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Experimental Evaluation of Eco-friendly Light Weight Concrete with Optimal Level of Rice Husk Ash Replacement

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Abstract

Concrete is a versatile and cost-effective building material whose properties are influenced by age, curing condition, and installation. A number of studies deduced that there should be an association of benefits encouraged the use of partial replacements of cement seems to improve strength and durability properties of concrete. This paper presents a framework for feasibility assessment and determination of optimum percentage of rice husk ash (RHA) replacement. Five mix plans with RHA replacing ratio of 0-20% and constant micro- silica value by 10% were prepared. Tests results indicated that compressive strength increased by 20% with an increase in RHA up to 15%. The similar trend was observed in mix designs made of cement replaced by RHA up to 20% in water absorption coefficient measurement. Higher chloride ion penetration was observed in mix designs containing 25% RHA compared to that of conventional concrete. Mixes developed a slightly higher impact resistance than the control mix.

Keywords: Rice Husk Ash; Micro-Silica; Lightweight Concrete; Compressive and Durability Properties.

1. Introduction

Today, construction industry encountered host of problems mostly concerned with associated environmental warnings, disposal of wastes, and depletion of natural resources. There has been a nominal decrease in the availability of quality natural aggregates especially in the last 15 years has compelled authorities in some countries to put a series of restrictions on natural aggregates extraction and utilization [1]. A significant amount of carbon dioxide (CO2) and other greenhouse gases (GHGs) release into the atmosphere by the production of Ordinary Portland Cement [2]. It is estimated that approximately one ton of carbon dioxide is generated in production of one ton Portland cement [3, 4]. The maintenance and improvement of living conditions requires a particular focus on ecology and environmental protection worldwide [5].

Over the last twenty years, the observed values of by-products have encouraged a number of researches concerned substituent materials to have a cleaner production. Eco-friendly materials using renewable and local resources are in full development [6]. These include industrial (steel slag, copper slag, waste iron, fly ash, lime stone, pond ash, etc.) and agricultural by products (hemp shives, flax, reed, expanded cork, natural wood, rice husk ash, etc.). The waste utilized as cement replacement include minerals derived from other production processes. Cement replacement materials include

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