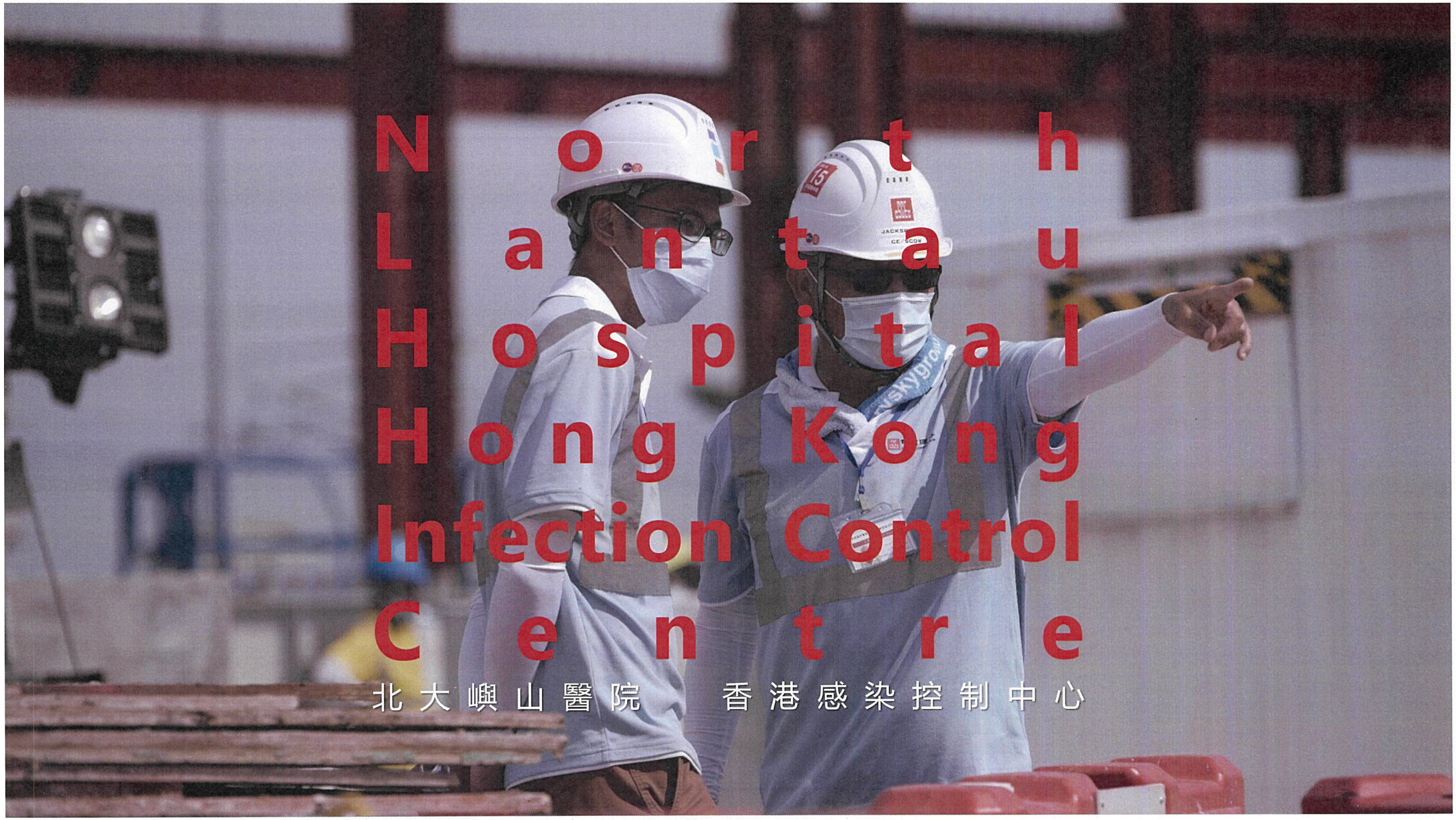
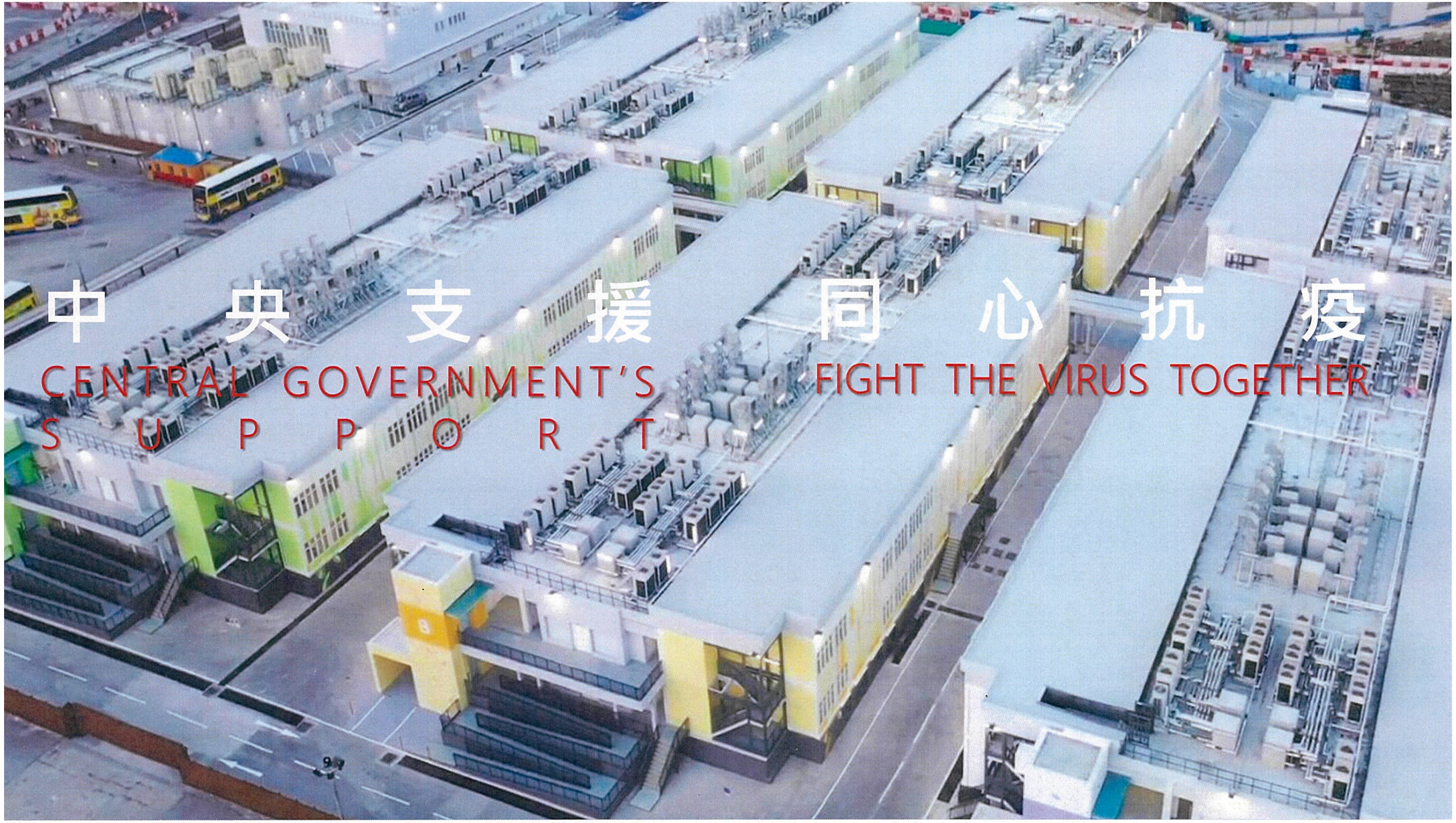

Seeing is believing
北 大 嶼 山 醫 院
香 港 感 染 控 制 中 心



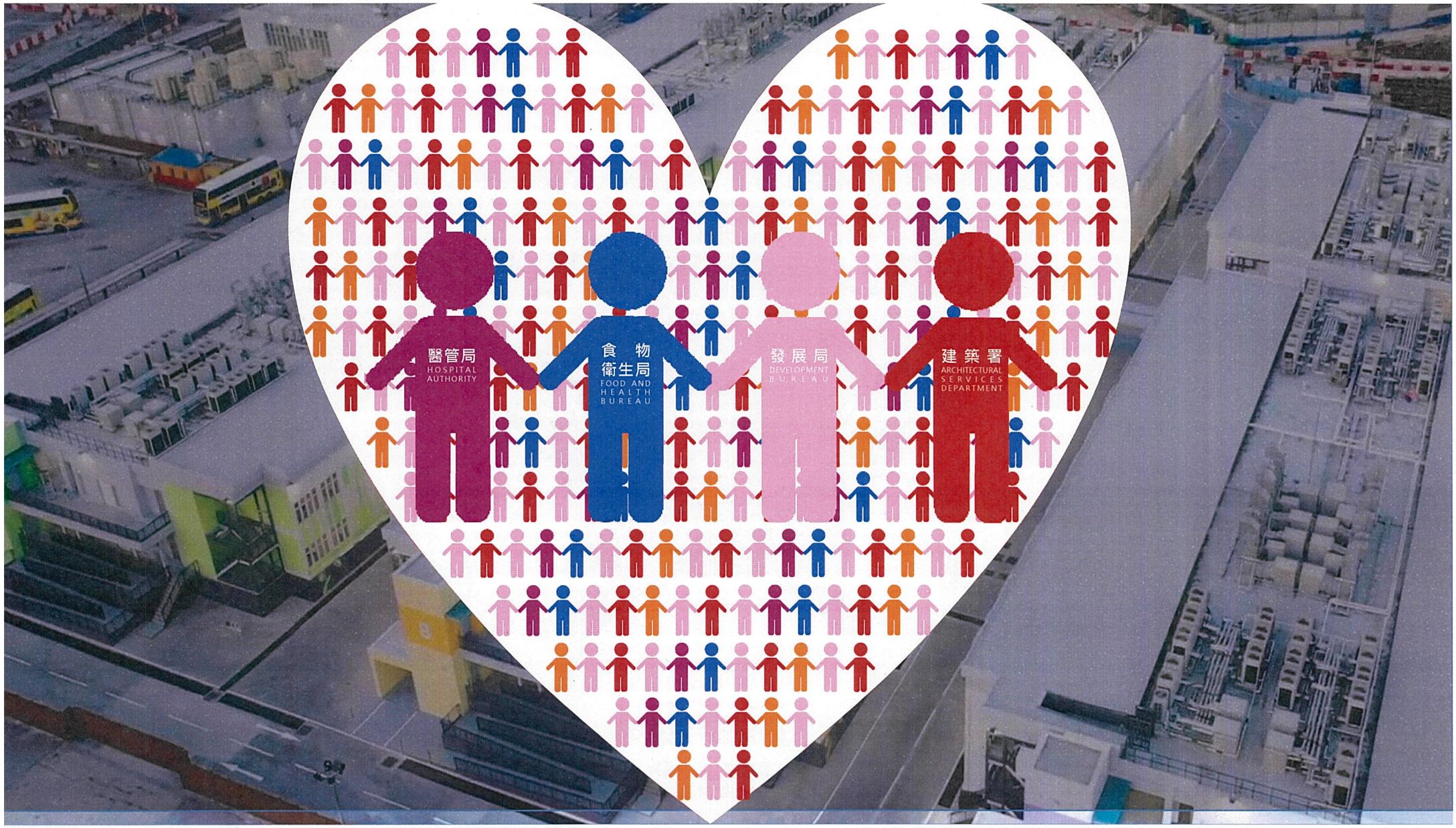
North Lantau Hospital Hong Kong Infection Control Centre

北大嶼山醫院　香港感染控制中心


DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN
2019
2020
2021
3rd WAVE
• HIGHEST RECORD OF CONFIRMED CASES
• 145 NO. OF LOCAL TRANSMITTED CASES IN A DAY
• 149 NO. OF CONFIRMED CASES IN A DAY (30/7/2020)


中央支援 同心抗疫
CENTRAL GOVERNMENT'S SUPPORT
FIGHT THE VIRUS TOGETHER


聯合工作小組
Joint Working Group
深圳市政府
Shenzhen Municipal Government
香港特區政府
Hong Kong SAR Government
工程承辦單位
港方註冊承建商
（建築丙組）
及設計團隊
Joint Contractor & Design Team


