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An Insight into High Strength Concrete with Steel Fibre Reinforcement under Cyclic Loading

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Abstract : Concrete which is very comfortable under compression is also expected to behave ductile under tension for various structural applications. High strength concrete which has more potential for higher compressive strengths more than 100 MPa is prone to brittle mode of failure at service loads. To overcome this deficit of brittle behaviour and to achieve ductility in high strength concrete, discrete micro-reinforcements in the form of hooked end steel fibre having tensile strengths of 1100 MPa are dispersed in the concrete randomly to instigate the inherent tensile properties within the concrete matrix. The experimental programme consisted of casting of six high strength concrete beams prepared by the addition of 8% silica fume as mineral admixture at a constant water-cement ratio of 0.36 with a tension reinforcement designed for 1% and reinforced with steel fibre in volume fractions of 0.5%, 1.0% and 1.5 %. In addition to this, two high strength concrete beams without steel fibres are casted. Further to achieve more flexural strength, the concept of confinement shear reinforcement is implemented by varying stirrup spacing at 100 and 200mm c/c combinations. The beams are tested under cyclic loading and the test results were compared between beams with and without steel fibre to analyze the effect of ductility in concrete. The test result shows satisfactory performance in deformation and ductility characteristics with the incorporation of steel fibre and improvement in flexural strength due to confinement of shear reinforcement. The experimental results are compared with analytical results obtained by predicted regression values.
Keywords: high strength concrete, steel fibre, hooked end fibre, fibre volume fraction, mineral admixture, silica fume, shear confinement.

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