



Designation: B686-03 Designation: B 686/B 686M - 07

Standard Specification for Aluminum Alloy Castings, High-Strength¹

This standard is issued under the fixed designation B 686/B 686M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers aluminum-alloy high-strength castings designated as shown in Table 1.

1.2 Castings covered by this specification are intended for use in airframe, missile, and other critical applications where high strength, ductility, and sound castings are required.

~~1.3 For acceptance criteria for inclusion of new aluminum and aluminum alloys and their properties in this specification, see~~

~~1.3 Unless the order specifies the "M" specification designation, the material shall be furnished to the inch-pound units.~~

~~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.~~

~~1.4~~ ~~The~~ ~~1.5~~ The values stated in either inch-poundSI units or SIinch-pound units are to be regarded separately as standard. ~~Within the text, the SI units are shown in brackets. The~~ ~~The~~ values stated in each system ~~are~~ may not be exact equivalents²; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

~~1.5~~ ~~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 regular limitations prior to use.*

2. Referenced Documents

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

2.2 *ASTM Standards:*²

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 Products²~~ Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

~~B 557M Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products [Metric]~~

~~B 660 Practices for Packaging/Packing of Aluminum and Magnesium Products²~~ 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~~ 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 ~~Examination~~ Inspection of Aluminum and Magnesium Castings

E 165 Test Method for Liquid Penetrant Examination

~~E 527 Practice for Numbering Metals and Alloys (UNS)~~ Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

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 Apr. 10, 2003. Published August 2003. Originally approved in 1981. Last previous edition approved in 2002 as B686-02a.

Current edition approved Oct. 1, 2007. Published October 2007. Originally approved in 1981. Last previous edition approved in 2003 as B 686 - 03.

² 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* Vol 02-02 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.

TABLE 1 Chemical Composition Limits

NOTE 1—When single units are shown, they indicate the maximum amounts permitted.

NOTE 2—Analysis shall be made for the elements for which limits are shown in this table.

NOTE 3—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 E 29.

Composition, %													
ANSI H35.1	ASTM E 527	Former	Aluminum	Silicon	Iron	Copper	Man-ganese	Magne-sium	Zinc	Titanium	Beryl-lium	Each ^A	Others Total ^B
A201.0	A12010		remainder	0.05	0.10	4.0–5.0	0.20–0.40	0.15–0.35		0.15–0.35	^C	0.03	0.10
354.0	A03540	SC92A	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
354.0	A03540	SC92A	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
C355.0	A33550	SC51B	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
C355.0	A33550	SC51B	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
A356.0	A13560	SG70B	remainder	6.5–7.5	0.20	0.20	0.10	0.25–0.45	0.10	0.20	...	0.05	0.15
A356.0	A13560	SG70B	remainder	6.5–7.5	0.20	0.20	0.10	0.25–0.45	0.10	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	0.04–0.07	0.05	0.15
A201.0	A12010		remainder	0.05	0.10	4.0–5.0	0.20–0.40	0.15–0.35		0.15–0.35		0.03^D	0.105
A201.0	A12010		remainder	0.05	0.10	4.0–5.0	0.20–0.40	0.15–0.35		0.15–0.35		0.03 ^D	0.15

^A "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.

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

^C Silver 0.40 to 1.0 %.

^D Beryllium 0.04–0.07.

~~E 607 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique, Nitrogen Atmosphere⁵. 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 Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Argon Atmosphere, Point-to-Plane, Unipolar Self-Initiating Capacitor Discharge⁵. Test Method for Analysis of Aluminum and Aluminum Alloys by Atomic Emission Spectrometry~~

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

2.3 AMS Standard:³

AMS 2771 Heat Treatment of Aluminum Alloy Castings

2.4 ANSI Standards:⁴

~~H35.1 Alloy and Temper Designation Systems for Aluminum². H35.1 / H35.1 (M) – 2006 Alloy and Temper Designation Systems for Aluminum~~

