Type of Fixture	Unit Value	Trap Minimum Size Inches	Soil or Waste Minimum Size Inches	Vent Minimum Size Inches
Bath Tub, all types*	3	1½	1½	1½
Bed Pan Washer	6	2	3	2
Bidet	4	2	2	1½
Cuspidor, fountain or dental	1	1¼	1¼	1¼
Dishwasher, residential	4	1½	1½	1½
Drinking Fountain	½	1¼	1¼	1¼
Floor Drain,				
2 inch	4	2	2	1½
3 inch or larger**	4	3	3	2
Laundry Tray	3	1½	1½	1½
Refrigerator, ice	½	1¼	1¼	1¼
Shower Stall, each head	4	2	2	1½
Sinks,				
combination	4	1½	1½	1½
factory wash-up	4	2	2	1½
fountain or bar	3	1½	1½	1½
glass or silver	3	1½	1½	1½
pack or plaster work	4	2	2	1½
residential	4	1½	1½	1½
restaurant, all types	4	2	2	1½
siphon jet	4	3	3	2
service sink, wall outlet	4	2	2	1½
service sink, floor outlet	4	3	3	2
surgeons wash-up	3	1½	1½	1½
Sterilizer,				
bed pan	4	2	2	1½
instrument or water	1	1¼	1¼	1¼
Urinal	4	2	2	1½
Wash basin	1	1¼	1½	1¼
Water Closet, any type	6	2	3	2

*Includes foot, Sitz and infant baths and regular bath tubs with or without shower.
**Trap and waste pipe sizes to correspond to floor drain when 4 inches or larger.

(3) UNIT CAPACITY AND LENGTH OF SANITARY PIPING. The number of fixture units connected to any stack, branch or vent and the length of piping shall not exceed that shown in the following table for a given diameter of pipe. After maximum length, including vent, for any given pipe size is reached, the diameter of the pipe shall be increased to the next size.

Pipe Diameter (inches)	Fixture Unit Capacity Soil, Waste or Vent Pipe			Maximum Length (in feet)
	On Stack	On Branch	On Vent	
1¼	1	1	1	50
1½	8	4	12	65
2	18	9	24	85
2½	40	20	60	105
3	84*	42	126	212
4	252	126	252	300
5	680	340	680	390
6	1,380	690	1,380	510
8	3,600	1,800	3,600	750
10	7,600	3,800	7,600	----------
12	12,000	6,000	12,000	----------

*See H 62.06 (2) on water closet limitations.

H 62.04 Building sewers. (1) PREMISES SERVED. The plumbing system of each new building, or a new plumbing system in an existing building, shall be entirely separate from and independent of that of any other building. Every building shall have an independent connec-

tion with a sanitary street sewer or sanitary main sewer when available. Private sanitary main sewers shall conform to specifications for public sewers and be approved by local authorities before installation.

(2) MATERIALS. All building sanitary sewers shall be constructed of cast iron, vitrified clay, concrete, asbestos cement pipe or other materials approved by the board for restricted, tentative or experimental use. See subsections H 62.15 (3) and (4); H 62.16 (1), (2), and (3); sections H 62.23, and H 63.01.

(3) SLOPE. Building sanitary sewers shall, where possible, have a slope of one-fourth inch per foot or more. In no case shall the slope of a building sanitary sewer be less than one-eighth inch per foot. Between the lot line and the street sewer, or riser pipe therefrom, the sewer shall be laid at a uniform slope not exceeding one-half inch per foot. Where the main sewer in the street has sufficient depth, or where a lot is 3 feet or more above the established grade line, the building sewer between the lot line and the building may receive greater inclination than one-half inch per foot as may be provided for by local ordinance, or as in the judgment of the authorized supervisor is acceptable.

(4) SIZE. (a) *Sanitary sewer.* The size of the building sanitary sewer shall be determined by the total number of fixture units tributary to such building sewer using the following table. The diameter of the building sewer shall be equal to or greater than that of the building drain. The minimum inside diameter of the building sanitary sewer shall be 4 inches.

Diameter of Pipe (inches)	Maximum Number of Fixture Units		
	⅛" per ft. slope	¼" per ft. slope	½" per ft. slope
4	115	150	210
5	270	370	540
6	510	720	1,050
8	1,290	1,860	2,640
10	2,520	3,600	5,250
12	4,890	6,300	9,300

(b) *Storm sewer.* The required size of building storm sewers, other exterior drains and lateral branches should be determined on the basis of the horizontal projection of roofs, yards and other tributary areas. A building storm sewer shall not connect to a building sanitary sewer. The building sanitary sewer and building storm sewer shall be installed separately and connected to the appropriate street or main sewer. In the event an existing adequate building sewer connects to a combined sewer or street sewer it may be continued in use as a common building sewer until such time as separation of storm water is accomplished. The size of interior roof leaders and building storm drains shall be determined on the total horizontal area to be drained thereby. The size of a smooth bore building storm drain or sewer should be at least equal to the size of a single vertical leader that would be required for the entire tributary area. The size of the vertical leader should be determined from the following table or be calculated using a formula which provides equivalent values.

Type of Roof	Allowable Roof Area in Square Feet for Given Size of Inside Leader					
	2½"	3"	4"	5"	6"	8"
Roof covered with gravel, slag or similar material with incline ¼" to 1' or less	Up to 1,645	1,646 to 2,120	2,121 to 3,780	3,781 to 5,885	5,886 to 8,490	8,491 to 15,125
Same with incline ½" to 1' or more and sawtoothed roofs	Up to 1,220	1,221 to 1,770	1,771 to 3,150	3,151 to 4,905	4,906 to 7,075	7,076 to 12,600
Metal, tile, brick, slate, or similar roofs of any incline	Up to 975	976 to 1,415	1,416 to 2,520	2,521 to 3,925	3,926 to 5,660	5,661 to 10,080

(5) ALIGNMENT. All building sanitary sewers shall be laid in alignment between fittings. Any changes in grade or direction shall be made with proper wyes or long radius fittings. Clipping of pipe or fittings is prohibited.

(6) INSTALLATION. (a) *Trenching.* All excavations shall be open trench work unless otherwise permitted by local ordinance or accepted by the local inspector.

Note: See sections Ind 6.06, 6.12 and 6.21 concerning timber requirements for trenches and general safety precautions.

