

Control of Base Isolated Benchmark using Combined Control Strategy with Fuzzy Algorithm Subjected to Near-Field Earthquakes

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Abstract : The purpose of control structure against earthquake is to dissipate earthquake input energy to the structure and reduce the plastic deformation of structural members. There are different methods for control structure against earthquake to reduce the structure response that they are active, semi-active, inactive and hybrid. In this paper two different combined control systems are used first system comprises base isolator and multi tuned mass dampers (BI & MTMD) and another combination is hybrid base isolator and multi tuned mass dampers (HBI & MTMD) for controlling an eight story isolated benchmark steel structure. Active control force of hybrid isolator is estimated by fuzzy logic algorithms. The influences of the combined systems on the responses of the benchmark structure under the two near-field earthquake (Newhall & Elcentro) are evaluated by nonlinear dynamic time history analysis. Applications of combined control systems consisting of passive or active systems installed in parallel to base-isolation bearings have the capability of reducing response quantities of base-isolated (relative and absolute displacement) structures significantly. Therefore in design and control of irregular isolated structures using the proposed control systems, structural demands (relative and absolute displacement and etc.) in each direction must be considered separately.

Keywords : base-isolated benchmark structure, multi-tuned mass dampers, hybrid isolators, near-field earthquake, fuzzy algorithm

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