NFPA 220
Standard on Types of Building Construction

1999 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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Types of Building Construction

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This edition of NFPA 220, *Standard on Types of Building Construction*, was prepared by the Technical Committee on Building Construction and acted on by the National Fire Protection Association, Inc., at its May Meeting held May 17–20, 1999, in Baltimore, MD. It was issued by the Standards Council on July 22, 1999, with an effective date of August 13, 1999, and supersedes all previous editions.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

This edition of NFPA 220 was approved as an American National Standard on August 13, 1999.

Origin and Development of NFPA 220

In 1952, the Committee on Building Construction secured tentative adoption of NFPA 220, *Standard 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 include 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.

This 1999 edition has 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.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of this document.

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 design, installation, and maintenance of building construction features not covered by other NFPA committees. This Committee does not cover building code requirements, exits, protection at openings, vaults, air conditioning, blower systems, etc., which are handled by other committees.

Contents

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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 Appendix A.

Information on referenced publications can be found in Chapter 4 and Appendix D.

Chapter 1 General

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.

1-2.1 This standard provides definitions for standard types of building construction.

1-2.2 Nothing in this standard is intended to prevent the use of alternate materials or devices, provided sufficient technical data are submitted to the authority having jurisdiction to demonstrate that the alternate method of construction or device provides equivalent strength and fire resistance.

1-3* Guide to Classification of Types of Building Construction. The types of construction include five basic types designated by roman numerals as Type I, Type II, Type III, Type IV, and Type V. This system of designating types of construction also includes a specific breakdown of the types of construction through the use of arabic numbers. These numbers follow the roman numeral notation where identifying a type of construction (e.g., Type I-443, Type II-111, Type III-200).

Specific fire resistance requirements are found in Table 3-1.

Chapter 2 Definitions

2-1* Definitions. For the purpose of this standard, terms shall be defined as follows:

Approved.* Acceptable to the authority having jurisdiction.

Authority Having Jurisdiction.* The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

Fire Resistance Rating.* The time, in minutes or hours, that materials or assemblies have withstood a fire exposure as established in accordance with the test procedures of NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials.*

Flame Spread Index.* A number obtained according to NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials.*

Limited-Combustible Material. A building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), where tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* and complies with (a) or (b): (a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of $^1/_8$ in. (3.2 mm) that has a flame spread index not greater than 50; and (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. (Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible.)

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.

Noncombustible Material. A 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. Materials that are reported as passing ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C,* shall be considered noncombustible materials.

Shall. Indicates a mandatory requirement.

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

Chapter 3 Types of Construction

3-1* Type I (443 or 332). Type I construction shall be that type in which the structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are of approved noncombustible or limited-combustible materials and shall have fire resistance ratings not less than those specified in Table 3-1.

Table 3-1 Fire Resistance Ratings (in hours) for Type I through Type V Construction

	Type I		Type II			Type III		Type IV	Type V	
	443	332	222	111	000	211	200	2HH	111	000
Exterior Bearing Walls										
Supporting more than one floor, columns, or other bearing walls	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting one floor only	4	3	2	1	0[1]	2	2	2	1	0[1]
Supporting a roof only	4	3	1	1	0[1]	2	2	2	1	0[1]
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[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting roofs only	3	2	1	1	0	1	0	H[2]	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[2]	1	0
Supporting one floor only	3	2	2	1	0	1	0	H[2]	1	0
Supporting roofs only	3	2	1	1	0	1	0	H[2]	1	0
Floor Construction	3	2	2	1	0	1	0	H[2]	1	0
Roof Construction	2	1½	1	1	0	1	0	H[2]	1	0
Exterior Nonbearing Walls[3]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]	0[1]

Those members that shall be permitted to be of approved combustible material.

[1]See A-3-1 (table).

[2]"H" indicates heavy timber members; see text for requirements.

[3] Exterior nonbearing walls meeting the conditions of acceptance of NFPA 285, *Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus,* shall be permitted to be used.

3-2 Type II (222, 111, or 000). Type II construction shall be that type not qualifying as Type I construction in which the structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are of approved noncombustible or limited-combustible materials and shall have fire resistance ratings not less than those specified in Table 3-1.

3-3 Type III (211 or 200). Type III construction shall be that type in which exterior walls and structural members that are portions of exterior walls are of approved noncombustible or limited-combustible materials, and interior structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are entirely or partially of wood of smaller dimensions than required for Type IV construction or of approved noncombustible, limited-combustible, or other approved combustible materials. In addition, structural members shall have fire resistance ratings not less than those specified in Table 3-1.

3-4* Type IV (2HH).

3-4.1 Type IV construction shall be that type in which exterior and interior walls and structural members that are portions of such walls are of approved noncombustible or limited-combustible materials. Other interior structural members, including columns, beams, girders, trusses, arches, floors, and roofs, shall be of solid or laminated wood without concealed spaces and shall comply with the provisions of 3-4.2 through 3-4.6. In addition, structural members shall have fire resistance ratings not less than those specified in Table 3-1.

