



Designation: D4439 – 20

## Standard Terminology for Geosynthetics<sup>1</sup>

This standard is issued under the fixed designation D4439; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Referenced Documents

#### 1.1 *ASTM Standards*:<sup>2</sup>

**C125** Terminology Relating to Concrete and Concrete Aggregates

**D1987** Test Method for Biological Clogging of Geotextile or Soil/Geotextile Filters

**D4354** Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing

**D4491/D4491M** Test Methods for Water Permeability of Geotextiles by Permittivity

**D4533/D4533M** Test Method for Trapezoid Tearing Strength of Geotextiles

**D4594/D4594M** Test Method for Effects of Temperature on Stability of Geotextiles

**D4955** Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method

**D4632/D4632M** Test Method for Grab Breaking Load and Elongation of Geotextiles

**D4716/D4716M** Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

**D4751** Test Methods for Determining Apparent Opening Size of a Geotextile

**D4759** Practice for Determining the Specification Conformance of Geosynthetics

**D4833/D4833M** Test Method for Index Puncture Resistance of Geomembranes and Related Products

**D4873/D4873M** Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

**D4884/D4884M** Test Method for Strength of Sewn or Bonded Seams of Geotextiles

**D4885** Test Method for Determining Performance Strength of Geomembranes by the Wide Strip Tensile Method

**D5101** Test Method for Measuring the Filtration Compatibility of Soil-Geotextile Systems

**D5141** Test Method for Determining Filtering Efficiency and Flow Rate of the Filtration Component of a Sediment Retention Device

**D5262** Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics

**D5322** Practice for Laboratory Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids

**D5323** Practice for Determination of 2 % Secant Modulus for Polyethylene Geomembranes

**D5397** Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

**D5494** Test Method for the Determination of Pyramid Puncture Resistance of Unprotected and Protected Geomembranes

**D5496** Practice for In Field Immersion Testing of Geosynthetics

**D5514/D5514M** Test Method for Large-Scale Hydrostatic Puncture Testing of Geosynthetics

**D5567** Test Method for Hydraulic Conductivity Ratio (HCR) Testing of Soil/Geotextile Systems

**D5594** Test Method for Determination of the Vinyl Acetate Content of Ethylene-Vinyl Acetate (EVA) Copolymers by Fourier Transform Infrared Spectroscopy (FT-IR)

**D5617** Test Method for Multi-Axial Tension Test for Geosynthetics

**D5641/D5641M** Practice for Geomembrane Seam Evaluation by Vacuum Chamber

**D5747/D5747M** Practice for Tests to Evaluate the Chemical Resistance of Geomembranes to Liquids

**D5818** Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics

**D5820** Practice for Pressurized Air Channel Evaluation of Dual-Seamed Geomembranes

**D5994/D5994M** Test Method for Measuring Core Thickness of Textured Geomembranes

#### 1.2 *Federal Standard*:<sup>3</sup>

**Federal Standard 751a** Stitches, Seams, and Stitchings

<sup>1</sup> This terminology is under the jurisdiction of D35 on Geosynthetics and is the direct responsibility of D35.93 on Editorial and Terminology.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

## 2. Terminology

**absorption**, *n*—the process by which a liquid is drawn into and tends to fill permeable pores in a porous solid body, also, the increase in mass of a porous solid body resulting from penetration of a liquid into its permeable pores. **C125**

**aerobic**, *n*—a condition in which a measurable volume of air is present in the incubation chamber or system. **D1987**

**anaerobic**, *n*—a condition in which no measurable volume of air is present in the incubation chamber or system. **D1987**

**apparent opening size (AOS)**,  $O_{95}$ , *n*—for a geotextile, a property which indicates the approximate largest particle that would effectively pass through the geotextile. **D4751**

**atmosphere for testing geosynthetics**, *n*—air maintained at a relative humidity between 50 to 70 % and a temperature of  $21 \pm 2$  °C ( $70 \pm 4$  °F). **D4439, D4751, D5494**

**back flushing**, *n*—a process by which liquid is forced in the reverse direction to the flow direction. **D1987**

**basis weight**—deprecated term (do not use in the sense of mass per unit area). **D4439**

**bend**, *vt*—in *mechanics*, to force an object from its natural or manufactured shape into a curve or into increased curvature. **D4439**

**biocide**, *n*—a chemical used to kill bacteria and other microorganisms. **D1987**

**bituminous geosynthetic barrier (GBR-B)**, *n*—factory-produced structure of geosynthetic materials in the form of a sheet in which the barrier function is fulfilled by bitumen. **D4439**

