INCH-POUND
MIL-T-24107B
16 October 1987
SUPERSEDING
MIL-T-24107A(SH)
7 May 1976
(See 6.4)

MILITARY SPECIFICATION

TUBE, COPPER (SEAMLESS)
(COPPER ALLOY NUMBERS C10100, C10200, C10300, C10800, C12000, C12200, AND C14200)

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

1. SCOPE

1.1 Scope. This specification covers seamless copper tube with standard pipe size outside diameters (od), including some intermediate nonstandard sizes. Drawn-temper tubes may be used with brazed or solder type fittings. Annealed-temper tubes may be used with flared, flanged, soldered, or brazed fittings.

1.2 Classification. Copper tube shall be of the following alloys and tempers (see 6.2.1):

Composition

Alloy number C10100
Alloy number C10200 (Formerly alloy 102)
Alloy number C10300 (Formerly alloy 103)
Alloy number C10800 (Formerly alloy 108)
Alloy number C12000 (Formerly alloy 120)
Alloy number C12200 (Formerly alloy 122)
Alloy number C14200 (Formerly alloy 142)

Temper

Annealed
Drawn

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 4710

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Standards. The following standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

STANDARDS

FEDERAL

FED-STD-151 - Metals; Test Methods.
FED-STD-185 - Identification Marking of Copper and Copper Base Alloy Mill Products.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-792 - Identification Marking Requirements for Special Purpose Components.

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 75 - Standard Specification for Seamless Copper Tube. (DoD adopted)
B 251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube. (DoD adopted)

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

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. Seamless copper tubes shall be in accordance with ASTM B 75 and as specified herein.

3.2 Mechanical properties. Annealed and drawn temper tubes shall meet the tensile and yield strength requirements in accordance with ASTM B 75.

3.2.1 Expansion or flattening. Expansion or alternate flattening shall be performed in accordance with ASTM B 75.

3.3 Embrittlement. Embrittlement shall be performed in accordance with ASTM B 75.

3.4 Dimensions and weights. The size of tube required shall be as specified (see 6.2.1). Standard dimensions and weights shall be as specified in table I. Tube larger than 10.75-inch od shall be ordered with wall thicknesses as specified by the command or agency concerned.

TABLE I. Standard sizes, dimensions, weight and minimum test pressure. 1/

Standard pipe size 2/ (inches)	Tube dimensions		Weight per foot of length (pounds)	Minimum test pressure (lb/in^2)
	Specified od (inches)	Specified wall thickness, minimum (inch)		
----	0.125	0.032	0.0362	1000
	.188	.032	.0608	1000
	.250	.032	.0846	1000
	.312	.032	.109	1000
	.375	.032	.134	1000
1/8	.405	.065	.269	1000
		.083	.325	1000
		.109	.393	1000
3/	.438	.032	.158	1000

See footnotes at end of table.

TABLE I. Standard sizes, dimensions, weight and minimum test pressure. 1/ - Continued

Standard pipe size 2/ (inches)	Tube dimensions		Weight per foot of length (pounds)	Minimum test pressure (lb/in^2)
	Specified od (inches)	Specified wall thickness, minimum (inch)		
3/	0.500	0.032	0.182	1000
		.065	.344	1000
1/4	.540	.065	.376	1000
		.072	.411	1000
		.109	.572	1000
		.134	.662	1000
3/8	.675	.065	.483	1000
		.095	.671	1000
		.134	.883	1000
		.165	1.02	1000
1/2	.840	.065	0.613	1000
		.083	.765	1000
		.120	1.05	1000
		.165	1.36	1000
		.220	1.66	1000
3/4	1.050	.065	0.780	1000
		.095	1.10	1000
		.148	1.63	1000
		.203	2.09	1000
		.263	2.52	1000
1	1.315	.065	0.989	950
		.120	1.75	1000
		.180	2.49	1000
		.259	3.33	1000
		.340	4.04	1000
1-1/4	1.660	0.065	1.26	700
		.072	1.39	850
		.084	1.61	950
		.148	2.72	1000
		.220	3.86	1000
		.340	5.47	1000
		.425	6.39	1000

See footnotes at end of table.

