Designation: D7056 – 07 (Reapproved 2012)

Standard Test Method for Determining the Tensile Shear Strength of Pre-Fabricated Bituminous Geomembrane Seams[1]

This standard is issued under the fixed designation D7056; 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 presents the procedures used for determining the quality of prefabricated bituminous geomembrane (PBGM) bonded seams subjected to a shear test. It describes a destructive quality control test used to determine the integrity of PBGM seams.

1.2 This test procedure is intended for PBGM only.

1.3 The type of thermal field seaming technique used to construct PBGM seams include the following.

1.3.1 Torch-on—This technique melts two PBGM surfaces to be seamed by running a flame from a propane torch between them. Pressure is applied on the top or bottom, or both PBGM, forcing together both surfaces to form a continuous bond.

1.3.2 Hot Air—This technique introduces high-temperature air or gas between two PBGM surfaces to facilitate melting. Pressure is applied on the top or bottom, or both PBGM, forcing together both surfaces to form a continuous bond.

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:*[2]

D638 Test Method for Tensile Properties of Plastics

D5199 Test Method for Measuring the Nominal Thickness of Geosynthetics

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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *geomembrane, n*—an essentially impermeable geosynthetic composed of one or more synthetic sheets.

3.1.2 *geosynthetic, n*—a planar product manufactured from bitumen or polymeric material used with soil, rock, earth or other geotechnical engineering related material as an integral part of a man-made project, structure or system.

3.1.3 *geotextile, n*—any permeable textile material used in foundation, soil, rock, earth, or any other geotechnical engineering related material, as an integral part of a man made project, structure, or system.

3.1.4 *Prefabricated Bituminous Geomembrane (PBGM), n*—a material fabricated in a plant and consisting principally of non-woven polyester textile, impregnated by a blend of oxidized or polymer-modified bitumen incorporating filler.

3.1.5 *Quality assurance, n*—all planned and systematic actions necessary to provide adequate confidence that an item or a facility will perform satisfactorily in service.

3.1.6 *Quality control, n*—the operational techniques and the activities, which sustain a quality of material, product, system, or service that will satisfy given needs; also the use of such techniques and activities.

4. Significance and Use

4.1 The use of PBGM as barrier materials to restrict liquid migration from one location to another in soils has created a need for a standard test method to evaluate the quality of PBGM seams. In the case of PBGM, it has become evident that seams can exhibit separation in the field under certain conditions. Although this is an index type test method used for quality assurance and quality control purposes, it is also intended to provide the quality assurance engineer with sufficient seam shear data to evaluate seam quality. Recording and reporting data will allow the quality assurance engineer to take measures necessary to ensure the repair of seams with unacceptable strength during facility construction, and therefore, minimize the potential for seam separation in service.

5. Apparatus

5.1 Tensile instrumentation shall meet the requirements outlined in Test Method D638.

[1] This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.10 on Geomembranes.

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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.

5.2 *Grip Faces*—Grip faces shall be a minimum of 50 mm (2 in.) wide and a minimum of 50 mm (2 in.) in length. Smooth rubber, fine serrated or coarse serrated grip faces have all been found to be suitable for testing PBGM. If needed, the use of a silicone-coated paper to help holding the PBGM specimen ends into the grips is recommended The silicone-coated side is to be used in contact with the PBGM specimen (see Fig. 1).

6. Sample and Specimen Preparation

6.1 *Seam Samples*—Cut a portion of the fabricated seam sample from the installed PBGM in accordance with the project specifications. It is recommended that the cutout sample be a minimum of 0.5 m (1.65 ft) wide and a minimum 0.6 m (2 ft) in length with the seam centered in the middle.

6.2 *Specimen Preparation*—Prepare five (5) specimens from each sample. The specimens shall be rectangular and 50 ± 0.5 mm (2 ± 0.02 in.) wide. The length of the specimen shall be at least 200 mm (8 in.) greater than the width of the seam. Specimens shall be cut such that the seam is perpendicular to the longer dimension of the strip specimen.

