SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS4046 | REV. F

Issued 1961-01
Revised 2005-07
Reaffirmed 2012-03

Superseding AMS4046E

Aluminum Alloy Sheet and Plate, Alclad One Side 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad One Side 7075; -T6 Sheet -T651 Plate) Solution and Precipitation Heat Treated

(Composition similar to UNS A87075)

RATIONALE

AMS4046F has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of sheet and plate clad on one side.

1.2 Application:

These products have been used typically for structural components, including chemically milled and machined parts subject to excessive warpage during machining, but usage is not limited to such application.

1.2.1 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 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 issue is specified. When the referenced document has been cancelled and no superceding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications:

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

AMS 2355	Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS4046F

2.1 (Continued):

AMS 2772	Heat Treatment of Aluminum Alloy Raw Material
ARP823	Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products
AS1990	Aluminum Alloy Tempers

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken PA, 19428-2959 or www.astm.org.

ASTM B 594	Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B 666M	Identification of Aluminum and Magnesium Alloy Products

2.3 ANSI Publications:

Available from ANSI, 25 West 43rd Street, New York, NY 10036 or www.ansi.org.

ANSI H35.2	Dimensional Tolerances for Aluminum Mill Products
ANSI H35.2M	Dimensional Tolerances for Aluminum Mill Products (Metric)

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Tables 1 and 2, determined in accordance with AMS 2355.

TABLE 1 – Composition, Core (7075)

Element	min	max
Silicon	--	0.40
Iron	--	0.50
Copper	1.2	2.0
Manganese	--	0.30
Magnesium	2.1	2.9
Chromium	0.18	0.28
Zinc	5.1	6.1
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

TABLE 2 – Composition, Cladding (7072)

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

3.2 Condition:

The product shall be supplied in the following conditions; solution and precipitation heat treatment shall be performed in accordance with AMS 2772.

3.2.1 Sheet: Solution heat treated and aged to the T6 temper (See AS1990).

3.2.2 Plate: Solution heat treated, stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and aged to the T651 temper (See AS1990).

3.2.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties:

The product shall conform to the following requirements, determined in accordance with AMS 2355 on the mill produced size:

3.3.1 Tensile Properties: Shall be as specified in Table 2. Tensile properties shall be determined in the long-transverse direction and, when specified, in the longitudinal direction.

TABLE 2A - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.012 to 0.039, incl	73.0	63.0	7
Over 0.039 to 0.062, incl	74.0	64.0	8
Over 0.062 to 0.187, incl	75.0	65.0	8
Over 0.187 to 0.249, incl	76.0	66.0	8
Over 0.249 to 0.499, incl	76.0	66.0	9
Over 0.499 to 1.000, incl	78.0	68.0	7
Over 1.000 to 2.000, incl	77.0	67.0	6

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
0.30 to 0.99, incl	503	434	7
Over 0.99 to 1.57, incl	510	441	8
Over 1.57 to 4.75, incl	517	448	8
Over 4.75 to 6.32, incl	524	455	8
Over 6.32 to 12.67, incl	524	455	9
Over 12.67 to 25.40, incl	538	468	7
Over 25.40 to 50.80, incl	531	462	6

3.3.2 Bending: Product 0.012 to 0.499 inch (0.30 to 12.67 mm), inclusive, 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 3 times the nominal thickness of the product with axis of bend parallel to the direction of rolling. The bare (unclad) face shall be on the outside of the bend.

TABLE 3 - Bending Requirements

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.012 to 0.032, incl	0.30 to 0.81, incl	7
Over 0.032 to 0.062, incl	Over 0.81 to 1.57, incl	8
Over 0.062 to 0.091, incl	Over 1.57 to 2.31, incl	9
Over 0.091 to 0.125, incl	Over 2.31 to 3.18, incl	10
Over 0.125 to 0.249, incl	Over 3.18 to 6.32, incl	11
Over 0.249 to 0.499, incl	Over 6.32 to 12.67, incl	13

3.3.3 Cladding Thickness: The average cladding thickness shall be as shown in Table 4.

TABLE 4 - Cladding Thickness, Percent of Total Thickness

Thickness of Product Inches	Thickness of Product Millimeters	Average Cladding Thickness %, min	Average Cladding Thickness %, max
0.012 to 0.062, incl	0.30 to 1.57, incl	3.2	--
Over 0.062 to 0.187, incl	Over 1.51 to 4.75, incl	2.0	--
Over 0.187 to 0.499, incl	Over 4.75 to 12.67, incl	1.2	--
Over 0.499 to 4.000, incl	Over 12.67 to 101.60, incl	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.

3.4.1 When specified, each plate shall be ultrasonically inspected in accordance with ASTM B 594 and shall meet the acceptance limits of Table 5.

TABLE 5 – Ultrasonic Discontinuity Acceptance Limits

Thickness Inches	Maximum Weight Per Piece Pounds	Discontinuity Class
0.500 thru 1.499	2000	B
1.500 thru 2.000	2000	A

3.5 Tolerances:

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

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 specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.3.1), ultrasonic inspection when specified (3.4.1), and tolerances (3.5) are acceptance tests and shall be performed on each inspection lot.

4.2.2 Periodic Tests: Bending (3.3.2) and cladding thickness (3.3.3) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2355.

4.4 Reports:

The vendor of the product shall furnish with each shipment a report stating that the product conforms to the chemical composition, tolerances and ultrasonic testing when specified, showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements, and stating that the product conforms to the other specified requirements. This report shall include the purchase order number, inspection lot number(s), AMS 4046F, size, and quantity. The report shall also identify the producer, the mill product form, and the mill produced size.