



Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength¹

This standard is issued under the fixed designation A325; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification² covers two types of quenched and tempered steel heavy hex structural bolts having a minimum tensile strength of 120 ksi for sizes 1.0 in. and less and 105 ksi for sizes over 1.0 to 1½ in., inclusive.

1.2 The bolts are intended for use in structural connections. These connections are comparable to those covered under the requirements of the Specification for Structural Joints Using High-Strength Bolts, approved by the Research Council on Structural Connections; endorsed by the American Institute of Steel Construction and by the Industrial Fastener Institute.

1.3 The bolts are furnished in sizes ½ to 1½ in., inclusive. They are designated by type, denoting chemical composition as follows:

Type	Description
Type 1	Medium carbon, carbon boron, or medium carbon alloy steel.
Type 2	Withdrawn in November 1991.
Type 3	Weathering steel.

NOTE 1—Bolts for general applications, including anchor bolts, are covered by Specification A449. Also refer to Specification A449 for quenched and tempered steel bolts and studs with diameters greater than 1½ in. but with similar mechanical properties.

1.4 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 2—A complete metric companion to Specification A325 has been developed, Specification A325M; therefore, no metric equivalents are presented in this specification.

1.5 This specification is applicable to heavy hex structural bolts only. For bolts of other configurations and thread lengths with similar mechanical properties, see Specification A449.

¹ This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.02 on Steel Bolts, Nuts, Rivets and Washers.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-325 in Section II of that Code.

1.6 Terms used in this specification are defined in Terminology F1789.

1.7 The following safety hazard caveat pertains only to the test methods portion, Section 10, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:³

A194/A194M Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

A325M Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric)

A449 Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

A563 Specification for Carbon and Alloy Steel Nuts

A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

D3951 Practice for Commercial Packaging

F436 Specification for Hardened Steel Washers

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

F788/F788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series

F959 Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

³ 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.

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

F1136 Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection
F1789 Terminology for F16 Mechanical Fasteners
F2329 Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
G101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

2.2 ASME Standards:⁴

B 1.1 Unified Screw Threads

B 18.2.6 Fasteners for Use in Structural Applications

B 18.24 Part Identification Number (PIN) Code System Standard for B18 Fastener Products

2.3 RCSC Standard:⁵

Specification for Structural Joints Using High-Strength Bolts

3. Ordering Information

3.1 Orders for heavy hex structural bolts under this specification shall include the following:

3.1.1 Quantity (number of pieces of bolts and accessories).

3.1.2 Size, including nominal bolt diameter, thread pitch, and bolt length.

3.1.3 Name of product, heavy hex structural bolts.

3.1.4 When bolts threaded full length are required, Supplementary Requirement S1 shall be specified.

3.1.5 Type of bolt: Type 1 or 3. When type is not specified, either Type 1 or Type 3 shall be furnished at the supplier's option.

3.1.6 ASTM designation and year of issue.

3.1.7 Other components such as nuts, washers, and compressible washer-type direct-tension indicators, if required.

3.1.7.1 When such other components are specified to be furnished, also state "Nuts, washers, and direct tension indicators, or combination thereof, shall be furnished by lot number."

3.1.8 *Zinc Coating*—Specify the zinc coating process required, for example, hot dip, mechanically deposited, Zinc/Aluminum Corrosion Protective Coating or no preference (see 4.3).

3.1.9 *Other Finishes*—Specify other protective finish, if required.

3.1.10 Test reports, if required (see Section 13).

3.1.11 Supplementary or special requirements, if required.

3.1.12 For establishment of a part identifying system, see ASME B18.24.

NOTE 3—A typical ordering description follows: 1000 pieces 1 $\frac{1}{8}$ -7 UNC in. dia $\times$ 4 in. long heavy hex structural bolt, *Type 1* ASTM A325-02, each with one hardened washer, ASTM F436 Type 1, and one heavy hex nut, ASTM A563 Grade DH. Each component hot-dip zinc-coated. Nuts lubricated.

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁵ Available from American Institute of Steel Construction (AISC), One E. Wacker Dr., Suite 700, Chicago, IL 60601-2001, <http://www.aisc.org>.

3.2 Recommended Nuts:

3.2.1 Nuts conforming to the requirements of Specification A563 are the recommended nuts for use with Specification A325 heavy hex structural bolts. The nuts shall be of the class and have a surface finish for each type of bolt as follows:

Bolt Type and Finish	Nut Class and Finish
1, plain (noncoated)	A563-C, C3, D, DH, DH3, plain
1, zinc coated	A563-DH, zinc coated
1, coated in accordance with Specification F1136, Grade 3	A563-DH coated in accordance with Specification F1136, Grade 5
3, plain	A563-C3, DH3, plain

3.2.2 Alternatively, nuts conforming to Specification A194/A194M Gr. 2H are considered a suitable substitute for use with Specification A325 Type 1 heavy hex structural bolts.

3.2.3 When Specification A194/A194M Gr. 2H zinc-coated nuts are supplied, the zinc coating, overtapping, lubrication, and rotational capacity testing shall be in accordance with Specification A563.

3.3 Recommended Washers:

3.3.1 Washers conforming to Specification F436 are the recommended washers for use with Specification A325 heavy hex structural bolts. The washers shall have a surface finish for each type of bolt as follows:

Bolt Type and Finish	Washer Finish
1, plain (uncoated)	plain (uncoated)
1, zinc coated	zinc coated
1, coated in accordance with Specification F1136, Grade 3	coated in accordance with Specification F1136, Grade 3
3, plain	weathering steel, plain

3.4 Other Accessories:

3.4.1 When compressible washer type direct tension indicators are specified to be used with these bolts, they shall conform to Specification F959, Type 325.

4. Materials and Manufacture

4.1 Heat Treatment:

4.1.1 Type 1 bolts produced from medium carbon steel shall be quenched in a liquid medium from the austenitizing temperature. Type 1 bolts produced from medium carbon steel to which chromium, nickel, molybdenum, or boron were intentionally added shall be quenched only in oil from the austenitizing temperature.

4.1.2 Type 3 bolts shall be quenched only in oil from the austenitizing temperature.

4.1.3 Type 1 bolts, regardless of the steel used, and Type 3 bolts shall be tempered by reheating to not less than 800°F.

4.2 Threading—Threads shall be cut or rolled.

4.3 Zinc Coatings, Hot-Dip and Mechanically Deposited, Zinc/Aluminum Corrosion Protective Coating:

4.3.1 When zinc-coated fasteners are required, the purchaser shall specify the zinc coating process, for example, hot