

ICC/ANSI 2.0-1998

American National Standard

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*Manufactured Housing Construction
and Safety Standards (MHCSS)*



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2.0-1998

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Manufactured Housing Construction and Safety Standards

**International Code Council
5203 Leesburg Pike, Suite 708
Falls Church, VA 22041**

Approved February 23, 1998

**American National Standards Institute, Inc.
11 West 42nd Street
New York, NY 10036**

Second Printing

Publication Date: January, 2000

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BUILDING OFFICIALS AND CODE ADMINISTRATORS INTERNATIONAL, INC.
4051 West Flossmoor Road • Country Club Hills, Illinois 60478-5795
(708) 799-2300

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
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FOREWORD

(This Foreword is not part of American National Standard ICC/ANSI 2.0-1998.)

More than 20 years ago, Congress enacted the National Mobile Home Construction and Safety Standards Act of 1974. This bill directed the U.S. Department of Housing and Urban Development (HUD) to develop a preemptive code to regulate the construction of manufactured housing, resulting in the promulgation of the Federal Manufactured Housing Construction and Safety Standards (FMHCSS, 42 U.S.C. 5401 et seq.; 24 CFR Part 3280 and Part 3282.) From 1987 through 1994, the Council of American Building Officials (CABO) processed proposed changes to the FMHCSS on an annual basis under an agreement with HUD, using code change procedures similar to those used for other CABO building codes. In 1994, the National Commission on Manufactured Housing recommended that the FMHCSS be revised in accordance with American National Standards Institute procedures. At that time, CABO dissolved the code change committee and appointed a consensus committee to operate under ANSI-accredited procedures. In 1998, CABO became the International Code Council (ICC).

This first edition of ICC/ANSI 2.0-1998, Manufactured Housing Construction and Safety Standards, includes changes to the federal standards approved by the ICC MHCSS Consensus Committee, which were forwarded to HUD for consideration as modifications to 24 CFR Part 3280. To facilitate the use of this standard, each section number is followed by the corresponding section in the FMHCSS in brackets, for example: [3280.1].

Suggestions for improving this edition will be welcome. They should be sent to the International Code Council, 5203 Leesburg Pike, Suite 708, Falls Church, VA 22041.

This standard was processed and approved for submittal to ANSI by the ICC MHCSS Consensus Committee. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the ICC MHCSS Consensus Committee had the following members:

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Chapter 1. General

101 Scope. [3280.1] 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 the maximum extent possible to establish performance requirements. In certain instances, however, the use of specific requirements is necessary.

102 Definitions. [3280.2] Definitions in this chapter are those common to all chapters of the standard and are in addition to the definitions provided in individual chapters. 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.

Center. The midline between the right and left side of a manufactured home.

Certification label. The approved form of certification by the manufacturer that, under 108, is permanently affixed to each transportable section of each manufactured home manufactured for sale in the United States.

Combustible material. Materials made of, or surfaced with, wood, compressed paper, plant fibers, or other material that will ignite and burn. Such materials shall be considered as combustible even though flameproofed, fire-retardant treated, or plastered.

Defect. Any defect in the performance, construction, components, or material of a manufactured home that renders the home or any part thereof not fit for the ordinary use for which it was intended.

Department. The Department of Housing and Urban Development.

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

Equipment. 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. 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.

Imminent safety hazard. A hazard that presents an imminent and unreasonable risk of death or severe personal injury.

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

Labeled. 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 in compliance with nationally recognized standards or tests to determine suitable usage in a specified manner.

Length of a manufactured home. 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, nor does it include drawbars, couplings or hitches.

Listed or certified. 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. Any person engaged in manufacturing or assembling manufactured homes, including any person engaged in importing manufactured homes for resale.

Manufactured home. 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, 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 therein. Calculations used to determine the number of square feet in a structure 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. This term includes all structures which meet the above requirements except the size requirements and with respect to which the manufacturer voluntarily files a certification pursuant to Section 3282.13 and complies with the standards set forth in this standard. Nothing in this standard 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. 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. 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. 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. 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 Public Law 93-383.

State. 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. 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.

103 Manufactured home procedural and enforcement regulations and manufactured home consumer manual requirements. [3280.3] A manufacturer must comply with the requirements of this standard and in addition must comply with the requirements of 24 CFR Parts 3282, Manufactured Home Procedural and Enforcement Regulations, and 3283, Manufactured Home Consumer Manual Requirements.

104 Incorporation by reference. [3280.4]

104.1 Referenced standards. [3280.4(a)] Some of the specifications, standards and codes of the following organizations are incorporated by reference in 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. Referenced standards have the same force and effect as this standard, except that whenever referenced standards and this standard are inconsistent, the requirements of this standard prevail to the extent of the inconsistency.

104.2 Organizations. [3280.4(b)] The abbreviations and addresses of organizations issuing the referenced standards appear below. Referenced standards which are not available from their producer organizations are available 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, D.C. 20410.

AA. Aluminum Association, 900 19th Street NW, #300, Washington, D.C. 20006

AAMA. American Architectural Manufacturers Association, 1827 Walden Office Square, Suite 104, Schaumburg, Illinois 60173

AFPA. American Forest and Paper Association, 111 19th Street, NW, #800, Washington, D.C. 20036

AISC. American Institute of Steel Construction, One East Wacker Drive, #3100, Chicago, Illinois 60601-2001

ISI. American Iron and Steel Institute, 1101 17th Street, NW, 1300, Washington, D.C. 20036-4700

AITC. American Institute of Timber Construction, 7012 South Revere Parkway, #140, Englewood, Colorado 80112

ANSI. American National Standards Institute, 11 W. 42nd Street, New York, New York 10036

APA. APA — The Engineered Wood Association, P.O. Box 11700, Tacoma, Washington 98411-0700

ARI. Air Conditioning and Refrigeration Institute, 4301 North Fairfax Drive, #425, Arlington, Virginia 22203

ASCE. American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, Virginia 20191

ASHRAE. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, Georgia 30329

ASME. American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017-2392

ASSE. American Society of Sanitary Engineering, 28901 Clemens Road, #100, Westlake, Ohio 44145

ASTM. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshocken, Pennsylvania 19428

AWS. American Wood Systems, P.O. Box 11700, Tacoma, Washington, CA 98411

CISPI. Cast-Iron Soil Pipe Institute, 5959 Shallowford Road, # 419, Chattanooga, Tennessee 37421

DOC. U.S. Department of Commerce, National Institute of Standards and Technology, Gaithersburg, Maryland 20899-0001

FS. Federal Specifications, General Services Administration, Specifications Branch, Room 6039, GSA Building, 7th and D Streets, SW, Washington, D.C. 20407

HPVA. Hardwood Plywood and Veneer Association, P.O. Box 2789, Reston, Virginia 22090

HUD. FHA, Department of Housing and Urban Development, 451 Seventh Street, SW, Washington, D.C. 20410

HUD USER. Department of Housing and Urban Development, HUD User, P.O. Box 280, Germantown, Maryland 20874

IAPMO. International Association of Plumbing and Mechanical Officials, 20001 Walnut Drive South, Walnut, California 91784-2825

IAS. International Approval Services (Formerly AGA) , 8501 East Pleasant Valley Road, Cleveland, Ohio 44131

IITRI. IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

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

NFPA. National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

NPA. National Particleboard Association, 18928 Premiere Court, Gaithersburg, Maryland 20879

NSF. NSF International, P.O. Box 130140, Ann Arbor, Michigan 48105

NWWDA. National Wood Window and Door Association, 1400 East Touhy Avenue, Suite G-54, Des Plaines, Illinois 60018

SAE. Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096

SJI. Steel Joist Institute, 1205 48th Avenue North, Suite A, Myrtle Beach, South Carolina 29577

TECO. Timberco, Inc. dba TECO, 2402 Daniels Street, Madison, WI 53704

TPI. Truss Plate Institute, 583 D'Onofrio Drive, Suite 200, Madison, Wisconsin 53719

UL. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, Illinois 60062

104.3 Edition. [3280.4(c)] The Department will enforce the listed editions of material incorporated by reference into this standard. If a later edition is to be enforced, the Department will publish a notice of change in the Federal Register.

105 Data plate. [3280.5] 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 numbers that are affixed to each transportable manufactured section under 108.
- 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 405.3. This information shall be permitted to be combined with the heating/cooling certificate and insulation zone map required by 610 and 611. 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 1,500 feet 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 manufacturer's printed instructions."
- h) The statement: "Design Approval by," followed by the name of the agency that approved the design.

106 Serial number. [3280.6(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 3/8 inch minimum in height. Numbers must not be stamped into hitch assembly or drawbar.

107 Excluded structures. [3280.7] Certain structures are excluded from this standard as modular homes under 24 CFR 3282.12.

108 Waivers. [3280.8]

108.1 Equivalency. [3280.8(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.

108.2 Notice. [3280.8(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.

108.3 Contents. [3280.8(c)] Each proposed and final waiver shall include a statement of the nature of the waiver, and identification of the particular standard affected.

108.4 Publication. [3280.8(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 shall 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.

109 Interpretative bulletins. [3280.9] Interpretative bulletins are issued to clarify the meaning of the standard; or to assist in the enforcement of the standard.

110 Use of alternative construction. [3280.10] Requests for alternative construction can be made pursuant to 24 CFR 3282.14 of this chapter.

111 Certification label. [3280.11(a)] A permanent label complying with 111.1 through 111.3 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 is required by 105.

111.1 Size and construction. [3280.11(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 four 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 three-letter designation which identifies the production inspection primary inspection agency and which the Secretary shall assign. Each label shall be marked with a six-digit number which the label supplier shall furnish. The labels shall be stamped with numbers sequentially.

111.2 Contents. [3280.11(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 data plate."

111.3 Location. [3280.11(d)] The label shall be located at the tail-light end of each transportable section of the manufactured home approximately 1 foot up from the floor and 1 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.