(b) *Stable bottom.* Where the bottom of the trench can be maintained in a stable condition and free of water during time of installation of pipe, the building sanitary sewer, depending on the type of material used, shall be bedded and be initially backfilled as hereinafter provided. Grade, as used in this subsection, is defined as the elevation of the bottom of the pipe.

1. Concrete, clay and asbestos-cement pipe. The trench bottom throughout its length shall be excavated to a depth at least 3 inches below the grade elevation and be brought back to grade with a sand, gravel, or crushed stone bedding which is tamped in place. The size of the bedding material shall be such that 100% shall pass a one-half inch sieve. The bedding shall be shaped to accommodate pipe bells or couplings. No planking or blocks shall be used to support the pipe. Initial backfill on the sides of the pipe and to a depth of 12 inches over the pipe for that portion of the building sewer located on private property shall be well tamped sand, gravel, crushed stone or excavated material which is neither corrosive nor organic in nature. The material shall be of such size that 100% shall pass a one-inch sieve. For that portion of the sewer located within the limits of the street, the initial backfill shall be sand, gravel or crushed stone of such size that 100% shall pass a one-inch sieve. Initial backfill shall be placed in increments not exceeding 6 inches in depth and be well tamped for the full length of the sewer.

2. Cast iron soil pipe. Where the trench bottom does not contain stone one inch or larger in size or where bedrock is not encountered, the trench for that portion of the sewer on private property may be

excavated to grade. When stone one inch or larger in size or when bedrock is encountered, the trench on private property shall be excavated to a depth at least three inches below the grade elevation and be brought back to grade with a bedding of sand, gravel, or crushed stone of which 100% shall pass a one-half inch sieve. The bedding material shall be tamped in place. Such three-inch deep bedding shall be used for that portion of the sewer located within the limits of the street. The bedding or trench bottom shall be shaped to accommodate the bells of the pipe. No planking or blocks shall be used to support the pipe. Initial backfill on the sides of the pipe and to a depth of 3 inches over the pipe for that part of the building sewer laid on private property shall be well tamped sand, gravel, crushed stone or excavated material which is neither corrosive nor organic in nature. The material shall be such that 100% shall pass a one-inch sieve. For that portion of the sewer in the street, the initial backfill material to a depth of 12 inches over the pipe shall be sand, gravel or crushed stone of such size that 100% shall pass a one-inch sieve. It shall be placed in increments not exceeding 6 inches and be well tamped.

(c) *Unstable bottom.* Where a mucky or unstable bottom is encountered in the trench, the required dry and stable foundation conditions shall be provided by sheathing driven and left in place to a depth of 48 inches below the trench bottom or to solid foundation at a lesser depth, the removal of wet and yielding material to a depth of 24 inches or to solid material, and replacement of the unstable material with limestone screenings, pea gravel or equivalent material for the bedding under the pipe. The trench bedding shall be shaped to accommodate pipe bells or couplings. In lieu of the foregoing, the required dry and stable foundation conditions may be provided by installation of a longitudinally reinforced concrete cradle at least 3 inches thick under the pipe, or by installation of a longitudinally reinforced concrete slab at least 3 inches thick and bedding material as provided for in subsection H 62.04 (6) (b) 1. Initial backfill material and its placement shall conform to that specified in subsections H 62.04 (6) (b) 1 and 2. All sheathing should be cut off at a depth of 3 feet or more below the ground surface to prevent heaving due to frost action.

(d) *Backfill completion.* Due care shall be exercised in placing the balance of the backfill to prevent breakage of the pipe. Large boulders or rock or concrete slabs, or frozen masses, shall not be used in the backfill nor shall machinery be operated within the trench until a cover of 6 feet over the pipe has been attained.

(e) *Inspection.* The building sewer shall be inspected upon completion of placement of the pipe and before backfilling. Upon request of the plumbing inspector, a tee shall be provided to permit testing the pipe for leakage or infiltration. Such tee, when used, shall be located as near as possible to the point of connection with the street or main sewer.

(7) CONNECTIONS TO MAIN SEWER. When a building connection on the street or main sewer is not found within 3 feet of the point designated by the local governing body, or its authorized representative, a "Y" or "T" fitting approved by the board shall be used. The connection shall be set upon or in a carefully cut opening centered in the upper quadrant of the street sewer, and be secured by encasement of

the main sewer pipe and the fitting with concrete at least 3 inches thick so as to assure permanency of connection and adequate backing of the street sewer pipe. In lieu of the use of fittings and in the event that the opening cannot be centered in the upper quadrant of the street sewer, a length of the street sewer pipe shall be removed and a "Y" branch section inserted in its place. The joints at the ends of such section shall be encased in concrete at least 3 inches thick. Such connection or insertion shall be made under the supervision of the authorized representative of the municipality. See subsection H 62.22 (2).

(8) SEWER ENDS AND CONNECTIONS GUARDED. The ends of all sanitary sewer pipes not immediately connected shall be securely closed so as to prevent the introduction of sand or earth or drainage from an excavation.

(9) LIMITATION ON LOCATION. The following minimum distances shall be maintained between building sewers and water wells:

(a) Sewers of cast iron pipe—leaded joints—8 feet.

(b) Sanitary sewers of material other than cast iron—25 feet.

(c) Rain water drains or other clear water conductors—10 feet.

(10) LIMITATIONS ON USE. (a) *Sewers discharging objectionable liquids.* No person shall connect to a public sewer any sewer through which is discharged any substance likely to cause undue corrosion, obstruction, nuisance, explosion or interference with sewage treatment processes. See section H 62.11.

(b) *Storm and clear water connections prohibited.* Roof-leaders, surface drains, ground water drains, foundation footing drains, and refrigerator cooling water drains shall be connected wherever possible with a storm sewer, but they shall not be connected to a building sewer which discharges into a sanitary sewer or private sewage treatment plant. Air conditioning and clear water drains not described herein shall also discharge to storm drains or sewers unless special permission is obtained from the board by the local authority.

History: 1–2–56; am. (10) (b), Register, February, 1957, No. 14, eff. 3–1–57; am. Register, August, 1961, No. 68, eff. 9–1–61.

H 62.05 Building drains. (1) ELEVATION. All building drains shall be brought into the building underground, preferably below the level of the basement floor.

