AMERICAN NATIONAL STANDARD ANSI/ASTM D 1905 - 73

American Association of Textile Chemists and Colorist Method 96-1967

Standard Test Method for DIMENSIONAL CHANGES IN LAUNDERING OF WOVEN OR KNITTED TEXTILES[1,2]

This Standard is issued under the fixed designation D 1905; 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.

1. Scope

1.1 This method covers the determination of the dimensional changes in woven or knitted fabrics when the cloth is subjected to laundering procedures commonly used in a commercial laundry or in the home.

NOTE 1—For the measurement of dimensional changes of wool fabrics, refer to Method D 1284, Test for Relaxation and Consolidation Dimensional Changes of Stabilized Knit Wool Fabrics[3] and Method D 462, Testing and Tolerances for Certain Wool and Part Wool Fabrics.[3]

2. Applicable Documents

2.1 *ASTM Standards:*

D 123 Definitions of Terms Relating to Textiles[4]

D 496 Specification for Chip Soap[5]

D 1776 Recommended Practice for Conditioning Textiles and Textile Products for Testing[4]

2.2 *Other Standards:*

P-S-579a Federal Specification for Soap, Laundry, Chip and Powdered

3. Definitions

3.1 For definitions of terms used in this method, refer to Definitions D 123.

4. Summary of Method

4.1 A specified load of fabric specimens or garments is washed in a cylindrical reversing wash wheel, dried, and subjected to restorative forces where necessary. The temperature and time agitation in the wash wheel can be varied to obtain different degrees of severity. Drying procedures and the application of restorative forces can be varied to conform with normal handling encountered during home or commercial laundering. The distances between bench marks on the specimen in the warp and filling directions for woven fabrics (or wales and courses for knitted fabrics) are measured before washing, after drying, and after the restoration procedure (if any). From these measurements, the changes in dimension are calculated.

5. Uses and Significance

5.1 The procedures in this method are not recommended for acceptance testing because between-laboratory precision has been established (See Note 9, Section 15).

5.2 Five washing test procedures are included, ranging from very severe to very mild, and are intended to cover the range of practical washing from commercial procedures to hand washing. Five drying test procedures are included to cover the range of drying techniques used in the home and commercial laundries. Three methods for determining the dimensional restorability characteristics are included for those textiles which require restoration by ironing or pressing after laundering. These procedures are not accelerated tests and

---

[1] This method is under the jurisdiction of ASTM Committee D-13 on Textiles, and is the direct responsibility of Subcommittee D13.59 on Fabric Test Methods.

Current edition approved June 27, 1973. Published August 1973. Originally published as D 1905 - 61 T as a consolidation and revision of former Methods D 416, D 437 - 36, D 1470 - 59 T, D 1487 - 57 T, and D 1773 - 60 T. Last previous edition D 1905 - 68.

[2] The precision of this method is such that the method's usefulness as an acceptance test is dubious. Additional work is underway by the Subcommittee responsible for this method to improve the precision of this method.

[3] *Annual Book of ASTM Standards*, Part 32.

[4] *Annual Book of ASTM Standards*, Parts 32 and 33.

[5] *Annual Book of ASTM Standards*, Part 30.

must be repeated to evaluate dimensional changes after repeated launderings.

5.3 A combination of procedures that is practical for any specific item must be established in order to evaluate the dimensional changes of textile fabrics for garments after laundering by procedures commonly used in the home or in a commercial laundry. The test procedure can be completely identified by a code consisting of a Roman numeral, a letter, and an Arabic number, as shown in Table 1. For example, Test III E 1 refers to a specimen that has been washed by procedure III (at 1400°F (600°C) for a total of 45 min in the machine), dried in a tumble dryer by procedure E, and subjected to restorative forces on the tension presser by procedure 1.

