Designation: B372 – 12a

Standard Specification for Seamless Copper and Copper-Alloy Rectangular Waveguide Tube[1]

This standard is issued under the fixed designation B372; 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.

1. Scope*

1.1 This specification establishes the requirements for seamless copper and copper-alloy rectangular tube intended for use as transmission lines in electronic equipment. Five types of material are specified having the following nominal compositions:[2]

Copper or Copper Alloy UNS[2] No.	Previously Used Designation	Nominal Composition, % Copper	Zinc	Phosphorus
C10100	Copper, Type OFE[A]	99.99[B]	...	...
C10200	Copper, Type OF[A]	99.95[B]	...	...
C10300	Copper, Type OFXLP[A]	99.95[B]	...	0.003
C12000	Copper, Type DLP[A]	99.90[B]	...	0.008
C22000	Commercial bronze, 90 %	90	10	...

[A] Types OF, OFE, OFXLP, and DLP are described in Classification B224.
[B] Minimum copper percentage.

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

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]

B170 Specification for Oxygen-Free Electrolytic Copper—Refinery Shapes

B193 Test Method for Resistivity of Electrical Conductor Materials

B224 Classification of Coppers

B428 Test Method for Angle of Twist in Rectangular and Square Copper and Copper Alloy Tube

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

B846 Terminology for Copper and Copper Alloys

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

E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)[4]

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

E478 Test Methods for Chemical Analysis of Copper Alloys

2.3 *Other Standard:*

ANSI B46.1 Surface Roughness, Waviness, and Lay[5]

3. Terminology

3.1 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 for products under this specification, as applicable:

4.1.1 ASTM designation and year of issue,

4.1.2 Copper or copper alloy UNS No. designation,

4.1.3 Outer and inner rectangular dimensions, dimensional tolerances (Section 10),

4.1.4 Length (10.6),

4.1.5 Total length of each size,

[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 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.

[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.

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

[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

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

4.2 The following options are available but may not be included unless specified at the time of placing of the order when required:

4.2.1 Rockwell (Section 8.1),
4.2.2 Electrical resistivity test (Section 7),
4.2.3 Embrittlement test (Section 9.2),
4.2.4 Special finish (Section 11.2),
4.2.5 Heat Identification (Section 13.1.1.4),
4.2.6 Certification (Section 18),
4.2.7 Test Report (Section 19), and
4.2.8 Special packing (Section 20).

5. Materials and Manufacture

5.1 *Materials:*

5.1.1 The material of manufacture shall be of such quality and purity to be suitable for processing into the products prescribed herein.

5.2 *Manufacture:*

5.2.1 The product shall be manufactured by such hot working, cold-working and annealing process as to produce a uniform wrought structure in the finished product.

5.2.2 The product shall be hot or cold worked to the finished size, and subsequently annealed when required, to meet the temper properties.

6. Chemical Composition

6.1 The material shall conform to the chemical composition requirements in Table 1 for the copper or copper alloy UNS No. designation specified in the ordering information.

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

6.3 For alloys in which zinc is listed as "remainder," either copper or zinc may be taken as the difference between the sum of results of all other elements determined and 100 %. When all elements for C22000 in Table 1 are determined, the sum of the results shall be 99.8 % minimum.

TABLE 1 Chemical Requirements

Element	Composition, %				
	Copper UNS Nos.				Copper Alloy UNS No. C22000
	C10100[A]	C10200[B]	C10300	C12000	
Copper	99.99 min	99.95[C] min	...	99.90[C] min	89.0–91.0
Copper, + phosphorus	...	...	99.95[C] min	...	...
Phosphorus	0.0003 max	...	0.001–0.005	0.004–0.012	...
Zinc	0.0001 max	...	...	...	remainder
Lead, max	0.0005	...	...	...	0.05
Iron, max	0.0010	...	...	...	0.05

[A] The following additional impurity maximum limits shall apply: As 0.0005%, Sb 0.0004%, Te 0.0002%, O 0.0005%, Bi 0.0001%, Cd 0.0001%, Mn 0.00005%, Ni 0.0010%, Se 0.0003%, Ag 0.0025%, S 0.0015% and Sn 0.0002%.
[B] Oxygen in C10200 shall be 0.0010 % max.
[C] Silver counting as copper.

7. Physical Property Requirements

7.1 *Electrical Resistivity Requirement:*

7.1.1 When specified in the contract or purchase order, the product furnished shall conform to the electrical mass resistivity requirements prescribed in Table 2, when tested in accordance with Test Method B193.

