CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

This study is focused on the plasticity characteristics and shear strength properties of lime treated soft clay. Soft clay is said give a lot of trouble for the Civil Engineers and Geotechnical Engineers. The problem that often occurs due to the soft clay is like deposition and low bearing capacity. Nowadays, many projects are rapidly develop due to the population growth and economics progress. Most construction projects undertaken focused on the soft clay area including rural area, coastal area and etc. However, this area actually becomes a great challenge to the engineers due to the existing soils that is soft clays are generally weak and high compressible in nature and also it exhibits moderate swelling when comes in contact with moisture. This behavior is due to the presence of clay minerals with expanding lattice structure. The soft clay is very hard when it is dry but loses its strength on wetting. As a geotechnical engineer, it is necessary to them to improve the behavior of this soil by using any of the available ground improvement techniques such as lime treatment, cement-mixed and other. So, to overcome these problems, lime stabilization can be adopted for this study (Maniam, S. V., 2012).

The application of lime to improve the engineering behavior of fine grained soils is not new and it is an age-old method. As we know, the field of highways and air-field pavements were proved successfully treated by using the lime stabilization. Indirectly, this method now being extended for deep in-situ treatment of clayey soil to improve their strength, and minimize the compressibility (Rajasekaran, G. and Roa, S. N., 2005).

There are two types of lime that can be used to treat the soils, quicklime and hydrated lime. Hydrated lime and quicklime are both calcium compounds
Lime in the form of quicklime (calcium oxide – CaO), hydrated lime (calcium hydroxide – Ca(OH)2), or lime slurry can be used to improve the behavior of the soils. Hydrated lime is created when the quicklime chemically reacts with water. It is hydrated lime that reacts with particles of clay and permanently transforms them into a strong cementious matrix. However, the hydrated lime is more suitable for this study due to the its behavior that is already neutralized, so it will not undergo oxidation and can be used with water, for water ph control, lime slurry addition, lime slurry mixes, soil rehabilitation and more. Almost all fine-grained soils can be modified by using the hydrated lime including the most dramatic increase occurred in the clay of medium to high plasticity. Modification occurred because calcium cations supplied by hydrated lime replace the cations normally present on the surface of clay minerals. The structure of clay particles modified by particle flocculation/agglomeration will produce several benefits like plasticity reduction, increasing in the shear strength and bearing capacity, reduction in the susceptibility to swelling and shrinkage, and ability to construct a solid working platform. (Carmuese).

1.2 PROBLEM STATEMENT

In generally, soft clay usually living in coastal or marine area and rural area where the existing soils are weak and more deformative. This area usually become a great challenge to civil engineering to design suitable foundation or make any of construction. The soft clays have low strength, low permeability and weak confining pressure. The soft clays also are highly compressible soft clays and it exhibits moderate swelling when comes in contact with moisture. This behavior is due to the presence of clay minerals with expanding lattice structure. The soft clay is very hard when it is dry but loses its strength on wetting. These characteristics will give the problems for the structure or foundation because of the shear failure or different settlement and it is become more serious in the future because of the damage that will be happen either in slow or fast condition. Therefore, it is necessary to improve the behavior of this soil by using any of the appropriate soil stabilization techniques such as lime treatment that will be done for this study.
1.3 OBJECTIVES

The aim of the study are:

i. To determine the effect of lime stabilization on plasticity characteristics soft clay.

ii. To determine the unconfined compressive strength of lime treated soft clay.

1.4 SCOPE OF STUDY

This study focuses on the laboratory study on the plasticity characteristics and shear strength properties of lime treated soft clays. The untreated clay were being collected at Chenor, Maran, Pahang (3° 27' 21" North, 102° 40' 44" East). Preliminary tests will be conducted to determine the suitability of the soil for the lime stabilization based on the physical and chemical properties before we start the main laboratory to know whether the untreated soil can shown the engineering properties of soft clay or not. The main test will be conducted such as Atterberg Limit, in order to determine the plasticity of the lime treated soft clay; and Unconfined Compressive tests, to define the unconfined compression strength of lime treated soft clay. The tests will be performed on samples after curing periods of 7, 14, and 28 days.

1.5 SIGNIFICANCE OF PROPOSE STUDY

This researched will be carried out to find the solution to improved the plasticity characteristics and shear strength of the untreated soft clays that can be a suitable soil as construction field. As we know, untreated soft clay is not recommended for any construction because of the instability. So, this is important to carried out this research. Other than that, this research also will study the different between the untreated and treated soft clay in term of plasticity and strength.