Designation: B940 – 05 (Reapproved 2014)

Standard Practice for Testing Non-Chromate Coatings on Zinc and Cadmium Surfaces[1]

This standard is issued under the fixed designation B940; 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 practice covers a procedure for evaluating the protective value of chemical and electrochemical conversion coatings produced by non-chromate (chromate being defined as a compound that has chromium in the plus six oxidation state, and as such, chromium compounds in other oxidation states, such as plus three, shall not be excluded) treatments of zinc and cadmium surfaces.

1.2 The protective value of a non-chromate coating is usually determined by salt-spray test and by determining whether or not the coating possesses adequate abrasion resistance when applied for that purpose.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B117 Practice for Operating Salt Spray (Fog) Apparatus

3. Terminology

3.1 *Descriptions of Terms:*

3.1.1 *time to failure*—time to failure will depend on the type of coating tested. The minimum expected protective value obtainable in a given salt spray test is given in Appendix X2.

3.1.1.1 *Discussion*—In most instances, failure is defined as the first appearance on significant surfaces of white corrosion products visible to the unaided eye at normal reading distance, except that the presence of white corrosion products at sharp edges (for example, on threaded fasteners) and at junctions between dissimilar metals should not be considered failure. In some instances, it may be desirable to regard the first appearance of red rust as failure.

3.1.2 *significant surfaces*—in general, significant surfaces are those surfaces that are visible and subject to corrosion or wear, or both, except that surfaces that are normally difficult to coat by electroplating or mechanical deposition may be exempt. The designation of significant surfaces may be indicated on the drawing.

4. Significance and Use

4.1 This practice is applicable to non-chromate coatings that are colorless, colored, electrochemically applied or non-electrochemically applied. The zinc or cadmium, or both, may be electrodeposited, mechanically deposited, hot-dipped, rolled, or in the form of castings.

4.2 Because of variables inherent in the salt-spray test which may differ from one test cabinet to another, interpretation of test results for compliance with expected performance should be specified by the purchaser.

4.3 Properties such as thickness, color, luster, and ability to provide good paint adhesion are not covered in this practice, nor are the chemical composition and the method of application of these finishes.

5. Conditioning

5.1 *Aging*—Before subjecting a non-chromate coating to test, check with the chemical producer to determine if aging is an issue that needs to be considered.

5.2 *Preparation of Specimen*—The test surface must be free of fingerprints and other extraneous stains and must not be cleaned except by gentle wiping with a clean, dry, soft cloth to remove loose particles. Oily or greasy surfaces should not be used for testing, and degreasing with organic solvents is not recommended.

6. Procedure

6.1 *Salt Spray Test*—Expose the clean specimen to a 5 % solution salt spray and conduct the test in accordance with the

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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.

latest revision of Practice B117. Unless otherwise specified, only those surfaces that are positioned in the test chamber in accordance with Practice B117 are considered pertinent for evaluating failure. The exposed surfaces of the test specimens shall be free of all visible defects, such as scratches or pits, or both, and shall be flat. The surfaces shall not be cleaned with abrasive materials or abrasive chemical agents that may etch the exposed surfaces. Corrosion found on surfaces within ¼ of an inch of the edges of the exposed specimens shall not be considered significant to the test.

6.2 *Abrasion Resistance Test*—For those non-chromated coatings designed and specified by the chemical producer as abrasion-resistant, rub the non-chromated surface with a gritless, soft gum eraser (art-gum) for 2 to 3 s by hand (about ten strokes) using normal pressure (about 70 kPa (10 psi)) and a stroke approximately 50 mm long. The non-chromate coating should not be removed or worn through to the underlying metal as a result of this treatment.

7. Keywords

7.1 non-chromate coatings

APPENDIXES

(Nonmandatory Information)

X1. NATURE OF COATINGS

X1.1 The primary purpose of non-chromate finishes used as a replacement for chromate finishes is to retard the formation of white corrosion products upon exposure to stagnant water, moist atmosphere, or stagnant environments containing organic vapors, such as may emanate from certain plastics, paints, and other organic materials. These finishes will not prevent the growth of metallic filaments, commonly known as "whiskers."

X1.2 Coatings covered by this practice generally contain oxides of the basis metal in varying proportions. They may be produced by either chemical or electrochemical processes from solutions free of hexavalent chromium compounds.

X1.3 The quality of the non chromate film depends to a large extent on the chemical purity and the physical condition of the basis surface to which it is applied. In order to produce an acceptable coating, it is essential that the surface be properly cleaned and free of heavy metallic impurities such as lead, or copper, which may interfere with the proper formation of the coating.

X1.4 The color and luster produced by a given treatment will depend to some extent on the surface condition of the metal to which it is applied and may vary from part to part, or even on one single part.

X2. PROTECTION BY NON-CHROMATE COATINGS

X2.1 The minimum degree of protection that can be expected from non-chromate coatings on electrodeposited zinc when subjected to a 5 % salt spray test is 12 h.

X2.2 This value is given for guidance purposes only and is not to be construed as endpoint requirements. All types of zinc and cadmium coatings can be non-chromated, and there may or may not be differences in the protection afforded by the non-chromate, depending on the type of coating and the method of processing, so the actual protection required should be established to the satisfaction of the manufacturer and the purchaser.