NFPA 102

Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures

2006 Edition

NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA 102

Standard for

Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures

2006 Edition

This edition of NFPA 102, *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures*, was prepared by the Technical Committee on Assembly Occupancies and Membrane Structures, and released by the Technical Correlating Committee on Safety to Life. It was issued by the Standards Council on January 27, 2006, with an effective date of February 16, 2006, and supersedes all previous editions.

This edition of NFPA 102 was approved as an American National Standard on February 16, 2006.

Origin and Development of NFPA 102

This standard is the result of a committee project inaugurated shortly after the circus fire in Hartford, CT, on July 6, 1944, in which 168 lives were lost.

A committee was organized under the joint sponsorship of the Building Officials Conference of America and the National Fire Protection Association under the procedure of the American Standards Association. As a result of extensive deliberation during the winter of 1944–1945, this committee prepared a draft of a proposed standard, which was submitted at the annual meeting of the National Fire Protection Association in June, 1945. This was then printed and sent to all of the members of the Association, to a representative group of leaders in the outdoor amusement industry, and to all others who filed requests for copies. As a result, numerous constructive suggestions were received, all duly considered by the committee in several meetings, and the 1946 standard was completed by the committee. It was then adopted by the sponsoring organizations, the National Fire Protection Association, and the Building Officials Conference of America, and approved by the American Standards Association as an American Standard on May 22, 1946.

As a result of circulation and use of the 1946 standard, various proposals were made for revision in the interest of clarification. These were considered by the committee and revisions recommended by the committee and circulated to all concerned for comment, further amended, and adopted by the National Fire Protection Association and the Building Officials Conference of America in 1948; the American Standards Association approved the 1948 edition as an American Standard on January 5, 1949.

In 1949 the committee recommended further changes to include the essential features of an earlier standard on grandstands, Z20.1, which covered certain types of grandstands not covered in the 1946-1948 standard, Z20.2, thus making the continuance of the earlier separate standard unnecessary. The 1949 revision, Z20.3, also made the standard applicable to foldable grandstands in buildings that had not been previously covered. After the usual circulation for comment the revisions were adopted in 1949 by the sponsors, and the revised text was approved by the American Standards Association as an American Standard, April 5, 1950.

Revised editions of the standard have been prepared by the committee and adopted by the sponsors in 1957, 1966, and 1967. The 1972 edition was a reconfirmation of the 1967 edition.

The 1978 edition was prepared by the Committee on Tents, Grandstands, and Air-Supported Structures and represented a complete revision of the 1972 edition, complete with a new title, *Standard for Assembly Seating, Tents, and Air-Supported Structures*. The means of egress section was coordinated with the provisions of NFPA *101*®, *Life Safety Code*.®

The 1986 edition further coordinated with the *Life Safety Code*. It was prepared by the Technical Committee on Safety to Life through its Subcommittee on Tents and Membrane Structures. Its scope was extended beyond assembly occupancies to include tents and membrane structures used for any occupancy.

The 1992 and 1995 editions deleted all means of egress provisions that were adequately covered by NFPA *101*, *Life Safety Code*, so as to avoid redundancy and inconsistencies between the two documents. The 1995 edition was retitled *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures* to reflect more accurately the scope and contents of the document.

The 2006 edition is wholly comprised of requirements extracted from NFPA *101*®, *Life Safety Code*®, and *NFPA 5000*®, *Building Construction and Safety Code*®. For future revision cycles, users are advised to submit public proposals on extracted text to the source documents (that is, *NFPA 101* and *NFPA 5000*) and not to NFPA 102.

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Committee Scope: This Committee shall have primary responsibility for documents on the protection of human life from fire and other circumstances capable of producing similar consequences and for the non-emergency and emergency movement of people.

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Committee Scope: This Committee shall have primary responsibility for documents on protection of human life and property from fire and other circumstances capable of producing similar consequences, and on the non-emergency and emergency movement of people in assembly occupancies, tents, and membrane structures.

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Standard for

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2006 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. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex B. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope. This standard addresses the following:

(1) The construction, location, protection, and maintenance of grandstands and bleachers, folding and telescopic seating, tents, and membrane structures
(2) Seating facilities located in the open air or within enclosed or semi-enclosed structures such as tents, membrane structures, and stadium complexes.

1.2 Purpose. The purpose of this standard is to provide minimum requirements for life safety in relation to fire, storm, collapse, and crowd behavior in tents, membrane structures, and assembly seating as covered in Section 1.1.

1.3 Application. The requirements of this standard shall apply to the following:

(1) New facilities
(2) Existing facilities where specifically noted

1.4 Equivalency. 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.

1.4.1 Technical Documentation. Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.4.2 Approval. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.5 Units.

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

1.5.2 Primary Values. The inch-pound value for a measurement, and the SI value given in parentheses, shall each be acceptable for use as primary units for satisfying the requirements of this standard.

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.

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

NFPA 10, *Standard for Portable Fire Extinguishers,* 2002 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2002 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2003 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment,* 2006 edition.

NFPA 54, *National Fuel Gas Code,* 2006 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2004 edition.

NFPA 70, *National Electrical Code®,* 2005 edition.

NFPA 72®, National Fire Alarm Code®, 2002 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* 2002 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems,* 2006 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids,* 2004 edition.

NFPA *101®, Life Safety Code®,* 2006 edition.

NFPA 160, *Standard for the Use of Flame Effects Before an Audience,* 2006 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances,* 2006 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials,* 2006 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* 2003 edition.

NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films,* 2004 edition.

NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles,* 2006 edition.

NFPA 1126, *Standard for the Use of Pyrotechnics Before a Proximate Audience,* 2006 edition.

NFPA 5000®, Building Construction and Safety Code®, 2006 edition.

2.3 Other Publications.

2.3.1 ASCE Publication. American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

ASCE/SEI 17, *Air Supported Structures,* 1996.

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

ASTM A 153, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware,* 2001a.

ASTM D 2898, *Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing*, 1994 (1999).

ASTM E 84, *Standard Test Method of Surface Burning Characteristics of Building Materials*, 2004.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2004.

ASTM G 155, *Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials*, 2000ae1.

2.3.3 IAPMO Publication. International Association of Plumbing and Mechanical Officials, 5000 E. Philadelphia Street, Ontario, CA 91761.

UMC, *Uniform Mechanical Code*, 2003.

2.3.4 Other Publication.

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

2.4 References for Extracts in Mandatory Sections.

NFPA *101®*, *Life Safety Code®*, 2006 edition.
NFPA 5000®, *Building Construction and Safety Code®*, 2006 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* Code. A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

3.2.4 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.5* 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.

