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Standard Guide for Selecting Test Methods for Geomembrane Seams¹

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1. Scope

1.1 This guide is intended for use as a summary of test methods necessary to evaluate geomembrane seams. It is intended to guide geomembrane users toward the appropriate evaluation techniques to assess geomembrane seam quality.

1.2 Geomembrane seams covered by this guide are: high-density polyethylene (HDPE), linear low-density polyethylene (LLDPE), very low-density polyethylene (VLDPE), flexible polypropylene (fPP), polyvinyl chloride (PVC), ethylene propylene diene terpolymer (EPDM), prefabricated bituminous geomembranes (PBGm), Ethylene Interpolymer Alloy (EIA) and reinforced geomembranes

1.3 Although a significant effort has been made to gather all types of geomembranes and related evaluation techniques which were on the market at the date of completion of this document, some available materials and technologies may have been omitted. The information presented in this document shall thus be considered to be non exhaustive.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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

[D751 Test Methods for Coated Fabrics](#)

[D4437 Practice for Non-destructive Testing \(NDT\) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes](#)

[D4439 Terminology for Geosynthetics](#)

[D5641 Practice for Geomembrane Seam Evaluation by Vacuum Chamber](#)

[D5820 Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes](#)

[D6214/D6214M Test Method for Determining the Integrity of Field Seams Used in Joining Geomembranes by Chemical Fusion Methods](#)

[D6365 Practice for the Nondestructive Testing of Geomembrane Seams using the Spark Test](#)

[D6392 Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods](#)

[D6747 Guide for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes](#)

[D7002 Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Puddle Method](#)

[D7006 Practice for Ultrasonic Testing of Geomembranes](#)

[D7007 Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials](#)

[D7056 Test Method for Determining the Tensile Shear Strength of Pre-Fabricated Bituminous Geomembrane Seams](#)

[D7177 Specification for Air Channel Evaluation of Polyvinyl Chloride \(PVC\) Dual Track Seamed Geomembranes](#)

[D7272 Test Method for Determining the Integrity of Seams Used in Joining Geomembranes by Pre-manufactured Taped Methods](#)

[D7408 Specification for Non Reinforced PVC \(Polyvinyl Chloride\) Geomembrane Seams](#)

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.

[D7747 Test Method for Determining Integrity of Seams Produced Using Thermo-Fusion Methods for Reinforced Geomembranes by the Strip Tensile Method](#)

[D7749 Test Method for Determining Integrity of Seams Produced Using Thermo-Fusion Methods for Reinforced Geomembranes by the Grab Method](#)

3. Terminology

3.1 Definitions:

3.1.1 *destructive technique, n*—a method of seam testing requiring that a sample be removed from the fabricated or installed geomembrane for further evaluation.

TABLE 1 Seam Evaluation Techniques and Their Applicability to Different Geomembrane Materials

Type of seam evaluation technique	ASTM Test Method / Type of Geomembrane	Non-reinforced Polyethylene geomembranes (PE)	Non-reinforced Polypropylene geomembranes (PP)	Non-reinforced Polyvinyl Chloride (PVC)	All other types of nonreinforced geomembranes (for example, fPP, LLDPE, EPDM, EVA, VLDPE)	Bituminous Geomembranes (PBGM)	Other reinforced Geomembranes
Destructive	D751, section 16: Coated Fabrics—Cut Strip Test					—	× (see Note 1)
	D6214 Field seams; chemical fusion methods			× (see Note 2)		—	× (see Note 2)
	D6392 Nonreinf. GM-Seams Thermo-Fusion Meth	×	×	×	—	—	× (see Note 3)
	D7408 PVC Seam			×		—	—
	D7056 BGM-Seams					×	—
	D7272 Taped seams evaluation					×	—
	D5644 Vacuum Chamber (Note 4) (Note 5)	×	×	×	—	×	×
	D4437 Air lance (Note 4)	×	×	×	×	×	×
	D4437 Mechanical point stressing	×	×	×	—	×	×
	D5820 Pressurized Air Channel (Note 4)	×	×	×	—	—	× (see Note 9)
Non-destructive	D6365 Spark Test (Note 4)	×	×	×	—	×	—
	D7177 Air Channel Evaluation of PVG			×		—	—
	D7006 Ultrasonic Testing of Geomembranes (Note 4)	×	×	×	—	×	—
	D7002 Leak location / water puddle/lance	×	×	×	—	× (see Note 12)	× (see Note 12)
Electrical Leak location	D7007 Leak location / covered geomembranes	×	×	×	—	× (see Note 12)	× (see Note 12)

3.1.2 *nondestructive technique, n*—a method of seam testing which does not compromise the geomembrane’s ability to function as intended.

