NFPA No.

102

TENTS
GRANDSTANDS
AIR-SUPPORTED STRUCTURES
USED FOR PLACES OF ASSEMBLY
1967

Sixty Cents

NATIONAL FIRE PROTECTION ASSOCIATION
International
60 Batterymarch Street, Boston, Mass. 02110

5M-6-67-WP
Printed in U.S.A.

National Fire Protection Association
International

Official NFPA Definitions

Adopted Jan. 23, 1964. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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SHOULD is intended to indicate recommendations or that which is advised but not required.

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Units of Measurements

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters. One foot = 0.3048 meters. One inch = 25.40 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water. One pound = 453.6 grams.

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Standard for

Tents, Grandstands and Air-Supported Structures Used for Places of Assembly

NFPA No. 102 — 1967

1967 Edition of No. 102

This edition, adopted by the National Fire Protection Association on May 18, 1967, and by the Building Officials Conference of America, supersedes the edition of 1966.

Changes in the 1967 edition are in: 111, definition of places of Assembly, 441, 522, 531 and 532. New material is the definition of Air-Supported Structure, Section 6 and 771.

Committee on Tents, Grandstands and Air-Supported Structures

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SCOPE: To develop recommendations for the construction, location, protection and maintenance of tents, grandstands (including temporary, permanent, portable and foldable stands), and air-supported structures used for places of assembly, with respect to the hazards of fire, storm, collapse and panic. Exit and egress recommendations are to be coordinated with the NFPA Committee on Safety to Life.

Origin and Development of No. 102

This standard is the result of a committee project inaugurated shortly after the circus fire in Hartford, Conn., 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, 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, 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, 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 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 standards, Z20.2, thus making the continuance of the earlier separate standard unnecessary. The 1949 revisions, Z20.3, also make the standards applicable to foldable grandstands in buildings which 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 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.

Standard for
Tents, Grandstands and Air-Supported Structures Used for Places of Assembly

NFPA No. 102 — 1967

SECTION 1. SCOPE AND DEFINITIONS

11. Scope and Purpose.

111. This standard is concerned with the hazards of fire, storm, collapse, and panic, and covers the construction, location, protection and maintenance of tents and air-supported structures used for places of assembly; temporary, permanent and portable grandstands and bleachers; interior folding or telescopic seating normally used in gymnasiums, multi-use rooms and similar indoor mass seating as differentiated from grandstands and bleachers intended primarily to support persons for purposes of assembly for outdoor use.

12. Definitions.

ADMINISTRATIVE OFFICIAL means the executive officer, public official or other persons charged with the administration of matters covered by this standard.

AIR-SUPPORTED STRUCTURE means a shelter or structural element consisting of skin diaphragms which are made of a pliable material, but which achieves its structural shape, function and basic support by pretensioning from internal air pressure.

APPROVED refers to approval by the authority having jurisdiction in the enforcement or application of the standard.

BUILDING means a combination of materials to form a construction that is adapted to permanent or continuous occupancy; the term "building" shall be construed as if followed by the words "or part thereof".

GRANDSTAND means any structure, excepting (movable) folding and telescopic seating, sectional benches, seats and chairs as herein defined, intended primarily to support persons for purposes of assembly, but shall not apply to the permanent seating in theatres, churches, auditoriums and similar buildings. Where the term grandstand is preceded by an adjective denoting a material, it shall mean a grandstand the essential members of which exclusive of seating, are of the material designated.

MAINTENANCE means the operation care, upkeep and repair necessary to insure, through periodic inspection, the preservation of the safety factors originally provided for in the requirements of this standard.

OWNER means any person, firm, corporation, association, or governmental subdivision owning or controlling property and legally liable for the use thereof.

PLACE OF ASSEMBLY means all premises used or intended to be used for gatherings of persons other than buildings and other structures in which public safety is covered by building codes or other codes governing permanent buildings.

PORTABLE GRANDSTAND OR BLEACHER means an assembly of prefabricated units, readily erected, dismantled and transported, and used or intended for use as movable or temporary support of persons.

SEATS AND CHAIRS (MOVABLE SEATING) means any form of seating which is not a fixed part of a structure or attached to the surface on which it rests and which is set out on the same floor or ground level.

