BUILDOFFSITE
COLLABORATING FOR IMPACT

IS CO-HOSTING THE
OFFSITE SUMMIT
AT
OFFSITE EXPO
17-18 SEP 2024

17.09.2024

International best practice

Join in the conversation

@buildoffsite | @CIRIAupdates | @ExploreOffsite
#OffsiteSummit | #CollaboratingForImpact

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17.09.2024 13:50 – 15:20 | Session 3

International changemakers delivering homes

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Ken Davie

Industry Advisor
BUILDOFFSITE

International changemakers delivering homes

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#BUILDOFFSITE | #BOS | #CollaboratingForImpact
#ExploreOffsite | #OffsiteExpo | #OffsiteSummit
#Housing | #Construction | #MMC

Celebrating 20 years of BUILDOFFSITE

Set up in 2004 as the voice of the industry, BUILDOFFSITE has sought to promote, support and increase the adoption of offsite and pre-manufactured solutions for the built environment.

“To be the trusted independent voice of the construction industry with respect to offsite and pre-manufacturing, and to provide all relevant support to our members and other stakeholders.”

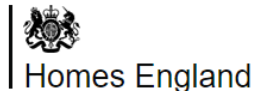
Join BUILDOFFSITE

SCAN ME

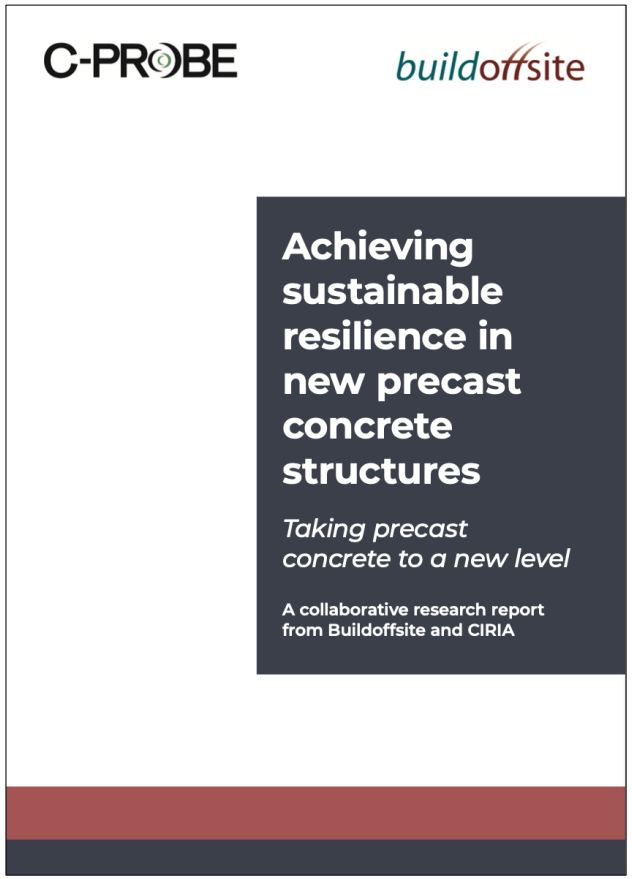
BUILDOFFSITE
COLLABORATING FOR IMPACT

Networking | Events
Exhibition Seminars
Site visits | Advice & Guidance
Knowledge Sharing | Publications
Marketing & Promoting Members
Influencing

BUILDOFFSITE members



BUILDOFFSITE guidance 2022 – 2024



Client Group proposal approved for 2023 – 2024

Performance specifications guidance

Upcoming BUILDOFFSITE events

2-4 October

Structural Timber Awards 2024

13 November

DfMA for net zero carbon

20-21 November

London Build Expo

28 November

BOPAS Forum

4 December*

BOS Christmas members' meeting

Spring 2025*

Using performance specifications to facilitate the adoption of MMC – new BOS/CIRIA guidance

*Provisional date

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Pascal Chazal
HORS SITE

Bengt Magnussen
TALO

Ewelina Woźniak-Szpakiewicz
DMDmodular

Andrew Pryke
BAM Design

Professor Wei Pan
The University of Hong Kong

Dr Sherman Yip
Hong Kong Housing Authority

Damien Crough
prefabAUS

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Pascal Chazal

Chief Executive Officer
Hors-site Conseil

International changemakers delivering homes

FRANCE, country of cement !

VICAT

LAFARGE

BOUYGUES

VINCI CONSTRUCTION

EIFFAGE

This is the cheapest way of building ! Before crisis 1 000€ / m2

Building crisis in France

In France, between august 2021 and dec 2024

- **40% reduction sales old property**
- **50% reduction sales new property**

- 30% increase in the price of new property
- rise in mortgage rates

Public authorities recognise off-site construction as a major tool for decarbonisation

GOUVERNEMENT
Liberté
Égalité
Fraternité

Financé par l'Union européenne
NextGenerationEU

FRANCE 2030

ADEME
AGENCE DE LA TRANSITION ÉCOLOGIQUE

"I am a great believer in off-site construction as it reduces costs".

FRANCE 2030

VILLE DURABLE ET BÂTIMENTS INNOVANTS

APPEL A PROJETS POUR LE DEVELOPPEMENT DE LA CONSTRUCTION ET RENOVATION HORS SITE (CRHOS)

2024 : Creation of the Offsite association

filière hors-site FRANCE ASSOCIATION

Transform the way construction is done in France in order to reveal, increase, disseminate and equitably share values and pride between all those involved in the act of building. To do this, we need to **create the conditions for the development of a powerful French off-site industry, with deep roots in the local area,** by increasing demand, removing obstacles of all kinds and decompartmentalising the value chain.

grandparis aménagement
3F Groupe ActionLogement
Société du Grand Paris
BATIGERE HABITATS SOLIDAIRES
cdc habitat
epf ILE-DE-FRANCE
PARIS-SACLAY
GROUPE RATP
in'li Groupe ActionLogement
SNCF IMMOBILIER

Major land developers

Very Hight ambitions !

- % Offsite
- Carbon footprint
- Local production

We want 80% of our buildings using Off-site

Evaluation grid

% Offsite

CO2

Local

OBJECTIF	CRITÈRES	3 NIVEAUX D'AMBITION 1 - STANDARD	2 - PERFORMANT	3 - EXEMPLAIRE
Recours à la préfabrication	Une part minimale du coût travaux dédiée à la fourniture de produits hors-site et à leur transport puis montage sur chantier, rapporté au coût travaux hors VRD, EV, INFRA, ALEAS	* Part du coût travaux dédiée au hors-site selon usage du bâtiment	* Part du coût travaux dédiée au hors-site selon usage du bâtiment	* Part du coût travaux dédiée au hors-site selon usage du bâtiment
Impact carbone exemplaire	Un indicateur IC construction conforme aux seuils RE2025 ou RE2028 pour les bâtiments soumis à la réglementation	IC construction - seuil RE2025	IC construction - seuil RE2028	IC construction - seuil RE2028
Soutien aux filières locales	Une distance moyenne maîtrisée entre site de chantier et site industriel, inférieure ou égale à :	≤ 600 km	≤ 450 km	≤ 300 km

*Part du coût travaux dédiée à la construction hors-site selon l'usage du bâtiment :

USAGE DU BÂTIMENT	3 NIVEAUX D'AMBITION 1 - STANDARD	2 - PERFORMANT	3 - EXEMPLAIRE
Industrie - bâtiment d'activités (logistique, entrepôt, atelier, industrie, artisanat)	35%	50%	65%
Tertiaire - bureaux	30%	50%	70%
Tertiaire - équipements publics	20%	40%	60%
Hébergement - résidence gérée, hôtellerie	30%	45%	60%
Logement collectif	20%	35%	50%
Logement individuel	30%	45%	60%

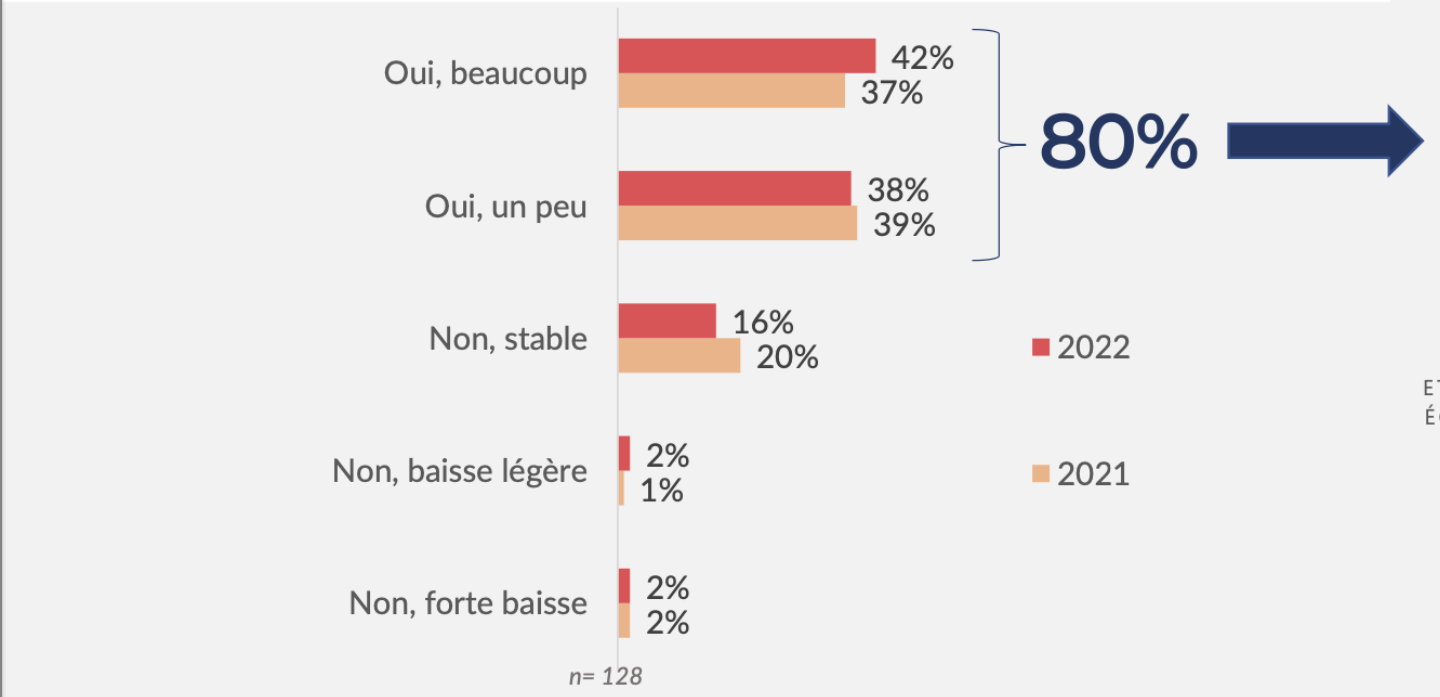
% Offsite

An exemplary housing project means :

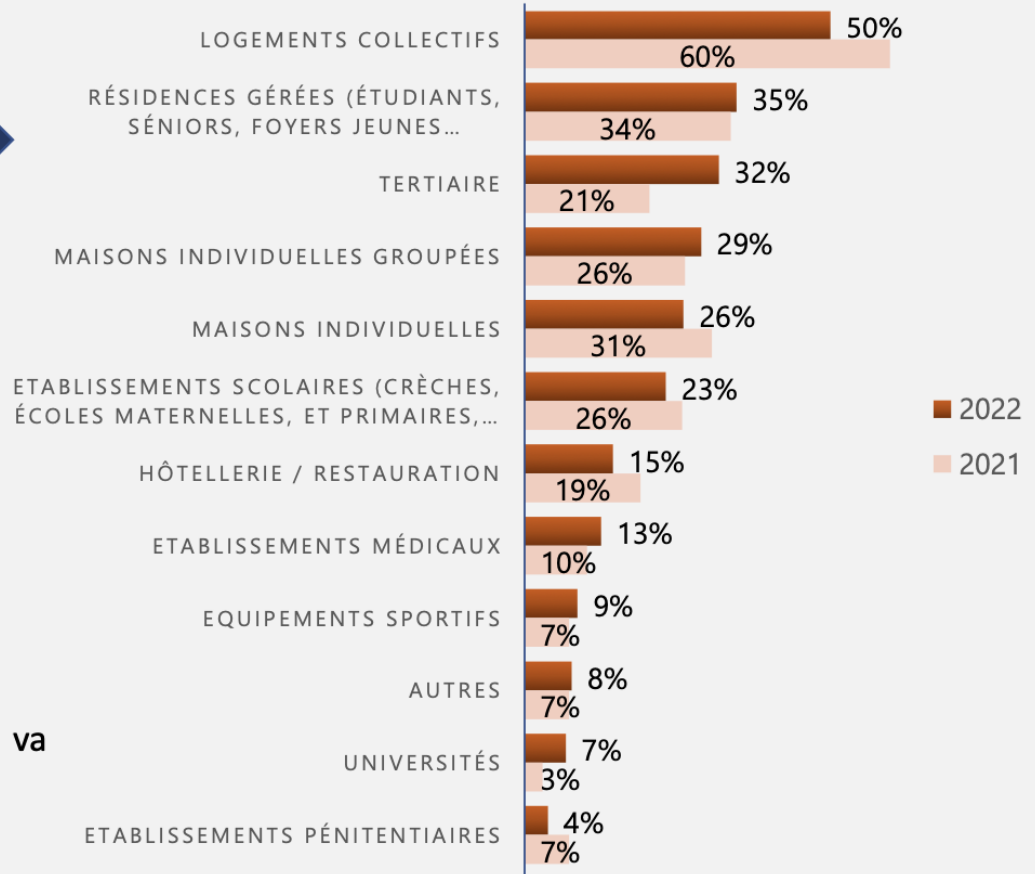
- Net zero carbon
- Using 50% elements offsite
- Prefabricated less than 300 km

In France demand for offsiste is exploding!

Q: Pensez-vous que la part de construction hors-site est amenée à augmenter dans votre carnet de commande ?



Q: Quels secteurs en bénéficieront les premiers ?



Les users sont **très optimistes** quant l'évolution du marché: 80% pensent que celui-ci va continuer à se développer.

Comme en 2021, les logements collectifs arrivent en 1er position (malgré une baisse).

80% of respondents want more off-site construction

High pressure on timber building

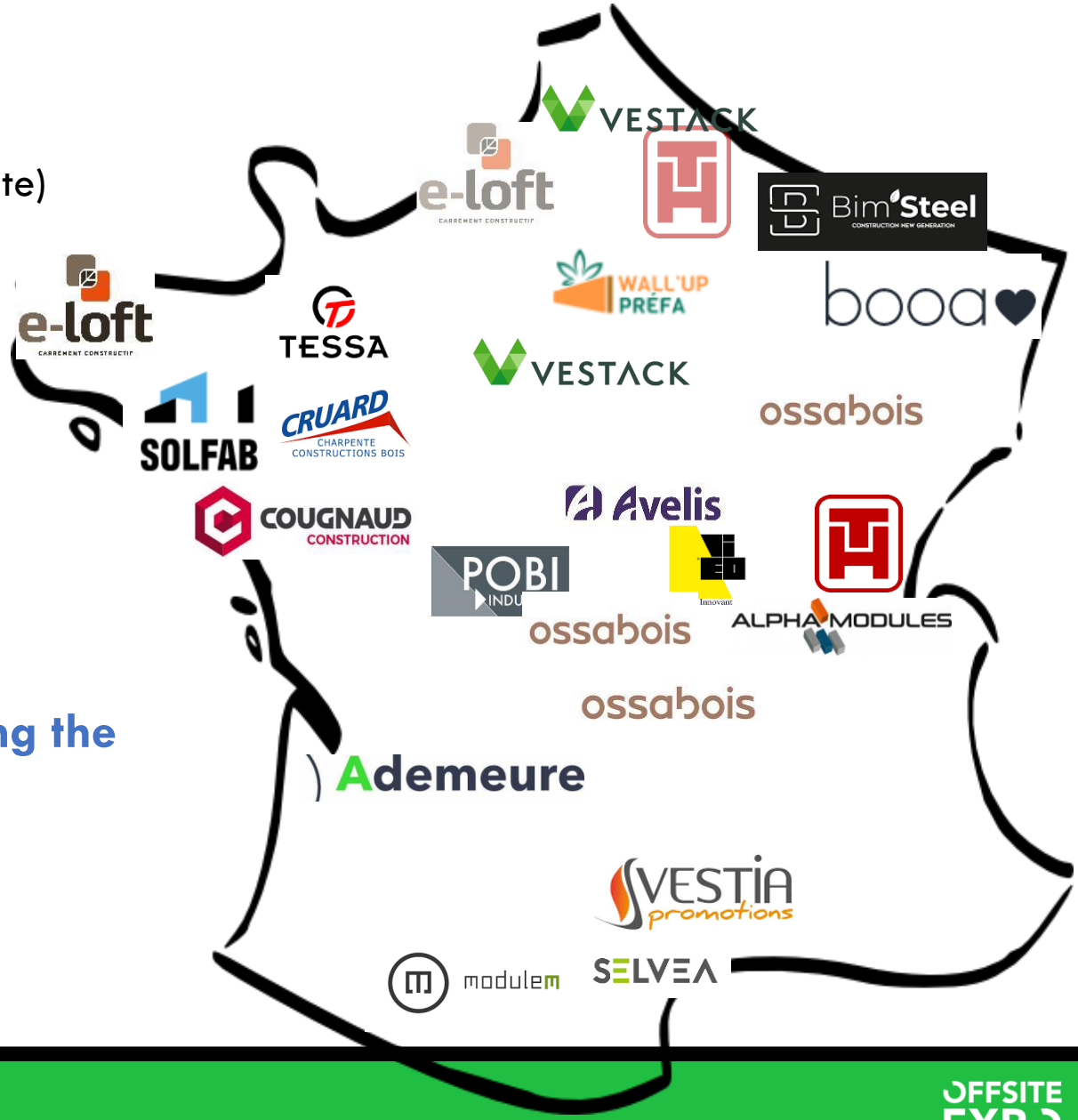
Carbon footprint – Bio based construction

Olympic 2024 athletes' village

The goal was 80% Timber !

The offer is developing

- A large number of 2D industrial players (wood, steel, concrete)
- A development of 3D players (wood, steel, concrete)
- New industrial players
- Networking of the territory with the creation of factories in progress
- Possibility of rapid creation of new factories to adapt to demand (2 years maximum)

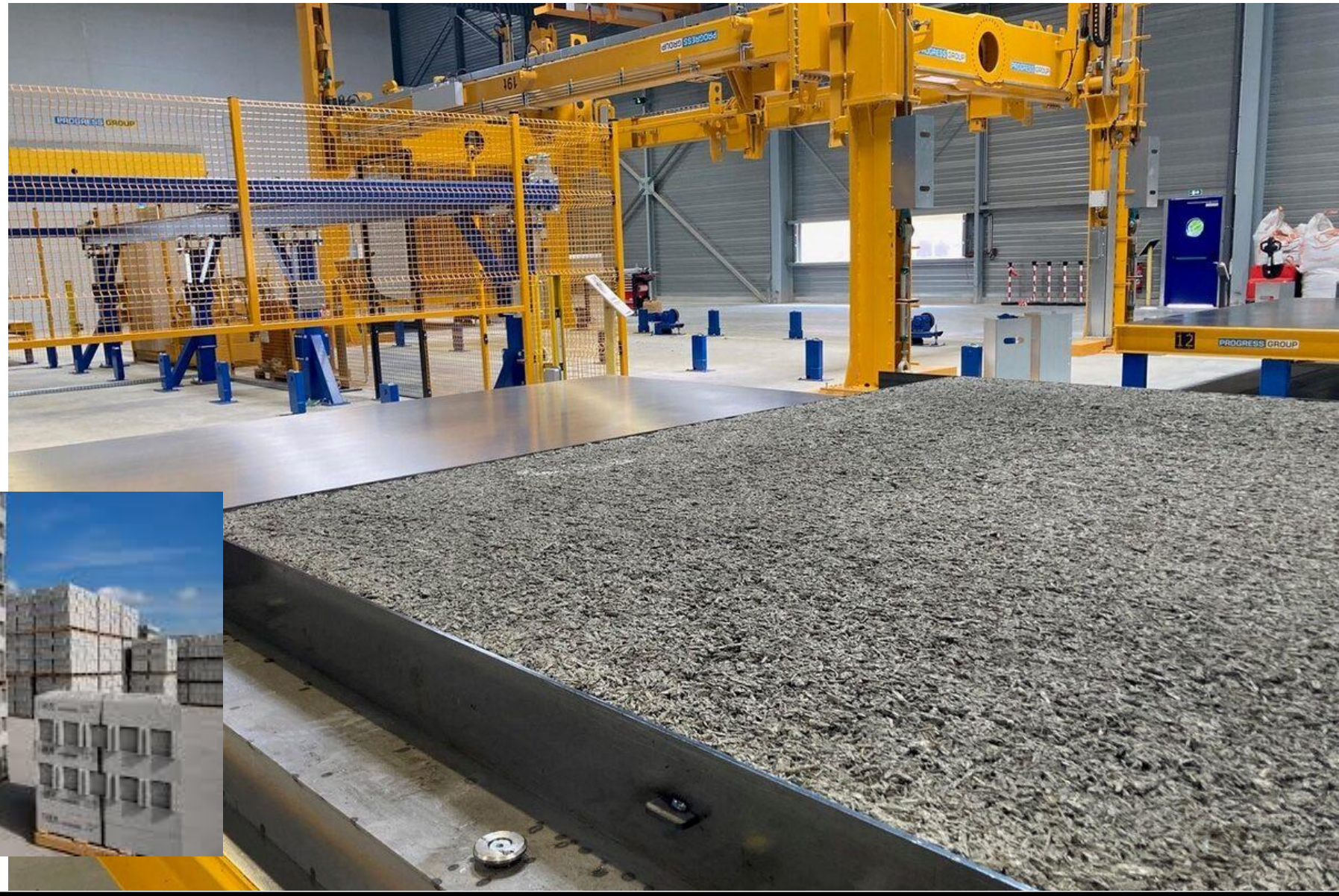


French industry is capable of producing the current volume

Emerging players who can meet your future needs

Concrete :

