SAE Aerospace
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# AEROSPACE MATERIAL SPECIFICATION

SAE AMS 6371J

Issued 1942-12
Revised 2003-10
Reaffirmed 2008-04

Superseding AMS 6371H

## Steel, Mechanical Tubing
## 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)

(Composition similar to UNS G41300)



1. SCOPE:

1.1 Form:

This specification covers an aircraft-quality, low-alloy steel in the form of mechanical tubing.

1.2 Application:

This tubing has been used typically for parts, 0.375 inch (9.52 mm) and under in nominal thickness at time of heat treatment, requiring a through-hardening steel capable of developing hardness as high as 40 HRC when properly hardened and tempered and for 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 supplied 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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

| | |
|---|---|
| AMS 2253 | Tolerances, Carbon and Alloy Steel Tubing |
| AMS 2259 | Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels |
| AMS 2301 | Steel Cleanliness, Aircraft Quality, Magnetic Particle Inspection Procedure |
| AMS 2370 | Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock |



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

AMS 2806 Identification, Bars, Wire, Mechanical Tubing, and Extrusions, Carbon and Alloy Steels and Corrosion and Heat-Resistant Steels and Alloys

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

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM A 255 Determining Hardenability of Steel
ASTM A 370 Mechanical Testing of Steel Products
ASTM E 112 Determining the Average Grain Size
ASTM E 350 Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
ASTM E 384 Microindentation 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 AMS 2259.

3.2 Condition:

Cold finished unless otherwise ordered, having hardness not higher than 25 HRC, or equivalent (See 8.2). Tubing ordered hot finished and annealed or tempered shall have hardness not higher than 99 HRB, or equivalent (See 8.2). Hardness shall be determined in accordance with ASTM A 370.

3.3 Properties:

Tubing shall conform to the following requirements:

3.3.1 Grain Size: Shall be 5 or finer, determined in accordance with ASTM E 112.

3.3.2 Hardenability: Shall be J 5/16 inch (7.9 mm) = 35 HRC minimum and J 8/16 inch (13 mm) = 28 HRC minimum (See 8.3), 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).

3.3.3 Decarburization:

3.3.3.1 Tubing ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces.

3.3.3.2 Decarburization of tubing to which 3.3.3.1 is not applicable shall be not greater than shown in Table 2.



TABLE 2A - Maximum Decarburization, Inch/Pound Units

| Nominal Wall Thickness Inches | Total Depth of Decarburization Inch ID | Total Depth of Decarburization Inch 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 2B - Maximum Decarburization, SI Units

| Nominal Wall Thickness Millimeters | Total Depth of Decarburization Millimeter ID | Total Depth of Decarburization Millimeter 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 10.16 to 15.24, incl | 0.38 | 0.76 |
| Over 15.24 to 25.40, incl | 0.43 | 0.89 |
| Over 25.40 | 0.51 | 1.02 |

3.3.3.3 Decarburization shall be measured by the metallographic method, by the HR30N scale hardness testing method, or by a traverse method using microhardness testing in accordance with ASTM E 384. The hardness method(s) 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 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 on the adjacent surface. In case of dispute, the depth of decarburization determined using the microhardness traverse method shall govern.

3.3.3.3.1 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:

Tubing, 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 tubing.

3.4.1 Steel shall be aircraft quality conforming to AMS 2301.

3.4.2 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 surface.

3.5 Tolerances:

Shall conform to all applicable requirements of AMS 2253.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

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

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 AMS 2370.