

## CHAPTER 4

# FIXTURES, FAUCETS AND FIXTURE FITTINGS

### 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 A112.19.2M 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. All 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 B 152 and shall not weigh less than 12 ounces per square foot (3.7 kg/m<sup>2</sup>).

**402.4 Sheet lead.** Sheet lead for pans shall not weigh less than 4 pounds per square foot (19.5 kg/m<sup>2</sup>) coated with an asphalt paint or other approved coating.

### SECTION 403 MINIMUM PLUMBING FACILITIES

**403.1 Minimum number of fixtures.** In new construction or building additions and in changes of occupancy as defined in the North Carolina Building Code, plumbing fixtures shall be provided for the type of occupancy and in the minimum number shown in Table 403.1. Types of occupancies 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*. Occupancy classification shall be determined in accordance with the *International Building Code*.

**[B] 403.1.1 Unisex toilet and bath fixtures.** Fixtures located within unisex toilet and bathing rooms complying with Section 404 are permitted to be included in determining the minimum required number of fixtures for assembly and mercantile occupancies.

**403.2 Separate facilities.** Where plumbing fixtures are required, separate facilities shall be provided for each sex.

#### Exceptions:

1. Separate facilities shall not be required for private facilities.
2. Separate employee facilities shall not be required in occupancies in which 25 or less people are employed.
3. Separate facilities shall not be required in structures or tenant spaces with a total occupant load, including both employees and customers, of 25 or less.
4. Separate facilities shall not be required in mercantile occupancies in which the maximum occupant load is 100 or less.

**403.3 Number of occupants of each sex.** The required water closets, lavatories, and showers or bathtubs shall be distributed equally between the sexes based on the percentage of each sex anticipated in the occupant load. The occupant load shall be composed of 50 percent of each sex, unless statistical data approved by the code official indicate a different distribution of the sexes.

**403.3.1 Adjustments in occupant content.** If an owner or tenant requests, the plumbing official shall make adjustments in the occupant content established by Table 403.1 for manufacturing, workshops, loft building, foundries, storage, aircraft hangars, garages and similar establishments. The owner or occupant shall provide satisfactory written data accompanied by plans which substantiates a claim that the occupant content of a particular building or tenancy will, at all times, be less than provided for in the above table. Approval of such data and accompanying claims shall not prevent the plumbing official from requiring additional facilities based on the above table, should changes be made affecting the floor plan upon which the original approval was based whether such changes be made by the original or ultimate owner or building occupant or occupants. The remainder of the facilities requirements of Section 403.2 are not affected by this paragraph.

**403.4 Location of employee toilet facilities in occupancies other than assembly or mercantile.** Access to toilet facilities in occupancies other than mercantile and assembly occupancies shall be from within the employees' working area. Employee facilities shall be either separate facilities or combined employee and public facilities.

**Exception:** Facilities that are required for employees in storage structures or kiosks, and are located in adjacent struc-

**TABLE 403.1  
MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES<sup>a</sup>  
(See Sections 403.2 and 403.3)**

NO.	CLASSIFICATION	USE GROUP	DESCRIPTION	WATERCLOSETS (URINALS SEE SECTION 419.2) <sup>j</sup>		LAVATORIES <sup>j</sup>		BATHTUBS/SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410.1) <sup>j</sup>	OTHER <sup>g</sup>
				MALE	FEMALE	MALE	FEMALE			
1	Assembly (see Sections 403.2, 403.5 and 403.6)	A-1	Theaters usually with fixed seats and other buildings for the performing arts and motion pictures	1 per 125	1 per 65	1 per 200		—	1 per 500	—
			<u>Theaters in K-12 Schools<sup>l</sup></u>	<u>1 per 125</u>	<u>1 per 100</u>	<u>1 per 200</u>		—	<u>1 per 500</u>	1 Service Sink
		A-2	Nightclubs, bars, taverns, dance halls and buildings for similar purposes	1 per 40	1 per 40	1 per 75		—	1 per 500	—
			Restaurants, banquet halls and food courts	1 per 75	1 per 75	1 per 200		—	1 per 500	1 Service Sink <sup>h</sup>
			<u>Cafeterias in K-12 Schools<sup>l</sup></u>	<u>1 per 125</u>	<u>1 per 100</u>	<u>1 per 200</u>		—	<u>1 per 500</u>	1 Service Sink
		A-3	Auditoriums without permanent seating, art galleries, exhibition halls, museums, lecture halls, libraries, arcades and gymnasiums	1 per 125	1 per 65	1 per 200		—	1 per 500	—
			<u>Gymnasiums in K-12 Schools<sup>l</sup></u>	<u>1 per 125</u>	<u>1 per 100</u>	<u>1 per 200</u>		—	<u>1 per 500</u>	1 Service Sink
			Passenger terminals and transportation facilities	1 per 500	1 per 500	1 per 750		—	1 per 1,000	1 Service Sink
		A-3	Places of Worship and other religious services. Churches without assembly halls <sup>b</sup>	1 per 150	1 per 75	1 per 200		—	1 per 1,000	—
		A-4	Coliseums, arenas, skating rinks, pools and tennis courts for indoor sporting events and activities	1 per 75 for the first 1500 and 1 per 120 for the remainder	1 per 40 for the first 1500 and 1 per 60 for the remainder	1 per 200	1 per 150	—	1 per 1,000	—
A-5	Stadiums, amusement parks, bleachers and grandstands for outdoor sporting events and activities <sup>k</sup>	1 per 75 for the first 1500 and 1 per 120 for the remainder	1 per 40 for the first 1500 and 1 per 60 for the remainder	1 per 200	1 per 150	—	1 per 1,000	—		
	<u>K-12 stadiums, bleachers and grandstands for outdoor sporting events and activities<sup>l,k</sup></u>	<u>1 per 125</u>	<u>1 per 100</u>	<u>1 per 250</u>	<u>1 per 200</u>	—	<u>1 per 1,000</u>	—		
2	Business (see Sections 403.2, 403.4 and 403.6)	B	Buildings for the transaction of business, professional services, other services involving merchandise, office buildings, banks, light industrial and similar uses	1 per 25 for first 50 occupants and 1 per 50 for remaining occupants exceeding 50		1 per 40 for first 80 occupants and 1 per 80 for remaining occupants exceeding 80		—	$\frac{15-100}{101-250} \frac{1}{2}$ $\frac{251-500}{3}$ add 1 per 500 exceeding 500	—
3	Educational	E	Educational facilities <sup>i</sup> <u>K-8</u> <u>9 thru 12</u> <u>Teacher/Staff</u>	<u>1 per 50</u> <u>1 per 25</u> <u>1 per 30</u> <u>1 per 30</u>	<u>1 per 50</u> <u>1 per 25</u> <u>1 per 25</u> <u>1 per 25</u>	<u>1 per 50</u> <u>1 per 60</u> <u>1 per 100</u> <u>1 per 100</u>		—	1 per 100	—

