# Building Information Modelling for Asset Management (BIM-AM) Standards and Guidelines


Version 3.0
**2022 Edition**

機電工程署
EMSD

Document Revision Tracking

| Document Revision | Issue Date |
|---|---|
| Version 1.0 | 24th November 2017 |
| Version 2.0 | 18th January 2019 |
| Version 3.0 | 14th September 2022 |

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**List of Abbreviations: -**

For common BIM terminologies, refer to the latest CIC BIM Dictionary.

| Abbreviation | Definition |
|---|---|
| A&A | Addition and Alternation |
| ACB | Air Circuit Breaker |
| ADT | Asset Data Templates |
| AIM | Asset Information Model |
| AIMP | Asset Information Management Platform |
| AIR | Asset Information Requirements |
| API | Application Programming Interface |
| AMS | Asset Management System |
| ARC | Agent Responsible Code |
| ArchSD | Architectural Services Department |
| BEP | BIM Execution Plan |
| BH | BIM Harmonisation Guidelines for Works Department by Development Bureau |
| BIM | Building Information Modelling |
| BIM-AM | Building Information Modelling – Asset Management |
| BIM-AM SG | Building Information Modelling – Asset Management Standards and Guidelines |
| BMS | Building Management System |
| CAD | Computer-Aided Design |
| CCeP-JM | Customer Centric e-Platform for Job Management |
| CCMS | Central Control and Monitoring System |
| CCTV | Closed-circuit Television |
| CCS | Corporate Computer System |
| CDE | Common Data Environment |
| CIC | Construction Industry Council |
| COBie | Construction Operation Building Information Exchange |
| COBieLite | Lightweight Extensible Markup Language (XML) format of COBie data |
| CRAC | Computer Room Air Conditioner |
| CSWP | Computer-Aided-Drafting Standard for Works Projects |
| DDC | Direct Digital Controller |
| DEVB | Development Bureau |
| DLP | Defect Liability Period |
| DSD | Drainage Services Department |
| E-CAS | Electronic Contract Administration System |
| E&M | Electrical and Mechanical |
| ELV | Extra Low Voltage |
| EPC | Electronic Product Code |

| Abbreviation | Definition |
|---|---|
| EMABS | Electrical Mechanical, Air-Conditioning, Building Services |
| EMSD | Electrical and Mechanical Services Department |
| EMSTF | Electrical and Mechanical Services Trading Fund |
| GWIN | Government Wide IoT Network |
| HVAC | Heating, Ventilating and Air Conditioning |
| iBMS | Integrated Building Management System |
| IFC | Industry Foundation Classes |
| IoT | Internet of Things |
| JSON | JavaScript Object Notation |
| LOD-G | Level of Development – Geometry |
| LOD-I | Level of Development – Information |
| LOIN | Level of Information Need |
| LoRA | Long Range Radio |
| LPWAN | low-powered wide area network |
| MEP | Mechanical, Electrical and Plumbing |
| MiMEP | Multi-trade Integrated MEP |
| O&M | Operation and Maintenance |
| PABX | Private Automatic Branch Exchange |
| PAU | Primary air handling unit |
| PIM | Project Information Model |
| PS | Particular Specification |
| QA/QC | Quality Assurance/ Quality Control |
| QR Code | Quick Response Code |
| RDCC | Regional Digital Control Center |
| REST | Representational State Transfer |
| RFID | Radio-frequency Identification |
| RTLS | Real Time Location System |
| T&C | Testing and Commissioning |
| UHF | Ultra High Frequency |
| VRV-IDU | Variable Refrigerant Volume-Indoor Unit |
| WDs | Works Departments under DEVB |
| WIP | Work in Progress |
| XML | eXtensible Markup Language |

**List of Interpretations:**

For common BIM terminologies, refer to CIC BIM Dictionary.

| Abbreviation | Term | Definition / Description |
|---|---|---|
| ADT | Asset Data Templates | All templates have been included in Appendix B of this Guide. |

| Abbreviation | Term | Definition / Description |
|---|---|---|
| | | Common attributes as shown in ADT should be added as Project Parameters<br>Specific attributes as shown in ADT should be added as Object's Parameters |
| | Asset relationship | This is the relationship diagram as illustrated in Figure 6-1 |
| | Attribute | It is a piece of data describing a BIM object. |
| | Project CDE | The CDE location allowing contractor to upload models/ documents for EMSD review and approval |
| | Venue CDE | The CDE location for EMSD internal use and synchronise with other internal system like CCS, AMS, CCeP-JM, etc. |
| | Consultant | It includes the meaning of any appointed parties to deliver the services included in BIM-AM SG for which they have been assigned. |
| | Contractor | It includes the meaning of any contracted/ appointed parties to deliver the works included in BIM-AM SG for which they have been contracted |
| | Federated Model | A model that links distinct component models, tables, analysis and other data sources without losing their identity or integrity by being linked, such that any change to one component model will not change another component model. |
| | BIM Object | A building component in BIM software that can be inserted, moved and rotated into required location and orientation within models (e.g. MCB board, air diffuser, etc.). |
| | Level 1 System/ Equipment | The E&M systems as defined in the BIM-AM SG |
| | Level 2 Equipment | The crucial E&M equipment for asset management as specified in the BIM-AM SG |
| PT | Project Team | This team is the project execution and supervision team issuing the contract or managing Contractor to deliver the contracted works and check for the compliance and quality of works in accordance with BIM-AM SG |
| SBU | Strategic Business Unit | Different strategic business units in EMSD under the Electrical and Mechanical Services Trading Fund (EMSTF) |

# 1. INTRODUCTION

## 1.1 Overview

The Building Information Modelling for Asset Management (BIM-AM) Standards and Guidelines (thereafter referred to as BIM-AM SG) is a summary of lifecycle information requirements of Electrical and Mechanical Services Department (EMSD). BIM-AM SG provides the BIM modelling standard, coding standard and information requirements for E&M systems, and assets from construction stage to handover for building operations for parties (thereafter referred to as Contractor) working on EMSD projects. Relevant templates have been developed based on these requirements. During design and construction stage, BIM is used as a design visualisation and coordination tool. Meanwhile, asset information should be gradually built up in the Project Information Model (PIM) so that by the end of the construction stage, the BIM model becomes an Asset Information Model (AIM) for handover to asset management. BIM-AM SG provides guidelines on what information should be included and how it is managed. It aims to provide a standard for as-built BIM and asset information at handover stage conforming to EMSD BIM-AM System.

### 1.1.1 Goals

BIM-AM SG aims to achieve the following goals:

- Standardise E&M systems, sub-systems and equipment coding;
- Specify the information requirement for E&M equipment to be inputted in the BIM model;
- Specify the modelling requirement, project settings, E&M settings, and presentation style; and
- BIM-AM SG is built on the guidelines defined by world-wide standards.

### 1.1.2 Previous Versions

Version 1.0 was published in 2017, followed by Version 2.0 published in 2019. International standards and guidelines were referenced when authoring the previous versions.

### 1.1.3 Version 3.0

In October 2021, Development Bureau (DEVB) promulgated BIM Harmonisation Guidelines for Works Departments Version 1.0 (thereafter referred to as BH). In accordance with DEVB's Technical Circular (TC) (Works) 8/2021, WDs should further review and update their own BIM standards and guidelines to align with BH to serve their future projects. As a response, in preparation for updating BIM-AM SG from Version 2.0 to Version 3.0, BIM-AM SG has been developed to align with BH, CIC BIM Standards - General Version 2.1 – 2021 (thereafter referred to as CIC BIM Standards), and CIC Production of BIM Object Guide – General Requirement Version 2 – 2021 (thereafter referred to as CIC BIM Object Guide).

In addition, the following standards or guidelines have been referenced:

- The latest DEVB TC (Works) – Adoption of Building Information Modelling for Capital Works Projects in Hong Kong;
- CIC BIM Standards for Mechanical, Electrical and Plumbing (Version 2 – 2021); and
- BS EN ISO 19650.

