CIC – DfMA Alliance Forum Integrated Digital Delivery
24 July 2019

DfMA for MEP in West Kowloon Government Office

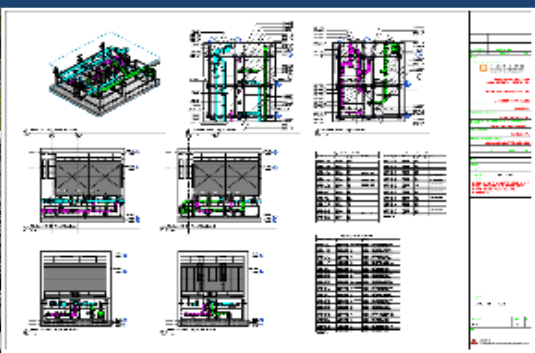
Mr. Gary L.P. Fong

Project Manager

FSE Engineering Group Ltd







Content

1. Planning for MEP DfMA
2. Pre-requisite Requirement
3. Workflow for Modules Installation
4. Optimize the working sequence
5. Video for Cooling Tower Modularization
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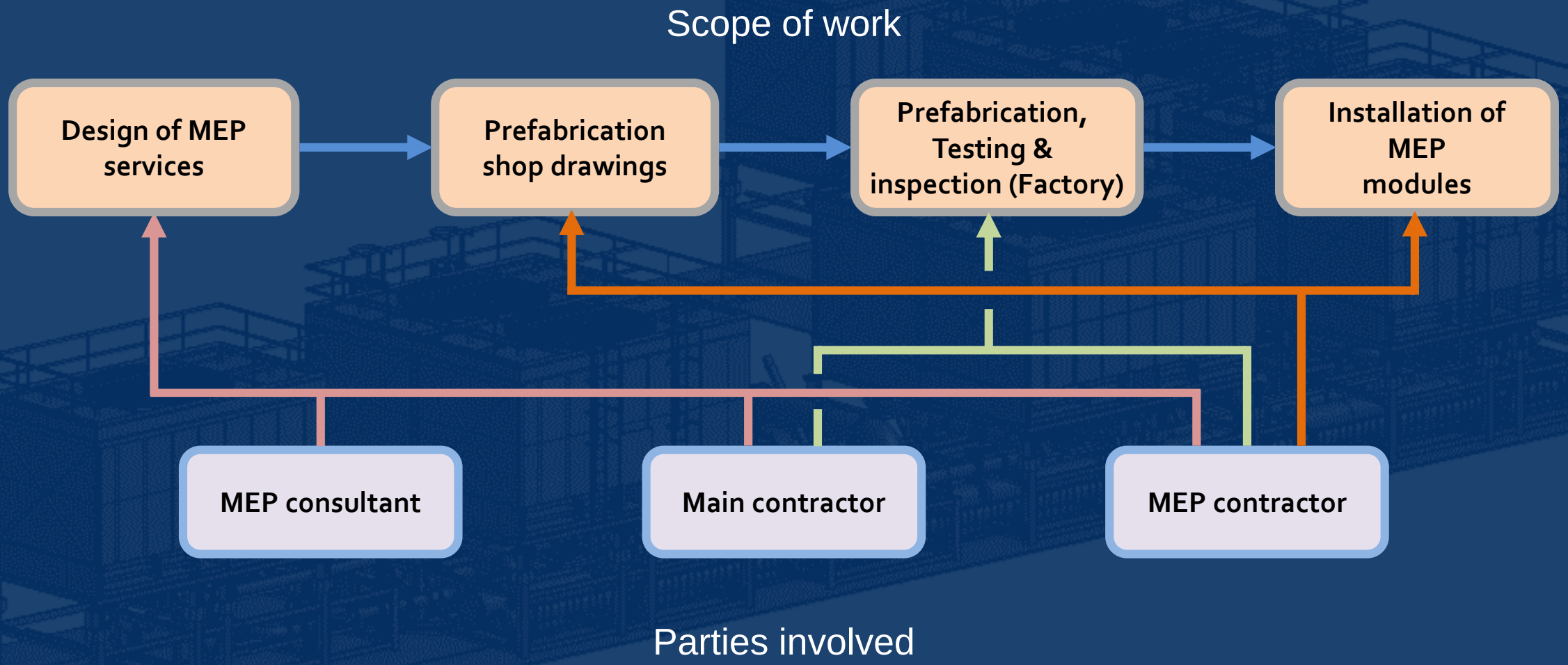
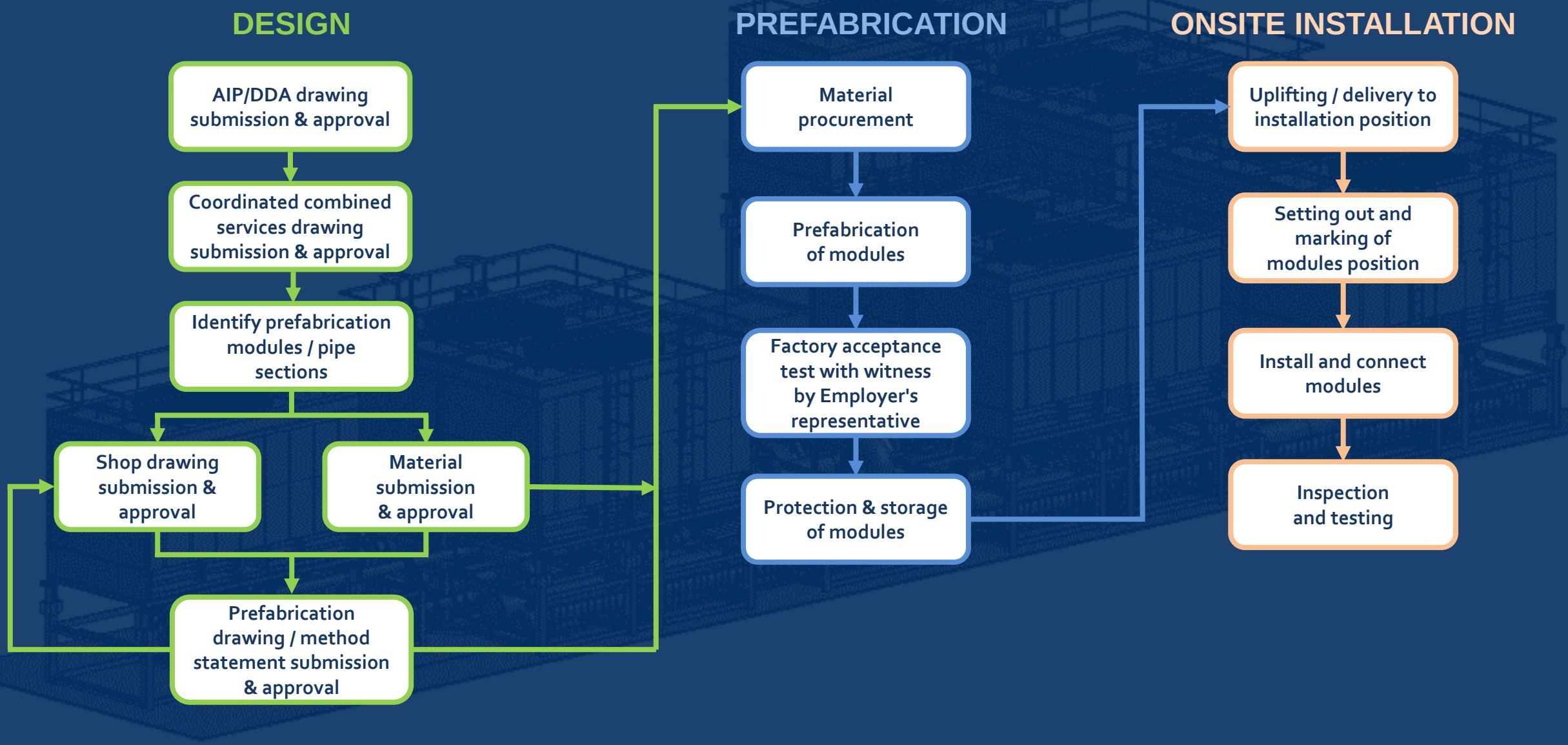
7. Advantage

