TECHNICAL ARTICLE

CORROSION IN CONCRETE STRUCTURES IN THE TROPICS

Kuan You Wai[1,*]
[1]PKN Building Solution Sdn Bhd, Unit 17.2, Level 17, Wisma Sunway, 40100 Shah Alam, Selangor, Malaysia
[*]*kuanyouwai@gmail.com*

1. Introduction

Being in the Tropics, Malaysia enjoys abundant rain fall and sunshine. Such climate has supported vast green vegetation and lush greenery. Global urbanization and economic activities since the 70s have brought about greenhouse effects with increase in intensity and frequency of tropical cyclones in our region. Besides, increased emission of industrial and vehicular combustion increases the acidity of rainwater and other environmental pollutants also accelerate the dilapidation of our buildings. Such climate and industrial progress have brought about threats to the concrete structures silently in the Tropics. Nevertheless, the awareness of the adverse impact to the concrete structures is still in its infancy among the general public and engineering community. Recent scientific studies revealed that concrete structures which are commonly regarded for as being strong, robust and maintenance free suffer from accelerated dilapidation and disintegration due to the worsening greenhouse effect and environmental pollution. This is further exacerbated with increase in exposure to excessive dampness.

Figure 1 *Bare concrete surfaces of a bridge with excessive dampness*

"BS EN1504 Products and systems for the protection and repair of concrete structures" is the standard developed based on substantial scientific efforts in concrete diagnosis, repair and rehabilitation. It was enforced in European countries and implemented since 2011. It is also the standard recommended by the Ministry of Urban Wellbeing, Housing and Local Government for the diagnosis and maintenance of concrete structures in stratified buildings in Malaysia.

It contains holistic and scientific recommendations in diagnosis of concrete structures and eleven (11) principles in concrete repair and maintenance including the mitigation and remedies in loss of concrete strength and control of corrosion on the reinforcement steel bars (rebars). The focus of this article is mainly on the corrosion of rebars only.

Reinforcement steel bars and concrete mix work synergistically due to identical coefficient of thermal

Figure 2 *A flyer from Ministry of Urban Wellbeing, Housing and Local Government in Maintenance of Stratified Building*

2. Main Causes of Deterioration of Concrete Structures

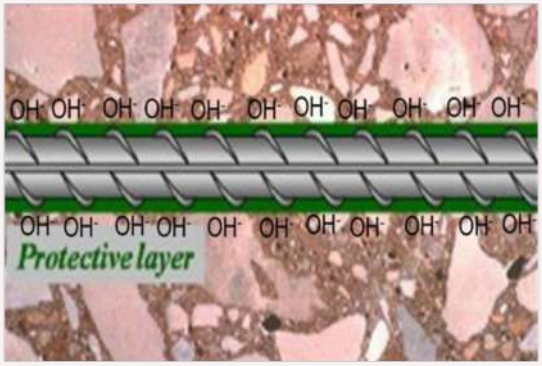

Figure 3 *Passive protective layer of OH^- due to high level of alkalinity of concrete mix*
Source:https://larissacglima.wordpress.com/2014/12/11/corrosion-of-steel-rebars-in-concrete/

expansion (Portland cement concrete at 8 to 12 microstrains/°C, rebar at 11.3 microstrains/°C) [1]. Nevertheless, little is known that the high level of alkalinity of concrete (pH 12 to 13) due to the large amount of calcium and small amount of sodium and potassium ions also provides a passive protective film to the rebars against corrosion. This layer, which is self-generated soon after the hydration of cement has started, consist of Fe_2O_3 adhering tightly to the rebars [2].