

**DETERMINATION OF OPTIMUM CONCENTRATION OF LIME SOLUTION
FOR
SOIL STABILIZATION**

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To my beloved family

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ABSTRACT

The main objective of this research is to determine the optimum concentration of lime solution for soil stabilization. Dry lime, either quicklime or hydrated lime is being use currently as soil stabilization agent. Although it is very useful in soil stabilization, it always causes dusting problem and is corrosive to human skin. To avoid these problems, application of lime in solution form is suggested in this research. Several soil tests had been carried out on the untreated soil and lime before the lime added to soil for stabilization to ensure the soil is suitable to be stabilized by lime. After those soil properties determined, the lime solution with different concentration will be added to the soil samples for stabilization for 0, 7, 14 and 28 days. The unconfined strength test is carried out on cured soil to evaluate the effectiveness of lime stabilization with different concentration of the lime solution. The concentration of the lime solution that gives the highest soil strength is the optimum concentration of lime solution for soil stabilization. From the result in this research, the highest Unconfined Compressive Strength achieved is 730 kPa, by stabilized the kaolin with 1.35M lime solution and cured for 28 days. Consequently, this value is the optimum concentration of lime solution for soil stabilization.

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ABSTRAK

Objektif utama kajian ini adalah untuk menentukan kepekatan optimum larutan kapur untuk penstabilan tanah. Kapur kering, sama ada dalam bentuk “quicklime” atau dalam bentuk kapur terhidrat biasa digunakan untuk penstabilan tanah pada masa kini. Walaupun kapur ini sangat berguna dalam penstabilan tanah, ia sentiasa menyebabkan masalah pencemaran dan bersifat mengakis terhadap kulit dan mata manusia semasa digunakan. Untuk mengelakkan masalah sedemikian, penggunaan larutan kapur telah dicadangkan dalam kajian ini. Beberapa ujian tanah telah dijalankan untuk menentukan kesesuaian tanah tersebut distabilkan dengan kapur. Setelah ciri-ciri tanah dikenalpastikan, larutan kapur yang mempunyai kepekatan yang berlainan disediakan untuk bercampur dengan tanah untuk tujuan penstabilan. Selepas tanah diawet dengan larutan kapur yang berkepekatan yang berlainan pada 0, 7, 14, dan 28 hari, Ujian Mampatan Tak Terkurung dijalankan ke atas sampel-sampel tanah. Didapati bahawa sampel tanah yang menunjukkan kekuatan mampatan yang tertinggi, 730 kPa, ialah tanah yang diawet dengan 1.35 M larutan kapur, dan diawet selama 28 hari. Maka, kepekatan optimum larutan kapur yang diperolehi dalam kajian ini ialah 1.35 M larutan kapur.

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LIST OF SYMBOLS

SYMBOLS

c_u	undrained shear strength
G_s	specific gravity
m	mass
V	volume

CHAPTER I

INTRODUCTION

1.1 Background of Research

In geotechnical engineering, we always face the problem of soil where the soil cannot reach the required specification for some constructions. As an example, the bearing capacity of soft soils is always too weak to support the superstructure above it before any soil treatment done. Consequently, soil stabilization is a very important part to be done before the construction carried out.

Lime stabilization is one of the methods of soil stabilization. It was used in many fields in the world, especially in geotechnical and agriculture field since many years ago for changing the soil characteristics so that the soil become more suitable for certain purposes.

In this research, which titled “*Determination of optimum concentration of lime solution for lime stabilization*”, we will look into the problems facing by using the solid

limes as soil stabilizer and how the liquefied limes can help us in solving these problems. Meanwhile, the optimum concentration of the lime solution need to be determined so that the effect of the soil stabilization is same or even better than what we have by using solid limes.

1.2 Objective

The research objectives are as below: -

- ❑ To understand the problems facing as dealing with the solid limes for soil stabilization
- ❑ To improve the workability and effectiveness of lime by using lime solution
- ❑ To determine the optimum concentration of lime solution for soil stabilization

1.3 Scope of study

Lime stabilization is more suitable and effective to be used in fine-grained soil, such as clay. The present study is focused on the study of the optimum lime solution to be used in soil stabilization in clay. The clay will be used is kaolin from Tapah, Perak. The lime to be used in this research is hydrated lime, since it is not too exothermic and harmful to our skin compared to quicklime. The resource of hydrated lime is Limetreat Private Limited, Pasir Gudang Johor.

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