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Superseding AMS4250

Aluminum Alloy, Plate  
8.1Zn - 2.3Mg - 1.0Cu - Zr (7449-T7651)  
Solution Heat Treated, Stress Relieved, and Overaged  
(Composition similar to UNS A97449)

**RATIONALE**

AMS4250A 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 plate.

**1.2 Application:**

This plate has been used typically for structural applications requiring a combination of high tensile strength and compressive properties and good exfoliation corrosion resistance, 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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or [www.sae.org](http://www.sae.org).

AMS 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings

AMS 2750 Pyrometry

AMS 2772 Heat Treatment of Aluminum Alloy Raw Parts

AS1990 Aluminum Alloy Tempers

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**SAE WEB ADDRESS:**

## 2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or [www.astm.org](http://www.astm.org).

|                   |                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------|
| ASTM B 557        | Tension Testing of Wrought and Cast Aluminum and Magnesium Alloy Parts                           |
| ASTM B 594        | Ultrasonic Inspection of Aluminum Alloy Products for Aerospace Applications                      |
| ASTM B 645        | Plain Strain Fracture Toughness Testing of Metallic Materials                                    |
| ASTM B 660        | Packing/Packaging of Aluminum Alloy and Magnesium Products                                       |
| ASTM B 666/B 666M | Identification Marking of Aluminum and Magnesium Products                                        |
| ASTM E 9          | Compressive Testing of Metallic Materials at Room Temperature                                    |
| ASTM E 399        | Plain-Strain Fracture Toughness of Metallic Materials                                            |
| 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 2XXX and 7XXX Aluminum Alloy Products |

## 2.3 ANSI Publications:

Available from ANSI, 25 West 43<sup>rd</sup> Street, New York, NY 10036 or [www.ansi.org](http://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 Table 1, determined in accordance with AMS 2355.

Table 1 - Composition

| Element               | min       | max  |
|-----------------------|-----------|------|
| Silicon               | --        | 0.12 |
| Iron                  | --        | 0.15 |
| Copper                | 1.4       | 2.1  |
| Manganese             | --        | 0.20 |
| Magnesium             | 1.8       | 2.7  |
| Zinc                  | 7.5       | 8.7  |
| Titanium + Zirconium  | --        | 0.25 |
| Other Elements, each  | --        | 0.05 |
| Other Elements, total | --        | 0.15 |
| Aluminum              | remainder |      |

### 3.2 Condition:

Solution heat treated, stretched 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.

- 3.2.1 Heat Treatment: Plate shall be solution heat treated by heating to 870 to 890 °F (465 to 475 °C), holding at heat for a time commensurate with section thickness, and rapid cooling in a suitable quenching medium; overaging shall be performed at a temperature, for a time, and cooling as required to meet requirements of 3.4. Pyrometry shall be in accordance with AMS 2750.

### 3.3 Properties:

Plate shall conform to the following requirements, determined on the mill produced size in accordance with AMS 2355 and as specified herein.

- 3.3.1 Tensile Properties: Shall be as specified in Table 2, when tested in accordance with ASTM B 557.

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

| Nominal Thickness<br>Inches | Specimen<br>Orientation | Tensile<br>Strength<br>ksi | Yield Strength<br>at 2% Offset<br>ksi | Elongation<br>in 2 Inches<br>or 4D<br>% |
|-----------------------------|-------------------------|----------------------------|---------------------------------------|-----------------------------------------|
| 0.250 to 1.500, incl        | Longitudinal            | 84                         | 78                                    | 8                                       |
|                             | Long-Transverse         | 84                         | 77                                    | 8                                       |
| Over 1.500 to 2.500, incl   | Longitudinal            | 82                         | 76                                    | 7                                       |
|                             | Long-Transverse         | 82                         | 75                                    | 6                                       |
| Over 2.500 to 3.000, incl   | Short-Transverse        | 77                         | 67                                    | 3                                       |
|                             | Longitudinal            | 81                         | 75                                    | 7                                       |
|                             | Long-Transverse         | 81                         | 74                                    | 5                                       |
|                             | Short-Transverse        | 77                         | 67                                    | 1.5                                     |
| Over 3.000 to 3.500, incl   | Longitudinal            | 80                         | 75                                    | 7                                       |
|                             | Long-Transverse         | 81                         | 74                                    | 5                                       |
|                             | Short-Transverse        | 77                         | 67                                    | 1.5                                     |
| Over 3.500 to 4.000, incl   | Longitudinal            | 79                         | 74                                    | 6                                       |
|                             | Long-Transverse         | 80                         | 73                                    | 4                                       |
|                             | Short-Transverse        | 77                         | 67                                    | 1                                       |

