

MIL-T-6945A

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SUPERSEDING

MIL-T-6945

5 September 1950

## MILITARY SPECIFICATION

## TUBING, BRASS SEAMLESS

This specification is approved for use by the Department of the Air Force, and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers seamless brass tubing used to fabricate turnbuckle barrels used on aircraft.

1.2 Classification. Tubing shall be sizes as specified (see 6.2).

1.3 Material identification. Bulk material identification number shall be contracted per 6.3.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

## STANDARDS

## FEDERAL

FED-STD-151

Metals, Test Methods

(Copies of specifications and standards required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: the Engineering Division, San Antonio Air Logistics Center/MMEDO, Kelly AFB, Texas 78241 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2.2 Other publications: The following document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 154	Mercurous Nitrate Test for Copper and Copper Alloys
ASTM B 251	General Requirement for Wrought Seamless Copper and Copper - Alloy Tube
ASTM D 3951	Standard Practice for Commercial Packaging

(Application for copies of ASTM publications should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Material. The material used shall be such as to produce tubing in full conformance with all requirements of this specification.

3.1.1 Tubing. The tubing shall be made by extruding, rocking and cold drawing; by extruding and drawing; or by piercing and drawing; annealing as necessary, and bringing to final finish by cold drawing and relief annealing.

3.1.2 Workmanship. The tubing shall have a good workmanlike finish conforming to the best practice for high quality aircraft material. It shall be smooth, clean, and free from burrs, seams, tears, grooves, laminations, slivers, pits and other injurious defects. Surface imperfections such as handling marks, straightening marks, light mandrel and die marks, and shallow pits, will not be considered as injurious defects, provided the imperfections are removable within the tolerances specified herein for diameter and wall thickness. The removal of surface imperfections is not required.

3.2 Composition. Chemical composition shall be as specified in Table I.

TABLE I. Chemical composition.

Compo- sition	Copper	Tin	Iron (max.)	Lead (max.)	Total Other Elements (max.)	Zinc	CDA Alloy (Ref)
	Percent	Percent	Percent	Percent	Percent	Percent	
I	59-62	0.5-1.5	0.10	0.20	0.10	Remainder	464, 465, 466
II	68.5-71.5	"	0.06	0.075	-	Remainder	260
III	65-68	"	0.07	0.80	-	Remainder	330

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3.3 Mechanical properties. The tubing shall be furnished in the hard drawn and relief annealed condition to develop the mechanical properties specified in Table II.

TABLE II. Physical properties.

Tensile Strength (min.)	Yield Strength at 0.2% Offset or at Extension Indicated		Elongation in 2 inches (min.)
	(min.)	Extension under load	
lb. per sq. in.	lb. per sq. in.	Inch in 2 inches	percent
67 000	45 000	0.0100	9

3.4 Internal strain. Tubing specimens shall withstand internal strain test without showing surface cracks.

3.5 Microstructure. Specimens when examined microscopically shall not show dendritic or fernlike structures, coarse grain, or other evidence of excessive heating or other improper treatment during manufacturing operations.

3.6 Diameters. Outside and inside diameters shall be as specified in Table III.

TABLE III. Diameters.

Size Code	Outside Diameter +0.005	Inside Diameter +0.002
	Inch	Inch
A	0.250	0.093
B	0.250	0.115
C	0.375	0.160
D	0.438	0.215
E	0.500	0.271
F	0.625	0.334
G	0.750	0.387
H	0.875	0.450

3.7 Straightness. Tubing must meet the straightness requirements of ASTM B 251.

3.8 Length.

3.8.1 Exact Lengths. Tubing of all sizes may be ordered to exact lengths or in lengths expressed as a multiple of a definite unit, with tolerances as specified in the contract or purchase order.

3.8.2 Mill lengths. When exact or multiple lengths are not ordered, tubing will be accepted in mill lengths of 7 to 14 feet.

- \* 3.9 Reclaimed materials. The use of reclaimed materials shall be encouraged to the maximum extent possible.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

#### 4.2 Inspection.

4.2.1 General. Sampling, inspection and tests shall be conducted in accordance with FED-STD-151 and as specified herein.

4.2.2 Report of tests. The contractor shall furnish test reports, in duplicate, showing quantitative results for all tests and analyses required by this specification, and signed by the Director, or his authorized assistant, of the laboratory in which the tests were conducted.

4.2.3 Examination of product. Representative pieces of tubing from each lot shall be carefully examined to determine conformance with this specification with respect to material, workmanship and tolerances.

4.2.4 Inspection lot. An inspection lot shall consist of all tubing of the same size and composition submitted for inspection at the same time.

