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Incorporation of high-volume fly ash waste and high-volume recycled alumina waste in the production of self-consolidating concrete

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Abstract

In this article, we considered the properties of self-consolidating concrete (SCC) into which both high-volume fly ash waste (FA) and high-volume recycled alumina waste (AW) were incorporated. FA was used as a cement substitution at 40% and 60%, and AW was used as a substitute for fine aggregate at 25%, 50%, 75%, and 100 %wt. The SCC blends were designed with the intention of creating a controlled flowing slump. In this study, the workability and mechanical properties of the blends were investigated by utilizing slump flow, J-ring flow behavior, blocking flow evaluation, V-funnel, compressive strength, and ultrasonic pulse velocity (UPV) estimations. The findings show that, compared with SCC without AW, the SCC blends that included AW required increased doses of superplasticizer and produced denser fresh concrete. With the increased cement content and altered FA content, the percentage of superplasticizer required and thickness of the fresh SCC decreased. When AW was incorporated at between 25%-75%, its rheological and mechanical benefits

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