

Test Method for Colorfastness to Flat Abrasion (Frosting): Emery

Foreword

This test method was developed from the Celanese Corp's test procedure APD; EL 9C, and was known as the Celanese Test. This method approximates localized color change similar to that produced on some garments over relatively long periods of actual wear in which the garment is exposed to relatively severe abrasive action. To evaluate the effect of relatively mild abrasion action, refer to AATCC TM119.

1. Purpose and Scope

1.1 This test method is intended for evaluating the resistance of colored fabrics to changes in shade caused by flat abrasion.

1.2 It can be used for all colored fabrics, but is especially sensitive to poor dye penetration in all-cotton fabrics and to abrasion-caused changes in color of union-dyed blends.

2. Principle

2.1 The fabric specimen is mounted over a diaphragm inflated under controlled air pressure and rubbed multi-directionally against an emery abradant surface mounted on a weighted head. After rinsing and conditioning, specimens are evaluated for color change. Color change is reported as a grade from 5 to 1, with 5 representing no color change and 1 representing the most color change.

3. Referenced Documents

NOTE: Use current versions of all publications unless otherwise specified.

3.1 AATCC EP1, Evaluation Procedure for Gray Scale for Color Change (see 14.1).

3.2 AATCC EP7, Evaluation Procedure for Instrumental Assessment of the Change in Color of a Test Specimen (see 14.1).

3.3 AATCC LP1, Laboratory Procedure for Home Laundering: Machine Washing (see 14.1).

3.4 AATCC TM119, Test Method for Colorfastness to Flat Abrasion (Frosting): Screen Wire (see 14.1).

3.5 ASTM D1776, Standard Practice for Conditioning and Testing Textiles (see 14.2).

4. Terminology

4.1 **abrasion**, n.—the wearing away of any part of a material by rubbing against another surface.

4.2 **frosting**, n.—in textiles, a change of fabric color caused by localized abrasive wear. (Syn: *differential wear*, *fibrillation*).

NOTE: Frosting may be the result of differential wear, as in multicomponent blends in which the fibers do not match in shade, or of the abrasion of single-fiber constructions in which there is a variation in, or incomplete penetration of dye.

5. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Users MUST consult manufacturers for specific details such as safety data sheets and other manufacturer's recommendations. Consult and follow all applicable OSHA standards and rules.

5.1 Follow good laboratory practices. Wear safety glasses in all laboratory areas.

5.2 Follow manufacturer's safety recommendations when operating laboratory testing equipment.

6. Apparatus and Materials (see 14.3)

6.1 Conditioning facilities and racks with pull-out, perforated shelves for laying specimens flat (see 14.1).

6.2 Stoll-Universal Wear Tester

6.3 Rubber diaphragm, without electrical contact point.

6.4 Emery polishing paper, 600 grit, 3.8 × 22.8 cm (see 14.4).

6.5 Vacuum cleaner.

6.6 Towels, for blotting specimens after rinsing.

6.7 Cloth, white cotton, for ironing.

6.8 Hand iron.

6.9 Equipment and environment for evaluating color change.

6.9.1 For visual evaluation, use Gray Scale for Color Change (see 14.1). Refer to AATCC EP1 for additional materials and use of gray scale.

6.9.2 For instrumental evaluation, use a spectrophotometer as specified in AATCC EP7.

7. Specimens

7.1 Cut 2 circular specimens approximately 10.8 cm in diameter. Take no specimen within one-tenth of the width of the fabric from either selvage.

7.2 Mark length direction on back side of specimen.

8. Conditioning

8.1 Prior to testing, condition test specimens as directed in ASTM D1776. (Use conditions indicated in Table 1 for Textiles, general. Estimate conditioning time as indicated in Table 2 for the appropriate fiber content.) Lay each swatch or product, separately, on a screen or perforated shelf of a conditioning/drying rack.

9. Preparation of Specimens and Apparatus

9.1 To obtain information pertinent to the behavior of the fabric in actual use, it may sometimes be desirable to pretreat test specimens, as by laundering, before subjecting them to the frosting test. See AATCC LP1 for standard home laundering procedures.

9.2 At regular intervals, check the operation of the frosting tester with one or more standard fabrics of known frosting properties.

9.3 Verify that instrument head will neither fall forward nor tilt backward when not loaded with weights. If the head is not balanced, the abrasion pressure between screen and fabric will be altered.

10. Procedure

10.1 Conduct the test in the standard atmosphere for testing textiles: 65 ± 5% relative humidity and 21 ± 2°C (70 ± 4°F).

