Particular Specification for Building Information Modelling (BIM)

1. SCOPE OF WORK

1.1   Adoption of BIM technology in project/ works would be specified in each Works Order by SO. For BIM adopted Works Order, the Contractor is required to apply Building Information Modelling (BIM) technology, provide the services and submit all the deliverables as detailed in this Particular Specification.

1.2   The Contractor is required to set up a BIM Team with a Building Information Modelling Team Leader (BIM Team Leader) leading the BIM Team and to provide, a minimum of, 1 cross-disciplinary BIM coordinator and modellers in architectural, structural and building services disciplines as detailed in the below table. Qualifications of the BIM Team are specified in **Appendix 1** of this Particular Specification.

	Cross-Disciplinary BIM Coordinator (No.)	Modeller (No.)
Architectural		1
Structural	1	1
Building Services		1

1.2.1   The BIM Team Leader of the Contractor shall carry out the following duties and functions

1. lead and manage the BIM Team and be responsible for the overall BIM management and provide control to ensure the deliverables are issued on time;
2. coordinate with the Supervising Officer (SO) and his representatives including the SO's consultants;
3. plan, develop and manage the project BIM standard and implementation strategy;
4. provide quality control and checking procedures;
5. provide advice/guidance to the SO and his representatives in
    a) reviewing BIM modelling formats/protocol and co-ordination;
    b) reviewing analysis and findings on application by using different softwares such as the clash detection and resolving the clashes;
    c) providing technical support to the SO's representatives regarding modelling enquiries; and
6. conduct and/ or attend regular BIM collaboration meetings among project team members.

1. SCOPE OF WORK (CONT'D)

1.2.2   The BIM Team shall provide the following services:

1.   to coordinate all parties including but not limited to different design disciplines, sub-contractors, Specialist Sub-contractors, Specialist Contractors, suppliers, SO and his representatives, Government Departments and utility undertakings and collect suitable information and data from them;

2.   to build and develop the BIM models and all deliverables based on the information and data collected, to manage the BIM databases, to report any clash/conflict or difficulties in BIM models production and to resolve such difficulties with relevant parties;

3.   to utilise BIM for avoidance of risks and minimisation of changes, to monitor project costs and programmes in various stages, and to enhance safety design for construction and operation;

4.   to input the updated information and data, including but not limited to all variations, from time to time; to create, manage, develop and update the BIM models to all deliverables for the construction works; to ensure the updated BIM models are coordinated and always kept ahead of the site construction to enhance the project delivery process through BIM adoption;

5.   to coordinate the BIM models and all deliverables to ensure consistency among all deliverables; to use the best practice in setting up the system for coordinating BIM models among all parties;

6.   to provide technical support and guidance to the SO and his representatives in using the BIM models, managing the BIM database and resolving potential construction difficulties; and

7.   to consolidate design information from the Nominated Sub-contractor(s) and develop the BIM model and all deliverables as required in this Contract.

1.2.3   The Contractor shall submit the organization chart and qualification of the members of the BIM Team for the SO's approval within **14** calendar days after the commencement of the Contract. For any proposed staff movement or change in the BIM Team, the Contractor shall notify the SO as soon as possible and provide a CV of the replacement personnel together with evidence of equivalent BIM competency to the SO within **7** calendar days of the notification for approval. The Contractor shall provide sufficient and technically competent resources as agreed or directed by the SO or his representatives in order to complete all BIM tasks and deliverables specified in the Contract according to the approved programme.

2. OBJECTIVES

2.1   The objective of the application of BIM is to create a digital building information model for the project and to use BIM as a platform to facilitate project planning, site administration, safety planning, design co-ordination, clash detection prior to construction, financial planning, minimization of abortive works, waste reduction, efficient asset management and smart city planning in order to achieve the following beneficial purpose:

1. to minimize design discrepancies and improve design co-ordination through the use of 3D modelling technique;
2. to enhance visual communication between the Contractor and all stakeholders, improve mutual understanding of the design intent and facilitate design review and vetting process;
3. to support efficient delivery of drawings, including Combined Services Drawings (CSDs) and Combined Builder's Work Drawings (CBWDs);
4. to support the development of 4D modelling construction sequence during the construction stage to enhance communication, predict and manage construction process;
5. to support the development of digital fabrication to facilitate efficient design and fabrication processes, and offsite fabrication;
6. to support the development of asset management by using BIM with an as-built BIM models for effective operation and maintenance of the buildings; and
7. to facilitate the integration between BIM and Geographical Information System (GIS) as well as the development of Common Spatial Data Infrastructure (CSDI).

