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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-T-8506A

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Superseding AMS-T-8506

Tubing, Steel, Corrosion-Resistant, (304), Annealed, Seamless and Welded

NONCURRENT NOTICE

This specification has been declared “NONCURRENT” by the Aerospace Materials Division, SAE, as of September, 2002. It is recommended, therefore, that this specification not be specified for new designs.

“NONCURRENT” refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division, however, does not recommend these as standard materials for future use in new designs. Each of these “NONCURRENT” specifications is available from SAE.

This specification is not directly superseded by an AMS. However, AMS 5565 covers a similar product.

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1. SCOPE:

1.1 Scope:

This specification covers seamless and welded tubing of corrosion-resistant steel in the annealed condition.

2. APPLICABLE DOCUMENTS:

The following publications, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2243 Tolerances, Corrosion and Heat Resistant Steel Tubing

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-6875 Heat Treatment of Steels (Aircraft Practice), Process for
QQ-P-35 Passivation Treatments for Austenitic, Ferritic, and Martensitic Corrosion-Resisting Steel (Fastening Devices)

FED-STD-151 Metals; Test Methods

FED-STD-183 Continuous Identification Marking for Iron and Steel Products

MIL-STD-129 Marking for Shipment and Storage
MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage
MIL-STD-753 Corrosion-Resistant Steel Parts; Sampling, Inspection and Testing for Surface Passivation

AND10104 Tubing, Steel, Corrosion-Resistant, Round, Standard Dimensions for
MS33584 Tubing End - Standard Dimensions for Flared

3. REQUIREMENTS:

3.1 Materials:

The steel shall be manufactured by the electric furnace process. Heat treating equipment used in connection with tubing production shall be capable of meeting the temperature control requirements of section 3 of MIL-H-6875. Heating shall be accomplished in air or protective atmosphere which will provide a smooth gray surface free from carburization, nitriding, or other deleterious surface effects.

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3.1.1 Chemical composition: The chemical composition shall be as specified in table I.

TABLE I. Chemical composition

Element	Limits (percent)	Check analysis tolerance 1/ (under min. or over max.)	
Carbon	0.08 (max)	--	0.01
Manganese	2.00 (max)	--	.04
Phosphorus	0.03 (max)	--	.005
Sulfur	0.030 (max)	--	.005
Silicon	1.00 (max)	--	.05
Chromium	18.00 - 20.00	0.20	.20
Nickel	8.00 - 12.00	0.10	.15
Molybdenum	0.50 (max)	--	.03
Copper	0.50 (max)	--	.03

1/ Individual determinations may vary from the specified range to the extent shown in the check analysis column, except that elements in any heat shall not vary both above and below the specified range.

3.2 Surface treatment:

The interior and exterior surfaces shall be pickled or treated by other methods producing equally satisfactory surface conditions that do not affect the wall thickness or corrosion resistance of the material. After treatment, tubing shall be washed to remove acid residue and loose particles.

3.3 Mechanical properties:

The mechanical properties of the tubing shall be as specified in table II.

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TABLE II. Mechanical properties

Nominal outside diameter (inch)	Nominal wall thickness (inch)	Ultimate tensile strength (psi) (max)	Elongation in 2 inches (percent) (min)	
			Full tube	Strip
0.187 and under	0.016 and under	115,000	35	--
	Over 0.016	100,000	40	--
Over 0.187 to 0.500, incl.	0.010 and under	110,000	37	32
	Over 0.010	100,000	40	35
Over 0.500	0.010 and under	100,000	32	27
	Over 0.010	100,000	35	30

3.4 Flaring:

Tubing 0.125-inch outside diameter and over shall flare to the respective dimensions of MS33584 as a minimum without rupture, when tested as specified in 4.7. The flared zones shall be sound, uniform and smooth, and capable of forming pressure-tight joints with standards fittings.

3.5 Corrosion resistance:

3.5.1 Resistance to acidified copper-sulfate solution: The tubing shall exhibit no evidence of cracks due to intergranular attack when subjected to the examination after exposure to boiling acidified copper-sulfate solution at the conditions specified in 4.8.

3.5.2 Passivation treatment: Treatment of inner and outer surfaces by other than pickling shall be followed by a passivation treatment in accordance with QQ-P-35. The surfaces shall be passive to tests specified in 4.9.

