Designation: B506 – 16

Standard Specification for Copper-Clad Stainless Steel Sheet and Strip for Building Construction[1]

This standard is issued under the fixed designation B506; 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 establishes the requirements for rolled copper-clad stainless steel, sheet and strip in flat lengths, coils, or in rolls in thicknesses for roofing, siding, flashing, rain drainage, windows, doors, curtain wall components, and for other architectural sheet metal work and fabricated products in building and construction.

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 which are provided for information only and are not considered standard.

1.2.1 *Exception*—Grain size units are stated in SI units.

1.3 The following safety hazard caveat pertains only to the test method(s) described in this specification.

1.3.1 *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.*

1.4

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

B152/B152M Specification for Copper Sheet, Strip, Plate, and Rolled Bar

B846 Terminology for Copper and Copper Alloys

E3 Guide for Preparation of Metallographic Specimens

E8/E8M Test Methods for Tension Testing of Metallic Materials

E18 Test Methods for Rockwell Hardness of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E112 Test Methods for Determining Average Grain Size

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 product under this specification, as applicable:

4.1.1 ASTM designation and year of issue,

4.1.2 UNS No. designations of both the copper and stainless steel specified,

4.1.3 Temper (see 7.1),

4.1.4 *Dimensions:* thickness, width, and length (see 10.2, 10.3, and 10.4),

4.1.5 *How Furnished:* flat lengths or rolls,

4.1.6 *Quantity:* total weight or total length or number of pieces of each size, and

4.1.7 Cladding ratio (see 6.3).

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 Heat identification or traceability details,

4.2.2 Certification, and

4.2.3 Test Report.

5. Materials and Manufacture

5.1 *Material:*

5.1.1 The material of manufacture shall be a form of sheet or strip of such purity and soundness as to be suitable for processing into the products prescribed herein.

5.2 *Manufacture:*

5.2.1 The product shall be produced by roll bonding the cladding metals to the specified base metal (core), and subsequently annealed, when required, to meet the temper properties specified.

[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**

6. Chemical Composition

6.1 The cladding shall be, unless otherwise specified, a copper conforming in chemical composition to any of those established in Specification B152/B152M.

6.2 The core shall be a stainless steel conforming in chemical composition to any of those established by Specification A240/A240M. Unless otherwise specified, stainless steel UNS Alloy No. S43000 shall be supplied.

6.3 The cladding ratio shall be 10/80/10, copper/stainless steel/copper, unless otherwise specified.

7. Temper

7.1 The standard temper for the product described in this specification is given in Table 1, unless otherwise specified.

7.1.1 Annealed temper O61.

8. Grain Size

8.1 Although no minimum grain size is prescribed for annealed material, it shall be fully recrystallized in both cladding and core.

9. Mechanical Property Requirements

9.1 *Tensile Strength Requirements:*

9.1.1 Product furnished under this specification shall conform to the tensile requirements prescribed in Table 1 when tested in accordance with Test Methods E8/E8M.

9.1.2 Acceptance or rejection based upon mechanical properties shall depend only on tensile properties.

9.1.3 The mechanical properties of material in tempers other than annealed and with cladding ratios other than 10/80/10 shall be as agreed upon between purchaser and supplier.

9.2 *Rockwell Hardness Requirement:*

9.2.1 The approximate Rockwell hardness values given in Table 1 are for general information and assistance in testing, and shall not be used as a basis for product rejection.

9.2.2 Copper should be etched off with a suitable reagent prior to test.

NOTE 1—The Rockwell Hardness test offers a quick and convenient method of checking for general conformity to the specification requirements for temper and tensile strength.

10. Dimensions and Permissible Variations

10.1 Unless closer tolerances are specified in the contract or purchase order, the product furnished shall conform to the following appropriate tables:

10.2 *Thickness Tolerances*—Table 2.

10.3 *Width Tolerances*—Table 3 for slit metal and Table 4 for square-sheared metal.

10.4 *Length Tolerances*—Table 5 for stock lengths of flat sheet and strip. Table 6 for square-sheared metal.

10.5 *Straightness Tolerances*—Table 7 for slit metal. Table 8 for square-sheared metal.

10.6 *Cladding Ratio*—Cladding ratios shall be within ±10 % of nominal; method of test shall be metallurgical microsection of at least three samples per lot.

11. Workmanship, Finish, and Appearance

11.1 The material shall be free of defects, but blemishes of a nature that do not interfere with the intended application are acceptable.

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 10 000 lb (4550 kg), or less material of the same mill form, alloy, temper, and thickness, subject to inspection at one time.

12.1.2 *Portion Size*—A portion shall be four or more pieces selected as to be representative of each lot. If the lot consists of less than four pieces, a sample shall be taken from each piece.

12.1.2.1 *Chemical Analysis*—A sample for chemical analysis shall not be taken. The copper sheet or strip that is used as the cladding for this product was sampled and tested as prescribed in Specification B152/B152M. The stainless steel strip that is used as the core in this product was sampled and tested as prescribed in Specification A240/A240M.

12.1.2.2 *Samples for All Other Tests*—Samples for all other tests shall be taken from the sample portion in 12.1.2 and be of a convenient size to accommodate the test and comply with the requirements of the appropriate ASTM Product Standards and Test Methods.

13. Number of Tests and Retests

13.1 *Test:*

13.1.1 *Grain Size and Tensile Strength*—Results shall be reported as the average obtained from at least two test specimens, each taken from a separate test piece where possible.

13.2 *Retest:*

13.2.1 When requested by the manufacturer or supplier, a retest shall be permitted when results of tests obtained by the purchaser fail to conform to the requirements of the product specification.

