Designation: B1005 – 17 (Reapproved 2023)

Standard Specification for Copper-Clad Aluminum Bar for Electrical Purposes (Bus Bar)[1]

This standard is issued under the fixed designation B1005; 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 copper clad aluminum rectangular bar for electrical (bus) applications.

1.2 Six classes of copper-clad aluminum bar are covered as follows:

Class 20A—Nominal 20 volume % copper, annealed.
Class 25A—Nominal 25 volume % copper, annealed.
Class 30A—Nominal 30 volume % copper, annealed.
Class 20H—Nominal 20 volume % copper, hard-worked.
Class 25H—Nominal 25 volume % copper, hard-worked.
Class 30H—Nominal 30 volume % copper, hard-worked.

1.3 The values stated in inch-pound units are to be regarded as the standard, except for resistivity and density, where the SI units are the standard. The values given in parentheses are for information only.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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:*[2]

B193 Test Method for Resistivity of Electrical Conductor Materials
B354 Terminology Relating to Uninsulated Metallic Electrical Conductors
E3 Guide for Preparation of Metallographic Specimens
E8/E8M Test Methods for Tension Testing of Metallic Materials
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E290 Test Methods for Bend Testing of Material for Ductility

3. Terminology

3.1 *Definitions*—Refer to Terminology B354 for definition of product terms used in this specification.

4. Ordering Information

4.1 Orders for materials to this specification shall include the following information:

4.1.1 This specification designation (which includes the number, the year, and the revision letter, if applicable),
4.1.2 Quantity in weight or pieces,
4.1.3 Classes, (see 1.2),
4.1.4 Edge contour (Section 12),
4.1.5 Cross-Sectional Dimensions: Thickness and Width (Section 13),

4.2 Additionally, orders for material to this specification shall include the following information when required by the purchaser:

4.2.1 Whether witness of inspection by the purchaser's representative is required prior to material shipment (Section 15),
4.2.2 Whether certification is required (Section 17),
4.2.3 Whether an alternative tensile sampling selection procedure is acceptable (Section 7).

5. Manufacture

5.1 The products covered by this specification shall consist of a solid core of aluminum with a continuous outer copper layer bonded to the core throughout and shall be of such quality that the resulting products comply with the requirements in this specification.

6. Quality Assurance

6.1 *Responsibility for Inspection and Tests*—Unless otherwise specified in the contract or purchase order, the producer is

[1] This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.06 on Bi-Metallic Conductors.

Current edition approved Oct. 1, 2023. Published October 2023. Originally approved in 2017. Last previous edition approved in 2017 as B1005 – 17. DOI: 10.1520/B1005-17R23.

[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.

responsible for the performance of all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser in the order or at the time of contract signing. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to assure that material conforms to prescribed requirements.

6.2 *Lot Definition*—An inspection of the lot shall consist of an identifiable quantity of same mill form, and nominal dimensions and subjected to inspection at one time.

7. Tensile Properties

7.1 *Limits*—The material shall conform to the tensile properties in Table 1.

7.2 *Number of Specimens:*

7.2.1 For material having a nominal weight of less than 1 lb/ft (up through 1.8 kg/linear m), one tension test specimen shall be taken for each 2000 1b (1000 kg), or fraction thereof, in the lot.

7.2.2 For material having a nominal weight of greater than 1 lb/ ft (over 1.8 kg/linear m), one tension test specimen shall be taken for each 2000 ft (600 m), or fraction thereof, in the lot.

7.2.3 One tension test specimen shall be taken from a random bar representing each 3000 lb of bar, or fraction thereof, of the same temper, thickness, and width in the shipment.

7.2.4 Other procedures for selecting samples may be employed if agreed upon between the producer and the supplier or purchaser.

7.3 The geometry of test specimens and the location in the product from which they are taken shall conform to Test Methods E8/E8M.

7.4 *Test Methods*——The tensile testing shall be in accordance with Test Methods E8/E8M.

7.5 *Retests*—When there is evidence that the test specimen is defective or is not representative of the lot of material, retesting shall be performed in accordance with Test Methods E8/E8M.

8. Bend Properties

8.1 *Limits:*

8.1.1 Class 20A, 25A and Class 30A bars shall withstand a flatwise bend at room temperature, through an angle of 90° around mandrel having a radius shown in Table 2 without cracking or obvious orange peel or evidence of slivers or other imperfections on the surface (the cladding layer), or blister phenomenon inside the bending width. In macrostructure, near the curved areas, interface holes or cracks should not appear, and no separation phenomenon between the cladding layer and the aluminum core. For a flatwise bend, the mandrel shall be 90° from the rolling direction, and across the greater (width) dimension of the bar. The required 90° bend shall be in the rolling direction. This is a longitudinal guided bend as defined and shown in Test Method E290, Fig. 6.

TABLE 1 Tensile and Elongation Requirements

Copper Volume %	Tensile Strength		Elongation, min % in 9.84 in. (250 mm)	
	Minimum H Classes ksi (MPa)	Maximum A Classes ksi (MPa)	H Classes	A Classes
20	23.2 (160)	18.1 (125)	3	25
25	24.6 (170)	18.5 (126)	3.5	28
30	26.1 (180)	18.8 (130)	3.8	30

TABLE 2 The Diameter of the Bending Cylinder

Thickness, in. (mm)	Bending Diameter in. (mm)
<0.394 (10.0)	0.623 (16)
≥0.394 (10.0)	1.260 (32)

8.2 *Number of Specimens*—The number of specimens (test frequency) shall be the same as for tension tests as required in 7.2.

8.3 *Test Specimens*—Bend test specimens shall be a full section of the material with a minimum length of 13 in. (330 mm).

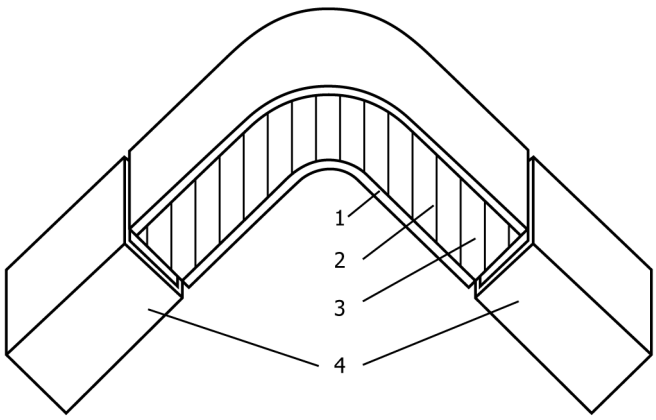
8.4 *Test Methods*—Bend tests shall be made in accordance with Test Method E290.

8.5 *Bending Result Secondary Test:*

8.5.1 Removing 1/2 straight segment of at each end of the samples after the bending test, retain contains 1/2 part of bending parts, as shown in Fig. 1.

8.5.2 Removing the cladding layer on one narrow side of the bending sample contain the bending part, then grind and polish the section of the remove cladding layer until the aluminum core exposes according to the provisions of Guide E3.

8.5.3 Checking the macrostructure on the section near the interface.



Where:
1 = The cladding layer;
2 = The aluminum core;
3 = The observed section;
4 = The cut straight segment.

FIG. 1 Schematic Fixture for Preparation of Metallographic Specimens After Bending Test