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Optimizing the Location of Mass Dampers and Determining Their Weight Percentage in the Passive Control

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Abstract

The location of the country in the earthquake-prone region of the world and the occurrence of severe earthquakes in this region, clarifies the need to control the structures against such natural disasters in the country. in one hand, passive control is an effective way to reduce the reflection of structures without the need for an external energy source. On the other hand, the cost of installation, commissioning and maintenance of these dampers is very low. These dampers are absorbed by the structural elements by absorbing energy and thus reducing damage and Breakdown.
In the present study, the inactive control function of the structure with mass damper has been investigated. In this study, the optimal weight percentage of this type of dampers and their optimal location are. The characteristics of these structures (stiffness matrix, mass and damping matrix) were calculated through valid sources as well as the use of limited component relationships and structural analysis, as well as regardless of the axial deformation versus moment and loads. After this step, the structure was modeled in opensees. Change the weight of the damper and its location to optimize the values. Finally, the result of the structure is compared with the damper installed with the structure without the damper and the results are expressed. According to the obtained results, it is determined that the weight percentage of 4% was determined as the optimal weight percentage of the mass damper. Also, the use of two dampers in the ninth and tenth floors has a more optimal response than other modes, so that the Rms displacement is about 20% and the Rms acceleration is reduced by 25 to 30% compared to the mode without a damper.