## 1.2 Objectives

BIM-AM SG aims to enable all parties working with EMSD to understand EMSD's BIM-AM requirements, including:

- Specify modelling requirements, project settings, E&M settings, and presentation styles;
- Standardise E&M systems, sub-systems, and equipment coding;
- Specify the information requirement for E&M equipment to be inputted in BIM models;
- Specify information exchange protocols in preparation for handover and acceptance processes;
- Prepare BIM-related information for the purpose of asset management (BIM-AM); and
- Adopt the standardised approaches in BIM Execution Plan (BEP).

## 1.3 Document Structure

BIM-AM SG contains the following sections:

1) Introduction
2) BIM Modelling Standard: provide preliminary guide to setting up a BIM project with EMSD BIM-AM required content.
3) BIM Object Authoring: sets the standard for creating objects, in accordance with the BH, the CIC BIM Object Guide's principles, and EMSD BIM-AM's requirement.
4) BIM Model Authoring: sets the standard for creating models, in accordance with the BH, including federation strategy and system modelling methods.
5) Coding and Numbering System: provide the coding principles for districts, disciplines, and assets.
6) Asset Information Requirements: explains how BIM models can be setup to provide asset information for future management and maintenance.
7) Interfacing and integrating BIM-AM System with other systems: explains how BIM Asset Management can be integrated with other systems and functions, such as RFID Readers and CCTV system, as well as the Asset Tag coding requirements for facilitating integration.

8) CDE Workflow: explains how BIM-AM information is integrated into EMSD's Common Data Environment (CDE).

9) Handover and Acceptance: states the tasks and handover materials necessary for ease of information transfer from Contractor to EMSD.

# 2. BIM MODELLING STANDARD

## 2.1 BIM Reference Software

BIM-AM SG takes Autodesk Revit and Navisworks as examples for illustration. Other software fulfilling the requirements may be used for openness. The exact version of BIM authoring software needs to be agreed by the Project Team (PT) of EMSD.

If other software platform is proposed in a project, it shall comply with:

- Industry Foundation Classes (IFC) file format v4;
- Commercially available collaborative software that provides interoperability between different software applications (e.g. Navisworks or equivalent); and
- Capability to carry and export all E&M asset information described in Section 6.

## 2.2 BIM Modelling Workflow

EMSD's overall BIM modelling workflow involves BIM model template creation, federation structure, BIM object authoring, BIM model authoring, and BIM model review. BIM models should be authored using BIM objects aligned with BH, and then conduct quality check reviews.

For all new projects as well as addition and alternation (A&A) projects, BIM-AM SG and Guidelines for the Handover of E&M Installation to EMSD (H/O Guide) would be included in the tender document which formed the baseline for understanding EMSD's BIM-AM requirements.

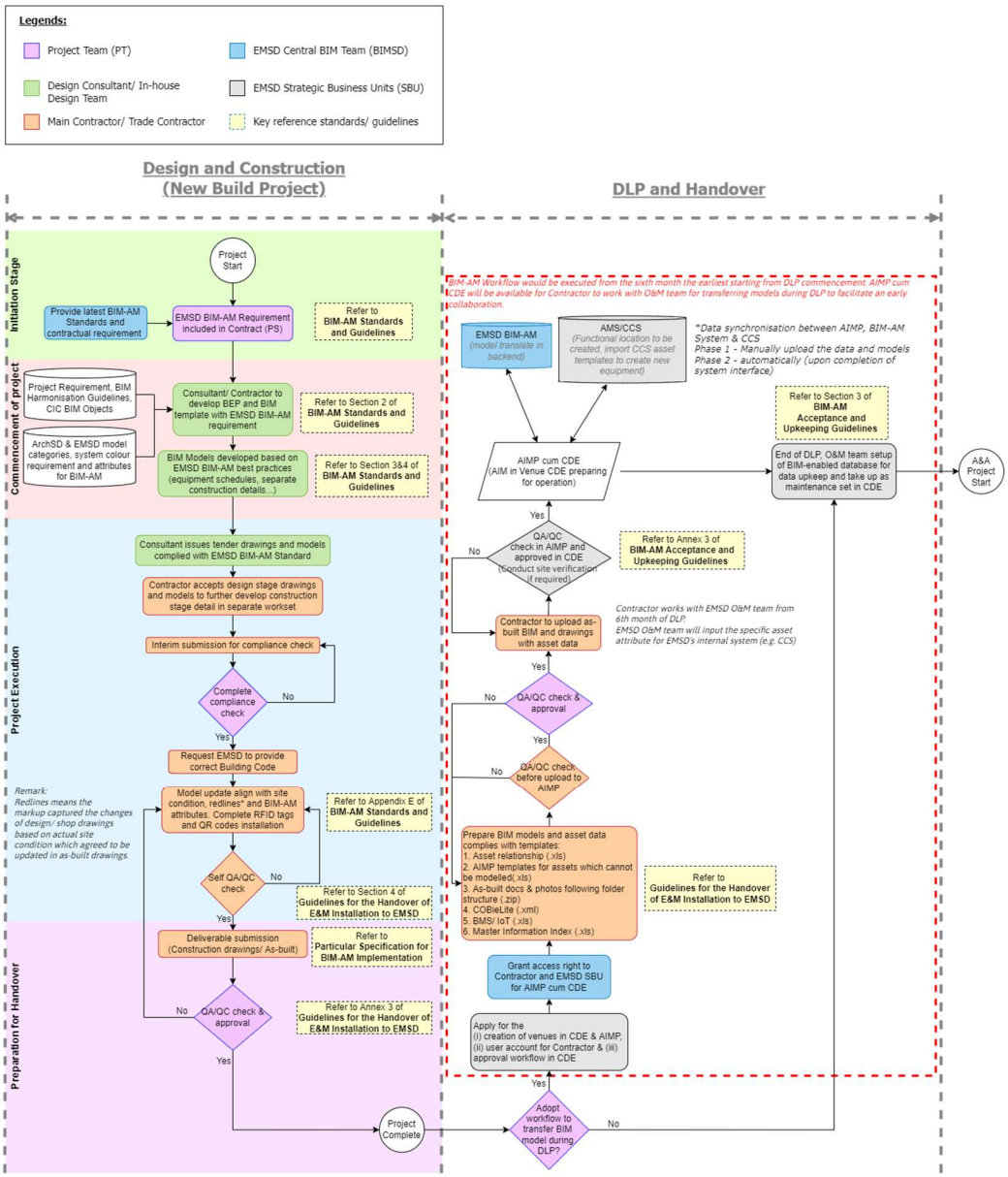
Contractor shall fulfil the minimum requirement in Section 2.3 to setup BIM project template with consideration of departmental requirements from interfacing departments (e.g. ArchSD). Section 3 and 4 of BIM-AM SG outlined the requirement of BIM objects and model authoring.

During project execution, Contractor shall refer to H/O Guide to identify handover requirements applicable to the project scope. Contractor shall then carry out its works and conduct compliance check/ self-quality check in accordance with these requirements.

Upon project completion, the PT will conduct compliance and quality check for the deliverable as submitted by Contractor. Contractor shall include all required document type including as-built BIM model & objects, O&M document & photos, COBieLite file, asset relationship and equipment attributes as mentioned in BIM-AM SG and H/O Guide. The submission would undergo EMSD's internal acceptance procedures prior to project closeout.

The BIM workflow steps are shown in Figure 2-1. Details of each workflow step are explained in subsequent sections of BIM-AM SG. This workflow (and project-specific amendments, if any) shall be clearly mentioned in BEP and agreed by Project Team (PT).

Figure 2-1 BIM-AM Workflow on Using Different Guidelines




## 2.3 BIM Template

BIM model template shall be approved by the PT together with the submission of BEP before authoring each BIM model. BIM model templates should contain:

- Units and Symbols
- Project coordinates and base point (origin)
- Browser organisation
- Mandatory attributes (as mentioned in Section 3.4)
- E&M System and System colour as mentioned in Section 4.4.3
- Proper separation of model elements for construction details as mentioned in Section 4.2.4

## 2.4 BIM Model Naming Convention

BIM model naming convention shall follow BH, which has been aligned with CIC BIM Standards. Codification shall refer to Appendix F – Codification for EMSD BIM Model Naming Convention.

The requirement on this file naming convention is ONLY applicable to BIM model files to tally with the Smart City Development for 3D digital maps. However, the metadata of files shall be well defined in EMSD's CDE prior to uploading the BIM-AM deliverables for approval.

## 2.5 Federation Strategy

Federation shall follow the federation principles set out in BH whilst fulfilling the following EMSD-specific requirements outlined in Appendix F:

- Federated model file shall be created to link all the architectural, structural, and E&M models for the operation of BIM-AM system. Individual models should not be bound into the federated model.
- All BIM models shall be linked with same coordinate system and same origin.
- The linked models shall be set as relative path in any combined model.
- CAD file used to produce drawing inside BIM model shall be linked with relative path and located in "CAD" folder subject to the latest version of CDE guideline.
- BIM models of different disciplines (e.g. architectural, structural, each E&M system as specified in Appendix G of this Guide) shall be separately modelled and federated.
- BIM model shall be separately constructed per individual building blocks and per floors.

## 2.6 Level of Information Need (LOIN)

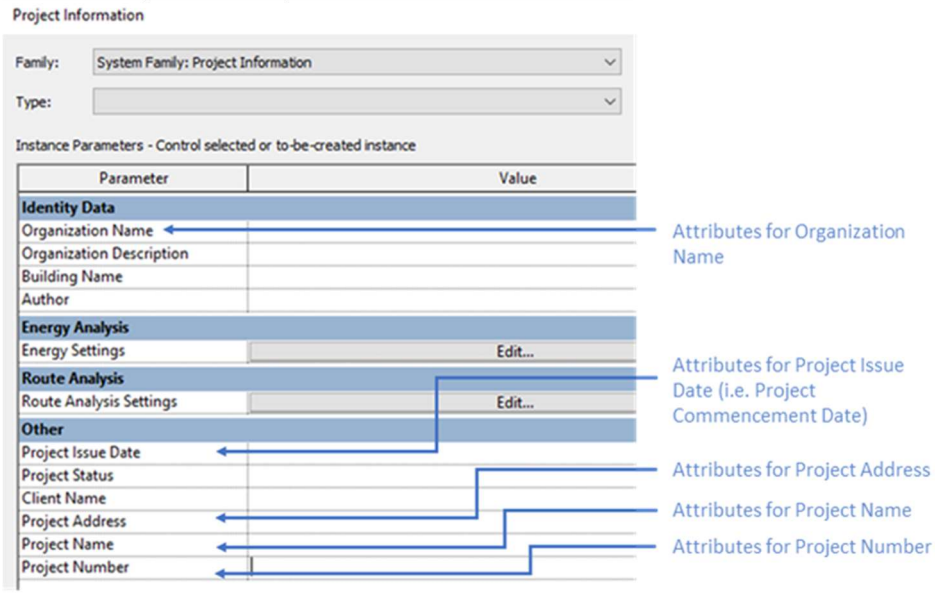
In accordance with the principles of ISO 19650, information is required for the purpose to perform a task or support a decision. Level of information need (LOIN) is defined as the appropriate level (or "richness") of information to be provided to satisfy the purpose of information need. LOIN could either be expressed in the richness of geometric details (LOD-G) and/or richness of datasets (LOD-I). The following sections contain further details of the requirements of LOD-G and LOD-I for BIM-AM.

EMSD's LOD-I requirements include project information in BIM models and mandatory attributes in BIM objects.

### 2.6.1 LOD-I for BIM Models

For capital works projects, within BIM models, it is mandatory to input Project Information in accordance with BH. The figure below illustrates the parameters used for inputting Project Information. Refer to Appendix VI - LOD-I Requirements, Creation and Extraction of BH for details.

Figure 2-2 Project Information Attributes in Revit




### 2.6.2 LOD-I for BIM Objects

For BIM objects, refer to Section 3.4 for BIM object-related LOD-I requirements in accordance with Asset Data Template (ADT).

## 2.7 BIM File Size

BIM file size is mentioned in BH and listed as follows for reference.

### 2.7.1 BIM Object File Size

The file size of each BIM object shall not exceed 5MB.

### 2.7.2 BIM Model File Size

The file size of each BIM model shall be kept under 500MB.

# 3. BIM OBJECT AUTHORING

## 3.1 BIM Object Naming Convention

BIM objects shall be modelled for a specific purpose and assigned with the most appropriate and representative category. BIM objects shall be named systematically and logically for the understanding of users and for easy BIM object management.

BIM object naming convention shall follow the principles outlined in BH. Naming codes for Category and Functional Type are managed by CIC under the CIC Master List. While the naming codes for Category and Functional Type are from three sources (CIC, DSD, and HyD), those from CIC shall be followed.

## 3.2 BIM Object Authoring

To maintain single source of truth, BIM objects from CIC BIM Portal should be used as far as practicable. If unavailable from CIC BIM Portal, newly created BIM objects for EMSD BIM-AM use should include the specific attributes mentioned in the EMSD Asset Data Templates (ADT) for Level 2 Equipment. Refer to Appendix B for details on EMSD ADT. Specific asset data as shown in the ADT should be created under the object parameters.

When authoring new BIM objects by altering existing objects from the CIC BIM Portal as the basis, LOD-G can be simplified or enhanced to meet the project requirement, while LOD-I should be preserved. Altered BIM object shall be renamed after the Originator.

It is encouraged to submit newly developed BIM objects to the CIC BIM Portal. For the BIM object requirement, including the object sheets format, shall be referred to the CIC BIM Object Guide for detailed requirements.

LOD-G and LOD-I requirements are as below.

## 3.3 LOD-G Requirements

To minimise file size, the object should be kept as light as possible, given that it fulfils the project's LOD-G requirement. Reference materials and unused components shall be purged prior to submission. For the purpose of asset management, the LOD-G for E&M equipment should be no less than LOD-G 300. Best practices on adding construction details within objects should follow principles set out in Section 2.2 and Section 4 of Appendix E.

The modelling of nested objects, which are comprised of several BIM objects, should be minimised as far as practicable. All necessary nested objects should follow principles set out in Section 2.1 of Appendix E.

Modelling of maintenance and clearance space should follow principles set out in Section 2.3 of Appendix E.

## 3.4 LOD-I Requirements

Asset data template should be used when authoring new BIM objects. LOD-I, or object attributes, should be grouped by property types, such as general information,

design properties, classification properties (e.g. OmniClass), and installation information, for efficient information retrieval. Refer to Section 6.6 and Appendix B for each E&M equipment.

### 3.4.1 Classification Properties

Adoption of OmniClass as classification for BIM objects shall refer to CIC BIM Object Guide. Refer to Appendix G for sample of OmniClass of EMSD Level 2 Equipment.

### 3.4.2 Asset Data Template (ADT)

Individual BIM object used for representing Level 1 and Level 2 Equipment in EMSD BIM-AM system should contain the specific attributes as listed in Appendix B. The adoption of ADT is excluded for those assets with (*) as shown in Appendix G.

# 4. BIM MODEL AUTHORING

## 4.1 BIM Model Set Up

### 4.1.1 Units and Symbols

The BIM model shall be modelled in metric and in consistent units. Commonly used model units are provided below. For units or symbols not listed below, Contractor is advised to propose the new units and/or symbols, with substantiation and submit the mapping table, where deemed necessary. Such newly-introduced units and/or symbols should be agreed by all parties and documented in BEP.

Table 4-1 SI Base Units

| # | Name | Unit | Symbol |
|---|---|---|---|
| 1 | Length | Millimetre | mm |
| 2 | Mass | kilogram | kg |
| 3 | Time | second | s |
| 4 | Electric Current | Ampere | A |
| 5 | Thermodynamic Temperature | Kelvin | K |
| 6 | Luminous Intensity | candela | cd |

Table 4-2 SI Derived Units

| # | Name | Unit | Symbol |
|---|---|---|---|
| 1 | Energy | joule | J |
| 2 | Frequency | hertz | Hz |
| 3 | Force | newton | N |
| 4 | Illuminance | lux | lux |
| 5 | Pressure | Pascal | Pa |
| 6 | Power | watt | W |
| 7 | Temperature | Celsius | $^{o}$C |
| 8 | Potential | volt | V |
| 9 | Resistance | ohm | Ω |

The table below lists the prefixes used to denote decimal fractions and multiples of SI units and derived SI units. Compound prefixes are **not** permitted (e.g. millimicro). The prefix attaches directly to the name of a unit, and a prefix symbol attaches directly to the symbol for a unit.

Table 4-3 Prefixes for SI Base Units and SI Derived Units

| # | Prefix | Symbol | Factor |
|---|---|---|---|
| 1 | yotta | Y | $10^{24}$ |
| 2 | zetta | Z | $10^{21}$ |
| 3 | exa | E | $10^{18}$ |
| 4 | peta | P | $10^{15}$ |
| 5 | tera | T | $10^{12}$ |
| 6 | giga | G | $10^{9}$ |

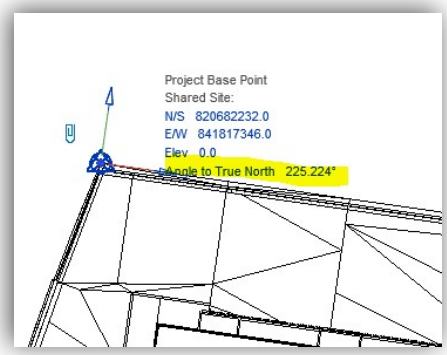
| # | Prefix | Symbol | Factor |
|---|---|---|---|
| 7 | mega | M | $10^{6}$ |
| 8 | kilo | k | $10^{3}$ |
| 9 | hecto | h | $10^{2}$ |
| 10 | deca | da | $10^{1}$ |
| 11 | deci | d | $10^{-1}$ |
| 12 | centi | c | $10^{-2}$ |
| 13 | milli | m | $10^{-3}$ |
| 14 | micro | μ | $10^{-6}$ |
| 15 | nano | n | $10^{-9}$ |
| 16 | pico | p | $10^{-12}$ |
| 17 | femto | f | $10^{-15}$ |
| 18 | atto | a | $10^{-18}$ |
| 19 | zepto | z | $10^{-21}$ |
| 20 | yocto | y | $10^{-24}$ |

Table 4-4 SI Preferred Engineering Units

| # | Name | Unit |
|---|---|---|
| 1 | Area | $m^2$ |
| 2 | Apparent Power | kVA |
| 3 | Calorific Value | kJ/kg |
| 4 | Compressed Air Pressure | kPa |
| 5 | Cooling Power | kW |
| 6 | Density | $kg/m^3$ |
| 7 | Sound Power | dB |
| 8 | Ductwork Pressure | Pa |
| 9 | Electric Power | kW |
| 10 | Enthalpy Difference | kJ/kg |
| 11 | Heating Power | kW |
| 12 | Mass Flow Rate | kg/s |
| 13 | Pipework Pressure | kPa |
| 14 | Potential | V |
| 15 | Rotational Speed | Rev/min |
| 16 | Specific Heat | kJ/kg K |
| 17 | Specific Volume | $m^3$ /kg |
| 18 | Thermal Resistance | $m^2K/W$ |
| 19 | Velocity | m/s |
| 20 | Volume | $m^3$ |
| 21 | Volume Flow Rate | l/s |
| 22 | Viscosity | $N.s./m^2$ |

### 4.1.2 BIM Project Coordinates

Figure 4-1 BIM Model Coordinates Set up




BIM models shall be set up and base on true north world coordinates and elevation. Also, the project origin/base point should be set up by Contractor and further confirmed by the PT in the project. The model sharing systems among different disciplines shall be set up as follow:

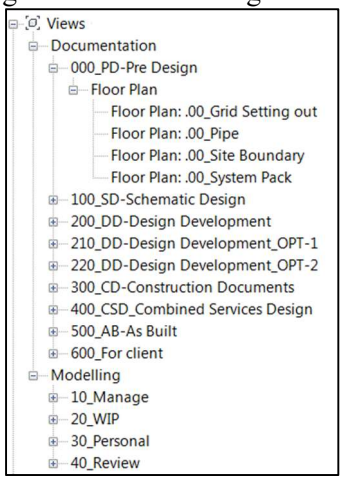
- Hong Kong 1980 Grid System for the Eastings and Northings
- The location of city should be set as Hong Kong, China (Latitude: 22.2833 °; Longitude: 114.15°)
- The project shall set and reflect True North, i.e. the angles to True North.
- Elevations shall refer to Hong Kong Principal Datum (HKPD)

### 4.1.3 Browser Organization

Project Browser should be designed by Contractor so that views can be organised according to its purpose, its viewing details, and types of views. Views prepared in accordance with EMSD guidelines should be named beginning with “EMSD” to facilitate finding the correct view for import into AIMP during handover.

Below is an example of one project browser, it is organised in 3 levels:

Figure 4-2 Browser Organization




- The first level shows whether the view is used for Documentation (if any) or Modelling
- The second level shows whether the view belongs to coordination or layout, i.e. sheet views or coordination.
- The third level shows the type of the views, such as floor plan / 3D view / section views/ elevations, etc.

## 4.2 Disciplinary BIM Model Authoring Principles

### 4.2.1 BIM Settings by Category – Duct System

Duct System shall have the following settings:

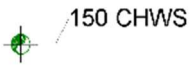
Table 4-5 Duct System Settings

| # | BIM Model field | Setting | | Example / Symbol |
|---|---|---|---|---|
| 1 | System type name | Consists of the system code and routing code separated by a hyphen "-" | | HVAC-EAD |
| 2 | System abbreviation | Input routing code in Section 5.5 | | EAD |
| 3 | Description | Input routing name in Section 5.5 | | Exhaust Air Duct |
| 4 | Rise/ drop symbol | PAD | Slash |  |
| | | EAD | Cross - Filled |  |
| | | FAD | Wye |  |
| | | SAD | Wye |  |
| | | RAD | Backslash |  |
| | | TAD | Backslash |  |
| | | SED | Cross - Filled |  |
| 5 | System colour coding | Refer to Section 4.4.3 for the requirement | | -- |

### 4.2.2 BIM Settings by Category – Pipe System

Pipe system shall have the following settings:

Table 4-6 Pipe System Settings

| # | BIM Model field | Setting | Example / Symbol |
|---|---|---|---|
| 1 | System type name | Consists of the system code and routing code separated by a hyphen "-" | HVAC-CHWS |
| 2 | System abbreviation | Input routing code in Section 5.5 | CHWS |
| 3 | Description | Input routing name in Section 5.5 | Chilled Water Supply Pipe |
| 4 | Rise / Drop symbol | Yin Yang - Filled |   |
| 5 | System colour Coding | Refer to Section 4.4.3 | -- |

### 4.2.3 Modelling E&M Equipment and Routing

The following objects of the E&M systems shall be modelled for the operation of BIM-AM system that includes:

- Equipment as specified in Appendix G (List of Equipment and Equipment Code and Provisional Requirement of RFID tags and QR codes) is mandatory,
- Objects of E&M systems which are visible on sight (e.g. air terminals of HVAC system, socket outlets of electrical distribution system, etc.)
- Main routing of all the systems as specified in Section 5.5. Detailed system routing including all duct or pipe accessories shall be included in HVAC system.

E&M routing and equipment should be modelled in correct BIM categories as listed below:

Table 4-7 Required BIM Category for E&M Routing Type

| Routing Type | BIM Category |
|---|---|
| Trunking | Duct, if system type of trunking is not available in the BIM software |
| Cable Tray | Cable Tray |
| Duct | Duct |
| Pipe | Pipe |

For BIM categories of E&M equipment, the following table only reveals the requirement of equipment as specified in Appendix G. Contractor shall assign the remaining unlisted equipment to an appropriate category. "Generic Models" shall not be used for BIM category.

