Mega bracing system with RC multistory based on plate-frame method by sap2000

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Abstract. This study investigates the optimal arrangement of steel braces for a 15-story reinforced concrete building. The analysis is based on a 0.1 mm plate model at the exterior face of the building, which is subjected to nonlinear time history analysis of Elcentro ground motion earthquake. The study focuses on the internal forces path induced by seismic loads and aims to identify the most preferable results for different configurations of steel bracing using sap2000 software. By selecting the moment that led to the maximum internal drift, the study determined the maximum load concentrations. The results indicate that model 4 and 6 produced the optimal results, with a significant increase of 32% and 37% in base shear, as well as a notable improvement of 60.64% and 60.5% in roof displacement, respectively.

1 Introduction

Structures in areas of high seismic risk may be susceptible to severe damage in a large earthquake. [1]. The catastrophic seismic events have urged the need for effective retrofitting techniques for the non-seismically designed structures built in the seismic active zone. [2]. Steel bracing is used to enhance the seismic strength of reinforced concrete frames or multistory building, a wide research activity developed since 80's and the need to construct a multistory building for the increasing population worldwide. Steel bracing provides a similar advantage to shear walls by enhancing the structural integrity, rigidity, and ability to withstand deformation of the structure. The braces are commonly constructed inside existing bays of the building and they contribute to the lateral resistance of the structure through the axial force developing in their inclined members. The diagonals are pinned to steel plates that are anchored at the corners of each concrete bay with epoxy resins, whereas at the ground level special footing configurations for each brace are provided.

Steel bracing, by providing strength and stiffness, generally decreases the seismic demand on existing members, similarly to reinforced concrete shear walls (though usually to a lesser extent to the latter). The level of strength and stiffness increase can be tuned relatively easily by the choice of the number and the size of the braces, and it is easy to avoid large irregularities in elevation. Bracing is an ideal solution for the strengthening of soft ground story, where the steel braces are applied only at the lower building level.

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