



SURFACE VEHICLE RECOMMENDED PRACTICE

J361™

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Procedure for Visual Evaluation of Interior and Exterior Automotive Trim

RATIONALE

Added LED in as a daylight alternative. LED sources may be used in addition to cool white fluorescent to simulate typical viewing conditions.

1. SCOPE

This SAE Recommended Practice applies to parts and materials used in vehicle manufacture which are intended to be acceptable color matches to a specified standard. This document is intended for use with parts or materials which are opaque or nearly so. Materials covered by this document include topcoat paint finishes, interior soft trim, interior and exterior hard trim, and exterior film and flexible trim. This practice requires judgments by observers with a minimum of normal color vision and preferably superior as rated with the FM-100 hue test as specified in ASTM E1499.

1.1 Purpose

The intent of this document is to precisely specify procedures for the visual evaluation of appearance of colored materials or parts incorporated in the manufacture of vehicles. The document provides a consistent engineering practice for the determination of visual color difference between materials or parts of the same or like materials. A suitable fixture providing daylight, fluorescent, and horizon lighting conditions is necessary for this evaluation.

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 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D1729	Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials
ASTM E284	Standard Terminology of Appearance
ASTM E308	Standard Practice for Computing the Colors of Objects by using the CIE System
ASTM E1499	Standard Guide for Selection, Evaluation and Training of Observers

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2.1.2 CIE Publications

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

ISO 23603/CIE S012 Standard Method of Assessing the Spectral Quality of Daylight Simulators for Visual Appraisal and Measurement of Colour (previously designated as CIE Publication 51.2)

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

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

2.2.2 Wiley Publications

Available from Wiley Publishers, 111 River Street, Hoboken, NJ 07030-5774, Tel: 201-748-6000, www.wiley.com.

Billmeyer and Saltzman's Principles of Color Technology, 3rd Edition, by Roy S. Berns, April 2000.

3. DEFINITIONS

3.1 Master Standard, Sample

3.1.1 MASTER STANDARD

The appropriately identified engineering approved standard sample against which specified similar materials are evaluated.

3.1.2 SAMPLE

The material or part that is evaluated for color and appearance match to the master standard.

3.2 Color Attributes

The color of a material can be described by three basic attributes. Figure 1 shows a diagram of Munsell hue, value, and chroma and their relationship to one another.

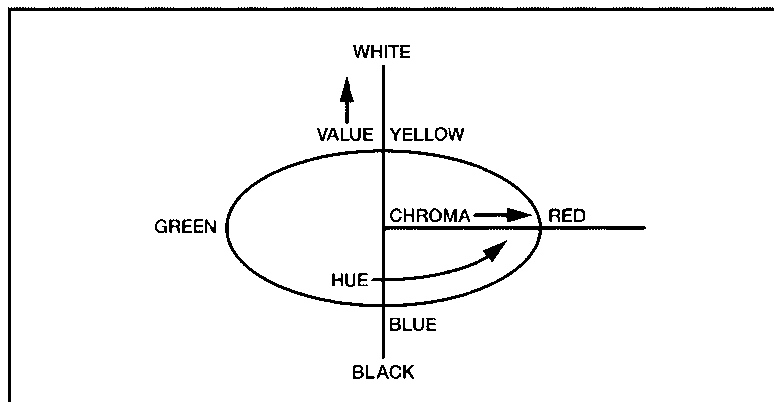


Figure 1 - Munsell hue, value, and chroma diagram

3.2.1 HUE

The attribute of color perception by means of which an object is judged to be red, yellow, green, blue, or intermediate between some adjacent pair of these.

3.2.2 VALUE

The attribute of color perception by means of which an object is judged to appear light or dark relative to an object of the same hue and chroma.

3.2.3 CHROMA

The attribute of color perception that expresses the degree of departure from gray, toward the pure hue, at the same value and hue.

3.3 Changes in Viewing Geometry

3.3.1 METALLIC BRILLIANCE

Departure from solid color (straight shade) appearance to a highly metallic or opalescent appearance, often accompanied by a change in the angle of viewing (goniochromatic effect).

3.3.2 GONIOCHROMATISM

Change in value/lightness, hue, or chroma of a specimen upon change in angular illuminating or viewing conditions but without change in light source or observer. When two specimens are compared to each other, they may or may not exhibit metamerism in addition to differences in goniochromatism. They should also be viewed under different lights to check for metamerism (refer to ASTM E284).

3.3.3 METAMERISM

Property of two specimens that match under a specified illuminator and to a specified observer and whose spectral reflectances or transmittances differ in the visible wavelengths (refer to ASTM E284).

3.3.4 ILLUMINANT METAMERISM

Occurs when two objects match under one light source, but do not match under a different light source. This results when the objects have different spectral reflectance curves but the same color coordinates for one set of viewing conditions.

3.3.5 OBSERVER METAMERISM

Occurs when a metameric pair matches for one person but fails to match when seen by another person under the same viewing conditions.

3.3.6 FIELD SIZE METAMERISM

Occurs when the field size changes, for example from 2 to 10 degrees. A metameric pair which matches when seen at a distance (small field of view) may no longer match when seen closer to the eyes (large field of view).

4. EQUIPMENT

The proper lighting unit(s) and measuring equipment are essential for consistent appearance evaluation. Figure 2 shows the critical dimensions and relative positions of an examination perch/stand and lighting sources.

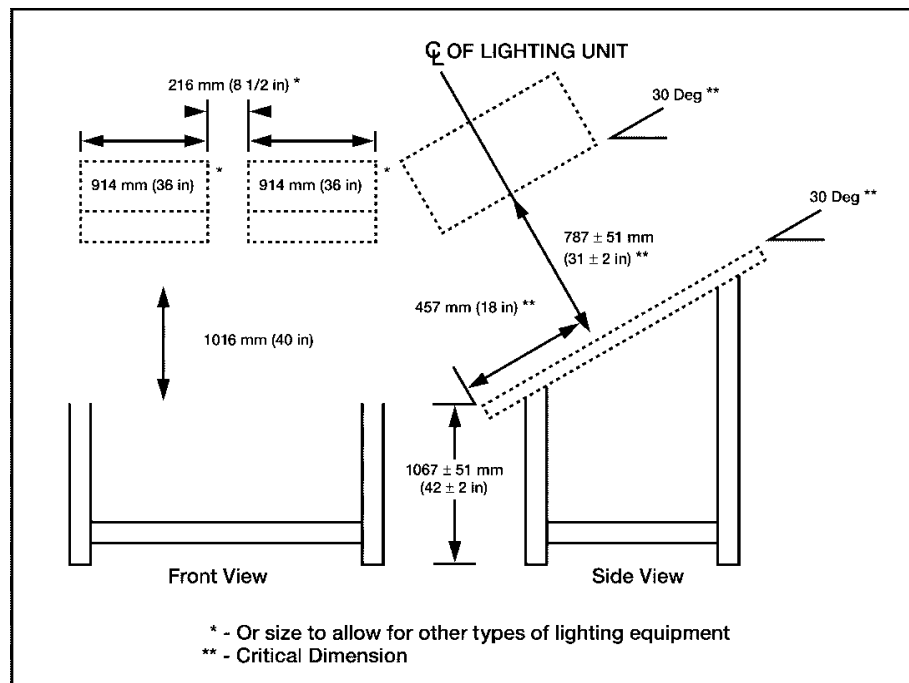


Figure 2 - Recommended installation for lighting unit(s)

4.1 Lighting Unit(s)

Each color evaluation area shall be provided with an overhead lighting unit (along with an accompanying material examination perch/stand) capable of broadcasting the following lighting conditions:

4.1.1 Daylight capable of providing a color temperature of $6500\text{ K} \pm 200\text{ K}$ at an illuminance of 1080 to 1730 lx (100 to 160 ft-c). Although typically provided by filtered tungsten halogen lamps, daylight fluorescent lamps with equivalent spectral and illuminance characteristics can be used as an acceptable alternative. The resulting spectral power distribution of the incident light must be maintained to conform to ASTM E308 and ISO 23603/CIE S012 with a quality grade of B/C or better. LED lamps may be used as daylight simulators provided, they meet the spectral qualities and illuminance characteristics as specified.

4.1.2 Cool white fluorescent (CWF) capable of providing a color temperature of $4150\text{ K} \pm 200\text{ K}$ at a minimum illuminance of 860 lx (80 ft-c). This source is typically provided by CWF tubes simulating standard illuminant F2.

NOTE: Changes in energy legislation has altered the spectral power of some cool white lamps to more closely simulate standard illuminant F11. LED sources may be used in addition to CWF to simulate typical viewing conditions.

4.1.3 Simulated horizon sunlight source providing a color temperature of $2300\text{ K} \pm 200\text{ K}$ at a minimum illuminance of 860 lx (80 ft-c). This source is typically provided by tungsten halogen lamps to simulate early morning sunrise or late afternoon sunset conditions. Due to reduced availability of incandescent lamps, LED lamps may be substituted for incandescent representing horizon sunlight lighting provided they are approximately equal in correlated color temperature and spectral characteristics.

4.1.4 As an option, an ultraviolet lighting source providing energy near the visible spectrum, and also known as black light (no Kelvin value associated), can be used alone or in combination with any of the previous light sources to exaggerate the effects of optical brighteners, whitening agents, fluorescent pigments, dyes, or resins. **DO NOT USE ULTRAVIOLET LIGHT FOR A COLOR MATCH DECISION. DO NOT LOOK DIRECTLY INTO AN ULTRAVIOLET LIGHT SOURCE BECAUSE EYE DAMAGE CAN OCCUR FROM PROLONGED EXPOSURE TO UV LIGHT.**