- 500 companies
- 20 000 employees
- 3,3 M€ turnover



Timber construction

- 2 000 companies
- 30 000 employees
- 1 M€ turnover

UICB
UNION DES INDUSTRIELS
ET CONSTRUCTEURS BOIS

Modular construction

La construction modulaire et hors site,
PLUS QUE VOUS L'IMAGINEZ

- 250 companies
- 10 000 employees
- 1 M€ turnover

- 40% renting

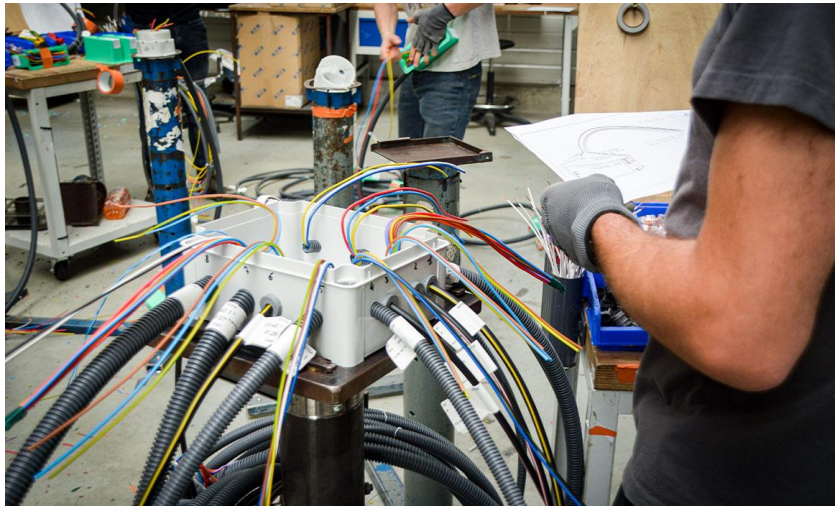
MEP

Bathroom pods
20 000 pods / year

BAUDET

EIFFAGE HVA CONCEPT

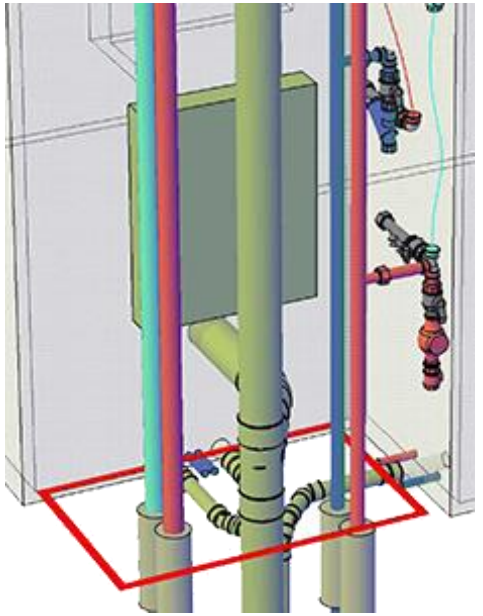
ALTOR



Electric systems
50 % / family houses

AD-CA

Groupe ipelec



Plumbing systems
Emerging market

FLOVEA

GAINES TECHNIQUES EUROPE

Retrofit !

energie sprong fr

- Start in 2019
- 6 000 renovation in 5 years
- 10,000 renovations planned

A fast-growing market

We want Offsite !

But most of the developers go to Offsite the same way than traditional

You have to understand the difference between prefabrication and industrialisation !

Pré-fabrication

- The project management team designs the project
- Launches a consultation
- **The building is a pure prototype**
- The industrialist is considered a building company
- The factory is not a factory, but a building activity under a roof.

It is a building approach

Ok for specific's elements

Industrialisation

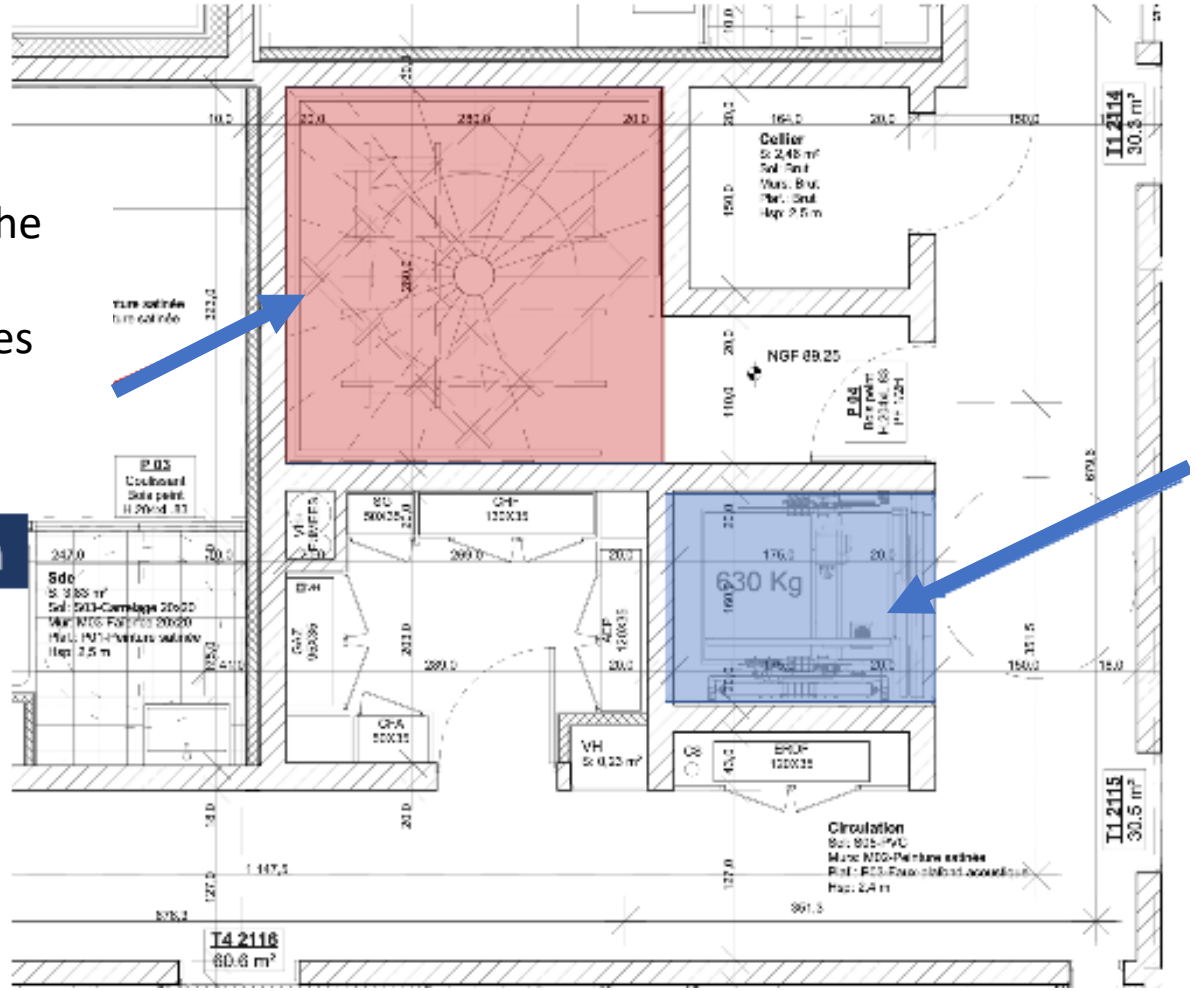
- Manufacturers develop components
- Offer them on the market
- The architect designs his project from the components
- He uses the DfMA (Design for Manufacture & Assembly)
- The manufacturer can set up real efficient production flows

It’s a product approach

Ok for repetives elements

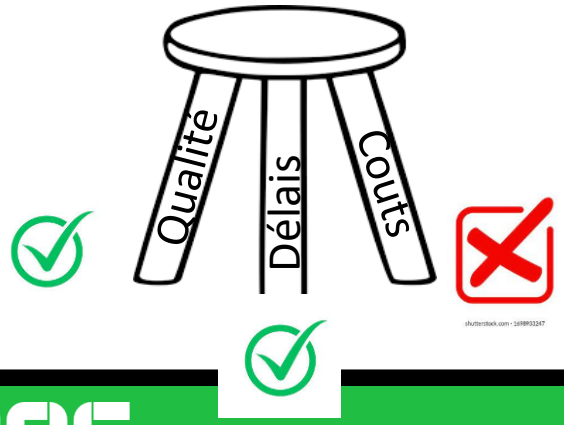
Both approaches are possible
But the real gains come with industrialisation...

- The architect designs the stairwell,
- the manufacturer makes the staircase that goes inside !

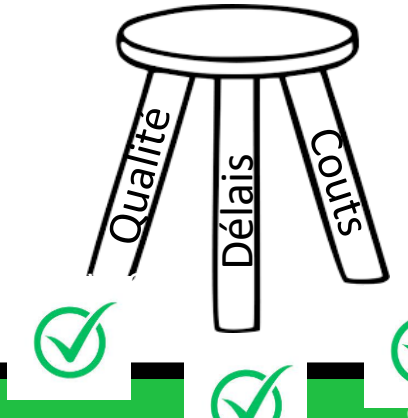


The architect uses the industrial data to design the lift shaft.

Pré-fabrication



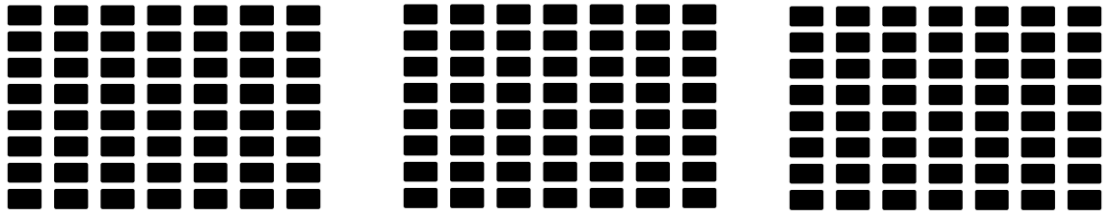
Industrialisation



INDUSTRIALISATION, is the real change

1- REPETITION

2 - VOLUME



3 - **STANDARDISATION & continuous improvement !**

LEAN : Management & Manufacturing

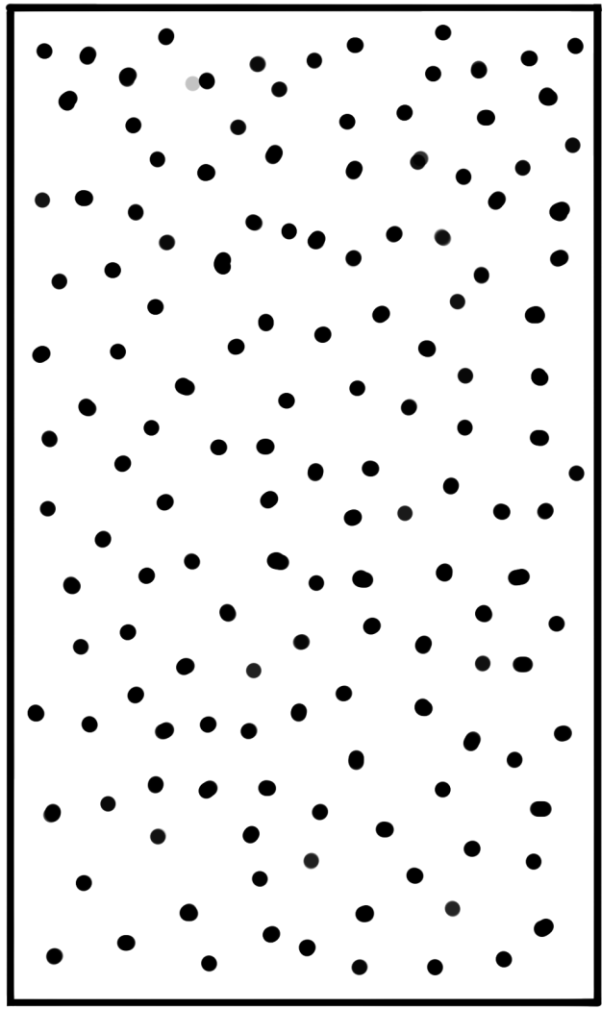
DfMA : Design for Manufacture & Assembly

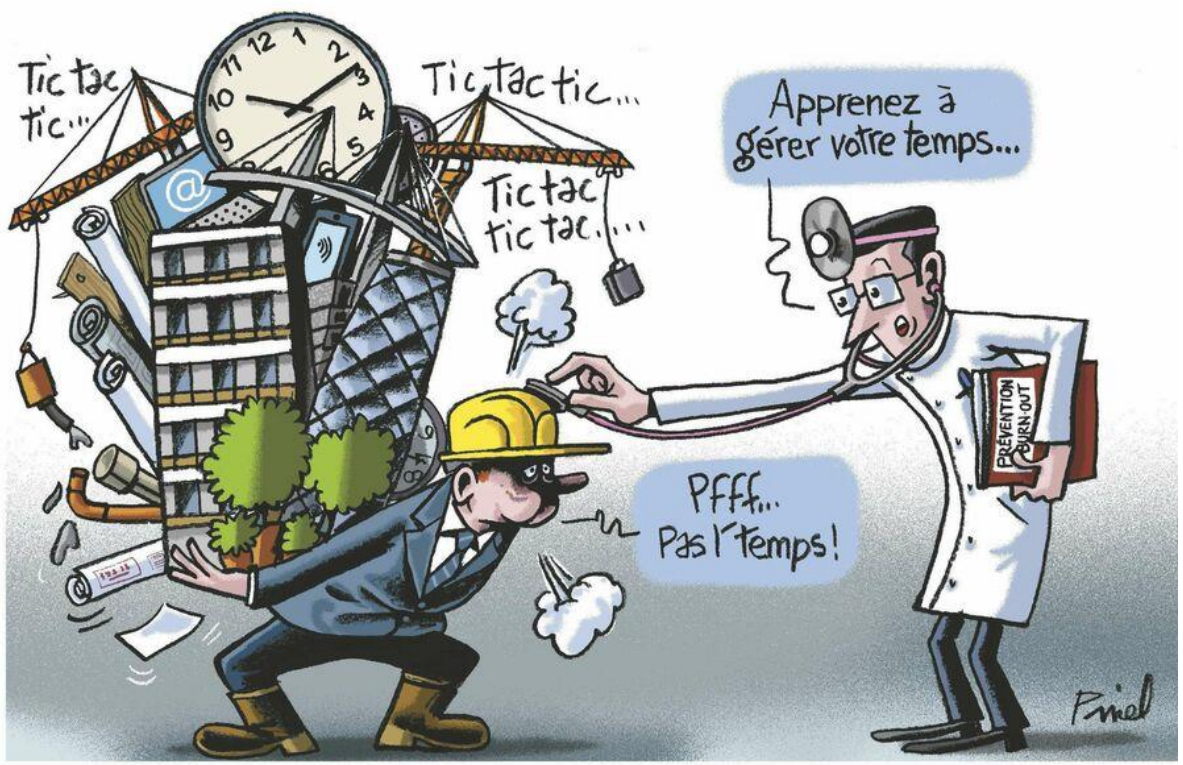
Industrialisation is a response to mass needs


Construction site
Keep out

COMPLEX WORKSITES, UNDER PRESSURE!

A multitude of tasks, materials, tools and people

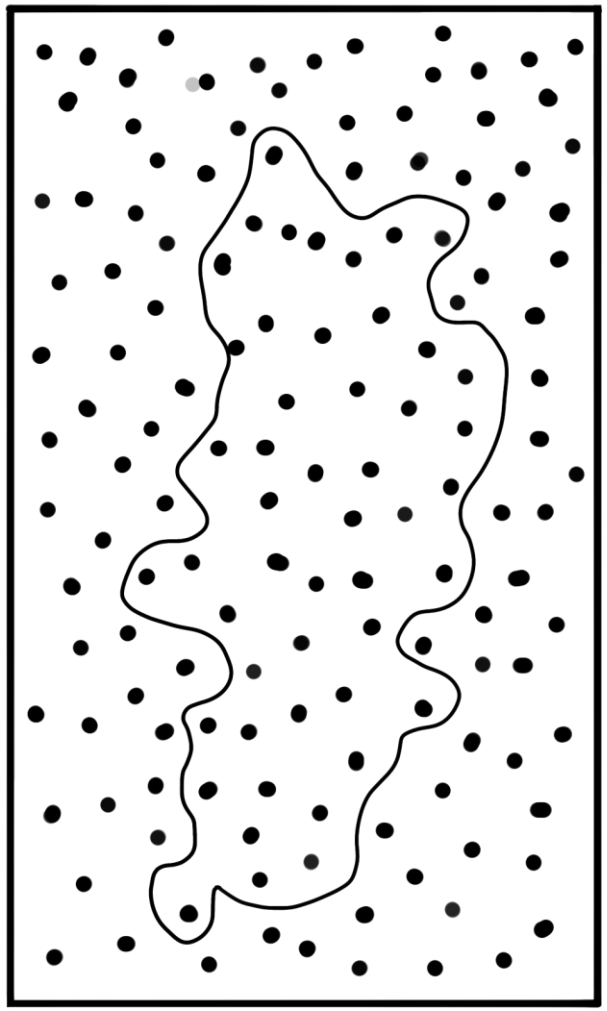




COMPLEX WORKSITES, UNDER PRESSURE!

A multitude of tasks, materials, tools and people

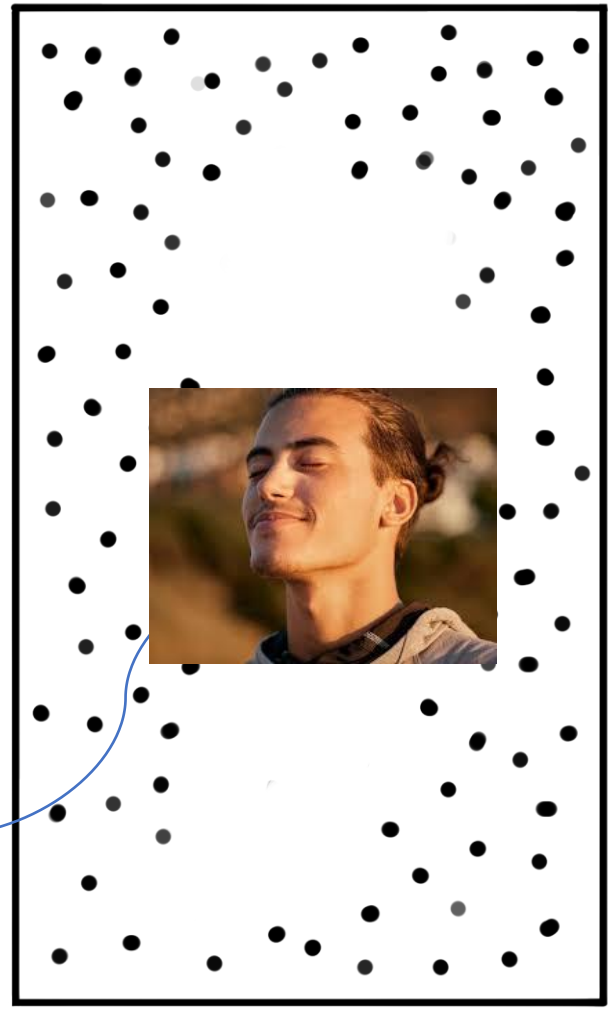
Complex repetitive parts



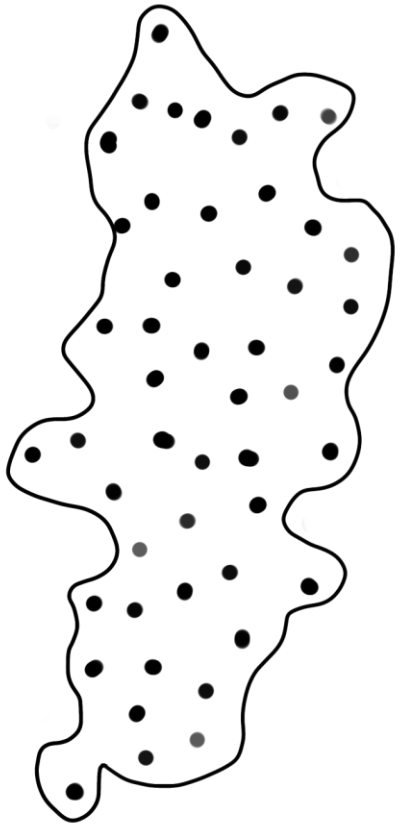
COMPLEX WORKSITES, UNDER PRESSURE!

