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

AEROSPACE MATERIAL SPECIFICATION

AMS 4084

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Revised

UNS A97475

ALUMINUM ALLOY SHEET
5.7Zn - 2.2Mg - 1.6Cu - 0.22Cr (7475-T61)

1. SCOPE:

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

1.2 Application: Primarily for structural applications requiring material with high static strength, moderate fatigue strength, and high fracture-toughness.

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-Base and Magnesium-Base 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 E338 - Sharp-Notch Tension Testing of High-Strength Sheet Materials

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

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

	min	max
Zinc	5.2	6.2
Magnesium	1.9	2.6
Copper	1.2	1.9
Chromium	0.18	0.25
Iron	--	0.12
Silicon	--	0.10
Manganese	--	0.06
Titanium	--	0.06
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

Printed in U.S.A.

3.2 Condition: Solution and precipitation heat treated.

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as follows, determined in accordance with AMS 2355:

3.3.1.1 Sheet 0.040 In. (1.02 mm) and Over in Nominal Thickness:

Tensile Strength, min	75,000 psi (517 MPa)
Yield Strength at 0.2% offset, min	64,000 psi (441 MPa)
Elongation in 2 in. (50.8 mm), min	9%

3.3.1.2 Sheet Under 0.040 In. (1.02 mm) in Nominal Thickness: As agreed upon by purchaser and vendor.

3.3.2 Notch Tensile/Tensile Yield Strength Ratio: The notch tensile strength/smooth tensile yield strength (NTS/TYS) ratio, determined in accordance with 3.3.2.1, shall be not lower than the following:

Nominal Thickness		
Inch	(Millimetres)	NTS/TYS Ratio
0.040 to 0.125, incl	(1.02 to 3.18, incl)	0.85
Over 0.125 to 0.249, incl	(Over 3.18 to 6.32, incl)	0.70

3.3.2.1 Notch tensile strength in the long-transverse direction shall be determined in accordance with ASTM E338 on specimens conforming to Fig. 1. The values shall be divided by the tensile yield strength to obtain the NTS/TYS ratio.

3.3.3 Critical-Stress-Intensity Factor: If sheet fails to meet the requirements of 3.3.2, the sheet will be considered acceptable if the critical-stress-intensity factor (K_c) is as follows, determined in accordance with 3.3.3.1 or as agreed upon by purchaser and vendor:

Nominal Thickness		K_c min	
Inch	(Millimetres)	$ksi\sqrt{in.}$	$(MPa\sqrt{m})$
0.040 to 0.125, incl	(1.02 to 3.18, incl)	75	(82.4)
Over 0.125 to 0.249, incl	(Over 3.18 to 6.32, incl)	60	(66.0)

3.3.3.1 Panels as in 4.3.1.2 shall be fixtured in a tensile test machine so that the jaw separation is 32 in. (813 mm) and the slot is centered between jaws. Panels shall be stressed in tension at a rate of approximately 50,000 psi (345 MPa) per min. on the net section and the crack length at instability determined by a plot of load versus specimen deformation. The latter shall be measured using a compliance gage reading over a gage length of at least 2/3 the panel width and a suitable compliance correlation. Check measurements should also be made by direct visual observation and ink staining techniques. Values of K_c shall be calculated by the following equation:

$$K_c = \frac{P\,(a)^{1/2}}{BW}\left[1.77 + 0.227\left(\frac{2a}{W}\right) - 0.510\left(\frac{2a}{W}\right)^2 + 2.7\left(\frac{2a}{W}\right)^3\right]$$

where, K_c = Critical stress intensity factor in plane stress, $ksi\sqrt{in.}$ $(MPa\sqrt{m})$
P = Load at fracture instability (maximum load), in thousands of pounds (MN)
2a = Total crack length at fracture instability, in. (m)
B = Thickness, in. (m)
W = Width, in. (m)

3.4 Quality: Sheet shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

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 sheet 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 sheet conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance or routine control tests, except that the critical-stress-intensity factor need not be determined if the notched tensile/tensile yield ratio requirements are met.

4.3 Sampling: Shall be in accordance with AMS 2355 and the following; an inspection lot shall be all product of the same alloy, temper, section, and size traceable to a heat treatment lot and subjected to vendor's inspection at one time.

4.3.1 Sampling for notch tensile/tensile yield strength ratio and for critical-stress-intensity factor shall be as agreed upon by purchaser and vendor.

4.3.1.1 Specimens for notch-tensile testing shall be taken from sheet in the long-transverse direction. Configuration of the specimen shall conform to Fig. 1.

4.3.1.2 Specimens for the critical-stress-intensity factor test shall be panels nominally 44 in. (1118 mm) long by 16 in. (406 mm) wide by the thickness of the sheet. The panel shall have a slot 4 in. (102 mm) in length centered on the length and width of the specimen with the length of the slot parallel to the width of the specimen. The last 0.50 in. (12.7 mm) of each end of the slot shall be a sawed slot not over 0.010 in. (0.25 mm) wide.

4.4 Reports:

4.4.1 The vendor of sheet shall furnish with each shipment three copies of a report stating that the sheet conforms to the chemical composition and other technical requirements of this specification. This report shall include the purchase order 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 sheet, part number, and quantity. When sheet for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of sheet to determine conformance to the requirements of this specification, and shall include in the report a statement that the sheet 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 sheet shall be marked on one face, in the respective location indicated below, with the alloy number and temper, AMS 4084, 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 material or its performance.

5.1.1 Flat Sheet Under 6 In. (162 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 the piece.

5.1.2 Flat Sheet 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 that 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 4084. The inspection lot number may be included in the rows with the alloy, temper, and specification designations or may appear at only one location on each piece.

5.1.3 Flat Sheet 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 except that the inspection lot number may be omitted. If two rows are used, one row shall show the alloy number and temper and AMS 4084; 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 sheets are supplied, an arrow shall also be applied near one corner indicating the direction of rolling.

5.2 Protective Treatment: Flat sheet shall be protected, during shipment and storage, by interleaving with suitable paper sheets.

5.3 Packaging:

5.3.1 Sheet shall be prepared for shipment in accordance with commercial practice to ensure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.3.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-649, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.3.1 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Sheet not conforming to this specification or to authorized modifications will be subject to rejection.

8. NOTES:

8.1 The dimensions and properties in U.S. conventional units are primary; dimensions and properties in SI units are the equivalent of the U.S. conventional units and are not to be construed as standard for product produced to SI dimensions.