Designation: D 6567 – 00

Standard Test Method for Measuring the Light Penetration of a Turf Reinforcement Mat (TRM)[1]

This standard is issued under the fixed designation D 6567; 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 measuring the amount of light that penetrates through a Turf Reinforcement Mat.

1.2 This test method does not provide light penetration values for TRM under variable normal sun and soil conditions. This test method determines nominal light penetration.

1.3 The values stated as a percentage are to be regarded as the standard. The values provided in foot-candles are for information only.

1.4 *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 123 Terminology Relating to Textiles[2]

D 1776 Practice for Conditioning Textiles for Testing[2]

D 4354 Practice of Sampling of Geosynthetics for Testing[3]

D 4439 Terminology for Geosynthetics[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *light penetration*, *n*—the percentage of incandescent light that is measurable through a geosynthetic material from a static light source.

3.1.2 *turf reinforcement mat* (TRM), *n*—a long term non-degradable rolled erosion control product composed of a UV stabilized, non-degradable, synthetic fibers, nettings or filaments, or all of these, processed into three dimensional reinforcement matrices.

3.2 For definition of other textile terms used in this test method, refer to Terminology D 123.

3.3 For definitions of other terms relating to geotextiles and geomembranes used in this test method, refer to Terminology D 4439.

4. Summary of Test Method

4.1 The nominal light penetration of TRM's is determined by observing the foot-candles on the light meter through a determined open area versus the amount of foot-candles on the light meter once the TRM is placed over the determined open area.

5. Significance and Use

5.1 Light penetration may be used to control the quality of many TRM's. Light penetration is not indicative of field performance and therefore is not recommended for specifications.

5.2 The light penetration of TRM's may vary considerably depending on the composite materials used in the matrix of the mat or due to inconsistency within a given mat. To minimize variation, specific sample size and procedures are indicated in this test method to help ensure comparable results.

5.3 This test method may be used to determine the effect of different composite materials and make-up of TRM's.

5.4 This test method may be used for acceptance testing of commercial shipments of TRM's, but caution is advised since information on between laboratory precision is incomplete. Comparative tests as directed in 5.4.1 may be advisable.

5.4.1 In case of a dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are formed from a lot of material of the type in question. The test specimens should be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using Student's t-test for unpaired date and an acceptable probability level chosen by the two begun. If bias is found, either its cause must be corrected, or the purchaser and supplier must agree to the light of the known bias.

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[1] This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.05 on Geosynthetic Erosion Control.

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[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] *Annual Book of ASTM Standards*, Vol 04.09.

NOTE 1—The user should be aware that the makeup and possible movement of the composite materials, and the like, may affect the TRM's following the time when they are rolled up on rolls shipped and stored.

6. Apparatus

6.1 *Light Penetration Box*—See Fig. 1 (length view), and see Fig. 2: (width view)

NOTE 2—The light penetration box shown in Fig. 1: is built from ¾ in. wood.

6.2 *Adjustable Rod with Light Bulb*—See Fig. 3.

6.3 *Light Meter*—The light meter must measure in foot-candles and be capable of measuring determined open area foot-candle reading as well as determined area with dense TRM material in place. A meter with a digital readout such as Extech Instruments Model 407026 Heavy Duty Light Meter is recommended.

6.4 *Cutting Dies*—The cutting dies must be capable of cutting specimen dimensions at least 200 mm (8 in.) by at least 250 mm (10 in.).

NOTE 3—Due to possible loss of loose internal components during cutting and handling of many TRM's, care should be exercised to minimize these effects.

7. Sampling

7.1 *Sample by Lot*—In the absence of other guidelines, divide the product into lots and sample as specified in Practice D 4354.

7.2 *Laboratory Sample*—For the laboratory sample, take a full width sample of sufficient length along the selvage or edge of roll so that the requirements of 7.3 through 7.5.2 can be met. Exclude the inner and outer wraps of the roll or any material containing folds, crushed areas or other distortions not representative of the sampled lot.