NOTE 1—The International Annealed Copper Standard electrical conductivity equivalents are as follows:

Electrical Resisitivity, Ω·g/m^2	Conductivity, %
0.15176	101.00
0.15328	100.00
0.15585	98.35
0.15614	98.16
0.15737	97.40
0.15940	96.16
0.17031	90
0.17418	88

8. Mechanical Property Requirements

8.1 *Rockwell Hardness Requirements:*

8.1.1 When specified in the contract or purchase order, the product shall conform to the Rockwell hardness requirement prescribed in Table 3, when tested in accordance with Test Method E18.

9. Performance Requirements

9.1 *Microscopical Examination:*

9.1.1 Samples of Copper UNS Nos. C10100, C10200, C10300, and C12000 shall be free of cuprous oxide as determined by Procedure A of Test Methods B577. In case of a dispute, a referee method in accordance with Procedure C of Test Method B577 shall be used.

9.2 *Hydrogen Embrittlement Test:*

9.2.1 Samples of Copper UNS Nos. C10100, C10200, C10300, and C12000 shall be capable of passing the embrittlement test of Procedure B of Test Methods B577. The actual performance of this test is not mandatory under the terms of this specification unless definitely specified in the ordering information. In case of a dispute, a referee method in accordance with Procedure C shall be employed.

10. Dimensions and Permissible Variations

10.1 *General:*

10.1.1 The standard method of specifying, ordering, and measuring rectangular waveguide tube shall be major by minor outer dimension and major by minor inner dimension.

10.1.2 All cross-sectional measurements shall be made at the corners at a point at least ½ in. (12.7 mm) from the ends.

10.1.3 For the purpose of determining conformance with the dimensional requirements prescribed in this specification, any

TABLE 2 Electrical Resistivity Requirements for Copper UNS Nos. C10100, C10200, C10300, and C12000

Alloys	Electrical Resistivity max. Ω·g/m ^{2}
C10100	0.15585
C10200	0.15737
C10300	0.15940
C12000	0.17418

TABLE 3 Hardness Requirements

Copper or Copper Alloy UNS No.	Rockwell Hardness, 30T Scale[A]
C10100	30 min
C10200	30 min
C10300	30 min
C12000	30 min
C22000	43 to 66

[A] The tube shall be split along the center line of its narrow side, and Rockwell hardness readings then taken on its inner surface.

measured value outside the specified limiting values for any dimension may be cause for rejection.

10.2 *Dimensional Tolerances:*

10.2.1 Standard dimensions and tolerances of waveguide tube shall be as specified in Table 4.

10.2.2 Other dimensions and tolerances shall be subject to agreement between the manufacturer or supplier and the purchaser.

10.3 *Corner Radii*—Outer corner radii shall be 0.015 in. (0.381 mm) min and 0.032 in. (0.813 mm) max. Maximum inner corner radii shall be as specified in Table 5.

10.4 *Eccentricity*—The maximum allowable eccentricity, defined as one-half the difference between the maximum and minimum opposite wall thicknesses as measured at any cross section perpendicular to the longitudinal axis, shall be in accordance with Table 6.

10.5 *Rectangularity*—The adjoining faces of the tube shall be as square in relation to each other as the best mill practice will permit.

10.6 *Length*—Unless otherwise specified, waveguide tube shall be furnished in 12-ft (3.66-m) standard (stock) straight lengths with ends. The shortest permissible length of the ends shall not be less than 60 % of the nominal length (specific and stock), and the maximum permissible weight of ends shall not exceed 25 % of the lot weight. Waveguide tube, ordered to specific or stock lengths, with or without ends, shall conform to the tolerances prescribed in Table 7.

TABLE 5 Permissible Inner Corner Radii

Nominal Wall Thickness, in. (mm)	Permissible Inner Corner Radii, max, in. (mm)
0.040 (1.02)	0.016 (0.41)
0.050 (1.27)	0.032 (0.81)
0.064 (1.63)	0.032 (0.81)
0.080 (2.03)	0.047 (1.2)

TABLE 6 Eccentricity Tolerances

Specified Major Outer Dimension, in. (mm)	Allowable Eccentricity,[A] max, in. (mm)
0.420 to 0.850 (10.7 to 21.6), excl	0.003 (0.08)
0.850 to 2.418 (21.6 to 61.4), excl	0.004 (0.10)
2.418 to 3.000 (61.4 to 76.2), excl	0.005 (0.13)
3.000 to 3.560 (76.2 to 90.4), excl	0.006 (0.15)
3.560 to 4.460 (90.4 to 113), excl	0.007 (0.18)
4.460 to 6.660 (113 to 169), incl	0.008 (0.20)

[A] Applicable only to those sizes of tubes shown in Table 4. See 10.2.2.

