

Adopting Multi-trade Integrated MEP (MiMEP) From the Government's Perspective

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Architectural Services Department

TRADITIONAL CONSTRUCTION SITE

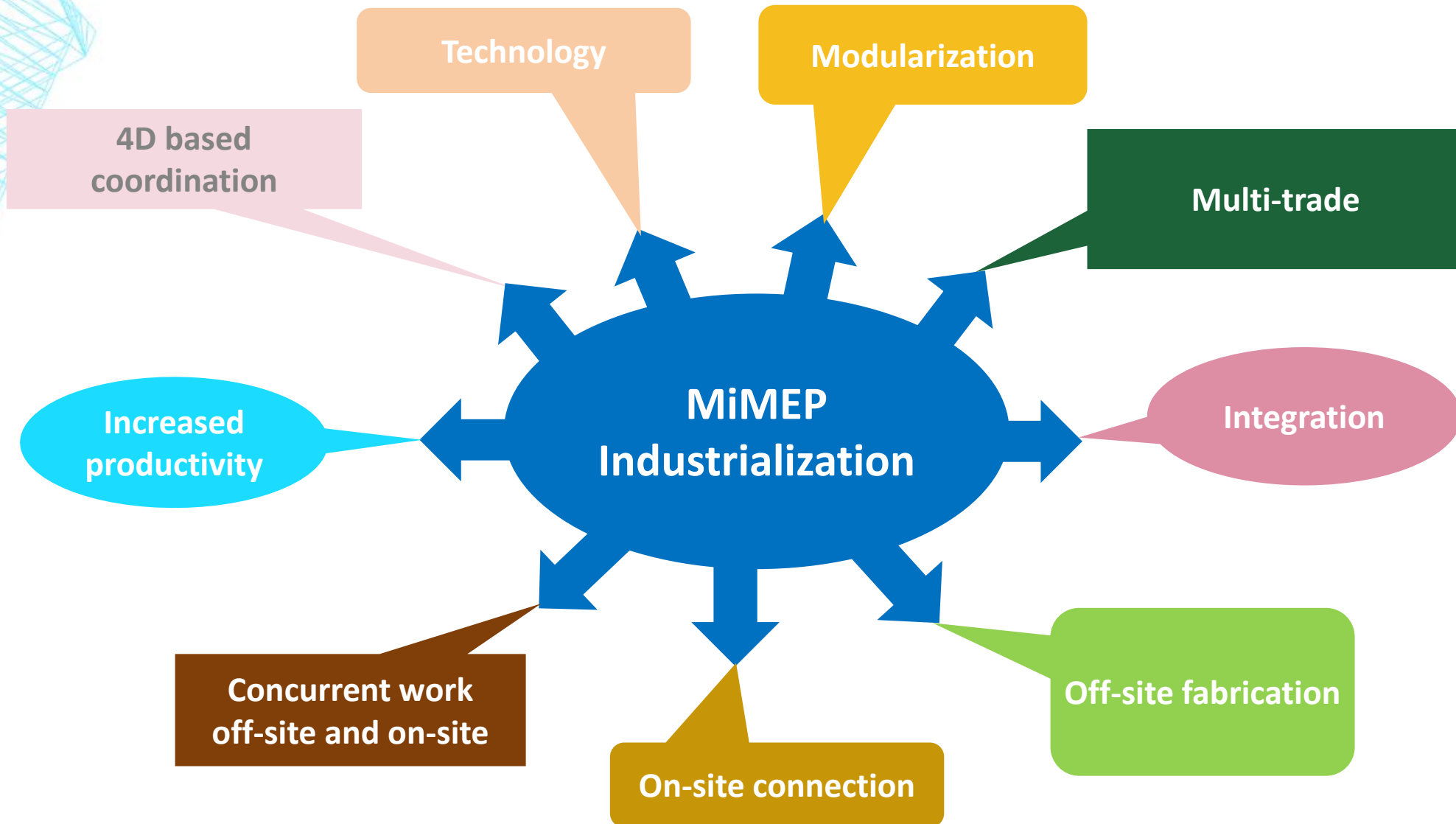
- Complicated process of coordination
 - Spatial
 - Pre-assembly
 - Material delivery
- Disharmonized sequence of works for different trades
- Many Installations within limited space
- Poor working environments
- Concerns of site safety
- Waste generation



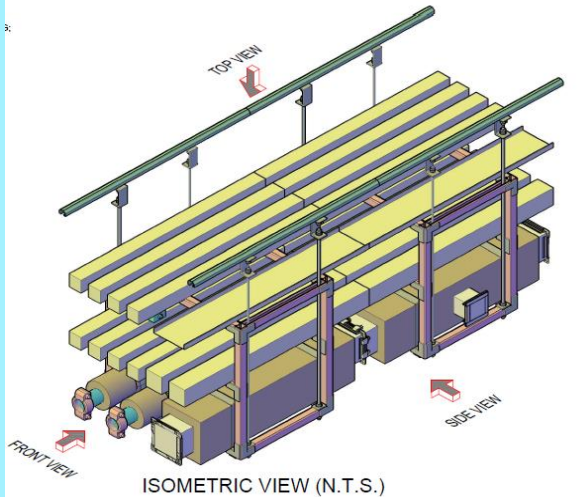
How to improve performance in time, cost, quality, safety and environmental ?



M MEP INDUSTRIALIZATION

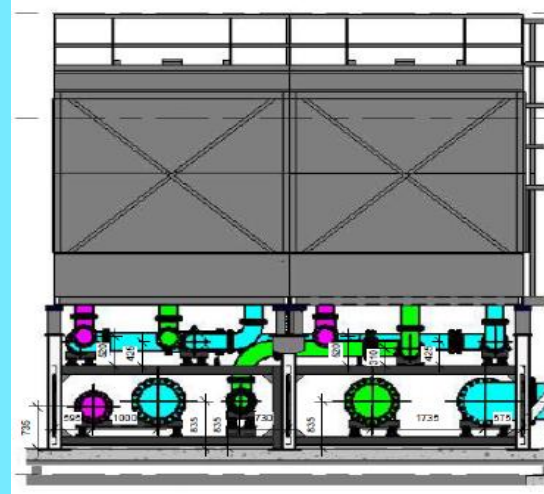


EXAMPLES OF MiMEP VS CONVENTIONAL BS INSTALLATION



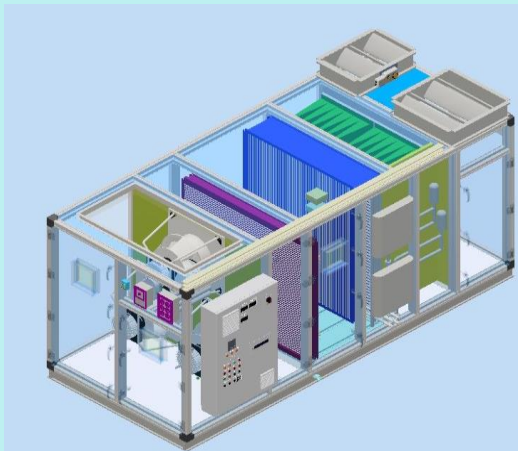
Multi-trade Horizontal Module

- Suitable for building areas with standardized and regular room layout such as open plan office and service corridor
- Components include:
 - Electrical cabling system
 - A/C Terminal box
 - Air ductwork



Modular Condensing Pipework for Cooling Tower

- Suitable for all buildings with cooling tower installation
- Components include:
 - Condensing pipes and fittings
 - Valves
 - Vibration isolators



Integrated Air-handling Unit

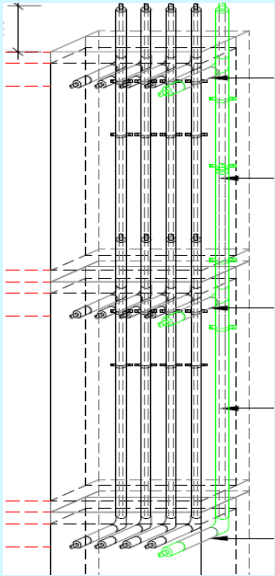
- Suitable for all buildings with AHU installation
- Components include:
 - AHU
 - LMCP & DDC Panel
 - Chilled water valve set



Pump Room Module

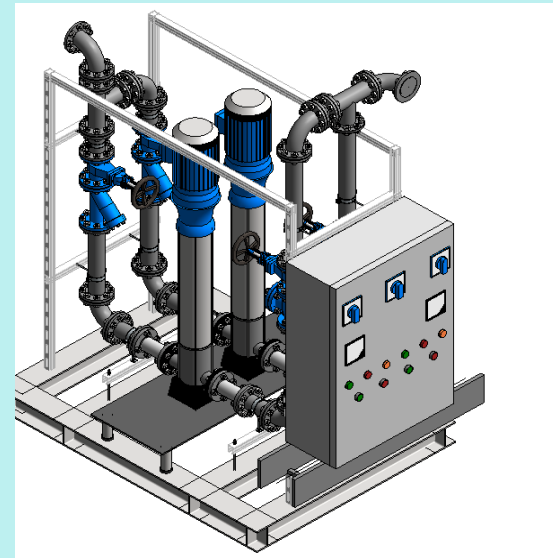
- Pump modules are integrated with structural frameworks and water tanks

