NFPA®

220

Standard on Types of Building Construction

2021

NFPA®

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NFPA® 220

Standard on

Types of Building Construction

2021 Edition

This edition of NFPA 220, *Standard on Types of Building Construction*, was prepared by the Technical Committee on Building Construction. It was issued by the Standards Council on June 1, 2020, with an effective date of June 21, 2020, and supersedes all previous editions.

This edition of NFPA 220 was approved as an American National Standard on June 21, 2020.

Origin and Development of NFPA 220

In 1952, the Committee on Building Construction secured tentative adoption of NFPA 220, *Standard on Types of Building Construction*, at the NFPA Annual Meeting. At the 1954 NFPA Annual Meeting, revisions of the 1952 tentative text were adopted by the Association, and in 1955 minor revisions also were acted on favorably. A new definition of *noncombustibility* and editorial changes in the description of the fire resistance rating of structural members (under the definition of *fire-resistive construction*) were adopted at the 1956 NFPA Annual Meeting on the recommendation of the Committee on Building Construction.

In 1958, with the development of the use of plastics in building construction, recommendations on the types of standard fire tests to be used in evaluating the fire safety of these materials were adopted and inserted in the appendix.

In 1961, an appendix was adopted to furnish a guide to NFPA committees, regulatory officials, and others that addressed the classification of air-supported structures.

In 1975, a more fundamental definition of *noncombustible* was added, including the introduction of a definition of the term *limited-combustible* based on potential heat value limitations and more generalized definitions for types of building construction.

In 1979, the standard was extensively rewritten to introduce the nomenclature related to construction Type I through Type V, which included parenthetically placed hourly fire resistance designations of the structural components.

The 1985 edition included the addition of a new Chapter 4, which provided referenced publications whose use is mandated within this standard. The 1992 and 1995 editions provided changes in technical terminology as well as changes to increase the user-friendliness of the standard.

The 1999 edition implemented a number of relatively minor changes, including the addition of several new definitions, the addition of a new requirement pertaining to exterior non-load-bearing walls, and a new provision concerning the use of heavy timber exterior walls.

In the 2006 edition, NFPA 220 became an extract document of *NFPA 5000*®, Section 7.2. At the request of the Standards Council, the new edition provided users with a stand-alone set of requirements for construction types and fire resistance ratings of structural elements.

The 2009 edition provided updates to the extracted text that was sourced back to *NFPA 5000* and NFPA 90A. These revisions included updates to the test protocols used to establish flame spread/smoke developed index values, modified criteria for materials used in air handling plenum spaces, and provided recognition of the new criteria used to determine building height and grade geometries.

The 2012 edition was updated to reflect changes in *NFPA 5000* and NFPA 90A. Revisions included updates to the requirements for plenums and noncombustible materials.

The 2015 edition was revised to include new requirements for limited and noncombustible materials. Referenced publications were updated.

The 2018 edition included updates to extracted material from *NFPA 5000*. Referenced publications were updated.

The 2021 edition includes new sections from *NFPA 5000* that address special requirements for two different types of Type IV construction and updates referenced publications.

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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This committee shall have primary responsibility for documents on the selection and design of types of building construction, exterior walls, building height and area, firewalls, and fire barrier walls, as they relate to the protection of life and property from fire. For the processing of *NFPA 5000*, Chapter 7, and Sections 8.3 and 8.4, this committee reports directly to the *NFPA 5000* Correlating Committee; whereas, for the processing of NFPA 220 and NFPA 221, this committee does not report to the *NFPA 5000* Correlating Committee.

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Standard on

Types of Building Construction

2021 Edition

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced and extracted publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1* Scope. This standard defines types of building construction based on the combustibility and the fire resistance rating of a building's structural elements. Fire walls, nonbearing exterior walls, nonbearing interior partitions, fire barrier walls, shaft enclosures, and openings in walls, partitions, floors, and roofs are not related to the types of building construction and are regulated by other standards and codes, where appropriate.

1.2 Purpose. This standard provides definitions for standard types of building construction.

1.3 Application. (Reserved)

1.4 Retroactivity.

1.4.1 The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.2 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.4.3 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.4.4 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

1.5 Equivalency.

1.5.1 Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.5.2 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.6 Units.

1.6.1 SI Units. Metric units in this standard are in accordance with the modernized metric system known as the International System of Units (SI).

1.6.2 Primary and Equivalent Values. If a value for a measurement as given in this standard is followed by an equivalent value in other units, the first stated value shall be regarded as the requirement. A given equivalent value might be approximate.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

Δ 2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2019 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* 2021 edition.

NFPA *101®, Life Safety Code®,* 2021 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* 2018 edition.

NFPA 285, *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components,* 2019 edition.

NFPA 5000®, Building Construction and Safety Code®, 2021 edition.

Δ 2.3 Other Publications.

2.3.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2019a.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2018c e1.

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C,*2019.

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C,*2018.

ASTM E2965, *Standard Test for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Combustion Calorimeter,* 2017.

***N* 2.3.2 AWC Publications.** American Wood Council, 222 Catoctin Circle SE, Suite 201, Leesburg, VA 20175.

AWC Technical Report No. 10, *Calculating the Fire Resistance of Wood Members and Assemblies*, 2018.

