



Designation: F1665 – 08 (Reapproved 2022)

Standard Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain-Link Fence¹

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1. Scope

1.1 This specification covers PVC and other conforming organic polymer-coated steel barbed wire consisting of two polymer-coated strands, with four-point barbs of zinc-coated steel or aluminum alloy wire. PVC and other organic polymer coatings hereinafter will be designated as polymer coating.

1.2 Barbed wire strand wire, produced from three classes of wire coatings, is covered as follows:

1.2.1 *Class 1*, consisting of a polymer coating extruded over zinc-coated or aluminum-coated or zinc-5 % aluminum-mischmetal alloy-coated steel wire;

1.2.2 *Class 2a*, consisting of a polymer coating extruded and adhered to zinc-coated or aluminum-coated or zinc-5 % aluminum-mischmetal alloy-coated steel wire; and

1.2.3 *Class 2b*, consisting of a polymer coating fused and adhered to zinc-coated or aluminum-coated or zinc-5 % aluminum-mischmetal alloy-coated steel wire.

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.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This specification is under the jurisdiction of ASTM Committee F14 on Fences and is the direct responsibility of Subcommittee F14.40 on Chain Link Fence and Wire Accessories.

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2. Referenced Documents

2.1 *ASTM Standards:*²

A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A428/A428M Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles

A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment

D1499 Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics

F552 Terminology Relating to Chain Link Fencing

F934 Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials

G152 Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

G153 Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

2.2 *Federal Standard:*³

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)

2.3 *Military Standards:*³

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

3. Terminology

3.1 *Definitions*—For definitions of terms such as fabric (chain-link fence), PVC, and polymer coating, see Terminology F552.

4. Classification

4.1 Polymer-coated steel barbed wire is supplied in a choice of two types as follows:

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.

³ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

- 4.1.1 *Type I (Standard)*, with barbs spaced on 5-in. (127-mm) centers; and
- 4.1.2 *Type II (High Security)*, with barbs spaced on 3-in. (76-mm) centers.

5. Ordering Information

- 5.1 Orders for barbed wire purchased in accordance with this specification shall include the following information:
 - 5.1.1 Quantity (expressed in number of spools);
 - 5.1.2 Length of spools (1320 or 1000 ft (402 or 305 m); see 9.4);
 - 5.1.3 Class of a polymer coating to be applied to metallic-coated steel strand wire;
 - 5.1.4 Color of coating;
 - 5.1.5 Type of barbs (galvanized steel or aluminum alloy; see 6.3);
 - 5.1.6 Type of barbed wire (Type I or II; see 4.1.1 and 4.1.2);
 - 5.1.7 Selection of type of metallic coating on the steel strand wire substrate, which shall be the choice of the producer unless otherwise specified;
 - 5.1.8 Packaging requirements;
 - 5.1.9 ASTM designation and year of issue; and
 - 5.1.10 Certification, if required;

5.2 Any tests required other than those covered specifically in this specification must be stipulated by the purchaser in the order or contract.

5.3 All spools of barbed wire accepted by the purchaser shall be billed on the basis of the number and original length.

NOTE 1—A typical ordering description is as follows: 20 spools polymer-coated steel barbed wire, 1000-ft (305-m) spools, Class 2b coating, olive green color, aluminum alloy barbs, Type II (high security), on pallets, certified this specification.

6. Materials

6.1 *Base Metal*—The base metal shall be steel of such quality and purity that, when drawn to the size of wire specified, it shall be of uniform quality and have properties and characteristics as prescribed in this specification.

6.2 Wire used for the manufacture of strand wire shall meet the requirements of this specification. The polymer coating shall be formulated and produced properly to conform to the requirements of this specification.

6.3 *Materials for Barbs:*

6.3.1 *Zinc-Coated Steel Wire*, if used for the barbs, shall be 14 gage, 0.080 in. (2.03 mm), having a Class 3 zinc coating, minimum 0.70 oz/ft (215 g/m) when tested in accordance with Test Method A90/A90M.

6.3.2 *Aluminum Alloy Wire*, if used for the barbs, shall be 14 gage, 0.080 in. (2.03 mm), Alloy 5000-H38, 6061-T94, or equal, as agreed upon between the manufacturer and the purchaser at the time of purchase.

6.3.3 The choice of either zinc-coated steel wire or aluminum alloy wire for the barbs shall be that of the manufacturer, unless otherwise specified by the purchaser.

7. Manufacture

7.1 Class 1 polymer-coated wire shall have the coating extruded onto the strand wire that conforms to the requirements as given in Table 1.

7.2 Class 2a polymer-coated wire shall have the coating extruded and adhered to the strand wire that conforms to the requirements as given in Table 1.

7.3 Class 2b polymer-coated wire shall have the coating fused and adhered to the strand wire that conforms to the requirements as given in Table 1.

8. Size and Construction

8.1 All barbed wire furnished in accordance with this specification shall be fabricated from two strands of 14 gage, 0.080-in. (2.03-mm) metallic-coated core, polymer-coated steel wire, with four-point barbs of 14 gage, 0.080-in. zinc-coated steel or aluminum alloy wire.

9. Size and Permissible Variations

9.1 *Line Wire*—The permissible variation from the nominal diameter of the wire shall be ±0.004 in. (0.10 mm).

9.2 *Barbs*—Due to the mechanics of the manufacture when forming the barbs, a certain amount of out-of-roundness can be expected, and this precludes barbs from being subjected to checks for other than nominal diameter and length. Measured from the center of the two strand wires, the barb length shall be 3/8 in. (9.5 mm), minimum.

9.3 *Spacing of Barbs*—Barbs shall be spaced as indicated in 4.1.1 or 4.1.2. The individual barb spacing shall be measured from the edge of one barb at the strand to the corresponding edge of the adjacent barb. Cumulative spacing is established by counting the total number of barbs in a 25-ft (7.6-m) length of barbed wire. Barbs are subject to relocation during fabrication and handling; therefore, a rigid interpretation of the spacing requirement may lead to undue rejections. Any sample with 93.5 % of the individual barb spacings conforming to the specified spacing (±3/4 in. (19 mm)) and containing a minimum of 55 barbs (5-in. (127-mm) spacing) or a minimum of 86 barbs (3-in. (76-mm) spacing) in 25 ft shall be considered acceptable.

9.4 The length of barbed wire in each spool shall be 80 rods (402 m). This is equivalent to one-quarter mile, or 1320 ft. At the option of the manufacturer, 1000-ft (305-m) spools may be offered.

10. Joints and Workmanship

10.1 Splicing of individual wires by means of a wrap joint or an electric butt weld is permitted. Not more than three

TABLE 1 Weight of Strand Wire Metallic Coatings

Specified Core Diameter of Strand Wire, in. (mm)	Minimum Weight of Zinc Coating, oz/ft (g/m)	Minimum Weight of Aluminum Coating, oz/ft ² (g/m ²)	Minimum Weight of Zinc-5 % Aluminum-Mischmetal Coating, oz/ft (g/m)
0.080 (2.03)	0.25 (75)	0.20 (61)	0.25 (75)

splices or joints shall exist in any spool of barbed wire. Such splices or joints shall be made in a workmanlike manner.

10.2 The strands shall be twisted with a uniform length of lay. The direction of twisting may be either right or left hand. Alternate left and right hand twisting is not permitted.

10.3 The barbs shall be sharp, well-formed, wrapped tightly, and spaced in accordance with 9.3.

11. Weight of Metallic Coating

11.1 The minimum weight of zinc coating for the galvanized barbs shall be 0.70 oz/ft (215 g/m). The minimum weight of the strand wire metallic coating shall conform to **Table 1** when tested in accordance with Test Method **A90/A90M** or Test Method **A428/A428M**, as applicable.

12. Breaking Strength

12.1 The minimum breaking strength of the stranded barbed wire shall be 760 lbf (3380 N) when tested in accordance with Test Methods and Definitions **A370**. This breaking strength value reflects that of both strand wires together as one unit.

