# Are We Ready?
# Pilot Modular Integrated Construction (MiC) Project of Student Residence at Wong Chuk Hang Site for the University of Hong Kong

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# Modular Integrated Construction (MiC)

# Modular Integrated Construction (MiC)

## A new construction method in Hong Kong

- Free-standing volumetric modules which are pre-fabricated and prefinished (including loose furniture) off-site in a controlled manufacturing environment;

- Completed modular units are then delivered and assembled on site;

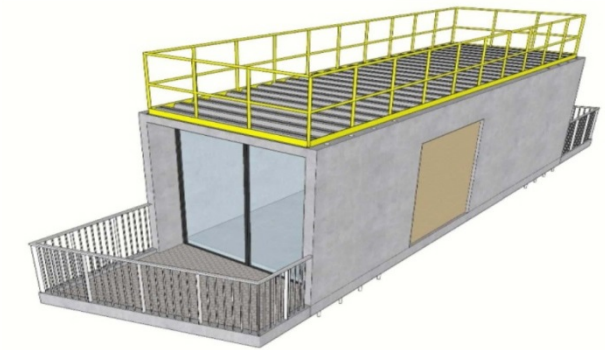
- Modular buildings are intended for permanent use. They are designed and built to the same or higher standard of conventional buildings;

*Notes: Definition of MiC extracted from Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP) ADV-36 issued by Buildings Department, HKSAR.*

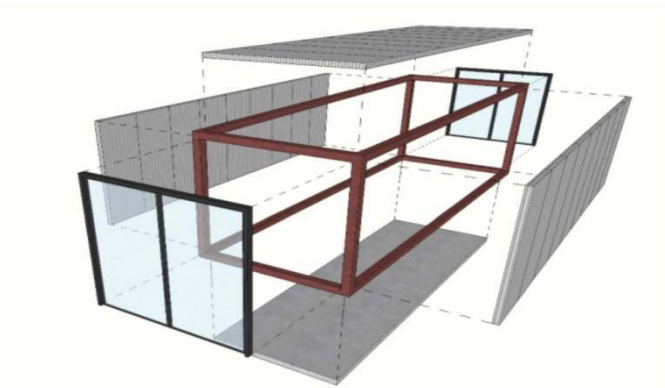
# Modular Integrated Construction (MiC)

## Major types of Modular Integrated Constructions:-

1. Reinforced concrete modular unit;



2. Steel frame modular unit;



3. Steel – RC hybrid modular unit

# Modular Integrated Construction (MiC)

Places with popular modular building construction:-

- the UK;
- Singapore;
- Australia;
- China;

particularly for student hostels and hotels


MiC Factory Visit to Jiangmen, Guangdong

The UK experience – The APEX House, London (Student Rooms)

# Modular Integrated Construction (MiC)

## HKSAR Government Initiative for MiC Application on Construction Projects

- As stated in the Policy Agenda, the HKSAR Government is committed to promote and lead the adoption of Modular Integrated Construction in the construction industry.


- Chief Executive announced in her Policy Address 2017 to support non-profit-making organisations to explore the feasibility of constructing pre-fabricated modular housing.

# Modular Integrated Construction (MiC)

## HKSAR Government Initiative for MiC Application on Construction Projects

- The Government are considering **extending the current GFA concessions** for promoting green and innovation buildings to cover buildings adopting MiC.


- In the 2018-19 Budget, the Government proposed to set up a **$1 billion Construction Innovation and Technology Fund** to boost the construction industry to adopt new technology.

- Eligible contractors, registered sub-contractors and consultants can apply for financial support from the Fund for using local and overseas innovative construction technologies, such as MiC when carrying out construction projects.

# Current Status
# of
# Student Residences for HKU

# Current Status of Student Residences for HKU

- A shortfall of more than 2,400[1] student places is entitled to HKU.
- There is a need for HKU to complete student hostel projects to make up the shortfall.
- Innovative approach in construction method is required to accelerate the provision of student hostels.
- HKU has studied MiC approach to student hostel projects.


