

Test Method for Stain Resistance: Pile Floor Coverings

Developed in 1991 by AATCC Committee RA57; reaffirmed 1992; reaffirmed and editorially revised 1993, 1998, 2003, 2019; editorially revised 2006, 2016; reaffirmed and editorially revised with technical correction 2008; revised 2013.

1. Purpose and Scope

1.1 This test method is used to determine the resistance to staining by acid food colors on pile floor coverings.

2. Principle

2.1 A specimen of pile floor covering is stained with a small volume of a diluted aqueous solution of Food Drug & Cosmetic (FD&C) Red 40 adjusted to an acid pH. After allowing the stained specimen to remain at controlled conditions for 24 ± 4 h, it is rinsed in water to remove all unused FD&C Red 40 dye. Any residual stain is assessed after drying.

3. Terminology

3.1 **stain**, n.—for pile floor covering, a discoloration due to a color adding material, such as food or liquid, that exhibits resistance to removal by standard cleaning methods.

3.2 **stainblocker**, n.—a chemical substance which, when applied to a textile substrate, imparts partial or total resistance to staining.

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 the handling of 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 All chemicals should be handled with care.

5. Apparatus and Materials

5.1 AATCC stain cup and 50 mm (2.0 in.) diam staining ring (see 12.1 and Fig. 1)

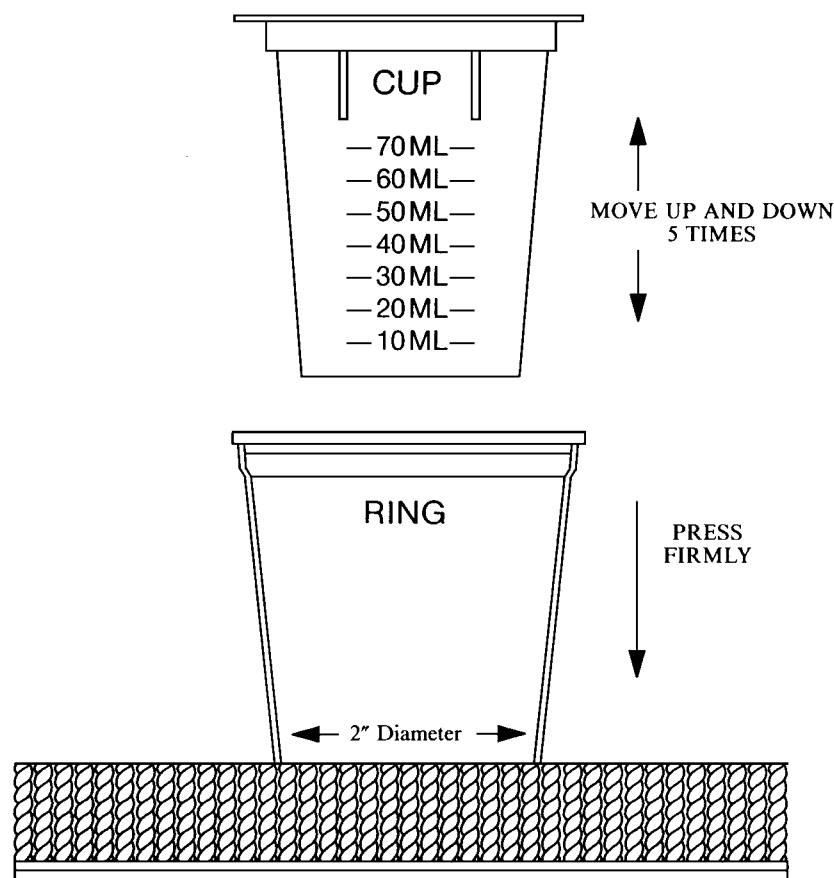


Fig. 1—AATCC stain cup and ring.

5.2 AATCC Red 40 Stain Scale (see 12.1)

5.3 FD&C Red 40 (C.I. Food Red 17) (see 12.1)

5.4 Citric acid (technical grade or better)

5.5 Deionized or distilled water

5.6 pH meter

5.7 Buffer solutions, pH 2.0 and 4.0

6. Staining Solution

6.1 Weigh 100 ± 1 mg of FD&C Red 40 and dissolve in 1 L ± 10 mL of distilled or deionized water at $24 \pm 3^\circ\text{C}$ ($75 \pm 5^\circ\text{F}$).

6.2 Adjust the pH of this solution to 2.8 ± 0.1 with citric acid (approximately 3.2 g). Check the pH of the solution with a meter that has been calibrated with pH 2.0 and 4.0 buffer solutions. Due to their lack of precision, the use of pH strips is not advised. If the pH of the prepared staining solution is below 2.7 discard this solution and prepare a new one.

7. Test Specimen

7.1 Cut one specimen at least 150 mm (6 in.) square for each test to be run.

7.2 Remove any extraneous surface materials by brushing and or vacuuming.

8. Procedure

8.1 Condition all test specimens, pile side up, on a nonabsorbent surface for 24 h at standard conditions of $21 \pm 2^\circ\text{C}$ ($70 \pm 4^\circ\text{F}$) and $65 \pm 5\%$ RH. Avoid contamination by contact with extraneous materials (see 12.2).

8.2 Place the 50 mm (2 in.) diameter staining ring in the center of the test specimen. While pressing down on the ring pour 20 mL of the staining solution into the center of the ring. Press the bottom of the stain cup through the ring into the pile, moving it up and down 5 times to facilitate wetting of the pile fiber from top to bottom. Do not rotate or twist the cup inside the ring since this may result in

surface abrasion which may remove the stainblocker from the fiber surface. Carefully remove the staining ring and stain cup.

8.3 Recondition the stained specimen for 24 ± 4 h in a flat position, pile side up, at standard conditions of $21 \pm 2^\circ\text{C}$ ($70 \pm 4^\circ\text{F}$) and $65 \pm 5\%$ RH (see 12.2). Avoid any air draft which could result in an accelerated drying of the stained surface.

8.4 Rinse the stained specimen with running water at $21 \pm 6^\circ\text{C}$ ($70 \pm 10^\circ\text{F}$) until the rinse water is clear which indicates removal of all unfixed red dye. Make sure to rinse the backing thoroughly for removal of red dye. Removal of unfixed surface red dye is enhanced by squeezing the specimen in the rinse water.

8.5 Extract (centrifuge or vacuum) the wet specimen to remove excess water.

8.6 Oven dry the test specimen in a flat position, pile side up, at $100 \pm 5^\circ\text{C}$ ($212 \pm 9^\circ\text{F}$) for 90 min maximum or allow to air dry. NOTE: Excessive time in the oven can cause discoloration of the specimen.

8.7 If red dye wicks to the surface during drying, repeat 8.4, 8.5 and 8.6.

9. Evaluation of Results

9.1 Rate the stain resistance of the test specimen by use of the AATCC Red 40 Stain Scale, where a grade of 10 is no staining and 1 is severely stained (see 12.3).

9.2 Rotate the specimen and/or gently brush the pile to produce the maximum display of visual red stain. Place the Red 40 Stain Scale over the test specimen with the stained area of the test specimen between the two reference columns and the non-stained portion (original) of the test specimen directly under the numbered colored film square.

9.3 Illuminate the surfaces with north sky light or equivalent source with illumination of 538 lx (50 lumens per square foot) or more. The light should be incident upon the surfaces at $45 \pm 5^\circ$ and the direction of viewing $90 \pm 5^\circ$ to the plane of the surfaces (see Fig. 2). Those angles of incident light and viewing should minimize any gloss from the scale. If neces-

sary, alter the angle of illumination to eliminate direct reflection of the incident light from the scale surface (see 12.4).

9.4 Compare the color of the stained portion of the test specimen to that of the closest numbered colored square of the Stain Scale. Record the Stain Scale number that most closely matches the specimen's stained area (see 12.3). Interpolation of Stain Scale numbers is not recommended.

10. Report

10.1 Report the numerical grade for stain resistance as determined in Section 9.

10.2 Report the presence of staining at the base of the pile floor covering.

10.3 Report any deviation from the test procedure such as lighting conditions, angle of viewing, temperature, RH, etc.

11. Precision and Bias

11.1 Three interlaboratory tests were conducted in 1989 and 1990. The results of these tests indicate that the within-lab method precision standard deviation is 0.5 stain units. The within-lab 95% confidence interval is ± 1 . There were signifi-

cant level differences between labs related to the application of the staining agent, so the total method precision sigma (including both the between and within-lab components) is 1. Therefore the between-lab 95% confidence interval is ± 2 .

11.2 No statement of bias can be made because the true stain value cannot be established by an independent method.

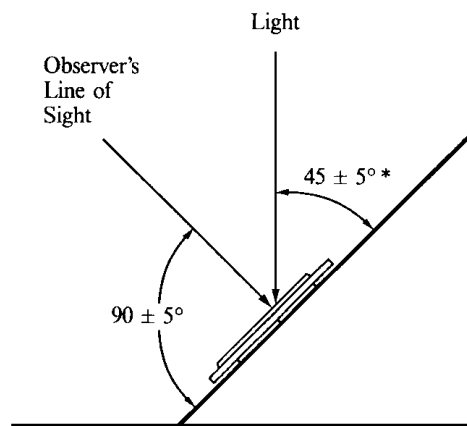
12. Notes

12.1 AATCC Red 40 Stain Scale is 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.

12.2 The presence of vapors and fumes from a strong base; i.e., ammonia, etc., in the test environment can increase the severity of staining.

12.3 Any test specimen which has a change in color or contrast decidedly greater than a grade of 1 should be given a grade a 0.

12.4 Reflection of the incident light from the scale surface will make it difficult to properly evaluate the test specimen. The problem generally occurs when either the light source is too close to the scale or is too bright. These conditions should be avoided.



*Adjust this angle to reduce light reflection (gloss) from the staining scale

Fig. 2—Illumination and viewing angles for rating samples.