Fracture modelling of reinforced concrete beams in mode I crack

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Abstract

This study deals with the application of fracture mechanics to predict the residual strength capacity of reinforced concrete beams weakened by the presence of a crack whose tip is subjected to a Mode I stress field. Carpinteri Model for fracture collapse of reinforced concrete beams served as a catalyst for the present formulation in which the requirement of yielding of reinforcement incipient to crack propagation as assumed by carpinteri was relaxed.

A fracture mechanics approach to the design of reinforced concrete member in flexural, with the salient feature of incorporation of maximum tolerable crack height as a design parameter is presented. The model yields the area of reinforcement necessary to satisfy the given loading and crack conditions.

In addition, a fracture based concept of minimum reinforcement for a reinforced concrete member is also developed. The proposed criterion defines an invariant fractural parameters, which are dimensionally used to yield a minimum reinforcement ratio. A regressed relationship for P is provided, showing sensitivity to a range of material and geometrical variables.