3.2.6 Shall. Indicates a mandatory requirement.

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

3.2.8 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Air-Inflated Structure. A structure whose shape is maintained by air pressure in cells or tubes forming all or part of the enclosure of the usable area and in which the occupants are not within the pressurized area used to support the structure. [***5000***, 2006]

3.3.2* Air-Supported Structure. A structure where shape is maintained by air pressure and in which occupants are within the elevated pressure area. [***5000***, 2006]

3.3.3* Assembly Occupancy. An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; or (2) used as a special amusement building, regardless of occupant load. [***5000***, 2006]

3.3.4 Bleachers. A grandstand in which the seats are not provided with backrests. [***5000***, 2006]

3.3.5* Exit. That portion of a means of egress that is separated from all other spaces of a building or structure by construction or equipment as required to provide a protected way of travel to the exit discharge. [***5000***, 2006]

3.3.6 Exit Access. That portion of a means of egress that leads to an exit. [***5000***, 2006]

3.3.7 Exit Discharge. That portion of a means of egress between the termination of an exit and a public way. [***101***, 2006]

3.3.8 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 *NFPA 5000, Building Construction and Safety Code*. [***5000***, 2006]

3.3.9 Folding and Telescopic Seating. A structure that is used for tiered seating of persons and whose overall shape and size can be reduced, without being dismantled, for purposes of moving or storing. [***5000***, 2006]

3.3.10* Grandstand. A structure that provides tiered or stepped seating. [***101***, 2006]

3.3.11* Limited-Combustible (Material). Refers to 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 includes either of the following: (1) materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of ⅛ in. (3.2 mm) that has a flame spread index not greater than 50; and (2) materials, in the form and thickness used, 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, when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*, or ASTM E 84, *Standard Test Method of Surface Burning Characteristics of Building Materials*. [***5000***, 2006]

3.3.12* Means of Egress. A continuous and unobstructed way of travel from any point in a building or structure to a public way consisting of three separate and distinct parts: (1) the exit access, (2) the exit, and (3) the exit discharge. [***5000***, 2006]

3.3.13 Membrane. A thin layer of construction material. [***5000***, 2006]

3.3.14 Membrane Structure. A building or portion of a building incorporating an air-inflated, air-supported, tensioned-membrane structure; a membrane roof; or a membrane-covered rigid frame to protect habitable or usable space. [***5000***, 2006]

3.3.15 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 Degrees C*, shall be considered noncombustible materials. [***5000***, 2006]

3.3.16 Permanent. Any object that is intended to remain in place for more than 180 days in any consecutive 12-month period. *(See also 3.3.19.)* [***5000***, 2006]

3.3.17 Private Party Tent. A tent erected in the yard of a private residence for entertainment, recreation, dining, a reception, or similar function. [***5000***, 2006]

3.3.18 Professional Engineer. A person registered or licensed to practice engineering in a jurisdiction, subject to all laws and limitations imposed by the jurisdiction. [***5000***, 2006]

3.3.19 Temporary. Any object that is in place for a period of 180 consecutive days or less. *(See also 3.3.16.)* [***5000***, 2006]

3.3.20 Tensioned-Membrane Structure. A membrane structure incorporating a membrane and a structural support system such as arches, columns and cables, or beams wherein the stresses developed in the tensioned membrane interact with those in the structural support so that the entire assembly acts together to resist the applied loads. [***5000***, 2006]

3.3.21* Tent. A temporary structure, the covering of which is made of pliable material that achieves its support by mechanical means such as beams, columns, poles, or arches, or by rope or cables, or both. [***5000***, 2006]

3.3.22 Weathered-Membrane Material. Membrane material that has been subjected to a minimum of 3000 hours in a weatherometer in accordance with ASTM G 155, *Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials*, or approved equivalent. [***5000***, 2006]

Chapter 4 Means of Egress

4.1 New Facilities. New facilities included within the scope of this Standard shall comply with one of the following:

(1) The means of egress provisions of NFPA *101*, *Life Safety Code*, for the applicable occupancies

(2) The means of egress provisions of *NFPA 5000*, *Building Construction and Safety Code*, for the applicable occupancies

4.2 Existing Facilities. Existing facilities included within the scope of this Standard shall comply with the means of egress provisions of NFPA *101*, *Life Safety Code* for the applicable occupancies.

Chapter 5 Grandstands and Bleachers

5.1 General. Grandstands and bleachers shall comply with the requirements of this chapter. [***5000***:32.7.1]

5.2 Location. Grandstands shall be erected or otherwise located only where load-carrying capacities exist to support the loads. [***5000***:32.7.2]

5.3 Minimum Construction Requirements. [***5000***:32.7.3]

5.3.1 Grandstands and bleachers shall be permitted to be of unlimited area when of Type I or Type II construction. [***5000***:32.7.3.1]

5.3.2 Grandstands and bleachers shall be permitted to be of Type III, Type IV, or Type V construction when designed in accordance with Section 5.7. [***5000***:32.7.3.2]

5.4 Design. [***5000***:32.7.4]

5.4.1 Grandstands shall be designed to withstand the structural loading requirements of Chapter 35 of *NFPA 5000, Building Construction and Safety Code*, unless otherwise permitted by 5.4.2. [***5000***:32.7.4.1]

5.4.2 The manufacturer shall comply with the requirements of 5.4.2.1 and 5.4.2.2. [***5000***:32.7.4.2]

5.4.2.1 Where required by the authority having jurisdiction, the manufacturer shall submit either of the following:

(1) Calculations verifying the design analysis prepared by a professional engineer or registered architect
(2) Report of load tests conducted by an approved, independent testing laboratory and certified by a professional engineer [***5000***:32.7.4.2.1]

5.4.2.2 Where required by the authority having jurisdiction, the manufacturer shall certify that the equipment supplied is in accordance with the design. [***5000***:32.7.4.2.2]

5.5 Seating. [***5000***:16.4.8.2]

5.5.1 Where grandstand seating without backs is used indoors, rows of seats shall be spaced not less than 22 in. (560 mm) back-to-back. [***5000***:16.4.8.2.1]

5.5.2 The depth of footboards and seat boards in grandstands shall be not less than 9 in. (230 mm). Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided. [***5000***:16.4.8.2.2]

5.5.3 Seats and footrests of grandstands shall be supported securely and fastened in such a manner that they cannot be displaced inadvertently. [***5000***:16.4.8.2.3]

5.5.4 Individual seats or chairs shall be permitted only if secured in rows in an approved manner, unless the seats do not exceed 16 in number and are located on level floors and within railed-in enclosures, such as boxes. [***5000***:16.4.8.2.4]

Table 5.5.5 Maximum Number of Seats Permitted Between Farthest Seat and an Aisle

Application	Outdoors	Indoors
Grandstands	11	6
Bleachers	20	9

5.5.5 The maximum number of seats permitted between the farthest seat in an aisle in grandstands and bleachers shall not exceed that shown in Table 5.5.5. [***5000***:16.4.8.2.5]

5.5.6 Vertical openings between guardrails and footboards or seat boards shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [***5000***:16.4.8.6.7]

5.5.7 An opening between the seat board and footboard located more than 30 in. (760 mm) above grade shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [***5000***:16.4.8.6.8]

5.6 Guards and Railings. [***5000***:16.4.8.6]

5.6.1 Railings or guards not less than 42 in. (1065 mm) above the aisle surface or footrest or not less than 36 in. (915 mm) vertically above the center of the seat or seat board surface, whichever is adjacent, shall be provided along those portions of the backs and ends of all grandstands where the seats are more than 48 in. (1220 mm) above the floor or ground. [***5000***:16.4.8.6.1]

