

Test Practice for Efficacy Evaluation of Encapsulate Solutions

Table of Contents

1.0 Scope.....	2
2.0 Referenced Documents	2
3.0 Terminology	2
4.0 Significance and Use	2
5.0 Apparatus, Materials, and Reagent	3
6.0 Conditioning	4
7.0 Initial Preparation and Conditioning of Test Carpet.....	4
8.0 Soil Application of Nylon Pellets	5
9.0 Soil Application of Test Carpet	5
10.0 Maintenance Procedure.....	6
11.0 Report	6
12.0 Precision and Bias.....	7



1.0 Scope

- 1.1 This is a standardized laboratory procedure for determining the efficacy of encapsulate solutions which are designed to be used between deep cleaning maintenance intervals.
- 1.2 The encapsulate solution is applied in a manner consistent with industry practice onto uniformly soiled control carpets then rated visually and instrumentally to determine the degree to which the solution was able to visually improve the appearance of the control carpet.
- 1.3 This test practice is applicable to all liquid encapsulate solutions to be applied using the industry practice.

2.0 Referenced Documents

- 2.1 Standard Test Method for Accelerated Soiling of Pile Yarn Floor Covering ASTM D6540-10.
- 2.2 ASTM F2828
- 2.3 AATCC Evaluation Procedure 1 - Gray Scale for Color Change
- 2.4 AATCC Evaluation Procedure 6 - Instrumental Color Measurement
- 2.5 AATCC Evaluation Procedure 7 - Instrumental Assessment of Color Change

3.0 Terminology

- 3.1 Encapsulate Solutions – solutions used between deep cleaning cycles designed to visually improve the appearance of a carpet.

4.0 Significance and Use

- 4.1 This test practice will provide an indication of the capability of an encapsulate solution to improve the appearance of soiled carpet. The level of visual improvement in the laboratory practice may differ from that in home/commercial installations due to variations in carpet styles, soil and other solid particulate composition, the maintenance process employed by individual operators and other factors.
- 4.2 In order to provide a uniform basis for measuring the performance, standardized test carpets and standardized test soil is employed in this practice.



5.0 Apparatus, Materials, and Reagent

- 5.1 Weighing scale accurate to 0.01 gram and having a capacity of at least 2000 grams.
- 5.2 Drum capable of containing a 263 mm x 1000 mm (10.4" x 39.4") test specimen.
- 5.3 Unitized Jar Mill
- 5.4 Nylon pellets (ULTRAMID® B2712)
- 5.5 Chrome alloy ball bearings 9.5 mm, (.375") diameter
- 5.6 AATCC Standard Dry Soil
- 5.7 Conveyor with a minimum bed length of 3 m (10 feet) and stroke of 2 m (7 feet) and minimum bed width of 89 cm (35 inches). Conveyor must be capable of maintaining specified test speed both forward and reverse. Conveyor must be equipped with brackets to hold the test equipment stationary, exert no horizontal or vertical force, and be capable of maintaining the handle height of the control maintenance equipment to assure proper test equipment contact with the test material.
- 5.8 Conveyor plate to which sample is affixed must be made of a rigid material. Suitable material is 6.4 mm (0.25"- inch) aluminum.
- 5.9 Tachometer used to measure conveyor speed in meters/second (feet/second).
- 5.10 Template comprised of the same material as test carpet a minimum of 10 cm (4 inches) wider than the head of test equipment mounted to conveyor plate using double sided fiber reinforced tape or other suitable mounting material.
- 5.11 Room conditioned and maintained at 50% ± 5% relative humidity and 21°C ± 2°C (70°F ± 5°F).
- 5.12 45/0 Spectrophotometer with one 25 mm (1 inch) or larger viewing aperture.
- 5.13 45/0 Spectrophotometer template comprised of ten (10) viewing locations. See **Diagram 1** for template blueprint.
- 5.14 Thermometer capable of ranges of 0°C to 100°C (32°F to 212°F) with a minimum one degree centigrade resolution.
- 5.15 Control vacuum Machine with rotating agitator head with soil removal performance range as specified in ASTM F2828.
- 5.16 A control pump up sprayer minimum 1 gallon capacity, capable of a fan spray pattern providing a uniform application of the solution.
- 5.17 Standard Test Material (See **Table 1**)
- 5.18 Control Test Equipment (See **Table 2**)



Table 1

Commercial Loop Pile	
Style	10203
Weight	30 oz/sq yd
Color	00201
Finished Pile Thickness	0.115 Inch
Gauge	1/10
Stitches/Inch	10
Yarn	Nylon
Fluorochemical	No

Table 2

Control Test Equipment	
Vacuum Specifications¹	Vacuum motor 1000 watt, 80 inch waterlift, 105 cfm; Brush motor 14 inch, 150 watt; Filtration 99.6% at 0.3 microns 76 in. ² filtration area; Electrical operates on 120 volt, 60 cycle
Twin Cylindrical Brush roll Agitator Specifications²	14" brush width, 380 RPM, 47 lb, 800 watt motor, 110 volt, 60 cycle
Brush Type	Blue Control Brush – Bristle length: 34mm, bristle denier: 0.35 mm, brush density: 50 bristles/hole; 4 holes per 1 cm ² = 224 holes/brush

6.0 Conditioning

- 6.1 Test room - temperature and humidity are maintained in standard laboratory conditions, 50% ± 5% relative humidity and 21.1°C ± 2°C (70°F ± 5°F) in which all conditioning and testing is conducted.
- 6.2 All components involved in the test shall remain and be exposed in the test room for at least 16 hours prior to the start of the test.

