

Analytical Investigation of concrete beams reinforced with embedded CFRP plates

ABSTRACT

A detailed model and a nonlinear finite element analysis for concrete beams reinforced with embedded carbon fibre reinforced polymer (CFRP) plates, used as an alternative to FRP-bars, in a micro-model framework have been presented in this study. Bond relations between the CFRP plates and concrete have been proposed and failure shear envelope of the concrete-plate interface for normal and shear stress (σ - τ) has been also presented. A nonlinear analysis has been conducted for loaded concrete beams reinforced with embedded CFRP plates till failure. Results of the finite element analysis show a good agreement with the experimental behaviour observed. The surface texture of the embedded CFRP plate has been found to affect the concrete-CFRP interface bond behaviour and the structural response of concrete beams reinforced with embedded CFRP plates.

Keyword: Bond; Finite element modelling; Nonlinear analysis; Embedded CFRP plates; Beams; Structural behaviour