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Standard Guide for Evaluating Stain Removal Performance in Home Laundering[1]

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1. Scope

1.1 This is a guide for evaluating stain removal performance of home laundry products or home laundering conditions. It provides guidance for the selection, preparation, application, and examination of various types of stains on test fabrics that are subjected to controlled but practical stain removal treatment conditions.

1.2 There is no single combination of stain and fabric that will predict the overall performance of a product or treatment method. A single test, even with a variety of stains/fabrics, can only predict how products or treatment methods compare under the particular conditions chosen for evaluations. A series of assessments is necessary to evaluate the many aspects of stain removal performance and to simulate consumer experience more closely.

1.3 In this guide, the use of both traditional top-loader washing machines as well as front and top-loading high-efficiency washers is addressed.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1729 Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials

2.2 *AATCC Standard:*[3]

Test Method 130-2010 Soil Release: Oily Stain Release Method

3. Terminology

3.1 *Definitions:*

3.1.1 *front-loading high-efficiency (HE) washing machine/washer, n*—horizontally or nearly horizontally oriented machine used for laundry that uses varying amounts of water to launder fabrics.

3.1.1.1 *Discussion*—These washers: *(1)* may not exhibit any visible free water or may show significant quantities of visible free water, *(2)* may lift and tumble the clothes load, *(3)* may use both spinning and tumbling in both the washer or rinse processes, *(4)* may use jet sprays of wash solution or rinse solution, or *(5)* may use thermal or chemical inputs, or both, to offer sanitation or allergen claims. HE washers use considerably less water and energy than traditional deep-fill washers in the laundering process. HE washers are labeled by the appliance industry and may be recognized by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) as Energy Star rated machines.

3.1.2 *home laundering, n*—cleaning or conditioning, or both, of textile materials using the washing and drying equipment commonly found in the home.

3.1.3 *pretreaters, n*—usage of a product designed to treat fabric stains not likely to be removed using detergent in wash alone in the normal household laundering process.

3.1.3.1 *Discussion*—Pretreaters can be found in many forms such as sprays and liquids and detergents themselves can be used as a pretreater when applied directly to the stain.

3.1.4 *stain, n*—a local area of undesired foreign matter on a textile material, differing in appearance from the textile substrate.

3.1.5 *top-loading HE washing machine/washer, n*—vertically oriented agitation machine that is used for home

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, http://www.aatcc.org.

laundry with the fundamental difference from a traditional top-loading washer being that this washer uses reduced water resources during the process.

3.1.5.1 *Discussion*—This washer may: *(1)* deep fill once (during the wash or rinse), *(2)* partially fill one or more times, *(3)* may have a full agitator, *(4)* may have an impeller in place of an agitator, *(5)* may use thermal or chemical inputs or both to offer sanitation or allergen claims, or *(6)* may use spray washing or spray rinsing technologies, or combination thereof. HE washers use considerably less water and energy than traditional deep-fill washers in the laundering process. HE washers are labeled by the appliance industry and may be recognized by the U.S. DOE and U.S. EPA as Energy Star rated machines.

3.1.6 *traditional deep-fill top-loading washing machine/ washer, n*—vertically oriented agitation machine that is used for home laundry.

3.1.6.1 *Discussion*—This washer fills to the basket top at least two times during the wash process: once for washing and once for rinsing. The type of washer may also include spray flushes in either the wash or rinse portions of the cycle.

4. Summary of Guide

4.1 Stains are artificially applied in a repeatable manner to specified fabric substrates. After a prescribed time for setting the stains, the test swatches are treated with the products or procedures being compared or both, and the relative degree of removal is assessed.

5. Significance and Use

5.1 This guide suggests a number of staining agents that are representative of stains commonly encountered in household laundry. The assessment need not be limited to this suggested list of stains, especially if special product types or end uses are being evaluated. This guide can be used to compare stain removal performance of products; however, there is no confirmed basis for correlation of this controlled laboratory technique with consumers' ranking of stain removal performance.

5.2 The evaluations generated by this guide should be regarded as diagnostic screening tests that are useful in formulation studies, quality control, and ingredient raw material qualification. This guide provides considerable flexibility in choosing specific stains, washing conditions, and laboratory equipment appropriate to the objective of the evaluation. This procedural latitude may result in a reduced level of interlaboratory precision and such comparison of results must be evaluated with caution.

5.3 The procedure is applicable to all types of home laundry products including detergents, presoak and prespotter products, bleaches, and detergent boosters and is expected to be applicable to horizontal and vertical axis machines.

5.4 It is not intended for the evaluation of products or conditions normally associated with commercial laundering or dry cleaning establishments.

6. Selection and Preparation of Fabric Swatches

6.1 The relative effectiveness of various laundry products or procedures for removing different types of stains will be influenced by the nature of the fabric. If interest is in cleaning on more than one fabric, testing may encompass more than one fiber composition (for example, cotton, polyester/cotton blend, or polyester) and fabric construction (for example, wovens or knits) with results tabulated separately for each. The fabric types most common for the U. S. laundry are polyester/cotton blends, 100 % cotton, and 100 % polyester.

NOTE 1—When ordering pre–cut swatches, the vendor must be alerted that identification of the face side and grain (thread direction) of the swatches is an important testing criterion. These factors must also be considered when bulk yardage is purchased from any source by the experimenter for eventual cutting into test specimen swatches.

6.2 Fabric test swatches should be washed prior to application of stains, if necessary. This is done to eliminate residues of mill finishing agents which might influence stain removal results and also to better simulate the fabric condition when staining incidents occur in household use.

6.2.1 Sufficient yardage of test fabric is pre-washed to cover the need of the test series. The washing is more sufficiently done before the cloth is cut into individual swatches, but can be accomplished with the pre-cut swatches if this is the fabric form that has been purchased.

6.2.2 Minimum pre-washing conditions should be two wash cycles in a household automatic washer (see Note 2) with 120-140°F (48.8-60°C) (less than 50-ppm) water and ambient (less than 50-ppm) water rinses. The first cycle should include a recommended usage level of a standard detergent such as American Association of Textile Chemists and Colorists (AATCC) liquid or powder standard detergent without brightener. Recommended usage level of liquid hypochlorite bleach may also be added. Additional washes with no detergent are recommended until no suds are present.

NOTE 2—Any brand of industrial or household automatic washer (or electric dryer) is acceptable. For household machines, refer to AATCC recommendations as a general guideline.[4] There may be special circumstances in which other conditions may be required in testing (for example, emerging washing machine types). Testing in different machines and different conditions may yield different results. Data comparison can only be made under the same test conditions.

6.2.3 Dry the test cloth 35 to 40 min at 150 ± 10°F (65.5 ± 6°C) in a home dryer after the last wash cycle (see Note 2).

6.2.4 Wash and dry carrier towels or ballast fabrics to be used with the stained test swatches in accordance with 6.2.2 and 6.2.3, but separately from the test fabrics.

6.3 Iron the fabric on permanent press setting if necessary to obtain a flat, smooth surface.

6.4 Cut washed test fabric into desired size swatches.

6.4.1 Orientation of the test swatch can influence the observed staining/wicking characteristics of the test stain and also the stain removal perceived by either visual grading or instrumental reflectance. It is therefore important to identify the fabric grain (direction of the threads relative to the selvage

[4] http://www.aatcc.org/testing/supplies/washers.htm