

## Seismic Performance Evaluation of Structures with Hybrid Dampers Based on FEMA P-58 Methodology

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**Abstract :** In this study, a hybrid energy dissipation device is developed by combining a steel slit plate and friction pads to be used for seismic retrofit of structures, and its effectiveness is investigated by comparing the life cycle costs of the structure before and after the retrofit. The seismic energy dissipation capability of the dampers is confirmed by cyclic loading tests. The probabilities of reaching various damage states are obtained by fragility analysis, and the life cycle costs of the model structures are computed using the PACT (Performance Assessment Calculation Tool) program based on FEMA P-58 methodology. The fragility analysis shows that the probabilities of reaching limit states are minimized by the seismic retrofit with hybrid dampers and increasing column size. The seismic retrofit with increasing column size and hybrid dampers results in the lowest repair cost and shortest repair time. This research was supported by a grant (13AUDP-B066083-01) from Architecture & Urban Development Research Program funded by Ministry of Land, Infrastructure and Transport of Korean government.

**Keywords :** FEMA P-58, friction dampers, life cycle cost, seismic retrofit

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