Designation: A 640 – 97 (Reapproved 2002)ε1

Standard Specification for Zinc-Coated Steel Strand for Messenger Support of Figure 8 Cable[1]

This standard is issued under the fixed designation A 640; 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.

ε[1] NOTE—Several editorial corrections were made throughout the specification in September 2002.

1. Scope

1.1 This specification covers two sizes of extra-high-strength grade of concentric-lay steel wire strand, composed of seven, zinc-coated steel wires, specifically intended for use as the supporting messenger in Figure 8-type communication and electrical cables.

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

2. Referenced Documents

2.1 *ASTM Standards:*

A 90/A 90M Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles[2]

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

B 6 Specification for Zinc (Slab Zinc)[3]

3. Terminology

3.1 *Definitions*—See Terminology A 902 for definitions of general terminology relating to metallic coated steel products.

4. Description

4.1 Figure 8 cable consists of a plastic-sheathed communication or electrical cable made with an integral supporting messenger strand. The supporting messenger strand has a plastic sheath with a narrow, longitudinal web connecting to the plastic sheath of the cable. Generally the plastic sheath over the supporting strand, the connecting web, and the plastic sheath over the cable are all applied by extruding in one operation.

4.2 The galvanized steel strand used for the support messenger of Figure 8-type cable is generally coated by flooding with a sealing compound before the plastic sheath is applied (Note). It is generally preferred that this sealing compound be applied to the individual wires during the stranding operation just before the wires are laid together. This ensures that all wires are completely covered and the interstices between the wires are sealed with a thermoplastic flooding compound to prevent intrusion of moisture under the plastic sheath. Sometimes the thermoplastic material is only applied to the outside of the finished strand.

NOTE 1—The cable manufacturer should advise the strand manufacturer of the plastic to be used for the sheath so that a sealing compound can be selected to avoid any adverse effects on the sheath.

5. Ordering Information

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

5.1.1 Nominal strand diameter (Table 1),

5.1.2 Quantity of each size of strand, length in feet (metres),

5.1.3 Unit length (see 16.1),

5.1.4 Sealing compound, if required, and the method of application. Special requirements of sealing compound (Note),

5.1.5 Package size if different from standard (Section 16),

5.1.6 Special package marking (see 16.4), and

5.1.7 Inspection (Section 14).

6. Materials and Manufacture

6.1 The base metal of the wires shall be steel made by the open-hearth, basic-oxygen, or electric-furnace process and of such quality and purity that, when drawn to the size of wire specified and coated with zinc, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as prescribed in this specification.

6.2 The slab zinc, when used for the wire coating, shall be any grade of zinc conforming to Specification B 6.

7. Stranding

7.1 Six wires shall be stranded with a uniform left-hand lay about a center wire to form the completed strand. All wires shall be stranded with uniform tension. Stranding shall be

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[2] *Annual Book of ASTM Standards,* Vols 01.06 and 02.03.

[3] *Annual Book of ASTM Standards,* Vols 02.03 and 02.04.

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TABLE 1 Mechanical Requirements

	Nominal Diameter of Strand	
	3/16 in. (4.76 mm)	1/4 in. (6.35 mm)
Nominal diameter of coated wires, in. (mm)	0.062 (1.57)	0.080 (2.03)
Minimum breaking strength of the strand, lbf (kN)	3990 (17.748)	6650 (29.581)
Minimum elongation of the strand in 24 in. (610 mm), %	4.0	4.0

TABLE 2 Approximate Weight of Strand

	Nominal Diameter of Strand	
	3/16 in. (4.76 mm)	1/4 in. (6.35 mm)
Before flooding:		
lb/1000 ft	73	121
kg/km	109	180
With flooding compound:		
lb/1000 ft	75	125
kg/km	112	186

sufficiently close to ensure no appreciable reduction in diameter when stressed to 10 % of the specified strength. A left-hand lay is defined as a counter-clockwise twist away from the observer.

7.2 The strand shall have a uniform pitch of not less than 14 times nor more than 22 times the nominal strand diameter.

7.3 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 shall be accomplished by a means or process, such as preforming, post forming, or form setting at the manufacturer's option.

8. Joints and Splices

8.1 Electric-welded butt joints made prior to the start of cold drawing of the wire are permitted.

8.2 Joints made in the individual finished wires shall be acceptable, provided there is not more than one joint in any 150-ft (45.7-m) section of the completed strand. Such joints shall either be the brazed-lap type or electric-butt-welded type. When the brazed 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. When the electric-butt-welded type of joint is used, care shall be taken to prevent injury to the wire during the electric-butt-welding. The wires shall be in alignment and the joints shall be well made and free from sharp burrs and sharp projections. The joints shall be coated with zinc after completion so that the joints shall have protection from corrosion equivalent to that of the zinc-coated wire itself.

