



Designation: D7585/D7585M – 10 (Reapproved 2022)

Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments¹

This standard is issued under the fixed designation D7585/D7585M; 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 describes several field techniques to evaluate the retroreflective properties of pavement markings containing retroreflecting optics (for example, centerlines and edgelines) and applied to the road surface. The techniques described in this practice contain sampling criteria such as the length of test sections and the number of measurements needed. The practice is based on retroreflective measurements made with portable hand-operated instruments in compliance with Test Method E1710.

1.2 The data obtained from this practice can be used to determine the acceptance or rejection of a project based on specified levels of retroreflectivity established by the agency having jurisdiction.

1.3 This practice can be used for the evaluation of newly installed or existing pavement markings. When testing newly applied pavement markings, it is recommended that the evaluation be done no sooner than 48 h after application but before 30 days after application so that excess retroreflective optics, such as glass spheres, are no longer present.

1.4 The assessment techniques in this practice are based on best practices and designed to provide three levels of confidence in terms of quantifying the retroreflective performance of markings. Each technique represents a tradeoff between the number of measurements and the confidence of the retroreflective performance of the markings under study.

1.5 This practice can be used by agencies as is or may be customized to meet an agency's specific needs. Where applicable, the practice describes areas where different assumptions could be made, which would impact the sampling needs and the confidence levels of the results. When deviations from this practice are made, they shall be documented in the test report.

NOTE 1—When measuring newly installed pavement markings, there

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are several factors that contribute to erroneous values for measurements made within a short time after application, such as excess retroreflective optics, top coatings on tape, incomplete curing of the binder, and coatings on the retroreflective optics. Retroreflective measurements taken within 48 h after application may be useful to quickly gauge the application quality but are not intended to be used with this practice.

NOTE 2—When measuring existing or in-service pavement markings, care should be taken so that representative sections of pavement markings are measured. There are particular conditions where excessive pavement marking wear can be associated with a specific cause such as vehicle tracking along horizontal curves, access points to gravel pits, and high weave areas. Pavement markings can also collect dirt, grime, and debris.

1.6 This practice replaces Specification D6359 with a multi-level strategy for evaluating the retroreflectance of pavement marking materials. This change was desired to provide agencies with options for project acceptance and monitoring of pavement markings during service.

1.7 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.8 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D4061 Test Method for Retroreflectance of Horizontal Coatings

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.

- D6359** Specification for Minimum Retroreflectance of Newly Applied Pavement Marking Using Portable Hand-Operated Instruments (Withdrawn 2006)³
- E284** Terminology of Appearance
- E808** Practice for Describing Retroreflection
- E1710** Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer

3. Terminology

3.1 The terms and definitions in Terminology **E284** and Practice **E808** are applicable to this specification.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acceptable quality level, AQL, n*—the maximum percent defective that, for purposes of sampling inspection, can be considered satisfactory as a process average (that is, the percent defective that can be tolerated without impairing performance).

3.2.1.1 *Discussion*—This is the maximum allowable proportion of pavement marking readings with values below specification.

3.2.2 *evaluation section*—the specific area of the pavement marking along which measurements will be made.

3.2.3 *limit quality, LQ, n*—limit of the AQL that is acceptable, providing a specified limited quality for protection.

3.2.3.1 *Discussion*—This is the proportion of pavement marking readings with values below the acceptable level, which in the worst case, would be allowed.

3.2.4 *producer's risk*—the risk the producer of the marking takes that the marking will fail the requirement specified when the marking is actually acceptable.

3.2.4.1 *Discussion*—If the population of the entire pavement marking fulfills the specification, there is still the probability that the sampling of the marking will fall below the required level as specified. This is designated the α risk (alpha risk).

3.2.5 *user's risk*—the risk the owner of the marking takes that the marking will meet the requirement specified when the marking retroreflectivity is actually substandard.

3.2.5.1 *Discussion*—If the population of the entire pavement marking fails the specification, there is still the probability that the sampling of the marking will equal or exceed the required level as specified. This is designated the β risk (beta risk).

4. Summary of Practice

4.1 This practice does not set the minimum retroreflectance values for newly installed pavement markings or minimum maintenance levels of pavement markings. It is the responsibility of the agency having jurisdiction to set the acceptable retroreflectivity values within their specifications.

4.2 This practice describes assessment techniques (including sampling criteria) to evaluate the retroreflective performance of pavement markings, which can then be used to determine compliance to a referenced specification. More specifically, this practice includes:

4.2.1 A nighttime visual inspection protocol to inspect the appearance of the markings and identify sections that appear to have inadequate retroreflectivity levels.

4.2.2 A standard evaluation protocol, which provides a reasonable measure of assurance that the retroreflectivity data collected with handheld devices is representative of the markings being evaluated. The protocol was designed to require a minimum number of measurements while maintaining confidence with the results.

4.2.3 A more rigorous evaluation protocol, which provides a higher level of assurance that the retroreflectivity data collected with handheld devices is representative of the marking being evaluated. This protocol requires an intensive measurement protocol and should be used as the referee method to resolve disputes regarding the status of a marking.

4.3 The three assessment techniques described in 4.2 were designed so that they could be used independently of one another. In other words, an agency can specify the use of a specific assessment technique, a combination, or all three. Furthermore, they are not meant to be used sequentially for all evaluations, but that is certainly an option.

5. Significance and Use

5.1 This practice provides procedures for the determination of the retroreflective performance of pavement markings. This practice does not set the minimum retroreflectance values for pavement markings; it describes sampling criteria for determining the retroreflective properties of pavement markings, which then can be used to determine compliance with a specification. It is the responsibility of the agency having jurisdiction to set the acceptable retroreflectivity values within their own specifications.

5.2 This practice does not purport to address all the concerns regarding contamination of the markings, but the following may be helpful. It is very important that the markings being evaluated are *clean and dry*. If the evaluation is being used relative to a measure of the performance of a contractor, it is imperative that the parties agree beforehand on the definition of *clean and dry*. There are many forms of contamination on a roadway that will lower the retroreflectivity readings of a marking, but not all of them can be removed. Asphalt oil and rubber skid marks are examples. Loose dirt can be removed by pressure washing, perhaps using soap, brushing, or high-pressure air; however, these techniques are usually insufficient to remove dirt that is packed into the marking surface. Care should be taken to select areas that are *typical* of the marking section, avoiding areas of paint tracking or contamination, for example. It may be useful to take photographs using a digital camera and a good macro lens to be able to see the contamination on or between the glass beads.

6. Procedure

6.1 *Standardization of Portable Hand-Operated Retroreflective Measurement Instruments:*

6.1.1 Before taking measurements, the retroreflectometer(s) shall be standardized with an instrument standard as defined in Test Method **D4061**.

³ The last approved version of this historical standard is referenced on www.astm.org.