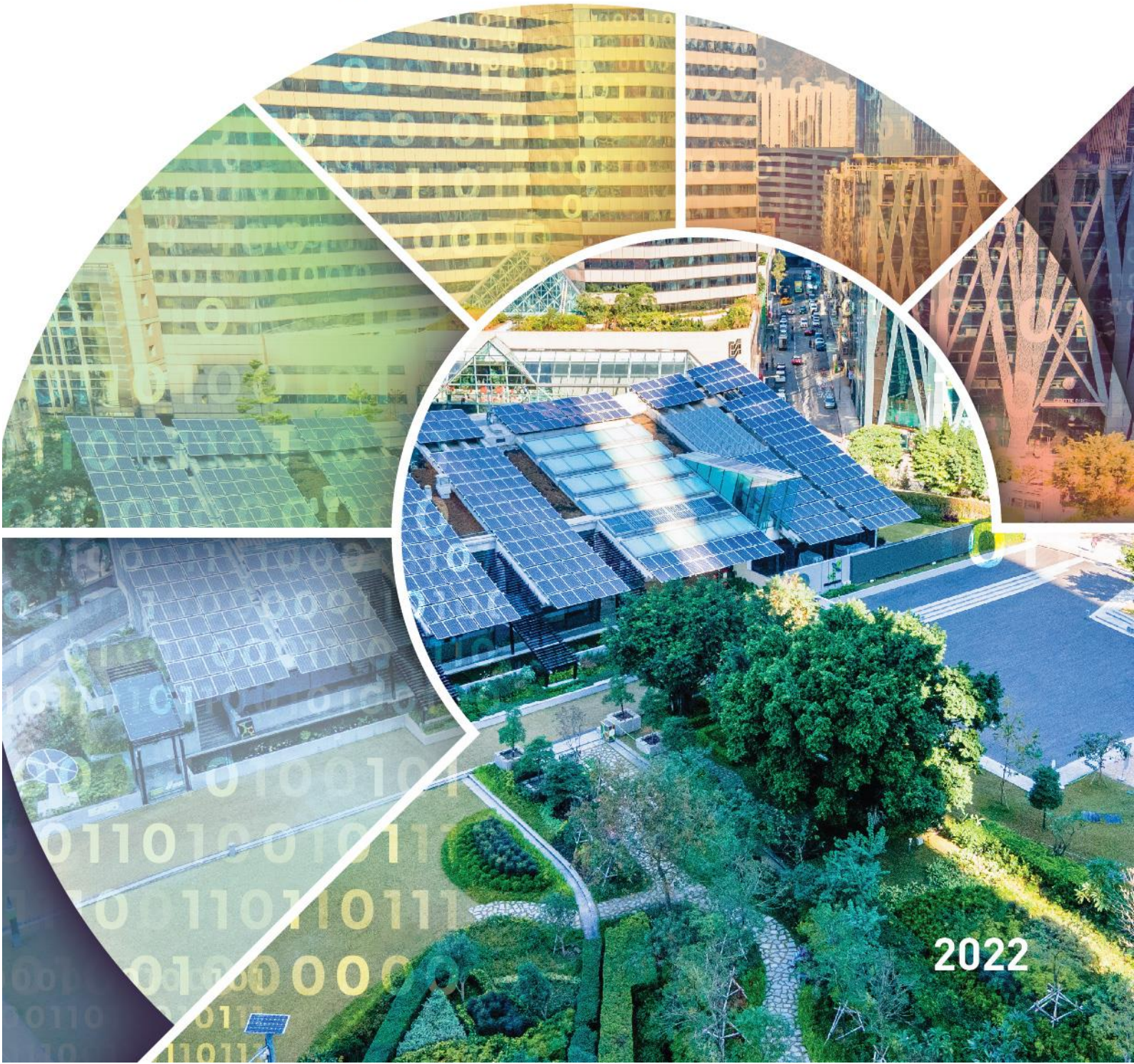
CONSTRUCTION INDUSTRY COUNCIL
建造業議會

BIM

Supply and Installation of Internet of Things (IoT) and Building Information Modelling (BIM) at Construction Industry Council – Zero Carbon Park

CIC-ZCP BIM Implementation Plan (BIM IP) Case Sharing



2022

Disclaimer

Whilst reasonable efforts have been made to ensure the accuracy of the information contained in this publication (Reference Materials), the CIC nevertheless encourages readers to seek appropriate independent advice from their professional advisers where possible. Readers should not treat or rely on this publication (Reference Materials) as a substitute for such professional advice.

Enquiries

Enquiries about this Reference Materials may be made to the CIC Secretariat at:
38/F, COS Centre
56 Tsun Yip Street, Kwun Tong, Kowloon
Hong Kong

Tel: (852) 2100 9000
Fax: (852) 2100 9090
Email: bim@cic.hk
Website: www.cic.hk

Copyright Notice

Document Revision Tracking

Issue Date	Notes
November 2022	BIM IP (Revision 1.5) and its Appendices as the first publication for reference by the industry

Preface

The Construction Industry Council (CIC) is committed to seeking continuous improvement in all aspects of the construction industry in Hong Kong. To achieve this aim, the CIC forms Committees, Task Forces and other forums to review specific areas of work with the intention of producing Alerts, Reference Materials, Guidelines and Codes of Conduct to assist participants in the industry to strive for excellence.

The CIC appreciates that some improvements and practices can be implemented immediately whilst others may take more time for implementation. It is for this reason that four separate categories of publication have been adopted, the purposes of which are given as follows:

Alerts	The Alerts are reminders in the form of brief leaflets produced quickly to draw the immediate attention of relevant stakeholders to the need to follow some good practices or to implement some preventive measures in relation to the construction industry.
Reference Materials	The Reference Materials provide standards or methodologies generally adopted and regarded by the industry as good practices. The CIC recommends the adoption of the standards or methodologies given in the Reference Materials by industry stakeholders where appropriate.
Guidelines	The Guidelines provide information and guidance on particular topics relevant to the construction industry. The CIC expects all industry stakeholders to adopt the recommendations set out in the Guidelines where applicable.
Codes of Conduct	The Codes of Conduct set out the principles that all relevant industry participants should follow. Under the Construction Industry Council (Cap 587), the CIC is tasked to formulate codes of conduct and enforce such codes. The CIC may take necessary actions to ensure compliance with the codes.

To allow us to further enhance this publication for the benefit of the construction industry, we encourage you to share your feedback with us, after you have read this publication. Please take a moment to fill out the Feedback Form attached to this publication and send it back to us.. With our joint efforts, we believe our construction industry will develop further and will continue to prosper in the years to come.

Introduction of this Publication

This publication provides a case sharing on the use of Building Information Modelling (BIM) for Asset Management and Facility Management for reference by the industry. The CIC aims to promote and support the construction industry in BIM adoption throughout the lifecycle in projects, and to cultivate and nurture a culture of adopting BIM and related technologies, such as IoT, to support the green and intelligent building approach. Observations are found in the CIC BIM Adoption Survey Reports 2019[1] and 2020[2], which indicate that the top BIM hurdles in the construction industry in Hong Kong, include (i) a lack of BIM expertise, (ii) a lack of BIM project experience, and (iii) an absence of BIM requirements by the client. Meanwhile, the adoption rate in BIM uses for asset management and facility management or related purposes is still low. For these reasons, the CIC has been collecting relevant showcases from the industry, as well as identifying our own pilot projects, and have developed them as a reference case for sharing with the industry.

The target users are primarily Appointing Parties / Employers / Clients / Owners (hereafter referred to as 'Appointing Parties') or their agents in the private sector who plan to implement BIM for Asset Management and Facility Management, and are looking for references. This publication is not a BIM Standard or Guideline, however, it provides project-specific details as reference.

This project, namely the "Supply and Installation of Internet of Things (IoT) and Building Information Modelling (BIM) at Construction Industry Council - Zero Carbon Park", is selected by the CIC as one of our projects for the implementation of BIM and IoT for Asset Management and Facilities Management. This document is the BIM Implementation Plan (BIM IP) of the project, covering the contents of the BIM Execution Plan (BEP). The publication of this document serves as a case sharing for reference by the industry.

The CIC welcomes any feedback and we wish to acquire more project cases from the industry for sharing to practitioners.

Relevant resources

CIC Webinar on BIM and IoT Implementation for AM&FM at the CIC-Zero Carbon Park (Case Sharing) was held on 28 September 2022, to replay the video of the webinar, please visit CIC BIM Portal: https://www.bim.cic.hk/en/events/list or

i-Club (Innovation Learning): https://www.citac.cic.hk/en-hk/iclub/innovation-training

[1] CIC BIM Adoption Survey 2019, available at CIC BIM Portal: https://www.bim.cic.hk/en/resources/publications
[2] CIC BIM Adoption Survey 2020, available at CIC BIM Portal: https://www.bim.cic.hk/en/resources/publications

Building Information Modelling Implementation Plan (BIM IP)

Document Ref.: CIC_ZCP_BIMIPv1-4

Prepared by
ATAL Technologies Ltd., with collaboration with the CIC and other appointed parties.

Prepared by	Checked by	Approved by
Lionel Lambourn	T.W. Kwok	Ron Ng
BIM Manager	Information Manager, ATAL	Manager - Industry Development, CIC

DOCUMENT CHANGE RECORD

Revision No.	Date of Issue	History
0.0	14 Sep 2021	Advanced copy for comments.
0.1	23 Sep 2021	First draft - moved contents from BIM Process to Project Information Production Methods and Procedures; updated Federation Strategy; added Information Management Assignment Matrix; added Security Strategy; added Delivery Team Risk Register; updated Mobilisation Plan; added appendix for TIDP; updated Project Information Functions; updated High Level Responsibility Matrix.
1.0	7 Nov 2021	Replaced cover image; added text to sections 1.1 to 1.11; added Planon to Lead Appointed Party; added Planon's address; moved EOMS Manager to Lead Appointed Party under section 2.2; changed "Family" or "Families" to BIM Object(s); updated section 2.3.2 with RACI; added Master Setting Out to section 2.5; section 2.5 BIM Object Naming Convention revised; caption on Figure 5 revised; Table 16 revised; Table 21 added software version; section 2.18 Quality Assurance revised.
1.1	19 Nov 2021	Corrected Planon's role to EOMS Vendor under section 2.1; added CIC_OmniClass_Number under section 2.6.5 Step 2; corrected spelling of OmniClass under section 2.6.5 Step 3; added full name of SDI under section 2.6.5 Step 4.
1.2	15 Dec 2021	Updated 1.11 for Security Information Requirements; updated section 2.6.3. BIM Object Naming Convention to *CIC Production of Building Information Modelling Object Guide: General Requirements (Version 2 - 2021);* updated Table 9 for PV panels and saltwater treatment systems; updated Figure 4. Workflow for creation of initial model with the input of asset management data.
1.3	20 Dec 2021	Updated Table 13, Model data for manual input; minor update of wording in sections 2.14, MIDP and 2.15, TIDP; updated 2.16 Table 20, Project Milestones; App A: LOD Responsibility Matrix; App B: Required Equipment List; App. C, Attributes/Properties of objects for FM/AM; App. D, Drawing List/Schedule; App. E, MIDP; App. F, EOMS Task Team's TIDP.
1.4	13 Oct 2022	General refinements by the project team for publication for reference by the industry.
1.5	31 Oct 2022	General refinements by the CIC for publication for reference by the industry.

Table of Contents

1. BIM Implementation Plan (BIM IP) Overview

Introduction

To successfully implement BIM on a project, ATAL has developed this BIM IP to define the project needs, develop the BIM implementation and produce required deliverables. Additionally, this BIM IP contains the BIM Execution Plan, or BEP, which establishes the necessary processes for the execution, control and monitoring of BIM works on this project.

As a Construction Industry Council (CIC) project, the Supply of IoT and BIM on the Zero Carbon Park shall be implemented using BIM. As stated in section 4.2 of Appendix I of the tender documentation, *BIM Exchange Information Requirement (EIR) (Particular Specifications of Building Information Modelling)*, a BIM IP shall be provided for the approval of the CIC. The organisation of this BIM IP shall conform to Section 3 of the *CIC BIM Standards - General (Version 2.1 - 2021)*. As shown in Figure 1 below, the BIM IP consists of 11 items.

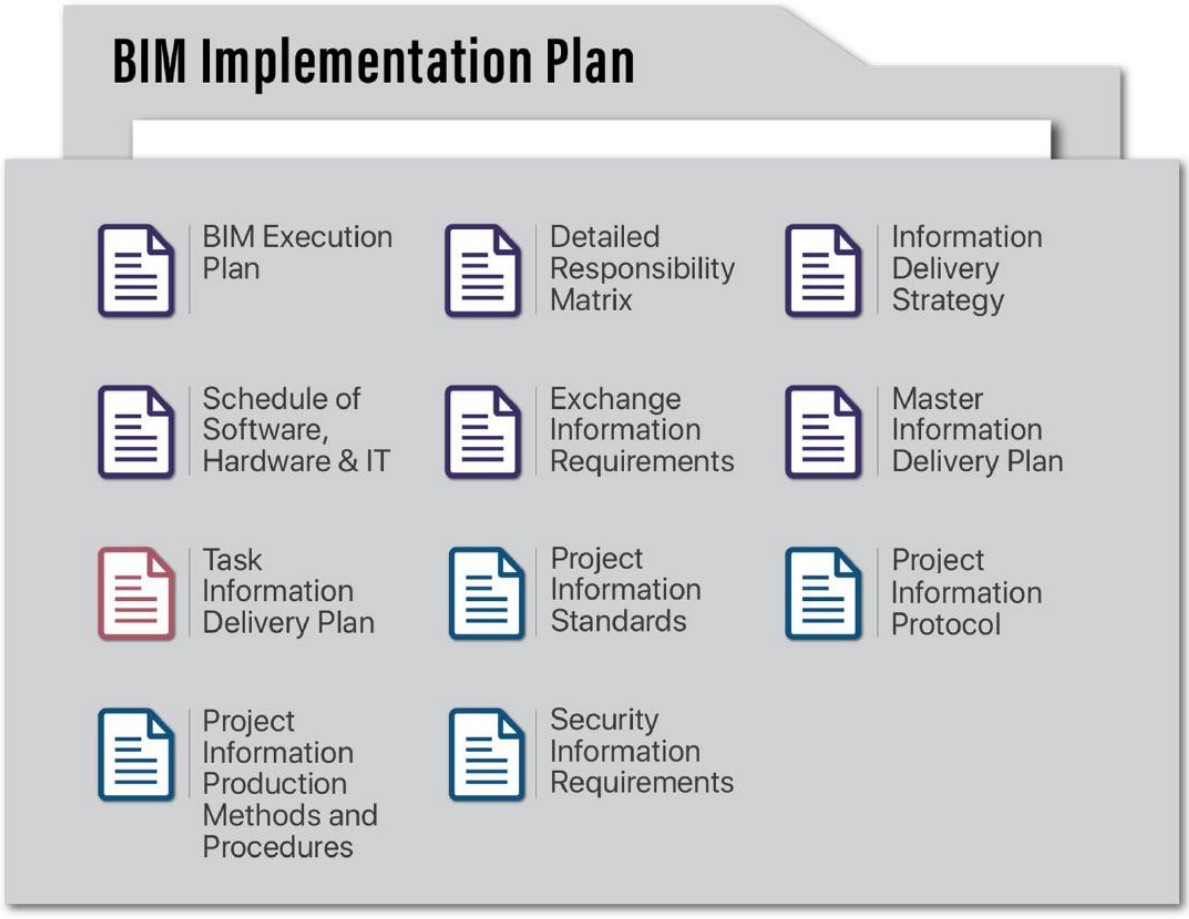


Figure 1. BIM Implementation Plan (BIM IP) contents as defined in section 3.2 of CIC BIM Standards - General (Version 2.1 - 2021)

1.1. BIM Execution Plan

The BIM Execution Plan or BEP, is detailed in section 2 of this BIM IP and will include the contents listed in section 3.7.2 of the *CIC BIM Standards - General (Version 2.1 - 2021)* for a Post-appointment BEP. In the course of this project, the BEP shall be a live document, meaning that it is subject to continued development and review until the completion of the project and handover to the Appointing Party.

1.2. Detailed Responsibility Matrix

The Detailed Responsibility Matrix is contained in Appendix A of this BIM IP and defines the Model Author (AUT), the Level of Graphics (LOD-G) and the Level of Information (LOD-I), at the as-built phase of the ZCP, to ensure that the BIM is produced to a high level of geometric quality with the relevant asset information linked to the model elements and the IoT sensor systems are integrated with the BIM.

1.3. Information Delivery Strategy

The Information Delivery Strategy shall comply with section 3.6.4 of the *CIC BIM Standards - General (Version 2.1 - 2021).* As a response to the requirements of this project, ATAL shall,

i. Deliver the project information in accordance to the EIR, as stated in section 4.2 of Appendix I of the tender documentation, *BIM Exchange Information Requirement (EIR) (Particular Specifications of Building Information Modelling)*;

ii. Organise its team structure to ensure the appropriate level of resourcing and expertise to ensure successful information delivery;

iii. Manage its commercial relationships with its appointed parties and to the Appointing Party to remove any obstacles to the provision of information; and,

iv. Manage its procurement and supply chain with the information delivery strategy in mind.

1.4. Schedule of Software, Hardware, and IT

The Schedule of Software, Hardware, and IT shall comply with section 5 of *BIM Exchange Information Requirement (EIR) (Particular Specifications of Building Information Modelling)*. ATAL will use hardware and software which will ensure the delivery of the required BIM Uses in a productive and efficient manner; provide the Appointing Party with free, compatible, standalone BIM viewing software to view the BIM deliverables, where appropriate; ensure BIM deliverables comply with the software versions and in the correct file formats approved by the Appointing Party and indicate those versions and file formats in this BEP.

1.5. Exchange Information Requirements

The Exchange Information Requirements, or EIR, for the project are detailed in the *BIM Exchange Information Requirement (EIR) (Particular Specifications of Building Information Modelling)*. ATAL shall observe these EIRs throughout the delivery of this project with the objective of producing the as-built BIM models of the entire site for the purpose of allowing the CIC to utilise

the model in the asset management and facilities upkeep of ZCP.

1.6. Master Information Delivery Plan

The Master Information Delivery Plan, or MIDP, shall comply with section 3.6.16 of the *CIC BIM Standards - General (Version 2.1 - 2021)*. The MIDP, has been developed by ATAL and is contained in Appendix E of this BIM IP. It indicates the overall delivery programme of works and will be updated in response to project needs, inputs from all parties, changes in the TIDPs of the task teams, and the availability of required information for integration with the as-built BIM.

