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Standard Guide for Evaluating Fabric Softeners[1]

This standard is issued under the fixed designation D5237; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide evaluates the performance characteristics of fabric softener products. It provides guidance for ~~treating fabric in~~ evaluating the on fabric efficacy of treatment chemicals dosed into the wash, rinse, or dryer cycle in a home laundry ~~and for evaluating the efficacy of the treatment chemicals.~~ washer or dryer. This guide can be used for ~~simple~~ screening of fabric softener products, or to evaluate the products through multiple accumulative cycles.

1.2 The relative ranking of products assessed by these procedures may be affected by such factors as ~~fabric load composition and the kind and level of soils,~~ machine type and settings, fabric load composition, as well as by the washing and drying procedures used.

1.3 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.

1.4 *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]

E313 Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates

E1958 Guide for Sensory Claim Substantiation

E2164 Test Method for Directional Difference Test

2.2 *~~Other~~AATCC Standard:*[3]

AATCC Test Method 110-1994 Whiteness of Textiles

3. Terminology

3.1 *Definitions:*

3.1.1 *fabric ~~softener—~~softener, n—*~~a~~ laundry auxiliary product or laundry detergent ingredient that gives fabrics a soft feel, smooth surface, provides fragrance, or reduces static electricity, or a combination thereof.

3.1.2 *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.

3.1.2.1 *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 employ 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

[1] This guide is under the jurisdiction of ASTM Committee D12 on Soaps and Other Detergents and is the direct responsibility of Subcommittee D12.25 on Consumer Standards.

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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, P.O. Box 12215, Research Triangle Park, NC 27709.

by the appliance industry and may be recognized by the U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (EPA) as Energy Star rated machines.

3.1.3 *home ~~laundering~~—laundering, n—~~the cleaning and restoring~~* cleaning or conditioning, or both, of textile materials ~~to a serviceable condition~~ using the washing and drying equipment commonly found in the home.

3.1.4 *top-loading high-efficiency (HE) washing machine/washer, n*—vertically oriented agitation machine that is used for home laundry, with the fundamental difference from a traditional top-loading washer being that this washer uses reduced water resources during the process.

3.1.4.1 *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.

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

3.1.5.1 *Discussion*—

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

4. Summary of Guide

4.1 Fabrics are ~~stripped~~evaluated for the ~~removal of mill textile conditioners or previously applied fabric softeners following which they are treated with fabric softener products in the wash or rinse, dried and evaluated~~ impact of fabric softener products applied in the wash, rinse or dryer cycle for softness, whiteness retention, rewet or water absorbency, ~~and static control~~ static control, or fragrance, or combination thereof, using test panels or instrumental methods.

5. Significance and Use

5.1 The methods in this guide can be used for ~~simple~~ screening of fabric softener products or to evaluate ~~the~~their performance, through a single cycle or multiple accumulative cycles, relative to a designated reference ~~product.~~ product or a comparative product(s).

5.2 A single assessment of each of the product characteristics tested by these methods will not predict overall performance of the softener product. A single test run under specified fixed conditions cannot be expected to reflect the comparative performance under many other possible conditions of use.

6. Fabric ~~Pretreatment~~Preparation

6.1 *Scope:*

6.1.1 This section provides a procedure for preparing new or previously used textile specimens for further treatment and evaluation.

6.1.2 All new fabrics received directly from the mill or purchased from vendors must be stripped of mill conditioners and processing auxiliaries. Test ~~towels may be reused for up to five evaluations and sheets~~fabrics are to be used for only a single evaluation while ballast used for load bulk may be reused ~~indefinitely,~~indefinitely if stripping is done between each evaluation.

6.2 *Apparatus and Materials:*

6.2.1 ~~*Household*~~ *Automatic Washing Machine,* ~~top load.~~

6.2.2 ~~*Household*~~ *Automatic Laundry Dryer,* gas or electric.

