PART 3280—MANUFACTURED HOME CONSTRUCTION AND SAFETY STANDARDS

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3280.1 Scope.

This standard covers all equipment and installations in the design, construction, transportation, fire safety, plumbing, heat-producing and electrical systems of manufactured homes which are designed to be used as dwelling units. This standard seeks to establish performance requirements. In certain instances, however, the use of specific requirements is necessary.

3280.2 Definitions.

Definitions in this subpart are those common to all subparts of the standard and are in addition to the definitions provided in individual parts. The definitions are as follows:

Approved, when used in connection with any material, appliance or construction, means complying with the requirements of the Department of Housing and Urban Development.

Bay window—a window assembly whose maximum horizontal projection is not more than two feet from the plane of an exterior wall and is elevated above the floor level of the home.

Certification label means the approved form of certification by the manufacturer that, under §3280.8, is permanently affixed to each transportable section of each manufactured home manufactured for sale in the United States.

Dwelling unit means one or more habitable rooms which are designed to be occupied by one family with facilities for living, sleeping, cooking and eating.

Equipment includes materials, appliances, devices, fixtures, fittings or accessories both in the construction of, and in the fire safety, plumbing, heat-producing and electrical systems of manufactured homes.

Federal manufactured home construction and safety standard means a reasonable standard for the construction, design, and performance of a manufactured home which meets the needs of the public including the need for quality, durability, and safety.

Installations means all arrangements and methods of construction, as well as fire safety, plumbing, heat-producing and electrical systems used in manufactured homes.

Labeled means a label, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling is indicated compliance with nationally recognized standards or tests to determine suitable usage in a specified manner.

Length of a manufactured home means its largest overall length in the traveling mode, including cabinets and other projections which contain interior space. Length does not include bay windows, roof projections, overhangs, or eaves under which there is no interior space.
Listed or certified means included in a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

Manufacturer means any person engaged in manufacturing or assembling manufactured homes, including any person engaged in importing manufactured homes for resale.

Manufactured home means a structure, transportable in one or more sections, which in the traveling mode is 8 body feet or more in width or 40 body feet or more in length or which when erected on-site is 320 or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air-conditioning, and electrical systems contained in the structure. This term includes all structures that meet the above requirements except the size requirements and with respect to which the manufacturer voluntarily files a certification pursuant to §3282.13 of this chapter and complies with the construction and safety standards set forth in this part 3280. The term does not include any self-propelled recreational vehicle. Calculations used to determine the number of square feet in a structure will include the total of square feet for each transportable section comprising the completed structure and will be based on the structure’s exterior dimensions measured at the largest horizontal projections when erected on site. These dimensions will include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows. Nothing in this definition should be interpreted to mean that a manufactured home necessarily meets the requirements of HUD’s Minimum Property Standards (HUD Handbook 4900.1) or that it is automatically eligible for financing under 12 U.S.C. 1709(b).

Manufactured home construction means all activities relating to the assembly and manufacture of a manufactured home including, but not limited to, those relating to durability, quality and safety.

Manufactured home safety means the performance of a manufactured home in such a manner that the public is protected against any unreasonable risk of the occurrence of accidents due to the design or construction of such manufactured home, or any unreasonable risk of death or injury to the user or to the public if such accidents do occur.

Registered Engineer or Architect means a person licensed to practice engineering or architecture in a state and subject to all laws and limitations imposed by the state’s Board of Engineering and Architecture Examiners and who is engaged in the professional practice of rendering service or creative work requiring education, training and experience in engineering sciences and the application of special knowledge of the mathematical, physical and engineering sciences in such professional or creative work as consultation, investigation, evaluation, planning or design and supervision of construction for the purpose of securing compliance with specifications and design for any such work.

Secretary means the Secretary of Housing and Urban Development, or an official of the Department delegated the authority of the Secretary with respect to title VI of Pub. L. 93–383.

State includes each of the several States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, the Virgin Islands, the Canal Zone, and American Samoa.

Width of a manufactured home means its largest overall width in the traveling mode, including cabinets and other projections which contain interior space. Width does not include bay windows, roof projections, overhangs, or eaves under which there is no interior space.

§ 3280.3 Manufactured home procedural and enforcement regulations and consumer manual requirements.

A manufacturer must comply with the requirements of this part 3280, part 3282 of this chapter, and 42 U.S.C. 5416.

[61 FR 18250, Apr. 25, 1996]

§ 3280.4 Incorporation by reference.

(a) The specifications, standards and codes of the following organizations are incorporated by reference in 24 CFR part 3280 (this Standard) pursuant to 5 U.S.C. 552(a) and 1 CFR part 51 as though set forth in full. The incorporation by reference of these standards has been approved by the Director of the Federal Register. Reference standards have the same force and effect as this Standard (24 CFR part 3280) except that whenever reference standards and this Standard are inconsistent, the requirements of this Standard prevail to the extent of the inconsistency.

(b) The abbreviations and addresses of organizations issuing the referenced standards appear below. Reference standards which are not available from their producer organizations may be obtained from the Office of Manufactured Housing and Regulatory Functions, Manufactured Housing and Construction Standards Division, U.S. Department of Housing and Urban Development, 451 Seventh Street, SW., room B–133, Washington, DC 20410.


AFPA (previously NFPA)—American Forest and Paper Association, 1250 Connecticut Avenue, NW., Washington, DC 20036 (previously named NFPA-National Forest Products Association)

AGA—American Gas Association, 8501 East Pleasant Valley Road, Cleveland, Ohio 44131

AISC—American Institute of Steel Construction, One East Wacker Drive, Chicago, IL 60601

AISI—American Iron and Steel Institute, 1101 17th Street, NW., Washington, DC 20036

AITC—American Institute of Timber Construction, 11418 SE Mill Plain Blvd., suite 415, Vancouver, Washington 98684

ANSI—American National Standards Institute, 1430 Broadway, New York, New York 10018

APA—American Plywood Association, P.O. Box 11700, Tacoma, Washington 98411

ARI—Air Conditioning and Refrigeration Institute, 1501 Wilson Blvd., 6th Floor, Arlington, VA 22209–2493

ASCE—American Society of Civil Engineers, 345 East 47th Street, New York, New York 10017–2398

ASHRAE—American Society of Heating, Refrigeration and Air Conditioning Engineers, 1791 Tulle Circle, NE., Atlanta, Georgia 30329

ASME—American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017

ASSE—American Society of Sanitary Engineering, P.O. Box 40962, Bay Village, Ohio 44140


CISPI—Cast Iron Soil Pipe Institute, 5959 Shallowford Road, suite 419, Chattanooga, TN 37421


FS—Federal Specifications, General Services Administration, Specifications Branch, room 6539, GSA Building, 7th and D Streets, SW., Washington, DC 20407

HPVA (previously HPMA)—Hardwood Plywood and Veneer Association, P.O. Box 2789, Reston, VA 20190 (previously named HPMA Hardwood Plywood Manufacturers Association)

HUD-FHA—Department of Housing and Urban Development, 451 Seventh Street, SW., Washington, DC 20410

HUD User, 11491 Sunset Hills Road, Reston, VA 20190–5254

IAPMO—International Association of Plumbing and Mechanical Officials, 20001 Walnut Drive South, Walnut, CA 91784–2825

ITT—IIT Research Institute, 18 West 39th Street, Chicago, IL 60616

MIL—Military Specifications and Standards, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120

NEMA—National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209

NER—International Code Council Evaluation Service (previously known as National Evaluation Service), 5960 Workman Mill Road, Whittier, CA 90601–0548

NFPA—National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

NPA—National Particleboard Association, 8984 Georgia Avenue, Suite 320, Silver Spring, MD 20910

NFRC—National Fenestration Rating Council, 8984 Georgia Avenue, Suite 320, Silver Spring, MD 20910

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§ 3280.5 Data plate.

Each manufactured home shall bear a data plate affixed in a permanent manner near the main electrical panel or other readily accessible and visible location. Each data plate shall be made of material that will receive typed information as well as preprinted information, and which can be cleaned of ordinary smudges or household dirt without removing information contained on the data plate; or the data plate shall be covered in a permanent manner with materials that will make it possible to clean the data plate of ordinary dirt and smudges without obscuring the information. Each data plate shall contain not less than the following information:

(a) The name and address of the manufacturing plant in which the manufactured home was manufactured.

(b) The serial number and model designation of the unit, and the date the unit was manufactured.

(c) The statement:

This manufactured home is designed to comply with the Federal Manufactured Home Construction and Safety Standards in force at the time of manufacture.

(d) A list of the certification label(s) number(s) that are affixed to each transportable manufactured section under § 3280.8.

(e) A list of major factory-installed equipment, including the manufacturer’s name and the model designation of each appliance.

(f) Reference to the roof load zone and wind load zone for which the home is designed and duplicates of the maps as set forth in § 3280.305(c). This information may be combined with the heating/cooling certificate and insulation zone map required by §§ 3280.510 and 3280.511. The Wind Zone Map on the Data Plate shall also contain the statement:

This home has not been designed for the higher wind pressures and anchoring provisions required for ocean/coastal areas and should not be located within 1500′ of the coastline in Wind Zones II and III, unless the home and its anchoring and foundation system have been designed for the increased requirements specified for Exposure D in ANSI/ASCE 7–88.

(g) The statement:

This home has—has not—(appropriate blank to be checked by manufacturer) been equipped with storm shutters or other protective coverings for windows and exterior door openings. For homes designed to be located in Wind Zones II and III, which have not been provided with shutters or equivalent covering devices, it is strongly recommended that the home be made ready to be equipped with these devices in accordance with the method recommended in the manufacturers printed instructions.

(h) The statement: “Design Approval by”, followed by the name of the agency that approved the design.

§ 3280.6 Serial number.

(a) A manufactured home serial number which will identify the manufacturer and the state in which the manufactured home is manufactured, must be stamped into the foremost cross member. Letters and numbers must be $\frac{3}{8}$ inch minimum in height. Numbers must not be stamped into hitch assembly or drawbar.
§ 3280.7 Excluded structures.

Certain structures may be excluded from these Standards as modular homes under 24 CFR 3282.12.

[52 FR 581, Feb. 12, 1987]

§ 3280.8 Waivers.

(a) Where any material piece of equipment, or system which does not meet precise requirements or specifications set out in the standard is shown, to the satisfaction of the Secretary, to meet an equivalent level of performance, the Secretary may waive the specifications set out in the Standard for that material, piece of equipment, or system.

(b) Where the Secretary is considering issuing a waiver to a Standard, the proposed waiver shall be published in the FEDERAL REGISTER for public comment, unless the Secretary, for good cause, finds that notice is impractical, unnecessary or contrary to the public interest, and incorporates into the waiver that finding and a brief statement of the reasons therefor.

(c) Each proposed and final waiver shall include:

(1) A statement of the nature of the waiver; and

(2) Identification of the particular standard affected.

(d) All waivers shall be published in the FEDERAL REGISTER and shall state their effective date. Where a waiver has been issued, the requirements of the Federal Standard to which the waiver relates may be met either by meeting the specifications set out in the Standard or by meeting the requirements of the waiver published in the FEDERAL REGISTER.

[58 FR 5503, Oct. 25, 1993]

§ 3280.9 Interpretative bulletins.

Interpretative bulletins may be issued for the following purposes:

(a) To clarify the meaning of the Standard; and

(b) To assist in the enforcement of the Standard.

[58 FR 5503, Oct. 25, 1993]

§ 3280.10 Use of alternative construction.

Requests for alternative construction can be made pursuant to 24 CFR 3282.14 of this chapter.

[58 FR 5503, Oct. 25, 1993]

§ 3280.11 Certification label.

(a) A permanent label shall be affixed to each transportable section of each manufactured home for sale or lease in the United States. This label shall be separate and distinct from the data plate which the manufacturer is required to provide under §3280.5 of the standards.

(b) The label shall be approximately 2 in. by 4 in. in size and shall be permanently attached to the manufactured home by means of 4 blind rivets, drive screws, or other means that render it difficult to remove without defacing it. It shall be etched on 0.32 in. thick aluminum plate. The label number shall be etched or stamped with a 3 letter designation which identifies the production inspection primary inspection agency and which the Secretary shall assign. Each label shall be marked with a 6 digit number which the label supplier shall furnish. The labels shall be stamped with numbers sequentially.

(c) The label shall read as follows:

As evidenced by this label No. ABC 000001, the manufacturer certifies to the best of the manufacturer’s knowledge and belief that this manufactured home has been inspected in accordance with the requirements of the Department of Housing and Urban Development and is constructed in conformance with the Federal manufactured home construction and safety standards in effect on the date of manufacture. See date plate.

(d) The label shall be located at the tail-light end of each transportable section of the manufactured home approximately one foot up from the floor and one foot in from the road side, or as near that location on a permanent part of the exterior of the manufactured home unit as practicable. The road side is the right side of the manufactured home when one views the
manufactured home from the tow bar end of the manufactured home.

§ 3280.103 Light and ventilation.

(a) Lighting. Each habitable room shall be provided with exterior windows and/or doors having a total glazed area of not less than 8 percent of the gross floor area.

(1) Kitchens, bathrooms, toilet compartments, laundry areas, and utility rooms may be provided with artificial light in place of windows.

(2) Rooms and areas may be combined for the purpose of providing the required natural lighting provided that at least one half of the common wall area is open and unobstructed, and the open area is at least equal to 10 percent of the combined floor area or 25 square feet whichever is greater.

(b) Whole-house ventilation. Each manufactured home must be provided with whole-house ventilation having a minimum capacity of \(0.035 \, \text{ft}^3/\text{min}/\text{ft}^2\) of interior floor space or its hourly average equivalent. This ventilation capacity must be in addition to any openable window area. In no case shall the installed ventilation capacity of the system be less than 50 cfm nor more than 90 cfm. The following criteria must be adhered to:

(1) The ventilation capacity must be provided by a mechanical system or a combination passive and mechanical system. The ventilation system or provisions for ventilation must not create a positive pressure in Uo Value Zone 2 and Zone 3 or a negative pressure condition in Uo Value Zone 1. Mechanical systems must be balanced. Combination passive and mechanical systems must have adequately sized inlets or exhaust to release any unbalanced pressure. Temporary pressure imbalances due to gusting or high winds are permitted.

(2) The ventilation system or provisions for ventilation must exchange air directly with the exterior of the home, except the ventilation system, or provisions for ventilation must not draw or expel air with the space underneath the home. The ventilation system or provisions for ventilation must not draw or expel air into the floor, wall, or ceiling/roof systems, even if those systems are vented. The ventilation system must be designed to ensure that outside air is distributed to all bedrooms and main living areas. The combined use of undercut doors or transom grills connecting those areas to the room where the mechanical system is located is deemed to meet this requirement.

(3) The ventilation system or a portion of the system is permitted to be integral with the home’s heating or cooling system. The system must be capable of operating independently of the heating or cooling modes. A ventilation system that is integral with the heating or cooling system is to be listed as part of the heating and cooling system or listed as suitable for use with that system.

(4) A mechanical ventilation system, or mechanical portion thereof, must be
§ 3280.104 Ceiling heights.

(a) Every habitable room and bathroom shall have a minimum ceiling height of not less than 7 feet, 0 inches for a minimum of 50 percent of the room’s floor area. The remaining area may have a ceiling with a minimum height of 5 feet, 0 inches. Minimum height under dropped ducts, beams, etc. shall be 6 feet, 4 inches.

(b) Hallways and foyers shall have a minimum ceiling height of 6 feet, 6 inches.

§ 3280.105 Exit facilities; exterior doors.

(a) Number and location of exterior doors. Manufactured homes shall have a minimum of two exterior doors located remote from each other.

(1) Required egress doors shall not be located in rooms where a lockable interior door must be used in order to exit.

(2) In order for exit doors to be considered remote from each other, they must comply with all of the following:

(i) Both of the required doors must not be in the same room or in a group of rooms which are not defined by fixed walls.

(ii) Single wide units. Doors may not be less than 12 ft. c-c from each other as measured in any straight line direction regardless of the length of path of travel between doors.

(iii) Double wide units. Doors may not be less than 20 ft. c-c from each other as measured in any straight line direction regardless of the length of path of travel between doors.

(iv) One of the required exit doors must be accessible from the doorway of each bedroom without traveling more than 35 ft.

(b) Door design and construction. (1) Exterior swinging doors shall be constructed in accordance with §3280.405 the “Standard for Swinging Exterior Passage Doors for Use in Manufactured Homes”. Exterior sliding glass doors shall be constructed in accordance with §3280.403 the “Standard for Windows and Sliding Glass Doors Used in Manufactured Homes”.

(2) All exterior swinging doors shall provide a minimum 28 inch wide by 74 inch high clear opening. All exterior sliding glass doors shall provide a minimum 28 inch wide by 72 inch high clear opening.

(3) Each swinging exterior door other than screen or storm doors shall have a key-operated lock that has a deadlocking latch or a key-operated dead bolt with a passage latch. Locks shall not require the use of a key for operation from the inside.
§ 3280.106 Exit facilities; egress windows and devices.

(a) Every room designed expressly for sleeping purposes, unless it has an exit door (see §3280.105), shall have at least one outside window or approved exit device which meets the requirements of §3280.404, the “Standard for Egress Windows and Devices for Use in Manufactured Homes.”

(b) The bottom of the window opening shall not be more than 36 inches above the floor.

(c) Locks, latches, operating handles, tabs, and any other window screen or storm window devices which need to be operated in order to permit exiting, shall not be located in excess of 54 inches from the finished floor.

(d) Integral rolled-in screens shall not be permitted in an egress window unless the window is of the hinged-type.

§ 3280.107 Interior privacy.

Bathroom and toilet compartment doors shall be equipped with a privacy lock.

§ 3280.108 Interior passage.

(a) Interior doors having passage hardware without a privacy lock, or with a privacy lock not engaged, shall open from either side by a single movement of the hardware mechanism in any direction.

(b) Each manufactured home interior door, when provided with a privacy lock, shall have a privacy lock that has an emergency release on the outside to permit entry when the lock has been locked by a locking knob, lever, button, or other locking device on the inside.

§ 3280.109 Room requirements.

(a) Every manufactured home shall have at least one living area with not less than 150 sq. ft. of gross floor area.

(b) Rooms designed for sleeping purposes shall have a minimum gross square foot floor area as follows:

1. All bedrooms shall have at least 50 sq. ft. of floor area.
2. Bedrooms designed for two or more people shall have 70 sq. ft. of floor area plus 50 sq. ft. for each person in excess of two.

(c) Every room designed for sleeping purposes shall have accessible clothes hanging space with a minimum inside depth of 22 inches and shall be equipped with a rod and shelf.

§ 3280.110 Minimum room dimensions.

The gross floor area required by §3280.110 (a) and (b) shall have no clear horizontal dimension less than 5 feet except as permitted by §3280.102(a).

§ 3280.111 Toilet compartments.

Each toilet compartment shall be a minimum of 30 inches in width, except, when the toilet is located adjacent to the short dimension of the tub, the distance from the tub to the center line of the toilet shall not be less than 12 inches. At least 21 inches of clear space shall be provided in front of each toilet.

§ 3280.112 Hallways.

Hallways shall have a minimum horizontal dimension of 28 inches measured from the interior finished surface to the interior finished surface of the opposite wall. When appliances are installed in a laundry area, the measurement shall be from the front of the appliance to the opposite finished interior surface. When appliances are not installed and a laundry area is provided, the area shall have a minimum clear depth of 27 inches in addition to
§ 3280.113 Glass and glazed openings.

(a) Windows and sliding glass doors. All windows and sliding glass doors shall meet the requirements of § 3280.403 the “Standard for Windows and Sliding Glass Doors Used in Manufactured Homes”.

(b) Safety glazing. Glazing in all entrance or exit doors, sliding glass doors, units (fixed or moving sections), unframed glass doors, unbacked mirrored wardrobe doors (i.e., mirrors not secured to a backing capable of being the door itself), shower and bathtub enclosures and surrounds to a height of 6 feet above the bathroom floor level, storm doors or combination doors, and in panels located within 12 inches on either side of exit or entrance doors shall be of a safety glazing material. Safety glazing material is considered to be any glazing material capable of passing the requirements of Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings, ANSI Z97.1–1984.


Subpart C—Fire Safety

Source: 49 FR 32008, Aug. 9, 1984, unless otherwise noted.

§ 3280.201 Scope.

The purpose of this subpart is to set forth requirements that will assure reasonable fire safety to the occupants by reducing fire hazards and by providing measures for early detection.


§ 3280.202 Definitions.

The following definitions are applicable to subparts C, H, and I of the Standards:

- **Combustible material:** Any material not meeting the definition of limited-combustible or non-combustible material.
- **Flame-spread rating:** The measurement of the propagation of flame on the surface of materials or their assemblies as determined by recognized standard tests conducted as required by this subpart.
- **Interior finish:** The surface material of walls, fixed or movable partitions, ceilings, columns, and other exposed interior surfaces affixed to the home’s structure including any materials such as paint or wallpaper and the substrate to which they are applied. Interior finish does not include:
  1. Trim and sealant 2 inches or less in width adjacent to the cooking range and in furnace and water heater spaces provided it is installed in accordance with the requirements of § 3280.203(b)(3) or (4), and trim 6 inches or less in width in all other areas;
  2. Windows and frames;
  3. Single doors and frames and a series of doors and frames not exceeding 5 feet in width;
  4. Skylights and frames;
  5. Casings around doors, windows, and skylights not exceeding 4 inches in width;
  6. Furnishings which are not permanently affixed to the home’s structure;
  7. Baseboards not exceeding 6 inches in height;
  8. Light fixtures, cover plates of electrical receptacle outlets, switches, and other devices;
  9. Decorative items attached to walls and partitions (i.e., pictures, decorative objects, etc.) constituting no more than 10% of the aggregate wall surface area in any room or space not more than 32 square feet in surface area, whichever is less;
  10. Plastic light diffusers when suspended from a material which meets the interior finish provisions of § 3280.203(b);
  11. Coverings and surfaces of exposed wood beams; and
  12. Decorative items including the following:
§ 3280.203 Flame spread limitations and fire protection requirements.

(a) Establishment of flame spread rating. The surface flame spread rating of interior-finish material must not exceed the value shown in §3280.203(b) when tested by Standard Test Method for Surface Burning Characteristics of Building Materials, ASTM E84–01, 2001, or Standard Method of Test of Surface Burning Characteristics of Building Materials NFPA 255, 1996, except that the surface flame spread rating of interior-finish materials required by §3280.203(b)(5) and (6) may be determined by using the Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source, ASTM E 162–94. However, the following materials need not be tested to establish their flame spread rating unless a lower rating is required by the standards in this part:

1. Flame-spread rating—76 to 200.
   (i) .035-inch or thicker high pressure laminated plastic panel countertop;
   (ii) 3⁄4-inch or thicker unfinished plywood with phenolic or urea glue;
   (iii) Unfinished dimension lumber (1-inch or thicker nominal boards);
   (iv) 3⁄8-inch or thicker unfinished particleboard with phenolic or urea binder;
   (v) Natural gum-varnished or latex- or alkyd-painted:
      (A) 3⁄4-inch or thicker plywood, or
      (B) 3⁄8-inch or thicker particleboard, or
      (C) 1-inch or thicker nominal board;
   (vi) 5⁄16-inch gypsum board with decorative wallpaper; and
   (vii) 5⁄16-inch or thicker unfinished hardboard,
2. Flame-spread rating—25 to 200,
   (i) Painted metal;
   (ii) Mineral-base acoustic tile;
   (iii) 5⁄16-inch or thicker unfinished gypsum wallboard (both latex- or alkyd-painted); and
   (iv) Ceramic tile.

(1) The interior finish of all walls, columns, and partitions shall not have a flame spread rating exceeding 200 except as otherwise specified herein.
(2) Ceiling interior finish shall not have a flame spread rating exceeding 75.
(3) Walls adjacent to or enclosing a furnace or water heater and ceilings above them shall have an interior finish with a flame spread rating not exceeding 25. Sealants and other trim materials 2 inches or less in width used to finish adjacent surfaces within these spaces are exempt from this provision provided that all joints are completely supported by framing members or by materials having a flame spread rating not exceeding 25.
(4) Exposed interior finishes adjacent to the cooking range shall have a flame spread rating not exceeding 50, except that backsplashes not exceeding 6 inches in height are exempted. Adjacent surfaces are the exposed vertical surfaces between the range top height and the overhead cabinets and/or ceiling and within 6 horizontal inches of the cooking range. (Refer also to §3280.204(a), Kitchen Cabinet Protection.) Sealants and other trim materials 2 inches or less in width used to finish adjacent surfaces are exempt from this provision provided that all
§ 3280.204 Kitchen cabinet protection.

(a) The bottom and sides of combustible kitchen cabinets over cooking ranges shall be protected with at least 5/16-inch thick gypsum board or equivalent limited combustible material. One-inch nominal framing members and trim are exempted from this requirement. The cabinet area over the cooking range or cooktops shall be protected by a metal hood (26-gauge sheet metal, or .017 stainless steel, or .024 aluminum, or .020 copper) with not less than a 3-inch eyebrow projecting horizontally from the front cabinet face.

(b) The 3-inch metal eyebrow required by paragraph (a) of this section will project from the front and rear cabinet faces when there is no adjacent surface behind the range, or the 5/16-inch thick gypsum board or equivalent material shall be extended to cover all exposed rear surfaces of the cabinet.

(c) The metal hood required by paragraphs (a) and (b) of this section can be omitted when an oven of equivalent metal protection is installed between the cabinet and the range and all exposed cabinet surfaces are protected as described in paragraph (a) of this section.

(d) When a manufactured home is designed for the future installation of a cooking range, the metal hood and cabinet protection required by paragraph (a) of this section and the wall-facing protection behind the range required by § 3280.203 shall be installed in the factory.

(e) Vertical clearance above cooking top. Ranges shall have a vertical clearance above the cooking top of not less than 24 inches to the bottom of combustible cabinets.

§ 3280.205 Carpeting.

Carpeting shall not be used in a space or compartment designed to contain only a furnace and/or water heater. Carpeting may be used in other areas where a furnace or water heater is installed, provided that it is not located under the furnace or water heater.

§ 3280.206 Fireblocking.

(a) General. Fireblocking must comply with the requirements of this section. The integrity of all fireblocking materials must be maintained.

(b) Fireblocking materials. Fireblocking must consist of the following materials:

(1) Minimum one inch nominal lumber, 5/16 inch thick gypsum board, or equivalent fire resistive materials; or
§ 3280.207 Requirements for foam plastic thermal insulating materials.

(a) General. Foam plastic thermal insulating materials shall not be used within the cavity of walls (not including doors) or ceilings or be exposed to the interior of the home unless:

(1) The foam plastic insulating material is protected by an interior finish of ¾-inch thick gypsum board or equivalent material for all cavities where the material is to be installed; or

(2) The foam plastic is used as a sheathing or siding backerboard, and it:

(i) Has a flame spread rating of 75 or less and a smoke-developed rating of 450 or less (not including outer covering of sheathing);

(ii) Does not exceed ¾-inch in thickness; and

(iii) Is separated from the interior of the manufactured home by a minimum of 2 inches of mineral fiber insulation or an equivalent thermal barrier; or

(3) The foam plastic insulating material has been previously accepted by the Department for use in wall and/or ceiling cavities of manufactured homes, and it is installed in accordance with any restrictions imposed at the time of that acceptance; or

(4) The foam plastic insulating material has been tested as required for its location in wall and/or ceiling cavities in accordance with testing procedures described in the Illinois Institute of Technology Research Institute (IIT) Report, "Development of Mobile Home Fire Test Methods to Judge the Fire-Safe Performance of Foam Plastic Sheathing and Cavity Insulation. IITRI Fire and Safety Research Project J-6461, 1979" or other full-scale fire tests accepted by HUD, and it is installed in a manner consistent with the way the material was installed in the foam plastic test module. The materials must be capable of meeting the following acceptance criteria required for their location:

(i) Wall assemblies. The foam plastic system shall demonstrate equivalent or superior performance to the control module as determined by:

(A) Time to reach flashover (600 °C in the upper part of the room);

(B) Time to reach an oxygen (O2) level of 14% (rate of O2 depletion), a carbon monoxide (CO) level of 1%, a carbon dioxide (CO2) level of 6%, and a smoke level of 0.26 optical density/meter measured at 5 feet high in the doorway; and

(C) Rate of change concentration for O2, CO, CO2 and smoke measured 3 inches below the top of the doorway.