醫管局
HOSPITAL AUTHORITY
食物衛生局
FOOD AND HEALTH BUREAU
發展局
DEVELOPMENT BUREAU
建築署
ARCHITECTURAL SERVICES DEPARTMENT

Project Management and supervision arrangement

Bureau Public Works of Shenzhen Municipality

Development Bureau

Food & Health Bureau / Hospital Authority

Architectural Services Department

Arch vetting panel	BS&EM Vetting panel	T&C working group	Statutory Vetting panel	QC Audit Team	Handover working group

ArchSD's Role and Responsibilities:

- Provide technical advices to ensure timely completion of the works within 4 months
- Delegated authority under BA on statutory compliance checking
- Ensure meeting of HA's operational requirements
- Facilitate between contractor and other depts./statutory authorities

ArchSD Project Team - Tier 3

Independent Architectural / Structural / BS Checkers — ***Tier 2***

Architectural (AP) / Structural (RSE) / BS Designers and TCPs

China State (Approved List of Contractor(Group C)) — ***Tier 1***


Passionate teamwork
Early contractor's involvement
Intense coordination
Innovation & smart construction
Proactive facilitation

香港特別行政區政府
建築署

中國建築
CHINA STATE CONSTRUCTION

中建國際醫療
CHINA STATE CONSTRUCTION INT'L MEDICAL

Project Brief

1st Entirely MiC Negative Pressure Ward Infectious Disease Hospital in the World

D&B Contractor: China State Construction

Designer: China State Construction Int'l Medical

Project Type: Design & Build Project

HKICC	
CFA	~ 44,000m²
Site Area	~ 29,000m²
Project Scope	➢ Site formation & modification of utilities ➢ 6 ward blocks, 1 medical block, 1 energy centre, 1 VIE tank, 1 DG Store and supporting facilities
No. of Beds	136 no Negative Pressure Wards & 816 no patient beds
Standards	Building Regulations, relevant regulations, CoPs & HTM Standards currently in use in Hong Kong
Designed Service Life	50 Years
Construction Period	Less than 4 month
Supervision Department	ASD
Land	Former Carpark of AWE

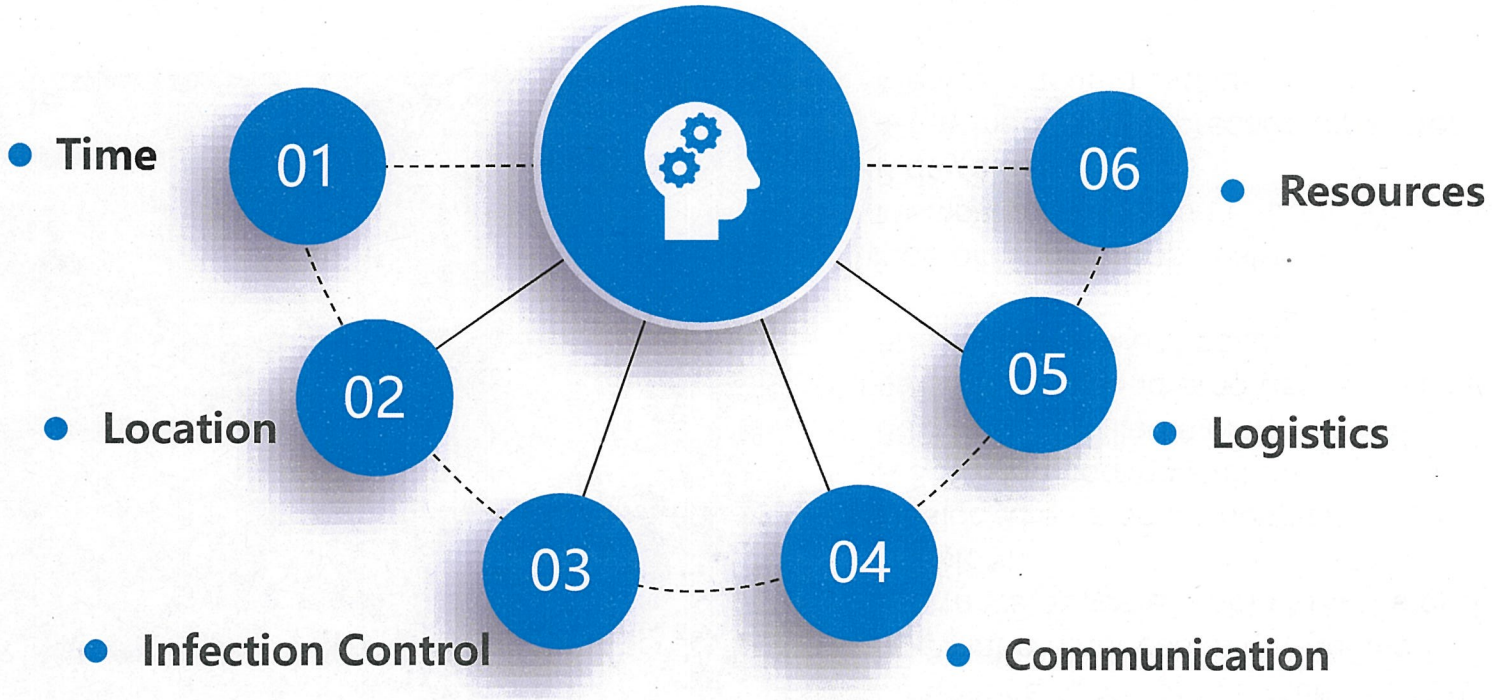
Project Features

- Designed as permanent building, comply HK Wind Code 2019, able to withstand signal No. 10 typhoon
- Comply with Building Ordinance, Fire Safety (Buildings) Ordinance, CoP for Minimum FS Installations and relevant ordinances and regulations
- Storm water system able to withstand a 50-year rainstorm
- Designed as a smart hospital
- A 3500-ton cooling system
- 8000KVA installed electrical load
- 4000KVA installed emergency genset, with 8 hours of emergency power backup

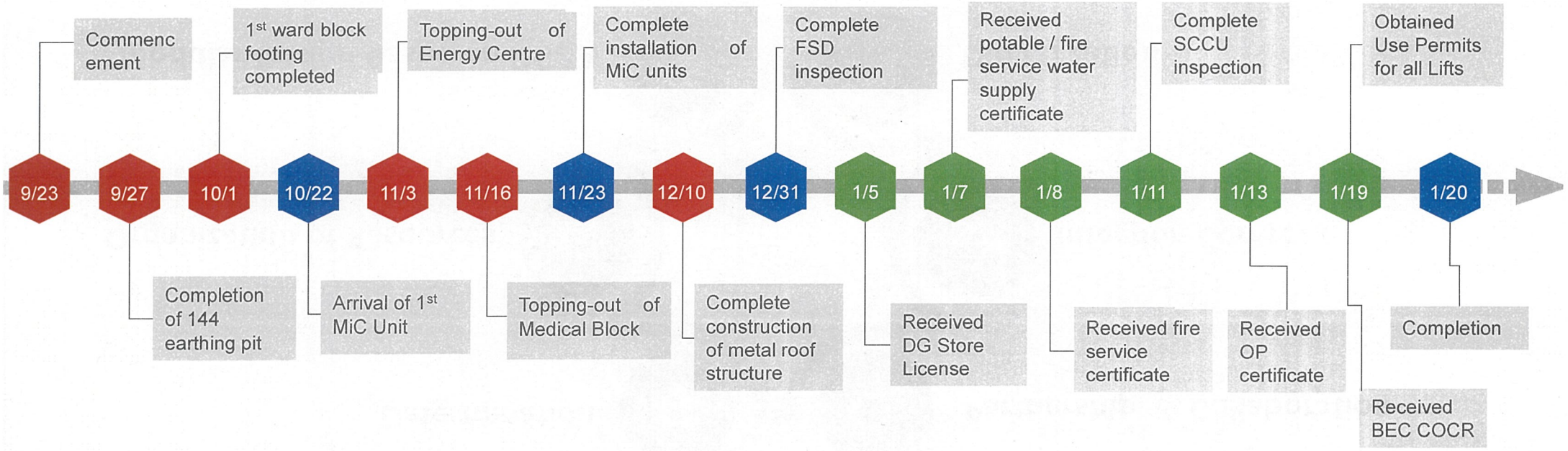
3 types of Medical gas systems:

- Medical oxygen gas (11,000L VIE tank, sufficient for 5-8 day's usage)
- 4-bar medical compressed air system
- Medical vacuum system