Chapter 2. Planning Considerations

201 Scope. [3280.101] Chapter 2 states the planning requirements in manufactured homes. The intent of this chapter is to assure the adequacy of architectural planning considerations which assist in determining a safe and healthful environment.

202 Definitions. [3280.102]

Gross floor area. All space, wall to wall, including recessed entries not to exceed 5 square feet and areas under built-in vanities and similar furniture. Where the ceiling height is less than that specified in 204, the floor area under such ceilings shall not be included. Floor area of closets shall not be included in the gross floor area.

Habitable room. A room or enclosed floor space arranged for living, eating, food preparation, or sleeping purposes not including bathrooms, foyers, hallways, and other accessory floor space.

Laundry area. An area containing or designed to contain a laundry tray, clothes washer or clothes dryer.

203 Light and ventilation. [3280.103] Provisions shall be made for adequate light and ventilation in accordance with 203.1 through 203.3.

203.1 Lighting. [3280.103(a)] Each habitable room shall be provided with exterior windows or doors having a total glazed area of not less than 8 percent of the gross floor area.

203.1.1 Artificial light. [3280.103(a)(1)] Kitchens, bathrooms, toilet compartments, laundry areas, and utility rooms shall be permitted to be provided with artificial light in place of windows.

203.1.2 Area combination. [3280.103(a)(2)] Rooms and areas shall be permitted to 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.

203.2 Whole house ventilation. [3280.103(b)] Each manufactured home shall be capable of providing a minimum of 0.35 air changes per hour continuously or at an equivalent hourly average rate in accordance with 203.2.1 through 203.2.7.

203.2.1 Infiltration and exfiltration. [3280.103(b)(1)] Natural infiltration and exfiltration shall be considered as providing 0.25 air changes per hour.

203.2.2 Capacity. [3280.103(b)(2)] The remaining ventilation capacity of 0.10 air change per hour or its hourly average equivalent shall be calculated using 0.035 cubic feet per minute per square foot of interior floor space. This ventilation capacity shall be in addition to any openable window area.

203.2.3 System. [3280.103(b)(3)] The remaining ventilation capacity shall be provided by either a mechanical system or a passive system, or a combination passive and mechanical system. The ventilation system or provisions shall not create a positive pressure in U_o -value Zones 2 and 3 or a negative pressure condition in U_o -value Zone 1. Mechanical systems shall be balanced. Combination passive and mechanical systems shall have adequately sized inlets or exhaust to release any unbalanced pressure. Passive systems shall have inlets and exhaust of sufficient size to alleviate unbalanced pressure conditions under normal conditions. Temporary imbalances due to gusting or high winds are permitted.

203.2.4 Outdoor air. [3280.103(b)(4)] The ventilation system or provision shall exchange air directly with the exterior of the home, except it shall not draw or expel air with the space underneath the home. The ventilation system or provision shall not draw or expel air into the floor, wall, or ceiling/roof systems even if those systems are vented.

203.2.5 Integral systems. [3280.103(b)(5)] The ventilation system or a portion thereof shall be permitted to be integral with the home's heating or cooling system. The system shall be capable of

operating independently of the heating or cooling modes. A ventilation system that is integral with the heating or cooling system shall be listed as part of the heating and cooling system or listed as suitable for use therewith.

203.2.6 Controls. [3280.103(b)(6)] A mechanical ventilation system, or mechanical portion thereof, shall be provided with a manual control and shall be permitted to be provided with automatic timers or humidistats.

203.2.7 Substantiation. [3280.103(b)(7)] Substantiation of the ventilation capacity to provide 0.10 ACH shall be provided for a mechanical system, or a passive system, or a combination passive and mechanical system.

203.3 Additional ventilation. [3280.103(c)] Additional ventilation shall be provided in accordance with 203.3.1 through 203.3.3.

203.3.1. Openable area. [3280.103(c)(1)] At least half of the minimum required glazed area in 203.1 shall be openable directly to the outside of the manufactured home for unobstructed ventilation. These same ventilation requirements apply to rooms combined in accordance with 203.2.2.

203.3.2 Kitchens. [3280.103(c)(2)] Kitchens shall be provided with a mechanical ventilation system that is capable of exhausting 100 cfm to the outside of the home. The exhaust fan shall be located as close as possible to the range or cooktop, but in no case farther than 10 feet horizontally from the range or cook top.

203.3.3 Bathrooms. [3280.103(c)(3)] Each bathroom and separate toilet compartment shall be provided with a mechanical ventilation system capable of exhausting 50 cfm to the outside of the home.

EXCEPTION: In other than U_o -value Zone 3, a separate toilet compartment shall be permitted with 1.5 square feet of openable glazed area in place of mechanical ventilation.

204 Ceiling heights. [3280.104]

204.1 Habitable rooms and bathrooms. [3280.104(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 shall be permitted to 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.

204.2 Hallways and foyers. [3280.104(b)] Hallways and foyers shall have a minimum ceiling height of 6 feet, 6 inches.

205 Exit facilities. [3280.105, 3280.106]

205.1 Exterior doors. [3280.105(a)] Manufactured homes shall have a minimum of two remote exterior doors in accordance with 205.1.1 and 205.1.3.

205.1.1 Location. [3280.105(a)(1)] Required egress doors shall not be located in rooms where a lockable interior door must be used in order to exit.

205.1.2 Remoteness. [3280.105(a)(2)] In order for exit doors to be considered "remote" from each other, they must comply with 205.1.2.1 through 205.1.2.4.

205.1.2.1 [3280.105(a)(2)(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.

205.1.2.2 [3280.105(a)(2)(ii)] In single-wide units, doors shall not be less than 12 feet center to center from each other as measured in any straight line direction regardless of the length of path of travel between doors.

205.1.2.3 [3280.105(a)(2)(iii)] In a double-wide unit, doors shall not be less than 20 feet

center to center from each other as measured in any straight line direction regardless of the length of path of travel between doors.

205.1.2.4 [3280.105(a)(2)(iv)] One of the required exit doors must be accessible from the doorway of each bedroom without traveling more than 35 feet.

205.1.3 Design and construction. [3280.105(b)]

205.1.3.1 Standards. [3280.105(b)(1)] Exterior swinging doors shall be constructed in accordance with 505, the "Standard for Swinging Exterior Passage Doors for Use in Manufactured Homes." Exterior sliding glass doors shall be constructed in accordance with 503, the "Standard for Windows and Sliding Glass Doors Used in Manufactured Homes."

205.1.3.2 Opening size. [3280.105(b)(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.

205.1.3.3 Locks. [3280.105(b)(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.

205.1.3.4 Safety door check. [3280.105(b)(4)] All exterior doors, including storm and screen doors, opening outward shall be provided with a safety door check.

205.2 Egress windows and devices. [3280.106]

205.2.1 Standards. [3280.106(a)] Every room designed expressly for sleeping purposes, unless it has an exit door complying with 205.1, shall have at least one outside window or approved exit device which meets the requirements of 504, the "Standard for Egress Windows and Devices for Use in Manufactured Homes."

205.2.2 Opening height. [3280.106(b)] The bottom of the window opening shall not be more than 36 inches above the floor.

205.2.3 Hardware height. [3280.106(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.

205.2.4 Integral screens. [3280.106(d)] Integral rolled-in screens shall not be permitted in an egress window unless the window is of the hinged type.

206 Interior privacy. [3280.107, 3280.108]

206.1 Bathroom and toilet compartments. [3280.107] Bathroom and toilet compartment doors shall be equipped with a privacy lock.

206.2 Interior passage. [3280.108]

206.2.1 Operation. [3280.108(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.

206.2.2 Emergency release. [3280.108(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.

207 Room requirements. [3280.109]

207.1 Living area. [3280.109(a)] Every manufactured home shall have at least one living area with not less than 150 square feet of gross floor area.

207.2 Sleeping rooms. [3280.109(b)] Rooms designed for sleeping purposes shall comply with 207.2.1 through 207.2.3.

207.2.1 Floor area. [3280.109(b)(1)] All bedrooms shall have at least 50 square feet of gross floor area.

207.2.2 Multiple occupants. [3280.109(b)(2)] Bedrooms designed for two or more people shall have 70 square feet of gross floor area plus 50 square feet for each person in excess of two.

207.2.3 Storage. [3280.109(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.

207.3 Minimum room dimension. [3280.110] The gross floor area required by 207.1 and 207.2 shall have no clear horizontal dimension less than 5 feet except as permitted by 202.1.

207.4 Toilet compartments. [3280.111] 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.

207.5 Hallways. [3280.112] 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 the 28 inches required for passage. In addition, a notice of the available clearance for washer/dryer units shall be posted in the laundry area. Minor protrusions into the minimum hallway width by doorknobs, trim, smoke detectors or light fixtures are permitted.

208 Glass and glazed openings. [3280.113]

208.1 Windows and sliding glass doors. [3280.113(a)] All windows and sliding glass doors shall meet the requirements of 503, the "Standard for Windows and Sliding Glass Doors Used in Manufactured Homes."

208.2 Safety glazing. [3280.113(b)] 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.

Chapter 3. Fire Safety

301 Scope. [3280.201] The purpose of this chapter 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.

302 Definitions. [3280.202(a)] The following definitions are applicable to Chapters 3, 8, and 9 of this standard:

Combustible material. Any material not meeting the definition of limited combustible or noncombustible 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 chapter.

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 303.2.3 or 303.2.4, 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 percent 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 303.2;
- 11) Coverings and surfaces of exposed wood beams; and
- 12) Decorative items including the following:
 - a) Nonstructural beams not exceeding 6 inches in depth and 6 inches in width and spaced not closer than 4 feet on center;
 - b) Nonstructural lattice work;
 - c) Mating and closure molding; and
 - d) Other items not affixed to the home's structure.

