

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

As one of the oldest and most common construction materials in the world, concrete formerly used in construction nowadays because it is economically, versatility, availability, long durability, and ability to sustain extreme weather environments. In United States, about four tons of concrete are produced per person per year globally and still increase until today due to the rapid advancement in concrete technology. The term concrete refers to a mixture consist of natural materials such as fine and coarse aggregates, usually sand, and either gravel or crushed stone in order to held together by a binder of cementitious paste. The cementitious paste is typically made up by the Portland cement and water and also may containing additional materials such as fly ash or slag cement, and chemical admixtures or fibres.

It is necessary to understand the concept, fundamentals, and properties of concrete in order to produce good quality of concrete. Today's concrete is made by using Portland cement, coarse and fine aggregates and water. In order to control its setting properties, admixtures are chemicals which have been added to the concrete mix and used primarily when placing concrete during environmental extremes, such as high or low temperatures, windy conditions, etc. As a brittle material, concrete has a high compressive strength, but a low tensile strength. Thus, reinforcement of concrete normally by using steel is required to allow it to support the tensile stresses (known as reinforced concrete).

These days, ordinary Portland cement concrete is the best choices of the common used materials which are normally used for the construction of various

structures in civil engineering field. For some years afterward before the ordinary Portland cement was found and introduced to construction industries, large quantities of natural cement were used which were produced by burning a naturally occurring mixture of lime and clay. Its properties vary widely due to the use of ingredients from the nature.

According to detailed standards, modern Portland cement has been produced. Some of the compounds found in Portland cement are important to the hydration process and the chemical characteristics of cement. It has been produced by using the heating process of a mixture of limestone and clay in a kiln. The temperature used in heating process is between 1,300° F and 1,500° F. The mix of Portland cement becomes molten up to 30% but the balances remains in solid state will undergo the chemical reactions that can be slow. Eventually, the mix of Portland cement forms a clinker which is then ground into powder. Small proportion of gypsum is added to the mix of Portland cement in order to reduce or slower the rate of hydration and gives extra longer time to the concrete workable.

The use of Portland cement concrete becomes popular in construction field during the time period. This is regarding to most economical cost of materials and construction for concrete structures which is lower than other materials such as steel or polymer that is more expensive materials. It is also one of the options which require small investment for any construction project as well as its low cost of maintenance. Along these lines, it is not surprising if there are a lot of advancement in terms of concrete technology which lead towards the time saving of concrete construction and the durability of concrete itself.

Throughout this chapter, explanation of background study, scope of work, objectives and problem statement of the study will discussed briefly in order to provide the clear view regarding to this research. All the information provided is basically with reference to the trusted sources in that helps a lot to study further more about the related issue.

## 1.2 Background of Study

Concrete is a heterogeneous mixture that consists of four main components which are water, cement, coarse aggregate and also fine aggregate. These entire components play their own important roles as they have been used in concrete mix. In concrete, the water used to plays an important part during the mixing process, laying compaction setting when casting or pouring it in formwork and hardening of concrete along the curing period. Water is only the component that reacts chemically with cement and thus setting and hardening takes place. It is acting as a lubricant for the aggregate and makes the concrete workable. It is also helps to facilitate the spreading of cement over the fine aggregate. The concrete strength is directly depending on the quality of water is used in the concrete mix.

Cement is acting as a binder agent which binding all material used in the cement concrete. This cement ratio used may be vary due to the concrete grade for different engineering works regarding to its strength and durability in handling various load and condition of the concrete structure itself. Cement will fills up the voids that exist in between the aggregates and makes the concrete becomes impermeable. When it mixed with the water, it will provides strength to concrete on setting and hardening where it binds the aggregate into a solid mass by virtue of its properties of setting and hardening stage.

In providing the good quality of concrete, aggregate is used in two size groups in the cement concrete mix where for the fine aggregate (sand), particle size must less than 4.75mm meanwhile the coarse aggregate used the particle size that is bigger than 4.75mm. Generally, fine aggregate like sand consists of small angular or rounded grains of silica which commonly used in the cement concrete. Both natural and artificial sands can be used in concrete mixture. There are various functions of fine aggregate where it is able to fill in the voids exist in the coarse aggregate; it also can reduce the shrinkage and cracking of concrete. For any required strength can be prepared economically by varying the proportion of sand.

In addition, fine aggregate also helps in hardening of cement by allowing the water through its voids. Some practices normally used the fine aggregates according to