Designation: B882 – 10

Standard Specification for Pre-Patinated Copper for Architectural Applications[1]

This standard is issued under the fixed designation B882; 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 covers the establishment of the requirements for pre-patinated (artificially aged) copper sheet and strip in ounce-weight thicknesses supplied in flat lengths for roofing, flashing, and other architectural applications.

1.2 The pre-patinated surface is the result of chemical reaction with the copper and shall be applied on one side of the product.

1.2.1 The pre-patinated surface formed is comparable in color and ability to be bent or formed to the surface formed in naturally occurring patinated copper.

1.3 The pre-patinated surface is not the result of coating applications such as painting.

1.4 Materials made to this specification are not intended to be used for electrical applications.

1.5 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.

NOTE 1—A companion specification for copper sheet and strip for building construction is Specification B370.

1.6 The following precautionary statement pertains only to the test method portion, Section 12, 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]

B248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

B370 Specification for Copper Sheet and Strip for Building Construction

B571 Practice for Qualitative Adhesion Testing of Metallic Coatings

B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B846 Terminology for Copper and Copper Alloys

E8 Test Methods for Tension Testing of Metallic Materials

E478 Test Methods for Chemical Analysis of Copper Alloys

G23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Withdrawn 2000)[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms related to copper and copper alloys, refer to Terminology B846.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *pre-patinated copper*—copper that has been artificially aged under controlled and monitored conditions to produce a protective surface that is within the range of colors from green to turquoise.

4. Ordering Information

4.1 Orders for product produced to this specification should include the following information:

4.1.1 ASTM designation and year of issue,

4.1.2 Ounce weight thickness of the base copper sheet (see Table 1),

4.1.3 Temper (see Table 2),

4.1.4 *Dimensions*—Width and length of sheets, and

4.1.5 *Quantity*—Total weight or number of sheets of each size.

4.2 The following requirements are optional and shall be included in the purchase order or contract when required:

4.2.1 Certification, or

4.2.2 Mill test reports,

[1] This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.01 on Plate, Sheet, and Strip.

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[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**

TABLE 1 Thickness and Weight Tolerances of Sheet and Strip

Ounce-Weight/ft^2	Theoretical Thickness,[A] in. (mm)	Tolerances, Plus and Minus, in. (mm)
6	0.0081 (0.206)	0.001 (0.026)
8	0.0108 (0.274)	0.0011 (0.028)
10	0.0135 (0.343)	0.0011 (0.028)
12	0.0162 (0.411)	0.0012 (0.030)
16	0.0216 (0.549)	0.0012 (0.031)
20	0.0270 (0.686)	0.0012 (0.031)
24	0.0323 (0.820)	0.0015 (0.038)
32	0.0431 (1.09)	0.002 (0.05)
48	0.0646 (1.64)	0.0025 (0.06)

[A] Based on a density of 0.322 lb/in.^{3} (8.91 g/cm^3).

4.2.3 Supplementary requirements for agencies of the U.S. government as given in Specification B248, or both.

5. General Requirements

5.1 The following sections of Specification B248 constitute a part of this specification:

5.1.1 Sampling,
5.1.2 Number of tests and retests,
5.1.3 Specimen preparation,
5.1.4 Test methods,
5.1.5 Significance of numerical limits,
5.1.6 Inspection,
5.1.7 Rejection and rehearing,
5.1.8 Certification,
5.1.9 Test reports,
5.1.10 Packaging and package markings, and
5.1.11 Supplementary requirements.

5.2 In addition, when a section with a title identical to that referenced in 5.1 appears in this specification, it contains additional requirements that supplement those appearing in Specification B248.

6. Materials and Manufacture

6.1 *Materials*—The base or starting material shall be copper sheet or strip manufactured by any process that provides a product that conforms to the requirements of Specification B370.

6.2 *Manufacture:*

6.2.1 The pre-patinated surface shall be the result of chemical treatment that artificially ages the base metal, under controlled conditions, to form the green- to turquoise-colored protective layer.

6.2.2 The untreated side of the copper sheet is permitted to have a dull appearance. Stains or discolorations are permitted as long as they do not interfere with the function of the product.

7. Chemical Composition

7.1 The copper sheet shall have a minimum copper content of 99.5 % (including silver) as prescribed in Specification B370.

7.1.1 Any copper that complies with 7.1 shall be acceptable.

7.2 When limits for unnamed elements are required, those limits shall be established, and the concentration of such elements determined by agreement between the manufacturer and the purchaser.

7.3 The artificial patina is composed of metallic salts which are also found in naturally occurring patinas.

8. Temper

8.1 The nonpatinated base copper sheet, referred to in 6.1 of this specification, is commercially available in the following tempers as defined by Classification B601: H00 (eighth hard, cold-rolled), H01 (quarter hard, cold-rolled high yield), and H02 (half hard) temper.

8.1.1 Unless otherwise specified, the product is normally supplied in the H00 (eighth hard, cold-rolled) temper.

9. Mechanical Properties

9.1 *Tensile Strength:*

9.1.1 The nonpatinated base copper sheet material shall conform to the requirements of Table 2, for the temper specified in the purchase order, when tested in accordance with Test Methods E8.

9.1.2 The tension test results shall be the basis for purchaser acceptance or rejection based upon mechanical properties.

9.2 *Rockwell Hardness:*

9.2.1 Since Rockwell hardness tests offer a quick and convenient method of checking the conformity of the product to the requirements of tensile strength, approximate Rockwell hardness values are given in Table 2 for general information and assistance in testing.

9.2.1.1 The hardness testing must be performed on a non-patinated surface, and the values obtained shall not be used as a basis for rejection.

