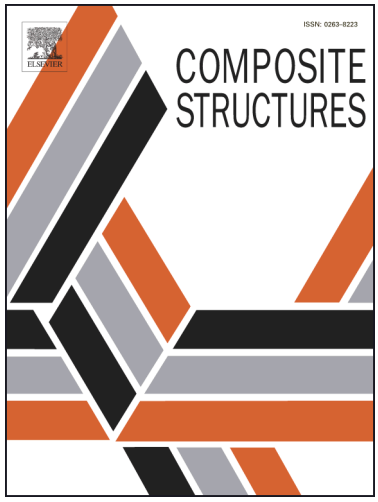

letter

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Seismic retrofit of square reinforced concrete columns using basalt and carbon fiber-reinforced polymer sheets: a comparative study

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Abstract: This paper presents results of an experimental program in which basalt and carbon fiber-reinforced polymer (FRP) sheets are used as confining jackets to enhance the seismic performance of square reinforced concrete (RC) columns with inadequate transverse reinforcement. Crack patterns, failure modes, lateral hysteresis loops, displacement ductility, energy dissipation capacity and stiffness degradations of one unretrofitted column and five retrofitted columns are presented and discussed. The effects of the amount and type of FRP sheets on the seismic behavior of the retrofitted columns are also examined. Experimental results indicate that the unretrofitted column has poor ductility with brittle shear failure, while the FRP jackets are useful in enhancing the seismic resistance of the retrofitted columns and result in more stable hysteresis loops with improved energy dissipation capacity and lower stiffness degradations. The columns retrofitted with BFRP sheets have equivalent or even superior seismic performance compared to counterparts that are retrofitted with the same number of layers of carbon FRP (CFRP) sheets, and the material costs of the former are only 20% that of the latter. It has been demonstrated that the BFRP composites have promising potential for use as an alternative to conventional FRPs for seismic retrofit of square RC columns.

Keywords: Concrete column; Fiber-reinforced polymer (FRP); Basalt fiber; Seismic load; Ductility; Energy dissipation.

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