



AEROSPACE MATERIAL SPECIFICATION

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

AMS 5504G
Superseding AMS 5504F

Issued 7-1-48
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UNS S41000

STEEL SHEET, STRIP, AND PLATE, CORROSION AND MODERATE HEAT RESISTANT
12.5Cr (SAE 51410)

1. SCOPE:

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

1.2 Application: Primarily for parts and assemblies requiring oxidation resistance up to 1000°F (540°C), but useful at the higher temperatures only when stresses are low.

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 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

SAE Technical Board rules provide that: "All technical reports, including standards approved and published, are advisory only. Their use by anyone engaged in industry or trade or their use by governmental agencies is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against infringement of patents."

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 | -- | 0.15 |
| Manganese | -- | 1.00 |
| Silicon | -- | 1.00 |
| Phosphorus | -- | 0.040 |
| Sulfur | -- | 0.030 |
| Chromium | 11.50 - 13.50 | |
| Nickel | -- | 0.75 |
| Molybdenum | -- | 0.50 |
| Aluminum | -- | 0.05 |
| Copper | -- | 0.50 |
| Tin | -- | 0.05 |
| Nitrogen | -- | 0.08 |

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:** Cold rolled, annealed, and descaled (No. 2D Finish).

3.2.2 **Strip:** Cold rolled, annealed, and descaled (No. 1 Strip Finish).

3.2.3 **Plate:** Hot rolled, annealed, and descaled.

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

3.3.1 **Tensile Properties:** Shall be as follows:

| | | |
|--|--------------------|---------------|
| Tensile Strength, max | 95,000 (655 MPa) | |
| Elongation in 2 in. (50 mm) or 4D, min | | |
| | Nominal Thickness | |
| | Inch | (Millimetres) |
| Up to 0.030, excl | (Up to 0.76, excl) | 12% |
| 0.030 and over | (0.76 and over) | 15% |

3.3.2 **Bending:** Product 0.500 in. (12.70 mm) and under in nominal thickness shall withstand, without cracking, bending through the angle indicated below around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling. Only one type of test will be required in routine inspection; in case of dispute, results of tests using the V-block procedure shall govern.

| Nominal Thickness | | Type of Bend | Angle deg, min | Bend Factor |
|---------------------------|----------------------------|--------------|----------------|-------------|
| Inch | (Millimetres) | | | |
| Up to 0.375, incl | (Up to 9.52, incl) | Free Bend | 180 | 1 |
| | | V-Block | 135 | 2 |
| Over 0.375 to 0.500, incl | (Over 9.52 to 12.70, incl) | Free Bend | 180 | 2 |
| | | V-Block | 135 | 4 |

- 3.3.2.1 Bending requirements for plate over 0.500 in. (12.70 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.
- 3.3.3 Grain Size: Sheet and strip shall have grain size predominantly 5 or finer with occasional grains as large as 3 permissible, determined by comparison of a polished and etched specimen with the chart in ASTM E112. Grain size requirements for plate shall be as agreed upon by purchaser and vendor.
- 3.3.4 Response to Heat Treatment: Product 0.500 in. (12.70 mm) and under in nominal thickness and specimens 0.500 in. ± 0.010 (12.70 mm ± 0.25) thick cut from heavier product shall have hardness of 35 - 45 HRC, or equivalent, after being heat treated by heating to 1750°F ± 10 (955°C ± 5), holding at heat for 15 - 30 min., and cooling in still air.
- 3.4 Quality: The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.
- 3.5 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2242.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples 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 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 lot.
- 4.3 Sampling: Shall be in accordance with AMS 2371 and the following:
- 4.3.1 Specimens for tensile tests of widths 9 in. (229 mm) and over shall be taken with the axis of the specimen perpendicular to the direction of rolling; for widths less than 9 in. (229 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 and bending properties, grain size, and response to heat treatment of each size from each heat. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat.
- 4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, 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 a statement that the material conforms, or shall include 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 5504G, heat number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be clearly 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. (152 mm) and Under in Width: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm).

5.1.2 Flat Sheet, Flat Strip Over 6 In. (152 mm) in Width, and Plate: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm), the rows being spaced not more than 6 in. (152 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 inside end of the coil is inaccessible, as when the product is wound on cores, the tag or label may be attached to the core.

5.2 Packaging:

5.2.1 The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.2.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-163, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (ϕ) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Form and size of product desired
Quantity of product desired
Applicable level of packaging (See 5.2.2).

8.3 Similar Specifications:

8.3.1 This specification exceeds the minimum requirements of Federal QQ-S-766c, Class 410, Amendment 5, dated 15 December 1966.

8.3.2 Federal QQ-S-766, Class 410, is listed for information only and shall not be construed as an acceptable alternate unless all requirements of this AMS are met.



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