**Chapter 25 Grandstands and Bleachers, Folding and Telescopic Seating, Tents, and Membrane Structures**

25.1 General

25.1.1

The construction, location, protection, and maintenance of grandstands and bleachers, folding and telescopic seating, tents, and membrane structures shall meet the requirements of this chapter. Seating facilities located in the open air or within enclosed or semi-enclosed structures, such as tents, membrane structures, and stadium complexes, shall comply with this chapter, NFPA 101, and NFPA 102.

25.1.2 Permits

Permits, where required, shall comply with Section 1.12.

25.1.3 Means of Egress

25.1.3.1

Means of egress shall comply with the requirements of Chapter 14.

25.1.3.2

No guy wire or guy rope shall cross any means of egress at a height of less than 7 ft (2.1 m).

25.1.3.3

Tent stakes adjacent to any means of egress from any tent open to the public shall be railed off, capped, or covered so as not to present a hazard to the public.

25.1.3.4

New facilities shall comply with the means of egress provisions of NFPA 101 for the applicable occupancies.

25.1.3.5

Existing facilities shall comply with the means of egress provisions of NFPA 101 for the applicable occupancies.

25.1.4 Flammable Liquids and Gases

25.1.4.1

Where required by the provisions of Chapters 11 through 43 of NFPA 101, occupancies with storage and handling of hazardous materials shall comply with the following codes unless otherwise modified by other provisions of NFPA 101: Chapter 66 for flammable and combustible liquids, NFPA 54, Chapter 66 for compressed gases and cryogenic fluids, Chapter 69 for liquefied petroleum gases and liquefied natural gases, NFPA 400, and NFPA 495. [101:8.7.3.1]

25.1.4.2\*

No storage, use, or handling of hazardous materials shall be permitted in any location where such storage, use, or handling would jeopardize egress from the structure, unless otherwise permitted by a document listed in 25.1.4.1. [101:8.7.3.2]

25.1.4.3

Refueling of equipment with liquids having flash points below 100°F (38°C) shall not be permitted within the structure.

25.1.5 Fire Hazards

25.1.5.1

The finished ground level enclosed by the structure, and the surrounding finished ground level 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]

25.1.5.2

Where prohibited by the AHJ, smoking shall not be permitted in any temporary membrane structure. [101:11.10.2.2]

25.1.5.3

Hay, straw, shavings, or similar combustible materials that have not been treated to make them flame retardant to a degree acceptable to the AHJ shall not be permitted within any structure used as an assembly occupancy.

Exception: Animal bedding and fodders in quantities approved by the AHJ.

25.1.5.4 Open Flame Devices and Pyrotechnics

Use of open flame devices and pyrotechnics shall comply with 20.1.5.3.

25.1.6 Extinguishment Requirements

25.1.6.1

Enclosed stadiums, arenas, and similar structures shall be protected throughout by an approved, electrically supervised automatic sprinkler system in accordance with Section 13.3, unless otherwise permitted by the following:

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 AHJ.

Sprinklers shall not be required above seating areas that view the playing/activity area.

[5000:32.3.5.2]

25.1.6.2

An enclosed area shall be protected by an approved sprinkler system in accordance with Section 13.3, unless such an area is one of the following:

Enclosed stadiums, arenas, and similar structures

Press boxes of less than 1000 ft2 (93 m2)

Storage facilities of less than 1000 ft2 (93 m2), if enclosed with minimum 1-hour fire-resistance-rated construction

Enclosed areas underneath grandstands or bleachers that comply with 16.4.10.5 of NFPA 5000

[5000:32.3.5.3]

25.1.6.3

Portable fire extinguishers shall be installed in assembly occupancies in accordance with Section 13.6, unless otherwise permitted by one of the following:

The requirement of 25.1.6.3 shall not apply to seating areas.

The requirement of 25.1.6.3 shall not apply to floor areas used for contests, performances, or entertainment.

The requirement of 25.1.6.3 shall not apply to outside assembly occupancy areas.

Portable extinguishers shall be permitted to be located in secure locations accessible to staff.

[5000:16.3.5.3]

25.1.6.4

Fire-extinguishing equipment shall be maintained in accordance with Section 13.6.