SEATING means foldable or telescopic seating, an assembly of prefabricated units, used to provide seating which can readily be folded, rolled or telescoped into a comparatively small space when not in use, without being dismantled, and can readily be extended for use as support for spectators.

TENT means a shelter or structure, the covering of which is made of a pliable material which achieves its sole support by mechanical means such as beams, columns, poles, arches and/or cables.

SECTION 2. GENERAL REQUIREMENTS

21. Capacity.

211. The number of persons admitted to any place of outdoor assembly shall not exceed the capacity as computed in accordance with the provisions of this section.

212. The capacity of any structure or enclosure for outdoor assembly shall be the number of fixed seats plus an allowance of one person for each 6 square feet of floor or ground area designated or used as standing space, or for (movable seat) seats or chairs. A distance of 18 inches shall constitute one seat in computing capacity. For determining the seating capacity of interior folding and telescopic seating, the width of any seat shall be not less than 18 inches. The floor area of stairways, ramps, aisles, passageways or spaces within such structures or enclosures used for access or circulation shall not be considered in computing the capacity of a place of assembly, and shall not be used for seats or for standing room.

22. Accessibility to Public Ways.

221. All places of outdoor assembly shall have at all times ample and unrestricted access to public ways of approach from at least two points remote from each other. An available park, field or open space approved as an area of refuge may be used in lieu of one means of access to a public way.

23. Design Standards.

222. The materials, design, fabrication, and construction of structures or devices included within the scope of this standard shall comply with approved construction standards for safety to life and property. Where no specific standards are prescribed, conformity with the following applicable standards shall be deemed as compliance with approved standards for safety to persons and property.

a. ALUMINUM. Specifications for Structures of Aluminum Alloys, Aluminum Construction Manual. — 1963 Section A, The Aluminum Association.

b. CONCRETE. American Standard Building Code Requirements for Re-inforced Concrete, AC1 318; USAS A89.1-1963.

c. MASONRY. American Standard Building Code Requirements for Masonry, USAS A41.1-1953.

d. STEEL. Specification for the Design of Light Gage Cold-formed Steel Structural Members — 1962, American Iron and Steel

Institute. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings — 1963, American Institute of Steel Construction. Standard Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses, ASTM A120-1965.

e. WOOD. National Design Specifications for Stress-Grade Lumber and Its Fastenings — National Forest Products Association.

f. MEANS OF EGRESS. Life Safety Code, NFPA No. 101-1967, National Fire Protection Association.

g. ELECTRIC WIRING AND APPARATUS. National Electrical Code USAS C1-1965.

h. ELEVATORS AND MOVING STAIRWAYS. USA Standard Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks, USAS A17.1-1965.

SECTION 3. GRANDSTANDS

31. Location.

311. No grandstand shall be erected on the roof of any building or structure unless such building or structure is of adequate strength to support safely the additional loads.

32. Separation.

321. No outdoor wood grandstand shall be erected within less than two-thirds of its height but in no case less than 10 feet of a building unless the separation from such building be of not less than 1-hour fire resistance and have any openings therein protected against the fire exposure hazard created by the grandstand or unless a protection of not less than 1-hour fire resistance is interposed between such grandstand and building.

322. No wood grandstand unit shall exceed 10,000 square feet in ground area or 200 feet in length. (A unit whose total area, or length, does not exceed the above may be made up on one or more sections.) Grandstand units shall be placed not less than 20 feet apart or shall be separated by walls of 1-hour fire resistance. Not more than 3 such units shall be erected in any one group. Each such group shall be separated from any other group by a wall of 2-hour fire resistive construction extending 2 feet above the seat platforms or by an open space not less than 50 feet, or by noncombustible construction of not less than 50 feet in length, fire-stopped at each end with walls of 1-hour fire resistive construction extending 2 feet above the seat platforms. If the grandstand units are made of fire retardant treated lumber treated in accordance with standard practice, the permitted areas and lengths may be doubled. The administrative official may accept a recognized label or certificate of a manufacturer or processor as evidence that the wood is treated in accordance with standard practice.

323. The highest level of seat platforms of any wood grandstand shall be not more than 20 feet, and of portable grandstands within tents or air supported structures not more than 12 feet, above the ground or the surface at the front of the grandstand.

