



Standard Test Method for Colorfastness and Transfer of Color in the Washing of Leather¹

This standard is issued under the fixed designation D2096; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of the colorfastness of colored leathers, with or without a surface coating. The leathers to be tested are of the type normally expected to withstand frequent laundering. This test method also covers the simultaneous staining of adjacent textile materials when the leather specimens are washed. This test method does not apply to wet blue. Two procedures are covered depending on the apparatus used:

- 1.1.1 *Procedure A*, using the Launder-Ometer,² and
- 1.1.2 *Procedure B*, using an alternative washing machine.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values stated in parentheses are provided for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

- 2.1 *ASTM Standards*:³

¹ This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.04 on Apparel. This test method was developed in cooperation with the American Leather Chemists Assn.

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² The Launder-Ometer and its development are described in the *American Dyestuff Reporter*, Oct. 29, 1928, p. 679. It is described also in the current Technical Manual of the American Association of Textile Chemists and Colorists. Such an apparatus is illustrated in Figs. 3, 4, and 5.

The sole source of supply of the apparatus known to the committee at this time is SDL Atlas, 3934 Airway Drive, Rock Hill SC 29732. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- D 499 Standard Specification for White Floating Toilet Soap⁴

- 2.2 *ISO Standard*:⁵

- ISO R105/I, Part 2 Gray Scale for Evaluating Change in Color

- ISO R105/I, Part 3 Gray Scale for Evaluating Staining

- 2.3 *ASTM Adjunct*:⁶

- Leather washing apparatus (1 drawing)

3. Summary of Test Method

3.1 Three leather specimens 50 by 80 mm (approximately 2 by 3 in.), and one piece of multifiber test fabric of nearly equal size are washed together in soapy water at 120°F (49°C). After ½ h of washing, the leather specimens and cloth are removed and rinsed carefully in running water at about 95°F (35°C). One leather specimen and the test cloth are removed and air-dried. A new piece of test cloth is added to the remaining two leather specimens and these are washed, as above, for ½ h. The rinsing is repeated; again one leather specimen and the test cloth are removed for drying. The remaining leather specimen, with a new piece of test cloth, is washed again for ½ h. This final leather specimen and test cloth are then rinsed and dried as above. When dry, the color of the washed leather specimens is rated by comparing it with an unwashed piece of leather. Transfer of color to the test fabric is rated by comparison with an unwashed piece of test fabric. These comparisons are made with the aid of the proper Gray Scale. All ratings are made on dry test specimens.

4. Significance and Use

4.1 The procedure is intended, primarily to evaluate the ability of a leather specimen to withstand fixed, and rather strenuous, laundering conditions. This test is not intended as a recommended washing procedure, neither household nor commercial. Although this test concerns itself with colorfastness

⁴ Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁶ Detailed drawings for such an apparatus are available from ASTM International Headquarters. Order Adjunct ADJD2096. Original adjunct produced in 1962.



FIG. 1 Washing Machine, Heated Air Bath (Procedure B)

and transfer of color during washing, the washed leather specimens are available also for comparing other properties (that is, tensile strength, area change, change in outline, etc.) with those of unwashed samples.

5. Apparatus

5.1 *Washing Machine*—A Launder-Ometer, or an assembly of apparatus capable of similar test conditions (Note 1). In either machine, 1-pt (500-mL) specimen containers are held with their bases toward a horizontal shaft and 2-in. (50 mm) out from its center of rotation. Speed of rotation shall be 40 to 45 rpm. Provision shall be made for maintaining the initial temperature of the specimen containers throughout the test. Additional agitation shall be provided by ¼-in. (6.4 mm) stainless steel balls in the specimen containers.

NOTE 1—A motor-driven assembly, designed to hold 1-pt (500-mL) specimen containers so that they are relative to the axis of the motor shaft in the same way as in the Launder-Ometer, can be used.⁶ The entire assembly, fitted with specimen containers, shall be turned at 40 to 45 rpm inside a simple boxlike container which is heated at 120°F (49°C) with thermostatic control. Thus, heat loss from the preheated contents of the specimen containers is held at a minimum during the 30-min washing periods. Such an apparatus is illustrated in Figs. 1 and 2.

