

# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard



AMS 4337

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Aluminum Alloy, Extruded Profiles (7055-T77511)  
8.0Zn - 2.3Cu - 2.0Mg - 0.16Zr  
Solution Heat Treated, Stress Relieved, and Overaged

UNS A97055

## 1. SCOPE:

### 1.1 Form:

This specification covers an aluminum alloy in the form of extruded profiles (shapes).

### 1.2 Application:

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

## 2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

### 2.1 SAE Publications:

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

- AMS 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
- MAM 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings, Metric (SI) Units
- AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials

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## 2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

|                  |  |
|------------------|--|
| ASTM B 594       | Ultrasonic Inspection of Aluminum-Alloy Wrought Products for Aerospace Applications      |
| ASTM G 34        | Exfoliation Corrosion Susceptibility in 2xxx and 7xxx Series Aluminum Alloys (EXCO Test) |
| ASTM B 666/B666M | Identification Marking of Aluminum Products  |

## 2.3 ANSI Publications:

Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

|             |  |
|-------------|--|
| 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 or MAM 2355.

TABLE 1 - Composition

| Element               | min       | max  |
|-----------------------|-----------|------|
| Silicon               | -         | 0.10 |
| Iron                  | -         | 0.15 |
| Copper                | 2.0       | 2.6  |
| Manganese             | -         | 0.05 |
| Magnesium             | 1.8       | 2.3  |
| Chromium              | -         | 0.04 |
| Zinc                  | 7.6       | 8.4  |
| Titanium              | -         | 0.06 |
| Zirconium             | 0.08      | 0.25 |
| Other Elements, each  | -         | 0.05 |
| Other Elements, total | -         | 0.15 |
| Aluminum              | remainder |      |

## 3.2 Condition:

Solution heat treated, stress-relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% or more than 3%, and overaged.

3.2.1 Product shall be supplied with an as-extruded surface finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within the dimensional tolerances.

3.2.2 Product may receive minor straightening, after stretching, of an amount necessary to meet the requirements of 3.6.

## 3.3 Heat Treatment:

Shall be in accordance with AMS 2772 and as follows:

3.3.1 Solution Heat Treatment: Heat to 870 to 890 °F (466 to 477 °C), hold at heat for a time commensurate with product thickness, rapidly cool in a suitable quenching medium.

3.3.2 Overaging Heat Treatment: Overaging shall be performed at a specific temperature and time, as required to meet the requirements of 3.4 (See 8.1).

## 3.4 Properties:

Product shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.4.1 Longitudinal and long transverse tensile properties of extrusions, with a maximum cross-sectional area of 20 square inches (129 cm<sup>2</sup>) and a maximum circle size of 10 inches (254 mm), shall be as specified in Table 2. Products exceeding the stated size limits shall have properties as agreed upon by purchaser and vendor.

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

| Nominal Thickness<br>Inch | Specimen<br>Orientation | Tensile<br>Strength<br>ksi | Yield<br>Strength<br>at 0.2% Offset<br>ksi | Elongation in<br>2 inches or 4D<br>% |
|---------------------------|-------------------------|----------------------------|--|--------------------------------------|
| 0.500 to 1.500, incl      | Longitudinal            | 94.0                       | 90.0                                       | 9                                    |
|                           | Long-Transverse         | 88.0                       | 84.0                                       | 5                                    |

TABLE 2B - Minimum Tensile Properties, SI Units

| Nominal Thickness<br>Millimeters | Specimen<br>Orientation | Tensile<br>Strength<br>MPa | Yield<br>Strength<br>at 0.2% Offset<br>MPa | Elongation in<br>50.8 mm or 4D<br>% |
|----------------------------------|-------------------------|----------------------------|--|-------------------------------------|
| 12.7 to 38.1, incl               | Longitudinal            | 648                        | 621  | 9                                   |
|                                  | Long-Transverse         | 607                        | 579  | 5                                   |

- 3.4.2 Longitudinal compressive yield strength, when specified, shall be 92.0 Ksi (634 MPa), minimum.
- 3.4.3 Electrical Conductivity: Shall be not lower than 35.5% IACS (International Annealed Copper Standard) (20.6 MS/m), determined on the surface of the test coupon prior to turning.
- 3.4.4 Exfoliation Corrosion Resistance: Specimens cut from extrusions shall not exhibit exfoliation corrosion at a T/10 plane greater than that illustrated by Photograph EB, Figure 2, of ASTM G 34.
- 3.4.5 Residual Strength: The net area residual strength of the product (with sufficient size to accommodate the test specimen), when tested in ambient air, shall be not lower than 45 ksi (310 MPa).
- 3.4.5.1 Test Specimen: Shall be a 4-inch (102-mm) wide by 0.25 inch (6.4-mm) thick center cracked panel machined from the mid-thickness of the extruded leg. The length of the specimen shall be such that the central 11.0 inches (279 mm) are exposed between test machine grips. The center notch shall consist of a 0.1875 inch (4.8-mm) drilled central hole, a 0.75 inch (19.0-mm) long center cut 0.062 inch (1.6-mm) wide, and extension cuts on both ends of approximately 0.125 inch (3.2-mm) length and maximum width of 0.012 inch (0.3 mm). The total length of the fabricated center notch should be approximately 1.0 inch (25 mm).
- 3.4.5.2 Test Procedure: Measure panel width, thickness and total crack length to the nearest 0.001 inch (0.025 mm); fatigue precrack from a 1.0 to 1.1-inch (25 to 28-mm) long center notch to a total crack length of 1.25 inches (31.8 mm), using constant amplitude cycling ( $f=5$  Hz,  $R=+0.06$ ) and a maximum gross area stress of 15.3 ksi (106 MPa); ramp load to fracture at a rate of 1.0 gross ksi per second (6.9 MPa/s); determine the total non-precracked cross-sectional area after fracture; calculate the peak net area stress at fracture (Residual Strength) and record to  $\pm 0.1$  ksi (0.7 MPa).
- 3.5 Quality:
- Products, 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 extrusions.
- 3.5.1 When specified, each extruded profile (shape) shall be subjected to ultrasonic inspection in accordance with ASTM B 594 and shall meet the following requirements:

3.5.1.1 Each extruded profile (shape) weighing 600 pounds (272 kg) and under and having a maximum width-to-thickness ratio of 10:1 shall meet ultrasonic class B requirements, as described in ASTM B 594.

3.5.1.2 The ultrasonic class for all tubing and for other extruded profiles weighing over 600 pounds (272 kg), or in excess of 10:1 maximum width-to-thickness ratio shall be as agreed upon by purchaser and vendor.

3.5.2 Intergranular Attack (IGA): No IGA is permitted on sections up to 0.450 inch (11.43 mm) thick. IGA, if found during this inspection, shall be removed by suitable means (machining, sanding, chem-milling, etc.). (See 8.2).

3.5.2.1 IGA up to 0.006 inch (0.15 mm) is allowed on product over 0.450 inch (11.43 mm) in thickness.

3.6 Tolerances:

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

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the products 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 products conform to the specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.4.1), electrical conductivity (3.4.3), tolerances (3.6), and when specified, ultrasonic soundness (3.5.1) are acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests: Tests for exfoliation-corrosion resistance (3.4.4) and residual strength (3.4.5) 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 or MAM 2355.