33. Loads.

331. Grandstands shall be designed to support, in addition to their own weight, a uniformly distributed live load of not less than 100 pounds per square foot of gross horizontal projection of the grandstand. All seats and footboard members shall be designed for live loads of not less than 120 pounds per linear foot.

332. Grandstands shall be designed to resist, with or without live load, a horizontal wind load of 30 pounds per square foot of all vertical projections of the stands.

333. Grandstands shall be designed to resist a horizontal swaying force applied to the seats in a direction parallel to the length of the seats, of 24 pounds per linear foot of seats, and in a direction perpendicular to the length of the seats, of 10 pounds per linear foot of seats.

334. Members in which the stresses are greater under a partial loading of the grandstand than under full load shall be designed to meet the conditions causing the largest stress.

34. Design.

341. Grandstands shall conform to the requirements of 23, Design Standards, and their design shall be in accordance with accepted engineering practice, and shall admit of analysis in accordance with principles of mechanics. When due to the complexity of a structure or a part thereof, it is determined that an analysis in accordance with principles of mechanics would be so involved, and assumptions so uncertain that results become questionable, load tests as accepted practice may be made in lieu of the design analysis.

342. A grandstand shall be so designed and assembled that the maximum expansion, contraction, settlement, or misalignment likely to occur will not cause stresses in excess of those permissible, nor jeopardize the structure or its occupants. It shall be of such design as to remain stable, so as not to be overturned either by wind or by unequal distribution of live load. It shall not be used for public occupancy unless all parts have been erected, or re-erected, in accordance with the approved design and specifications. Members comprising the seating, walkways, railings, bracing, and supporting members shall be structurally sound.

343. Grandstands of materials not otherwise provided for in 23, Design Standards, shall be so designed and proportioned that their stresses shall not exceed the allowable stresses generally accepted as safe by engineering practice.

35. Portable Grandstands — Special Requirements.

351. Portable grandstands shall conform to the requirements of Section 3, Grandstands, and to the following special requirements.

352. Portable grandstands shall be self-contained, having within themselves all necessary parts to withstand and restrain all forces

which might be developed during human occupancy. They shall be so designed and manufactured 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 will make the omissions self-evident. The workmanship shall be of such quality as to produce in construction the strength required by the design.

353. Portable grandstands shall be provided with base plates, sills, floor runners, or sleepers of such area that the total live and dead load exerted under any of these shall not exceed 55 psi. When portable grandstands rest directly on earth of such character as to be 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. All bearing surfaces shall be in contact.

354. A-frames, or other supports, and seat stringers for portable grandstands shall be secured to prevent accidental displacement during occupancy.

355. Field connections to wood members shall be by means of rivets, bolts, approved connectors, friction or other devices, or lag screws. The use of nails, lag screws and woodscrews is permissible for holding wood parts together, except that these shall not be used for demountable joinings, nor shall these be used where their loosening or splitting of surrounding wood would jeopardize the structure or its occupants. Members in tension shall be connected at each end by means of not less than 2 bolts, rivets or lag screws, or by approved connectors, or other approved devices. Adequate provision shall be made to prevent the splitting or shearing of wood at such connections.

36. Aisles.

361. Any grandstand having seats with backs or a railing or guard along the front shall be provided with aisles so located that no seat in a row shall have more than 16 seats between it and the nearest aisle, provided that in any grandstand within a tent or an air-supported structure building no seat in a row shall have more than 11 seats between it and the nearest aisle.

362. Aisles provided in compliance with 361 shall be of not less than 40 inches clear width except that:

a. Aisles in portable grandstands or bleachers without canopy, roof, or cover, or in grandstands of steel, concrete or masonry, or combination thereof, which have a closed noncombustible deck under the seating, may be not less than 36 inches, and

b. Aisles serving not more than 60 seats may be of 24 inches clear width. Where an aisle is divided by a portal, column or other obstruction, each part shall be not less than 24 inches wide. Where the entrance to an aisle is elevated above the ground level, such aisle shall be provided with a stairway, or ramp, whose width is not less than the width of the aisle.

