



Standard Test Method for Determining Performance Strength of Geomembranes by the Wide Strip Tensile Method¹

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1. Scope

1.1 This test method covers the determination of the performance strength of synthetic geomembranes by subjecting wide strips of material to tensile loading.

1.2 This test method covers the measurement of tensile strength and elongation of geomembranes and includes directions for calculating initial modulus, offset modulus, secant modulus, and breaking toughness.

1.3 The basic distinctions between this test method and other methods measuring tensile strength of geomembranes are the width of the specimens tested and the speed of applied force. The greater width of the specimens specified in this test method minimizes the contraction edge effect (necking) which occurs in many geosynthetics and provides a closer relationship to actual material behavior in service. The slower speed of applied strain also provides a closer relationship to actual material behavior in service.

1.4 As a performance test, this method will be used relatively infrequently, and to test large lots of material. This test method is not intended for routine quality control testing of geomembranes.

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.*

1.6 The values stated in SI units are to be regarded as the standard. The inch-pound values stated in parentheses are provided for information only.

2. Referenced Documents

2.1 ASTM Standards:

- D 76 Specification for Tensile Testing Machines for Textiles²
- D 123 Terminology Relating to Textiles²
- D 751 Test Methods for Coated Fabrics³

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 *Annual Book of ASTM Standards*, Vols 07.01 and 07.02.

³ *Annual Book of ASTM Standards*, Vol 09.02.

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting⁴

D 1593 Specification for Nonrigid Vinyl Chloride Plastic Film and Sheeting⁴

D 1909 Table of Commercial Moisture Regains for Textile Fibers²

D 4354 Practice for Sampling of Geosynthetics for Testing⁵

D 4439 Terminology for Geosynthetics⁵

3. Terminology

3.1 Definitions:

3.1.1 *atmosphere for testing geomembranes, n*—air maintained at a relative humidity of 50 to 70 % and a temperature of $21 \pm 2^\circ\text{C}$ ($70 \pm 4^\circ\text{F}$).

3.1.1.1 *Discussion*—Within the range of 50 to 70 % relative humidity, moisture content is not expected to affect the tensile properties of geomembrane materials. In addition, geotextile standard test methods restrict the range of relative humidity to $65 \pm 5\%$, while geomembrane standard test methods restrict the range of relative humidity to $55 \pm 5\%$. The restricted range in this test method is made broader to reduce the need for testing laboratories to change laboratory conditions, and considering the lack of expected effect of moisture on geomembranes. The user should consult Table D1909 to resolve questions regarding moisture regains of textile fibers, especially if the user is testing a new or unknown material.

3.1.2 *breaking force, (F), J, n*—the force at failure.

3.1.3 *breaking toughness, T, (FL⁻¹), Jm⁻², n*—for geosynthetics, the actual work per unit volume of a material corresponding to the breaking force.

3.1.3.1 *Discussion*—Breaking toughness is proportional to the area under the force-elongation curve from the origin to the breaking point (see also, work-to-break). Breaking toughness is calculated from work-to-break and width of a specimen. In geomembranes, breaking toughness is often expressed as force per unit width of material in inch-pound values. In other materials, breaking toughness is often expressed as work per unit mass of material.

3.1.4 *corresponding force, n*—synonym for force at specified elongation.

⁴ *Annual Book of ASTM Standards*, Vol 08.01.

⁵ *Annual Book of ASTM Standards*, Vol 04.09.