DESIGN OF STABILIZING FOUNDATION FOR ONE-STOREY OFFICE BUILDING ON PEAT SOIL

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(Supervisor)

Dedicated in memory of my father and to my beloved mom, sister and brothers and wonderful friends

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ABSTRAK

Tapak bagi sebuah bangunan adalah tidak sesuai jika dibina di atas tanah gambut disebabkan oleh kekuatannya yang rendah berbanding dengan tanah jenis lain. Di Sarawak, boleh dikatakan mempunyai tanah gambut yang luas seperti di kawasan Matang dan Sibu. Walau bagaimanapun, pelbagai kajian telah dilaksanakan dan inovasi seperti tiang batu, cerucuk mikro, mampatan dynamik, pakuan tanah, tetulang tanah dan sebagainya telah dicipta supaya tanah jenis ini tidak dibiarkan begitu sahaja. Kajian ini mempersembahkan rekabentuk sistem tapak bagi bangunan satu tingkat untuk tanah gambut di Sarawak secara khusus.

Konsep ini digunakan untuk mengurang kos bagi pembinaan sebuah bangunan di atas tanah gambut. Rekabentuk yang digunakan dalam projek ini adalah penstabilan simen, tiang batu, cerucuk mikro, dan saliran tanah pasang siap (PVD). Analisis tentang factor keselamatan akan dijalankan untuk memastikan rekaan baru ini berada dalam keadaan selamt untuk digunakan. Ciptaan ini adalah berdasarkan konsep teori dalam rekabentuk cerrucuk tapak dan mengikuti peraturan BS 6399: 1196. Rekaan ini sangat berguna dan ekonomik bagi kejuruteraan awam khususnya dan kontraktor.

ABSTRACT

Peat soil is not suitable to be used as foundation for the construction of building because of its low strength compared to other types of soil. Sarawak has a very wide area of peat soil such as in Matang and Sibu. However, many researches have been done and innovation like stone column, micro pile, dynamic compaction, soil nailing, earth reinforcement and others have been made so that this land not be wasted. This project presents a foundation design system for one storey building of peat soil for especially in Sarawak.

The concept is used to decrease the cost for building construction in peat soil areas. The designs used in this project are cement stabilizing, stone column, micro pile, and prefabricated vertical drain. Further analysis on its safety is done to ensure the design is safe to be used. This new design is based on the theory of foundation design and abides to the guidelines provided by BS 6399:1196. These designs conceptual are found to be useful and economic for the geotechnical engineer and contractor.

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Q_{all} = allowable load-carrying for each pile

Q_p = point bearing of pile

Q_s = frictional resistance

Fs = factor of safety

A_p = area of pile tip

q_p = unit point resistance

c_u = undrained cohesion of soil supporting the pile tip

N_c = the bearing capacity factor

α = α value

p = perimeter of pile section

L = length of pile

d = spacing between pile to pile

D = diameter of pile

c_u = undrained cohesion of soil

L = Lentgh of Pile

π = 3.142

ø' = effective stress friction angle of the stone column material

σr = effective radial stress as measured by a pressumeter (≈ 2 c_u)

$\boldsymbol{q_u}$ = allowable load-carrying for each pile

γ = unit weight

D_f = depth of foundation

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Appendix 1

The calculation of using **α** method on designing foundation using cement stabilization with micro pile as pile itself of the structure. The formula:

$$Q_{all} = (Q_p + Q_s) / Fs$$

$$Q_p = A_p \; x \; q_p$$

$$q_p = c_u \; x \; N_c$$

$$Q_s = \alpha \; x \; c_u \; x \; p \; x \; L$$

where; Q_{all} = allowable load-carrying for each pile

Q_p = point bearing of pile

Q_s = frictional resistance

Fs = factor of safety

A_p = area of pile tip

q_p = unit point resistance

c_u = undrained cohesion of soil supporting the pile tip

N_c = the bearing capacity factor (Appendix 2)

α = α value from Table 1

p = perimeter of pile section

L = length of pile