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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Field Measurement of Raised Retroreflective Pavement Markers Using a Portable Retroreflectometer¹

This standard is issued under the fixed designation E 1696; 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 covers the measurement of the retroreflective properties of raised retroreflective pavement markers at a prescribed geometry, by means of a portable retroreflectometer that can be used in the field. The measurements can be compared to minimum requirements to determine the need for replacement.

1.2 The observation angle specified for retroreflectometers in this test method is that currently specified for raised pavement markers in the United States and may differ from the angles used elsewhere. For other jurisdictions, replace the observations angle specified herein with the observation angle specified by the pertinent agency.

1.3 This test method is intended to be used for field measurement of raised retroreflective pavement markers but may also be used to measure the performance of new markers before they are placed in the field.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *The 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:

E 284 Terminology of Appearance²

E 809 Practice for Measuring Photometric Characteristics of Retroreflectors²

3. Terminology

3.1 The terms and definitions in Terminology E 284 are applicable to this test method.

3.2 *Definitions—The delimiting phrase “in retroreflection” applies to each of the following definitions when used outside the context of this or other retroreflection standards:*

3.2.1 *coefficient of luminous intensity, R_l , n —of a retroreflector, ratio of the luminous intensity (I) of the retroreflector in the direction of observation to the illuminance ($E|nt$) at the retroreflector on a plane perpendicular to the direction of incident light, expressed in candelas per lux ($cd \cdot lx^{-1}$).*

3.2.1.1 *Discussion—When values are low, the coefficient of (retroreflected) luminous intensity may be given in millicandelas per lux ($mcd \cdot lx^{-1}$). $R_l = (I/E|nt)$.*

3.2.2 *entrance angle, n —angle between the illumination axis and the retroreflector axis.*

3.2.3 *illumination axis, n —line from the effective center of the source aperture to the retroreflector center.*

3.2.4 *observation angle, α , n —the angle between the illumination axis and the observation axis.*

3.2.5 *portable retroreflectometer—a hand-held instrument that can be used in the field or in the laboratory for measurement of retroreflectance.*

3.2.5.1 *Discussion—In this test method, “portable retroreflectometer” refers to a hand-held instrument that can be placed over a raised retroreflective pavement marker to measure the coefficient of luminous intensity with a prescribed geometry.*

3.2.6 *instrument standard, n —a working standard used to standardize the portable retroreflectometer.*

3.2.7 *retroreflection, n —reflection in which the reflected rays are preferentially returned in directions close to the opposite of the direction of the incident rays, this property being maintained over wide variations of the direction of the incident rays.*

3.2.8 *retroreflective element, n —one optical unit which by refraction or reflection or both produces the phenomenon of retroreflection.*

4. Summary of Test Method

4.1 This test method involves the use of commercial portable retroreflectometers for determining the coefficient of luminous intensity of pavement markers.

4.2 Entrance angle β_1 shall be between 0 and 2°, entrance angle β_2 shall be $0 \pm 2^\circ$.

4.3 Unless otherwise specified by the user, the observation angle shall be $0.2^\circ \pm 0.01^\circ$.

4.4 The observation half plane shall be vertical. Rotation angle shall be 0° (see Fig. 1 and Fig. 2).

4.5 The sum of the aperture angles of source plus receiver shall be $0.2^\circ \pm 0.04^\circ$ (see Table 1 of Practice E 809).

¹ This test method is under the jurisdiction of ASTM Committee E-12 on Appearance and is the direct responsibility of Subcommittee E12.10 on Retroreflection.

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² Annual Book of ASTM Standards, Vol 06.01.