

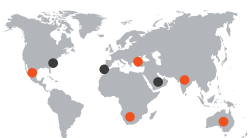


ATARFIL CONDUCTIVE GEOMEMBRANES INSTALLATION GENERAL GUIDELINES

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Manufacturing plants: Atarfil | Europe | Middle East | America

Sales offices: Spain, UAE, USA, Mexico, Turkey, India, South Africa and Australia.



1. SCOPE

This document provides general instructions for installing and performing Electrical Leak Location Surveys on Atarfil Conductive (C) Category Geomembranes.

This general instructions could be used for Atarfil Conductive Geomembranes installed in basins, ponds, tanks, ore and waste pads, landfill cells, landfill caps, canals, and other containment facilities. This guidance is best applicable for locating leaks where the proper preparation have been made during the construction of the facility.

1. DELIVERY, STORAGE, HANDLING AND PRODUCT ONSITE

The Geomembrane shall be protected from mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

Rolls should be stored away from high traffic areas. Continuously and uniformly support rolls on a smooth, level prepared surface.

Each roll delivered to the site would be labelled. The label would be firmly affixed and clearly state Atarfil name, product identification, material thickness, roll number, roll dimensions and roll weight.

Conductive surveys can only be carried out on a Conductive Geomembrane that has been installed with the conductive layer on the base. This requires clear identification of the Geomembrane Conductive side onsite. The conductive side always would be:

- The outer layer of the roll which would always be installed facing the ground during deployment.
- The opposite side of the printing line.
- Resistivity of each side of the Geomembrane can be compared by using a Multimeter onsite. This process must be adhered to for any application of part rolls or patches that have been separated from the roll core. The benchmark resistivity is 10,000 Ω / square, please consult your Atarfil branch for specific multi-meter instructions in this regard.

2. WELDING PROCEDURE FOR CONDUCTIVE GEOMEMBRANES

The Conductive Geomembrane requires no specific welding machine and standard Double Fusion Seams and Extrusion Fillet Seams can be carried out.

Welding processes being tested to ASTM D7240 should be carried out as per the standard Atarfil Geomembrane Installation Specification.

Calibration of all welding apparatus and procedures should be established with the material samples having the conductive side facing down.

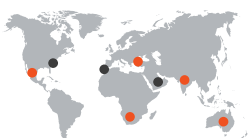
Seam quality is ensured by carrying out standard Field Quality Control requirements as per the most recent IAGI HDPE and LLDPE Installation Specification and GRI-GM29 guidelines.

ASTM D7240 is preferred Leak Location Methods standard when intimate contact cannot be guaranteed. Alternative Leak Location Methods if intended for the site need to pre-qualified.

3. TEST SUMMARY TO ASTM D7240-18

ASTM D7240 – Standard Practice for Electrical Leak Location Using Geomembrane with an insulating Layer in Intimate Contact with Conductive Layer via Electrical Capacitance Technique (Conductive-Backed Geomembrane Spark Test) is the preferred method for electrical leak location of conductive-base geomembranes using methods in lieu of or in addition to the spark testing method.

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It is critical that all personal protective equipment (PPE) is observed as per the leak survey system guidelines to avoid electric shock. As such only an experienced Leak Location Team should conduct this survey to the ASTM D7240 requirements as per below. Using an electrically conductive grounding pad placed within the seams of the tested sheet, excitation power that connects to a “Holiday Detector” and wands of varying dimensions that connect to a rubber or a wire brush.