3. GUIDELINES AND STANDARDS

3.1   The BIM Team Leader should adopt the predominant BIM industry standard on discharging his duties. Reference may be made to the latest version of the published guidelines, such as:

1. CIC Building Information Modelling Standards - General;
2. CIC Building Information Modelling Standards for Architecture and Structural Engineering;
3. CIC Building Information Modelling Standards for Mechanical, Electrical and Plumbing;
4. CIC Building Information Modelling Standards for Underground Utilities;
5. CIC Production of Building Information Modelling Object Guide - General Requirements;
6. AEC (UK) BIM Technology Protocol – Practical implementation of BIM for the Architectural, Engineering and Construction (AEC) industry, by the AEC (UK);
7. BIM Project Execution Planning Guide, by The Computer Integrated Construction Research Program of the Pennsylvania State University;
8. BIM Project Specification, by the Hong Kong Institute of Building Information Modelling;
9. BIM Harmonisation Guidelines for Works Departments issued by the Development Bureau;
10. Building Information Modelling for Asset Management (BIM-AM) Standards and Guidelines, issued by the Electrical and Mechanical Services Department;

3. GUIDELINES AND STANDARDS (CONT'D)

11. Building Information Modelling (BIM) Guide for Architectural Design issued by Architectural Branch (AB), Architectural Services Department;

12. Building Information Modelling (BIM) Guide for Structural Engineering issued by Structural Engineering Branch (SEB), Architectural Services Department;

13. Building Information Modelling (BIM) Guide for Building Services Installation issued by Building Services Branch (BSB), Architectural Services Department;

14. Building Information Modelling (BIM) Guide for Cost Estimation issued by Quantity Surveying Branch (QSB), Architectural Services Department;

15. Building Information Modelling (BIM) Guide for Facilities Upkeep issued by Property Services Branch (PSB), Architectural Services Department;

16. Building Information Modelling (BIM) Guide for SCCU Submissions issued by Architectural Branch (AB), Architectural Services Department;

17. Drafting Specification for Engineering Survey, by Civil Engineering and Development Department;

18. BS EN ISO 19650-1:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 1: Concepts and principles;

19. BS EN ISO 19650-2:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 2: Delivery phase of the assets;

20. BS EN ISO 19650-3:2020 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 3: Operational phase of the assets;

21. BS EN ISO 19650-5:2020 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 5: Security-minded approach to information management;

22. BS 1192-4:2014 Collaborative production of information. Fulfilling employer's information exchange requirements using COBie. Code of practice.

4. DELIVERABLES

The Contractor shall submit the following deliverables according to the programme stipulated in Clause 5 of this Particular Specification.

Except otherwise stated in the Conditions of Contract, the copyright of all data and information contained in all deliverables including BIM models and reports created, developed and provided under this Contract, including all draft and final versions, shall be the property of the Employer.

4.1   BIM Execution Plan:

The Contractor shall base on the design stage BIM Execution Plan to prepare and submit a BIM Execution Plan as per **Appendix 2** for the SO's approval.

The Contractor shall define the full details of the implementation and collaboration process in the BIM Execution Plan.

The Contractor shall review the BIM Execution Plan regularly.

4.2   Design Authoring and Design Reviews

4.2.1   The Contractor shall create, maintain and update the BIM models, including the following:-

1.   A Base Model modelled according to Contract Documents for both 3D geometry and information, which serves as a basis for contract administration;
2.   Updated model for each Supervising Officer's instruction.

The Contractor shall use BIM models to show the following components to the agreement and satisfaction of the SO or his representatives before construction, but not limited to:

4.2.1.1   Architectural BIM model

The minimum requirements of LOD-Graphics (LOD-G) and LOD-Information (LOD-I) for architectural components/objects shall refer to the latest version of the BIM Guide for Architectural Design issued by the Architectural Services Department.

4. DELIVERABLES (CONT'D)

4.2.1.2 Structural BIM model

The minimum requirements of LOD-Graphics (LOD-G) and LOD-Information (LOD-I) for structural components/objects shall refer to the latest version of the BIM Guide for Structural Engineering issued by the Architectural Services Department.

4.2.1.3 Building Services BIM model

The minimum requirements of LOD-Graphic (LOD-G) and LOD-Information (LOD-I) for building services components/objects shall refer to the latest version of the BIM Guide for BS Installation issued by the Architectural Services Department.