Less tasks, materials and human resource requirements

A breath of fresh air for the construction industry

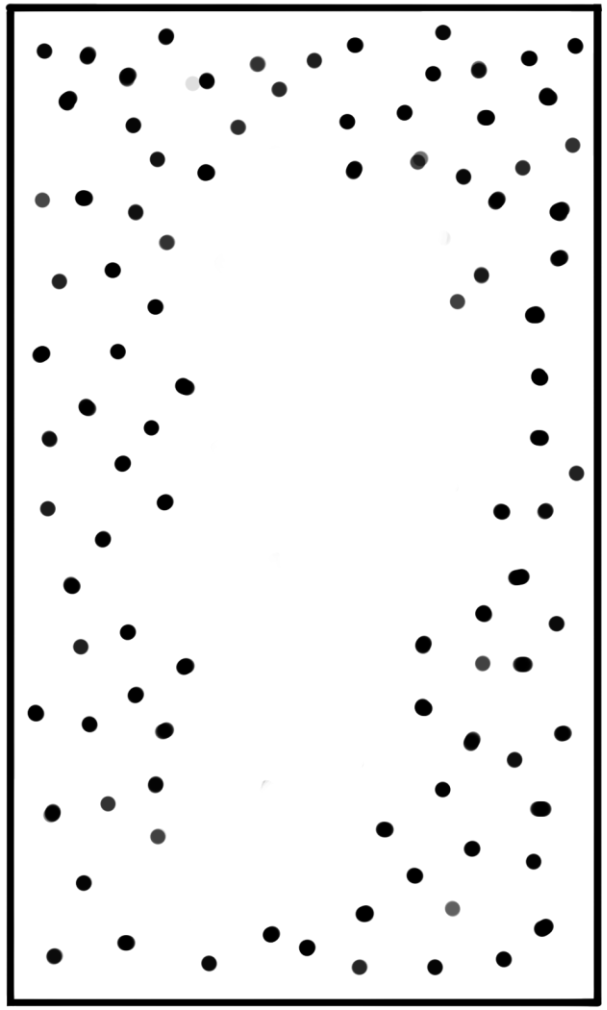


Complex repetitive parts



DES CHANTIERS COMPLEXES

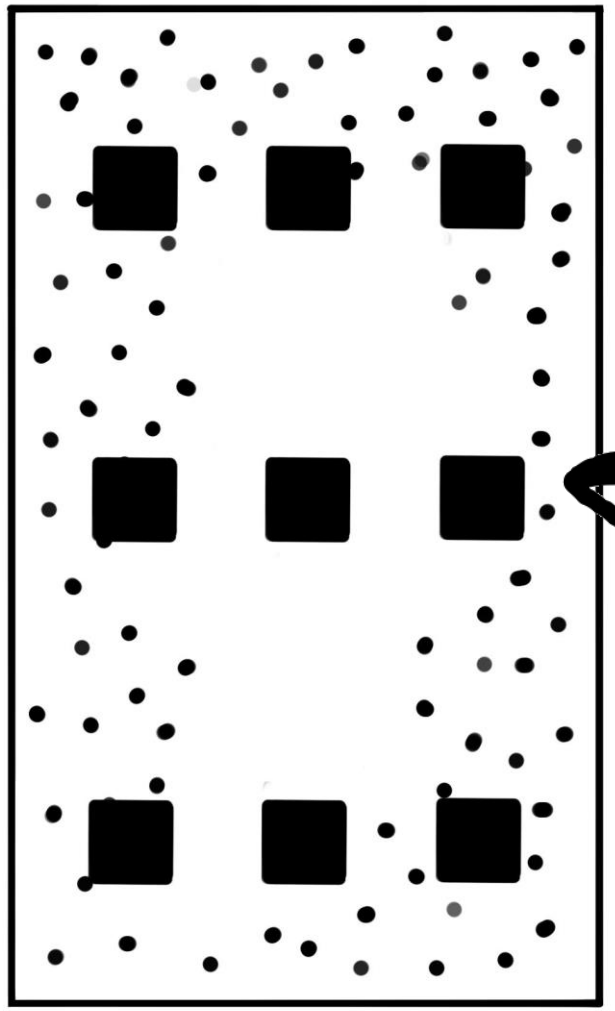
Reduction
of tasks,
materials and
human resource
requirements



Complex repetitive parts

SIMPLIFIED CONSTRUCTION for everyone

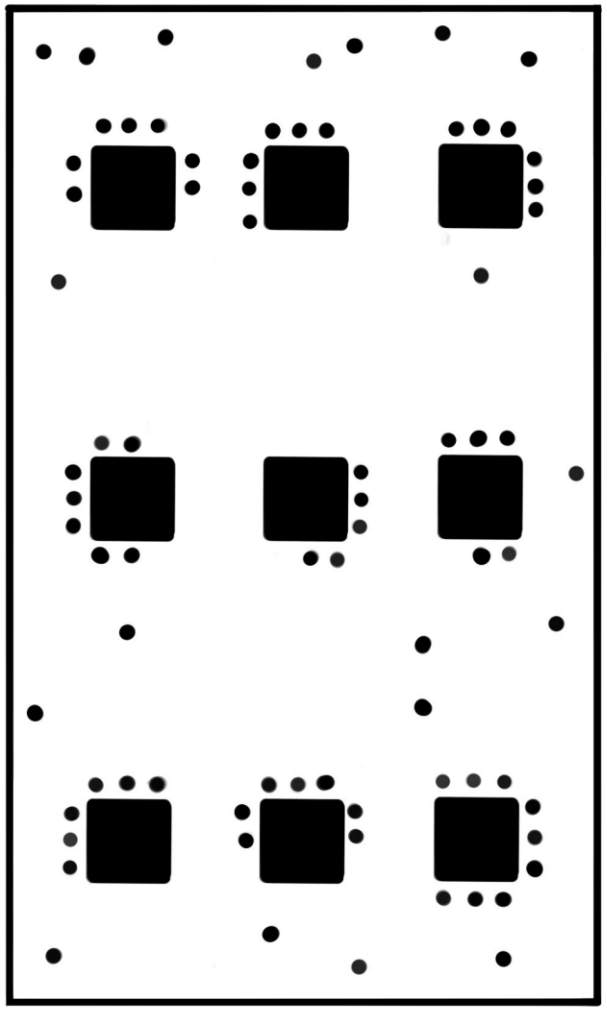
Reduction
of tasks,
materials and
human resource
requirements



Integration of elements

FASTER, SAFER SITE REORGANISATION

Reorganisation tasks, materials and human resource requirements



Gains from factory-made products

Gains through better site organisation

Everyone wins!

-The community
-The investor
-The project owner
-The operator
-The project manager
-Building companies
-The end user

The keys success :

- **Awareness is needed from all the actors !**

- **Think prefabrication rather than construction !**
  - **From the first stroke of the pen**, and encourage collaborative working
- **Don't pit construction against industry**
  - **Learn how to meet specific needs from efficiently produced factory components.**
- **Don't forget the learning curve!**
  - Educate, support and train !

Manufacturing in a factory is not the most difficult thing, What is difficult is to put in place a culture and a project management that makes industrialisation possible!

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Bengt Magnussen

Commercial Director
TALO

International changemakers delivering homes

Around 70 per cent of new homes in Finland are prefabricated offsite

Source: Finnish Association for Manufacturers of Prefabricated Houses




Finland – Drivers for Offsite Manufacturing

Extreme climate:

- Requirement for thermal efficiency
- The need to reduce work on site

Market:

- Private development drives factory-built quality, design flexibility and cost efficiency

UK – Drivers for Offsite Manufacturing

Challenges in UK construction:

- Skills shortages
- Lack of productivity
- Poor quality

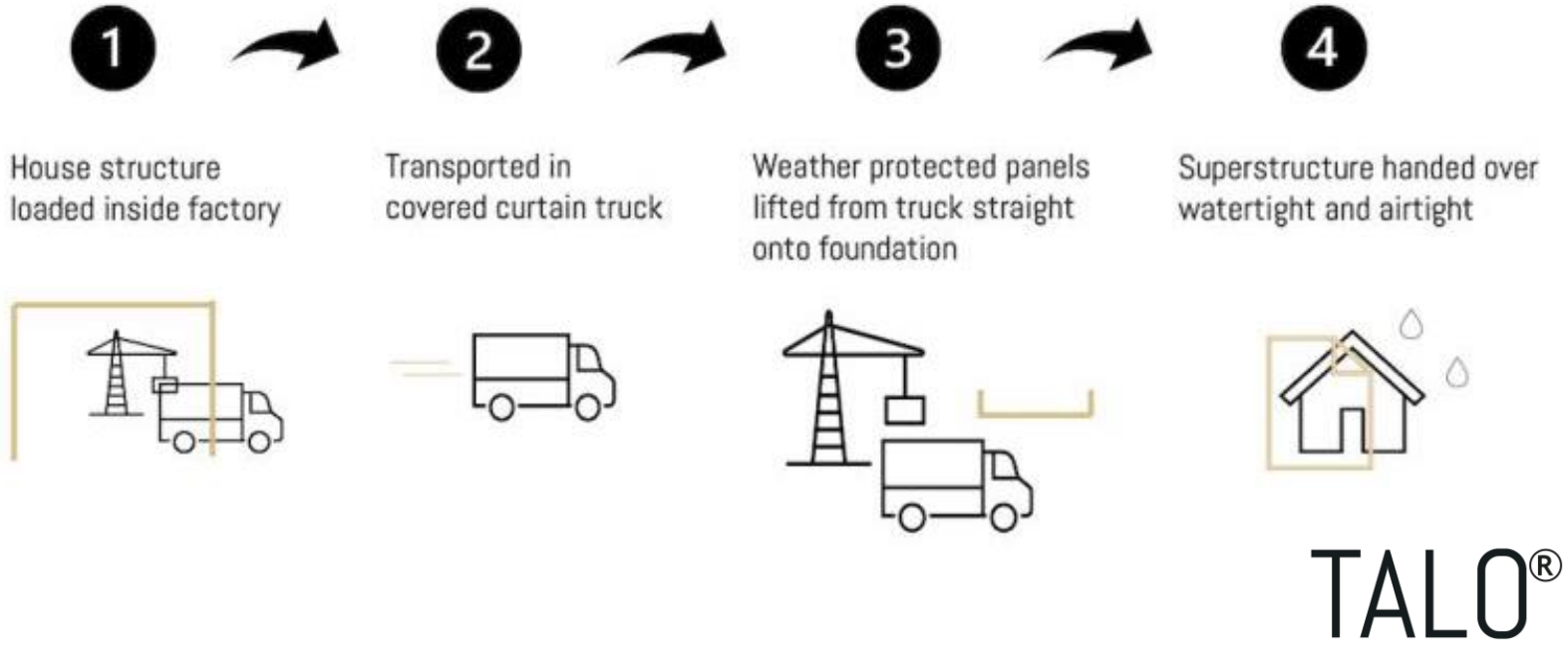
Rising demand for new homes:

- Housing crisis
- Affordable homes
- Increase energy efficiency

Constraints:

- Risk – large factories
- Design restrictions
- Lack of capacity
- Cost premium

Finland – Dry Timber Processes from Forest to Site



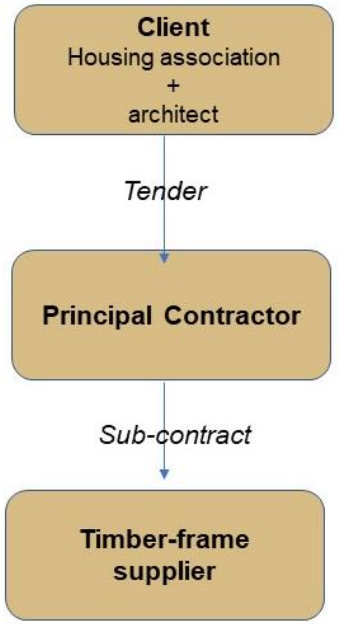
How are we addressing challenges facing UK construction?

UK industry challenges	TALO Solution – Finnish technology
Design flexibility for different housing types / planning:	No restriction on design – from terraced to detached houses
Low productivity in UK construction, delays:	Advanced, proven offsite technology that has delivered 30,000 homes over 40 years in Finland and Norway
Drive to net zero, increased energy standards:	Exceeding Passivhaus energy standards and Future Homes Standards on every project
Lack of consistent quality:	Dry timber chain – forest, sawmill, factory, site – zero snagging
Cost sensitivity:	No cost premium
Skills shortages:	Use of offsite manufacturing means fewer trades on site; TALO Training Academies to upskill local workforce
Increasing legislation – Building Safety Act:	Exceeds fire regulations by 200%

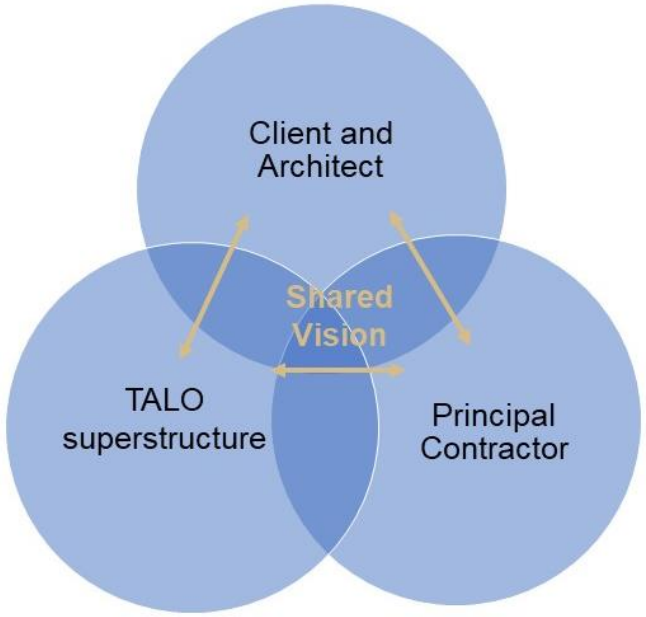
Regional Factory Model – Reduced Risk

Opportunity for Transformation – Use Partnership Model

UK – Housing procurement



Finland – Partnership model



TALO®

Mission-driven Approach – Eradicate Fuel Poverty

Proven offsite housebuilding technology
from Finland to build low rising housing:

- *Zero* energy housing
- *Exceed* Passivhaus energy standards
- *Any* tenure / house design
- *Reduced* build time
- *Higher* quality – zero snagging
- *No* cost premium

www.talo.co.uk
hello@talo.co.uk

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Ewelina Woźniak-Szpakiewicz

Chief Executive Officer
DMDmodular

International changemakers delivering homes


DMD modular

DMD modular

since 2017 - CEO, Shareholder, DMDmodular

since 2024 - Board Member, Board of Directors, Modular Building Institute

Co-Chair of EU Council of MBI

13 years in the modular industry (playing different roles, collecting diverse experience, as architect, director of Product Development, manager in the production companies, manager, entrepreneur, etc.)

Leader of R&D Consortium DMD-M

PhD in Technical Science, Academic Teacher, Cracow University of Technology

DMDmodular - Markets & Products

DMDmodular was established in 2016. DMD's award-winning expertise, supported by proven technology and the backing of the shareholder, FORUM TFI S.A. [Closed Investment Fund], enables DMD to provide superior modular solutions for various sectors.

DMD's stable and credible supply chain is built on Poland's extensive experience in furniture, ceramics, doors, and windows production, making us the ideal business partner in the construction industry.

The core business of DMD is focused on:

- student housing (PBSA, camps, etc.)
- hospitality & leisure
- housing.

sectors: which require durability, quality & technical standards, time reduction and flexibility.

The company has provided facilities to Holland, Denmark, the UK, Slovakia, Poland and is currently exploring opportunities in other regions.

Our aim is to provide volumetric modular solutions where technology, quality and aesthetics integrate together

Production: key parts

DMD modular

1

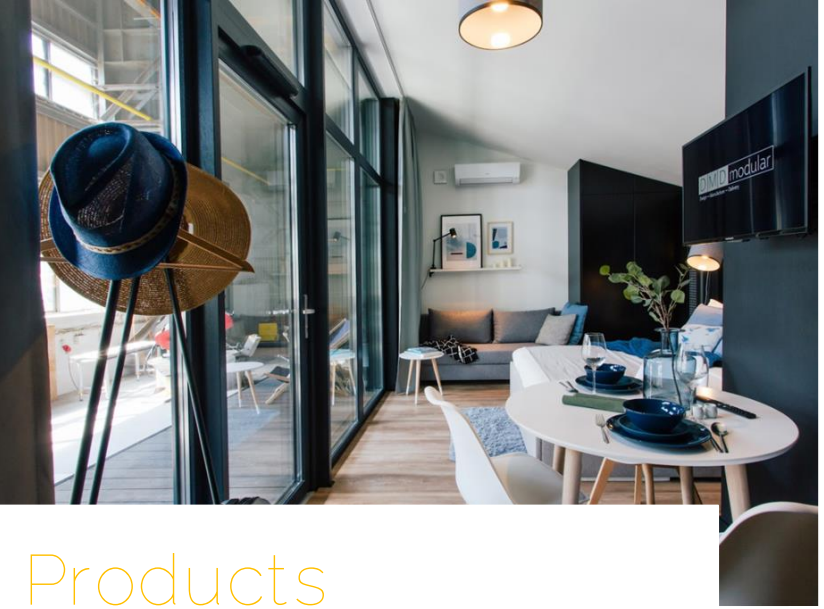
based on own
PRODUCTS

- hotel rooms
- student units
- leisure modules

2

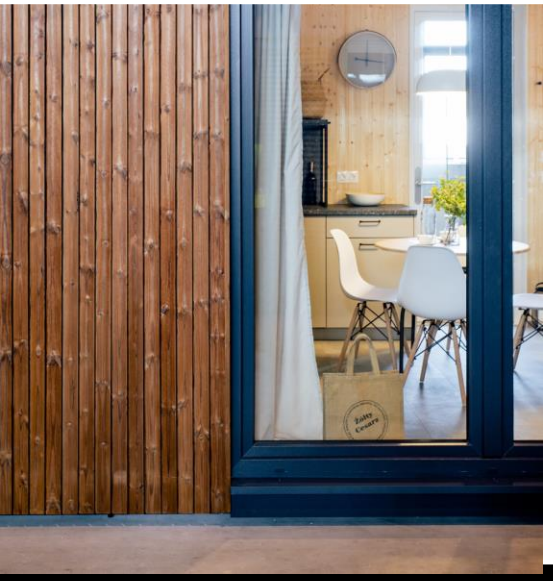
based on
PROJECTS

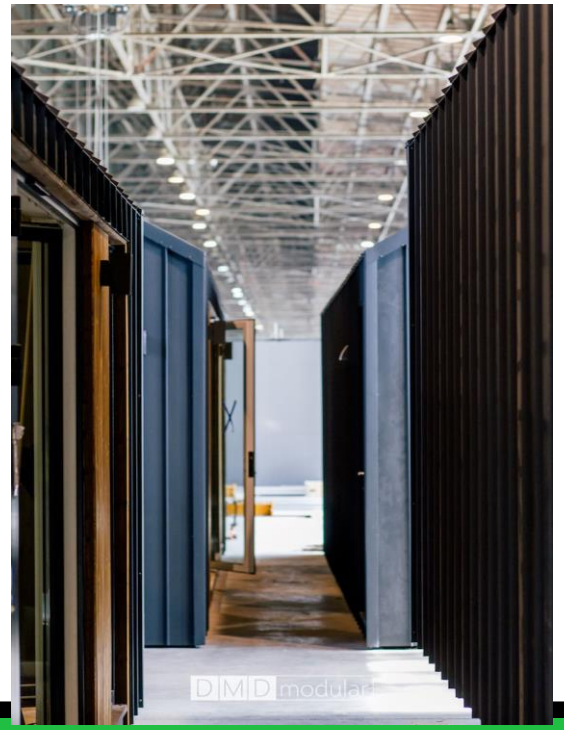
individual projects: hotels, student housing, etc



