CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Concrete was widely used in the construction of building and infrastructure due to its excellent durability and cost effectiveness. The concrete was a composite construction material which produced by mixing cement, coarse and fine aggregates, water and also other admixture which was in right proportion. Changing in environmental condition and also the quantity and quality of raw materials used when mixing concrete will lead to the different in the properties of concrete. It cannot be denied that Ordinary Portland Cement (OPC) had been popular to use as one of the common binder during the mixing of concrete. (Sarker et al., 2014). However, there was high energy consumptions during the manufacturing of cement and indeed there was larger amount of the emission of greenhouse gases such as CO₂ into the atmosphere. Thus, the cement production industries had their responsibility to take care about the greenhouse gases emissions issues. (Ganesan et al., 2014).

Thus, many researches had been carried out to find out another new types of raw materials that can replace cement as the binder for the mixing of concrete. Then, after few years of researches, there was emerging of the new alternative binders called geopolymer mortar that can help to lower down the greenhouse gases emissions during manufacturing of concrete. (Sarker et al., 2014). Fly ash based geopolymer mortar was existed as new environmental friendly construction materials for sustainable development alternative to conventional concrete made from alkali activated aluminosilicate and aggregate. Accounting to the history of the geopolymer, geopolymer technology was first introduced by Davidovits that had the idea to provide an alternative low emission binding agent to Portland cement. Geopolymers were inorganic aluminosilicates which produced by alkali activation of waste
materials such as low and high calcium fly ash, steel dust, metakaolin, blast furnace slag and also benite. The process of manufacturing geopolymer mortar was called geopolymerization in the presence of two kind of chemical solution which called sodium hydroxide and sodium silicate solution. The difference between the mechanical properties of geopolymer mortar compare to Portland cement were geopolymer mortar had high early strength, drying period was faster, low shrinkage, and also resistance to sulphate attack and corrosion (Ganesan et al., 2014). Even though geopolymer mortar can be produced by various sources of waste materials, but fly ash was the most effective geopolymer binders for the manufacturing of concrete.

Since geopolymer mortar was emerging as the effective and environmental friendly construction material, thus it was a need to do the research for the performance of geopolymer mortar in different building structures. One of these building structure was bricks that make up of geopolymer mortar with the addition of other raw materials to check for the heat optimization during the internal curing process.. (Sarker et al., 2014). The durability of the geopolymer mortar had the relationship with the heating efficiency during the internal curing process on the geopolymer mortar. Concrete which act as the building materials were now widely used in the construction of building and infrastructure. Conventional concrete will caused the emission of greenhouse gases to the atmosphere. Thus in order to save our Earth, many researches had been done to explore new materials to replace conventional concrete. One of the latest and common technology was the geopolymerization process which produce geopolymer concrete from waste materials such as fly ash. Geopolymerization was the reaction undergone by aluminosilicates in a highly concentrated alkali hydroxide or silicate solution, forming a very stable material called geopolymer having amorphous polymeric structures with interconnected Si–O–Al–O–Si bonds .According to (Duxson et al. and Dimas et al.) the geopolymerization process took place when there was dissolution of solid aluminosilicate materials in a strong alkaline solution, formation of silica–alumina oligomers, polycondensation of the oligomeric species to form inorganic polymeric material, and bonding of un-dissolved solid particles in the final geopolymeric structure. (Ahmari & Zhang, 2012)
1.2 PROBLEM STATEMENT

Nowadays, concrete has been popular as the building materials in all the construction of building and infrastructures. But environmental issues continue to exist as the major problems in all over the world due to the higher percentage of emission of the greenhouse gases such as CO2 into the atmospheres during the production of concrete since it is high energy consumptions. Owing to this, geopolymer mortar that produced from geopolymerization process is produced in order to replace the usage of concrete since geopolymer concrete was more environmental friendly and cost effectiveness. It cannot be denied that the characteristic and mechanical properties of geopolymer mortar can be activated by elevated temperature of curing. But, the problem arose was the high temperature of curing can cause the shrinkage for geopolymer mortar and it was not economically. Meanwhile, low temperature curing cannot accelerate the strength improvement of geopolymer mortar. So, therefore this research was carried out to study about the effect of steel dust as internal heat distributor during the curing process for geopolymer mortar. The optimization of heating on internal curing process of geopolymer mortar can lead to the enhancement on the behavior of geopolymer mortar and its properties due to the adding of steel dust at low curing temperature. In order words, the strength improvement of geopolymer mortar for compressive strength can be achieved even at low curing temperature with the addition of steel dust. Thus in this project, in order to optimize the heating distribution on internal curing process for the geopolymer mortar and also checked whether it would lead to the inclined or declined the compressive strength, steel dust had been added into during the casting of geopolymer mortar by replaced some portion of fine aggregates.