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# Standard Practice for Visual Color Evaluation of Transparent Sheet Materials[1]

This standard is issued under the fixed designation E1478; 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 practice was developed to help its users critically judge the transmitted color appearance of transparent sheet materials. Its primary application is for colored flat glass and plastic materials.

1.2 This practice is not meant to be used to evaluate colors of curved, diffusing, self-luminous, or opaque materials.

1.3 *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]

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

E284 Terminology of Appearance

E1499 Guide for Selection, Evaluation, and Training of Observers

2.2 *ASTM Adjuncts:*ASTM Color Photo—Outdoor Specimen Holder[3]

## 3. Terminology

3.1 For the definitions of appearance terms used in this practice, refer to Terminology E284.

## 4. Summary of Practice

4.1 This practice describes the recommended visual procedure to evaluate color by transmittance of transparent sheet materials. The spatial relationships between the observer, materials, and light source are prescribed in order to derive good color judgments from their interactions.

## 5. Significance and Use

5.1 This practice applies to production quality control and customer acceptance of regularly transmitting sheet materials such as tinted windows where visual color discrimination is critical.

## 6. Apparatus

6.1 The apparatus shall consist of specimen holders, product color standards, and defined light sources.

6.1.1 *Specimen Holders*—These devices must hold the specimen(s) and standard in contiguous positions, in the same plane, so that they may be viewed, relative to the light source, for maximum color discrimination.

6.1.1.1 An *indoor specimen holder* should be a ventilated box, coated with a flat white ceiling paint on its inside, containing evenly spaced fluorescent lamps with a flat, white diffuser (glass or plastic) between them and the samples, and have edge supports for the specimens and standards. Fig. 1 is typical, housing two Standard Cool White Fluorescent (CIEF2)[4] lamps.

6.1.1.2 An *outdoor specimen holder*[3] should allow the specimen and standard to be viewed contiguously in the same plane with daylight transmitted through them. Alternatively, the transmitted light may be viewed after reflection from a diffuse colored surface, such as a carpet, to enhance color difference. These holders are usually large window frame structures. See Fig. 2.

6.1.2 *Product Color Standards*—These standards shall be similar in shape, size, and spectral characteristics to specimens being evaluated for color. The observer shall use color-tolerance standards to provide an unambiguous judgment of a product's acceptable color limits.

## 7. Test Specimen Preparation

7.1 Take enough production test specimens from known sampling positions to properly disclose the product's visual color range. Refer to Fig. 3.

[1] This practice is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.11 on Visual Methods.

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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 ASTM International Headquarters. Order Adjunct ADJE1478. Original adjunct produced in 1992.

[4] See Publication CIE No. 15.2, Tables 3.1 and 3.2. CIE Publications are available from U.S. National Committee of the CIE (International Commission on Illumination), C/o Thomas M. Lemons, TLA-Lighting Consultants, Inc., 7 Pond St., Salem, MA 01970, http://www.cie-usnc.org.

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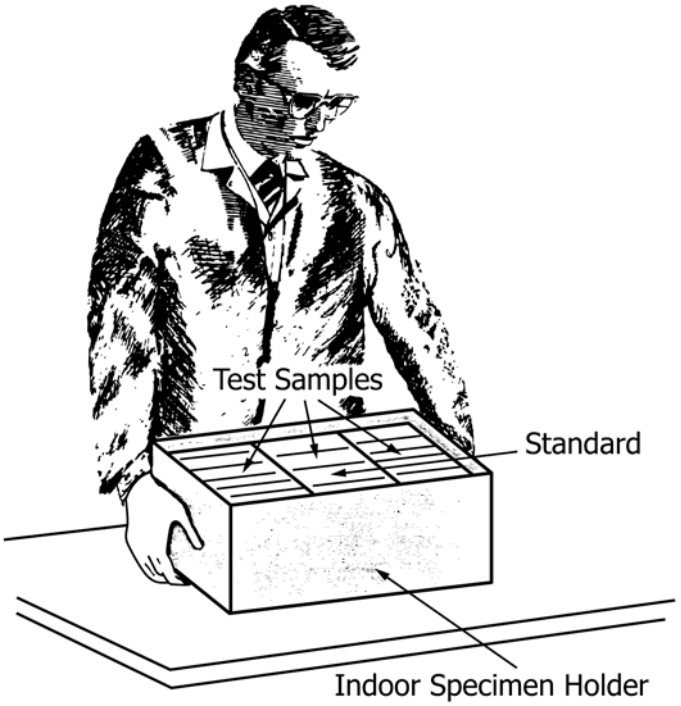


**FIG. 1 Arrangement of Apparatus**

7.2 Size and shape the test specimens for viewing to afford maximum color discrimination. Prepare according to industry standards.

7.3 Test specimens should be clean and free of physical surface defects.

## 8. Procedure

8.1 Test a manufacturer's observer(s) for normal color vision. Refer to Guide E1499.

8.2 The evaluation procedure will depend upon whether the standard and the test specimen colors are compared indoors or outdoors, that is, upon which light source is used for the color judgements.

8.2.1 *Indoor Evaluation*—The observer should be located in a darkened room such that ambient light will not distort color judgments by glare and colored reflections when viewing light through the test specimen. Make color judgments, to avoid color fatigue, by quick glances at the test specimen and standard followed by deliberate consideration of the resulting color impressions. Repeat this process until the viewer can make consistent judgments. If possible exchange the test specimen and standard in the holder followed by the same observation technique to confirm the viewer's prior color judgments.

8.2.2 *Outdoor Evaluation*—The observer should be located such that color discrimination between the test specimen and standards is maximized with respect to the surrounding objects, sources, and backgrounds. Make color judgements from many viewing angles and distances which afford acute color observations using the indoor evaluation viewing technique in 8.2.1.

8.3 When small color differences are involved, judgments by two or more observers will be necessary to determine the color acceptability of the test specimens.

## 9. Report

9.1 Report the following information.

9.1.1 A description of the color tolerance standards used at the color trial,

9.1.2 A description by the observers of the test specimen's appearance compared to the color standards,

9.1.3 A description of the light source(s) used for the color evaluation and their intensity during the color trial,

9.1.4 Identities of the observers and the location(s) of observation, and

9.1.5 Any additional information required by the reader to ensure proper communication of the test specimen's color characteristics. Refer to Section 8 of Practice D1729.

9.2 A color photograph of the color trial may be useful if it satisfactorily reproduces the test specimen color characteristics which are of concern to the observers. Alternatively, a photograph of the color evaluation site along with test specimens may be used. If photography is not feasible, the author must use color terms which are known to be understood in this context by the readers.

## 10. Keywords

10.1 color; transparent material

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