

Home Laundering: Machine Washing

Developed in 2018 by AATCC Committee RA88 (supersedes Monograph 6).

Foreword

This procedure is based on laundering methods and parameters originally developed as part of various AATCC standards. As a stand-alone laundering protocol, it may be combined with other test methods, including those for appearance, care label verification, and flammability. A procedure for hand laundering may be found in Laboratory Procedure 2, Home Laundering: Hand Washing.

Standard laundering procedures remain consistent to allow valid comparison of results. Standard parameters represent, but may not exactly replicate, current consumer practices, which vary over time and among households. *Alternate* laundering parameters (water level, agitation, temperature, etc.) are updated periodically to more closely mirror consumer practices and allow use of available consumer machines, though different parameters may produce different test results.

1. Purpose and Scope

1.1 This procedure provides standard and alternate home laundering conditions using an automatic washing machine. While the procedure includes several options, it is not possible to include every existing combination of laundering parameters.

1.2 This test is applicable to all fabrics and end products suitable for home laundering.

2. Principle

2.1 Home laundering procedures, including washing in an automatic washing machine and several drying methods are described. Parameters for washing machines and tumble dryers are also included. The procedures described herein need to be combined with an appropriate test method to obtain and interpret results.

3. Terminology

3.1 **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.

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 procedure. 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 protect skin and eyes from exposure.

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

5. Uses and Limitations

5.1 *Standard* laundering parameters represent, but may not exactly replicate, current consumer practices, which vary over time and among households. *Alternate* laundering parameters (water level, agitation, temperature, etc.) are updated periodically to more closely mirror consumer practices and allow use of available consumer machines, though different parameters may produce different test results.

5.2 Equipment meeting all listed parameters may not be readily available.

6. Apparatus and Materials (see 17.1)

6.1 Automatic washing machine (see Tables I, IIA-D, IIIA-C, IVA-B, 17.2).

6.2 Tumble dryer (see Table VI, 17.2) or facilities for drip/line/flat drying.

6.3 1993 AATCC Standard Reference Detergent (powder) or AATCC High Efficiency (HE) Standard Reference Liquid Detergent (see 17.3, 17.4).

6.4 Scale with at least 5.0-kg (10.0-lb) capacity.

6.5 Laundering ballast Type 1 or Type 3 (see Table VII).

7. Verification

7.1 Verify top-loading washing machine parameters before running a test, or at minimum, once a year. No laboratory verification methods are currently available for front loading machines.

7.2 Water level verification

7.2.1 Using a graduated pail, fill machine with room-temperature water until it totals the specified volume.

7.2.2 Vertically, (perpendicularly to water surface), submerge an 1-m ruler until it touches the bottom of the machine drum. Using a permanent ink marker, draw a line on the ruler at the point of contact with the surface of the water. Drain water from drum.

7.2.3 Begin cycle, stopping when fill is complete (before agitation begins). Use the marked ruler to verify water level. Ensure ruler is submerged at the same place as when it was marked.

7.3 Agitation speed

7.3.1 To facilitate counting the number of strokes per minute during agitation in the wash cycle, tape one end of a short ruler or rod (approximately 150-mm) to the center point on the top of the agitator or impeller.

7.3.2 Place a small piece of colored tape at the free end of the rod.

7.3.3 Begin wash cycle and count the number of strokes per minute by focusing your eyes on the colored tape.

7.4 Spin speed (rpm)

7.4.1 Use a tachometer and reflective tape to measure the rpm of the machine during the spin cycle. Follow the manufacturer's instructions for the tachometer used.

8. Specimens

8.1 Cut and prepare specimens as directed in the applicable test method. This laundering procedure may be performed on any size or shape specimen(s) with a total dry mass less than or equal to 1.8 kg (4.0 lb) or 3.6 kg (8.0 lb).

8.2 If required, condition and evaluate specimens before laundering, as directed in an applicable test method.

9. Standard Washing Procedure

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

9.2 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).

