

IBC 2021 UNIFORM PLUMBING CODE AMENDMENTS

Project Summary:

For the project, I developed and wrote a 2021 Uniform Plumbing Code (UPC) online course with 12 lessons. It covers UPC amendments, deletion, additions, etc., and at the end of each lesson I created 20-30 questions on the section. The next few pages are from the project and serve as an example of my work.

Lesson 4

PLUMBING FIXTURES AND FIXTURE FITTINGS

Note:
2021 UPC changes are
highlighted in yellow.

401. General.

401.1 Applicability.

This chapter covers the materials and installation of plumbing fixtures, including faucets and fixture fittings. The number of plumbing fixtures required based on occupancy is specified.

401.2 Quality of Fixtures.

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



402. Installation.

402.1 Cleaning.

Installed plumbing fixtures must provide easy access for cleaning and repairs.

402.2 Joints.

Where a fixture encounters a wall or floor, the joint between the fixture and wall or floor must be made watertight.

402.3 Securing Fixtures.

Floor-outlet or floor-mounted fixtures must be securely attached to the drainage connection and floor. Screws or bolts made of copper, copper alloy, or other equally corrosion-resistant material must be used.

402.4 Wall-Hung Fixtures.

Metal supports must be installed for wall-hung fixtures. They must be tightly secured to ensure the connection is not strained.

Flush tanks and similar appurtenances must be secured with approved non-corrosive screws or bolts.

Off-the-floor plumbing fixtures must have floor-affixed supports. Off-the-floor water closets with concealed tanks must have framing-affixed supports.

402.5 Setting.

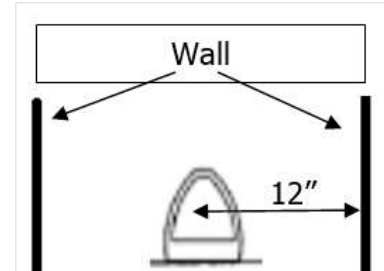


When installed, fixtures must be mounted level and in alignment with adjacent walls.

Water closets and bidets must be set closer than 15 inches (381 mm) from its center to a side wall or obstruction or closer than 30 inches (762 mm) center to center to a similar fixture.

Clear space in front of a water closet, lavatory, or bidet must be at least 24 inches (610 mm).

Urinals must be installed closer at least 12 inches (305 mm) from its center to a side wall or partition or closer than 24 inches (610 mm) center to center.



Exception:

The installation of paper dispensers or accessibility grab bars are not considered obstructions.

402.6 Flanged Fixture Connections.

Fixture connections between drainage pipes and water closets, floor outlets, service sinks, and urinals must be an approved type from the listed below.

- Copper alloys
- Hard lead
- ABS
- PVC
- Iron



Other requirements for flanged fixture connections are below.

- Gaskets must be neoprene, felt, or a similar approved type.
- Iron flanges must be caulked, soldered, or solvent cemented.
- Rubber compression gaskets must be screwed to the drainage pipe.
- Connections must be bolted with an approved gasket, washer, or setting compound between the fixture and the connection.
- The flange bottom must be set on an approved firm base.

402.6.1 Closet Rings (Closet Flanges).

Closet rings (closet flanges) for water closets or similar fixtures must be an approved type from the list below.

- Copper alloy
- Copper
- Hard lead
- Cast iron
- Galvanized malleable iron
- ABS
- PVC

Other code specifications are listed below.

- Each closet ring (closet flange) must be approximately 7 inches (178 mm) in diameter.
- Where installed, together with the soil pipe, present a 1 1/2 inch (38 mm) wide flange or face to receive the fixture gasket or closet seal.
- Caulked-on closet rings (closet flanges) must be at least 1/4 of an inch (6.4 mm) thick and not less than 2 inches (51 mm) in overall depth.
- Closet rings (closet flanges) must be burned or soldered to lead bends or stubs, caulked to cast-iron soil pipe, solvent cemented to ABS and PVC, and screwed or fastened in an approved manner to other materials.
- Closet bends or stubs must be cut-off to create a smooth surface that is even with the top of the closet ring.
- Closet rings (closet flanges) must be adequately designed and secured to support connected fixtures.

