

**CHAPTER 15. GRANDSTANDS****GENERAL PROVISIONS**

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**Authority**

The provisions of this Chapter 15 issued under act of April 27, 1927 (P. L. 465, No. 299) (35 P. S. §§ 1221—1235.1), unless otherwise noted.

**Source**

The provisions of this Chapter 15 adopted August 15, 1933; amended through July 1, 1968, unless otherwise noted.

**GENERAL PROVISIONS****§ 15.1. Definitions.**

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

*Foldable grandstand*—An assembly of prefabricated units used to produce a grandstand which may be readily folded, rolled or telescoped into a small space when not in use, and easily extended for use as support for audiences.

*Grandstand*—A structure, including bleachers, intended primarily to support persons attending athletic events, parades, concerts or other types of assembly, including permanent seating in theatres, churches, auditoriums and similar buildings.

*Permanent grandstand*—A grandstand, other than a portable or foldable grandstand, permanently erected upon and attached to concrete or masonry footings.

*Portable grandstand*—An assembly of prefabricated units able to be readily erected, dismantled and transported on base plates, sills, floor runners or sleepers.

*Steel grandstand*—A grandstand, the majority of whose main structural members, such as columns, struts, beams, stringers and the like, are constructed of iron or steel.

*Wood grandstand*—A grandstand, the majority of whose main structural members, such as columns, struts, beams, stringers and the like, are constructed of wood.

**Source**

The provisions of this § 15.1 adopted August 15, 1933; amended through July 1, 1968.

**§ 15.2. Scope.**

This chapter pertains to grandstands in which the main structural members consist of steel or wood. A grandstand of a design or material not covered by this chapter shall be of an approved type, and subject to the loading requirements of § 15.15 (relating to loading) and other requirements the Department may determine.

**Source**

The provisions of this § 15.2 adopted August 15, 1933; amended through July 1, 1968.

**§ 15.3. Classes.**

Grandstands covered by this chapter are divided into two general classes: new construction and existing construction.

**Source**

The provisions of this § 15.3 adopted August 15, 1933; amended through July 1, 1968.

**§ 15.4. Responsibility of owners.**

Owners shall be responsible for the maintenance of grandstands in their original condition unless permission to make changes is obtained from the Department.

**Source**

The provisions of this § 15.4 adopted August 15, 1933; amended through July 1, 1968.

**§ 15.5. Penalty.**

A person who violates a provision of this chapter or a regulation of the Department or who interferes with the Department or its authorized representatives in

the enforcement of the provisions or regulations shall upon conviction be punishable under section 13 of the act of April 27, 1927 (P. L. 465, No. 299) (35 P. S. § 1233).

**Source**

The provisions of this § 15.5 adopted August 15, 1933; amended through July 1, 1968.

**RULES OF CONSTRUCTION**

**§ 15.11. Applicability.**

This section and §§ 15.12—15.21 apply equally to portable, foldable and permanent grandstands, except where the context clearly indicates otherwise.

**Source**

The provisions of this § 15.11 adopted August 15, 1933; amended through July 1, 1968.

**§ 15.12. Plans for permanent grandstands.**

(a) Under section 8 of the act of April 27, 1927 (35 P. S. § 1228), detailed plans for the new construction or remodeling of permanent grandstands shall be submitted to the Department in triplicate for approval before building operations are begun.

(b) The plans shall show the details of construction, including the size and material of the members, and the method of anchorage. The applicant shall submit his calculations of design for the structural members. Specifications shall also be furnished if requested.

(c) A fee of \$75 will be charged for the examination of plans for permanent grandstands. The payment shall be made by check or money order, payable to the Commonwealth, at the time of submission of the plans.

**Source**

The provisions of this § 15.12 adopted August 15, 1933; amended through July 1, 1968; amended January 12, 1990, effective January 13, 1990, 20 Pa.B. 183. Immediately preceding text appears at serial page (8339).

**Cross References**

This section cited in 34 Pa. Code § 15.11 (relating to applicability).

**§ 15.13. Approval.**

(a) A petition shall be made to the Secretary to secure approval of portable and foldable grandstands. The petition shall be accompanied by photographs or cuts and complete plans and design calculations of the members and connections submitted in triplicate.

