



Designation: B108/B108M – 19

## Standard Specification for Aluminum-Alloy Permanent Mold Castings<sup>1</sup>

This standard is issued under the fixed designation B108/B108M; 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<sup>2</sup> covers aluminum-alloy permanent mold castings designated as shown in [Table 1](#).

1.2 This specification is for aluminum-alloy permanent mold castings used in general purpose applications. It may not address the mechanical properties, integrity testing, and verification required for highly loaded or safety critical applications.

1.3 Alloy and temper designations are in accordance with ANSI H35.1/H35.1(M).

1.4 Unless the order specifies the “M” specification designation, the material shall be furnished to the inch-pound units.

1.5 For acceptance criteria for inclusion of new aluminum and aluminum alloys and their properties in this specification, see [Annex A1](#) and [Annex A2](#).

1.6 *Units*—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.

1.7 *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 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.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.01 on Aluminum Alloy Ingots and Castings.

Current edition approved Sept. 1, 2019. Published October 2019. Originally approved in 1936. Last previous edition approved in 2018 as B108/B108M – 18<sup>ε1</sup>. DOI: 10.1520/B0108\_B0108M-19.

<sup>2</sup> For ASME Boiler and Pressure Code application see related SB-108.

### 2. Referenced Documents

2.1 The following documents of the issue in effect on the date of casting purchase form a part of this specification to the extent referenced herein:

#### 2.2 ASTM Standards:<sup>3</sup>

- [B179 Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes](#)
- [B275 Practice for Codification of Certain Zinc, Tin and Lead Die Castings](#)
- [B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products](#)
- [B557M Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products \(Metric\)](#)
- [B660 Practices for Packaging/Packing of Aluminum and Magnesium Products](#)
- [B666/B666M Practice for Identification Marking of Aluminum and Magnesium Products](#)
- [B881 Terminology Relating to Aluminum- and Magnesium-Alloy Products](#)
- [B917/B917M Practice for Heat Treatment of Aluminum-Alloy Castings from All Processes](#)
- [B985 Practice for Sampling Aluminum Ingots, Billets, Castings and Finished or Semi-Finished Wrought Aluminum Products for Compositional Analysis](#)
- [D3951 Practice for Commercial Packaging](#)
- [E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)
- [E34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys \(Withdrawn 2017\)<sup>4</sup>](#)
- [E94/E94M Guide for Radiographic Examination Using Industrial Radiographic Film](#)
- [E155 Reference Radiographs for Inspection of Aluminum and Magnesium Castings](#)
- [E165/E165M Practice for Liquid Penetrant Testing for General Industry](#)
- [E607 Test Method for Atomic Emission Spectrometric](#)

<sup>3</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>4</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