6.2.3 ~~*Hand Towels,*~~*Test Fabrics,* ~~approximately 16 by 24 in., white cotton loop terry cloth.~~ white cotton or cotton/polyester loop terry cloth, or both, such as hand towels. Other fabrics suitable for fabric softener products are also acceptable. Care should be taken to use ~~towels of similar construction, and weight fiber mix.~~matched sets of fabrics of the same brand and manufacturing origin, and similar construction, weight, and fiber blend within each specific test.

6.2.4 ~~*Flat Bed Sheets,*~~ *Fabric Load,* ~~full size (approximately 104 by 81 in.), 65 % polyester/35 % cotton or 50/50 blend.~~Minimum of 6 lb (2.7 kg) for each total load. Supplement test fabrics with ballast fabrics, such as pillow cases, terry towels, or commercially available yard goods cut in pieces no larger than 1 yd^2 (0.8 m^2) per piece. All ballast loads shall be the same composition for each run within a test. When running successive test loads, use fresh ballast or strip the ballast prior to use.

6.2.5 ~~*AATCC (American Association of Textile Chemists and Colorists) 1993 Standard Reference Detergent WOB,*~~ *Standard Referemce Detergent,* ~~(without brighteners), or~~ such as, AATCC (American Association of Textile Chemists and Colorists), liquid or powder (suggested to use without brightener formula if testing whiteness retention), or a commercially built anionic detergent, ~~as~~if desired.

6.3 *Stripping ~~Procedure:~~ Procedure*—The objective of this procedure is to remove finishes or residues, or both, from the ballast and test fabrics. The procedure below is one suggested way to meet this objective.

6.3.1 Load washer with ~~up to 8 lb of dry~~ appropriate amount of fabrics. Do not overload.

6.3.2 Add ~~50 to 80 g~~ appropriate dosage of built anionic detergent.

6.3.3 Set machine for ~~normal cycle, high or large water fill level, and hot wash/warm rinse~~ hot wash temperature setting. Allow washer to fill with water and continue on through the complete wash and rinse cycle.

6.3.4 Repeat 6.3.2 and 6.3.3 four more times.

6.3.5 Wash this load of fabric through ~~the~~ an additional complete cycle three times with no detergent. If there appears to be residual detergent (as evidenced by sudsing during the previous cycle) repeat the water only cycles one or two more times or as needed to ensure removal of ~~all anionic detergent.~~residual anionic detergent to a minimal level.

6.3.6 Dry fabrics in ~~the~~an automatic dryer at the *normal* or *hot* setting until the load is dry.

6.3.7 ~~Store the fabrics. If closed storage is not available, store in plastic bags.~~If fabrics are stored prior to evaluation, protect from environmental influences such as odor, moisture, dust, etc.

7. Fabric Treatment with Fabric Softener

7.1 *Scope:*

7.1.1 This section provides the procedure for application of the test products to the textile substrates.

~~7.2 *Apparatus and Materials*—Same as 6.2.~~

7.2 ~~*Conditions of Treatment:*~~ *Fixed Test Conditions*—All test conditions not under study should be fixed within the range of normal household practice. The following are suggested as representative of many households.

7.2.1 ~~*Washing Machine Water Level—Matched Washing Machines*—Use the water fill setting that will give a 16 to 19-gal water level. Record actual water fill to the nearest gallon.~~All washings shall be performed in the same machine or in mechanically matched units of the same model machine using a controlled experimental design.

7.2.2 *Household Automatic Washing Machine:*

7.2.2.1 *Conventional Deep-fill Traditional Top Loader*—Normal/casual with 10-14 min wash cycle, appropriate water fill for load size, and regular spin speed.

7.2.2.2 *Front-loading High Efficiency*—Normal/casual or normal/colors setting, normal soil level, and high spin speed,

7.2.2.3 *Top-loading High Efficiency*—Normal/casual or normal/colors setting, normal soil level, and high spin speed.

7.2.3 *Household Automatic Laundry Dryer,* gas or electric.

7.2.4 *Stripped Test Fabrics,* defined in 6.2 and 6.3.

7.2.5 *Water Hardness*—~~Tap water or conditioned water containing 150 ± 20 ppm calcium carbonate hardness.~~35 ppm (2 grains/gal); 100 ppm (6 grains/gal); 150 ppm (9 grains/gal); and 260 ppm (15 grains/gal). 120 ppm (7 grains/gal) is suggested if only one level is tested.