*Note: 1 Updated figure given by UGC on January 18, 2018*

# Proposed MiC Application
# for
# Student Residence at Wong Chuk Hang Site

Estates Office, HKU

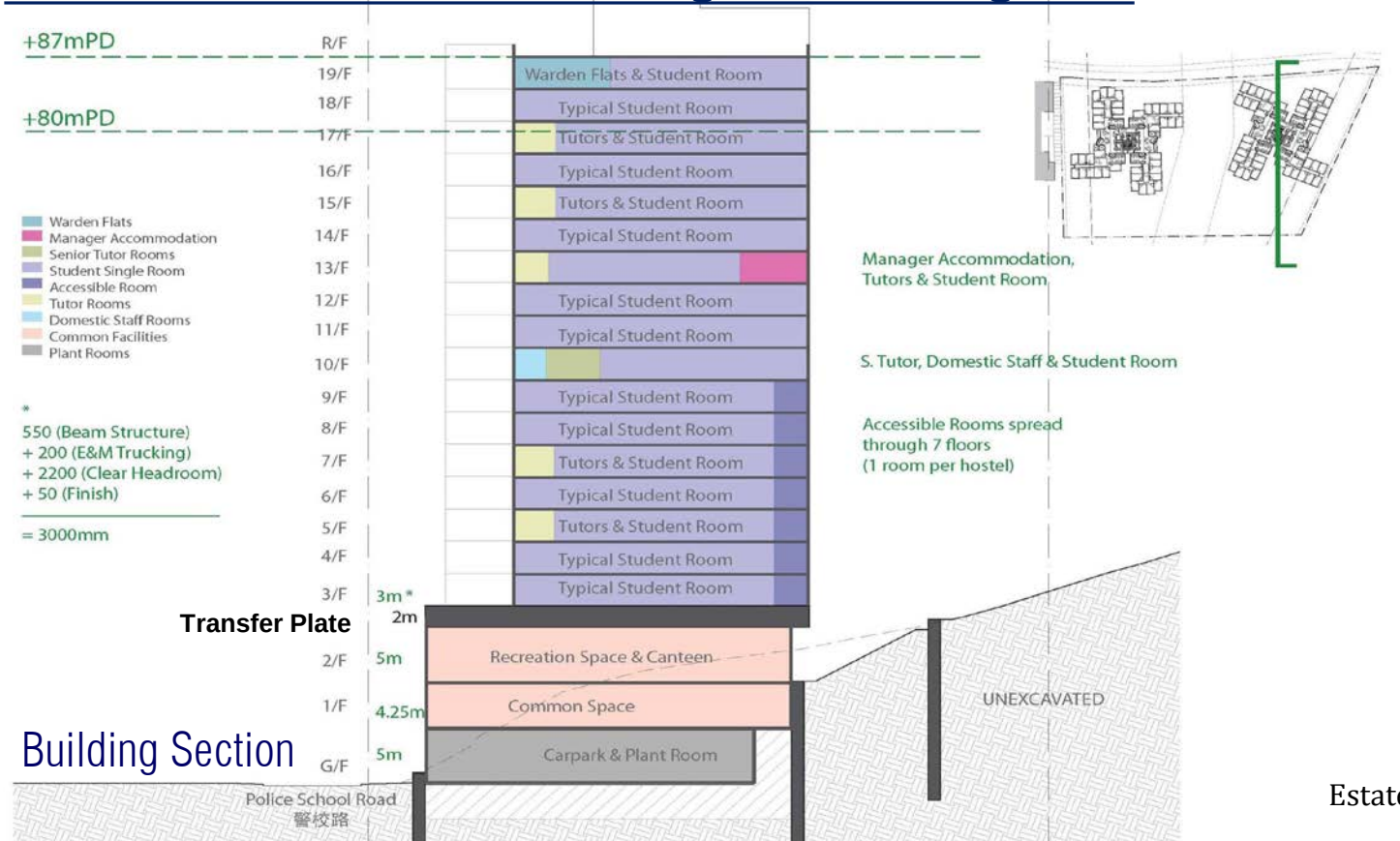
# Proposed MiC Application for Student Residence at Wong Chuk Hang Site

- Selected by Development Bureau as a Pilot Project for MiC in Hong Kong


- Site Location Plan

- A combined non-residential podium
- Two 17-floor towers of student residences
- 1,224 hostel places
- Associated living accommodation for management staff, common space, canteen, support facilities and car-parking space
- 14,277 m2 (NOFA)
- 28,176 m2 (CFA)

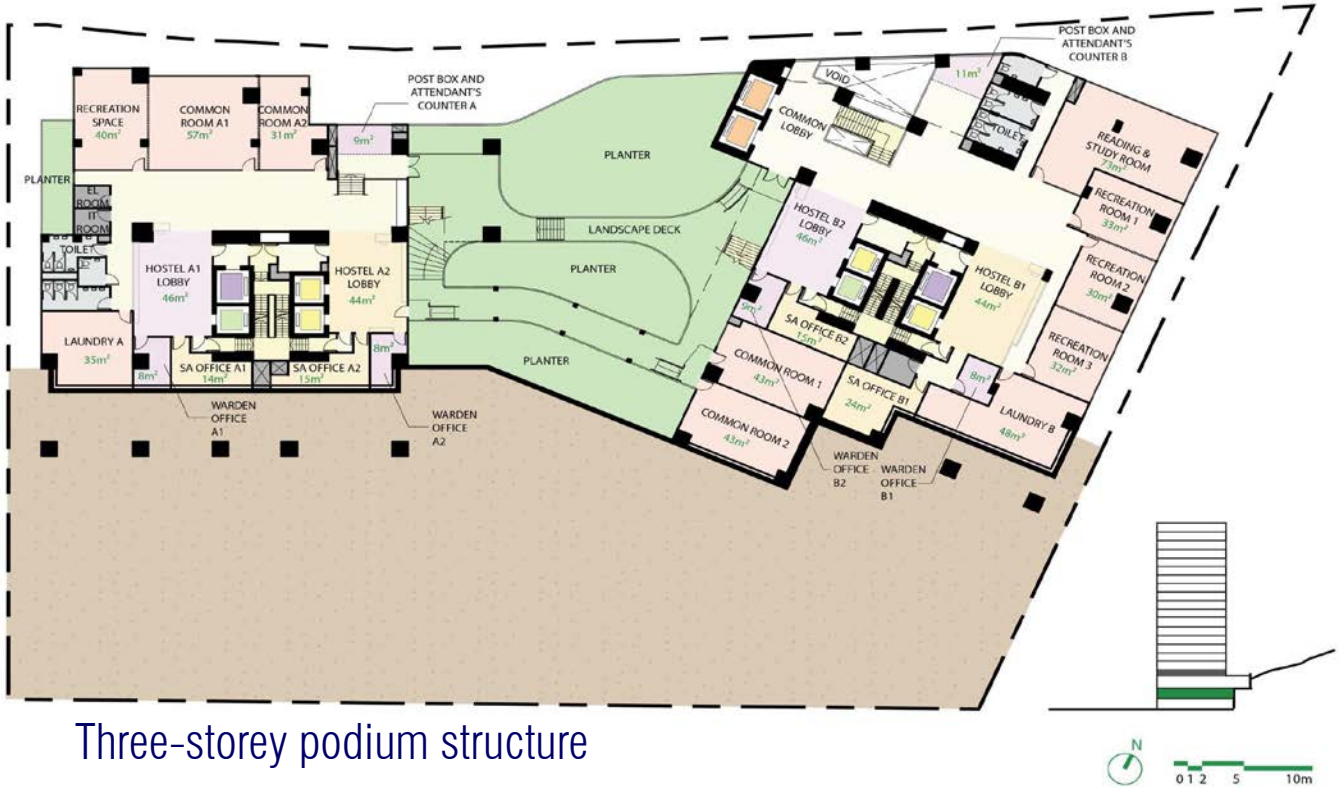
# Proposed MiC Application for Student Residence at Wong Chuk Hang Site