Involvement of Various Parties in MEP DfMA



Planning for MEP DfMA

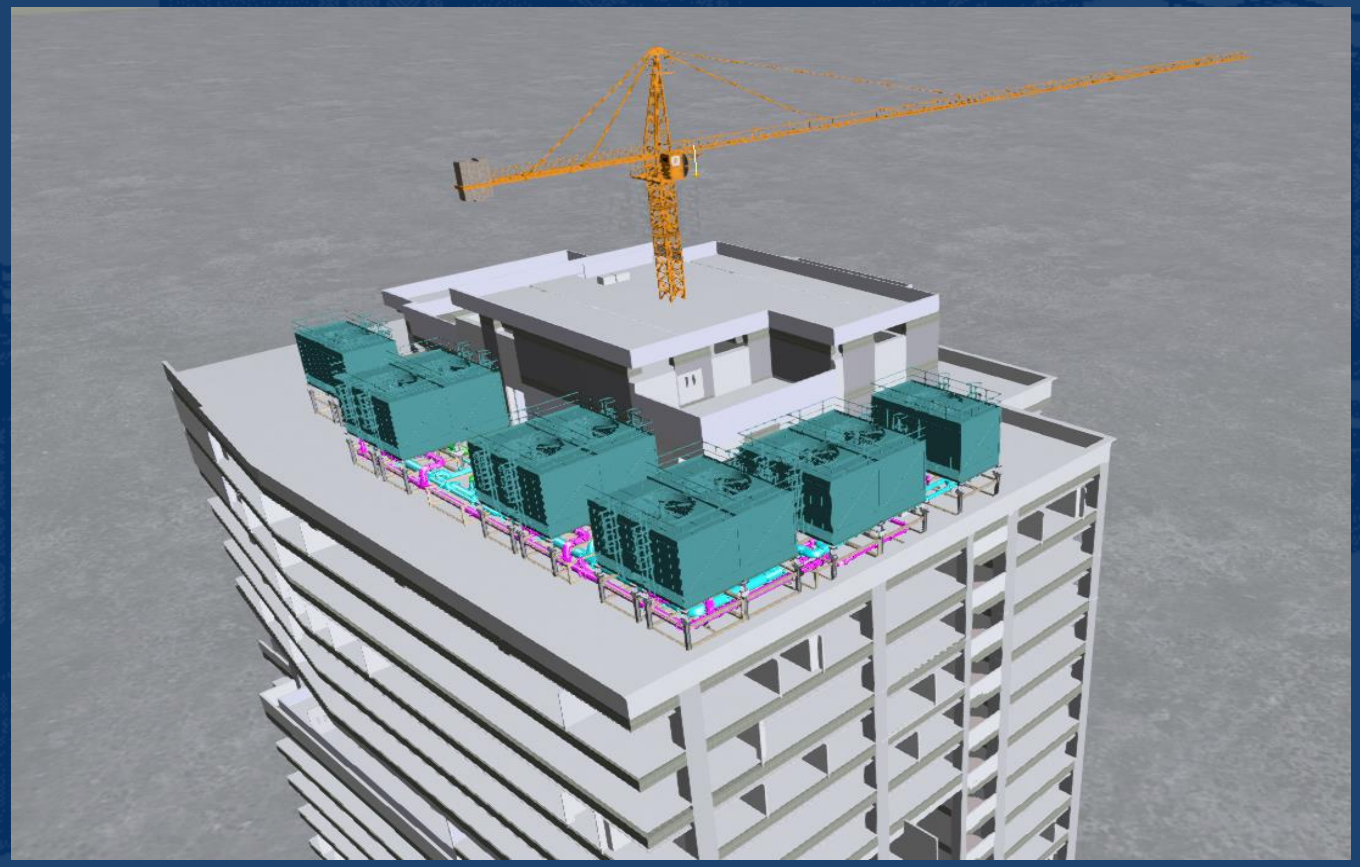


WKGO Cooling Tower Modularization

Vertical Transportation

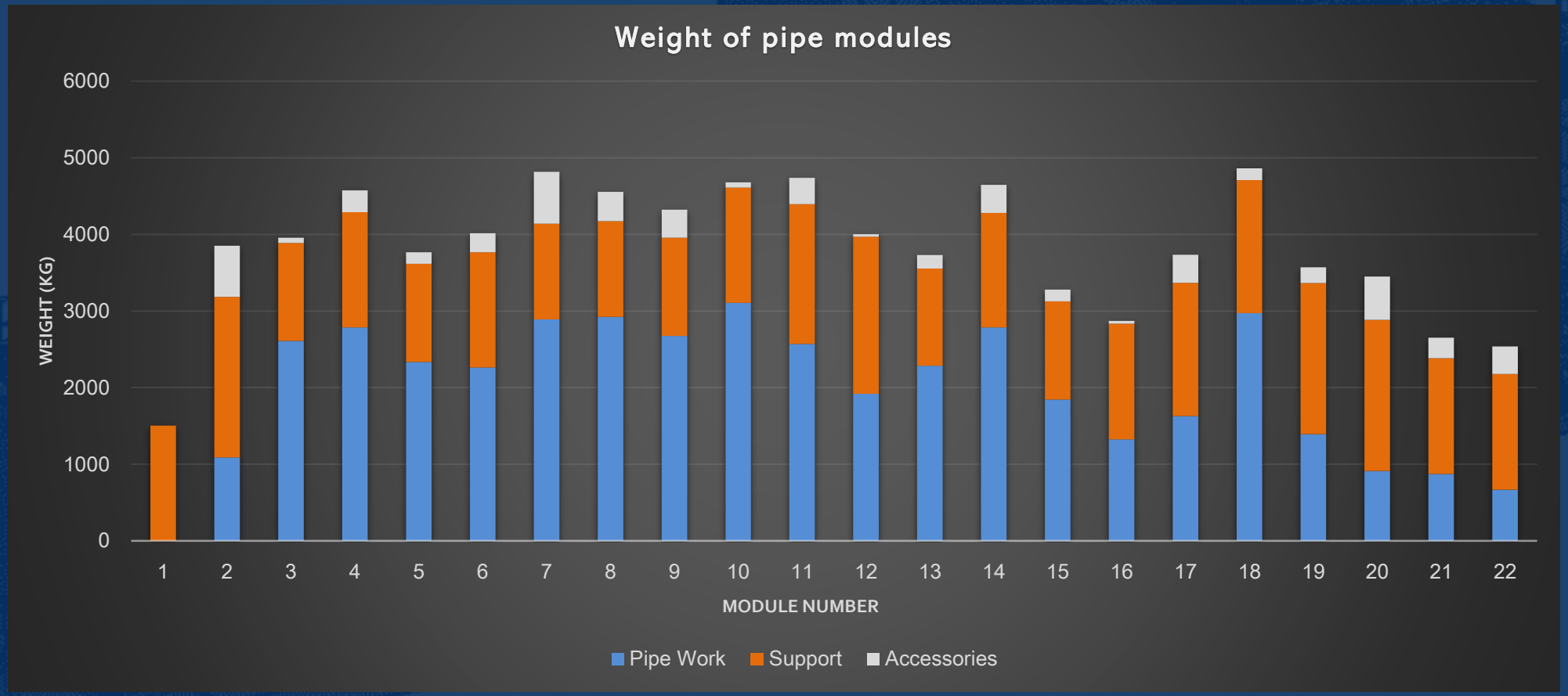
Tower crane capacity:

5 tons at a radius 40m



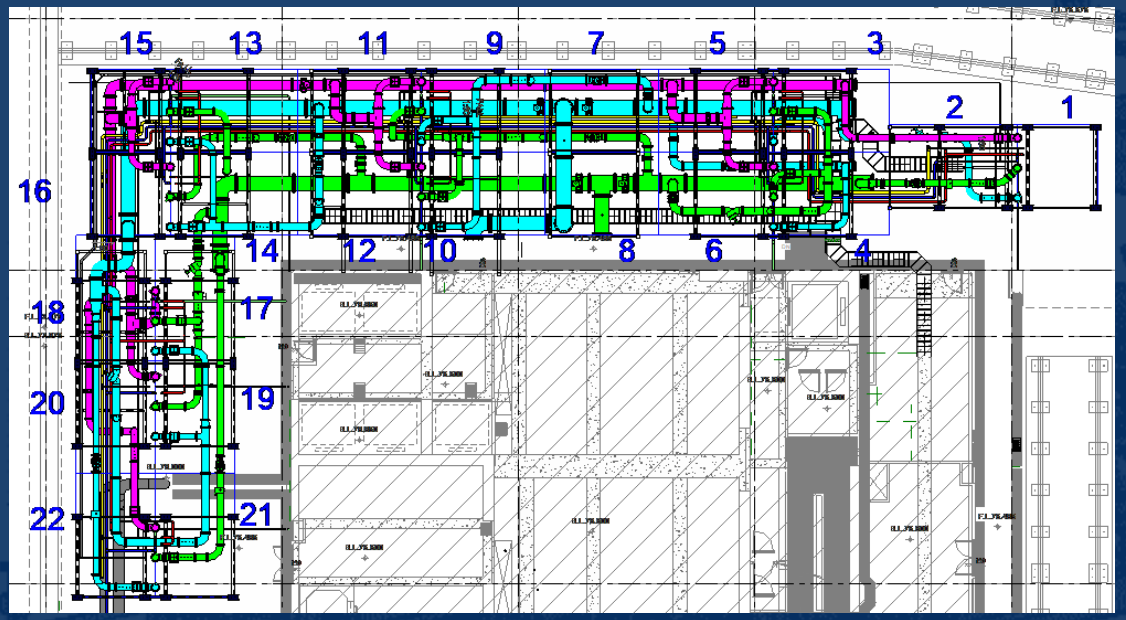
WKGO Cooling Tower Modularization

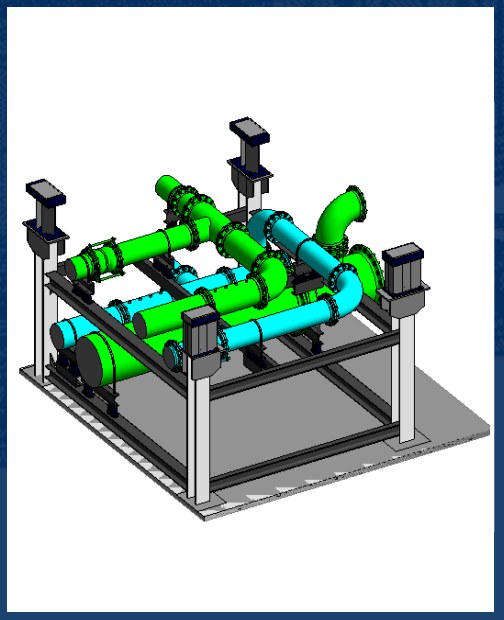
Number of Modules and the Criteria of Segmentation



