CHAPTER 1

INTRODUCTION

1.0 BACKGROUND

The rapid population growth around the world has caused the housing demands to increase rapidly. More infrastructures and buildings are required in order to facilitate the expanding population. This phenomenon has caused the demands on construction materials such as concrete and steel rebar to increase as well. Ghavami (2005) stated that the present energy crisis provoked by the industrial over-growth has resulted in the increasing anxieties about environmental degradation and managing the energy resources still available. The concept of environmentally friendly technology has inspired the researchers to do more in protecting the environment. Therefore, there is an intense on-going search for non-polluting renewable materials which helps to improve the concrete performance.

Concrete is essentially a mixture of cement, aggregates and water. It is widely used in construction industry because all the raw materials required are widely available and are of low cost. Concrete is very strong in compression but it has a very low tensile strength. To improve its tensile strength, various fibres such as steel fibre, glass fibre, natural fibre, and synthetic fibre are also used to improve the properties of concrete, mainly enhancing the tensile strength.

Ghavami (2005) also proposed that the selection of materials especially in this era of industrialization is based mainly on the price, availability and the type of facility used for production or processing. Bamboo appears to meet the requirement as it reaches its full growth in just a few months and reaches its maximum mechanical
resistance in just few years. Bamboo is considerably cheap because according to Ghavami (2005), it is rich in tropical and subtropical regions around the world.

1.1 PROBLEM STATEMENT

Concrete is one of the most commonly used materials in construction around the world. Although it has many advantages including low cost, high availability, low maintenance, high compressive strength and durability, concrete’s low tensile strength requires it to be reinforced with high tensile strength materials. Typically, in the construction industry, steel, in the form of rebar, is used to reinforce concrete, but the cost of rebar in many developing countries including Malaysia is relatively high compared to the average income. Therefore, minimal rebar is often used by developers to reinforce concrete homes and buildings, leading to unsafe structures.

Studies were carried out in order to enhance the concrete’s tensile strength itself in the respect of reducing size of steel rebar to be used to reinforce concrete, while restricting the structure failure. Adding various fibres which possessed high tensile strength into the concrete was found to be a way to enhance the concrete’s tensile strength.

Inspired by a vision of sustainability, bamboo fibre was selected as the additive in this study because bamboo has an economical advantage as it reaches its full growth in just a few months. Moreover, bamboo exists in abundance in Malaysia. Thus, utilizing bamboo fibre as an additive in concrete tends to become a considerable solution to promote safer structure while minimal rebar is used.
1.2 RESEARCH OBJECTIVES

The main aim of this study is to determine the possibility on increasing the flexural strength of conventional concrete by adding various quantities of bamboo fibre as an additive. The other objectives of this study are stated as follow:

i. To determine the workability of the concrete added with bamboo fibre which is 0.5%, 1.0% and 1.5% of mixture volume.

ii. To determine the compressive strength of the concrete added with bamboo fibre which is 0.5%, 1.0% and 1.5% of mixture volume.

iii. To determine the flexural strength of the concrete added with bamboo fibre which is 0.5%, 1.0% and 1.5% of mixture volume.

iv. To compare the workability, compressive and flexural strength between normal concrete and concrete with additive (bamboo fibre)

1.3 SIGNIFICANCE OF STUDY

The adoption of agriculture fibres such as bamboo fibre as an additive in concrete, enhancing concrete’s tensile strength would bring significant impacts to the construction industry. The low tensile strength of concrete is always been a concern whenever the concrete is used. Therefore, introducing bamboo fibre as an additive in concrete to enhance the tensile strength would help to minimize the adoption of steel rebar, as well as reduce the construction cost. In terms of novelty, the success of this study will help to understand the behaviour of the concrete when bamboo fibre is added.

1.4 SCOPE OF WORK

There are several scopes covered in this study, as listed below:

i. The grade 30 concrete are designed using bamboo fibre, crushed granite, river sand, Ordinary Portland cement, and tap water.

ii. The dimensions of cube and beam chosen for compressive test and flexural test are 150 mm x 150 mm x 150 mm and 100 mm x 100 mm x 500 mm respectively. The specimens are tested at the curing age of 7th, 14th and 28th days referencing