Designation: B 42 – 02ε1

Standard Specification for Seamless Copper Pipe, Standard Sizes[1]

This standard is issued under the fixed designation B 42; 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 Department of Defense.

ε[1] NOTE—Referenced Documents were editorially corrected in November 2003.

1. Scope*

1.1 This specification[2] covers seamless copper pipe in all nominal or standard pipe sizes, both regular and extra-strong, suitable

[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 Apr. 10, 2002. Published June 2002. Originally published as B 42 – 22 T. Last previous edition B 42 – 98.

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

for use in plumbing, boiler feed lines, and for similar purposes.[3]

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

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:*

B 153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing[4]

B 170 Specification for Oxygen-Free Electrolytic Copper—Refinery Shapes[4]

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast[4]

E 8 Test Methods for Tension Testing of Metallic Materials[5]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[6]

E 53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry[7]

~~E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition[7]~~

~~E 62 Test~~ E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Method)[7]

E 243 Practice for Electromagnetic (Eddy-Current) Examination of Copper and Copper-Alloy Tubes[8]

E 255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition[7]

E 478 Test Methods for Chemical Analysis of Copper Alloys[7]

E 527 Practice for Numbering Metals and Alloys (UNS)[9]

3. Terminology

3.1 *Definitions:*

3.1.1 *lengths*—straight pieces of the product.

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

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

3.1.2.1 *pipe*—a seamless tube conforming to the particular dimensions commercially known as Nominal or Standard Pipe Sizes.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *capable of*—as used in this specification, the test need not be performed by the producer of the material. However, should subsequent testing by the purchaser establish that the material does not meet these requirements the material shall be subject to rejection.

4. Ordering Information

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

4.1.1 Type of copper, if required,

4.1.2 Temper (see 6.1),

4.1.3 Pipe size, regular or extra-strong, (see 10.2),

4.1.4 Length (see 10.3),

4.1.5 Total length of each size,

4.1.6 If material is required to meet *ASME Boiler and Pressure Vessel Code*,

4.1.7 Certification, if required (see 18.1),

4.1.8 Mill test report, if required (see 20.1),

4.1.9 Hydrostatic test, if required, and

4.1.10 Pneumatic test, if required.

4.2 In addition, when material 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.

5. Chemical Composition

5.1 The material shall conform to the following chemical requirements:

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[2] For *ASME Boiler and Pressure Vessel Code* applications, see related Specification SB-42 in Section II of that Code.

[3] The UNS system for copper and copper alloys (see Practice E 527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix "C" and a suffix "00." The suffix can be used to accommodate composition variations of the base alloy.

[4] *Annual Book of ASTM Standards*, Vol 02.01.

[5] *Annual Book of ASTM Standards*, Vol 03.01.

[6] *Annual Book of ASTM Standards*, Vol 14.02.

[7] *Annual Book of ASTM Standards*, Vol 03.05.

[8] *Annual Book of ASTM Standards*, Vol 03.03.

[9] *Annual Book of ASTM Standards*, Vol 01.01.

Copper (incl silver), min, %	99.9
Phosphorus, max, %	0.04

5.2 The pipe shall be produced from one of the following coppers, and unless otherwise specified, anyone of them is permitted to be furnished:

Copper UNS No.	Previously Used Designation	Type of Copper
C10200	OF	Oxygen-free without residual deoxidants
C10300		Oxygen-free, extra-low phosphorus
C10800		Oxygen-free, low phosphorus
C12000	DLP	Phosphorized, low residual phosphorus
C12200	DHP	Phosphorized, high residual phosphorus

5.3 When the copper is specified, the material shall conform to the chemical requirements specified in Table 1.

5.4 These specification limits do not preclude the possible presence of other elements. When required, limits for unnamed elements are to be established by agreement between manufacturer or supplier and purchaser.

5.4.1 The major element that is not analyzed shall be determined by difference between the sum of those elements analyzed and 100 %. By agreement between manufacturer and purchaser, it is permitted to establish limits and required analysis for elements not specified.

6. Temper

6.1 All pipe shall normally be furnished in the O61 (annealed), H55 (light drawn), or H80 (hard drawn) temper, as prescribed in Practice B 601, and shall have the properties shown in Table 2.

6.2 When pipe is required for bending, it shall be so specified in the purchase order, and the pipe shall be furnished in the temper agreed upon between the manufacturer or supplier and the purchaser.