Building Section

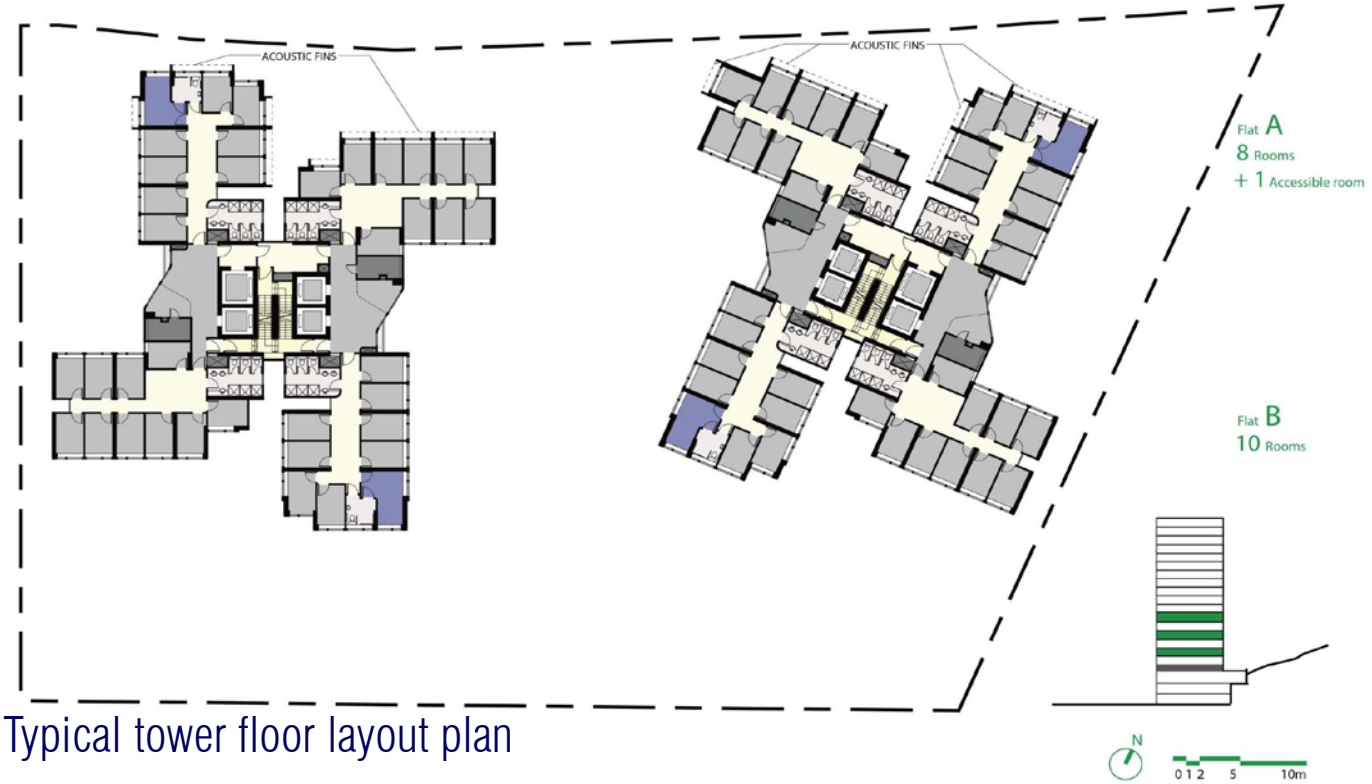
Estates Office, HKU

# Proposed MiC Application for Student Residence at Wong Chuk Hang Site



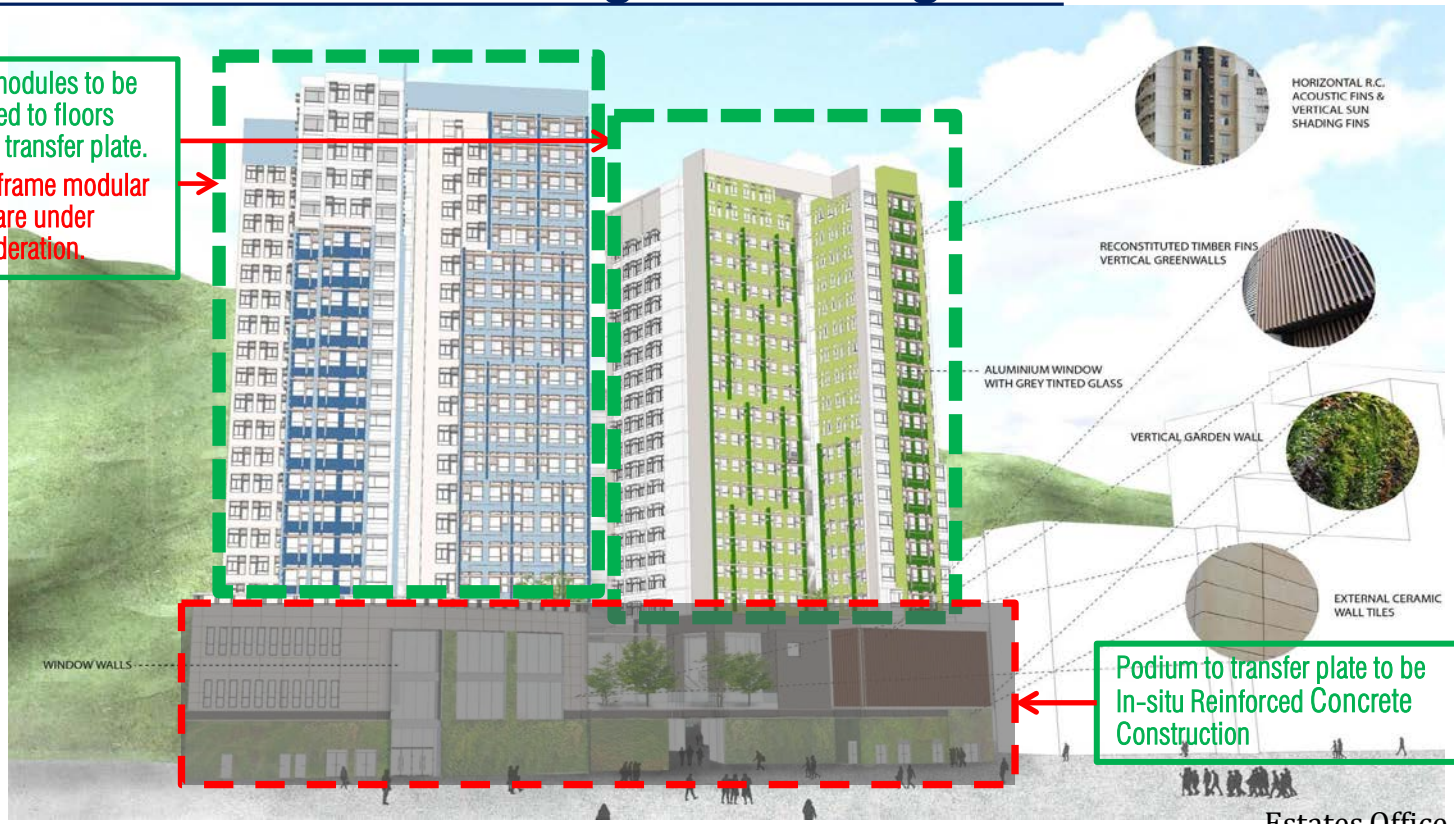

Three-storey podium structure

# Proposed MiC Application for Student Residence at Wong Chuk Hang Site




Typical tower floor layout plan

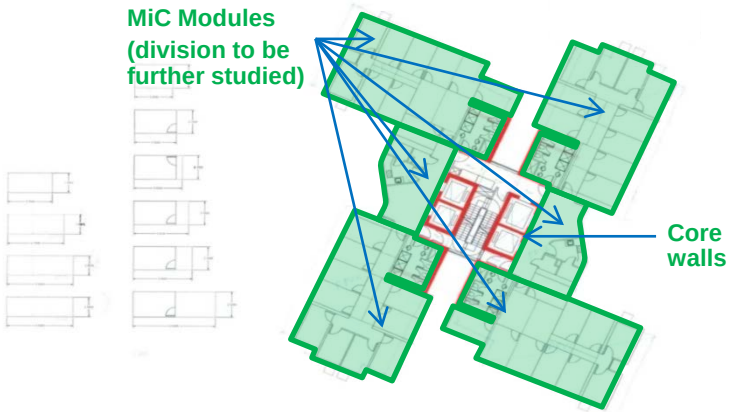
# Proposed MiC Application for Student Residence at Wong Chuk Hang Site



