



Standard Practice for
Discontinuity (Holiday) Testing of Nonconductive Protective
Coating on Metallic Substrates¹

This standard is issued under the fixed designation D 5162; 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 practice covers procedures for determining discontinuities using two types of test equipment:

- 1.1.1 *Test Method A*—Low Voltage Wet Sponge, and
- 1.1.2 *Test Method B*—High Voltage Spark Testers.

1.2 This practice addresses metallic substrates. For concrete surfaces, refer to Practice D 4787.²

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 Document

2.1 *ASTM Standard:*

D 4787 Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates²

3. Terminology

3.1 *Description of Terms Specific to This Standard:*

3.1.1 *discontinuity, as used in this standard*—a void, crack, thin spot, foreign inclusion, or contamination in the coating film that significantly lowers the dielectric strength of the coating film. May also be identified as a holiday or pinhole.

3.1.2 *holiday, as used in this standard*—a term that identifies a discontinuity.

3.1.3 *holiday detector, as used in this standard*—a device that locates discontinuities in a nonconductive coating film applied to a conductive surface.

3.1.4 *pinhole, as used in this standard*—a film defect characterized by small porelike flaws in the coating which, when extended entirely through the film, will appear as a discontinuity. A pinhole in the finish coat may not appear as a discontinuity.

4. Significance and Use

4.1 A coating is applied to a metallic substrate to prevent corrosion, reduce abrasion or reduce product contamination, or both. The degree of coating continuity required is dictated by service conditions. Discontinuities in a coating are frequently very minute and not readily visible. This practice provides a procedure for electrical detection of minute

discontinuities in nonconductive coating systems.

4.2 Electrical testing to determine the presence and number of discontinuities in a coating film is performed on a nonconductive coating applied to a conductive surface. The allowable number of discontinuities should be determined prior to conducting this test since the acceptable quantity of discontinuities will vary depending on coating film thickness, design, and service conditions.

4.3 The low voltage wet sponge test equipment is generally used for determining the existence of discontinuities in coating films having a total thickness of 20 mils (0.5 mm) or less. High voltage spark test equipment is generally used for determining the existences of discontinuities in coating films having a total thickness of greater than 20 mils (0.5 mm).

4.4 Coatings that are applied at a thickness of less than 20 mils (0.5 mm) may be susceptible to damage if tested with high voltage spark testing equipment. Consult the coating manufacturer for proper test equipment and inspection voltages.

4.5 To prevent damage to a coating film when using high voltage test instrumentation, total film thickness and dielectric strength in a coating system shall be considered in selecting the appropriate voltage for detection of discontinuities. Atmospheric conditions shall also be considered since the voltage required for the spark to gap a given distance in air varies with the conductivity of the air at the time the test is conducted. Suggested starting voltages are provided in Table 1.

4.6 The coating manufacturer shall be consulted to obtain the following information, which would affect the accuracy of this test to determine discontinuities:

4.6.1 Establish the length of time required to adequately dry or cure the applied coating film prior to testing. Solvents retained in an uncured coating film may form an electrically conductive path through the film to the substrate.

4.6.2 Determine whether the coating contains electrically

TABLE 1 Suggested Voltages for High Voltage Spark Testing

Total Dry Film Thickness		Suggested Inspection, V
mils	mm	
8–12	0.20–0.31	1 500
13–18	0.32–0.46	2 000
19–30	0.47–0.77	2 500
31–40	0.78–1.03	4 000
41–60	1.04–1.54	5 000
61–80	1.55–2.04	7 500
81–100	2.05–2.55	10 000
101–125	2.56–3.19	12 000
126–160	3.20–4.07	15 000
161–200	4.08–5.09	20 000
201–250	5.10–6.35	25 000

¹ This practice is under the jurisdiction of ASTM Committee D-33 on Protective Coating and Lining Work for Power Generation Facilities and is the direct responsibility of Subcommittee D33.04 on Inspection.

Current edition approved Sept. 23, 1991. Published November 1991.

² *Annual Book of ASTM Standards*, Vol 06.02.