Designation: A 116 – 05

Standard Specification for Metallic-Coated, Steel-Woven Wire Fence Fabric[1]

This standard is issued under the fixed designation A 116; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers metallic-coated steel fence fabric having a series of horizontal (line) wires, with vertical (stay) wires either wrapped around the line wire (hinge joint) or fixed with another separate wire to the line wire (continuous stay fixed knot joint), forming rectangular openings. The fence fabric is suitable for use in fences for farm field enclosure (to keep domestic animals in or out), for wildlife and exotic animal control, for highway or railroad right-of-way fencing (to control access), and other similar uses.

1.2 This specification covers fence fabric in various designs, tensile strength grades, and metallic coating types and grades.

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

1.4 The text of 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 the specification.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

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

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

A 428/A 428M Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles[2]

A 510 Specification for General Requirements for Wire Rod and Coarse Round Wire, Carbon Steel

A 641/A 641M Specification for Zinc-Coated (Galvanized) Carbon Steel Wire[2]

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment

A 809 Specification for Aluminum-Coated (Aluminized) Carbon Steel Wire[2]

A 856/A 856M Specification for Zinc-5 % Aluminum-Mischmetal Alloy-Coated Carbon Steel Wire[2]

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

2.2 *U.S. Federal Standard:*

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)[3]

2.3 *U.S. Military Standards:*

MIL-STD-129 Marking for Shipment and Storage[3]

MIL-STD-163 Steel Mill Products, Preparation for Shipments and Storage[3]

3. Terminology

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

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *continuous stay fixed knot joint*, *n*—horizontal line wire and vertical stay wire joint made by fastening continuous stay wires to line wires by tying them together with a separate piece of knot wire at each joint.

3.2.2 *hinge joint*, *n*—horizontal line wire and vertical stay wire joint made by wrapping stay wire around line wires.

3.2.3 *intermediate wires*, *n*—line wires other than top and bottom wires.

3.2.4 *top and bottom wires*, *n*—line wires at the edge of the fence fabric (the top and bottom edges as erected).

4. Ordering Information

4.1 Orders for material under this specification shall include the following information, as necessary to describe each product ordered.

4.1.1 Name of material and joint style (woven steel fence fabric with hinge joint or continuous stay fixed knot joint);

4.1.2 Quantity (number of rolls);

4.1.3 Design Number—Number describing standard sizes and construction of the fabric as listed in Table 1;

NOTE 1—The design numbers are related to the characteristics of the construction of the fence fabric. The design number indicates the number

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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.

[3] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111–5094, Attn: NPODS.

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of line wires, approximate height, stay wire spacing, and size (gage) of the line and stay wires.

4.1.4 Fabric Length—When length is not specified by the order fabric is furnished to the standard length of 330 ft [10 m];

4.1.5 Tensile Strength Grade—The fabric is available in strength grades of 60, 125, and 175 (see Table 1);

TABLE 1 Design Numbers for Woven Wire Fence Fabric, Hinge Joint or Continuous Stay Fixed Knot Joint

NOTE 1—Design combinations other than listed in the table can be manufactured upon purchaser's request.
NOTE 2—Each design can be manufactured with hinge joint or continuous stay fixed knot joint.

