



Designation: B 302 – 00

Standard Specification for Threadless Copper Pipe, Standard Sizes¹

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1. Scope *

1.1 This specification establishes requirements for threadless, seamless, deoxidized copper pipe (TP) in straight lengths, in all nominal or standard pipe sizes, for piping systems that are assembled with brazed-joint pipe fittings. The pipe shall be produced from either of coppers UNS Nos. C10300 or C12200.

1.2 The values stated in inch-pound units are the standard. The values given in parentheses are provided for information only.

1.3 The following safety hazard caveat pertains only to the test methods described 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 and health practices and determine the applicability of regulatory limitations prior to its use.*

2. Referenced Documents

2.1 ASTM Standards:

- B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast²
- B 846 Terminology for Copper and Copper Alloys²
- E 8 Test Methods for Tension Testing of Metallic Materials³
- E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials³
- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁴
- E 53 Methods for Chemical Analysis of Copper⁵
- E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)⁵
- E 243 Practice for Electromagnetic (Eddy-Current) Examination of Copper and Copper-Alloy Tubes⁶

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 *Annual Book of ASTM Standards*, Vol 02.01.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ *Annual Book of ASTM Standards*, Vol 03.05.

⁶ *Annual Book of ASTM Standards*, Vol 03.03.

E 255 Practice for Sampling Copper and Copper Alloys for Determination of Chemical Composition⁵

3. Terminology

3.1 *Definitions*—Refer to Terminology B 846 for definitions of terms related to copper and copper alloys.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *threadless pipe (TP)*—seamless tube conforming to the particular dimensions commercially known as “Threadless Pipe (TP).”

4. Ordering Information

4.1 Orders for products under this specification shall include the following information:

4.1.1 ASTM designation and year of issue,

4.1.2 Copper UNS No. designation,

4.1.3 Nominal or standard size (Table 1), and

4.1.4 Total length, total weight, or number of pieces of each size.

4.2 The following options are available and are to be specified in the contract or purchase order at the time of placing of the order:

4.2.1 Tension test (Section 8),

4.2.2 Hydrostatic test (10.2),

4.2.3 Pneumatic test (10.3),

4.2.4 Heat identification or traceability requirements,

4.2.5 Certification (Section 20), and

4.2.6 Mill test report (Section 21).

5. Materials and Manufacture

5.1 *Material*—The material of manufacture shall be cast billets, bars, or tubes of copper UNS No. C10300 or C12200 and shall be of such quality and soundness as to be suitable for processing into finished lengths of pipe to meet the properties prescribed herein.

5.2 *Manufacture:*

5.2.1 The pipe shall be manufactured by such hot extrusion or piercing and subsequent cold working as to produce a uniform, seamless wrought structure in the finished product.

5.2.2 The product shall be cold worked to the finished size so as to meet the temper properties specified.

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

TABLE 1 Dimensions and Weights and Tolerance in Diameter and Wall Thickness for Copper Threadless Pipe (TP) Sizes