1.7. Task Information Delivery Plan

The Task Information Delivery Plan, or TIDP, shall comply with section 3.6.17 of the *CIC BIM Standards - General (Version 2.1 - 2021)*. The TIDPs of each Task Team are contained in Appendix F of this BIM IP and indicate the timeframe and contents of deliverables and the resources used in producing them. Tasks are identified with reference IDs, associated file deliverables are listed, and dependencies are stated, along with project milestones.

1.8. Project Information Standards

The Project Information Standards shall comply with section 3.6.7 of the *CIC BIM Standards - General (Version 2.1 - 2021)*. ATAL will obtain from the Appointing Party, the initial Project Information Standards and will follow them and expand on them if required. Project Information Standards for the ZCP include file data requirements, nomenclature for files, objects, and elements, BIM object standards, annotations and symbology, classification and properties, layer and work-sets conventions, units of measurement and PIM origin and orientation.

1.9. Project Information Protocol

The Project Information Protocol shall comply with section 2.10 of the *CIC BIM Standards - General (Version 2.1 - 2021)*. The CIC shall provide ATAL with the Project Information Protocol, setting out its contractual needs. In response ATAL shall ensure that those contractual needs are applied to ATAL's delivery team. The Project Information Protocol will include specific obligations of all parties relating to the management or production of information; any specific warranty or liabilities associated with the information model; intellectual property rights of information including background and foreground intellectual property; restrictions on the use of existing asset information and shared resources; restrictions on the use of information during the project, including any required licensing terms; and restrictions on the re-use of information after the appointment or in the event of termination.

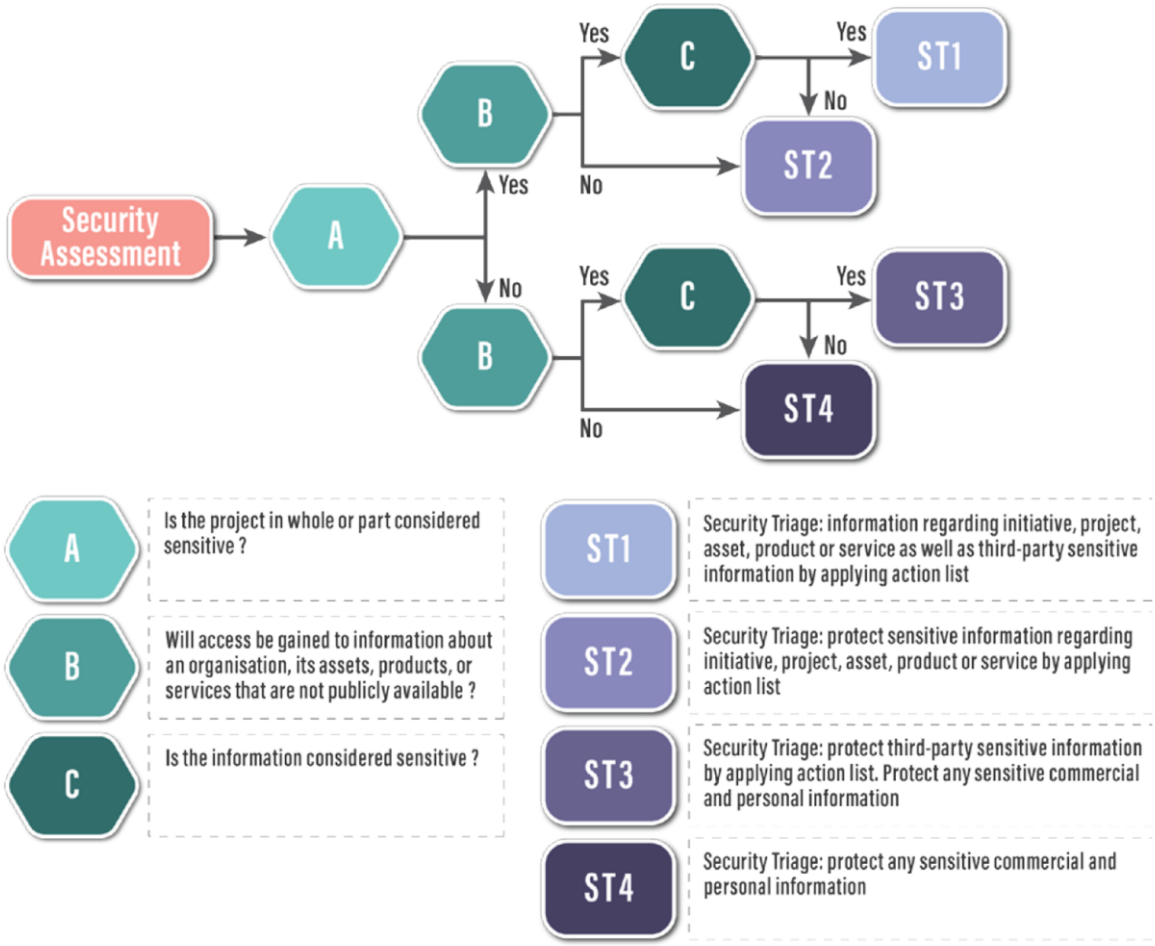
1.10. Project Information Production Methods and Procedures

The Project Information Production Methods and Procedures shall comply with section 3.6.8 of the *CIC BIM Standards - General (Version 2.1 - 2021)*. The CIC shall provide the initial Project Information Methods and Procedures, which ATAL will with any additions or amendments that ATAL's Delivery Team have identified. The Project Information Production Methods and Procedures ensures the consistency of information delivered on the ZCP.

1.11. Security Information Requirements

The Security Information Requirements (SIR) shall comply with section 2.4 and 3.6.10 of the *CIC BIM Standards - General (Version 2.1 - 2021)*. Throughout the project, ATAL shall facilitate CIC in the identification of security risks, establish security mitigation measures, implement any required security-breach mitigation policies, and develop the security triage processes (see Figure 2. The Security Triage Process). Additionally, ATAL shall that ensure that logistical security concerns are considered, that information dissemination is controlled, and an incident management plan is in place. The SIR shall be aligned with the *Security Information Requirements - Templates for CIC BIM Standards General (Version 2.1 - 2021).*

Figure 2. The Security Triage Process



2. BIM Execution Plan (BEP)

2.1. Project Information

Table 1 shows this project's basic information.

Table 1. Project Information

Appointing Party	Construction Industry Council
Appointing Party Address	38/F, COS Centre, 56 Tsun Yip Street, Kwun Tong, Kowloon
Project Name	Supply and Installation of Internet of Things (IoT) and Building Information Modelling (BIM) for the Construction Industry Council - Zero Carbon Park
CIC Contract No.	PREO2021000461
Project Address	8 Sheung Yuet Road, Kowloon Bay, Kowloon
Project Description	1. B/F, G/F, M/F & R/F, Zero Carbon Building, 8 Sheung Yuet Road, Kowloon Bay, Kowloon; 2. Landscape, Paveway and Parking Area, Zero Carbon Park, 8 Sheung Yuet Road, Kowloon Bay, Kowloon
Lead Appointed Parties	ATAL Technologies Limited (Contractor) Planon Software (EOMS Vendor)
Lead Appointed Parties Addresses	ATAL: 13/F, Island Place Tower, 510 King's Road, North Point, Hong Kong Planon: Room 608A Ocean Centre, 5 Canton Rd, Tsim Sha Tsui, Hong Kong
Objectives	1. Modify the BIM as-built model provided by CIC for the covered area of this project, including the existing as-built information, as required by the CIC for both Facility Management and Asset Management use at the Construction Industry Council - Zero Carbon Park (CIC-ZCP); 2. Supply and installation of IoT devices at CIC-ZCP; and 3. Integration of BIM models and IoT devices, with the CIC's Estates Office Management System (the "EOMS") used in the CIC and provided by Planon Hong Kong Limited.
Project Commencement	September 2021
Target Completion	End of December 2021

2.2. Project Information Functions

Table 2 shows the Project Information Assignment Matrix.

Table 2. Project Information Assignment Matrix

Project Function	Name	Company	Contact	Email
APPOINTING PARTY FUNCTIONS				
Manager - Estates Office	Mr. William Chan	CIC	Masked	Masked
Assistant Manager - Estates Office	Mr. Kenneth Kwan	CIC	Masked	Masked
Senior Officer - Estates Office	Mr. Joseph Chu	CIC	Masked	Masked
Manager - Industry Development	Mr. Ron Ng	CIC	Masked	Masked
Assistant Manager - Industry Development	Mr. Lok Fung	CIC	Masked	Masked
Senior Officer - Industry Development	Mr. Michael Leung	CIC	Masked	Masked
LEAD APPOINTED PARTY (CONTRACTOR) FUNCTIONS				
Project Manager	Mr. Keith Mak	ATAL	Masked	Masked
Project Engineer	Mr. K.K. Chan	ATAL	Masked	Masked
Information Manager	Mr. T.W. Kwok	ATAL	Masked	Masked
EOMS Manager	Mr. Terence Lo	Planon	Masked	Masked
EOMS Consultant	Ms. Samantha Loi	Planon	Masked	Masked
TASK TEAM MANAGEMENT FUNCTIONS				
BIM Manager (CIC-Certified BIM Manager, as required by the CIC)	Mr. Lionel Lambourn	Good Year-Syntegrate JV (Sub-con of ATAL)	Masked	Masked
BIM Coordinator	Mr Suresh Santhanam	Good Year-Syntegrate JV (Sub-con of ATAL)	Masked	Masked
Digital Twin Platform Manager	Mr. Terrence Lui	Varadise	Masked	Masked
Digital Twin Platform Consultant	Mr. Luiz Lui	Varadise	Masked	Masked

2.3. Information Delivery Strategy

As a response to the BIM Exchange Information Requirement (EIR) (Particular Specifications of Building Information Modelling), ATAL shall employ the following strategy for the delivery of the project's information.

2.3.1. Approach to fulfilling the EIR

ATAL shall follow the stated BIM Standards and Guidelines of the EIR, as stated in section 3 of the BIM Exchange Information Requirement (EIR) (Particular Specifications of Building Information Modelling), and the procedures detailed in this BEP to ensure that the Asset Information Requirements, AIR, are met in the creation of the Asset Information Model, AIM.

2.3.2. Information Management Assignment Matrix

In accordance with Section 3.6.6 of the *CIC BIM Standards - General (Version 2.1 - 2021)*, "Information Management Assignment Matrix", and Appendix A of the same standards, the Information Management Assignment Matrix in Table 3 shall be adopted and updated as necessary throughout the project duration in order to clarify the responsible party or parties for each Information Task.

Table 3. Information Management Assignment Matrix

I.D.	Information Tasks R = Responsible for undertaking activity A = Accountable for activity completion C = Consulted during activity I = Informed following activity completion	Appointing Party: CIC	Lead Appointed Party: ATAL	Task Team: IoT	Task Team: BIM	Lead Appointed Party: Planon
5.4	APPOINTMENT					
5.4.1	Confirm the Delivery Team's BIM Execution Plan	R	A	C	A	C
5.4.1a	Confirm the names of the information management function	R	A	C	A	C
5.4.1b	Update the information delivery plan	I	R	A	A	A
5.4.1c	Update the high-level responsibility matrix	I	R	A	A	A
5.4.1d	Confirm and document the proposed information production methods and procedures	I	R	A	A	A
5.4.1e	Agree with the Appointing Party (CIC) any additions or amendments to the project's information standard	I	R	A	A	A
5.4.1f	Confirm the schedule of software, hardware and IT infrastructure	I	R	A	C	A
5.4.2	Establish the Delivery Team's detailed responsibility matrix	I	R	A	A	A

I.D.	R = Responsible for undertaking activity A = Accountable for activity completion C = Consulted during activity I = Informed following activity completion Information Tasks	Appointing Party: CIC	Lead Appointed Party: ATAL	Task Team: IoT	Task Team: BIM	Lead Appointed Party: Planon
5.4.3	Establish the Lead Contractor's (ATAL's) Exchange Information Requirements	I	R	A	A	A
5.4.3a	Define each information requirement	R	A	A	A	A
5.4.3b	Establish the Level of Information Need	R	A	A	A	A
5.4.3c	Establish the acceptance criteria	R	A	A	A	A
5.4.3d	Establish the dates that need to be met for each requirement	R	A	A	A	A
5.4.3e	Establish the supporting information	R	A	A	A	A
5.4.4	Establish the task information delivery plan(s)	I	R	A	A	A
5.4.5	Establish the master information delivery plan	I	R	A	A	A
5.4.6	Complete Lead Contractor (ATAL's) appointment documents	R	C			
5.4.7	Complete Task Teams appointment documents		R	C	C	R
5.4.8	Activities for appointment	R	C	I	I	C
5.5	MOBILISATION					
5.5.1	Mobilise resources		R	A	A	R
5.5.2	Mobilise information technology		R	A	C	R
5.5.3	Test the project's information production methods and procedures		R	A	A	R
5.5.4	Activities for mobilisation		R	A	A	R
5.6	PRODUCTION					
5.6.1	Check availability of reference information and shared resources		R	A	A	R
5.6.2	Generate information in accordance with the TIDP		R	A	A	R
5.6.2a	Generate information in accordance with SMPs		R	A	A	R
5.6.2b	Generate information in accordance with Level of Information Need		R	C	A	A
5.6.2c	Generate information coordinated and cross-referenced with Shared Information		R	C	A	A
5.6.2d	Generate information that is spatially coordinated		A	C	R	
5.6.2e	Generate information with appropriate suitability (Status Code)		A		R	A
5.6.3	Undertake quality assurance check against SMPs		A	C	R	A
5.6.4	Review information and approve for sharing		R		A	A

I.D.	R = Responsible for undertaking activity A = Accountable for activity completion C = Consulted during activity I = Informed following activity completion Information Tasks	Appointing Party: CIC	Lead Appointed Party: ATAL	Task Team: IoT	Task Team: BIM	Lead Appointed Party: Planon
5.6.5	Information Model review		R		A	A
5.6.6	Activities for collaborative production of information		R	A	A	A
5.6.7	Ensure that the versioning between the as-built information model and Planon's information model is aligned at all times		R	C	A	R
5.7	MODEL DELIVERY					
5.7.1	Submit Information Model for Lead Contractor's (ATAL's) authorisation			A	R	A
5.7.2	Review and authorise the Information Model		R	I	I	I
5.7.3	Submit Information Model for Appointing Party (CIC) acceptance	I	R	I	I	I
5.7.4	Review and accept the Information Model	R	C	I	I	C
5.7.5	Activities for Information Model delivery	C	R	A	A	R
5.8	PROJECT CLOSEOUT					
5.8.1	Archive the Project Information Model	R				
5.8.2	Capture lessons learned for future projects	R	A	A	A	A
5.8.3	Activities for project close-out	R	A	A	A	A

2.3.3. Specification of Level of Information Need (LOIN)

The as-built, AIM shall be developed to the Level of Development (LOD) as detailed in section 4.5 of the EIR. Additionally, the Level of Documentation a (DOC) for the project is stated in Table 4. Itemised details of LOD requirements for model elements are stated in **Appendix A - LOD Responsibility Matrix**.

Table 4. Level of Documentation (DOC)

Types of Model Element	Stage	Documentation	Format
Furniture	As-built Stage	Catalogue or Detailed drawing (as provided by CIC)	.pdf/.dwg (as provided by ATAL)
E&M objects	As-built Stage	Catalogue or Detailed drawing (as provided by CIC)	.pdf/.dwg (as provided by CIC)

Types of Model Element	Stage	Documentation	Format
IoT	As-built Stage	Catalogue	.pdf

ATAL shall work closely with the CIC in order to establish the formal Acceptance Criteria for the model files and linked documentation. Furthermore, ATAL shall work collaboratively with the CIC in order to meet the project milestones as stated in section 2.15 BIM Deliverable Schedule (Programme) and to meet interim deliverable deadlines as necessitated by the project programme.

2.3.4. BIM Objects

The project-oriented BIM Objects library will be created in accordance with section 4 of the EIR. BIM objects will be managed and classified in central repository and included in handover. The relational database will be verified as LOD-I 500 with LOD-G between 200 and 400 as required for the specific system or equipment. Other information such as Testing and Commissioning data, Supplier records, Operations and maintenance manuals and As-built Drawings will be linked to the BIM Objects from the BIM database.

2.3.5. BIM Templates

Revit templates will be created so that all model files will be correctly configured with the necessary information, attributes, structural system setting, MEP system settings, 3D and 2D graphic standards, shared and project parameters, and asset code formatting.

2.3.6. Linked Model Files

The various trade Revit files will be linked to a master file for the ZCP. The linked files will be organised into the structural model, the building services model, the architecture and interior fitting-out model, and the landscape model. Each trade model may consist of a single or multiple Revit files.

2.3.7. Federated Model

A federated model will be created in accordance with section 4.7 of the EIR. Due to the manageable size of this project, the federated model will be created as both a Master Revit file with linked trade files (see section 2.3.6 of this BEP) and as a Navisworks file which combines all of the Revit files. This is to facilitate the different uses of the federated model depending on the task. For example, in order to markup, create saved views, conduct clash checking and play 4D simulations, the Navisworks federated model shall be used. In order to edit model elements in real time and see the effects on surrounding elements from interfacing trades, the federated Revit model shall be used.

2.3.8. File Size of Models

A file-size limit will be agreed with CIC and with the Task Team to ensure the effective and efficient handling of the BIM model throughout this project by all participants and in compliance with section 4.6 of the EIR.

2.4. BIM Goals, Uses and Deliverables

2.4.1. BIM Deliverables

Section 4 of the EIR details all BIM deliverables for this project. For convenience, they are reproduced here in Table 5

Table 5. Summary of BIM Deliverables from EIR section 4

BIM Deliverables	EIR section	ATAL Comments
Draft BIM IP	4.1	This is a Pre-appointment only deliverable and is not applicable to the Post-appointment stage.
BIM IP	4.2	This deliverable is fulfilled by the submission and continuing update of this document until the completion of works.
BIM Models	4.3	BIM models will be submitted to the requirements of the EIR and to the standards as stated in section 3 of the EIR.
BIM Objects	4.4	See section 2.3.4 above.
Level of Information Need (LOIN)	4.5	See section 2.3.3 above.
File Size of Models	4.6	See section 2.3.8 above.
Model federation	4.7	See section 2.3.7 above.
BIM Uses	4.8	See section 2.4.2 below.
Handover of BIM Deliverables	4.9	All final BIM deliverables developed for the project shall become the property of the CIC and shall be unconditionally transferred and handed over to the CIC upon completion of the project or as and when requested by the CIC during the project.

2.4.2. BIM Uses

Section 4.8 of the EIR lists the BIM Uses for the project. For convenience, they are reproduced here in Table 6.

Table 6. BIM Uses as stated in section 4.8 of the EIR

BIM Uses	Description
1. Existing Conditions Modelling	The model will be developed from the As-built model provided by the CIC and further updated by laser scanning, conventional survey methods or record drawings where necessary. The 3D digital survey model will be supplemented by photographic records of condition survey. (For further details refer to EIR section 4.8 1).
2. As-Built Modelling for As-built Information	The As-Built Information Model (ABIM) will be updated based on the final approved construction information that has been built, checked and shall be accurate as shown on the as-built drawings / models.