4.2.2   For efficient handling of models, the BIM model should be sub-divided into separate zones/ services/ systems as appropriate to maintain reasonable file size of the models. The model sub-division strategy (by zones/ services/ systems) should be stated in the BIM Execution Plan. File sizes of each sub-divided BIM model shall be kept in minimum by purging of unused views, BIM objects and settings before publish or submission. The maximum file size for each sub-divided BIM model should not exceed 500MB unless otherwise approved.

4.2.3   The BIM models shall be prepared in accordance with the DEVB BIM Harmonisation Guidelines for Works Departments as promulgated by the DEVB TC(W) No. 8/2021 or its subsequent updates (if any).

4.3   Existing Conditions Modelling

The Contractor shall make use of 3D digital survey technology to provide existing conditions model and as-built condition verified for the Works. It provides documentation of environment for future modelling and 3D design coordination. It can supplement photographic records of condition survey. The 3D digital survey model shall be georeferenced to the same absolute coordinate system, e.g. Hong Kong 1980 Grid, according to x, y, z coordinates *and comply with the department's standards and guidelines*. The format can be:

1.   Point Cloud (.las and .rcs);
2.   Build mesh (.tin);
3.   Export ortho-image (.jpeg, .png and .tiff); or
4.   Video (H.264 & other formats specified in the latest version of OGCIO – The HKSARG Interoperability Framework (S18)).

4.4   3D Coordination

4.4.1   The Contractor shall carry out clash analysis monthly during the construction period based on the different BIM models created and updated at different stages in order to resolve all major system clashes prior to construction by identifying and resolving clashes among different disciplines.

4. DELIVERABLES (CONT'D)

4.4.2 Clash analysis shall include the checking of headroom requirements and working spaces for building services operations and maintenance activities. In particular, for major equipment which must provide services without any break, dynamic envelope model showing the estimated dimensions of the physical space sufficient for equipment delivery and maintenance is required as well as installation sequence. The Contractor shall liaise with the SO or his representatives to determine the criteria level of acceptable clashes, e.g. sprinkler pipes pass through beams.

4.4.3 Procedure of clash analysis:

1. compare BIM models built up from design of different disciplines and shop drawings from sub-contractors;
2. identify and visualize clashes;
3. report to the SO or his representatives in an agreed format;
4. revise design and shop drawings;
5. revise BIM models; and
6. perform another round of analysis until clashes are resolved.

4.4.4 Clash analysis should be presented in the form of a report to compare the different clashes, record the clash detection process and assumptions on element tolerances, areas and elements, identify any major conflict discovered in the process and generate resolution result summary. The report shall address the following:

1. software used;
2. process overview;
3. responsibilities;
4. outputs;
5. technical query workflow;
6. clash resolution process;
7. action plan with target completion schedule to handle and resolve detected clashes;
8. tolerance levels (mm) for different discipline;
9. operation clearance;
10. maintenance clearance;
11. buildability; and
12. services compatibility.

4. DELIVERABLES (CONT'D)

4.5   Cost Estimation (Financial Model)

4.5.1   The Contractor shall reconcile the quantities derived according to the Contract Documents and the Quantity-Take-Off (QTO) extracted from the Base Model as described in Clause 4.2.

4.5.2   The Contractor shall base on the 4D Model established in Clause 4.6 for the Works and prepare a financial model for:

1.   interim payment simulation in video format with dynamic bar chart showing time and cost relationship for major construction activities;
2.   cashflow forecast to compare actual cashflow against planned cashflow; and
3.   estimate of variations including the schedule for the cost of omission and addition.

4.6   Engineering Analysis

The Contractor shall conduct at least one engineering analysis which may be related to structural, lighting, solar and shading, airflow, energy, thermal comfort, acoustic, thermal, mechanical, people movement, hydraulic, etc.

4.7   Sustainability Evaluation

For building projects which aim to obtain the Gold or above rating of "BEAM Plus NB V2.0" certification, the credit(s) for "BIM Integration" shall be achieved. Detail requirements shall be referred to the relevant certification documents.