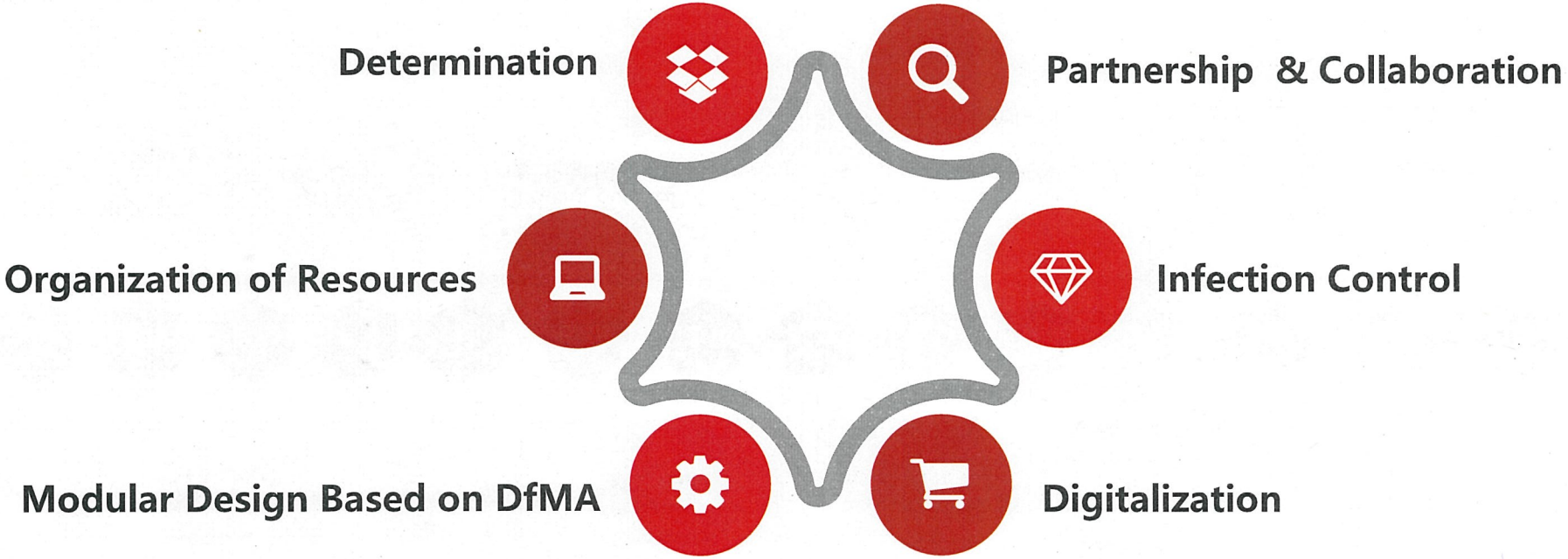
Project Difficulties



Project Milestones

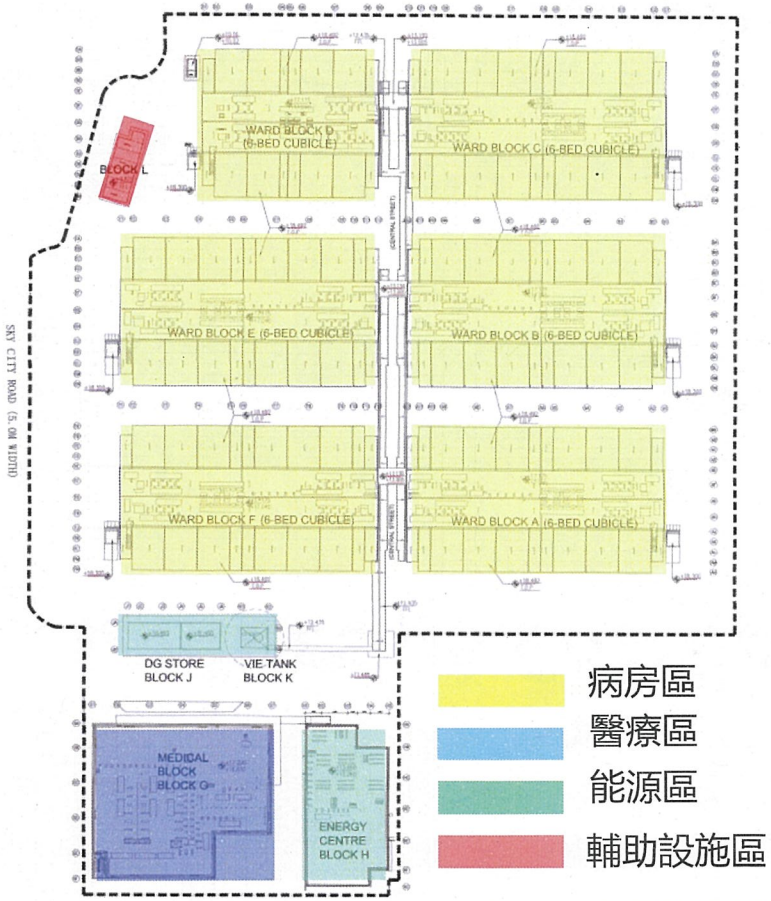


Key to Success



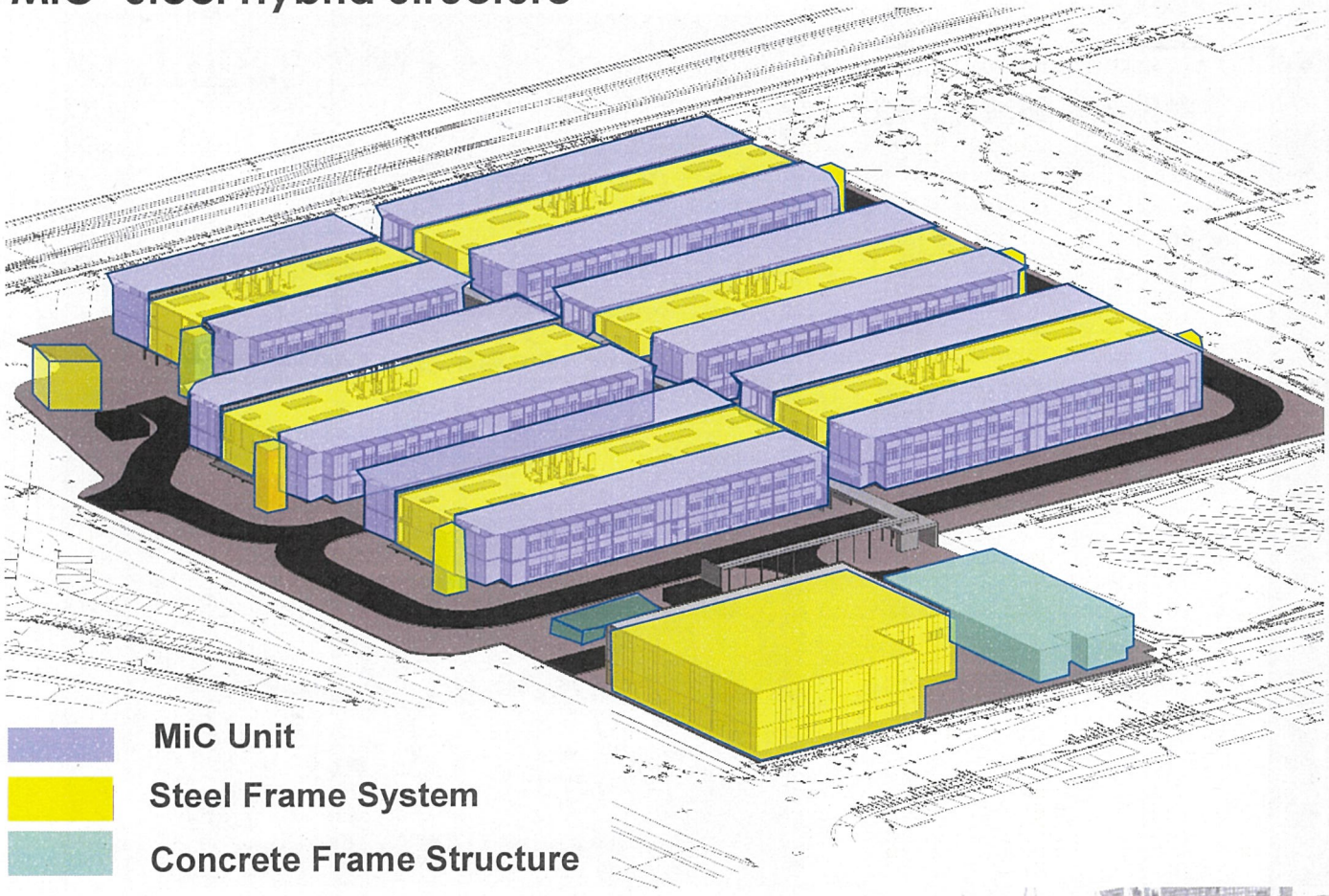
Design Concept

Modular Design



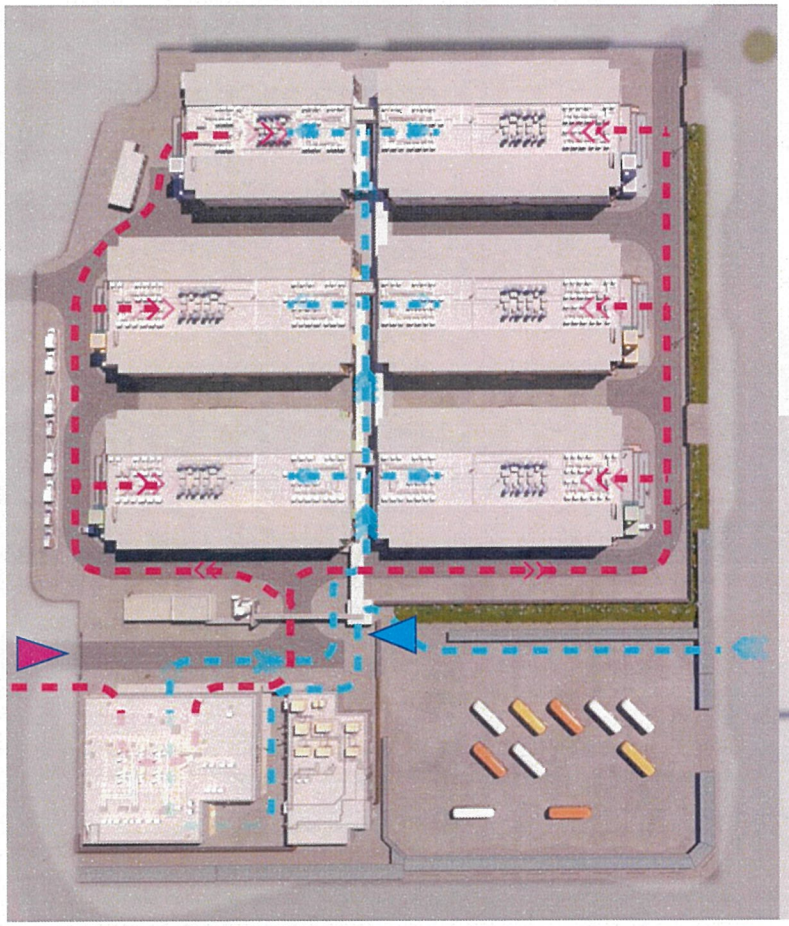
病房區
醫療區
能源區
輔助設施區

MiC- Steel Hybrid Structure



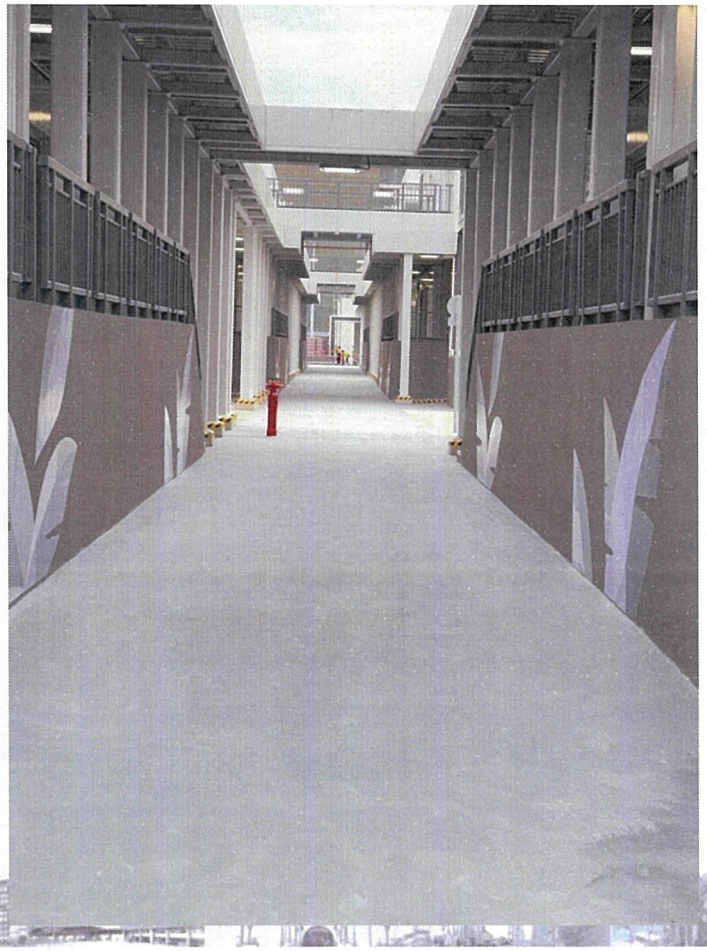
- Total 136 no. Negative Pressure Wards;
- 524 MiC units in total:
  - 46 Facilities units
  - 70 Staircase units
  - 408 Ward units
- 6 Ward blocks, 2 floors each, 14,000 ㎡ of MiC units, around 32% of GFA