Δ 2.3.3 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 263, *Fire Tests of Building Construction and Materials,* 2011.

UL 723, *Test for Surface Burning Characteristics of Building Materials,* 2018.

2.3.4 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 5000®, Building Construction and Safety Code®, 2021 edition.

Chapter 3 Definitions

3.1* General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.4 Shall. Indicates a mandatory requirement.

3.2.5 Should. Indicates a recommendation or that which is advised but not required.

3.2.6 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

Δ 3.3.1 Fire Resistance Rating. The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as determined by the tests, or methods based on tests, prescribed by this standard. [**5000,** 2021]

Δ 3.3.2* Flame Spread Index. A number obtained according to ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials.*

3.3.3 Limited-Combustible Material. See 4.1.6.

3.3.4 Noncombustible Material. See 4.1.5.

Chapter 4 Types of Construction

Δ 4.1 General.

4.1.1* Buildings and structures shall be classified according to their type of construction, which shall be based upon one of five basic types of construction designated as Type I, Type II, Type III, Type IV, and Type V, with fire resistance ratings not less than those specified in Table 4.1.1 and Sections 4.3 through 4.6, and with fire resistance ratings meeting the requirements of Chapter 5. [**5000:**7.2.1.1]

4.1.2 Where two or more types of construction are used in the same building, the entire building shall be classified as the least type of construction in the building and shall be subject to the requirements for that type, except as permitted by other provisions of *NFPA 5000*. [**5000:**7.2.1.2]

4.1.3 Requirements for specific materials, types of construction, and fire protection shall be minimum requirements, and any material, type of construction, or fire protection affording safety or a fire resistance rating equal to or greater than that provided in *NFPA 5000*, shall be permitted. [**5000:**7.2.1.3]

Table 4.1.1 Fire Resistance Ratings for Type I through Type V Construction (hr)

	Type I		Type II			Type III		Type IV	Type V	
Construction Element	**442**	**332**	**222**	**111**	**000**	**211**	**200**	**2HH**	**111**	**000**
Exterior Bearing Walls[a]										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0[b]	2	2	2	1	0[b]
Supporting one floor only	4	3	2	1	0[b]	2	2	2	1	0[b]
Supporting a roof only	4	3	1	1	0[b]	2	2	2	1	0[b]
Interior Bearing Walls										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0	1	0	2	1	0
Supporting one floor only	3	2	2	1	0	1	0	1	1	0
Supporting roofs only	3	2	1	1	0	1	0	1	1	0
Columns										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0	1	0	H	1	0
Supporting one floor only	3	2	2	1	0	1	0	H	1	0
Supporting roofs only	3	2	1	1	0	1	0	H	1	0
Beams, Girders, Trusses, and Arches										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0	1	0	H	1	0
Supporting one floor only	2	2	2	1	0	1	0	H	1	0
Supporting roofs only	2	2	1	1	0	1	0	H	1	0
Floor-Ceiling Assemblies	2	2	2	1	0	1	0	H	1	0
Roof-Ceiling Assemblies	2	1½	1	1	0	1	0	H	1	0
Interior Nonbearing Walls	0	0	0	0	0	0	0	0	0	0
Exterior Nonbearing Walls[c]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]	0[b]

H: heavy timber members *(see text for requirements).*
[a]See *NFPA 5000*, 7.3.2.1.
[b]See *NFPA 5000*, Section 7.3.
[c]See 4.3.2.12, 4.4.2.3, and 4.5.6.8.
[**5000:**Table 7.2.1.1]

4.1.4 Materials shall be in accordance with all of the following, except as modified by any special requirements in Section 4.3:

(1) *NFPA 5000*, Chapter 41, Concrete
(2) *NFPA 5000*, Chapter 42, Aluminum
(3) *NFPA 5000*, Chapter 43, Masonry
(4) *NFPA 5000*, Chapter 44, Steel
(5) *NFPA 5000*, Chapter 45, Wood
(6) *NFPA 5000*, Chapter 46, Glass and Glazing
(7) *NFPA 5000*, Chapter 47, Gypsum Board, Lath, and Plaster
(8) *NFPA 5000*, Chapter 48, Plastics

[**5000:**7.2.1.4]

4.1.5 Noncombustible Material.

4.1.5.1* A material that complies with any of the following shall be considered a noncombustible material:

(1)* The material that, in the form in which it is used, and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.
(2) The material is reported as passing ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C.*
(3) The material is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C.*

[**5000:**7.1.4.1.1]

4.1.5.2 Where the term *limited-combustible* is used in this *Code*, it shall also include the term *noncombustible*. [**5000:**7.1.4.1.2]

Δ **4.1.6* Limited-Combustible Material.** A material shall be considered a limited-combustible material where one of the following is met:

(1) The conditions of 4.1.6.1 and 4.1.6.2, and the conditions of either 4.1.6.3 or 4.1.6.4,shall be met.
(2) The conditions of 4.1.6.5 shall be met.

[**5000:**7.1.4.2]

4.1.6.1 The material does not comply with the requirements for a noncombustible material in accordance with 4.1.5. [**5000:**7.1.4.2.1]

Δ **4.1.6.2** The material, in the form in which it is used, exhibits a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) when tested in accordance with NFPA 259. [**5000:**7.1.4.2.2]

Δ **4.1.6.3** The material shall have a structural base of noncombustible material with a surfacing not exceeding a thickness of 1/8 in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Test for Surface Burning Characteristics of Building Materials*. [**5000:**7.1.4.2.3]

Δ **4.1.6.4** The material shall be composed of materials that in the form and thickness used neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723 and are of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [**5000:**7.1.4.2.4]

Δ **4.1.6.5** Materials shall be considered limited-combustible materials where tested in accordance with ASTM E2965, *Standard Test for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Combustion Calorimeter*, at an incident heat flux of 75 kW/m^2 for a 20-minute exposure, and both the following conditions are met:

(1) The peak heat release rate does not exceed 150 kW/m^2 for longer than 10 seconds.
(2) The total heat released does not exceed 8 MJ/m^2.

[**5000:**7.1.4.2.5]

4.1.6.6 Where the term *limited-combustible* is used in this *Code*, it shall also include the term *noncombustible*. [**5000:**7.1.4.2.6]

4.2 Reserved.

Δ **4.3 Type I (442 or 332) and Type II (222, 111, or 000) Construction.**

4.3.1 Type I and Type II Construction. Type I (442 or 332) and Type II (222, 111, or 000) construction shall be those types in which the fire walls, structural elements, walls, arches, floors, and roofs are of approved noncombustible or limited-combustible materials. [**5000:**7.2.3.1]

4.3.2 Special Requirements — Type I and Type II Construction. The special requirements in 4.3.2.1 through 4.3.2.16 shall apply to Type I and Type II construction. [**5000:**7.2.3.2]

4.3.2.1 Wood Sleepers. Where wood sleepers are used for installing wood flooring on noncombustible floors, the furring space shall be filled with noncombustible or limited-combustible material or shall be fireblocked so that there will be no open space exceeding 100 ft^2 (9 m^2) in area under the flooring. [**5000:**7.2.3.2.1]

4.3.2.2 Sleeper Space. The furring spaces created by sleepers in 4.3.2.1 shall be filled solidly under all permanent partitions to prevent spread of fire under the flooring. [**5000:**7.2.3.2.2]

4.3.2.3 Mezzanine Floors in Type I and Type II (222 or 111) Construction. Mezzanine floors in Type I and Type II (222 or 111) construction shall have a fire resistance rating of not less than 1 hour. [**5000:**7.2.3.2.3]

4.3.2.4 Mezzanine Floors in Type II (000) Construction. Mezzanine floors in Type II (000) construction shall not be required to have a fire resistance rating. [**5000:**7.2.3.2.4]

4.3.2.5 Platforms. Permanent platforms shall be constructed of noncombustible or limited-combustible materials. [**5000:**7.2.3.2.5]

4.3.2.6 Space Beneath Platforms. When the space beneath any permanent platform is used for storage or any purpose other than equipment, wiring, or plumbing, the floor construction shall have a fire resistance rating not less than 1 hour. [**5000:**7.2.3.2.6]

4.3.2.7 Fire-Retardant-Treated Wood Platforms. Fire-retardant-treated wood shall be permitted for permanent platforms that do not exceed 3000 ft^2 (278 m^2), that are not more than 30 in. (760 mm) above the floor, and that do not occupy more than 50 percent of the floor area of the room or space in which they are located. [**5000:**7.2.3.2.7]

4.3.2.8 Roofs 20 ft (6100 mm) or More Above Any Floor. In occupancies other than mercantile, industrial, or storage occupancies with ordinary or high hazard contents, or other occupancies with high hazard contents exceeding the maximum allowable quantities (MAQ) per control area as set forth in 34.1.3 of *NFPA 5000*, the fire-resistive protection of the roof/ceiling assembly required by Table 4.1.1 shall not be required where every part of the roof/ceiling assembly is 20 ft (6100 mm) or more above any floor immediately below. [**5000:**7.2.3.2.8]

Δ **4.3.2.9 Fire-Retardant-Treated Wood Roof.**

4.3.2.9.1 Fire-retardant-treated wood members shall be permitted to be used for unprotected members specified in 4.3.2.8. [**5000:**7.2.3.2.9.1]

Δ **4.3.2.9.2** Fire-retardant-treated wood shall be permitted for roof construction, including girders and trusses, under the following conditions:

(1) In Type II buildings
(2) In Type I buildings where the number of stories is two or fewer
(3) In Type I buildings where the number of stories is three or more when the vertical distance from the floor to the roof is 20 ft (6100 mm) or more

[**5000:**7.2.3.2.9.2]

4.3.2.10 Heavy Timber Structural Elements. In all occupancies, heavy timber structural elements shall be permitted to be used for the roof construction where a 1-hour fire resistance rating or less is required. [**5000:**7.2.3.2.10]

Δ 4.3.2.11 Interior Nonbearing Walls.

