

§ 3280.304

24 CFR Ch. XX (4-1-06 Edition)

accepted engineering practices to insure durable, livable, and safe housing and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.

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

(d) [Reserved]

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

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

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

(g) *Alternative test procedures.* In the absence of recognized testing procedures either in 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 §3280.3.)

(1) Testing procedures so developed shall be submitted to the Department for approval.

(2) Upon notification of approval, the alternative test procedure is considered acceptable.

(3) Such tests shall be witnessed by an independent licensed professional engineer or architect or by a recog-

nized testing organization. Copies of the test results shall be kept on file by the manufactured home manufacturer.

[40 FR 58752, Dec. 18, 1975. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 58 FR 55005, Oct. 25, 1993; 59 FR 2469, Jan. 14, 1994]

EFFECTIVE DATE NOTE: At 70 FR 72043, Nov. 30, 2005, §3280.303 was amended by revising paragraph (g), effective May 30, 2006. For the convenience of the user, the revised text follows:

§ 3280.303 General requirements.

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

§ 3280.304 Materials.

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

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

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 reference 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 reference 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 reference 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.

#### 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.

Interim Voluntary Standard for Hardwood and Decorative Plywood—HPVA Interim Standard HP-1-1993.

Structural Design Guide for Hardwood Plywood Wall Panels—HPMA Design Guide HP-SG-86.

For wood products—Structural Glued Laminated Timber—ANSI/AITC A190.1-1992.

Voluntary Product Standard, Construction and Industrial Plywood—PS-1-83.

APA Design/Construction Guide, Residential and Commercial—APA E30M-1993.

Design and Fabrication of All-Plywood Beams, Suppl. 5—APA-H 815D-1989.

Plywood Design Specification—APA-Y 510Q-1993.

Design and Fabrication of Glued Plywood-Lumber Beams, Suppl. 2—APA-S 812P-1992.

Design and Fabrication of Plywood Curved Panels, Suppl. 1—APA-S 811M-1990.

Design and Fabrication of Plywood Sandwich Panels, Suppl. 4—APA-U 814G-1990.

Performance Standards and Policies for Structural Use Panels—APA-PRP-E-108P, E445N-1989.

Design and Fabrication of Plywood Stressed-Skin Panels, Suppl. 3—APA-U 813K-1990.

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 A208.1-1989.

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.

Water Repellent Preservative Non Pressure 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-Base Materials—ASTM D4442.

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

#### Other

Standard Specification for Gypsum Wallboard—ASTM C36-93.

#### Fasteners

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

#### Unclassified

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

§ 3280.304

24 CFR Ch. XX (4-1-06 Edition)

Performance Standard for Wood-Based Structural Use Panels—PS-2-92, APA (also known as NIST Standard PS-2-92).

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

(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.

(3) Engineering analysis and testing methods contained in these references shall be utilized to judge conformance with accepted engineering practices required in § 3280.303(c).

(4) Materials and methods of installation conforming to these standards shall be considered acceptable when installed in conformance with the requirements of this part.

(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.

(c) Wood products shall be identified as complying with the appropriate standards.

[40 FR 58752, Dec. 18, 1975, as amended at 42 FR 961, Jan. 4, 1977. Redesignated at 44 FR 20679, Apr. 6, 1979, as amended at 58 FR 55006, Oct. 25, 1993; 59 FR 15113, Mar. 31, 1994]

EFFECTIVE DATE NOTE: At 70 FR 72043, Nov. 30, 2005, §3280.304 was amended by revising paragraph (b)(1), effective May 30, 2006. For the convenience of the user, the revised text follows:

§ 3280.304 Materials.

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

ALUMINUM

Aluminum Design Manual, Specifications and Guidelines for Aluminum Structures, Part 1-A, Sixth Edition, October 1994, and Part 1-B, First Edition, October 1994.

STEEL

Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design—AISC-S335, 1989. The following parts

of this reference standard are not applicable: 1.3.3, 1.3.4, 1.3.5, 1.3.6, 1.4.6, 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-1996.

Specification for the Design of Cold-Formed Stainless Steel Structural Members—SEI/ASCE 8-02, 2002.

Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders, SJI, Fortieth Edition, 1994.

Structural Applications of Steel Cables for Buildings—ASCE19, 1996.

Standard Specification for Strapping, Flat Steel and Seals—ASTM D3953, 1991.

WOOD AND WOOD PRODUCTS

Basic Hardboard—ANSI/AHA A135.4-1995.

Prefinished Hardboard Paneling—ANSI/AHA A135.5-1995.

Hardboard Siding—ANSI/AHA A135.6-1998.

American National Standard for Hardwood and Decorative Plywood—ANSI/HPVA HP-1-1994 (Approved 1995).

Structural Design Guide for Hardwood Plywood Wall Panels—HPVA Design Guide HP-SG-96, 1996.

For wood products—Structural Glued Laminated Timber—ANSI/AITC A190.1-1992.

Construction and Industrial Plywood (With Typical APA Trademarks)—PS 1-95.

APA Design/Construction Guide, Residential and Commercial—APA E30-P-1996.

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

Design and Fabrication of All-Plywood Beams—APA H-815E (PDS Supplement #5), 1995.

Panel Design Specification—APA D410A, 2004.

Design and Fabrication of Glued Plywood-Lumber Beams—APA-S 812Q, Suppl. 2-1992.

Design and Fabrication of Plywood Curved Panels—APA-S 811M, Suppl. 1, 1990.

Design and Fabrication of Plywood Sandwich Panels—APA-U 814H, Suppl. 4, 1990.

Voluntary Product Standard, Performance Standard for Wood-based Structural Use Panels—PS 2-92, 1992 (also known as NIST Standard PS 2-96).

Design and Fabrication of Plywood Stressed-Skin Panels—APA-U 813L, Suppl. 3, 1990.

National Design Specifications for Wood Construction, 2001 Edition, with Supplement, Design Values for Wood Construction, NDS-2001, ANSI/AFPA.

Wood Structural Design Data, 1989, Revised 1992, AFPA.

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

Design Values for Joists and Rafters 1992, AFPA.

Particleboard—ANSI A208.1-1999.  
 Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors—ANSI/AAMA/NWDA 101/I.S.2-97.

Standard Test Methods for Puncture and Stiffness of Paperboard, and Corrugated and Solid Fiberboard—ASTM D781, 1973.

Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials—ASTM D 4442-92 (Re-approved 1997), 1997.

Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters—ASTM D4444, 1992.

## OTHER

Standard Specification for Gypsum Wallboard—ASTM C 36/C 36M-99, 1999.

## FASTENERS

National Evaluation Report, Power Driven Staples, Nails, and Allied Fasteners for Use in All Types of Building Construction—NER-272, 1997.

## UNCLASSIFIED

Minimum Design Loads for Buildings and Other Structures—ASCE 7-1988.

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

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### § 3280.305 Structural design requirements.

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

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

(2) *Design live loads.* The design live loads and wind and snow loads shall be

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

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

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

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

(ii) *Wind loads for high wind areas (Zone II and Zone III).* When designed for high wind areas (Zone II and Zone III), the manufactured home, each of its wind resisting parts (including, but not limited to, shear walls, diaphragms, ridge beams, and their fastening and anchoring systems), 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 resist:

(A) The design wind loads for Exposure C specified in ANSI/ASCE 7-88, "Minimum Design Loads for Buildings and Other Structures," for a fifty-year recurrence interval, and a design wind speed of 100 mph, as specified for Wind