(continued)

**TABLE 403.1—continued**  
**MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES<sup>a</sup>**  
**(See Sections 403.2 and 403.3)**

NO.	CLASSIFICATION	USE GROUP	DESCRIPTION	WATERCLOSETS (URINALS SEE SECTION 419.2) <sup>l</sup>		LAVATORIES <sup>l</sup>		BATHTUBS/SHOWERS	DRINKING FOUNTAIN (SEE SECTION 410.1) <sup>l</sup>	OTHER <sup>9</sup>
				MALE	FEMALE	MALE	FEMALE			
4	Factory and Industrial	F-1 and F-2	Structures in which occupants are engaged in work fabricating, assembly or processing of products or materials (See Section 403.3.1 for adjustments in occupant content)	1 per 100 (See OSHA 29 CFR paragraph 1910.141)		1 per 100		(See Section 411)	1 per 400	—
5	Institutional	I-1	Residential care	1 per 10		1 per 10		1 per 8	—	—
		I-2	Hospitals and other health care facilities <sup>cd</sup>	Fixture requirements are regulated and enforced by state licensing and certification jurisdictions only.						
			Employees	1 per 25	1 per 35	—	1 per 100	—		
			Visitors	1 per 75	1 per 100	—	1 per 500	—		
		I-3	Prisons	Fixture requirements are regulated and enforced by state licensing and certification jurisdictions only.						
			Reformatories, detention centers, and correctional centers <sup>e</sup>	Fixture requirements are regulated and enforced by state licensing and certification jurisdictions only.						
			Employees	1 per 25	1 per 35	—	1 per 100	—		
			Visitors	1 per 75	1 per 100	—	1 per 500	—		
		I-4	Adult daycare <sup>e</sup>	Fixture requirements are regulated and enforced by state licensing and certification jurisdictions only.						
			Child care <sup>e</sup>	1 per 15	1 per 25	—	—	—		
			Employees	1 per 25	1 per 35	—	1 per 100	—		
			Visitors	1 per 75	1 per 100	—	1 per 500	—		
6	Mercantile(see Sections 403.2, 403.5 and 403.6)	M	Retail stores, service stations, shops, salesrooms, markets and shopping centers	1 per 500		1 per 750		—	1 per 1,000	—
7	Residential	R-1	Hotels, motels, boarding houses (transient)	1 per guestroom		1 per guestroom		1 per guestroom	—	—
		R-2	Dormitories, fraternities, sororities and boarding houses (non-transient)	1 per 10		1 per 10		1 per 8	1 per 100	—
		R-2	Apartment House	1 per dwelling unit		1 per dwelling unit		1 per dwelling unit	—	1 kitchen sink per dwelling unit; 1 automatic clothes washer connection per 20 dwelling units <sup>1</sup>
		R-3	One- and two-family dwellings	1 per dwelling unit		1 per dwelling unit		1 per dwelling unit	—	1 kitchen sink per dwelling unit;
		R-4	Residential care/unlicensed assisted living facilities	1 per 10		1 per 10		1 per 8	—	—
8	Storage (see Sections 403.2 and 403.4)	S-1 S-2	Structures for the storage of goods, warehouses, storehouses and freight depots, low and moderate hazard <sup>m,n</sup>	1 per 100		1 per 100		See Section 411	—	—

