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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4095A

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Superseding AMS 4095

ALUMINUM ALLOY SHEET AND PLATE, ALCLAD
6.3Cu - 0.30Mn - 0.18Zr - 0.10V - 0.06Ti
Alclad 2219-T31; Sheet, Solution Heat Treated and Cold Worked
Alclad 2219-T351; Plate, Solution Heat Treated and Stress Relieved

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of sheet and plate.

1.2 Application: Primarily for parts requiring high strength up to 600°F (315°C). These products are also well suited for cryogenic applications and where welding and maximum corrosion resistance are required. Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking after heat treatment; ARP 823 recommends practices to minimize such conditions.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2202 - Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate
MAM 2202 - Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate
AMS 2350 - Standards and Test Methods
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 2770 - Heat Treatment of Aluminum Alloy Parts

REAFFIRMED 4/92

Printed in U.S.A.

2.1.2 Aerospace Recommended Practices:

ARP 823 - Minimizing Stress Corrosion Cracking in Wrought Heat Treatable Aluminum Alloy Products

2.2 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.2.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

2.2.2 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, Ø determined in accordance with AMS 2355 or MAM 2355:

	Core (2219)		Cladding (7072)	
	min	max	min	max
Copper	5.8	6.8	Zinc	0.8 - 1.3
Manganese	0.20	0.40	Silicon + Iron	-- 0.7
Zirconium	0.10	0.25	Magnesium	-- 0.10
Vanadium	0.05	0.15	Copper	-- 0.10
Titanium	0.02	0.10	Manganese	-- 0.10
Iron	--	0.30	Other Impurities, each	-- 0.05
Silicon	--	0.20	Other Impurities, total	-- 0.15
Zinc	--	0.10	Aluminum	remainder
Magnesium	--	0.02		
Other Impurities, each	--	0.05		
Other Impurities, total	--	0.15		
Aluminum	remainder			

3.2 Condition: The product shall be supplied in the following condition; heat Ø treatment shall be performed in accordance with MIL-H-6088:

3.2.1 Sheet: Solution heat treated and cold worked.

3.2.2 Plate: Solution heat treated and stress relieved by stretching 1-1/2 - 3%. Ø

3.3 Properties: The product shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.3.1 As Solution Heat Treated and Cold Worked or Stress Relieved:

3.3.1.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

Nominal Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation % in 2 in or 4D, min
0.040 to 0.099, incl	42,000	25,000	10
Over 0.099 to 0.499, incl	44,000	26,000	10

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation % in 50 mm or 4D, min
1.00 to 2.50, incl	290	170	10
Over 2.50 to 12.65, incl	305	180	10

3.3.1.2 Bending: Product 0.006 - 0.500 in. (0.15 - 12.50 mm), excl, in nominal thickness shall withstand, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

Nominal Thickness		Bend Factor
Inch	Millimetres	
0.006 to 0.020, incl	0.15 to 0.50, incl	8
Over 0.020 to 0.249, incl	Over 0.50 to 6.25, incl	12
Over 0.249 to 0.500, excl	Over 6.25 to 12.50, excl	16

3.3.1.2.1 Bending requirements for plate 0.500 in. (12.50 mm) and over in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 After Precipitation Heat Treatment: Product 0.020 to 0.499 in (0.50 to 12.50 mm), incl, in nominal thickness shall have the following properties after being precipitation heat treated in accordance with AMS 2770. Product under 0.020 in. (0.50 mm) or over 0.499 in. (12.50 mm) in nominal thickness shall have properties as agreed upon by purchaser and vendor.

3.3.2.1 Tensile Properties: The product, after precipitation heat treatment in accordance with AMS 2770, shall have the properties specified in Table II.

TABLE II

Nominal Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation % in 2 in. or 4D, min
0.020 to 0.039, incl	49,000	37,000	6
Over 0.039 to 0.099, incl	55,000	41,000	7
Over 0.099 to 0.249, incl	58,000	43,000	7
Over 0.249 to 0.499, incl	58,000	42,000	8

TABLE II (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation % in 50 mm or 4D, min
0.50 to 1.00, incl	340	255	6
Over 1.00 to 2.50, incl	380	285	7
Over 2.50 to 6.25, incl	400	295	7
Over 6.25 to 12.50, incl	400	290	8

3.3.3 Cladding Thickness: After rolling, the average cladding thickness shall Ø conform to the requirements shown in Table III.

TABLE III

Nominal Thickness		Cladding Thickness Per Side % of Total Thickness	
Inch	Millimetres	min	max
0.020 to 0.039, incl	0.50 to 1.00, incl	8	-
0.039 to 0.099, incl	Over 1.00 to 2.50, incl	4	-
Over 0.099 to 0.499, incl	Over 2.50 to 12.50, incl	2	-
Over 0.499	Over 12.50	2	3

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

3.5 Tolerances: Shall conform to all applicable requirements of AMS 2202 or MAM 2202.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all Ø samples for vendor's tests and shall be responsible for performing 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 product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for Ø composition (3.1), tensile properties as solution heat treated and cold worked or stress relieved (3.3.1.1), and tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for Ø bending as solution heat treated and cold worked or stress relieved (3.3.1.2), tensile properties after precipitation heat treatment (3.3.2.1) and cladding thickness (3.3.3) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355. Ø

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment a report stating that the product conforms to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 4095A, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 4095A, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and shall include in the report either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2355 or MAM 2355. Ø