EuroSciCon

International Conference on
Structural and
Civil Engineering Research

June 06-07, 2019
Paris, France

Siu-shu Eddie Lam et al., JET 2019, Volume:8

AN APPROACH TO STRENGTHEN REINFORCED CONCRETE BEAM-COLUMN JOINTS BY UNSYMMETRICAL CHAMFERS

Siu-shu Eddie Lam, Zhihang Xue, Sohail Maqsood
The Hong Kong Polytechnic University, Hong Kong

Over the years, many methods have been proposed to strengthen reinforced concrete beam-column joints ("BCJs"), e.g. by jacketing using different materials. In buildings, strengthening will provide to have sufficient fire resistance, minimum alteration to building plans, and minimum impact to the environment, like dust and noise. It is the objective of this study to develop a strengthening strategy for BCJs with the above in mind. It comprises experimental studies to be completed in December 2018 and numerical studies which will still be on-going. In this study, unsymmetrical chamfers are proposed to enhance the joint shear capacity of BCJs. Chamfers are installed on the soffit of beams and concealed by the false ceilings, i.e. no alteration to building plans. Further, they can be constructed easily within one hour by unskilled labours and are especially attractive for hospitals and fire-station requiring minimum interruption of service. In the experimental studies, 17 BCJ specimens are tested to failure under progressive increase in cyclic deformation. Structural configurations are based on typical BCJs commonly found in Hong Kong. The specimens are at 2/3-scale and include interior BCJs, exterior BCJs and BCJs with unequal column sections. It is well demonstrated that, by developing compression chords in chamfers to resist the joint shear force, joint shear strength is increased. Mode of failure is shifted from joint shear failure to flexural failure in columns or beams. Numerical studies have also been carried out using finite element models and micro-truss elements. The former implements WCOMD, a non-linear finite element package for reinforced concrete and the latter is based on a 4-node truss element developed in this study. Performance of BCJs with chamfers is predicted numerically to understand the load transfer mechanism. Parametric studies will be applied to develop simple strut-and-tie model for the design of chamfers.

Biography

Siu-shu Eddie Lam has received his PhD in 1989 from the University of Southampton, UK. He is an Associate Professor in the Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University. He is a Fellow of the Institution of Structural Engineers and the Hong Kong Institution of Engineers, Registered Structural Engineer in both Hong Kong and China, Member of the Institution of Mechanical Engineers and a Barrister. His research interest is in Structural Engineering and Earthquake Engineering.

cesslam@polyu.edu.hk