



Designation: A711 – 04

## Standard Specification for Steel Forging Stock<sup>1</sup>

This standard is issued under the fixed designation A711; 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.*

### 1. Scope\*

1.1 This specification covers cast carbon and alloy steel ingots and strand castings, semi-wrought ingots and strand castings and rolled or forged blooms, billets, and slabs for forging.

1.2 Blooms, billets, and slabs are semi-finished steel products, hot rolled or forged to approximate cross-sectional dimensions. Blooms and billets may be square, round, octagonal, or rectangular in section; slabs are rectangular. Although no invariable rule prevails between the terms blooms and billets, and they are frequently used interchangeably, the following size distinctions are in general use.

1.2.1 *Blooms*—Cross-sectional area greater than 36 in.<sup>2</sup> (232 cm<sup>2</sup>).

1.2.2 *Billets*—Maximum cross-sectional area 36 in.<sup>2</sup> (232 cm<sup>2</sup>).

1.2.3 *Slabs*—Minimum thickness, 1½ in. (38.0 mm); width, more than twice the thickness; and generally a cross-sectional area of not less than 16 in.<sup>2</sup> (103 cm<sup>2</sup>).

1.2.4 Ingots either top or bottom poured or secondary remelted are covered.

1.2.5 Strand castings with or without additional reduction are covered.

1.3 Supplementary requirements (S1 to S19) of an optional nature are provided. They shall apply only when specified by the purchaser.

1.4 The values stated in either inch-pound or SI (metric) units are to be regarded separately as standards. Within the text and tables, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore each system must be used independent of the other. Combining values from the two systems may result in nonconformance with the specification.

<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 A01.06 on Steel Forgings and Billets.

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1.5 Unless the order specifies the "M" specification, the material shall be furnished to the inch-pound units.

### 2. Referenced Documents

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

A29/A29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for

A275/A275M Practice for Magnetic Particle Examination of Steel Forgings

A388/A388M Practice for Ultrasonic Examination of Steel Forgings

A788/A788M Specification for Steel Forgings, General Requirements

E45 Test Methods for Determining the Inclusion Content of Steel

E112 Test Methods for Determining Average Grain Size

E381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings

### 3. Ordering Information and General Requirements

3.1 When this specification is to be applied to an inquiry, contract, or order, the purchaser shall furnish the following information in addition to those specified in Specification A788/A788M:

3.1.1 The grade of material desired.

3.1.2 Product form restrictions (for example, ingots, strand castings, billets) if any, and

3.1.3 Applicable supplementary requirements.

3.1.4 Surface condition.

3.2 Material supplied to this specification shall conform to the requirements of Specification A788/A788M, which outlines additional ordering information, manufacturing requirements, testing and retesting methods and procedures, marking, certification, product analysis variations, and additional supplementary requirements.

<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.

\*A Summary of Changes section appears at the end of this standard.

3.2.1 If the requirements of this specification are in conflict with the requirements of Specification **A788/A788M**, the requirements of this specification shall prevail.

#### 4. Materials and Manufacture

4.1 *Discard*—Sufficient discard shall be made to secure freedom from piping and undue segregation.

4.2 *Reduction from Ingot*—Except as otherwise agreed in accordance with Supplementary Requirement S3.2, the material shall be made from product having at least two times the cross-sectional area of the material.

4.3 *Stability*—Material shall be furnished in a condition to withstand, for an indefinite time, exposure to all climatic conditions without developing any external or internal cracks. The method of cooling or of treatment before shipment shall be optional with the manufacturer, but he shall be responsible (in the same manner as for defects disclosed after delivery) for cracks that may develop before material is subjected to reheating. When specific stability treatment of material is specified by the purchaser, the manufacturer shall be responsible only for carrying out those specific operations but shall not be responsible for cracks that may develop before material is subjected to reheating.

#### 5. Chemical Composition

5.1 The chemical composition shall conform to the requirements specified in the purchase order or the individual product specification. For convenience the grades commonly specified for carbon and alloy steel, blooms, billets, or slabs are shown in Table 1 and Table 2 of the latest issue of Specification **A29/A29M**. Blooms, billets, or slabs may be ordered to these grade designations, and when so ordered shall conform to the specified limits by heat analysis.

##### 5.2 Heat Analysis:

5.2.1 An analysis of each heat of steel shall be made in accordance with Specification **A788/A788M**.

##### 5.3 Product Analysis:

5.3.1 A product analysis may be made by the purchaser in accordance with Specification **A788/A788M**.

5.3.2 To indicate adequately the composition of a heat or lot, samples selected to represent the heat as fairly as possible

shall be taken midway between center and outside of the material from a minimum number of pieces as follows:

Lots	Number of Pieces
15 tons (13.5 t) or less	4
Over 15 tons (13.5 t)	6

5.3.3 If the number of pieces from cast or heat is less than the number of samples specified in **5.3.2**, one sample shall be taken from each piece.

5.3.4 When chips are taken by drilling, the approximate diameter of the drill used shall be as follows:

Area of Cross Section to Be Sampled, in. <sup>2</sup> (cm <sup>2</sup> )	Approximate Drill Diameter, in. (mm)
16 (103) and under	½ (12.7)
Over 16 (103)	1 (25.4)

#### 6. Permissible Variations

6.1 The permissible variation from the specified or theoretical weight of blooms, billets, and slabs shall be  $\pm 5\%$  for individual pieces or for lots of less than a carload. For carload lots the permissible variation shall be  $\pm 2.5\%$  of the total weight of the lot.

#### 7. Workmanship, Finish, and Appearance

7.1 The material shall be free of injurious imperfections.

7.2 Conditioning, cutting, or parting of material may be done by scarfing or flame-cutting when methods involving preheating and temperature control necessary to avoid any damage to flame-cut material are employed.

7.3 *Surface Conditioning*—Material may be conditioned to remove injurious surface defects, provided the depth of conditioning does not exceed  $\frac{1}{16}$  in. (1.6 mm) for each inch of dimension concerned, up to a maximum depth of  $\frac{3}{4}$  in. (18.1 mm), and provided that the width of the conditioning is at least four times its greatest depth; except that in the case of slabs where the width is at least twice the thickness, the depth of conditioning on the wide surfaces may exceed this allowance by 50 %, up to a maximum depth of  $\frac{3}{4}$  in. (19.1 mm). The maximum depth of conditioning on two parallel sides at opposite locations shall not exceed one and one half times the maximum allowed for one side. All conditioned areas must be flared to result in a uniform blending.

#### 8. Keywords

8.1 billets; blooms; slabs; steel forging stock

### SUPPLEMENTARY REQUIREMENTS

One or more of the following supplementary requirements shall apply when specified by the purchaser in the inquiry, contract, and order. Details of these supplementary requirements shall be agreed upon by the manufacturer and purchaser.

#### S1. Specified Process

S1.1 The steel shall be vacuum treated.

#### S2. Discard

S2.1 Specific discard shall be taken as defined in the ordering information.

#### S3. Reduction in Area

S3.1 The purchaser may specify any definite amount of reduction in area greater than 2.1 as provided in **4.2**.