5.6.2 The requirement of 5.6.1 shall not apply where an adjacent wall or fence affords equivalent safeguard. [***5000***:16.4.8.6.2]

5.6.3 Where the front footrest of any grandstand is more than 24 in. (610 mm) above the floor, railings or guards not less than 33 in. (825 mm) above such footrests shall be provided. [***5000***:16.4.8.6.3]

5.6.4 The railings required by 5.6.3 shall be permitted to be not less than 26 in. (660 mm) high in grandstands or where the front row of seats includes backrests. [***5000***:16.4.8.6.4]

5.6.5 Cross aisles located within the seating area shall be provided with rails not less than 26 in. (660 mm) high along the front edge of the cross aisle. [***5000***:16.4.8.6.5]

5.6.6 The railings specified by 5.6.5 shall not be required where the backs of the seats in front of the cross aisle project 24 in. (610 mm) or more above the surface of the cross aisle. [***5000***:16.4.8.6.6]

5.6.7 Vertical openings between guardrails and footboards or seat boards shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [***5000***:16.4.8.6.7]

5.6.8 An opening between the seat board and footboard located more than 30 in. (760 mm) above grade shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [***5000***:16.4.8.6.8]

5.7 Special Requirements — Type III, Type IV, and Type V Grandstands. [***5000***:32.7.5]

5.7.1 An outdoor grandstand of Type III, Type IV, or Type V construction shall not be erected a distance less than two-thirds of its height from a building, but in no case shall the grandstand be erected less than 10 ft (3050 mm) from a building, unless one of the following criteria is met:

(1) The exterior wall of the building is of at least 1-hour fire resistance–rated construction with all openings protected.
(2) A fire wall of at least 1-hour fire resistance–rated construction is provided between the grandstand and the building. [***5000***:32.7.5.1]

5.7.2 The following shall apply to outdoor grandstand units of Type III, Type IV, or Type V construction:

(1) No outdoor grandstand unit shall exceed 10,000 ft^2 (930 m^2) or 200 ft (61 m) in length.
(2) Grandstand units of the maximum size shall be placed not less than 20 ft (6100 mm) apart or shall be separated by walls with a 1-hour fire resistance rating.
(3) Not more than three units shall be erected in any one group.
(4) Each group of less than three units shall be separated from any other group by a wall of 2-hour fire resistance-rated construction extending 24 in. (610 mm) above the seat platforms or by an open space of not less than 50 ft (15 m).
(5) Where entirely constructed of labeled fire retardant–treated wood that has passed the standard rain test in ASTM D 2898, *Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing*, or where constructed of members conforming to dimensions for heavy timber construction [Type IV (2HH)], the area or length specified by 5.7.2(1) shall be permitted to be doubled. [***5000***:32.7.5.2]

5.7.3 The highest level of seat platforms above the ground or the surface at the front of the grandstand shall be as follows:

(1) Grandstands of Type III, Type IV, or Type V construction — not more than 20 ft (6100 mm)
(2) Portable grandstands of Type III, Type IV, or Type V construction within tents or membrane structures — not more than 12 ft (3660 mm) [***5000***:32.7.5.3]

5.7.4 Where entirely constructed of labeled fire retardant–treated wood that has passed the standard rain test in ASTM D 2898 or where constructed of members conforming to dimensions for heavy timber construction [Type IV (2HH)], the heights specified by 5.7.3 shall be permitted to be doubled. [***5000***:32.7.5.4]

5.8 Special Requirements — Portable Grandstands. Portable grandstands shall conform to the requirements of this chapter for grandstands and the special requirements of Section 5.8. [***5000***:32.7.6]

5.8.1 General. Portable grandstands shall comply with the following:

(1) Portable grandstands shall be self-contained, having within them all necessary parts to withstand and restrain all forces that might be developed during human occupancy.
(2) Portable grandstands shall be designed and manufactured so that, if any structural members required for the strength and stability of the structure have been omitted during erection, the presence of unused connection fittings shall make the omissions self-evident.
(3) The construction shall produce the strength required by the design.
(4) Portable grandstands shall not be used until all parts have been erected, or re-erected, in accordance with the approved design and specifications.
(5) The seating, walkways, railings, bracing, and supporting members shall be structurally sound. [***5000***:32.7.6.1]

5.8.2 Placement. The following shall apply to the placement of portable grandstands:

(1) Portable grandstands shall be provided with base plates, sills, floor runners, or sleepers of such area that the allowable bearing capacity of the supporting material is not exceeded.
(2) Where portable grandstands rest directly on a base where settlement can or does occur beyond that allowed by design, mud sills of suitable material having sufficient area to prevent undue or dangerous settlement shall be installed under base plates, runners, or sleepers.
(3) All bearing surfaces shall be in full contact with each other. [***5000***:32.7.6.2]

5.8.3 Prevention of Displacement. A-frames or other supports and seat stringers for portable grandstands shall be secured to prevent accidental displacement during occupancy. [***5000***:32.7.6.3]

5.8.4 Fasteners. The following shall apply to fasteners for portable grandstands:

(1) The use of nails, lag screws, and wood screws shall be permitted for holding wood parts together, provided that the following criteria are met:
   (a) Nails, lag screws, and wood screws shall not be used for demountable joinings.
   (b) Nails, lag screws, and wood screws shall not be used where their loosening or splitting of surrounding wood would jeopardize the structure or its occupants.
(2) Members in tension shall be connected at each end by not less than two bolts, rivets, or lag screws or by approved connectors or other approved devices.
(3) All ferrous fastenings and fastening devices shall be stainless steel or hot-dipped galvanized in accordance with ASTM A 153, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*. [***5000***:32.7.6.4]

5.9 Spaces Underneath Grandstands. Spaces underneath a grandstand shall be kept free of flammable or combustible materials, unless protected by an approved, electrically supervised automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, unless otherwise permitted by the following:

(1) This requirement shall not apply to accessory uses of 300 ft^2 (27.9 m^2) or less, such as ticket booths, toilet facilities, or concession booths where constructed of noncombustible, limited-combustible, or fire-resistive construction, in otherwise nonsprinklered facilities.
(2) This requirement shall not apply to rooms enclosed in not less than 1-hour fire resistance–rated construction that are of less than 1000 ft^2 (93 m^2), in otherwise nonsprinklered facilities. [***5000***:16.4.8.5]

5.10 Maintenance. Maintenance shall be provided as follows:

(1) The owner shall provide for not less than annual inspection and required maintenance of each grandstand to ensure safe conditions.
(2) At least biennially, the inspection shall be performed by a professional engineer or registered architect.
(3) Where required by the authority having jurisdiction, the owner shall provide certification that both inspections have been performed. [***5000***:32.7.7]

Chapter 6 Folding and Telescopic Seating

6.1 Application. Folding and telescopic seating shall be permitted only if the supporting structure has been designed to handle the loading and has the exit facilities to accommodate the occupants of the seating, as well as all other occupants. [***5000***:32.7.8.1]

6.2 Design. [***5000***:32.7.8.2]

6.2.1 Structural Loading. The design of folding and telescopic seating shall withstand the structural loading requirements of Chapter 35 of *NFPA 5000, Building Construction and Safety Code*. [***5000***:32.7.8.2.1]