Design Numbers	Number of Horizontal Wires	Nominal Fence Height	Spacing of Stay Wires, in. [cm]	Size, Steel Wire Gage	
				Intermediate Line and Stay Wires	Top and Bottom Wires
			No. 9 Grade 60		
1155-12-9	11	55	12 [30]	9	9
1047-12-9	10	47	12 [30]	9	9
939-12-9	9	39	12 [30]	9	9
832-12-9	8	32	12 [30]	9	9
726-12-9	7	26	12 [30]	9	9
949-12-9	9	49	12 [30]	9	9
845-12-9	8	45	12 [30]	9	9
635-12-9	6	35	12 [30]	9	9
1155-6-9	11	55	6 [15]	9	9
1047-6-9	10	47	6 [15]	9	9
726-6-9	7	26	6 [15]	9	9
			No. 11 Grade 60		
1047-12-11	10	47	12 [30]	11	9
939-12-11	9	39	12 [30]	11	9
832-12-11	8	32	12 [30]	11	9
726-12-11	7	26	12 [30]	11	9
845-12-11	8	45	12 [30]	11	9
635-12-11	6	35	12 [30]	11	9
1047-6-11	10	47	6 [15]	11	9
939-6-11	9	39	6 [15]	11	9
832-6-11	8	32	6 [15]	11	9
726-6-11	7	26	6 [15]	11	9
			No. 12½ Grade 60		
1047-12-12½	10	47	12 [30]	12½	10
939-12-12½	9	39	12 [30]	12½	10
832-12-12½	8	32	12 [30]	12½	10
726-12-12½	7	26	12 [30]	12½	10
845-12-12½	8	45	12 [30]	12½	10
635-12-12½	6	35	12 [30]	12½	10
1047-6-12½	10	47	6 [15]	12½	10
939-6-12½	9	39	6 [15]	12½	10
832-6-12½	8	32	6 [15]	12½	10
726-6-12½	7	26	6 [15]	12½	10
			No. 14½ Grade 60		
939-6-14½	9	39	6 [15]	14½	11
832-6-14½	8	32	6 [15]	14½	11
726-6-14½	7	26	6 [15]	14½	11
			No. 12½ Grade 125		
1047-12-12½	10	47	12 [30]	12½	10½
939-12-12½	9	39	12 [30]	12½	10½
832-12-12½	8	32	12 [30]	12½	10½
726-12-12½	7	26	12 [30]	12½	10½
1047-6-12½	10	47	6 [15]	12½	10½
939-6-12½	9	39	6 [15]	12½	10½
832-6-12½	8	32	6 [15]	12½	10½
726-6-12½	7	26	6 [15]	12½	10½
			No. 12½ Grade 125		
1478-6-12½	14	78	6 [15]	12½	12½
			No. 14 Grade 125		
1047-12-14	10	47	12 [30]	14	12½
939-12-14	9	39	12 [30]	14	12½
832-12-14	8	32	12 [30]	14	12½
726-12-14	7	26	12 [30]	14	12½
1047-6-14	10	47	6 [15]	14	12½

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TABLE 1 *Continued*

Design Numbers	Number of Horizontal Wires	Nominal Fence Height	Spacing of Stay Wires, in. [cm]	Size, Steel Wire Gage	
				Intermediate Line and Stay Wires	Top and Bottom Wires
939-6-14	9	39	6 [15]	14	12½
832-6-14	8	32	6 [15]	14	12½
726-6-14	7	26	6 [15]	14	12½
No. 14½ Grade 125					
1047-12-14½	10	47	12 [30]	14½	12½
939-12-14½	9	39	12 [30]	14½	12½
832-12-14½	8	32	12 [30]	14½	12½
726-12-14½	7	26	12 [30]	14½	12½
1047-6-14½	10	47	6 [15]	14½	12½
939-6-14½	9	39	6 [15]	14½	12½
832-6-14½	8	32	6 [15]	14½	12½
726-6-14½	7	26	6 [15]	14½	12½
No. 12½ Grade 175. For continuous stay fixed knot joint style fabric, stay wire minimum tensile strength is 100 ksi, ties wire diameter is minimum 13.5 GA					
1375-12-12½	13	75	12 [30]	12½	12½
1047-12-12½	10	47	12 [30]	12½	12½
2096-12-12½	20	96	12 [30]	12½	12½
1796-12-12½	17	96	12 [30]	12½	12½
1886-12-12½	18	86	12 [30]	12½	12½
1775-12-12½	17	75	12 [30]	12½	12½
1584-12-12½	15	84	12 [30]	12½	12½
1561-12-12½	15	61	12 [30]	12½	12½
1348-12-12½	13	48	12 [30]	12½	12½
1060-12-12½	10	60	12 [30]	12½	12½
949-12-12½	9	49	12 [30]	12½	12½
842-12-12½	8	42	12 [30]	12½	12½
1047-9-12½	10	47	9 [23]	12½	12½
23120-6-12½	23	120	6 [15]	12½	12½
2096-6-12½	20	96	6 [15]	12½	12½
1796-6-12½	17	96	6 [15]	12½	12½
1886-6-12½	18	86	6 [15]	12½	12½
1584-6-12½	15	84	6 [15]	12½	12½
1348-6-12½	13	48	6 [15]	12½	12½
1060-6-12½	10	60	6 [15]	12½	12½
949-6-12½	9	49	6 [15]	12½	12½
842-6-12½	8	42	6 [15]	12½	12½
735-6-12½	7	35	6 [15]	12½	12½
1047-6-12½	10	47	6 [15]	12½	12½
1775-6-12½	17	75	6 [15]	12½	12½
1561-6-12½	15	61	6 [15]	12½	12½
1375-6-12½	13	75	6 [15]	12½	12½
2096-3-12½	20	96	3 [7.5]	12½	12½
1775-3-12½	17	75	3 [7.5]	12½	12½
1561-3-12½	15	61	3 [7.5]	12½	12½
1348-3-12½	13	48	3 [7.5]	12½	12½