WKGO Cooling Tower Modularization

Number of Modules and the Criteria of Segmentation

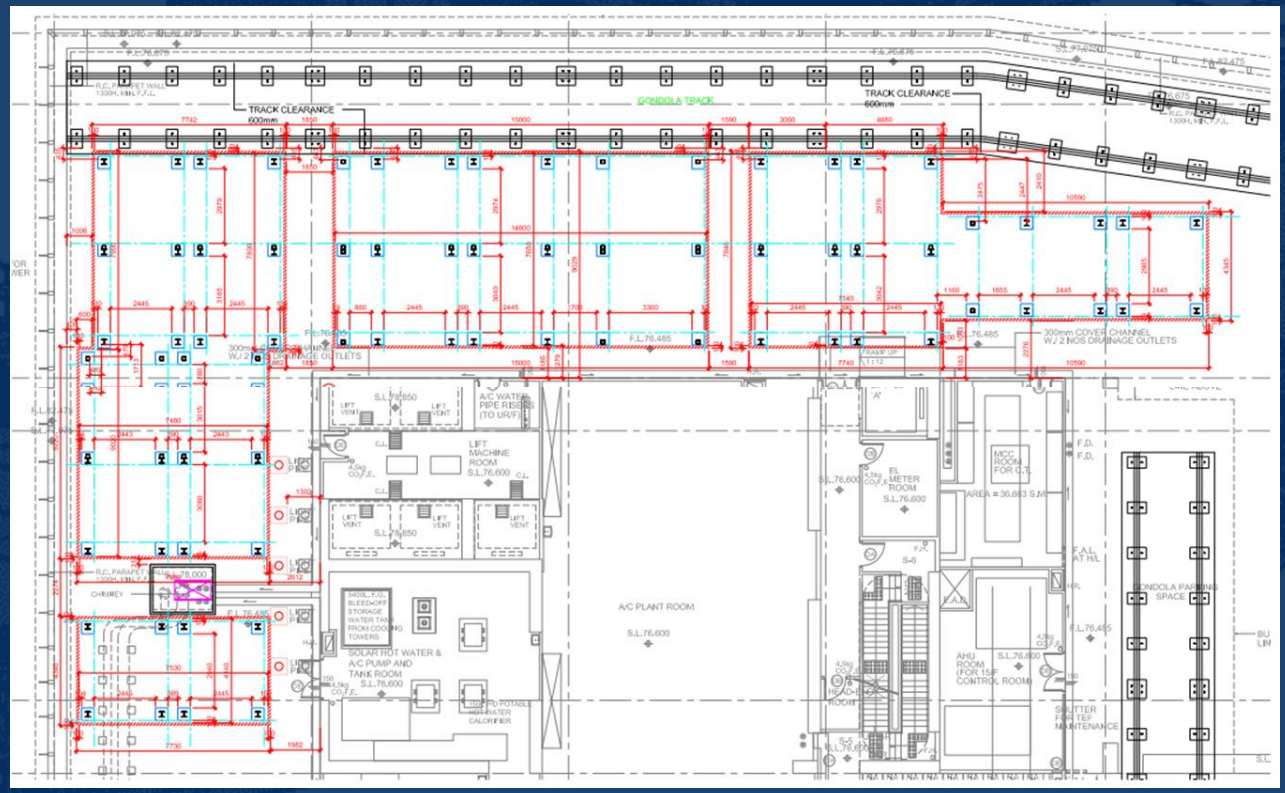




Max. Dimension: 5m(L) x 4m(W) x 3.5m(H)

WKGO Cooling Tower Modularization

Working drawing for the coordinated setting out of floating plinth, pipe modules and cooling tower modules



WKGO Cooling Tower Modularization

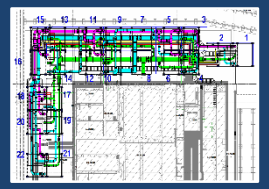
Location and Facilities of the Prefabrication Workshop

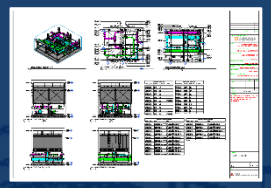
- Lane for large vehicles to deliver the pipe modules
- Floor condition and area of the workshop
- Lifting Tools for prefabrication

WKGO Cooling Tower Modularization

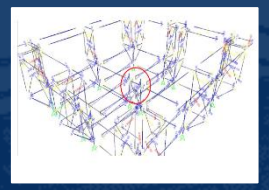
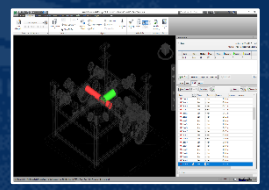
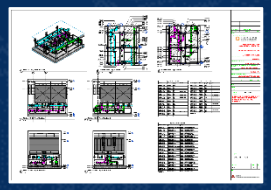
Workflow for Modules Installation

Design of Pipe Modules → **Coordination** → **Procurement** → **Off-site Prefabrication** → **Positioning** → **Delivery** → **On-site Installation**

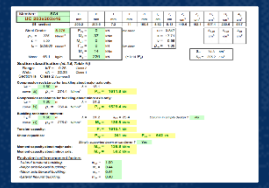
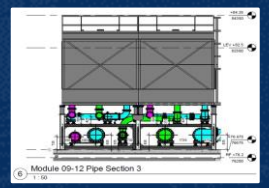