Z1.4 Sampling Procedures and Tables for Inspection by Attributes

~~2.42.5 Military Standards:~~⁵

MIL-STD-129 Marking for Shipment and Storage

~~2.52.6 Federal Standard:~~⁵

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

3. Classification

~~3.1 Castings shall be classified by inspection classes.~~

~~3.1.1 Terminology~~

~~3.1.1.1 Definitions: Refer to Terminology B 881 for definitions of product terms used in this specification.~~

4. Classification

4.1 Castings shall be classified by inspection classes.

4.1.1 Classes (Inspection):

3.1.1.1

4.1.1.1 Class 1—A class of casting, the single failure of which would result in the loss of a missile, aircraft, or other vehicle.

³ Annual Book of ASTM Standards, Vol 15.09.

³ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

⁴ Annual Book of ASTM Standards, Vol 14.02.

⁴ Available from Aluminum Association, Inc., 1525 Wilson Blvd., Suite 600, Arlington, VA 22209, <http://www.aluminum.org>.

⁵ Annual Book of ASTM Standards, Vol 03.05.

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

3.1.1.2

4.1.1.2 *Class 2*—Class 1 castings not included in Class 1, the single failure of which would cause significant danger to operating personnel or would result in a significant operational penalty. In the case of missiles, aircraft, and other vehicles, this includes loss of major components, loss of control, unintentional release of inability to release armament stores, or failure of weapon installation components.

3.1.1.3

4.1.1.3 *Class 3*—Castings having a margin of safety of 200 % or less.

3.1.1.4

4.1.1.4 *Class 4*—Castings having a margin of safety of greater than 200 %, or for which no stress analysis is required. All target drone castings and aerospace ground support equipment fall in this category, except for such critical parts, the failure of which would make the equipment unsatisfactory and cause the vehicles which they are intended to support to be inoperable.

3.1.2

4.1.2 *Grades (Radiographic Quality)* :

NOTE 1—Caution should be exercised in specifying the grade of maximum permissible radiographic discontinuity level to be met in the casting. Radiographic quality has only a qualitative relationship to mechanical properties. In general, the highest property levels of an alloy will require the higher grades of radiographic quality. However, section size and shape parameters may be able to tolerate certain discontinuities without significant reduction in functional integrity. Too severe soundness requirements may cause the part producibility to be impractical or uneconomical.

3.1.2.1

4.1.2.1 *Grade A*—A grade in which there is no discernible discontinuity visible on the radiograph of the specified area of the casting.

3.1.2.2

4.1.2.2 *Grade B*—A premium grade of casting for critical applications or specified area of a casting with low margins of safety.

3.1.2.3

4.1.2.3 *Grade C*—A high-quality grade of casting or area of a casting for general applications.

3.1.2.4

4.1.2.4 *Grade D*—A grade included for less important areas of a casting.

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 number (Section 6)

5. Ordering Information

5.1 Orders for material under this specification shall include the following information:

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

NOTE 2—For inch-pound application, specify Specification B 686 and for metric application specify Specification B 686M. Do not mix units.

5.1.2 Alloy number (Section 7.1, Table 1) radiographic grade (3.1.2.1, Table 2) inspection class of castings (3.1.1.1, Table 3) and class of mechanical properties (or [Table 4]) and class of mechanical properties (Table 5);

4.1.3 Tensile property requirements on the drawing or purchase order (8.1.5 or [Table 6]),

5.1.3 Tensile property requirements on the drawing or purchase order (9.1.5, 14.5.15.5, 14.6.15.6, Table 3 and Table 5 or [Table 4] and [Table 6]),

5.1.4 Identification of product information (Section 11),

4.1.4 Identification of product information (Section 10)

5.1.5 Applicable drawings or part number,

5.1.6 The quantity in either pieces or [kilograms].

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

5.2.1 Whether heat treatment is to be performed in accordance with AMS 2771 (10.2),

4.1.5 Applicable drawings or part number;

4.1.6 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 the material shall be packed or marked, or both, in accordance with MIL-STD-129

