Designation: A 827/A 827M – 02

Standard Specification for Plates, Carbon Steel, for Forging and Similar Applications[1]

This standard is issued under the fixed designation A 827/A 827M; 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 carbon steel plates, forging quality, intended for forging, quenching-and-tempering, and similar applications in which uniformity of composition and freedom from injurious imperfections are important.

1.2 The plates are available in six grades, or chemical compositions.

1.3 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 X 3 of Specification A 6/A 6M for information on weldability.

1.4 The values stated in either inch-pound 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 sytems may result in nonconformance with the specification.

2. Referenced Documents

2.1 *ASTM Standards:*

A 6/A6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling[2]

2.2 *ASME Code:*

Boiler and Pressure Vessel Code, Section IX, Welding Qualifications[3]

3. General Requirements and Ordering Information

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. Materials and Manufacture

4.1 The steel shall be killed.

5. Chemical Composition

5.1 The heat analysis shall conform to the requirements for the applicable grade listed in Table 1.

6. Mechanical Property Requirements

6.1 The plates shall not be subject to mechanical property testing unless otherwise specified on the order.

7. Quality

7.1 *General*—The plates shall be free of injurious imperfections and shall have a workmanlike finish.

7.2 *Finish*—The plates shall be furnished with a finish such as that produced by hot-rolling, except for ground areas resulting from conditioning operations, unless otherwise specified on the order.

7.3 *Surface Imperfections*:

7.3.1 All injurious surface imperfections shall be removed by the material manufacturer or processor.

7.3.1.1 Shallow imperfections shall be ground to sound metal; the ground area shall be well-faired and the thickness of the ground plate shall not be reduced below the minimum thickness permitted.

7.3.1.2 All surface imperfections, the removal of which will reduce the plate thickness below the minimum permitted, shall be cause for rejection; however, such imperfections may be repaired by welding as provided in 7.5.

7.4 *Edge Imperfections*:

7.4.1 Laminar-type discontinuities 1 in. [25 mm] and less in length, and visible to the unaided eye on the edges of plates as prepared for shipment by the manufacturer or processor, are acceptable and do not require exploration.

7.4.2 All larger discontinuities shall be explored to determine their depth and extent. Discontinuities shall be considered continuous when located in the same plane within 5 % of the plate thickness and when separated by a distance less than the length of the smaller of two adjacent discontinuities.

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[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] *Annual Book of ASTM Standards,* Vol 01.04.

[3] Available from American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.

TABLE 1 Chemical Requirements

Grade		Element, %				
UNS	SAE	Carbon	Manganese	Phosphorus, max	Sulfur, max	Silicon
G10090	1009	0.15 max	0.60 max	0.035	0.040	0.15 to 0.40
G10200	1020	0.18 to 0.23	0.30 to 0.60	0.035	0.040	0.15 to 0.40
G10350	1035	0.32 to 0.38	0.60 to 0.90	0.035	0.040	0.15 to 0.40
G10400	1040	0.37 to 0.44	0.60 to 0.90	0.035	0.040	0.15 to 0.40
G10450	1045	0.43 to 0.50	0.60 to 0.90	0.035	0.040	0.15 to 0.40
G10500	1050	0.48 to 0.55	0.60 to 0.90	0.035	0.040	0.15 to 0.40

7.4.3 Indications visible to the unaided eye, on the cut edges of a plate as prepared for shipment by the manufacturer or processor shall not exceed the limits given in Columns 1 and 2 of Table 2.

7.4.4 Larger indications shall be removed by the manufacturer or processor by grinding provided the resultant cavity does not exceed the limits given in Columns 3 and 4 of Table 2.

7.4.5 Indications of greater magnitude shall be cause for rejection; however, the defects may be removed and replaced with weld metal as provided in 7.5.

7.4.6 Indications on the edges of a plate cut during fabrication shall be cause for rejection of the plate, at the discretion of the purchaser, when the magnitude exceeds the limits given in Columns 5 and 6 of Table 2. The defects may be removed and replaced with weld metal as provided in 7.5.

7.5 *Repair by Welding*:

7.5.1 Repairs shall be done by welders or welding operators meeting the qualification requirements of ASME Boiler and Pressure Vessel Code, Section IX.

7.5.2 The welding procedures shall be demonstrated to be suitable for the grade of material being repaired.

7.5.3 The deposited weld metal shall have a chemical composition similar to the nominal composition of the plate.

7.5.4 Preparation for repair welding shall include inspection to assure complete removal of the defect.

7.5.5 If repair by welding is not acceptable, or if approval of the welding procedure by the purchaser is required, the order shall so specify.

8. Certification

8.1 A report of the heat analysis and the results of all tests required by the order shall be furnished to the purchaser. The report shall include a certification that the material was manufactured in accordance with the requirements of this specification.

9. Keywords

9.1 carbon; forging; imperfections; plates; quenching; steel; structural steel; tempering; uniformity of composition

TABLE 2 Visible Edge Indications Extending Approximately Parallel to Rolled Surfaces

Plate Thickness	Acceptable		Remove by Grinding		Acceptable on Edges Cut in Fabrication	
	Depth	Length[A]	Depth	Length[A]	Depth	Length[A]
Column	1	2	3	4	5	6
to 6 in. [150 mm], incl	1/16 in. [2 mm], max	any	over 1/16 in. to 1/8 in. [2 to 3 mm], incl	over 1 in. [25 mm]	1/8 in. [3 mm], max	any
over 6 in. [150 mm]	1/8 in. [3 mm], max	any	over 1/8 in. to 1/2 in. [3 to 13 mm], incl	over 1 in. [25 mm]	1/2 in. [13 mm], max	any

[A] Laminar-type discontinuities 1 in. [25 mm] and less in length are acceptable and do not require exploration.

SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not apply unless specified in the purchase 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:

S1. Vacuum Treatment,
S2. Product Analysis,
S5. Charpy V-Notch Impact Test, and
S8. Ultrasonic Examination.

ADDITIONAL SUPPLEMENTARY REQUIREMENTS

In addition, the following special supplementary requirements are also suitable for use with this specification.

S95. Tension Test Requirements

S95.1 Two tension tests shall be made on each lot unless the lot consists of only the product of one plate as-rolled, in which case one test shall be made on the lot. A lot shall consist of all plates of the same heat not differing in thickness by more than ⅜ in. [10 mm]. The test results shall conform to the requirements stated on the order.

S82. Hardness Tests

S82.1 Hardness tests shall be made as specified on the order and the test results shall conform to the requirements specified on the order.