AEROSPACE MATERIAL SPECIFICATION

AMS6348	REV. D

Issued 1979-10
Reaffirmed 2000-09
Revised 2013-10

Superseding AMS6348C

Steel, Bars
0.95Cr - 0.20Mo (0.28 to 0.33C) (SAE 4130)
Normalized
(Composition similar to UNS G41300)

RATIONALE

AMS6348D results from 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 bars.

1.2 Application

These bars have been used typically for parts, 0.50 inch (12.7 mm) and under in section thickness or diamerter at time of heat treatment, requiring a through-hardening steel capable of developing hardness as high as 35 HRC when properly hardened and tempered and also parts of greater thickness but requiring proportionately lower hardness, but usage is not limited to such applications.

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), www.sae.org.

AMS2251 Tolerances, Low-Alloy Steel Bars

AMS2259 Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels

AMS2301 Steel Cleanliness,Aircraft Quality, Magnetic Particle Inspection Procedure

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS6348D

AMS2370 Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock

AMS2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys

AS1182 Standard Stock Removal Allowance, Aircraft-Quality and Premium Aircraft-Quality Steel Bars and Mechanical 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, www.astm.org.

ASTM A 255 Determining Hardenability of Steel

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 381 Macroetch Testing Steel Bars, Billets, Blooms, and Forgings

ASTM E 384 Knoop and Vickers 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 AMS2259.

3.2 Condition

Bars shall be supplied in the following condition:

3.2.1 Bars 0.500 Inch (12.70 mm) and Under in Nominal Diameter or Least Distance Between Parallel Sides

Normalized and cold finished.

3.2.2 Bars Over 0.500 Inch (12.70 mm) in Nominal Diameter or Least Distance Between Parallel Sides

Hot finished and normalized or normalized and cold finished, as ordered.

3.2.3 Bars shall not be cut from plate (Also see 4.4.2).

3.3 Properties

Bars shall conform to the following requirements; hardness testing shall be performed in accordance with ASTM A 370.

3.3.1 Macrostructure

Visual examination of transverse full cross-sections from bars and billets, etched in hot hydrochloric acid in accordance with ASTM E 381, shall show no pipe or cracks. Porosity, segregation, inclusions, and other imperfections shall be no worse than the macrographs of ASTM E 381 shown in Table 2.

TABLE 2 - MACROSTRUCTURE LIMITS

Cross-Sectional Area Square Inches	Cross-Sectional Area Square Centimeters	Macrographs
Up to 36, incl	Up to 232, incl	S2 - R1 - C2
Over 36 to 133, incl	Over 232 to 858, incl	S2 - R2 - C3
Over 133	Over 858	Note 1

Note 1 Limits for larger sizes shall be agreed upon by purchaser and vendor. The purchaser shall have written approval of the agreement from the cognizant engineering organization.

3.3.2 Average Grain Size

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

3.3.3 Hardenability

Shall be J5/16 inch (7.9 mm) = 34 HRC minimum and J8/16 inch (12.7 mm) = 27 HRC minimum, determined on the standard end-quench test specimen in accordance with ASTM A 255 except that the steel shall be normalized at 1700 °F ± 10 (927 °C ± 6) and the test specimen austenitized at 1600 °F ± 10 (871 °C ± 6).

3.3.4 Decarburization

3.3.4.1 Bars ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces.

3.3.4.2 Allowable decarburization of bars and billets ordered for redrawing or to specified microstructural requirements shall be agreed upon by purchaser and vendor.

3.3.4.3 Decarburization of bars to which 3.3.4.1 or 3.3.4.2 is not applicable shall be not greater than shown in Table 3.

TABLE 3A - MAXIMUM DEPTH OF DECARBURIZATION, INCH/POUND UNITS

Nominal Diameter or Distance Between Parallel Sides Inches					Total Depth of Decarburization Inch
	Up	to	0.375,	incl	0.010
Over	0.375	to	0.500,	incl	0.012
Over	0.500	to	0.625,	incl	0.014
Over	0.625	to	1.000,	incl	0.017
Over	1.000	to	1.500,	incl	0.020
Over	1.500	to	2.000,	incl	0.025
Over	2.000	to	2.500,	incl	0.030
Over	2.500	to	3.000,	incl	0.035
Over	3.000	to	4.000,	incl	0.045

TABLE 3B - MAXIMUM DEPTH OF DECARBURIZATION, SI UNITS

Nominal Diameter or Distance Between Parallel Sides Millimeters					Total Depth of Decarburization Millimeter
	Up	to	9.52,	incl	0.25
Over	9.52	to	12.70,	incl	0.30
Over	12.70	to	15.88,	incl	0.36
Over	15.88	to	25.40,	incl	0.43
Over	25.40	to	38.10,	incl	0.51
Over	38.10	to	50.80,	incl	0.64
Over	50.80	to	63.50,	incl	0.76
Over	63.50	to	76.20,	incl	0.89
Over	76.20	to	101.60,	incl	1.14

3.3.4.4 Decarburization shall be measured by the metallographic method or by a traverse method using microhardness testing in accordance with ASTM E 384. The microhardness method shall be conducted on a hardened but untempered specimen protected during heat treatment to prevent changes in surface carbon content. Depth of decarburization, when measured by the microhardness method, is defined as the perpendicular distance from the surface to the depth under that surface where there is no further increase in hardness. Such measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization on the adjacent surface. In case of dispute, the depth of decarburization determined using the microhardness traverse method shall govern.

3.3.4.4.1 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 inches (0.13 mm) and the width is 0.065 inches (1.65 mm) or less.

3.4 Quality

Bars, 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 bars.

3.4.1 Steel shall be aircraft quality conforming to AMS2301.

3.4.2 Bars ordered hot rolled or cold drawn or ground, turned, or polished shall, after removal of the standard stock removal allowance in accordance with AS1182, be free from seams, laps, tears, and cracks open to the machined, ground, turned, or polished surface.

3.5 Tolerances

Shall conform to all applicable requirements of AMS2251.