**PERFORMANCE-BASED DESIGN OF SEISMICALLY ISOLATED BRIDGES**

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**Abstract**

A performance-based design procedure is presented for seismically isolated bridges equipped with linear or nonlinear viscous dampers (VDs). Accounting for multiple performance objectives, the proposed method initially identifies the critical hazard level and ‘near-optimal’ alternatives of the isolation system in terms of both economy and performance, based on the inelastic response of a single-degree-of-freedom system. By incorporating nonlinear response history analysis (NLRHA) of the multi-degree-of-freedom (MDOF) system in a number of successive design steps that correspond to different performance levels (PLs), it subsequently leads (in a non-iterative way) to a refinement of the initial design solution through the control of a broad range of material strains and deformations. The efficiency of the proposed design methodology is demonstrated by applying it to an actual bridge that was previously designed for ductile behaviour. Assessment of the design using NLRHA for spectrum-compatible motions indicates that the introduction of nonlinearity in viscous dampers can effectively reduce their size (i.e. reduced damper force demand) without significantly affecting the overall bridge response. Furthermore, enhanced seismic performance and cost reduction in the substructure design emerge, thus, rendering base-isolation an appealing design alternative.

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