular to the door shall be 48 inches (1220 mm) minimum.
> 3. For the maneuvering clearance at sliding and folding doors for the front approach direction, the dimension perpendicular to the door shall be 48 inches (1220 mm) minimum.
> 4. For doorways without doors, the dimension perpendicular to the doorway for the front direction shall be 48 inches (1220 mm) minimum.

1104.5.2: User passage doorways.

Doorways intended for user passage shall comply with Section 1104.5.2.

> **Exception:** Doors that are part of a shower door assembly shall not be required to comply with this section.

1104.5.2.1: Clear width.

Doorways shall have a clear opening of 31 3/4 inches (805 mm) minimum. Clear opening of swinging doors shall be measured between the face of the door and stop, with the door open 90 degrees.

1104.5.2.1.1: Double leaf doorways.

Where the operable parts on an inactive leaf of a double leaf doorway are located more than 48 inches (1220 mm) or less than 15 inches (380 mm) above the floor, the active leaf shall provide the clearance required by Section 1104.5.2.1.

1104.5.2.2: Thresholds.

Thresholds shall comply with Section 303.

> **Exception:** Thresholds at exterior sliding doors shall be permitted to be 3/4 inch (19 mm) maximum in height, provided they are beveled with a slope not steeper than 1:2.

1104.5.2.3: Automatic doors.

Automatic doors shall comply with Section 404.3.

1104.6: Ramps.

Ramps shall comply with Section 405.

1104.7: Elevators.

Elevators serving the unit shall comply with Sections 407, 408 or 409.

> **Exception:** In private residence elevators, the inside dimensions of elevator cars shall provide a clear floor length of 48 inches (1220 mm) minimum and a clear floor width of 36 inches (760 mm) minimum.

1104.8: Platform lifts.

Platform lifts within the unit shall comply with Section 410.

> **Exception:** Platform lifts with a single door or with doors on opposite ends shall provide a clear floor width of 36 inches (915 mm) minimum and a clear floor length of 48 inches (1220 mm) minimum.

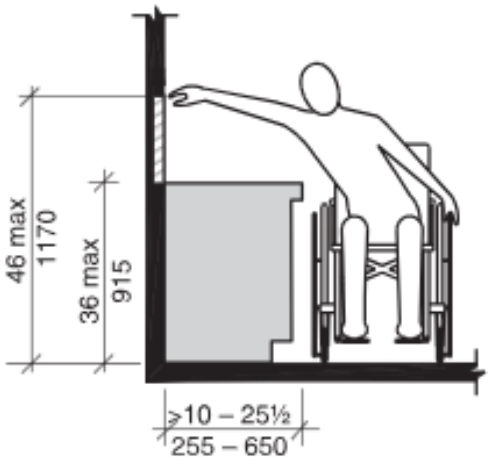
1104.9: Operable parts.

Lighting controls, electrical switches and receptacle outlets, environmental controls, electrical panelboards, and user controls for security or intercom systems shall comply with Sections 309.3 and 1104.1.1.

> **Exceptions:**
>
> 1. Receptacle outlets serving a dedicated use.
> 2. In a kitchen where two or more receptacle outlets are provided above a length of countertop that is uninterrupted by a sink or appliance, only one receptacle outlet shall be required to comply with this section.
> 3. In a kitchen where a clear floor space for a parallel approach cannot be located at a countertop in a corner between appliances, receptacle outlets over the countertop shall not be required to comply with this section provided that the countertop area does not exceed 9 square feet (0.835 m2) maximum.
> 4. Floor receptacle outlets.

5. HVAC diffusers.
6. Controls mounted on ceiling fans.
7. Controls or switches mounted on appliances.
8. Plumbing fixture controls.
9. Reset buttons and shut-offs serving appliances, piping and plumbing fixtures.
10. Where redundant controls other than light switches are provided for a single element, one control in each space shall not be required to comply with this section.
11. Within kitchens and bathrooms, lighting controls, electrical switches and receptacle outlets are permitted to be located over cabinets with countertops 36 inches (915 mm) maximum in height and 25 1/2 inches (650 mm) maximum in depth.

Figure 1104.9 REACH OVER A KITCHEN OR BATHROOM CABINET



1104.10: Laundry equipment.

Washing machines and clothes dryers shall comply with Section 1104.10.

1104.10.1: Clear floor space.

A clear floor space shall be provided for each washing machine and clothes dryer. A parallel approach shall be provided for a top loading machine. A forward or parallel approach shall be provided for a front loading machine.

1104.11: Toilet and bathing facilities.

Toilet and bathing fixtures shall comply with Section 1104.11.

Exception: Fixtures on levels not required to be accessible.

1104.11.1: Grab bar and shower seat reinforcement.

Reinforcement shall be provided for the future installation of grab bars and shower seats at water closets, bathtubs, and shower compartments. Where walls are located to permit the installation of grab bars and seats complying with Section 604.5 at water closets; grab bars complying with Section 607.4 at bathtubs; and for grab bars and shower seats complying with Sections, 608.3, 608.2.1.3, 608.2.2.3 and 608.2.3.2 at shower compartments; reinforcement shall be provided for the future installation of grab bars and seats complying with those requirements.

Exceptions:

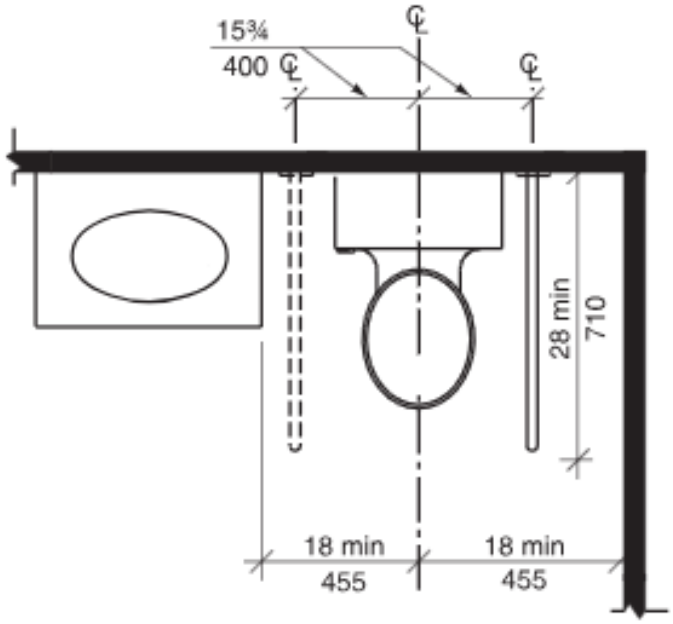
1. In a room containing only a lavatory and a water closet, reinforcement is not required provided the room does not contain the only lavatory or water closet on the accessible level of the unit.
2. At water closets reinforcement for the side wall vertical grab bar component required by Section 604.5 is not required.
3. At water closets where wall space will not permit a grab bar complying with Section 604.5.2, reinforcement for a rear wall grab bar 24 inches (610 mm) minimum in length centered on the water closet shall be provided.
4. At water closets where a side wall is not available for a 42-inch (1065 mm) grab bar complying with Section 604.5.1, reinforcement for a sidewall grab bar, 24 inches (610 mm) minimum in length, located 12 inches (305 mm) maximum from the rear wall, shall be provided.
5. At water closets where a side wall is not available for a 42-inch (1065 mm) grab bar complying with Section 604.5.1 reinforcement for a swing-up grab bar complying with Section 1104.11.1.1 shall be permitted.
6. At water closets where a side wall is not available for a 42-inch (1065 mm) grab bar complying with Section 604.5.1 reinforcement for two swing-up grab bars complying with Section 1104.11.1.1 shall be permitted to be installed in lieu of reinforcement for rear wall and side wall grab bars.
7. In shower compartments larger than 36 inches (915 mm) in width and 36 inches (915 mm) in depth reinforcement for a shower seat is not required.