(ii) Ceiling assemblies. A minimum of three valid tests of the foam plastic system and one valid test of the control module shall be evaluated to determine if the foam plastic system demonstrates equivalent or superior performance to the control module. Individual factors to be evaluated include intensity of cavity fire (temperature-time) and post-test damage.

(iii) Post-test damage assessment for wall and ceiling assemblies. The overall performance of each total system shall also be evaluated in determining the acceptability of a particular foam plastic insulating material.

(b) All foam plastic thermal insulating materials used in manufactured
§ 3280.208 Smoke alarm requirements.

(a) Labeling. Each smoke alarm required under paragraph (b) of this section must conform with the requirements of UL 217, Single and Multiple Station Smoke Alarms, dated January 4, 1999 (incorporated by reference, see §3280.4), or UL 268, Smoke Detectors for Fire Protective Signaling Systems, dated January 4, 1999 (incorporated by reference, see §3280.4), and must bear a label to evidence conformance.

(b) Required smoke alarm locations. (1) At least one smoke alarm must be installed in each of the following locations:
   (i) To protect both the living area and kitchen space. Manufacturers are encouraged to locate the alarm in the living area remote from the kitchen and cooking appliances. A smoke alarm located within 20 feet horizontally of a cooking appliance must incorporate a temporary silencing feature or be of a photoelectric type.
   (ii) In each room designed for sleeping.
   (iii) On the ceiling of the upper level near the top or above each stairway, other than a basement stairway, in any multistory home completed in accordance with this part or part 3282 of this chapter. The alarm must be located so that smoke rising in the stairway cannot be prevented from reaching the alarm by an intervening door or obstruction.
   (2) For each home designed to be placed over a basement, the manufacturer must provide a smoke alarm for the basement and must install at the factory an electrical junction box for the installation of this smoke alarm and for its interconnection to other smoke alarms required by this section. The instructions for installers and information for homeowners required in paragraph (f) of this section must clearly indicate that a smoke alarm should be installed and is to be located on the basement ceiling near the stairway.
   (3) A smoke alarm required under this section must not be placed in a location that impairs its effectiveness or in any of the following locations:
      (i) Within 3 feet horizontally from any discharge grille when a home is equipped or designed for future installation of a roof-mounted evaporative cooler or other equipment discharging conditioned air through a ceiling grille into the living space; and
      (ii) In any location or environment that is prohibited by the terms of its listing, except as permitted by this section.

(c) Mounting requirements. (1) Except in rooms with peaked sloping or shed sloping ceilings with a slope of more than 1.5/12 or as permitted pursuant to paragraph (e) of this section, smoke alarms must be mounted either:
   (i) On the ceiling at least 4 inches from each wall; or
   (ii) On a wall with the top of the alarm not less than 4 inches below the ceiling, and not farther from the ceiling than 12 inches or the distance from the ceiling specified in the smoke alarm manufacturer’s listing and instructions, whichever is less.
   (2) Except as permitted pursuant to paragraph (e) of this section, in rooms with peaked sloping ceilings with a slope of more than 1.5/12, smoke alarms must be mounted on the ceiling within 3 feet, measured horizontally, from the peak of the ceiling; at least 4 inches, measured vertically, below the peak of the ceiling; and at least 4 inches from any projecting structural element.
   (3) Except as permitted pursuant to paragraph (e) of this section, in rooms with shed sloping ceilings with a slope of more than 1.5/12, smoke alarms must be mounted on the ceiling within 3 feet, measured horizontally, of the high side of the ceiling, and not closer than 4 inches from any adjoining wall surface and from any projecting structural element.

(d) Connection to power source. (1) Each smoke alarm must be powered from:
   (i) The electrical system of the home as the primary power source and a battery as a secondary power source; or
   (ii) A battery rated for a 10-year life, provided the smoke alarm is listed for use with a 10-year battery.
(2) Each smoke alarm whose primary power source is the home electrical system must be mounted on an electrical outlet box and connected by a permanent wiring method to a general electrical circuit. More than one smoke alarm is permitted to be placed on the same electrical circuit. The wiring circuit for the alarm must not include any switches between the overcurrent protective device and the alarm, and must not be protected by a ground fault circuit interrupter.

(3) Smoke alarms required under this section must be interconnected such that the activation of any one smoke alarm causes the alarm to be triggered in all required smoke alarms in the home.

(e) Visible and tactile notification appliances. (1) In addition to the smoke alarms required pursuant to this section, the manufacturer must provide visible and listed tactile notification appliances if these appliances are ordered by the purchaser or retailer before the home enters the first stage of production. These appliances are required to operate from the primary power source, but are not required to operate from a secondary power source.

(2) A visible notification appliance in a room designed for sleeping must have a minimum rating of 177 candela, except that when the visible notification appliance is wall-mounted or suspended more than 24 inches below the ceiling, a minimum rating of 110 candela is permitted.

(3) A visible notification appliance in an area other than a room designed for sleeping must have a minimum rating of 15 candela.

(f) Testing and maintenance. (1) Each required smoke alarm installed at the factory must be operationally tested, after conducting the dielectric test specified in §3280.810(a), in accordance with the alarm manufacturer's instructions. A smoke alarm that does not function as designed during the test and is not fixed so that it functions properly in the next retest must be replaced. Any replacement smoke alarm must be successfully tested in accordance with this paragraph.

(2) Home manufacturers must provide specific written instructions for installers on how to inspect and test the operation of smoke alarms during installation of the home. These instructions must indicate that any smoke alarm that does not meet the inspection or testing requirements needs to be replaced and retested.

(3) Home manufacturers must provide the homeowner with the alarm manufacturer's information describing the operation, method and frequency of testing, and proper maintenance of the smoke alarm. This information must be provided in same manner and location as the consumer manual required by §3282.207 of this chapter, but does not have to be incorporated into the consumer manual. No dealer, distributor, construction contractor, or other person shall interfere with the distribution of this information.

§ 3280.209 Fire testing.

All fire testing conducted in accordance with this subpart shall be performed by nationally recognized testing laboratories which have expertise in fire technology. In case of dispute, the Secretary shall determine if a particular agency is qualified to perform such fire tests.

§ 3280.301 Scope.

This subpart covers the minimum requirements for materials, products, equipment and workmanship needed to assure that the manufactured home will provide:

(a) Structural strength and rigidity,

(b) Protection against corrosion, decay, insects and other similar destructive forces,

(c) Protection against hazards of windstorm,

(d) Resistance to the elements, and

(e) Durability and economy of maintenance.

§ 3280.302 Definitions.

The following definitions are applicable to subpart D only:
§ 3280.303 General requirements.

(a) Minimum requirements. The design and construction of a manufactured home shall conform with the provisions of this standard. Requirements for any size, weight, or quality of material modified by the terms of minimum, not less than, at least, and similar expressions are minimum standards. The manufacturer or installer may exceed these standards provided such deviation does not result in any inferior installation or defeat the purpose and intent of this standard.

(b) Construction. All construction methods shall be in conformance with accepted engineering practices to insure durable, livable, and safe housing and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.

(c) Structural analysis. The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur. (See subparts E and J.)

(d) [Reserved]

(e) New materials and methods. (1) Any new material or method of construction not provided for in this standard...
and any material or method of questioned suitability proposed for use in the manufacture of the structure shall nevertheless conform in performance to the requirements of this standard.

(2) Unless based on accepted engineering design for the use indicated, all new manufactured home materials, equipment, systems or methods of construction not provided for in this standard shall be subjected to the tests specified in paragraph (g) of this section.

(f) Allowable design stress. The design stresses of all materials shall conform to accepted engineering practice. The use of materials not certified as to strength or stress grade shall be limited to the minimum allowable stresses under accepted engineering practice.

(g) Alternative test procedures. In the absence of recognized testing procedures either in the Standards in this part or in the applicable provisions of those standards incorporated in this part by reference, the manufacturer electing this option must develop or cause to be developed testing procedures to demonstrate the structural properties and significant characteristics of the material, assembly, sub-assembly component, or member, except for testing methods involving one-piece metal roofing as would be required in §3280.305(c)(1)(iii). Such testing procedures become part of the manufacturer’s approved design. Such tests must be witnessed by an independent licensed professional engineer or architect or by a recognized testing organization. Copies of the test results must be kept on file by the manufactured home manufacturer.


§ 3280.304 Materials.

(a) Dimension and board lumber shall not exceed 19 percent moisture content at time of installation.

(b)(1) Standards for some of the generally used materials and methods of construction are listed in the following table:

<table>
<thead>
<tr>
<th>Material</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design—AISC–S335, 1989. The following parts of this reference standard are not applicable: 1.3.3, 1.3.4, 1.3.5, 1.3.6, 1.4.8, 1.5.1.5, 1.5.5, 1.6, 1.7, 1.8, 1.9, 1.10.4 through 1.10.7, 1.10.9, 1.11, 1.13, 1.14.5, 1.17.7 through 1.17.9, 1.19.1, 1.19.3, 1.29, 1.21, 1.23.7, 1.24, 1.25.1 through 1.25.5, 1.26.4, 2.3, 2.4, 2.8 through 2.19.</td>
</tr>
<tr>
<td></td>
<td>Specification for the Design of Cold-Formed Steel Structural Members—AISI–1996.</td>
</tr>
<tr>
<td></td>
<td>Specification for the Design of Cold-Formed Stainless Steel Structural Members—SEI/ASCE 8-02, 2002.</td>
</tr>
<tr>
<td></td>
<td>Structural Applications of Steel Cables for Buildings—ASCE19, 1996.</td>
</tr>
<tr>
<td></td>
<td>Hardboard Siding—ANSI/AHA A135.6–1996.</td>
</tr>
<tr>
<td></td>
<td>Construction and Industrial Plywood (With Typical APA Trademarks)—PS 1–95.</td>
</tr>
<tr>
<td></td>
<td>Design Specifications for Metal Plate and Wood Connected Trusses—TP–85.</td>
</tr>
</tbody>
</table>
Wood Structural Design Data, 1989, Revised 1992, AFPA.
Span Tables for Joists and Rafters—PS–20–70, 1993, AFPA.
Design Values for Joists and Rafters 1992, AFPA.
Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors—ANSI/AAMA/NWWDA 101/1.5.2–97.

Other

Fasteners

Unclassified

§ 3280.305 Structural design requirements.

(a) General. Each manufactured home shall be designed and constructed as a completely integrated structure capable of sustaining the design load requirements of this standard, and shall be capable of transmitting these loads to stabilizing devices without exceeding the allowable stresses or deflections. Roof framing shall be securely fastened to wall framing, walls to floor structure, and floor structure to chassis to secure and maintain continuity between the floor and chassis, so as to resist wind overturning, uplift, and sliding as imposed by design loads in this part. Uncompressed finished flooring greater than 1/8 inch in thickness shall not extend beneath load-bearing walls that are fastened to the floor structure.

(b) Design loads—(1) Design dead loads. Design dead loads shall be the actual dead load supported by the structural assembly under consideration.

(2) Design live loads. The design live loads and wind and snow loads shall be as specified in this section and shall be considered to be uniformly distributed. The roof live load or snow load shall not be considered as acting simultaneously with the wind load and the roof live or snow load and floor live loads shall not be considered as resisting the overturning moment due to wind.

(3) When engineering calculations are performed, allowable unit stresses may be increased as provided in the documents referenced in § 3280.304 except as otherwise indicated in §§ 3280.304(b)(1) and 3280.306(a).

(4) Whenever the roof slope does not exceed 20 degrees, the design horizontal wind loads required by § 3280.305(c)(1) may be determined without including...
the vertical roof projection of the manufactured home. However, regardless of the roof slope of the manufactured home, the vertical roof projection shall be included when determining the wind loading for split level or clerestory-type roof systems.

(c) Wind, snow, and roof loads—(1) Wind loads—design requirements. (i) Standard wind loads (Zone I). When a manufactured home is not designed to resist the wind loads for high wind areas (Zone II or Zone III) specified in paragraph (c)(1)(ii) of this section, the manufactured home and each of its wind resisting parts and portions shall be designed for horizontal wind loads of not less than 15 psf and net uplift load of not less than 9 psf.

(ii) Wind loads for high wind areas (Zone II and Zone III). When designed for high wind areas (Zone II and Zone III), the manufactured home, each of its wind resisting parts (including, but not limited to, shear walls, diaphragms, ridge beams, and their fastening and anchoring systems), its components and cladding materials (including, but not limited to, roof trusses, wall studs, exterior sheathing, roof and siding materials, exterior glazing, and their connections and fasteners) shall be designed by a Professional Engineer or Architect to resist:

(A) The design wind loads for Exposure C specified in ANSI/ASCE 7–88, “Minimum Design Loads for Buildings and Other Structures,” for a fifty-year recurrence interval, and a design wind speed of 100 mph, as specified for Wind Zone II, or 110 mph, as specified for Wind Zone III (Basic Wind Zone Map); or

(B) The wind pressures specified in the following table:

### TABLE OF DESIGN WIND PRESSURES

<table>
<thead>
<tr>
<th>Element</th>
<th>Wind zone II design wind speed 100 MPH</th>
<th>Wind zone III design wind speed 110 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchorage for lateral and vertical stability (See § 3280.306(a)):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Horizontal Drag</td>
<td>3±39 PSF</td>
<td>3±47 PSF</td>
</tr>
<tr>
<td>Uplift</td>
<td>3±27 PSF</td>
<td>3±32 PSF</td>
</tr>
<tr>
<td>Main wind force resisting system:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shearwalls, Diaphragms and their Fastening and Anchorage Systems</td>
<td>3±39 PSF</td>
<td>3±47 PSF</td>
</tr>
<tr>
<td>Ridge beams and other Main Roof Support Beams (Beams supporting expanding room sections, etc.)</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>Components and cladding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof trusses</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>Exterior roof coverings, sheathing and fastenings*</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>- Within 3'-0&quot; from each eave (overhang at end wall) of the roof or endwall if no overhang is provided</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>- Within 3'-0&quot; from the ridge and eave (overhang at sidewall) or sidewall if no eave is provided</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>Eaves (Overhangs at Sidewalls)</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>Gables (Overhangs at Endwalls)</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>Wall studs in sidewalls and endwalls, exterior windows and sliding glass doors (glazing and framing), exterior coverings, sheathing and fastenings</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>- Within 3'-0&quot; from each corner of the sidewall and endwall</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
<tr>
<td>All other areas</td>
<td>3±30 PSF</td>
<td>3±36 PSF</td>
</tr>
</tbody>
</table>

**NOTES:**
1. The net horizontal drag of ±39 PSF to be used in calculating Anchorage for Lateral and Vertical Stability and for the design of Main Wind Force Resisting Systems is based on a distribution of wind pressures of +0.8 or +0.24 PSF to the windward wall and −0.5 or −0.15 PSF to the leeward wall.
2. Horizontal drag pressures need not be applied to roof projections when the roof slope does not exceed 20 degrees.
3. + sign would mean pressures are acting towards or on the structure; − sign means pressures are acting away from the structure.
4. Design values in this “Table” are only applicable to roof slopes between 10 degrees (nominal 2/12 slope) and 30 degrees.
5. The design uplift pressures are the same whether they are applied normal to the surface of the roof or to the horizontal projection of the roof.
6. Shingle roof coverings that are secured with 6 fasteners per shingle through an underlayment which is cemented to a 3/8" structural rated roof sheathing need not be evaluated for these design wind pressures.
7. Structural rated roof sheathing that is at least 3/8" in thickness, installed with the long dimension perpendicular to roof framing supports, and secured with fasteners at 4" on center within 3'-0" of each gable end or endwall if no overhang is provided and 6" on center in all other areas, need not be evaluated for these design wind pressures.
8. Exterior coverings that are secured at 6 o.c. to a 3/8" structural rated sheathing that is fastened to wall framing members at 6" on center need not be evaluated for these design wind pressures.
(iii) One-piece metal roofing capable of resisting the design wind pressures for “Components and Cladding: (Exterior roof coverings)” in the Table for Design Wind Pressures in this section is allowed to be used without structural sheathing, provided the metal roofing is tested using procedures that have been approved by HUD and that meet all requirements of §§3280.303(c) and (g) and 3280.401.

(2) Wind loads—zone designations. The Wind Zone and specific wind design load requirements are determined by the fastest basic wind speed (mph) within each Zone and the intended location, based on the Basic Wind Zone Map, as follows:

(i) Wind Zone I. Wind Zone I consists of those areas on the Basic Wind Zone Map that are not identified in paragraphs (c)(2)(ii) or (iii) of this section as being within Wind Zone II or III, respectively.

(ii) Wind Zone II.....100 mph. The following areas are deemed to be within Wind Zone II of the Basic Wind Zone Map:

Local governments: The following local governments listed by State (counties, unless specified otherwise):

Florida: All counties except those identified in paragraph (c)(1)(i)(C) of this section as within Wind Zone II or III, respectively.


North Carolina: Carteret, Dare, and Hyde.

(iv) Consideration of local requirements. For areas where local building code requirements exceed the design wind speed requirements of these standards, the Department will consider the adoption through rulemaking of the more stringent requirements of the State or local building authority.

(3) Snow and roof loads. (i) Flat, curved and pitched roofs shall be designed to resist the following live loads, applied downward on the horizontal projection as appropriate for the design zone marked on the manufactured home:

<table>
<thead>
<tr>
<th>Zone (see Map in § 3280.305(c)(4))</th>
<th>Pounds per square foot</th>
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</thead>
<tbody>
<tr>
<td>North Zone</td>
<td>40</td>
</tr>
<tr>
<td>Middle Zone</td>
<td>30</td>
</tr>
<tr>
<td>South Zone</td>
<td>20</td>
</tr>
</tbody>
</table>

(A) North Roof Load Zone. The following counties in each of the following states are deemed to be within the North Roof Load Zone:

Maine—Aroostook, Piscataquis, Somerset, Penobscot, Waldo, Knox, Hancock, and Washington.

Alaska—All Counties
(B) Middle Roof Load Zone. The following counties in each of the following states are deemed to be within the Middle Roof Load Zone:

<table>
<thead>
<tr>
<th>States</th>
<th>Counties</th>
</tr>
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<tbody>
<tr>
<td>South Dakota</td>
<td>Grant</td>
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<td></td>
<td>Deuel</td>
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<td>Hamlin</td>
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<td>Kingsbury</td>
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<td>Brookings</td>
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<td>Hanson</td>
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<td>Minnehaha</td>
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<td>Hutchinson</td>
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<td>Turner</td>
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<td>Lincoln</td>
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<td>Yankton</td>
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<td>Clay</td>
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<td>Minnesota</td>
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<td>Lac qui Parle</td>
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<td>Chippewa</td>
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<td>Yellow Medicine</td>
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<td>Mille Lacs</td>
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<td>Washington</td>
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(C) **South Roof Load Zone.** The states and counties that are not listed for the North Roof Load Zone in paragraph (c)(3)(i)(A) of this section, or the Middle Roof Load Zone in paragraph (c)(3)(i)(B) of this section, are deemed to be within the South Roof Load Zone.

(ii) For exposures in areas (mountainous or other) where snow or wind records or experience indicate significant differences from the loads stated above, the Department may establish more stringent requirements for homes known to be destined for such areas. For snow loads, such requirements are to be based on a roof snow load of 0.6 of the ground snow load for areas exposed to wind and a roof snow load of 0.8 of the ground snow load for sheltered areas.

(iii) Eaves and cornices shall be designed for a net uplift pressure of 2.5 times the design uplift wind pressure cited in §3280.305(c)(1)(i) for Wind Zone I, and for the design pressures cited in §3280.305(c)(1)(ii) for Wind Zones II and III.

(iv) Skylights must be capable of withstanding roof loads as specified in paragraphs (c)(3)(i) or (c)(3)(ii) of this section. Skylights must be listed and tested in accordance with AAMA 1600/ I.S.7–00, 2003, Voluntary Specification for Skylights.

(4) **Data plate requirements.** The Data Plate posted in the manufactured home (see §3280.5) shall designate the wind and roof load zones or, if designed for higher loads, the actual design external snow and wind loads for which the home has been designed. The Data Plate shall include reproductions of the Load Zone Maps shown in this paragraph (c)(4), with any related information. The Load Zone Maps shall be not less than either 3½ in. by 2¼ in., or one-half the size illustrated in the Code of Federal Regulations.
Basic Wind Zone Map for Manufactured Housing

NOTE: See Section 3280.305(c)(2) for areas included in each Wind Zone.
(d) Design load deflection. (1) When a structural assembly is subjected to total design live loads, the deflection for structural framing members shall not exceed the following (where $L$ equals the clear span between supports or two times the length of a cantilever):
Floor—L/240
Roof and ceiling—L/180
Headers, beams, and girders (vertical load)—L/180
Walls and partitions—L/180

(2) The allowable eave or cornice deflection for uplift is to be measured at the design uplift load of 9 psf for Wind Zone I, and at the design uplift pressure cited in paragraph (c)(1)(ii) of this section for Wind Zones II and III. The allowable deflection shall be \( (2 \times Lc)/180 \), where \( Lc \) is the measured horizontal eave projection from the wall.

(e) Fastening of structural systems. (1) Roof framing must be securely fastened to wall framing, walls to floor structure, and floor structure to chassis, to secure and maintain continuity between the floor and chassis in order to resist wind overturning, uplift, and sliding, and to provide continuous load paths for these forces to the foundation or anchorage system. The number and type of fasteners used must be capable of transferring all forces between elements being joined.

(2) For Wind Zone II and Wind Zone III, roof framing members must be securely fastened at the vertical bearing points to resist design overturning, uplift, and sliding forces. When engineered connectors are not installed, roof framing members must be secured at the vertical bearing points to wall framing members (studs), and wall framing members (studs) must be secured to floor framing members, with 0.016 inch base metal, minimum steel strapping or engineered connectors, or by a combination of 0.016 inch base metal, minimum steel strapping or engineered connectors, and structural-rated wall sheathing that overlaps the roof and floor system if substantiated by structural analysis or by suitable load tests. Steel strapping or engineered connectors are to be installed at a maximum spacing of 24 inches on center in Wind Zone II, and 16 inches on center in Wind Zone III. Exception: Where substantiated by structural analysis or suitable load tests, the 0.016 inch base metal minimum steel strapping or engineered connectors may be omitted at the roof to wall and/or wall to floor connections, when structural rated sheathing that overlaps the roof and wall and/or wall and floor is capable of resisting the applicable design wind loads.

(f) Walls. The walls shall be of sufficient strength to withstand the load requirements as defined in §3280.305(c) of this part, without exceeding the deflections as specified in §3280.305(d). The connections between the bearing walls, floor, and roof framework members shall be fabricated in such a manner as to provide support for the material used to enclose the manufactured home and to provide for transfer of all lateral and vertical loads to the floor and chassis.

(1) Except where substantiated by engineering analysis or tests, studs shall not be notched or drilled in the middle one-third of their length.

(2) Interior walls and partitions shall be constructed with structural capacity adequate for the intended purpose and shall be capable of resisting a horizontal load of not less than five pounds per square foot. An allowable stress increase of 1.33 times the permitted published design values may be used in the design of wood framed interior partitions. Finish of walls and partitions shall be securely fastened to wall framing.

(g) Floors. (1) Floor assemblies shall be designed in accordance with accepted engineering practice standards to support a minimum uniform live load of 40 lb/ft² plus the dead load of the materials. In addition (but not simultaneously), floors shall be able to support a 200-pound concentrated load on a one-inch diameter disc at the most critical location with a maximum deflection not to exceed one-eighth inch relative to floor framing. Perimeter wood joists of more than six inches depth shall be stabilized against overturning from superimposed loads as follows: at ends by solid blocking not less than two-inch thickness by full depth of joist, or by connecting to a continuous header not less than two-inch thickness and not less than the depth of the joist with connecting devices; at eight-feet maximum intermediate spacing by solid blocking or by wood cross-bridging of not less than one inch by three inches, metal cross-bridging of equal strength, or by other approved methods.
(2) Wood, wood fiber or plywood floors or subfloors in kitchens, bathrooms (including toilet compartments), laundry areas, water heater compartments, and any other areas subject to excessive moisture shall be moisture resistant or shall be made moisture resistant by sealing or by an overlay of nonabsorbent material applied with water-resistant adhesive. Use of one of the following methods would meet this requirement:
   (i) Sealing the floor with a water-resistant sealer; or
   (ii) Installing an overlay of a non-absorbent floor covering material applied with water-resistant adhesive; or
   (iii) Direct application of a water-resistant sealer to the exposed wood floor area when covered with a non-absorbent overlay; or
   (iv) The use of a non-absorbent floor covering which may be installed without a continuous application of a water-resistant adhesive or sealant when the floor covering meets the following criteria:
      (A) The covering is a continuous membrane with any seams or patches seam bonded or welded to preserve the continuity of the floor covering; and
      (B) The floor is protected at all penetrations in these areas by sealing with a compatible water-resistant adhesive or sealant to prevent moisture from migrating under the nonabsorbent floor covering; and
      (C) The covering is fastened around the perimeter of the subfloor in accordance with the floor covering manufacturer’s instructions; and
      (D) The covering is designed to be installed to prevent moisture penetration without the use of a water-resistant adhesive or sealer except as required in this paragraph (g). The vertical edges of penetrations for plumbing shall be covered with a moisture-resistant adhesive or sealant. The vertical penetrations located under the bottom plates of perimeter walls of rooms, areas, or compartments are not required to be sealed; this does not include walls or partitions within the rooms or areas.

(3) Wood panel products used as floor or subfloor materials on the exterior of the home, such as in recessed entryways, must be rated for exterior exposure and protected from moisture by sealing or applying nonabsorbent overlay with water resistant adhesive.

(4) Carpet or carpet pads shall not be installed under concealed spaces subject to excessive moisture, such as plumbing fixture spaces, floor areas under installed laundry equipment. Carpet may be installed in laundry space provided:
   (i) The appliances are not provided;
   (ii) The conditions of paragraph (g)(2) of this section are followed; and
   (iii) Instructions are provided to remove carpet when appliances are installed.

(5) Except where substantiated by engineering analysis or tests:
   (i) Notches on the ends of joists shall not exceed one-fourth the joist depth.
   (ii) Holes bored in joists shall not be within 2 inches of the top or bottom of the joist, and the diameter of any such hole shall not exceed one-third the depth of the joist.
   (iii) Notches in the top or bottom of the joists shall not exceed one-sixth the depth and shall not be located in the middle third of the span.

(6) Bottom board material (with or without patches) shall meet or exceed the level of 48 inch-pounds of puncture resistance as tested by the Beach Puncture Test in accordance with Standard Test Methods for Puncture and Stiffness of Paperboard, and Corrugated and Solid Fiberboard, ASTM D-781-1968 (73). The material shall be suitable for patches and the patch life shall be equivalent to the material life. Patch installation instruction shall be included in the manufactured home manufacturer’s instructions.

(h) Roofs. (1) Roofs shall be of sufficient strength to withstand the load requirements as defined in §3280.305(b) and (c) without exceeding the deflections specified in §3280.305(d). The connections between roof framework members and bearing walls shall be fabricated in such a manner to provide for the transfer of design vertical and horizontal loads to the bearing walls and to resist uplift forces.

(2) Roofing membranes shall be of sufficient rigidity to prevent deflection which would permit ponding of water or separation of seams due to wind, snow, ice, erection or transportation forces.