363. Steps shall not be placed in aisles to overcome difference in level unless the gradient shall exceed one foot in 10 feet of run. When the rise of seating platform exceeds 11 inches an intermediate step shall be provided the full width of the aisles and so proportioned as to provide two steps of equal rise per platform. When the rise of the seating platform exceeds 18 inches, two intermediate steps shall be provided the full width of the aisles and so proportioned as to provide three steps of equal rise per platform.

364. Trailer-mounted seating on noncombustible decking not exceeding 300 capacity each shall provide aisles or stairways not less than 36 inches in width.

365. The usual line of travel, from any seat to the nearest exit on the seating area, shall be not greater than 150 feet.

37. Seating.

371. The horizontal distance back to back of seats shall be not less than 30 inches for seats having back rests or not less than 22 inches for portable grandstands or bleachers without back rests. Where the same level is used for both seats and footrests these levels shall be not less than 22 inches in width. There shall be a space of not less than 12 inches between the back of each seat and the front of the seat immediately behind it. All measurements shall be taken between plumb lines.

372. The width of footboards (footrests) in grandstands shall be not less than 9½ inches and that of seat board not less than 7½ inches. Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided.

373. Seats and footrests of grandstands shall be securely supported and fastened in such manner that they cannot be displaced inadvertently.

374. Individual seats or chairs shall be permitted only if firmly secured in rows in an approved manner, except that seats if not more than 16 in number, on level floors, and within railed-in enclosures, such as boxes, need not be fastened.

375. Spaces underneath grandstands shall be kept free of extraneous flammable materials and shall not be occupied for other than protective or exit purposes, except that such space as is enclosed with constructions surfaced with noncombustible materials and having not less than ¾-hour fire resistance may be used for other purposes as approved by the administrative official. A fully enclosed portable ticket booth or similar portable structure of unprotected noncombustible construction throughout and not over 100 square feet in area may be located under a grandstand as approved by the administrative official.

38. Railings or Guards.

381. Railings or guards not less than 42 inches high above the aisle surface or footrest or 36 inches vertically above the center of the 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 four feet above the ground. Where the front footrest of any grandstand is more than 2 feet above the ground, railings or guards not less than 33 inches high above such front footrests shall be provided. Openings between the top railing or guard and walkway surface below, if more than 18 inches in height, shall be not more than 11 inches wide. Railings or guards shall be capable of sustaining a vertical load of 100 pounds per linear foot and a horizontal thrust of 50 pounds per linear foot acting outwardly at the top rail. When grandstands are used adjacent to a wall or fence, railings or guards may be omitted from those portions where such wall or fence affords equivalent safeguard.

39. Movable Seating — Seats or Chairs

391. Seats or chairs shall not be used in permanent or temporary grandstands except as provided in 371, but may be used in places of outdoor assembly when placed upon the ground, or upon the level floor of a structure which shall be enclosed, railed, or otherwise safeguarded. The arrangement of such seats or chairs shall conform to 36, Aisles, and 37, Seating.

SECTION 4. FOLDING AND TELESCOPIC SEATING

41. Location.

411. No folding and telescopic seating shall be erected in any building or structure unless such building or structure is of adequate strength, and the building exits are adequate to support safely the seating load, and there are adequate building exit facilities to accommodate the occupants of the seating as well as all other occupants of the room, and/or building.

42. Loads.

421. The minimum unit live load for folding and telescopic seating shall be 100 pounds per square foot of horizontal projection for the structure as a whole. Seat-rests and footrests shall be designed for a live load of 120 pounds per linear foot. A sway force, applied to seats shall be 24 pounds per linear foot parallel to the seats, and 10 pounds per linear foot perpendicular to the seats. Guard rails, posts and supports shall be designed for 25 pounds per foot acting outward at the top rail. The intermediate barrier of the guard rail shall be designed for 25 pounds per foot acting outward. Each of these horizontal forces need not be applied simultaneously with other lateral forces such as seismic loads. Folding and telescopic seating which is not wall attached shall be stable against overturning when being operated, and when in a closed position.

422. Stresses permitted in the design standards of the various materials may be increased 33⅓ per cent due to sway loads or by a combination of sway loads and vertical loads provided that no such increases shall be allowed for stresses due to vertical loads acting alone.

