



Designation: A 490M – 00

METRIC

Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric]¹

This standard is issued under the fixed designation A 490M; 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 specification covers the chemical and mechanical requirements of quenched and tempered steel bolts, in nominal thread diameters M16 to M36, inch. These bolts are intended for use in structural joints that are comparable to those made under the Specification for Structural Joints Using ASTM A 325 or A 490 Bolts² issued by the Research Council on Structural Connections of the Engineering Foundation. The various types of bolts covered by this specification are:

1.1.1 *Type 1*—Bolts made of alloy steel, supplied in nominal thread diameters M16 to M36, inclusive.

1.1.2 *Type 2*—Bolts made from what is generally described as low-carbon martensite steel, supplied in nominal thread diameters M16 to M24 inclusive.

1.1.3 *Type 3*—Bolts in nominal thread diameters M16 to M36, inclusive, having atmospheric corrosion resistance and weathering characteristics comparable to that of the steels covered in Specifications A 588/A 588M, A 242/A 242M, and A 709/A 709M. The atmospheric corrosion resistance of these steels is substantially better than that of carbon steel with or without copper addition. See 6.3. When properly exposed to the atmosphere, these steels can be used bare (uncoated) for many applications.

1.2 Unless otherwise specified, all nuts used on these bolts shall conform to the requirements of Specification A 563M, shall be heavy hex, and shall be of the class and surface finish for each type of bolt as follows:

Bolt Type and Finish	Nut Class and Finish
1 and 2, plain (noncoated)	10S, 1053, plain
3, plain	10S3, plain

1.3 Unless otherwise specified, all washers used on these bolts shall conform to the requirements of Specification

F 436M and shall be of a surface finish for each type of bolt as follows:

Bolt Type and Finish	Washer Finish
1 and 2, plain (uncoated)	plain (uncoated)
3, plain	weathering steel, plain

1.4 This specification provides that heavy hex structural bolts and heavy hex nuts shall be furnished unless other dimensional requirements are stipulated in the purchase inquiry and order.

NOTE 1—For quenched and tempered steel bolts, studs, and other externally threaded fasteners with nominal thread diameters larger than M36, but with similar mechanical properties, refer to class 10.9 of Specification F 568.

NOTE 2—This specification is the metric companion of Specification A 490.

2. Referenced Documents

2.1 ASTM Standards:

A 242/A242M Specification for High-Strength Low-Alloy Structural Steel³

A 563M Specification for Carbon and Alloy Steel Nuts [Metric]⁴

A 588/A588M Specification for High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4 in. [100 mm] Thick³

A 709/A709M Specification for Structural Steel for Bridges³

D 3951 Practice for Commercial Packaging⁵

E 138 Method for Wet Magnetic Particle Inspection⁶

E 709 Guide for Magnetic Particle Examination⁷

F 436M Specification for Hardened Steel Washers [Metric]⁸

F 568 Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners⁸

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 Published by the American Institute of Steel Construction, 400 N. Michigan Ave., Chicago, IL 60611.

³ Annual Book of ASTM Standards, Vol 01.04.

⁴ Annual Book of ASTM Standards, Vols 01.01 and 01.08.

⁵ Annual Book of ASTM Standards, Vol 15.09.

⁶ Discontinued; see 1980 Annual Book of ASTM Standards, Part II.

⁷ Annual Book of ASTM Standards, Vol 03.03.

⁸ Annual Book of ASTM Standards, Vol 01.08.

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



F 606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets⁸

F 788/F788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series⁸

G 101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels⁹

2.2 *ANSI/ASME Standards:*

B1.13M Metric Screw Threads¹⁰

B18.2.3.7M Metric Heavy Hex Structural Bolts¹⁰

B18.24.1 Part Identifying Number (PIN) Code System¹¹

2.3 *Military Standard:*

MIL-STD-105 Sampling Procedure and Tables for Inspection by Attributes¹²

3. Terminology

3.1 *Definitions:*

3.1.1 Surface discontinuities as covered by this specification are defined as follows:

3.1.2 *acceptable quality level (AQL)*—as defined in MIL-STD-105, the maximum percent defective that, for purposes of sampling inspection, can be considered satisfactory as the process average.