1104.11.1.1: Swing–up grab bars.

A clearance of 18 inches (455 mm) minimum from the centerline of the water closet to any side wall or obstruction shall be provided where reinforcement for swing–up grab bars is provided. When the approach to the water closet is from the side, the 18 inches (455 mm) minimum shall be on the side opposite the direction of approach. Reinforcement shall accommodate a swing–up grab bar centered 15 3/4 inches (400 mm) from the centerline of the water closet and 28 inches (710 mm) minimum in length, measured from the wall to the end of the horizontal portion of the grab bar. Reinforcement shall accommodate a swing-up grab bar with a height in the down position of 33 inches (840 mm) minimum and 36 inches (915 mm) maximum. Reinforcement shall be adequate to resist forces in accordance with Section 609.8.

Exception: Where a water closet is positioned with a wall to the rear and to one side, the centerline of the water closet shall be 16 inches (405 mm) minimum and 18 inches (455 mm) maximum from the sidewall.

Figure 1104.11.1.1 SWING-UP GRAB BARS FOR WATER CLOSETS



1104.11.2: Clear floor space.

Clear floor spaces required by Section 1104.11.3.1 (Option A) or 1104.11.3.2 (Option B) shall comply with Sections 1104.11.2 and 1104.1.1.

1104.11.2.1: Doors.

Doors shall not swing into the clear floor space or clearance for any fixture.

Exception: Where a clear floor space, excluding knee and toe clearances under elements, is provided within the room beyond the arc of the door swing.

1104.11.2.2: Knee and toe clearance.

Clear floor space at fixtures shall be permitted to include knee and toe clearances complying with Section 306.

1104.11.3: Toilet and bathing areas.

Either all toilet and bathing areas provided shall comply with Section 1104.11.3.1 (Option A), or one toilet and bathing area shall comply with Section 1104.11.3.2 (Option B).

1104.11.3.1: Option A.

Each fixture provided shall comply with Section 1104.11.3.1.

Exceptions:

1. Where multiple lavatories are provided in a single toilet and bathing area such that travel between fixtures does not require travel through other parts of the unit, not more than one lavatory is required to comply with Section 1104.11.3.1.
2. A lavatory and a water closet in a room containing only a lavatory and water closet, provided the room does not contain the only lavatory or water closet on the accessible level of the unit.

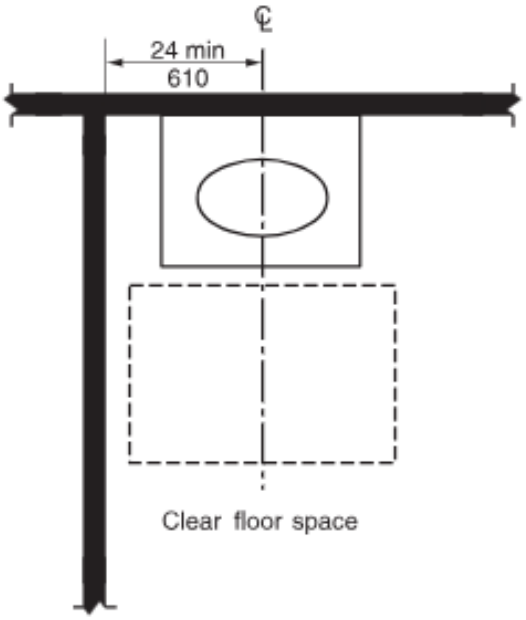
1104.11.3.1.1: Lavatory.

A clear floor space positioned for a parallel approach shall be provided at a lavatory. The clear floor space shall be centered on the lavatory.

Exception: A lavatory complying with Sections 606.3, 606.4 and 1104.1.1 shall be permitted. Cabinetry shall be permitted under the lavatory provided the following criteria are met:

1. The cabinetry can be removed without removal or replacement of the lavatory, and
2. The floor finish extends under the cabinetry, and
3. The walls behind and surrounding the cabinetry are finished.

Figure 1104.11.3.1.1 LAVATORY IN TYPE B UNITS - OPTION A BATHROOMS



1104.11.3.1.2: Water closet.

The water closet shall comply with Section 1104.11.3.1.2.

