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AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 5077E

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Superseding AMS 5077D

STEEL TUBING, WELDED
(0.22 - 0.28C) (SAE 1025)
Normalized or Stress Relieved

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 SAE publications shall apply. The applicable issue of other documents shall be as specifed 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
MAM 2253 - Tolerances, Metric, 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 ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM E8 - Tension Testing of Metallic Materials
ASTM E8M - Tension Testing of Metallic Materials (Metric)
ASTM E350 - Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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

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 E350, by spectrochemical methods, or by other analytical methods acceptable to 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 ASTM E8 or ASTM E8M:

Tensile Strength, minimum	55,000 psi (379 MPa)
Yield Strength at 0.2% Offset, minimum	36,000 psi (248 MPa)
Elongation in 2 Inches (50.8 mm), minimum	
Full Tube	22%
Strip Specimen	15%

3.3.1.1 For each 2,000 psi (13.8 MPa) in excess of 55,000 psi (379 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°F ± 10 (885°C ± 6) 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 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 inch (1.6 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 feet (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 feet (3 m).

3.6 Tolerances: Shall conform to all applicable requirements of AMS 2253 or MAM 2253 and the following:

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 inch (1.19 mm).

3.6.2 Tubing 1-1/8 inch (28.6 mm) and over in nominal OD, when ordered flash removed, shall have no flash height exceeding 0.010 inch (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 feet (305 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: The vendor of tubing shall furnish with each shipment 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 5077E, size, and quantity.

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

5. PREPARATION FOR DELIVERY:

5.1 Identification: Shall be as follows:

5.1.1 Straight Tubes 0.029 Inch (0.74 mm) and Over in Wall Thickness and 0.500 Inch (12.70 mm) and Over in OD, Minor Axis, or Least Width of Flat Surface: Shall be marked in a row of characters recurring at intervals not greater than 3 feet (914 mm) with AMS 5077E, manufacturer's identification, and wall thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be removable in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the tubing or its performance and shall be sufficiently stable to withstand normal handling.