CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Reinforced concrete is a structural material that widely used in all over the world due to its desirable mechanical properties. Reinforced concrete structure is the rigid structure that made up of cement and stone aggregate mixture with the addition of water and embedded steel bars, plates, or fibres that strengthen the material. The structures are of varying quality and function, but they are all ageing and deteriorating over time and the structure may also, for a variety of reasons, be found to perform unsatisfactorily.

This could manifest itself by poor performance under service loading in the form of excessive deflections and cracking, or there could be inadequate ultimate strength. In the present economic climate, the strengthening of existing concrete structures to carry higher permissible loads, seem to be a more attractive alternative to demolishing and rebuilding. Therefore, there is a need for upgrading or strengthening the structures to bring them back to their originally or better intended service mode (D.N. Shinde, Pudale Yojana M, Nair Veena V, 2014).

Therefore, throughout this chapter, the background, problem statements, objectives, scopes and significance of this study on the hemp fibres which serve as strengthening material to flexural strengthen the beam will be clarified to give the basic overview for this entire study.
1.2 BACKGROUND OF STUDY

The strengthening and repair or rehabilitation of reinforced concrete members either for increase the service life or for their restoration is becoming a common trend (Grantham, Basheer, Magee & Soutsos, n.d.). Structural deterioration caused by exposure to adverse environmental conditions, overloading, usage of poor quality construction materials, faulty design practices and others related factors are the reason why repair and rehabilitation of the existing structures becoming a very universal constructional practice as the cost and environmental impact for repair or upgrade the structure by retrofitting is relative lower than full structural replacement. Repair/retrofit methods can helps to reduce maintenance requirements, increase life safety and the entire service life of concrete structures (Sen & Reddy, 2014).

Besides improving the strength of the structure, it is to be bear in mind that the chosen retrofitting material should has the ability to cause of sustainability and a better quality for example these materials should not bring negative impact to the environment and endanger bio reserves. Carbon fibre composites and glass fibre composites are most frequently used as retrofitting material in previous retrofitting field applications because of their high tensile strength properties. There is very little work being imparted in improving structures using natural fibres.

The application of composites in structural facility is more concentrated on enhancing the strength of structure instead the issue of sustainability of these raw materials used for strengthening purposes. The need for strengthening’s raw materials that would satisfy the demand on the world market is rapidly growing in an expanding world population and with the increase of the purchasing potentials. In times when we cannot expect the fibre reinforced polymer prices to come down, with the consumption growing day by day (Sen & Jagannatha Reddy, 2013).

Therefore, a new cheaper material that offer equal or better properties and have enhancement in structural improvement should be developed and used for structural strengthening. Fibres which are basically bio-fibres have reported good performances by various researchers (Dhawan, Singh & Singh, 2013, Mathur, 2006). The natural fibre such as hemp fibre have excellent potential to be strengthening materials as it is one of the strongest and durable natural fibres. It also holds its shape having one of the lowest
percent elongations of any natural fibre and has the best ratio of heat capacity of all fibres giving it superior insulation properties. Furthermore, they can be recycled, can be grown ecologically and have no waste disposal problems (Binhaitimes.com, 2015).

Here an attempt is made to study the possibilities of using hemp fibre in field of structural retrofitting and strengthening which not only tries to improve the flexural strength but also would address various environmental issues associated with the use of natural products over synthetic products.

1.3 PROBLEM STATEMENT

Under the rapid industrialization, the reinforced concrete was widely used as structural materials due to its greater compressive and tensile strength. It has a relatively low cost compare to other material such as steel and it also provides long service life with low maintenance cost. However, during the service life, these structures are often subjected to impact loads from external surrounding, causing the service life of structures become shorten. These structures need an adequate fatigue flexural strength and energy absorption capacity. Therefore, a lot of repair or retrofit method was introduced in or on the reinforced concrete structure to enhance the performance of structure. This study presents an experimental study on suitability of the natural fibre, hemp fibre as a strengthening material in enhance the flexural strength of the reinforced concrete beam.

1.4 OBJECTIVES

The objectives of this study include:

- To examine the effectiveness and suitability of hemp fibre in enhancing the flexural strength of concrete beams
- To study the failure modes and load deflection behaviour of RC beams bonded externally with hemp fibre
- To compare the different method of applying hemp fibre i.e. U wrapping, sides wrapping and bottom wrapping scheme