



Designation: **D6583 – 04 (Reapproved 2010) D6583 – 13**

Standard Test Method for Porosity of Paint Film by Mineral Oil Absorption¹

This standard is issued under the fixed designation D6583; 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 is applicable to air-dry architectural coatings of any type, both solvent and water-borne, and of any color, dark as well as light. It cannot be used with films that are dissolved or excessively softened by mineral oil, but practical examples of such films will be encountered rarely, if ever.

1.2 The values stated in SI units are to be regarded as ~~the standard. The values given in parentheses are for information only.~~ standard. No other units of measurement are included in this standard.

1.3 *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 Documents

2.1 *ASTM Standards:*²

[D1475 Test Method For Density of Liquid Coatings, Inks, and Related Products](#)

[D2369 Test Method for Volatile Content of Coatings](#)

[D3258 Test Method for Porosity of White or Near White Paint Films by Staining](#)

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

3. Terminology

3.1 *Definitions:*

3.1.1 *porosity, n*—presence of numerous minute voids in a cured material; that is, the fraction of air by volume in the dry film.

4. Summary of Test Method

4.1 The test paint is applied to a preweighed nonporous panel, air dried, then reweighed to obtain the weight of the film.

4.2 Mineral oil is applied to the surface of the paint film, allowed to absorb for a fixed period of time, and the excess removed in a specified manner. The test panel is then reweighed to determine the amount of mineral oil absorbed.

4.3 Porosity is calculated from the weight ratio of absorbed oil to dry paint film and from previously determined values of non-volatile and density for the whole paint.

5. Significance and Use

5.1 The porosity of a paint film is closely related to the important practical characteristics of stain resistance, abrasion resistance, durability, and the hold-out of any paint subsequently applied.

5.2 This test provides a precise means for evaluating and comparing the quality of paint films, insofar as it pertains to porosity as determined on a coating applied to a nonporous substrate. Porosity measured using this test method may *not* be an accurate predictor of coating porosity when the coating is applied to substrate of higher absorption characteristics.

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.42 on Architectural Coatings.

Current edition approved Feb. 1, 2010 Nov. 1, 2013. Published February 2010 December 2013. Originally approved in 2000. Last previous edition approved in 2004 2010 as D6583 – 04 D6583 – 04 (2010). DOI: 10.1520/D6583-04R10.1520/D6583-13.

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.

5.3 Unlike current Test Method **D3258** Porosity of Paint Films, which is effective only with light colored paints, this test method is equally effective with paints of any color, both dark and light. Also unlike Test Method **D3258**, its results are not influenced by the hiding characteristics of the paint film.

6. Apparatus and Materials

- 6.1 *Bird Type Film Applicator*, 150-mm wide with a clearance of 150 μm .
- 6.2 *Bird Type Film Applicator*, 150-mm wide with a clearance of 100 μm .
- 6.3 *Vacuum Drawdown Plate*.
- 6.4 *Test Panel*.³
- 6.5 *Mineral Oil*, specific gravity 0.8200 to 0.8350; viscosity 6.5 to 7.8 cSt at 40°C.
- 6.6 *Absorbent Wipers*.

7. Procedure

- 7.1 Weigh each test panel to the nearest milligram. Record as W_p .
- 7.2 Place the test panel on the vacuum plate and apply the paint under test with the 150- μm clearance drawdown blade. Remove the test panel from the vacuum plate and air dry as 48 h under standard conditions of $23 \pm 2^\circ\text{C}$ ($73 \pm 3.5^\circ\text{F}$) and $50 \pm 5\%$ relative humidity.
- 7.3 Weigh the coated test panel to the nearest milligram. Record this weight as W_{p+f} .
- 7.4 Place the coated test panel on the vacuum plate and apply the mineral oil with the 100- μm clearance drawdown blade making sure the entire surface of the coating is covered by the oil.
- 7.5 After 3 min, wipe off excess mineral oil with the absorbent wipers. Hold the test panel at an angle to a light source to ascertain from its sheen if all mineral oil is removed from the test panel. Repeat wiping, if necessary, until the film has no sheen. Failure to remove this excess will produce erroneous results. Results are invalid if paint film is removed during this process.
- 7.6 Weigh the test panel from 7.5 to the nearest milligram and record as W_o .
- 7.7 Determine the density D of the paint in g/mL and the density d of the saturant in g/mL, in accordance with Test Method **D1475**.
- 7.8 Determine the nonvolatile by weight N of the paint, in accordance with Test Method **D2369**.

8. Calculation

8.1 *Weight of Applied Paint Film:*

8.1.1 Calculate the weight of the applied paint film as follows:

$$W_f = W_{p+f} - W_p \quad (1)$$

where:

- W_f \equiv paint film, g,
- W_{p+f} \equiv test panel and paint film, g, and
- W_p \equiv test panel, g.

where:

- W_f = paint film, g,
- W_{p+f} = test panel and paint film, g, and
- W_p = test panel, g.

8.2 *Weight of Mineral Oil Absorbed:*

8.2.1 Calculate the weight of the mineral oil m absorbed by the paint film as follows:

$$W_m = W_o - W_{p+f} \quad (2)$$

where:

- W_m \equiv mineral oil absorbed by the paint film, g,
- W_o \equiv oiled test paint, g, and
- W_{p+f} \equiv test panel and paint film, g.

³ Transparency film AF 4300, from 3M Visual Systems Division, Austin, TX 78726-4599 was used in this test method. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.