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# Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/ 105/90 ksi Minimum Tensile Strength, General Use<sup>1</sup>

This standard is issued under the fixed designation A449; 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 ( $\varepsilon$ ) 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<sup>2</sup> covers quenched and tempered steel hex cap screws, bolts, and studs having a minimum tensile strength of 120 ksi for diameters 1.0 in. and smaller; 105 ksi for diameters over 1.0 in. to  $1\frac{1}{2}$  in.; and 90 ksi for diameters  $1\frac{3}{4}$  in. to 3.0 in. inclusive. The term "fasteners" in this specification denotes hex cap screws, bolts, and studs.

1.2 The fasteners are intended for general engineering use.

1.3 The fasteners are furnished in diameters  $\frac{1}{4}$  to 3.0 in. inclusive. They are designated by type denoting chemical composition as follows:

Туре	Description	
Type I	Plain carbon steel, carbon boron steel, alloy steel, or alloy boron steel	
Type 2 Type 3	iTeh Standa Withdrawn 2003 Weathering steel	

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

1.5 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information purposes only. standard. No other units of measurement are included in this standard.

1.6 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:<sup>3</sup>

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

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

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

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<sup>&</sup>lt;sup>1</sup> This specification is under the jurisdiction of ASTM Committee F16 on Fastenersand is the direct responsibility of Subcommittee F16.02 on Steel Bolts, Nuts, Rivets and Washers.

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<sup>&</sup>lt;sup>2</sup> For ASME Boiler and Pressure Vessel Code applications see related Specifications SA-449 in Section II of that Code.

<sup>&</sup>lt;sup>3</sup> 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.



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

2.2 ASME Standards:<sup>4</sup>

B 1.1 Unified Screw Threads

B 18.2.1 Square and Hex Bolts and Screws

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

### 3. Ordering Information

3.1 Orders for fasteners under this specification shall include the following:

3.1.1 Quantity (number of pieces),

3.1.2 Size, including nominal diameter and length,

3.1.3 Name of product,

3.1.4 Type, that is, Type 1, or Type 3 as required,

3.1.5 ASTM designation and year of issue, and

3.1.6 Other components such as nuts and washers if required.

3.1.7 *Hot-Dip or Mechanically Deposited Zinc Coatings*—For hot-dip or mechanically deposited zinc coatings covered by 5.1 and requiring over-tapped nuts, specify the zinc coating process required, that is, hot-dip, mechanically deposited, or no preference (see 5.1).

3.1.8 Other Coatings—Specify other protective coating if required (see 5.2).

3.1.9 Specify if inspection at point of manufacture is required.

3.1.10 Test reports if required.

3.1.11 Supplementary or special requirements.

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

Note 1—A typical ordering description follows: 1000 pieces  $\frac{1}{8}$  in. diameter × 4.0 in. long hex cap screw, Type 1, ASTM A449–XX, each with one finished hex nut ASTM A563, Grade DH. Each component mechanically zinc coated in accordance with B695, Class 5, Type II.

3.2 Suitable Nuts and Washers:

3.2.1 Suitable nuts are covered in Specification A563. Unless otherwise specified, the grade and style of nut shall be as follows:

Fastener Size and Surface Finish Standards iten.a	Nut Grade and Style <sup>A</sup>
1/4 to 11/2 in., plain (or with a coating of insufficient thickness to require over-tanned puts)	B, hex
Over 1½ to 3 in., plain (or with a coating of insuffi-	A, heavy hex
1/4 to 3 in., zinc-coated (or with a coating thickness	DH, heavy hex
1/4 to 3 in., Type 3 ASTM A449-14	C3, DH3, heavy hex

<sup>A</sup> Nuts of other grades and styles having specified proof load stresses (Specification A563, Table 3) greater than the specified grade and style of nut are suitable.

3.2.2 Unless otherwise specified, washers ordered with fasteners shall be furnished to the requirements of Specification F436, Type 1 or Specification F436, Type 3. Washers for A449 Type 3 fasteners shall conform to Specification F436 Type 3.

# 4. Materials and Manufacture

#### 4.1 Heat Treatment:

4.1.1 Type 1 fasteners produced from medium carbon steel shall be quenched in a liquid medium from the austenitizing temperature.

4.1.2 Type 1 fasteners produced from medium carbon steel to which chromium, nickel, molybdenum, or boron were intentionally added, and Type 3 fasteners, shall be quenched in oil from the austenitizing temperature.

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

4.2 Threading—Threads shall be rolled, cut, or ground.

4.3 *Secondary Processing*—If any processing which can affect the mechanical properties of the fasteners is performed after the initial testing, the fasteners shall be retested for all specified mechanical properties affected by the reprocessing.

#### 5. Protective Coatings

5.1 Zinc, Hot Dip, and Mechanically Deposited Requiring Over-tapped Nuts:

5.1.1 When zinc-coated fasteners are required, the purchaser shall specify the zinc-coating process, such as, hot-dip, mechanically deposited, or no preference.

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