Designation: D7267 – 13

Standard Test Method for Edge Ravel Resistance of Finished Loop Pile, Pile Yarn Floor Covering[1]

This standard is issued under the fixed designation D7267; 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 force required to ravel a straight sewn yarn from the edge of a loop pile, textile floor covering.

1.2 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.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

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
D5684 Terminology Relating to Pile Floor Coverings

3. Terminology

3.1 For definitions of terms relating to pile floor coverings, refer to Terminology D5684.

3.2 The following terms are relevant to this standard: carpet, constant-rate-of-extension, finished, finished pile yarn floor covering, floor covering, loop pile yarn floor covering, pile, pile yarn floor covering, textile floor covering, tuft, tuft leg, tufted fabric, edge ravel.

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

4. Summary of Test Method

4.1 A yarn end is raveled from a straight sewn, loop pile textile floor covering using a tensile testing machine. The force required to pull the tufted yarn from the edge of a tufted loop pile floor covering is measured and recorded. The required load or force to remove the yarn from the specimen is calculated and defined as "edge ravel strength." Floor covering installation experts recommend using a seam sealer to secure the cut edges of a textile floor covering.

5. Significance and Use

5.1 The satisfactory performance of a loop pile floor covering depends, to a considerable extent, on the installation and maintenance of the product. A loop pile floor covering with inadequate edge ravel strength may result in loops pulling out from the backing, resulting in an aesthetically displeasing appearance. Tuft rows located at the seam of a loop pile floor covering are the most susceptible to raveling.

6. Apparatus

6.1 *Tensile Testing Machine*—A constant-rate-of extension (CRE) type conforming to Specification D76, a constant rate of speed of 12 ± 0.5 in./min (300 ± 10 mm/min) is required. Full-scale loads range from 1 to 10 lb (0.545 to 4.53 kg) are generally adequate. A constant rate of traverse (CRT) type tensile testing machine conforming to the 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 the case of controversy, the CRE-type testing machine shall prevail.

6.2 *Clamps and Jaw Faces*—The use of hydraulic or pneumatic, serrated or padded face, clamping systems with a minimum of 1 by 3 in. (25 by 75 mm) are recommended to reduce specimen slippage. 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.

7. Sampling, Test Specimens, and Test Units

7.1 *Lot Sample*—When performing acceptance testing for a sample lot, take at random the number of rolls or pieces of pile yarn floor covering as directed on an applicable material

[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.