4. DELIVERABLES (CONT'D)

4.8   Phase Planning (4D Modelling)

4.8.1 The Contractor shall provide 4D Model simulations to the construction process of the Works to:

1.   establish relationships between the programme and sequence of construction activities including the delivery of material and equipment to be carried out during the construction;
2.   demonstrate the Contractor's works sequences;
3.   identify potential time and spatial conflicts;
4.   optimize the use of critical resources;
5.   enhance safety requirements and construction process control;
6.   minimize disturbance to the neighbourhood;
7.   better co-ordinate with affected parties and resolve interfacing issues at early stages;
8.   monitor procurement status of project materials; and
9.   facilitate the preparation of Financial Model as required in Clause 4.5.

4.8.2 The 4D simulations shall be demonstrated in quarterly intervals linking all activities in the master programme and it shall be automatically matched with the activities as shown in the master programme with appropriate file format.

4.8.3 The Contractor shall submit a 4D Simulation Report containing the following but not limited to:

1.   description of the 4D simulation report, e.g., assumptions, time interval, construction method statement, guide for accessing the files and models…etc.;
2.   video(s) of the 4D simulation;
3.   BIM native model(s);
4.   models(s) for 4D simulation platform; and
5.   linked project programme or equivalent deliverable.

4.9   Digital Fabrication

For mass customized components which are of large quantities and variety in dimensions, shapes, geometries, etc. and modular construction units[1], the Contractor shall digitalize the construction details in BIM model to facilitate the fabrication of construction materials.

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[1] Modular construction units refer to construction units which are modularized in the design, integrated with all construction components/elements as far as practical, constructed in either off-site or on-site prefabrication yards and then delivered to site for installation/fixing.

4.10   Site Utilization Planning

The Contractor shall use the 4D model by assigning the transportation path of the construction plant and equipment in the model to demonstrate the feasibility and effectiveness of the site logistic arrangements. For construction activities with very high to extreme risk level identified from the Systematic Risk Management (SRM) according to ETWB TC(W) No. 6/2005 or other identified activities of significant added values at construction stage, all temporary works and the Contractor's proposed method statements of the Works shall be modelled to demonstrate the feasibility and to prove the constructability and buildability of the proposed method statement.

4.11   3D Control and Planning

For a large-scale project requiring Digital Works Supervision System, the Contractor shall utilize the BIM model for digital setting-out, construction checking, etc. as appropriate by means of 3D laser scanners, robotic total stations, etc. as far as practicable.

4.12   As-built Modelling

4.12.1 The Contractor shall prepare and submit the as-built BIM models of all components (including Architectural, Structural and Building Services Installation) as described in Clause 4.2 of this Particular Specification.

4. DELIVERABLES (CONT'D)

4.12.2 The as-built BIM models shall be based on the final approved construction information that had actually been built, and shall be used to produce as-built drawings. Information on location such as room number and building name, staircase number, washroom number, lift lobby number is required to be incorporated into the as-built BIM models. The Contractor shall also import and display the operation data, product catalogues, manuals, warranties and maintenance history of equipment etc. into the as-built BIM models.

4.12.3 The as-built BIM models shall be prepared in accordance with the DEVB BIM Harmonisation Guidelines for Works Departments as promulgated by the DEVB TC(W) No. 8/2021 or its subsequent updates (if any) and the latest version of the BIM Guide for Facilities Upkeep issued by the Architectural Services Department.

The Contractor shall include as-built construction and equipment components of the Works with information as listed below for approval:

1. Room Data Sheets;
2. Door Schedules;
3. Ironmongery Schedules;
4. Window Schedules;
5. Access Panel Schedules;
6. Shutter Schedules;
7. Cat ladder Schedules;
8. Louvre Schedules;
9. Sanitary Fitment Schedules;
10. Signage Schedules;
11. Roofing System;
12. Comprehensive materials data sheet list and completed materials/equipment warranty list;
13. Other textual information subject to agreement of facility management at later stage;
14. 360-degree spherical panoramic photographic record showing the on-site as-built condition and 3D Digital Point Cloud Scanning in accordance with the latest version of the BIM Guide for Facilities Upkeep issued by the Architectural Services Department;
15. As-built BIM models and 2D drawing files;
16. Export data files;
17. Folder storing all the object files;
18. Testing and Commissioning reports;
19. Operation and Maintenance manuals;
20. Relevant statutory certificates, approval documents and forms; and
21. Other relevant project information as required.

4. DELIVERABLES (CONT'D)

4.12.4 The as-built BIM models shall be provided with animation(s) showing the assembly, disassembly, repair and replacement procedures for viewing in the ArchSD's Asset Information System (AIS) as required.

