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Standard Specification for Carbon Steel Track Bolts and Nuts¹

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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 standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

A700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment

F606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets

2.2 *ANSI Standards*:³

B1.1 Unified Screw Threads

B18.10 Track Bolts and Nuts

2.3 *AREMA Standard*:⁴

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

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 1 and Table 2),

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.

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 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from the American Railway Engineering and Maintenance-of-Way Association (AREMA), 10003 Dereewood Lane, Suite 210 Lanham, MD 20706, <http://www.arena.org>.



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 1/8 in Oversize in Thickness 60° Chamfer	Regular Square	Heavy Square 25° Chamfer	Heavy Square 1/8 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.

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.

5. 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 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 F606.

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 F606.

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:

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 3/4 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