7.0 Initial Preparation and Conditioning of Test Carpet

- 7.1 New test carpet shall conform to 5.17, **Table 1**.
- 7.2 Cut three (3) samples of the test carpet to fit the inside wall of the soiling drum. The long dimension should be parallel to the machine direction.
- 7.3 Mark the test specimen with test identification number
- 7.4 Prepare carpet for testing by vacuuming to remove loose fibers with the control vacuum, using 10 passes at 5.5 cm/second (1.8 ft./second).

¹ Recommend Windsor Versamatic - found suitable for this application

² Recommend Brush Pro 17 – found to be suitable for this application



8.0 Soil Application of Nylon Pellets

- 8.1 Place two (2) grams of the standard AATCC dry soil for each 1000 grams of Nylon pellets (ULTRAMID® B2712) into a 3.8 liter (2.0 gal) cylindrical container.
- 8.2 Rotate the container on the jar mill for 30 minutes at 37 ± 3 rpm reversing the direction of rotation after 15 minutes.
- 8.3 The soiled pellets are ready for use.

9.0 Soil Application of Test Carpet

- 9.1 Collect, record and average ten (10) Lab measurements on a specimen of the test carpet using template A and the spectrophotometer. Report as “initial” Lab.
- 9.2 Secure the carpet to the inside wall of the drum, (double-sided tape may be used). Make sure the sample is firmly attached and properly contoured to the curvature of the drum, otherwise non-uniformities will occur.
- 9.3 Position the soiling drum containing the test carpet on its side. Place 3 ± 0.2 grams of the chrome alloy ball bearings per square inch of the test material into the drum. Spread 150 ± 2 grams of the soiled nylon pellets over the ball bearings inside the soiling drum.
- 9.4 Close the drum and rotate on jar mill at 40 rpm for 30 ± 1 minutes.
- 9.5 Open drum, remove the ball bearings, pellets and carpet sample. Physically remove any loose pellets from the carpet.
- 9.6 Place the soiled carpet into a clean conveyor template from the same carpet construction. Double sided tape may be used to secure the sample to the conveyor plate.
- 9.7 Make four (4) passes in the long direction with the control vacuum cleaner at 0.55 m/second (1.8 feet/second). (Note: Ensure the last stroke of the vacuum is in the direction of the pile lay, if present).
- 9.8 Repeat measuring steps as described in 9.1 for the soiled carpet in the same ten (10) places and calculate the ΔE and AATCC Gray Scale rating and record as initial soil level. **The ΔE is the mean light difference between the original and the soiled test specimens according to the following formulae:**

$$\Delta E = \sqrt{[(L_o - L_s)^2 + (a_o - a_s)^2 + (b_o - b_s)^2]}$$

Where L_o , a_o , and b_o are the mean co-ordinates of the original test specimen and L_s , a_s and b_s are the mean co-ordinates of the soiled test specimens.



- 9.9 The initial target level of soiling is $\Delta E 7.0 \pm 0.6$, equivalent to step 2 on the AATCC Gray Scale. All soiled carpets released for use in this procedure will fall within the predetermined target level of soiling.

NOTE: The amount of soiled pellets used in the drum may need to be adjusted in order to achieve the desired soil level yielding a ΔE of 7.0 ± 0.6 , which corresponds with step 2 of the AATCC Gray Scale for Color Change.

- 9.10 The soiled carpet sample must be labeled with the date it was prepared. Cleaning must be accomplished within seven (7) days from the time of carpet soiling.

10.0 Maintenance Procedure

- 10.1 Place the soiled carpet sample in an appropriate template of the same carpet so that a larger carpet sample is presented to the maintenance equipment, and the maintenance process overlaps the sample sides. Confirm equipment settings meet those outlined in Section 5.0, **Table 2**.
- 10.2 In general the encapsulate process will include a vacuuming step (see 9.7), followed by application of the encapsulate solution, followed by an agitation step and a final vacuum step.
- 10.2.a Application rate must be on the label or specified on the Seal of Approval Registration Form. Default application rate is 500 sq. ft. per gallon
 - 10.2.b Follow manufacturer dilution ratio. If multiple dilution ratios are listed the highest concentration will be used.
 - 10.2.c Using the Control Agitator, make four (4) passes in the long direction at 0.55 m/second (1.8 feet/second). (Note: Ensure the last stroke of the control agitator is in the direction of the pile lay, if present).
 - 10.2.d Allow the test specimens to dry a minimum of 16 hours. Complete the maintenance procedure by making four (4) passes in the long direction with the control vacuum cleaner at 0.55 m/second (1.8 feet/second). (Note: Ensure the last stroke of the vacuum is in the direction of the pile lay, if present).
- 10.3 After completing the maintenance process, the carpet samples are to be stored horizontally on a non-ventilated rack in standard laboratory conditions. Final evaluation shall occur after a minimum of 16 hours, and not longer than 72 hours.
- 10.4 Collect, record and average ten (10) Lab measurements on a cleaned specimen of the test carpet using the procedure as described in 9.8. Report as "final" ΔE Lab and AATCC Gray Scale rating. The final ΔE is the mean light difference between the original and the cleaned test specimens.

11.0 Report

- 11.1 Complete product description of the solution tested including dilution ratio and application rate.
- 11.2 "Initial" and "final" average soil levels as measured by spectrophotometer. Report ΔE , Lab and AATCC Gray Scale rating.
- 11.3 Carpet sample specifications.



- 11.4 Maintenance process details. Details of the equipment, number of passes, speed of each pass, equipment settings, brush rolls employed, etc.
- 11.5 Report any deviations from this test practice.

12.0 Precision and Bias

- 12.1 Precision – No interlaboratory test have been performed; therefore, no precision statements regarding the repeatability and reproducibility of this test methods are available at this time.
- 12.2 Bias – No justifiable statement can be made on the accuracy of this test method since the true value of the property cannot be established by an acceptable referee method.

Diagram 1

