Performance Evaluation Procedures for Household Clothes Washers

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ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

Leadership ➤ Knowledge ➤ Innovation

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PREFACE

The Association of Home Appliance Manufacturers develops standards in accordance with AHAM's "Policy and Procedures Governing Technical Standards" which states:

> "AHAM Standards shall be in the best interest, mutually, of consumers who use appliances, the industries which provide and service appliances, and other interested parties. They shall relate to actual use conditions, and be technically and scientifically sound."

Use or observance of AHAM standards is voluntary. AHAM standard procedures do not preclude other valid testing procedures, each of which should be evaluated based on its own merit.

AHAM standards are presented to the American National Standards Institute (ANSI) for recognition as American National Standards. This standard will be subjected to public scrutiny by use of the canvass method and submitted to ANSI for approval once it has been accepted as an AHAM standard.
This standard contains test procedures which provide a practical means of measuring specific performance characteristics of any brand or model of automatic household electric clothes washers. When using any of the test procedures to determine performance rating status or to compare the performance of appliances, it is recommended that multiple test units (typically at least 3) be run to ensure that the results obtained are statistically valid.

With regard to safety, AHAM recommends that all appliance products--major and portable--manufactured or marketed in the United States be submitted to an appropriate Nationally Recognized Test Laboratory for inspection and listing in conformance with the safety standards and procedures followed by such laboratories. The relevant standard for clothes washers is ANSI/UL 2157, “Standard for Safety, Electric Home-Laundry Equipment”.

AHAM welcomes comments and suggestions regarding this standard. Any standard may be reviewed and improved as needed. All standards must be updated or reconfirmed at least every five years. Any interested party, at any time, may request a change in an AHAM standard. Such request should be addressed to AHAM's President, and should be accompanied by a statement of reason for the request and a suggested alternate proposal.

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1. PURPOSE

The purpose of this standard is to establish a uniform, repeatable procedure for evaluating the performance of household clothes washers.

This standard provides technical means to compare and evaluate the performance of different brands and models of household clothes washers.

This standard is not intended to inhibit improvement and innovation in product testing, design or performance.

2. SCOPE

This standard applies to automatic household clothes washers and combination washer-dryer equipment. With respect to combination washer-dryer equipment, this standard covers the washing function only.

This standard includes definitions and test methods for evaluating the performance of various cycles of household clothes washers.

3. DEFINITIONS

3.1 **Base Load**: The textile load without any additional test strips, test pieces or test materials.

3.2 **Bone Dry**: A condition of a load that has been dried in an automatic clothes dryer or equivalent set at the maximum temperature for a minimum of 10 minutes, removed and weighed before cool-down, and then dried for additional 10 minute periods until the final weight change of the load is 1% or less.

3.3 **Conditioning Cycle**: The cycle used to prepare a washer for test.

3.4 **Cycle**: A complete washing process consisting of a series of different operations (wash, rinse, spin, etc.).

3.5 **Horizontal Axis (HA) Washing Machine**: A washing machine in which textiles are placed in a horizontal or inclined (< 45deg from horizontal axis) drum where the spin extraction means is by rotation of the drum about its axis and the mechanical washing action being produced by rotation of the drum about its axis, the movement being either continuous or periodically reversed.

3.6 **Normalization**: The process of removing residual detergent or other chemicals from the base load.

3.7 **Pre-treatment**: The washing of new base load items prior to use.

3.8 **Replication**: A repeat run of a test. For example, when three duplicate runs are required, each run is referred to as a replication.

3.9 **Stuffer Load**: In procedures for evaluating washer performance, material used to bring the total weight of textiles to a specified amount (or weight).

3.10 **Test Load**: The base load plus soil test strips, test pieces and/or test materials.

3.11 **Vertical Axis (VA) Washing Machine**: A washing machine in which textiles are placed in a vertical or inclined >45deg from vertical axis) drum where the spin extraction means is by rotation of the drum about its axis and the mechanical

washing action being produced either by rotation of the drum about its axis (the movement being either continuous or periodically reversed) or by other devices contained within the drum and moves relative to the drum.

4. GENERAL TEST CONDITIONS

4.1 Equipment. For user convenience, the specific equipment required for any given test is listed in the Section covering that test.

Additionally, it is recommended that the pretreatment and normalization of the loads be carried out in a separate clothes washer specifically retained for that purpose.

4.2 Base Loads

4.2.1 The base load is designed to simulate consumer loads using test pieces that are reproducible and facilitate test repeatability.

4.2.2 The base load shall consist of items that simulate bed sheets, pillowcases and towels as specified in Annex A.A.1. Provision is made to test with various load sizes, and the number of items for various nominal test load weights is given in Table 2 (Section 5).

4.2.3 The stated load weight shall be the weight of the base load. The weight of added test strips and/or swatches is ignored.

4.2.4 All load sizes given in pounds (lbs.) in this standard are 'bone dry' weights (refer to 4.4.3 for description of the bone dry procedure.)

4.2.5 Load Size conversion between IEC and AHAM

- 1 kg $_{IEC}$ test load is approximately 975 grams IEC Base Load (the stain strip is approximately 25 grams and there is 1 per kg).
- 975 grams IEC base load are approximately 907 grams bone dry (estimating the difference between climate control conditions and bone dry to be approximately 7%).
- 907 g base load bone dry are equal to 1.999 lbs (with 1 lbs being equal to 453.59237 g).
- Therefore: 1 kg $_{IEC}$ test load translates almost exactly to 2 lbs AHAM Load.

To facilitate the usage of this standard for users of the IEC standard 60456, this standard also mentions the IEC test load mass in kg $_{IEC}$ corresponding to the AHAM base load mass in lbs.

4.2.6 The procedure for making up a test load is as follows:

4.2.6.1 The base load is assembled using the exact number of items specified in Table 2 for the weight desired.

4.2.6.2 The assembled base load is weighed. If the measured weight differs from the nominal weight by more than 0.12 lb (50 g), final adjustment of the base load weight is made by adding or removing towels as necessary.

4.2.7 **Usage.** No item shall be used for more than 84 test cycles, not counting pre-treatment and normalization cycles.

To minimize the influence of aging of the textiles, the cotton base load shall consist of sheets, pillowcases and towels of mixed age. The weighted average age of the load should be between 29 and 51 test cycles. Examples of how to create and maintain a mixed age load, and how the average age of a load may be estimated, are given in Annex C.

4.3 AHAM Stuffer Load

An AHAM stuffer shall comply with the specification given in Annex A.A.2: No stuffer shall be used for more than 25 test cycles, excluding the extra rinse and preconditioning cycles.

4.4 Test Load Preparation and Maintenance

4.4.1 **Pre-Treatment**. New textile items shall be treated before their first use. Follow the parameters in Table 1.

4.4.2 **Normalization**. Before first use in any series of tests, and subsequently after every three cycles, the base load shall be normalized. Follow the parameters in Table 1.

Table 1

	Pre-Treatment for New Textiles	Normalization for Base Load
Cycle	The cycle recommended by the manufacturer for washing cotton or linen clothes.	The cycle recommended by the manufacturer for washing cotton or linen clothes.
Wash Temperature	Hot water	Hot water
Rinse Temperature	Cold water	Cold water
Detergent	AHAM Standard Detergent (Formula 3) 27 g + 4.0 g per pound of base load	None
Number of Cycles	5	2
Drying	Only after the fifth cycle	Bone dry

4.4.3 **Drying Procedure**. To obtain consistency in determining load sizes, the base load should be dried to "bone dry" weight by the following procedure:

If load* is damp following removal from a clothes washer or if load has been removed from storage and is nominally dry, place it in an automatic clothes dryer or equivalent set at the maximum temperature and dry for 10 to 40 minutes depending upon the load size. Remove before cool down and weigh immediately. Continue drying for ten minute periods until the final weight change between each weighing is 1% or less.

**Note: If necessary the base load may be divided into not more than two similar portions.*

4.5 Water

4.5.1 **Temperature**. Water supply temperatures as measured at the point of the hose connection at the clothes washer are to be as follows unless otherwise noted.

4.5.1.1 Hot = 130 ± 2°F (54 ± 1°C).

4.5.1.2 Cold = 60 ± 5°F (16 ± 3°C).

4.5.2 **Pressure.** The static water pressure at the hot and cold water inlet connections of the clothes washer shall be maintained at 35 (± 2.5) psig. {241.3 (± 17.2) kPa} during the test. The static water pressure for a single water inlet connection shall be maintained at 35 (± 2.5) psig. {241.3 (± 17.2) kPa} during the test.

4.5.3 **Hardness.** Water hardness is to be 0-3 grains/gal (50 parts per million of $CaCO_3$ or less).

4.6 Electricity Supply. The supply voltage shall be maintained at the rated voltage ± 2 % throughout the test. If a voltage range is indicated, then the supply voltage shall be the nominal voltage of the country in which the clothes washer is intended to be used.

The supply frequency shall be maintained at the rated frequency ± 1 % throughout the test. If a frequency range is indicated, the test frequency shall be the nominal frequency of the country in which the machine is intended to be used.

4.7 Standard Test Detergent (Formula 3).

4.7.1 The detergent used in all tests shall be AHAM Standard Test Detergent (Formula 3) as specified in Annex A.A.5.

4.7.2 **Concentration.** The detergent quantity (unless otherwise specified) shall be 27 g plus 4.0 g per pound (0.454 kg) of base load.

4.7.3 **Storage.** The detergent shall be stored in accordance with the manufacturer's instructions. It shall not be used beyond the expiration date. If no expiration date for the detergent is specified by the manufacturer, the expiration date is deemed to be one year from the date of manufacture.