



# Standard Specification for High-Strength Low-Alloy Structural Steel<sup>1</sup>

This standard is issued under the fixed designation A 242/A 242M; 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 Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.*

## 1. Scope

1.1 This specification covers high-strength low-alloy structural steel shapes, plates and bars for welded, riveted, or bolted construction intended primarily for use as structural members where savings in weight or added durability are important. The atmospheric corrosion resistance of the steel in most environments is substantially better than that of carbon structural steels with or without copper addition. When properly exposed to the atmosphere, this steel can be used bare (unpainted) for many applications (see Note 1). This specification is limited to material up to 4 in. [100 mm], inclusive, in thickness.

NOTE 1—For methods of estimating the atmospheric corrosion resistance of low-alloy steels, see Guide G 101.

1.2 When the steel is to be welded, it is presupposed that a welding procedure suitable for the grade of steel and intended use or service will be utilized. See Appendix X3 of Specification A 6/A 6M for information on weldability.

1.3 The values stated in either inch-pound units or SI units are to be regarded 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 must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

## 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<sup>2</sup>

G 101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels<sup>3</sup>

## 3. General Requirements for Delivery

3.1 Material furnished under this specification shall conform to the requirements of the current edition of Specification A 6/A 6M, for the ordered material, unless a conflict exists in which case this specification shall prevail.

4. Process

### 4.1 Process

4.1 The steel shall be made by one or more of the following processes: open-hearth, basic-oxygen, or electric-furnace.

4.2 Rimmed-type steels shall not be used.

## 5. Chemical Requirements

5.1 The heat analysis shall conform to the requirements prescribed in Table 1.

5.2 The steel shall conform on product analysis to the requirements prescribed in Table 1, subject to the product analysis tolerances in Specification A 6/A 6M.

5.3 Choice and use of alloying elements, combined with carbon, manganese, phosphorus, sulfur, and copper within the limits prescribed in 5.1 to give the mechanical properties prescribed in Section 6 and to provide the atmospheric corrosion resistance of 1.1, shall be made by the manufacturer and included and reported in the heat analysis to identify the type of steel applied. Elements commonly added include: chromium, nickel, silicon, vanadium, titanium, and zirconium.

5.4 When required, the manufacturer shall supply evidence of corrosion resistance satisfactory to the purchaser. The basis for this evidence may be a corrosion index calculated on the basis of the chemical composition of the steel, as described in Guide G 101.

NOTE 2—The user is cautioned that the Guide G 101 predictive equation for calculation of an atmospheric corrosion resistance index has only been verified for the composition limits stated in that guide.

## 6. Tensile Requirements

6.1 The material as represented by the test specimens shall conform to the requirements as to tensile properties prescribed in Table 2.

TABLE 1 Chemical Requirements (Heat Analysis)

Element	Composition, %	
	Type 1	
Carbon, max	0.15	
Manganese, max	1.00	
Phosphorous, max	0.15	
Sulfur, max	0.05	
Copper, min	0.20	

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A-1 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.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 01.04.

<sup>3</sup> Annual Book of ASTM Standards, Vol 03.02.

**TABLE 2 Tensile Requirements**

	Plates and Bars <sup>A</sup>			Structural Shapes		
	For thick- nesses ¼ in. [20 mm], and under	For thick- nesses over ¼ to 1½ in. [20 to 40 mm], incl	For thick- nesses over 1½ to 4 in. [40 to 100 mm], incl	Groups 1 and 2	Group 3	Groups 4 and 5
Tensile strength, min, ksi [MPa]	70 [480]	67 [460]	63 [435]	70 [485]	67 [480]	63 [435]
Yield point, min, ksi [MPa]	50 [345]	48 [315]	42 [290]	50 [345]	48 [315]	42 [290]
Elongation in 8 in. [200 mm], min, %	18 <sup>B,C</sup>	18 <sup>B,C</sup>	18 <sup>B,C</sup>	18 <sup>C</sup>	18	18
Elongation in 2 in. [50 mm], min, %	21 <sup>C</sup>	21 <sup>C</sup>	21 <sup>C</sup>	21	21	21 <sup>D</sup>

<sup>A</sup> See Specimen Orientation under the Tension Tests section of Specification A 6/A 6M.

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

<sup>C</sup> For plates wider than 24 in. [600 mm] the elongation requirement is reduced two percentage points. See elongation requirement adjustments in the Tension Tests section of Specification A 6/A 6M.

<sup>D</sup> For wide flange shapes over 426 lb/ft [634 kg/m] elongation in 2 in. [50 mm] of 18 % minimum applies.

### SUPPLEMENTARY REQUIREMENTS

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:

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| <p>S2. Product Analysis,<br/>S3. Simulated Post-Weld Heat Treatment of Mechanical Test Coupons,<br/>S5. Charpy V-Notch Impact Test,</p> | <p>S6. Drop Weight Test,<br/>S8. Ultrasonic Examination,<br/>S14. Bend Test, and<br/>S15. Reduction of Area Measurement.</p> |
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