E XAMPLES OF MiMEP



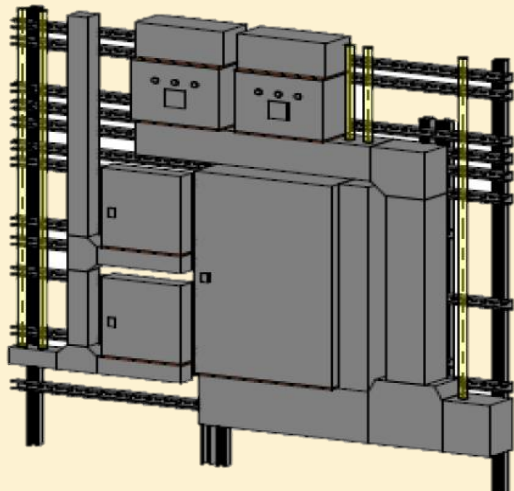
Building Services Riser Module

- Suitable for multi-storey buildings
- Vertical ducts or pipes
- Can be safely installed horizontally in a factory
- Hoisting and delivery route are usually from top of the building
- Floor to floor fire barriers is required



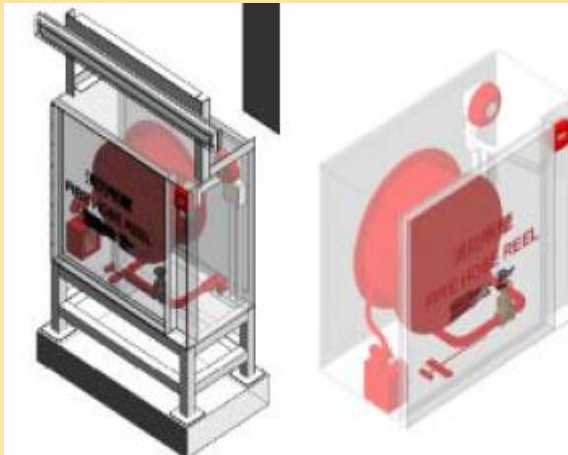
Modular Pump Set with Control Panel

- Suitable for all electrical pump installations
- Fully assembled with control panels, instruments mounted on skids, valve cable termination



Panelised Electrical Modules

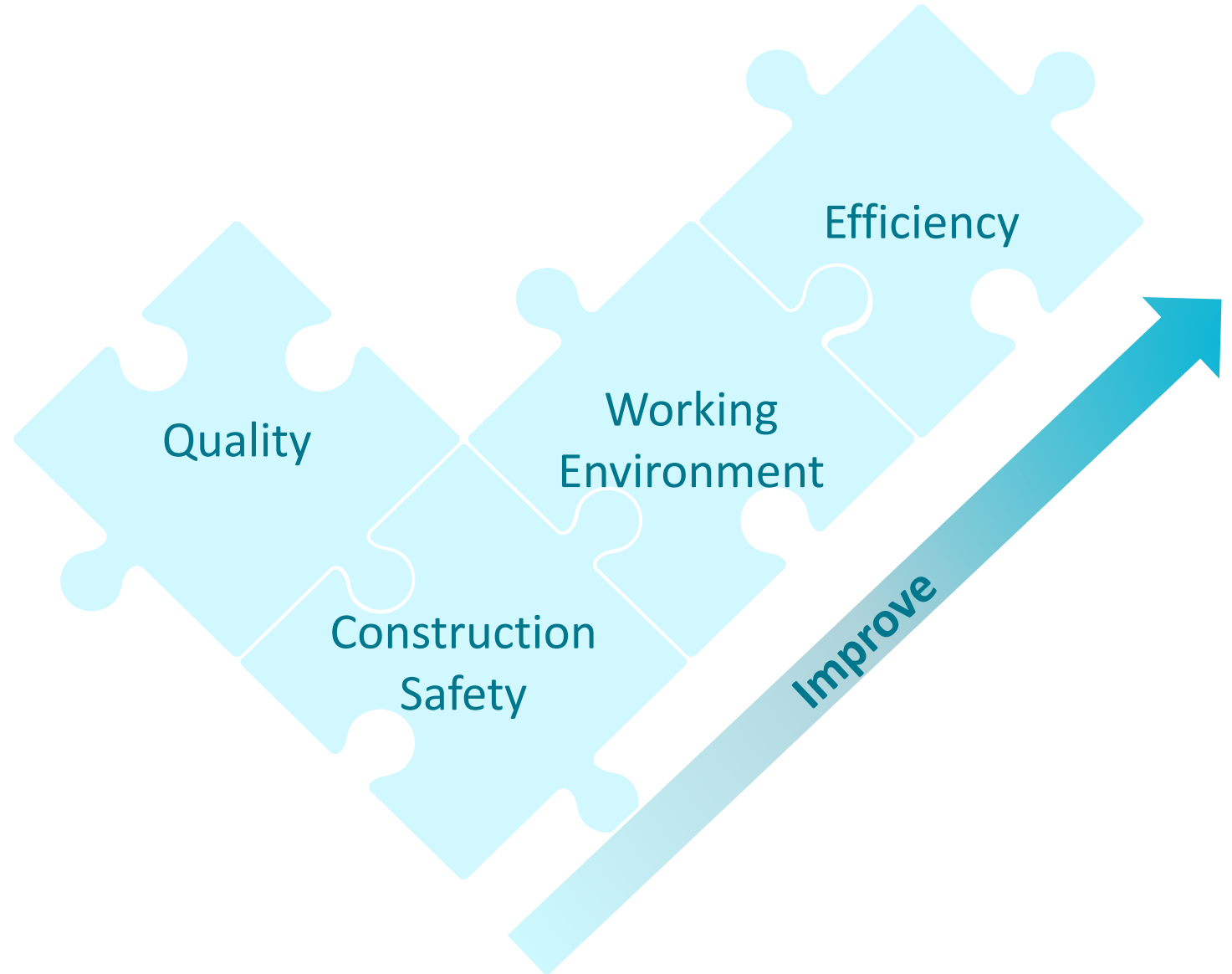
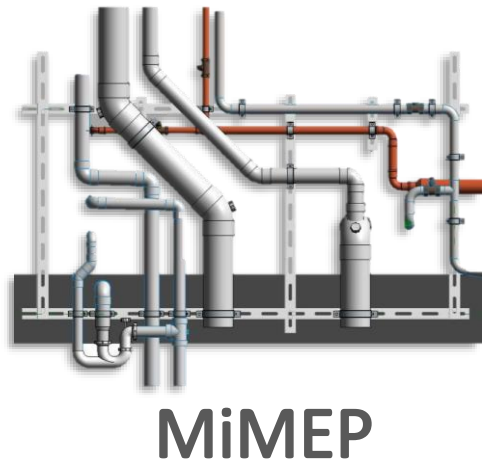
- Suitable for electrical rooms with repetitive electrical configurations
- Components include:
 - MCCB/ MCB Boards
 - Power Quality Meter
 - Trunkings & cables