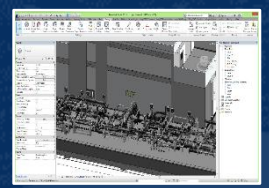


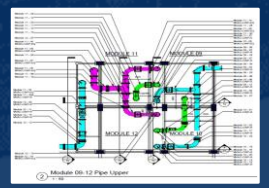




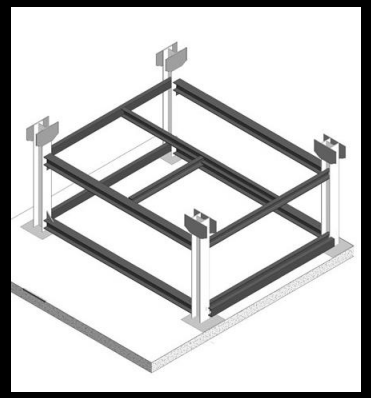




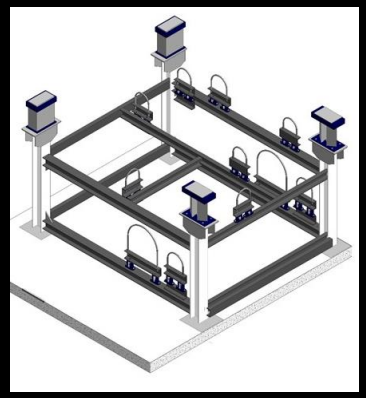



WKGO Cooling Tower Modularization

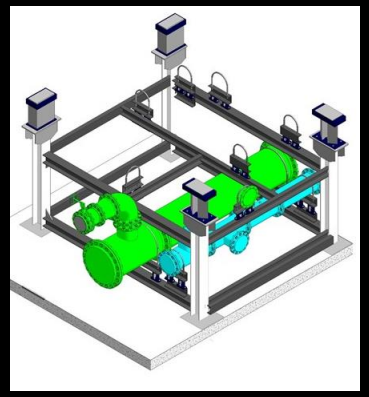
Installation Sequence of Pipe Modules



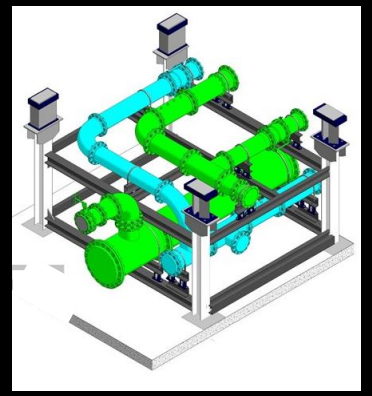
Phase 1
Manufacture steel frame modules



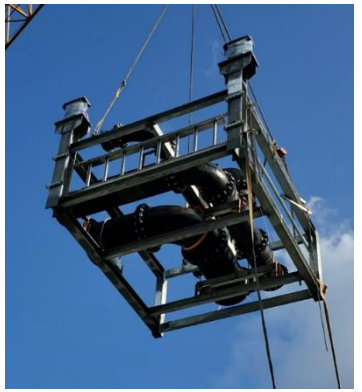
Phase 2
Install pipe support & springs



Phase 3
Install first layer pipework c/w accessories

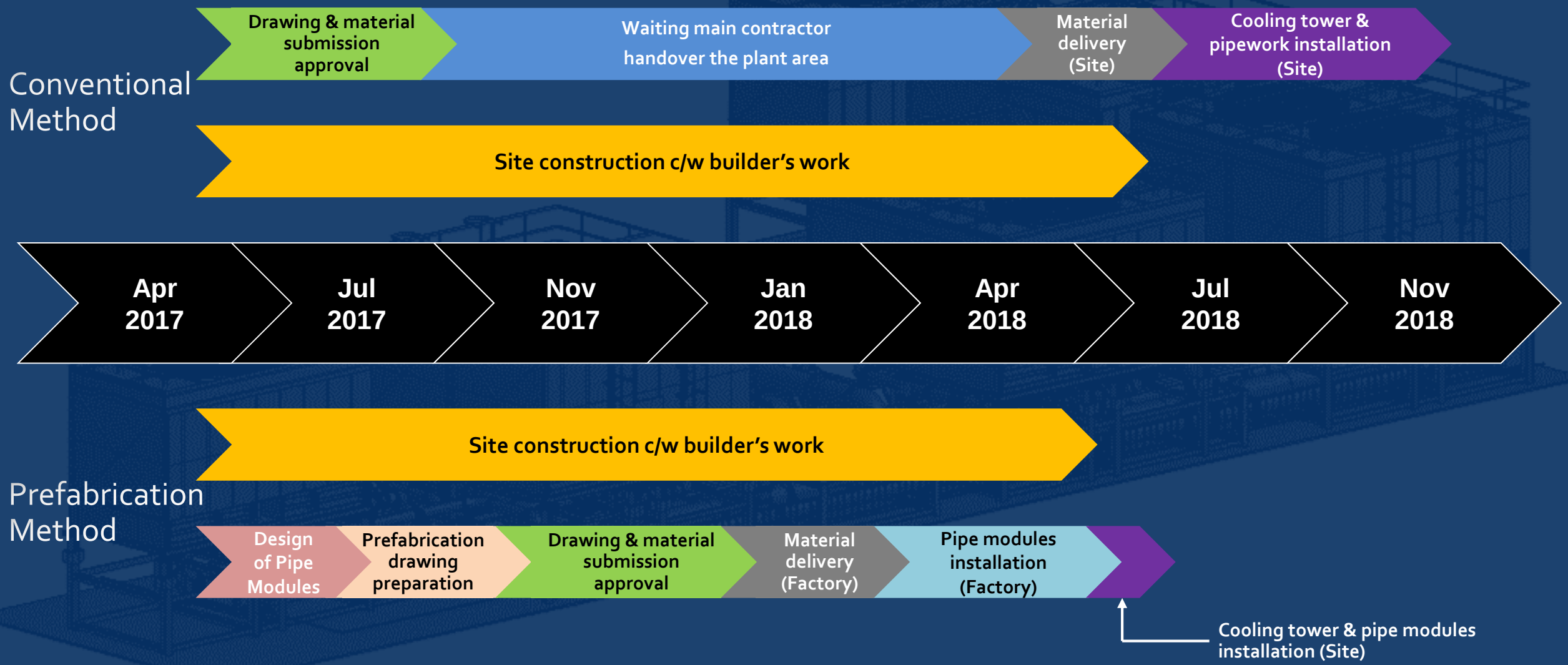


Phase 4
Install second layer pipework c/w accessories



Phase 5
Deliver and connect / install pipe modules

Comparison of Installation Timeline between Conventional Method & Prefabrication Method



Why DfMA can be Widely Used?

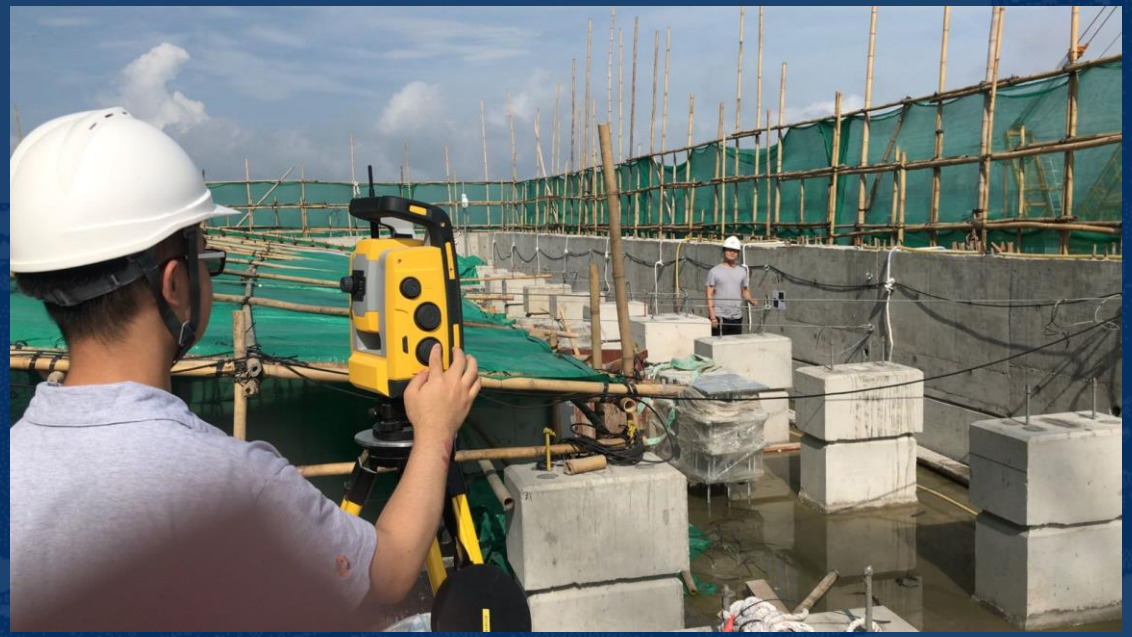
1. Can Accurate Position and Align MEP Services (By RTS)