7.2.5.1 The calcium/magnesium ratio of the hardness minerals (expressed as $CaCO^3$) should be adjusted to attain different water hardness as shown in Table 1.

7.2.5.2 *Hard Water Stock Solution*—For a 2:1 ratio, prepare a hard water stock solution by dissolving 2.940 g of calcium chloride dihydrate ($CaCl2{\cdot}2H_2O$) and 2.033 g of magnesium chloride hexahydrate ($MgCl2{\cdot}6H_2O$) in DI water. Dilute to a volume of 1 L with additional deionized (DI) water. This solution contains 3000 ppm hardness (expressed as calcium carbonate) with a Ca:Mg molar ratio of 2:1. For a 3:1 ratio, use 4.41 g of calcium chloride dihydrate ($CaCl2{\cdot}2H_2O$) and 2.033 g of magnesium chloride hexahydrate ($MgC12{\cdot}6H_2O$) in DI water. Larger batches or concentrations may be scaled up using this ratio of calcium chloride to magnesium chloride.

7.2.6 *Water Temperature*—Record temperature actually used. If only one treatment temperature is tested, use a warm wash/cold rinse setting. The suggested test temperatures for respective machine formats are as follows:

~~Hot water~~	~~130°F (54.4°C)~~
~~Warm water~~	~~90°F (32.2°C)~~
~~Cold water~~	~~80°F (26.7°C)~~

Conventional Deep-Fill Top Loader—86 ± 5°F (30 ± 5°C) wash cycle, 60 ± 10°F (15.6 ± 5.5°C) rinse.
Front-Loading High Efficiency—77 ± 5°F (25 ± 5°C) wash cycle, 60 ± 10°F (15.6 ± 5.5°C) rinse.
Top-Loading High Efficiency—75 ± 5°F (23.8 ± 5°C) wash cycle, 60 ± 10°F (15.6 ± 5.5°C) rinse.

NOTE 1—Within a single test, the respective wash and rinse temperature profiles should be consistent.

~~7.3.4 *Dryer Setting*—Use the *regular* or *normal* dryer setting.~~

TABLE 1 High-Static Fabric Bundle

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Fabric	Articles	Approximate Weight, g	Bundle, %
Nylon Tricot, 100 %	slips, 3 whole and 2 half	250	10
Polyester, 100 %	3 knit shirts, short sleeved	250	10
Acrylic, 100 %	2 knit shirts (virgin orlon)	300	12
Rayon, 100 %	1 shirt, long sleeved	100	4
Acetate, 100 %	1 slip	100	4
Polyester/ Cotton, 65/35 blend	1 or 2 sheets, full size, cut into quarters	700	28
Cotton Terry	6 towels	775	31

TABLE 1 Water Hardness Range

Water Hardness Range	Ca/Mg Ratio
0 to 60 ppm	4:1
61 to 120 ppm	3:1
121 ppm and over	2:1

7.2.7 *Fabric Load Weight*—Dry ballast and test fabric load should weigh 2.3 to 2.7 kg. A load consisting of three sheets and four hand towels will generally be in this range.minimum 6 lb (2.7 kg). Towels preferably should be pre-weighed. Towels of similar weights (±1.0 g) should be compared, as different weights can impact results.

7.2.8 *Wash Detergent Dosage*—Use 50 grecommended dosage of AATCC 1993 Standard Reference Detergent WOB (without brighteners). If a commercial detergent is used, follow manufacturer's recommendation. If the wash detergent is also the softening product being evaluated, determine dosage in accordance with 7.3.7.

7.2.9 *Softener Product Dosage*—The amount of the softener dispersion to be used in each test is determined by the level of active softener ingredient desired per unit weight of dry fabric. If commercial products are being tested, follow manufacturer's dosage recommendations.

