Designation: F392/F392M – 21

Standard Practice for Conditioning Flexible Barrier Materials for Flex Durability[1]

This standard is issued under the fixed designation F392/F392M; 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 conditioning of flexible barrier materials for the determination of flex resistance. Subsequent testing can be performed to determine the effects of flexing on material properties. These tests are beyond the scope of this practice.

1.2 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]

E171 Practice for Conditioning and Testing Flexible Barrier Packaging

F2097 Guide for Design and Evaluation of Primary Flexible Packaging for Medical Products

3. Terminology

3.1 *pinhole, n*—a small opening of non-specific shape or dimension that passes completely through all layers of a flexible material.

3.1.1 *Discussion*—The use of the term "pin" provides the relative size reference as in a small hole made with or as if with a pin.

4. Summary of Practice

4.1 Specimens of flexible materials are flexed at standard atmospheric conditions defined in Practice E171, unless otherwise specified. Flexing conditions, number of cycles, and severity of flexing strokes vary with the type of material structure being tested. Except for condition E, the flexing condition consists of a twisting motion followed, in conditions A to D, by a horizontal motion, thus, repeatedly twisting and crushing the film. The frequency is at a rate of 45 cycles per minute (cpm).

4.2 Flex failure is determined by measuring the effect of the tested flex conditioning on the barrier and/or mechanical performance of the structure. The property to be evaluated determines the appropriate conditioning level.

4.3 The various flex conditioning levels are summarized as follows:

4.3.1 *Condition A*—Full flex for 1 h (that is, 2700 cycles).

4.3.2 *Condition B*—Full flex for 20 min (that is, 900 cycles).

4.3.3 *Condition C*—Full flex for 6 min (that is, 270 cycles).

4.3.4 *Condition D*—Full flex for 20 cycles.

4.3.5 *Condition E*—Partial flex for 20 cycles.

5. Significance and Use

5.1 This practice is valuable in determining the resistance of flexible packaging materials to flex-formed pinhole failures. Conditioning levels A, B, or C are typically used. Reference Practice E171 and Guide F2097.

5.2 Conditioning D and E are typically used for determining the effect of flexing on barrier properties transmission rates related to gas and/or moisture.

5.3 This practice does not measure or condition materials for abrasion related to flex failure.

5.4 Failures in the integrity of one or more of the plies of a multi-ply structure may require alternative testing. Supplementary permeation testing using gas or water vapor can be used in conjunction with the flex test to measure the loss of ply integrity. Other test methods may be used after flexing for

[1] This practice is under the jurisdiction of ASTM Committee F02 on Primary Barrier Packaging and is the direct responsibility of Subcommittee F02.50 on Package Design and Development.

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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.