

Designation: F2453/F2453M - 14

Standard Specification for Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer Coated) for Meshes of 6 in.² [3871 mm²] or Less, in Panels or Rolls, with Uniform Meshes¹

This standard is issued under the fixed designation F2453/F2453M; 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 welded wire mesh fence fabric produced from steel wire or metallic-coated steel wire. The metallic-coated fabric may be polymer coated after fabrication.

1.2 Welded wire mesh fence fabric is produced in four types, based on the kind of coating, as described in Section 4.

1.3 This specification is applicable to orders in either inch-pound units or SI units. Values stated in either inch-pound or SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values in the two systems are not exact equivalents; therefore, each system shall be used independent of the other, without combining values in any way.

1.4 This specification references notes and footnotes, which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this specification.

1.5 The following safety hazards caveat pertains only to the test methods portion, Section 13, of this specification: *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 and health practices and determine the applicability of regulatory limitations proper to use.*

2. Referenced Documents

2.1 *ASTM Standards:*² A82/A82M Specification for Steel Wire, Plain, for Concrete Reinforcement (Withdrawn 2013)³

- A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
- A123/A123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A185/A185M Specification for Steel Welded Wire Reinforcement, Plain, for Concrete (Withdrawn 2013)³
- A641/A641M Specification for Zinc–Coated (Galvanized) Carbon Steel Wire
- A853 Specification for Steel Wire, Carbon, for General Use
- A856/A856M Specification for Zinc-5 % Aluminum-Mischmetal Alloy-Coated Carbon Steel Wire
- A902 Terminology Relating to Metallic Coated Steel Products
- B117 Practice for Operating Salt Spray (Fog) Apparatus
- D1499 Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics
- F934 Specification for Colors for Polymer-Coated Chain Link Fence Materials
- 2.2 ISO Standard:⁴

3. Terminology

3.1 *Definitions*—Refer to Terminology A902 for general terminology relating to metallic-coated steel products.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *welded wire mesh fence fabric*—material composed of a series of longitudinal and transverse steel wires arranged substantially at right angles to each other, and welded together at the points of intersection by electrical resistance welding to form fabricated sheets or rolls. See Tables 1 and 2 for list of standard mesh sizes.

4. Classification

4.1 Welded wire mesh fence fabric is classified in accordance with coating as follows:

¹ This specification is under the jurisdiction of ASTM Committee F14 on Fences and is the direct responsibility of Subcommittee F14.35 on Architectural Metal Fence Systems.

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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.

ISO 2178 Non-Magnetic Coatings on Magnetic Substrates— Measurement of Coating Thickness—Magnetic Method

 $^{^{3}\,\}mathrm{The}$ last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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TABLE 1 Panel Sizes^A

Vertical Mesh	Horizontal Mesh	Wire Diameter			Panel Width for Post	Panel Length (Height) (ft)	
Spacing (in.)	Spacing (in.)	Guage in.		[mm]	Spacings 6, 7, 8, and 10 ft (in.)		
2.0	2.0	11	0.120	3.06	74, 86, 98, 122	6 - 21	
2.0	2.0	8.5	0.155	3.93	74, 86, 98, 122	6 - 21	
2.0	2.0	6	0.192	4.88	74, 86, 98, 122	6 - 21	
2.0	2.0	6.5	0.185	4.70	74, 86, 98, 122	6 - 21	
0.5	2.0	10.5	0.128	3.25	74, 86, 98, 122	6 - 21	
0.5	2.0	11	0.120	3.06	74, 86, 98, 122	6 - 21	
0.5	3.0	11	0.120	3.06	75, 87, 99, 123	6 - 21	
0.5	3.0	10.5	0.128	3.25	75, 87, 99, 123	6 - 21	
0.5	3.0	9	0.148	3.77	75, 87, 99, 123	6 - 21	
0.5	3.0	8.5	0.155	3.94	75, 87, 99, 123	6 - 21	
0.5	3.0	8	0.162	4.12	75, 87, 99, 123	6 - 21	
0.5	3.0	6	0.192	4.88	75, 87, 99, 123	6 - 21	
0.75	3.0	1	0.225	5 72	75 87 00 123	6 - 21	

^APanels available up to 10 ft 6 in. in width (not all meshes) and 21 ft in length. The vertical mesh spacing is the distance measured from the top to the bottom. The horizontal mesh opening is the distance measured from left to right.