6.2.2 Load Tests. Load tests in accordance with accepted engineering practice shall be permitted in lieu of the design analysis for a seating unit or part thereof. [***5000***:32.7.8.2.2]

6.2.3 Manufacturer Requirements. The manufacturer shall comply with the requirements of 6.2.3.1 and 6.2.3.2. [***5000***:32.7.8.2.3]

6.2.3.1 Where required by the authority having jurisdiction, the manufacturer shall submit either of the following:

(1) Calculations verifying the design analysis prepared by a professional engineer or registered architect
(2) Report of load tests conducted by an approved, independent testing laboratory and certified by a professional engineer [***5000***:32.7.8.2.3.1]

6.2.3.2 Where required by the authority having jurisdiction, the manufacturer shall certify that the equipment supplied is in accordance with the design or is essentially identical to the structure tested. [***5000***:32.7.8.2.3.2]

6.3 Review and Approval. [***5000***:32.7.8.2.4]

6.3.1 Design and installation drawings shall be approved prior to installation, and seating shall be installed in conformance with such drawings. [***5000***:32.7.8.2.4.1]

6.3.2 The drawings shall include the following:

(1) Conformance with approved designs, which are permitted to refer to approved standard drawings, with any variations applicable to the job noted
(2) Location of the folding or telescopic seating units and details of attachments, if any
(3) Location of guards and details thereof [***5000***:32.7.8.2.4.2]

6.3.3 The owner, or the owner's duly authorized representative, shall file with the authority having jurisdiction evidence of the following:

(1) Capability of means of egress to accommodate the occupants of the seating, as well as all other occupants, based on Chapter 11 of *NFPA 5000*.
(2) Structural capacity of the site to support the folding and telescopic seating dead loads when closed and also to support the dead loads and live loads when open [***5000***:32.7.8.2.4.3]

6.4 Seating. [***5000***:16.4.9.2]

6.4.1 The horizontal distance of seats, measured back-to-back, shall be not less than 22 in. (560 mm) for seats without backs, and the following requirements shall also apply:

(1) There shall be a space of not less than 12 in. (305 mm) between the back of each seat and the front of each seat immediately behind it.

(2) If seats are of the chair type, the 12 in. (305 mm) dimension shall be measured to the front edge of the rear seat in its normal, unoccupied position.
(3) All measurements shall be taken between plumb lines. [*5000*:16.4.9.2.1]

6.4.2 The depth of footboards (footrests) and seat boards in folding and telescopic seating shall be not less than 9 in. (230 mm). [*5000*:16.4.9.2.2]

6.4.3 Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided. [*5000*:16.4.9.2.2]

6.4.4 Individual chair-type seats shall be permitted in folding and telescopic seating only if firmly secured in groups of not less than three. [*5000*:16.4.9.2.3]

6.4.5 The maximum number of seats permitted between the furthest seat in an aisle in folding and telescopic seating shall not exceed that shown in Table 5.5.5. [*5000*:16.4.9.2.4]

6.4.6 An opening between the seat board and footboard located more than 30 in. (760 mm) above grade shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [*5000*:16.4.9.3.8]

6.5 Guards and Railings. [*5000*:16.4.9.3]

6.5.1 Guards. Guards in accordance with Chapter 11 of *NFPA 5000* shall be provided at the open sides of means of egress that exceed 30 in. (760 mm) above the floor or grade below, except as otherwise permitted by 6.5.2 through 6.5.9. [*5000*:11.1.8.1]

6.5.2 Railings or guards not less than 42 in. (1065 mm) above the aisle surface or footrest, or not less than 36 in. (915 mm) vertically above the center of the seat or seat board surface, whichever is adjacent, shall be provided along those portions of the backs and ends of all folding and telescopic seating where the seats are more than 48 in. (1220 mm) above the floor or ground. [*5000*:16.4.9.3.1]

6.5.3 The requirement of 6.5.2 shall not apply where an adjacent wall or fence affords equivalent safeguard. [*5000*:16.4.9.3.2]

6.5.4 Where the front footrest of folding or telescopic seating is more than 24 in. (610 mm) above the floor, railings or guards not less than 33 in. (825 mm) above such footrests shall be provided. [*5000*:16.4.9.3.3]

6.5.5 The railings required by 6.5.4 shall be permitted to be not less than 26 in. (660 mm) high where the front row of seats includes backrests. [*5000*:16.4.9.3.4]

6.5.6 Cross aisles located within the seating area shall be provided with rails not less than 26 in. (660 mm) high along the front edge of the cross aisle. [*5000*:16.4.9.3.5]

6.5.7 The railings specified by 6.5.6 shall not be required where the backs of the seats in front of the cross aisle project 24 in. (610 mm) or more above the surface of the cross aisle. [*5000*:16.4.9.3.6]

6.5.8 Vertical openings between guardrails and footboards or seat boards shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [*5000*:16.4.9.3.7]

6.5.9 An opening between the seat board and footboard located more than 30 in. (760 mm) above grade shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [*5000*:16.4.9.3.8]

6.6 Maintenance and Operation of Folding and Telescopic Seating. [*101*:12.7.11]

6.6.1 Instructions in both maintenance and operation shall be transmitted to the owner by the manufacturer of the seating or his or her representative. [*101*:12.7.11.1]

6.6.2 Maintenance and operation of folding and telescopic seating shall be the responsibility of the owner or his or her duly authorized representative and shall include the following:

(1) During operation of the folding and telescopic seats, the opening and closing shall be supervised by responsible personnel who shall ensure that the operation is in accordance with the manufacturer's instructions.
(2) Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the seating.
(3) An annual inspection and required maintenance of each grandstand shall be performed to ensure safe conditions.
(4) At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. [*101*:12.7.11.2]

Chapter 7 Membrane Structures

7.1 General. [*5000*:32.2.1]

7.1.1 Scope. Chapter 7 shall apply to permanent air-supported, air-inflated, and tensioned-membrane structures, collectively known as membrane structures, that are used as complete buildings and as roofs or other portions of buildings or other types of construction, and the following also shall apply:

(1) Membrane structures also shall comply with the applicable provisions of *NFPA 5000, Building Construction and Safety Code.*
(2) Temporary membrane structures shall comply with Section 7.5. [*5000*:32.2.1.1]

7.1.1.1 General. Membrane structures that provide the complete enclosure for the occupied space shall be considered as complete buildings and subject to the requirements of Chapter 7 of *NFPA 5000.* [*5000*:32.2.1.1.1]

7.1.1.2 Height. Membrane structures shall be limited to one story in height, but height shall not be limited in number of feet. [*5000*:32.2.1.1.2]

7.1.1.3 Area. For determining allowable area, the construction type for a membrane structure shall be based on the support system. [*5000*:32.2.1.1.3]

7.1.1.3.1 Air-supported membrane structures shall not exceed the allowable areas listed in Chapter 7 of *NFPA 5000* for Type II(000) unprotected construction. [*5000*:32.2.1.1.3.1]

7.1.1.3.2 Area increases in accordance with Chapter 7 of *NFPA 5000* shall be permitted. [*5000*:32.2.1.1.3.2]

7.1.2 Structural Design. Membrane structures, and portions thereof shall be designed and constructed to support, within the limitations specified by *NFPA 5000,* all loads set forth in Chapter 35 and elsewhere in *NFPA 5000* and combined in accordance with Section 35.15 of *NFPA 5000.* [*5000*:35.1.2]