Figure 1104.11.3.1.2(A) CLEARANCE AT WATER CLOSETS IN TYPE B UNITS WATER CLOSET LOCATION

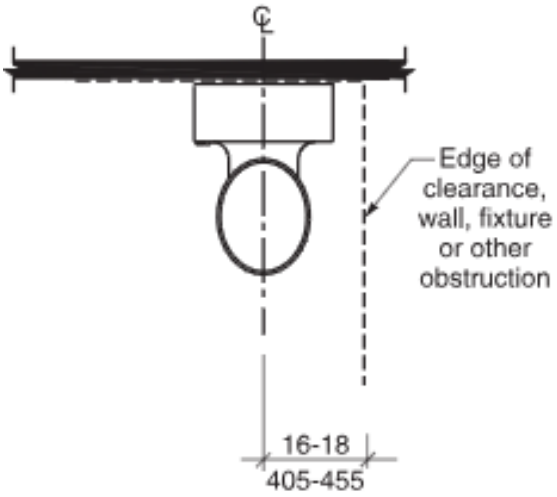


Figure 1104.11.3.1.2(B) CLEARANCE AT WATER CLOSETS IN TYPE B UNITS CLEARANCE WIDTH AND DEPTH

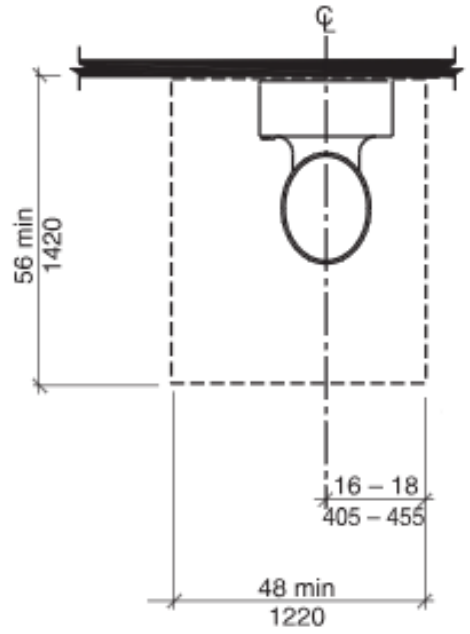


Figure 1104.11.3.1.2(C) CLEARANCE AT WATER CLOSETS IN TYPE B UNITS INCREASED CLEARANCE DEPTH - FORWARD APPROACH

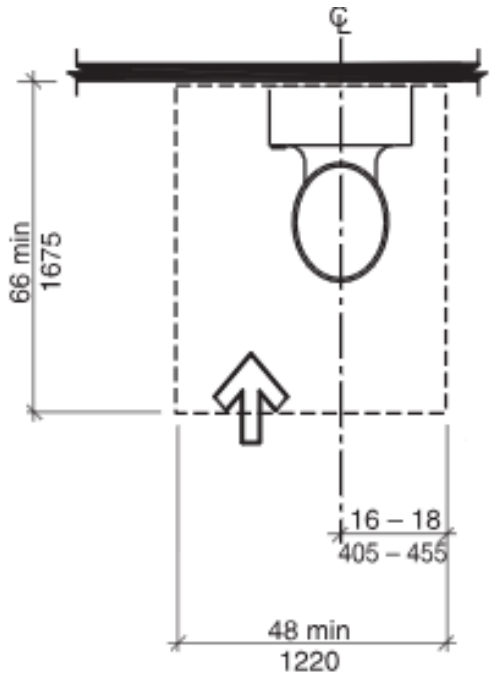
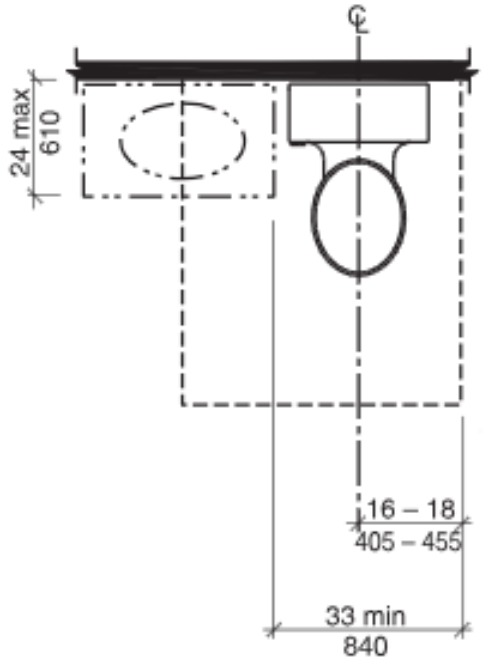


Figure 1104.11.3.1.2(D) CLEARANCE AT WATER CLOSETS IN TYPE B UNITS CLEARANCE WITH LAVATORY OVERLAP



1104.11.3.1.2.1: Location.

The centerline of the water closet shall be 16 inches (405 mm) minimum and 18 inches (455 mm) maximum from one side of the required clearance.

1104.11.3.1.2.2: Clearance.

Clearance around the water closet shall comply with Sections 1104.11.3.1.2.2.1 through 1104.11.3.1.2.2.3.

Exception: Clearance complying with Sections 1103.11.2.4.2 through 1103.11.2.4.4.

1104.11.3.1.2.2.1: Clearance width.

Clearance around the water closet shall be 48 inches (1220 mm) minimum in width, measured perpendicular from the side of the clearance that is 16 inches (405 mm) minimum and 18 inches (455 mm) maximum from the water closet centerline.

1104.11.3.1.2.2.2: Clearance depth.

Clearance around the water closet shall be 56 inches (1420 mm) minimum in depth, measured perpendicular from the rear wall.

1104.11.3.1.2.2.3: Increased clearance depth at forward approach.

Where a forward approach is provided, the clearance shall be 66 inches (1675 mm) minimum in depth, measured perpendicular from the rear wall.

1104.11.3.1.2.2.4: Clearance overlap.

A vanity or other obstruction 24 inches (610 mm) maximum in depth, measured perpendicular from the rear wall, shall be permitted to overlap the required clearance, provided the width of the remaining clearance at the water closet is 33 inches (840 mm) minimum.

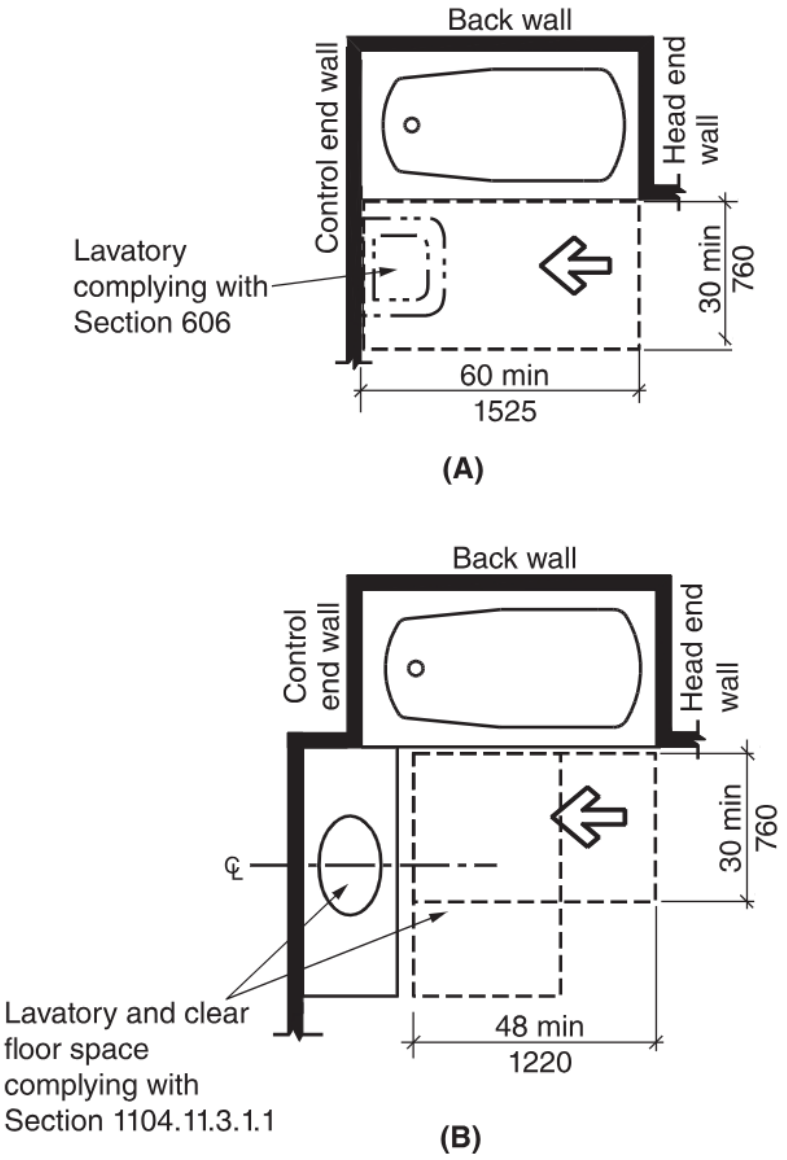
1104.11.3.1.3: Bathing fixtures.