(b) An applicant shall include calculations for live, dead, sway and wind loads for all structural members of portable, foldable and permanent grandstands.

(c) Detailed plans and design calculations of permanent grandstands shall be submitted for approval before building operations begin. The grandstands shall be inspected after erection and permission granted by the Department before they may be used.

**Source**

The provisions of this § 15.13 adopted August 15, 1933; amended through July 1, 1968.

**Cross References**

This section cited in 34 Pa. Code § 15.11 (relating to applicability).

**§ 15.14. Design and workmanship.**

(a) The design of grandstands shall conform to the best modern engineering practice; the design or method of construction shall be in accordance with established principles of mechanics. Prior to granting approval of portable and foldable grandstands, the Department may require that tests be performed under the supervision of a nationally recognized testing laboratory in the presence of a representative of the Department. The test shall be performed upon a full-size, complete structural unit of the grandstand, having the maximum number of rows on which approval is desired. The grandstand being tested shall be loaded, vertically and horizontally, with not less than 1 1/2 times the loads prescribed in § 15.17 (relating to materials). After removal of the loads, no member of the grandstand may show permanent deformation, nor may the connections or bolt holes show permanent deformity.

(b) Workmanship shall be of such quality as to produce in construction the full strength intended by the designer.

(c) A portable grandstand shall be self-contained, including parts necessary to withstand and restrain forces which may develop during human occupancy. The strength, stability or safety of the structure may not depend upon stakes, curbs, walls or other external objects. A foldable grandstand, if permanently attached to the wall of a building, may depend upon the wall for resistance to horizontal loads, but not for the support of vertical loads.

(d) A grandstand may not be occupied until all parts have been securely assembled in accordance with the approved design and specifications.

(e) Grandstands shall be so designed that the maximum expansion, contraction, settlement or misalignment which may occur during the life of the grandstand will not cause stresses in excess of those specified, nor jeopardize the strength or stability of the structure or the safety of its occupants. The owner shall provide and maintain proper bearing surface for outdoor installations.

(f) The owner of a building in which grandstands are to be used shall provide walls and floors of sufficient strength to withstand the loads and stresses caused by the grandstand when loaded, as specified in § 15.17.

**Source**

The provisions of this § 15.14 adopted August 15, 1933; amended through July 1, 1968.

**Cross References**

This section cited in 34 Pa. Code § 15.11 (relating to applicability).

**§ 15.15. Loading.**

(a) Seats and foot rests of grandstands shall be designed to support, in addition to their own weight, a uniformly distributed live load of 120 pounds per linear foot of seatboard and footrest. Other parts of grandstands shall be designed to support, in addition to their own weight, a uniformly distributed live and impact load according to the back to back distance between seats as follows:

<i>Back to Back of Seats (in inches)</i>	<i>Pounds per Square Foot</i>
22	130
23	125
24	120
25	115
26	110
27	105
More than 27	100

(b) Grandstands shall be designed to resist, when occupied, 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 ten pounds per linear foot of seats. On grandstands supporting chairs these loads shall be applied at a height of 17 inches above the foot rest.

(c) Grandstands able to be used outdoors shall be designed to resist a horizontal wind load on the vertical projection of the stand, applied in any direction, as follows:

- (1) When fully loaded, 4 pounds per square foot.
- (2) When unoccupied, if of open construction, 15 pounds per square foot.
- (3) When unoccupied, if filled in solid vertically, 30 pounds per square foot.
- (4) Vertical projection shall include railings.

(d) Members whose stresses are greater under a partial loading of the stand than under full load, shall be designed to meet the conditions causing the largest stresses.

(e) The design shall remain stable so as not to be overturned by wind or unequal distribution of the live load.

**Source**

The provisions of this § 15.15 adopted August 15, 1933; amended through July 1, 1968.

**Cross References**

This section cited 34 Pa. Code § 15.11 (relating to applicability).

**§ 15.16. Foundations.**

(a) Permanent grandstands for outdoor use shall be erected upon and attached to concrete or masonry footings extending below the surface of the ground to a depth of either 3 feet or the maximum depth of frost, whichever is greater, unless solid rock is encountered at a lesser depth.

