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Effect of Fluid Viscous Damper parameters on the seismic performance

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ABSTRACT

Energy dissipation devices are widely used to enhance the response of structures subjected to dynamic loads caused by wind and earthquake. Especially, viscous dampers are hydraulic devices widely used in structural engineering that dissipate mechanical energy by producing a damping force against the motion. The dampers can mitigate transversal and longitudinal or vertical displacement. It can be set up in different kinds of structures. This study is aimed at comparing the impact of various Fluid viscous damper parameters on the structures under the earthquake. To this aim, a seven-story steel frame structure retrofitted with fluid viscous dampers was considered for analyzing with a variety of parameters. The results showed that installing longitudinal nonlinear Fluid viscous damper can significantly reduce the seismic response by selecting affordable damping parameters, including stiffness, damping coefficient, and velocity exponent. The optimum damping parameters can be calculated accurately by analyzing structure with different damping parameters of nonlinear Fluid viscous damper.

Keywords: Damper parameters, Damping force, Damping coefficient, Velocity exponent, Seismic performance

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1. INTRODUCTION

ne of the most popular passive energy dissipation systems using for civil engineering [1], is the fluid viscous damper (FVD) [2,3] which has obtained popularity recently, because of: 1) the significant energy dissipation and enhancing the seismic performance; 2) The ability to generate forces which are uncorrelated with displacement; 3) the capability of increasing the damping ratio without changing the stiffness characteristics considerably [4–6]. FVDs are effective energy dissipation devices enhancing structural responses to resist the effects of wind and earthquakes. The damping force developed by the FVDs depends on the physical properties of the fluid used in the device [7]. Using FVDs is an effective method for improving the seismic performance of existing and new