

Fresh State Properties of Steel Fiber Reinforced Self Compacting Concrete

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Abstract : The object of the study is to investigate fresh state properties of the steel fiber reinforced self-compacting concrete (SFR-SCC). Three different steel fibers; straight ($V_f:0.5\%$), hooked-end long ($V_f:0.5\%$ and 1%) and hybrid fibers (0.5% short+ 0.5% long) were used in the research aiming to obtain flow properties of non-fibrous self-compacting concrete. Fly ash was used as a supplementary with an optimum dosage of 30% of the total cementitious materials. Polycarboxylic ether based high-performance concrete superplasticizer was used to get high flowability with percentages ranging from 0.81% (non-fibrous SCC) to 1.07% (hybrid SF-SCC) of the cement weight. The flowability properties of SCCs were measured via slump flow and V-funnel tests; passing ability properties of SCCs were measured with J-Ring, L-Box, and U-Box tests. Workability results indicate that small increase on the superplasticizer dosages compensate the adverse effects of steel fibers on flowability properties of SSC. However, higher dosage fiber addition has a negative effect on passing ability properties, causing blocking of the mixes. In addition, compressive strength, tensile strength, and four point bending results were given. Results indicate that SCCs including steel fibers have superior performances on tensile and bending strength of concrete. Crack bridging capability of steel fibers prevents concrete from splitting, yields higher deformation and energy absorption capacities than non-fibrous SCCs.

Keywords : fiber reinforced self-compacting concrete, fly ash, fresh state properties, steel fiber

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