10.2 Place an unused strip of emery paper around the abradant plate and clamp at each end. Apply the minimum amount of tension on the paper that is necessary to make it lie flat against the lower surface of the abradant plate.

10.3 Place the first test specimen (face up) over the rubber diaphragm (without electrical contact) so that the fabric is free from wrinkles. Clamp the test specimen against the diaphragm with the clamping ring, taking care not to distort the fabric.

10.4 Set the air pressure on the diaphragm to 20.68 kPa and place a 1361-g load on the balanced head.

10.5 Engage the rotation mechanism of the specimen clamp to cause multidirectional abrasion on the specimen.

10.6 Gently lower the abradant plate with the emery paper until it contacts the specimen, and push the “start” button. (The lower carriage should oscillate at a speed of approximately 120 cycles/min).

10.7 Allow the carriage to oscillate for 100 continuous cycles, and then stop the machine.

10.8 Remove the test specimen from the machine and vacuum it to remove fiber and abradant residue.

10.9 Hand rinse the test specimen in clear lukewarm water at 38°C (100°F) to remove remaining detritus; blot between towels to remove excess water.

10.10 Place specimen face down between two pieces of clean white cotton cloth and press with a hand iron set at approximately 149°C (300°F) until dry.

10.11 Repeat the procedure for the remaining specimen.

10.12 If a specimen slips in the clamp, the air pressure does not remain constant or an abnormal wear pattern is obtained, discard the specimen and repeat the test on an additional specimen.

10.13 Recondition specimens as described in Section 8 before evaluating.

11. Evaluation

11.1 For visual evaluation, evaluate color change of each abraded specimen as directed in AATCC EP1, with modified viewing angles.

11.1.1 Place the specimen flat on the viewing table with the illumination overhead. The light should be sufficiently diffused so that shadows are not caused by viewing the specimen from overhead. Align the specimen with machine (warp or wale) direction in the line of sight.

11.1.2 Keep the specimen stationary while the viewer moves to adjust viewing angle. Scan the specimen at 0.27-1.57 rad (15°-90°) overhead.

11.1.3 Turn the specimen to align the cross (filling or course) direction with the line of sight. Scan at 0.2-1.57 rad (15°-90°) overhead.

11.2 For instrumental evaluation, evaluate color change of each abraded specimen as directed in AATCC EP7.

12. Report

12.1 Describe or identify the sample tested.

12.2 Report that the sample was tested using AATCC TM120-2019.

12.3 Report the testing conditions:

12.3.1 Emery paper used.

12.3.2 Evaluation procedure for color change (AATCC EP1 or AATCC EP7).

12.4 Report the test results:

12.4.1 Individual and average color change grade for tested specimens.

12.5 Describe any modification(s) of the published method.

13. Precision and Bias

13.1 *Precision*. Precision for this test method has not been established. Until a precision statement is generated for this test method, use standard statistical techniques in making any comparisons of test results for either *within-laboratory* or *between-laboratory* averages.

13.2 *Bias*. The color change due to flat abrasion, frosting, emery method, can be defined only in terms of a test method. There is no independent method for determining the true value. As a means of

estimating this property, the method has no known bias.

14. Notes

14.1 Available from AATCC, PO Box 12215, Research Triangle Park, NC 27709, USA; +1.919.549.8141; ordering@aatcc.org; www.aatcc.org.

14.2 Available from ASTM International, 100 Barr Harbor Dr, W Conshohocken PA 19428, USA; +1.610.832. 9500; www.astm.org.

14.3 For potential equipment information pertaining to this test method, please visit the online AATCC Buyer's Guide at www.aatcc.org/bg. AATCC provides the possibility of listing equipment and materials sold by its Corporate members, but AATCC does not qualify, or in any way approve, endorse or certify that any of the listed equipment or materials meets the requirements in its test methods.

14.4 The method originally called for 0 grade emery paper. The current specification of 600 grit provides the same abrasive action, but is a more precise measure and should be consistent among manufacturers.

15. History

15.1 Revised (with title change) in 2019 for clarification and alignment of format with AATCC style.

15.2 Editorially revised 2016. Editorially revised and reaffirmed 2013. Editorially revised 2010. Reaffirmed 2009. Editorially revised and reaffirmed 2004. Reaffirmed 1999. Editorially revised 1997. Editorially revised and reaffirmed 1994. Reaffirmed 1989. Editorially revised 1986. Editorially revised and reaffirmed 1984. Editorially revised and reaffirmed 1980. Reaffirmed 1977. Reaffirmed 1974. Reaffirmed 1970.

15.3 Developed in 1967 by AATCC Committee RR29. Maintained by RA99.