7.3 *Test Specimens*—Remove the test specimens from the laboratory sample in a randomly distributed pattern across the width with no specimen taken nearer than 100 mm (4 in.) from the selvage or roll edge, unless otherwise specified. Cut five 250 by 200 mm (10 by 8 in.) test specimens from the sample. Handle the specimens in a manner to avoid the loss of loose filler and weaving components.

7.4 *Number of Specimens*—Unless otherwise agreed upon, as when provided in an applicable material specification, take a number of test specimens per laboratory sample such that the user may expect a 95 % probability level that the test result is not more than 5 % of the average above or below the true average of the sample. Determine the number of specimens per sample as follows:

7.4.1 *Reliable Estimate of v*—When there is a reliable estimate of *v* based upon extensive past records for similar materials tested in the user's laboratory as directed in the method, calculate the required number of specimens for the laboratory sample using Eq 1, as follows:

$$n = (tv/A)^2 \quad (1)$$

where:

- n = number of test specimens (rounded upward to a whole number),
- v = reliable estimate of the coefficient of variation of the individual observations on similar materials in the user's laboratory under conditions of single-operator position, %,
- t = the value of Student's t for one sided limits, a 95 % probability level, and the degrees of freedom associated with the estimate of *v*, and
- A = 5.0 % of the average, the value of the allowable variation.

7.4.2 *No Reliable Estimate of v*—When there is no reliable estimate of v for the user's laboratory, Eq 1 should not be used directly. Instead, specify the fixed number (5) specimens. The number of specimens is calculated using v = 9.5 % of the average. These values for v are somewhat larger than usually found in practice. When a reliable estimate of *v* for the user's

