SEISMIC PERFORMANCE OF STEEL MOMENT RESISTING FRAMES WITH FLUID VISCOUS DAMPER

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The supplementary energy dissipation represents an efficient technique for the seismic protection of structural systems. Specifically, the insertion of steel braces equipped with damping devices proves to be effective in order to enhance the performance of a framed building under horizontal seismic loads. This study evaluates the seismic resistance of steel moment resisting frames (MRFs) with supplemental fluid viscous dampers against collapse and check the effectiveness of the damped braces structure. We have been designed six, eight and twelve story steel structure with and without damper by ASCE07-10 for this study. Then, we modeled those structures with plastic hinge in opensees software with and without damper. The study investigated collapse state of those structures by using Incremental Dynamic Analysis and probability of collapse get from fragility curve. We used Equation (1) to calculate damper properties (Hwang et al., 2008). This properties illustrated in Table 1.

The studies in this paper presented probability of collapse in structure with Linear damper less than Nonlinear damper and structure with Nonlinear damper is less than structure without damper under far field earthquake.

$$\xi = \frac{T^{2-\alpha}\sum_j \eta_j C_j \lambda_j \left|(f_h)_j(\phi_h)_{rj} - (f_v)_j(\phi_v)_{rj}\right|^{1+\alpha}}{(2\pi)^{3-\alpha} A^{1-\alpha}\sum_i m_i(\phi_h)_i^2} \qquad (1)$$

Table 1. Properties of Viscous Damper

Structure	Viscous damping	Damping Coefficient ($ton.\sec/m$)		Damper Stiffness (ton/m)	
		α=1	α=0.5	α=1	α=0.5
6 Story	%20	350.34	130.93	3887.90	1637.20
8 Story	%20	604.66	168.7413	5510.90	1846.20
12 Story	%25	1025.6	269.19	8326.50	2628.30

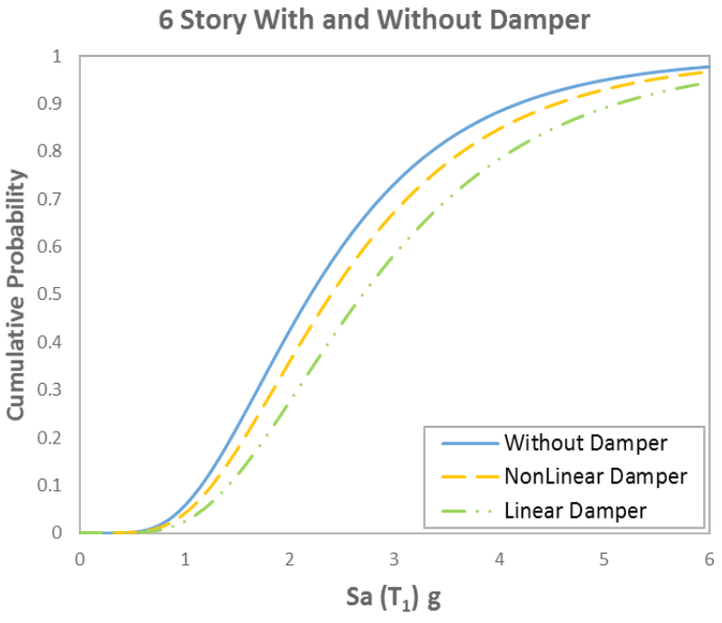

Figure 1. Comparing Collapse Fragility Curve for Structure with and without Damper

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