

Seismic Retrofit of Reinforced Concrete Beam-column Joints with CFRP Composites

by

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ABSTRACT

This study is on a new seismic retrofitting method with CFRP composite for a critical reinforced concrete beam-column joints longitudinally over reinforced, to shift the critical part from the joints to the beam ends to ensure a beam-hinging mechanism and increase the story shear capacity. Four specimens of 1/3 scale reinforced concrete beam-column joint were constructed to be subjected to statically cyclic lateral loading simulating earthquake. The parameter of the test is with and without a retrofit using CFRP composite. The previous methods using CFRP for seismic retrofit of beam-column joints in actual three-dimensional frame are considered to be challenging because of the presence of transverse beams and floor slab that limit the accessibility of the joint. The difficulties in developing the strength of externally placed CFRP are also considered to limit the application of seismic retrofit. But the method used in this study has overcome the challenge based on a new idea of retrofit to increase the strength of a beam-column joint resulting from passive vertical confinement in columns. This idea is implemented by four CFRP bundled strands vertically placed at the four corners of a column. The bundled strands make it possible to place CFRP strands easily passing through a floor slab by boring small holes. The tensile force in the CFRP strands are to be developed by a fan shaped spread with epoxy on the column surface. Additional transverse and longitudinal CFRP sheet may be placed to secure the effective development. Due to its simplicity, the application of this method is easy and applicable to most three-dimensional beam-column joints with transverse beams and floor slab despite of architectural restrictions. Test result in **Fig. 1** shows the method used here alters the joint shear failure to beam-hinging mechanism and the story shear increased to the level of calculated story shear at flexural capacity of beams. So it is revealed that the seismic retrofit of the beam-column joint shown here is promising for more practical seismic retrofit of critical beam-column joints.

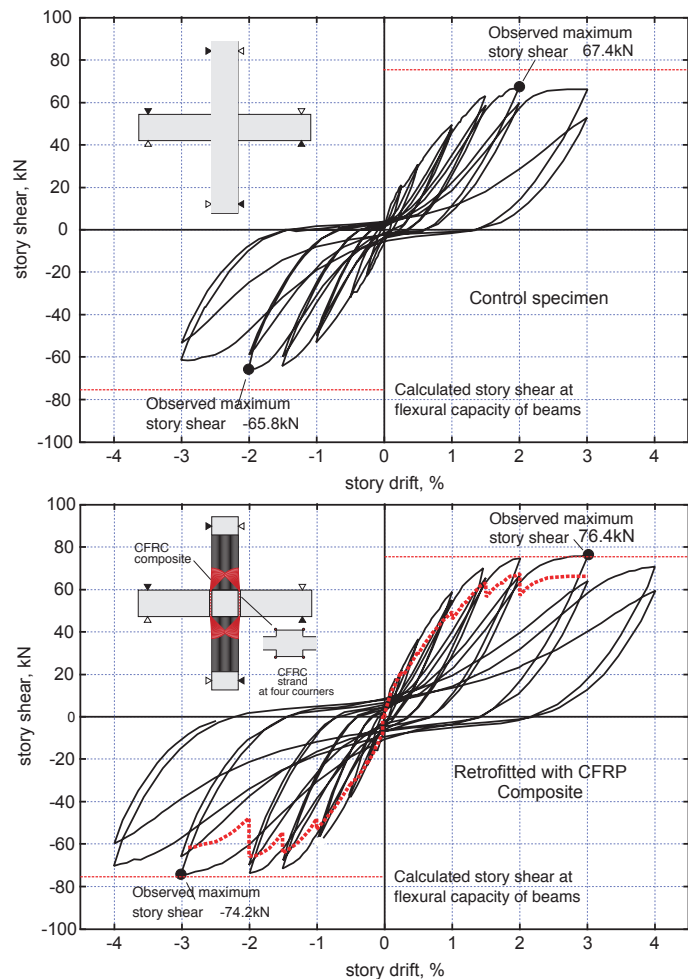


Figure 1 Comparison of the story shear-story drift relations