

Test Method for Colorfastness to Storage: Dye Transfer

1. Purpose and Scope

1.1 The storage of garments made with component parts of more than one shade sometimes results in the transfer of dye from one area to another, normally from the darker to the lighter shade. This phenomenon is distinct from sublimation because it occurs below the sublimation temperature of dyes as well as with non-subliming dyes.

1.2 Dye transfer occurs when garments are folded with different shades in intimate contact with each other. Normally the amount of dye transferred is intensified when moisture is present, and thus the problem is more severe during warm, humid weather or when garments are steamed immediately before storage. Storage in plastic bags tends to maintain the initial relative humidity of the garment environment and can aggravate or reduce transfer depending on the condition of the fabric when it enters the bag.

1.3 This test method is intended to estimate if color transfer might be expected to occur during prolonged periods of storage. In general, no problems will be expected under normal conditions of storage or time-delay, if color transfer does not occur under the conditions specified in Section 7 (Procedure).

1.4 This test method may be used also to assess potential color transfer problems that relate to finishing. Some dyes are inherently more prone to transfer than others, and some chemical finishes and finishing conditions accelerate transfer.

2. Principle

2.1 Dyed and finished test specimens are sandwiched between pre-wet multifiber fabric and a selected second fabric, placed in a Perspiration Tester for 48 h at room temperature, dried and rated.

3. Terminology

3.1 **colorfastness**, *n.*—the resistance of a material to change in any of its color characteristics, to transfer of its colorant(s) to adjacent materials or both, as a result of the exposure of the material to any environment that might be encountered during the processing, testing, storage or use of the material.

3.2 **dye**, *n.*—a colorant applied to or formed in a substrate, via the molecularly dispersed state, which exhibits some degree of permanence.

3.3 **transfer**, *n.*—*in textile processing, testing, storage and use*, movement of a

chemical, dye or pigment between fibers within a substrate or between substrates.

4. Safety Precautions

NOTE: These safety precautions are for information purposes and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials and equipment 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.

4.3 Observe padder safety. Ensure adequate guard at the nip point. Normal safeguards on pad should not be removed. A foot-operated kickoff is recommended.

5. Apparatus and Materials (see 11.1)

5.1 Perspiration tester.

5.2 Plastic bag, polyethylene, large enough to contain perspiration tester.

5.3 Multifiber Test Fabric (8 mm [0.33 in.] bands) containing acetate, cotton, nylon, polyester, acrylic and wool.

5.4 White fabric of same fiber composition as test specimens. If not available, cotton cloth as defined in AATCC TM8, Test Method for Colorfastness to Crocking: Crockmeter.

5.5 Distilled or deionized water.

5.6 Evaporating dish or glass beaker having the capacity to hold 50 mL of water. Wet sponge may also be used.

5.7 AATCC 9-Step Chromatic Transference Scale (AATCC EP8) (see 11.2)

5.8 Gray Scale for Staining (AATCC EP2) (see 11.2)

5.9 Gray Scale for Color Change (AATCC EP1) (see 11.2).

6. Test Specimens

6.1 Prepare 5.7×5.7 cm (2.25×2.25 in.) test specimens from each sample of the dyed fabric to be tested.

6.2 Prepare 5.7×5.7 cm (2.25×2.25 in.) multifiber and 5.7×5.7 cm (2.25×2.25 in.) white fabric swatches.

7. Procedure

7.1 Option I.

7.1.1 Immerse in distilled or deionized water at $24 \pm 3^\circ\text{C}$ ($75 \pm 5^\circ\text{F}$) both the multifiber fabric and the fabric selected for the opposite side of the sandwich (see 5.4). The wet pickup of these fabrics should be 100-110% (see 11.3). Do not wet out the specimen to be tested to prevent removal of dye or finish before testing begins.

7.1.2 Prepare a sandwich with the dyed test specimen between pre-wet multifiber cloth and the pre-wet white swatch (see 5.4).

7.1.3 Clamp the sandwich (prepared as directed in 7.1.2) between two clean plates of the Perspiration Tester. Set the Perspiration Tester as instructed in 9.4.1 of AATCC TM15, Colorfastness to Perspiration, except that the unit is not placed in an oven.

7.1.4 Enclose the Perspiration Tester in a polyethylene bag along with a dish (see 5.6) containing at least 50 mL of distilled or deionized water to maintain high relative humidity in the polyethylene bag. Seal the opening in the bag with a twist tie or rubberband if zipping bag is not used (see 5.2). Allow to remain 48 h at room temperature ($24 \pm 3^\circ\text{C}$ [$75 \pm 5^\circ\text{F}$]). Take care that the Perspiration Tester does not fall into the water dish (see 11.4).

7.1.5 Remove the cover from the Perspiration Tester, remove the sandwiched specimens from the tester and separate the swatches. Allow the swatches to dry at room temperature.

7.2 Option II.

7.2.1 An accelerated test procedure has been used showing approximately the same results on some dyed or finished fabrics by placing the test apparatus (see 7.1.4) in a force draft oven at $38 \pm 1^\circ\text{C}$ ($100 \pm 2^\circ\text{F}$) for 4 h (see 11.4).

8. Evaluation (see 11.8)

8.1 After the swatches are dried, examine the multifiber and the white cloth for color transfer. Rate each of the fiber types in the multifiber fabric and the swatch on the opposite side of the sandwich separately, by comparison with the Gray Scale for Staining (AATCC EP2), the AATCC 9-Step Chromatic Transference Scale (AATCC EP8 or AATCC EP12), and record the numerical rating that corresponds to the appropriate one on either of them. Record which scale was used.

8.2 If a change in color is noted in any of the test specimens, rate such change with AATCC EP1 or AATCC EP7, and record the numerical rating that corresponds to the appropriate one on the Gray Scale.

9. Report

9.1 Identify the white fabric used in the sandwich (see 5.4 and 11.6).

9.2 Report the moisture pickup if other than 100-110% (see 11.3).

9.3 Report the grade for staining of each of the fibers in the multifiber fabric, as well as on the white swatch used in the test, and the rating scale used.

9.4 Report the grade for color change in any of the test specimens, and the evaluation procedure used (see 11.7.2).

10. Precision and Bias (see 11.7)

10.1 *Interlaboratory Data.* An interlaboratory comparison was run in 1982 in which samples from two different textile materials were tested in each of four laboratories, each material having five different finishes. Both the AATCC 9-Step Chromatic Transference Scale and the Gray Scale for Staining were used and a correlation within one unit was established between laboratories.

10.2 *Precision.* Based on the observations described in 10.1 and on general practice in the trade, a lot or consignment is generally considered as having a rating that is significantly worse than a specified value when a specimen from the lot or consignment has a rating of dye transfer that is more than one unit below the specified rating on the Gray Scale for Staining.

10.3 *Bias.* The true value of dye transfer can only be defined in terms of a test method. Within this limitation, this method has no known bias.

11. Notes

11.1 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.

11.2 Available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: +1.919.549.8141; fax: +1.919.549.8933; e-mail: ordering@aatcc.org; web site: www.aatcc.org.

11.3 With some fabrics and constructions, 100% pickup causes a dripping wet condition. For those materials, use the highest pickup that is possible without water dripping from the specimen when it is suspended.

11.4 If any temperature and/or time other than those specified in 7.2 are used, report the change and reason for same.

11.5 For very critical evaluation and in case of arbitration, rating must be based on the geometric gray scale for evaluating staining.

11.6 All materials are not affected equally. Results obtained by the use of any one test procedure should not be representative of those of any other test procedure unless the degree of quantitative correlation for a given material has been established. In any event,

the test procedure should be described in a material specification.

11.7 The precision of this test method is dependent on the combined variability of the material being tested, the test method itself, and the evaluation procedure utilized.

11.7.1 The precision statement in Section 10 was developed from results obtained by visual evaluations (AATCC EP2 and AATCC EP8).

11.7.2 It is expected that the use of instrumental evaluation (AATCC EP7 or AATCC EP12) will result in greater precision than that obtained from visual evaluations.

11.8 CAUTION: It has been reported that the results for staining obtained by this method on fabrics dyed to dark shades (navy, black, etc.) that contain a combination of polyester and spandex, or their blends, may not show the full staining propensity of such fabrics in consumer use. It is, therefore, recommended that the staining results obtained by this test not be used for the acceptance testing of such fabrics.

12. History

12.1 Reaffirmed and editorially revised 2020 to add History section and change Jurisdiction.

12.2 Revised 2013. Reaffirmed 2007, 1987. Editorially revised 2019 (with title change), 2011, 2010, 2008, 2001, 1995. Editorially revised and reaffirmed 2012, 2002, 1997, 1992, 1986.

12.3 Developed in 1985 by Committee RA92. Jurisdiction transferred to Committee RA87 in 2020.