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Enhancing Seismic Performance of Ductile Moment Frames with Delayed Wire-Rope Bracing Using Middle Steel Plate

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Abstract : Moment frames have considerable ductility against cyclic lateral loads and displacements; however, if this feature causes the relative displacement to exceed the permissible limit, it can impose unfavorable hysteretic behavior on the frame. Therefore, adding a bracing system with the capability of preserving the capacity of high energy absorption and controlling displacements without a considerable increase in the stiffness is quite important. This paper investigates the retrofitting of a single storey steel moment frame through a delayed wire-rope bracing system using a middle steel plate. In this model, the steel plate lies where the wire ropes meet, and the model geometry is such that the cables are continuously under tension so that they can take the most advantage of the inherent potential they have in tolerating tensile stress. Using the steel plate also reduces the system stiffness considerably compared to cross bracing systems and preserves the ductile frame’s energy absorption capacity. In this research, the software models of delayed wire-rope bracing system have been studied, validated, and compared with other researchers’ laboratory test results.

Keywords : cyclic loading, delayed wire rope bracing, ductile moment frame, energy absorption, hysteresis curve
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