

Slope stability analysis with applicability of lime in capillary barrier effects

ABSTRACT

Many hill slope areas in Malaysia are vulnerable to soil erosion and shallow slope failures due to tropical climate and intense and frequent rainfall events. This failure can be attributed to the surface erosion, loss of shear strength, and formation of tension cracks on the surface. Lime as a construction material has been used to improve soil properties for long time. In this study a series of laboratory tests were performed on natural soil and soil artificially mixed with 3, 5, 7 and 9% of hydrated lime, based on dry unit weight of the soil. Numerical analysis was conducted using finite element method to simulate capillary barrier effects at the interface of soil and soil-mixture due to change in permeability. The results demonstrate that, for the soil used in this study, an addition of 7% lime is considerable to improve properties of the soil surface with optimum thickness of 30 cm in capillary barrier effects. The improvement of soil at slope surface not only prevents erosion and crack formation but also limits deep infiltration of rainwater into the slope which was achieved through numerical modeling. This study can be contributed to the path of stability of surficial slope failures.

Keyword: Capillary barrier effects; Hydrated lime; Slope stability; Soil properties; Surficial failure