

Structural behaviour and fracture energy of recycled steel fibre self compacting reinforced concrete beam

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Abstract

Mechanical strength and structural behaviour of Recycled Steel Fibre Self-Compacting Concrete (RSFSCC) were investigated using different Recycled Steel Fibre (RSF) contents (30, 45 and 60 kg/m³) incorporated in three SCC mixes. The corresponding steel fibre volume fraction can be approximated to (0.4%, 0.6% and 0.8%) of the concrete mixtures, respectively. Compressive, splitting, and flexural strengths in addition to water absorption tests were performed to investigate some hardened properties of the tested mixes. The structural behaviour was assessed by determining and calculating flexural stiffness k , flexural toughness I and residual strength factor R for reinforced concrete beams having the dimensions of 100 × 150 × 1000 mm. Fractal dimension D was calculated using Image Processing Technique for all assessed beams to study and quantify the cracks and their tortuosity. It was found that incorporating RSF improved the mechanical properties, strength and structural behaviour of SCC. However, the best strength and behaviour in addition to best cracking resistance were achieved using 60 kg/m³ RSF content. Both first crack and ultimate load capacity were increased with RSF incorporation. The flexural stiffness and toughness in addition to residual strength factor increased with incorporating RSF. In addition, fracture mechanics parameters are determined and discussed