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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for Zinc–5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)¹

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1. Scope

1.1 This specification covers round, zinc–5 % aluminum-mischmetal (Zn–5Al–MM) alloy-coated, steel core wire with three classes of Zn–5Al–MM 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 193 Test Method for Resistivity of Electrical Conductor Materials⁴

B 750 Specification for Zinc–5 % Aluminum-Mischmetal Alloy (UNS Z38510) in Ingot Form for Hot-Dip Coatings⁵

E 47 Test Methods for Chemical Analysis of Zinc Die-Casting Alloys⁶

E 1277 Test Method for Chemical Analysis of Zinc-5

Aluminum-Mischmetal Alloy by ICP Emission Spectrometry⁷

2.3 Other Standard:

GF-1 Standard Practice for Determination of Cerium and Lanthanum Compositions in Galfan Alloy (5 % Al-0.04 % La-0.04 % Ce-Bal SHG Zn)⁸

3. Terminology

3.1 Abbreviations:

3.1.1 MM—mischmetal.

3.1.2 Zn–5Al–MM—zinc–5 % aluminum mischmetal.

3.2 Definition:

3.2.1 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. 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 12 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 8),

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 Zn–5Al–MM alloy to produce the desired properties.

7. Chemical Composition

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

¹ This specification is under the jurisdiction of ASTM Committee B-01 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 02.03.

⁵ Annual Book of ASTM Standards, Vol 02.04.

⁶ Annual Book of ASTM Standards, Vol 03.05.

⁷ Annual Book of ASTM Standards, Vol 03.06.

⁸ Available from International Lead Zinc Research Organization, 2525 Meridian Parkway, P.O. Box 12036, Research Triangle Park, NC 27709-2036.

TABLE 1 Zn-5A1-MM Alloy 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 0.0599, 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 Zn-5A1-MM Alloy 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

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

7.3 The ingot form of zinc-5% aluminum-mischmetal alloy shall conform to Specification B 750.

7.3.1 For a two-step coating operation where the first coating is zinc (hot-dip galvanized or electrogalvanized), the final bath may have an aluminum content of up to 7.2 %, to prevent depletion of the aluminum content of the bath.

7.3.2 *Method of Analysis*—The determination of chemical composition shall be made in accordance with suitable chemical (Test Method E 47 for Tin), ICP argon plasma spectrometric (Test Method E 1277), or other methods. In case of dispute, the results secured by Test Method E 1277 shall be the basis of acceptance.

7.3.3 A standard practice of X-ray fluorescence spectrometry for determination of cerium and lanthanum in a Zn-5A1-MM alloy has been established by the International Lead Zinc Research Organization (Standard Practice GF-1). In case of dispute, the results secured by Test Method E 1277 shall be the basis of acceptance.

8. Dimensions, Mass, and Permissible Variations

8.1 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.

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

8.3 Determine the greatest and least diameter 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 4 or Table 5.

9. Workmanship, Finish, and Appearance

9.1 The Zn-5A1-MM alloy coating shall be reasonably smooth, continuous, of reasonably uniform thickness, and free of imperfections not consistent with good commercial practice.

10. Tensile Test

10.1 The Zn-5A1-MM-coated steel core wire shall conform to the tensile and elongation requirements prescribed in Table 6 or Table 7.

10.2 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 8 or Table 9 of this specification.

10.3 *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.

11. Wrap Test

11.1 The material, as represented by the test specimens, shall not fracture when the Zn-5A1-MM alloy-coated 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, ±5 %.

12. Coating Test

12.1 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.

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

13. Adherence of Coating Test

13.1 The Zn-5A1-MM alloy-coated wire shall be capable of being wrapped in a close helix at a rate not exceeding 15

TABLE 4 Permissible Variations in Diameter of Zn-5A1-MM Alloy-Coated Steel Wire

NOTE 1—It is recognized that the surface of Zn-5A1-MM alloy coatings, particularly those produced by hot-dip coating, are not perfectly smooth and devoid of irregularities. If the tolerances shown in the table are rigidly applied to such irregularities that are inherent to the product, unjustified rejections of wire that would actually be satisfactory for use could occur. Therefore, it is intended that these tolerances be used in gauging the uniform areas of the coated wire.

Specified Diameter, in.	Permissible Variation, in.	
	Plus	Minus
0.0500 to 0.0749, incl	0.0015	0.001
0.0750 to 0.1199, incl	0.002	0.002
0.1200 to 0.1399, incl	0.003	0.002
0.1400 to 0.1900, incl	0.004	0.003