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ACTIVE CONTROL RESEARCH IN THE U.S.

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ABSTRACT

In recent years, new and innovative concepts of structural protection have been advanced and are at various stages of development. Modern structural protective systems can be divided into three major groups: seismic isolation, passive energy dissipation, and active control. Passive energy dissipation systems encompass a range of materials and devices for enhancing damping, stiffness and strength, and can be used both for natural hazard mitigation and for rehabilitation of aging or deficient structures. In recent years, serious efforts have been undertaken to develop the concept of energy dissipation, or supplemental damping, into a workable technology, and a number of these devices have been installed in structures throughout the world. In general, such systems are characterized by a capability to enhance energy dissipation in the structural system to which they are installed. This goal may be achieved either by conversion of kinetic energy to heat or by transferring of energy among vibrating modes. Active structural control is an area of structural protection in which the motion of a structure is controlled or modified by means of the action of a control system through some external energy supply. Considerable attention has been paid to active structural control research in recent years, with particular emphasis on the alleviation of wind and seismic response. The technology is now at the stage where actual systems have been designed, fabricated and installed in full-scale structures.

The focus of this paper is on the state-of-the-art of active control research in the U.S. These research activities in the U.S. can be grouped into the following areas: (a) Sensors and actuators, (b) Control algorithm development, (c) Applications to buildings, and (d) Applications to infrastructures. Research activities in these areas are briefly reviewed in the paper. Included in this review are descriptions of several international cooperative projects involving U.S. investigators.

KEYWORDS

Structural dynamics, wind and earthquake engineering, active control