

Fabric Hand: Guidelines for the Subjective Evaluation of

Developed in 1990 by AATCC Committee RA89; reaffirmed 1991, 1992, 2006; revised 1996 (with title change); editorially revised 1997; editorially revised and reaffirmed 2001.

1. Purpose and Scope

1.1 This evaluation procedure describes guidelines for the presentation of fabrics for the evaluation of hand. Its purpose is to standardize the conditions under which a fabric is evaluated for one or more of the constituent elements of hand (for references on constituent elements of hand see Appendix A).

1.2 These guidelines may be used in the following circumstances:

1.2.1 When different people at different times wish to follow the same protocol for examining fabrics.

1.2.2 In training evaluators to detect and distinguish among different constituent elements or components of hand.

1.2.3 When an individual wishes to duplicate the conditions under which a fabric has been previously evaluated.

1.2.4 With a panel of individuals evaluating the same fabric(s).

2. Principle

2.1 An evaluator is presented a specimen in a prescribed manner and is asked to handle the specimen in a prescribed sequence.

3. Terminology

3.1 **hand**, n.—the tactile sensations or impressions which arise when fabrics are touched, squeezed, rubbed or otherwise handled.

3.2 **constituent elements of hand**, n.—those components, qualities, attributes, dimensions, properties or impressions which make the sensation of touching one fabric different from that of touching another.

NOTE: The various terms comprising elements of hand can be categorized by physical attributes of compression, bending, shearing and surface (see Appendix A).

4. Uses and Limitations

4.1 Effective use of these guidelines is limited by the ability of the evaluator to describe the sensations being felt. Care should be taken to determine if any evaluator exhibits impairment in touch and to determine if any variation between evaluators exists.

4.2 The validity of the data collected will be dependent on prior agreement re-

garding which constituent elements of hand are to be evaluated and mutual acceptance of a scale for evaluation.

5. Specimens

5.1 Test Specimens.

5.1.1 Take large enough test specimens from each sample to allow an evaluator to hold the specimen in both hands. In general, cut all specimens to greater than 200 mm (8 in.) and less than 900 mm (35.4 in.) in either length or width direction. All specimens are to be cut to the same size and shape, even if ratings are done at different times/dates.

5.1.2 Identify the length and width direction of each specimen to provide a means to assess differences that may exist.

5.1.3 Avoid using a specimen more than one time for evaluation because stretching and crushing may change the fabric hand.

5.1.4 The number of specimens of each sample used is to be consistent with accepted statistical analysis and with the number of evaluators.

5.2 Specimen Marking.

5.2.1 Prior to conditioning and evaluation, specimens are to be prepared and marked by someone other than the evaluator.

5.2.2 Mark specimens to denote sample and specimen identification, the surface of the specimen to be evaluated and the length direction of the fabric (see 5.1.2). Use a pen or pencil, not attached labels, to mark the specimens with identification, directional and surface information.

5.2.3 Condition specimens from the dry side for a minimum of 4 h at $21 \pm 1^\circ\text{C}$ ($70 \pm 2^\circ\text{F}$) and $65 \pm 2\%$ RH prior to evaluation. Report if other conditions are used (see 9.6).

6. Evaluator Preparation

6.1 Evaluators are to wash their hands 0.5 h prior to the evaluation of specimens using the same washing procedure and soap, preferably a hand soap that does not contain moisturizers.

6.2 Evaluators are to dry their hands with the same toweling; i.e., all use cotton fabric towels or all use paper towels.

6.3 Evaluators are to avoid activities involving extreme exercise and should not expose hands to temperature changes or moisture after washing hands prior to specimen evaluation.

7. Procedure

7.1 Evaluation Set-up.

7.1.1 The evaluator is to be relaxed and comfortable in a room free of distractions. The evaluation may be performed seated or standing.

7.1.2 The evaluator is to be assisted by a facilitator who is to provide instructions about the specific elements of hand to be evaluated, the rating scale to be used, the number of samples and specimens to be rated or compared, the order of presentation, the expected duration of the rating session, and other pertinent information regarding the evaluation protocol.