3.1.3 *burst*—a break located at the periphery of the bolt head.

3.1.4 *crack*—a clean crystalline break passing through the grain boundary without inclusion of foreign elements.

3.1.5 *process average*—as defined in MIL-STD-105, the average percent defective of product at the time of original inspection. Original inspection is that first inspection of a particular quantity of product which is being reinspected after rejection and reconditioning.

3.1.6 *seam or lap*—a noncrystalline break through the metal which is inherent in the raw material.

4. Ordering Information

4.1 Orders for products under this specification shall include the following:

4.1.1 Quantity (number of pieces of bolts and accessories),

4.1.2 Name of products, including accessories such as nuts and washers when desired,

4.1.3 Dimensions, including nominal bolt diameter, thread pitch, and length. For bolts of dimensional requirements other than heavy hex structural bolts (see section 1.4) it is normally necessary to specify grip length,

4.1.4 Type of bolt (that is, Type 1, 2, or 3).

4.1.4.1 When the bolt type is not specified Type 1, 2 or 3 bolts may be supplied by the manufacturer.

4.1.4.2 When atmospheric corrosion resistance and weathering characteristics are required, Type 3 bolts should be specified by the purchaser.

4.1.5 ASTM designation and date of issue,

4.1.6 Whether proof load tests are required,

4.1.7 Specify if test reports are required, and

4.1.8 Any special requirements.

4.1.9 For establishment of a part identifying system, see ASME B18.24.1.

NOTE 3—Two examples of ordering descriptions follow: (1) 1000 pieces, heavy hex structural bolts, each with two hardened washers, ASTM F 436M, and one heavy hex nut, ASTM A 563M class 10S, M24 × 3 × 100, ASTM A 490M dated _____. (2) 1000 pieces, heavy hex structural bolts, no nuts or washers, M20 × 2.5 × 60, Type 1, ASTM A 490M dated _____.

5. Materials and Manufacture

5.1 Steel for bolts, and the heading, threading, and heat treatment of bolts shall be in accordance with requirements specified for classes 10.9 and 10.9.3 bolts in Specification F 568.

6. Chemical Composition

6.1 Type 1 bolts shall conform to the chemical composition requirements specified for alloy steel class 10.9 bolts in Specification F 568. The steel shall contain sufficient alloying elements to qualify it as an alloy steel.

NOTE 4—Steel is considered to be alloy, by the American Iron and Steel Institute, when the maximum of the range given for the content of alloying elements exceeds one or more of the following limits: manganese, 1.65 %; silicon, 0.60 %; copper, 0.60 %; or in which a definite range or a definite minimum quantity of any of the following elements is specified or required within the limits of the recognized field of constructional alloy steels: aluminum, chromium up to 3.99 %, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, or any other alloying elements added to obtain a desired alloying effect.

6.2 Type 2 bolts shall conform to the chemical composition requirements specified for low carbon martensite steel class 10.9 bolts in Specification F 568.

6.3 Type 3 bolts shall conform to the chemical composition requirements specified for class 10.9.3 bolts in Specification F 568. See Guide G 101 for methods of estimating the atmospheric corrosion resistance of low alloy steels.

6.4 Product analyses may be made by the purchaser from finished material representing each lot of bolts. The chemical composition thus determined shall conform to the requirements given in Tables 1 or 2 of Specification F 568, as applicable.

7. Mechanical Requirements

7.1 Bolts shall meet the mechanical requirements specified for classes 10.9 and 10.9.3 bolts in Specification F 568. In addition, bolts shall not have a tensile strength greater than 1200 MPa.

NOTE 5—For information purposes only, the mechanical properties of bolts are given in Appendix X1.

7.2 For bolts on which hardness and tension tests are performed, acceptance based on tensile requirements shall take precedence in case of controversy over low or high hardness readings.

8. Dimensions

8.1 Unless otherwise specified, bolts shall conform to the

⁹ Annual Book of ASTM Standards, Vol 03.02.

¹⁰ Available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

¹¹ Available from American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

¹² Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.