



AEROSPACE MATERIAL SPECIFICATION	AMS4407™	REV. B
	Issued 2007-01 Reaffirmed 2012-04 Revised 2024-03 Superseding AMS4407A	
Aluminum Alloy, Plate (7056-T7651), 9.1Zn - 1.6Cu - 1.9Mg, Solution Heat Treated, Stress Relieved, and Overaged (Composition similar to UNS A97056)		

RATIONALE

AMS4407B results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (see 3.4.5, 3.7, and 8.5), relocate Definitions (see 2.4), revise Stress-Corrosion Cracking (see 3.4.3.1) and Acceptance Testing (see 4.2.1) to clarify that testing applies when specified, and update Applicable Documents (see Section 2), Acceptance Tests (see 4.2.1), and Ordering Information (see 8.6).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of plate 0.500 to 1.500 inches (12.7 to 38.1 mm), inclusive, in nominal thickness (see 8.6).

1.2 Application

This product has been used typically for parts requiring high mechanical properties and fracture toughness, coupled with moderate stress corrosion and exfoliation corrosion resistance, 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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2355 Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

AS7766 Terms Used in Aerospace Metals Specifications

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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 B594	Ultrasonic Inspection of Aluminum-Alloy Wrought Products
ASTM B645	Linear-Elastic Plane Strain Fracture Toughness Testing of Aluminum Alloys
ASTM B660	Packaging/Packaging of Aluminum and Magnesium Products
ASTM B666/B666M	Identification Marking of Aluminum and Magnesium Products
ASTM E9	Compression Testing of Metallic Materials at Room Temperature
ASTM E399	Linear-Elastic Plane Strain Fracture Toughness of Metallic Materials
ASTM G34	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)
ASTM G47	Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products

2.3 ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI H35.1/H35.1M	Standard Alloy and Temper Designation System for Aluminum
ANSI H35.2	Dimensional Tolerances for Aluminum Mill Products
ANSI H35.2M	Dimensional Tolerances for Aluminum Mill Products (Metric)

2.4 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS2355.

Table 1 - Composition

Element	Min	Max
Silicon	--	0.10
Iron	--	0.12
Copper	1.2	1.9
Manganese	--	0.20
Magnesium	1.5	2.3
Zinc	8.5	9.7
Titanium	--	0.08
Zirconium	0.05	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Solution heat treated, stress relieved by stretching to produce a nominal permanent set of 2.5%, but not less than 1.5% nor more than 3%, and overaged to the T7651 temper (refer to ANSI H35.1/H35.1M).

3.2.1 The product shall receive no further straightening operations after stretching.

3.3 Heat Treatment

Shall be in accordance with AMS2772 and as follows:

3.3.1 Solution Heat Treatment

Heat to 860 to 890 °F (460 to 477 °C), hold at heat for a time commensurate with product thickness, and rapidly cool in a suitable quenching medium.

3.3.2 Overaging Heat Treatment

Overaging shall be performed at a specific temperature and time as required to meet the requirements of 3.4 (see 8.2).

3.4 Properties

The product shall conform to the following requirements, determined in accordance with AMS2355 on the mill product:

3.4.1 Tensile Properties

Shall be as specified in Table 2.

Table 2A - Minimum tensile properties, inch/pound units

Nominal Thickness Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.500 to 1.000, incl	Longitudinal	83.0	79.0	10
	Long-Trans.	83.0	79.0	10
1.001 to 1.500, incl	Longitudinal	81.0	77.0	10
	Long-Trans.	81.0	77.0	9

Table 2B - Minimum tensile properties, SI units

Nominal Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Over 12.7 to 25.4, incl	Longitudinal	572	545	10
	Long-Trans.	572	545	10
Over 25.4 to 38.1, incl	Longitudinal	558	531	10
	Long-Trans.	558	531	9

3.4.2 Compressive Yield Strength

When specified, the compressive yield strength, determined in accordance with ASTM E9, shall be as shown in Table 3.

Table 3 - Minimum compressive yield strength

Nominal Thickness Inches	Nominal Thickness Millimeters	Compressive Yield Strength Longitudinal/Long Trans. ksi	Compressive Yield Strength Longitudinal/Long Trans. MPa
0.500 to 1.000, incl	12.7 to 25.4, incl	78.0/83.0	538/572
Over 1.001 to 1.500, incl	Over 25.4 to 38.1, incl	76.0/81.0	524/558

3.4.3 Corrosion Resistance

3.4.3.1 Stress-Corrosion Cracking

When specified, specimens, cut from plate 0.750 inch (19.05 mm) and over in nominal thickness, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse direction to 25.0 ksi (170 MPa) in accordance with ASTM G47.

3.4.3.2 Exfoliation Corrosion Resistance

Specimens cut from plate shall not exhibit exfoliation corrosion at a T/2 plane greater than that illustrated by Photograph B, Figure 2, of ASTM G34.

3.4.4 Fracture Toughness

Plain-strain fracture toughness (K_{Ic}) for the L-T and T-L specimen orientations and configurations conforming to ASTM E399 and ASTM B645 shall be not lower than the values specified in Table 4 for plate 0.500 to 1.500 inches (12.7 to 38.1 mm) in nominal thickness.

Table 4 - Minimum fracture toughness parameters

Nominal Thickness Inches	Nominal Thickness Millimeters	Specimen Orientation	K_{Ic} ksi $\sqrt{\text{inch}}$	K_{Ic} MPa $\sqrt{\text{m}}$
0.500 to 1.500, incl	12.7 to 38.1, incl	L-T	27	30
		T-L	23	25

3.4.5 Mechanical property requirements for sheet and plate outside the thickness range of 1.1 shall be as agreed upon by the purchaser and producer and reported per 4.4.1 (see 8.6).

3.5 Quality

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

3.5.1 Each plate shall be ultrasonically inspected in accordance with ASTM B594 and shall meet ultrasonic Class A requirements.

3.6 Tolerances

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

3.7 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.