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Abstract

SOME CONSIDERATIONS ABOUT ACTIVE, PASSIVE, HYBRID AND SEMI-ACTIVE TECHNIQUES

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Structural control has a long and successful history in civil engineering for mitigating dynamic hazards. The traditional approach to mitigate vibrations due to the earthquake and wind loads is to design structures with sufficient strength and deformation capacity in a ductile manner. This approach, based on the ensuring of strength-ductility combination, provides the strong wind or seismic action as ultimate load, accepting a certain number of structural or non-structural degradations. Usually, for a steel structure, the dissipation of the energy introduced in structure by dynamic action occurs only in the plastic hinges. For this reason, taking into account the way in which the load bearing structural elements of a steel system function together, a global plastic mechanism is generated.

New concepts of active control, designed in such a way that the control forces are supplied to the structure through the employment of the actuators, may exclude the inelastic deformations in the elements of the structural system. These systems require large external power sources that may reach several megawatts for large structure.

The promising alternative between the passive and active techniques has been developed recently in a form called semi-active technique. In another way said, semi-active control techniques make the rehabilitation of passive control systems, while they can occur similar performances of active control systems.

Hybrid control techniques blend passive and active control techniques. In the scheme of hybrid control the forces generated by the actuators are aimed to increase the efficiently of passive control devices.

Attention of this paper is focused on passive, active, hybrid and semi-active control systems. If passive control systems are used for enhancing the structural damping, stiffness or strength, the other control techniques employ controllable forces to add or dissipate energy in a structure, or both, due to the specific devices integrated with sensors, controllers and real-time processes to operate. This paper includes the advantages of these technologies in the context of dynamic hazard mitigation consisting of the following section: section 1 as an introduction; section 2 deals with passive control system; section 3 deals with active control techniques; section 4 deals hybrid control techniques; section 5 deals semi-active control techniques; and section 6 deals with general conclusions.

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