Designation: D5496 – 15 (Reapproved 2020)

Standard Practice for In-Field Immersion Testing of Geosynthetics[1]

This standard is issued under the fixed designation D5496; 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 describes an approach and methodology for immersion testing of geosynthetics (for example, geomembranes used for landfill liner).

1.2 This practice does not provide for definition of the testing to be performed on the geosynthetic samples for field immersion. This practice does not address the determination of resistance of the geosynthetic to the liquid in which it is immersed. The user of this practice is referred to the appropriate Standard Guide for Tests to evaluate the chemical resistance and for defining the testing to be performed for each of the geosynthetic components listed in 2.1.

NOTE 1—EPA Method 9090 has been used in the past to investigate the compatibility of geomembrane to leachates.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles

D4439 Terminology for Geosynthetics

D5322 Practice for Laboratory Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids

D5747/D5747M Practice for Tests to Evaluate the Chemical Resistance of Geomembranes to Liquids

2.2 *EPA Document:*[3]

SW846 Method 9090 Compatibility Test for Wastes and Membrane Liners

3. Terminology

3.1 *Definitions:*

3.1.1 *field testing, n*—testing performed in the field under actual conditions of temperature and exposure to the fluids for which the immersion testing is being performed.

3.1.2 For definitions relating to geosynthetics, refer to Terminology D4439.

3.1.3 For definitions relating to textiles, refer to Terminology D123.

4. Significance and Use

4.1 This practice provides an approach and methodology for conducting field immersion testing of geosynthetics used in the construction of liners in reservoirs, ponds, impoundments, or landfills for containing liquids and solids. This practice should be performed in accordance to and in conjunction with Practice D5322 for assessing chemical resistance under both laboratory and field conditions.

4.2 The specification of procedures in this practice is intended to serve as a guide for those wishing to compare or investigate the chemical resistance of geosynthetics under actual field conditions.

5. Apparatus

5.1 *Sample Container,* for containment of the geosynthetic test specimens. The containers should be perforated on all sides and at the bottom to allow for complete flooding of the test specimens. Stainless steel, or other chemically resistant steel alloys, is recommended. Do not use 316 stainless steel for fluids known to contain high-chloride ion concentrations.

[1] This practice is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.02 on Endurance 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.

[3] Available from United States EPA, Office of Solid Waste and Emergency Response, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

NOTE 2—A chemical analysis of the fluid should be available to the user prior to the start of field compatibility testing to allow for a review of a suitable material of construction for the sample container. If in doubt, tests can be conducted by placing samples of the sample container material of construction in the fluid for a suitable period of time to determine compatibility of the sample container with the fluid. If in doubt, and testing cannot be performed prior to start of field compatibility testing, then an alloy such as Carpenter 20 or tantalum-coated carbon steel should be considered for any field samples that will be exposed to aggressive fluids for more than one year.

5.1.1 The size of the sample container is not specified since it will be dependent on the number of geosynthetic specimens requiring testing and the size of the sump, tank, or other device used for conducting the field testing.

5.1.2 *Sample Container Lid,* to allow easy access for placing and removing geosynthetic specimens from the container. The lid should be constructed from the same material as the sample container and perforated to allow for contact between fluid and the geosynthetic samples within the container. In addition, the lid should be secured to the container using threaded rods made from the same material as the container. Do not use dissimilar metals when fabricating parts of the sample containers, as this may result in severe corrosion of the completed assembly.

5.1.3 *Sample Container Cables,* to place the sample containers within sumps or tanks. It is recommended that two cables be attached to each container, one made from the same material as the sample container, and the other, as a backup, made from ¼-in. (6.35 mm) polypropylene rope.

6. Hazards

6.1 (**Warning—**The fluids used in this practice may contain hazardous or toxic chemicals. Take appropriate precautions when handling hazardous waste, chemicals, and the fluid. All personnel handling or exposed to the fluids used for the immersion testing should wear equipment suitable for protection from the chemicals present in the fluid. Take care to prevent spilling any hazardous materials or fluids, and clean up any accidental spills that may occur away from the collection sump or tank used for conducting the fluid exposure.)

NOTE 3—The user should refer to local, state, or federal laws and practices regarding the conduct of this type of testing at hazardous waste sites or other similar facilities.

7. Sampling

7.1 In the absence of site-specific sampling agreed upon by the user and between the testing agency, take samples of the geosynthetic(s) to be tested in a manner appropriate for the particular material and for the tests to be performed on the exposed materials. It is essential that all initial samples have physical properties that are as similar as possible. Refer to the section on sampling in the applicable standard for the chemical resistance of the specific geosynthetic to be tested.

7.2 Prepare one complete set of samples in accordance with 7.1 for each testing interval identified in 8.8 of this practice, plus three additional sample sets. Identify and use one of the additional sets as the unexposed samples. Identify the other two sample sets as spares.

NOTE 4—If field testing is being performed in conjunction with laboratory immersion testing, then only the two spare sample sets as described in 7.2 are required. The unexposed sample set used for the laboratory immersion testing can be used as the unexposed sample set for the field testing.

8. Procedure

8.1 *Sample Container Preparation*—Thoroughly clean the container and lid prior to placement of geosynthetic samples. Use of tap or service water for final rinse of the container is acceptable.

8.2 *Sample Placement*—Place the geosynthetic material samples in the sample container in such a way so that contact with other sheets of material is limited as much as possible. Do not place different types of resin materials in the same vessel if it can be avoided. If space within the sample containers permits, then place spacers, made from a material known to be inert with the fluid, between geosynthetic sheets or between sheets and the sample container walls, or both.

NOTE 5—Placement of geosynthetic sample containers may be dictated by landfill permit or other operating conditions. In those circumstances where the number and size of sample containers must be limited due to physical constraints of the sump or tank in which the containers are to be installed, or due to regulatory limitations on maximum head (or other similar stipulation), then place the geosynthetic samples in the most efficient manner possible. This can be accomplished by reducing the total number and size of the sample containers. For these situations it is allowable to place dissimilar resins within the same container and eliminate, if necessary, the spacers between geosynthetic sheets and between sheets and side walls.

8.3 *Assembling the Containers*—Assemble the sample containers, lids, and cabling in a manner that will minimize movement of the specimens within the final containers and maintain the structural integrity of the sample container throughout the testing interval(s). Use sufficiently long threaded rods for joining all sample containers that will have to be removed at the same testing interval. This will minimize the number of cables required for securing the sample containers and make the job of removing and shipping the exposed containers easier. Since it is very likely that assembled systems will have to be turned on their sides or rotated during placement, fasten all spacers used in the sample containers to either the side walls or to adjoining geosynthetic sheets.

8.3.1 If more than one container is being installed, it is extremely important to mark or label the cables, or both, for each assembly so that removal of the assemblies can be minimized.

8.3.2 Construct final assemblies to minimize sharp corners and any other protrusions from the face of the assembly so that the polyethylene bags used to wrap the assemblies for shipment to the laboratory will not be easily punctured or torn.

8.4 *Placing Final Assemblies*—Perform placement of assembled sample container(s) within sumps, tanks, or other fluid storage devices with caution since exposure to fluid or fumes in sumps is a possibility. Position assemblies within the sump or tank used for field exposure in such a way so as to ensure that they will be completely immersed within the fluid at all times.

8.4.1 For sumps or tanks with level control devices, install the assembled sample containers below the low-level position in order to ensure flooded conditions at all times.