Designation: B370 – 11$^{\varepsilon 1}$

Standard Specification for Copper Sheet and Strip for Building Construction[1]

This standard is issued under the fixed designation B370; 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—Section 12.1.2.1 was editorially corrected in March 2012.

1. Scope*

1.1 This specification establishes the requirements for rolled copper sheet and strip in flat lengths or coils in ounce-weight thicknesses for roofing, flashing, gutters, downspouts, and general sheet metal work in building construction.

1.1.1 Products produced to this specification are not intended for electrical applications.

1.2 *Units*—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—Specification B101 is an associated specification for lead-coated copper sheets and strip for building construction.

1.3 *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]

B101 Specification for Lead-Coated Copper Sheet and Strip for Building Construction

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

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

B846 Terminology for Copper and Copper Alloys

E3 Guide for Preparation of Metallographic Specimens

E8 Test Methods for Tension Testing of Metallic Materials

E112 Test Methods for Determining Average Grain Size

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

E478 Test Methods for Chemical Analysis of Copper Alloys

3. General Requirements

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

3.1.1 Terminology,
3.1.2 Materials and Manufacture,
3.1.3 Workmanship, Finish, and Appearance,
3.1.4 Specimen Preparation,
3.1.5 Test Methods,
3.1.6 Significance of Numerical Limits,
3.1.7 Inspection,
3.1.8 Certification,
3.1.9 Mill Test Report,
3.1.10 Packaging and Package Marking, and
3.1.11 Supplementary Requirements.

3.2 In addition, when a section with a title identical to that referenced in 3.1, above, appears in this specification, it contains additional requirements, which supplement those appearing in Specification B248.

4. Terminology

4.1 *Definitions:*

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

[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.

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

4.1.2 *coil*, *n*—a length of the product wound into a series of connected turns.

4.1.2.1 *Discussion*—The unqualified term "coil" as applied to "flat product" usually refers to a coil in which the product is spirally wound, with the successive layers on top of one another (sometimes called a "roll").

4.1.3 *lengths, mill*, *n*—straight lengths, including ends, that are be manufactured conveniently in the mills.

4.1.3.1 *Discussion*—Full length pieces usually are 8 or 10 ft (2.4 or 3.0 m) and subject to established length tolerances.

4.1.4 *length, stock*, *n*—straight lengths that are mill cut and stored in advance of orders.

4.1.4.1 *Discussion*—They usually are 8 or 10 ft (2.4 or 3.0 m) and subject to established length tolerances.

4.1.5 *ounce-weight*, *n*—the weight of copper sheet or strip expressed in ounces per square foot.

4.1.6 *sheet, for building construction*, *n*—a rolled flat product over 24 in. (610 mm) in width and of ounce-weight thickness from 8 to 48 oz.

4.1.7 *strip, for building construction*, *n*—a rolled flat product up to 24 in. (610 mm), inclusive, in width and of ounce-weight thickness from 8 to 48 oz.

NOTE 2—In 4.1.6 and 4.1.7, the 8 to 48 oz refers to the names commonly used in the building industry for the sizes used. The respective sizes that correspond to these names are listed in Table 1.

5. Ordering Information

5.1 Include the following information when placing orders for product under this specification, as applicable:

5.1.1 ASTM designation and year of issue (for example, B370–XX),

5.1.2 Temper (Section 8),

5.1.3 Dimensions: tolerances (Section 12),

5.1.4 How furnished: flat lengths or coils (4.1.2-4.1.4),

5.1.5 Quantity: total weight or number of pieces of each form and size, and

5.1.6 When product is purchased for agencies of the U.S. Government (Section 11).

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

5.2.1 Heat identification or traceability details,

5.2.2 Certification, and

5.2.3 Mill test report.

TABLE 1 Thickness 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)	.001(.026)
8	0.0108 (0.274)	.0011(.028)
10	0.0135 (0.343)	.0011(.028)
12	0.0162 (0.411)	.0012(.030)
16	0.0216 (0.549)	.0012(.031)
20	0.0270 (0.686)	.0012(.031)
24	0.0323 (0.820)	.0015(.038)
32	0.0431 (1.09)	.002(.05)
48	0.0646 (1.64)	.0025(.06)

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

6. Materials and Manufacture

6.1 *Materials*—The material shall be any copper conforming with the chemical composition requirements (Section 7).

6.2 *Manufacture*:

6.2.1 *Sheet*—The product shall be manufactured in flat sheets.

6.2.2 *Strip*—The product shall be manufactured in flat lengths or in coils (rolls) of one single continuous length not less than 25 ft (7.5 m) wound into a cylindrical spiral.

7. Chemical Composition

7.1 The material shall be any copper with a minimum copper content, including silver, of 99.5 %.

TABLE 2 Thickness Tolerances of Sheet and Strip to be Coated for Flashing

Ounce- Weight/ft^2	Theoretical Thickness,[A] in. (mm)	Tolerances, Plus and Minus in. (mm)
2	.0027 (.068)	.0004 (.010)
3	.004 (.103)	.0005 (.013)
4	.0054 (.138)	.0006 (.0152)
5	.0067 (.171)	.0006 (.0152)

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

7.1.1 Limits shall be established and analysis required for unnamed elements by agreement between the manufacturer and the purchaser.