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(3) Cutting of roof framework members for passage of electrical, plumbing or mechanical systems shall not be allowed except where substantiated by engineering analysis.

(4) All roof penetrations for electrical, plumbing or mechanical systems shall be properly flashed and sealed. In addition, where a metal roof membrane is penetrated, a wood backer shall be installed. The backer plate shall be not less than 5/16 inch plywood, with exterior glue, secured to the roof framing system beneath the metal roof, and shall be of a size to assure that all screws securing the flashing are held by the backer plate.

(i) Frame construction. The frame shall be capable of transmitting all design loads to stabilizing devices without exceeding the allowable load and deflections of this section. The frame shall also be capable of withstanding the effects of transportation shock and vibration without degradation as required by subpart J.

(1) [Reserved]

(2) Protection of metal frames against corrosion. Metal frames shall be made corrosion resistant or protected against corrosion. Metal frames may be protected against corrosion by painting.

(j) Welded connections. (1) All welds must be made in accordance with the applicable provisions of the Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, AISC–S335, 1989; the Specification for the Design of Cold-Formed Steel Structural Members, AISI, 1996; and the Specification for the Design of Cold-Formed Stainless Steel Structural Members, SEI/ASCE 8–02, 2002.

(2) Regardless of the provisions of any reference standard contained in this subpart, deposits of weld slag or flux shall be required to be removed only from welded joints at the following locations:

(i) Drawbar and coupling mechanisms;

(ii) Main member splices, and

(iii) Spring hanger to main member connections.

§ 3280.306 Windstorm protection.

(a) Provisions for support and anchoring systems. Each manufactured home shall have provisions for support/anchoring or foundation systems that, when properly designed and installed, will resist overturning and lateral movement (sliding) of the manufactured home as imposed by the respective design loads. For Wind Zone I, the design wind loads to be used for calculating resistance to overturning and lateral movement shall be the simultaneous application of the wind loads indicated in §3280.305(c)(1)(i), increased by a factor of 1.5. The 1.5 factor of safety for Wind Zone I is also to be applied simultaneously to both the vertical building projection, as horizontal wind load, and across the surface of the full roof structure, as uplift loading. For Wind Zones II and III, the resistance shall be determined by the simultaneous application of the horizontal drag and uplift wind loads, in accordance with §3280.305(c)(1)(ii). The basic allowable stresses of materials required to resist overturning and lateral movement shall not be increased in the design and proportioning of these members. No additional shape or location factors need to be applied in the design of the tiedown system. The dead load of the structure may be used to resist these wind loading effects in all Wind Zones.

(1) The provisions of this section shall be followed and the support and anchoring systems shall be designed by a Registered Professional Engineer or Architect.

(2) The manufacturer of each manufactured home is required to make provision for the support and anchoring systems but is not required to provide the anchoring equipment or stabilizing devices. When the manufacturer’s installation instructions provide for the main frame structure to be used as the
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points for connection of diagonal ties, no specific connecting devices need be provided on the main frame structure.

(b) Contents of instructions. (1) The manufacturer must provide printed instructions with each manufactured home that specify the location and required capacity of stabilizing devices on which the home's design is based. The manufacturer must identify by paint, label, decal stencil, or other means: the location of each column support pier location required along the marriage line(a) of multi-section manufactured homes; each pier location required along the perimeter of the home; each required shear wall pier support; and any other special pier support locations specified in the manufacturer's printed instructions. Such identifications must be visible after the home is installed. The manufacturer must provide drawings and specifications, certified by a registered professional engineer or architect, that indicate at least one acceptable system of anchoring, including the details or required straps or cables, their end connections, and all other devices needed to transfer the wind loads from the manufactured home to an anchoring or foundation system.

(2) For anchoring systems, the instructions shall indicate:

(i) The minimum anchor capacity required;

(ii) That anchors should be certified by a professional engineer, architect, or a nationally recognized testing laboratory as to their resistance, based on the maximum angle of diagonal tie and/or vertical tie loading (see paragraph (c)(3) of this section) and angle of anchor installation, and type of soil in which the anchor is to be installed;

(iii) That ground anchors are to be embedded below the frost line, unless the foundation system is frost-protected in accordance with §§3285.312(b) and 3285.404 of the Model Manufactured Home Installation Standards in this chapter.

(iv) That ground anchors must be installed to their full depth, and stabilizer plates must be installed in accordance with the ground anchor listing or certification to provide required resistance to overturning and sliding.

(v) That anchoring equipment should be certified by a registered professional engineer or architect to resist these specified forces in accordance with testing procedures in ASTM Standard Specification D3953–91, Standard Specification for Strapping, Flat Steel and Seals.

(c) Design criteria. The provisions made for anchoring systems shall be based on the following design criteria for manufactured homes.

(1) The minimum number of ties provided per side of each home shall resist design wind loads required in §3280.305(c)(1).

(2) Ties shall be as evenly spaced as practicable along the length of the manufactured home, with not more than two (2) feet open-end spacing on each end.

(3) Vertical ties or straps shall be positioned at studs. Where a vertical tie and a diagonal tie are located at the same place, both ties may be connected to a single anchor, provided that the anchor used is capable of carrying both loadings, simultaneously.

(4) Add-on sections of expandable manufactured homes shall have provisions for vertical ties at the exposed ends.

(d) Requirements for ties. Manufactured homes in Wind Zone I require only diagonal ties. These ties shall be placed along the main frame and below the outer side walls. All manufactured homes designed to be located in Wind Zones II and III shall have a vertical tie installed at each diagonal tie location.

(e) Protection requirements. Protection shall be provided at sharp corners where the anchoring system requires the use of external straps or cables. Protection shall also be provided to minimize damage to siding by the cable or strap.

(f) Anchoring equipment—load resistance. Anchoring equipment shall be capable of resisting an allowable working load equal to or exceeding 3,150 pounds and shall be capable of withstanding a 50 percent overload (4,725 pounds total) without failure of either the anchoring equipment or the attachment point on the manufactured home.

(g) Anchoring equipment—weatherization. Anchoring equipment exposed to
weathering shall have a resistance to weather deterioration at least equivalent to that provided by a coating of zinc on steel of not less than 0.30 ounces per square foot of surface coated, and in accordance with the following:

(1) Slit or cut edges of zinc-coated steel strapping do not need to be zinc coated.

(2) Type 1, Finish B, Grade 1 steel strapping, 1-1/4 inches wide and 0.035 inches in thickness, certified by a registered professional engineer or architect as conforming with ASTM Standard Specification D3953-91, Standard Specification for Strapping, Flat Steel, and Seals.

§ 3280.307 Resistance to elements and use.

(a) Exterior coverings shall be of moisture and weather resistive materials attached with corrosion resistant fasteners to resist wind, snow and rain. Metal coverings and exposed metal structural members shall be of corrosion resistant materials or shall be protected to resist corrosion. All joints between portions of the exterior covering shall be designed, and assembled to protect against the infiltration of air and water, except for any designed ventilation of wall or roof cavity.

(b) Joints between dissimilar materials and joints between exterior coverings and frames of openings shall be protected with a compatible sealant suitable to resist infiltration of air or water.

(c) Where adjoining materials or assemblies of materials are of such nature that separation can occur due to expansion, contraction, wind loads or other loads induced by erection or transportation, sealants shall be of a type that maintains protection against infiltration or penetration by air, moisture or vermin.

(d) Exterior surfaces shall be sealed to resist the entrance of rodents.

§ 3280.308 Formaldehyde emission controls for certain wood products.

(a) Formaldehyde emission levels. All plywood and particleboard materials bonded with a resin system or coated with a surface finish containing formaldehyde shall not exceed the following formaldehyde emission levels when installed in manufactured homes:

(1) Plywood materials shall not emit formaldehyde in excess of 0.2 parts per million (ppm) as measured by the air chamber test method specified in §3280.406.

(2) Particleboard materials shall not emit formaldehyde in excess of 0.3 ppm as measured by the air chamber test specified in §3280.406.

(b) Product certification and continuing qualification. All plywood and particleboard materials to be installed in manufactured homes which are bonded with a resin system or coated with a surface finish containing formaldehyde, other than an exclusively phenol-formaldehyde resin system or finish, shall be certified by a nationally recognized testing laboratory as complying with paragraph (a) of this section.

(1) Separate certification shall be done for each plant where the particleboard is produced or where the plywood or particleboard is surface-finished.

(2) To certify plywood or particleboard, the testing laboratory shall witness or conduct the air chamber test specified in §3280.406 on randomly selected panels initially and at least quarterly thereafter.

(3) The testing laboratory must approve a written quality control plan for each plant where the particleboard is produced or finished or where the plywood is finished. The quality control plan must be designed to assure that all panels comply with paragraph (a) of this section. The plan must establish ongoing procedures to identify increases in the formaldehyde emission characteristics of the finished product resulting from the following changes in production.

(i) In the case of plywood:

(A) The facility where the unfinished panels are produced is changed;
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(B) The thickness of the panels is changed so that the panels are thinner; or

(C) The grooving pattern on the panels is changed so that the grooves are deeper or closer together.

(ii) In the case of particleboard:

(A) The resin formulation is changed so that the formaldehyde-to-urea ratio is increased;

(B) The amount of formaldehyde resin used is increased; or

(C) The press time is decreased.

(iii) In the case of plywood or particleboard:

(A) The finishing or top coat is changed and the new finishing or top coat has a greater formaldehyde content; or

(B) The amount of finishing or top coat used on the panels is increased, provided that such finishing or top coat contains formaldehyde.

(4) The testing laboratory shall periodically visit the plant to monitor quality control procedures to assure that all certified panels meet the standard.

(5) To maintain its certification, plywood or particleboard must be tested by the air chamber test specified in § 3280.406 whenever one of the following events occurs:

(i) In the case of particleboard, the resin formulation is changed so that the formaldehyde-to-urea ratio is increased; or

(ii) In the case of particleboard or plywood, the finishing or top coat is changed and the new finishing or top coat contains formaldehyde.

(6) In the event that an air chamber test measures levels of formaldehyde from plywood or particleboard in excess of those permitted under paragraph (a) of this section, then the tested product’s certification immediately lapses as of the date of production of the tested panels. No panel produced on the same date as the tested panels or on any day thereafter may be used or certified for use in manufactured homes.

(i) Provided, however, that a new product certification may be obtained by testing randomly selected panels which were produced on any day following the date of production of the tested panels. If such panels pass the air chamber test specified in § 3280.406, then the plywood or particleboard produced on that day and subsequent days may be used and certified for use in manufactured homes.

(ii) Provided further, that plywood or particleboard produced on the same day as the tested panels, and panels produced on subsequent days, if not certified pursuant to paragraph (b)(4)(i) of this section, may be used in manufactured homes only under the following circumstances:

(A) Each panel is treated with a scavenger, sealant, or other means of reducing formaldehyde emissions which does not adversely affect the structural quality of the product; and

(B) Panels randomly selected from the treated panels are tested by and pass the air chamber test specified in § 3280.406.

(c) Panel identification. Each plywood and particleboard panel to be installed in manufactured homes which is bonded or coated with a resin system containing formaldehyde, other than an exclusively phenol-formaldehyde resin system, shall be stamped or labeled so as to identify the product manufacturer, date of production and/or lot number, and the testing laboratory certifying compliance with this section.

(d) Treatment after certification. If certified plywood or particleboard subsequently is treated with paint, varnish, or any other substance containing formaldehyde, then the certification is no longer valid. In such a case, each stamp or label placed on the panels pursuant to paragraph (c) of this section must be obliterated. In addition, the treated panels may be recertified and reidentified in accordance with paragraphs (b) and (c) of this section.

[49 FR 32011, Aug. 9, 1984]

§ 3280.309 Health Notice on formaldehyde emissions.

(a) Each manufactured home shall have a Health Notice on formaldehyde emissions prominently displayed in a
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temporary manner in the kitchen (i.e., countertop or exposed cabinet face). The Notice shall read as follows:

IMPORTANT HEALTH NOTICE

Some of the building materials used in this home emit formaldehyde. Eye, nose, and throat irritation, headache, nausea, and a variety of asthma-like symptoms, including shortness of breath, have been reported as a result of formaldehyde exposure. Elderly persons and young children, as well as anyone with a history of asthma, allergies, or lung problems, may be at greater risk. Research is continuing on the possible long-term effects of exposure to formaldehyde.

Reduced ventilation resulting from energy efficiency standards may allow formaldehyde and other contaminants to accumulate in the indoor air. Additional ventilation to dilute the indoor air may be obtained from a passive or mechanical ventilation system offered by the manufacturer. Consult your dealer for information about the ventilation options offered with this home.

High indoor temperatures and humidity raise formaldehyde levels. When a home is to be located in areas subject to extreme summer temperatures, an air-conditioning system can be used to control indoor temperature levels. Check the comfort cooling certificate to determine if this home has been equipped or designed for the installation of an air-conditioning system.

If you have any questions regarding the health effects of formaldehyde, consult your doctor or local health department.

(b) The Notice shall be legible and typed using letters at least 1/4 inch in size. The title shall be typed using letters at least 3/4 inch in size.

(c) The Notice shall not be removed by any party until the entire sales transaction has been completed (refer to part 3282—Manufactured Home Procedural and Enforcement Regulations for provisions regarding a sales transaction).

(d) A copy of the Notice shall be included in the Consumer Manual (refer to part 3283—Manufactured Home Consumer Manual Requirements).


Subpart E—Testing

§ 3280.401 Structural load tests.

Every structural assembly tested shall be capable of meeting the Proof Load Test or the Ultimate Load Test as follows:

(a) Proof load tests. Every structural assembly tested must be capable of sustaining its dead load plus superimposed live loads equal to 1.75 times the required live loads for a period of 12 hours without failure. Tests must be conducted with loads applied and deflections recorded in 1/4 design live load increments at 10-minute intervals until 1.25 times design live load plus dead load has been reached. Additional load shall then be applied continuously until 1.75 times design live load plus dead load has been reached. Assembly failure shall be considered as design live load deflection (or residual deflection measured 12 hours after live load removal) that is greater than the limits set in §3280.305(d), rupture, fracture, or excessive yielding. Design live load deflection criteria do not apply when the structural assembly being evaluated does not include structural framing members. An assembly to be tested shall be of the minimum quality of materials and workmanship of the production. Each test assembly, component, or subassembly shall be identified as to type and quality or grade of material. All assemblies, components, or subassemblies qualifying under this test shall be subject to a continuing qualification testing program acceptable to HUD.

(b) Ultimate load tests. Ultimate load tests must be performed on a minimum of three assemblies or components to generally evaluate the structural design. Every structural assembly or component tested must be capable of sustaining its total dead load plus the design live load increased by a factor of safety of at least 2.5. A factor of safety greater than 2.5 shall be used when required by an applicable reference standard in §3280.304(b)(1). Tests shall be conducted with loads applied and deflections recorded in 1/4 design live load increments at 10-minute intervals until 1.25 times design live load plus dead load has been reached. Additional loading shall then be applied continuously until failure occurs, or the total of the factor of safety times the design live load plus the dead load is reached. Assembly failure shall be considered as design live load deflection greater than
§ 3280.402 Test procedure for roof trusses.

(a) Roof load tests. The following is an acceptable test procedure, consistent with the provisions of §3280.401, for roof trusses that are supported at the ends and support design loads. Where roof trusses act as support for other members, act as cantilevers, or support concentrated loads, they shall be tested accordingly.

(b) General. Trusses may be tested in pairs or singly in a suitable test facility. When tested singly, simulated lateral support of the test assembly may be provided, but in no case shall this lateral support exceed that which is specified for the completed manufactured home. When tested in pairs, the trusses shall be spaced at the design spacing and shall be mounted on solid support accurately positioned to give the required clear span distance (L) as specified in the design. The top and bottom chords shall be braced and covered with the material, with connections or method of attachment, as specified by the completed manufactured home.

(1) As an alternate test procedure, the top chord may be sheathed with ¼ inch by 12 inch plywood strips. The plywood strips shall be at least long enough to cover the top chords of the trusses at the designated design truss spacing. Adjacent plywood strips must be separated by at least ½ inch. The plywood strip shall be nailed with 4d nails or equivalent staples not closer than 8 inches on center along the top chord. The bottom chords of the adjacent trusses may be either:

(i) Unbraced,

(ii) Laterally braced together (not cross braced) with 1″x2″ stripping not closer than 24 inches on center nailed with only one 6d nail at each truss, or

(iii) Covered with the material, with connections or methods of attachment, as specified for the completed manufactured home.

(2) Truss deflections will be measured relative to a taut wire running over the support and weighted at the end to insure constant tension or other approved methods. Deflections will be measured at the two quarter points and at midspan. Loading shall be applied to the top chord through a suitable hydraulic, pneumatic, or mechanical system, masonry units, or weights to simulate design loads. Load units for uniformly distributed loads shall be separated so that arch action does not occur, and shall be spaced not greater than 12 inches on center so as to simulate uniform loading.

(c) Nondestructive test procedure—(1) Dead load plus live load. (i) Noting figure A–1, measure and record initial elevation of the truss in test position at no load.
(ii) Apply load units to the top chord of the truss equal to the full dead load of roof and ceiling. Measure and record deflections.

(iii) Maintaining the dead load, add live load in approximate 1/4 design live load increments. Measure the deflections after each loading increment.
Apply incremental loads at a uniform rate such that approximately one-half hour is required to establish the total design load condition. Measure and record the deflections five minutes after loads have been applied. The maximum deflection due to design live load (deflection measured in step (iii) minus step (ii)) shall not exceed \( L/180 \), where \( L \) is a clear span measured in the same units.

(iv) Continue to load truss to dead load plus 1.75 times the design live load. Maintain this loading for 12 hours and inspect the truss for failure.

(v) Remove the total superimposed live load. Trusses not recovering to at least the \( L/180 \) position within 12 hours shall be considered as failing.

(2) **Uplift loads.** This test shall only be required for truss designs which may be critical under uplift load conditions.

(i) Measure and record initial elevation of the truss in an inverted test position at no load. Bottom chord of the truss shall be mounted in the horizontal position.

(ii) Apply the uplift load as stated in §3280.305(c) to the bottom chord of the truss. Measure and record the deflections 5 minutes after the load has been applied.

(iii) Continue to load the truss to 1.75 times the design uplift load. Maintain this load for 3 hours and inspect the truss for failure.

(iv) Remove applied loads and within three hours the truss must recover to at least \( L/180 \) position, where \( L \) is a clear span measured in the same units.

(d) **Destructive test procedure.** (1) Destructive tests shall be performed on three trusses to generally evaluate the truss design.

(2) Noting figure A–1, apply the load units to the top chord of the truss assembly equal to full dead load of roof and ceiling. Measure and record deflections. Then apply load and record deflections in \( \frac{1}{4} \) design live load increments at 10-minute intervals until 1.25 times design live load plus dead load has been reached.

(3) Additional loading shall then be applied continuously until failure occurs or the factor of safety times the design live load plus the dead load is reached.

(4) Assembly failure shall be considered as design live load deflection greater than the limits set in §3280.305(d), rupture, fracture, or excessive yielding.

(5) The assembly shall be capable of sustaining the dead load plus the applicable factor of safety times the design live load (the applicable factor of safety for wood trusses shall be taken as 2.50).

(e) Trusses qualifying under the non-destructive test procedure. Tests §3280.402(c)(1) and (2) (when required), shall be subject to a continuing qualification testing program acceptable to the Department. Trusses qualifying under the destructive test procedures, Tests §3280.402(c)(2) (when required), and (d), shall be subject to periodic tests only.


§ 3280.403 Standard for windows and sliding glass doors used in manufactured homes.

(a) **Scope.** This section sets the requirements for prime windows and sliding glass doors except for windows used in entry doors. Windows so mounted are components of the door and thus are excluded from this standard.

(b) **Standard.** All primary windows and sliding glass doors shall comply with AAMA 1701.2–95, Voluntary Standard Primary Window and Sliding Glass Door for Utilization in Manufactured Housing, except the exterior and interior pressure tests must be conducted at the design wind loads required for components and cladding specified in §3280.305(c)(1).

(c) **Installation.** All primary windows and sliding glass doors shall be installed in a manner which allows proper operation and provides protection against the elements (see §3280.205).

(d) **Glass.** (1) Safety glazing materials, where used, shall meet ANSI Z97.1–1984, “Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings.”

(2) Sealed insulating glass, where used, must meet all performance requirements for Class C in accordance
with ASTM E 774–97, Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units. The sealing system must be qualified in accordance with ASTM E 773–97, Standard Test Methods for Accelerated Weathering of Sealed Insulating Glass Units. Each glass unit must be permanently identified with the name of the insulating glass manufacturer.

(e) Certification. All primary windows and sliding glass doors to be installed in manufactured homes must be certified as complying with AAMA 1701.2–95. This certification must be based on tests conducted at the design wind loads specified in §3280.305(c)(1).

(1) All such windows and doors must show evidence of certification by affixing a quality certification label to the product in accordance with ANSI Z34.1–1993, Third-Party Certification Programs for Products, Processes, and Services.

(2) In determining certifiability of the products, an independent quality assurance agency shall conduct pre-production specimen tests in accordance with AAMA 1701.2–95. Further, such agency must inspect the product manufacturer’s facility at least twice per year.

(f) Protection of primary window and sliding glass door openings in high wind areas. For homes designed to be located in Wind Zones II and III, manufacturers shall design exterior walls surrounding the primary window and sliding glass door openings to allow for the installation of shutters or other protective covers, such as plywood, to cover these openings. Although not required, the Department encourages manufacturers to provide the shutters or protective covers and to install receiving devices, sleeves, or anchors for fasteners to be used to secure the shutters or protective covers to the exterior walls. If the manufacturer does not provide shutters or other protective covers to cover these openings, the manufacturer must provide to the homeowner instructions for at least one method of protecting primary window and sliding glass door openings. This method must be capable of resisting the design wind pressures specified in §3280.305 without taking the home out of conformance with the standards in this part. These instructions must be included in the printed instructions that accompany each manufactured home. The instructions shall also indicate whether receiving devices, sleeves, or anchors, for fasteners to be used to secure the shutters or protective covers to the exterior walls, have been installed or provided by the manufacturer.


§ 3280.404 Standard for egress windows and devices for use in manufactured homes.

(a) Scope and purpose. The purpose of this section is to establish the requirements for the design, construction, and installation of windows and approved devices intended to be used as an emergency exit during conditions encountered in a fire or similar disaster.

(b) Performance. Egress windows including auxiliary frame and seals, if any, shall meet all requirements of AAMA 1701.2–95. Voluntary Standard Primary Window and Sliding Glass Door for Utilization in Manufactured Housing and AAMA Standard 1704–1985, Voluntary Standard Egress Window Systems for Utilization in Manufactured Housing, except the exterior and interior pressure tests for components and cladding must be conducted at the design wind loads required by §3280.305(c)(1).

(c) Installation. (1) The installation of egress windows or devices shall be installed in a manner which allows for proper operation and provides protection against the elements. (See §3280.307.)

(2) An operational check of each installed egress window or device shall be made at the manufactured home factory. All egress windows and devices shall be openable to the minimum required dimension without binding or requiring the use of tools. Any window or device failing this check shall be repaired or replaced. A repaired window shall conform to its certification. Any repaired or replaced window or device shall pass the operational check.
(d) Operating instructions. Operating instructions shall be affixed to each egress window and device and carry the legend “Do Not Remove.”

(e) Certification of egress windows and devices. Egress windows and devices shall be listed in accordance with the procedures and requirements of AAMA Standard 1704–1985. As of January 17, 1995, this certification must be based on tests conducted at the design wind loads specified in §3280.305(c)(1).

(f) Protection of egress window openings in high wind areas. For homes designed to be located in Wind Zones II and III, manufacturers shall design exterior walls surrounding the egress window openings to allow for the installation of shutters or other protective covers, such as plywood, to cover these openings. Although not required, the Department encourages manufacturers to provide the shutters or protective covers and to install receiving devices, sleeves, or anchors for fasteners to be used to secure the shutters or protective covers to the exterior walls. If the manufacturer does not provide shutters or other protective covers to cover these openings, the manufacturer must provide to the homeowner instructions for at least one method of protecting egress window openings. This method must be capable of resisting the design wind pressures specified in §3280.305 without taking the home out of conformance with the standards in this part. These instructions must be included in the printed instructions that accompany each manufactured home. The instructions shall also indicate whether receiving devices, sleeves, or anchors, for fasteners to be used to secure the shutters or protective covers to the exterior walls, have been installed or provided by the manufacturer.

§3280.405 Standard for swinging exterior passage doors for use in manufactured homes.

(a) Introduction. This standard applies to all exterior passage door units, excluding sliding doors and doors used for access to utilities and compartments. This standard applies only to the door frame consisting of jambs, head and sill and the attached door or doors.

(b) Performance requirements. The design and construction of exterior door units must meet all requirements of AAMA 1702.2–95, Voluntary Standard Swinging Exterior Passage Door for Utilization in Manufactured Housing.

(c) Materials and methods. Any material or method of construction shall conform to the performance requirements as outlined in paragraph (b) of this section. Plywood shall be exterior type and preservative treated in accordance with NWWDA I.S.4–81, Water Repellent Preservative Non-Pressure Treatment for Millwork.

(d) Exterior doors. All swinging exterior doors shall be installed in a manner which allows proper operation and provides protection against the elements (see §3280.307).

(e) Certification. All swinging exterior doors to be installed in manufactured homes must be certified as complying with AAMA 1702.2–95, Voluntary Standard Swinging Exterior Passage Door for Utilization in Manufactured Housing.

(1) All such doors must show evidence of certification by affixing a quality certification label to the product in accordance with ANSI Z34.1–1993, Third Party Certification Programs for Products, Processes, and Services.

(2) In determining certifiability of the products, an independent quality assurance agency must conduct a pre-production specimen test in accordance with AAMA 1702.2–95, Voluntary Standard Swinging Exterior Passage Door for Utilization in Manufactured Housing.

(f) Protection of exterior doors in high wind areas. For homes designed to be located in Wind Zones II and III, manufacturers shall design exterior walls surrounding the exterior door openings to allow for the installation of shutters or other protective covers, such as plywood, to cover these openings. Although not required, the Department encourages manufacturers to provide the shutters or protective covers and to install receiving devices, sleeves, or anchors for fasteners to be used to secure the shutters or protective covers to the exterior walls. If the manufacturer does not provide shutters or
other protective covers to cover these openings, the manufacturer must pro-
vide to the homeowner instructions for at least one method of protecting exter-
ior door openings. This method must be capable of resisting the design wind
pressures specified in §3280.305 without taking the home out of conformance
with the standards in this part. These instructions must be included in the
printed instructions that accompany each manufactured home. The instruc-
tions shall also indicate whether receiving devices, sleeves, or anchors, for
fasteners to be used to secure the shutters or protective covers to the exter-
ior walls, have been installed or provided by the manufacturer.


§ 3280.406 Air chamber test method for

certification and qualification of

formaldehyde emission levels.

(a) Preconditioning. Preconditioning

of plywood or particleboard panels for

air chamber tests shall be initiated as

soon as practicable but not in excess of

30 days after the plywood or

particleboard is produced or surface-

finished, whichever is later, using ran-

domly selected panels.

(1) If preconditioning is to be initi-

ated more than two days after the ply-

wood or particleboard is produced or

surface-finished, whichever is later, the

panels must be dead-stacked or air-

tight wrapped until preconditioning is

initiated.

(2) Panels selected for testing in the

air chamber shall not be taken from

the top or bottom of the stack.

(b) Testing. Testing must be con-

ducted in accordance with the Stan-

dard Test Method for Determining

Formaldehyde Levels from Wood Prod-

ucts Under Defined Test Conditions

Using a Large Chamber, ASTM E 1333–

96, with the following exceptions:

(1) The chamber shall be operated in-

doors.

(2) Plywood and particleboard panels

shall be individually tested in accord-

ance with the following loading ratios:

(i) Plywood—0.29 Ft²/Ft³, and

(ii) Particleboard—0.13 Ft²/Ft³.

(3) Temperature to be maintained in-

side the chamber shall be 77° plus or

minus 2 °F.

(4) The test concentration (C) shall

be standardized to a level (C₀) at a
temperature (t₀) of 77 °F and 50% rel-
ative humidity (H₀) by the following

formula:

\[
C = C₀ \times [1 + Ax (H - H₀)] \times e^{R(t - t₀)}
\]

where:

- \(C\) = Test formaldehyde concentration
- \(C₀\) = Standardized formaldehyde concentration
- \(e\) = Natural log base
- \(R\) = Coefficient of temperature (9799)
- \(t\) = Actual test condition temperature (° K)
- \(t₀\) = Standardized temperature (° K)
- \(A\) = Coefficient of humidity (0.0175)
- \(H\) = Actual relative humidity (%)
- \(H₀\) = Standardized relative humidity (%)

The standardized level (C₀) is the con-

centration used to determine compli-

ance with §3280.308(a).

(5) The air chamber shall be in-

spected and recalibrated at least annu-

ally to insure its proper operation

under test conditions.

[49 FR 32312, Aug. 9, 1984, as amended at 58 FR 55009, Oct. 25, 1993; 70 FR 72046, Nov. 30, 2005]

Subpart F—Thermal Protection

§ 3280.501 Scope.

This subpart sets forth the require-
ments for condensation control, air in-
filtration, thermal insulation and cer-
tification for heating and comfort cool-
ing.

§ 3280.502 Definitions.

(a) The following definitions are ap-

icable to subpart F only:

(1) Pressure envelope means that pri-
mary air barrier surrounding the living
space which serves to limit air leakage.
In construction using ventilated cav-
ities, the pressure envelope is the inte-
rior skin.

(2) Thermal envelope area means the

sum of the surface areas of outside
walls, ceiling and floor, including all
openings. The wall area is measured by
multiplying outside wall lengths by the
inside wall height from floor to ceiling.
§ 3280.503 Materials.

Materials used for insulation shall be of proven effectiveness and adequate durability to assure that required design conditions concerning thermal transmission are attained.

§ 3280.504 Condensation control and installation of vapor retarders.

(a) Ceiling vapor retarders. (1) In Uo Value Zones 2 and 3, ceilings must have a vapor retarder with a permeeance of not greater than 1 perm (as measured by ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials) installed on the living space side of the roof cavity.

(2) For manufactured homes designed for Uo Value Zone 1, the vapor retarder may be omitted.

(b) Exterior walls. (1) Exterior walls must have a vapor retarder with a permeeance no greater than 1 perm (dry cup method) installed on the living space side of the wall; or

(2) Unventilated wall cavities must have an external covering and/or sheathing that forms the pressure envelope. The covering and/or sheathing must have a combined permeeance of not less than 5.0 perms. In the absence of test data, combined permeeance is permitted to be computed using the following formula: \( P_{\text{total}} = \frac{1}{(P_1^{-1} + P_2^{-1})} \), where \( P_1 \) and \( P_2 \) are the permeeance values of the exterior covering and sheathing in perms. Formed exterior siding applied in sections with joints not caulked or sealed, are not considered to restrict water vapor transmission; or

(3) Wall cavities must be constructed so that ventilation is provided to dissipate any condensation occurring in these cavities; or

(4) Homes manufactured to be sited in "humid climates" or "fringe climates" as shown on the Humid and Fringe Climate Map in this paragraph are permitted to have a vapor retarder specified in paragraph (b)(1) of this section installed on the exterior side of the wall insulation or be constructed with an external covering and sheathing with a combined permeeance of not greater than 1.0 perms, provided the interior finish and interior wall panel materials have a combined permeeance of not less than 5.0 perms. The following need not meet the minimum combined permeeance rating of not less than 5.0 perms for interior finish or wall panel materials:

(i) Kitchen back splash materials, less than 50 square feet in area installed around countertops, sinks, and ranges;

(ii) Bathroom tub areas, shower compartments;

(iii) Cabinetry and built-in furniture;

(iv) Trim materials;

(v) Hardboard wall paneling of less than 50 square feet in area under chair rails.
(5) The following areas of local governments (counties or similar areas, unless otherwise specified), listed by state are deemed to be within the humid and fringe climate areas shown on the Humid and Fringe Climate Map in paragraph (b)(4) of this section, and the vapor retarder or construction methods specified in paragraph (b)(4) of this section may be applied to homes built to be sited within these jurisdictions:

**ALABAMA**

**FLORIDA**
All counties and locations within the State of Florida.

**GEORGIA**

**HAWAII**
All counties and locations within the State of Hawaii.

**LOUISIANA**
All counties and locations within the State of Louisiana.

**MISSISSIPPI**
Adams, Amite, Claiborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Issaquena, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Lamar, Lawrence, Lincoln, Marion, Pearl River, Perry, Pike, Rankin, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson.

**NORTH CAROLINA**
Brunswick, Carteret, Columbus, New Hanover, Onslow, Pender.

**SOUTH CAROLINA**
Jasper, Beaufort, Colleton, Dorchester, Charleston, Berkeley, Georgetown, Horry.

**TEXAS**
Anderson, Angelina, Aransas, Atascosa, Austin, Bastrop, Bee, Bexar, Brazoria, Brazos, Brooks, Burleson, Caldwell, Calhoun,
§ 3280.505 Attic or roof ventilation.

(a) Attic and roof cavities shall be vented in accordance with one of the following:

(1) A minimum free ventilation area of not less than 1/300 of the attic or roof cavity floor area. At least 50 percent of the required free ventilation area shall be provided by ventilators located in the upper portion of the space to be ventilated. At least 40 percent shall be provided by eave, soffit or low gable vents. The location and spacing of the vent openings and ventilators shall provide cross-ventilation to the entire attic or roof cavity space. A clear air passage space having a minimum height of 1 inch shall be provided between the top of the insulation and the roof sheathing or roof covering. Baffles or other means shall be provided where needed to insure the 1 inch height of the clear air passage space is maintained.

(2) A mechanical attic or roof ventilation system may be installed instead of providing the free ventilation area when the mechanical system provides a minimum air change rate of 0.02 cubic feet per minute (cfm) per sq. ft. of attic floor area. Intake and exhaust vents shall be located so as to provide air movement throughout space.

(3) Parallel membrane roof section of a closed cell type construction are not required to be ventilated.

(4) The vents provided for ventilating attics and roof cavities shall be designed to resist entry of rain and insects.

§ 3280.506 Envelope air infiltration.

(a) Envelope air infiltration. The opaque envelope shall be designed and constructed to limit air infiltration to the living area of the home. Any design, material, method or combination thereof which accomplishes this goal may be used. The goal of the infiltration control criteria is to reduce heat loss/heat gain due to infiltration as much as possible without impinging on health and comfort and within the limits of reasonable economics.

(1) Envelope penetrations. Plumbing, mechanical and electrical penetrations of the pressure envelope not exempted by this part, and installations of window and door frames shall be constructed or treated to limit air infiltration. Penetrations of the pressure envelope made by electrical equipment, other than distribution panel boards and cable and conduit penetrations, are exempt from this requirement. Cable penetrations through outlet boxes are considered exempt.

(2) Joints between major envelope elements. Joints not designed to limit air infiltration between wall-to-wall, wall-to-ceiling and wall-to-floor connections shall be caulked or otherwise sealed. When walls are constructed to form a pressure envelope on the outside of the wall cavity, they are deemed to meet this requirement.

§ 3280.506 Heat loss/heat gain.

The manufactured home heat loss/heat gain shall be determined by methods outlined in §§ 3280.508 and 3280.509. The Uo (Coefficient of heat transmission) value zone for which the manufactured home is acceptable and the outlets, electrical junctions, electrical cable penetrations, plumbing penetrations, flue pipe penetrations and exhaust vent penetrations are sealed.
lowest outdoor temperature to which the installed heating equipment will maintain a temperature of 70°F shall be certified as specified in §3280.510 of this subpart. The Uo value zone shall be determined from the map in figure 506.
(a) **Coefficient of heat transmission.**

The overall coefficient of heat transmission (Uo) of the manufactured home for the respective zones and an indoor design temperature of 70°F, including internal and external ducts, and excluding infiltration, ventilation and condensation control, shall not exceed the Btu/(hr.) (sq. ft.) (F) of the manufactured home envelope are as tabulated below:

<table>
<thead>
<tr>
<th>Uo value zone</th>
<th>Maximum coefficient of heat transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.116 Btu/(hr.) (sq. ft.) (F)</td>
</tr>
<tr>
<td>2</td>
<td>0.096 Btu/(hr.) (sq. ft.) (F)</td>
</tr>
<tr>
<td>3</td>
<td>0.079 Btu/(hr.) (sq. ft.) (F)</td>
</tr>
</tbody>
</table>

(b) To assure uniform heat transmission in manufactured homes, cavities in exterior walls, floors, and ceilings shall be provided with thermal insulation.

(c) Manufactured homes designed for Uo Value Zone 3 shall be factory equipped with storm windows or insulating glass.

[58 FR 55009, Oct. 25, 1993; 59 FR 15113, Mar. 31, 1994]

§ 3280.507  Comfort heat gain.

Information necessary to calculate the home cooling load shall be provided as specified in this part.

(a) **Transmission heat gains.** Homes complying with this section shall meet the minimum heat loss transmission coefficients specified in §3280.506(a).

§ 3280.508  Heat loss, heat gain and cooling load calculations.

(a) Information, values and data necessary for heat loss and heat gain determinations must be taken from the 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition, chapters 22 through 27. The following portions of those chapters are not applicable:

- 23.1 Steel Frame Construction
- 23.2 Masonry Construction
- 23.3 Foundations and Floor Systems
- 23.15 Pipes
- 23.17 Tanks, Vessels, and Equipment
- 23.18 Refrigerated Rooms and Buildings
- 24.18 Mechanical and Industrial Systems
- 25.19 Commercial Building Envelope Leakage
- 27.9 Calculation of Heat Loss from Crawl Spaces

(b) The calculation of the manufactured home’s transmission heat loss coefficient (Uo) must be in accordance with the fundamental principles of the 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition, and, at a minimum, must address all the heat loss or heat gain considerations in a manner consistent with the calculation procedures provided in the document, Overall U-values and Heating/Cooling Loads—Manufactured Homes—February 1992—PNL 8006, HUD User No. 0005945.

(c) Areas where the insulation does not fully cover a surface or is compressed shall be accounted for in the U calculation (see §3280.506). The effect of framing on the U-value must be included in the Uo calculation. Other low-R-value heat-flow paths (“thermal shorts”) shall be explicitly accounted for in the calculation of the transmission heat loss coefficient if in the aggregate all types of low-R-value paths amount to more than 1% of the total exterior surface area. Areas are considered low-R-value heat-flow paths if:

1. They separate conditioned and unconditioned space; and
2. They are not insulated to a level that is at least one-half the nominal insulation level of the surrounding building component.

(d) **High efficiency heating and cooling equipment credit.** The calculated transmission heat loss coefficient (Uo) used for meeting the requirement in §3280.506(a) may be adjusted for heating and cooling equipment above that required by the National Appliance Energy Conservation Act of 1987 (NAECA) by applying the following formula:

\[ U_{o\text{ adjusted}} = U_{o\text{ standard}} \times \left[1 + (0.6) \left( \text{heating efficiency increase factor}\right) + (\text{cooling multiplier}) \left( \text{cooling efficiency increase factor}\right) \right] \]

where:

- \( U_{o\text{ standard}} \) = Maximum Uo for Uo Zone required by §3280.506(a)
- \( U_{o\text{ adjusted}} \) = Maximum Uo standard adjusted for high efficiency HVAC equipment
- Heating efficiency increase factor = The increase factor in heating equipment efficiency measured by the Annual Fuel Utilization Efficiency (AFUE), or the Heating Seasonal Performance Factor (HSPF) for heat pumps, above that required by
NAECA (indicated as “NAECA” in formula). The formula is heating efficiency increase factor = AFUE (HSPF) home – AFUE (or HSPF) NAECA divided by AFUE (HSPF) NAECA.

Cooling efficiency increase factor = the increase factor in the cooling equipment efficiency measured by the Seasonal Energy Efficiency Ratio (SEER) above that required by NAECA. The formula being cooling equipment=SEER home–SEER NAECA divided by SEER NAECA.

The cooling multiplier for the Uo Zone is from the following table:

<table>
<thead>
<tr>
<th>Uo zone</th>
<th>Cooling multiplier (Cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 .......</td>
<td>0.60 (Florida only).</td>
</tr>
<tr>
<td>1 .......</td>
<td>0.20 (All other locations).</td>
</tr>
<tr>
<td>2 .......</td>
<td>0.07.</td>
</tr>
<tr>
<td>3 .......</td>
<td>0.03.</td>
</tr>
</tbody>
</table>

(e) U values for any glazing (e.g., windows, skylights, and the glazed portions of any door) must be based on tests using AAMA 1503.1–1988, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections, or the National Fenestration Rating Council 100, 1997 Edition, Procedure for Determining Fenestration Product U-factors. In the absence of tests, manufacturers are to use the residential window U values contained in Chapter 29, Table 5 of the 1997 ASHRAE Handbook of Fundamentals, Inch-Pound Edition. In the event that the classification of the window type is indeterminate, the manufacturer must use the classification that gives the higher U value. Where a composite of materials from two different product types is used, the product is to be assigned the higher U value. For the purpose of calculating Uo values, storm windows are treated as an additional pane.

(f) Annual energy used based compliance. As an alternative, homes may demonstrate compliance with the annual energy used implicit in the coefficient of heat transmission (Uo) requirement. The annual energy use determination must be based on generally accepted engineering practices. The general requirement is to demonstrate that the home seeking compliance approval has a projected annual energy use, including both heating and cooling, less than or equal to a similar “base case” home that meets the standard. The energy use for both homes must be calculated based on the same assumptions; including assuming the same dimensions for all boundaries between conditioned and unconditioned spaces, site characteristics, usage patterns and climate.

§ 3280.510 Heat loss certificate.

The manufactured home manufacturer shall permanently affix the following “Certificate” to an interior surface of the home that is readily visible to the homeowner. The “Certificate” shall specify the following:

(a) Heating zone certification. The design zone at which the manufactured home heat loss complies with §3280.506(a).

(b) Outdoor certification temperature. The lowest outdoor temperature at which the installed heating equipment will maintain a 70°F temperature inside the home without storm sash or insulating glass for Zones 1 and 2, and with storm sash or insulating glass for Zone 3 and complying with §§3280.508 and §3280.509.

(c) Operating economy certification temperature. The temperature to be specified for operating economy and energy conservation shall be 20°F or 30% of the design temperature difference, whichever is greater, added to the temperature specified as the heating system capacity certification temperature without storm windows or insulating glass in Zones 1 and 2 and with storm windows or insulating glass in Zone 3. Design temperature difference is 70°
minus the heating system capacity certification temperature in degrees Fahrenheit.

HEATING CERTIFICATE

Home Manufacturer ____________________________
Plant Location ____________________________

(Include Uo Value Zone Map)

This manufactured home has been thermally insulated to conform with the requirements of the Federal Manufactured Home Construction and Safety Standards for all locations within Uo Value Zone ________.

Heating Equipment Manufacturer ____________________________
Heating Equipment Model ____________________________

The above heating equipment has the capacity to maintain an average 70°F temperature in this home at outdoor temperatures of [see paragraph (b) of this section] °F. To maximize furnace operating economy and to conserve energy, it is recommended that this home be installed where the outdoor winter design temperature (97 1/2%) is not higher than [see paragraph (c) of this section] °F degrees Fahrenheit.

The above information has been calculated assuming a maximum wind velocity of 15 MPH at standard atmospheric pressure.

(d) The following additional statement must be provided on the heating certificate and data plate required by § 3280.5 when the home is built with a vapor retarder of not greater than one perm (dry cup method) on the exterior side of the insulation: "This home is designed and constructed to be sited only in humid or fringe climate regions as shown on the Humid and Fringe Climate Map." A reproduction of the Humid and Fringe Climate Map in § 3280.504 is to be provided on the heating certificate and data plate. The map must be not less than 3 1/2 inch × 2 1/4 inch in size and may be combined with the U Value Zone Map for Manufactured Housing in § 3280.506.


§ 3280.511 Comfort cooling certificate and information.

(a) The manufactured home manufacturer shall permanently affix a "Comfort Cooling Certificate" to an interior surface of the home that is readily visible to the home owner. This certificate may be combined with the heating certificate required in § 3280.510. The manufacturer shall comply with one of the following three alternatives in providing the certificate and additional information concerning the cooling of the manufactured home:

(1) Alternative I. If a central air conditioning system is provided by the home manufacturer, the heat gain calculation necessary to properly size the air conditioning equipment shall be in accordance with procedures outlined in chapter 22 of the 1989 ASHRAE Handbook of Fundamentals, with an assumed location and orientation. The following shall be supplied in the Comfort Cooling Certificate:

   Air Conditioner Manufacturer ____________________________
   Air Conditioner Model ____________________________
   Certified Capacity ______ BTU/Hr. in accordance with the appropriate Air Conditioning and Refrigeration Institute Standards.

   The central air conditioning system provided with this home has been sized, assuming an orientation of the front (hitch end) of the home facing ______ and is designed on the basis of a 75 °F indoor temperature and an outdoor temperature of ______ °F dry bulb and ______ °F wet bulb.

   EXAMPLE ALTERNATE I

   COMFORT COOLING CERTIFICATE

   Manufactured Home Mfg ____________________________
   Plant Location ____________________________
   Manufactured Home Model ____________________________
   Air Conditioner Manufacturer ____________________________
   Certified Capacity ______ BTU/Hr. in accordance with the appropriate Air Conditioning and Refrigeration Institute Standards.

   The central air conditioning system provided with this home has been sized assuming an orientation of the front (hitch end) of the home facing ______. On this basis, the system is designed to maintain an indoor temperature of 75 °F when outdoor temperatures are ______ °F dry bulb and ______ °F wet bulb.

   The temperature to which this home can be cooled will change depending upon the amount of exposure of the windows to the sun's radiant heat. Therefore, the home's heat gains will vary dependent upon its orientation to the sun and any permanent shading provided. Information concerning the calculation of cooling loads at various locations, window exposures and shadings is provided in chapter 22 of the 1989 edition of the ASHRAE Handbook of Fundamentals.

   (2) Alternative 2. For each home suitable for a central air cooling system,
§ 3280.601 Scope.

Subpart G—Plumbing Systems

The manufacturer shall provide the following statement: “This air distribution system of this home is suitable for the installation of a central air conditioning system.”

EXAMPLE ALTERNATE 2

COMFORT COOLING CERTIFICATE
Manufactured Home Manufacturer
Plant Location
Manufactured Home Model
This air distribution system of this house is suitable for the installation of central air conditioning.

The supply air distribution system installed in this home is sized for Manufactured Home Central Air Conditioning System of up to ______ B.T.U./Hr. rated capacity which are certified in accordance with the appropriate Air Conditioning and Refrigeration Institute Standards. When the air circulators of such air conditioners are rated at 0.3 inch water column static pressure or greater for the cooling air delivered to the manufactured home supply air duct system.

Information necessary to calculate cooling loads at various locations and orientations is provided in the special comfort cooling information provided with this manufactured home.

(3) Alternative 3. If the manufactured home is not equipped with an air supply duct system, or if the manufacturer elects not to designate the home as being suitable for the installation of a central air conditioning system, the manufacturer shall provide the following statement: “This air distribution system of this home has not been designed in anticipation of its use with a central air conditioning system.”

EXAMPLE ALTERNATE 3

COMFORT COOLING CERTIFICATE
Manufactured Home Mfg
Plant Location
Manufactured Home Model
The air distribution system of this home has not been designed in anticipation of its use with a central air conditioning system.

(b) For each home designated as suitable for central air conditioning the manufacturer shall provide the maximum central manufactured home air conditioning capacity certified in accordance with the ARI Standard 210/240-89 Unitary Air-Conditioning and Air-Source Heat Pump Equipment and in accordance with §3280.715(a)(3). If the capacity information provided is based on entrances to the air supply duct at other than the furnace plenum, the manufacturer shall indicate the correct supply air entrance and return air exit locations.

(c) Comfort cooling information. For each manufactured home designated, either “suitable for” or “provided with” a central air conditioning system, the manufacturer shall provide comfort cooling information specific to the manufactured home necessary to complete the cooling load calculations. The comfort cooling information shall include a statement to read as follows:

To determine the required capacity of equipment to cool a home efficiently and economically, a cooling load (heat gain) calculation is required. The cooling load is dependent on the orientation, location and the structure of the home. Central air conditioners operate most efficiently and provide the greatest comfort when their capacity closely approximates the calculated cooling load. Each home’s air conditioner should be sized in accordance with chapter 22 of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals, 1989 Edition, once the location and orientation are known.

INFORMATION PROVIDED BY THE MANUFACTURER NECESSARY TO CALCULATE SENSIBLE HEAT GAIN

Walls (without windows and doors) __________________________ U
Ceilings and roofs of light color ___________________________ U
Ceilings and roofs of dark color ___________________________ U
Floors __________________________________________________ U
Air ducts in floor ________________________________________ U
Air ducts in ceiling ______________________________________ U
Air ducts installed outside the home ________________________ U

Information necessary to calculate duct areas.

§ 3280.602 Definitions.

The following definitions are applicable to subpart G only:

Accessible, when applied to a fixture, connection, appliance or equipment, means having access thereto, but which may require removal of an access panel or opening of a door.

Air gap (water distribution system) means the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, water supplied appliances, or other device and the flood level rim of the receptacle.

Anti-siphon trap vent device means a device which automatically opens to admit air to a fixture drain above the connection of the trap arm so as to prevent siphonage, and closes tightly when the pressure within the drainage system is equal to or greater than atmospheric pressure so as to prevent the escape of gases from the drainage system into the manufactured home.

Backflow means the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than its intended sources.

Backflow preventer means a device or means to prevent backflow.

Branch means any part of the piping system other than a riser, main or stack.

Common vent means a vent connecting at the junction of fixture drains and serving as a vent for more than one fixture.

Continuous vent means a vertical vent that is a continuation of the drain to which it connects.

Continuous waste means a drain from two or more fixtures connected to a single trap.

Critical level means a point established by the testing laboratory (usually stamped on the device by the manufacturer) which determines the minimum elevation above the flood level rim of the fixture or receptacle served on which the device may be installed. When a backflow prevention device does not bear a critical level marking, the bottom of the vacuum breaker, combination valve, or of any such approved or listed device shall constitute the critical level.

Cross connection means any physical connection or arrangement between two otherwise separate systems or sources, one of which contains potable water and the other either water, steam, gas or chemical of unknown or questionable safety whereby there may be a flow from one system or source to the other, the direction of flow depending on the pressure differential between the two systems.

Developed length means that length of pipe measured along the center line of the pipe and fittings.

Diameter, unless otherwise specifically stated, means the nominal (inside) diameter designated commercially.

Drain means a pipe that carries waste, water, or water-borne waste in a drainage system.

Drain connector means the removable extension, consisting of all pipes, fittings and appurtenances, from the drain outlet to the drain inlet serving the manufactured home.

Drain outlet means the lowest end of the main or secondary drain to which a sewer connection is made.

Drainage system means all piping within or attached to the structure that conveys sewage or other liquid waste to the drain outlet, not including the drain connector.

Fixture drain means the drain from the trap of a fixture to the junction of that drain with any other drain pipe.

Fixture supply means the water supply pipe connecting a fixture to a branch water supply pipe or directly to a main water supply pipe.

Flood-level means the level in the receptacle over which water would overflow to the outside of the receptacle.

Flooded means the condition which results when the liquid in a container or receptacle rises to the flood-level.

Flush tank means that portion of a water closet that is designed to contain sufficient water to adequately flush the fixture.

Flush valve means a device located at the bottom of a flush tank for flushing a water closet.
Flushometer tank: means a device integrated within an air accumulator vessel which is designed to discharge a predetermined quantity of water to fixtures for flushing purposes.

Flushometer valve means a device which discharges a predetermined quantity of water to a fixture for flushing purposes and is closed by direct water pressure.

Grade means the fall (slope) of a pipe in reference to a horizontal plane expressed in inches per foot length.

Horizontal branch means any pipe extending laterally, which receives the discharge from one or more fixture drains and connects to the main drain.

Horizontal pipe means any pipe or fitting which makes an angle of not more than 45 degrees with the horizontal.

Individual vent means a pipe installed to vent a fixture drain.

Inlet coupling means the terminal end of the water system to which the water service connection is attached. It may be a swivel fitting or threaded pipe end.

Main means the principal artery of the system to which branches may be connected.

Main drain means the lowest pipe of a drainage system which receives sewage from all the fixtures within a manufactured home and conducts these wastes to the drain outlet.

Main vent means the principal artery of the venting system to which vent branches may be connected.

Offset means a combination of pipe and/or fittings that brings one section of the pipe out of line but into a line parallel with the other section.

Pitch. See Grade.

Plumbing appliance: means any one of a special class of plumbing fixture which is intended to perform a special plumbing function. Its operation and/or control may be dependent upon one or more energized components, such as motors, control, heating elements, or pressure or temperature-sensing elements. Such fixture may operate automatically through one or more of the following actions: A time cycle, a temperature range, a pressure range, a measured volume or weight, or the fixture may be manually adjusted or controlled by the user or operator.

Plumbing appurtenance: means a manufactured device, or a prefabricated assembly, or an on-the-job assembly of component parts, and which is an adjunct to the basic piping system and plumbing system and plumbing fixtures. An appurtenance demands no additional water supply, nor does it add any discharge load to a fixture or the drainage system.

Plumbing fixtures means receptacles, devices, or appliances which are supplied with water or which receive liquid or liquid-borne wastes for discharge into the drainage system.

Plumbing system means the water supply and distribution pipes; plumbing fixtures, faucets and traps; soil, waste and vent pipes; and water-treating or water-using equipment.

Primary vent. See main vent.

Relief vent means an auxiliary vent which permits additional circulation of air in or between drainage and vent systems.

Secondary vent means any vent other than the main vent or those serving each toilet.

Sewage means any liquid waste containing animal or vegetable matter in suspension or solution, and may include liquids containing chemicals in solution.

Siphonage means the loss of water seal from fixture traps resulting from partial vacuum in the drainage system which may be of either of the following two types, or a combination of the two: (a) Self-siphonage resulting from vacuum in a fixture drain generated solely by the discharge of the fixture served by that drain, or,

(b) Induced siphonage resulting from vacuum in the drainage system generated by the discharge of one or more fixtures other than the one under observation.

Trap means a fitting or device designed and constructed to provide a liquid seal that will prevent the back passage of air without materially affecting the flow of liquid waste through it.

Trap arm means the portion of a fixture drain between a trap and its vent.

Trap seal means the vertical depth of liquid that a trap will retain.

Vacuum breaker. See backflow preventer.

Vent cap means the device or fitting which protects the vent pipe from foreign substance with an opening to the
atmosphere equal to the area of the vent it serves. Vent system means that part of a piping installation which provides circulation of air within a drainage system. Vertical pipe means any pipe or fitting which makes an angle of not more than 45 degrees with the vertical. Water closet drain means that part of the drainage piping which receives the discharge from each individual water closet. Water connection means the fitting or point of connection for the manufactured home water distribution system designed for connection to a water supply. Water connector means the removable extension connecting the manufactured home water distribution system to the water supply. Water distribution system means potable water piping within or permanently attached to the manufactured home. Wet vent means a vent which also serves as a drain for one or more fixtures. Wet vented drainage system means the specially designed system of drain piping that also vents one or more plumbing fixtures by means of a common waste and vent pipe. Whirlpool bathtub means a plumbing appliance consisting of a bathtub fixture which is equipped and fitted with a circulation piping system, pump, and other appurtenances and is so designed to accept, circulate, and discharge bathtub water upon each use. 

