THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學
國家鋼結構工程技術研究中心香港分中心
Chinese National Engineering Research Centre For Steel Construction (Hong Kong Branch)
Address: Hong Kong Polytechnic University, Phase 8, Hung Hom, Kowloon, Hong Kong.
Telephone: (852) 3400 8441 Email: cnerc.steel@polyu.edu.hk Website: https://www.polyu.edu.hk/cnerc-steel/

Work Theme B: Structural engineering on modern steel construction

B2 Application of high performance steel materials Q690 to Q960 in super high-rise commercial buildings

Project Title:
b) "Blind-bolted End-plate to Concrete-filled Tubular Connections using High Strength Materials"

Theme: Application of high performance steel-concrete composite structures

Principal Investigator: **Dr. T.M. CHAN (CEE)**

Project Team Member: **Dr. F. Xu**

Project Outline:

This project aims to characterize a modified blind-bolt connection system to connect steel Ibeam to concrete-filled steel tubular column with octagonal shape. This connection aims to reach a compromise among the mechanical performance, fabrication and design limitations in high-rise-buildings, meanwhile achieving a balance between strength and ductility for connections under static loads. To achieve this, particular emphasis will be put in the following three aspects:

1. **Load transfer mechanism especially on the tension side for moment resisting composite connections:** Through experimental investigation on individual basic components and the interactions among them, the component design method which has been proven to be an effective design method for bolted connections between open section members, will be extended to the blind-bolted composite connection system;

2. **Optimizations for blind-bolted composite connections:** An effective optimization and appropriate design approach will be established to provide a technical solution on achieving an anticipated mechanical performance among initial stiffness, ductility, strength capacity and rotation capacity in relation to the grade of steel/concrete and the geometric information of the blind bolts;

3. **Design framework for blind-bolted composite connections:** On the basis of the findings in the experimental and numerical programme, the current design codes and recommendations will be evaluated and the rational and reliable design approaches will be developed.

In this project, the load transfer mechanism between composite column and beam through modified blind bolts including column-face bending mechanism and bond-slip mechanism will be extensively investigated. The constitutive model based on the yield line theory for tube face, the bond-slip model and the effective embedment depth of blind bolts will be obtained. The moment resisting performance will then be characterized and quantified through laboratory tests and numerical analysis. Finally, the statistically validated design guidance will be developed.