Project Title:	Development of Advanced Seismic Design Guidelines for MiC Buildings in Hong Kong and in the Greater Bay Area
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Research Institution:	The Hong Kong Polytechnic University
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Background

The Hong Kong Construction Industry has delivered infrastructures that form an important part of the urban systems for people living in Hong Kong. The continuous population growth and further city development come with huge construction demand in Hong Kong, which is driving the bid for significantly improved construction productivity. The Modular Integrated Construction (MiC) method by forming the overall structures using the modules fabricated off-site provides an attractive option to facilitate the realization of these Vision and Strategy (Building Department, 2019). Advanced design tools and construction techniques are in urgent need to facilitate the wide adoption of MiC to achieve the desired construction productivity.

The preliminary research of the investigators shows that steel MiC building structures designed following traditional seismic design methods are prone to the disastrous 'soft-story mechanism' under earthquake excitation. The soft story will experience a sudden reduction in lateral stiffness and large story drift, resulting in a concentrated deformation that can cause severe damage to total collapse. There is an urgent need to develop an advanced seismic design guideline specifically suited for MiC buildings. The development of such a guideline will not only address the need to integrate necessary earthquake resilience into MiC buildings that are to be massively constructed in Hong Kong, but also strengthen and maintain Hong Kong's established leading position in research and application of MiC buildings.

Objectives

- To conduct structural analysis of an existing MiC building in Hong Kong (e.g. InnoCell) to showcase the unique behaviour of MiC buildings under earthquakes.
- To study MiC buildings under earthquakes of different intensities with focus on the effect of the unique structural characteristics, e.g. discrete diaphragm, different rotational stiffness of inter-module joints.
- To develop a seismic design method with optimum design parameters for MiC buildings that can ensure satisfactory performance under earthquakes of different intensities.

Key Deliverables

- Optimum value of the seismic response modification factor, i.e., the behavior factor (q) in line with Eurocode 8 (CEN, 2005), which is used to determine the optimum seismic design force.
- Development of acceptance criteria for inter-module joints, i.e., the strength and stiffness demand which can guide the design and evaluation of inter-module joints.
- An advanced seismic design framework for steel MiC building structures, including seismic design force determination, analysis method of structures, method for determining strength and ductility demand for individual members.