3.2 For definitions of other geosynthetic terms, refer to Terminology D4439.

3.3 Acronyms:

- EPDM—Ethylene propylene diene terpolymer
- fPP—Flexible polypropylene
- HDPE—High-density polyethylene
- LLDPE—Linear low-density polyethylene
- PVC—Polyvinyl chloride

VLDPE—Very low-density polyethylene

4. Significance and Use

4.1 There are a large number of geomembrane types and seaming techniques. This guide is intended to help practitioners select the appropriate seam test methods for their material.

4.2 Geomembranes are relatively impermeable planar materials sheets that are shipped either as rolls or folded panels. The panels may be seamed in a factory or in the field. This guide provides geomembrane users with the most appropriate seam evaluation techniques for the most common geomembrane materials available on the market.

4.3 Some type of geomembrane may not be listed and some seam evaluation techniques may offer a good performance with a given material although this may not be indicated on [Table 1](#). Users ~~that~~^{who} are aware of this situation are invited to contact ASTM to propose an update of this guide.

4.4 The relevance of a seaming technique within a particular engineering context is beyond the scope of this guide.

5. Geomembrane Seam Evaluation Techniques

5.1 Geomembrane seam evaluation techniques can be either destructive or non destructive. The destructive techniques provide an indication of the strength ~~and/or elongation characteristics~~ or elongation characteristics, or both, of a small sample of a seam. The non-destructive techniques are used to test for leaks or defects along the entire length of a seam. The types of seam tests that are potentially applicable to various types of geomembrane materials are listed in [Table 1](#). Their applicability may depend on the particular seaming technique used, and their feasibility given specific issues on the project.

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TABLE 1 Seam Evaluation Techniques and Their Applicability to Different Geomembrane Materials

Type of Seam Evaluation Technique	ASTM Test Method/Type of Geomembrane	Non-Reinforced Polyolefin Geomembranes		Non Reinforced PolyvinylChloride (PVC) and Ethylene Interpolymer Alloy (EIA)	Ethylene Propylene Diene Terpolymer (reinforced and nonreinforced) (EPDM)	Bituminous Geomembranes (PBGGM)	Other Reinforced Geomembranes
		HDPE	All other types of nonreinforced geomembranes (for example, iPP, LLDPE, VLDPE)				
Destructive	<u>D6214/D6214M</u> Field seams, chemical fusion methods	=	=	X (see Note 1)	=	=	X (see Note 1)
	<u>D6392</u> Nonreinf GM-Seams Thermo-Fusion Meth	X	X	X	=	=	X (see Note 2)
	<u>D7408</u> PVC Seam	=	=	X	=	=	=
	<u>D7056</u> BGM Seams	=	=	=	=	X	=
	<u>D7272</u> Taped seams evaluation	=	=	=	X	=	=
	<u>D7747</u> Reinforced GM, Strip Test	=	=	=	=	=	X
	<u>D7749</u> Reinforced GM, Grab Test	=	=	=	=	=	X
	<u>D5641</u> Vacuum Chamber (Notes 3 and 4)	X	X	X	=	X	X
	<u>D4437</u> Air lance (Note 3)	X (see Note 5)	X (see Note 6)	X	X	X	X
	<u>D4437</u> Mechanical point stressing	X (see Note 7)	X	X	=	X	X
Non-Destructive	<u>D5820</u> Pressurized Air Channel (Note 3)	X (see Note 8)	X (see Note 8)	X (see Note 8)	=	=	X (see Note 8)
	<u>D6365</u> Spark Test (Note 3)	X	X	X	=	X	=
	<u>D7177</u> Air Channel Evaluation of PVC	=	=	X	=	=	=
	<u>D7006</u> Ultrasonic Testing of Geomembranes (Note 3)	X (see Note 9)	X (see Note 9)	X (see Note 10)	=	X	=
	<u>D7002</u> Leak location/water puddle/lance	X (see Note 11)	X (see Note 11)	X (see Note 11)	=	X (see Note 11)	X (see Note 11)
	<u>D7007</u> Leak location/covered geomembranes	X (see Note 11)	X (see Note 11)	X (see Note 11)	=	X (see Note 11)	X (see Note 11)

X = Applicable
 — = Not Applicable

NOTE 1—A new standard test method is being worked on in D35.10 for seam evaluation for reinforced geomembranes

NOTE 1—This type of test not commonly performed on this type of material, but it can be performed if desired.

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NOTE 2—While Test Method **D6392** was originally developed for non-reinforced geomembranes, it is standard practice for some manufacturers, fabricators, designers, and installers to use this method for reinforced products. However, a new standard test method is being worked on in D35.10 for seam evaluation of reinforced geomembranes, which shall be preferred to Test Method **D6392** as soon as it is ~~available~~available.

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