Where provided, a bathtub shall comply with Section 1104.11.3.1.3.1 or 1104.11.3.1.3.2 and a shower compartment shall comply with Section 1104.11.3.1.3.3.

1104.11.3.1.3.1: Parallel approach bathtubs.

A clearance 60 inches (1525 mm) minimum in length and 30 inches (760 mm) minimum in width shall be provided in front of bathtubs with a parallel approach. Lavatories complying with Section 606 shall be permitted in the clearance. A lavatory complying with Section 1104.11.3.1.1 shall be permitted at one end of the bathtub if a clearance 48 inches (1220 mm) minimum in length and 30 inches (760 mm) minimum in width is provided in front of the bathtub.

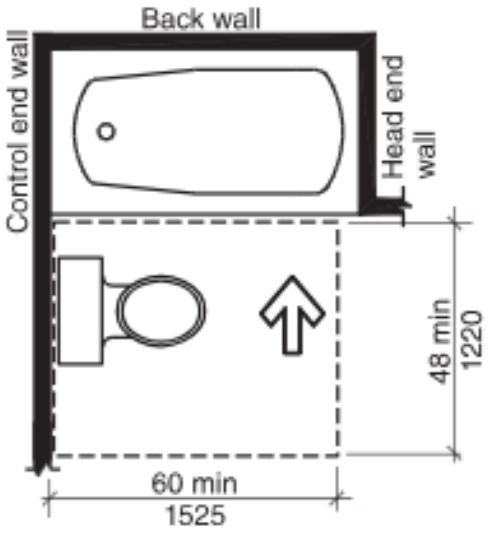
Figure 1104.11.3.1.3.1 PARALLEL APPROACH BATHTUB IN TYPE B UNITS - OPTION A BATHROOM



1104.11.3.1.3.2: Forward approach bathtubs.

A clearance 60 inches (1525 mm) minimum in length and 48 inches (1220 mm) minimum in width shall be provided in front of bathtubs with a forward approach. A water closet and a lavatory shall be permitted in the clearance at one end of the bathtub.

Figure 1104.11.3.1.3.2 FORWARD APPROACH BATHTUB IN TYPE B UNITS - OPTION A BATHROOM



1104.11.3.1.3.3: Shower compartment.

If a shower compartment is the only bathing facility, the shower compartment shall have dimensions of 36 inches (915 mm) minimum in width and 36 inches (915 mm) minimum in depth. A clearance of 48 inches (1220 mm) minimum in length, measured perpendicular from the control wall, and 30 inches (760 mm) minimum in depth, measured from the face of the shower compartment, shall be provided.

Exceptions:

1. A shower compartment with dimensions of 30 inches (760 mm) minimum in depth and 44 inches (1120 mm) minimum in width shall be permitted.
2. A shower door assembly shall be permitted where the assembly can be removed without removal or replacement of the surrounding walls and floor to which it is affixed.

Figure 1104.11.3.1.3.3(A) TRANSFER-TYPE SHOWER COMPARTMENT IN TYPE B UNITS

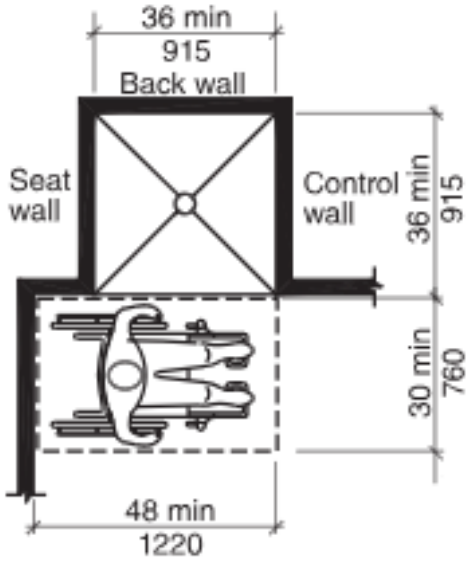
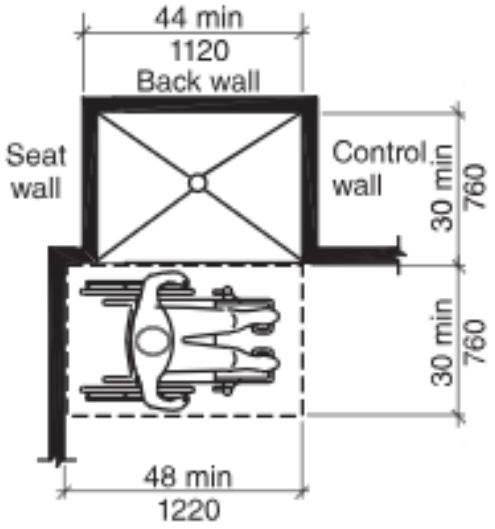


Figure 1104.11.3.1.3.3(B) TRANSFER-TYPE SHOWER COMPARTMENT IN TYPE B UNITS EXCEPTION



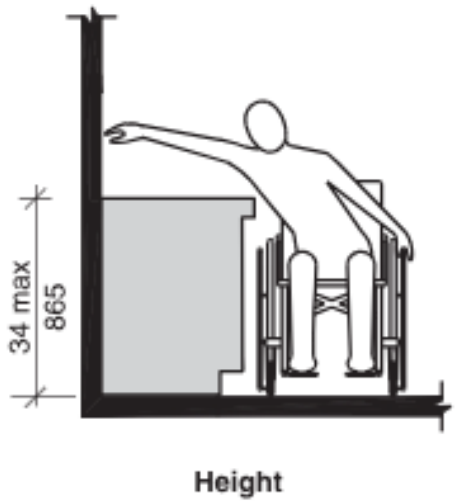
1104.11.3.2: Option B.

