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Standard Specification for Zinc-Coated Steel Structural Wire Rope¹

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1. Scope

1.1 This specification covers zinc-coated steel structural wire rope, prestretched or nonprestretched for use where a high-strength, relatively flexible prefabricated zinc-coated multiple-wire tension member is desired as a component part of a structure.

1.2 The wire rope is furnished with Class A weight zinc-coated wires throughout. It can be furnished with Class B weight or Class C weight zinc-coated outer wires or Class B weight or Class C weight zinc-coated wires throughout where additional corrosion protection is required.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 ASTM Standards:

A 90/A 90M Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles²

A 902 Terminology Relating to Metallic Coated Steel Products²

B 6 Specification for Zinc (Slab Zinc)³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, see Terminology A 902.

NOTE 1—The following term used in this specification is defined in Terminology A 902: *carbon steel*.

4. Ordering Information

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

4.1.1 Length of wire rope,

4.1.2 Nominal diameter of wire rope (Tables 1-4),

4.1.3 Prestretched (see 8.3) or nonprestretched,

4.1.4 Coating-weight class if other than Class A (Table 5),

4.1.5 Mechanical tests if required (see 10.1),

4.1.6 Special packaging requirements (Section 13), and

4.1.7 Inspection (Section 12).

5. Materials and Manufacture

5.1 *Base Metal*—The base metal shall be carbon steel made by the open-hearth, basic-oxygen, or electric-furnace process and of such quality that the finished wire rope and the hard-drawn individual zinc-coated wires coated by the hot-dip or electrolytic process shall have the properties and characteristics as prescribed in this specification.

5.2 *Zinc*—The slab zinc when used shall conform to Specification B 6 or better.

6. Physical Properties

6.1 Tensile Properties:

6.1.1 The zinc-coated wire used in the wire rope shall conform to the mechanical properties in Table 6 prior to fabrication, but the wire test sample may be prestretched to 55 % of the minimum tensile strength specified in Table 6 prior to conducting the tests.

6.1.2 The tensile strength and the stress at 0.7 % extension shall be based on the actual cross-sectional area of the finished wire, including the zinc coating.

6.1.3 *Test Specimens*—The test specimens shall be free of bends or kinks other than the curvature resulting from the usual coiling operation. The 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.

6.2 *Stress at 0.7 % Extension Under Load*—The value of stress at 0.7 % extension under load shall be determined by one of the following procedures, depending on the type of extensometer used:

6.2.1 *Non-Autographic Extensometer*—When a non-autographic extensometer is used to measure the 0.7 % extension, it shall have a gage length of 10 in. (254 mm), and it shall be so graduated that the smallest division corresponds to a strain not larger than 0.0001 in./in. (0.0001 mm/mm) of gage length. Apply a load corresponding to the tensile stress indicated in Table 5, using the nominal diameter of the specimen. Maintain this load while a 10-in. extensometer is attached and adjusted to the initial setting shown in Table 5.

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² *Annual Book of ASTM Standards*, Vol 01.06.

³ *Annual Book of ASTM Standards*, Vol 02.04.

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TABLE 1 Properties of Single-Class Zinc-Coated Steel Structural Wire Rope (Inch-Pound Units)