§ 3280.603 General requirements.

(a) Minimum requirements. Any plumbing system installed in a manufactured home shall conform, at least, with the provisions of this subpart.

(1) General. The plumbing system shall be of durable material, free from defective workmanship, and so designed and constructed as to give satisfactory service for a reasonable life expectancy.

(2) Conservation. Water closets shall be selected and adjusted to use the minimum quantity of water consistent with proper performance and cleaning.

(3) Connection to drainage system. All plumbing, fixtures, drains, appurtenances, and appliances designed or used to receive or discharge liquid waste or sewage shall be connected to the manufactured home drainage system in a manner provided by this standard.

(4) Workmanship. All design, construction, and workmanship shall be in conformance with accepted engineering practices and shall be of such character as to secure the results sought to be obtained by this standard.

(5) Components. Plumbing materials, devices, fixtures, fittings, equipment, appliances, appurtenance, and accessories intended for use in or attached to a manufactured home shall conform to one of the applicable standards referenced in §3280.604. Where an applicable standard is not referenced, or an alternative recognized standard is utilized, the plumbing component shall be listed by a nationally recognized testing laboratory, inspection agency or other qualified organization as suitable for the intended use.

(6) Prohibited fittings and practices. (i) Drainage or vent piping shall not be drilled and tapped for the purpose of making connections.

(ii) Except as specifically provided elsewhere in this standard, vent pipes shall not be used as waste or drain pipes.

(iii) Fittings, connections, devices, or methods of installation that obstruct or retard the flow of sewage, or air in the drainage or venting systems in an amount greater than the normal frictional resistance to flow shall not be used unless their use is acceptable in this standard or their use is accepted as having a desirable and acceptable function of ultimate benefit to the proper and continued functioning of the plumbing system.

(iv) Cracks, holes, or other imperfections in materials shall not be concealed by welding, brazing, or soldering or by paint, wax, tar, or other leak-sealing or repairing agents.

(v) Piping, fixtures or equipment shall be located so as not to interfere with the normal use or with the normal operation and use of windows, doors or other required facilities.
(vi) Galvanized pipe shall not be bent or welded.

(7) **Alignment of fittings.** All valves, pipes, and fittings shall be installed in correct relationship to the direction of flow.

(b) **Protective requirements.**

(1) Cutting structural members. Structural members shall not be unnecessarily or carelessly weakened by cutting or notching.

(2) **Exposed piping.** All piping, pipe threads, hangers, and support exposed to the weather, water, mud, and road hazard, and subject to damage therefrom, shall be painted, coated, wrapped, or otherwise protected from deterioration.

(3) **Road damage.** Pipes, supports, drains, outlets, or drain hoses shall not extend or protrude in a manner where they could be unduly subjected to damage during transit.

(4) **Freezing.** All piping and fixtures subject to freezing temperatures shall be insulated or protected to prevent freezing, under normal occupancy. The manufacturer shall provide:

(i) Written installation instructions for the method(s) required for compliance to this section;

(ii) A statement in his installation instructions that if heat tape is used it shall be listed for use with manufactured homes;

(iii) A receptacle outlet for the use of a heat tape located on the underside of the manufactured home within 2 feet of the water supply inlet. The receptacle outlet provided shall not be placed on a branch circuit which is protected by a ground fault circuit interrupter.

(5) All piping, except the fixture trap, shall be designed to allow drainage.

(6) **Rodent resistance.** All exterior openings around piping and equipment shall be sealed to resist the entrance of rodents.

(7) Piping and electrical wiring shall not pass through the same holes in walls, floors or roofs. Plastic piping shall not be exposed to heat in excess of manufacturers recommendation or radiation from heat producing appliances.


MISCELLANEOUS

Material and Property Standard for Cast Brass and Tubing P-Traps—IAPMO PS 2–89.
§ 3280.605  Joints and connections.

(a) Tightness. Joints and connections in the plumbing system shall be gastight and watertight for the pressures required under testing procedures.

(1) Assembling of pipe. All joints and connections shall be correctly assembled for tightness. Pipe threads shall be fully engaged with the threads of the fitting. Plastic pipe and copper tubing shall be inserted to the full depth of the solder cup or welding sockets of each fitting. Pipe threads and slip joints shall not be wrapped with string, paper, putty, or similar fillers.

(2) Threaded joints. Threads for screw pipe and fittings shall conform to the approved or listed standard. Pipe ends shall be reamed out to size of bore. All burrs, chips, cutting oil and foreign matter shall be removed. Pipe joint cement or thread lubricant shall be of approved type and applied to male threads only.

(3) Solder joints. Solder joints for tubing shall be made with approved or listed solder type fittings. Surfaces to be soldered shall be cleaned bright. The joints shall be properly fluxed with noncorrosive paste type flux and, for manufactured homes to be connected to a public water system, made with solder having not more than 0.2 percent lead.

(4) Plastic pipe, fittings and joints. Plastic pipe and fittings shall be joined by installation methods recommended by the manufacturer or in accordance with the provisions of a recognized, approved, or listed standard.

(5) Union joints. Metal unions in water piping shall have metal-to-metal ground seats.

(6) Flared joints. Flared joints for soft-copper water tubing shall be made with approved or listed fittings. The tubing shall be expanded with a proper flaring tool.

(7) Cast iron soil pipe joints. Approved or listed cast iron pipe may be joined as follows:


§ 3280.606 Traps and cleanouts.

(a) Traps—

(1) Traps required. Each plumbing fixture, except listed toilets, shall be separately trapped by approved water seal "P" traps. All traps shall be effectively vented.

(2) Dual fixtures. A two-compartment sink, two single sinks, two lavatories, or a single sink and a single lavatory with waste outlets not more than 30 inches apart and in the same room and flood level rims at the same level may be connected to one "P" trap and may be considered as a single fixture for the purpose of drainage and vent requirements.

(3) Prohibited traps. A trap which depends for its seal upon concealed interior partitions shall not be used. Full "S" traps, bell traps, drum traps, crown-vented traps, and running traps are prohibited. Fixtures shall not be double-trapped.

(4) Material and design. Each trap shall be self-cleaning with a smooth and uniform interior waterway. Traps shall be manufactured of cast iron, cast brass, or drawn brass tubing of not less than No. 20 Brown and Sharpe gage, or approved or listed plastic, or other approved or listed material. Union joints for a trap shall be beaded to provide a shoulder for the union nut. Each trap shall have the manufacturer's name stamped or cast in the body of the trap, and each tubing trap shall show the gage of the tubing.

(5) Trap seal. Each "P" trap shall have a water seal of not less than 2 inches and not more than 4 inches and shall be set true to its seal.

(6) Size. Traps shall be not less than 1½ inches in diameter. A trap shall not be larger than the waste pipe to which it is connected.

(7) Location. Each trap shall be located as close to its vent and to its fixture outlet as structural conditions will permit.

(b) Cleanout openings—

(1) Location of cleanout fittings. Cleanouts shall be installed if the drainage system cannot be cleaned through fixtures, drains, or vents. Cleanouts shall also be provided when fittings of more than 45 degrees are used to affect an offset except where long turn ells are used which provide sufficient "sweep" for cleaning.

(2) Access to cleanouts. Cleanouts shall be accessible through an unobstructed minimum clearance of 12 inches directly in front of the opening. Each cleanout fitting shall open in a direction opposite to the flow or at right angles to the pipe. Concealed cleanouts

(8) Length of tailpiece. The vertical distance from a trap to the fixture outlet shall not exceed 24 inches.

(9) Installation. (i) Grade of trap arm. The piping between a "P" trap and the fixture tee or the vented waste line shall be graded ¼ inch per foot towards the vent and in no event shall have a slope greater than its diameter. The vent opening at fixture tees shall not be below the weir of the "P" trap outlet.

(ii) Trap arm offset. The piping between the "P" trap and vent may change direction or be offset horizontally with the equivalent of no more than 180 degrees total change in direction with a maximum of 90 degrees by any one fitting.

(iii) Concealed traps. Traps with mechanical joints shall be accessible for repair and inspection.

(iv) Removability of traps, etc. Traps shall be designed and installed so the "U" bend is removable without removing the strainers from the fixture. Continuous waste and tail pieces which are permanently attached to the "U" bend shall also be removable without removing the strainer from the fixture.

(i) Grade of trap arm.
that are not provided with access covers shall be extended to a point above the floor or outside of the manufactured home, with pipe and fittings installed, as required, for drainage piping without sags and pockets.

(3) Material. Plugs and caps shall be brass or approved or listed plastic, with screw pipe threads.

(4) Design. Cleanout plugs shall have raised heads except that plugs at floor level shall have counter-sunk slots.

above the finished dam or threshold. In no case shall the depth of a shower receptor be less than 2 inches or more than 9 inches measured from the top of the finished dam or threshold to the top of the drain. The wall area shall be constructed of smooth, noncorrosive, and nonabsorbent waterproof materials to a height not less than 6 feet above the bathroom floor level. Such walls shall form a watertight joint with each other and with the bathtub, receptor or shower floor. The floor of the compartment shall slope uniformly to the drain at not less than one-fourth nor more than one-half inch per foot.

(ii) The joint around the drain connection shall be made watertight by a flange, clamping ring, or other approved listed means.

(iii) Shower doors and tub and shower enclosures shall be constructed so as to be waterproof and, if glazed, glazing shall comply with the standard for Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings, ANSI Z97.1–1984.

(iv) Prefabricated plumbing fixtures shall be approved or listed.

(4) Dishwashing machines. (i) A dishwashing machine shall not be directly connected to any waste piping, but shall discharge its waste through a fixed air gap installed above the machine, or through a high loop as specified by the dishwashing machine manufacturer, or into an open standpipe-receptor with a height greater than the washing compartment of the machine. When a standpipe is used, it shall be at least 18 inches but not more than 30 inches above the trap weir. The drain connections from the air gap or high loop may connect to an individual trap, to a directional fitting installed in the sink tailpiece or to an opening provided on the inlet side of a food waste disposal unit.

(ii) Drain from a dishwashing machine shall not be connected to a sink tailpiece, continuous waste line, or trap on the discharge side of a food waste disposal unit.

(5) Clothes washing machines. (i) Clothes washing machines shall drain either into a properly vented trap, into a laundry tub tailpiece with watertight connections, into an open standpipe receptor, or over the rim of a laundry tub.

(ii) Standpipes shall be 1 1/2 inches minimum nominal iron pipe size, 1 1/2 inches diameter nominal brass tubing not less than No. 20 Brown and Sharpe gage, or 1 1/2 inches approved plastic materials. Receptors shall discharge into a vented trap or shall be connected to a laundry tub tailpiece by means of an approved or listed directional fitting. Each standpipe shall extend not less than 18 inches or more than 30 inches above its trap and shall terminate in an accessible location no lower than the top of the clothes washing machine. A removable tight fitting cap or plug shall be installed on the standpipe when clothes washer is not provided.

(iii) Clothes washing machine drain shall not be connected to the tailpiece, continuous waste, or trap of any sink or dishwashing machine.

(c) Installation—(1) Access. Each plumbing fixture and standpipe receptor shall be located and installed in a manner to be accessible for usage, cleaning, repair and replacement. Access to diverter valves and other connections from the fixture hardware is not required.

(2) Alignment. Fixtures shall be set level and in true alignment with adjacent walls. Where practical, piping from fixtures shall extend to nearest wall.

(3) Brackets. Wall-hung fixtures shall be rigidly attached to walls by metal brackets or supports without any strain being transmitted to the piping connections. Flush tanks shall be securely fastened to toilets or to the wall with corrosive-resistant materials.

(4) Tub supports. Bathtub rims at wall shall be supported on metal hangers or on end-grain wood blocking attached to the wall unless otherwise recommended by the manufacturer of the tub.

(5) Fixture fittings. Faucets and diverters shall be installed so that the flow of hot water from the fittings corresponds to the left-hand side of the fitting.

(6) Whirlpool bathtub appliances—(i) Access panel. A door or panel of sufficient size shall be installed to provide access to the pump for repair and/or replacement.
§ 3280.608 Hangers and supports.

(a) Strains and stresses. Piping in a plumbing system shall be installed without undue strains and stresses, and provision shall be made for expansion, contraction, and structural settlement.

(b) Piping supports. Piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents. Unless otherwise stated in the standards for specific materials shown in the table in §3280.604(a), or unless specified by the pipe manufacturer, plastic drainage piping shall be supported at intervals not to exceed 4 feet and plastic water piping shall be supported at intervals not to exceed 3 feet.

(c) Hangers and anchors. (1) Hangers and anchors shall be of sufficient strength to support their proportional share of the pipe alignments and prevent rattling.

(2) Piping shall be securely attached to the structure by hangers, clamps, or brackets which provide protection against motion, vibration, road shock, or torque in the chassis.

(3) Hangers and straps supporting plastic pipe shall not compress, distort, cut or abrade the piping and shall allow free movement of the pipe.

§ 3280.609 Water distribution systems.

(a) Water supply—(1) Supply piping. Piping systems shall be sized to provide an adequate quantity of water to each plumbing fixture at a flow rate sufficient to keep the fixture in a clean and sanitary condition without any danger of backflow or siphonage. (See table in §3280.608(f)(1)). The manufacturer shall include in his written installation instructions that the manufactured home has been designed for an inlet water pressure of 80 psi, and a statement that when the manufactured home is to be installed in areas where the water pressure exceeds 80 psi, a pressure reducing valve should be installed.

(2) Hot water supply. Each manufactured home equipped with a kitchen sink, and bathtub and/or shower shall be provided with a hot water supply system including a listed water heater.

(b) Water outlets and supply connections—(1) Water connection. Each manufactured home with a water distribution system shall be equipped with a 3/4 inch threaded inlet connection. This connection shall be tagged or marked “Fresh Water Connection” (or marked “Fresh Water Fill”). A matching cap or plug shall be provided to seal the water inlet when it is not in use, and shall be permanently attached to the manufactured home or water supply piping. When a master cold water shutoff full flow valve is not installed on the main feeder line in an accessible location, the manufacturer’s installation instructions shall indicate that such a valve is to be installed in the water supply line adjacent to the home. When a manufactured home includes expandable rooms or is composed of two or more units, fittings or connectors designed for such purpose shall be provided to connect any water piping. When not connected, the water piping shall be protected by means of matching threaded caps or plugs.

(2) Prohibited connections. (i) The installation of potable water supply piping or fixture or appliance connections shall be made in a manner to preclude the possibility of backflow.

(ii) No part of the water system shall be connected to any drainage or vent piping.

(3) Rim outlets. The outlets of faucets, spouts, and similar devices shall be spaced at least 1 inch above the flood level of the fixture.

(4) Appliance connections. Water supplies connected to clothes washing or dishwashing machines shall be protected by an approved or listed fixed
(5) **Flushometer values or manually operated flush valves.** An approved or listed vacuum breaker shall be installed and maintained in the water supply line on the discharge side of a water closet flushometer valve or manually operated flush valve. Vacuum breakers shall have a minimum clearance of 6 inches above the flood level of the fixture to the critical level mark unless otherwise permitted in their approval.

(6) **Flush tanks.** Water closet flush tanks shall be equipped with an approved or listed anti-siphon ball cock which shall be installed and maintained with its outlet or critical level mark not less than 1 inch above the full opening of the overflow pipe.

(7) **Hose bibs.** When provided, all exterior hose bibs and laundry sink hose connections shall be protected by a listed non-removable backflow prevention device. This is not applicable to hose connections provided for automatic washing machines with built-in backflow prevention.

(8) **Flushometer tanks.** Flushometer tanks shall be equipped with an approved air gap on the vacuum breaker assembly located above the flood level rim above the fixture.

(c) **Water heater safety devices—(1) Relief valves.** (i) All water heaters shall be installed with approved and listed fully automatic valve or valves designed to provide temperature and pressure relief.

(ii) Any temperature relief valve or combined pressure and temperature relief valve installed for this purpose shall have the temperature sensing element immersed in the hottest water within the upper 6 inches of the tank. It shall be set to start relieving at a pressure of 150 psi or the rated working pressure of the tank whichever is lower and at or below a water temperature of 210 °F.

(iii) Relief valves shall be provided with full-sized drains, with cross sectional areas equivalent to that of the relief valve outlet, which shall be directed downward and discharge beneath the manufactured home. Drain lines shall be of a material listed for hot water distribution and shall drain fully by gravity, shall not be trapped, and shall not have their outlets threaded, and the end of the drain shall be visible for inspection.

(d) **Materials—(1) Piping material.** Water pipe shall be of standard weight brass, galvanized wrought iron, galvanized steel, Type K, L or M copper tubing, approved or listed plastic or other approved or listed material.

(i) **Plastic piping.** All plastic water piping and fittings in manufactured homes must be listed for use with hot water.

(ii) [Reserved]

(2) **Fittings.** Appropriate fittings shall be used for all changes in size and where pipes are joined. The material and design of fittings shall conform to the type of piping used. Special consideration shall be given to prevent corrosion when dissimilar metals are joined.

(i) Fittings for screw piping shall be standard weight galvanized iron for galvanized iron and steel pipe, and of brass for brass piping. They shall be installed where required for change in direction, reduction of size, or where pipes are joined together.

(ii) Fittings for copper tubing shall be cast brass or drawn copper (sweat-soldered) or shall be approved or listed fittings for the purpose intended.

(3) **Prohibited material.** Used piping materials shall not be permitted. Those pipe dopes, solder, fluxes, oils, solvents, chemicals, or other substances that are toxic, corrosive, or otherwise detrimental to the water system shall not be used. In addition, for those manufactured homes to be connected to a public water system, all water piping shall 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.
§ 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 shall be standard weight steel, wrought iron, brass, copper tube DWV, listed 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.

 EXCEPTIONS TO TABLE: ¾ inch nominal diameter or 1½ inch OD minimum size for clothes washing or dishwashing machines, unless larger size is recommended by the fixture manufacturer. ¾ inch nominal diameter or ½ inch OD minimum size for flushometer or metering type valves unless otherwise specified in their listing. No galvanized screw piping shall be less than ½ inch iron pipe size.

(ii) 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 tallied 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.

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(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) 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) 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 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. (1) Fixture load. Except as provided by §3280.611(d), drain pipe sizes shall be determined by the type of fixture and the total number connected to each drain.

(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 “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 1/4 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 1/4 inch per foot, the pipe or piping may have a grade of not less than 1/8 inch per foot, when a full size cleanout is installed at the upper end.

§ 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 1 1/4 inch minimum diameter vent or rectangular vent of venting cross section equivalent to or greater than the venting cross section of a 1 1/2 inch diameter vent, connected to the toilet drain by one of the following methods:

(i) A 1 1/2 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 1 1/2 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 1 1/2 inch or smaller trap shall be provided with a vent pipe equivalent in area to a 1 1/4 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 1 1/2 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
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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:

<table>
<thead>
<tr>
<th>Size of fixture drain (inches)</th>
<th>Distance trap to vent</th>
</tr>
</thead>
<tbody>
<tr>
<td>11⁄4</td>
<td>4 ft. 6 in.</td>
</tr>
<tr>
<td>11⁄2</td>
<td>4 ft. 6 in.</td>
</tr>
<tr>
<td>2</td>
<td>5 ft.</td>
</tr>
<tr>
<td>3</td>
<td>6 ft.</td>
</tr>
</tbody>
</table>

(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 11⁄2 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 11⁄2 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;


(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.

(i) 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.

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§ 3280.701 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.

§ 3280.702 Definitions.

The definitions in this subpart apply to subpart H only.

Accessible, when applied to a fixture, connection, appliance or equipment, means having access thereto, but which may require the removal of an access panel, door or similar obstruction.

Air conditioner blower coil system means a comfort cooling appliance where the condenser section is placed external to the manufactured home and evaporator section with circulating blower attached to the manufactured home air supply duct system. Provision must be made for a return air system to the evaporator/blower section. Refrigerant connection between the two parts of the system is accomplished by tubing.

Air conditioner split system means a comfort cooling appliance where the condenser section is placed external to the manufactured home and the evaporator section incorporated into the heating appliance or with a separate blower/coil section within the manufactured home. Refrigerant connection between the two parts of the system is accomplished by tubing.

Air conditioning condenser section means that portion of a refrigerated air cooling or (in the case of a heat pump) heating system which includes the refrigerant pump (compressor) and the external heat exchanger.

Air conditioning evaporator section means a heat exchanger used to cool or (in the case of a heat pump) heat air for use in comfort cooling (or heating) the living space.

Air conditioning self contained system means a comfort cooling appliance combining the condenser section, evaporator and air circulating blower into one unit with connecting ducts for the supply and return air systems.

Air duct means conduits or passageways for conveying air to or from heating, cooling, air conditioning or ventilation equipment, but not including the plenum.

Automatic pump (oil lifter) means a pump, not an integral part of the oil-burning appliance, that automatically pumps oil from the supply tank and delivers the oil under a constant head to an oil-burning appliance.
Btu. British thermal units means the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Btuh means British thermal units per hour.

Burner means a device for the final conveyance of fuel or a mixture of fuel and air to the combustion zone.

Central air conditioning system means either an air conditioning split system or an external combination heating/cooling system.

Class 0 air ducts means ducts of materials and connectors having a fire-hazard classification of zero.

Class 1 air ducts means ducts of materials and connectors having a flame-spread rating of not over 25 without evidence of continued progressive combustion and a smoke-developed rating of not over 50.

Class 2 air ducts means ducts of materials and connectors having a flame-spread rating of not over 50 without evidence of continued progressive combustion and a smoke-developed rating of not over 50 for the inside surface and not over 100 for the outside surface.

Clearance means the distance between the appliance, chimney, vent, chimney or vent connector or plenum and the nearest surface.

Connector-Gas appliance: means a flexible or semi-rigid connector used to convey fuel gas between a gas outlet and a gas appliance.

Energy Efficiency Ratio (EER) means the ratio of the cooling capacity output of an air conditioner for each unit of power input.

\[ \text{EER} = \frac{\text{Capacity (Btuh)}}{\text{Power input (watts)}} \]

External combination heating/cooling system means a comfort conditioning system placed external to the manufactured home with connecting ducts to the manufactured home for the supply and return air systems.

Factory-built fireplace means a hearth, fire chamber and chimney assembly composed of listed factory-built components assembled in accordance with the terms of listing to form a complete fireplace.

Fireplace stove means a chimney connected solid fuel-burning stove having part of its fire chamber open to the room.

Fuel gas piping system means the arrangement of piping, tubing, fittings, connectors, valves and devices designed and intended to supply or control the flow of fuel gas to the appliance(s).

Fuel oil piping system means the arrangement of piping, tubing, fittings, connectors, valves and devices designed and intended to supply or control the flow of fuel oil to the appliance(s).

Gas clothes dryer means a device used to dry wet laundry by means of heat derived from the combustion of fuel gases.

Gas refrigerator means a gas-burning appliance which is designed to extract heat from a suitable chamber.

Gas supply connection means the terminal end or connection to which a gas supply connector is attached.

Gas supply connector, manufactured home means a listed flexible connector designed for connecting the manufactured home to the gas supply source.

Gas vents means factory-built vent piping and vent fittings listed by an approved testing agency, that are assembled and used in accordance with the terms of their listings, for conveying flue gases to the outside atmosphere.

1. Type B gas vent means a gas vent for venting gas appliances with draft hoods and other gas appliances listed for use with Type B gas vents.

2. Type BW gas vent means a gas vent for venting listed gas-fired vented wall furnaces.

Heat producing appliance means all heating and cooking appliances and fuel burning appliances.

Heating appliance means an appliance for comfort heating or for domestic water heating.

Liquefied petroleum gases. The terms Liquefied petroleum gases, LPG and LP-Gas as used in this standard shall mean and include any material which is composed predominantly of any of the following hydrocarbons, or mixtures of them: propane, propylene butanes (normal butane or isobutane), and butylenes.

Plenum means an air compartment which is part of an air-distributing system, to which one or more ducts or outlets are connected.
§ 3280.703

(1) Furnace supply plenum is a plenum attached directly to, or an integral part of, the air supply outlet of the furnace.

(2) Furnace return plenum is a plenum attached directly to, or an integral part of, the return inlet of the furnace.

Quick-disconnect device means a hand-operated device which provides a means for connecting and disconnecting a gas supply or connecting gas systems and which is equipped with an automatic means to shut off the gas supply when the device is disconnected.

Readily accessible means direct access without the necessity of removing any panel, door, or similar obstruction.

Roof jack means that portion of a manufactured home heater flue or vent assembly, including the cap, insulating means, flashing, and ceiling plate, located in and above the roof of a manufactured home.

Sealed combustion system appliance means an appliance which by its inherent design is constructed so that all air supplied for combustion, the combustion system of the appliance, and all products of combustion are completely isolated from the atmosphere of the space in which it is installed.

Water heater means an appliance for heating water for domestic purposes other than for space heating.


§ 3280.703 Minimum standards.

Heating, cooling and fuel burning appliances and systems in manufactured homes shall be free of defects, and shall conform to applicable standards in the following table unless otherwise specified in this standard. (See §3280.4) When more than one standard is referenced, compliance with any one such standard shall meet the requirements of this standard.

Appliances


Ferrous Pipe and Fittings


Nonferrous Pipe, Tubing, and Fittings


§ 3280.704 Fuel supply systems.

(a) **LP—Gas system design and service line pressure.** (1) Systems shall be of the vapor-withdrawal type.

(2) Gas, at a pressure not over 14 inches water column (\(1/2\) psi), shall be delivered from the system into the gas supply connection.

(b) **LP-gas containers—(1) Maximum capacity.** No more than two containers having an individual water capacity of not more than 105 pounds (approximately 45 pounds LP-gas capacity), shall be installed on or in a compartment of any manufactured home.

(2) **Construction of containers.** Containers shall be constructed and marked in accordance with the specifications for LP-Gas Containers of the U.S. Department of Transportation (DOT) or the Rules for Construction of Pressure Vessels 1986, ASME Boiler and Pressure Vessel Code section VIII, Division 1 ASME Containers shall have a design pressure of at least 312.5 psig.

(i) Container supply systems shall be arranged for vapor withdrawal only.

(ii) Container openings for vapor withdrawal shall be located in the vapor space when the container is in service or shall be provided with a suitable internal withdrawal tube which communicates with the vapor space on or near the highest point in the container when it is mounted in service position, with the vehicle on a level surface. Containers shall be permanently and legibly marked in a conspicuous manner on the outside to show the correct mounting position and the position of the service outlet connection. The method of mounting in place shall be such as to minimize the possibility of an incorrect positioning of the container.

(3) **Location of LP-gas containers and systems.** (i) LP-gas containers shall not be installed, nor shall provisions be made for installing or storing any LP-gas container, even temporarily, inside any manufactured home except for listed, completely self-contained, hand torches, lanterns, or similar equipment with containers having a maximum water capacity of not more than 2 1/4 pounds (approximately one pound LP-gas capacity).

(ii) Containers, control valves, and regulating equipment, when installed,
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shall be mounted on the “A” frame of the manufactured home, or installed in a compartment that is vaportight to the inside of the manufactured home and accessible only from the outside. The compartment shall be ventilated at top and bottom to facilitate diffusion of vapors. The compartment shall be ventilated with two vents having an aggregate area of not less than two percent of the floor area of the compartment and shall open unrestricted to the outside atmosphere. The required vents shall be equally distributed between the floor and ceiling of the compartment. If the lower vent is located in the access door or wall, the bottom edge of the vent shall be flush with the floor level of the compartment. The top vent shall be located in the access door or wall with the bottom of the vent not more than 12 inches below the ceiling level of the compartment. All vents shall have an unrestricted discharge to the outside atmosphere. Access doors or panels of compartments shall not be equipped with locks or require special tools or knowledge to open.

