



Designation: B280 – 23

Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service¹

This standard is issued under the fixed designation B280; 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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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

1. Scope*

1.1 This specification covers the requirements for seamless copper tube intended for use in the connection, repairs, or alternations of air conditioning or refrigeration units in the field.

NOTE 1—Fittings used for soldered or brazed connections in air conditioning and refrigeration systems are described in ASME Standard B16.22.

NOTE 2—The assembly of copper tubular systems by soldering is described in Practice B828.

NOTE 3—Solders for joining copper tubular systems are described in Specification B32. The requirements for acceptable fluxes for these systems are described in Specification B813.

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
C10200	OF	Oxygen free without residual deoxidants
C12000	DLP	Phosphorus deoxidized, low residual phosphorus
C12200	DHP	Phosphorus deoxidized, high residual phosphorus

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The following hazard statement pertains only to the test method described in 18.2.4 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 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.

Current edition approved Oct. 1, 2023. Published October 2023. Originally approved in 1953. Last previous edition approved in 2020 as B280–20. DOI: 10.1520/B0280-23.

1.5 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 ASTM Standards:²

- B32 Specification for Solder Metal
- 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
- B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast
- B813 Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
- B828 Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
- B900 Practice for Packaging of Copper and Copper Alloy Mill Products for U.S. Government Agencies
- E3 Guide for Preparation of Metallographic Specimens
- E8/E8M Test Methods for Tension Testing 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)³
- E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)³
- E112 Test Methods for Determining Average Grain Size
- E243 Practice for Electromagnetic (Eddy Current) Examination of Copper and Copper-Alloy Tubes

² 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.

³ The last approved version of this historical standard is referenced on www.astm.org.

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

E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition

2.2 ASME Standard.⁴

B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

3. Terminology

3.1 Definitions:

3.1.1 *average diameter (for round tubes only)*, *n*—the average of the maximum and minimum outside diameters, or maximum and minimum inside diameters, whichever is applicable, as determined at any one cross section of the tube.

3.1.2 *bright anneal*, *n*—a thermal treatment carried out in a controlled atmosphere so that surface oxidation is reduced to a minimum and the surface remains relatively bright.

3.1.3 *coil*, *n*—a length of the product wound into a series of connected turns. The unqualified term “coil” as applied to tube usually refers to a bunched coil.

3.1.3.1 *bunched*, *n*—a coil in which the turns are bunched and held together such that the cross section of the bunched turns is approximately circular.

3.1.3.2 *level or traverse wound*, *n*—a coil in which the turns are wound into layers parallel to the axis of the coil such that successive turns in a given layer are next to one another. (Sometimes called “helical coil.”)

3.1.3.3 *single layer flat*, *n*—a coil in which the product is spirally wound into a single disc-like layer. (Sometimes called “pancake coil” or “single layer spirally wound coil.”)

3.1.3.4 *double layer flat*, *n*—a coil in which the product is spirally wound into two connected disc-like layers such that one layer is on top of the other. (Sometimes called “double layer pancake coil” or “double layer spirally wound coil.”)

3.1.4 *lengths*, *n*—straight pieces of the product.

3.1.4.1 *specific*, *n*—straight lengths that are uniform in length, as specified, and subject to established length tolerances.

3.1.4.2 *standard*, *n*—uniform lengths recommended in a Simplified Practice Recommendation or established as a Commercial Standard.

3.1.5 *tube, seamless*, *n*—a tube produced with a continuous periphery in all stages of the operations.

3.1.5.1 *tube, air conditioning*, *n*—a seamless copper tube conforming to a standard series of sizes (Table 1) and to specified internal cleanliness requirements, normally furnished in drawn temper straight lengths with the ends capped or sealed.

3.1.5.2 *tube, refrigeration service*, *n*—a seamless copper tube conforming to a standard series of sizes (Table 2) and to special internal cleanliness and dehydration requirements, normally furnished in soft temper coils and with ends capped or sealed.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *capable of*—the test need not be performed by the producer of the material. However, if subsequent testing by the purchaser establishes that the material does not meet these requirements, the material shall be subject to rejection.

4. Ordering Information

4.1 Include this information for contracts or purchase orders for products furnished to this specification:

4.1.1 ASTM designation and year of issue (for example, B280 – 03);

4.1.2 Copper UNS No. (not necessary unless a specific copper is desired);

4.1.3 Dimensions; wall thickness, diameter, and so forth (Section 13);

4.1.4 How furnished: coils or straight lengths;

4.1.5 Temper (for example, O60, O62, H55, or H58);

4.1.6 Size (Tables 1 and 2);

4.1.7 Length (Section 13);

⁴ 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 Standard Dimensions and Weights, and Tolerances in Diameter and Wall Thickness for Straight Lengths

NOTE 1—Applicable to drawn temper tube only.

Standard Size, in.	Outside Diameter, in. (mm)	Wall Thickness, in. (mm)	Weight, lb/ft (kg/m)	Tolerances	
				Average ^A Outside Diameter, Plus and Minus, in. (mm)	Wall ^B Thickness, Plus and Minus, in. (mm)
¼	0.250 (6.35)	0.025 (0.635)	0.068 (0.102)	0.001 (0.025)	0.0025 (0.06)
⅜	0.375 (9.52)	0.030 (0.762)	0.126 (0.187)	0.001 (0.025)	0.003 (0.08)
½	0.500 (12.7)	0.035 (0.889)	0.198 (0.295)	0.001 (0.025)	0.004 (0.10)
⅝	0.625 (15.9)	0.040 (1.02)	0.285 (0.424)	0.001 (0.025)	0.004 (0.10)
¾	0.750 (19.1)	0.042 (1.07)	0.362 (0.539)	0.001 (0.025)	0.004 (0.10)
7/8	0.875 (22.3)	0.045 (1.14)	0.455 (0.677)	0.001 (0.025)	0.004 (0.10)
1 ¼	1.125 (28.6)	0.050 (1.27)	0.655 (0.975)	0.0015 (0.038)	0.004 (0.10)
1 ½	1.375 (34.9)	0.055 (1.40)	0.884 (1.32)	0.0015 (0.038)	0.006 (0.15)
1 ¾	1.625 (41.3)	0.060 (1.52)	1.14 (1.70)	0.002 (0.051)	0.006 (0.15)
2 ¼	2.125 (54.0)	0.070 (1.78)	1.75 (2.60)	0.002 (0.051)	0.007 (0.18)
2 ½	2.625 (66.7)	0.080 (2.03)	2.48 (3.69)	0.002 (0.051)	0.008 (0.20)
3 ¼	3.125 (79.4)	0.090 (2.29)	3.33 (4.96)	0.002 (0.051)	0.009 (0.23)
3 ½	3.625 (92.1)	0.100 (2.54)	4.29 (6.38)	0.002 (0.051)	0.010 (0.25)
4 ¼	4.125 (105)	0.110 (2.79)	5.38 (8.01)	0.002 (0.051)	0.011 (0.28)

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

^B The tolerances listed represent the maximum deviation at any point.