TABLE I. Standard sizes, dimensions, weight and minimum test pressure. 1/ - Continued

Standard pipe size 2/ (inches)	Tube dimensions		Weight per foot of length (pounds)	Minimum test pressure (lb/in^2)
	Specified od (inches)	Specified wall thickness, minimum (inch)		
1-1/2	1.900	0.065	1.45	650
		.096	2.11	900
		.180	3.77	1000
		.259	5.18	1000
		.380	7.03	1000
2	2.375	.065	1.83	550
		.083	2.32	650
		.109	3.01	850
		.120	3.30	950
		.220	5.77	1000
		.340	8.43	1000
		.457	10.67	1000
2-1/2	2.875	.065	2.22	400
		.100	3.38	650
		.134	4.47	850
		.145	4.82	950
		.259	8.25	1000
		.380	11.54	1000
3	3.500	.065	2.72	350
		.083	3.45	450
		.122	5.02	650
		.165	6.70	850
		.177	7.16	950
		.340	13.08	1000
3-1/2	4.000	.065	3.11	300
		.095	4.52	450
		.140	6.58	650
		.202	9.34	1000
4	4.500	0.065	3.51	100
		.107	5.72	450
		.157	8.30	650
		.228	11.86	950
3/	5.000	.065	3.91	250
		.119	7.07	450
		.174	10.23	650

See footnotes at end of table.

TABLE I. Standard sizes, dimensions, weight and minimum test pressure. 1/ - Continued

Standard pipe size 2/ (inches)	Tube dimensions		Weight per foot of length (pounds)	Minimum test pressure (lb/in^2)
	Specified od (inches)	Specified wall thickness, minimum (inch)		
5	5.563	0.068	4.55	250
		.132	8.73	450
		.194	12.68	650
		.281	18.07	950
3/	6.125	.075	5.53	250
		.146	10.63	450
		.214	15.40	650
6	6.625	.081	6.45	250
		.158	12.44	450
		.231	17.99	650
		.335	25.66	1000
3/	7.125	.087	7.46	250
		.170	14.40	450
		.249	20.85	650
3/	7.625	.093	8.53	250
		.182	16.50	450
		.266	23.84	650
3/	8.125	.099	9.68	250
		.193	18.64	400
		.283	27.02	650
8	8.625	.105	10.89	250
		.205	21.02	450
		.301	30.51	650
		.463	43.48	950
3/	9.125	0.111	12.18	250
		.217	23.54	450
		.318	34.10	650
3/	9.625	.117	13.55	250
		.229	26.20	450
		.336	38.01	650

See footnotes at end of table.

TABLE I. Standard sizes, dimensions, weight and minimum test pressure. 1/ - Continued

Standard pipe size 2/ (inches)	Tube dimensions		Weight per foot of length (pounds)	Minimum test pressure (lb/in^2)
	Specified od (inches)	Specified wall thickness, minimum (inch)		
3/	10.250	0.125 .244 .358	15.41 29.73 43.12	250 450 650
10	10.750	.131 .256 .375 .544	16.94 32.71 47.38 67.61	250 450 650 1000

1/ Tubes shall be designated by actual od and wall thickness.
2/ For information only.
3/ There is no corresponding standard pipe size for this od.

3.5 Tolerances. The tolerances shall be as specified in ASTM B 251, when tubing is specified for torpedo use (see 6.2.1). The straightness tolerance specified in ASTM B 251 shall be applicable to drawn temper tube from 1/4 to 10 inches in od.

3.5.1 Roundness (straight lengths only).

3.5.1.1 Annealed-temper tube. Provided that the tube conforms to all other dimensional requirements specified herein, the tube, when examined at the mill, will be acceptable if the difference between the major and minor od at any one cross section does not exceed the percentages of the nominal od specified in table II.

TABLE II. Roundness tolerances for annealed temper tube.