(iii) Permanent and removable fuel containers shall be securely mounted to prevent jarring loose, slipping or rotating and the fastenings shall be designed and constructed to withstand static loading in any direction equal to twice the weight of the tank and attachments when filled with fuel, using a safety factor of not less than four based on the ultimate strength of the material to be used.

(4) LP-gas container valves and accessories. (i) Valves in the assembly of a two-cylinder system shall be arranged so that replacement of containers can be made without shutting off the flow of gas to the appliance(s). This provision is not to be construed as requiring an automatic change-over device.

(ii) Shutoff valves on the containers shall be protected as follows, in transit, in storage, and while being moved into final utilization by setting into a recess of the container to prevent possibility of their being struck if container is dropped upon a flat surface, or by ventilated cap or collar, fastened to the container, capable of withstanding a blow from any direction equivalent to that of a 30-pound weight dropped 4 feet. Construction shall be such that the blow will not be transmitted to the valve.

(iii) [Reserved]

(iv) Regulators shall be connected directly to the container shutoff valve outlets or mounted securely by means of a support bracket and connected to the container shutoff valve or valves with listed high pressure connections. If the container is permanently mounted the connector shall be as required above or with a listed semi-rigid tubing connector.

(5) LP-gas safety devices. (i) DOT containers must be provided with safety relief devices as required by the regulation of the U.S. Department of Transportation. ASME containers must be provided with relief valves in accordance with subsection 2.3.2 of NFPA 58–2001, Standard for the Storage and Handling Liquefied Petroleum Gases. Safety relief valves must have direct communication with the vapor space of the vessel.

(ii) The delivery side of the gas pressure regulator shall be equipped with a safety relief device set to discharge at a pressure not less than two times and not more than three times the delivery pressure of the regulator.

(iii) Systems mounted on the “A” frame assembly shall be so located that the discharge from the safety relief devices shall be into the open air and not less than three feet horizontally from any opening into the manufactured home below the level of such discharge.

(iv) Safety relief valves located within liquefied petroleum gas container compartments may be less than three feet from openings provided the bottom vent of the compartment is at the same level or lower than the bottom of any opening into the vehicle, or the compartment is not located on the same wall plane as the opening(s) and is at least two feet horizontally from such openings.

(6) LP-gas system enclosure and mounting. (i) Housings and enclosures shall be designed to provide proper ventilation at least equivalent to that specified in §3280.704(b)(3)(i).

(ii) Doors, hoods, domes, or portions of housings and enclosures required to be removed or opened for replacement of containers shall incorporate means
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for clamping them firmly in place and preventing them from working loose during transit.

(iii) Provisions shall be incorporated in the assembly to hold the containers firmly in position and prevent their movement during transit.

(iv) Containers shall be mounted on a substantial support or a base secured firmly to the vehicle chassis. Neither the container nor its support shall extend below the manufactured home frame.

(c) Oil tanks—(1) Installation. Oil tanks and listed automatic pumps (oil lifters) installed for gravity flow of oil to heating equipment shall be installed so that the top of the tank is no higher than 8 feet above the appliance oil control and the bottom of the tank is not less than 18 inches above the appliance oil control.

(2) Auxiliary oil storage tank. Oil supply tanks affixed to a manufactured home shall be so located as to require filling and draining from the outside and shall be in a place readily available for inspection. If the fuel supply tank is located in a compartment of a manufactured home, the compartment shall be ventilated at the bottom to permit diffusion of vapors and shall be insulated from the structural members of the body. Tanks so installed shall be provided with an outside fill and vent pipe and an approved liquid level gage.

(3) Shut off valve. A readily accessible, approved manual shut off valve shall be installed at the outlet of an oil supply tank. The valve shall be installed to close against the supply.

(4) Fuel oil filters. All oil tanks shall be equipped with an approved oil filter or strainer located downstream from the tank shut off valve. The fuel oil filter or strainer shall contain a sump with a drain for the entrapment of water.

§ 3280.705 Gas piping systems.

(a) General. The requirements of this section shall govern the installation of all fuel gas piping attached to any manufactured home. The gas piping supply system shall be designed for a pressure not exceeding 14 inch water column (½ psi) and not less than 7 inch water column (¼ psi). The manufacturer shall indicate in his written installation instructions the design pressure limitations for safe and effective operation of the gas piping system. None of the requirements listed in this section shall apply to the piping supplied as a part of an appliance. All exterior openings around piping, ducts, plenums or vents shall be sealed to resist the entrance of rodents.

(b) Materials. All materials used for the installation, extension, alteration, or repair of any gas piping system shall be new and free from defects or internal obstructions. It shall not be permissible to repair defects in gas piping or fittings. Inferior or defective materials shall be removed and replaced with acceptable material. The system shall be made of materials having a melting point of not less than 1,450 F, except as provided in §3280.705(e). They shall consist of one or more of the materials described in §3280.705(b) (1) through (4).

(1) Steel or wrought iron pipe shall comply with ANSI Standard B36.10–1979, Welded and Seamless Wrought Steel Pipe. Threaded brass pipe in iron pipe sizes may be used. Threaded brass pipe shall comply with ASTM B43-91, Standard Specification for Seamless Red Brass Pipe, Standard Sizes.

(2) Fittings for gas piping shall be wrought iron, malleable iron, steel, or brass (containing not more than 75 percent copper).

(3) Copper tubing must be annealed type, Grade K or L, conforming to the Standard Specification for Seamless Copper Water Tube, ASTM B88-93, or must comply with the Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Service, ASTM B280-1995. Copper tubing must be internally tinned.

(4) Steel tubing must have a minimum wall thickness of 0.032 inch for tubing of ½ inch diameter and smaller and 0.049 inch for diameters ½ inch and larger. Steel tubing must be in accordance with A5T M Standard Specification for Electric-Resistance-Welded Coiled Steel Tubing for Gas and Fuel
Oil Lines, ASTM A539–1999, and must be externally corrosion protected.

(c) Piping design. Each manufactured home requiring fuel gas for any purpose shall be equipped with a natural gas piping system acceptable for LP-gas. Where fuel gas piping is to be installed in more than one section of an expandable or multiple unit home, the design and construction of the crossover(s) shall be as follows:

1. All points of crossover shall be readily accessible from the exterior of the home.

2. The connection(s) between units must be made with a connector(s) listed for exterior use or direct plumbing sized in accordance with § 3280.705(d). A shutoff valve of the non-displaceable rotor type conforming to ANSI Z21.15–1997, Manually Operated Gas Valves for Appliances, Appliances Connector Valves, and Hose End Valves, suitable for outdoor use must be installed at each crossover point upstream of the connection.

3. The connection(s) may be made by a listed quick disconnect device which shall be designed to provide a positive seal of the supply side of the gas system when such device is separated.

4. The flexible connector, direct plumbing pipe, or “quick disconnect” device shall be provided with protection from mechanical and impact damage and located to minimize the possibility of tampering.

5. For gas line cross over connections made with either hard pipe or flexible connectors, the crossover point(s) shall be capped on the supply side to provide a positive seal and covered on the other side with a suitable protective covering.

6. Suitable protective coverings for the connection device(s) when separated, shall be permanently attached to the device or flexible connector.

7. When a quick disconnect device is installed, a 3 inch by 1¼ inch minimum size tag made of etched, metal-stamped or embossed brass, stainless steel, anodized or alclad aluminum not less than 0.020 inch thick or other approved material (e.g., 0.005 inch plastic laminates) shall be permanently attached on the exterior wall adjacent to the access to the “quick disconnect” device. Each tag shall be legibly inscribed with the following information using letters no smaller than ¼ inch high:

Do Not Use Tools To Separate the ‘Quick-Disconnect’ Device

(d) Gas pipe sizing. Gas piping systems shall be sized so that the pressure drop to any appliance inlet connection from any gas supply connection, when all appliances are in operation at maximum capacity, is not more than 0.5 inch water column as determined on the basis of test, or in accordance with table § 3280.705(d). When determining gas pipe sizing in the table, gas shall be assumed to have a specific gravity of 0.65 and rated at 1000 B.T.U. per cubic foot. The natural gas supply connection(s) shall be not less than the size of the gas piping but shall not be smaller than ¾ inch nominal pipe size.

(e) Joints for gas pipe. All pipe joints in the piping system, unless welded or brazed, shall be threaded joints that comply with Pipe Threads, General Purpose (Inch), adopted 25 October 1984, ANSI/ASME B1.20.1–1983. Right and left nipples or couplings shall not be used. Unions, if used, shall be of ground joint type. The material used for welding or brazing pipe connections shall have a melting temperature in excess of 1,000 F.

(f) Joints for tubing. (1) Tubing joints shall be made with either a single or a double flare of 45 degrees in accordance with Flares For Tubing, SAE-J533b-1972 or with other listed vibration-resistant fittings, or joints may be brazed with material having a melting point exceeding 1,000 F. Metallic ball sleeve compression-type tubing fittings shall not be used.

(2) Steel tubing joints shall be made with a double-flare in accordance with Flares For Tubing, SAE-J533b-1972.

(g) Pipe joint compound. Screw joints shall be made up tight with listed pipe joint compound, insoluble in liquefied petroleum gas, and shall be applied to the male threads only.

(h) Concealed tubing. Tubing shall not be run inside walls, floors, partitions, or roofs. Where tubing passes through walls, floors, partitions, roofs, or similar installations, such tubing shall be protected by the use of weather resistant grommets that shall snugly fit
both the tubing and the hole through which the tubing passes.
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<tr>
<th>Iron pipe sizes—Length in feet</th>
<th>Tubing—Length in feet</th>
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(i) Concealed joints. Piping or tubing joints shall not be located in any floor, wall partition, or similar concealed construction space.

(j) Gas supply connections. When gas appliances are installed, at least one gas supply connection shall be provided on each home. The connection shall not be located beneath an exit door. Where more than one connection is provided, the piping system shall be sized to provide adequate capacity from each supply connection.

(k) Identification of gas supply connections. Each manufactured home shall have permanently affixed to the exterior skin at or near each gas supply connection or the end of the pipe, a tag of 3 inches by 1 3/4 inches minimum size, made of etched, metal-stamped or embossed brass, stainless steel, anodized or alclad aluminum not less than 0.020 inch thick, or other approved material (e.g., 0.005 inch plastic laminates), which reads as follows. The connector capacity indicated on this tag shall be equal to or greater than the total Btuh rating of all intended gas appliances.

COMBINATION LP-GAS AND NATURAL GAS SYSTEM

This gas piping system is designed for use of either liquefied petroleum gas or natural gas.

NOTICE: BEFORE TURNING ON GAS BE CERTAIN APPLIANCES ARE DESIGNED FOR THE GAS CONNECTED AND ARE EQUIPPED WITH CORRECT ORIFICES. SECURELY CAP THIS INLET WHEN NOT CONNECTED FOR USE.

When connecting to lot outlet, use a listed gas supply connector for mobile homes rated at □ 100,000 Btuh or more; □ 250,000 Btuh or more.

Before turning on gas, make certain all gas connections have been made tight, all appliance valves are turned off, and any unconnected outlets are capped.

After turning on gas, test gas piping and connections to appliances for leakage with soapy water or bubble solution, and light all pilots.

The connector capacity indicated on this tag shall be equal to or greater than the total Btuh rating of all intended gas appliances.

(i) LP-gas supply connectors. (1) A listed LP-Gas flexible connection conforming to UL 569–1995, Pigtails and Flexible Hose Connectors for LP Gas, or equal must be supplied when LP-Gas cylinders(s) and regulator(s) are supplied.

(2) Appliance connections. All gas burning appliances shall be connected to the fuel piping. Materials as provided in §3280.705(b) or listed appliance connectors shall be used. Listed appliance connectors when used shall not run through walls, floors, ceilings or partitions, except for cabinetry, and shall be 3 feet or less in length or 6 feet or less for cooking appliances. Connectors of aluminum shall not be used outdoors. A manufactured home containing a combination LP-natural-gas system may be provided with a gas outlet to supply exterior appliances when installed in accordance with the following:

(i) No portion of the completed installation shall project beyond the wall of the manufactured home.

(ii) The outlet must be provided with an approved quick-disconnect device, which must be designed to provide a positive seal on the supply side of the gas system when the appliance is disconnected. A shutoff valve of the non-displaceable rotor type conforming to ANSI Z21.15–1997, Manually Operated Gas Valves, must be installed immediately upstream of the quick-disconnect device. The complete device must be provided as part of the original installation.

(iii) Protective caps or plugs for the “quick-disconnect” device, when disconnected, shall be permanently attached to the manufactured home adjacent to the device.

(iv) A tag shall be permanently attached to the outside of the exterior wall of the manufactured home as close as possible to the gas supply connection. The tag shall indicate the type of gas and the Btuh capacity of the outlet and shall be legibly inscribed as follows:

THIS OUTLET IS DESIGNED FOR USE WITH GAS PORTABLE APPLIANCES WHOSE TOTAL INPUT DO NOT EXCEED __________ BTUH. REPLACE PROTECTIVE COVERING OVER CONNECTOR WHEN NOT IN USE.
(3) **Valves.** A shutoff valve must be installed in the fuel piping at each appliance inside the manufactured home structure, upstream of the union or connector in addition to any valve on the appliance and so arranged to be accessible to permit servicing of the appliance and removal of its components. The shutoff valve must be located within 6 feet of any cooking appliance and within 3 feet of any other appliance. A shutoff valve may serve more than one appliance if located as required by this paragraph (3). The shutoff valve must be of the non-displaceable rotor type and conform to ANSI Z21.15–1997, Manually Operated Gas Valves.

(4) **Gas piping system openings.** All openings in the gas piping system shall be closed gas-tight with threaded pipe plugs or pipe caps.

(5) **Electrical ground.** Gas piping shall not be used for an electrical ground.

(6) **Couplings.** Pipe couplings and unions shall be used to join sections of threaded piping. Right and left nipples or couplings shall not be used.

(7) **Hangers and supports.** All gas piping shall be adequately supported by galvanized or equivalently protected metal straps or hangers at intervals of not more than 4 feet, except where adequate support and protection is provided by structural members. Solid-iron-pipe gas supply connection(s) shall be rigidly anchored to a structural member within 6 inches of the supply connection(s).

(8) **Testing for leakage.** (i) Before appliances are connected, piping systems shall stand a pressure of at least six inches mercury or three PSI gage for a period of not less than ten minutes without showing any drop in pressure. Pressure shall be measured with a mercury manometer or slope gage calibrated so as to be read in increments of not greater than one-tenth pound, or an equivalent device. The source of normal operating pressure shall be isolated before the pressure tests are made. Before a test is begun, the temperature of the ambient air and of the piping shall be approximately the same, and constant air temperature be maintained throughout the test.

(ii) After appliances are connected, the piping system shall be pressurized to not less than 10 inches nor more than 14 inches water column and the appliance connections tested for leakage with soapy water or bubble solution.


**§ 3280.706 Oil piping systems.**

(a) **General.** The requirements of this section shall govern the installation of all liquid fuel piping attached to any manufactured home. None of the requirements listed in this section shall apply to the piping in the appliance(s).

(b) **Materials.** All materials used for the installation extension, alteration, or repair, of any oil piping systems shall be new and free from defects or internal obstructions. The system shall be made of materials having a melting point of not less than 1,450 F, except as provided in § 280.706(d) and (e). They shall consist of one or more of the materials described in § 3280.706(b) (1) through (4).

(1) Steel or wrought-iron pipe shall comply with ANSI B 36.10–1979, Welded and Seamless Wrought Steel Pipe. Threaded copper or brass pipe in iron pipe sizes may be used.

(2) Fittings for oil piping shall be wrought-iron, malleable iron, steel, or brass (containing not more than 75 percent copper).

(3) Copper tubing must be annealed type, Grade K or L conforming to the Standard Specification for Seamless Copper Water Tube, ASTM B88–93, or shall comply with ASTM B280–1995, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

(4) Steel tubing shall have a minimum wall thickness of 0.032 inch for diameters up to ½ inch and 0.049 inch for diameters ½ inch and larger. Steel tubing shall be constructed in accordance with the Specification for Electric-Resistance-Welded Coiled Steel Tubing for Gas and Field Oil Lines, ASTM, A539–90a, and shall be externally corrosion protected.

(c) **Size of oil piping.** The minimum size of all fuel oil tank piping connecting outside tanks to the appliance...
shall be no smaller than 3/8 inch OD copper tubing or 1/4 inch IPS. If No. 1 fuel oil is used with a listed automatic pump (fuel lifter), copper tubing shall be sized as specified by the pump manufacturer.

(d) Joints for oil piping. All pipe joints in the piping system, unless welded or brazed, shall be threaded joints which comply with ANSI/ASME B1.20.1-1983, Pipe Threads, General Purpose (Inch). The material used for brazing pipe connections shall have a melting temperature in excess of 1,000 °F.

(e) Joints for tubing. Joints in tubing shall be made with either a single or double flare of the proper degree, as recommended by the tubing manufacturer, by means of listed tubing fittings, or brazed with materials having a melting point in excess of 1,000 °F.

(f) Pipe joint compound. Threaded joints shall be made up tight with listed pipe joint compound which shall be applied to the male threads only.

(g) Couplings. Pipe couplings and unions shall be used to join sections of threaded pipe. Right and left nipples or couplings shall not be used.

(h) Grade of piping. Fuel oil piping installed in conjunction with gravity feed systems to oil heating equipment shall slope in a gradual rise upward from a central location to both the oil tank and the appliance in order to eliminate air locks.

(i) Strap hangers. All oil piping shall be adequately supported by galvanized or equivalently protected metal straps or hangers at intervals of not more than 4 feet, except where adequate support and protection is provided by structural members. Solid-iron-pipe oil supply connection(s) shall be rigidly anchored to a structural member within 6 inches of the supply connection(s).

(j) Testing for leakage. Before setting the system in operation, tank installations and piping shall be checked for oil leaks with fuel oil of the same grade that will be burned in the appliance. No other material shall be used for testing fuel oil tanks and piping. Tanks shall be filled to maximum capacity for the final check for oil leakage.

§ 3280.707 Heat producing appliances.

(a) Heat-producing appliances and vents, roof jacks and chimneys necessary for their installation in manufactured homes shall be listed or certified by a nationally recognized testing agency for use in manufactured homes.

(1) A manufactured home shall be provided with a comfort heating system.

(i) When a manufactured home is manufactured to contain a heating appliance, the heating appliance shall be installed by the manufacturer of the manufactured home in compliance with applicable sections of this subpart.

(ii) When a manufactured home is manufactured for field application of an external heating or combination heating/cooling appliance, preparation of the manufactured home for this external application shall comply with the applicable sections of this part.

(2) Gas and oil burning comfort heating appliances shall have a flue loss of not more than 25 percent, and a thermal efficiency of not less than that specified in nationally recognized standards (See §3280.703).

(b) Fuel-burning heat-producing appliances and refrigeration appliances, except ranges and ovens, shall be of the vented type and vented to the outside.

(c) Fuel-burning appliances shall not be converted from one fuel to another fuel unless converted in accordance with the terms of their listing and the appliance manufacturer’s instructions.

(d) Performance efficiency. (1) All automatic electric storage water heaters installed in manufactured homes shall have a standby loss not exceeding 43 watts/meter² (4 watts/ft²) of tank surface area. The method of test for standby loss shall be as described in section 4.3.1 of Household Automatic Electric Storage Type Water Heaters, ANSI C72.1-1972.
(2) All gas and oil-fired automatic storage water heaters shall have a recovery efficiency, E, and a standby loss, S, as described below. The method of test of E and S shall be as described in section 2.7 of Gas Water Heaters, Vol. I, Storage Water Heaters with Input/Ratings of 75,000 BTU per hour or less, ANSI Z21.10.1–1990, with addendums Z21.10.1a–1991 and Z21.10.1b–1992 except that for oil-fired units. CF = 1.0, Q = total gallons of oil consumed and H = total heating value of oil in BTU/gallon.

<table>
<thead>
<tr>
<th>Storage capacity in gallons</th>
<th>Recovery efficiency</th>
<th>Standby loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 25</td>
<td>At least 75 percent</td>
<td>Not more than 7.5 percent.</td>
</tr>
<tr>
<td>25 up to 35</td>
<td>00</td>
<td>Not more than 7 percent.</td>
</tr>
<tr>
<td>35 or more</td>
<td>00</td>
<td>Not more than 6 percent.</td>
</tr>
</tbody>
</table>

(e) Each space heating, cooling or combination heating and cooling system shall be provided with at least one readily adjustable automatic control for regulation of living space temperature. The control shall be placed a minimum of 3 feet from the vertical edge of the appliance compartment door. It shall not be located on an exterior wall or on a wall separating the appliance compartment from a habitable room.

(f) Oil-fired heating equipment. All oil-fired heating equipment must conform to Liquid Fuel-burning Heating Appliances for Manufactured Homes and Recreational Vehicles, UL 307A—1995, with 1997 revisions, and be installed in accordance with Standard for the Installation of Oil Burning Equipment, NFPA 31–1997. Regardless of the requirements of the above-referenced standards, or any other standards referenced in this part, the following are not required:

(1) External switches or remote controls which shut off the burner or the flow of oil to the burner; or
(2) An emergency disconnect switch to interrupt electric power to the equipment under conditions of excessive temperature.

§ 3280.708 Exhaust duct system and provisions for the future installation of a clothes dryer.

(a) Clothes dryers. (1) All gas and electric clothes dryers shall be exhausted to the outside by a moisture-lint exhaust duct and termination fitting. When the clothes dryer is supplied by the manufacturer, the exhaust duct and termination fittings shall be completely installed by the manufacturer. However, if the exhaust duct system is subject to damage during transportation, it need not be completely installed at the factory when:

(i) The exhaust duct system is connected to the clothes dryer, and

(ii) A moisture lint exhaust duct system is roughed in and installation instructions are provided in accordance with paragraph (b)(3) or (c) of this section.

(2) A clothes dryer moisture-lint exhaust duct shall not be connected to any other duct, vent or chimney.

(3) The exhaust duct shall not terminate beneath the manufactured home.

(4) Moisture-lint exhaust ducts shall not be connected with sheet metal screws or other fastening devices which extend into the interior of the duct.

(5) Moisture-lint exhaust duct and termination fittings shall be installed in accordance with the appliance manufacturer’s printed instructions.

(b) Provisions for future installation of a gas clothes dryer. A manufactured home may be provided with “stubbed in” equipment at the factory to supply a gas clothes dryer for future installation by the owner provided it complies with the following provisions:

(1) The “stubbed in” gas outlet shall be provided with a shutoff valve, the outlet of which is closed by threaded pipe plug or cap;

(2) The “stubbed in” gas outlet shall be permanently labeled to identify it for use only as the supply connection for a gas clothes dryer;

(3) A moisture lint duct system consisting of a complete access space (hole) through the wall or floor cavity with a cap or cover on the interior and exterior of the cavity secured in such a manner that they can be removed by a common household tool shall be provided. The cap or cover in place shall limit air infiltration and be designed to...
resist the entry of water or rodents. The manufacturer is not required to provide the moisture-lint exhaust duct or the termination fitting. The manufacturer shall provide written instructions to the owner on how to complete the exhaust duct installation in accordance with the provisions of §3280.708(a)(1) through (5).

(c) Provisions for future installation of electric clothes dryers. When wiring is installed to supply an electric clothes dryer for future installation by the owner, the manufacturer shall:

(1) Provide a roughed-in moisture-lint exhaust duct system consisting of a complete access space (hole) through the wall or floor cavity with a cap or cover on the interior and exterior of the cavity which are secured in such a manner that they can be removed by the use of common household tools. The cap or cover in place shall limit air filtration and be designed to resist the entry of water or rodents into the home. The manufacturer is not required to provide the moisture-lint exhaust duct or the termination fitting;

(2) Install a receptacle for future connection of the dryer;

(3) Provide written instructions on how to complete the exhaust duct installation in accordance with the provisions of paragraphs (a)(1) through (5) of this section.

§3280.709 Installation of appliances.

(a) The installation of each appliance shall conform to the terms of its listing and the manufacturer’s instructions. The installer shall leave the manufacturer’s instructions attached to the appliance. Every appliance shall be secured in place to avoid displacement. For the purpose of servicing and replacement, each appliance shall be both accessible and removable.

(b) Heat-producing appliances shall be so located that no doors, drapes, or other such material can be placed or swing closer to the front of the appliance than the clearances specified on the labeled appliances.

(c) Clearances surrounding heat producing appliances shall not be less than the clearances specified in the terms of their listings.

(1) Prevention of storage. The area surrounding heat producing appliances installed in areas with interior or exterior access shall be framed-in or guarded with noncombustible material such that the distance from the appliance to the framing or guard is not greater than three inches unless the appliance is installed in compliance with paragraph (c)(2), of this section. When clearance required by the listing is greater than three inches, the guard or frame shall not be closer to the appliance than the distance provided in the listing.

(2) Clearance spaces surrounding heat producing appliances are not required to be framed-in or guarded when:

(i) A space is designed specifically for a clothes washer or dryer;

(ii) Dimensions surrounding the appliance do not exceed three inches; or

(iii) The manufacturer affixes either to a side of an alcove or compartment containing the appliance, or to the appliance itself, in a clearly visible location, a 3″×5″ adhesive backed plastic laminated label or the equivalent which reads as follows:

“Warning”

This compartment is not to be used as a storage area. Storage of combustible materials or containers on or near any appliance in this compartment may create a fire hazard. Do not store such materials or containers in this compartment.

(d) All fuel-burning appliances, except ranges, ovens, illuminating appliances, clothes dryers, solid fuel-burning fireplaces and solid fuel-burning fireplace stoves, shall be installed to provide for the complete separation of the combustion system from the interior atmosphere of the manufactured home. Combustion air inlets and flue gas outlets shall be listed or certified as components of the appliance. The required separation may be obtained by:

(1) The installation of direct vent system (sealed combustion system) appliances, or

(2) The installation of appliances within enclosures so as to separate the appliance combustion system and venting system from the interior atmosphere of the manufactured home. There
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shall not be any door, removable access panel, or other opening into the enclosure from the inside of the manufactured home. Any opening for ducts, piping, wiring, etc., shall be sealed.

(e) A forced air appliance and its return-air system shall be designed and installed so that negative pressure created by the air-circulating fan cannot affect its or another appliance’s combustion air supply or act to mix products of combustion with circulating air.

(1) The air circulating fan of a furnace installed in an enclosure with another fuel-burning appliance shall be operable only when any door or panel covering an opening in the furnace fan compartment or in a return air plenum or duct is in the closed position. This does not apply if both appliances are direct vent system (sealed combustion system) appliances.

(2) If a warm air appliance is installed within an enclosure to conform to § 3280.709(d)(2), each warm-air outlet and each return air inlet shall extend to the exterior of the enclosure. Ducts, if used for that purpose, shall not have any opening within the enclosure and shall terminate at a location exterior to the enclosure.

(3) Cooling coils installed as a portion of, or in connection with, any forced-air furnace shall be installed on the downstream side unless the furnace is specifically otherwise listed.

(4) An air conditioner evaporator section shall not be located in the air discharge duct or plenum of any forced-air furnace unless the manufactured home manufacturer has complied with certification required in § 3280.511.

(5) If a cooling coil is installed with a forced-air furnace, the coil shall be installed in accordance with its listing. When a furnace-coil unit has a limited listing, the installation must be in accordance with that listing.

(6) When an external heating appliance or combination cooling/heating appliance is to be field installed, the home manufacturer shall make provision for proper location of the connections to the supply and return air systems. The manufacturer is not required to provide said appliance(s). The preparation by the manufacturer for connection to the home’s supply and return air system shall include all fittings and connection ducts to the main duct and return air system such that the installer is only required to provide:

(i) The appliance;

(ii) Any appliance connections to the home; and

(iii) The connecting duct between the external appliance and the fitting installed on the home by the manufacturer. The above connection preparations by the manufacturer do not apply to supply or return air systems designed only to accept external cooling (i.e., self contained air conditioning systems, etc.)