7.1.3 Electrical. Electrical wiring shall comply with NFPA 70, *National Electrical Code*. [***5000***:32.2.1.3]

7.1.4 Fire Protection Systems and Equipment. All membrane structures shall be in accordance with Chapter 55 of *NFPA 5000*. [***5000***:32.2.1.4]

7.1.5 Mechanical. [***5000***:32.2.1.5]

7.1.5.1 Fuel gas heating, ventilation, and air-conditioning installations shall conform to the requirements of NFPA 54, *National Fuel Gas Code*. [***5000***:32.2.1.5.1]

7.1.5.2 The installation of equipment not covered in 7.1.5.1 shall conform to the requirements of the UMC, *Uniform Mechanical Code*. [***5000***:32.2.1.5.2]

7.1.6 Occupancy Separation. A membrane structure building that is occupied by more than one use group shall comply with Chapter 6 of *NFPA 5000*. [***5000***:32.2.1.6]

7.1.7 Mixed Construction. [***5000***:32.2.1.7]

7.1.7.1 Membrane structures shall be permitted to be utilized as a portion of buildings of other types of construction as specified in Chapter 7 of *NFPA 5000*. [***5000***:32.2.1.7.1]

7.1.7.2 Height and area limits shall be as specified for the type of construction and occupancy of the building. [***5000***:32.2.1.7.2]

7.2 Permanent Membrane Structures. [***5000***:32.2.2]

7.2.1 Required Tests. All tests of membrane materials for compliance with this chapter shall be performed on weathered-membrane materials. [***5000***:32.2.2.1]

7.2.2 Use of Membrane Materials. Membrane materials shall not be used where fire resistance ratings are required for walls or roofs, unless otherwise permitted by the following:

(1) Where every part of the roof, including the roof membrane, is not less than 20 ft (6100 mm) above any floor, balcony, or gallery, a noncombustible or limited-combustible membrane shall be permitted to be used as the roof in any type of construction.
(2) With approval of the authority having jurisdiction, membrane materials shall be permitted to be used where every part of the roof membrane is located sufficiently above every significant fire potential so that the imposed temperature will not exceed the capability of the membrane, including seams, to maintain its structural integrity. [***5000***:32.2.2.2]

7.2.3 Flame Spread. [***5000***:32.2.2.3]

7.2.3.1 Flame spread of all membrane materials exposed within the structure shall be Class A, as defined in Chapter 10 of *NFPA 5000*. [***5000***:32.2.2.3.1]

7.2.3.2 The requirement of 7.2.3.1 shall not apply to plastic less than 20 mil (0.51 mm) in thickness located less than 30 ft (9100 mm) above any floor in greenhouses where occupancy by the general public is prohibited. [***5000***:32.2.2.3.2]

7.2.4 Flame Resistance. [***5000***:32.2.2.4]

7.2.4.1 All membrane structure fabric shall meet the requirements of Test Method 2 contained in NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. [***5000***:32.2.2.4.1]

7.2.4.2 The requirement of 7.2.4.1 shall not apply to plastic less than 20 mil (0.51 mm) in thickness located less than 30 ft (9100 mm) above any floor in greenhouses where occupancy by the general public is prohibited. [***5000***:32.2.2.4.2]

7.2.4.3 The authority having jurisdiction shall require one of the following as evidence that membrane structure fabric materials have the required flame resistance:

(1) Certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction
(2) Report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction [***5000***:32.2.2.4.3]

7.2.4.4 Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material affixed at the time of manufacture to the exterior of the structure. [***5000***:32.2.2.4.4]

7.3 Tensioned-Membrane Structures. [***5000***:32.2.3]

7.3.1 Protection for Membrane Roofs. Protection for membrane roofs for structures in climates subject to freezing temperatures and ice buildup shall be as specified in 7.3.1.1 or 7.3.1.2. [***5000***:32.2.3.1]

7.3.1.1 The roof shall be composed of two layers with an air space between the layers through which heated air can be moved to guard against ice accumulation. [***5000***:32.2.3.1.1]

7.3.1.2 Any approved methods that protect against ice accumulation shall be permitted. [***5000***:32.2.3.1.2]

7.3.2* Protection for Roof Drains. Protection for roof drains shall be as specified in 7.3.2.1 and 7.3.2.2 or 7.3.2.3. [***5000***:32.2.3.2]

7.3.2.1 Roof drains shall be equipped with listed de-icing and snow-melting equipment to protect against ice buildup, which would prevent the drains from functioning. [***5000***:32.2.3.2.1]

7.3.2.2 The equipment specified in 7.3.2.1 shall be served by on-site standby electrical power in addition to the normal public service. [***5000***:32.2.3.2.2]

7.3.2.3 In lieu of de-icing and snow-melting equipment, any other approved methods that protect against ice accumulation shall be permitted. [***5000***:32.2.3.2.3]

7.4 Air-Supported, Air-Inflated Structures. [***5000***:32.2.4]

7.4.1* General. In addition to the requirements of this chapter, air-supported structures shall be designed and operated in accordance with ASCE/SEI 17, *Air Supported Structures*. [***5000***:32.2.4.1]

7.4.2 Maintenance and Operation. [***5000***:32.2.4.2]

7.4.2.1 Instructions in both operation and maintenance shall be transmitted to the owner by the manufacturer of the tensioned-membrane, air-supported, or air-inflated structure. [***5000***:32.2.4.2.1]

7.4.2.2 An annual inspection and required maintenance of each structure shall be performed. [***5000***:32.2.4.2.2]

7.4.2.3 At least biannually, the annual inspection shall be performed by a professional engineer or qualified service representative. [***5000***:32.2.4.2.3]

7.5 Temporary Membrane Structures. [***5000***:32.2.5]

7.5.1 General. Membrane structures designed to meet all the requirements of this chapter shall be permitted to be used as temporary buildings subject to the approval of the authority having jurisdiction. [***5000***:32.2.5.1]

7.5.2 Temporary Membrane Structures. Temporary membrane structures shall comply with the requirements of 7.5 and 7.2.4. [*5000*:32.2.5.2]

7.5.3* Temporary Tensioned-Membrane Structures. Temporary tensioned-membrane structures shall be permitted to comply with Chapter 8, provided that the following criteria are met:

(1) Roof drains shall be equipped with listed de-icing and snow-melting equipment.
(2) The de-icing and snow-melting equipment shall be served by on-site standby electrical power in addition to the normal public service.
(3) Any approved methods that protect against ice accumulation shall be permitted. [*5000*:32.2.5.3]

7.5.4 Clearance. There shall be a minimum clearance of 36 in. (915 mm) between the membrane and the contents or equipment within the building and between the membrane and any exterior object. [*5000*:32.2.5.4]

7.5.5 Fire Hazards.

7.5.5.1 Temporary membrane structures shall be protected as specified in 7.5.5.1.1 through 7.5.5.1.4. [*5000*:32.3.5.1]

7.5.5.1.1 The ground enclosed by the structure, and the surrounding ground not less than 10 ft (3050 mm) outside of the structure, shall be cleared of all flammable or combustible material and vegetation. [*5000*:32.3.5.1.1]

