

## Discrete Crack Modeling of Side Face FRP-Strengthened Concrete Beam

**Authors :** Shahriar Shahbazpanahi, Mohammad Hemen Jannaty, Alaleh Kamgar

**Abstract :** Shear strengthening can be carried out in concrete structures by external fibre reinforced polymer (FRP). In the present investigation, a new fracture mechanics model is developed to model side face of strengthened concrete beam by external FRP. Discrete crack is simulated by a spring element with softening behavior ahead of the crack tip to model the cohesive zone in concrete. A truss element is used, parallel to the spring element, to simulate the energy dissipation rate by the FRP. The strain energy release rate is calculated directly by using a virtual crack closure technique and then, the crack propagation criterion is presented. The results are found acceptable when compared to previous experimental results and ABAQUS software data. It is observed that the length of the fracture process zone (FPZ) increases with the application of FRP in side face at the same load in comparison with that of the control beam.

**Keywords :** FPZ, fracture, FRP, shear

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