Probabilistic pile reinforced slope stability analysis using load transfer factor considering anisotropy of soil cohesion

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Abstract

A probabilistic limit equilibrium framework combining empirical load transfer factor and anisotropy of soil cohesion is developed to conduct pile-reinforced slope reliability analysis. The anisotropy of soil cohesion is determined conditioned on that the thrust force direction is parallel to the major principal direction and it is easily combined with load transfer factor, which are related with soil parameters, and pile parameters. The proposed method is illustrated against a homogeneous soil slope. The sensitivity studies of pile parameters on FS (calculated at respective means of soil parameters) and β demonstrated that the anisotropy of soil cohesion tends to pose significant effect on reliability index β than on FS. The effect of anisotropy of soil cohesion on FS is found to be slightly different under different pile locations, whereas its effect on β is observed to be least if piles are drilled at the middle part of slope and more significant effect is observed when piles are drilled at the lower and upper part of slope. The plots from the sensitivity studies provide an alternative tool for pile designs aiming at the target reliability index β. The proposed method contributes to the pile-reinforced slope stability within limit equilibrium framework.

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