**blinding**, *n*—for *geotextiles*, the condition where soil particles block the surface openings of the fabric, thereby reducing the hydraulic conductivity of the system. **D4439**

**breaking force**, ( $F$ ),  $J$ , *n*—the force at failure. **D4885**

**breaking load**, *n*—the maximum force applied to a specimen in a tensile test carried to rupture. **D4632/D4632M**

**breaking toughness**,  $T$ , ( $FL^{-1}$ ),  $Jm^{-2}$ , *n*—for *geotextiles*, the actual work-to-break per unit surface area of material. **D4595, D4885**

**chemical resistance**, *n*—the ability to resist chemical attack. **D5322**

**clogging**, *n*—for *geotextiles*, the condition where soil particles move into and are retained in the openings of the fabric, thereby reducing the hydraulic conductivity. **D4439**

**clogging potential**, *n*—in *geotextiles*, the tendency for a given geotextile to decrease permeability due to soil particles that have either lodged in the geotextile openings or have built up a restrictive layer on the surface of the geotextile. **D5101**

**compressed thickness** ( $t$ , (L), mm), *n*—thickness under a specified stress applied normal to the material. **D4439**

**constant-rate-of-load tensile testing machine (CRL)**, *n*—a testing machine in which the rate of increase of the load being applied to the specimen is uniform with time after the first 3 s. **D4439**

**corresponding force**, *n*—synonym for force at specified elongation. **D4885**

**coupon**, *n*—a portion of a material or laboratory sample from which multiple specimens can be taken for testing. **D5747/D5747M**

**creep**, *n*—the time-dependent increase in accumulative strain in a material resulting from an applied constant force. **D5262**

**critical height (ch)**, *n*—the maximum exposed height of a cone or pyramid that will not cause a puncture failure of a geosynthetic at a specified hydrostatic pressure for a given period of time. **D5514/D5514M**

**cross-machine direction**, *n*—the direction in the plane of the fabric perpendicular to the direction of manufacture. **D4632/D4632M**

**density** ( $\rho$ , ( $ML^{-3}$ ),  $kg/m^3$ ), *n*—mass per unit volume. **D4439**

**design load**—the load at which the geosynthetic is required to operate in order to perform its intended function. **D5262**

**elastic limit**, *n*—in *mechanics*, the stress intensity at which stress and deformation of a material subjected to an increasing force cease to be proportional; the limit of stress within which a material will return to its original size and shape when the force is removed, and hence, not a permanent set. **D4885**

**elongation at break**, *n*—the elongation corresponding to the breaking load, that is, the maximum load. **D4632/D4632M**

**failure**, *n*—an arbitrary point beyond which a material ceases to be functionally capable of its intended use. **D4885, D5262**

**failure**, *n*—in *testing geosynthetics*, water or air pressure in the test vessel at failure of the geosynthetic. **D5514/D5514M**

**field testing**, *n*—testing performed in the field under actual conditions of temperature and exposure to the fluids for which the immersion testing is being performed. **D5496**

**fill**—deprecated term, see **filling**.

**filling**, *n*—yarn running from selvage to selvage at right angles to the warp in a woven fabric. **D4439**

**flexible polypropylene**, *n*—a material having a 2 % secant modulus of less than 300 MPa (40 000 psi) as determined by Practice **D5323**, produced by polymerization of propylene with or without other alpha olefin monomers.

**force at specific elongation, FASE**, *n*—the force associated with a specific elongation on the force-elongation curve. **D4439**

**force-elongation curve**, *n*—in a *tensile test*, a graphical representation of the relationship between the magnitude of an externally applied force and the change in length of the