TABLE 2 Minimum Weight of Metallic Coating

Size, Steel Wire Gage	Diameter in. [mm]	Minimum Weight of Coating, oz/ft^2[g/m^2]					
		Type A Grade 60	Type Z Class 1 Grade 60	Type Z Class 3 Grades 60, 125, and 175	Type ZA Class 20 Grade 60	Type ZA Class 40 Grades 60, 125, and 175	TYPE ZA Class 80 Grades 60, 125, and 175
No. 9	0.148 [3.76]	0.40 [122]	0.35 [107]	0.90 [275]	0.20 [61]	0.40 [122]	0.80 [244]
No. 10	0.135 [3.43]	0.35 [107]	0.30 [92]	0.85 [259]	0.20 [61]	0.40 [122]	0.80 [244]
No. 10½	0.128 [3.25]			0.85 [259]		0.40 [122]	0.80 [244]
No. 11	0.120 [3.05]	0.35 [107]	0.30 [92]	0.85 [259]	0.20 [61]	0.40 [122]	0.80 [244]
No. 12½	0.099 [2.51]	0.32 [98]	0.28 [85]	0.80 [244]	0.20 [61]	0.40 [122]	0.80 [244]
No. 13½	0.086 [2.18]		0.25 [76]	0.75 [229]	0.20 [61]	0.40 [122]	0.80 [244]
No. 14	0.080 [2.03]			0.70 [214]		0.40 [122]	0.80 [244]
No. 14½	0.076 [1.93]	0.30 [92]	0.25 [76]	0.70 [214]	0.20 [61]	0.40 [122]	0.80 [244]

4.1.6 Metallic Coating Type;

4.1.6.1 Coating Type A—Made from aluminum coated wire.

4.1.6.2 Coating Type Z—Made from zinc coated wire.

4.1.6.3 Coating Type ZA—Made from Zn-5 % Al-miscmetal alloy (Zn-5Al-MM) coated wire.

4.1.7 Metallic Coating Class (see Table 2);

4.1.8 ASTM designation and year of issue, and

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4.1.9 Certification, or test report, or both, if required (see Section 10).

NOTE 2—A typical ordering description is as follows: Woven-steel fence fabric, hinge joint, 60 rolls, Design Number 1047-6-12 ½ , roll length 330 ft, Grade 60, Coating Type Z, Coating Class 3, to ASTM A 116-___, with certification.

4.2 All rolls of fence fabric accepted by the purchaser shall be billed on the basis of the original length of the rolls before sampling unless changed by contractual agreement.

5. Material

5.1 *Wire*—The steel wire shall be coated prior to fabrication, to the coating class specified in the order, the coating weight [mass] conforming to the requirements of Table 3. Coated wire shall be produced to the following applicable specifications:

5.1.1 *Coating Type A*—Specification A 809;

5.1.2 *Coating Type Z*—Specification A 641/A 641M;

5.1.3 *Coating Type ZA*—Specification A 856/A 856M.

5.2 *Coated Wire Size*—Coated wire gage sizes shown in Table 1, Table 3, and Table 2 corresponds to steel wire gage sizes listed in Specification A 510, within the tolerances stated in Section 7.