Medical Planning



醫護至病房大樓路線
STAFF TO WARD BLOCK

病患至病房大樓路線
PATIENT TO WARD BLOCK



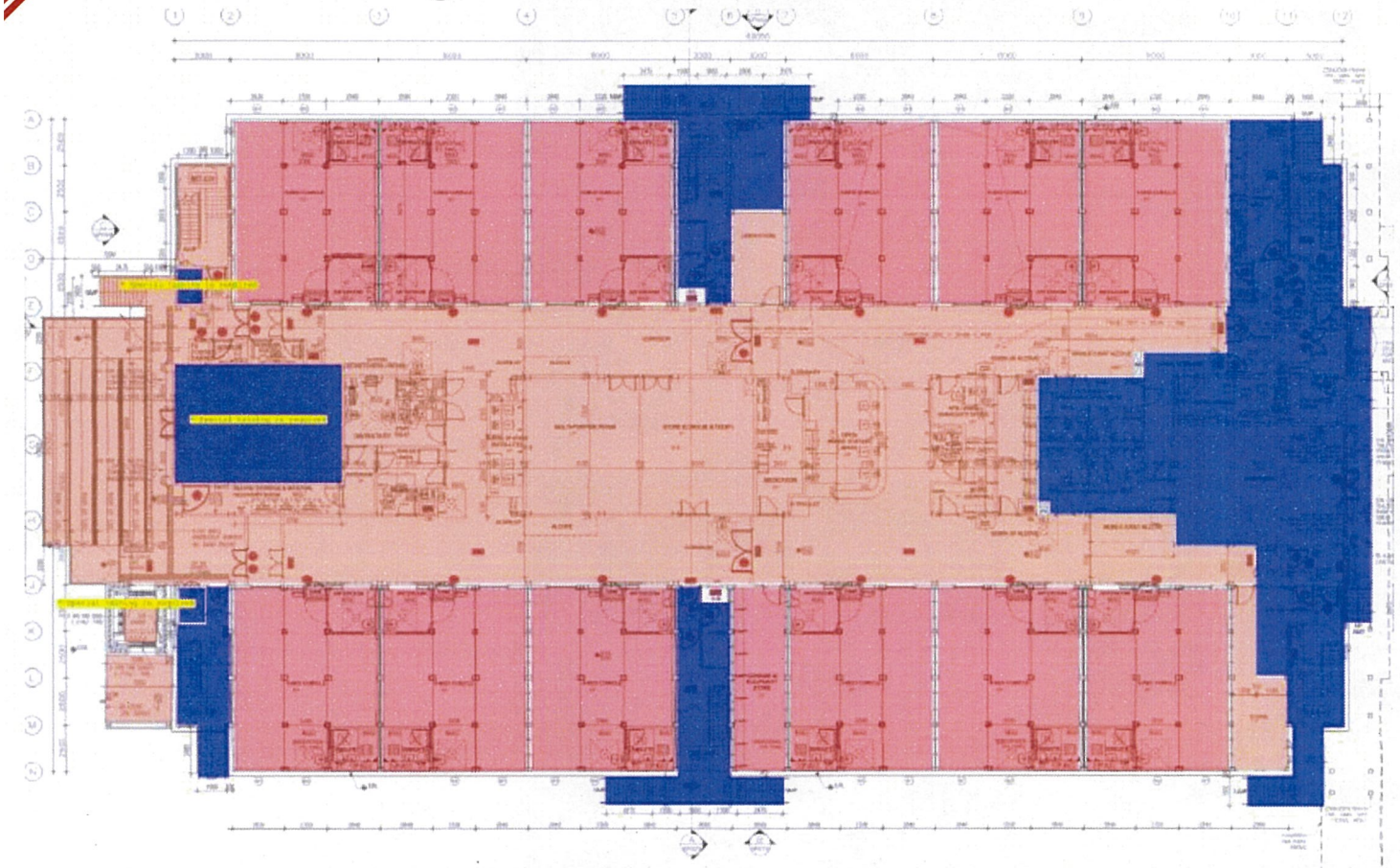
Medical Planning

Ramp connecting LG/F to G/F of Ward

Ambulance loading bay and stretcher lift to all floors

Vertical lifting platform to all floors

Medical Planning – Ward Block

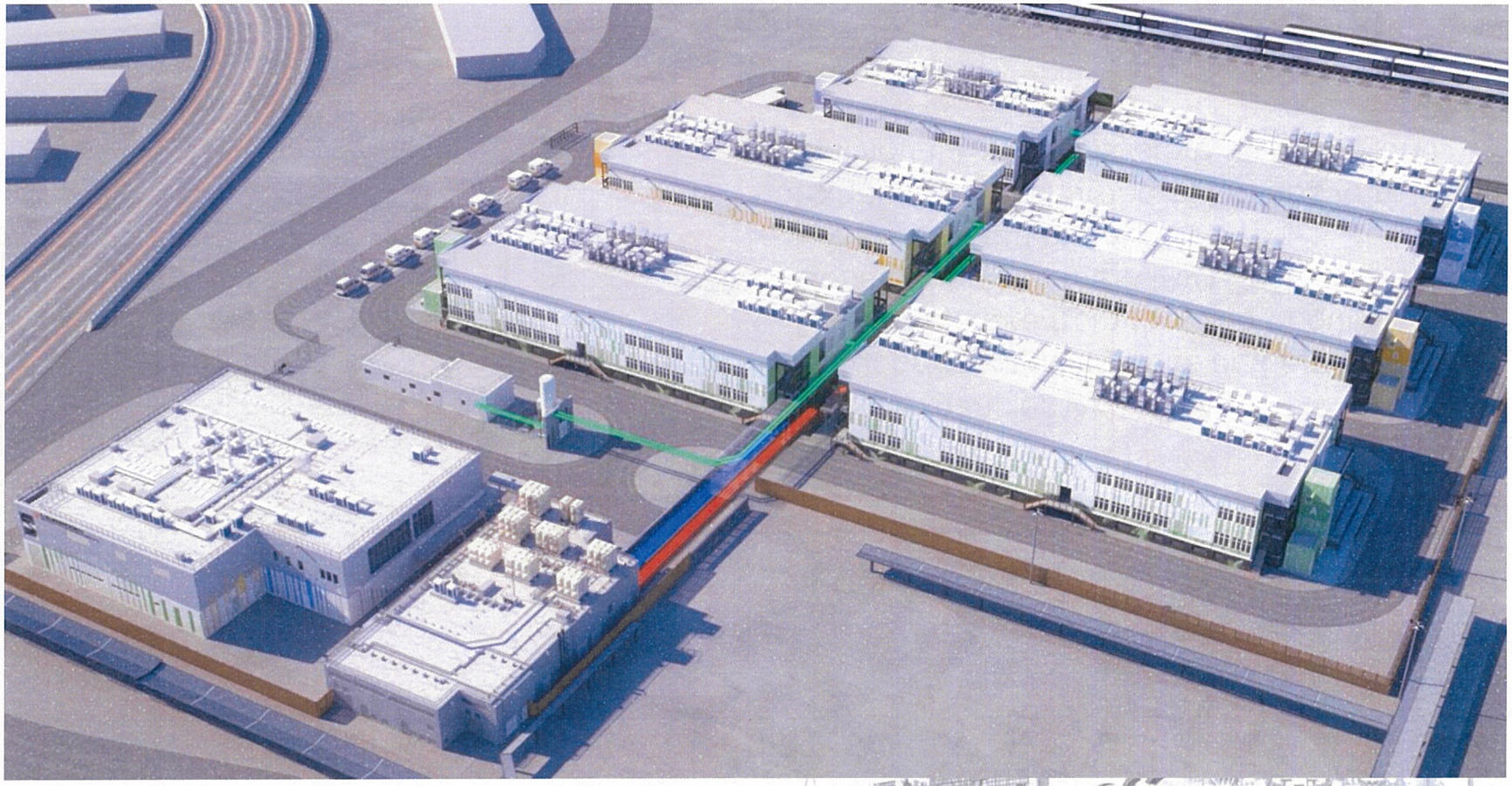


Clean zone

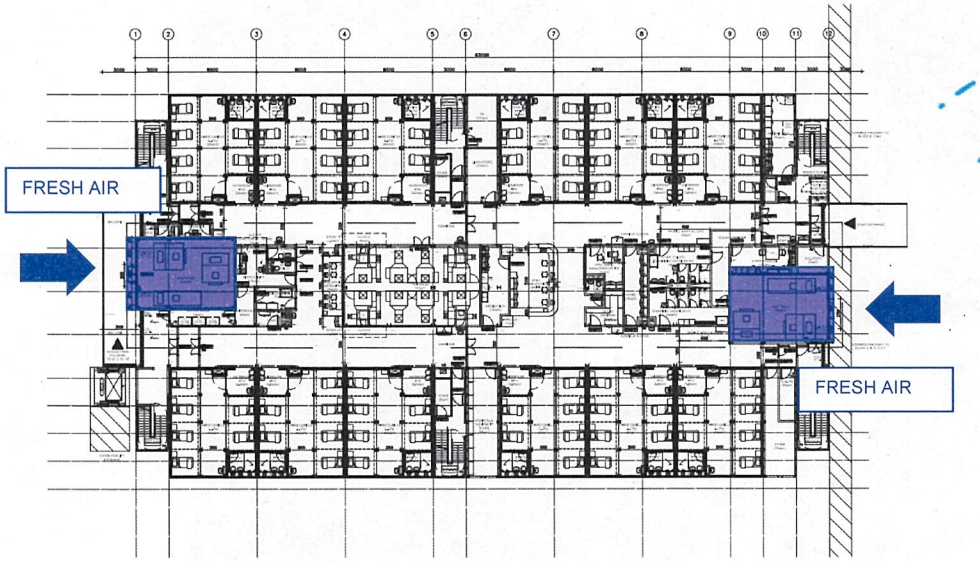
Warm zone

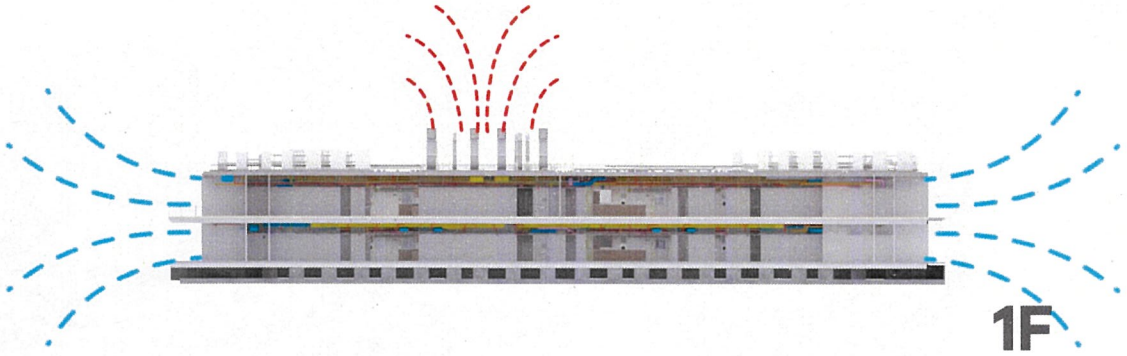
Dirty zone

Main Routes of Building Services Systems



MVAC System





- Direct expansion AHU/PAU
- Outdoor condensing units at the roof
- Fresh air intake from the side of building
- Constant air volume (CAV) System
- Exhaust air fan at 1/F
- Exhaust air discharged at 3m above roof level
- Individual Exhaust System for Dirty Zone

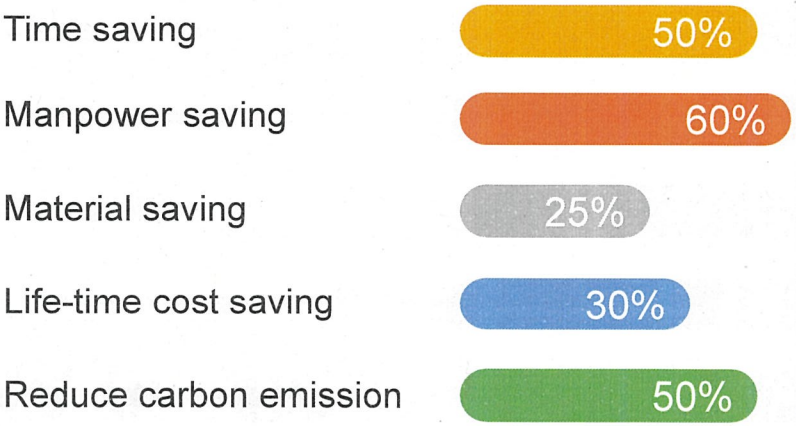
DfMA & MiC

Design for Manufacture and Assembly (DfMA)

Examples of DfMA in this project:

a) MiC Ward
b) Structural Steel Frame
c) Precast Central Services Trench
d) MIMEP
e) Modular Airtight Panels
f) Prefabricated Roof Modules

Advantages of DfMA applied to construction



Design for Manufacture and Assembly (DfMA)

Examples of DfMA adopted in the Design & Build of the HKICC project

MiC Unit Manufacturing Factory

MiC Unit

Pre-cast Trench

Design for Manufacture and Assembly (DfMA)

Examples of DfMA adopted in the Design & Build of the HKICC project

Medical Block & Ward Block Common Area Pre-fab Steel work

Ward Block E&M Module

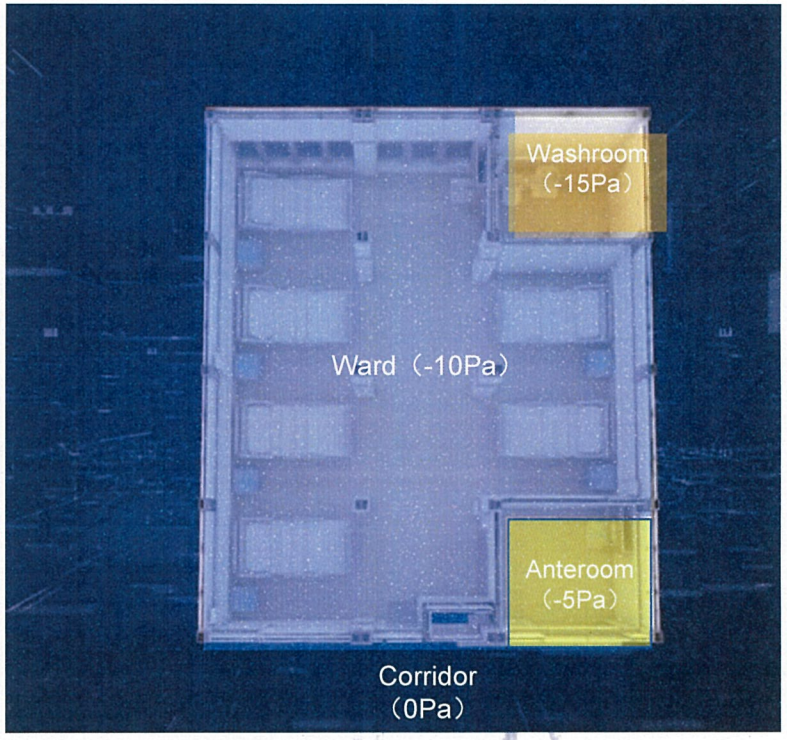
Prefabricated E&M Modules at BCF Yard

Athena III

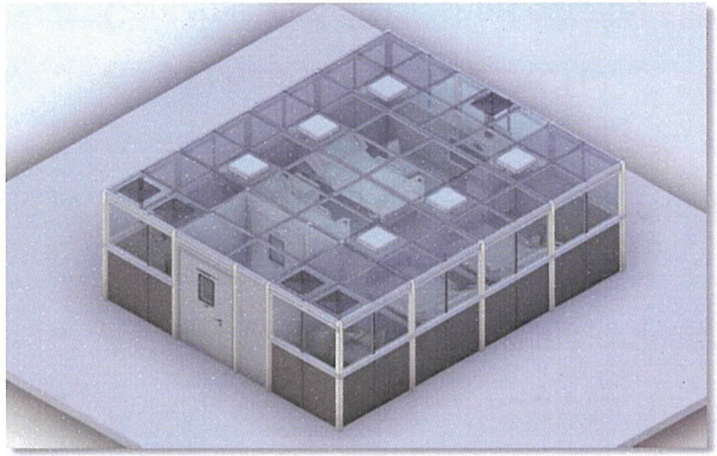
Standard MiC Negative Pressure Ward Unit

