SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

AMS 4344C

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Superseding AMS 4344B

Aluminum Alloy, Extrusions
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7175-T73511)
Solution Heat Treated, Stress Relieved by Stretching, Straightened, and Overaged

(Composition similar to UNS A97175)

RATIONALE

AMS 4344C is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of extruded bars, rods, and profiles.

1.2 Application

These extrusions have been used typically for structural applications requiring a combination of high tensile properties, moderate fatigue strength, stress-corrosion resistance, and good fracture toughness, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
AMS 2772	Heat Treatment of Aluminum Alloy Raw Materials
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications
AS1990	Aluminum Alloy Tempers

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 594	Ultrasonic Inspection of Aluminum-Alloy Wrought Products for Aerospace Applications
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B 666M	Identification Marking of Aluminum Products
ASTM G 47	Determining Susceptibility to Stress-Corrosion Cracking of 2xxx and 7xxx Aluminum Alloys

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036, Tel: 212-642-4900, www.ansi.org.

ANSI H 35.2	Dimensional Tolerances for Aluminum Mill Products
ANSI H 35.2M	Dimensional Tolerances for Aluminum Mill Products (Metric)

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355.

TABLE 1 - COMPOSITION

Element	min	max
Silicon		0.15
Iron		0.20
Copper	1.2	2.0
Manganese		0.10
Magnesium	2.1	2.9
Chromium	0.18	0.28
Zinc	5.1	6.1
Titanium	--	0.10
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Extruded, solution heat treated, stress relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, and overaged to the T73511 (see AS1990) temper.

3.2.1 Extrusions may receive minor straightening, after stretching, of an amount necessary to meet the requirements of 3.6.

3.2.2 Extrusions shall be supplied with an as-extruded surface finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within specified dimensional tolerances.

3.3 Heat Treatment

Heat treatment shall be performed in accordance with AMS 2772 except as noted:

3.3.1 Solution Heat Treatment

Solution heat treat at 870 °F ± 10 (466 °C ± 6).

3.3.2 Aging

Recommended practice is 225 °F ± 10 (107 °C ± 6) for 6-8 hours followed by 350 °F ± 10 (177 °C ± 6) for 6 to 8 hours.

3.4 Properties

Extrusions shall conform to the following requirements, determined in accordance with AMS 2355 on the mill produced size.

3.4.1 Tensile Properties

Shall be as specified in Table 2A or 2B, determined on specimens from extrusions 0.250 to 2.000 inches (6.35 to 50.80 mm) in nominal thickness and up to 32 square inches (206 cm^2), inclusive, in cross-sectional area.

TABLE 2A - MINIMUM TENSILE STRENGTH, INCH/POUND UNITS

Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Longitudinal	69.0	59.0	8
Long-Transverse	63.0	52.0	4

TABLE 2B - MINIMUM TENSILE STRENGTH, SI UNITS

Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 5D %
Longitudinal	476	407	8
Long-Transverse	434	359	4

3.4.2 Fracture Toughness

When specified, plane strain fracture toughness (K_{Ic}) shall be not lower than the values shown in Table 3A or 3B.

TABLE 3A - MINIMUM FRACTURE TOUGHNESS, INCH/POUND UNITS

Nominal Diameter or Least Thickness Inches	Specimen Orientation (See 8.2)	$\frac{K_{Ic}}{ksi\sqrt{inch}}$
Over 0.749 to 1.800, incl	L-T	30
Over 0.749 to 1.800, incl	T-L	22

TABLE 3B - MINIMUM FRACTURE TOUGHNESS, SI UNITS

Nominal Diameter or Least Thickness Millimeters	Specimen Orientation (See 8.2)	$\frac{K_{Ic}}{MPa\sqrt{m}}$
Over 19.02 to 45.72, incl	L-T	33
Over 19.02 to 45.72, incl	T-L	24

3.4.3 Conductivity

3.4.3.1 If the conductivity is 40.0% IACS (International Annealed Copper Standard) (23.2 MS/m) or higher and the longitudinal tensile properties meet specified requirements, the extrusions are acceptable.

3.4.3.2 If the conductivity is 38.0 to 39.9% IACS (22.0 to 23.1 MS/m), the longitudinal tensile properties meet specified requirements, and the longitudinal yield strength does not exceed the specified minimum by more than 11.9 ksi (82.0 MPa), the extrusions are acceptable.

3.4.3.3 If the conductivity is lower than 40.0% IACS (23.2 MS/m), and the longitudinal yield strength exceeds the specified minimum by more than 11.9 ksi (82.0 MPa), the extrusions shall be given additional overaging heat treatment. If, after such treatment, the extrusions meet the requirements of 3.4.1, 3.4.2 (when specified), and 3.4.3.1 or 3.4.3.2, extrusion are acceptable.

3.4.3.4 If the conductivity is below 38.0% IACS (22.0 MS/m), the extrusions are not acceptable.

3.4.3.4.1 Extrusions found to be unacceptable may be given additional overaging heat treatment, and if, upon completion of such treatment, they develop conductivity/property relationships conforming to 3.4.1, 3.4.2 (when specified), and 3.4.3.1 or 3.4.3.2, they shall be acceptable.

3.4.4 Stress-Corrosion Resistance

Specimens, cut from extrusions 0.750 inch (19.05 mm) and over in nominal diameter or section thickness, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse (perpendicular to grain flow) direction to 44.0 ksi (303 MPa) when tested per ASTM G 47.

3.5 Quality

Extrusions, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the extrusions.

3.5.1 When specified, extrusions shall be subjected to ultrasonic inspection in accordance with ASTM B 594 or other techniques acceptable to purchaser. Extrusions 0.500 to 1.499 inches (12.70 to 38.07 mm), inclusive, in nominal thickness, not exceeding 600 pounds (272 kg) in weight per piece, and not exceeding a 10 to 1 width-to-thickness ratio shall meet discontinuity class B. Extrusions 1.500 inches (38.10 mm) and over in nominal thickness not exceeding 600 pounds in weight (272 kg) per piece, and not exceeding a 10 to 1 width-to-thickness ratio shall meet discontinuity class A.

3.6 Tolerances

Shall conform to all applicable requirements of ANSI H35.2 or ANSI H35.2M.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of extrusions shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the extrusions conform to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.4.1), fracture toughness (3.4.2), when specified, conductivity (3.4.3), ultrasonic inspection (3.5.1) when specified, and tolerances (3.6) are acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests

Stress-corrosion resistance (3.4.4) is a periodic test and shall be performed at a frequency selected by vendor unless frequency of testing is specified by purchaser.