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Abstract

The aim of this paper is to carry out extensive numerical investigations about the effect of various parameters on both buckling loads and ultimate behavior of continuous partially composite castellated beams under vertical loads. Efficient nonlinear 3D Finite Element Model using ABAQUS software is developed. The initial geometric imperfection and material nonlinearities were carefully considered in the analysis. At first, Eigenvalue analysis is carried out to obtain the elastic buckling load and the corresponding buckling mode. In order to trace the entire load-deflection curve, the first buckling mode is factored and inserted into the inelastic geometrical nonlinear analysis of the beam as initial imperfection. The reliability of the model is demonstrated by comparisons with experiments and with alternative numerical and analytical analyses for continuous composite beam. Different modeling techniques available in ABAQUS are used for the modeling of the shear connectors. In addition, a parametric study is carried out to investigate the effect of change in cross-section geometries, beam length, alignment of stiffeners, concrete strength, steel strength and concrete slab thickness on the both buckling and the overall structural behavior of continuous partially composite castellated beams under vertical loads. A total of 96 partially composite castellated beams are studied. Based on the

findings of the finite element results, a number of recommendations on the methods of modeling and on the design of continuous steel-concrete composite castellated beams are suggested.

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Index Terms

Computer Science Information Science

Keywords

Castellated beams partially composite beams Distortional buckling Finite element.