
Standard Specification for

High-Strength Bolts for Structural Steel Joints

AASHTO Designation: M 164-05 (2008)

ASTM Designation: A 325-04b



AASHTO M 164-05 (2008) is identical to ASTM A 325-04b except for the following provisions:

1. All references to the ASTM standards contained in ASTM A 325-04b, listed in the following table, shall be replaced with the corresponding AASHTO standard:

<i>Referenced Standards</i>	
ASTM	AASHTO
A 153	M 232M/M 232
A 194	M 292M/M 292
A 490	M 253
A 563	M 291
A 709/A 709M	M 270M/M 270
B 695	M 298
F 436	M 293M

2. Replace Section 14.1 of ASTM A 325-04b with the following:

14.1 The party responsible for the fastener shall be the organization that supplies the fastener to the purchaser. The responsible party shall supply test reports certified by the manufacturer that indicate the fasteners were manufactured, sampled, tested, and inspected in accordance with this specification and meet all of its requirements.



Designation: A 325 – 04b

American Association
State Highway and
Transportation Officials
Standard AASHTO No.: M 164

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

This standard is issued under the fixed designation A 325; 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 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 covered under the requirements of the Specification for Structural Joints Using ASTM A 325 or A 490 Bolts, approved by the Research Council on Structural Connections, endorsed by the American Institute of Steel Construction and by the Industrial Fastener Institute.³

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Type 2	Withdrawn in November 1991.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 A 449. Also refer to Specification A 449 for quenched and tempered steel bolts and studs with diameters greater than 1½ in. but with similar mechanical properties.

NOTE 2—A complete metric companion to Specification A 325 has been developed—Specification A 325M; therefore, no metric equivalents are presented in this specification.

1.4 This specification is applicable to heavy hex structural bolts only. For bolts of other configurations and thread lengths with similar mechanical properties, see Specification A 449.

1.5 Terms used in this specification are defined in Terminology F 1789.

1.6 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:⁴

- A 153/A 153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A 194/A 194M Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
- A 449 Specification for Quenched and Tempered Steel Bolts and Studs
- A 490 Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
- A 563 Specification for Carbon and Alloy Steel Nuts
- A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- B 695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- D 3951 Practice for Commercial Packaging
- F 436 Specification for Hardened Steel Washers
- F 606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets
- F 788/F 788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series
- F 959 Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners
- F 1470 Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection
- F 1789 Terminology for F16 Mechanical Fasteners
- G 101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

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.

³ Published by American Institute of Steel Construction, One East Wacker Dr., Ste. 3100, Chicago, IL 60601-2001.

⁴ 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.

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2.2 ASME Standards:⁵

B 1.1 Unified Screw Threads

B 18.2.6 Fasteners for Use in Structural Applications

B 18.24.1 Part Identifying Number (PIN) Code System

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, 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 B18.24.1.

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 A 325-02*, each with one hardened washer, ASTM F 436 Type 1, and one heavy hex nut, ASTM A 563 Grade DH. Each component hot-dip zinc-coated. Nuts lubricated.

3.2 Recommended Nuts:

3.2.1 Nuts conforming to the requirements of Specification A 563 are the recommended nuts for use with Specification A 325 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)	A 563-C, C 3, D, DH, DH3, plain
1, zinc coated	A 563-DH, zinc coated
3, plain	A 563-C3, DH3, plain

3.2.2 Alternatively, nuts conforming to Specification A 194/A 194M Gr. 2H are considered a suitable substitute for use with Specification A 325 Type 1 heavy hex structural bolts.

3.2.3 When Specification A 194/A 194M Gr. 2H zinc-coated nuts are supplied, the zinc coating, overtapping, lubrication, and rotational capacity testing shall be in accordance with Specification A 563.

3.3 Recommended Washers:

3.3.1 Washers conforming to Specification F 436 are the recommended washers for use with Specification A 325 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
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 F 959 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 born 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:*

4.3.1 When zinc-coated fasteners are required, the purchaser shall specify the zinc coating process, for example, hot dip, mechanically deposited, or no preference.

4.3.2 When hot-dip is specified, the fasteners shall be zinc-coated by the hot-dip process and the coating shall conform to the coating weight/thickness and performance requirements of Class C of Specification A 153/A 153M.

4.3.3 When mechanically deposited is specified, the fasteners shall be zinc-coated by the mechanical deposition process and the coating shall conform to the coating weight/thickness and performance requirements of Class 50 of Specification B 695.

4.3.4 When no preference is specified, the supplier shall furnish either a hot-dip zinc coating in accordance with Specification A 153/A 153M, Class C, or a mechanically deposited zinc coating in accordance with Specification B 695, Class 50. Threaded components (bolts and nuts) shall be coated by the same zinc-coating process and the supplier's option is limited to one process per item with no mixed processes in a lot.

4.4 *Lubrication*—When zinc-coated nuts are ordered with the bolts, the nuts shall be lubricated in accordance with Specification A 563, Supplementary Requirement S1, to minimize galling.

4.5 Secondary Processing:

4.5.1 If any processing, which can affect the mechanical properties or performance of the bolts, is performed after the

⁵ Available from ASME International, Information Central, 22 Law Dr., PO Box 2300, Fairfield, NJ 07007-2300