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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

**AEROSPACE
MATERIAL
SPECIFICATION**

Submitted for recognition as an American National Standard

AMS 4094A

G-61-09

Issued 11-1-69
Revised 10-1-87

Superseding AMS 4094

ALUMINUM ALLOY SHEET AND PLATE, ALCLAD
6.3Cu - 0.30Mn - 0.18Zr - 0.10V - 0.06Ti
Alclad 2219-T81 Sheet
Solution Heat Treated, Cold Worked, and Precipitation Heat Treated
Alclad 2219-T851 Plate
Solution Heat Treated, Stress Relieved and Precipitation Heat Treated

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; 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

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2.1.2 Aerospace Recommended Practices:

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

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B660 - Packaging/Packing of Aluminum and Magnesium Products

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

2.3.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, 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 treatment shall be performed in accordance with MIL-H-6088.

3.2.1 Sheet: Solution heat treated, cold worked and precipitation heat treated.

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

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

3.3.1 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
0.020 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 I (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

3.3.1.1 Tensile property requirements for plate over 0.499 in. (12.50 mm) in
∅ nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 Cladding Thickness: After rolling, the average cladding thickness shall
∅ conform to the requirements shown in Table II.

TABLE II

Nominal Thickness	Cladding Thickness Per side % of Total Thickness		
	Inch	Millimetres	min
0.020 to 0.039, incl	0.50 to 1.00, incl	8	-
Over 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
∅ 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 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 composition (3.1), tensile properties (3.3.1), 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 cladding thickness (3.3.2) 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.

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 4094A, 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 4094A, 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.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet and plate shall be marked on one face, in the respective location indicated below, with the alloy number and temper, AMS 4094, inspection lot number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be sufficiently stable to withstand normal handling. The markings shall have no deleterious effect on the product or its performance.