Bringing a Wide Variety of Concrete MiC in Government Building

HKCI Annual Seminar 2022

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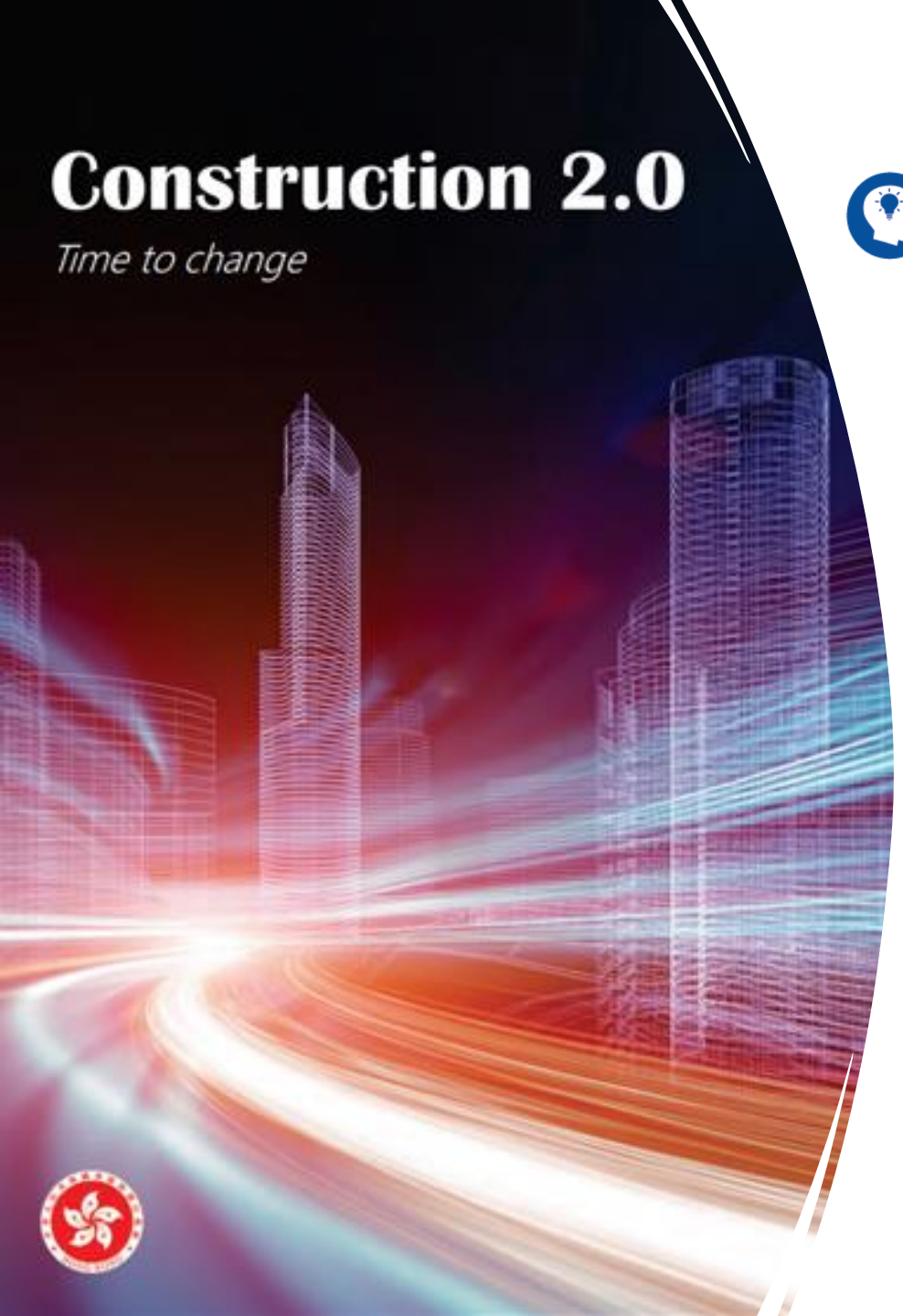
Architectural Services Department

Construction 2.0

Time to change



Pillar 1: Innovation

The vision: The development of an Industry culture that embraces change, innovation and new technologies to drive forward productivity, efficiency and enhanced project delivery outcomes.

Pillar 2: Professionalisation

The vision: Improved professionalism of the Industry through step change increases in project leadership, project management, procurement capabilities and professional skills and practices within Government and the private sector, to deliver higher quality construction and built assets, combined with a first priority focus on safety, construction supervision and quality in the workplace.

Pillar 3: Revitalisation

The vision: Reinvigorating the appeal and benefits of joining the Industry to attract and nurture growing numbers of young and energetic talent to the workforce and increasing the agility at the individual, organisational and Industry levels.

Construction 2.0

Modular Integrated Construction (MiC)

Huge Construction Volumes	High Cost	Project Performance	Site Safety	Productivity	Innovation
• Standardized and repeated design	• Reduce on-site labour cost	• Assure construction quality	• Reduce on-site works	• Prefabricate MiC in vast and remote factories	• Non-traditional construction approach
• Minimized impact to environment	• Minimize abundancy and defects	• Secure construction progress against unforeseen factors	• Enhance site safety	• Enhance production rate	• Innovative connection details and construction material

ArchSD's MiC Construction Projects

Pak Shing Kok Disciplined Services Quarters

North Lantau Hospital Hong Kong Infection Control Centre

Quarantine Camps Projects

Residential Care Homes for the Elderly in Kwu Tung North

Kai Tak CIF/CTF

Penny Bay CIF/CTF (Ph5, 6A-6E)

Fire Station-cum-Ambulance Depot with Departmental Quarters and Facilities in Tseung Kwan O