TABLE 2 Roll Siz	zes ^A
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Mesh Size as Produced in Rolls							
Vertical Mesh Spacing		Horizontal Mesh Spacing		Wire Diameter			Roll Height (Width)
in.	[mm]	in.		Gage	in.	[mm]	ft
1.0	25	1.0	25	12.5	0.99	2.51	3 - 10.5
1.0	25	1.0	25	11	.120	3.06	3 - 10.5
1.5	38	1.5	38	12.5	.099	2.51	3 - 10.5
1.5	38	1.5	38	11	.120	3.06	3 - 10.5
2.0	50	2.0	50	11	.120	3.06	3 - 10.5
2.0	50	2.0	50	10	.135	3.43	3 - 10.5
2.0	50	2.0	50	8.5	.155	3.93	3 - 10.5
2.0	50	2.0	50	6.5	.185	4.70	3 - 10.5
2.4	60	2.4	60	10	.135	3.43	3 - 10.5
2.4	60	2.4	60	8.5	.155	3.93	3 - 10.5
2.0	50	0.5	13	11	.120	3.06	3 - 10.5
2.0	50	1.0	25	11	.120	3.06	3 - 10.5
2.0	50	1.0	25	10	.135	3.43	3 - 10.5
3.0	75	1.0	25	12.5	.099	2.51	3 - 10.5
3.0	75	1.0	25	11	.120	3.06	3 - 10.5

^ARolls available up to 10 ft 6 in. in width (not all meshes) in foot increments up to 100 ft in length. The vertical mesh spacing is the distance measured from the top to the bottom. The horizontal mesh opening is the distance measured from left to right.

4.1.1 *Type 1*, consists of welded wire fabric made from wire which is zinc-coated, as per Specification A641/A641M Class 3 minimum, before being welded into fabric, known as galvanized before welding.

4.1.2 *Type 2*, consists of welded wire fabric which is made from uncoated wire and the fabric is subsequently zinc-coated after fabrication, in accordance with Specification A123/A123M, Coating Grade 35, known as galvanized after welding.

4.1.3 *Type 3*, consists of welded wire fabric made from wire which is coated with zinc-5 % aluminum-mischmetal alloy (Zn-5A1-MM), in accordance with Specification A856/A856M, Class A, before being welded into fabric, known as zinc 5 % aluminum mischmetal alloy-coated steel before welding.

4.1.4 *Type 4*, consists of welded wire fabric made from wire which is zinc-coated, in accordance with Specification A641/A641M, Class 1 minimum, before being welded into fabric, known as galvanized before welding, and subsequently polymer coated.

4.1.5 In agreement between buyer and supplier Type 1, 2 or 3 can be used to produce polymer coated welded wire fabric.

5. Ordering Information

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

5.1.1 Quantity (number of units of rolls or panels)

5.1.2 Mesh description: wire spacing and size (gage)

5.1.3 Panel (height by length) or Roll (height by length)

5.1.4 Type of coating (Section 4), including the specific type to be furnished.

5.1.5 ASTM designation and year of issue.

5.1.6 Any special requirements (see Section 8).

5.1.7 Certification, if required (see 15.1)

Note 1—A typical ordering description, when same mesh and gage, is as follows: 500 panels—0.5 in. by 3 in. by 8.5 gage/120 in. by 99 in. Type 2, conforming to Specification F2453 or 100 rolls of 2 in. by 2 in. 8.5 gage/96 in. by 100 ft, Type 1, conforming to Specification F2453. The vertical mesh opening (height measured from top to bottom) is designated

first followed by the horizontal mesh opening (width measured from left to right).

6. Material and Manufacture

6.1 The wire used in the manufacture of welded wire mesh fence fabric shall conform to the specifications in 6.1.1 as appropriate for the type ordered, except the tensile strength shall conform to 7.1. The wire may be produced from any grade of steel listed in Specification A82/A82M or Specification A853.

6.1.1 Type 1 welded wire fabric shall be manufactured from zinc-coated steel wire conforming to Specification A641/ A641M Class 3 coating (minimum). Type 2 welded wire fabric shall be manufactured from uncoated steel wire conforming to Specification A82/A82M or Specification A853, and the fabric subsequently zinc-coated by the hot-dip process, conforming to Specification A123/A123M, Coating Grade 35 (minimum). Type 3 welded wire fabric shall be manufactured from zinc-5 % aluminum-mischmetal coated steel wire conforming to Specification A856/A856M, Class A coating (minimum). Type 4 welded wire fabric shall be manufactured from zinc-coated steel wire conforming to Specification A641/A641M-Class 1 coating.

6.2 Wire for welded wire mesh fence fabric shall be assembled by automatic machines or other suitable mechanical means that will ensure accurate spacing and alignment of all members of the finished fabric. Longitudinal and transverse members of the welded wire fabric shall be connected at every intersection in accordance with the requirements of 13.4 by the process of electric resistance welding, which employs the principle of fusion combined with pressure.

6.3 The polymer coating used in the manufacture of polymer-coated welded wire mesh fence fabric shall conform to the properties in 8.2 and 8.3.

6.3.1 The polymer-coated welded wire mesh fence fabric shall have the polymer coating fused and adhered onto the metallic-coated welded wire fabric after fabrication of mesh.

7. Mechanical Properties **Tensile Strength**

7.1 Tensile Strength—The tensile strength of the wire used for the welded wire mesh fence fabric shall be soft, medium or hard in accordance with the requirements of Specifications A641/A641M (Type 1 and 4), A856/A856M (Type 3) and hard drawn in accordance with Specification A82/A82M or Specification A853 (Type 2). The cross-sectional area of the test specimen shall be based on the diameter of the metallic coated wire. (See Table 3.)

8. Physical Properties

8.1 Metallic Coating-The minimum metallic coating weight shall conform to the requirements of Specification A641/A641M, Class 3 coating for Type 1 and Type 2 and Specification A856/A856M Class A coating for Type 3.

8.2 Polymer Coated—The minimum coating weight of the metallic coated wire shall conform to the requirements of Specification A641/A641M Class 1 for Type 4.

TABLE 3 Breaking Strength of Core Wire

Specified Diameter of Wire (Metallic Coated)			Minimum Breaking Strength		
Gauge	in.	[mm]	lb	[N]	
4	0.225	5.72	1392	6192	
6.5	0.185	4.70	1410	6270	
6	0.192	4.88	1013	4506	
8	0.162	4.12	721	3207	
8.5	0.155	3.94	990	4400	
9	0.148	3.77	602	2678	
10.5	0.128	3.25	500	2224	
11	0.120	3.06	590	2620	

8.3 Polymer Coating on Wire-The initial properties of the polymer coating on the wire and welded wire fabric shall have a demonstrated ability to conform to the following requirements:

8.3.1 Salt Spray Exposure and Ultraviolet Light Exposure:

8.3.1.1 The polymer coating shall show no effect after 1000 h of salt spray exposure in accordance with Practice B117.

8.3.1.2 The polymer coating shall show no effect of exposure to ultraviolet light with test exposure of 1000 h using apparatus Type E and 63°C, when tested in accordance with Practice D1499.

8.3.1.3 Evaluation of Coating after Salt Spray and Ultraviolet Exposure Test-After 1000 h salt spray test and exposure to ultraviolet light as specified in 8.3.1.1 and 8.3.1.2, the polymer coating shall not show cracks, blisters or splits. The change in color, measured in terms of ΔE , shall not be more than ten.

