

Test Method for Colorfastness to Heat: Dry (Excluding Pressing)

Foreword

Several tests differing in temperature are provided; one or more of them may be used, depending on the requirements and the stability of the fibers. This test excludes hot pressing, which is addressed in AATCC TM133; however, the heating device does provide some pressure on the specimen and adjacent undyed cloth.

1. Purpose and Scope

1.1 This test method is intended for assessing the degree of color change and staining caused by the action of dry heat, excluding pressing.

1.2 It is applicable to textiles of all kinds and in all forms.

2. Principle

2.1 A specimen in contact with undyed fabrics is exposed to dry heat by close contact under controlled conditions. Color change of the test specimen is reported as a grade from 5 to 1, with 5 representing no color change and 1 representing the most color change. Staining on each undyed fabric or fiber is reported as a grade from 5 to 1, with 5 representing no staining and 1 representing the most staining.

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 13.1).

3.2 AATCC EP2, Evaluation Procedure for Gray Scale for Staining (see 13.1).

3.3 AATCC EP7, Evaluation Procedure for Instrumental Assessment of the Change in Color of a Test Specimen (see 13.1).

3.4 AATCC EP8, Evaluation Procedure for AATCC 9-Step Chromatic Transference Scale (see 13.1).

3.5 AATCC EP12, Evaluation Procedure for Instrumental Assessment of Degree of Staining (see 13.1).

3.6 AATCC TM133, Test Method for Colorfastness to Heat: Hot Pressing (see 13.1).

3.7 ASTM D1776, Standard Practice for Conditioning and Testing Textiles (see 13.2).

3.8 "The Determination of Colour Fastness to Dry-heat Pleating and Setting." *Journal of the Society of Dyers and Colourists*. March 1960. 76. 158-168.

4. Terminology

4.1 **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.

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.

6. Uses and Limitations

6.1 When this test method is used for assessing color changes and staining in dyeing, printing and finishing processes, other chemicals and physical factors may influence the results.

6.2 A color change of the undyed fabric may be caused by factors other than staining from the test specimen. To determine this, pieces of the undyed fabric may be tested alone.

7. Apparatus and Materials (see 13.3)

7.1 Heating device, providing even heat transfer at controlled temperatures by close contact on both sides of the specimen (see 13.4).

7.2 Undyed fabrics, two pieces, with dimensions appropriate for the heating device used.

7.2.1 One piece shall be of the same kind of fiber as that of the textile to be tested or that predominating in the case of blends.

7.2.2 The fiber content of the second piece shall be the second component of the blend; a multifiber fabric, 15 mm (0.6 in.) bands, containing acetate, cotton, nylon, polyester, acrylic and wool; or any other fabric of particular interest as specified in the test request.

7.3 Conditioning facilities and racks

with pull-out, perforated shelves for laying specimens flat (see 13.1).

7.4 Equipment and environment for evaluating color change.

7.4.1 For visual evaluation, use Gray Scale for Color Change (see 13.1). Refer to AATCC EP1 for additional materials and use of gray scale.

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

7.5 Equipment and environment for evaluating staining.

7.5.1 For visual evaluation, use Gray Scale for Staining or AATCC 9-Step Chromatic Transference Scale (see 13.1). Refer to AATCC EP1 or AATCC EP8 for additional materials and use of scales. (see 13.5)

7.5.2 For instrumental evaluation, use a spectrophotometer as specified in AATCC EP12.

8. Specimens

8.1 If the textile to be tested is fabric, place a test specimen with dimensions appropriate for the heating device between the two pieces of undyed fabric (see 7.2), and sew along one of the shorter sides to form a composite test specimen.

8.2 If the textile to be tested is yarn, knit it into fabric and treat it as in 8.1 or form a uniform layer of parallel yarn lengths between two pieces of undyed fabric (see 7.2), the amount of yarn taken being approximately equal to half the combined mass of the undyed fabrics. Sew along one side to hold the yarn in place and to form a composite test specimen.

