

## **SEISMIC PROTECTION OF A MODEL STRUCTURE USING SEMI-ACTIVE RESETABLE DEVICES**

### Abstract

In recent years, semi-active control systems have been considered for the control of structures subjected to seismic excitation. They are capable of generating large forces, offer highly reliable operation at a modest cost, and do not destabilize the structural system. Semi-active control systems are essentially nonlinear in nature.

Initial results indicate that newly developed semi-active resetable devices are quite promising for earthquake engineering applications. Semi-active resetable devices are fundamentally hydraulic or pneumatic spring elements. They possess the ability to release the stored spring energy at any time.

This paper describes analytical and experimental research into the effectiveness and feasibility of the semi-active control systems for structural protection during severe earthquake loading. The research involves experimental and analytical studies of a four-storey model structure subjected to seismic excitation and controlled by semi-active resetable energy dissipation devices.

Analytical studies are carried out to determine the optimal placement and size of the semi-active devices in the miniature building structure. The effects on the structural response induced by damping and stiffness increases resulting from the addition of the devices are examined.

Shaking table tests are performed on the model structure both with and without the semi-active resetable devices. The devices are installed in the lateral bracing of the model structure. The mechanical properties of the devices are modified according to a control algorithm that takes into account the measured response of the model structure. The results of the shaking table tests are presented, interpreted, and compared with analytical predictions.