NOTICE OF
ADOPTION

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Title of Document: Steel Tubing, Seam-Free, Round
0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
95,000 psi (655 MPa) Tensile Strength

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The Engineering Society For Advancing Mobility Land Sea Air and Space®
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-6374 REV A

Issued 1985-07-01
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Submitted for recognition as an American National Standard

STEEL TUBING, SEAM-FREE, ROUND
0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
95,000 psi (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: Primarily for use in airframe tubular parts requiring a minimum tensile strength of 95,000 psi (655 MPa) as received, or up to 180,000 psi (1241 MPa) after heat treatment.

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-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

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

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

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	0.28	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° - 1700°F (871° - 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; hardness and tensile testing shall be performed in accordance with ASTM A 370:

3.4.1 Tensile Properties:

Tensile Strength, minimum	95,000 psi (655 MPa)
Yield Strength at 0.2% Offset, minimum	75,000 psi (517 MPa)
Elongation in 2 Inches (50.8 mm), minimum	
Full Tube	12%
Strip	7%

3.4.2 Grain Size: Shall be predominantly 5 or finer with occasional grains as large as 3 permissible, determined in accordance with ASTM E 112.

3.4.3 Decarburization: Tubing OD surface shall be free from decarburization. Tubing ID surface shall be free from complete 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, smooth, clean, with a surface finish conforming to the best practice for high quality aircraft tubing.

3.5.1 Steel from which tubing is made should be equivalent in cleanliness to that required to meet AMS-2301, (See 4.2.2).

3.5.2 Tubing OD shall be substantially free from seams (See 3.5.2.1); 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.

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

3.5.2.1.1 Any piece of tubing found to contain a seam.

3.5.2.1.2 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.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight tubing shall be supplied in mill lengths of 12 - 20 feet (3.7 - 6.1 m).

3.7 Tolerances: Shall conform to AMS-2253 or MAM-2253 except that the tolerance for 1 inch (25 mm) and under OD shall be ±0.003 inch (±0.08 mm).