

# CHAPTER 1

## Introduction

### 1.1 General

Steel has been used in structures ranging from single storey industrial buildings to landmark skyscrapers and long span buildings, short span girder bridges to long span suspension bridges, support for water tanks to electricity pylons, guyed masts and telecommunication towers. There are significant advantages of steel over other materials, such as, higher strength to weight ratio leading to lighter structure, inherent quality control from raw materials to finished product, prefabrication, greater quality control and reliability, minimum disruption to activities on site, speedy construction, no formwork required, no delays due to slow strength gain, dry construction, easier to demolish and recyclable. Main disadvantages are the reduced life time of the structure due to corrosion and loss of area and stiffness of the members.

Steel is defined in BS EN 10020[1]-definition and classification of grades of steel as a material that contains by weight more iron than any other single element, having carbon content generally less than 2% and containing other elements. Steel is an alloy of iron, carbon and other elements, some of which are added deliberately to achieve certain properties. Steel is produced by refining molten iron, removing impurities and adding of alloying elements. The process is carried out in an oxygen converter. This yields low impurity steel from molten iron at high rates of productivity.

Different methods could be implemented to reduce corrosion of steel structure. That should be at the beginning of the design and detailing stage. The environmental corrosivity category should be defined at the design stage and appropriate steel detailing should be done avoiding water stagnating places etc. Steel surface should be identified and surface preparation should be done accordingly to achieve standard surface grades before applying a paint system.

### 1.2 Objectives

The main objective of the research is to introduce an effective corrosion control

system to Sri Lanka. This objective is sub divided into three sub objectives.

1. Identification of corrosion categories within Sri Lanka and locate the atmospheric corrosive categories on a map of Sri Lanka.
2. Introduce a surface preparation system for structural steel which can be used at any location of the country.
3. Identification of suitable applications of surface protection for structural steel (as primer/ final paint).

### **1.3 Methodology**

1. A detailed literature review is carried out for collecting the variation of factors affecting corrosion parameters such as temperature, rainfall, marine environment and industrial zones.
2. Collect data to be imposed on to the Sri Lanka map to identify the critical zones of the country which are vulnerable to corrosion.
3. Collect data from industries regarding existing corrosion protection methods and carry out the field survey of different locations of the country to identify the corrosion pattern of the structures.
4. Collect data for primer and paint application from paint suppliers and steel fabricators.

### **1.4 Outline of the report**

The usage of steel, objective of this study, methodology and scope are presented in the first chapter. The next chapter describes the basics of corrosion and methods of reducing of rate of corrosion. Surface preparations methods, the relevant standard, their advantages and disadvantages are discussed in the chapter 3 in the context of achieve the second objective of this study. While discussed in the chapter 4 in the context of study existing coating methods, advantages and disadvantages are achieved the third objective of this study. Chapter 5 discusses environmental corrosivity category and the factors affecting the rate of corrosion in achieved the first objective of this thesis. Several different steel structures under different corrosivity category are compared in chapter 6. Recommendations, conclusions and future work are presented in the final chapter.