Designation: C 536 – 83 (Reapproved 2004)ε1

Standard Test Method for Continuity of Coatings in Glassed Steel Equipment by Electrical Testing[1]

This standard is issued under the fixed designation C 536; 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.

ε[1] NOTE—Keywords were added editorially in September 2004.

1. Scope

1.1 This test method covers the detection of discontinuities in the glass coating of glassed steel equipment where such discontinuities would result in early failure due to the attack of the chemical contents of the vessel on the metal substrate. It is applicable to (*1*) provide a manufacturing and inspection test of glassed-steel equipment designed for relatively mild, low-temperature corrosive service, and (*2*) the field testing of similar equipment used in more severely corrosive environment.

NOTE 1—A manufacturing test method for the latter type of equipment is described in Test Method C 537.

1.2 *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.*

2. Referenced Document

2.1 *ASTM Standards:* [2]

C 537 Test Method for Reliability of Glass Coatings on Glassed Steel Reaction Equipment by High Voltage

3. Summary of Test Method

3.1 The test method consists essentially of grounding the metal structure of the equipment being tested to the ground side of a voltage generator and sweeping the surface of the glass with a suitable probe electrically connected to the other side of the generator. Wherever a discontinuity exists, a discharge will give a positive indication that such a discontinuity exists. The voltage is set at 5000 V in order to show existing discontinuities without breaking through the existing glass coating. A built-in current limiting device ensures electrical safety for the operator.

4. Significance and Use

4.1 This test method is designed to detect existing discontinuities in the glass coating of glassed steel equipment while maintaining a voltage low enough as to be unlikely to cause breakdown of the coating. The test is adaptable for manufacturing inspection in the processing of equipment and for field use to find existing defects which can be "plugged" or repaired before serious damage is done to the equipment. As a means of positive detection, it is applicable to process studies, quality control, or specification.

5. Definition

5.1 *glassed steel (glass-lined steel or glass-coated steel)*—designations generally applied to a class of porcelain enamels that have high resistance to chemical attack at elevated temperatures and pressures.

6. Interferences

6.1 Since the test method is electrical, it is necessary to have a good ground connection between the instrument and the metal substrate of the equipment being tested. It is also necessary that the surfaces of the glass be reasonably clean and dry. A wet surface will conduct enough voltage to any exposed metal to give an indication of a "contact" over a large area instead of at a specific area of discontinuity. Such a capacitance discharge can be distinguished from a true failure by extending over a large area instead of at local spots that could be identified and marked for repair.

7. Apparatus[3]

7.1 The test apparatus comprises a voltage stabilizing transformer, a step-up transformer, a current-limiting resistance, a

[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] 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.

[3] When requesting information, specific reference should be made to the ASTM designation number.

voltmeter and pilot light, along with a suitably insulated cable and probe handle equipped with interchangeable wire brush-type and point electrodes (see Fig. 1 for a schematic wiring diagram). The current output is limited to 2.5 mA. The wire brush-type electrode is designed for sweeping larger areas of glass coating while the point electrode is better adapted to corners and the more restricted areas.

7.2 A portable 5000-volt d-c tester may be used in this test method.

8. Safety Precautions

8.1 The equipment being tested should be well grounded as well as electrically connected to the ground side of the testing apparatus.

8.2 The probe should be handled only by the insulating plastic handle.

8.3 Keep the probe electrode away from personnel and from conducting surfaces that might lead to personnel.

8.4 Turn the switch off and ground the electrode before changing probe heads. Although the current is low enough to be electrically safe, the involuntary reaction to a surprise discharge can cause injury.

9. Procedure

9.1 Using a 14-gage (1.63-mm) (or heavier) wire, connect the ground connection of the tester to the cleaned metal substrate of the equipment to be tested. A similar connection should be made to a suitable external ground.

9.2 Attach the probe cable to the tester and the desired probe electrode to the end of the probe handle.

9.3 Connect the input to a 115 to 120-V, 60-Hz source, or use a portable 5000-volt d-c unit.

9.4 While holding the probe by the plastic handle move the switch to the on position. A red pilot light indicates that the tester is in operation.

9.5 Apply the test probe lightly to the surface of the glass coating in a sweeping motion to cover the whole area to be tested. If the interferences are not too great, a spark should also be seen and heard as it arcs between the electrode and the metal substrate.

9.6 Mark each area where a contact is found using suitably colored chalk or crayon.

9.7 Turn the switch off and ground the electrode to the metal ground before laying the probe down or changing the electrodes on the probe.

10. Report

10.1 The report shall include the following:

10.1.1 Date of test,

10.1.2 Description or identification of equipment being tested, and

10.1.3 Number and location of failures.

11. Precision and Bias

11.1 No justifiable statements can be made regarding the precision and bias of this test method because it is designed for application to full-size production vessels and reactors with the result that variables due to design, metal composition, fabrication, and metal processing, as well as porcelain enameling, are introduced into the results.

12. Keywords

12.1 continuity of coating; discontinuities; glass coated steel equipment; glass coating; high voltage test; porcelain enamel

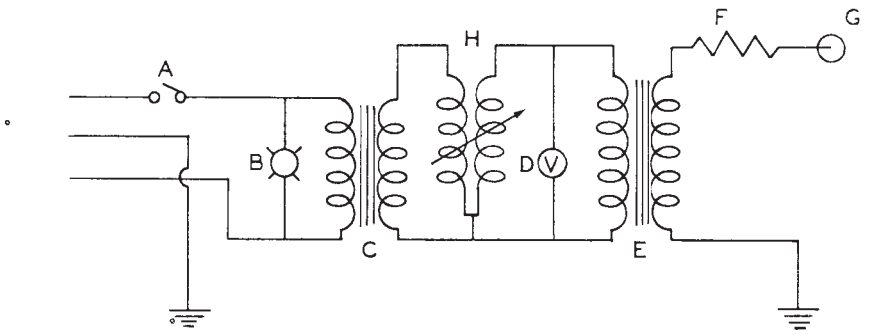

FIG. 1 Circuit Diagram, 5000 V A-C Tester