

NFPA 102
Standard for
Grandstands, Folding
and Telescopic Seating,
Tents, and
Membrane Structures
1995 Edition



National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

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5-2.4 Design Loads.

5-2.4.1 Folding and telescopic seating shall be designed to support, in addition to its own weight and the weight of added accessories, a uniformly distributed live load of not less than 100 lb/ft² (488 kg/m²) of gross horizontal projection.

5-2.4.2 Seat boards and footrests shall be designed for a live load of not less than 120 lb/linear ft (179 kg/linear m).

5-2.4.3 A sway force applied to seats shall be 24 lb/linear ft (36 kg/linear m) parallel to the seats and 10 lb/linear ft (15 kg/linear m) perpendicular to the seats. Sway forces shall not be required to be applied simultaneously.

5-2.4.4 Handrails shall be designed and constructed for:

- (a) A concentrated load of 200 lb (91 kg) applied at any point and in any direction, and
- (b) A uniform load of 50 lb/ft (74 kg/m) applied in any direction.

The concentrated and uniform loading conditions shall not be required to be applied simultaneously.

5-2.4.5 Guards shall be designed and constructed for:

- (a) A concentrated load of 200 lb (91 kg) applied at any point and in any direction along the top railing member, and
- (b) A uniform load of 50 lb/ft (74 kg/m) applied horizontally at the required guardrail height and a simultaneous uniform load of 100 lb/ft (149 kg/m) applied vertically downward at the top of the guardrail.

The concentrated and uniform loading conditions shall not be required to be applied simultaneously.

5-2.4.6 Each of the horizontal forces in 5-2.4.3, 5-2.4.4, and 5-2.4.5 shall not be required to be applied simultaneously with other lateral forces such as wind or seismic loads.

5-2.4.7 Stresses permitted in the design standards of the various materials shall be permitted to be increased 33 1/3 percent due to sway or wind loads or by a combination of sway or wind loads and vertical loads, provided that no such increases shall be allowed for stresses due to vertical loads acting alone.

5-2.5 Structural design shall consider the stresses in all members due to all of the loadings indicated in 5-2.4, with particular attention to the following:

- (a) Vertical dead load and live load,
- (b) Wind loads,
- (c) Sway load parallel with the seats,
- (d) Sway load to the front and sway load to the rear,
- (e) Wall attachments,
- (f) Partial loading conditions,

(g) For movable, 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, when operated in accordance with the manufacturer's operating instructions.

5-2.6 All design criteria shall be met when the seating is in each configuration intended for occupancy.

NEW CENTURY DESIGN™ IMPROVEMENT TO 5-2.6 AS FOLLOWS:

All design criteria shall be met when the seating is in each configuration intended or unintended for occupancy and the additional vertical support will be located as close to the leading edge (riser) as possible. The vertical support will be continuous and uninterrupted during operation.

5-3 Review and Approval.

5-3.1 Design and installation drawings shall be approved prior to installation, and seating shall be installed in conformance therewith. These data shall include the following:

- (a) Conformance with approved designs; this shall be permitted to be by reference to approved standard drawings with any variables applicable to the job noted;
- (b) Location of the folding or telescopic seating units and details of attachments, if any;
- (c) Location of guards and details thereof.

5-3.2 The owner, or his duly authorized representative, shall file with the authority having jurisdiction evidence of the following:

- (a) The adequacy of means of egress to accommodate the occupants of the seating as well as all other occupants, based on *NFPA 101, Life Safety Code*;
- (b) Structural ability 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.

5-4 Seating.

5-4.1 The horizontal distance back-to-back of seats shall be not less than 22 in. (55.9 cm) for seats without backs. There shall be a space of not less than 12 in. (30.5 cm) 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. (30.5-cm) 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.

5-4.2 The depth of footboards (footrests) and seat boards in folding and telescopic seating shall be not less than 9 in. (22.9 cm). Where the same level is not used for both seat foundations and footrests, footrests independent of seats shall be provided.

5-4.3 Individual chair-type seats shall be permitted in folding and telescopic seating only if firmly secured in groups of not less than three.

5-4.4 Any opening between the seat board and footboard that is located more than 30 in. (76 cm) above grade shall be provided with intermediate construction such that a 4-in. (10.2-cm) diameter sphere cannot pass.

5-5 Guards and Rails.

5-5.1 Railings or guards not less than 42 in. (107 cm) high above the aisle surface or footrest or 36 in. (91 cm) 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 4 ft (1.2 m) above the floor.

Exception: Where the front row of seats includes backrests, the rails shall be not less than 26 in. (66 cm) high.

5-5.3 Rails 42 in. (107 cm) high shall be located at the foot of each aisle that extends to the front of such folding or telescopic seating and along the front of any cross aisle located at the front of the seating where the foot of the aisle or the cross aisle is more than 30 in. (76 cm) above grade.

5-5.4 Cross aisles located within the seating area shall be provided with rails not less than 26 in. (66 cm) high along the front edge of the aisle.

Exception: Where the backs of the seats in front of the cross aisle project 24 in. (61 cm) or more above the surface of the cross aisle, this rail shall not be required.

5-5.5 Vertical openings between guardrails and footboards or seat boards shall prevent the passage of a 4-in. (10.2-cm) diameter sphere.

5-6 Maintenance and Operation.

5-6.1 Instructions in both maintenance and operation shall be transmitted to the owner by the manufacturer of the seating or his or her representative.

5-6.2 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:

(a) During operation of the folding and telescopic seats, the opening and closing shall be supervised by responsible personnel who will ensure that the operation is in accordance with the manufacturer's instructions.

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

(c) 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 or qualified service personnel.

The Bleacherman recommends making a few changes to the NFPA 102 Standard -- adding just these few words makes all the difference between bleachers that sag, and bleachers that will never sag.

1.06 Design Criteria

- A. Folding and Telescopic Gymnasium Seating shall be designed to support, in addition to its own weight the following:
 - 1. Seats and decking to resist live load of 120 lbs. per lineal foot
 - 2. Uniformly disrupted live load of not less than 100 lbs. per sq. ft. of gross horizontal projection must be applied in any configuration. Live load is not required to be simultaneously applied to the intermediate rows in the closed position.
- B. A parallel sway load in excess of 24 lbs. per lineal foot of row.
- C. A perpendicular sway load of 10 lbs. per lineal foot of row.
- D. Guard and hand railing, post and supports:
- E. Engineered to withstand the following forces applied separately.
- F. Guard Rail shall be designed and constructed for:
 - 1. A concentrated load of 200 lbs. applied at any point and in any direction along top rail.
 - 2. A uniform load of 50 lbs. per foot applied horizontally at the required guardrail height and simultaneous uniform load of 100 lbs. per foot applied vertically downward at any top of guardrail. The concentrated and uniform loading conditions shall not be required to be applied simultaneously.
- G. American Institute of Steel Construction (AISC), American Iron and Steel Institute (AISA) and Aluminum Association (AA) design criteria shall be the basis for calculation of member sizes and connections.
- H. Wood members shall be designed in accordance with National Forest Products Association's (NFOPA) National Design Specification for Wood Construction.
- I. Southern Pine Inspection Bureau (SPIB): Standard Grading Rules for Southern Pine.
- J. National Bureau of Standards/Products Standard (NSB/PS): Construction and Industrial Plywood.
- K. All design criteria shall be met when the seating is in each configuration intended or unintended for occupancy.
- L. Accessibility codes Americans with Disability Architectural guidelines (ADAAG).