

Standardization of Home Laundry Test Conditions

Developed in 1984 by AATCC Committee RA88; revised 1986, 1992, 1995, 2003, 2005.

Many AATCC test methods include procedures for laundering and/or restoring fabrics or garments after laundering. In the past, these methods have been developed independently of each other, with little consultation between test method committees. This had led to a wide variation in test conditions between methods, and even when the same condition was specified in two methods there might be differences in nomenclature or designation of the condition. The situation was further complicated by the fact that some of the test conditions; e.g., wash water temperature, did not adequately reflect actual consumer practice. This was in large part due to significant changes in consumer practices in the past several years as a result of energy conservation measures and changing lifestyles.

In order to establish a consistent set of test conditions for all test methods involving home laundering, an AATCC committee was established. Based on the input of a number of AATCC and ASTM committees and a survey of actual consumer practice, a set of guidelines was developed for the standardization of laundering, drying and restoration terminology in AATCC test methods. These guidelines have been approved by all AATCC committees involved in laundering test methods and are now presented in Tables I-IV for the guidance of committees developing test methods utilizing laundry procedures. Energy-efficient washing machines sold after 1989 and dryers sold after 1983 have standard settings which differ from those of older models, as noted in Table II and Table IV. Table V provides the Federal Trade Commission (FTC) wash temperatures for information purposes only. FTC drying conditions are the same.

It should be noted that the designated wash temperatures are at the upper limit of each temperature range, as this is the critical area for appearance retention test methods. In actual practice, the cold water temperature, $27 \pm 3^\circ\text{C}$ ($80 \pm 5^\circ\text{F}$), is probably higher than a significant number of consumers can achieve, particularly in the winter. It is for this reason that the very cold temperature, 16°C (60°F), was added. It should be emphasized that it is not necessary that all test conditions be included in any test method. However, if these conditions are used, the numerical/alphabetic designations and terminology shown in the tables should be used.

Table I—Machine Wash Conditions

Designation	Wash Temperature	Rinse Temperature
I	Very Cold: $16 \pm 3^\circ\text{C}$ ($60 \pm 5^\circ\text{F}$)	$<18^\circ\text{C}$ (65°F)
II	Cold: $27 \pm 3^\circ\text{C}$ ($80 \pm 5^\circ\text{F}$)	$<29^\circ\text{C}$ (85°F)
III	Warm: $41 \pm 3^\circ\text{C}$ ($105 \pm 5^\circ\text{F}$)	$<29^\circ\text{C}$ (85°F)
IV	Hot: $49 \pm 3^\circ\text{C}$ ($120 \pm 5^\circ\text{F}$)	$<29^\circ\text{C}$ (85°F)
V	Very Hot: $60 \pm 3^\circ\text{C}$ ($140 \pm 5^\circ\text{F}$)	$<29^\circ\text{C}$ (85°F)

Table IIA—Washing Machine Setting Conditions without Load 2000⁵

Cycle ¹	Normal ¹	Permanent Press ¹	Delicate ¹
Water Level Medium ²	18 ± 1 gal	18 ± 1 gal	18 ± 1 gal
Agitation Speed	179 ± 2 spm ³	179 ± 2 spm	119 ± 2 spm
Washing Time	12 min	10 min	8 min
Spin Speed	645 ± 15 rpm ⁴	430 ± 15 rpm	430 ± 15 rpm
Final Spin Time	6 min	4 min	6 min

Table IIB—Washing Machine Setting Conditions without Load 1992–1999

Cycle ¹	Normal ¹	Permanent Press ¹	Delicate ¹
Water Level Medium ²	18 ± 1 gal	18 ± 1 gal	18 ± 1 gal
Agitation Speed	179 ± 2 spm ³	179 ± 2 spm	119 ± 2 spm
Washing Time	12 min	10 min	8 min
Spin Speed	645 ± 15 rpm ⁴	430 ± 15 rpm	430 ± 15 rpm
Final Spin Time	6 min	4 min	6 min