5.4 The drying procedure to be used is governed by the intended end use of the fabric. Procedure A is recommended for certain durable press fabrics and garments. Procedure B is used for other durable press fabrics but is not recommended for garments or knitted fabrics, or for fabrics made from thermoplastic man-made fibers. Procedure C is recommended for knitted fabrics and garments. Procedure D is applicable to some knitted fabrics and garments, and to all woven fabrics and garments. Procedure E is applicable to all fabrics and garments.

5.5 The use of a restoration procedure is dependent upon the characteristics of the fabric. Procedure 1 (tension presser) is used for woven or warp knitted fabrics. Procedure 2 (knit shrinkage gage) is used only for those knitted fabrics which have not stretched in either direction during laundering. Procedure 3 (hand iron) is an alternative procedure corresponding to household practice and will give the least reproducible results because of different techniques in handling and exertion of tension by operators during pressing. It is used primarily for evaluation of garments which require ironing to remove wrinkles prior to wearing and is not recommended for knitted fabrics or garments.

5.6 When using this method, the combination of washing, drying, and restorative procedures to be used in the evaluation of each lot, or of a particular sample, should be agreed upon before the testing is started.

6. Apparatus and Materials

6.1 *Wash Wheel*—A machine of the cylindrical, reversing wash-wheel type, having a wheel (cage) 20 to 24 in. (approx 500 to 600 mm) in inside diameter and 20 to 24 in. (approx 500 to 600 mm) in inside length. Three fins, each approximately 3 in. (75 mm) wide, shall extend the full length of the inside of the wheel at 120-deg intervals around the inside diameter of the wheel. The wash wheel shall rotate at a speed of 30 rpm making 5 to 10 revolutions before reversing. The water inlets shall be large enough to permit filling the wheel to an 8-in. (200-mm) level in less than 2 min, and the outlet shall be large enough to permit discharge of this same amount of water in less than 2 min. The machine shall be equipped with a pipe for injecting live steam that is capable of raising the temperature of water at an 8-in. level from 100 to 140 F (38 to 60 C) in less than 2 min. The machine shall contain an opening for the insertion of a thermometer or other device for determining the temperature of the water during the washing and rinsing procedures. The machine shall be equipped with an outside water gage that will indicate the level of the water in the wheel.[6]

NOTE 2—A domestic automatic washer that will give equivalent results may be used for Tests I, II, and III.[7]

6.2 *Pressing Equipment*—A flat-bed press, 24 by 50 in. (approx 600 by 1250 mm) or larger, maintained at a temperature of not less than 275 F (135 C). Any flat-bed press large enough for pressing a specimen 22 in. (approx 560 mm) square may be used.[8]

6.3 *Dryer*—A rotary-tumble type dryer having a cylindrical basket approximately 30 in. (750 mm) in diameter and 24 in. (600 mm)

[6] Washing machines of the type described may be obtained from The American Laundry Machinery Co., Cincinnati, Ohio; Robert Ewing and Sons Co., Green Island, N. Y.

[7] Various brands of home-type automatic washers have been found to give equivalent results. The Sears Roebuck & Co. Model 600, or any washer that gives equivalent results is satisfactory. The Model 600 referred to is obtainably only through Sears Roebuck commercial sales division and should not be confused with the Model 600 sold in their retail stores.

[8] Pressing equipment of the type described may be obtained from Pantex Co., Pawtucket, R. I. (Flat-Plate Press, Model FPR-60); Ametek Co., East Moline, Ill. (Flat-Plate Press, Model No. on request); and U. S. Testing Co., Inc., Hoboken, N. J. (Flat-Plate Press Model 6584).

in length that rotates at approximately 35 rpm, and having a drying temperature of 120 to 160 F (49 to 71 C) measured in the exhaust vent as close as possible to the drying chamber.

6.4 *Drying Racks*, made of plastic (saran or velon) screening, with 16 openings/1 in. (25.4 mm).