2. Survey Site Conditions and Compare Against BIM (By 3D scanning, VR)

3. Support by the Government / Industry

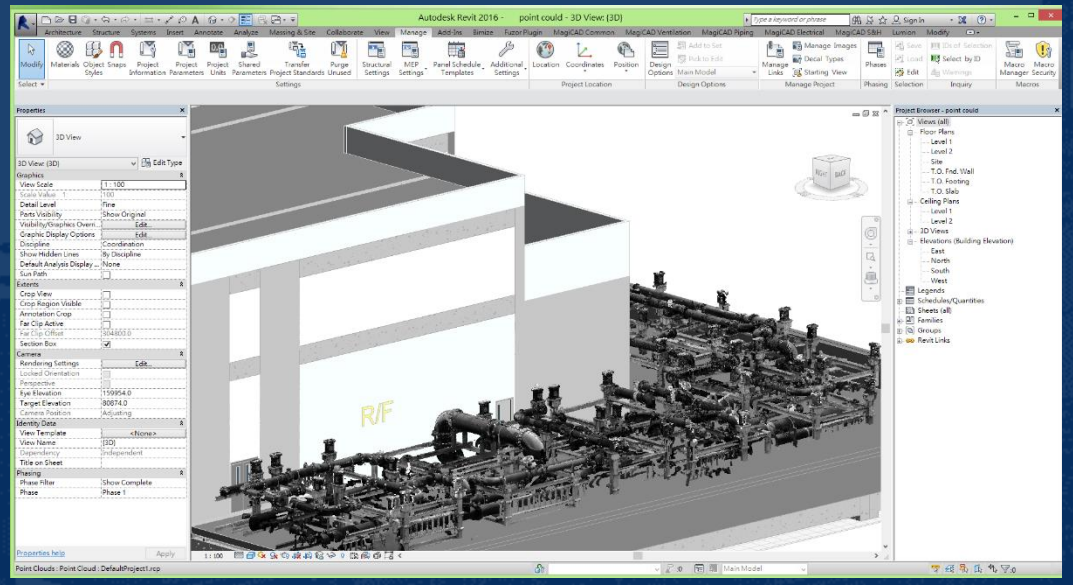
BIM Modularization - Tools

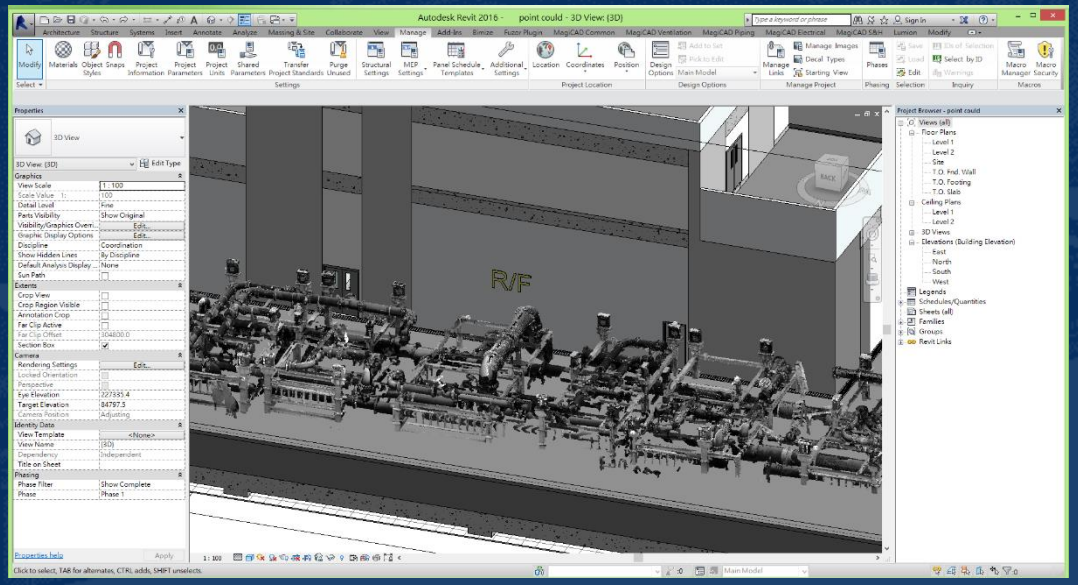
Accurate Positioning - RTS



BIM Modularization - Tools

Accurate Positioning – 3D scanning

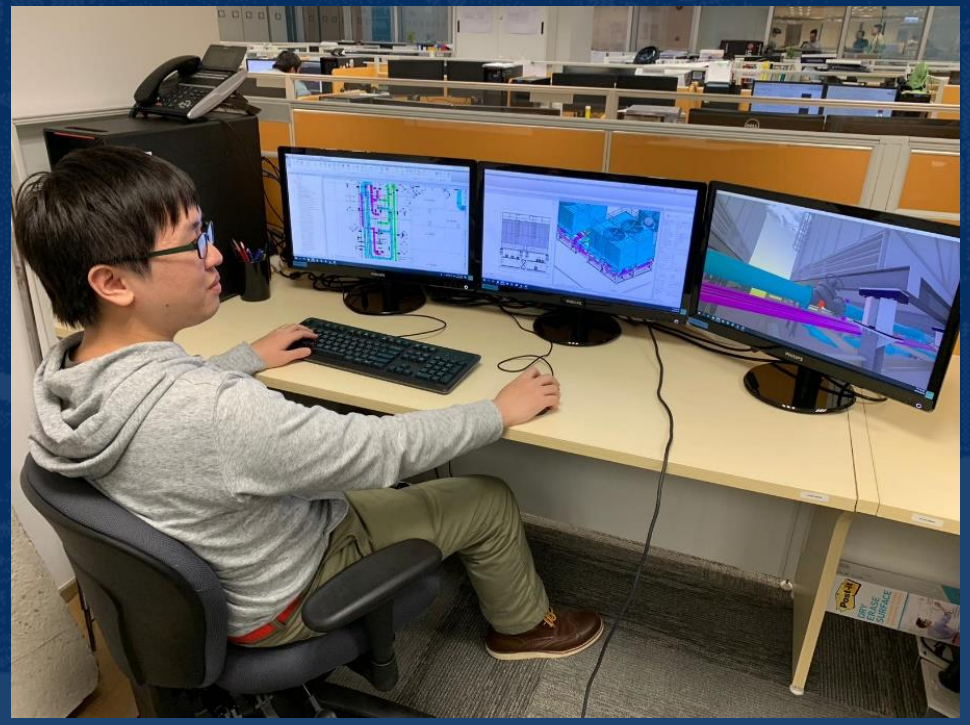




BIM Modularization - Tools

Visualization

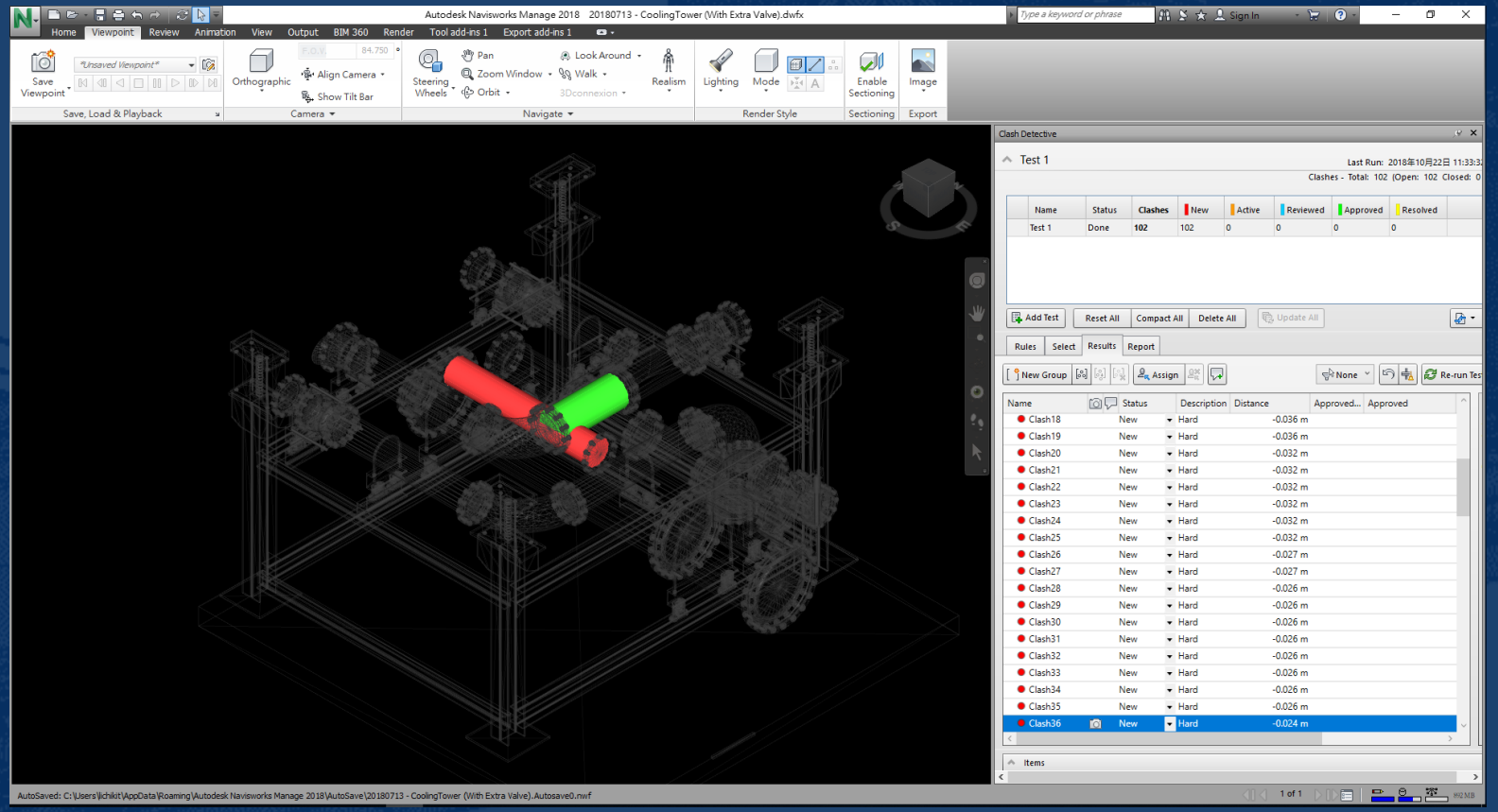
VR Support



Real Time Editing

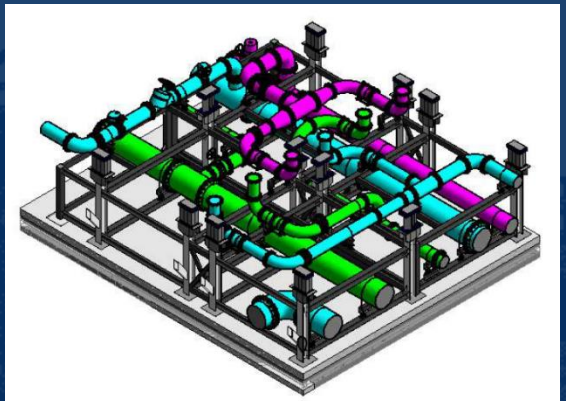
BIM Modularization - Tools

Clash Analysis

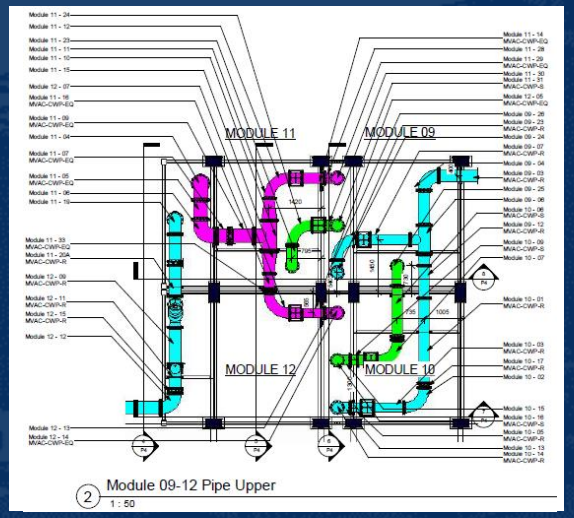


BIM Modularization - Tools

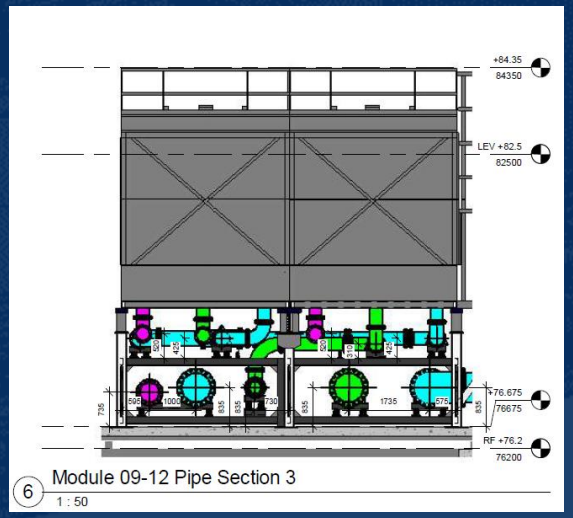
Attributes Embedded in the Model



1 Module 09-12 Pipe 3D View



2 Module 09-12 Pipe Upper
1 : 50



6 Module 09-12 Pipe Section 3
1 : 50

Pipe Schedule - Module 09-12

Module / Pipe No.	Diameter	Length (mm)	Particular
Module 09 - 03	300 mm	1105	
Module 09 - 05	300 mm	945	
Module 09 - 07	250 mm	1122	
Module 09 - 12	250 mm	896	