4.3.2.11.1 Interior nonbearing walls shall be constructed of noncombustible or limited-combustible materials. [**5000:**7.2.3.2.11.1]

4.3.2.11.2 Interior nonbearing walls required to have a fire resistance rating of 2 hours or less shall be permitted to be fire-retardant-treated wood enclosed within noncombustible or limited-combustible materials, provided that such walls are not used as shaft enclosures. [**5000:**7.2.3.2.11.2]

4.3.2.12 Exterior Nonbearing Walls. Nonbearing exterior walls shall be constructed of noncombustible materials, limited-combustible materials, or materials specified in 4.3.2.12.1 or 4.3.2.12.2. [**5000:**7.2.3.2.12]

4.3.2.12.1 Fire-retardant-treated wood shall be permitted in exterior nonbearing walls when such walls are not required to have fire resistance ratings. [**5000:**7.2.3.2.12.1]

4.3.2.12.2 Exterior nonbearing walls tested in accordance with and meeting the conditions of acceptance of NFPA 285 shall be permitted. [**5000:**7.2.3.2.12.2]

4.3.2.13 Combustible Materials. Combustible materials shall be permitted in accordance with the following:

(1) Foamed plastic insulation complying with Section 48.4 of *NFPA 5000*
(2) Metal composite material complying with Section 37.4 of *NFPA 5000*
(3) Thermal and acoustical insulation, other than foamed plastic, complying with Section 8.16 of *NFPA 5000*
(4) Interior floor finish and interior finish, trim, and millwork, such as doors, door frames, window sashes, and window frames
(5) Light-transmitting plastic complying with Sections 38.11 and 48.7 of *NFPA 5000*
(6) Class A, Class B, or Class C roof coverings
(7) Blocking

[**5000:**7.2.3.2.13]

4.3.2.14 Ceiling Cavity Plenums and Raised Floor Plenums. [5000:7.2.3.2.14] For the purpose of this *Code*, the application of these provisions for ceiling cavity plenums and raised floor plenums shall apply to all buildings and shall not be subject to the limitations as set forth in Section 1.3 of NFPA 90A. [**5000:**7.2.3.2.14.2]

4.3.2.15 Plenum Materials Combustibility. Materials exposed to the airflow within ceiling cavity plenums and raised floor plenums shall comply with NFPA 90A.

Δ 4.3.2.16 Ceiling Plenum Tested Assembly. Where the plenum is a part of a floor/ceiling or roof/ceiling assembly that has been tested or investigated and assigned a fire resistance rating of 1 hour or more, and the assembly contains air ducts and openings for air ducts, all the materials and the construction of the assembly, including the air duct materials and the size and protection of the openings, shall conform with the design of the fire-resistance-rated assembly, as tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*; or UL 263, *Fire Tests of Building Construction and Materials*. [**5000:**8.2.1.4]

Δ 4.4 Type III (211 or 200) Construction.

4.4.1 Type III Construction. Type III (211 or 200) construction shall be that type in which exterior walls and structural elements that are portions of exterior walls are of approved noncombustible or limited-combustible materials, and in which fire walls, interior structural elements, walls, arches, floors, and roofs are entirely or partially of wood of smaller dimensions than required for Type IV construction or are of approved noncombustible, limited-combustible, or other approved combustible materials. [**5000:**7.2.4.1]

4.4.2 Special Requirements — Type III Construction. The special requirements in 4.4.2.1 through 4.4.2.3 shall apply to Type III construction. [**5000:**7.2.4.2]

4.4.2.1 Fire-Retardant-Treated Wood. Approved fire-retardant-treated wood framing shall be permitted within the assembly of exterior walls having a required fire resistance rating of 2 hours or less and a horizontal separation of not less than 60 in. (1525 mm), provided that the fire resistance rating is maintained and the exposed outer and inner faces of such walls are constructed of limited-combustible or noncombustible materials. [**5000:**7.2.4.2.1]

4.4.2.2 Heavy Timber. Wood columns and arches conforming to heavy timber sizes shall be permitted where exterior walls are required to have a 1-hour fire resistance rating or less. [**5000:**7.2.4.2.2]

4.4.2.3 Exterior Nonbearing Walls. Exterior nonbearing walls tested in accordance with, and meeting the conditions of acceptance of, NFPA 285 shall be permitted. [**5000:**7.2.4.2.3]

Δ 4.5 Type IV (2HH) Construction.

4.5.1 Type IV Construction. Type IV (2HH) construction shall be that type in which fire walls, exterior walls, and interior bearing walls and structural elements that are portions of such walls are of approved noncombustible or limited-combustible materials, except as allowed for exterior walls in 4.5.6.7. Other interior structural elements, arches, floors, and roofs shall be of solid or laminated wood or cross-laminated timber without concealed spaces or with concealed spaces conforming to 4.5.6.7 and shall comply with the allowable dimensions of 4.5.5. [**5000:**7.2.5.1]

Δ 4.5.2 Exterior Wall Separation.

