



# Standard Specification for Carbon Structural Steel<sup>1</sup>

This standard is issued under the fixed designation A36/A36M; 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 ( $\epsilon$ ) 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 carbon steel shapes, plates, and bars of structural quality for use in riveted, bolted, or welded construction of bridges and buildings, and for general structural purposes.

1.2 Supplementary requirements are provided for use where additional testing or additional restrictions are required by the purchaser. Such requirements apply only when specified in the purchase order.

1.3 When the steel is to be welded, a welding procedure suitable for the grade of steel and intended use or service is to be utilized. See Appendix X3 of Specification **A6/A6M** for information on weldability.

1.4 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system is to be used independently of the other, without combining values in any way.

1.5 The text of this specification contains notes or footnotes, or both, that provide explanatory material. Such notes and footnotes, excluding those in tables and figures, do not contain any mandatory requirements.

1.6 For structural products produced from coil and furnished without heat treatment or with stress relieving only, the additional requirements, including additional testing requirements and the reporting of additional test results, of **A6/A6M** apply.

---

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee **A01** on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee **A01.02** on Structural Steel for Bridges, Buildings, Rolling Stock and Ships.

Current edition approved Dec. 1, 2014. Published December 2014. Originally approved in 1960. Last previous edition approved in 2012 as A36/A36M – 12. DOI: 10.1520/A0036\_A0036M-14.

<sup>2</sup> For ASME Boiler and Pressure Vessel Code Applications, see related Specifications SA-36 in Section II of that Code.

## 2. Referenced Documents

2.1 *ASTM Standards*:<sup>3</sup>

- A6/A6M** Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
- A27/A27M** Specification for Steel Castings, Carbon, for General Application
- A307** Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
- A325** Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A325M** Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric)
- A500** Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A501** Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- A502** Specification for Rivets, Steel, Structural
- A563** Specification for Carbon and Alloy Steel Nuts
- A563M** Specification for Carbon and Alloy Steel Nuts (Metric)
- A668/A668M** Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use
- A1011/A1011M** Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- A1018/A1018M** Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- F568M** Specification for Carbon and Alloy Steel Externally

---

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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

**TABLE 1 Appurtenant Material Specifications**

NOTE 1—The specifier should be satisfied of the suitability of these materials for the intended application. Chemical composition or mechanical properties, or both, may be different than specified in A36/A36M.

Material	ASTM Designation
Steel rivets	A502, Grade 1
Bolts	A307, Grade A or F568M, Class 4.6
High-strength bolts	A325 or A325M
Steel nuts	A563 or A563M
Cast steel	A27/A27M, Grade 65–35 [450–240]
Forgings (carbon steel)	A668/A668M, Class D
Hot-rolled sheets and strip	A1011/A1011M, SS Grade 36 [250] Type 1 or Type 2 or A1018/A1018M, SS Grade 36 [250]
Cold-formed tubing	A500, Grade B
Hot-formed tubing	A501
Anchor bolts	F1554, Grade 36

[Threaded Metric Fasteners \(Metric\) \(Withdrawn 2012\)<sup>4</sup>](#)  
[F1554 Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength](#)

### 3. Appurtenant Materials

3.1 When components of a steel structure are identified with this ASTM designation but the product form is not listed in the scope of this specification, the material shall conform to one of the standards listed in [Table 1](#) unless otherwise specified by the purchaser.

### 4. General Requirements for Delivery

4.1 Structural products furnished under this specification shall conform to the requirements of the current edition of Specification [A6/A6M](#), for the specific structural product ordered, unless a conflict exists in which case this specification shall prevail.

4.2 Coils are excluded from qualification to this specification until they are processed into a finished structural product. Structural products produced from coil means structural products that have been cut to individual lengths from a coil. The processor directly controls, or is responsible for, the operations involved in the processing of a coil into a finished structural product. Such operations include decoiling, leveling or straightening, hot-forming or cold-forming (if applicable), cutting to length, testing, inspection, conditioning, heat treatment (if applicable), packaging, marking, loading for shipment, and certification.

NOTE 1—For structural products produced from coil and furnished without heat treatment or with stress relieving only, two test results are to be reported for each qualifying coil. Additional requirements regarding structural products produced from coil are described in Specification [A6/A6M](#).

<sup>4</sup>The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

## 5. Bearing Plates

5.1 Unless otherwise specified, plates used as bearing plates for bridges shall be subjected to mechanical tests and shall conform to the tensile requirements of [Section 8](#).

5.2 Unless otherwise specified, mechanical tests shall not be required for plates over 1½ in. [40 mm] in thickness used as bearing plates in structures other than bridges, subject to the requirement that they shall contain 0.20 to 0.33 % carbon by heat analysis, that the chemical composition shall conform to the requirements of [Table 3](#) in phosphorus and sulfur content, and that a sufficient discard shall be made to secure sound plates.