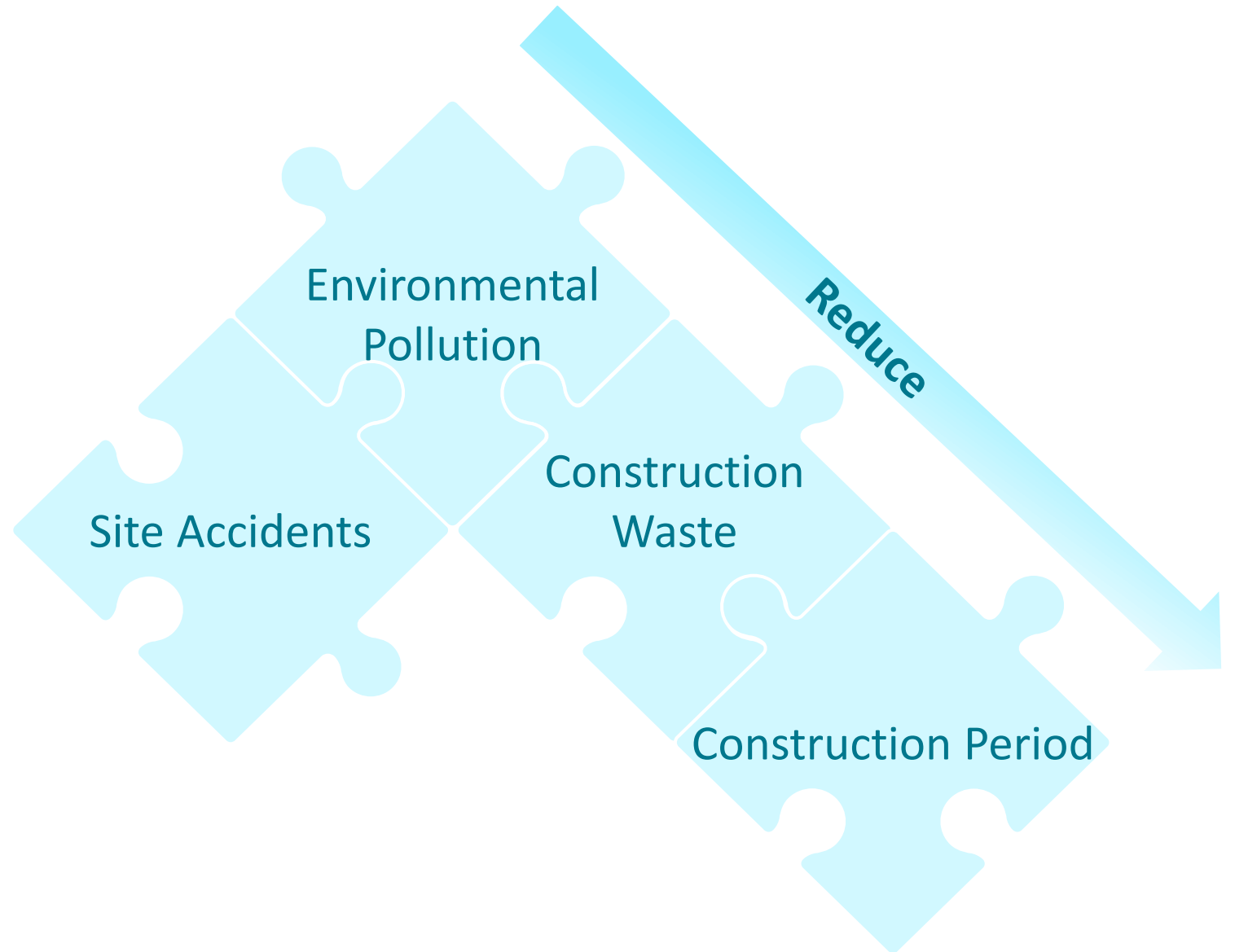
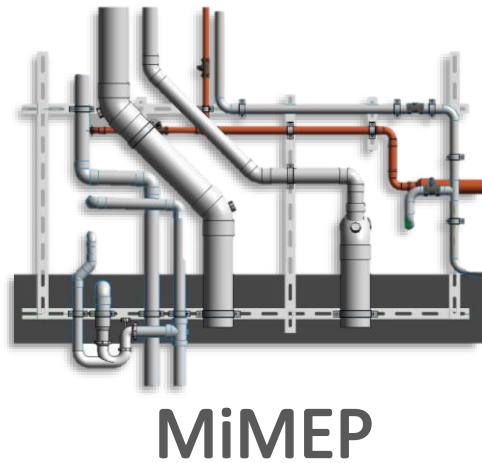
Hosereel Cabinet Module

- Repetitive design suitable for all buildings
- Components include:
 - Hosereel
 - Alarm bell
 - Breakglass
 - Cabinet

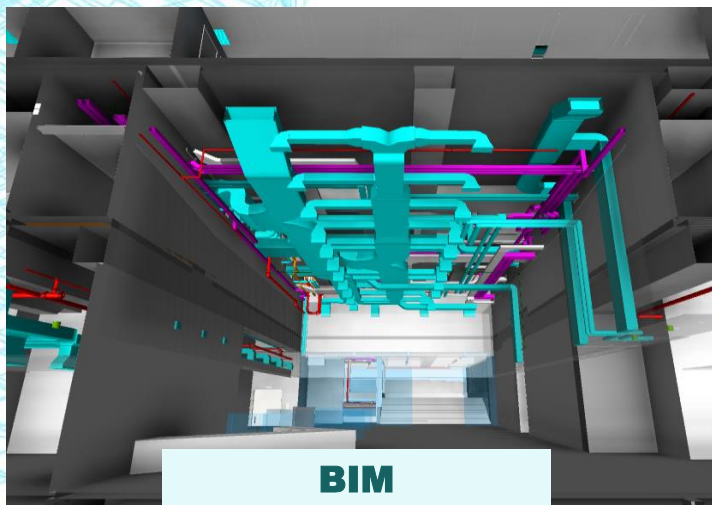
BENEFITS OF OFF-SITE CONSTRUCTION METHODS



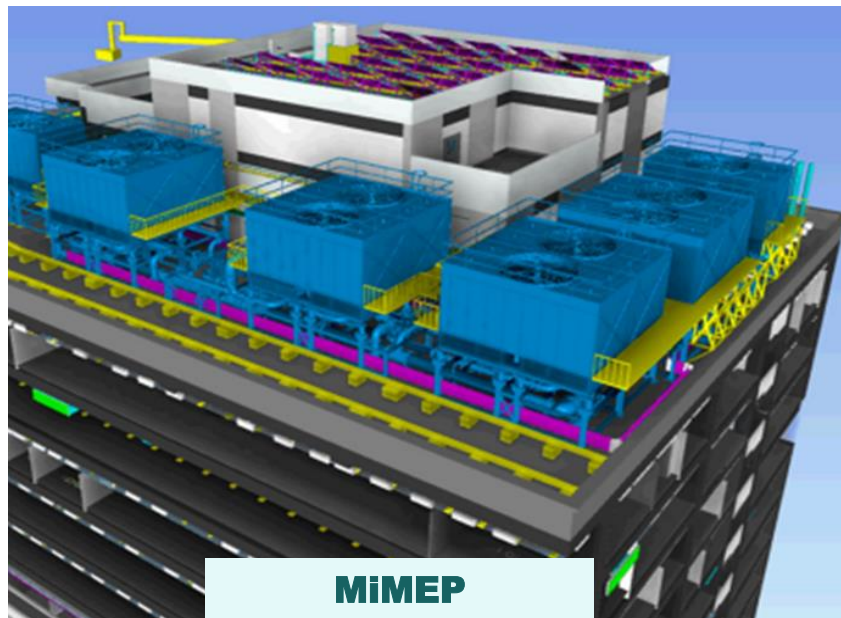
BENEFITS OF OFF-SITE CONSTRUCTION METHODS



INNOVATIVE TECHNOLOGIES TO FACILITATE MiMEP



BIM



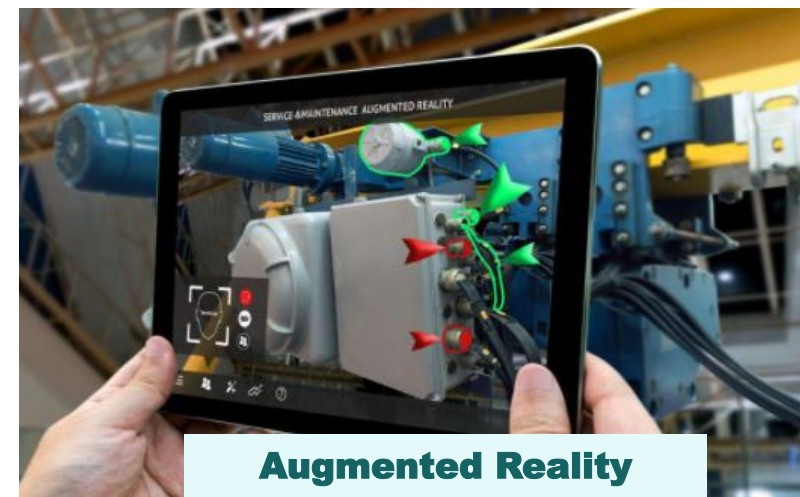
MiMEP



RFID



Virtual Reality

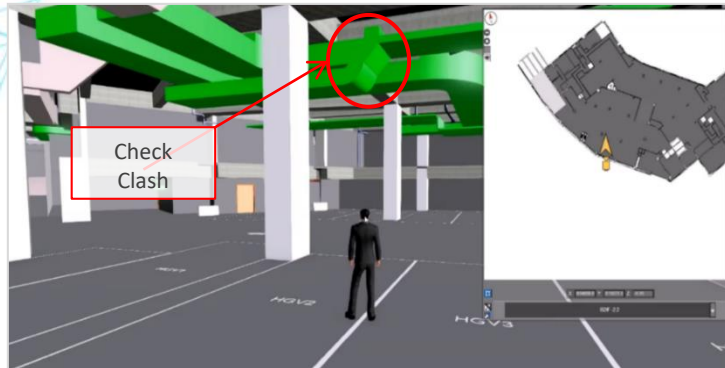
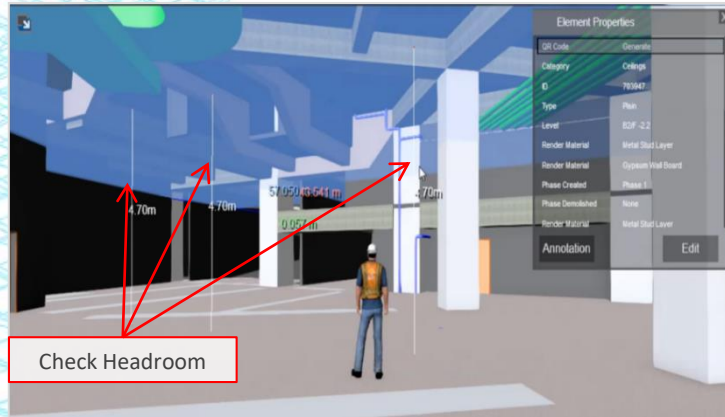


