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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

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AMS 6357G

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Superseding AMS 6357F

Submitted for recognition as an American National Standard

STEEL SHEET, STRIP, AND PLATE
0.50Cr - 0.55Ni - 0.25Mo (0.33 - 0.38C) (SAE 8735)

UNS G87350

1. SCOPE:

1.1 Form:

This specification covers an aircraft-quality, low-alloy steel in the form of sheet, strip, and plate.

1.2 Application:

This product has been used typically for components requiring welding and moderate tensile properties, but usage is not limited to such applications.

- 1.2.1 Product 0.125 inch (3.18 mm) and under in nominal thickness may be through-hardened to a minimum tensile strength of 180 ksi (1241 MPa); greater thickness will present proportionately lower strength.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

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2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

- AMS 2252 Tolerances, Low-Alloy Steel Sheet, Strip, and Plate
- MAM 2252 Tolerances, Metric, Low-Alloy Steel Sheet, Strip, and Plate
- AMS 2259 Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
- AMS 2301 Aircraft Quality Steel Cleanliness, Magnetic Particle Inspection Procedure
- AMS 2370 Quality Assurance Sampling and Testing, Carbon and Low Alloy-Steel Wrought Products and Forging Stock
- AMS 2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM A 370 Mechanical Testing of Steel Products
- ASTM E 112 Determining Average Grain Size
- ASTM E 350 Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
- ASTM E 384 Microhardness of Materials

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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

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3. TECHNICAL REQUIREMENTS:**3.1 Composition:**
(R)

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	0.33	0.38
Manganese	0.75	1.00
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.40	0.60
Nickel	0.40	0.70
Molybdenum	0.20	0.30
Copper	--	0.35

3.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2259.

3.2 Condition:

The product shall be supplied in the following condition; hardness shall be determined in accordance with ASTM A 370:

3.2.1 Sheet and Strip: Cold finished, bright or atmosphere annealed, and descaled if necessary; or hot rolled; annealed if necessary, and descaled; having hardness not higher than 98 HRB, or equivalent.

3.2.2 Plate: Hot rolled, annealed if necessary, and descaled, having hardness not higher than 24 HRC, or equivalent.

3.3 Properties:

The product shall conform to the following requirements; hardness and bend testing shall be performed in accordance with ASTM A 370:

3.3.1 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, determined in accordance with ASTM E 112.

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- 3.3.2 Response to Heat Treatment: Product 0.499 inch (12.67 mm) and under in nominal thickness shall have tensile strength not lower than 125 ksi (862 MPa) or hardness not lower than 26 HRC, or equivalent, after being heated to $1525\text{ }^{\circ}\text{F} \pm 10$ ($829\text{ }^{\circ}\text{C} \pm 6$), held at heat for 15 - 30 minutes, quenched in oil, tempered by heating to $1000\text{ }^{\circ}\text{F} \pm 10$ ($538\text{ }^{\circ}\text{C} \pm 6$), holding at heat for not less than 30 minutes, and cooling in air.
- 3.3.3 Decarburization:
- 3.3.3.1 Product Under 0.025 Inch (0.64 mm) in Nominal Thickness: The method of (R) test and the decarburization allowance shall be as agreed upon by purchaser and vendor.
- 3.3.3.2 Product 0.025 to 0.375 Inch (0.64 to 9.52 mm), Exclusive, in Nominal Thickness:
- 3.3.3.2.1 Specimens: Shall be the full thickness of the product except that specimens from plate 0.250 inch (6.35 mm) and over in nominal thickness shall be slices approximately 0.250 inch (6.35 mm) thick cut parallel to and preserving one original surface of the plate. Recommended specimen size is 1 x 4 inches (25 x 102 mm).
- 3.3.3.3 Procedure: Specimens shall be hardened by austenitizing and quenching; preferably, they shall not be tempered but, if tempered, the tempering temperature shall be not higher than $300\text{ }^{\circ}\text{F}$ ($149\text{ }^{\circ}\text{C}$). During heat treatment, specimens shall be protected by suitable atmosphere or medium or by suitable plating to prevent carburization or further decarburization.
- 3.3.3.3.1 Protective plating, if used, shall be removed from specimens of (R) product 0.025 to 0.250 inch (0.64 to 6.35 mm), exclusive, in nominal thickness and a portion of the specimen shall be ground to a depth of 0.050 inch (1.27 mm) or one-half thickness, whichever is less. Specimens from product 0.250 to 0.375 inch (6.35 to 9.52 mm), exclusive, in nominal thickness shall be ground to remove 0.010 inch (0.25 mm) of metal from the original surface of the plate and a portion of the specimen shall be further ground to a depth of at least one-third the original thickness of the specimen. At least three Rockwell hardness readings shall be taken on each prepared step and each group of readings averaged.
- 3.3.3.3.2 Alternatively, a metallographic cross-section may be prepared from the (R) heat treated specimen, but in case of dispute, the metallographic microhardness method conducted in accordance with ASTM E 384, shall govern.
- 3.3.3.4 Allowance:

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- 3.3.3.4.1 Product 0.025 to 0.250 Inch (0.64 to 6.35 mm), Exclusive, in Nominal Thickness: The product shall show no layer of complete decarburization, determined microscopically at a magnification not exceeding 100X. It shall also be free from partial decarburization to the extent that the difference in hardness between the original surface and the portion ground as in 3.3.3.3.1 or, when metallographic microhardness methods are used, the hardness 0.002 inch (0.05 mm) below the surface and at mid-thickness 0.05 inch (1.3 mm), whichever is greater, shall be not larger than 2 units on the Rockwell "A" scale.
- 3.3.3.4.2 Product 0.250 to 0.375 Inch (6.35 to 9.52 mm), Exclusive, in Nominal Thickness: Shall be free from decarburization to the extent that the difference in hardness between the two prepared steps or, when metallographic microhardness methods are used, the difference in hardness at 0.01 inch (0.25 mm) and 0.12 inch (3.0 mm) below the surface, shall be not greater than 3 units on the Rockwell "A" scale.
- 3.3.3.5 Product 0.375 Inch (9.52 mm) and Over in Nominal Thickness: The total decarburization, determined microscopically at a magnification not exceeding 100X on the as-supplied plate, shall be not greater than shown in Table 2.

TABLE 2A - Maximum Decarburization, Inch/Pound Units

Nominal Thickness Inches	Depth of Decarburization Inch
0.375 to 0.500, incl	0.015
Over 0.500 to 1.000, incl	0.025
Over 1.000 to 2.000, incl	0.035
Over 2.000	As agreed upon

TABLE 2B - Maximum Decarburization, SI Units

Nominal Thickness Millimeters	Depth of Decarburization Millimeter
9.52 to 12.70, incl	0.38
Over 12.70 to 25.40, incl	0.64
Over 25.40 to 50.80, incl	0.89
Over 50.80	As agreed upon

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- 3.3.4 Bending: Product 0.749 inch (19.02 mm) and under in nominal thickness shall withstand, without cracking, free bending through the angle shown in Table 3 around a diameter equal to the nominal thickness of the product with axis of bend parallel to the direction of rolling:

TABLE 3 - Bending Properties

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Angle Degrees Minimum
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

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

3.4 Quality:

- 3.4.1 Steel shall be aircraft-quality conforming to AMS 2301.

- 3.4.2 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.

3.5 Tolerances:

Shall conform to all applicable requirements of AMS 2252 or MAM 2252.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection:
(R)

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. 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 for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

- 4.3 Sampling and Testing:
(R)

Shall be in accordance with AMS 2370.