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An apparatus to measure gas permeability of geosynthetic clay liners

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Abstract: This paper describes a test device and test method for measuring the gas permeability of partially saturated geosynthetic clay liners. The tests were carried out on a commercially available needle punched geosynthetic clay liner (GCL). The GCL samples were partially hydrated with de-ionized water for 7-10 days under zero confinement and 20 kPa surcharge, respectively, prior to testing. Measurements of the differential pressure across the GCL samples at varying flow rates were used to calculate gas permeability at different gravimetric moisture contents. The differential pressure used in the present investigation ranged from 1 to 40 kPa. The highest pressures (> 0 kPa) were used to verify the validity of Darcy's equation. The results highlighted the influence of moisture content on gas flow kinetics and also showed that the apparatus can provide a reliable and simple method of measuring gas permeability. For the GCL and conditions examined, it was found that the intrinsic permeability decreased as the volumetric moisture content increased. More importantly it was found that the pre-hydration curing process could affect the intrinsic permeability. Higher intrinsic permeabilities (when volumetric water content >40%) were obtained when the moisture was not distributed uniformly. (i.e. for samples pre-hydrated under no confinement). At lower volumetric water content (<40%) the pre-hydrating conditions did not seem to affect the intrinsic permeability values simply because there was less water available for further hydration. (C) 2003 Elsevier Science Ltd. All rights reserved.

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