TABLE 7 Length Tolerances

Length, ft (m)	Tolerance,[A] plus in. (mm)
Standard (stock)	1 (25)
Specific:	
Up to 14 (4.27), incl	¼ (6.4)
Over 14 (4.27)	½ (13)

[A] Applicable only to full-length pieces.

TABLE 4 Dimensional Tolerances

Outer Dimensions, in. (mm)			Inner Dimensions, in. (mm)			Nominal Wall Thickness, in. (mm)
Major Dimensions	Minor Dimensions	Tolerance, plus and minus	Major Dimensions	Minor Dimensions	Tolerance, plus and minus	
0.420 (10.7)	0.250 (6.35)	0.003 (0.076)	0.340 (8.64)	0.170 (4.32)	0.002 (0.051)	0.040 (1.02)
0.500 (12.7)	0.250 (6.35)	0.003 (0.076)	0.420 (10.7)	0.170 (4.32)	0.002 (0.051)	0.040 (1.02)
0.590 (15.0)	0.335 (8.51)	0.003 (0.076)	0.510 (13.0)	0.255 (6.48)	0.002 (0.051)	0.040 (1.02)
0.702 (17.8)	0.391 (9.93)	0.003 (0.076)	0.622 (15.8)	0.311 (7.90)	0.002 (0.051)	0.040 (1.02)
0.850 (21.6)	0.475 (12.1)	0.003 (0.076)	0.750 (19.0)	0.375 (9.52)	0.003 (0.076)	0.050 (1.27)
1.000 (25.4)	0.500 (12.7)	0.004 (0.10)	0.900 (22.9)	0.400 (10.2)	0.004 (0.010)	0.050 (1.27)
1.250 (31.8)	0.625 (15.9)	0.004 (0.10)	1.122 (28.5)	0.497 (12.6)	0.004 (0.10)	0.064 (1.63)
1.500 (38.1)	0.750 (19.0)	0.004 (0.10)	1.372 (34.8)	0.622 (15.8)	0.004 (0.10)	0.064 (1.63)
1.718 (43.6)	0.923 (23.4)	0.005 (0.13)	1.590 (40.4)	0.795 (20.2)	0.005 (0.13)	0.064 (1.63)
2.000 (50.8)	1.000 (25.4)	0.005 (0.13)	1.872 (47.5)	0.872 (22.1)	0.005 (0.13)	0.064 (1.63)
2.418 (61.4)	1.273 (32.3)	0.006 (0.15)	2.290 (58.2)	1.145 (29.1)	0.006 (0.15)	0.064 (1.63)
3.000 (76.2)	1.500 (38.1)	0.006 (0.15)	2.840 (72.1)	1.340 (34.0)	0.006 (0.15)	0.080 (2.03)
3.560 (90.4)	1.860 (47.2)	0.006 (0.15)	3.400 (86.4)	1.700 (43.2)	0.006 (0.15)	0.080 (2.03)
4.460 (113)	2.310 (58.7)	0.008 (0.20)	4.300 (109)	2.150 (54.6)	0.008 (0.20)	0.080 (2.03)
5.260 (134)	2.710 (68.8)	0.008 (0.20)	5.100 (130)	2.550 (64.8)	0.008 (0.20)	0.080 (2.03)
6.660 (169)	3.410 (86.6)	0.008 (0.20)	6.500 (165)	3.250 (82.6)	0.008 (0.20)	0.080 (2.03)

10.7 *Squareness of Cut*—The departure from the squareness of the end of any tube shall not exceed 0.010 in. (0.25 mm) for tube up to ⅝-in. (15.9-mm) dimension, inclusive, across the measured section, and 0.016 in./in. (0.41 mm/mm) of distance between parallel surfaces for tube over ⅝-in. dimension across the measured section.

