

A new 3D interface element for three dimensional finite element analysis of FRP strengthened RC beams

ABSTRACT

The analysis of interfacial stresses in structural component has been the subject of several investigations but it still requires more effort and studies. In this study a general three-dimensional interface element has been formulated for stress and displacement analyses in the interfacial area between two adjacent plate bending element and brick element. Interface element has 16 nodes with 5 degrees of freedom (DOF) in each node adjacent to plate bending element and 3 DOF in each node adjacent to brick element. The interface element has ability to transfer three translations from each side of interface element and two rotations in the side adjacent to the plate element. Stiffness matrix of this element was formulated and implemented in three-dimensional finite element code. Application of this element to the reinforced concrete (RC) beam strengthened with fiber reinforced polymer (FRP) including variation of deflection, slip between plate and concrete, normal and shear stresses distributions in FRP plates have been verified using experimental and numerical work of strengthened RC beams carried out by some researchers. The results show that this interface element is effective and can be used for structural component with these types of interface elements.

Keyword: Interface element; Bond; Plate bending element; Three dimensional; FRP.