Table 4-8 BIM Category for E&M Equipment

| No. | System Name | Equipment Type | BIM Category (Under BIM authoring tools) |
|---|---|---|---|
| 01 | Lift and Escalator | (All) | Specialty Equipment |
| 02 | LV Switchboard | (All) | Electrical Equipment |
| 03 | Emergency Generator | (All except type below) | Electrical Equipment |
| | | Fuel Pump | Mechanical Equipment |
| 04 | HVAC | (All except types below) | Mechanical Equipment |
| | | Fire Dampers/ Volume Control Dampers/ Silencer | Duct Accessories |
| | | Air Grille/ louver | Air Terminal |

| No. | System Name | Equipment Type | BIM Category (Under BIM authoring tools) |
|---|---|---|---|
| | | Local Motor Control Panel | Electrical Equipment |
| | | Auto-strainer | Pipe Accessories |
| | | Valve | Pipe Accessories |
| 05 | Boiler System | (All) | Mechanical Equipment |
| 06 | Filtration Plant | (All except type blow) | Mechanical Equipment |
| | | Local Motor Control Panel | Electrical Equipment |
| | | Piping System | Pipes, Pipe fittings and Pipe Accessories |
| 07 | Fire Services Installation | (All except type below) | Fire Alarm Devices |
| | | Sprinkler Control Valve Set | Pipe Accessories |
| | | Sprinkler | Sprinkler |
| | | Gas Suppression / Gas Cylinder Equipment | Specialty Equipment |
| | | Fire Hydrant / Hose Reel | Plumbing Equipment |
| | | Directional sign / Emergency lights | Lighting fixtures |
| | | Pump | Mechanical Equipment |
| 08 | Uninterrupted Power Supply | (All) | Electrical Equipment |
| 09 | Burglar Alarm | (All) | Security Device |
| 10 | Radar and Navigation System | (All) | Communication Device |
| 11 | Microwave Link System | (All) | Communication Device |
| 12 | Timing & Display System | (All) | Communication Device |
| 13 | Audio Video System | (All) | Communication Device |
| 14 | Audio Electronics System | (All) | Communication Device |

| No. | System Name | Equipment Type | BIM Category (Under BIM authoring tools) |
|---|---|---|---|
| 15 | Radio System | (All) | Communication Device |
| 16 | Closed Circuit TV System | (All) | CCTV Security Device |
| 17 | Broadcast Reception | (All) | Communication Device |
| 18 | Lighting | (All except type below) | Lighting Fixtures |
| | | Lighting Control System | Electrical Fixtures |
| 19 | Electrical Distribution | (All except types below) | Electrical Equipment |
| | | Busbar Trunking / Main Distribution Cable | Ducts / Cable Trays |
| | | Isolating switch | Electrical Fixtures |
| | | Fuse switch & Switch fuse | Electrical Fixtures |
| 20 | Medical Gas System | (All except types below) | Specialty Equipment |
| | | Blower/ Compressor / Pump | Mechanical Equipment |
| 21 | Pneumatic Tube Transport | (All except types below) | Specialty Equipment |
| | | Blower Unit | Mechanical Equipment |
| | | Power Pack | Electrical Equipment |
| 22 | Internet-of-thing Installation (IoT) | (All) | Data Device |
| 23 | High Voltage Power Supply | (All) | Electrical Equipment |
| 24 | Private Automatic Branch Exchange System | (All) | Telephone Device |
| 25 | Automatic Refuse Collection System | (All) | Specialty Equipment |

| No. | System Name | Equipment Type | BIM Category (Under BIM authoring tools) |
|---|---|---|---|
| A1 | Drainage | (All, except those pipes, fitting and pipe accessories and control panels) | Mechanical Equipment |
| | | Pump Control Panel | Electrical Equipment |
| A2 | Plumbing | (All, except those pipe, pipe fitting and accessories and control panels) | Mechanical Equipment |
| | | Pump Control Panel | Electrical Equipment |
| A3 | Water Leakage Detection System | (All) | Specialty Equipment |
| A4 | Mechanical Handling & Lifting Installation | (All) | Specialty Equipment |

### 4.2.4 Best Practices on Model Settings

Refer to Appendix E for details of the best practices on BIM object authoring, architectural BIM model authoring, E&M BIM authoring, and construction BIM details. Some key best practice categories and items are as follows:

1. Nested object is not preferable for the E&M objects having different asset information requirement as specified in the Appendix B – ADT.
2. Multi-trade Integrated MEP (MiMEP) is a trend for design and construction stage whereas the three EMSD BIM-AM standards and guidelines focused on BIM for asset management. Thus, nested object for a modular unit is not preferable for major E&M equipment from asset management perspective. Individual BIM object shall be created for each major E&M equipment in the project model as defined in Appendix G.
3. Architectural BIM models includes model setup, zone creation and modelling rooms and adding parameters.
4. E&M BIM model authoring includes browser organization, model setup and presentation style for E&M system.
5. Construction BIM details includes separate storage set (workset/ layer/ level) for construction and fabrication details.
6. BIM model upgrade.

## 4.3 Schedules

### 4.3.1 Equipment Schedules

Equipment schedules should be created in BIM models for all equipment by types showing mandatory attributes.

Equipment designation as shown in the equipment schedule shall follow field 4-7 of asset code mentioned in Section 5.1 that would benefit from design stage to operation stage with an aligned coding system.

The proposed equipment designation for AHU at ground floor would be as follows:

Example: GF-HVAC-AHU-01

## 4.4 Presentation Style

This Section addresses the BIM model elements display setting for 2D and 3D presentation. For 2D Computer Aided Drafting (CAD) drawings, CAD Standard for Works Projects (CSWP) for 2D CAD drawings shall be followed. If 2D drawings are generated from the BIM model, CSWP does not need to be followed if technically impracticable.

### 4.4.1 Line Weight

Line thicknesses to be used for 2D submittals are tabulated as follows.

Table 4-9 Line Weight

| Line Weight | Line Thickness |
|---|---|
| Weight 0 | 0.13mm |
| Weight 1 | 0.18mm |
| Weight 2 | 0.25mm |
| Weight 3 | 0.35mm |
| Weight 4 | 0.50mm |
| Weight 5 | 0.70mm |
| Weight 6 | 1.00mm |
| Weight 7 | 2.00mm |

### 4.4.2 E&M Object Colour

The appearance of BIM objects for asset management shall reflect the product material; otherwise, product surface colour is acceptable.

### 4.4.3 Requirements of Line Thickness, Line Type and Colour Coding for E&M Systems

The colour coding shall be assigned for the system types below by configuration of corresponding “Filters” under “Visibility/Graphics Override”. For system types not listed in the table below, Contractor is advised to propose new colour coding for new system types with substantiation, where deemed necessary.

Table 4-10 Line Thickness, Line Type and Colour Coding for E&M Systems

| No. | System Name | Routing | Presentation (2D) | | Presentation (3D) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Line Thick-ness (mm) | Line Type | Red | Green | Blue | Colour Palette |
| 01 | Lift and Escalator | Cable containment for lift and escalator | 0.25 | Continuous | 128 | 0 | 128 | |
| 02 | LV Switchboards | Cable containment for LV Switchboards | 0.35 | Divide2 | 128 | 128 | 0 | |
| 03 | Emergency Generator | Cable containment for Emergency Generator | 0.35 | Continuous | 255 | 0 | 64 | |
| | | Trunking for Emergency Generator | 0.25 | Continuous | 0 | 128 | 255 | |
| | | Fuel Oil Return Pipe | 0.25 | Dashdot2 | 255 | 126 | 0 | |
| | | Fuel Oil Supply Pipe | 0.25 | Dashdot2 | 255 | 126 | 0 | |
| | | Fuel Oil Tank Vent Pipe | 0.35 | Hidden | 0 | 128 | 255 | |
| | | Exhaust Air Duct | 0.35 | Continuous | 0 | 255 | 0 | |
| | | Chimney Pipe | 0.35 | Continuous | 0 | 255 | 0 | |
| 04 | HVAC | Primary Air Duct | 0.35 | Continuous | 0 | 255 | 255 | |
| | | Exhaust Air Duct | 0.35 | Continuous | 0 | 255 | 0 | |
| | | Fresh Air Duct | 0.35 | Continuous | 0 | 0 | 255 | |
| | | Supply Air Duct | 0.35 | Continuous | 255 | 0 | 0 | |
| | | Return Air Duct | 0.35 | Continuous | 255 | 0 | 255 | |
| | | Transfer Air Duct | 0.35 | Continuous | 0 | 128 | 255 | |
| | | Smoke Extraction Duct | 0.35 | Continuous | 128 | 128 | 0 | |
| | | Make Up Air Duct | 0.35 | Continuous | 192 | 192 | 192 | |
| | | Staircase Pressurization Duct | 0.35 | Continuous | 192 | 192 | 192 | |
| | | Pressure Relief Duct | 0.35 | Continuous | 0 | 153 | 153 | |
| | | Chilled Water Return Pipe | 0.25 | Dashdot2 | 0 | 255 | 0 | |
| | | Chilled Water Supply Pipe | 0.25 | Dashdot2 | 0 | 0 | 255 | |
| | | Condensate Drain Pipe | 0.18 | Dashed2 | 255 | 128 | 0 | |
| | | Condensing Water Supply Pipe | 0.25 | Border2 | 0 | 128 | 64 | |
| | | Condensing Water Return Pipe | 0.25 | Border2 | 0 | 128 | 255 | |
| | | Chemical Dosing Pipe | 0.25 | Hidden | 192 | 192 | 192 | |
| | | Make-up Water Pipe | 0.25 | Continuous | 192 | 192 | 192 | |

| No. | System Name | Routing | Presentation (2D) | | Presentation (3D) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Line Thick-ness (mm) | Line Type | Red | Green | Blue | Colour Palette |
| | | Heating Hot Water Supply Pipe | 0.25 | Phantom2 | 128 | 0 | 0 | |
| | | Heating Hot Water Return Pipe | 0.25 | Phantom2 | 255 | 128 | 64 | |
| | | Refrigerant Pipe | 0.25 | Continuous | 128 | 0 | 255 | |
| | | Chimney Pipe | 0.35 | Continuous | 0 | 255 | 0 | |
| 05 | Boiler System | Hot Water Supply Pipe | 0.25 | Dash dot | 255 | 0 | 0 | |
| | | Hot Water Return Pipe | 0.25 | Long Dash dot | 255 | 128 | 128 | |
| | | Boiler/ Steam Pipe | 0.35 | Continuous | 255 | 255 | 0 | |
| | | Vent Pipe | 0.35 | Hidden | 0 | 128 | 255 | |
| | | Boiler Exhaust Pipe | 0.35 | Continuous | 0 | 255 | 0 | |
| | | Condensate pipe (for condensate boiler) | 0.18 | Dashed2 | 255 | 128 | 0 | |
| | | Fuel Pipe | 0.25 | Dashdot2 | 255 | 126 | 0 | |
| | | Chimney Pipe | 0.35 | Continuous | 0 | 255 | 0 | |
| | | Cold Water Pipe | 0.25 | Continuous | 0 | 128 | 255 | |
| 06 | Filtration Plant | Filtration Plant Pipe | 0.25 | Continuous | 0 | 128 | 0 | |
| | | Return Pipe | 0.25 | Continuous | 0 | 128 | 128 | |
| | | Overflow Pipe | 0.25 | Continuous | 0 | 128 | 0 | |
| | | Water Supply Pipe | 0.25 | Continuous | 0 | 128 | 255 | |
| 07 | Fire Services Installation | Sprinkler Pipe | 0.25 | Continuous | 255 | 0 | 0 | |
| | | Hose Reel/ Fire Hydrant Pipe | 0.25 | Continuous | 255 | 0 | 0 | |
| | | Gas Suppression | 0.25 | Continuous | 255 | 0 | 0 | |
| | | Trunking of Automatic Fire Alarm System | 0.25 | Divide2 | 255 | 0 | 0 | |
| | | Pre-action sprinkler Pipe | 0.25 | Continuous | 255 | 0 | 0 | |
| 08 | Uninterrupted Power Supply | Cable containment for Uninterrupted Power Supply | 0.35 | Continuous | 128 | 64 | 64 | |
| 09 | Burglar Alarm and Security Installation | Cable containment for Burglar Alarm and Security Installation | 0.25 | Continuous | 128 | 255 | 255 | |
| 10 | Radar and Navigation System | Cable containment for Radar and Navigation System | 0.25 | Continuous | 0 | 153 | 0 | |

| No. | System Name | Routing | Presentation (2D) | | Presentation (3D) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Line Thick-ness (mm) | Line Type | Red | Green | Blue | Colour Palette |
| 11 | Microwave Link System | Cable containment for Microwave Link System | 0.25 | Continuous | 0 | 64 | 64 | |
| 12 | Timing & Display System | Cable containment for Timing & Display System | 0.25 | Continuous | 128 | 128 | 128 | |
| 13 | Audio Video System | Cable containment for Audio Video System | 0.25 | Continuous | 0 | 128 | 128 | |
| 14 | Audio System | Cable containment for Audio System | 0.25 | Continuous | 102 | 102 | 51 | |
| 15 | Radio System | Cable containment for Radio System | 0.25 | Continuous | 204 | 153 | 255 | |
| 16 | Closed Circuit TV System (for non-burglar alarm purpose such as CCTV at LV switch room, people control and thermal camera) | Cable containment for CCTV System | 0.25 | Continuous | 255 | 153 | 102 | |
| 17 | Broadcast Reception | Cable containment for Broadcast Reception System | 0.35 | Continuous | 128 | 255 | 255 | |
| 18 | Lighting | Cable Containment for Lighting and Lighting Control | 0.35 | Center2 | 0 | 255 | 0 | |
| 19 | Electrical Distribution | Cable Containment for Low Voltage Electricity Supply – Normal | 0.35 | Divide2 | 0 | 255 | 0 | |
| | | Cable Containment for Low Voltage Electricity Supply – Emergency | 0.35 | Divide2 | 0 | 255 | 0 | |
| | | Cable Containment for High Voltage Electricity Supply | 0.35 | Divide2 | 0 | 255 | 0 | |
| | | Trunking for ELV | 0.25 | Continuous | 0 | 128 | 255 | |
| 20 | Medical Gas System | Oxygen | 0.25 | Continuous | 255 | 153 | 0 | |
| | | Vacuum System | 0.25 | Long Dash Dash | 255 | 0 | 255 | |
| | | Nitrous Oxide | 0.25 | Center | 51 | 204 | 51 | |

| No. | System Name | Routing | Presentation (2D) | | Presentation (3D) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Line Thick-ness (mm) | Line Type | Red | Green | Blue | Colour Palette |
| | | Anaesthetic Gas System | 0.25 | Dash | 255 | 0 | 0 | |
| | | Compressor Air (4 Bar) System | 0.25 | Dashdot | 0 | 0 | 255 | |
| | | Compressor Air (7 Bar) System | 0.25 | Dashdot2 | 0 | 255 | 255 | |
| | | Non-Medical Compressed Air System | 0.25 | Divide2 | 191 | 143 | 0 | |
| | | Vent Pipe | 0.35 | Hidden | 0 | 128 | 255 | |
| 21 | Pneumatic Tube Transport | Piping for Pneumatic Tube Transport System | 0.25 | Continuous | 196 | 89 | 17 | |
| 22 | Internet-of-thing (IoT) Installation | Cable Containment for IoT equipment | 0.35 | Divide2 | 0 | 255 | 0 | |
| 23 | High Voltage Power Supply | Trunking for ELV | 0.25 | Continuous | 0 | 128 | 255 | |
| | | Cable Containment for High Voltage Electricity Supply | 0.35 | Divide2 | 0 | 255 | 0 | |
| | | Cable Containment for High Voltage Electricity Supply | 0.35 | Divide2 | 0 | 255 | 0 | |
| 24 | Private Automatic Branch Exchange System (PABX System) | Trunking for PABX System | 0.25 | Continuous | 0 | 128 | 255 | |
| 25 | Automatic Refuse Collection System | Cable Containment for Automatic Refuse Collection System | 0.35 | Divide2 | 0 | 255 | 0 | |
| A1 | Plumbing System | Cleansing Water Pipe | 0.25 | Dash | 0 | 0 | 255 | |
| | | Cold Water Pipe | 0.25 | Long Dash Dash | 0 | 0 | 255 | |
| | | Flushing Water Pipe | 0.25 | Center | 255 | 255 | 0 | |
| | | Fresh Water Pipe | 0.25 | Continuous | 0 | 255 | 0 | |
| | | Hot Water Supply Pipe | 0.25 | Dash dot | 255 | 0 | 0 | |
| | | Hot Water Return Pipe | 0.25 | Long Dash dot | 255 | 128 | 128 | |