402.6.2 Securing Closet Flanges.

Closet screws, bolts, washers, and similar fasteners must be copper alloy, copper, or other equally corrosion-resistant materials. Screws and bolts must be a size and number that will that effectively support the fixture installed.



402.6.3 Securing Floor-Mounted, Back-Outlet Water Closet Bowls.

To secure a floor-mounted, back-outlet bowl the following specifications must be followed.

- The bowls must be set level with a 90 degree (1.57 rad) angle between the floor and wall at the centerline of the fixture outlet.
- The flat mounting surface must be at least 5 inches (127 mm) to the right and left of the fixture outlet centerline.
- Using corrosion-resistant screws or bolts, the fixture must be secured to the wall outlet flange or drainage connection and the floor.
- The closet flange must be secured to a firm base.
- Where floor-mounted, back-outlet water closets are used, the soil pipe shall be not less than 3 inches (80 mm) in diameter.



Offset, eccentric, or reducing closet flanges cannot be used.

402.7 Supply Fittings.

The supply lines and fittings installed must prevent backflow.

402.8 Installation.

Manufacturer's instructions for installation must be followed.

402.9 Design and Installation of Plumbing Fixtures.

It is critical to follow manufacturer installation instructions for fixtures with manufacturer built in integral back-flow protection. Backflow prevention must not be compromised by the fixture fitting mounting surface.

402.10 Slip Joint Connections.

Fixtures with concealed slip joint connections must have the following.

- An access panel or utility space with the smallest dimension at least 12 inches (305 mm).
- No obstructions that prevent accessibility for inspections and repairs.



402.11 Future Fixtures.

If a design indicates future installation of fixtures, each future fixture must be considered when determining the size requirements for a drain and water supply piping.

The opening for system additions can be closed with an approved plug fitting or fittings until installation.

403. Accessible Plumbing Facilities.

403.1 General.

When applicable building regulations require system accessibility, installation must be done to specifications for accessibility compliance.

403.3 Exposed Pipes and Surfaces.

Water supply and drain piping that is located near accessible bathrooms and sinks must be covered with insulation or other approved protective material.

404. Waste Fittings and Overflows.

404.1 Waste Fittings.

Waste fittings must comply with Table 701.2 for aboveground drainage piping and fittings.



TABLE 701.2
MATERIALS FOR DRAIN, WASTE, VENT PIPE AND FITTINGS

MATERIAL	UNDERGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS	ABOVEGROUND DRAIN, WASTE, VENT PIPE AND FITTINGS	BUILDING SEWER PIPE AND FITTINGS	REFERENCED STANDARD(S) PIPE	REFERENCED STANDARD(S) FITTINGS
ABS (Schedule 40)	X	X	X	ASTM D2661, ASTM D2680*	ASME A112.4.4, ASTM D2661, ASTM D2680*
Cast-Iron	X	X	X	ASTM A74, ASTM A888, CISPI 301	ASME B16.12, ASTM A74, ASTM A888, CISPI 301
Co-Extruded ABS (Schedule 40)	X	X	X	ASTM F628	ASME A112.4.4, ASTM D2661, ASTM D2680*
Co-Extruded Composite (Schedule 40)	X	X	X	ASTM F1488	ASME A112.4.4, ASTM D2661, ASTM D2665, ASTM F794*, ASTM F1866
Co-Extruded PVC (Schedule 40)	X	X	X	ASTM F891, ASTM F1760	ASME A112.4.4, ASTM D2665, ASTM F794*, ASTM F1336*, ASTM F1866
Copper and Copper Alloys (Type DWV)	X	X	X	ASTM B43, ASTM B75, ASTM B251, ASTM B302, ASTM B306	ASME B16.23, ASME B16.29
Galvanized Malleable Iron	—	X	—	—	ASME B16.3
Galvanized Steel	—	X	—	ASTM A53	—
Polyethylene	—	—	X	ASTM F714, ASTM F894	—
PVC (Schedule 40)	X	X	X	ASTM D1785, ASTM D2665, ASTM F794*	ASME A112.4.4, ASTM D2665, ASTM F794*, ASTM F1866
PVC (Sewer and Drain)	—	—	X	ASTM D2729	ASTM D2729
PVC PSM	—	—	X	ASTM D3034	ASTM D3034
Stainless Steel 304	—	X	—	ASME A112.3.1	ASME A112.3.1
Stainless Steel 316L	X	X	X	ASME A112.3.1	ASME A112.3.1
Vitrified Clay (Extra strength)	—	—	X	ASTM C700	ASTM C700

404.2 Overflows.

Fixtures that have an overflow, must be installed so waste in standing water within a fixture does not rise into the overflow where the stopper is closed. The waste and water also must not remain in the overflow where the fixture is empty.