8.3.2 Adhesion-The polymer coating shall adhere to the wire such that the coating breaks rather than separates from the wire when tested in accordance with 13.3.

8.3.3 Mandrel Bend-The polymer-coated wire when subjected to a single 360° bend at -0°F [-18°C] around a mandrel ten times the diameter of the wire, shall not exhibit breaks or cracks in the polymer coating.

8.3.4 Color—Unless otherwise agreed upon between buyer and supplier, the color of the polymer-coated wire shall conform to Specification F934.

9. Dimensions and Tolerances

9.1 The diameter of metallic-coated wire shall conform to Table 3.

9.2 The minimum thickness of the polymer coating, not to be considered the finished gage, shall be as shown in Table 4.

9.3 Welded wire mesh fence fabric shall have mesh openings as designated in Tables 1 and 2. Mesh opening shall be considered to be center-to-center distance between two consecutive longitudinal or transverse wires as designated in

Fig. 1. The permissible tolerance is $\pm \frac{1}{8}$ in. [3.2 mm] on meshes 2 in. and above and 1/16 in. [1.6 mm] on meshes under 2 inches.

TABLE 4 Thickness of Polymer Coating

Minimum Thickness at Any Point					
in.	mm				
.004	[.10]				



9.4 In panel or roll length, the permissible tolerance shall not exceed $\pm \frac{1}{4}$ in. [6.3 mm] when measured over a 6 ft direction. In all cases, the mesh count must be correct.

9.5 The width and height of the mesh openings for welded wire mesh fence fabric as installed on fence posts shall be as shown in Fig. 2.





9.6 The flatness of panels shall conform to the following: when a panel is laid on a flat surface, such that any lift is in the middle of the panel, the maximum lift shall not exceed 2 in. [50.8 mm].

10. Workmanship

10.1 Wire of proper grade and quality, when fabricated in the manner herein required, shall result in a strong, serviceable mesh-type product having substantially square or rectangular openings. It shall be fabricated and finished in a workmanlike manner, as determined by visual inspection, and shall conform to this specification.

11. Sampling

11.1 Sampling for determining the mechanical and physical properties of the welded wire fabric shall be obtained by cutting from the finished fabric a full-width section of sufficient length to perform testing.

12. Number of Tests

12.1 Perform a minimum of four tests for conformance to tensile strength of metallic coated wire, weld shear strength, wire and fabric dimensions, metallic coating weight, polymer coating thickness, adhesion of polymer coating, and mandrel bend from each 200,000 ft² [18,587 m²] of fabric or remaining fraction thereof.

13. Test Methods

13.1 *Metallic Coating Weight*—Perform coating weight tests in accordance with Test Methods A90/A90M.

13.2 Polymer Coating Thickness:

13.2.1 Determine the thickness of the polymer coating on an individual piece of wire removed from the fabric.

13.2.2 Determine the diameter of the metallic coated wire after stripping the polymer coating by chemical means. Determine the thickness of the polymer coating by scraping the coating from one side of the wire and measuring 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 metallic coated wire. Determine the thickness of the coating at right angles to the first determination in a similar manner. When removing the polymer coating by scraping, take care not to remove any of the metallic surfaces. The magnetic method can be applied as a non-destructive measurement of the thickness in accordance with ISO 2178.

13.3 Polymer Adhesion Test—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 $\frac{1}{8}$ in. [3.2 mm] and $\frac{1}{4}$ in. [6.4 mm] long to produce a tab. Attempt to remove the $\frac{1}{16}$ -in. 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 four specimens.

13.4 Weld Shear Strength of Fabric:

13.4.1 *Scope*—This test method covers the procedure for determining the strength of welded intersections of welded wire fabric.

13.4.2 *Significance and Use*—The weld shear strength is a measure of the ability of welds in wire fabric to resist the forces imposed on the wires tending to pull them apart.

13.4.3 *Apparatus*—Use a testing fixture such as shown in Fig. 3, which is intended to stress the vertical wire close to its centerline, and to prevent rotation of the horizontal wire. This fixture can be used in most tensile testing machines and should be hung in a ball and socket arrangement at the center of the machine. This or a similarly effective fixture designed on the same principle is acceptable (see Specification A185/A185M).

