



Nuna Innovations Inc.



Concrete Impregnated Containment

IMPERMEABILITY TESTING

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Hydrocarbon Impermeability Testing

Based on BS1377:Part6:Clause6 “Determination of Permeability in a Triaxial Cell” and ISO 6179: “Transmission rate of volatile liquids”

CC Hydro™ GCCM (Geosynthetic Cementitious Composite Mat) products have been independently tested by GEOLabs Ltd, UK, to assess the material’s permeability with regards to water and diesel. Testing was carried out on 5mm CC Hydro™ (CCH5). The test method used is based on BS1377:Part6:Clause6 Determination of Permeability in a Triaxial Cell. Additionally, the permeability of CC Hydro™ to volatile hydrocarbon vapours was also independently tested by BICS Laboratories Ltd according to ISO 6179: Transmission rate of volatile liquids.

Determination of Permeability in a Triaxial Cell

BS1377:Part6:Clause6 Determination of Permeability in a Triaxial Cell

The test method involves fitting a cured disc of CCH5 into a tri-axial cell and sealed in place with silicone sealant. The cell is filled with the fluid of concern (water or diesel), with the flow set perpendicular to the CC Hydro™ membrane. The disk is allowed to saturate for 1-2 days before the fluid is pressurised. During the pressurised stage of the test the hydraulic gradient of the fluid is monitored and from this the coefficient of permeability is calculated. For each fluid, samples were tested to determine the permeability of un-jointed CC Hydro™ and thermally welded joints over a period of up to 2 days.

	Permeability (m/s)
Water	7.5×10^{-13}
Diesel	1.6×10^{-12}
Welded Joint	8.1×10^{-12}



Transmission Rate of Volatile Liquids

ISO 6179: Transmission rate of volatile liquids

The test method involves fitting a swatch of PVC membrane from CC Hydro™ over an inverted cup, partially filled with a variety of common industrial hydrocarbon contaminants, and allowed to equilibrate with the volatile vapour over the course of several days. The swatch of material is weighed before and after exposure to the chemical and the vapour transmission rate is determined gravimetrically.

Reagent	Vapour Transmission (g/m ² /h)
Diesel	0.014
Ethanol	0.225
Kerosene (Paraffin)	0.470
Petrol (Gasoline)	2.258