5.2 *Specimen Containers*, glass or stainless steel, 1-pt (500-mL), washer, and cap.

5.3 *Balls*, type 316 stainless steel, ¼-in. (6.4-mm) diameter, 20 per specimen container.

5.4 *Test Cloth*,⁷ multifiber, 50 by 80 mm, three pieces per test.

NOTE 2—Multifiber test fabrics are available in 6-fiber cloth, containing filling strips of wool, Orlon,⁸ Dacron,⁸ nylon-66, bleached cotton, and acetate, assembled in 2-in. (50-mm) repeats. Tests may be run with any test fabric of special interest and reported accordingly.

5.5 *Gray Scales*,⁹ consisting of the following:

5.5.1 ISO R105/I, Part 2, British, for assessing the effect in fastness testing, and

⁷ The sole source of supply of the test cloth known to the committee at this time is Testfabrics, Inc., 200 Blackford Ave., P.O. Box 420, Middlesex, NJ 08846-0420; telephone: (201) 469-6446; fax: (201) 469-1147. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

⁸ Trademark of E. I. du Pont de Nemours & Co.

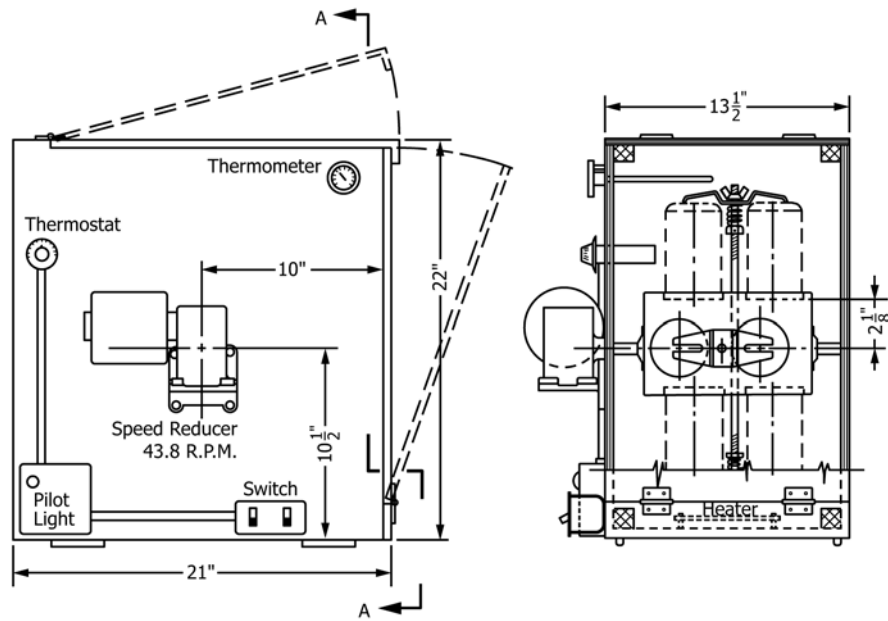
⁹ These scales and their use are described in the 1989 Technical Manual of the American Association of Textile Chemists and Colorists. Additional references on the use of Gray Scales in leather washing tests are as follows:

Journal, JSLTC, Society Leather Trades Chemists, Vol 43, 1959, pp. 117–128.

Journal, JSLTC, Society Leather Trades Chemists, Vol 40, 1956, pp. 183–184.

Journal, JSLTC, Society Leather Trades Chemists, Vol 42, 1958, pp. 229–231.

The Gray Scales are available from the American Association of Textile Chemists and Colorists, Box 12215, Research Triangle Park, NC 27709.



in.	2 1/8	10	10 1/2	13 1/2	21	22
mm	54	254	267	343	533	559

FIG. 2 Diagram of Washing Machine (Procedure B)

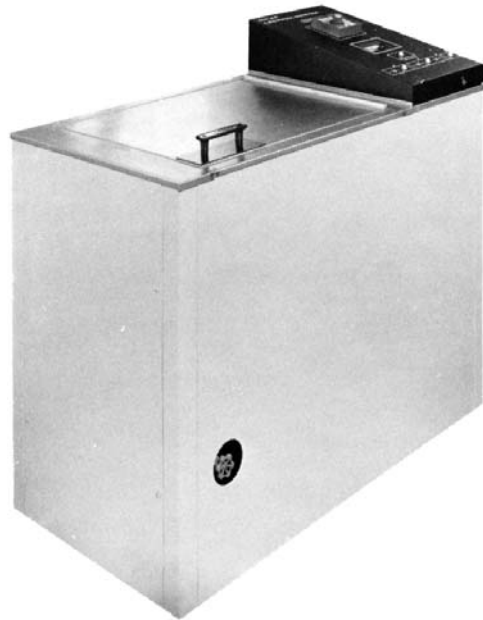


FIG. 3 Launder-Ometer (Procedure A)



FIG. 4 Launder-Ometer Stainless Steel Specimen Containers (Procedure A)

5.5.2 ISO R105/I, Part 3, British, for determining the degree of staining in fastness testing.

6. Reagent

6.1 *Mild Soap Solution, 0.5 %*, such as made from a white, floating, toilet soap (Specification D 499). The solution shall be made with distilled water; 300 mL are required for a complete three-wash test for each specimen container.

7. Test Specimen

7.1 The specimen shall be a piece of leather 2 by 3 in. (approximately 50 by 80 mm). Three specimens are required for each complete wash test. A fourth piece, unwashed, is required for purposes of comparison.

8. Procedure A—Using Launder-Ometer

8.1 Adjust the Launder-Ometer to maintain the temperature at 120°F (49°C).

8.2 Preheat the soap solution to 120°F (49°C) and add 150 mL to each specimen container.

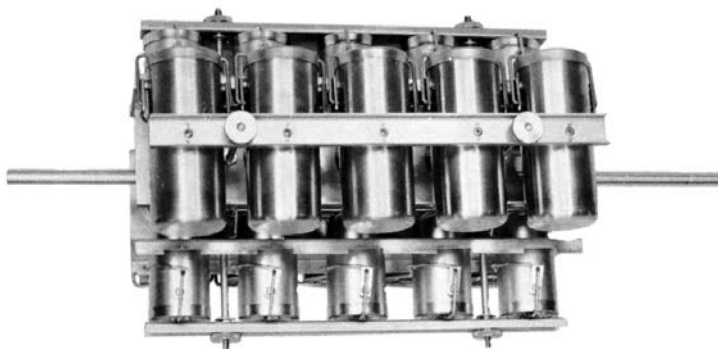


FIG. 5 Specimen Containers Mounted on Launder-Ometer Rotor (Procedure A)

8.3 Add twenty stainless steel balls to each specimen container.

8.4 Place a test cloth and three leather specimens in each specimen container. Place the gaskets and covers on the specimen containers and clamp each one carefully to assure no leaks.

8.5 Fasten the specimen containers to the rotor and arrange them so that an equal number of specimen containers are fixed on opposite sides of the shaft. Use a blank specimen container (filled with an equivalent weight of water), if necessary, to ensure a balanced load on the shaft.

8.6 Run the machine for a 30-min interval. Remove and empty the specimen containers in a systematic manner to avoid confusion in sample identification.

8.7 Rinse well the leather specimens and test fabric in clear, running water at about 95°F (35°C). Squeeze and work the test pieces to ensure the removal of soap and finally to remove all excess water. Work one leather specimen and the test fabric flat and hang these up to dry at room temperature.

8.8 Repeat this procedure, rewashing the remaining two leather specimens with a new test cloth in 100 mL of soap solution. After the ½-h washing and rinsing as described above, remove one leather sample and the test cloth for drying.