R&D by CSIM

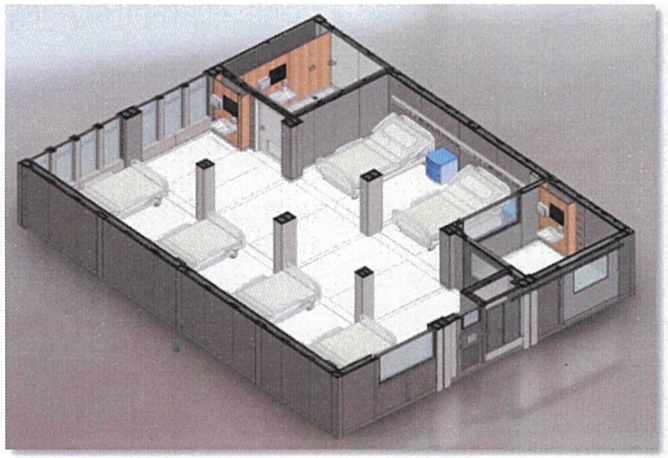
- Dimensions of **6-bed unit**： 8000W x 10000L x 3900H
- Composed of 3 MiC units, weight over 80 tons in total
- Comply with **HTM standards** for hospital Negative Pressure wards
- Airtightness needs to fulfill the requirements of **ASTM E779-10 Standard**
- Maintain Negative Pressure room minimum pressure gradient within the room（corridor 0Pa, anteroom -5Pa, ward -10Pa, washroom>-15Pa）
- **Air exchange rate at 12 ACH**
- Contaminated air discharged after **H14** HEPA filter filtration



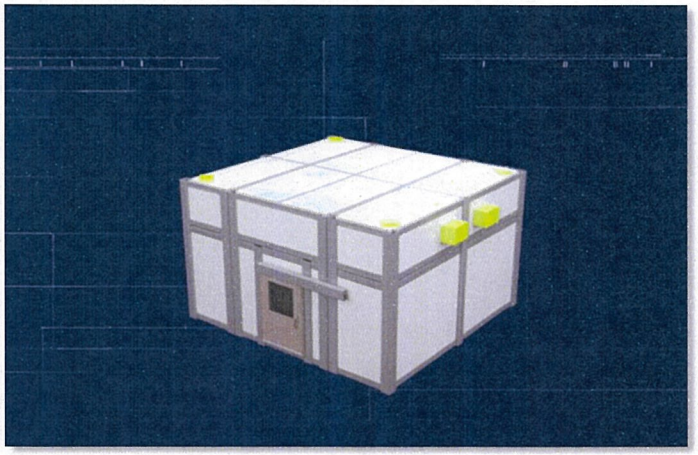
CSIM - Leading Consultant in Modular Hospital Design



Negative Pressure Isolation Makeshift Ward

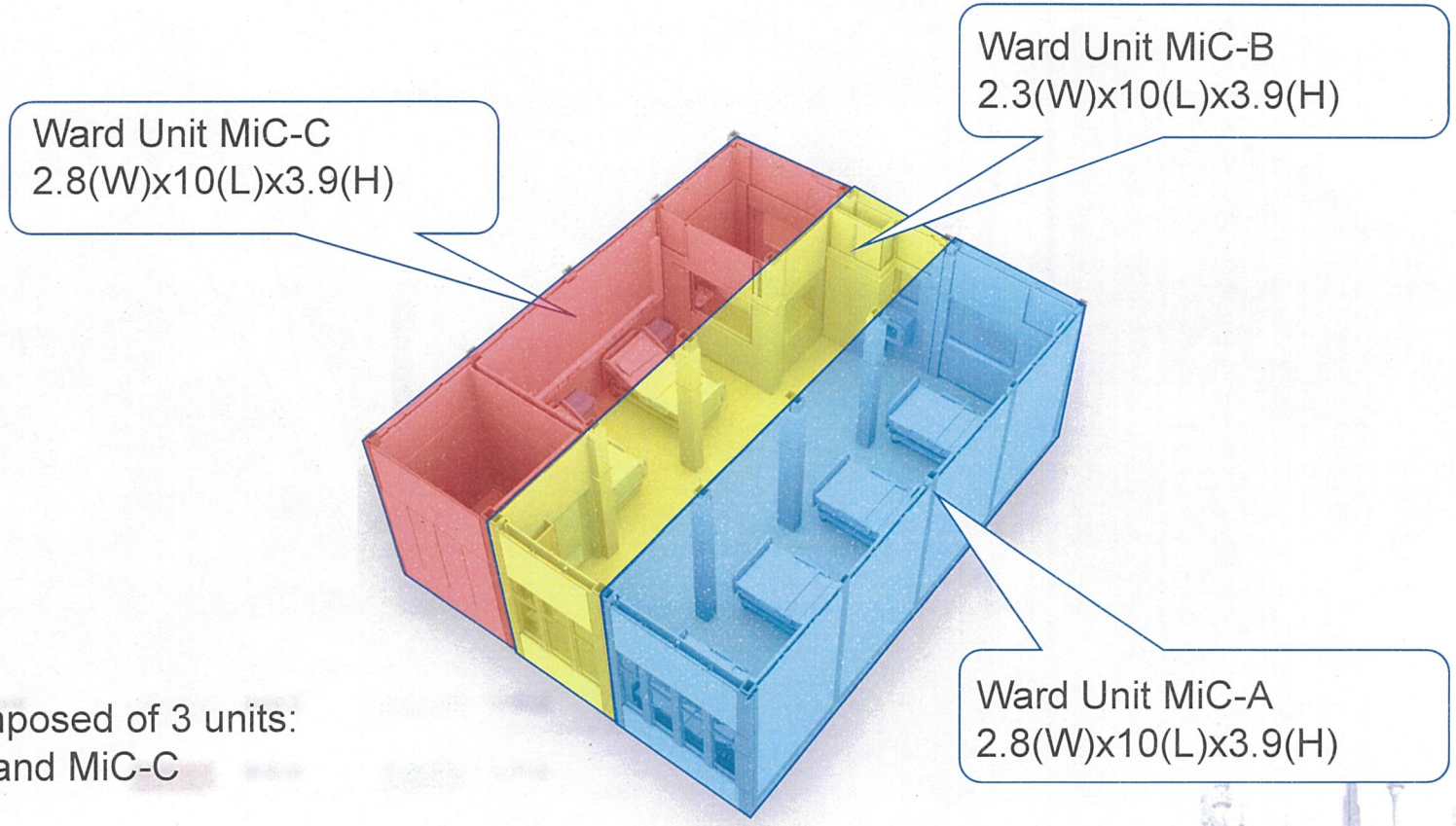


Negative Pressure Isolation Ward



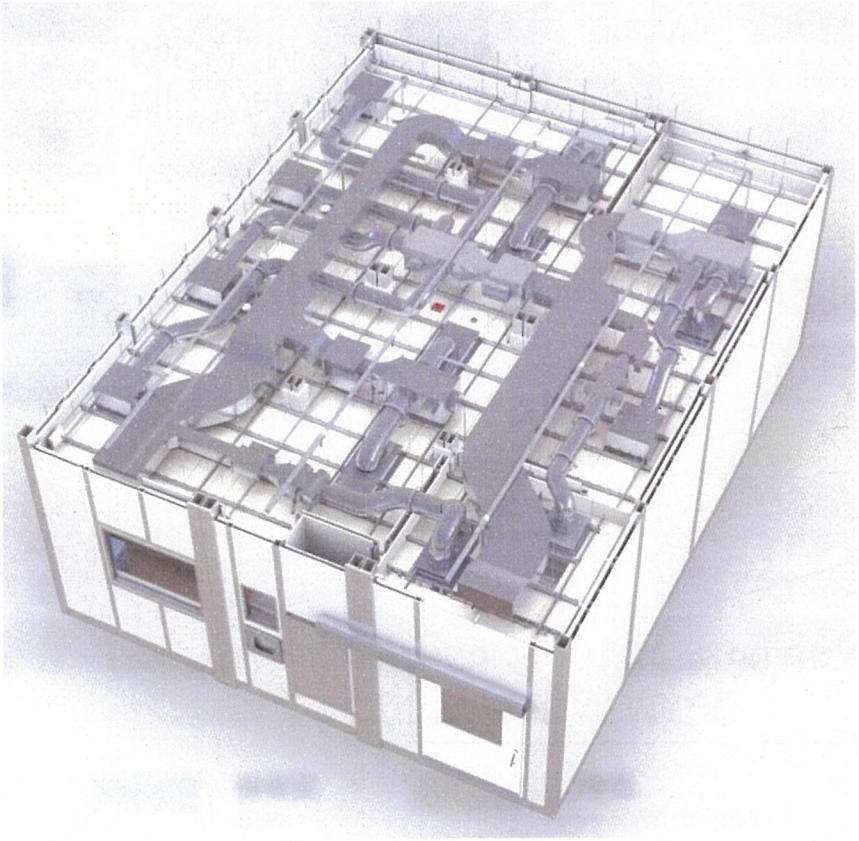
Operating Theatre

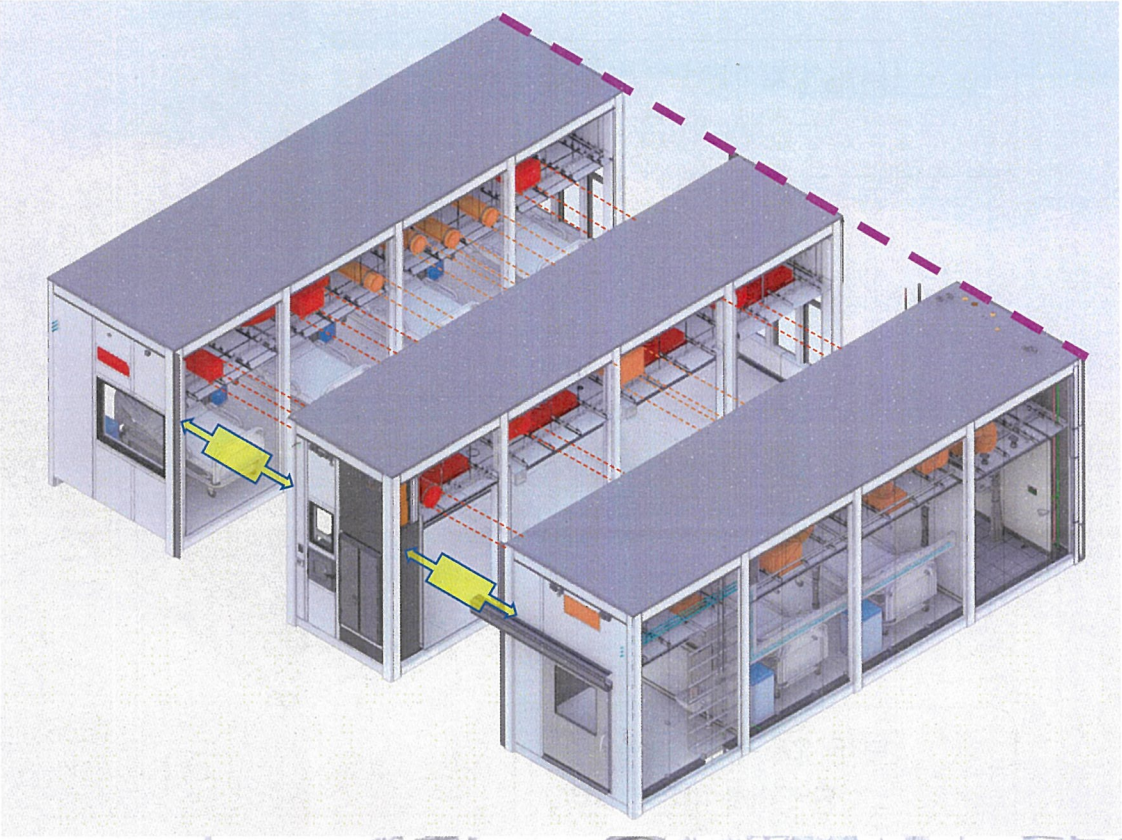
MiC Negative Pressure Ward's Composition



