Designation: A 656/A 656M – 05$^{\epsilon 2}$

Standard Specification for Hot-Rolled Structural Steel, High-Strength Low-Alloy Plate with Improved Formability[1]

This standard is issued under the fixed designation A 656/A 656M; 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.

ε[1] NOTE—Table 1 was corrected editorially in February 2006.
ε[2] NOTE—The Scope (1.1) was corrected editorially in October 2007.

1. Scope*

1.1 This specification covers three types and four strength grades of high-strength low-alloy, hot rolled structural steel plate for use in truck frames, brackets, crane booms, rail cars, and similar applications. Steels that conform to this specification offer improved formability. These steels are normally furnished in the as-rolled condition. The type and strength grade furnished is as agreed upon between the manufacturer and the purchaser. The types and strength grades are shown in the tables.

1.2 The maximum thickness of plates shall be as follows:

Grade	Plate Thickness, max, in. [mm]
50	2 [50]
60	1½ [40]
70	1 [25]
80	¾ [20]

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 this specification. See Appendix X3 of Specification A 6/A 6M for information on weldability.

1.4 For plates 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

3. General Requirements for Delivery

3.1 Plates furnished under this specification shall conform to the requirements of the current edition of Specification A 6/A 6M, for the specific plate 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 finished plates. Plates produced from coil means plates 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 finished plates. Such operations include decoiling, leveling, cutting to length, testing, inspection, conditioning, heat treatment (if applicable), packaging, marking, loading for shipment, and certification.

NOTE 1—For plates 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 plate produced from coil are described in Specification A 6/A 6M.

4. Materials and Manufacture

4.1 The steel shall be made to fine grain practice.

5. Chemical Composition

5.1 Heat analyses shall conform to the chemical requirements given in Table 1. Dependent upon thickness, grade, and intended application, variations in the chemical composition are permitted within the limits given in Table 1 for the

[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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TABLE 1 Chemical Requirements

NOTE—An ellipsis (...) indicates that element is not defined for that Type.

Elements	Composition, %		
	Type 3	Type 7	Type 8
Carbon, max[A]	0.18	0.18	0.18
Manganese, max[A]	1.65	1.65	1.65
Phosphorus, max	0.025	0.025	0.025
Sulfur, max	0.035	0.035	0.035
Silicon, max	0.60	0.60	0.60
Vanadium, max	0.08	0.15[B]	0.15[C]†
Nitrogen, max	0.020	0.020	0.020
Columbium	0.008–0.10	0.10 max[B]	0.10 max[C]†
Titanium, max	...	...	0.15[C]

[A] For each reduction of 0.01 percentage point below the specified maximum for carbon, an increase of 0.06 percentage points above the specified maximum for manganese is permitted, up to a maximum of 1.75 % for Grades 50, 60, and 70; and up to a maximum of 1.90 % for Grade 80.

[B] The contents of columbium and vanadium shall additionally be in accordance with one of the following:
columbium 0.008-0.10 % with vanadium <0.008 %;
columbium <0.008 % with vanadium 0.008-0.15 %; or
columbium 0.008-0.10 % with vanadium 0.008-0.15 % and columbium plus vanadium not in excess of 0.20 %.

[C] The sum of Columbium, Vanadium, and Titanium shall be between 0.008 and 0.20 %.

† Footnote reference corrected editorially.

TABLE 2 Tensile Requirements[A]

	Grade 50 [345]	Grade 60 [415]	Grade 70 [485]	Grade 80 [550]
Yield point, min, ksi [MPa]	50 [345]	60 [415]	70 [485]	80 [550]
Tensile strength, min, ksi [MPa]	60 [415]	70 [485]	80 [550]	90 [620]
Elongation in 8 in. [200 mm], min, %[B]	20	17	14	12
Elongation in 2 in. [50 mm], min, %[B]	23	20	17	15

[A] See Specimen Orientation under the Tension Tests section of Specification A 6/A 6M.

[B] For plates wider than 24 in. [600 mm], the elongation requirement is reduced two percentage points for Grade 50 [345] and three percentage points for Grades 60, 70, and 80 [415, 485, and 550]. See Elongation Requirement Adjustments in the Tension Tests section of Specification A 6/A 6M.

applicable type. Where it is of particular importance, the manufacturer should be consulted for specific chemical composition.

5.2 *Product Analysis*—If a product analysis is made, it shall conform to the requirements given in Table 1, subject to the product analysis tolerances of Specification A 6/A 6M.

5.3 Where 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.

5.4 Unless specifically ordered, the type is at the discretion of the producer.

6. Tension Test

6.1 The plates as represented by the test specimens shall conform to the requirements given in Table 2.

7. Keywords

7.1 high-strength low-alloy steel; steel plates; structural applications

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 656/A 656M–03) that may impact the use of this standard.

(*1*) Table 1 was modified to include Type 8 chemistry and Titanium.

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