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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)~~ 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~~ 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.~~

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1.6 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

~~D4437~~D4437/D4437M Practice for Nondestructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes

~~D4439~~ Terminology for Geosynthetics

~~D564~~D5641/D5641M Practice for Geomembrane Seam Evaluation by Vacuum Chamber

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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.

- [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 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 Prefabricated Bituminous Geomembrane Seams](#)
[D7177/D7177M 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 Premanufactured Taped Methods](#)
[D7408 Specification for Non-Reinforced PVC \(Polyvinyl Chloride\) Geomembrane Seams](#)
[D7703 Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Lance Method](#)
[D7747/D7747M 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](#)
[D7953 Practice for Electrical Leak Location on Exposed Geomembranes Using the Arc Testing Method](#)
[D7982 Practice for Testing of Factory Thermo-Fusion Seams for Fabricated Geomembrane Panels](#)
[D8172 Test Method for Shear and Peel Strength of Solvent-Welded Seams with Nonreinforced Geomembranes](#)
[D8265 Practices for Electrical Methods for Mapping Leaks in Installed Geomembranes](#)

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.

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

3.3 Abbreviations:

3.3.1 *EPDM*—ethylene propylene diene terpolymer

3.3.2 *fPP*—flexible polypropylene

3.3.3 *HDPE*—high-density polyethylene

3.3.4 *LLDPE*—linear low-density polyethylene

3.3.5 *PVC*—polyvinyl chloride

3.3.6 *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 ~~typetypes~~ 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~~ in Table 1. Users 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~~. nondestructive. The destructive techniques provide an indication of the strength or elongation characteristics, or both, of a small sample of a seam. The ~~non-destructive~~nondestructive techniques are used to test for leaks or defects along the entire length of a seam. Some tests can serve both purposes, such as Specification [D7177/D7177M](#). 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 Geomembranes	Nonreinforced Polyolefin Polyvinyl Chloride	Non-Reinforced Polyvinyl Chloride (PVC) and Ethylene Interpolymer Alloy (EIA)	Ethylene Propylene Diene Terpolymer (reinforced and nonreinforced) (EPDM)	Bituminous Geomembranes (PBGM)	Other Reinforced Geomembranes	
		HDPE	All other types of nonreinforced geomembranes (for example, fPP, LLDPE, VLDPE)					
Destructive	<u>D6214/D6214M</u> Field seams, chemical fusion methods	—	—	X (see Note 1)	—	—	X (see Note 1)	
	Destructive	<u>D6214/D6214M</u> Field seams, chemical fusion methods	—	—	—	X —	—	X —
		<u>D6392</u> Nonreinf GM-Seams Thermo-Fusion Meth	—	X	X	X	—	— X (see Note 2)
		<u>D6392</u> Nonreinf GM seams, thermo-fusion meth	—	X	X	X	—	—
		<u>D7408</u> PVC Seam	—	—	—	X	—	—
		<u>D7408</u> PVC seam	—	—	—	X	—	—
		<u>D7056</u> BGM Seams	—	—	—	—	—	X
		<u>D7056</u> BGM seams	—	—	—	—	—	X
		<u>D7272</u> Taped seams evaluation	—	—	—	—	X	—
		<u>D7747</u> Reinforced GM, Strip Test	—	—	—	—	—	X
		<u>D7747/D7747M</u> Reinforced GM, strip test	—	—	—	—	X	—
		<u>D7749</u> Reinforced GM, Grab Test	—	—	—	—	X	—
		<u>D7749</u> Reinforced GM, grab test	—	—	—	—	X	—
		<u>D7982</u> Factory seams, thermo-fusion meth	—	O	O	—	—	O
		<u>D8172</u> Nonreinf GM seams, solvent-welded meth	—	O	X	—	—	—
Non-Destructive	<u>D5641</u> Vacuum Chamber (Notes 3 and 4)	X	X	X	—	X	X	
	Nondestructive	<u>D5641/D5641M</u> Vacuum chamber	—	X	X	X	—	X
		<u>D4437</u> Air lance (Note 3)	—	X (see Note 5)	X (see Note 6)	X	X	X
		<u>D4437/D4437M</u> Air lance ^B	—	X D	X E	X	X	X
		<u>D4437</u> Mechanical point stressing	—	X (see Note 7)	X	X	—	X
		<u>D4437/D4437M</u> Mechanical point stressing	—	X F	X	X	—	X
		<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>D5820</u> Pressurized air channel ^B	—	X G	X G	—	—	X G
		<u>D6365</u> Spark Test (Note 3)	X	X	—	X	—	—