



Designation: B88 – 22

Standard Specification for Seamless Copper Water Tube¹

This standard is issued under the fixed designation B88; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification establishes the requirements for seamless copper water tube suitable for general plumbing, similar applications for the conveyance of fluids, and commonly used with solder, flared, or compression-type fittings. The type of copper water tube suitable for any particular application is determined by the internal or external fluid pressure, by the installation and service conditions, and by local requirements. Means of joining or bending are also factors which affect the selection of the type of tube to be used.²

NOTE 1—Annealed tube is suitable for use with flared or compression fittings, and with solder-type fittings, provided rounding and sizing of the tube ends is performed where needed.

NOTE 2—Drawn temper tube is suitable for use with solder-type fittings. Types K and L tube, in the drawn temper, are suitable for use with certain types and sizes of compression fittings.

NOTE 3—Fittings used for soldered or brazed connections in plumbing systems are described in ASME B16.18 and ASME B16.22.

1.2 The tube shall be produced from the following coppers, and the manufacturer has the option to supply any one of them, unless otherwise specified.

Copper UNS No.	Previously Used Designation	Description
C12000	DLP	Phosphorus deoxidized, low residual phosphorus
C12200	DHP	Phosphorus deoxidized, high residual phosphorus

1.3 The assembly of copper plumbing or fire sprinkler systems by soldering is described in Practice B828.

1.4 Solders for joining copper potable water or fire sprinkler systems are covered by Specification B32. The requirements for acceptable fluxes for these systems are covered by Specification B813.

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.04 on Pipe and Tube.

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² The UNS system for copper and copper alloys (see Practice E527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix “C” and a suffix “00.” The suffix is permitted to be used to accommodate composition variations of the base alloy.

1.5 *Units*—The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.5.1 This specification is the companion specification to SI Specification B88M; therefore, no SI equivalents are shown in this specification.

1.5.1.1 *Exception*—Values given in inch-pound units are the standard except for grain size, which is stated in SI units.

1.6 The following safety hazards caveat pertains only to the test methods portion, Section 16, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:³

B32 Specification for Solder Metal

B88M Specification for Seamless Copper Water Tube (Metric)

B153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing

B577 Test Methods for Detection of Cuprous Oxide (Hydrogen Embrittlement Susceptibility) in Copper

B813 Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube

B828 Practice for Making Capillary Joints by Soldering of

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

Copper and Copper Alloy Tube and Fittings
B846 Terminology for Copper and Copper Alloys
B900 Practice for Packaging of Copper and Copper Alloy Mill Products for U.S. Government Agencies
B968/B968M Test Method for Flattening of Copper and Copper-Alloy Pipe and Tube
E8/E8M Test Methods for Tension Testing of Metallic Materials
E18 Test Methods for Rockwell Hardness of Metallic Materials
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry (Withdrawn 2022)⁴
E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)⁴
E112 Test Methods for Determining Average Grain Size
E243 Practice for Electromagnetic (Eddy Current) Examination of Copper and Copper-Alloy Tubes
E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.3 ASME Standards:

ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings⁵

ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings⁵

3. Terminology

3.1 *Definitions*:—For definitions of terms related to copper and copper alloys, refer to Terminology **B846**.

4. Ordering Information

4.1 Include the following specified choices when placing orders under this specification, as applicable.

4.1.1 ASTM designation and year of issue (for example, B88 – 03);

4.1.2 Copper [Alloy] UNS No. (or other internationally recognized alloy) designation (not necessary unless a specific copper is desired);

4.1.3 Nominal or standard size (Column 1 of **Table 1**) and whether Type K, L, or M (Sections 3 and 12);

4.1.4 Temper (Section 7);

4.1.5 Length (see 12.5);

4.1.6 How furnished: straight lengths or coils; and

4.1.7 Quantity (pieces) of each size and type.

4.1.8 If product is purchased for agencies of the U.S. Government, it shall conform to the Supplementary Requirements as defined herein when specified in the contract or purchase order.

4.2 The following options are available and shall be specified at the time of the order, when required:

4.2.1 Expansion of chemical analysis (see 6.2);

4.2.2 Tensile test;

4.2.3 Grain size determination (Section 8);

4.2.4 Hardness test (Section 9);

⁴ The last approved version of this historical standard is referenced on www.astm.org.

⁵ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

TABLE 1 Dimensions, Weights, and Tolerances in Diameter and Wall Thickness for Nominal or Standard Copper Water Tube Sizes
 (All tolerances are plus and minus except as otherwise indicated)

Nominal or Standard Size, in.	Outside Diameter, in.	Average Outside Diameter ^A Tolerance, in.		Wall Thickness and Tolerances, in.						Theoretical Weight, lb/ft		
		Annealed	Drawn	Type K		Type L		Type M		Type K	Type L	Type M
				Wall Thickness	Tolerance ^B	Wall Thickness	Tolerance ^B	Wall Thickness	Tolerance ^B			
1/4	0.375	0.002	0.001	0.035	0.0035	0.030	0.003	^C	^C	0.145	0.126	^C
3/8	0.500	0.0025	0.001	0.049	0.005	0.035	0.004	0.025	0.002	0.269	0.198	0.145
1/2	0.625	0.0025	0.001	0.049	0.005	0.040	0.004	0.028	0.003	0.344	0.285	0.204
5/8	0.750	0.0025	0.001	0.049	0.005	0.042	0.004	^C	^C	0.418	0.362	^C
3/4	0.875	0.003	0.001	0.065	0.006	0.045	0.004	0.032	0.003	0.641	0.455	0.328
1	1.125	0.0035	0.0015	0.065	0.006	0.050	0.005	0.035	0.004	0.839	0.655	0.465
1 1/4	1.375	0.004	0.0015	0.065	0.006	0.055	0.006	0.042	0.004	1.04	0.884	0.682
1 1/2	1.625	0.0045	0.002	0.072	0.007	0.060	0.006	0.049	0.005	1.36	1.14	0.940
2	2.125	0.005	0.002	0.083	0.008	0.070	0.007	0.058	0.006	2.06	1.75	1.46
2 1/2	2.625	0.005	0.002	0.095	0.010	0.080	0.008	0.065	0.006	2.93	2.48	2.03
3	3.125	0.005	0.002	0.109	0.011	0.090	0.009	0.072	0.007	4.00	3.33	2.68
3 1/2	3.625	0.005	0.002	0.120	0.012	0.100	0.010	0.083	0.008	5.12	4.29	3.58
4	4.125	0.005	0.002	0.134	0.013	0.110	0.011	0.095	0.010	6.51	5.38	4.66
5	5.125	0.005	0.002	0.160	0.016	0.125	0.012	0.109	0.011	9.67	7.61	6.66
6	6.125	0.005	0.002	0.192	0.019	0.140	0.014	0.122	0.012	13.9	10.2	8.92
8	8.125	0.006	+ 0.002 – 0.004	0.271	0.027	0.200	0.020	0.170	0.017	25.9	19.3	16.5
10	10.125	0.008	+ 0.002 – 0.006	0.338	0.034	0.250	0.025	0.212	0.021	40.3	30.1	25.6
12	12.125	0.008	+ 0.002 – 0.006	0.405	0.040	0.280	0.028	0.254	0.025	57.8	40.4	36.7

^A The average outside diameter of a tube is the average of the maximum and minimum outside diameter, as determined at any one cross section of the tube.

^B Maximum deviation at any one point.

^C Indicates that the material is not generally available or that no tolerance has been established.