Designation: D7241 – 22

Standard Test Method for Pile Thickness of Finished Multilevel Pile Yarn Floor Covering[1]

This standard is issued under the fixed designation D7241; 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 pile thickness of finished multilevel pile yarn floor covering using a thickness measuring instrument having a stationary surface (platen), a circular pressure foot under specified force, and capable of being moved vertically above the platen.

1.2 This test method is applicable only to finished multilevel loop pile constructions.

NOTE 1—Determination of pile thickness of multilevel pile yarn floor coverings was previously contained within Test Method D418. For user convenience, Subcommittee D13.21 subdivided Test Method D418 into separate standards of which this test method is one.

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, health, and 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]

D123 Terminology Relating to Textiles

D1776 Practice for Conditioning and Testing Textiles

D5684 Terminology Relating to Pile Floor Coverings

D5823 Test Method for Tuft Height of Pile Floor Coverings

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

3. Terminology

3.1 For definitions of terms relating to Pile Floor Coverings, refer to the Terminology D5684.

3.2 The following terms are relevant to this standard: carpet, cut pile yarn floor covering, finished, finished pile yarn floor covering, floor covering, pile, pile thickness, pile yarn floor covering, pitch, primary backing, shorn pile stubble, stubble height, textile floor covering, tufted fabric.

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

3.4 For discussion of terminology specific to this standard, see Annex A1.

4. Summary of Test Method

4.1 The thickness and mass are measured on each selected strip specimen in the unsheared condition and after removing approximately 25, 50, 75 % and all of the pile down to a stubble by shearing. The net pile thicknesses at the 25, 50, and 75 % levels are calculated by subtracting the stubble specimen thickness from the thicknesses measured at each of the other stages. The net pile masses are calculated by subtracting the mass of the stubble specimen from the four other weighings. The 25, 50, and 75 % net masses are expressed as a percent of the net pile mass of the unsheared specimen and the 25, 50, and 75 % net thicknesses are plotted against these net mass percentages. A smooth curve is drawn through the three plotted points. The net pile thickness corresponding to 50 % net mass is read from the smooth curve and doubled to obtain the average pile thickness.

5. Significance and Use

5.1 The determination of pile thickness of multilevel 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 changes in pile thickness of pile yarn floor coverings. This test method is considered

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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.

satisfactory for acceptance testing of commercial shipments because current estimates of between laboratory precision are acceptable, and this test 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. Sampling, Test Specimens, and Test Units

6.1 *Sampling Units:*

6.1.1 *Coated Floor Covering*—The basic sampling unit of coated floor covering is a shipping roll. The number of shipping rolls obtained from each production roll ranges from one to over ten.

6.1.2 *Lot Sample*—Take a lot sample as directed in Practice E122 when statistical knowledge of the product variability and test method precision is available, and a decision has been made on the maximum deviation that can be tolerated between the estimate to be made from the sample and the result that would be obtained by measuring every sampling unit of the lot. Otherwise the number of sampling units in a lot sample and the use of the test results obtained from the individual test samples shall be in accordance with the manufacturer's quality control program or with the specification agreed upon between the purchaser and the supplier.

6.1.3 *Laboratory Sampling Unit*—A laboratory sampling unit shall consist of a full width section of floor covering cut from one end of each roll in the lot sample and shall be at least 4 in. (100 mm) longer than the specimens required for the tests being conducted. Do not cut a laboratory sampling unit of coated floor covering from a seam end of a production roll.

6.1.4 *Test Specimens*—A test specimen is a designated area cut from a laboratory sampling unit For laboratory sampling units 120 in. (3000 mm) wide or wider, three test specimens are required for a test method, one at each edge no nearer to the edge than 5 % of the total floor covering width and one in the middle portion of the test sample. For laboratory sampling units 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 laboratory sampling units less than 120 in. (1500 mm) wide, take one test specimen from the middle.

6.2 Where it is known that systematic variations in a floor covering characteristic may occur in bands 18 in. (460 mm) or more in width, as with a modular pattern device having separate controls or adjustments for each module, take test specimens from the middle of each band.

6.3 When a full-width sample is not available, take specimens as directed in 6.1.4, and state in the report the width available and the number of test specimens taken.

7. Apparatus

7.1 *Balance,* capable of weighing to the nearest 0.01 g.

7.2 *Shear or Clipper,* capable of shearing close enough to the backing so as to leave a stubble of no more than 0.05 in. (1.3 mm).

7.2.1 Means for adjusting the height of the shear, such as shims or mechanical mount for a shearing head.

7.3 *Thickness Measuring Instrument:*

7.3.1 Having a stationary surface (plate) on which to place the specimen, and a presser foot capable of being moved vertically above the plate, at least 1 in. (25 mm) from the plate.

7.3.2 Having two interchangeable presser feet; one 1.000 in. ± 0.001 in. (25.4 mm ± 0.03 mm) diameter, the other 2.250 in. ± 0.001 in. (57.15 mm ± 0.03 mm) in diameter.

7.3.3 Having means for indicating the vertical distance between the presser foot and the plate to the nearest 0.001 in. (0.03 mm) and capable of developing and indicating a force up to 0.6 lbf (2.77 N) between the presser foot and the plate.

7.4 *Graph Paper,* with 0.1 in. (2 mm) divisions.

7.5 *Drafting Curves,* such as a set of French curves, flexible curve, or software capable of drawing the graph.

8. Preparation of Apparatus

8.1 Attach the presser foot loosely to the moveable stem or head of the instrument and bring the presser foot into firm contact with the plate. Tighten the presser foot on the stem, check the instrument zero by lowering the presser foot into contact with the plate until the indicated pressure increases to the pressure to be used in measuring the distance between the foot and the plate. The instrument must read 0 in. ± 0.001 in. (0 mm ± 0.03 mm), if the reading is not within this range a adjustment shall be made appropriate to the type of instrument being used. Verify the instrument with calibrated thickness blocks.

9. Conditioning

9.1 Condition the laboratory sampling unit or the test specimens in the standard atmosphere for testing textiles, that is 70 °F ± 2 °F (21 °C ± 1 °C) at 65 ± 2 % relative humidity, 12 h or until the mass changes no more than 0.1 % in 2 h as directed in Practice D1776.

10. Procedure

10.1 Select the number and location of the test specimens as directed in Section 6. Prepare the test specimens according to the procedure in Annex A2.

10.2 The test specimens shall comprise a full pattern repeat or a whole number multiple of a full pattern repeat in each direction but no less than 9.9 in. ± 0.1 in. (250 mm ± 3 mm) in the lengthwise direction by 12.5 in. ± 0.1 in. (320 mm ± 3 mm) in the widthwise direction. If the pattern repeat is not