

AEROSPACE
MATERIAL
SPECIFICATION

AMS 5077D
Superseding AMS 5077C

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STEEL TUBING, WELDED
(0.22 - 0.28C) (SAE 1025)

UNS G10250

1. SCOPE:

1.1 Form: This specification covers a low-carbon steel in the form of welded tubing.

1.2 Application: Primarily for parts requiring a moderate-strength tubing suitable for forming and for welding and brazing.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2253 - Tolerances, Carbon and Alloy Steel Tubing

AMS 2259 - Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels

AMS 2350 - Standards and Test Methods

AMS 2370 - Quality Assurance Sampling of Carbon and Low-Alloy Steels, Wrought Products Except Forgings and Forging Stock

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E8 - Tension Testing of Metallic Materials

ASTM E350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 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 E350, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Carbon	0.22	0.28
Manganese	0.30	0.60
Silicon	0.10	0.30
Phosphorus	--	0.040
Sulfur	--	0.050

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2259.

3.2 Condition: Normalized or stress relieved, having a uniform fine grain size.

3.2.1 Fabrication:

3.2.1.1 Tubing shall be produced by electrical-resistance, shielded-metal-arc, or gas welding the edges of formed sheet or strip.

3.2.1.2 Any surface finishing operation applied to remove objectionable pits and surface blemishes shall be performed prior to normalizing or stress relieving. A light polish to improve surface appearance may be employed after normalizing or stress relieving.

3.3 Properties: Tubing shall conform to the following requirements:

- 3.3.1 Tensile Properties: Shall be as follows, determined in accordance with
 Ø ASTM E8:

Tensile Strength, min	55,000 psi (380 MPa)
Yield Strength at 0.2% Offset, min	36,000 psi (250 MPa)
Elongation in 2 in. (50 mm), min	
Full Tube	22%
Strip Specimen	15%

- 3.3.1.1 For each 2,000 psi (15 MPa) in excess of 55,000 psi (380 MPa) tensile strength, a reduction in elongation of 1% to a minimum elongation of 10% for full tube specimens or to a minimum elongation of 8% for strip specimens is permissible.

- 3.3.2 Response to Heat Treatment: Tubing shall develop the tensile properties specified in 3.3.1 when normalized by heating to $1625^{\circ}\text{F} \pm 10$ ($885^{\circ}\text{C} \pm 5$) and cooling in still air.

- 3.3.3 Crushing Test: Specimens as in 4.3.1 shall withstand, without failure of the weld, crushing lengthwise under a gradually applied load until the cross-sectional dimension is increased in one zone by 20%, or until one complete fold is formed, or until the specimen is reduced in length to two-thirds of the original length.

- 3.4 Quality: Tubing, as received by purchaser, shall be uniform in quality and condition and shall have a finish conforming to the best practice for high-quality aircraft tubing. It shall be smooth and free from heavy scale or oxide, burrs, seams, tears, grooves, 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 will not be considered injurious if the imperfections are removable within the tolerances specified for wall thickness but removal of such imperfections is not required.

- 3.4.1 Ø Each length of tubing shall be subjected to a nondestructive test by the tube manufacturer for detection of injurious imperfections. Internal or external imperfections, determined by such nondestructive test, having a length greater than 1/16 in. (1.5 mm) and a total depth equivalent to, or greater than, one-half the nominal wall thickness of the tubing are not acceptable.

- 3.5 Sizes: Except when exact lengths or multiples of exact lengths are ordered, straight tubing will be acceptable in mill lengths of 6 - 20 ft (2 - 6 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

- 3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2253; flash tolerances shall conform to the following:

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3.6.1 The height of the ID welding flash shall not exceed 60% of the nominal wall thickness but, in no case, shall it be greater than 0.047 in. (1.20 mm).

3.6.2 Tubing 1-1/8 in. (28 mm) and over in nominal OD, when ordered flash removed, shall have no flash height exceeding 0.010 in. (0.25 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 performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each heat or lot as applicable.

4.3 Sampling: Shall be in accordance with AMS 2370 and the following:

4.3.1 At least one sample for crushing test (3.3.3) shall be selected from each 1,000 ft (300 m) or less from each lot of tubing in the shipment. Specimens shall be full cross-section of the tube, with the length equal to approximately 1-1/2 times the nominal OD; the ends of the specimen shall be perpendicular to the axis.

4.4 Reports:

4.4.1 The vendor of tubing shall furnish with each shipment three copies of a report showing the results of tests for chemical composition of each heat and for tensile properties of each lot and stating that the tubing conforms to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 5077D, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 5077D, 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 either a statement that the tubing conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2370.

5. PREPARATION FOR DELIVERY: