Experimental Study on Drainage Behavior and Improvement Measures of Low Permeable Soil with Geosynthetic Drainage Layers

低滲透土壤內地工排水帶排水行為與改善措施之試驗研究

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1. Background

Objectives:

1. To **evaluate** the drainage behavior and permeability of **low permeable soil-geosynthetic drainage system**
2. To **quantify** the effect of **sand cushion** on improving the permeability of soil-geosynthetic system.
3. To **determine** the **equivalent hydraulic conductivity** of soil-geosynthetic system.

Goal:

To mitigate heavy rainfall induced damage or collapse of infrastructures and to establish a sustainable and safe homeland.

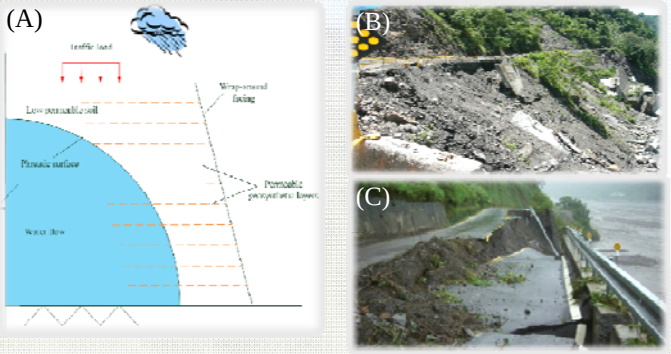


Figure1. (A)Schematic of a geosynthetic-reinforced slope with marginal soil as a backfill. (B)&(C) Real cases of slope failure.

2. Methodology

Develop a permeameter to investigate the drainage behavior of low permeable soil. The variables include: (1) **soil type**, (2) **drainage material**, (3) **number of drainage layers**, (4) **with and without sand cushion**, (5) **sand cushion thickness.**

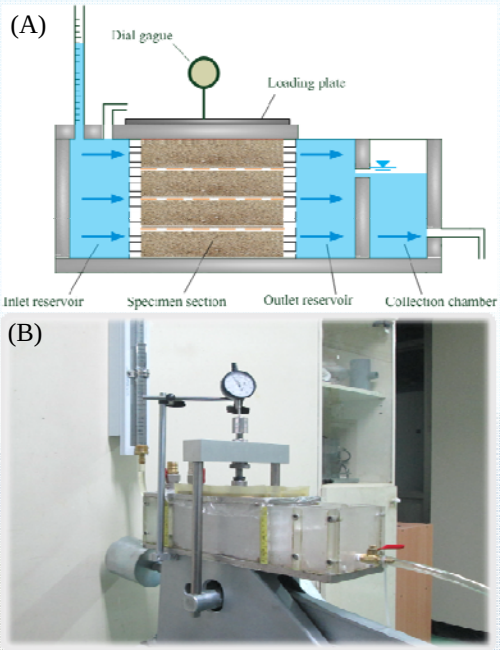


Figure2. Permeameter setup: (A) Schematic illustration; (b)Photo

3. Results and Findings

Evaluate permeability of low permeable soils with variations of soil types, number of geosynthetic layers and sand cushion thickness.

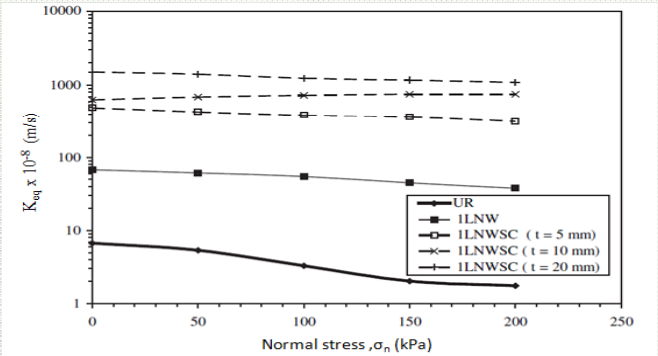


Figure3 shows the results of the permeameter tests

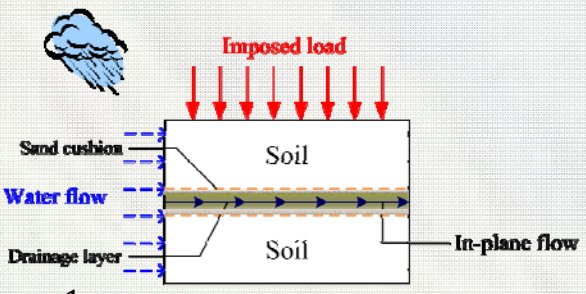
(D.V. Raisinghani)

Observe the clogging mechanism of geosynthetic drainage layer

(by Ghosh and K. Yasuhara)

4. Analyses

Determine and Validate equivalent hydraulic conductivity of soil-geosynthetic system.



$$K_{eq} = \frac{1}{H}[(n_s k_s S_v) + (n_g k_g t_g) + (n_{sc} k_{sc} t_{sc})]$$

System — soil — geosynthetic — sand cushion

Evaluate deformation and stability of GRS structures with low permeable soil under heavy rainfall conditions using FE simulation.