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Standard Specification for Aluminum-Coated Steel Wire Strand[1]

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1. Scope

1.1 This specification covers five grades of aluminum-coated, steel wire strand, composed of a number of round, steel wires, with aluminum coatings, for use as guys, messengers, span wires, and for similar purposes.

1.2 The five grades covered are as follows:

1.2.1 Utilities,

1.2.2 Common,

1.2.3 Siemens-Martin,

1.2.4 High-Strength, and

1.2.5 Extra High-Strength.

1.3 Minimum breaking strengths of strand for each grade are specified in Table 1.

1.4 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 428/A 428M Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles

3. Description of Strand

3.1 The designation of the finished strand shall be expressed as the nominal diameter of the strand, the number of the wires in the strand, and the grade of the strand as prescribed in Table 1.

4. Ordering Information

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

4.1.1 Quantity of strand in feet.

4.1.2 Nominal strand diameter (size), number of wires, grade, and minimum breaking strength of strand (Section 8 and Table 1).

4.1.3 Length of strand in coils or on reels (Section 19).

5. Material and Manufacture

5.1 The base metal shall be steel made any commercially accepted steel making process and of such quality and purity that, when drawn to the size of wire specified and coated with aluminum, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as prescribed in this specification.

5.2 The ingot or pig aluminum used for coating shall conform to the following impurity limits: copper, maximum, %, 0.10, and iron, maximum, %, 0.50.

6. Stranding

6.1 Unless otherwise specified, 3-wire strand shall have a left lay with a uniform pitch of not less than 10 nor more than 16 times the nominal diameter of the strand. Seven-wire strand shall have a left lay with a uniform pitch of not more than 16 times the nominal diameter of the strand. A left lay is defined as a counter-clockwise twist away from the observer. All wires shall be stranded with uniform tension. Stranding shall be sufficiently close to ensure no appreciable reduction in diameter when stressed to 10% of the specified strength.

6.2 All wires in the strand shall lie naturally in their true positions in the completed strand, and when the strand is cut, the ends shall remain in position or be readily replaced by hand and then remain in position. This may be accomplished by any means or process, such as preforming, post forming, or form setting.

7. Joints and Splices

7.1 There shall be no strand joints or strand splices in any length of the completed strand unless specifically permitted by the purchaser.

7.2 In 3-wire strand, there shall be no joints in individual wires. In 7-wire strand, joints in individual wires shall be acceptable provided there is not more than one joint in any 150-ft [46-m] section of the completed strand and the location

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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* volume information, refer to the standard's Document Summary page on the ASTM website.

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TABLE 1 Physical Properties of Aluminum-Coated Steel Wire Strand

Nominal Diameter of Strand, in. [mm]	Number of Wires in Strand	Nominal Diameter of Coated Wires in Strand, in. [mm]	Approximate Weight of Strand, lb/1000 ft [kg/m]	Minimum Breaking Strength of Strand, lbf [kN]							
				Utilities Grade[A]		Common Grade		Siemens-Martin Grade		High-Strength Grade		Extra-High-Strength Grade	
3/16 [4.76]	7	0.062 [1.57]	73 [0.108]	...	...	1 150	[5.1]	1 900	[8.5]	2 850	[12.7]	...	...
3/16 [4.76]	7	0.065 [1.65]	80 [0.118]	2 400	[10.7] (1)[B]	...	...	...	...	...	...	...	...
1/4 [6.35]	3	0.120 [3.05]	117 [0.173]	3 150	[14.0] (2)	...	...	...	...	...	...	...	...
1/4 [6.35]	3	0.120 [3.05]	117 [0.173]	4 500	[20.0] (3)	...	...	...	...	...	...	...	...
1/4 [6.35]	7	0.080 [2.03]	121 [0.179]	...	...	1 900	[8.5]	3 150	[14.0]	4 750	[21.1]	6 650	[29.6]
9/32 [7.14]	7	0.093 [2.36]	164 [0.243]	4 600	[20.5] (1)	...	...	...	...	...	...	...	...
5/16 [7.94]	3	0.145 [3.68]	171 [0.253]	6 500	[28.9] (3)	...	...	...	...	...	...	...	...
5/16 [7.94]	7	0.104 [2.64]	205 [0.303]	...	...	3 200	[14.2]	5 350	[23.8]	8 000	[35.6]	11 200	[49.8]
5/16 [7.94]	7	0.109 [2.77]	225 [0.333]	6 000	[26.7] (1)	...	...	...	...	...	...	...	...
3/8 [9.52]	3	0.165 [4.19]	220 [0.326]	8 500	[37.8] (3)	...	...	...	...	...	...	...	...
3/8 [9.52]	7	0.120 [3.05]	273 [0.404]	11 500	[51.2] (4)	4 250	[18.9]	6 950	[30.9]	10 800	[48.0]	15 400	[68.5]
7/16 [11.11]	7	0.145 [3.68]	399 [0.591]	18 000	[80.1] (4)	5 700	[25.4]	9 350	[41.6]	14 500	[64.5]	20 800	[92.5]
1/2 [12.7]	7	0.165 [4.19]	517 [0.765]	25 000	[111.2] (4)	7 400	[32.9]	12 100	[53.8]	18 800	[83.6]	26 900	[119.7]

