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Structural Performance of Composite Steel and Concrete Beams

Authors : Jakub Bartus

Abstract : In general, composite steel and concrete structures present an effective structural solution utilizing full potential of both materials. As they have a numerous advantages on the construction side, they can reduce greatly the overall cost of construction, which is the main objective of the last decade, highlighted by the current economic and social crisis. The study represents not only an analysis of composite beams' behaviour having web openings but emphasizes the influence of these openings on the total strain distribution at the level of steel bottom flange as well. The major investigation was focused on a change of structural performance with respect to various layouts of openings. Examining this structural modification, an improvement of load carrying capacity of composite beams was a prime object. The study is devided into analytical and numerical part. The analytical part served as an initial step into the design process of composite beam samples, in which optimal dimensions and specific levels of utilization in individual stress states were taken into account. The numerical part covered description of imposed structural issue in a form of a finite element model (FEM) using strut and shell elements accounting for material non-linearities. As an outcome, a number of conclusions were drawn describing and explaining an effect of web opening presence on the structural performance of composite beams.

Keywords : composite beam, web opening, steel flange, totalstrain, finite element analysis
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