# AEROSPACE MATERIAL SPECIFICATION

| AMS4460 | REV. A |
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Superseding AMS4460

Aluminum Alloy, Clad Two Sides Sheet
0.6Mg - 0.35Si - 0.28Cu (No. 24 Brazing Sheet)
As Fabricated
(Composition similar to UNS A86951)

RATIONALE

AMS4460A revises Properties (3.3.1.1.1), Reports (4.4.1) and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet, clad on two sides.

1.1.1 This specification covers product from 0.010 to 0.249 inches (0.25 to 6.32 mm) inclusive, in thickness (See 8.5).

1.2 Application

This sheet has been used typically for brazed assemblies that are subjected to heat treatment after joining, but usage is not limited to such applications.

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.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

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

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

AS1990 Aluminum Alloy Tempers





**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/AMS4460A**

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 B660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B666/B666M Identification Marking of Aluminum and Magnesium Products

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, Tel: 212-642-4900, www.ansi.org.

ANSI H35.2 Dimensional Tolerance for Aluminum Mill Products

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

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1 and Table 2, determined in accordance with AMS2355.

***Table 1 - Composition, core (6951)***

| Element | Min | Max |
|---|---|---|
| Silicon | 0.20 | 0.50 |
| Iron | -- | 0.8 |
| Copper | 0.15 | 0.40 |
| Manganese | -- | 0.10 |
| Magnesium | 0.40 | 0.8 |
| Zinc | -- | 0.20 |
| Other Elements, each | -- | 0.05 |
| Other Elements, total | -- | 0.15 |
| Aluminum | Remainder | |

***Table 2 - Composition, cladding (4045)***

| Element | Min | Max |
|---|---|---|
| Silicon | 9.0 | 11.0 |
| Iron | -- | 0.8 |
| Copper | -- | 0.30 |
| Manganese | -- | 0.05 |
| Magnesium | -- | 0.05 |
| Zinc | -- | 0.10 |
| Titanium | -- | 0.20 |
| Other Elements, each | -- | 0.05 |
| Other Elements, total | -- | 0.15 |
| Aluminum | Remainder | |



3.2 Condition

As fabricated (F) (See AS1990).

3.3 Properties

The sheet shall conform to the following applicable requirements, determined in accordance with AMS2355 on the mill product:

3.3.1 After Solution and Precipitation Heat Treatment

Sheet shall have the following properties after solution and precipitation heat treatment to the -T62 temper in accordance with AMS2772 for 6951 alloy.

3.3.1.1 Tensile Properties

Shall be as shown in Table 3.

3.3.1.1.1 Mechanical property requirements for product outside the range covered by 1.1.1 shall be agreed upon between purchaser and producer.

***Table 3A - Minimum tensile properties, inch/pound units (see 8.2)***

| Nominal Thickness Inch | Tensile Strength ksi | Yield Strength at 2% Offset ksi | Elongation in 2 inches or 4D % |
|---|---|---|---|
| 0.010 to 0.020, incl | 35.0 | 30.0 | 6 |
| Over 0.020 to 0.249, incl | 35.0 | 30.0 | 8 |

***Table 3B - Minimum tensile properties, SI units (see 8.2)***

| Nominal Thickness Millimeters | Tensile Strength MPa | Yield Strength at 2% Offset MPa | Elongation in 50.8 mm or 4D % |
|---|---|---|---|
| 0.25 to 0.51, incl | 241 | 207 | 6 |
| Over 0.51 to 6.32, incl | 241 | 207 | 8 |

3.3.1.2 Bending

Sheet 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 4 times the nominal thickness of the sheet with axis of bend parallel to the direction of rolling.

***Table 4 - Bending parameters***

| Nominal Thickness Inch | Nominal Thickness Millimeters | Bend Factor |
|---|---|---|
| 0.010 to 0.036, incl | 0.25 to 0.91, incl | 3 |
| Over 0.036 to 0.064, incl | Over 0.91 to 1.63, incl | 4 |
| Over 0.064 to 0.128, incl | Over 1.63 to 3.25, incl | 5 |
| Over 0.128 to 0.249, incl | Over 3.25 to 6.32, incl | 6 |



3.4 Cladding

Shall be applied to both faces of the core.

3.4.1 Cladding Thickness

The average cladding thickness shall be as shown in Table 5.

***Table 5 - Average cladding thickness***

| Total Thickness of Composite Product Inch | Total Thickness of Composite Product Millimeters | Cladding Thickness Per Side, Percent of Total Thickness min, average | Cladding Thickness Per Side, Percent of Total Thickness Max, average |
|---|---|---|---|
| 0.010 to 0.090, incl | 0.25 to 2.29, incl | 8 | 12 |
| Over 0.090 | Over 2.29 | 4 | 6 |

3.5 Quality

Sheet, 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 sheet.

3.6 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 sheet 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 sheet conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties after solution and precipitation heat treatment (3.3.1.1), and tolerances (3.6) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests

Bending after solution and precipitation heat treatment (3.3.1.2) and cladding thickness (3.4.1) 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 AMS2355.

4.4 Reports

The vendor of clad sheet shall furnish with each shipment a report stating that the product conforms to the composition and showing the numerical results of tests to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number, AMS4460A, size, and quantity. The report shall also identify the producer and the size of the mill product.

4.4.1 When the product size is outside the range covered by 1.1.1, the report shall contain a statement to that effect.

4.5 Resampling and Retesting

Shall be in accordance with AMS2355.