



# AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.  
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## AMS 6281C

Superseding AMS 6281B

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### STEEL TUBING, MECHANICAL 0.50Cr - 0.55Ni - 0.20Mo (0.28 - 0.33C) (SAE 8630)

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. **APPLICATION:** Primarily for parts with sections 0.50 in. or less in thickness at the time of heat treatment which require a through-hardening steel capable of developing hardness as high as Rockwell C 35 when properly hardened and tempered and also parts of greater thickness but requiring proportionately lower hardness.

3. **COMPOSITION:**

|            | min         | max |
|------------|-------------|-----|
| Ø Carbon   | 0.28 - 0.33 |     |
| Manganese  | 0.70 - 0.90 |     |
| Silicon    | 0.20 - 0.35 |     |
| Phosphorus | -- 0.025    |     |
| Sulfur     | -- 0.025    |     |
| Chromium   | 0.40 - 0.60 |     |
| Nickel     | 0.40 - 0.70 |     |
| Molybdenum | 0.15 - 0.25 |     |
| Copper     | -- 0.35     |     |

- 3.1 **Check Analysis:** Composition variations shall meet the requirements of the latest issue of AMS 2259, paragraph titled "Low Alloy Steels".
4. **CONDITION:** Unless otherwise ordered, tubing shall be supplied in a machinable condition and cold finished having hardness not higher than Rockwell C 25 or equivalent, except that tubing ordered hot finished shall be furnished in a machinable condition having hardness not higher than Rockwell B 99 or equivalent.
5. **TECHNICAL REQUIREMENTS:** When ASTM methods are specified for determining conformance to the following requirements, tests shall be conducted in accordance with the issue of the ASTM method listed in the latest issue of AMS 2350.
  - 5.1 **Hardenability:** Shall be J35=5 min and J28=8 min when determined by the standard end-quench test specimen in accordance with the Method of Determining Hardenability published in the latest issue of the SAE Handbook, except that the steel shall be normalized at  $1700\text{ F} \pm 10$  ( $926.7\text{ C} \pm 5.6$ ) and the test specimen austenitized at  $1525\text{ F} \pm 10$  ( $829.4\text{ C} \pm 5.6$ ). The hardenability test is not required on tubing which will not yield a suitable specimen but the steel from which the tubing is made shall conform to the hardenability specified.
  - 5.2 **Grain Size:** Predominantly 5 or finer with occasional grains as large as 3 permissible, ASTM E112, McQuaid-Ehn test.

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5.3 Decarburization:

- 5.3.1 Tubing ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces. Inside decarburization of such tubing shall not exceed the maximum depth specified in 5.3.3.
- 5.3.2 Allowable decarburization of pierced billets, of tubing for redrawing or forging, or of tubing ordered to specified microstructural requirements shall be as agreed upon by purchaser and vendor.
- 5.3.3 Decarburization of all tubing to which 5.3.1 or 5.3.2 is not applicable shall be not greater than the following.

| Nominal Wall Thickness<br>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 |

- 5.3.4 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 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 nondecarburized 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.

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

6. QUALITY: Steel shall be aircraft quality and shall conform to the latest issue of AMS 2301. Tubing 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.

7. TOLERANCES: Unless otherwise specified, tolerances shall conform to all applicable requirements of the latest issue of AMS 2253.

8. REPORTS:

- 8.1 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 AMS 2301 frequency-severity rating of each heat in the shipment. This report shall include the purchase order number, material specification number and its revision letter, heat number, size, and quantity from each heat.
- 8.2 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 and its revision letter, contractor or other direct supplier of tubing, part number, and quantity. When tubing for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of tubing to determine conformance to the requirements of this specification, and shall include in the report a statement that the tubing conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.