

Standard Laboratory Test Practice For Measurement Of Surface Appearance Change Of Textile Floor Covering As A Result Of The Vacuuming Process

1. Scope

- 1.1 This test practice provides a laboratory test for the measurement of surface appearance change of textile floor covering as a direct result of the vacuuming process.
- 1.2 This test practice is applicable to all residential and/or commercial upright, canister, central, and combination vacuum systems.
- 1.3 This test practice may involve hazardous materials, operations, and equipment. This test practice 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 test practice to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Reference Document

- 2.1 ASTM D5684 Terminology Relating to Pile Yarn Floor Coverings
- 2.2 ASTM D7330 Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales.
- 2.3 CRI Surface Appearance Reference Scale Photographs (Residential and Commercial) from CRI TM 101

3. Precision & Bias

3.1 No precision and bias has been established.

4. Significance & Use

- 4.1 This test practice will determine the level of surface appearance change caused by specific vacuuming equipment on a standard carpet floor covering. The level of surface appearance change generated in the laboratory practice will differ from that in residential and commercial installations due to the type of vacuum, variations in floor covering styles, soil and other solid particulate compositions which may be present, the vacuuming process employed by individual operators, and other factors.
- 4.2 In order to provide a uniform basis for measuring the performance in section 1.1, specific equipment and floor covering materials are employed in this test method.

5. Apparatus

- 5.1 **Reciprocating Conveyor (or equivalent)** (See Annex A.5.1)
- 5.2 **Tachometer** scaled in feet/second. (See Annex A.5.2)
- 5.3 **CRI TM 101 Appearance Retention Scale Photographs** (See Annex A.5.3)
- 5.4 **Illumination System** (See Annex A.5.4)
- 5.5 **Dual-Range Light Meter** (See Annex A.5.5)
- 5.6 **Sample Rack** (See Annex A.5.6)

6. Reagents and Materials

6.1 Test Carpet (See Annex A.6.1)

Residential Cut Pile		Commercial Cut Pile	
Weight	25 oz/sq yd ± 7%	Weight	30 oz/sq yd ± 7%
Pile Height	0.470 inch	Pile Height	0.281 inch
Gauge	1/8	Gauge	1/10
Stitches/Inch	8	Stitches/Inch	9
Yarn	BCF Nylon 6	Yarn	BCF Nylon 6
Fluorochemical	No	Fluorochemical	No

6.2 Carpet Template (See Annex A.6.2)

7. Conditioning

- 7.1 Test room - temperature and humidity are maintained in standard laboratory conditions, 70° F ± 5° F and 50% ± 5% relative humidity in which all conditioning, sample preparation, and testing is performed.
- 7.2 All components involved in the test shall be exposed in the standard laboratory conditions for at least 16 hours prior to the start of the test.

8. Sampling, Test Specimens, and Test Units

- 8.1 Only one test vacuum unit is required for this test method. (See Annex A.8.1)
- 8.2 New carpet test material and carpet template material shall conform to 6.1 and 6.2.
- 8.3 Cut two 30.5 cm x 30.5 cm (12 inch x 12 inch) carpet samples of the appropriate test material. (See 6.1)
- 8.4 Mount one 30.5 cm x 30.5 cm (12 inch x 12 inch) test sample (see 6.1) into a carpet template of identical carpet (see 6.2), and mount assembly onto the reciprocating conveyor (or equivalent) (See Annex A.5.1)

- 8.5 Retain the second untested 30.5 X 30.5 cm (12" X 12") control sample for later use by raters in comparing surface appearance change as specified in this test method to the tested sample.
- 8.6 Mark all test specimens and control specimens with identification numbers and orient and mark each of the four edges (on the back) of both samples identically to aid with sample rotation and rater evaluation.
- 8.7 Condition all test samples and control samples for 16 hours prior to testing and maintain test and laboratory conditions until rater evaluations are completed. Place samples in a horizontal, non-ventilated sample rack. Do not stack samples against each other.