8.9 Repeat the procedure again,¹⁰ rewashing for the third time the remaining leather specimen with a new test cloth in 50 mL of soap solution.

8.10 When the leather specimens are dry, work them by hand to soften and shape them, to make them approach, as near as possible, an unwashed specimen in size, shape, and feel.

NOTE 3—With many samples, this mechanical treatment gives best results when the leather sample is slightly damp.

8.11 Evaluate the color of the washed sample by comparing it with the unwashed specimen. Use ISO R105/I, Part 2 (5.5.1) to express the degree of difference (color retention).

¹⁰ This procedure is a modification of that listed as Test Method 61, Test IIA, Colorfastness to Washing, Domestic and Laundering, Commercial: Accelerated, described in the 1981–82 Technical Manual of the American Association of Textile Chemists and Colorists.

8.12 Evaluate the staining of the test fabrics by visual inspection or, when required, by means of ISO R105/I, Part 3 (5.5.2).

9. Procedure B—Using Heated Air Bath Equipment (Optional)

9.1 Preheat and adjust the air-bath assembly to maintain the temperature at 120°F (49°C).

9.2 Add 150 mL of soap solution and twenty stainless steel balls to each specimen container.

9.3 Preheat specimen containers (containing the above) to 122°F (50°C) with gaskets and covers on top, but not clamped.

9.4 Continue the test as outlined in 8.4 – 8.12.

NOTE 4—Paragraphs 9.1 – 9.3 differ from those listed in Section 7, Procedure A, because an air bath is not as effective as the water bath of the Launder-Ometer for bringing the specimen container and its contents to the required temperature.

10. Report

10.1 The report shall include the following, reporting all test data on the basis of dry specimens only:

10.1.1 Procedure used, whether samples were washed in the Launder-Ometer (Procedure A) or optional equipment (Procedure B).

10.1.2 Effect on the color of the test specimens, expressed and defined by reference to ISO R105/I, Part 2 (5.5.1) as follows:

10.1.2.1 *Class 5*—Negligible or no change as shown in Gray Scale Step 5.

10.1.2.2 *Class 4*—Change in color equivalent to Gray Scale Step 4.

10.1.2.3 *Class 3*—Change in color equivalent to Gray Scale Step 3.

10.1.2.4 *Class 2*—Change in color equivalent to Gray Scale Step 2.

10.1.2.5 *Class 1*—Change in color equivalent to Gray Scale Step 1.

10.1.3 Staining, evaluated by visual inspection, reported as follows for each fiber tested:

Test cloth made of (*type of fiber*) is stained by sample.

Test cloth made of (*type of fiber*) is not stained by sample.

10.1.4 Staining, evaluated by means of ISO R105/I, Part 3 (5.5.2) as follows:

10.1.4.1 *Class 5*—Negligible or no staining as shown in Gray Scale Step 5.

10.1.4.2 *Class 4*—Staining equivalent to Gray Scale Step 4.

10.1.4.3 *Class 3*—Staining equivalent to Gray Scale Step 3.

10.1.4.4 *Class 2*—Staining equivalent to Gray Scale Step 2.

10.1.4.5 *Class 1*—Staining equivalent to Gray Scale Step 1.

10.1.5 Type of fabric stained (that is cotton, wool, nylon, etc.).

11. Precision and Bias

11.1 The mathematical and physical data on which the Gray Scales are based are described in the reference literature.⁷ The precision in estimating the degree of color change or the degree

of staining depends somewhat on the experience of the observer and the facility with which he can use the Gray Scales.

11.2 A series of evaluations of color change by a group of nonexpert observers indicates that differences greater than one class (in the range of Classes 4 and 5) are not probable. In the geometric scale, the actual difference between Class 4 and Class 5 is very small, and could lead to disagreement. However, the change between Class 5 and Class 3 is sufficiently obvious that the possibility of improper rating of a given leather sample is remote.

12. Keywords

12.1 colorfastness; gray scale; staining; washing leather

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