

This is a sample specification for a leak location survey on a geomembrane over a conductive material both before and after it is covered with soil. It should be used as a guide and not verbatim. Ausenco Vector will review your specific application and recommend changes to the specification as needed. Contact Ausenco Vector personnel at (530)272-2448 or abigail.beck@ausencovector.com.

SECTION 02780

GEOMEMBRANE LEAK DETECTION TESTING – BEFORE AND AFTER COVER SOIL PLACEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes a description of the leak location testing using the water puddle and dipole methods before and after cover soil placement, respectively.

1.2 RELATED SECTIONS

- A. Section XXXXX – _____
- B. Section XXXXX – _____
- C. Section XXXXX – _____
- D. Section XXXXX – _____

1.3 REFERENCES

- A. ASTM D6747 – Standard Guide for Selection of Techniques for Electrical Detection of Potential Leak Paths in Geomembranes
- B. ASTM D7002 – Standard Practices for Locating Leak on Exposed Geomembranes Using the Water Puddle System
- C. ASTM D7007 – Standard Practices for Locating Leak in Geomembranes Covered with Water or Earth Materials

1.4 SUBMITTALS

- A. Prior to commencement of the leak location survey, the leak detection consultant shall submit a Work Plan to the CONTRACTOR. The Leak Location Survey Work Plan shall include:
 - 1. Qualifications of the proposed leak detection consultant including the number of years the leak detection consultant has performed the proposed survey method.
 - 2. Description of the proposed survey method, procedures, site preparations, estimated duration of survey, and quality control and field calibration procedures.
 - 3. A Statement of Qualifications meeting the requirements of Section 2.1, Paragraph A.
- B. If necessary, the leak detection consultant shall provide any permanent electrodes, wires, and installation instructions to the CONTRACTOR prior to the installation of the geomembrane cover.
- C. The leak detection consultant shall report the general results of the survey to the

CONTRACTOR and OWNER during the daily progress of the field work.

- D. Prior to the demobilization of the survey personnel from the site, the leak detection consultant shall submit a list of locations of the leaks detected to the OWNER, CONTRACTOR, and INSTALLER.
- E. The leak detection consultant shall submit a letter report documenting the field work and results of the surveys to the OWNER within fourteen (14) days after completion of the field work signed by a Registered Civil Engineer in the state where the work was performed.

PART 2 PRODUCTS

2.1 LEAK LOCATION CONTRACTOR AND SUPERVISOR QUALIFICATIONS

- A. The leak detection consultant shall have a qualifications and experience in conducting geoelectric surveys including having tested a minimum of 10,000,000 square feet of geomembrane liner and a minimum of 5,000,000 square feet of the proposed survey method on at least five projects. In addition, the leak location survey shall be supervised by a professional or technician with a minimum of 2,000,000 square feet of liner testing experience using the proposed method on at least three projects.

PART 3 EXECUTION

3.1 INFORMATION REQUIRED

- A. The leak detection consultant shall be provided with drawings showing:
 - 1. All layers constituting the lining system and details of all liner penetrations.
 - 2. Plan of the survey area.
 - 3. Peripheral details, including welds to adjacent lining systems.
 - 4. Structures and obstructions above the liner.
 - 5. Electrical equipment above the geomembrane.

3.2 PREPARATION AND SUPPORT – WATER PUDDLE SURVEY

- A. The CONTRACTOR is responsible for preparing the survey area for the leak detection surveys. The preparation consists of, but is not limited to, the following:
 - 1. Provide the leak detection consultant the liner installation schedule.
 - 2. Provide a water truck and driver with water as a continuous water source for the water lance leak detection testing.
 - 3. Provide one laborer per leak detection equipment operator to assist with the water puddle leak detection testing.
 - 4. Remove and dispose of residual water, as needed.
 - 5. Render the geomembrane clean and uncluttered. Remove all standing water from the surface of the geomembrane and provide electrical isolation at the perimeter of the survey area.
 - 6. The survey area must have a low point where water is allowed to collect. As the

survey progresses, water is sprayed onto the liner. If the water exits the survey area and touches the surrounding ground, the survey cannot be performed. Often features such as rain flaps and berms are required to keep the water restrained to the survey area.

7. The subgrade must contain sufficient moisture to conduct the survey. One percent by weight is usually adequate. It may be necessary to wet the subgrade if it has desiccated before deployment of the geomembrane; however the surface tends to rehydrate after several days by wicking up moisture from the underlying soil. The Client may also wet the installed geomembrane with approximately 0.1 inches of water (2,700 gallons per acre) several days before the performance of the leak location survey. An equivalent recent rainfall would also suffice.
8. Calibration requires drilling holes in the geomembrane. The Contractor must be prepared to have these holes repaired.