7.3 *Procedure: Procedure—*

7.4.1 Weigh three sheets and four towels previously prepared as in 6.3. Load weight should be 2.3 to 2.7 kg.Calculate the proper number of test fabrics to be used in your experimental design. One test fabric may be evaluated by up to five panelists. It is recommended that at least two, preferably three or more replicates are tested in each respective test wash. Multiple wash runs can also strengthen your experimental design. Determine the number of desired panelists (see Section 8) and calculate total number of test fabrics needed for each product tested.

7.3.1 Set wash controls for *regular* or *normal* cycle with a wash period of 12 ± 2 min and a water fill level of 16 to 19 gal.*Traditional Top Load Deep Fill Washer:*

7.3.1.1 Set washer controls for *regular* or *normal* cycle with a wash period of 12 ± 2 min and a water fill level of 16 to 19 gal. The wash period and fill level chosen should be similar for all products being tested within the experiment.

7.3.1.2 Washing machine model safety and mechanical variations will impact specific procedural steps for adding product, fabric load, and fabric softener; therefore, inter-laboratory procedural steps may vary. It is recommended, if feasible, that your detergent dosage and fabric softener dosage (if applicable) are dispersed evenly into solution.

7.3.1.3 Place fabric bundle in dryer. Add dry cycle softener, if appropriate. Use the *regular* or *normal* dryer setting.

7.3.1.4 Dry fabric bundle for 45 min or until dry. Store the test fabric overnight so they equilibrate (see 8.1.2).

7.3.1.5 Equilibrate substrates to equal temperature and humidity, preferably overnight in a humidity controlled environment (see 8.1.2). Record conditions (RH and temperature).

7.4.3 Start wash cycle. As the washer fills, add wash detergent dose to washing machine.

7.4.4 Put fabric bundle in washer and allow washer to run until it reaches the deep rinse cycle. (If *untreated* control fabrics are being prepared, allow washer to go to final spin and skip to 7.4.8).

7.4.5 Stop washer and remove towels and sheets.

7.4.6 Start deep rinse cycle until tub is approximately one third filled with cold water. If a rinse cycle product is being evaluated, add the required amount of fabric softener and agitate to ensure uniform dispersion. Record water temperature and time. Specify water temperature.

7.4.7 Add damp fabric bundle. Start machine and allow it to complete the rinse and spin cycles.

7.4.8 Place fabric bundle in dryer. Add dryer cycle softener, if appropriate. Use the *regular* or *normal* dryer setting.

7.4.9 Dry towels for 45 min or until dry. Store the towels overnight so they equilibrate (see 8.2.1).

7.3.2 ~~Treated towels can now be evaluated for softness (Section 8) or absorbency (Section 9), or both.~~*HE Washer:*

7.3.2.1 Set wash controls for *regular* or *normal* cycle, warm wash.

7.3.2.2 Place detergent and fabric softener (if applicable) in their respective dispenser drawers. If using unit dose product, place in machine drum.

7.3.2.3 Put fabric bundle in washer. Start wash.

7.3.2.4 Once finished, place fabric bundle in dryer. Add dryer cycle softener, if appropriate. Use the regular or normal dryer setting.

7.3.2.5 Dry test fabrics for 45 min or until dry.

7.3.2.6 Equilibrate substrates to equal temperature and humidity, preferably overnight in a humidity controlled environment (see 8.1.2). Record conditions (RH and temperature).

7.4 Treated test fabrics can now be evaluated for softness (Section 8), fragrance (Section 9) or absorbency (Section 10), or combination thereof.

8. Fabric Softness Evaluation by Test Panel Scoring or Instrumental, or both

8.1 ~~*Scope—Procedure—*~~This section covers a subjective testing procedureFabric Softness Evaluation by Test Panel Scoring ~~for ranking the relative softness of treated fabrics. Treated towels are ranked by panelists on a five point scale (least soft = 1, most soft = 5). The comparisons include an untreated towel~~—These assessments are provided as guidance for evaluating softness by test panel scoring. Other suitable approaches may be used, for example, those referenced in Guide E1958 and ~~a towel treated with a control product for benchmark~~ sensory textbooks such as Sensory Evaluation Techniques, 4th ed.~~rankings.~~[4]

8.1.1 Note that anyone with a potential bias (for example, employees working on the development of the product) is not appropriate for conducting evaluations.

