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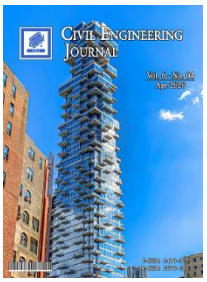

Effect of Fly Ash and Un-crushed Coarse Aggregates on Characteristics of SCC

Muneeb Ayoub Memon [a*], Noor Ahmed Memon [a], Bashir Ahmed Memon [a]

[a] *Civil Engineering Department, Quaid-e-Awam University of Engineering Science & Technology Nawabshah, Sindh, Pakistan.*

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Abstract

This research paper discusses the change in the workability and strength characteristics of Self Compacting Concrete (SCC) due to addition of fly-ash and use of un-crushed Coarse Aggregate (CA). Laboratory based experimental work was carried out by preparing 12 SCC mixtures among which six mixtures contained crushed aggregate and other six mixtures contained un-crushed coarse aggregate. A total of 550 kg/m^3 binder content and fixed Water-Binder (W/B) ratio as 0.35 were used. Two mixtures were controlled by using Portland Cement (PC) and other ten mixtures contained PC and Fly Ash (FA). Slump flow time, slump flow diameter and J-ring height tests were conducted to study the fresh properties of SCC. Furthermore, compressive strength was calculated at 7, 14 and 28 days of curing. The outcomes indicated that the slump flow time, slump flow diameter and J-Ring height for all the mixes are within the limits specified by EFNARC guidelines. The compressive strength of SCCs depends upon dosage of fly ash. Compressive strength for SCCs with crushed CA was better than obtained in case of un-crushed CA. The maximum compressive-strengths were observed as 64.58 MPa and 58.05 MPa for SCC with crushed and un-crushed CA respectively.

Keywords: Self-Compacting Concrete; SCC; Fly Ash; Un-crushed Coarse Aggregates; Fresh Properties; Compressive Strength.

1. Introduction

Compaction at narrow places is one of the major problems observed in reinforced concrete construction. However, the SCC is the best option in such situations. SCC is the one that flows through its own weight and hence is very effective in pouring at heavily-reinforced, narrow and deep sections without any vibrational efforts required [1-3]. SCC is the mixture of cement, aggregates, water, admixtures and some mineral additives analogous to the normal concrete. Unlike normal concrete, SCC requires more amount of fillers materials and Super Plasticizers (SP) to give better strength and workability. SCC results in reduction of labour work and also economizes the cost of concreting [4-8]. High quantity of fine-materials such as fly-ash is utilized for acquiring required workability to SCC. This also reduces the issue of segregation and bleeding while transportation and placement of concrete. Many researchers concerned with environmental conservation have criticized the use of cement as a binding material.

Since the demand of cement in concrete production is amplified, it has caused resource depletion, environmental damages and huge amount of carbon-dioxide (CO_2) emission during cement manufacturing process [9]. This has made serious concern of the practitioners and researchers to bring alternative materials of cement such as fly ash. These types of materials are considered safer for emitting. Thus, investigating symbolic properties of these waste materials open new possibilities for concrete development [10]. Use of such waste material in concrete is also very useful in enhancing the properties of concrete and also enhancing durability values [11–14]. Hence, this study has focused to

* Corresponding author: engr.muneebmemon@gmail.com

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