



Designation: B200 – 22

Standard Specification for Electrodeposited Coatings of Lead and Lead-Tin Alloys on Steel and Ferrous Alloys¹

This standard is issued under the fixed designation B200; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification covers the requirements for electrodeposited coatings of lead and lead-tin alloys on steel and ferrous alloys. The coatings of lead-tin alloys are those that range in tin content up to, but not exceeding, 15 mass %. The coatings ranging between 3 and 15 mass % in tin content are known also as “terne” metallic electrodeposits.

1.2 This specification does not apply to sheet, strip, or wire in the unfabricated form.

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

1.4 The following precautionary caveat pertains only to the test method portion, Section 11, 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

B117 Practice for Operating Salt Spray (Fog) Apparatus

B183 Practice for Preparation of Low-Carbon Steel for Electroplating

B242 Guide for Preparation of High-Carbon Steel for Electroplating

B320 Practice for Preparation of Iron Castings for Electroplating

B322 Guide for Cleaning Metals Prior to Electroplating

B339 Specification for Pig Tin

B374 Terminology Relating to Electroplating

B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section

B499 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals

B504 Test Method for Measurement of Thickness of Metallic Coatings by the Coulometric Method

B507 Practice for Design of Articles to Be Electroplated on Racks

B567 Test Method for Measurement of Coating Thickness by the Beta Backscatter Method

B568 Test Method for Measurement of Coating Thickness by X-Ray Spectrometry

B571 Practice for Qualitative Adhesion Testing of Metallic Coatings

B602 Guide for Attribute Sampling of Metallic and Inorganic Coatings

B697 Guide for Selection of Sampling Plans for Inspection of Electrodeposited Metallic and Inorganic Coatings

B849 Specification for Pre-Treatments of Iron or Steel for Reducing Risk of Hydrogen Embrittlement

B850 Guide for Post-Coating Treatments of Steel for Reducing the Risk of Hydrogen Embrittlement

3. Terminology

3.1 *Definitions*—Definitions of the terms used in this specification are in accordance with Terminology **B374**.

4. Classification

4.1 The coating designation shall comprise the following:

4.1.1 The chemical symbol for the basis metal.

4.1.2 The chemical symbol for the undercoating of copper or nickel, if used.

¹ This specification is under the jurisdiction of ASTM Committee **B08** on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee **B08.06** on Soft Metals.

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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.

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

4.1.3 The chemical symbol Pb representing lead or the symbol Pb Sn for the lead-tin alloy. When tin is present, the tin content of the coating will appear before the symbol Sn. For example, Pb 5 Sn refers to a coating having the minimum composition 5 mass % tin, remainder lead.

4.1.4 A number indicating the minimum thickness of the coating in micrometres (μm). This minimum thickness shall be 6, 12, 25, or 40 μm , and shall apply to all significant surfaces specified in 8.2.2 and 8.3.1.

4.2 Examples:

4.2.1 Fe-Pb-5-Sn-40 represents a lead-tin alloy coating having 5 mass % tin content, remainder lead, on a ferrous basis metal. The thickness is 40 μm minimum.

4.2.2 Fe-Cu-Pb-6 represents a lead coating on a ferrous basis metal with a copper strike. The thickness is 6 μm minimum.

5. Sampling

5.1 *Lot*—An inspection lot is defined as a collection of finished articles that are of the same kind, that have been produced to the same specification, that have been coated by a single supplier at one time or at approximately the same time under essentially identical conditions, and that are submitted for acceptance or rejection as a group.

5.2 *Selection*—A random sample of the size required by Test Method B602 shall be selected from the inspection lot (see 5.1). The articles in the lot shall be inspected for conformance to the requirements of this specification and the lot shall be classified as conforming or nonconforming to each requirement according to the criteria of the sampling plans in Test Method B602.

