PERFORMANCE OF MAT (OR RAFT) FOUNDATIONS DUE TO SETTLEMENT PROBLEM

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ABSTRAK

Penilaian tanah perlu dilakukan bagi mengetahui tentang kekuatan sebenar keupayaan sesuatu tanah sebelum sebarang keputusan penukaran sistem asas sesuatu bangunan dapat dilaksanakan. Kertas projek ini membincangkan isu berkaitan penukaran sistem asas 'piling' kepada sistem asas rakit bagi sebuah blok asrama di projek Asrama Berkelompok Yayasan Terengganu, Besut. Antara faktor lain yang diambil kira adalah dari aspek kos dan masa. Aspek kos menjadi isu utama kepada pemilik/klien sesuatu projek kerana ianya akan mempengaruhi budget yang telah diperuntukkan. Manakala aspek masa pula akan menentukan tempoh pembinaan dapat disiapkan, adakah lebih cepat atau sebaliknya yang akan menguntungkan pihak kontraktor juga. Akhirnya aspek kejuruteraan geoteknikal akan dinilai untuk memastikan kawasan kes tersebut boleh mengadaptasi perlaksanaan cadangan asas yang baru tanpa melibatkan sebarang risiko kegagalan berkaitan dengan kekuatan tanah.

ABSTRACT

Soil evaluation must done to find out of real strength capacity before any conversion decision is taken to change the foundation system of building. This project paper discussed an issue relating foundation system conversion from ‘piling' to mat (raft) system for a hostel block in the Project of Asrama Berkelompok Yayasan Terengganu, Besut. Among other factors taken into account is from cost and time aspect. Cost aspects be major issue to owners / a project client because it will affect budget were appropriated. While time aspect also will determine able construction period completed, do quicker or otherwise will benefit contractor also. Finally geotechnical engineering aspect will be evaluated to be sure the case study can adapt a new of foundation proposal to be implement without involving any risk of failing relates to the strength of soil.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

A foundation is a structure that transfers loads to the earth. Foundations are generally divided into two categories: shallow foundations (spread footing, rafts or mats) and deep foundations (Piles, Drilled Shaft, Soil Columns, Cassions).

The foundation is the part of an engineered system that transmits to, and into, the underlying soil or rock the loads supported by the foundation and its, self-weight. The resulting soil stresses except at the ground surface- are in addition to those presently existing in the earth mass from its self-weight and geological history. The term superstructure is commonly used to describe the engineered part of the system bringing load to the foundation or substructure. The term superstructure has particular significance for building, bridges, towers etc. For these reasons it is better to describe a foundation as that part of the engineered system that interfaces the load-carrying components to the ground. It is evident on the basis of this definition that a foundation is the most important part of the engineering system.

The amalgamation of experience, study of what others have done in somewhat similar situations, and the site-specific geotechnical information to produce an economical, practical and safe substructure design is application or engineering judgment. Design parameters for shallow foundations fall into two classes; structural design parameters and geotechnical design parameters. Structural Design Parameters that influence the design of the shallow foundation include the building type and use, loading (live, dead, and uplift), column spacing, presence or absence of a basement, allowable, settlement and applicable building codes. Geotechnical factor that influence the design include the thickness and lateral extent of bearing strata the depth of frost penetration, the depth of seasonal volume change and the cut fill requirements. The strength, compressibility and shrink swell potential of the bearing strata are the properties of concern. In addition the presence or absence of ground water and its minimum and maximum elevations have an important impact on the design process.

The following steps are the minimum required for designing a foundation:

i. Locate the site and the position of load. A rough estimate of the foundation loads is usually provided by the client or made in-house. Depending on the site or load system complexity, a literature survey may be started to see how others have approached similar problems.
ii. Physically inspect the site for any geological or other evidence that may indicate a potential design problem that will have to be taken into account when making the design or giving a design recommendation. Supplement this inspection with any previously obtained soil data.
iii. Establish the field exploration program and, on the basis of discovery (or what is found in the initial phase), set up the necessary supplemental field testing and any laboratory test program.
iv. Determine the necessary soil design parameters based on integration of test data, scientific principles, and engineering judgment. Simple or complex computer analyses may be involved. For complex problems, compare the recommended

data with published literature or engage another geotechnical consultant to give an outside perspective to the results.

v. Design the foundation using the soil parameters from step (iv). The foundation should be economical and be able to be built by the available construction personnel. Take into account practical construction tolerances and local construction practices. Interact closely with all concerned (client, engineers, architect, contractor) so that the substructure system is not excessively over designed and risk is kept within acceptable levels. A computer may be used extensively (or not at all) in this step.

Normally, for building height 2 – 4 storey, the geotechnical engineer not involve for foundation design. The structural engineer whose design overall the building. For design the foundation, the structural engineers usually choose piles foundation for more safety and not complicated especially using structural software design. Drawing construction, the contractor more prefer shallow the foundation for more economical and faster in construction. Thus, the characteristic and the strata of the soil at the site must suitable for shallow foundation. For replacement piles foundation design to raft or mat foundation design, the geotechnical engineer are challenged to suit this soil condition suitable or not for raft or mat foundation.

1.2 PROBLEM STATEMENT

Originally foundation design for Project 4 Storey Asrama Kelompok, Yayasan Terengganu had used piling system. After project awarded to contractor, contractor propose conversion of foundation system from piling to raft foundation with it reason will be able to accelerate again building process later apart from cost factor can be saved to client.

After client consented the proposal, then geotechnical engineer are challenge to suit the Soil Condition are suitable for use the mat (or raft) foundations.

To make sure the bearing capacity and settlement adequate.

1.3 OBJECTIVE OF STUDY

The objectives of this study are as follows:

i. To evaluate cost implications of the pile foundations and mat or raft foundations.

ii. Analysis numerical modeling (Using PLAXIS) to evaluate the settlement mat or raft foundation in good agreement with actual performance.

iii. To obtaining adopted soil stiffness in soil condition.

1.4 SCOPE OF STUDY

The scope of the study includes several aspects as follows:

i. Study bearing capacity for raft foundation.

ii. Literature review on previous factor settlement in raft foundation.

iii. Suggestion using raft foundation for certain soil properties.

iv. Calculation for comparison cost estimate between pile foundation and raft foundation.

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