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AEROSPACE MATERIAL SPECIFICATION

AMS 4555E
Superseding AMS 4555D

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BRASS TUBING, SEAMLESS
68Cu - 31Zn
Light Annealed

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 Aerospace Material Specifications (AMS) 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
AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 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 E8 - Tension Testing of Metallic Materials
ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E112 - Estimating the Average Grain Size of Metals
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 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 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 spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

	min	max
Copper	65.00	71.50
Lead	--	0.80
Tin	--	0.15
Iron	--	0.07
Other Elements, each (3.1.1)	--	0.05
Other Elements, total (3.1.1)	--	0.15
Zinc	remainder	

3.1.1 Determination not required for routine acceptance.

3.2 Condition: Fully recrystallized, in light annealed temper. Tubing shall be either bright annealed or acid cleaned after final annealing operations.

3.3 Fabrication: Tubing shall be produced by a seamless process. The external and internal surface finishes shall be produced by any method which will provide the required surface condition and which will 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:

Tensile Strength, min	44,000 psi (305 MPa)
Elongation in 2 in. (50 mm), min	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 deg included angle to produce a flare having a permanent expanded OD not less than specified in Table I.

TABLE I

Nominal OD		Permanent Expanded OD
Inches	(Millimetres)	
Up to 0.750, incl	(Up to 18.75, incl)	1.20 X nominal OD
Over 0.750 to 4.000, incl	(Over 18.75 to 100.00, incl)	1.15 X nominal OD

3.4.5 Embrittlement: Specimens of tubing, approximately 6 in. (150 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 internal and external imperfections detrimental to usage of the tubing.

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to AMS 2223 as applicable to nonrefractory alloys.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of tubing shall supply all Ø 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 Ø 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 Ø 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 and the following:

4.3.1 Specimens for flarability (3.4.4) test 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:

4.4.1 The vendor of tubing shall furnish with each shipment three copies of 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 4555E, nominal size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, AMS 4555E, 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 either a statement that the tubing conforms or copies of laboratory reports showing the results of tests to determine conformance.

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 the purchase order number, AMS 4555E, and nominal size or shall be boxed and the box marked with the same information.

5.2 Packaging:

5.2.1 Ø Tubing shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the tubing to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.2.2 Ø For direct U.S. Military procurement, packaging shall be in accordance with MIL-C-3993, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 will be acceptable if it meets the requirements of Level C.

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