Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 6266D
Superseding AMS 6266C
Issued 3-1-49
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STEEL BARS, FORGINGS, AND TUBING
0.50Cr - 1.82Ni - 0.25Mo - 0.018B - 0.06V (0.08 - 0.13C) (43BV12)

1. SCOPE:

1.1 Form: This specification covers an aircraft-quality, low-alloy steel in the form of bars, forgings, mechanical tubing, and forging stock.

1.2 Application: Primarily for carburized parts requiring high minimum core hardness with narrow range. The core is machinable after hardening.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) and Aerospace Standards (AS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.

2.1.1 Aerospace Material Specifications:

AMS 2251 - Tolerances, Low-Alloy Steel Bars
AMS 2253 - Tolerances, Carbon and Alloy Steel Tubing
AMS 2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2301 - Aircraft-Quality Steel Cleanliness, Magnetic Particle Inspection Procedure
AMS 2350 - Standards and Test Methods
AMS 2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Wrought Products Except Forgings and Forging Stock
AMS 2372 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Forgings and Forging Stock
AMS 2375 - Approval and Control of Critical Forgings
AMS 2808 - Identification, Forgings

2.1.2 Aerospace Standards:

AS 1182 - Standard Machining Allowance, Aircraft-Quality and Premium-Quality Steel Products

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM A255 - End-Quench Test for Hardenability of Steel
ASTM A370 - Mechanical Testing of Steel Products
ASTM E112 - Estimating the Average Grain Size of Metals
ASTM E350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
ASTM E381 - Rating Macroetched Steel

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E350, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

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	min	max
Carbon	0.08	- 0.13
Manganese	0.75	- 1.00
Silicon	0.20	- 0.40
Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.40	- 0.60
Nickel	1.65	- 2.00
Molybdenum	0.20	- 0.30
Boron	0.0005	- 0.005
Vanadium	0.03	- 0.08
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 and tensile strength shall ø be determined in accordance with ASTM A370:

3.2.1 Bars:

3.2.1.1 Bars 0.500 In. (12.70 mm) and Under in Diameter or Distance Between Parallel Sides: Cold ø finished having tensile strength not higher than 125,000 psi (862 MPa) or equivalent hardness.

3.2.1.2 Bars Over 0.500 In. (12.70 mm) in Diameter or Distance Between Parallel Sides: Hot finished ø having hardness not higher than 229 HB or equivalent except that bars ordered cold finished may have hardness as high as 248 HB or equivalent.

3.2.2 Forgings: As ordered.

3.2.3 Mechanical Tubing: Cold finished having hardness not higher than 25 HRC or equivalent except that ø tubing ordered hot finished shall have hardness not higher than 99 HRB or equivalent.

3.2.4 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties: The product shall conform to the following requirements; hardness testing shall be per- ø formed in accordance with ASTM A370:

3.3.1 Hardenability: Shall be J41=1 max and J35=8 min, determined on the standard end-quench test specimen in accordance with ASTM A255 except that the steel shall be normalized at 1700° F ± 10 (926.7° C ± 5.6) and the test specimen austenitized at 1600° F ± 10 (871.1° C ± 5.6). The hardenability ø test is not required on a product which will not yield a suitable specimen but the steel from which the product is made shall conform to the hardenability specified.

3.3.2 Grain Size: Predominantly 5 or finer, with occasional grains as large as 3 permissible, ASTM E112, McQuaid-Ehn test.

3.3.3 Macrostructure: Visual examination of transverse sections from bars, billets, forging stock, and tube rounds or tubes, etched in accordance with ASTM E381 in hot hydrochloric acid (1:1) at 160° - 180° F (71.1° - 82.2° C) for sufficient time to develop a well-defined macrostructure, shall show no injurious imperfections such as pipe, cracks, porosity, segregation, and inclusions detrimental to fabrication or to performance of parts. Macrostructure shall be equal to or better than the following macrographs of ASTM E381:

Section Size		
Square Inches	(Square Centimetres)	Macrographs
Up to 36, incl	(Up to 232, incl)	S2 - R1 - C2
Over 36 to 100, incl	(Over 232 to 645, incl)	S2 - R2 - C3
Over 100	(Over 645)	As agreed upon

3.3.3.1 Macrostructure of Tubes: If tubes are produced directly from ingots or large blooms, transverse sections may be taken from tubes rather than tube rounds and macrostructure standards 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 shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

3.4.2.1 Bars and tubing ordered ground, turned, or polished shall be free from seams, laps, tears, and cracks open to the ground, turned, or polished surfaces.

3.4.2.2 Product ordered to surface conditions other than ground, turned, or polished shall, after removal of the standard machining allowance, be free from seams, laps, tears, cracks, and other defects exposed to the machined surfaces. Standard machining allowance shall be in accordance with AS 1182.

3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, bars and tubing will be acceptable in mill lengths of 6 - 20 ft (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of the following:

3.6.1 Bars: AMS 2251.

3.6.2 Mechanical Tubing: AMS 2253.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance or routine control tests.

4.3 Sampling: Shall be in accordance with the following:

Ø 4.3.1 Bars and Mechanical Tubing: AMS 2370.

Ø 4.3.2 Forgings and Forging Stock: AMS 2372.

4.3.3 Macrostructure: Specimens for macrostructure (3.3.3) testing shall represent the full cross-section of stock taken from the top and bottom of at least the first, middle, and last usable ingots of each heat. Samples shall be full cross-sectional specimens obtained from the finished billet or a suitable rerolled product.

4.4 Approval: When specified, approval and control of critical forgings shall be in accordance with Ø AMS 2375.

4.5 Reports:

4.5.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition, hardenability, grain size, macrostructure, and AMS 2301 frequency-severity rating of each heat in the shipment. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.5.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

Ø 4.6 Resampling and Retesting: Shall be in accordance with the following:

Ø 4.6.1 Bars and Mechanical Tubing: AMS 2370.

Ø 4.6.2 Forgings and Forging Stock: AMS 2372.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Bars and Tubing:

5.1.1.1 Each straight bar and tube 0.500 in. (12.70 mm) and over in OD or least width of flat surface shall be marked in a row of characters recurring at intervals not greater than 3 ft (914 mm) with AMS 6266D, heat number, and manufacturer's identification. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.