(b) Portable grandstands shall be provided by the manufacturers with base plates and sills, floor runners or sleepers of such area that the total live and dead load does not exceed 14 pounds per square inch of the base plate, mud sills, floor runners or sleepers. The owner shall see that all bearing surfaces are in contact.

(c) Base plates, mud sills or another part of the structure in contact with the earth may be subject to no stresses other than those caused by the vertical forces resulting from live, dead, sway and wind loads and the horizontal friction resulting from sway and wind loads. The stress shall be limited to those set forth in § 15.20 (relating to painting and treatment of members) reduced as follows:

(1) For base members of pressure-treated wood, allowable stresses shall be reduced by 1/4.

(2) For base runners of ungalvanized steel, allowable stresses shall be reduced by 2/3.

(3) For base members of galvanized steel, no reduction in allowable stress is required.

(d) In the absence of definite knowledge of the sustaining power of the earth, different soils, excluding mud and artificial fill, shall be deemed to sustain safely the following loads per square inch:

<i>Material</i>	<i>Pounds per Square Inch</i>
Soft clay	14
Wet sand, firm clay or sand and clay mixed	28
Fine and dry sand	42
Hard, dry clay or coarse sand	50
Gravel	55
Hard pan	110
Soft, firm rock	140
Medium rock	200
Hard rock	400

(e) For grandstands on artificial fill, either the sustaining power of the earth shall be determined by test, or the foundations shall be extended down to the natural earth, whose sustaining power shall be computed from the loads per square inch set forth in subsection (d).

**Source**

The provisions of this § 15.16 adopted August 15, 1933; amended through July 1, 1968.

**Cross References**

This section cited in 34 Pa. Code § 15.11 (relating to applicability).

**§ 15.17. Materials.**

(a) *Steel.* Wherever used, steel shall conform to the standard specifications of the American Institute of Steel Construction, as amended. In addition, load carrying steel members of permanent grandstands for outdoor use, and of portable grandstands, including steel members which may be in contact with the earth may not be less than 1/4 inch thick, except for the following:

(1) The web of rolled structural shapes may be not less than 17/100 inch thick.

(2) The deck plates of a steel-deck grandstand, railings and hot galvanized load carrying members not in contact with the earth, may not be less than 3/16 inch thick.

(3) In foldable and permanent grandstands used entirely indoors the required thickness of steel may be decreased 50%, if in all other respects it complies with the requirements of this chapter, and if the location and usage of a member is such that there is no likelihood of distortion which might affect the safety of the grandstand.

(b) *Wood.* Each wood structural member shall be well seasoned and of a quality not less than the lowest grade in the respective species, as provided in § 15.18(b) (relating to allowable stresses). The quality of seats may be not less than the lowest grade of finish lumber, and of boarding and sheathing not lower than No. 2 common grade. In specifying wooden parts, the species and grade and the actual finished sizes of the parts shall be given.

(c) *Other materials.* Other materials, where used, shall be suitable, of uniform quality, and without defects affecting the strength or service of the grandstand.

**Source**

The provisions of this § 15.17 adopted August 15, 1933; amended through July 1, 1968.

**Cross References**

This section cited in 34 Pa. Code § 15.11 (relating to applicability); and 34 Pa. Code § 15.14 (relating to design and workmanship).

**§ 15.18. Allowable stresses.**

(a) *For steel.* Parts of the structure shall be so proportioned that the sum of the maximum stresses in pounds per square inch does not exceed the following:

(1) *Tension.* Tension shall be regulated as follows:

<i>Item</i>	<i>Maximum Stresses</i> <i>(pounds per square inch)</i>
Structural steel, net section	20,000
Butt welds, section through throat	20,000
Rivets on area based on nominal diameter	20,000
Bolts and other threaded parts, on nominal area at root of thread	20,000

(2) *Compression.* Compression shall be regulated as follows:

(i) For the purposes of this paragraph, symbols represent the following:

L = The unsupported length of the column.

r = The corresponding least radius of gyration of the section.

(ii) Rolled steel, on short length or where lateral deflection is prevented, may not exceed 20,000 pounds per square inch.