6. General Requirements

6.1 *Construction*—The sizes and constructions for fence fabric furnished under this specification shall be in accordance with the requirements of Table 1 for the design number specified in the order, within the tolerances stated in Section 7. Designs other than specified in the table can be manufactured upon agreement between purchaser and producer. Each design can be manufactured with hinge joint or continuous stay fixed knot joint.

6.2 *Horizontal Wire*—Horizontal wires of all woven fencing shall be furnished with tension curves, at least one tension curve per each 9 in. [229 mm] of horizontal (line) wire.

6.3 *Splices*—Splicing of the individual line wires by means of a wrap joint, mechanical fasteners, or an electric buttweld is permitted. The maximum number of line wire splices or joints shall not exceed one-half of the number of line wires in any 330 ft [101 m] (20 rod) roll of fabric. Such splices and joints shall be made in an workman-like manner and welded joints shall be coated with the corresponding Type A, Z, or ZA-coating material to provide corrosion protection equivalent to the type coated wire being used.

6.4 *Stay Wires*—Stay wires shall be uniformly spaced and substantially perpendicular to the line wires. Tie wire used for the continuous stay fixed knot joint style fabric shall be minimum 13.5 gage and of the same coating type and class as stay wire.

6.5 *Fence Fabric Length*—The length of fence fabric in a roll shall be 330 ft [101 m] (20 rod). Fabric length other than 330 ft can be manufactured upon agreement between purchaser and producer.

6.6 *Breaking Strength*—The breaking strength of line wires shall conform to the requirements of Table 3 for the grade specified in the order. There is no strength requirement for the stay wires for hinge joint style fabric. For Grade 175 continuous stay fixed knot joint style fabric, stay wire minimum tensile strength is 100 ksi (Grade 100).

TABLE 3 Breaking Strength of Line Wires

NOTE 1—There is no breaking strength requirement for stay wires.

Size, Steel Wire Gage	Tensile Strength Grade, ksi	Nominal Diameter in. [mm]	Minimum Breaking Strength Line Wires Only lbf [N]
9	60 (60)	0.148 [3.77]	1030 [4590]
10	60 (60)	0.135 [3.43]	860 [3820]
10½	125 (125)	0.128 [3.25]	1610 [7160]
11	60 (60)	0.120 [3.05]	685 [3050]
12½	60 (60)	0.099 [2.51]	460 [2050]
12½	100 [100]	0.099 [2.51]	770 [3493]
12½	125 (125)	0.099 [2.51]	960 [4280]
12½	175 (175)	0.099 [2.51]	1345 [5990]
14	125 (125)	0.080 [2.03]	630 [2800]
14½	60 (60)	0.076 [1.93]	270 [1210]
14½	125 (125)	0.076 [1.93]	565 [2520]

7. Permissible Variations in Dimensions

7.1 *Wire Diameter*—The permissible variation of the wire, from the nominal diameter shown in Table 3, shall be ±0.005 in. [±0.127 mm]. Determine the diameter using a micrometer or other suitable measuring instrument, based on the greatest and least measurement at the same cross-section, with measurement to the nearest 0.001 in. [0.025 mm]. The average of the two measurements shall be considered the diameter of the test specimen.

7.1.1 *Out-of-Roundness*—Due to the mechanics of manufacture, a certain amount of out-of-roundness is expected on the stay wires of the finished fence fabric. No limits are placed on out-of-roundness of the stay wires.

7.2 *Fabric Height*—The height of the woven wire fence fabric (center-to-center distance between top and bottom wires) shall not vary more than 1 in. [25 mm] from the specified height shown in Table 1. The specified height of the fence fabric is based on the sum of the line wire spacings shown in Fig. 1, Fig. 2, or Fig. 3.

7.3 *Stay Wire Spacing*—The spacing between individual pairs of stay wires, shall not vary from the nominal dimensions more than ⅜ in. [10 mm] for 3 in. and 6 in. spacing and no more than ¾ in. [19 mm] for 12 in. spacing product.

7.4 *Horizontal (Line) Wire Spacing*—The spacing between horizontal wires shall be as illustrated in Fig. 1, Fig. 2, and Fig. 3. Alternative spacing to that illustrated in Fig. 1, Fig. 2, and Fig. 3 is acceptable for given design number when agreed upon between purchaser and producer, providing that the total number of line wires remains unchanged. The spacing between individual pairs of horizontal wires shall not vary from the accepted nominal dimensions by more than ⅜ in. [10 mm]. The tolerance of the line wires spacing shall not alter the tolerance on the overall height of the fence fabric.

