SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

AMS 4207B

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Superseding AMS 4207A

Aluminum Alloy Sheet, Alclad
5.7Zn - 2.2Mg - 1.6Cu - 0.22Cr (7475-T61)
Solution and Precipitation Heat Treated

(Composition similar to A87475)

RATIONALE

AMS 4207B 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 sheet.

1.2 Application

This sheet has been used typically for structural applications requiring a combination of high strength, moderate fatigue strength, and high 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 of 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

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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 B 646	Fracture Toughness Testing of Aluminum Alloys
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/ B 666M	Identification Marking of Aluminum and Magnesium Products
ASTM E 338	Sharp-Notch Tension Testing of High-Strength Sheet Materials
ASTM E 561	R-Curve Determination

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 1A - COMPOSITION-CORE (7475)

Element	min	max
Silicon	--	0.10
Iron	--	0.12
Copper	1.2	1.9
Manganese	--	0.06
Magnesium	1.9	2.6
Chromium	0.18	0.25
Zinc	5.2	6.2
Titanium	--	0.06
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

TABLE 1B - COMPOSITION-CLADDING (7072)

Element	min	max
Silicon + Iron	--	0.7
Copper	--	0.10
Manganese	--	0.10
Magnesium	--	0.10
Zinc	0.8	1.3
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Solution and precipitation heat treated in accordance with AMS 2772.

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3.3 Properties

Sheet 0.040 inch (1.02 mm) and over in nominal thickness shall conform to the following requirements, determined in accordance with AMS 2355 except that notch tensile testing shall be performed as in 3.3.3.1. Tensile properties, notch tensile strength/tensile yield strength ratio, and critical-stress-intensity factor requirements for sheet under 0.040 inch (1.02 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.1 Tensile Properties

Shall be as specified in Table 2, determined in the long-transverse direction.

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

Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches %
0.040 to 0.062, incl	69.0	59.0	9
Over 0.062 to 0.187, incl	70.0	60.0	9
Over 0.187 to 0.249, incl	72.0	61.0	9

TABLE 2B - MINIMUM TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm %
1.02 to 1.57, incl	476	407	9
Over 1.57 to 4.75, incl	483	414	9
Over 4.75 to 6.32, incl	496	421	9

3.3.2 Fracture Toughness

Plane stress fracture toughness (K_c) shall be not lower than values shown in Table 3, determined in the T-L direction in accordance with ASTM B 646 and ASTM E 561 or by other method acceptable to purchaser.

TABLE 3 - T-L K_c MINIMUM FRACTURE TOUGHNESS REQUIREMENTS

Nominal Thickness Inch	Nominal Thickness Millimeters	K_c, minimum $ksi\sqrt{inch}$	K_c, minimum $MPa\sqrt{m}$
0.040 to 0.125, incl	1.02 to 3.18, incl	75	82.4
Over 0.125 to 0.249, incl	Over 3.18 to 6.32, incl	60	66.0

3.3.3 Alternate Testing for Demonstration of Fracture Toughness

When specified, the producer shall guarantee that sheet meets the fracture toughness requirements based on correlation of notch tensile strength/tensile yield strength (NTS/YTS) ratio, determined in accordance with 3.3.3.1 in lieu of fracture toughness testing (3.3.2) (See 8.4). Sampling and testing requirements and lot acceptance criteria shall be as agreed upon.

3.3.3.1 Notch tensile strength in the long-transverse direction shall be determined in accordance with ASTM E338. The values shall be divided by the long transverse tensile yield strength to obtain the NTS/YTS ratio. Acceptance values for NTS/YTS ratio shall be specified based on evidence of documented correlation between the NTS/YTS ratio and the fracture toughness values (3.3.2) as demonstrated and maintained by the producer.

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3.3.4 Bending

Sheet 0.008 to 0.249 inch (0.20 to 6.32 mm), incl, in nominal thickness shall withstand, without cracking, bending at room temperature through an angle of 180 degrees around a diameter equal to the bend factor shown in Table 4 times the nominal thickness of the sheet with axis of bend parallel to the direction of rolling.

TABLE 4 - BENDING TEST PARAMETERS

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.008 to 0.020, incl	0.20 to 0.51, incl	6
Over 0.020 to 0.063, incl	Over 0.51 to 1.60, incl	7
Over 0.063 to 0.091, incl	Over 1.60 to 2.31, incl	8
Over 0.091 to 0.125, incl	Over 2.31 to 3.18, incl	9
Over 0.125 to 0.249, incl	Over 3.18 to 6.32, incl	10

3.3.5 Cladding Thickness

After rolling, the average cladding thickness per side shall be as shown in Table 5:

TABLE 5 - CLADDING THICKNESS

Nominal Sheet Thickness Inch	Nominal Sheet Thickness Millimeters	% of Sheet Thickness Nominal	% of Sheet Thickness Min Average
Up to 0.062, incl	Up to 1.57, incl	4	3.2
Over 0.062 to 0.187, incl	Over 1.57 to 4.75, incl	2.5	2.0
Over 0.187 to 0.249, incl	Over 4.75 to 6.32, incl	1.5	1.2

3.4 Quality

Sheet, 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 sheet.

3.5 Tolerances

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

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the sheet shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the sheet conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.3.1), and fracture toughness (3.3.2), or, when specified, alternate testing for demonstration of fracture toughness (3.3.3), and dimensional tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each lot.

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