Augmented Reality

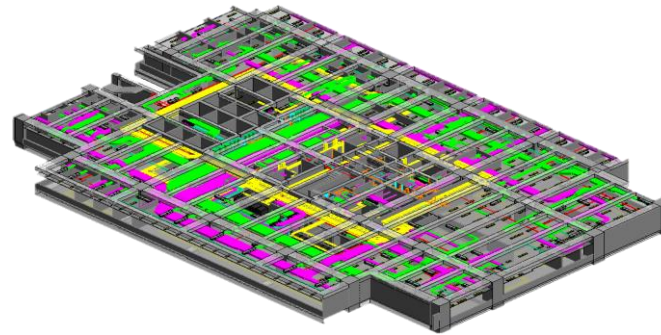
Design, Fabrication, Packaging, Delivery, Assembly, T&C, Maintenance and Disassembly

INNOVATIVE TECHNOLOGIES TO FACILITATE MiMEP

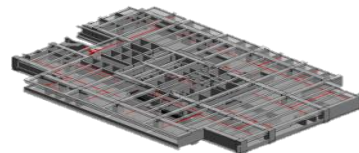
Building Information Modelling (BIM) and Virtual Reality (AR)



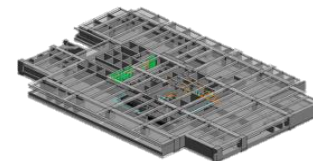
CSD Coordination based on BIM



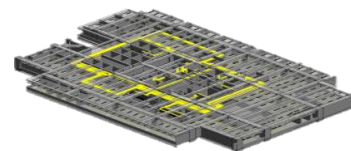
FS BIM Model



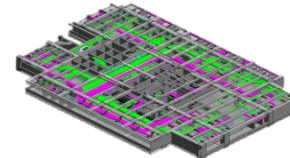
P&D BIM Model



EL BIM Model



HVAC BIM Model



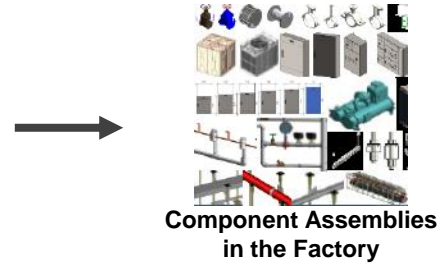
- Virtual reconstructions
- Support for large-scale integration
- Spatial coordination
- Delivery route planning
- Optimization of module size
- Design for disassembly sequence
- Incorporation of maintenance requirements

INNOVATIVE TECHNOLOGIES TO FACILITATE MiMEP

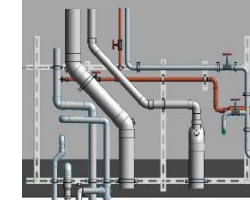
Radio Frequency Identification(RFID)



Stock In:



When components
assembly is
completed



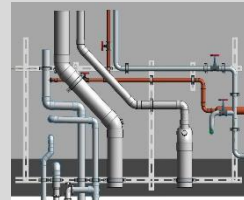
Stock Out:
To the
Installation
Location



When the module
inspection is
completed



The module
arrives onsite



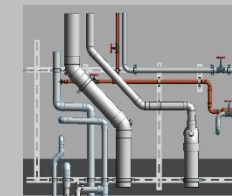
When the module
is at the right
location



When the module
installation is
completed



Stock Check:
Inspection & T&C



When the module
T&C is completed



INNOVATIVE TECHNOLOGIES FOR FACILITY UPKEEP OF MiMEP

Building Information Modelling and Augmented Reality



- Digitization for building information modelling - asset management (BIM-AM)
- Incorporate with tablet computer for extract of as-built information for AA&I works

RECENT PROJECTS WITH MiMEP

Temporary Quarantine Camps



LYMP Basketball Ct



LYMP Football Ct



PHJPC



PB2



PB3A



PB3B

2019

2020



West Kowloon Government Offices

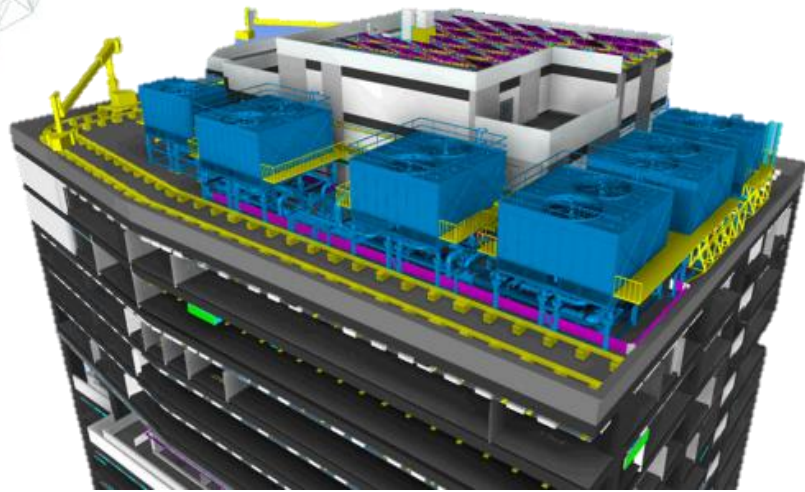


Vehicle Examination Centre

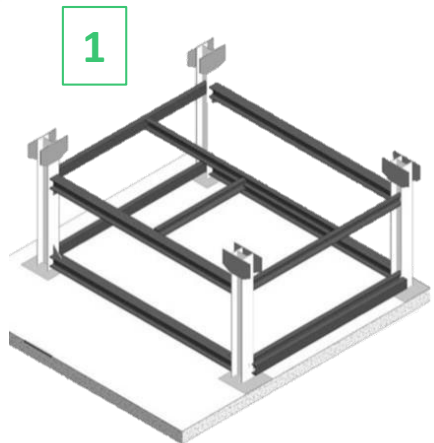


North Lantau Hospital Hong Kong
Infection Control Centre

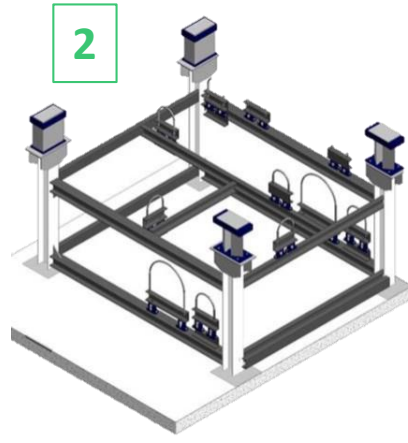
COOLING TOWERS CONDENSING WATER PIPEWORK SYSTEM



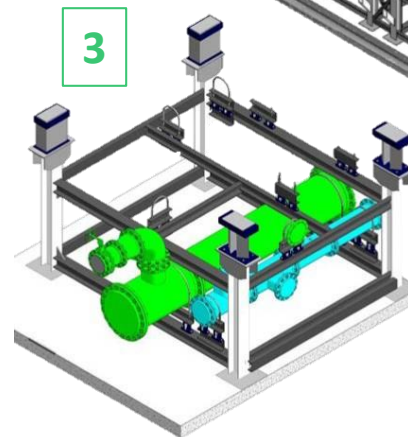
Cooling Towers Condensing Water Pipework System



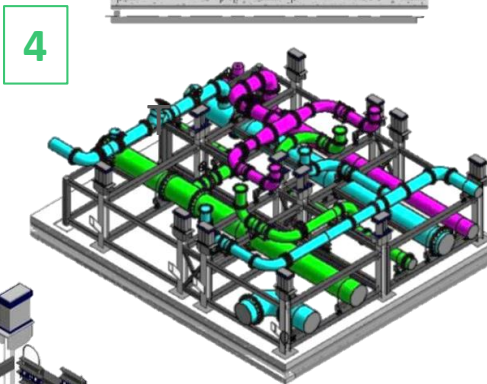
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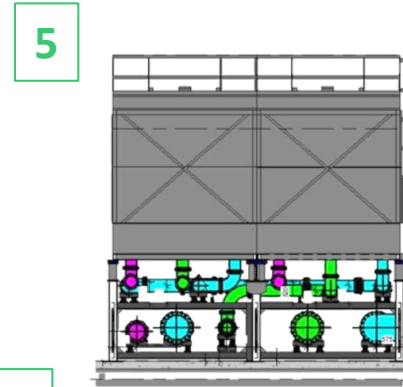
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3



