

Consolidation of a Geosynthetic Clay Liner under Isotropic States of Stress

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ABSTRACT

The consolidation behavior of a geosynthetic clay liner GCL was evaluated by consolidating duplicate specimens of the GCL in a flexible-wall cell to a final effective stress, σ' , of 241 kPa (35.0 psi). The hydraulic conductivity, k , also was measured at the end of each loading increment. The results indicated that the GCL was normally consolidated for values of σ' greater than 34.5 kPa (5.0 psi), which correlates well with limited consolidation data reported in the literature for GCLs based on confined compression using oedometers. Values of the coefficient of consolidation, c_v , for the GCL ranged from 5.2×10^{-10} m²/s to 2.1×10^{-9} m²/s, and generally decreased with increasing σ' , albeit only slightly. Values of the measured k , k_{measured} , for the GCL were low ($\leq 5.0 \times 10^{-9}$ cm/s) due to the sodium bentonite content of the GCL, and were within a factor of about two of the values of k calculated on the basis of classic (Terzaghi) small-strain consolidation theory, k_{theory} (i.e., $0.5 \leq k_{\text{theory}}/k_{\text{measured}} \leq 2.0$), suggesting that the theory is appropriate for describing the consolidation behavior of the GCL. The results also are consistent with the results of previous studies based on one-dimensional consolidation of sodium montmorillonite, suggesting that there would be little difference in the consolidation behavior of the GCL under confined compression.

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