Designation: ~~F119 – 82 (Reapproved 2008)~~ F119 – 82 (Reapproved 2015)

Standard Test Method for Rate of Grease Penetration of Flexible Barrier Materials (Rapid Method)[1]

This standard is issued under the fixed designation F119; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method provides standard conditions for determining the rate of grease penetration of flexible barrier materials. Pinholes, which can be measured by a separate test, will increase the rate of grease penetration as determined by this test method.

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

1.3 *This standard does not purport to address the safety concerns 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]
D374 Test Methods for Thickness of Solid Electrical Insulation (Withdrawn 2013)[3]
D618 Practice for Conditioning Plastics for Testing
D1898 Practice for Sampling of Plastics (Withdrawn 1998)[3]
2.2 *TAPPI Standard:*
TAPPI T465 sm-52 Creasing of Paper for Water Vapor Permeability Tests[4]

3. Summary of Test Method

3.1 Flexible barrier materials, uncreased or creased by a standard procedure, are exposed on one side to grease contained in a weighted cotton patch. The time required to show a visual change caused by wetting (reduction in light scattering) of a ground-glass back-up plate is measured.

4. Significance and Use

4.1 This test method is valuable in the development and selection of flexible barrier materials suited for use as grease barriers.

4.2 The test is rapid in comparison with other methods because of the extremely small quantity of oil required for detection (about 6 µg). The actual time to failure is a multiple of the values obtained by this test method. When permeation is through an absorbent structure such as kraft paper coated with polyethylene, the failure times will be longer and variable, depending on the variation in porosity and thickness of the structure.

5. Apparatus

5.1 *Backing Plates,* ground-glass, 50 by 50 by 3-mm (2 by 2 by ⅛-in.), very fine grind on one side only.

NOTE 1—The ground-glass backing plates may be prepared from 2 by 2-in. squares of ⅛-in. plate glass by lightly grinding the surface with a silicon carbide abrasive as follows: Place a piece of plate glass approximately 1ft square on a flat surface. Mix some abrasive and water in small quantities to make a fairly uniform paste. Place one of the 2-in. squares of plate glass face down in the abrasive paste, and rotate it in a figure eight movement with the finger tips using the slightest amount of pressure. When the paste gets too heavy, remove the plate glass square from the bed and wash it to remove

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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] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from Technical Association of the Pulp and Paper Industry (TAPPI), 15 Technology Parkway South, Norcross, GA 30092, http://www.tappi.org.

all traces of abrasive. Add more water to the thick abrasive paste on the bed. (If necessary, add small amounts of abrasive.) Continue the process until a uniform and light overall etch is present on the face of the square. When a uniform etch has been obtained, wash the square thoroughly to remove all traces of abrasive and pat dry with lens tissue.

5.2 *Weights,* 50-g, 20 mm (0.75 in.) in diameter at the base.

5.3 *Patches,* rifle cleaning, cotton flannel.

5.4 *Medicine dropper.*

5.5 *Forced-Circulation Oven,* designed to maintain a test temperature of 40 or 60°C within ±1°C.

5.6 *Creasing Surface,* consisting of a flat rectangular plate (for example, a piece of machined metal plate about 10 mm thick or a piece of plate glass) with a width at least 75 mm (3 in.) on all sides.

5.7 *Creasing Platen,* consisting of a 5.5-kg (12-lb) square metal bar with 65-mm (2.5-in.) sides and a flat base.

NOTE 2—The developers of this method believe that a standard crease is easier to obtain with a flat platen than with a roller. The weight of the platen was selected to conform to the weight loading per inch of crease in TAPPI T465 sm-52.

5.8 *Flat Strip* of wood or metal to give the specimen a preliminary light crease.

5.9 *Thickness Measuring Device,* capable of measuring thickness of specimens in compliance with Test Methods D374.

6. Reagents

6.1 *Animal Oil* (lard).

6.2 *Mineral Oil.*

6.3 *Vegetable Oil.*

6.4 Other reagents, such as butter, tallow, and oils. These may be substituted for standard reagents listed above to simulate actual end-use conditions. Standard reagents are, however, recommended for purposes of interlaboratory comparisons.

7. Sampling, Test Specimens, and Test Unit

7.1 No single procedure for sampling is adequate for all situations. Sampling, however, should be designed to provide the desired result in each situation. Therefore, Practice D1898 is recommended as a guide in designing appropriate sampling procedures for the purposes at hand.

7.2 *Flat Specimen*—Cut a minimum of three test specimens 60 by 60 mm (2⅜ by 2⅜ in.) from each sample after conditioning at least 40 h at 23 ± 2°C and 50 ± 5 % relative humidity. Measure the thickness of each specimen in five equally spaced positions as described in Test Methods D374 to three significant figures, or to 0.00025 mm (0.01 mil) when three significant digits cannot be obtained. Record the measurements.

7.3 *Crease Test*—Prepare a minimum of six test specimens as described in 7.2. Fold three specimens with top side up and three specimens with bottom side up. Fold through the center parallel to one side and press a flat strip of wood or metal down on the fold to give the specimen a preliminary light crease. Tilt the 5.5-kg (12-lb) creasing platen and slip the folded specimen under it and parallel to its edge, until the fold lies at the center of gravity of the platen. Gently lower the platen and let it rest on the specimen for 15 s. Remove the specimen and unfold it. Then fold it on the same side to make a new crease at a 90° angle to the first crease, following the same procedure. Flatten the specimen by unfolding it and placing it under platen for 15 s.

7.4 *Test Unit*—A minimum of three similar specimens make up a test unit.

8. Procedure

8.1 Place the test specimen of measured thickness on a clean ground-glass backing plate. The film specimen should more than cover the glass backing plate so premature edge creep failure does not occur. Test specimens should include flat, creased into, and creased away from the side that will come into contact with grease in the package.

NOTE 3—Previously used ground-glass backing plates should be thoroughly cleaned by allowing them to stand overnight in a chromic acid solution.

8.2 Cut the cotton flannel rifle cleaning patches into 20-mm (0.75-in.) diameter disks to just fit under the 50-g weight.

8.3 Place two cotton flannel disks on top of each other at the center of the test specimen.

8.4 Place the 50-g weight on the patches and preheat the entire assembly (glass, test specimen, cotton disks, and weight) to the desired test temperature (40 or 60 ±1°C) for 30 min. This is particularly necessary when short failure times are expected, where ±30 min would be critical.

8.5 With the assembly still in the oven, remove the weights and add six drops of reagent, oil, or grease, to the cotton disks. If necessary, melt the grease so it can be added dropwise. Periodic addition may be required when volatile reagents are used under the option of 6.4.

8.6 Replace the 50-g weights on the oiled patches.