SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS4316 REV. A

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Superseding AMS4316

Aluminum Alloy, Alclad Sheet and Plate
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr
7075: (-T76 Sheet, -T7651 Plate)
Solution and Precipitation Heat Treated

(Composition similar to UNS R87075)

RATIONALE

AMS4316A corrects an error in Tables 3A and 3B.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of Alclad sheet and plate.

1.2 Application

This product has been used typically for applications requiring a high level of mechanical properties and good resistance to exfoliation corrosion, but usage is not limited to such applications.

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

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/AMS4316A

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2355 Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

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

AS1990 Aluminum Alloy Tempers

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 594 Ultrasonic Inspection of Aluminum-Alloy Wrought 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

ASTM G 34 Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)

ASTM G 47 Determining Susceptibility to Stress-Corrosion Cracking of High Strength Aluminum Alloy Products

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, 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 AMS2355.

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
Titanium	--	0.20
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
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

The product shall be supplied in the following condition; heat treatments shall be performed in accordance with AMS2772.

3.2.1 Sheet

Solution and precipitation heat treated to the T76 temper (See AS1990).

3.2.2 Plate

Solution heat treated, stress-relieved by stretching to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and precipitation heat treated to the T7651 temper (See AS1990).

3.2.2.1 Plate shall receive no straightening operations after stretching.

3.3 Properties

Shall conform to the following requirements, determined in accordance with AMS2355 on the mill produced size (See 8.2):

3.3.1 Tensile Properties

Shall be as specified in Table 3. Tensile properties shall be determined in the long-transverse direction and, when specified, in the longitudinal direction.

TABLE 3A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Temper	Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 2% Offset ksi	Elongation in 2 inches or 4D %, min
T76	0.040 to 0.062, incl	67.0	56.0	8
	Over 0.062 to 0.187, incl	68.0	57.0	8
	Over 0.187 to 0.249, incl	70.0	59.0	8
T7651	Over 0.249 to 0.499, incl	69.0	58.0	8
	Over 0.499 to 1.000, incl	71.0	60.0	6

TABLE 3B - MINIMUM TENSILE PROPERTIES, SI UNITS

Temper	Nominal Thickness Inch	Tensile Strength MPa	Yield Strength at 2% Offset MPa	Elongation in 2 inches or 4D %
T76	1.02 to 1.57, incl	462	386	8
	Over 1.57 to 4.75, incl	469	393	8
	Over 4.75 to 6.32, incl	483	407	8
T7651	Over 6.32 to 12.67, incl	476	400	8
	Over 12.67 to 25.40, incl	490	414	6

3.3.2 Electrical Conductivity

3.3.2.1 If the conductivity is 38% IACS or higher, and the tensile properties meet the minimum limits specified herein, the material is acceptable.

3.3.2.2 If the conductivity is at least 36% IACS but less than 38% IACS, the material may be tested as specified in 3.3.3 and 3.3.4 and accepted if it passes these tests. As alternatives, the product may be given an additional precipitation heat treatment, or entirely reheat treated, and retested.

3.3.2.3 If the conductivity is lower than 36.0% IACS (22.0 MS/m), the product is not acceptable and may be given an additional precipitation heat treatment, or entirely reheat treated, and retested.

3.3.3 Exfoliation Resistance

Plate shall not exhibit exfoliation corrosion at the T/10 plane greater than that illustrated by Photo B, Figure 2 of ASTM G 34.

3.3.4 Stress-Corrosion Test

Specimens, cut from plate 0.750 inch (19.05 mm) and over in nominal thickness, shall show no evidence of stress-corrosion cracking when tested in accordance with ASTM G 47 and stressed in the short-transverse direction to 25.0 ksi (172 MPa).

3.3.5 Cladding Thickness

After rolling, the average cladding thickness on each side shall be as shown in Table 4.

TABLE 4 - CLADDING THICKNESS

Total Thickness of Composite Product Inch (Millimeters)	Average Cladding Thickness Each Side % Total Thickness, Minimum	Average Cladding Thickness Each Side % Total Thickness, Nominal
Up to 0.062 (1.57) incl	3.2	4
Over 0.062 (1.57) to 0.187 (4.750) incl	2	2.5
Over 0.187	1.2	1.5 (3.3.5.1)

3.3.5.1 For plate 0.500 inch and over, the average cladding thickness per side shall have a maximum value of 3% of the plate thickness.

3.4 Quality

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, 0.500 inch (12.70 mm) to 1.000 inch (25.40 mm) in nominal thickness weighing less than 2000 pounds (907 kg), shall be ultrasonically inspected in accordance with ASTM B 594 and shall meet ultrasonic Class B.

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 product shall supply all samples for vendor's tests and shall be responsible for the performance of 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), electrical conductivity (3.3.2), quality (3.4), and tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests

4.2.2.1 Exfoliation resistance (3.3.3) and stress-corrosion resistance (3.3.4) are periodic tests and shall be performed at a frequency of at least one sample per month for each size range of plate produced during that month unless frequency of testing is specified by purchaser.

4.2.2.2 Cladding thickness (3.3.5) is a periodic test 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 AMS2355 and the following: