CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Steel fiber concrete is one of the special concrete that normal concrete mix with discontinuous discrete steel fiber. There are abundant of small-scale fibers are distribute randomly during the concrete mix (Bandera et al, 2012). The evolution of using steel fibers in the field is to replace and reduce the traditional reinforcement bar in the concrete members (Soetens et al, 2014). Thus steel fiber tend to increase the tensile strength of the concrete by deflecting micro cracks which develop in the concrete under exterior force and load effects (Lee et al, 2010). The lengths of the steel fibers are usually small and short, this is because it wants to avoid inadequate workability of the concrete mixture (Sebaibi et al, 2014).

The objective carry this research is to identify the 2D closed loop of steel fiber that affects the performance of the steel fiber concrete which compare with the normal straight steel fibers (Alan et al, 2013). The challenge of using the straight steel fiber is the fiber may assemble at one location where they cannot function properly which is used as load transfer (Richardson et al, 2013). Since steel fibers consists of weight, during the mix the fibers will tend to stick to the sides in the rotary mixer, as the final result the performance of the steel fiber concrete cannot be greatly increase yet waste of the dosage of the addition. On the other hand the closed loop steel fibers are cast in random layer; this is to make sure the orientation of the steel fiber will not change significantly due to the compaction. The target of using 2D closed loop steel fiber is to increase the performance of the concrete which the fibers able to interlock with the
aggregate in the mix (Daniel et al, 2014). The shapes that used during the research are square closed loop steel fiber.

The addition of the steel fiber to the concrete is normally can increase the compressive strength and tensile strength into 8% to 15% (Gebman, Nd). In additional steel for structural purpose steel fibers should be add as supplements to the reinforcement bars. This is because fibers able to limit the percentage of cracking that due to load, thus it also can improve the resistance to material deterioration due to fatigue, shrinkage and thermal stresses (Bandera et al, 2012).

1.2 BACKGROUND

Concrete is one of the most essential materials that used in construction area. Moreover, it able to cast into desired structural shape from cylindrical to rectangular. However, concrete is good and string in compression, but weak in tension. To overcome this issue, reinforcement bars are added to the concrete (Faxing et al, 2006). Generally by adding reinforcement bar to concrete can typically increase it tensile strength up to 10%. The main bar which is longitudinal bar in the structural elements is to resists tensile stresses that apply to it, while for the bars that wrapped around the longitudinal bar is to resist the shear stresses. Generally the role of using reinforcement bar in the structural elements is good, but it mostly increases the tensile strength (Kang et al, 2011). Nevertheless, the issue of cracks in the reinforced concrete still often occurs nowadays, so that the involvement of fiber in the concrete to overcome this problem. Fiber reinforced concrete is the concrete that mix which consists of short and discrete fibers in it (Aliabdo et al, 2013). The amount of the fibers that usually added to the concrete mix is calculated in percentages form from the total volume of the concrete we need (Ali et al, 2013).

Besides that, there include many type of fibers such as steel fibers, polypropylene fibers, glass fibers, and slurry infiltrated fiber (Wafa, Nd). However for the steel fibers, they are normally classified based on their manufacturing process. There contain different shape of steel fibers such as straight, hooked, paddled, deformed, crimped and irregular (Kaikea et al, 2014). The addition of these steel fibers will not
significantly improve the compressive strength; merely it will increase the tensile strength and ductility. The most important of adding these steel fibers, they can increase the ability of withstanding after cracking and shear resistance (Neves et al, 2005).

1.3 PROBLEM STATEMENT

The increasing of urbanization and improvement of the developed and developing countries increased the demand of the cement. This is because concrete is the most generally used material in the world. Generally, concrete can be described as the composite material that composed form a coarse granular substances that embedded in a matrix of cement that occupy the space between the particles which glue them together. Although concrete is a widely used materials, it was consider a brittle materials with low tensile strength in nature (Shah et al, 2011). As the revolution and improvement of concrete characteristics was adding reinforcement bar which allow it improves the tensile strength and strain capacity. Reinforcement bar had finally become the alternative materials that to encounter the bending problem in the concrete. However, reinforcement bar may increase the load and dimension of the concrete, fibers were introduced to overcome the problem (Uygungolu, 2011). There many types of fibers such as steel, glass, organic and etc. (Soylev, 2014).

Besides that, there is present of many types of effect on the concrete for example segregation, honey comb and microcracks (Soetens et al, 2014). The present of the effect will lead to structural defect. So the improvement of the concrete is to solve the present issues in the hardened concrete.

According to researchers, hooked end steel fiber is the better fiber among the steel fiber that available (Soetens et al, 2014). However, during the mix proportion the orientation of the steel fibers are added randomly to the mix. The location of the steel fibers will not locate the design location due to its strip shape that able to allow it to pass through easily between the spaces of the coarse aggregate. In this study, 2D closed steel fibers are used to overcome the issue. During this research, compressive test for cube as well as flexural test for beam are tested and compare between normal concrete and steel fiber concrete.