POSSIBILITY OF USING CAPILLARY BARRIERS FOR LANDSLIDE RISK REDUCTION

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Degree of Master of Science

Department of Civil Engineering

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Thesis submitted in partial fulfilment of the requirements for the degree
Master of Science in Civil Engineering

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DECLARATION

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E. Havisanth Date

The above candidate has carried out research for the Master's thesis under my supervision.

…….. ……..

Prof. S.A.S. Kulathilaka Date

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ABSTRACT

Possibility of Using Capillary Barriers for Landslide Risk Reduction.

Rainfall induced slope failures are a very critical issue in Sri Lanka. The risk of rainfall induced slope failures has increased over the past few years in Sri Lanka due to the introduction of new cut slopes as a part of development, as well as due to an increase in the number of intense rainfall events with climate change effect. Natural or cut slopes which remain stable during the dry season due to prevalence of high matric suction undergo failure because of loss of matric suction and pore water pressure buildup during prolong intense rainfalls. Presently cut off drains, berm drains and cascade drains together with vegetation cover and impermeable material on surface are used to reduce infiltration into cut slopes. But these techniques are not effective enough o cut off the infiltration into the slope during prolong intense rainfall events.

Capillary barrier cover system is a cost-effective system with natural soils that could minimize infiltration of rainwater. Capillary barriers are unsaturated cover system that functions in response to change in negative pore water pressure. This research on applicability of capillary barrier cover system on local Sri Lankan cut slopes was done through rainfall experiments on laboratory physical model and 2-D & 3-D numerical simulation using GeoStudio, 2012 SEEP/W software, and Midas GTS-NX software.

The research study concludes that 20cm thick river sand placed over 10cm thick M-sand(coarse) develops a capillary barrier effect which can significantly cut off the rainfall infiltration into the cut slopes even during 20mm/hr rainfall for 5 continuous days. Performance of this cover increase with slope angle and when the layer materials are sufficiently dry.

Keywords: landslides, matric suction, capillary barrier, infiltration

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