



AEROSPACE MATERIAL SPECIFICATION	AMS6350™	REV. R
	Issued 1942-12 Reaffirmed 1994-04 Revised 2024-12	
Superseding AMS6350P		
Steel Sheet, Strip, and Plate 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) Aircraft Quality (Composition similar to UNS G41300)		

RATIONALE

AMS6350R is the result of a Five-Year Review and update of the specification. The revision adds material quality to the Title, updates composition reporting (see 3.1.2), adds pyrometry (see 3.3.1), revises decarburization test methods (see 3.3.3), clarifies bend testing (see 3.3.4), updates testing and reporting requirements consistent with AMS2301 (see 4.2.1, 4.4.1, and 4.4.3), removes details on acceptance tests for ingot cast and continuous cast product - deferring to AMS2301 for this detail (see 4.2), and updates the prohibition of exceptions requirements (see 4.4.2).

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.

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<https://www.sae.org/standards/content/AMS6350R/>

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2252	Tolerances, Low-Alloy Steel Sheet, Strip, and Plate
AMS2259	Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS2301	Steel Cleanliness, Aircraft Quality, Magnetic Particle Inspection Procedure
AMS2370	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock
AMS2750	Pyrometry
AMS2807	Identification, Carbon and Low-Alloy Steels, Corrosion- and Heat-Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing
AS7766	Terms Used in Aerospace Metals Specifications

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, www.astm.org.

ASTM A370	Mechanical Testing of Steel Products
ASTM A751	Chemical Analysis of Steel Products
ASTM E112	Determining Average Grain Size
ASTM E140	Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness
ASTM E290	Bend Testing of Material for Ductility
ASTM E1077	Estimating the Depth of Decarburization of Steel Specimens

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Composition shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM A751 or by other analytical methods acceptable to the 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 Aluminum, vanadium, and columbium (niobium) are optional grain refining elements and need not be determined or reported unless used to satisfy the average grain size requirements of 3.3.2.2.

3.1.2 The producer may test for any element not listed in Table 1 and include this analysis in the report of 4.4. Reporting of any element not listed in the composition table is not a basis for rejection unless limits of acceptability are specified by the purchaser.

3.1.3 Check Analysis

Composition variations shall meet the applicable requirements of AMS2259.

3.2 Condition

The product shall be supplied in the following condition; hardness shall be determined in accordance with ASTM A370:

3.2.1 Sheet and Strip

Sheet and strip shall be cold rolled or hot rolled, annealed, sub-critically annealed or normalized, and descaled if necessary, having hardness not higher than 98 HRB, or equivalent (see 8.2).

3.2.2 Plate

Plate shall be hot rolled, annealed, sub-critically annealed or normalized, and descaled if necessary, having hardness not higher than 25 HRC, or equivalent (see 8.2).

3.2.2.1 If allowed by the purchaser, cold rolled, annealed, sub-critically annealed or normalized, and descaled if necessary, 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 A370:

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 \pm 0.010 inch (6.32 mm \pm 0.25 mm) 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 \pm 10 °F (871 °C \pm 6 °C) and tempered for not less than 30 minutes at not lower than 900 °F (482 °C). Pyrometry shall be in accordance with AMS2750.

3.3.2 Average Grain Size

Average grain size shall be determined by either 3.3.2.1 or 3.3.2.2.

- 3.3.2.1 Average grain size shall be ASTM No. 5 or finer, determined in accordance with ASTM E112.
- 3.3.2.2 The product of the heat shall be considered to have an ASTM No. 5 or finer austenitic grain size if one or more of the following are determined by heat analysis (see 8.4):

A total aluminum content of 0.020 to 0.050%
 An acid soluble aluminum content of 0.015 to 0.050%
 A vanadium content of 0.02 to 0.08%
 A columbium (niobium) content of 0.02 to 0.05%

3.3.3 Decarburization

Decarburization shall be evaluated by one of the methods of 3.3.3.1 or 3.3.3.2.

3.3.3.1 Metallographic (Microscopic) Method

A cross section taken perpendicular to the surface shall be prepared in accordance with ASTM E1077 and examined metallographically at a magnification not to exceed 200X. The sample shall not show a layer of complete (ferrite) or partial decarburization exceeding the limits of Table 2.

3.3.3.2 Hardness Traverse (Microindentation) Method

The total depth of decarburization shall be determined by a traverse method using microindentation hardness testing in accordance with ASTM E1077. Samples shall be hardened in a protective atmosphere to prevent changes in surface carbon content. Samples may be tempered at the option of the producer. Measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization on the adjacent surface. Acceptance shall be as listed in Table 2.

Table 2A - Maximum total depth of decarburization, inch/pound units

Nominal Thickness	Total Depth of Decarburization
Inches	Inch
Up to 0.500, incl	0.015
Over 0.500 to 1.000, incl	0.025
Over 1.000	0.035

Table 2B - Maximum total depth of decarburization, SI units

Nominal Thickness	Total Depth of Decarburization
Millimeters	Millimeter
Up to 12.70, incl	0.38
Over 12.70 to 25.40, incl	0.64
Over 25.40	0.89

- 3.3.3.3 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the above limits by more than 0.005 inch (0.13 mm) and the width is 0.065 inch (1.65 mm) or less.
- 3.3.3.4 In the case of dispute, the total depth of decarburization determined using the microindentation hardness traverse method shall govern.

3.3.4 Bending

Product 0.749 inch (19.02 mm) and under in nominal thickness shall be transverse bend tested in accordance with ASTM E290. Testing shall be performed at room temperature. Bend requirements shall be in accordance with Table 4. When visually examined, the specimen shall exhibit no cracking. In case of dispute, the results of tests using the guided bend test of ASTM E290 shall govern.

Table 3 - Bend requirements

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

⁽¹⁾ Bend radius is defined as a bend factor multiplied by the nominal thickness (t).

3.4 Quality

The product, as received by the purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and imperfections detrimental to usage of the product.

3.4.1 Steel shall be aircraft-quality conforming to AMS2301.

3.5 Tolerances

Tolerances shall conform to all applicable requirements of AMS2252.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (see 3.1), hardness (see 3.2), response to heat treatment (see 3.3.1), average grain size (see 3.3.2), decarburization (see 3.3.3), bending (see 3.3.4), frequency-severity rating (see 3.4.1), and tolerances (see 3.5) are classified as acceptance tests and shall be performed on each heat or lot as applicable. If grain refining elements (see 3.3.2.2) are not present, the ASTM E112 grain size test (see 3.3.2.1) shall be conducted on each lot. If process qualification in accordance with AMS2301 has been met, the frequency-severity cleanliness rating shall be conducted on a periodic basis as defined in AMS2301.

4.2.2 Periodic Tests

If grain refining elements (see 3.3.2.2) are present, the ASTM E112 grain size test (see 3.3.2.1) shall be conducted on a periodic basis and shall be performed at a frequency selected by the producer (not to exceed 1 year), unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Sampling and testing shall be in accordance with AMS2370.