



Designation: B606/B606M – 23

# Standard Specification for High-Strength Zinc-Coated (Galvanized) Steel Core Wire for Use in Overhead Electrical Conductors<sup>1</sup>

This standard is issued under the fixed designation B606/B606M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers round, high-strength, zinc-coated (galvanized), steel core wire with Class A zinc coating (GA3) for use in overhead electrical conductors.

1.2 This specification covers wire of diameter from 0.0500 in. to 0.1900 in. inclusive or 1.27 mm to 4.82 mm inclusive.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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:*<sup>2</sup>

A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings  
A370 Test Methods and Definitions for Mechanical Testing of Steel Products  
A751 Test Methods and Practices for Chemical Analysis of Steel Products

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.05 on Conductors of Ferrous Metals.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

B6 Specification for Zinc

B193 Test Method for Resistivity of Electrical Conductor Materials

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

## 3. Terminology

3.1 *Definitions:*

3.1.1 *lot, n*—unless otherwise specified in the contract or order, a lot shall consist of all coils of wire of the same diameter and unit lengths submitted for inspection at the same time.

3.1.2 *product code, n*—defines product coating type, coating class and strength grade; this specification covers only High Strength Class A Zinc Coated products and identified as product code GA3.

## 4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Quantity of each size,

4.1.2 Wire diameter in inches or millimeters (Section 13),

4.1.3 Certification, if required (Section 18),

4.1.4 Test report, if required (Section 18), and

4.1.5 Package size (Section 19).

4.1.6 *Order Example*—Five multiple lengths of 12 000 ft each, 0.1327 in. GA3 wire, packaged onto wooden non-returnable reels, with certified test report.

4.1.7 Product code (see paragraph 3.1.2).

## 5. Materials and Manufacture

5.1 The base metal shall be steel produced by the open-hearth, electric-furnace, or basic-oxygen process.

5.2 The wire shall be cold drawn and coated with zinc to produce the desired properties.

5.3 The slab zinc used for coating shall be high grade or better, conforming to Specification B6.

## 6. Chemical Composition

6.1 The steel shall conform to the requirements prescribed in Table 1.

**TABLE 1 Chemical Requirements**

| Element         | Composition, % |
|-----------------|----------------|
| Carbon          | 0.50 to 0.88   |
| Manganese       | 0.50 to 1.30   |
| Phosphorus, max | 0.035          |
| Sulfur, max     | 0.045          |
| Silicon         | 0.10 to 0.35   |

6.2 Chemical analysis shall be conducted in accordance with Test Methods and Practices **A751**.

## 7. Tensile Test

7.1 The zinc-coated steel core wire shall conform to the tensile and elongation requirements prescribed in **Table 2** or **Table 3** and a minimum breaking strength (lb [N]) calculated from the minimum required tensile and nominal wire diameter. The wire tensile strength used to determine compliance to **Table 2** or **Table 3** shall be calculated using the actual wire breaking strength and the nominal finished diameter of the wire.

7.2 Tensile tests shall be conducted in accordance with Test Methods and Definitions **A370**, using the initial settings for determining stress at 1 % extension given in **Table 4** or **Table 5** of this specification.

7.3 *Test Specimens*—The test specimens shall be free of bends or kinks other than the curvature resulting from the usual coiling operations. Any hand straightening necessary to permit insertion of the specimen in the jaws of the testing machine shall be performed by drawing between wood blocks or by some other equally satisfactory means.

## 8. Wrap Test

8.1 The material, as represented by the test specimens, shall not fracture when the galvanized wire is wrapped at a rate not exceeding 15 turns/min in a helix of at least eight turns around a cylindrical mandrel with a diameter equal to three times the specified diameter of the wire under test,  $\pm 5$  %. The edge-to-edge spacing of consecutive turns shall not exceed two times the diameter of the wire.

## 9. Coating Test

9.1 The zinc-coated wire shall conform to the coating requirements prescribed in **Table 6** or **Table 7**.

9.2 The coating test shall be conducted in accordance with Test Method **A90/A90M**.

## 10. Adherence of Coating Test

10.1 The zinc-coated wire shall be capable of being wrapped in a close helix at a rate not exceeding 15 turns/min around a cylindrical mandrel having a diameter as prescribed in **Table 8** or **Table 9**, without cracking or flaking the zinc coating to such an extent that any zinc can be removed by rubbing with the bare fingers.

NOTE 1—Loosening or detachment during the adhesion test of superficial, small particles of zinc formed by mechanical polishing of the surface of the coated wire shall not be considered cause for rejection.

## 11. Joints

11.1 No joints shall be made in the finished wire.

11.2 Joints may be made at any stage of processing prior to final cold drawing, by the electric butt-weld or flash-welding process.

11.3 Welding equipment and procedure shall be such that it can be demonstrated that the ultimate tensile strength of a finished wire specimen containing the welded section shall be not less than 96 % of the specified minimum stress at 1 % extension.

11.4 A welded section shall not be required to meet the stress at 1 % extension, elongation, and wrap tests.

## 12. Density and Resistivity

12.1 For the purpose of calculating mass per unit length, cross sections, and so forth, the density of galvanized steel wire at 20 °C shall be taken as 0.281 lb/in.<sup>3</sup> [7780 kg/m<sup>3</sup>].

12.2 A maximum resistivity of galvanized steel wire is not guaranteed but a typical value of 0.19157  $\Omega \cdot \text{mm}^2/\text{m}$  may be used for calculating purposes. For conversion to other units of conductivity or resistivity, refer to Test Method **B193**.

## 13. Dimensions and Permissible Variations

13.1 The specified diameter of the zinc-coated wire shall be expressed in decimal fractions of an inch to four decimal places, or in millimeters to two decimal places.

13.2 To determine the applicable tolerance range from **Table 10** or **Table 11**, round the specified diameter to the nearest 0.001 in. [0.01 mm], in accordance with the rounding method of Practice **E29**.

13.3 Measure the largest and smallest diameter taken at the same cross section rounded to the nearest 0.001 in. [0.01 mm] in accordance with the rounding method of Practice **E29**. Calculate the average of the two measurements. The calculated

**TABLE 2 Tensile Requirements**

| Specified Diameter<br>in. | Stress at 1 % Extension, min<br>kpsi | Ultimate Tensile Strength, min<br>kpsi | Elongation in 10 in.,<br>min % |
|---------------------------|--------------------------------------|----------------------------------------|--------------------------------|
| 0.0500 to 0.0899, incl    | 210                                  | 235                                    | 3.0                            |
| 0.0900 to 0.1199, incl    | 205                                  | 230                                    | 3.0                            |
| 0.1200 to 0.1399, incl    | 200                                  | 225                                    | 3.5                            |
| 0.1400 to 0.1900, incl    | 195                                  | 220                                    | 3.5                            |