Module 09 - 13	400 mm	5361	
Module 09 - 18	300 mm	924	
Module 09 - 19	300 mm	1586	
Module 09 - 22	250 mm	940	
Module 09 - 23	250 mm	423	Distance Piece
Module 10 - 01	250 mm	2356	
Module 10 - 03	250 mm	849	
Module 10 - 05	250 mm	310	
Module 10 - 06	250 mm	1386	
Module 10 - 09	250 mm	414	Distance Piece
Module 10 - 11	600 mm	2475	
Module 10 - 14	250 mm	423	Distance Piece
Module 10 - 16	250 mm	538	Distance Piece
Module 10 - 17	250 mm	104	
Module 10 - 18	250 mm	104	
Module 11 - 01	400 mm	3303	
Module 11 - 03	400 mm	418	
Module 11 - 03A	400 mm	834	
Module 11 - 05	350 mm	529	
Module 11 - 07	350 mm	319	
Module 11 - 09	350 mm	613	
Module 11 - 14	250 mm	632	Distance Piece

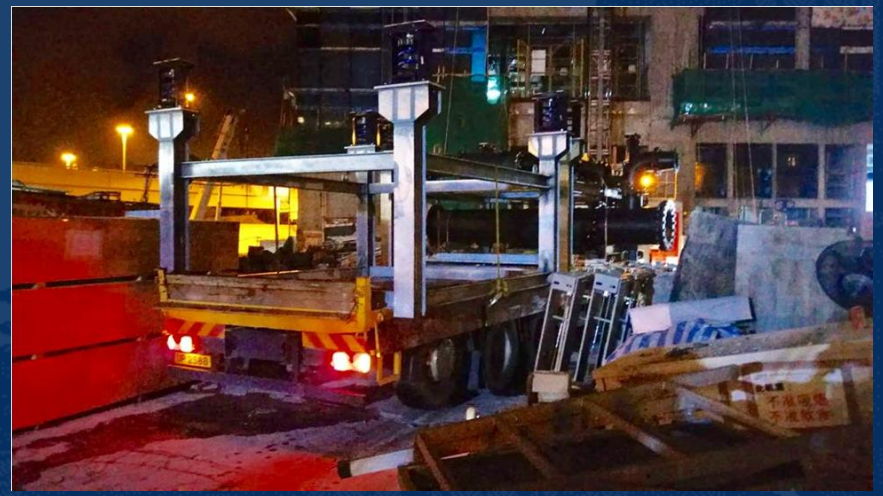
Materials Dimensions for Fabrication

Materials Quantities for Procurement

WKGO Cooling Tower Modularization

Quality Control & Joint Inspection

WKGO Cooling Tower Modularization

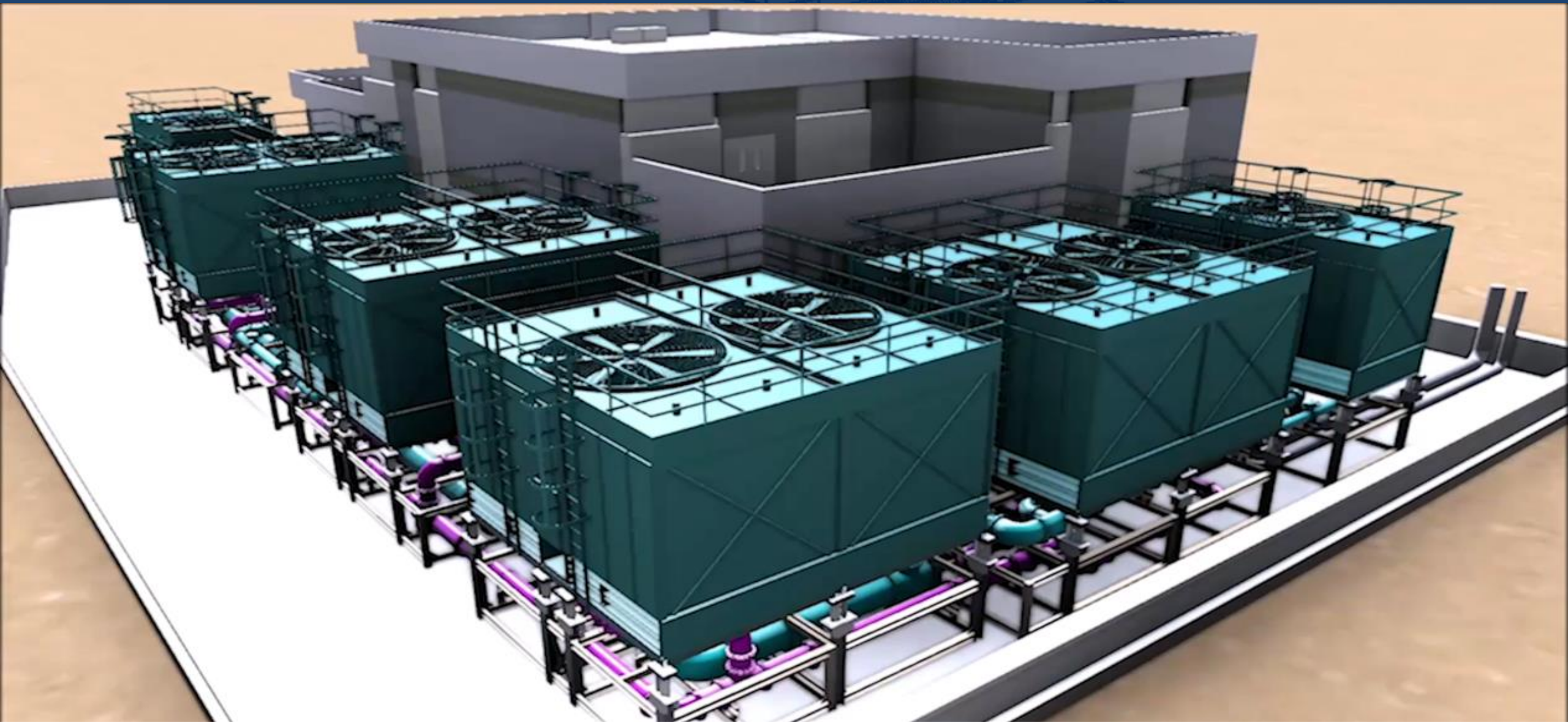


Mid-night delivery of modules due to the allowable lorry width for daytime traffic (3500mm)