8.3 If the textile to be tested is loose fiber, comb and compress an amount approximately equal to half the combined mass of the undyed fabrics (see 7.2) into a uniform sheet of the required size. Place the sheet between the two undyed fabrics and sew along all four sides to form a composite test specimen.

9. Procedure

9.1 Set the heating device to one of the following temperatures, based on expected end use and stability of the specimen.

I	150 ± 2°C
II	180 ± 2°C
III	210 ± 2°C

9.2 Set the device pressure to 4 ± 1 kPa.

9.3 Place the composite test specimen in the heating device and leave it there for 30 s.

9.4 Remove the composite specimen and condition 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.

10. Evaluation

10.1 Evaluate color change of the test specimen.

10.1.1 For visual evaluation, evaluate color change of the specimen as directed in AATCC EP1.

10.1.2 For instrumental evaluation, evaluate color change of the specimen as directed in AATCC EP7.

10.2 Evaluate staining on each undyed fabric and each strip of the multifiber fabric, as appropriate.

10.2.1 For visual evaluation, evaluate staining on each undyed fabric and/or multifiber fabric strip as directed in AATCC EP2 or AATCC EP8 (see 13.5).

10.2.2 For instrumental evaluation, evaluate staining on each undyed fabric and/or multifiber fabric strip as directed in AATCC EP12.

11. Report

11.1 Describe or identify the sample tested.

11.2 Report that the sample was tested using AATCC TM117-2019.

11.3 Report the testing conditions:

11.3.1 Temperature of test.

11.3.2 Heating device used.

11.3.3 Nominal fiber content of test specimen and undyed fabrics.

11.3.4 Evaluation procedure for color

change (AATCC EP1 or AATCC EP7).

11.3.5 Evaluation procedure for staining (AATCC EP2, AATCC EP8, or AATCC EP12).

11.4 Report the test results:

11.4.1 Color change grade for tested specimen.

11.4.2 Staining grade for each undyed fabric and/or multifiber fabric strip.

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

12. Precision and Bias

12.1 *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.

12.2 *Bias.* The colorfastness to dry heat (excluding pressing) 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.

13. Notes

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

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

13.3 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.

13.4 One of the following heating devices

may be used:

(a) A pair of electrically-heated hot plates whose temperature is accurately controllable at temperatures over the specified range and which can be adjusted to provide a pressure on the specimen of 4 ± 1 kPa. To obtain the specified pressure, the total area of the composite specimen should be at a suitable relationship to that of the plates so that the four spring-loaded pins acting against the housing of the upper plate is utilized. This is accomplished by using a small-diameter rod—e.g., a small Allen wrench—to push the upper protruding end of each pin down through the plastic plate and then moving it slightly to one side so that the pin remains engaged against the underside of the plate. These spring-loaded pins, when in their normal up position, provide a counter balance to the weight of the upper plate and its housing so that the pressure between the plates is 8.8 g/cm². Other similar devices providing identical test conditions and results may be used.

(b) Molten metal bath, in which a holder containing the composite specimen is immersed, as described in “The Determination of Colour Fastness to Dry-heat Pleating and Setting.”).

13.5 For very critical evaluations and in the cases of arbitration, ratings must be based on the geometric Gray Scale for Staining.

14. History

14.1 Revised in 2019 for clarification and to align format with AATCC style.

14.2 Revised (with title change) 2018. Editorially revised 2016. Editorially revised and reaffirmed 2013. Editorially revised 2010. Editorially revised and reaffirmed 2009. Editorially revised 2008. Editorially revised and reaffirmed 2004. Editorially revised 2002. Editorially revised 2001. Editorially revised and reaffirmed 1999. Editorially revised and reaffirmed 1994. Reaffirmed 1989. Editorially revised 1988. Editorially revised 1985. Reaffirmed 1984. Editorially revised 1983. Editorially revised 1981. Reaffirmed 1979. Reaffirmed 1976. Revised 1973. Revised 1971. Revised 1967.

14.3 Developed in 1966 by AATCC Committee RR54. Maintained by RA99.