Specified od (inches)	Percentage of specified od (percent)
5.563 and less	3
Over 5.63	6

3.5.2 Weight. No lot of tubing shall exceed the calculated weight by more than 10 percent.

3.6 Mill lengths. Unless otherwise specified (see 6.2.1), tubing shall be in mill lengths. When specified to be specific lengths, tubing shall meet the length tolerances of ASTM B 251 (see 6.2.1).

3.7 Coils. Tubing shall be straight lengths or coils as specified (see 6.2.1).

3.8 Ends. Unless threaded ends are specified (see 6.2.1), tubing shall be made with sawed or machine cut ends.

3.9 Identification marking. Unless otherwise specified (see 6.2.1), continuous identification marking shall be applied in accordance with FED-STD-185. Material may be marked for identification by means of a vibratory tool, electrochemical etching, or paint or ink stenciling in accordance with MIL-STD-792. Markings resulting from those methods shall not reduce the wall thickness below the specified minimum. Marking paints or inks shall not contain mercury. Electric arc or impression marking is prohibited. Tube with minimum wall thickness less than 0.125 inch shall not be marked by vibratory tool.

3.10 Removal and repair of defects. Removal of surface defects shall be accomplished by grinding, machining or filing with a clean file, provided the wall thickness is not reduced below the minimum specified in 3.4 and the ground areas are well-faired into the rest of the tube or pipe. A well-faired area shall be considered one in which the bottom radius of the ground area equals at least 3 times the depth of the defect. If grinding is used to remove the surface defect, the grinding medium shall be 120 or finer iron-free alumina grit. Grinding shall be limited to the use of either resin or rubber bonded wheels. After such conditioning operations, the conditioned areas shall be reinspected by the nondestructive inspection techniques used in originally detecting the defect. Tube shall not be repaired by welding or brazing.

3.11 Workmanship. Tubes shall be commercially clean, free of films or scale, dirt, chips or any foreign matter. In addition, tubes shall be uniform in quality, sound and free from seams, cracks, laps, burrs, blisters, slivers, scale or other injurious defects such as pitting as determined by visual examination. Surface imperfections such as handling marks, straightening marks, light mandrel, die or roll marks that do not reduce the wall thickness below the minimum specified are permissible, provided the imperfections have visible bottoms and the depth does not exceed 3 percent of the wall thickness.

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 that supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Certification of quality compliance. When specified in the contract or order, a certification data/report shall be prepared (see 6.2.2).

4.2 Lot and melts.

4.2.1 Lot. Unless otherwise specified (see 6.2.1), a lot shall consist of tubes of the same size and temper. Unless otherwise specified (see 6.2.1), the maximum lot size shall be as specified in ASTM B 251.

4.2.2 Melts. The contractor shall report the melt source of the master melt if the contractor is not the melter of the master melt.

4.3 Sampling. Sampling shall be as specified in 4.3.1 through 4.3.4.

4.3.1 Sampling for visual and dimensional examination. Sampling for visual and dimensional examination shall be as specified in MIL-STD-105, general inspection level II, acceptable quality level (AQL) 1.5.

4.3.2 Sampling for tests. Sampling for tests, other than chemical analysis, shall be as specified in ASTM B 251.

4.3.3 Sampling for chemical analysis. When samples are taken from the finished product, 2 ounces of clean chips selected in accordance with method 111 or a solid sample selected and prepared in accordance with method 112.1 of FED-STD-151 shall be taken from two tubes selected at random from each lot.

4.3.4 Sampling for mechanical and microstructural properties. Sampling for mechanical and microstructural properties shall be as specified in table III.

TABLE III. Sampling for destructive tests.

Number of tubes in lot	Number of tubes to be tested
1	1
2 - 64	2
65 - 160	3
161 - 400	5
401 - 1000	8
1001 - 2500	13

4.4 Examination.

4.4.1 Visual and dimensional examination. Each sample tube selected in accordance with 4.3.1 shall be visually examined and measured to verify conformance to 3.4, 3.7, and 3.9.