3.3 PREPARATION AND SUPPORT – DIPOLE SURVEY

A. The CONTRACTOR is responsible for preparing the survey area for the leak detection survey. The preparation consists of, but is not limited to, the following:

1. Coordinate with the leak detection consultant to provide a survey area within the liner expansion area that is electrically isolated from the surrounding ground (i.e. the cover soil is not tied into the ground surface outside of the cover area). Isolation can be accomplished by open trenching or installation of a non-conductive insulator such as the liner materials.
2. Provide the leak detection consultant the liner installation schedule.
3. Provide water, water truck and driver, and wet the survey area prior to and during the dipole survey to ensure that there is adequate moisture in the material(s) covering the geomembrane for the dipole leak detection testing. To detect a leak, moisture must exist in the leak and be in contact with moisture in the materials above and below the liner. Therefore, the material(s) covering the geomembrane must be moistened with water prior to conducting the leak detection survey. In order to achieve uniform moisture distribution, the CONTRACTOR shall add water as the construction progresses on and within cover layer(s). A water truck must be available at all times as it may be necessary to wet the surface just in advance of the survey, as deemed necessary by the leak detection consultant.
4. The calibration process requires digging a hole down to the surface of the geomembrane to place the artificial leaks. The Contractor is to provide a backhoe and/or hand labor, as appropriate, to excavate the cover soils down to the geomembrane. A water source must also be provided to rehydrate the soil as it is backfilled over the artificial leaks, preferably a water truck. The Contractor is also responsible for backfilling the calibration hole, and uncovering and retrieving the artificial leak apparatus, and backfilling the hole appropriately, including patching any intervening geotextiles.

Several calibration exercises may be required, and the Contractor must be prepared to assist with each survey. In some cases an actual hole may be drilled for calibration, in which case the Contractor must be prepared to repair the calibration hole. If an actual hole is drilled, it is recommended to be performed after the artificial calibration is performed, and after an area has been surveyed so that the calibration hole does not interfere with the actual survey results.

B. The CONTRACTOR shall uncover and expose any leaks detected for repair by the INSTALLER in accordance with the Specifications.

3.4 WATER PUDDLE LEAK LOCATION SURVEY

- A. The water puddle leak detection survey shall be performed after the installation of the primary HDPE geomembrane.
- B. The leak detection consultant is responsible for calibrating equipment utilized to achieve optimum data quality and sensitivity for the site conditions. This usually involves drilling some holes in the geomembrane which may be required to be repaired by the Contractor.
- C. All testing shall be performed in accordance with current industry and ASTM standards.
- D. The survey works best when the geomembrane is in intimate contact with the subgrade. Wrinkles are an impediment to conducting a good survey. Defects on wrinkles may not be detected. Therefore, it is usually in the interest of the project to conduct the survey when the liner system is cool and flat, such as in the morning or during the night.
- E. Working on slopes with smooth geomembrane can create safety hazards with slippery surfaces, and may require additional harnessing and slower production rates.
- F. Leak locations shall be logged, visibly marked, and reported for repair.
- G. The leak detection consultant shall report the general results of the survey to the Lead CQA Monitor and CONTRACTOR during the daily progress of the field work.
- H. Prior to the demobilization of the survey personnel from the site, the leak detection consultant shall submit a list of locations of the leaks detected to the Lead CQA Monitor and CONTRACTOR.
- I. The leak detection consultant shall submit a letter report documenting the field work and results of the surveys to the CONTRACTOR within fourteen (14) days after completion of the field work.

3.5 DIPOLE LEAK LOCATION SURVEY

- A. The dipole leak detection survey shall be performed after the placement of the protective cover layer.
- B. The leak detection consultant is responsible for calibrating all equipment utilized to achieve optimum data quality and sensitivity for the site conditions.
- C. All work shall be performed in accordance with current industry and ASTM standards.
- D. Manual measurements shall be made to verify leak signals and to pinpoint the leak positions on top of the protective cover layer for excavation while the survey personnel are on site. Within one foot of the liner, the CONTRACTOR's laborers shall hand excavate possible leak locations to expose the liner.
- E. Additional manual measurements should be made to guide the CONTRACTOR's personnel while they excavate the leak, if required.
- F. After the identification and excavation of a leak, the soil around the leak location shall be tested while the leak is uncovered and cleaned to check for adjacent leaks.
- G. Leak locations shall be logged, visibly marked, and reported for repair.

- H. The leak detection consultant shall report the general results of the survey to the Lead CQA Monitor and CONTRACTOR during the daily progress of the field work.
- I. Prior to the demobilization of the survey personnel from the site, the leak detection consultant shall submit a list of locations of the leaks detected to the Lead CQA Monitor and CONTRACTOR.
- J. The leak detection consultant shall submit a letter report documenting the field work and results of the surveys to the CONTRACTOR within fourteen (14) days after completion of the field work.

END OF SECTION