4.12.5 In general, the animation shall not be lower than LOD-G 400. The objective of the animation is to illustrate how to maintain the special part of the building. The extent of the animation required will depend on the design of the building. The Contractor shall propose the animation which shall fulfill, inter alia, the requirement in the latest version of the BIM Guide for Facilities Upkeep for approval.

4.12.6 The required as-built data and relevant documentations shall be stored in a standardized file folder structure.

4.12.7 The Contractor shall follow the requirements stipulated in the latest version of the EMSD's BIM-AM Standards and Guidelines in delivering the as-built BIM models for building services installation.

4.13   Maintenance Scheduling

The Contractor shall provide and input the following information or documents related to building fabric and structure, subject to periodic maintenance inspection or testing into the as-built BIM models:

1.   Recommended frequency of maintenance inspection or testing;
2.   Recommended scope of maintenance inspection or testing activities;
3.   Recommended maintenance cycle of the building fabric or structure;
4.   Shop drawings;
5.   Operation and Maintenance Manuals;
6.   Warranties and guarantees (together with the names and addresses of specialist contractors and/ or suppliers);
7.   Technical information (such as specifications of materials and design standards); and
8.   Relevant material certificates and test reports, etc.

4. DELIVERABLES (CONT'D)

4.14   Asset Management

4.14.1 The Contractor shall submit asset information as exported from the approved as-built models in the format of excel spreadsheet. The requirements of data set and data formats for building elements shall refer to Appendix 1 of the latest version of the BIM Guide for Facilities Upkeep. The proposed format of the spreadsheet shall be submitted to the SO for approval.

4.14.2 The Contractor shall also submit Project Underground Utilities (UU) BIM model based on UU surveys by means of photogrammetry, 3D laser scanning, etc. for all opened-up areas.

4.15   Drawing Generation (Drawing Production)

4.15.1 The Contractor shall generate drawings in the required file format from the BIM models including but not limited to architectural drawings, building services drawings, structural drawings, Combined Services Drawings, Combined Builder's Works Drawings etc to facilitate the co-ordination and operation for the construction of the Works during the contract period. As far as practicable, the 2D drawings should be generated from the BIM authoring software directly. Production of 2D drawings by other platforms shall be ceased if those drawings can be generated from the BIM model. 2D drawings which are generated from the BIM model need not follow the CAD Standard for Works Projects (CSWP).

4.15.2 It is acceptable that certain 2D drawings such as architectural details, building services schematic /control logic diagrams /drawings and reinforcement details cannot be generated from the BIM model directly. Alternative software, i.e. non-BIM authoring software, could be used and these 2D drawings shall be prepared in accordance with the CAD Standard for Works Projects (CSWP).

4.16   BIM Object

The Contractor shall utilize BIM objects shared at CIC BIM Portal as far as practicable.

All BIM objects created by the Contractor for the Works shall comply with the latest version of the DEVB BIM Harmonisation Guidelines and related guidelines/ standards. The Contractor shall create and submit not less than 20 or as assigned by the SO project specific BIM objects. Upon **6** months from the target date of completion of the Contract, the Contractor shall submit a proposed list of BIM objects to the SO for agreement. The Contractor shall submit alternative BIM objects if their proposal was rejected.   The Contractor shall demonstrate which BIM objects are being used to facilitate the construction stage BIM.

5. PROGRAMME

The BIM models are built and developed for the purposes of design co-ordination, phase planning and communication.

The Contractor shall produce and submit at regular intervals updated BIM models on part or whole of the Works in the required file format, such that the project team can easily view and capture the images and perform simple marking-up of annotations on the selected images and transmit through the internet or intranet.

The target programme for production of the BIM models and the deliverables, which will be subject to change according to actual circumstances as per the direction of the SO or his representatives, is at **Appendix 3**.

6. BIM AUDIT

6.1   Project BIM Audit

6.1.1   The Contractor shall be responsible for ensuring the integrity of their BIM and drawings as well as compliance with the BIM standards. The Contractor shall formulate BIM audit strategy and establish a BIM audit plan to ensure appropriate checks on accuracy and quality of the information models. The BIM audit plan shall include the strategy and methodology of checking. The BIM audit plan shall be included in the BIM Execution Plan for SO's approval. The Contractor shall submit BIM Audit report to SO at bi-monthly intervals.

The final BIM models shall be fully coordinated and without any conflict with as-built asset attributes.