- specimen in the direction of the applied force. (*Synonym for stress-strain curve.*) **D4885**
- geocomposite**, *n*—a product composed of two or more materials, at least one of which is a geosynthetic.
- geofoam**, *n*—block or planar rigid cellular foamed polymeric material used in geotechnical engineering applications.
- geogrid**, *n*—a geosynthetic formed by a regular network of integrally connected elements with apertures greater than 6.35 mm (¼ in.) to allow interlocking with surrounding soil, rock, earth, and other surrounding materials to function primarily as reinforcement. **D5262**
- geomembrane**, *n*—an essentially impermeable geosynthetic composed of one or more synthetic sheets. **D4439, D4873/D4873M, D4885, D5994/D5994M, D5820**
- geonet**, *n*—a geosynthetic consisting of integrally connected parallel sets of ribs overlying similar sets at various angles for planar drainage of liquids or gases. **D4439**
- geostrip**—polymeric material in the form of a strip of width not more than 200 mm (7.87 in.), used in contact with soil or other materials in geotechnical and civil engineering applications, or both.
- 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 man-made project, structure, or system. **D4354, D4759, D4873/D4873M, D5617, D5818**
- geosynthetic barrier**—low-permeability geosynthetic material, used in geotechnical and civil engineering applications with the purpose of reducing or preventing the flow of fluid through the construction. **D4439**
- geosynthetic barrier clay (GBR-C)**, *n*—factory-produced structure of geosynthetic materials in the form of a sheet, in which the barrier function is fulfilled by clay.
- geosynthetic barrier polymeric (GBR-P)**, *n*—factory-produced structure of geosynthetic materials in the form of a sheet, in which the barrier function is fulfilled by polymers.
- geosynthetic cementitious composite mat (GCCM)**, *n*—a factory-assembled geosynthetic composite consisting of a cementitious material contained within layer or layers of geosynthetic materials that becomes hardened when hydrated.
- geosynthetic clay liner**, *n*—a manufactured hydraulic barrier consisting of clay bonded to a layer or layers of geosynthetic materials.
- geotechnical engineering**, *n*—the engineering application of geotechnics. **D4439, D4595**
- geotechnics**, *n*—the application of scientific methods and engineering principles to the acquisition, interpretation, and use of knowledge of materials of the earth's crust to the solution of engineering problems. **D4439, D4491/D4491M, D4595, D4716/D4716M, D4751**
- geotextile**, *n*—a permeable geosynthetic comprised solely of textiles.  
DISCUSSION—Geotextiles perform several functions in geotechnical engineering applications, including: separation, filtration, drainage, reinforcement, and protection. **D1987, D4439, D5594**
- grab test**, *n*—*in fabric testing*, a tension test in which only a part of the width of the specimen is gripped in the clamps. **D4632/D4632M**
- gradient ratio**, *n*—*in geotextiles*, the ratio of the hydraulic gradient through a soil-geotextile system to the hydraulic gradient through the soil alone. **D5101**
- gravity flow**, *n*—flow in a direction parallel to the plane of a geotextile or related product driven predominately by a difference in elevation between the inlet and outflow points of a specimen. **D4716/D4716M**
- head**, *n*—pressure at a point in a liquid, expressed in terms of the vertical distance of the point below the surface of the liquid. **D4716/D4716M**
- hydraulic conductivity** (*k*), *n*—the rate of discharge of water under laminar flow conditions through a unit cross-sectional area of a porous medium under a unit hydraulic gradient and standard temperature conditions (20 °C). **D5567**
- hydraulic conductivity ratio** (HCR), *n*—the ratio of the hydraulic conductivity of the soil/geotextile system,  $k_{sg}$ , at any time during the test, to the initial hydraulic conductivity,  $k_{sg0}$ , measured at the beginning of the test (NEW).
- hydraulic gradient**, *i*, *s* (*D*)—the loss of hydraulic head per unit distance of flow,  $dH/dL$ . **D5101**
- hydraulic transmissivity**,  $\theta$  ( $L^2 T^{-1}$ ), *n*—*for a geotextile or related product*, the volumetric flow rate of water per unit width of specimen per unit gradient in a direction parallel to the plane of the specimen. **D4716/D4716M**
- hydrostatic pressure**, *n*—a state of stress in which all the principal stresses are equal (and there is no shear stress), as in a liquid at rest; induced artificially by means of a gaged pressure system; the product of the unit weight of the liquid and the difference in elevation between the given point and the free water elevation. **D5514/D5514M**
- index test**, *n*—a test procedure which may contain a known bias but which may be used to establish an order for a set of specimens with respect to the property of interest. **D4833/D4833M, D4885**
- inflection point**, *n*—the first point of the force-elongation curve at which the second derivative equals zero. **D4885**
- initial tensile modulus**,  $J_p$  ( $FL^{-1}$ ),  $Nm^{-1}$ , *n*—*for geosynthetics*, the ratio of the change in force per unit width to the change in elongation of the initial portion of a force-elongation curve. **D4885**
- in-plane flow**, *n*—fluid flow confined to a direction parallel to the plane of a geotextile or related product. **D4716/D4716M**