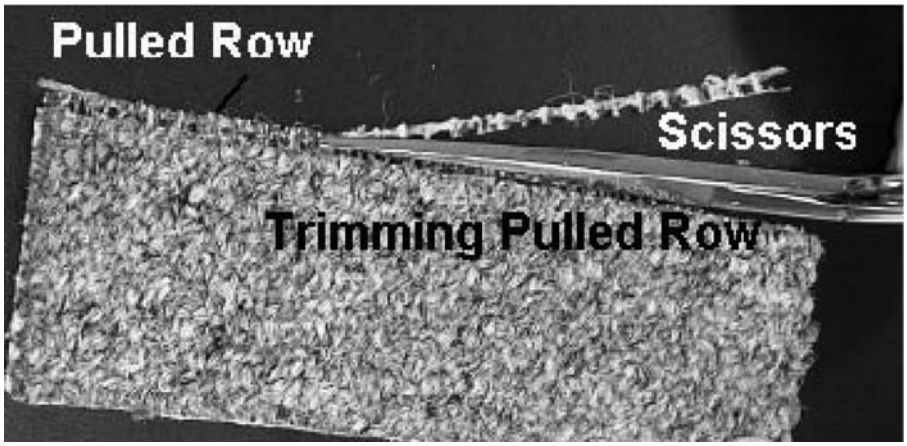

FIG. 1 Photograph of Trimming the Edge of a Pulled Tufted Row of Yarn

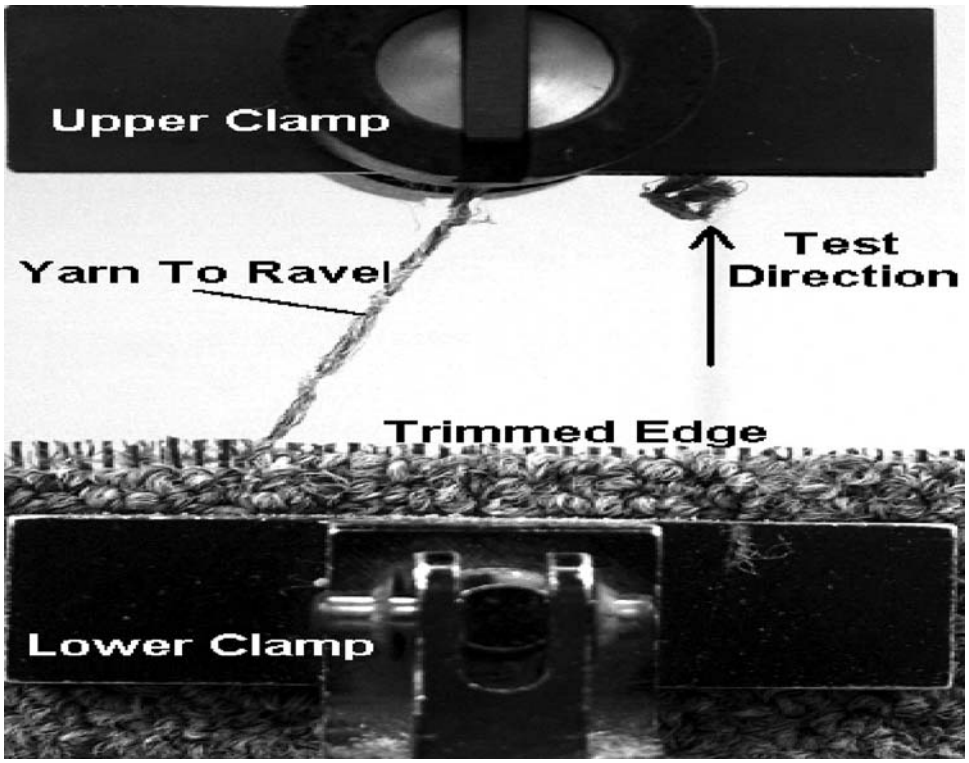

FIG. 2 Photograph of Edge Ravel Specimen Ready for Testing

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 agreement, take one roll or piece from the lot to be tested.

7.2 *Laboratory Sample*—For acceptance testing, take a "laboratory sampling unit" that is a minimum of 18 in. (460 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 sample unit, cut three specimens with the longer direction parallel to the machine direction. Consider the long dimension as the direction of the test.

7.4 *Specimen Dimension*—Cut the specimens to a width/length dimension of 2 by 6 in. ± 0.1 in. (50 by 150 mm ± 2 mm), respectively.

7.5 *Specimen Sampling and Labeling*—Obtain specimens, representing a broad distribution along the length and width of each laboratory sample unit. Take one specimen near each edge of the sampling unit but, no nearer the edge than 5 % of the width, and take one specimen from the center area. Ensure that specimens are free of folds, creases or wrinkles. Label to maintain specimen identity.

7.6 *Preparation of Specimens*—With hemostats or like device, grasp a yarn end that is near to the edge of the specimen

and that can be pulled the entire specimen length. Remove the entire tufted row of yarn from the specimen.

7.7 With scissors or knife remove the void backing area (created by removing the tufted row of yarn in 7.6), See Fig. 1.

7.8 Grasp the yarn from the tufted row next to the area trimmed from in 7.7, and pull the yarn away from the backing for distance of 1.5 to 2 in. (37.5 to 50.0 mm).

8. Preparation of Apparatus

8.1 *Tensile Testing Machine*—Prepare the machine according to the manufacture's instructions and using the conditions given in 8.1.1 and 8.1.2.

8.1.1 The distance between the clamps should be 1 ± 0.05 in (25 ± 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.

8.1.2 Select a testing machine speed of 12 ± 0.5 in. (300 ± 12 mm)/min.

9. Conditioning

9.1 Condition the laboratory sampling unit or the test specimens in the standard atmosphere for textile testing, 70 ± 2°F (21 ± 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 Center and secure the length of the test specimen in the lower clamps with the trimmed edge facing the top clamp, as shown in Fig. 2. Set the distance between the upper and lower clamps to 1 in.

