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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 5543A

Issued 6-30-60
Revised 1-1-86

Superseding AMS 5543

STEEL SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT 13.5Cr - 26Ni - 1.75Mo - 3.0Ti - 0.07B Vacuum Melted, Solution Heat Treated

UNS S66545

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of 5-10-84. 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.

This specification is under the jurisdiction of AMS Committee "F".

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

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AMS 5543A
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STEEL SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT
13.5Cr - 26Ni - 1.75Mo - 3.0Ti - 0.07B
Vacuum Melted, Solution Heat Treated

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant steel in the form of sheet, strip, and plate.

1.2 Application: Primarily for parts and assemblies requiring high strength up to 1350°F (730°C) and oxidation resistance up to 1500°F (815°C) and which may be welded during fabrication and subsequently precipitation heat treated.

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 2242 - Tolerances, Corrosion and Heat Resistant Steel and Iron Base Alloy Sheet, Strip, and Plate and Titanium and Titanium Alloy Sheet, Strip, and Plate
AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

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

ASTM A370 - Mechanical Testing of Steel Products
ASTM E112 - Estimating the Average Grain Size of Metals
ASTM E139 - Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials
ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

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

2.3.1 Federal Standards:

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

2.3.2 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 E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Carbon	--	0.08
Manganese	1.25	2.00
Silicon	0.10	0.80
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	12.00	15.00
Nickel	24.00	28.00
Molybdenum	1.25	2.25
Titanium	2.70	3.30
Boron	0.025	0.12
Aluminum	--	0.25
Copper	--	0.35

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

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

3.2.1 Sheet and Strip: Hot or cold rolled, solution heat treated, and descaled having a surface finish 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, solution heat treated, and descaled.

3.3 Solution Heat Treatment: The product shall be solution heat treated by heating in a suitable atmosphere to 1900°F ± 25 (1040°C ± 15), holding at heat for not less than 60 min., and cooling in an air blast or quenching in oil or water.

3.4 Properties: The product shall conform to the following requirements; tensile, hardness, and bend testing shall be performed in accordance with ASTM A370:

3.4.1 As Solution Heat Treated:

3.4.1.1 Tensile Properties: Shall be as follows:

Tensile Strength, max	115,000 psi (793 MPa)
Elongation in 2 in. (50 mm) or 4D, min	20%

3.4.1.2 Hardness: Shall not be higher than 94 HRB or equivalent.

3.4.1.3 Bending: Product 0.749 in. (19.02 mm) and under in nominal thickness shall withstand, without cracking, bending at room temperature through the angle indicated below around a diameter equal to the nominal thickness of the product with axis of bend parallel to the direction of rolling:

Nominal Thickness		Angle
Inch	(Millimetres)	Deg, Min
Up to 0.249, incl	(Up to 6.32, incl)	180
Over 0.249 to 0.749, incl	(Over 6.32 to 19.02, incl)	90

3.4.1.3.1 Ø Bending requirements for plate over 0.749 in. (19.02 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.2 After Precipitation Heat Treatment: The product shall have the following properties after being precipitation heat treated by heating in a suitable atmosphere to a temperature within the range 1325° - 1375°F (720° - 745°C), holding at heat for not less than 20 hr, cooling to 1200°F ± 15 (650°C ± 8), holding at heat for not less than 20 hr, and cooling in air:

3.4.2.1 Tensile Properties: Shall be as follows:

Tensile Strength, min	155,000 psi (1069 MPa)
Yield Strength at 0.2% Offset, min	120,000 psi (827 MPa)
Elongation in 2 in. (50 mm) or 4D, min	12%

3.4.2.2 Ø Hardness: Should be 33 - 41 HRC or equivalent but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.2.1 are met.

3.4.2.3 Grain Size: Shall be predominantly 3 or finer with occasional grains as large as 2 permissible, determined by comparison of a polished and etched specimen with the chart in ASTM E112.

3.4.2.4 Stress-Rupture Properties at 1300°F (704°C): A tensile test specimen, maintained at 1300°F ± 3 (704°C ± 2) while a load sufficient to produce an initial axial stress of 65,000 psi (448 MPa) is applied continuously, shall not rupture in less than 23 hours. The test shall be continued to rupture without change of load. Elongation after rupture, measured at room temperature, shall be not less than 5% in 2 in. (50 mm) or 4D if the specimen ruptures in 48 hr or less and not less than 3% in 2 in. (50 mm) or 4D if the specimen ruptures in more than 48 hours. Tests shall be conducted in accordance with ASTM E139.

3.4.2.4.1 Ø The test of 3.4.2.4 may be conducted using a load higher than required to produce an initial axial stress of 65,000 psi (448 MPa) but the load shall not be changed while test is in progress. Time to rupture and elongation requirements shall be as specified in 3.4.2.4.

3.4.2.4.2 When permitted by purchaser, the test of 3.4.2.4 may be conducted using incremental loading. In such case, the load required to produce an initial axial stress of 65,000 psi (448 MPa) shall be used to rupture or for 48 hr, whichever occurs first. After the 48 hr and at intervals of 8 - 16 hr, preferably 8 - 10 hr, thereafter, the stress shall be increased in increments of 5000 psi (34.5 MPa). Time to rupture and elongation requirements shall be as specified in 3.4.2.4.

3.5 Quality:

3.5.1 Ø Alloy shall be produced by multiple melting using consumable electrode practice in the remelt cycle or shall be induction melted under vacuum. If consumable electrode remelting is not performed in vacuum, electrodes which have been produced by vacuum induction melting shall be used for remelting.