7.5 *Fence Fabric Length*—The length of fence fabric in a roll shall be the specified length within a tolerance of –0 and +3 %.

8. Sampling and Testing

8.1 Unless otherwise specified in the purchase order or contract, the manufacturer is responsible for the performance

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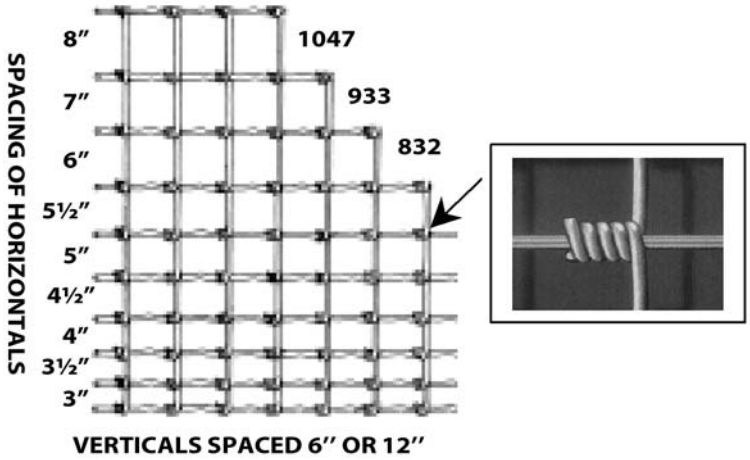

FIG. 1 Typical Hinge Joint Fence Fabric Dimensions for Design Numbers

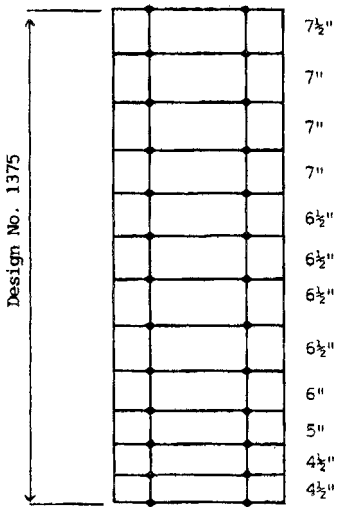

FIG. 2 Fence Fabric Dimensions for Design Number 1375

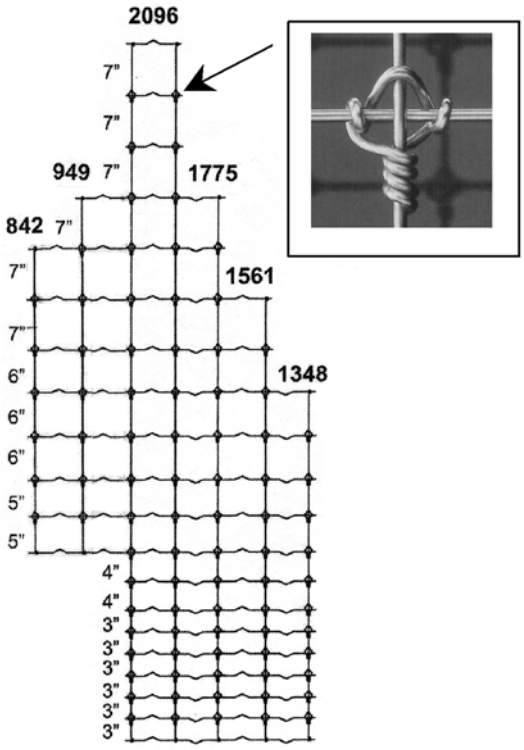

FIG. 3 Typical Continuous Stay Fixed Knot Joint Fence Fabric Dimensions for Design Numbers

of all inspection and test requirements specified in this specification. Except as otherwise specified in the purchase order or contract, the manufacturer may use any suitable facilities for the performance of the inspection and test requirements unless disapproved by the purchaser at the time the order is placed. The purchaser shall have the right to perform any of the inspection and tests set forth in this specification when such inspections and tests are deemed necessary to assure that the material conforms to prescribed requirements.