9.3 Begin selected wash cycle. Allow machine to fill to water level specified in Table I.

9.4 Add 66 ± 1 g of 1993 AATCC Standard Reference Detergent to washing machine as directed by washing machine manufacturer's instructions. (Do not use

Table I—Standard Washing Machine Parameters

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) (III) Warm: 41 ± 3 (105 ± 5) (IV) Hot: 49 ± 3 (120 ± 5) (V) Very Hot: 60 ± 3 (140 ± 5)	(II) Cold: 27 ± 3 (80 ± 5) (III) Warm: 41 ± 3 (105 ± 5) (IV) Hot: 49 ± 3 (120 ± 5) (V) Very Hot: 60 ± 3 (140 ± 5)	(II) Cold: 27 ± 3 (80 ± 5) (III) Warm: 41 ± 3 (105 ± 5) (IV) Hot: 49 ± 3 (120 ± 5) (V) Very Hot: 60 ± 3 (140 ± 5)

¹ The temperatures in this table are similar to those specified by the US Federal Trade Commission for care label verification (see Table VIII). Due to US Department of Energy requirements, many consumer washing machines use cooler water. An external control box may be used to override the machine set temperatures.

Table IIA—Alternate Laundering Parameters (Traditional Top-loading Washing Machines 2000-2008)

Cycle	Normal	Delicate	Permanent Press
Water Level, L (gal) 1.8-kg load	68 ± 4 (18 ± 1)	68 ± 4 (18 ± 1)	68 ± 4 (18 ± 1)
3.6-kg load	83 ± 4 (22 ± 1)	83 ± 4 (22 ± 1)	83 ± 4 (22 ± 1)
Agitation Speed, strokes/min.18	179 ± 2	119 ± 2	179 ± 2
Washing Time, min.	12 ± 1	8 ± 1	10 ± 1
Final Spin Speed, rpm	645 ± 15	430 ± 15	430 ± 15
Final Spin Time, min.	6 ± 1	6 ± 1	4 ± 1
Wash Temp, °C (°F)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)
Rinse Temp.	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)

Table IIB—Alternate Laundering Parameters (Traditional Top-loading Washing Machines 2009-2010)

Cycle	Normal	Delicate	Permanent Press
Water Level, L (gal)			68 ± 4 (18 ± 1)
1.8-kg load	68 ± 4 (18 ± 1)	68 ± 4 (18 ± 1)	
3.6-kg load	83 ± 4 (22 ± 1)	83 ± 4 (22 ± 1)	83 ± 4 (22 ± 1)
Agitation Speed, ¹ strokes/min.	179/119 ± 2	119 ± 2	179/119 ± 2
Washing Time, min.	12 (6 at stepdown agitation) ± 1	6 ± 1	9 (3 at stepdown agitation) ± 1
Final Spin Speed, rpm	645 ± 15	430 ± 15	430 ± 15
Final Spin Time, min.	6 ± 1	3 ± 1	4 ± 1
Wash Temp, °C (°F)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)
Rinse Temp.	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)

¹ Around 2009-2010, many of the top selling vertical axis washing machines featured a step-down agitation that started at a higher agitation (e.g., 179 rpm) and then changed to a lower agitation (e.g., 119 rpm) during the cycle.

Table IIC—Alternate Laundering Parameters (Traditional Top-loading Washing Machines 2011-2012)

Cycle	Normal	Delicate	Permanent Press
Water Level, L (gal)			
1.8-kg load	72 ± 4 (19 ± 1)	72 ± 4 (19 ± 1)	72 ± 4 (19 ± 1)
3.6-kg load	83 ± 4 (22 ± 1)	83 ± 4 (22 ± 1)	83 ± 4 (22 ± 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)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)	Very Cold: 16 ± 3 (60 ± 5) Cold: 27 ± 3 (80 ± 5) Warm: 41 ± 3 (105 ± 5) Hot: 49 ± 3 (120 ± 5) Very Hot: 60 ± 3 (140 ± 5)
Rinse Temp.	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)	Very Cold: < 18°C (< 65°F) Other: < 29°C (< 85°F)