7. Expansion Test

7.1 Pipe ordered in the annealed (O) condition, selected for test, shall withstand an expansion of 25 % of the outside diameter when expanded in accordance with Test Method B 153. The expanded pipe shall show no cracking or rupture visible to the unaided eye. Pipe ordered in the drawn (H) condition is not subject to this test.

NOTE 1—The term "unaided eye," as used herein, permits the use of corrective spectacles necessary to obtain normal vision.

7.2 As an alternative to the expansion test for pipe over 4 in. (102 mm) in diameter in the annealed condition, a section 4 in. in length shall be cut from the end of one of the lengths for a flattening test. This 4-in. specimen shall be flattened so that a gage set at three times the wall thickness will pass over the pipe freely throughout the flattened part. The pipe so tested shall develop no cracks or flaws visible to the unaided eye (Note 1) as a result of this test. In making the flattening test, the elements shall be slowly flattened by one stroke of the press.

8. Microscopical Examination

8.1 The pipe shall be made from copper that is free of cuprous oxide as determined by microscopical examination at a 75× magnification. When Copper UNS No. C12200 is supplied, microscopical examination for cuprous oxide is not required.

9. Nondestructive Testing

9.1 The material shall be tested in the final size but is permitted to be tested before the final anneal or heat treatment, when these thermal treatments are required, unless otherwise agreed upon by the manufacturer or supplier and purchaser.

9.2 *Eddy-Current Test*—Each piece of material from ⅛-in. up to and including 2½-in. nominal outside diameter, or within the capabilities of the eddy-current tester, shall be subjected to an eddy-current test. Testing shall follow the procedures of Practice E 243, except for determination of "end effect." The material shall be passed through an eddy-current testing unit adjusted to provide information on the suitability of the material for the intended application.

TABLE 1 Chemical Requirements

Copper UNS No.	Copper (incl Silver), min, %	Phosphorus, %
C10200[A]	99.95	...
C10300	99.95[B]	0.001 to 0.005
C10800	99.95[B]	0.005 to 0.012
C12000	99.90	0.004 to 0.012
C12200	99.9	0.015 to 0.040

[A] Oxygen in C10200 shall be 10 ppm max.
[B] Copper + silver + phosphorus.

TABLE 2 Tensile Requirements

Temper Designation		Pipe Size Nominal or Standard, in.	Tensile Strength, min, ksi[A] (MPa)[B]	Yield Strength,[C] min, ksi[A] (MPa)[B]
Standard	Former			
O61	annealed	all	30 (294)	9 (88)[D]
H80	hard drawn	⅛ –2, incl	45 (310)	40 (280)
H80	hard drawn	over 2	38 (260)	32 (220)
H55	light drawn	2–12, incl	36 (250)	30 (210)

[A] ksi = 1000 psi.
[B] See Appendix X1.
[C] At 0.5 % extension under load.
[D] Light-straightening operation is permitted.

9.2.1 Notch-depth standards rounded to the nearest 0.001 in. (0.025 mm) shall be 10 % of the nominal wall thickness. The notch depth tolerance shall be ±0.0005 in. (0.013 mm). Alternatively, when a manufacturer uses speed-insensitive equipment that allows the selection of a maximum imbalance signal, a maximum imbalance signal of 0.3 % is permitted to be used.

9.2.2 Material that does not actuate the signaling device of the eddy-current test shall be considered as conforming to the requirements of this test. Material with discontinuities indicated by the testing unit is permitted to be reexamined or retested, at the option of the manufacturer, to determine whether the discontinuity is cause for rejection. Signals that are found to have been caused by minor mechanical damage, soil, or moisture shall not be cause for rejection of the material provided the dimensions of the material are still within prescribed limits and the material is suitable for its intended application.

9.3 *Hydrostatic Test*—When specified, the material shall stand, without showing evidence of leakage, an internal hydrostatic pressure sufficient to subject the material to a fiber stress of 6000 psi (41 MPa), determined by the following equation for thin hollow cylinders under tension. The material need not be tested at a hydrostatic pressure of over 1000 psi (6.9 MPa) unless so specified.

$$P = 2S\,t/(D - 0.8t) \quad (1)$$

where:
P = hydrostatic pressure, psi (or MPa);
t = wall thickness of the material, in. (or mm);
D = outside diameter of the material in. (or mm); and
S = allowable stress of the material, psi (or MPa).

9.4 *Pneumatic Test*—When specified, the material shall be subjected to an internal air pressure of 60 psi (415 kPa) minimum for 5 s without showing evidence of leakage. The test method used shall permit easy visual detection of any leakage, such as by having the material under water or by the pressure-differential method. Any evidence of leakage shall be cause for rejection.