Products

houses & recreation

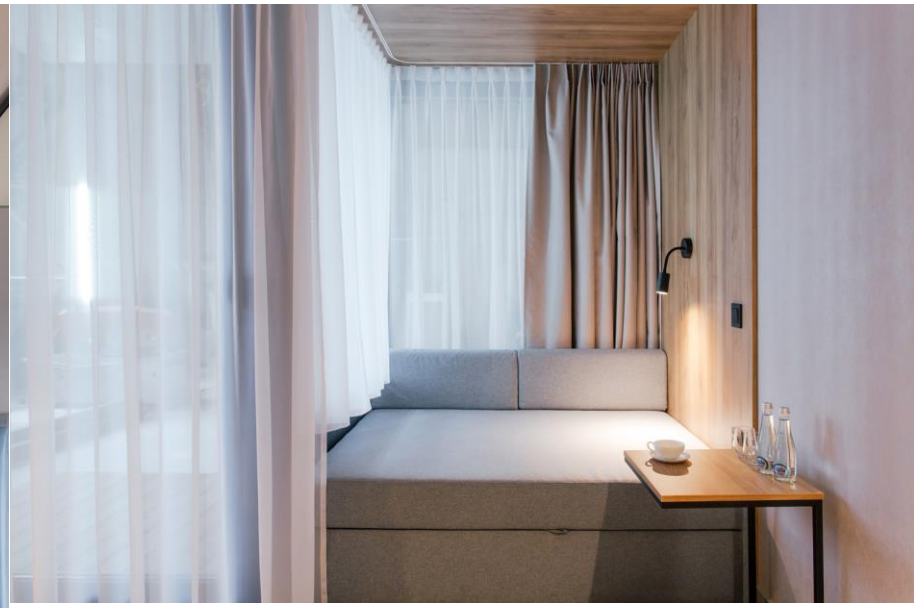




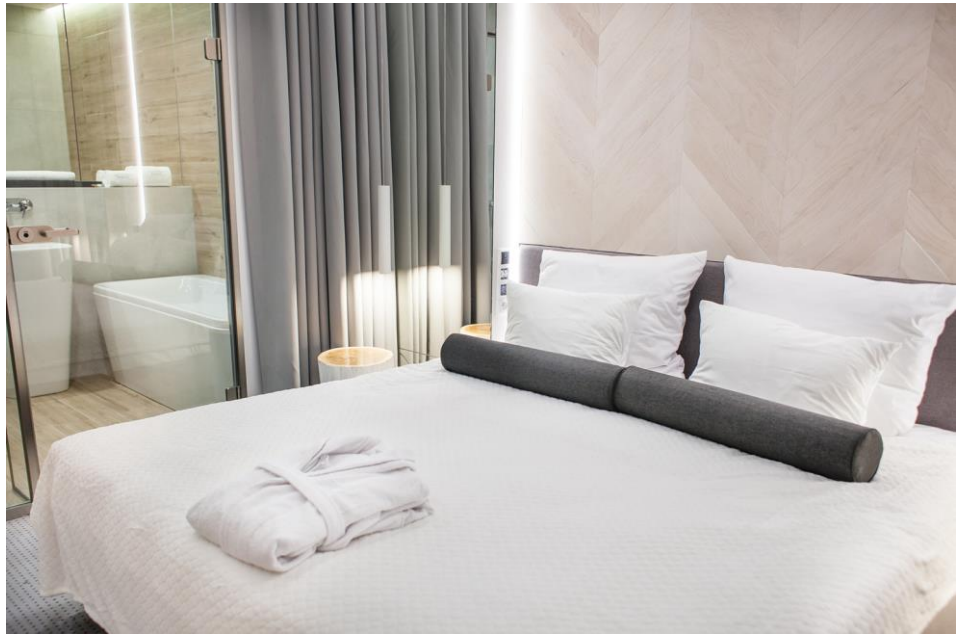
Projects

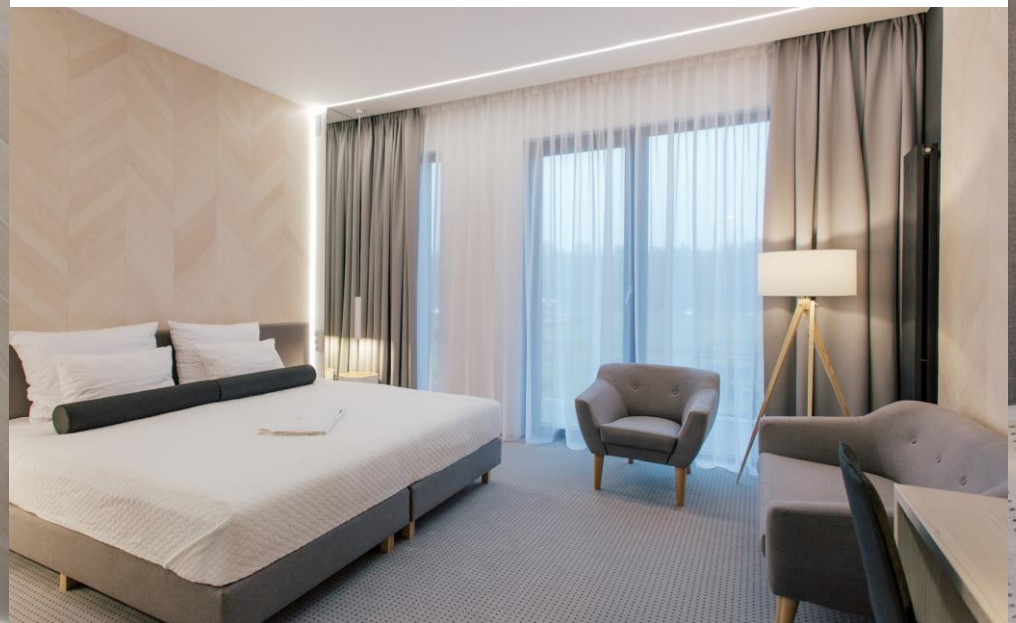
housing, dormitories, hotels

DMD modular



DMD modular





DMD modular

International Case Studies

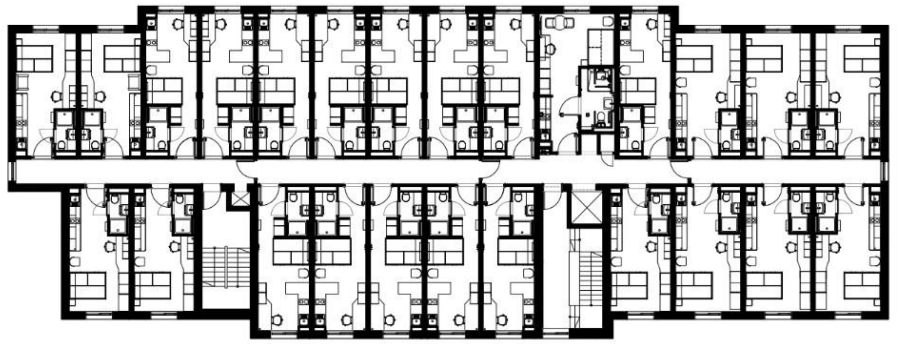
DMD modular

Edinburgh | part 1

144 modules | 148 apartments

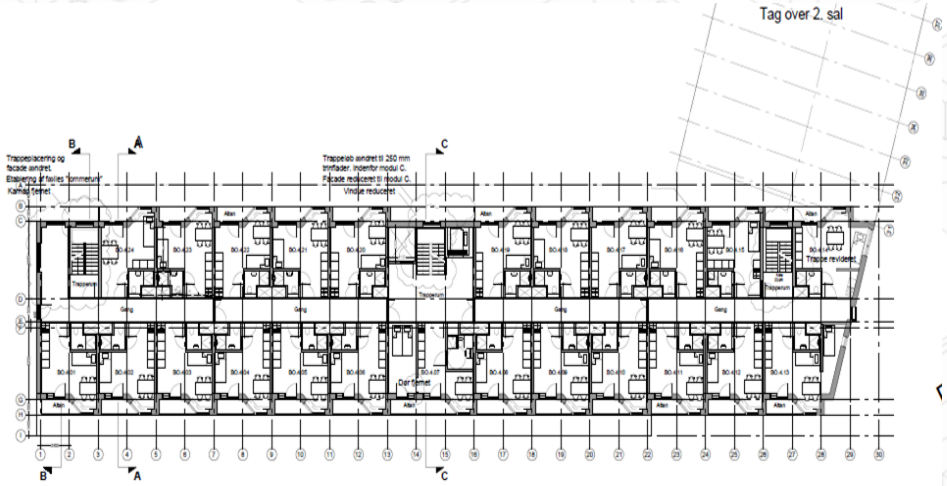
Edinburgh | part 2

70 modules | 102 apartments



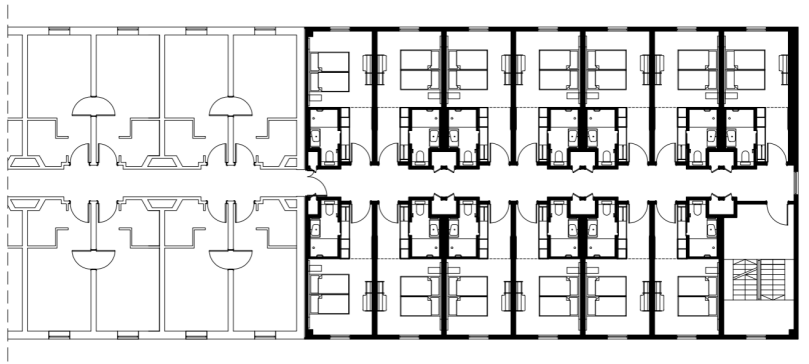
Copenhagen

84 modules | 75 apartments



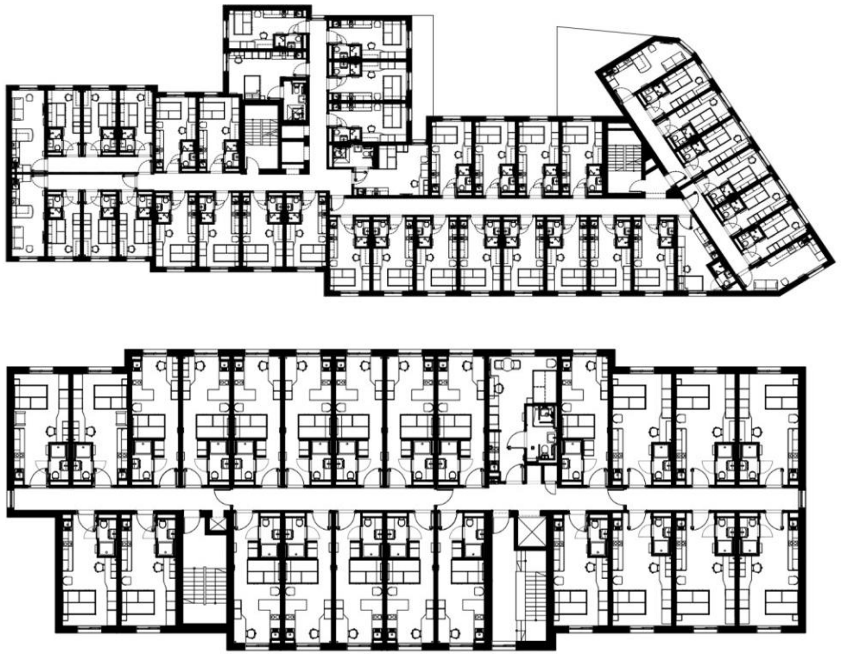
England

Hotel rooms



PBSA | Edynburg, Scotland

DMD modular



new building

INFORMATION

Building M1

- Modules 144
- Rooms 148
- Floors 4
- Gross area 3 645 m2

Building M2

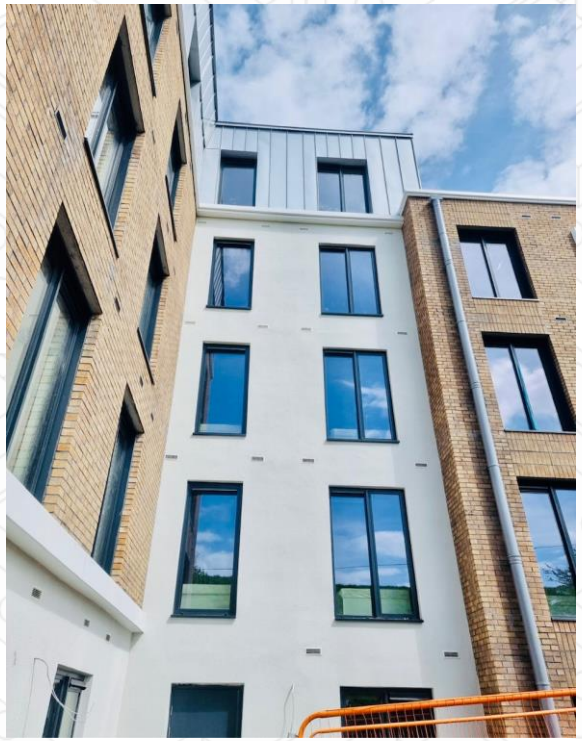
- Modules 70
- Rooms 102
- Floors 4
- Gross area 2 706 m2

PBSA | Edynburg, Scotland

DMD modular

PBSA | Edynburg, Scotland

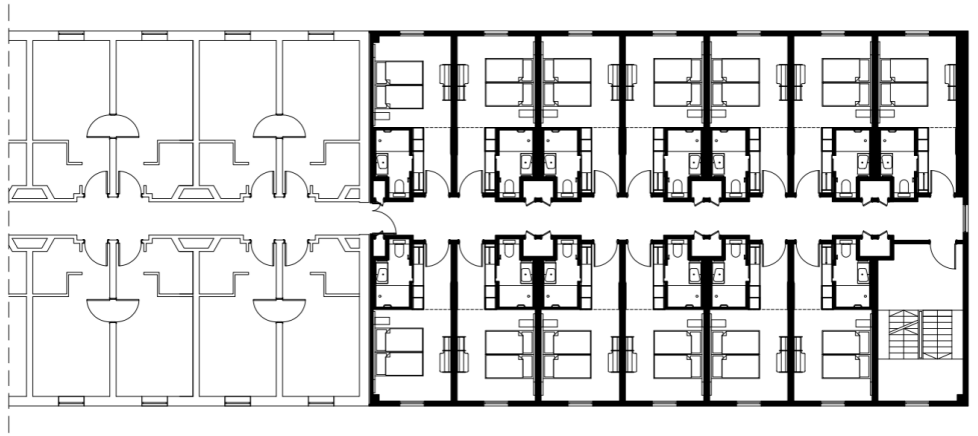
DMD modular



Hampton by Hilton I Bristol, Airport

DMD modular

horizontal extension

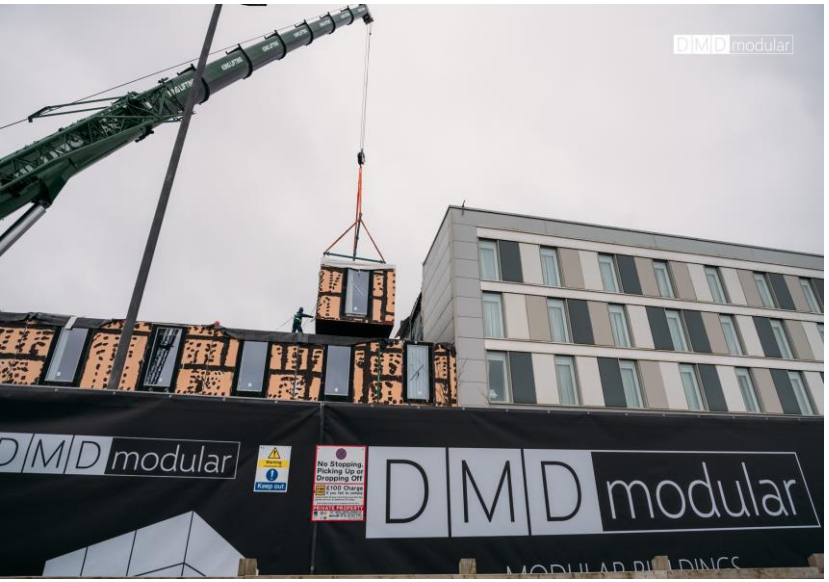


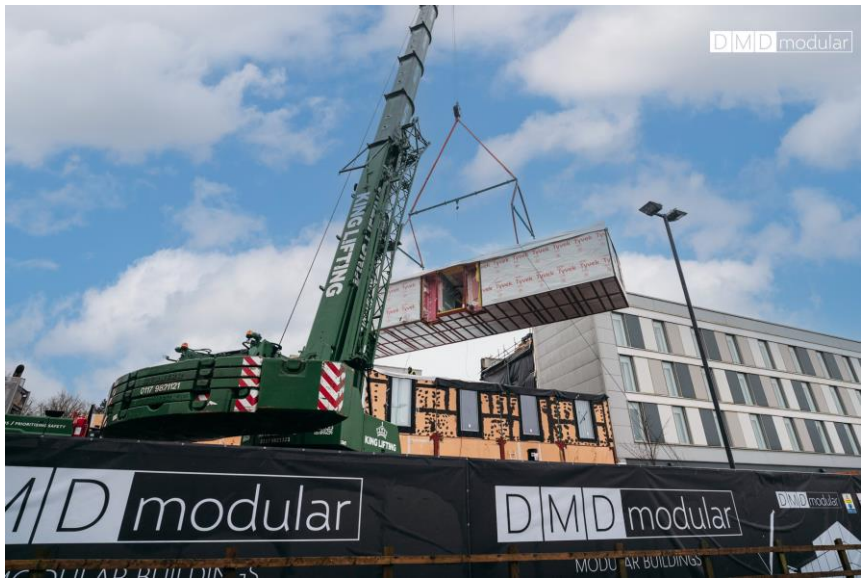
INFORMATION

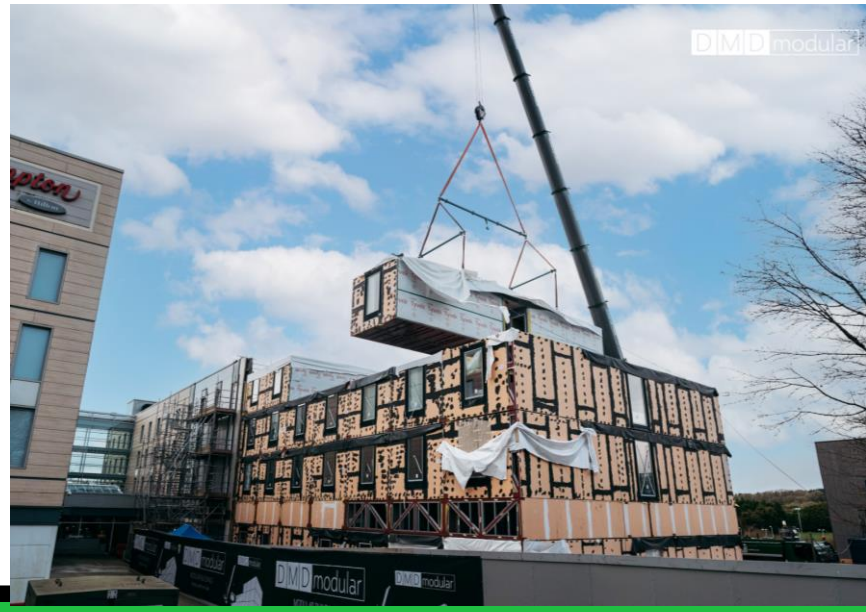
- New floors 4
- Standard of finishing turn key
- Modular gross area 1 555 m2
- Modules 30
- Rooms 50

Hampton by Hilton I Bristol, Airport

DMD modular





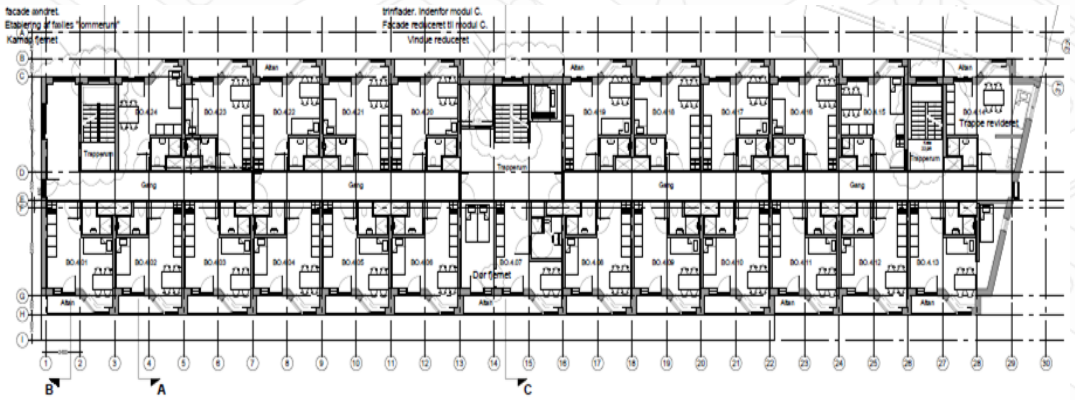


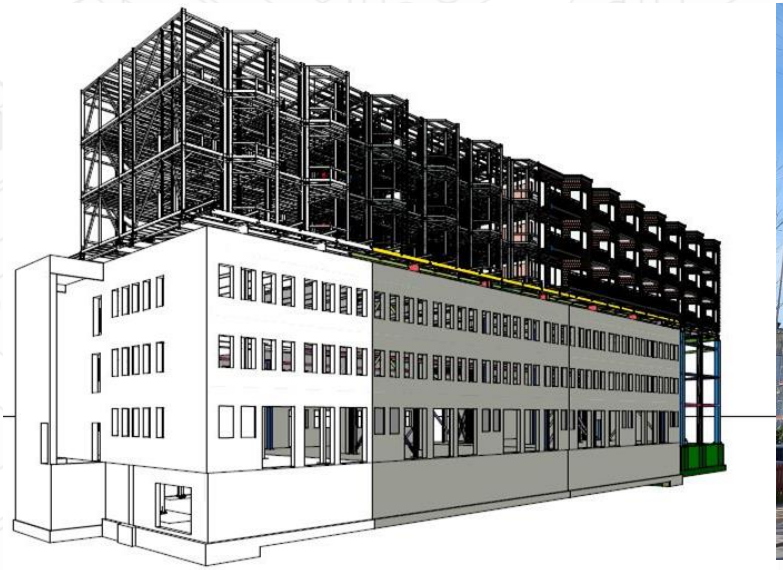

DMD modular
KING LIFTING
KING LIFTING
0117 9821121
Nationwide Platform
0345 745 0000

