

The Effect of Ceramic Powder on Compacting Concrete

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Abstract : Concrete technology is advanced through time, and self-compacting concrete is one among many advancements in the concrete industry. The high powder content of self-compacting concrete (SCC) mixtures is needed to maintain adequate stability/cohesion of the mixture and thus improve segregation. It is not ideal to use high cement content to satisfy the need for high powder, as it will increase the cost and have other adverse effects on concrete properties. The main objective of the study is to investigate WCP pozzolanic characteristics and evaluate SCC properties by partially replacing cement with 5%, 10%, 15% and 20% WCP. Two experimental stages are involved in the study. The effect of using WCP on the fresh and hardened properties of SCC is investigated in the second stage, then the optimum waste ceramic powder percentage is selected. ASTM C-618 standard is used to evaluate the pozzolanic property of the WCP. Based on the standard, the WCP is classified as Class-N pozzolanic material. The WCP is distinguished by the size and chemical composition of its fine particles, which are primarily SiO_2 and Al_2O_3 . 15% WCP fulfills flow-ability, filling-ability, passing-ability and segregation resistance of the fresh properties of the SCC. 20% replacement of WCP doesn't satisfy the flow-ability of the SCC which is 540mm by slump flow test. 10% of WCP incorporation gives satisfactory hardened properties of SCC. The 10% replacement is the optimum percentage replacement which satisfies both the fresh and hardened properties of the SCC. Therefore, the outcome of the investigation indicates WCP is a very strong candidate to be used as cement replacing material to manufacture SCC effectively with satisfied fresh and hardened concrete properties.

Keywords : self-compacting concrete (SCC), waste ceramic powder (WCP), pozzolanic property, segregation

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