8.1.2 Condition the fabrics in a constant temperature-humidity room (if available) overnight prior to evaluation. Suggested controlled environments are between 65 to 75°F (18.3 to 23.9°C) and 50 to 65 % relative humidity. Measure and record temperature and humidity.

8.2 The panelists must clean and dry their hands and have no lotions or other products on them before handling the test fabrics. During the evaluation the panelists may need to re-clean and dry their hands to remove any softener or oily buildup that might interfere with the test.

8.3 Panelists should be chosen based on test objective and indicated in the report. “Screened” panelists are qualified or trained, or both, in a manner that indicates an ability to determine differences where differences are expected. “Naive” panelists typically have no prior training or qualification and are typically used for consumer testing. Descriptive panelists are highly trained and can also be used.

8.4 Individual panelists should use the same handling technique when evaluating each fabric in the test set.

8.5 ~~*Procedure:*~~ *Ranking Comparison*—This evaluation uses three or more products/treatments. (For more information refer to Sensory Evaluation Techniques, 4th Ed.)[4]

8.5.1 ~~Condition the fabrics in a constant temperature-humidity room (if available) for 24 h prior to evaluation. Suggested controlled environments are between 65 to 75°F (18.3 to 23.9°C) and 40 to 50 % relative humidity.~~Each panelist is given a group of test fabrics for scoring (for example, A, B, C, and D). Samples should be completely randomized and balanced such that order of appearance of each treatment is evenly distributed.

8.5.2 ~~It has been observed that different scores result when one-day old towels are compared to four-day old towels. This may be due to a loss~~ Each set of comparisons shall consist of 3-6 products/treatments. An increased number of product comparisons may decrease sensitivity.~~fluff over time, resulting in a leveling effect. Fabrics being tested should all be treated with softener the day prior to the evaluation.~~

~~8.2.3 To effectively evaluate a set of towels, at least four panel members are needed. Eight are preferred. The panelists should wash their hands before handling the test fabrics. During the evaluation the panelists may need to rewash their hands to remove any softener or oily build up that might interfere with the test.~~

8.5.3 ~~Each panelist is given a group of test fabrics for scoring.~~Panelists should rank the samples from least to most soft. If desired, additional comments by the panel member on the feel of the fabric can be recorded, for example, oily, waxy, greasy, etc. Panelists may allow for ties in ranking. In this case both should be assigned a half grade, for example, if 4 fabrics are tested and 2 are judged to be a tie for the most soft, they may be assigned a score of 3.5 for each.

~~8.2.4.1 Each group of test fabrics shall consist of up to five pieces. The test group should contain one untreated control, one softness reference fabric, and no more than three test fabrics. The softness reference fabric has been treated with dihydrogenated tallow dimethyl ammonium chloride at 0.1 % single use level, based on dry fabric weight.~~

~~8.2.4.2 Panelist should use the same handling technique for scoring each towel in the test set.~~

[4] Meilgaard, ~~Civille, and Carr,~~ Morten C., *Sensory Evaluation Techniques*, ~~CRC Press LLC, 2000 N.W. Corporate Blvd., Boca Raton FL, 33431, pp. 103–106.~~4th Edition, CRC Press, 2005.

8.2.4.3 The panelist first picks out the harshest towel and scores it one. Then the softest towel is selected and scored five. The other towels are scored intermediate between the high and low selections and given scores such as two, three, or four. The towels are then rearranged and the evaluation repeated. (To eliminate bias, towels are blind coded and panel members are not told their rating results before repeat evaluations.)

8.2.4.4 Additional comments by the panel member on the feel of the fabric should be recorded, for example, *oily*,*waxy*,*greasy*, etc.

8.2.4.5 After each test the scores are totaled and averaged to give a single rating number for each treatment product.

8.5.4 After each test the scores are evaluated using Friedman Analysis and Least Significant Rank Difference multiple comparison test (see Sensory Evaluation Techniques, 4th ed., pages 110-112).[4]

8.6 *Degree-of-Difference Testing*—This evaluation compares one or more treatments versus a control.