PRS I Kopenhaga, Denmark

DMD modular

Vertical extension

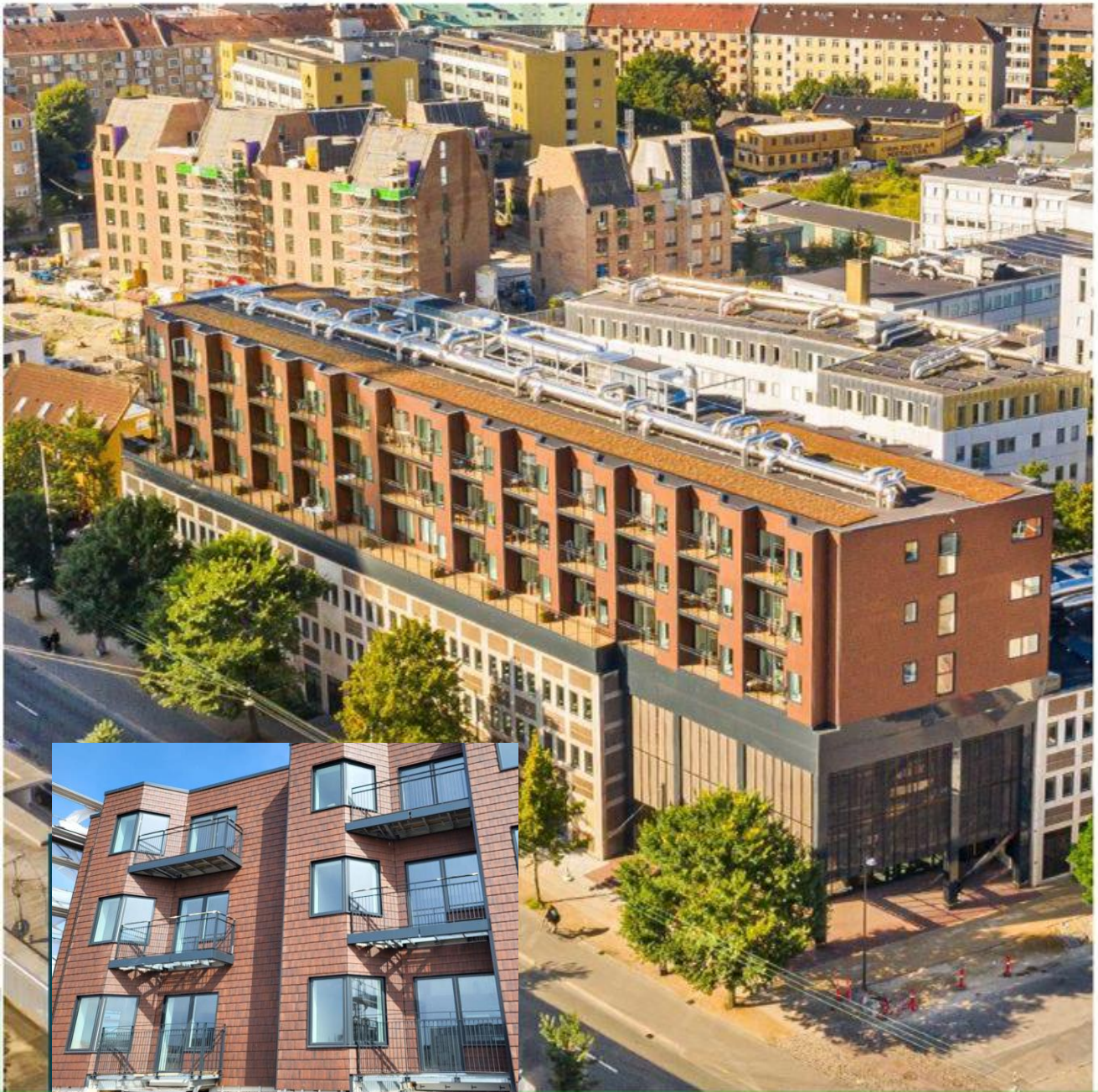




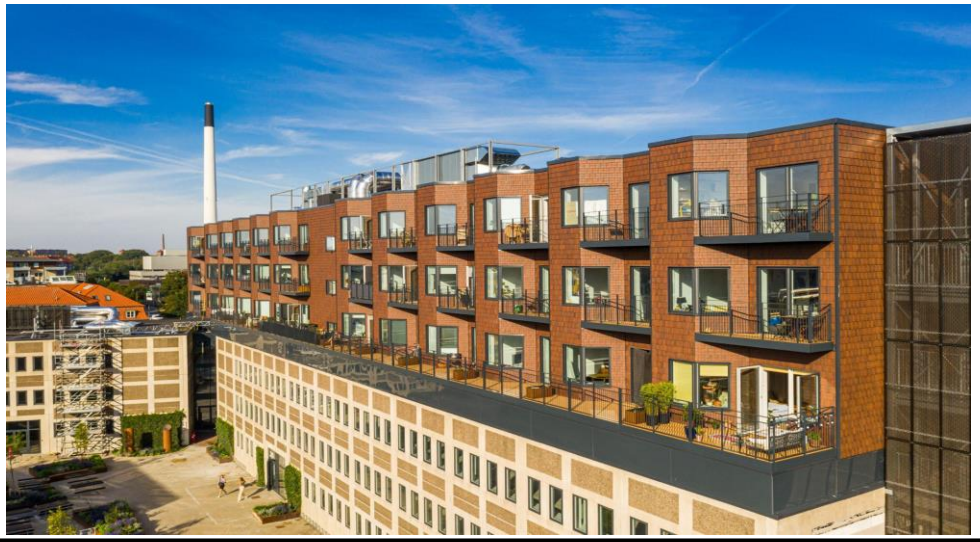
INFORMATION

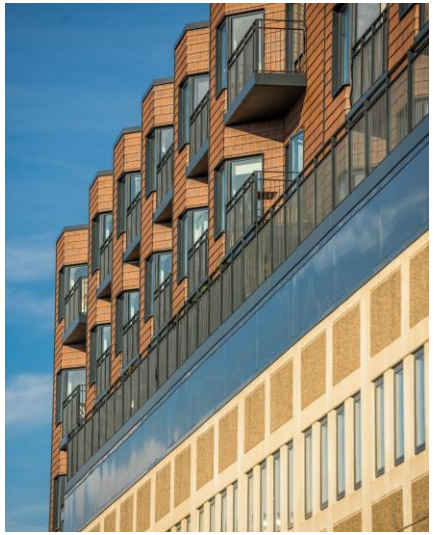
- New floors 3
- Standard of finishing turn key
- Modular gross area 2 464 m2
- Modules 84
- Flats 77

PRS I Kopenhaga, Denmark



DMD modular






KBS BYG A/S
NØRREBRO BYCENTER

DMD modular

Thank you for your attention

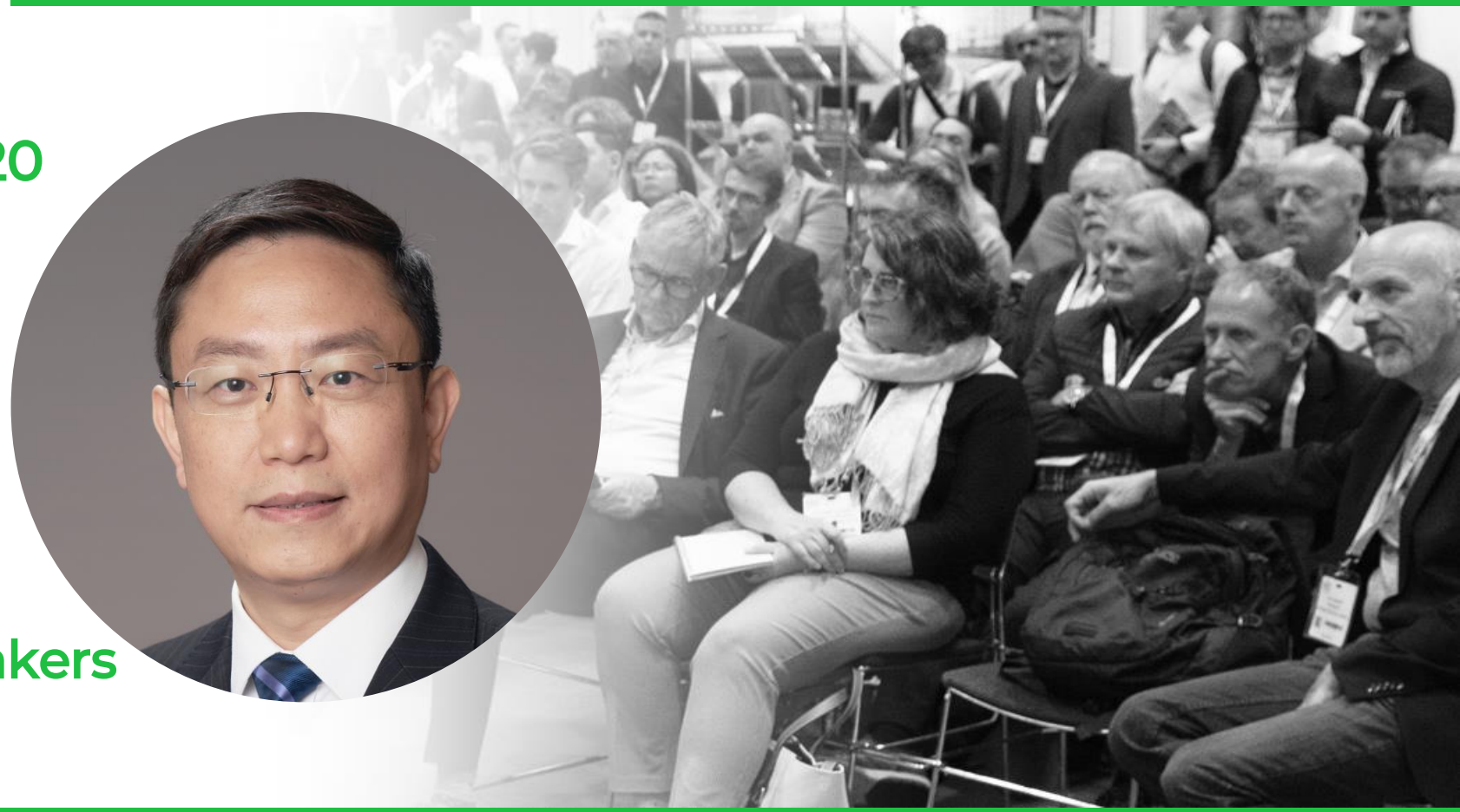
Ewelina Woźniak-Szpakiewicz
CEO, DMDmodular
Board Member, Board of Directors, Modular Building Institute
Co-Chair of EU Council of MBI

ewelina.szpakiewicz@dmdmodular.com

BOS
BUILDOFFSITE
COLLABORATING FOR IMPACT

IS CO-HOSTING THE OFFSITE SUMMIT AT OFFSITE EXPO

17-18 SEP 2024



17.09.2024 13:50 – 15:20

Professor Wei Pan

Head of Civil Engineering Department
The University of Hong Kong

International changemakers delivering homes

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Precut, Preassembly, Precast, Prefabrication, Modular

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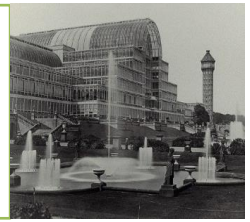
B.C.

Pyramid

Great Wall

1851

Steel & Glass
(The Crystal Palace)



1870s

1st Precast Concrete Slab

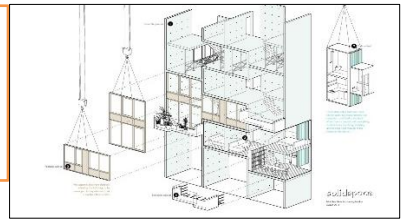
· **1878**, England
· W.H. Lascelles
· Prefab Slab

1880s

Steel Structure
1: **1883**, US
2: **1889**, France
1|2

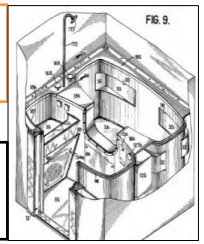
1910s

Prefabricated Kit-of-part)



1940s

Prefab Modular Blocks



1940, Modular bathroom

1960s

1st Modular High-rise

· Habitat 67, **1967**
· Canada
· **12-store residential**

2018

40-storey Concrete Modular Building, SG

2019

Highest Steel Modular Building 44 stories UK

2022

Highest Concrete Modular Building 56 stories SG

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HK Challenges & Opportunities

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123 100
Applications for public rental housing in 2021

5.5 Years
Average waiting period

30 000
Light public housing

20 000
Transitional housing

27, 330
Persons/km2

24.9%
Land area for living

~ 6, 570, 000
Citizens live in high-rises

10 & 26
Ranked @ technology readiness & innovation

LANTAU 明日大嶼 tomorrow

Significant Construction Volume

301 000
Public housing units supply by next decade

129 000
Private housing units supply by next decade

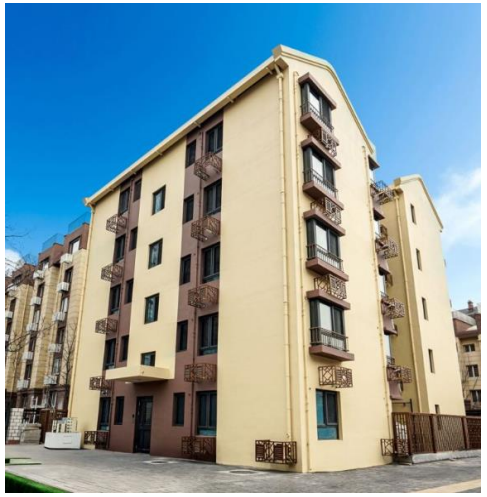
330
Hectare of land

Housing Authority 2022

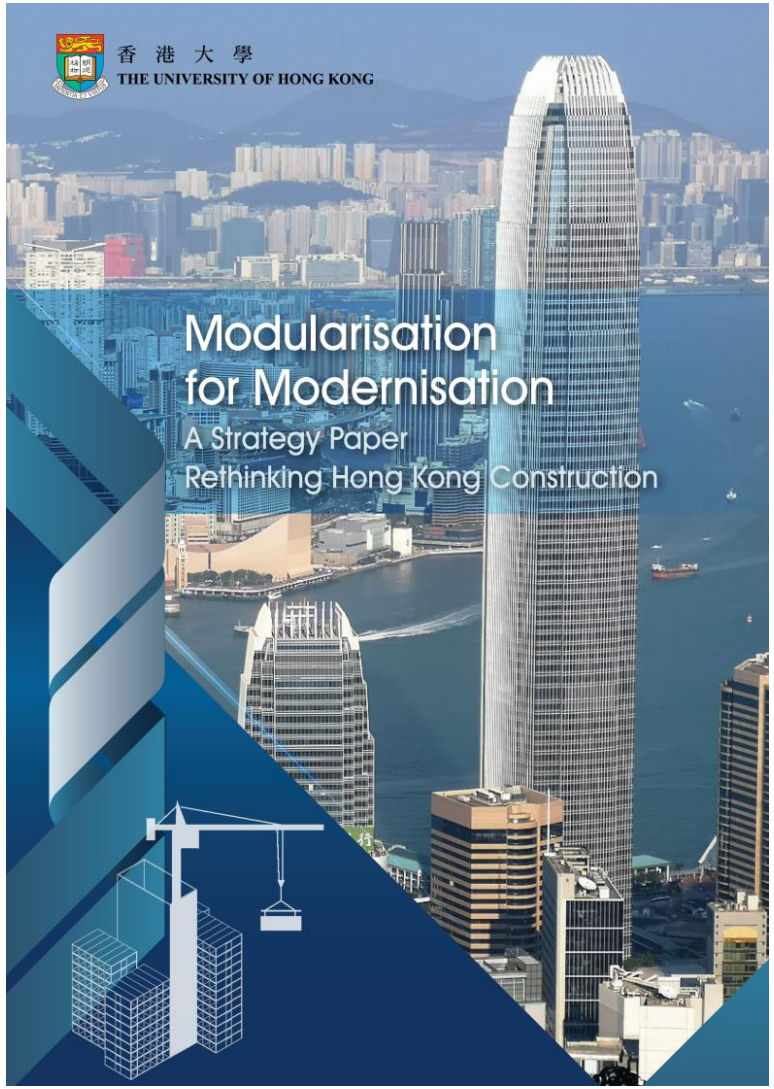
MiC Development in China

MiC in Hong Kong:
~50% public housing
~80% government buildings
Increasing private buildings

MiC in Mainland China:
Millions of public housing, residential redevelopment schools, hotels, etc.



MiC Concept

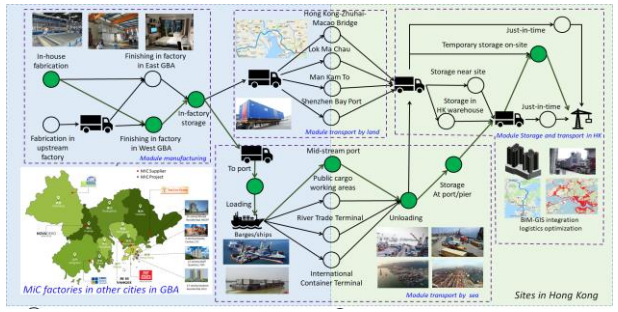


-- Wei Pan et al. (2019)

Modular




Integrated



Construction



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Pilot MiC Projects in HK

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1st Concrete MiC
2018

1st Steel MiC
2019

1st MiC Student Hostel
2019

1st MiC Quarantine Camp
2020

1st SSF MiC
2022

1st Private MiC Residential
2022

1st MiC School
2021

1st MiC Temporary Hospital
2020

1st MiC Elderly Home
2022

1st MiC Hospital
2023

1st PRH MiC
2023

1st MiC LPH
2024

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Benefits Achieved from MiC in HK

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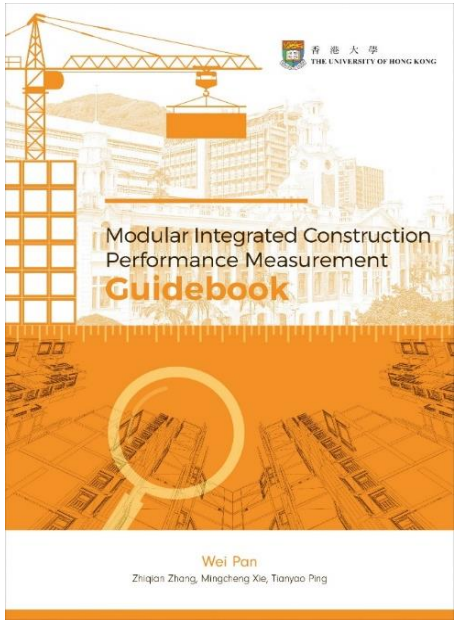

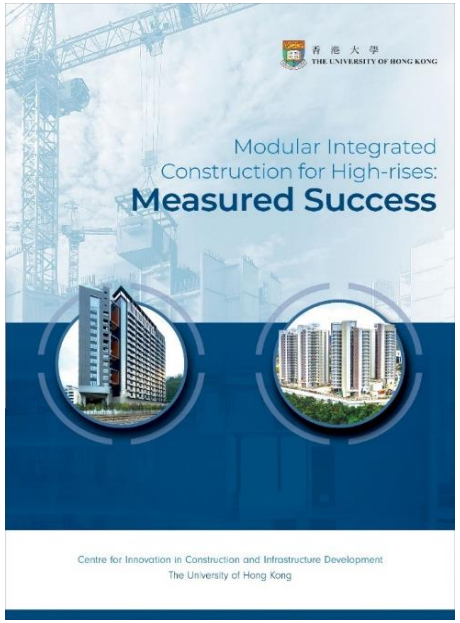

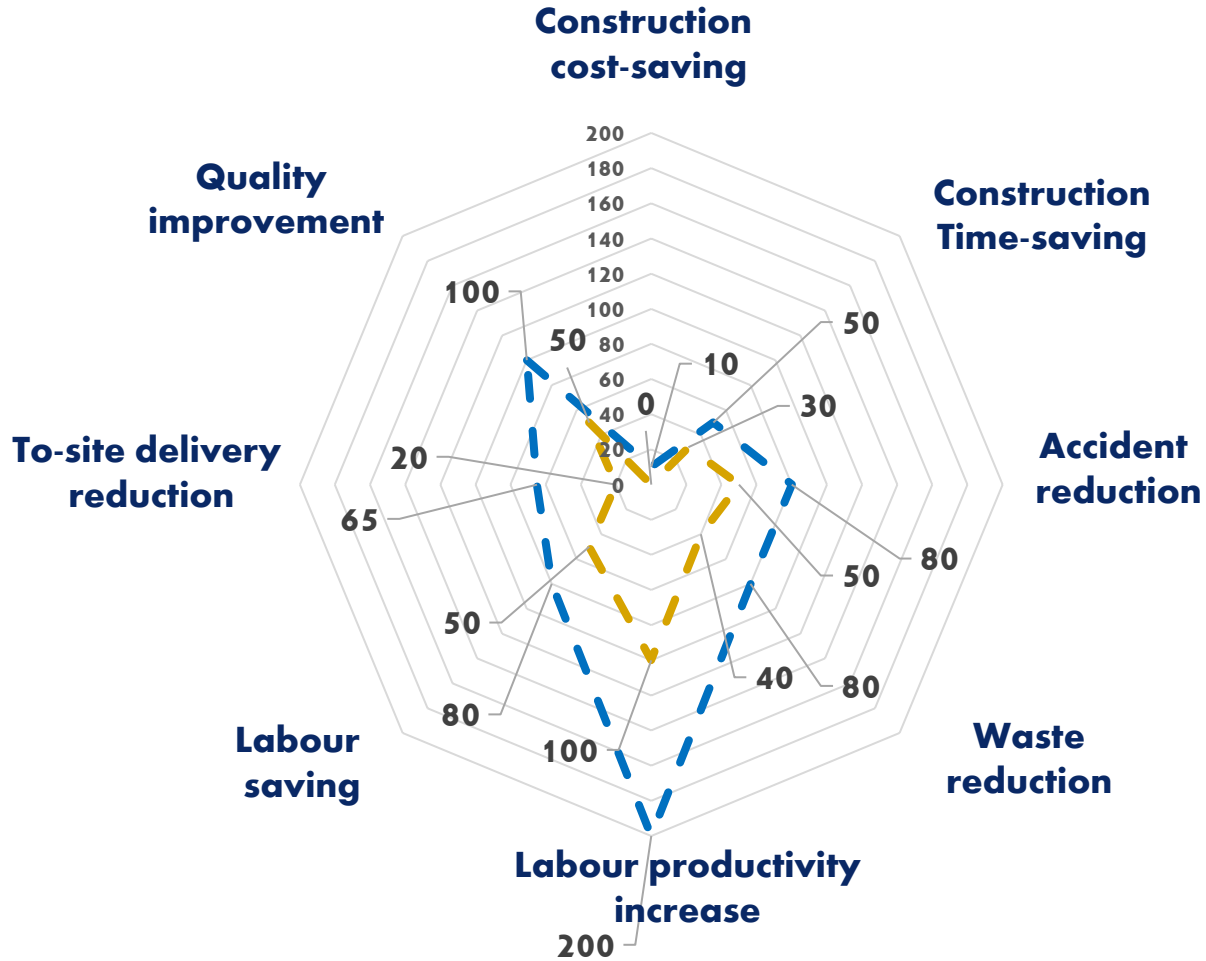

Pan, W. and Zhang, Z.* (2023) Benchmarking the sustainability of concrete and steel modular construction for buildings in urban development. *Sustainable Cities and Society, 90*, 104400.