Limited combustible. A material meeting:

- 1) The definition of Article 2-3 or NFPA 220-1992; or
- 2) 5/16-inch or thicker gypsum board.

Noncombustible material. A material meeting the definition contained in NFPA 220-1992.

Single-station alarm device. An assembly incorporating the smoke detector sensor, the electrical control equipment, and the alarm-sounding device in one unit.

Smoke detector. A wall-mounted detector of the ionization chamber or photoelectric type which detects visible or invisible particles of combustion and operates from a 120V AC source of current.

303 Flame spread limitations and fire protection requirements. [3280.203]

303.1 Establishment of flame spread rating. [3280.203(a)] The surface flame spread rating of interior-finish material shall not exceed the value shown in 303.2 when tested by "Standard Test Method for Surface-Burning Characteristics of Building Materials, ASTM E 84-91a" except that the surface flame spread rating of interior-finish materials required by 303.2.5 or 303.2.6 shall be permitted to be determined by using the "Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source, ASTM E 162-90."

303.1.1 Exempt materials. [3280.203(a)] Materials listed in 303.1.1.1 or 303.1.1.2 are not required to be tested to establish their flame spread rating unless a lower rating is required by this standard. These material applications do not waive the requirements of 303.3 or 304.

303.1.1.1 [3280.203(a)(1)] The following materials are not required to be tested where a flame spread rating of 76 to 200 is required:

- 1) .035-inch or thicker high-pressure laminated plastic panel countertop;
- 2) 1/4-inch or thicker unfinished plywood with phenolic or urea glue;
- 3) Unfinished dimension lumber (1-inch or thicker nominal boards);
- 4) 3/8-inch or thicker unfinished particleboard with phenolic or urea binder;
- 5) Natural gum-varnished or latex- or alkyd-painted:
 - a) 1/4-inch or thicker plywood, or
 - b) 3/8-inch or thicker particleboard, or
 - c) 1-inch or thicker nominal board.
- 6) 5/16-inch gypsum board with decorative wallpaper; and
- 7) 1/4-inch or thicker unfinished hardboard,

303.1.1.2 [3280.203(a)(2)] The following materials are not required to be tested where a flame spread rating of 25 to 200 is required:

- 1) Painted metal;
- 2) Mineral-based acoustic tile;
- 3) 5/16-inch or thicker unfinished gypsum wallboard (both latex- or alkyd-painted); and
- 4) Ceramic tile.

303.2 Flame spread rating requirements. [3280.203(b)]

303.2.1 Walls, columns and partitions. [3280.203(b)(1)] The interior finish of all walls, columns, and partitions shall not have a flame spread rating exceeding 200 except as otherwise specified herein.

303.2.2 Ceilings. [3280.203(b)(2)] Ceiling interior finish shall not have a flame spread rating exceeding 75.

303.2.3 Walls adjacent to equipment. [3280.203(b)(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.

303.2.4 Cooking range. [3280.203(b)(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 or ceiling and within 6 horizontal inches of the cooking range (refer also to 304.1 and 304.2).

EXCEPTION: Sealants and other trim materials 2 inches or less in width used to finish adjacent surfaces are exempt from this provision provided that all joints are completely supported by a framing member.

303.2.5 Kitchen cabinets. [3280.203(b)(5)] Kitchen cabinet doors, countertops, backsplashes, exposed bottoms, and end panels shall have a flame spread rating not to exceed 200.

EXCEPTION: Cabinet rails, stiles, mullions, and top strips are exempted.

303.2.6 Plastic fixtures. [3280.203(b)(6)] Finish surfaces of plastic bathtubs, shower units, and tub or shower doors shall not exceed a flame spread rating of 200.

303.3 Fire protective requirements. [3280.203(c)]

303.3.1 Limited combustible materials. [3280.203(c)(1)] Materials used to surface the following areas shall be of limited combustible material (e.g., 5/16-inch gypsum board, etc.):

- 1) The exposed wall adjacent to the cooking range (see 303.2.4);
- 2) Exposed bottoms and sides of kitchen cabinets as required by 304;
- 3) Interior walls and ceilings enclosing furnace or water heater spaces; and
- 4) Combustible doors which provide interior or exterior access to furnace or water heater spaces. Louvers ventilating the enclosure shall be permitted to interrupt the surface. However, the louvers shall not be constructed of a material of greater combustibility than the door itself (e.g., plastic louvers on a wooden door).

303.3.2 Cooking burners. [3280.203(c)(2)] No burner of a surface cooking unit shall be closer than 12 horizontal inches to a window or an exterior door with glazing.

304 Kitchen cabinet protection. [3280.204]

304.1 Protection. [3280.204(a)] The bottom and sides of combustible kitchen cabinets over cooking ranges to a horizontal distance of 6 inches from the outside edge of the cooking range shall be protected with at least 5/16-inch-thick gypsum board or equivalent limited combustible material.

EXCEPTION: One-inch nominal framing members and trim are exempted from this requirement.

304.2 Hood. [3280.204(a)] 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. The 5/16-inch-thick gypsum board or equivalent material which is above the top of the hood shall be permitted to be supported by the hood. A 3/8-inch enclosed air space shall be provided between the bottom surface of the cabinet and the gypsum board or equivalent material. The hood shall be at least as wide as the cooking range.

304.2.1 Eyebrow. [3280.204(b)] The 3-inch metal eyebrow required by 304.2 shall 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.

304.3 Equivalent protection. [3280.204(c)] The metal hood required by 304.2 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 304.1.

304.4 Factory installation. [3280.204(d)] When a manufactured home is designed for the future installation of a cooking range, the metal hood and cabinet protection required by 304.1 and 304.2 and the wall-surfacing protection behind the range required by 303 shall be installed in the factory.

304.5 Vertical clearance above cooking top. [3280.204(e)] Ranges shall have a vertical clearance above the cooking top of not less than 24 inches to the bottom of combustible cabinets.

305 Carpeting. [3280.205] Carpeting shall not be used in a space or compartment designed to contain only a furnace or water heater. Carpeting shall be permitted in other areas where a furnace or water heater is installed, provided that it is not located under the furnace or water heater.

306 Firestopping. [3280.206]

306.1 Concealed openings. [3280.206(a)] Firestopping of at least 1-inch nominal lumber, 5/16-inch-thick gypsum board, or the equivalent, shall be provided to cut off concealed draft openings between walls and partitions, including furred spaces, and the roof or floors, so as to retard vertical movement of fire. In particular, such concealed spaces must be constructed so that floor-to-ceiling concealed spaces on one floor do not communicate with any concealed space on another floor, any concealed spaces in the floor, or any concealed space in the roof cavity. A barrier must be installed to prevent communication between adjacent concealed spaces.

306.1.1 Vertical spaces. [3280.206(a)(1)] Where the barrier is vertical, it must be made of exterior or interior coverings equivalent to that used on the nearest exposed wall surface; and

306.1.2 Nonvertical spaces. [3280.206(a)(2)] In all other cases, the barrier must be made of 1-inch nominal lumber, 5/16-inch-thick gypsum board, or the equivalent.

306.2 Insulation. [3280.206(b)] A space shall be considered a concealed draft opening if it is filled with insulation or other material or if it is blocked by a barrier other than as required by 306.1.

306.3 Penetrations. [3280.206(c)] All openings for pipes and vents and other penetrations in walls, floors, and ceilings of furnace and water heater spaces shall be tight fitted or firestopped. Pipes, vents, and other penetrations are considered tight fitted when they cannot be moved freely in the opening.

307 Requirements for foam plastic thermal insulating materials.

307.1 General. [3280.207] 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.

EXCEPTIONS:

1) [3280.207(a)(1)] Foam plastic insulating material shall be permitted where protected by an interior finish of 5/16-inch-thick gypsum board or equivalent material for all cavities where the material is to be installed.

2) [3280.207(a)(2)] Foam plastic shall be permitted to be used as a sheathing or siding backer board, where the following are met:

- a) It has a flame spread rating of 75 or less and a smoke-developed rating of 450 or less (not including outer covering of sheathing); and
- b) It does not exceed 3/8 inch in thickness; and
- c) It is separated from the interior of the manufactured home by a minimum of 2 inches of mineral fiber insulation or an equivalent thermal barrier.

3) [3280.207(a)(3)] Foam plastic insulating material shall be permitted where it has been previously accepted by the Department for use in wall or ceiling cavities of manufactured homes, and it is installed in accordance with any restrictions imposed at the time of that acceptance.

4) [3280.207(a)(4)] Foam plastic insulating material shall be permitted where it has been tested as required for its location in wall or ceiling cavities in accordance with testing procedures described in the Illinois Institute of Technology Research Institute (IITRI) Report, "Development of Mobile Home Fire Test Methods to Judge the Fire Safe Performance of Foam Plastic, J-6461," or other full-scale fire tests accepted by the Department, and it is installed in a manner consistent with the way the material was installed in the foam plastic test module. The materials shall be capable of meeting the following acceptance criteria required for their location:

- a) Wall assemblies. The foam plastic system shall demonstrate equivalent or superior performance to the control module as determined by time to reach flashover (600°C. in the upper part of the room); time to reach an oxygen (O₂) level of 14 percent (rate of O₂ depletion), a carbon monoxide (CO) level of 1 percent, a carbon dioxide (CO₂) level of 6 percent, and a smoke level of 0.26 optical density/meter measured at 5 feet high in the doorway; and rate of change concentration for O₂, CO, CO₂ and smoke measured 3 inches below the top of the doorway.
- b) 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.
- c) 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.

307.2 Flame spread. [3280.207(b)] All foam plastic thermal insulating materials used in manufactured housing shall have a flame spread rating of 75 or less (not including outer covering or sheathing) and a maximum smoke-developed rating of 450.

308 Fire detection equipment. [3280.208]

308.1 General. [3280.208(a)] At least one smoke detector shall be installed in the home in the locations specified in 308.2. A single-station alarm device shall be permitted.

