Introduction and statement of the problem

In practice, there are not many options to strengthen vulnerable reinforced concrete beam column joints. Moreover, their design is usually time consuming and complicated. In this work, the Fiber Reinforced Polymer (FRP) beam-column joint strengthening layout adopted by the researchers at the University of Canterbury (UC) has been studied and improved for practical adoption by structural engineers.

A simplified analysis and design procedure is proposed that can be used to quantify the provided capacity. This work aims to provide the New Zealand Structural Engineering community with a practical and accurate FRP strengthening design approach. The proposed procedure can facilitate the use of this strengthening scheme in real-life engineering applications. The developed methods are based on the utilization of strength hierarchy assessment, which was improved previously within the scope of this project.

Summary of the strength hierarchy assessment method

Strength hierarchy assessment was previously improved and presented as the basis of the approaches in this project. It is used in order to quantify the capacity of an existing RC frame structure as well as the design of the joint strengthening. RC beam column joint strengthening by FRPs can be directly implemented in this assessment method.

FRP Strengthening Scheme for the RC Beam Column Joints

FRP application on a test specimen (courtesy of Dr. Umut Akguzel)

Concluding remarks

The procedure is confirmed and reported for the quantification and assessment of the provided capacity as a result of the given FRP joint shear strengthening layout. The procedure does not require complicated computer models and can be conveniently implemented by the practictioner engineers using only a spreadsheet software and fundamental knowledge of reinforced concrete structures with accuracy and efficiency.

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