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Standard Guide for Placement of Blind Actual Leaks during Electrical Leak Location Surveys of Geomembranes[1]

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1. Scope

1.1 This guide is for placing blind actual 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 blind actual leaks by the owner or owner's representative helps ensure that the leak location survey is being performed correctly and completely.

1.3 Placing blind actual leaks can also assist in determining whether or not the site conditions permit the flow of electric current through leaks, which is necessary for detecting leaks using electrical methods.

1.4 For clarification, this guide is in addition to the typical placement of the artificial or actual leaks placed as described in the relevant ASTM International standards for the various leak location methods.

1.5 Placing blind actual 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 use blind 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 actual blind holes be included on the liner documentation and repair record drawing.

1.6 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. 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.)

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

1.8 *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

D6747 Guide for Selection of Techniques for Electrical Detection of Leaks in Geomembranes

D7002 Practice for Leak Location on Exposed Geomembranes Using the Water Puddle System

D7007 Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials

[1] This test method 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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[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.

D7240 Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test)
D7703 Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Lance System

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 *artificial leak, n*—for the purposes of this guide, an artificial leak is an electrical simulation of a leak in a geomembrane during the leak detection sensitivity setup.

3.2.2 *blind actual leak, n*—for the purposes of this guide, a blind actual 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 and that a valid electric leak location survey is performed in a location unknown to the leak location practitioner.

3.2.2.1 *Discussion*—A blind actual leak is not a leak used to determine the leak detection sensitivity parameters.

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

3.2.4 *leak, n*—for the purposes of this guide, a leak is any unintended 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.

3.2.5 *leak detection sensitivity, n*—smallest size leak that the leak location equipment and survey methodology are capable of detecting under a given set of conditions.

3.2.5.1 *Discussion*—The leak detection sensitivity specification is usually stated as a diameter of the smallest leak that can be reliably detected.

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, and D7703.

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. For 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 blind actual leak is also a test of site preparations and conditions.

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

4.6 The importance of blind actual leaks is to provide an additional measure to assess whether the site conditions are proper for a leak location survey and that the electric leak location survey is performed correctly and completely. The use of blind actual 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.

5. Procedural Guidance for Placement of Blind Actual Leaks

5.1 The fact that blind actual leak(s) will be installed in the geomembrane, and who will install the blind leak(s), who will survey the locations of the blind leak(s), and finally who will repair the blind actual leaks should be clearly described in the project specifications and understood by all affected parties so responsibilities and costs involved are fully understood by all affected parties. For the geomembrane leak location survey and use of blind actual leaks to be decisive, the project specifications should also specify the relevant ASTM International standard procedures to be used to perform the geomembrane leak location survey (see 2.1).

5.2 A realistic test of the leak detection sensitivity should be performed and documented as part of every leak location survey. The leak detection sensitivity of the leak location system via an actual or artificial leak is typically used according to the corresponding standard practices for the various leak location systems. The procedures for installing the actual leak holes for determining the leak detection sensitivity listed in the corresponding ASTM procedure can be used with the modifications described in 5.3 to place blind actual leaks.

5.3 The various electrical leak location practices all specify the use of actual leaks and procedures for making those actual leaks to determine the survey parameters and verify proper