Flexural Fatigue Performance of Self-Compacting Fibre Reinforced Concrete

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Abstract : The paper presents results of an investigation conducted to study the flexural fatigue characteristics of Self Compacting Concrete (SCC) and Self Compacting Fibre Reinforced Concrete (SCFRC). In total 360 flexural fatigue tests and 270 static flexural strength tests were conducted on SCC and SCFRC specimens to obtain the fatigue test data. The variability in the distribution of fatigue life of SCC and SCFRC have been analyzed and compared with that of NVC and NVFRC containing steel fibres of comparable size and shape. The experimental coefficients of fatigue equations have been estimated to represent relationship between stress level (S) and fatigue life (N) for SCC and SCFRC containing different fibre volume fractions. The probability of failure (Pf) has been incorporated in S-N relationships to obtain families of S-N-Pf relationships. A good agreement between the predicted curves and those obtained from the test data has been observed. The fatigue performance of SCC and SCFRC has been evaluated in terms of two-million cycles fatigue strength/endurance limit. The theoretic fatigue lives were also estimated using single-log fatigue equation for 10% probability of failure to estimate the enhanced extent of theoretic fatigue lives of SCFRC with reference to SCC and NVC. The reduction in variability in the fatigue life, increased endurance limit and increased theoretiac fatigue lives demonstrates an overall better fatigue performance for SCC and SCFRC.

Keywords : fatigue life, fibre, probability of failure, self-compacting concrete
Conference Title : ICCSCE 2014 : International Conference on Civil, Structural and Construction Engineering
Conference Location : Singapore, Singapore
Conference Dates : March 30-31, 2014

Open Science Index, Civil and Architectural Engineering Vol:8, No:03, 2014 publications.waset.org/abstracts/6843.pdf