25.1.6.5

Employees shall be trained to operate fire-extinguishing equipment and shall be required to exhibit their skill when requested by the AHJ.

25.1.7 Detection, Alarm, and Communications Systems

Detection, alarm, and communications systems shall comply with Section 13.7 where required by 13.7.2.1 or 13.7.2.2.

25.1.8\* Fire Detail

See 1.7.17 for fire detail requirements.

25.1.9 Electrical Installations

25.1.9.1 Electrical Systems

Electrical wiring and equipment shall be in accordance with Section 11.1, unless such installations are approved existing installations, which shall be permitted to be continued in service. [101:9.1.2]

25.1.9.2

The electrical system shall be installed, maintained, and operated in a safe and professional manner. When in use, portable electrical systems shall be inspected daily by a qualified person representing the owner, and any defects found shall be corrected before the public is admitted.

25.1.9.3

The electrical system and equipment shall be isolated from the public by proper elevation or guarding, and all electrical fuses and switches shall be enclosed in approved enclosures. Cables on the ground in areas traversed by the public shall be placed in trenches or protected by approved covers.

25.1.10 Heating Devices

25.1.10.1 Fired Heaters

25.1.10.1.1

Heating devices shall comply with Sections 11.2 and 11.5.

25.1.10.1.2

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

25.1.10.1.3

Fuel-fired heaters and their installation shall be approved by the AHJ. [101:11.9.5.1.2]

25.1.10.1.4 Air-Conditioning, Heating, Ventilating Ductwork, and Related Equipment

Air-conditioning, heating, ventilating ductwork, and related equipment shall be in accordance with 11.2.1, as applicable, unless such installations are approved existing installations, which shall be permitted to be continued in service. [101:9.2.1]

25.1.10.1.5 Ventilating or Heat-Producing Equipment

Ventilating or heat-producing equipment shall be in accordance with 11.2.2, as applicable, unless such installations are approved existing installations, which shall be permitted to be continued in service. [101:9.2.2]

25.1.10.1.6

Containers for liquefied petroleum gases shall be installed not less than 5 ft (1.5 m) from any tent or temporary membrane structure and shall be in accordance with the provisions of Chapter 69.

25.1.10.1.7

Tanks shall be secured in the upright position and protected from vehicular traffic.

25.1.10.2 Electric Heaters

25.1.10.2.1

Electric heaters shall comply with 25.1.10.2 and Section 11.5.

25.1.10.2.2

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

25.1.10.2.3

Electric heaters, their placement, and their installation shall be approved by the AHJ. [101:11.9.5.2.2]

25.1.10.2.4

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. [101:11.9.5.2.3]

25.1.11 Cooking

Cooking operations shall comply with Chapter 50.

25.1.12 Generators

25.1.12.1

Generators and other internal combustion power sources shall comply with Section 10.15 and 25.1.12.

25.1.12.2\*

Generators and other internal combustion power sources shall be separated from temporary membrane structures and tents by a minimum of 20 ft (6.1 m) and shall be protected from contact by fencing, enclosure, or other approved means.

25.1.12.3 Fueling

Fuel tanks shall be of adequate capacity to permit uninterrupted operation during normal operating hours. Refueling shall be conducted only when not in use.

25.1.12.4 Fire Extinguishers

A minimum of one portable fire extinguisher with a rating of not less than 2-A:10-B:C shall be provided.

25.2 Tents

25.2.1 General

25.2.1.1

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

25.2.1.2

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

25.2.2 Flame Propagation Performance

25.2.2.1

All tent fabric shall meet the flame propagation performance criteria contained in Test Method 2 of NFPA 701. [101:11.11.2.1]

25.2.2.2

One of the following shall serve as evidence that the tent fabric materials have the required flame propagation performance:

The AHJ shall require a certificate or other evidence of acceptance by an organization acceptable to the AHJ.

The AHJ shall require a report of tests made by other inspection authorities or organizations acceptable to the AHJ.