308.2 Smoke detector locations. [3280.208(b)]

308.2.1 Bedroom areas. [3280.208(b)(1)] A smoke detector shall be installed in the hallway or space communicating with each bedroom area between the living area and the first bedroom door unless a door separates the living area from that bedroom area, in which case the detector shall be installed on the living area side as close to the door as practicable. Homes having bedroom areas separated by any one or combination of common-use areas such as kitchen, dining room, living room, or family room (but not a bathroom or utility room) shall have at least one detector protecting each bedroom area.

308.2.2 Hallway location. [3280.208(b)(2)] When located in hallways, the detector shall be between the return air intake and the living area.

308.2.3 Ceiling grilles. [3280.208(b)(3)] 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 environment, the detector closest to the air discharge shall be located no closer than 3 horizontal feet from any discharge grille.

308.2.4 Prohibited locations. [3280.208(b)(4)] A smoke detector shall not be placed in a location which impairs its effectiveness.

308.3 Labelling. [3280.208(c)] Smoke detectors shall be labeled as conforming with the requirements of Underwriters Laboratories Standard No. 217-Fourth Edition 1993 for Single and Multiple Station Smoke Detectors.

308.4 Installation. [3280.208(d)] Each smoke detector shall be installed in accordance with its listing. Required smoke detectors shall receive their primary power from the building wiring and when the primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke detectors shall not be placed on the same branch circuit or any circuit protected by a ground fault circuit interrupter.

309 Fire testing. [3280.209] All fire testing conducted in accordance with this chapter 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.

Chapter 4. Body and Frame Construction Requirements

401 Scope. [3280.301] This chapter 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.

402 Definitions. [3280.302(a)] The following definitions are applicable to this chapter only.

Anchoring equipment. Straps, cables, turnbuckles, and chains, including tensioning devices, which are used with ties to secure a manufactured home to ground anchors.

Anchoring system. A combination of ties, anchoring equipment, and ground anchors that will, when properly designed and installed, resist overturning and lateral movement of the manufactured home from wind forces.

Diagonal tie. A tie intended to primarily resist horizontal forces, but which shall be permitted to resist vertical forces.

Footing. That portion of the support system that transmits loads directly to the soil.

Ground anchor. Any device at the manufactured home stand designed to transfer manufactured home anchoring loads to the ground.

Load, dead. The weight of all permanent construction including walls, floors, roof, partition, and fixed service equipment.

Load, live. The weight superimposed by the use and occupancy of the manufactured home, including wind load and snow load, but not including dead load.

Load, wind. The lateral or vertical pressure or uplift on the manufactured home due to wind blowing in any direction.

Main frame. The structural component on which is mounted the body of the manufactured home.

Pier. That portion of the support system between the footing and manufactured home exclusive of caps and shims.

Sheathing. Material which is applied on the exterior side of a building frame under the exterior weather-resistant covering.

Stabilizing devices. All components of the anchoring and support system such as piers, footings, ties, anchoring equipment, ground anchors, and any other equipment which supports the manufactured home and secures it to the ground.

Support system. A combination of footings, piers, caps, and shims that will, when properly installed, support the manufactured home.

Tie. Straps, cable, or securing devices used to connect the manufactured home to ground anchors.

Vertical tie. A tie intended to resist the uplifting or overturning forces.

403 General requirements. [3280.303]

403.1 Minimum requirements. [3280.303(a)] 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 shall be permitted to exceed these standards provided such deviation does not result in any inferior installation or defeat the purpose and intent of this standard.

403.2 Construction. [3280.303(b)] 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.

403.3 Structural analysis. [3280.303(c)] The strength and rigidity of the component parts and 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 Chapters 5 and 10).

403.4 New materials and methods. [3280.303(e)]

403.4.1 Performance. [3280.303(e)(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.

403.4.2 Tests. [3280.303(e)(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 403.6.

403.5 Allowable design stress. [3280.303(f)] 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.

403.6 Alternative test procedures. [3280.303(g)] In the absence of recognized testing procedures either in these standards or the applicable provisions of those standards incorporated by reference, the manufacturer electing this option shall develop or cause to be developed testing procedures to demonstrate the structural properties and significant characteristics of the material, assembly, subassembly component or member. Such testing procedures shall become part of the manufacturer's approved design (refer to 103).

403.6.1 Submittal. [3280.303(g)(1)] Testing procedures so developed shall be submitted to the Department for approval.

403.6.2 Acceptability. [3280.303(g)(2)] Upon notification of approval, the alternative test procedure shall be considered acceptable.

403.6.3 Witness. [3280.303(g)(3)] Such tests shall be witnessed by an independent licensed professional engineer or architect or by a recognized testing organization.

403.6.4 Records. [3280.303(g)(3)] Copies of the test results shall be kept on file by the manufactured home manufacturer.

404 Materials. [3280.304]

404.1 Moisture content. [3280.304(a)] Dimension and board lumber shall not exceed 19 percent moisture content at time of installation.

404.2 Standards. [3280.304(b)(1)] Standards for some of the generally used materials and methods of construction are listed in the following table.

404.2.1 Steel

Specification for Aluminum Structures Construction Manual Series-Section 1, Fifth Edition-1986, The Aluminum Association.

Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design-AISC-June 1, 1989.

The following parts of this referenced standard are not applicable: 1.3.3, 1.3.4, 1.3.5, 1.3.6, 1.4.6, 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, 1.20, 1.21, 1.23.7, 1.24, 1.25.1 through 1.25.5, 1.26.4, 2.3, 2.4, 2.8 through 2.10.

Specification for the Design of Cold-Formed Steel Structural Members-AISI-1986 Edition with 1989 Addendum.

The following parts of this referenced standard are not applicable: 3.1.2, 4.2.1, 4.2.4.

Stainless Steel Cold-Formed Structural Design Manual-AISI-1974.

The following part of this referenced standard is not applicable: 3.1.2.

Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, only Sections 1-6 and the table for "H Series only" are applicable-Steel Joist Institute-1992.

Manual for Structural Applications of Steel Cables for Buildings-AISI-1973.

Standard Specification for Strapping, Flat Steel and Seals-ASTM D3953-91.

404.2.2 Wood and Wood Products

Basic Hardboard-ANSI/AHA A135.4-1982.

Prefinished Hardboard Paneling-ANSI/AHA A135.5-1988.

Hardboard Siding-ANSI/AHA A135.6-1990.

Hardwood and Decorative Plywood - ANSI/HPVA HP1-1994

Structural Design Guide for Hardwood Plywood Wall Panels - HPVA Design Guide HP-SG-96.

For Wood Products-Structural Glued Laminated Timber-ANSI/AITC A190.1-1992.

Voluntary Product Standard, Construction and Industrial Plywood-PS-1-1995.

Performance Standards and Policies for Structural-Use Panels-APA-PRP-108, E445Q-1996.

National Design Specifications for Wood Construction, 1991 Edition, with Supplement, Design Values for Wood Construction, AFPA.

Wood Structural Design Data, 1986 Edition with 1992 Revisions, AFPA.

Span Tables for Joists and Rafters-PS-20-70, 1993, AFPA.

Design Values for Joists and Rafters, American Softwood Lumber Standard Sizes, 1992, AFPA.

Design Specifications for Metal Plate Connected Wood Trusses-TPI-85.

Wood Particleboard-ANSI A208.1-1993.

Wood Flush Doors-ANSI/NWWDA I.S.1-87.

Wood Windows-ANSI/NWWDA I.S.2-87.

Wood Sliding Patio Doors-NWWDA-I.S.3-88.

Medium Density Fiberboard (MDF) ANSI A208.2-1994.

Water-Repellent Preservative Nonpressure Treatment for Millwork-NWWDA-I.S.4-81.

Standard Test Methods for Puncture and Stiffness of Paperboard, and Corrugated and Solid Fiberboard-ASTM D781-68 (73).

Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials-ASTM D4442.

Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters-ASTM D4444-92.

Performance Standard for Wood-Based Structural-Use Panels - Voluntary Product Standard PS-2-92, National Institute of Standards and Technology.

Performance Standards and Policies for Structural-Use Panels - TECO PRP-133-1991

404.2.3 Other

Standard Specification for Gypsum Wallboard-ASTM C36-93.

404.2.4 Fasteners

Application and Fastening Schedule: Power-Driven, Mechanically Driven and Manually Driven Fasteners-HUD-FHA Use of Materials Bulletin-UM-25d-73.

404.2.5 Unclassified

American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures-ANSI/ASCE 7-88.

Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Building-ANSI Z97.1-1984.

404.3 Compliance. [3280.304(b)(2)] Materials and methods of construction utilized in the design and construction of manufactured homes which are covered by the standards in the following table, or any applicable portion thereof shall comply with these requirements.

404.4 Analysis and testing. [3280.304(b)(3)] Engineering analysis and testing methods contained in these references shall be utilized to judge conformance with accepted engineering practices required in 403.3.

404.5 Acceptability. [3280.304(b)(4)] Materials and methods of installation conforming to these standards shall be considered acceptable when installed in conformance with the requirements of this section.

404.6 Conformance. [3280.304(b)(5)] Materials meeting the standards (or the applicable portion thereof) are considered acceptable unless otherwise specified herein or unless substantial doubt exists as to conformance.

405 Structural design requirements.

405.1 General. [3280.305(a)] 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 chapter. Uncompressed finished flooring greater than 1/8 inch in thickness shall not extend beneath load-bearing walls that are fastened to the floor structure.

405.2 Design loads. [3280.305(b)]

405.2.1 Design dead loads. [3280.305(b)(1)] Design dead loads shall be the actual dead load supported by the structural assembly under consideration.