(continued)

**TABLE 403.1—continued**  
**MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES**  
**(See Sections 403.2 and 403.3)**

- 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. The number of fixtures provided shall be based on either the capacity of the church sanctuary or the church educational building, whichever is larger.
- c. Toilet facilities for employees shall be separate from facilities for inmates or patients.
- d. A single-occupant toilet room with one water closet and one lavatory serving not more than two adjacent patient rooms shall be permitted where such room is provided with direct access from each patient room and with provisions for privacy.
- e. For day nurseries, a maximum of one bathtub shall be required.
- f. For attached one- and two-family dwellings, one automatic clothes washer connection shall be required per 20 dwelling units.
- g. A mop receptacle with a water supply, or a hose bib and floor drain, may be used in lieu of a service sink.
- h. A can wash may be used in lieu of a service sink.
- i. See Section 403.9 for additional information on plumbing fixtures for schools.
- j. When the rearrangement of an area or space increases the occupant content, the plumbing facilities shall be increased in accordance with this code.
- k. For baseball stadiums, the number of fixtures shall be reduced by 50 percent.
- l. Service sink may be omitted when located within a single-family dwelling.
- m. Self-service mini-storage facilities without an office area are exempt.
- n. Unheated storage buildings which are used periodically are not required to have toilet rooms.

tures under the same ownership, lease or control, shall be a maximum travel distance of 500 feet (152 m) from the employees' working area.

**403.4.1 Travel distance.** The required toilet facilities in occupancies other than assembly or mercantile shall be located not more than one story above or below the employee's working area and the path of travel to such facilities shall not exceed a distance of 500 feet (152 m).

**Exception:** The location and maximum travel distances to required employee toilet facilities in factory and industrial occupancies are permitted to exceed that required in Section 403.4.1, provided the location and maximum travel distance are approved by the code official.

**403.5 Location of employee toilet facilities in mercantile and assembly occupancies.** Employees shall be provided with toilet facilities in building and tenant spaces utilized as restaurants, nightclubs, places of public assembly and mercantile occupancies. The employee facilities shall be either separate facilities or combined employee and public facilities. The required toilet facilities shall be located not more than one story above or below the employees' work area and the path of travel to such facilities, in other than covered malls, shall not exceed a distance of 500 feet (152 m). The path of travel to required facilities in covered malls shall not exceed a distance of 300 feet (91 440 mm).

**Exception:** Employee toilet facilities shall not be required in tenant spaces where the travel distance from the main entrance of the tenant space to a central toilet area does not exceed 300 feet (91 440 mm) and such central toilet facilities are located not more than one story above or below the tenant space.

**403.6 Public facilities.** Customers, patrons and visitors shall be provided with public toilet facilities in structures and tenant spaces intended for public utilization. Public toilet facilities shall be located not more than one story above or below the space required to be provided with public toilet facilities and the path of travel to such facilities shall not exceed a distance of 500 feet (152 m).

**403.6.1 Covered malls.** In covered mall buildings, the path of travel to required toilet facilities shall not exceed a distance of 300 feet (91 440 mm). Facilities shall be installed in each individual store or in a central toilet area located in accordance with this section. The maximum travel distance to the central toilet facilities in covered mall buildings shall be measured from the main entrance of any store or tenant space.

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

**403.7 Signage.** Required public facilities shall be designated by a legible sign for each sex. Signs shall be readily visible and located near the entrance to each toilet facility.

**403.8 Multiplex theaters.** Plumbing fixtures for multiple adjoining motion picture theaters with a common lobby shall be based upon the seating capacity of the largest single auditorium plus 50 percent of the seats in the remaining auditoriums.

**403.9 Plumbing fixtures for public schools.**

**403.9.1 Occupant content.** Occupant content of public schools for the purpose of determining the number of required facilities shall be the maximum legal class size multiplied by the number of classrooms. A public school classroom is a room or space 500 square feet (46.5 m<sup>2</sup>) or larger normally used for instructional purposes. Maximum class sizes are 29 students for grades K-9 and 33 students for grades 10-12 (GS 115C-301). The occupant load for private schools shall be as listed in Table 1004.1.2 in the North Carolina Building Code.

**403.9.2 Occupant load and distance.** The total student occupant load shall be the sum of the occupant loads for all classrooms, labs, shops and vocational spaces. The total occupant load for all buildings on a campus may be utilized when calculating the total number of fixtures required. Toilet facilities for students and teachers may be located in an adjacent building but shall be located so that no person will have more than 200 feet (61 m) of accessible, covered horizontal travel distance from any classroom lab, shop or vocational space closest door for access to the required number

of fixtures. The occupant content of kindergarten and first-grade classrooms with internal toilet facilities is not required to be used in determining the number of group facilities for the entire school.

**403.9.3 Occupant load for teachers and staff.** Fixtures provided for teachers and staff shall be determined by multiplying the number of classrooms by 1.75. Staffing ratio for grades K-8 is 80-percent female and 20-percent male.