10. Dimensions and Permissible Variations

10.1 For the purpose of determining conformance with the dimensional requirements prescribed in this specification, any measured value outside the limiting values for any dimensions shall be sufficient cause for rejection.

10.2 *Standard Dimensions, Wall Thickness, and Diameter Tolerances*—The standard dimensions, wall thickness, and diameter tolerances shall be in accordance with Table 3.

10.3 *Length and Length Tolerances*—The standard length of copper pipe is 12 ft (3.66 m) with a tolerance of ±½ in. (13 mm).

10.4 *Roundness*:

10.4.1 For drawn unannealed pipe in straight lengths, the roundness tolerances shall be as follows:

t/d (ratio of Wall Thickness to Outside Diameter)	Roundness Tolerances as Percent of Outside Diameter (Expressed to the Nearest 0.001 in. (0.025 mm))
0.01 to 0.03, incl	1.5
Over 0.03 to 0.05, incl	1.0
Over 0.05 to 0.10, incl	0.8
Over 0.10	0.7

10.4.2 Compliance with the roundness tolerance shall be determined by taking measurements on the outside diameter only, irrespective of the manner in which the pipe dimensions are specified.

10.4.3 The deviation from roundness is measured as the difference between major and minor diameters as determined at any one cross section of the tube.

10.5 *Squareness of Cut*—The departure from squareness of the end of any pipe shall not exceed the following:

Outside Diameter, in. (mm)	Tolerance
Up to ⅝ (15.9), incl	0.010 in. (0.25 mm)
Over ⅝ (15.9)	0.016 in./in. (0.016 mm/mm) of diameter

TABLE 3 Standard Dimensions, Weights, and Tolerances

NOTE 1—All tolerances plus and minus except as otherwise indicated.

Nominal or Standard Pipe Size, in.	Outside Diameter, in. (mm)	Average Outside Diameter Tolerance,[A] in. (mm) All Minus	Wall Thickness, in. (mm)	Tolerance,[B] in. (mm)	Theoretical Weight, lb/ft (kg/m)
		Regular			
⅛	0.405 (10.3)	0.004 (0.10)	0.062 (1.57)	0.004 (0.10)	0.259 (0.385)
¼	0.540 (13.7)	0.004 (0.10)	0.082 (2.08)	0.005 (0.13)	0.457 (0.680)
⅜	0.675 (17.1)	0.005 (0.13)	0.090 (2.29)	0.005 (0.13)	0.641 (0.954)
½	0.840 (21.3)	0.005 (0.13)	0.107 (2.72)	0.006 (0.15)	0.955 (1.42)
¾	1.050 (26.7)	0.006 (0.15)	0.114 (2.90)	0.006 (0.15)	1.30 (1.93)
1	1.315 (33.4)	0.006 (0.15)	0.126 (3.20)	0.007 (0.18)	1.82 (2.71)
1¼	1.660 (42.2)	0.006 (0.15)	0.146 (3.71)	0.008 (0.20)	2.69 (4.00)
1½	1.900 (48.3)	0.006 (0.15)	0.150 (3.81)	0.008 (0.20)	3.20 (4.76)
2	2.375 (60.3)	0.008 (0.20)	0.156 (3.96)	0.009 (0.23)	4.22 (6.28)
2½	2.875 (73.0)	0.008 (0.20)	0.187 (4.75)	0.010 (0.25)	6.12 (9.11)
3	3.500 (88.9)	0.010 (0.25)	0.219 (5.56)	0.012 (0.30)	8.76 (13.0)
3½	4.000 (102)	0.010 (0.25)	0.250 (6.35)	0.013 (0.33)	11.4 (17.0)
4	4.500 (114)	0.012 (0.30)	0.250 (6.35)	0.014 (0.36)	12.9 (19.2)
5	5.562 (141)	0.014 (0.36)	0.250 (6.35)	0.014 (0.36)	16.2 (24.1)
6	6.625 (168)	0.016 (0.41)	0.250 (6.35)	0.014 (0.36)	19.4 (28.9)
8	8.625 (219)	0.020 (0.51)	0.312 (7.92)	0.022 (0.56)	31.6 (47.0)
10	10.750 (273)	0.022 (0.56)	0.365 (9.27)	0.030 (0.76)	46.2 (68.7)
12	12.750 (324)	0.024 (0.61)	0.375 (9.52)	0.030 (0.76)	56.5 (84.1)
		Extra Strong			
⅛	0.405 (10.3)	0.004 (0.10)	0.100 (2.54)	0.006 (0.15)	0.371 (0.552)
¼	0.540 (13.7)	0.004 (0.10)	0.123 (3.12)	0.007 (0.18)	0.625 (0.930)
⅜	0.675 (17.1)	0.005 (0.13)	0.127 (3.23)	0.007 (0.18)	0.847 (1.26)
½	0.840 (21.3)	0.005 (0.13)	0.149 (3.78)	0.008 (0.20)	1.25 (1.86)
¾	1.050 (26.7)	0.006 (0.15)	0.157 (3.99)	0.009 (0.23)	1.71 (2.54)
1	1.315 (33.4)	0.006 (0.15)	0.182 (4.62)	0.010 (0.25)	2.51 (3.73)
1¼	1.660 (42.2)	0.006 (0.15)	0.194 (4.93)	0.010 (0.25)	3.46 (5.15)
1½	1.900 (48.3)	0.006 (0.15)	0.203 (5.16)	0.011 (0.28)	4.19 (6.23)
2	2.375 (60.3)	0.008 (0.20)	0.221 (5.61)	0.012 (0.30)	5.80 (8.63)
2½	2.875 (73.0)	0.008 (0.20)	0.280 (7.11)	0.015 (0.38)	8.85 (13.2)
3	3.500 (88.9)	0.010 (0.25)	0.304 (7.72)	0.016 (0.41)	11.8 (17.6)
3½	4.000 (102)	0.010 (0.25)	0.321 (8.15)	0.017 (0.43)	14.4 (21.4)
4	4.500 (114)	0.012 (0.30)	0.341 (8.66)	0.018 (0.46)	17.3 (25.7)
5	5.562 (141)	0.014 (0.36)	0.375 (9.52)	0.019 (0.48)	23.7 (35.3)
6	6.625 (168)	0.016 (0.41)	0.437 (11.1)	0.027 (0.69)	32.9 (49.0)
8	8.625 (219)	0.020 (0.51)	0.500 (12.7)	0.035 (0.89)	49.5 (73.7)
10	10.750 (273)	0.022 (0.56)	0.500 (12.7)	0.040 (1.0)	62.4 (92.9)

