

Color Change Due to Flat Abrasion (Frosting): Screen Wire Method

Developed in 1967 by AATCC Committee RA29; reaffirmed 1970, 1974, 1977, 1989, 1999, 2004; editorially revised and reaffirmed 1979, 1984, 1994; editorially revised 1980, 1985, 1986, 1997.

1. Purpose and Scope

1.1 This test method (see 11.1) is intended for evaluating the resistance of colored fabrics to change in shade caused by flat abrasion. It can be used for all colored fabrics, but is especially sensitive to the color change of durable press cross-dyed blend fabrics, in which one fiber is abraded away faster than another.

1.2 The test method produces in an accelerated manner, a localized color change similar to that produced on some garments over relatively short periods of actual wear in which the garment is exposed to relatively mild abrasive action (see 11.2).

2. Principle

2.1 The fabric specimen is mounted over a foam rubber cushion and rubbed multidirectionally against a wire screen mounted on a weighted head. Any change in the 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 A schematic diagram of the frosting unit is shown in Fig. 1.

5.2 CSI Stoll—Universal Wear Tester Model CS-22C, or CSI Surface Abrader Model CS-59 (see 11.3 and Fig. 2).

5.3 Circular frosting specimen holder (see 11.3 and 11.4).

5.4 Rubber O ring (see 11.3).

5.5 Conical mounting piece (see 11.3).

5.6 Abradant, stainless steel wire

screening, 16 mesh, 0.23 mm wire (see 11.3).

5.7 Side clamps (see 11.3).

5.8 Gray Scale for Color Change (with intermediate steps) (see 11.5).

6. Test Specimens

6.1 Cut a minimum of two 127 × 127 mm specimens from each sample (see 11.6). No specimen shall be taken from within one-tenth of the width of the fabric from either selvage.

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

7. Procedure (see 11.7 and 11.8)

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

7.2 Remove the circular surface abra-

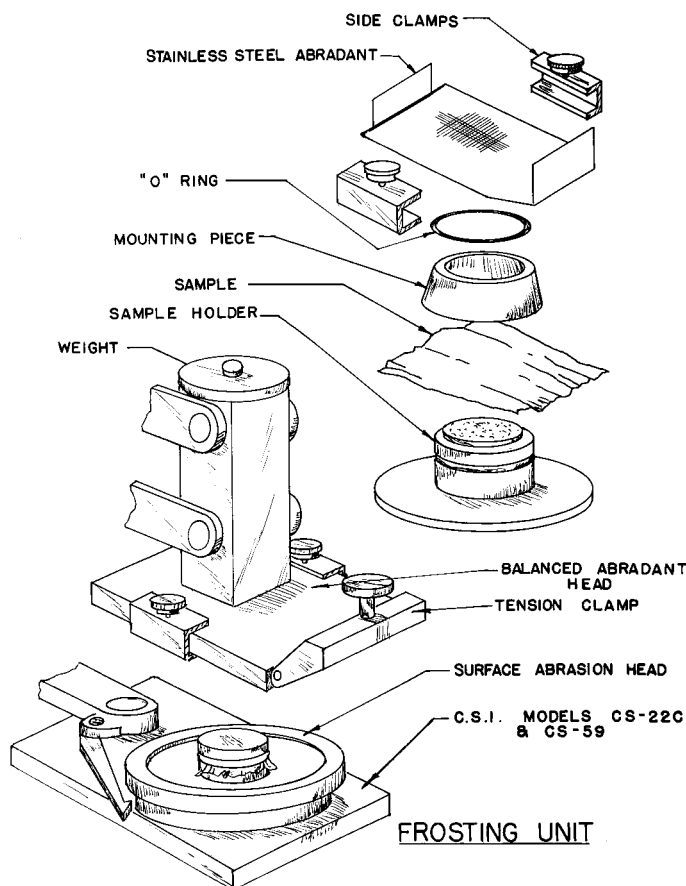


Fig. 1—Schematic drawing of frosting unit.



Fig. 2—C.S.I. Surface Abrader prepared for frosting test.

sion head from the reciprocating table of the abrasion tester by removing the circular locking stud in the center. Use the special two-pronged wrench supplied with the Frosting Unit.

7.3 Insert circular frosting specimen holder in surface abrasion head, place the metal O ring over specimen holder, and lock in place with screw collar.

7.4 Place the test specimen face up and centrally over the specimen holder, and then place the conical mounting piece over the specimen. (This mounting piece holds the specimen over the foam rubber cushion and facilitates the insertion of the rubber O ring over the test specimen into the groove. The rubber O ring holds the sample firmly in place without distortion during the test.) Insert the rubber O ring over the specimen into the groove, and remove the mounting piece.

7.5 Replace the surface abrasion head holding the test specimen onto the reciprocating table.

7.6 Attach the stainless steel screen (see 11.9) to the abradant plate by clamping screen ends in the abradant plate. Apply necessary tension by means of the front tension clamp. Secure sides with side clamps.

7.7 Apply head weights totaling 1134 g to the balanced abradant head (see 11.10).

7.8 Adjust rotary motor pawl to rotate the surface abrasion head approximately one revolution per 100 cycles.

7.9 Gently lower the head until it contacts the test specimen and push the "start" button. Abrade for 1200 cycles and stop the machine.

7.10 Remove abrasion head with the abraded specimen and remove the test specimen.

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

7.12 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.

8. Evaluation

8.1 Examine 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 angle of viewing. First, view the specimen with the warp direction in the line of sight by scanning the specimen at angles from 0.2-1.57 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 grade for specimens from each sample.

9. Report

9.1 Report the average grade and the number of specimens tested.

10. Precision and Bias

10.1 *Interlaboratory Test Data.* Interlaboratory tests were conducted in 1966 and 1967 in which five laboratories each made two observations on each of eight fabrics. The components of variance, ex-

pressed as standard deviations, were calculated to be: *Within-laboratory* component, 0.3 Gray Scale units; *Between-laboratory* component, 0.5 Gray Scale units.

10.2 *Precision.* For the components of variance reported in 10.1, two averages of observed values should be considered significantly different at the 95% probability level if the difference equals or exceeds the critical differences listed in Table I.

10.3 *Bias.* No justifiable statement on bias can be made since the true value cannot be established by an independent method.

11. Notes

11.1 This test method was developed by an industry committee, and was known as the Industry Committee Test. For additional information about this method, see A Proposed Test Method to Evaluate Frosting Potential Caused by Abrasive Wear, *American Dyestuff Reporter*, Vol. 54, No. 24, 42-9, 1965.

11.2 See AATCC 120 (Emery Method) for a test designed to simulate the effect of relatively severe abrasion action.

11.3 This equipment may be obtained 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. The stainless steel screen should be obtained from this standard source since there may be differences in the screen wire obtained from other sources.

11.4 When the specimen holder with the foam rubber cushion is first received, or after it has been used extensively, the plane of the surface of the rubber head may not be in perfect alignment with the abradant plate. This may lead to poor or uneven wear pattern. Such a condition can be rectified by abrading the rubber surface (without specimen) on the tester with "0" emery cloth under a 1134 g head weight.

11.5 The Gray Scale for Color Change (with intermediate steps) may be ordered from AATCC, P.O. Box 12215, Research Triangle

Table I—Critical Difference, Gray Scale Units, For the Conditions Noted*

Number of Observations in Each Average	Within-Laboratory Precision	Between-Laboratory Precision
2	0.4	1.4
4	0.3	1.4
8	0.2	1.4

*The critical differences were calculated using $t = 1.960$, which is based on infinite degrees of freedom.

Note: The tabulated values of the critical differences should be considered a general statement. The above is a general statement, particularly with respect to between-laboratory precision. Before a meaningful statement can be made about two specific laboratories, the amount of statistical bias, if any, between them must be established with each comparison being based on recent data obtained on randomized specimens from one sample of the material to be tested.