***N* 4.5.2.1** Exterior walls greater than 30 ft (9.1 m) from the property line shall be permitted to be of heavy timber construction, provided that the 2-hour rating as required by Table 4.1.1 is maintained and such walls contain no combustible concealed spaces. [**5000:**7.2.5.2.1]

***N* 4.5.2.2** Exterior walls of buildings in accordance with 7.2.5.6.1.1 or 7.2.5.6.1.2 shall be permitted to be located any distance from the property line and shall be constructed as required therein, including permitted concealed spaces. [**5000:**7.2.5.2.2]

4.5.3 Interior Columns, Arches, Beams, Girders, and Trusses. Interior columns, arches, beams, girders, and trusses of approved materials other than wood shall be permitted, provided that they are protected to provide a fire resistance rating of not less than 1 hour. [**5000:**7.2.5.3]

Δ 4.5.4 Concealed Spaces. Certain concealed spaces shall be permitted in accordance with the following:

(1) Concealed spaces in accordance with 4.5.5.3.4.
(2) Concealed spaces within 1-hour fire-resistance-rated interior walls and partitions in accordance with 4.5.6.3 do not require additional protection.

(3) Concealed spaces in floors, roofs, or walls of cross-laminated timber construction in accordance with one or more of the following and which do not contain combustibles other than building elements and electrical, mechanical, fire protection, or plumbing materials and equipment:

(a) The building is sprinklered throughout and automatic sprinklers are also provided in the concealed space.
(b) The concealed space is filled completely with noncombustible insulation.
(c) Surfaces within the concealed space are fully sheathed with not less than ½ in. (12.7 mm) gypsum board or noncombustible materials.

[**5000:**7.2.5.4]

4.5.5 Type IV (2HH) Allowable Dimensions. All dimensions in 4.5.5 for solid sawn members shall be considered nominal. [**5000:**7.2.5.5]

Δ 4.5.5.1 Columns.

4.5.5.1.1 Wood columns supporting floor loads shall be not less than 8 in. (205 mm) in any dimension. [**5000:**7.2.5.5.3.1]

4.5.5.1.2 Wood columns supporting only roof loads shall be not less than 6 in. (150 mm) in width and not less than 8 in. (205 mm) in depth. [**5000:**7.2.5.5.3.2]

Δ 4.5.5.2 Beams.

4.5.5.2.1 Wood beams and girders supporting floor loads shall be not less than 6 in. (150 mm) in width and not less than 10 in. (255 mm) in depth. [**5000:**7.2.5.5.4.1]

4.5.5.2.2 Wood beams and girders and other roof framing supporting roof loads only shall be not less than 4 in. (100 mm) in width and not less than 6 in. (150 mm) in depth. [**5000:**7.2.5.5.4.2]

Δ 4.5.5.3 Arches.

4.5.5.3.1 Framed or glued laminated arches that spring from the finished ground level or the floor line, and timber trusses that support floor loads, shall be not less than 8 in. (205 mm) in width or depth. [**5000:**7.2.5.5.5.1]

4.5.5.3.2 Framed or glued laminated arches for roof construction that spring from the finished ground level or the floor line and do not support floor loads shall have members not less than 6 in. (150 mm) in width and not less than 8 in. (205 mm) in depth for the lower half of the member height, and not less than 6 in. (150 mm) in depth for the upper half of the member height. [**5000:**7.2.5.5.5.2]

4.5.5.3.3 Framed or glued laminated arches for roof construction that spring from the top of walls or wall abutments, and timber trusses that do not support floor loads, shall have members not less than 4 in. (100 mm) in width and not less than 6 in. (150 mm) in depth. [**5000:**7.2.5.5.5.3]

4.5.5.3.4 Spaced members shall be permitted to be composed of two or more pieces not less than 3 in. (75 mm) in thickness where blocked solidly throughout their intervening spaces or where such spaces are tightly closed by a continuous wood cover plate not less than 2 in. (51 mm) in thickness that is secured to the underside of the members. [**5000:**7.2.5.5.5.4]

4.5.5.4 Splice Plates. Splice plates shall be not less than 3 in. (75 mm) in thickness. [**5000:**7.2.5.5.6]

4.5.5.5 Floors. Floors shall be constructed without concealed spaces and shall be permitted to be any of the following materials:

(1) Materials shall be spline or tongue-and-groove plank not less than 3 in. (75 mm) in thickness that is covered with 1 in. (25 mm) tongue-and-groove flooring, laid crosswise or diagonally to the plank, or with ½ in. (12.7 mm) wood structural panel; or they shall be constructed of laminated planks not less than 4 in. (100 mm) in width, set close together on edge, spiked at intervals of 18 in. (455 mm), and covered with 1 in. (25 mm) tongue-and-groove flooring, laid crosswise or diagonally to the plank, or with ½ in. (12.7 mm) wood structural panel.
(2) Cross-laminated timber complying with 45.5.7 of *NFPA 5000* shall be not less than 4 in. (100 mm) thick and shall be continuous between supports. Individual timbers shall be fastened to one another. Cross-laminated timbers shall be permitted to be connected to walls without shrinkage gaps provided dimensional changes are considered in design. Concealed spaces shall be permitted in accordance with 4.5.4.