8. Temper

8.1 The standard tempers for products described in this specification are given in Table 3.

8.2 Cold Rolled tempers as defined in Classification B601: H00 (cold-rolled), H01 (cold-rolled, high yield), H02 (half hard), H03 (three-quarter hard), and H04 (hard).

8.3 Annealed temper as defined in Classification B601: O60 (soft)

NOTE 3—The purchaser should confer with the manufacturer or supplier concerning the availability of a specific temper and form.

NOTE 4—H00 temper is commonly known in the building industry as cold-rolled temper.

NOTE 5—H01 temper is commonly known in the building industry as cold-rolled, high yield temper.

9. Physical Property Requirements

9.1 *Grain Size*—Although no grain size has been established for temper O60, the product shall be recrystallized fully as determined by Test Method E112.

10. Mechanical Property Requirements

10.1 *Tensile and Yield Strength Requirements*:

10.1.1 The product shall conform to the requirements specified in Table 3 for the specific temper when subjected to test in accordance with Test Methods E8.

10.1.2 Acceptance or rejection for mechanical properties shall be based upon the results of the tensile and yield strength tests.

10.2 *Rockwell Hardness Requirement*—The approximate Rockwell values given in Table 3 are for general information and assistance in testing and shall not be a basis for product rejection.

TABLE 3 Mechanical Properties

Temper Designation		Tensile Strength, ksi[A] (MPa)		Yield Strength, at 0.5 % Extension Under Load, min ksi[A] (MPa)	Approximate Rockwell Hardness[B] (For Information Only) Scale	
Standard	Former	Min	Max		F	Superficial 30 T
O60	soft	30 (205)	38 (260)	. . .	up to 65	up to 31
H00	cold-rolled	32 (220)	40 (275)	20 (135)	54–82	15–49
H01	cold-rolled, high yield	34 (235)	42 (290)	28 (190)	60–84	18–51
H02	half hard	37 (255)	46 (315)	30 (205)	77–89	43–57
H03	three-quarter hard	41 (285)	50 (345)	32 (220)	82–91	47–59
H04	hard	43 (295)	52 (360)	35 (240)	86–93	54–62

[A] ksi = 1000 psi.
[B] Rockwell hardness values apply as follows: The F scale applies to metal 0.020 in. (0.508 mm) and over in thickness; the superficial 30T scale applies to metal 0.012 in. (0.305 mm) to 0.020 in. (0.508 mm) in thickness.

NOTE 6—The Rockwell hardness test offers a quick and convenient method of checking for general conformity to the specification requirements for temper and tensile strength.

11. Purchases for U.S. Government Agencies

11.1 When identified in the contract or purchase order, product purchased for agencies of the U.S. Government shall conform to the special government requirements stipulated in the Supplemental Requirements.

12. Dimensions, Mass, and Permissible Variations

12.1 The product shall conform to the following requirements:

12.1.1 *Thickness*:

12.1.1.1 *Tolerances of Sheet and Strip*—The standard method for specifying thickness shall be by ounce-weight. The theoretical thickness for standard ounce-weights and the minimum and maximum thickness, measured at any point, shall be as specified in Table 1.

12.1.2 *Thickness for Coated Copper for Flashing*:

12.1.2.1 *Tolerances of Sheet and Strip to be Coated for Flashing*—The standard method for specifying thickness shall be by ounce-weight. The theoretical thickness for standard ounce-weights and the minimum and maximum thickness, measured at any point, shall be as specified in Table 2.

12.1.3 *Weight*:

12.1.3.1 Weight tolerances shall be as specified in Table 1.

12.1.4 *Width*:

12.1.4.1 *Tolerances for Slit Metal*—Table 4.

12.1.4.2 *Tolerance for Square-Sheared Metal*—Table 5.

12.1.5 *Length*.

12.1.5.1 *Tolerances for Specific and Stock*—Table 6.

12.1.5.2 *Tolerances for Square-Sheared Metal*—Table 7.

12.1.6 *Straightness*.

12.1.6.1 *Tolerances or Slit Metal*—Table 8.

12.1.6.2 *Tolerances for Square-Sheared Metal*—Table 9.

13. Sampling

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

TABLE 4 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 48 (610 to 1219), incl	3/64 (1.2)

TABLE 5 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 6 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 7 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 8 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 9 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)

13.1.1 *Lot Size*—An inspection lot shall be 10 000 lb (4540 kg) or less of product of the same mill form, alloy, temper, and nominal dimensions, subject to inspection at one time, or shall be the product of one cast bar from a single melt charge whose weight shall not exceed 25 000 lb (11 340 kg) that has been processed continuously and subject to inspection at one time.

