

## Mitigation of Seismic Pounding between Adjacent Buildings by means of Isolation and Supplemental Dissipation at the Base

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Double concave surface slider (DCSS) is considered as an effective solution for base-isolation of existing structures located in a near-fault site, because of its capacity to notably increase horizontal displacements that can be accommodated in comparison to a single concave surface slider (SCSS) of identical in-plan dimensions. However, unexpected torsional pounding of in-plan irregular adjacent structures may be induced by variability of frictional force and lateral stiffness of both SCSS and DCSS, depending on the axial load and friction coefficient changes during an earthquake [1]. Effectiveness of supplemental viscous damping at the base is studied in this work with the aim to analyse its effectiveness for limiting base displacement, so avoiding too large seismic gap requirement. To this end, structural pounding between fixed-base and base-isolated L-shaped buildings, placed adjacent to form T- and C-shaped plans, is analysed. A simulated design of the original reinforced concrete (RC) fixed-base framed structure is preliminarily carried out in accordance to a former Italian code, for a medium-risk seismic zone and a typical subsoil class. Then, seismic retrofitting with SCSSs is carried out, in order to attain performance levels imposed by the current Italian code in a high-risk seismic zone and for moderately-soft subsoil, while DCSSs have radius of curvature equal to half the SCSSs and the same friction coefficient. Different in-plan distributions of linear fluid viscous dampers (FVDs) are examined, following damping distribution inversely proportional to the distance between the stiffness centre of the base-isolation system and the plane frame where each FVD is placed. Moreover, the equivalent viscous damping ratio of the supplemental FVDs is taken in the range 10%-20%. Nonlinear modelling of SCSSs and DCSSs considers variable axial load combined with friction coefficient at breakaway and stick-slip and as function of the sliding velocity, axial pressure and rising temperature at the sliding interface. Attention is focused on the pulse-type nature of near-fault earthquakes generally observed in the velocity time-histories but largely overlooked in the acceleration ones. Automated classification algorithms using wavelet analysis are adopted to compile three datasets of seismic input rotated in the range 0°-360°, with a constant step of 15°. Distinction is made between no-pulse and velocity-pulse, the latter further categorized into non-acceleration and acceleration-pulses. Combination of DCSSs and FVDs results the most suitable trade-off between mitigation of maximum response of the isolation system and seismic pounding between adjacent fixed-base and base-isolated structures.

### REFERENCES

- [1] F. Mazza and R. Labernarda, Concave surface base-isolation system against seismic pounding of irregular adjacent buildings. *14th World Congress on Computational Mechanics (WCCM), ECCOMAS Congress 2020, 19-24 July 2020, Paris, France.*