PREPARATIONS AND REQUIREMENTS GUIDE

WATER PUDDLE CONVENTIONAL METHOD

The Water Puddle Conventional Method for Bare-Liner Surveys is:

- Applicable to double geomembrane liner systems for geosynthetic applications (double-lined systems).
- Performed when the top-most, relative geomembrane liner is exposed and bare, is typical or conductive-backed, contains a conductive geotextile, contains an underlying geosynthetic clay liner, or has a layer of drainage/filtration soil directly underneath.
- Conducted on smooth geomembrane floor areas and side slopes with a slight inclined plane angle of 14° or less (slope gradient of 4H:1L or shallower).
- Conducted on textured geomembrane floor areas and side slopes with a slight inclined plane angle of 22° or less (slope gradient of 2.5H:1L or shallower).

Please note that this guide:

- Includes key preparations and requirements for the electrical leak detection survey.
- Should be reviewed carefully, modified and/or combined accordingly to fit the specifications format per ASTM Standard.
- May be changed, revised, or updated accordingly from time-to-time.
- Is only a reference guide and may not apply to all geomembrane-lined geosynthetic systems or applications.

Please contact **Beyond Leak Detection** for any comments, concerns, or questions regarding the leak detection service or this guide.

The General Contractor shall be responsible for preparing the application for the Electrical Leak Detection Bare-Liner Survey using, specifically, the Water Puddle Conventional Method. These preparations and requirements are to:

- **Provide any safety training, site specific training, drug tests, vehicle driving tests or inspections to obtain any clearances.** The General Contractor must provide transportation if technicians cannot obtain a vehicle permit pass for on-site transportation. The General Contractor will be responsible for expenses required in organizing any clearances for technicians to perform the service.

- **Provide supervised laborers to assist in the leak detection service during the preparation, survey, or investigation process.** The laborers will be assigned certain duties and responsibilities to assist technicians throughout th entire leak detection service such as, but not limited to, digging holes or trenches, moving objects or machinery that may interfere with the survey, safety patrol, cleanup, etc. Since the "Buddy System" is supported as a monitoring safety measure during the service, at least one laborer is required to work the same hours as technicians and must accompany them at all times while on site. All laborers must be competent, aware, and have knowledge of on-site safety and emergency procedures if an unexpected issue or situation were to occur.

- **Provide a light source (if the survey were to be conducted during the night).** One or two light trailers will be required. During the night or when temperature drops, the liner wrinkles are minimized. Since the survey requires an intimate contact with earth ground, liner wrinkles would create a gap or an air space preventing this intimacy. Performing the survey on these wrinkles would not be reliable and the chances of not detecting a leak would increase. Therefore, minimizing liner wrinkles would effectively increase leak detection.

- **Disconnect and remove conductive materials and isolate ground sources that are electrically connected with the operations layer inside the application.** Conductive materials may include metal pipes, cables, wires, ladders, pumps, etc. Ground sources may include concrete structures, batten strips, metal strainers, drains, valves, etc. If feasible, isolating, eliminating, or insulating these conductive current channels will help increase the leak detection sensitivity and minimize masking of smaller leaks in their proximity.

- **Zone segments of the survey area to prevent technicians from surveying into a restricted, non-required or unintended area.** Depending on the type of survey required and the application, this is accomplished by using survey flags, string, twine, rope, sand bags, floating devices, non-toxic marking paint, or with any type of physical guideline.

- **Schedule or provide a water truck, source of water, and driver during the leak detection process.** Water source from a main water liner must be within 50 to 300 ft (15 to 100 m) from the edge of the application and able to output approximately 5 gpm (19 lpm) with a minimum constant water pressure of 40 psi (280 kPa). If a water source from a main water line is unavailable, a water truck and driver must be available at all times during the leak detection survey. Frequent refills of water in water truck will be required from driver. Driver must position water truck within 50 ft (15 m) from the edge of application. The water truck must have a typical garden hose connection or adapter for industrial garden hoses.

- **Verify the top-most, relative geomembrane in the application is not frozen, or contain a surface layer of ice.** Technicians cannot perform a survey if the geomembrane or the conductive medium underneath is frozen. Since ice or frozen soil acts as an insulator and current barrier, this would create high resistance during data collection, and leaks would not be detected.

- **Remove and dispose of any residual water on the top-most, relative geomembrane.** The geomembrane liner must be exposed and bare. Puddles on the bare geomembrane will increase the difficulty level for pinpointing the leak signals. During the leak detection survey, only the area directly in front of the probe will be covered with water. If a leak was encountered in this suspect area, the technicians would only have to pinpoint the leak in this area. If puddles were present, the suspect area would increase making it very difficult to find the leak. A leak may be on one end of the puddle since the leak is electrically connected through the water and with the leak detection equipment. Therefore, minimizing the puddle areas would substantially decrease the difficulty in pinpointing the leaks.

- **Confirm the layering directly underneath the top-most, relative geomembrane to be tested contain a properly-prepared subgrade or medium with sufficient conductivity.** Some conductive mediums are required for sufficient conductivity: conductive-backed geomembranes, conductive geotextiles, a geosynthetic clay liner, or a layer of drainage/filtration soil.

- **Minimize or remove trapped air pockets (aka “hippos” or “ballooning”) and wrinkles.** These areas will decrease leak detection sensitivity since an air void is present preventing intimate contact with the underlying conductive layer.

- **Location and reference marks on the geomembrane must not be erased or covered until the documentation, pinpointing, and repair process is complete.** The documentation process from the leak detection survey will require reference and location marks relative to the location of each anomaly or leak. These marks cannot be erased or covered until the repair process from the repair field crew is complete. Erasing or covering of these marks may compromise the location of the pinpointed anomaly or leak. This may result in a repair of geomembrane in an area where a leak may not be present.

- **Purchase or provide industrial type garden hoses.** The diameter of the garden hose must be 0.625 or 0.750 in (1.6 or 2 cm) with a 0.750 in (2 cm) garden hose threaded connector that is rated with a minimum of 100 to 400 psi (700 to 2,700 kPa). The lengths of each hose will be determined during the proposal process of the application.

- **Verify the floor areas and side slopes can be walked on without slipping, tripping, or falling.** The survey is conducted on smooth and textured geomembranes along floor areas, smooth geomembranes along side slopes with a slight inclined plane angle of 14° or less (slope gradient of 4H:1L or shallower), and textured geomembranes along side slopes with a slight inclined plane angle of 22° or less (slope gradient of 2.5H:1L or shallower). Other survey methods are recommended if these parameters are not satisfied.

- **Provide access to place temporary electrodes through slits for electrical contact with the conductive medium (if copper wire electrodes were <u>not</u> installed).** Slits may be required for electrical contact with the material below the top-most, relative gemembrane to be tested. If slits were made and copper wire electrodes were not installed, technicians may opt to energize the application by placing electrodes in the slits. Technicians are not qualified to cut or penetrate the geomembrane, or repair the cuts or slits once they have been made. The General Contractor will be responsible for cutting or repairing any cuts or slits made during the leak detection process.

- **Install an 8-AWG solid, bare copper wire electrode prior to installation of the top-most, relative geomembrane (typical or conductive-backed), conductive geotextile, geosynthetic clay liner, or drainage/filtration soil.** The solid bare copper wire electrode is required to help ensure electrical contact in between the geomembranes. The electrode must not be damaged and must exit between the geomembranes. Access to the wire electrodes will be required during the entire leak detection survey in order to energize the application. The copper wire electrode must be electrically isolated from contacting any material contained in the application or the surrounding earth ground area. If an electrical ground connection is present and isolation is not achieved, false leak signals (false positives) will be detected during the leak detection process and loss in leak detection sensitivity will occur. The General Contractor must contact the Electrical Leak Detection Testing Firm for detailed drawings and installation instructions specified for their application and will be responsible for purchase and installation of the wire electrode.