Designation: A 588/A 588M – 05

American Association State
Highway and Transportation Officials Standard
AASHTO No.: M 222

Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance[1]

This standard is issued under the fixed designation A 588/A 588M; 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 high-strength low-alloy structural steel shapes, plates, and bars for welded, riveted, or bolted construction but intended primarily for use in welded bridges and buildings where savings in weight or added durability are important. The atmospheric corrosion resistance of this steel in most environments is substantially better than that of carbon structural steels with or without copper addition (see Note 1). When properly exposed to the atmosphere, this steel is suitable for many applications in the bare (unpainted) condition. This specification is limited to material up to 8 in. [200 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, 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.

1.3 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.

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

1.5 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 Specification A 6/A 6M apply.

2. Referenced Documents

2.1 *ASTM Standards*[2]*:*

A 6/A 6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

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

3. General Requirements for Delivery

3.1 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.

3.2 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 2—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 A 6/A 6M.

[1] 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.

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[2] 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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4. Materials and Manufacture

4.1 The steel shall be made to fine grain practice.

5. Chemical Composition

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 The atmospheric corrosion-resistance index, calculated on the basis of the heat analysis of the steel, as described in Guide G 101–Predictive Method Based on the Data of Larabee and Coburn, shall be 6.0 or higher.

NOTE 3—The user is cautioned that the Guide G 101 predictive equation (Predictive Method Based on the Data of Larabee and Coburn) for calculation of an atmospheric corrosion-resistance index has only been verified for the composition limits stated in the guide.

5.4 When required, the manufacturer shall supply evidence of corrosion resistance satisfactory to the purchaser.

TABLE 1 Chemical Requirements (Heat Analysis)

NOTE 1—Where ". . ." appears in this table, there is no requirement.

Element	Composition, %			
	Grade A	Grade B	Grade C	Grade K
Carbon[A]	0.19 max	0.20 max	0.15 max	0.17 max
Manganese[A]	0.80–1.25	0.75–1.35	0.80–1.35	0.50–1.20
Phosphorus	0.04 max	0.04 max	0.04 max	0.04 max
Sulfur	0.05 max	0.05 max	0.05 max	0.05 max
Silicon	0.30–0.65	0.15–0.50	0.15–0.40	0.25–0.50
Nickel	0.40 max	0.50 max	0.25–0.50	0.40 max
Chromium	0.40–0.65	0.40–0.70	0.30–0.50	0.40–0.70
Molybdenum	...	...	...	0.10 max
Copper	0.25–0.40	0.20–0.40	0.20–0.50	0.30–0.50
Vanadium	0.02–0.10	0.01–0.10	0.01–0.10	...
Columbium	...	...	...	0.005–0.05[B]

[A]For each reduction of 0.01 percentage point below the specified maximum for carbon, an increase of 0.06 percentage point above the specified maximum for manganese is permitted, up to a maximum of 1.50 %.

[B]For plates under ½ in. [13 mm] in thickness, the minimum columbium is waived.

6. Tensile Requirements

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

7. Keywords

7.1 atmospheric corrosion resistance; bars; bolted construction; bridges; buildings; durability; high-strength; low-alloy; plates; riveted construction; shapes; steel; structural steel; weight; welded construction

TABLE 2 Tensile Requirements[A]

NOTE 1—Where ". . ." appears in this table, there is no requirement.

	Plates and Bars			Structural Shapes
	For Thicknesses 4 in. [100 mm] and Under	For Thicknesses Over 4 in. [100 mm] to 5 in. [125 mm] incl	For Thicknesses Over 5 in. [125 mm] to 8 in.[200 mm] incl	All
Tensile strength, min,ksi [MPa]	70 [485]	67 [460]	63 [435]	70 [485]
Yield point, min, ksi [MPa]	50 [345]	46 [315]	42 [290]	50 [345]
Elongation in 8 in. [200 mm], min, %	18[B,C]	...	...	18[C]
Elongation in 2 in. [50 mm], min, %	21[B,C]	21[B,C]	21[B,C]	21[D]

[A]See specimen orientation under the Tension Tests section of Specification A 6/A 6M.

[B]Elongation not required to be determined for floor plate.

[C]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.

[D]For wide flange shapes with flange thickness over 3 in. [75 mm], elongation in 2 in. [50 mm] of 18 % minimum applies.

SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not apply unless specified in the order or contract. 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:

S2. Product Analysis,

S3. Simulated Post-Weld Heat Treatment of Mechanical Test Coupons,

S5. Charpy V-Notch Impact Test,

S6. Drop-Weight Test (for Material 0.625 in. [16 mm] and over in Thickness),

S8. Ultrasonic Examination,

S15. Reduction of Area Measurement,

S18. Maximum Tensile Strength,

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

S32. Single Heat Bundles.

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SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 588/A 588M - 04) that may impact the use of this standard. (Approved April 1, 2005.)

(1) Revised the title.

Committee A01 has identified the location of selected changes to this standard since the last issue (A 588/A 588M - 03a) that may impact the use of this standard. (Approved April 1, 2004.)

(1) Added Supplementary Requirement S32.

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