5.2.2 Where the preproduction samples shall be sent, and activity responsible for testing, and instructions concerning submittal of the test reports (14.2.1 and 14.2.2),

5.2.3 Penetrant inspection standards (15.3).

5.2.4 Whether the material shall be packed or marked, or both, in accordance with MIL-STD-129, Practices B 660, or Fed. Std. No. 123 (15.3);

TABLE 2 Discontinuity-Level Requirements for High-Strength Aluminum Castings—Maximum Permissible in Accordance with (Reference Radiographs E 155)

NOTE 1—When two or more types of discontinuities are present within a 2 by 2-in. area to an extent equal to or not significantly better than the acceptance standards for respective discontinuities, the castings shall be rejected.

NOTE 2—When two or more types of discontinuities are present within a 2 by 2-in. area and the predominating discontinuity is not significantly better than the acceptance standard, the casting shall be considered borderline.

NOTE 3—Borderline castings shall be reviewed for acceptance or rejection by competent engineering personnel from the manufacturer and purchaser.

NOTE 4—Gas holes, sand spots, and inclusions allowed by this table shall be cause for rejection when closer than twice their maximum dimension to an edge or extremity of a casting.

NOTE 5—Castings with the following characteristics apply to Alloy A201.1 only:

1. Banding or striated segregation shall be acceptable to the extent that the mechanical properties in the affected section meet the requirements of Table 3.
2. Healed hot tears or discrete segregation cracks, evidenced by linear irregular white lines, shall be rejected.
3. Spheroidal segregation, evidenced by white spheroids, shall be evaluated for size and concentration by using the standards for gas holes.

Discontinuity	Radiograph	Grade A		Grade B		Grade C		Grade D	
		Section Thickness, in.							
		1/4	3/4	1/4	3/4	1/4	3/4	1/4	3/4
		1/4 [6 mm]	3/4 [19 mm]	1/4 [6 mm]	3/4 [19 mm]	1/4 [6 mm]	3/4 [19 mm]	1/4 [6 mm]	3/4 [19 mm]
Gas holes	1.1	none		1	1	2	2	5	5
Gas porosity (round)	1.21	none		1	1	3	3	7	7
Gas porosity (elongated)	1.22	none		1	1	3	4	5	5
Shrinkage cavity	2.1	none		1	A	2	A	3	A
Shrinkage porosity or sponge	2.2	none		1	1	2	2	4	3
Foreign material (less dense material)	3.11	none		1	1	2	2	4	4
Foreign material (more dense material)	3.12	none		1	1	2	1	4	3
Segregation	....	none			none		none		none
Cracks	....	none			none		none		none
Cold shuts	....	none			none		none		none
Laps	....	none			none		none		none
Surface irregularity	....				not to exceed drawing tolerance				
Core shift	....				not to exceed drawing tolerance				

^A Not available. Use 1/4 in. for all thicknesses.

TABLE 3 Mechanical Properties of Specimens^A Cut from Designated Areas of Casting^B(Inch-Pound Units).

