

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5858A

Issued 10-15-79
Revised 1-1-87

Superseding AMS 5858

STEEL SHEET, STRIP, AND PLATE, CORROSION AND HEAT RESISTANT
15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V
Multiple Melted, 1800°F (980°C) Solution Heat Treated, Welding Grade
Precipitation Hardenable

UNS S66286

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, such as cases, requiring high strength up to 1300°F (705°C) and oxidation resistance up to 1500°F (815°C), particularly those which are welded and then heat treated to develop required properties.

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 2242 - Tolerances, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
- MAM 2242 - Tolerances, Metric, Corrosion and Heat Resistant Steel, Iron Alloy, Titanium, and Titanium Alloy Sheet, Strip, and Plate
- AMS 2248 - Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron 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

SAE Technical Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

AMS documents are protected under United States and international copyright laws. Reproduction of these documents by any means is strictly prohibited without the written consent of the publisher.

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 - Determining Average Grain Size

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 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 E353 or by spectrographic or other analytical methods approved by purchaser:

	min	max
Carbon	--	0.08
Manganese	--	0.35
Silicon	--	0.30
Phosphorus	--	0.020
Sulfur	--	0.010
Chromium	13.50	- 16.00
Nickel	24.00	- 27.00
Molybdenum	1.00	- 1.50
Titanium	1.90	- 2.35
Boron	0.0030	- 0.010
Vanadium	0.10	- 0.50
Aluminum	--	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: Hot rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish.

3.2.2 Strip: Cold rolled, solution heat treated, and, unless solution heat treatment is performed in an atmosphere yielding a bright finish, descaled having a surface appearance comparable to a commercial corrosion-resistant steel No. 1 strip finish.

3.2.3 Plate: Hot rolled, solution heat treated, and descaled.

3.3 Heat Treatment: The product shall be solution heat treated by heating to $\emptyset$ $1800^{\circ}\text{F} \pm 25$ ($980^{\circ}\text{C} \pm 15$), holding at heat for a time commensurate with section thickness, and cooling as required.

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 specified in Table I.

TABLE I

Nominal Thickness Inches	Tensile Strength psi, max	Elongation in 2 in. or 4D %, min
0.001 - 0.0015, incl	105,000	10
Over 0.0015 - 0.002, incl	105,000	12
Over 0.002 - 0.004, incl	105,000	20
Over 0.004	105,000	25

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, max	Elongation in 50 mm or 4D %, min
0.025 - 0.038, incl	725	10
Over 0.038 - 0.05, incl	725	12
Over 0.05 - 0.10, incl	725	20
Over 0.10	725	25

3.4.1.2 Hardness: Should be not higher than 90 HRB, or equivalent, for product 0.030 in. (0.75 mm) and over in nominal thickness but the product shall not be rejected on the basis of hardness if the tensile property requirements of 3.4.1.1 are met.

3.4.1.3 Bending: Product 0.749 in. (18.75 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 deg, min
Inch	Millimetres	
Up to 0.249, incl	Up to 6.25, incl	180
Over 0.249 to 0.749, incl	Over 6.25 to 18.75, incl	90

3.4.1.3.1 Bending requirements for plate over 0.749 in. (18.75 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4.2 After Precipitation Heat Treatment: Product shall have the following properties after being precipitation heat treated by heating to $1325^{\circ}\text{F} \pm 15$ ($720^{\circ}\text{C} \pm 8$), holding at heat for 16 hr ± 0.5 , and cooling in air:

3.4.2.1 Tensile Properties: Shall be as specified in Table II.

TABLE II

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
0.001 - 0.0015, incl	125,000	95,000	4
Over 0.0015 - 0.002, incl	130,000	95,000	8
Over 0.002 - 0.004, incl	135,000	95,000	10
Over 0.004	140,000	95,000	15

TABLE II (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm or 4D %, min
0.02 - 0.038, incl	860	655	4
Over 0.038 - 0.05, incl	895	655	8
Over 0.05 - 0.10, incl	930	655	10
Over 0.10	965	655	15

3.4.2.2 Hardness: Should be not lower than 24 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 five or finer with occasional grains as large as three permissible, determined by comparison of a polished and etched specimen with the chart in ASTM E112.

3.4.2.4 Stress-Rupture Properties at 1200°F (650°C): A tensile specimen, maintained at $1200^{\circ}\text{F} \pm 3$ ($650^{\circ}\text{C} \pm 2$) while a load sufficient to produce an initial axial stress not lower than specified below is applied continuously, shall not rupture in less than 23 hours. The test may be discontinued after 23 hours. Tests shall be conducted in accordance with ASTM E139.

Nominal Thickness		Stress, min	
Inches	Millimetres	psi	MPa
0.020 to 0.1875, excl	0.05 to 4.75, excl	62,500	465
0.1875 and over	4.75 and over	70,000	485

3.5 Quality:

- 3.5.1 Steel shall be produced by multiple melting using consumable electrode practice in the remelt cycle.
- 3.5.2 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.

- 3.6 Tolerances: Shall conform to all applicable requirements of AMS 2242 or MAM 2242.

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 tensile, hardness, bending, and stress-rupture properties of each lot. This report shall include the purchase order number, heat number, AMS 5858A, size, and quantity.
- 4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 5858A, 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.