8.3 The finished strand shall not be joined or spliced as a unit, unless specifically permitted by the purchaser.

9. Physical Requirements

9.1 The minimum breaking strength and minimum elongation in 24 in. (610 mm) of the strand and the nominal diameter of individual wires are given in Table 1. The approximate weights per 1000 ft (305 m) are given in Table 2.

9.2 *Ductility of Steel*—The individual wires of the completed strand shall not fracture when wrapped at a rate of not exceeding 15 turns/min 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.

9.3 *Weight of Coating*—The weight of zinc coating shall be not less than 0.65 oz/ft^2 (198 g/m^2) of uncoated wire surface on the 3/16-in. (4.8-mm) and 1/4-in. (6.4-mm) strand.

9.4 *Adherence of Coating*—When the wire is wrapped on the cylindrical mandrel in accordance with 9.2, the zinc coating shall not crack or flake to such an extent that any zinc can be removed by rubbing with the bare fingers. Loosening or detachment during the adhesion test of superficial, small particles of zinc formed by mechanical polishing of the surface of the zinc-coated wire shall not be considered cause for rejection.

10. Permissible Variations in Diameter

10.1 The diameter of the individual zinc-coated wires shall be the nominal size as given in Table 1 within a tolerance of ±0.003 in. (0.08 mm).

11. Finish

11.1 The zinc-coated wire shall be free from imperfections not consistent with good commercial practice. The zinc coating shall be continuous and of reasonably uniform thickness.

12. Sampling

12.1 Sampling for determination of compliance to this specification shall be performed on each lot of material. A lot shall consist of all strands of one size in each shipment. The number of samples to be taken shall be as follows:

	Number of Samples
One reel	1
Two to four reels	2
Five to ten reels	3
Over ten reels	4

12.2 Each strand sample taken shall be tested for conformance to the requirements of 7.2 and Table 1.

12.3 In addition to the strand testing in 12.2 the individual wires from the strand samples shall be tested. Four wires are to be selected from the seven-wire strand and tested to determine compliance with 9.2, 9.3, 9.4, and Section 10. Individual wire samples selected for compliance to Section 10 shall be discarded if any distortion of the wire occurred during the stranding operation.

12.4 Instead of testing the wires from the completed strand in accordance with 12.3, the purchaser has the option to accept the manufacturer's certification that tests of the wires made prior to stranding meet requirements of 9.2, 9.3, 9.4, and Section 10.

13. Test Methods

13.1 The breaking strength shall be determined on the specimen tested for elongation in accordance with 13.2. A test in which the breaking strength is below the minimum specified possibly due to slipping of the specimen in the jaws of the testing machine, by breaking within the jaws or within 1 in.

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(25.4 mm) of the jaws, or by the improper socketing of a specimen shall be disregarded and another sample from the same reel shall be tested.

13.2 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 of the test specimen. The separation of the jaws of the testing machine shall be approximately 2 ft (610 mm) 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 which break over 1 in. from the jaws of the testing machine. Additional samples shall be taken from the same length when previous tests are to be disregarded.

13.3 The weight of the zinc coating shall be determined by a stripping test in accordance with Test Method A 90/A 90M.

14. Inspection

14.1 The manufacturer shall afford the inspector representing the purchaser all reasonable facilities 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.

15. Rejection

15.1 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 reel. If failure occurs in either of these tests, the lot of strand shall be rejected.

16. Packaging and Marking

16.1 The strand shall be furnished on reels in standard lengths in accordance with Table 3. These standard lengths are multiples of unit lengths of 5000 ft (1500 m) plus 300 ft (91 m) to allow for threading into an extruder. If a length different than these standard lengths or unit lengths of 5000 ft is required, the purchase order shall include this requirement.

16.2 The permissible length of strand is permitted to vary between standard length and 4 % over the standard length.

16.3 Ten percent of any lot of strand is permitted to be supplied in lengths shorter than the standard length, provided the shipped length is one or more of the unit lengths as specified on the purchase order, or if no unit length is specified, a multiple of 5000 ft, plus 300 ft on each piece to allow for threading an extruder.

16.4 Each reel shall have a strong weather-resistant tag securely fastened to it showing the nominal diameter, length, ASTM Specification A 640, and the name and mark of the manufacturer. If additional information is required on the tag, it shall be so specified at the time of purchase.

17. Keywords

17.1 Figure 8 cable support strand; messenger strand; steel wire strand; steel wire-zinc coated

TABLE 3 Standard Lengths

Nominal Diameter of Strand, in. (mm)	Standard Length, ft (m)
3/16 (4.76)	20 300 (6187)
1/4 (6.35)	15 300 (4663)

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