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PVC Geomembrane Interface Friction Angle

Dr. Shobha Bhatia and Gautam Kasturi of Syracuse University conducted interface friction angle testing of 3 different types of PVC geomembranes and 2 types of HDPE membranes with sand, sandy loam, silty clay and non-woven geotextile.

This report offers many useful items of information about PVC:

- O'Rourke (1990) reported that the higher stiffness or hardness of the geomembrane, like HDPE, the lower the friction angle, as compared to a flexible membrane, like PVC.
- All testing programs involving PVC and HDPE membranes have shown that PVC membranes are more efficient than smooth HDPE membranes in their frictional behavior.
- PVC geomembranes are exceptional in that their adhesion to soil tends to be greater than the cohesion of the soil itself.
- The more flexible the geomembrane, the higher the friction angle.
- The stiffer the geotextile, the lower the friction angle.
- Interface friction angle increases with particle size.
- A flexible membrane like PVC can conform to the asperities of soil

particles, thereby increasing effective area of contact, hence the friction angle is higher.

- Since PVC has lower elastic modulus than HDPE, soil particles get embedded in the surface, causing higher shear stress to be mobilized. Even with clay soil, the adhesion has been observed to be higher with PVC than HDPE.

Vaid & Rinne (1995) tested PVC with quartz sand and concluded:

- Interface friction angle of soil with PVC membranes is close to the internal friction angle of the soil because the failure in this case occurs within the soil.
- The waviness of the shearing plane (base) does not effect interface friction values.
- PVC geomembranes do not show a clear peak or residual stress-displacement behavior.

"The stress stain behavior of PVC is much different from that of HDPE. Even after reaching yield stress of the interface, PVC interfaces will not fail but maintain stability by stretching of the membrane material without loss of strength or material damage."

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Preserving water resources for future generations

To learn more about interface friction angle, visit our Internet web site at www.geomembrane.com