(iii) On a gross section of columns,  $L/r$  does not exceed 120:

$$1,700 - .485 L^2/r^2$$

if  $L/r$  exceeds 120:

$$1 + [(18,000 \div L^2) \div 18,000r^2]$$

(iv) The ratio of unbraced length to least radius of gyration  $L/r$  for compression members and for tension members other than rods shall not exceed the following:

<i>Item</i>	<i>Maximum Stresses</i> <i>(pounds per square inch)</i>
For main compression members	120
For bracing and other secondary members in compression	200
For main tension members	240
For bracing and other secondary members in tension	300

(3) *Bending.* Bending shall be regulated as follows:

(i) For the purposes of this paragraph, the following designations will apply:

L = The unsupported length of the column.

b = The width of the compression flange.

(ii) Extreme fibres of rolled shapes, and built up sections, net section, if lateral deflection is prevented, may not exceed 20,000 pounds per square inch.



(iii) Where L exceeds 15 times b, the stress in pounds per square inch in b may not exceed the following:

$$1 + [(20,000 \div L^2) \div 2,000b^2]$$

(iv) The laterally unsupported length of beams and girders may not exceed 40 times b in width of the compression flange.

(v) Extreme fibres of pins, when the forces are assumed as acting at the center of gravity of the pieces may not exceed 30,000 pounds per square inch.

(4) *Shearing*. Shearing shall be regulated as follows:

(i) For the purposes of this paragraph, the following designations will apply:

A = The gross area of the web in inches.

V = The total shear.

h = The height between flanges in inches.

t = The thickness of the web in inches.

(ii) The following table will apply:

<i>Item</i>	<i>Maximum Stresses (pounds per square inch)</i>
Pins	15,000
Power-driven rivets	15,000
Turned bolts in reamed holes with a clearance of not more than 1/50 inch	15,000
Hand-driven rivets	10,000
Unfinished bolts	10,000
The gross area of the webs of beams and girders where h is not more than 60 times t	13,000

(iii) The gross area of the webs of beams and girders if the web is not stiffened, where h is more than 60 times t, the thickness of the web, the maximum shear per square inch, V/A may not exceed:

$$1 + [(18,000 \div h^2) \div 7,200t^2]$$

(iv) A section through the throat of a fillet weld may not exceed 13,600 pounds per square inch.

(5) *Bearing*. Bearing shall be regulated as follows:

(i) For the purposes of this paragraph, the letter “d” shall designate the diameter of the roller in inches.

(ii) The following table will apply:

<i>Item</i>	<i>Maximum Stresses</i> <i>(pounds per square inch)</i>	
	<i>Single Shear</i>	<i>Double Shear</i>
Pins	32,000	32,000
Power-driven rivets	32,000	40,000
Turned bolts in reamed holes	32,000	40,000
Hand-driven bolts	20,000	25,000
Unfinished bolts	20,000	25,000

(iii) On expansion rollers, pounds per linear inch, -600d.

(6) *Combined stresses.* Combined stresses shall conform with the following:

(i) For the purposes of this paragraph, the following designations will apply:

Fa = Axial unit stress that would be permitted by this specification if axial stress only existed.

Fb = Bending unit stress that would be permitted by this specification if bending stress only existed.

fa = Axial unit stress (actual) = axial stress divided by area of member.

fb = Bending unit stress (actual) = bending moment divided by section modulus of member.

(ii) For stresses due to wind sway loads, combined with those due to dead or live loads, the permissible total working stress may be increased 33 1/3%, if the section thus found is not less than that required by the dead or live loads alone.

(iii) Members subject to both axial and bending stresses shall be so proportioned that the quantity  $f_a/F_a + f_b/F_b$  does not exceed unity.

(7) *Members carrying wind and sway only.* For members carrying wind and sway stresses only, the permissible working stresses may be increased 33 1/3%.

(8) *Welding.* Welds shall be made only by operators who have qualified by the tests prescribed in the Standard Qualification Procedure of the American Welding Society to perform the type of work required, except that this provision need not apply to tack welds not later incorporated into finished welds carrying calculated stress.

