

# **INFLUENCE OF SURCHARGE ON NEGATIVE SKIN FRICTION**

A report submitted to MARA University of Technology in partial fulfillment of the requirements for the Degree of Bachelor of Engineering (Hons.) (Civil) in the faculty of Civil Engineering.

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## **ACKNOWLEDGEMENTS**

One of the most pleasant part of writing a thesis is an opportunity to thank to those who have contribute to it, the list of expression of thank, no matter how extensive, is always inadequate. The acknowledgements are no exception.

Although a single author has written this thesis, it owes its existence to many peoples. The author wishes to express his gratitude and appreciation to project advisor, Prof. Ir. Haron Hj. Ismail and Tuan Hj. Sabri Hj. Yusof, for the continuing advice, guidance, assistance, constructive, criticism and interest shown without that this project might not have been possible to be completed.

The author is grateful for the valuable assistance of the laboratory Coordinator, En. Abdul Rahman and staffs of Civil Engineering laboratory, En. Yusof, En. Yusnal, En. Suhaimi and En. Saiful for their helpful with the experimental program and did a superlative job as laboratory assistance. They were a constant source of information and advice.

The author would like to express his appreciation of assistance which has received from his colleague, En. Affendi and En. Zamri, who are constant source of new ideas and critical insights of author's research and writing efforts.

## **ABSTRACT**

This project paper presents some laboratory studies of the influence of surcharge on negative skin friction on clay specimen. The objective of this experiment is to study the effect of variable surcharges on negative skin friction and strain energy in the member of the pile. Negative skin friction is the downward force acting on a pile as a result of relative downward displacement between the pile and surrounding soil. The diameter of the pile is 2cm and 3cm having a length about 91 cm each. The specimens were each 1m in diameter and about 1.5 m in height. They were reconstituted from Speswhite Kaolin (a China clay) and consolidated one dimensionally with top and bottom drainage to the required stress history. Two measurements system were used such that strain gages (to measure strain energy on the member of the pile) and transducer (to measure settlement of the specimen). The pile (that has been placed strain gages at interval of 200 mm from each other) was penetrated in the steel-testing chamber to a certain depth and surcharges were applied on the specimen surface and data were collected.

In this study, the skin friction of two different types diameter of piles were calculated. The  $\beta$  - Method was the most accurate method used to determined the skin friction in this study.

From the results of both diameters of piles, the skin friction showed that it varies with depth. When the surcharge applied was increased, the skin friction also increased. This phenomenon was transformed to the plotted graph to show the variation of skin friction with depth and loading.

From this study, it was found that the highest values of skin friction for both piles were located at the lowest section of the pile while the least value were located at the top of the pile. The highest skin friction value for pile 2cm diameter was 2368.9 kPa and 8170.2 kPa for pile 3cm diameter.

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## **CHAPTER 1**

### **1. INTRODUCTION**

In chapter one, background of study, objective of study, scope of study, problem statement, how to estimate and minimize, and the safety factor for negative skin friction were discussed.

#### **1.1 Background of Study**

Piles are long, slender, prefabricated structural members driven into the ground to form a foundation. Engineers use them both on land and in the sea to support many kinds of structures. Piles are made from a variety of materials and in different diameters and lengths according to the needs of each project.

Negative skin friction is a term used to describe the skin friction between the pile and the soil which acts downward. It is a force developed through friction between the pile and the soil in a direction to increase the loading on the pile. Generally, the drag is downward because of a relative movement between the soil and pile. This may occur when a pile is driven through a compressible soil, which has recently, or will be covered with a fill, so that the point is in firm material. As the soil consolidates, the earth fill moves downward. This movement develops friction forces on the perimeter of the pile which tend to carry the pile farther into the ground. If the pile does not move, or if the pile does move, but not as much as the consolidation movement, the maximum friction strength of the fill soil is developed along the pile perimeter for the depth of the fill. This force may be large enough so that, in conjunction with the applied load, the pile will settle excessively. Alternatively, the stresses developed may be large enough to overstress the pile material.

Negative skin friction may also be developed by such other causes:

1. Surcharge loading on soil.
2. Consolidation of soil under its own weight.
3. Ground water lowering.
4. The effects of pile driving in soft soils.