NOTICE: This standard has either been superseded and replaced by a new version or withdrawn.
Contact ASTM International (www.astm.org) for the latest information

Designation: B 587 – 97 (Reapproved 2003)

Standard Specification for Welded Brass Tube[1]

This standard is issued under the fixed designation B 587; 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.

1. Scope*

1.1 This specification establishes the requirements for round, rectangular, and square copper alloy welded tube for general engineering applications.

1.2 The values stated in inch-pound units are the standard except for grain size which is stated in SI units. SI values given in parentheses are for information only.

1.3 The following hazard statement pertains only to the test method described in 18.2.3, 18.2.4, 18.2.6, and 18.2.7 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

B 153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing

B 154 Test Method for Mercurous Nitrate Test for Copper and Copper-Alloys

B 428 Test Method for Angle of Twist in Rectangular and Square Copper and Copper Alloy Tube

B 601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

E 3 Practice for Preparation of Metallographic Specimens

E 8 Test Methods for Tension Testing of Metallic Materials

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E 112 Test Methods for Determining Average Grain Size

E 243 Practice for Electromagnetic (Eddy Current) Examination of Copper and Copper Alloy Tubes

E 255 Practice for Sampling Copper and Copper Alloys for Determination of Chemical Composition

E 478 Test Methods for Chemical Analysis of Copper Alloys

E 527 Practice for Numbering Metals and Alloys (UNS)

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 the maximum and minimum inside diameters, whichever is applicable, as determined at any one cross section of the tube.

3.1.2 *coil*—a length of the product wound into a series of connected turns. The unqualified term "coil" as applied to tube is normally understood as referring to a bunched coil.

3.1.2.1 *mill length*—lengths that can be conveniently manufactured in the mills.

3.1.2.2 *mill lengths with ends*—lengths, including ends, that can be conveniently manufactured in the mills.

3.1.3 *flash or bead*—weld metal that protrudes beyond the normal wall, both inside or outside.

3.1.4 *lengths*—straight pieces of the product.

3.1.4.1 *ends*—straight pieces, shorter than the nominal length, left over after cutting the product into mill lengths, stock lengths, or specified lengths. They are subject to minimum length and maximum weight requirements.

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

3.1.4.3 *stock*—straight lengths that are mill cut and stored in advance of orders. They are usually subject to established tolerances.

3.1.5 *scarfing*—the removing of flash or bead by a cutting operation.

3.1.6 *tube*—a hollow product of round or any other cross section, having a continuous periphery.

3.1.6.1 *welded*—product made from sheet, strip, or plate with a seam made by welding.

3.1.6.2 *as-welded*—a condition created as a result of shaping sheet, strip, or plate into a tubular form and welding without subsequent heat treatment or cold work, or both.

[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, 2003. Published November 2003. Originally approved in 1973. Last previous edition approved in 1997 as B 587 – 97ϵ1.

[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.

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

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.

Documents
Document Sharing Hub
Full document details: ASTM B587-97(2003)

3.1.6.3 *welded and annealed*—welded tube that has been annealed to produce a uniformed grain size appropriate to the specified annealed temper.

3.1.6.4 *welded and cold-drawn*—welded tube with internal flash removed by scarfing and subsequently cold-drawn to conform to the specified temper.

3.1.6.5 *fully finished*—welded tube with internal and processed to conform to the specified temper.

4. Classification (Type)

4.1 The basic types of welded tube are:

4.1.1 *Type I*—As-welded tube finished by passing through sizing and straightening rolls at ambient temperature.

4.1.2 *Type II*—As-welded tube finished by sizing, straightening, and annealing.

4.1.3 *Type III*—As-welded tube finished by cold reducing or cold drawing over a plug or mandrel.

4.1.4 *Type IV*—As-welded tube finished by both cold drawing over a plug or mandrel and annealing, and redrawing and annealing when necessary to conform to a specified size and temper.

4.1.4.1 Type IV tube may be substituted for Types I, II, and III by agreement between the manufacturer or supplier and the purchaser. The temper of substituted Type IV tube shall be stated in the contract or purchase order.

