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

AEROSPACE MATERIAL SPECIFICATION

AMS 5549D
Superseding AMS 5549C
Issued 11-1-59
Revised 4-1-81

UNS S35500

STEEL PLATE, CORROSION AND MODERATE HEAT RESISTANT
15.5Cr - 4.5Ni - 2.9Mo - 0.10N
Solution Heat Treated

1. SCOPE:

1.1 Form: This specification covers a hardenable corrosion and moderate heat resistant steel in the form of plate.

1.2 Application: Primarily for parts requiring oxidation resistance and high strength up to 800°F (425°C) and where such parts may require welding during fabrication. In the solution heat treated condition, this product has better formability but lower machinability than AMS 5594.

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, Iron Alloy, 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 Steels and Alloys, Wrought Products Except Forgings and Forging Stock

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 E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 U.S. 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

Printed in U.S.A.

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	0.10	0.15
Manganese	0.50	1.25
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	15.00	16.00
Nickel	4.00	5.00
Molybdenum	2.50	3.25
Nitrogen	0.07	0.13

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

3.2 Condition: Hot rolled, solution heat treated, and descaled.

3.3 Solution Heat Treatment: The product shall be solution heat treated by heating to 1900°F ± 25 (1040°C ± 15), holding at heat for 1 - 3 hr, and quenching in water or otherwise cooling as rapidly as possible to room temperature.

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

3.4.1 As Solution Heat Treated:

3.4.1.1 Bending: Plate 0.750 in. (19.05 mm) and under in nominal thickness shall withstand, without cracking, free bending through the angle shown below around a diameter equal to 3 times the nominal thickness of the plate with axis of bend parallel to the direction of rolling:

Nominal Thickness		Angle
Inches	(Millimetres)	deg, min
Over 0.187 to 0.249, incl	(Over 4.75 to 6.32, incl)	130
Over 0.249 to 0.750, incl	(Over 6.32 to 19.05, incl)	90

3.4.1.2 Bending requirements for plate over 0.750 in. (19.05 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.2 As Re-Solution Heat Treated, Sub-Zero Cooled, Austenite Conditioned, Sub-Zero Cooled, and Tempered: The product shall conform to the following requirements after being heat treated as follows: Re-solution heat treat by heating to 1900°F ± 25 (1040°C ± 25), holding at heat for 1 - 3 hr, and quenching in water; cool to -100°F (-75°C) or colder, hold at this temperature for not less than 3 hr, and warm in air to room temperature; austenite condition by heating to 1750°F ± 10 (955°C ± 5), holding at heat for 10 - 60 min., and quenching in water; cool to -100°F (-75°C) or colder, hold at this temperature for not less than 3 hr, and warm in air to room temperature; temper by heating to 1000°F ± 25 (540°C ± 5), holding at heat for not less than 3 hr, and cooling in air:

3.4.2.1 Tensile Properties:

Tensile Strength, min	165,000 psi (1138 MPa)
Yield Strength at 0.2% Offset, min	140,000 psi (965 MPa)
Elongation in 2 in. (50 mm), min	12%

3.4.2.2 Hardness: Should be 37 - 44 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.

3.5 Quality:

3.5.1 Steel shall be multiple melted using consumable electrode practice in the remelt cycle, unless otherwise permitted by purchaser.

3.5.2 The product, as received by purchaser, shall be uniform in quality and condition, free of grain boundary carbides, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2242. Flatness tolerances shall be as agreed upon by purchaser and vendor.

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 such confirmatory testing as he deems 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 and the following; a heat shall be the consumable electrode remelted ingots from steel originally melted as a single furnace charge:

4.3.1 Specimens for tensile tests of widths 9 in. (225 mm) and over shall be taken with the axis of the specimen perpendicular to the direction of rolling; for widths less than 9 in. (225 mm), specimens shall be taken with the axis parallel to the direction of rolling.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and for tensile properties and hardness of each lot. This report shall include the purchase order number, heat number, AMS 5549D, size, and quantity from each heat.