

Effect of Superplasticizer on the Workability of Recycled Plastic Aggregate Concrete

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Globally, the widespread accumulation of plastic waste causes serious environmental issues. Its detrimental impact extends to human health, marine life, and flora & fauna. Currently, researchers are exploring the potential use of plastic aggregate concrete (PAC) in construction applications to mitigate waste problems and natural coarse aggregates (NCA) scarcity. More investigation on the uniform distribution of plastic coarse aggregates (PCA) in PAC is essential for real-world application. In this study, an optimum replacement level of 20% of NCA was replaced with PCA in both normal (NSC) and high (HSC) strength concrete and their workability performances were compared with conventional concrete. Here, the targeted normal and high strength were 30 MPa and 65 MPa, respectively. The main motive of this study is to observe the influence of superplasticizer (SP) on the workability performance of PAC and to assess the homogeneity of PCA in concrete. Plastobuild ES type SP and Masterglenium SKY 8233 type SP were utilized in NSC and HSC, respectively. In NSC, the workability of PAC exhibited a significant reduction of about 42% when 20% of NCA was replaced with PCA. It was attributed to irregular shape and sharp edges of PCA. The dosage of 300 ml per 100 kg of cement of SP enhanced the slump of NSC from 55 mm to 170 mm, without any segregation. Here, hand compaction ensured consistent distribution of PCAs within the concrete specimens. In HSC with SP, substituting 20% of PCA had minimal impact on the workability. Here, as the SP increased the workability (~230mm), some of the PCA tended to float to the top surface of the concrete when hand compaction was applied. Further, compaction using the vibrating table increased the number of PCA that float to the top surface. In summary, the dosage of SP should be limited, and appropriate compaction should be given to maintain the homogeneity of PAC.

Keywords: Plastic Aggregate Concrete, Superplasticizer, Workability

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