



Standard Specification for Aluminum-Alloy Permanent Mold Castings¹

This standard is issued under the fixed designation B 108; 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 approval. 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 specification² covers aluminum-alloy permanent mold castings designated as shown in **Table 1**.

1.2 This specification is not intended for aluminum-alloy permanent mold castings used in aerospace applications.

1.3 Alloy and temper designations are in accordance with ANSI H35.1. The equivalent unified numbering system alloy designations are in accordance with Practice **E 527**.

1.4 For acceptance criteria for inclusion of new aluminum and aluminum alloys and their properties in this specification, see **Annex A1** and **Annex A2**.

1.5 The values stated in inch-pound units are to be regarded as the standard. The SI values given in parentheses are for information only.

1.6 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 and health practices and determine the applicability of regulatory limitations prior to use.

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*:³

B 179 Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes

B 275 Practice for Codification of Certain Nonferrous Metals and Alloys, Cast and Wrought

B 557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

B 660 Practices for Packaging/Packing of Aluminum and

Magnesium Products

B 881 Terminology Relating to Aluminum- and Magnesium-Alloy Products

B 917/B 917M Practice for Heat Treatment of Aluminum-Alloy Castings from All Processes

D 3951 Practice for Commercial Packaging

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E 34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys

E 88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

E 94 Guide for Radiographic Examination

E 155 Reference Radiographs for Inspection of Aluminum and Magnesium Castings

E 165 Test Method for Liquid Penetrant Examination

E 527 Practice for Numbering Metals and Alloys (UNS)

E 607 Test Method for Atomic Emission Spectrometric Analysis Aluminum Alloys by the Point to Plane Technique Nitrogen Atmosphere

E 716 Practices for Sampling Aluminum and Aluminum Alloys for Spectrochemical Analysis

E 1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Atomic Emission Spectrometry

2.3 *ANSI Standard*:

H35.1/H35.1M Alloy and Temper Designation Systems for Aluminum⁴

2.4 *Military Standards*:⁵

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-276 Impregnation of Porous Nonferrous Metal Castings

NAVSEA Technical Publication S9074-AR-GIB-010/278

2.5 *AMS Specification*:

AMS 2771 Heat Treatment of Aluminum Alloy Castings⁶

2.6 *Federal Standard*:⁵

¹ 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 Nov. 1, 2006. Published December 2006. Originally approved in 1936. Last previous edition approved in 2003 as B 108 – 03a.

² For ASME Boiler and Pressure Code application see related SB-108.

³ 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.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁵ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁶ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

