CHAPTER 1

INTRODUCTION

1.1 Grounding System

According to the IEEE Guide for Safety Grounding Design, the two main design goals to be accomplished by any ground system under fault conditions and both normal are [5]:

1. To not exceed any operating and equipment limits by providing way to dissipate electric currents into the earth.

2. To assure the danger of critical electric shock is not exposed to a person in the surrounding of grounded facilities.

In order to ensure the safety and well-being of personnel who may come close to conductive media, it is significant to do proper and practical analysis and calculations of design grounding systems parameters. In other words, the primary purpose of creating ground systems is to avoid the injury of human beings during unbalanced fault conditions. However, important aspect such as the type of soil used for the grounding rod must be taken care. Most engineers use their trial-and-error techniques or long term experience in order to reduce the soil resistance as path for fault conditions situation.

There are two factors that affect the grounding system performance that are: soil parameter and size and material of electrode. Generally, soil resistivity give high influence to the performance of grounding system. Soil resistivity depends on many factors, such as humidity, temperature, type of soil, salt content, etc. and varies upon time and depends on the season of the year, reaching
maximum values during the summer months. Unfortunately, due to geological environmental, the soil resistivity value is not good enough. Thus, by increasing the size of grounding rod, a better grounding performance can be achieved. Still, this method involved more cost. Therefore, by modifying the soil characteristic, it will increase the effective area around the grounding electrode. For further analysis, backfilled with low resistivity must be added in the system. In this project, rice straw ashes, cow dung and oil palm husks is used.

1.2 Safety Aspect in Grounding

There are three main intention of the grounding system [11]. The first part is overvoltage protection. Electrical distribution system wire can be damaged by line surges, lightning or intentional contact with higher voltage lines as its can boost dangerous high voltages. Thus, to minimize damage from such occurrences, grounding provide an alternative path around the electrical system of the building. By the same token, the role of grounding system is for voltage stabilization. There are many resources of electricity such as transformer that can be considered as separate source. Their relationship to each other will be extremely difficult to calculate if all these voltage sources were not a common reference point. The earth is the most omnipresent conductive surface, and so it was adopted in the very beginnings of electrical distribution systems as a nearly universal standard for all electrical system. In order to facilitate the operation of overcurrent devices, current path must be provided. The purpose of grounding system is very important to be understand. Grounding system provides certain level of safety to property and humans in case of equipment damages.

1.3 Background of Study

The used of galvanized steel in one the interest in this study. As the copper is more expensive than galvanized steel, it caused some problem especially the theft issues. In addition, the used of copper will result in high construction cost. Thus, different alternative material needs to be used to replace copper as grounding electrode, in order to reduce theft issues and as well as to reduce the cost. By referring to the previous research conducted by Mohd Hazrek Bin Hamzah
has shown that grounding grid using enhancement of additive material as well as galvanized steel will give the grounding system a low resistance.

![Galvanize Vs Copper Resistance](image)

**Figure 1.1**: Resistance Reading for Copper and Galvanized Steel [1]

Other than that, the used of enhancement material is also one the important aspect in this project. As environmental issues are became main topic nowadays, the used of waste material is encouraged to keep preserve the environment. Hence, by adding after product generated from various sectors into grounding system, the improvement of grounding system can be achieved. By referring to the previous study done by Nazarrudin Bin Nazri [12] has shown that low resistance of grounding system can be achieved by using a very fine size of oil palm carbon ashes.