The quality assurance and control shall include but not limited to the following contents:

1.   model compliance according to the modelling methodology which is stated in the BIM Execution Plan;
2.   model quality (LOD-G);
3.   model data integrity check and validation (LOD-I);
4.   interference check & clash analysis checking;
5.   document deliverable check; and
6.   field survey for verification

6. BIM AUDIT (CONT'D)

6.1.2   Model Compliance Check

Model compliance checks shall include but not limited to the following:
1.   format, such as software version and extension;
2.   naming, such as naming of the files and their corresponding folders;
3.   general settings, such as grid, survey point, project base point, shared coordinate and coordinate system, shared parameters, attributes;
4.   LOD-G of geometry;
5.   modelling errors;
6.   unintended model components;
7.   consistency of 2D information generated from model;
8.   attributes for asset entries tracking;
9.   model cleanliness including flag links, unpurged elements and unused views in final model submission; and
10.   compliance with the design.

6.1.3   Documentation Compliance Check

Documentation compliance checks shall be carried out to the BIM Execution Plans, federation maps, lists of self-check items, clash reports and model register list.

6.2   Quarterly BIM Audit

The Contractor shall be required to provide attendance and any other necessary assistance for the SO to carry out Quarterly BIM Audit either in his office or on site. The Contractor shall follow up the corrective actions on non-compliance and observations identified in the Quarterly BIM Audit.

7. HARDWARE AND SOFTWARE REQUIREMENTS

7.1   The Contractor shall submit a proposal with details on specification and quantities of compatible software and hardware to build up a Common Data Environment (CDE). After the SO or his representative's approval of the proposal, the Contractor shall provide, set up and maintain the proposed hardware and software for the CDE.

7.2   The Contractor shall provide a dedicated CDE for storage, viewing and sharing of BIM models, drawings, animation, rendering and other related files of the Works with the following properties:

    1.   it shall have a clear folder structure, being part of the CDE to store various BIM related information;

    2.   it shall contain encryption function for data security and be of sufficient capacity to store all files during the whole project life cycle; and

    3.   it shall be installed with anti-virus software and maintained with updated security patches for all software.

7.3   The Contractor shall be required to:

    1.   submit the folder structure of the BIM storage CDE for the SO or his representatives' agreement before uploading files into the BIM storage CDE;

    2.   prepare access control plan of the BIM storage CDE for the SO or his representatives' agreement and ensure no unauthorized access to the BIM storage CDE;

    3.   provide daily backup and off-site backup for the BIM storage CDE in which the backup media shall be stored properly away from the working office;

    4.   maintain the BIM storage CDE to ensure it operates properly during the whole project life cycle; and

    5.   handover the CDE's files in an approved folder structure format to the SO before the issuance of the maintenance certificate.

7.4   Preferred File Formats

The Contractor shall submit native and editable BIM and an open format file of the BIM such as Industry Foundation Classes (IFC) format to the SO. The Contractor shall ensure that data in the file is in order and consistent with those in the native file. The Contractor shall ensure all the BIM deliverables comply with the approved software versions during the contract period and at the time of delivery. The Contractor shall also convert the final version of the BIM to other additional software versions specified by the SO.

7.5   All tools and software applications used must be IFC compliant in order to allow BIM model interoperability.

8. TRAINING

8.1   The Contractor is required to nominate suitable staff or sub-contractors' staff for the SO's approval to attend, within 6 months from the commencement of the Contract, suitable BIM skill training courses under the pre-approved list of the Construction Innovation and Technology Fund (CITF) managed by the Construction Industry Council (CIC) as follows:

4 staff members for the Contractor and

4 staff members for the engaged sub-contractor(s).

The nominated staff of the Contractor or his sub-contractors should attend the assigned BIM skill training course, including signing the attendance record, completing all course assignments and undertaking any necessary assessment.

After completion of the training courses, the Contractor shall submit a training log to the SO for record. The training log should list out the course information, including but not be limited to, description of the training course, date, duration, venue and attendee details. The content of the training log shall be commented and agreed by the SO. The training log should be reviewed and updated regularly.

In case the nominated staff of the Contractor or his sub-contractors fail to complete the course, the Contractor/sub-contractors shall arrange additional BIM training courses to the nominated staff to fulfil the contract requirements at his/their own cost.