43. Design

431. Folding and telescopic seating shall conform to the requirements of 23, Design Standards, and their design shall be in accordance with accepted engineering practice, and shall admit of analysis in accordance with principles of mechanics and shall be so certified to by the manufacturer. When due to the complexity of a structure, or a part thereof, it is determined that an analysis in accordance with the principles of mechanics would be so involved, and assumptions so uncertain that results become questionable, load tests as accepted practice may be made in lieu of the design analysis. Structural design shall consider the stresses in all members due to all of the loadings indicated in 42, Loads, with particular attention to the following:

a. Vertical dead load and live load.

b. Sway load parallel with the seat rests.

c. Sway load to the front and sway load to the rear.

d. Wall attachments.

e. For movable and reverse fold and forward fold folding and telescopic seating, stability against overturning forward or backward during normal operation or in any condition of intended use.

f. Partial loading conditions.

44. Fabrication and Installation.

441. Steel fabrication and installation shall be in accordance with the 1963 edition of the American Institute of Steel Construction, Specification for the Design, Fabrication and Erection of Structural Steel for Buildings or in accordance with the 1962 edition of Specification for the Design of Light Gage Cold-Formed Steel Structural Members of the American Iron and Steel Institute as applicable.

442. Design and installation drawings shall be approved prior to installation and seating shall be installed in conformance therewith. This data shall include the following:

a. Conformance with approved designs. This may be by reference to approved standard drawings with any variables applicable to the job noted.

b. Location of the folding and telescopic seating units in the building and details of attachments, if any, to the structure.

c. Location of guard rails and details thereof.

443. The building owner or the owner of the structure, or his representative shall file with the Administrative Official evidence of the following:

a. The adequacy of the building exit facilities to accommodate the occupants of the seating as well as all other occupants of the room and/or building.

b. Structural ability of the building to support the folding and telescopic seating dead loads closed and open, and also to support the dead loads and live loads when open (or partially open).

45. Aisles.

451. Aisles shall comply with 361, 362 and 365.

46. Seating.

461. Seating shall comply with 37, Seating.

47. Railings or Guards.

471. Railing and guards shall comply with 38, Railings or Guards, except that loads shall comply with 421.

48. Maintenance and Operation.

481. Maintenance and operation of folding and telescopic seating shall be the responsibility of the owner after proper instructions in accordance with the following have been transmitted to him by the manufacturer of the seating, or his representative.

a. Instructions in both the maintenance and operation should be given to the owner or to his representative who is responsible for the maintenance and operation of the seating.

b. During operation of the folding and telescopic seats, the opening and closing should be supervised by responsible personnel who will assure that the operation is in accordance with the manufacturers instructions.

c. No attachment not specifically approved by the manufacturer for the specific installation shall be attached to the seating.

d. An inspection should be made semiannually of all bolts and nuts and other fasteners and of all members, for proper alignment and operation.

SECTION 5. TENTS.

51. Location.

511. No tent or tents shall be erected to cover more than 75 per cent of the premises; nor shall any tent be erected closer than 10 feet to other structures except as hereinafter provided. Stake lines of adjacent tents shall be sufficiently distant from each other to provide an area to be used as a means of emergency egress.

512. Concession or other tents not occupied by the public need not be separated from each other and may be erected less than 10 feet from other structures only if the administrative official deems such closer spacing safe from hazard to the public.

513. Tents, each not exceeding 1,200 square feet in ground area, located on fair grounds or similar open spaces need not be separated from each other, provided safety precautions meeting the approval of the administrative official are taken.

52. Structural Requirements.

521. All supporting members shall be of sufficient size and strength to support the structure.

522. Tents shall be adequately guyed, supported and braced to withstand a wind pressure or suction of 10 pounds per square foot. The poles and their supporting guys, stays, stakes, fastenings, etc., shall be of sufficient strength and attached so as to resist wind pressure of 20 pounds per square foot of projected area of the tent.

NOTE: Pull-down ropes on center poles and side poles on push pole tents should be provided.

53. Flame Resistance

531. All tents occupied for assembly, or in which animals are stabled, or those located within that portion of the premises used by the public; and all tents in places of assembly in or about which any devices using fuel are operated, and all tarpaulins and decorative materials used in connection with any of these, shall meet the appropriate requirements for resistance to fire prescribed in the Standard for Flame-Resistant Textiles and Films, NFPA No. 701 — 1966. Safety nets shall be exempt from the above requirements for resistance to fire.