8.2 *Sampling*—For the purpose of tests, select one roll at random from every 50 rolls, or fraction thereof in a lot, or a total of seven rolls, whichever is less. A lot shall consist of all rolls of a single design, grade, coating type, and coating class offered for delivery at the same time. A sample for physical tests is a length of fence fabric, at least 3 ft [1 m] long, cut from the end of the sample roll to include at least three of the vertical (stay) wires.

8.3 *Testing for Weight of Coating*—Coating weight for Types Z and ZA shall be determined in accordance with Test Method A 90/A 90M. Coating weight for Type A shall be determined in accordance with Test Method A 428/A 428M.

8.3.1 A test specimen for weight of coating determination shall consist of a number of lengths cut from a single wire, excluding all wire knots, wraps, and welded sections, such that the total length of wire tested is a minimum of 12 in. [305 mm]. Test at least six test specimens for weight of coating, selected as follows:

8.3.1.1 One specimen from the top or bottom line wires,

8.3.1.2 Three specimens from different intermediate line wires, and

8.3.1.3 Two specimens from different vertical (stay) wires.

8.4 *Tests for Breaking Strength*—Cut specimens approximately 12 in. [305 mm] in length from the line wires, excluding

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knots, wraps, and welds. Test for breaking strength in accordance with Test Method A 370. Test at least four specimens, with one specimen from the top or bottom line wires, and three specimens from intermediate line wires.

8.5 *Pretesting of Wire*—Instead of testing wire for breaking strength and weight of coating from the completed fence fabric in accordance with 8.3 and 8.4, the manufacturer, at his election, shall establish compliance with the requirements in Sections 5 and 6 by tests made on wire prior to fabrication. If the manufacturer makes this election, the purchaser still has the right to test wire from the completed fence fabric for compliance.

8.6 *Inspection for General Workmanship*—For the purpose of inspection, a maximum of two rolls from the lot, as described in 8.2, shall be subjected to observations for the line and stay wire spacing, overall length, and workmanship.

8.6.1 Instead of inspecting for length by unrolling full rolls, the purchaser and manufacturer have the option of agreeing on a weight per roll related to the fabric design, or measuring tools employed during manufacturing. The purchaser still reserves the right to confirm the length by actual measurement.

9. Retests and Rejection

9.1 If one or more of the test specimens from a sample roll of fence fabric fail the weight-of-coating test, or the breaking strength test, the lot shall be subjected to retests. For retest purposes, four additional rolls for each 50 rolls offered shall be sampled. The lot size then becomes 50. Test specimens shall be cut in accordance with 8.3 or 8.4 as appropriate.

9.2 If more than four of the 24 retest specimens for weight-of-coating fail to meet the requirements of Table 2, or if any of the retest specimens has less than 75 % of the specified coating weight, the entire lot represented by the retest specimens may be rejected.

9.3 If more than 3 of 16 retest specimens for breaking strength fail to meet the requirements of Table 3, or if any of the retest specimens has less than 90 % of the specified breaking strength, the entire lot represented by the retest specimens may be rejected.

9.4 If instead of rejecting the entire lot as provided for in 9.2 or 9.3, the producer may test specimens from every roll as provided for in 8.3 or 8.4 and resubmit those rolls meeting specification requirements.

9.5 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

10. Certification

10.1 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 purchase order or contract, a report of the test results shall be furnished.

11. Packaging and Package Marking

11.1 Unless otherwise specified, packaging, marking, and loading for shipment shall be in accordance with Practices A 700.

11.2 When specified in the contract or order, and for direct procurement by or direct shipment to the U.S. Government, when Level A is specified, preservation, packaging, and packing shall be in accordance with the Level A requirement of MIL-STD-163.

11.3 When specified in the contract or order, and for the direct procurement by or direct shipment to the U.S. Government, marking for shipment, in addition to requirements specified in the contract or order, shall be in accordance with MIL-STD-129 for U.S. military agencies and in accordance with Fed. Std. No. 123 for U.S. Government civil agencies.

12. Keywords

12.1 fence fabric; fencing material; metallic coated steel wire; steel wire; wire

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