TABLE 2B - Minimum Tensile Properties, SI Units

| Nominal Thickness<br>Millimeters | Specimen<br>Orientation | Tensile<br>Strength<br>MPa | Yield Strength<br>at 2% Offset<br>MPa | Elongation<br>in 50.8 mm<br>or 4D<br>% |
|----------------------------------|-------------------------|----------------------------|---------------------------------------|----------------------------------------|
| 6.35 to 38.10, incl              | Longitudinal            | 579                        | 538                                   | 8                                      |
|                                  | Long-Transverse         | 579                        | 531                                   | 8                                      |
| Over 38.10 to 63.50, incl        | Longitudinal            | 565                        | 524                                   | 7                                      |
|                                  | Long-Transverse         | 565                        | 517                                   | 6                                      |
| Over 63.50 to 76.2, incl         | Short-Transverse        | 531                        | 462                                   | 3                                      |
|                                  | Longitudinal            | 558                        | 517                                   | 7                                      |
|                                  | Long-Transverse         | 558                        | 510                                   | 5                                      |
| Over 76.2 to 88.9, incl          | Short-Transverse        | 531                        | 462                                   | 1.5                                    |
|                                  | Longitudinal            | 552                        | 517                                   | 7                                      |
|                                  | Long-Transverse         | 558                        | 510                                   | 5                                      |
| Over 88.9 to 100.00, incl        | Short-Transverse        | 531                        | 462                                   | 1.5                                    |
|                                  | Longitudinal            | 544                        | 517                                   | 6                                      |
|                                  | Long-Transverse         | 552                        | 503                                   | 4                                      |
|                                  | Short-Transverse        | 531                        | 462                                   | 1                                      |

3.3.2 Compressive Yield Strength: When specified, the compressive and yield strength, determined in accordance with ASTM E 9, shall be shown in Table 3.

TABLE 3 - Minimum Compressive Yield Strength, Inch/Pound and SI Units

| Nominal<br>Thickness<br>Inch | Nominal<br>Thickness<br>Millimeters | Specimen<br>Orientation | Compressive<br>Yield Strength<br>ksi | Compressive<br>Yield Strength<br>MPa |
|------------------------------|-------------------------------------|-------------------------|--------------------------------------|--------------------------------------|
| 0.250 to 1.500, incl         | 6.35 to 38.10, incl                 | Longitudinal            | 77                                   | 531                                  |
|                              |                                     | Long-Transverse         | 81                                   | 559                                  |
| Over 1.500 to 2.500, incl    | Over 38.10 to 63.50, incl           | Longitudinal            | 75                                   | 517                                  |
|                              |                                     | Long-Transverse         | 79                                   | 545                                  |
| Over 2.500 to 3.000, incl    | Over 63.50 to 76.20, incl           | Longitudinal            | 75                                   | 517                                  |
|                              |                                     | Long-Transverse         | 79                                   | 545                                  |
| Over 3.000 to 3.555, incl    | Over 76.20 to 88.90, incl           | Longitudinal            | 74                                   | 510                                  |
|                              |                                     | Long-Transverse         | 78                                   | 538                                  |
| Over 3.555 to 4.000, incl    | Over 88.90 to 102.00, incl          | Longitudinal            | 73                                   | 503                                  |
|                              |                                     | Long-Transverse         | 78                                   | 538                                  |

3.3.3 Corrosion Resistance:

3.3.3.1 Exfoliation-Corrosion Resistance: Specimens from plate shall show exfoliation corrosion at a T/10 plane not greater than EB when tested at the T/10 plane that illustrated by Photo B, Figure 2, of ASTM G 34.

### 3.3.3.2 Stress-Corrosion Cracking:

3.3.3.2.1 Specimens, cut from plate 0.750 inch (19.05 mm) and over in nominal thickness, shall show no evidence of stress-corrosion cracking when stressed in the short transverse direction to 25 ksi (172 Mpa).

3.3.3.2.2 Specimens, cut from plate 0.250 inch (6.35 mm) and up to .749 inch (19.02mm) in nominal thickness, shall show no evidence of stress-corrosion cracking when stressed in the long transverse direction to 58 ksi (400 Mpa).

3.3.4 Fracture Toughness: Plane-strain fracture toughness ( $K_{Ic}$ ) for the L-T and T-L specimen orientations and configurations conforming to ASTM E 399 shall be not lower than the values specified in Table 4 for plate 0.750 to 4.000 inches (19.05 to 100.2 mm) in nominal thickness.

TABLE 4 - Minimum Fracture Toughness Parameters

| Nominal Thickness<br>Inch | Nominal Thickness<br>Millimeters | Specimen Orientation | $K_{Ic}$<br>Ksi $\sqrt{\text{inch}}$ | $K_{Ic}$<br>MPa $\sqrt{\text{m}}$ |
|---------------------------|----------------------------------|----------------------|--------------------------------------|-----------------------------------|
| 0.750 to 2.500, incl      | 19.05 to 63.5, incl              | Longitudinal         | 22.0                                 | 24.2                              |
|                           |                                  | Long-Transverse      | 20.0                                 | 22.0                              |
| Over 2.500 to 3.000, incl | Over 63.5 to 76.0, incl          | Longitudinal         | 20.0                                 | 22.0                              |
|                           |                                  | Long-Transverse      | 19.0                                 | 21.0                              |
| Over 3.000 to 3.500, incl | Over 76.0 to 89.0, incl          | Longitudinal         | 19.0                                 | 21.0                              |
|                           |                                  | Long-Transverse      | 19.0                                 | 21.0                              |
| Over 3.500 to 4.000, incl | Over 89.0 to 102.0, incl         | Longitudinal         | 18.0                                 | 20.0                              |
|                           |                                  | Long-Transverse      | 18.0                                 | 20.0                              |

3.3.5 Electrical Conductivity: Should be not lower than 36.0% IACS (International Annealed Copper Standard) (20.9MS/m), except that the electrical conductivity shall be determined and reported but shall not be cause for rejection of the plate.

### 3.4 Quality:

Plate, 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 plate.

3.4.1 Each plate 0.500 inch (12.70 mm) and over in nominal thickness shall be ultrasonically inspected in accordance with ASTM B 594 and shall meet ultrasonic Class A requirements.

### 3.5 Tolerances:

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