



ANSI/ASTM A 307 – 78

Standard Specification for CARBON STEEL EXTERNALLY THREADED STANDARD FASTENERS¹

This standard is issued under the fixed designation A 307; 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.

1. Scope

1.1 This specification² covers the chemical and mechanical requirements of two grades of carbon steel externally threaded standard fasteners, in sizes 1/4 in. (6.35 mm) through 4 in. (104 mm). This specification does not cover requirements for externally threaded fasteners having heads with slotted or recessed drives or for mechanical expansion anchors. The fasteners covered by this specification are frequently used for the following applications:

1.1.1 *Grade A Bolts*, for general applications, and

1.1.2 *Grade B Bolts*, for flanged joints in piping systems where one or both flanges are cast iron.

1.2 If no grade is specified in the inquiry, contract, or order, Grade A bolts shall be furnished.

1.3 Nonheaded anchor bolts, either straight or bent, to be used for structural anchorage purposes, shall conform to the requirements of Specification A 36 with tension tests to be made on the bolt body or on the bar stock used for making the anchor bolts.

1.4 Suitable nuts are covered in Specification A 563. Unless otherwise specified, the grade and style of nut for each grade of fastener, of all surface finishes, shall be as follows:

Fastener Grade and Size	Nut Grade and Style ⁴
A, 1/4 to 1 1/2 in.	A, hex
A, over 1 1/2 to 4 in.	A, heavy hex
B, 1/4 to 4 in.	A, heavy hex

⁴ Nuts of other grades and styles having specified proof load stresses (Specification A 563, Table 3) greater than the specified grade and style of nut are also suitable.

NOTE—The values stated in U.S. customary units are to be regarded as the standard.

2. Applicable Documents

2.1 *ASTM Standards*:

A 36 Specification for Structural Steel³

A 153 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware⁴

A 370 Methods and Definitions for Mechanical Testing of Steel Products⁷

A 563 Specification for Carbon and Alloy Steel Nuts⁵

B 454 Specification for Mechanically Deposited Coatings of Cadmium and Zinc on Ferrous Metals⁶

2.2 *American National Standards*:⁸

ANSI B1.1 Unified Screw Threads

ANSI B18.2.1 Square and Hex Bolts and Screws

3. Materials and Manufacture

3.1 Steel for bolts shall be made by the open-hearth, basic-oxygen, or electric-furnace process.

3.2 Bolts may be produced by hot or cold forging of the heads or machining from bar stock.

3.3 Bolt threads may be rolled or cut.

¹ This specification is under the jurisdiction of ASTM Committee F-16 on Fasteners, and is the direct responsibility of Subcommittee F 16.02 on Steel Bolting.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-307 in Section II of that Code.

³ *Annual Book of ASTM Standards*, Part 4.

⁴ *Annual Book of ASTM Standards*, Part 3.

⁵ *Annual Book of ASTM Standards*, Parts 1 and 4.

⁶ *Annual Book of ASTM Standards*, Parts 4 and 9.

⁷ *Annual Book of ASTM Standards*, Parts 1, 2, 3, 4, 5, and 10.

⁸ May be obtained from American National Standards Institute, Inc., 1430 Broadway, New York, N. Y. 10018.

3.4 When specified, galvanized bolts shall be hot-dip zinc coated in accordance with the requirements of Class C of Specification A 153. When specified by the purchaser to be mechanically galvanized, bolts covered by this specification shall be mechanically zinc coated and the coating and coated fasteners shall conform to the requirements for Class 50 of Specification B 454, or to the coating thickness, adherence, and quality requirements for Class C of Specification A 153.

4. Chemical Requirements

4.1 Steel shall conform to the following chemical requirements:

	Grade A Bolts	Grade B Bolts
Phosphorus, max, %	0.06	0.04
Sulfur, max, %	0.15	0.05

4.2 Resulfurized material is not subject to rejection based on product analysis for sulfur.

4.3 Bolts are customarily furnished from stock, in which case individual heats of steel cannot be identified.

4.4 Application of heats of steel to which bismuth, selenium, tellurium, or lead has been intentionally added shall not be permitted for Grade B bolts.

5. Mechanical Requirements

5.1 Bolts shall not exceed the maximum hardness required in Table 1. Bolts less than three diameters in length, or bolts with drilled or undersize heads shall have hardness values not less than the minimum nor more than the maximum hardness limits required in Table 1, as hardness is the only requirement.

5.2 Bolts $1\frac{3}{8}$ in. in diameter or less, other than those excepted in 4.1, shall be tested full size and shall conform to the requirements for tensile strength specified in Table 2.

5.3 Bolts larger than $1\frac{3}{8}$ in. in diameter, other than those excepted in 4.1, shall preferably be tested full size and when so tested, shall conform to the requirements for tensile strength specified in Table 2. When equipment of sufficient capacity for full-size bolt testing is not available, or when the length of the bolt makes full-size testing impractical, machined specimens shall be tested and shall

conform to the requirements shown below:

	Tensile Strength, ksi (MPa)	Elonga- tion in 2 in. or 50 mm, %
Grade A and Grade B bolts	60 (415) min	18 min
Grade B bolts only	100 (690) max	...

In the event that bolts are tested by both full size and by machine test specimen methods, the full-size test shall govern if a controversy between the two methods exists.

5.4 For bolts on which both hardness and tension tests are performed, acceptance based on tensile requirements shall take precedence in the event that there is controversy over low readings of hardness tests.

6. Dimensions

6.1 Unless otherwise specified, threads shall be the Coarse Thread Series as specified in the latest issue of ANSI B1.1, having a Class 2A tolerance.

6.2 Unless otherwise specified, Grade A bolts shall be hex bolts with dimensions as given in the latest issue of ANSI B 18.2.1. Unless otherwise specified, Grade B bolts shall be heavy hex bolts with dimensions as given in the latest issue of ANSI B 18.2.1.

6.3 Unless otherwise specified, bolts to be used with nuts or tapped holes which have been tapped oversize, in accordance with Specification A 563, shall have Class 2A threads before hot dip or mechanical galvanizing. After galvanizing, the maximum limit of pitch and major diameter may exceed the Class 2A limit by the following amount:

Diameter, in.	Oversize Limit, in. (mm) ⁴
Up to 7/16, incl	0.016 (0.41)
Over 7/16 to 1, incl	0.021 (0.53)
Over 1	0.031 (0.79)

⁴ These values are the same as the minimum overlapping required for galvanized nuts in Specification A 563.

6.4 The gaging limit for bolts shall be verified during manufacture or use by assembly of a nut tapped as nearly as practical to the amount oversize shown above. In case of dispute, a calibrated thread ring gage of that same size (Class X tolerance, gage tolerance plus) shall be used. Assembly of the gage, or the nut described above, must be possible with hand effort following application of light