Designation: D7852 – 13

Standard Practice for Use of an Electrically Conductive Geotextile for Leak Location Surveys[1]

This standard is issued under the fixed designation D7852; 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 standard practice describes standard procedures for using a conductive geotextile with electrical methods to locate leaks in exposed geomembranes and geomembranes covered with water or earth materials containing moisture.

1.2 This standard practice provides guidance for the use of appropriate conductive geotextile used in leak location survey on geomembrane. This guide includes all types of conductive geotextile with sufficient conductivity for the particular electrical leak location method. A conductive geotextile is applicable to all types of geoelectric surveys when there is otherwise not a conductive layer under the geomembrane.

1.3 The leak stream itself being adequately conductive. A conductive geotextile is applicable to all types of geoelectric surveys when there is otherwise not a conductive layer under the geomembrane.

1.4 This standard practice is intended to ensure that leak location surveys can always be performed with a reasonable level of certainty. This standard practice provides guidance for the use of appropriate conductive geotextile used in leak location survey on geomembranes.

1.5 Leak location surveys can be used on non-conductive geomembranes installed in basins, ponds, tanks, ore and waste pads, landfill cells, landfill caps, other containment facilities and building applications such as in parking garages, decks and green roofs. The procedures are applicable for geomembranes made of non conductive materials such as polyethylene, polypropylene, polyvinyl chloride, chlorosulfonated polyethylene, bituminous material, and other electrically-insulating materials. Leak location survey involving conductive or partially conductive geomembranes are not within the scope of this document.

1.6 **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. Because of the high voltage that could be involved, and the shock or electrocution hazard, do not come in electrical contact with any leak unless the excitation power supply is turned off. The electrical methods used for geomembrane leak location should be attempted only by qualified and experienced personnel. Appropriate safety measures must be taken to protect the leak location operators as well as other people at the site.

1.7 *This standard guide does not purport to address all of the safety and liability concerns, if any, associated with its use. It is the responsibility of the user of this standard guide 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

3. Terminology

3.1 For general definitions related to geosynthetics, see Terminology D4439

3.2 *Definitions:*

3.2.1 *conductive geotextile, n*—a geotextile fabricated in a plant using conductive materials, in part or in whole, and providing a sufficient electrical conductivity to perform electrical leak location. **D7002**

3.2.2 *electrical leak location, n*—any method which uses electrical current or electrical potential to locate leaks. **D7002**

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

Current edition approved Jan. 15, 2013. Published February 2012. DOI: 10.1520/D7852–13

[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.

3.2.3 *leak, n*—for the purposes of this document, a leak is any unintended opening, perforation, breach, slit, tear, puncture, crack, or seam breach through which liquid can flow. Scratches, gouges, dents, or other aberrations that do not completely penetrate the geomembrane are not considered to be leaks. Leaks detected during surveys have been grouped into five categories: (1) Holes—round shaped voids which may or may not have downward or upward protruding rims, (2) Tears—linear or areal voids with irregular edge borders, (3) Linear cuts—linear voids with neat close edges, (4) Seam defects—area of separation between sheets, and (5) Burned through zones—areas where the polymer has been melted during the welding process. **D7002**

3.2.4 *water, n*—for the purposes of this document, water includes electrolytes and electrically conductive solutions such as wastewater, brine, leachate, or any other conductive liquid. **D7002**

4. Summary of Practice

4.1 The principle of the electrical leak location method is to place a voltage across a geomembrane and then locate areas where electrical current flows through discontinuities in the geomembrane and at seams. It requires an electrically conductive layer below the geomembrane.

4.2 The electrical leak location survey can be applied to exposed and covered geomembranes. The various electrical leak location methods are described in Guide D6747. Standards procedures for the relevant leak location methods are described in Practices D7002 and D7007.

4.3 Appropriate conductive geotextiles can be used as the conductive media that is needed under the geomembrane. The methods described in Guide D6747 will require various levels of conductivity of the geotextile, depending on the method, the conductivity of the media on the geomembrane, the thickness of the material on the geomembrane, the leak detection capabilities of the equipment, the leak location survey parameters and other factors.

For exposed geomembranes, one output of an electrical excitation power supply is connected to an electrode placed in a water puddle created on top of the geomembrane. For covered geomembranes, the most common implementation of this method is to make dipole measurements using two moving electrodes spaced a constant distance apart. Pole measurements can also be made by making potential measurements on the protective soil cover using one moving electrode referenced to a second distant electrode. In both case, the other output of the power supply is connected to an electrode clamped to the electrically conductive geotextile placed under the geomembrane (Fig. 1).

5. Significance and Use

5.1 With the increased use of geomembranes as a barrier material to restrict liquid migration from one location to another, a need has been created for standardized tests by which the integrity of the installed geomembrane, including the seams, can be evaluated. This practice is intended to meet such a need whenever the sub-graded soil is non-conductive, or a geomembrane is installed on a non-conductive material.

