The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Dr., Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

AMS 4195B

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Superseding AMS 4165A

Submitted for recognition as an American National Standard

## ALUMINUM ALLOY SHEET AND PLATE, ALCLAD
## 4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024 and 1-1/2% Alclad 2024-T861 Flat Sheet; 1-1/2% Alclad 2024-T861 Plate)
## Solution Heat Treated, Cold Worked, and Precipitation Heat Treated

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of flat sheet and plate 0.500 inch (12.70 mm) and under in nominal thickness.

1.2 Application: Primarily for structural parts requiring a combination of good strength and maximum corrosion resistance. These products, when re-solution heat treated by the user, may not have the tensile properties shown. Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP823 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

2.1. Aerospace Recommended Practices:

ARP823 - Minimizing Stress Corrosion Cracking in Wrought Heat Treatable Aluminum Alloy Products

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1915 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, Ø determined in accordance with AMS 2355 or MAM 2355:

| | Core (2024) | | | Cladding (1230) | | |
|---|---|---|---|---|---|---|
| | min | | max | | min | max |
| Copper | 3.8 | - | 4.9 | Iron + Silicon | -- | 0.7 |
| Magnesium | 1.2 | - | 1.8 | Copper | -- | 0.10 |
| Manganese | 0.30 | - | 0.9 | Zinc | -- | 0.10 |
| Iron | -- | | 0.50 | Manganese | -- | 0.05 |
| Silicon | -- | | 0.50 | Magnesium | -- | 0.05 |
| Zinc | -- | | 0.25 | Vanadium | -- | 0.05 |
| Titanium | -- | | 0.15 | Titanium | -- | 0.03 |
| Chromium | -- | | 0.10 | Residual Elements, each | -- | 0.03 |
| Residual Elements, each | -- | | 0.05 | Aluminum, by difference | 99.30 | -- |
| Residual Elements, total | -- | | 0.15 | | | |
| Aluminum | remainder | | | | | |



3.2 Condition: Solution heat treated, cold reduced approximately 6% in thickness, and precipitation heat treated. Heat treatments shall be performed in accordance with MIL-H-6088.

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 Inches | Tensile Strength psi, min | Yield Strength At 0.2% Offset psi, minimum | Elongation in 2 inches or 4D %, minimum |
|---|---|---|---|
| 0.020 to 0.062, incl | 64,000 | 58,000 | 3 |
| Over 0.062 to 0.187, incl | 69,000 | 64,000 | 4 |
| Over 0.187 to 0.249, incl | 70,000 | 65,000 | 4 |
| Over 0.249 to 0.500, excl | 69,000 | 63,000 | 4 |
| 0.500 | 70,000 | 64,000 | 4 |

TABLE I (SI)

| Nominal Thickness Millimeters | Tensile Strength MPa, min | Yield Strength At 0.2% Offset psi, minimum | Elongation in 50.8 mm or 4D %, minimum |
|---|---|---|---|
| 0.51 to 1.57, incl | 441 | 400 | 3 |
| Over 1.57 to 4.75, incl | 476 | 441 | 4 |
| Over 4.75 to 6.32, incl | 483 | 448 | 4 |
| Over 6.32 to 12.70, excl | 476 | 434 | 4 |
| 12.70 | 483 | 441 | 4 |

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

TABLE II

| Total Thickness of Composite Product | | Cladding Thickness Per Side % of Total Thickness | |
|---|---|---|---|
| Inch | Millimeters | min | max |
| 0.020 to 0.062, incl | 0.51 to 1.57, incl | 4.0 | -- |
| Over 0.062 to 0.187, incl | Over 1.57 to 4.75, incl | 2.0 | -- |
| Over 0.187 to 0.500, excl | Over 4.75 to 12.70, excl | 1.2 | -- |
| 0.500 | 12.70 | 1.2 | 3.0 |

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 t6is specification. This report shall include the purchase order number, lot number, AMS 4195B, 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 4195B, contractor or other direct supplier of product, part number, and quantity. When product for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of product to determine conformance to the requirements of this specification and shall include in the report either a statement that the product 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 of 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 4195, inspection lot number, manufacturer's identification, and nominal thickness. The alloy number shall be "Alclad 2024" for sheet 0.187 inch (4.75 mm) and under in thickness and "1-1/2% Alclad 2024" for sheet and plate over 0.187 inch (4.75 mm) thick. 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.