



# Seismic Response Analysis for Engineering Structures Equipped with Double Viscous Damper Toggle Brace System

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## Abstract

The toggle brace viscous damping system has been proved to be an effective motion amplification device, which can amplify the deformation of the damper under wind load and earthquake action, thus significantly improving the energy dissipation efficiency of the damper. In the existing viscous damping system of elbow joint, the damping force will act directly on the floor beam, which often leads to unsatisfied performance of the connected floor beam. Therefore, a double-damper toggle brace device is proposed in this paper, and a mathematical model of geometric parameter optimization of double-damper toggle brace device system is established. According to this mathematical model, a larger displacement amplification factor can be obtained, which is far superior to the existing toggle damping system. Finally, a two-story steel frame model is taken as an example to verify the effectiveness and applicability of the proposed double-damper toggle brace device system.

**Keywords:** viscous damping device; double-damper toggle viscous damping device; seismic response.

## 1 Introduction

Viscous damper is a kind of velocity-dependent damper with no stiffness. It has the advantages of strong energy dissipation, no additional stiffness, and the displacement and damping force are out of

phase. A large number of engineering practices have proved that viscous damper is a kind of energy dissipation device that can effectively absorb and dissipate seismic action and wind load [1], such as Huntington Building 111 in Boston, Yintai Center in Beijing, International Trade Center in Tianjin, Four