(2) MATERIALS. All building drains shall be constructed of vitrified clay, type L hard temper copper or cast iron pipe. The use of vitrified clay is permitted only where there is a soil covering of 18 inches or more or where the pipe is covered with 12 inches of soil and a substantial concrete floor. Where a building drain leaves the building at a point above the basement floor, it shall be constructed of cast iron or type L hard temper copper pipe to a point 5 feet from the inside of the building foundation wall or to such additional distance as necessary to reach undisturbed stable ground. See subsection H 62.22 (3).

(3) SIZE. The size of building drains and building sub-drains shall be determined by the number of fixture units tributary thereto. The minimum size of a building drain shall be 4 inches. The minimum size

of an underground building sub-drain shall be 3 inches. See subsections H 62.04 (4) (a) and H 62.10 (1).

(4) BACKFLOW VALVES. Building drains when subject to backflow or backwater at the time of installation, shall be provided with adequate backwater valves, installed to prevent interference with the flow or discharge of any fixture, and be readily accessible for cleaning. Provisions for a free circulation of air shall be made.

(5) OTHER REQUIREMENTS. Installation of building drains shall also conform to subsection H 62.04 (3) as to slope, subsections (5), (6), (8), (9) and (10); sections H 62.15 and H 62.16, insofar as they are applicable and necessary for proper installation.

History: 1–2–56; am. (1), (2) and (3), Register, February, 1957, No. 14, eff. 3–1–57; am. Register, August, 1961, No. 68, eff. 9–1–61.

H 62.06 Stacks and branches. (1) SOIL AND WASTE STACKS. Every building in which plumbing fixtures are installed shall have a soil, waste or vent stack at least 3 inches in diameter extending through the roof with an increaser or frost proof housing. See subsections H 62.07 (12), H 62.22 (4), (5), (6), (7).

(2) SIZE. The size of the stacks and branches shall be determined by the number of fixture units connected thereto. If pitch or grade of a soil or waste branch is 45 degrees or more, the same unit capacities as for vertical stacks will be permissible. Any underground branch shall be at least 2 inches in diameter. A water closet may connect to a 3 inch stack through a 4 x 3 inch bend. Not more than two water closets shall be connected to a 3 inch soil stack. Not more than one water closet shall be connected to a 3 inch branch. Two water closets located back to back shall be connected to a 3 inch soil stack with a 3 x 3 inch double wye and one-eighth bends or similar fittings or fitting. A sanitary cross will not be permitted. All waste openings provided for future use shall be properly vented and sealed. See subsections H 62.03 (1), (3).

(3) STACK CONNECTION AT BASE. A long sweep one-fourth bend, two one-eighth bends, or a "Y" and one-eighth or one-sixth bend or its equivalent shall be used at the base of all soil and waste stacks. When such bend or fittings constitute the connection between a soil or waste stack and an underground house drain or branch of larger size than the soil or waste stack served, the increase shall be made above the floor unless a special approved fitting is used. See subsections H 62.22 (8), (9).

(4) MULTIPLE BUILDING STACKS. Where more than one unit in a motel, cabin court or mobile home park are connected to the same sewer or drain, a minimum vent stack of 2 inches may be permitted in each unit when the total number of fixture units does not exceed the capacity of such 2-inch pipe, provided that a full sized 3-inch stack is installed in the uppermost unit or at the upper end of the sewer. In the latter case the stack shall have frost protection. See subsections H 62.07 (12) (a).

(5) BRANCHES. (a) *Soil and waste extensions.* Any branch extending from a soil or waste pipe, running vertically, horizontally, or both, shall be carried full size to fixture connections and shall

be vented or revented to conform with the provisions of H 62.03 (1) and (3). See subsections H 62.22 (11), (12).

(b) *Grade of horizontal pipes.* All horizontal drain, soil and waste pipes shall be run in practical alignment, and where possible at a uniform grade of one-fourth inch per foot or more. In no case shall the grade be less than one-eighth inch per foot.

(c) *Change in direction.* All changes in direction shall be made by the proper use of 45 degree "Y"s, half-"Y"s, long sweep one-fourth bends, one-sixth, one-eighth or one-sixteenth bends, or with fittings producing a like radius, except that single or double sanitary "T"s may be used on vertical stack or on horizontal runs where it is impracticable to install a 45 degree "Y" with a one-eighth bend. Short one-fourth bends may be used in soil and waste lines where the change in direction of flow is from the horizontal to the vertical and for closet discharge connections. No common pattern double sanitary "T", "Y" or straight through fitting shall be used on either a vertical or horizontal stack or branch, serving wall-hung closet bowls installed back to back. See subsections H 62.06 (2), H 62.14 (10), H 62.15 (5) (a).

(6) HANGERS AND SUPPORTS. Stacks shall be substantially supported at 10 foot or floor intervals. Horizontal piping shall be supported at intervals not to exceed 10 feet. Cast iron soil pipe shall be supported at intervals of not more than 5 feet. All pipe supports shall be heavy iron posts, wall hangers or bracket, or concrete or masonry piers. Supports secured in or against masonry shall be attached with expansion bolts or other approved methods without the use of wood plugs. All drainage and plumbing pipes shall be rigidly secured and supported so that proper alignment will be retained. See subsection H 62.22 (9).

(7) INCREASERS AND REDUCERS. Where different sizes of pipes or pipes and fittings are to be connected, proper size increasers or reducers shall be used.

(8) MATERIALS. All main branch, soil and waste pipes shall be made of cast iron, coated with tar or asphaltum, galvanized wrought iron or galvanized steel pipe, or lead, brass, or type M hard temper copper. All piping, other than cast iron pipe, when installed so as to be embedded through concrete, shall be protected by thoroughly applying one or more coats of asphaltum paint or adequate tar paper wrapping or both, or by other equivalent means of insulation. No galvanized steel or wrought iron waste pipes shall be laid underground.

(9) PROTECTION FROM FROST. All drain, soil, or waste pipes shall, unless entirely impracticable, be placed within the walls of buildings and shall be as direct as possible and shall together with all fixture traps and other appliances be protected from frost. Wherever soil and waste pipes are placed in outside walls, protection from frost shall be provided by adequate insulation which may consist of proper air spacing, approved insulating materials, warm air circulation or any effective combination of the same. The underfloor work of bath rooms located on outside walls, shall be protected from frost by

the placing of cold air draft stops between joists or studdings, or by the use of approved insulating materials.

History: 1-2-56; (2) am. Register, February, 1957, No. 14, eff. 3-1-57.