NOTE 1—Test Method B602 contains three sampling plans that are to be used with nondestructive test methods and a fourth to be used with destructive test methods. The three methods for nondestructive tests differ in the quality level they require of the product. Test Method B602 requires use of the plan with the intermediate quality level unless the purchaser specifies otherwise. The purchaser should compare the plans with their needs and state which plan is to be used. If the plans in Test Method B602 do not serve the needs, additional ones are given in Guide B697.

NOTE 2—When both destructive and nondestructive tests exist for the measurement of a characteristic, the purchaser needs to state which is to be used so that the proper sampling plan is selected. Also, a test may destroy the coating in a noncritical area; or, although it destroys the coating, the tested article might be reclaimed by stripping and recoating. The purchaser needs to state whether the test is to be considered destructive or nondestructive.

5.3 *Separate Specimens*—If separate specimens are to be used to represent the finished articles in a test, the specimens shall be of the nature, size, number, and be processed as required in 6.1, 6.2, 6.3 and 6.4.

6. Specimen Preparation

6.1 *Electroplated Parts or Separate Specimens*—When the electroplated parts are of such form, shape, size, and value as to prohibit use thereof, or are not readily adaptable to a test specified herein, or when destructive tests of small lot sizes are required, the test shall be made by the use of separate specimens plated concurrently with the articles represented. The separate specimens shall be of a basis metal equivalent to that of the articles represented. “Equivalent” basis metal

includes chemical composition, grade, condition, and finish of surface prior to electroplating. For example, a cold-rolled steel surface should not be used to represent a hot-rolled steel surface. Due to the impracticality of forging or casting separate test specimens, hot-rolled steel specimens may be used to represent forged and cast-steel articles. The separate specimens may also be cut from scrap castings when ferrous alloy castings are being electroplated. These separate specimens shall be introduced into a lot at regular intervals before the cleaning operations, preliminary to electroplating of specimens, including the spacing, plating media, bath agitation, and temperature, in respect to other objects being electroplated, shall correspond as nearly as possible to those affecting the significant surfaces of the articles represented. Unless a need can be demonstrated, separately prepared specimens shall not be used in place of production items for nondestructive and visual examinations.

6.2 *Thickness and Adhesion Specimens*—If separate specimens for thickness and adhesion tests are required, they shall be strips approximately 25 mm wide, 100 mm long, and 1 mm thick.

6.3 *Corrosion Resistance Specimens*—If separate specimens for corrosion resistance tests are required, they shall be panels not less than 150 mm long, 100 mm wide, and approximately 1 mm thick.

6.4 *Hydrogen Embrittlement Specimens*—If specimens are required, the configuration shall be that specified by the purchaser.

7. Significance and Use

7.1 Electrodeposits of lead and lead-tin alloys on steel and ferrous alloys are produced where it is desired to obtain atmospheric corrosion resistance. Deposits of lead and lead-tin alloys on steel have shown to have excellent corrosion protective qualities in atmospheric exposure, especially when undercoated by a thin deposit of copper (or nickel). Applications of lead and lead-tin alloy deposits include the following: protection from dilute sulfuric acid; lining of brine refrigeration tanks; chemical apparatus; and parts for storage batteries; and for coating bearing surfaces. In this last application, lead is electroplated alone, or as an alloy and coated with another metal, such as indium. The indium may be diffused into the lead or lead alloy by heat treatment. See Appendix X1.

8. Ordering Information

8.1 When ordering articles to be electroplated in accordance with this specification, the purchaser shall state the coating designation (see Section 4), the minimum thickness on significant surfaces, in addition to the ASTM designation number and year of issue.

8.2 If necessary, the purchaser shall include, on their part, drawings, or purchase order the following:

8.2.1 Electroplating application to high-strength steel, if specified (see 9.2.2).

8.2.2 Location of significant surfaces, to be shown on part drawing, or by the provision of a suitably marked sample.

8.2.3 Hydrogen embrittlement test, if required (see 6.4).