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



TABLE 1 Chemical Composition Limits<sup>A,B,C,D</sup>

Desig. <sup>1</sup>	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	Be	Pb	Sn	Zr	FNs	Others <sup>F</sup>		Al. Min
																Each	Total <sup>F</sup>	
204.0	0.20	0.35	4.2-5.0	0.10	0.15-0.35	...	0.05	0.10	0.15-0.30	...	...	...	0.05	...	...	0.05	0.15	Rem.
242.0	0.7	1.0	3.5-4.5	0.35	1.2-1.8	0.25	1.7-2.3	0.35	0.25	...	...	...	0.05	...	...	0.05	0.15	Rem.
296.0	2.0-3.0	1.2	4.0-5.0	0.35	0.05	...	0.35	0.50	0.25	...	...	...	...	...	...	...	0.35	Rem.
308.0	5.0-6.0	1.0	4.0-5.0	0.50	0.10	...	...	1.0	0.25	...	...	...	...	...	...	...	0.50	Rem.
319.0	5.5-6.5	1.0	3.0-4.0	0.50	0.10	...	0.35	1.0	0.25	...	...	...	...	...	...	...	0.50	Rem.
332.0 <sup>H</sup>	8.5-10.5	1.2	2.0-4.0	0.50	0.50-1.5	...	0.50	1.0	0.25	...	...	...	...	...	...	...	0.50	Rem.
333.0	8.0-10.0	1.0	3.0-4.0	0.50	0.05-0.50	...	0.50	1.0	0.25	...	...	...	...	...	...	...	0.50	Rem.
336.0 <sup>H</sup>	11.0-13.0	1.2	0.50-1.5	0.35	0.7-1.3	...	2.0-3.0	0.35	0.25	...	...	...	...	...	...	...	0.05	Rem.
354.0	8.6-9.4	0.20	1.6-2.0	0.10	0.40-0.6	...	...	0.10	0.20	...	...	...	0.05	...	...	0.05	0.15	Rem.
355.0	4.5-5.5	0.6 <sup>G</sup>	1.0-1.5	0.50 <sup>G</sup>	0.40-0.6	0.25	...	0.35	0.25	...	...	...	0.05	...	...	0.05	0.15	Rem.
C355.0	4.5-5.5	0.20	1.0-1.5	0.10	0.40-0.6	...	...	0.10	0.20	...	...	...	0.05	...	...	0.05	0.15	Rem.
356.0	6.5-7.5	0.6 <sup>G</sup>	0.25	0.35 <sup>G</sup>	0.20-0.45	...	...	0.35	0.25	...	...	...	0.05	...	...	0.05	0.15	Rem.
A356.0	6.5-7.5	0.20	0.20	0.10	0.25-0.45	...	...	0.10	0.20	...	...	...	0.05	...	...	0.05	0.15	Rem.
357.0	6.5-7.5	0.15	0.05	0.03	0.45-0.6	...	...	0.05	0.20	...	...	...	0.05	...	...	0.05	0.15	Rem.
A357.0	6.5-7.5	0.20	0.20	0.10	0.40-0.7	...	...	0.10	0.04-0.20	...	0.04-0.07	...	0.05	...	...	0.05	0.15	Rem.
E357.0	6.5-7.5	0.10	...	0.10	0.55-0.6	...	...	...	0.10-0.20	...	0.002	...	0.05	...	...	0.05	0.15	Rem.
F357.0	6.5-7.5	0.10	0.20	0.10	0.40-0.7	...	...	0.10	0.04-0.20	...	0.002	...	0.05	...	...	0.05	0.15	Rem.
359.0	8.5-9.5	0.20	0.20	0.10	0.50-0.7	...	...	0.10	0.20	...	...	...	0.05	...	...	0.05	0.15	Rem.
443.0	4.5-6.0	0.8	0.6	0.50	0.05	0.25	...	0.50	0.25	...	...	...	0.05	...	...	0.05	0.35	Rem.
B443.0	4.5-6.0	0.8	0.15	0.35	0.05	...	...	0.35	0.25	...	...	...	0.05	...	...	0.05	0.15	Rem.
A444.0	6.5-7.5	0.20	0.10	0.10	0.05	...	...	0.10	0.20	...	...	...	0.05	...	...	0.05	0.15	Rem.
513.0 <sup>H</sup>	0.30	0.40	0.10	0.30	3.5-4.5	...	...	1.4-2.2	0.10-0.25	...	0.003-0.007	...	0.05	...	0.005B	0.05	0.15	Rem.
535.0	0.15	0.15	0.05	0.10-0.25	6.2-7.5	...	...	...	0.10-0.25	...	...	...	0.05	...	...	0.05	0.15	Rem.
705.0	0.20	0.8	0.20	0.40-0.6	1.4-1.8	0.20-0.40	...	2.7-3.3	0.25	...	...	...	0.05	...	...	0.05	0.15	Rem.
707.0	0.20	0.8	0.20	0.40-0.6	1.8-2.4	0.20-0.40	...	4.0-4.5	0.25	...	...	...	0.05	...	...	0.05	0.15	Rem.
711.0 <sup>H</sup>	0.30	0.7-1.4	0.35-0.6	0.05	0.25-0.45	...	...	6.0-7.0	0.20	...	...	...	0.05	...	...	0.05	0.15	Rem.
713.0	0.25	1.1	0.40-1.0	0.6	0.20-0.50	0.35	0.15	7.0-8.0	0.25	...	...	...	0.10	...	...	0.10	0.25	Rem.
850.0	0.7	0.7	0.7-1.3	0.10	0.10	...	0.7-1.3	...	0.20	...	...	5.5-7.0	...	...	...	...	0.30	Rem.
851.0 <sup>H</sup>	2.0-3.0	0.7	0.7-1.3	0.10	0.10	...	0.30-0.7	...	0.20	...	...	5.5-7.0	...	...	...	...	0.30	Rem.
852.0 <sup>H</sup>	0.40	0.7	1.7-2.3	0.10	0.6-0.9	...	0.9-1.5	...	0.20	...	...	5.5-7.0	...	...	...	...	0.30	Rem.

<sup>A</sup> When single units are shown, they indicate the maximum amounts permitted.

<sup>B</sup> Analysis shall be made for the elements for which limits are shown in this table.

<sup>C</sup> The following applies to all specified limits in this table: For purposes of determining conformance to these limits, an observed value or a calculated value obtained from analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the specified limit in accordance with the rounding-off method of Practice E29.

<sup>D</sup> In case of discrepancy between the values listed in Table 1 and those listed in the "Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot ("The Pink Sheets")" the composition limits registered with the Aluminum Association and published in the "Pink Sheets" shall be considered the controlling composition.

<sup>E</sup> "Others" includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer or the purchaser establish that an "others" element exceeds the limit of "Each" or that the aggregate of several "others" elements exceeds the limit of "Total," the material shall be considered nonconforming.

<sup>F</sup> The sum of those "Others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum.

<sup>G</sup> If iron exceeds 0.45, manganese content shall not be less than one-half iron content.