8.6.1 Create a scale ranging from no difference (numerical value = 0) to very large difference. The scale may be as large as is useful to the product developer, but note that the panelists must be able to understand the use of each part of the scale. As a suggestion, assign a verbal scale value (for example slight difference, moderate difference, etc.) to each part of the scale. It is recommended the panelists have training using physical examples spanning the expected range to guide use of the scale. The scale may also contain positive and negative values to indicate which sample is softer in addition to the size of the softness difference.

8.6.2 Panelists are presented initially with a control sample. They are to be instructed that the test samples may or may not be different from the control sample. They then receive a series of test samples (including the blinded control) and are asked to assign a numerical value to the difference between the control sample and the test sample. Samples should be completely randomized such that order or appearance of each treatment is evenly distributed as well as the sample that it follows.

8.6.3 After the evaluation is complete, samples may be evaluated for significant-from-control differences using t-test (to compare a sample versus the control) or ANOVA + multiple comparison test (for example, Dunnett test, in the case of more than one product being compared versus control). See Sensory Evaluation in Quality Control[5] for more information.

8.7 ~~*Paired Comparison Method:*~~ *Directional Difference Test (Paired Comparison)—*

8.3.1 Towels should be conditioned as in 8.2.1. This evaluation compares two treatments, (for example, A versus B).

8.3.2 Fabrics (towels) being tested should all be treated with softener the day before testing.

8.7.1 For effective evaluation, at least 10 anduse Test Method E2164 preferably 15-20 panelists are required.as a reference tool.

8.7.2 Arrange the towels in pairs so that towels treated with a product are paired at least once and preferably twice with towels treated with all the other treatments. Untreated towels may be included as an additional treatment.treated fabrics in pairs. The panelist evaluates one pair.

8.7.3 A panelist feels each pair of towels and records their preference as to which towel of the pair is asked to feel a pair and judge which fabric is softer. The panelist must choose one of the towelsfabrics in each pair, even if both appear equally soft. All results are recorded. An assessor who detects no difference between samples should be instructed to make a guess and select one of the samples, and can indicate in the comments section that the selection was only a guess.

8.3.6 When all the panelists have evaluated all the pairs, the results are tabulated and treated as described in *Sensory Evaluation Techniques*.[4]

8.3.6.1 For each pair of towels, total number of times each towel was judged softer.

8.3.6.2 Create a table with the number of columns and the number of rows both equal to the number of treatments. Label one column and one row with each treatment.

8.3.6.3 In the row for treatment "A" and the column for treatment "B" enter the number of times the towel treated with A were judged softer than the towel treated with B. In the row for treatment B, and the column for treatment A, enter the number of times treatment B was judged softer than treatment A. Do this for all the pairings.

NOTE 2—Softness gauges are not appropriate for Directional Difference testing.

8.8 *Instrumental Evaluation*—Within the textile industry, there are several known instruments that measure fabric hand. These instruments may be a viable way to assess fabric softeners and their attributes. As with all experiments, statistical robustness and scientific rigor should be taken into consideration when designing your experiment. Consult with the instruments manufacturer to understand the instrument's limitations and capabilities. Internal experimentation may be required to gain the knowledge necessary to understand how these instruments and their data can be used to predict consumer experience. While instruments can provide useful information, human perception needs to be considered when determining consumer performance.

9. Measurement of Fragrance Intensity

9.1 *Scope*—This section is intended to provide guidance in the assessment of fragrance intensity regardless of preference. Fragrance can be assessed at various stages of the laundering process including but not limited to neat, damp, fresh dry, and X days after drying.

[5] ~~The sole source of supply of the apparatus known to the~~Munoz, Aleandra M., Civille, G. V., and Carr, B. T., Eds., ~~*committee at this time is*~~*Sensory Evaluation in Quality Control,* ~~Simco Inc., 2257 North Penn Rd., Hatfield, PA 19440. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee~~ Springer Science+Business Media, New York, 1992.~~, which you may attend.~~