



Standard Specification for Phosphate/Oil Corrosion Protective Coatings for Fasteners¹

This standard is issued under the fixed designation F1137; 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 requirements for four grades of corrosion protection for fasteners. Grade A consists of a zinc phosphate coating with no additional sealer (dry), Grade B consists of a zinc phosphate coating with a dry organic sealer, Grade C, and Grade D. 1.2 This specification is intended primarily for fasteners such as nuts, clips, washers, and other ferrous threaded and non-threaded fasteners that require corrosion protection.

1.2 This specification is intended primarily for fasteners such as nuts, clips, washers, and other ferrous threaded and non-threaded fasteners that require corrosion protection.

1.3 These coatings may or may not have a decorative finish.

2. Referenced Documents

2.1 *ASTM Standards*:²

B117 Practice for Operating Salt Spray (Fog) Apparatus

F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

3. Classification

3.1 The zinc phosphate treatment and subsequent protective coatings are classified into four 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 **Table 1**), and

¹ This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.03 on Coatings on Fasteners.

Current edition approved May 1, 2011. Published May 2011. Originally approved in 1988. Last previous edition approved in 2006 as F1137 – 00(2006). DOI: 10.1520/F1137-11.

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.

TABLE 1 Classification and Performance Requirements of Protective Coatings

Grade No.	Zinc Phosphate, g/m ²	Supplemental Coating	Coating Thickness, μ m	Salt Spray, h
Grade A	11, min	none	see 5.3	72 ^A
Grade B	11, min	sealer	see 5.3	72
Grade C	11, min	protective oil-type compound	see 5.3	24
Grade D	11, min	protective oil-type compound	see 5.3	72

^A When testing Grade A finished parts, a protective oil coating shall be added before salt spray testing.

4.1.3 Any additions agreed upon between the purchaser and the supplier.

5. Requirements

5.1 *Appearance*—Unless otherwise agreed upon between the purchaser and the producer, the color of the protective coating shall be as-coated gray for Grades A, B, C, and D.

5.2 *Corrosion Resistance*—These coatings shall be capable of withstanding neutral salt spray for the minimum h specified in **Table 1** with no base metal corrosion on significant surfaces. Significant surfaces on threaded fasteners are defined as the exposed surfaces when the fasteners are installed in a normal manner (bolt head, nut head, face, etc.). On other surfaces where control of the coating cannot be obtained under normal processing such as holes, recesses, threads, etc., the above requirements do not apply.

5.3 *Thread Fit*—The maximum thickness of coating which may be applied to threads on threaded products is limited by the basic thread size (see 8.2). Threads may be produced undersize/oversize (before coating) to accommodate the coating thickness, providing the finished product (after coating) meets all specified mechanical properties. All undersize/oversize must be within permissible limits as agreed upon between the supplier and the purchaser.

5.4 *Dry-to-Touch*—Grade C shall be evenly coated and dry-to-touch such that when held with filter paper or equivalent and applying hand pressure for 5 to 10 s, there shall be no visible staining of the filter paper when viewed without use of

*A Summary of Changes section appears at the end of this standard.

supplementary magnification. For referee purposes, this test shall be performed using a force of 10 N as measured with a load-indicating gage.

6. Sampling

6.1 The purchaser may request samples in accordance with Practice **F1470**.

7. Test Methods

7.1 The corrosion resistance shall be determined in accordance with Practice **B117**.

7.2 The coating thickness may be determined by microscopic examination of the cross-section taken perpendicular to the significant surface or by determining the coating mass (g/m^2) by a weigh-strip-weigh method and then converting to a coating thickness (see **Note 1**). Coating thickness, for referee purposes, shall be measured by microscopic examination.

NOTE 1—The weigh-strip-weigh method involves weighing the test specimen before and after stripping the deposit with a reagent which does not attack the base metal.

The formula used for measuring the thickness of a deposit by the weigh-strip-weigh method is:

$$T = \frac{W}{A \times D} \times 10^3$$

where:

T = thickness, μm ,

W = mass of deposit, g,
 A = area of deposit, m^2 , and
 D = density of coating, kg/m^3 .

8. Inspection

8.1 Samples shall be taken in accordance with Practice **F1470**.

8.2 *Referee Inspection*—The following referee thread inspection procedure may be utilized if the specified “go” gage binds on the screw.

8.2.1 *Bolt or Screw*—Assemble a phosphate-plated test nut with a 2B or 6H class thread down the full length of the thread.

8.2.2 *Nut*—Assemble a phosphate-plated test bolt or screw with a 2A or 6g class thread for a minimum of one diameter through the nut.

8.2.3 The test nut or screw/bolt must run freely for the total length without binding.

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 manufacturer as soon as practical after receipt of the product by the purchaser.

10. Keywords

10.1 coating; corrosion; fasteners; protection; phosphate; resistance; rust

SUMMARY OF CHANGES

Committee F16 has identified the location of selected changes to this standard since the last issue (F1137–00(2006)) that may impact the use of this standard.

- (1) References to Grades I, II and III are removed.
- (2) The designations to 0A, 0B, 0C, 0D are revised to A, B C and D.

- (3) The note” “Fasteners manufactured from phosphated raw material shall be dephosphated before heat treatment.” Was removed.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT).