



Designation: **A1090/A1090M – 14 A1090/A1090M – 19**

## Standard Specification for Forged Rings and Hollows Produced from Steels with Atmospheric Corrosion Resistance for Use as Base Plates in Power Transmission Structures<sup>1</sup>

This standard is issued under the fixed designation A1090/A1090M; 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.

### 1. Scope Scope\*

1.1 This specification covers high-strength, low-alloy steel ring and hollow forgings intended primarily for use as base plates in welded tubular structures. ~~However structures for power transmission applications. However, use of this specification is not restricted to such applications and it may be used in other applications for which the attributes of the materials, as defined by this specification, are appropriate.~~

1.2 The atmospheric corrosion resistance of ~~these steels~~ Grades A, B, and C in most environments is substantially better than that of carbon structural steel with or without copper addition (see **Note 1**). When exposed to the atmosphere, ~~this steel is these grades are~~ suitable for many applications in the bare (unpainted) condition.

NOTE 1—See Guide **G101** for methods of estimating the atmospheric corrosion resistance of low-alloy steels.

1.3 The thickness of forgings is limited only by the capacity of the composition to meet the specified mechanical property requirements; however, current practice normally limits the thickness of forgings furnished under this specification to a range of 2 to 6 in. [51 to 152 mm].

NOTE 2—When the steel is to be welded, a welding procedure suitable for the grade of steel and intended use or service should be used. See Appendix X3 of Specification **A6/A6M** for information on weldability.

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 Supplementary requirements are available but shall apply only when specified by the purchaser at the time of ordering.

1.6 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~~ are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other. ~~Combining other, and values from the two systems may result in non-conformance with the standard; shall not be combined.~~

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and ~~health~~ environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *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](#)

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[A788/A788M Specification for Steel Forgings, General Requirements](#)

<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.

Current edition approved March 1, 2014 June 1, 2019. Published March 2014 June 2019. Originally approved in 2014. Last previous edition approved in 2014 as A1090/A1090M-14. DOI: ~~10.1520/A1090\_A1090M-14~~ 10.1520/A1090\_A1090M-19.

<sup>2</sup> 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

**A1058** Test Methods for Mechanical Testing of Steel Products—Metric  
**E112** Test Methods for Determining Average Grain Size  
**G101** Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

### 3. Ordering Information

- 3.1 In addition to the ordering information required by Specification **A788/A788M**, the purchaser shall specify:
- 3.1.1 Grade and class designation.
  - 3.1.2 Surface condition (for example, as-forged, rough machined, etc.).
  - 3.1.3 Include a sketch or written description of the forging with the inquiry and order.
- 3.2 The purchaser may specify:
- 3.2.1 Limits on repair welding, if permissible.
  - 3.2.2 Non-destructive evaluation, in which case reporting and acceptance criteria must be provided.

### 4. Materials and Manufacture

4.1 The steel shall be deoxidized and shall be capable of achieving an ASTM grain size of 6 or finer when evaluated using any of the methods in Test Methods **E112**.

### 5. Chemical Composition

- 5.1 The heat analysis shall conform to the requirements prescribed in **Table 1**.
- 5.2 Product analysis shall be conducted once per heat and shall conform to the requirements prescribed in **Table 1** subject to the product tolerances in Specification **A788/A788M**.
- 5.3 The atmospheric corrosion-resistance index, calculated on the basis of the heat analysis of the steel, as described in Guide **G101** shall be 6.0 or higher for Grades A, B, and C.

**TABLE 1 Chemical Requirements**

NOTE 1—Values are maximums unless a minimum or a range is specified. Where “...” appears in this table, there is no requirement.

Element	Grade A	Grade B	Grade C
Carbon <sup>A</sup>	0.19	0.20	0.17
Manganese <sup>A</sup>	0.80 to 1.35	0.75 to 1.35	0.50 to 1.20
Phosphorous	0.025	0.025	0.025
Sulfur	0.025	0.025	0.025
Silicon	0.30 to 0.65	0.15 to 0.50	0.25 to 0.50
Nickel	0.40	0.50	0.40
Chromium	0.40 to 0.70	0.40 to 0.70	0.40 to 0.70
Molybdenum	...	...	0.10
Copper	0.25 to 0.40	0.20 to 0.40	0.30 to 0.50
Vanadium	0.02 to 0.10	0.01 to 0.10	...
Columbium	...	...	0.005 to 0.05 <sup>B</sup>

**TABLE 1 Chemical Requirements**

NOTE 1—Values are maximums unless a minimum or a range is specified. Where “...” appears in this table, there is no requirement.

Element	Grade A	Grade B	Grade C	Grade D	Grade E
Carbon, max <sup>A</sup>	0.19	0.20	0.17	0.14 to 0.16	0.16 to 0.19
Manganese <sup>A</sup>	0.80 to 1.35	0.75 to 1.35	0.50 to 1.20	1.15 to 1.30	1.30 to 1.60
Phosphorous	0.025	0.025	0.025	0.015	0.025
Sulfur	0.025	0.025	0.025	0.015	0.015
Silicon	0.30 to 0.65	0.15 to 0.50	0.25 to 0.50	0.15 to 0.25	0.15 to 0.35
Nickel	0.40	0.50	0.40	0.15	0.40
Chromium	0.40 to 0.70	0.40 to 0.70	0.40 to 0.70	0.15	0.20
Molybdenum	...	...	0.10	0.06	0.08
Copper	0.25 to 0.40	0.20 to 0.40	0.30 to 0.50	0.20	0.35
Vanadium	0.02 to 0.10	0.01 to 0.10	...	0.065 to 0.075	0.10
Columbium <sup>B</sup>	...	...	0.005 to 0.05 <sup>C</sup>	0.010 to 0.020	...
Nitrogen	...	...	...	0.010 to 0.030	...
Aluminum	...	...	...	0.020 to 0.040	0.045
Carbon Equivalent (CE) <sup>D</sup>	...	...	...	...	0.53

<sup>A</sup> 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 %.

<sup>B</sup> Columbium (Cb) and Niobium (Nb) are alternate names for element 41 in the Periodic Table of the Elements.

<sup>C</sup> For sections under ½ in. [13 mm], the columbium is waived.

<sup>D</sup> CE=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15.