405.2.2 Design live loads. [3280.305(b)(2)] 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.

405.2.3 Increased unit stresses. [3280.305(b)(3)] When engineering calculations are performed, allowable unit stresses shall be permitted to be increased as provided in the documents referenced in 404 except as otherwise indicated in 404.2 and 406.1.

405.3 Wind, snow, and roof loads. [3280.305(c)]

405.3.1 Design requirements for wind loads. [3280.305(c)(1)]

405.3.1.1 Standard wind loads (Zone I). [3280.305(c)(1)(i)] When a manufactured home is not designed to resist the wind loads for high wind areas (Zone II or Zone III) specified in 405.3.1.2, 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.

405.3.1.2 Wind loads for high wind areas (Zones II and III). [3280.305(c)(1)(ii)] When designed for high wind areas (Zones II and 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), and its components and cladding materials (including, but not limited to, roof trusses, wall studs, exterior sheathing, roofing and siding materials, exterior glazing, and their connections and fasteners) shall be designed by a professional engineer or architect to comply with 405.3.1.2.1 or 405.3.1.2.2.

405.3.1.2.1 Standards. [3280.305(c)(1)(ii)(A)] Parts shall resist the design wind loads for Exposure C specified in ANSI/ASCE 7-88, "Minimum Design Loads for Buildings and Other Structures," for a 50-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).

405.3.1.2.2 Wind pressures. [3280.305(c)(1)(ii)(B)] Parts shall resist the wind pressures specified in Table 405.3.1.2.

**TABLE 405.3.1.2
DESIGN WIND PRESSURES**

ELEMENT	WIND ZONE II DESIGN WIND SPEED 100 MPH	WIND ZONE III DESIGN WIND SPEED 110 MPH
ANCHORAGE FOR LATERAL AND VERTICAL STABILITY (See 406.1)		
Net horizontal drag ^{1,2} :	+39 PSF ³	+47 PSF ³
Uplift ⁴ :	-27 PSF ⁵	-32 PSF
MAIN WINDFORCE-RESISTING SYSTEM		
Shearwalls, diaphragms and their fastening and anchorage systems ^{1,2} :	+39 PSF	+47 PSF
Ridge beams and other main roof support beams (Beams supporting expanding room sections, etc.):	-30 PSF	-36 PSF
COMPONENTS AND CLADDING		
Roof trusses ⁴ in all areas; trusses shall be doubled within 3'-0" from each end of the roof:	-39 PSF ⁵	-47 PSF ⁵
Exterior roof coverings, sheathing and fastenings ^{4,6,7} in all areas except the following:	-39 PSF ⁵	-47 PSF ⁵
Within 3'-0" from each gable end (overhang at end wall) of the roof or endwall if no overhang is provided:	-73 PSF ⁵	-89 PSF ⁵
Within 3'-0" from the ridge and eave (overhang at sidewall) or sidewall if no eave is provided:	-51 PSF ⁵	-62 PSF ⁵
Eaves (overhangs at sidewalls):	-51 PSF ⁵	-62 PSF ⁵
Gables (overhangs at endwalls):	-73 PSF ⁵	-89 PSF ⁵
Wall studs in sidewalls and endwalls, exterior windows and sliding glass doors (glazing and framing), exterior coverings, sheathing and fastenings ⁸ :	+48 PSF	+58 PSF
Within 3'-0" from each corner of the sidewall and endwall:	+38 PSF	+46 PSF
All other areas:		

Table 405.3.1.2 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 WindForce-Resisting Systems is based on a distribution of wind pressures of +0.8 or +24 PSF to the windward wall and -0.5 or -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; ± sign means forces can act in either direction, towards or 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-inch structural-rated roof sheathing need not be evaluated for these design wind pressures.
7. Structural-rated roof sheathing that is at least 3/8 inch in thickness, installed with the long dimension perpendicular to roof framing supports, and secured with fasteners at 4 inches on center ("o.c.") within 3'-0" of each gable end or endwall if no overhang is provided and 6 inches o.c. in all other areas, need not be evaluated for these design wind pressures.
8. Exterior coverings that are secured at 6 inches o.c. to a 3/8-inch structural-rated sheathing that is fastened to wall framing members at 6 inches o.c. need not be evaluated for these design wind pressures.

405.3.2 Zone designations for wind loads. [3280.305)(c)(2)] 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 (Figure 405.3.2), as described in 405.3.2.1 through 405.3.2.3.

405.3.2.1 Wind Zone I. [3280.305)(c)(2)(i)] Wind Zone I consists of those areas on the Basic Wind Zone Map that are not identified in 405.3.2.2 for Wind Zone II, or in 405.3.2.3 for Wind Zone III.

405.3.2.2 Wind Zone II (100 mph). [3280.305)(c)(2)(ii)] The following local governments listed by state (counties, unless specified otherwise) are deemed to be within Wind Zone II of the Basic Wind Zone Map:

- 1) *Alabama:* Baldwin and Mobile.
- 2) *Florida:* All counties except those identified in 405.3.2.3 as within Wind Zone III.
- 3) *Georgia:* Bryan, Camden, Chatham, Glynn, Liberty, McIntosh.
- 4) *Louisiana:* Parishes of Acadia, Allen, Ascension, Assumption, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Evangeline, Iberia, Iberville, Jefferson Davis, LaFayette, Livingston, Pointe Coupee, St. Helena, St. James, St. John the Baptist, St. Landry, St. Martin, St. Tammany, Tangipahoa, Vermillion, Washington, West Baton Rouge, and West Feliciana.

- 5) *Maine:* Hancock and Washington.
- 6) *Massachusetts:* Barnstable, Bristol, Dukes, Nantucket, and Plymouth.
- 7) *Mississippi:* George, Hancock, Harrison, Jackson, Pearl River, and Stone.
- 8) *North Carolina:* Beaufort, Brunswick, Camden, Chowan, Columbus, Craven, Currituck, Jones, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell, and Washington.
- 9) *South Carolina:* Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, Jasper, and Williamsburg.
- 10) *Texas:* Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Orange, Refugio, San Patricio, and Willacy.
- 11) *Virginia:* Cities of Chesapeake, Norfolk, Portsmouth, Princess Anne, and Virginia Beach.

405.3.2.3 Wind Zone III (110 mph). [3280.305(c)(2)(iii)] The following states, territories, and local governments (counties, unless specified otherwise) are deemed to be within Wind Zone III of the Basic Wind Zone Map:

- (1) The entire state of Hawaii.
- (2) Alaska: Coastal regions as determined by the 90 mph isotach on the ANSI/ASCE 7-88 map).
- (3) All of the U.S. Territories of American Samoa, Guam, Northern Mariana Islands, Puerto Rico, Trust Territory of the Pacific Islands, and the United States Virgin Islands.
- (4) *Florida:* Broward, Charlotte, Collier, Dade, Franklin, Gulf, Hendry, Lee, Martin, Manatee, Monroe, Palm Beach, Pinellas, and Sarasota.
- (5) *Louisiana:* Parishes of Jefferson, La Fourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. Mary, and Terrabonne.
- (6) *North Carolina:* Carteret, Dare, and Hyde.

405.3.2.4 Consideration of local requirements. [3280.305(c)(2)(iv)] 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.

405.3.3.3 Eaves and cornices. [3280.305(c)(3)(iii)] Eaves and cornices shall be designed for a net uplift pressure of 2.5 times the design uplift wind pressure cited in 405.3.1.1 for Wind Zone I, and for the design pressures cited in 405.3.1.2 for Wind Zones II and III.

405.3.4 Data plate requirements. [3280.305(c)(4)] The data plate posted in the manufactured home (see 105) 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 section, with any related information. The Load Zone Maps shall be not less than either 3 1/2 inches by 2 1/4 inches, or one-half the size illustrated in the Code of Federal Regulations.

405.4 Design load deflection. [3280.305(d)]

405.4.1 Structural framing. [3280.305(d)(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	$L/180$

405.4.2 Eave and cornice uplift. [3280.305(d)(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 405.3.1.2 for Wind Zones II and III. The allowable deflection shall be $(2 \times L_e)/180$, where L_e is the measured horizontal eave projection from the wall.

405.5 Fastening of structural systems. [3280.305(e)]

405.5.1 Continuity. [3280.305(e)(1)] 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 specified in this section.

405.5.2 Wind Zones II and III. [3280.305(e)(2)] For Wind Zones II and III, roof trusses shall be secured to exterior wall framing members (studs), and exterior wall framing members (studs) shall be secured to floor framing members, with 26-gage minimum steel strapping or brackets or by a combination of 26-gage minimum steel strapping or brackets and structural-rated wall sheathing that overlaps the roof and floor. Steel strapping or brackets shall be installed at a maximum spacing of 24 inches o.c. in Wind Zone II and at a maximum of 16 inches o.c. in Wind Zone III. The number and type of fasteners used to secure the steel straps or brackets or structural sheathing shall be capable of transferring all uplift forces between elements being joined.

405.6 Walls. [3280.305(f)] The walls shall be of sufficient strength to withstand the load requirements as defined in 405.3, without exceeding the deflections as specified in 405.4. 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.

405.6.1 Notching and drilling. [3280.305(f)(1)] Except where substantiated by engineering analysis or tests, studs shall not be notched or drilled in the middle one-third of their length.

405.6.2 Interior walls and partitions. [3280.305(f)(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 5 pounds per square foot. An allowable stress increase of 1.33 times the permitted published design values shall be permitted to be used in the design of wood-frame interior partitions. Finish of walls and partitions shall be securely fastened to wall framing.

405.7 Floors. [3280.305(g)]

405.7.1 Floor assemblies. [3280.305(g)(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 1-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 6 inches deep shall be stabilized against overturning from superimposed loads as follows: at ends by solid blocking not less than 2-inch thickness by full depth of joist, or by connecting to a continuous header not less than 2-inch thickness and not less than the depth of the joist with connecting devices; at 8-foot maximum intermediate spacing by solid blocking or by wood cross-bridging of not less than 1 inch by 3 inches, metal cross-bridging of equal strength, or by other approved methods.