4



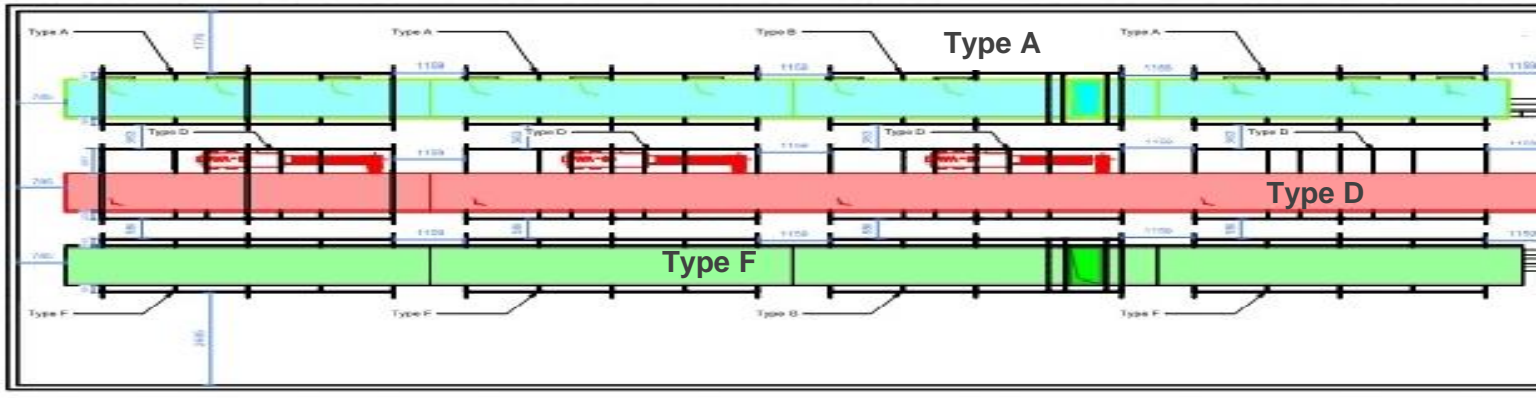
5

Modules Installation

1. Manufacture steel frame modules
2. Install Pipe support & Springs
3. Install first layer of pipework and accessories
4. Install second layer of pipework and accessories
5. Deliver and connect pipe modules

Shorten the installation period from 3 months to 1.5 months (corresponding to a reduction of around 450 man-days of site labor)

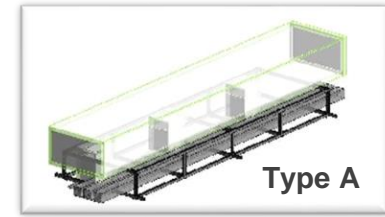
HORIZONTAL BS CEILING MODULES



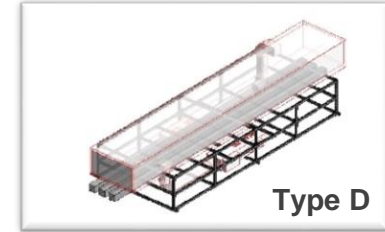
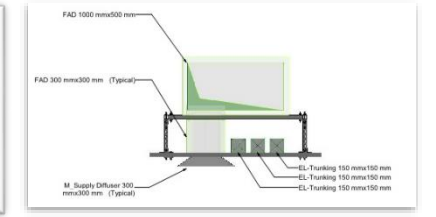
3/F Training Workshop Plan View

Modular Components

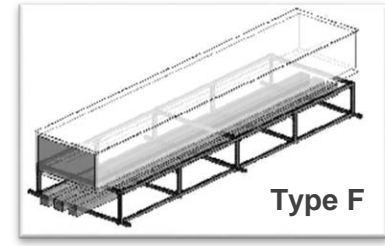
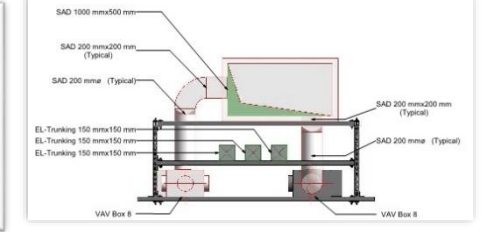
1. Electrical and ELV trunking
2. AC ductwork and VAV boxes



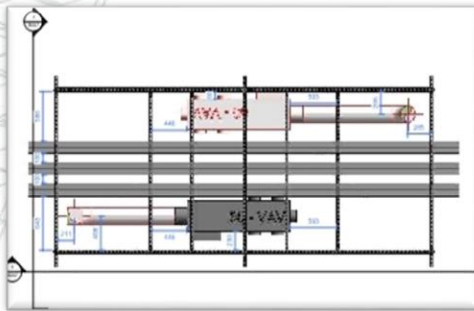
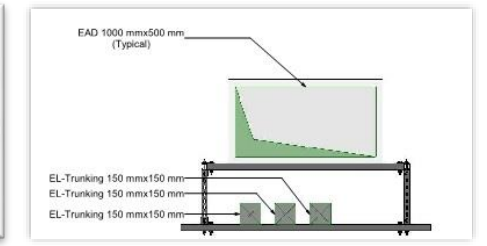
Type A



Type D



Type F



Design of Modules



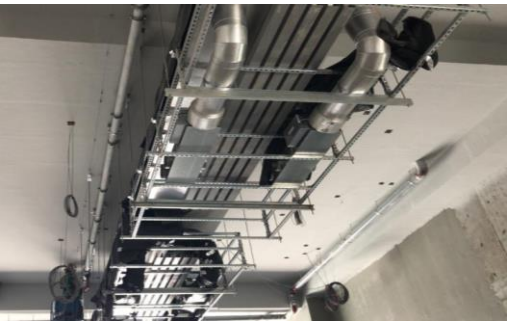
Off-site Prefabrication



Delivery On-site



Ready For Installation



INTEGRATED AHU MODULES



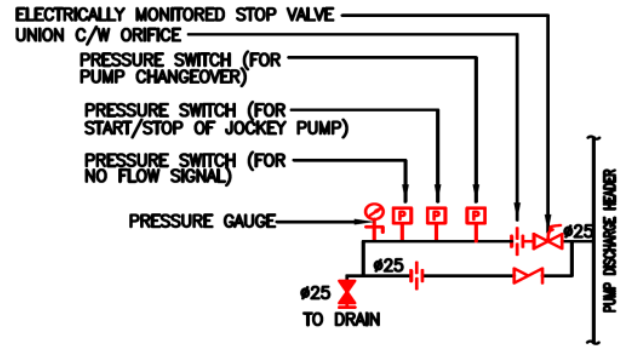
AHU Installation can be done concurrently with the builders work

Save installation time of complex piping and wiring connection

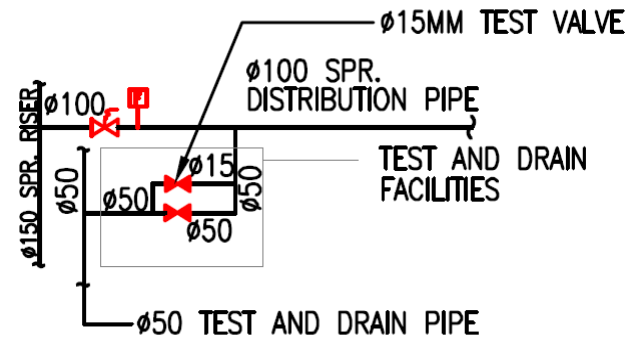
Shorten the installation period from 8 weeks to 4 weeks

Sprinkler System

Pressure Switch Assembly, Test and Drain Facilities & Pipework



Pressure Switch Assembly for Sprinkler System



Sprinkler Test and Drain Facilities

FS Installation	Time required (Conventional)	Time required (MiMEP)
FS Pipework Installation	12 Weeks per floor	8 Week per floor
Pipe Painting	6 Weeks	1.5 Week
Pressure Switch Assembly	2 Week	4 days
Sprinkler Test and Drain Facilities	4 Weeks per floor	2.5 Weeks per floor

PUMP ROOM MODULE

Prefabrication of most components saves on site construction time

Shorten the installation time from 160 hours to 40 hours (corresponding to a reduction of around 15 man-days of site labours)



