



# Standard Guide for the Selection of Test Methods for Prefabricated Bituminous Geomembranes (PBGGM)<sup>1</sup>

This standard is issued under the fixed designation D 6455; 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 guide provides recommendations for the selection of appropriate test methods for prefabricated bituminous sheet used in geomembrane applications to provide consistency in data reporting.

1.2 This guide includes test methods for all types of composite bituminous geomembranes fabricated in a plant and consisting of a synthetic fabric saturated by a modified bituminous or an oxidized bituminous blend.

1.3 This guide is intended to aid all personnel involved in the selection, manufacture, installation, or evaluation of prefabricated bituminous geomembranes.

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 5 Test Method for Penetration of Bituminous Materials<sup>2</sup>
- D 36 Test Method for Softening Point of Bitumen: Ring and Ball Apparatus<sup>3</sup>
- D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature<sup>4</sup>
- D 3746 Test Method for Impact Resistance of Bituminous Roofing Systems<sup>3</sup>
- D 3776 Test Methods for Mass Per Unit Area (Weight) of Woven Fabric<sup>5</sup>
- D 4354 Practice for Sampling of Geosynthetics for Testing<sup>6</sup>
- D 4355 Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)<sup>6</sup>

- D 4437 Practice for Determining the Integrity of Field Seams<sup>6</sup>
- D 4439 Terminology for Geotextiles<sup>6</sup>
- D 4595 Test Method for Tensile Properties of Geotextiles by Wide-Width Strip Method<sup>6</sup>
- D 4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products<sup>6</sup>
- D 5147 Test Methods for Sampling and Testing Modified Bituminous Sheet Material<sup>3</sup>
- D 5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes<sup>6</sup>
- D 5262 Test Method for Evaluating the Unconfined Tension Creep Behavior of Geosynthetics<sup>6</sup>
- D 5321 Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Friction by Direct Shear Method<sup>6</sup>
- D 5322 Practice for Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids<sup>6</sup>
- D 5635 Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens<sup>3</sup>
- D 5641 Practice for Geomembrane Seam Evaluation by Vacuum Chamber<sup>6</sup>
- D 5747 Practice for Tests to Evaluate the Chemical Resistance of Geomembranes to Liquids<sup>6</sup>
- D 5886 Guide for Selection of Test Methods to Determine Rate of Fluid Permeation Through Geomembranes for Specific Applications<sup>6</sup>
- E 96 Test Methods for Water Vapor Transmission of Materials<sup>7</sup>
- G 151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices That Use Laboratory Light Sources<sup>8</sup>
- G 154 Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials<sup>8</sup>
- G 155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials<sup>8</sup>

## 3. Terminology

### 3.1 Definitions:

<sup>7</sup> Annual Book of ASTM Standards, Vol 04.06.

<sup>8</sup> Annual Book of ASTM Standards, Vol 14.02.

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D-35 on Geosynthetics and is the direct responsibility of D35.10 on Geomembranes.

Current edition approved August 10, 1999. Published October 1999.

<sup>2</sup> Annual Book of ASTM Standards, Vol 04.03.

<sup>3</sup> Annual Book of ASTM Standards, Vol 04.04.

<sup>4</sup> Annual Book of ASTM Standards, Vol 08.01.

<sup>5</sup> Annual Book of ASTM Standards, Vol 07.02.

<sup>6</sup> Annual Book of ASTM Standards, Vol 04.09.

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 polymeric material used with soil, rock, earth, or other geotechnical engineering related material as an integral part of a manmade project, structure, or system.

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

3.1.4 *prefabricated bituminous geomembrane (PFBGM), n*—a material fabricated in a plant and consisting principally of a synthetic fabric, an oxidized or an elastomeric modified bitumen blend incorporating a filler.

#### 4. Significance and Use

4.1 To properly evaluate prefabricated bituminous geomembranes, tests must be performed according to specific test methods and procedures. Failure to follow this practice can result in data not representative of the material’s characteristics and performance.

#### 5. Test Methods

5.1 Recommended test methods for prefabricated bituminous geomembranes have been grouped in categories and are listed in tables as follows:

5.1.1 *Table 1*—Prefabricated Bituminous Geomembrane Relevant Properties

5.1.2 *Table 2*—Prefabricated Bituminous Geomembrane Optional Properties.

