

be lead-free (as defined in section 109(c)(2) of the Safe Drinking Water Act Amendments of 1986) with solders and flux containing not more than 0.2 percent lead and pipes and pipe fittings containing not more than 8.0 percent lead.

(e) *Installation of piping*—(1) *Minimum requirement.* All piping equipment, appurtenances, and devices shall be installed in workmanlike manner and shall conform with the provisions and intent of this standard.

(2) *Screw pipe.* Iron pipe-size brass or galvanized iron or steel pipe fittings shall be joined with approved or listed standard pipe threads fully engaged in the fittings. Pipe ends shall be reamed to the full bore of the pipe. Pipe-joint compound shall be insoluble in water, shall be nontoxic and shall be applied to male threads only.

(3) *Solder fittings.* Joints in copper water tubes shall be made by the appropriate use of approved cast brass or wrought copper fittings, properly soldered together. The surface to be soldered shall be thoroughly cleaned bright mechanically. The joints shall be properly fluxed and made with a solder that contains no more than 0.2 percent lead.

(4) *Flared fittings.* A flaring tool shall be used to shape the ends of flared tubing to match the flare of fittings.

(5) *Plastic pipe and fittings.* Plastic pipe and fittings shall be joined by installation methods recommended by the manufacturer or in accordance with provisions of a listed standard.

(f) *Size of water supply piping*—(1) *Minimum size.* The size of water supply piping and branch lines shall not be less than sizes shown in the following table:

MINIMUM SIZE TUBING AND PIPE FOR WATER DISTRIBUTION SYSTEMS

Number of fixtures	Tubing (nominal)		Pipe iron pipe size (inches)
	Diameter (inches)	Outer diameter (inches)	
1	¹ / ₄	³ / ₈	¹ / ₂
2	³ / ₈	¹ / ₂	¹ / ₂
3	¹ / ₂	⁵ / ₈	¹ / ₂
4	¹ / ₂	⁵ / ₈	¹ / ₂
5 or more	³ / ₄	⁷ / ₈	³ / ₄

*6 ft maximum length.

Exceptions to table: ³/₈ inch nominal diameter or ¹/₂ inch OD minimum size for

clothes washing or dishwashing machines, unless larger size is recommended by the fixture manufacturer. ¹/₂ inch nominal diameter or ⁵/₈ inch OD minimum size for flushometer or metering type valves unless otherwise specified in their listing. No galvanized screw piping shall be less than ¹/₂ inch iron pipe size.

(2) *Sizing procedure.* Both hot and cold water piping systems shall be computed by the following method:

(i) *Size of branch.* Start at the most remote outlet on any branch of the hot or cold water piping and progressively count towards the water service connection, computing the total number of fixtures supplied along each section of piping. Where branches are joined together, the number of fixtures on each branch shall be totalled so that no fixture is counted twice. Following down the left-hand column of the preceding table a corresponding number of fixtures will be found. The required pipe or tubing size is indicated in the other columns on the same line.

(ii) A water heater, food waste disposal unit, evaporative cooler or ice maker shall not be counted as a water-using fixture when computing pipe sizes.

(g) *Line valves.* Valves, when installed in the water supply distribution system (except those immediately controlling one fixture supply) and when fully opened, shall have a cross-sectional area of the smallest orifice or opening, through which the water flows, at least equal to the cross-sectional area of the nominal size of the pipe in which the valve is installed.

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§ 3280.610 Drainage systems.

(a) *General.* (1) Each fixture directly connected to the drainage system shall be installed with a water seal trap (§ 3280.606(a)).

(2) The drainage system shall be designed to provide an adequate circulation of air in all piping with no danger of siphonage, aspiration, or forcing of trap seals under conditions of ordinary use.

(b) *Materials*—(1) *Pipe*. Drainage piping must be standard weight galvanized steel, brass, copper tube DWV, listed Scheduled 40 ABS plastic, listed Scheduled 40 PVC plastic, cast iron, or other listed or approved materials.

(2) *Fittings*. Drainage fittings shall be recessed drainage pattern with smooth interior waterways of the same diameter as the piping and shall be of a material conforming to the type of piping used. Drainage fittings shall be designed to provide for a ¼ inch per foot grade in horizontal piping.

(i) Fittings for screw pipe shall be cast iron, malleable iron, brass, or listed plastic with standard pipe threads.

(ii) Fittings for copper tubing shall be cast brass or wrought copper.

(iii) Socket-type fittings for plastic piping shall comply with listed standards.

(iv) Brass or bronze adaptor or wrought copper fittings shall be used to join copper tubing to threaded pipe.

(c) *Drain outlets*. (1) *General*. Each manufactured home shall have only one drain outlet.

(2) *Clearance from drain outlet*. The drain outlet shall be provided with a minimum clearance of 3 inches in any direction from all parts of the structure or appurtenances and with not less than 18 inches unrestricted clearance directly in front of the drain outlet.

(3) *Drain connector*. The drain connector shall not be smaller than the piping to which it is connected and shall be equipped with a water-tight cap or plug matching the drain outlet. The cap or plug shall be permanently attached to the manufactured home or drain outlet.

(4) *Size Requirement*. The drain outlet and drain connector shall not be less than 3 inches inside diameter.

(5) *Preassembly of drain lines*. Section(s) of the drain system, designed to be located underneath the manufactured home or between stories of the manufactured home, are not required to be factory installed when the manufacturer designs the system for site assembly and also provides all materials and components, including piping, fittings, cement, supports, and instructions necessary for proper site installation.