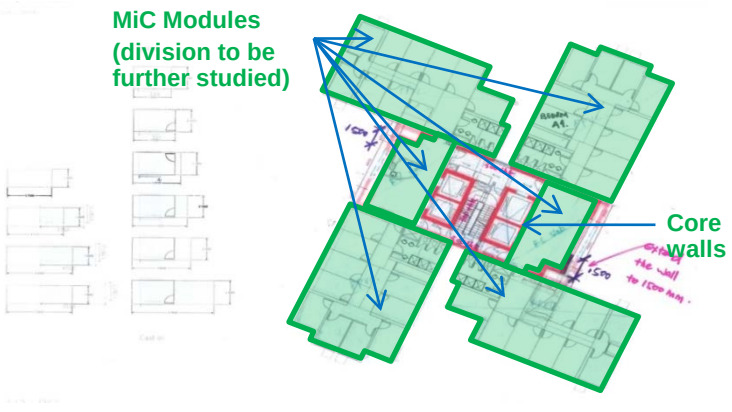
# Proposed MiC Application for Student Residence at Wong Chuk Hang Site

- Potential MiC modularization study for WCH project;

Core Wall Study Option 1




Core Wall Study Option 2




Structural design of core walls and tower portions, including relevant foundation works, shall allow earlier construction progress than the remaining podium area to facilitate the earliest delivery of MiC units for on-site installation.

# Student Residence at Wong Chuk Hang Site

## Programme Keydates

| Activities | Date |
|---|---|
| Detailed Design | 2nd Quarter, 2018 |
| Statutory submissions | 2nd Quarter, 2018 |
| Funding approval | 3rd Quarter, 2018 |
| Tendering | 3rd Quarter, 2018 |
| Commencement of Main Contract<br>(Tentative works period: 57 months) | 1st Quarter, 2019 |
| Completion | Before 4th Quarter, 2023 |

# Advantages of Student Residence at Wong Chuk Hang Site to Adopt MiC

# Advantages of Student Residence at Wong Chuk Hang Site to Adopt MiC

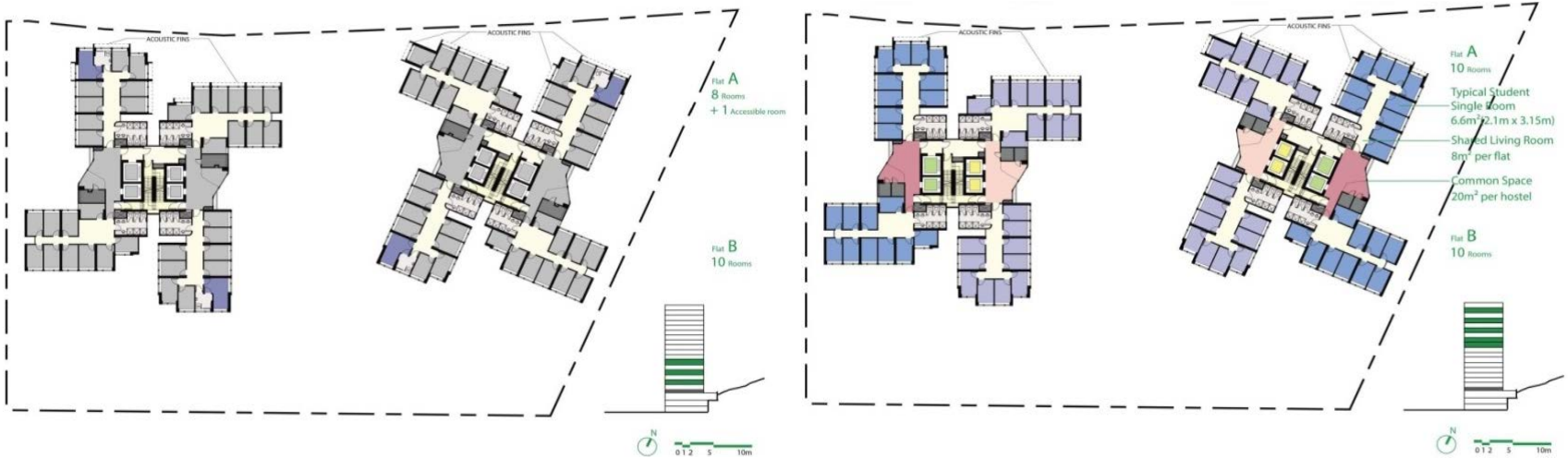
- Development Bureau (DEVB) has engaged with the Centre for Innovation in Construction & Infrastructure Development (CICID) of Civil Engineering Department of the HKU to research on Modular Integrated Construction (MiC);


- Research team from CICID to provide support and feedback on research for MiC;

- WCH project had been selected by DEVB as one of the Pilot Projects for MiC in Hong Kong.

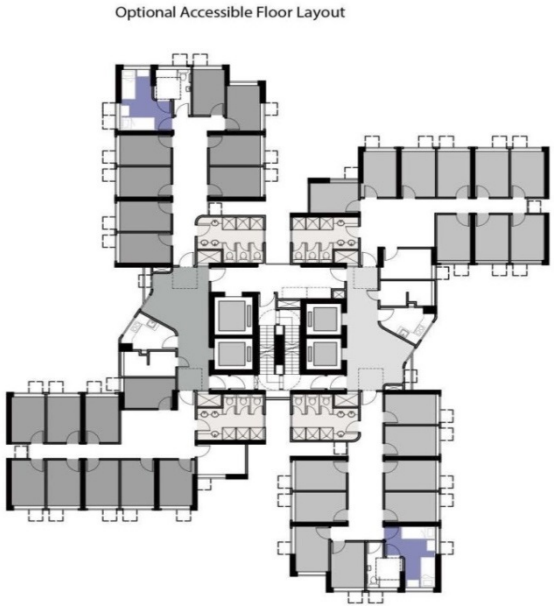
# Advantages of Student Residence at Wong Chuk Hang Site to Adopt MiC