3.6 Dimensions and tolerances:

3.6.1 Sizes: Tubing shall be furnished in standard diameters and wall thicknesses specified on AND10104, as specified by the contract or purchase order (see 6.2).

3.6.1.1 Tolerances: The variation between actual outside diameter, wall thickness, and ovality from the nominal dimension shall be within the tolerances of AMS 2243 for welded tubing.

3.6.1.2 Weld bead: When tubing is fabricated by welding, it shall be so processed as to remove the bead or any dimensional indication beyond the limits of allowable tolerance of the presence of the weld.

3.6.2 Straightness: In no portion of any piece of tubing shall departure from straightness exceed 0.060 inch in a length of 3 feet.

3.6.3 Length:

3.6.3.1 Exact lengths: Tubing of all sizes may be ordered to exact lengths or in lengths expressed as a multiple of a definite unit, with tolerances as specified in the contract or purchase order (see 6.2).

3.6.3.2 Mill lengths: When exact or multiple lengths are not specified (see 6.2), tubing will be accepted in mill lengths of 5 to 24 feet, but not more than 10 percent of any order shall be furnished in lengths shorter than 12 feet.

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3.7 Identification of product:

Tubing shall be marked in accordance with FED-STD-183. The following additional marking items shall be included:

Outside diameter
Wall thickness

3.7.1 In lieu of continuous marking, tubing less than ¼ inch in diameter may be bundled and each bundle identified by metal tags impression stamped with the legend as specified in FED-STD-183 and 3.7, and securely attached near each end of the bundle.

3.8 Workmanship:

Tubing surfaces shall be smooth, clean, and free from burrs, seams, tears, grooves, laminations, slivers, pits, scale, carbonaceous residue, heat discoloration, or other injurious defects. Welded tubing shall contain no welds other than the longitudinal weld and shall show no dimensional indications of the weld bead.

3.8.1 Surface imperfections: Surface imperfections such as handling marks, straightening marks, light mandrel and die, or roll marks, shallow pits, and scale pattern will not be considered as injurious defects provided the imperfections are removable without reducing either the diameter or wall thickness of the tubing below the permissible tolerance limits. The removal of surface imperfections is not required.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection:

All the examintions and tests specified herein for the testing of tubing are classified as quality conformance inspections.

4.3 Inspection lot:

A lot shall consist of one size and wall thickness from one heat of steel, and annealed in the same charge (batch anneal) or all tubing of the same size and heat annealed at the same temperature, time and atmosphere, without interruption, in a continuous furnace.

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4.4 Examination of product:

Each length of tubing shall be visually examined for compliance with surface condition and workmanship requirements. Samples selected in accordance with table III shall be examined for compliance with nominal dimensions, identification marking requirements, and preparation for delivery for compliance with section 5.

TABLE III. Sampling plan

Lot size	Sample size	Acceptance No.
1 to 110	5	0
111 to 500	7	0
501 to 800	10	0
801 to 1,200	15	0
Over 1,200	25	0

4.5 Chemical tests:

4.5.1 Sampling for chemical analysis: A random sample, consisting of not less than 2 ounces of material, shall be selected from each lot and processed in accordance with Method 111 or Method 112 of FED-STD-151.

4.5.1.1 Samples for check chemical analysis may be waived provided that all of the material under inspection can be identified as being made from a heat previously analyzed and found to conform to the chemical composition specified herein.

4.5.2 Analysis: Analysis shall be by Method 111 or 112 of FED-STD-151. In the event of dispute, analysis shall be by Method 111.

4.6 Mechanical properties:

4.6.1 Sampling: Two samples shall be selected to represent each 2,000 feet of tubing of each lot up to 5,000 feet, and two additional samples from each additional 5,000 feet.

4.6.2 Method: Samples shall be tested as full-tube specimens with a test section of not less than 6 inches between plugs, as required by figure 1, Method 211 of FED-STD-151, entitled “Metal plugs used for testing tubing, location of plugs in tubular specimen, and proper location of specimens in heads of testing machine.” In larger diameters of tubing, type T1 or T2 specimens may be used. Tests shall comply with the applicable requirements of Method 211.

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