Designation: ~~D7570 – 09~~ D7570 – 17

Standard Test Method for Evaluation of Dimensional Stability of Pile Yarn Floor Covering[1]

This standard is issued under the fixed designation D7570; 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 dimensional changes in the lengthwise and ~~widthwise~~width-wise direction and distortion likely to occur when pile floor coverings are exposed to various conditions of moisture and heat. This method is applicable to all pile floor coverings including carpet module form.

1.2 This method is applicable to machine made pile yarn floor covering.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversion to SI units that are ~~proveded~~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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles
D1776 Practice for Conditioning and Testing Textiles
D5684 Terminology Relating to Pile Floor Coverings
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

3. Terminology

3.1 For all terminology relating to D13.21, Pile Yarn Floor Coverings, refer to Terminology D5684.

3.2 The following terms are relevant to this standard: backing, carpet, dimensional stability, cut pile yarn floor covering, finished pile yarn floor covering, floor covering, lengthwise direction, pile yarn floor covering, textile floor covering, tufted fabric, widthwise direction

3.3 For definitions of other terms related to textiles, refer to Terminology D123.

4. Summary of Test Method

4.1 This test method describes the dimensional stability of machine made pile yarn floor coverings when subjected to heat, water and various atmospheric conditions. The dimensions of the specimen are measured in the original state and after each stage of conditioning in the lengthwise and ~~widthwise~~width-wise directions. The change in the dimensions are determined and reported to the nearest .001 in. (.03 mm).

5. Significance and Use

5.1 The determination of dimensional change of pile yarn floor covering is useful in quality and cost control during manufacture of pile yarn floor covering. The appearance and performance may be affected by the changes in the dimensions of pile yarn floor

[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.

covering. This test method is considered satisfactory for acceptance testing of commercial shipment because current estimates of between laboratory precision are acceptable, and this method is commonly used in the trade for acceptance testing.

5.2 If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them using competent statistical assistance. As a minimum use the samples for such comparative tests that are as homogenous as possible, drawn from the same lot of material as the samples that resulted in disparate results during initial testing and randomly assigned in equal numbers to each laboratory. The test results from the laboratories involved should be compared using a statistical test for unpaired data, a probability level chosen prior to the testing series. If a bias is found either its cause must be found and corrected, or future test results for that material must be adjusted in consideration of the known bias.

6. Apparatus

6.1 *Measuring Device,* capable of measuring a dimension to an accuracy of 0.001 in. (0.03 mm). A loading plate made of metal or glass with dimensions slightly smaller than the test specimen or any other device capable of keeping the specimen flat during measurement of dimensional change.

6.2 *Support Plate,* with a dimension slightly larger than the test specimens on which to place specimen during measurement.

6.3 *Laboratory Oven,* with forced ventilation capable of maintaining a temperature of ~~140°~~140 ± ~~2° F~~2 °F (60 ± 1 °C) equipped with perforated racks or grids to permit free circulation of air.

6.4 *Water– Basin,* with dimensions slightly larger than the test specimens, filled with tap water at 68 ± ~~2° F~~5 °F (20 ± ~~1 °C~~) 3 °C) containing 0.1 % Sodium Lauryl Sulfate.

6.4.1 *Weights,* to allow full submersion of the specimen.

NOTE 1—Water temperature in 6.4 does not need to be maintained.

6.5 *Grids,* to allow free circulation of air for conditioning.

7. Reagents and Materials

7.1 Sodium Lauryl Sulfate 0.1%.

8. Sampling, Test Specimens, and Test Units

8.1 Specimens presented for testing should be representative of manufacturer production roll. If possible the specimen shall be tested in the size that it was submitted in order to prevent skewing of specimen and test results. If specimen must be cut to accommodate testing equipment such as ovens or measuring apparatus it shall only be reduced to the minimal size no smaller than 18 ~~in. x~~ by 18 in. (457 by 457 mm) to meet these requirements.

8.2 The specimen shall have clear identification on it to identify the machine direction.

8.3 For test samples 120 in. (3000 mm) wide or wider, three test specimens are required for a test method, one at each edge or no nearer the edge than ~~5%~~ 5 % of the total floor covering width and one in the middle portion of the laboratory sampling unit. For test samples at least 60 in. (1500 mm) wide but less than 120 in. (3000 mm) take two test specimens, one at each edge no nearer to the edge than 5% of the total floor covering width. For test samples less than 60 in. (1500 mm) wide, take one specimen from the middle portion. For test samples of pile yarn floor covering in carpet module form one carpet tile should be selected representative of the lot. For referee testing, select three carpet tiles .

9. Preparation of Apparatus

9.1 The test equipment shall be verified and any adjustments made before starting each test cycle.

9.2 Fill water basin with a solution of ~~0.1%~~ 0.1 % Sodium Lauryl Sulfate as directed in step ~~6.4.1~~6.4.

10. Calibration and Standardization

10.1 Verification of the equipment should be made prior to starting of test using a certified ruler or gauge blocks tracable to a national standard. Make any adjustments to the equipment to assure accuracy of measuring device.