TABLE 1 Mechanical Properties for 10/80/10 Ratio Composite Strip Material with Type 430 Stainless Steel Core

Temper Designation		Tensile Strength ksi[A] (MPa[B])		Yield Strength at 0.5 % Extension Under Load ksi[A] (MPa[B])		Approximate Rockwell Hardness (for Information Only)
Code	Name	Min	Max	Min	Max	15T
O61	annealed	58 (400)	70 (485)	30 (205)	51 (350)	89 max

[A] ksi = 1000 psi
[B] See Appendix X1.

TABLE 2 Thickness Tolerances

Thickness, in. (mm)	Thickness Tolerances, Plus and Minus			
	For Widths 8 in. and Under (203 mm and Under) in. (mm)	For Widths Over 8 to 14 in. (203 to 356 mm), incl in. (mm)	For Widths Over 14 to 20 in. (356 to 508 mm), incl in. (mm)	For Widths Over 20 in. (508 mm) in. (mm)
0.012 in. (0.305 mm) to 0.018 in. (0.457 mm), incl	0.0010 (0.025)	0.0015 (0.038)	0.0020 (0.051)	0.0025 (0.064)
Over 0.018 in. (0.457 mm) to 0.022 in. (0.559 mm), incl	0.0013 (0.033)	0.0018 (0.046)	0.0020 (0.051)	0.0030 (0.076)
Over 0.022 in. (0.559 mm) to 0.030 in. (0.762 mm), incl	0.0015 (0.038)	0.0020 (0.051)	0.0025 (0.064)	0.0030 (0.076)
Over 0.030 in. (0.762 mm) to 0.065 in. (1.65 mm), incl	0.0020 (0.051)	0.0025 (0.064)	0.0030 (0.076)	0.0035 (0.089)

TABLE 3 Width Tolerances for Slit Metal

Width in. (mm)	Width Tolerance, Plus and Minus in. (mm)
Up to 20 (508 incl)	1/64 (0.40)
Over 20 to 48 (508 to 1219 incl)	1/32 (0.79)

TABLE 4 Width Tolerances for Square-Sheared Metal

Width in. (mm)	Width Tolerance, Plus and Minus in. (mm)
Up to 20 (508)	1/32 (0.79)
Over 20 to 36 (508 to 814, incl)	3/64 (1.2)
Over 36 (914)	1/16 (1.6)

TABLE 5 Length Tolerance for Specific and Stock Lengths

Length	Length Tolerance (Applicable Only to Full-Length Pieces) in. (mm)
Specific lengths 120 in. (3.05 m) and under	1/4 (6.4) (all plus)

TABLE 6 Length Tolerances for Square-Sheared Metal

Length	Length Tolerance, Plus and Minus in. (mm)
Over 36 in. (914 mm) to 120 in. (3.05 m), incl	1/16 (1.6)

13.2.2 The retest shall be as directed in the product specification for the initial test, except the number of test specimens shall be twice that normally required for the specified test.

13.2.3 All test specimens shall conform to the product specification requirement(s) in the retest. Failure to conform shall be cause for rejection.

14. Specimen Preparation

14.1 *Grain Size*—The test specimens shall be prepared in accordance with Guide E3.

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	Straightness Tolerance in. (mm)
Over 4 in. (102 mm) to 48 in. (1219 mm) 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 Tolerance	
	Up to 10 in. (254 mm), incl, in Width in. (mm)	Over 10 in. (254 mm) in Width in (mm)
All Thicknesses	1/16 (1.6)	1/32 (0.79)

14.2 *Tensile Strength*—The test specimen shall be taken so that the longitudinal axis is parallel to the direction of rolling and shall conform to the requirements prescribed for the specific product described in the Test Specimen section of Test Methods E8/E8M.

15. Test Methods

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

Test	ASTM Designation
Grain Size	E112
Tension	E8/E8M
Rockwell Hardness	E18

16. Significance of Numerical Limits

16.1 For purpose of determining compliance with the specified limits for requirements of the properties listed in the following table and for dimensional tolerances, an observed value or a calculated value shall be rounded as indicated in accordance with the rounding method of recommended Practice E29.

Property	Rounded Unit for Observed or Calculated Value
Grain Size Under 0.060 mm	Nearest multiple of 0.005 mm
Grain Size 0.060 mm and over	Nearest 0.01 mm
Hardness	Nearest unit in the last right-hand place of figures of the specified limit
Tensile strength and yield strength	Nearest ksi (nearest 5 MPa)

17. Inspection

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

17.2 Source inspection of the product by the purchaser may be agreed upon by 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.

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

18. Rejection and Rehearing

18.1 *Rejection:*

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

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

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

18.2 *Rehearing:*

18.2.1 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 the product specification and subjected to test by both parties using the test method(s) specified in the product specification, or alternately, upon agreement of both parties, an independent laboratory may be selected for the test(s) using the test method(s) specified in the product specification.

19. Certification

19.1 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.

20. Test Report

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

21. Packaging and Package Marking

21.1 *Packaging:*

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

21.2 *Package Marking:*

21.2.1 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.

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

22. Keywords

22.1 architectural sheet metal work; building construction; copper-clad stainless steel sheet; copper-clad stainless steel strip; curtain wall components; doors; flashing; gutters; roofing; siding; windows

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 ($N = k \cdot mg/s^2$). 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 SI 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 (B506-09) that may impact the use of this standard.

(1) The specification was revised throughout to comply with Guide B950.

(2) Table 1 conversions to MPa were rounded to nearest 5 MPa.