Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10000

AEROSPACE MATERIAL SPECIFICATION

AMS 6390A
Superseding AMS 6390

Issued 6-30-62
Revised 5-1-69

STEEL TUBING, MECHANICAL
0.95Cr - 0.20Mo (0.38 - 0.43C) (SAE 4140)
Special Quality

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

2. APPLICATION: Primarily for high strength structural applications where magnetic inspection of both machined and unmachined surfaces is required.

3. COMPOSITION:

	min	max
Carbon	0.38	0.43
Manganese	0.75	1.00
Silicon	0.20	0.35
Ø Phosphorus	--	0.025
Sulfur	--	0.025
Chromium	0.80	1.10
Molybdenum	0.15	0.25
Nickel	--	0.25
Copper	--	0.35

3.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2259, paragraph titled "Low Alloy Steels."

4. CONDITION: Unless otherwise ordered, the product shall be supplied in a machinable condition and cold finished having hardness not higher than Brinell 248 or equivalent.

5. TECHNICAL REQUIREMENTS: When ASTM methods are specified for determining conformance to Ø the following requirements, tests shall be conducted in accordance with the issue of the ASTM method listed in the latest issue of AMS 2350.

5.1 Hardenability: Shall be J50=6 min and J44=9 min when determined by the standard end-quench test specimen in accordance with the Method of Determining Hardenability published in the latest issue Ø of the SAE Handbook, except that the steel shall be normalized at 1700 F ± 10 (926.7 C ± 5.6) and the test specimen austenitized at 1550 F ± 10 (843.3 C ± 5.6). The hardenability test is not required on tubing which will not yield a suitable specimen but the steel from which the tubing is made shall conform to the hardenability specified.

5.2 Grain Size: Predominantly 5 or finer with occasional grains as large as 3 permissible, ASTM Ø E112, McQuaid-Ehn test.

5.3 Decarburization:

5.3.1 Tubing ordered ground, turned, or polished shall be free from decarburization on the ground, turned, or polished surfaces. Inside decarburization shall not exceed the maximum depth specified in 5.3.3.

5.3.2 Allowable decarburization of pierced billets, of tubing for redrawing or for redrawing or forging, and of tubing ordered to specified microstructural requirements shall be as agreed upon by purchaser and vendor.

5.3.3 Decarburization of tubing to which 5.3.1 or 5.3.2 is not applicable shall be not greater than the following:

Nominal Wall Thickness Inches	Depth of Decarburization, Inch	
	Inside	Outside
Up to 0.109, incl	0.008	0.015
Over 0.109 to 0.203, incl	0.010	0.020
Over 0.203 to 0.400, incl	0.012	0.025
Over 0.400 to 0.600, incl	0.015	0.030
Over 0.600 to 1.000, incl	0.017	0.035
Over 1.000	0.020	0.040

5.3.4 Unless otherwise agreed upon by purchaser and vendor, decarburization shall be measured by the microscopic method or by Rockwell Superficial 30-N scale hardness method, or equivalent hardness testing method, on hardened but untempered specimens protected during heat treatment to prevent changes in surface carbon content. Depth of decarburization, when measured by a hardness method, is defined as the perpendicular distance from the surface to the nondecarburized depth under that surface below which there is no further increase in hardness. Such measurements shall be far enough away from any adjacent surface to be uninfluenced by any decarburization or lack of decarburization thereon.

5.3.4.1 When determining the depth of decarburization, it is permissible to disregard local areas provided the decarburization of such areas does not exceed the limits above by more than 0.005 in. and the width is 0.065 in. or less.

6. QUALITY: Steel shall be aircraft quality and shall conform to the latest issue of AMS 2301. Tubing shall be uniform in quality and condition, shall have a good workmanlike finish conforming to the best practice for high quality material, and shall be suitable for use in parts required to pass magnetic particle inspection either with or without machining of the surface. 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 diameter and wall thickness. The removal of surface imperfections is not required.

7. TOLERANCES: Unless otherwise specified, tolerances shall conform to all applicable requirements of Ø the latest issue of AMS 2253.

8. REPORTS:

8.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report of the results of tests for chemical composition, hardenability, grain size, and AMS 2301 frequency-severity rating of each heat in the shipment. This report shall include the purchase order number, material specification number and its revision letter, 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 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.

Ø 9. IDENTIFICATION: Unless otherwise specified, the product shall be identified as follows: