



Standard Test Method for Pore Size Characteristics of Geotextiles by Capillary Flow Test¹

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1. Scope

1.1 This test method covers the determination of the pore size distribution of geotextile filters with pore sizes ranging from 1 to 500 μm .

NOTE 1—The accuracy of this procedure has been verified up to a maximum pore size of 200 μm . Above this value accuracy has been found to be equipment dependent and should be verified by the user through checks on materials with known opening sizes.

1.2 The test method measures the entire pore size distribution in terms of a surface analysis of specified pore sizes in a geotextile, defined in terms of the limiting diameters.

1.3 The analyst should be aware that adequate collaborative data for bias statements as required by Practice D 2777 is not provided. See the precision and bias section for details.

1.4 *This standard may involve hazardous materials, operations, 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 1129 Definition of Terms Relating to Water²
- D 2777 Practice for Determination of Precision and Bias of Applicable Methods of Committee D-19 on Water²
- D 4354 Practice for Sampling Geosynthetics (for Testing)³
- D 4439 Terminology Relating to Geosynthetics³
- E 128 Test Method for Maximum Pore Diameter and Permeability of Rigid Porous Filters for Laboratory Use⁴
- F 316 Pore Size Characteristics of Membrane Filter by Bubble Point and Mean Flow Pore Test⁴

3. Terminology

3.1 *Definitions*—For definitions of other terms used in these test methods, refer to Definitions D 4439 and D 1129.

¹ This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.03 on Hydraulic Properties.

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² Annual Book of ASTM Standards, Vol 11.01.

³ Annual Book of ASTM Standards, Vol 04.02.

⁴ Annual Book of ASTM Standards, Vol 14.02.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *bubble point pore size (O_{98})*, n —the largest effective pore diameter detected by the sudden increase of flow rate at the beginning of the wet test.

3.2.2 *pore constriction (O)*, n —diameter of a circle having the same area as the smallest section of a given pore.

3.2.3 *pore size (O_i)*, n —capillary equivalent pore diameter for which the percent of total pore diameters i in a given geotextile based on the surface occupied by the pores are smaller than or equal to that diameter.

3.2.4 *pore size distribution (PSD)*, n —percent cumulative distribution of the complete range of pore sizes with in a given geotextile based on the surface occupied by the pores.

3.2.5 *wetting liquid*, n —liquid used to submerge the geotextile specimen prior to beginning the test.

4. Summary of Test Method

4.1 Geotextile filters have discrete pores from one side to the other of the geotextile. The bubble point test is based on the principle that a wetting liquid is held in these continuous pores by capillary attraction and surface tension, and the minimum pressure required to force liquid from these pores is a function of pore diameter.

4.2 A fluid-wet geotextile will pass air when the applied air pressure exceeds the capillary attraction of the fluid in the pore constriction. Smaller pore constrictions will exhibit similar behavior at higher pressures. The relationship between pore size and pressure has been established for water.

4.3 By comparing the gas flow rates of both a wet and dry geotextile at the same pressures, the percentage of the flow passing through the filter pores larger than or equal to the specified size may be calculated from the pressure-size relationship. By increasing pressure in small steps, it is possible to determine the flow contribution of very small pore size increments by difference.

5. Significance and Use

5.1 This test method may be used to:

- 5.1.1 Determine the pore size distribution of a geotextile,
- 5.1.2 Determine the maximum pore size of a geotextile,
- 5.1.3 Determine the mean flow pore size of a geotextile,
- 5.1.4 Determine the effect of processes such as calendaring or needle punching upon the pore size distribution,