Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE MATERIAL SPECIFICATION

AMS 5573D
Superseding AMS 5573C
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STEEL TUBING, SEAMLESS, CORROSION AND HEAT RESISTANT
17Cr - 12.5Ni - 2.5Mo (SAE 30316)

1. SCOPE:

1.1 Form: This specification covers a corrosion and heat resistant steel in the form of seamless tubing.

1.2 Application: Primarily for parts and assemblies requiring both corrosion and heat resistance up to 1600 F (871 C). At high temperatures, strength of this steel is slightly higher than, and oxidation resistance similar to, that of 18-8 types.

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 Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2243 - Tolerances, Corrosion and Heat Resistant Steel Tubing
AMS 2248 - Chemical Check Analysis Limits, Wrought Heat and Corrosion Resistant Steels and Alloys
AMS 2350 - Standards and Test Methods
AMS 2371 - Quality Assurance Sampling of Corrosion and Heat Resistant Alloys, Wrought Products Except Forgings

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

ASTM A370 - Mechanical Testing of Steel Products
ASTM E353 - Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

2.3 Government Publications: Available from Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.

2.3.1 Federal Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E353, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods.

Printed in U.S.A.

	min	max
Carbon	--	0.08
Manganese	1.25	2.00
Silicon	--	1.00
Phosphorus	--	0.040
Sulfur	--	0.30
Chromium	16.00	19.00
Nickel	11.00	14.00
Molybdenum	2.00	3.00
Copper	--	0.50

3.1.1 Check Analysis: Composition variations shall meet the requirements of AMS 2248.

3.2 Condition: Solution heat treated free from continuous carbide network and descaled.

3.3 Fabrication: Tubing shall be produced by a seamless process. Any surface finishing operation applied to remove objectionable pits and surface blemishes shall be performed prior to final solution heat treatment. A light polish to improve surface appearance may be employed after solution heat treatment. Passivation treatment shall follow any polishing treatment.

3.4 Properties:

3.4.1 Tensile Properties: Shall be as specified in Table I, determined in accordance with ASTM A370:

TABLE I

Nominal OD Inches	Nominal Wall Thickness Inch	Tensile Strength psi, max	Elongation % in 2 in., min	
			Strip	Full Tube
Up to 0.188, incl	Up to 0.016, incl	115,000	--	35
	Over 0.016	100,000	--	40
Over 0.188 to 0.500, incl	Up to 0.010, incl	110,000	32	37
	Over 0.010	100,000	35	40
Over 0.500	Up to 0.010, incl	100,000	27	32
	Over 0.010	100,000	30	35

TABLE I (SI)

Nominal OD Millimeters	Nominal Wall Thickness Millimeters	Tensile Strength MN/m^2, max	Elongation % in 50.8 mm, min	
			Strip	Full Time
Up to 4.77, incl	Up to 0.406, incl	793	--	35
	Over 0.406	690	--	40
Over 4.77 to 12.70, incl	Up to 0.254, incl	758	32	37
	Over 0.254	690	35	40
Over 12.70	Up to 0.254, incl	690	27	32
	Over 0.254	690	30	35

3.4.2 Flarability: Tubing shall be capable of being flared without formation of cracks or other visible defects. Specimens for flaring may be cut from any portion of a tube or an entire tube may be used as a specimen. The end of the specimen to be flared shall be cut square, with the cut end smooth and free from burrs, but not rounded. The specimen shall, at room temperature, be forced axially with steady pressure over a hardened and polished tapered steel pin having a 74 deg (1.29 rad) included angle, to produce a flare having the permanent expanded OD specified in Table II.

TABLE II

Nominal OD Inches	Expanded OD Inches min	Nominal OD Inches	Expanded OD Inches min
0.125	0.200	0.750	0.937
0.188	0.290	1.000	1.187
0.250	0.359	1.250	1.500
0.312	0.421	1.500	1.721
0.375	0.484	1.750	2.106
0.500	0.656	2.000	2.356
0.625	0.781		

TABLE II (SI)

Nominal OD Millimeters	Expanded OD Millimeters	Nominal OD Millimeters	Expanded OD Millimeters
3.18	5.08	19.04	23.80
4.78	7.36	25.40	30.15
6.35	9.11	31.75	35.10
7.93	11.70	38.10	43.71
9.54	12.29	44.45	53.49
12.70	16.68	50.80	59.74
15.88	19.82		

3.4.2.1 Tubing with nominal OD between any two standard sizes given in 3.4.2 shall take the same percentage flare as shown for the larger of the two sizes.

3.4.2.2 Tubing with nominal OD greater than 2.000 in. (50.8 mm) or less than 0.125 in. (3.18 mm) shall have flarability as agreed upon by purchaser and vendor.

3.5 Quality: Tubing shall be uniform in quality and condition and shall have a workmanlike finish conforming to the best practice for high quality material. It shall be smooth, clean, and free from heavy scale or oxide, burrs, seams, tears, grooves, laminations, slivers, pits, and other injurious conditions. 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. The removal of surface imperfections is not required.

3.6 Sizes: Except when exact lengths or multiples of exact lengths are ordered, tubing will be acceptable in mill lengths of 6 - 20 ft (1.8 - 6.1 m) but not more than 10% of any shipment shall be supplied in lengths shorter than 10 ft (3 m).

3.7 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2243.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor shall supply all samples 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 perform such confirmatory testing as he deems necessary to assure that material conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Routine Control Tests: Tests to determine conformance to composition (3.1), condition (3.2), tensile property (3.4.1), and tolerance (3.7), requirements are classified as routine control tests.

4.2.2 Periodic Control Tests: Tests to determine conformance to flarability (3.4.2) requirements are classified as qualification and/or periodic control tests.

4.3 Sampling: Shall be in accordance with AMS 2371.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition of each heat in the shipment and for tensile properties of each size from each heat. This report shall include the purchase order number, heat number, material specification number and its revision letter, size, and quantity from each heat.

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, material specification number and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the tubing may be based on the testing of three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the tubing represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Tubing shall be identified as follows:

5.1.1 Straight Tubes 0.029 In. (0.74 mm) and Over in Wall Thickness and 0.500 In. (12.7 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 ft (914 mm) with AMS 5573D, heat number, manufacturer's identification, and nominal wall thickness. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the material or its performance and shall be sufficiently stable to withstand normal handling.

5.1.2 Straight Tubes Under 0.029 In. (0.74 mm) in Wall Thickness or Under 0.500 In. (12.7 mm) in OD, Minor Axis, of Least Width of Flat Surface: Shall be securely bundled and identified by a metal or plastic tag embossed with the above information and the nominal OD and attached to each bundle or shall be boxed and the box marked with the same information.

5.1.3 Coiled Tubing: Shall be securely bundled and identified by a metal or plastic tag embossed with the purchase order number, AMS 5573D, heat number, nominal OD and wall thickness, and manufacturer's identification and attached to each coil or shall be boxed and the box marked with the same information.

5.2 Packaging: Tubing shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to requirements of carrier rules and regulations applicable to the mode of transportation.