

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 ⅓ 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

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fixture. Sections of the wet vented drain that are 3 inches in diameter are permitted to carry the waste of an unlimited number of fixtures; or

(iii) Two or more vented drains when at least one is wet-vented, or 2-inch diameter (minimum), and each drain is separately connected to the toilet drain. At least one of the drains shall connect within the distance allowed in § 3280.611(c)(5) for 3-inch trap arms.

(2) *Vent pipe areas.* Each individually vented fixture with a 1½ inch or smaller trap shall be provided with a vent pipe equivalent in area to a 1¼ inch nominal pipe size. The main vent, toilet vent and relief vent, and the continuous vent of wet-vented systems shall have an area equivalent to 1½ inch nominal pipe size.

(3) *Common vent.* When two fixture traps located within the distance allowed from their vent have their trap arms connected separately at the same level into an approved double fitting, an individual vent pipe may serve as a common vent without any increase in size.

(4) *Intersecting vents.* Where two or more vent pipes are joined together, no increase in size shall be required; however, the largest vent pipe shall extend full size through the roof.

(5) Distance of fixture trap from vent shall not exceed the values given in the following table:

MAXIMUM DISTANCE OF FIXTURES FROM VENT TRAP	
Size of fixture drain (inches)	Distance trap to vent
1¼ .....	4 ft. 6 in.
1½ .....	4 ft 6 in.
2 .....	5 ft.
3 .....	6 ft.

(d) *Mechanical Vents.* Where mechanical vents are used as a secondary vent system for plumbing fixtures that are protected by traps, the mechanical vents must comply with paragraphs (d)(1) or (2) of this section.

(1) Spring-operated mechanical (anti-siphon) vents must comply with the following:

(i) No more than two fixtures individually protected by the spring-operated mechanical vent may be drained by a common 1½ inch diameter drain.

(ii) The drain size for three or more fixtures individually protected by a spring-operated mechanical vent must be at least 2 inches in diameter.

(iii) Spring-operated mechanical vents are restricted to venting fixtures with 1½ inch traps.

(iv) A spring-operated mechanical vent must be installed in a location that allows a free flow of air and is accessible for inspection, maintenance, and replacement. The sealing function must be at least 6 inches above the top of the trap arm.

(v) Materials for the spring-operated mechanical vents must be as follows:

(A) Cap and housing must be listed acrylonitrile-butadiene-styrene, DWV grade;

(B) Stem must be DWV grade nylon or acetal;

(C) Spring must be stainless steel wire, Type 302; and

(D) Sealing disc must be either:

(1) Neoprene, conforming to CISPI-HSN-85, Specification for Neoprene Rubber Gaskets for HUB and Spigot Cast Iron Soil Pipe and Fittings (incorporated by reference, see § 3280.4), and to ASTM C564-97, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings (incorporated by reference, see § 3280.4); or

(2) Other material, conforming to ASTM C920-02, Standard Specification for Elastomeric Joint Sealants (incorporated by reference, see § 3280.4), and to ASTM D4635-01, Standard Specification for Polyethylene Films Made from Low-Density Polyethylene for General Use and Packaging Applications (incorporated by reference, see § 3280.4).

(2) Gravity-operated mechanical (air admittance valves) vents must comply with the following:

(i) Where installed to vent any fixture, the drain system must have a minimum 1½ inch diameter vent that terminates outside the manufactured home.

(ii) Where gravity-operated mechanical vent devices terminate in the attic cavity, the following requirements must be met:

(A) The attic cavity must be accessible;

(B) The sealing device must be installed a minimum of 6 inches above the insulation materials; and

(C) The attic must be vented in accordance with § 3280.504(c)(1)(i);

(3) Mechanical vents must be installed in accordance with the vent manufacturer's instructions.

(e) *Grade and connections*—(1) *Horizontal vents*. Each vent shall extend vertically from its fixture "T" or point of connection with the waste piping to a point not less than 6 inches above the extreme flood level of the fixture it is venting before offsetting horizontally or being connected with any other vent pipe. Vents for horizontal drains shall connect above the centerline of the drain piping ahead (downstream) of the trap. Where required by structural conditions, vent piping may offset below the rim of the fixture at the maximum angle or height possible.

(f) *Vent terminal*. Vents must terminate through the roof or wall, or to a mechanical vent device in accordance with paragraph (d) of this section.

(1) *Roof extension*. Each vent pipe must extend through its flashing and terminate vertically. Vents that extend through the roof must extend undiminished in size, not less than 2 inches above the roof. Vent openings must be at least 3 feet away from any motor-driven air intake that opens into any habitable area.

(2) *Wall extensions*. Extensions through exterior walls must terminate downward, have a screen to prevent entrance of birds and rodents, and be located as follows:

(i) Extensions must not be located beneath a door, window, or other opening;

(ii) Extensions must be a minimum of 10 feet above the finished floor;

(iii) Extensions must be located a minimum of 2 feet above any building opening that is within 10 feet horizontally of any extension; and

(iv) Extensions must not terminate under an overhang with soffit vents.

(3) *Flashing*. The opening around each vent pipe shall be made watertight by an adequate flashing or flashing material.

(g) *Vent caps*. Vent caps, if provided, shall be of the removable type (without removing the flashing from the roof). When vent caps are used for roof space ventilation and the caps are identical to vent caps used for the plumbing sys-

tem, plumbing system caps shall be identified with permanent markings.

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### § 3280.612 Tests and inspection.

(a) *Water system*. All water piping in the water distribution system must be subjected to a pressure test. The test must be made by subjecting the system to air or water at 80 psi + or - 5 psi for 15 minutes without loss of pressure. The water used for the test must be obtained from a potable water source.

(b) *Drainage and vent system and plumbing fixtures*. The waste and vent system shall be tested by one of the three following alternate methods for evidence or indication of leakage:

(1) *Water test*. Before plumbing fixtures are connected, all of the openings into the piping shall be plugged and the entire piping system subjected to a static water test for 15 minutes by filling it with water to the top of the highest vent opening. There shall be no evidence of leakage.

(2) *Air test*. After all fixtures have been installed, the traps filled with water, and the remaining openings securely plugged, the entire system shall be subjected to a 2-inch (manometer) water column air pressure test. If the system loses pressure, leaks may be located with smoke pumped into the system, or with soap suds spread on the exterior of the piping (Bubble test).

(3) *Flood level test*. The manufactured home shall be in a level position, all fixtures shall be connected, and the entire system shall be filled with water to the rim of the water closet bowl. (Tub and shower drains shall be plugged). After all trapped air has been released, the test shall be sustained for not less than 15 minutes without evidence of leaks. Then the system shall be unplugged and emptied. The waste piping above the level of the water closet bowl shall then be tested and show no indication of leakage when the high fixtures are filled with water and emptied simultaneously to obtain the maximum possible flow in the drain piping.