



Experimental Investigation of VFPI and FPS Under Harmonic Loading

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Abstract

Previous analytical studies have shown that Variable Frequency Pendulum Isolator (VFPI) system can effectively mitigate the resonance issue that is likely to occur in a standard Friction Pendulum System (FPS) because of its variable isolation frequency. However, experimental research on the performance of VFPI is limited compared to analytical research; hence, designers are discouraged of using VFPI for practical design as compared to FPS. Therefore, in this research work, the experimental performance of rigid mass isolated by VFPI and FPS has been investigated on the shake table and, the hysteresis curves of both systems plotted from the experimental data have been validated with the analytical. This research work also compares the experimental behavior of the VFPI and FPS under harmonic ground motion. The results show that the VFPI successfully mitigates the response phenomenon, which is clearly observed in the case of FPS at the design isolation frequency ($T_b = 1.5$ sec). Under low excitation frequency ground motion (< 1.0 Hz), the VFPI system efficiently decreases the absolute acceleration response of the rigid mass than the FPS system, although the VFPI system may exhibit larger sliding displacement than the FPS system. Under excitation frequencies larger than 1 Hz, the performance of the rigid mass isolated by VFPI and FPS is approximately similar.

Keywords: Base isolation, Variable frequency isolators, Variable frequency pendulum isolator (VFPI), Friction pendulum system (FPS), Harmonic loading