

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 7801A
Superseding AMS 7801

Issued 1-15-62
Revised 10-1-84

**MOLYBDENUM SHEET, STRIP, AND PLATE
Arc Cast, Stress Relieved**

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of 10-25-83. It is recommended that this specification not be specified for new designs.

This cover sheet should be attached to the "A" revision of the subject specification.

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AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.

TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

SPECIFICATION

AMS 7801A

Superseding AMS 7801

Issued 1-15-62

Revised 12-1-73

MOLYBDENUM SHEET, STRIP, AND PLATE Arc Cast, Stress Relieved

1. SCOPE:

- 1.1 Form: This specification covers premium-quality molybdenum in the form of sheet, strip, or plate.
- 1.2 Application: Primarily for parts requiring high modulus and uniform strength characteristics up to 1800° F (982° C). Because of its excessive oxidation rate, this material is not recommended for use in oxidizing atmospheres at 1000° F (538° C) and above unless protected by a suitable coating.

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., Two Pennsylvania Plaza, New York, New York 10001.

- 2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

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

ASTM E8 - Tension Testing of Metallic Materials

ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

ASTM E350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon
Electrical Steel, Ingot Iron, and Wrought Iron

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

- 2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight; carbon shall be determined in accordance with ASTM E350, molybdenum by difference, gaseous elements by vacuum fusion, and other metallic elements by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

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	min	max	Check Analysis Over max
Molybdenum (3.1.1)	99.90	--	--
Carbon	--	0.030	0.005
Iron	--	0.020	0.002
Silicon	--	0.010	0.002
Nickel	--	0.010	0.001
Oxygen (3.1.2)	--	0.0030 (30 ppm)	--
Nitrogen (3.1.2)	--	0.0010 (10 ppm)	0.0005 (5 ppm)

3.1.1 Determination not required for routine acceptance.

3.1.2 Pending establishment of approved methods of analysis, deviation from these limits alone shall not be cause for rejection.

3.2 Condition: Hot-cold rolled, leveled, and fully stress relieved, having a surface appearance as close as possible to a commercial corrosion-resistant steel No. 2D finish; standards for acceptance shall be as agreed upon by purchaser and vendor.

3.3 Properties: The product shall conform to the following requirements as applicable to the orientation of specimen axis with respect to direction of rolling:

3.3.1 As Received:

3.3.1.1 Tensile Properties: Specimens tested in accordance with ASTM E8 using strain rates of 0.002 - 0.005 in. per in. per min. (0.002 - 0.005 mm/mm/min.) through the 0.6% offset and 0.020 - 0.050 in. per in. per min. (0.020 - 0.050 mm/mm/min.) to fracture shall conform to the requirements of Table I.

TABLE I

Nominal Thickness Inches	Specimen Axis Orientation	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 0.1875, incl	Parallel	93,000	80,000	10
	Perpendicular	95,000	82,000	8
Over 0.1875 to 0.500, incl	Parallel	90,000	82,000	3
	Perpendicular	93,000	85,000	4
Over 0.500 to 1.500, incl	Parallel	85,000	77,000	2
	Perpendicular	90,000	82,000	3

TABLE I (SI)

Nominal Thickness Millimeters	Specimen Axis Orientation	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 4.762, incl	Parallel	641	552	10
	Perpendicular	655	565	8
Over 4.762 to 12.70, incl	Parallel	621	565	3
	Perpendicular	641	586	4
Over 12.70 to 38.10, incl	Parallel	586	531	2
	Perpendicular	621	565	3

3.3.1.2 Bending: Product 0.065 in. (1.65 mm) and under in nominal thickness shall withstand, without cracking, bending in accordance with ASTM E290 at room temperature through an angle of 105 deg (1.83 rad) around a diameter equal to 4 times the nominal thickness of the product with axes of bend both parallel and perpendicular to the direction of rolling, using a ram speed of 1 - 10 in. per min. (25 - 254 mm/min.). Bend requirements for product over 0.065 in. (1.65 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 After High Temperature Exposure: Product shall be capable of meeting the tensile property (3.3.1.1) and bending (3.3.1.2) requirements after being heated in a suitable protective atmosphere to 1700° F $\pm$ 25 (926.7° C $\pm$ 14), holding at heat for 30 min. $\pm$ 3, and cooling rapidly.

3.4 Quality: Material shall be carbon deoxidized and vacuum arc melted using consumable electrode practice. The product shall be uniform in quality and condition, clean, sound, smooth, 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 be as follows:

3.5.1 Thickness:

TABLE II

Nominal Thickness (T) Inches	Tolerance, Inch, Plus and Minus For Width Ranges Shown, Inches			
	Up to 18 incl	Over 18 to 24 incl	Over 24 to 30 incl	Over 30 to 48 incl
Up to 0.010, incl	0.001	--	--	--
Over 0.010 to 0.017, incl	0.002	--	--	--
Over 0.017 to 0.040, incl	0.002	0.0025	0.003	--
Over 0.040 to 0.050, incl	0.05T	0.0025	0.10T	0.10T
Over 0.050 to 0.100, incl	0.05T	0.05T	0.10T	0.10T
Over 0.100	0.10T	0.10T	0.10T	0.10T

TABLE II (SI)

Nominal Thickness (T) Millimeters	Tolerance, Millimeters, Plus and Minus For Width Ranges Shown, Millimeters			
	Up to 457 incl	Over 457 to 603 incl	Over 603 to 762 incl	Over 762 to 1219 incl
Up to 0.25, incl	0.03	--	--	--
Over 0.25 to 0.43, incl	0.05	--	--	--
Over 0.43 to 1.02, incl	0.05	0.064	0.08	--
Over 1.02 to 1.27, incl	0.05T	0.064	0.10T	0.10T
Over 1.27 to 2.54, incl	0.05T	0.05T	0.10T	0.10T
Over 2.54	0.10T	0.10T	0.10T	0.10T

3.5.2 Width:3.5.2.1 Sheared Flat Sheet and Plate:

	Tolerance Plus and Minus
All widths	1/16 in. (1.6 mm)

3.5.3 Length:3.5.3.1 Sheared Flat Sheet and Plate:

	Tolerance Plus and Minus
All lengths	3/32 in. (2.4 mm)

3.5.4 Camber:3.5.4.1 Sheared Flat Sheet:

	Tolerance Plus and Minus
Nominal Length	
Up to 96 in. (2.44 m)	3/32 in. (2.4 mm)

3.5.5 Flatness: The total deviation from flatness shall not exceed 5% on nominal thicknesses of 0.010 in. (0.25 mm) to 0.017 in. (0.43 mm), incl, and 4% on product over 0.017 in. (0.43 mm) in thickness, determined by the formula:

$$\frac{H}{L} \times 100 = \% \text{ Flatness Deviation}$$

Where, H = Maximum distance between a flat surface and the lower surface of the sheet

L = Minimum distance between the highest point on the sheet and the point of contact with a flat surface

3.5.5.1 If a gradual bow in the sheet can be eliminated by a slight pressure without the ends coiling or an "oil can" effect resulting, the sheet shall be acceptable.