

UNIVERSITI TEKNOLOGI MARA

**CREEP PULLOUT MECHANICAL
BEHAVIOUR OF V-ARMED HYBRID
ANCHOR SOIL NAIL IN SLOPE
STABILISATION**

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ABSTRACT

Various slope stabilisation and landslide protection methods are available to combat landslide risk. Soil nailing is a soil reinforcement technique or mechanical technique that provides internal stability to reinforce the slope post construction and during excavation. It is widely implemented due to the simplicity of construction and it is economical. However, there are shortcomings in the system based on many failures reported by the authorities. One of the shortcomings in the conventional soil nails is the creep behaviour in the pullout resistance force i.e., the pre-stressed tension diminishes when slippage between the nails and the surrounding soil occurs. Creep occurs when the nail is pre-stressed; it elongates and is followed by longitudinal movement towards the bearing plate thus lead to the loss of tension. This research focused on the bond resistance, shape and failure mechanism of the V-Arm Hybrid Anchor due to creep effect. The V-Arm Hybrid Anchor System is a mechanical anchor head connecting with the rebar and has a locking system that can grip at the end of the rebar. This research was conducted in Malaysian soil to evaluate the performance of the soil reinforcement in Malaysian condition i.e., tropics, high weathering rate, soil invariants etc. The soil laboratory tests were carried out to determine the characteristic of the soil and its relating strength parameters. Field tests were executed to evaluate the performance of hybrid soil nail system in reducing creep and its performance in various soil conditions. The triaxial tests were carried out to determine soil shear strength in unsoaked and soaked conditions. The slope stability analysis was simulated in GeoStudio Slope/W and Slope Rain to illustrate the effect of soaking to the shear strength of the soil. The pullout test and monitoring were conducted on two (2) numbers of soil nails for each selected site. The nails tested consist of one (1) number of nails attached with the V-armed flip anchor system and one (1) number using the conventional soil nail system where both systems are fully grouted. The shear strength degradation due to soaking is substantiated where non-linear envelopes are considered. The pullout tests with stress monitoring using strain gauges were conducted and the results showed that the high stresses were developed at the nail head and at the anchor tip of hybrid anchor. These implicated that the hybrid anchor system can provide additional passive stress resistance at both ends of the soil nails. Thus, applying a hybrid anchor minimizes the displacement due to pullout stress and is in accordance with the guidelines stipulated in FHWA and Geo 7. The creep performances for both types of soil nail systems are presented, and the results showed that the V-Armed Hybrid Anchor has the ability to restrain creep.

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