Pump room modules in Pat Heung



Pump Room Electrical Panels and Pump Modules



Installed Electrical System and Control Panel



Installed Pump Modules



Birds-eye View Of Installed Pump Room



Architectural features of pump room modules

PLUMBING AND DRAINAGE MODULES

PD Modules manufacturing and installation

1. Soil & Waste Pipe
2. Flushing Water Supply Pipe
3. Vent Pipe
4. Fresh Water Supply Pipe

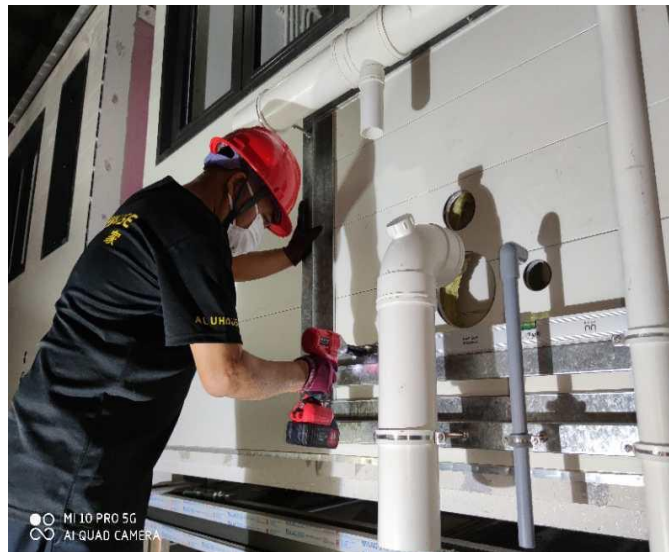
Shorten the installation period from 1200 hours to 300 hours (corresponding to a reduction of around 110 man-days of site labours)



Module pre-installations in factory or on-site



Module Manufactures in the Factory



Module Installations in the Factory

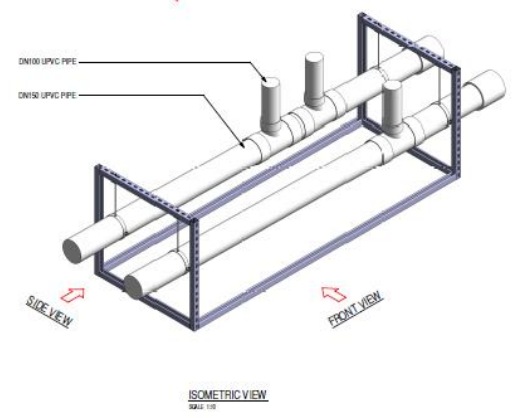


Actual Installed Modules and BIM Drawing of Drainage Module Installations for Pre-alignment

UNDERGROUND DRAINAGE MODULES

Quarantine unit row in **back to back configuration & Dirty corridor arrangement**

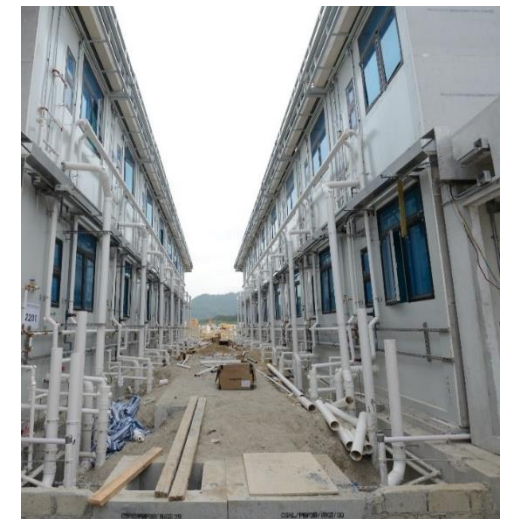
Parallel Operation of BS and builder works through use of flying factory, pre-casted trenches and prefabricated drainage pipe modules



Prefabricated Drainage pipe modules to be installed



Installed drainage pipe modules installed in pre-casted trench

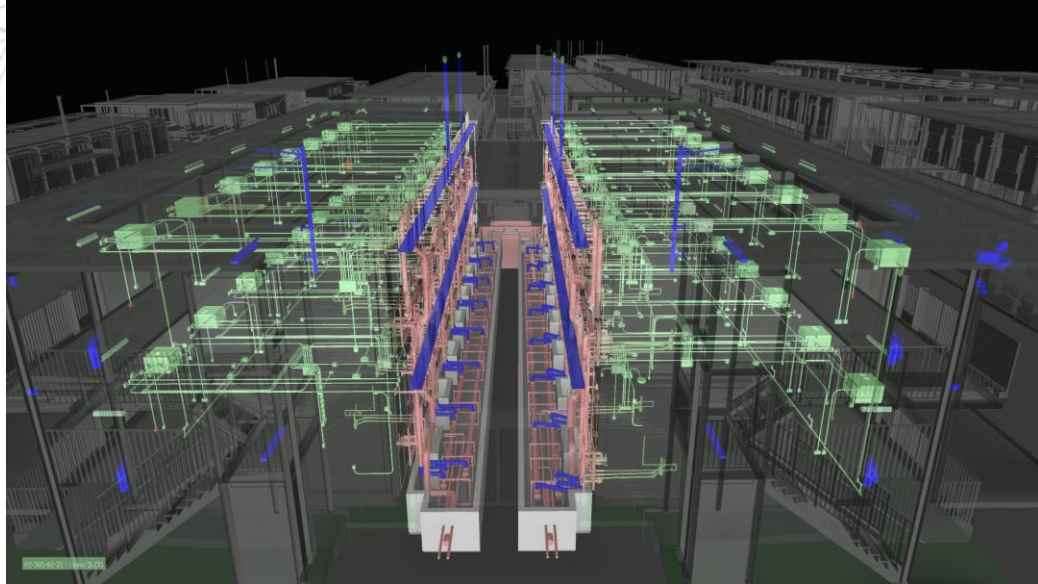


Trench and drainage pipes located at dirty zone connected to each unit

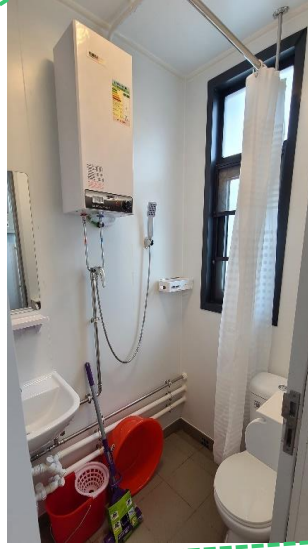
Module Fabrication Drawing from CSD

MiC UNITS WITH PRE-INSTALLED BS EQUIPMENT

- Pre-installed off-site
- DfMA Module
- On site



MCB Board



Fused Spur Unit
Storage Type
Water Heater



Home Feel
Lighting Fitting



Smoke Detector
(Addressable)

