

MODELING OF FILLING ABILITY AND MIX DESIGN OF SELF-COMPACTING CONCRETE

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ABSTRACT: Filling ability of SCC is defined as the ability to fill spaces in formwork and encapsulate reinforcing bars only through the self-weight of the concrete. To cope with satisfactory filling ability, three main mechanisms, deformability, segregation resistance and passing ability, must be concerned. So, a combined theoretical and empirical approach for SCC mix proportioning based on the authors' developed models for predicting deformability, segregation and passing ability through narrow spaces was introduced. The deformability model was developed based on the concepts of water retainability of solid particles, free water content and inter-particle forces in the concrete. Both deformation capacity, measured by a slump flow value, and velocity of deformation, measured by a time to attain slump flow of 50 cm, were included. Segregation was considered to have relationship with bleeding, so a bleeding prediction model was adopted. Passing ability was simulated by adopting a model for predicting aggregate blocking during SCC flow through narrow spaces. The parameters considered in the model are size distribution, volumetric ratio and shape of aggregates. Also considered for passing ability are the effect of viscosity of the concrete, clear spacing of the reinforcement and size of the reinforcement. Experimental results from the authors and other researchers were used in the verification of the proposed models. It was evident that the proposed models were satisfactory for predicting the tested results.

KEYWORDS: Filling ability, Self-compacting concrete, Modeling, Mix design