17th Symposium on Earthquake Engineering
November 14-17, 2022
IIT Roorkee, India
Paper No. 33

Experimental Investigation of Direct and Mitigated Pounding in Base-Isolated Frames with Adjacent Rigid Walls

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Abstract

Base-isolated structures pounding with surrounding walls have been observed due to large displacement at isolation level and insufficient gap be-tween the structure and surrounding walls during many major earthquakes. Due to pounding at the isolation level, the response at the structure's top slab is also affected. Hence, an experimental investigation into direct pounding (DP) and mitigated pounding (MP) at the isolation level of a base-isolated frame structure is necessary. So far, many researchers have experimented with point contact pounding, but no experiments with surface contact pounding have been conducted. An experimental study on two base-isolated frame models of different lengths, surrounded by rigid walls in the longitudinal direction, was carried out for earthquake excitation on a shake table. The isolated slab cross-section and wall surface are free for pounding interaction during excitation, which is realistic in the field. The pounding responses at the isolation level and frame slab level are acquired and analysed. These experiments are repeated with mitigation material (rubber pad) in the gap be-tween the isolated slab and the wall to study MP responses. Results show that the magnitude of acceleration responses decreases at the isolation level and frame slab level due to pounding. Despite the reduction in the open gap, the mitigation technique significantly reduced base shear forces compared to DP. The effect of pounding is observed more in the lengthier model as compared to the shorter one.

Keywords: Pounding, Base-isolation, Pounding mitigation, Frame structure, Shake table testing