MiC Ward Composed of 3 units:
MiC-A, MiC-B and MiC-C

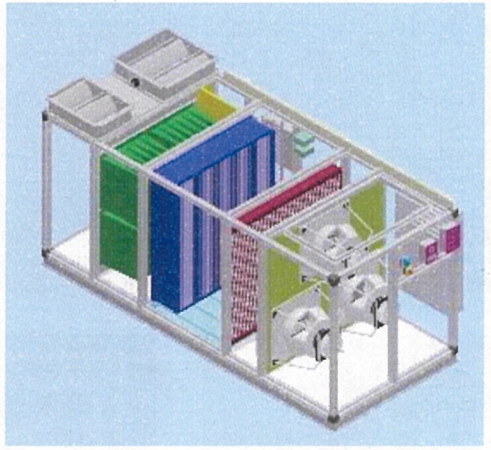
3 MiC Units Forming a Negative Pressure Ward

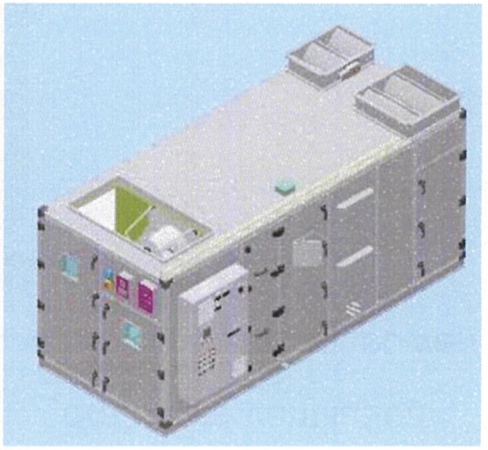




DfMA application in building service design

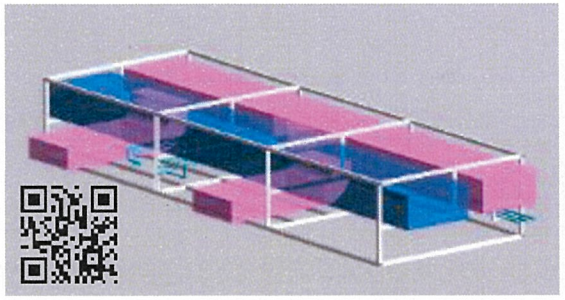
- MiMEP integrated AHU / PAU installation
- MiMEP refrigerant pipe unit for plantroom & roof
- MiMEP FS pipe valve
- MiC bedhead trunking (with medical gas and wiring system)
- MiMEP MCB board at electrical room
- MiMEP roof supporting frame for refrigerant pipe and cable tray

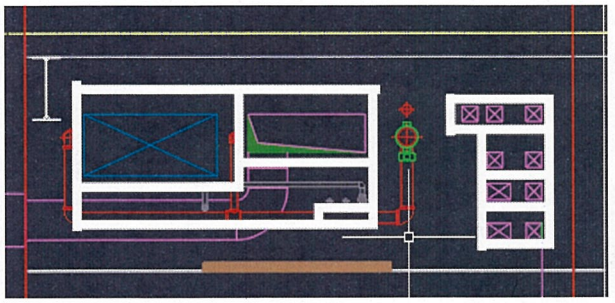


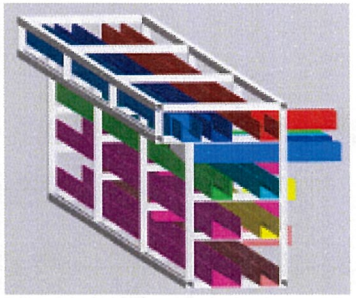


MiMEP AHU / PAU installation

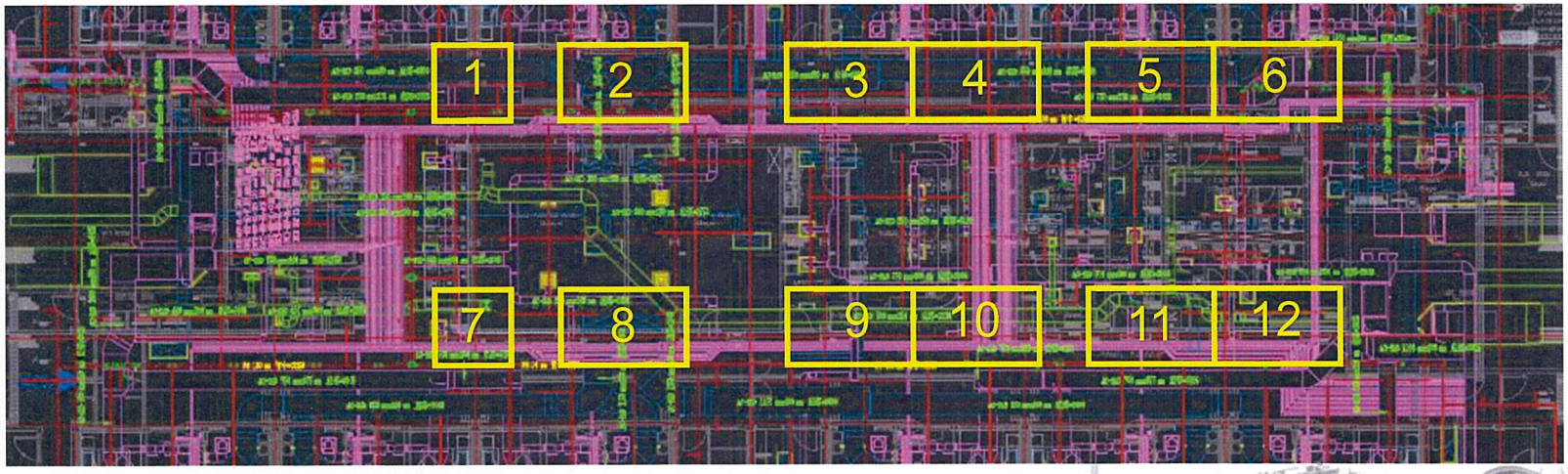
DfMA application in building service design



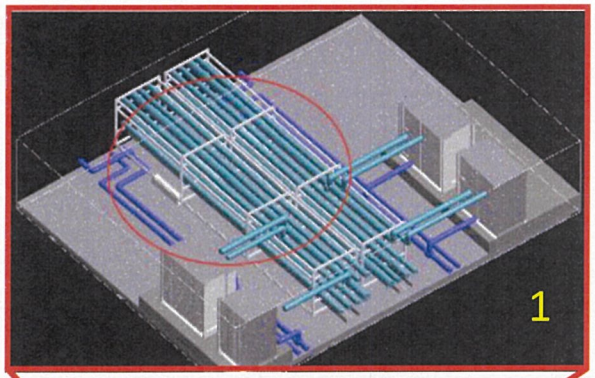


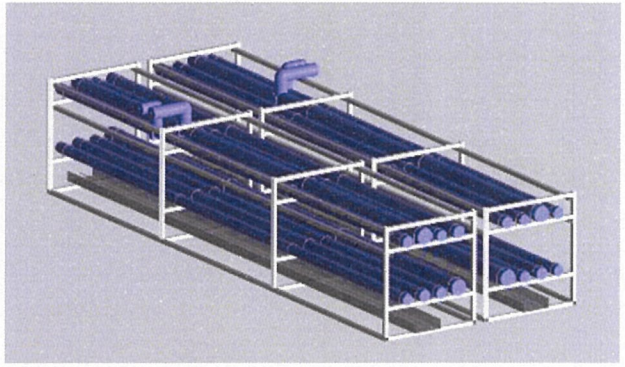


MiMEP indoor MEPG unit (plumbing & drainage/ ventilation/ ELV & electrical power/ medical gas)

