



Designation: E 1349 – 90 (Reapproved 1998)

# Standard Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry<sup>1</sup>

This standard is issued under the fixed designation E 1349; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method describes the instrumental measurement of the reflection properties and color of object-color specimens by use of a spectrophotometer or spectrocolorimeter with a bidirectional optical measuring system, such as annular, circumferential, or uniplanar 45/0 or 0/45 geometry.

1.2 This test method is generally suitable for any flat object-color specimen. It is especially recommended for measuring retroreflective specimens, fluorescent specimens, and specimens of intermediate gloss.

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:

- D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates<sup>2</sup>
- E 179 Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials
- E 284 Terminology Relating to Appearance of Materials<sup>2</sup>
- E 308 Practice for Computing the Colors of Objects by Using the CIE System<sup>2</sup>
- E 805 Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials<sup>2</sup>
- E 991 Practice for Color Measurement of Fluorescent Specimens<sup>2</sup>
- E 1164 Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation<sup>2</sup>

## 3. Terminology

### 3.1 Definitions:

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee E-12 on Appearance and is the direct responsibility of Subcommittee E12.02 on Spectrophotometry and Colorimetry.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.01.

3.1.1 The definitions contained in Guide E 179, Terminology E 284, and Practice E 1164 are applicable to this test method.

## 4. Summary of Test Method

4.1 This test method provides a procedure for measuring the reflectance factors of reflecting object-color specimens by using a spectrophotometer or spectrocolorimeter equipped with a bidirectional optical measuring system.

4.2 When the specimens exhibit directionality, and an instrument with uniplanar geometry is used, information on directionality may be obtained by measuring the specimens at more than one rotation angle, typically at two angles 90° apart. When such information is not required, these measurements may be averaged, or an instrument with annular or circumferential geometry may be used.

4.3 This test method includes procedures for calibrating the instrument or verifying its calibration, and for selecting specimens suitable for precision measurement.

4.4 Most modern spectrophotometers have the capacity to compute the color coordinates of the specimen immediately following the measurement. When this is the case, the user must preselect the color system, observer, and illuminant (see Practice E 308, Section 6).

## 5. Significance and Use

5.1 The most direct and accessible methods for obtaining the color coordinates of object colors are by instrumental measurement using spectrophotometers or colorimeters with either hemispherical or bidirectional optical measuring systems. This method provides procedures for such measurement by spectrophotometry using a bidirectional optical measuring system.

5.2 This test method is especially suitable for measurement of the following types of specimens for the indicated uses (see also Guide E 179, Practice E 805):

5.2.1 Object-color specimens of any gloss level for color assessment.

5.2.2 All types of object-color specimens to obtain data for use in computer colorant formulation.

5.2.3 Retroreflective specimens.