



Often containment systems are required to be built over unstable subgrades that are susceptible to settlement. This tech notes discusses several factors that should be considered and the options available to deal with settlement and/or differential settlement.

A common oilfield construction technique is to lay down a supportive geotextile over the subgrade and then place earthen fill onto the textile creating a pad to support the structures and activities that are required of the site. If the subgrade is comprised of materials that have a high moisture content, such as muskeg, then over time the weight of the earthen pad will squeeze the water out of the subgrade and the entire pad will begin to sink downwards. This decrease in elevation is termed settlement, however if one area on the pad moves more than areas directly adjacent, then this is classified as differential settlement. The degree of moisture content, as well as freeze/thaw cycles all play a role in the amount and location of settlement in a given area.

Driven or screw piles are a common technique to combat settlement, however this may in fact at times create more issues than it was intended to solve. When a pile is driven the intent is for the pile to provide a fixed elevation so that any structure mounted on top of it will remain at that designed elevation, meaning that if the ground were to move up or down, the structure would not. Typically in the case of piles supporting a tank or pipe racks, the piles are driven well below grade, with a section extending from grade to the base of the tank platform. If the ground were to move in relation to these piles the attachment point of the liner and the piles would be put into tension. By using Settlement Detection pipe boots or “SD Pipe Boots” manufactured by Contain Enviro Services Ltd. (See tech note on SD Pipe Boots), this change in elevation would be allowed for and it would be unlikely that the geomembrane liner would be compromised.



Tech Note: Differential Settlement

Contain Enviro suggests that the most appropriate time for our crews to install SD pipe boots is immediately after the piles have been put in place and cut to elevation. This allows us to pull a prefabricated liner over the entire section, and then cut holes from below to slide the liner down over the piles and onto grade. The next step is to slide the prefabricated SD Pipe boots over the piles and weld them onto the main geomembrane liner. The area is then backfilled with sand to protect the liner from welding slag that may fall during the installation of pile caps. Often welding blankets or plywood is also laid down as an additional layer of protection.



However if the pipe caps or even the tanks are already in place when our crews arrive it is still possible to install the geomembrane liner and pipe boots. Often in these situations, sections of liner can be pulled between the rows of piling and the seams welded together; custom pipe boots would be fabricated on site, and welded in place. These methods are more subject to weather delays and require a great deal more labour to both install and test the geomembrane liner and are not the preferred installation methods.

The containment berm itself also needs to be considered when designing on sites prone to settlement. Contain installs a zero ground disturbance containment system that typically does not require the use of piles to support it. The three dimensional pad “engages” the subgrade and hold the braces and containment wall in place. The entire installed system is relatively lightweight and would not be a contributing factor to any settlement on site. Concrete containment systems are heavy and bulky requiring piles cut at grade for support and to maintain elevation; if settlement occurs, the liner can be put in tension and may fail as the ground drops in relation to the fixed concrete berm. Contains corrugated steel panels simply ride on top of the soil so if settlement occurs, the original containment volume remains the same and the liner is not put under tension. If differential settlement was to occur along the containment wall itself, the containment wall has enough flexibility to simply undulate and conform to the change, while still providing the required containment.

Contain Enviro Services Ltd. has been supplying and installing secondary containment systems into areas with these conditions for over 15 years and in that time has gained the experience necessary to deal with these and many other design challenges.

For More Information, Please Visit Our Website www.contain.ca