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Standard Guide for Placement of Intentional Leaks During Electrical Leak Location Surveys of Geomembranes¹

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1. Scope

1.1 This guide is for placing leaks in geomembranes before performing an electrical leak location survey. The geomembranes can be bare (not covered) or can be covered with water or moist soil.

1.2 This guide is intended to serve as an additional quality control/quality assurance (QC/QA) measure to ensure that leaks through the geomembrane are detectable, site conditions are proper for leak location surveys, and a valid and complete leak location survey is performed. Because various leak location practitioners use a wide variety of equipment to perform these surveys and have a wide range of expertise, placement of leaks by the owner or owner's representative helps ensure that the leak location survey is being performed correctly and completely.

1.3 Placing leaks should be done with the consent and knowledge of all involved parties and specifically the "owner" of the geomembrane. Geomembranes are typically purchased and installed by dedicated geosynthetic installers who "own" the geomembrane until the ownership gets transferred to the end user. A project meeting should be set up with the owner, the consultant, the geosynthetic installers, and the leak location contractor. The intention to create leaks should be clearly stated by the owner or consultants or both, and the scope and number to be placed should be understood by all parties. The consultant should broadly identify to the lining contractor a location that can be easily repaired after the test. It is critical that all leaks be included on the liner documentation and repair record drawing.

1.4 Leak location surveys can be used on geomembranes installed in basins, ponds, tanks, ore and waste pads, landfill cells, landfill caps, and other containment facilities. The procedures are applicable for geomembranes made of electrically insulating materials. (**Warning**—The electrical methods used for geomembrane leak location could use high voltages, resulting in the potential for electrical shock or electrocution.

¹ This guide is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.10 on Geomembranes.

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This hazard might be increased because operations might be conducted in or near water. In particular, a high voltage could exist between the water or earth material and earth ground or any grounded conductor. These procedures are potentially very dangerous and can result in personal injury or death. The electrical methods used for geomembrane leak location should be attempted only by qualified and experienced personnel. Appropriate safety measures shall be taken to protect the leak location operators as well as other people at the site.)

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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.*

1.7 *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

- D4439 Terminology for Geosynthetics
- D6747 Guide for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes
- D7002 Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Puddle Method
- D7007 Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials
- D7240 Practice for Electrical Leak Location Using Geomembranes with an Insulating Layer in Intimate

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

Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive-Backed Geomembrane Spark Test)

D7703 Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Lance Method

D7953 Practice for Electrical Leak Location on Exposed Geomembranes Using the Arc Testing Method

D8265 Practices for Electrical Methods for Mapping Leaks in Installed Geomembranes

3. Terminology

3.1 *Definitions*—For general definitions used in this guide, refer to Terminology **D4439**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *blind leak, n*—for the purposes of this guide, a blind leak is a circular hole in the geomembrane intentionally placed by the owner or owner’s representative in a location unknown to the leak location practitioner.

3.2.2 *electrical leak location, n*—method that uses electrical current or electrical potential to detect and locate leaks in electrically isolating geomembranes.

3.2.3 *known leak, n*—for the purposes of this guide, a known leak is a circular hole in the geomembrane intentionally placed by the owner or owner’s representative to ensure that the site conditions are suitable for an electrical leak location survey. One known leak is used for equipment calibration and to gauge site-specific leak detection sensitivity before beginning the leak location survey.

3.2.4 *leak, n*—for the purposes of this guide, a leak is any opening, perforation, breach, slit, tear, puncture, crack, or seam breach in electrically isolating geomembranes.

3.2.4.1 *Discussion*—Significant amounts of liquids or solids may or may not flow through a leak. Scratches, gouges, dents, or other aberrations that do not completely penetrate the geomembrane are not considered to be leaks.

4. Significance and Use

4.1 Geomembranes are used as low-permeability barriers to control liquids from leaking from landfills, ponds, and other containments. The liquids may contain contaminants that, if released, can cause damage to the environment. Leaking liquids can also erode the subgrade. Leakage can result in product loss or otherwise prevent the installation from performing its intended containment purpose. For these reasons, it is desirable that the geomembrane have as little leakage as practical.

4.2 Geomembrane leaks can result even when the quality of the subgrade preparation, the quality of the material placed on the geomembrane, and the quality of the workmanship are not deficient.

4.3 Electrical leak location methods are an effective final quality assurance (QA) measure to locate previously undetected leaks in electrically insulating geomembranes. Practices for these implementations are contained in Guide **D6747** and Practices **D7002**, **D7007**, **D7240**, **D7703**, **D7953**, and **D8265**.

4.4 It is important to realize that the detection of leaks depends not only on the capabilities of the leak location equipment, procedures, and experience of the leak location practitioner, but also on local site conditions that are not under the control of the leak location practitioner. In particular, to detect a leak, there shall be an electrical conduction path through the leak and through the materials above and below the leak to allow sufficient electrical current through the leak for detection. Some site conditions, such as a leak not making contact with the subgrade, dry geotextile, or geocomposite above or below the leak; dry materials above or below the leak; degree of isolation between the materials above and below the geomembrane; and other factors, may preclude the detection of leaks. Therefore, the use of a properly placed leak is also a test of site preparations and conditions.

4.5 It is not necessarily proper to conclude that, if a leak is not detected, a leak location survey using the proper relevant ASTM International standard has no validity. Other leaks that have more favorable local conditions and larger leaks may still be detected.

4.6 The importance of blind leaks is to provide an additional measure to assess whether the site conditions throughout the entire survey area are proper for a leak location survey and that the electric leak location survey is performed correctly and completely. The use of blind leaks provides: (1) a check that the equipment is operating properly, (2) a test for proper survey coverage, and (3) a check that all survey data (results) have been assessed to confirm a proper survey has been done. These all result in a high likelihood that significant-sized leaks are detected.

4.7 The placement of blind leaks should not replace hiring a reputable and qualified leak location practitioner to perform the electrical leak location survey. Many site-specific issues and technical limitations can preclude the detection of leaks, but a non-expert will find it difficult to impossible to determine whether the non-detection of leaks is due to survey performance errors or issues with site conditions. It is therefore important to achieve a satisfactory resolution to any issues with the non-detection of leaks but, much more importantly, to check leak location practitioner references and qualifications before hiring. In addition to checking references from previous clients, qualifications should include reports from at least three projects completed, similar in cross section to the proposed project, where leaks were found. The report output should provide indisputable evidence that the survey was performed effectively.

4.8 It is important to note that the placement of leaks may affect the sensitivity of the electrical leak location survey for geomembranes covered with soil or water or both. The placement of leaks larger than the leaks present in the lining system may preclude detection of those smaller leaks, especially for highly conductive cover materials.

5. Procedural Guidance for the Placement of Leaks

5.1 The project specification should include: who will install the leak(s), who will survey the location(s) of the leak(s), and who will repair the leak(s). This should be clearly