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Seismic Response of Multistory Building with Varying Stiffness Modifiers

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Abstract

Due to rapid urbanization, many high-rise buildings are constructed and safety is the primary concern for engineers and researchers if the high-rise building is situated in a higher seismic zone. The cracks can be developed in the structural members for ultimate load condition. To consider crack section of structural elements for seismic load condition, the stiffness modifiers are considered to reduce the seismic demand on the structures. The concept of stiffness modifiers is mentioned in IS 1893 (Part 1)-2016 code stating that to consider effective moment of inertia which is 35% of the gross moment of inertia for beams and 70% of the gross moment of inertia for columns in clause no. 6.4.3.1 of IS1893-2016. As the code specified, the value can be modified in the next revision depending on the suggestions and submission of papers on proposed values. On account of this, a detailed analytical and numerical study is carried out to observe the impact of stiffness modifiers on building subjected to seismic force. The present paper aims towards the comparative analysis of multistorey building with different heights subjected to seismic force are investigated by considering different stiffness modifier values. The building is analyzed in all seismic Zones with soil type-III. Analysis has been carried out by the response spectrum method using finite element-based software. Different response parameters such as story displacement, story drift, and story shear have been determined. From the examination, it is observed that the model considering the optimal value of moment of inertia (I2) is showing lower story drift and story displacement resulting in higher seismic holding capacity than with the model considering other moment of inertias.

Keywords: Stiffness modifiers, Response spectrum method, Story drift, Story displacement, Multistory building