ADOPTION NOTICE

SAE-AMS 6437, "Steel, Sheet, Strip, and Plate 5.0Cr - 1.3Mo - 0.50V (0.38 - 0.43C)" was adopted on 22 May 1995 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: Air Force, ASC/ENSI, Building 125, 2335 Seventh Street, Suite 6, Wright-Patterson AFB OH45433-7809. DoD activities may obtain copies of this standard from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. The private sector and other Government agencies may purchase copies from the Society of Automotive Engineers Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 6437E

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Superseding AMS 6437D

Submitted for recognition as an American National Standard

STEEL, SHEET, STRIP, AND PLATE
5.0Cr - 1.3Mo - 0.50V (0.38 - 0.43C)

UNS T20811

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:

These products have been used typically for parts requiring relatively high levels of strength, fatigue resistance, toughness, ductility, and thermal stability for service up to 1000 °F (538 °C), and where such parts may require welding, during fabrication, but usage is not limited to such applications.

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.

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 the 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 DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

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	0.38	0.43
Manganese	0.20	0.40
Silicon	0.80	1.00
Phosphorus	--	0.020
Sulfur	--	0.020
Chromium	4.75	5.25
Molybdenum	1.20	1.40
Vanadium	0.40	0.60
Nickel	--	0.25
Copper	--	0.35

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

3.2 Condition:

The product shall be supplied in the following condition; tensile tests shall be conducted in accordance with ASTM A 370:

3.2.1 Sheet and Strip: Cold finished and bright annealed, or hot rolled, annealed if necessary, and descaled, having tensile strength not higher than 125 ksi (862 MPa).

3.2.2 Plate: Hot rolled, annealed if necessary, and descaled, having tensile strength not higher than 125 ksi (862 MPa), or equivalent hardness (See 8.2).

3.3 Properties:

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

3.3.1 Decarburization:

3.3.1.1 Product 0.025 to 0.375 Inch (0.64 to 9.52 mm), Exclusive, in Nominal Thickness: (R)

3.3.1.1.1 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).

3.3.1.1.2 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 °F (149 °C). During heat treatment, specimens shall be protected by suitable atmosphere or medium or by suitable plating to prevent carburization or further decarburization.

3.3.1.1.3 (R) Protective plating, if used, shall then be removed from specimens of 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.

3.3.1.1.4 (R) Alternatively, a metallographic cross-section may be prepared from the heat treated specimen. In case of dispute, the metallographic microhardness method conducted in accordance with ASTM E 384 shall govern.

3.3.1.1.5 Allowance:

3.3.1.1.5.1 (R) 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 3.3.1.1.3 shall be not greater than two units on the HRA scale. When metallographic microhardness methods are used as in 3.3.1.1.4, the hardness 0.002 inch (0.05 mm) below the surface and at mid-thickness or 0.05 inch (1.3 mm) below the surface, whichever is greater, shall be not greater than two units on the HRA scale.

3.3.1.1.5.2 (R) 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 shall be not greater than three units on the HRA scale. When metallographic microhardness methods as in 3.3.1.1.4 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 three units on the HRA scale.

3.3.1.2 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

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

3.3.2 (R) Bending: Product 0.437 inch (11.10 mm) and under in nominal thickness shall withstand, without cracking, free bending through the angle indicated in Table 3 around a diameter equal to three times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 3 - Bending Parameters

Nominal Thickness Inch	Nominal Thickness Millimeters	Angle Degree, min
Up to 0.249, incl	Up to 6.32, incl	180
Over 0.249 to 0.437, incl	Over 6.32 to 11.10, incl	90

3.3.3 Response to Heat Treatment: Tensile specimens shall meet the following requirements after being austenitized by heating to 1850 °F ± 25 (1010 °C ± 14), holding at heat for 15 to 25 minutes, and cooling in air to room temperature and tempered three times by heating to a temperature not lower than 1000 °F (538 °C), holding at heat for 2 to 3 hours, and cooling in air.

3.3.3.1 Tensile Properties: Shall be as shown in Table 4.

TABLE 4 - Minimum Tensile Properties

Property	Value
Tensile Strength	260 ksi (1793 MPa)
Yield Strength at 0.2% Offset	220 ksi (1517 MPa)
Elongation in 2 inches (50 mm) or 4D	5%

3.3.3.2 Hardness: Shall be 50 to 56 HRC, or equivalent (See 8.3).
(R)

3.3.3.3 Average Grain Size: Shall be ASTM No. 7 or finer, determined in accordance with
(R) ASTM E 112 (See 8.4).

3.4 Quality:

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.

3.4.1 Steel shall be aircraft quality conforming to AMS 2301.

3.5 Tolerances:

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