- Student hostels with repetitive units are ideal for MiC application



# Advantages of Student Residence at Wong Chuk Hang Site to Adopt MiC

- Single student room area is about 7m$^2$ each;
- Average dimension of each room is 2.1m(W) x 3.3m (L);
- Size and dimension of tentative modular unit is suitable to comply with local traffic restrictions



# Advantages of Student Residence at Wong Chuk Hang Site to Adopt MiC

- An extensive site formation works is required prior to superstructure construction which allows sufficient time for design and approval of Mic units;
- WCH project's programme for infrastructure works, such as foundation and site formation works would allow sufficient time for detailed design, approval and production of MiC units (29 months construction period);


Possibility to reduce superstructure construction time with MiC application, subject to further study on the MiC proposal

| | Activity | 2019 | | | | 2020 | | | | 2021 | | | | 2022 | | | | 2023 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| 1 | Piling and Site Formation Works | | | | | | | | | | | | | | | | | | | | |
| 2 | Superstructure MiC Design | | | | | | | | | | | | | | | | | | | | |
| 3 | Substructure, Superstructure and MiC installation | | | | | | | | | | | | | | | | | | | | |

# Potential Benefits of MiC Application

# Potential Benefits of MiC Application

- **Improved site safety with some works procedure to be carried out off-site in a controlled environment**

**Summary of Occupational Safety and Health Statistics of 1st Half of 2017**

| | | 1st Half of 2016 *No. of Cases* | 1st Half of 2017 *No. of Cases* | Percentage change in figures |
|---|---|---|---|---|
| *( a ) Industrial Accidents* | | | | |
| | Construction | 1 758 ( 6 ) | 1 816 ( 8 ) | +3.3% |
| | Food and Beverage Services | 2 352 | 2 409 | +2.4% |
| | Manufacturing | 696 ( 1 ) | 671 ( 3 ) | -3.6% |
| | Others | 251 ( 2 ) | 304 ( 3 ) | +21.1% |
| | *Total* | **5 057 ( 9 )** | **5 200 ( 14 )** | +2.8% |
| *( b ) Occupational Injuries* | | **17 283 ( 103 )** | **17 092 ( 104 )** | -1.1% |

Notes: Figures in brackets denotes the number of fatalities which has also been included in the number of accidents

Source: Occupational Safety and Health Statistics of Labour Department, HKSAR

# Potential Benefits of MiC Application

- **Shortened construction period**

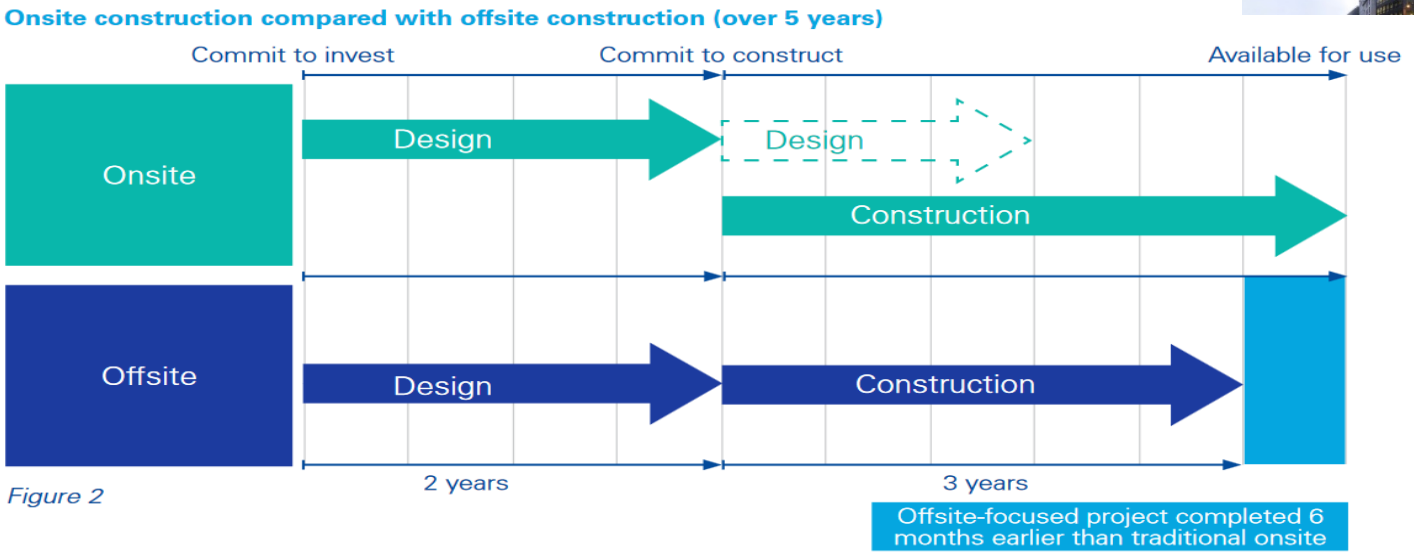




*Figure 2*

*Source: "Smart Construction Report – How Offiste manufacturing can transform our industry" by KPMG, April 2016*