Alloy Number			Class Number	Tensile Strength, min, ksi (MPa) ^C	Yield Strength, 0.2 % Offset, min, ksi (MPa) ^C	Elongation in 2 in. or 4D, min, %
ANSI H35.1	ASTM E 527(UNS)	Former				
A201.0 ^C	A12010		1	60.0	50.0	3
354.0	A03540	SC92A	1 ^D	60.0	50.0	5
			2 ^D	47.0 (324)	36.0 (248)	3
354.0	A03540	SC92A	1	50.0 (345)	42.0 (290)	2
			2 ^D	47.0	36.0	3
			3 ^D	50.0	42.0	2
C355.0	A33550	SC51	1	41.0 (283)	31.0 (214)	3
			2	44.0 (303)	33.0 (228)	3
			3 ^D	50.0 (345)	40.0 (276)	2
C355.0	A33550	SC51	1	41.0	31.0	3
			2	44.0	33.0	3
			3 ^D	50.0	40.0	2
A356.0	A13560	SC70B	1	38.0 (262)	28.0 (193)	5
			2	40.0 (276)	30.0 (207)	3
			3 ^D	45.0 (310)	34.0 (234)	3
A356.0	A13560	SC70B	1	38.0	28.0	5
			2	40.0	30.0	3
			3 ^D	45.0	34.0	3
A357.0	A13570		1	45.0 (310)	35.0 (241)	3
			2 ^D	50.0 (345)	40.0 (276)	5
A357.0	A13570		1	45.0	35.0	3
			2 ^D	50.0	40.0	5
A201.0 ^E	A12010		1	60.0 (414)	50.0 (345)	3
			2 ^C	60.0 (414)	50.0 (345)	5

^A For purposes of determining conformance with this specification, each value for tensile strength and yield strength shall be rounded to the nearest 0.1 ksi, and each value for elongation shall be rounded to the nearest 0.5 %, both in accordance with the rounding method of Practice E 29.

^B For any casting process, special mold, or sand mold permanent mold with chills may be used. Properties in other areas may vary with mold process and foundry techniques used but will be inspected under foundry control (0.1.2). Special negotiated properties may be called for by the drawing note.

^C SI units for information only. For explanation of the SI unit "MPa" see Appendix X1.

^D This class is obtainable in favorable casting configurations and must be negotiated with the foundry for particular configuration desired. See Note 1 and Note 1 and 78.3.

^E Alloy A201.0 is intended for use in the -T7 temper, which provides a high level of resistance to stress-corrosion cracking when properly heat treated. In other tempers, alloy A201.0 may exhibit susceptibility to stress-corrosion cracking. Additionally, its tendency for hot shortness may make alloy A201.0 unsuitable in some casting designs.

TABLE 4 Mechanical Properties of Specimens^A Cut from Designated Areas of Casting^B (SI Units) - [Metric].^C

Alloy Number			Class Number	Tensile Strength, min, MPa	Yield Strength, 0.2 % Offset, min, MPa	Elongation in 5D, min, %
ANSI H35.1	ASTM E 527 (UNS)	Former				
A201.0 ^D	A12010		1	415	345	3
			2 ^E	415	345	5
354.0	A03540	SC92A	1	325	250	3
			2 ^E	345	290	2
C355.0	A33550	SC51	1	285	215	3
			2	305	230	3
			3 ^E	345	275	2
A356.0	A13560	SC70B	1	260	195	5
			2	275	205	1
			3 ^E	310	235	3
A357.0	A13570		1	310	240	3
			2 ^E	345	275	5

^A For purposes of determining conformance with this specification, each value for tensile strength and yield strength shall be rounded to the nearest 1 MPa, and each value for elongation shall be rounded to the nearest 0.5 %, both in accordance with the rounding method of Practice E 29.

^B For any casting process utilized, special mold, or sand mold permanent mold with chills may be used. Properties in other areas may vary with mold process and foundry techniques used but will be inspected under foundry control (0.1.2). Special negotiated properties may be called for by the drawing note.

^C Guidelines for metric conversion from the *Tempers for Aluminum and Aluminum Alloys, Metric Edition (Tan Sheets)* were used to convert the tensile and yield values to SI units. Section 15.5 and 15.6.3 state that the "coupons must meet the tensile property requirements specified," therefore there has been no reduction in elongation values during metric conversion.⁶

^D Alloy A201.0 is intended for use in the -T7 temper, which provides a high level of resistance to stress-corrosion cracking when properly heat treated. In other tempers, alloy A201.0 may exhibit susceptibility to stress-corrosion cracking. Additionally, its tendency for hot shortness may make alloy A201.0 unsuitable in some casting designs.

