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# Standard Specification for Zinc-Coated Steel Wire Rope and Fittings for Highway Guardrail[1]

This standard is issued under the fixed designation A 741; 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 ¾ and 1-in. [19 and 25-mm] zinc-coated steel wire rope and fittings for use in the construction of highway guardrail.

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

## 2. Referenced Documents

2.1 *ASTM Standards:*

A 90/A 90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.[2]

A 123/A 123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products[2]

A 153/A 153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware[2]

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products[3]

A 902 Terminology Relating to Metallic Coated Steel Products[2]

B 6 Specification for Zinc[4]

## 3. Terminology

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

## 4. Ordering Information

4.1 Orders for wire rope guardrail material purchased to this specification shall include the following:

4.1.1 Diameter of wire rope,

4.1.2 Type of wire rope construction,

4.1.3 Class of zinc coating required (Table 1),

4.1.4 Quantity of wire rope and length per reel, and

4.1.5 ASTM designation and year of issue.

NOTE 1—A typical ordering description is as follows: ¾ -in. [19-mm] diameter, Zinc-Coated Wire Rope for Guardrail, Type 1 Construction, Class A Coating, 80 000 lineal ft [24 300 m] on forty 2 000-ft [608-m] reels, ASTM A 741– .

## 5. Material

5.1 *Base Metal*—The base metal shall be steel made by any process and shall be of such quality that the finished wire rope and the individual zinc-coated wires shall have the properties as prescribed in this specification.

5.2 *Zinc*—The slab zinc when used for the coating shall be any grade of zinc conforming to Specification B 6.

## 6. Mechanical Requirements

6.1 *Breaking Strength*—The zinc-coated steel wire rope shall conform to the mechanical properties in Table 2 when tested in accordance with Test Methods and Definitions A 370 and employing a suitable gripping device as covered in Supplement VII of Test Methods and Definitions A 370.

6.2 *Construction*—The zinc-coated wire rope and individual wires shall conform to the dimension and construction requirements of Table 2.

6.3 *Ductility of Steel*—The individual zinc-coated wires shall be capable of being wrapped two turns in a close helix at a rate not exceeding 15 turns per minute around a cylindrical steel mandrel equal to three times the nominal diameter of the wire under test without cracking or breaking of the wire.

6.4 *Weight of Zinc Coating*—The class of zinc coating shall be specified by the purchaser. The weight of the zinc coating on the individual wires for the specified class and appropriate wire size shall not be less than that specified in Table 1 when tested in accordance with the stripping test of Test Method A 90 /A 90M.

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

[1] This specification is under the jurisdiction of ASTM Committee A05 on Metallic Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.12 on Wire Specifications.

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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.

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**TABLE 1 Minimum Weight of Coating**

| Nominal Diameter of Coated Wire | | Weight of Zinc Coating, min | | | | | |
|---|---|---|---|---|---|---|---|
| | | oz/ft$^2$ of Uncoated Wire Surface | | | g/m$^2$ of Uncoated Wire Surface | | |
| in. | mm | Class A Coating | Class B Coating | Class C Coating | Class A Coating | Class B Coating | Class C Coating |
| 0.040 to 0.061, incl | 1.02 to 1.55, incl | 0.40 | 0.80 | 1.20 | 122 | 244 | 366 |
| 0.062 to 0.079, incl | 1.58 to 2.01, incl | 0.50 | 1.00 | 1.50 | 152 | 305 | 458 |
| 0.080 to 0.092, incl | 2.03 to 2.34, incl | 0.60 | 1.20 | 1.80 | 183 | 366 | 549 |
| 0.093 to 0.103, incl | 2.36 to 2.62, incl | 0.70 | 1.40 | 2.10 | 214 | 427 | 640 |
| 0.104 to 0.119, incl | 2.64 to 3.02, incl | 0.80 | 1.60 | 2.40 | 244 | 488 | 732 |
| 0.120 to 0.142, incl | 3.05 to 3.61, incl | 0.85 | 1.70 | 2.55 | 259 | 518 | 778 |

