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Literature Review on Torsional Strain Energy for Self Compacting Concrete Containing Glass and Steel Fibres.

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Abstract:
Concrete is a composite material that can resist compression better than tension. Many attempts have been made in the past to improve its tensile strength from the time of invent of concrete. In structural mechanics, the strain energy is reported as a fundamental parameter which defines the performance of concrete after cracking. Many researchers have carried out and investigations on torsional strain energy of concrete. Very few literatures are available on the estimation of torsional strain energy of SCC with glass and steel fibers. An attempt has been made to review the available literature on torsional strain energy and to consolidate the same.

Key words: *Strain energy, Total strain energy, Torsional strain energy, Torsional strain energy for Glass Fibers, Strain energy for Steel fibers.*

I. Literature Review

Gambhir M.L. (2011)1: reported that the strain energy was positive and contains second powers of stress resultants. It is expressed by a homogeneous equation. superposition. It was also reported that strain energy depends on final values of stress resultants. Strain energy and strain energy density are scalar quantities. Strain energy density can be evaluated by the area under the stress strain curve. Strain energy density at rupture is called modulus of toughness. Strain energy density at yield point called modulus of resilience.

Ramamrutham.S and Narayan.R (2008)[2:] reported that concrete when deformed under the action of external load, the member is said to have stored energy which is called strain energy. This energy equals to the amount of work done by the external load which produces deformation.

Asghari.A, Barr.B (1994)[3] : investigated the strain energy density subjected to fracture. Beams of 500mm x 100mm x 100mm were used for the investigation. Three and four point loading bending test was conducted. It was reported that the strain energy density achieved between predicted fracture loads and predicted loads.

A.L. Shah, and S.R.Karve (2005)[4] : reported that torsion forms one of the four major structural actions. Pure torsion occurs rarely in structures. Torsion is classified in to compatibility torsion and equilibrium torsion.

Jasim-Al-Khafagi, et.al (2016)[5] : investigated the torsional behavior of self compacted concrete beams experimentally and compared with that of the plain concrete. They reported that cracking torque is equal

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to ultimate torque. It was also reported that usage of high strength SCC beams improves the torsional strength significantly.

Jaism-Al-Khafaji (2016)[6] : carried out an experidmental investigation on torsional behavior of steel fiber reinforced self compacting concrete beams with 0.4 to 0.8 steel fibres SCC beams without steel fibers.

Ahmed S.Eisa, and Khaled S.Ragab (2014)[7] : reported that the SCC Improves the torsional resistance when compared to ordinary concrete. Post cracking ductility and toughness were formed to improve with the introduction of steel fibers. Torsional capacity was found to improve with concrete compressive strength.

Zeel Vashi, and Megha Thoms (2017)[8] : reported that SCC is a self workable concrete, and addition of fibers can drasticallndy change the property of concrete. They reports that workability of SCC decreases with addition of fibers but fracture energy increases with strain energy. Fibers increased the compressive strength nominally, and marginally increased the tensile strength. But addition of steel fibers significantly increased the split tensile strength and strain energy.

B. Raja Rjeshwari and M.V.N. Sivakumar (2018)[9] : reported that fracture property and strain energy of concrete are affected by aggregate size, aggregate volume, aggregate type and volume of fiber content. The results reveals that fracture properties of fiber reinforced SCC increased its fracture energy. With increase in coarse aggregate size, peak stress was obtained from smaller aggregate size.

Mohammed Ishtiaque, and M.G. Shaikh (2017)[10] : reported that concrete is a brittle material and it fractures with increase in load because of less in tensile strength at tension zone. These fractures can be arrested or improved by glass and steel fibers.

P.Ramalinger chari, and S. Adiseshu (2019)[11] : reported that fracture energy SCC and Bazant's size. Fracture parameters are determined for maximum loads. As fly ash replaces with cement from 0% to 30% the workability also increases (Slump Value). Replacement of fly ash decreases the compressive strength, modulus of elasticity and flexural strength. Durability of SCC improves.

KH.M.Heiza.et.al (2012)[12] : compare the fracture parameters of SCC and normal vibrating concrete. The SCC gives good fracture toughness than that of normal concrete. Crack propagation resistance of SCC was found to be more when with that of ordinary concrete.

Basit Nabi,et.al (2018)[13] : made a comparative study of mechanical properties of SCC, reinforced with different types of fibers. They reported that there is improvement in the mechanical properties of concrete.

Conclusion and Remarks: A detailed review of literature has been carried out on torsional stain energy for SCC with steel and glass fibers. Strain energy of concrete is an important parameter which determines the post cracking behavior of concrete elements. Torsional strain energy is found to increase with addition of fibers.

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