Designation: A 183 – 03

Standard Specification for Carbon Steel Track Bolts and Nuts[1]

This standard is issued under the fixed designation A 183; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers carbon steel track bolts and carbon steel nuts for use in conjunction with joint bars to connect rails in railroad track.

1.2 Two grades of track bolts are defined:

1.2.1 *Grade 1, Low-Carbon, Untreated*, primarily for industrial and mine track use.

1.2.2 *Grade 2, Heat-Treated*, for general track use.

1.3 Two grades of nuts are defined:

1.3.1 *Grade 1, Low-Carbon* or *Soft Steel*, primarily for application on Grade 1 track bolts.

1.3.2 *Grade 2, Medium-Carbon*, for general application on track bolts.

1.4 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

F 606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets[2]

2.2 *ANSI Standards:*

B1.1 Unified Screw Threads[3]

B18.10 Track Bolts and Nuts[3]

2.3 *AREMA Standard:*

American Railway Engineering and Maintenance-of-Way Association Manual, Design of Track Bolts and Nuts, Chapter 4, Part 1[4]

3. Ordering Information

3.1 Orders for track bolts and nuts under this specification shall include the following information:

3.1.1 Quantity of bolts and nuts (weights),

3.1.2 ASTM designation and date of issue,

3.1.3 Grade of bolt: 1, low-carbon untreated, or 2, heat-treated (see 1.2 and Table 1),

3.1.4 Design of bolt: oval or elliptical neck (see 2.3),

3.1.5 Dimensions of bolt: nominal diameter and length under head,

3.1.6 Grade of nut: 1, low-carbon, or 2, medium-carbon (see 1.3 and Table 2 and Table 1),

3.1.7 Nominal size of nut, thickness, and chamfer angle (see 2.3),

3.1.8 Thread fit of nuts on bolts: free or wrench-turn fit (see 2.2), and

3.1.9 Certification or test reports, if required (see Section 12).

4. Manufacture

4.1 The steel shall be made by the open-hearth, basic-oxygen, or electric-furnace process, and may be either continuous strand or ingot cast.

4.2 Bolts, including the head and oval or elliptical neck, may be produced by hot or cold forging at the option of the manufacturer.

4.3 Bolt threads may be machine cut or hot- or cold-rolled at the option of the manufacturer.

4.4 Grade 2 bolts shall be heat-treated by quenching in a liquid medium from above the austenitizing temperature, and tempering at a temperature not less than 750°F (399°C). Grade 1 bolts need not be heat-treated.

5. Chemical Requirements

5.1 The steel shall conform to the requirements for chemical composition specified in Table 1.

5.2 *Heat or Cast Analysis*—An analysis of each heat or cast shall be made by the manufacturer to determine the percentages of the elements specified in Table 1. The analysis shall be made from a test sample taken preferably during the pouring of the heat. The chemical composition thus determined shall conform to the heat-cast requirements of Table 1.

5.3 *Product Analysis*—An analysis may be made by the purchaser from a finished bolt or nut. The chemical composition thus determined shall conform to the product requirements

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.01 on Steel Rails and Accessories.

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[2] *Annual Book of ASTM Standards,* Vol 01.08.

[3] Available from American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036.

[4] Available from the American Railway Engineering and Maintenance of Way Assn., 8201 Corporate Drive, Suite 1125, Landover, MD 20785..

***A Summary of Changes section appears at the end of this standard.**

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TABLE 1 Chemical Requirements

Element, %	Bolts				Nuts			
	Grade 1		Grade 2		Grade 1		Grade 2	
	Heat-Cast	Product	Heat-Cast	Product	Heat-Cast	Product	Heat-Cast	Product
Carbon, min or range	0.15	0.13	0.30	0.27	0.15	0.13	0.40–0.55	0.37–0.58
Phosphorus, max	0.04	0.050	0.04	0.050	0.12	[A]	0.04	0.050
Sulfur, max	0.33	[A]	0.06	0.070	0.33	[A]	0.06	0.070

[A] Where rephosphorized or resulfurized material is applied, due to the degree to which phosphorus and sulfur segregate, check analyses for these elements are not technologically appropriate.

TABLE 2 Nut Suitability

Bolt Grade	Nut Grade					
	Low-Carbon Grade 1			Medium-Carbon Grade 2		
	Regular Square 25° Chamfer	Heavy Square 25° Chamfer	Heavy Square ⅛ in Oversize in Thickness 60° Chamfer	Regular Square	Heavy Square 25° Chamfer	Heavy Square ⅛ in Oversize in Thickness 60° Chamfer
Grade 1	X[A]	X[A]	X[A]	X[A]	X[A]	X[A]
Grade 2	. . .	. . .	X[A]	X[A]	X[A]	X[A]

[A] X = suitable combination.

of Table 1. Note that rephosphorized or resulfurized material is not subject to rejection based on product analysis for these elements.

6. Tensile Requirements

6.1 *Tension Tests*:

6.1.1 The material as represented by a tension test of a full-section bolt with nut assembled, or by a specimen machined from a finished bolt, as prescribed in Table 3, shall conform to the respective requirements specified in Table 4 or Table 5.

6.1.2 Full-section and reduced-section bolt tension tests shall be performed as described in Test Methods F 606.

6.1.3 Nuts shall be tested by assembling the nut on the grade bolt with which it is to be used, and testing as described under the full-section tension test for bolts in Test Methods F 606.

6.1.4 The bolt-nut assembly shall be capable of reaching the minimum load specified in Table 4 before failure of the assembly.

6.2 *Number of Tests*:

TABLE 3 Required Tension Tests

Product	Grade	Full-Section Test of Bolt with Nut Assembled	Reduced-Section Test Specimen
Bolts	1	X[A]	NR[B]
Nuts	2	X[A]	X
	1	X	NA[C]
	2	X	NA[C]

[A] X = required test. Test must be performed with 10° wedge under bolt head.
[B] NR = test not required.
[C] NA = test not applicable.

6.2.1 *Grade 1 Bolts*—One full-section tension test shall be made by the manufacturer from each lot of bolts. Each lot shall consist of not more than one heat of steel, nor be greater than 10 tons (9.7 Mg).

6.2.2 *Grade 2 Bolts*—One full-section tension test and one reduced-section tension test shall be made by the manufacturer from each lot of bolts. Each lot shall consist of not more than one heat of steel, heat-treated in the same furnace load in a batch heat-treating operation or under the same conditions in a continuous heat-treating operation, with no lot to exceed 10 tons (9.7 Mg).

6.3 *Retests*:

6.3.1 *Grade 1 Bolts*—If the result of the full-section tension test of any lot does not conform to the specified requirement, two bolts shall be selected from the same lot for tension tests. If the results of both tests conform to the specified requirements, the lot shall be accepted.

6.3.2 *Grade 2 Bolts*—If the result of the full-section or reduced-section tension tests of any lot does not conform to the specified requirements, the manufacturer may re-heat treat such lot, not more than two times, in which case two additional full-section and two additional reduced-section tension tests shall be made from the retreated lot. If all retest results conform to the specified requirements, the lot shall be accepted.

6.3.3 If the percentage of elongation of any reduced section test specimen is less than that specified and any part of the fracture is more than ¾ in. (19 mm) from the center of the gage length, a retest shall be allowed.

6.3.4 If during the full-section tension test a flaw is detected in the bolt or nut that does not permit attainment of the test requirements, the manufacturer shall be permitted to conduct sorting or other reconditioning to eliminate the material containing that flaw, after which the test shall be repeated.

7. Dimensions and Permissible Variations

7.1 Track bolts manufactured in accordance with this specification may have either oval or elliptical necks; the nuts may be square or heavy square, with 25° chamfer, or heavy square with 60° chamfer.

7.2 The bolts and nuts shall conform to the designs and nominal dimensions specified by the purchaser in the order or contract, subject to the tolerances and variations prescribed in ANSI B18.10.

8. Threads and Thread Fit

8.1 The threads and thread fit of bolts and nuts shall be as described in ANSI B18.10 for either free fit or wrench turn fit

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TABLE 4 Full-Section Tension Test Requirements

Nominal Bolt Size, in. (mm)	Threads per Inch	Stress Area, in.^{2} (cm^2)	Minimum Full-Section Test Load, lbf (kN)	
			Bolts Grade 1	Bolts Grade 2[A]
½ (12.7)	13	0.142 (0.91)	7 800 (34)	[B]
⅝ (15.9)	11	0.226 (1.46)	12 400 (55)	[B]
¾ (19.0)	10	0.334 (2.15)	18 300 (81)	36 700 (163)
13/16 (20.6)	10	0.401 (2.59)	[B]	44 100 (196)
⅞ (22.2)	9	0.462 (2.98)	25 400 (112)	50 800 (226)
15/16 (23.8)	9	0.540 (3.48)	[B]	59 400 (264)
1 (25.4)	8	0.606 (3.96)	33 300 (148)	66 600 (296)
1-1/16 (27.0)	8	0.695 (4.48)	[B]	76 400 (340)
1-⅛ (28.6)	7	0.763 (4.92)	[B]	83 900 (373)

[A] These test requirements are based on the use of heavy square Grade 2 nuts or ⅛ in oversize heavy square Grade 1 nuts.
[B] These items are not covered by this specification.