532. The Administrative Official shall

a. require a certificate or other evidence of approval by a laboratory of recognized standing, or

b. he may accept the report of tests made by other inspection authorities or a recognized testing laboratory as evidence that the tents, tarpaulins and decorations have the required resistance to fire. He may also wish to make confirmatory field tests by either of the two small scale methods recommended in NFPA No. 701.

c. Confirmatory field tests shall be made using test specimen from the original material affixed at the time of manufacture to the exterior of the tent. The test specimen shall consist of a full width of material which has been cut into test strips 2¾ inches by 8 inches.

54. Fire Hazards.

541. Tents shall conform to the general requirements of Section 8, Fire Protection, and to the following special requirements.

542. The ground enclosed by any tent used in connection with a place of outdoor assembly, and for a reasonable distance but not less than 10 feet outside of such structure or structures, shall be cleared of all flammable material or vegetation which will carry fire. This work shall be accomplished to the satisfaction of the administrative official prior to the erection of such structure or structures. The premises shall be kept free from such flammable materials during the period for which the premises are used by the public.

543. No hay, straw, shavings or similar combustible materials other than that necessary for the current feeding and care of animals shall be permitted within any tent used for public assembly except that sawdust and shavings may be used if kept damp.

544. No smoking, fireworks, or unapproved open flame of any kind shall be permitted in any tent while occupied by the public. "No smoking" signs shall be conspicuously posted in any tent open to the public.

545. Tents shall not be used for the display of motion pictures unless safety film is used.

SECTION 6. AIR-SUPPORTED STRUCTURES

61. Design and Construction.

611. Design and construction of the fabric envelope and the method of anchoring the air-supported structure shall be in accordance with the Minimum Standards for Air-Supported Structures, 1961, published by the Air Structures Manufacturers and Suppliers Association.

62. Location.

621. No air-supported structure shall be erected to cover more than 75 per cent of the premises; nor shall any air-supported structure be erected closer than 10 feet to other structures except as hereinafter provided. Adjacent air-supported structures shall be sufficiently distant from each other to provide an area to be used as a means of emergency egress.

622. Concession or other air-supported structures not occupied by the public need not be separated from each other and may be erected less than 10 feet from other structures only if the administrative official deems such closer spacing safe from hazard to the public.

63. Pressurization (Inflation) System.

631. The inflation differential pressure of the structure shall be adequate to withstand a minimum wind velocity of 60 mph. To satisfy this requirement an inflation differential pressure of 1.0 inch of water is required for structures having a semicircular cross section or less.

632. The pressurization system shall consist of one or more centrifugal blowers, as follows:

a. All blowers shall be powered by continuous rated motors (at the maximum power required for any flow condition).

b. All blowers shall have adequate personnel protection, such as inlet screens and belt guards (if belt driven).

c. All blowers shall be weather protected if external to the structure to assure continued service in all weather conditions.

d. All blowers shall be equipped with back draft check dampers.

e. Any air-supported structure used as a place of outdoor assembly shall be furnished with not less than two blowers, each of which has adequate capacity to maintain full inflation pressure with normal leakage.

f. The design of the blower should be so as to provide integral limiting pressure at the design pressure.

64. Emergency Power System.

641. Places of public assembly for more than 200 persons shall be furnished with either a fully automatic auxiliary engine-generator set capable of powering one blower continuously for four hours, or a supplementary blower powered by an internal combustion engine (also automatic) unless an auxiliary power line is available from a supplementary electric source.

65. Flame Resistance

651. All air-supported structures occupied for assembly or in which animals are stabled or those located within that portion of the premises used by the public; and all air-supported structures in places of outdoor assembly in or about which any devices using fuel are operated and all tarpaulins and decorative materials used in connection with any of these, shall meet the appropriate requirements for resistance to fire prescribed in the Standard for Flame Resistant Textile and Films, NFPA No. 701 — 1966.

