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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4258 | REV. A

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Superseding AMS 4258

Laminated Sheet, Aluminum Alloy, Aramid Fiber Reinforced 5.7Zn - 2.2Mg - 1.6Cu - 0.22Cr (Alclad, One Side 7475-T761) 5 or 7 Ply

RATIONALE

This document has been reaffirmed to comply with the SAE five-year review policy.

NONCURRENT NOTICE

This specification has been declared “NONCURRENT” by the Aerospace Materials Division, SAE, as of September, 2006. It is recommended, therefore, that this specification not be specified for new designs.

“NONCURRENT” refers to those specifications which have previously been widely used and which may be required for production or processing of existing designs in the future. The Aerospace Materials Division, however, does not recommend these specifications for future use in new designs. “NONCURRENT” specifications are available from SAE upon request.

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1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of sheet laminated with two or more layers of unidirectional aramid fiber/epoxy prepreg.

1.2 Application:

This product has been used typically for structural parts requiring a combination of high fatigue-crack-growth resistance, fracture toughness, and resistance to corrosion, but usage is not limited to such applications.

1.3 Classification:

Laminated sheet supplied shall be of one of the types shown in Table 1, as specified by purchaser: Aluminum alloy sheet is represented in the lay-up sequence by the letter A and prepreg by the letter P.

TABLE 1 - Laminate Types

Laminate Type	Lay-up Sequence
Type 3/2	A/P/A/P/A
Type 4/3	A/P/A/P/A/P/A

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2202	Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate
MAM 2202	Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate
AMS 2355	Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
MAM 2355	Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units
AMS 2468	Hard Coating Treatment of Aluminum Alloys
AMS 2470	Anodic Treatment of Aluminum Alloys, Chromic Acid Process
AMS 4085	Aluminum Alloy Sheet, 5.7Zn - 2.2Mg - 1.6Cu - 0.22Cr, (7475-T761), Solution Heat Treated and Overaged
AMS 4100	Aluminum Alloy Sheet, Alclad, 5.7Zn - 2.2Mg - 1.6Cu - 0.22Cr, (7475-T761), Solution and Precipitation Heat Treated

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 557	Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products
ASTM B 557M	Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products, (Metric)
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM D 3167	Floating Roller Peel Resistance of Adhesives
ASTM E 338	Sharp-Notch Tension Testing of High-Strength Sheet Materials

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MMM-A-132 Adhesive, Heat Resistant, Airframe Structural, Metal to Metal

3. TECHNICAL REQUIREMENTS:

3.1 Material:

3.1.1 The sheet layers shall be AMS 4085 aluminum alloy 0.012 inch (0.30 mm) thick except one outside ply of the laminate shall be alclad one side AMS 4100 aluminum alloy sheet with the cladding being the exposed surface.

3.1.2 Interior layers of the laminate shall consist of two or three layers of unidirectional aramid fibers preimpregnated with epoxy resin adhesive, hereafter referred to as prepreg, separated by sheets of aluminum as described in 3.2.1.

3.1.3 The nominal thickness of laminated sheet shall be as shown in Table 2:

TABLE 2 - Nominal Thickness

Laminate Type	Thickness Inch	Thickness Millimeters
Type 3/2	0.053	1.35
Type 4/3	0.073	1.85

3.2 Laminating:

3.2.1 Faying (bonding) surfaces of the aluminum sheets, before assembly as a laminate, shall be cleaned, rinsed, and anodized (but not sealed) in accordance with AMS 2468, AMS 2470, or other process agreed upon by purchaser and vendor. All anodized surfaces shall be primed prior to lay-up with prepreg.

3.2.2 The epoxy adhesive in the prepreg shall conform to MMM-A-132, Type I. The aramid fiber and the quality characteristics of the prepreg shall be as agreed upon by purchaser and vendor. The prepreg shall be laid-up in the laminate assembly so that the fibers of all layers are oriented longitudinally, corresponding to the rolling direction of the aluminum sheets.

3.2.3 After lay-up, laminates shall be cured (bonded) using heat and pressure by a process, such as autoclaving, to produce the required properties. A typical practice is one hour at 260 °F ± 10 (127 °C ± 6) at a pressure of 70 to 75 psi (483 to 517 kPa).

3.2.4 The laminate shall be processed to adjust residual stresses (ARS) by causing the aluminum components to be in longitudinal compression rather than in tension. Adjustment shall be accomplished by stretching after curing, or by other means, to achieve 0.35 to 0.50% permanent set (See 8.1).

3.2.5 When specified, exterior surfaces of laminates shall be supplied anodized and primed.

3.3 Properties:

Laminated sheet shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as specified in Table 3, determined in accordance with ASTM B 557 or ASTM B 557M using specimens with 3-inch (76-mm) fillet radii in lieu of 0.500-inch (12.70-mm).

TABLE 3A - Minimum Tensile Properties, Inch/Pound Units

Laminate Type	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi
3/2	Longitudinal	108.0	77.0
	Long-Transverse	49.0	41.0
4/3	Longitudinal	109.0	78.0
	Long-Transverse	47.0	40.0

TABLE 3B - Minimum Tensile Properties, SI Units

Laminate Type	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa
3/2	Longitudinal	745	531
	Long-Transverse	338	283
4/3	Longitudinal	752	538
	Long-Transverse	324	276

3.3.2 Notch Tensile Strength: Shall be determined in accordance with ASTM E 338 using a center-cracked 2-inch (51-mm) wide by 12-inch (305-mm) long specimen having a 0.2-inch (5-mm) diameter open hole. Acceptance standards shall be as agreed upon by purchaser and vendor.

3.3.3 Roller Peel Strength: Adhesion of either outer layer shall be determined in accordance with ASTM D 3167 using a 1-inch (25-mm) wide specimen. Acceptance standards shall be as agreed upon by purchaser and vendor.

3.4 Quality:

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

3.4.1 Each laminated panel shall be inspected for anomalies and continuity of bond using either transmission or immersion ultrasonic techniques acceptable to purchaser. Ultrasonic transducers shall operate with a minimum frequency of 5 megahertz regardless of the inspection methods employed. Imperfections, that cause 50% or greater attenuation of ultrasound at 5 megahertz frequency over an area of response which is equal to or greater than the area of response from a 0.25 inch (6.4 mm) diameter reference defect, are not acceptable.

3.5 Tolerances:

Laminated sheet shall conform to all applicable requirements of AMS 2202 or MAM 2202, except that thickness tolerance shall be ±0.003 inch (±0.08 mm).

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and shall be performed on each lot.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2355 or MAM 2355 and the following:

4.3.1 Inspection Lot: An identifiable quantity of laminated sheet of the same type (thickness) containing bare aluminum sheet from one heat treat lot, alclad one side aluminum sheet from one heat treat lot, prepreg from one manufacturer's-batch lot, cured in the same lamination cycle, and presented for vendor's inspection at one time.