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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for Zinc-Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)¹

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1. Scope

1.1 This specification covers round, zinc-coated, steel core wire with three classes of zinc coating used for mechanical reinforcement in the manufacture of aluminum conductors, steel-reinforced (ACSR).

1.2 This specification covers wire of diameter from 0.0500 to 0.1900 in. or 1.60 to 4.80 mm, 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 Coatings²

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products³

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products³

B 6 Specification for Zinc⁴

B 193 Test Method for Resistivity of Electrical Conductor Materials⁵

3. Terminology

3.1 Definition:

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.

¹ This specification is under the jurisdiction of ASTM Committee B-1 on Electrical Conductors and is the direct responsibility of Subcommittee B01.05 on Conductors of Ferrous Metals.

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² Annual Book of ASTM Standards, Vol 01.06.

³ Annual Book of ASTM Standards, Vol 01.03.

⁴ Annual Book of ASTM Standards, Vol 02.04.

⁵ Annual Book of ASTM Standards, Vol 02.03.

4. Classification

4.1 The wire is furnished in three classes of coating, Class A, Class B, or Class C, as specified, in conformance with the requirements of Section 10 and Table 1 or Table 2.

5. Ordering Information

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

5.1.1 Quantity of each size,

5.1.2 Wire diameter in inches or millimetres (Section 14),

5.1.3 Class of coating (see 4.1),

5.1.4 Certification, if required (Section 19),

5.1.5 Test report, if required (Section 19), and

5.1.6 Package size (Section 20).

6. Materials and Manufacture

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

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

6.3 The slab zinc used for coating shall be high-grade or better, conforming to Specification B 6.

7. Chemical Composition

7.1 The steel shall conform to the requirements prescribed in Table 3.

7.2 Chemical analysis shall be conducted in accordance with Test Methods A 751.

8. Tensile Test

8.1 The zinc-coated steel core wire shall conform to the tensile and elongation requirements prescribed in Table 4 and Table 5.

8.2 Tensile tests shall be conducted in accordance with Test Methods A 370, using the initial settings for determining stress at 1 % extension given in Table 6 or Table 7 of this specification.

8.3 *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.

TABLE 1 Zinc Coating

Specified Diameter of Coated Wire, in.	Area Density of Coating, min, oz/ft ² of Uncoated Wire Surface		
	Class A	Class B	Class C
0.0500 to 0.599, incl	0.60	1.20	1.80
0.0600 to 0.0749, incl	0.65	1.30	1.95
0.0750 to 0.0899, incl	0.70	1.40	2.10
0.0900 to 0.1039, incl	0.75	1.50	2.25
0.1040 to 0.1199, incl	0.80	1.60	2.40
0.1200 to 0.1399, incl	0.85	1.70	2.55
0.1400 to 0.1799, incl	0.90	1.80	2.70
0.1800 to 0.1900, incl	1.00	2.00	3.00

TABLE 2 Zinc Coating

Specified Diameter of Coated Wire, mm	Area Density of Coating, min, g/m ² of Uncoated Wire Surface		
	Class A	Class B	Class C
1.60 to 1.90, incl	210	420	630
Over 1.90 to 2.30, incl	220	440	660
Over 2.30 to 2.70, incl	230	460	690
Over 2.70 to 3.10, incl	240	480	720
Over 3.10 to 3.50, incl	260	520	780
Over 3.50 to 3.90, incl	270	540	810
Over 3.90 to 4.50, incl	275	550	825
Over 4.50 to 4.80, incl	300	600	900

TABLE 3 Chemical Requirements

Element	Composition, %
Carbon	0.50 to 0.85
Manganese	0.50 to 1.10
Phosphorus, max	0.035
Sulfur, max	0.045
Silicon	0.10 to 0.35

9. Wrap Test

9.1 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 two times the specified diameter of the wire under test, $\pm 5\%$.

10. Coating Test

10.1 The material, as represented by the test specimens, shall conform to the coating requirements of Table 1 or Table 2. for the diameter and class of coating specified.

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

11. Adherence of Coating Test

11.1 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 and 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—During the adhesion test the loosening or detachment 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.

12. Joints

12.1 No joints shall be made in the finished wire.

12.2 Joints may be made at any stage of processing before final cold drawing by the electric butt-weld or flash-welding process.

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

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

13. Density and Resistivity

13.1 For the purposes 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.³ (7780 kg/m³).

13.2 A maximum resistivity of galvanized steel wire is not guaranteed, but a typical value of 0.191 57 $\Omega \cdot \text{mm}^2/\text{m}$ may be used for purposes of calculation. For conversion to other units of conductivity or resistivity, refer to Test Method B 193.

14. Dimensions and Permissible Variations

14.1 The specified diameter shall be expressed in decimal fractions of an inch to four decimal places or in millimetres and decimal fractions of a millimetre to two decimal places.

14.2 For diameter measurements and diameter tolerances, specified diameters shall be rounded to the closest 0.0005 in. or 0.01 mm.

14.3 Determine the greatest and least diameters each to the nearest 0.001 in. or 0.01 mm, at the same cross-section. The average of these two diameters shall not differ from the specified diameter by more than the tolerances shown in Table 10 and Table 11.

15. Workmanship, Finish, and Appearance

15.1 The zinc coating shall be reasonably smooth, continuous, of reasonably uniform thickness, and free from imperfections not consistent with good commercial practice.

16. Number of Tests and Retests

16.1 One test specimen shall be taken from each 5000 lbs or 2500 kg. or fraction, thereof, in the inspection lot.

16.2 Each specimen shall be tested for compliance with Sections 8, 9, 11, and 14. At least half of the specimens shall be tested for compliance with Section 10.

16.3 Should one or more of the test specimens fail any of the tests specified, the nonconforming coil or coils may be removed and the balance of the lot subjected to retests. For retest purposes, two additional coils for each 5000 lbs or 2500 kg. in the lot shall be sampled and tested for the property in which the original sample failed to comply.

16.4 Should any of the retest specimens fail to meet the properties specified, the lot represented by the test specimens shall be rejected.

16.5 Instead of rejecting the entire lot as provided in 16.4, the producer may test specimens from every coil in the lot for the property in which failure occurred, and reject only the nonconforming coils.

17. Inspection

17.1 Unless otherwise specified in the contract or purchase