6.5 *Extractor*—A centrifugal extractor of the laundry-type with a perforated basket, approximately 11 in. (280 mm) deep and 17 in. (430 mm) in diameter, with an operating speed of approximately 1500 rpm.[9]

6.6 *Measuring Scale.*[10]

6.7 *Detergent*, synthetic.[11]

6.8 *Softener*—Sodium metaphosphate or sodium hexametaphosphate (if needed in hard water areas).

6.9 *Soap, Neutral*, conforming to Specification D 496, or to the Federal Specification (P-S-579a) on synthetic detergent.

NOTE 3—A stock solution of the soap may be prepared by dissolving 1 lb (0.45 kg) of chip soap in 1 gal (0.0038 m^3) or 3.8 liter of hot water. When cooled this forms a thick homogeneous jelly which may be used as required.

6.10 *Flatiron*, approximately 3 lb (1.4 kg).

6.11 *Tension Presser*,[12] consisting of a padded ironing board from which clamping members extend on all four sides (Fig. 1). Two of the clamps are fixed to the edges of the board; two clamps move on guide rails opposite to the fixed clamps. The movable clamps travel on carriages which ride on rails and are drawn by suitable weights.

6.11.1 *Sets of Weights*, such that the load can be selected in the range from ½ to 4 lb (0.23 to 1.81 kg).

6.11.2 *Perforated Aluminum Plate*, 3/16 in. (4.8 mm) thick by 12 in. (305 mm), used to provide the drying surface.

6.11.3 *Special Template*, 1/16- by 9½-in. (1.6- by 241-mm) aluminum sheet with a 10- by 10-in. (102- by 102-mm) cutout conforming to Fig. 2.

6.12 *Knit Shrinkage Gage*,[13] consisting of a set of 20 mounting pins set in guides in radial slots as shown in Fig. 3. Each pin is individually sprung to a tensioning member which is driven outwardly in the slot. The springs have an extension of 1 in. (25.4 mm) at 16 ± ½ oz (0.454 ± 0.014 kg) tension. The tensioning members shall have a common drive so that the application of restorative force takes place simultaneously in all directions in the plane of the test specimen. The minimum diameter of the pin frame in the collapsed state shall be 11 in. (approx 280 mm) and the maximum diameter in the freely extended state (unloaded) shall be 14 in. (approx 350 mm). The surface of the apparatus in contact with the test specimen shall be uncluttered and polished so as to be essentially friction free.

NOTE 4—The tensions applied to the specimen by this gage are directly proportional to the residual shrinkage remaining in the specimen and will normally vary from point-to-point around the specimen and from specimen to specimen.

6.13 *Source of Live Steam.*

7. Number of Specimens

7.1 Unless otherwise agreed upon, as when specified in an applicable material specification, take a number of specimens such that the user may expect at the 95% probability level that the test result is no more than 10.0% of the average above or below the true average (that is, a theoretical average obtained from an infinite number of observations). Determine the number of specimens as follows:

7.1.1 *Reliable Estimate of v*—When there is a reliable estimate of v based upon extensive past records for similar materials tested in the user's laboratory as directed in the method, calculate the number of specimens using Eq 1:

$$n = (t^2 \times v^2)/A^2 = 0.0384 \times v^2 \qquad (1)$$

where:

n = number of specimens (rounded upward to a whole number),

v = reliable estimate of the coefficient of variation of individual observations on similar materials in the user's laboratory under conditions of single-operator precision,

[9] Extracting machines of the type described may be obtained from Bock Laundry Machine Co., Toledo, Ohio (Model 24 BC); American Laundry Machinery Co., Cincinnati, Ohio.

[10] A mechanical marking device, and a measuring tape calibrated directly in percent dimensional change may be obtained from "Sanforized" Division, Cluett, Peabody and Co., Inc., Troy, N. Y.

[11] This type of detergent is available under varying trade names from almost all suppliers of detergents.

[12] The Tension Presser is available from the U. S. Testing Co., Inc., 1415 Park Ave., Hoboken, N. J.

[13] The Knit Shrinkage Gage is available from the U. S. Testing Co., Inc., 1415 Park Ave., Hoboken, N. J.