10. Dimensions, Mass, and Permissible Variations

10.1 *Thickness:*

10.1.1 The standard method of measuring the thickness of the nonpatinated base sheet shall be by ounce-weight.

10.1.1.1 The corresponding theoretical thickness in inches for the standard ounce-weights is shown in Table 1.

10.1.2 The minimum and maximum thickness permitted at any point on the nonpatinated base sheet shall be as specified in Table 1.

10.1.2.1 The thickness of the patinated product shall not be less than the thickness of the base copper sheet.

10.2 *Width:*

10.2.1 The width tolerance for slit metal shall be as shown in Table 3.

10.2.2 The width tolerances for square-sheared metal shall be as shown in Table 4.

10.3 *Length:*

10.3.1 Specific and stock length tolerances shall be as shown in Table 5.

10.3.2 Square sheared metal length tolerances shall be as shown in Table 6.

10.4 *Straightness:*

10.4.1 The straightness or edgewise curvature (depth of arc) tolerance measured in any 72-in. (1.8-m) portion of the total length shall be as follows:

10.4.1.1 For slit metal—As shown in Table 7 and
10.4.1.2 For square-sheared metal as shown in Table 8.

TABLE 2 Mechanical Properties

Temper Designation		Tensile Strength, ksi (MPa)		Yield Strength, at 0.5 % Extension Under Load, min, ksi (MPa)	Approximate Rockwell Hardness[A] (for Information Only)	
Standard	Former	min	max		F Scale	Superficial 30
H00	cold-rolled	32 (220)	40 (273)	20 (135)	54 to 82	15 to 49
H01	cold-rolled, high yield	34 (235)	42 (290)	28 (190)	60 to 84	18 to 51
H02	half hard	37 (255)	46 (315)	30 (205)	77 to 89	43 to 57

[A] Rockwell hardness values apply as follows: The F scale applies to only 32- and 48-oz-weight/ft^2 metal; the superficial 30T scale applies to lesser ounce-weight/ft^2 metal.

TABLE 3 Width Tolerances for Slit Metal

Width, in. (mm)	Width Tolerances, Plus and Minus, in. (mm)
Up to 24 (610), incl	1/64 (0.40)
Over 24 to 36 (610 to 914), incl	3/64 (1.2)

TABLE 4 Width Tolerances for Square-Sheared Metal

Width, in. (mm)	Width Tolerances, Plus and Minus, in. (mm)
Up to 24 (610), incl	1/32 (0.79)
Over 24 to 36 (610 to 914), incl	3/64 (1.2)
Over 36 (914)	1/16 (1.6)

TABLE 5 Length Tolerances for Specific and Stock Lengths

Length, in. (m)	Length Tolerance (Applicable Only to Full-Length Pieces), in. (mm)
Specific lengths 120 (3) and under	1/4 (6.4) (all plus)

TABLE 6 Length Tolerances for Square-Sheared Metal

Length, in. (m)	Length Tolerance Plus and Minus, in. (mm)
Over 36 to 120 (0.9 to 3), incl	1/16 (2)

TABLE 7 Straightness Tolerances for Slit Metal

NOTE 1—Maximum edgewise curvature (depth of arc) in any 72-in. (1.83-m) portion of the total length.

Width, in. (mm)	Straightness Tolerance, in. (mm)
Over 4 to 24 (102 to 610), incl	1/2 (13)

TABLE 8 Straightness Tolerances for Square-Sheared Metal

NOTE 1—Maximum edgewise curvature (depth of arc) in any 72-in. (1.83-m) portion of the total length (not applicable to metal over 120 in. (3.05 m) in length).

	Straightness Tolerances, in. (mm)	
	Up to 10 in. (254 mm) incl. in Width	Over 10 in. (254 mm) in Width
All thicknesses	1/16 (1.6)	1/32 (0.79)

11. Workmanship, Finish, and Appearance

11.1 The pre-patinated copper surface shall be applied to only one side of the product and shall have a green to turquoise color that is similar in texture and appearance to patina that typically forms on copper when exposed to any form of weather.

11.1.1 The pre-patinated copper surface will not fade upon exposure to ultraviolet light; however, some color change is normal upon exposure to weather for a brief period of time (few months).

11.1.1.1 Any concern the purchaser may have as to color fade must be discussed with the supplier, and any testing shall be done in accordance with agreed upon conditions available in Practice G23– 96.

11.1.2 The product can be bent, formed, or given edging operations as is considered normal in roofing, flashing, and other applications.

11.1.2.1 Minor flaking of the pre-patinated surface in the vicinity of worked areas is permitted as the pre-patinated surface will self-heal over time where abraded or marred.

11.1.2.2 Testing for the adhesiveness of the pre-patinated coating and its resistance to flaking shall be done in accordance with the bend test section of Practice B571.

11.2 Acceptance or rejection based on color shall be by mutual agreement between producer and consumer.

12. Test Methods

12.1 The chemical composition of the base copper sheet shall, in case of disagreement, be determined by Test Methods E478.

12.2 *Color Fade Resistance*—See Practice G23– 96.

12.3 *Resistance to Flaking*—See Test section of Practice B571.

13. Keywords

13.1 architectural copper; building construction; flashing; pre-patinated copper; roofing copper

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B882 – 05) that may impact the use of this standard. (Approved Oct. 1, 2010.)

(1) Section 10.2 Weight Tolerance in previous issue has been eliminated. This should have been eliminated in the last revision when Table 1 was revised.

(2) Added "maximum" to section 10.1.2.

(3) Indicated G 23 as historical document.