#### 4.3 Sampling.

4.3.1 Chemical samples. Samples for analysis shall be selected as described in FED-STD-151 to represent each 5000 pounds, or fraction thereof, comprising a lot.

4.3.2 Sampling plan. Samples for analysis shall include material from the entire cross-section of the tubing. The sample shall consist of not less than two ounces.

4.3.3 Sampling plan. Samples for analysis may be waived at the discretion of the Inspector, provided that all of the material under inspection can be identified as having been previously analyzed and found to be in conformance with the chemical composition specified herein.

4.3.4 Test samples. At least one tension test sample, one internal strain test sample and two microscopic examination samples shall be selected from each 5000 lbs. or less of material comprising the lot. The two microscopic examination samples shall not be taken from the same length of tubing.

4.3.4.1 Tension test specimens. The specimens shall be full section, straight, and of suitable length.

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4.3.4.2 Internal strain specimens. Specimens for the internal strain test shall be full cross-section not less than six inches long.

4.3.4.3 Microscopic examination specimens. Specimens shall be full cross-sections of the tubing of suitable length.

#### 4.4 Tests.

4.4.1 Chemical analysis. Chemical analysis shall be by standard wet chemical or spectrographic methods. In case of dispute, chemical analysis by standard wet chemical methods shall be the basis for acceptance.

4.4.2 Tension tests. Tension tests shall be conducted in accordance with FED-STD-151. Yield strength shall be determined by the offset or the extension under load methods in accordance with FED-STD-151.

4.4.3 Internal strain. The specimen shall be tested per ASTM B 154.

4.4.4 Microstructure. Microscopic examination shall be made of the character and conformation of the microstructure which is of greater importance than the actual grain size.

#### 4.5 Retest.

4.5.1 Tension test. If any tension test specimen breaks in the grips of the testing machine, a retest shall be allowed.

4.5.2 Sample. If the internal strain sample is found to be cracked after 30 minutes immersion in accelerated cracking solution, two additional samples shall be taken from different lengths of tubing. Both retests shall be required to withstand the 30 minute immersion without cracking.

4.5.3 Failures. Where failure of any lot of material to meet the requirements of this specification is due to inadequate annealing, the material may be reannealed and resubmitted for tests. Only one such reannealing will be allowed.

### 5. PACKAGING

5.1 Preservation and packing. Preservation and packing of the brass tubing shall be within the constraints of commercial/industrial level of packaging as specified (see 6.2). The commercial/industrial packaging of the brass tubing shall be in accordance with the requirements of ASTM D 3951.

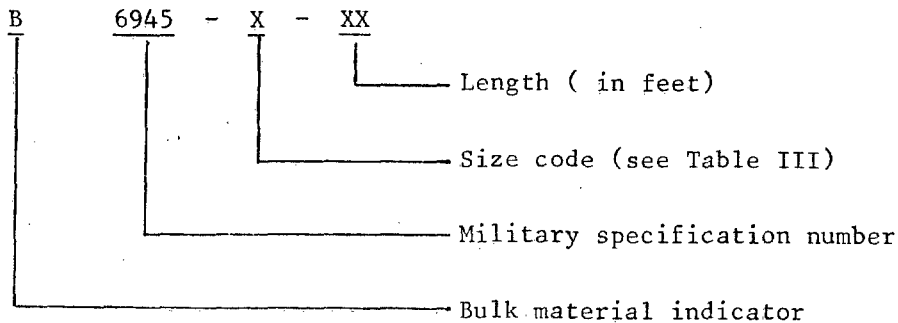
5.2 Marking. In addition to any special or other identification markings required by the contract (see 6.2) each unit pack, intermediate and exterior container shall be marked in accordance with ASTM D 3951.

### 6. NOTES

6.1 Intended use. Tubing covered by this specification is intended for use in fabrication of turnbuckle barrels for aircraft.

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- \* 6.2 Ordering data. Acquisition documents should specify:
- Title, number and date of this specification
  - Definitive part number
  - Levels of preservation/packaging and packing (see 5.1)
- \* 6.3 Bulk material identification number. Number shall be constructed as shown.



Example:

B6945-C-10 is .3750D, .160 ID and 10 feet long tube.

6.4 Changes from previous issue. The margins of this document are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractor's are cautioned to evaluate the requirements of this document based on the entire content, irrespective of the marginal notations and relationship to the last previous issue.

Custodian:  
Air Force - 99

Preparing activity:  
Air Force - 82

Review activities:  
Army - AR, MI, ER  
Air Force - 20

Project 4710-A726

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## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-T-6945A		2. DOCUMENT TITLE TUBING, BRASS SEAMLESS	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
b. ADDRESS (Street, City, State, ZIP Code)			
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
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