(f) Vertical clearance above cooking top.

Ranges shall have a vertical clearance above the cooking top of not less than 24 inches. (See § 3280.204).

(g) Solid fuel-burning factory-built fireplaces and fireplace stoves listed for use in manufactured homes may be installed in manufactured homes provided they and their installation conform to the following paragraphs. A fireplace or fireplace stove shall not be considered as a heating facility for determining compliance with subpart F.

(1) A solid fuel-burning fireplace or fireplace stove shall be equipped with integral door(s) or shutter(s) designed to close the fireplace or fireplace stove fire chamber opening and shall include complete means for venting through
§ 3280.710 Venting, ventilation and combustion air.

(a) The venting as required by §3280.707(b) shall be accomplished by one or more of the methods given in (a)(1) and (2) of this section:

(1) An integral vent system listed or certified as part of the appliance.

(2) A venting system consisting entirely of listed components, including roof jack, installed in accordance with the terms of the appliance listing and the appliance manufacturer’s instructions.

(b) Venting and combustion air systems shall be installed in accordance with the following:

(1) Components shall be securely assembled and properly aligned at the factory in accordance with the appliance manufacturer’s instructions except vertical or horizontal sections of a fuel fired heating appliance venting system that extend beyond the roof line or outside the wall line may be installed at the site. Sectional venting systems shall be listed for such applications and installed in accordance with the terms of their listings and manufacturers’ instructions. In cases where sections of the venting system are removed for transportation, a label shall be permanently attached to the appliance indicating the following:

Sections of the venting system have not been installed. Warning-do not operate the appliance until all sections have been assembled and installed in accordance with the manufacturer’s instructions.

(2) Draft hood connectors shall be firmly attached to draft hood outlets or flue collars by sheet metal screws or by equivalent effective mechanical fasteners.

(3) Every joint of a vent, vent connector, exhaust duct and combustion air intake shall be secure and in alignment.

(c) Venting systems shall not terminate underneath a manufactured home.

(d) Venting system terminations shall be not less than three feet from
any motor-driven air intake discharging into habitable areas.

(e) The area in which cooking appliances are located shall be ventilated by a metal duct which may be single wall, not less than 12.5 square inches in cross-sectional area (minimum dimension shall be two inches) located above the appliance(s) and terminating outside the manufactured home, or by listed mechanical ventilating equipment discharging outside the home, that is installed in accordance with the terms of listing and the manufacturer's instructions. Gravity or mechanical ventilation shall be installed within a horizontal distance of not more than ten feet from the vertical front of the appliance(s).

(f) Mechanical ventilation which exhausts directly to the outside atmosphere from the living space of a home shall be equipped with an automatic or manual damper. Operating controls shall be provided such that mechanical ventilation can be separately operated without directly energizing other energy consuming devices.

§ 3280.711 Instructions. Operating instructions shall be provided with each appliance. These instructions shall include directions and information covering the proper use and efficient operation of the appliance and its proper maintenance.

§ 3280.712 Marking.

(a) Information on clearances, input rating, lighting and shutdown shall be attached to the appliances with the same permanence as the nameplate, and so located that it is easily readable when the appliance is properly installed or shutdown for transporting of manufactured home.

(b) Each fuel-burning appliance shall bear permanent marking designating the type(s) of fuel for which it is listed.

§ 3280.713 Accessibility.

Every appliance shall be accessible for inspection, service, repair, and replacement without removing permanent construction. For those purposes, inlet piping supplying the appliance shall not be considered permanent construction. Sufficient room shall be available to enable the operator to observe the burner, control, and ignition means while starting the appliance.

§ 3280.714 Appliances, cooling.

(a) Every air conditioning unit or a combination air conditioning and heating unit shall be listed or certified by a nationally recognized testing agency for the application for which the unit is intended and installed in accordance with the terms of its listing.

(i) Mechanical air conditioners shall be rated in accordance with the ARI Standard 210/240–89 Unitary Air Conditioning and Air Source Unitary Heat Pump Equipment and certified by ARI or other nationally recognized testing agency capable of providing follow-up service.

(ii) Electric motor-driven vapor compression heat pumps with supplemental electrical resistance heat shall be sized to provide by compression at least 60 percent of the calculated annual heating requirements for the manufactured home being served. A control shall be provided and set to prevent operation of supplemental electrical resistance heat at outdoor temperatures above 40 F, except for defrost operation.

(iii) Electric motor-driven vapor compression heat pumps with supplemental electric resistance heat conforming to ARI Standard 210/240–89 Unitary Air-Conditioning and Air-Source Heat Pump Equipment shall show coefficient of performance ratios not less than shown below:
§ 3280.715 Circulating air systems.

(a) Supply system. (1) Supply ducts and air conditioner blower are installed with a furnace or heating appliance, they shall be tested and listed in combination for heating and safety performance by a nationally recognized testing agency.

(2) Cooling or heat pump and outdoor sections shall be certified, listed and rated in combination for capacity and efficiency by a nationally recognized testing agency(ies). Rating procedures shall be based on U.S. Department of Energy test procedures.

(b) Installation and instructions. (1) The installation of each appliance shall conform to the terms of its listing as specified on the appliance and in the manufacturer's instructions. The installer shall include the manufacturer's installation instructions in the manufactured home. Appliances shall be secured in place to avoid displacement and movement from vibration and road shock.

(2) Operating instructions shall be provided with the appliance.

(c) Fuel-burning air conditioners shall also comply with § 280.707.

(d) The appliance rating plate shall be so located that it is easily readable when the appliance is properly installed.

(e) Every installed appliance shall be accessible for inspection, service, repair and replacement without removing permanent construction.


§ 3280.715 Circulating air systems.

(a) Supply system. (1) Supply ducts and air conditioner blower are installed with a furnace or heating appliance, they shall be made from galvanized steel, tin-plated steel, or aluminum, or shall be listed Class 0, Class 1, or Class 2 air ducts. Class 2 air ducts shall be located at least 3 feet from the furnace bonnet or plenum. A duct system integral with the structure shall be of durable construction that can be demonstrated to be equally resistant to fire and deterioration. Ducts constructed from sheet metal shall be in accordance with the following tabular:

<table>
<thead>
<tr>
<th>Duct type</th>
<th>Diameter 14 in. or less</th>
<th>Width over 14 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round</td>
<td>0.013</td>
<td>0.016</td>
</tr>
<tr>
<td>Enclosed rectangular</td>
<td>0.013</td>
<td>0.016</td>
</tr>
<tr>
<td>Exposed rectangular</td>
<td>0.016</td>
<td>0.019</td>
</tr>
</tbody>
</table>

1 When "nominal" thicknesses are specified, 0.003 in. shall be added to these "minimum" metal thicknesses.

(b) Installation and instructions. (1) The installation of each appliance shall conform to the terms of its listing as specified on the appliance and in the manufacturer's instructions. The installer shall include the manufacturer's installation instructions in the manufactured home. Appliances shall be secured in place to avoid displacement and movement from vibration and road shock.

(2) Operating instructions shall be provided with the appliance.

(c) Fuel-burning air conditioners shall also comply with § 280.707.

(d) The appliance rating plate shall be so located that it is easily readable when the appliance is properly installed.

(e) Every installed appliance shall be accessible for inspection, service, repair and replacement without removing permanent construction.

pressure shall be measured between the furnace and the coil and it shall not exceed 90 percent of that shown on the label of the furnace.

(iv) The minimum dimension of any branch duct shall be at least 1 1/2 inches, and of any main duct, 2 1/2 inches.

(3) Sizing of ducts. (i) The manufactured home manufacturer shall certify the capacity of the air cooling supply duct system for the maximum allowable output of ARI certified central air conditioning systems. The certification shall be at operating static pressure of 0.3 inches of water or greater. (See §3280.511).

(ii) The refrigerated air cooling supply duct system including registers must be capable of handling at least 300 cfm per 10,000 btuh with a static pressure no greater than 0.3 inches of water when measured at room temperature. In the case of application of external self contained comfort cooling appliances or the cooling mode of combination heating/cooling appliances, either the external ducts between the appliance and the manufactured home supply system shall be considered part of, and shall comply with the requirements for the refrigerated air cooling supply duct system, or the connecting duct between the external appliance and the mobile supply duct system shall be a part of the listed appliance. The minimum dimension of any branch duct shall be at least 1 1/2 inches, and of any main duct, 2 1/2 inches.

(4) Airtightness of supply duct systems. A supply duct system shall be considered substantially airtight when the static pressure in the duct system, with all registers sealed and with the furnace air circulator at high speed, is at least 80 percent of the static pressure measured in the furnace casing, with its outlets sealed and the furnace air circulator operating at high speed. For the purpose of this paragraph and §3280.715(b) pressures shall be measured with a water manometer or equivalent device calibrated to read in increments not greater than ¼ inch water column.

(5) Expandable or multiple manufactured home connections. (i) An expandable or multiple manufactured home may have ducts of the heating system installed in the various units. The points of connection must be so designed and constructed that when the manufactured home is fully expanded or coupled, the resulting duct joint will conform to the requirements of this part.

(ii) Installation instructions for supporting the crossover duct from the manufactured home shall be provided for onsite installation. The duct shall not be in contact with the ground.

(6) Air supply ducts shall be insulated with material having an effective thermal resistance (R) of not less than 4.0 unless they are within manufactured home insulation having a minimum effective value of R=4.0 for floors or R=6.0 for ceilings.

(7) Supply and return ducts exposed directly to outside air, such as under chassis crossover ducts or ducts connecting external heating, cooling or combination heating/cooling appliances shall be insulated with material having a minimum thermal resistance of R=4.0, with a continuous vapor barrier having a perm rating of not more than 1 perm. Where exposed underneath the manufactured home, all such ducts shall comply with §3280.715(a)(5)(ii).

(b) Return air systems—(1) Return air openings. Provisions shall be made to permit the return of circulating air from all rooms and living spaces, except toilet room(s), to the circulating air supply inlet of the furnace.

(2) Duct material. Return ducts and any diverting dampers contained therein shall be in accordance with the following:

(i) Portions of return ducts directly above the heating surfaces, or closer than 2 feet from the outer jacket or casing of the furnace shall be constructed of metal in accordance with §3280.715(a)(1) or shall be listed Class 0 or Class 1 air ducts.

(ii) Return ducts, except as required by paragraph (a) of this section, shall be constructed of one-inch (nominal) wood boards (flame spread classification of not more than 200), other suitable material no more flammable than one-inch board or in accordance with §3280.715(a)(1).

(iii) The interior of combustible ducts shall be lined with noncombustible material at points where there might be danger from incandescent
particles dropped through the register or furnace such as directly under floor registers and the bottom return.

(iv) Factory made air ducts used for connecting external heating, cooling or combination heating/cooling appliances to the supply system and return air system of a manufactured home shall be listed by a nationally recognized testing agency. Ducts applied to external heating appliances or combination heating/cooling appliances supply system outlets shall be constructed of metal in accordance with §3280.715(a)(1) or shall be listed Class 0 or Class 1 air ducts for those portions of the duct closer than 2 feet from the outer casing of the appliance.

(v) Ducts applied to external appliances shall be resistant to deteriorating environmental effects, including but not limited to ultraviolet rays, cold weather, or moisture and shall be resistant to insects and rodents.

(3) Sizing. The cross-sectional areas of the return air duct shall not be less than 2 square inches for each 1,000 Btu per hour input rating of the appliance. Dampers shall not be placed in a combination fresh air intake and return air duct so arranged that the required cross-sectional area will not be reduced at all possible positions of the damper.

(4) Permanent uncloseable openings. Living areas not served by return air ducts or closed off from the return opening of the furnace by doors, sliding partitions, or other means shall be provided with permanent uncloseable openings in the doors or separating partitions to allow circulated air to return to the furnace. Such openings may be grilled or louvered. The net free area of each opening shall be not less than 1 square inch for every 5 square feet of total living area closed off from the furnace by the door or partition serviced by that opening. Undercutting doors connecting the closed-off space may be used as a means of providing return air area. However, in the event that doors are undercut, they shall be undercut a minimum of 2 inches and not more than 2½ inches, as measured from the top surface of the floor decking to the bottom of the door and no more than one half of the free air area so provided shall be counted as return air area.

(c) Joints and seams. Joints and seams of sheet metal and factory-made flexible ducts, including trunks, branches, risers, crossover ducts, and crossover duct plenums, shall be mechanically secured and made substantially air-tight. Slip joints in sheet metal ducts shall have a lap of at least one inch and shall be mechanically fastened. Tapes or caulking compounds shall be permitted to be used for sealing mechanically secure joints. Sealants and tapes shall be applied only to surfaces that are dry and dust-, dirt-, oil-, and grease-free. Tapes and mastic closure systems for use with factory-made rigid fiberglass air ducts and air connectors shall be listed in accordance with UL Standard 181A–1994, with 1998 revisions. Tapes and mastic closure systems used with factory-made flexible air ducts and air connectors shall be listed in accordance with UL Standard 181B–1995, with 1998 revisions.

(d) Supports. Ducts shall be securely supported.

(e) Registers and grilles. Fittings connecting the registers and grilles to the duct system must be constructed of metal or material that complies with the requirements of Class 1 or 2 ducts under UL 181–1996 with 1998 revisions, Factory Made Air Ducts and Connectors. Air supply terminal devices (registers) when installed in kitchen, bedrooms, and bathrooms must be equipped with adjustable closeable dampers. Registers or grilles must be constructed of metal or conform with the following:

(1) Be made of a material classified 94V-0 or 94V-1, when tested as described in UL 94–1996, with 2001 revisions, Test for Flammability of Plastic Materials for Parts in Devices and Appliances, Fifth Edition; and

(2) Floor registers or grilles shall resist without structural failure a 200 lb. concentrated load on a 2-inch diameter disc applied to the most critical area of the exposed face of the register or grille. For this test the register or grille is to be at a temperature of not less than 165 °F and is to be supported
§ 3280.801

Subpart I—Electrical Systems

§ 3280.801 Scope.

(a) Subpart I of this part and Part II of Article 550 of the National Electrical Code (NFPA No. 70–2005) cover the electrical conductors and equipment installed within or on manufactured homes and the conductors that connect manufactured homes to a supply of electricity.

(b) In addition to the requirements of this part and Part II of Article 550 of the National Electrical Code, the applicable portions of other Articles of the National Electrical Code must be followed for electrical installations in manufactured homes. The use of arc-fault breakers under Articles 210.12(A) and (B), 440.65, and 550.25(A) and (B) of the National Electrical Code, NFPA No. 70–2005 is not required. However, if arc-fault breakers are provided, such use must be in accordance with the National Electrical Code, NFPA No. 70–2005. Wherever the requirements of this standard differ from the National Electrical Code, these standards apply.

(c) The provisions of this standard apply to manufactured homes intended for connection to a wiring system nominally rated 120/240 volts, 3-wire AC, with grounded neutral.

(d) All electrical materials, devices, appliances, fittings and other equipment shall be listed or labeled by a nationally recognized testing agency and shall be connected in an approved manner when in service.

(e) Aluminum conductors, aluminum alloy conductors, and aluminum core conductors such as copper clad aluminum are not acceptable for use in branch circuit wiring in manufactured homes.

§ 3280.802 Definitions.

(a) The following definitions are applicable to subpart I only.

1. Accessible (i) (As applied to equipment) means admitting close approach because not guarded by locked doors, elevation, or other effective means. (See readily accessible.)

(ii) (As applied to wiring methods) means capable of being removed or exposed without damaging the manufactured home structure or finish, or not permanently closed-in by the structure or finish of the manufactured home (see concealed and exposed).

2. Air conditioning or comfort cooling equipment means all of that equipment intended or installed for the purpose of processing the treatment of air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space.

3. (i) Appliance means utilization equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions, such as clothes washing, air conditioning, food mixing, deep frying, etc.

(ii) Appliance, fixed means an appliance which is fastened or otherwise secured at a specific location.

(iii) Appliance, portable means an appliance which is actually moved or can easily be moved from one place to another in normal use. For the purpose of this Standard, the following major appliances are considered portable if cord-connected: refrigerators, clothes washers, dishwashers without booster heaters, or other similar appliances.

(iv) Appliance, stationary means an appliance which is not easily moved from one place to another in normal use.

4. Attachment plug (plug cap) (cap) means a device which, by insertion in a receptacle, establishes connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle.

5. Bonding means the permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.
(6) **Branch circuit** means the circuit conductors between the final overcurrent device protecting the circuit and the outlet(s). A device not approved for branch circuit protection, such as a thermal cutout or motor overload protective device, is not considered as the overcurrent device protecting the circuit.

(ii) **Branch circuit—appliance** means a branch circuit supplying energy to one or more outlets to which appliances are to be connected, such circuits to have no permanently connected lighting fixtures not a part of an appliance.

(iii) **Branch circuit—general purpose** means a circuit that supplies a number of outlets for lighting and appliances.

(iv) **Branch circuit—individual** means a branch circuit that supplies only one utilization equipment.

(7) **Cabinet** means an enclosure designed either for surface or flush mounting, and provided with a frame, mat, or trim in which swinging doors are hung.

(8) **Circuit breaker** means a device designed to open and close a circuit by nonautomatic means, and to open the circuit automatically on a predetermined overload of current without injury to itself when properly applied within its rating.

(9) **Concealed** means rendered inaccessible by the structure or finish of the manufactured home. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them. (See accessible (As applied to wiring methods))

(10) **Connector, pressure (solderless)** means a device that establishes a connection between two or more conductors or between one or more conductors and a terminal by means of mechanical pressure and without the use of solder.

(11) **Dead front (as applied to switches, circuit-breakers, switchboards, and distribution panelboard)** means so designed, constructed, and installed that no current-carrying parts are normally exposed on the front.

(12) **Demand factor** means the ratio of the maximum demand of a system, or part of a system, to the total connected load of a system or the part of the system under consideration.

(13) **Device** means a unit of an electrical system that is intended to carry but not utilize electrical energy.

(14) **Disconnecting means** means a device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

(15) **Distribution panelboard** means a single panel or a group of panel units designed for assembly in the form of a single panel, including buses, and with or without switches or automatic overcurrent protective devices or both, for the control of light, heat, or power circuits of small individual as well as aggregate capacity; designed to be placed in a cabinet placed in or against a wall or partition and accessible only from the front.

(16) **Enclosed** means surrounded by a case that will prevent a person from accidentally contacting live parts.

(17) **Equipment** means a general term, including material, fittings, devices, appliances, fixtures, apparatus, and the like used as a part of, or in connection with, an electrical installation.

(18) **Exposed** (i) (As applied to live parts) means capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts not suitably guarded, isolated, or insulated. (See accessible and concealed.)

(ii) (As applied to wiring method) means on or attached to the surface or behind panels designed to allow access. (See Accessible (as applied to wiring methods))

(19) **Externally operable** means capable of being operated without exposing the operator to contact with live parts.

(20) **Feeder assembly** means the overhead or under-chassis feeder conductors, including the grounding conductor, together with the necessary fittings and equipment, or a power supply cord approved for manufactured home use, designed for the purpose of delivering energy from the source of electrical supply to the distribution panelboard within the manufactured home.

(21) **Fitting** means an accessory, such as a locknut, bushing, or other part of a wiring system, that is intended primarily to perform a mechanical rather than an electrical function.
(22) **Ground** means a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and earth, or to some conducting body that serves in place of the earth.

(23) **Grounded** means connected to earth or to some conducting body that serves in place of the earth.

(24) **Grounded conductor** means a system or circuit conductor that is intentionally grounded.

(25) **Grounding conductor** means a conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

(26) **Guarded** means covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats or platforms to remove the likelihood of approach or contact by persons or objects to a point of danger.

(27) **Isolated** means not readily accessible to persons unless special means for access are used.

(28) **Laundry area** means an area containing or designed to contain either a laundry tray, clothes washer and/or clothes dryer.

(29) **Lighting outlet** means an outlet intended for the direct connection of a lampholder, a lighting fixture, or a pendant cord terminating in a lampholder.

(30) **Manufactured home accessory building or structure** means any awning, cabana, ramada, storage cabinet, carport, fence, windbreak or porch established for the use of the occupant of the manufactured home upon a manufactured home lot.

(31) **Manufactured home service equipment** means the equipment containing the disconnecting means, overcurrent protective devices, and receptacles or other means for connecting a manufactured home feeder assembly.

(32) **Outlet** means a point on the wiring system at which current is taken to supply utilization equipment.

(33) **Panelboard** means a single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent protective devices, and with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front.

(34) **Raceway** means any channel for holding wires, cables, or busbars that is designed expressly for, and used solely for, this purpose. Raceways may be of metal or insulating material, and the term includes rigid metal conduit, rigid nonmetallic conduit, flexible metal conduit, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface raceways, structural raceways, wireways, and busways.

(35) **Raintight** means so constructed or protected that exposure to a beating rain will not result in the entrance of water.

(36) **Readily accessible** means capable of being reached quickly for operation, renewal, or inspection, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc. (See Accessible.)

(37) **Receptacle** means a contact device installed at an outlet for the connection of a single attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is a single device containing two or more receptacles.

(38) **Receptacle outlet** means an outlet where one or more receptacles are installed.

(39) **Utilization equipment** means equipment which utilizes electric energy for mechanical, chemical, heating, lighting, or similar purposes.

(40) **Voltage (of a circuit)** means the greatest root-mean-square (effective) difference of potential between any two conductors of the circuit concerned. Some systems, such as 3-phase 4-wire, single-phase 3-wire, and 3-wire direct-current may have various circuits of various voltages.

(41) **Weatherproof** means so constructed or protected that exposure to the weather will not interfere with successful operation. Rainproof, raintight, or watertight equipment can fulfill the requirements for weatherproof where varying weather conditions other than wetness, such as snow, ice, dust, or temperature extremes, are not a factor.
§ 3280.803 Power supply.

(a) The power supply to the manufactured home shall be a feeder assembly consisting of not more than one listed 50 ampere manufactured home power-supply cords, or a permanently installed circuit. A manufactured home that is factory-equipped with gas or oil-fired central heating equipment and cooking appliances shall be permitted to be provided with a listed manufactured home power-supply cord rated 40 amperes.

(b) If the manufactured home has a power-supply cord, it shall be permanently attached to the distribution panelboard or to a junction box permanently connected to the distribution panelboard, with the free end terminating in an attachment plug cap.

(c) Cords with adapters and pigtail ends, extension cords, and similar items shall not be attached to, or shipped with, a manufactured home.

(d) A listed clamp or the equivalent shall be provided at the distribution panelboard knockout to afford strain relief for the cord to prevent strain from being transmitted to the terminals when the power-supply cord is handled in its intended manner.

(e) The cord shall be of an approved type with four conductors, one of which shall be identified by a continuous green color or a continuous green color with one or more yellow stripes for use as the grounding conductor.

(f) The attachment plug cap shall be a 3-pole, 4-wire grounding type, rated 50 amperes, 125/250 volts with a configuration as shown herein and intended for use with the 50-ampere, 125/250 receptacle configuration shown. It shall be molded of butyl rubber, neoprene, or other approved materials which have been found suitable for the purpose, and shall be molded to the flexible cord so that it adheres tightly to the cord at the point where the cord enters the attachment-plug cap. If a right-angle cap is used, the configuration shall be so oriented that the grounding member is farthest from the cord.

(g) Cords with adapters and pigtail ends, extension cords, and similar items shall not be attached to, or shipped with, a manufactured home.

(h) The power supply cord shall bear the following marking: “For use with manufactured homes—40 amperes” or “For use with manufactured homes—50 amperes.”

(i) Where the cord passes through walls or floors, it shall be protected by means of conduit and bushings or equivalent. The cord may be installed within the manufactured home walls, provided a continuous raceway is installed from the branch-circuit panelboard to the underside of the manufactured home floor. The raceway may be rigid conduit, electrical metallic tubing or polyethylene (PE), polyvinylchloride (PVC) or acrylonitrile-butadiene-styrene (ABS) plastic tubing having a minimum wall thickness of nominal 1/8 inch.

(j) Permanent provisions shall be made for the protection of the attachment-plug cap of the power supply cord and any connector cord assembly or receptacle against corrosion and mechanical damage if such devices are in an exterior location while the manufactured home is in transit.

(k) Where the calculated load exceeds 50 amperes or where a permanent feeder is used, the supply shall be by means of:
§ 3280.804 Disconnecting means and branch-circuit protective equipment.

(a) The branch-circuit equipment is permitted to be combined with the disconnecting means as a single assembly. Such a combination is permitted to be designated as a distribution panelboard. If a fused distribution panelboard is used, the maximum fuse size of the mains must be plainly marked with lettering at least ⅛-inch high and that is visible when fuses are changed. (See Article 110.22 of NFPA 70–2005, National Electrical Code, concerning identification of each disconnecting means and each service, feeder, or branch circuit at the point where it originated and the type marking needed.)

(b) Plug fuses and fuseholders shall be tamper-resistant. Type “S,” enclosed in dead-front fuse panelboards. Electrical distribution panels containing circuit breakers shall also be dead-front type.

(c) Disconnecting means. A single disconnecting means shall be provided in each manufactured home consisting of a circuit breaker, or a switch and fuses and their accessories installed in a readily accessible location near the point of entrance of the supply cord or conductors into the manufactured home. The main circuit breakers or fuses shall be plainly marked “Main.” This equipment shall contain a solderless type of grounding connector or bar for the purposes of grounding with sufficient terminals for all grounding conductors. The neutral bar termination of the grounded circuit conductors shall be insulated.

(d) The disconnecting equipment shall have a rating suitable for the connected load. The distribution equipment, either circuit breaker or fused type, shall be located a minimum of 24 inches from the bottom of such equipment to the floor level of the manufactured home.

(e) A distribution panelboard employing a main circuit breaker shall be rated 50 amperes and employ a 2-pole circuit breaker rated 40 amperes for a 40-ampere supply cord, or 50 amperes for a 50-ampere supply cord. A distribution panelboard employing a disconnect switch and fuses shall be rated 60 amperes and shall employ a single 2-
§ 3280.805 Branch circuits required.

(a) The number of branch circuits required shall be determined in accordance with the following:

(1) Lighting, based on 3 volt-amperes per square foot times outside dimensions of the manufactured home (coupler excluded) divided by 120 volts times amperes to determine number of 15 or 20 ampere lighting area circuits.

(2) Small appliances. For the small appliance load in kitchen, pantry dining room and breakfast rooms of manufactured homes, two or more 20-ampere appliance branch circuits, in addition to the branch circuit specified in §3280.805(a)(1), shall be provided for all receptacle outlets in these rooms, and such circuits shall have no other outlets. Receptacle outlets supplied by at least two appliance receptacle branch circuits shall be installed in the kitchen.

§ 3280.806 Fuses and fuseholders.

(a) Fuses and fuseholders shall be selected and installed in accordance with the provisions of this section.

(b) The fuse or fuseholder shall be selected in accordance with the rating of the circuit and shall be provided for each branch circuit.

(c) The fuse or fuseholder shall be selected in accordance with the rating of the circuit and shall be provided for each branch circuit.

(d) The fuse or fuseholder shall be selected in accordance with the rating of the circuit and shall be provided for each branch circuit.

(e) The fuse or fuseholder shall be selected in accordance with the rating of the circuit and shall be provided for each branch circuit.

(f) The distribution panelboard shall not be located in a bathroom, or in any other inaccessible location, but shall be permitted just inside a closet entry if the location is such that a clear space of 6 inches to easily ignitable materials is maintained in front of the distribution panelboard, and the distribution panelboard shall be extended to its full open position (at least 90 degrees). A clear working space at least 30 inches wide and 30 inches in front of the distribution panelboard shall be provided. This space shall extend from floor to the top of the distribution panelboard.

(g) Branch-circuit distribution equipment shall be installed in each manufactured home and shall include overcurrent protection for each branch circuit consisting of either circuit breakers or fuses.

