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On Influence of Web Openings Presence on Structural Performance of Steel and Concrete Beams

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Abstract : In general, composite steel and concrete structures present an effective structural solution utilizing the full potential of both materials. As they have numerous advantages on the construction side, they can greatly reduce the overall cost of construction, which has been 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' behavior having web openings but emphasizes the influence of these openings on the total strain distribution at the level of the steel bottom flange as well. The major investigation was focused on a change in 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 objective. The study is divided into analytical and numerical parts. 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 the discretization of the preset structural issue in the form of a finite element (FE) model using beam and shell elements accounting for material non–linearities. As an outcome, several conclusions were drawn describing and explaining the effect of web opening presence on the structural performance of composite beams.

Keywords : beam, steel flange, total strain, web opening
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