405.7.2 Moisture resistance. [3280.305(g)(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. Materials manufactured with fully exterior-type resin bonding systems shall be deemed to comply with this requirement without additional waterproofing or sealing. Materials manufactured with interior-type resin bonding systems that are not fully waterproof shall be made moisture resistant by sealing or by an overlay of nonabsorbent material applied with water-resistant adhesive complying with one of the methods in 405.7.2.1, 405.7.2.2, 405.7.2.3, or 405.7.2.4.

405.7.2.1 [3280.305(g)(2)(i)] The floor shall be sealed with a water-resistant sealer.

405.7.2.2 [3280.305(g)(2)(ii)] An overlay of a nonabsorbent floor-covering material applied with water-resistant adhesive shall be installed.

405.7.2.3 [3280.305(g)(2)(iii)] A direct application of a water-resistant sealer to the exposed wood floor area when covered with a nonabsorbent overlay shall be provided.

405.7.2.4 [3280.305(g)(2)(iv)] A nonabsorbent floor covering shall be installed without a continuous application of a water-resistant adhesive or sealant, where the floor covering meets the following criteria:

- 1) The covering is a continuous membrane with any seams or patches seam bonded or welded to preserve the continuity of the floor covering; and
- 2) 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
- 3) The covering is fastened around the perimeter of the subfloor in accordance with the floor covering manufacturer's instructions; and
- 4) 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 section. 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.

405.7.3 Carpet. [3280.305(g)(3)] Carpet or carpet pads shall not be installed under concealed spaces subject to excessive moisture, such as plumbing fixture spaces and floor areas under installed laundry equipment. Carpet shall be permitted in laundry spaces meeting 405.7.2 where appliances are not provided, and instructions are provided to remove carpet when appliances are installed.

405.7.4 Joists. [3280.305(g)(4)] Except where substantiated by engineering analysis or tests, joists shall comply with 405.7.4.1 and 405.7.4.2.

405.7.4.1 Notches. [3280.305(g)(4)(i), 3280.305(g)(4)(iii)] Notches on the ends of joists shall not exceed one-fourth the joist depth. 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.

405.7.4.2 Holes. [3280.305(g)(4)(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.

405.7.5 Bottom board. [3280.305(g)(5)] 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 instructions shall be included in the manufactured home manufacturer's instructions.

405.8 Roofs. [3280.305(h)]

405.8.1 Design. [3280.305(h)(1)] Roofs shall be of sufficient strength to withstand the load requirements as defined in 405.2 and 405.3 without exceeding the deflections specified in 405.4. 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.

405.8.2 Rigidity. [3280.305(h)(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.

405.8.3 Cutting of framework. [3280.305(h)(3)] Cutting of roof framework members for passage of electrical, plumbing or mechanical systems shall not be allowed except where substantiated by engineering analysis.

405.8.4 Penetrations. [3280.305(h)(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 glues, 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.

405.8.5 Frame construction. [3280.305(i)] 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 Chapter 10.

405.8.5.1 Welded connections. [3280.305(i)(1)] All welds shall be made in accordance with the applicable provisions of the Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, AISC, June 1, 1989. The Specification for the Design of Cold-Formed Steel Structural Members, AISI-1986 with 1989 Addendum, and the Stainless Steel Cold-Formed Structural Design Manual, AISI-1974. Regardless of the provisions of any referenced standard contained in this chapter, deposits of weld slag or flux shall be required to be removed only from welded joints at the following locations:

- 1) Drawbar and coupling mechanisms;
- 2) Main member splices, and
- 3) Spring hanger to main member connections.

405.8.5.2 Protection of metal frames against corrosion. [3280.305(i)(2)] Metal frames shall be made corrosion resistant or protected against corrosion. Painting metal frames shall be permitted to protect against corrosion.

406 Windstorm protection. [3280.306]

406.1 Provisions for support and anchoring systems. [3280.306(a)] 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 405.3.1.1, 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 405.3.1.2. 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 shall be permitted to be used to resist these wind loading effects in all wind zones.

406.1.1 Design. [3280.306(a)(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.

406.1.2 Support and anchoring. [3280.306(a)(2)] The manufacturer of each manufactured home is required to make provisions 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 point for connection of diagonal ties, no specific connecting devices need be provided on the main frame structure.

406.2 Contents of instructions. [3280.306(b)]

406.2.1 General. [3280.306(b)(1)] The manufacturer shall provide printed instructions with each manufactured home specifying the location and required capacity of stabilizing devices on which the design is based. The manufacturer shall provide drawings and specifications certified by a registered professional engineer or architect indicating at least one acceptable system of anchoring, including the details of 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.

406.2.2 [3280.306(b)(2)] For anchoring systems, the instructions shall indicate:

- 1) The minimum anchor capacity required;
- 2) 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 or vertical tie loading (see 406.3.3) and angle of anchor installation, and type of soil in which the anchor is to be installed;
- 3) That ground anchors should be embedded below the frost line and be at least 12 inches above the water table; and
- 4) That ground anchors should be installed to their full depth, and stabilizer plates should be installed to provide added resistance to overturning or sliding forces.
- 5) 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.

406.3 Design criteria. [3280.306(c)]

406.3.1 Wind loads. [3280.306(c)(1)] The minimum number of ties provided per side of each home shall resist design wind loads required in 405.3.1.

406.3.2 Spacing. [3280.306(c)(2)] Ties shall be as evenly spaced as practicable along the length of the manufactured home, with not more than 2 feet open-end spacing on each end.

406.3.3 Vertical ties. [3280.306(c)(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 shall be permitted to be connected to a single anchor, provided that the anchor used is capable of carrying both loadings simultaneously.

406.4 Requirements for ties. [3280.306(d)] 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.

406.5 Protection requirements. [3280.306(e)] 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.

406.6 Load resistance of anchoring equipment. [3280.306(f)] 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.

406.7 Weatherization of anchoring equipment. [3280.306(g)] 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 406.7.1 and 406.7.2.

406.7.1 Edges. [3280.306(g)(1)] Slit or cut edges of zinc-coated steel strapping do not need to be zinc coated.

406.7.2 Standards. [3280.306(g)(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, shall be provided.

407 Resistance to elements and use.

407.1 Exterior coverings. [3280.307(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.

407.2 Joints. [3280.307(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.

407.3 Protection. [3280.307(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.

407.4 Rodent resistance. [3280.307(d)] Exterior surfaces shall be sealed to resist the entrance of rodents.

408 Formaldehyde emission controls for certain wood products.

408.1 Formaldehyde emission levels. [3280.308(a)] All plywood, particleboard, and medium density fiberboard materials bonded with a resin system or coated with a surface finish containing formaldehyde shall not exceed the formaldehyde emission levels specified in 408.1.1 through 408.1.3 when installed in manufactured homes.

408.1.1 Plywood. [3280.308(a)(1)] Plywood materials shall not emit formaldehyde in excess of 0.20 parts per million (ppm) as measured by the air chamber test method specified in 506.

408.1.2 Particleboard. [3280.308(a)(2)] Particleboard grades D-2, D-3, and PBU materials shall not emit formaldehyde in excess of 0.20 ppm as measured by the air chamber test specified in 506. All other grades of particleboard materials shall not emit formaldehyde in excess of 0.30 ppm as measured by the air chamber test specified in 506.

408.1.3 Medium density fiberboard. [3280.308(a)(3)] Medium density fiberboard materials shall not emit formaldehyde in excess of 0.30 ppm as measured by the air chamber test specified in 506.

408.2 Product certification and continuing qualification. [3280.308(b)] All plywood and particleboard and medium density fiberboard 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 408.1.

408.2.1 Separate certification. [3280.308(b)(1)] Separate certification shall be done for each plant where the particleboard or medium density fiberboard is produced or where the plywood, particleboard, or medium density fiberboard is surface finished.

408.2.2 Frequency. [3280.308(b)(2)] To certify plywood, particleboard, or medium density fiberboard, the testing laboratory shall witness or conduct the air chamber test specified in 506 on randomly selected panels initially and at least quarterly thereafter.

408.2.3 Quality control plan. [3280.308(b)(3)] The testing laboratory shall approve a written quality control plan for each plant where the particleboard or medium density fiberboard is produced or finished or where the plywood is finished. The quality control plan shall be designed to assure that all panels comply with 408.1. The plan shall establish ongoing procedures to identify increases in the formaldehyde emission characteristics of the finished product resulting from the following changes in production:

- 1) In the case of plywood:
 - a) The facility where the unfinished panels are produced is changed;
 - 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.
- 2) In the case of particleboard or medium density fiberboard:
 - 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.
- 3) In the case of plywood, particleboard, or medium density fiberboard:
 - 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.

408.2.4 Plant visits. [3280.308(b)(4)] The testing laboratory shall periodically visit the plant to monitor quality control procedures to assure that all certified panels meet the standard.

408.2.5 Certification maintenance. [3280.308(b)(5)] To maintain its certification, plywood, particleboard, or medium density fiberboard shall be tested by the air chamber test specified in 506 whenever one of the following events occurs:

- 1) In the case of particleboard or medium density fiberboard, the resin formulation is changed so that the formaldehyde-to-urea ratio is increased; or
- 2) In the case of particleboard, plywood or medium density fiberboard, the finishing or top coat is changed and the new finishing or top coat contains formaldehyde; or
- 3) In the case of particleboard, plywood, or medium density fiberboard, the testing laboratory determines that an air chamber test is necessary to assure that panels comply with 408.1.

408.2.6 Lapse of certification. [3280.308(b)(6)] In the event that an air chamber test measures levels of formaldehyde from plywood, particleboard, or medium density fiberboard in excess of those permitted under 408.1, 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 shall be permitted to be used or certified for use in manufactured homes.

