SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS5554 REV. F

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Superseding AMS5554E

Steel, Corrosion and Heat-Resistant, Seamless Tubing
16.5Cr - 4.5Ni - 2.9Mo - 0.10N
Annealed

(Composition similar to UNS S35000)

RATIONALE

AMS5554F revises response to heat treatment (3.5.2, Table 2) and results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a corrosion and heat-resistant steel in the form of thin-wall seamless tubing.

1.2 Application

This tubing has been used typically for parts, such as fluid lines, requiring high strength and oxidation resistance up to 800 °F (427 °C), but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2243 Tolerances, Corrosion and Heat-Resistant Steel Tubing

AMS2248 Chemical Check Analysis Limits, Corrosion and Heat-Resistant Steels and Alloys, Maraging, and Other Highly-Alloyed Steels, and Iron Alloys

AMS2371 Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steels and Alloys, Wrought Products and Forging Stock

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS5554F

AMS2634 Ultrasonic Inspection, Thin Wall Metal Tubing

AMS2807 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 International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM E 8/E 8M Tension Testing of Metallic Materials

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

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

ASTM E 1417 Liquid Penetrant Testing

3. TECHNICAL REQUIREMENTS

3.1 Composition

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	0.12
Manganese	0.50	1.25
Silicon	--	0.50
Phosphorus	--	0.040
Sulfur	--	0.030
Chromium	16.00	17.00
Nickel	4.00	5.00
Molybdenum	2.50	3.25
Nitrogen	0.07	0.13

3.1.1 Check Analysis

Composition variations shall meet the applicable requirements of AMS2248.

3.2 Condition

Cold drawn, annealed, 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 anneal. A light polish to improve external surface appearance may be employed after solution heat treatment and, if performed, the product shall be subsequently passivated.

3.4 Heat Treatment

Tubing shall be annealed by heating to 1850 to 1975 °F (1010 to 1079 °C), holding at the selected temperature within ±25 °F (±14 °C) for a time commensurate with cross-sectional wall thickness, and cooling as rapidly as possible to room temperature.

3.5 Properties

Tubing shall conform to the following requirements:

3.5.1 As Received

3.5.1.1 Flarability

Specimens as in 4.3.1 from tubing 0.500 to 2.000 inches (12.70 to 50.80 mm), inclusive, in nominal OD shall withstand, without formation of cracks or other visible defects, flaring at room temperature 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 1.20 times the original nominal OD.

3.5.1.1.1 Flarability requirements for tubing under 0.500 inch (12.70 mm) or over 2.000 inches (50.80 mm) in nominal OD shall be as agreed upon by purchaser and vendor.

3.5.2 Response to Heat Treatment

Tubing shall have the following properties after being austenite conditioned by heating to 1710 °F ± 25 (932 °C ± 14), holding at heat for not less than 45 minutes per inch (25 mm) of nominal thickness, and cooling as rapidly as possible to room temperature; cold treated by cooling to -100 °F (-73 °C), or lower, holding at this temperature for not less than 1 hour for wall thicknesses up to 0.010 inch (0.25 mm), inclusive, and not less than 3 hours for wall thicknesses over 0.010 inch (0.25 mm), and warming in air to room temperature; and tempered by heating as specified at 850 °F ± 25 (454 °C ± 14), holding at heat for not less than 3 hours, and cooling in air.

3.5.2.1 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM E 8/E 8M.

TABLE 2 - Minimum Tensile Properties (SCT 850 Condition)

Property	Value
Tensile Strength	185 ksi (1276 M Pa)
Yield Strength at 0.2% Offset	150 ksi (1034 MPa)
Elongation in 2 inches (50.8 mm)	8%

3.6 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.

3.6.1 When specified by purchaser, tubing shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417, to ultrasonic inspection in accordance with AMS2634, to electromagnetic (Eddy-Current) examination in accordance with ASTM E 426, or to any combination thereof. Standards for acceptance shall be as established by purchaser.

3.7 Tolerances

Shall conform to all applicable requirements of AMS2243.

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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), nondestructive inspection when specified (3.6.1), and tolerances (3.8) are acceptance tests and shall be performed on each heat or lot as applicable.

4.2.2 Periodic Tests

Flarability (3.5.1.1) and tensile properties (3.5.2.1) 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

Shall be in accordance with AMS2371 and the following:

4.3.1 Specimens for flarability test (3.5.1.1) 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.

4.4 Reports

The vendor of the product shall furnish with each shipment a report showing the results of tests for composition of each heat and for nondestructive inspection, when specified, and tolerances of each lot, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, heat and lot numbers, AMS5554F, size, and quantity.

4.5 Resampling and Retesting

Shall be in accordance with AMS2371.

5. PREPARATION FOR DELIVERY

5.1 Sizes

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

5.2 Identification

Shall be in accordance with AMS2807.