SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Dr., Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4555F

Issued 9-1-41
Revised 10-1-89

Superseding AMS 4555E

BRASS TUBING, SEAMLESS
66.5Cu - 32.5Zn - 0.48Pb
Light Annealed (050)

UNS C33000

1. SCOPE:

1.1 Form: This specification covers one type of brass in the form of seamless tubing.

1.2 Application: Primarily for parts requiring moderate strength and fair ductility.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2223 - Tolerances, Copper and Copper Alloy Seamless Tubing
MAM 2223 - Tolerances, Metric, Copper and Copper Alloy Seamless Tubing
AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM B154 - Mercurous Nitrate Test for Copper and Copper Alloys
ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube
ASTM B251M - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube (Metric)
ASTM E8 - Tension Testing of Metallic Materials
ASTM E8M - Tension Testing of Metallic Materials (Metric)
ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E112 - Determining Average Grain Size
ASTM E478 - Chemical Analysis of Copper Alloys

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-C-3993 - Copper and Copper-Base Alloy Mill Products, Packaging of

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, Ø determined by wet chemical methods in accordance with ASTM E478, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Copper	65.00	68.0
Lead (3.1.1)	0.25	0.7
Iron	--	0.7
Zinc + Sum of Named Elements (3.1.3)	99.6	--
Zinc (3.1.2)	remainder	

3.1.1 For tubing over 5 inches (127 mm) in OD, lead may be less than 0.20%. Ø

3.1.2 Applicable when zinc is not determined by analysis. The reported Ø (certified) value is the difference between the sum of all other specified elements and 100%; and will therefore include unnamed elements. Limits for unnamed elements may be established by agreement between purchaser and manufacturer and supplier.

3.1.3 Applicable only when zinc is determined by direct analysis. Ø

3.2 Condition: In light annealed (O50) temper (See 8.2). Tubing shall be Ø either bright annealed or acid cleaned after final annealing operation.

3.3 Fabrication: Tubing shall be produced by a seamless process. The external Ø and internal surface finishes shall be produced by any method which will result in surfaces free from laps, folds, tears, extraneous materials, and which show no oxide discoloration. Processing shall not affect limits of wall thickness or corrosion resistance.

3.4 Properties: Tubing shall conform to the following requirements:

3.4.1 Tensile Properties: Shall be as follows, determined in accordance with ASTM E8 or ASTM E8M:

Tensile Strength, minimum	44,000 psi (303 MPa)
Elongation in 2 Inches (50.8 mm), minimum	35%

3.4.2 Grain Size: Average grain size shall be not larger than 0.035 mm, determined in accordance with ASTM E112.

3.4.3 Hardness: Should be 28 - 53 HR30T, or equivalent, determined in accordance with ASTM E18, but tubing shall not be rejected on the basis of hardness if the tensile property and grain size requirements are met.

3.4.4 Flarability: Tubing shall withstand flaring at room temperature, without formation of cracks or other visible defects, 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 specified in Table I.

TABLE I

Nominal OD		Permanent
Inches	Millimetres	Expanded OD
Up to 0.750, incl	Up to 19.05, incl	1.20 X nominal OD
Over 0.750 to 4.000, incl	Over 19.05 to 101.60, incl	1.15 X nominal OD

3.4.5 Embrittlement: Specimens of tubing, approximately 6 inches (152 mm) in length, shall withstand, without cracking, immersion in mercurous nitrate in accordance with ASTM B154, Procedure A.

3.5 Quality: Tubing, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the tubing.

3.6 Tolerances: Shall conform to AMS 2223 or MAM 2223 as applicable to nonrefractory alloys.

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 performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the tubing conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile properties (3.4.1), grain size (3.4.2), hardness (3.4.3), flarability (3.4.4), and tolerances (3.6) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for embrittlement (3.4.5) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with ASTM B251 or ASTM B251M and the following:

4.3.1 Specimens for flarability test (3.4.4) 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 tubing shall furnish with each shipment a report showing the results of tests for chemical composition, tensile properties, grain size, hardness, and flarability of each lot, and stating that the tubing conforms to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 4555F, nominal size, and quantity.

4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the tubing may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the tubing represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Individual tubes or bundles shall have attached a durable tag marked with not less than the purchase order number, AMS 4555F, and nominal size or shall be boxed and the box marked with the same information.