NANYANG TECHNOLOGICAL UNIVERSITY

Institute of Catastrophe Risk Management

A/P Li Bing

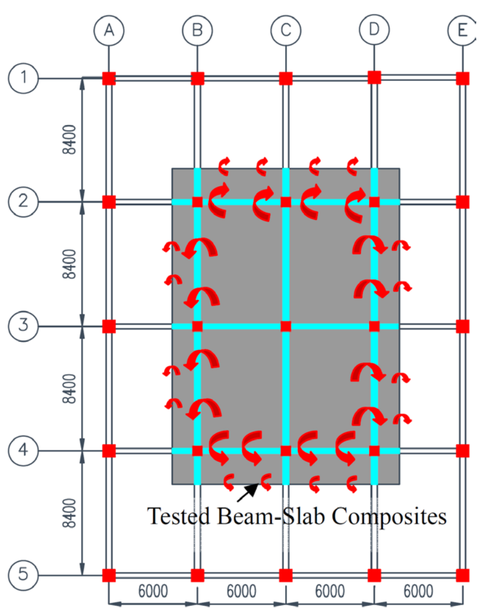
Dr Qian Kai

Load Carrying Mechanisms to Mitigate Collapse Risk of RC Buildings

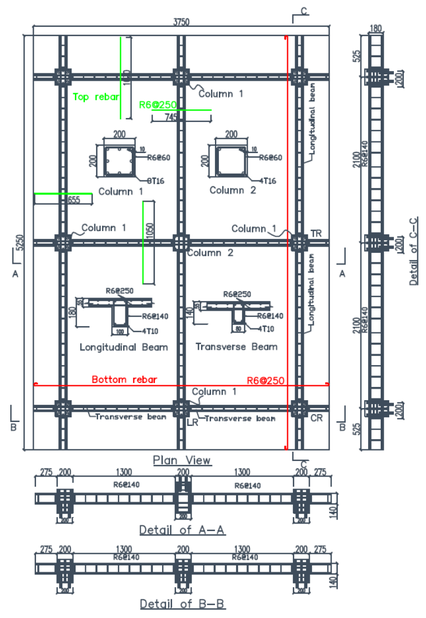
It is uneconomical to design buildings to resist progressive collapse based fully on their flexural strength as progressive collapse are relatively low possibility events. Fortunately, there are secondary load carrying mechanisms which are not considered in ordinary design. This could provide a second line of defense to prevent collapse. However, to date, limited studies had been carried out to quantify the ability of secondary load carrying mechanisms in resisting collapse of RC buildings. Therefore, a series of experimental, numerical and analytical analyses had been carried out in this study. Secondary carrying mechanisms include tensile membrane action and compressive membrane action developed in RC slab ,and compressive arch action and catenary action developed in RC beams.

Experimental Program

Six one-quarter scaled beam-column or beam-slab substructures were tested under push-down load regime.