[101:11.11.2.2]

25.2.2.3

Where required by the AHJ, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the tent. [101:11.11.2.3]

25.2.3 Location and Spacing

25.2.3.1

There shall be a minimum of 10 ft (3050 mm) between stake lines. [101:11.11.3.1]

25.2.3.2

Adjacent tents shall be spaced to provide an area to be used as a means of emergency egress. Where 10 ft (3050 mm) between stake lines does not meet the requirements for means of egress, the distance necessary for means of egress shall govern. [101:11.11.3.2]

25.2.3.3

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 where the AHJ deems such close spacing to be safe from hazard to the public. [101:11.11.3.3]

25.2.3.4

Tents, each not exceeding 1200 ft2 (112 m2) in finished ground level area and located in fairgrounds or similar open spaces, shall not be required to be separated from each other, provided that safety precautions meet the approval of the AHJ. [101:11.11.3.4]

25.2.3.5

The placement of tents relative to other structures shall be at the discretion of the AHJ, with consideration given to occupancy, use, opening, exposure, and other similar factors. [101:11.11.3.5]

25.2.4 Fire Hazards

25.2.4.1

The finished ground level enclosed by any tent, and the finished ground level for a reasonable distance, but for not less than 10 ft (3050 mm) outside of such a tent, shall be cleared of all flammable or combustible material or vegetation that is not used for necessary support equipment. The clearing work shall be accomplished to the satisfaction of the AHJ prior to the erection of such a tent. The premises shall be kept free from such flammable or combustible materials during the period for which the premises are used by the public. [101:11.11.4.1]

25.2.4.2 Smoking

25.2.4.2.1

Smoking shall not be permitted in any tent, unless approved by the AHJ. [101:11.11.4.2.1]

25.2.4.2.2

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

NO SMOKING

[101:11.11.4.2.2]

25.2.5 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 AHJ. [101:11.11.5]

25.3 Grandstands

25.3.1 Seating

25.3.1.1

Where grandstand seating without backs is used indoors, rows of seats shall be spaced not less than 22 in. (560 mm) back-to-back. [101:12.4.10.2.1]

25.3.1.2

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. [101:12.4.10.2.2]

25.3.1.3

Seats and footrests of grandstands shall be supported securely and fastened in such a manner that they cannot be displaced inadvertently. [101:12.4.10.2.3]

25.3.1.4

Individual seats or chairs shall be permitted only if secured in rows in an approved manner, unless seats do not exceed 16 in number and are located on level floors and within railed-in enclosures, such as boxes. [101:12.4.10.2.4]

25.3.1.5

The maximum number of seats permitted between the farthest seat in an aisle in grandstands and bleachers shall not exceed that shown in Table 25.3.1.5. [101:12.4.10.2.5]

Table 25.3.1.5 Maximum Number of Seats Between Farthest Seat and an Aisle

Application

Outdoors

Indoors

Grandstands

11

6

Bleachers (See 13.2.5.8.1.2 of NFPA 101)

20

9

[101:Table 12.4.10.2.5]

25.3.2 Special Requirements — Wood Grandstands

25.3.2.1

An outdoor wood grandstand shall be erected within not less than two-thirds of its height and, in no case, within not less than 10 ft (3050 mm) of a building, unless otherwise permitted by one of the following:

The distance requirement shall not apply to buildings having minimum 1-hour fire-resistance-rated construction with openings protected against the fire exposure hazard created by the grandstand.

The distance requirement shall not apply where a wall having minimum 1-hour fire-resistance-rated construction separates the grandstand from the building.

[101:12.4.10.3.1]

25.3.2.2

An outdoor wood grandstand unit shall not exceed 10,000 ft2 (929 m2) in finished ground level area or 200 ft (61 m) in length, and all of the following requirements also shall apply:

Grandstand units of the maximum size shall be placed not less than 20 ft (6100 mm) apart or shall be separated by walls having a minimum 1-hour fire-resistance rating.

The number of grandstand units erected in any one group shall not exceed three.

Each group of grandstand units shall be separated from any other group by a wall having minimum 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).

