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A Combination of GFRP Sheets and Steel Cage for Seismic Strengthening of Shear-Deficient Corner RC Beam-Column Joints

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ABSTRACT

This paper is focused on the performance of a proposed scheme for seismic strengthening of shear deficient joints of 3D reinforced concrete (RC) corner beam-column connections. This technique is composed of a combination of GFRP sheets and a steel cage, and does not require perforating the existing concrete elements to anchor the FRP sheets. Two similar full-scale beam-column connections were made without any transverse reinforcement in their joint region. One of which was tested in its as-built condition, taken as control specimen, while the other one was tested after strengthening. Seismic behaviour of these specimens were studied under a cyclic loading pattern imposed simultaneously with a constant column's axial load. Comparison of the test results of these specimens revealed a noticeable improvement in the seismic response of the strengthened specimen. This achievement along with the application feasibility of this technique indicates the suitability of the proposed strengthening scheme for practical applications. Finally, the experimentally obtained joint shear strength of the control and retrofitted specimens are compared to the one estimated by the relationships of the softened strut-and-tie model and ACI-318, respectively. This comparison revealed a satisfactory prediction of joint shear strength for both specimens, the as-built and the strengthened one.

KEYWORDS

Seismic retrofitting; RC beam-column joint; GFRP sheets; Steel cage; Bidirectional loading, Cyclic behaviour; Anchorage system

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