(b) *For wood.* Allowable unit stresses for wood parts of grandstands shall be considered in light of the following:

(1) Wood parts shall be so designed and proportioned that their stresses do not exceed the allowable unit stresses in the following table:

Allowable Unit Stresses in Pounds Per Square Inch for Wood Parts of Grandstands Based on the American Lumber Standards

SPECIES OF LUMBER	Manufacturers Grade	BEAMS				COLUMNS—Ratio of Length to Least Diameter									
		Extreme Fibre in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Modulus of Elasticity	L/d and less	L/d 12	L/d 15	L/d 20	L/d 25	L/d 30	L/d 35	L/d 40	L/d 50	
Cypress, Tidewater Red	Select Structural	1300	100	3000	1,200,000	1100	1063	1008	810	729	526	365	268	132	
	Common Structural	1040	80	300	1,200,000	880	861	832	729	526	365	268	132		
Douglas Fir (Coast Region)	Dense Select Structural	1800	140	380	1,600,000	1300	1265	1214	1027	702	487	358	274	175	
	Select Structural	1600	120	345	1,600,000	1220	1172	1133	988	702	487	358	274	175	
	No. 1 Dimension	1200	120	325	1,600,000	1100	1079	1048	937	702	487	358	274	175	
	No. 1 Timbers	1000	100	300	1,400,000	1160	1079	1048	937	702	487	358	274	175	
Hemlock, West Coast	No. 1 Dimension	1040	100	300	1,400,000	1100	1079	1048	937	702	487	358	274	175	
	Select Structural	1800	133	380	1,600,000	1466	1388	1283	877	570	396	291	223	142	
Larch, Western	Structural	1600	100	345	1,300,000	1200	1158	1098	877	570	396	291	223	142	
	Common Structural	1200	90	325	1,300,000	1100	1068	1022	851	570	396	291	223	142	
Oak, Commercial White and Red	Select Dimension	1400	125	500	1,500,000	1000	982	956	860	658	457	336	257	164	
	Common Dimension	1120	100	500	1,500,000	800	790	778	728	625	457	336	257	164	
Pine, Longleaf Southern Yellow	Select Structural	2000	125	375	1,600,000	1450	1400	1331	1073	702	487	358	274	175	
	Prime Structural	1800	125	375	1,600,000	1300	1265	1214	1027	702	487	358	274	175	
	Merchantable and Structural Square Edge and Sound	1600	125	375	1,600,000	1200	1172	1133	988	702	487	358	274	175	
	No. 1 Structural	1400	105	300	1,600,000	1000	984	962	876	702	487	358	274	175	
Pine, Shortleaf Southern Yellow	Dense Select Struc.	2000	125	375	1,600,000	1450	1400	1331	1073	702	487	358	274	175	
	Dense Structural	1800	125	375	1,600,000	1300	1265	1214	1027	702	487	358	274	175	
	Dense Sq. Edge and Sound	1600	125	375	1,600,000	1200	1172	1133	983	702	487	358	274	175	
	Dense No. 1 Struc.	1200	125	375	1,600,000	850	840	826	774	663	487	358	274	175	
Redwood	Prime Structural	1494	82	267	1,200,000	1245	1191	1114	822	526	365	268	132		
	Select Structural Heart Structural	1322	70	267	1,200,000	1100	1063	1008	810	526	365	268	132		
		1150	56	267	1,200,000	1000	972	931	781	526	365	268	132		

(2) A species or grade of wood excluded from paragraph (1) may not be used except when permitted by the Department and after the wood is determined to be satisfactory.

(3) For stresses produced by wind loads or impact only, or by a combination of wind or impact loads and dead and live loads, allowable stresses may be increased 50% if the resulting sections are not less than those for dead and live loads alone.

(4) Connections to wooden members shall be by means of rivets, bolts, lag screws, except lag screws in tension or for field connections or approved modern timber connectors. It is recommended that a bulletin issued in the United States Department of Commerce entitled, "Modern Connection for Timber Construction" be consulted. The use of nails and wood screws is permissible for holding parts together, but for designing purposes the nails or screws shall be considered incapable of transmitting calculable stresses.

(5) Nails or screws may not be used if their loosening or splitting of the surrounding wood causes stresses in excess of those permitted or would jeopardize the strength and stability of the structure or the safety of its occupants.

(6) Connections to wooden tension members may be by means of not less than two bolts, rivets or lag screws or approved modern timber connectors. Reference should be made to the bulletin referred to in paragraph (4). Adequate provision shall be made to prevent wood splitting at such connections.

