

SPECIFICATION FOR CARBON STRUCTURAL STEEL



SA-36/SA-36M



(Identical with ASTM Specification A 36/A 36M-03a.)

1. Scope

1.1 This specification 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 A 6/A 6M 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 coiled 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 A 6/A 6M apply.

2. Referenced Documents

2.1 *ASTM Standards:*

- A 6/A 6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
- A 27/A 27M Specification for Steel Castings, Carbon, for General Application
- A 307 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

A 325 Specification for High-Strength Bolts for Structural Steel Joints

A 325M Specification for High-Strength Bolts for Structural Steel Joints [Metric]

A 500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

A 501 Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

A 502 Specification for Steel Structural Rivets

A 563 Specification for Carbon and Alloy Steel Nuts

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

A 668/A 688M Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use

A 1011/A 1011M Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, High Strength Low Alloy, and High Strength Low Alloy with Improved Formability

F 568M Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

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 A 6/A 6M, 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 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 A 6/A 6M.

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 $1\frac{1}{2}$ 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 2 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 for plates and bars over $\frac{1}{2}$ in. [12.5 mm] in thickness and shapes other than Group 1 shall be semi-killed or killed.

7. Chemical Composition

7.1 The heat analysis shall conform to the requirements prescribed in Table 2, except as specified in 5.2.

7.2 The steel shall conform on product analysis to the requirements prescribed in Table 2, subject to the product analysis tolerances in Specification A 6/A 6M.

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 3.

8.2 Shapes less than 1 in.^2 [645 mm²] in cross section and bars, other than flats, less than $\frac{1}{2}$ 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 3.

9. Keywords

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

TABLE 1
APPURTENANT MATERIAL SPECIFICATIONS

Material	ASTM Designation
Steel rivets	A 502, Grade 1
Bolts	A 307, Grade A or F 568M, Class 4.6
High-strength bolts	A 325 or A 325M
Steel nuts	A 563 or A 563M
Cast steel	A 27/A 27M, Grade 65–35 [450–240]
Forgings (carbon steel)	A 668, Class D
Hot-rolled sheets and strip	A 1011/A 1011M, SS Grade 36 [250] Type 1 or Type 2 or A 1018/A 1018M SS Grade 36 [250]
Cold-formed tubing	A 500, Grade B
Hot-formed tubing	A 501
Anchor bolts	F 1554

NOTE 1 — The specifier should be satisfied of the suitability of these materials for the intended application. Chemical composition and/or mechanical properties may be different than specified in A 36/A 36M.

TABLE 2
CHEMICAL REQUIREMENTS

Product Thickness, in. [mm]	Shapes ^A All	Plates ^B						Bars		
		To 3/4 [20], Incl.	Over 3/4 to 1 1/2 [20 to 40], Incl.	Over 1 1/2 to 2 1/2 [40 to 65], Incl.	Over 2 1/2 to 4 [65 to 100], Incl.	Over 4 [100]	To 3/4 [20], Incl.	Over 3/4 to 1 1/2 [20 to 40], Incl.	Over 1 1/2 to 4 [40 to 100], Incl.	Over 4 [100]
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	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Sulfur, max., %	0.05	0.05	0.05	0.05	0.05	0.05	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 copper steel is specified	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

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 A 6/A 6M.

^A 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].

^B 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%.

TABLE 3
TENSILE REQUIREMENTS^A

Plates, Shapes,^B and Bars:	
Tensile strength, ksi [MPa]	58–80 [400–550]
Yield point, min., ksi [MPa]	36 [250] ^C
Plates and Bars^{D,E}:	
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 ^B

^A See the Orientation subsection in the Tension Tests section of Specification A 6/A 6M.

^B 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.

^C Yield point 32 ksi [220 MPa] for plates over 8 in. [200 mm] in thickness.

^D Elongation not required to be determined for floor plate.

^E For plates wider than 24 in. [600 mm], the elongation requirement is reduced two percentage points. See Elongation Requirement Adjustments subsection under the Tension Tests section of Specification A 6/A 6M.

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 A 6/A 6M. 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

In addition, the following optional supplementary requirement is also suitable for use with this specification.

S97. Limitation on Rimmed or Capped Steel

S97.1 The steel shall be other than rimmed or capped.