H 62.07 Vents. (1) MAIN VENT. All soil or waste stacks, 3 inches or more in diameter with fixtures on three or more floor levels, shall have the main vent connect full size to the main soil or waste pipe, below the lowest fixture branch.

(2) CIRCUIT VENTS. (a) *Water closets.* Circuit vents for water closets shall have a diameter of 2 inches for a battery of two closets, 3 inches for a battery of three to six closets and 4 inches for a battery of seven or eight closets.

(b) *Other fixtures.* The size of circuit vents shall be determined from the number of fixture units connected thereto. The size of the soil or waste branch shall be carried full diameter to the last fixture connection. A branch soil or waste pipe, to which two and not more than eight fixtures are connected may be vented by a circuit vent which shall be taken off ahead of the last fixture. See subsections H 62.03 (1), (3), H 62.22 (10), (11), (12) (24).

basin shall be sufficient to hold at least one gauge of the boiler. All cooling devices when receiving the blowoff from such boilers shall be provided with a relief pipe, extended independently to the outer air. The size of the relief pipe shall be equal to the threaded opening provided in the cover of the basin.

(10) PIPE BENDING PROHIBITED. Bending of brass, galvanized steel or galvanized wrought iron pipe is prohibited. See section H 63.04.

H 62.15 Materials. (1) QUALITY. All material used in any drainage or plumbing system, or part thereof, shall be free from defects that impair service.

(2) LABELING. Each length of pipe, fitting, trap, fixture, and device used in a plumbing or drainage system, shall be stamped or indelibly marked with the weight, or quality thereof, and the maker's mark or name.

(3) SEWER AND DRAIN PIPE. (a) Asbestos-cement building sewer pipe and fittings shall be fabricated from material consisting of a mixture of portland cement, or portland pozzolana cement, and asbestos fiber, with or without the addition of curing agents. The pipe shall be free from organic substance and shall be formed under pressure, be thoroughly cured and meet the following requirements:

1. The pipe shall show no signs of leaking, weeping, or cracking when tested for general soundness and strength by subjection to an internal hydrostatic pressure of 50 pounds per square inch. The test shall be conducted by placing the pipe in a pressure testing machine with gaskets which seal the ends of the pipe and exert no end pressure. All air shall be expelled from the pipe and the internal water pressure increased at a steady rate to the specified hydrostatic test pressure.

2. Test pipe specimens shall have a crushing strength such that they shall not fail until the total applied load exceeds the tabular values given in the following table for the size of pipe being tested. The specimens shall be tested by the 3-edge bearing method. The two lower bearings shall consist of 2 straight wooden strips with vertical sides, each strip having its interior top corner rounded to a radius of approximately ½ inch. The strips shall be securely fastened to a block with their interior vertical sides parallel and a distance apart of not less than ½ inch nor more than one inch per foot of diameter of pipe. The upper bearing shall be a wooden block, not less than 6 by 6 inches in cross section, straight and true from end to end. The upper and lower bearings shall extend the full length of the specimen. The test load shall be applied in such a way as to leave free movement in a vertical plane passing midway between the lower bearings. The rate of loading shall be 2,000 pounds per minute per lineal foot, with a tolerance of plus or minus 500 pounds per minute per lineal foot. The breaking load shall be determined. For sewers laid at a depth of 12

Size Inches	Flexural Strength 9 Foot Span Pounds	Crushing Strength 3-edge Method Pounds per Foot
4	550	1,740
5	950	1,680
6	1,475	1,420
8	----------	2,500
10	----------	2,200
12	----------	2,200

feet or more the crushing strength per foot shall be at least 2,400 pounds for 4 inch to 8 inch pipe, 2,800 pounds for 10 inch pipe, and 3,000 pounds for 12 inch pipe.

3. The pipe shall be of uniform structure throughout and such that it may be cut, drilled and tapped.

4. Couplings shall be of the same crushing strength and general soundness as specified for the pipe. The necessary rubber rings shall be furnished with each coupling.

5. Each pipe shall be free from bulges, dents, and tears on the inside surface which result in a variation in diameter greater than 3/16 inch from that obtained on adjacent unaffected portions of the surface.

6. The exterior edge of the ends of the pipe which extend into the coupling area shall be free from axial chips having a length greater than ½ inch, a width greater than ½ inch, or a depth greater than ⅛ inch. Similarly, the interior edge shall be free from axial chips having a length greater than one inch, a width greater than one inch, or a depth greater than ⅛ inch.

(b) Cast iron pipe and fittings shall be coated pipe conforming to Commercial Standard CS 188–59, United States Department of Commerce, and the following requirements:

1. Weights. Use of service weight pipe shall be limited to buildings 5 stories or less in height. Extra heavy weight pipe shall be used in buildings 6 stories or more in height. Wall thickness of fittings and the hubs shall correspond with that of the pipe of the same size and kind.

2. Bends. When direction of flow changes from horizontal to vertical the radius of bends shall be as follows: (All dimensions are given as inches)

Size of pipe	2	3	4	5	6
Minimum radius	3	3½	4	4½	5

When direction of flow changes from vertical to horizontal or when it is at right angles and changes in the same horizontal plane the radius of bends shall be as follows: (All dimensions are given as inches)

Size of pipe	2	3	4	5	6
Minimum radius	8	8½	9	9½	10

(c) Concrete pipe and fittings shall conform to A.S.T.M. "Standard Specifications for Concrete Sewer Pipe," serial designation C-14-59. Extra strength pipe shall be used for sewers laid at a depth of 12 feet or more. For pipe 27 inches or larger in diameter, the pipe shall conform to serial designation, C-76-60T.

(d) Copper pipe and fittings shall conform to A.S.T.M. "Standard Specifications for Seamless Copper Water Tube" (TYPE L) serial designation B–88–58.

(e) Vitrified clay pipe and fittings shall conform to A.S.T.M. "Standard Specifications for Clay Sewer Pipe," serial designation C-13-57T or C-200-59T, the latter standard to be used for sewers laid at a depth of 12 feet or more.

(4) Cast iron soil and waste pipe stacks and branches shall conform to subsections H 62.15 (3) (b) or H 62.15 (5). Extra heavy pipe shall be used for stacks and branches receiving drainage from more than 5 stories of any building.

(5) Screw thread cast iron I.P.S. pipe and fittings shall conform to A.S.T.M. "Standard Specifications for Cast Iron Pressure Pipe," serial designation A-377-57.