The overflow pipe from a fixture must be connected to the house or inlet side of the fixture trap.

Exception:

Overflow on flush tanks can discharge into the water closet or urinal they serve. However, such an overflows must not be connected to any other part of the drainage system.

405. Prohibited Fixtures.

405.1 Prohibited Water Closets.

Water closets with an invisible seal, an unventilated space, or walls that are not washed thoroughly after discharge cannot be installed.

Water closets that allow content siphonage of the bowl back into the tank also cannot be installed.

405.2 Prohibited Urinals.

Trough urinals and urinals with an invisible seal cannot be installed.

405.3 Miscellaneous Fixtures.

The following cannot be installed in a building designed or used for human habitation unless first approved by the Health Officer.

- Fixed wood or tile wash trays or sinks
- Sheet metal-lined wooden bathtubs
- Dry or chemical closet (toilet)

406. Special Fixtures and Specialties.

406.1 Water and Waste Connection.

Fountains (ornamental, baptismal), small decorative ponds (fish ponds), and other similar decorative landscaping that requires water, a waste connection, or both must be submitted to the Authority Having Jurisdiction (AHJ) prior to installation for approval.



406.2 Special Use Sinks.

Special use sinks like those used in restaurant kitchens can be installed if they are an approved type of bonded and galvanized sheet that is not less than No. 16 U.S. gauge (0.0635 inches/1.6 mm). Sheet-metal plumbing fixtures may also be installed if adequately designed, constructed, and braced for the intended purpose.

406.3 Special Use Fixtures.

Special-use fixtures must be made of the following materials.

1. Soapstone
2. Chemical stoneware
3. Copper-based alloy
4. Nickel-based alloy
5. Corrosion-resistant steel

407. Lavatories.

407.1 Application.

When determining the number of lavatories required, every 20 inches (508 mm) of rim space of a group wash fixture must be considered as one lavatory.

407.2.1 Maximum Flow Rate.

The maximum flow rate for public faucets must not exceed the following limits.

- Public lavatory faucets .5 gpm @ 60 psi



- Private lavatory faucets 2.2 gpm @ 60 psi

407.2.2 Metering Faucets.

Public metered faucets must not deliver more than 0.25 gallons (0.95 L) per metering cycle. Public faucets should be spring-loaded or electronically controlled.



407.3 Limitation of Hot Water Temperature in Public Lavatories.

The UPC specifies the maximum temperature for hot water in public-use lavatories as follows.

"Hot water delivered from public-use lavatories shall be limited to a maximum temperature of 120°F (49°C)." ¹

Water temperature must be regulated with a limiting device

407.4 Transient Public Lavatories.

In public lavatories, self-closing or metered faucets must be installed in train stations, airports, restaurants, convention halls, and rest stops.

407.5 Waste Outlet.

The waste outlet and fixture tailpiece in public lavatories must not have a diameter of less than 1 1/4 inches (32 mm). Waste outlets must have an approved stopper or strainer.

408. Showers.

408.2 Water Consumption.

The maximum flow rate for showerheads is 2.5 gpm at 80 psi (9.5 L/m at 552 kPa).

408.3 Individual Shower and Tub-Shower Combination Control Valves.

Showers and tub-shower combos require individual control valves. The types of valves that can be mixed are pressure balance, thermostatic, and combination pressure balance and thermostatic.



Valves must provide scalding and thermal shock protection for the showerhead flow rate rating.

408.3.1 Gang Showers.

A mixing valve must be installed for gang showers with a single temperature-controlled water supply pipe.



408.3.2 Temperature Limiting.

The maximum water temperature during discharge from an individual

showerhead must not exceed 120°F (49°C) and must be controlled with one of the following methods.

