

## Analytical model for viscous wall dampers

### ABSTRACT

By now, many civil engineering researchers have extensively studied the application of earthquake energy dissipation systems in seismic-resistant buildings. Earthquake energy dissipation systems play an important role in enhancing the sustainability of structures against seismic excitation. Frame buildings are strengthened by installing damper devices as supplemental structural members. This article presents the finite-element-based development of an analytical model for a viscous wall damper (VWD) device, an alternative to other earthquake energy dissipation systems, which can diminish the effect of earthquakes on structures and improve the seismic performance of multistory buildings subjected to ground motion. The constitutive law of VWDs has been formulated and integrated to develop a finite element model of VWD compatible with the reinforced concrete (RC) structure analytical model. Then, the finite element algorithm has been developed for inelastic analysis of RC buildings equipped with VWD devices capable of detecting damage to both structural members and damper connections under dynamic loading. Based on the developed system, the special finite element program was codified and verified by applying it to a real model of a RC building with supplementary VWD devices. Influence of VWDs on seismic performance of the RC building during earthquake excitation was evaluated. The proposed analytical model for VWD is verified by using experimental test data and analysis result proved that this energy dissipation system succeeds by substantially diminishing and dissipating a structure's induced seismic responses. Also the parametric study indicated that the damping coefficient is very effective on performance of VWD.

**Keyword:** Viscous wall damper; Earthquake energy dissipation systems; Seismic excitations