Nominal Diameter, in.	Minimum Breaking Strength in Tons of 2000 lb			Approximate Gross Metallic Area, in. ²	Approximate Weight/ft, lb
	Class A Coating Throughout	Class B Coating Throughout	Class C Coating Throughout		
3/8	6.5	6.2	5.9	0.065	0.24
7/16	8.8	8.4	8.0	0.091	0.32
1/2	11.5	11.0	10.5	0.119	0.42
9/16	14.5	13.8	13.2	0.147	0.53
5/8	18.0	17.2	16.4	0.182	0.65
11/16	21.5	20.5	19.5	0.221	0.79
3/4	26.0	24.8	23.6	0.268	0.95
13/16	30.0	28.6	27.3	0.311	1.10
7/8	35.0	33.4	31.8	0.361	1.28
15/16	40.0	38.2	36.4	0.414	1.47
1	45.7	43.6	41.5	0.471	1.67
1 1/8	57.8	55.1	52.5	0.596	2.11
1 1/4	72.2	68.9	65.6	0.745	2.64
1 3/8	87.8	83.8	79.8	0.906	3.21
1 1/2	104.0	99.2	94.5	1.076	3.82
1 5/8	123.0	117.0	112.0	1.270	4.51
1 3/4	143.0	136.0	130.0	1.470	5.24
1 7/8	164.0	156.0	149.0	1.690	6.03
2	186.0	177.0	169.0	1.920	6.85
2 1/8	210.0	200.0	191.0	2.170	7.73
2 1/4	235.0	224.0	214.0	2.420	8.66
2 3/8	261.0	249.0	237.0	2.690	9.61
2 1/2	288.0	275.0	262.0	2.970	10.60
2 5/8	317.0	302.0	288.0	3.270	11.62
2 3/4	347.0	331.0	315.0	3.580	12.74
2 7/8	379.0	362.0	344.0	3.910	13.90
3	412.0	393.0	374.0	4.250	15.11
3 1/4	475.0	453.0	432.0	5.040	18.00
3 1/2	555.0	529.0	504.0	5.830	21.00
3 3/4	640.0	611.0	582.0	6.670	24.00
4	730.0	696.0	664.0	7.590	27.00

Then increase the load uniformly until the extensometer indicates an extension of 0.07 in. (1.78 mm) or 0.7 % extension. Record the load for this extension. The stress corresponding to this load shall meet the requirements for the stress of 0.7 % extension specified in Table 6, depending on the class of coating under consideration. Hold the specimen at 0.7 % extension under load and remove the extensometer used to measure the stress at 0.7 % extension; then replace it with an elongation extensometer. Continue the application of load until fracture occurs. Record the elongation attained from the elongation extensometer and add to it 0.7 % obtained from the stress at 0.7 % extensometer to get the total elongation.

6.2.2 Autographic Extensometer—When an autographic extensometer is used, it shall have a gage length of at least 2 in. (50.8 mm) and the magnification of strain shall not be less than 250. Apply a load, corresponding to the tensile stress indicated in Table 5, using the nominal diameter of the specimen. Maintain this load and attach the extensometer. Then increase the load uniformly until the extension recorded by the extensometer is at least 0.7 %. Determine the load at 0.7 % extension from the load-strain curve. The stress corresponding to this load shall meet the requirements for stress at 0.7 % extension prescribed in Table 6, depending on the class of coating under consideration. Hold the specimen at 0.7 % extension under load and remove the extensometer used to measure the stress at 0.7 % extension; then replace it with an elongation extensometer. Continue the application of load until fracture occurs. Record the elongation attained from the elongation extensometer and add to it 0.7 % obtained from the stress at 0.7 % extensometer to get the total elongation.

NOTE 2—The extensometer used for the stress at 0.7 % extension and the elongation extensometer may be the same instrument. Two separate instruments are advisable in that the more sensitive stress at 0.7 % extensometer which could be damaged when the wire fractures, may be removed following the determination of the 0.7 % extension. The elongation extensometer may be constructed with less sensitive parts or be constructed in such a way that little damage would result if fracture occurs while the extensometer is attached to the specimen.

6.3 Elongation—In determining total elongation (elastic plus plastic extension) autographic or extensometer methods may be employed. If fracture takes place outside the middle third of the gage length, the elongation value obtained may not be representative of the material.

6.4 Tensile Strength—The tensile strength is determined from the maximum load during the total elongation test.

6.5 Ductility of Steel—The zinc-coated wire, prior to fabrication into wire rope, shall be capable of being wrapped two turns in a close helix at a rate not exceeding 15 turns/min around a cylindrical steel mandrel equal to three times the nominal diameter of the wire under test without fracture of the wire.

6.6 Weight of Zinc Coating—The weight of the zinc coating on the individual wires prior to the fabrication of the wire rope shall be not less than that specified in Table 7 when tested in accordance with the stripping test of Test Method A 90/A 90M.

6.7 Adherence of Coating—The zinc-coated wire, prior to fabrication into wire rope, shall be capable of being wrapped two turns in a close helix at a rate not exceeding 15 turns/min around a cylindrical steel mandrel equal to five times the nominal diameter of the wire under test without delamination.