[**5000:**7.2.5.5.7]

4.5.5.6 Roof Decks. Roof decks shall be permitted to be constructed of any of the following materials:

(1) Spline or tongue-and-groove plank not less than 2 in. (51 mm) in thickness
(2) Laminated planks not less than 3 in. (75 mm) in width, set close together on edge, and laid as required for floors
(3) 1⅛ in. (29 mm) thick interior wood structural panel, exterior glue
(4) Cross-laminated timber
(5) Approved noncombustible or limited-combustible materials of equivalent fire durability

[**5000:**7.2.5.5.8]

4.5.6 Special Requirements — Type IV Construction. The special requirements in 4.5.6.1 through 4.5.6.8 shall apply to Type IV construction. [**5000:**7.2.5.6]

4.5.6.1 Structural Elements. Structural elements shall be of heavy timber members (sawn or glued-laminated), cross-laminated timber, or fire-resistance-rated construction as set forth in Table 4.1.1 when materials other than heavy timber or cross-laminated timber are used. [**5000:**7.2.5.6.1]

N **4.5.6.1.1** Type IV construction with mass timber construction elements having fire resistance ratings required for Type I (332) shall be permitted where they comply with all of the following:

(1) The building shall be protected throughout with an approved automatic sprinkler system in accordance with NFPA 13.
(2) The fire resistance rating of construction elements and connections shall meet one of the following:

(a) Two-thirds of the required fire resistance rating of construction elements shall be provided by gypsum wallboard in accordance with Section 4.4.2 of AWC Technical Report No. 10, *Calculating the Fire Resistance of Wood Members and Assemblies.*

(b) Wood connections, including connectors, fasteners, and members, shall be protected from fire exposure for the required fire resistance time in accordance with Section 4.5 of AWC Technical Report No. 10.

(3) All elements of the exterior wall shall comply with 4.5.6.7(1).

(4) In buildings equal to or less than 180 ft (54.9 m) in height, exit enclosures, elevator hoistways, and other shafts shall be permitted to be constructed of mass timber elements.

(5) In buildings greater than 180 ft (54.9 m) but less than or equal to 270 ft (82.3 m) in height, exit enclosures, elevator hoistways, and other shafts shall be constructed of noncombustible or limited-combustible materials.

[**5000:**7.2.5.6.1.1]

N **4.5.6.1.2** Type IV construction with mass timber construction elements having fire resistance ratings required for Type II (222) shall be permitted where they comply with all of the following:

(1) The building shall be protected throughout with an approved automatic sprinkler system in accordance with NFPA 13.

(2) The fire resistance rating of construction elements shall be provided as specified in Chapter 4 of AWC Technical Report No. 10, *Calculating the Fire Resistance of Exposed Wood Members*.

(3) In buildings less than 85 ft (25.9 m) in height, exit enclosures, elevator hoistways, and other shafts shall be permitted to be constructed of mass timber elements.

(4) In buildings greater than 85 ft (25.9 m) but equal to or less than 180 ft (54.9 m) in height, two-thirds of the required fire resistance rating of construction elements for exit enclosures, elevator hoistways, and other shafts shall be provided by gypsum wallboard in accordance with Section 4.4.2 of AWC Technical Report No. 10.

(5) The fire resistance rating of wood connections, including connectors, fasteners, and members, shall be protected from fire exposure for the required fire resistance time in accordance with Section 4.5 of AWC Technical Report No. 10.

(6) All elements of the exterior wall shall comply with 4.5.6.7(1).

[**5000:**7.2.5.6.1.2]

4.5.6.2 Columns, Arches, Beams, and Roof Decking. Where horizontal separation of 20 ft (6100 mm) or more is provided, wood columns, arches, beams, and roof decking conforming to the requirements for heavy timber in 4.5.5 shall be permitted to be used on the exterior of the building. [**5000:**7.2.5.6.2.1]

4.5.6.3 Partitions. Permanent partitions shall be permitted to be of solid wood construction formed by not less than two layers of matched boards of 1 in. (25 mm) nominal thickness or of 1-hour fire-resistance-rated construction as set forth in Table 4.1.1. [**5000:**7.2.5.6.3.1]

4.5.6.4 Floors. Floors shall be permitted to be of heavy timber, masonry, concrete, wood, or steel and shall be constructed as required in Chapter 8 of *NFPA 5000*. [**5000:**7.2.5.6.4.1]

Δ 4.5.6.5 Roofs.

N **4.5.6.5.1** Roofs of 1-hour fire-resistance-rated construction shall be permitted. [**5000:**7.2.5.6.5.1]

N **4.5.6.5.2** Roofs of buildings in accordance with 4.5.6.1.1 or 4.5.6.1.2 shall be of mass timber or of noncombustible or limited-combustible materials. [**5000:**7.2.5.6.5.2]

Δ 4.5.6.6 Stairways.

Δ 4.5.6.6.1 Stairways of buildings in accordance with 4.5.6.1.1 or 4.5.6.1.2 shall be permitted to be constructed with treads and risers of solid mass timber. [**5000:**7.2.5.6.6.1]

4.5.6.6.2 Where built-on, laminated, or plank inclines are required for floors, stairways shall be permitted to be 1 in. (25 mm) nominal thickness or shall be permitted to be constructed as required for buildings of Type I or Type II construction. [**5000:**7.2.5.6.6.2]

Δ 4.5.6.7 Exterior Walls. Exterior walls shall meet at least one of the following requirements:

(1) In buildings complying with 4.5.6.1.1 or 4.5.6.1.2, bearing and nonbearing exterior walls shall be constructed with any of the following materials:

(a) Noncombustible material
(b) Limited-combustible material
(c) Mass timber complying with Chapter 45 of NFPA 5000, provided the exterior surface of the mass timber is protected by at least one layer of $\frac{5}{8}$ in. (16 mm) Type X gypsum board
(d) Weather-resistive barrier in accordance with Section 37.4 of *NFPA 5000*

(2) Other exterior walls having a required fire resistance rating of 2 hours or less shall be permitted to be constructed with any of the following materials:

(1) Noncombustible material shall be permitted.