BIM Uses	Description
Model (ABIM) and Asset Information Model (AIM)	Information on location such as room number, room name and building name, staircase number, washroom number, lift lobby number will be incorporated into the ABIM. The operation data, product catalogues, manuals, warranties, certificates and maintenance history of equipment, etc. shall also be linked to the ABIM so as to facilitate an AIM. (For further details refer to EIR section 4.8 2).
3. Maintenance Scheduling	Maintenance Scheduling will be adopted in the construction stage in collecting and providing maintenance attributes for facility structures, fabrics and equipment in the as-built BIM models as considered appropriate. This will be achieved by linking maintenance schedules/ attributes to the As-Built BIM. (For further details refer to EIR section 4.8 3).
4. Asset Management	The data contained in the ABIM and AIM will be used to populate the CIC's asset management system. A bi-directional link will be established between the ABIM/AIM which will allow users to visualise an asset in the model before servicing it. The CIC's facility manager shall specify the data required for each element in this BEP, see section 2.6.2. (For further details refer to EIR section 4.8 4).
5. Drawing Generation (Drawing Production)	ATAL will submit as-built 2D drawings generated from the BIM models, and that are field verified, within 60 calendar days from the commencement date of the Works. (For further details refer to EIR section 4.8 5).

2.4.3. Drawing Generation (Drawing Production)

Plans, sections, elevations, details and 3D views can be extracted into drawings sheets where the approved title blocks are applied. The 2D presentation style (line-types, line-weights, text styles, annotations, etc.) generated directly from Revit may not be a perfect match with the required drawings style; however, Revit will be configured to minimise any required dress-up work in AutoCAD. The geo-reference and unit of scale will be presented in drawings. Some drawings (e.g., schematic diagrams and associated schedules) may not be able producible by Revit. A drawing list will be provided indicating which drawings are produced from the BIM model and which are not. The drawing list should be approved by the CIC prior to drawing production. View templates shall be used for the same drawing types so as to standardise the configuration of sheets. The cover sheet and sheet list will also be provided.

2.4.3.1. Drawing List / Sheet List

The drawing list will indicate the following information:

- Drawing Number
- Drawing Title
- Revision

- Status
- Date
- Drawn By
- Source model filename and file path

2.4.3.2. As-built Drawings

The as-built drawings produced from Revit will have the following criteria:

a. Drawings to be produced from Revit shall be clearly listed in drawing list for approval;

b. Layout plan, sections, elevations and 3D views of as-fitted drawings shall be directly plotted in pdf format. Any detail modification and text annotation shall be configured entirely within Revit;

c. Drawings shall be created in Sheets in Revit. A pre-defined title block family shall be created for drawing production from Revit models. The title block for drawings from Revit shall be aligned to the requirements established by the Appointing Party;

d. 2D annotation including arrows, details patterns and arrow lines will be presented with Fill Region and Detail Lines in Revit, while text annotation will be presented with Text Notes;

e. If an element does not show in the layout due to limitations in the view range or view depth but its data is required on the drawing, it is acceptable practice to have that information be presented using Text Notes instead of Tagging;

f. Any descriptive information such as F/A T/B, C/W WIRE MESH, CONCRETE PLINTH FOR GENERATOR, FROM TOP TO BOTTOM, etc., shall be presented using Text Notes;

g. The drawings submitted shall be plotted in pdf format in black and white; and

h. For drawing production, some BIM Objects will be presented in their actual size, shape, orientation and location, while some BIM Objects will be presented by a legend/symbol in 2D views in order to highlight their existence. In order to maintain the link between the 2D legend/symbol and 3D object, the legend/symbol will be created in the BIM Objects themselves. Note however, that legends/symbols may overlap when two or more elements are installed closely together. The instances and quantities will be annotated clearly by Text Notes in the drawings.

2.5. Project Information Standards

2.5.1. Coordinate System

The BIM models shall be in HK1980 Grid Coordinates System and refer to the Hong Kong Principal Datum.

The positioning of all BIM models is coordinated in Revit with a Shared Coordinate System. The Survey Point and the Project Base Point of models shall be set to Site Boundary Point A (see Figure 3). The coordinates for Site Boundary Point A and the Angle to True North for all model files is detailed in Table 7.

Figure 3 Master setting-out showing site boundary point A

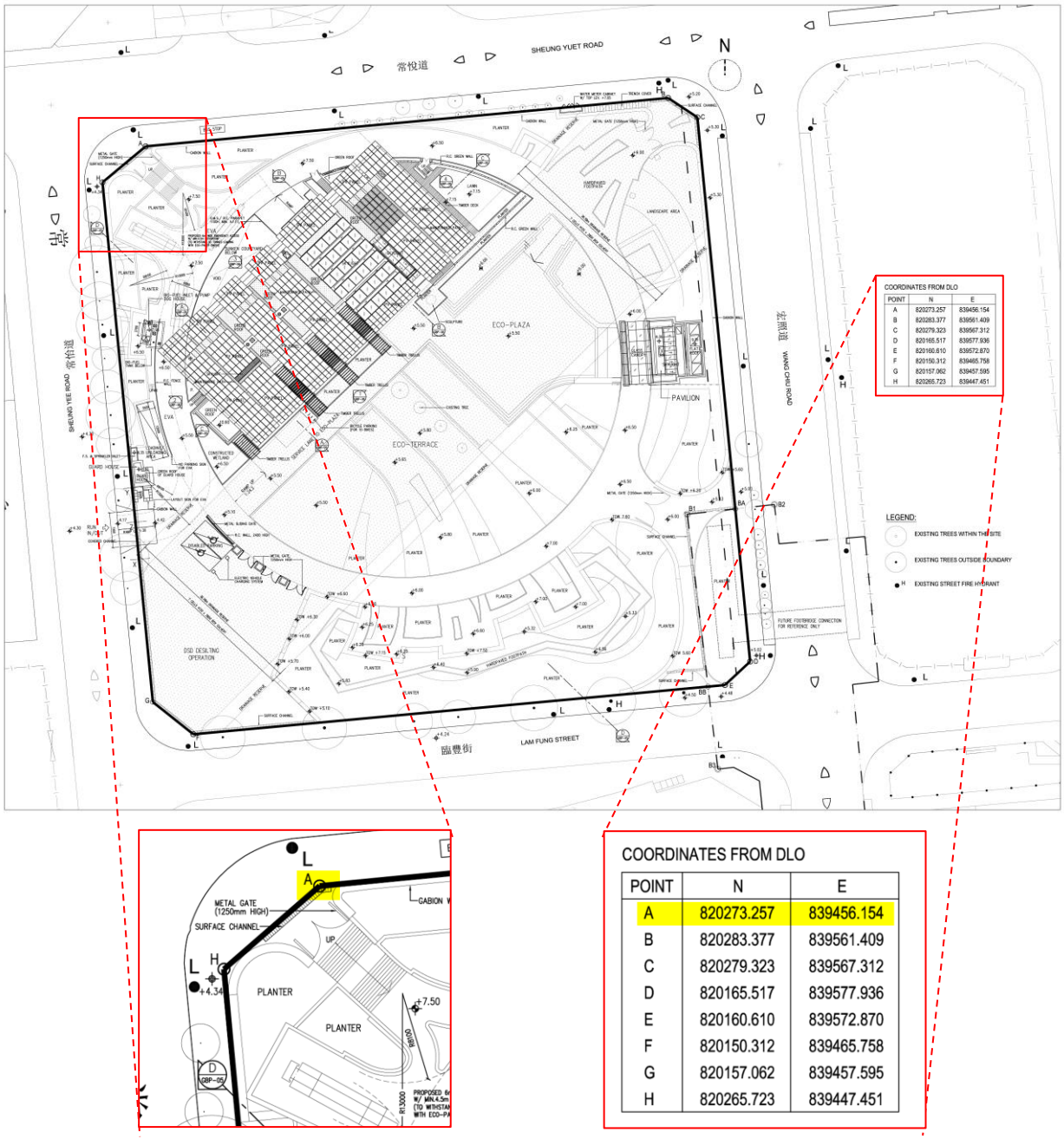


Table 7. Survey Point, Project Base Point and Angle to True North

Survey Point and Project Base Point (all in metres)	N/S: 820273.257 E/W: 839456.154 Elevation: 0.000
Angle to True North	315°

2.5.2. Model File Naming Convention

The model file naming convention refers to the Hong Kong 'Local Annex' of ISO 19650-2:2018 in the *CIC BIM Standards - General (Version 2.1 - 2021)* and may be modified under the CIC's approval.

The Revit model files shall be named as below:

[Project Code (1-8)]-[Originator (3)]-[Volume (1-3)]-[Location (1-4)]-[Discipline (1-2)]-[Type (1-2)_Characteristic (1)]-[Sequential Number (3)].rvt

Blue text refers to the field length in alphanumeric format
Green text refers to the field length in alphabetic format
Red text refers to the field length in numeric format

[Project Code] shall be: ZCP21
[Originator] shall be: CIC
[Volume] shall be: C1
[Location] refers to: Locations within the ZCP project (VC for the Zero Carbon Building, TER for the Park area)
[Discipline] refers to: AR for Architectural, ST for Structural, BS for Building Services, FS for Fire Services, LA for Landscape
[Type] shall be: M3 for model files
[Characteristic] shall be: A for as-built
[Sequential Number] shall be: 001, 002, 003, etc. if needed

e.g., ZCP21-CIC-C1-VC-AR-M3_A.rvt

2.5.3. BIM Object Naming Convention

BIM Object file naming will refer to the *CIC Production of Building Information Modelling Object Guide: General Requirements (Version 2 - 2021)* section 7.1 which also refers to the CIC's Master list of 'Category' and 'Functional Type'. Each BIM Object name should not exceed 30 characters, including hyphen marks.

BIM Objects will be created with the file naming convention below:

BIM Object File Name:
[Category]-[Functional Type]-[Originator]-[Descriptor 1]-[Descriptor 2].File Format Extension

[Category]

a. The category field shall indicate the BIM object category / classification / catalogue based on the BIM platform system;
b. Three capital letters will be used in this field; and
c. Any new Category code proposed, that this not following the CIC Master Type List, will be subject to approval by the Appointing Party.

[Functional Type]

a. This field shall indicate the functional type of the BIM Object and is a subdivision under

the Category field. See the example from Table 8 below;

b. Three capital letters will be used in this field - Refer to the CIC Master Type List;

c. Any new Functional Type code proposed, that this not in the CIC Master Type List, will be subject to approval by the Appointing Party; and

d. When a Functional Type is not necessary, three underscores (___) should be used.

[Originator]

a. The originator field shall indicate who owns or creates the BIM object;

b. Three capital letters will be used in this field;

c. For BIM objects originating from Works Departments, corresponding department names should be used as originator names. However, other consultants or contractors who create the new BIM objects should follow Agent Responsible Code (ARC) list for originator. For those consultants or contractors, this field shall follow the up-to-date version of the ARC published by DEVB under the CAD Standard for Works Projects. ARC full list can be referred to this link:

https://www.devb.gov.hk/en/construction_sector_matters/electronic_services/cad_standard/computer_aided_drafting/cad/index.html; and

d. Any new Originator code proposed, that this not in the CIC Master Type List, will be subject to approval by the Appointing Party.

Descriptors: The descriptor fields shall indicate the critical characteristic of the BIM object.

[Descriptor 1]:

a. Descriptor 1 contains information about primary use and material when applicable.

b. Duplicated information within the Category and Functional Type will be avoided. For example, if category is “WDW” (meaning window), “window” should not be used in this field. If functional type is “DBL” (meaning double), then “double” should not be used in this field;

c. Capital letters should be used for first letter of each word (e.g., WallMounted, GlobalValve);

d. All-capital short forms should be used to indicate materials when applicable (e.g., CONC for concrete, WD for Wood). If Descriptor 1 starts with all-capital short form, an underscore (_) should be used to separate the short form and the following word (e.g., CONC_Kerb, WD_Slash);

e. If Descriptor 1 is blank, three underscores (___) should be used in place of Descriptor 1 (e.g., SFM-RCB-ACM-___-01.rfa); and

f. Descriptor 1 should be kept as concise as practicable with a maximum length of 15 characters in order to reserve space for the potential future expansion of the 2-digit sequential number in Descriptor 2 for potential future expansion.

[Descriptor 2]:

a. Descriptor 2 is a 2-digit sequential number (e.g., 01 to 99) to distinguish different types that cannot be sufficiently identified by preceding fields. (e.g., STE-STA-ACM-NB_Pier-01.rfa)

b. If Descriptor 2 is blank, two underscores (__) should be used in place of Descriptor 2. (e.g., PPF-UPV-ACM-BendSocket-__.rfa).

Type Name:

Further description shall be added for controlled parameters, such as dimension, size, model type, and mounting method etc., if necessary. Otherwise, Type Names shall be equal to the Equipment Name or Description in the BIM Object name.

Table 8 Example of BIM Object file naming

Field	Example	Description
Category	**DOR**-SGL-AEC-Wood-01.xxx	A Door, DOR, is the abbreviation of the **category / classification / catalog** "**door**".
Functional Type	DOR-**SGL**-AEC-Wood-01.xxx	A Single Door, SGL, is the abbreviation of the sub-type "**single**".
Originator	DOR-SGL-**AEC**-Wood-01.xxx	AEC is the abbreviation of **Architecture, Engineering and Construction**. It represents a common standard of the industry. Alternatively this can be replaced by the abbreviated name of the owner / creator
Descriptor 1	DOR-SGL-AEC-**Wood**-01.xxx	A door is made of **Wood** (Material). An optional descriptive text.
Descriptor 2	DOR-SGL-AEC-Wood-**01**.xxx	A door is built **with a Louvre**. This text further describes the BIM object.
File Format Extension	DOR-SGL-AEC-Wood-01.**xxx**	File Format Extension

2.5.4. Model Objects Colour Scheme

The colour scheme for model objects is a modified version of the EMSD BIM-AM Standards and Guidelines v2.0, see Table 9.

Table 9. EMSD BIM-AM Standards and Guidelines v2.0

No.	System	Description	Presentation (2D)		Presentation (3D)	
			Line Weight	Line Type	R, G, B	Colour Palette
1	Lift and Escalator	Cable containment for lift and escalator	0.25	Continuous	128, 0, 128	
2	LV Switchboards	Cable containment for LV Switchboards	0.35	Divide2	128, 128, 0	
3	Emergency Generator	Cable containment	0.35	Continuous	255, 0, 64	

No.	System	Description	Presentation (2D)		Presentation (3D)	
			Line Weight	Line Type	R, G, B	Colour Palette
		for Emergency Generator				
4	HVAC	Exhaust Air Duct System	0.35	Continuous	0, 255, 0	
		Fresh Air Duct System	0.35	Continuous	0, 0, 255	
		Supply Air Duct System	0.35	Continuous	255, 0, 0	
		Return Air Duct System	0.35	Continuous	255, 0, 255	
		Make Up Air Duct System	0.35	Continuous	192, 192, 192	
		Condensate Drain Pipe System	0.18	Dashed2	255, 128, 0	
		Condensing Water Supply Pipe System	0.25	Border2	0, 128, 64	
		Condensing Water Return Pipe System	0.25	Border2	0, 128, 255	
		Make-up Water Pipe System	0.25	Continuous	192, 192, 192	
5	Fire Services Installation	Sprinkler	0.25	Continuous	255, 0, 0	
		Hose Reel/Fire Hydrant	0.25	Continuous	255, 0, 0	
		Automatic Fire Alarm	0.25	Divide2	255, 0, 0	
6	Burglar Alarm and Security Installation	Cable containment for Burglar Alarm and Security Installation	0.25	Continuous	128, 255, 255	
7	PA System		0.25	Continuous	0, 128, 128	
8	Security System	CCTV	0.25	Continuous	255, 153, 102	

No.	System	Description	Presentation (2D)		Presentation (3D)	
			Line Weight	Line Type	R, G, B	Colour Palette
9	Communication System		0.35	Continuous	128, 255, 255	
10	Lighting		0.35	Center2	0, 255, 0	
11	Electrical Distribution		0.35	Divide2	0, 255, 0	
12	Plumbing System	Cold Water Pipe System	0.25	Long Dash	0, 0, 255	
		Flushing Water Pipe System	0.25	Centre	255, 255, 0	
13	Drainage System		0.35	Divide2	128, 128, 0	
14	Water Leakage Detection System	Leak Detection Cable	0.35	Continuous	122, 48, 160	
15	Photovoltaic Panel System	Solar panels, cable containment, inverter, transformer	0.35	Divide2	0, 255, 0	
16	Saltwater treatment system		0.25	Centre	255, 255, 0	

2.6. Project Information Production Methods and Procedures

Table 10 shows the document delivery formats and their submissions dates.

Table 10. Document delivery formats and requirements

Deliverables	Format	Submission Date
1. BIM Implementation Plan	.pdf & .docx	Within 2 weeks after commencement date of the Works
2. Asset Data Worksheets	.xls	Within 6 weeks after commencement date of the Works
3. BIM Object	.rfa	Within 60 calendar days after commencement date of the Works
4. As-built Model with Asset Data	.rvt, .ifc & .svf	Within 60 calendar days after commencement date of the Works
5. Asset Data File	.xml (COBieLite)	Within 60 calendar days after commencement date of the Works

Deliverables	Format	Submission Date
6. As-built Drawings	.pdf	Within 60 calendar days after commencement date of the Works

2.6.1. Details on BIM Use 1 & 2: Existing and As-built Verification

As stated in section 4.8 1) of the EIR, the Contractor shall incorporate existing conditions and verify as-built conditions through a number of methods. These methods are listed in Table 11.

Table 11. Methods for field verification

Verification Type	Verification Source
Visual Inspection	360 camera, Site photos, videos,
Drawings Verification	As-built Drawings
Survey	Traditional Surveying techniques, UAS/LiDAR/laser scanning
Other	Digital map products available from the Lands Department

In Revit, parameter "CIC_Site_Verify" is used for indicating objects that are checked with on-site verification, such as images, 360 image/video, and point cloud data.

2.6.2. Details on BIM Use 4: Data Requirements for Asset Management

As stated in section 4.8.4 of the EIR, the CIC's facility manager shall specify the data required for the asset management of each element. The detailed list of agreed equipment is provided in Appendix B: List of Required Equipment. The equipment list will contain basic object information such as BIM Object Name, LOD, Location, as well as attribute fields which are requested by Planon and approved by CIC. Asset data will be inserted to these fields according to their dedicated FM category.

The associated attributes are provided in Appendix C: Attributes / Properties of objects for FM/AM. Shared parameters will be developed and created for model elements according to the attribute fields in the equipment list.

Figure 4 shows the workflow for the creation of the bi-directional link of the BIM model to the asset management data set. This workflow will be aligned with Appendix IV of the tender documentation, *Integration Specification Document for Construction Industry Council (CIC) - Version: 01, Date 19 Apr 2021*.

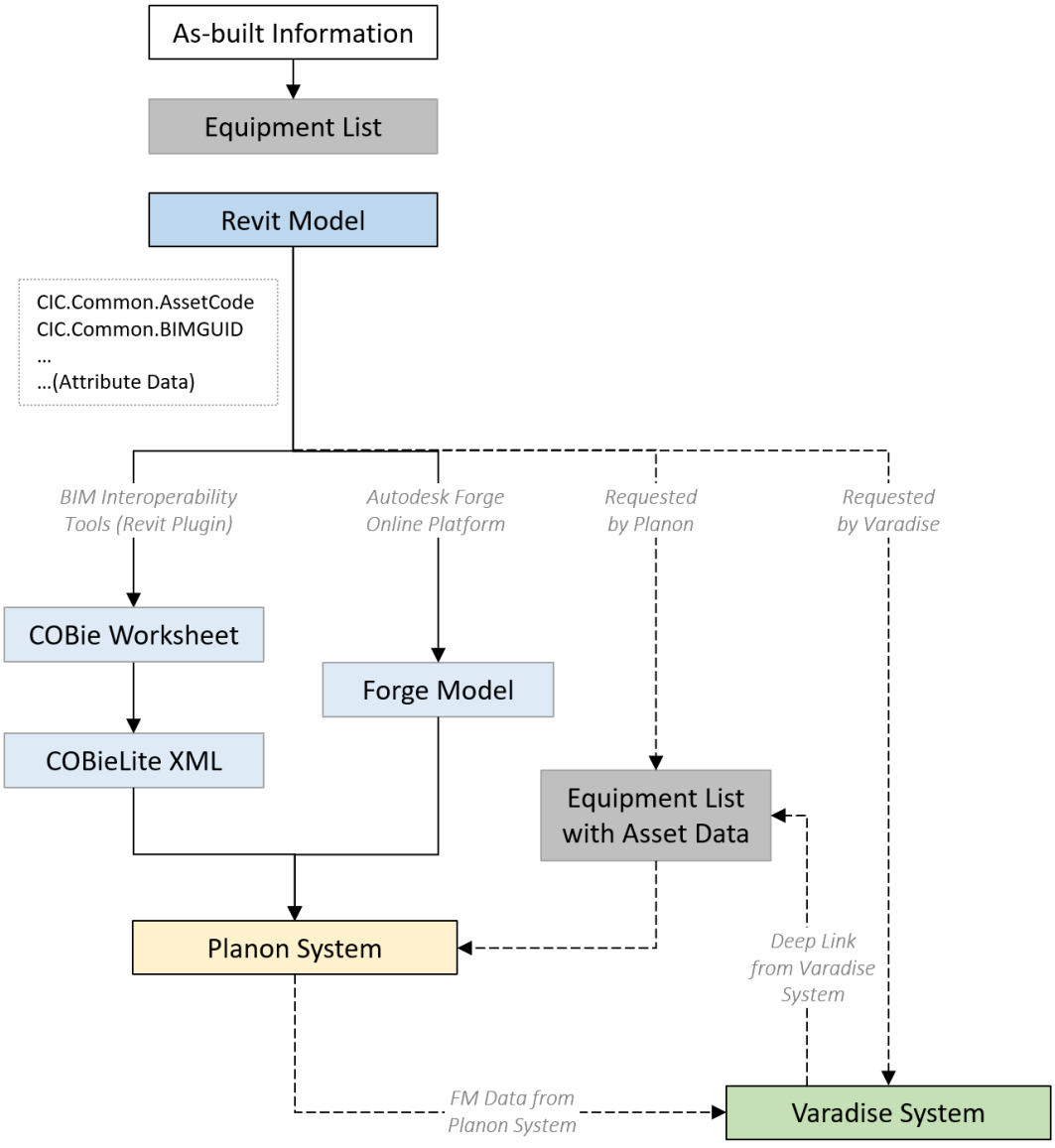


Figure 4. Workflow for creation of initial model with the input of asset management data

2.6.3. Details on BIM Use 4: Use of Autodesk Forge in Asset Data Workflow

As shown in Figure 4, an Autodesk Forge model (.svf) is generated from the Revit model so that it can be brought into the Planon software system as a 3D model. The asset data contained in each Revit element in the equipment list is then mapped to its Forge counterpart by using its asset code (refer to the CIC.Common.AssetCode in Appendix C: Attributes / Properties of objects for FM/AM) and its GUID (refer to CIC.Common.BIMGUID in Appendix C: Attributes / Properties of objects for FM/AM).

For elements from linked Revit files, their GUID (LinkBIMGUID) is prepended with the Linked Revit Model GUID. This Linked Revit Model GUID is generated automatically when a model file is linked to the master file. An example is show in Table 12.

Table 12. Example of GUID formatting across linked Revit files

	MEP File (Master)	**ARC File**	**STR File**
Linked Revit Model GUID in Master File	N/A	e.g. 2558c4e6-cdff-4fe2-81e2-51bf8e89da5e-00102705	e.g. e75eb4fc-f590-4df8-849b-01f311d707ad-000331b4
Original Object GUID	e.g. ce54ee25-3eec-4c6b-9dd4-8486e5d1dcde-00099ea4	e.g. ce54ee25-3eec-4c6b-9dd4-8486e5d1dcde-00099ea4	e.g. ce54ee25-3eec-4c6b-9dd4-8486e5d1dcde-00099ea4
LinkBIMGUID **(Linked Revit Model GUID in Master File/ Original Object GUID)**	e.g. ce54ee25-3eec-4c6b-9dd4-8486e5d1dcde-00099ea4	e.g. 558c4e6-cdff-4fe2-81e2-51bf8e89da5e-00102705/ ce54ee25-3eec-4c6b-9dd4-8486e5d1dcde-00099ea4	e.g. e75eb4fc-f590-4df8-849b-01f311d707ad-000331b4/ ce54ee25-3eec-4c6b-9dd4-8486e5d1dcde-00099ea4

2.6.4. Details on BIM Use 4: Data Exchange via COBieLite

The use of COBieLite export files is specified in sections 10.3 and 10.4 of the EIR and is the means of achieving an OpenBIM approach to a bi-directional data exchange with the CIC EOMS platform.

2.6.5. Details on BIM Use 4: Operations-phase Model and Data Updates

During the operations phase, new assets will inevitably be required to be introduced to the AIM. This will involve both adding (or changing) model geometry and inputting (or updating) data. Figure 5 illustrates the proposed workflow for such a change. Users are suggested to input data with this operation stage data flow. The workflow relies on the Revit model, the Forge model, and the updated Equipment List with asset data (see Appendix B: List of Required Equipment).

It should be noted that the key objective is to ensure that information for asset items - both existing and new - is incorporated into the CIC's EOMS platform completely and accurately. Whether this is achieved through the use of the Equipment List or, as stated in section 2.6.4, by COBieLite, will be subject to the technical specifications and best practices of the EOMS platform.

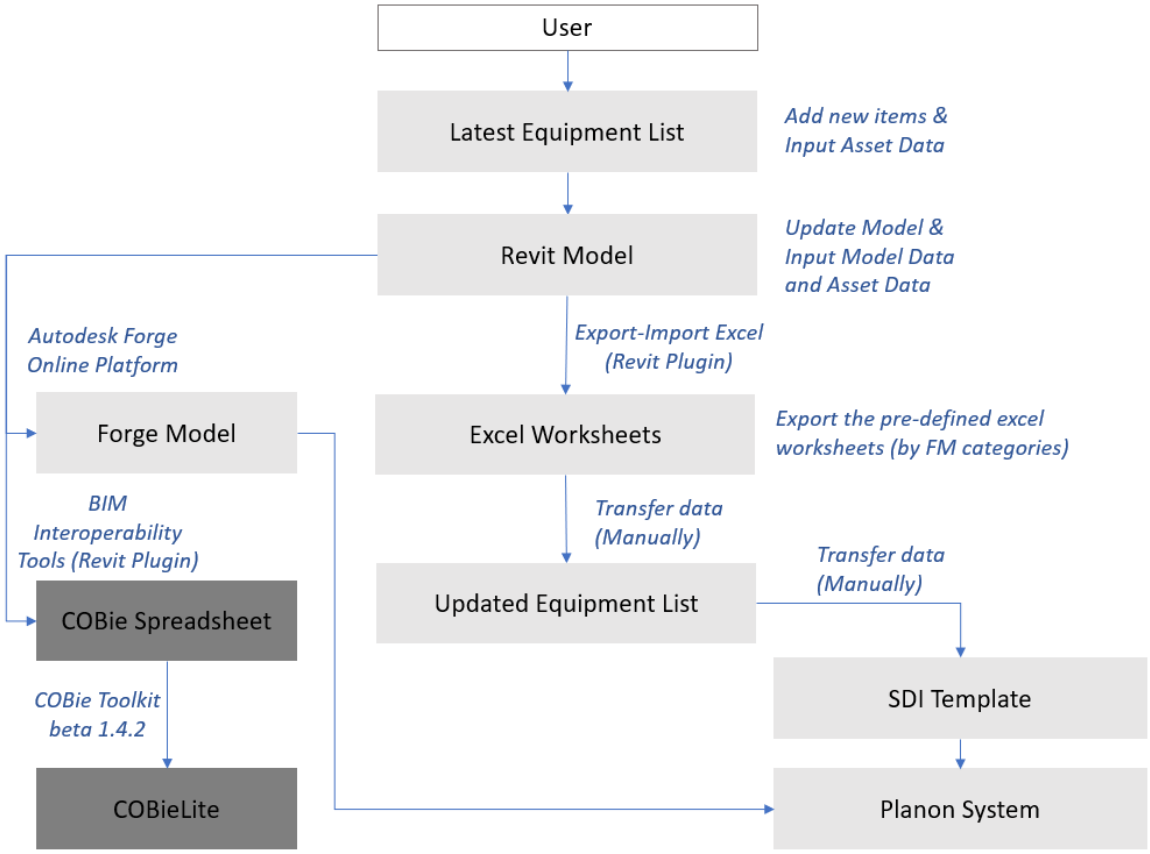


Figure 5. Workflow for update of model and data during operations phase

Below are the detailed steps of producing the updated equipment list from the Revit model:

- **Step 1 - Request to add new items and data**

When a new item is proposed to be added to the model, the user shall start by editing the latest equipment list. The user should add a new row for the item on the correct FM category page in the equipment list. All asset data fields, except LinkBIMGUID and CIC.Common.BIMGUID should be filled in. See Figure 6

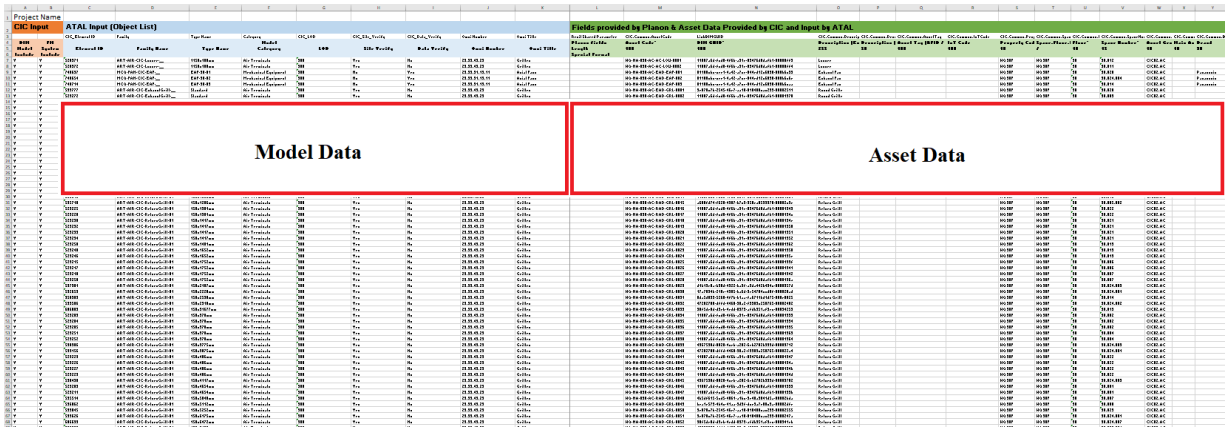


Figure 6. Equipment List with Model Data and Asset Data

- **Step 2 - Modelling and data input**

Modellers can build up the objects in the model according to the equipment list. The new object should be assigned with a BIM Object name and a unique asset ID (CIC.Common.AssetCode) which conforms to project BIM standards. At the same time, the data in Table 13 and Table 14 below should be input manually into the model:

Table 13. Model Data for manual input

Parameter	Description	Data Format in Revit Model
CIC_Element ID	Refer to "Element ID" in Equipment List; The value of the parameter referenced the unique ID generated from by Revit (Element ID). This value is only unique in its own file and is extracted for easy checking internally. This project will use CIC.Common.AssetCode, which is unique across all files, for mapping data into the Planon system.	Text
CIC_LOD	Refer to "LOD" in Equipment List; This parameter indicates the LOD requirement of each BIM object.	Text
CIC_Site_Verify	Refer to "Site Verify" in Equipment List; This parameter indicates whether the BIM object was site-verified.	Ys/No
CIC_Data_Verify	Refer to "Data Verify" in Equipment List; This parameter indicates whether catalogues or detailed drawings of BIM objects were provided and if the BIM object was built according to these information sources.	Ys/No
CIC_OmniClass_Number	Refer to "OmniClass Number" in Equipment List; This parameter refers to the properly formatted OmniClass Number of the BIM object.	xx-xx xx xx xx xx
CIC_Shared_Parameter	A parameter used to for the purposes of extracting equipment schedules from Revit and organising the data in accordance with the established equipment list for the project.	Text

Table 14. Asset data for manual input

Parameter	Description	Data Format in Revit Model
All asset data provided by user in equipment list (Except LinkBIMGUID and CIC.Common.BIMGUID)	Refer to Planon's fields/Asset data in Equipment List; These data are provided by user and should be input into the model.	Text

In the master file Revit file, the name of the Linked Revit Model should be input with its File GUID. By doing so, the LinkBIMGUID of each linked element can be formulated in Revit schedules and be used for data mapping into the Planon FM system, see Table 15 and Figure 7.

Table 15. Linked Revit Model Properties

Parameter	Description	Data Format in Revit Model
Name	The value of this parameter should be inputted into the Linked Revit Model GUID, which is generated internally as the "UniqueId" in the Revit master file. See Figure 7.	Text

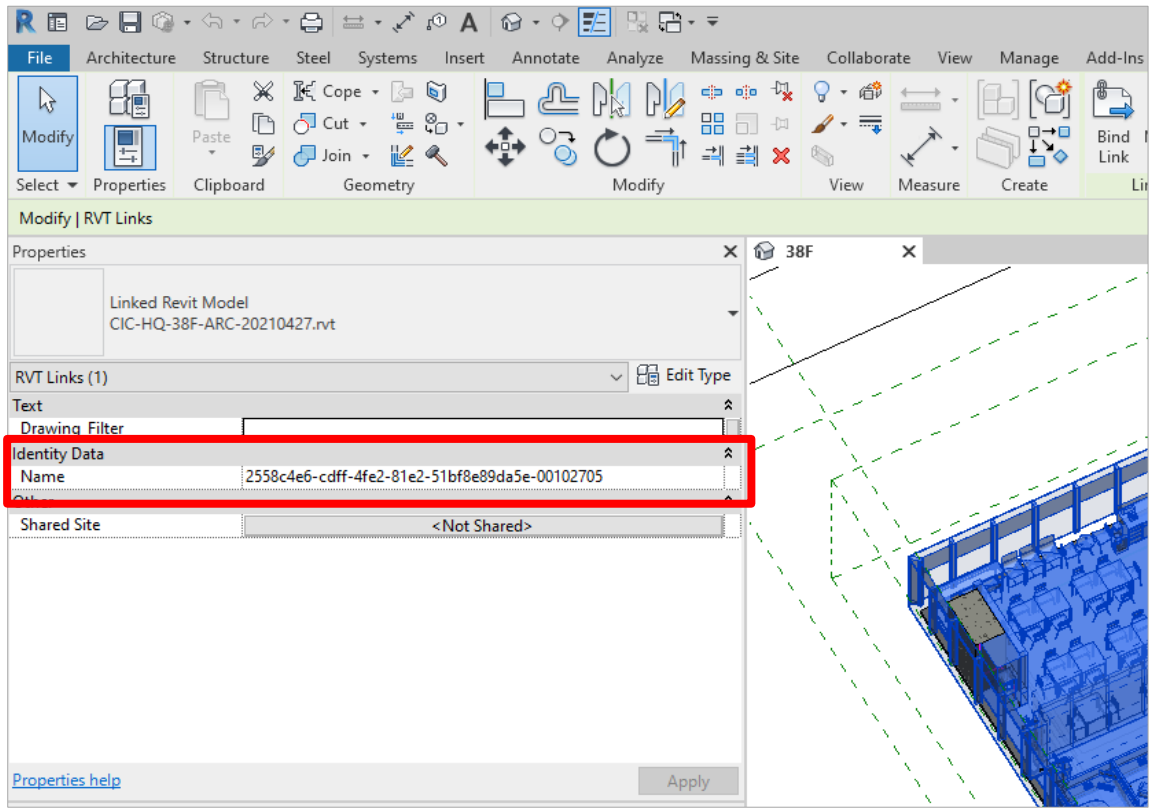


Figure 7. Name parameter of the linked Revit model (example for reference from CIC HQ project)

- **Step 3 - Export Excel worksheets**

After modelling and data input, pre-defined Revit schedules can be exported as Excel worksheets using the Revit plugin "Export-Import Excel". For each Revit file, there are 10 predefined schedule templates for exporting, see Table 16.

