

AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AMS 6418B

Issued 6-15-50

Revised 11-1-54

STEEL

1.3Mn - 1.5Si - 0.3Cr - 1.8Ni - 0.4Mo (0.23-0.28C)

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. **FORM:** Bars, forgings, forging stock, and mechanical tubing.
3. **APPLICATION:** Primarily for parts requiring high tensile strength and good ductility with relatively high impact strength and hardness.
4. **COMPOSITION:**

Check Analysis Under Min or Over Max

| Ø | Carbon | 0.23 - 0.28 | 0.01 | 0.01 |
|---|------------|-------------|------|-------|
| | Manganese | 1.20 - 1.50 | 0.04 | 0.04 |
| | Silicon | 1.30 - 1.70 | 0.05 | 0.05 |
| | Phosphorus | 0.040 max | -- | 0.005 |
| | Sulfur | 0.040 max | -- | 0.005 |
| | Chromium | 0.20 - 0.40 | 0.03 | 0.03 |
| | Nickel | 1.65 - 2.00 | 0.05 | 0.05 |
| | Molybdenum | 0.35 - 0.45 | 0.03 | 0.03 |

- 4.1 If size is over 100 sq in. in cross sectional area, the chemical composition shall be negotiated between purchaser and vendor.

5. **CONDITION:**

- 5.1 **Bars:** In a machinable condition having hardness not higher than Brinell 241 or equivalent, except that, if ordered cold finished, hardness may be as high as Brinell 248 or equivalent.
- 5.2 **Tubing:** In a machinable condition, and, unless otherwise specified, cold finished.
- 5.3 **Forgings:** As ordered.
- 5.4 **Forging Stock:** As ordered by the forging manufacturer.

6. **TECHNICAL REQUIREMENTS:**

- 6.1 **Hardenability:** The hardenability shall be J45=24 min when determined by the standard end-quench test specimen in accordance with the SAE Method of Determining Hardenability published in the latest issue of the SAE Handbook, except that the steel shall be normalized at 1700 F + 10 and the test specimen austenitized at 1575 F + 10. The hardenability test is not required on a product that will not yield a suitable specimen but the steel from which the product is made shall conform to the hardenability specified in this paragraph.

Section 7C of the SAE Technical Board rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

6.2 Grain Size: Five or finer, ASTM E19, method a, modified by cooling from the carburizing temperature to 1300 F + 25, and holding for 1 hr before cooling to room temperature. A heat of steel predominantly five or finer with grains as large as three is permissible.

6.3 Impact Strength (Notch Sensitivity): The Izod impact value shall be not less than 20 ft-lb when tested at room temperature in accordance with ASTM E23 using a V-notched specimen. Specimens, before test, shall have hardness not lower than Rockwell C 45 after being quenched in oil from 1575 F + 10 and tempered at 525-550 F. Before heat treatment, specimens shall be to size or approximately to size, except for the notch. The impact test is not required for tubing from which standard impact specimens cannot be made.

6.4 Decarburization:

6.4.1 Bars or tubing ordered ground, turned, or polished shall be free from decarburization on such ground, turned, or polished surfaces. Inside decarburization of such tubing shall not exceed the maximum depth specified in 6.4.4.

6.4.2 Allowable decarburization of bars or tubing ordered for redrawing or forging, or to definite microstructural requirements, shall be as agreed upon by purchaser and vendor.

6.4.3 Decarburization of bars to which 6.4.1 or 6.4.2 is not applicable shall be not greater than the following:

| Nominal Diameter or Distance Between Parallel Sides Inches | Depth of Decarburization Inch |
|--|-------------------------------------|
| 0.375 and under | 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 | 0.040 |

6.4.4 Decarburization of tubing to which 6.4.1 or 6.4.2 is not applicable shall be not greater than the following:

| Nominal Wall Thickness Inches | Depth of Decarburization Inch | |
|----------------------------------|-------------------------------------|---------|
| | Inside | Outside |
| 0.109 and under | 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 |

6.4.5 Unless otherwise agreed upon by purchaser and vendor, decarburization shall be measured by the microscopic method, or by Rockwell Superficial 30-N scale hardness method, or equivalent hardness testing method, on hardened specimens. Depth of decarburization, when measured by a hardness method, is defined as the distance measured from the nearest original surface to the point at which no increase in hardness is found.

6.4.5.1 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the limits above by more than 0.005 in. and the width is 0.065 in. or less.

7. QUALITY: Steel shall be aircraft quality. The product shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external defects detrimental to fabrication or to performance of parts.

8. TOLERANCES: Unless otherwise specified, tolerances shall conform to the followings:

8.1 Bars: The latest issue of AMS 2251 as applicable. Diameter or thickness tolerances for cold finished bars and all hexagons shall conform to Table I, column headed "over 0.28 to 0.55 incl".

Ø 8.2 Tubing: The latest issue of AMS 2253 as applicable to Mechanical Type.

9. REPORTS:

9.1 Unless otherwise specified, 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, and impact value of each heat in the shipment. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat. If forgings are supplied, the part number and size of stock used to make the forgings shall also be included.

9.2 Unless otherwise specified, 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, 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.

10. IDENTIFICATION:

10.1 Bars and Tubing: Individual pieces or bundles shall have attached a metal tag stamped with the purchase order number, AMS 6418B, nominal size, and heat number, or shall be boxed and the box marked with the same information. In addition to the above identification, flats 2 in. and larger in both dimensions and other bars 2 in. and over in diameter or distance between parallel sides shall be stamped with the heat number within 2 in. of one end.