Chinese Medicine Hospital

ArchSD's Concrete MiC Projects

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Chinese Medicine Hospital

Procurement of MiC

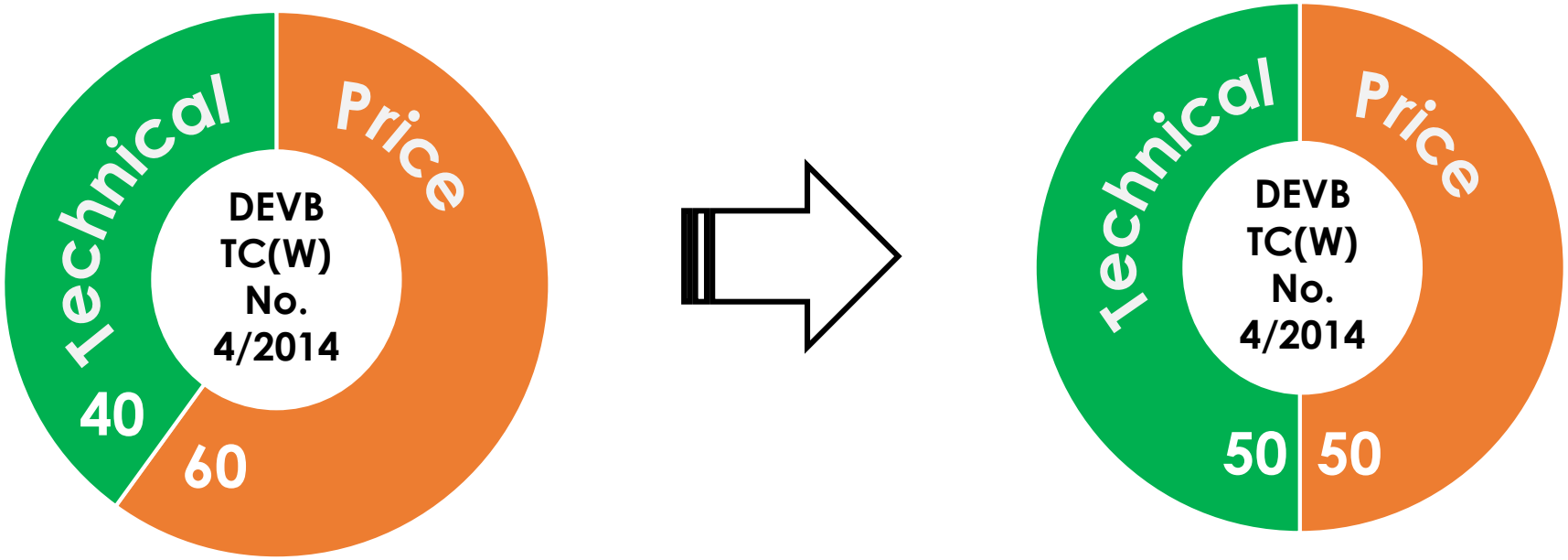
Adoption of Design-and-Build (D&B) Contract for MiC

- ✓ **Only** design intent or reference drawing of MiC in tender;
- ✓ **Diverse MiC designs** and construction approach;
- ✓ **Buildability enhancement** in view of contractor's own resources;
- ✓ **Earlier inputs** in MiC development; &
- ✓ **Tighter teamwork** among all parties under D&B.

Tendering for Innovations

MiC Conducive Tendering

Weighting for Price and Technical Score



for D&B Projects

MiC Conducive Tendering

Standard marking scheme in accordance with DEVB TC(W) NO. 4/2014A

Quantitative Requirement	Design	Technical Proposal
		
% CFA	Architectural	Method Statement
% Types	BS	Programme
Completeness	Structure	Quality Assurance Plan
	Operation & maintenance	

MiC Conducive Tendering

Look for:

