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Development of Tensile Stress-Strain Relationship for High-Strength Steel Fiber Reinforced Concrete

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Abstract : This paper provides a tensile stress-strain (σ -ε) relationship for High-Strength Steel Fiber Reinforced Concrete (HSFRC). Load-deflection (P-δ) behavior of HSFRC beams tested under four-point flexural load were used with inverse analysis to calculate the tensile σ -ε relationship for various tested concrete grades (70 and 90MPa) containing 60 kg/m3 (0.76 %) of hook-end steel fibers. A first estimate of the tensile (σ -ε) relationship is obtained using RILEM TC 162-TDF and other methods available in literature, frequently used for determining tensile σ -ε relationship of Normal-Strength Concrete (NSC) Non-Linear Finite Element Analysis (NLFEA) package ABAQUS® is used to model the beam's P-δ behavior. The results have shown that an element-size dependent tensile σ -ε relationship for HSFRC can be successfully generated and adopted for further analyzes involving HSFRC structures.

Keywords: tensile stress-strain, flexural response, high strength concrete, steel fibers, non-linear finite element analysis

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