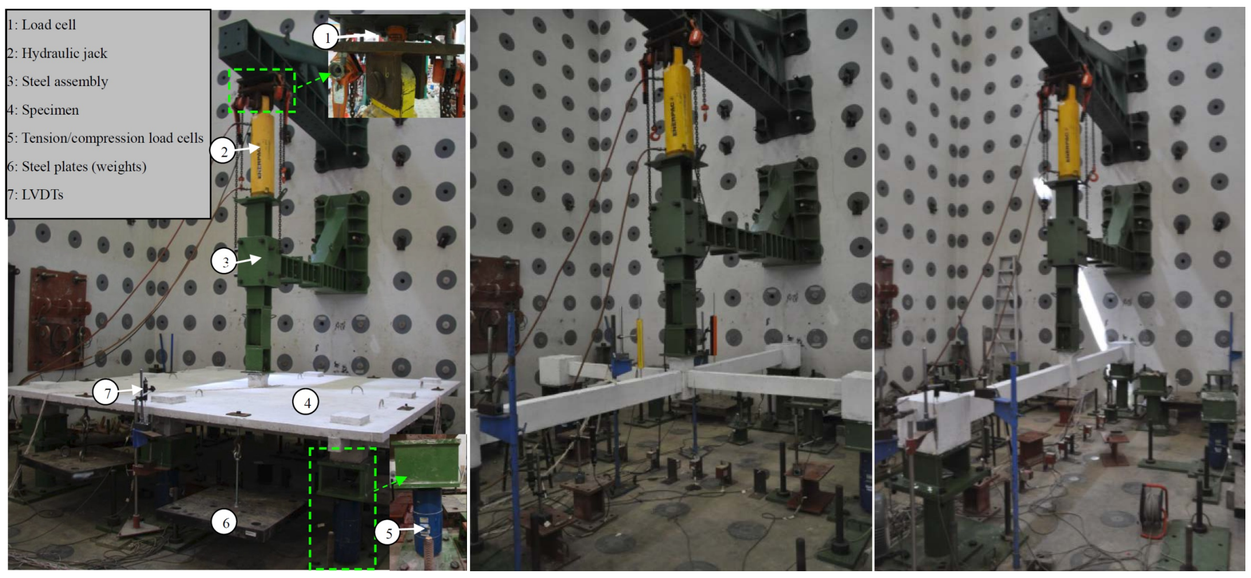


Prototype Frame



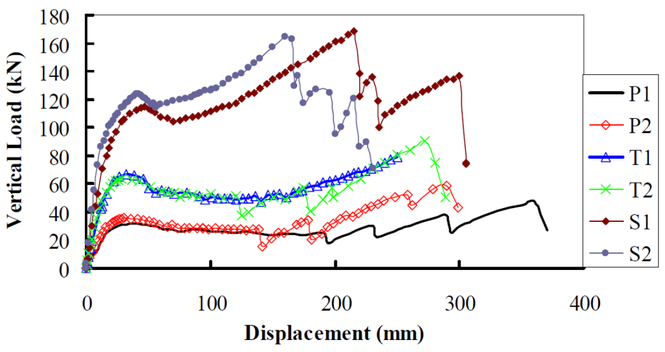
Details of typical specimen

Test Setup

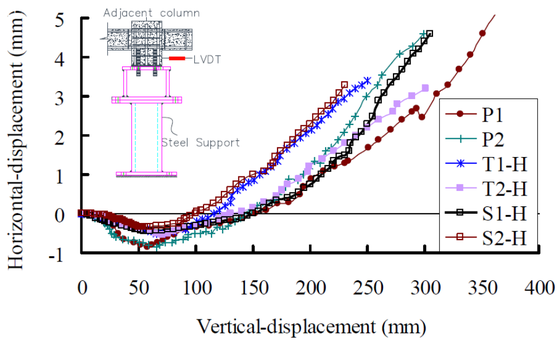


S-Series Specimens *3D-Series Specimens* *2D-Series Specimens*

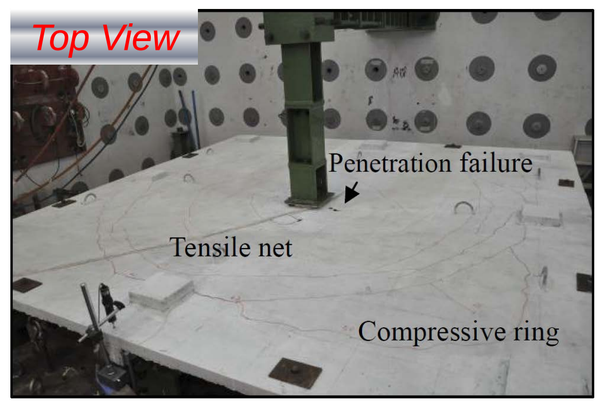
Test Results

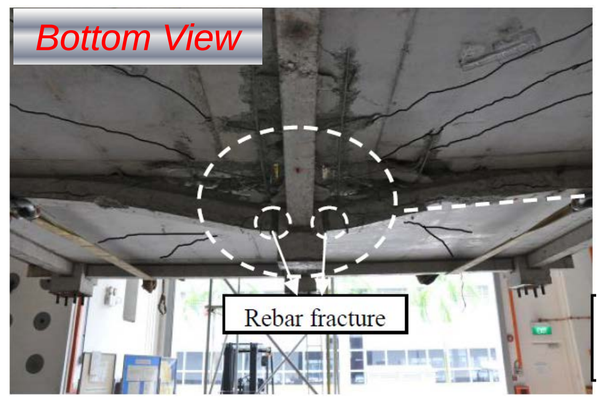


Load-displacement curve

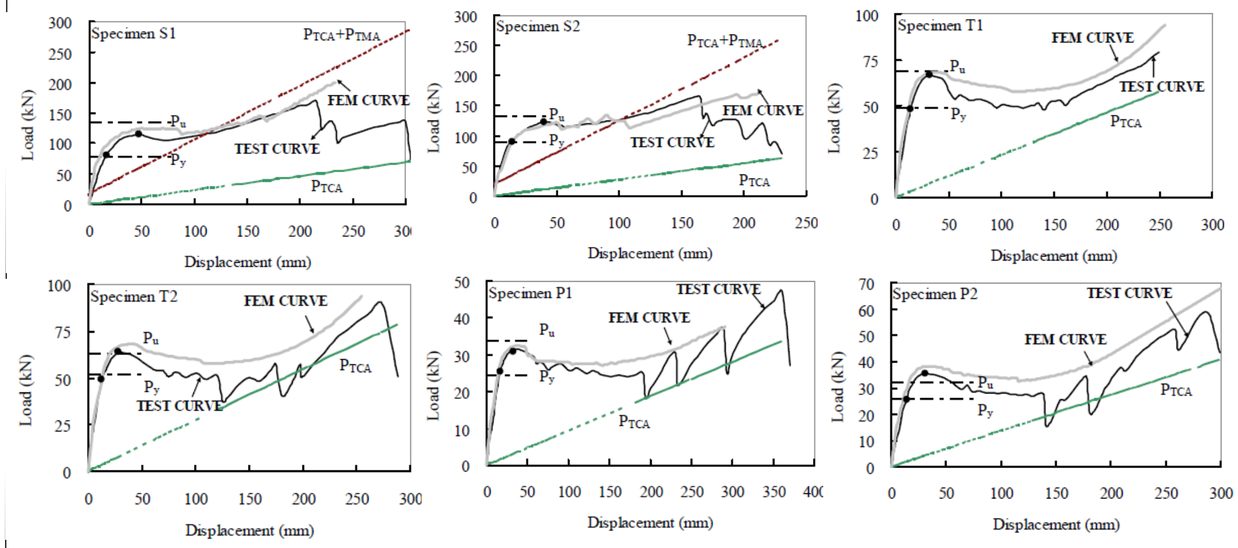


Horizontal movement of column



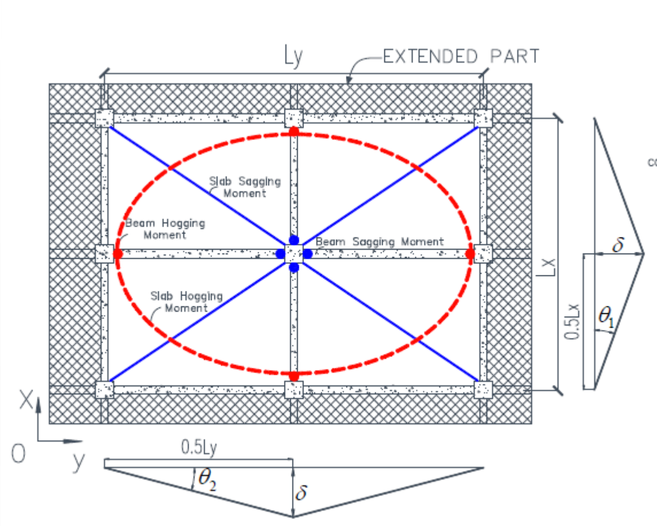