10.8 *Straightness*—The maximum curvature (depth of arc) measured along any 2-ft (0.610-m) portion of the total length shall not exceed 0.010 in. (0.25 mm) edgewise and 0.020 in. (0.51 mm) flatwise on the concave external surfaces. The tube shall be so positioned during measurement that gravity will not tend to increase the amount of bow. The edgewise and flatwise bow shall be determined by using a suitable straightedge.

10.9 *Twist*—The maximum twist about the longitudinal axis of the finished tube shall not exceed 1°/ft of length on the face of any surface, inside or outside. Determination of twist shall be in accordance with Test Method B428.

10.10 *Surface Roughness*—The average interior surface roughness of the finished tube, in accordance with ANSI B46.1, shall not exceed 32 µin. A.A.[6] for tube up to 4 in. (102 mm) major ID and 64 µin. A.A.[6] for tube whose major ID is 4 in. or over.

11. Workmanship, Finish, and Appearance

11.1 The product shall be free of defects, but blemishes of a nature that do not interfere with the intended application are acceptable. The finished tube shall be uniform in composition and wall thickness, straight and smooth from end to end, and shall be free of internal or external mechanical imperfections in accordance with good commercial practice. In addition, the interior surface of the tube shall be free of burrs, plug marks, chatter marks, dirt, grease, scale, and splinters. Scratches not more than 0.001-in. (0.025-mm) deep, as measured metallographically, will be permitted in the longitudinal direction of the interior surfaces for tubes 0.622 in. (15.8 mm) by 0.311 in. (7.90 mm) and larger. For tubes smaller than 0.622 by 0.311 in., the depth of scratches on interior surfaces shall not exceed 0.12 % of the width.

11.2 Unless otherwise specified, the interior and exterior surfaces of the finished tube shall be bright, dry, and free of scale or oxides.

12. Sampling

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

12.1.1 *Lot Size*—An inspection lot shall be 5000 lb (2270 kg) or less, of the same mill form, alloy, rockwell hardness range, and nominal dimensions, subject to inspection at one time.

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

Number of Pieces in Lot	Number of Sample Pieces to be Taken
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 over 10 samples.

13. Number of Tests and Retests

13.1 *Chemical Analysis*—Samples for chemical analysis shall be taken in accordance with Practice E255. Drillings, millings, etc., 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 E255, 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 semi-finished 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 semi-finished 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 Due to 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 *Number of Tests*—Sample pieces selected for purpose of tests in accordance with 12.1 shall be subjected to the following tests.

13.2.1 A specimen from each sample piece shall be subjected to the Rockwell hardness test (see 8.1). The value for the Rockwell hardness number of each specimen shall be established by taking the arithmetical average of at least three readings.

13.2.2 In the case of Copper UNS Nos. C10100, C10200, C10300, and C12000, a specimen from each sample piece shall be submitted to microscopical examination as specified in 9.1, to the embrittlement test, if specified, as prescribed in 9.2; and also for determination of electrical resistivity, if specified, as prescribed in 7.1.

13.3 *Retests:*

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

13.3.2 If the results of the test on one of the specimens fail to meet the specified requirements, two additional specimens

[6] The symbol "A.A." stands for arithmetic average.

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.

13.3.3 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 *Chemical Analysis:*

14.1.1 In cases of disagreement, test methods for chemical analysis shall be subject to agreement between the manufacturer or supplier and purchaser.

14.1.2 The chemical test methods listed below along with other chemical test methods may be used subject to agreement between the manufacturer or supplier and purchaser.

14.2 *Other Tests:*

14.2.1 The product furnished shall conform to specified requirements when subjected to test in accordance with the following table:

Test	ASTM Designation
Chemical analysis	B170,[A] E53, E62, E478
Hardness	E18
Electrical Resistivity	B193
Hydrogen Embrittlement	B577

[A] Reference to Specification B170 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 B170 annex will be eliminated.

15. Significance of Numerical Limits

15.1 For purposes of determining compliance with the specified limits for requirements of chemical composition, hardness, and electrical resistivity, an observed value or a calculated value shall be rounded to the nearest unit in the last right-hand place of the figures of the specified limit in accordance with the rounding method of Practice E29.

16. Inspection

16.1 The manufacturer, or supplier, shall inspect and make tests necessary to verify the furnished product conforms to specification requirements.

16.2 Source inspection of the product by the purchaser may be agreed upon between the manufacturer, or supplier, and the purchaser as part of the purchase order. In such case, the nature of the facilities needed to satisfy the inspector, representing the purchaser, that the product is being furnished in accordance with the specification, shall be included in the agreement. All testing and inspection shall be conducted so as not to interfere unnecessarily with the operation of the works.