5.2 The use of a suitably-conductive geotextile installed between a non-conductive soil or material and the geomembrane will permit electrical leak location survey to be conducted.

5.3 The compatibility of a conductive geotextile and leak location equipment shall be assessed for each leak location technique considered (covered or exposed, when applicable). A realistic small scale test shall have been conducted by the supplier of geotextile and / or leak detection equipment to demonstrate their mutual compatibility for a given leak detection technique.

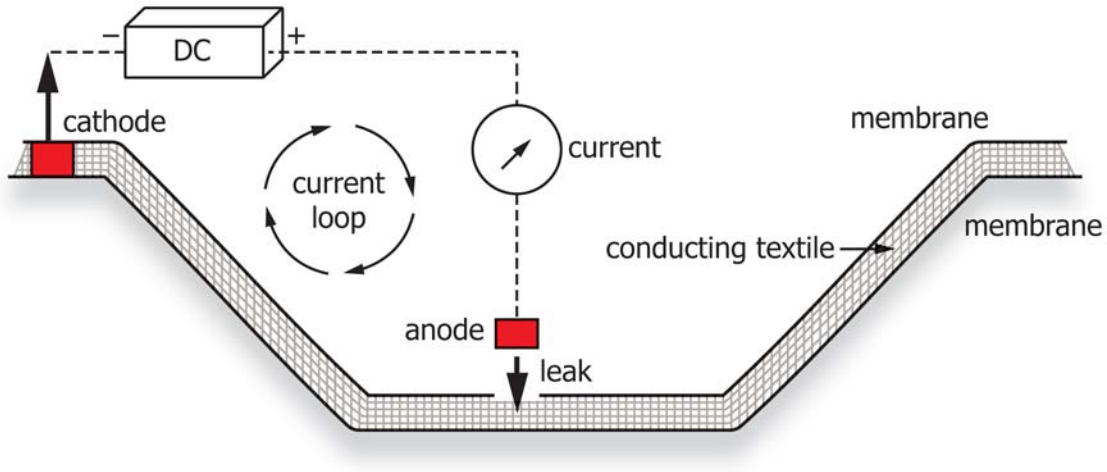

FIG. 1 Schematic of leak detection with conducting geotextile

6. System calibration and functionality

6.1 **The conductive geotextile**

6.1.1 **Geotextile installation**— The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall be free of tension, folds, and wrinkles. The number of seams and overlaps shall be minimized by selective orientation of geotextile panels, within the limitations of maintaining a consistent pattern. Geotextile shall be placed immediately prior to geomembrane installation to limit damage to the geotextile from equipment, repeated pedestrian traffic and weather.

6.1.2 **Seaming (sewing) of the geotextile**—The electrical conductive geotextile shall be sewn, heat welded or overlapped according to the recommendations of the conductive geotextile manufacturer.

6.1.3 **Electrical source and connections**—Insulation must be secured prior to a survey to prevent pipe penetration, flange bolts, steel drains and batten strips on structure to conduct electricity through the liner and mask potential leak paths. The conductive geotextile must be connected to the power supply using clamps or ground sheets/plates and electrically conducting wires installed below the geomembrane. The design, number, and spacing of the clamps, electrodes, or wires needed to connect to the conductive geotextile depends on the conductance of the geotextile, the electrical leak location method being used, and other factors. These factors must be considered to provide sufficient conductance for aIl possible leak points on the geomembrane being tested.

6.1.4 **Electrical conductivity calibration**—A test of the geotextile conductivity and leak detection sensitivity for the worst-case points away from the clamps, electrodes, or wires should be performed and documented before the textile is covered by the geomembrane.

6.2 **The leak location system calibration**

6.2.1 A realistic test of the leak detection sensitivity should be performed and documented as part of the leak location survey. An actual or artificial leak simulator can be used. The corresponding standard practice for the various leak location systems can be used to determine the size, construction, use, and operation of the actual or artificial leak simulator for that system.

6.2.2 For the water puddle and water lance systems, Practice D7002 contains relevant details about the use of an artificial leak. An artificial leak consists of a leak placed in a piece of geomembrane installed on the conductive geotextile. The leak location equipment and procedures should be demonstrated to be able to detect the artificial or actual leak.

6.2.3 For a soil-covered geomembrane, Practice D7007 contains the relevant details about the construction and use of an artificial leak. The artificial leak is buried in the protective soil cover at the depth of the geomembrane with an insulated wire connecting the electrode to the conductive geotextile under the geomembrane. The leak location equipment and procedures should be demonstrated to be able to detect the artificial leak under worst-case conditions.

7. Report

7.1 In addition to the reporting required in the ASTM standard procedure for the electrical leak location method being used, the report should contain the complete identification of the conductive geotextile installed.

8.1 No statement is made about either the precision or bias of this practice since it merely refers to nondestructive methods that could be used in determining the integrity of an installed geomembrane

9. Keywords

9.1 conductive geotextile; geomembrane; leak detection; electrical leak location system