**403.9.4 Gymnasiums, cafeterias, auditoriums and stadiums for schools.** Fixtures in group toilet facilities provided for classroom areas may be used toward satisfying the total number of required fixtures for gymnasiums, cafeterias and auditoriums provided that such facilities are located within 200 feet (61 m) from the space and cannot be locked-off from access during after-school-hours use of the gymnasium, cafeteria or auditorium. Simultaneous use of classrooms, gymnasium, cafeteria or auditoriums shall not be considered for calculation of occupant loads for toilet fixtures. Stadium facilities shall be located within 400 feet (122 m) of the closest bleacher exit from each set of bleachers that the facility serves.

**403.9.5 Miscellaneous provisions.**

**403.9.5.1 Unisex facilities.** A single unisex facility may be used when the classroom area served is 1,200 square feet (112 m<sup>2</sup>) or less and is used either for kindergarten through grade 2 or is a modular classroom used for any grade level. Unisex facilities may be provided for teacher/staff if their total occupant load within 200 feet (61 m) is 15 or less.

**403.9.5.2 Student group facilities.** Every public school group facility shall have a minimum of four flushing-type fixtures. Four flushing male group toilets shall have a minimum of two water closets.

**403.9.5.3 Substitutions.** Water closets may be substituted for urinals for grades K through 2. Urinals may be substituted for water closets in male group toilet rooms for teachers/staff and gymnasiums, auditoriums, cafeterias or stadiums. The number of water closets shall not be reduced to less than one-third of the required total number of flushing fixtures.

**403.9.5.4 Modular classroom buildings.** Toilet rooms may be omitted in a modular classroom building when facilities of sufficient capacity for the additional occupants are provided in an adjacent building and located within 200 feet (61 m) of horizontal travel distance from the modular classroom.

**403.9.5.5 Temporary modular classroom buildings.** Toilet rooms may be omitted in modular classroom buildings grades 9 through 12 when these temporary buildings are to be replaced by permanent facilities which are under contract. Facilities of sufficient capacity for the additional occupants shall be provided within 450 feet of horizontal travel distance from the modular classroom.

**SECTION 404  
ACCESSIBLE PLUMBING FACILITIES**

**404.1 Where required.** Accessible plumbing facilities and fixtures shall be provided in accordance with the *International Building Code*.

**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, **and not** closer than 30 inches (762 mm) center-to-center between water closets, urinals or adjacent fixtures. There shall be at least a 21-inch (533 mm) clearance in front of the water closet, urinal or bidet to any wall, fixture or door. Water closet compartments shall not be less than 30 inches (762 mm) wide **and not less than** 60 inches (1524 mm) deep. There shall be at least a 21-inch (533 mm) clearance in front of a lavatory to any wall, fixture or door (see Figure 405.3.1).

**405.3.2 Public lavatories.** In employee and public toilet rooms, the required lavatory shall be located in the same room as the required water closet.

**405.4 Floor and wall drainage connections.** Connections between the drain and floor outlet plumbing fixtures shall be made with a floor flange. 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 adapter. 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 A 112.4.3 or setting compound conforming to FS TT-P-1536a.

**405.4.1 Floor flanges.** Floor flanges for water closets or similar fixtures shall not be less than 0.125 inch (3.2 mm) thick for brass, 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 brass. 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 con-

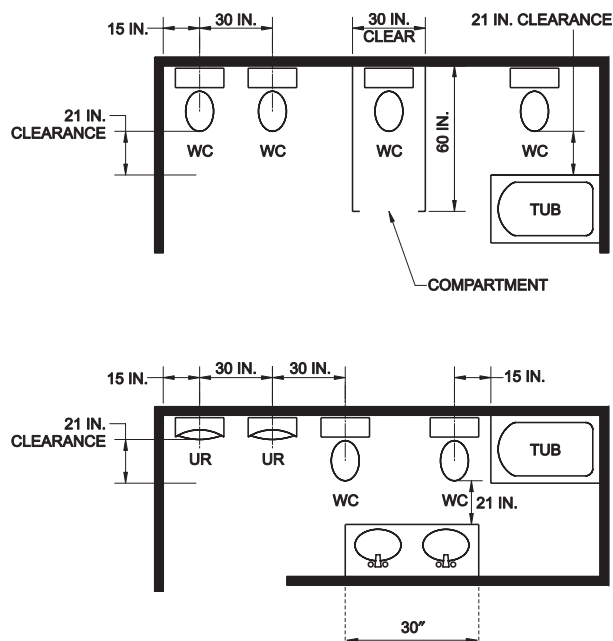


FIGURE 405.3.1  
FIXTURE CLEARANCE

sealed metal carrier that is attached to the building structural members so that strain is not transmitted to the closet 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 Water-tight joints.** Joints formed where fixtures come in contact with walls or floors shall be sealed.

**405.6 Plumbing in mental health centers.** Deleted.

**405.7 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 no water will remain in the overflow when the fixture is empty.