[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 pipe.
[B] Maximum deviation at any one point.

10.6 *Straightness Tolerance*—For pipe of H (drawn) tempers of Nominal Pipe Sizes from ¼ to 12 in. inclusive, the maximum curvature (depth of arc) shall not exceed ½ in. (13 mm) in any 10-ft (3048-mm) portion of the total length. For H temper pipe of other sizes, and for the O611 (annealed) temper, no numerical values are established, however, the straightness of the pipe shall be suitable for the intended application.

11. Workmanship, Finish, and Appearance

11.1 The material shall be free of defects of a nature that interfere with normal commercial applications. It shall be well cleaned and free of dirt.

12. Sampling

12.1 *Sampling*—The lot size, portion size, and selection of sample pieces shall be as follows:

12.1.1 *Lot Size*—The lot size shall be as follows:

Pipe Size, in.	Lot Weight, lb (kg)
Up to 1½ , incl	5 000 (2270) or fraction thereof
Over 1½ to 4, incl	10 000 (4550) or fraction thereof
Over 4	40 000 (18 100) or fraction thereof

12.1.2 *Portion Size*—Sample pieces shall be taken for test purposes from each lot according to the following schedule:

Number of Pieces in Lot	Number of Sample Pieces to be Taken[A]
1 to 50	1
51 to 200	2

201 to 1500	3
Over 1500	0.2 % of total number of pieces in the lot, but not to exceed ten sample pieces

[A] Each sample piece shall be taken from a separate tube.

13. Number of Tests and Retests

13.1 *Chemical Analysis*—Samples for chemical analysis shall be taken in accordance with Practice E 255. Drillings, millings, and so forth shall be taken in approximately equal weight from each of the sample pieces selected in accordance with 12.1.2 and combined into one composite sample. The minimum weight of the composite sample that is to be divided into three equal parts shall be 150 g.

13.1.1 Instead of sampling in accordance with Practice E 255, the manufacturer shall have the option of determining conformance to chemical composition as follows: Conformance shall be determined by the manufacturer by analyzing samples taken at the time the castings are poured or samples taken from the semifinished product. If the manufacturer determines the chemical composition of the material during the course of manufacture, he shall not be required to sample and analyze the finished product. The number of samples taken for determination of chemical composition shall be as follows:

13.1.1.1 When samples are taken at the time the castings are poured, at least one sample shall be taken for each group of castings poured simultaneously from the same source of molten metal.