9. Vacuum Cleaner Conditioning

- 9.1 Preconditioning a new test vacuum cleaner by energizing the vacuum cleaner in a stationary position at the rated voltage $\pm 1\%$ and rated frequency with filters in place for one (1) hour.
- 9.2 Preconditioning New Rotating Agitator Type Test Vacuum Cleaner in a stationary position by energizing the vacuum cleaner for one (1) hour with the agitator bristles not engaged on any surface.
- 9.3 Preconditioning a New Straight-Air Canister Test Vacuum Cleaner by energizing the vacuum cleaner in a stationary position for one (1) hour with a wide-open air inlet with hose attached.

10. Procedure

- 10.1 Prepare test carpet specimens in accordance with section 8.
- 10.2 Place test carpet sample and clean carpet template assembly (see 8.3) on the reciprocating conveyor or equivalent (see 5.1) with pile lay, if present, towards the vacuum so that the process does not encounter a height difference at any edge of the sample. (See Annex A.10.2)

- 10.3 Install vacuum (with new bag) on conveyor as specified in 5.10. Position vacuum on the carpet template 4-6 inches in front of the carpet test specimen. Mount the stationary test vacuum unit in place on the conveyor with the handle in an inclined operating position at a vertical handle height of 888 mm (31 ½") above the test material and follow the manufacturer directions for any adjustable settings on the vacuuming equipment. All adjustable settings shall be recorded.
- 10.4 Verify reciprocating conveyor (or equivalent) speed is set at a specified 0.55 m (1.8 ft.) per second and set reciprocating conveyor counter for 50 passes. (Residential vacuums require a total of 200 passes, while commercial vacuums require a total of 900 passes in increments of 50 passes between sample turns.)
- 10.5 Energize test vacuum.
- 10.6 Activate continuous back and forth conveyor movement until 50 passes are achieved. Make sure that each pass begins and ends on the template, not on the test specimen.
- 10.7 Rotate the test specimen 90° after each set of 50 passes so that the test specimen is exposed from each of its four sides to achieve the 200 total passes (3 sample rotations) for residential vacuums, and 900 total passes (17 sample rotations) for commercial vacuums.
- 10.8 Return vacuum to the starting position on the carpet template, de-energize vacuum, and remove test sample.
- 10.9 Place sample in a horizontal, non-ventilated sample rack. Do not stack samples against each other.

11. Evaluation

- 11.1 Assess the level of appearance change within 24 hours of the conclusion of the test using the appropriate residential or commercial CRI Surface Appearance Reference Scale Photographs for determining surface appearance change (See Annex A.5.3).
- 11.2 Place unexposed control and exposed test samples under specified light source (see 5.4) such that the unexposed control sample and

exposed test sample are adjacent and pile lay is in the same direction.

- 11.3 Observe features such as loss of tip definition, matting and fuzzing, etc. per ASTM D7330 and CRI TM 101 for the carpet type specified in 6.1.
- 11.4 Determine if the degree of surface appearance change between the exposed and unexposed sample is worse than, equal to, or better than the appropriate reference photograph based on the rating scale in Table 1 (see 12.6).
- 11.5 Three assessors shall independently evaluate the sample. The assessors shall each observe the sample from a distance of 0.5 to 1.0 meter, (approximately 1.5 ft. – 3.0 ft.) at a 45° - 90° angle. Assessors shall observe the sample from various directions and determine the rating based upon the highest degree of surface change per ASTM D7330.

12. Report

- 12.1 Product test number, chain of custody number (CRI number), test date, test method conducted, vacuum name, model number, manufacturer, serial number, bag type, filter types, and vacuum height setting.
- 12.2 Complete carpet test material description, including carpet style and other specifications. (see 6.1)
- 12.3 Speed of travel of vacuum cleaner expressed in feet/second.
- 12.4 The number of total passes the vacuum cleaner made on the test carpet.
- 12.5 In accordance with Table 1, provide individual assessor rating on the test sample and the combined average rating of the texture appearance change rounded to the nearest whole number for the three assessors. The average numerical rating of the test sample indicates the texture change is better than, equal to, or worse than the standard reference photograph.

Table 1	
Surface Appearance Change Rating Scale	
Better	+1
Equal	0
Worse	-1

NOTE: A panel of carpet manufacturing technical personnel performed a blind examination of multiple textile floor covering samples with varying degrees of surface appearance change caused by multiple passes of a vacuum in a controlled environment. Based upon current appearance retention warranties a maximum level of appearance change caused by the vacuuming process was established.

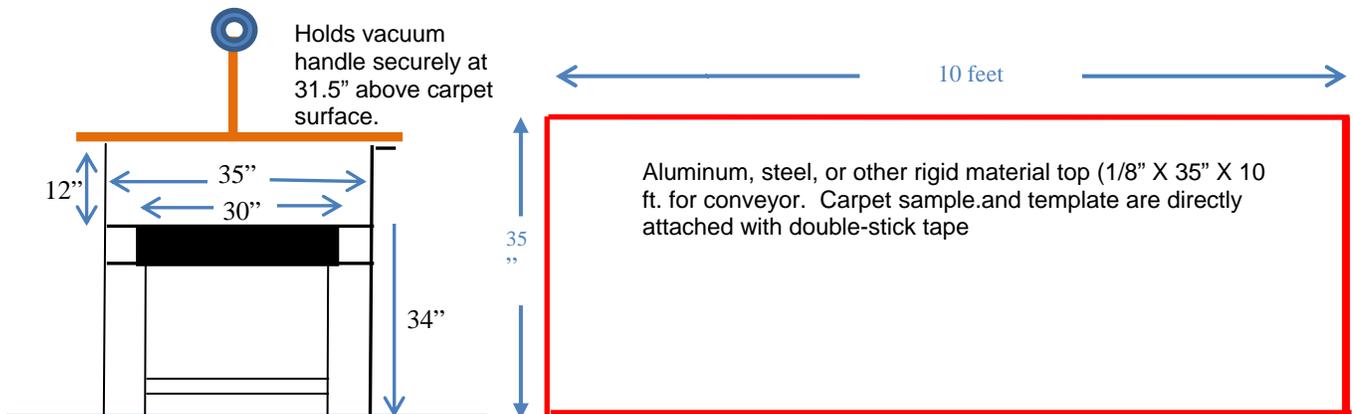
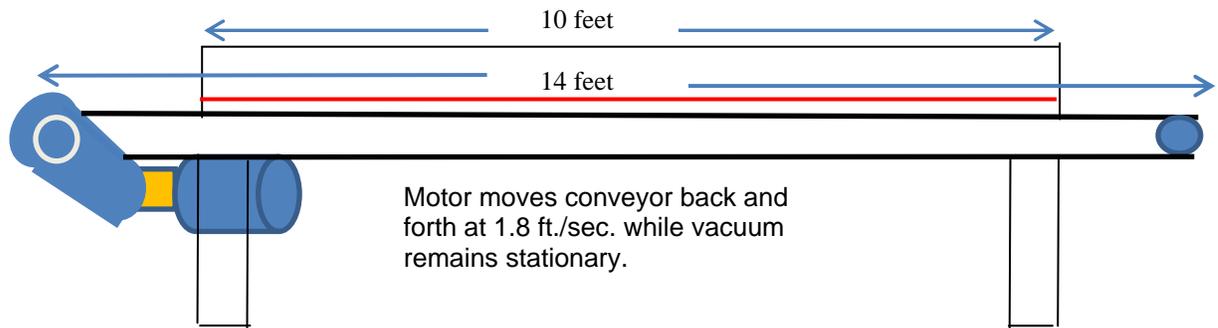
**ANNEX A
(Mandatory Information)**