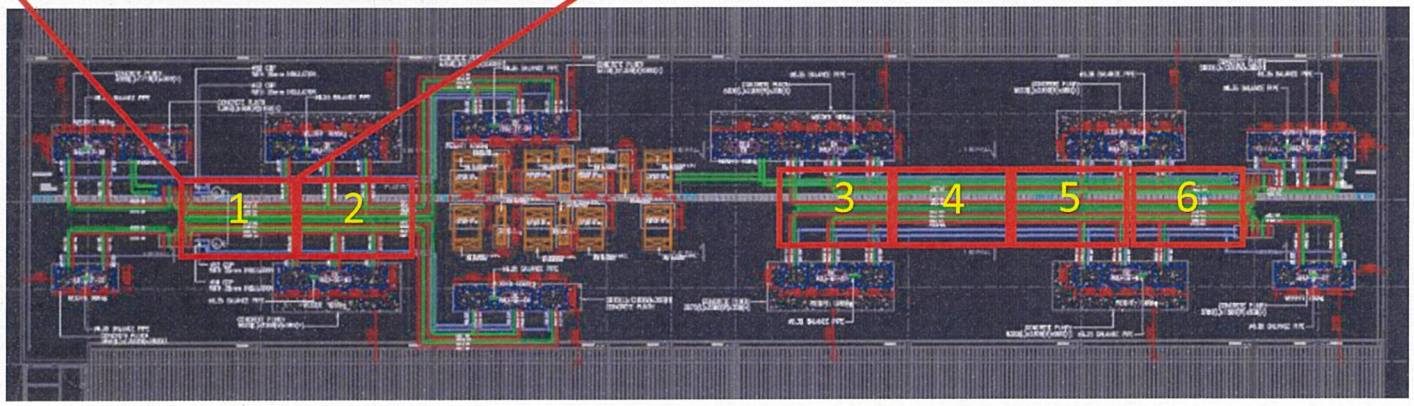


DfMA application in building service design



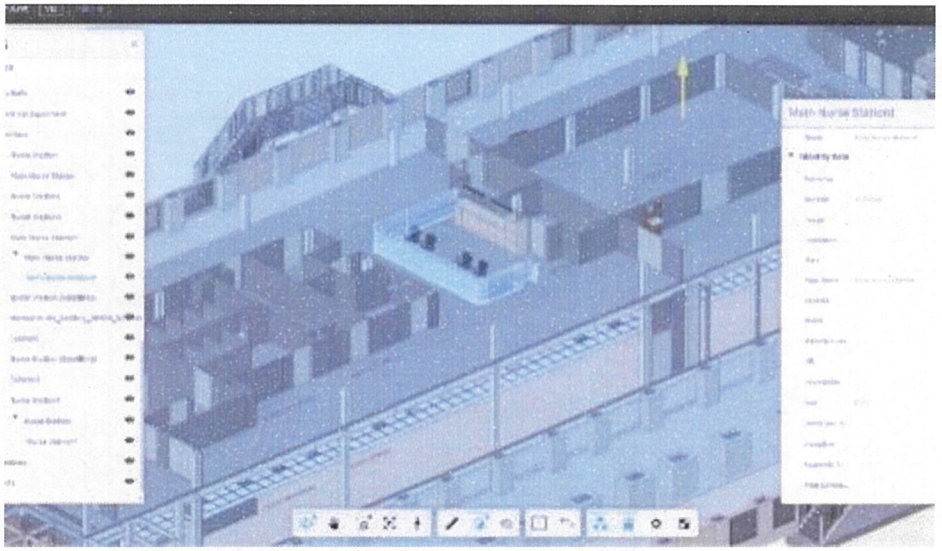


MiMEP roof supporting frame for refrigerant pipe and cable tray



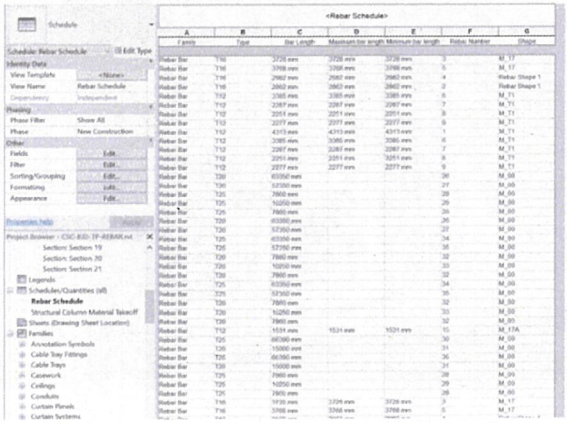
Digitalization

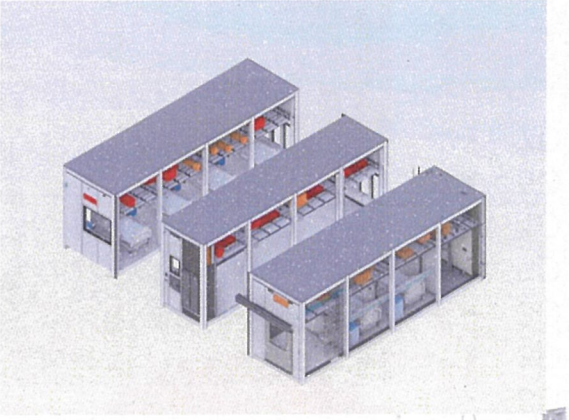
BIM-Aided Design

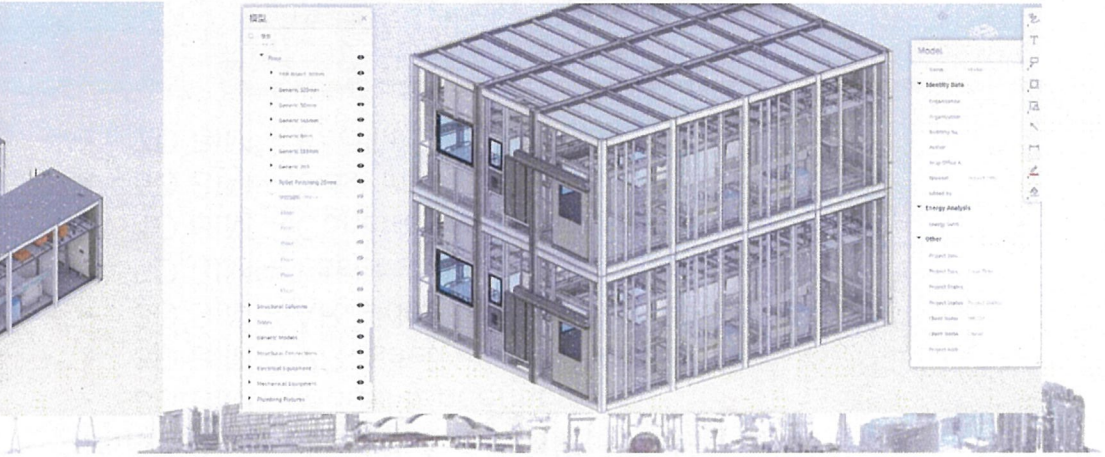


Full-BIM-engaged design and construction process

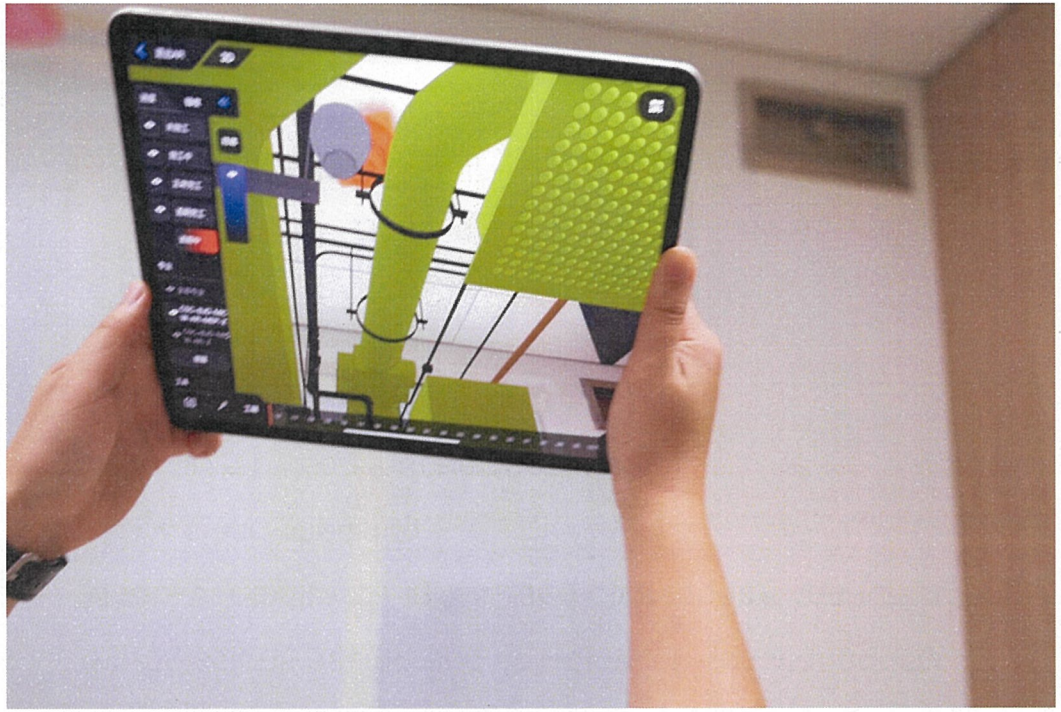
- Online Design Real-time coordination between HK-SZ
- 8 professions design and coordination simultaneously
- Model used directly in MiC and components manufacturing
- 100% clash checking
- Save time by continuous coordination





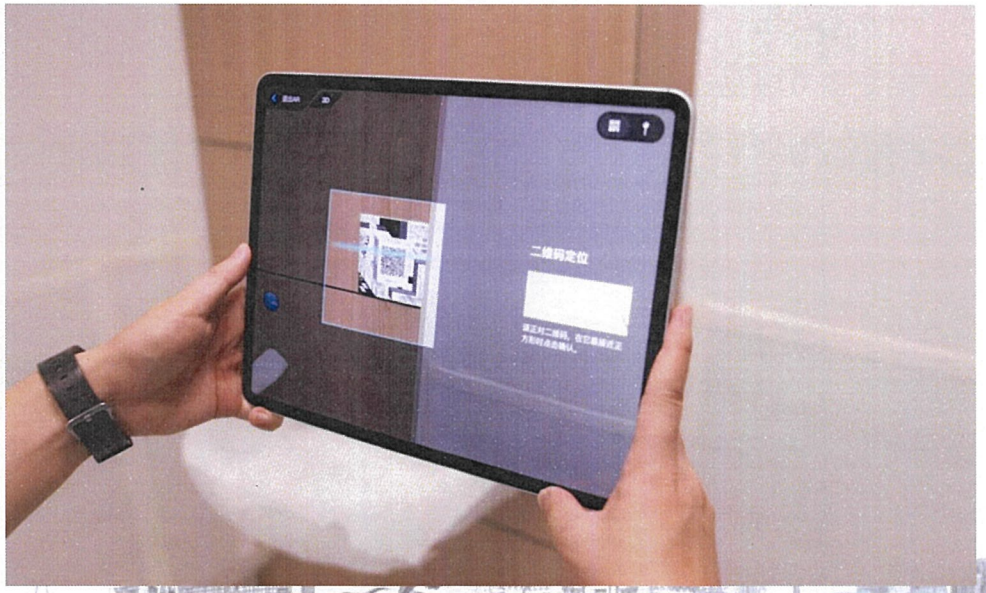


AR-aided Construction & Maintenance



Multi dimensional usage of Full-BIM

- 3D BIM – Model renderings
- 3D BIM – VR-aided interior design
- 3D BIM – AR-aided construction inspection
- 3D BIM – Laser scan defect inspection
- 4D BIM – Construction progress info
- 5D BIM – Cost info
- 7D BIM – Facilities maintenance info



VR-aided Interior Design

Multi dimensional usage of Full-BIM

- 3D BIM – Model renderings
- 3D BIM – VR-aided interior design
- 3D BIM – AR-aided construction inspection
- 3D BIM – Laser scan defect inspection
- 4D BIM – Construction progress info
- 5D BIM – Cost info
- 7D BIM – Facilities maintenance info

Smart Construction

- Real-time worker count
- Real-time construction progress on BIM model

Smart Construction

CCTV+AI safety monitoring system

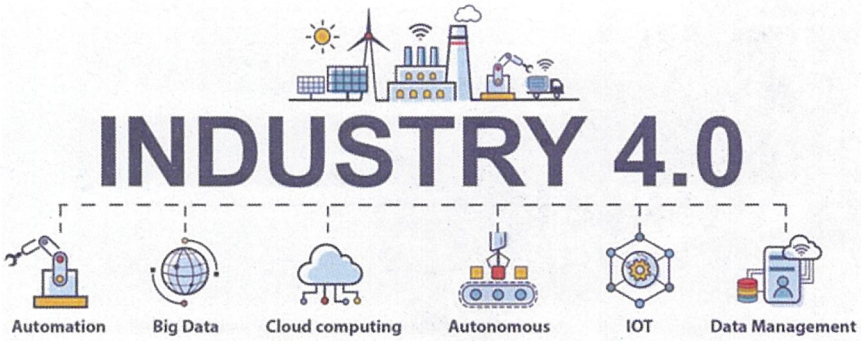
Mobile User Interface

Smart Construction

Manufacturing execution system (MES)

Command Centre

Some Thoughts on the Future of Construction Industry



發展局
Development Bureau

Construction 2.0

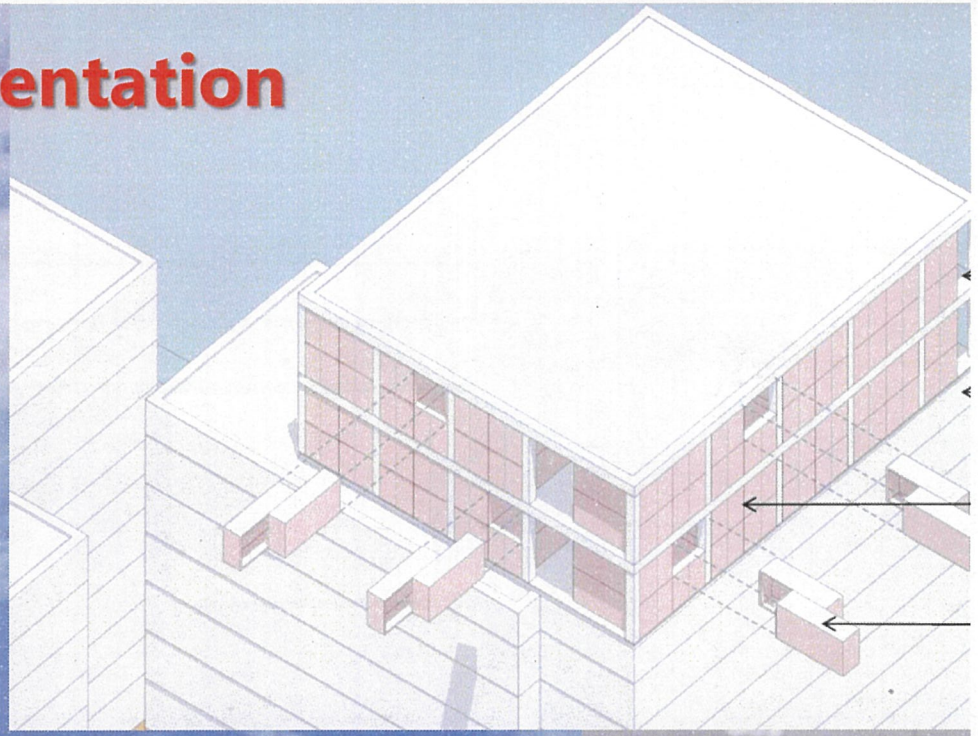
Time to change

Way forward...

