

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 4544D
Superseding AMS 4544C

Issued 5-1-48
Revised 4-1-85

ALLOY SHEET, STRIP, AND PLATE, CORROSION RESISTANT
67Ni - 30Cu
Annealed

UNS N04400

1. SCOPE:

1.1 Form: This specification covers a corrosion-resistant nickel-copper alloy in the form of sheet, strip, and plate.

1.2 Application: Primarily for formed or moderately drawn parts, such as fuel and oil systems components, requiring corrosion resistance.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2262 - Tolerances, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate

MAM 2262 - Tolerances, Metric, Nickel, Nickel Alloy, and Cobalt Alloy Sheet, Strip, and Plate

AMS 2269 - Chemical Check Analysis Limits, Wrought Nickel Alloys and Cobalt Alloys

AMS 2350 - Standards and Test Methods

AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Steels and Alloys, Wrought Products Except Forgings and Forging Stock

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

ASTM E8 - Tension Testing of Metallic Materials
 ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
 ASTM E76 - Chemical Analysis of Nickel-Copper Alloys
 ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

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

- 2.3.1 Military Standards:

MIL-STD-163 - Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E76 or by spectrographic or other analytical methods approved by purchaser:

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	min	max
Nickel + Cobalt	63.00	70.00
Iron	--	2.50
Manganese	--	2.00
Cobalt (3.1.1)	--	1.00
Silicon	--	0.50
Carbon	--	0.30
Sulfur	--	0.024
Copper	remainder	

- 3.1.1 Determination not required for routine acceptance.

- 3.1.2 Check Analysis: Composition variations shall meet the requirements of AMS 2269.

- 3.2 Condition: The product shall be supplied in the following condition:

- 3.2.1 Sheet and Strip: Cold rolled, annealed, and, unless annealing is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish; standards for acceptance shall be as agreed upon by purchaser and vendor.

- 3.2.2 Plate: Hot rolled and annealed; when so ordered, plate shall be descaled.

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

3.3.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E8:

Tensile Strength	70,000 - 85,000 psi (485 - 585 MPa)
Elongation in 2 in. (50 mm) or 4D, min	35%

3.3.2 Bending: Product 0.250 in. (6.25 mm) and under in nominal thickness shall withstand, without cracking, bending in accordance with ASTM E290 through an angle of 180 deg around a diameter equal to the nominal thickness of the product with axis of bend parallel to the direction of rolling.

3.3.2.1 Bending requirements for product over 0.250 in. (6.25 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.3 Hardness: The product should have hardness as follows, or equivalent, determined in accordance with ASTM E18, but shall not be rejected on the basis of hardness if the tensile property requirements are met:

Nominal Thickness		Hardness
Inch	Millimetres	
Up to 0.250, incl	Up to 6.25, incl	73 HRB, max
Over 0.250	Over 6.25	69 - 80 HRB

3.4 Quality: The product, 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 product.

3.5 Tolerances: Shall conform to all applicable requirements of AMS 2262 or MAM 2262.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests 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 sample and to perform any confirmatory testing deemed necessary to ensure that the product 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 tests and shall be performed on each heat or lot, as applicable.

4.3 Sampling: Shall be in accordance with AMS 2371.

4.4 Reports:

- 4.4.1 The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition of each heat and for the tensile and bending properties of each lot. This report shall include the purchase order number, heat number, AMS 4544D, size, and quantity from each heat.
- 4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 4544D, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and shall include in the report either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2371.

5. PREPARATION FOR DELIVERY:

- 5.1 Identification: Each sheet, strip, and plate shall be marked on one face, in the respective location indicated below, with AMS 4544D, heat number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or its performance and shall be sufficiently stable to withstand normal handling.
- 5.1.1 Flat Strip 6 In. (150 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm).
- 5.1.2 Flat Sheet, Flat Strip Over 6 In. (150 mm) in Width, and Plate: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm), the rows being spaced not more than 6 in. (150 mm) apart and alternately staggered.
- 5.1.3 Coiled Sheet and Strip: Shall be marked near both the outside and inside ends of the coil; the markings shall be applied as in 5.1 or shall appear on a durable tag or label attached to the coil and marked with the information of 5.1. When the product is wound on cores, the tag or label may be attached to the core.