1. Shower or tub/shower combination valve where either:
 - The valve is field adjusted to the required maximum temperature.
 - The handle position, stop, or temperature limiting control is set in accordance with the manufacturer's instructions to the required maximum temperature.
2. Mixing valve for gang showers that are supplied by a single water supply pipe and is field adjusted to the required maximum temperature.
3. Limiting device
4. Water heater
5. Temperature-actuated flow reduction device

408.4 Waste Outlet.

Showers must have a waste outlet and fixture tailpiece that is at least 2 inches (50 mm) in diameter.

Strainers serving shower drains must have a waterway that is at least equivalent to the area of the tailpiece.



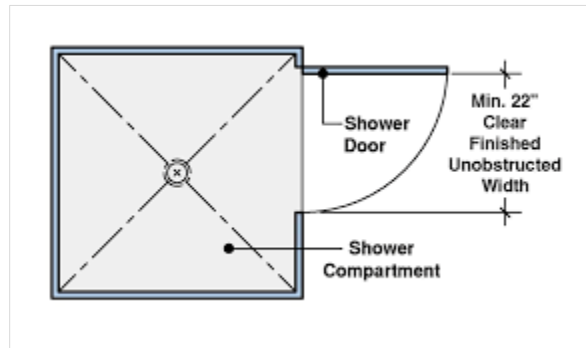
408.5 Finished Curb or Threshold.

The following are required for a shower receptor.

- Where a shower receptor has a finished dam, curb, or threshold it must not be less than 1" (25.4 mm) lower than the sides and back of the receptor.
- A dam or threshold must never be less than 2 inches (51 mm) or exceed 9 inches (229 mm) in depth. It is measured from the top of the dam or threshold to the top of the drain.
- Each of the receptors must have an integral nailing flange located where the receptor meets the vertical surface of a shower compartments finished interior.
- The flange must be watertight and extend vertically at least 1 inch (25.4 mm) above the top of the receptor sides.
- The finished floor of the receptor must have a uniformed slope on all sides towards the drain. The slope must be between 1/8 inch per foot (10.4 mm/m) and 1/2 inch per foot (41.6 mm/m).



- The thresholds size must accommodate a door at least 22-inch (559 mm) wide.
- The minimum clear space for a shower door is at least a 22-inch (559 mm) unobstructed opening for egress.
- Where there is a shower without a threshold, the floor space within the same room is considered a wet location subject to requirements of the building, residential, and electrical codes.



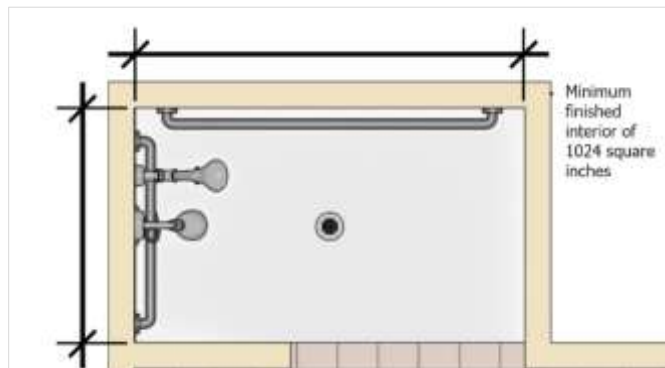
Exceptions:

- A cast-iron shower receptor flange shall be not less than 0.3 of an inch (7.62 mm) in height.
- For flanges not used as a means of securing, the sealing flange shall be not less than 0.3 of an inch (7.62 mm) in height.

408.6 Showers Compartments.

Shower compartments must meet the following specifications.

- Regardless of shape, a shower compartment must have a minimum finished interior of 1024 square inches (0.6606 m²).
- All shower compartments must be capable of encompassing a 30-inch (762 mm) circle.
- The area and dimensions must be maintained to a point of not less than 70 inches (1778 mm) above the shower drain outlet with no protrusions other than the fixture valve or valves, showerheads, soap dishes, shelves, and safety grab bars, or rails.
- Fold-down seats in accessible shower stalls must not protrude into the 30-inch (762 mm) circle.



