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# Local web buckling failure criteria of the steel-concrete composite beam with openings subjected to combined negative bending and axial compression

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An investigation of the buckling behavior of webs in castellated beams of steel-concrete composite beam subjected to combined in-plane negative bending and axial compressionis conducted. A Finite Element (FE) model was developed for a steel-concrete composite beam subjected to combined negative bending and axial compression and validated against global and local failure behaviors using experimental analysis in the existing literatures such that the developed FE model can be used for further parametric studies. Subsequently, castellated web panels were modeled in two forms such as square and circle patterns,while the boundary condition and load application of the composite beam were remained sameand further investigations have been done on failure behaviors by applying a series of numerical analyses using the three-dimensional finite element modeling. Failure modes in two areas such as local buckling in the web and flanges of castellated steel beamwere adopted to predict the ultimate strength of the composite beam, which the predicted ultimate strengths were found earlier with reduction in comparison. Due to the influences of axial compression on mechanical shear connectors, excessivestresses will be induced, which will affect the transmitting shear and accordingly, complexities of interaction analysis techniquesshould be adopted such that the assessment of existing composite beams and bridge girders in the castellated beams is conservative. It can be concluded in the comparison with the assessment of existing composite beams and bridge girdersthat this conservative approach may not be warranted as it is often necessary to extract the accurate capacity and stiffness of the beam.This study proposes combined axial loads to predict the failure behavior of steel castellated section composite beam, which is asignificant new concept that allows engineers to develop more accurate procedures for determining the strength and endurance of existing composite beams and bridge girders.

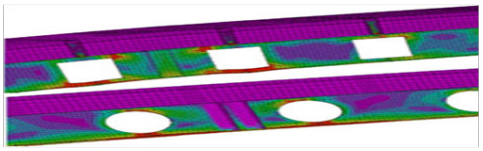

Figure-1: Early buckling effects encountered in the castellated steel section of the composite beam.

**Recent Publications**

1. Bavan M, Baharom S B, Mutalib A A, Osman S A (2013) Numerical prediction of a composite beam subjected to combined negative bending and axial tension. Journal of Engineering Science and Technology;8(4): 428-447.
2. Bavan M, Baharom S B, Mutalib A A (2013) Refined FEM analysis of steel-concrete composite beam subjected to negative bending and axial compressive forces. Journal Teknologi; 65(2): 143-156.

## Biography

Mahesan Bavan has completed his MSc in Civil and Structural Engineering from National University of Malaysia, Malaysia. He is a Civil Engineer with 12 years of vast professional experiences in planning, designing and directing the constructions of infrastructure, utilities, geotechnical and structural projects and currently he is enduring the research to read PhD. He has published more than 40 papers in reputed journals and international conferences.

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