[101:12.4.10.3.2]

25.3.2.3

The finished ground level area or length required by 25.3.2.2 shall be permitted to be doubled where one of the following criteria is met:

Where the grandstand is constructed entirely of labeled fire-retardant-treated wood that has passed the standard rain test, ASTM D2898, Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing

Where the grandstand is constructed of members conforming to dimensions for heavy timber construction [Type IV (2HH)]

[101:12.4.10.3.3]

25.3.2.4

The highest level of seat platforms above the finished ground level or the surface at the front of any wood grandstand shall not exceed 20 ft (6100 mm). [101:12.4.10.3.4]

25.3.2.5

The highest level of seat platforms above the finished ground level, or the surface at the front of a portable grandstand within a tent or membrane structure, shall not exceed 12 ft (3660 mm). [101:12.4.10.3.5]

25.3.2.6

The height requirements specified in 25.3.2.4 and 25.3.2.5 shall be permitted to be doubled where constructed entirely of labeled fire-retardant-treated wood that has passed the standard rain test, ASTM D2898, 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)]. [101:12.4.10.3.6]

25.3.3 Special Requirements — Portable Grandstands

25.3.3.1

Portable grandstands shall conform to the requirements of Section 25.3 for grandstands and the requirements of 25.3.3.2 through 25.3.3.7. [101:12.4.10.4.1]

25.3.3.2

Portable grandstands shall be self-contained and shall have within them all necessary parts to withstand and restrain all forces that might be developed during human occupancy. [101:12.4.10.4.2]

25.3.3.3

Portable grandstands shall be designed and manufactured so that, if any structural members essential to the strength and stability of the structure have been omitted during erection, the presence of unused connection fittings shall make the omissions self-evident. [101:12.4,10.4.3]

25.3.3.4

Portable grandstand construction shall be skillfully accomplished to produce the strength required by the design. [101:12.4.10.4.4]

25.3.3.5

Portable grandstands shall be provided with base plates, sills, floor runners, or sleepers of such area that the permitted bearing capacity of the supporting material is not exceeded. [101:12.4.10.4.5]

25.3.3.6

Where a portable grandstands rest directly on a base of such character that it is incapable of supporting the load without appreciable settlement, mud sills of suitable material, having sufficient area to prevent undue or dangerous settlement, shall be installed under base plates, runners, or sleepers. [101:12.4.10.4.6]

25.3.3.7

All bearing surfaces of portable grandstands shall be in contact with each other. [101:12.4.10.4.7]

25.3.4 Spaces Underneath Grandstands

Spaces underneath a grandstand shall be kept free of flammable or combustible materials, unless protected by an approved, supervised automatic sprinkler system in accordance with Section 13.3 or unless otherwise permitted by one of the following:

This requirement shall not apply to accessory uses of 300 ft2 (28 m2) or less, such as ticket booths, toilet facilities, or concession booths where constructed of noncombustible or fire-resistive construction in otherwise nonsprinklered facilities.

This requirement shall not apply to rooms that are enclosed in not less than 1-hour fire-resistance-rated construction and are less than 1000 ft2 (93 m2) in otherwise nonsprinklered facilities.

[101:12.4.10.5]

25.3.5 Guards and Railings

25.3.5.1

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 the finished ground level. [101:12.4.10.6.1]

25.3.5.2

The requirement of 25.3.5.1 shall not apply where an adjacent wall or fence affords equivalent safeguard. [101:12.4.10.6.2]

25.3.5.3

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. [101:12.4.10.6.3]

25.3.5.4

The railings required by 25.3.5.3 shall be permitted to be not less than 26 in. (660 mm) high in grandstands or where the front row of seats includes backrests. [101:12.4.10.6.4]

25.3.5.5

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. [101:12.4.10.6.5]

25.3.5.6

The railings specified by 25.3.5.5 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. [101:12.4.10.6.6]

25.3.5.7

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. [101:12.4.10.6.7]

25.3.5.8

An opening between the seat board and footboard located more than 30 in. (760 mm) above the finished ground level shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [101:12.4.10.6.8]

25.3.6 Maintenance of Outdoor Grandstands

25.3.6.1

The owner shall provide for not less than annual inspection and required maintenance of each outdoor grandstand to ensure safe conditions. [101:12.7.10.1]

25.3.6.2

At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. [101:12.7.10.2]

25.3.6.3

Where required by the AHJ, the owner shall provide a copy of the inspection report and certification that the inspection required by 25.3.6.2 has been performed. [101:12.7.10.3]

25.4 Folding and Telescopic Seating

25.4.1 Seating

25.4.1.1

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

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.

