Tech Note: Exposed vs Backfilled Geomembranes

When designing a Primary or Secondary Containment cell, you may consider leaving the geomembrane exposed. This Tech Note discusses some issues that should be considered before proceeding with a design calling for an exposed geomembrane.

Safety; first and foremost the safety of individuals working on the geomembrane should always be considered. Not only do we need to consider the safety of the individuals who are initially tasked with installing the geomembrane, we need to consider the foot-traffic that this area will see during the entire life-span of the containment. Regardless of whether it is a primary or a secondary containment cell, the area will be exposed to foot traffic from people and potentially wildlife. Most geomembranes are manufactured from a material very similar to that which "Krazy-Carpets" are made from, so if there is foot traffic on a smooth geomembrane that is wet from rain or snow and ice, there is a high risk factor of that individual slipping, potentially falling and hitting the ground or some other object within the containment. This applies to people as well as wildlife, there have been several instances in the past of wildlife walking down the slope into a lined pond, perhaps to take a drink, then slipping in and drowning in the primary containment cell, unable to climb out over the wet slippery geomembrane.

The use of a textured geomembranes can certainly offer some relief from the geomembrane becoming a slip-hazard. By selecting a textured geomembrane the friction between the liner and any foot traffic will be increased. This increased friction is not only effective at improving safety on the exposed geomembrane it can also an important design consideration. A textured geomembranes' higher soil retention angle may allow a steeper slope over certain soils or protective geotextiles in backfilled liner applications. By increasing the angle of the slope, a smaller footprint is needed to provide the same containment volumes.

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Over time, sunlight will take its toll on exposed geomembranes; UV Degradation is sunlight attacking the intermolecular bonds, decreasing the materials mechanical properties until such a point that it will not perform as it was initially intended. Most, if not all geomembranes have some degree of UV protection built into them, without it some geomembranes would only last a few months in an exposed application before they became measurable hard and brittle. There are geomembranes on the market that offer enhanced UV protection in the order of 20-25 years and should be strongly considered if an exposed geomembrane is required to perform for extended periods in the field. However the onsite conditions should always be considered, if the containment is relatively small, in a wooded area, or covered with snow for most of the year, you need not be as concerned with the UV performance of a given geomembrane.

Another important factor to consider is the protection of the geomembrane liner itself, not only from UV Light but from potential foot traffic directly on the liner. If the liner is left exposed, it is open to foot traffic on a daily basis; a rock stuck in the soul of a work-boot can do serious damage to an exposed geomembrane. Geomembranes have also been damaged by the sharp hooves of deer or moose walking across an unprotected geomembranes, and many lined water hazards on golf courses were severely damaged by golfer's spiked shoes as they waded into the shallow water to retrieve an errant golf shot.

While there are unique applications where an exposed geomembrane is a necessity, sometimes this design feature is driven solely by financial reasons. Often the intent of removing the backfill from the design is driven by the desire to save on procuring, transporting and placing the backfill, or to avoid the added cleanup costs of the backfill in the event of a spill. If the containment is required for a short period of time, meaning a few months, then perhaps an exposed geomembrane can be considered. However if the containment is designed for a longer time frame than we suggest these short-term cost saving be weighed against the greater risk of endangerment to both workers and wildlife, as well as the higher risk of the geomembrane being compromised by mechanical or UV damage.

Contain Enviro Services suggests that a layer of protective back-fill over the geomembrane, along with a layer of non-woven geotextile placed directly above and below the liner should always be considered. These layers will improve the safety on the site for both workers and wildlife, and offer added protection from both mechanical and UV damage. Contain Enviro suggests this layer of backfill should consist of 3-4 inches of sand or screened sand (3/8" minus aggregate).

Contain Enviro Services has over 15 years of geomembrane installation experience and can help guide you through your project. With access to the complete range of materials, Contain Enviro can suggest the most cost-effective material while still meeting the timing, environmental and safety requirements of your project.

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