QQ-A-200/16A
January 9, 1974
SUPERSEDING
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August 28, 1970

FEDERAL SPECIFICATION

ALUMINUM ALLOY STRUCTURAL SHAPES, EXTRUDED, 6061

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for use of all Federal Agencies.
(This specification forms a part of the latest issue of Federal Specification QQ-A-200)

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the specific requirements for aluminum alloy 6061 structural shapes produced by extrusion. The general requirements are covered in QQ-A-200.

1.2 Classification. Structural shapes shall be furnished in the -T6 temper (solution heat-treated and artificially aged) only (see 6.2 and 6.3). The definition for this temper shall be as specified in ANSI H35.1.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

Federal Specification:

QQ-A-200 - Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube, and Wire, Extruded; General Specification for.

Federal Standard:

Fed. Std. No. 184 - Identification Marking of Aluminum, Magnesium, and Titanium.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle.

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Military Specification:

MIL-H-6088 - Heat Treatment of Aluminum Alloys.

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-414 - Sampling Procedures and Tables for Inspection by Variable for Percent Defective.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American National Standards Institute ANSI Standard:

H35.1 - Alloy and Temper Designation Systems for Aluminum.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

3. REQUIREMENTS

3.1 Chemical composition. The chemical composition shall conform to the requirements specified in Table I.

TABLE I. Chemical composition 1/

Element	Percent	
	Minimum	Maximum
Magnesium	0.8	1.2
Silicon	0.40	0.8
Copper	0.15	0.40
Iron	-	0.7
Chromium	0.04	0.35
Zinc	-	0.25
Titanium	-	0.15
Manganese	-	0.15
Others, each	-	0.05
Others, total	-	0.15
Aluminum	Remainder	

1/ Analysis shall regularly be made only for the elements specifically mentioned in the table. If, however, the presence of other elements is indicated in the course of routine analysis, further analysis shall be made to determine conformance to the limits specified for other elements.

3.2 Mechanical properties of material as supplied. The mechanical properties in the direction of extrusion shall conform to the requirements in Table II. The elongation requirements shall not be applicable to the following:

(a) Material of such dimensions that a standard test specimen cannot be taken in accordance with QQ-A-200, and of such shape that it cannot be satisfactorily tested in full section.

(b) Material thinner than 0.062 inch (nominal).

TABLE II. Mechanical properties

Temper	Thickness Inches	Tensile strength, P.s.i. minimum	Yield strength at 0.2 percent offset or at extension indicated		Elongation in 2 in. or 4 times D[1]/, percent minimum
			P.s.i. minimum	Extension under load Inch per inch	
T6	Up thru 0.249	38,000	35,000	.0055	8
	0.250 and over	38,000	35,000	.0055	10

1/ "D" represents specimen diameter.

3.3 Heat treatment. Material shall be either furnace heat-treated in accordance with MIL-H-6088 or shall comply with the requirements of 3.3.1 (see QQ-A-200).

3.3.1 Alternate heat-treatment. The producer may use an alternate heat treating procedure in lieu of furnace heat treatment in accordance with MIL-H-6088 provided the material conforms to all other requirements of this specification when sampled and tested in accordance with 4.1.1. The alternate heat treatment (press quenching) shall be performed on the whole of a piece, never on a part only, and shall be performed in a manner that will produce the utmost uniformity.

3.4 Marking. When specified (see 6.2), and in addition to the marking required in Fed. Std. No. 184, material shall be identified by a lot number marked in at least one location on each piece.

4. QUALITY ASSURANCE PROVISIONS
(See QQ-A-200.)

4.1 Lot. An inspection lot shall consist of an identifiable quantity of structural shapes of the same type, section thickness, and size subjected to inspection at one time.

4.2 Heat treatment.

4.2.1 Additional sampling and testing when material has not been heat-treated in accordance with MIL-H-6088. When material has not been heat-treated in accordance with MIL-H-6088, in addition to the requirements of 3.2, hardness tests shall be performed either on each extruded charge in the lot or on samples selected in accordance with MIL-STD-105, Level II, Acceptable Quality Level (AQL) 1.5 percent defective or MIL-STD-414, Level IV, Acceptable Quality Level (AQL) 1.5 percent defective. The minimum hardness control value shall be in accordance with Table III for the type of hardness tester used. The specific type of hardness tester used shall be left to the discretion of the producer. The hardness shall be checked at the portion of

the piece which is determined to have received the least drastic quench. Lots rejected by the statistical sampling plan may be retested by hardness testing each extruded charge and all charges or finished lengths meeting the applicable requirements of Table III are acceptable. Individual extrusion charges which fail to conform to the requirements of Table III may be accepted provided the two pieces in the lot having the two lowest hardness readings are tensile tested and found to conform to the requirements of Table II.

TABLE III. Hardness values

Thickness, inch	Hardness number, minimum		
	Webster	Barcol	Rockwell E
0.050 to 0.075	15	76	89
0.076 to 0.499	15	76	90
0.500 and over	-	76	-

5. PREPARATION FOR DELIVERY (See QQ-A-200).

6. NOTES

6.1 Intended use. This material is intended for structural applications where good strength and workability are required.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

(a) Title, number, and date of this specification.

(b) Shape required.

(c) Dimensions required.

(d) When lot number identification is required (see 3.4).

(e) Selection of applicable levels of preservation, packaging, and packing required, if other than level C (see QQ-A-200).

6.3 Definitions.

6.3.1 Structural shape. An extruded shape in certain standard alloys, tempers, sizes, and sections, such as angles, channels, tees, I-beams, and H-sections, commonly used for structural purposes.

6.4 Certain provisions of this specification are the subject of international standardization agreement ABC-NAVY-STD 44. When amendment, revision, or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

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