Designation: D5818 – 11

Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics[1]

This standard is issued under the fixed designation D5818; 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 This practice covers standardized procedures for obtaining samples of geosynthetics from a test section for use in assessment of the effects of damage immediately after installation caused only by the installation techniques. The assessment may include physical testing. This practice is applicable to any geosynthetic.

1.2 This practice is limited to full-scale test sections, and does not address laboratory modeling of field conditions. This practice does not address which test method(s) to use for quantifying installation damage.

1.3 *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]

D4439 Terminology for Geosynthetics

D4873 Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

3. Terminology

3.1 *Definitions:*

3.1.1 *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.

3.1.2 *sample, n—(1)* a portion of material that is taken for testing or for record purposes; *(2)* a group of specimens used, or of observations made, which provide information that can be used for making statistical inferences about the population(s) from which the specimens are drawn.

3.1.3 *test section, n*—a distinct area of actual or simulated full-scale construction.

3.1.4 For definitions of other geosynthetic terms used in this practice, refer to Terminology D4439.

4. Summary of Practice

4.1 Damage to geosynthetics from installation operations may be quantified by evaluating specimens from a sample(s) exhumed from a full-scale installation. The sample(s) should be installed using project specific procedures and materials. When project specific materials and/or procedures are unknown, generally accepted, representative materials and procedures, should be used and thoroughly documented and reported. Addressed within this practice are: amount of geosynthetic sample(s) to install procedures for installing the geosynthetic sample(s); procedures for exhuming the geosynthetic sample(s); procedure for obtaining control sample(s); and report preparation guidelines. The sample(s) should be retrieved immediately after installation to minimize potential aging of the geosynthetic. Comparison of test results on exhumed and control specimens may be used to assess effects of installation. Tests to perform are not addressed herein, and will vary with the type and function of geosynthetic and project requirements.

5. Significance and Use

5.1 The ability to maintain design function (for example, reinforcement, separation, barrier, etc.) or design properties (for example, tensile strength, chemical resistance, etc.), or both, of a geosynthetic may be affected by damage to the physical structure of the geosynthetic due to the rigors of field installation. The effect of damage may be assessed by analyzing specimens cut from sample(s) retrieved after installation in a representative test section. Analysis may be performed with visual examination or laboratory testing of specimens from the control sample(s), and from the exhumed sample(s).

5.2 A uniform practice for installing and retrieving representative sample(s) from a test section is needed to assess installation damage using project specific or generally accepted, representative materials and procedures. Damage of a

[1] This practice 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] 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.

specific grade and type of geosynthetic under specific installation procedures may be assessed with sample(s) exhumed from a full-scale test section.

6. Procedure

6.1 *Objective*—Geosynthetic and soil placement techniques shall model the methods anticipated during construction but may also be designed to model hypothetical conditions such as various degrees of compaction, lift heights, drop heights, equipment operations, and/or types of fill material.

6.2 *Exhumed Sample:*

6.2.1 The amount of geosynthetic to install in and retrieve from a test section is a function of the type and number of laboratory tests to be conducted for assessment of damage. An amount of material sufficient to obtain 20 tests on representative specimens. for each type of test should be installed for each set of installation conditions.

6.2.2 The test sample should be marked prior to installation and exhumation, or a template made, showing the exact location where specimens for testing are to be obtained. They shall also be labeled with sufficient information to assure identification of the exposed sample and associated exposure conditions, such as: geosynthetic and fill type. Machine and transverse machine direction of specimens shall be designated. Designation of specimen locations is recommended to eliminate potential bias in specimen selection after the geosynthetic has been damaged. Alternate areas may also be designated in the event the primary specimen area is damaged by exhumation.

6.3 *Control Sample:*

6.3.1 Control or base line (un-installed) sample(s) of the geosynthetic being investigated shall be from the same roll of material that is to be installed in the test section. Sample(s) from each roll of geosynthetic shall be gathered in cases where multiple geosynthetic rolls are used in the test section. Document all control sample information pertinent to sample such as: date of manufacture, manufacturer or supplier, geosynthetic grade and type, machine and transverse machine directions, and roll and lot number, if available. These control samples shall be handled and stored (see Guide D4873) in such a manner to eliminate, or minimize, damage or degradation (for example, exposure to ultraviolet light).

6.3.2 The orientation of the exhumed sample(s) and control sample(s) are to be documented. That is, the left and right hand sides of each sample must correspond. It is also recommended that the control sample should be a direct continuation of the exhumed sample so as to minimize differences in control and exhumed specimen properties due to inherent product variability.