EXCEPTIONS:

1) [3280.308(b)(6)(i)] However, provided that a new product certification can 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 506, then the plywood, particleboard, or medium density fiberboard produced on that day and subsequent days shall be permitted to be used and certified for use in manufactured homes.

2) [3280.308(b)(6)(ii)] Plywood, particleboard, or medium density fiberboard produced on the same day as the tested panels, and panels produced on subsequent days, if not certified pursuant to 408.2, shall be permitted where each panel is treated with a scavenger, sealant, or other means of reducing formaldehyde emissions that do not adversely affect the structural quality of the product. Panels shall be randomly selected from the treated panels to be tested by and pass the air chamber test specified in 506.

408.3 Panel identification. [3280.308(c)] Each plywood, particleboard, and medium density fiberboard panel to be installed in manufactured homes, which is bonded or coated with a resin other than an exclusively phenol-formaldehyde resin system, shall be stamped or labeled so as to identify the product manufacturer, date of production or lot number, and the testing laboratory certifying compliance with this section. Unit or bundle labels are permitted on panels intended to be cut into smaller segments for use in cabinetry, built-in furniture, and like products.

408.4 Treatment after certification. [3280.308(d)] If certified plywood, particleboard, or medium density fiberboard 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 408.3 shall be obliterated. The treated panels shall be permitted to be recertified and reidentified in accordance with 408.2 and 408.3.

Chapter 5. Testing

501 Structural load tests. [3280.401] Every structural assembly tested shall be capable of meeting the Proof Load Test or the Ultimate Load Test as required in 501.1 or 501.2.

501.1 Proof load tests. [3280.401(a)] Every structural assembly tested shall 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 shall be conducted with loads applied and deflections recorded in one-quarter 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) which is greater than the limits set in 405.4, rupture, fracture, or excessive yielding. 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 section shall be subject to a continuing qualification testing program acceptable to the Department.

501.2 Ultimate load tests. [3280.401(b)] Ultimate load tests shall be performed on a minimum of three assemblies or components to generally evaluate the structural design. Every structural assembly or component tested shall 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 referenced standard in 404.2. Tests shall be conducted with loads applied and deflections recorded in one-quarter 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 the limits set in 405.4, rupture, fracture, or excessive yielding. Assemblies to be tested shall be representative of average quality or 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 section shall be subject to a periodic qualification testing program acceptable to the Department.

502 Test procedure for roof trusses. [3280.402]

502.1 Roof load tests. [3280.402(a)] This section provides an acceptable test procedure, consistent with the provisions of 501, 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.

502.2 General. [3280.402(b)] Trusses shall be tested in pairs or singly in a suitable test facility. When tested singly, simulated lateral support of the test assembly shall be permitted, 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.

502.2.1 Alternative procedure. [3280.402(b)(1)] As an alternate test procedure, the top chord shall be permitted to be sheathed with 1/4-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 1/8 inch. The plywood strip shall be nailed with 4d nails or equivalent staples not closer than 8 inches on center ("o.c.") along the top chord. The bottom chords of the adjacent trusses shall be permitted to be unbraced, laterally braced together (not cross braced) with 1-inch by 2-inch stripping not closer than 24 inches o.c. nailed with only one 6d nail at each truss, or covered with the material, with connections or methods of attachment, as specified for the completed manufactured home.

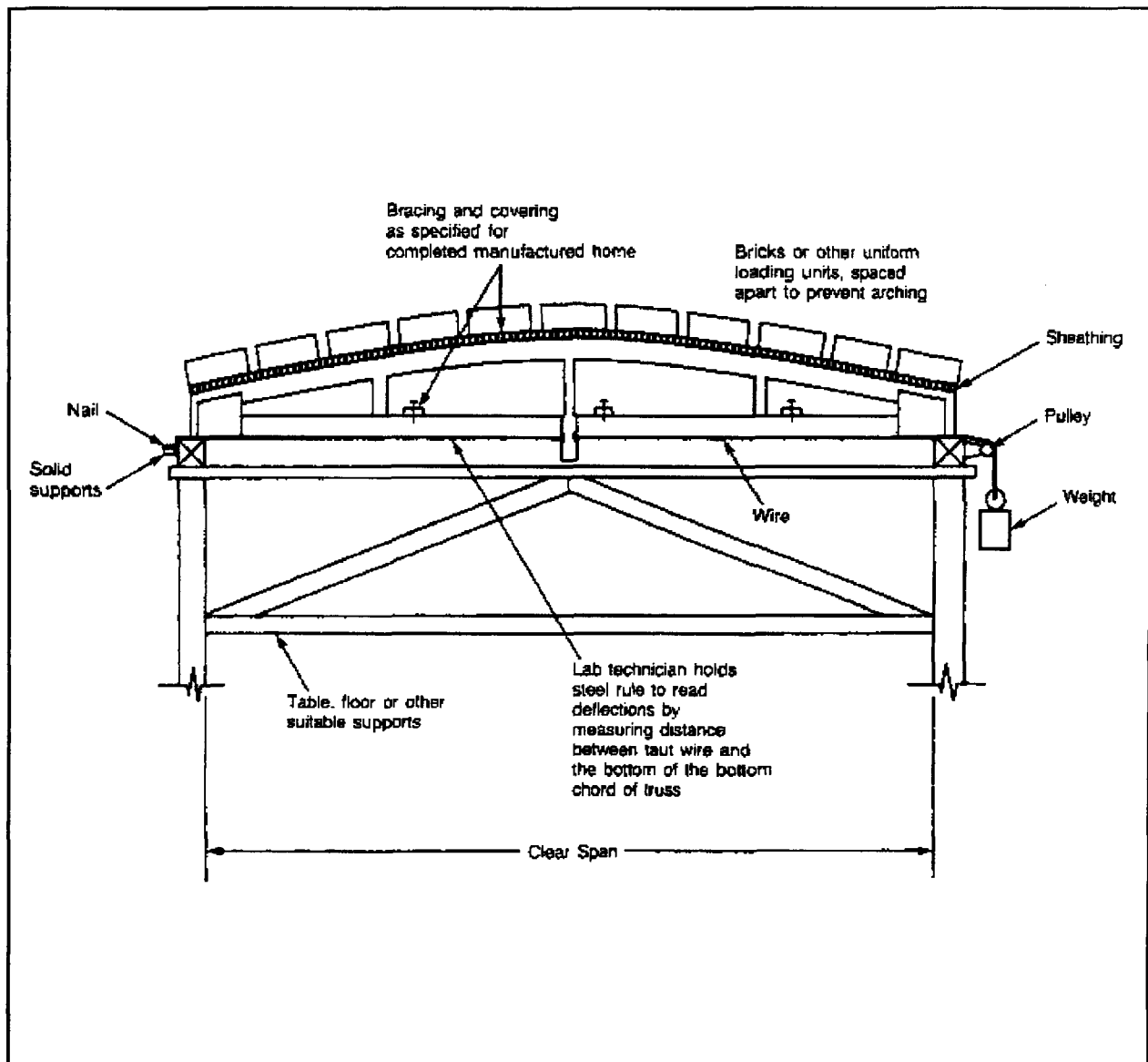
502.2.2 Deflection. [3280.402(b)(2)] Truss deflections will be measured relative to a taut wire running over the support and weighted at the end to insure constant tension or other approved methods. Deflections will be measured at the two quarter points and at midspan. Loading shall be applied to the 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 o.c. so as to simulate uniform loading.

502.3 Nondestructive test procedure. [3280.402(c)]

502.3.1 Dead load plus live load. [3280.402(c)(1)]

- 1) Noting Figure 502.3.1, measure and record initial elevation of the truss in test position at no load.

**FIGURE 502.3.1
TEST PROCEDURE FOR ROOF TRUSSES**



- 2) Apply load units to the top chord of the truss equal to the full dead load of roof and ceiling. Measure and record deflections.

- 3) Maintaining the dead load, add live load in approximate one-quarter 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 3 minus Step 2) shall not exceed $L/180$, where L is a clear span measured in the same units.
- 4) Continue to load the truss to dead load plus 1.75 times the design live load. Maintain this loading for 12 hours and inspect the truss for failure.
- 5) Remove the total superimposed live load. Trusses not recovering to at least the $L/180$ position within 12 hours shall be considered as failing.

502.3.2 Uplift loads. [3280.402(c)(2)] This test shall only be required for truss designs which can be critical under uplift load conditions.

- 1) 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.
- 2) Apply the uplift load as stated in 405.3 to the bottom chord of the truss. Measure and record the deflections 5 minutes after the load has been applied.
- 3) 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.
- 4) Remove applied loads and within 3 hours the truss must recover to at least the $L/180$ position, where L is a clear span measured in the same units.

502.4 Destructive test procedure. [3280.402(d)(1)] Destructive tests shall be performed as follows on three trusses to generally evaluate the truss design.

- 1) Noting Figure 502.3.1, 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 1/4 design live load increments at 10-minute intervals until 1.25 times design live load plus dead load has been reached.
- 2) 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.
- 3) Assembly failure shall be considered as design live load deflection greater than the limits set in 405.4, rupture, fracture, or excessive yielding.
- 4) 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).

502.5 Trusses qualifying under the nondestructive test procedure. [3280.402(e)] 502.3.1 and 502.3.2 (when required) shall be subject to a continuing qualification testing program acceptable to the Department. Trusses qualifying under the destructive test procedures, 502.3.2 (when required) and 502.4, shall be subject to periodic tests only.

503 Standard for windows and sliding glass doors used in manufactured homes. [3280.403]

503.1 Scope. [3280.403(a)] This section sets the requirements for prime windows and sliding glass doors.

EXCEPTION: Windows used in entry doors, which shall be considered components of the door.

