



Designation: C949 – 80 (Reapproved 2020)

Standard Test Method for Porosity in Vitreous Whitewares by Dye Penetration¹

This standard is issued under the fixed designation C949; 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 test method covers procedures for detecting pores, cracks, or other voids that may be present in otherwise impermeable whiteware ceramics, or as porosity in underfired ware.

NOTE 1—This test method was partially derived from ANSI C29.1.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *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

C242 Terminology of Ceramic Whitewares and Related Products

2.2 *ANSI Standard:*³

C29.1 Test Methods for Electrical Power Insulators

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology **C242**.

4. Summary of Test Method

4.1 Randomly selected unglazed fragments of vitreous whiteware products are immersed in a fuchsine dye solution, at

¹ This test method is under the jurisdiction of ASTM Committee C21 on Ceramic Whitewares and Related Products and is the direct responsibility of Subcommittee C21.03 on Methods for Whitewares and Environmental Concerns.

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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 Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

one or more pressures for prescribed times. After drying, the specimens are broken and inspected for the extent of dye penetration into the body, or into defects present in the body.

5. Significance and Use

5.1 This test method provides a means for readily determining if a ceramic is properly fired (matured). Penetration of any extent may negate the usefulness of the ceramic, or, arbitrarily, some degree of penetration may be acceptable for the use or commercial quality of the item being tested.

6. Apparatus

6.1 *Vessel*, capable of applying and holding a pressure of 10 000 psi (68.9 MPa).

6.1.1 **Fig. 1** illustrates a satisfactory device.

NOTE 2—**Fig. 1** does not represent the only possible design or configuration. It is representative of a device that has been successfully used.

6.1.2 **Fig. 2** illustrates an actual device and typical examples.

6.1.3 **Fig. 3** illustrates an assembled device, including fixture, under pressure.

7. Testing Solution

7.1 Use a solution consisting of 1 g of basic fuchsine dye dissolved in 1 L of 50 % alcohol.

NOTE 3—The alcohol used should not react with the dye to cause fading.

