

Color Change Due to Flat Abrasion (Frosting): Emery Method

Developed in 1967 by AATCC Committee RA29; reaffirmed 1970, 1974, 1977, 1989, 1999, 2004; editorially revised and reaffirmed 1980, 1984, 1994, 2004; editorially revised 1986, 1997.

1. Purpose and Scope

1.1 This test method (see 10.1) is intended for evaluating the resistance of colored fabrics to changes in shade caused by flat abrasion. 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.

1.2 The test method produces, in an accelerated manner, a 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 abrasion action (see 10.2).

2. Principle

2.1 The fabric specimen is mounted over a diaphragm inflated under controlled air pressure and rubbed multidirectionally against an emery abrasant surface mounted on a weighted head. Any change in color of the specimen is evaluated by comparison with the Gray Scale for Color Change.

3. Terminology

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

3.2 **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.

4. 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. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

4.2 Manufacturer's safety recommendations should be followed when operating laboratory testing equipment.

5. Apparatus and Materials

5.1 CSI Stoll-Universal Wear Tester Model CS-22C, or CSI Surface Abrader Model CS-59 (see 10.3).

5.2 Rubber diaphragm without electrical contact point (see 10.3).

5.3 "O" emery polishing paper, 3.8 × 22.8 cm (see 10.4).

5.4 Vacuum cleaner.

5.5 Gray Scale for Color Change (see 10.5).

6. Test Specimens

6.1 Cut two circular specimens approximately 10.8 cm in diameter. No specimen shall be taken within one-tenth of the width of the fabric from either selvage.

6.2 Condition the specimens under standard conditions of 65 ± 2% relative humidity and 21 ± 1°C until they reach equilibrium.

7. Procedure (see 10.6 and 10.7)

7.1 Conduct the test in the standard atmosphere for testing textiles.

7.2 Place an unused strip of "O" emery abrasive paper beneath the abrasant 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 abrasant plate.

7.3 Place the 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.

7.4 Set the air pressure on the diaphragm to 20.68 kPa, and place a 1361 g load on the balanced head (see 10.8).

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

7.6 Gently lower the upper carriage

with the "O" 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).

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

7.8 Remove the test specimen from the machine and vacuum it to remove fiber and abrasant residue.

7.9 Hand rinse the test specimen in clear lukewarm water at 38°C to remove remaining detritus; blot between towels to remove excess water.

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

7.11 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 (see 10.7).

8. Evaluation

8.1 Examining the abraded specimen under north sky light or an equivalent light source with illumination of at least 538 lx on the specimen surface.

8.2 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. The specimen should remain stationary and the viewer assume the angles of viewing. First, view the specimen with the warp direction in the line of sight by scanning the specimen at angles from 0.27-1.57 RAD (15-90°) overhead. Then turn the specimen and repeat for the fill-direction.

8.3 Rate the color change by comparing with the Gray Scale for Color Change and record the lowest grade observed for each specimen in accordance with the following scale:

Grade 5—negligible or no change as shown in Gray Scale Step 5.

Grade 4.5—change in color equivalent to Gray Scale Step 4-5.

Grade 4—change in color equivalent to Gray Scale Step 4.

Grade 3.5—change in color equivalent to Gray Scale Step 3-4.

Grade 3—change in color equivalent to Gray Scale Step 3.

Grade 2.5—change in color equivalent to Gray Scale Step 2-3.

Grade 2—change in color equivalent to Gray Scale Step 2.

Grade 1.5—change in color equivalent to Gray Scale Step 1-2.

Grade 1—change in color equivalent to Gray Scale Step 1.

8.4 Report the average for two specimens.

9. Precision and Bias

9.1 *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.

9.2 *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.

10. Notes

10.1 This test method was developed from the Celanese Corporation's test procedure APD; EL 9C, and was known as the Celanese Test.

10.2 See AATCC Method 119 (Screen Wire Method) for a test designed to simulate the effect of relatively mild abrasive action.

10.3 This equipment is available from SDL Atlas L.L.C., 1813A Associate Lane, Charlotte NC 28217; tel: 704/329-0911; fax: 704/329-0914; e-mail: info@sdlatlas.com.

10.4 It is suggested that to minimize variability of results Behr-Manning Company's O emery abrasive paper be used and is available from SDL Atlas L.L.C., 1813A Associate Lane, Charlotte NC 28217; tel: 704/

329-0911; fax: 704/329-0914; e-mail: info@sdlatlas.com.

10.5 The Gray Scale for Color Change is available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: 919/549-8141; fax: 919/549-8933; e-mail: orders@aatcc.org.

10.6 To obtain information pertinent to the behavior of the fabric in actual use, it is sometimes desirable to pretreat test specimens, as by laundering, before subjecting them to the frosting test.

10.7 At regular intervals, check the operation of the frosting tester with one or more standard fabrics of known frosting properties. A satisfactory calibration test fabric has not yet been found by AATCC Research Committee RA29 on Abrasion Resistance.

10.8 A balanced 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.