13. Properties of Polymer-Coated Barbed Wire

13.1 The polymer-coated barbed wire shall have a demonstrated ability to conform to the following requirements:

13.2 Adhesion Tests:

13.2.1 Class 2a shall conform to the requirements of 13.2.2. Class 2b shall conform to the requirements of 13.2.3.

13.2.2 Three specimens from each lot shall be tested. Measure a distance of $\frac{3}{4}$ in. (19 mm) from the end of the specimen. With a regular hand grip wire stripper, exert maximum hand pull parallel to the axis of the wire. Attempt to remove the measured portion of the polymer sleeve from the core wire. The lot shall be acceptable if the polymer sleeve is not capable of being removed from the core wire on all three samples.

13.2.3 Three specimens from each lot shall be tested. Make two cuts parallel to the axis of the wire through the coating, approximately $\frac{1}{16}$ in. (1.6 mm) apart, at least $\frac{1}{2}$ in. (12.7 mm) long. With a knife, peel back a section of the coating between $\frac{1}{8}$ and $\frac{1}{4}$ in. (3.2 and 6.4 mm) long to produce a tab. Attempt to remove the $\frac{1}{16}$ -in. (1.6 mm) strip of coating by pulling the tab. The lot shall be acceptable if the coating breaks rather than separates from the core wire on all three specimens.

13.3 *Accelerated Aging*—The polymer-coated wire shall withstand exposure for 1000 h without failure at a black panel temperature of 145°F (63°C) when tested in accordance with Practice **D1499**. The appropriate apparatus described in Practices **G152** or **G153** shall be used for the test. The product shall be construed to have failed the test if one of the following occurs:

13.3.1 Shrinkage of the polymer coating is greater than $\frac{1}{16}$ in./ft (1.6 mm/305 mm) of wire.

13.3.2 There shall be no significant change in color or gloss of the polymer surface as determined by visual inspection.

13.4 *Color*—Unless otherwise stipulated by the purchaser, the color of the polymer shall be in accordance with the

standard colors contained in Specification **F934**: green, olive green, brown, and black.

14. Thickness of Polymer Coating

14.1 The thickness of the polymer coating shall be in accordance with **Table 2**.

14.2 The thickness of the polymer coating shall be determined on an individual piece of wire. This specimen may be any length of wire over 12 in. (305 mm).

14.3 For Class 1 and Class 2a material, strip the polymer coating mechanically from the wire and measure the minimum and maximum thickness of the polymer coating with a suitable micrometer.

14.4 For Class 2b material, strip the polymer coating by chemical means and determine the diameter of the bare wire. Scrape the coating from one side of the wire and measure the reduced diameter with a micrometer. The thickness of the coating at this point is the difference between the measurement thus obtained and the measured diameter of the bare wire. In a similar manner, determine the thickness of the coating at right angles to the first determination.

14.5 Take care not to remove any of the metallic surface when removing polymer coating by scraping.

15. Sampling

15.1 For the purpose of the tests, one spool from every 50 spools or fraction thereof in a lot shall be selected at random, or a total of seven samples, whichever is less. A lot shall consist of all of the spools of a single type of barbed wire offered for delivery at the same time.

15.2 *Test Specimens*—A 4-ft (1.2-m) length of barbed wire shall be cut from the end of the spool for the tests prescribed in Sections 11 – 14. Each strand wire shall be tested for its metallic and polymer coating. The breaking strength value shall be determined by having the twisted strand tested as a composite.

15.3 Instead of testing wire for its coating and breaking strength from the completed barbed wire in accordance with 15.2, the manufacturer may elect to establish compliance with Sections 11 – 14 by tests made on wire prior to fabrication. If the manufacturer makes this election, the purchaser still reserves the right to test wire from the completed barbed wire for compliance.

15.4 For the purpose of inspection, a maximum of two spools from the lot (as described in 15.1) may be subjected to observations for barb length and spacing, overall length, and general workmanship.

15.5 Instead of inspecting for length by unrolling full spools in accordance with 15.4, the purchaser and the manufacturer

TABLE 2 Thickness of Polymer Coating

	Class 1 and Class 2a, in. (mm)	Class 2b, in. (mm)
Minimum thickness at any point	0.015 (0.38)	0.006 (0.15)
Maximum thickness at any point	0.025 (0.64)	0.010 (0.25)