7.5.5.1.2 The requirement of 7.5.5.1.1 shall be accomplished to the satisfaction of the authority having jurisdiction prior to the erection of tents and temporary membrane structures. [*5000*:32.3.5.1.2]

7.5.5.1.3 The premises shall be kept free from flammable or combustible materials during the period for which the premises are used by the public. [*5000*:32.3.5.1.3]

7.5.5.1.4 The requirements of 7.5.5.1.1 through 7.5.5.1.3 shall not apply to necessary support equipment. [*5000*:32.3.5.1.4]

7.5.5.2 Containers for liquefied petroleum gases shall be installed not less than 60 in. (1525 mm) from any temporary membrane structure and shall be in accordance with the provisions of NFPA 58, *Liquefied Petroleum Gas Code*. [*101*:11.9.5.1.3]

7.5.5.3 Tanks shall be secured in the upright position and protected from vehicular traffic. [*101*:11.9.5.1.4]

Chapter 8 Tents

8.1 General. [*101*:11.11.1]

8.1.1 The provisions of Chapter 8 shall apply to tents. [*101*:11.11.1.1]

8.1.2 Tents shall be permitted only on a temporary basis. [*101*:11.11.1.2]

8.1.3 Tents shall be erected to cover not more than 75 percent of the premises, unless otherwise approved by the authority having jurisdiction. [*101*:11.11.1.3]

8.2 Structural Design Load Requirements. Tents, other than private party tents and camping tents, under 400 ft^2 (37.2 m^2), shall comply with the requirements of Chapter 35 of *NFPA 5000, Building Construction and Safety Code* for structural design loads. [*5000*:32.3.1, 32.3.2]

8.3 Flame Propagation Performance. [*5000*:32.3.3]

8.3.1 All tent fabric shall meet the flame propagation performance criteria of Test Method 2, as required in NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*. [*5000*:32.3.3.1]

8.3.2 The authority having jurisdiction shall require one of the following as evidence that the fabric materials have the required flame propagation performance:

(1) Certificate or other evidence of acceptance by an organization acceptable to the authority having jurisdiction
(2) Report of tests made by other inspection authorities or organizations acceptable to the authority having jurisdiction [*5000*:32.3.3.2]

8.3.3 Where required by the authority having jurisdiction, confirmatory field tests shall be conducted using test specimens from the original material affixed at the time of manufacture to the exterior of the tent. [*5000*:32.3.3.3]

8.4 Location and Spacing. [*5000*:32.3.4]

8.4.1 There shall be a minimum of 10 ft (3050 mm) between stake lines. [*5000*:32.3.4.1]

8.4.2 Adjacent tents shall meet the requirements of 8.4.2.1 and 8.4.2.2. [*5000*:32.3.4.2]

8.4.2.1 Adjacent tents shall be no closer to each other than allowed in order to provide an area to be used as a means of emergency egress as calculated in accordance with Chapter 11 of *NFPA 5000*. [*5000*:32.3.4.2.1]

8.4.2.2 Where 10 ft (3050 mm) between stake lines is not sufficient for means of egress, the distance necessary for means of egress shall govern. [*5000*:32.3.4.2.2]

8.4.3 Subject to the approval of the authority having jurisdiction, the requirements of 8.4.2 shall not apply, provided that the following criteria are met:

(1) Tents not occupied by the public and not used for the storage of combustible material shall be permitted to be erected less than 10 ft (3050 mm) from other structures.
(2) Tents, each not exceeding 1200 ft^2 (110 m^2), and located in fairgrounds or similar open spaces, shall not be required to be separated from each other. [*5000*:32.3.4.3]

8.4.4 The placement of tents relative to other structures shall be at the discretion of the authority having jurisdiction, based on the occupancy, use, opening, exposure, and other similar factors. [*5000*:32.3.4.4]

8.5 Fire Hazards. [*101*:11.11.4]

8.5.1 Where prohibited by the authority having jurisdiction, smoking shall not be permitted in any tent. [*101*:11.11.4.2]

8.5.2 Tents shall be protected as specified in 8.5.2.1 through 8.5.2.4. [*5000*:32.3.5.1]

8.5.2.1 The ground enclosed by the structure, and the surrounding ground not less than 10 ft (3050 mm) outside of the structure, shall be cleared of all flammable or combustible material and vegetation. [*5000*:32.3.5.1.1]

8.5.2.2 The requirement of 8.5.2.1 shall be accomplished to the satisfaction of the authority having jurisdiction prior to the erection of tents and temporary membrane structures. [*5000*:32.3.5.1.2]

8.5.2.3 The premises shall be kept free from flammable or combustible materials during the period for which the premises are used by the public. [***5000***:32.3.5.1.3]

8.5.2.4 The requirements of 8.5.2.1 through 8.5.2.3 shall not apply to necessary support equipment. [***5000***:32.3.5.1.4]

8.5.3 Containers for liquefied petroleum gases shall be installed not less than 60 in. (1525 mm) from any tent and shall be in accordance with the provisions of NFPA 58, *Liquefied Petroleum Gas Code*. [***101***:11.11.6.1.3]

8.5.4 Tanks shall be secured in the upright position and protected from vehicular traffic. [***101***:11.11.6.1.4]

8.6 Portable Fire-Extinguishing Equipment. Portable fire-extinguishing equipment of approved types shall be furnished and maintained in tents in such quantity and in such locations as directed by the authority having jurisdiction. [***101***:11.11.5]

Chapter 9 Protection

9.1 General. Facilities included within the scope of this Standard shall comply with the requirements of this chapter.

9.2 Flammable Liquids and Gases.

9.2.1 The storage and handling of flammable liquids or gases shall be in accordance with the following applicable standards:

(1) NFPA 30, *Flammable and Combustible Liquids Code*
(2) NFPA 54, *National Fuel Gas Code*
(3) NFPA 58, *Liquefied Petroleum Gas Code* [***101***:8.7.3.1]

9.2.2* No storage or handling of flammable liquids or gases shall be permitted in any location where such storage would jeopardize egress from the structure, unless otherwise permitted by 9.2.1. [***101***:8.7.3.2]

9.3 Open Flame Devices and Pyrotechnics. No open flame devices or pyrotechnic devices shall be used in any assembly occupancy, unless otherwise permitted by the following:

(1) Pyrotechnic special effect devices shall be permitted to be used on stages before proximate audiences for ceremonial or religious purposes, as part of a demonstration in exhibits, or as part of a performance, provided that both of the following criteria are met:
   (a) Precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible material.
   (b) Use of the pyrotechnic device complies with NFPA 1126, *Standard for the Use of Pyrotechnics Before a Proximate Audience*.
(2) Flame effects before an audience shall be permitted in accordance with NFPA 160, *Standard for the Use of Flame Effects Before an Audience*.
(3) Open flame devices shall be permitted to be used in the following situations, provided that precautions satisfactory to the authority having jurisdiction are taken to prevent ignition of any combustible material or injury to occupants:
   (a) *For ceremonial or religious purposes
   (b) On stages and platforms where part of a performance
   (c) Where candles on tables are securely supported on substantial noncombustible bases and candle flame is protected
(4) This requirement shall not apply to heat-producing equipment complying with 9.2.2 of NFPA *101*.
(5) This requirement shall not apply to food service operations in accordance with 12.7.2 of NFPA *101*.
(6) Gas lights shall be permitted to be used, provided that precautions are taken, subject to the approval of the authority having jurisdiction, to prevent ignition of any combustible materials. [***101***:12.7.3]