BALANCE SOLUTON IN BOTH TECHNICAL AND PRICE

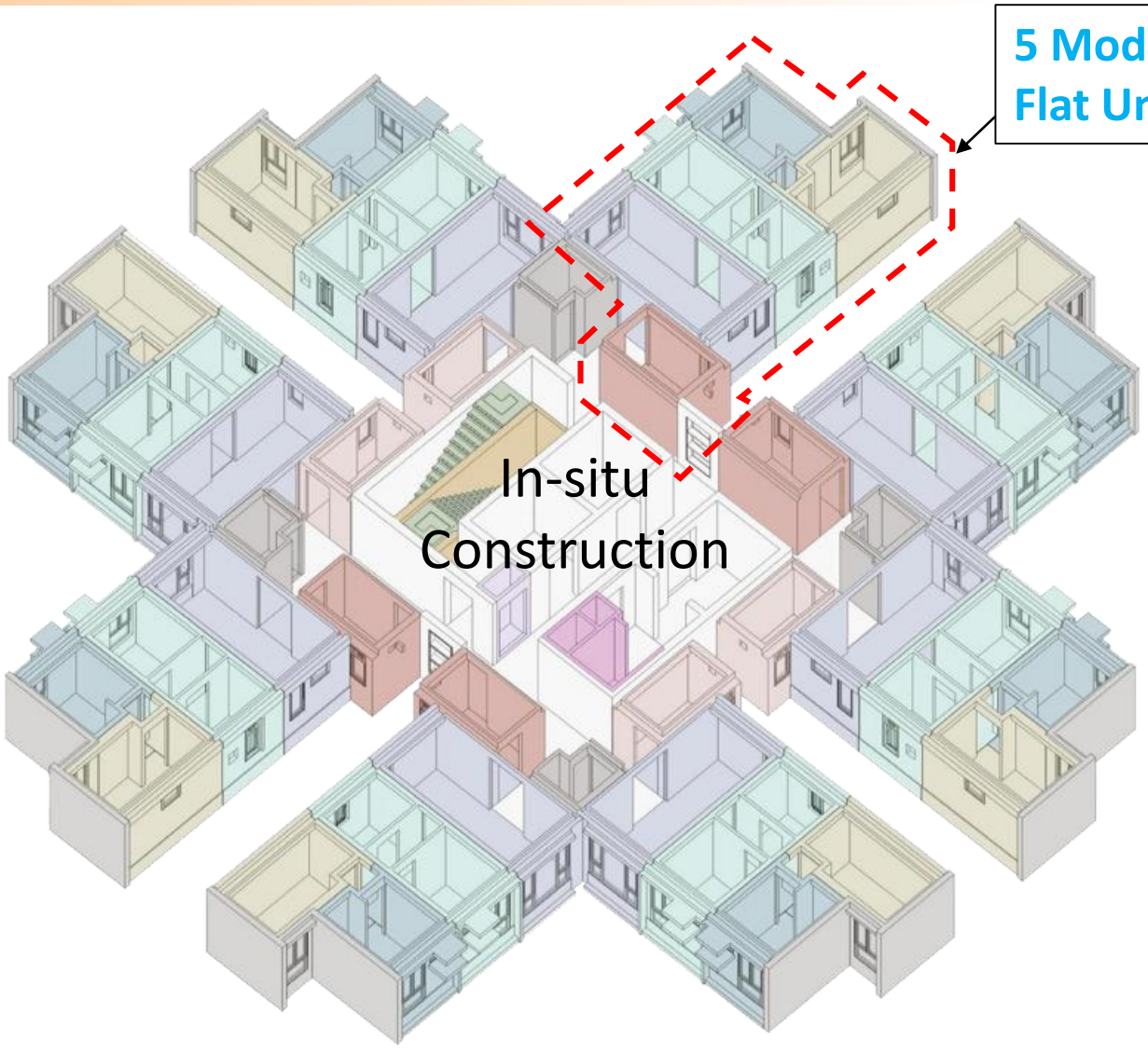
Completed Concrete MiC Project

Pak Shing Kok Disciplined Services Quarters

Pak Shing Kok Disciplined Services Quarters

- **Pilot Project**
- The **FIRST** high-rise concrete MiC building in Hong Kong
- 5 towers of 16-17 storey high (**648 nos.** of DQ units)
- **3726 nos.** of MiC Modules
- Commencement: Aug 2018
- Completion: Mar 2021
- **Design and Build Contract**
- Adoption of MiC proposed by contractor after contract award
- Construction Approach
  - Concrete MiC comprised of bearing and shear walls
  - In-situ cores and floor structure

MiC Modules and Extent



Legend

Liv/Din Room

Bedroom 1

Refuse Room & Vent Duct

WMC

Bathroom & Bedroom 2

Bathroom & Bedroom 2

E&M

External Wall

Kitchen (Type A)

Kitchen (Type B)