Table 16. Schedule templates for Excel export

Schedule Name in Revit	FM Category
CICZCP_FM_AC	AC
CICZCP_FM_FS	FS
CICZCP_FM_PD	PD
CICZCP_FM_EL	EL
CICZCP_FM_LIFT	LIFT
CICZCP_FM_ELV	ELV
CICZCP_FM_BLDG	BLDG
CICZCP_FM_LAND	LAND
CICZCP_FM_FE	FE
CICZCP_FM_OTH	OTH

In addition to the data that was manually input during modelling, the data in Table 17 and

Table 18 and will also be generated automatically and included in the schedules:

Table 17. Additional model data generated automatically and included in the schedules

Parameter	Description	Data Format in Revit Model
BIM Object	Refer to "BIM Object Name" in Equipment List; This parameter indicates the Name of the BIM Object.	Text
Type	Refer to "Type Name" in Equipment List; This parameter indicates the Type Name of the BIM object.	Text
Category	Refer to "Model Category" in Equipment List; This parameter indicates the Revit Category used for building the BIM object.	Text
OmniClass Number	Refer to "OmniClass Number" in Equipment List;	Text

Parameter	Description	Data Format in Revit Model
	This parameter indicates the OmniClass Table 23 Products (2012-05-16) number classified for the BIM object.	
OmniClass Title	Refer to "OmniClass Title" in Equipment List; This parameter indicates the OmniClass Table 23 Products (2012-05-16) title classified for the BIM object.	Text

Table 18. Additional asset data generated automatically and included in the schedules

Parameter	Description	Data Format in Revit Model
CIC.Common.BIMGUID	Refer to "CIC.Common.BIMGUID" in Equipment List; The value of this parameter is generated internally "UniqueId" in Revit models.	Text
LinkBIMGUID	Refer to "LinkBIMGUID" in Equipment List; The parameter is a combined parameter consisted of Linked File Name and CIC.Common.BIMGUID. The data is generated automatically in the schedules. Planon system requires this parameter for mapping the data to the model geometry.	Text

- **Step 4 - Updating the equipment list and SDI template**

The content of the equipment list can be replaced entirely by the newly exported Excel worksheets. The updated equipment list will contain the latest data from model and is ready to be transferred to the SDI (Standard Data Import) template. Since the SDI template requires data in a specific format in order to transfer data into the Planon system, users must take care to verify the formatting of the data before it is input into the SDI template.

2.7. Federation Strategy

The approach for federation for the ZCP model is relatively simple due to the limited size of the project. A master Revit file links the trade Revit files of structure, architecture, and building services. Each trade file is a single Revit model. While the model for the landscaping is still under discussion at this time, it will most likely be its own Revit file and will be linked to the master Revit file in the same way as the other trade Revit files.

2.8. Security Strategy

All task teams and ATAL shall ensure that project data is maintained on secure servers or computers that are protected by fire walls, updated anti-virus software, and backed up at a secondary location at all times. Project participants' access to project data shall be managed by the IT department of each task team and ATAL such that only direct employees of each team who are involved in the production, management, or review of project data shall have access. Task team members who are involved in production or management of project data shall have different access rights to the data from team members involved in review and approval such that production team members cannot approve their output and reviewing team members cannot edit the content of project data files. Project data access shall also be traceable such that which team member modified a file at what time can be reported. Project data shall be versioned such that, if necessary, a project data file may be reverted to an earlier version. Task teams shall be responsible to vet the background of each team member and ensure their suitability for the task assigned to them; additionally, those listed in Section 2.2 Project Information Functions shall have their CVs and qualifications on file with ATAL.

2.9. High and Detail Level Responsibility Matrix

The organisation of the project participants is as shown in Figure 8. Updates to the organisation structure shall be subject to CIC's approval as stipulated in section 2.4 of *BIM Exchange Information Requirement (EIR) (Particular Specifications of Building Information Modelling).*

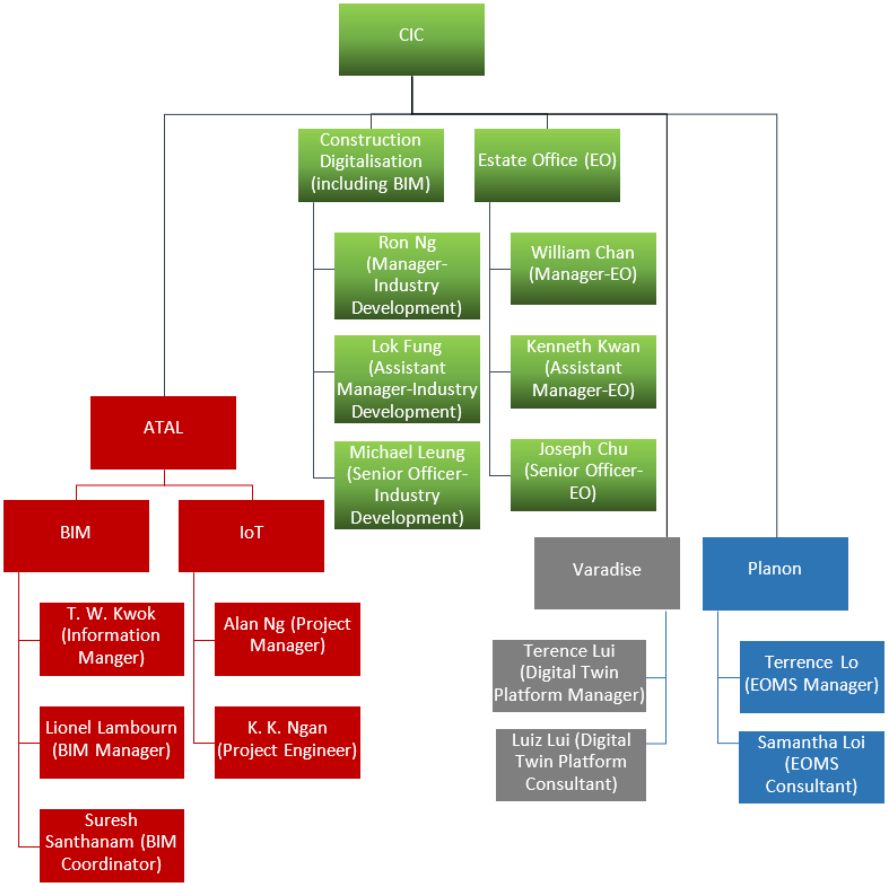


Figure 8. Project Organisation Chart

2.10. BIM Team Resources, Competency and Training

The BIM team resources and structure has been established for this project in compliance with section 2.4 of the EIR.

2.11. Delivery Team Risk Register

In order to mitigate against potential risks on this project, the Delivery Team Risk Register has been created in Table 19. This risk register will be updated as needed throughout the project duration.

Table 19. Delivery Team Risk Register

ID	L = Low M = Medium H = High Name	Probability	Impact	Mitigation	Responsibility	Time-frame
1	Missing as-built records	M	H	On-site verification	ATAL	Within 24 hrs
2	Discrepancy between actual construction and as-built records	M	H	Remodel according to on-site verification	BIM	Varies
3	Clashes in BIM provided by CIC	L	H	Remodel according to on-site verification	BIM	Varies
4	Unable to locate matching models for vegetation on site	H	L	Provide best match and supplement with attribute data	BIM	Per TIDP
5	IoT objects not available in 3D	M	L	Create new models	BIM	Per TIDP
6	Revit models become too heavy	M	M	Further divide models and federate with Navisworks	BIM	Per TIDP
7	Missing FM data on as-fitted equipment	M	H	Inform CIC to follow up with supplier	ATAL	Within 24 hrs

2.12. Mobilisation Plan

In accordance with Section 3.6.15 of the *CIC BIM Standards - General (Version 2.1 - 2021)*, the purpose of the Mobilisation Plan is to formulate mitigating action against identified risks prior to the commencement of delivery. In preparation for the delivery of this project, ATAL and the Task Teams incorporated the following activities into their Mobilisation Plan:

a. Reviewed lessons learned from the delivery of the CIC HQ project to refine the proposed methods statements for the ZCP;

b. Adapted and improved the BIM Execution Plan from the CIC HQ project into this BIM IP;

c. Ensured that each of the teams were represented by suitably qualified personnel and are adequately staffed for the tasks involved;

d. Held meetings with the delivery team to identify risks, plan mitigating measures, and formulate contingencies;

e. Audited BIM workflows - including software and hardware provisions - to identify any gaps, and ensure readiness on commencement.

2.13. Master Information Delivery Plan (MIDP)

See Appendix E: Master Information Delivery Plan which indicates the overall delivery programme of works and will be updated in response to project needs, inputs from all parties, changes in the TIDPs of the task teams, and the availability of required information for integration with the as-built BIM.

2.14. Task Information Delivery Plans (TIDPs)

The TIDPs of the BIM task team, the IoT task team and the EOMS task team is provided under Appendix F: Task Information Delivery Plans.

For further details on the TIDP of Planon, the EOMS task team, refer to Appendices IV and V of the tender documentation, *Integration Specification Document for Construction Industry Council (CIC) - Version: 01, Date 19 Apr 2021*.

2.15. BIM Deliverable Schedule (Programme)

Table 20 shows the project milestones.

Table 20. Project milestones

Milestone	Description	Target Completion Date
M0	Works Commencement Date	Beginning of Sep 2021
M1	BIM Implementation Plan	Within 2 weeks after commencement date of the Works
M2	Information Collection & Verification	End of Sep 2021
M3	Site Record	End of Sep 2021
M4	BIM Object and Base Model Development	End of Oct 2021
M5	Asset Data Worksheet Format	Within 6 weeks after commencement date of the Works
M6	IoT Works	End of Dec 2021

Milestone	Description	Target Completion Date
M7	Asset Data Input	Middle of Dec 2021
M8	As-built Model Submission	End of Dec 2021
M9	BIM Object Library Submission	End of Dec 2021
M10	As-built Drawings Submission	End of Dec 2021

2.16. Spatial Coordination Process

Navisworks Manage will be used to check clash of visible E&M services. For any issue found in the clash analysis process, our BIM Engineer will attend BIM meetings to solve the potential problems with client before submitting as-built BIM model for approval and proceeding with the transition to the EOMS system.

2.17. Software, Hardware, CDE and IT Infrastructure

2.17.1. Software Requirement

The software that will be used on this project are listed in Table 21.

Table 21. Software platforms for this project

Usage	Software
BIM Modelling	Autodesk Revit 2020
BIM Model Viewer	Autodesk Navisworks Manage 2020, Simulate 2020, or Freedom 2020 Autodesk Online Viewer
COBieLite	BIM Interoperability Tools, COBie Toolkit beta 1.4.2
Forge	Forge GUI, Autodesk Forge Online Platform
EOMS	Planon
Digital Twin Platform	Varadise

2.17.2. Data Archiving

BIM models and their related asset database were archived at the CIC’s servers.

2.18. Quality Assurance

As required by section 7.1 of the EIR, a Quality Assurance Plan shall be a part of the BEP. Table 22 lists the overall Quality Assurance and Quality Checking procedures that are employed on this project.

Table 22. Quality Assurance and Quality Checking procedures

QA Items	QC Support
Information	
• Layout Information	360 Video and Images Verification; Site photos Verification; As-built drawings verification
• Asset Data	O&M Manual Checking; Catalogue Checking
Modelling Quality	
• Issue Management	Visual Checking; Clash Analysis (Navisworks Manage 2020)
• Level of Development	LOD equipment list; LOD system list
Standards	
• Modelling Standards	Modelling Checklist
• Drawings Standards	Drawing Standards Checklist

2.18.1. Quality Assurance and BIM Auditing

In accordance with section 5.8.4 of the *CIC BIM Standards - General (Version 2.1 - 2021,* the quality checking process shall incorporate a BIM auditing procedure which shall be undertaken on a regular basis throughout the duration of the project. While this project involves the creation of an Asset Information Model (AIM) of a building and park that is already constructed and the failure to detect clashes, reduce change orders, or meet building requirements will not result in construction delays or cost overruns, the need to assure quality in the AIM is, nevertheless, critical to the optimal maintenance of the facilities. Therefore, the BIM Audit checks as shown in Table 23 shall be carried out.

Table 23 Level of BIM Audit Checks

Checks	Definition/Description	Responsibility	Methodology	Frequency
1. Visual check (LOD-G)	To ensure that the model elements in the ZCP (building and park) accurately reflect the as-built conditions. To check that the modelled elements are conforming to the required LOD-G.	Disciplinary Modeller	Model walkthroughs using Forge model viewer	once a week and before each BIM coordination meeting

Checks	Definition/Description	Responsibility	Methodology	Frequency
	To eliminate any modelling errors that cannot be detected using automated clash detection, e.g., pipes that are disconnected along its routing, walls that are not touching the slab, wall mounted light fixtures that are floating is space, etc.			
2. Interference check, Clash detection	To detect when ZCP's modelled elements are occupying the same space. These may be hard clashes, where the modelled elements are overlapping, or soft clashes, where the elements are within a pre-defined tolerance distance of each other. Proper element grouping and clash rules shall be set up to reduce the occurrence of false positive clashes and duplicated instances of the same category of clashes.	Disciplinary Modeller and BIM Coordinator	A Clash Detective in Navisworks will be conducted and the results will be reviewed and organised into a Clash Report prior to each BIM coordination meeting.	once a week and before each BIM coordination meeting
3. Standards check	To ensure that the ZCP models are in compliance with the requisite standards and this BEP. For example, object naming, shared parameters, labels, annotations, graphics guidelines.	Disciplinary Modeller and BIM Coordinator	Manual checking and extraction of related data into Excel for automated checking.	Bi-weekly
4. Model data integrity check (LOD-I)	To ensure that the equipment, IoT devices, maintainable assets, plants in the park, etc. are included on the master equipment list maintained in Excel. Space names must also be correct.	Disciplinary Modeller and BIM Coordinator	Extraction of schedules and the use of automation and Excel rule checking to highlight any errors, duplicated data entries, or missing entries.	Bi-weekly

Checks	Definition/Description	Responsibility	Methodology	Frequency
5. Document Deliverable Check (DOC)	To ensure that the as-built ZCP model is used to generate all documentations such as as-built drawings.	BIM Manager and BIM Coordinator	Work with Project Manager and Information Manager of Lead Appointed Party to ensure extracted as-built drawings include all relevant items and are correctly represented with respect to graphics and information.	Twice a week once the process of ZCP as-built drawing extraction begins
6. Model Audit	Spot checking of the model for items 1-4 and model extractions for item 5 above.	BIM Manager, BIM Coordinator, Project Manager of Lead Appointed Party, Information Manager of Lead Appointed Party	Same methods as stated above	Bi-weekly

2.18.2. Issue Management

ATAL shall utilise Navisworks Manage 2020 as the means for tracking issues with the as-built BIM that require clarification from CIC or from other parties in the Delivery Team. Documentation of the issues will be by a combination of clash reports generated by Navisworks and by saved viewpoints in Navisworks if the issue was identified by visual checking. Exports of the lists of issues identified, status (open/closed), duration outstanding, responsible party, involved trades/models, and level of risk will be produced and updated.

Other types of identified issues will be discussed on a case-by-case basis and an appropriate means of tracking and managing them will be agreed with the other members of the Delivery Team and the Appointed Party.

2.18.3. Submission and approval control

ATAL's submissions of work deliverables will be by a secure electronic means in a manner as agreed with the Appointing Party.

2.18.4. Model compliance

ATAL will conduct regular self-checking of the model files in accordance with the *CIC BIM Standards - General (Version 2 - September 2021* and with the processes elsewhere detailed in this BIM IP. Non-compliant modelling will be identified by using both automated means, such as automatic clash detection or model checking software tools, or by manual means, such as visual checking. All non-compliant modelling will be corrected prior to final handover.

2.18.5. Model quality

ATAL will self-check the quality of the model against the LOD responsibility matrix in Appendix A: LOD Responsibility Matrix of this BEP. Any model element that is not to the appropriate level of development will be recorded as an issue and tracked under Issue Management (see 2.18.2 Issue Management) until the model quality issue is resolved. All model quality issues will be corrected prior to final handover.

2.18.6. Data validation

ATAL will validate all relevant data in the model by a combination of automated and manual means. Shared parameter values, attributes and properties will be exported and checked automatically using rules in Excel. Further checking will be undertaken manually. Invalid data will be recorded as an issue and tracked under Issue Management (see 2.18.2 Issue Management) until the data validation issue is resolved. All data validation issues will be corrected prior to final handover.

2.18.7. Clash analysis

Clash analyses will be conducted within and between the discipline models of the ZCP as-built BIM and, where clashes are found, they will be documented for follow up by the party or parties involved and tracked until they are resolved. Multiple clashes of the same element will be grouped, where appropriate, and resolved accordingly. False positive clashes will be avoided by creating sets of items that should be excluded from clash detection.

Where critical spatial requirements exist - such as installation or maintenance space requirements, head room requirements, etc. - “dynamic volumes” will be modelled and used in the clash detection process to identify insufficient spatial needs.

2.18.8. As-built verification

ATAL will employ a combination of as-built drawings, survey reports, photos (both regular and 360° photos), and site observations in order to verify the as-built conditions of the ZCP and produce the as-built BIM in accordance with these records.

2.19. Handover Procedure

2.19.1. Information Management Workflow for As-built and Handover Stage

As the objective of this project is to create an Asset Information Model (AIM) of ZCP, the handover of a complete and accurate set of as-built information is paramount. The procedure for the information management workflow is facilitated through an Asset Information List Template, see Appendix B: List of Required Equipment. The detailed steps in this procedure can be found in Figure 4. Workflow for creation of initial model with the input of asset management data. Furthermore, the detailed steps for future updating of the AIM can be found in Figure 5. Workflow for update of model and data during operations phase.

2.19.2. Archive of Project Information including models

During project delivery, all documents including the models shall be stored and archived in accordance with the following folder structure that has been agreed with the Appointing Party:

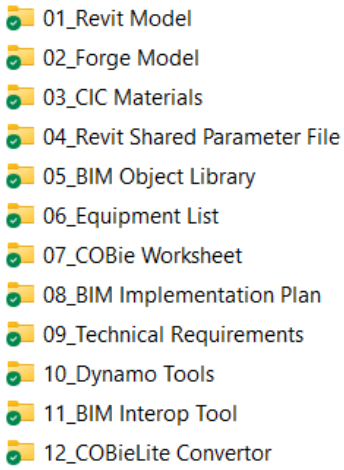


Figure 9. ZCP standardised folder structure

Moreover, all information contained in this repository shall be in compliance with the Security Information Requirements as stipulated in section 1.11 of the BIM Implementation Plan and adhere to the Security Strategy as detailed in section 2.8 of this BEP.

2.19.3. Checklist of Handover items

At handover, the contents of the following folders will be submitted in accordance with the procedure detailed in 2.19.4 Handover medium and transmittal:

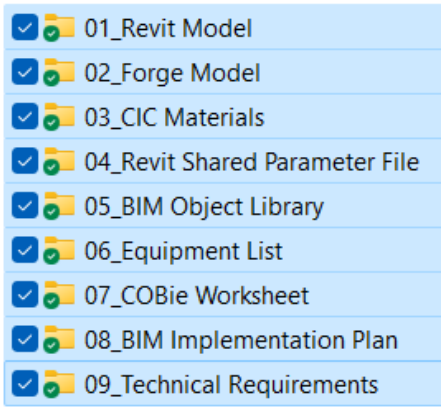


Figure 10. ZCP folders designated for handover

2.19.4. Handover medium and transmittal

All information produced in the course of this project shall be stored on a DVD-ROM disk or disks and be submitted to the Appointing Party as a part of the handover process. The disk(s) shall be accompanied by a formal transmittal document to record the submission by the Lead Appointed Party.

List of Appendices

Acknowledgement

<u>Appointing Party</u>	
Mr. William Chan	Construction Industry Council (Estates Office)
Mr. Kenneth Kwan	
Mr. Joseph Chu	
Mr. Alex Ho	Construction Industry Council (Construction Digitalisation)
Mr. George Wong	
Mr. Ron Ng	
Mr. Lok Fung	
Mr. Michael Leung	
<u>Lead Appointed Parties</u>	
Mr. Keith Mak	ATAL Technologies Limited
Mr. K.K. Chan	
Mr. T.W. Kwok	
Mr. Terence Lo	Planon Hong Kong Limited
Ms. Samantha Loi	
Mr. Terrence Liu	Varadise Limited
Mr. Luiz Lui	
<u>Appointed Party / Task Team</u>	
Mr. Lionel Lambourn	Good Year-Syntegrate JV (Sub-con of ATAL)
Mr. Suresh Santhanam	

Member List of the Task Force on BIM Standards

Members	Representative of:
Prof. Jack CHENG (Chairperson)	The Hong Kong University of Science and Technology
Ar. Prof. Ada FUNG	Chairperson of the Committee on BIM
Ir Boris YIU	Development Bureau
Mr. Alex CHU	Lands Department
Sr Mark LAI	Buildings Department
Ir Kelvin WONG	Airport Authority Hong Kong
Ar. Aaron CHAN	The Hong Kong Institute of Architects
Ir Clement CHUNG	The Association of Consulting Engineers of Hong Kong
Mr. Froky WONG	Hong Kong Institute of Building Information Modelling
Mr. Billy WONG	Hong Kong Construction Association
Mr. KWOK Tak Wai	The Hong Kong Federation of Electrical and Mechanical Contractors Limited

CONSTRUCTION INDUSTRY COUNCIL 建造業議會

Feedback Form

CIC-ZCP BIM Implementation Plan (BIM IP) Case Sharing

To improve future editions of this publication, we would be grateful to have your comments.

(Please put a "✓" in the appropriate box.)

1. As a whole, I feel that the publication is:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Informative	❑	❑	❑	❑	❑
Comprehensive	❑	❑	❑	❑	❑
Useful	❑	❑	❑	❑	❑
Practical	❑	❑	❑	❑	❑
2. Does the publication enable you to understand more about the subject?	Yes		No		No Comment
	❑		❑		❑
3. Have you made reference to the publication in your work?	Quite Often		Sometimes		Never
	❑		❑		❑
4. To what extent have you incorporated the recommendations of the publication in your work?	Most		Some		None
	❑		❑		❑
5. Overall, how would you rate our publication?	Excellent	Very Good	Satisfactory	Fair	Poor
	❑	❑	❑	❑	❑
6. Other comments and suggestions, please specify (use separate sheets if necessary).					
Personal Particulars (optional):* Name: Mr. / Mrs. / Ms./ Dr. / Prof. / Ar. / Ir / Sr ^ Company: Tel: Address: E-mail:					

* The personal data in this form will be used only for this survey. Your data will be kept confidential and dealt with only by the Construction Industry Council.

^ Circle as appropriate.

Please return the feedback form to:
CIC Secretariat – BIM
E-mail:bim@cic.hk
Address: 38/F, COS Centre, 56 Tsun Yip Street, Kwun Tong, Kowloon, Hong Kong
Fax No.: (852) 2100 9090

Construction Industry Council

Address : 38/F, COS Centre
56 Tsun Yip Street
Kwun Tong, Kowloon
Tel : (852) 2100 9000
Fax : (852) 2100 9090
Email : enquiry@cic.hk
Website : www.cic.hk

Appendix A: LOD Responsibility Matrix

- (*) Individual items which are not covered by ceiling has been site-verified
- LOD 500 data are input according to CIC provided information

Model Element	Required	As-Built Modelling			
	(Y/N)	AUT	LOD/LOD-G	LOD-I	Site Verified
Asset Group: AC					
Air Grill	Y	ATAL	300	500	*
Louvre	Y	ATAL	300	500	*
Supply Diffuser	Y	ATAL	300	500	*
Plenum	Y	ATAL	300	500	*
Fire Damper	Y	ATAL	300	500	*
Non-Return Damper	Y	ATAL	300	500	*
Air Conditioner	Y	ATAL	300	500	*
Exhaust Fan	Y	ATAL	300	500	*
Duct	Y	ATAL	300	500	*
Duct Fitting	Y	ATAL	300	500	*
Duct Accessories/Hanger	Y	ATAL	300	500	*
Flex Ducts	Y	ATAL	300	500	*
Pipe	Y	ATAL	300	500	*
Pipe Fitting	Y	ATAL	300	500	*
Pipe Insulation	Y	ATAL	300	500	*
Asset Group: FS					
Alarm Bell	Y	ATAL	300	500	*
Visual Alarm	Y	ATAL	300	500	*
Emergency Recessed Light	Y	ATAL	300	500	*
Breakglass Unit	Y	ATAL	300	500	*
Exit-Sign	Y	ATAL	300	500	*
Smoke Detector Beam Receiver	Y	ATAL	300	500	*

Model Element	Required	As-Built Modelling			
	(Y/N)	AUT	LOD/LOD-G	LOD-I	Site Verified
Fire Extinguisher	Y	ATAL	300	500	*
Sprinkler	Y	ATAL	300	500	*
Hose Reel	Y	ATAL	300	500	*
Asset Group: PD					
Flush Sensor	Y	ATAL	300	500	*
Pump Tank	Y	ATAL	300	500	*
Water Closet	Y	ATAL	200	500	*
Urinal	Y	ATAL	200	500	*
Basin	Y	ATAL	300	500	*
Tap/Faucet	Y	ATAL	200	500	*
Sink	Y	ATAL	200	500	*
Asset Group: EL					
Lighting Fixture	Y	ATAL	300	500	*
Floor Box	Y	ATAL	300	500	*
Light Box	Y	ATAL	300	500	*
AC Control	Y	ATAL	300	500	*
AC Panel	Y	ATAL	300	500	*
MCB/MCCB	Y	ATAL	300	500	*
PM Panel	Y	ATAL	300	500	*
Pump Control	Y	ATAL	300	500	*
Lighting Control	Y	ATAL	300	500	*
Cable Tray	Y	ATAL	300	500	*
Cable Ladder	Y	ATAL	300	500	*
Trunking	Y	ATAL	300	500	*
Concealed and cast-in-place conduit	N				
Asset Group: Lift					
Lift Panel	Y	ATAL	200	200	*
Lift Car	Y	ATAL	200	200	*
Lift Button	Y	ATAL	200	200	*

Model Element	Required	As-Built Modelling			
	(Y/N)	AUT	LOD/LOD-G	LOD-I	Site Verified
Asset Group: ELV					
Sensor	Y	ATAL	300	500	*
IoT Sensor	Y	ATAL	300	500	*
Temperature Controller	Y	ATAL	300	500	*
Shade Control	Y	ATAL	300	500	*
Door Control	Y	ATAL	300	500	*
Alarm Button	Y	ATAL	300	500	*
Alarm Indicator	Y	ATAL	300	500	*
Card Reader	Y	ATAL	300	500	*
CCTV	Y	ATAL	300	500	*
Door Release Button	Y	ATAL	300	500	*
Key Switch	Y	ATAL	300	500	*
Emergency Button	Y	ATAL	300	500	*
Room Booking Panel	Y	ATAL	300	500	*
Touchless Door Button	Y	ATAL	300	500	*
Air Purifier	Y	ATAL	200	500	*
Printer	Y	ATAL	200	500	*
Projector	Y	ATAL	200	500	*
Projector Screen	Y	ATAL	200	500	*
Shredder	Y	ATAL	200	500	*
TV Plasma	Y	ATAL	200	500	*
Video Wall	Y	ATAL	200	500	*
IP Phone	Y	ATAL	200	500	*
Electric Curtain	Y	ATAL	200	500	*
Computer Set	Y	ATAL	200	500	*
Asset Group: BLDG					
Door	Y	ATAL	200	200	*
Window	Y	ATAL	200	200	*
Wall	Y	ATAL	200	200	*
Structural Column	Y	ATAL	200	200	*

Model Element	Required	As-Built Modelling			
	(Y/N)	AUT	LOD/LOD-G	LOD-I	Site Verified
Structural Framing	Y	ATAL	200	200	*
Curtain Panel	Y	ATAL	200	200	*
Mullion	Y	ATAL	200	200	*
Asset Group: LAND					
Green Wall	Y	ATAL	300	500	*
Office Planting	Y	ATAL	200	500	*
Asset Group: FE					
Dishwasher	Y	ATAL	200	500	*
Hand Dryer	Y	ATAL	200	500	*
Microwave	Y	ATAL	200	500	*
Refrigerator	Y	ATAL	200	500	*
Video-Camera	Y	ATAL	200	500	*
Dispenser	Y	ATAL	200	500	*
Cabinet	Y	ATAL	200	500	*
Pantry Cabinet	Y	ATAL	300	500	*
Locker	Y	ATAL	300	500	*
Mail Box	Y	ATAL	200	500	*
Mail Collection	Y	ATAL	200	500	*
Tissue Box	Y	ATAL	200	500	*
Tissue Sanitizer	Y	ATAL	200	500	*
Toilet Seat Paper Box	Y	ATAL	200	500	*
Mirror	Y	ATAL	200	500	*
Walk-in Closet	Y	ATAL	300	500	*
Chair	Y	ATAL	200	500	*
Table/Desk	Y	ATAL	200	500	*
Office Table	Y	ATAL	300	500	*
Manager Desk	Y	ATAL	300	500	*
Boardroom Table	Y	ATAL	300	500	*
Reception Counter	Y	ATAL	300	500	*
Ceiling Fan	Y	ATAL	200	500	*

Model Element	Required	As-Built Modelling			
	(Y/N)	AUT	LOD/LOD-G	LOD-I	Site Verified
Trash	Y	ATAL	200	500	*
Sofa	Y	ATAL	200	500	*
Asset Group: OTH					
AV Control Panel	Y	ATAL	300	500	*
Microphone	Y	ATAL	300	500	*
PA Panel	Y	ATAL	300	500	*
Speaker	Y	ATAL	300	500	*
Access Panel	Y	ATAL	300	500	*
White Board	Y	ATAL	200	500	*
Server Rack	Y	ATAL	200	500	*
Wall Art	Y	ATAL	200	500	*
Painting	Y	ATAL	200	500	*
Signage/Logo	Y	ATAL	200	500	*
Room Name Label	Y	ATAL	200	500	*

Appendix B: List of Required Equipment

MVAC items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Air Conditioner	Y	Y	Y	200	500
Air Handling Unit	Y	Y	Y	300	500
Balancing Valve	Y	Y	Y	300	500
Butterfly Valve	Y	Y	Y	300	500
Ceiling Fan	Y	Y	Y	200	500
Check Valve	Y	Y	Y	200	500
Chemical Dosing Tank	Y	Y	Y	300	500
Chemical Tank	Y	Y	Y	200	500
Chilled Beam	Y	Y	Y	300	500
Chiller	Y	Y	Y	200	500
Chiller Pump	Y	Y	Y	300	500
Cooling Tower	Y	Y	Y	300	500
Dual Flap Wafer Check	Y	Y	Y	300	500
Exhaust Grille	Y	Y	Y	300	500
Exhaust Fan	Y	Y	Y	300	500
Fire Damper	Y	Y	Y	300	500
Flexible Connection	Y	Y	Y	300	500
Floor Supply	Y	Y	Y	200	500
Flow Meter	Y	Y	Y	300	500
Fresh Air Fan	Y	Y	Y	300	500
Fresh Air Inlet	Y	Y	Y	200	500
Gate Valve	Y	Y	Y	300	500

MVAC items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Globe Valve	Y	Y	Y	300	500
Heat Wheel	Y	Y	Y	200	500
Hydrant Valve	Y	Y	Y	200	500
Jockey Pump	Y	Y	Y	300	500
Louvre	Y	Y	Y	300	500
Make up Tank	Y	Y	Y	200	500
Motorized Valve	Y	Y	Y	200	500
Pressure Gauge	Y	Y	Y	300	500
Pressure Vessel	Y	Y	Y	200	500
Primary Air Handling Unit	Y	Y	Y	300	500
Return Grille	Y	Y	Y	300	500
Silencer	Y	Y	Y	300	500
Supply Diffuser	Y	Y	Y	200	500
Temperature Sensor	Y	Y	Y	200	500
Test Point	Y	Y	Y	300	500
Variable Air Volume Box	Y	Y	Y	300	500
Volume Control Damper	Y	Y	Y	300	500
Water Cooled Chiller	Y	Y	Y	300	500
Y Strainer	Y	Y	Y	300	500

Fire Services items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Alarm Bell	Y	Y	Y	300	500
Ball Valve	Y	Y	Y	200	500
Break Glass Unit	Y	Y	Y	300	500

Fire Services items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Check Valve	Y	Y	Y	300	500
Exit Sign	Y	Y	Y	300	500
Fire Extinguisher	Y	Y	Y	300	500
Fire Hydrant	Y	Y	Y	200	500
Flow Switch	Y	Y	Y	300	500
Gate Valve	Y	Y	Y	300	500
Heat Detector	Y	Y	Y	300	500
Loose Jumper Stopcock	Y	Y	Y	200	500
Orifice Valve	Y	Y	Y	200	500
Sprinkler control pump panel	Y	Y	Y	200	500
FS control pump panel	Y	Y	Y	200	500
Pressure Switch	Y	Y	Y	200	500
FS Jockey Pump (vertical pump)	Y	Y	Y	300	500
FS Pump (horizontal inline pump)	Y	Y	Y	300	500
Sprinkler pump (horizontal inline pump)	Y	Y	Y	300	500
Sprinkler Jockey Pump (vertical pump)	Y	Y	Y	300	500
Sand Bucket	Y	Y	Y	200	500
Smoke Detector	Y	Y	Y	300	500
Sprinkler	Y	Y	Y	300	500
Subsidiary Stop	Y	Y	Y	200	500
Swing Check	Y	Y	Y	300	500
Visual Alarm	Y	Y	Y	300	500
Y Strainer	Y	Y	Y	300	500

Plumbing and Drainage items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Ball Valve	Y	Y	Y	200	500
Bio Diesel Fuel Tank	Y	Y	Y	200	500
Bio Diesel Pump	Y	Y	Y	200	500
Bottle Trap	Y	Y	Y	200	500
Bronze Gate Valve	Y	Y	Y	200	500
Cartridge Filter	Y	Y	Y	200	500
Check Valve	Y	Y	Y	200	500
Cleansing Water Tank	Y	Y	Y	200	500
Electrical 2-way Pressure Independent Control Valve	Y	Y	Y	200	500
Equalisation Tank	Y	Y	Y	200	500
Flexible Connection	Y	Y	Y	200	500
Floor Drain	Y	Y	Y	200	500
Flow Meter	Y	Y	Y	300	500
Flushing Tank	Y	Y	Y	200	500
Foul Water Pump	Y	Y	Y	200	500
Fresh Water Tank	Y	Y	Y	200	500
Gate Valve	Y	Y	Y	200	500
Irrigation Water Tank	Y	Y	Y	200	500
Manhole	Y	Y	Y	200	500
Modulating Valve	Y	Y	Y	200	500
P Trap	Y	Y	Y	200	500
PD Filter Tank	Y	Y	Y	200	500
Plug Valve	Y	Y	Y	200	500
Potable Water Tank	Y	Y	Y	200	500
Puddle Flange	Y	Y	Y	200	500

Plumbing and Drainage items	**Model Required (Y/N)**	**FM System Required (Y/N)**	**Site Verified**	**LOD-G**	**LOD-I**
Sand Filter	Y	Y	Y	200	500
Shower Head	Y	Y	Y	200	500
Sink	Y	Y	Y	200	500
Smart Living Room Sink	Y	Y	Y	200	500
Subsidiary Stop	Y	Y	Y	200	500
Tap	Y	Y	Y	200	500
Temperature Sensor	Y	Y	Y	200	500
Urinal	Y	Y	Y	200	500
UV Water Sterilizer	Y	Y	Y	200	500
Water Closet	Y	Y	Y	200	500
Water Flow Switch	Y	Y	Y	200	500
Water Heater	Y	Y	Y	200	500
Water Meter	Y	Y	Y	200	500
Water Pump	Y	Y	Y	200	500
Water Tank	Y	Y	Y	200	500
Y Strainer	Y	Y	Y	200	500

Electrical items	**Model Required (Y/N)**	**FM System Required (Y/N)**	**Site Verified**	**LOD-G**	**LOD-I**
Battery Charger	Y	Y	Y	200	500
Downlight	Y	Y	Y	300	500
Earth Terminal	Y	Y	Y	200	500
Economizer	Y	Y	Y	200	500
Electrical Meter	Y	Y	Y	200	500
Floor Box	Y	Y	Y	200	500

Electrical items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Generator	Y	Y	Y	200	500
Isolating Switch	Y	Y	Y	200	500
Lighting	Y	Y	Y	200	500
Lighting	Y	Y	Y	300	500
Mosquito Catcher	Y	Y	Y	200	500
Motor Circuit Protector	Y	Y	Y	200	500
Moulded Case Circuit Breaker	Y	Y	Y	300	500
RMT Switch	Y	Y	Y	200	500
Solar Panel	Y	Y	Y	200	500
Switch	Y	Y	Y	200	500
Switchboard	Y	Y	Y	300	500
Track Light	Y	Y	Y	300	500

Lift items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Elevator Door	Y	Y	Y	200	500

Extra Low Voltage items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Air Flow Sensor	Y	Y	Y	200	500
Alarm	Y	Y	Y	200	500
Bin Sensor	Y	Y	Y	300	500
Card Reader	Y	Y	Y	300	500
CCTV	Y	Y	Y	300	500

Extra Low Voltage items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
CCTV Access Point	Y	Y	Y	300	500
Door Contact Sensor	Y	Y	Y	300	500
Door Release Button	Y	Y	Y	300	500
Emergency Button	Y	Y	Y	200	500
External Pole	Y	Y	Y	200	500
Gateway	Y	Y	Y	300	500
Indoor Environment Quality (IEQ) Sensor	Y	Y	Y	300	500
IOT-CCTV-Indoor	Y	Y	Y	300	500
IOT-CCTV-Outdoor	Y	Y	Y	300	500
Outdoor Environment Quality Sensor	Y	Y	Y	300	500
Power Meter with Current Transformer (CT) Sensor	Y	Y	Y	300	500
Pressure Sensor	Y	Y	Y	200	500
Room Sensor	Y	Y	Y	200	500
Server	Y	Y	Y	200	500
Smoke Detector	Y	Y	Y	200	500
Soap Dispense Usage Sensor	Y	Y	Y	300	500
Temperature Controller	Y	Y	Y	200	500
Temperature Sensor	Y	Y	Y	200	500
Towel Paper Usage Sensors	Y	Y	Y	300	500
Urinal Sensor	Y	Y	Y	200	500
Vibration Sensor	Y	Y	Y	300	500
Video Recorder	Y	Y	Y	200	500
Water Leakage Sensor	Y	Y	Y	300	500
Water Level Sensor for Wetland	Y	Y	Y	300	500