**405.7.1 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.

**405.8 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 at least 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. Where such access cannot be provided, access doors shall not be required provided that all joints are soldered, solvent cemented or screwed to form a solid connection.

**405.9 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 A112.19.2M or ASME A112.19.3M.

## SECTION 406 AUTOMATIC CLOTHES WASHERS

**406.1 Approval.** Domestic automatic clothes washers shall conform to ASSE 1007.

**406.2 Water connection.** The water supply to an automatic clothes washer shall be protected against backflow by an air gap installed integrally within the machine conforming to ASSE 1007 or with the installation of a backflow preventer in accordance with Section 608.

**406.3 Waste connection.** The waste from an automatic clothes washer shall connect to a vertical branch drain of not less than 2 inches (51 mm) in diameter, or a horizontal branch drain of not less than 3 inches (76 mm) in diameter. The 2-inch (51 mm) trap in the waste connection may be used as a cleanout for both the 2-inch (51 mm) and the 3-inch (76 mm) branch.

## SECTION 407 BATHTUBS

**407.1 Approval.** Bathtubs shall conform to ANSI Z124.1, ASME A112.19.1M, ASME A112.19.4M, ASME A112.19.9M, CSA B45.2, CSA B45.3 or CSA B45.5.

**407.2 Bathtub waste outlets.** Bathtubs shall have waste outlets a minimum of 1.5 inches (38 mm) in diameter. The waste outlet shall be equipped with an approved stopper.

**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 within a bathtub enclosure shall conform to ASME A112.19.15.

## SECTION 408 BIDETS

**408.1 Approval.** Bidets shall conform to ASME A112.19.2M, ASME A112.19.9M or CSA B45.1.

**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 608.13.1, 608.13.2, 608.13.3, 608.13.5, 608.13.6 or 608.13.8.

## SECTION 409 DISHWASHING MACHINES

**409.1 Approval.** Domestic dishwashing machines shall conform to ASSE 1006. Commercial dishwashing machines shall conform to ASSE 1004 and NSF 3.

**409.2 Water connection.** The water supply to a dishwashing machine shall be protected against backflow by an air gap or backflow preventer in accordance with Section 608.

**409.3 Waste connection.** The waste connection of a dishwashing machine shall comply with Section 802.1.6 or 802.1.7, as applicable.

### SECTION 410 DRINKING FOUNTAINS

**410.1 Approval.** Drinking fountains shall conform to ASME A112.19.1M, ASME A112.19.2M or ASME A112.19.9M, and water coolers shall conform to ARI 1010. Drinking fountains and water coolers shall conform to NSF 61, Section 9. Where water is served in restaurants, drinking fountains shall not be required. In other occupancies, where drinking fountains are required, bottled water dispensers shall be permitted to be substituted for not more than 50 percent of the required drinking fountains.

**410.2 Prohibited location.** Drinking fountains 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.

### SECTION 412 FLOOR AND TRENCH DRAINS

**412.1 Approval.** Floor drains shall conform to ASME A112.6.3, ASME A112.3.1 or CSA B79. Trench drains shall comply with ASME A112.6.3.

**412.2 Floor drain trap and strainer.** Floor drain traps shall have removable strainers. The strainer shall have a waterway area of not less than the area of the tailpiece. The floor drain shall be constructed so that the drain is capable of being cleaned. Access shall be provided to the drain inlet.

**412.3 Size of floor drains.** Floor drains shall have a minimum 2-inch-diameter (51 mm) drain outlet.

**412.4 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 a minimum outlet of not less than 3 inches (76 mm) in diameter.

**412.5 Location.** Floor drains shall be located to readily drain the entire floor area.

**412.6 Trap primers.** The water seal of floor drain traps shall be maintained by an automatic trap primer, drainage from a clear water fixture or other method acceptable to the authority having jurisdiction.

**Exception:** Hose bibbs located in rooms with nonabsorbent floors may be used in lieu of an automatic trap primer.

### SECTION 413 FOOD WASTE GRINDER UNITS

**413.1 Approval.** Domestic food waste grinders shall conform to ASSE 1008. Commercial food waste grinders shall conform to ASSE 1009. Food waste grinders shall not increase the drainage fixture unit load on the sanitary drainage system.

**413.2 Domestic food waste grinder waste outlets.** Domestic food waste grinders shall be connected to a drain of not less than 1.5 inches (38 mm) in diameter.

**413.3 Commercial food waste grinder waste outlets.** Commercial food waste grinders shall be connected to a drain a minimum of 2 inches (51 mm) in diameter. Commercial food waste grinders shall be connected and trapped separately from any other fixtures or sink compartments.

**413.4 Water supply required.** All food waste grinders shall be provided with a supply of cold water.

### SECTION 414 GARBAGE CAN WASHERS

**414.1 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 608.13.1, 608.13.2, 608.13.3, 608.13.5, 608.13.6 or 608.13.8.

**414.2 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 415 LAUNDRY TRAYS

**415.1 Approval.** Laundry trays shall conform to ANSI Z124.6, ASME A112.19.1M, ASME A112.19.3M, ASME A112.19.9M, CSA B45.2 or CSA B45.4.