[A]The utilities grade is used principally by communication and power and light industries.
[B]The last numbers in parentheses refer to elongation requirements specified in Section 9⅜.

of each wire joint is marked on the strand with paint or some other distinguishing mark.

7.3 Joints in the wires composing the strand shall be of the electric-butt-welded type. Care shall be taken to prevent injury to the wire during electric-butt-welding. All joints shall be well made and shall have protection from corrosion equivalent to that of the aluminum-coated wire itself.

8. Breaking Strength and Weight

8.1 The minimum breaking strength of the finished strand shall be as specified in Table 1 and the approximate weight per 1000 ft or 305 m of strand shall be as indicated in Table 1.

8.2 A test in which the breaking strength is below the minimum specified and which may have been caused by the slipping of the specimen in the jaws of the testing machine, by breaking within the jaws or within 1 in. [25 mm] of the jaws, or by the improper socketing of a specimen shall be disregarded and another sample from the same coil or reel shall be tested. Tests shall be made on lengths of strand that do not contain wire joints or splices.

9. Elongation

9.1 The elongation of the strand in 24 in. [610 mm] shall be not less than that specified in Table 2.

9.2 The elongation shall be determined as the percent increase in separation between the jaws of the testing machine from the position after application of the initial load to the position at the initial failure in the test specimen. The separation of the jaws of the testing machine shall be approximately 2 ft [0.61 m] when under an initial load equal to 10 % of the required minimum breaking strength of the strand. The elongation values shall be recorded only for specimens that break over 1 in. from the jaws of the testing machine. Additional samples shall be taken from the same coil or reel when the previous tests are to be disregarded.

9.3 Elongation tests shall be made on lengths of strand that do not contain wire joints or splices.

TABLE 2 Elongation Requirements for Grades of Strand

Grade of Strand	Elongation in 24 in. or 610 mm, min, %
Utilities (1)[A] and common strand	10
Utilities (2)[A] and Siemens-Martin	8
Utilities (3)[A] and high-strength	5
Utilities (4)[A] and extra-high-strength	4

[A]See Table 1, Footnote *B*.

10. Dimensions and Permissible Variations of Wires

10.1 The diameter of the aluminum-coated wire forming the strand specified in Table 1 shall be within the limits prescribed in Table 3.

11. Sampling

11.1 Perform sampling for determination of compliance to this specification on each lot of material. A lot shall consist of all the strand of one size and one grade in each shipment. The number of samples to be taken shall be as follows:

	Number of Samples
5000 ft [1525 m] or less	1
Over 5000 to 30 000 ft [1525 to 9145 m]	2
Over 30 000 to 150 000 ft [9145 to 45 720 m]	3
Over 150 000 ft [45 720 m]	4

11.2 Each sample taken shall be subjected to all tests prescribed in this specification.

TABLE 3 Permissible Variations in Diameter of Aluminum-Coated Wires[A]

Nominal Diameter of Coated Wires in the Strand, in. [mm]	Permissible Variations, plus and minus, in. [mm]
0.061 to 0.090 [1.55 to 2.29]	0.003 [0.08]
0.091 to 0.120 [2.31 to 3.05]	0.004 [0.10]
0.121 and over [3.07 and over]	0.005 [0.13]

[A]It is recognized that the surface of aluminum coatings, particularly those produced by hot dipping, is not perfectly smooth and devoid of irregularities. If the tolerances shown in this 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 gaging the uniform areas of the aluminum-coated wire.

