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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4341D

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Superseding AMS 4341C

Submitted for recognition as an American National Standard

## Aluminum Alloy, Extrusions
## 6.2Zn - 2.3Cu - 2.2Mg - 0.12Zr (7050-T73511)
## Solution Heat Treated, Stress Relieved by Stretching, Straightened, and Overaged

UNS A97050



1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of extruded bars, rods, wire, profiles, and tubing.

1.2 Application:

These extrusions have been used typically for structural applications requiring a combination of high mechanical properties and good resistance to stress-corrosion cracking, 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



QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7154 FAX: (724) 776-0243
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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/B 666M | Identification Marking of Aluminum and Magnesium Products |

2.3 ANSI Publications:

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

| | |
|---|---|
| ANSI H 35.2 | Dimensional Tolerances for Aluminum Mill Products |
| ANSI H 35.2M | 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 |
|---|---|---|
| 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, stress relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, and overaged to the T73511 temper.

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

3.2.2 Extrusions 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 specified dimensional tolerances.

3.3 Heat Treatment:

Shall be performed as follows; heat treatment shall be in accordance with AMS 2772 and/or the following:

3.3.1 Solution Heat Treatment: Heat to 890 °F ± 10 (477 °C ± 6), hold at heat for a time commensurate with section thickness but not less than 15 minutes, and quench in water.

3.3.2 Overaging Heat Treatment: No specific heat treatment is specified but it is recommended that extrusions be overaged by heating to 250 °F ± 5 (121 °C ± 3), holding at heat for not less than 4 hours, further heating to 345 °F ± 5 (174 °C ± 3), holding at heat for not less than 8 hours, and cooling in air.

3.4 Properties:

Extrusions, 5.000 inches (127.00 mm) and under in nominal diameter or thickness (wall thickness of tubing) and 32 square inches (206 $cm^2$) and under in cross-sectional area, shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.4.1 Tensile Properties: Shall be as shown in Table 2 for specimens taken in the longitudinal direction:



TABLE 2 - Minimum Longitudinal Tensile Properties

| Property | Requirement |
|---|---|
| Tensile Strength | 70.0 ksi (483 MPa) |
| Yield Strength at 0.2% Offset | 60.0 ksi (414 MPa) |
| Elongation in 4D | 8% |
| 5D | 7% |

3.4.2 Corrosion Resistance: Resistance to stress-corrosion cracking and to exfoliation-corrosion shall be acceptable if the extrusions conform to the requirements of 3.4.1 and of 3.4.2.1.2 or 3.4.2.1.3.

3.4.2.1 Electrical Conductivity/Mechanical Property Relationship:

3.4.2.1.1 Electrical conductivity shall be not lower than 40.0% IACS (International Annealed Copper Standard) (23.2 MS/m), determined on the samples used for tensile testing.

3.4.2.1.2 If electrical conductivity is 41.0% IACS (23.8 MS/m) or higher and tensile properties meet the requirements of 3.4.1, the extrusions are acceptable.

3.4.2.1.3 If electrical conductivity is at least 40.0% IACS (23.2 MS/m) but not greater than 40.9% (23.7 MS/m) and longitudinal yield strength does not exceed 69.0 ksi (476 MPa), the extrusions are acceptable.

3.4.2.1.4 If electrical conductivity is less than 41.0% IACS (23.8 MS/m) and the longitudinal yield strength exceeds 69.0 ksi (476 MPa), the extrusions are not acceptable and may be given additional overaging heat treatment. If upon completion of such treatment, extrusions conform to 3.4.2.1.2 and/or 3.4.2.1.3, they are acceptable.

3.4.2.2 Exfoliation Corrosion Resistance: Specimens, cut from extrusions, shall exhibit exfoliation corrosion, at a T/10 plane, not greater than that illustrated by Photo B, Figure 2, of ASTM G 34-72.

3.4.2.3 Stress-Corrosion Resistance: Specimens, cut from extrusions 0.750 inch (19.05 mm) and over in nominal diameter or section thickness, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse (perpendicular to grain flow) direction at 45.0 ksi (310 MPa).

3.5 Quality:

Extrusions, 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 Each bar, rod, and profile shall be subjected to ultrasonic inspection in accordance with ASTM B 594 and shall meet the requirements shown in Table 3.



TABLE 3A - Ultrasonic Requirements

| Nominal Thickness Inches | Maximum Weight per Piece Pounds | Discontinuity Class |
|---|---|---|
| 0.500 to 1.500, excl | 600 | B |
| 1.500 to 5.000, incl | 600 | A |

TABLE 3B - Ultrasonic Requirements (SI)

| Nominal Thickness Millimeters | Maximum Weight per Piece Kilograms | Discontinuity Class |
|---|---|---|
| 12.70 to 38.10, excl | 272 | B |
| 38.10 to 127.00, incl | 272 | A |

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 extrusions 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 extrusions conform to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.4.1), corrosion resistance by conductivity/tensile property relationship (3.4.2.1), ultrasonic soundness (3.5.1), and tolerances (3.6) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests: Exfoliation-corrosion resistance (3.4.2.2) and stress-corrosion resistance (3.4.2.3) are periodic tests and shall be performed at a frequency selected by vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2355 or MAM 2355.

4.4 Reports:

The vendor of extrusions shall furnish with each shipment a report stating that the extrusions conform to the chemical composition, ultrasonic inspection, and tolerances and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number, AMS 4341D, size or section identification number, and quantity.