Designation: ~~D3936 – 17~~ D3936 – 21

Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering[1]

This standard is issued under the fixed designation D3936; 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 measurement of the resistance to delamination of the secondary backing applied to some pile yarn floor coverings.

1.2 This test method is applicable to all backings including natural manufactured fibers or attached cushion.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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]

D76 Specification for Tensile Testing Machines for Textiles
D123 Terminology Relating to Textiles
D1776 Practice for Conditioning and Testing Textiles
D4697 Guide for Maintaining Test Methods in the User's Laboratory (Withdrawn 2009)[3]
D5684 Terminology Relating to Pile Floor Coverings
E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

3. Terminology

3.1 For all other terminology related to Pile Floor Coverings, D13.21, see Terminology D5684.

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[1] This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.21 on Pile Floor Coverings.

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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.

3.1.1 The following terms are relevant to this standard: attached cushion, carpet, constant-rate-of-extension, finished, finished pile yarn floor covering, floor covering, peak force, pile, pile yarn floor covering, resistance to delamination, secondary backing, textile floor covering, tufted fabric.

3.2 For all other terminology related to textiles, see Terminology D123.

4. Summary of Test Method

4.1 A specimen is separated manually for a distance of about 1.5 in. (38 mm). Each layer then is placed in opposing clamps of a tensile tester, and the force to continue the separation for a specified distance is recorded. The peak forces in specified length intervals are averaged and the resistance to delamination calculated.

5. Significance and Use

5.1 This test method is used for acceptance testing of commercial shipments. Comparative tests as directed in 5.2 may be advisable.

5.2 In a case of a dispute arising from differences in reported test results when using this test method, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test samples that are as homogenous as possible and are from a lot of material of the type in question. The test samples then should be assigned randomly in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using a statistical test for unpaired data and an acceptable probability level chosen by the two parties before testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results with consideration to the known bias.

5.3 This test method is useful to evaluate quality and cost control during the manufacture of pile yarn floor covering. Both appearance and performance of the pile floor covering can be affected by delamination of the secondary backing.

6. Apparatus

6.1 *Tensile Testing Machine*—A constant-rate-of extension (CRE) type conforming to Specification D76 with a constant rate of speed of 12 ± 0.5 in./min (304 ± 10 mm/min) is preferred. A constant-rate-of-traverse (CRT) type tensile testing machine conforming to Specification D76 and operated at the same speed is permitted. There may be no overall correlation with CRE-type and CRT-type testing machines. Consequently, the two machines cannot be used interchangeably. In case of controversy, the CRE-type testing machine shall prevail.

6.2 *Clamps and Jaw Faces*—The use of hydraulic or pneumatic clamping systems with a minimum of 1 by 3 in. (25 by 76 mm) serrated or padded faces designed to minimize slippage in the clamps during testing is recommended. Manual clamping is permitted providing no slippage of the specimen is observed. The faces shall be parallel and have matching centers with respect to one another in the same clamp and to the corresponding jaw face of the other clamp.

6.3 *Tape,* self adhering, cloth reinforced tape has been found suitable.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls or pieces of pile yarn floor covering as directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider the rolls or pieces of pile yarn floor covering to be the primary sampling units. In the absence of such an agreement, take one roll or piece from the lot to be tested.

NOTE 1—An adequate specification or other agreement between the purchaser and supplier requires taking into account the variability between rolls or pieces of pile yarn floor covering and between specimens from a roll or pieces of pile yarn floor covering to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

7.2 *Laboratory Sample*—For acceptance testing, take a laboratory sampling unit that is a minimum of 18 in. (457 mm) in the machine direction by full width (cross machine direction) from each roll or piece in the lot sample.

7.3 *Test Specimens*—From each laboratory sampling unit, cut three specimens with the longer direction parallel to the machine direction. Consider the long dimension as the direction of the test.

7.3.1 *Secondary Back of Textile Construction*—Cut the specimens 3 ± 0.08 in. by at least 6 in. (76 ± 2 mm by ~~at least~~ a minimum of 150 mm).

7.3.2 *Attached Cushion Construction*—Cut the specimens 2 ± 0.08 in. by at least 6 in. (50 ± 2 mm by ~~at least 152~~ a minimum of 150 mm).

7.3.3 *Specimen Sampling and Labelling*— Take specimens, representing a broad distribution along the length and across the width of each laboratory sampling unit. Take one specimen near each edge of the laboratory sampling unit but no nearer the extreme edge than 5 % of its width, and take one specimen from the center area. Ensure that specimens are free of folds, creases or wrinkles. Avoid getting oil, water, grease, etc., on the specimens when handling. Label to maintain specimen identity.