Qualifications of the BIM Team

Position	Qualification
BIM Team Leader	1. CIC – Certified BIM Manager (CCBM)
Disciplinary BIM Coordinators : Architectural / Structural/ Building Services	EITHER 1. Minimum 3 years related construction project experience; 2. Minimum 1 year practical experience in BIM projects; and 3. Completion of CIC-accredited BIM Coordinator course with effect from 1 July 2022 if the engaged BIM Coordinators are not CIC-Certified BIM Coordinator (CCBC) OR 4. CCBC
Modeller	1. Diploma holder in construction related discipline; and 2. Minimum 1 year practical experience in BIM projects

BIM Execution Plan

The BIM Execution Plan shall include but not limited to the following sections:

1. BIM Execution Plan Overview

2. Project Information

3. BIM Requirements
    3.1. BIM Goals
    3.2. BIM Uses
    3.3. BIM Data
    3.4. LOIN Responsibility Matrix
    3.5. Meeting Schedule

4. BIM Management
    4.1. Roles, responsibilities and authority
    4.2. BIM Team Resources, Competency & Training
    4.3. BIM Deliverable Schedule (Programme)

5. BIM Process
    5.1. Information Management Workflow Diagram
    5.2. Common Data Environment (CDE)
    5.3. Individual Discipline Modelling
    5.4. BIM Coordination and Clash Detection
    5.5. Drawing Production
    5.6. Model Archive
    5.7. BIM Audit Plan

6. BIM Procedures
    6.1. BIM Origin Point & Orientation
    6.2. Modelling Methodology
    6.3. Federation Strategy
    6.4. Model Units
    6.5. Naming Convention
    6.6. Drawing Sheet Templates
    6.7. Annotation, dimensions, abbreviation and symbols
    6.8. Colour Scheme

7. IT Hardware & Software Solutions
    7.1. Software Versions
    7.2. Exchange Formats
    7.3. Data Security & Back-up
    7.4. Hardware Specifications
    7.5. IT Upgrades

8. Asset Management
   8.1. Requirements and Data Structure of As-built BIM Models
   8.2. Data Conversion for Integration with ArchSD PSB's Systems
   8.3. Deliverables and Training
   8.4. Handover of As-built BIM Models

DEVB TC(W) No. 2/2021		Construction Contract		Notes
	BIM Use	**Main Contractor**	**DSC**	**Const. Stage**
1	Design Authoring	- Lead and consolidate construction design from NSC/DSC and develop federated BIM model - Lead BIM design coordination process	- Agree between MC and DSC	
2	Design Reviews	- Take lead to review federated BIM construction model and coordinate design changes - Facilitate virtual mock-up for review and approval by designers or employer	- Agree between MC and DSC	
3	Existing Conditions Modelling	- Carry out 3D digital survey and produce BIM model for existing site condition (including E&M if any) to facilitate construction planning	N/A	
4	Site Analysis	N/A	N/A	N/A
5	3D Coordination	- Carry out clash analysis for the federated BIM construction model - Take lead to resolve conflict	- Agree between MC and DSC	
6	Cost Estimation	- Consolidate the inputs from NSC/DSC and prepare a financial model for project cost control, cost evaluation on variation of works, spending analysis	- Agree between MC and DSC	See Note b below
7	Engineering Analysis	- Consolidate the inputs from NSC/DSC to carry out the analysis	- Agree between MC and DSC	See Note l below

8.	Sustainability Evaluation	- Consolidate the inputs from NSC/DSC to facilitate the certification process	- Agree between MC and DSC	See Note j below
9	Space Programming	N/A	N/A	N/A
10	Phase Planning (4D Modelling)	- Consolidate and coordinate construction programme with inputs from NSC/DSC - Carry out 4D planning using BIM	- Agree between MC and DSC	
11	Digital Fabrication	- Facilitate the fabrication of construction materials or assemblies with inputs from NSC/DSC	- Agree between MC and DSC	See Note e below
12	Site Utilization Planning	- Consolidate and coordinate site utilization with inputs from NSC/DSC - Carry out site utilization planning using BIM	- Agree between MC and DSC	See Note f below
13	3D Control and Planning	- Consolidate and coordinate with inputs from NSC/DSC - Carry out digital setting-out/ construction checking using BIM	- Agree between MC and DSC	See Note m below
14	As-built BIM Modelling	- Produce federated as-built BIM models	- Provide as-built information to MC - Agree between MC and DSC	
15	Maintenance Scheduling	- Consolidate and coordinate the data required for facility management and input into as-built BIM models	- Agree between MC and DSC	See Note g below