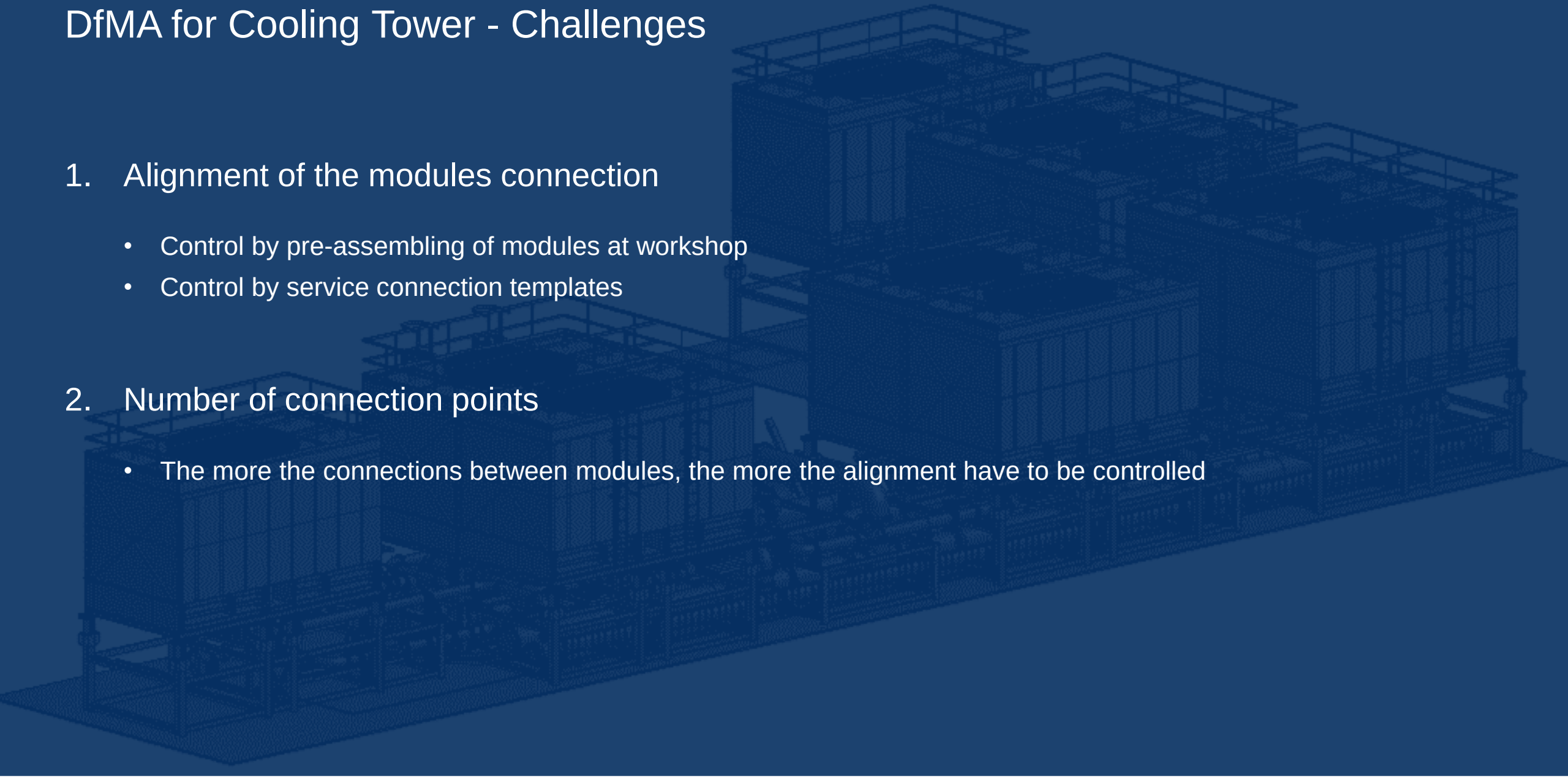
WKGO Cooling Tower Modularization

Module hoisted by tower crane, loading capacity was checked and confirmed in early stage

Video for Cooling Tower Modularization



DfMA for Cooling Tower - Challenges



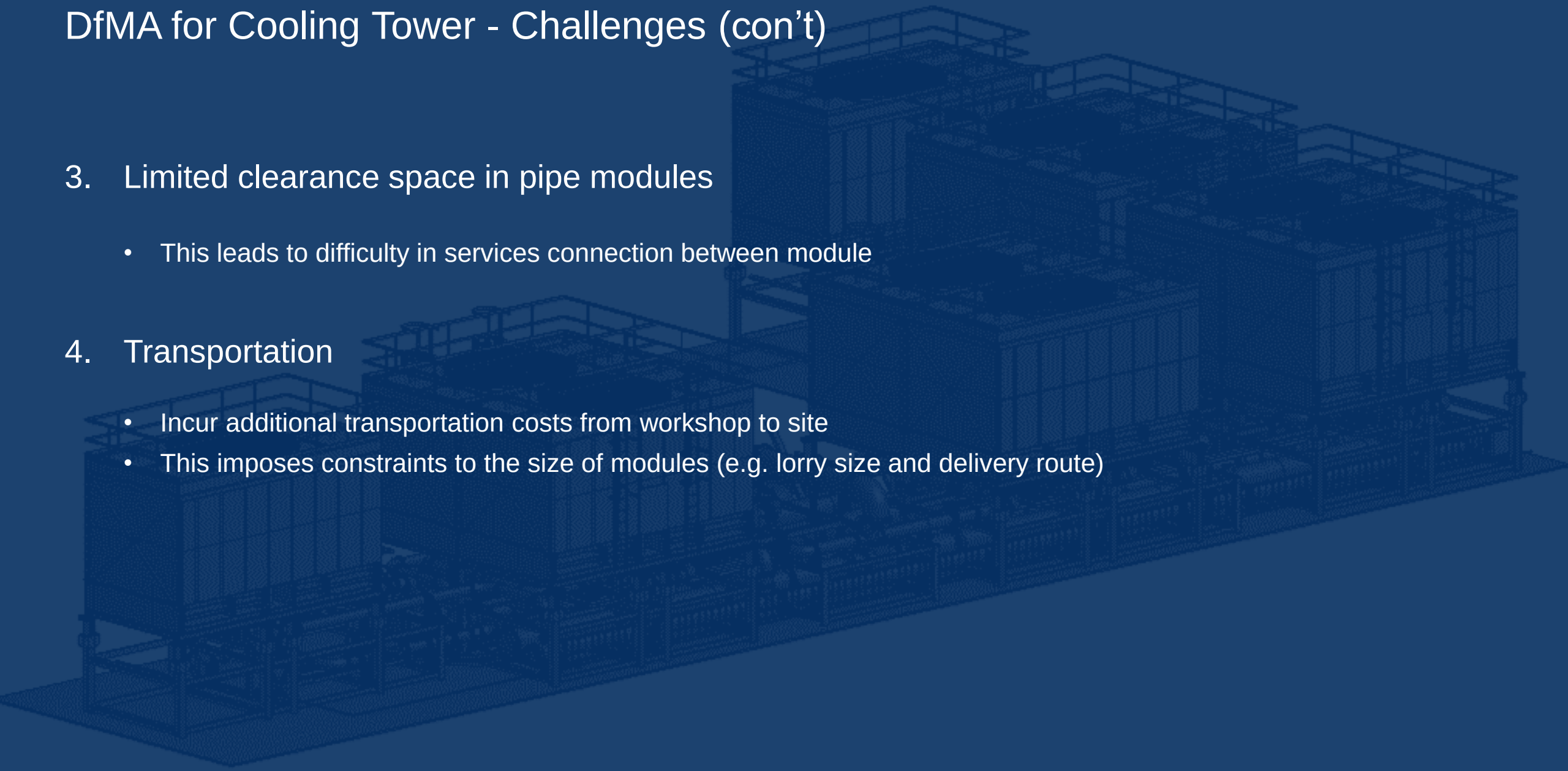
1. Alignment of the modules connection

   - Control by pre-assembling of modules at workshop
   - Control by service connection templates

2. Number of connection points

   - The more the connections between modules, the more the alignment have to be controlled

DfMA for Cooling Tower - Challenges (con’t)



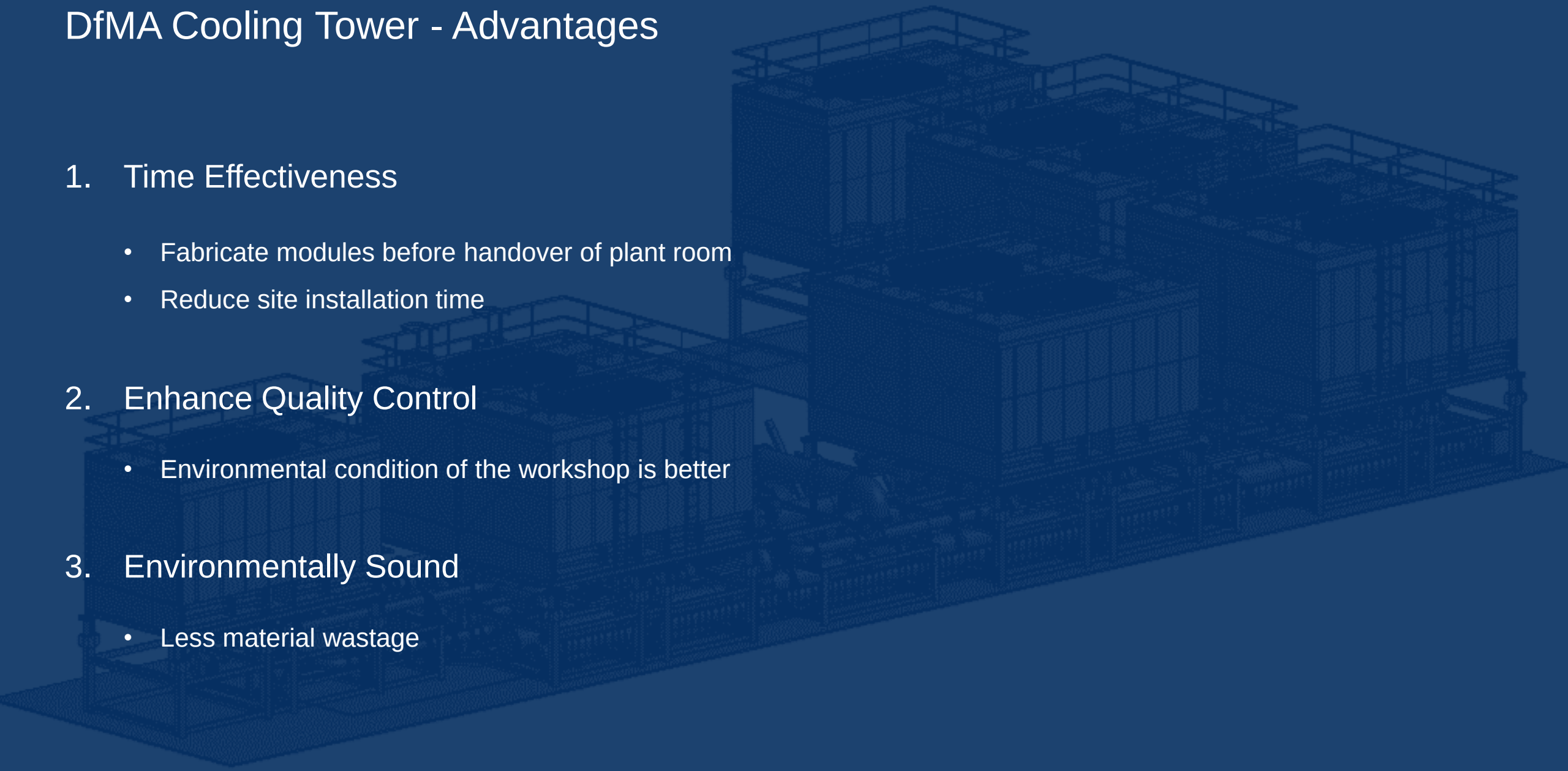
3. Limited clearance space in pipe modules