One of each type of fixture provided shall comply with Section 1104.11.3.2. These fixtures shall be in a single toilet/bathing area, such that travel between fixtures does not require travel through other parts of the unit.

1104.11.3.2.1: Lavatory.

Lavatories shall comply with Sections 1104.11.3.1.1 and 1104.11.3.2.1.1.

Figure 1104.11.3.2.1 LAVATORY IN TYPE B UNITS - OPTION B BATHROOM



1104.11.3.2.1.1: Height.

The front of the lavatory shall be 34 inches (865 mm) maximum above the floor, measured to the higher of the rim or counter surface.

1104.11.3.2.2: Water closet.

The water closet shall comply with Section 1104.11.3.1.2.

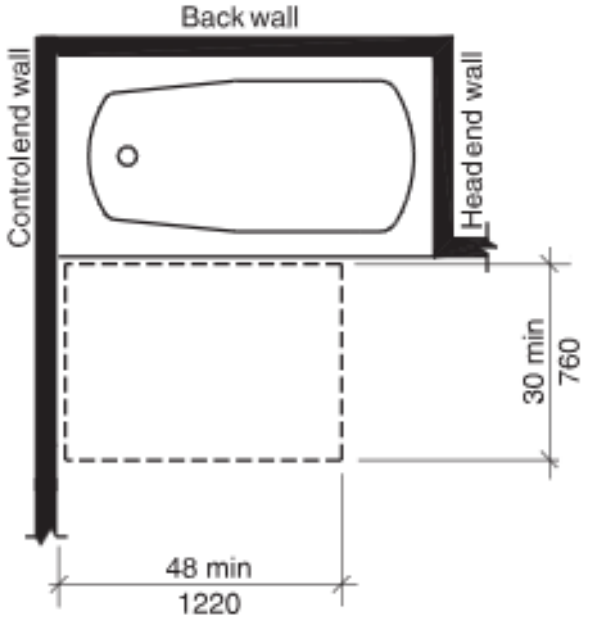
1104.11.3.2.3: Bathing fixtures.

The bathing fixture shall be a bathtub complying with Section 1104.11.3.2.3.1 or a shower compartment complying with Section 1104.11.3.2.3.2.

1104.11.3.2.3.1: Bathtub.

A clearance 48 inches (1220 mm) minimum in length measured perpendicular from the control end of the bathtub, and 30 inches (760 mm) minimum in width shall be provided in front of bathtubs.

Figure 1104.11.3.2.3.1 BATHROOM CLEARANCE IN TYPE B UNITS - OPTION B BATHROOM



1104.11.3.2.3.2: Shower compartment.

A shower compartment shall comply with Section 1104.11.3.1.3.3.

1104.12: Kitchens.

Kitchens shall comply with Section 1104.12.

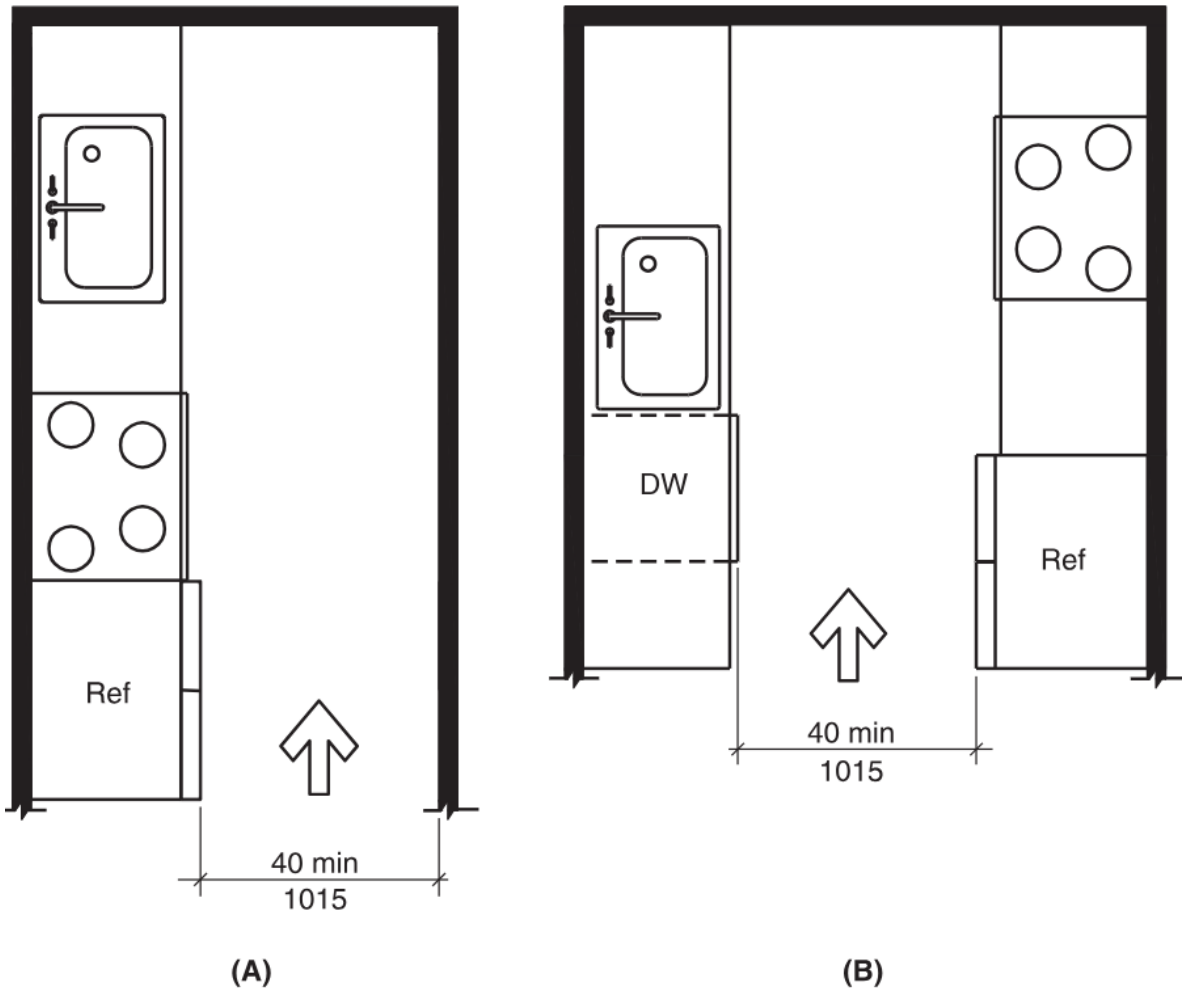
1104.12.1: Clearance.

