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Evaluation Procedure for Visual Assessment of Color Difference of Textiles

Developed in 1999 by AATCC Committee RA36; revised 2002, 2010, 2011, 2017; reaffirmed 2007; editorially revised 2008, 2012, 2019.

1. Purpose and Scope

1.1 This evaluation procedure provides general principles and a procedure for determining and describing the color difference of test specimens by visual comparison with a standard. The scope is to standardize the procedure for visual color difference evaluations of textile materials.

2. Principle

2.1 The color of a specimen or specimens and a reference standard are compared and evaluated under specific lighting and viewing conditions. The observed color difference can also be compared with tolerance range specimens.

3. Terminology

3.1 **chroma,** n.—the proportion of spectrally pure color that expresses the degree of departure from the gray of the same lightness.

3.2 **hue,** n.—the attribute of visual perception according to which a color field is judged similar to one conventionally named yellow, red, blue, or green or a combination of an adjacent pair of these colors, considered to be arranged in a closed ring.

3.3 **lightness,** n.—the attribute of visual perception by which a non-self-luminous body is judged to reflect more or less light.

3.4 **metamerism,** n.—visual phenomenon according to which spectrally different materials have, for a given observer in a given illumination, matching color appearance. The fields may no longer match when viewed in a different light or by a different observer.

3.5 **reference standard,** n.—a material that defines the specific color to be matched, and may also be used to define other appearance properties, such as finish, texture and construction.

3.6 **tolerance range specimens,** n.—selected specimens which deviate from the reference standard in hue, lightness, chroma, or in combinations of the three, and impose a range of observable color differences around the reference standard for evaluation purposes.

4. Uses and Limitations

4.1 This evaluation procedure is used for the determination and description of the magnitude of color difference of textile materials against a standard color specimen.

4.2 When evaluating multicolored patterns, each color is evaluated separately.

4.3 To determine if illuminant metamerism is present, evaluate specimens under more than one illuminant.

4.4 This procedure shall be performed only by observers with normal color vision according to color discrimination test methods such as the Farnsworth Munsell 100 Hue Test (see 10.1) and pseuodoisochromatic plate tests such as the Ishihara Color Vision Test (see 10.2).

5. Apparatus

5.1 Illumination conditions. The source under which the comparison is made shall be determined prior to evaluation. Sources simulating any of the following illuminants may be utilized (see 10.3 and 10.4):

Illuminant	Description	Color Temperature
D_{65}	Daylight	6500K ± 200
D_{75}	Daylight	7500K ± 200
A	Incandescent	2856K ± 200
CWF	Cool White Fluorescent	4150K ± 350

Note: Additional illuminants or changes in color temperature can be negotiated between the contractual parties.

5.1.1 Specimens may be viewed with UV illumination to test for the presence of Fluorescent Whitening Agents (FWAs).

5.1.2 The recommended illumination level at the specimen plane is in range of 1080-1340 lx (100-125 fc).

5.2 Viewing environment. The viewing environment consists of an illumination source (such as a lighting cabinet or luminaire) and a viewing surface located within the lighting cabinet or on a table in a designated visual evaluation area of a room and is limited in area to that which corresponds to the normal field of view of an observer performing normal visual evaluations. Within the viewing environment the specimens will be placed on a flat, uniform surface having no distortions or depressions, and having a color matching the range of grays from Munsell N5/ to N7/ (see 10.5). The color of the area surrounding the viewing surface, that is, the interior surfaces of the lighting cabinet or the walls surrounding the designated visual evaluation area of a room, shall be a matte gray matching to within +/1 N value the Munsell gray selected for the viewing surface (see Table I). The gray selected for the viewing surface and surrounding area may be negotiated between the contractual parties. The viewing environment shall contain no other items, and *shall be shielded from extraneous light*. Observers shall wear clothing of neutral color, and there shall be no reflection on the specimens from surrounding surfaces.

5.3 Viewing geometry.

5.3.1 Option A. The illumination source is horizontal. The specimen plane shall be at a 45 ± 5° angle to horizontal, resulting in illumination incident at a 45° angle relative to the specimen plane. The observer shall view at a 90° angle relative to the specimen. This option shall be used for either glossy or matte specimens.

5.3.2 Option B. The illumination source is horizontal. The specimen plane shall be horizontal, resulting in illumination incident at a 90° angle, relative to the specimen plane. The observer shall view at a 45 ± 5° angle relative to the specimen. This option shall be used for either glossy or matte specimens.

5.3.3 Option C. The specimen plane and illumination source shall be parallel to each other and aligned so that the light flux is incident at the center of the specimen plane, which is set at a 35 ± 5° angle relative to the horizontal. The observer shall view the specimens at a 90° angle, relative to the plane of the specimens. This option shall not be used for evaluations of glossy or non-matte specimens. The observer shall take care when evaluating specimens not to block the incident light from the source.

Table I—Color of Background and Surround

Evaluation Category	Color of Background	Color of Surround	Maximum Munsell Chroma of Background and Surround
Critical	similar to standard	N5/ to N7/	0.2
General	N5/ to N7/	N5/ to N7/	0.3

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