| No. | System Name | Routing | Presentation (2D) | | Presentation (3D) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Line Thick-ness (mm) | Line Type | Red | Green | Blue | Colour Palette |
| | | Irrigation Water Pipe | 0.25 | Dash dot dot dot | 0 | 255 | 255 | |
| | | Grey Water Pipe | 0.25 | Continuous | 0 | 128 | 255 | |
| A2 | Drainage System | Waste Pipe | 0.35 | Divide2 | 128 | 128 | 0 | |
| | | Soil and Waste Pipe | 0.35 | Center2 | 128 | 0 | 0 | |
| | | Vent Pipe | 0.35 | Hidden | 0 | 128 | 255 | |
| | | Rainwater Pipe | 0.35 | Phantom2 | 0 | 255 | 255 | |
| | | Pumped Soil & Waste Pipe | 0.35 | Center2 | 64 | 0 | 0 | |
| | | Pumped Waste Pipe | 0.35 | Divide2 | 64 | 64 | 0 | |
| | | Pumped Rainwater Pipe | 0.35 | Phantom2 | 0 | 128 | 128 | |
| A3 | Water Leakage Detection System | Leak Detection Cable | 0.35 | Continuous | 122 | 48 | 160 | |
| A4 | Mechanical Handling & Lifting Installation (MHL) | Cable Containment for Mechanical Handling & Lifting Installation | 0.35 | Divide2 | 125 | 48 | 255 | |

## 4.5 A&A Works

For A&A works, existing condition information or as-built information (including drawings and models) should be obtained from EMSD SBU and BIMSD. Once an A&A project has been initiated, EMSD SBU will share the latest BIM models, drawings, objects and asset data with assigned Consultant / Contractor. Consultant / Contractor should liaise with EMSD O&M team and BIMSD to acquire the trimmed model per the specific A&A area. The detail workflow of accessing data in EMSD CDE is illustrated in Section 8.

Once completed the A&A works, Contractor shall submit the final as-built BIM models, drawings, objects, O&M documents & photos, COBieLite files, asset relationship and equipment attributes as mentioned in BIM-AM SG and H/O Guide.

When the previous version of BIM-AM SG were adopted in the existing building, the existing data and model outside A&A areas should be remained unchanged. Only the models and data of newly added asset under the A&A works needs to follow the latest version of this Guide. Existing BIM model elements that directly interface with new A&A works should be revised or remodelled to comply with the latest BIM-AM SG, however, the asset data of the existing elements should be remained unchanged.

# 5. ASSET CODING AND NUMBERING SYSTEM

Unified conventions for E&M equipment are essential for asset management during operation and maintenance stage. The naming convention sets out principles for all fields (including districts, disciplines and assets) for the implementation of EMSD's BIM-AM Systems.

## 5.1 E&M Asset Coding

Equipment number (i.e. "Asset Code") consists of 7 parts, it shall be in the form as shown below and separated by a hyphen "-" between fields.

Asset code consists of all 7 parts as stated below with maximum 37 characters, including hyphen. It is used for EMSD central maintenance management so that user knows the district, building, block, and level by reading the asset code.

Asset code should be inputted in the parameter named "EMSD.Common.Asset Code" in common attribute. For Building Codes, Contractor is required to enquire (i) the new code for new build projects or (ii) the coding requirement for existing venues without any unique building code as stated in Appendix A.

Table 5-1 Asset Code Convention

| **Requirement of Asset Coding** | | | | | | |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| District Code (Refer to Section 5.2) | Building Code (Refer to Section 5.3) | Block Code (Refer to Section 5.4) | Building Level | System Code/ Routing Code(note 3) (Refer to Section 5.5) | Equipment Code (Refer to Appendix G) | Number (note 1,2) |
| 1 to 3 characters | 1 to 5 characters | 1 to 3 characters | 1 to 4 characters | 2 to 5 characters | 2 to 5 characters | 2 to 6 Numbers |
| KT – Kwun Tong | **EMSDN** – EMSD HQS (NEW) | NA- No Block<br>T1- Tower 1<br>B1- Block 1<br>N- North Wing<br>S- South Wing | B2F – Basement 2<br>B1F – Basement 1<br>GF – Ground Floor<br>LG1F – Lower Ground Floor 1<br>UG1F – Upper Ground Floor 1<br>1F – 1st Floor<br>1MF – 1st Mezzanine Floor<br>2F – 2nd Floor<br>RF – Roof Floor | BLR – Boiler System<br>FP – Filtration Plant<br>ACS – Access Control System<br>STV – Satellite TV System | AHU – Air Handling Unit<br>FCU – Fan Coil Unit | 01<br>02<br>10<br>99<br>101 |

Notes:

(1) The sequence should be restarted for each type of equipment on different floor.

(2) One leading zero should be provided for single digital equipment number, for example 01 to 09.

(3) System code should be used for asset coding, except for equipment of ACS, BAS, CCTVI, SCS, CAS, VPS, KLS, DAB and ELS of No. 09 "Burglar Alarm System" and UTV and STV of No. 17 "Broadcast Reception" in which routing code should be adopted.

Examples:

- Fan Coil Unit on first floor in EMSD Headquarter:

| | |
|---|---|
| Asset Code: | KT-EMSDN-NA-1F-HVAC-FCU-01 |

- FS Pump on second floor in EMSD Headquarter:

| | |
|---|---|
| Asset Code: | KT-EMSDN-NA-2F-FS-PMP-01 |

- AHU (Air Handling Unit) on first floor in EMSD Headquarter:

| | |
|---|---|
| Asset Code: | KT-EMSDN-NA-1F-HVAC-AHU-701 |

## 5.2 District Code

District Code is location-based with reference to geolocations in Hong Kong. All districts in Hong Kong and their corresponding district codes are listed as follows:

Table 5-2 District Code

| District | | District Code |
|---|---|---|
| Hong Kong Island | Central and Western | CW |
| | Eastern | E |
| | Southern | S |
| | Wan Chai | WC |
| Kowloon | Kowloon City | KC |
| | Kwun Tong | KT |
| | Sham Shui Po | SSP |
| | Wong Tai Sin | WTS |
| | Yau Tsim Mong | YTM |
| New Territories | Islands | I |
| | Kwai Tsing | KWT |
| | North | N |
| | Sai Kung | SK |
| | Shatin | ST |
| | Tai Po | TP |
| | Tsuen Wan | TW |
| | Tuen Mun | TM |
| | Yuen Long | YL |

## 5.3 Building Code

The list of buildings and their building code in Hong Kong can be referred to Appendix A – Building Code (List of existing buildings in Hong Kong and their corresponding building code). Please noted that this Appendix is in Excel format and only illustrates the building code for the existing government facilities being maintained under EMSTF. For those newly constructed venues and any discrepancies of existing building codes found in Appendix A, please liaise with EMSD for acquiring the new building codes.

## 5.4 Block Code

The coding below represents the blocks or towers of a development with multiple buildings. Other coding used in a project should be agreed by all parties and documented in BEP.