(6) WROUGHT IRON PIPE (GENUINE). All wrought iron pipe shall be galvanized and shall conform to the A.S.T.M. "Standard Specifications for Welded Wrought Iron Pipe," serial designation A-72, latest revision.

(7) MILD STEEL PIPE. All mild steel, welded or seamless, shall be galvanized, and shall conform to the A.S.T.M. "Standard Specifications for Welded and Seamless Steel Pipe," serial designation A-53, latest revision.

(8) SCREW THREAD FITTINGS. Threaded fittings for vents, back vents, soil and waste pipes shall be of cast iron, galvanized malleable iron or brass. Waste fittings shall be of recessed, drainage pattern, and shall be galvanized or asphaltum coated. Drainage fittings shall have a minimum length from face to center as follows:

Pipe size, inches	1¼	1½	2	2½	3	4	5	6
Length, inches	2¼	2½	3 1/16	3 5/16	4¼	5 3/16	6 1/8	7 1/8

Note: Long turn Y branches or Y and 1/8 bend are recommended. See H 62.14 (10) and H 62.22 (38).

(9) LEAD MATERIALS. (a) *Waste and vents.* Lead waste and vent pipes shall be the best quality of drawn lead pipe, having a minimum weight per foot as follows:

Inside diameter, inches	1¼	1½	2	3	4
Weight per foot, pounds	2½	3½	4¾	6	8

(b) *Traps.* All lead traps and bends shall have a minimum wall thickness of one-eighth inch.

(c) *Water supply piping.* Lead water supply piping should have minimum weights shown in the following table:

Inside diameter, inches	Weight lbs. per foot	Wall thickness inches	Classification	
			East	West
⅜	2	----------	AA	XS
½	2	----------	AA	XS
⅝	3	----------	AA	XS
¾	3½	.231	AA	XS
1	4¾	.246	AA	XS
1¼	7¾	.320	AAA	XXS
1½	11¼	.386	AAA	XXS
2	19½	.504	AAA	XXS

(d) *Sheet lead.* Sheet lead shall weigh not less than 4 pounds per square foot.

(10) BRASS PIPE AND FITTINGS. (a) *Specifications.* All brass pipe used for soil, waste, vent and water pipes, except fixture traps and overflows, shall be of commercial standard pipe size and conform to A.S.T.M. "Standard Specifications for Brass Pipe," serial number B-43, latest revision.

(b) *Fittings for soil and waste pipes.* Brass screw thread fittings used for soil and waste pipes, shall be of the recessed, drainage fitting pattern.

(c) *Fittings for water pipe.* Fittings and couplings for brass water pipe shall be of unfinished red brass, with flat band, guaranteed for

175 pounds water-working pressure and shall conform to A.S.A. "American Standard Brass or Bronze Screwed Fittings," serial number B-16.15, latest revision. In erecting brass pipe, friction wrenches and friction vises shall be used exclusively except on pipe larger than 3 inches in diameter.

(d) *Brass tubing.* All brass tubing used for fixtures, traps and overflows between wall or floor and fixtures shall be made of seamless brass tube with a thickness of at least 0.0453 inch (No. 17 Brown & Sharp Gauge) and shall conform to A.S.T.M. "Standard Specifications for Seamless Brass Tubes," serial number B–135, latest revision.

(e) *Traps and overflows.* All brass fittings used for fixtures, traps and overflows shall be of a good quality of brass, free from sand holes, flaws or other defects, and of a uniform thickness equal to twice the thickness of the brass tubing. The thickness of the threaded ends shall be equal to the thickness of the fitting at the root of the thread.

(f) *Soldering nipples* shall be of heavy cast brass, or of brass pipe of weight, thickness and size conforming to standard pipe sizes. (SPS). When cast they shall be of full bore and of not less than the weights given in the following table:

Inside diameter	Weight
1¼ inch	0 lb. 6 oz.
1½ inch	0 lb. 8 oz.
2 inch	0 lb. 14 oz.
2½ inch	1 lb. 6 oz.
3 inch	2 lb. 6 oz.
4 inch	3 lb. 8 oz.

(g) *Weight of brass ferrules.* Brass ferrules shall be of a good quality of brass, composed of a mixture that will fuse readily with plumbers' solder, free from sand holes, flaws or other defects uniform in thickness, and at least four and one-half inches long, of a size and weight as shown in the following table:

Inside diameter, inches	Weight
1½	1 lb. 1 oz.
2	1 lb. 4 oz.
3	1 lb. 14 oz.
4	2 lb. 8 oz.
5	3 lb. 0 oz.
6	3 lb. 8 oz.

(11) COPPER TUBE AND FITTINGS. (a) *Copper tube* used for water, soil, waste and vent piping shall conform to A.S.T.M. "Standard Specifications for Seamless Copper Water Tube," serial number B-88, latest revision. Copper water tube used for underground water lines shall be type "K," either soft or hard temper. Copper tube used for interior water lines shall have a wall thickness equal to or better than type "L" and shall be hard temper, except that concealed vertical tube may be of soft temper for repair and replacement lines only. Copper tube used for soil, waste and vent piping shall have a wall thickness equal to or better than type "M" and shall be of hard temper.

(b) *Fittings* used with copper water tube shall be of the sleeve type, of such size that the solder will completely fill the joints by capillary action. Cast red brass fittings shall conform to A.S.A. "American Standard Cast-Brass-Solder-Joint Fittings," serial number B–16.18, latest revision. Wrought copper fittings may be used for water piping only and shall have a wall thickness at least equal to that of the tube with which it is to be used. All waste fittings shall be cast red brass recessed drainage fittings and shall be soldered. Sleeve branches (saddle tees) will not be allowed. Fittings on water pipe may be soldered, flared or flanged provided that all above-ground tube which will be concealed shall be soldered. The solder used shall be 50–50 lead-tin (new metals) or tin-antimony containing 90 to 96% tin and 4 to 10% antimony.

(12) SHEET COPPER OR BRASS. All sheet copper or brass shall be of sufficient weight to serve the purpose for which it is used. Sheet used for local and interior ventilating pipe shall have a thickness of at least 0.0159 inch (No. 26, B. & S. gauge).

(13) GALVANIZED SHEET IRON. Galvanized sheet iron for local room vents shall be not lighter than the following B. & S. gauge:

No. 26 for 2 to 12 inch pipe.
No. 24 for 13 to 20 inch pipe.
No. 22 for 21 to 26 inch pipe.