**415.2 Waste outlet.** Each compartment of a laundry tray shall be provided with a waste outlet a minimum of 1.5 inches (38 mm) in diameter and a strainer or crossbar to restrict the clear opening of the waste outlet.

### SECTION 416 LAVATORIES

**416.1 Approval.** Lavatories shall conform to ANSI Z124.3, ASME A112.19.1M, ASME A112.19.2M, ASME A112.19.3M, ASME A112.19.4M, ASME A112.19.9M, CSA B45.1, CSA B45.2, CSA B45.3 or CSA B45.4. Group wash-up equipment shall conform to the requirements of Section 402. Every 20 inches (508 mm) of rim space shall be considered as one lavatory.

**416.2 Cultured marble lavatories.** Cultured marble vanity tops with an integral lavatory shall conform to ANSI Z124.3 or CSA B45.5.

**416.3 Lavatory waste outlets.** Lavatories shall have waste outlets not less than 1.25 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.

**416.4 Moveable lavatory systems.** Moveable lavatory systems shall comply with ASME A112.19.12.

**SECTION 417  
SHOWERS**

**417.1 Approval.** Prefabricated showers and shower compartments shall conform to ANSI Z124.2, ASME A112.19.9M or CSA B45.5. Shower valves for individual showers shall conform to the requirements of Section 424.3.

**417.2 Water supply riser.** Every water supply riser from the shower valve to the shower head outlet, whether exposed or not, shall be attached to the structure in an approved manner.

**417.3 Shower waste outlet.** Waste outlets serving showers shall be at least 2 inches (51 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 0.25 inch (6.4 mm) in minimum 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.

**417.4 Shower compartments.** Showers compartments shall conform to Table 417.4 and shall have approved shower pan material or the equivalent thereof as determined by the plumbing official. The pan shall turn up on three sides at least 2 inches (51 mm) above the finished curb level. The remaining side shall wrap over the curb. Shower drains shall be constructed with a clamping device so that the pan may be securely fastened to the shower drain thereby making a water-tight joint. Shower drains shall have an approved weephole device system to ensure constant drainage of water from the shower pan to the sanitary drainage system. There shall be a water-tight joint between the shower and drain and trap. Shower receptacle waste outlets shall be not less than 2 inches (51 mm) and shall have a removable strainer.

**Exception:** Shower compartments with prefabricated receptors conforming to the standards listed in Table 417.4.

**417.4.1 Wall area.** The wall area above built-in tubs with installed shower heads and in shower compartments shall be constructed of smooth, noncorrosive and nonabsorbent waterproof materials to a height not less than 6 feet (1829 mm) above the room floor level, and not less than 70 inches (1778 mm) where measured from the compartment floor at

the drain. Such walls shall form a water-tight joint with each other and with either the tub, receptor or shower floor.

**417.5 Shower floors or receptors.** Floor surfaces shall be constructed of impervious, noncorrosive, nonabsorbent and waterproof materials.

**417.5.1 Support.** Floors or receptors under shower compartments shall be laid on, and supported by, a smooth and structurally sound base.

**417.5.2 Shower lining.** Floors under shower compartments, except where prefabricated receptors have been provided, shall be lined and made water tight utilizing material complying with Sections 417.5.2.1 through 417.5.2.4. Such liners shall turn up on all sides at least 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 water-tight joint between the liner and the outlet.

**Exception:** Floor surfaces under shower heads provided for rinsing laid directly on the ground are not required to comply with this section.

**417.5.2.1 PVC sheets.** Plasticized polyvinyl chloride (PVC) sheets shall be a minimum of 0.040 inch (1.02 mm) thick, and shall meet the requirements of ASTM D 4551. Sheets shall be joined by solvent welding in accordance with the manufacturer’s installation instructions.

**417.5.2.2 Chlorinated polyethylene (CPE) sheets.** Nonplasticized chlorinated polyethylene sheet shall be a minimum 0.040 inch (1.02 mm) thick, and shall meet the requirements of ASTM D 4068. The liner shall be joined in accordance with the manufacturer’s installation instructions.

**417.5.2.3 Sheet lead.** Sheet lead shall not weigh less than 4 pounds per square foot (19.5 kg/m<sup>2</sup>) 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 its equivalent. Sheet lead shall be joined by burning.

**417.5.2.4 Sheet copper.** Sheet copper shall conform to ASTM B 152 and shall not weigh less than 12 ounces per square foot (3.7 kg/m<sup>2</sup>). The copper sheet shall be insulated from conducting substances other than the connecting drain by 15-pound (6.80 kg) asphalt felt or its equivalent. Sheet copper shall be joined by brazing or soldering.

**417.6 Glazing.** Windows and doors within a shower enclosure shall conform to the safety glazing requirements of the *International Building Code*.

