Evaluating the robustness of self-consolidating concrete: An approach to the mix design procedure

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Abstract

This paper aimed to develop a method to analyze and rank self-consolidating concrete (SCC) according to its robustness, considering isolated and simultaneous variations in its main components, like water (±6%) and cement content (ΔC±), in three matrices with binder to aggregate ratio (rich, intermediate and poor). In the experimental campaign, only water variations (±6%) were considered, and the cement content variations were considered in the analytical method. The method regarded the behavior of SCC in fresh and hardened states and turned out to be potentially useful to the academic community and the industry. The simple additive weighting method was used for that reason, which is probably the most adopted among methods for decisions with multiple variables due to its simplicity. Among the families studied, the poor mixture presented the lowest robustness with variation in water content due to the higher initial w/c ratio. However, for the condition ΔC±, the poor mixture achieved the second-best robustness index. The rich mixture behaved differently as it was ranked second for ±6% of water and the worst for ΔC± due to slump-flow and segregation results. The intermediate matrix presented the highest robustness in both conditions analyzed, water (±6%), and cement content (ΔC±).

Keywords

Mixture design method; Robustness index; Self-consolidating concrete