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(i) A 1½ inch minimum diameter piping shall be required for one and not more than three individually vented fixtures.

(ii) A 2-inch minimum diameter piping shall be required for four or more fixtures individually vented.

(iii) A 3-inch minimum diameter piping shall be required for water closets.

(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 can-

not 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.

[40 FR 58752, Dec. 18, 1975. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 52 FR 4586, Feb. 12, 1987; 58 FR 55015, Oct. 25, 1993]

§ 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 shall be standard weight steel, wrought iron, brass, copper tube DWV, listed plastic, cast iron or other approved or listed 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 §3280.611(c)(5) for 3 inch trap arms through a 2-inch wet vented drain that carries the waste of not more than one fixture, 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) *Anti-siphon trap vent.* An anti-siphon trap vent may be used as a secondary vent system for plumbing fixtures protected by traps not larger than 1½ inches, when installed in accordance with the manufacturers' recommendations and the following conditions:

(1) Not more than two fixtures individually protected by the device shall be drained by a common 1½ inch drain.

(2) Minimum drain size for three or more fixtures individually protected by the device shall be 2 inches.

(3) A primary vent stack must be installed to vent the toilet drain at the point of heaviest drainage fixture unit loading.

(4) The device shall be installed in a location that permits a free flow of air and shall be accessible for inspection, maintenance, and replacement and the sealing function shall be at least 6 inches above the top of the trap arm.

(5) Materials for the anti-siphon trap vent shall be as follows:

(i) Cap and housing shall be listed acrylonitrile-butadiene-styrene, DWV grade;

(ii) Stem shall be DWV grade nylon or acetal;

(iii) Spring shall be stainless steel wire, type 302;

(iv) Sealing disc shall be neoprene, conforming to CISPI-HSN-85, the Specification for Neoprene Rubber Gaskets for HUB and Spigot Cast Iron Soil Pipe and Fittings, and ASTM C 564-88, Standard Specification for Rubber Gaskets for Case Iron Soil Pipe and Fittings, or, Silicone Rubber, Low and High Temperature and Tear Resistant, Conforming to Rubber, Silicone, FS ZZ-R-765B-1970, With 1971 Amendment

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1; and Liners, Case, and Sheet, Overwrap; Water-Vapor Proof or Waterproof, Flexible, MIL-L-10547E-1975.

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

(2) *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 system, plumbing system caps shall be identified with permanent markings.

[40 FR 58752, Dec. 18, 1975, as amended at 42 FR 961, Jan. 4, 1977. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 58 FR 55015, Oct. 25, 1993]

§ 3280.612 Tests and inspection.

(a) *Water system*. All water piping in the water distribution system shall be subjected to a pressure test. The test shall be made by subjecting the system to air or water at 100 psi for 15 minutes without loss of pressure.

(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.

(c) *Fixture test*. The plumbing fixtures and connections shall be subjected to a flow test by filling them with water and checking for leaks and retarded flow while they are being emptied.

(d) *Shower compartments*. Shower compartments and receptors shall be tested for leaks prior to being covered by finish material. Each pan shall be filled with water to the top of the dam for not less than 15 minutes without evidence of leakage.

[40 FR 58752, Dec. 18, 1975, as amended at 42 FR 961, Jan. 4, 1977; 42 FR 54383, Oct. 5, 1977. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 58 FR 55015, Oct. 25, 1993]

Subpart H—Heating, Cooling and Fuel Burning Systems

§ 3280.701 Scope.

Subpart H of this standard covers the heating, cooling and fuel burning equipment installed within, on, or external to a manufactured home.