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.

All measurements shall be taken between plumb lines.

[101:12.4.11.2.1]

25.4.1.2

The depth of footboards (footrests) and seat boards in folding and telescopic seating shall be not less than 9 in. (230 mm). [101:12.4.11.2.2]

25.4.1.3

Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided. [101:12.4.10.2.3]

25.4.1.4

Individual chair-type seats shall be permitted in folding and telescopic seating only if firmly secured in groups of not less than three. [101:12.4.11.2.4]

25.4.1.5

The maximum number of seats permitted between the farthest seat in an aisle in folding and telescopic seating shall not exceed that shown in Table 25.3.1.5. [101:12.4.11.2.5]

25.4.2 Guards and Railings

25.4.2.1

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 folding and telescopic seating where the seats are more than 48 in. (1220 mm) above the floor or the finished ground level. [101:12.4.11.3.1]

25.4.2.2

The requirement of 25.4.2.1 shall not apply where an adjacent wall or fence affords equivalent safeguard. [101:12.4.11.3.2]

25.4.2.3

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. [101:12.4.11.3.3]

25.4.2.4

The railings required by 25.4.2.3 shall be permitted to be not less than 26 in. (660 mm) high where the front row of seats includes backrests. [101:12.4.11.3.4]

25.4.2.5

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. [101:12.4.11.3.5]

25.4.2.6

The railings specified by 25.4.2.5 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. [101:12.4.11.3.6]

25.4.2.7

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. [101:12.4.11.3.7]

25.4.2.8

An opening between the seat board and footboard located more than 30 in. (760 mm) above the finished ground level shall be provided with intermediate construction so that a 4 in. (100 mm) diameter sphere cannot pass through the opening. [101:12.4.11.3.8]

25.4.3 Maintenance and Operation of Folding and Telescopic Seating

25.4.3.1

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]

25.4.3.2

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 all of the following:

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.

Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the seating.

An annual inspection and required maintenance of each grandstand shall be performed to ensure safe conditions.

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]

25.5 Permanent Membrane Structures

25.5.1 Application

25.5.1.1 Use of Membrane Roofs

Membrane roofs shall be used in accordance with the following:

Membrane materials shall not be used where fire resistance ratings are required for walls or roofs.

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 construction type.

With approval of the AHJ, membrane materials shall be permitted to be used where every part of the roof membrane is sufficiently above every significant fire potential, such that the imposed temperature cannot exceed the capability of the membrane, including seams, to maintain its structural integrity.

[101:11.9.1.2]

25.5.1.2 Testing

Testing of membrane materials for compliance with the requirements of Section 25.5 for use of the categories of noncombustible and limited-combustible materials shall be performed on weathered-membrane material as defined in 3.3.179.8 of NFPA 101. [101:11.9.1.3]

25.5.1.3 Flame Spread Index

The flame spread index of all membrane materials exposed within the structure shall be Class A in accordance with Section 12.5. [101:11.9.1.4]

25.5.1.4 Roof Covering Classification

Roof membranes shall have a roof covering classification, as required by the applicable building codes, when tested in accordance with ASTM E108, Standard Test Methods for Fire Tests of Roof Coverings; or UL 790, Test Methods for Fire Tests of Roof Coverings. [101:11.9.1.5]

25.5.1.5 Flame Propagation Performance

25.5.1.5.1

All membrane structure fabric shall meet the flame propagation performance criteria contained in Test Method 2 of NFPA 701. [101:11.9.1.6.1]

25.5.1.5.2

One of the following shall serve as evidence that the fabric materials have the required flame propagation performance:

The AHJ shall require a certificate or other evidence of acceptance by an organization acceptable to the AHJ.

The AHJ shall require a report of tests made by other inspection authorities or organizations acceptable to the AHJ.