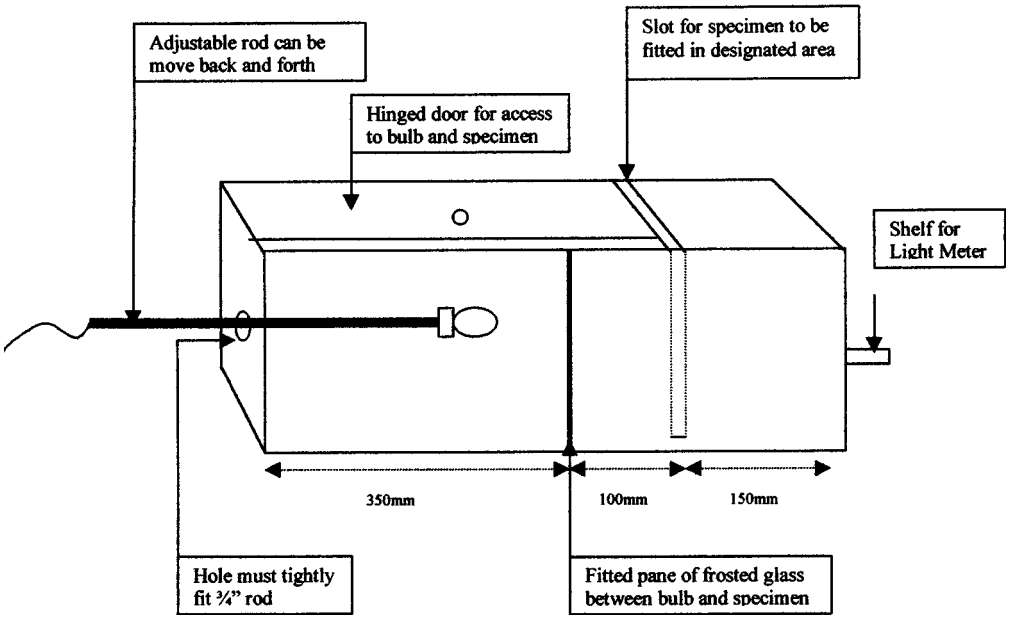

FIG. 1 Light Penetration Box

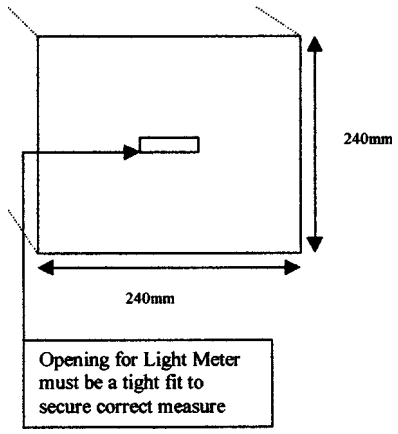

FIG. 2 End View of Box

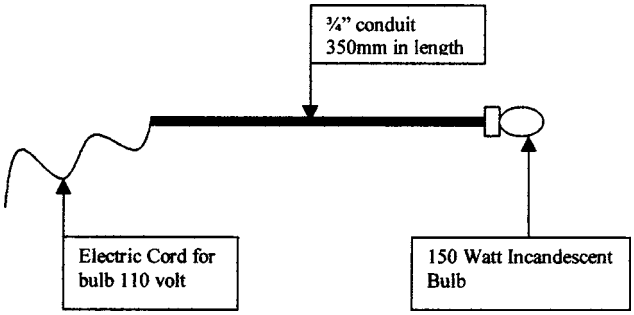

FIG. 3 Adjustable Rod and Bulb

laboratory becomes available, Eq 1 will usually require fewer than the fixed number of specimens.

8. Conditioning

8.1 Bring the specimens to moisture and temperature equilibrium in the atmosphere for testing TRM's, that is a temperature of 21 ± 2°C (70 ± 4°F) and relative humidity of 60 ± 10 %.

9. Procedure

9.1 Test the conditioned specimens in the standard atmospheric condition as set forth in 8.1.

9.2 Care should be taken in handling of the test specimens to avoid altering the natural finished state of the material.

9.3 Close the top of box, cover the slot where the sample is placed, and turn on the light source. Place the light meter on the shelf in front of the opening at the end of the box.

9.4 Slide the adjustable rod with bulb inside the box to obtain maximum brightness (highest meter reading), record reading.

9.5 Open top of box and insert the specimen into the slotted area, being sure to leave no area open to avoid false readings.

NOTE 4—A stiff opaque border may be use to ensure proper holding of the specimen in place if material is flexible. When a border is used, the meter reading taken before placement of the specimen, must include the open border placed in the slot.

9.6 After the top has been closed and the slot opening covered, obtain meter reading. Ensure meter is set on the appropriate scale to obtain best reading. Record the results.

9.7 Repeat the procedure for each of the remaining specimens.

10. Calculation

10.1 Calculate the percent of light penetration as follows in Eq 2:

$$\% \text{ light penetration } = \frac{MR2}{MR1} \times 100 \quad (2)$$

where:

*MR*1 = meter reading prior to placement of specimen, and
*MR*2 = meter reading with specimen in place.

10.2 Calculate the average % light penetration for all specimens.

11. Report

11.1 The report for the nominal % light penetration shall include the following information:

11.1.1 Project, type of TRM tested, and test method of sampling,

11.1.2 Specimen size used in testing if other than standard,

11.1.3 Number of tests performed,

11.1.4 Type of light source and testing apparatus used,

11.1.5 Average nominal % light penetration,

11.1.6 Coefficient of variation of light penetration within the sample, in percent (optional), and

11.1.7 Any unusual observations or modifications of sample specimens as manufactured or test method as described.

12. Precision and Bias

12.1 *Precision*—The precision of the procedure in this test

method is being evaluated.

12.2 *Bias*—The procedure in this test method has no bias, because the % light penetration value of the property can only be described in terms of the test method.

13. Keywords

13.1 adjustable rod and bulb; light meter; light penetration; light penetration box; TRM