Press Conference on “Blockchain-Enabled e-Inspection 2.0 for MiC: From a COVID-19 Expediency to a Post-Pandemic Common Practice”

呂偉生教授 (Prof. Wilson Lu)
葉嘉安教授 (Prof. Anthony G.O. Yeh)
譚景良處長 (Mr. K. L. Tam)
薛帆博士 (Dr. Xue Fan)

This research (project number: ITP/029/20LP) is funded by:

創新與科技委員會 (Innovation and Technology Commission)
Outline

• Background – Inspection in Modular integrated Construction (MiC)

• The pilot project – HKU Wong Chuk Hang (WCH) student hostel project

• Digitalization of the MiC project

• Introduction of e-inStar

• Prospects and challenges
Part I:
Inspection in Modular integrated Construction (MiC)
Quality Assurance in MiC Logistic and Supply Chain

• There are many quality scandals in cast in-situ construction. For offsite or even offshore construction, quality assurance is even more concerned by clients.
Quality Assurance in MiC Logistic and Supply Chain
Quality Assurance in MiC Logistic and Supply Chain

Because of COVID-19, no one from HK can be dispatched to Mainland for inspection.

Quality inspections required at Mainland factories

Infeasible to dispatch now due to 14 + 14 days quarantines

(Photo source: Authors, SCMP)
Quality Assurance in MiC Logistic and Supply Chain
Different Generations of E-inspection Systems
Part II:
The pilot project
Project Information

- A 3-storey non-residential podium with common space, canteen, support facilities and car-parking space
- Two 17-floor towers of student residences and staff accommodation
- 1,224 hostel places
- Site Area: 4306 m²
- NOFA: 14,277 m²
- CFA: 28,176 m²
Project Information

Student Hostels (MiC)
Two 17 storeys towers
1,224 student places.
(952 Modules)

Podium (RC Structure)
Three storeys of podium space

“BIM square”: BIM and blockchain
Part III:

Digitalization of the MiC project
Digitalization of MiC

Mobile Platform

- Production
- Inspection Records
- Photo Video Record
- Workflow
- Reports / Certifications
- Logistics
- GPS
- Humidity/temperature monitoring
- Positioning Checking
- Installation Timing
- Installation
- Installation
- Timing
- BIM square
- BIM and blockchain
Mobile Platforms for MiC

Off-Site Production
- Digitalized workflow procedures
- Detailed record of inspection records carried out by AP/RSE/RC streams
- Test reports uploads
- Production progress status

Cross Boarder Logistics
- Real time tracking of modules during transportation
- Pin point exact location of module
- Estimated arrival time

On-Site Installation
- Real time update of installation progress
- Positioning checking for installed modules
- Recording of installation time
Digitalization of MiC Off-Site Fabrication

- Compliance with BD’s Statutory Requirements
- Credibility of workmanship & inspection records
- Off-Site Factory
- Digitalised Management Control
- Mobile Platform

“BIM square”: BIM and blockchain
MiC Off-Site Production: E-inspection 2.0

Sign-In

- Reports
  - Upload Test Reports / Certification
- Inspection
  - Workflow Procedure
  - Parties involved
    - Worker
    - Main Contractor
    - AP/RSE
    - Client’s Representative
  - Video/Photo Record
  - Detailed Report
- Statistics
  - Production Status
  - Logistics Status
  - On-Site Installation Status

"BIM square": BIM and blockchain
Part IV:

Introduction of e-inStar
Transform 40+ workstage procedures into a digital platform
E-inspection 2.0: Module ID

- Each Module is given a unique ID using a naming convention system
- A QR code is generated from the ID
- The QR code is created as soon as the 3D module is formed and applied to the structure.

Create a Naming Convention System Standard for all future MiC Module projects

The Naming Convention System created for the modules allows us to identify the following information:

- Block
- Floor
- Module Sequence
- High / Middle / Low Zone
- Module Type

A-10F-09-M-M2-MU
E-inspection 2.0: Inspection Record

- Scan Module ID
- Workstage 01 (Structure)
- Workstage 02 Doors & Windows
- Workstage 03 Concreting
- Workstage 04 Walls
- Workstage 05 Wet Trades
- Workstage 06 Painting
- Workstage 07 MEP
- Workstage 08 Sanitary Fitting
- Workstage 09 Facade
- Workstage 10 Cleaning & Protection
- Workstage 11 T&C Final Check

Blockchain system

Inspection history

Inspections procedures

“BIM square”: BIM and blockchain
E-inspection 2.0: Inspection Record

Scan Module ID

Workstage 01 (Structure)

Inspection by Tradesmen: Pass
Inspection by Main Contractor: Pass
Inspection by AP/RSE: Pass
Inspection by Client's Representative: Failed

Failed inspections:
- Dooms & Windows
- Inspections procedures

Rectify defects and re-inspect

Blockchain system
E-inspection 2.0: Inspection Record

Two Factor Authentication

Scan Module ID

Inspection status of module

User ID

Fingerprint verification
E-inspection 2.0: Inspection Record

Comment box

Help button

Photo upload function

"BIM square": BIM and blockchain
E-inspection 2.0: Dashboard

Statistics for decision-making
E-inspection 2.0: Inspection APP - eInStar
E-inspection 2.0: The Blockchain System

Transaction (Inspection record)
Part V:

Prospects and challenges
What’s Next: Logistics

The i-Core sensors and smart address systems are one of the development tools with multi-functions to monitor both the logistics and installation of MiC modules.

i-Core sensors and smart address plates are installed in the MiC modules.
What’s Next: Logistics

“BIM square”: BIM and blockchain
What’s Next: Logistics

"BIM square": BIM and blockchain
Thank You