# AEROSPACE MATERIAL SPECIFICATION

| AMS6342™ | REV. K |
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| Revised | 1990-10 |
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Superseding AMS6342J

Steel Bars, Forgings, and Tubing
0.80Cr - 1.0Ni - 0.25Mo (0.38 - 0.43C) (SAE 9840)

G98400

RATIONALE

AMS6342K has been declared Stabilized as it is no longer being used by industry.

STABILIZED NOTICE

AMS6342K has been declared "STABILIZED" by AMS Committee E. This document will no longer be updated and may no longer represent standard industry practice. This document was stabilized because Committee E can find no users for this document. Previously this document was reaffirmed Noncurrent. The last technical update of this document occurred in October 1990. Users of this document should refer to the cognizant engineering organization for disposition of any issues with reports/certifications to this specification; including exceptions listed on the certification. NOTE: In many cases, the purchaser may represent a sub tier supplier and not the cognizant engineering organization.





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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 parts which require moderate hardenability.

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.

2.1.1 Aerospace Material Specifications:

AMS-2251 Tolerances, Low-Alloy Steel Bars
MAM-2251 Tolerances, Metric, Low-Alloy Steel Bars
AMS-2253 Tolerances, Carbon and Alloy Steel Tubing
MAM-2253 Tolerances, Metric, 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-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-2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat Resistant Steels and Alloys
AMS-2808 Identification, Forgings

2.1.2 Aerospace Standards:

AS1182 Standard Machining Allowance, Aircraft-Quality and Premium Aircraft-Quality Steel Bars and Mechanical Tubing

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM A 255 End-Quench Test for 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, Inspection, and Rating Steel Products, Comprising Bars, Billets, Blooms, and Forgings

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

2.3.1 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E 350, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

| | min | max |
|---|---|---|
| Carbon | 0.38 | 0.43 |
| Manganese | 0.70 | 0.90 |
| Silicon | 0.15 | 0.35 |
| Phosphorus | -- | 0.025 |
| Sulfur | -- | 0.025 |
| Chromium | 0.70 | 0.90 |
| Nickel | 0.85 | 1.15 |
| Molybdenum | 0.20 | 0.30 |
| 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 be determined in accordance with ASTM A 370:

3.2.1 Bars:

3.2.1.1 Bars 0.500 Inch (12.70 mm) and Under in Nominal Diameter or Distance Between Parallel Sides: Cold finished having tensile strength not higher than 125,000 psi (862 MPa) or hardness not higher than 27 HRC.

3.2.1.2 Bars Over 0.500 Inch (12.70 mm) in Nominal Diameter or Distance Between Parallel Sides: Hot finished and annealed 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 tubing ordered hot finished and annealed 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 performed in accordance with ASTM A 370:

3.3.1 Macrostructure: Visual examination of transverse sections as in 4.3.3 from bars, billets, tube rounds or tubes, and forging stock, etched in accordance with ASTM E 381 in hot hydrochloric acid, shall show no pipe or cracks. Except as specified in 3.3.1.1, porosity, segregation, inclusions, and other imperfections shall be no worse than the following macrographs of ASTM E 381:

| 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 |

3.3.1.1 If tubes are produced directly from ingots or large blooms, transverse sections may be taken from tubes rather than tube rounds. Macrostructure standards for such tubes shall be as agreed upon by purchaser and vendor.

3.3.2 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, determined in accordance with ASTM E 112.

3.3.3 Hardenability: Shall be J51=9 minimum and J45=14 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 1500 °F ± 10 (816 °C ± 6). The hardenability 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.

3.3.4 Decarburization:

3.3.4.1 Bars and tubing ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces. Decarburization on tubing ID shall not exceed the maximum depth specified in Table II.

3.3.4.2 Allowable decarburization of bars, billets, and tube rounds ordered for redrawing or forging or to specified microstructural requirements shall be as 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 I.



TABLE I

| Nominal Diameter or Distance Between Parallel Sides Inches | 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 I (SI)

| Nominal Diameter or Distance Between Parallel Sides Millimetres | Depth of Decarburization Millimetres |
|---|---|
| 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 |

3.3.4.3.1 Limits for depth of decarburization of bars over 4.000 inches (101.60 mm) in nominal diameter or distance between parallel sides shall be as agreed upon by purchaser and vendor.

3.3.4.4 Decarburization of tubing to which 3.3.4.1 or 3.3.4.2 is not applicable shall be not greater than shown in Table II.



TABLE II

| Nominal Wall Thickness Inches | Depth of Decarburization Inch | |
|---|---|---|
| | ID | OD |
| Up to 0.109, incl | 0.008 | 0.015 |
| Over 0.109 to 0.203, incl | 0.010 | 0.020 |
| Over 0.203 to 0.400, incl | 0.012 | 0.025 |
| Over 0.400 to 0.600, incl | 0.015 | 0.030 |
| Over 0.600 to 1.000, incl | 0.017 | 0.035 |
| Over 1.000 | 0.020 | 0.040 |

TABLE II (SI)

| Nominal Wall Thickness Millimetres | Depth of Decarburization Millimetres | |
|---|---|---|
| | ID | OD |
| Up to 2.77, incl | 0.20 | 0.38 |
| Over 2.77 to 5.16, incl | 0.25 | 0.51 |
| Over 5.16 to 10.16, incl | 0.30 | 0.64 |
| Over 10.16to 15.24, incl | 0.38 | 0.76 |
| Over 15.24to 25.40, incl | 0.43 | 0.89 |
| Over 25.40 | 0.51 | 1.02 |

3.3.4.5 Decarburization shall be measured by the microscopic method or by Rockwell Superficial 30-N scale or equivalent hardness testing method on hardened but untempered specimens protected during heat treatment to prevent changes in surface carbon content. Depth of decarburization, when measured by a hardness method, is defined as the perpendicular distance from the surface to the depth under that surface below which there is no further increase in hardness. Such measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization or lack of decarburization thereon.

3.3.4.5.1 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 inch (0.13 mm) and the width is 0.065 inch (1.65 mm) or less.

3.4 Quality:

3.4.1 Steel shall be aircraft quality conforming to AMS-2301.

3.4.2 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.

3.4.2.1 Bars and mechanical tubing ordered hot rolled or cold drawn, or ground, turned, or polished shall, after removal of the standard machining allowance in accordance with AS1182, be free from seams, laps, tears, and cracks open to the ground, turned, or polished surfaces.

3.4.3 Grain flow of die forgings, except in areas which contain flash-line end grain, shall follow the general contour of the forgings showing no evidence of re-entrant grain flow.

3.5 Sizes:

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

3.6 Tolerances:

Shall conform to all applicable requirements of the following:

3.6.1 Bars: AMS-2251 or MAM-2251.

3.6.2 Mechanical Tubing: AMS-2253 or MAM-2253.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling and Testing:

Shall be in accordance with the following:

4.3.1 Bars and Tubing: AMS-2370.

4.3.2 Forgings and Forging Stock: AMS-2372.

4.3.3 Samples for macrostructure rating (3.3.1) shall be full cross-sectional specimens obtained from the finished billet or suitable rerolled product representing the top and bottom of at least the first, middle, and last usable ingot of each heat.

4.4 Reports:

The vendor of bars, forgings, and mechanical tubing shall furnish with each shipment a report showing the results of tests for chemical composition, macrostructure, grain size, hardenability, and frequency-severity cleanliness rating of each heat. This report shall include the purchase order number, lot number, AMS6342K, size, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.