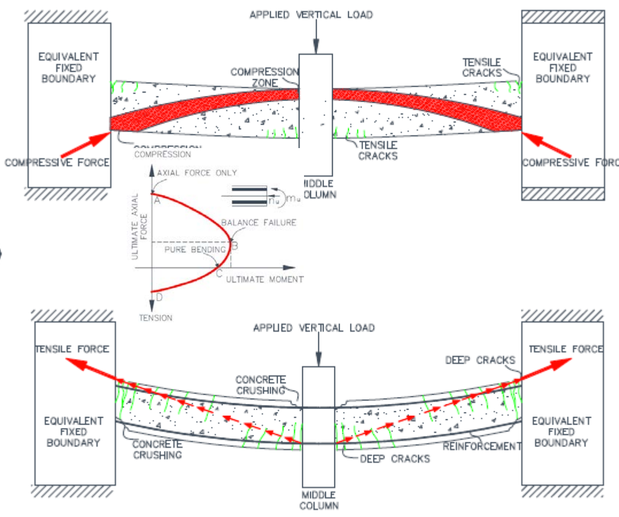
Failure mode of Specimen S2



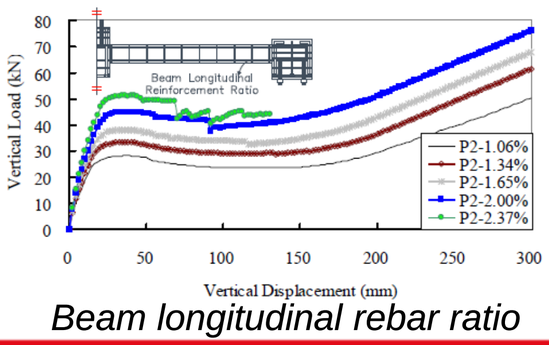
Comparison of the measured load-displacement curves with analytical results

Analytical Analysis

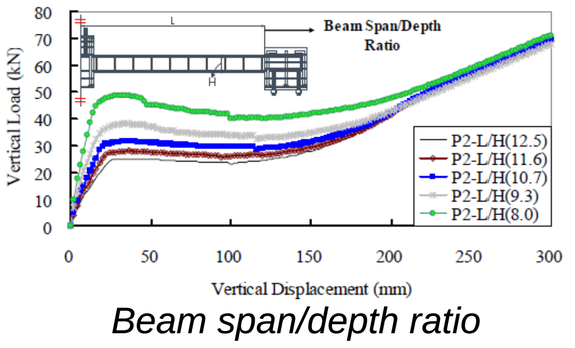




Parametric Study



Beam longitudinal rebar ratio



Beam span/depth ratio

Contact Us:
Executive Director, ICRM (ExecDir-ICRM@ntu.edu.sg)

N1-B1b-07, 50 Nanyang Avenue, Singapore 639798
Tel: +65 6592 1866