

Shear Strengthening of Exterior Beam-Column Joints using FRP Sheets

Saleh H. Alsayed, Yousef A. Al-Salloum, Tarek H. Almusallam

Department of Civil Engineering, King Saud University, Riyadh, Saudi Arabia

ABSTRACT

In this paper, efficiency and effectiveness of Carbon fiber reinforced polymers (CFRP) in upgrading the shear strength and ductility of seismically deficient exterior beam-column joints have been studied. For this purpose, two reinforced concrete exterior beam-column sub-assemblages were constructed with non-optimal design parameters (inadequate joint shear strength with no transverse reinforcement) representing pre-seismic code design construction practice of joints and encompassing the vast majority of existing beam-column connections. Out of these two, one specimen was used as baseline specimen (control specimen) and other one was strengthened with CFRP sheets (strengthened specimen). These two sub-assemblages were subjected to cyclic lateral load histories so as to provide the equivalent of severe earthquake damage. The damaged control specimen was then repaired using CFRP sheets. This repaired specimen was subjected to the similar cyclic lateral load history and its response history was obtained. Response histories of control, repaired and strengthened specimens were then compared. The results were compared through hysteretic loops, load-displacement envelopes, ductility and stiffness degradation. The comparison shows that CFRP sheets improve the shear resistance of the joint and increase its ductility.

Keywords: *Beam-column joints, CFRP, seismic, retrofitting, strengthening, repair, cyclic loads.*