Exception No. 1: Exterior walls greater than 30 ft (9.1 m) from the property line shall be permitted to be of heavy timber construction provided the 2-hour rating as required by Table 3-1 is maintained and such walls contain no combustible concealed spaces.

Exception No. 2: Interior columns, arches, beams, girders, and trusses of approved materials other than wood shall be permitted, provided they are protected to provide a fire resistance rating of not less than 1 hour.

Exception No. 3: Certain concealed spaces shall be permitted by the exception to 3-4.4.

3-4.2 Wood columns supporting floor loads shall be not less than 8 in. (203 mm) in any dimension; wood columns supporting roof loads only shall be not less than 6 in. (152 mm) in the smallest dimension and not less than 8 in. (203 mm) in depth.

3-4.3 Wood beams and girders supporting floor loads shall be not less than 6 in. (152 mm) in width and not less than 10 in. (254 mm) in depth; wood beams and girders and other roof framing supporting roof loads only shall be not less than 4 in. (102 mm) in width and not less than 6 in. (152 mm) in depth.

3-4.4 Framed or glued laminated arches that spring from grade or the floor line and timber trusses that support floor loads shall be not less than 8 in. (203 mm) in width or depth. Framed or glued laminated arches for roof construction that spring from grade or the floor line and do not support floor loads shall have members not less than 6 in. (152 mm) in width and not less than 8 in. (203 mm) in depth for the lower half of the member height and not less than 6 in. (152 mm) in depth for the upper half of the member height. 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. (102 mm) in width and not less than 6 in. (152 mm) in depth.

Exception: Spaced members shall be permitted to be composed of two or more pieces not less than 3 in. (76 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, secured to the underside of the members.

Splice plates shall be not less than 3 in. (76 mm) in thickness.

3-4.5 Floors shall be constructed of spline or tongue-and-groove plank not less than 3 in. (76 mm) in thickness that is covered with 1-in. (25-mm) tongue-and-groove flooring, laid crosswise or diagonally to the plank, or with $^1/_2$-in. (12.7-mm) plywood; or they shall be constructed of laminated planks not less than 4 in. (102 mm) in width, set close together on edge, spiked at intervals of 18 in. (457 mm), and covered with 1-in. (25-mm) tongue-and-groove flooring, laid crosswise or diagonally to the plank, or with $^1/_2$-in. (12.7-mm) plywood.

3-4.6 Roof decks shall be constructed of spline or tongue-and-groove plank not less than 2 in. (51 mm) in thickness; or of laminated planks not less than 3 in. (76 mm) in width, set close together on edge, and laid as required for floors; or of $1^1/_8$-in. (28.6-mm) thick interior plywood (exterior glue); or of approved noncombustible or limited-combustible materials of equivalent fire durability.

3-5 Type V (111 or 000). Type V construction shall be that type in which exterior walls, bearing walls, columns, beams, girders, trusses, arches, floors, and roofs are entirely or partially of wood or other approved combustible material smaller than material required for Type IV construction. In addition, structural members shall have fire resistance ratings not less than those specified in Table 3-1.

Chapter 4 Referenced Publications

4-1 The following documents or portions thereof are referenced within this standard as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are also listed in Appendix D.

4-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, 1995 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 1996 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 1998 edition.

NFPA 285, *Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus*, 1998 edition.

4-1.2 Other Publication.

4-1.2.1 ASTM Publication. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E 136-96ae1, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.*

Appendix A Explanatory Material

Appendix A is not a part of the requirements of this NFPA document but is included for informational purposes only. This appendix 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, *Standard for Fire Walls and Fire Barrier Walls*. For the installation of opening protection, see NFPA 80, *Standard for Fire Doors and Fire Windows*, and NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*.

A-1-3 The arabic numbers following each basic type of construction (e.g., Type I, Type II) 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

A-2-1 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-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 jurisdic-

tion 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-2-1 Authority Having Jurisdiction. The phrase "authority having jurisdiction" 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-2-1 Fire Resistance Rating. The fire resistance of building construction varies with the susceptibility to damage by fire of the building materials used and the degree of fire protection, if any, provided for the structural members. *(See also ASTM E 119, Standard Test Method of Fire Tests of Building Construction and Materials, and UL 263, Standard for Safety Fire Tests of Building Construction and Materials.)*

A-2-1 Flame Spread Index. Under the criteria of NFPA 255, *Standard Method of Test of 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 inorganic-reinforced cement board and the 100 point (approximately) is fixed by the performance of untreated red oak flooring. (*See also ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, and UL 723, Standard for Safety Test for Surface Burning Characteristics of Building Materials.*)

A-2-1 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.

A-3-1 (table) Requirements for fire resistance of exterior walls located in close proximity to property lines, other buildings, or exposures, the provision of spandrel wall sections, and the limitation or protection of wall openings are not related to type of construction. They could be specified in other standards and codes, where appropriate, and could be required in addition to the requirements of this standard for the type of construction.

A-3-4 The dimensions used for sawn and glued laminated lumber in Section 3-4 are nominal dimensions.

Appendix B Recommendations on Plastics in Building Codes and Standards

This appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.

This appendix is prepared to furnish guidance to NFPA committees and for the drafting of provisions applying to plastics that could be permitted to be used in building codes.

