RATIONALE

Being revised to address editorial errors in 5.1 (Equation 4) and 5.3.

1. SCOPE

The practice described applies to textile and flexible plastic parts and materials used in automotive vehicles. Special care should be taken when high pile carpet samples are being evaluated.

1.1   Purpose

The intent of this SAE Recommended Practice is to specify procedures for the instrumental measurement of color differences brought about by the exposure of textile and flexible plastic automotive parts to various colorfastness tests. It may be used for the specification of limits of color differences which may be tolerated in a specific test.

2. REFERENCES

2.1   Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1   CIE Publications

Available from CIE Central Bureau, Babenbergerstrasse 9/9A, 1010   Vienna, Austria, Tel: +43 1 714 31 87, www.cie.co.at.

CIE Publication No. 15.2   Colorimetry, 2nd edition, 1986

2.1.2   AATCC Publications

Available from American Association of Textile Chemists and Colorists, 1 Davis Drive, P.O. Box 12215, Research Triangle Park, NC 27709-2215, 919-549-8141, Fax 919-549-8933.

AATCC Method 173-1992   Calculation of Small Color Differences for Acceptability

3. DEFINITIONS

3.1 COLORFASTNESS

The resistance of a material to change in any of its color characteristics, to transfer its colorant(s) to adjacent materials, or both, as a result of the exposure of the material to any environment that might be encountered during testing.

3.2 COLOR DIFFERENCE

A color change in a sample or in a fabric, in which color has been altered or transferred from the sample as a result of testing.

3.2.1 COLOR CHANGE

A change in color of any kind, whether in lightness, hue, or chroma, that may be measured instrumentally by comparing materials before and after testing.

4. BASIC COLOR MEASUREMENT SPECIFICATIONS

4.1 Uniform Color Space

All measurements and calculations will be made using CIE 1976 L*a*b* Uniform Color Space, which may be abbreviated CIELAB (see 2.1.1).

4.2 Standard Illuminant

The standard illuminant for colorimetric determinations will be the CIE illuminant D65 (see 2.1.1). No other illuminant may be used, except by agreement between contractual parties.

4.3 Standard Observer

The standard observer for colorimetric determinations will be the CIE 10 degrees observer. No other observer may be used, except by agreement between contractual parties.

5. COLOR DIFFERENCE CALCULATIONS

Three sets of color difference calculations may be used.

5.1 Delta L*,a*,b*

$$DL^* = (L^*_t - L^*_o) \qquad \text{(Eq. 1)}$$

$$Da^* = (a^*_t - a^*_o) \qquad \text{(Eq. 2)}$$

$$Db^* = (b^*_t - b^*_o) \qquad \text{(Eq. 3)}$$

$$DE^* = \{(DL^*)^2 + (Da^*)^2 + (Db^*)^2\}^{1/2} \qquad \text{(Eq. 4)}$$

Where subscripts "o" and "t" refer to measurements in the original and final material.

5.2 Delta L*,C*,H*

$$DL^* = (L^*t - L^*o) \qquad \text{(Eq. 5)}$$

$$DC^* = \{(a^*_t{}^2 + b^*_t{}^2)^{1/2} - (a^*_o{}^2 + b^*_o{}^2)^{1/2}\} \qquad \text{(Eq. 6)}$$

$$DH^* = (DE^*)^2 - (DL^*)^2 - (DC^*)^2 \qquad \text{(Eq. 7)}$$

5.3   Delta CMC

The CMC method of color difference measurement is one which is being used with increasing frequency; the necessary calculations are given in 2.1.2 (reference only).

6.   COLOR DIFFERENCE SPECIFICATIONS

Color difference specifications shall be determined by the contractual parties. The specifications should be in the form described in Section 4.

7.   COLOR MEASURING INSTRUMENTS

The instruments used to determine color must have capabilities to meet the requirements set forth in Section 3. If a sphere instrument is used, the specular component must be included in the measurement. The angle between the specimen normal and illuminating beam or vice-versa in the sphere instruments must not exceed 10 degrees.

8.   COLOR MEASUREMENT METHOD

8.1   Color Difference Sample

A single sample is used. The color properties of the sample are measured first and the data stored, the sample is exposed to the test conditions, and the color is again measured.

It is imperative that the measured location be identified exactly in order that the same spot and orientation on the fabric surface can be measured each time.

8.2   Sample Preparation

Particular attentions hall be given to the appearance of the sample. The sample shall be cut so that the direction or lay of the pile or fabric is easily identified and oriented in a constant direction during the exposure and measurement of its color. It shall be freed from lint, etc., using a lint brush and if it has a pile, it shall be brushed in the direction of the pile lay before reading and exposure.

8.3   Sample Mounting

The sample shall be mounted on a flat surface so that it is presented to the measuring port of the color measuring instrument in a uniform reproducible manner. If the sample is transparent, it shall be backed with a sufficient thickness of the test fabric to eliminate a contribution of the backing material to the measurement. The direction of the natural lay of the sample shall be identified on the back of the mounting surface to facilitate correct sample orientation in the measurement instrument.

8.3.1   Instrument Set Up

The instrument used for the color measurement shall be standardized according to the procedures specified by its manufacturer.

8.3.2   Sample Equilibration

The sample shall be in equilibrium with the standard laboratory environment before reading on the measurement instrument. The time to reach equilibrium will be different for different fabric types and should be agreed upon by the contractual parties. The standard laboratory environment is 21 °C ± 2 °C and 50% ± 5% RH, or as agreed to by the contractual parties.