5. Ordering Information

5.1 The contract or purchase order for product under this specification should include the following information:

5.1.1 ASTM designation and year of issue (for example, B 587 – 97),

5.1.2 Copper Alloy UNS[3] No. (for example, C21000) (Section 6),

5.1.3 Classification (type) (Section 4),

5.1.4 Temper (Section 8 and Table 2 and Table 3),

5.1.5 Dimensions (diameter, distances between parallel surfaces, wall thickness and so forth) (Section 13),

5.1.6 How furnished (coils or lengths, specific or stock, with or without ends),

5.1.7 Number of coils or pieces, each size and type, and

5.1.8 Total weight, each size and type.

5.2 The following options are available under this specification and should be specified in the contract or purchase order when required:

5.2.1 Mercurous nitrate test (11.1),

5.2.2 Hydrostatic test (12.2),

5.2.3 Pneumatic test (12.3),

5.2.4 Certification (Section 22),

5.2.5 Mill test report (Section 23), and

5.2.6 Product marking (Section 24).

6. Material and Manufacture

6.1 *Material*—The material shall be strip, sheet, or plate produced of Copper Alloy UNS No. C21000, C22000, C23000, C26000, C26800, C27000, or C27200 and shall be of such quality and soundness as to be suitable for processing into the products described in this specification.

6.2 *Manufacture*:

6.2.1 Tubes shall be welded by any process which produces forged or fusion welds.

6.2.1.1 Tube welded from cold-rolled strip can be regularly furnished by welding standard strip tempers and shall have mechanical properties as agreed upon between the manufacturer or supplier and the purchaser.

6.2.2 Forged-welded tube shall be scarfed to remove both internal and external flash.

6.2.2.1 Forged-welded tube to be drawn over a mandrel to produce Types III and IV may have the internal flash completely removed.

6.2.2.2 Forged-welded Types I, II, and III tube may contain a residual thickness at the weld not to exceed 0.006 in. (0.15 mm) or 10 % of the nominal wall thickness, whichever is greater.

6.2.3 Fusion-welded tube shall be mechanically worked to produce a smooth external and internal surface without the application of scarfing or other removal of the weld metal bead.

7. Chemical Composition

7.1 The material shall conform to the chemical requirements given in Table 1 for the specified alloy.

7.1.1 These composition limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements by agreement between the manufacturer and the purchaser.

7.2 Either copper or zinc may be taken as the difference between the sum of results of all elements determined and 100 %; however, when copper is so determined, that difference shall conform to the limits given in Table 1 for copper.

7.3 When all elements in Table 1 for the specified alloy are determined, the sum of results shall be as follows:

Copper Alloy UNS No.	Copper Plus Specified Elements, min, %
C21000, C22000, C23000	99.8
C26000, C26800, C27000, C27200	99.7

8. Temper

8.1 The material furnished shall be one of the tempers indicated in Table 2 or Table 3.

8.1.1 Light-drawn and hard-drawn tempers are normally available in round tube only.

8.1.2 Special temper requirements are subject to agreement between the manufacturer or supplier and the purchaser.

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Composition, %			
	Copper	Lead, max	Iron, max	Zinc
C21000	94.0–96.0	0.05	0.05	remainder
C22000	89.0–91.0	0.05	0.05	remainder
C23000	84.0–86.0	0.05	0.05	remainder
C26000	68.5–71.5	0.07	0.05	remainder
C26800	64.0–68.5	0.15	0.05	remainder
C27000	63.0–68.5	0.10	0.07	remainder
C27200	62.0–65.0	0.07	0.07	remainder

[3] Refer to Practice E 527 for explanation of the Unified Numbering System (UNS).

AVA Documents
Document Sharing Hub

Full document details: ASTM B587-97(2003)

TABLE 2 Tensile Strength Requirements and Approximate Rockwell Hardness Values for Welded (Type I), Welded and Cold-Worked (Type III), and Fully Finished (Type IV) Tube