(7) The bearing values of bolts in wood shall be calculated by the following tables:

(i) Basic stresses for calculating safe loads for bolted joints shall be subject to the following:

Group	Species of Wood	Basic Stress (pounds per square inch)	
		Parallel with the Grain	Perpendicular to the Grain
	<i>Softwoods (conifers)</i>		
2	Cedar, Alaska, Port Oxford and western red	1,000	200
2	Douglas fir (Rocky Mountain region)	1,000	200
2	Hemlock, western	1,000	200
2	Pine, Norway	1,000	200
3	Cypress, southern	1,300	275
3	Douglas fir (coast region)	1,300	275
3	Larch, western	1,300	275
3	Pine, southern yellow	1,300	275
3	Redwood	1,300	275

Group	Species of Wood	Basic Stress (pounds per square inch)	
		Parallel with the Grain	Perpendicular to the Grain
3	Tamarack	1,300	275
	<i>Hardwoods (broad-leaved species)</i>		
2	Maple (soft), red and silver	1,200	250
2	Elm, American and slippery	1,200	250
2	Gum, black, red, and tupelo	1,200	250
2	Sycamore	1,200	250
3	Ash, commercial white	1,500	400
3	Beech	1,500	400
3	Birch, sweet and yellow	1,500	400
3	Elm, rock	1,500	400
3	Hickory, true and pecan	1,500	400
3	Maple (hard), black and sugar	1,500	400
3	Oak, commercial red and white	1,500	400

(A) The stresses set forth in subparagraph (i) apply to seasoned timber used in dry covered locations. Exposed parts of grandstands which may be used outdoors require 7/8 of those values.

(B) When the stress is neither parallel nor perpendicular to the grain of the wood, the maximum basic stress in pounds per square inch shall not exceed the following:

$$\frac{PQ}{P \sin^2\theta + Q \cos^2\theta}$$

in which P is the allowable basic stress parallel with the grain, Q is the allowable basic stress perpendicular to the grain, and  $\theta$  is the angle between the direction of the grain and the direction of the load normal to the face considered.

(ii) The percentages of basic stress parallel with the grain for calculating safe bearing stresses under bolts shall be derived as follows:

<i>Length of Bolt in Main Member Divided by its Diameter (L/D)</i>	<i>Percentage of Basic Stress for—</i>					
	<i>Common Bolts</i>			<i>High-strength Bolts</i>		
	<i>Group 1 Woods</i>	<i>Group 2 Woods</i>	<i>Group 3 Woods</i>	<i>Group 1 Woods</i>	<i>Group 2 Woods</i>	<i>Group 3 Woods</i>
1.0	100.0	100.0	100.0	100.0	100.0	100.0
1.5	100.0	100.0	100.0	100.0	100.0	100.0
2.0	100.0	100.0	100.0	100.0	100.0	100.0
2.5	100.0	100.0	97.7	100.0	100.0	100.0
3.0	100.0	100.0	99.0	100.0	100.0	100.0
3.5	100.0	99.3	96.7	100.0	100.0	99.7
4.0	99.5	97.4	92.5	100.0	100.0	99.0
4.5	97.9	93.8	86.8	100.0	100.0	97.8
5.0	95.4	88.3	80.0	100.0	99.8	96.0
5.5	91.4	82.2	73.0	100.0	98.2	93.0
6.0	85.6	75.8	67.2	100.0	95.4	89.5
6.5	79.0	70.0	62.0	98.5	92.2	85.2
7.0	73.4	65.0	57.6	95.8	88.8	81.0
7.5	68.5	60.6	53.7	92.7	85.0	76.8
8.0	64.2	56.9	50.4	89.3	81.2	73.0
8.5	60.4	53.5	47.4	85.9	77.7	69.6
9.0	57.1	50.6	44.8	82.5	74.2	66.4
9.5	54.1	47.9	42.4	79.0	71.0	63.2
10.0	51.4	45.5	40.3	75.8	68.0	60.2
10.5	48.9	43.3	38.4	72.5	64.8	57.4
11.0	46.7	41.4	36.6	69.7	61.9	54.8
11.5	44.7	39.6	35.0	66.8	59.2	52.4
12.0	42.8	37.9	33.6	64.0	56.7	50.2
12.5	41.1	36.4	32.2	61.4	54.4	48.2
13.0	39.5	35.0	31.0	59.1	52.4	46.3