4.4.2 Nonconforming tubes. Any tube not meeting the requirements of 3.7 or 3.9 in each examination sample shall not be offered for delivery, and if the number of nonconforming tubes in the sample exceeds the number specified in MIL-STD-105, general inspection level II, AQL 1.5, the entire lot shall be rejected. The disposition of nonconforming material shall be in accordance with MIL-STD-105.

4.5 Tests. Tests shall be as specified in 4.5.1 and 4.5.2.

4.5.1 Tensile and yield strength. Annealed and drawn temper tubes shall have tensile and yield strength tests performed in accordance with ASTM B 75.

4.5.2 Hydrostatic pressure test. When the hydrostatic pressure test specified in ASTM B 75 is used rather than the eddy current test, the internal hydrostatic pressure shall be not less than 150 percent or exceed 165 percent of the maximum allowable working pressure calculated by the equation given in ASTM B 75. Test pressures over 4500 pounds per square inch (lb/in^2) shall only be used when specified (see 6.2.1). When specified (see 6.2.1), tube may be tested at the minimum test pressure specified in table I.

4.5.3 Eddy current test. In lieu of the calibration method for eddy current testers specified in ASTM B 75, for small diameter tube, notches or drilled holes shall comply with the calibration standards specified in table IV. For all other sizes, calibration standards shall be in accordance with ASTM B 75.

TABLE IV. Calibration standards.

Nominal tube od (inches)	Wall thickness (inches)	Notch depth (inches)	Diameter drilled holes (inches)	Maximum percent unbalance signal magnitude
1/4	0.030	0.006	0.025	0.15
5/16	.032	.006	.025	.15

For larger diameter tube, calibration standards for speed-insensitive eddy-current testers shall comply with the following:

Nominal tube od (inches)	Maximum unbalance signal magnitude (percent)
3/8	0.2
1/2 to 2, incl.	.3
Over 2 to 3-1/8, incl.	.4

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 Packaging and packing. Packaging and packing shall be in accordance with the levels specified (see 6.2.1), and shall include marking in accordance with ASTM B 251.

6. NOTES

6.1 Intended use. Seamless copper tube covered by this specification is intended for general use on board ship with flanges and soldered, brazed, or flared fittings when straight and not threaded. When bending or threading is required, tubes with adequate wall thickness should be specified.

6.1.1 In other than shipboard application, seamless copper tube is intended for soldered, brazed, or flared type fittings for plumbing, heating, and other work with pressure up to 250 lb/in^2. Copper water tube is covered in ASTM B 88, copper refrigeration tube in ASTM B 280, and copper pipe in WW-P-377.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.
(b) Alloy and temper required (see 1.2).
(c) Size of tube required (outside diameter, wall thickness, and length, if to specific lengths) (see 3.4).
(d) When tube is for torpedo use (see 3.5).
(e) Whether specific lengths are required and length required (see 3.6).
(f) Whether tube shall be furnished in straight lengths or coils (see 3.7).
(g) When threading is required and details of special threading (see 3.8).
(h) If identification is other than specified (see 3.9).
(i) If lot definition and size are other than specified (see 4.2.1).
(j) When a minimum test pressure as specified in table I is to be used and if tests at pressures over 4500 lb/in^2 are to be negotiated (see 4.5.2).
(k) Level of packaging and packing required (see 5.1).

6.2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DoD FAR Supplement, Part 27, Sub-Part 27.475-1 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification are cited in the following paragraph.

Paragraph no.	Data requirement title	Applicable DID no.	Option
4.1.2	Certification data/report	UDI-A-23264	----

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5010.12-L., AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 Subject term (key word) listing.

Annealed-temper
Drawn-temper
Embrittlement

6.4 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:
Army - MR
Navy - SH
Air Force - 99

Review activities:
Navy - MC, YD
Air Force - 84
DLA - CS

Preparing activity:
Navy - SH
(Project 4710-0715)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-T-24107B	TUBE, COPPER (SEAMLESS) (COPPER ALLOY NUMBERS C10100, C10300, C10800, C12000, C12200, AND C14200)

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR ☐ USER ☐ MANUFACTURER ☐ 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
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)

DD FORM 82 MAR 1426 PREVIOUS EDITION IS OBSOLETE.