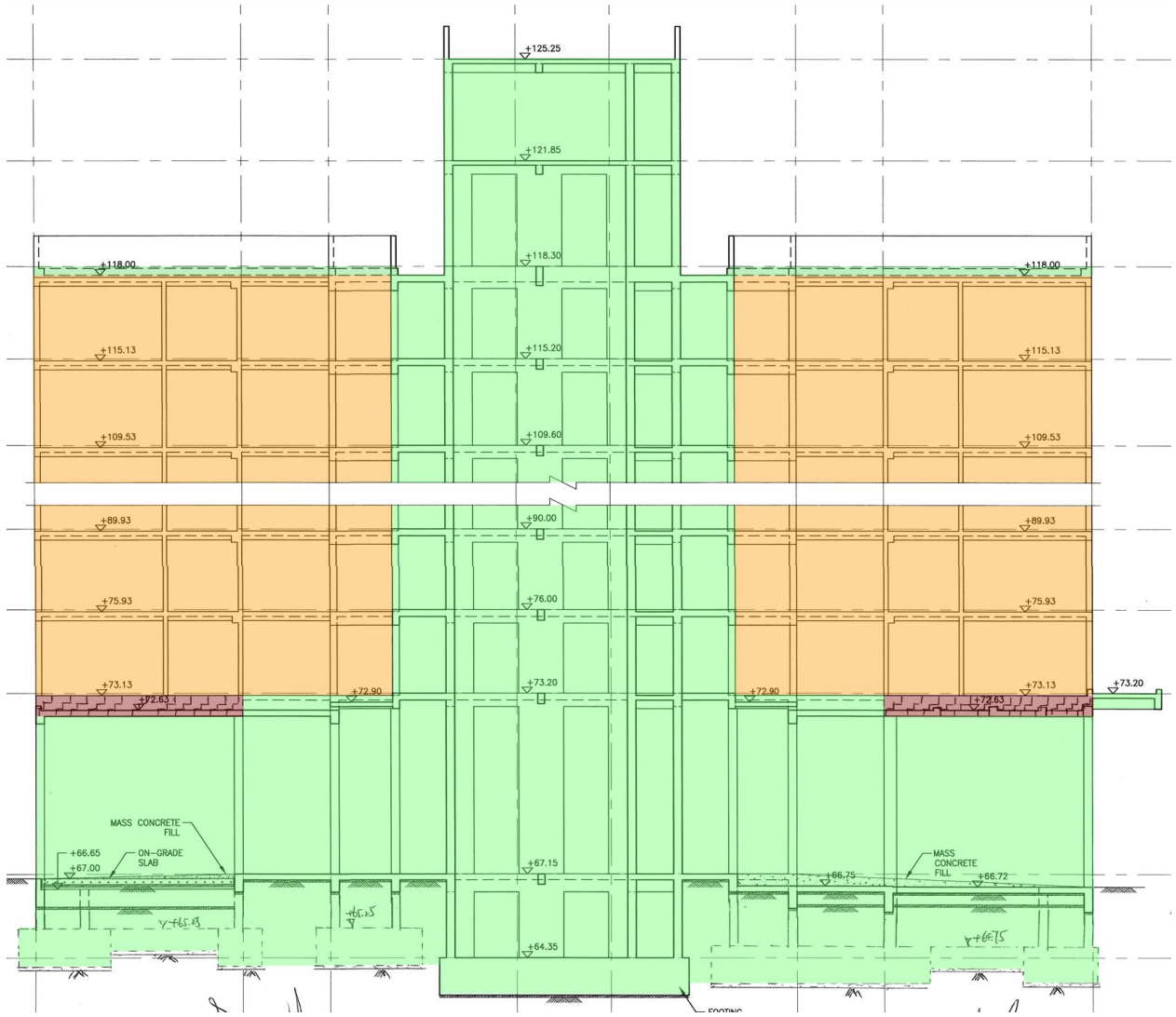
Stairs

Typical Section

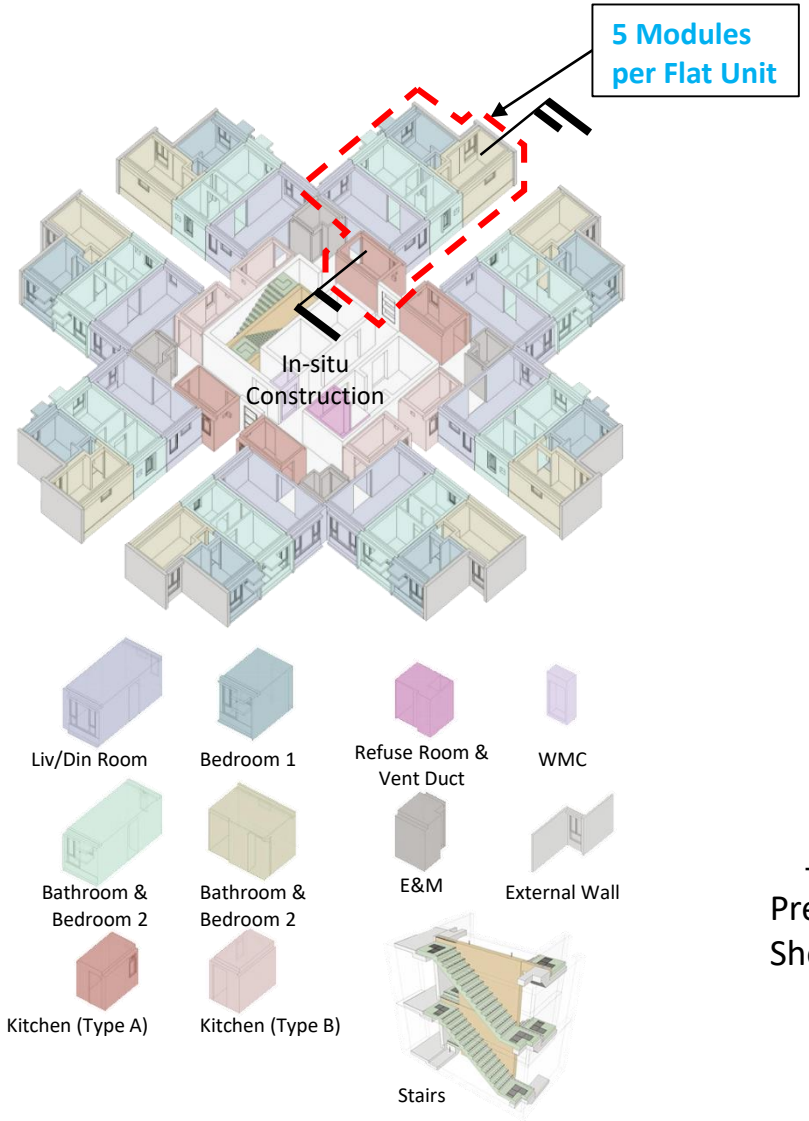
Legend

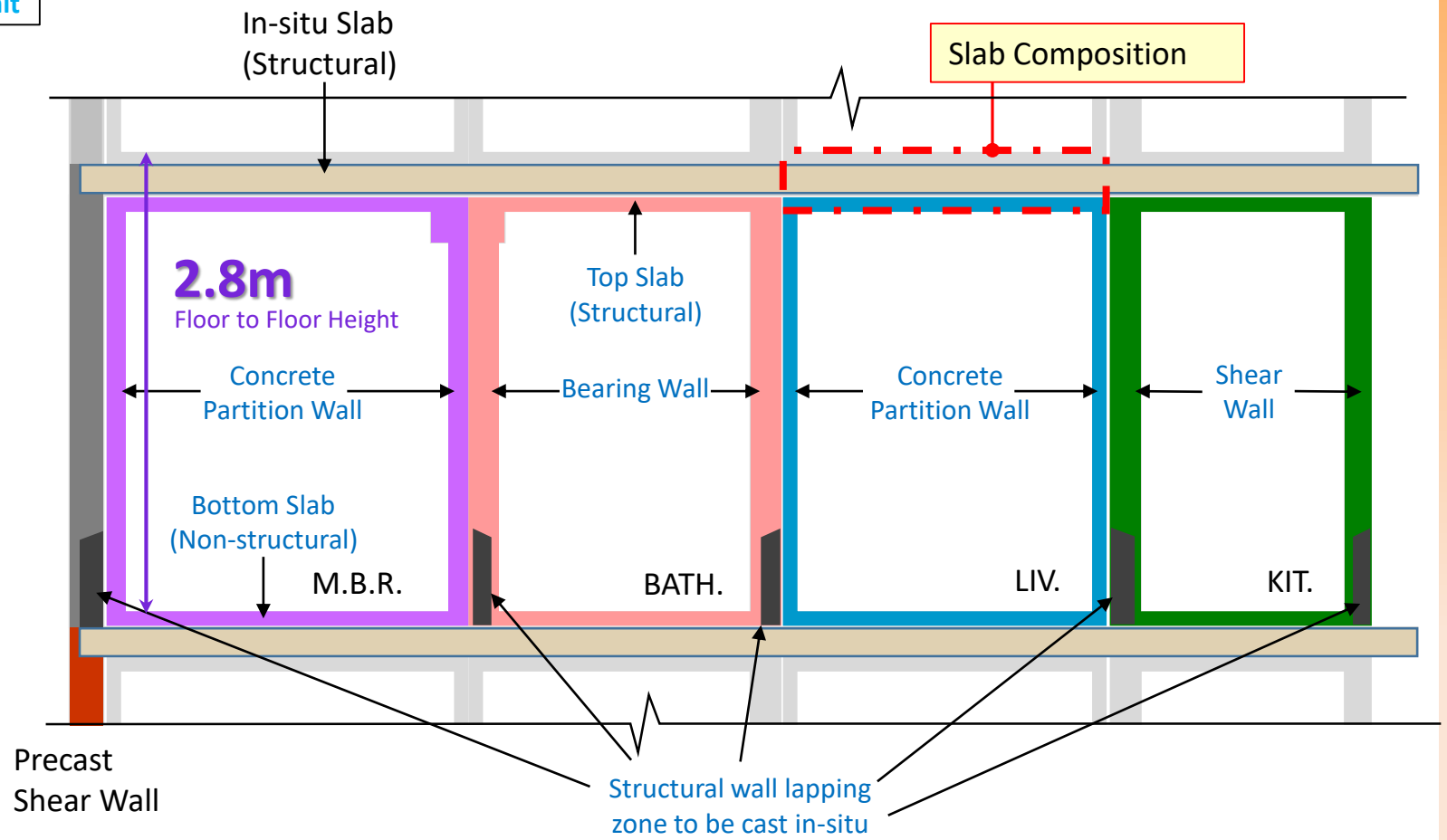
- **Transfer Plate at 1/F**
- **MiC Modules**
- **In-situ structure**

- Rest on rock
- G/F~1/F: Cast in-situ
- Small transfer plate at 1/F
- Typical floor: MiC at wings
- Roof : Cast in-situ



MiC Modules Section and Clear Height





Measured Indicators

- Skilled labours demand reduced by 40-50%
- Early completion about 4 months in advance of contract complete date
- In-situ concrete and rebar usage for a typical floor is 50% less than the traditional project
- Site waste (landfill) reduced by over 50% compared to traditional in-situ construction
- Use of water and electricity on-site reduced by around 70%

On-going Concrete MiC Project

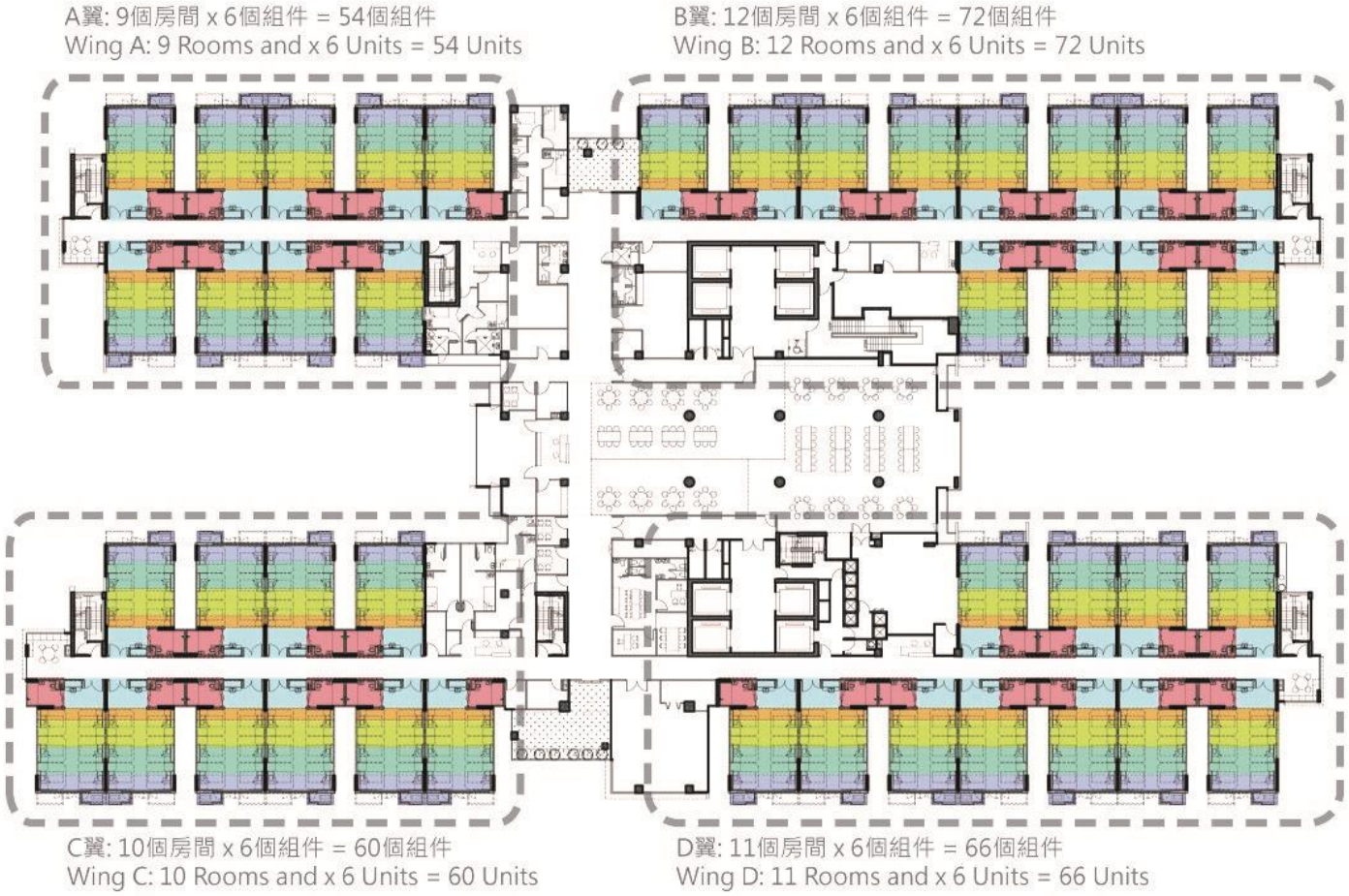
Residential Care Homes for the Elderly in Kwu Tung North