(14) ASBESTOS CEMENT PIPE AND FITTINGS. Asbestos cement pipe and fittings and other equal piping materials with approved fittings and methods of jointing may be used for local vent pipes. See subsections H 62.14 (8) (b), H 63.02.

Note: The addresses of the organizations preparing standards referred to in this section are as follows:
A.S.A. (American Standards Association), 70 East 45th St., New York 17, N. Y.; A.S.T.M. (American Society for Testing Materials), 1916 Race St., Philadelphia 3, Pa.; A.S.M.E. (American Society of Mechanical Engineers), 29 W. 39th St., New York, N. Y.

History: 1–2–56; am. (3), (4), and (5), Register, August, 1961, No. 68, eff. 9–1–61.

H 62.16 Joints and connections. (1) SEWER AND DRAIN PIPE JOINTS. (a) *Vitrified pipe.* Joints in vitrified pipe shall be either hot poured joints, made with acceptable bituminous or plastic materials, or be pre-fabricated resilient materials bonded to the pipe at the producing plant.

1. Hot poured joint. Hot poured joint compounds shall be water resistant and shall meet requirements hereinafter set forth. A primer shall be applied to the inside face of the bell and outside face of the spigot at least 24 hours prior to installation and preferably by the manufacturer. Joint faces shall be clean. In joining vitrified clay pipe, or fittings, the spigots shall be carefully centered into the bells. Joints shall be firmly packed with unoiled hemp, oakum or jute in such a manner as not to disturb alignment. The depth of the jointing compound shall be at least 75% of the hub-depth. Care shall be exercised in placing the running rope to insure non-leakage during pouring and it shall not be removed until the compound is set. The compound shall be poured continuously and as rapidly as possible until the joint is completely filled.

a. Joint-sealer compounds shall consist essentially of asphalt, coal-tar pitch or plastic soluble in CS_2 and inert mineral filler. The com-

pounds shall be free from water, uniform in appearance and consistency, and shall not foam when heated to 350° F. Proportions of component materials of the compounds, expressed as percentages of total weight, shall be within the limits of the accompanying table. The physical properties of joint sealing compound also shall be as shown in said table. Material not definitely specified shall be of a good commercial quality entirely suitable for the purpose.

CHEMICAL COMPOSITION AND PHYSICAL PROPERTIES

	Asphalt Base	Coal Tar Pitch Base	Plastic Base
Asphalt (soluble in CS_2)	45–60		
Coal-tar pitch[1]		75–80	
Plastic[2] (soluble in CS_2)			35–50
Inert mineral matter (determined as ash)	40–55	20–25	50–65
Organic matter (insoluble in CS_2), maximum	5		5
Specific gravity at 77° F.	1.40–1.55	1.40–1.50	1.65–1.75
Ductility at 77° F. (cm.), minimum	1.5		
Soften point, °F.	190–250	180–190	200–230
Penetration:			
At 77° F., 100 gm., 5 sec	5–15	0–2	0–1
At 115° F., 50 gm., 5 sec		5–10	0–3

[1]The coal-tar pitch shall be produced from coke-oven tar by distillation or special processing.
[2]Acyclic polymeric hydrocarbon.

b. No chemical action shall occur when the joint sealer compounds are subjected to emersion for 5 days in each of the following solutions: 1 percent HCL, 1 percent HNO_3, 1 percent H_2SO_4, 5 percent KOH, and saturated H_2S.

c. The content of inert mineral filler, asphalt, plastic, and organic matter in the compound shall be determined in accordance with A.S.T.M. "Standard Method of Test for Bitumen," serial designation D 4–52.

d. The specific gravity of the compound shall be determined in accordance with A.S.T.M "Standard Method of Test for Specific Gravity of Asphalts and Tar Pitches Sufficiently Solid To Be Handled In Fragments," serial designation D 71–52.

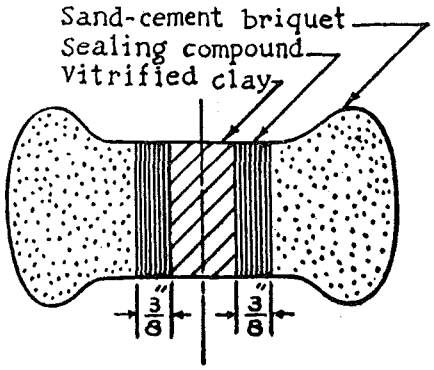
e. Ductility shall be determined in accordance with A.S.T.M. "Standard Method of Test for Ductility of Bituminous Materials," serial designation D 113–44.

f. The softening point of the compound shall be determined in accordance with A.S.T.M. "Standard Method of Test for Softening Point of Bituminous Materials," serial designation D 36 –26.

g. The penetration of the compound shall be determined in accordance with A.S.T.M. "Tentative Method of Test for Penetration of Bituminous Materials," serial designation D 5–59T.

h. Joint-sealing compounds shall not fail, either in bond or cohesion, under a bond stress of 75 p.s.i. when tested as follows: Three portland-cement briquets shall be made and cured for 7 days in accordance with A.S.T.M. "Standard Method of Test for Tensile Strength of Hydraulic Cement Mortars," serial designation C 190–59, except that the sand shall be concrete sand conforming to the requirements of A.S.T.M. "Standard Specifications for Concrete Aggregates," serial designation C 33–57. The briquets shall be cut smoothly in two parts transversely at the waist, oven dried at 220° F. for 2 hours and allowed to cool at room temperature for at least 2 hours. The two parts shall

be placed in a suitable mold or form and a one-inch-square piece of vitrified clay with all glaze removed shall be placed between and approximately ⅜ inch from the two parts of the briquet and so that the longitudinal axis will be approximately normal to the one-inch-square surfaces. Sealing compound, heated to a free-flowing temperature but not in excess of the pouring temperature indicated on the container, shall be poured into the mold between the cut surfaces of the briquet and the piece of vitrified clay as indicated in the accompanying figure and allowed to air cool at room temperature for at least 2 hours. If the manufacturer's directions for use of the compound as printed on the container require priming, the cut surfaces of the briquet and the vitrified clay shall be so primed with the recommended primer before pouring the compound. Any bituminous material which may have accumulated on the briquets or pieces of vitrified clay other than on the one-inch-square surfaces shall be removed with a knife.



