



## Standard Practice for Quality Control of Geosynthetic Clay Liners<sup>1</sup>

This standard is issued under the fixed designation D 5889; 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. Scope

1.1 This practice covers the manufacturing quality control of geosynthetic clay liners (GCLs), describing types of tests, the proper test methods, and the minimum testing frequencies.

1.2 This practice is intended to aid manufacturers, suppliers, purchasers and users of GCLs in establishing a minimum level of effort for manufacturing quality control.

1.3 This practice does not address manufacturing quality assurance, product acceptance testing, or conformance testing. These are independent activities taken by organizations other than the GCL manufacturer.

1.4 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

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. Referenced Documents

#### 2.1 ASTM Standards:

- D 638 Test Method for Tensile Properties of Plastics<sup>2</sup>
- D 4354 Practice for Sampling of Geosynthetics for Testing<sup>3</sup>
- D 4439 Terminology for Geosynthetics<sup>3</sup>
- D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles<sup>3</sup>
- D 4759 Practice for Determining the Specification Conformance of Geosynthetics<sup>3</sup>
- D 5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes<sup>3</sup>
- D 5261 Test Method for Measuring Mass per Unit Area of Geotextiles<sup>3</sup>
- D 5887 Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using Flexible Wall Permeameter<sup>3</sup>

D 5890 Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners<sup>3</sup>

D 5891 Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners<sup>3</sup>

D 5993 Test Method for Measuring the Mass Per Unit Area of Geosynthetic Clay Liners<sup>3</sup>

#### 2.2 Government Document:

EPA/600/R-93/182 Technical Guidance Document Quality Assurance and Quality Control for Waste Containment Facilities<sup>4</sup>

### 3. Terminology

#### 3.1 Definitions:

##### 3.1.1 Geosynthetic Definitions:

3.1.1.1 *geomembrane, n*—an essentially impermeable geosynthetic composed of one or more synthetic sheets.

3.1.1.2 *geotextile, n*—a permeable geosynthetic comprised solely of textiles.

##### 3.1.2 Organizational Definitions:

3.1.2.1 *installer, n*—the party who installs, or facilitates installation of, any materials purchased from manufacturers or suppliers.

3.1.2.2 *manufacturer, n*—the group, corporation, partnership, or individual that manufactures a product.

3.1.2.3 *purchaser, n*—the person, company, or organization that purchases any materials or work to be performed.

3.1.2.4 *supplier, n*—the party who supplies material or services.

##### 3.1.3 Quality Definitions:

3.1.3.1 *quality assurance (QA), n*—all those planned or systematic actions necessary to provide adequate confidence that a material, product, system, or service will satisfy given needs.

3.1.3.2 *quality control (QC), n*—a planned system of activities whose purpose is to provide a level of quality that meets the needs of users; also, the use of such a system.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D35 on Geosynthetics and Rock and is the direct responsibility of Subcommittee D35.04 on Geosynthetic Clay Liners.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 08.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.13.

<sup>4</sup> Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

#### 4. Significance and Use

4.1 GCLs must be properly manufactured in a manner consistent with a minimum level of quality control as determined by in-house testing of the final product. This practice suggests the types of tests, the methods of the testing and the minimum testing frequencies.

4.2 It should be clearly recognized that manufacturers may perform additional tests or at greater frequency than required in this practice, or both. In this case, the manufacturer's quality control plan will then take precedence over this practice. The quoted tests and test methods in Table 1 must appear in the QC

producing such project specific specification or quality assurance plan should recognize that such requirements are beyond the current state of the practice. If such a request is made by purchasers or installers, they should clearly communicate the requirements to the manufacturer or supplier during the contract decisions in order that disputes do not arise at a subsequent time.

#### 5. Procedure

5.1 The procedure for this practice is embodied in Table 1.

5.1.1 The minimum recommended quality control tests for

**TABLE 1 Minimum Types of Tests and Their Frequencies for the QC of GCLs**

Test Designation	Test Method	Frequency of Testing	Report Value
Clay: <sup>A</sup>			
Free swell	D 5890	One per truck or railcar but min, every 50 tonnes	Minimum average
Fluid loss	D 5891	One per truck or railcar but min, every 50 tonnes	Minimum average
Geosynthetic Materials:			
Geotextiles:			
Mass per unit area	D 5261	20 000 m <sup>2</sup> (200 000 ft <sup>2</sup> )	Typical and MARV
Grab tensile strength (MD and CD)	D 4632	20 000 m <sup>2</sup> (200 000 ft <sup>2</sup> )	MARV
Geomembrane			
Mass per unit area	D 5261	20 000 m <sup>2</sup> (100 000 ft <sup>2</sup> )	Typical and MARV
Thickness	D 5199	20 000 m <sup>2</sup> (200 000 ft <sup>2</sup> )	MARV
Tensile strength at break and yield (MD and CD)	D 638	20 000 m <sup>2</sup> (200 000 ft <sup>2</sup> )	MARV
Finished GCL: <sup>C</sup>			
Clay mass per unit area (dried) <sup>D</sup>	D 5993	4000 m <sup>2</sup> (40 000 ft <sup>2</sup> )	MARV
Clay moisture content	D 4643	4000 m <sup>2</sup> (40 000 ft <sup>2</sup> )	Average value <sup>E</sup>
Grab tensile strength (MD and CD) <sup>F</sup>	D 4632	20 000 m <sup>2</sup> (200 000 ft <sup>2</sup> )	MARV
Index flux <sup>B</sup>	D 5887	Once weekly with the last 20 values reported <sup>G</sup>	Maximum value

<sup>A</sup> The tests on the bentonite are to be performed on the as-received material before fabrication into the GCL product.

<sup>B</sup> Cert letter from component manufacturer or QA from GCL manufacturer, or both. Cert letters must arrive and be checked before the components are used for the GCL production.

<sup>C</sup> Components from finished GCL product should not be separated and tested, because the production process may alter the properties of the components.

<sup>D</sup> Dried bentonite should be defined as 0 % moisture content.

<sup>E</sup> Only for information.

<sup>F</sup> This test may not be applicable for geomembrane-backed GCLs.

<sup>G</sup> The last 20 values to be reported should end at the production date of the supplied GCL. If the manufacturer has more production facilities or production lines, or both, the tests must be performed and reported for each line.

plan and the QC report.

4.3 It should also be recognized that purchasers and installers of GCLs may require additional tests or at a great frequency than called for in this practice, or both. The organization(s)

the manufacture of GCLs are given in Table 1. The tests are performed on the clay, the geosynthetic component material(s) and the finished GCL.\

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