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12. Weight of Coating

12.1 The weight of aluminum coating, in ounces per square foot or kilograms per square metre, of uncoated wire surface, on any individual wire of the completed strand shall be not less than that specified in Table 4.

13. Tests of Coating

13.1 Determine the weight of the aluminum coating in accordance with Test Method A 428.

14. Adherence of Coating

14.1 The aluminum-coated wire shall be capable of being wrapped at a rate not exceeding 15 turns per minute in a close helix of at least two turns around a cylindrical mandrel equal to three times the nominal diameter of the wire under test, without cracking or flaking the aluminum coating to such an extent that any aluminum can be removed by rubbing with the bare fingers. Loosening or detachment during the adhesion test of superficial, small particles of aluminum formed by mechanical polishing of the surface of aluminum-coated wire shall not be considered cause for rejection.

15. Ductility of Steel

15.1 The individual wires of the completed strand shall not fracture when wrapped at a rate not exceeding 15 turns per minute in a close helix of at least two turns around a cylindrical mandrel. The mandrel diameter for testing common- and Siemens-Martin-grade strand shall be equal to the nominal diameter of the individual wires of the strand. The mandrel diameter for utilities, high-strength, and extra-high-strength grade strand, shall be equal to three times the nominal diameter of the individual wires of the strand.

TABLE 4 Nominal Diameters and Minimum Weights of Coating for Aluminum-Coated Steel Wires

Nominal Diameter of Coated Wire in the Strand, in. [mm]	Minimum Weight of Aluminum Coating, oz/ft^2[g/m^2] of Uncoated Wire Surface
0.062 [1.57]	0.30 [92]
0.065 [1.65]	0.30 [92]
0.080 [2.03]	0.30 [92]
0.093 [2.36]	0.32 [98]
0.104 [2.64]	0.32 [98]
0.109 [2.77]	0.35 [107]
0.120 [3.05]	0.35 [107]
0.145 [3.68]	0.35 [107]
0.165 [4.19]	0.40 [122]

16. Finish

16.1 The aluminum-coated wire shall be free of imperfections not consistent with good commercial practice. The coating shall be continuous and reasonably uniform.

17. Inspection

17.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with this specification. All tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

18. Rejection

18.1 If the wire or strand fails in the first test to meet any requirement of this specification, two additional tests shall be made on samples of wire or strand from the same coil or reel. If failure occurs in either of these tests, the lot of wire or strand shall be rejected.

19. Packaging and Marking

19.1 Wire strand shall be furnished in standard lengths, (19.1.1) and in compact coils or on reels (19.1.2) as specified by the purchaser; otherwise lengths shall be as agreed upon at the time of purchase. Only one length of strand shall be furnished in each coil or on each reel. Lengths of strand may vary between the standard (nominal) length and 10 % over the standard (nominal) length, unless otherwise specified by the purchaser.

19.1.1 Standard lengths of strand are as follows: 250, 500, 1000, 2500, and 5000 ft [75, 150, 305, 760, and 1525 m].

19.1.2 Standard practice is to furnish all strand 7⁄16 in. [11.11 mm] and over in diameter on reels in lengths of 1000 ft and over. Strand lengths of less than 1000 ft are regularly furnished in coils.

19.2 Each coil or reel shall have a strong weather-resistant tag securely fastened to it showing the length, nominal diameter, number of wires, grade of the strand, ASTM designation A 474, and the name or mark of the manufacturer. If additional information is required on the tag, it shall be so specified at the time of purchase.

20. Keywords

20.1 aluminum-coated steel wire strand; wire strand

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