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Effect of the Mix Design on the Robustness of Fresh Self-Compacting Concrete

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# Effect of the Mix Design on the Robustness of Fresh Self-Compacting Concrete

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## **ABSTRACT**

Self-compacting concrete (SCC) has many advantages compared to vibrated concrete. A disadvantage is the lower robustness of fresh SCC. SCC is more sensitive to small changes in the mix design, material properties, and the applied production methods. In an experimental program, the influence of important mix design parameters on the robustness of SCC was studied. First, the influence of the paste volume and the water-to-powder volumetric ratio was investigated. Depending on the mechanisms providing stability in the mixture, different levels of impact were observed. When the yield stress is the main factor providing stability in the mixture, a change in the water content will mainly affect the yield stress, making the stability of the yield stress the most important factor determining the robustness of the mixture and can be improved by lowering the paste volume. Analogue, the sensitivity of the plastic viscosity is determining the robustness of mixtures in which mainly the plastic viscosity is providing stability. The robustness of such a mixture can be improved by increasing the water-to-powder volumetric ratio. The influence of two types of viscosity modifying agents (VMA's) on the robustness of fresh SCC was examined in a second stage. The two used VMA's (diutan gum and attapulgite clay) were especially effective in SCC mixtures having a high yield stress and a low plastic viscosity. In mixtures having a low yield stress and a high plastic viscosity, the inclusion of a VMA in the mix design resulted in a decrease of the robustness.

Keywords: Self-Compacting Concrete, Robustness, Sensitivity, Variations, Viscosity-modifying agent, Rheology

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