# Tech Note: Lining Earthen Pits

A common construction technique to provide either primary or secondary containment is the construction of a lined earthen pit. It is more complex than simply digging a hole in the ground as several factors need to be considered during the design process.

A major consideration is whether or not the geomembrane liner is intended to be left exposed or if it is to be back-filled with a soil covering. Typically it is always recommended to design the containment with a protective layer of back-fill. This will not only protect the geomembrane from mechanical damage from vehicle or foot traffic from people and wildlife; it will protect the geomembrane from harmful UV rays which will decrease the life of most all geomembranes.

For situations involving the primary containment of water, such as a storm-water retention pond or water hazard on a golf course. The geomembrane will be given a degree of protection by the water which it is intended to contain. Through reflection and diffusion, water depths of 2 feet or greater provide the necessary UV protection required to ensure a longer design life of the containment. However the slope leading into the containment needs to be considered. Water is often a magnet for wildlife and the slopes leading into the pond may become damaged if left exposed, so it is suggested that the slopes of any primary containment be protected with a veneer of backfill to at least a water depth of 2 feet.

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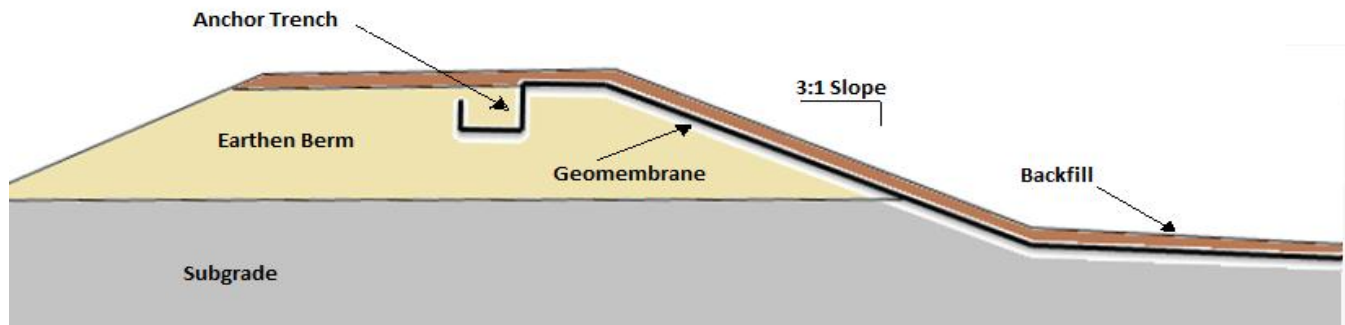
After the pit is excavated to suit the desired capacity of the containment, the subgrade should be smooth and free of protruding debris which may puncture the geomembrane liner. (refer to the tech note "Subgrade Preparation"), a layer of sand and/or a protective non-woven geotextile should be placed of the compacted surface and then the geomembrane installed and keyed into an anchor trench around the perimeter of the containment. Another layer of sand or non-woven geotextile is placed over the geomembrane for protection and finally the protective backfill is placed over top as the final layer (refer to the tech note "Backfilling Geomembranes").

As a general rule, a slope no steeper than 3:1 is recommended to help prevent the backfill from sliding into the containment; however the interface friction between the geomembrane and backfill needs to be considered. Slopes greater than 3:1 are quite easily achieved by a more involved design with, depending on the requirements, a textured geomembrane or a cellular confinement system.

The proximity to the water table and the presence of soil gases should also be addressed during the design phase of the project. Soil gases or positive hydrostatic pressures can push geomembranes upwards, sometimes causing the liner to be pushed above the water level itself. These factors can be mitigated by the use of a variety of techniques such as Geocomposites or strip drains to channel the water or gases away for the containment. Another method is to construct the earthen berms up and above the water table rather than to excavate into it.

Dual-lined containment systems with a leak detection sump can also be considered when the facility desires continuous monitoring of the containment system. In this design if the primary geomembrane is compromised, after a rain or snow melt, liquid will be detected in the collection sump. This liquid is then analyzed to ensure that the primary containment tanks are secure, and the liner inspected and repaired. Constantly ensuring the containment is doing its job.

Contain Enviro Services Ltd. is the leader in the supply and installation of geomembranes for a wide variety of challenging containment applications. Contain Enviro Services Ltd. feels that there is no single geomembrane which is suitable for every containment application; therefore we have insured that we have access to the complete spectrum of geomembrane materials and can suggest the most appropriate and cost effective material for your containment project.

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