Residential Care Homes for the Elderly in Kwu Tung North

- 1 single block with 8 storeys, with 7-storey of MiC construction
- **1764nos.** of MiC Modules
- Commencement: Dec 2019
- Target Completion: Q4 2022
- **Design and Build Contract**
- Construction Approach
  - Concrete MiC comprised of permanent formworks for cast in-situ concrete work
  - In-situ cores and floor structure

MiC Modules and Extent

標準樓層平面圖
Typical Floor Plan

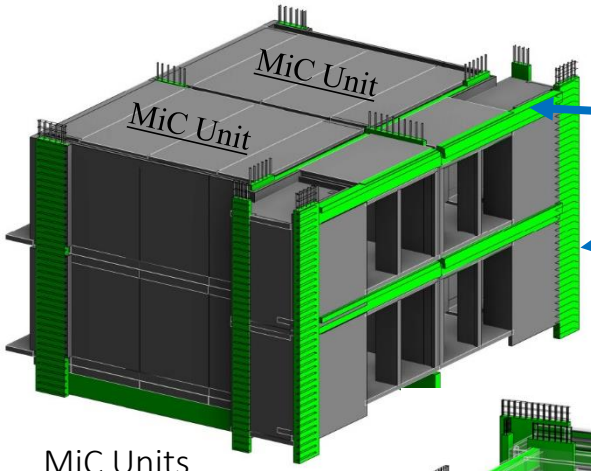


252 Units per floor
Total **1,764** Units

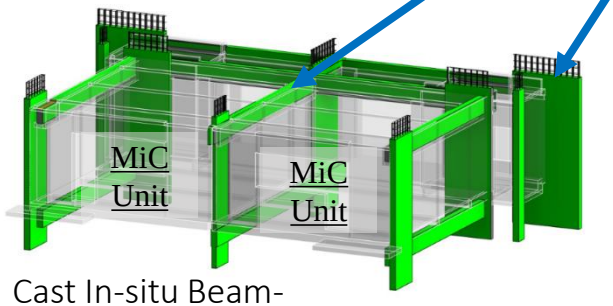
圖例 Legend

Structural Design of MiC Module

- MiC Modules shall be **permanent formwork** for Cast In-situ Reinforced Concrete Beam-Wall Frame
- Challenge - ensure concreting quality without demoulding

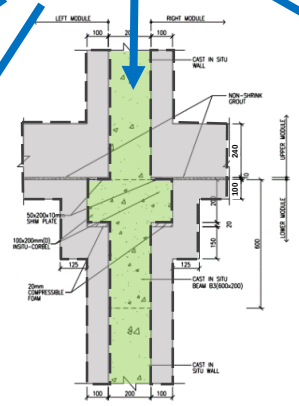


MiC Units

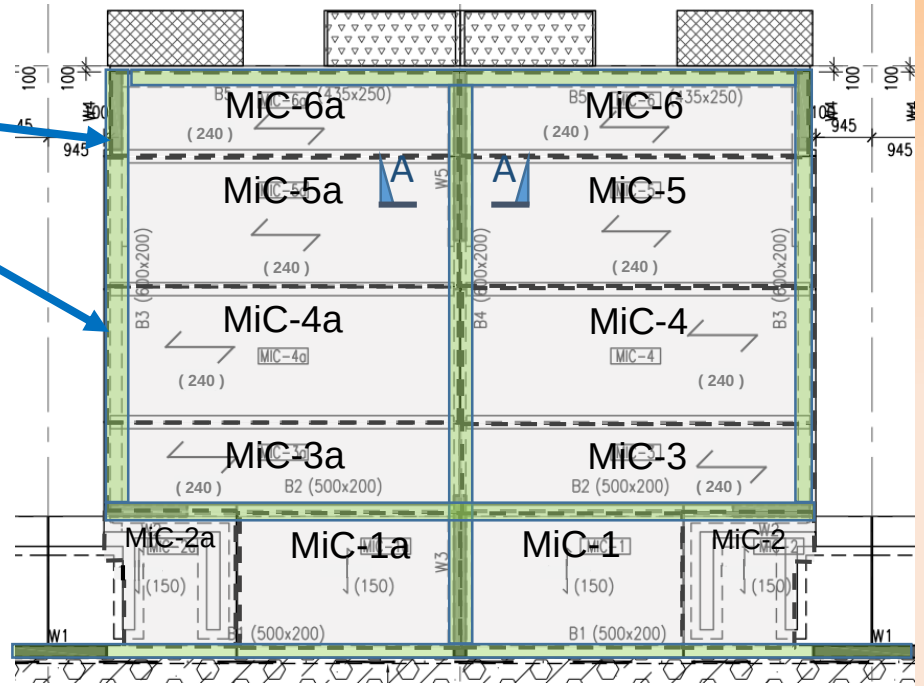


Cast In-situ Beam-Wall Frame

Cast in-situ concrete



A - A



MiC Uints consist of 6 MiC Modules

Quality Control of Self Compacting Concrete

- Quality control method:

  ✘ Ultrasonic Pulse Echo on Surface of Finished In-situ Concrete
  ✘ Sonic logging with Pre-installed Probes
  ✘ Inspection Openings on MiC Module

✓ **Concreting by Method Specification Combined with Control Tests/Inspections**

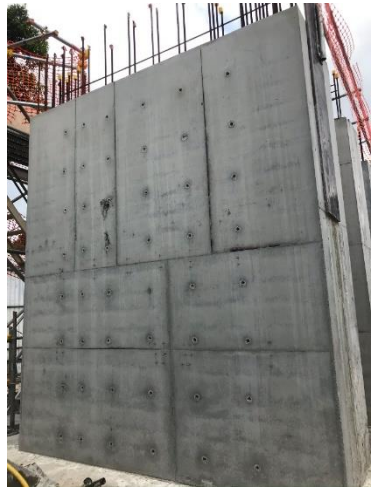
Method:

Self Compacting Concrete (SCC)
for concreting of Cast in-situ Beams / Walls

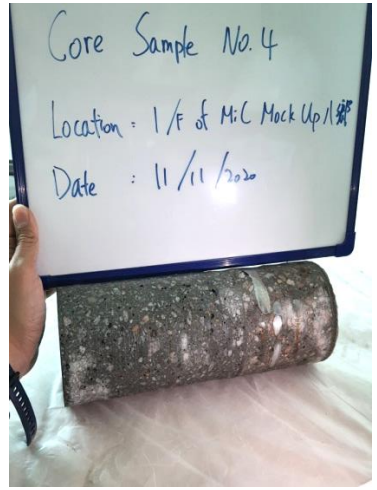
+

Control Tests / Inspections:

Step 1: Trial Panels

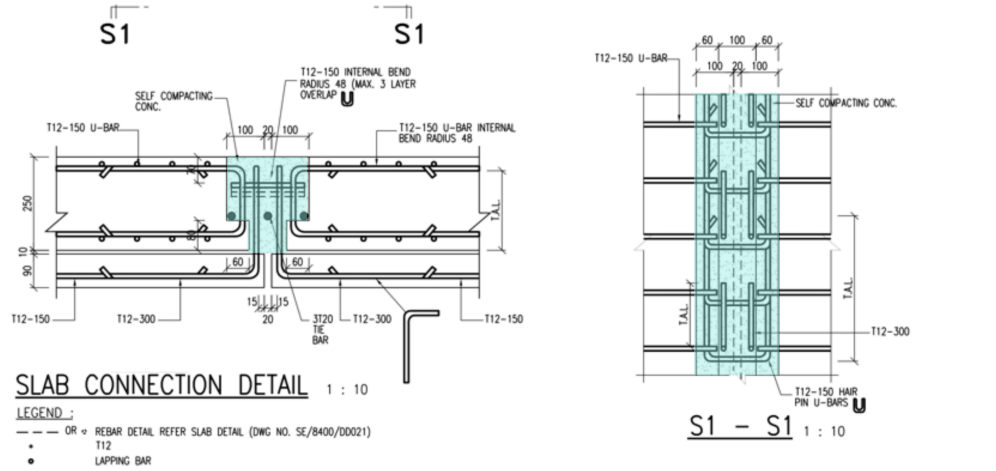


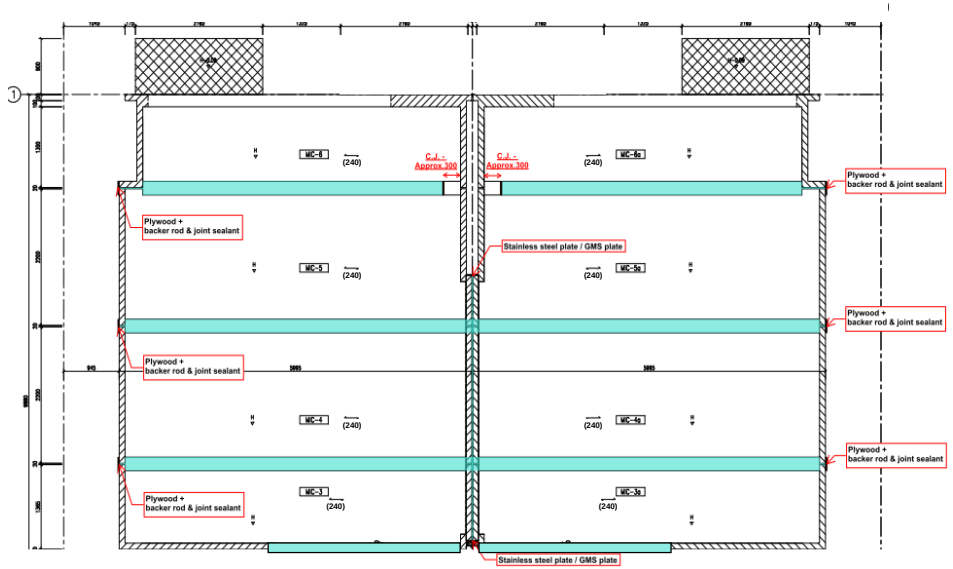
Step 2: Mock-up with Coring Test



Structural Connection between MiC

Casting by Self-Compacting Concrete





Extent for Floor Joint

Up-comimg Concrete MiC Projects

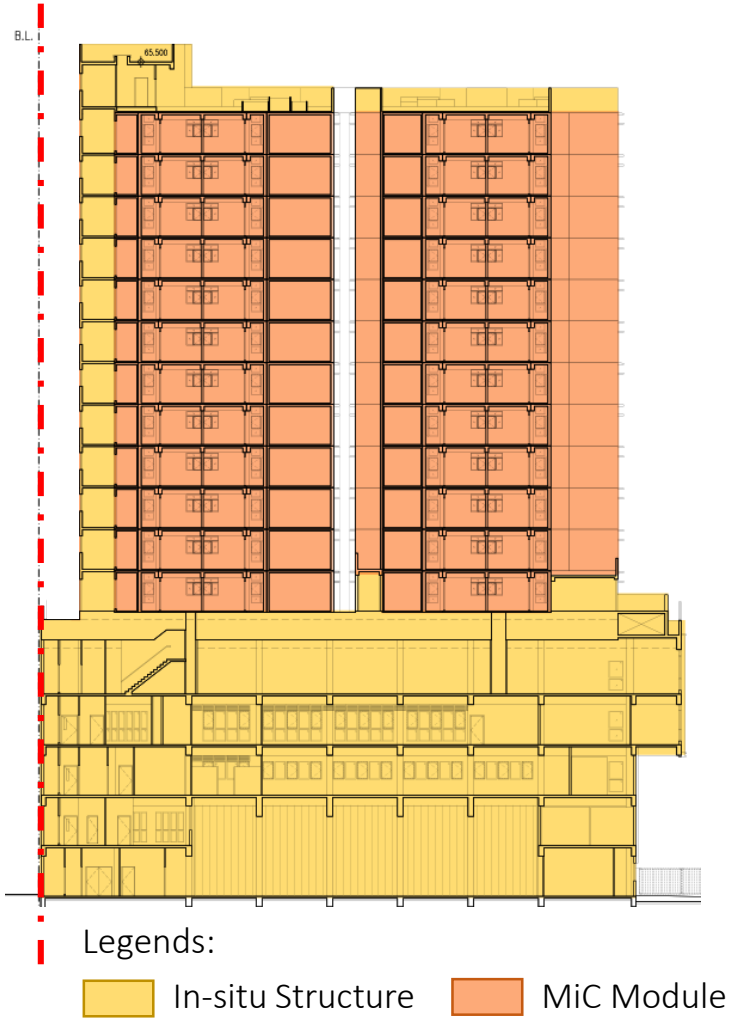
Projects Adopting Concrete MiC

- Concrete MiC will be widely adopted in up-coming projects of following building types:
  - ☑ Staff Quarters
  - ☑ Residential and Care Homes
  - ☑ Schools
  - ☑ Office
  - ☑ Medical Facilities

- Among those projects adopting concrete MiC, the following projects are designated to introduce:
  - ➢ Fire Station-cum-Ambulance Depot with Departmental Quarters and Facilities in Tseung Kwan O
  - ➢ Redevelopment of Western Police Married Quarters

Fire Station-cum-Ambulance Depot with Departmental Quarters and Facilities in Tseung Kwan O

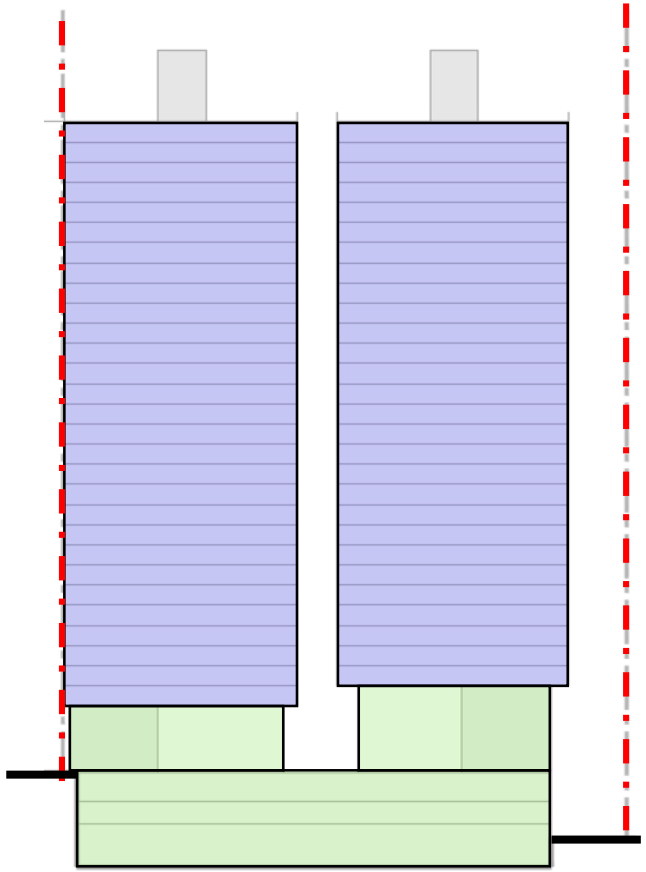
- 1 single block with 17 storeys, in which 12 storeys of MiC construction
- Around **640nos** of MiC Modules
- Commencement: May 2022
- Target completion: Q1/Q2 2025
- **Consultancy Contract**
- MiC is **Design-and-Build item**, where reference design of MiC unit is provided during tendering
- **Alternative MiC design** proposed by tenderer in tender return
- Construction Approach
  - Concrete MiC comprised of structural floor and walls
  - In-situ cores and floor structure of lobby/corridor



Redevelopment of Western Police Married Quarters

- 3 blocks with 28-29 storeys of MiC construction
- Tentative commencement: Q1 2023*
- Tentative completion: Q2 2027*
- **Design and Build Contract**
- Construction Approach
  - ➢ Concrete MiC comprised of permanent formworks for cast in-situ concrete work
  - ➢ In-situ cores and floor structure of lobby/corridor

Site Location Plan



Legends:

In-situ Podium & Basement

DQ Tower by MiC Modules with In-situ Corridor/ Lobby/ Core

*: Commencement and completion of D&B contract

What’s Next?