(A) The product of the basic stress parallel with the grain selected from the table set forth in paragraph (7)(i), and the percentage for the particular L/D ratio and species group taken from the table set forth in subparagraph (i), is the safe working stress at that ratio for joints with metal splice plates. If wood splice plates are used, each of which is 1/2 the thickness of the main timber, 80% of this product is the safe working stress.

(B) The common bolts referred to in subparagraph (i) are those having a yield point of approximately 45,000 pounds per square inch.

(C) The high-strength bolts referred to in subparagraph (i) are those having a yield point of approximately 125,000 pounds per square inch.

(iii) The percentages of basic stress perpendicular to the grain used in calculating safe bearing stresses under bolts shall be derived as shown in the following tables:

**TABLE I***Percentage for Common Bolts*

<i>Length of Bolt in Main Member divided by its Diameter (L/D)</i>	<i>Group 1 Conifers and Hardwoods</i>		<i>Group 2 Hardwoods and Conifers</i>		<i>Percentage for High-Strength Bolts (all groups)</i>
	<i>Group 1 Hardwoods</i>	<i>Group 2 Conifers</i>	<i>Group 3 Conifers</i>	<i>Group 3 Hardwoods</i>	
1.0	100.0	100.0	100.0	100.0	100.0
5.5	100.0	100.0	100.0	99.0	100.0
6.0	100.0	100.0	100.0	96.3	100.0
6.5	100.0	100.0	99.5	92.3	100.0
7.0	100.0	100.0	97.3	86.9	100.0
7.5	100.0	99.1	93.3	81.2	100.0
8.0	100.0	96.1	88.1	75.0	100.0
8.5	98.1	91.7	82.1	69.9	99.8
9.0	94.6	86.3	76.7	64.6	97.7
9.5	90.0	80.9	71.9	60.0	94.2
10.0	85.0	76.2	67.2	55.4	90.0
10.5	80.1	71.6	62.9	51.6	85.7
11.0	76.1	67.6	59.3	48.4	81.5
11.5	72.1	64.1	55.6	45.4	77.4
12.0	68.6	61.0	52.0	42.5	73.6
12.5	65.3	58.0	49.0	40.0	70.2
13.0	62.2	55.3	45.9	37.5	66.9

**TABLE II**

<i>Diameter of Bolt (in inches)</i>	<i>Diameter Factor</i>
1/4	2.50
3/8	1.95
1/2	1.68
5/8	1.52
3/4	1.41
7/8	1.33
1	1.27
1-1/4	1.19

<i>Diameter of Bolt (in inches)</i>	<i>Diameter Factor</i>
1-1/2	1.14
1-3/4	1.10
2	1.07
2-1/2	1.03
3 and over	1.00

(A) The safe working stress for a given value of L/D is the product of three factors:

- (I) The basic stress perpendicular to the grain taken from the table in paragraph (7)(i).
- (II) The percentage from the table set forth in clause (A).
- (III) The factor for bolt diameter, as set forth in clause (B).

(B) No reduction need be made when wood splice plates are used except that the safe load perpendicular to the grain should never exceed the safe load parallel to the grain for any given size and quality of bolt and timber.

(C) The common bolts referred to in Table I are those having a yield point of approximately 45,000 pounds per square inch.

(D) The high-strength bolts referred to in Table I are those having a yield point of approximately 125,000 pounds per square inch.

(8) *For other materials.* Other materials when used shall be so designed and proportioned that their stresses do not exceed the allowable unit stresses generally accepted as safe by engineering practice.

#### Source

The provisions of this § 15.18 adopted August 15, 1933; amended through July 1, 1968.

#### Cross References

This section cited in 34 Pa. Code § 15.11 (relating to applicability); and 34 Pa. Code § 15.17 (relating to materials).

