Designation: ~~D5891 – 02 (Reapproved 2009)~~ D5891/D5891M – 02 (Reapproved 2016)$^{\varepsilon 1}$

Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners[1]

This standard is issued under the fixed designation ~~D5891;~~D5891/D5891M; 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.

ε[1] NOTE—Designation was changed to dual, units statement in 1.4 and units, where applicable, were corrected editorially in January 2016.

1. Scope

1.1 This test method covers an index method that enables the evaluation of fluid loss properties of a clay mineral film deposited on a filter paper from a 6 % solids slurry of clay mineral at 100-psi (-kPa) pressure as a measure of its usefulness for permeability or hydraulic conductivity reduction in geosynthetic clay liners (GCL).

1.2 This test method is adapted from American Petroleum Institute drilling fluid specifications for bentonite.

1.3 Powdered clay mineral is tested as produced; granular clay mineral should be ground to 100 % passing a 100 mesh U.S. Standard Sieve with a minimum of 65 % passing a 200 mesh U.S. Standard Sieve with the whole ground product used for testing.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as ~~the~~ standard. The values ~~given in parentheses are for information only.~~stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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.*[2]

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D1193 Specification for Reagent Water

E1 Specification for ASTM Liquid-in-Glass Thermometers

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

E725 Test Method for Sampling Granular Carriers and Granular Pesticides

2.2 *API Standards:*[4]

API RP 131, Recommended Practice for Laboratory Testing of Drilling Fluids

3. Terminology

3.1 *Definitions*~~— For~~ —For definitions of terms used in this test method, refer to API Standards and ASTM definitions for GCL products.

4. Significance and Use

4.1 Clay mineral is the functional component of GCL that reduces the hydraulic conductivity of industrial waste or ground water through the liner.

4.2 Clay mineral quality can vary significantly and effect the hydraulic conductivity of the GCL composite. This test method evaluates a significant property of clay mineral that relates to performance.

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[1] This test method is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.04 on Geosynthetic Clay Liners.

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[2] When bentonite is removed from a GCL product for testing, it may include adhesives that can influence test results.

[3] 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.

[4] Available from American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005-4070, http://www.api.org.

5. Apparatus

5.1 *Laboratory Balance,* 100 g capacity, ±0.01-g accuracy and precision.

5.2 *Weighing Paper,* or small weighing dish.

5.3 *Graduated Cylinder,* 500 ± 5-mL graduated TD (to deliver) with 10-mL subdivisions, Class A volumetrically calibrated; 10 ± 0.1-mL graduated cylinder, graduated TC (to contain) with 0.1-mL subdivisions.

5.4 *U.S. Standard Sieve,* 100 mesh, 200 mesh, and automated sieve shaker.

5.5 *Mortar and Pestle or Laboratory Hammer Mill,* for grinding clay mineral to required particle sizing.

5.6 *ASTM Calibration Immersion Thermometer,* 0 to 105 ± 0.5°C (see Specification E1).

5.7 *Mixer*—11 000 ± 300 rpm under load with single sine-wave impeller approximately 25 mm ~~(1.0 in.)~~[1.0 in.] in diameter (mounted flash side up).[5] The impeller shall be replaced when it weighs a minimum of 5.1 g, from an original weight of about 5.5 g. New blades will be weighed prior to installation in order to ensure conformance to manufacturing criteria. Mixer speed under sample loading shall be determined and documented once every 90 days unless the manufacturer has documented objective evidence to extend calibration time.

NOTE 1—Sterling Multimixer Model 9B with 9B29X impeller blades or equivalent may be obtained from the suppliers given in Footnote ~~9.~~6.

5.8 *Mixing Container*—Approximate dimensions are ~~180 mm (7 in.)~~ 180 mm [7 in.] deep, 97-mm ~~(3~~[3 13/16~~ in.)~~-in.] inner diameter at top, and 70-mm ~~(2~~[2 3/4~~ in.)~~-in.] inner diameter at bottom.[6]

NOTE 2—Mixing containers or equivalent may be obtained from the suppliers given in Footnote ~~8.~~5.

5.9 *Timers,* 30 min, two interval, mechanical or electrical, precision ±0.1 min.

5.10 *Spatula,* flat blade, to dislodge clay mineral clumps adhering to the mixing container walls.

5.11 *Covered or Sealed ~~Container ,~~ Container,* of ~~400~~400- to 600-mL capacity.

5.12 *Ambient Temperature/Low-Pressure Filter Press,* conforming to API RP 131, Section 3.2. This filter press consists mainly of a cylindrical cell having an inside diameter of ~~76.2 mm (3 in.)~~ 76.2 mm [3 in.] and a height of at least 64.0 mm ~~(2.5 in.).~~[2.5 in.]. This chamber is made of materials resistant to strongly alkaline solutions, and is so fitted that a pressure medium can be conveniently admitted into and bled from the top. Arrangement is also such that a sheet of 90-mm filter paper can be placed in the bottom of the chamber just above a suitable support. The filtration area is 4580 ± 60 mm^2 ~~(7.1~~[7.1 ± 0.1 in^2~~).~~].] Below the support is a drain tube for discharging the filtrate into a graduated cylinder. Sealing is accomplished with gaskets, and the entire assembly supported by a stand. A mini-press or half-area press does not directly correlate with the results obtained when using the above described standard-sized press. Pressure can be applied with any nonhazardous fluid medium, either gas or liquid. Presses are equipped with pressure regulators and can be obtained with portable pressure cylinders, midget pressure cartridges, or means of utilizing hydraulic pressure.

NOTE 3—Ambient temperature/low-pressure filter press conforming to API RP 131, Section 3.2, or equivalent, may be obtained from the suppliers given in Footnote ~~9.~~6.

5.13 *Filter Paper, 90-mm,* very dense, hardened with smooth lint-free surface, must be used.[7] These papers have high wet strength permitting application of high pressure during filtration. They also have good resistance to alkalies and acids.

6. Reagents

6.1 *Purity of Reagents*—Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specification D1193, Type I, II, or III. Such water is best prepared by distillation or the passage of tap water through an ion-exchange resin.

6.2 Specification D1193 for reagent water, Type I, II, or III.

7. Hazards

7.1 *Safety Precautions*—Establish appropriate safety and health practices for high-pressure equipment prior to use.

8. Sampling and Selection

8.1 Conduct the sampling in accordance with Test Method E725.

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[5] For example, Sterling Multimixer Model 9B with 9B29X impeller blades available from Fann Instrument Co., P.O. Box 4350, Houston, TX 77210, has been found suitable for this purpose.

[6] For example, Hamilton Beach Mixer Cup No. M110-D, or equivalent, has been found suitable for this purpose. Mixing containers supplied by Fann Instrument Co., P.O. Box 4350, Houston, TX 77210.

[7] For example, Whatman No. 50, S & S No. 576, or equivalent, have been found suitable for this purpose.