AERONAUTICAL MATERIAL SPECIFICATION

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AMS 6413 B

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STEEL TUBING, SEAMLESS (MECHANICAL)

1.8Ni - 0.8Cr - 0.25Mo (0.35-0.40C) (4337)

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

2. FORM: Heavy wall tubing for machining.

3. APPLICATION: Parts with sections 0.875 in. or less in thickness at the time of heat treatment which require a through-hardening steel capable of developing hardness as high as Rockwell C50 when properly hardened and tempered and also parts of greater sections but requiring proportionately lower hardness.

4. COMPOSITION:

		Check Analysis Under Min	Check Analysis Over Max
Carbon	0.35 - 0.40	0.02	0.02
Manganese	0.65 - 0.85	0.03	0.03
Silicon	0.20 - 0.35	0.02	0.02
Phosphorus	0.040 max	--	0.005
Sulfur	0.040 max	--	0.005
Chromium	0.70 - 0.90	0.03	0.03
Nickel	1.65 - 2.00	0.05	0.05
Molybdenum	0.20 - 0.30	0.02	0.02

5. CONDITION: Unless otherwise specified, tubing shall be supplied cold finished in a machinable condition with hardness not higher than Rockwell C25. If hot finished tubing is ordered, it shall be supplied in a machinable condition with hardness not higher than Rockwell B99.

6. TECHNICAL REQUIREMENTS:

6.1 Hardenability: The hardenability shall be J50=10 min and J44=18 min when determined by the standard end-quench test specimen in accordance with the SAE Method of Determining Hardenability published in the latest issue of the SAE Handbook, except that the steel shall be normalized at 1700 F ± 10 and the test specimen austenitized at 1500 F ± 10. 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 in this paragraph.

6.2 Grain Size: Five or finer as determined on the billet, ASTM E19-46, method a. A heat of steel predominantly five or finer with grains as large as three is permissible.

6.3 Decarburization:

6.3.1 Tubing ordered ground, turned, or polished shall be free from decarburization on such ground, turned or polished surfaces. Inside decarburization shall not exceed the maximum depth specified in 6.3.3.

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

6.3.3 Decarburization of tubing to which 6.3.1 or 6.3.2 is not applicable shall be not greater than the following:

Nominal Wall Thickness Inch	Maximum Depth of Decarburization, Inch	
	Inside	Outside
0.109 and under	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

6.3.4 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 specimens. Depth of decarburization when measured by a hardness method, is defined as the distance measured from the nearest original surface to the point at which no increase in hardness is found.

7. QUALITY: Steel shall be aircraft quality. Tubing shall be uniform in quality and condition, clean, sound, smooth, and free from foreign materials and from internal and external defects detrimental to fabrication or to performance of parts.

8. TOLERANCES: Unless otherwise specified, tolerances shall conform to the latest issue of AMS 2253 as applicable to Mechanical Type.

9. REPORTS:

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

9.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three oopies 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.