

STABILITY ANALYSIS OF UNSATURATED SLOPES SUBJECTED TO RAINFALL INFILTRATION

Mohamed El-Byhagi El-Fadil

*Building & Road Research Institute, Khartoum University, Office Box321, Khartoum, SUDAN
Graduate Student, Department of Geotechnics & Transportation, Faculty of Civil Engineering,
Universiti Teknologi Malaysia, 81310 UTM Skudai, MALAYSIA*

gazoli78@hotmail.com

Nurly Gofar

*Associate Professor, Department of Geotechnics & Transportation, Faculty of Civil
Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, MALAYSIA*

nurly@utm.my

ABSTRACT: Prolonged high intensity rainfall which took place on 17 to 20 December has triggered a number of slope failures at Universiti Teknologi Malaysia (UTM) Skudai campus. Two instrumented slopes were investigated for the effects of soil characteristics on the mechanism of rainfall infiltration in slope. One slope (Site-1) failed due to the rainfall on the 20th December 2006 while the other (Site- 2) remained stable. With other conditions deemed to be equal, the slope failure at Site-1 was predicted to be caused by the behavior of the soil forming the slope. Analysis showed that for Site 1, the continuous rainfall has caused a significant increase in soil's moisture, decrease in negative pore-water pressure (from 28 kPa to 0), and hence reduction in the factor of safety (FOS) of the slope from 2.15 to 0.99 for slip plane at depth of 1.8 m. On the other hand, the same rainfall induces a very small change in negative pore-water pressure, and hence reduces the minimum FOS of slope at Site 2 from 3.34 to 2.78. The results showed that the permeability of the soil mass plays an important role in the slope instability; hence more attention should be given to the fine-grained soil slope during monsoon season. Comparison between predicted FOS based on SWCC curve and actual measurement showed that there are other factors that may influence the soil response to rainfall infiltration such as mineralogy of the clay content and the dispersibility of the soil.

Keywords: slope stability, rainfall infiltration, factor of safety, permeability