A.5.0 Apparatus Details

A.5.1 Reciprocating Conveyor (or equivalent) with minimum bed length of 4.3 m (14 ft.) and width of 0.9 m (3 ft.) equipped with a 35" X 10 foot rigid metal plate loosely affixed to the conveyor, to which a carpet template and carpet test specimen may be attached. The conveyor must be capable of maintaining specified test speeds between 1 meter (3.3 ft.) per second and 0.55 meters (1.8 ft.) per second in a reciprocating cycle of forward and reverse directions. Conveyor bed must be equipped with brackets to hold the test vacuum in a stationary inclined operating position during testing with the vacuum handle at 888 mm (31 1/2") vertical height above the test material per the diagram below.

Perpetual Machines
706-226-1883

Reciprocating Carpet Conveyor Diagram



A.5.2 **Tachometer** used to measure conveyor speed in feet/second.

Grainger Industries
888-361-8649

A.5.3 **CRI Reference Photographs** for Surface Appearance Change in Carpets

CRI Reference Scales from CRI TM-101
Carpet & Rug Institute
<http://www.carpet-rug.org>

A.5.4 **Illumination System** capable of providing a minimum of 1500 lux ± 100 of Northern Sky Light (D65) or equivalent light source.

MacBeth Spectra Light Booth
X-Rite, Inc.
616-803-2678

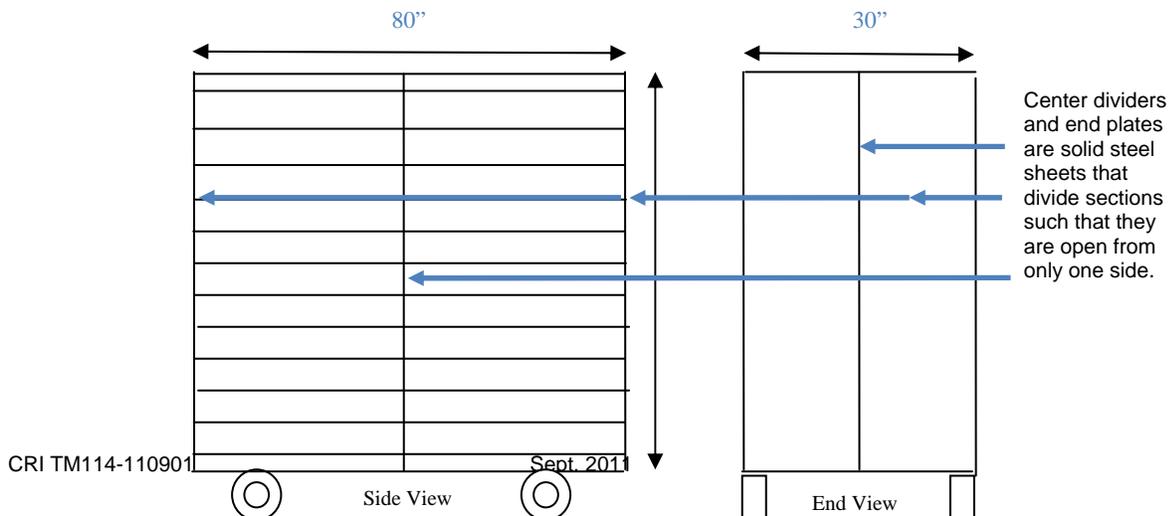
A.5.5 **Dual-Range Light Meter** cable of measuring up to 1800 lux.

Model 06-662-63
Fisher Scientific
800-766-7000

A.5.6 **Sample Rack (or equivalent)** - horizontal , non-ventilated per diagram below or adequate to keep entire sample flat .

