

COMPARISON OF VISCOELASTIC DAMPERS MADE FROM WOOD AND STEEL

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Passive energy dissipation (PED) devices, when incorporated into a structure, work by adding supplemental damping to the system which reduces the structural response during an earthquake or high winds. Viscoelastic dampers are one type of PED device that has emerged as an innovative solution to improving the seismic performance and wind response of structures. Viscoelastic dampers have been especially successful at gaining widespread acceptance by the engineering and construction industries as evidenced by its increased application over the last 10 years. Traditionally, viscoelastic dampers have been used exclusively in steel and reinforced concrete structures; however, there have been some recent studies demonstrating the feasibility of using viscoelastic dampers in woodframe structures.

These initial studies used dampers consisting of viscoelastic material bonded to steel plates, typical of devices found in steel and concrete structures. This was the first study to investigate viscoelastic material bonded to wood. The objective of this study was to characterize the performance and quantify the differences between viscoelastic dampers constructed with steel and wood. Static and cyclic tests were conducted on steel and wood dampers utilizing 3M ISD-111 viscoelastic polymer. Twelve specimens, six wood and six steel, were loaded statically to failure. Six dampers, three wood and three steel, were subjected to ten fully reversed cycles of sinusoidal displacement at various strains and frequencies. For all dampers, the shear area of the VE was held constant, while the thickness varied.

The static investigation demonstrated that the failure mode for all wood specimens was a shearing of the material at strains over 500%. There was no debonding of the VE material from the wood. The results of the cyclic tests showed good agreement between the stiffness and energy dissipations for the wood and steel dampers. These results show that there was no appreciable difference in performance between the steel and wood specimens. Based on this initial study, engineers can begin to investigate new applications of VE material in woodframe structures.

Publications Resulting from this Work:

- Dinehart, D. W. and Lewicki, D. E. (2001) "Viscoelastic Material as a Seismic Protection System for Wood-Framed Buildings", *Proceedings of the 2001 Structures Congress*, Washington D.C.
Lewicki, D. and Dinehart, D. W. (2000), "Combining Wood and Viscoelastic Material", *Proceedings of the World Conference on Timber Engineering*, Vancouver, British Columbia.