[101:11.9.1.6.2]

25.5.1.5.3

Where required by the AHJ, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the structure. [101:11.9.1.6.3]

25.5.2 Tensioned-Membrane Structures

25.5.2.1

The design, materials, and construction of the building shall be based on plans and specifications prepared by a licensed architect or engineer knowledgeable in tensioned-membrane construction. [101:11.9.2.1]

25.5.2.2

Material loads and strength shall be based on physical properties of the materials verified and certified by an approved testing laboratory. [101:11.9.2.2]

25.5.2.3

The membrane roof for structures in climates subject to freezing temperatures and ice buildup shall be composed of two layers separated by an air space through which heated air can be moved to guard against ice accumulation. As an alternative to the two layers, other approved methods that protect against ice accumulation shall be permitted. [101:11.9.2.3]

25.5.2.4

Roof drains shall be equipped with electrical elements to protect against ice buildup that can prevent the drains from functioning. Such heating elements shall be served by on-site standby electrical power in addition to the normal public service. As an alternative to such electrical elements, other approved methods that protect against ice accumulation shall be permitted. [101:11.9.2.4]

25.5.3 Air-Supported and Air-Inflated Structures

25.5.3.1 General

In addition to the general provisions of 25.5.1, the requirements of 25.5.3 shall apply to air-supported and air-inflated structures. [101:11.9.3.1]

25.5.3.2 Pressurization (Inflation) System

The pressurization system shall consist of one or more operating blower units. The system shall include automatic control of auxiliary blower units to maintain the required operating pressure. Such equipment shall meet the following requirements:

Blowers shall be powered by continuous-rated motors at the maximum power required.

Blowers shall have personnel protection, such as inlet screens and belt guards.

Blower systems shall be weather protected.

Blower systems shall be equipped with backdraft check dampers.

Not less than two blower units shall be provided, each of which has capacity to maintain full inflation pressure with normal leakage.

Blowers shall be designed to be incapable of overpressurization.

The auxiliary blower unit(s) shall operate automatically if there is any loss of internal pressure or if an operating blower unit becomes inoperative.

The design inflation pressure and the capacity of each blower system shall be certified by a professional engineer.

[101:11.9.3.2]

25.5.3.3 Standby Power System

25.5.3.3.1\*

A fully automatic standby power system shall be provided. The system shall be either an auxiliary engine generator set capable of running the blower system or a supplementary blower unit that is sized for 1 times the normal operating capacity and is powered by an internal combustion engine. [101:11.9.3.3.1]

25.5.3.3.2

The standby power system shall be fully automatic to ensure continuous inflation in the event of any failure of the primary power. The system shall be capable of operating continuously for a minimum of 4 hours. [101:11.9.3.3.2]

25.5.3.3.3

The sizing and capacity of the standby power system shall be certified by a professional engineer. [101:11.9.3.3.3]

25.5.4 Maintenance and Operation

25.5.4.1

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. [101:11.9.4.1]

25.5.4.2

Annual inspection and required maintenance of each structure shall be performed to ensure safety conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. [101:11.9.4.2]

25.6 Temporary Membrane Structures

25.6.1 Application

25.6.1.1 Required Approval

Membrane structures designed to meet all the requirements of Section 25.6 shall be permitted to be used as temporary buildings subject to the approval of the AHJ. [101:11.10.1.2]

25.6.1.2 Alternative Requirements

Temporary tensioned-membrane structures shall be permitted to comply with Section 25.2 instead of Section 25.6. [101:11.10.1.3]

25.6.1.3 Roof Covering Classification

Roof membranes shall have a roof covering classification, as required by the applicable building codes, when tested in accordance with ASTM E108, Standard Test Methods for Fire Tests of Roof Coverings, or UL 790, Test Methods for Fire Tests of Roof Coverings. [101:11.10.1.4]

25.6.1.4 Flame Propagation Performance

25.6.1.4.1

All membrane structure fabric shall meet the flame propagation performance criteria contained in Test Method 2 of NFPA 701. [101:11.10.1.5.1]

25.6.1.4.2

One of the following shall serve as evidence that the fabric materials have the required flame propagation performance:

The AHJ shall require a certificate or other evidence of acceptance by an organization acceptable to the AHJ.

The AHJ shall require a report of tests made by other inspection authorities or organizations acceptable to the AHJ.