8. Preparation of Test Specimens

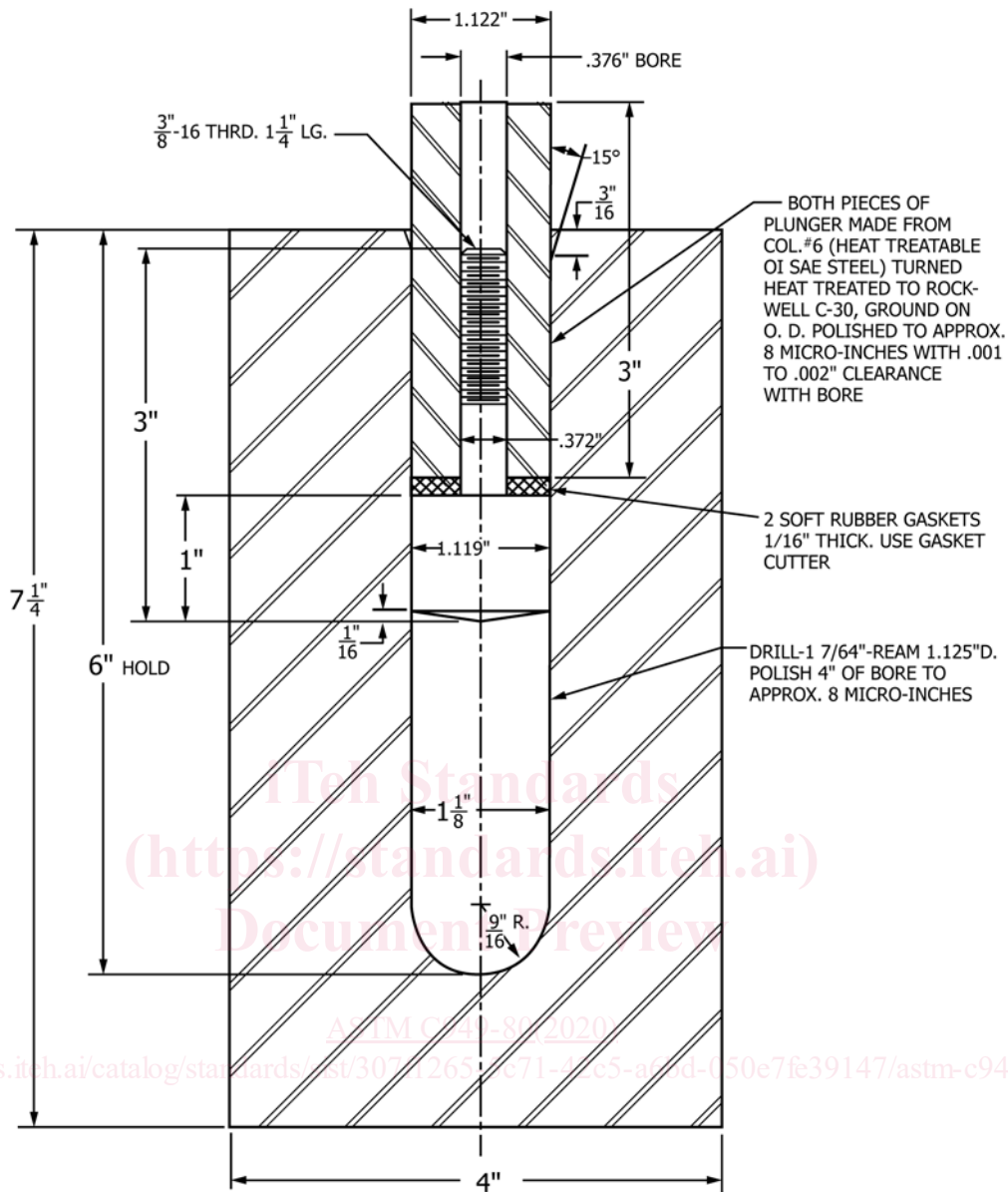
8.1 Use freshly broken fragments, approximately ¼ in. (6 mm) in the smallest dimension, up to ¾ in. (19 mm) in the largest dimension, of the whiteware ceramic. At least 75 % of the surface shall be free of glaze or other surface treatment.

9. Procedure

9.1 Immerse the test specimens in the testing solution within the pressure chamber, and

9.2 Apply a minimum pressure of 4000 psi (27.6 MPa) for not less than 5 h, or

9.3 Apply a minimum 10 000 psi (68.9 MPa) for not less than 2 h, or



MATERIAL: VASCA JET #1000 HIGH SPEED STEEL-HARDEN TO ROCKWELL C-42 TO C-48 BEFORE HONING

NOTE 1—1 in. = 25.4 mm.

FIG. 1 Typical Pressure Vessel for Dye Penetration Test

9.4 Immerse the specimens in the testing solution at atmospheric pressure, in an open vessel, for any period of time appropriate to the needs of the tester.

10. Examination

10.1 After following the procedures in 9.2, 9.3, or 9.4, dry and break the test specimen for examination.

10.2 Porosity is indicated by penetration of the dye into the specimens to an extent visible to the unaided eye.

10.3 Disregard penetration into small fissures formed in preparing the test specimens.

11. Report

11.1 Report the following information:

- 11.1.1 Whether penetration occurred and to what depth,
- 11.1.2 Pressure used, and
- 11.1.3 Time under pressure.

12. Precision and Bias

12.1 This test method is qualitative and is liable to subjective interpretation. Within a given laboratory, agreement should be possible between several operators whether penetration exceeds in-house acceptance standards.



FIG. 2 Typical Unassembled Pressure Vessel and Samples



FIG. 3 A Typical Assembled Pressure Vessel

13. Keywords

13.1 ceramics; porosity; whitewares