Socket
Outlet

TV Point

A/C

MULTI-TRADE HORIZONTAL CEILING MODULES

Module components

1. Electrical and ELV trunking
2. Medical Gas Pipes
3. Air Ducts



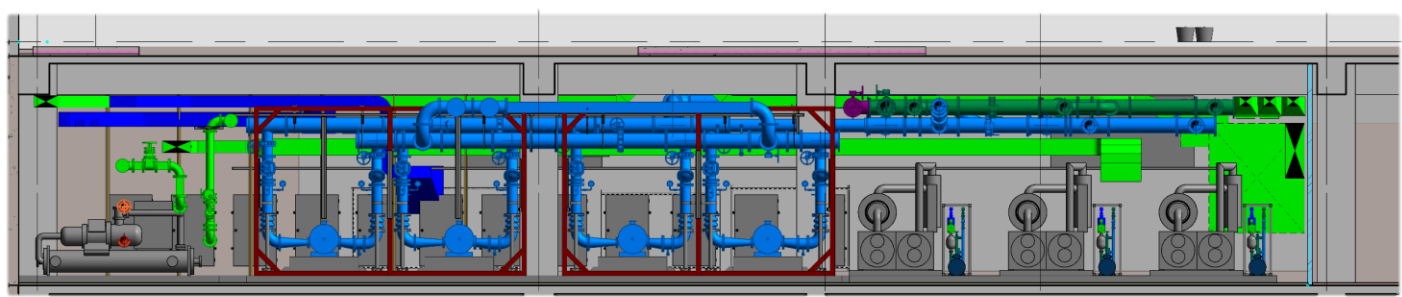
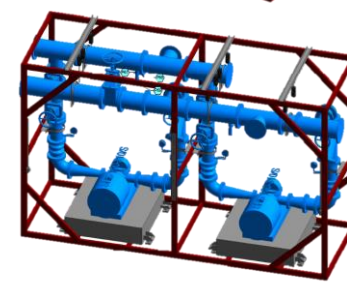
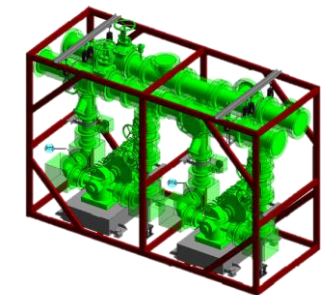
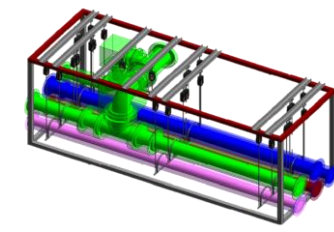
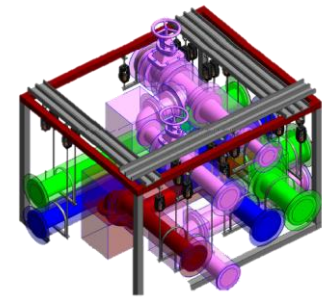
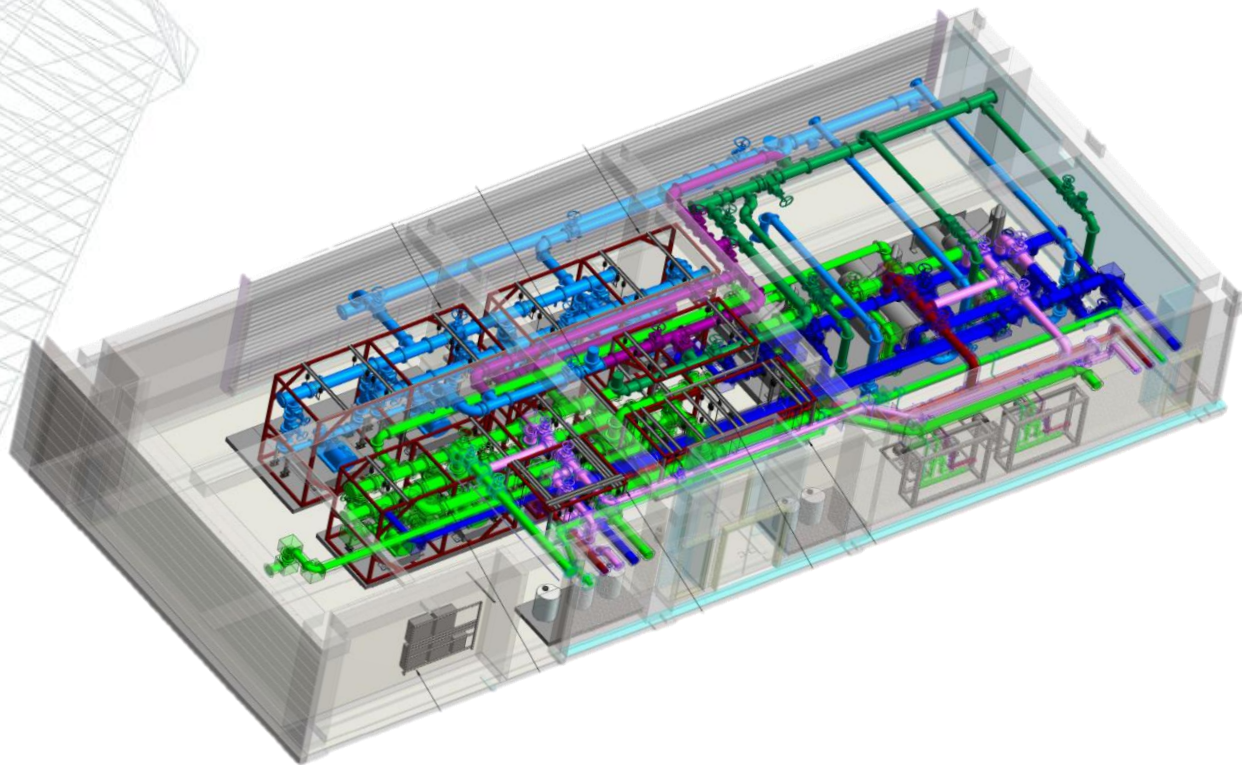
MiMEP modules are installed with transparent ceiling panels in wards

QR Code tag for accessing as-built drawings of MiMEP



ELV trunking for User is allocated at the bottommost part of MiMEP module which can be easily accessible by User's contractor for wiring work at later stage

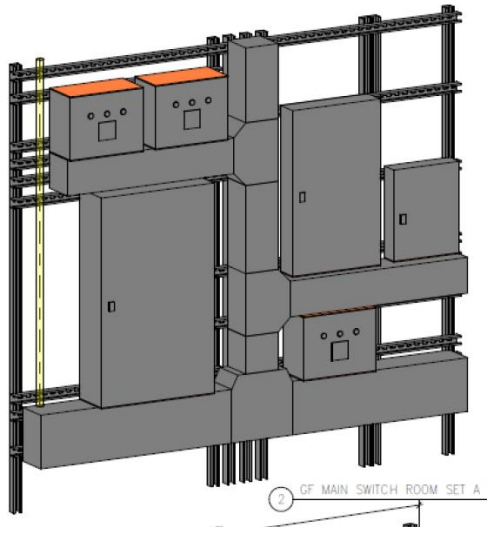
Chilled Water Plant Pipework System



Chilled Water Plant Pipework System

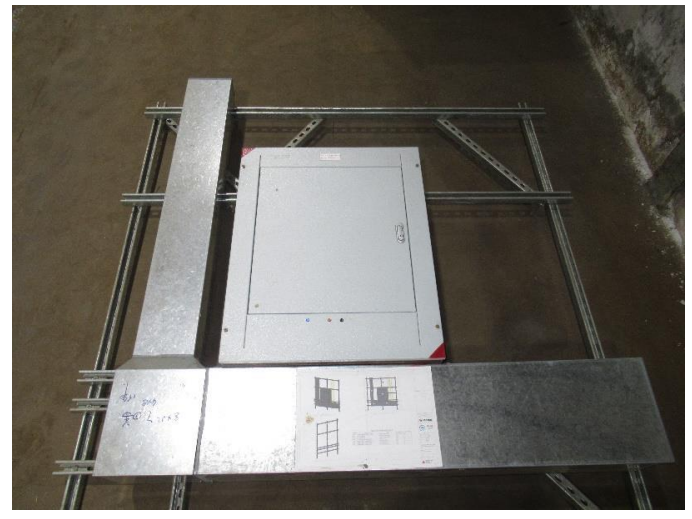
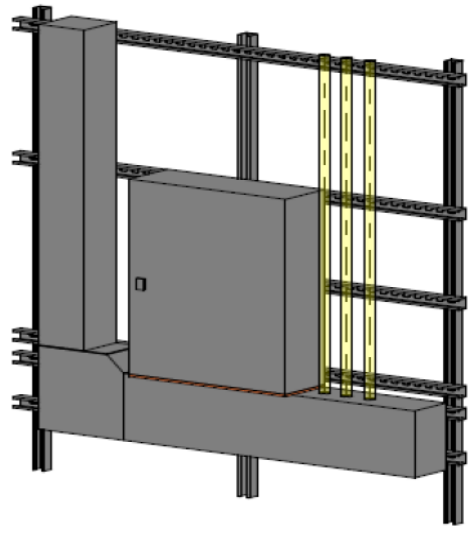
Pipework Modules

Panelised Electrical Modules



Modular Components

1. MCCB/ MCB Boards
2. Power Quality Meter Panels
3. Trunkings & Tee Fittings
4. Cables



Panelised Electrical Modules in Main Switch Room

FEEDBACK FROM THE STAKEHOLDERS

Shorten the Construction Period



- BS and builder works can be done in parallel

Cost Savings



- Contract preliminaries reduced due to shortened programme
- Scale of economy by standardization
- Optimisation of modular size

Improve Health and Safety

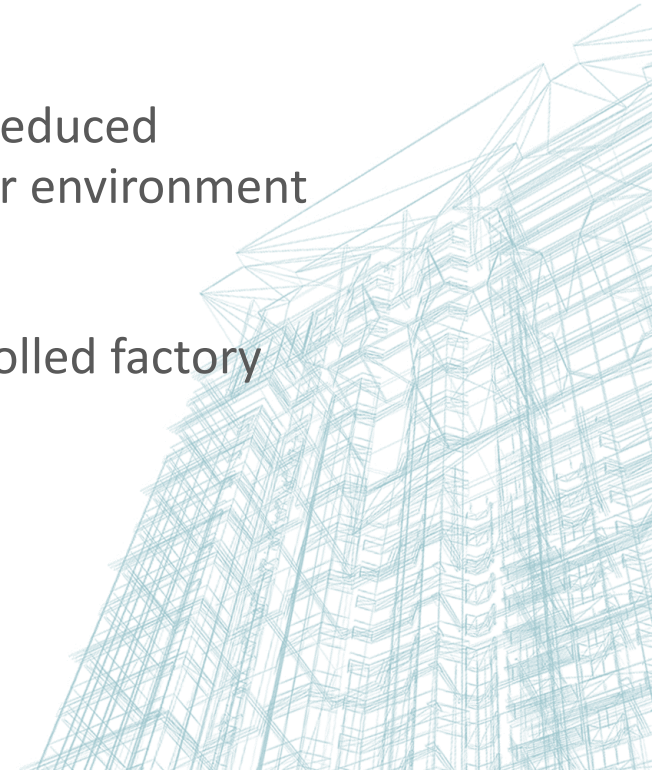


- Risks relate to working at height can be reduced
- Factories contribute to a cleaner, safer environment

