Designation: B841 – 18

Standard Specification for Electrodeposited Coatings of Zinc Nickel Alloy Deposits[1]

This standard is issued under the fixed designation B841; 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 requirements for electrodeposited zinc nickel alloy coatings on metals.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 The following precautionary statement pertains to the test method portion only, Section 8, 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.*

1.4 *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
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
B568 Test Method for Measurement of Coating Thickness by X-Ray Spectrometry
B571 Practice for Qualitative Adhesion Testing of Metallic Coatings
B602 Test Method for Attribute Sampling of Metallic and Inorganic Coatings
B697 Guide for Selection of Sampling Plans for Inspection of Electrodeposited Metallic and Inorganic Coatings
B762 Test Method of Variables Sampling of 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
D3951 Practice for Commercial Packaging

3. Terminology

3.1 *Definitions*—Many items used in this specification are defined in Terminology B374.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *significant surface, n*—that portion of a coated article's surface where the coating is required to meet all the requirements of the coating specification for that article. Significant surfaces are usually those that are essential to the serviceability or function of the article, or that can be a source of corrosion products or tarnish films that interfere with the function or desirable appearance of the article.

3.2.2 *Discussion*—Significant surfaces are those surfaces that are identified by the purchaser by, for example, indicating them on an engineering drawing of the product or marking a sample item of the product.

4. Classification

4.1 There are two classes of zinc nickel coating defined as follows:

4.1.1 *Class 1*—Deposits having a minimum of 5 and maximum 12 mass % nickel, the balance being zinc.

[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.

4.1.2 *Class 2*—Deposits having a minimum of 12 and maximum 16 mass % nickel, the balance being zinc.

4.2 There are five chromate conversion coating or passivation types that are defined as follows:

Type	Description	Conversion Designation	
		Hexavalent Chromium	Non-Hexavalent Chromium
Type A	Colorless (Blue Bright) Conversion	A	AN
Type B	Yellow Iridescent Conversion	B	BN
Type C	Bronze Conversion	C	CN
Type D	Black Chromate Conversion	D	DN
Type E	Any of the above plus organic topcoat	E	

NOTE 1—Whereas colored chromate conversion coatings are usually meant to include various shades of yellow to bronze when used with nonalloyed zinc, yellow and bronze chromate conversion coatings are considered distinctly different in appearance and performance when applied to alloyed zinc coatings and are formulated specifically to produce the desired coating and are formulated specifically to produce the desired coating.

4.3 There are three grades according to thickness and are defined as follows:

Minimum Thickness, µm	New ASTM Grade	Old ASTM Grade
5	5	1
8	8	2
10	10	3

5. Ordering Information

5.1 In order to make the application of this specification complete, the purchaser needs to supply the following information to the seller in the purchase order and drawings:

5.1.1 Title, ASTM designation number, and date of issue of this standard specification,

5.1.2 Deposit by classification including Class, Type, and Grade (see 4.1, 4.2, 4.3),

5.1.3 Composition and metallurgical condition of the substrate to be coated,

5.1.4 Location of significant surfaces (see 3.2.1),

5.1.5 Heat treatment for stress relief, whether it has been performed by purchaser or is required (see 6.7),

5.1.6 Heat treatment after electroplating, if required (see 6.8),

5.1.7 Whether or not location of rack marks is to be defined (see 6.3.1),

5.1.8 Any requirement for special test specimens (see 8.1.1),

5.1.9 Acceptance inspection procedure to be used (see Section 8), and

5.1.10 Any requirement for certification (see Section 10).

5.1.11 Any other items needing agreement. For the purposes of this specification, prior agreement on the nature of the finish is required as items plated in bulk may differ in appearance from those that are rack plated.

6. Coating Requirements

6.1 *Substrate*—The metal to be plated shall be free of flaws and defects that will be detrimental to the zinc alloy coating. It shall be subjected to such cleaning, pickling, and electroplating procedures as are necessary to yield deposits with the desired quality.

NOTE 2—Proper preparatory procedures and thorough cleaning are essential to ensure satisfactory adhesion and corrosion resistance performance of the coating. Materials used for cleaning should not damage the basis metal, for example by causing defects such as pits, intergranular attack or stress corrosion cracking. It is recommended that the following practices for cleaning, where appropriate, be used: Practices B183 and B320, and Guides B242 and B322.

6.1.1 The electroplating shall be applied after all basis metal heat treatments have been completed.

6.2 *Nature of Coating:*

6.2.1 The zinc-nickel alloy plate shall consist of a composition conforming to the requirements called out in section 4.1.

6.2.2 The coating shall be produced from an aqueous electroplating system that may be either an alkaline or acid formulation as specified by the purchaser.

6.2.3 The coating shall have such supplementary conversion coatings as defined in 4.2 and specified in the purchase order.

6.3 *Appearance:*

6.3.1 The coating on all ready visible surfaces shall have an acceptable and characteristic appearance as agreed upon by the purchaser and seller. The coating shall be uniform insofar as the basis metal will permit. When the article is to be plated on a rack, contact marks may be unavoidable. Location of such marks(s) shall be indicated on the article or its drawing.

6.3.2 Defects and variations in appearance that arise from surface conditions of the substrate (scratches, pores, roll marks, inclusions, and the like) and that persist in the coating despite the observance of good metal finishing practices shall not be cause for rejection. The coating shall be adherent, free from blisters, pits, discontinuities, or combinations thereof, and shall be free of cracks in the as plated state. Flaking shall be cause for rejection in either the as plated state or after subsequent operations.

NOTE 3—These coatings are commonly used in automotive applications where subsequent forming, bending, and crimping operations are commonly performed. These operations will necessarily detract from the performance of the coatings. While some cracking of coatings will be unavoidable, flaking of the coating after these subsequent operations shall be cause for rejection.

NOTE 4—Coatings generally perform better in service when the substrate over which they are applied is smooth and free of torn metal, inclusions, pores, and other defects. The specifications covering the unfinished product should provide limits for these defects. A metal finisher can often remove defects through special treatments, such as grinding, polishing, abrasive blasting, chemical etches, and electropolishing. However, these are not normal in the treatment steps preceding the application of the coating. When they are desired, they are the subject of special agreement between the purchaser and the seller.

6.4 *Thickness:*

6.4.1 The thickness of the coating everywhere on the significant surfaces as defined in 3.2.1 and shall conform to the requirements of the specified grade as defined in 4.3.

NOTE 5—The thickness of electrodeposited coatings varies from point to point on the surfaces of a product (see Practice B507). The thickness is less in interior corners and in holes. Such surfaces are often exempt from thickness requirements. If the full thickness is required in those locations, the electroplater will have to use special techniques that will probably