SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

AMS 6350K

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Superseding AMS 6350J

Steel Sheet, Strip, and Plate
0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)

(Composition similar to UNS G41300)

RATIONALE

AMS 6350K is a Five Year Review and update of this specification.

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 use where welding and moderate tensile properties are required, but usage is not limited to such applications. Sheet and strip are extensively used where minimum tensile strength of 180 ksi (1241 MPa) is required in sections up to 0.125 inch (3.18 mm) in nominal thickness and proportionately lower strength is required in heavier thicknesses.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), or www.sae.org.

AMS 2252	Tolerances, Low-Alloy Steel Sheet, Strip, and Plate
AMS 2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2301	Steel Cleanliness, Aircraft-Quality 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 International, 100 Barr Harbor Drive, P. O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, or www.astm.org.

ASTM A 370	Mechanical Testing of Steel Products
ASTM E 112	Determining Average Grain Size
ASTM E 290	Bend Testing of Material for Ductility
ASTM E 350	Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
ASTM E 384	Microindentation Hardness of Materials

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	0.28	0.33
Manganese	0.40	0.60
Silicon	0.15	0.35
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.80	1.10
Molybdenum	0.15	0.25
Nickel	--	0.25
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 rolled or hot rolled, annealed if necessary and descaled as necessary, having hardness not higher than 98 HRB, or equivalent (See 8.2).

3.2.2 Plate

Hot rolled, annealed if necessary, and descaled, having hardness not higher than 25 HRC, or equivalent (See 8.2).

3.3 Properties

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

3.3.1 Response to Heat Treatment

Product 0.249 inch (6.32 mm) and under in nominal thickness and thicker product reduced to 0.249 inch ± 0.010 (6.32 mm ± 0.25) in thickness shall have tensile strength not lower than 125 ksi (862 MPa) or hardness not lower than 26 HRC, or equivalent, (See 8.2), after being hardened by quenching in oil from 1600 °F ± 10 (871 °C ± 6) and tempered for not less than 30 minutes at not lower than 900 °F (482 °C).

3.3.2 Average Grain Size

Shall be ASTM No. 5 or finer, determined in accordance with ASTM E 112.

3.3.3 Decarburization

Depending upon thickness of the product, decarburization may be measured by a HR30N hardness step test method, or by the microhardness traverse method. Additionally, the metallographic method shall be used, in part (See 3.3.3.4.1), to inspect product 0.025 to 0.250 inch (0.64 to 6.35 mm) thick, and it may be used to inspect product with thickness 0.375 inch (9.52 mm) and over.

3.3.3.1 In the case of dispute, the microhardness method, conducted in accordance with ASTM E 384, shall govern. The allowance for decarburization shall be that which would have been applicable had the step method been used (See 3.3.3.4.1 or 3.3.3.5.1, as applicable.).

3.3.3.2 Specimens

Shall be full thickness of the product except that specimens from plate 0.250 inch (6.35 mm) and over in nominal thickness may be slices approximately 0.250 inch (6.35 mm) thick cut parallel to and preserving one original surface of the plate. Recommended minimum specimen size is 1 × 4 inches (25 × 102 mm). For product 0.025 to 0.250 inch (0.64 to 6.35 mm), a full cross section metallographic sample shall be prepared to inspect for presence of complete decarburization (ferrite).

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 °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.

3.3.3.4 Product 0.025 to 0.250 Inch (0.64 to 6.35 mm) Exclusive, in Nominal Thickness

Protective plating, if used to prevent any decarburization during hardening, shall be removed, and a portion of the specimen shall be ground with copious coolant to prevent thermal or mechanical effects to a depth of 0.050 inch (1.27 mm) or one-half thickness, whichever is less.

3.3.3.4.1 Allowance

The product shall show no layer of complete decarburization (ferrite) determined metallographically at a magnification not exceeding 100X. It shall also be free from any partial decarburization to the extent that the difference in hardness between the original surface and the surface (depth) generated by grinding as in 3.3.3.4 shall not be greater than two units on the HRA scale, or equivalent (See 8.2). Also, refer to 3.3.3.1.

3.3.3.5 Product 0.250 to 0.375 Inch (6.35 to 9.52 mm), Exclusive, in Nominal Thickness

Specimens shall be ground to remove 0.010 inch (0.25 mm) of metal to create a test reference surface, and a portion of the specimen shall be further ground to a depth of at least one-third the original thickness of the specimen.

3.3.3.5.1 Allowance

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, or equivalent (See 8.2). Also, refer to 3.3.3.1.

3.3.3.6 Product 0.375 inch (9.52 mm) and Over in Nominal Thickness

3.3.3.6.1 Allowance

The total depth of the decarburization, determined metallographically at a magnification not exceeding 100X, on the as-supplied plate, shall be not greater than shown in Table 2. Also, refer to 3.3.3.1. The depth of decarburization shall be that which is defined as the perpendicular distance from the surface to the depth under that surface below which there is not further increase in hardness.

TABLE 2A - MAXIMUM DECARBURIZATION, INCH/POUND UNITS

Nominal Wall Thickness Inches	Total 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	Total 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

3.3.4 Bending

Product 0.749 inch (19.02 mm) and under in nominal thickness shall be tested in accordance with ASTM E 290 using a sample prepared nominally 0.75 inch (19.0 mm) in width with its axis of bending parallel to the direction of rolling and shall withstand without cracking when bending at room temperature through the angle and bend radius shown in Table 3. In case of dispute, the results of tests using the guided bend test of ASTM E 290 shall govern.

TABLE 3 - BEND REQUIREMENTS

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Angle Degrees	Bend Radius t = nominal thickness
Up to 0.249, incl	Up to 6.32, incl	180	1/2t
Over 0.249 to 0.749, incl	Over 6.32 to 19.02, incl	90	1/2t

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.