



Standard Practice for Describing Retroreflection¹

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1. Scope

1.1 This practice provides terminology, alternative geometrical coordinate systems, and procedures for designating angles in descriptions of retroreflectors, specifications for retroreflector performance, and measurements of retroreflection.

1.2 Terminology defined herein includes terms germane to other ASTM documents on retroreflection.

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

E284 Terminology of Appearance

2.2 *Federal Standard:*

Fed. Std. No. 370 Instrumental Photometric Measurements of Retroreflecting Materials and Retroreflecting Devices³

2.3 *CIE Document:*

CIE Publication No. 54 Retroreflection-Definition and Measurement⁴

3. Terminology

3.1 Terms and definitions in Terminology E284 are applicable to this standard.

3.1.1 In accordance with the convention appearing in the Significance and Use section of Terminology E284, the superscript *B* appearing after [CIE] at the end of a definition indicates that the given definition is a modification of that cited with little difference in essential meaning.

NOTE 1—The terminology given here describes visual observation of luminance as defined by the CIE $V(\lambda)$ spectral weighting function for the photopic observer. Analogous terms for other purposes can be defined by using appropriate spectral weighting.

3.2 Definitions:

3.2.1 The delimiting phrase “in retroreflection” applies to each of the following definitions when used outside the context of this or other retroreflection standards.

3.2.2 *coefficient of line retroreflection, R_M , n* —of a retroreflecting stripe, the ratio of the coefficient of luminous intensity (R_I) to the length (l), expressed in candelas per lux per metre ($\text{cd}\cdot\text{lx}^{-1}\cdot\text{m}^{-1}$). $R_M = R_I/l$.

3.2.2.1 *Discussion*— R_M depends on the spectral composition of the illumination which is usually CIE illuminant A.

3.2.3 *coefficient of luminous intensity, R_I , n* —of a retroreflector, ratio of the luminous intensity (I) of the retroreflector in the direction of observation to the illuminance ($E_\perp$) at the retroreflector on a plane perpendicular to the direction of the incident light, expressed in candelas per lux ($\text{cd}\cdot\text{lx}^{-1}$). $R_I = (I/E_\perp)$.

3.2.3.1 *Discussion*—In a given measurement one obtains the average R_I over the solid angles of incidence and viewing subtended by the source and receiver apertures, respectively. In practice, I is often determined as the product of the illuminance at the observer and the distance squared ($I = E_r d^2$). R_I depends on the spectral composition of the illumination which is usually CIE illuminant A.

3.2.3.2 *Discussion*—Also called *coefficient of (retroreflected) luminous intensity*. Equivalent commonly used terms are *CIL* and *SI* (specific intensity). CIE Publication 54 uses the symbol R for R_I . The ASTM recommendation is to use the symbol R_I .

3.2.4 *coefficient of retroreflected luminance, R_L , n* —the ratio of the luminance, L , in the direction of observation to the normal illuminance, $E_\perp$, at the surface on a plane normal to the incident light, expressed in candelas per square metre per lux [$(\text{cd}\cdot\text{m}^{-2})\cdot\text{lx}^{-1}$].

$$R_L = (L/E_\perp) = (R_I/A \cos v) = (I/E A \cos v) = (R_A/\cos v) \quad (1)$$

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

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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 Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁴ 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>.