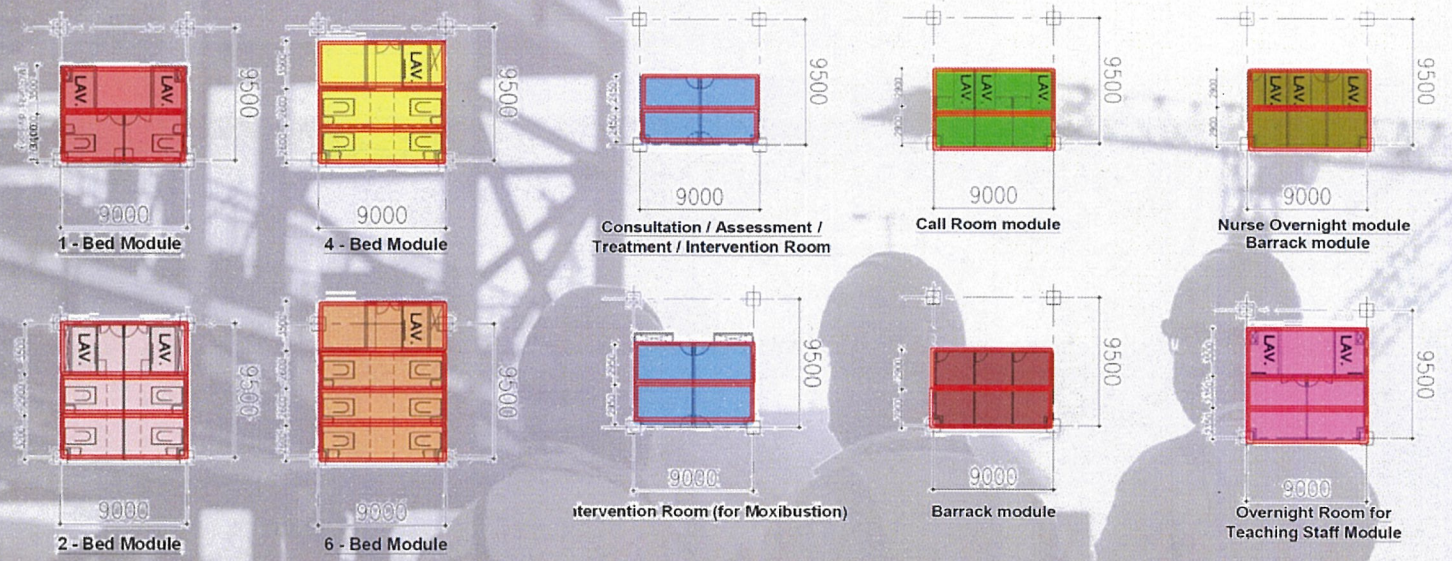
Public Hospitals in Hong Kong are generally characterised by

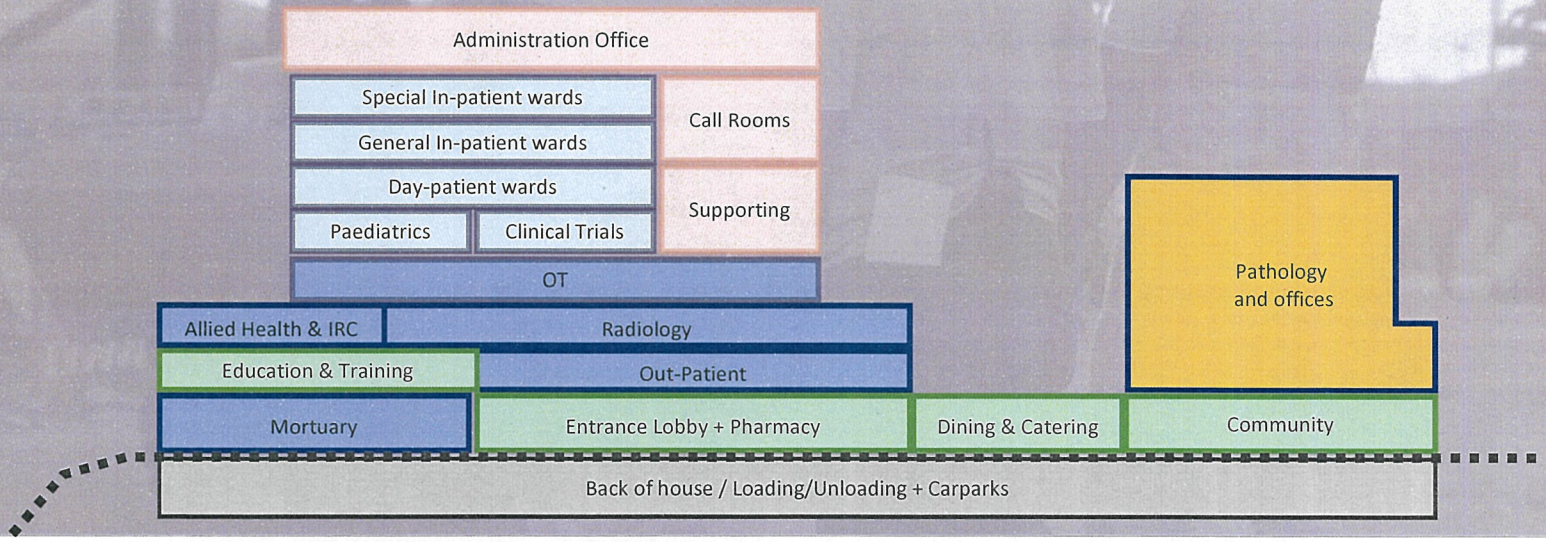
- Large floor plate to maximise operational efficiency
- Compact to achieve cost effectiveness
- highrise blockings with non-uniform stackings
- Vertically serviced functional spaces
- Tight and limited working space for construction
- Public utilization is high
- Flexibility to meet changing needs

Evolving strategy for MiC implementation for hospital projects

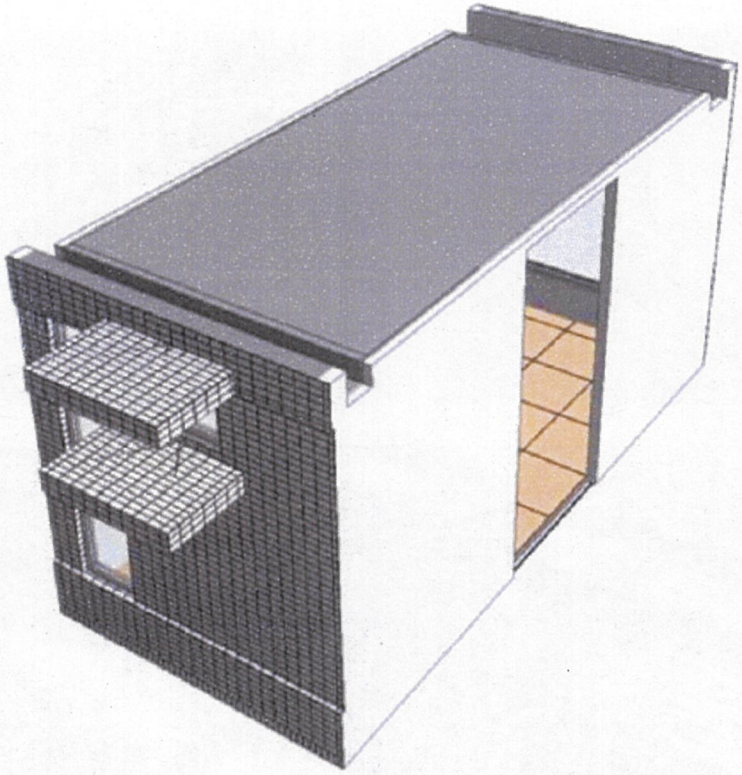


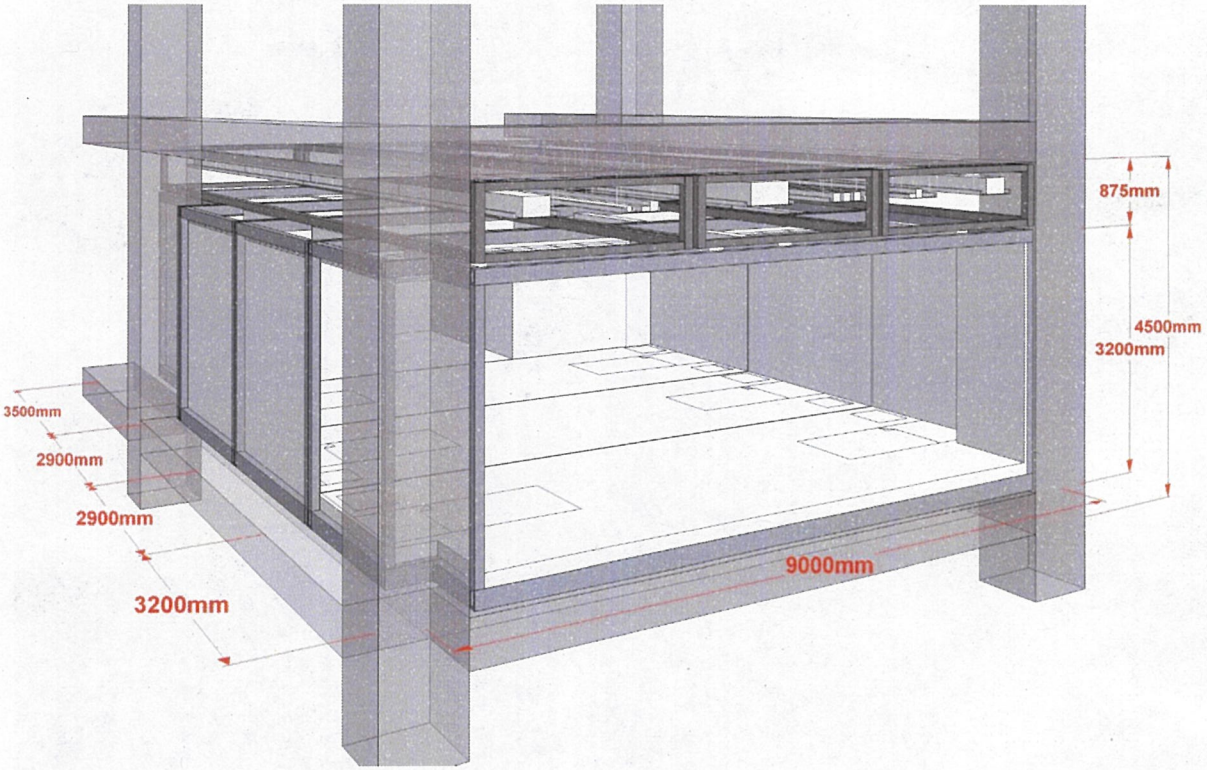
Non-uniform stackings



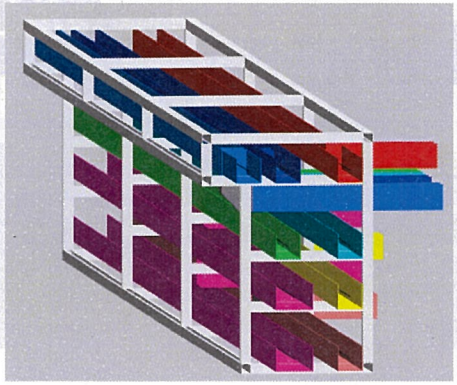


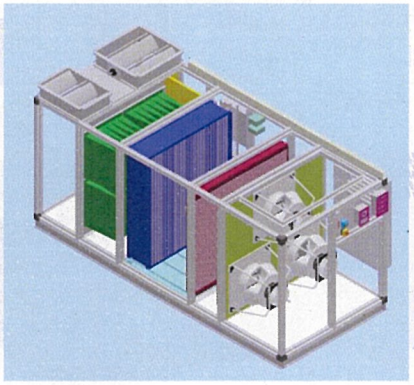
Optimization of module size, weight and ceiling void



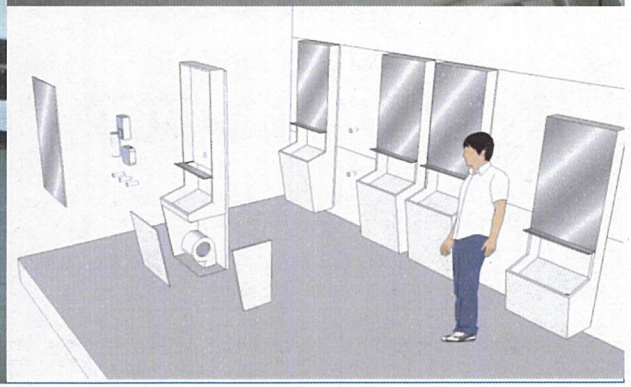


MiMEP and Segregation of services





System Integration



Digitization and advanced technologies

- Blockchain
- Augmented reality (AR) assisted design and construction
- Real time site supervision and management
  - real time labour monitoring
  - real time construction progress
- Facilities management
  - BIM Asset information model

Thank you very much!