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## Flexural Behavior of Self-Compacting Concrete Beams Strengthened with Steel Fiber Reinforcement

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### Abstract

Steel fiber self-compacting concrete (SFSCC) is an innovative material that can flow underneath its own weight in the fresh state, thus eliminating any need for mechanical vibration and complexity of the formwork, and which employs the benefits of steel fibre addition in the hardened state. Hence, this study evaluated the performance of a self-compacting concrete (SCC) under the effect of filler addition and then investigated the effect of steel fiber (SF) addition on flexural behavior, splitting tensile strength, compressive strength, and modulus of elasticity. Fourteen reinforced concrete beams were tested under monotonic loads: two sets of six SCCs (with and without SFs) and two normal concretes (NCs). Ultimate capacity, deflection, crack pattern, and mode of failure were recorded. The present experimental and theoretical results were compared in accordance with ACI 318 codes to assess the applicability of the aforementioned methods to predict the flexural strength of SCC specimens. The results of the tests carried out on fresh concretes indicate excellent deformability without blocking. Moreover, the flexural strength in beams increases with increasing concrete compressive strength, longitudinal steel reinforcement ratio, and SF amount.

Keywords: Concrete structure, failure mode, flexural strength, self-compacting concrete, steel fibers.

### List of Symbols

$f_y$	: Yield stress, MPa
$f_u$	: Ultimate stress, MPa
$E_c$	: Modulus of elasticity, MPa
$E_{exp}$	: Experimental modulus of elasticity, MPa
$f_{cu}$	: Ultimate compressive Strength, MPa
$f'_c$	: Compressive strength, MPa
$f_t$	: Splitting tensile strength, MPa
$f_r$	: Modulus of rupture (Flexural Strength of Concrete), MPa
$f_{ct}$	: Compressive strength of tested mixtures, MPa

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