Nominal or Standard Pipe Size, in.	Outside Diameter, in. (mm)	Inside Diameter, in. (mm),	Wall Thickness, in. (mm)	Cross-Sectional Area of Bore, in. ² (cm ²)	Theoretical Weight, lb/ft (kg/m)	Tolerances, in. (mm)	
						Average Outside Diameter, ^A All Minus	Wall Thickness Plus and Minus
1/4	0.540(13.7)	0.410(10.4)	0.065(1.65)	0.132(0.852)	0.376(0.559)	0.004(0.10)	0.0035(0.089)
3/8	0.675(17.1)	0.545(13.8)	0.065(1.65)	0.233(1.50)	0.483(0.719)	0.004(0.10)	0.004(0.10)
1/2	0.840(21.3)	0.710(18.0)	0.065(1.65)	0.396(2.55)	0.613(0.912)	0.005(0.13)	0.004(0.10)
3/4	1.050(26.7)	0.920(23.4)	0.065(1.65)	0.665(4.29)	0.780(1.16)	0.005(0.13)	0.004(0.10)
1	1.315(33.4)	1.185(30.1)	0.065(1.65)	1.10(7.10)	0.989(1.47)	0.005(0.13)	0.004(0.10)
1 1/4	1.660(42.2)	1.530(38.9)	0.065(1.65)	1.84(11.9)	1.26(1.87)	0.006(0.15)	0.004(0.10)
1 1/2	1.900(48.3)	1.770(45.0)	0.065(1.65)	2.46(15.9)	1.45(2.16)	0.006(0.15)	0.004(0.10)
2	2.375(60.3)	2.245(57.0)	0.065(1.65)	3.96(25.5)	1.83(2.72)	0.007(0.18)	0.006(0.15)
2 1/2	2.875(73.0)	2.745(69.7)	0.065(1.65)	5.92(38.2)	2.22(3.30)	0.007(0.18)	0.006(0.15)
3	3.500(88.9)	3.334(84.7)	0.083(2.11)	8.73(56.3)	3.45(5.13)	0.008(0.20)	0.007(0.18)
3 1/2	4.000(102)	3.810(96.8)	0.095(2.41)	11.4(73.5)	4.52(6.73)	0.008(0.20)	0.007(0.18)
4	4.500(114)	4.286(109)	0.107(2.72)	14.4(92.9)	5.72(8.51)	0.010(0.25)	0.009(0.23)
5	5.562(141)	5.298(135)	0.132(3.40)	22.0(142)	8.73(13.0)	0.012(0.30)	0.010(0.25)
6	6.625(168)	6.309(160)	0.158(4.01)	31.3(202)	12.4(18.5)	0.014(0.36)	0.010(0.25)
8	8.625(219)	8.215(209)	0.205(5.21)	53.0(342)	21.0(31.2)	0.018(0.46)	0.014(0.36)
10	10.750(273)	10.238(260)	0.256(6.50)	82.3(531)	32.7(48.7)	0.018(0.46)	0.016(0.41)
12	12.750(324)	12.124(308)	0.313(7.95)	115(742)	47.4(70.5)	0.018(0.46)	0.020(0.51)

^AThe 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.

6. Chemical Composition

6.1 The product shall conform to the chemical composition requirements specified in Table 2 for the copper UNS number designation specified in the ordering information.

6.2 These composition limits do not preclude the presence of other elements. Limits for unnamed elements shall be established and analysis required by agreement between the manufacture or supplier and purchaser.

7. Temper

7.1 The product shall be furnished in the H58 (drawn general purpose) temper as defined in Practice B 601.

8. Mechanical Properties

8.1 Tensile Strength:

8.1.1 Product in all sizes and coppers shall have a minimum tensile strength of 36 ksi (250 MPa) when tested in accordance with Test Methods E 8.

8.1.2 The tension test need not be performed except when specified by the purchaser in the ordering information at the time of placing of the order.

8.2 **Rockwell Hardness**—Product in all sizes and coppers shall have a minimum Rockwell F hardness of 55 when tested in accordance with Test Methods E 18.

9. Microscopical Examination

9.1 The pipe shall be made from copper free from cuprous oxide, as determined by microscopical examination at a mag-

nification of 75 diameters. When copper UNS No. C12200 is supplied, microscopical examination for cuprous oxide is not required.

10. Nondestructive Test Requirements

10.1 Electromagnetic (Eddy-Current) Test:

10.1.1 Each tube up to and including 2 1/2-in. nominal pipe size shall be subjected to an eddy-current test. Testing shall follow the procedures of Practice E 243 and 15.2.

10.1.1.1 The provisions for the determination of “end-effect” in Practice E 243 shall not apply.

10.1.1.2 **Hydrostatic Test Alternative**—As an alternative to the eddy-current test for tubes of diameters above 1.25 in. (32 mm), the manufacturer shall perform the hydrostatic test to the requirements of 10.2.

10.1.2 The tested tubes, which do not actuate the signaling device of the testing unit, shall be considered as conforming to the requirements of the test.

10.1.3 Either notch depth or drilled hole standards shall be used.

10.1.3.1 Notch depth standards shall be 10 % of the nominal wall thickness.

10.1.3.2 The sizes of drilled hole standards shall be determined in accordance with Table X1.2 of Practice E 243.

10.2 Hydrostatic Test:

10.2.1 When specified in the contract or purchase order, or as an alternative to the eddy-current test for tubes above 1.25 in. (32 mm) in diameter (see 10.1.1.2), each tube shall stand, without showing evidence of leakage, an internal hydrostatic pressure sufficient to produce a fiber stress of 6000 psi (41 MPa) as determined by the following equation for thin hollow cylinders under tension:

$$P = 2St/(D - 0.8t) \tag{1}$$

where:

TABLE 2 Chemical Requirements

Copper UNS No.	Composition, %	
	Copper (Incl Silver), min	Phosphorus
C10300	99.95 ^A	0.001 to 0.005
C12200	99.9	0.015 to 0.040

^ACopper + silver + phosphorus.