

Title of Research:

Seismic Vulnerability of Reinforced Concrete Beam-column Joints

Recipient:

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Summary:

The 2011 AIJ Prize was awarded to the author with a series of 8 research papers on theoretical and experimental studies on reinforced concrete beam-column joints. He has proposed a new set of general and rational concepts and models useful in identifying and defining the ultimate behavior of two-dimensional reinforced concrete beam-column joints subjected to lateral seismic load. Novel concepts of ultimate moment capacity and moment at balanced failure of beam-column joints are proposed. The design factors affecting the performance of the beam-column joints are identified theoretically with the model. Then, he verified the validity of the model and the equations by two series of tests on 26 interior and 24 exterior RC beam-column joints respectively. From the tests, the deficient story shear strength was observed for column-to-beam flexural strength ratios in the range from 1.0 to 2.0 despite the beam-column joint is under reinforced. To date, this type of joint failure has not been identified and there has been no simple analytical model facilitated for predicting such poor behavior of RC beam-column joints. The proposed model gives a good correlation with the test results. Correlation studies using test database on the past tests on beam-column joint has been carried out to increase the reliability. This research is of great importance because it reveals unknown potential vulnerability of beam-column joints to seismic action, gives it theoretical explanation and warns the threat of seismic risk hidden in existing moment resisting frame reinforced concrete structures in seismic zones.