11. Conditioning

11.1 Condition the ~~specimen as directed in practice Practice~~ specimens or test samples in the ~~D1776 in~~ standard atmosphere for testing ~~textile, which is 70° ±~~textiles in accordance with Practice D1776~~2° F (21 ± 1° C) at 65 ± 2% relative humidity before starting the test.~~ .

12. Procedure

12.1 Place the specimen on the measuring device for lengthwise and widthwise direction. Place the loading plate on the sample for ease of keeping the sample flat. A minimum of two measurements for each direction of the specimen shall be taken. The original

measurements shall be marked with a permanent waterproof marker along the edge to ensure all measurements are repeated at the same point. The measurements shall be taken at least 1 in. (25 mm) from each corner of the specimen. Measure to the nearest ~~0.001in. (0.03mm).~~ 0.001 in. (0.03 mm).

12.2 Place the specimen in a forced air oven for 2 h ± 15 min at 140 ± ~~2° F (60 ±1° C).~~2 °F (60 ± 1 °C).

12.3 After time in the oven has elapsed, remove the specimen from the oven.

12.4 Place the sample in the water basin with the ~~water~~ initial water temperature at 68 ± 5 °F (20 ± 3 °C) and sodium lauryl sulfate solution for 2 h ± 15 ~~min.~~ min, allowing water solution to cool to ambient temperature. If specimen floats in water, use a weighted object to keep the specimen submerged in water.

12.5 Remove the specimen from the sodium lauryl sulfate ~~solution ,~~ solution, avoid distorting the shape of the specimen. Excess water may be removed by placing the specimen between sheets of blotting paper.

12.6 Place the wet specimen in the forced air oven at ~~140 ± 2° F (60 ± 1 ° C)~~ 140 ± 2 °F (60 ± 1 °C) for 24 h ± 30 min and allow it to dry.

12.7 Place the specimen on the grids for conditioning in ~~a controlled atmosphere at 70 ± 2 ° F (21± 1° C), 65 ± 2% relative humidity for a minimum of 48 hand repeat measuring~~the standard atmosphere for testing textiles in accordance with Practice D1776 ~~instructions as directed in 12.1~~.

13. Calculation

13.1 Calculate the measurement of the dimensional change for the lengthwise and widthwise direction after 12.7 expressed to the nearest ~~001~~0.001 in. (0.03 mm) using the following formula:

$$DC = lo - lc$$

DC = Dimensional Change
lo = is the arithmetic mean of the original measurement
lc = is the arithmetic mean of the measurement after 12.7.

13.2 Calculate the measurement for lengthwise and widthwise direction. Indicate shrinkage by a minus sign and an increase in the dimension by a plus sign. The dimensional change may be measured and calculated for 12.3, 12.4, and 12.5, and 12.6 if specified by the requestor for research and development purposes.

NOTE 2—The dimensional change can be calculated and reported as a percentage if specified by the requestor (see Appendix X1).

14. Report

14.1 Report the following information:
14.1.1 State the test was conducted in accordance with Test Method D7570.
14.1.2 ~~Idenification~~Identification and description of the material tested.
14.1.3 Any deviation from the test standard.
14.1.4 Any relative comments to the standard.
14.1.5 The dimensional change as determined in Section 12.
14.1.6 ~~f~~If specified by requestor, the percentage in dimensions as calculated in Appendix X1.

15. Precision and Bias

15.1 The precision of this test method is based on an interlaboratory study of WK9474, Standard Test Method for Determining the Dimensional Stability of Pile Yarn Floor Covering, conducted in 2007. Results in this study were obtained from five laboratories, testing three different types of adhesive backed modular carpet tile. Every "test result" reported represents an individual determination. Each participating laboratory reported three replicate test results for every material. Except for the use of only five laboratories, Practice E691 was followed for the design and analysis of the data.

15.1.1 *Repeatability limit (r)*—Two test results obtained within one laboratory shall be judged not equivalent if they differ by more than the "*r*" value for that material; "*r*" is the interval representing the critical difference between two test results for the same material, obtained by the same operator using the same equipment on the same day in the same laboratory.

15.1.2 *Reproducibility limit (R)*—Two test results shall be judged not equivalent if they differ by more than the "*R*" value for that material; "*R*" is the interval representing the critical difference between two test results for the same material, obtained by different operators using different equipment in different laboratories.

15.1.3 The above terms (repeatability limit and reproducibility limit) are used as specified in Practice E177.

15.1.4 Any judgment in accordance with statements 15.1.1 and 15.1.2 would normally have an approximate ~~95%~~ 95 % probability of being correct, however the precision statistics obtained in this ILS must not be treated as exact mathematical quantities which are applicable to all circumstances and uses. The limited number of materials tested, and laboratories reporting results, guarantees that there will be times when differences greater than predicted by the ILS results will arise, sometimes with considerably greater or smaller frequency than the ~~95%~~ 95 % probability limit would imply. The repeatability limit and the