(h) A 15-ampere multiple receptacle shall be acceptable when connected to a 20-ampere laundry circuit.

(i) When circuit breakers are provided for branch-circuit protection 240 circuits shall be protected by 2-pole common or companion trip, or handle-tied paired circuit breakers.

(j) A 3 inch by 1-3/4 inch minimum size tag made of etched, metal-stamped or embossed brass, stainless steel, anodized or alclad aluminum not less than 0.020 inch thick, or other approval material (e.g., 0.005 inch plastic laminates) shall be permanently affixed on the outside adjacent to the feeder assembly entrance and shall read: This connection for 120/240 Volt, 3 Pole, 4-Wire, 60 Hertz, _____ Ampere Supply.

(k) The correct ampere rating shall be marked on the blank space.
§ 3280.806  Receptacle outlets.

(a) All receptacle outlets shall be:

(1) Of grounding type;

(2) Installed according to Article 406.3 of the National Electrical Code, NFPA No. 70–2005.

(3) Except when supplying specific appliances, be parallel-blade, 15-ampere, 125-volt, either single or duplex.

(b) All 120 volt single phase, 15 and 20 ampere receptacle outlets, including receptacles in light fixtures, installed outdoors, in compartments accessible from the outdoors, in bathrooms, and within 6 feet of a kitchen sink to serve counter top surfaces shall have ground-fault circuit protection for personnel. Feeders supplying branch circuits may be protected by a ground-fault circuit interrupter in lieu of the provision for such interrupters specified above. Receptacles dedicated for washer and dryers, also located in a bathroom, are exempt from this requirement.

(c) There shall be an outlet of the grounding type for each cord-connected fixed appliance installed.

(d) Receptacle outlets required. Except in the bath and hall areas, receptacle outlets shall be installed at wall spaces 2 feet wide or more, so that no point along the floor line is more than 6 feet, measured horizontally, from an outlet in that space. In addition, a receptacle outlet shall be installed:

(1) Over or adjacent to counter tops in the kitchen (at least one on each side of the sink if counter tops are on each side and 12 inches or over in width).

(2) Adjacent to the refrigerator and free-standing gas-range space. A duplex receptacle may serve as the outlet for a countertop and a refrigerator.

(3) At counter top spaces for built-in vanities.

(4) At counter top spaces under wall-mounted cabinets.

(5) In the wall, at the nearest point where a bar type counter attaches to the wall.

(6) In the wall at the nearest point where a fixed room divider attaches to the wall.

(7) In laundry areas within 6 feet of the intended location of the appliance(s).

(8) At least one receptacle outlet shall be installed outdoors.

(9) At least one wall receptacle outlet shall be installed in bathrooms within 36 inches (914 mm) of the outside edge of each basin. The receptacle outlet must be located on a wall that is adjacent to the basin location. This receptacle is in addition to any receptacle that is part of a lighting fixture or appliance. The receptacle must not be enclosed within a bathroom cabinet or vanity.

(10) Receptacle outlets are not required in the following locations:

(i) Wall space occupied by built-in kitchen or wardrobe cabinets.

(ii) Wall space behind doors which may be opened fully against a wall surface.

(iii) Room dividers of the lattice type, less than 8 feet long, not solid within 6 inches of the floor,
(iv) Wall space afforded by bar type counters.
(e) Receptacle outlets shall not be installed in or within reach (30 inches) of a shower or bathtub space.
(f) Receptacle outlets shall not be installed above electric baseboard heaters.


§ 3280.807 Fixtures and appliances.
(a) Electrical materials, devices, appliances, fittings, and other equipment installed, intended for use in, or attached to the manufactured home shall be approved for the application and shall be connected in an approved manner when in service. Facilities shall be provided to securely fasten appliances when the manufactured home is in transit. (See §3280.809.)
(b) Specifically listed pendant-type fixtures or pendant cords shall be permitted in manufactured homes.
(c) If a lighting fixture is provided over a bathtub or in a shower stall, it must be of the enclosed and gasketed type, and be listed for use in wet locations. See also Article 410.4(D) of the National Electrical Code, NFPA No. 70–2005.
(d) The switch for shower lighting fixtures and exhaust fans located over a tub or in a shower stall shall be located outside the tub shower space. (See §3280.806(e).)
(e) Any combustible wall or ceiling finish exposed between the edge of a fixture canopy, or pan and an outlet box shall be covered with non-combustible or limited combustible material.
(f) Every appliance shall be accessible for inspection, service, repair, or replacement without removal of permanent construction.


§ 3280.808 Wiring methods and materials.
(a) Except as specifically permitted by this part, the wiring methods and materials specified in the National Electrical Code, NFPA No. 70–2005, must be used in manufactured homes.
(b) Nonmetallic outlet boxes shall be acceptable only with nonmetallic cable.
(c) Nonmetallic cable located 15 inches or less above the floor, if exposed, shall be protected from physical damage by covering boards, guard strips, or conduit. Cable likely to be damaged by stowage shall be so protected in all cases.
(d) Nonmetallic sheathed cable shall be secured by staples, straps, or similar fittings so designed and installed as not to injure any cable. Cable shall be secured in place at intervals not exceeding 4½ feet and within 12 inches from every cabinet, box or fitting.
(e) Metal-clad and nonmetallic cables shall be permitted to pass through the centers of the wide side of 2-inch by 4-inch studs. However, they shall be protected where they pass through 2-inch by 2-inch studs or at other studs or frames where the cable or armor would be less than 1½ inches from the inside or outside surface of the studs when the wall covering materials are in contact with the studs. Steel plates on each side of the cable, or a tube, with not less than No. 16 MSG wall thickness shall be required to protect the cable. These plates or tubes shall be securely held in place.
(f) Where metallic faceplates are used they shall be effectively grounded.
(g) If the range, clothes dryer, or similar appliance is connected by metalclad cable or flexible conduit, a length of not less than three feet of free cable or conduit shall be provided to permit moving the appliance. Type NM or Type SE cable shall not be used to connect a range or a dryer. This shall not prohibit the use of Type NM or Type SE cable between the branch circuit overcurrent protective device and a junction box or range or dryer receptacle.
(h) Threaded rigid metal conduit shall be provided with a locknut inside and outside the box, and a conduit bushing shall be used on the inside. Rigid nonmetallic conduit shall be permitted. Inside ends of the conduit shall be reamed.
(i) Switches shall be rated as follows:
§ 3280.809 24 CFR Ch. XX (4–1–10 Edition)

(1) For lighting circuits, switches, shall have a 10-ampere, 120–125 volt rating; or higher if needed for the connected load.

(2) For motors or other loads, switches shall have ampere or horsepower ratings, or both, adequate for loads controlled. (An “AC general-use” snap switch shall be permitted to control a motor 2 horsepower or less with full-load current not over 80 percent of the switch ampere rating).

(j) At least 4 inches of free conductor shall be left at each outlet box except where conductors are intended to loop without joints.

(k) When outdoor or under-chassis line-voltage wiring is exposed to moisture or physical damage, it shall be protected by rigid metal conduit. The conductors shall be suitable for wet locations. Electrical metallic tubing may be used when closely routed against frames, and equipment enclosures.

(l) The cables or conductors shall be Type NMC, TW, or equivalent.

(m) Outlet boxes of dimensions less than those required in Table 314.16(A) of the National Electrical Code, NFPA 70–2005, are permitted provided the box has been tested and approved for that purpose.

(n) Boxes, fittings, and cabinets shall be securely fastened in place, and shall be supported from a structural member of the home, either directly or by using a substantial brace. Snap-in type boxes provided with special wall or ceiling brackets that securely fasten boxes in walls or ceilings shall be permitted.

(o) Outlet boxes must fit closely to openings in combustible walls and ceilings and must be flush with the finish surface or project therethrough. In walls and ceilings of noncombustible material, outlet boxes and fittings must be installed so that the front edge of the box or fitting will not be set back from the finished surface more than 1/8 inch. Plaster, drywall, or plasterboard surfaces that are broken or incomplete must be repaired so that there will be no gaps or open spaces greater than 1/8 inch at the edge of the box or fitting.

(p) Appliances having branch-circuit terminal connections which operate at temperatures higher than 60 °C (140 °F) shall have circuit conductors as described in paragraphs (p) (1) and (2) of this section:

(1) Branch-circuit conductors having an insulation suitable for the temperature encountered shall be permitted to run directly to the appliance.

(2) Conductors having an insulation suitable for the temperature encountered shall be run from the appliance terminal connections to a readily accessible outlet box placed at least one foot from the appliance. These conductors shall be in a suitable raceway which shall extend for at least 4 feet.

(q) A substantial brace for securing a box, fitting, or cabinet must be as described in the National Electrical Code, NFPA 70–2005, Article 314.23(B), or the brace, including the fastening mechanism to attach the brace to the home structure, must withstand a force of 50 lbs. applied to the brace at the intended point(s) of attachment for the box in a direction perpendicular to the surface on which the box is installed.

(r) Where the sheathing of NM cable has been cut or damaged and visual inspection reveals that the conductor and its insulation has not been damaged, it shall be permitted to repair the cable sheath with electrical tape which provides equivalent protection to the sheath.

§ 3280.809 Grounding.

(a) General. Grounding of both electrical and nonelectrical metal parts in a manufactured home shall be through connection to a grounding bus in the manufactured home distribution panelboard. The grounding bus shall be grounded through the green-colored conductor in the supply cord or the feeder wiring to the service ground in the service-entrance equipment located adjacent to the manufactured home location. Neither the frame of the manufactured home nor the frame of any appliance shall be connected to the neutral conductor in the manufactured home.

(b) Insulated neutral. (1) The grounded circuit conductor (neutral) shall be insulated from the grounding conductors and from equipment enclosures and other grounded parts. The grounded
neutral) circuit terminals in the distribution panelboard and in ranges, clothes dryers, counter-mounted cooking units, and wall-mounted ovens shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panelboard or in appliances shall be removed and discarded. However, when service equipment is installed on the manufactured home, the neutral and the ground bus may be connected in the distribution panel.

2. Connection of ranges and clothes dryers with 120/240 volt, 3-wire ratings shall be made with 4 conductor cord and 3 pole, 4-wire grounding type plugs, or by type AC metal clad conductors enclosed in flexible metal conduit. For 120 volt rated devices a 3-conductor cord and a 2-pole, 3-wire grounding type plug shall be permitted.

(c) Equipment grounding means. (1) The green-colored grounding wire in the supply cord or permanent feeder wiring shall be connected to the grounding bus in the distribution panelboard or disconnecting means.

(2) In the electrical system, all exposed metal parts, enclosures, frames, lamp fixture canopies, etc., shall be effectively bonded to the grounding terminal or enclosure of the distribution panelboard.

(3) Cord-connected appliances, such as washing machines, clothes dryers, refrigerators, and the electrical system of gas ranges, etc., shall be grounded by means of an approved cord with grounding conductor and grounding-type attachment plug.

(d) Bonding of noncurrent-carrying metal parts. (1) All exposed noncurrent-carrying metal parts that may become energized shall be effectively bonded to the grounding terminal or enclosure of the distribution panelboard. A bonding conductor shall be connected between each distribution panelboard and an accessible terminal on the chassis.

(2) Grounding terminals shall be of the solderless type and approved as pressure-terminal connectors recognized for the wire size used. Star washers or other approved paint-penetrating fitting shall be used to bond terminals to chassis or other coated areas. The bonding conductor shall be solid or stranded, insulated or bare and shall be No. 8 copper minimum, or equal. The bonding conductor shall be routed so as not to be exposed to physical damage. Protection can be afforded by the configuration of the chassis.

(3) Metallic gas, water and waste pipes and metallic air-circulating ducts shall be considered bonded if they are connected to the terminal on the chassis (see §3280.809) by clamps, solderless connectors, or by suitable grounding-type straps.

(4) Any metallic roof and exterior covering shall be considered bonded if (i) the metal panels overlap one another and are securely attached to the wood or metal frame parts by metallic fasteners, and (ii) if the lower panel of the metallic exterior covering is secured by metallic fasteners at a cross member of the chassis by two metallic straps per manufactured home unit or section at opposite ends. The bonding strap material shall be a minimum of 4 inches in width of material equivalent to the skin or a material of equal or better electrical conductivity. The straps shall be fastened with paint-penetrating fittings (such as screws and star washers or equivalent).


§3280.810 Electrical testing.

(a) Dielectric strength test. The wiring of each manufactured home shall be subjected to a 1-minute, 900 to 1079 volt dielectric strength test (with all switches closed) between live parts and the manufactured home ground, and neutral and the manufactured home ground. Alternatively, the test may be performed at 1080 to 1250 volts for 1 second. This test shall be performed after branch circuits are complete and after fixtures or appliances are installed. Fixtures or appliances which are listed shall not be required to withstand the dielectric strength test.

(b) Each manufactured home shall be subject to:

(1) A continuity test to assure that metallic parts are properly bonded;

(2) Operational test to demonstrate that all equipment, except water heaters, electric furnaces, dishwashers, clothes washers/dryers, and portable
§ 3280.811 Calculations.

(a) The following method shall be employed in computing the supply cord and distribution-panelboard load for each feeder assembly for each manufactured home and shall be based on a 3-wire, 120/240 volt supply with 120 volt loads balanced between the two legs of the 3-wire system. The total load for determining power supply by this method is the summation of:

(1) Lighting and small appliance load as calculated below:

(i) Lighting volt-amperes: Length time width of manufactured home (outside dimensions exclusive of coupler) times 3 volt-amperes per square foot; e.g. Length \( \times \) width \( \times \) 3=lighting volt-amperes.

(ii) Small appliance volt-amperes: Number of circuits \( \times \) 1,500 volt-amperes for each 20-ampere appliance receptacle circuit (see definition of “Appliance Portable” with Note): e.g. Number of circuits \( \times \) 1,500=small appliance volt-amperes.

(iii) Total volts-amperes: Lighting volt-amperes plus small appliance=total volt-amperes.

(iv) First 3,000 total volts-amperes at 100 percent=amps to be divided by 240 volts to obtain current (amperes) per leg.

(2) Nameplate amperes for motors and heater loads (exhaust fans, air conditioners, electric, gas, or oil heating). Omit smaller of air conditioning and heating except include blower motor if used as air conditioner evaporator motor. When an air conditioner is not installed and a 40-ampere power supply cord is provided, allow 15 amperes per leg for air conditioning.

(3) 25 percent of current of largest motor in paragraph (a)(2) of this section.

(4) Total of nameplate amperes for: Disposal, dishwasher, water heater, clothes dryer, wall-mounted oven, cooking units. Where number of these appliances exceeds three, use 75 percent of total.

(5) Derive amperes for free-standing range (as distinguished from separate ovens and cooking units) by dividing values below by 240 volts.

<table>
<thead>
<tr>
<th>Nameplate rating (in watts)</th>
<th>Use (in watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000 or less</td>
<td>80 percent of rating.</td>
</tr>
<tr>
<td>10,001 to 12,500</td>
<td>8,000.</td>
</tr>
<tr>
<td>12,501 to 13,500</td>
<td>8,400.</td>
</tr>
<tr>
<td>13,501 to 14,500</td>
<td>8,800.</td>
</tr>
<tr>
<td>14,501 to 15,500</td>
<td>9,200.</td>
</tr>
<tr>
<td>15,501 to 16,500</td>
<td>9,600.</td>
</tr>
<tr>
<td>16,501 to 17,500</td>
<td>10,000.</td>
</tr>
</tbody>
</table>

(6) If outlets or circuits are provided for other than factory-installed appliances, include the anticipated load. The following example is given to illustrate the application of this Method of Calculation:

Example: A manufactured home is 70\(\times\)10 feet and has two portable appliance circuits, a 1000 volt-ampere 240 volt heater, a 200 volt-ampere 120 volt exhaust fan, a 400 volt-ampere 120 volt dishwasher and a 7000 volt-ampere electric range.

<table>
<thead>
<tr>
<th>Lighting and small appliance load</th>
<th>Volt-amperes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting 70(\times)10 ft</td>
<td>2,100</td>
</tr>
<tr>
<td>Small Appliance</td>
<td>3,000</td>
</tr>
<tr>
<td>Total</td>
<td>5,100</td>
</tr>
<tr>
<td>1st 3,000 Volt-Amperes at 100%</td>
<td>3,000</td>
</tr>
<tr>
<td>Remainder (5,100-3,000=2,100, at 35%)</td>
<td>735</td>
</tr>
<tr>
<td>Total</td>
<td>3,735</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Amperses per leg A</th>
<th>Amperses per leg B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting and small Appliance</td>
<td>15.5</td>
<td>15.5</td>
</tr>
<tr>
<td>Heater 240 volt</td>
<td>4.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Fan 120 volt</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Dishwasher 120 volt</td>
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<td>3.3</td>
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<tr>
<td>Range</td>
<td>23.3</td>
<td>23.3</td>
</tr>
<tr>
<td>Total</td>
<td>44.6</td>
<td>46.2</td>
</tr>
</tbody>
</table>

Note: Based on the higher current calculated for either leg, use one 50-A supply cord.

(b) The following is an optional method of calculation for lighting and appliance loads for manufactured homes served by single 3-wire 120/240 volt set of feeder conductors with an ampacity of 100 or greater. The total load for determining the feeder ampacity may be computed in accordance with the following table instead of the method previously specified. Feeder conductors whose demand load is determined by this optional calculation are permitted to have the neutral load
determined by Article 220.61 of the National Electrical Code, NFPA No. 70–2005. The loads identified in the table as “other load” and as “Remainder of other load” must include the following:

1. 1500 volt-amperes for each 2-wire, 20-ampere small appliance branch circuit and each laundry branch circuit specified.
2. 3 volt-amperes per square foot for general lighting and general-use receptacles.
3. The nameplate rating of all fixed appliances, ranges, wall-mounted ovens, counter-mounted cooking units, and including 4 or more separately controlled space heating loads.
4. The nameplate ampere or kVA rating of all motors and of all low-power-factor loads.
5. The largest of the following:
   (i) Air conditioning load;
   (ii) The 65 percent diversified demand of the central electric space heating load;
   (iii) The 65 percent diversified demand of the load of less than four separately-controlled electric space heating units.
   (iv) The connected load of four or more separately-controlled electric space heating units.

Optional Calculation for Manufactured Homes With 110-Ampere or Larger Service

<table>
<thead>
<tr>
<th>Load (in kilowatt or kilovoltampere)</th>
<th>Demand factor (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-conditioning and cooling including heat pump compressors</td>
<td>100</td>
</tr>
<tr>
<td>Central electric space heating</td>
<td>65</td>
</tr>
<tr>
<td>Less than 4 separately controlled electric space heating units</td>
<td>65</td>
</tr>
<tr>
<td>1st 10 kW of all other load</td>
<td>100</td>
</tr>
<tr>
<td>Remainder of other load</td>
<td>40</td>
</tr>
</tbody>
</table>

§ 3280.812 Wiring of expandable units and dual units.

(a) Expandable or multiple unit manufactured homes shall use fixed-type wiring methods and materials for connecting such units to each other.

(b) Expandable or multiple unit manufactured homes not having permanently installed feeders and which are to be moved from one location to another, shall be permitted to have disconnecting means with branch circuit protective equipment in each unit when so located that after assembly or joining together of units the requirements of §3280.803 will be met.

§ 3280.813 Outdoor outlets, fixtures, air-conditioning equipment, etc.

(a) Outdoor fixtures and equipment shall be listed for use in wet locations, except that if located on the underside of the home or located under roof extensions or similarly protected locations, they may be listed for use in damp locations.

(b) A manufactured home provided with an outlet designed to energize heating and/or air conditioning equipment located outside the manufactured home, shall have permanently affixed, adjacent to the outlet, a metal tag which reads:

This Connection Is for Air Conditioning Equipment Rated at Not More Than ___ Amperes, at ___ Volts, 60 Hertz. A disconnect shall be located within sight of the appliance.

The correct voltage and ampere ratings shall be given. The tag shall not be less than 0.020 inch, etched Brass, stainless steel, anodized or clad aluminum or equivalent or other approved material (e.g., .005 inch plastic laminates). The tag shall be not less than 3 inches by 13/4 inches minimum size.

§ 3280.814 Painting of wiring.

During painting or staining of the manufactured home, it shall be permitted to paint metal raceways (except where grounding continuity would be reduced) or the sheath of the nonmetallic cable. Some arrangement, however, shall be made so that no paint shall be applied to the individual wires, as the color coding may be obliterated by the paint.

§ 3280.815 Polarization.

(a) The identified (white) conductor shall be employed for grounding circuit conductors only and shall be connected to the identified (white) terminal or
lead on receptacle outlets and fixtures. It shall be the unswitched wire in switched circuits, except that a cable containing an identified conductor (white) shall be permitted for single-pole three-way or four-way switch loops where the connections are made so that the unidentified conductor is the return conductor from the switch to the outlet. Painting of the terminal end of the wire shall not be required.

(b) If the identified (white) conductor of a cable is used for other than grounded conductors or for other than switch loops as explained above (for a 240 volt circuit for example), the conductor shall be finished in a color other than white at each outlet where the conductors are visible and accessible.

c) Green-colored wires or green with yellow stripe shall be used for grounding conductors only.

§ 3280.816 Examination of equipment for safety.

The examination or inspection of equipment for safety, according to this standard, shall be conducted under uniform conditions and by organizations properly equipped and qualified for experimental testing, inspections of the run of goods at factories, and service-value determinations through field examinations.

Subpart J—Transportation

§ 3280.901 Scope.

Subpart J of this standard covers the general requirement for designing the structure of the manufactured home to fully withstand the adverse effects of transportation shock and vibration without degradation of the integrated structure or of its component parts and the specific requirements pertaining to the transportation system and its relationship to the structure.

§ 3280.902 Definitions.

(a) Chassis means the entire transportation system comprising the following subsystems: drawbar and coupling mechanism, frame, running gear assembly, and lights.

(b) Drawbar and coupling mechanism means the rigid assembly, (usually an A frame) upon which is mounted a coupling mechanism, which connects the manufactured home’s frame to the towing vehicle.

(c) Frame means the fabricated rigid substructure which provides considerable support to the affixed manufactured home structure both during transport and on-site; and also provides a platform for securement of the running gear assembly, the drawbar and coupling mechanism.

(d) Running gear assembly means the subsystem consisting of suspension springs, axles, bearings, wheels, hubs, tires, and brakes, with their related hardware.

(e) Lights means those safety lights and associated wiring required by applicable U.S. Department of Transportation regulations.

(f) Transportation system, (Same as chassis, above).

(g) Highway, includes all roads and streets to be legally used in transporting the manufactured home.

§ 3280.903 General requirements for designing the structure to withstand transportation shock and vibration.

(a) The cumulative effect of highway transportation shock and vibration upon a manufactured home structure may result in incremental degradation of its designed performance in terms of providing a safe, healthy and durable dwelling. Therefore, the manufactured home shall be designed, in terms of its structural, plumbing, mechanical and electrical systems, to fully withstand such transportation forces during its intended life. (See §§ 3280.303(c) and 3280.305(a)).

(b) Particular attention shall be given to maintaining watertight integrity and conserving energy by assuring that structural components in the roof and walls (and their interfaces with vents, windows, doors, etc.) are capable of resisting highway shock and vibration forces during primary and subsequent secondary transportation moves.
§ 3280.904 Specific requirements for designing the transportation system.

(a) General. The entire system (frame, drawbar and coupling mechanism, running gear assembly, and lights) shall be designed and constructed as an integrated, balanced and durable unit which is safe and suitable for its specified use during the intended life of the manufactured home. In operation, the transportation system (supporting the manufactured home structure and its contents) shall effectively respond to the control of the braking, while traveling at applicable towing vehicle in terms of tracking and highway speeds and in normal highway traffic conditions.

Note: While the majority of manufactured homes utilize a fabricated steel frame assembly, upon which the manufactured home structure is constructed, it is not the intent of this standard to limit innovation. Therefore, other concepts, such as integrating the frame function into the manufactured home structure, are acceptable provided that such design meets the intent and requirements of this part.

(b) Specific requirements—

(1) Drawbar. The drawbar shall be constructed of sufficient strength, rigidity and durability to safely withstand those dynamic forces experienced during highway transportation. It shall be securely fastened to the manufactured home frame by either a continuous weld or by bolting.

(2) Coupling mechanism. The coupling mechanism (which is usually of the socket type) shall be securely fastened to the drawbar in such a manner as to assure safe and effective transfer of the maximum loads, including dynamic loads, between the manufactured home structure and the hitch-assembly of the towing vehicle. The coupling shall be equipped with a manually operated mechanism so adapted as to prevent disengagement of the unit while in operation. The coupling shall be so designed that it can be disconnected regardless of the angle of the manufactured home to the towing vehicle. With the manufactured home parked on level ground, the center of the socket of the coupler shall not be less than 20 inches nor more than 26 inches from ground level.

(3) Chassis. The chassis, in conjunction with the manufactured home structure, shall be designed and constructed to effectively sustain the designed loads consisting of the dead load plus a minimum of 3 pounds per square foot floor load, (example: free-standing range, refrigerator, and loose furniture) and the superimposed dynamic load resulting from highway movement but shall not be required to exceed twice the dead load. The integrated design shall be capable of insuring rigidity and structural integrity of the complete manufactured home structure and to insure against deformation of structural or finish members during the intended life of the home.

(4) Running gear assembly. (i) The running gear assembly, as part of the chassis, shall be designed to perform, as a balanced system, in order to effectively sustain the designed loads set forth in § 3280.904(b)(3) and to provide for durable dependable safe mobility of the manufactured home. It shall be designed to accept shock and vibration, both from the highway and the towing vehicle and effectively dampen these forces so as to protect the manufactured home structure from damage and fatigue. Its components shall be designed to facilitate routine maintenance, inspection and replacement.

(ii) Location of the running gear assembly shall be determined by documented engineering analysis, taking into account the gross weight (including all contents), total length of the manufactured home, the necessary coupling hitch weight, span distance, and turning radius. The coupling weight shall be not less than 12 percent nor more than 25 percent of the gross weight.

(5) Spring assemblies. Spring assemblies (springs, hangers, shackles, bushings and mounting bolts) shall be capable of withstanding all the design loads
as outlined in §3280.904(b)(3) without exceeding maximum allowable stresses for design spring assembly life as recommended by the spring assembly manufacturer. The capacity of the spring system shall assure, that under maximum operating load conditions, sufficient clearance shall be maintained between the tire and manufactured home frame or structure to permit unimpeded wheel movement and for changing tires.

(6) Axles. Axles, and their connecting hardware, shall be capable of withstanding all of the design loads outlined in §3280.904(b)(3) without exceeding maximum allowable stresses for design axle life as recommended by the axle manufacturer. The number of axles required to provide a safe tow and good ride characteristics shall be determined and documented by engineering analysis. Those alternatives listed in §3280.903(c) may be accepted in place of such an analysis.

(7) Hubs and bearings. Hubs and bearings shall meet the requirements of §3280.904(b)(3) and good engineering practice. Both of these components shall be accessible for inspection, routine maintenance and replacement of parts.

(8) Tires, wheels and rims. Tires, wheels and rims shall meet the requirements of §3280.904(b)(3). Tires shall be selected for anticipated usage.

(9) Brake assemblies. (i) The number, type, size and design of brake assemblies required to assist the towing vehicle in providing effective control and stopping of the manufactured home shall be determined and documented by engineering analysis. Those alternatives listed in §3280.903(c) may be accepted in place of such an analysis.

(ii) Brakes on the towing vehicle and the manufactured home shall be capable of assuring that the maximum stopping distance from an initial velocity of 20 miles per hour does not exceed 40 feet (U.S. Department of Transportation Regulations).

(iii) Lights and associated wiring. Highway safety electrical lights and associated wiring shall conform to applicable Federal requirements in terms of location and performance. The manufacturer shall have the option of meeting this requirement by utilizing a temporary light/wiring harness provided by the manufactured home transportation carrier.