TABLE 5 Reduced-Section Tension Test Requirements, Grade 2 Only

Property	Minimum Requirement
Tensile strength, psi (MPa)	110 000 (760)
Yield point, psi (MPa)	80 000 (550)
Elongation in 2 in. or 50 mm, %	12
Reduction of area, %	25

as specified by the purchaser in the order or contract. The specification provides that free-fit threads shall be provided unless wrench-turn fit is specified in the order or contract.

8.2 The torque to assemble the nut on the bolt for free-fit or wrench-turn-fit requirements shall be as prescribed in Table 6:

8.2.1 *Free Fit*—The torque for free fit shall be the maximum experienced during assembly.

8.2.2 *Wrench-Turn Fit*—The nut shall have a free fit for at least two threads in starting on the bolt. When engaged for the thickness of the nut plus two threads, the torque shall fall within the maximum and minimum specified. When engaged for the remainder of the thread length, the torque shall not exceed the maximum requirement.

9. Workmanship

9.1 The bolts and nuts shall be neatly formed and free of fins and nicks that would affect application. The head of the bolt shall be concentric with the shank, with the underside at right angles to the axis of the bolt. The bolts and nuts shall be free of injurious imperfections and shall have a workmanlike finish.

10. Inspection

10.1 The manufacturer shall afford the purchaser's inspector all reasonable facilities necessary to satisfy that the material is being produced and furnished in accordance with this specification. Mill inspection by the purchaser shall not interfere unnecessarily with the manufacturer's operations. All tests and inspections shall be made at the place of manufacture, unless otherwise agreed upon.

11. Rejection and Rehearing

11.1 Material that fails to conform to the requirements of this specification may be rejected. Rejections shall be reported to the manufacturer or supplier promptly and in writing. In case of dissatisfaction with the test results, the manufacturer or supplier may make claim for a rehearing.

12. Certification

12.1 When specified in the purchase order or contract, a manufacturer's certification shall be furnished to the purchaser that the material was produced and tested in conformance with this specification and has been found to meet the requirements.

12.2 When specified in the purchase order or contract, a report of the chemical and mechanical test results shall be furnished.

12.3 A Material Test Report, Certificate of Inspection, or similar document printed from or used in electronic form from an electronic data interchange (EDI) transmission shall be regarded as having the same validity as a counterpart printed in the certifier's facility. The content of the EDI transmitted document must meet the requirements of the invoked ASTM standard(s) and conform to any existing EDI agreement between the purchaser and the supplier.

12.4 Notwithstanding the absence of a signature, the organization submitting either a printed document (Material Test Report, Certificate of Inspection or similar document) or an EDI transmission is responsible for the content of the report.

13. Product Marking

13.1 The bolt heads shall be marked with a symbol identifying the manufacturer. The symbol may be raised or depressed

TABLE 6 Track Bolt and Nut Assembly Torque Requirements[A]

Bolts \ Nuts	Torque, lbf·ft (N·m)			
	Grade 1		Grade 2	
	Free-Fit	Wrench-Turn Fit	Free-Fit	Wrench-Turn Fit
Grade 1	10 (14) max	[B]	10 (14) max	[B]
Grade 2	10 (14) max	10–90 (14–122)[C]	10 (14) max	10–110 (14–149)[C]

[A] Torque values shall be as measured on the bolt-nut contract as ordered.
[B] These combinations are not covered by this specification.
[C] The nut shall have a free fit for at least two full threads while starting on the bolt.

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at the option of the manufacturer. The manufacturer may apply additional marks for his own use.

13.2 Grade 2 bolts shall be marked on the head with a symbol to indicate heat-treated.

14. Packaging and Package Marking

14.1 Prior to packing wrench-fit assemblies, the nuts shall be screwed onto the bolts enough to hold them in place until used.

14.2 Unless otherwise specified, nuts for free-fit assemblies shall be placed loose in the container with the bolts.

14.3 All containers shall be marked by the manufacturer to indicate the name of the manufacturer, the size (diameter and length) of the bolts, type, and weight in container.

14.4 The Automotive Industry Action Group (AIAG) Bar Code Standard for Primary Metals for Steel Products may be considered as a possible auxiliary method of identification on the containers used for packaging the bolts and nuts. Use of this method shall be by agreement between purchaser and supplier.

15. U.S. Government Procurement

15.1 When specified in the contract or purchase order, material shall be prepared for shipment and storage in accordance with the requirements of Practice A 700.

16. Keywords

16.1 fasteners-steel; rails; railway applications; steel bolting materials; steel rails; track bolts and nuts

SUMMARY OF CHANGES

Committee A01 has identified the location of selectedchanges to this standard since the last issue (A 183 – 98) that may impact the use of this standard.

(1) Military standard references deleted in Section 2.
(2) Updated Footnotes.
(3) Made U.S. Government Procurement its own section and deleted references to Military Specifications.
(4) Updated Table 1 to meet Specification A6 tolerances.

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