Clearance complying with Section 1104.12.1 shall be provided.

1104.12.1.1: Minimum clearance.

Clearance between all opposing base cabinets, countertops, appliances, or walls within kitchen work areas shall be 40 inches (1015 mm) minimum.

Figure 1104.12.1.1 MINIMUM CLEARANCE IN TYPE B UNITS



1104.12.1.2: U-shaped kitchens.

In kitchens with counters, appliances or cabinets on three contiguous sides, clearance between all opposing base cabinets, countertops, appliances, or walls within kitchen work areas shall be 60 inches (1525 mm) minimum.

Exception: U-shaped kitchens with an island complying with Section 1104.12.1.1.

Figure 1104.12.1.2(A) U-SHAPED KITCHEN CLEARANCE IN TYPE B UNITS

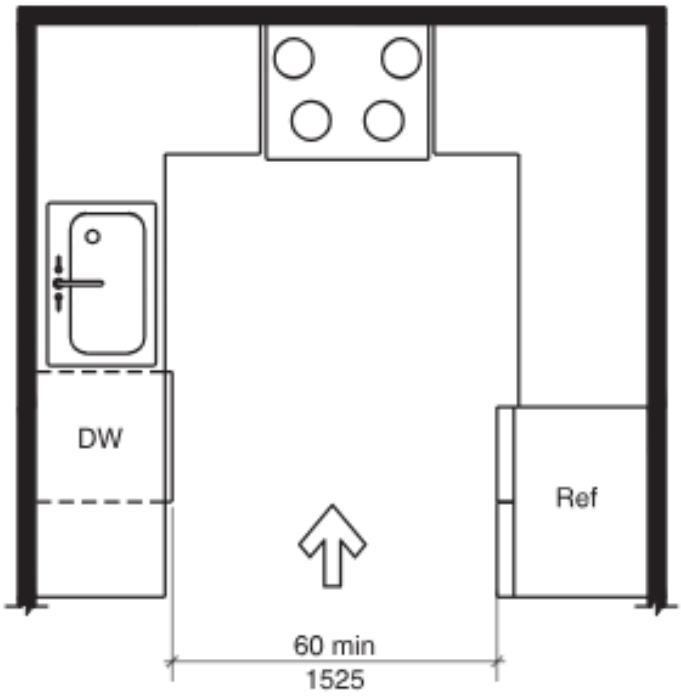
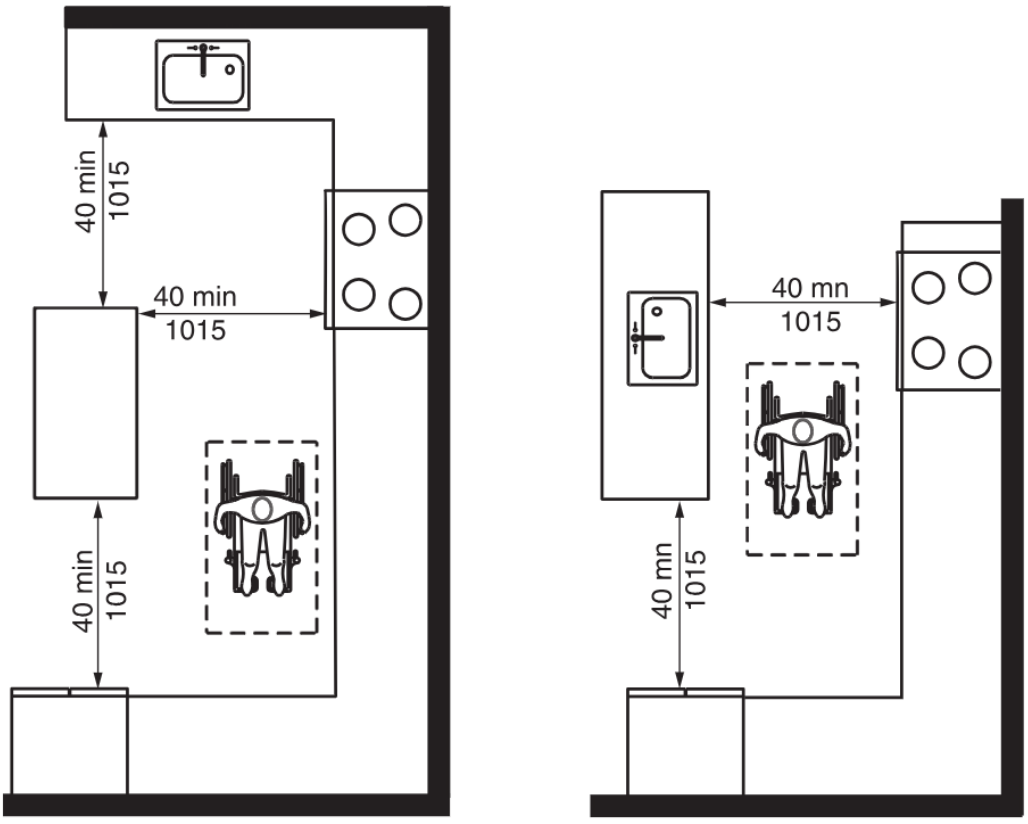


Figure 1104.12.1.2(B) U-SHAPED KITCHEN CLEARANCE IN TYPE B UNITS – EXCEPTION



1104.12.2: Clear floor space.

Clear floor spaces at appliances shall comply with Sections 1104.12.2 and 1104.1.1.

1104.12.2.1: Sink.

A clear floor space, positioned for a parallel approach to the sink, shall be provided. The clear floor space shall be centered on the sink bowl.

Exception: A sink with a forward approach complying with Section 1103.12.4.1.

1104.12.2.2: Dishwasher.

A clear floor space, positioned for a parallel or forward approach to the dishwasher, shall be provided. The dishwasher door in the open position shall not obstruct the clear floor space for the dishwasher.

1104.12.2.3: Cooktop.

Cooktops shall comply with Section 1104.12.2.3.

1104.12.2.3.1: Approach.

A clear floor space, positioned for a parallel or forward approach to the cooktop, shall be provided.

1104.12.2.3.2: Forward approach.

Where the clear floor space is positioned for a forward approach, knee and toe clearance complying with Section 306 shall be provided. The underside of the cooktop shall be insulated or otherwise configured to prevent burns, abrasions, or electrical shock.

1104.12.2.3.3: Parallel approach.

Where the clear floor space is positioned for a parallel approach, the clear floor space shall be centered on the appliance.

1104.12.2.4: Oven.

A clear floor space, positioned for a parallel or forward approach adjacent to the oven shall be provided. The oven door in the open position shall not obstruct the clear floor space for the oven.

1104.12.2.5: Refrigerator/freezer.

The refrigerator/freezer shall comply with Section 1104.12.2.5.

