FINITE ELEMENT ANALYSIS OF FRP-TO-STEEL BONDED JOINTS WITH VARIOUS NON-LINEAR TRACTION SEPARATION LAWS

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Abstract

This thesis presents the findings of a parametric study using a finite element analysis to investigate the influences of various traction-separation relationships on the behavior of FRP-to-steel double-lap shear coupons with thin outer adherends. The research primarily investigates the influences of shear traction-separation laws on mixed-mode bond capacity and general interface behavior. The results of the parametric study are used to assess the influence of shear strength, shear toughness, shear elastic stiffness, and ultimate slip traction-separation parameters. Additional insight is provided into the effects of peel stresses and their correlated peel traction-separation laws. The findings of this research demonstrate that under certain configurations, bond capacity at low bond lengths is governed by shear strength while bond capacity at high bond lengths is governed by shear toughness. This thesis suggests two equations for the prediction of bond capacity at low and high bond lengths, while characterizing the bond capacity relationship at an intermediate bond length.