



Designation: **B916 – 01 (Reapproved 2013)^{ε1} B916 – 01 (Reapproved 2017)**

Standard Test Method for Adherence of Porcelain Enamel Coatings to Sheet Metal¹

This standard is issued under the fixed designation B916; 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.

^{ε1} NOTE—Abstract and ratings in Figures 3 and 4 were added editorially in May 2013.

INTRODUCTION

The purpose of this test is to provide a standardized procedure to determine and rate the impact adhesion of porcelain enamels on sheet steel.

1. Scope

1.1 The scope of this test method is:

1.1.1 To determine quantitatively the amount of enamel remaining after the porcelain enamel coating specimen has been deformed;

1.1.2 To standardize the deformation parameters for testing adherence of porcelain enamel to sheet metal; and,

1.1.3 To provide a quantitative adherence rating scale for comparison to reference standards.

1.2 This adherence test method is applicable to porcelain enamel coatings on substrates from 18 to 24 gauge (0.0478 to 0.025 in. or from 1.214 to 0.654 mm).

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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.*

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. Significance and Use

2.1 The measurement of adherence in porcelain enamel systems, such as ground coat, ground coat/cover coat, and direct-on cover-coat enamels, is an important procedure for monitoring process variables in metal preparation, enamel application thickness, steel selection, and enamel selection, as well as assuring the ultimate quality of the finished product.

3. Apparatus

3.1 *Drop Weight Deformation Device², see Figs. 1 and 2.*

3.2 The drop weight deformation device as shown in Fig. 1 shall impart a single impact blow from a hemispherical indenter to a coated specimen supported over a sharp-edged bottomless die. The area of the deformation and the concomitant damage to the coating is largely influenced by the size of the hemispherical indenter; the die opening size and edge sharpness; and, the energy of the blow at impact.

3.3 A satisfactory degree of deformation and damage are obtained if the conditions in 3.2 use the following parameters: 0.50 in. (12.7 mm) diameter hemispherical indenter, 0.75 in. (19.1 mm) diameter bottomless die (lower plunger guide in Fig. 1) with sharp edge, and 80 in./lb (9.03 J) energy at impact.

¹ This test method is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.12 on Materials for Porcelain Enamel and Ceramic-Metal Systems.

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² A drop weight device that has been found suitable is available from Pacific Scientific Co., Gardner/Neotech Instrument Div., 2431 Linden Lane, Silver Spring, MD 20910.

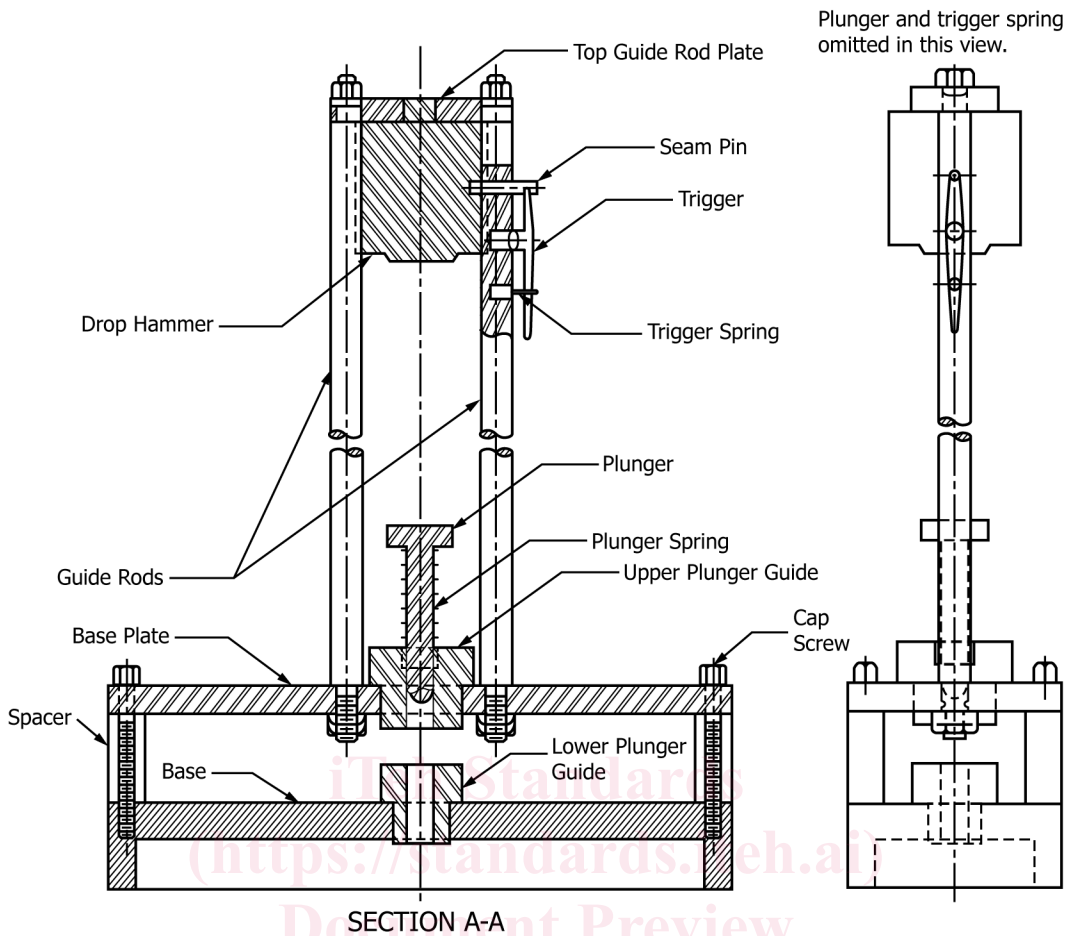


FIG. 1 Drawing of Suitable Drop Weight Device

3.4 *Deformation Devices*, of other designs may be used provided that the parameters in 3.3 are used.

3.5 *Adherence Reference Standards*, see 7.1.

4. Test Specimens

4.1 The test specimens shall be flat enameled panels not less in size than 4 in.² (101.6 mm²). Larger sizes and shapes may be used provided that a flat surface can be held firmly against and parallel to the lower plunger guide during deformation.

5. Safety Precautions

5.1 During the procedure in 6.1, fine enameled chips may be released with some force from the steel surface; therefore, it is recommended that personnel in the immediate vicinity of the test wear safety goggles.

6. Procedure

6.1 *Specimen Deformation*—The hammer weight of the suggested drop weight device is 5 lb (2268 g), which requires a 16 in. (406.4 mm) drop distance to yield the specified 80 in./lb (9.03 J) energy at impact. The hammer weight of the drop weight device may range from 2 to 8 lb (907 to 3629 g). If the hammer weight is within this range, but not 5 lb, calculate the drop distance to yield 80 in./lbf of energy at impact. The center of the area to be deformed shall be at least 1½ in. (38.1 mm) from the edge of the specimen. If two or more deformations are made on a single specimen, place them at least 3 in. (76.2 mm) between centers and average and treat the measurements on them as a single measurement. Raise and secure the hammer to obtain the required drop distance. Hold the specimen firmly against and parallel to the top surface of the die with the enameled side up and release the hammer.

6.2 The specified drop weight device is provided with a spring to limit the indenter to a single impact blow against the specimen. If the device to be used is not designed in this way, use another means or procedure to avoid a restrike of the indenter.

6.3 A visual examination of the impact area is then made. Evaluation of the degree of adherence obtained is judged by the amount of glass retained in the impact area.