10.2 Secure the partially raveled yarn end in the upper clamps, as shown in Fig. 2.

10.3 Activate the machine to start the test. The recording device will record the force required to ravel the loop away from the specimen. The recording will show a series of peaks and valleys. Each peak represents the force required to ravel the yarn end from the edge of the carpet backing. Conduct the evaluation until there is approximately 6 in. (150 mm) of jaw separation. Then stop the machine, remove the yarn and specimen from the clamps, and return the clamp to the starting position.

11. Calculation or Interpretation of Results

11.1 From the recording device, determine and document the five highest peaks for each specimen of the sampling unit. Average the five highest peaks and record to the nearest 0.1 lbf (0.5 N).

11.2 If the yarn breaks during testing, record the breaking strength obtained, and report that the "Test was not completed due to yarn breakage."

11.3 Using the values from the three specimens of the sampling unit tested in 11.1; calculate the overall average edge ravel value for each laboratory sampling unit or lot.

12. Report

12.1 State that edge ravel resistance was determined as directed in Test Method D7267. Describe the material or product sampled and the method of sampling used.

12.2 Report the following information:

12.2.1 Edge ravel resistance of each specimen and laboratory sampling unit.

12.2.2 If the yarn breaks before completing the test, record the maximum resistance at the break of the yarn. Note that the resistance to raveling exceeds the yarns' breaking strength.

13. Precision and Bias

13.1 An inter-laboratory study involving five laboratories and eight different loop pile tufted carpets was performed in 2004, using the procedure described in this test method. Each loop pile carpet was sampled using a side–center–side configuration. The data was analyzed using Practice E691. The inter-laboratory precision study is characterized by reproducibility (Sr & r), reproducibility (SR & R) and average results, as shown in Table 1.

13.2 *Precision Analysis Between and Within Labs*—The within lab precision statistics for the method were calculated using the h (between labs) and k (within labs) values. The laboratories used in the study were not found to be significantly different, in terms of variation between or within, if they did not exceed the Critical h-statistic (±1.75) or the Critical k statistic (±1.91). Results for h and k precision data are shown in Table 2 and Table 3, respectively.

13.3 *Bias*—The value of resistance to edge raveling of a loop pile, tufted carpet can only be defined in terms of a test method. Within this limitation, the test method has no known biases.

14. Keywords

14.1 carpet; edge ravel strength; loop pile floor covering; ravel; textile floor covering

TABLE 1 Inter-Laboratory Precision Analysis for Edge Ravel Resistance of Finished Loop Pile, Pile Yarn Floor Covering

Materials	Average Resistance (lb)	Sr	SR	R	R
Carpet A	1.611	0.181	0.440	0.507	1.233
Carpet B	2.593	0.581	0.600	1.627	1.678
Carpet D	1.013	0.360	0.360	1.009	1.009
Carpet F	1.274	0.243	0.297	0.680	0.830
Carpet G	3.781	0.283	0.733	0.793	2.052
Carpet H	2.519	0.613	0.613	1.717	1.717
Carpet I	2.645	0.284	0.321	0.795	0.899

TABLE 2 h Value Results Describing Between Lab Precision for Edge Ravel Resistance of Finished Loop Pile Yarn, Tufted Floor Coverings

Laboratory	Carpet Specimen						
	A	B	D	F	G	H	I
1	-0.61	-0.71	0.23	-0.01	1.16	0.23	0.59
2	-1.23	-1.35	0.24	-1.55	-0.98	-1.37	-0.35
3	1.02	0.47	-0.95	-0.19	-0.86	0.28	-0.73
4	1.02	0.47	-0.95	0.72	0.94	1.33	1.45
5	-0.19	1.11	1.44	1.02	-0.26	-0.47	-0.95

Critical h-statistic = 1.75

TABLE 3 k Value Results Describing Within Lab Precision for Edge Ravel Resistance of Finished Loop Pile Yarn, Tufted Floor Coverings

Laboratory	Carpet Specimen						
	A	B	D	F	G	H	I
1	1.16	0.73	1.46	0.78	0.39	0.30	0.84
2	1.46	0.30	0.16	0.95	0.93	0.77	1.42
3	0.64	1.31	1.16	1.44	0.97	1.10	0.67
4	0.64	1.31	1.16	0.86	1.59	0.90	1.13
5	0.84	0.96	0.42	0.82	0.71	1.51	0.73

Critical k-statistic = 1.91