6.3.3 The positions of the test specimens on the control sample, relative to roll edge, should correspond with the positions of the exhumed sample.

6.4 *Installation Procedure:*

6.4.1 The soil subgrade or initial lift on which the geosynthetic(s) will be placed shall be constructed to specified conditions of soil type, moisture content and compaction. Construction equipment used should be the same as to be used to construct overlying lifts, unless otherwise requested. The geosynthetic should be installed in accordance with project specific procedures. When project specific procedures and/or materials are not known, representative equipment, materials and procedures should be used and thoroughly documented.

6.4.2 The material to be placed above the geosynthetic under investigation will typically be a soil or rock fill, or another geosynthetic material(s) with soil then placed upon it. In the case of another geosynthetic, it also shall be placed in accordance with project specific procedures. When project specific procedures and/or materials are not known, representative equipment, materials and procedures should be used and thoroughly documented.

NOTE 1—In certain situations, such as multiple layer installations, movement of individual layers in test sections may occur. Care should be taken to ensure that stress and potential slippage conditions in the test sections simulate actual field conditions, as closely as possible.

6.4.3 Fill placement above the geosynthetic shall model expected field conditions. Construction equipment used in fill placement should be the same as that to be used in subsequent construction of the earth structure. Equipment shall be operated in accordance with project specific procedures. When project specific equipment, procedures and/or materials are not known, representative equipment, materials and procedures should be used and thoroughly documented.

6.4.4 Spread fill into lifts above the geosynthetic modeling expected field conditions. Construction equipment used in fill spreading should be in accordance with project specific procedures. When project specific equipment, procedures and/or materials are not known, representative equipment, materials and procedures should be used and thoroughly documented.

6.4.5 Fill lift compaction above the geosynthetic shall model expected field conditions. Construction equipment used in soil compaction should be in accordance with project specifications. When project specific equipment, procedures and/or materials are not known, representative equipment, materials and procedures should be used and thoroughly documented.

NOTE 2—Commonly used procedures include the following: 200 mm soil lifts compacted to >90 % Modified Proctor density using a minimum 4500 kg (total) vibratory steel roll (single or tandem). Typical soils/aggregates include coarse gravel (GP, d50 > 20 mm) concrete sand (SW d50 > 1.0 mm) or silty sand (SM d50 > 0.4 mm).

NOTE 3—Following placement and compaction for the lift, procedures could include the simulation of post construction traffic such as loaded trucks moving transversely over the test section.

6.5 *Exhuming of Samples:*

6.5.1 Samples from the test section should be exhumed within 48 hours after installation.

6.5.2 Method(s) employed to exhume the samples shall prevent or minimize additional damage to the geosynthetic. Document the method (s) used to exhume samples.

NOTE 4—Extreme caution should be exercise if using mechanical equipment to remove soil covering the geosynthetic. Careful “hand” removal methods are preferred near the geosynthetic.

6.5.3 Areas of the geosynthetic damaged during removal shall be identified (for example, spray painted) and designated as being non-representative of installation damage.

6.5.4 Exhumed samples shall be handled and stored in such a manner to eliminate, or minimize further damage or degradation (for example, exposure to ultraviolet light).

7. Report

7.1 Report the following information:

7.1.1 The construction equipment, procedures and materials used for the test section(s) including, but not limited to, equipment types, equipment operation, subgrade and fill types and gradation, maximum particle size, fill placement, compaction requirements, fill compaction control technique(s), and the exhumation system employed.

7.1.2 Geosynthetic material(s) identification such as manufacturer or supplier, style number, roll numbers, material grade and type, if available.

7.1.3 Laboratory test(s) to be conducted on both exhumed and control samples.

7.1.4 Conditioning of samples prior to testing (for example, washing and removing of soil, drying, etc.).

7.1.5 Identify any specimens rejected and alternative specimens added due to unrepresentative damage.

7.1.6 Test section construction quality control measurements such as lift thickness, density, moisture content, gradation curves, number of soil lifts, type and number of passes of construction equipment and the number of passes of the compactor.

7.1.7 Typical photographs of test section construction.

7.1.8 Detail sequence of photographs depicting the geosynthetic before and after exposure process should be provided in the final report.

8. Precision and Bias

8.1 No statement is made about either the precision or bias of this practice since it does not address which test method(s) to use for quantifying installation damage.

9. Keywords

9.1 construction; fill; geosynthetics; installation damage; sampling; soil; test section