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Typical fracture behaviour of the steel-concrete composite beam with web openings in various sizes under axial tension and uniaxial negative bending

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The effects of openings on the web of steel section of the steel-concrete composite beam under combined uniaxial negative bending and axial tension were examined herein by utilising finite element (FE) analysis. This emerging area of research, which was a composite beam with openings subjected to biaxial loads is not even inherently existed. The development of the FE analysis for a composite beam by realistic geometries of material components with accurate nonlinear material models, which was with assembling by complicated interactions, load applications and boundary conditions, was studied. In order to validate the FE model, the FE model was included by a comparative study with the existing experimental analysis and it was confirmed that the FE model and experimental results were in an acceptable manner by means of failure mode and limit state of the composite beam. The FE model validated was consisted of a series of web openings in ratio, each of which represented the formation of effective area on the web. In order to obtain the failure mode, both axial loads were increased simultaneously and stress-strain values of each material component were studied thoroughly throughout the analysis, such that the limiting stress and strain of material components leading to the best estimate of failure mode will lead to the failure mechanism, which was the concept of the failure state prediction. It was predicted that the presence of openings with its provision ratio noticeably reduces the plastic moment capacity of the composite beam such that the phenomenon whereby the ratio increases leads the early failure state concurrently. Furthermore, important failure behaviour of the material components that influence on limit state is extensively discussed in this paper.

Biography

Mahesan Bavan has completed his MSc in Civil and Structural Engineering from National University of Malaysia, Malaysia. He is a Civil Engineer with twelve years of vast professional experiences in planning, designing and directing the constructions of infrastructure, utilities, geotechnical & structural projects and currently he is enduring the research to pursue PhD. He has published more than 25 papers in reputed journals and international conferences.

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