Designation: ~~B456 – 11ε1~~ B456 – 17

Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium[1]

This standard is issued under the fixed designation B456; 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.

~~ε[1] NOTE—This standard was corrected editorially in 2011.~~

1. Scope

1.1 This specification covers requirements for several types and grades of electrodeposited copper plus nickel plus chromium or nickel plus chromium coatings on steel, nickel plus chromium coatings on copper and copper alloys, nickel plus chromium coatings on Type 300 and 400 series stainless steel and copper plus nickel plus chromium coatings on aluminum and its alloys and zinc alloys for applications where both appearance and protection of the basis metal against corrosion are important. Five grades of coatings are provided to correspond with the service conditions under which each is expected to provide satisfactory performance: namely, extended very severe, very severe, severe, moderate, and mild. Definitions and typical examples of these service conditions are provided in Appendix X1.

1.2 This specification does not cover the requirements for the plating on plastics, see Specification B604.

1.3 The following hazards caveat pertains only to the test methods portions, Appendix X2, Appendix X3, Appendix X4, and Appendix X5 of this specification: *This standard does not purport to address all of 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.*

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]

B183 Practice for Preparation of Low-Carbon Steel for Electroplating
B242 Guide for Preparation of High-Carbon Steel for Electroplating
B252 Guide for Preparation of Zinc Alloy Die Castings for Electroplating and Conversion Coatings
B253 Guide for Preparation of Aluminum Alloys for Electroplating
B254 Practice for Preparation of and Electroplating on Stainless Steel
B281 Practice for Preparation of Copper and Copper-Base Alloys for Electroplating and Conversion Coatings
B320 Practice for Preparation of Iron Castings for Electroplating
B368 Test Method for Copper-Accelerated Acetic Acid-Salt Spray (Fog) Testing (CASS Test)
B380 Test Method for Corrosion Testing of Decorative Electrodeposited Coatings by the Corrodkote Procedure
B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
B489 Practice for Bend Test for Ductility of Electrodeposited and Autocatalytically Deposited Metal Coatings on Metals
B490 Practice for Micrometer Bend Test for Ductility of Electrodeposits
B499 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals

[1] This specification is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.05 on Decorative Coatings.

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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.

B504 Test Method for Measurement of Thickness of Metallic Coatings by the Coulometric Method
B530 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Electrodeposited Nickel Coatings on Magnetic and Nonmagnetic Substrates
B537 Practice for Rating of Electroplated Panels Subjected to Atmospheric Exposure
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
B604 Specification for Decorative Electroplated Coatings of Copper Plus Nickel Plus Chromium on Plastics
B659 Guide for Measuring Thickness 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
B764 Test Method for Simultaneous Thickness and Electrode Potential Determination of Individual Layers in Multilayer Nickel Deposit (STEP Test)
B995 Test Method for Chloride Resistance Test for Chromium Electroplated Parts (Russian Mud Test)
D1193 Specification for Reagent Water
D3951 Practice for Commercial Packaging
E50 Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials
G85 Practice for Modified Salt Spray (Fog) Testing

2.2 *ISO Standards:*
ISO 1456 Metallic coatings—Electrodeposited coatings of nickel plus chromium and of copper plus nickel plus chromium[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *significant surfaces*—those surfaces normally visible (directly or by reflection) that are essential to the appearance or serviceability of the article, or both, when assembled in normal position; or that can be the source of corrosion products that deface visible surfaces on the assembled article. When necessary, the significant surfaces shall be specified by the purchaser and shall be indicated on the drawings of the parts, or by the provision of suitably marked samples.

3.1.2 *p-points*—specific points of measurement that are encouraged to be determined and agreed upon with the customer early in the contract review process. These are used for measurement of critical characteristics that vary with current density such as thickness, STEP, active sites, etc. and may be designated at multiple locations per part.

4. Classification

4.1 Five grades of coatings designated by service condition numbers and several types of coatings defined by classification numbers are covered by this specification.

4.2 *Service Condition Number:*

4.2.1 The service condition number indicates the severity of exposure for which the grade of coating is intended:
SC 5 extended severe service
SC 4 very severe service,
SC 3 severe service,
SC 2 moderate service, and
SC 1 mild service.

4.2.2 Typical service conditions for which the various service condition numbers are appropriate are given in Appendix X1.

4.3 *Coating Classification Number*—The coating classification number comprises:

4.3.1 The chemical symbol for the basis metal (or for the principal metal if an alloy) followed by a slash mark, except in the case of stainless steel. In this case, the designation shall be SS followed by the designated AISI number followed by a slash, that is, SS463/,

4.3.2 The chemical symbol for copper (Cu) (if copper is used),

4.3.3 A number indicating the minimum thickness of the copper coating in micrometers (if copper is used),

4.3.4 A lower-case letter designating the type of copper deposit (if copper is used) (see 4.4 and 6.2.3),

4.3.5 The chemical symbol for nickel (Ni),

4.3.6 A number indicating the minimum thickness of the nickel coating, in micrometers,

4.3.7 A lower-case letter designating the type of nickel deposit (see 4.4 and 6.2.4),

4.3.8 The chemical symbol for chromium (Cr), and

4.3.9 A letter (or letters) designating the type of chromium deposit and its minimum thickness in micrometers (see 4.4 and 6.2.5).

[3] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.