

AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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Revised

ALLOY TUBING, WELDED, CORROSION AND HEAT RESISTANT
Iron Base - 20Cr - 20Ni - 20Co - 3Mo - 2W - 1(Cb+Ta)

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. APPLICATION: Parts and assemblies requiring high strength up to approximately 1500 F and oxidation resistance up to 1800 F.

3. COMPOSITION:

		Check Analysis	
		Under Min	or Over Max
Carbon	0.08 - 0.16	0.01	0.01
Manganese	1.00 - 2.00	0.04	0.04
Silicon	1.00 max	----	0.05
Phosphorus	0.030 max	----	0.005
Sulphur	0.030 max	----	0.005
Chromium	20.00 - 22.50	0.25	0.25
Nickel	19.00 - 21.00	0.20	0.20
Cobalt	18.50 - 21.00	0.20	0.20
Molybdenum	2.50 - 3.50	0.10	0.10
Tungsten	2.00 - 3.00	0.10	0.10
Columbium + Tantalum	0.75 - 1.25	0.05	0.05
Nitrogen	0.10 - 0.20	0.01	0.01
Iron	Remainder		

4. CONDITION: Solution heat treated and pickled, unless otherwise ordered.

5. TECHNICAL REQUIREMENTS:

5.1 Solution Heat Treatment: Material shall be heated to 2150 F \pm 20, followed by air cooling.

5.2 Tensile Properties:

Tensile Strength, psi	100,000 - 140,000
Elongation, % in 2 in.	
Strip	35 min
Full Section 0.625 in. and over	40 min
Full Section under 0.625 inch	30 min

5.3 Flarability: The 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 the 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-degree included angle, to produce a flare having the permanent expanded OD specified in the following table:

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Nominal OD Inch	Expanded OD Inch	Nominal OD Inch	Expanded OD Inch
0.188	0.290	0.750	0.937
0.250	0.359	1.000	1.187
0.312	0.421	1.250	1.500
0.375	0.484	1.500	1.721
0.500	0.656	1.750	2.106
0.625	0.781	2.00	2.356

Note 1: Tubing with intermediate nominal OD shall take the same percentage flare as that for the next larger OD.

Note 2: Tubing with nominal OD greater than 2.00 inches, flarability shall be as agreed upon by purchaser and vendor.

5.4 Pressure Testing: Tubing shall show no bulges, leaks, or other defects when subjected to an internal hydrostatic pressure, based on nominal dimensions, sufficient to cause a tensile stress of 20,000 psi in the tubing wall.

6. QUALITY:

6.1 Tubing shall have a good workmanlike finish conforming to the best practice for high quality aircraft material. Tubing shall be uniform in quality and condition, clean, sound, and free from grease or other foreign matter, and from internal and external defects detrimental to fabrication or to performance of parts.

6.2 If beads are present at the welds on the inner surfaces of the tubing, such beads shall not be thicker than 0.010 in., unless otherwise specified. The outer surfaces of the tubing shall be free from beads.

7. TOLERANCES: Unless otherwise specified, tolerances shall conform to the latest issue of AMS 2243 as applicable to welded tubing.

8. REPORTS:

8.1 Unless otherwise specified, the vendor of tubing shall furnish with each shipment three copies of a report of the results of tests for the chemical composition of each heat in the shipment and the tensile properties of each size from each heat. This report shall include the purchase order number, heat number, material specification number, size, and quantity from each heat.

8.2 Unless otherwise specified, 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, 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 a statement that the tubing conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.