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Standard Test Method for ~~Determining Filtering Efficiency and Flow Rate of a Geotextile for Silt Fence Application Using Site-Specific Soil~~Determining Filtering Efficiency and Flow Rate of the Filtration Component of a Sediment Retention Device Using Site-Specific Soil[1]

This standard is issued under the fixed designation D 5141; 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

~~1.1This test method is used to determine the filtering efficiency and the flow rate of a geotextile used exclusively in silt fence or silt barrier application.~~

~~NOTE1—The terms silt fence and silt barrier are used synonomously.~~

1.1 This test method is used to determine the filtering efficiency and the flow rate of the filtration component of a sediment retention device, such as a silt fence, silt barrier, or inlet protector.

1.1.1 The results are shown as a percentage for filtering efficiency and cubic metres per square metre per minute ($m^3/m^2/min$) or gallons per square foot per minute ($gal/ft^2/min$) for flow rate.

1.1.2 The filtering efficiency indicates the percent of sediment removed from sediment-laden water.

~~1.1.3The flow rate is the average rate of passage of the sediment-laden water through the geotextile.~~

1.1.3 The flow rate is the average rate of passage of the sediment-laden water through the filtration component of a sediment retention device.

1.2 This test method requires several specialized pieces of equipment, such as an integrated water sampler and an analytical balance, and site specific soil from the construction project.

1.3 The values stated in SI units are the standard, while the inch-pound units are provided for information. The values expressed in each system may not be exact equivalents; therefore, each system must be used independently of the other, without combining values in any way.

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:*[2]

D 123 ~~Terminology Relating to Textile Materials~~ Terminology Relating to Textiles

D 653 Terminology Relating to Soil, Rock, and Contained Fluids

D 4439 Terminology for Geosynthetics

D 4354 Practice for Sampling of Geosynthetics for Testing

D 4759 Practice for Determining the Specification Conformance of Geosynthetics

2.2 *American Public Health Association (APHA) Standard:*

208D Total Nonfiltrable Residue Dried at 103–105°C (Total Suspended Matter)[3]

3. Terminology

3.1 *Definitions:*

3.1.1 ~~*filtration*—See *filter*.~~ filtration component—a geotextile or other material designed to act as a filter.

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[1] This test method is under the jurisdiction of ASTM Committee D35 Geosynthetics and is the direct responsibility of Subcommittee D35.03 on Permeability and Filtration.

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

[3] Available from American Public Health Association (APHA), 1015 Eighteenth St. NW, Washington, DC 20036.

3.1.2 *filter*—See Terminology D 653.

3.1.3 *geosynthetic*, *n*—a planar product manufactured from polymeric material used with foundation soil, rock, earth, or any other geotechnical engineering related material as an integral part of a man-made project, structure, or system. (See Practice D 4759.)

3.1.4 ~~*geotextile*, *n*—any permeable textile material used with foundation, soil, rock, earth, or any other geotechnical engineering related material, as an integral part of a man-made project, structure, or system.~~

~~3.1.5~~*performance property*, *n*—a result obtained by conducting a performance test.

~~3.1.6~~

3.1.5 *performance test*, *n*— *in geosynthetics*, a laboratory procedure which simulates selected field conditions which can be used in design.

~~3.1.7For~~3.1.6 For definitions of other terms relating to geosynthetics, refer to Terminology D 4439. For definitions of textile terms, refer to Terminology D 123. For definitions of soil terms, refer to Terminology D 653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *filtering efficiency, FE, n—in geosynthetics*, the percent of sediment removed from sediment-laden water by the filtration component of a ~~geotextile~~sediment retention device over a specified period of time.

3.2.2 *flow rate, FR* [$L^3L^{-2}T^{-1}$], *n—in geosynthetics*, the volume of fluid per unit time, expressed as an average, which passes through a cross-sectional plane perpendicular to the fluid flow.

3.2.3 *flume*, *n*—an apparatus that carries a liquid to an outlet.

3.2.4 *sediment retention device (SRD), n—in geosynthetics*, a temporary composite structure used to induce the removal of suspended sediments from sediment-laden flowing water.