Copper Alloy UNS No.	Temper	Type	Outside Diameter, in. (mm)	Wall Thickness, in. (mm)	Rockwell 30T Hardness,[A] min	Tensile Strength, min, ksi[B] (MPa)[C]
C21000	welded from annealed strip	I	all	all	7	34 (235)
C21000	welded from cold-rolled strip	I	all	all	[D]	[D]
C21000	cold reduced or light drawn	III, IV	all	all	34	37 (255)
C21000	cold reduced or hard drawn	III, IV	up to 1 (25.4) incl	0.020–0.119 (0.508–3.02)	52	46 (315)
			over 1 to 2 (25.4 to 50.8) incl	0.035–0.119 (0.889–3.02)		
			over 2 to 3½ (50.8 to 88.9) incl	0.060–0.119 (1.52–3.02)		
C22000	welded from annealed strip	I	all	all	10	37 (255)
C22000	welded from cold-rolled strip	I	all	all	[D]	[D]
C22000	cold reduced or light drawn	III, IV	all	all	38	40 (275)
C22000	cold reduced or hard drawn	III, IV	up to 1 (25.4) incl	0.020 to 0.119 (0.508 to 3.02)	55	52 (360)
			over 1 to 2 (25.4 to 50.8) incl	0.035 to 0.119 (0.889 to 3.02)		
			over 2 to 3½ (50.8 to 88.9) incl	0.060 to 0.119 (1.52 to 3.02)		
C23000	welded from annealed strip	I	all	all	24	40 (275)
C23000	welded from cold-rolled strip	I	all	all	[D]	[D]
C23000	cold reduced or light drawn	III, IV	all	all	43	44 (305)
C23000	cold reduced or drawn (general purpose)	III, IV	all	all	43	44 (305)
C23000	cold reduced or hard drawn	III, IV	up to 1 (25.4) incl	0.020 to 0.119 (0.508 to 3.02)	65	57 (395)
			over 1 to 2 (25.4 to 50.8) incl	0.035 to 0.119 (0.889 to 3.02)		
			over 2 to 3½ (50.8 to 88.9) incl	0.060 to 0.119 (1.52 to 3.02)		
C26000, C26800, C27000, C27200	welded from annealed strip	I	all	all	25	48 (330)
C26000, C26800, C27000, C27200	welded from cold-rolled strip	I	all	all	[D]	[D]
C26000, C26800, C27000, C27200	cold reduced or drawn (general purpose)	III, IV	all	all	53	54 (370)
C26000, C26800, C27000, C27200	cold reduced or hard drawn[E]	III, IV	up to 1 (25.4) incl	0.020 to 0.119 (0.508 to 3.02)	70	66 (455)
			over 1 to 2 (25.4 to 50.8) incl	0.035 to 0.119 (0.889 to 3.02)		
			over 2 to 3½ (50.8 to 88.9) incl	0.060 to 0.119 (1.52 to 3.02)		

[A] Rockwell hardness values shall only apply to: (*a*) tubes having a wall thickness of 0.012 in. (0.305 mm) or greater; (*b*) round tube having an inside diameter of 5/16 in. (7.94 mm) or greater; and (*c*) rectangular and square tube having an inside major distance between parallel surfaces of ¾ in. (4.76 mm) or greater. Rockwell hardness tests shall be made on the inside surface of the tube, and the value of the Rockwell hardness number of each specimen shall be established by taking the arithmetical average of at least three readings. When suitable equipment is not available for determining the specified Rockwell hardness, other Rockwell scales and values may be specified subject to agreement between the manufacturer and the purchaser.

[B] ksi = 1000 psi.

[C] See Appendix X1.

[D] Tube welded from cold-rolled strip can be regularly supplied by welding standard strip tempers and shall have mechanical properties as agreed upon between the purchaser and the supplier.

[E] Light-drawn and hard-drawn tempers are normally available in round tube only.

9. Physical Properties

9.1 *Grain Size*:

9.1.1 Type II and Type IV tubes with tempers designated as W060 (welded and soft-annealed) and W050 (welded and light-annealed) shall conform to the requirements prescribed in Table 3 for the specified copper alloy UNS No. and temper when tested in accordance with Test Methods E 112.

9.1.2 Grain size shall be the basis for acceptance or rejection based upon physical properties.

10. Mechanical Properties

10.1 *Tensile Strength Requirements*:

10.1.1 Type I, Type III, and Type IV tube in drawn tempers shall conform to the requirements prescribed in Table 2 for the specified copper alloy and temper when tested in accordance with Test Methods E 8.

10.1.2 The tensile test results shall be the basis for acceptance or rejection based upon mechanical properties.

AVA Documents
Document Sharing Hub

Full document details: ASTM B587-97(2003)