学　位　論　文　内　容　の　要　旨

博士の専攻分野の名称　　博士（工学）　　氏名　CHEA BUNYA

学　位　論　文　題　名

Study on Corrosive Resistance of Bare, Painted, and Hot-Dip Galvanized Structural Steel in Thailand
(タイにおける塗装および溶融亜鉛めっき構造用鋼材の腐食抵抗性に関する研究)

Developed countries have had a lot of trouble lately maintaining some structures, particularly steel structures. Many steel structures were built during the country's developing stage without taking maintenance costs, good coating systems, or sustainable materials with low maintenance costs into account. As a result, it is recommended to employ durable materials like hot-dip galvanized steel more frequently. The most difficult problem for steel construction is corrosion. The many environmental circumstances in Thailand, such as marine, industrial, urban, or rural zones, influence the corrosion rate at varying rates. Nonetheless, knowledge regarding how various coated structural steel types perform in those varied environments is still limited.

This study examined the effects of atmospheric parameters and environmental pollutants on coated structural steel across Thailand. For this study, two steel grades—SS400 and SM490A—with six different coating types were used. Based on ASTM standards, 19 test sites representing a variety of Thai atmospheric conditions were selected. Additionally, of those 19 locations, 7 have established environmental parameter-collecting data stations, with the remaining locations utilizing meteorological data collected from meteorological authorities to fill in the gaps. The exposed specimens were collected to be analyzed after being exposed for a determined period of time in order to determine the thickness loss of the steel, the changing appearance, and the assessment of the painted steel using ASTM and ISO standards.

To adequately inform consumers or designers, thickness loss data for the test sites alone is insufficient. Since construction might occur anywhere in the country under a variety of environmental circumstances, a corrosion map is required. A huge number of test locations are needed to cover the entire nation, which is made up of various zones of atmospheric and environmental behaviors. A significant source of information for predicting corrosion rates and managing atmospheric corrosion risk is the atmospheric corrosivity map. A corrosion map in Thailand that shows the thickness loss value ranges for HDG steel and bare steel with two steel grades, SS400 and SM490A, has not been developed yet. It needs to be created. More sites with data on atmospheric factors and environmental pollutants are needed to improve the accuracy of the corrosion map. In order to produce a corrosivity heat map, additional data points must be added to the map by gathering information at the designated places from the meteorological authority. To obtain more information when the number of on-site test locations is limited, dose response models must be investigated and developed. The dose-response function is an empirical relationship equation that relates contaminants and atmospheric conditions to the steel's rate of corrosion.

Although some researchers have attempted to conduct atmospheric tests over longer time periods, such

as three, or five years, the behavior cannot yet be sufficiently understood for longer time periods, such as 20, or 25 years. The majority of atmospheric exposure tests have been conducted over short time periods. The thickness loss amount for the subsequent years can be inferred from the first year. A good prediction model can be used to forecast thickness loss, which helps anticipate corrosive behavior in a given environment. Researchers and designers can estimate the thickness loss of steel without requiring a long-period experiment by using the projection of thickness loss for both bare steel and HDG steel. The research's findings provide a guide for choosing between hot-dip galvanizing and painting for corrosion protection, along with information on the corrosion rate and the effectiveness of hot-dip galvanized, and painted steel in different regions of Thailand. Users can obtain the relevant information regarding the thickness loss of HDG and bare steel throughout the corrosivity map. Users and designers can utilize the corrosivity maps to determine the thickness loss value at the site of their intended building. They have two options: either they can reserve thickness loss for the structure's intended year life, or they can estimate the structure's year life using the permitted thickness loss.