



Designation: A827/A827M – 14 (Reapproved 2018)

## Standard Specification for Plates, Carbon Steel, for Forging and Similar Applications<sup>1</sup>

This standard is issued under the fixed designation A827/A827M; 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 U.S. 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 X3 of Specification A6/A6M for information on weldability.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

A6/A6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

2.2 *ASME Code:*<sup>3</sup>

ASME Boiler and Pressure Vessel Code, Section IX

<sup>1</sup> 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.

Current edition approved Sept. 1, 2018. Published September 2018. Originally approved in 1984. Last previous edition approved in 2014 as A827/A827M – 14. DOI: 10.1520/A0827\_A0827M-14R18.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

### 3. General Requirements and Ordering Information

3.1 Material furnished under this specification shall conform to the requirements of the current edition of Specification A6/A6M, 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

**TABLE 1 Chemical Requirements**

Grade	Element, %				
SAE	Carbon	Manganese	Phosphorus, max	Sulfur, max	Silicon
1009	0.15 max	0.60 max	0.030	0.030	0.15 to 0.40
1020	0.18 to 0.23	0.30 to 0.60	0.030	0.030	0.15 to 0.40
1035	0.32 to 0.38	0.60 to 0.90	0.030	0.030	0.15 to 0.40
1040	0.37 to 0.44	0.60 to 0.90	0.030	0.030	0.15 to 0.40
1045	0.43 to 0.50	0.60 to 0.90	0.030	0.030	0.15 to 0.40
1050	0.48 to 0.55	0.60 to 0.90	0.030	0.030	0.15 to 0.40

**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 <sup>A</sup>	Depth	Length <sup>A</sup>	Depth	Length <sup>A</sup>
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

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

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.

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.

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

## **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 **A6/A6M**. 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.

**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.

plates of the same heat not differing in thickness by more than  $\frac{3}{8}$  in. [10 mm]. The test results shall conform to the requirements stated on the order.

**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

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