In Search of the Electric Limit of Geosynthetic Clay Liners[i]

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Electrical leak location surveys, or ELLs as they are commonly known, are quickly becoming an accepted quality control method for installed geomembranes. Required by many local and state officials, ELLs have also proven financially beneficial based on reduced solution loss from copper and gold heap leaching (Smith, et. al., 2005). When performed correctly and with proper field conditions, surveys can pinpoint leaks through exposed or soil-covered geomembrane installations; leaks that could otherwise cause significant solution loss. The authors' field experience coupled with a recently published case study is bringing to light an important issue with the performance of an ELL over an encapsulated geosynthetic clay liner (GCL).

A composite liner system consisting of a geomembrane over a compacted clay liner (CCL) is a common design especially for solution ponds and ditches, but also for impounding heaps and other high-head facilities. The use of a GCL has become an appealing alternative to the conventional CCL for its superior speed of installation and where lack of local clay, wet site conditions or steep side slopes preclude the use of a CCL. ELLs depend on the conductivity of the mediums above and below the electrically insulative geomembrane. While moist soils are generally highly conductive, it is often taken for granted that GCLs are installed with sufficient moisture to conduct electricity. However, when a GCL is encapsulated between two geomembranes, the GCL will often not be conductive (Peggs, 2007).

GCLs typically arrive from the manufacturer with a moisture content of 12 to 20%. A maximum moisture content of about 30% is typically specified by designers to prevent slope failures and to control shrinkage and loss of overlap. And measures are usually taken to prevent additional water from entering a GCL during and after installation. Until recent, unsuccessful applications of an ELL to dry GCLs, thought has not been given to specifying a minimum moisture content. The moisture content required to reliably conduct electricity will depending on the chemistry of the clay within the GCL and thus may be product-specific.

Research is currently being conducted by the authors to determine the conductivity of GCLs produced by various manufacturers with varying moisture contents. Once a relationship has been established between moisture content and electrical conductivity, a minimum moisture content required for sufficient conductivity will be published along with field moisture control and testing protocols designed to satisfy both the minimum (for conductivity) and maximum (stability, shrinkage) moisture contents. Until these protocols have been developed, product-specific testing will be required by the designers or CQA personnel to determine the allowable minimum moisture content for successful application of ELL technology to encapsulated GCL installations.

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