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

TABLE 1 Chemical Composition Limits^{A,B,C}

Alloy		Composition, %												Other Elements ^E	
ANSI ^D	UNS	Aluminum	Silicon	Iron	Copper	Manga- nese	Magne- sium	Chromium	Nickel	Zinc	Titanium	Tin	Each	Total ^F	
204.0	A02040	remainder	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	
242.0	A02420	remainder	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	0.15	
296.0		remainder	2.0–3.0	1.2	4.0–5.0	0.35	0.05	...	0.35	0.50	0.25	...	...	0.35
308.0		remainder	5.0–6.0	1.0	4.0–5.0	0.50	0.10	...	...	1.0	0.25	...	...	0.50
319.0	A03190	remainder	5.5–6.5	1.0	3.0–4.0	0.50	0.10	...	0.35	1.0	0.25	...	...	0.50
332.0 ^G	A03320	remainder	8.5–10.5	1.2	2.0–4.0	0.50	0.50–1.5	...	0.50	1.0	0.25	...	...	0.50
333.0	A03330	remainder	8.0–10.0	1.0	3.0–4.0	0.50	0.05–0.50	...	0.50	1.0	0.25	...	...	0.50
336.0 ^G	A03360	remainder	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	...	
354.0	A03540	remainder	8.6–9.4	0.20	1.6–2.0	0.10	0.40–0.6	...	...	0.10	0.20	...	0.05	0.15
355.0	A03550	remainder	4.5–5.5	0.6 ^H	1.0–1.5	0.50 ^H	0.40–0.6	0.25	...	0.35	0.25	...	0.05	0.15	
C355.0	A33550	remainder	4.5–5.5	0.20	1.0–1.5	0.10	0.40–0.6	...	...	0.10	0.20	...	0.05	0.15
356.0	A03560	remainder	6.5–7.5	0.6 ^H	0.25	0.35 ^H	0.20–0.45	...	...	0.35	0.25	...	0.05	0.15
A356.0	A13560	remainder	6.5–7.5	0.20	0.20	0.10	0.25–0.45	...	...	0.10	0.20	...	0.05	0.15
357.0		remainder	6.5–7.5	0.15	0.05	0.03	0.45–0.6	...	...	0.05	0.20	...	0.05	0.15
A357.0	A13570	remainder	6.5–7.5	0.20	0.20	0.10	0.40–0.7	...	...	0.10	0.04–0.20	...	0.05 ^I	0.15
E357.0		remainder	6.5–7.5	0.10	0.10	0.10	0.55–0.6	...	...	...	0.10–0.20	...	0.05 ^J	0.15
F357.0		remainder	6.5–7.5	0.10	0.20	0.10	0.40–0.7	...	...	0.10	0.04–0.20	...	0.05 ^J	0.15
359.0	A03590	remainder	8.5–9.5	0.20	0.20	0.10	0.50–0.7	...	...	0.10	0.20	...	0.05	0.15
443.0	A04430	remainder	4.5–6.0	0.8	0.6	0.50	0.05	0.25	...	0.50	0.25	...	...	0.35
B443.0	A24430	remainder	4.5–6.0	0.8	0.15	0.35	0.05	...	...	0.35	0.25	...	0.05	0.15
A444.0	A14440	remainder	6.5–7.5	0.20	0.10	0.10	0.05	...	...	0.10	0.20	...	0.05	0.15
513.0 ^G	A05130	remainder	0.30	0.40	0.10	0.30	3.5–4.5	...	...	1.4–2.2	0.20	...	0.05	0.15
535.0	A05350	remainder	0.15	0.15	0.05	0.10–0.25	6.2–7.5	...	...	...	0.10–0.25	...	0.05 ^K	0.15
705.0	A07050	remainder	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	0.15	
707.0	A07070	remainder	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	0.15	
711.0 ^G	A07110	remainder	0.30	0.7–1.4	0.35–0.65	0.05	0.25–0.45	...	...	6.0–7.0	0.20	...	0.05	0.15
713.0	A07130	remainder	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	0.25	
850.0	A08500	remainder	0.7	0.7	0.7–1.3	0.10	0.10	...	0.7–1.3	...	0.20	5.5–7.0	...	0.30	
851.0 ^G	A08510	remainder	2.0–3.0	0.7	0.7–1.3	0.10	0.10	...	0.3–0.7	...	0.20	5.5–7.0	...	0.30	
852.0 ^G	A08520	remainder	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	

^A When single units are shown, these indicate the maximum amounts permitted.

^B Analysis shall be made for the elements for which limits are shown in this table.

^C 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 method of Practice E 29.

^D ASTM alloy designations are recorded in Practice B 275.

^E *Others* includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the specification. However, such analysis is not required and may not cover all metallic *Others* elements. Should any analysis by 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.

^F *Other Elements*—Total shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.

^G 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 formerly B850.0.

^H If the iron content exceeds 0.45 %, manganese content shall not be less than one half of the iron.

^I Beryllium 0.04–0.07.

^J Beryllium 0.002 max

^K Beryllium 0.003–0.007, boron 0.005 max.

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

3. Terminology

3.1 *Definitions*—Refer to Terminology B 881 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:

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

4.1.2 Alloy (see Section 7 and Table 1),

4.1.3 Temper (see Section 11 and Table 2),

4.1.4 Applicable drawing or part number,

4.1.5 The quantity in either pieces or pounds.

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

4.2.1 Whether yield strength tests are required (see 11.1 and Table 2, Footnote F),

4.2.2 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 11.3),

4.2.3 Whether test specimens cut from castings are required in addition to or instead of separately cast specimens (see Sections 11, 12.2, 13.2, and 15),

4.2.4 Whether repairs are permissible (see Section 18),

4.2.5 Whether inspection is required at the producer's works (see Section 19),

4.2.6 Whether certification is required (see Section 23),

4.2.7 Whether surface requirements will be checked visually or by observational standards where such standards are established (see 20.1),

4.2.8 Whether liquid penetrant inspection is required (see 20.2),

4.2.9 Whether radiographic inspection is required (see 20.3), and

4.2.10 Whether foundry control is required (see 10.2).

4.2.11 Whether Practices B 660 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. Materials and 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 castings shall conform to the chemical composition limits prescribed in Table 1. Conformance shall be determined by the producer by analyzing samples at the time the castings are poured, or samples taken from castings or tension test specimens representative of the castings. If the producer has determined the chemical composition of the material during the course of manufacture, he shall not be required to sample and analyze the finished product.