Funded by:
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Development Bureau

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MiC Benefits
HK vs. Worldwide

However, multi-faceted socio-technical challenges

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Systematic MiC R&D

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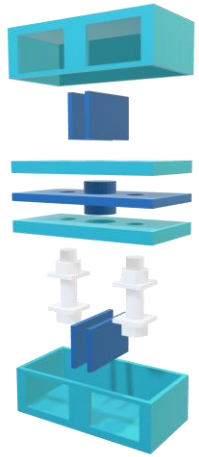
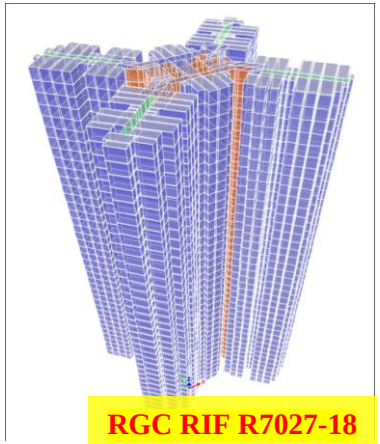
MiConnection





RGC RIF R7027-18

MiCost

DEVB & HKHA-funded Studies

MiCarbon

RGC CRF C7070-19G;
GRF 17210223; 17201022; 17201120

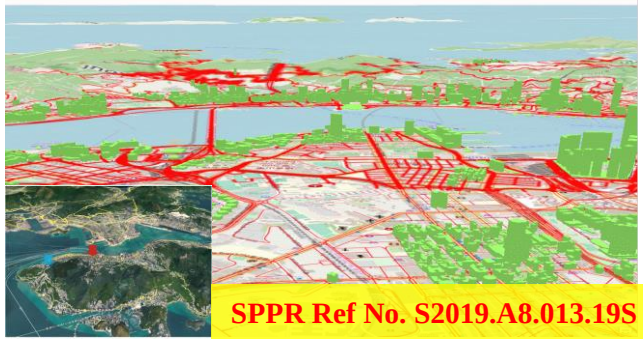
MiCrane

DEVB-funded Study

MiCarry:

STF-PSRI/69/2306/RA

MiChain



SPPR Ref No. S2019.A8.013.19S

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MiConnection: Concrete MiC Structure

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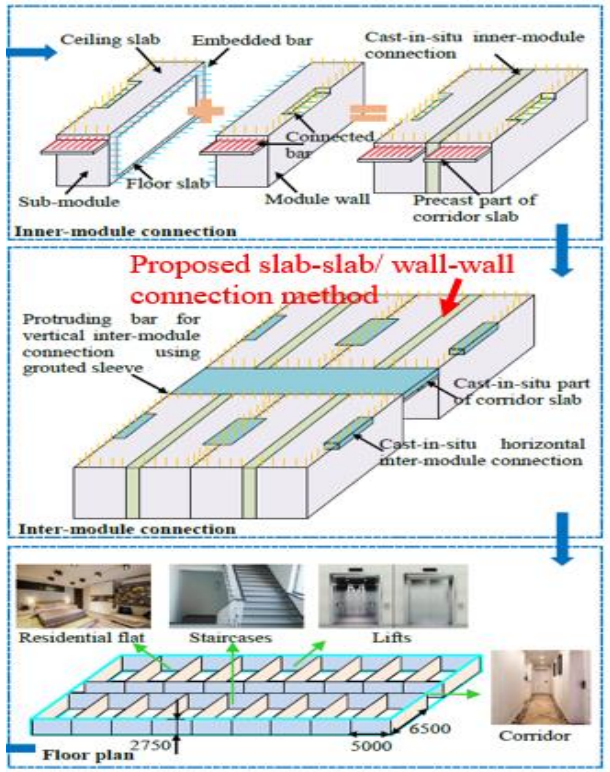
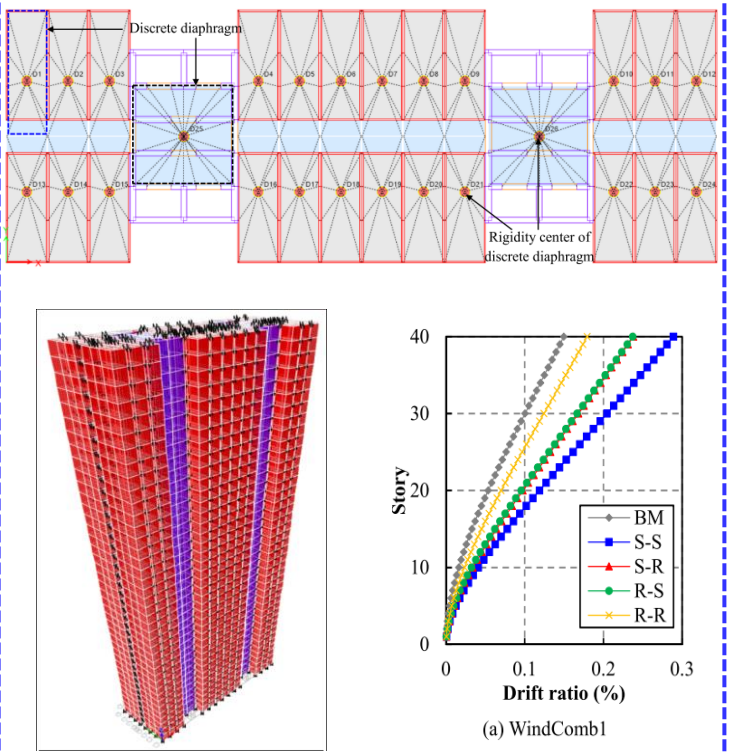
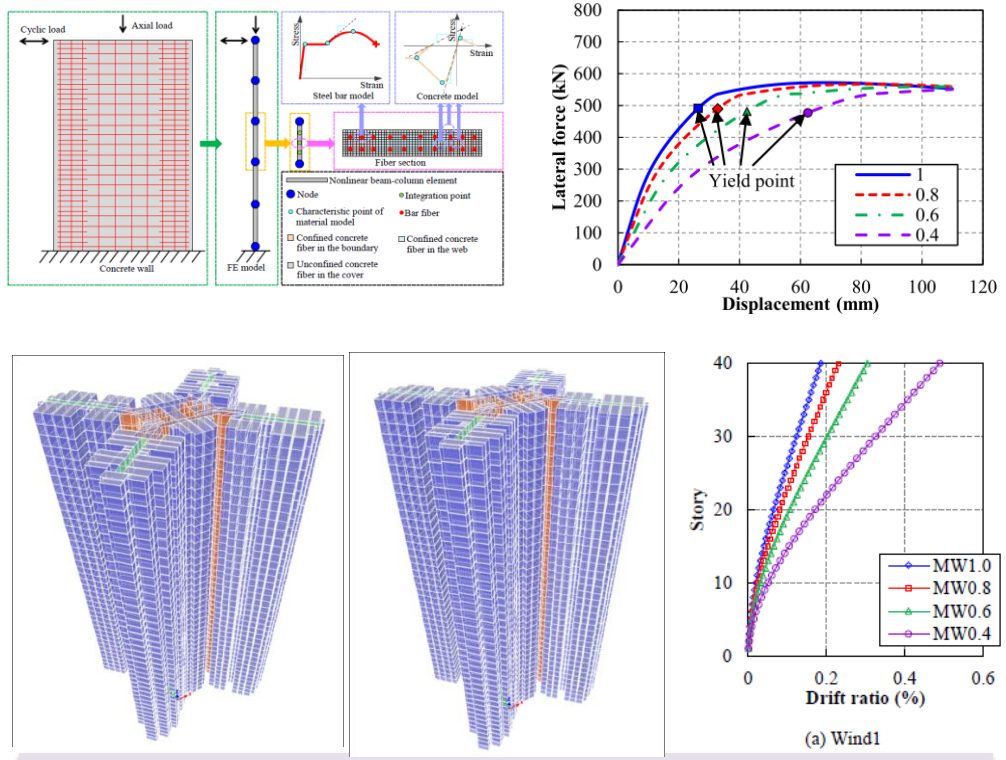


Lateral force resisting system



Discrete diaphragm system considering stiffness reduction of horizontal connections



Comparison of wind-induced displacement (normal stiffness vs. 40% reduction of stiffness, under wind-combination 1)

1.Pan, W., Wang, Z.* and Zhang, Y. (2021) Module equivalent frame method for structural design of concrete high-rise modular buildings. Journal of Building Engineering, 44, 103214. https://doi.org/10.1016/j.jobe.2021.103214
2.Pan, W., Wang, Z.* and Zhang, Y. (2022) Novel discrete diaphragm system of concrete high-rise modular buildings. Journal of Building Engineering, 51, 104342. https://doi.org/10.1016/j.jobe.2022.104342.
3.Wang, Z., Pan, W.* and Zhang, Y. (2021) Parametric study on module wall-core system of concrete modular high-rises considering the influence of vertical inter-module connections. *Engineering Structures, 241*, 112436. https://doi.org/10.1016/j.engstruct.2021.112436

UGC 大學教育資助委員會 University Grants Committee

RGC RIF R7027-18

High West Development
Pilot MiC Project

HKU High West Development

Courtesy of Estates Office, HKU

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MiCarry: MiC Smart Transport

MiCLab
The University of Hong Kong

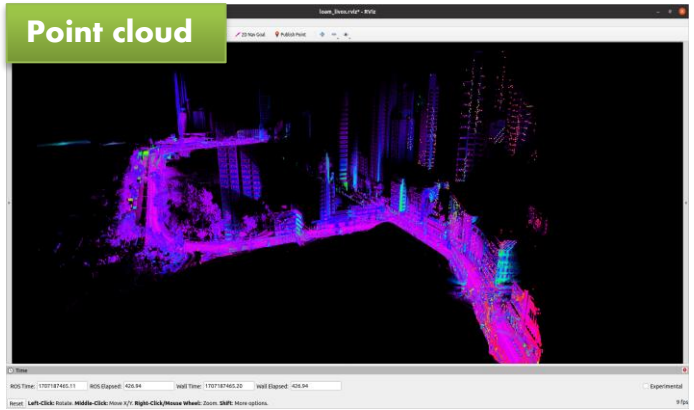
Simulation

Simulation-to-Real

Real Implementation

Trajectory

Point cloud



Sensors – Lidar, Camera, IMU, etc.

STF-PSRI/69/2306/RA

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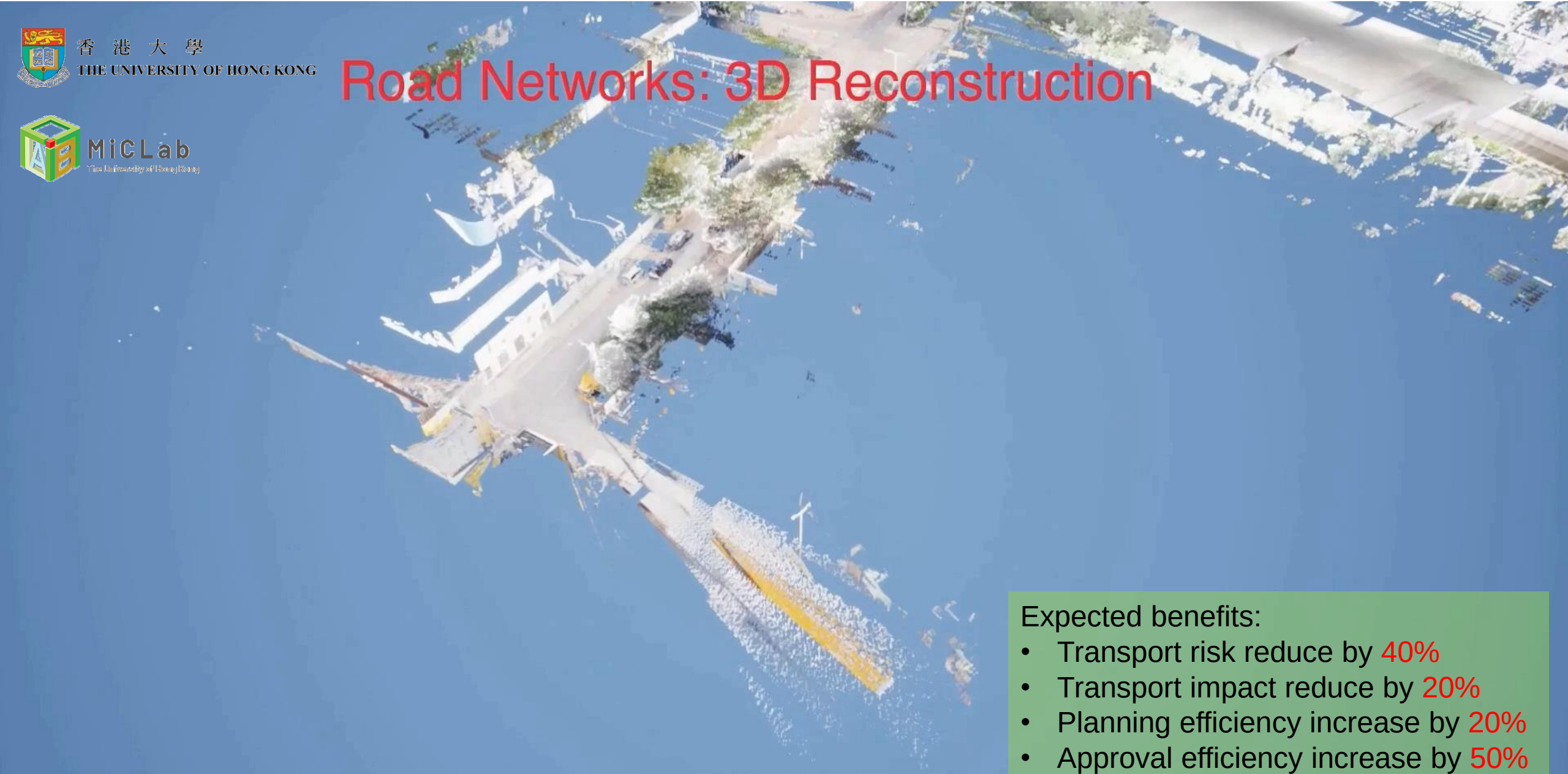
Road Networks: 3D Reconstruction



Expected benefits:

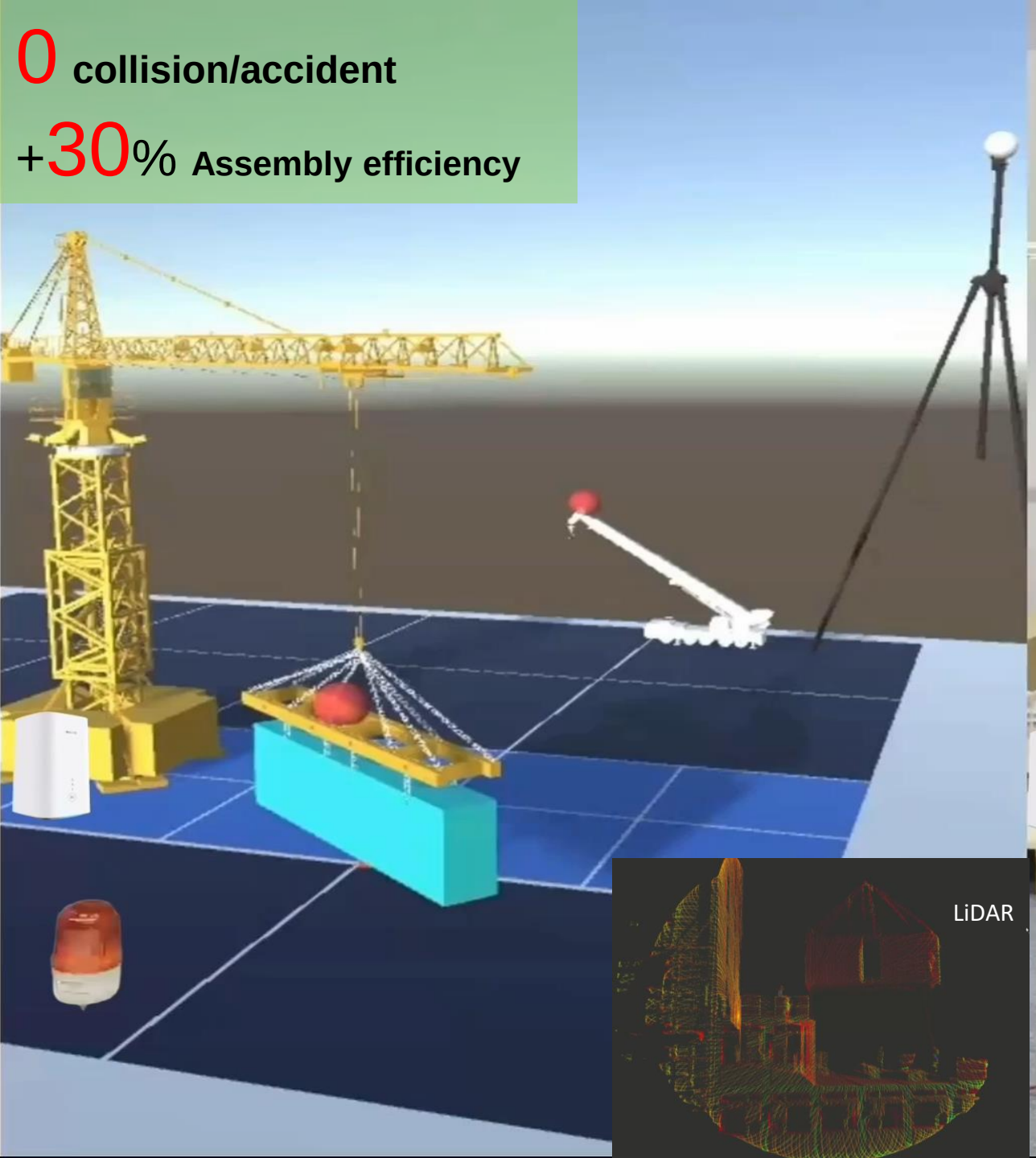
- Transport risk reduce by 40%
- Transport impact reduce by 20%
- Planning efficiency increase by 20%
- Approval efficiency increase by 50%

MiCarry: Smart Transport – Case Demo

STF-PSRI/69/2306/RA

0 collision/accident

+30% Assembly efficiency



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MiCLab
The University of Hong Kong

MiCrane: Smart Installation

Funded by:

發展局
Development Bureau

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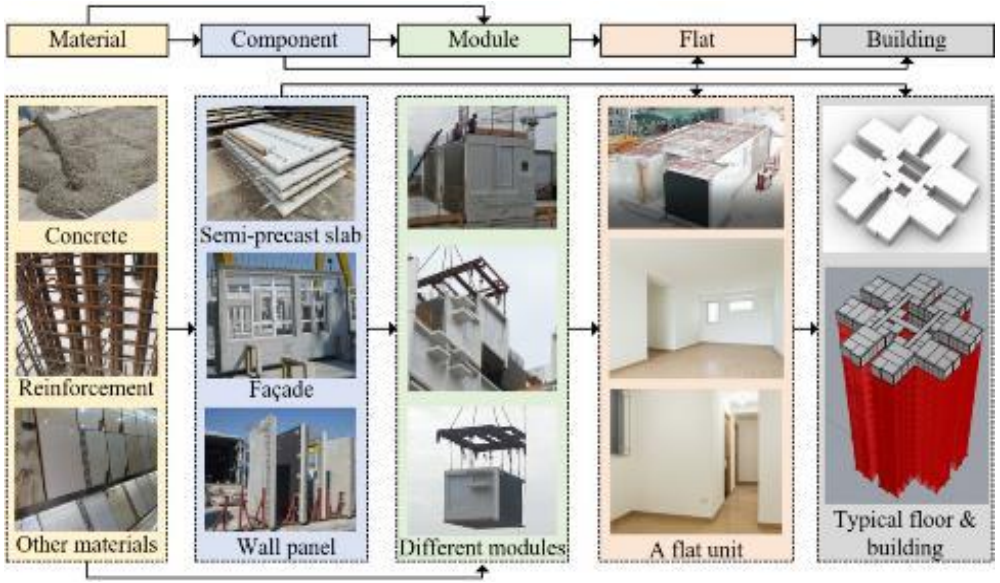
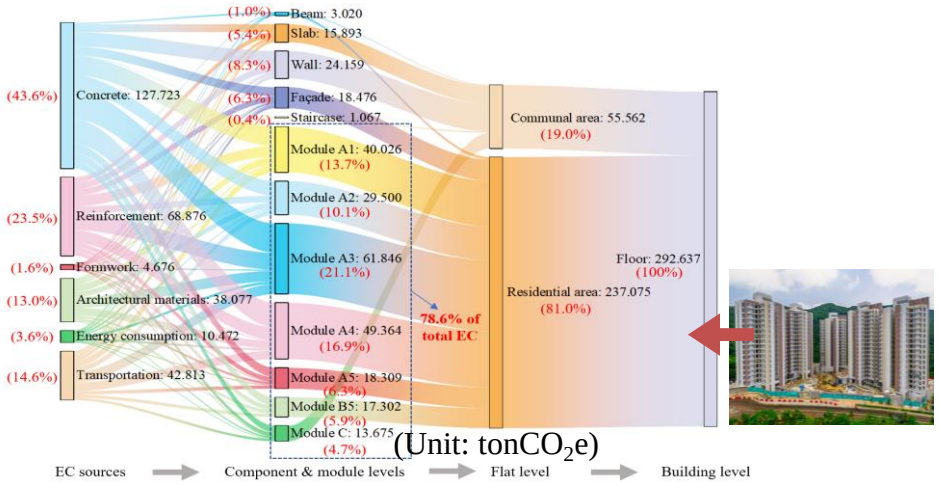
MiCarbon: MiC EC Assessment

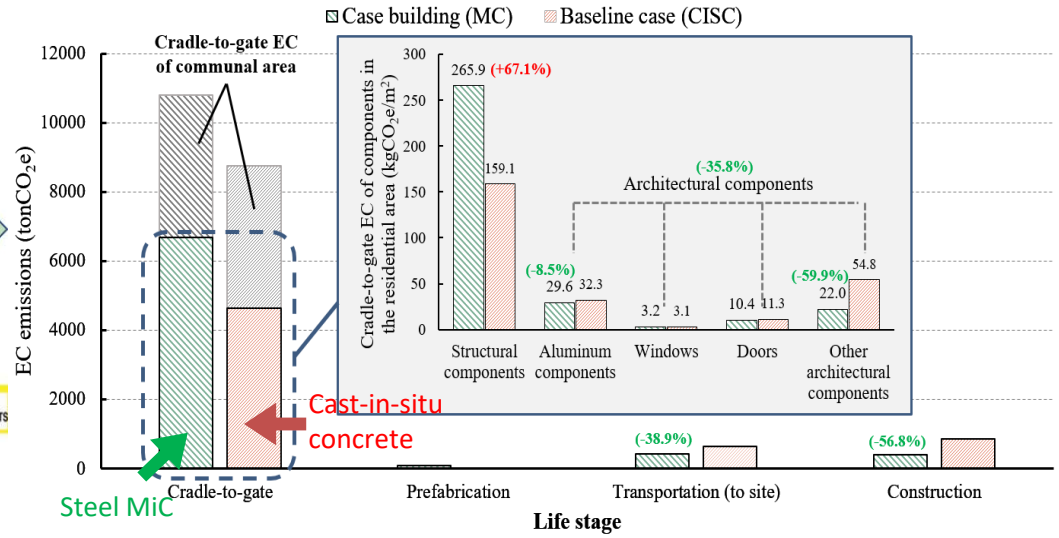
MiCLab
The University of Hong Kong



Multi-level MiC EC assessment framework



Concrete MiC building EC assessment



Steel MiC building EC assessment

GRF 17203219, 17201120, 17201022
CRF C7047-20G

Xu, J., Zhang, Q., Teng, Y. & Pan, W. 2023. Integrating IoT and BIM for tracking and visualising embodied carbon of prefabricated buildings. *Building and Environment*, 242, 110492

Zhang, Y., Chen, S. & Pan, W. 2024. Systematic initial embodied carbon assessment of concrete modular high-rise residential buildings: A case in Hong Kong. *Building and Environment*, 265, 111917.

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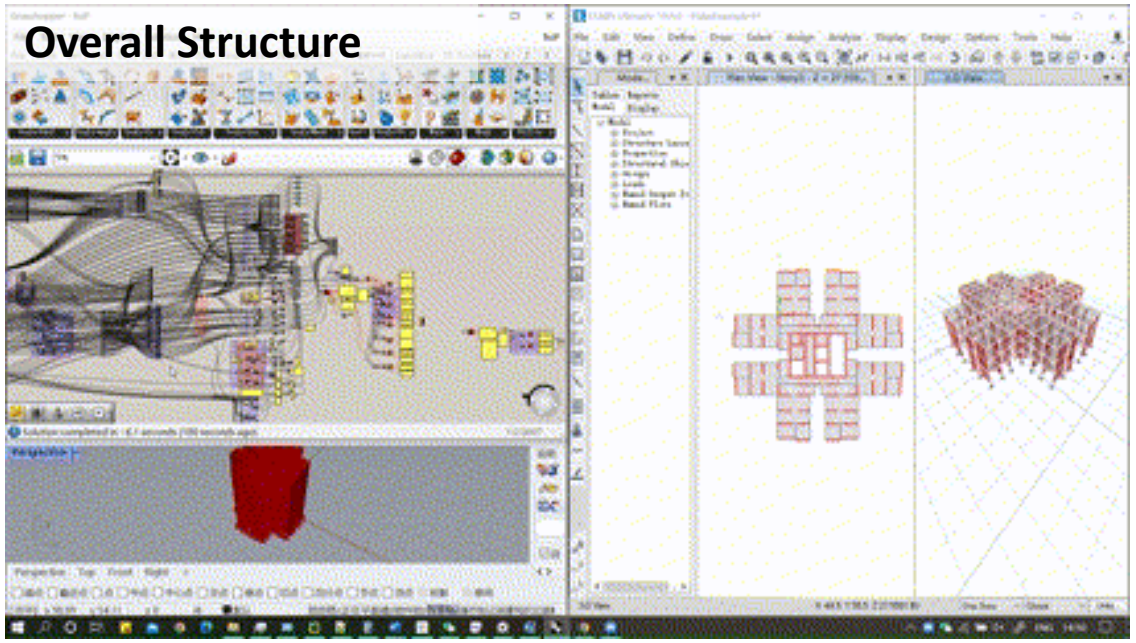
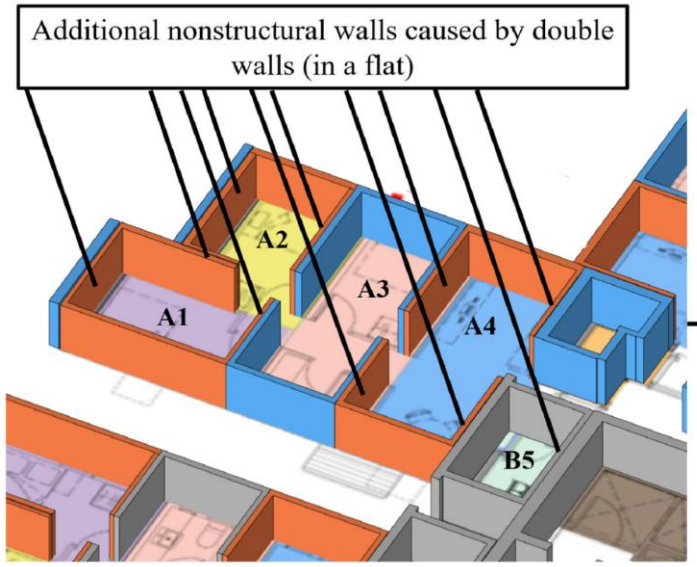
MiCarbon: MiC Low-Carbon Design

MiCLab
The University of Hong Kong

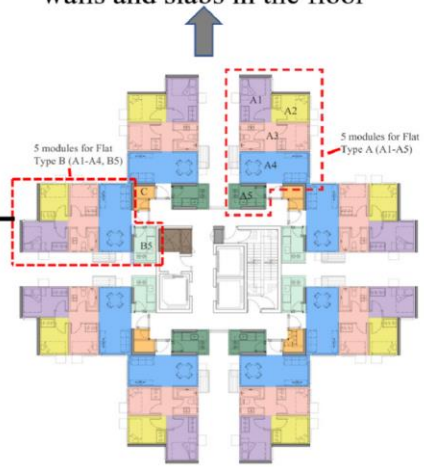


CIB WBC 2022 Best Paper Award

GRF 17201120，17201022, CRF C7047-20G

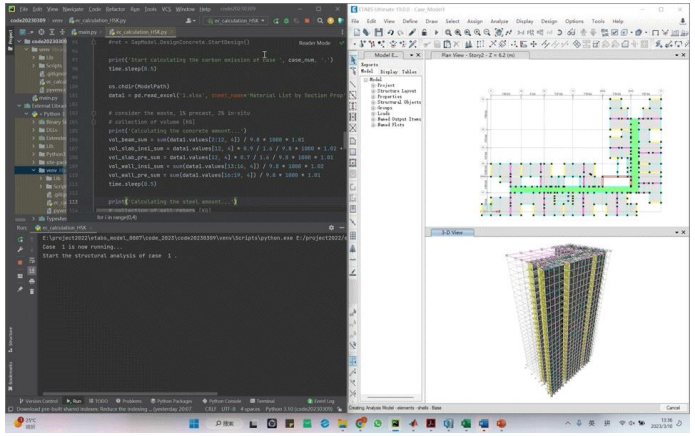


95.1 kgCO$_2$e/m^2 (16.7%) EC reduction by eliminating all nonstructural module walls and slabs in the floor



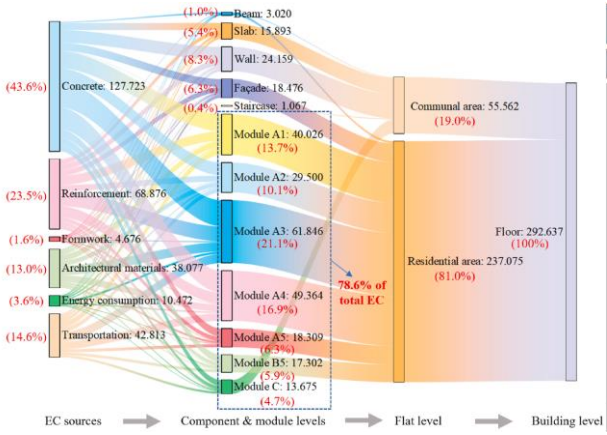
Zhang, Y., Teng Y. and Pan W. (2022). Reducing embodied carbon emissions of concrete modules in high-rise buildings through structural design optimisation. *CIB WBC2022*, Melbourne, Australia
Chen, S., Zhang, Y., Teng, Y., Poon, C., and Pan, W. (2022) Estimating embodied carbon reduction in modular high-rise residential buildings through low carbon concrete. *CRIOCM 2022*, Hong Kong, China
Zhang, Y., Chen, S. & Pan, W. 2024. Systematic initial embodied carbon assessment of concrete modular high-rise residential buildings: A case in Hong Kong. *Building and Environment*, 265, 111917

MiC Total Factor Sustainability (TFS)
TFS Innovations & Optimization

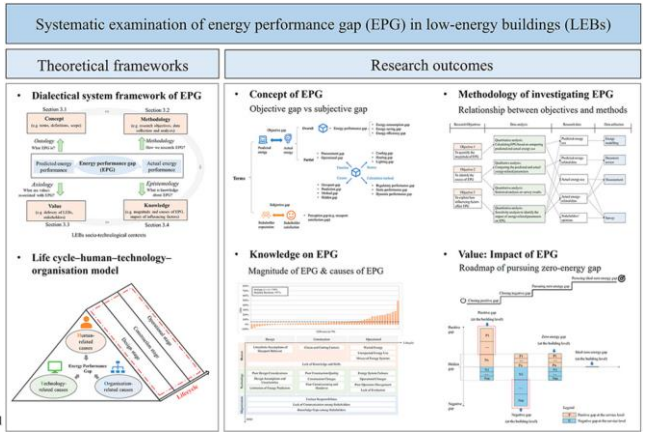


Innovative MiC **structures**

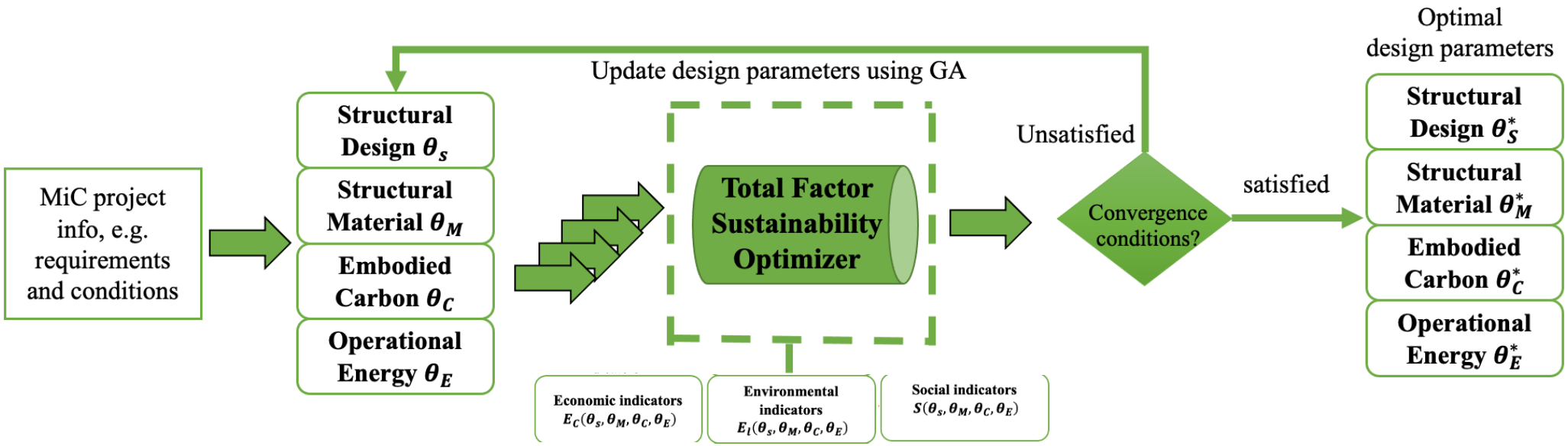
Innovative MiC **materials**



MiC for **EC** reduction



MiC **low-energy** design



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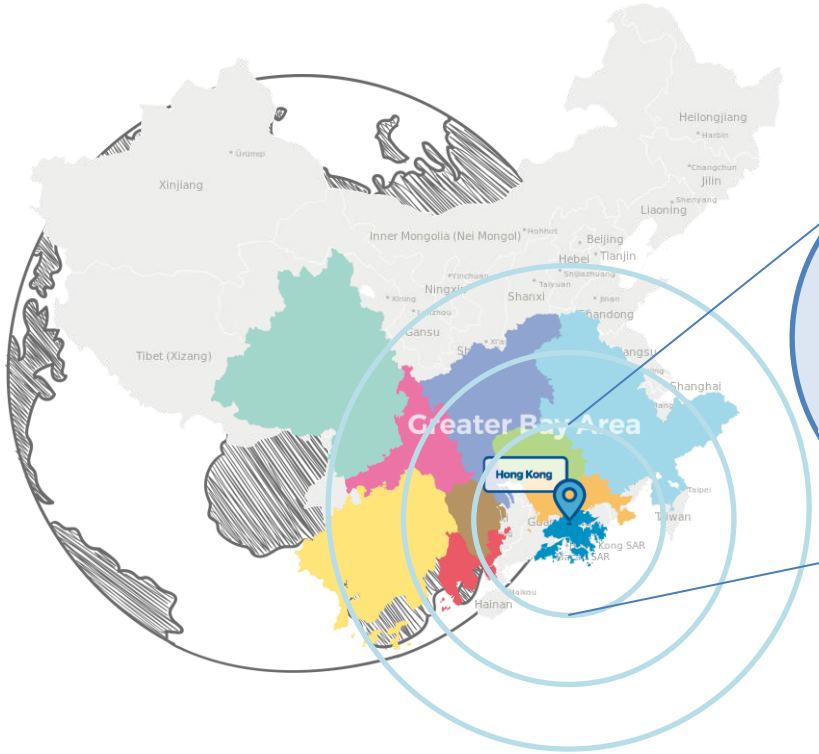
Our Vision on MiC R&D

MiCLab
The University of Hong Kong



A **world-leading research laboratory** to foster continuous improvements and target excellence in MiC

Interdisciplinary & Integrated Research

Civil, Management, CS, ME, EEE, Geo, IMSE

Gov-Industry-Uni Collaboration

Basic & Applied research
Local & Overseas

Smart & Digital for Sustainability

AI, IoT, Digital Twin, VR/AR, BIM, GIS, Scanning

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17-18 SEP 2024

Modular Construction Innovations for Delivering Sustainable Homes

Thank You!

Professor Wei Pan
wpan@hku.hk

Head, Department of Civil Engineering
Executive Director, Centre for Innovation in Construction and Infrastructure Development
Director, MiC Laboratory

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THE UNIVERSITY OF HONG KONG

香港大學建造及基建創新研究中心
CENTRE FOR INNOVATION IN CONSTRUCTION AND INFRASTRUCTURE DEVELOPMENT

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The University of Hong Kong

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RIF(R7027-18), CRF (C7047-20G) and GRFs (17203219, 17201120, 17201022, 17210223) of Hong Kong Research Grants Council, Smart Traffic Fund (STF PSRI/69/2306/RA), Strategic Public Policy Research (SPPR) Funding Scheme (S2019.A8.013), DEVB-funded MiC performance, lifting studies, and HKHA-funded MiC performance study.

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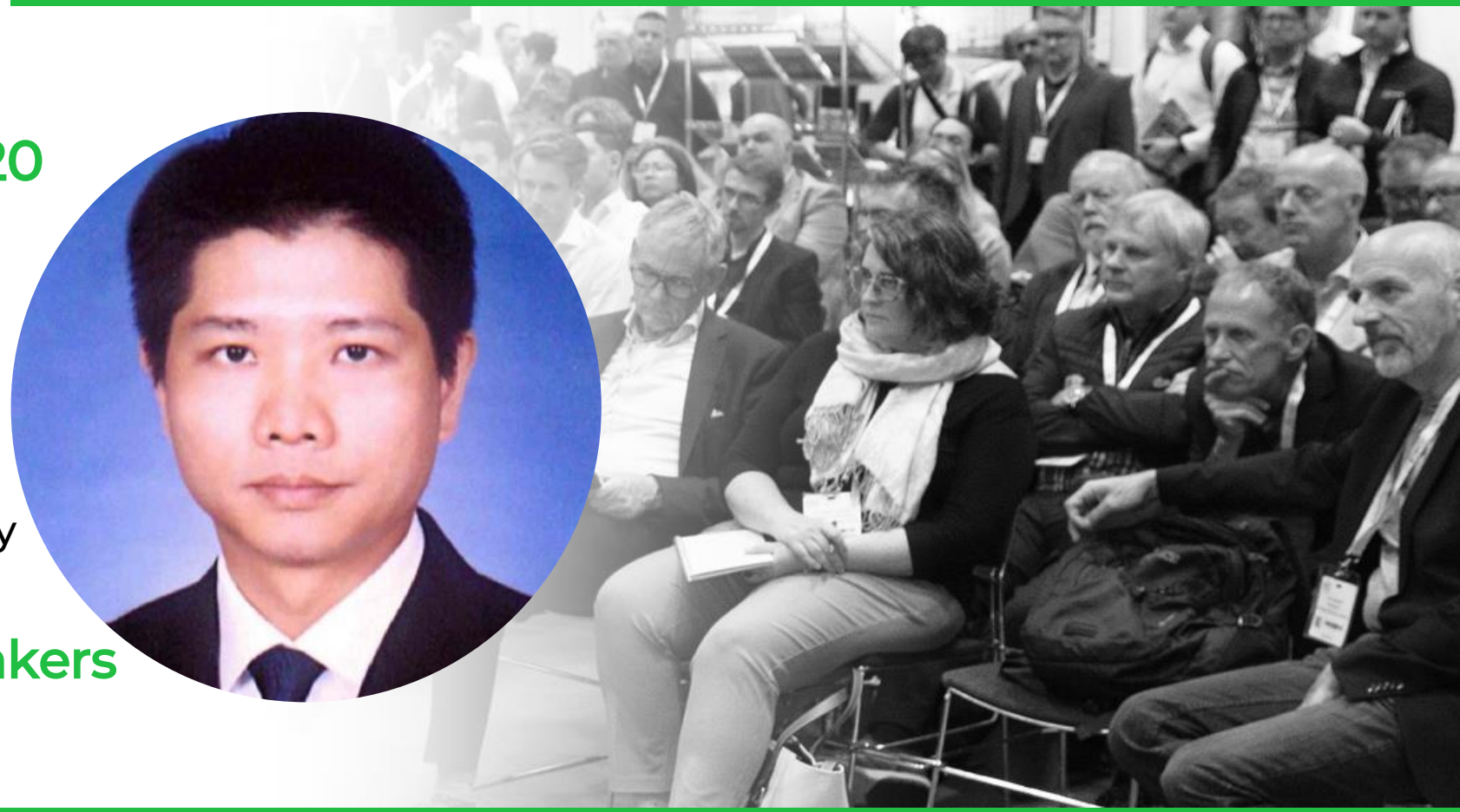
17-18 SEP 2024