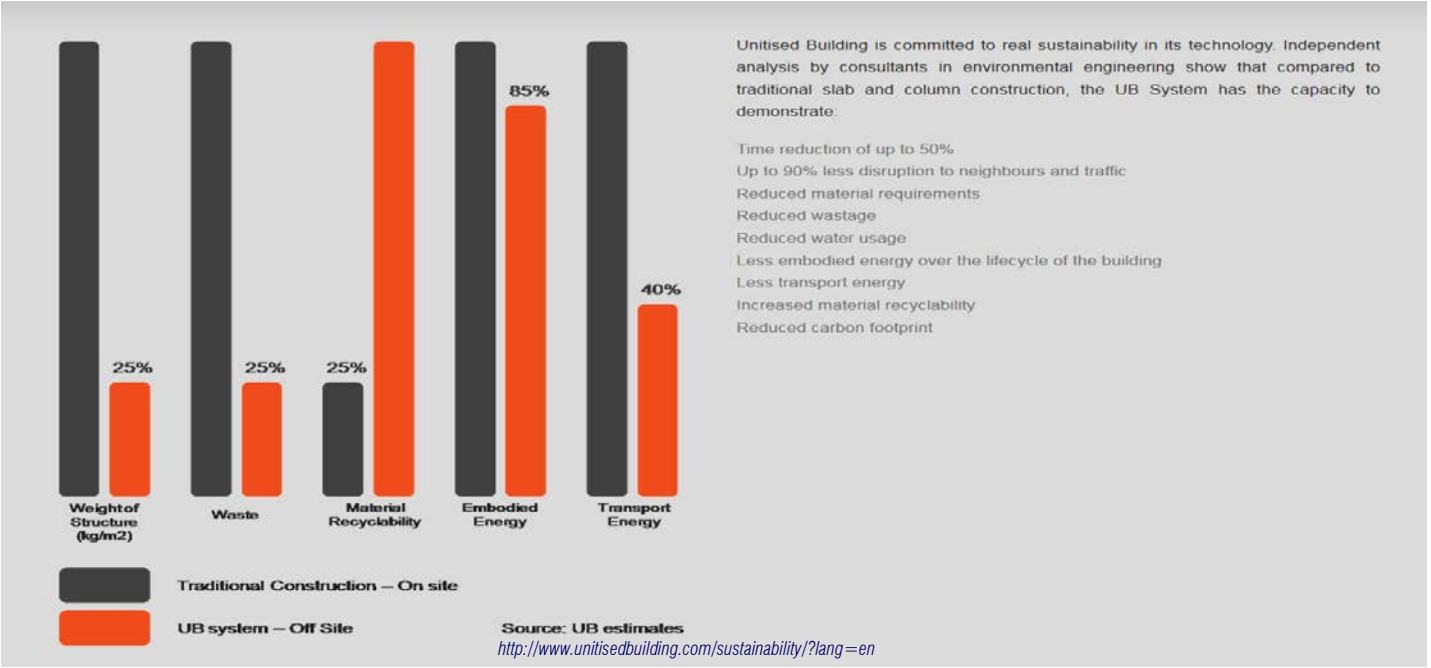
# Potential Benefits of MiC Application

- Less construction waste and a more tidy construction site


https://www.google.com.hk/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwizgaeBtPXYAhWCgbwKHTO7AeIQjhwIBQ&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DCiB-mxxfuP4&psig=AOvVaw1Z6SNyCoXwxYgR02nwQdSH&ust=1517048431108933

# Potential Benefits of MiC Application

- More environmentally-friendly, particularly the reduction in carbon footprint




Unitised Building is committed to real sustainability in its technology. Independent analysis by consultants in environmental engineering show that compared to traditional slab and column construction, the UB System has the capacity to demonstrate:

Time reduction of up to 50%
Up to 90% less disruption to neighbours and traffic
Reduced material requirements
Reduced wastage
Reduced water usage
Less embodied energy over the lifecycle of the building
Less transport energy
Increased material recyclability
Reduced carbon footprint

# Potential Benefits of MiC Application

- Less demand for on-site labour

WATERPROOFING

Installation Pocket Door Frame

Installation Window Frame

Tiling works

Skim coating

Plastering

M&E Installation

Cabinet Carcass

# Potential Benefits of MiC Application

- More efficient and better quality control

# Potential Benefits of MiC Application

- Less disturbance and nuisance to the neighbourhood

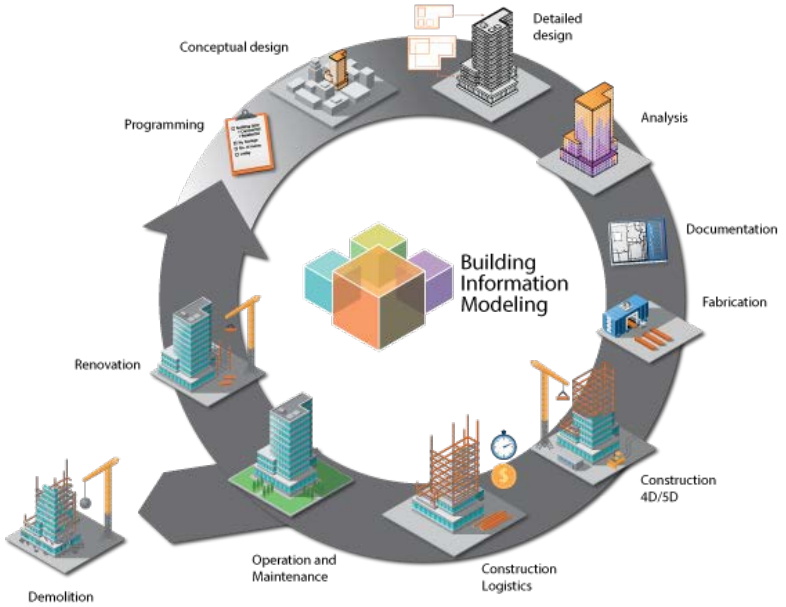
http://www.scmp.com/news/hong-kong/article/1279583/noise-and-city-hong-kongs-struggle-quiet

