Trends in Civil Engineering and Challenges for Sustainability pp 333-347
| Cite as

Comparative Study on Behaviour of CFST and CES Columns Using ABAQUS Software

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Conference paper
First Online: 29 September 2020

Part of the Lecture Notes in Civil Engineering book series (LNCE, volume 99)

Abstract

The composite construction has always been the area of interest for structural engineers as the use of two or more material to make one structural member have always proved to be beneficial. The concrete-filled steel tubes (CFST) and concrete-encased steel (CES) columns are gaining popularity and have been adopted for the construction of high rise buildings. In the present work, CFST columns and CES columns subjected to axial compression were analysed. The columns are assumed to be having fixed-free end and the loads were applied on the loading plate for even distribution of loads. The circular, square and rectangular shapes of columns are considered. CFST columns were considered for varying steel tube thickness of 3 mm, 5 mm and 7 mm, and the I-section selected was ISMB 100 for CES columns. CFST and CES columns were analysed separately. The behaviour of these columns and their ductility was studied. The analysis was carried out using the finite element software ABAQUS. The modelling and meshing were done in the software and analysed. The loads versus deformation graphs are plotted for each column. The ductility factor and load carrying capacity for all CES and CFST columns are compared. The circular CFST column with 7 mm tube thickness was found to be the better in terms of ductility and load carrying capacity.

Keywords

CFST CES Ductility factor Axial deformation Load carrying capacity Tube thickness ABAQUS

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Trends in Civil Engineering and Challenges for Sustainability pp 349-372
| Cite as

Time-Invariant Reliability Analysis of RC T-Beam Bridge Girder—Limit State of Strength in Flexure

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Conference paper
First Online: 29 September 2020

Part of the Lecture Notes in Civil Engineering book series (LNCE, volume 99)

Abstract

The purpose of structural design is to fix the dimensions of a structural member, to safely withstand the loads anticipated during its life cycle and to serve the intended purpose satisfactorily throughout its service life in the environment it is built for. The main aim of the present work is to determine the probability of satisfactory performance of flanged reinforced concrete beams in limit state of strength in flexure. For this purpose, two methods, namely simulation approach and analytical approach, have been made use of. For the study purpose, standard T-beam bridge cross sections for different spans as recommended by MORTH have been made use of. The typical load combinations as specified in IRC: 6-2017 are considered. Also, the special vehicle load which was introduced in the recent code IRC: 6-2017 is also considered to check the performance of bridge beams against limit state of strength in flexure. The various basic random variables are assumed to be statistically independent normal and non-normal random variables. The moment of resistance is found to follow normal distribution, external moment found to follow Type-1 distribution, and the safety margin is found to follow lognormal distribution. The reliability index value tends to decrease with an increase in span.

Keywords

Reliability index Flexure Probability T-beam bridge

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