3.2.5 *silt fence*, *n—in geosynthetics*~~, a temporary sediment control measure used to remove soil from runoff.~~ , a type of sediment retention device.

4. Summary of Test Method

~~4.1A geotextile specimen is placed across a flume while sediment-laden water is passed through the specimen.~~

~~4.1.1The time that water flows through the geotextile and the amount of soil passed by the geotextile are measured. The amount of soil retained, filtering efficiency, and flow rate are calculated from these measured values.~~

4.1 A filtration component of a sediment retention device specimen is placed vertically across a flume or over a horizontal opening at the end of a flume while sediment-laden water is passed through the specimen.

4.1.1 The time that water flows through the filtration component of a sediment retention device and the amount of soil passed by the filtration component of a sediment retention device are measured. The amount of soil retained, filtering efficiency, and flow rate are calculated from these measured values.

4.2 Soil from the construction project should be used in this test method.

5. Significance and Use

5.1 This test method is used to determine the filtering efficiency and flow rate of the filtration component of a ~~geotextile used in~~ sediment retention device, such as a silt ~~fence or~~fence, a silt ~~barrier installation~~ barrier, or a silt curtain, for specific soil conditions.

5.2 This test method may be used for the design of ~~a silt fence or silt barrier~~ the filtration component of a sediment retention device to meet requirements of regulatory agencies in filtering efficiency or flow rate for specific soil conditions.

5.2.1 The designer can use this test method to determine the spacing between ~~silt fences or silt barriers.~~ sediment retention devices.

5.3 This test method is intended for performance evaluation, as the results will depend on the specific soil evaluated. It is recommended that the user or representative perform the test to pre-approved products, as ~~geotextile~~ sediment retention device manufacturers are not typically equipped to handle or test soil requirements.

5.4 This test method provides a means of evaluating ~~geotextiles~~ the filtration component of sediment retention devices with different soils under various conditions that simulate the conditions that exist in a ~~silt fence or silt barrier~~ sediment retention device installation. This test method may be used to simulate several storm events on the same ~~geotextile~~sediment retention device specimen. Therefore, the number of times this test is repeated per specimen is dependent upon the user and the site conditions.

