Designation: F3300 – 18

Standard Test Method for Abrasion Resistance of Flexible Packaging Films Using a Reciprocating Weighted Stylus[1]

This standard is issued under the fixed designation F3300; 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 the determination of the abrasion resistance of flexible non-conductive films and packaging materials using a weighted stylus that wears completely through a film by oscillating or reciprocating back and forth along a linear path until an electrical circuit is completed shutting down the test.

1.2 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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]

D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing

D6988 Guide for Determination of Thickness of Plastic Film Test Specimens

E171/E171M Practice for Conditioning and Testing Flexible Barrier Packaging

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

F2251 Test Method for Thickness Measurement of Flexible Packaging Material

3. Terminology

3.1 *Definitions:*

3.1.1 *abrasion*—the wearing away of any part of a material by rubbing against another surface.

3.1.2 *abrasion cycle—in abrasion testing*, one or more movements of an abradant across a material surface, or the material surface across an abradant, that permits a return to its starting position.

3.1.2.1 *Discussion*—In the case of the linear abrading device, an abrasion cycle consists of one complete forward and one complete backward stroke.

3.1.3 *abrasion resistance—in abrasion testing*, the ability of a material to withstand degradation caused by the rubbing of one material against another.

3.1.4 *durability*—the ability of a material to withstand deterioration from the sum of all sources.

3.1.5 *non-conductive film*—any film used in this test method that allows the stylus to completely abrade through the film, making a hole, and does not prematurely stop the test before the hole is made.

3.1.5.1 *Discussion*—The stylus (on one side of the film) and the mandrel (on the other side of the film) form part of an electrical circuit that signals the end of the test. Wearing a hole through a non-conductive film closes the circuit and stops the test. A conductive film would conduct electricity between the stylus and the mandrel before the film completely abrades through and prematurely signal the end of the test.

4. Summary of Test Method

4.1 A specimen is abraded using a linear rubbing action. The test specimen, mounted over a mandrel and held in place by two plates, is rubbed back and forth with the hemispherical tip of a special stylus. The hemispherical tip rubs the specimen until it abrades through and the test is automatically stopped.

[1] This test method is under the jurisdiction of ASTM Committee F02 on Primary Barrier Packaging and is the direct responsibility of Subcommittee F02.20 on Physical Properties.

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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.

Resistance to abrasion in this test method is reported as the number of back-and-forth cycles to breakthrough. Variables that influence the rubbing action are pressure on the specimen, temperature, relative humidity, and speed.

5. Significance and Use

5.1 Materials such as engineered thermoplastic films are often used for flexible barrier packaging. However, handling and transportation can cause abrasion to the packaging film and possibly compromise the integrity of the contents (e.g., sterility of a medical device). This test method provides a comparative ranking of material performance that can be used as an indication of relative end-use performance.

5.2 The resistance of material surfaces to abrasion, as measured on a testing machine under laboratory conditions, is only one of several factors contributing to wear performance or durability as experienced in the actual use of the material. While abrasion resistance and durability are frequently related, the relationship varies with different end uses and different factors may be necessary in any calculation of predicted durability from specific abrasion data.

5.3 The resistance of material surfaces to abrasion may be affected by factors including test conditions of temperature and humidity, type of abradant, pressure between the specimen and abradant, mounting or tension of the specimen, and type, kind, or amount of finishing materials such as coatings or additives. Other causes of variation include local material movement during testing, material direction alignment, material characteristics, and mandrel and stylus wear. For consistency, samples to be evaluated under special environmental conditions shall be conditioned under those same conditions. It is important that the test instrument be shown to operate properly under special environmental conditions.

5.4 This test method may not be suitable for all films, including the following cases:

5.4.1 Films that stretch and generate a ripple in the abraded region during testing,

5.4.2 Films that have a thickness greater than 0.25 mm (0.010 in.), or are of such rigidity that forming over the mandrel would cause internal stresses that weaken the film, and

5.4.3 Conductive films.

6. Apparatus

6.1 *Linear Abrading Device*,[3] as shown in Fig. 1, consisting of the following elements:

6.1.1 *Crank-Slide Drive Mechanism* (not shown) to operate an oscillating arm in a linear distance of 25.4 mm (1 in.) at a speed of 30 cycles/min,

6.1.2 *Splined Shaft,* such that it cannot rotate during the test, mounted vertically at the end of the oscillating arm,

6.1.3 A means to increase the vertical force on the stylus. This may be as simple as adding additional mass to the top of the splined shaft,

6.1.4 Attachment affixed to the end of the splined shaft to securely hold the stylus perpendicular to the test specimen,

6.1.5 Mechanism to keep stylus off specimen surface until time of test,

6.1.6 Means to automatically stop the test when the stylus abrades through the specimen and contacts the mandrel, and

6.1.7 *Specimen Table,* to which the flexible material holder can be secured.

[3] The sole source of supply of the apparatus known to the committee at this time is Taber® Industries, 455 Bryant Street, North Tonawanda, NY 14120. 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, which you may attend.

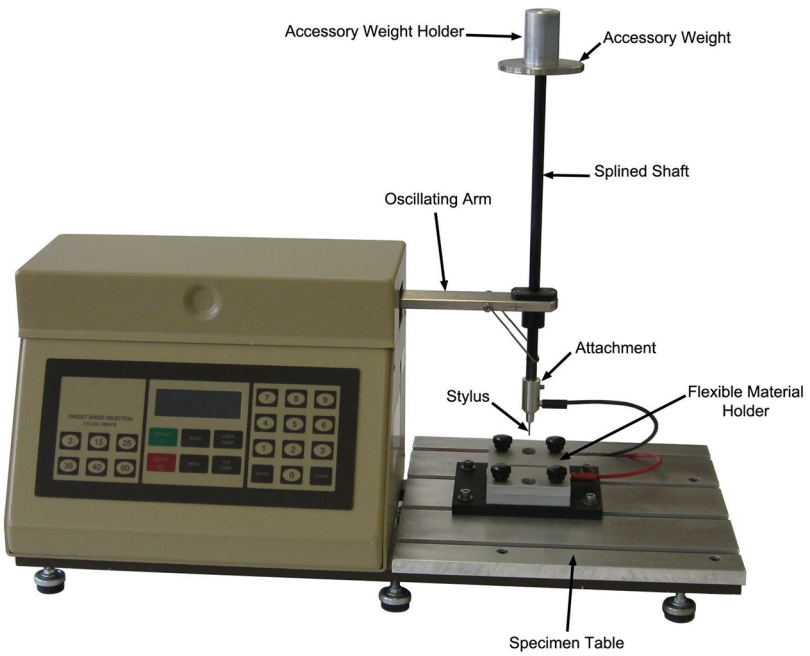

FIG. 1 Linear Abrading Device