[101::11.10.1.5.2]

25.6.1.4.3

Where required by the AHJ, confirmatory field tests shall be conducted using test specimens from the original material, which shall have been affixed at the time of manufacture to the exterior of the structure. [101:11.10.1.5.3]

25.6.2 Fire Hazards

25.6.2.1

The finished ground level enclosed by any temporary membrane structure, and the finished ground level for a reasonable distance but for not less than 10 ft (3050 mm) outside of such a structure, shall be cleared of all flammable or combustible material or vegetation that is not used for necessary support equipment. The clearing work shall be accomplished to the satisfaction of the AHJ prior to the erection of such a structure. The premises shall be kept free from such flammable or combustible materials during the period for which the premises are used by the public. [101:11.10.2.1]

25.6.2.2

Where prohibited by the AHJ, smoking shall not be permitted in any temporary membrane structure. [101:11.10.2.2]

25.6.3 Fire-Extinguishing Equipment

Portable fire-extinguishing equipment of approved types shall be furnished and maintained in temporary membrane structures in such quantity and in such locations as directed by the AHJ. [101:11.10.3]

25.6.4 Tensioned-Membrane Structures

25.6.4.1

The design, materials, and construction of the building shall be based on plans and specifications prepared by a licensed architect or engineer knowledgeable in tensioned-membrane construction. [101:11.10.4.1]

25.6.4.2

Material loads and strength shall be based on physical properties of the materials verified and certified by an approved testing laboratory. [101:11.10.4.2]

25.6.4.3

The membrane roof for structures in climates subject to freezing temperatures and ice buildup shall be composed of two layers separated by an air space through which heated air can be moved to guard against ice accumulation. As an alternative to the two layers, other approved methods that protect against ice accumulation shall be permitted. [101:11.10.4.3]

25.6.4.4

Roof drains shall be equipped with electrical elements to protect against ice buildup that can prevent the drains from functioning. Such heating elements shall be served by on-site standby electrical power in addition to the normal public service. As an alternative to such electrical elements, other approved methods that protect against ice accumulation shall be permitted. [101:11.10.4.4]

25.6.5 Air-Supported and Air-Inflated Structures

25.6.5.1 General

In addition to the general provisions of 25.6.1, the requirements of 25.6.5 shall apply to air-supported and air-inflated structures. [101:11.10.5.1]

25.6.5.2 Pressurization (Inflation) System

The pressurization system shall consist of one or more operating blower units. The system shall include automatic control of auxiliary blower units to maintain the required operating pressure. Such equipment shall meet the following requirements:

Blowers shall be powered by continuous-rated motors at the maximum power required.

Blowers shall have personnel protection, such as inlet screens and belt guards.

Blower systems shall be weather protected.

Blower systems shall be equipped with backdraft check dampers.

Not less than two blower units shall be provided, each of which has capacity to maintain full inflation pressure with normal leakage.

Blowers shall be designed to be incapable of overpressurization.

The auxiliary blower unit(s) shall operate automatically if there is any loss of internal pressure or if an operating blower unit becomes inoperative.

The design inflation pressure and the capacity of each blower system shall be certified by a professional engineer.

[101:11.10.5.2]

25.6.5.3 Standby Power System

25.6.5.3.1

A fully automatic standby power system shall be provided. The system shall be either an auxiliary engine generator set capable of running the blower system or a supplementary blower unit that is sized for 1 times the normal operating capacity and is powered by an internal combustion engine. [101:11.10.5.3.1]

25.6.5.3.2

The standby power system shall be fully automatic to ensure continuous inflation in the event of any failure of the primary power. The system shall be capable of operating continuously for a minimum of 4 hours. [101:11.10.5.3.2]

25.6.5.3.3

The sizing and capacity of the standby power system shall be certified by a professional engineer. [101:11.10.5.3.3]

25.6.6 Maintenance and Operation

25.6.6.1

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. [101:11.10.6.1]

25.6.6.2

Annual inspection and required maintenance of each structure shall be performed to ensure safety conditions. At least biennially, the inspection shall be performed by a professional engineer, registered architect, or individual certified by the manufacturer. [101:11.10.6.2]