TABLE 2 Tensile Requirements^{A,B}

Alloy		Temper ^C	Tensile Strength, min, ksi (MPa) ^D	Yield Strength ^E (0.2 % offset), min, ksi (MPa) ^D	Elongation in 2 in. or 4 × Diameter, min, %	Typical Brinell Hardness ^F 500-kgf load, 10-mm ball
ANSI ^G	UNS					
204.0	A02040	T4 separately cast specimens	48.0 (331)	29.0 (200)	8.0	...
242.0	A02420	T571	34.0 (234)	...	H	105
		T61	40.0 (276)	...	H	110
296.0	A02960	T4	33.0 (230)	15.0 (105)	4.5	75
		T6	35.0 (240)	...	2.0	90
		T7	33.0 (230)	16.0 (110)	3.0	...
308.0	A03080	F	24.0 (165)	...	...	70
319.0	A03190	F	27.0 (186)	14.0 (97)	2.5	95
332.0 ^I	A03320	T5	31.0 (214)	...	H	105
333.0	A03330	F	28.0 (193)	...	H	90
		T5	30.0 (207)	...	H	100
		T6	35.0 (241)	...	H	105
		T7	31.0 (214)	...	H	90
336.0 ^I	A03360	T551	31.0 (214)	...	H	105
		T65	40.0 (276)	...	H	125
354.0	A03540	T61	48.0 (331)	37.0 (255)	3.0	...
		separately cast specimens	47.0 (324)	36.0 (248)	3.0	...
		casting, designated area ^J	43.0 (297)	33.0 (228)	2.0	...
		castings, no location designated ^J	52.0 (359)	42.0 (290)	2.0	...
		T62	50.0 (344)	42.0 (290)	2.0	...
		separately cast specimens	43.0 (297)	33.0 (228)	2.0	...
		castings, designated area ^J	27.0 (186)	...	H	75
		castings, no location designated ^J	42.0 (290)	...	H	105
355.0	A03550	T51	42.0 (290)	...	H	105
		T62	36.0 (248)	...	H	90
		T7	34.0 (234)	27.0 (186)	H	80
		T71	34.0 (234)	27.0 (186)	H	80
C355.0	A33550	T61	40.0 (276)	30.0 (207)	3.0	85–90
		separately cast specimens	40.0 (276)	30.0 (207)	3.0	...
		castings, designated area ^J	37.0 (255)	30.0 (207)	1.0	85
		castings, no location designated ^J	21.0 (145)	10.0 (69)	3.0	...
356.0	A03560	F	33.0 (228)	22.0 (152)	3.0	85
		T6	25.0 (172)	...	3.0	70
		T71	25.0 (172)	...	3.0	70
A356.0	A13560	T61	38.0 (262)	26.0 (179)	5.0	80–90
		separately cast specimens	33.0 (228)	26.0 (179)	5.0	...
		castings, designated area ^J	28.0 (193)	26.0 (179)	3.0	...
		castings, no location designated ^J	45.0 (310)	...	3.0	...
357.0	A13570	T6	45.0 (310)	36.0 (248)	3.0	100
A357.0	A13570	T61	46.0 (317)	36.0 (248)	3.0	...
		separately cast specimens	41.0 (283)	31.0 (214)	3.0	...
		castings, designated area ^J	45.0 (310)	36.0 (248)	3.0	100
		castings, no location designated ^J	46.0 (317)	36.0 (248)	3.0	...
E357.0 ^K		T61	41.0 (283)	31.0 (214)	3.0	...
		separately cast specimens	45.0 (310)	36.0 (248)	3.0	100
		castings, designated area ^J	46.0 (317)	36.0 (248)	3.0	...
		castings, no location designated ^J	41.0 (283)	31.0 (214)	3.0	...