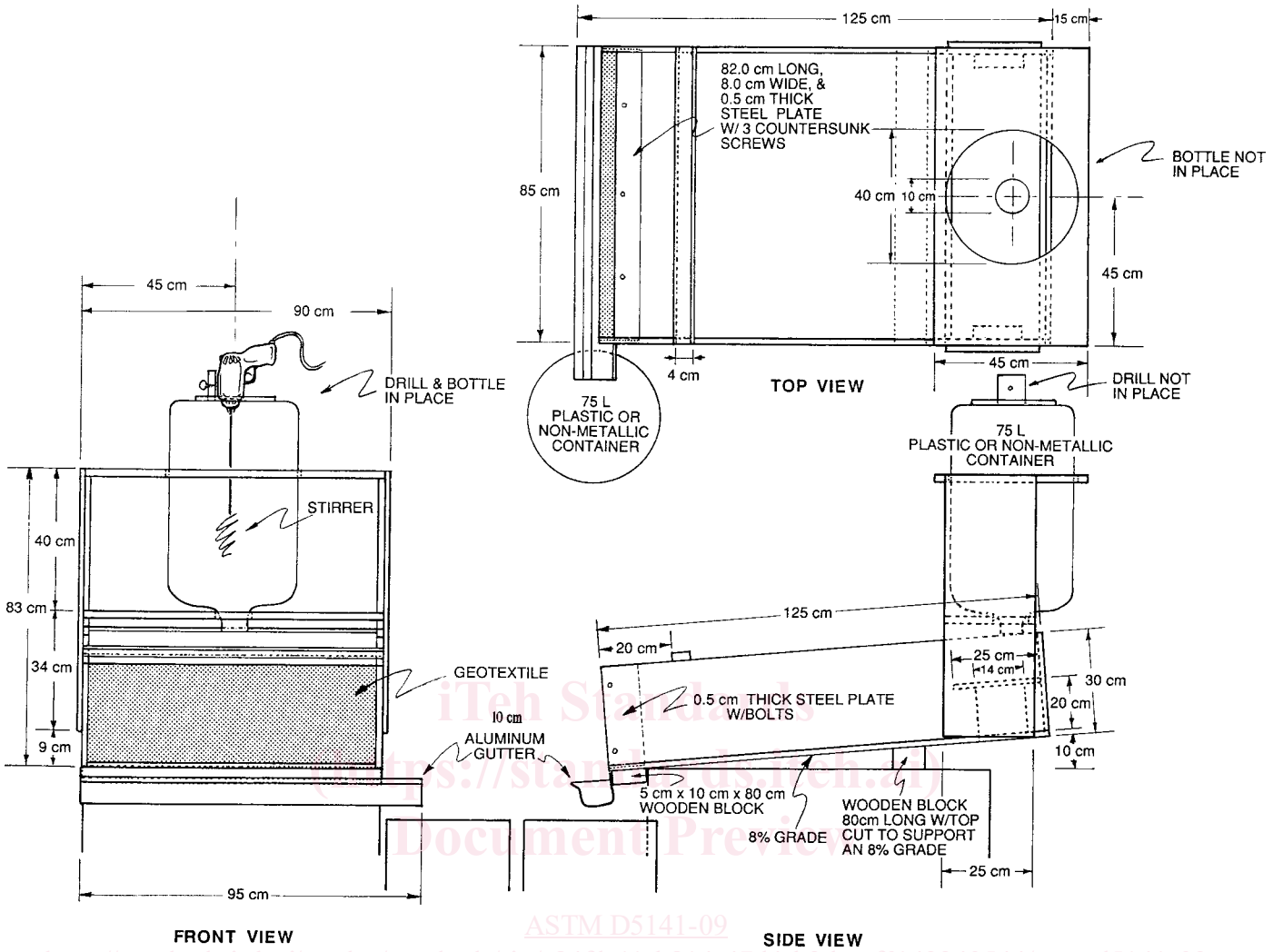
6. Apparatus

6.1 *Flume*, constructed from marine-grade plywood, plexiglas, aluminum, or other material. The flume should be watertight and constructed as shown in Fig. 1.

NOTE~~2—Metal~~ 1—Metal flumes should be mounted on a wood frame. The flume opening is the standard length of a straw bale. With a standard length flume of 122 cm (48 in.), the height of the back of the flume would be elevated 10 cm (3⅞ in.).

6.2 *Inlet Extension*, constructed from marine-grade plywood, plexiglass, aluminum, or other material. The inlet extension should be watertight and constructed as shown in Fig. 2.

NOTE 2—Metal inlet extensions should be mounted on a wood frame. The inlet extension opening should be appropriate for the type of SRD being tested.



NOTE 1—Sides and bottom of flume can be constructed of 2-cm thick marine grade plywood.

FIG. 1 Flume (For Vertical SRDs)

6.3 *Sample Cutter*, appropriate to prepare test specimens.

~~6.3~~

6.4 *Integrated Water Sampler,*[4] a 500-mL (0.13-gal) device used to collect integrated samples of water.

~~6.4~~

6.5 *Two Containers*, 75-L (20-gal), plastic or nonmetallic.

~~6.5~~

6.6 *Stopwatch*.

~~6.6~~

6.7 *Stirrer*, such as a stirring rod on a portable electric drill.

~~6.7~~

6.8 *Sediment-Free Water*, containing no flocculent agents.

NOTE 3—Flocculent agents used in water treatment may cause erroneous results by affecting the settling rate of soil particles in the water.

~~6.8~~

6.9 *Soil*, site-specific.

~~6.9~~

6.10 *Gooch Crucible*.

~~[4] The US DH-48 integrated water sampler has been found to be satisfactory. It is available from the Federal Inter-Agency Sedimentation Project, St. Anthony Falls Hydraulic Laboratory, 3rd Avenue S.E., Minneapolis, MN 55414.~~

[4] The US DH-48 integrated water sampler has been found to be satisfactory. It is available commercially.