503.2 Standard. [3280.403(b)] All primary windows and sliding glass doors shall comply with AAMA Standard 1701.2-1985, Primary Window and Sliding Glass Door Voluntary Standard for Utilization in Manufactured Housing, except that by January 17, 1995, the exterior and interior pressure tests shall be conducted at the design wind loads required for components and cladding specified in 405.3.1.

503.3 Installation. [3280.403(c)] All primary windows and sliding glass doors shall be installed in a manner which allows proper operation and provides protection against the elements (see 407).

503.4 Glass. [3280.403(d)]

503.4.1 Safety glazing. [3280.403(d)(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."

503.4.2 Sealed insulating glass. [3280.403(d)(2)] Sealed insulating glass, where used, shall meet all performance requirements for Class C in accordance with ASTM E-774-92, Standard Specification for Sealed Insulating Glass Units. The sealing system shall be qualified in accordance with ASTM E-773-88 Standard Test Methods for Seal Durability of Sealed Insulating Glass Units. Each glass unit shall be permanently identified with the name of the insulating glass manufacturer.

503.5 Certification. [3280.403(e)] All primary windows and sliding glass doors to be installed in manufactured homes shall be certified as complying with AAMA Standard 1701.2-1985. As of January 17, 1995, this certification must be based on tests conducted at the design wind loads specified in 405.3.1.

503.5.1 Label. [3280.403(e)(1)] All such windows and doors shall show evidence of certification by affixing a quality certification label to the product in accordance with ANSI Z34.1-1987, "For Certification-Third-Party Certification Program."

503.5.2 Preproduction specimen test. [3280.403(e)(2)] In determining certifiability of the products, an independent quality assurance agency shall conduct preproduction specimen tests in accordance with AAMA 1702.2-1985. Such agency shall inspect the product manufacturer's facility at least twice per year.

503.6 Protection of primary window and sliding glass door openings in high wind areas. [3280.403(f)] 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 405 without taking the home out of conformance with the standards in this chapter. 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.

504 Standard for egress windows and devices for use in manufactured homes.

504.1 Scope and purpose. [3280.404(a)] 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.

504.2 Performance. [3280.404(b)] Egress windows including auxiliary frame and seals, if any, shall meet all requirements of AAMA Standard 1701.2-1985, Primary Window and Sliding Glass Door Voluntary Standard for Utilization in Manufactured Housing and AAMA Standard 1704-1985, Voluntary Standard Egress Window Systems for Utilization in Manufactured Housing, except that by January 17, 1995, the exterior and interior pressure tests for components and cladding shall be conducted at the design wind loads required by 405.3.1.

504.3 Installation. [3280.404(c)]

504.3.1 Operation and protection. [3280.404(c)(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 407).

504.3.2 Operational check. [3280.404(c)(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.

504.4 Operating instructions. [3280.404(d)] Operating instructions shall be affixed to each egress window and device and carry the legend "Do Not Remove."

504.5 Certification of egress windows and devices. [3280.404(e)] 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 on the design wind loads specified in 405.3.1.

504.6 Protection of egress window openings in high wind areas. [3280.404(f)] 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 405 without taking the home out of conformance with the standards in this chapter. 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.

505 Standard for swinging exterior passage doors for use in manufactured homes.

505.1 Scope and applicability. [3280.405] 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.

505.2 Performance requirements. [3280.405(b)] The design and construction of exterior door units shall meet all requirements of AAMA 1702.2-1985, Swinging Exterior Passage Doors Voluntary Standard for Utilization in Manufactured Housing.

505.3 Materials and methods. [3280.405(c)] Any material or method of construction shall conform to the performance requirements as outlined in 505.2. Wood materials or wood-based materials shall also conform to 505.3.1 and 505.3.2.

505.3.1 Wood. [3280.405(c)(1)] Doors shall conform to the Type 1 requirements of ANSI/NWWDA I.S.1-87, Wood Flush Doors.

505.3.2 Plywood. [3280.405(c)(2)] Plywood shall be exterior type and preservative treated in accordance with NWWDA I.S.4-81, Water-Repellent Preservative Nonpressure Treatment for Millwork.

505.4 Exterior doors. [3280.405(d)] All swinging exterior doors shall be installed in a manner which allows proper operation and provides protection against the elements (see 407).

505.5 Certification. [3280.405(e)] All swinging exterior doors to be installed in manufactured homes shall be certified as complying with AAMA Standard 1702.2-1985.

505.5.1 Label. [3280.405(e)(1)] All such doors shall show evidence of certification by affixing a quality certification label to the product in accordance with ANSI Z34.1-1982, "For Certification-Third-Party Certification Program."

505.5.2 Preproduction specimen test. [3280.405(e)(2)] In determining certifiability of the products, an independent quality assurance agency shall conduct a preproduction specimen test in accordance with AAMA 1701.2-1985. Further, such agency shall inspect the product manufacturer's facility at least twice per year.

505.6 Protection of exterior doors in high wind areas. [3280.405(f)] 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 provide to the homeowner instructions for at least one method of protecting exterior door openings. This method must be capable of resisting the design wind pressures specified in 405 without taking the home out of conformance with the standards in this chapter. 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.

506 Air chamber test method for certification and qualification of formaldehyde emission levels.

506.1 Preconditioning. [3280.406(a)] 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, particleboard or medium density fiberboard is produced or surface finished, whichever is later, using randomly selected panels.

506.1.1 Timing. [3280.406(a)(1)] If preconditioning is to be initiated more than two days after the plywood or particleboard, or medium density fiberboard is produced or surface finished, whichever is later, the panels must be dead-stacked or air-tight wrapped until preconditioning is initiated.

506.1.2 Panel selection. [3280.406(a)(2)] Panels selected for testing in the air chamber shall not be taken from the top or bottom of the stack.

506.2 Testing. [3280.406(b)] Testing shall be conducted in accordance with the Standard Test Method for Determining Formaldehyde Levels from Wood Products Under Defined Test Conditions Using a Large Chamber, ASTM E-1333-90, with the following exceptions:

- 1) The chamber shall be operated indoors.
- 2) Plywood, particleboard and medium density fiberboard panels shall be individually tested in accordance with the following loading ratios:
 - a) Plywood — 0.29 ft²/ft³,
 - b) Particleboard — 0.13 ft²/ft³, and
 - c) Medium density fiberboard (MDF) - 0.08 ft²/ft³
- 3) Temperature to be maintained inside the chamber shall be 77 plus or minus 2°F.
- 4) The test concentration (*C*) shall be standardized to a level (*C_o*) at a temperature (*t_o*) of 77°F. and 50 percent relative humidity (*H_o*) by the following formula:

$$C = C_o \times [1 + Ax(H - H_o)] \times e^{-R(1/t - 1/t_o)}$$

where:

C	=	Test formaldehyde concentration.
C_o	=	Standardized formaldehyde concentration.
e	=	Natural log base.
R	=	Coefficient of temperature (9799).
t	=	Actual test condition temperature (°K).
t_o	=	Standardized temperature (°K).
A	=	Coefficient of humidity (0.0175).
H	=	Actual relative humidity (percent).
H_o	=	Standardized relative humidity (percent).

The standardized level (C_o) is the concentration used to determine compliance with 408.1.

- 5) The air chamber shall be inspected and recalibrated at least annually to insure its proper operation under test conditions.

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Chapter 6. Thermal Protection

601 Scope. [3280.501] This chapter sets forth the requirements for condensation control, air infiltration, thermal insulation and certification for heating and comfort cooling.

602 Definitions. [3280.502(a)] The following definitions are applicable to this chapter only.

Pressure envelope. The primary air barrier surrounding the living space which serves to limit air leakage. In construction using ventilated cavities, the pressure envelope is the interior skin.

Thermal envelope area. 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. The floor and ceiling areas are considered as horizontal surfaces using exterior width and length.

603 Materials. [3280.503] Materials used for insulation shall be of proven effectiveness and adequate durability to assure that required design conditions concerning thermal transmission are attained.

604 Condensation control and installation of vapor retarders. [3280.504]

604.1 Ceiling vapor retarders. [3280.504(a)] Ceilings shall have a vapor retarder with a permanence of not greater than 1 perm (as measured by ASTM E-96-93 Standard Test Methods for Water Vapor Transmission of Materials) installed on the living space side of the roof cavity.

EXCEPTION: For manufactured homes designed for U_o -value Zone 1, the vapor retarder shall not be required.

604.2 Exterior walls. [3280.504(b)] Exterior wall construction shall be protected from condensation using one of the methods described in 604.2.1.1, 604.2.1.2, or 604.2.1.3.

604.2.1 Vapor barrier. [3280.504(b)(1)] Exterior walls shall have a vapor barrier not greater than 1 perm (dry cup method) installed on the living space side of the wall.

604.2.2 Covering or sheathing. [3280.504(b)(2)] Unventilated wall cavities shall have an external covering or sheathing which forms the pressure envelope. The covering or sheathing shall have a combined permeance of not less than 5.0 perms. In the absence of test data, combined permeance shall be permitted to be computed using the formula: $P_{Total} = (1/[(1/P_1) + (1/P_2)])$ where P_1 and P_2 are the permeance values of the exterior covering and sheathing in perms. Formed exterior siding applied in sections with joints not caulked or sealed shall not be considered to restrict water vapor transmission.

604.2.3 Ventilation. [3280.504(b)(3)] Wall cavities shall be constructed so that ventilation is provided to dissipate any condensation occurring in these cavities.

604.3 Attic or roof ventilation. [3280.504(c)]

604.3.1 Cavities. [3280.504(c)(1)] Attic and roof cavities shall be vented in accordance with one of the methods described in 604.3.1.1 or 604.3.1.2.

604.3.1.1 Natural ventilation. [3280.504(c)(1)(i)] 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.

604.3.1.2 Mechanical ventilation. [3280.504(c)(1)(ii)] A mechanical attic or roof ventilation system shall be permitted instead of providing the free ventilation area when the mechanical