Professional Testing Laboratory
706-226-3283

Sample Rack for 10 3/8" X 39 1/2" Sample Size



A.6.0 Reagents and Materials

A.6.1 Test Carpet

Residential Cut Pile*		Commercial Cut Pile*	
Weight	25 oz/sq yd ± 7%	Weight	30 oz/sq yd ± 7%
Pile Height	0.470 inch	Pile Height	0.281 inch
Gauge	1/8	Gauge	1/10
Stitches/Inch	8	Stitches/Inch	9
Yarn	BCF Nylon 6	Yarn	BCF Nylon 6
Fluorochemical	No	Fluorochemical	No

*NOTE: Test material selected is dictated by the client based on the intended use of the vacuum, residential, commercial, or both.

NOTE: Carpets are available as custom orders only.

Residential Cut Pile Carpet
Commercial Cut Pile Carpet

Style #: 42B61
Style #: M7165

Shaw Industries, Inc.
800-521-7429

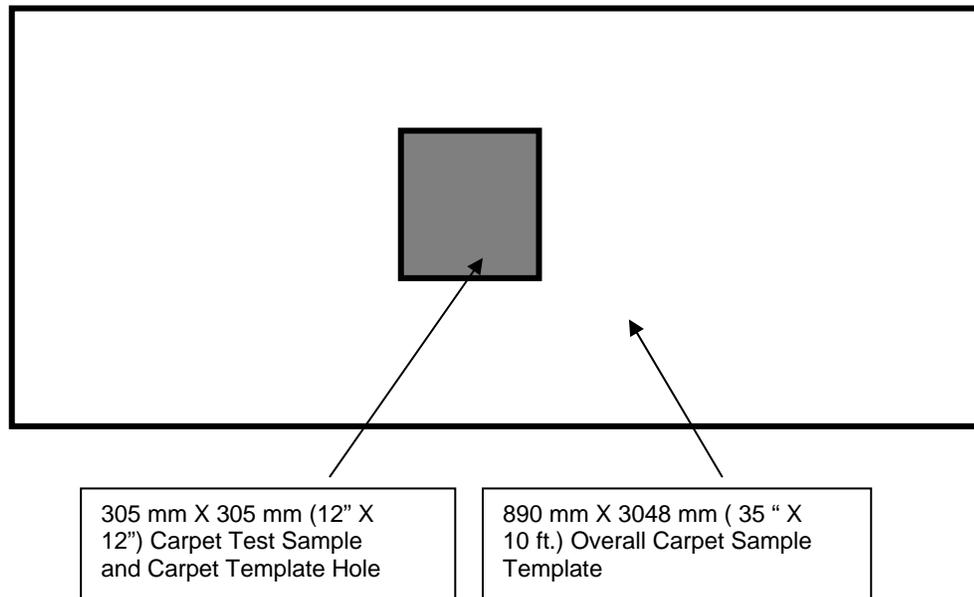
A.6.2 **Test Carpet Template** example is comprised of the same material as test sample and is a minimum of 10 cm (4 inch) wider on all four sides than the head of the test vacuum. The featured template is 35" X 10 feet and is mounted with double-sided tape to a 35" X 10 ft. rigid 1/8" plate loosely positioned on top of the conveyor using double sided tape. The carpet template must have a 31 cm x 31 cm (12 in x 12 in) square hole cut in the center to accept the sample without a surrounding height difference.

See Test Carpet A.6.1 and A.8.2

A.8.0 Sampling, Test Specimens, and Test Units

A.8.1 Note: Test vacuums are generally provided by the manufacturer with the understanding that the units provided are identical to those commercially available and have not been altered for the test.

A.8.2 Carpet Sample and Carpet Template Details



A.10.0 Procedure

- A.10.2 Note: Carpet templates may be vacuumed and reused unless they become visibly soiled or altered in appearance in ways that could affect test results.
- A.10.3 Note: If settings are provided, set the motor speed, suction regulator, nozzle height or combination thereof using the manufacturer's specifications provided in the vacuum cleaner instruction manual. Contact the manufacturer if no instructions are given, or if the instructions are unclear or inadequate.
- A.10.7 Note: The sample rotation requirement after each set of 50 passes creates the need to cut and mark each edge of the control and test carpet samples in the same way to identically orient for side-by-side assessment..