ESTIMATION OF THE STABILITY OF EMBANKMENT SLOPES USING FIELD MONITORING DATA

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ABSTRACT

Estimation of the Stability of Embankment Slopes Using Field Monitoring Data

In Sri Lanka lands underlain by soft, weak and problematic soil are being use for various constructions due to rapid development and the lack of suitable lands. Construction of an embankment over soft soil is challenging due to its low shear strength and high compressibility nature. As a result of that embankment can be subjected to a shear failure or excessive settlement. Assessment of the stability of the embankment is vital to ensure a safe embankment and stability can be evaluated by using available analytical methods or field monitoring data. Use of field monitoring data to evaluate the stability is easy and more practicable. In Sri Lanka Matsuo chart which is based on the field monitoring data was used for the prediction of stability of the embankments in the Colombo Katuanayaka highway project. However applicability of Matsuo chart for various embankment conditions is still questionable. This study was carried out to investigate the applicability of Matsuo chart for various embankment conditions using advanced numerical tools. Two test embankments published in the literature and three embankments, which belong to the Colombo - Katunayaka expressway were analyzed by using Finite Element Method, Limit Equilibrium Method and Matsuo chart and compared with the field data. Further, the effect of embankment width, height and the subsoil parameters on the prediction of stability using Matsuo method was investigated. Research finding verify that the Finite Element Method, Limit Equilibrium Method and Matsuo chart can predict the stability of the embankment accurately and Finite Element Method can be used to predict the deformation characteristics. Stability of the embankment is directly proportional to the un-drained shear strength of the sub soil and Factor of Safety values decrease with the increase of the embankment height. However it was found that the embankment width has little influence on the factor of safety.

Key words: embankment, Matsuo chart, finite element method, limit equilibrium method, soft soil

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LIST OF ABBREVIATIONS

Abbreviation	Description
CKE	Colombo Katunayaka Expressway
FEM	Finite Element Method
FOS	Factor of Safety
LEM	Limit Equilibrium Method
MC	Mohr-Coulomb
NC	Normally Consolidated
OC	Over Consolidated
SS	Soft Soil
SSC	Soft Soil Creep

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