CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

In the recent years, the government has been significantly developing the country by building vast amount of housing, commercial, industrial, and other infrastructure facilities. The extensive growth of urbanization and industrialization become more significant, owing to the tremendous increase of population. However, due to the limited availability of construction sites, prices of lands keep on increasing. The developers take the initiative to construct structure on the marginal sites which are considered more economic.

Constructing structure on poor ground such as soft clay will affect the stability and settlement of the structure. The soft clay consists of low shear strength, low permeability and high compressibility characteristics. Ground improvement may be necessitated to modify the soil properties. There are several methods to improve the soft clay properties such as preloading, sand drains, piling, granular columns, stone column and sand column. Recently, granular columns are gaining acceptances in geotechnical field since the construction is simple and easy, economical in terms of material used and not bringing effect to the material

1.2 PROBLEM STATEMENT

Soft clay is a problematic clay soil since it has low bearing capacity, low permeability and high compressibility characteristics. Therefore, the load induced by construction may results in bearing capacity failure and excessive settlement. The weak soft soil is not suitable for structure construction. The large proportion of the settlement on soft clay is attributed to consolidation which may continue for a long time depending on the ability of the soil to dissipate excess pore water pressure due to construction load.

Hence, an appropriate ground improvement is necessary to modify soil properties and increase shear strength of soft soil. Vertical granular column is one of the feasible and economic techniques that serve the purpose of soil strengthening, thus, to solve all these problems. Therefore, in this study, the strength of soft soils reinforced with ceramic waste as replacement material in granular column had been investigated. Ceramic waste is made of wastage of production of the ceramic factory where this ceramic waste is not recycled at any form at present. The designing and development group has now responded to the call for the utilization of green technology and reused by item in development. As regard in the ceramic industry the production goes as waste, which is not undergoing the recycle process yet. Large bulks of ceramic tiles change into wastage because these waste materials are not reusable and recyclable due to lack understanding of their physical and chemical structure.

Realizing this need, this study used ceramic waste as useful filler material instead of fully used of sand in cement grout mix design. The use of ceramic waste in development materials will altogether reduce the growth of the by-items in landfills and in this manner, diminish natural contamination. Hence, by using ceramic waste as granular material in vertical granular column, the cost of construction is reduced and this could be one of the methods in achieving sustainable development in construction industry.

1.3 OBJECTIVE OF STUDY

The purpose of this study is to determine the improvement shear strength of soft clay after being reinforced a group of three ceramic waste columns (CWC). This study is carried out to achieve the objectives as follow:

1. To determine the physical properties of kaolin clay and ceramic waste samples.
2. To determine undrained shear strength of soft clay reinforced with various length of a group of three CWC.
3. To establish correlations relating undrained shear strength with various dimensions of a group of three CWC.

1.4 SCOPE OF STUDY

The scope of study that required in the process to obtain the properties of kaolin clay and CWC samples. To obtain these properties, several laboratory tests will be conducted. The ceramic waste was collected from Guocera Ceramics, used as the granular material in vertical column while the 'S300' kaolin powder used in this study was bought from Kaolin (M) Sdn. Bhd. based in Selangor, Malaysia.

The ceramic waste and kaolin had been tested to determine their characteristics by laboratory tests in accordance with British Standard (BS) and/or the American Society of Testing Material (ASTM). The physical and mechanical properties of ceramic waste were determined from the following laboratory tests:

i. The physical properties of kaolin clay is determine from the following laboratory tests:
    a) Atterberg Limit Test