8. Conditioning

8.1 Condition and determine that moisture equilibrium for testing has been attained as directed in Practice D1776.

9. Preparation of Specimens

9.1 At one end of the specimen, manually separate the secondary backing from the pile yarn floor covering for approximately 1.5 in. (38 mm).

9.2 Cover the attached cushion side of each test specimen with self-adhering cloth reinforced tape. At one end of the test specimen, manually separate the attached cushion from the test specimen for approximately 1.5 in. (38 mm).

10. Preparation and Verification of Apparatus Systems

10.1 *Preparation of Tensile Testing Machine:*

10.1.1 Prepare the machine according to the manufacturer's instructions and using the conditions given in 10.1.2 – 10.2.2.

10.1.2 Set the distances between the clamps at 1.0 ± 0.05 in. (25.4 ± 1 mm). Select the full-scale force range of the testing machine such that the maximum force occurs between 15 and 85 % of full-scale force. Verify the testing machine for this range.

10.1.3 Select the testing machine speed of 12 ± 0.5 in./min (304 ± 10 mm/min).

10.1.4 When using a microprocessor automatic data gathering system, set the appropriate parameters as defined in the manufacturer's instructions.

10.2 *Verification of the Total Operating System of the Apparatus:*

10.2.1 Verify the total operating system, for example, loading, clamping, and recording or data collection, whenever there are changes in the loading system, especially an increase, or clamping mechanism by testing a control material.

10.2.2 Compare the data with the previous data, if the average is outside the tolerances established, and recheck the total system to locate the cause of the deviation (see Guide D4697).

11. Procedure

11.1 Mount the loose end of the secondary backing or attached cushion, as applicable, in the stationary clamp jaws and the other loose end of the specimen in the movable clamp. Apply uniform tension across the clamp width of the specimen (see Fig. 1).

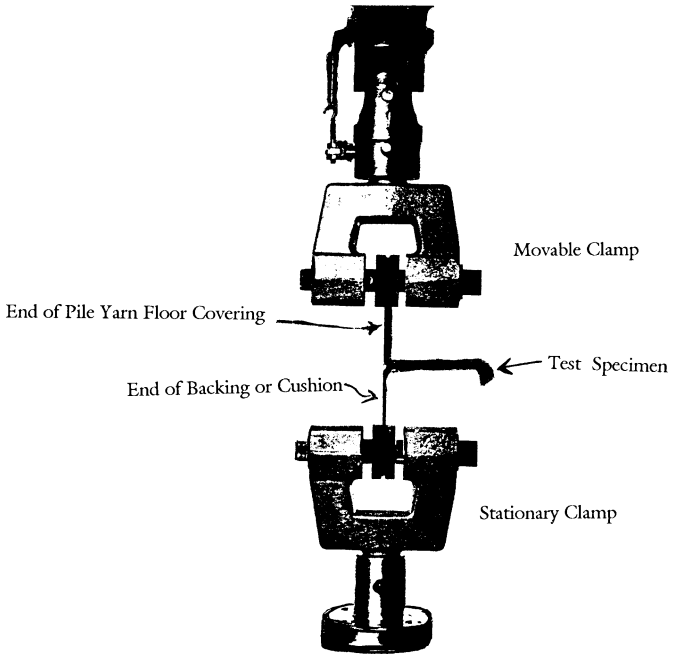

FIG. 1 Specimen Mounted in Clamps

11.2 Start the ~~machine and autographic recording device.~~ machine. If the attached cushion breaks, record that the resistance to delamination exceeds the breaking force of the cushion.

11.3 A trace from the recording device consisting of a series of peaks, each representing the force at which the layers have separated, and troughs corresponding to the fall back of the force will be generated. After the initial peak is recorded and an additional 3 in. (76 mm) of the specimen has been delaminated, (this represents approximately 6.0 in. (~~152~~150 mm) of jaw separation), stop the machine, and return the crosshead to the start position.

11.4 Remove the delaminated specimen from the clamps, and test the remaining specimens.

12. Calculation

12.1 From the recording device, determine the value of the highest peak in each 0.5-in. (13 mm) interval of delamination, ignoring the initial peak force (which represents approximately 1.0 in. (25 mm) of jaw separation). Average these five peak forces for each specimen to the nearest 0.1 lbf (0.5 N) (see Fig. 2).

12.2 Calculate the resistance to delamination for each specimen to the nearest 0.1 lbf (0.5 N)/unit width, using the following equation:

$$D = F/W \tag{1}$$

where:

D = resistance to delamination, lbf/in. (N/mm),
F = average peak force for the specimen, lbf (N), and
W = specimen width, 3 in. (76 mm).

12.3 Calculate the average resistance to delamination for each laboratory sampling unit and for the lot, or both.

12.4 Calculate the standard deviation or coefficient of variation, or both, if requested.