Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

# AEROSPACE MATERIAL SPECIFICATION

AMS 4201

Issued 1-15-80
Revised

## ALUMINUM ALLOY PLATE
## 6.2Zn - 2.3Cu - 2.2Mg - 0.12Zr (7050-T7651)



1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of plate.

1.2 Application: Primarily for parts requiring a high level of mechanical properties and resistance to exfoliation corrosion.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2202 - Tolerances, Aluminum and Magnesium Alloy Sheet and Plate
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM G34 - Exfoliation Corrosion Susceptibility in 7XXX Series Copper-Containing Aluminum Alloys (EXCO Test)
ASTM G47 - Determining Susceptibility to Stress-Corrosion Cracking of High Strength 7XXX Aluminum Alloy Products

2.3 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
MIL-I-8950 - Inspection, Ultrasonic, Wrought Metals, Process for

2.3.2 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage





Printed in U.S.A.

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 2355:

| | min | max |
|---|---|---|
| Zinc | 5.7 | 6.7 |
| Copper | 2.0 | 2.6 |
| Magnesium | 1.9 | 2.6 |
| Zirconium | 0.08 | 0.15 |
| Iron | -- | 0.15 |
| Silicon | -- | 0.12 |
| Manganese | -- | 0.10 |
| Titanium | -- | 0.06 |
| Chromium | -- | 0.04 |
| Other Impurities, each | -- | 0.05 |
| Other Impurities, 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. Heat treatments shall be performed at the proper temperatures and for the proper times to produce plate meeting the requirements of 3.3, using equipment and procedural controls in accordance with MIL-H-6088.

3.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties: Plate shall conform to the following requirements, determined in accordance with AMS 2355 and as specified herein:

3.3.1 Tensile Properties: Shall be as follows for plate 0.250 - 2.500 in. (6.35 - 63.50 mm) in nominal thickness, determined in both the longitudinal and long-transverse directions:

| | |
|---|---|
| Tensile Strength, min | 76,000 psi (524 MPa) |
| Yield Strength at 0.2% Offset, min | 66,000 psi (455 MPa) |
| Elongation in 2 in. (50 mm) or 4D, min | |
| Longitudinal | 8% |
| Long-Transverse | 6% |

3.3.1.1 Tensile property requirements for plate over 2.500 in. (63.50 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 Conductivity: Shall be not lower than 39% IACS, (International Annealed Copper Standard).

3.3.2.1 If the conductivity is below 39% IACS, the plate is not acceptable.

3.3.2.2 Plate found to be unacceptable may be given additional precipitation heat treatment and if, upon completion of such treatment, it develops conductivity/property relationships conforming to 3.3.1 and 3.3.2, it shall be acceptable.

3.3.3 Exfoliation Resistance: Plate processed to meet the requirements of 3.3.1 and 3.3.2, tested in accordance with ASTM G34, shall exhibit exfoliation corrosion not greater than that pictured in Photo B, Fig. 2, of ASTM G34 at a T/10 plane.

3.3.4 Stress-Corrosion Resistance: Specimens from plate over 0.750 in. (19.05 mm) in nominal thickness processed to meet the requirements of 3.3.1 and 3.3.2 shall meet the requirements of ASTM G47 when stressed to 20,000 psi (138 MPa) in the short-transverse direction.

3.3.5 Ultrasonic Soundness: Unless otherwise specified, each plate shall be inspected in accordance with MIL-I-8950 and shall meet the following requirements:

3.3.5.1 Plates weighing 2000 lb (908 kg) or less shall meet the following requirements for ultrasonic class:

| Nominal Thickness | | Ultrasonic Class |
|---|---|---|
| Inches | (Millimetres) | |
| 0.500 to 1.500, excl | (12.70 to 38.10, excl) | B |
| 1.500 to 2.000, incl | (38.10 to 50.80, incl) | A |

3.3.5.2 The ultrasonic class for plates under 0.500 in. (12.70 mm) or over 2.000 in. (50.80 mm) in nominal thickness or weighing over 2000 lb (908 kg) shall be as agreed upon by purchaser and vendor.

3.4 Quality: Plate, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the plate.

3.5 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2202.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of plate shall supply all samples 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 perform such confirmatory testing as he deems necessary to ensure that the plate 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), conductivity (3.3.2), tolerances (3.5), and, when specified, ultrasonic soundness (3.3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for exfoliation resistance (3.3.3) and stress-corrosion resistance (3.3.4) 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 and the following; an inspection lot shall be all plate of the same alloy, temper, section, and size traceable to a heat treatment lot and submitted for vendor's inspection at one time.

4.3.1 Specimens for tensile testing shall be taken with the axis of specimens parallel to both the longitudinal and long-transverse grain flow directions.

4.3.2 Specimens for conductivity testing shall be taken from the same samples used for tensile testing.

4.4 Reports:

4.4.1 The vendor of plate shall furnish with each shipment three copies of a report stating that the plate conforms to the chemical composition specified, showing the results of tests on each inspection lot to determine conformance to the other acceptance test requirements, and stating that the plate conforms to the other technical requirements of this specification. This report shall include the purchase order number, inspection lot number, material specification number, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of plate, part number, and quantity. When plate for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of plate to determine conformance to the requirements of this specification, and shall include in the report a statement that the plate conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each plate shall be marked on one face, in the respective location indicated below, with the alloy number and temper, AMS 4201, inspection lot number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be clearly 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 plate or its performance.

5.1.1 Plate Under 6 In. (152 mm) Wide: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm). The inspection lot number may appear in the row marking or may appear at only one location on each piece.

5.1.2 Plate 0.375 In. (9.52 mm) and Under Thick, 6 - 60 In. (152 - 1524 mm), Incl, Wide, and 36 - 200 In. (914 - 5080 mm), Incl, Long: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm), the rows being spaced approximately 6 in. (152 mm) on centers across the width and staggered. Every third row shall show the manufacturer's identification and nominal thickness. The other rows shall show the alloy number and temper and AMS 4201. The inspection lot number may be included in the rows with the alloy, temper, and specification designation or may appear at only one location on each piece.

5.1.3 Plate Over 0.375 In. (9.52 mm) Thick, or Over 60 In. (1524 mm) Wide, or Over 200 In. (5080 mm) Long: Shall be marked as in 5.1.2 or, at vendor's discretion, shall be marked in one or two rows of characters recurring at intervals not greater than 3 ft (914 mm) and running around the periphery of the piece. If one row is used, it shall show all information of 5.1. If two rows are used, one row shall show the alloy number and temper and AMS 4201; the second row shall show the manufacturer's identification and nominal thickness. The inspection lot number may be included in the line with the manufacturer's identification and nominal thickness or may appear at only one location on each piece.

5.1.3.1 If peripheral marking is applied to the full piece as produced but partial plates are supplied, an arrow shall also be applied near one corner indicating the direction of rolling.

5.2 Packaging:

5.2.1 Plate shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the plate to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.