CHAPTER 1

INTRODUCTION

1.1 Background

Soil is a one of the very importance component in human life because of it properties and characteristic that multi usage and natural materials that can be found everywhere around our surrounding. There are so many type of soil that can be found but basically the soil are divided into three type; clay soil, sandy soil and silt soil. Usually, in development area, clay soil are widely used compare to sandy soil and silt soil, because of their characteristic. Discovery of history proven that since the prehistoric era, the clay soil are used as the medium to support in the construction of building, houses, residential, walls and many more (Sa’ adon, 2009). Since then, human start to study and develop more about the clay soil besides the usage in development are increasing gradually.

Nowadays, the numbers of the community are rapidly increasing and Malaysia is one of the country that experiencing the population growth. In February 2014,
Department of Statistic Malaysia is stated that the population in Malaysia was reach 30 million people and this number are still increasing horary. The increasing of the population are required the increasing of the construction industry because of every people need the dwelling place. To fulfill the human needed, developer in construction industries need to explore and find the solution in the usage of the soil to develop.

Malaysia is one of the luckiest country in the world that richest with the difference type of soil and have the multipurpose usage. Unfortunately, developments throughout the industrialized sectors are cause for high usage of the suitable site. The uncontrollable use of the site for construction was led to exploit to the other type of soil. The increasing of the demand and restrictions on the suitable land for construction in recent time led the construction industries to exploit sites that were previously considered as the uneconomical site to develop (Eied et al., 2014).

Clay are widely used in construction and development and clay are divided into two type; hard clay and soft clay. Usually, the clay that used in construction is hard clay type but presently, the researcher are started to find the solution to use the soft clay in construction. Soft clay is known as the unsuitable and uneconomical type of soil to be used in construction because Eied et al., (2014) started that soft clay have low of shear strength and high compressibility that will cause the troubles during and after construction. By using the piling, building or structure can be construct, but the cost of the construction is higher and it can led to the uneconomical project.

Through the characteristic of the soft clay, any construction works that will constructed are believed to face more problem compared to other type of soils (Sa’adon, 2009). Luckily, the advance of the technology prove that there is an alternative to using soft clay in construction by ground improvement or modification technique. Other than more economical method, ground improvement is the technique that suit the construction requirement which change and improve the properties of the soil. The properties of ground improvement are; increases the shear strength, reduces the permeability and reduces the compressibility (How, 2011). There technique of ground improvement can be done either
by; mechanical compaction, dynamic compaction, deep vibratory, stone column, preloading, soil stabilization by use of admixture, use of geotextiles and many more.

Although the ground improvement technique improve the properties of the soil, but not all the technique are economical, suitable and preferable. Out of several technique, stone column is the one of the ground improvement method that most preferable, economical and widely used in construction. Many researcher have developed theoretical solutions for estimating the bearing capacity and settlement of foundation reinforced with stone column (Priebe, 1995). The main advantage of the stone column lies in improving the soil properties below a structure (raft and depth) and following the reduction of an irregular settlement (Pivarc, 2011). Stone column is the method which consist of the granular materials such as crushed rock or gravel is replaced into the soft soil at regular intervals throughout the area of the land where the soil bearing capacity is to be improved.

Usually, the granular materials which used for stone column are crushed rock and sand, but important in view that the fact of the sources of the natural materials are getting depleted gradually. An alternative are needed to prevent uncontrollable usage of natural material and the possibility of the extinction of natural materials. One of the alternative that preferable to use are the recycle materials. We are known and very familiar with the recycle of paper, plastic, aluminum and glasses, but there are so many other type of materials that can be recycle. One of the example is the recycle of coal.

Coal are known as a largest source of the energy for the generation of electricity and throughout history, coal has been used as an energy resource, primarily burned for the production of electricity and heat, and is also used for industrial purposes, such as refining metal. One of the famous coal power plant in Malaysia is Tanjung Bin Power Plant, Johor. The coal was produced the combustion waste, especially ash and due to the increasing of the demand of the coal gradually, the waste are cause the harmful to the environment and led to the increasing the number of disposal area. The ash is the combustion waste that produced from the process of biomass combustion can be divided into two; bottom ash