



Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength¹

This standard is issued under the fixed designation A490; 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 specification covers two types of quenched and tempered, alloy steel, heavy hex structural bolts having a tensile strength of 150 to 173 ksi.

1.2 These bolts are intended for use in structural connections. These connections are covered under the requirements of the Specification for Structural Joints Using Specification A325 or A490 bolts, approved by the Research Council on Structural Connections; endorsed by the American Institute of Steel Construction and by the Industrial Fastener Institute.²

1.3 The bolts are furnished in sizes 1/2 to 1 1/2 in., inclusive. They are designated by type denoting chemical composition as follows:

Type	Description
Type 1	Medium carbon alloy steel
Type 2	Withdrawn in 2002
Type 3	Weathering steel

1.4 This specification provides that heavy hex structural bolts shall be furnished unless other dimensional requirements are specified on the purchase order.

1.5 Terms used in this specification are defined in Terminology F1789 unless otherwise defined herein.

1.6 For metric bolts, see Specification A490M Classes 10.9 and 10.9.3

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

1.8 The following safety hazards caveat pertains only to the Test Methods portion, Section 12 of this specification: *This*

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

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
- A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A354 Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
- A490M Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric)
- A563 Specification for Carbon and Alloy Steel Nuts
- A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- D3951 Practice for Commercial Packaging
- E384 Test Method for Knoop and Vickers Hardness of Materials
- E709 Guide for Magnetic Particle Testing
- E1444 Practice for Magnetic Particle Testing
- 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
- F1136 Specification for Zinc/Aluminum Corrosion Protective Coatings for 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**

F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

F1789 Terminology for F16 Mechanical Fasteners

F2328 Test Method for Determining Decarburization and Carburization in Hardened and Tempered Threaded Steel Bolts, Screws, Studs, and Nuts

F2833 Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type

G101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

2.2 *ASME Standards*:⁴

B1.1 Unified Screw Threads

B18.2.6 Fasteners for Use in Structural Applications

B18.24 Part Identification Number (PIN) Code System Standard for B18 Fastener Products

2.3 *IFI Standard*:⁵

IFI 144 Test Evaluation Procedures for Coating Qualification Intended for Use on 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. The thread length shall not be changed;

3.1.3 Name of product: heavy hex structural bolts, or other such bolts as specified;

3.1.4 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;

3.1.5 ASTM designation and year of issue,

3.1.6 Other components such as nuts, washers, and washer-type direct tension indicators, if required;

3.1.7 Test Reports, if required (see Section 15); and

3.1.8 Protective coating per Specification **F1136**, Grade 3, if required. See 4.3.

3.1.9 Protective coating per Specification **F2833**, Grade 1, if required. See 4.3.

3.1.10 Special requirements.

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

NOTE 1—A typical ordering description follows: 1000 pieces 1–8 in. dia × 4 in. long heavy hex structural bolt, Type 1, *ASTM A490–02*; each with two hardened washers, ASTM **F436** Type 1; and one heavy hex nut, ASTM **A563** Grade DH.

3.2 *Recommended Nuts*:

3.2.1 Nuts conforming to the requirements of Specification **A563** are the recommended nuts for use with Specification A490 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

1, plain (uncoated)

1, coated in accordance with Specification **F1136**, Grade 3 or Specification **F2833**, Grade 1.

3, weathering steel

Nut Class and Finish

A563—DH, DH3 plain (uncoated)

A563—coated in accordance with Specification **F1136**, Grade 5 or Specification **F2833**, Grade 1.

A563—DH3, weathering steel

3.2.2 Alternatively, nuts conforming to Specification **A194/A194M** Gr. 2H plain (uncoated) are considered a suitable substitute for use with Specification A490 Type 1 heavy hex structural bolts.

3.3 *Recommended Washers*—Washers conforming to Specification **F436** are the recommended washers for use with Specification A490 heavy hex structural bolts. The washers shall have a surface finish for each type of bolt as follows:

Bolt Type and Finish

1, plain (uncoated)

1, coated in accordance with **F1136**, Grade 3 or **F2833**, Grade 1.

3, weathering steel

Washer Finish

plain (uncoated)

plain, coated in accordance with **F1136**, Grade 3 or **F2833**, Grade 1.

weathering steel

3.4 *Other Accessories*—When compressible washer type direct tension indicators are specified to be used with these bolts, they shall conform to Specification **F959** Type 490.

4. Materials and Manufacture

4.1 *Heat Treatment*—Type 1 and Type 3 bolts shall be heat treated by quenching in oil from the austenitic temperature and then tempered by reheating to a temperature of not less than 800°F.

4.2 *Threading*—The threads shall be cut or rolled.

4.3 *Protective Coatings*:

4.3.1 When a protective coating is required and specified, the bolts shall be coated with Zinc/Aluminum Corrosion Protective Coatings in accordance with Specification **F1136**, Grade 3, both chromium and non-chromium versions, or Specification **F2833**, Grade 1. These coatings have been qualified based on the findings of an investigation founded on IFI 144.⁶

4.3.2 No other metallic coatings are permitted unless authorized by Committee F16. Future consideration of any coating will be based on results of testing performed in accordance with the procedures in IFI 144, and submitted to Committee F16 for review (See note 2).

NOTE 2—For more detail see the H. E. Townsend Report “Effects of Zinc Coatings on Stress Corrosion Cracking and Hydrogen Embrittlement of Low Alloy Steel,” published in Metallurgical Transactions, Vol. 6, April 1975.

5. Chemical Composition

5.1 Type 1 bolts shall be alloy steel conforming to the chemical composition specified in Table 1. The steel shall

⁴ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5900, <http://www.asme.org>.

⁵ Available from Industrial Fastener Institute, (IFI), 6363 Oak Tree Boulevard, Independence, OH 44131. <http://www.industrial-fasteners.org>.

⁶ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Reports RR:F16-1001, RR:F16-1002, and RR:F16-1003.