Designation: D 6434 – 99

Standard Guide for the Selection of Test Methods for Flexible Polypropylene (fPP) Geomembranes[1]

This standard is issued under the fixed designation D 6434; 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 flexible polypropylene sheet used in geomembrane applications to provide consistency in data reporting.

1.2 This guide includes test methods for three types of flexible polypropylene geomembranes including smooth nonreinforced sheet, textured nonreinforced sheet, and scrim-reinforced sheet.

1.3 This guide is intended to aid all personnel involved in the selection, manufacture, installation, or evaluation of flexible polypropylene geomembrane sheet.

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 412 Test Method for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension[2]

D 413 Test Methods for Rubber Property—Adhesion to Flexible Substrate[2]

D 471 Test Method for Rubber Property—Effect of Liquids[2]

D 573 Test Method for Rubber—Deterioration in an Air Oven[2]

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[3]

D 638 Test Method for Tensile Properties of Plastics[3]

D 696 Test Method for Coefficient of Linear Thermal Expansion of Plastics[3]

D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact[3]

D 751 Test Methods for Coated Fabrics[4]

D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials[3]

D 792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement[3]

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting[3]

D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting[3]

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber[2]

D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature[3]

D 1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer[3]

D 1505 Test Method for Density of Plastics by the Density-Gradient Technique[3]

D 1603 Test Method for Carbon Black in Olefin Plastics[3]

D 2136 Test Method for Coated Fabrics—Low-Temperature Bend Test[2]

D 2137 Test Method for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics[2]

D 3389 Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double-Head Abrader)[4]

D 3417 Test Method for Heats of Fusion and Crystallization of Polymers by Thermal Analysis[5]

D 4218 Test Method for Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique[5]

D 4364 Practice for Performing Accelerated Outdoor Weathering of Plastics Using Concentrated Natural Sunlight[6]

D 4437 Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes[7]

D 4439 Terminology for Geotextiles[7]

D 4545 Practice for Determining the Integrity of Factory Seams Used in Joining Manufactured Flexible Sheet Geomembranes[7]

[1] This guide is under the jurisdiction of ASTM Committee D-35 on Geosynthetics and is the direct responsibility of Subcommittee D35.10 on Geomembranes.
Current edition approved June 10, 1999. Published September 1999.

[2] *Annual Book of ASTM Standards*, Vol 09.01.

[3] *Annual Book of ASTM Standards*, Vol 08.01.

[4] *Annual Book of ASTM Standards*, Vol 09.02.

[5] *Annual Book of ASTM Standards*, Vol 08.02.

[6] *Annual Book of ASTM Standards*, Vol 08.03.

[7] *Annual Book of ASTM Standards*, Vol 04.13.

D 4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products[7]
D 5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes[7]
D 5321 Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic Friction by the Direct Shear Method[7]
D 5323 Practice for Determination of 2 % Secant Modulus for Polyethylene Geomembranes[7]
D 5397 Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test[7]
D 5514 Test Method for Large Scale Hydrostatic Puncture Testing of Geosynthetics[7]
D 5617 Test Method for Multi-Axial Tension Test for Geosynthetics[7]
D 5721 Practice for Air-Oven Aging Polyolefin Geomembranes[7]
D 5747 Practice for Tests to Evaluate the Chemical Resistance of Geomembranes to Liquids[7]
D 5884 Test Method for Determining Tearing Strength of Internally Reinforced Geomembranes[7]
D 5994 Test Method for Measuring the Core Thickness of Textured Geomembrane[7]
E 96 Test Methods for Water Vapor Transmission of Materials[8]
F 1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor[9]
G 26 Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials[10]
G 151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices That Use Laboratory Light Sources[10]
G 154 Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials[10]
G 155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials[10]

2.2 *Federal Test Method Standards:*
FTMS 101C–2031 Puncture Resistance[11]

3. Terminology

3.1 *Definitions*—For definitions of geosynthetics terms used in this guide, refer to Terminology D 4439.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *flexible polypropylene*, *n*—a material having a 2 % secant modulus of less than 300 MPa (42 850 psi) as determined by Practice D 5323 produced by polymerization of propylene with or without other alpha olefin monomers.

4. Significance and Use

4.1 To evaluate flexible polypropylene properly, tests must be performed according to specific test methods and procedures. Failure to follow this guide can result in data not representative of the material's characteristics and performance.

5. Test Methods

5.1 Recommended test methods for flexible polypropylene sheet are listed in tables as follows:

5.1.1 *Table 1*—Flexible Polypropylene (fPP) Sheet Manufacturing Quality Control Tests;

5.1.2 *Table 2*—Optional Performance Tests for Flexible Polypropylene (fPP) Sheet; and,

5.1.3 *Table 3*—Tests for Field and Factory Prepared Seams of Flexible Polypropylene (fPP) Sheet.

6. Keywords

6.1 flexible polypropylene; geomembrane

[8] *Annual Book of ASTM Standards*, Vol 04.06.
[9] *Annual Book of ASTM Standards*, Vol 15.09.
[10] *Annual Book of ASTM Standards*, Vol 14.02.

[11] Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111–5094, Attn: NPODS.

TABLE 1 Flexible Polypropylene (fPP) Sheet Manufacturing Quality Control Tests

Sheet Type	Reinforced Sheet	Smooth Nonreinforced Sheet	Textured Sheet	Conditions
General:				
Terminology	D 4439	D 4439	D 4439	
Conditioning	D 618	D 618	D 618	
Physical Properties:				
Thickness	D 5199	D 5199	D 5994	
Ultimate tensile strength and elongation	D 751 Procedure A	D 638	D 638	Type IV, no extensometer grip separation = 63.5 mm (2.50 in.), strain rate = 509 mm/min (20 in./min)
	D 412, Die C	D 412, Die C	D 412, Die C	
	D 882	D 882	D 882	D 882 for thickness < 1 mm (0.040 in.)
Tear resistance	D 751 D 5884	D 1004	D 1004	
Puncture resistance	D 751 D 4833 FTMS 101C–2031	D 4833	D 4833	
Ply Adhesion	D 413	—	—	