

QQ-A-200/10E
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SUPERSEDING
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 April 13, 1971

FEDERAL SPECIFICATION SHEET

ALUMINUM ALLOY 6066, BAR, ROD, SHAPES, TUBE AND WIRE, EXTRUDED

This specification was approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

The complete requirements for procuring the aluminum alloy 6066, bar, rod, shapes, tube and wire, extruded described herein shall consist of this document and the latest issue of QQ-A-200/GEN (see 2.1).

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the specific requirements for aluminum alloy 6066, bar, rod, shapes, tube and wire produced by extrusion.

1.2 Classification.

1.2.1 Tempers. The bar, rod, shapes, tube and wire shall be of the following tempers: 0, T4, T42, T4510, T4511, T6, T62, T6510 or T6511, as specified (see 6.2). The definition of these tempers shall be as specified in QQ-A-200/GEN.

1.2.2 Type. Tubing shall be additionally classified as follows:

<u>Type</u>	<u>Description</u>
I	- Tubing extruded from hollow billets using die and mandrel (see QQ-A-200/GEN)
II	- Tubing extruded from solid billets using a porthole or spider die or similar tooling (see QQ-A-200/GEN)

2. APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on date of invitation for bids or solicitation for offers, form a part of this specification to the extent specified herein.

Federal Specifications

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

FSC 9530, 9525,
 4710, 9540

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(Single copies of this specification, and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

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	1.4
Silicon	0.9	1.8
Iron	-	0.50
Copper	0.7	1.2
Titanium	-	0.20
Manganese	0.6	1.1
Zinc	-	0.25
Chromium	-	0.40
Other elements, each	-	0.05
Other elements, total <u>2/</u>	-	0.15
Aluminum	Remainder	

TABLE 1. Chemical composition 1/ - Continued

- 1/ Analysis shall routinely be made only for the elements specifically mentioned in table I. If, however, the presence of other elements is indicated or suspected in amounts greater than the specified limits, further analysis shall be made to determine that these elements are not present in excess of specified limits
- 2/ The sum of those "Others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum

3.2 Mechanical properties.

3.2.1 Mechanical properties of material as supplied. The mechanical properties in the direction of extrusion shall conform to the requirements specified in table II (see QQ-A-200/GEN for exceptions to elongation requirements).

3.2.2 mechanical properties after heat treatment. In addition to conforming to the requirements of 3.2.1, materials identified in the following paragraphs shall, after having been heat-treated to other tempers also identified therein, have properties in the extrusion direction conforming to those specified in table II, as applicable.

3.2.2.1 Material in the O temper. Material in the O temper, without the subsequent imposition of cold work or forming operations, shall, after proper solution heat treatment and natural aging, develop the properties specified in table II for the T42 temper.

3.2.2.2 Material in the T4, T4510, T4511, T6, T6510 and T6511 tempers. Material in the T4, T4510, T4511, T6, T6510 and T6511 tempers shall, without the subsequent imposition of cold work or forming operations, be capable of being re-solution heat treated and naturally aged to the properties specified for the T42 temper. Such capability shall be demonstrated when specified (see 6.2).

3.2.2.3 Material in the T4, T42, T4510, and T4511 tempers. Material in the T4, T42, T4510 and T4511 tempers shall be age-hardenable to the properties specified for the T6, T62, T6510 and T6511 tempers, respectively. Such capability shall be demonstrated when specified (see 6.2).

3.3 Markings. (See QQ-A-200/GEN).

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

TABLE II. Mechanical properties

Temper	Thickness, (bar and shapes); diameter, (rod and wire); wall thickness, (tube), inches	Area, square inches	Tensile strength, Minimum, ksi	Yield strength at 0.2 percent offset or at extension indicated		Elongation in 2 inches or 4 times D 1/, Minimum, percent
				Minimum, ksi	Extension under load, inch per inch	
0	A11	A11	2/	2/	0.0038	16
T4, T4510, T4511 3/	A11	A11	40.0	25.0	0.0045	14
T42 4/	A11	A11	40.0	24.0	0.0044	14
T6, T6510, T6511 3/	A11	A11	50.0	45.0	0.0065	8
T62 4/	A11	A11	50.0	42.0	0.0062	8

1/ D represents specimen diameter

2/ No minimum. Maximum tensile and yield strengths shall be 29.0 ksi and 18.0 ksi, respectively

3/ For stress-relieved tempers, the characteristics and properties, other than those specified, may differ somewhat from the corresponding characteristics and properties of material in the basic temper

4/ Material in the T42 and T62 tempers is not available from the materials producers

4.1 Heat treatment.

4.1.1 Aging period before testing. Material solution heat-treated and selected for natural aging may be tested for compliance with 3.2.2 within 4 days after solution heat treatment, if the manufacturer so elects. If these tests fail, the manufacturer may test additional specimens taken after 4 days aging. These specimens shall be taken from the same location in the lot from which the first specimens were taken.

4.2 Mechanical tests after heat treatment.

4.2.1 Material in the O temper. From the material in the O temper, an additional number of specimens, equal to that required by QQ-A-200/GEN, shall be taken and tested after solution heat treatment and natural aging to determine compliance with 3.2.2.1.

4.2.2 Material in tempers other than O. When specified (see 6.2), from material in a temper other than the O temper, an additional number of specimens, equal to that required by QQ-A-200/GEN, shall be taken and tested after the appropriate solution heat treatment, where applicable, and aging treatment to determine compliance with 3.2.2.2 and 3.2.2.3, as applicable.

5. PREPARATION FOR DELIVERY (see QQ-A-200/GEN)

6. NOTES

6.1 Intended use. This alloy is intended for use where good strength and weldability are required along with corrosion resistance and workability equivalent to other presently used structural alloys. The T4510 and T6510 tempers are intended primarily to provide extruded material with low residual stresses and consequent minimum distortion during machining. The T4511 and T6511 tempers are straightened T4510 and T6510 material, respectively, and may have unknown residual stresses and may or may not distort during machining.

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) Form, quantity and temper required (see 1.2.1)
- (c) Dimensions required
- (d) Requirements for sizes not specifically covered (see QQ-A-200/GEN)
- (e) Special end use requirements
- (f) Whether type II tubing is acceptable for the application (see 1.2.2)

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- (g) Demonstrations of heat treatability where such demonstrations are optional (see 3.2.2.2 and 3.2.2.3)
- (h) Selection of applicable levels of preservation, packaging and packing (see section 5, QQ-A-200/GEN)

6.3 Properties after heat treatment. Mechanical properties are certified for the temper of material supplied. The producers capability demonstration is not evidence that user-treated material conforms to property requirements of a given temper. Frequently, user-heat-treated material may develop a lower level of properties, especially if any cold, warm or hot work is introduced prior to solution heat treatment. The user should be held responsible for demonstrating that his processing will yield properties meeting requirements.

MILITARY INTEREST:

Custodians

Army-MR
Navy-AS
Air Force-20

Review Activities

Army-AR, EA, MI
Navy-SH
DLA-IS

User Activities

Army-CR
Navy-MC

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-FSS
NASA-JFK
DOE-BPA

PREPARING ACTIVITY:

NAVY-AS
DOD Project 9530-0233

Orders for this publication are to be placed with the General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein.