



Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting Utilizing the Coplanar Geometry¹

This standard is issued under the fixed designation E810; 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 test method describes an instrument measurement of the retroreflective performance of retroreflective sheeting.

1.2 The user of this test method must specify the entrance and observation angles to be used, and may specify the rotation angles.

1.3 This test method is intended as a laboratory test and requires a facility that can be darkened sufficiently so that stray light does not affect the test results. The testing apparatus must be able to achieve the coplanar geometry.

1.4 Portable and bench retroreflection measuring equipment may be used to determine R_A values provided the geometry and appropriate substitution standard reference panels, measured in accordance with this test method, are utilized. In this case the methods of Procedure B in Practice E809 apply. Additional information on the use of portable retroreflectometers may be found in Test Method E1709.

1.5 *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

E284 Terminology of Appearance

E308 Practice for Computing the Colors of Objects by Using the CIE System

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E808 Practice for Describing Retroreflection

¹ This test method is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.10 on Retroreflection.

Current edition approved Jan. 1, 2013. Published January 2013. Originally approved in 1981. Last previous edition approved in 2008 as E810 – 03 (2008). DOI: 10.1520/E0810-03R13.

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.

E809 Practice for Measuring Photometric Characteristics of Retroreflectors

E1709 Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer at a 0.2 Degree Observation Angle

2.2 *Other Document:*

CIE Publication No 54 Retroreflection—Definition and Measurement³

3. Terminology

3.1 The terms and definitions in Terminology E284 and Practice E808 apply to this test method.

3.2 *Definitions:*

3.2.1 *coefficient of retroreflection, R_A* —of a plane retroreflecting surface, the ratio of the coefficient of luminous intensity (R_I) to the area (A), expressed in candelas per lux per square metre ($\text{cd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$). $R_A = R_I/A$.

3.2.1.1 *Discussion*—The equivalent inch–pound units for coefficient of retroreflection are candelas per foot–candle per square foot ($\text{cd} \cdot \text{fc}^{-1} \cdot \text{ft}^{-2}$). The SI and inch pound units are numerically equal, because the units of R_A reduce to $1/\text{sr}$. An equivalent term used for coefficient of retroreflection is specific intensity per unit area, with symbol SIA or the CIE symbol R' . The term coefficient of retroreflection and the symbol R_A along with the SI units of candelas per lux per square meter ($\text{cd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$) are recommended by ASTM.

3.2.1.2 *Discussion*— R_A is a useful engineering quantity for determining the photometric performance of such retroreflective surfaces as highway delineators or warning devices. R_A may also be used to determine the minimum area of retroreflective sheeting necessary for a desired level of photometric performance. R_A has been used extensively in the specification of retroreflective sheeting.

3.2.2 *coplanar geometry, n* —retroreflection geometry in which the retroreflector axis, illumination axis, and observation axis lie in one plane.

3.2.2.1 *Discussion*—In the coplanar geometry: the second entrance angle component, β_2 , is equal to 0° ; presentation angle, γ , is equal to either 0° or 180° ; orientation angle, ω_s , is equal to either the rotation angle, ϵ , or to $\epsilon + 180^\circ$ or $\epsilon - 180^\circ$.

³ Available from the CIE Webshop at <http://www.cie.co.at>.