The bearing surfaces of the clips of the testing machine shall be clean and free from incrustations. The roller bearings shall be well oiled and in condition to ensure free turning. The stirrups supporting the clips shall be kept free from accumulations and the pivots shall be in proper adjustment so that the clips may swing freely on the pivots without binding in the stirrups. The test specimens shall be carefully centered in the clips. The load shall be applied continuously at a uniformly increasing rate of 600 ± 25 pounds per minute until the specimen fails in bond or in cohesion.

2. Pre-fabricated joints. Resilient jointing materials shall conform to the A.S.T.M. "Tentative Specifications for Vitrified Clay Pipe Joints Using Materials Having Resilient Properties," serial designation C-425-60T. Only virgin materials shall be used. The composition of the jointing material shall be periodically checked after fabrication by an accredited laboratory. Prior to making the installation, the joint material on both the bell and spigot ends shall be wiped clean and coated with a lubricant of an adhesive or welding type. The spigot end shall be inserted in the bell and pressure applied until the pipe is properly seated.

(b) *Concrete pipe.* Joints in concrete pipe shall be made with hot poured jointing compounds or rubber gaskets.

1. Hot poured joint. Hot poured joints shall conform to requirements of subsection H 62.16 (1) (a) 1.

2. Rubber gasket joint. Rubber gaskets shall consist of durable and resilient rubber formed into a shape which will be compressed within the annular space between two adjacent pipes to form a watertight joint. The rubber gasket shall conform to A.S.T.M. "Tentative Specifications for Watertight Rubber Type Gasket for Circular Concrete Sewer and Clvert Pipe," serial designation C-443-60T.

(c) *Asbestos-cement pipe.* Asbestos-cement pipe shall be jointed by ring type coupling consisting of a sleeve made of the same material as the pipe, a rubber center ring, and 2 rubber sealing rings. Rubber rings shall be of moulded resilient and durable rubber. The inside diameter of the sleeve shall have end bevelling and inside machining to provide a smooth surface. A groove for the center ring and 2 grooves for the sealing rings shall be machined in the sleeve. The end outside surfaces of the pipe shall be machined at the factory to proper dimensions to permit the pipe to enter the coupling after lubricant is applied to the pipe ends in a manner to cause the sealing rings to compress and slide to provide a proper seal.

(d) *Dissimilar pipe.* Underground joints between dissimilar materials shall be made with suitable adapters approved by the board.

Note: Standards of the American Society for Testing Materials (ASTM) are available for inspection at the office of the board of health, the secretary of state and the revisor of statutes, or may be procured for personal use from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania. Commercial Standards of the U. S. Department of Commerce also are available for inspection at the office of the board of health, the secretary of state and the revisor of statutes, or may be procured for personal use from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

(3) CAST IRON PIPE. All joints in cast iron pipe and fittings shall be made by first inserting a roll of hemp, oakum or jute and thoroughly calking it in place, and then following with pure molten lead well calked, not less than one inch deep, lead to be brought to top of hub and faced. No paint, varnish or putty will be allowed on the joints until they have been tested.

(4) GALVANIZED WROUGHT IRON AND STEEL PIPE. Joints in galvanized iron pipe shall be standard screw joints, and all burrs or cuttings shall be removed. All screw joints shall be made with white or red lead, mineral paint, or other approved compounds, applied on outside thread. Not more than three threads of made-up joints shall be exposed, and they shall be protected by a coating of mineral or asphaltum paint or other approved compound, applied before the work is tested or inspected.

(5) BRASS PIPE. Joints on brass pipe shall conform to provisions of subsection (4) except that exposed threads require no coating.

(6) COPPER TUBE. All joints in copper water tube shall be made in a manner to insure a permanent water-tight joint. The joints shall be properly fluxed and made with approved solder. The joints shall be wiped clean to remove excess flux after the soldering operation has been completed. See subsection H 62.15 (11).

(7) DISSIMILAR METALS. Connections between wrought iron or brass and cast iron shall be either a calked joint or a screw thread joint. Connections between lead and cast or wrought iron pipes shall be

made with a calked joint, a soldering nipple or threaded joint. Wrought iron pipe connections shall be made with a right and left coupling, flanged union with durable gasket, a ground faced union or a running thread with lock nut made tight with wicking and red or white lead. Joints in lead pipe or between lead, brass or copper pipes shall be wiped joints except solder brazed or sweated joints on reamed, concave brass bushings in connection with exposed brass or lead traps. See subsection H 62.22 (20).

(8) WASTE PIPE. (a) *Lead.* All lead under-floor waste pipes so far as practicable should be free from short bends. All branch joints in connection with water-carrying waste pipes should be of the sanitary "Y" pattern and all such joints should be so prepared and joined as to leave a clean interior, free from solder, obstructions or reductions of the respective pipe diameter. All lead waste pipes should be properly graded and substantially supported to guard against sagging or displacement and so installed that stoppages may be removed from any portion. To accomplish this, sink and basin traps should be so joined or connected to the waste pipes that they may be readily removed for wiring or rodding of the pipe throughout its entire length including waste branches thereof. Where lead closet bends are used, no water carrying waste pipe or branch shall be connected thereto. Where solder nipples are used in connecting to iron bends they should be straight bore of a size corresponding with the inside diameter of the waste pipe, but no such nipple should be less than 2 inches inside diameter. All lead bends should be so made as not to weaken the lead at the heel of the bend and all joints shall have a wall thickness of solder not less than three-sixteenths of an inch measured at the center of the pipe joint.

(b) *Screw thread.* All under-floor and concealed threaded waste pipes and fittings should be designed and constructed by the plumber to conform with the following minimum specifications: The waste piping for baths, sinks, basins and other similar fixtures shall be properly graded, free from short or unnecessary offsets, and all fittings shall be of the long radius sanitary pattern. Ends of all piping shall be cut straight and reamed on the inside. The thread should be cut to the required length and depth and so made up that the end of the pipe extends to the recess receiving shoulder of the fitting. Where avoidable no 90 degree universal swing joints or any offset connection should be made. All changes in direction should be made by means of "Y"s or 5⅝, 11¼, 22½, 30, 45, 60, or 90 degree long radius pattern elbows. All ells and other fittings should be full bore and all such pipes and fittings should have a smooth interior.

(9) ROOF TERMINALS, FLASHING. The joint at the roof shall be made water tight by the use of copper, lead, galvanized sheet metal or iron plates or flashings. The flashing shall extend not less than 6 inches from the pipe. All flashings shall be substantially made and so placed as to insure a permanent tight joint. Roof flashings designed and constructed to provide an air space between the pipe and flashing to prevent freezing of soil and vent pipe terminals are recommended. See subsections H 62.15 (9) (d), (12), H 62.22 (18).