(d) *Fixture connections*. Drainage piping shall be provided with approved or listed inlet fittings for fixture connections, correctly located according to the size and type of fixture to be connected.

(1) *Water closet connection*. The drain connection for each water closet shall be 3 inches minimum inside diameter and shall be fitted with an iron, brass, or listed plastic floor flange adaptor ring securely screwed, soldered or otherwise permanently attached to the drain piping, in an approved manner and securely fastened to the floor.

(2) [Reserved]

(e) *Size of drainage piping*. Fixture drains must be sized as follows:

(1) Fixture drains serving a single lavatory must be a minimum of 1¼ inches in diameter.

(2) Fixture drains serving two or three fixtures must be a minimum of 1½ inches in diameter.

(3) Fixture drains serving four or more fixtures that are individually vented must be a minimum of 2 inches in diameter.

(4) Fixture drains for water closets must be a minimum of 3 inches in diameter.

(f) *Wet-vented drainage system*. Plumbing fixture traps may connect into a wet-vented drainage system which shall be designed and installed to accommodate the passage of air and waste in the same pipe.

(1) *Horizontal piping*. All parts of a wet-vented drainage system, including the connected fixture drains, shall be horizontal except for wet-vented vertical risers which shall terminate with a 1½ inch minimum diameter continuous vent. Where required by structural design, wet-vented drain piping may be offset vertically when other vented fixture drains or relief vents are connected to the drain piping at or below the vertical offsets.

(2) *Size*. A wet-vented drain pipe shall be 2 inches minimum diameter and at least one pipe size larger than the largest connected trap or fixture drain. Not more than three fixtures may connect to a 2-inch diameter wet-vented drain system.

(3) *Length of trap arm*. Fixture traps shall be located within the distance

given in § 3280.611(c)(5). Not more than one trap shall connect to a trap arm.

(g) *Offsets and branch fittings*—(1) *Changes in direction*. Changes in direction of drainage piping shall be made by the appropriate use of approved or listed fittings, and shall be of the following angles: 11¼, 22½, 45, 60, or 90 degrees; or other approved or listed fittings or combinations of fittings with equivalent radius or sweep.

(2) *Horizontal to vertical*. Horizontal drainage lines, connecting with a vertical pipe shall enter through 45-degree “Y” branches, 60-degree “Y” branches, long-turn “TY” branches, sanitary “T” branches, or other approved or listed fittings or combination of fittings having equivalent sweep. Fittings having more than one branch at the same level shall not be used, unless the fitting is constructed so that the discharge from any one branch cannot readily enter any other branch. However, a double sanitary “T” may be used when the drain line is increased not less than two pipe sizes.

(3) *Horizontal to horizontal and vertical to horizontal*. Horizontal drainage lines connecting with other horizontal drainage lines or vertical drainage lines connected with horizontal drainage lines shall enter through 45-degree “Y” branches, long-turn “TY” branches, or other approved or listed fittings or combination of fittings having equivalent sweep.

(h) *Grade of horizontal drainage piping*. Except for fixture connections on the inlet side of the trap, horizontal drainage piping shall be run in practical alignment and have a uniform grade of not less than ¼ inch per foot toward the manufactured home drain outlet. Where it is impractical, due to the structural features or arrangement of any manufactured home, to obtain a grade of ¼ inch per foot, the pipe or piping may have a grade of not less than ⅛ inch per foot, when a full size cleanout is installed at the upper end.

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§ 3280.611 Vents and venting.

(a) *General*. Each plumbing fixture trap shall be protected against siphonage and back pressure, and air circulation shall be ensured throughout all parts of the drainage system by means of vents installed in accordance with the requirements of this section and as otherwise required by this standard.

(b) *Materials*—(1) *Pipe*. Vent piping must be standard weight galvanized steel, brass, copper tube DWV, listed Scheduled 40 ABS plastic, listed Scheduled 40 PVC plastic, cast iron, or other listed or approved materials.

(2) *Fittings*. Appropriate fittings shall be used for all changes in direction or size and where pipes are joined. The material and design of vent fittings shall conform to the type of piping used.

(i) Fittings for screw pipe shall be cast iron, malleable iron, plastic, or brass, with standard pipe threads.

(ii) Fittings for copper tubing shall be cast brass or wrought copper.

(iii) Fittings for plastic piping shall be made to approved applicable standards.

(iv) Brass adaptor fittings or wrought copper shall be used to join copper tubing to threaded pipe.

(v) Listed rectangular tubing may be used for vent piping only providing it has an open cross section at least equal to the circular vent pipe required. Listed transition fittings shall be used.

(c) *Size of vent piping*—(1) *Main vent*. The drain piping for each toilet shall be vented by a 1½ inch minimum diameter vent or rectangular vent of venting cross section equivalent to or greater than the venting cross section of a 1½ inch diameter vent, connected to the toilet drain by one of the following methods:

(i) A 1½ inch diameter (min.) individual vent pipe or equivalent directly connected to the toilet drain within the distance allowed in § 3280.611(c)(5), for 3-inch trap arms undiminished in size through the roof;

(ii) A 1½-inch diameter (min.) continuous vent or equivalent, indirectly connected to the toilet drain piping within the distance allowed in paragraph (c)(5) of this section for 3 inch trap arms through a 2-inch wet vented drain that carries the waste of not more than one