6.3 *Conditioning*—Samples shall be conditioned for 24 h at 21 ± 2°C (70 ± 4°F) at a relative humidity of 30 % to 55 %. If the relative humidity is between 55 % and 70 %, the samples shall be conditioned for 48 h. The samples shall be conditioned flat and shielded from the sun.

7. Procedure

7.1 *Shear Testing*—Fully support the test specimen within the grips across the width of the specimen. Secure the grips 50 ± 2.5 mm (2 ± 0.1 in.) from each side of the start of the seam. Subject specimens to the shear test (see Fig. 2) using a constant machine crosshead speed of 50 ± 2.5 mm (2 ± 0.1 in.)/min. The test is complete when the specimen has ruptured.

8. Report

8.1 The report shall include the following information:
8.1.1 Report test temperature and humidity.
8.1.2 Report the cross head speed used during shear testing.
8.1.3 Report each individual specimen width.
8.1.4 Report each individual specimen seam length.

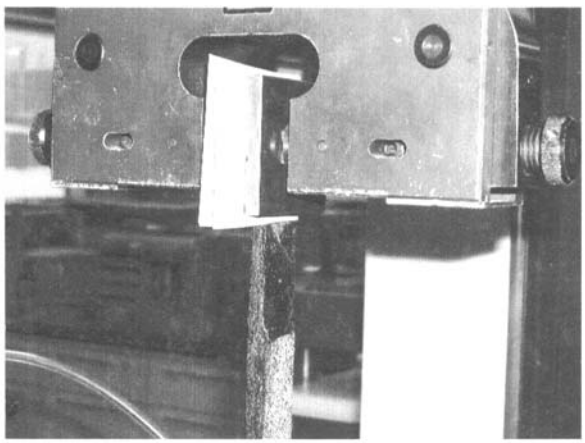

FIG. 1 Zoom of the use of silicone-coated paper

FIG. 2 Shear testing

8.1.5 Report each individual specimen maximum load values. If the shear specimen does not rupture, report the elongation at the maximum cross-head travel limitation.
8.1.6 Report the average and standard deviation of the maximum load values.
8.1.7 Report any other operating detail, as well as any possible incident.
8.1.8 If requested, report the maximum shear stress. This calculation will require an accurate measurement of thickness for each specimen. These measurements should be made in accordance with Test Method D5199 for PBGM.

9. Precision and Bias

9.1 *Precision*[3]—The precision of this test method is based on an Interlaboratory study of Test Method D7056-04 conducted in 2005. Each of ten laboratories tested three different materials. Each laboratory obtained three replicate test results for each material. After individual laboratory issues were addressed, the data set analyzed consisted of (at a minimum) replicate information from at least six laboratories for each of the three materials, therefore this study meets the basic criteria set forth in Practice E691.

9.1.1 *Repeatability*—Two test results obtained within one laboratory shall be judged not equivalent if they differ by more than the "*r*" value for that material; "*r*" is the interval representing the critical difference between two test results for the same material, obtained by the same operator using the same equipment on the same day in the same laboratory.

9.1.2 *Reproducibility*—Two test results should be judged not equivalent if they differ by more than the "*R*" value for that material; "*R*" is the interval representing the difference between two test results for the same material, obtained by different operators using different equipment in different laboratories. See Table 1.

9.1.3 Any judgment in accordance with these two statements would have an approximate 95% probability of being correct.

[3] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR: **D35:1010**.

TABLE 1 Summary Statistics

Material	Average	Repeatability Standard Deviation s_r	Reproducibility Standard Deviation s_R	Repeatability Limit r	Reproducibility Limit R
A	16.1109	1.0854	1.4109	3.0392	3.9506
B	25.5642	1.2396	2.7414	3.4708	7.6759
C	19.0560	0.5940	1.2260	1.6631	3.4328

9.2 *Bias*—At the time of the study, there was no accepted reference material suitable for determining the bias for this test method, therefore no statement on bias can be made.

9.3 The precision statement was determined through statistical examination of results from six laboratories reporting 3 replicates each for Materials A and C, and seven laboratories reporting 3 replicates each for Material B.

10. Keywords

10.1 geomembrane; bituminous; PBGM; prefabricated seam; shear; destructive