Extra Low Voltage items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Water Quality Sensor for Aquaculture	Y	Y	Y	300	500

Architectural items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Ceiling Feature	Y	Y	Y	200	500
Curtain Door	Y	Y	Y	200	500
Double Door	Y	Y	Y	200	500
Entrance Door	Y	Y	Y	200	500
Green Door	Y	Y	Y	200	500
Metal Gate	Y	Y	Y	200	500
Single Door	Y	Y	Y	200	500
Sliding Door	Y	Y	Y	200	500
Window	Y	Y	Y	200	500

Landscape items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Alangium chinense	Y	Y	Y	200	500
Antidesma bunius	Y	Y	Y	200	500
Aquilaria sinensis	Y	Y	Y	200	500
Artocarpus hypargyreus	Y	Y	Y	200	500
Bauhinia purpurea	Y	Y	Y	200	500
Bauhinia variegata	Y	Y	Y	200	500
Bauhinia x blakeana	Y	Y	Y	200	500
Bischofia javanica	Y	Y	Y	200	500
Bridelia tomentosa	Y	Y	Y	200	500

Landscape items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Ceiba speciosa	Y	Y	Y	200	500
Celtis sinensis	Y	Y	Y	200	500
Cinnamomum burmannii	Y	Y	Y	200	500
Cinnamomum camphora	Y	Y	Y	200	500
Cleistocalyx nervosum	Y	Y	Y	200	500
Dalbergia balansae	Y	Y	Y	200	500
Door	Y	Y	Y	200	500
Elaeocarpus apiculatus	Y	Y	Y	200	500
Elaeocarpus chinensis	Y	Y	Y	200	500
Elaeocarpus decipiens	Y	Y	Y	200	500
Elaeocarpus obtusus	Y	Y	Y	200	500
External Pole	Y	Y	Y	200	500
Ficus microcarpa	Y	Y	Y	200	500
Ficus subpisocarpa	Y	Y	Y	200	500
Ficus virens var. sublanceolata	Y	Y	Y	200	500
Flag	Y	Y	Y	200	500
Flag Pole	Y	Y	Y	200	500
Garcinia oblongifolia	Y	Y	Y	200	500
Gully	Y	Y	Y	200	500
Handroanthus impetiginosus	Y	Y	Y	200	500
Hibiscus tiliaceus	Y	Y	Y	200	500
Ilex rotunda	Y	Y	Y	200	500
Indicator Board	Y	Y	Y	200	500
Juniperus chinensis	Y	Y	Y	200	500
Lagerstroemia speciosa	Y	Y	Y	200	500
Lighting	Y	Y	Y	200	500

Landscape items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Lightning Terminal	Y	Y	Y	200	500
Liquidambar formosana	Y	Y	Y	200	500
Litsea glutinosa	Y	Y	Y	200	500
Logo	Y	Y	Y	200	500
Machilus breviflora	Y	Y	Y	200	500
Manhole	Y	Y	Y	200	500
Metal Gate	Y	Y	Y	200	500
Morus alba	Y	Y	Y	200	500
Mosquito Catcher	Y	Y	Y	200	500
Osmanthus fragrans	Y	Y	Y	200	500
Pavilion	Y	Y	Y	200	500
Plumeria rubra	Y	Y	Y	200	500
Prunus yunnanensis	Y	Y	Y	200	500
Pyrus calleryana	Y	Y	Y	200	500
Recycle Bin	Y	Y	Y	200	500
Recycle Seat	Y	Y	Y	200	500
Reevesia thyrsoidea	Y	Y	Y	200	500
Sapium sebiferum	Y	Y	Y	200	500
Schima superba	Y	Y	Y	200	500
Seating	Y	Y	Y	200	500
Security Gate	Y	Y	Y	200	500
Senna siamea (syn. Cassia siamea)	Y	Y	Y	200	500
Signage	Y	Y	Y	200	500
Signboard	Y	Y	Y	200	500
Solar Panel	Y	Y	Y	200	500
Sterculia lanceolata	Y	Y	Y	200	500

Landscape items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Syzygium hancei	Y	Y	Y	200	500
Tabebuia chrysantha	Y	Y	Y	200	500
Tabebuia pentaphylla	Y	Y	Y	200	500
Water Dispenser	Y	Y	Y	200	500

Furniture and Fixtures items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Baby Pad	Y	Y	Y	200	500
Bed	Y	Y	Y	200	500
Bin	Y	Y	Y	200	500
Cabinet	Y	Y	Y	200	500
Ceiling Feature	Y	Y	Y	200	500
Chair	Y	Y	Y	200	500
Children Table Set	Y	Y	Y	200	500
Clock	Y	Y	Y	200	500
Computer	Y	Y	Y	200	500
Computer Set (incl. keyboard and monitor)	Y	Y	Y	200	500
Cupboard	Y	Y	Y	200	500
Desk	Y	Y	Y	200	500
Dish Washer	Y	Y	Y	200	500
Display Area Logo Wall	Y	Y	Y	200	500
Executive Chair	Y	Y	Y	200	500
Exhibition Partition	Y	Y	Y	200	500
Flower Pot	Y	Y	Y	200	500

Furniture and Fixtures items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Hand Dryer	Y	Y	Y	200	500
Hand Soap	Y	Y	Y	200	500
Indicator Board	Y	Y	Y	200	500
Insect Killer	Y	Y	Y	200	500
Keyboard	Y	Y	Y	200	500
LED Monitor	Y	Y	Y	200	500
LED Wall	Y	Y	Y	200	500
Logo	Y	Y	Y	200	500
Meeting Room Blinds	Y	Y	Y	200	500
Meeting Table	Y	Y	Y	200	500
Microwave	Y	Y	Y	200	500
Mirror	Y	Y	Y	200	500
Monitor	Y	Y	Y	200	500
Office Cabinet	Y	Y	Y	200	500
Pantry Cabinet	Y	Y	Y	200	500
Pantry Chair	Y	Y	Y	200	500
Pantry Table	Y	Y	Y	200	500
Partition	Y	Y	Y	200	500
Phone	Y	Y	Y	200	500
Planter	Y	Y	Y	200	500
Projector	Y	Y	Y	200	500
Projector Screen	Y	Y	Y	200	500
Reception Chair	Y	Y	Y	200	500
Reception Table	Y	Y	Y	200	500
Recycle Bin	Y	Y	Y	200	500
Round Table	Y	Y	Y	200	500

Furniture and Fixtures items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Seating	Y	Y	Y	200	500
Shelf	Y	Y	Y	200	500
Show Stand	Y	Y	Y	200	500
Show Table	Y	Y	Y	200	500
Side Table	Y	Y	Y	200	500
Signboard	Y	Y	Y	200	500
Sofa	Y	Y	Y	200	500
Table	Y	Y	Y	200	500
Television	Y	Y	Y	200	500
Thermometer	Y	Y	Y	200	500
Tissue Box	Y	Y	Y	200	500
Vanity	Y	Y	Y	200	500
Water Dispenser	Y	Y	Y	200	500

Other items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Access Door	Y	Y	Y	200	500
Access Panel	Y	Y	Y	200	500
Automated External Defibrillator	Y	Y	Y	200	500
AV Speaker	Y	Y	Y	200	500
Cat Ladder	Y	Y	Y	200	500
Control Panel	Y	Y	Y	200	500
Gauge Stand	Y	Y	Y	200	500
Handset	Y	Y	Y	300	500
PA Speaker	Y	Y	Y	200	500

Other items	Model Required (Y/N)	FM System Required (Y/N)	Site Verified	LOD-G	LOD-I
Speaker	Y	Y	Y	200	500
Wifi Point	Y	Y	Y	200	500

Appendix C: Attributes/Properties of objects for FM/AM

The parameters are approved by CIC.

General Attributes

Share Parameter Name	Description	Type of Parameter
CIC.Common.AssetCode	Asset code	Text
CIC.Common.BIMGUID	BIM GUID	Text
CIC.Common.AssetTag	Asset Tag (RFID / QR Code)	Text
CIC.Common.IoTCode	IoT Code	Text
CIC.Common.Description.English	Description (English)	Text
CIC.Common.Description.Chinese	Description (中文)	Text
CIC.Common.PropertyCode	Property Code	Text
CIC.Common.Floor	Floor	Text
CIC.Common.SpaceNumber	Space Number	Text
CIC.Common.AssetGroup	Asset Group	Text
CIC.Common.MainAsset	Main Asset	Text

Share Parameter Name	Description	Type of Parameter
CIC.Common.Brand	Brand	Text
CIC.Common.Type	Type	Text
CIC.Common.ModelNumber	Model No.	Text
CIC.Common.SerialNumber	Serial No.	Text
CIC.Common.Dimension.Width	Dimension (W) mm	Text
CIC.Common.Dimension.Length	Dimension (L) mm	Text
CIC.Common.Dimension.Height	Dimension (H / D) mm	Text
CIC.Common.Weight	Weight (kg)	Text
CIC.Common.Manufacturer	Manufacturer	Text
CIC.Common.Origin	Origin	Text
CIC.Common.Manual	Manual / Catalog	Text
CIC.Common.ProductWebsite	Product Website	Text
CIC.Common.Supplier	Supplier	Text
CIC.Common.SupplierContract	Supplier Contract	Text

Share Parameter Name	Description	Type of Parameter
CIC.Common.DeliveryTime	Delivery Time	Text
CIC.Common.Maintenance.Company	Maintenance Service Company	Text
CIC.Common.Date.Handover	Date of Handover	Text
CIC.Common.Date.Installation	Date of Installation / Manufacture	Text
CIC.Common.Date.FirstUsed	Date first used	Text
CIC.Common.Warranty.StartDate	Warranty Start Date	Text
CIC.Common.Warranty.EndDate	Warranty End Date	Text
CIC.Common.Certificate.Renewal	Certificate Renewal	Text
CIC.Common.Certificate.Type	Type of Certificate	Text
CIC.Common.Certificate.Number	Certificate No.	Text
CIC.Common.Certificate.RenewalInterval	Certificate Renewal Interval	Text
CIC.Common.Certificate.ValidityPeriod	Certificate Validity Period	Text
CIC.Common.Maintenance.StartDate	Maintenance Start Date	Text
CIC.Common.Maintenance.EndDate	Maintenance End Date	Text

Share Parameter Name	Description	Type of Parameter
CIC.Common.Maintenance.Period	Maintenance Period	Text
CIC.Common.TermMaintenanceContract.ItemNumber	Term Maintenance Contract Item No.	Text
CIC.Common.Photo	Photo	Text
CIC.Common.Record	Record	Text
CIC.Common.SpaceFloorProperty	Property code to indicate the location of the space	Text

AC Attributes

Share Parameter Name	Description	Type of Parameter
CIC.AC.PowerSource	Power Source	Text
CIC.AC.ElectricalPowerSupply	Electrical Power Supply	Text
CIC.AC.Current	Current (A)	Text
CIC.AC.StartingCurrent	Starting Current (A)	Text
CIC.AC.CoolingCapacity	Cooling Capacity (kW)	Text
CIC.AC.HeatingCapacity	Heating Capacity (kW)	Text
CIC.AC.Refrigerant	Refrigerant	Text

Share Parameter Name	Description	Type of Parameter
CIC.AC.AirFlow	Air Flow (l/s)	Text
CIC.AC.EnergyLabel	Energy label	Text
CIC.AC.MotorPower	Motor Power (kW)	Text
CIC.AC.Filter	Filter	Text
CIC.AC.ServiceFloor	Service Floor / Location	Text
CIC.AC.Remarks	Remarks	Text

FS Attributes

Share Parameter Name	Description	Type of Parameter
CIC.FS.PowerSource	Power Source	Text
CIC.FS.ElectricalPowerSupply	Electrical Power Supply	Text
CIC.FS.Current	Current (A)	Text
CIC.FS.StartingCurrent	Starting Current (A)	Text
CIC.FS.Head	Head	Text
CIC.FS.TotalCapacity	Total Capacity	Text

Share Parameter Name	Description	Type of Parameter
CIC.FS.WaterFlow	Water Flow (l/s)	Text
CIC.FS.MotorPower.Pump	Motor Power of Pump (kW)	Text
CIC.FS.ServiceFloor	Service Floor / Location	Text
CIC.FS.Remarks	Remarks	Text

PD Attributes

Share Parameter Name	Description	Type of Parameter
CIC.PD.PowerSource	Power Source	Text
CIC.PD.ElectricalPowerSupply	Electrical Power Supply	Text
CIC.PD.Current	Current (A)	Text
CIC.PD.StartingCurrent	Starting Current (A)	Text
CIC.PD.Head	Head	Text
CIC.PD.TotalCapacity	Total Capacity	Text
CIC.PD.WaterFlow	Water Flow (l/s)	Text
CIC.PD.MotorPower.Pump	Motor Power of Pump (kW)	Text

CIC.PD.ServiceFloor	Service Floor / Location	Text
CIC.PD.Remarks	Remarks	Text

EL Attributes

Share Parameter Name	Description	Type of Parameter
CIC.EL.PowerSource	Power Source	Text
CIC.EL.ElectricalPowerSupply	Electrical Power Supply	Text
CIC.EL.Current	Current (A)	Text
CIC.EL.Number.Phase	Nos. of Phase	Text
CIC.EL.Number.Way	Nos. of Way	Text
CIC.EL.Number.Pole	Nos. of Pole	Text
CIC.EL.Rating	Rating	Text
CIC.EL.OutgoingCircuit	Outgoing Circuit	Text
CIC.EL.ServiceFloor	Service Floor / Location	Text
CIC.EL.Remarks	Remarks	Text

LIFT Attributes

Share Parameter Name	Description	Type of Parameter
CIC.LIFT.AccessibleLift	Accessible Lift Yes / No	Text
CIC.LIFT.PowerSource	Power Source	Text
CIC.LIFT.ElectricalPowerSupply	Electrical Power Supply	Text
CIC.LIFT.Current	Current (A)	Text
CIC.LIFT.StartingCurrent	Starting Current (A)	Text
CIC.LIFT.LiftCar.Number	Lift Car No.	Text
CIC.LIFT.LiftCar.Capacity	Lift Car Capacity	Text
CIC.LIFT.LiftCar.Loading	Lift Car Loading	Text
CIC.LIFT.ServiceFloor	Service Floor / Location	Text
CIC.LIFT.Remarks	Remarks	Text

ELV Attributes

Share Parameter Name	Description	Type of Parameter
CIC.ELV.PowerSource	Power Source	Text

Share Parameter Name	Description	Type of Parameter
CIC.ELV.ElectricalPowerSupply	Electrical Power Supply	Text
CIC.ELV.Current	Current (A)	Text
CIC.ELV.ServiceFloor	Service Floor / Location	Text
CIC.ELV.Remarks	Remarks	Text

BLDG Attributes

Share Parameter Name	Description	Type of Parameter
CIC.BLDG.Material	Material	Text
CIC.BLDG.FRC.FRR.Hours	FRC / FRR (Hour(s))	Text
CIC.BLDG.FireRetardant	Fire Retardant Yes / No	Text
CIC.BLDG.FireRetardant.Class	Class (Fire Retardant)	Text
CIC.BLDG.Colour	Colour	Text
CIC.BLDG.ColourCode	Colour Code	Text
CIC.BLDG.InternalFinish	Internal Finish	Text
CIC.BLDG.ExternalFinish	External Finish	Text

Share Parameter Name	Description	Type of Parameter
CIC.BLDG.ServiceFloor	Service Floor / Location	Text
CIC.BLDG.Remarks	Remarks	Text

LAND Attributes

Share Parameter Name	Description	Type of Parameter
CIC.LAND.TreeID	Tree ID	Text
CIC.LAND.TreeAssessmentRecords.Form1	Tree Assessment Records (Form 1) Cloud	Text
CIC.LAND.TreeAssessmentRecords.Form2	Tree Assessment Records (Form 2) Cloud	Text
CIC.LAND.DLORecords	DLO Records Cloud	Text
CIC.LAND.Slope.Number	Slope / Retaining Wall No.	Text
CIC.LAND.Category	Category (1, 2 or 3)	Text
CIC.LAND.EngineerInspection.Frequency	Frequency of Engineer Inspection	Text
CIC.LAND.ServiceFloor	Service Floor / Location	Text
CIC.LAND.Remarks	Remarks	Text

FE Attributes

Share Parameter Name	Description	Type of Parameter
CIC.FE.Material	Material	Text
CIC.FE.FireRetardant	Fire Retardant Yes / No	Text
CIC.FE.FireRetardant.Class	Class (Fire Retardant)	Text
CIC.FE.Colour	Colour	Text
CIC.FE.ColourCode	Colour Code	Text
CIC.FE.InternalFinish	Internal Finish	Text
CIC.FE.ExternalFinish	External Finish	Text
CIC.FE.ServiceFloor	Service Floor / Location	Text
CIC.FE.Remarks	Remarks	Text

OTH Attributes

Share Parameter Name	Description	Type of Parameter
CIC.OTH.HandleByDepartment	Handle by Department	Text
CIC.OTH.Remarks	Remarks	Text