### § 15.19. Special requirements.

(a) Railings shall be provided along the back of the grandstands if the rear seat is more than 4 feet above the ground, along those portions of the ends when the seats are more than 4 feet above the ground, and along the front if the front footrest is more than 1 foot, 6 inches above the ground. Railings along the rear and ends may be not less than 3 feet high above center of the nearest seat. When railings are required along the front, they may be not less than 3 feet high above the front footrest. The maximum dimension of a clear vertical opening in a railing may not be greater than 18 inches. This subsection shall be complied with by a mid-rail, wire fabric or other suitable means. Railings shall be capable of safely sustaining a vertical load of 80 pounds per linear foot and a horizontal thrust of



25 pounds per linear foot. When grandstands are used adjacent to a wall or fence, railings may be omitted from those portions where the wall or fence affords equivalent protection, if the gap between seat or foot rest and wall or fence does not exceed 6 inches. When the topmost seat of a stand is greater than 15 feet above the ground, the maximum dimension of a clear vertical opening between the rails of the back rail may not be greater than 12 inches.

(b) A grandstand having a railing along the front shall be provided with aisles so located that no portion of a seat is more than 25 feet, 6 inches from the nearest aisle. A grandstand having seats with backs shall be provided with aisles, so located that no portion of a seat is more than 18 feet from the nearest aisle. Aisles so provided may be not less than 3 feet wide, except that where an aisle is divided into two parts, one on each side of a portal, column or other obstruction, each part may be 2 feet wide. When the entrance to an aisle is elevated above the ground level, each aisle shall be provided with a stairway or ramp, whose width is not less than the width of the aisle. An aisle may not be immediately adjacent to the end of a portable or foldable grandstand. Stairs shall have a maximum slope of 10 degrees. Ramps shall have nonslip surfaces. Where aisles are provided adjacent to the end of permanent grandstands, the width of the aisles shall be a minimum of 2 feet wide.

(c) Footrests shall preferably be located above the stringer to avoid tripping. The width of footrests in permanent grandstands shall be the full open space between two rows of seats. The width of footrests in portable grandstands is preferably the full open width between seats. In no case may the width be less than 9 1/2 inches. The width of seats may also be not less than 9 1/2 inches.

(d) Seats shall be securely fastened to their supports in such a manner that they cannot accidentally be displaced. Footrests shall be so supported that they are not accidentally displaced a sufficient distance to endanger the occupant of the grandstand. Footrests which are lapped shall be provided with some positive means to prevent displacement of one piece on the other.

(e) The horizontal distance back to back of seats may not be less than 22 inches. When the same level is used for both seats and footrests the levels may not be less than 22 inches in width.

#### Source

The provisions of this § 15.19 adopted August 15, 1933; amended through July 1, 1968.

#### Cross References

This section cited in 34 Pa. Code § 15.11 (relating to applicability).

### § 15.20. Painting and treatment of members.

(a) *Steel.* Steelwork may be either painted or galvanized by the hot-dip process. If galvanized, it shall be thoroughly cleaned and the minimum thickness or weight of zinc applied shall be .0034 inch, or 2 ounces per square foot of sur-

faces (1 ounce of zinc per square foot of surface corresponds to a coating thickness of .0017 inch). The galvanized coating shall be capable of withstanding a six dip Preece Test. If painted, it shall be thoroughly cleaned and given not less than one coat of rust inhibiting paint of the best quality.

(b) *Wood.* Wood in contact with the earth shall be pressure treated with creosote or an equal preservative. Other wood shall be either pressure treated or given not less than one coat of good protecting paint, varnish, lacquer or an equivalent finish, either before or not more than 2 weeks after erection.

**Source**

The provisions of this § 15.20 adopted August 15, 1933; amended through July 1, 1968.

**Cross References**

This section cited in 34 Pa. Code § 15.11 (relating to applicability); and 34 Pa. Code § 15.16 (relating to foundations).

**§ 15.21. Existing construction.**

(a) Existing permanent and portable grandstands may continue to be used if determined to be safe by the Department.

(b) A grandstand determined by the Department to be unsafe for occupancy may not again be used unless made safe according to the instructions of the Department.

**Source**

The provisions of this § 15.21 adopted August 15, 1933; amended through July 1, 1968.

**Cross References**

This section cited in 34 Pa. Code § 15.11 (relating to applicability).

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