

AEROSPACE MATERIAL SPECIFICATION

SAE

AMS 5577F

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Superseding AMS 5577E

Submitted for recognition as an American National Standard

STEEL, CORROSION AND HEAT RESISTANT, WELDED TUBING 25Cr - 20Ni (SAE 30310) Solution Heat Treated

UNS S31008

1. SCOPE:

1.1 Form:

This specification covers a corrosion and heat resistant steel in the form of welded tubing.

1.2 Application:

This tubing has been used typically for parts requiring both corrosion and heat resistance, especially when such parts are welded during fabrication and for parts requiring oxidation resistance up to 2000 °F (1093 °C) but useful at that temperature only when stresses are low, however, usage is not limited to such applications.

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.

- AMS 2243 Tolerances, Corrosion and Heat Resistant Steel Tubing
- MAM 2243 Tolerances, Metric, Corrosion and Heat Resistant Steel Tubing
- AMS 2248 Chemical Check Analysis Limits, Wrought Corrosion and Heat Resistant Steels and Alloys, Maraging and Other Highly-Alloyed Steels, and Iron Alloys
- AMS 2371 Quality Assurance Sampling and Testing, Corrosion and Heat Resistant Steels and Alloys, Wrought Products and Forging Stock
- AMS 2632 Ultrasonic Inspection of Thin Materials, 0.5 Inch (13 mm) and Thinner
- AMS 2645 Fluorescent Penetrant Inspection

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2.1 SAE Publications: (Continued)

AMS 2807 Identification, Carbon and Low-Alloy Steels, Corrosion and Heat Resistant Steels and Alloys, Sheet, Strip, Plate, and Aircraft Tubing

2.2 ASTM Publications:

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

ASTM A 370 Mechanical Testing of Steel Products

ASTM E 353 Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

ASTM E 426 Electromagnetic (Eddy-Current) Testing of Seamless and Welded Tubular Products, Austenitic Stainless Steel and Similar Alloys

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

(R)

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 353, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element	min	max
Carbon	--	0.08
Manganese	--	2.00
Silicon	--	0.75
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	24.00	26.00
Nickel	19.00	22.00
Molybdenum	--	0.75
Copper	--	0.75

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 welded and drawn 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:

Tubing shall conform to the following requirements:

- 3.4.1 Tensile Properties: Shall be as specified in Table 2, determined in accordance with ASTM A 370.

TABLE 2A - Tensile Properties, Inch/Pound Units

Nominal OD Inch	Tensile Strength ksi, max	Elongation in 2 Inches %, min Strip	Elongation in 2 Inches %, min Full Tube
Up to 0.312, excl	105	35	40
0.312 and over	100	35	40

TABLE 2B - Tensile Properties, SI Units

Nominal OD Millimeters	Tensile Strength MPa, max	Elongation in 50.8 mm %, min Strip	Elongation in 50.8 mm %, min Full Tube
Up to 7.92, excl	724	35	40
7.92 and over	689	35	40

- 3.4.2 Flareability: Specimens as in 4.3.1 shall withstand flaring at room temperature, without formation of cracks or other visible defects, by being forced axially with steady pressure over a hardened and polished tapered steel pin having a 74 degree included angle to produce a flare having a permanent expanded OD not less than specified in Table 3.

TABLE 3A - Minimum Flarability, Inch/Pound Units

Nominal OD Inch	Expanded OD Inch	Nominal OD Inches	Expanded OD Inches
0.125	0.200	0.750	0.987
0.188	0.302	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 3B - Minimum Flarability, SI Units

Nominal OD Millimeters	Expanded OD Millimeters	Nominal OD Millimeters	Expanded OD Millimeters
3.18	5.08	19.05	23.80
4.78	7.67	25.40	30.15
6.35	9.12	31.75	38.10
7.92	10.69	38.10	43.71
9.52	12.29	44.45	53.49
12.70	16.66	50.80	59.84
15.88	19.84		

- 3.4.2.1 Tubing with nominal OD between any two standard sizes shown in Table 3 shall take the same percentage flare as shown for the larger of the two sizes.
- 3.4.2.2 Flarability requirements for tubing over 2.000 inches (50.80 mm) or under 0.125 inches (3.18 mm) in nominal OD shall be as agreed upon by purchaser and vendor.
- 3.4.3 Pressure Testing: Tubing shall show no bulges, leaks, pinholes, cracks, or other defects when subjected to an internal hydrostatic pressure, based on nominal dimensions, sufficient to cause a tensile stress of 20.0 ksi (138 MPa) in the tubing wall.

3.5 Quality:

- 3.5.1 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.
- 3.5.2 If beads are present at the welds on the inner surface of the tubing, such beads shall not be thicker than 0.010 inch (0.25 mm). The outer surfaces of the tubing shall be free from beads.
- 3.5.3 When specified by purchaser, tubing shall be subjected to fluorescent (R) penetrant inspection in accordance with AMS 2645, to ultrasonic inspection in accordance with AMS 2632, to eddy-current inspection in accordance with ASTM E 426, or to any combination thereof. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.6 Tolerances:

Shall conform to all applicable requirements of AMS 2243 or MAM 2243.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

- (R) The vendor of tubing shall supply all samples for vendor's tests and shall be responsible for performing all required tests. 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:

- 4.2.1 Acceptance Tests: Tests for composition (3.1), condition (3.2), tensile properties (3.4.1), pressure test (3.4.3), and tolerances (3.6) are acceptance tests and shall be performed on each heat or lot as applicable.
- 4.2.2 Periodic Tests: Tests for flarability (3.4.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

- (R) Shall be in accordance with AMS 2371 and the following:
- 4.3.1 Specimens for flarability test (3.4.2) shall be full tubes or sections cut from a tube. The end of the specimen to be flared shall be cut square, with the cut end smooth and free from burrs, but not rounded.