Designation: F 1135 – 99

Standard Specification for Cadmium or Zinc Chromate Organic Corrosion Protective Coating for Fasteners[1]

This standard is issued under the fixed designation F 1135; 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 the basic performance requirements for an electrolytic or mechanical coating of cadmium or zinc followed by a chromate and baked organic coating for ferrous and nonferrous fasteners.

1.2 There are eight grades available under this standard; four for zinc and four for cadmium.

1.3 This standard is intended primarily for fasteners such as nuts, bolts, and screws that require corrosion protection.

2. Referenced Documents

2.1 *ASTM Standards:*

B 117 Test Method of Salt Spray (Fog) Testing[2]

B 244 Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments[3]

B 487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section[3]

B 499 Test Method for Measurement of Coating Thickness by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals[3]

B 633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel[3]

B 695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel[3]

B 696 Specification for Coatings of Cadmium Mechanically Deposited[3]

D 3359 Test Method for Measuring Adhesion by Tape Test[4]

F 871M Specification for Electrodeposited Coatings on Threaded Components [Metric][5]

F 1470 Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection[5]

F 1940 Test Method for Process Control Verification to Prevent Hydrogen Embrittlement in Plated or Coated Fasteners[5]

3. Classification

3.1 These coatings are classified into eight grades according to the requirements shown in Table 1.

4. Ordering Information

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

4.1.1 Quantity of parts.

4.1.2 Grade required (see 3.1) and color code (see 5.4).

4.1.3 Any conditions or additions agreed upon by the purchaser and the supplier.

5. Requirements

5.1 Parts supplied to this specification shall have a chromate coating plus an organic coating applied to maintain adequate salt spray protection. The coatings shall not chip, leach color, or suffer color loss.

5.2 Substrate shall be either ferrous or nonferrous metal fasteners.

5.3 The finish shall be a cured organic coating.

5.4 The appearance shall be either CLEAR (Color code A) or BLACK (Color code B). Other colors may be specified by the purchaser.

5.5 The gloss shall be described as medium.

5.6 The film properties shall have sufficient hardness through curing at time of delivery to withstand normal handling and shipping without marring.

5.7 *Coating Thickness Measurement*— The thickness shall be determined by the method described in 8.1 and meet the requirements of Table 1.

5.8 *Organic Coating Determination*— Any part with the coating applied and properly cured shall exhibit no discoloration after soaking in a 5 % trisodium phosphate solution for 5 min at room temperature, water rinsed, towel dried, and subjected to 1 to 2 drops of a 5 % lead acetate solution on the surface for 60 s. Those parts lacking both an organic and chromate coating will have a color change after about 5 s.

5.9 *Adhesion*—Parts heated to 190°C for 30 min shall not exhibit blistering, peeling, flaking, or plating which can be

[1] This specification is under the jurisdiction of ASTM Committee F-16 on Fasteners and is the direct responsibility of Subcommittee F16.03 on Metal Coatings on Threaded Fasteners.

Current edition approved Oct. 10, 1999. Published December 1999. Originally published as F 1135 - 88. Last previous edition F 1135 - 88 (1993)ε1.

[2] *Annual Book of ASTM Standards*, Vol 03.02.

[3] *Annual Book of ASTM Standards*, Vol 02.05.

[4] *Annual Book of ASTM Standards*, Vol 06.01.

[5] *Annual Book of ASTM Standards*, Vol 01.08.

TABLE 1 Grade Classification of Coatings

Grade	Deposition Type	µmmin Thickness	Metal	Salt Spray Resistance, h min	
				White Corrosion	Red Rust
1	Electrolytic	5	zinc	120	240
2	Mechanical	5	zinc	50	240
3	Electrolytic	13	zinc	216	336
4	Mechanical	13	zinc	100	336
5	Electrolytic or Mechanical	5	cadmium	240	270
6	Electrolytic or Mechanical	8	cadmium	336	375
7	Electrolytic or Mechanical	13	cadmium	336	500
8	Electrolytic	13	cadmium	400	600

removed by filament tape in accordance with Test Method D 3359.

5.10 *Salt Spray Test*—No part shall exhibit white corrosion or red rust on significant surfaces (as agreed upon between supplier and producer prior to ordering) after exposure for the minimum number of salt spray h shown in Table 1.

6. Process Method

6.1 It is not intended to limit the supplier as to the formula or method of coating or surface treatment except as indicated:

6.1.1 Cadmium and zinc processing shall be in accordance with the applicable ASTM coating specification. Good practices may be found in Specifications B 633 and B 695 for zinc, Specification B 696 for cadmium and in Specification F 871M for both zinc and cadmium.

6.2 The chemical activator (surface conditioner) used shall not cause hydrogen embrittlement of hardened steel fasteners.

6.3 It is recommended that ferrous fasteners susceptible to time-delayed fracture caused by the diffusion of hydrogen under stress be processed by mechanically coating, or if electroplated be processed in accordance with Test Method F 1940.

7. Test Methods

7.1 The coating thickness shall be determined by eddy-current, Test Method B 244; magnetic methods, Test Method B 499; or microscopic examination of cross sections taken perpendicular to significant surfaces, Test Method B 487 (see Calibration of Micrometer Eyepiece) or other means agreed upon by the supplier and the producer. For referee purposes, microexamination in accordance with Test Method B 487 shall be used.

7.2 The corrosion resistance shall be determined in accordance with Test Method B 117.

7.3 The adhesion test shall be performed in accordance with Test Method D 3359.

8. Inspection

8.1 Samples shall be taken in accordance with Guide F 1470.

8.2 Coatings on the threads of threaded fasteners shall not have an adverse effect on normal installation and removal practices.

8.3 *Referee Thread Inspection*—The following referee thread inspection may be utilized if the specified go-gage binds on the bolt, nut, or screw:

8.3.1 *Bolts or Screws*—Assemble a phosphate-coated test nut with the applicable 2B or 6H class thread down the full length of the thread. If the nut can be assembled the full distance, the coating is acceptable.

8.3.2 *Nuts*—Assemble a phosphate coated bolt or screw with the applicable 2A or 6g class thread for a minimum of one diameter through the nut. If the bolt or screw can be assembled the full distance, the coating is acceptable.

9. Rejection and Rehearing

9.1 Unless otherwise specified, any rejection based on tests specified herein and made by the purchaser shall be reported to the supplier as soon as practical after receipt of the product by the purchaser.