

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 4085C

Issued JUL 1976
Revised MAR 2006

Superseding AMS 4085B

Aluminum Alloy Sheet
5.7Zn - 2.2Mg - 1.6Cu - 0.22Cr (7475-T761)
Solution Heat Treated and Overaged

(Composition similar to UNS A97475)

RATIONALE

AMS 4085C is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

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

1.2 Application

This product has been used typically for structural applications requiring sheet with high strength and resistance to exfoliation-corrosion, moderate fatigue strength, and high fracture-toughness, 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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), 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 2772	Heat Treatment of Aluminum Alloy Raw Materials
AS1990	Aluminum Alloy Tempers

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2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 646	Fracture Toughness Testing of Aluminum Alloy
ASTM B 660	Packing of Aluminum and Magnesium Products
ASTM B 666/B 666M	Identification Marking of Aluminum and Magnesium Products
ASTM E 338	Sharp-Notch Tension Testing of High-Strength Sheet Materials
ASTM E 561	R-Curve Determination
ASTM G 34	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036, Tel: 212-642-4900, www.ansi.org.

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 following percentages by weight, determined in accordance with AMS 2355:

TABLE 1 - COMPOSITION

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

3.2 Condition

Solution heat treated and precipitation heat treated to the T761 temper (see AS1990) in accordance with AMS 2772.

3.3 Properties

Sheet 0.040 inch (1.02 mm) and over in nominal thickness shall conform to the following requirements, determined in accordance with AMS 2355, except fracture toughness (3.3.3) and/or alternate fracture toughness testing (3.3.4) shall performed as indicated in the appropriate paragraph. Tests are to be performed on the mill produced size.

3.3.1 Tensile Properties

Shall be as shown in Table 2.

TABLE 2A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches %
0.040 to 0.249, incl	Longitudinal	71.0	61.0	9
	Long-Transverse	71.0	60.0	9

TABLE 2B - MINIMUM TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm %
1.02 to 6.32, incl	Longitudinal	490	421	9
	Long-Transverse	490	414	9

3.3.2 Exfoliation Corrosion Resistance

3.3.2.1 Resistance to exfoliation corrosion shall be determined according to the following criteria:

3.3.2.1.1 If the electrical conductivity is 39.0% IACS (International annealed Copper Standard) (22.7 MS/m) or higher and the long-transverse yield strength does not exceed the specified minimum by 9,000 psi (62 MPa) or more, the sheet is acceptable.

3.3.2.1.2 If the conductivity is 39.0% IACS (22.7 MS/m) or higher and the long-transverse yield strength exceeds the specified minimum by 9,000 psi (62 MPa) or more, the sheet is unacceptable.

3.3.2.1.3 If the conductivity is less than 39.0% IACS (22.7 MS/m), the sheet is unacceptable.

3.3.2.2 Sheet found to be unacceptable may be given additional overaging heat treatment or be entirely reheat treated and if, after completion of either treatment, it meets the criteria of 3.3.1 and 3.3.2, it is acceptable.

3.3.2.3 Sheet under 0.100 inch (2.54 mm) in nominal thickness examined on the surface and sheet 0.100 inch (2.54 mm) and over in nominal thickness (T) examined at at T/10 plane, shall show exfoliation corrosion not greater than that pictured in Photo B, Figure 2 of ASTM G 34.

3.3.3 Fracture Toughness

Plane stress fracture toughness (K_{Ic}) shall be as shown in Table 3, determined in accordance with ASTM B 646 and ASTM E 561.

TABLE 3 - FRACTURE TOUGHNESS CRITERIA

Nominal Thickness Inch		Nominal Thickness Millimeters		K_{Ic} minimum T-L Direction ksi inch ^{1/2}	K_{Ic} minimum T-L Direction MPa m ^{1/2}
0.040 to 0.125, incl		1.02 to 3.18, incl		87	96
Over 0.125 to 0.249, incl		Over 3.18 to 6.32, incl		80	88

3.3.4 Alternate Testing for Demonstration of Fracture Toughness

When specified, the producer shall guarantee that the sheet meets the fracture toughness requirements based on correlation of notch tensile strength/tensile yield strength (NTS/TYS) ratio, determined in accordance with 3.3.4.1 in lieu of fracture toughness testing (3.3.3). Sampling and testing requirements, and lot acceptance criteria shall be as agreed upon by purchaser and vendor.

3.3.4.1 Notch tensile strength in the long-transverse direction shall be determined in accordance with ASTM E 338. The values shall be divided by the long-transverse tensile yield strength to obtain the NTS/TYS ratio. Acceptance values for the NTS/TYS ratio shall be specified based on evidence of documented correlation between the NTS/TYS ratio and fracture toughness values (3.3.3) as demonstrated and maintained by the producer.

3.4 Quality

Sheet, 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 sheet.

3.5 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 sheet 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 sheet conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), exfoliation corrosion resistance (3.3.2), tensile properties (3.3.1), fracture toughness (3.3.3) or when specified, alternate testing for demonstration of fracture toughness (3.3.4), and dimensional tolerances (3.5) are acceptance tests and except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests

Exfoliation corrosion resistance determined in accordance with 3.3.2.3 is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser. When alternate testing for demonstration of fracture toughness is specified (3.3.4), fracture toughness determined in accordance with 3.3.3 is a periodic test and shall be performed at a frequency to maintain correlation as selected by the vendor unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS 2355 and the following:

4.3.1 Sampling for fracture toughness testing (3.3.3) shall be as acceptable to purchaser. When alternate fracture toughness testing (3.3.4) is specified, sampling and testing requirements for use of notch tensile strength/tensile yield strength (NTS/TYS) ratio (3.3.4.1) shall be as specified by the purchaser.

4.3.2 Specimens for conductivity testing shall be the tensile samples.

4.4 Reports

The vendor of sheet shall furnish with each shipment a report stating that the sheet conforms to the composition and tolerances, and showing numerical results of the other technical requirements of this specification. This report shall include the purchase order number, inspection lot number, AMS 4085C, size, and quantity. The report shall also identify the producer, the product form, and the mill produced size.