13.1.1.2 When samples are taken from the semifinished product, a sample shall be taken to represent each 10 000 lb (4550 kg) or fraction thereof, except that not more than one sample shall be required per piece.

13.1.1.3 Because of the discontinuous nature of the processing of castings into wrought products, it is not practical to identify specific casting analysis with a specific quantity of finished material.

13.1.1.4 In the event that heat identification or traceability is required, the purchaser shall specify the details desired.

13.2 *Retests*:

13.2.1 If any test specimen shows defective machining or develops flaws, it shall be discarded and another specimen substituted.

13.2.2 If a bend test specimen fails because of conditions of bending more severe than required by the specification, a retest shall be permitted on a new sample piece or on the remaining portion of the first sample piece.

13.2.3 If the results of the test on one of the specimens fail to meet the specified requirements, two additional specimens shall be taken from different sample pieces and tested. The results of the tests on both of these specimens shall meet the specified requirements. Failure of more than one specimen to meet the specified requirements for a particular property shall be cause for rejection of the entire lot.

13.2.4 If the chemical analysis fails to conform to the specified limits, analysis shall be made on a new composite sample prepared from additional pieces selected in accordance with 12.1. The results of this retest shall comply with the specified requirements.

14. Test Methods

14.1 The properties enumerated in this specification shall, in case of disagreement, be determined in accordance with the following applicable test methods:

Test	ASTM Designation[A]
Chemical analysis	B 170[B], E 53, E 62, E 478
Tension	E 8
Expansion (pin test)	B 153
Eddy current	E 243

[A] See 2.1.

[B] Reference to Specification B 170 is to the suggested chemical methods in the annex thereof. When Committee E01 has tested and published methods for assaying the low-level impurities in copper, the Specification B 170 annex will be eliminated.

14.2 Tension test specimens shall be of the full section of the pipe and shall conform to the requirements of the Specimens for Pipe and Tube section of Test Methods E 8 unless the limitations of the testing machine preclude the use of such a specimen. Test specimens conforming to Type No. 1 of Fig. 13, Tension Test Specimens for Large-Diameter Tubular Products, of Test Methods E 8 is permitted to be used when a full-section specimen cannot be tested.

14.3 Whenever tension test results are obtained from both full-size and machined test specimens and they differ, the results obtained from full-size test specimens shall be used to determine conformance to the specification requirements.

14.4 Tension test results on material covered by this specification are not seriously affected by variations in speed of testing. A considerable range of testing speed is permissible; however, it is recommended that the rate of stressing to the yield strength not exceed 100 ksi (700 MPa)/min. Above the yield strength, it is recommended that the movement per minute of the testing machine head under load not exceed 0.5 in./in. (0.5 mm/mm) of gage length (or distance between grips for full-section specimens).

15. Significance of Numerical Limits

15.1 For purposes of determining compliance with the specified limits for requirements of the properties listed in the following table, an observed value or a calculated value shall be rounded as indicated in accordance with the rounding method of Practice E 29.

Property	Rounded Unit for Observed or Calculated Value
Chemical composition	nearest unit in the last right-hand place of figures of the specified limit
Tensile strength	nearest ksi (nearest 5 MPa)
Yield strength	nearest ksi (nearest 5 MPa)

16. Inspection

16.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with the specified requirements.

17. Rejection and Rehearing

17.1 Material that fails to conform to the requirements of this specification shall be subject to rejection. Rejection is to be reported to the manufacturer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the manufacturer or supplier shall have the option to make claim for a rehearing.

18. Certification

18.1 When specified on the purchase order, the manufacturer shall furnish to the purchaser a certificate stating that each lot has been sampled, tested, and inspected in accordance with this specification and has met the requirements. When material is specified to meet the requirements of *ASME Boiler and Pressure Vessel Code*, the certification requirements are mandatory.

19. Packaging and Package Marking

19.1 The material shall be separated by size, composition, and temper and prepared for shipment in such a manner as to ensure acceptance by common carrier for transportation and to afford protection from the normal hazards of transportation.

19.2 Each shipping unit shall be legibly marked with the purchase order number, metal or alloy designation, temper, size, total length or piece count or both, and name of supplier. The specification number shall be shown, when specified.