Small-scale fire tests can provide misleading results for use in evaluating plastics for building materials. The exemption of plastics from recommendations on fire hazard characteristics specified by building codes and standards for other building materials should not be permitted.

The use of standard fire tests for all building materials, including plastics, is recommended, particularly those for fire resistance of structural assemblies *(see NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials)* and those for surface flame spread and other features *(see NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials).*

Appendix C Potential Heat of Selected Building Materials

This appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.

NOTE: See ASTM, Proceedings.

C-1 Potential Heat of Selected Building Materials. The following table provides heat values for a variety of common structural and building materials. See Table C-1.

Table C-1 Potential Heat of Selected Building Materials

Material	Thickness (in.)	Density (lb/ft^3)	Potential Heat, Weight Basis (Btu/lb)
1. Woods			
a. Douglas fir, untreated	3/4	38.0	8,400
b. Douglas fir (retardant treatment "A")	3/4	37.2	8,290
c. Douglas fir (retardant treatment "B")	3/4	47.2	7,850
d. Douglas fir (retardant treatment "C")	3/4	38.8	7,050
e. Maple soft, untreated	1	39.5	7,940
f. Hardboard, untreated	1/4	59.8	8,530
2. Plastics			
a. Polystyrene, wall tile	0.075	65.4	17,420
b. Rigid, polyvinyl chloride, retardant treated	0.147	86.0	9,290
c. Phenolic laminate	0.063	76.4	7,740
d. Polycarbonate resin	1/4	78.7	13,330
3. Insulation			
a. Glass fiber, semirigid, no vapor barrier	1	3.0	3,040
b. Rock wool batting, paper enclosure	3	2.4	1,050
c. Cork (reconstituted cork sheet)	1/4	14.8	11,110
d. Cellulose mineral board	2	47.8	2,250
4. Concrete			
a. Cinder aggregate		93.0	3,080

Table C-1 Potential Heat of Selected Building Materials *(continued)*

Material	Thickness (in.)	Density (lb/ft^3)	Potential Heat, Weight Basis (Btu/lb)
b. Slag aggregate		110.1	80
c. Shale aggregate		80.5	10
d. Calcareous gravel aggregate		133.1	–250
e. Siliceous gravel aggregate		166.8	– 40
5. Cement Board			
a. Asbestos cement board	$^3/_{16}$	117.0	80
b. Asbestos cement board + 20 mil paint	$^3/_{16}$	159.2	390
6. Gypsum			
a. $CaSO_4 \bullet H_2O$ hydrated neat gypsum	0.41	137.9	– 290
b. Perlite aggregate plaster, 21 percent aggregate	1	53.2	70
c. Sand aggregate plaster, 15 percent aggregate	1	101.8	– 50
d. Vermiculite aggregate plaster, 15 percent aggregate	1	51.2	– 90
e. Gypsum board "A"	$^3/_8$	50.5	760
f. Gypsum board "A" with paper removed	$^3/_8$	46.6	– 270
g. Gypsum board "A" + alkyd gloss paint	$^3/_8$	46.7	880
h. Gypsum board "B"	$^1/_2$	51.2	650
7. Lath			
a. Gypsum A	$^3/_8$	55.3	310
b. Metal diamond mesh	0.025	405	1,230
c. Metal diamond mesh, paint removed	0.019	401	660
8. Metals			
a. Structural steel, unpainted	0.060	489	230
b. Magnesium	0.128	122	10,800
c. Aluminum	0.004	165	30
d. Brass	0.004	534	100
e. Copper	0.024	556	60
f. Lead	0.036	710	280
g. Zinc		415	760
9. Miscellaneous			
a. Paint "E" (dried paint film)	0.05		3,640
b. Asphalt shingles (fire retardant)	$^1/_4$	70.7	8,320
c. Building paper (asphalt-impregnated)	0.042	42.8	13,620
d. Building paper (rosin-sized)	0.018	23.6	7,650
e. Linoleum tile	$^1/_8$	86.0	7,760
f. Brick, red-face	$2^1/_4$	139.1	20
g. Charcoal, coconut	—	—	13,870

Note: All weights and percentages refer to original air-dry weight.

Appendix D Referenced Publications

D-1 The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not considered part of the requirements of this standard unless also listed in Chapter 4. The edition indicated here for each reference is the current edition as of the date of the NFPA issuance of this standard.

D-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA, 02269-9101.

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1999 edition.

NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*, 1996 edition.

NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*, 1997 edition.

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, 1995 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, 1996 edition.

D-1.2 Other Publications.

D-1.2.1 ASTM Publications. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM *Proceedings*, Vol. 61, 1961, pp. 1336–1348.

ASTM E 84-98e1, *Standard Test Method for Surface Burning Characteristics of Building Materials.*

ASTM E 119-98, *Standard Test Method of Fire Tests of Building Construction and Materials.*

D-1.2.2 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 263, *Standard for Safety Fire Tests of Building Construction and Materials*, Eleventh Edition, 1992.

UL 723, *Standard for Safety Test for Surface Burning Characteristics of Building Materials*, Seventh Edition, 1993.