https://www.newham.gov.uk/Pages/Services/Pollution---report-a-nuisance.aspx

# Potential Benefits of MiC Application

- Facilitate the use of Building Information Modeling (BIM)


http://recoupwwhrs.co.uk/technical/bim/




https://www.kgo-gelderland.nl/events/inspiratiesessie-bim/

# Potential Benefits of MiC Application

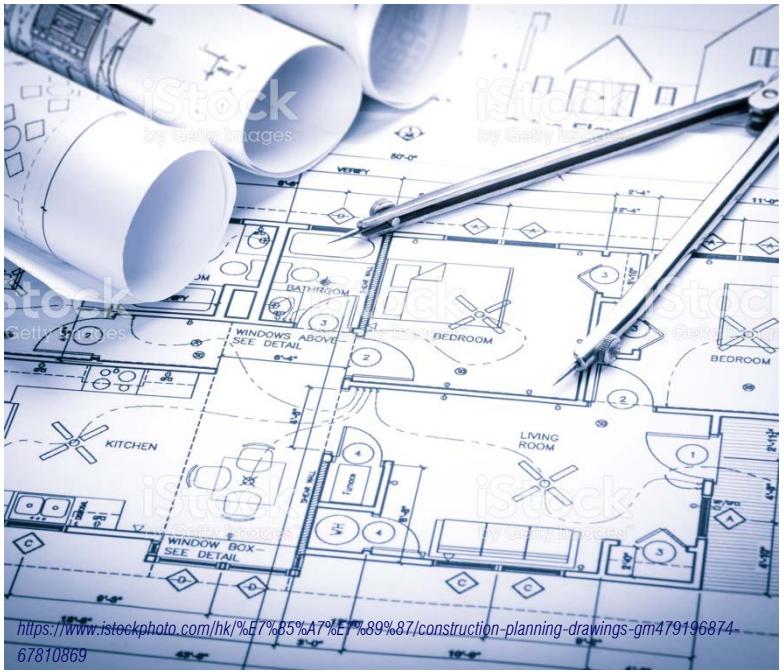
- Improved supply chain management on site


https://i0.wp.com/cerasis.com/wp-content/uploads/2015/05/supply-chain-management-trends-in-SCM.jpg?fit=596%2C320

# Potential Benefits of MiC Application

- May have less potential contractual claim?


https://theconstructor.org/construction/types-of-construction-contracts-comparison/14268/




https://www.istockphoto.com/hk/%E7%B5%A7%E7%89%87/construction-planning-drawings-gm479196874-67810869

# Challenges of MiC Application
# for
# Student Residence at Wong Chuk Hang Site

# Challenges of MiC Application for Student Residence at Wong Chuk Hang Site

## Potential challenges

- First MiC project in Hong Kong, no local expertise.

To team up with experts with MiC experience from the UK, Australia. Possibly with China and Singapore in the future.

# Challenges of MiC Application for Student Residence at Wong Chuk Hang Site

## Potential challenges

- Impact on project cost

Expected increase in cost of design and structural element fabrication of MiC to be compensated with savings from the followings:-

1. lower cost on off-site production;
2. re-design of building components and finishes to omit some redundant procedures;
3. highly furnished units off-site to reduce on-site operation cost

# Challenges of MiC Application for Student Residence at Wong Chuk Hang Site

## Potential challenges

- Local building control regulations

One of the largest wind load requirement in the world – Jointing and connection of modular units to be carefully designed to fulfill statutory requirements

Fire safety in modular units to be in the same standard of conventional building

# Challenges of MiC Application for Student Residence at Wong Chuk Hang Site

## Potential challenges

- No experienced supervision team and labour for MiC installation

Contractor can utilize the 29-month substructure construction period to provide trainings for supervision team and workers to equip with necessary skills

# Challenges of MiC Application for Student Residence at Wong Chuk Hang Site

## Potential challenges

### - Contract procurement strategy

An appropriate contract procurement arrangement shall be able to:-
- facilitate tenderers to submit competitive tenders;
- allow early engagement of MiC specialist;
- impose no bias towards particular MiC system or supplier;
- ensure payment to contractor to reflect the actual spending pattern of the project;
- allow longer tendering period for tenderers to team up with MiC specialists;
- adopt 2-envelope tendering procedure for enabling the selection of the most competent contractor.

# Expected Learnings from WCH Project's MiC Application

# Expected Learnings from WCH Project's MiC Application

As the first MiC project in Hong Kong, data collected from WCH project would facilitate the following learning for the construction industry in Hong Kong:-

- Logistic planning
- MiC assembly methods
- Productivity with MiC application
- Regulation compliance
- Cost control
- Social response

# Thank You