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Rapid Repair of Severely Damaged Reinforced Concrete Columns

by

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R289**



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16. Abstract Research on rapid repair of reinforced concrete (RC) columns has been limited to columns with slight or moderate damage. Moreover, few studies have been conducted on repair of severely damaged columns, particularly with buckled or fractured reinforcing bars. In those studies, however, the techniques used involve considerable time and effort and are not considered "rapid". The goal of this study was to develop an effective technique to rapidly repair severely damaged RC columns for temporary service use with externally bonded carbon fiber reinforced polymers (CFRP). This paper describes the repair and retest of three half-scale severely damaged square RC bridge columns within four or five days. Damage to each column included buckled longitudinal bars, and one column had fractured bars near the column base. The repairs were designed to restore the column strength using longitudinal and transverse CFRP. A novel anchorage system was designed to anchor the longitudinal CFRP to the column footing. This study illustrates the effectiveness and limitations of this repair technique. The technique was found to be successful in restoring the strength of the columns without fractured bars, but only partially successful for the column with fractured bars located near the base because of CFRP anchorage limitations.			
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Dr. Sneed's Ph.D. student, Ruili He, was supported in part by NUTC funds from January 1, 2012 to June 30, 2012. During this period, Ms. He continued to progress her Ph.D. research on rapid repair of severely damaged reinforced concrete columns and made notable progress in disseminating her research. During the period, one journal paper was submitted, and one presentation was made. This final report includes the abstracts of these activities.

He, R., Grelle, S., Sneed, L.H. and Belarbi, A. "Rapid Repair of a Severely Damaged RC Column Having Fractured Bars Using Externally Bonded CFRP" (submitted to *Composite Structures*, June 12, 2012)

Research on rapid repair of reinforced concrete (RC) columns has been limited to columns with slight or moderate damage. Moreover, few studies have been conducted on repair of severely damaged columns, particularly with buckled or fractured reinforcing bars. In those studies, however, the techniques used involve considerable time and effort and are not considered "rapid". The goal of this study was to develop an effective technique to rapidly repair severely damaged RC columns for temporary service use with externally bonded carbon fiber reinforced polymers (CFRP). This paper describes the repair and retest of three half-scale severely damaged square RC bridge columns within four or five days. Damage to each column included buckled longitudinal bars, and one column had fractured bars near the column base. The repairs were designed to restore the column strength using longitudinal and transverse CFRP. A novel anchorage system was designed to anchor the longitudinal CFRP to the column footing. This study illustrates the effectiveness and limitations of this repair technique. The technique was found to be successful in restoring the strength of the columns without fractured bars, but only partially successful for the column with fractured bars located near the base because of CFRP anchorage limitations.