

عنوان مقاله:

DESIGN OF PASSIVE STRUCTURAL CONTROL SYSTEMS USING VISCOUS FLUID DAMPERS CONSIDERING BRACE FLEXIBILITY

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نویسندگان:

.,Maziar Jamshidi - School of Civil Engineering, Sharif University of Technology, Azadi Ave

Mehdi Ahmadizadeh

خلاصه مقاله:

An effective method is developed for design of passive viscous fluid dampers for structural control, considering the flexibility of braces used for installation of dampers. In the first step of this method, a suitable damping ratio is determined based on the optimization results of single-degree-of-freedom systems with various natural periods and brace stiffness ratios. The optimization is carried out using an objective function that is a weighted combination of mean squares of inter-story drift and absolute acceleration responses. The search for optimum damping ratio is carried out for a set of scaled ground motion records, and the mean of the resulting record-specific optimum damping ratios is then adopted as the optimum damping ratio. By repeating this procedure for a range of natural periods and brace-to-story stiffness ratios, a set of control design spectra is generated that yield the suitable damping ratios for any given single-degree-of-freedom system. Next, the usage of this method is extended to multi-degree-of-freedom shear building systems by adding the above-mentioned optimum damping ratio to the inherent damping of the first natural vibration mode. Finally, assuming stiffness-proportional classical damping for the structure, the new damping matrix of the system is determined and used to find the required damping coefficients of viscous fluid devices. In order to demonstrate the application and effectiveness of the proposed design method, control systems are designed for an example 7-story structure and the achieved performances are compared to that of other design methods. It is shown that the control systems, designed using the proposed method, provide responses close to those of optimum systems, while greatly simplifying the design process.

کلمات کلیدی:

passive control, viscous fluid damper, brace flexibility, design spectra

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