



Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles¹

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

1. Scope *

1.1 This specification² covers extruded 6061-T6 aluminum-alloy standard structural profiles.

1.2 The profiles are limited to I-beams, H-beams, channels, angles, tees, and zeeks.

NOTE 1—For other extruded profiles in other alloys and tempers refer to Specification B 221.

1.3 Alloy and temper designations are in accordance with ANSI H35.1 [ANSI H35.1M]. The equivalent Unified Numbering System alloy designation is that in Table 1 preceded by A9, or A96061 for alloy 6061 in accordance with Practice E 527.

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

1.5 The values stated in either inch-pound or SI units are to be regarded separately as standard. The SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems will result in nonconformance with the specification.

2. Referenced Documents

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

2.2 ASTM Standards:

B 557 Test Methods of Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products³

B 557M Test Methods of Tension Testing Wrought and Cast Aluminum and Magnesium Alloy Products (Metric)³

B 597 Practice for Heat Treatment of Aluminum Alloys³

B 647 Test Method for Indentation Hardness of Aluminum Alloys by Means of a Webster Hardness Gage³

B 648 Test Method for Indentation Hardness of Aluminum Alloys by Means of a Barcol Impressor³

B 660 Practices for Packaging/Packing of Aluminum and

¹ This specification is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SB-308 in Section II of that Code.

³ Annual Book of ASTM Standards, Vol 02.02.

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

Alloy 6061	Composition, %
Silicon	0.40–0.8
Iron	0.7
Copper	0.15–0.40
Manganese	0.15
Magnesium	0.8–1.2
Chromium	0.04–0.35
Zinc	0.25
Titanium	0.15
Other elements ^D each	0.05
Total ^E	0.15
Aluminum	remainder

^A Where 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 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.

^D Others includes all 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.

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

Magnesium Products³

B 666/B 666M Practice for Identification Marking of Aluminum Products³

B 807 Practice for Extrusion Press Solution Heat Treatment for Aluminum Alloys³

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁴

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁵

E 34 Test Methods for Chemical Analysis of Aluminum and Aluminum Base Alloys⁶

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition⁶

E 227 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique⁶

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Annual Book of ASTM Standards, Vol 14.02.

⁶ Annual Book of ASTM Standards, Vol 03.05.

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

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- E 527 Practice for Numbering Metals and Alloys (UNS)⁷
 E 607 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique, Nitrogen Atmosphere⁸
 E 716 Practices for Sampling Aluminum and Aluminum Alloys for Spectrochemical Analysis⁸
 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 Discharge⁸
2.3 ANSI Standards:
 H35.1 Alloy and Temper Designation Systems for Aluminum³
 H35.1(M) Alloy and Temper Designation Systems for Aluminum (Metric)³
 H35.2 Dimensional Tolerances for Aluminum Mill Products³
 H35.2(M) Dimensional Tolerances for Aluminum Mill Products (Metric)³
2.4 Federal Standard:
 Fed. Std. No. 123 Marking for Shipment (Civil Agencies)⁹
2.5 Military Specifications:
 MIL-H-6088 Heat Treatment of Aluminum Alloys⁹
 MIL-STD-129 Marking for Shipment and Storage⁹

3. Terminology

3.1 Definitions:

- 3.1.1 *extruded structural profile*—a profile produced by hot extruding, commonly used for structural purposes but limited to profiles such as I-beams, H-beams, angles, channels, tees, and zees in certain standard alloys, tempers, and sizes.
 3.1.2 *producer*—the primary manufacturer of the material.
 3.1.3 *supplier*—includes only the category of jobbers and distributors as distinct from producers.

4. Ordering Information

4.1 Orders for material to 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),

NOTE 2—For inch-pound orders specify B 308; for metric orders specify B308M. Do not mix units.

- 4.1.2 Quantity in pieces or pounds [kilograms],
 4.1.3 Alloy (Section 8),
 4.1.4 Temper (10.1 and Table 2),
 4.1.5 Type of section (1.2), dimensions (including a drawing if necessary), and length,
 4.2 Additionally, orders for material to this specification shall include the following information when required by the purchaser:
 4.2.1 Whether solution heat treatment at the extrusion press is unacceptable (9.2),

TABLE 2 Tensile Property Limits^{A,B}

6061-T6	
Tensile strength, min, ksi [MPa]	38.0 [260]
Yield strength, min, ksi [MPa]	35.0 [240]
Elongation, ^C min, %	
in 2 in. [50 mm]	10 [10] ^D
in 4D [5D or 5.65 $\sqrt{A}$]	10 [9]

^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 [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 The basis for mechanical property limits is given in Annex A1.

^C Elongations in 2 in. [50 mm] apply for profiles tested in full section and for sheet-type specimens machined from material up through 0.500 in. [12.5 mm] in thickness having parallel surfaces. Elongations in 4D [5D or 5.65 $\sqrt{A}$], where D and A are diameter and cross-sectional area of the specimen, respectively, apply to round test specimens machined from thicknesses over 0.250 in. [6.30 mm].

^D For thicknesses less than 0.250 in. [up through 6.30 mm] the minimum elongation is 8 %.

4.2.2 Whether heat treatment in accordance with Practice B 597 is required (9.3),

4.2.3 Whether inspection or witness of inspection and tests by the purchaser's representative is required prior to material shipment (Section 13),

4.2.4 Whether certification of the material by the supplier is required (Section 15),

4.2.5 Whether marking for identification is required (Section 16) and whether marking of lot number is required (16.2), and

4.2.6 Whether Practices B 660 applies and, if so, the applicable levels of preservation, packaging, and packing required (17.3).

5. Materials and Manufacture

5.1 The products covered by this specification shall be produced by hot extruding only.

6. Quality Assurance

6.1 *Responsibility for Inspection and Tests*—Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser in the order or at the time of contract signing. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that material conforms to prescribed requirements.

6.2 *Lot Definition*—An inspection lot shall be defined as follows.

6.2.1 An inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, and nominal dimensions traceable to a heat-treat lot or lots, and subjected to inspection at one time.

7. General Quality

7.1 Unless otherwise specified, the structural profiles shall be supplied in the mill finish and shall be uniform as defined by the requirements of this specification and shall be commercially sound. Any requirement not so covered is subject to negotiation between the producer and purchaser.

⁷ Annual Book of ASTM Standards, Vol 01.01.

⁸ Annual Book of ASTM Standards, Vol 03.06.

⁹ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.