**TABLE 417.4  
PREFABRICATED SHOWER RECEPTOR STANDARDS  
MATERIALS STANDARDS**

Plastic shower receptors and shower stalls	ANSI Z124.2
Shower pans nonmetallic	ASTM D 4551, See Section 303.8



### SECTION 418 SINKS

**418.1 Approval.** Sinks shall conform to ANSI Z124.6, ASME A112.19.1M, ASME A112.19.2M, ASME A112.19.3M, ASME A112.19.4M, ASME A112.19.9M, CSA B45.1, CSA B45.2, CSA B45.3 or CSA B45.4.

**418.2 Sink waste outlets.** Sinks shall be provided with waste outlets a minimum of 1.5 inches (38 mm) in diameter. A strainer or crossbar shall be provided to restrict the clear opening of the waste outlet.

**418.3 Moveable sink systems.** Moveable sink systems shall comply with ASME A112.19.12.

### SECTION 419 URINALS

**419.1 Approval.** Urinals shall conform to ASME A112.19.2M, CSA B45.1 or CSA B45.5. Urinals shall conform to the water consumption requirements of Section 604.4. Urinals shall conform to the hydraulic performance requirements of ASME A112.19.6, CSA B45.1 or CSA B45.5.

Urinals that do not use water shall be permitted provided the urinals:

1. Provide a barrier liquid sealant contained in a removable trap to maintain the trap seal;
2. Permit the uninhibited flow of water through the trap to the sanitary drainage system; and
3. Comply with ANSI Z124.9 and ASME A112.19.2, as applicable.

**419.2 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.

**[B] 419.3 Surrounding material.** Wall and floor space to a point 2 feet (610 mm) in front of a urinal lip and 4 feet (1219 mm) above the floor and at least 2 feet (610 mm) to each side of the urinal shall be waterproofed with a smooth, readily cleanable, nonabsorbent material.

### SECTION 420 WATER CLOSETS

**420.1 Approval.** Water closets shall conform to the water consumption requirements of Section 604.4 and shall conform to ANSI Z124.4, ASME A112.19.2M, CSA B45.1, CSA B45.4 or CSA B45.5. Water closets shall conform to the hydraulic performance requirements of ASME A112.19.6. Water closet tanks shall conform to ANSI Z124.4, ASME A112.19.2, ASME A112.19.9M, CSA B45.1, CSA B45.4 or CSA B45.5. Electro-hydraulic water closets shall comply with ASME A112.19.13.

**420.2 Water closets for public or employee toilet facilities.** Water closet bowls for public or employee toilet facilities shall be of the elongated type.

**420.3 Water closet seats.** Water closets shall be equipped with seats of smooth, nonabsorbent material. All 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.

**420.4 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 421 WHIRLPOOL BATHTUBS

**421.1 Approval.** Whirlpool bathtubs shall comply with ASME A112.19.7M or with CSA B45.5 and CSA B45 (Supplement 1).

**421.2 Installation.** Whirlpool bathtubs shall be installed and tested in accordance with the manufacturer's installation instructions. The pump shall be located above the weir of the fixture trap. Access shall be provided to the pump.

**421.3 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.

**421.4 Suction fittings.** Suction fittings for whirlpool bathtubs shall comply with ASME A112.19.8M.

**421.5 Whirlpool enclosure.** Doors within a whirlpool enclosure shall conform to ASME A112.19.15.

### SECTION 422 HEALTH CARE FIXTURES AND EQUIPMENT

**422.1 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: nursing homes, homes for the aged, orphanages, infirmaries, first aid stations, psychiatric facilities, clinics, professional offices of dentists and doctors, mortuaries, educational facilities, surgery, dentistry, research and testing laboratories, establishments manufacturing pharmaceutical drugs and medicines, and other structures with similar apparatus and equipment classified as plumbing.

**422.2 Approval.** All special plumbing fixtures, equipment, devices and apparatus shall be of an approved type.

**422.3 Protection.** All 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 either the water supply or drainage system, shall be provided with protection against backflow, flooding, fouling, contamination of the water supply system and stoppage of the drain.

**422.4 Materials.** Fixtures designed for therapy, special cleansing or disposal of waste materials, combinations of such purposes, or any other special purpose, shall be of smooth, impervious, corrosion-resistant materials and, where subjected

to temperatures in excess of 180°F (82°C), shall be capable of withstanding, without damage, higher temperatures.

**422.5 Access.** Access shall be provided to concealed piping in connection with special fixtures where such piping contains steam traps, valves, relief valves, check valves, vacuum breakers or other similar items that require periodic inspection, servicing, maintenance or repair. Access shall be provided to concealed piping that requires periodic inspection, maintenance or repair.

**422.6 Clinical sink.** A clinical sink shall have an integral trap in which the upper portion of a visible trap seal provides a water surface. The fixture shall be designed so as to permit complete removal of the contents by siphonic or blowout action and to reseal the trap. A flushing rim shall provide water to cleanse the interior surface. The fixture shall have the flushing and cleansing characteristics of a water closet.

**422.7 Prohibited usage of clinical sinks and service sinks.** A clinical sink serving a soiled utility room shall not be considered as a substitute for, or be utilized as, a service sink. A service sink shall not be utilized for the disposal of urine, fecal matter or other human waste.

