Test Method for Dimensional Changes of Garments after Home Laundering

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Foreword

Although this method calls for measurement of dimensional changes in unseamed areas of garment specimens, results may be affected by garment construction, tensions, sewing threads or trims in addition to fabric dimensional change. An option is also provided for measuring dimensional change between or along garment seams.

Standard laundering procedures remain consistent to allow valid comparison of results. Standard procedures represent, but may not exactly replicate, current consumer practices, which vary over time and among households. Alternate laundering procedures and machine parameters may be found in AATCC LP1, Laboratory Procedure for Home Laundering: Machine Washing, AATCC LP2, Laboratory Procedure for Home Laundering: Hand Washing (see 12.3) and ISO 6330, Textiles — Domestic washing and drying procedures for textile testing (see 12.7).

1. Purpose and Scope

1.1 This test method is for the determination of dimensional (length and width) changes of garments when subjected to home laundering procedures. Four washing temperatures, three agitation cycles, and four drying procedures provide standard parameters to represent common home care options.

1.2 This method may not be applicable to garments made of certain stretch fabrics.

2. Principle

2.1 Pairs of benchmarks are applied to the garment before laundering. The distance between each pair is measured before laundering and remeasured after a specified number of standard laundering cycles. Percent change is calculated. A negative value indicates shrinkage; a positive value indicates growth. A value close to zero indicates little or no change.

3. Terminology

3.1 **dimensional change,** n.—a generic term for changes in length or width of a fabric specimen subjected to specified conditions. The change is usually expressed as a percentage of the initial dimension of a specimen.

3.2 **garment,** n.—a shaped article of textile fabric, or other flexible material, intended to cover portions of the human body.

3.3 **growth,** n.—a dimensional change resulting in an increase of length or width of a specimen.

3.4 **laundering,** n.—*of textile materials*, a process intended to remove soils and/or stains by treatment (washing) with an aqueous detergent solution and normally including rinsing, extraction and drying.

3.5 **shrinkage,** n.—a dimensional change resulting in a decrease in the length or width of a specimen.

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 handling 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 Detergent may cause irritation. Care should be taken to prevent exposure to skin and eyes.

4.3 Manufacturer's safety recommendations should be followed when operating laboratory testing equipment.

5. Apparatus and Materials (see 12.1)

5.1 Standard washing machine (see Table I and 12.2).

5.2 Standard tumble dryer (see Table III and 12.2) or facilities for drip/line drying.

5.3 Conditioning facilities and conditioning/drying racks with pull-out, perforated shelves (see 12.3).

5.4 Balance with at least 5.0-kg or 10.0-lb capacity.

5.5 AATCC 1993 Standard Reference Detergent (powder, with brightener, see 12.3).

5.6 Laundering ballast, Type 1 or Type 3 (see Table IV).

5.7 Indelible ink marking pen (see 12.3) for use with suitable rule, tape, marking template or mechanical marking device (see 12.3). Sewing thread may be used for making benchmarks.

5.8 Measuring devices.

5.8.1 Tape or rule marked in millimeters, eighths or tenths of an inch.

5.8.2 Tape or ruled template marked directly in percent dimensional change to 0.5% or smaller increment (see 12.3).

6. Test Specimens

6.1 Sampling and Preparation**.**

6.1.1 Each garment will be considered a specimen. Garments used as specimens should be representative of the production lot. When possible, three specimens should be used. One or two specimens may be used when an insufficient number of garments is available.

6.1.2 Garments that are distorted in their unlaundered state due to faulty fabric finishing, garment assembly, or packing may give deceptive dimensional change results when laundered by any procedure. In such cases, it is recommended that distorted garments not be tested.

6.1.3 Prior to marking, condition test specimens as directed in ASTM D1776, Standard Practice for Conditioning and Testing Textiles (see 12.4). (Use conditions indicated in Table 1 for Textiles, general. Estimate conditioning time as indicated in Table 2 for the appropriate fiber content.) Hang each specimen on an appropriate hanger. If the garment would not normally be hung on a hanger; e.g., T-shirts, boxer shorts, etc., lay each test specimen flat, separately, on a screen or perforated shelves of a conditioning rack.

6.2 Marking. Mark specimens without tension on a flat, smooth horizontal surface.

6.2.1 Using Table V as a guide for the selection of garment specimen areas to use as measurement sites, place benchmarks on the garment at the selected locations. Use at least three length and three width locations for marking benchmarks on each garment specimen. Location of benchmarks should be as agreed upon by the buyer and seller. If garment

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Table I—Standard Washing Machine Parameters (see 12.2, 12.6)

Cycle	(1) Normal		(2) Delicate		(3) Permanent Press	
Water Level, L (gal)	72 ± 4 (19 ± 1)		72 ± 4 (19 ± 1)		72 ± 4 (19 ± 1)	
Agitation Speed, strokes/min.	86 ± 2		27 ± 2		86 ± 2	
Washing Time, min.	16 ± 1		8.5 ± 1		12 ± 1	
Final Spin Speed, rpm	660 ± 15		500 ± 15		500 ± 15	
Final Spin Time, min.	5 ± 1		5 ± 1		5 ± 1	
Wash Temp, °C (°F)[1]	(II) Cold:	27 ± 3 (80 ± 5)	(II) Cold:	27 ± 3 (80 ± 5)	(II) Cold:	27 ± 3 (80 ± 5)
	(III) Warm:	41 ± 3 (105 ± 5)	(III) Warm:	41 ± 3 (105 ± 5)	(III) Warm:	41 ± 3 (105 ± 5)
	(IV) Hot:	49 ± 3 (120 ± 5)	(IV) Hot:	49 ± 3 (120 ± 5)	(IV) Hot:	49 ± 3 (120 ± 5)
	(V) Very Hot:	60 ± 3 (140 ± 5)	(V) Very Hot:	60 ± 3 (140 ± 5)	(V) Very Hot:	60 ± 3 (140 ± 5)

[1] Due to US Department of Energy requirements, many washing machines use cooler water. An external control box may be used to override the machine set temperatures.

areas are sufficient, place 460-mm (18.0-in.) benchmarks on the garment. Benchmark distances used will depend on the size of the garment. For some garments, especially children's clothing, sufficient area may require shorter benchmarks such as 250-mm (10.0-in) or less. Benchmarks must be at least 25 mm (1 in.) from all edges or seams, except as described in 6.2.2.