(2) Limited-combustible material shall be permitted.

(3) Fire-retardant-treated wood shall be permitted. Approved fire-retardant-treated wood framing shall be permitted within the assembly of exterior walls having a horizontal separation of not less than 60 in. (1525 mm), provided that the fire resistance rating is maintained and the exposed outer and inner faces of such walls are constructed of limited-combustible or noncombustible materials.

(4) Cross-laminated timber complying with 45.5.7 of *NFPA 5000* shall be permitted provided the exterior surface of the cross-laminated timber is protected by one of the following:

(a) Fire-retardant-treated wood not less than $\frac{15}{32}$ in. (12 mm) thick
(b) Type X gypsum board not less than $\frac{5}{8}$ in. (16 mm) thick
(c) Noncombustible material

[**5000:**7.2.5.6.7]

Δ 4.5.6.8 Exterior Nonbearing Walls. Exterior nonbearing walls shall be permitted when tested in accordance with and meeting the conditions of acceptance of NFPA 285. [**5000:**7.2.5.6.8]

4.6 Type V (111 or 000) Construction. Type V (111 or 000) construction shall be that type in which structural elements, walls, arches, floors, and roofs are entirely or partially of wood or other approved material. [**5000:**7.2.6]

Chapter 5 Fire Resistance Rating Requirements for Structural Elements

5.1 Fire Resistance Rating Requirements.

5.1.1 The fire resistance ratings of structural elements and building assemblies shall be determined in accordance with Section 8.2 in *NFPA 5000* or 8.2.3 in NFPA *101*.

5.1.2 Fire resistance protection shall be provided for structural elements as set forth in Chapter 5.

5.1.3 Structural elements shall meet the requirements of 5.1.3.1 through 5.1.3.3.

5.1.3.1 Structural elements, floors, and bearing walls shall have a fire resistance rating not less than the fire resistance rating required for the structural element, bearing or nonbearing wall, floor, or roof they support. [**5000:**7.2.7.2.1]

5.1.3.2 Structural elements, floors, and bearing walls shall be required to have only the fire resistance rating required for the construction classification of the building, provided that both of the following criteria are met:

(1) The structural elements support nonbearing wall or partition assemblies having a required fire resistance rating of 1 hour or less.
(2) The structural elements do not serve as exit enclosures, protection for vertical openings, or occupancy separations. [**5000:**7.2.7.2.2]

5.1.3.3 Structural elements, such as girders, beams, trusses, and spandrels, that have direct connections to columns carrying gravity loads, and that are essential to the stability of the building as a whole, shall have a fire resistance rating not less than that of the columns to which they are connected. [**5000:**7.2.7.2.3]

Δ **5.1.4*** Structural elements shall be individually protected on all sides for their full length with materials providing the required fire resistance rating where they are required to have a fire resistance rating and where they support any of the following:

(1) More than two floors
(2) More than one floor and roof
(3) A bearing wall more than two stories high
(4) A nonbearing wall more than two stories high

[**5000:**7.2.7.3]

5.1.5* Structural elements, other than those specified in 5.1.3, required to have a fire resistance rating shall be protected by individual encasement, or by membrane or ceiling protection in accordance with Section 8.6 of *NFPA 5000* or a combination of both. [**5000:**7.2.7.4]

5.1.6 In addition to the requirements of 5.1.3 and 5.1.4, columns shall meet the following requirements:

(1) Where columns require a fire resistance rating, the entire column, including its connections to beams or girders, shall be individually protected.
(2) Where the column extends through a ceiling, the fire-resistive protection provided for the column shall be continuous from the top of the floor through the ceiling space to the top of the column. [**5000:**7.2.7.5]

5.1.7 Structural elements complying with Section 4.5 shall not be required to comply with 5.1.4. [**5000:**7.2.7.6]

5.1.8 The required thickness and construction of fire-resistive materials or assemblies enclosing trusses shall be based on one of the following:

(1) Results of full-scale tests or combinations of tests on truss components
(2) Approved calculations based on such tests to verify that the assembly is provided with the required fire resistance rating in accordance with 8.2.3 of *NFPA 5000*

[**5000:**7.2.7.7]

5.1.9 The fire resistance rating required for external structural elements located beyond the perimeter of the building floor area shall be permitted to be calculated by using analytical methods in accordance with the provisions set forth in 8.2.3 of *NFPA 5000*. [**5000:**7.2.7.8]

5.1.10 Structural elements within exterior walls or located along the exterior perimeter of a building or structure shall have a fire resistance rating as required by Table 4.1.1 for exterior bearing walls based on the type of construction. [**5000:**7.2.7.9]