    - This leads to difficulty in services connection between module

4. Transportation

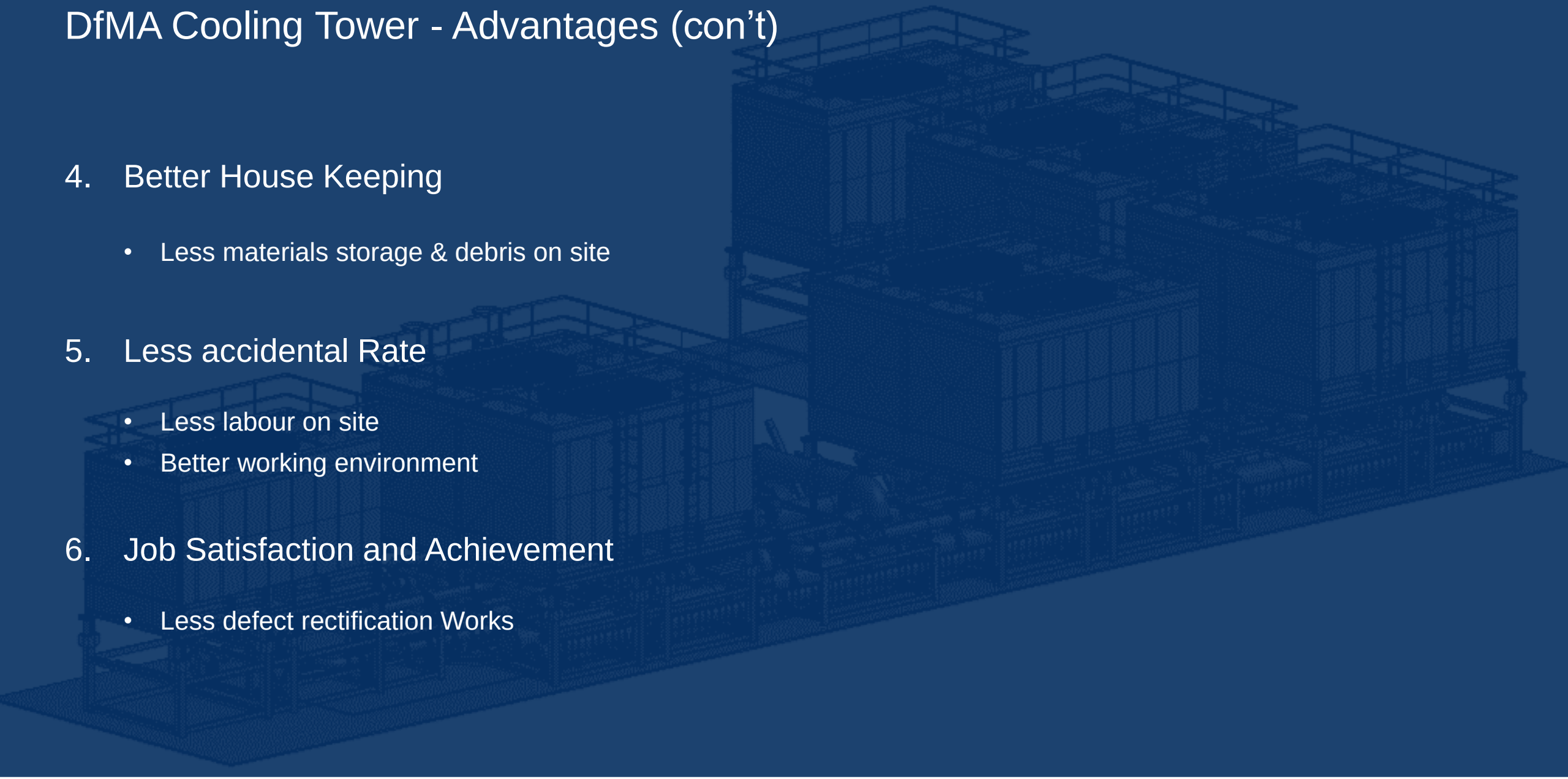
    - Incur additional transportation costs from workshop to site
    - This imposes constraints to the size of modules (e.g. lorry size and delivery route)

DfMA Cooling Tower - Advantages



1. Time Effectiveness
    - Fabricate modules before handover of plant room
    - Reduce site installation time
2. Enhance Quality Control
    - Environmental condition of the workshop is better
3. Environmentally Sound
    - Less material wastage

DfMA Cooling Tower - Advantages (con’t)



4. Better House Keeping

   - Less materials storage & debris on site

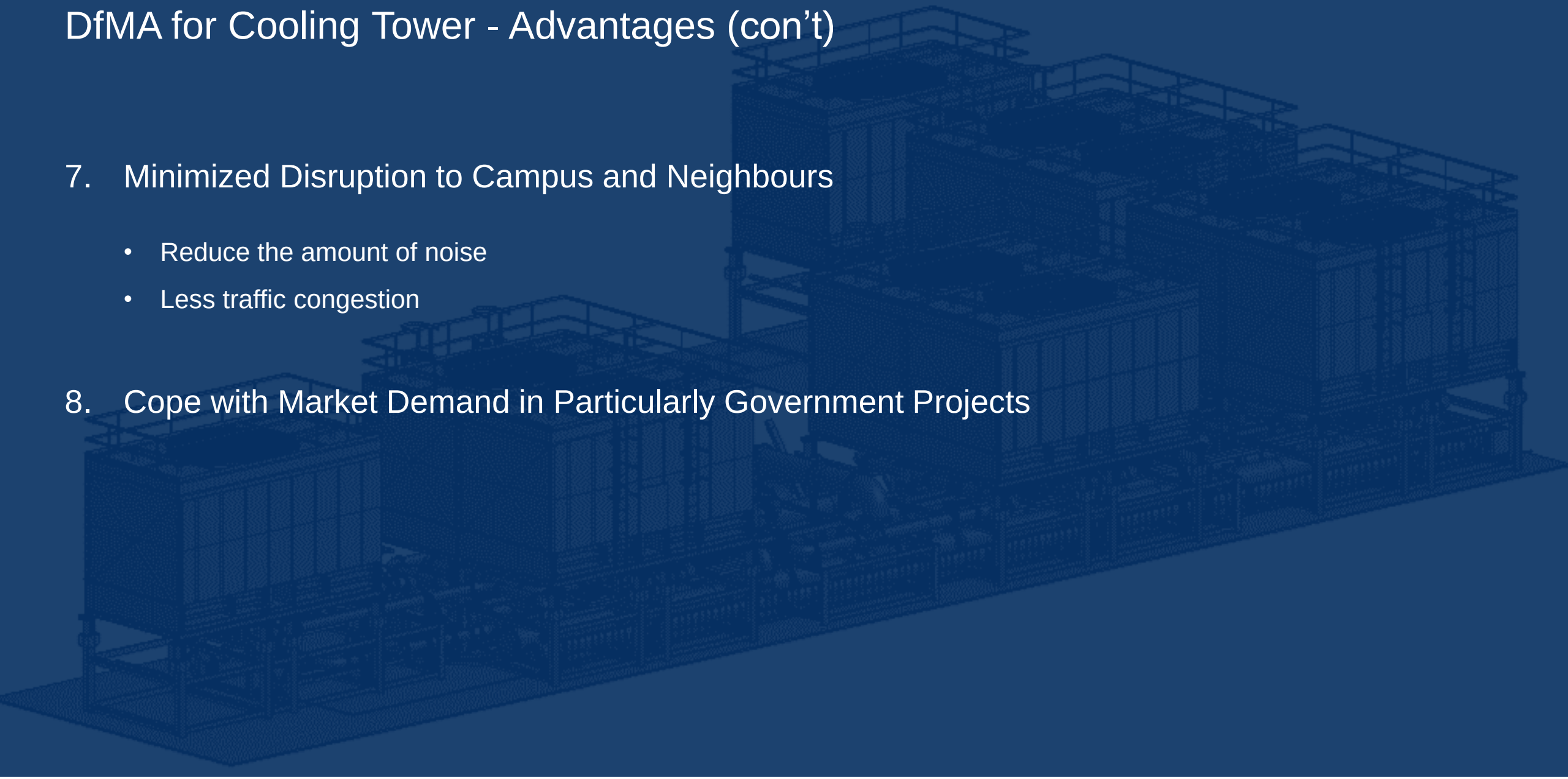
5. Less accidental Rate

   - Less labour on site
   - Better working environment

6. Job Satisfaction and Achievement

   - Less defect rectification Works

DfMA for Cooling Tower - Advantages (con’t)



7. Minimized Disruption to Campus and Neighbours
    - Reduce the amount of noise
    - Less traffic congestion

8. Cope with Market Demand in Particularly Government Projects

Thank you