5.1.3 *Table 3*—Prefabricated Bituminous Geomembrane Manufacturer Properties.

5.1.4 *Table 4*—Prefabricated Bituminous Geomembrane Seams Properties.

**TABLE 1 Prefabricated Bituminous Geomembrane Relevant Properties**

Characteristic	ASTM Standard
Terminology for Geosynthetics	D 4439
Guide for Identification and Handling of Geomembranes	<sup>A</sup>
Test Method for Measuring PFBGM Roll Dimensions	<sup>A</sup>
Practice for Sampling of Geosynthetics for Testing	D 4354
Test Method for Measuring Nominal Thickness of GTX and GM	D 5199
Test Method for Measuring Mass per Unit Area of PFBGM	<sup>A</sup>
Test Method for Tensile Properties of Geotextiles by Wide-Width Strip Method	D 4595
Test Method for Index Puncture Resistance of GTX, GM, and Related Products	D 4833
Guide for Selection of Test Methods to Determine Rate of Fluid Permeation	D 5886

<sup>A</sup>For the specific characteristics identified, an existing test method must be modified or developed.

**TABLE 2 Prefabricated Bituminous Geomembrane Optional Properties**

Characteristic	ASTM Standard
<b>General Properties:</b>	
Test Method for the Determination of Delamination Resistance	<sup>A</sup>
Dimensional Stability at High T	D 1204
<b>Hydraulic Properties:</b>	
Test Methods for Water Vapor Transmission of Materials	E 96
<b>Mechanical Properties:</b>	
Puncture: Dynamic	D 5635
Cold Bending 0°C	D 5147
Determining the Coefficient of Geosynthetic Friction by Direct Shear Method	D 5321
Test Method for Impact Resistance of Bituminous Roofing System	D 3746
<b>Durability:</b>	
Evaluating the Unconfined Tension Creep Behavior of Geosynthetics	D 5262
Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics	D 5322
Evaluate the Chemical Resistance of Geomembranes to Liquids	D 5747
Evaluate the Ultraviolet Resistance of Geosynthetics	D 4355
	G 151
	G 154
	G 155
Evaluate the Biodegradation Resistance of Geosynthetics	<sup>A</sup>

<sup>A</sup>For the specific characteristics identified, an existing test method must be modified or developed.

**TABLE 3 Prefabricated Bituminous Geomembrane Manufacturer Properties**

Characteristic	ASTM Standard
<b>Bitumen:</b>	
Test Method for Penetration of Bituminous Materials	D 5
Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)	D 36
<b>Modified Bitumen:</b>	
Evaluate the Polymer Content in the Modified Bituminous Materials	<sup>A</sup>
Test Method for Penetration of Bituminous Materials	D 5
Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)	D 36
<b>Geotextile:</b>	
Test Method for Measuring the Mass Per Unit Area of GTX	D 3776
Test Method for Measuring Nominal Thickness of GTX and GM	D 5199
Test Method for Tensile Properties of Geotextiles by Wide-Width Strip Method	D 4595
<b>Filler:</b>	
Evaluate the Filler Material Content in the Bituminous Materials	<sup>A</sup>

<sup>A</sup>For the specific characteristics identified, an existing test method must be modified or developed.

NOTE 1—The term “relevant” is used in this guide to identify a limiting number of properties that users will specify to characterize a prefabricated bituminous geomembrane.

#### 6. Keywords

6.1 geomembrane; geotextile; modified bitumen; oxidized bitumen; prefabricated bituminous

**TABLE 4 Pre-Fabricated Bituminous Geomembrane Seams Properties**

Characteristic	ASTM Standard
<b>Destructive Testing:</b>	
Shear Testing D 816	A
Peel Testing D 413	A
<b>Nondestructive Testing:</b>	
Practice for Geomembrane Seam Evaluation by Vacuum Chamber	D 5641
Practice for Determining the Integrity of Field Seams ... 7.4 Ultrasonic Pulse	D 4437
Guide for Electrical Leak Detection	A

<sup>A</sup>For the specific characteristics identified, an existing test method must be modified or developed.

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