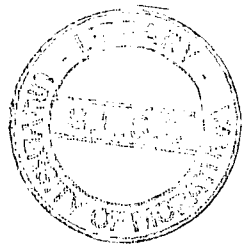
PEATY CLAY IMPROVEMENT WITH PREFABRICATED VERTICAL DRAINS



Thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science.

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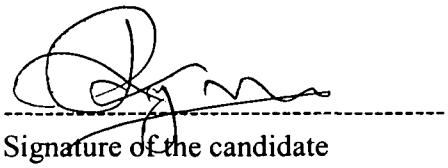
DECLARATION

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



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ABSTRACT

Peaty clay obtained from the Colombo-Katunayake Expressway route was tested in the laboratory for its consolidation characteristics. The main objective was to quantify the improvement in peaty clay by the use of pre-fabricated vertical drains (PVD).

Two large-scale model set-ups were erected to monitor the consolidation process of peaty clay, one without the use of PVD, and the other with the PVD installed. Both tests were conducted by depositing remoulded peaty clay in cylindrical barrels, and load was applied by several increments. Settlements and pore-water pressure were monitored over a long period. Axi-symmetric conditions were simulated by these tests. Based on the test results, the performance of PVD in accelerating the consolidation process is quantified. The model test results are back-analysed using the finite difference method, in order to give an indication of an appropriate numerical modeling process which can be used to model other instances of similar process.

In addition, the effect of sample size and the duration of the load increment period on consolidation in peaty clay is investigated. Tests were carried out in three different sizes of specimen dimensions. Values of c_v were calculated by several methods found in the literature, after carrying out tests using different load increment periods. Load increment periods for different sample thicknesses were calculated according to Terzaghi theory, for time simulation tests. The time necessary to obtain a specified degree of consolidation was calculated by an appropriate equation. The values of c_v obtained by these methods are of the same order for the time simulation tests. The secondary compression index of the peaty clay is found to be very high.

The improvement of shear strength in peaty clay due to consolidation is also investigated. Shear strength of peaty clay was measured at the end of laboratory tests and the results were compared with the strength of sample taken prior to consolidation. Soil strength after the treatment was evaluated by undrained triaxial tests, vane shear tests and consolidated drained triaxial tests. Soil strength before the treatment was evaluated only by vane shear tests as sample preparation with the soft soil was not possible. Gain in shear strength in peaty clay due to consolidation is quantified.

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