

# AEROSPACE MATERIAL SPECIFICATION



AMS 6374B

Issued JUL 1985  
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Superseding AMS 6374A

Steel Tubing, Seam-Free, Round  
0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)  
95.0 ksi (655 MPa) Tensile Strength

UNS G41300

## 1. SCOPE:

### 1.1 Form:

This specification covers an aircraft-quality, low-alloy steel in the form of round, non-welded tubing free from OD surface seams.

### 1.2 Application:

This product has been used typically for use in airframe tubular parts requiring a minimum tensile strength of 95.0 ksi (655 MPa) as received, or up to 180.0 ksi (1241 MPa) after heat treatment, 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 form a part of this specification to the extent specified 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 canceled 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.

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 Cleanliness, Aircraft Quality Steel, Magnetic Particle Inspection Procedure  
MAM 2301 Cleanliness, Aircraft Quality Steel, Magnetic Particle Inspection Procedure, Metric (SI) Measurement

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## 2.1 (Continued):

AMS 2370 Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock

AMS 2807 Identification, Carbon and Low-Alloy Steels and Alloys, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate and Aircraft Tubing

## 2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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

## 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:

Normalized by air cooling from a temperature within the range 1600 to 1700 °F (871 to 927 °C), cold drawn, and stress relieved.

## 3.3 Fabrication:

Tubing shall be produced by piercing, intermediate reduction, and drawing. Normalizing, followed by grinding or turning, shall be applied prior to final drawing in order to preclude decarburization and seams in the final product. Intermediate stress relief treatments may be applied before, and a final stress relief treatment shall be applied after, final drawing. A light polish to improve surface appearance may be employed as a final operation.

## 3.4 Properties:

Tubing shall conform to the following requirements; tensile testing shall be performed in accordance with ASTM A 370:

## 3.4.1 Tensile Properties: Shall be as shown in Table 2.

TABLE 2 - Minimum Tensile Properties

Property	Value
Tensile Strength	95.0 ksi (655 MPa)
Yield Strength at 0.2 Offset	75.0 ksi (517 MPa)
Elongation in 2 inches (50.8 mm)	
Full Tube	12%
Strip	7%

## 3.4.2 Average Grain Size: Shall be ASTM No. 5 or finer, determined in accordance with ASTM E 112 (See 8.3).

## 3.4.3 Decarburization: Tubing OD surface shall be free from decarburization. Tubing ID surface shall be free from complete (ferritic) decarburization, and partial decarburization shall be not greater than one-tenth of the wall thickness or 0.004 inch (0.10 mm), whichever is greater, determined visually on etched specimens at 100X magnification.

## 3.5 Quality:

Tubing, as received by purchaser, shall be uniform in quality and condition, sound, clean, with a surface finish conforming to the best practice for high quality aircraft tubing. Tubing OD shall be substantially free from seams (See 3.5.1); OD and ID shall be completely free from heavy scale, heavy oxide, burrs, tears, grooves, cracks, laminations, slivers, pits, and other imperfections detrimental to usage of the tubing. Surface imperfections such as handling marks, straightening marks, light mandrel and die marks, shallow pits, and scale pattern are acceptable provided imperfections are removable within tolerances specified for wall thickness but removal of such imperfections is not required.

3.5.1 The term "seams" does not include nonmagnetic inclusions. "Substantially free from seams" means that the following are not acceptable:

3.5.1.1 Any piece of tubing found to contain a seam.

3.5.1.2 Any lot of tubing from which a representative sample (See 4.3.1) has been found to contain more than one seam over 1/4 inch (6.4 mm) in length.

3.5.2 Steel shall be aircraft quality conforming to AMS 2301 or MAM 2301.

3.6 Tolerances:

Shall conform to AMS 2253 or MAM 2253 except that the tolerance for 1 inch (25 mm) and under OD shall be  $\pm 0.003$  inch ( $\pm 0.08$  mm).

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:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.4.1), average grain size (3.4.2), and decarburization (3.4.3) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests: Frequency-severity cleanliness rating (3.5.2) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with AMS 2370 and the following:

4.3.1 A representative sample (See 3.5.1.2) shall consist of at least one 6-inch (152-mm) long specimen, selected at random, from each 100 feet (30 m) of tubing or fraction thereof.

4.3.1.1 For evaluation of nonmetallic inclusions (as supplement to the AMS 2301/MAM 2301 periodic test), the representative samples shall be machined and polished, or ground, to remove material from the OD surface equivalent to not less than 10% of the nominal wall thickness.