Table IIC—Washing Machine Setting Conditions without Load 1989–1991

Cycle ¹	Normal ¹	Permanent Press ¹	Delicate ¹
Water Level Medium ²	18 ± 1 gal	18 ± 1 gal	18 ± 1 gal
Agitation Speed	179 ± 2 spm ³	179 ± 2 spm	119 ± 2 spm
Washing Time	12 min	10 min	8 min
Spin Speed	645 ± 15 rpm ⁴	430 ± 15 rpm	430 ± 15 rpm
Final Spin Speed	6 min	4 min	4 min

Table IID—Washing Machine Setting Conditions without Load before 1989

Cycle ¹	Normal ¹	Permanent Press ¹	Delicate ¹
Water Level Medium ²	18 ± 1 gal	18 ± 1 gal	18 ± 1 gal
Agitation Speed	68 ± 2 spm ³	68 ± 2 spm	45 ± 2 spm
Washing Time	12 min	10 min	8 min
Spin Speed	510 ± 15 rpm ⁴	340 ± 15 rpm	340 ± 15 rpm
Final Spin Time	6 min	4 min	4 min

¹ Cycle names vary with machine brand and model. "Normal Cycle" generally corresponds to the cycle that has the highest agitation and spin speed and it is also frequently designated as "Heavy Duty" or "Ultra Clean." "Permanent Press Cycle" generally corresponds to the cycle with the shortest final spin time to minimize wrinkle formation and it is also frequently designated as "Easy Care." "Delicate Cycle" generally corresponds to the cycle with the shortest washing time and it is also frequently designated as "Gentle."

² A water volume of 18 ± 1 gallons is equivalent to 68.1372 ± 3.7854 L. Since 1989, a water volume of 18 gallons is designated for washing medium size loads and it is frequently referred as "medium water level." A volume of 21-22 gallons (equivalent to 79.4934 - 83.2788 L) is designated for washing large size loads and it is frequently referred as "high water level."

³ spm = strokes per minute.

⁴ rpm = revolutions per minute.

⁵ The washers and dryers specifications listed are based upon models that are available in the U.S., specifically, the models at 60 Hz. Many models available outside of the U.S., specifically models at 50 Hz, may have some variations in these conditions. In many models, the wash time is shorter than listed. If this is the case, report the actual time.

Table III—Drying Procedures

Designation	Drying Techniques
A	Tumble
B	Line
C	Drip
D	Screen
E	Flat Bed Press

Table IV—Tumble Drying Conditions¹

Drying Designation	Cycle	Maximum Exhaust Stack Temperature with Loaded Dryer¹
a	Normal or Permanent Press	65 ± 6°C (150 ± 10°F) [67 ± 6°C (154 ± 10°F) after 1983]
b	Delicate, Synthetic, Low	<60°C (140°F) [<62°C (144°F) after 1983]
Cool Down Time	Normal and Delicate Permanent Press [All	5 min 10 min 10 min after 1983]

¹ The temperature of dryer exhaust should be measured at the end of the drying cycle before any cool down.

Table V—Federal Trade Commission—Wash Temperature

Cold	Initial water temperature setting same as cold water tap up to 29°C (85°F)
Warm	Initial warm temperature setting 32-43°C (90-110°F)
Hot	Water up to 66°C (150°F)

Note: It is recommended that washing machines used for performing standard testing be calibrated before running a test or at minimum once a year to confirm they are performing as specified. This is particularly important for older models and machines that are three or more years old. Simple procedures can be used to calibrate the machines as follows:

- a) Water Level: Manually, using a graduated metal pail, fill machine with room temperature water until it totals the specified volume (e.g. 18 gal). Vertically, submerge into the water (perpendicularly to its surface), an 18 inch or longer metal 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. In the future, use the marked ruler to check the volume of water in-taken by the machine (the ruler needs to be submerged at exactly the same point where it was submerged during the initial calibration).
- b) Agitation Speed (spm): To facilitate the counting of the spm during agitation in the wash cycle, tape (use duct tape) one end of a 6 inch metal ruler or rod to the center point on the top of the agitating post of the machine. Tape a small piece of the duct tape at the free end of the metal ruler. Start machine and count the number of strokes per minute in the wash cycle by focusing your eyes on the marked free end of the ruler.
- c) Spin Speed (rpm): Use a tachometer to measure the speed (rpm) of the machine during the spinning process. Follow the operating instructions for the tachometer that is used.