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Standard Specification for Zinc-5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)¹

This standard is issued under the fixed designation B 802/B 802M; 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 round, zinc-5 % aluminum-mischmetal (Zn-5Al-MM) alloy-coated, steel core wire with three classes of Zn-5Al-MM 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 1.27 to 4.82 mm, inclusive.

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

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

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

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

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

B 193 Test Method for Resistivity of Electrical Conductor Materials

B 750 Specification for GALFAN (Zinc-5 % Aluminum-Mischmetal) Alloy in Ingot Form for Hot-Dip Coatings

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

E 1277 Practice for Chemical Analysis of Zinc-5 Aluminum-Mischmetal Alloy by ICP Emission Spectrometry⁶ Test Method for Chemical Analysis of Zinc-5 % Aluminum-Mischmetal Alloys by ICP Emission Spectrometry

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

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)³

3. Terminology

3.1 Abbreviations: Abbreviations:

3.1.1 MM—mischmetal.

3.1.2 Zn-5Al-MM 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.

3.2.2 Product Code—Defines product coating type, coating class and strength grade. Two product codes for product produced to this specification: Class A Zn-5Al-MM Coated = MA1; and Class C Zn-5Al-MM Coated = MC1.

¹ 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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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* Vol 01-06, volume information, refer to the standard's Document Summary page on the ASTM website.

³ Annual Book of ASTM Standards, Vol 01.03.

⁶ Available from International Lead Zinc Research Organization (ILZRO), 1822 NC Highway 54 East, Suite 120, Durham NC 27713, <http://www.ilzro.org>.

*A Summary of Changes section appears at the end of this standard.

4. Classification

4.1 The wire is furnished in ~~three~~two classes of coating, ~~Class A, Class B, or~~Class A 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 millimeters (Section 14),
- ~~5.1.3 Class of coating (see~~
- 5.1.3 Product Code (see paragraphs 3.2.2 and 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~~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.
- 7.2 Chemical analysis of the steel shall be conducted in accordance with Test Methods, Practices and Terminology 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 Methods E 47 for Tin), ICP argon plasma spectrometric (Practice E 1277), or other methods. In case of dispute, the results secured by Practice 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-5Al-MM alloy has been established by the International Lead Zinc Research Organization (Standard Practice GF-1). In case of dispute, the results secured by Practice E 1277~~
 - 7.3.3 *Method of Coating Material Analysis*—Refer to Specification B 750. In case of dispute, the results secured by Practice E 1277 shall be the basis of acceptance.

8. Tensile Test

- 8.1 The ~~Zn-5Al-MM~~Zn-5Al-MM-coated steel core wire shall conform to the tensile and elongation requirements prescribed in Table 4 or Table 5.
- 8.2 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 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.

9. Wrap Test

- 9.1 The material, as represented by the test specimens, shall not fracture when the ~~Zn-5Al-MM~~Zn-5Al-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 %.

TABLE 1 Zn-5Al-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-5Al-MM Alloy Coating (Metric)

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
1.27 to 1.52, incl	183	5420	6309
Over 1.90 to 2.30, incl	220	440	660
1.53 to 1.90, incl	198	59440	660
Over 2.30 to 2.70, incl	230	460	690
1.91 to 2.28, incl	214	60	69042
Over 2.70 to 3.10, incl	240	480	720
2.29 to 2.64, incl	229	680	7
Over 3.10 to 3.50, incl	260	520	780
2.65 to 3.04, incl	244	520	732
Over 3.50 to 3.90, incl	270	540	810
3.05 to 3.55, incl	259	540	840777
Over 3.90 to 4.50, incl	275	550	825
3.56 to 4.57, incl	274	550	822
Over 4.50 to 4.80, incl	300	600	900
4.58 to 4.82, incl	305	600	915

TABLE 3 Chemical Requirements

Element	Composition, %
Carbon	0.50 to 0.85
Carbon	0.50 to 0.88
Manganese	0.50 to 1.10
Phosphorus, max	0.035
Sulfur, max	0.045
Silicon	0.10 to 0.35

TABLE 4 Tensile Requirements

Specified Diameter, in.	Stress at 1 % Extension, min, Ksi			Ultimate Tensile Strength, min, Ksi			Elongation in 10 in., min, %		
	Class A	Class-B	Class C	Class A	Class-B	Class C	Class A	Class B	Class C
0.0500 to 0.0899, incl	190	180	170	210	200	190	3.0		
0.0500 to 0.0899, incl	190	180	170	210	200	190	3.0		
0.0900 to 0.1199, incl	185	175	165	205	195	185	3.5		
0.0900 to 0.1199, incl	185	175	165	205	195	185	3.5		
0.1200 to 0.1399, incl	180	170	160	205	195	185	4.0		
0.1200 to 0.1399, incl	180	170	160	205	195	185	4.0		
0.1400 to 0.1900, incl	170	160	155	200	185	180	4.0		

TABLE 5 Tensile Requirements (Metric)

Specified Diameter, in.	mm	Stress at 1 % Extension, min, MPa			Ultimate Tensile Strength, min,		
		Class A	Class-B	Class C	Class A	Class-B	Class C
1.60 to 2.30, incl	1310	1240	1170	1450	1380	1310	3.0
1.27 to 2.28, incl	1310	1240	1170	1450	1380	1310	3.0
Over 2.30 to 3.05, incl	1280	1210	1140	1410	1340	1280	3.5
2.29 to 3.04, incl	1280	1210	1140	1410	1340	1280	3.5
Over 3.05 to 3.60, incl	1240	1170	1100	1410	1340	1280	4.0
3.05 to 3.55, incl	1240	1170	1100	1410	1340	1280	4.0
Over 3.60 to 4.80, incl	1170	1100	1070	1380	1280	1240	4.0
3.56 to 4.82, incl	1170	1100	1070	1380	1280	1240	4.0

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 Zn-5Al-MM Zn-5Al-MM alloy-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 coating to such an extent that any Zn-5Al-MM Zn-5Al-MM alloy can be removed by rubbing with the bare fingers.