**422.8 Ice prohibited in soiled utility room.** Machines for manufacturing ice, or any device for the handling or storage of ice, shall not be located in a soiled utility room.

**422.9 Sterilizer equipment requirements.** The approval and installation of all sterilizers shall conform to the requirements of the *International Mechanical Code*.

**422.9.1 Sterilizer piping.** Access for the purposes of inspection and maintenance shall be provided to all sterilizer piping and devices necessary for the operation of sterilizers.

**422.9.2 Steam supply.** Steam supplies to sterilizers, including those connected by pipes from overhead mains or branches, shall be drained to prevent any moisture from reaching the sterilizer. The condensate drainage from the steam supply shall be discharged by gravity.

**422.9.3 Steam condensate return.** Steam condensate returns from sterilizers shall be a gravity return system.

**422.9.4 Condensers.** Pressure sterilizers shall be equipped with a means of condensing and cooling the exhaust steam vapors. Nonpressure sterilizers shall be equipped with a device that will automatically control the vapor, confining the vapors within the vessel.

**422.10 Special elevations.** Control valves, vacuum outlets and devices protruding from a wall of an operating, emergency, recovery, examining or delivery room, or in a corridor or other location where patients are transported on a wheeled stretcher, shall be located at an elevation that prevents bumping the patient or stretcher against the device.

## 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.

## SECTION 424 FAUCETS AND OTHER FIXTURE FITTINGS

**424.1 Approval.** Faucets and fixture fittings shall conform to ASME A112.18.1 or CSA B125. 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.

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

**424.1.2 Waste fittings.** Waste fittings shall conform to one of the standards listed in Tables 702.1 and 702.4 for above-ground drainage and vent pipe and fittings, or the waste fittings shall be constructed of tubular stainless steel with a minimum wall thickness of 0.012 inch (0.30 mm), tubular copper alloy having a minimum wall thickness of 0.027 inch (0.69 mm) or tubular plastic complying with ASTM F 409.

**424.2 Hand showers.** Hand-held showers shall conform to ASSE 1014 or CSA B125.

**424.3 Shower valves.** 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 or CSA B125. Multiple (gang) showers supplied with a single tempered water supply pipe shall have the water supply for such showers controlled by a master thermostatic mixing valve complying with ASSE 1017. Shower and tub-shower combination valves and master thermostatic mixing 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. Scald preventative valves are not required in dwelling units with individual water heaters set at 120°F (49°C).

**424.4 Hose-connected outlets.** Faucets and fixture fittings with hose-connected outlets shall conform to ASME A112.18.3M.

**424.5 Temperature-actuated, flow reduction valves for individual fixture fittings.** Temperature-actuated, flow reduction devices, where installed for individual fixture fittings, shall conform to ASSE 1062. Such valves shall not be used alone as a substitute for the balanced pressure, thermostatic or combination shower valves required in Section 424.3.

**424.6 Transfer valves.** Deck-mounted bath/shower transfer valves containing an integral atmospheric vacuum breaker shall conform to the requirements of ASME A112.18.7.

**SECTION 425  
FLUSHING DEVICES FOR WATER CLOSETS AND  
URINALS**

**425.1 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.

A flushometer valve, flush tank or similar device shall not be required for urinal fixtures that comply with the waterless test requirements of ANSI Z124.9 and which:

1. Provide a barrier liquid sealant contained in a removable trap to maintain the trap seal;
2. Permit the uninhibited flow of water through the trap to the sanitary drainage system; and
3. Comply with ANSI Z124.9 and ASME A112.19.2, as applicable.

**425.1.1 Separate for each fixture.** A flushing device shall not serve more than one fixture.

**425.2 Flushometer valves and tanks.** Flushometer valves and tanks shall comply with ASSE 1037. Vacuum breakers on flushometer valves shall conform to the performance requirements of ASSE 1001 or CAN/CSA-B64.1.1. Access shall be provided to vacuum breakers. Flushometer valves shall be of the water-conservation type and shall not be utilized 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 valve flushing cycle.

**425.3 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.

**425.3.1 Fill valves.** All flush tanks shall be equipped with an antisiphon fill valve conforming to ASSE 1002 or CSA B125. The fill valve backflow preventer shall be located at least 1 inch (25 mm) above the full opening of the overflow pipe.

**425.3.2 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.

**425.3.3 Sheet copper.** Sheet copper utilized for flush tank linings shall conform to ASTM B 152 and shall not weigh less than 10 ounces per square foot (0.03 kg/m<sup>2</sup>).

**425.3.4 Access required.** All parts in a flush tank shall be accessible for repair and replacement.

**425.4 Flush pipes and fittings.** Flush pipes and fittings shall be of nonferrous material and shall conform to ASME A112.19.5 or CSA B125.

**SECTION 426  
MANUAL FOOD AND BEVERAGE DISPENSING  
EQUIPMENT**

**426.1 Approval.** Manual food and beverage dispensing equipment shall conform to the requirements of NSF 18.

**SECTION 427  
FLOOR SINKS**

**427.1 Approval.** Sanitary floor sinks shall conform to the requirements of ASME A112.6.7.