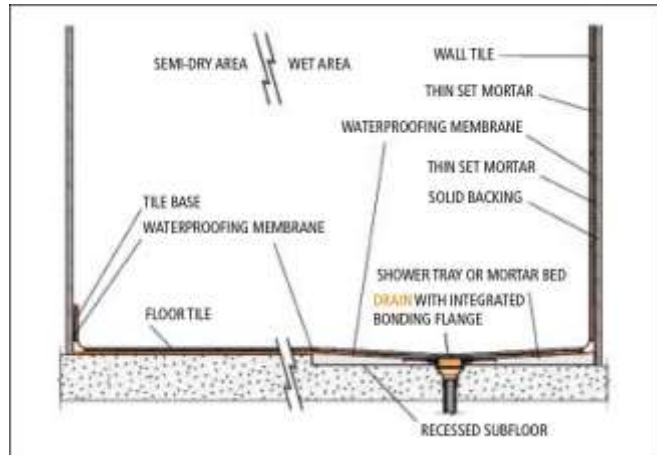
Exception:

A shower with a receptor having overall dimensions of not less than 30 inches (762 mm) in width and 60 inches (1524 mm) in length.

408.7 Lining for Showers and Receptors.

The following are code specifications for showers and receptors.

- Shower receptors built on-site must be watertight and constructed from approved dense, nonabsorbent, and noncorrosive materials.
- Every receptor must be adequately reinforced with an approved flanged floor drain design, so the floor has a watertight joint.
- The floor surface must be smooth, impervious, and durable.
- Shower receptors must have the subfloor and rough side of walls at a height of not less than 3 inches (76 mm) above the top of the finished dam or threshold.
- Showers built-in place with a permanent seat or seating area located within the shower enclosure must be first lined with sheet plastic, lead, copper, or other durable and watertight materials that are at least 3 inches (76 mm) above the horizontal surfaces of the seat or seating area.
- Lining materials must be pitched 1/4 inch per foot (20.8 mm/m) to weep holes in the subdrain of a smooth and solidly formed subbase.
- Lining materials must extend upward on the rough jambs of the shower opening to a point not less than 3 inches (76 mm) above the horizontal surfaces of the seat or the seating area.
- The top of the finished dam or threshold must extend outward over the top of the permanent seat, permanent seating area, or rough threshold and be turned over and fastened on the outside face of both the permanent seat, permanent seating area, or rough threshold and the jambs.
- Nonmetallic shower sub pans, or linings are permitted if built on the job site if they have not less than three layers of standard grade 15 pound (6.8 kg) asphalt impregnated roofing felt.
- The bottom layer must be fitted to the formed subbase, and each succeeding layer thoroughly hot-mopped.
- Corners must be carefully fitted so they are strong and watertight by folding or lapping. Each corner must be reinforced with suitable webbing hot-mopped in place.



-
- Folds, laps, and reinforcing webbing must extend at least 4 inches (102 mm) in all directions from the corner.
 - The webbing installed must be an approved mesh with a tensile strength of at least 50 pounds per square foot (lb./ft. 2) (244 kg/m²).
 - Nonmetallic shower sub pans or linings installed must be constructed of approved or equivalent materials and be reinforced with multiple layers.
 - Linings must be properly recessed and fastened to the approved backing, so it does not cover wall covering space. It must not be nailed or perforated anywhere less than 1 inch (25.4 mm) above the finished dam or threshold.
 - An approved subdrain must be installed with a shower sub pan or lining. The subdrain type must flush with the subbase and be equipped with a clamping ring or other device to make a tight connection between the lining and the drain.
 - The subdrain must have weep holes into the waste line located in the subdrain clamping ring to provide protection from clogging.
-

Question Examples:

The access openings to service a water heater must be at least what size?

- (a) 20" by 28"
- (b) 22" by 24"
- (c) 16" by 20"
- (d) 32" by 42"

What is the minimum dimension for combustible air outdoor opening?

- (a) 9"
- (b) 10"
- (c) 3"
- (d) 6"

Reference:

¹ 2021 Uniform Plumbing Code (UPC), The International Association of Plumbing and Mechanical Officials (IAPMO) & The American National Standards Institute (ANSI)