



Designation: B 606 – 02

# Standard Specification for High-Strength Zinc-Coated (Galvanized) Steel Core Wire for Aluminum and Aluminum-Alloy Conductors, Steel Reinforced<sup>1</sup>

This standard is issued under the fixed designation B 606; 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 used for mechanical reinforcement in the manufacture of special aluminum and aluminum-alloy conductors, steel reinforced.

1.2 This specification covers wire of diameter from 0.0500 to 0.1900 in. inclusive.

1.3 The values stated in inch-pound units or SI units are to be regarded separately as standard. The values in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with this specification.

## 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:

A 90/A 90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings<sup>2</sup>

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products<sup>3</sup>

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products<sup>3</sup>

B 6 Specification for Zinc<sup>4</sup>

B 193 Test Method for Resistivity of Electrical Conductor Materials<sup>5</sup>

<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> Annual Book of ASTM Standards, Vol 01.06.

<sup>3</sup> Annual Book of ASTM Standards, Vol 01.03.

<sup>4</sup> Annual Book of ASTM Standards, Vol 02.04.

<sup>5</sup> Annual Book of ASTM Standards, Vol 02.03.

## 3. Terminology

### 3.1 Definitions:

3.1.1 *lot*—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.

## 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 (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).

## 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 B 6.

## 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, Practices, and Terminology A 751.

**TABLE 2 Tensile Requirements**

Specified Diameter		Stress at 1 % Extension, min		Ultimate Tensile Strength, min		Elongation in 10 in. or 250 mm, min %
in.	mm	ksi	MPa	ksi	MPa	
0.0500 to 0.0899, incl	1.270 to 2.283, incl	210	1450	235	1620	3.0
0.0900 to 0.1199, incl	2.286 to 3.045, incl	205	1410	230	1590	3.0
0.1200 to 0.1399, incl	3.048 to 3.553, incl	200	1380	225	1550	3.5
0.1400 to 0.1900, incl	3.556 to 4.823, incl	195	1340	220	1520	3.5

**TABLE 3 Initial Settings for Determining Stress at 1 % Extension**

Specified Diameter	Initial Stress		Initial Setting of Extensometer in./in. or mm/mm
	in.	mm	
0.0500 to 0.0899, incl	ksi	MPa	0.0005 (0.05 % extension)
0.0900 to 0.1199, incl	14	97	0.0010 (0.10 % extension)
0.1200 to 0.1900, incl	28	193	0.0015 (0.15 % extension)
	42	290	

## 7. Tensile Test

7.1 The zinc-coated steel core wire shall conform to the tensile and elongation requirements prescribed in Table 2.

7.2 Tensile tests shall be conducted in accordance with Test Methods and Definitions A 370, using the initial settings for determining stress at 1 % extension given in Table 3 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 close 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,  $\pm 5\%$ .

## 9. Coating Test

9.1 The zinc-coated wire shall conform to the coating requirements prescribed in Table 4.

**TABLE 4 Zinc Coating**

Specified Diameter of Coated Wire		Area Density of Zinc Coating, min of Uncoated Wire Surface	
in.	mm	oz/ft <sup>2</sup>	g/m <sup>2</sup>
0.0500 to 0.0599 incl	1.270 to 1.521 incl	0.60	183
0.0600 to 0.0749 incl	1.524 to 1.902 incl	0.65	198
0.0750 to 0.0899 incl	1.905 to 2.283 incl	0.70	214
0.0900 to 0.1039 incl	2.286 to 2.639 incl	0.75	229
0.1040 to 0.1199 incl	2.642 to 3.045 incl	0.80	244
0.1200 to 0.1399 incl	3.048 to 3.553 incl	0.85	259
0.1400 to 0.1799 incl	3.556 to 4.569 incl	0.90	274
0.1800 to 0.1900 incl	4.572 to 4.823 incl	1.00	305

9.2 The coating test shall be conducted in accordance with Test Method A 90/A 90M.

## 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 5, without cracking or flaking the zinc coating to such an extent that any zinc can be removed by rubbing with the bare fingers.

**TABLE 5 Mandrel Size for Adherence Test**

Specified Wire Diameter		Ratio of Mandrel Diameter to Wire Diameter
in.	mm	
0.0500 to 0.0899, incl	1.270 to 2.283, incl	3
0.0900 to 0.1399, incl	2.286 to 3.553, incl	4
0.1400 to 0.1900, incl	3.556 to 4.823, incl	5

NOTE 1—Loosening or detachment during the adhesion test of superficial, small particles of zinc formed by mechanical polishing of the surface of the zinc-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, 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 B 193.

## 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 millimetres to three decimal places.