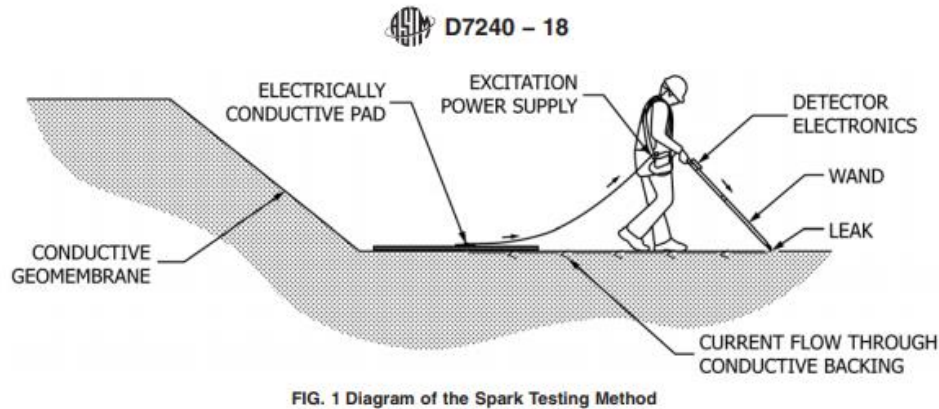


Figure 1 D7240-18 FIG.1 Diagram of the Spark Testing Method

The key to this leak location method is that the non-conductive top layer of the Geomembrane acts as an insulation layer and any holes result in a capacitor discharge to the conductive layer below. As such the Geomembrane must be electrically isolated to achieve optimum results.

Operator should work to a specific grid within a sheet to ensure the full survey area is covered with a handheld wand. Vehicles would not be approved for surveying function by Atarfil unless the site can demonstrate that a survey can be achieved with zero impacts on the liner.

Spark testing must be carried out on geomembranes that are generally clean and dry.

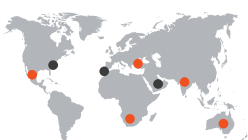
Prior to a leak survey, the equipment must be validated to ensure it is in working order. The power source should have a range of voltage from 15 000 to 35 000 V. The equipment should be checked and wired properly by an experienced operator.

To reduce set up issues on the designated liner, a trial test should be carried out on a puncture 1mm in diameter created in a test piece of geomembrane located on a non-conductive subgrade or separate non-conductive Geomembrane that is outside the survey area. The test piece of geomembrane must be of sufficient scope to enable standard operating wand handling and at normal speeds of operation.

As the machine is initially turned on, the test unit is adjusted with voltage and sensitivity to maximum settings. The test piece is then swept with the wand, ensuring intimate contact with the sample geomembrane surface. An alarm will sound when the wand passes over the hole created. If the alarm is not audible, adjust volumes settings should be adjusted or the connections should be rechecked and retested. If an alarm is observed anywhere other than the defect hole, then machine sensitivity should be adjusted and progressively the area should be retested.

The pre-trial would provide an indication as to site settings. It is important to monitor the settings during the project as minimum voltage settings will vary with atmospheric and other site conditions.

In the absence of the Leak Survey Team having their own calibration intervals, at the commencement of each day at minimum, the equipment should be checked before testing begins and after any shutdown of an hour or more. In the event the equipment is demonstrated as faulty, the entire area spark tested since the last passing equipment check of the equipment must be retested to ensure it was spark tested with





working equipment.

The leak location survey shall be conducted using procedures whereby the test wand covers every point on the geomembrane surface, accounting for and neglecting the edge and other ground effects.

It is crucial that the spark test carried out on a given geomembrane panel must be performed with the grounding pad over the surface of that panel. When crossing over panel overlaps, care must be taken to ensure that the pad is on the panel being tested.

In the case of Geomembrane intrusions (metal pipe penetrations, pump grounds, etc.) through the conductive paths survey, the survey can be undertaken up to the conductive feature - intrusions. Ensuring that the conductive feature is not producing a false positive.

A report should be generated in full compliance to ASTM D7240.

4. INSTALLER QUALIFICATIONS

Installer's Qualifications are as per IAGI requirements.

The Geomembrane Installer shall be approved Manufacturer's Installer or a contractor approved by the Owner's Representative to install the geomembrane.

The Geomembrane Installer shall have prior experience in the installation of the specified geomembrane or similar.

Installation shall be performed under the direction of a field Installation Supervisor who shall be responsible throughout the geomembrane installation, for geomembrane panel layout, seaming, patching, testing, repairs, and all other activities of the Geomembrane Installer.

The Field Installation Supervisor shall have prior experience in installing or supervising the installation and seaming of geomembrane of the type specified or similar product.

Seaming shall be performed under the direction of a Master Seamer (who may also be the Field Installation Supervisor or Crew Foreman) who has experience in seaming of geomembrane of the type specified or similar product, using the same type of seaming apparatus to be used in the current project. The Field Installation Supervisor and/or Master Seamer shall be present whenever seaming is performed.

All seaming, patching, other welding operations, and testing shall be performed by qualified technicians employed by the Geomembrane Installer.

5. LIMITATIONS

The information provided uses current international standards within the geomembrane industry. It is the exclusive responsibility of the user to define the suitability and use of the information.

