CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Concrete is relatively weak in tension but strong in compression so that it is a common practice to embed steel reinforcement in concrete structure as steel reinforcement can resist tensile loads to improve the mechanical properties of concrete. Thus, the combination of concrete and reinforcement common practice and mainly used of reinforced prestressed concrete in the construction of structures and infrastructures from the beginning of the twentieth century. The component of reinforced concrete consist cement, aggregates, water, sand, mineral additions, and steel reinforcement.

Reinforced concrete (RC) could be presumed as a durable construction material with nearly maintenance-free under normal conditions and designed to meet the requirement relating durability, safety, aesthetics, and serviceability. Besides that, the life span of reinforced concrete structures is predicted to have a life of more than hundred years. However, some of reinforced concrete structures have deteriorated excessively within 10 years due to aggressive environmental conditions. This led to several researches investigate and evaluate coating methods to prevent corrosion on the steel reinforcement.

However, coating reinforcement also may help effect toward the beam behaviour itself. Therefore, this chapter will discuss the background of study, problem statements, objectives, scopes and research significance. It will focus on the topics of flexural behaviour of reinforced concrete beam with variation of coated reinforcement.
1.2 BACKGROUND OF STUDY

Reinforcement corrosion has been identified as the dominant reasons for deterioration of reinforced concrete structures especially for those exposed to an oceanic environment, leading to premature failures prior the attainment of their design life. The corrosion reaction occurs due to chloride diffusion, presence of oxygen and water and carbonation to the embedded steel reinforcing bars in concrete. As stated by Rodriguez et al. (1997), more than 100 billion dollars are spent on the maintenance and repair of premature degradation of reinforced concrete structures due to corrosion of steel reinforcement on every year. In Canada, the cost of repairing the corrosion deterioration of reinforced concrete structures is about $74 billion (Pei, 2015).

As reported by (Selvaraj, Selvaraj, & Iyer, 2009), deterioration of concrete structures is a major issue due to corrosion of steel reinforcement and such a situation can be precluded to some extent by

i. Using addition of inhibitive admixtures
ii. Applying a exterior protective coating on the surface of concrete
iii. Increasing the cover thickness
iv. Implementing cathodic protection
v. Coating the steel reinforcement embedded in concrete

From the perspective of economic and technical statement, coating on the steel reinforcement is most feasible, effective barrier as corrosion protective and cost-saving benefit among the corrosion protection methods (Selvaraj, Selvaraj, & Iyer, 2009). Coating materials for steel reinforcement are available over the world such as epoxy coatings, acrylic latex coatings, vinyl, polymer cement inhibitor coating, chlorinated rubber and polyurethane coatings. There are several experimental testing methods to evaluate the performance of coatings used for mitigation the corrosion of steel reinforcement in reinforced concrete structure such as surface characterization, pull out test, visual inspection, and electrochemical measurement.
This paper research discusses the flexural behaviour of reinforced concrete beam with variation of coated reinforcement such as epoxy coatings, acrylic coatings and natural latex coatings. It has been widely reported that epoxy-coated have been applied in steel reinforcement’s surface to prevent corrosion of steel reinforcement on reinforced concrete structures since the 1970’s.

One of the main obstacles encountered in the application of epoxy coated reinforcement is cracking of the coating at bar bends and damage during transportation and handling process (David G.Manning, 1996). The utilization of acrylic and natural latex used as polymer reinforcement coating have been devised to strengthen the reinforcing steel by mitigate the corrosion of reinforcing steel in concrete. The application of natural latex to steel reinforcement create a physical barriers to protect the steel reinforcement embedded in the concrete, as well as its safety, cheapness and hygienic properties due to freedom of organic solvent (Wang et al., 1998).

1.3 PROBLEM STATEMENT

Reinforced concrete is one of the principal building materials in which concrete behaves as a brittle material with low tensile strength and durability and generally embedded steel reinforcement in concrete to improve its mechanical properties. The widespread use of reinforced and prestressed concrete became common practice in the construction of structures from the beginning of the twentieth century.

Besides that, fiber reinforced polymer bars have been invested as an alternative used in construction industry instead of using steel reinforced bars. Nevertheless, application of fibre reinforced bars has limited success within construction industry due to the high capital cost and the requisite to change design methodologies (Pei, 2015). Therefore, steel reinforcement continues to be most widely produced reinforcing material for concrete structures.