1104.12.2.5.1: Approach.

A clear floor space positioned for a parallel or forward approach to the refrigerator/freezer shall be provided.

1104.12.2.5.2: Forward approach.

Where the clear floor space is positioned for a forward approach, the centerline of the clear floor space shall be offset 15 inches (380 mm) maximum from the centerline of the appliance.

1104.12.2.5.3: Parallel approach.

Where the clear floor space is positioned for a parallel approach, the centerline of the clear floor space shall be offset 24 inches (610 mm) maximum from the centerline of the appliance.

1104.12.2.6: Trash compactor.

A clear floor space, positioned for a parallel or forward approach to the trash compactor, shall be provided.

Section 1105: Type C (Visitable) Units

1105.1: General.

Type C (Visitable) dwelling units shall comply with Section 1105.

1105.2: Unit entrance.

At least one unit entrance shall be on a circulation path complying with Section 1105.5 from a public street or sidewalk, a dwelling unit driveway, or a garage.

1105.3: Connected spaces.

A circulation path complying with Section 1105.5 shall connect the unit entrance complying with Section 1105.2 and with the spaces specified in Section 1105.4.

1105.4: Interior spaces.

The entrance level shall include a toilet room or bathroom complying with Section 1105.6 and one habitable space with an area 70 square feet (6.5 m2) minimum. Where a food preparation area is provided on the entrance level, it shall comply with Section 1105.7.

> **Exception:** A toilet room or bathroom shall not be required on an entrance level with less than 120 square feet (11.2 m2) of habitable space.

1105.5: Circulation path.

Circulation paths shall comply with Section 1105.5.

1105.5.1: Components.

The circulation path shall consist of one or more of the following elements: walking surfaces with a slope not steeper that 1:20, doors and doorways, ramps, elevators complying with Sections 407 through 409, and wheelchair (platform) lifts complying with Section 410.

1105.5.2: Walking surfaces.

Walking surfaces with slopes not steeper than 1:20 shall comply with Section 303.

1105.5.2.1: Clear width.

The clear width of the circulation path shall be 36 inches (915 mm) minimum.

1105.5.3: Doors and doorways.

Doors and doorways shall comply with Section 1105.5.3

1105.5.3.1: Clear width.

Doorways shall have a clear opening of 31 3/4 inches (805 mm) minimum. Clear opening of swinging doors shall be measured between the face of the door and stop, with the door open 90 degrees.

1105.5.3.2: Thresholds.

Thresholds shall comply with Section 303.

> **Exception:** Thresholds at exterior sliding doors shall be permitted to be 3/4 inch (19 mm) maximum in height, provided they are beveled with a slope not steeper than 1:2.

1105.5.4: Ramps.

Ramps shall comply with Section 405.

> **Exception:** Handrails, intermediate landings and edge protection shall not be required where the sides of ramp runs have a vertical drop off of 1/2 inch (13 mm) maximum within 10 inches (255 mm) horizontally of the ramp run.

1105.5.4.1: Clear width.

The clear width of the circulation path shall comply with Section 403.5.

1105.6: Toilet room or bathroom.

At a minimum, the toilet room or bathroom required by Section 1105.4 shall include a lavatory and a water closet. Reinforcement shall be provided for the future installation of grab bars at water closets. Clearances at the water closet shall comply with Section 1104.11.3.1.2.

1105.7: Food preparation area.

At a minimum, the food preparation area shall include a sink, a cooking appliance, and a refrigerator. Clearances between all opposing base cabinets, counter tops, appliances or walls within the food preparation area shall be 40 inches (1015 mm) minimum.

> **Exception:** Spaces that do not provide a cooktop or conventional range shall be permitted to provide a clearance of 36 inches (915 mm) minimum.

1105.8: Lighting controls and receptacle outlets.

Receptacle outlets and operable parts of lighting controls shall be located 15 inches (380 mm) minimum and 48 inches (1220 mm) maximum above the floor.

> **Exception:** The following shall not be required to comply with Section 1105.8.

1. Receptacle outlets serving a dedicated use.
2. Controls mounted on ceiling fans and ceiling lights.
3. Floor receptacle outlets.
4. Lighting controls and receptacle outlets over countertops.

Section 1106: Units with Communication Features

1106.1: General.

Units required to have communication features shall comply with Section 1106.

1106.2: Unit smoke detection.

Where provided, unit smoke detection shall include audible notification complying with NFPA 72 listed in Section 106.2.4.

1106.3: Building fire alarm system.

Where a building fire alarm system is provided, the system wiring shall be extended to a point within the unit in the vicinity of the unit smoke detection system.

1106.4: Visible notification appliances.

Visible notification appliances, where provided within the unit as part of the unit smoke detection system or the building fire alarm system, shall comply with Section 1106.4.

1106.4.1: Appliances.

Visible notification appliances shall comply with Section 702.

1106.4.2: Activation.

All visible notification appliances provided within the unit for smoke detection notification shall be activated upon smoke detection. All visible notification appliances provided within the unit for building fire alarm notification shall be activated upon activation of the building fire alarm in the portion of the building containing the unit.

1106.4.3: Interconnection.

The same visible notification appliances shall be permitted to provide notification of unit smoke detection and building fire alarm activation.

1106.4.4: Prohibited use.

Visible notification appliances used to indicate unit smoke detection or building fire alarm activation shall not be used for any other purpose within the unit.

1106.5: Unit primary entrance.

Communication features shall be provided at the unit primary entrance complying with Section 1106.5.

1106.5.1: Notification.

A hard-wired electric doorbell shall be provided. A button or switch shall be provided on the public side of the unit primary entrance. Activation of the button or switch shall initiate an audible tone within the unit. Where visible doorbell signals are located in sleeping areas, controls shall be provided to deactivate the signal.

1106.5.2: Identification.

A means for visually identifying a visitor without opening the unit entry door shall be provided. Peepholes, where used, shall provide a minimum 180-degree range of view.

1106.6: Site, building or floor entrance.

Where a system permitting voice communication between a visitor and the occupant of the unit is provided at a location other than the unit entry door, the system shall comply with Section 1106.6.

1106.6.1: Public or common-use interface.

The public or common-use system interface shall include the capability of supporting voice and TTY communication with the unit interface.

1106.6.2: Unit interface.

The unit system interface shall include a telephone jack capable of supporting voice and TTY communication with the public or common-use system interface.

1106.7: Closed-circuit communication systems.

Where a closed-circuit communication system is provided, the public or common-use system interface shall comply with Section 1106.6.1, and the unit system interface in units required to have communication features shall comply with Section 1106.6.2.

Supplement 1:

ICC A117.1—2017:

STANDARD FOR ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES

Supplement 1 provides a pathway to compliance with accessible adult changing station requirements in the 2024 I-Codes. (ANSI approval date: 2/27/24.)