16	Asset Management	- Consolidate and coordinate the data sets and data formats required for asset management and input into as-built BIM models - Carry out UU surveys for all open-up areas and deliver a project UU BIM model	- Agree between MC and DSC	See Note n below
17	Drawing Generation (Drawing Production)	- Produce drawing deliverables from BIM model	- Produce drawing deliverables from BIM model	

Notes:

a. Not used
b. Mandatory for project cost control, cost evaluation on variation of works, cash flow/spending analysis, etc. at construction stage as far as practicable.
c. Not used
d. Not used
e. Mandatory for digitalizing the construction details in the BIM model for mass customized components such as metal cladding, acoustic panels, building façade panels, ceiling panels, acoustic barriers, metal structural members, etc. which are of large quantities and variety in dimensions, shapes, geometries, etc. and modular construction units.
f. Mandatory for the construction activities with very high to extreme risk level identified from the Systematic Risk Management (SRM) according to ETWB TC(W) No. 6/2005 or other identified activities of significant added values at construction stage.
g. Mandatory for providing maintenance attributes for facility structures, fabrics and equipment in the as-built models as considered appropriate.
h. Mandatory for developing/reviewing digital 3D design scheme for a new construction project after TFS has been approved by the Works Branch of DEVB.
i. Mandatory for collecting sufficient and necessary existing site conditions as far as practicable to develop the design scheme and conduct the site analysis for new construction projects.
j. Mandatory for building projects which aim to obtain the Gold or above rating of "BEAM Plus NB V2.0" certification with credit(s) for "BIM Integration".
k. *Not used*
l. Mandatory for conducting at least one engineering analysis which may be related to structural, lighting, solar and shading, airflow, energy, acoustic, thermal, mechanical, people movement, hydraulic, etc. as appropriate in building projects.
m. Mandatory for a large-scale project requiring Digital Works Supervision System that digital setting-out, construction checking, etc. as appropriate by means of 3D laser scanners, robotic total stations, etc. shall be adopted as far as practicable.
n. Mandatory for identifying the required data sets and data formats which can be extracted from as-built BIM models for the maintenance agencies' use. Besides, underground utilities (UU) surveys by means of photogrammetry, 3D laser scanning, etc. for all opened-up areas are required so that a project UU BIM model can be provided to the maintenance agencies and LandsD for information sharing.

Programme

Deliverables	Completion Time
4.1) BIM Execution Plan as per Appendix 2.	*Within 1 month(s) from the date for commencement of the Works.*
4.2) Architectural and structural initial BIM models in Level of Information Need together with required 2D drawings (i.e. plans, elevations and sections).	*Within 3 month(s) from the date for commencement of the Works.*
4.2) Building services initial BIM models together with required 2D drawings (i.e. schematic, layout plans, elevations and sections).	*Within 6 month(s) from the date for commencement of the Works.*
4.2) Submission of CSD and CBWD BIM models together with required 2D drawings (i.e. plans, reflected ceiling plans, elevations and sections).	*BIM models accompanying with the master programme within 9 month(s) from the date for commencement of the Works.*
4.3) Existing Conditions Modelling	*Submit according to the project programme*
4.4) Clash Analysis Report	*Submit to resolve all clashes at least 1 month(s) before the construction of those elements*
4.5) Financial Model	*Submit according to the project programme*
4.6) Engineering Analysis Report	*Submit according to the project programme*
4.8) Phase Planning (4D Modelling)	*It should be performed at least 1 month(s) before the commencement of major construction sequences*

4.12) As-built BIM models	*Draft as-built BIM models shall be submitted within 4 months from the issuance of the certificate of completion.* *Revised as-built BIM models shall be submitted within 1 month from the issuance of comments from Supervising Officer (SO) and his representatives;* *The final as-built BIM models shall be submitted within 12 months from the issuance of the certificate of completion*
4.14) Asset Management *- Project Underground Utilities (UU) BIM model* *- Asset Information Spreadsheets*	*The final project UU BIM model for all opened-up areas shall be submitted within [6] months from the issuance of the certificate of completion;* *The Asset Information Spreadsheets shall be submitted with the as-built BIM models*
4.15) Drawing Generation (Drawing Production)	*Submit according to the project programme*
4.17) BIM Objects	*Submit according to the project programme*
7.3) Common Data Environment	*Handover the CDE's files to the SO before the issuance of the maintenance certificate*

- Note: The definition of Level of Information Need shall refer to BIM Guides issued by the Architectural Services Department