## 6. Materials and Manufacture

6.1 The steel shall be killed

## 7. Chemical Composition

7.1 The heat analysis shall conform to the requirements prescribed in [Table 3](#), except as specified in [5.2](#).

7.2 The steel shall conform on product analysis to the requirements prescribed in [Table 3](#), subject to the product analysis tolerances in Specification [A6/A6M](#).

## 8. Tension Test

8.1 The material as represented by the test specimen, except as specified in [5.2](#) and [8.2](#), shall conform to the requirements as to the tensile properties prescribed in [Table 2](#).

8.2 Shapes less than 1 in.<sup>2</sup> [645 mm<sup>2</sup>] in cross section and bars, other than flats, less than ½ in. [12.5 mm] in thickness or diameter need not be subjected to tension tests by the manufacturer, provided that the chemical composition used is appropriate for obtaining the tensile properties in [Table 2](#).

## 9. Keywords

9.1 bars; bolted construction; bridges; buildings; carbon; plates; riveted construction; shapes; steel; structural steel; welded construction

**TABLE 2 Tensile Requirements<sup>A</sup>**

Plates, Shapes, <sup>B</sup> and Bars:	
Tensile strength, ksi [MPa]	58–80 [400–550]
Yield point, min, ksi [MPa]	36 [250] <sup>C</sup>
Plates and Bars: <sup>D,E</sup>	
Elongation in 8 in. [200 mm], min, %	20
Elongation in 2 in. [50 mm], min, %	23
Shapes:	
Elongation in 8 in. [200 mm], min, %	20
Elongation in 2 in. [50 mm], min, %	21 <sup>B</sup>

<sup>A</sup> See the Orientation subsection in the Tension Tests section of Specification [A6/A6M](#).

<sup>B</sup> For wide flange shapes with flange thickness over 3 in. [75 mm], the 80 ksi [550 MPa] maximum tensile strength does not apply and a minimum elongation in 2 in. [50 mm] of 19 % applies.

<sup>C</sup> Yield point 32 ksi [220 MPa] for plates over 8 in. [200 mm] in thickness.

<sup>D</sup> Elongation not required to be determined for floor plate.

<sup>E</sup> For plates wider than 24 in. [600 mm], the elongation requirement is reduced two percentage points. See the Elongation Requirement Adjustments subsection under the Tension Tests section of Specification [A6/A6M](#).

**TABLE 3 Chemical Requirements**

NOTE 1—Where “. . .” appears in this table, there is no requirement. The heat analysis for manganese shall be determined and reported as described in the heat analysis section of Specification **A6/A6M**.

Product	Shapes <sup>A</sup>	Plates > 15-in. [380 mm] Width <sup>B</sup>					Bars; Plates ≤ 15-in. [380 mm] Width <sup>B</sup>			
		To ¾ [20], incl	Over ¾ to 1½ [20 to 40], incl	Over 1½ to 2½ [40 to 65], incl	Over 2½ to 4 [65 to 100], incl	Over 4 [100]	To ¾ [20], incl	Over ¾ to 1½ [20 to 40], incl	Over 1½ to 4 [100], incl	Over 4 [100]
Thickness, in. [mm]	All									
Carbon, max, %	0.26	0.25	0.25	0.26	0.27	0.29	0.26	0.27	0.28	0.29
Manganese, %	...	...	0.80–1.20	0.80–1.20	0.85–1.20	0.85–1.20	...	0.60–0.90	0.60–0.90	0.60–0.90
Phosphorus, max, %	0.04	0.030	0.030	0.030	0.030	0.030	0.04	0.04	0.04	0.04
Sulfur, max, %	0.05	0.030	0.030	0.030	0.030	0.030	0.05	0.05	0.05	0.05
Silicon, %	0.40 max	0.40 max	0.40 max	0.15–0.40	0.15–0.40	0.15–0.40	0.40 max	0.40 max	0.40 max	0.40 max
Copper, min, % when cop per steel is specified	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

<sup>A</sup> Manganese content of 0.85–1.35 % and silicon content of 0.15–0.40 % is required for shapes with flange thickness over 3 in. [75 mm].

<sup>B</sup> For each reduction of 0.01 percentage point below the specified carbon maximum, an increase of 0.06 percentage point manganese above the specified maximum will be permitted, up to the maximum of 1.35 %.

### SUPPLEMENTARY REQUIREMENTS

These requirements shall not apply unless specified in the order.

Standardized supplementary requirements for use at the option of the purchaser are listed in Specification **A6/A6M**. Those that are considered suitable for use with this specification are listed by title:

#### S5. Charpy V-Notch Impact Test.

#### S30. Charpy V-Notch Impact Test for Structural Shapes: Alternate Core Location

#### S32. Single Heat Bundles

S32.1 Bundles containing shapes or bars shall be from a single heat of steel.

### SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A36/A36M – 12) that may impact the use of this standard. (Approved Dec. 1, 2014.)

(1) Revised Table 3 to modify phosphorus and sulfur limits for plate products greater than 15 in. [380 mm] in width.

*ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; http://www.copyright.com/*