9.4 Smoking. [***101***:12.7.8]

9.4.1 Smoking in assembly occupancies shall be regulated by the authority having jurisdiction. [***101***:12.7.8.1]

9.4.2 In rooms or areas where smoking is prohibited, plainly visible signs shall be posted that read as follows:

NO SMOKING

[***101***:12.7.8.2]

9.4.3 No person shall smoke in prohibited areas that are so posted, unless permitted by the authority having jurisdiction under both of the following conditions:

(1) Smoking shall be permitted on a stage only where it is a necessary and rehearsed part of a performance
(2) Smoking shall be permitted only where the smoker is a regular performing member of the cast. [***101***:12.7.8.3]

9.4.4 Where smoking is permitted, suitable ashtrays or receptacles shall be provided in convenient locations. [***101***:12.7.8.4]

9.5 Extinguishment Requirements.

9.5.1 Enclosed stadiums, arenas, and similar structures shall be protected throughout by an approved, electrically supervised automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, unless otherwise permitted by the following:

(1) Where the ceiling or roof, whichever is lower, of the playing/activity area is more than 55 ft (16.7 m) above the floor, sprinklers shall not be required above the playing/activity area where permitted by the authority having jurisdiction.
(2) Sprinklers shall not be required above seating areas that view the playing/activity area. [***5000***:32.3.5.2]

9.5.2 An enclosed area shall be protected by an approved sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems* unless such an area is one of the following:

(1) Enclosed stadiums, arenas, and similar structures
(2) Press boxes of less than 1000 ft^2 (93 m^2)
(3) Storage facilities of less than 1000 ft^2 (93 m^2) if enclosed with minimum 1-hour fire resistance–rated construction
(4) Enclosed areas underneath grandstands or bleachers that comply with the exemptions of 5.9(1) or 5.9(2) [***5000***:32.3.5.3]

9.5.3 Portable fire extinguishers shall be installed in assembly occupancies in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, except as otherwise permitted by 9.5.3.1 through 9.5.3.4. [***5000***:16.3.5.3]

9.5.3.1 The requirement of 9.5.3 shall not apply to seating areas. [***5000***:16.3.5.3]

9.5.3.2 The requirement of 9.5.3 shall not apply to floor areas used for contest, performance, or entertainment. [***5000***:16.3.5.3]

9.5.3.3 The requirement of 9.5.3 shall not apply to outside assembly occupancy areas. [***5000***:16.3.5.3]

9.5.3.4 Portable extinguishers shall be permitted to be located in secure locations accessible to staff. [***5000***:16.3.5.3]

9.6 Detection, Alarm, and Communications Systems. [***5000***:16.3.4]

9.6.1 General. Assembly occupancies with occupant loads greater than 300 and all theaters with more than one audience-viewing room shall be provided with an approved fire alarm system in accordance with the following, unless otherwise permitted by 9.6.1.1 and 9.6.1.2:

(1) Section 55.2 of *NFPA 5000*
(2) 9.6.2 through 9.6.3.5. [***5000***:16.3.4.1]

9.6.1.1 Assembly occupancies that are a part of a mixed occupancy shall be permitted to be served by a common fire alarm system, provided that the individual requirements of each occupancy are met. [***5000***:16.3.4.1]

9.6.1.2 Voice communication or public address systems complying with 9.6.3.4 shall not be required to comply with Section 55.2 of *NFPA 5000*. [***5000***:16.3.4.1]

9.6.2 Initiation. [***5000***:16.3.4.2]

9.6.2.1 Initiation of the required fire alarm system shall be by manual means in accordance with 55.2.2 of *NFPA 5000*, which shall be provided with an emergency power source, unless otherwise permitted by 9.6.2.1.1 and 9.6.2.1.2. [***5000***:16.3.4.2.1]

9.6.2.1.1 The requirement of 9.6.2.1 shall not apply where initiation is by means of an approved automatic fire detection system in accordance with *NFPA 72, National Fire Alarm Code* that provides fire detection throughout the building. [***5000***:16.3.4.2.1]

9.6.2.1.2 The requirement of 9.6.2.1 shall not apply where initiation is by means of an approved automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems* that provides fire detection and protection throughout the building. [***5000***:16.3.4.2.1]

9.6.2.2 The initiating device shall be capable of transmitting an alarm to a receiving station, located within the building, that is constantly attended when the assembly occupancy is occupied. [***5000***:16.3.4.2.2]

9.6.2.3* In assembly occupancies with occupant loads greater than 300, automatic detection shall be provided in all hazardous areas that are not normally occupied, unless such areas that are protected throughout by an approved, electrically supervised automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. [***5000***:16.3.4.2.3]

9.6.3 Notification. [***5000***:16.3.4.3]

9.6.3.1 The required fire alarm system shall sound an audible alarm in a constantly attended receiving station within the building when occupied for purposes of initiating emergency action. [***5000***:16.3.4.3.1]

9.6.3.2 Positive alarm sequence in accordance with 55.2.3.4 of *NFPA 5000* shall be permitted. [***5000***:16.3.4.3.2]

9.6.3.3 Occupant notification shall be by means of visible signals and voice announcements, either live or prerecorded, initiated by the person in the constantly attended location. [***5000***:16.3.4.3.3]

9.6.3.4 The announcement shall be made via an approved voice communication or public address system that is provided with an emergency power *NFPA 5000* source and that is audible above the ambient noise level of the assembly occupancy. [***5000***:16.3.4.3.4]

9.6.3.5 Where the authority having jurisdiction determines that it is impractical to have a constantly attended location, a fire alarm system in accordance with Section 55.2 of *NFPA 5000* shall be used that meets the following criteria:

(1) It shall be initiated by manual stations in accordance with 55.2.2 of *NFPA 5000* or other approved means.
(2) It shall automatically provide prerecorded evacuation instructions in accordance with 55.2.3 of *NFPA 5000*. [***5000***:16.3.4.3.5]

9.7 Retail Sales of Consumer Fireworks, 1.4G. Mercantile occupancies where the retail sales of consumer fireworks, 1.4G, are conducted shall comply with NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles*. [***101***:36.4.6]

Chapter 10 Services

10.1 Electrical Systems. Electrical wiring and equipment shall be in accordance with NFPA 70, *National Electrical Code*, unless such installations are approved existing installations, which shall be permitted to be continued in service. [***101***:9.1.2]

10.2 Heating, Ventilating, and Air-Conditioning. [***101***:9.2]

10.2.1 Air-Conditioning, Heating, Ventilating Ductwork, and Related Equipment. Air-conditioning, heating, ventilating ductwork, and related equipment shall be in accordance with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, or NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, as applicable, unless such installations are approved existing installations, which shall be permitted to be continued in service. [***101***:9.2.1]