5.1.11* Structural elements within an exterior wall located where openings are not permitted, or where protection of openings is required in accordance with 7.3.5 of *NFPA 5000*, shall have a fire resistance rating based on protection against exterior fire exposure as required for exterior bearing walls or the structural element, whichever requires the greater fire resistance rating. [**5000:**7.2.7.10]

5.1.12 The edges of lugs, brackets, rivets, and bolt heads attached to structural elements shall be permitted to extend to within 1 in. (25 mm) of the surface of the fire-resistive protection. [**5000:**7.2.7.11]

5.1.13 Conduits, pipes, or ducts shall not be embedded within the required fire-resistive protection of any structural elements requiring individual encasement to achieve the required fire resistance rating. [**5000:**7.2.7.12]

5.1.14 Fire-resistive materials covering columns required to have a fire resistance rating, where exposed to impact damage by moving vehicles, by handling of merchandise, or by other means, shall be protected from damage. [**5000:**7.2.7.13]

5.1.15 In load bearing, light frame walls requiring a fire resistance rating, membrane protection shall not be required to extend beyond the edge or flange of the construction in openings that are framed or where doors or windows are installed. [**5000:**7.2.7.14]

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1 It is necessary for the user to consider the influence of location, occupancy, exterior exposure, possibility of mechanical and physical damage to fire-resistant material, and other features that could impose additional requirements for safeguarding life and property, as commonly covered in building codes.

For information on the construction of fire walls and fire barrier walls, see NFPA 221. For the installation of opening protection, see NFPA 80 and NFPA 90A.

A.3.1 These definitions apply to the materials used in the construction of buildings but do not apply to furnishings, the contents of buildings, or the fire hazard evaluation of materials.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.3 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

Δ **A.3.3.2 Flame Spread Index.** Under the criteria of ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* and UL 723, *Test for Surface Burning Characteristics of Building Materials,* the flame spread index is expressed numerically on a scale for which the zero point is fixed by the performance of fiber cement board and the 100 point (approximately) is fixed by the performance of untreated red oak flooring.

A.4.1.1 The system of designating types of construction also includes a specific breakdown of the types of construction through the use of Arabic numbers. These Arabic numbers follow the roman numeral notation where identifying a type of construction [e.g., Type I(442), Type II(111), Type III(200)] and indicate the fire resistance rating requirements for certain structural elements as follows:

(1) First Arabic number — exterior bearing walls
(2) Second Arabic number — columns, beams, girders, trusses and arches, supporting bearing walls, columns, or loads from more than one floor
(3) Third Arabic number — floor construction

Table A.4.1.1 provides a comparison of similar types of construction for various model building codes.

[**5000:** A.7.2.1.1]

A.4.1.5.1 The provisions of 4.1.5.1 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [**5000:**A.7.1.4.1]

A.4.1.5.1(1) Examples of such materials include steel, concrete, masonry, and glass. [**5000:**A.7.1.4.1.1(1)]

A.4.1.6 Material subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition is considered combustible. *(See NFPA 259.)*

N **A.5.1.4** It is not intended that the top of beams, trusses, or columns be individually protected when part of a tested fire-resistance-rated assembly. [**5000:**A.7.2.7.3]

A.5.1.5 Fire-resistance-rated bearing wall assemblies, floor/ceiling assemblies, and roof/ceiling assemblies that are not addressed by 5.1.4 can intersect and provide protection to each other to the extent that the same level of protection is provided by the individual protective elements that intersect.

A.5.1.11 It is not the intent to require protection of structural elements against exterior fire exposure due merely to the presence of fire sprinklers or an occupiable exterior space, such as a porch or balcony, unless specifically required by other codes, such as *NFPA 5000*.

Table A.4.1.1 Cross-Reference of Building Construction Types

NFPA 5000	I(442)	I(332)	II(222)	II(111)	II(000)	III(211)	III(200)	IV(2HH)	V(111)	V(000)
UBC	—	I FR	II FR	II 1 hr	II N	III 1 hr	III N	IV HT	V 1 hr	V N
B/NBC	1A	1B	2A	2B	2C	3A	3B	4	5A	5B
SBC	I	II	—	IV 1 hr	IV UNP	V 1 hr	V UNP	III	VI 1 hr	VI UNP
IBC	—	IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB

UBC: *Uniform Building Code.*
FR: Fire rated.
N: Nonsprinklered.
HT: Heavy timber.
B/NBC: *National Building Code.*
SBC: *Standard Building Code.*
IBC: *International Building Code.*
UNP: Unprotected. [**5000:** Table A.7.2.1.1]

Annex B Informational References

B.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

B.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2019 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2021 edition.

NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls*, 2021 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2018 edition.

NFPA 5000®, *Building Construction and Safety Code®*, 2021 edition.

B.1.2 Other Publications.

B.1.2.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2019a.

Δ **B.1.2.2 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 723, *Test for Surface Burning Characteristics of Building Materials*, 2008, revised 2013.

B.2 Informational References. (Reserved)

B.3 References for Extracts in Informational Sections.

NFPA 5000®, *Building Construction and Safety Code®*, 2021 edition.

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