652. The Administrative Official shall

a. require a certificate or other evidence of approval by a laboratory of recognized standing or

b. he may accept the report of tests made by other inspection authorities or a recognized testing laboratory as evidence that the tents, tarpaulins and decorations have the required resistance to fire. He may also wish to make confirmatory field tests by either of the two small scale methods recommended in NFPA No. 701 — 1966.

c. Confirmatory field tests shall be made using test specimen from the original material affixed at the time of manufacture to the exterior of the tent. The test specimen shall consist of a full width of material which has been cut into test strips 2¾ inches by 8 inches.

NOTE: Appropriate requirements of NFPA No. 701 for the fabric of air supported structures are the small scale test (22), the large scale test in single sheets (23) and the small scale test following accelerated weathering (46).

66. Fire Hazards

661. Air-supported structures shall conform to the general requirements of Section 8, Fire Protection, and to the following special requirements.

662. The ground enclosed by any air-supported structure used in connection with a place of assembly, and for a reasonable distance

but not less than 10 feet outside of such structure or structures, shall be cleared of all flammable material or vegetation which will carry fire. This work shall be accomplished to the satisfaction of the administrative official prior to the erection of such structure or structures. The premises shall be kept free from such flammable materials during the period for which the premises are used by the public.

663. No hay, straw, shavings or similar combustible materials other than that necessary for the current feeding and care of animals shall be permitted within any air-supported structure used for public assembly except that sawdust and shavings may be used if kept damp.

664. No smoking, fireworks, or unapproved open flame of any kind shall be permitted in any air-supported structure while occupied by the public. No Smoking signs shall be conspicuously posted in any air-supported structure open to the public.

665. Air-supported structures shall not be used for the display of motion pictures unless safety film is used.

67. Exits.

671. Exit doors shall swing in the direction of exit travel.

NOTE: To avoid hazardous air and pressure loss, all such doors should be automatically closing against normal operating pressures. Opening force at the door edge should not exceed 15 pounds with the structure at any operational pressure (zero to full differential).

SECTION 7. WAYS OF EGRESS.

71. Number of Exits.

711. Every structure used as a place of outdoor assembly, and every balcony or tier thereof considered separately, shall be provided with at least two exits as remote from each other as practicable and leading directly to the outside. If the capacity of such structure, balcony or tier thereof exceeds 1,000 there shall be at least three, and if the capacity exceeds 4,000 there shall be at least four exits, provided that in tents if the capacity exceeds 600 there shall be at least three, and if the capacity exceeds 1,000 there shall be at least four exits.

712. A fenced place of outdoor assembly shall have at least two exits from the enclosure. If more than 6,000 persons are to be served by such exits, there shall be at least three, and if more than 9,000 there shall be at least four exits. Exits shall be distributed as uniformly as practicable for exit purposes.

72. Distance to an Exit.

721. The line of travel to an exit or to an entrance to an exitway shall be not greater than 150 feet, except that in tents the line of travel to an exit shall be not greater than 150 feet.

73. Doorways, Stairways and Ramps.

731. The aggregate clear width of doorways, stairways, or ramps serving as required exits from structures used as places of outdoor assembly shall be determined on a basis of not less than one unit of 22 inches width for each 100 persons to be accommodated, provided that for grandstands of the types described in 362 such aggregate width may be determined on a basis of not less than one unit of 22 inches width for each 500 persons to be accommodated.

732. The aggregate clear width of doorways serving as exits from the enclosure of a fenced place of outdoor assembly shall be determined on a basis of not less than one unit of 22 inches width for each 100 persons to be accommodated, provided that if the enclosure has within it an easily accessible open space or spaces which provide refuge, or if such exits serve grandstands of the types described in 362, the aggregate width may be determined on a basis

of not less than one unit of 22 inches width for each 500 persons to be accommodated.

733. Doorways serving as required exits from stairways, ramps or passageways shall be not less than 36 inches in clear width, nor less in width than the required width of the exitway served except that the net width of such doorways may be 2 inches less in width for each unit of width of the exitway.

734. In computing exit width, credit for fractions of units shall not be allowed except that a credit of one-half unit shall be allowed for 12 inches of clear width added to one or more 22-inch units of width.

735. Except as provided in 36. Aisles, required stairways and ramps shall have a width of not less than 44 inches. Moving stairways may be considered the equivalent of stairways in computing exit capacity.