Enhance Quality Control



- Procedures can be carried out in a controlled factory environment



FEEDBACK FROM THE STAKEHOLDERS

Predictable Progress



- Progress less dependent to weather conditions

Productivity



- Assembly of MiMEP is faster in a control factory environment and leads to manpower and time saving

Sustainability



- Less construction waste is generated as less rectification work

Revolutionary Coordination



- Programme, spatial, pre-assembly, delivery, assembly, module interconnection, construction sequence, digitizing ITC, asset M&M coordination

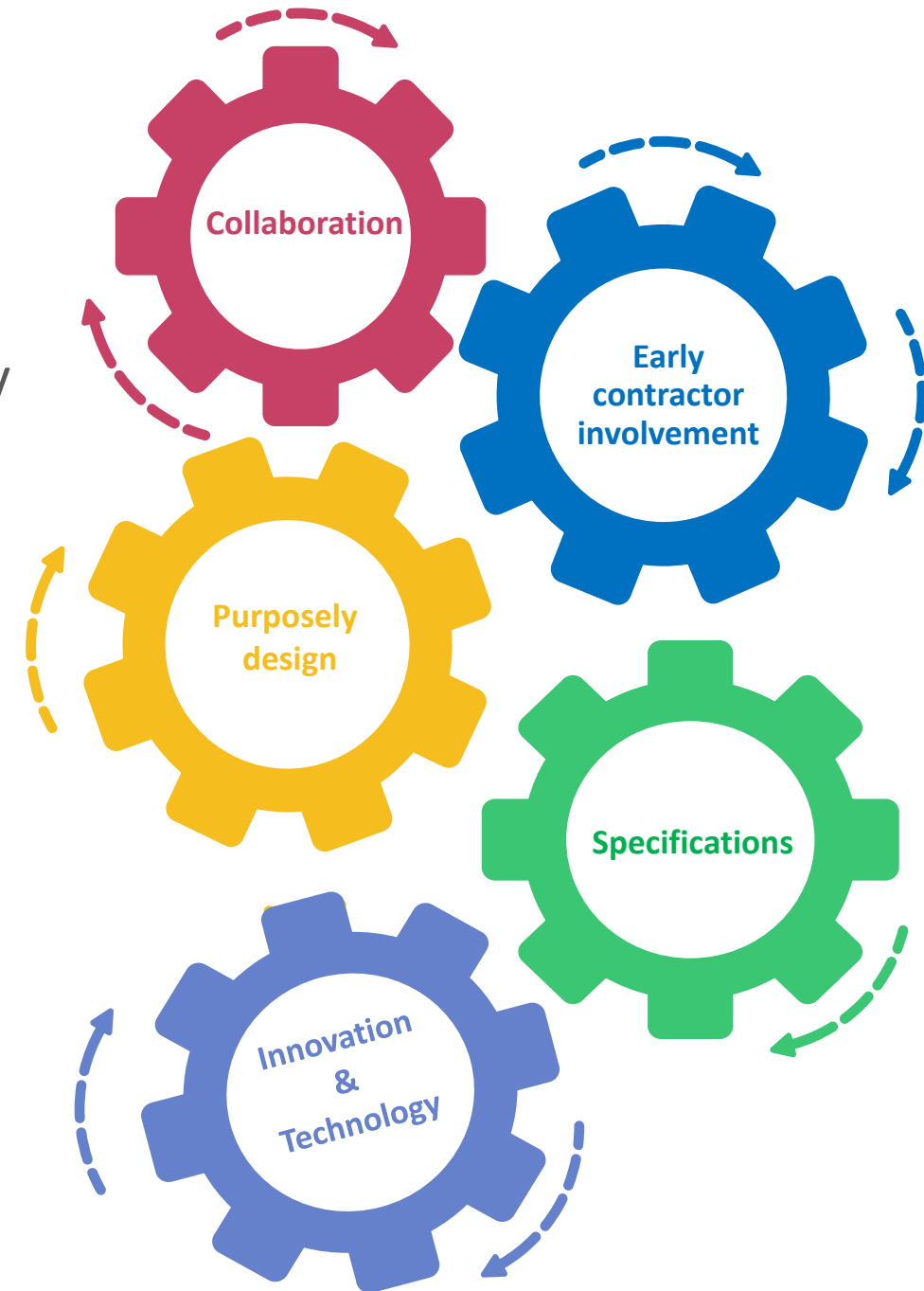
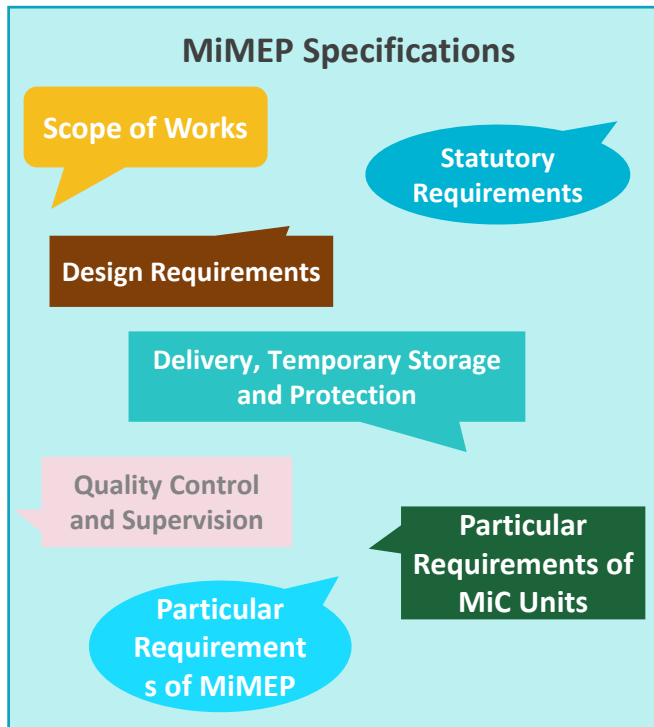
Integrated Use of BIM & MiMEP



- Digitization, technology, embedding RFID, smart safety

WIDER ADOPTION OF MIMEP

- Collaborations with the stakeholders
- Early contractor involvement
- Design for offsite fabrication, delivery and plug n play
- Guidelines and specifications for implementation
- Application of innovation and technology



CHALLENGES AHEAD...

- Off-site pre-fabrication yard with quality assurance scheme
- Sustainability for long-term investment
- One-for-all: Standardization of module frame design
- Capacity building: Regular training to ensure sufficient expertise
- Platform to share relevant experience and knowledge to new players
- Sufficiency of supply chain for MiMEP
- Close coordination between M&E Contractor and Main Contractor on-site logistic
- Partnering approach



MIMEP NURTURING AND BLOOMING



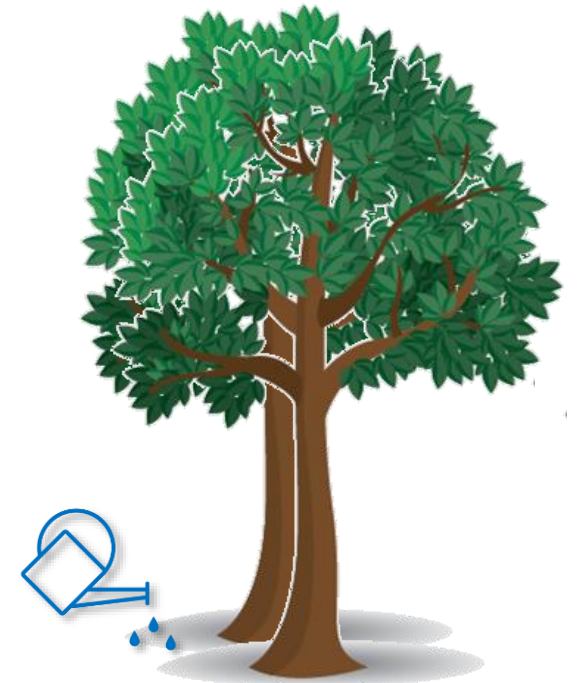
Adoption at
project
basis



Trade
acceptance



Standards
&
Guidelines



Adoption
as Practice

Nurturing and blooming process

WAY FORWARD

- Simultaneous in-factory and on-site work
- Precise 4D coordination with BIM
- Easier and quicker MiMEP installation
- Less workers working onsite, less time spent working at height
- Safer and cleaner construction sites
- Consistent, quality-controlled process
- Planned work more efficiently with better logistic coordination
- Factory controlled quality
- Maintenance Friendly
- Enhanced asset management



THANK YOU



建築署

Architectural Services Department