20. Mill Test Report

20.1 When specified on the purchase order, the manufacturer shall furnish to the purchaser a test report showing results of tests required by the specification.

21. Keywords

21.1 copper pipe; extra strong; regular; standard sizes

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the inquiry, contract, or order, for agencies of the U. S. Government.

S1. Referenced Documents

S1.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

S1.1.1 *Federal Standards:*[10]

Fed. Std. No. 102 Preservation, Packaging and Packing Levels

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

Fed. Std. No. 185 Identification Marking of Copper and Copper-Base Alloy Mill Products

S1.1.2 *Military Standard:*[10]

MIL-STD-129 Marking for Shipment and Storage

S1.1.3 *Military Specification:*[10]

MIL-C-3993 Packaging of Copper and Copper-Base Alloy Mill Products

S2. Quality Assurance

S2.1 *Responsibility for Inspection:*

S2.1.1 Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all inspection and test requirements specified. Except as otherwise specified in the contract or purchase order, the manufacturer shall

[10] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, ATTN: NPODS.

use his own or any other suitable facilities for the performance of the inspection and test requirements unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspections or tests set forth when such inspections and tests are deemed necessary to assure that the material conforms to prescribed requirements.

S3. Identification Marking

S3.1 All material shall be properly marked for identification in accordance with Fed. Std. No. 185 except that the ASTM specification number and the alloy number shall be used.

S4. Preparation for Delivery

S4.1 *Preservation, Packaging, Packing:*

S4.1.1 *Military Agencies*—The material shall be separated by size, composition, grade, or class and shall be preserved and packaged, Level A or C, and packed, Level A, B, or C, as specified in the contract or purchase order, in accordance with the requirements of MIL-C-3993.

S4.1.2 *Civil Agencies*—The requirements of Fed. Std. No. 102 shall be referenced for definitions of the various levels of packaging protection.

S4.2 *Marking:*

S4.2.1 *Military Agencies*—In addition to any special marking required by the contract or purchase order, marking for shipment shall be in accordance with MIL-STD-129.

S4.2.2 *Civil Agencies*—In addition to any special marking required by the contract or purchase order, marking for shipment shall be in accordance with Fed. Std. No. 123.

S5. Part or Identifying Numbers (PINs)

S5.1 Part numbers are essential to maintain the integrity of the Department of Defense cataloging system as multiple National Stock Numbers (NSN) exist for this product. The following information is provided for cross-reference purposes. The pipe previously described in WW-P-377 and MS14302 corresponds to ASTM B 42 copper pipe of copper UNS No. C12000 with a regular wall thickness.

S5.2 Part identifying numbers, for government use, shall be formulated by selecting from the options in this specification as shown in Table S5.1.

S5.3 An example of a PIN follows: A part identifying number of B42C12000H80-030R1264 indicates an ASTM B 42 pipe of copper UNS No. C12000 in the hard drawn (H80) temper, 3-in. standard pipe size, regular wall thickness, and it is 10 ft 6½ in. (3213 mm) in length.

APPENDIX

(Nonmandatory Information)

X1. METRIC EQUIVALENTS

X1.1 The SI unit for strength properties now shown is in accordance with the International System of Units (SI). The derived SI unit for force is the newton (N), which is defined as that force which when applied to a body having a mass of one kilogram gives it an acceleration of one metre per second squared ($N = kg \cdot m/s^2$). The derived SI unit for pressure or stress is the newton per square metre (N/m^2), which has been named the pascal (Pa) by the General Conference on Weights and Measures. Since 1 ksi = 6 894 757 Pa, the metric equivalents are expressed as megapascal (MPa), which is the same as MN/m^2 and N/mm^2.

TABLE S5.1 Part or Identifying Numbers

B42	XXXXXX	XXX	-XX	X	X	XXX	X
			Size (See Table 3)			Length	
Document Identifier	Alloy (See Table 1)	Temper (See 6.1)	inches	eighths of an inch	Wall thickness (R = regular, S = extra strong)	inches	eighths of an inch

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B 42 - 98) that may impact the use of this standard.

(*1*) Requirements of the now-cancelled Department of Defense document, WW-P-377, "Pipe, Copper, Seamless, Standard Sizes," were incorporated as follows:
(*1a*) An addition to Table 2, Tensile Requirements, to add sizes above 2-in. standard pipe size properties for H80 temper pipe.
(*1b*) The addition of a method of part identifying numbers (PINs) in agreement with the Department of Defense cataloging systems.