^E This class is obtainable in favorable casting configurations and must be negotiated with the foundry for particular configuration desired. See Note 1 and 8.3.

TABLE-4 5 Mechanical Properties of Specimens^A Cut from Any Area of Casting^B (Inch-Pound Units)

Alloy Number			Class Number ^C	Tensile Strength, min, ksi-(MPa) ^E	Yield Strength, 0.2 % Offset, min, ksi-(MPa) ^C	Elongation in 2 in. or 4D, min, %
ANSI H35.1	ASTM E 527(UNS)	Former				
A201.0 ^D	A12010		10	60.0	50.0	3
			11	56.0	48.0	1.5
354.0	A03540	SG92A	10	47.0 (324)	36.0 (248)	3
			11	43.0 (297)	33.0 (228)	2
354.0	A03540	SC92A	10	47.0	36.0	3
			11	43.0	33.0	2
C355.0	A33550	SC51	10	41.0 (283)	31.0 (214)	3
			11	37.0 (255)	30.0 (207)	1
			12	35.0 (241)	28.0 (193)	1
C355.0	A33550	SC51	10	41.0	31.0	3
			11	37.0	30.0	1
			12	35.0	28.0	1
A356.0	A13560	SG70B	10	38.0 (262)	28.0 (193)	5
			11	33.0 (228)	27.0 (186)	3
			12	32.0 (221)	22.0 (152)	2
A356.0	A13560	SG70B	10	38.0	28.0	5
			11	33.0	27.0	3
			12	32.0	22.0	2
A357.0	A13570		10	38.0 (262)	28.0 (193)	5
			11	41.0 (283)	31.0 (214)	3
A357.0	A13570		10	38.0	28.0	5
			11	41.0	31.0	3
A201.0 ^E	A12010		10	60.0 (414)	50.0 (345)	3
			11	56.0 (386)	48.0 (331)	1.5

^A For any casting process, special mold, permanent mold, or sand mold with chills may be used.

^B For purposes of determining conformance with this specification, each value for tensile strength and yield strength shall be rounded to the nearest 0.1 ksi, and each value for elongation shall be rounded to the nearest 0.5 %, both in accordance with the rounding method of Practice E 29.

^C For any alloy, yield strength will be reasonably consistent throughout the casting. This should be considered when selecting combinations of classes from Table 3 and Table 4 5. See Note 1 and 7.3 Note 1.

^D SI units for information only. For explanation of the SI unit "MPa" see d Appendix X18.3.

^E Alloy A201.0 is intended for use in the -T7 temper, which provides a high level of resistance to stress-corrosion cracking when properly heat treated. In other tempers, alloy A201.0 may exhibit susceptibility to stress-corrosion cracking. Additionally, its tendency for hot shortness may make alloy A201.0 unsuitable in some casting designs.

4.2.2 Where the preproduction samples shall be sent, and activity responsible for testing, and instructions concerning submittal of the test reports (13.2.1 and 13.2.2), and

4.2.3 Penetrant inspection standards (14.3(16.3),

5.2.5 Whether certification is required (17).

5.6. Materials and Manufacture

5.6.1 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 pattern

TABLE 6 Mechanical Properties of Specimens^A Cut from Any Area of Casting^B (SI Units) - [Metric]^C

Alloy Number			Class Number ^D	Tensile Strength, min, MPa	Yield Strength, 0.2 % Offset, min, MPa ^C	Elongation in 5D, min, %
ANSI H35.1	ASTM E 527 (UNS)	Former				
A201.0 ^F	A12010		10	415	345	3
			11	385	330	1.5
354.0	A03540	SC92A	10	325	250	3
			11	295	230	2
C355.0	A33550	SC51	10	285	215	3
			11	255	205	1
A356.0	A13560	SG70B	12	240	195	1
			10	260	195	4
A357.0	A13570		11	230	185	3
			12	220	150	2
			10	260	195	4
			11	285	215	3

^A For purposes of determining conformance with this specification, each value for tensile strength and yield strength shall be rounded to the nearest 1 MPa, and each value for elongation shall be rounded to the nearest 0.5 %, both in accordance with the rounding method of Practice E 29.

