



**BEHAVIOUR OF SRI LANKAN PEATY
SOILS UNDER SURCHARGING AND
VACUUM LOADING**

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Abstract

The composition of natural deposits of peaty soil may vary considerably among different sites, as do their engineering properties. Peaty soils have distinctive properties of low shear strength, high compressibility, high secondary compressibility and high initial permeability. This results excessive settlements and may continue for a long period of time due to the dominant creep behaviour. In addition, low shear strength often causes stability problems in peat soils when they are subjected to external loading. This criterion makes construction highway embankments over very soft highly compressible peat layers difficult. Therefore, in order to prevent differential settlements and subsequent potential failures, it is necessary to improve the strength and the stiffness properties of natural peat deposits using appropriate ground-improvement techniques.

In this process, it is important to understand and to quantify the consolidation behaviour of peaty soils when employing ground improvement techniques and to predict the short term and long term settlements. Since the consolidation behaviour of the peat may be region-specific, it important to study the index properties and engineering properties of peaty soils. The present research study focuses on the engineering properties and index properties of peaty soils found in Southern Transport Development Project. The first objective of this study is to establish empirical correlations between some important properties such as C_e vs moisture content, C , vs e_{Ot} C_a vs C_e , C , vs C_e , C , vs organic matter content and e_a vs organic matter content for STDP soils. Thereby update the empirical relationships for Sri Lankan peaty soils developed by Karunawardena (2000) using Southern Transport Development Project peaty soils empirical relationships.

Second phase of this research study is to concentrate on consolidation behaviour of peat under surcharges. It is important to identify and separate the components of settlement mainly immediate settlement, primary settlement and secondary settlement. For this purpose graphical methods can be used. The objective of this



study is to analyse the applicability of these graphical methods for Sri Lankan peaty soils and thereby predicting the degree of consolidation & hydraulic parameters of peaty soils from field monitoring data obtained from surface settlement plates, subsurface settlement plates, and piezometers.

Preloading can be used to improve the engineering properties of the peaty soils due to their high initial permeability. Successfulness of the pre loading depends on the stability of the embankment. This can be achieved by proper control of the pore pressure under embankment and the lateral displacement of foundation soil at the toe of the embankment. Third and final objective of this research study is to study about prediction and control the pore pressure under embankment and the lateral displacement of foundation soil at the toe of the embankment. Vacuum preloading method was applied first time in Sri Lanka at Southern Transport Development Project. The present study focuses on effectiveness of the vacuum pressure in controlling the pore pressures and the lateral displacements during the construction period.

DECLARATION

The work included in this thesis in part or whole, has not been submitted for any other academic qualification at any institute.

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Signature of the candidate

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