**TABLE 2 Guard Cable Requirements**

| Type | Diameter, min, in. [mm] | Construction (No. of Strands × No. of Wires per Strand) | Breaking Strength, min, lbf [kN] | Length of Lay of Strand, max, in. [mm] | Length of Lay of Wires in Strand, max, in. [mm] | Diameter of Coated Wires in Strand, in. [mm] |
|---|---|---|---|---|---|---|
| I | ¾ [19] | 3 by 7 | 25 000 [110] | 7.5 [190] | 4.5 [114] | 0.117 to 0.124 [2.97 to 3.15] |
| II | ¾ [19] | 6 by 19[A] IWRC[B] | 42 800 [190] | [C] | [C] | variable |
| II(a) | ¾ [19] | 6 by 19[A] wire strand core | 42 800 [190] | [C] | [C] | variable |
| III | 1 [25] | 7 by 7 | 45 000 [200] | 10 [254] | 4.5 [114] | 0.105 to 0.116 [2.67 to 2.84] |

[A] 6 by 19 classification may have from 15 to 26 wires per strand.
[B] IWRC = independent wire rope core.
[C] Length of lay as specified by the manufacturer.

6.6 *Appearance*—The individual wires shall be cylindrical in form, of uniform quality, and free of imperfections not consistent with good commercial practice. The coating shall be continuous and reasonably uniform.

## 7. Wire Rope

7.1 The wire rope shall be right regular lay, preformed, and of the type of construction shown in Table 2. A right lay is defined as a clockwise twist away from the observer. The type of construction shall be specified by the purchaser.

## 8. Joints and Splices

8.1 *Individual Wires*—The distance between joints in any two individual wires in a strand shall be not less than 18 in. [460 mm]. Joints in individual wires shall be either butt-welded or brazed-lap type. Joints made by butt welding shall have all flash removed. When the brazed-lap type of joint is used, the length of the lap shall be not less than three times the diameter of the wire and the overlapping faces shall be smooth, clean, properly fluxed, and completely covered by the brazing metal. All joints shall be recoated after welding so that the joints shall have protection from corrosion equivalent to the zinc-coated wire itself.

8.2 *Strand or Rope*—Strand or rope splices may only be made when authorized in writing by the purchaser.

## 9. Sampling and Testing

9.1 One wire rope test specimen shall be taken from each lot. A lot shall consist of not more than 20 tons [18 metric tons] of wire rope of one size and type delivered at one time.

9.2 The test specimen shall be of a length to perform conveniently all tests prescribed in this specification.

9.3 A minimum of four wire test specimens shall be cut from each size of main wires in the rope, selected at random for testing for compliance with 6.2, 6.3, 6.4, and 6.5.

9.4 If an individual wire or the rope fails to meet any requirements of this specification, that reel shall be rejected and two additional tests shall be made on samples of wire rope from two different reels in the lot. If failure occurs in either of these tests, the lot of wire rope shall be rejected. The lot may be resubmitted for inspection after testing every reel for the characteristic in which the specimen failed and sorting out the defective reels.

## 10. Inspection

10.1 All tests and inspection shall be made at the place of manufacture unless otherwise specified and shall be so conducted as not to interfere unnecessarily with the operation of the works. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities to satisfy him that the material being furnished is in accordance with this specification. When specified, inspection may be waived and certified copies of test reports furnished. The purchaser reserves the right to test individual wires for compliance to 6.2, 6.3, 6.4, and 6.5 and the zinc-coated wire rope after fabrication.

## 11. Packaging

11.1 Current standard practice is to ship the wire rope on wooden reels. Each reel shall have the length, nominal diameter, type of strand construction, weight of rope, and name or trademark of the manufacturer plainly and indelibly marked on a strong tag, firmly attached, or this information shall be painted on the reel. The wooden reel shall be mountable so that it will revolve and the rope will run off by pulling straight ahead.

## 12. Fittings

12.1 The fittings shall be of the design called for in the plans and shall have the properties necessary to develop the strength of the wire rope.

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