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Analysis for Stabilization of Soil Slope in Silty Soil with Replacement of Soil Cement

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Abstract

The slope instability may result due to change in stress conditions, rise in groundwater and rainfall. Similarly, many slopes that have been stable for many years may suddenly fail due to loss of soil shear strength, and external forces. This is a crucial problem as it may destroy buildings, damage roads, and even leads to loss of human life. So it is imperative to understand failure mechanism and adopt safety measures to prevent such failures. The objective of this study is to analyze the slope at different angles (at 30^0, 35^0, 45^0 & 60^0) in silty soil and propose a method to stabilize it. The proposed methods to stabilize the existing slope are replacing soil-cement (7% by weight) by vertical layering and layering along the slope. Limit equilibrium method was used to analyze the slopes. The existing slopes were likely to be failed because values of minimum FOS was computed less than 1.5. The FOS improved significantly after replacing soil cement by both methods. Among the two methods, it was revealed that the layering along slope method of soil replacement was most economical and easy to be executed at the site.

Keywords: Slope Stability Analysis; Soil Cement Replacement; Slope Stabilization; Limit Equilibrium Analysis.

1. Introduction

Slope instability problems in natural and manmade slopes are most common challenges for civil engineers. The slope instability may result due to change in stress conditions, rise in groundwater table and rainfall. Similarly, many slopes that have been stable for many years may suddenly fail due to changes in the slope geometry, loss of soil shear strength, and external forces effect [1]. Earthquakes are the greatest threat to the long term stability of slopes in active seismic zones [2]. Additionally, the long-term slope stability is also affiliated with the chemical influence and weathering action that can lessen the soil shear strength and produce tension cracks. In these conditions, the slope stability evaluation turns a basic interest all over.

The technical solutions to slope failure problems demand expert understanding of analysis methods, stabilization measures and investigative tools [1]. According to Nash [3], a quantitative evaluation of the safety factor is most significant when decisions are made. According to Chowdhury [4], the primary aim of stability analyses of a slope is to impart a secure and economical design of embankments, earth dams and excavations. Developing activities may face challenges due to the instability of earth surfaces. Likewise, the slope instability can disturb the accomplished essential servings as traffic movement, electricity production, water supply system and many other basic facilities. Therein, the

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