



Standard Guide for Chromium Electroplating on Steel for Engineering Use¹

This standard is issued under the fixed designation B 177; 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 standard provides information about the deposition of chromium on steel for engineering uses. This is sometimes called “functional” or “hard” chromium and is usually applied directly to the basis metal and is much thicker than decorative deposits.

1.2 This specification is not intended as a standardized procedure, but as a guide for obtaining smooth, adherent coatings of chromium of a desired thickness while retaining the required physical and mechanical properties of the steel base. Requirements for chromium electrodeposits on ferrous surfaces are defined in Specification B 650.

1.3 *This standard does not purport to address all of the safety problems, 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:

- B 183 Practice for Preparation of Low-Carbon Steel for Electroplating²
- B 242 Practice for Preparation of High-Carbon Steel for Electroplating²
- B 322 Practice for Cleaning Metals Prior to Electroplating²
- B 487 Test Method for Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section²
- B 499 Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals²
- B 504 Test Method for Measurement of Thickness of Metallic Coatings by the Coulometric Method²
- B 507 Practice for Design of Articles to Be Electroplated on Racks²
- B 571 Test Methods for Adhesion of Metallic Coatings²
- B 578 Test Method for Microhardness of Electroplated Coatings²

B 602 Test Method for Attribute Sampling of Metallic and Inorganic Coatings²

B 630 Practice for Preparation of Chromium for Electroplating with Chromium²

B 650 Specification for Electrodeposited Engineering Chromium Coatings on Ferrous Surfaces²

B 697 Guide for Selection of Sampling Plans for Inspection of Electrodeposited Metallic and Inorganic Coatings²

B 762 Test Method of Variables Sampling of Metallic and Inorganic Coatings²

2.2 Military Standard:

MIL-S-13165B Shot Peening of Metal Parts³

3. Nature of Steel

3.1 *High Strength Steel*—Since steel of high strength is susceptible to cracking, the tensile strength of the steel should not exceed 1000 MPa (150 000 psi) or a hardness of 32 HRC unless the steel has been stress-relieved (3.4). Before electroplating, heat-treated parts should be examined for cracks by suitable techniques such as the fluorescent dye or magnetic powder methods. It is important that the hardness of the steel base be sufficient to withstand the service load without deformation and consequent stress fracturing of the chromium deposit.

3.2 *Smoothness*—The smoothness of the steel surface to be electroplated should be adequate to meet the requirements of the finished product. Chromium electrodeposits do not exhibit leveling, and consequently the surface roughness of the electrodeposit will always be greater than that of the substrate. Any mechanical operations that can result in grinding checks or glazing of the steel are detrimental and should be eliminated. The required surface smoothness may be obtained by suitable chemical, mechanical, or electrochemical procedures. Depending upon the thickness of the electrodeposit and the smoothness required of the electrodeposit, grinding of the electrodeposit may be required.

3.3 *Fatigue Considerations*—Cracking that can occur in chromium electrodeposits either as a function of the plating bath chemistry, the plating conditions, or both, or as a result of grinding of the electrodeposit can lead to a reduction in the fatigue life of the electroplated part. If this is a design

¹ This guide is under the jurisdiction of ASTM Committee B-8 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.08 on Engineering Coatings.

Current edition approved Feb. 15, 1993. Published April 1993. Originally published as B 177 – 55. Last previous edition B 177 – 68 (1984).

² Annual Book of ASTM Standards, Vol 02.05.

³ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.