13.1.2 *Portion Size*— A portion shall be four or more pieces selected as to be representative of the lot. When the lot consist of less than four pieces, representative samples shall be taken from each piece.

13.2 *Chemical Analysis*:

13.2.1 The sample for chemical analysis shall be taken from the pieces selected and combined into one composite sample in accordance with Practice E255 for product in its final form. The minimum weight of the composite sample shall be 150 g.

13.2.2 Instead of sampling in accordance with Practice E255, the manufacturer shall have the option of taking samples at the time the castings are poured or by taking samples from the semifinished product.

13.2.2.1 When composition of the material has been determined during the course of manufacture, sampling of the finished product by the manufacturer is not required.

13.2.3 The number of samples to be taken for determination of chemical composition shall be as follows.

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

13.2.3.2 When sampled from the semifinished product, at least one sample shall be taken to represent each 10 000 lb, or fraction thereof, except that not more than one sample shall be required per piece.

13.2.3.3 Only one sample need be taken from the semifinished product of one cast bar from a single furnace melt charge continuously processed.

13.3 *Samples for All Other Tests*:

13.3.1 Samples for all other tests shall be taken from the sample portions of 13.1.2 and be of a convenient size to accommodate the test and comply with the requirements of this specification.

14. Number of Test and Retests

14.1 *Tests*:

14.1.1 *Chemical Analysis*—Composition shall be determined as the mean of results from at least two replicate analyses of the sample and the results of each replication shall meet the requirements of this specification.

14.1.2 *Mechanical Properties Tests*—Tensile strength for temper O60 and tensile strength and yield strength for all other tempers shall be reported as the results obtained from specimens prepared from a sample piece and the results must meet the requirements of this specification.

14.2 *Retests*:

14.2.1 When requested by the manufacturer or supplier, a retest shall be permitted when test results obtained by the purchaser fail to conform with specification requirements.

14.2.2 Retesting shall be as directed in this specification for the initial test(s) except that the number of test specimens shall be twice that required for the initial test.

14.2.3 Test results for all specimens shall conform to the requirements of this specification in retest and failure to conform shall be cause for lot rejection.

15. Specimen Preparation

15.1 *Chemical Analysis*

15.1.1 Preparation of the analytical specimen shall be the responsibility of the reporting laboratory.

15.2 *Grain Recrystalization*—The test specimen shall be prepared in accordance with Practice E3.

15.3 *Mechanical Properties Tests*:

15.3.1 The test specimen shall conform to the requirements prescribed for the specific product described in the Test Specimen section of Test Methods E8.

15.3.1.1 The test specimen shall be taken so that the longitudinal axis is parallel to the direction of rolling.

16. Test Methods

16.1 *Chemical Composition*:

16.1.1 Chemical composition shall be determined, in case of disagreement, in accordance with Test Methods E478.

16.1.2 Test method(s) used for the determination of element(s) required by contractual or purchase order agreement shall be as agreed upon between the manufacturer and the purchaser.

16.2 *Grain Recrystalization*—Recrystalization shall be determined in accordance with Test Methods E112.

16.3 *Mechanical Requirements*:

16.3.1 *Tensile Strength*— Tensile strength shall be determined in accordance with Test Methods E8.

16.3.2 *Yield Strength*— Yield strength shall be determined at 0.5 % extension-underload of Test Methods E8.

16.3.3 Test results are not seriously affected by variations in speed or testing. A considerable range of testing speed is permitted; however, the rate of stressing to the yield strength shall not exceed 100 ksi/min. Above the yield strength the movement per minute of the testing machine head under load shall not exceed 0.5 in./in. (0.5 mm/mm) of gage length (or distance between grips for full section specimens).

17. Rejection and Rehearing

17.1 *Rejection*:

17.1.1 Material that fails to conform to the requirements of this specification when inspected or tested by the purchaser, or purchaser's agent, is subject to rejection.

17.1.2 Rejection shall be reported to the manufacturer, or supplier, promptly and in writing.

17.1.3 The manufacturer, or supplier, shall make claim for a rehearing when dissatisfied with test results upon which rejection was based.

17.2 *Rehearing*:

17.2.1 As a result of product rejection, the manufacturer or supplier can make claim for a retest to be conducted by the manufacturer, or supplier, and the purchaser.

17.2.2 Samples of the rejected product will be taken in accordance with this specification and tested by both parties using the test method(s) specified in this specification, or, alternatively, upon agreement of both parties, an independent laboratory shall be selected for the test(s) using the specified test methods.

18. Keywords

18.1 building construction; copper sheet; copper strip; downspouts; flashing; gutters; roofing; sheet/strip in flat lengths/coils for building construction

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B370 – 09) that may impact the use of this standard. (Approved May 15, 2011.)

(*1*) Insertion of Table 2 for Tolerances on thinner gages.
(*2*) Renumbering Tables.
(*3*) Insertion of 12.1.2.1 explaining the sizes where Table 2 is applicable. Scope and Key Words already reference Flashing.