(10) EARTHENWARE. The connections between soil pipe and fixtures of earthenware, vitreous china or enameled iron shall be made by

means of a brass floor plate, not less than three-sixteenths inch in thickness, soldered or wiped to lead pipe, or an iron floor flange connection calked to iron pipe, or an iron or brass connection calked or screwed to wrought iron or steel pipe, with the fixture floor flange bolted to the floor connection with solid brass closet bolts. Floor joints shall be made air-tight with an asbestos graphite ring, asbestos or rubber gasket, or washer, or metal to earthenware, or metal to metal union. A paste of red or white lead or other equal compound may be used.

(11) OTHER TYPES. Any type of joint other than those specified in this code which the board approves may be used.

(12) PROHIBITED FITTINGS. Sanitary tees of short radius shall not be used except in connecting horizontal to vertical soil or waste pipes in which the flow is toward the vertical line. The use of one-fourth bends or elbows in soil or waste pipes is governed by H 62.15 (5), (8), H 62.22 (37), and (38). One-fourth bends with side or heel outlets except when they are made with "Y" or sanitary "T" branches, and all double hub fittings, double tees and double sanitary tees when used horizontally are prohibited, except when smaller pipes discharge into a larger pipe. Double hubs and double hub fittings may be used on rain water leader and vent lines. Offsets having less than one-fifth pitch will not be permitted. The use of a drive ferrule is prohibited and the use of combination lead ferrules will be permitted only when the calk joint can be made in the upright position. All waste and vent pipes must enter soil pipe by means of properly inserted fittings. The drilling and tapping of soil, vent and waste pipes and house drains to receive waste and vent pipes of any description is strictly prohibited, and in no case will the use of saddles or bands be permitted. No double hub or inverted calk joint shall be permitted in soil and waste lines. Whenever wrought or galvanized iron pipe connects with cast iron, soil waste or vent lines, tapped fittings or tap extension pieces shall be used except where pipe and hub are the same diameter.

History: 1–2–56; r. and recr. (1) and (2), Register, August, 1961, No. 68, eff. 9–1–61.

H 62.17 Repairs and reconstruction. (1) DEFECTIVE PLUMBING. Whenever it shall appear upon inspection that any part of an existing plumbing system is defective, or fails to conform to the requirements of this code and by reason of such failure tends to create a nuisance, it shall be repaired, renovated, replaced or removed within 30 days, upon written notice from the state or local health officer.

(2) FIXTURES REPLACED. When an old or defective fixture is removed, to be replaced by a new one, and no other fixture or piping is to be added or remodeled, it will not be necessary to reconstruct the soil, waste or vent piping to make it conform to this code, unless the same is in a defective condition. In such cases, if found necessary, the fixtures shall be provided with efficient deep seal traps or deep seal resealing traps of the self-scouring centrifugal type.

(3) RECONSTRUCTION. When old or defective plumbing is to be remodeled, additional fixtures installed or the whole plumbing system moved to another part of the building the remodeled system shall be made to conform to this code.

(4) OLD MATERIALS RE-USED. All fixtures, soil, waste, and vent pipes removed from an old building, if found to be in good condition, may be used in the same building or may be used in another building, provided they are approved by the board or local plumbing inspector and the owner of the building in which they are installed gives his written consent.

(5) OLD HOUSE DRAINS. Old house drains may be used in connection with new buildings or new plumbing only when they are found on examination or test to conform to the requirements of this code governing new sewers and drains. If the old work is found defective, the local or state inspector shall notify the owner of the changes necessary to make it conform to the requirements of this code.

(6) REPAIRS. All repairs to fixtures or piping shall be done in a substantial, sanitary and workmanlike manner.

H 62.18 Water supply systems. (1) WATER SERVICE. (a) *Size.* The water service pipe to any building shall be of sufficient size to permit a continuous ample flow of water under maximum simultaneous use to all fixtures and points of service. The minimum diameter of the service pipe shall be five-eighths inch.

(b) *Materials.* The service pipe from a main or from the pump of a privately owned supply to any building shall be copper water tube, lead, brass, cast iron or galvanized steel or wrought iron pipe.

(c) *Valve controls.* Service controls shall include a valve or shut-off at the main, a curb stop or valve at the curb or privately owned pump, and a valve or stop inside the foundation wall of each building.

(2) BUILDING DISTRIBUTION SYSTEM. (a) *Size.* The water supply piping shall be three-fourths inch in diameter for iron or brass pipe. The diameter of any riser or branch serving more than one plumbing fixture or appliance shall not be less than three-fourths inch for iron or brass pipe. The diameters of branches to single fixtures shall not be less than one-half inch except that three-eighths inch pipe not to exceed 5 feet in length may be used to supply water closet tanks, lavatories or similar fixtures. If copper water tube is used the minimum pipe diameters given above may be decreased one standard copper water tube size, except the minimum pipe diameter shall be three-eighths inch.

(b) *Materials.* All water supply pipes within a building shall be of lead, galvanized wrought iron or steel, brass, or cast iron, with brass or galvanized malleable iron fittings, or copper water tube and fittings. No pipe or fittings that have been used for other purposes shall be used for distributing water for drinking or domestic supply purposes. See section H 62.16.

(c) *Supports.* All piping shall be supported to prevent undue strains upon connections or fixtures, and shall be so aligned and graded that the entire system or parts thereof can be controlled and drained. The formation of traps or sags in water piping shall be avoided where possible. When unavoidable such sags, traps or inverts shall have provisions for properly draining same.

(d) *Valve controls.* Controls within a building shall include a valve or compression stop for each lawn sprinkler, hot water tank, water closet, urinal and point of entrance of the water service. In

a multiple dwelling or public building a valve shall also be provided at the base of each riser and for each dwelling unit or public toilet room unless served by an independent riser, and for each branch serving fixtures in the basement.

(e) *Water supply to fixtures.* All plumbing fixtures shall be provided with a sufficient supply of water for flushing to keep them in a sanitary condition. Every water closet shall be flushed by means of an approved tank or flush valve, of at least 4-gallon flushing capacity and at least one gallon for each urinal. The water from flush tanks shall be used for no other purpose than to reseal drain traps. See subsections H 62.12 (8), (9).