13.4.4 *Test Specimens*—Test specimens shall be obtained by cutting, from the finished fabric, a full-width section including at least two transverse wires.

13.4.4.1 The transverse wire of each specimen shall extend approximately 1 in. [25 mm] on each side of the longitudinal wire. The longitudinal wire of each test specimen shall be of such length below the transverse wire so as to be adequately engaged by the grips of the testing machine. It shall be of such length above the transverse wire that its end shall be above the centerline of the upper bearing of the testing device.

13.4.4.2 A test specimen shall consist of four welds selected at random from one transverse wire for weld shear strength. If the width of the fabric is such as to not include four welds that are suitable for testing, additional welds shall be taken from a second transverse wire to total four. (Welds at the edge wire are excluded from testing as there is no overhang to permit proper testing). If the average weld shear strength from the four specimens does not conform to the requirement of 13.4.6, test



NOTE 1—See Specification A185/A185M for additional information on weld shear testing. A detailed drawing showing complete dimensions of testing fixture may be obtained from ASTM. Order adjunct ADJA0185. FIG. 3 Welded Wire Fabric Weld Tester



all the welds across the width (excluding edge welds) on one transverse wire, or on two transverse wires if some of the initial specimens were from the second transverse wire.

13.4.5 Weld Shear Test procedure—Insert the long end of the vertical wire through the notch in the anvil. The vertical wire shall be in contact with the surface of the free-rotating rollers while the horizontal wires shall be supported by the anvil on each side of the slot. The bottom jaws of the testing machine shall grip the lower end of the vertical wire and the load shall be applied at the rate of stressing not to exceed 100,000 psi/min [689 Mpa/min].

13.4.6 Weld Shear Strength—The minimum average shear value in pounds-force shall be 70 % of the specified minimum breaking strength of the wire or as indicated in the table as follows, whichever is greater, when tested in accordance with 13.4 (see Specification A185/A185M). Typical minimum average shear strengths as specified are as follows:

Wire Diameter			Minimum B	reaking	Minimum Shear	
			Streng	yth	Strength	
in.	[mm]	Gage	Strength, lb	[N]	Strength, lb	[N]
0.099	[2.51]	12.5	400	[1775]	280	[1243]
0.120	[3.06]	11	590	[2620]	413	[1834]
0.135	[3.43]	10	750	[3335]	525	[2335]
0.155	[3.93]	8.5	990	[4400]	693	[3080]
0.185	[4.70]	6.5	1410	[6270]	987	[4390]

In agreement between buyer and supplier, other wires diameters may be used, providing they meet specifications designated in this specification.

13.4.7 *Conformance to Requirement*—The material shall be deemed to conform with the requirements for weld shear strength if the average of the test results of the first four specimens tested complies with the value in 13.4.6, or if the average of the test results for all welds tested complies with the value in 13.4.6.

13.4.8 *Report*—Report the test results to the nearest 5 lbf (25 N) for both individual results and the average of all tests.

13.4.9 *Precision and Bias*—The precision and bias of this test method for measuring weld shear strength are as specified in the test method included in Specification A185/A185M.

14. Inspection

14.1 Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements of this specification. The producer may use his own or any other suitable facilities for the performance of the tests. The purchaser, at their own expense, shall have the right to perform any of the inspections and tests set forth in this specification when such tests are deemed necessary to ensure that the material conforms to the prescribed requirements.

15. Certification

15.1 When specified in the purchase order or contract, a producer's or supplier's certification shall be furnished to the purchaser that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. When specified in the contract or purchase order, a report of the test results shall be furnished.

16. Keywords

16.1 galvanized after welding; organic polymer coatings; steel galvanized before welding; welded wire mesh fence fabric; welded mesh sizes; zinc and polymer coated; zinc-5 % aluminum-mishmetal alloy coated before welding

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