

# Colorfastness to Pleating: Steam Pleating

Developed in 1969 by AATCC Committee RR53; reaffirmed 1970, 1971, 1974, 1977, 1980, 1985, 1990, 2005; editorially revised 1981, 1988, 2004; editorially revised and reaffirmed 1995, 2000. Technically equivalent to ISO 105-P02.

## 1. Purpose and Scope

1.1 This test method is intended for assessing the resistance of the color of textiles of all kinds and in all forms to the action of steam pleating processes. The materials are not pleated during the test, and it is emphasized that the test is not intended for assessing the quality of the pleating process (see 11.6).

1.2 Three tests differing in severity are provided; one or more of them may be used depending on the requirements.

1.3 The severe test is intended primarily for wholly manufactured textiles such as those made from polyamide and polyester fibers. It should not be used for textiles containing wool.

## 2. Principle

2.1 A specimen of the textile in contact with specified undyed cloths is steamed under specific conditions of pressure and time and then dried. The change in color of the specimen and the staining of the undyed cloths are assessed with standard gray scales.

## 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 **pleating**, n.—the process of making one or more desirable folds in a cloth by doubling the material over on itself.

## 4. Safety Precautions

NOTE: These safety statements 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 recommenda-

tions. All OSHA standards and rules must 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 Specimen holder (see Fig. 1 and 11.1).

5.2 Jacketed steamer (see 11.2) or pressure cooker (see 11.3).

5.3 Two undyed scoured cloths, each measuring  $5 \times 4$  cm ( $2 \times 1.6$  in.), made of the same kind of fiber as that of the textile to be tested or as otherwise specified. In the case of blends, two different undyed scoured cloths are required, corresponding to the two predominating fibers (see 11.4).

5.4 Gray Scales for evaluating change in color and staining (see 11.5).

## 6. Test Specimens

6.1 If the textile to be tested is fabric, place a specimen of it  $5.0 \times 4.0$  cm ( $2.0 \times 1.6$  in.) between two pieces of undyed cloth (see 5.3) and sew along one side to form a composite specimen.

6.2 If the textile to be tested is yarn, knit it into fabric and treat it as in 6.1, or form a layer of parallel lengths of it between the two pieces of undyed cloth (see

5.3), the amount of yarn taken being approximately equal to half the combined mass of the undyed cloths. Sew along one side to hold the yarn in place and to form a composite specimen.

6.3 If the textile to be tested is loose fiber, comb and compress an amount approximately equal to half cloths (see 5.3) into a sheet  $5.0 \times 4.0$  cm ( $2.0 \times 1.6$  in.). Place the sheet between the two undyed cloths, and sew along all four sides to form a composite specimen.

## 7. Procedure

7.1 Mount the composite specimen in the holder between the two undyed cloths (see 5.3) as shown in Fig. 1.

7.2 Place the holder containing the composite specimen in a jacketed steamer (see 11.2) or a pressure cooker (see 11.3).

7.3 Steam under one of the sets of conditions listed in Table I.

7.4 When steaming is complete, release the pressure over a period not exceeding 2 min.

7.5 Open out the composite specimen and dry in air at a temperature not exceeding  $60^\circ\text{C}$  ( $140^\circ\text{F}$ ) with the two or three parts in contact only at one line of stitching. Condition at  $20 \pm 2^\circ\text{C}$  ( $68 \pm 3^\circ\text{F}$ ) and  $65 \pm 2\%$  RH for 4 h.

7.6 Specimens which liberate formaldehyde under steam pleating conditions should be tested separately.

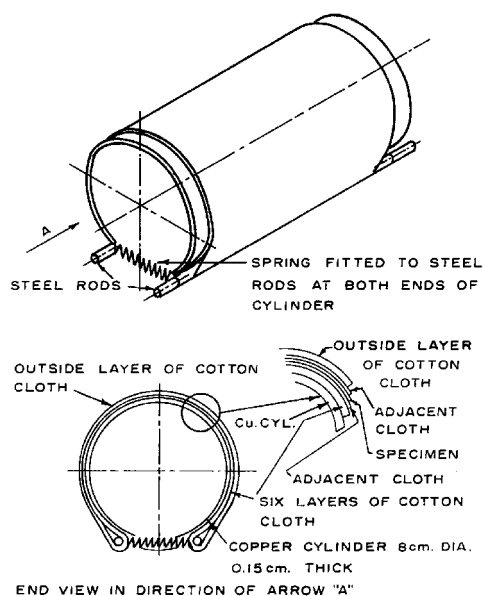


Fig. 1—Specimen holder.

Table I—Steaming Conditions

| Test             | Duration | Pressure (Gauge)                                  | Temperature   |
|------------------|----------|---------------------------------------------------|---------------|
| I. Mild          | 5 min    | 0.35 kg/cm <sup>2</sup> (5 lb/in. <sup>2</sup> )  | 108°C (226°F) |
| II. Intermediate | 10 min   | 0.7 kg/cm <sup>2</sup> (10 lb/in. <sup>2</sup> )  | 115°C (239°F) |
| III. Severe      | 20 min   | 1.76 kg/cm <sup>2</sup> (25 lb/in. <sup>2</sup> ) | 130°C (266°F) |

## 8. Evaluation

8.1 Rate the change in color of the test specimen with the Gray Scale for Color Change after conditioning (see 7.5).

8.2 Rate the staining of the undyed cloth(s) with the Gray Scale for Staining.

## 9. Report

9.1 Type of test (I, II, or III) (see 7.3).

9.2 Numerical grade of the change in color of the test specimen noting composition of the test specimen.

9.3 Numerical grade of the staining of the undyed cloth(s), noting the composition of the undyed cloth(s). If the two cloths are identical and show different degrees of staining, only the heavier should be reported.

## 10. Precision and Bias

10.1 *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.

10.2 *Bias.* Colorfastness to steam pleating 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.

## 11. Notes

11.1 The specimen holder consists of a copper tube 8 cm (3 in.) in external diameter. The thickness of the copper is 0.15 cm (0.06 in.). The copper tube is wrapped with six layers of bleached cotton cloth weighing 125g/m<sup>2</sup> (3.7 oz/yd<sup>2</sup>). The outside layer is made from bleached cotton cloth weighing 186g/m<sup>2</sup> (5.5 oz/yd<sup>2</sup>). The edge of the outside layer is folded back and sewn so as to provide a place for

insertion of the rods. The rods at each end are made from 0.6 cm (0.25 in.) diameter soft steel. The strength of the springs is not critical, but it should be sufficient to hold the layer tightly against the tube. The springs are fastened to one of the steel rods and should hook easily onto the other steel rod (see Fig. 1). A 15.2 cm (6 in.) long specimen holder 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.

11.2 A jacketed steamer may be used, provided that the pressure can be accurately determined and that no water splashes on the specimen during the test.

11.3 A domestic pressure cooker may be used as an alternative to a jacketed steamer. Its dimensions should be sufficiently large to avoid water splashing onto the specimen during the test; it is suggested that the minimum size should be 23 cm (9 in.) in diameter and 26 cm (10 in.) high. It should be fitted with an

accurate pressure gauge. If a domestic pressure cooker is used, the specimen holder should be loosely wrapped in one layer of polyester film, which projects 1 cm (0.5 in.) over each end of the tube and is not closed at the ends. The specimen holder (see Fig. 2) should then be placed in a rectangular metal container containing ten 0.1 cm (0.06 in.) holes equally spaced along the center of the bottom. The container should be sufficiently deep to reach to 1 cm (0.5 in.) from the top of the specimen holder. The bottom of the container should be slightly concave to ensure that condensed water rapidly drains away. The container is then placed on a stand which holds it 5 cm (2 in.) from the surface of the water. The quantity of water in the cooker is not critical, but water to a depth of 3 cm (1 in.) is suggested. Expel air from the pressure cooker for 2 min before raising the pressure.

11.4 If wool is used as one of the adjacent cloths (see 5.3) it may have an adverse effect on the dye in the specimen, particularly under alkaline conditions.

11.5 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.

11.6 It should be noted that the papers used in commercial pleating occasionally contain reducing agents which with certain coloring matters can produce a much greater change in color than occurs under the test conditions.

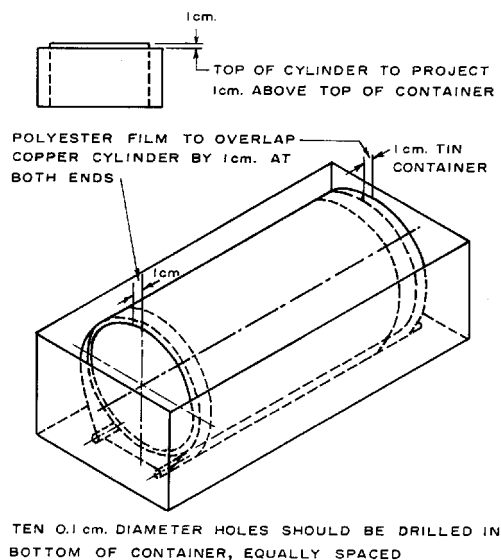


Fig. 2—Specimen holder in the container.