Designation: D7240 – 06

Standard 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)[1]

This standard is issued under the fixed designation D7240; 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 is a performance-based practice for using the spark test to electrically locate leaks in exposed geomembranes with an insulating layer that are in intimate contact with a conductive layer. For clarity, this document uses the term 'leak' to mean holes, punctures, tears, cuts, cracks and similar breaches over the partial or entire area of an installed geomembrane (as defined in 3.2.3).

1.2 This test method can be used on exposed geomembranes installed in basins, ponds, tanks, ore and waste pads, landfill cells, landfill caps, and other containment facilities. This standard is applicable for geomembranes in direct and intimate contact with a conductive surface or with a conductive layer integrally included.

1.3 **SAFETY WARNING:** The electrical methods used for geomembrane leak location use high voltage, low current power supplies, resulting in the potential for electrical shock. The electrical methods used for geomembrane leak location should be attempted by only qualified and experienced personnel. Appropriate safety measures must be taken to protect the leak location operators as well as other people at the site.

1.4 *This standard 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 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 Potential Leak Paths in Geomembranes

3. Terminology

3.1 Definition of terms applying to this test method appear in Terminology D4439.

3.2 *Definitions:*

3.2.1 *electrical leak location*, *n*—a method which uses electrical current or electrical potential to detect and locate leaks.

3.2.2 *geomembrane*, *n*—an essentially impermeable membrane used with foundation, soil, rock, earth or any other geotechnical engineering related material as an integral part of a man made project, structure, or system.

3.2.3 *leak*, *n*—For the purposes of this document, a leak is any unintended opening, perforation, breach, slit, tear, puncture or crack. 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.

Leaks detected during surveys have been grouped into three categories:

- Holes – round shaped voids with downward or upward protruding rims
- Tears – linear or circular voids with irregular edge borders
- Linear cuts – linear voids with neat close edges

3.2.4 *intimate contact*, *n*—for the purposes of this document, intimate contact is when a conductive layer is in direct contact with the insulating geomembrane, and there are no gaps between the two layers to prohibit the flow of current.

3.2.5 *leak detection sensitivity*, *n*—The smallest size leak that the leak location equipment and survey methodology are capable of detecting under a given set of conditions. The leak detection sensitivity specification is usually stated as a diameter of the smallest leak that can be reliably detected.

3.2.6 *wand*, *n*—for the purposes of this document, any rod that has a conductive brush that is attached to a power source to initiate the spark test.

4. Summary of Practice

4.1 The principle of this electrical leak location method is to use a high voltage pulsed power supply to charge a capacitor formed by the underlying conductive layer, the non-conductive

[1] This practice 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.

layer of the geomembrane and a coupling pad. The area is then swept with a test wand to locate points where the capacitor discharges through a leak. Once the system senses the discharge current, it is converted into an audible alarm.

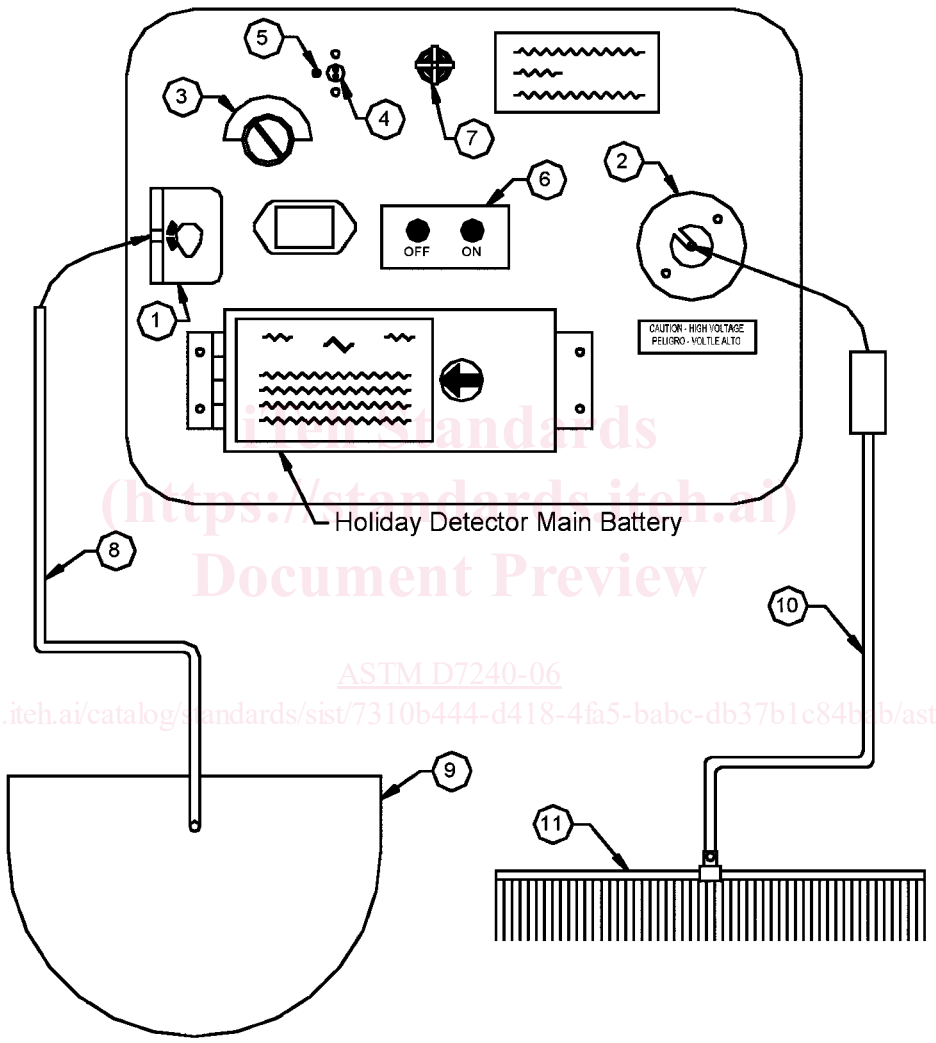
4.2 *General Principles*

4.2.1 Fig. 1 shows a wiring diagram of the coupling pad, power supply and test wand for the electrical leak location method of a geomembrane with a lower conductive layer. Once all necessary connections are made, the pad is placed on the upper surface of the geomembrane. The nonconductive (insulating layer(s)) of the geomembrane act as a dielectric in a capacitor which stores electrical potential across the geomembrane.

4.2.2 A grid, test lanes or other acceptable system should be used to ensure that the entire area is tested with the test wand.

4.2.3 Either a hand held wand or a larger wand mounted to an all terrain vehicle may be used. Generally a hand held wand is a more efficient method unless the area is quite large and flat.

4.3 *Preparations and Measurement Considerations*



Legend For Spark Tester Diagram

1. Ground Terminal
2. High Voltage Terminal
3. Sensitivity Dial
4. Voltage Dial (# x 1,000 = Wand Voltage)
5. Voltage Adjusting Screw (Remove plug first)
6. Main Power Switches
7. Alarm Buzzer
8. Ground Lead
9. Electrically Conductive Grounding Pad
10. High Voltage Lead
11. Wand

FIG. 1 Wiring Diagram of the Equipment Required for Spark Testing Geomembrane in Intimate Contact With a Conductive Surface.