CHAPTER I

INTRODUCTION

1.1 Overview:

Oceans make up 80 percent of the surface of our planet. Human earliest uses of ocean were for navigating and fishing, however pressures of the growing world population and a corresponding demand for resource is rapidly extending the sphere of a wide variety of man activities to the continental shelves.

Foundations, piers and retaining walls for sea structures are generally made of ordinary Portland cement concrete. Undoubtedly, most sea structures of the future would continue to be made from Portland cement concrete. This is because in the context of the aggressive nature of sea water, concrete is not only the most economic structural material, but also is the most durable.

The deterioration of concrete structures in marine environment may be brought by the single or combined agencies of physical and chemical corrosion. So far, chloride-induced corrosion of reinforcing steel is widely accepted as the primary cause of deterioration in concrete structures (Brown, 1980). In addition, chloride induced corrosion is the major type of corrosion encountered in reinforced concrete in marine conditions. The service life model based on this type of deterioration process can usually be subdivided into two parts: (i) the initiation period and (ii) the propagation period. During the initiation period, the service lifetime is fully effective and the structure does not deteriorate at all. On the other hand, during the propagation period, the service lifetime loses its effectiveness and the deterioration sets in. Normally, the end of service life is defined as the end of initiation phrase. However, for the application of the model, a propagation period is sometimes considered and in this case, the service life is defined as the appearance of first cracking.

Furthermore, the challenge of the civil engineering community in future will be to execute projects in harmony with the nature using the concept for sustainable development involving the use of high performance, economic friendly materials produces at reasonable cost with the lowest possible environment impact. In recent years, many researchers have established the use of supplementary materials such as fly ash, blast furnace slag, silica fume, rice husk ash which can improve the various properties in fresh and hardened concrete as well as decrease the rise in construction cost. The focus in the current study is also making an assessment and investigation of different Portland cement replacement levels with fly ash and rice husk ash on the durability properties of plain cement.

1.2 Scope of this work:

The philosophy of the current study has been to the computing of a practical and usable service life model for reinforced concrete structures exposed to sea water in Thailand and Vietnamese marine environment.

The scope of the current study is as follows:

1. Consider the local chloride conditions and temperature conditions as the local environmental actions on the concrete structures.

2. The service life model is governed by the reinforcement corrosion caused by only chloride ingress.

3. Consider pozzolan rice husk ash, fly ash and ordinary Portland cement as material parameter in model.

4. Consider the initial phase as the main phase in the life time of concrete structure and take into account the propagation phase as the application of the model.

5. Use accelerated experiments as the testing method.

1.3 Research objectives:

The current study consists of two main tasks, with mostly relating to investigate and improve the durability of reinforced concrete structures exposed to sea water.

The key objectives of the current study are two folds:

1. Study the effect of pozzolan fly ash, rice husk ash, and the triple blend of ordinary Portland cement, fly ash and rice husk ash on the chloride resistance of concrete structures by investigating the value of chloride diffusion coefficient.

2. Compute the practical service life model for certain concrete structures submerged marine environment of Thailand and Vietnam by considering the initial phase as the main phase and the propagation phase as the application phase and the chloride concentration in local sea water as the input environmental parameter.