



Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil¹

This standard is issued under the fixed designation D 6706; 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 Resistance of a geosynthetic to pullout from soil is determined using a laboratory pullout box.

1.2 The test method is intended to be a performance test conducted as closely as possible to replicate design or as-built conditions. It can also be used to compare different geosynthetics, soil types, etc., and thereby be used as a research and development test procedure.

1.3 The values stated in SI units are to be regarded as standard. The values stated in parentheses are provided for information only.

1.4 *This standard may involve hazardous materials, and equipment. 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 123 Definitions of Terms Relating to Textiles²

D 653 Terminology Relating to Soil, Rock and Contained Fluids³

D 2905 Statement on Number of Specimens Required to Determine the Average Quality of Textiles²

D 3080 Method for Direct Shear Test of Soils Under Consolidated Drained Conditions³

D 4354 Practice for the Sampling of Geotextiles³

D 4439 Terminology for Geotextiles³

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *apertures, n*—the open spaces in geogrids which enable soil interlocking to occur.

3.1.2 *atmosphere for testing geosynthetics, n*—air maintained at a relative humidity of $60 \pm 10\%$ and a temperature of $21 \pm 2^\circ\text{C}$ ($70 \pm 4^\circ\text{F}$).

3.1.3 *cross-machine direction, n*—the direction in the plane of the geosynthetic perpendicular to the direction of manufacture.

3.1.4 *failure, n*—a defined point at which a material ceases to be functionally capable of its intended use.

3.1.5 *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. **(D 4439)**

3.1.6 *junction, n*—the point where geogrid ribs are interconnected in order to provide structure and dimensional stability.

3.1.7 *machine direction, n*—the direction in the plane of the geosynthetic parallel to the direction of manufacture.

3.1.8 *pullout, n*—the movement of a geosynthetic over its entire embedded length, with initial pullout occurring when the back of the specimen moves, and ultimate pullout occurring when the movement is uniform over the entire embedded length.

3.1.9 *pullout force, (kN), n*—force required to pull a geosynthetic out of the soil during a pullout test.

3.1.10 *pullout resistance, (kN/m), n*—the pullout force per width of geosynthetic measured at a specified condition of displacement.

3.1.11 *rib, n*—the continuous elements of a geogrid which are either in the machine or cross-machine direction as manufactured.

3.1.12 *ultimate pullout resistance, (kN/m), n*—the maximum pullout resistance measured during a pullout test.

3.1.13 *wire gage, n*—a displacement gage consisting of a non extensible wire attached to the geosynthetic and monitored by connection to a dial extensometer, or electronic displacement transducer.

3.2 For definitions of other terms used in this test method refer to Terminology D 123, D 653, and D 4439.

4. Summary of Test Method

4.1 In this method, a geosynthetic is embedded between two layers of soil, horizontal force is applied to the geosynthetic and the force required to pull the geosynthetic out of the soil is recorded.

4.2 Pullout resistance is obtained by dividing the maximum load by the test specimen width.

4.3 The test is performed while subjected to normal compressive stresses which are applied to the top soil layer.

¹ This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.01 on Mechanical Properties.

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² *Annual Book of ASTM Standards*, Vol 07.01.

³ *Annual Book of ASTM Standards*, Vol 04.09.