Designation: D4708 – 12

Standard Practice for Preparation of Uniform Free Films of Organic Coatings[1]

This standard is issued under the fixed designation D4708; 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 the preparation of free films of organic coatings for use in determining the physical properties of the coatings. Procedures are given for preparing free films on three alternative substrates. These substrates are treated FEP (fluorinated ethylene-propylene) sheet, silicone coated paper, and halosilane coated glass plates.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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]

D823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels

D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers

D1653 Test Methods for Water Vapor Transmission of Organic Coating Films

D2370 Test Method for Tensile Properties of Organic Coatings

E96/E96M Test Methods for Water Vapor Transmission of Materials

3. Summary of Test Method

3.1 Free films are prepared by depositing a uniform wet coating of the test material on a release substrate. The applied films are dried or baked, cut into appropriate size for the intended physical property test, and then stripped from the release substrate.

4. Significance and Use

4.1 Free films are required for conducting tests to evaluate physical and mechanical properties such as tensile and elongation (Test Methods D2370 and E96/E96M), moisture vapor permeability (Test Methods D1653), and other physical properties of organic coatings where the substrate may interfere with the determination.

5. Apparatus and Materials

5.1 *Equipment,* for applying films of uniform thickness as described in Practices D823.

5.2 *Micrometer Film Thickness Gage,* as described in Test Method D1005.

5.3 *Alternative Release Substrates:*

5.3.1 *Sheet of FEP—(polyhexafluoropropylene)*, preferably 50-µm (2-mils) thick, coated with a thin film of a dry lubricant.[3,4]

5.3.2 *Sheet of Silicone Coated Paper,* preferably 125-µm (5-mil) thick.[5,4]

5.3.3 *Glass Plates,* coated with halosilane compound.

5.3.4 *Steel Panel*—wrapped with Tedlar[6] polyvinyl fluoride film, preferably 25 to 50–µm 9 (1 to 2 mils) thick.

NOTE 1—Other substrates that may be suitable are 250-µm (10-mil) thick polyethylene, polypropylene sheet, photographic paper, polished steel, and fluoropolymer coated metal panels.

5.4 *Precision Specimen Cutter,* having a double blade with a foot to hold the sample.[7,4]

[1] This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.23 on Physical Properties of Applied Paint Films.

Current edition approved July 1, 2012. Published August 2012. Originally approved in 1987. Last previous edition approved in 2007 as D4708 – 07. DOI: 10.1520/D4708-12.

[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] The sole source of supply of dry lubricant (MS-122 Fluorocarbon Release Agent) known to the committee at this time is Miller-Stephenson Chemical Co., Inc., 55 Backus Ave., Danbury, CT 06810.

[4] 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.

[5] The sole source of supply of silicone coated release paper, Form RP-1K, size 8⅝ by 11¼ in., known to the committee at this time is the Leneta Co., 15 Whitney Rd., Mahwah, NJ 07430.

[6] Tedlar is a registered trademark of E. I. du Pont de Nemours and Company.

[7] The sole source of supply of the JDC Precision Sample Cutter known to the committee at this time is the Thwing-Albert Instrument Co., 14 West Collins Ave., West Berlin, NJ 08091.

***A Summary of Changes section appears at the end of this standard**

6. Procedure

6.1 Prepare the free films by one of the following procedures:

NOTE 2—To prepare specimens for tensile property tests a precision specimen cutter must be used to ensure nick-free edges on the specimens. Even with this instrument, it is necessary to cut each specimen independently, allowing at least 13 mm (½ in.) of waste between specimens.

6.1.1 *FEP Substrate:*

6.1.1.1 Apply each material to be tested to a sheet of FEP that has been treated as follows: First, cover a smooth, flat polished glass plate with a sheet of FEP. Coat the sheet uniformly with a light coat of a dry fluorocarbon lubricant and allow to dry for 24 h at standard conditions. Then apply a uniform wet coating of the test material on the sheet by one of the procedures given in Practices D823.

6.1.1.2 Dry the applied films in 23 ± 2°C (73.5 ± 3.5°F) and 50 ± 5 % humidity, or bake under conditions mutually agreeable to the producer and the user. Dry film thicknesses must not vary by more than the specified or agreed upon tolerances of the average film thickness and must be free of visible flaws. Most films with a thickness of less than 50 µm (2.0 mil) are very difficult to handle.

6.1.1.3 When required for further treatment such as weathering, remount the coated sheet on a convenient smooth, flat substrate such as a glass or steel panel.

6.1.1.4 Age or expose the coated sheet to conditions mutually agreed upon. At the end of the aging or exposure period, remove the sheet-backed film from the glass or metal substrate and cut the specimens to size using a sharp knife or the precision cutter (Note 2). Carefully strip the coating film from the sheet substrate.

6.1.2 *Silicone Coated Paper:*

6.1.2.1 Apply each material to a sheet of silicone coated paper. First, cover a smooth, flat substrate with a sheet of a silicone-coated release paper. Then apply a film of the material under test, dry or cure, expose or treat if required, and prepare test specimens as described in 6.1.1.

6.1.3 *Halosilane Coated Glass Plates*—Apply each material to a glass plate coated with a halosilane compound. First, coat a glass plate with a thin film of a halosilane compound and dry. Then apply a film of the material under test, dry or cure, expose or treat if required, and prepare test specimens as described in 6.1.1.

6.1.4 *Tedlar Wrapped Steel Panel* (for specimens that are to be baked).

6.1.4.1 Apply each material that is to be tested to the Tedlar surface. First, wrap the panel with the Tedlar film, tape the film in place and bake the combination at 165°C (330°F) for 15 min to shrink the film onto the panel. Allow the panel to cool and wipe the surface with *i*-propanol. Then apply the material under test, bake as required, then expose or treat if required, and prepare test specimens as described in 6.1.1.

7. Keywords

7.1 film; halosilane coated glass plates; lacquer; organic coatings; paints and related coatings; polyhexafluoropylene (FEP) substrate; silicone-coated paper; substrates; surface preparation; tension (tensile) properties/tests; vapors; varnishes

SUMMARY OF CHANGES

Committee D01 has identified the location of selected changes to this standard since the last issue (D4708 – 07) that may impact the use of this standard. (Approved July 1, 2012.)

(1) Listing or an additional Test Methods (E96/E96M) where this method for preparing test films may be useful (Sections 2 and 4).

(2) Additional suitable substrates have been added, steel panels tightly wrapped with Tedlar polyvinyl fluoride film (Section 5.3.4) and polypropylene sheet (Note 1 under Section 5).

(3) The procedure for preparing Tedlar wrapped steel panels is given in Section 6.1.4.1.