



Bond between Steel Reinforcement Bars and Seawater Concrete

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Abstract

In order to promote sustainable development in the remote islands this present research attempted to study the suitability of seawater, that available abundantly surrounding the remote islands with Portland composite cement (PCC) and crushed river stones to produce concrete. This research aims to utilize seawater, and Portland composite cement (PCC) to produce high-performance concrete in order to eliminate the main problems of clean water shortage in the low land areas and the remote islands. Infrastructure development can be sustained through the effective use of natural available local materials on the remote islands. The method used in this research is an experimental method in the laboratory. Two variations of concrete were made using freshwater and seawater, respectively as a mixing material with a water to cement ratio (w/c) of 0.55. The evaluation result on concrete compressive strength and bond strength of seawater concrete were discussed. Experimental results showed the compressive strength of the seawater concrete is lower by 6.26% as compared to the normal concrete at water-cement ratio (w/c) of 0.55. In addition, the bonding strength of steel bar embedded in seawater concrete is lower by 4.34% as compared to the bonding strength of steel bar embedded in normal concrete at water-cement ratio (w/c) of 0.55.

Keywords: Seawater Concrete; Normal Concrete; Portland Composite Cement; Compressive Strength; Bond Strength.

1. Introduction

Indonesia is an archipelagic country in the sense that at every location, there are buildings located on the coastal areas and remote islands. Hence the process of constructing buildings on the coastal areas and remote islands, have the high tendency to contact with seawater which is inevitable, coupled with the limited supply of freshwater to the construction site, therefore making use of seawater for concrete work is an interesting innovation. One important aspect of reinforced concrete is the compressive strength of concrete, the bonding strength of steel reinforcement to concrete, and the water cement ratio in concrete structures exposed in coastal areas.

Portland composite cement is one of the newest blended cement types that contain fly ash. Currently, Portland composite cement has been widely used in concrete construction in Indonesia. Several studies revealed that seawater and Portland composite cement can be used to produce high performance concrete [1-4].

A previous study on the bond strength of steel reinforcement to concrete with regard to cement water factors was conducted by Hwan and Kim (2007) [5], with purpose to propose a realistic model for bond tension-slip relationships. Another research based on bonding strength was conducted by Yalciner et al. (2012) [6], where the bond strength due to the un-corroded influence and the corrosive influence between reinforcement and concrete were studied in an experimental series. The purpose of the research conducted by Diab et al. (2014) [7] was to assess bond tension of the

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