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Mitigation of seismic pounding between two L-shape in plan high-rise buildings considering SSI effect

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Abstract. Unsymmetrical high-rise buildings (HRBs) subjected to earthquake represent a difficult challenge to structural engineering, especially taking into consideration the effect of soil-structure interaction (SSI). L-shape in plan HRBs suffer from big straining actions when are subjected to an earthquake (in *x*- or *y*-direction, or both *x*- and *y*- directions). Additionally, the disastrous effect of seismic pounding may appear between two adjacent unsymmetrical HRBs. For two unsymmetrical L-shape in plan HRBs subjected to earthquake in three different direction cases (*x*, *y,* or both), including the SSI effect, different methods are investigated to mitigate the seismic pounding and thus protect these types of structures under the earthquake effect. The most effective technique to mitigate the seismic pounding and help in seismically protecting these adjacent HRBs is found herein to be the use of a combination of pounding tuned mass dampers (PTMDs) all over the height (at the connection points) together with tuned mass dampers (TMDs) on the top of both buildings.

Keywords: building vibration control; finite element method (FEM); high-rise building (HRB); irregular building; L-shape in plan building; nonlinear time history analysis; pounding tuned mass damper (PTMD); soil-structure interaction (SSI); tuned mass damper (TMD); unsymmetrical in plan building

1. Introduction

This research considers the conditions of utilization and architectural requirements that influence the shape of a building's horizontal plane. The structural engineer plays a crucial role in designing structures capable of withstanding natural disasters, such as earthquakes. Among the challenges faced is the phenomenon known as pounding, which occurs when adjacent buildings experience lateral forces from earthquakes. Additionally, unsymmetrical in-plan shapes, particularly L-shapes, exacerbate and complexities associated with the pounding.

Previous studies have shed light on various aspects of pounding and potential mitigation

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