16.3 When mutually agreed upon, the manufacturer, or supplier, and the purchaser shall conduct the final inspection simultaneously.

17. Rejection and Rehearing

17.1 *Rejection:*

17.1.1 Product that fails to conform to the specification requirements when tested by the purchaser or purchaser's agent shall be subject to rejection.

17.1.2 Rejection shall be reported to the manufacturer or supplier promptly. In addition, a written notification of rejection shall follow.

17.1.3 In case of dissatisfaction with results of the test upon which the rejection is based, the manufacturer or supplier shall have the option to make claim for a rehearing.

17.2 *Rehearing:*

17.2.1 As a result of product rejection, the manufacturer, or supplier, shall have the option to make claim for a retest to be conducted by the manufacturer, or supplier, and the purchaser. Samples of the rejected product shall be taken in accordance with this product specification and subjected to test by both parties, an independent laboratory may be selected for the test(s) using the test method(s) specified in this product specification.

18. Certification

18.1 When specified in the purchase order or contract, the purchaser shall be furnished certification that samples representing each lot have been tested and inspected as directed in this specification and requirements have been met.

19. Test Report

19.1 When specified in the contract or purchase order, a report of test results shall be furnished.

20. Packaging and Package Marking

20.1 *Packaging:*

20.1.1 The product shall be separated by size, composition, and temper, and prepared for shipment by common carrier in such manner to afford protection from the normal hazards of transportation.

20.2 *Package Marking:*

20.2.1 Each shipping unit shall be legibly marked with the purchase order number, metal or alloy designation, temper, size, shape, gross and net weight, and name of supplier.

20.2.2 When specified in the contract or purchase order, the product specification number shall be shown.

21. Keywords

21.1 seamless copper and copper alloy rectangular tube; waveguide tube; UNS No. C10100; UNS No. C10200; UNS No. C10300; UNS No. C12000; UNS No. C22000

APPENDIXES

(Nonmandatory Information)

X1. CROSS INDEX OF WAVEGUIDE DESIGNATIONS

X1.1 This Appendix gives the ASESA[B] and EIA[A] designations for those sizes of waveguide tube covered herein. These data are given in Table X1.1 for information purposes only.

TABLE X1.1 Waveguide Designations

Outer Dimensions, in.		Inner Dimensions, in.		Reference Designations	
Major	Minor	Major	Minor	EIA[A]	ASESA[B]
0.420	0.250	0.340	0.170	WR34	RG-354/U
0.500	0.250	0.420	0.170	WR42	RG-53/U
0.590	0.335	0.510	0.255	WR51	RG-352/U
0.702	0.391	0.622	0.311	WR62	RG-91/U
0.850	0.475	0.750	0.375	WR75	RG-346/U
1.000	0.500	0.900	0.400	WR90	RG-52/U
1.250	0.625	1.122	0.497	WR112	RG-51/U
1.500	0.750	1.372	0.622	WR137	RG-50/U
1.718	0.923	1.590	0.795	WR159	RG-343/U
2.000	1.000	1.872	0.872	WR187	RG-49/U
2.418	1.273	2.290	1.145	WR229	RG-340/U
3.000	1.500	2.840	1.340	WR284	RG-48/U
3.560	1.860	3.400	1.700	WR340	RG-112/U
4.460	2.310	4.300	2.150	WR430	RG-104/U
5.260	2.710	5.100	2.550	WR510	RG-337/U
6.660	3.410	6.500	3.250	WR650	RG-69/U

[A] Electronic Industries Association.
[B] Armed Services Electro-Standards Agency.

X2. METRIC EQUIVALENTS

X2.1 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 of 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.

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B372 – 12) that may impact the use of this standard. (Approved Oct. 1, 2012.)

(1) Sections 4, 7, and 14 have been changed along with the addition of a new Table 2 for Electrical Resistivity Requirements. With this addition, the remaining Table numbers have been changed accordingly.

Committee B05 has identified the location of selected changes to this standard since the last issue (B372 – 11) that may impact the use of this standard. (Approved April 1, 2012.)

(1) Sections 4, 5, 6, 7, 8, 9, 11, 12, 16, 17, 18, 19, and 20 have been altered to agree with ASTM B950.

(2) Added Section 21, Keywords.