



The Effectiveness of Fly Ash as a Substitute of Cement For Marine Concrete

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Abstract

The purpose of this research is to know the effectiveness of fly ash waste in marine concrete related to the average compressive strength to be used as a substitute for cement. The test is done for concrete base material, namely: coarse aggregate (gravel), fine aggregate (sand), fly ash, cement (PC = Portland Cement), water and additional material (superplasticizer). 10 cylinders were given each treatment with (0 %, 10 %, 20 %, 25 %) percentage of fly ash addition. The samples then soaked for 26 days in seawater. At 28th day, the sample was subjected to a compression test. Based on the results of analysis and discussion, then obtained: (1) The use of 10% fly ash amount will produce the biggest compressive strength $f_c - mean = 65.84$ MPa; (2) When compared with the average compressive strength, the sample without using fly ash (0 %) has compressive power 62.02 MPa and 6.16 % increase in average compressive strength on the addition of 10 % fly ash 65.84 MPa, but in addition to 20 % fly ash there was a decrease of 9.13 % (56.36 MPa) and in addition of 25 % fly ash the average compressive strength decrease to 22.49 % (48.07 MPa).

Keywords: Fly Ash; Marine Concrete; Compressive Strength Value; Cement's Substitute.

1. Introduction

At this time, humans are never far from concrete buildings. In the field of civil engineering, concrete structures are used to construct foundations, columns, beams, plates or shell plates. All structures in civil engineering will use concrete, at least in the foundation work [1]. The term 'Marine Concrete' (MC) is reserved for concrete materials for structures in coastal areas with extreme conditions [2]. Many civil engineering buildings in the suburbs, for example, docks and retaining walls of sea waves. It is hoped that the utilization of fly ash waste will be able to answer the demand of "market" (which represent the world of construction) for ready-mix concrete demand for the more economical price but with maintained quality [3]. The purpose of this research is to know how many percentages of fly ash waste usage as the most optimum cement's substitute to produce higher compressive strength in the marine concrete making. From this research, it can be known how much the effectiveness of the use of fly ash as a substitute for cement from marine concrete, in view of the compressive strength of the concrete.

2. Literature Review

Concrete is made with coarse aggregate, fine aggregate (sand), Portland cement, water and, selected admixtures such as fly ash, air-entraining agents, water-reducing agents, retarders, etc. [4]. Each constituent affects the characteristics of the concrete and must be controlled in accordance with the desired composition and quantity of concrete if the final product is within the limits of uniformity, workability, and strength desired [5]. Typically, in concrete, rough aggregates and sand will occupy about 80 percent of the total volume of the final mixture. The amount of cement depends mainly on the volume of aggregates in the concrete mix [6]. Specifications for the fine aggregate fraction of concrete have been

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