17.09.2024 13:50 – 15:20

Dr Sherman Yip

Assistant Director,
Development & Procurement
Hong Kong Housing Authority

International changemakers delivering homes

BUILDING OFFSITE

An Overview of Precast Construction in Hong Kong Housing Authority

Dr Sherman S L YIP

Assistant Director
Development & Procurement
Housing Department
Hong Kong Housing Authority

17.09.2024

Hong Kong Housing Authority

ORGANISATION | Hong Kong Housing Authority

THE CONTEXT | Innovative Technologies in Housing Construction

CHALLENGES

- High Density City
- Heavy Traffic
- Congested Site
- Aging Labour & Shortage

OPPORTUNITIES

- Mass Output
- Highly Standardised
- High Repeatability

INNOTECH

- Prefabrication & Modularization
- Digitalisation & Data Analytics
- Generative Design & AI
- Green & Sustainability
- Robotics & Lidar

GOALS

- Meeting Demand
- High Quality
- Safety First
- Environmentally Friendly
- Socially Responsible

EVOLUTION

From In-situ to Offsite

Conventional in-situ Concrete Construction

Before 1980s

on site rebar fixing and in-situ concreting work

80s – 90s

Planar Precast Concrete Components

Modular Flat Design

2000

2000-2017

Volumetric Precast Concrete Components

Enhanced Precast Concrete Components

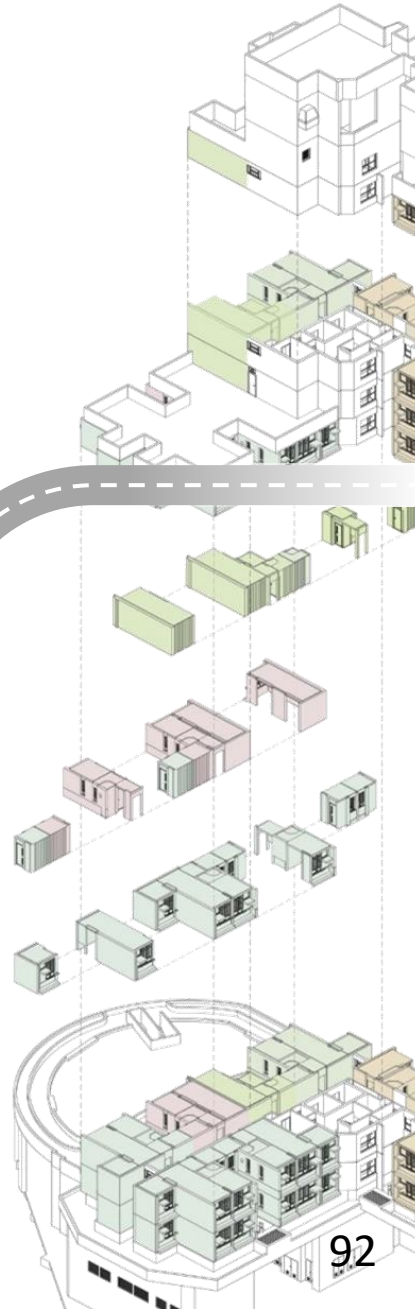
2019

with building services embedded

finishes, fixtures and fittings

2020+

Modular Integrated Construction (MiC)



Anderson Road Quarry Sites R2-6 and R2-7

MiC Blocks - Two 28-storey & One 17-storey

1,410 MiC Flats

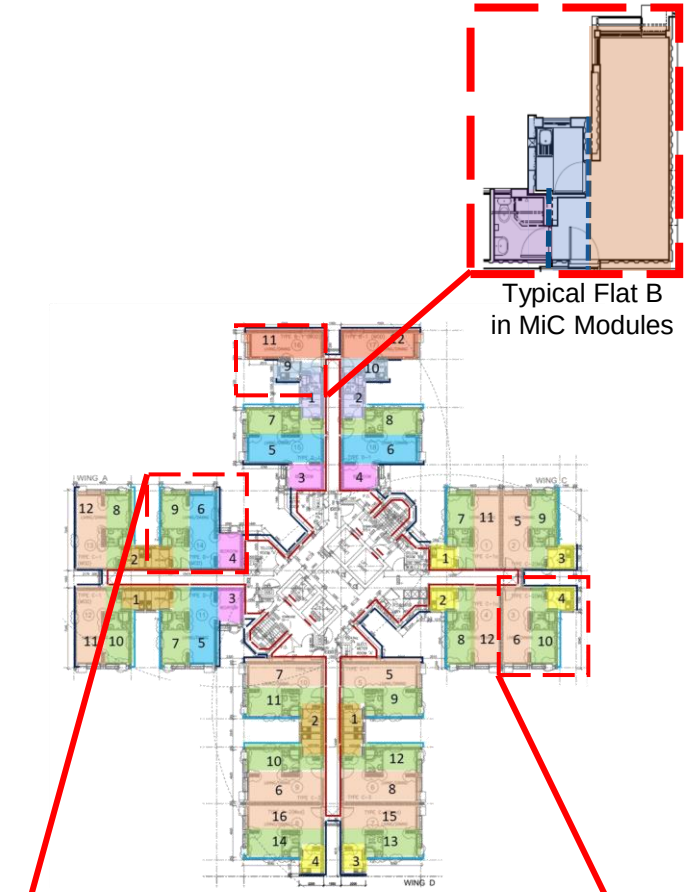
4,065 MiC Modules

6-day Cycle

5 day Cycle

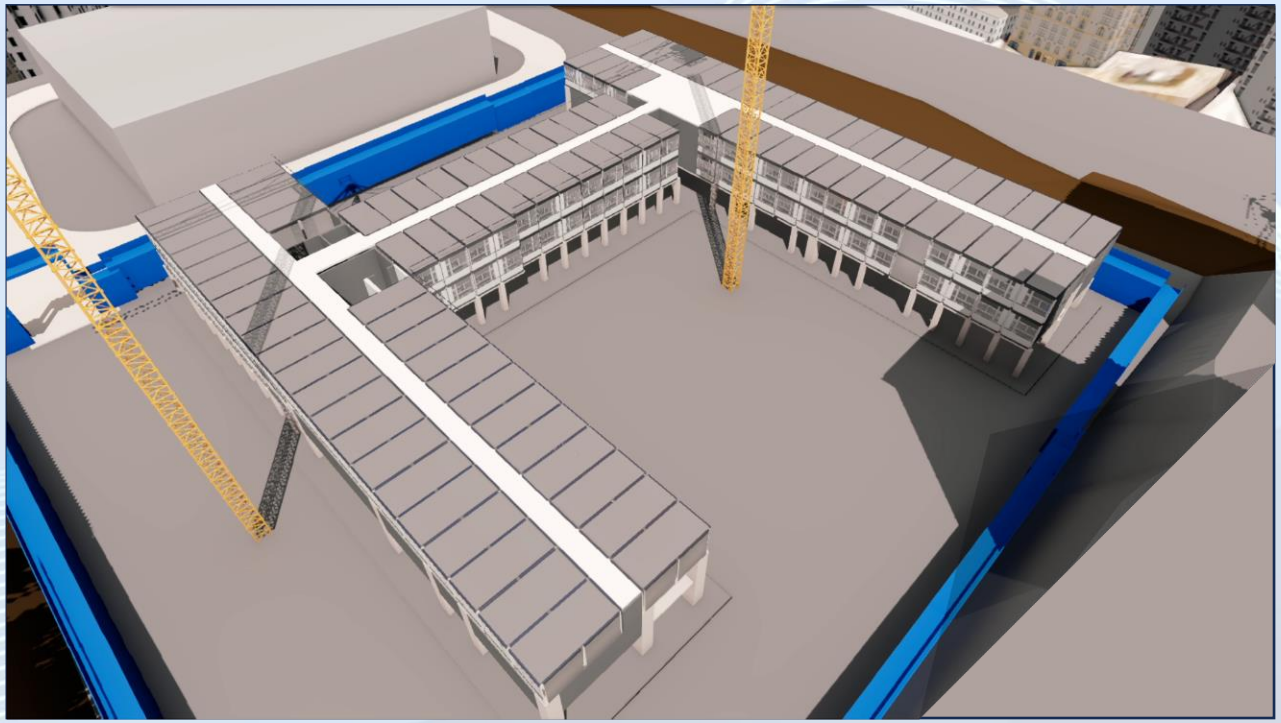
(Typical Floor Construction with 20 Flats in 52 Modules)

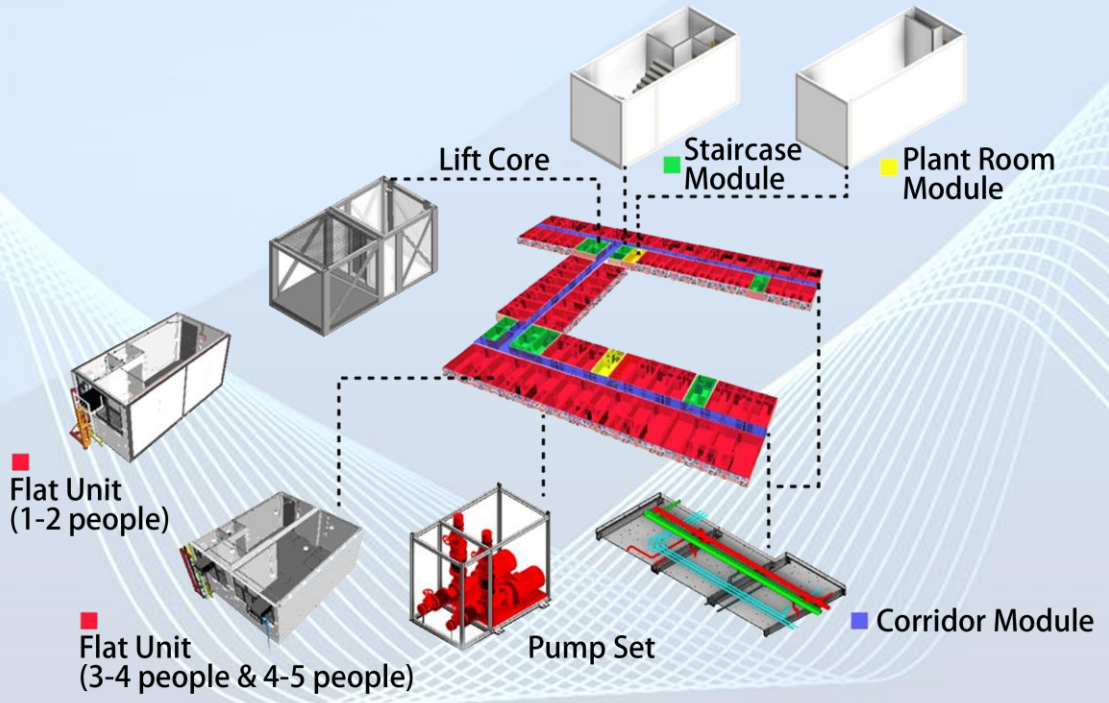
Construction Cycle



STEEL MiC

Low-rise Transitional Housing

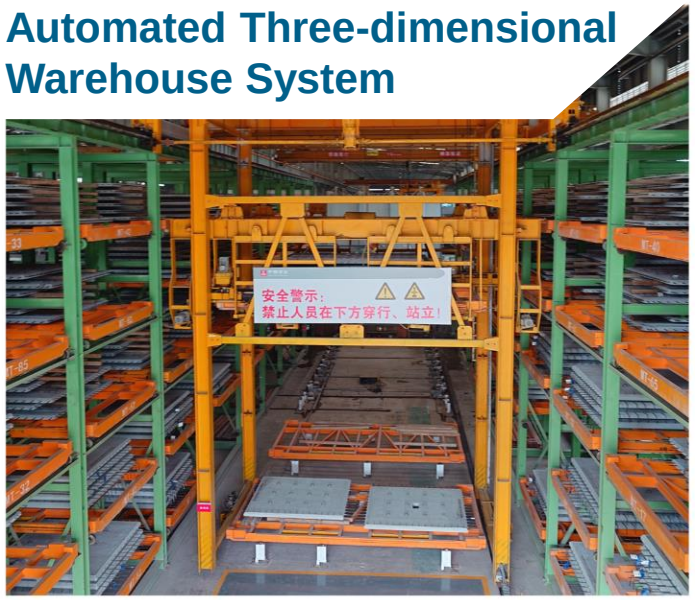




CONNECTION | MiC Factories in Close Proximity at Greater Bay Area of China

Internal Painting Works Done by Robots inside MiC Modules

Automated Three-dimensional Warehouse System



MiC Modules Stockpile

Internal Polishing Works done by Robots inside MiC Module

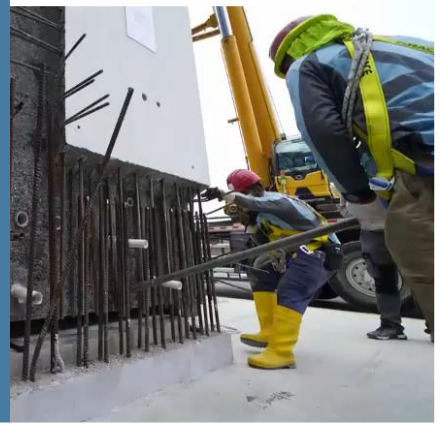
Concrete Surface Clearing done by Robots

RESEARCH | Construction Innovation and Process Improvement

MiC 1.0

5-face modules

Side Fixing

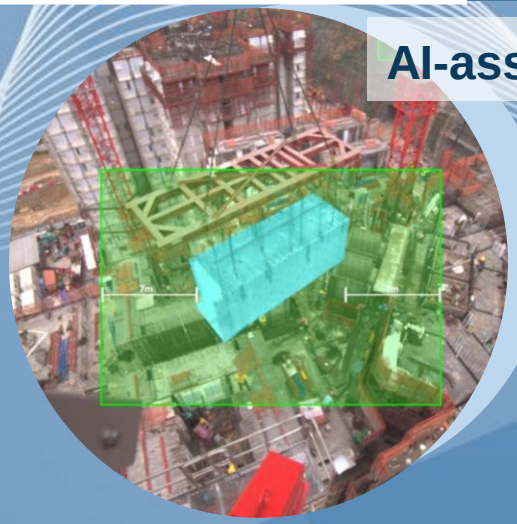


MiC 2.0

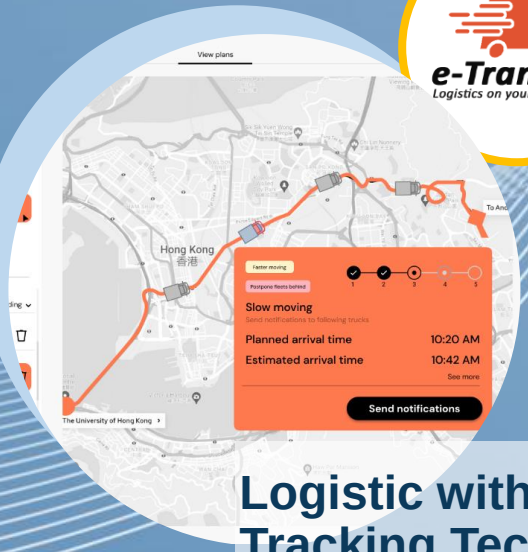
Top Fixing

6-face modules

AI-assisted Lifting

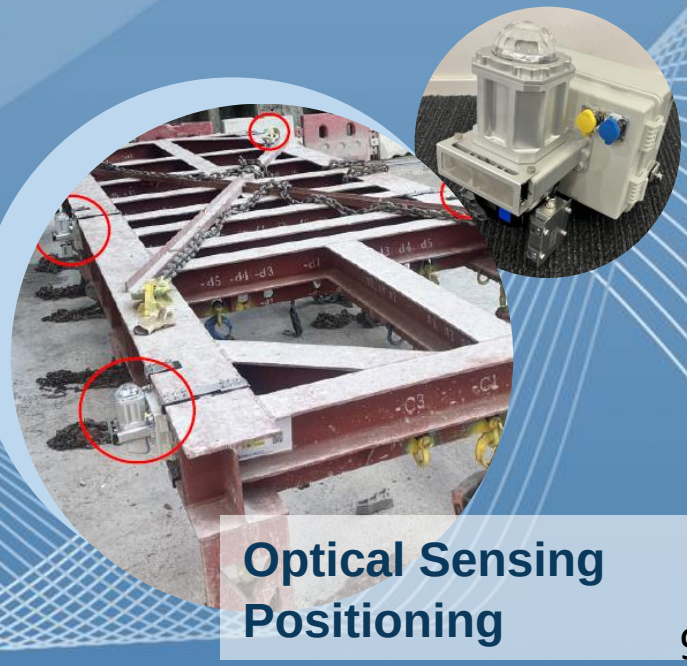


Logistic with Tracking Technology



5G-enabled Remote Control Tower Crane Trial

Optical Sensing Positioning

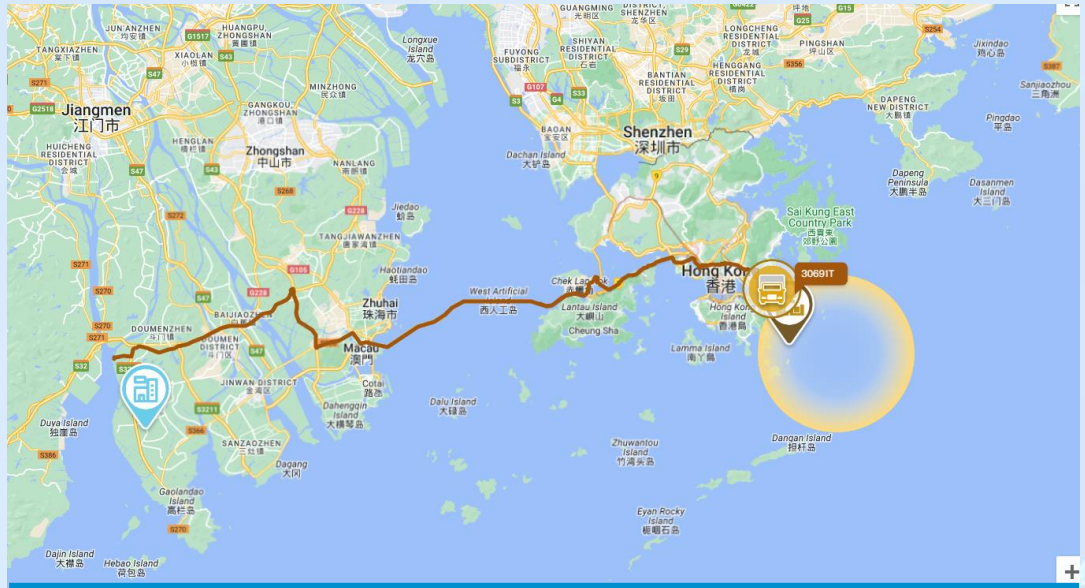


MiC Measurement Index

Systematic Life Cycle Assessment Framework

Environmental, Social and Economic Performance

Environmental	Social	Economic
Embodied Carbon	Neighbourhood Satisfaction	Productivity
Water Pollution	Accident Rate	Speed of Construction
Air Pollution	End-user Satisfaction	Cost
Material Wastage	Job Satisfaction	Quality
Noise Pollution		



Generic Transport and Supply Chain Monitoring

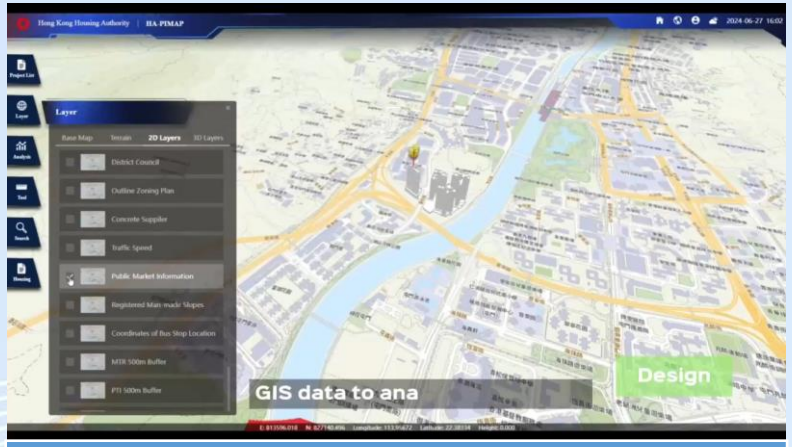
MiC Logistics Study

Generic Transport and Supply Chain Monitoring

Traffic Impact Assessment

Housing Authority Project Information and Analytics Platform (HA-PIMAP)

Centralised Platform – Store, Manage and Integrate Data



Data Analytic for Strategic Planning

Context Analysis in Planning and Design Stage

Progress Monitoring in Construction Stage

Safety and Environmental Monitoring Dashboard

Use of Digital Twin in Handover Stage

WAY FORWARD

Buildability
to unleash potential of offsite construction

Material
searching for suitable materials for the challenge

Logistics
to accommodate different transportation environments

to enhance

Safety & Quality

THANK YOU

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Interactive discussion and Q&A

International changemakers delivering homes

Pascal Chazal
HORS SITE

Bengt Magnussen
TALO

Ewelina Woźniak-Szpakiewicz
DMDmodular

Andrew Pryke
BAM Design

Professor Wei Pan
The University of Hong Kong

Dr Sherman Yip
Hong Kong Housing Authority

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International best practice

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