7.1.3 Evaluators may communicate evaluation ratings, rankings and other tactile responses verbally to the facilitator or to a recording device. They may record hand sensations on a rating form.

7.1.4 The evaluator may or may not view specimens during a judging session. Blocking the view of specimens is generally preferred (see 11.1). This may be accomplished by handling the specimens behind a screen or drape, closing the eyes and/or using a blindfold.

7.2 Handling Sequence.

7.2.1 The facilitator is to place a specimen on a smooth, nonmetallic surface. The specimen is to be placed with the surface to be evaluated uppermost and correctly aligned as indicated by the markings on the specimen.

7.2.2 If the thermal element of hand (warm/cool) is to be evaluated, the evaluator is to make this assessment first with the initial contact of the finger tips to the fabric surface.

7.2.3 While still on a flat surface, the specimen is to be held down with one hand and stroked or touched with the other hand (see 11.2).

7.2.4 The evaluator is to then touch the specimen by lightly pressing it with the fingers and palm of the hand.

7.2.5 The evaluator is then to pick up the specimen and rub it between the thumb and fingertips.

7.2.6 Next, the evaluator is to squeeze the specimen gently between the thumb, fingers and palm by making a fist.

7.2.7 If the ease of stretch is to be judged, the specimen is to be held so there is at least 90 mm (3.5 in.) and no more than 250 mm (10 in.) of fabric between the hands. With elbows close to the body, hands are to be pulled apart noting the ease of extending the specimen. The specimen is to be stressed in the lengthwise, widthwise and diagonal (bias) directions.

7.2.8 If recovery from squeezing (resiliency) is to be judged, the evaluator must look at the specimen. The specimen is to

be clenched tightly in a fist and then released quickly; i.e., in less than 5 s. Such evaluation is to be made after all other handling procedures have been completed.

7.2.9 Repeat steps 7.2.1-7.2.8 for each specimen.

8. Evaluation

8.1 Specimens can be compared in pairs or sets and judged for the direction and magnitude of the differences in the constituent elements of hand to be assessed. One of the following techniques may be used:

8.1.1 Establish a fabric standard and rate each specimen against the reference. Using agreed upon terminology (see Appendices A and B), describe the specimen as (smoother) than the reference specimen or not as (smooth) as the reference specimen. Several specimens can be rated one at a time against the standard.

8.1.2 Establish two extremes for a property of interest described by selected hand terminology and assign arbitrary numerical values to the extremes. For example, the descriptor (limp) can be selected and arbitrarily assigned a value of 1 while the other extreme descriptor (stiff) could be assigned the value of 5. Specimens to be evaluated could then be assigned values within the established numerical scale according to the differences felt.

8.1.3 Specimens may be ranked by comparative assessments such as “most” (rough), “least” (rough) or “moderately” (rough). Ranking specimens may be difficult with increasing numbers of specimens.

8.1.4 Perception scales for the description of change in a constituent element of hand when comparing an original sample specimen against processed, treated, or other finished specimens can be developed. For example, perception scales using numerical values assigned to judgment descriptions such as 1 = no difference perceived; 2 = slight difference perceived; 3 = moderate difference perceived; 4 = extreme difference detected. Numerical values and perception descriptions may be expanded.

8.2 The evaluation should be repeated by the same individual within 1-5 days.

8.2.1 If the individual fails to rate specimens at the same points on the scale or rank them in the same order on the second day; i.e., fails to obtain consistent results on a repeat evaluation, appropriate statistical analysis shall be used as a means to determine the agreement or non-agreement of the two sets of data.

9. Report

9.1 The number of samples and specimens evaluated by each individual.

9.2 The elements of hand evaluated.

9.3 The visual blocking procedure used.

9.4 The order of presentation if different than listed in Section 7.

9.5 The evaluation scale, ranking or other assessment procedure used.

9.6 The conditions under which specimens were rated.

9.7 The numerical or assessment values.

10. Precision and Bias

10.1 *Precision.* Precision of the techniques for subjective evaluation of hand described by this guideline have not been determined. There are no predetermined rating scales for assigning numeric values to constituent elements of hand that evaluators may apply in making material comparisons to facilitate derivation of components of variance needed for precision calculations. Consequently, the user must resort to other statistics than analysis of variance in assessing the utility of the methodology for comparative purposes.

10.1.1 Results from the subjective evaluation of hand usually are in the form of arbitrary rankings, weighted descriptors, or other arbitrary, discrete, discontinuous rating scales agreed upon by those making a comparison. Non-parametric analysis techniques, based usually on the chi-square or “t” statistics for determining statistical significance and probability levels of ranking orders, are suggested for data of this type. With this kind of analysis, significance between ratings is determined, but there can be no determination of magnitude associated with variability measurement.

10.2 *Bias.* Within the guideline techniques, bias, if any, cannot be determined, since there are no known procedures for determining the true values for the constituent elements of hand.

11. Notes

11.1 Visual impressions of a specimen can cause biased tactile judgments. For example, shiny fabrics are not always exclusively slick or smooth; looped, bulky fabrics are not exclusively soft. Color preferences can also influence hand judgments.

11.2 Use of left or right hand, associated with an evaluator’s dominant hand, may cause biased tactile judgments. Users may wish to specify evaluators use either their dominant hand, or opposite to dominant hand, for touching and stroking the specimens during the evaluation process.

APPENDIX A

A1. Constituent Elements of Hand: Terminology Categorized by Physical Attribute*

PHYSICAL ATTRIBUTE			
Compression	Bending	Shearing	Surface
hard	stiff	supple	coarse
thin	pliable	clinging	rough
thick	supple	tight	slippery

PHYSICAL ATTRIBUTE

Compression	Bending	Shearing	Surface
springy	crisp	loose	harsh
fullness	limp	firm	smooth
bulky	papery	pliable	fuzzy
firm	lively	elastic	soft
soft	springy	stretchy	scratchy
lively	boardy		slick
lofty			waxy
resilient			nappy
			oily
			raspy
			warm
			cool

*Appendix A is intended as a reference listing of hand descriptors and should not be considered an exhaustive compilation of terms.

NOTE: Some terms can be attributed to more than one physical property category; i.e., the term “soft” can be considered as a compression or as a surface attribute.

APPENDIX B

B1. References Concerning Specific Constituent Elements of Hand

B1.1 AATCC, “*Bibliography on Fabric Hand*,” Compiled by AATCC Committee RA89, Hand Evaluation Test Methods, August 1995.

B1.2 ASTM, D 123, Terminology Relating to Textiles, Annex 3, Terms Relating to the Hand of Fabrics, *Annual Book of ASTM Standards*, Vol. 07.01, p92, 1986; ASTM, 100 Barr Harbor Dr., W. Conshohocken PA 19428-2959; tel: 610/832-9500; fax: 610/832-9555.

B1.3 *ASTM Manual on Sensory Testing Methods*, Special Technical Publication 434, ASTM, 1968.

B1.4 Brand, R. H., Measurement of Fabric Aesthetics, Analysis of Aesthetic Components, *Textile Research Journal*, Vol. 34, pp 791-804, 1964.

B1.5 Civile, G. V., and Dus, C. A., Development of Terminology to Describe the Hand/Feel Properties of Paper and Fabrics, *Journal of Sensory Studies*, Vol. 5, pp 19-32, 1990.

B1.6 Kawabata, Sueo, *The Standardization and Analysis of Hand Evaluation*, 2nd Edition, The Textile Machinery Society of Japan, 1980.

B1.7 Kim, C. J. and Vaughn, E. A., Physical Properties Associated with Fabric Hand, *AATCC Book of Papers*, pp 78-95, 1995.

B1.8 Wiczynski, M. E., Psychometric Properties of the Hand of Polyester/Cotton Blend Fabrics, Unpublished doctoral dissertation, University of North Carolina at Greensboro, 1988.

B1.9 Winakor, G., Kim, C. J. and Wolins, L., Fabric Hand: Tactile Sensory Assessment, *Textile Research Journal*, Vol. 50, pp 601-610, 1980.