10.2.2 Ventilating or Heat-Producing Equipment. Ventilating or heat-producing equipment shall be in accordance with NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*; NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances*; NFPA 31, *Standard for the Installation of Oil-Burning Equipment*; NFPA 54, *National Fuel Gas Code*; or NFPA 70, *National Electrical Code*, as applicable, unless such installations are approved existing installations, which shall be permitted to be continued in service. [***101***:9.2.2]

10.3 Fired Heaters. [***101***:11.9.5.1]

10.3.1 Only labeled heating devices shall be used. [***101***:11.9.5.1.1]

10.3.2 Fuel-fired heaters and their installation shall be approved by the authority having jurisdiction. [***101***:11.9.5.1.2]

10.4 Electric Heaters. [***101***:11.9.5.2]

10.4.1 Only labeled heaters shall be permitted. [***101***:11.9.5.2.1]

10.4.2 Heaters shall be connected to electricity by electric cable that is suitable for outside use and is of sufficient size to handle the electrical load. [***101***:11.9.5.2.2]

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.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 Code. The decision to designate a standard as a "code" is based on such factors as the size and scope of the document, its intended use and form of adoption, and whether it contains substantial enforcement and administrative provisions.

A.3.2.5 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.3.3.2 Air-Supported Structure. A cable-restrained air-supported structure is one in which the uplift is resisted by cables or webbing that is anchored by various methods to the membrane or that might be an integral part of the membrane. An air-supported structure is not a tensioned-membrane structure. [***5000:***A.3.3]

A.3.3.3 Assembly Occupancy. Assembly occupancies might include the following:

(1) Armories
(2) Assembly halls
(3) Auditoriums
(4) Bowling lanes
(5) Club rooms
(6) College and university classrooms, 50 persons and over
(7) Conference rooms
(8) Courtrooms
(9) Dance halls
(10) Drinking establishments
(11) Exhibition halls
(12) Gymnasiums
(13) Libraries
(14) Mortuary chapels
(15) Motion picture theaters
(16) Museums
(17) Passenger stations and terminals of air, surface, underground, and marine public transportation facilities
(18) Places of religious worship
(19) Pool rooms
(20) Recreation piers
(21) Restaurants
(22) Skating rinks
(23) Special amusement buildings, regardless of occupant load
(24) Theaters

Assembly occupancies are characterized by the presence or potential presence of crowds with attendant panic hazard in case of fire or other emergency. They are generally open or occasionally open to the public, and the occupants, who are present voluntarily, are not ordinarily subject to discipline or control. Such buildings are ordinarily occupied by able-bodied persons and are not used for sleeping purposes. Special conference rooms, snack areas, and other areas incidental to, and under the control of, the management of other occupancies, such as offices, fall under the 50-person limitation.

Restaurants and drinking establishments with an occupant load of fewer than 50 persons should be classified as mercantile occupancies. [***5000:***A.3.3]

A.3.3.5 Exit. Exits include exterior exit doors, exit passageways, horizontal exits, exit stairs, and exit ramps. In the case of a stairway, the exit includes the following:

(1) Stair enclosure
(2) Door to the stair enclosure
(3) Stairs and landings inside the enclosure
(4) Door from the stair enclosure to the outside or to the level of exit discharge
(5) Any exit passageway and its associated doors, if such are provided, so as to discharge the stair directly to the outside. In the case of a door leading directly from the street floor to the street or open air, the exit comprises only the door.

Doors of small individual rooms, as in hotels, while constituting exit access from the room, are not referred to as exits, except where they lead directly to the outside of the building from the street floor. [***5000:***A.3.3]

A.3.3.10 Grandstand. Where the term *grandstand* is preceded by an adjective denoting a material, it refers to a grandstand the essential members of which, exclusive of seating, are of the material designated. [***5000:***A.3.3]

A.3.3.11 Limited-Combustible (Material). 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 are considered combustible. See NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, and NFPA 220, *Standard on Types of Building Construction*. Where the term *limited-combustible* is used in this standard, it is also intended to include the term *noncombustible*. [***5000:***A.3.3]

A.3.3.12 Means of Egress. A means of egress comprises the vertical and horizontal travel and includes intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, elevators, enclosures, lobbies, escalators, horizontal exits, courts, and yards. [***5000***:A.3.3]

A.3.3.21 Tent. A tent might also include a temporary tensioned-membrane structure. [***5000***:A.3.3]

A.7.3.2 UL Subject 1588, *Outline of Investigation for Roof and Gutter De-Icing Cable Units*, is used to list de-icing and snow-melting equipment intended to be installed in accordance with NFPA 70, *National Electrical Code*. [***5000***:A.32.2.3.2]

A.7.4.1 See *ASCE Guide for Tensioned Fabric Structures*. [***5000***:A.32.2.4.1]

A.7.5.3 UL Subject 1588 is used to list de-icing and snow-melting equipment intended to be installed in accordance with NFPA 70. [***5000***:A.32.2.5.3]

A.9.2.2 NFPA 58, *Liquefied Petroleum Gas Code*, permits portable butane-fueled appliances in restaurants and in attended commercial food catering operations where fueled by not in excess of two 10 oz (0.28 kg) LP-Gas capacity, nonrefillable butane containers having a water capacity not in excess of 1.08 lb (0.4 kg) per container. Containers are required to be directly connected to the appliance, and manifolding of containers is not permitted. Storage of cylinders is also limited to 24 containers, with an additional 24 permitted where protected by a 2-hour fire resistance–rated barrier. [***101***:A.8.7.3.2]

A.9.3(3)(a) Securely supported altar candles in churches that are well separated from any combustible material are permitted. On the other hand, lighted candles carried by children wearing cotton robes present a hazard too great to be permitted. There are many other situations of intermediate hazard where the authority having jurisdiction will have to exercise judgment. [***101***:A.12.7.3(3)(a)]

A.9.6.2.3 The intent is to require detectors only in nonsprinklered hazardous areas that are unoccupied. When the building is occupied, the detectors in the unoccupied, unsprinklered hazardous areas will initiate occupant notification. If the building is unoccupied, the fire in the nonsprinklered hazardous area is not a life safety issue, and the detectors, upon activation, are not required to notify anyone. The signal from a detector is permitted to be sent to a control panel in an area that is occupied when the building is occupied, but that is unoccupied when the building is unoccupied, without the need for central station monitoring or the equivalent. [***5000***:A.16.3.4.2.3]

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 58, *Liquefied Petroleum Gas Code*, 2004 edition.

NFPA 70, *National Electrical Code®*, 2005 edition.

NFPA 220, *Standard on Types of Building Construction*, 2006 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2003 edition.

B.1.2 Other Publications.

B.1.2.1 ASCE Publication. American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

ASCE Guide for Tensioned Fabric Structures, 1996.

B.1.2.2 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL Subject 1588, *Outline of Investigation for Roof and Gutter De-Icing Cable Units*, 2002.

B.2 Informational References. (Reserved)

B.3 References for Extracts in Informational Sections.

NFPA *101®*, *Life Safety Code®*, 2006 edition.

NFPA 5000®, *Building Construction and Safety Code®*, 2006 edition.