74. Aisles and Passageways.

741. Within any structure used as a place of outdoor assembly where there is not direct access to exits, safe and continuous aisles, passageways, spaces, or corridors leading directly to exits and so arranged as to be conveniently accessible to every occupant, shall be maintained at all times on all floors, tiers, or balconies of such structures.

742. The aggregate width of aisles, passageways, spaces or corridors serving an exit shall be at least equal to the required width of the exit. Where several ways lead to an exit, each shall have a width suitable for the traffic but not less than 36 inches unless otherwise provided herein.

743. Aisles in grandstands shall conform to the requirements of Section 3 Grandstands.

744. Within any tent, aisles from grandstands or other seating arrangements that do not lead directly to an exit shall discharge into an unobstructed space leading directly to one or more exits, and so arranged as to be conveniently accessible to every occupant; and such space shall have a clear width not less than the required width of the exit to which it leads, but in no case less than 5 feet.

745. If required exits from places of outdoor assembly do not discharge directly into a street or open space leading to a street, unobstructed lanes not less than 20 feet in width shall be maintained from such exits to the street at all times while such places of outdoor assembly are occupied by the public.

75. Unobstructed Means of Egress.

751. No aisle, passageway, stair, door or other way of ingress or egress in any place of outdoor assembly shall be obstructed in any manner while such place of outdoor assembly is occupied by the public. No tent stake, guy wire, or guy rope shall be permitted in any aisle or in any other way of ingress or egress, nor shall any guy wire or guy rope cross any aisle or other way of ingress or egress at a height of less than 7 feet. Tent stakes adjacent to any way of ingress or egress to any tent open to the public shall be railed off, capped, or covered in such manner as not to present a hazard to the public.

76. Exit Lighting and Signs.

761. Exits, and aisles and passageways leading to them, in structures used as places of outdoor assembly shall be kept adequately lighted at all times when such structures are occupied by the public. Artificial light shall be provided whenever natural light is inadequate. (Lighting conforming to the requirements of Sections 5-10 and 5-11 of the Life Safety Code (NFPA No. 101-1967) will be considered adequate.)

762. Exit doorways in structures used as places of outdoor assembly shall be adequately indicated; and in structures having a capacity of 200 persons or more there shall be placed over each doorway or opening to be used for egress a sign with the word EXIT in plainly legible letters not less than 6 inches high, and with the principal strokes of such letters not less than ¾ inch in width.

763. Exit signs shall be adequately illuminated by a reliable light source at all times when the structure is occupied by the public.

764. Where necessary, suitable directional signs shall be displayed in a conspicuous location to indicate the proper direction of egress.

77. Exits from Air-Supported Structures.

771. In addition to compliance with the applicable requirements of Section 7, 67. Exits, shall apply.

SECTION 8. FIRE PROTECTION.

81. Electrical Installations.

811. Except as otherwise provided by law, ordinance or regulation, electrical installations shall conform to the requirements of the National Electrical Code, as approved by the United States of America Standards Institute.

812. The electrical system shall be installed, maintained, and operated in a safe and workmanlike manner. If portable, it shall be inspected daily when in use by a qualified person representing the owner and any defects found shall be corrected before the public is admitted to the show or performance involved.

813. 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.

82. Storage and Handling of Flammable Liquids and Gases.

821. Storage and handling of flammable liquids or gases shall be in accordance with recognized safe practices. Compliance with the standards of the National Fire Protection Association shall be considered as evidence of safe practice. No storage or handling of flammable liquids or gases shall be permitted at any location at which it would jeopardize egress from the structure. Refueling of equipment with liquids with flash points below 100°F shall be permitted only with safety containers of approved type.

83. Police and Fire Detail.

831. Police and fire details, if deemed necessary in any place of outdoor assembly, shall be determined by the administrative official.

84. Fire Extinguishing Equipment.

841. Fire extinguishing equipment of approved types shall be furnished by the person operating, conducting, or promoting any place of outdoor assembly in such amount and in such locations as may be directed by the administrative official. Such fire extinguishing equipment shall be maintained in good working order and shall be operated by employees of such place of outdoor assembly who shall be properly trained for the purpose, and who shall be required to exhibit their skill on order of the administrative official. This equipment shall be maintained in such locations as may be directed by the administrative official, who may also direct the installation of