6.2.2 Benchmarks across garment panels (between or along garment seams) are sometimes used such as, from side seam-to-side seam, the full length or width of a garment and in other selected garment locations. For these types of benchmarks, the measurement points should be clearly marked.

6.2.3 Dimensional change results from different garment sizes, styles and/or benchmark lengths may not be comparable.

6.2.4 Benchmarks distances used must be indicated in the report.

6.3 Original Measurements. Make all measurements without tension, on the same surface used for marking.

6.3.1 To improve the accuracy and precision of the dimensional change calculations based on the benchmarks applied to the garment in 6.2, measure and record the distance between each pair of benchmarks with suitable tape or rule to nearest millimeter or eighth or tenth of an inch. This is measurement A. If using a calibrated template for marking and measuring in percent dimensional change directly, an initial measurement is not needed.

7. Laundering Procedure

7.1 Washing.

7.1.1 Select washing conditions for testing from Table I. Set washing machine controls to generate the selected cycle parameters.

7.1.2 Load for laundering shall consist of all specimens in the sample, plus enough laundering ballast pieces to make a total load weight of 1.8 ± 0.1 kg (4.0 ± 0.2 lb).

7.1.3 Begin selected wash cycle. Allow machine to fill to specified water level.

7.1.4 Add 66 ± 1 g of AATCC 1993 Standard Reference Detergent to washing machine as directed by washing machine manufacturer's instructions. If detergent is added directly to wash water, agitate briefly to dissolve completely. Stop agitation before adding wash load.

7.1.5 Add wash load (test specimens and ballast), distributing evenly around center agitator. Restart wash cycle.

7.1.6 For specimens to be drip dried (drying procedure C), stop wash cycle before the water begins to drain from the final rinse cycle. Remove specimens soaking wet. For specimens to be tumble (A), line (B), or screen/flat (D) dried, allow washing to proceed through the final spin cycle.

7.1.7 After each washing cycle, separate tangled specimens and ballast pieces, taking care to minimize distortion. Proceed to appropriate drying procedure.

7.2 Drying.

7.2.1 Select drying conditions from Table II.

Table II—Standard Drying Conditions

(A)	Tumble Dry
(Ai)	Tumble Dry Normal
(Aii	Tumble Dry Delicate
(Aiii)	Tumble Dry Permanent Press
(B)	Line/Hang Dry
(C)	Drip Dry
(D)	Screen Dry/Dry Flat

7.2.2 (A) Tumble Dry. Place the washed load (test specimens and ballast) in the tumble dryer, and set the temperature control to generate the selected cycle exhaust temperature (see Table III). Allow the dryer to run until the load is fully dry. Remove specimens immediately.

7.2.3 (B) Line/Hang Dry. Hang each specimen by two corners, with the fabric length in the vertical direction. Allow specimens to hang in still air at room temperature not greater than 26°C (78°F) until dry. Do not blow air directly on specimens as it may cause distortion.

7.2.4 (C) Drip Dry. Hang each dripping wet specimen by two corners, with the fabric length in the vertical direction. Allow specimens to hang in still air at room temperature not greater than 26°C (78°F) until dry. Do not blow air directly on specimens as it may cause distortion.

7.2.5 (D) Screen/Flat Dry. Spread each specimen on a horizontal screen or perforated surface, removing wrinkles without distorting or stretching it. Allow specimens to rest in still air at room temperature not greater than 26°C (78°F) until dry. Do not blow air directly on specimens as it may cause distortion.

7.2.6 For all drying methods, allow specimens to dry completely before washing again.

7.2.7 Repeat the selected washing and drying procedures for a total of 3 complete cycles, or an agreed upon number of

Table III—Standard Tumble Dryer Parameters (see 12.2)

Cycle	(Ai) Normal	(Aii) Delicate	(Aiii) Permanent Press
Max. Exhaust Temp, °C (°F)	68 ± 6 (155 ± 10)	60 ± 6 (140 ± 10)	68 ± 6 (155 ± 10)
Cool Down Time, min.	≤ 10	≤ 10	≤ 10

Table IV—Laundering Ballast Parameters

	Type 1	Type 3
Fiber Content	100% cotton	50% cotton/50% polyester ± 3%
Greige Fabric Yarns	16/1 ring spun	16/1 or 30/2 ring spun
Greige Fabric Construction	52 × 48 ± 5 yarns/in., plain weave	52 × 48 ± 5 yarns/in., plain weave
Finished Fabric Weight	155 ± 10 g/m^2	155 ± 10 g/m^2
Edges	All edges hemmed or over-edged	All edges hemmed or over-edged
Finished Piece Size	920 × 920 ± 30 mm (36.0 × 36.0 ± 1 in.)	920 × 920 ± 30 mm (36.0 × 36.0 ± 1 in.)
Finished Piece Weight	130 ± 10 g	130 ± 10 g

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