Section 613: Adult Changing Stations

613.1: General.

Adult changing stations shall comply with Sections 613.2 through 613.4.

613.2: Installation location.

Adult changing stations shall comply with Sections 613.2 through 613.4.

613.2.1: Single-user or family or assisted-use toilet or bathing room.

Where adult changing stations are provided in a toilet room with only one water closet and one lavatory, or in a family or assisted-use toilet or bathing room, the room shall provide all of the following components:

1. A dispenser for soap complying with Section 308.
2. A hand towel dispenser or hand dryer complying with Table 603.6.
3. A coat hook located in close proximity to the changing surface.
4. A waste receptacle.
5. Signage indicating “Adult Changing Station” provided at the entrance to the room and complying with the visual character requirements in Section 703.2.
6. Signage indicating the weight capacity and instructions for operation of the changing station within the room.

613.2.2: Multiuser toilet or bathing room.

Where adult changing stations are provided in a multiuser toilet or bathing room, the adult changing station shall be located in a compartment that includes all of the following components:

1. Privacy provided by walls, curtains or partitions enclosing the compartment.
2. A turning space complying with Section 304.
3. A lavatory complying with Section 606.
4. A dispenser for soap complying with Section 308.
5. A hand towel dispenser or hand dryer complying with Table 603.6.
6. A coat hook in close proximity to the changing surface.
7. A waste receptacle.
8. Signage indicating “Adult Changing Station” provided at the entrance to the room and complying with the visual character requirements in Section 703.2.
9. Signage indicating the weight capacity and instructions for operation of the changing station within the compartment.

613.2.3: Room or space other than a toilet room or bathing room.

Where adult changing stations are provided in a room or space other than a toilet or bathing room and including, but not limited to, nurses’ work areas, therapist work areas, or special education classrooms, the adult changing station shall be located in a compartment or room that includes all of the following components:

1. Privacy provided by walls, curtains or partitions.
2. A turning space complying with Section 304.
3. A lavatory complying with Section 606 or an alcohol-based hand sanitizer dispenser.

4. Where a lavatory is provided in the compartment or room, provide a dispenser for soap.
5. Where a lavatory is provided in the compartment or room, provide a hand towel dispenser or hand dryer complying with Table 603.6.
6. A waste receptacle.
7. Signage indicating the weight capacity and instructions for operation of the changing station within the room.

613.3: Room configurations.

An adult changing station and its supporting structure shall not obstruct required clear floor spaces and maneuvering clearances at fixtures, maneuvering clearances at the adult changing stations, maneuvering clearances at doors, or the turning spaces.

613.4: Changing surface.

A changing surface shall be provided and shall comply with Section 613.4.

613.4.1: Size.

The changing surface shall be 70 inches (1778 mm) minimum in length and 30 inches (762 mm) minimum in width.

613.4.2: Capacity.

Materials, fastening mounting devices and support structure shall support a user weight of not less than 400 pounds (182 kg).

613.4.3: Height adjustability.

The changing surface height shall be adjustable at variable heights from 17 inches (432mm) minimum to 38 inches (965mm) maximum above the floor as measured to the top of the changing surface.

> **Exception:** Where the adult changing station is not required by the administrative authority, a fixed height changing surface shall be permitted and shall be mounted with the top of the changing surface 19 inches (483mm) minimum and 23 inches (584 mm) maximum above the floor.

613.4.4: Maneuvering clearances.

Maneuvering clearances at the adult changing surface complying with Sections 613.4.4.1 and 613.4.4.2 shall be provided. Such maneuvering clearances shall be measured where the adult changing surface is in the operational position.

613.4.4.1: Side maneuvering clearance.

A side maneuvering clearance 36 inches (914 mm) minimum in depth shall be provided at the adult changing surface along the open long side of the changing surface.

> **Exception:** In the raised position, the side rail shall be permitted to overlap the side clearance.

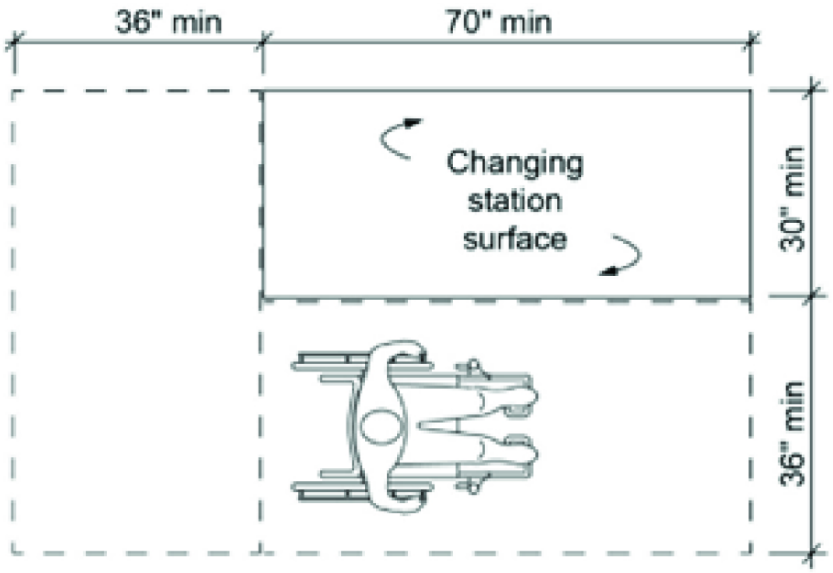
613.4.4.2: End maneuvering clearance.

An end maneuvering clearance 36 inches minimum in width shall be provided along the depth of one end of the changing surface. The depth of the end maneuvering clearance shall extend the depth of the changing surface and the side maneuvering clearance.

Exceptions:

1. An end maneuvering clearance 24 inches (610 mm) minimum in width shall be permitted where a clear floor space complying with Section 305.3 is provided within the room beyond the maneuvering clearances for the changing surface.
2. Where installed in locations specified in Section 613.2.3, end maneuvering clearances complying with Section 613.4.4.2 are not required.

Figure 613.4 SIZE AND MANEUVERING CLEARANCES AT THE ADULT CHANGING SURFACE



613.4.5: Side rail.

Where side rails are provided at the changing surface they shall comply with Sections 613.4.5.1 and 613.4.5.2.

613.4.5.1: Size and location.

Side rails shall be a minimum of 2/3 of the length of the changing surface and shall be centered +/- 3 inch (75 mm) along the long open sides of the changing surface.

613.4.5.2: Rail positioning.

Side rails shall be capable of being raised and lowered. The side rail shall be fixed in place when in the raised position. The top of the side rail shall extend 5 inches (127mm) minimum above the top of the changing surface.