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Seismic Evaluation of Building Having Steel-concrete Composite Columns and RC Beams

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Abstract

In the recent times, the use steel-concrete composite structures in construction industry is growing due to ease of construction and also speedy construction offered by these kind of structures. In spite of this, India lacks the availability of a detailed dedicated design code of practice for construction of steel-concrete composite structures. IS 11384 gives certain guidelines but is not a detailed code of practice. In this paper, we aim to study performance of a steel-concrete composite building structure designed as per the Indian standards as well as the European standards to assess the effectiveness of the Indian codes of practice when compared with the European standards. To achieve this aim, a regular rectangular plan is selected. This building is then designed using both Indian and European standards. For that purpose, same gravity loads are considered. In case of lateral loads, IS 1893 and Eurocode 8 are used. Based on these forces obtained, sections sizes are decided for the buildings. For the Indian building, M30 grade of concrete and Fe345 grade of steel is used. The materials and assumptions in case of building to be designed by European standards are kept of similar nature to have comparable results. These buildings with the obtained section sizes are then modeled using a finite element modeling software. Non-Linear Time History Analysis is used for the assessment of these structures in the event of an earthquake. In this process, time histories of 11 earthquakes are used to perform this analysis so as to have a detailed comparison between the responses from both the structures under different earthquake loads. Various factors like, story displacements, story drifts, story shear, etc. are considered for comparison. As it was expected, the differences were observed in the obtained values for both the structures and those differences were tabulated in form of tables and graphs and thus a general conclusion was drawn based on these results.

Keywords: Composite structure, Ductility, Finite element modeling, Non-linear time history analysis, Eurocode 8, IS 11384