

# AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.  
29 West 39th Street  
New York City

AMS 4087 A

Issued 11-1-45

Revised 11-1-52

ALUMINUM ALLOY TUBING, SEAMLESS  
4.5Cu - 1.5Mg - 0.6Mn (24S-0)

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

2. COMPOSITION:

Copper	3.8 - 4.9
Magnesium	1.2 - 1.8
Manganese	0.30 - 0.9
Iron	0.5 max
Silicon	0.5 max
Chromium	0.10 max
Zinc	0.10 max
Other Impurities, each	0.05 max
Other Impurities, total	0.15 max
Aluminum	remainder

3. CONDITION: Annealed.

4. TECHNICAL REQUIREMENTS:

4.1 Tensile Properties:

Tensile Strength, psi 35,000 max

4.2 Flattening:

4.2.1 Tubing having nominal wall thickness less than 10% of the nominal outside diameter shall be capable of being flattened sidewise under a gradually applied load, without cracking, to the following outside dimensions while under load:

Nominal Wall Thickness, Inch	Flattened Outside Dimension
0.049 and under	3 times the wall thickness
Over 0.049	4 times the wall thickness

4.2.1.1 If tubing does not pass the flattening test of 4.2.1, a section of the tubing not less than 1/2 in. in length and embracing 1/3 to 1/2 the circumference of the tube shall be capable of being bent around a mandrel having a diameter equal to the nominal wall thickness for tubing with nominal wall thickness 0.049 in. and under, or equal to twice the nominal wall thickness for tubing with nominal wall thickness over 0.049 in., without cracking, until the specimen encloses at least 180 degrees of the pin circumference. The test shall be made with the axis of bend parallel to the axis of the tube and with inside of tube on inside of bend.

Section 7C of the SAE Technical Board rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommendation or practice, and no commitment to conform to or be guided by any technical report, in formulating and approving technical reports. The Board and its committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

4.3 Flarability: Tubing with nominal OD of 0.375 in. and under shall be capable of being double-flared and tubing with nominal OD over 0.375 in. shall be capable of being single-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  $\emptyset$  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 except for sizes 0.375 in. and under. 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:

Nominal OD Inch	Expanded OD Inch, min	Nominal OD Inch	Expanded OD Inch, min
0.125	0.224	0.750	0.937
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
0.626	0.781		

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

4.3.2 Tubing with nominal OD greater than 2.00 in. shall have flarability as agreed upon by purchaser and vendor.

4.4 Properties After Solution Heat Treatment:

4.4.1 Tensile Properties:

Nominal Diameter Inches	Nominal Wall Thickness Inch	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E=10,500,000)		Elongation % in 2 in., min
			psi, min	Extension Under Load in. in 2 in.	
$\emptyset$ 1/4 to 2 incl	0.024 and under	62,000	40,000	0.0116	10
	Over 0.024 - 0.049, incl	62,000	40,000	0.0116	12
	Over 0.049 - 0.259, incl	62,000	40,000	0.0116	14
	Over 0.259 - 0.500, incl	62,000	40,000	0.0116	16
Over 2 to 8, incl	0.259 and under	62,000	40,000	0.0116	10
	Over 0.259 - 0.500, incl	62,000	40,000	0.0116	12

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