^B For any casting process utilized, special mold, sand mold, or permanent mold chills may be used. Properties in other areas may vary with mold process and foundry techniques used, but will be inspected under foundry control (8.1.2). Special negotiated properties may be called for by the drawing note.

^C Guidelines for metric conversion from the *Tempers for Aluminum and Aluminum Alloys, Metric Edition (Tan Sheets)* were used to convert the tensile and yield values to SI units. Section 15.5 and 15.6.3 state that the “coupons must meet the tensile property requirements specified,” therefore there has been no reduction in elongation values during metric conversion.⁶

^D For any alloy, yield strength will be reasonably consistent throughout the casting. This should be considered when selecting combinations of classes from Table 3 and Table 5. See Note 1 and 8.3.

^F Alloy A201.0 is intended for use in the –T7 temper, which provides a high level of resistance to stress-corrosion cracking when properly heat treated. In other tempers, alloy A201.0 may exhibit susceptibility to stress-corrosion cracking. Additionally, its tendency for hot shortness may make alloy A201.0 unsuitable in some casting designs.

equipment is furnished by the purchaser and any dimensional discrepancies can be clearly attributed to the pattern equipment as furnished.

56.1.1 Unless otherwise specified, only aluminum alloy conforming to the requirements of Specification B 179 or producer’s foundry scrap (identified as being made from alloy conforming to Specification B 179) shall be used in the remelting furnace from which molten metal is taken for pouring directly into castings. Additions of small amounts of modifiers and grain refining elements or alloys are permitted.

56.1.2 Pure materials, recycled materials, and master alloys may be used to make alloys conforming to this specification, provided chemical analysis can be taken and adjusted to conform to Table 1 prior to pouring any castings.

6. Chemical Composition

6.1 The composition of the castings shall be within the limits specified in Table 1.

6.2 Sampling for spectrochemical analysis shall be in accordance with Practices E716. Samples for other methods of analysis shall be suitable for the form of material being analyzed and the type of analytical method used.

7. Preproduction Sample

7.1 In advance of production, unless otherwise specified in the contract or order, two castings heat treated and straightened to drawing requirements shall be submitted as directed by the purchaser for examination and written approval. One casting shall be completely laid out by the foundry and identified as the “dimensional sample” for dimensional approval. The other casting shall be identified as the “foundry control sample” and shall be for all other inspections and requirements as necessary for approval.

7.2 The submitted castings shall be fully representative of the foundry practice that will be used in production. If temporary gating was used to develop suitable foundry practice, the submitted casting shall be made after the gating has been installed. If chills are required, their size and location shall also be permanently identified and recorded. Pouring temperature of the submitted casting shall be recorded. All details of manufacture and processing shall be recorded and documented by photographs, sketches, specifications, and manufacturing procedures.

7.3 Chemical Composition and Sampling

7.1 The composition of the castings shall be within the limits specified in Table 1. Conformance shall be determined by the producer by analyzing samples taken at the time the castings are poured, or samples taken from castings or tension test specimens representative of 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.

7.2 A sample for determining of chemical composition shall be taken to represent the following:

7.2.1 Not more than 2000 lb [1000 kg] of clean castings (gates and risers removed) or a single casting poured from one furnace.

7.2.2 Castings poured continuously from one furnace for not more than 8 consecutive hours.

7.3 Samples for determination of chemical composition shall be taken in accordance with one of the following methods:

7.3.1 *Samples for Chemical Analysis*—Samples for chemical analysis shall be in accordance with Practice E 88 except that the weight of a prepared sample shall be not less than 75 g.

7.3.2 *Samples for Spectrochemical and Other Methods of Analysis*—Sampling for spectrochemical analysis shall be in