Appendix D: Drawing List/Schedule

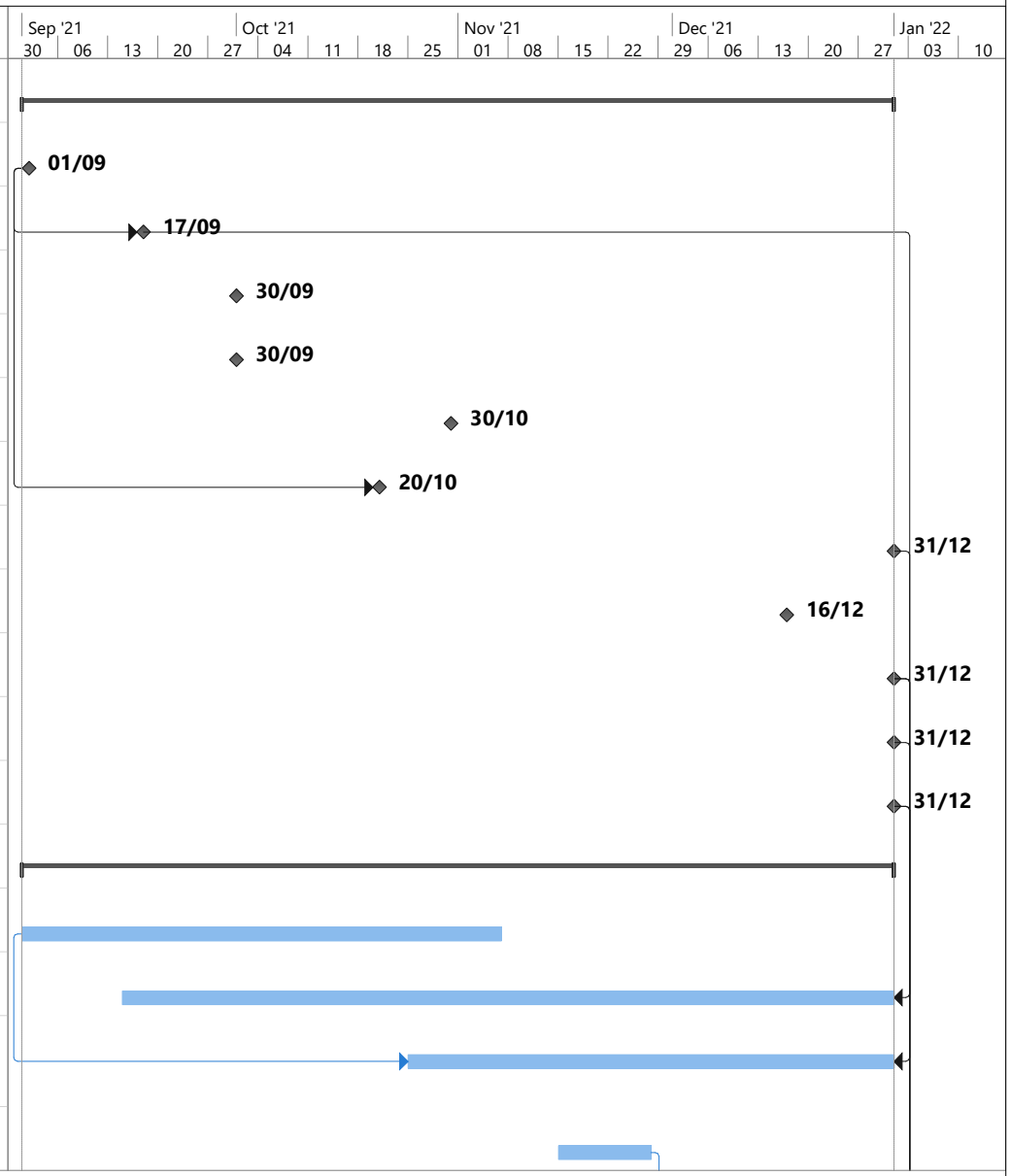
Drawing No.	Drawing Title	Revision	Status	Date	Drawn By
CIC- ZCP- LAN- LP-01	Layout Plan for Landscape - Zero Carbon Park	0	AS FITTED	31/12/2021	ATAL
CIC- ZCP- LAN- LP-02	Elevation East Side for Landscape - Zero Carbon Park	0	AS FITTED	31/12/2021	ATAL
CIC- ZCP- LAN- LP-03	Elevation South Side for Landscape - Zero Carbon Park	0	AS FITTED	31/12/2021	ATAL
CIC- ZCP- LAN- LP-04	Elevation West Side for Landscape - Zero Carbon Park	0	AS FITTED	31/12/2021	ATAL
CIC- ZCP- LAN- LP-05	Elevation North Side for Landscape - Zero Carbon Park	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- BF- LP-06	Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- GF- LP-07	Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- MF- LP-08	Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- RF- LP-09	Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- GF- LP-10	Furniture Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- MF- LP-11	Furniture Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- GF- LP-12	Reflected Ceiling Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- MF- LP-13	Reflected Ceiling Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- ELE- LP-14	Interior Elevation (I) - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- ELE- LP-15	Interior Elevation (II) - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- BF- AC-01	MVAC Layout Plan (Air Side) for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- GF- AC-02	MVAC Layout Plan (Air Side) for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- GF- AC-03	MVAC Layout Plan (Air Side) for G/F Raised Floor - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- MF- AC-04	MVAC Layout Plan (Air Side) for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- MF- AC-05	MVAC Layout Plan (Air Side) for M/F Raised Floor - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- RF- AC-06	MVAC Layout Plan (Air Side) for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB- BF- AC-07	MVAC Layout Plan (Water Side) for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL

Drawing No.	Drawing Title	Revision	Status	Date	Drawn By
CIC- ZCB GF- AC-08	MVAC Layout Plan (Water Side) for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- AC-09	MVAC Layout Plan (Water Side) for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- AC-10	MVAC Layout Plan (Water Side) for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- EL-01	Electrical Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- EL-02	Electrical Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- EL-03	Electrical Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- EL-04	Electrical Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- EL-05	Lighting Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- EL-06	Lighting Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- EL-07	Lighting Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- EL-08	Lighting Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- EL-09	Trunking Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- EL-10	Trunking Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- EL-11	Trunking Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- EL-12	Trunking Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- EL-13	ELV Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- EL-14	ELV Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- EL-15	ELV Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- EL-16	ELV Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- EL-13	CCTV Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- EL-14	CCTV Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- EL-15	CCTV Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCP LAN EL-16	CCTV Layout Plan for Landscape - Zero Carbon Park	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- PL-01	Plumbing Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- PL-02	Plumbing Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL

Drawing No.	Drawing Title	Revision	Status	Date	Drawn By
CIC- ZCB MF- PL-03	Plumbing Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- PL-04	Plumbing Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- DR-01	Drainage Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- DR-02	Drainage Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- DR-03	Drainage Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- DR-04	Drainage Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- FS-01	AFA Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- FS-02	AFA Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- FS-03	AFA Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- FS-04	AFA Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- FS-05	Fire Service Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- FS-06	Fire Service Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- FS-07	Fire Service Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- FS-08	Fire Service Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- FS-09	Sprinkler Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- FS-10	Sprinkler Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- FS-11	Sprinkler Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB LAN IOT-01	IoT Layout Plan for Landscape - Zero Carbon Park	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB BF- IOT-02	IoT Layout Plan for B/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB GF- IOT-03	IoT Layout Plan for G/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB MF- IOT-04	IoT Layout Plan for M/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL
CIC- ZCB RF- IOT-05	IoT Layout Plan for R/F - Zero Carbon Building	0	AS FITTED	31/12/2021	ATAL

Appendix E: MIDP for Supply and Installation of Internet of Things "IoT" and Building Information Modelling "BIM" at Construction Industry Council – Zero Carbon Park

ID	WBS	Task Name	Duration	Start	Finish
1	**ZCP1**	**MILESTONES**	**105 days**	**Wed 01/09/21**	**Fri 31/12/21**
2	ZCP1.16	M0 Works Commencement Date	1 day	Wed 01/09/21	Wed 01/09/21
3	ZCP1.6	M1 BIM Implementation Plan	1 day	Fri 17/09/21	Fri 17/09/21
4	ZCP1.7	M2 Information Collection and Verification	1 day	Thu 30/09/21	Thu 30/09/21
5	ZCP1.8	M3 Site Record	1 day	Thu 30/09/21	Thu 30/09/21
6	ZCP1.9	M4 BIM Object and Base Model Development	1 day	Sat 30/10/21	Sat 30/10/21
7	ZCP1.10	M5 Asset Data Worksheet Format	1 day	Wed 20/10/21	Wed 20/10/21
8	ZCP1.11	M6 IoT Works	1 day	Fri 31/12/21	Fri 31/12/21
9	ZCP1.12	M7 Asset Data Input	1 day	Thu 16/12/21	Thu 16/12/21
10	ZCP1.13	M8 As-built Model Submission	1 day	Fri 31/12/21	Fri 31/12/21
11	ZCP1.14	M9 BIM Object Library Submission	1 day	Fri 31/12/21	Fri 31/12/21
12	ZCP1.15	M10 As-built Drawings Submission	1 day	Fri 31/12/21	Fri 31/12/21
13	**ZCP4**	**BIM TIDP**	**105 days**	**Wed 01/09/21**	**Fri 31/12/21**
14	ZCP4.15	Preparatory Work for Model Development	58 days	Wed 01/09/21	Sat 06/11/21
15	ZCP4.16	BIM Implementation Plan First Draft	93 days	Wed 15/09/21	Fri 31/12/21
16	ZCP4.17	Model Development (with incremental quality checking, submission, review and fixes)	59 days	Mon 25/10/21	Fri 31/12/21
17	ZCP4.18	Setup of conversion pipeline and conversion to COBie Lite format	12 days	Mon 15/11/21	Sat 27/11/21



Appendix E: MIDP for Supply and Installation of Internet of Things "IoT" and Building Information Modelling "BIM" at Construction Industry Council – Zero Carbon Park

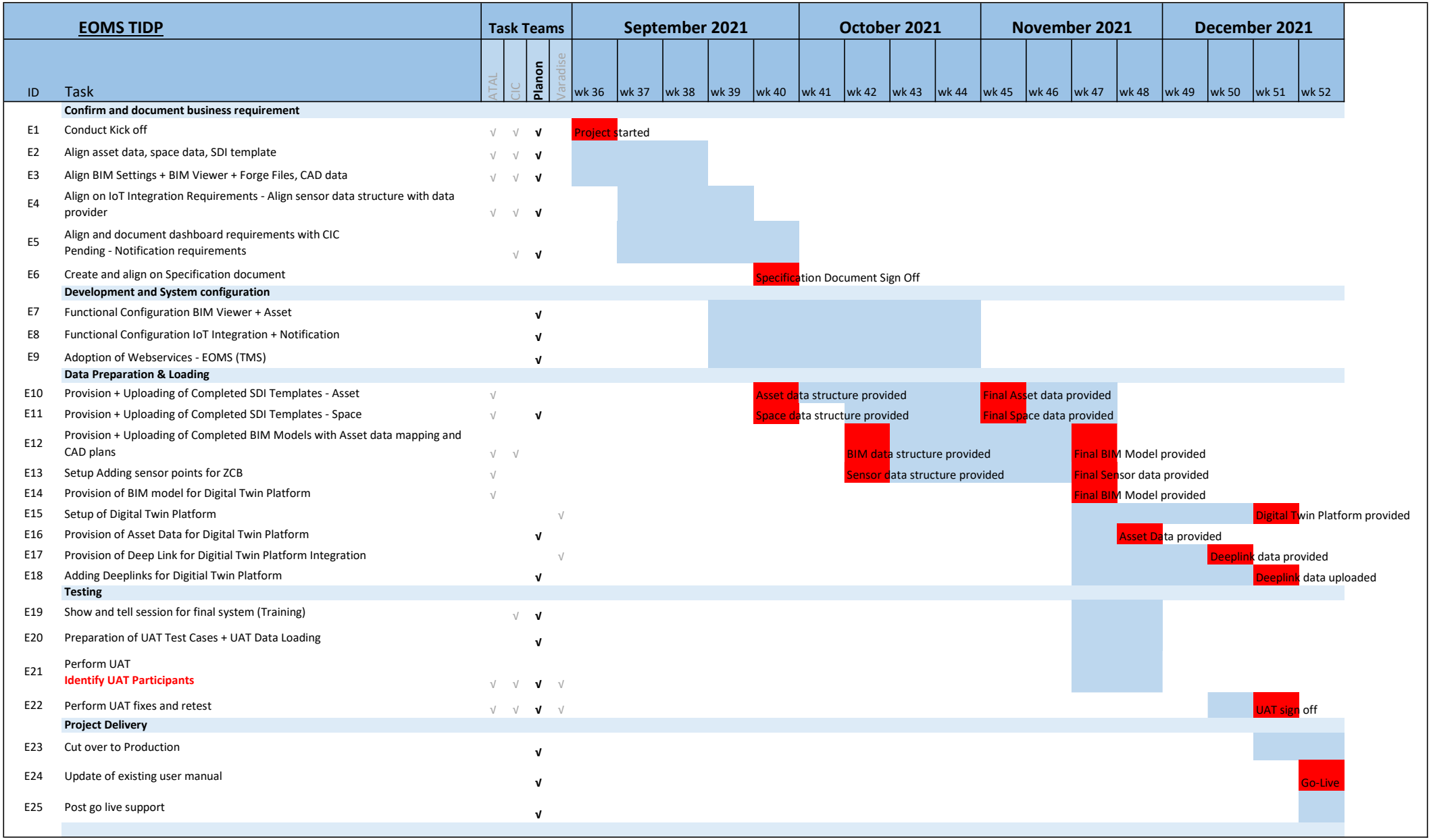
ID	WBS	Task Name	Duration	Start	Finish
18	ZCP4.19	Preparation of as-built drawings	35 days	Mon 22/11/21	Fri 31/12/21
19	ZCP4.20	Final IoT data check and final amendments for delivery	18 days	Mon 29/11/21	Sat 18/12/21
20	ZCP4.21	Final submission and approval	12 days	Sat 18/12/21	Fri 31/12/21
21	**ZCP2**	**IoT TIDP**	**105 days**	**Wed 01/09/21**	**Fri 31/12/21**
22	ZCP2.1	Site visit	4 days	Wed 01/09/21	Sat 04/09/21
23	ZCP2.18	Sensors and Gateways Procurement	90 days	Mon 06/09/21	Sat 18/12/21
24	ZCP2.19	CCTV Procurement	90 days	Mon 06/09/21	Sat 18/12/21
25	ZCP2.20	Testing and Commissioning	24 days	Mon 22/11/21	Sat 18/12/21
26	ZCP2.21	ATAL Cloud Platform Creation	88 days	Mon 20/09/21	Thu 30/12/21
27	ZCP2.22	API with EOMS Contractor Platform	88 days	Mon 20/09/21	Thu 30/12/21
28	ZCP2.17	Final Submission & Approval	12 days	Sat 18/12/21	Fri 31/12/21
29	**ZCP3**	**EOMS TIDP**	**105 days**	**Wed 01/09/21**	**Fri 31/12/21**
30	ZCP3.6	Confirm and Document Business Requirement	30 days	Wed 01/09/21	Tue 05/10/21
31	ZCP3.7	Development and System Configuration	37 days	Sat 25/09/21	Sat 06/11/21
32	ZCP3.8	Data Preparation and Loading	72 days	Mon 04/10/21	Sat 25/12/21
33	ZCP3.9	Testing	30 days	Mon 22/11/21	Sat 25/12/21
34	ZCP3.10	Project Delivery	11 days	Mon 20/12/21	Fri 31/12/21

APPENDIX F: TASK INFORMATION DELIVERY PLAN (TIDP) FOR BIM TASK TEAM, IOT TASK TEAM AND EOMS TASK TEAM

CIC ZERO CARBON PARK

	Sep				Oct						Nov						Doc	
BIM TIDP Project Schedule (Week)	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
	1-4 Sep	6-12 Sep	13-19 Sep	20-26 Sep	27Sep - 03Oct	04-10 Oct	11-17 Oct	18-24 Oct	25 -31 Oct	01-7 Nov	08-14 Nov	15-21 Nov	22-28 Nov	29 Nov -5 Dec	6-12 Dec	13-19 Dec	20-26 Dec	27-31 Dec
B1 Checking received and confirmed as-built record																		
B2 360 photo, laser scan and site visit																		
B3 Object and material checking after site visit and 360 photos																		
B4 Verify the existing/as-built information																		
B5 Submit objects list for confirmation																		
B6 Objects development for model																		
Modeling																		
B7 Arch & Structure																		
B8 First Submission & review																		
B9 M E P																		
B10 First Submission & review																		
B11 Input FM Data in MEP Model																		
B12 Landscape																		
B13 First Submission & review																		
B14 Setup of conversion pipeline and conversion to CobieLite format																		
B15 Preparing as-built drawings																		
B16 Final for IOT data clearance and amend for delivery																		
B17 Final Submission & Approval																		

IOT TIDP Project Schedule (Week)	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
	1-4 Sep	6-12 Sep	13-19 Sep	20-26 Sep	27Sep - 03Oct	04-10 Oct	11-17 Oct	18-24 Oct	25 -31 Oct	01-7 Nov	08-14 Nov	15-21 Nov	22-28 Nov	29 Nov -5 Dec	6-12 Dec	13-19 Dec	20-26 Dec	27-31 Dec
I1 Site Visit																		
I2 Equipment Confirmation (Sensor, gateway)																		
I3 Equipment Order (Sensor, gateway)																		
I4 Equipment Installation (Sensor, gateway)																		
I5 Equipment Confirmation (CCTV)																		
I6 Equipment Order (CCTV)																		
I7 Equipment Installation (CCTV)																		
I8 Equipment Installation (T&C)																		
I9 ATAL Cloud Platform - Design and UI																		
I10 ATAL Cloud Platform - Development																		
I11 ATAL Cloud Platform - UAT																		
I12 ATAL Cloud Platform - Production																		
I13 API with Planon - Design and Confirm																		
I14 API with Planon - Development																		
I15 API with Planon - UAT																		
I16 API with Planon - Production																		
I17 Final Submission & Approval																		


EOMS TIDP
Task Teams
ATAL
CIC
Planon
Varadise
September 2021
October 2021
November 2021
December 2021
wk 36
wk 37
wk 38
wk 39
wk 40
wk 41
wk 42
wk 43
wk 44
wk 45
wk 46
wk 47
wk 48
wk 49
wk 50
wk 51
wk 52
ID
Task
Confirm and document business requirement
E1 Conduct Kick off
Project started
E2 Align asset data, space data, SDI template
E3 Align BIM Settings + BIM Viewer + Forge Files, CAD data
E4 Align on IoT Integration Requirements - Align sensor data structure with data provider
E5 Align and document dashboard requirements with CIC
Pending - Notification requirements
E6 Create and align on Specification document
Specification Document Sign Off
Development and System configuration
E7 Functional Configuration BIM Viewer + Asset
E8 Functional Configuration IoT Integration + Notification
E9 Adoption of Webservices - EOMS (TMS)
Data Preparation & Loading
E10 Provision + Uploading of Completed SDI Templates - Asset
Asset data structure provided
Final Asset data provided
E11 Provision + Uploading of Completed SDI Templates - Space
Space data structure provided
Final Space data provided
E12 Provision + Uploading of Completed BIM Models with Asset data mapping and CAD plans
BIM data structure provided
Final BIM Model provided
E13 Setup Adding sensor points for ZCB
Sensor data structure provided
Final Sensor data provided
E14 Provision of BIM model for Digital Twin Platform
Final BIM Model provided
E15 Setup of Digital Twin Platform
Digital Twin Platform provided
E16 Provision of Asset Data for Digital Twin Platform
Asset Data provided
E17 Provision of Deep Link for Digitial Twin Platform Integration
Deeplink data provided
E18 Adding Deeplinks for Digitial Twin Platform
Deeplink data uploaded
Testing
E19 Show and tell session for final system (Training)
E20 Preparation of UAT Test Cases + UAT Data Loading
E21 Perform UAT
Identify UAT Participants
E22 Perform UAT fixes and retest
UAT sign off
Project Delivery
E23 Cut over to Production
E24 Update of existing user manual
Go-Live
E25 Post go live support