<sup>H</sup> 336.0 formerly A332.0, 332.0 formerly F332.0, 513.0 formerly A514.0, 711.0 formerly C712.0, 851.0 formerly A850.0, 852.0 for merely B850.0.

<sup>I</sup> For a cross reference of current and former alloy designations see the Aluminum Association's "Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot ("The Pink Sheets")."



Analysis Aluminum Alloys by the Point to Plane Technique Nitrogen Atmosphere (Withdrawn 2011)<sup>4</sup>

E716 Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spark Atomic Emission Spectrometry

E1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry

E2422 Digital Reference Images for Inspection of Aluminum Castings

IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System

2.3 *ANSI Standard*.<sup>5</sup>

H35.1/H35.1(M) Alloy and Temper Designation Systems for Aluminum

2.4 *Military Standards*.<sup>6</sup>

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-276 Impregnation of Porous Nonferrous Metal Castings

NAVSEA S9074-AR-GIB-010/278 Requirements for Fabrication Welding and Inspection, and Casting Inspection and Repair for Machinery, Piping, and Pressure Vessels

2.5 *AMS Specification*:

AMS 2771 Heat Treatment of Aluminum Alloy Castings<sup>7</sup>

2.6 *Federal Standard*.<sup>6</sup>

Fed Std. No. 123 Marking for Shipment (Civil Agencies)

2.7 *Aluminum Association Standard*.<sup>5</sup>

Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot (The Pink Sheets)

2.8 *Other Standards*.<sup>8</sup>

CEN EN 14242 Aluminum and Aluminum Alloys, Chemical Analysis, Inductively Coupled Plasma Optical Emission Spectral Analysis

### 3. Terminology

3.1 *Definitions*—Refer to Terminology B881 for definitions of product terms used in this specification.

### 4. Ordering Information

4.1 Orders for material under this specification shall include the following information (see 1.4 and 1.5):

4.1.1 This specification designation (which includes the number, the year, and the revision letter, if applicable),

NOTE 1—For inch-pound application, specify Specification B108 and for metric application specify Specification B108M. Do not mix units.

4.1.2 Alloy (see Section 7 and Table 1),

4.1.3 Temper (see Section 10 and Table 2 [Table 3]),

4.1.4 Applicable drawing or part number, and

<sup>5</sup> Available from Aluminum Association, Inc., 1400 Crystal Drive Suite 430 Arlington, VA 22202 <http://www.aluminum.org>.

<sup>6</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

<sup>7</sup> Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

<sup>8</sup> Available from European Committee for Standardization (CEN), 36 Rue de Stassart, B-1050, Brussels, Belgium, <http://www.cenorm.be>.

4.1.5 The quantity in either pieces or pounds [kilograms].

4.2 Additionally, orders for material to this specification shall include the following information when required by the purchaser.

4.2.1 Whether foundry control is required (see Section 9),

4.2.2 Whether yield strength tests are required (see 10.1 and Table 2, Footnote C, [Table 4, Footnote D]),

4.2.3 Whether castings or test bars, or both, are to be artificially aged for Alloys 705.0-T5, 707.0-T5, and 713.0-T5 (see 10.3),

4.2.4 Whether test specimens cut from castings are required in addition to or instead of separately cast specimens (see Sections 10, 12.2, 13.2, and 15),

4.2.5 Whether heat treatment is to be performed in accordance with AMS 2771 (see Section 16),

4.2.6 Whether repairs are permissible (see Section 17),

4.2.7 Whether inspection is required at the producer's works (see Section 18),

4.2.8 Whether certification is required (see Section 22),

4.2.9 Whether surface requirements will be checked visually or by observational standards where such standards are established (see 19.1),

4.2.10 Whether liquid penetrant inspection is required (see 19.2),

4.2.11 Whether radiographic inspection is required and, if so, the radiographic grade of casting required (19.3, Table 4), and

4.2.12 Whether Practices B660 applies and, if so, the levels of preservation, packaging, and packing required (see 24.4).

### 5. Responsibility for Quality Assurance

5.1 Unless otherwise specified in the contract or purchase order, the producer shall be responsible for the performance of all inspections and test requirements specified herein. Unless otherwise agreed upon, the producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein. The purchaser shall have the right to perform any of the inspections and tests set forth in the specification where such inspections are deemed necessary to confirm that the material conforms to prescribed requirements.

### 6. Manufacture

6.1 The responsibility of furnishing castings that can be laid out and machined to the finished dimensions within the permissible variations specified, as shown on the blueprints or drawings, shall rest with the producer, except where mold equipment is furnished by the purchaser.

### 7. Chemical Composition

7.1 The product shall conform to the chemical composition limits prescribed in Table 1. Conformance shall be determined by the producer by taking samples at the time castings are poured in accordance with Practice E716 and analyzed in accordance with Test Methods E34, E607, or E1251, or CEN EN 14242. If the producer has determined the composition of the material during casting, they shall not be required to sample and analyze the finished product.