Table 5-3 Bock Code for Asset Coding

| Block | Code |
|---|---|
| Administration Building | AB |
| Ancillary Block | AC |
| Building | BD |
| Staff Quarters | DQ |
| Footbridge | FB |
| Market | MK |
| Office | OF |
| Playground | PG |
| Subway | SB |
| Car Park | CAP |
| Management Office Building | MB |
| Service Block | SV |
| Toilet | TL |
| Visitor Centre | VC |
| Tower 1 | T1 |
| Tower 2 | T2 |
| Block 1 | B1 |
| Block 2 | B2 |
| North Wing | N |
| South Wing | S |
| West Wing | W |
| East Wing | E |
| Basement | B |
| Single building block in project | NA |

## 5.5 Names and Codes of E&M Systems and Corresponding Routing

Table 5-4 Names and Codes of E&M Systems and Corresponding Routing

| No. | System Name | System Code | Routing Name | Routing Code |
|---|---|---|---|---|
| 01 | Lift and Escalator | LIFT | Trunking for Lift and Escalator | LIFT |
| | | | Cable Tray for Lift and Escalator | |
| 02 | LV Switchboard | LVS | Trunking for LV Switchboards | LVS |
| | | | Cable Tray for LV Switchboards | |
| 03 | Emergency Generator | EMG | Trunking for Emergency Generator | EMG |
| | | | Cable Tray for Emergency Generator | |
| | | | Chimney for Emergency Generator | CHM |
| | | | Exhaust Air Duct for Emergency Generator | EEAD |
| | | | Fuel oil return pipe for Emergency Generator | FRP |
| | | | Fuel oil supply pipe for Emergency Generator | FSP |
| | | | Fuel oil tank vent pipe for Emergency Generator | VP |
| 04 | HVAC | HVAC | Primary Air Duct | PAD |
| | | | Exhaust Air Duct | EAD |
| | | | Fresh Air Duct | FAD |
| | | | Supply Air Duct | SAD |
| | | | Return Air Duct | RAD |
| | | | Transfer Air Duct | TAD |
| | | | Smoke Extraction Duct | SED |
| | | | Make Up Air Duct | MAD |
| | | | Staircase Pressurization Duct | SPD |
| | | | Pressure Relief Duct | PRD |
| | | | Condensate Drain Pipe | CDP |
| | | | Chilled Water Return Pipe | CHWR |
| | | | Chilled Water Supply Pipe | CHWS |
| | | | Condensing Water Supply Pipe | CDWR |
| | | | Condensing Water Return Pipe | CDWS |
| | | | Chemical Dosing Pipe | CHDP |
| | | | Make-up Water Pipe | MWP |
| | | | Heating Hot Water Supply Pipe | HHSP |
| | | | Heating Hot Water Return Pipe | HHRP |
| | | | Refrigerant Pipe | RP |
| | | | Chimney Pipe | CHP |
| 05 | Boiler System | BLR | Boiler/ Steam Pipes | BLR |
| | | | Hot Water Supply Pipe | HWSP |
| | | | Hot Water Return Pipe | HWRP |
| | | | Vent Pipe | VP |
| | | | Boiler Exhaust Pipe | BEP |
| | | | Condensate pipe (for condensate boiler) | CDP |
| | | | Fuel Pipe | FP |
| | | | Chimney Pipe | CHP |

| No. | System Name | System Code | Routing Name | Routing Code |
|---|---|---|---|---|
| | | | Cold Water Pipe | CWP |
| 06 | Filtration Plant | FP | Filtration Plant Pipes | FP |
| | | | Return Pipes | RP |
| | | | Overflow Pipe | OP |
| | | | Supply Pipe | SP |
| 07 | Fire Services Installation | FS | Sprinkler Pipe | SPR |
| | | | Hose Reel / Fire Hydrant Pipe | FSP |
| | | | Trunking for Automatic Fire Detection and Alarm System | AFA |
| | | | Gas Suppression System Pipe | GSS |
| | | | Pre-action sprinkler Pipe | SPR |
| 08 | Uninterrupted Power Supply | UPS | Trunking for UPS | UPS |
| | | | Cable Tray for UPS | |
| 09 | Burglar Alarm | BA | Trunking for Access Control System | ACS |
| | | | Cable Tray for Access Control System | |
| | | | Trunking for Burglar Alarm System | BAS |
| | | | Cable Tray for Burglar Alarm System | |
| | | | Trunking for CCTV and Intercom | CCTVI |
| | | | Cable Tray for CCTV and Intercom | |
| | | | Trunking for Smart Card System | SCS |
| | | | Cable Tray for Smart Card System | |
| | | | Trunking for Call Alarm System | CAS |
| | | | Cable Tray for Call Alarm System | |
| | | | Trunking for Videophone System | VPS |
| | | | Cable Tray for Videophone System | |
| | | | Trunking for Keypad Lock System | KLS |
| | | | Cable Tray for Keypad Lock System | |
| | | | Trunking for Drop-arm Barrier | DAB |
| | | | Cable Tray for Drop-arm Barrier | |
| 10 | Radar and Navigation System | RNS | Trunking for Radar and Navigation System | RNS |
| | | | Cable Tray for Radar and Navigation System | |
| 11 | Microwave Link System | MLS | Trunking for Microwave Link System | MLS |
| | | | Cable Tray for Microwave Link System | |
| 12 | Timing & Display System | TDS | Trunking for Timing & Display System | TDS |
| | | | Cable Tray for Timing & Display System | |
| 13 | Audio Video System | AV | Trunking for Audio Video System | AV |
| | | | Cable Tray for Audio Video System | |
| 14 | Audio Electronics System | AUS | Trunking for Audio System | AUS |
| | | | Cable Tray for Audio System | |
| 15 | Radio System | RS | Trunking for Radio System | RS |
| | | | Cable Tray for Radio System | |
| 16 | Closed Circuit TV System | CCTV | Trunking for Closed Circuit TV System | CCTV |

| No. | System Name | System Code | Routing Name | Routing Code |
|---|---|---|---|---|
| | | | Cable Tray for Closed Circuit TV System | |
| 17 | Broadcast Reception | BR | Trunking for UHF TV System | UTV |
| | | | Cable Tray for UHF TV System | |
| | | | Trunking for Satellite TV System | STV |
| | | | Cable Tray for Satellite TV System | |
| 18 | Lighting | LTG | Trunking for Lighting Control | LTG |
| | | | Cable Tray for Lighting | |
| 19 | Electrical Distribution | EL | Cable Containment for Low Voltage | LV |
| | | | Cable Containment for High Voltage | HV |
| | | | Trunking for Normal Power | TR-N |
| | | | Trunking for Emergency Power | TR-E |
| | | | Trunking for ELV Systems | TR-ELV |
| 20 | Medical Gas System | MG | Oxygen | O2 |
| | | | Vacuum System | MV |
| | | | Nitrous Oxide | N2O |
| | | | Anaesthetic Gas System | AGS |
| | | | Compressor Air (4 Bar) System | MA4 |
| | | | Compressor Air (7 Bar) System | SA7 |
| | | | Non-Medical Compressed Air System | NMA |
| 21 | Pneumatic Tube Transport | PTS | Piping for Pneumatic Tube Transport System | PTS |
| 23 | High Voltage Power Supply | HV | Trunking for ELV | HV |
| | | | Cable Containment for High Voltage Electricity Supply | |
| 24 | Private Automatic Branch Exchange System (PABX System) | PX | Trunking for PABX System | PX |
| 25 | Automatic Refuse Collection System | ARCS | Cable Containment for Automatic Refuse Collection System | ARCS |
| A1 | Plumbing | PL | Cleansing Water Pipe | CLWP |
| | | | Cold Water Pipe | CWP |
| | | | Flushing Water Pipe | FLWP |
| | | | Fresh Water Pipe | FWP |
| | | | Hot Water Supply Pipe | HWSP |
| | | | Hot Water Return Pipe | HWRP |
| | | | Irrigation Water Pipe | IWP |
| | | | Grey Water Pipe | GWP |
| A2 | Drainage | DR | Waste Pipe | WP |
| | | | Soil and Waste Pipe | SWP |
| | | | Vent Pipe | VP |
| | | | Rain Water Pipe | RWP |
| | | | Pumped Soil & Waste Pipe | PSWP |
| | | | Pumped Waste Pipe | PWP |
| | | | Pumped Rainwater Pipe | PRWP |
| A3 | Water Leakage Detection System | LDS | Water Leakage Detection Cable | LDS |

| No. | System Name | System Code | Routing Name | Routing Code |
|---|---|---|---|---|
| A4 | Mechanical Handling & Lifting Installation | MHL | Cable Containment Mechanical Handling & Lifting Installation | MHL |

Remarks:

- Contractor may further create other system types if any specific system is not listed above. The principle for system coding should be for easy identification and drawing production.

- The system name and coding used in a project should be agreed by all parties and documented in BEP.

## 5.6 List of E&M Equipment Code

Appendix G – "List of Equipment and Equipment Code and Provisional Requirement of RFID tags and QR codes" is based on the EMSD asset templates, which are designed to suit the EMSD asset management system. Thus, Appendix G does not exhaustively cover all the E&M equipment.

Contractor may further create other equipment coding if any equipment is not listed in Appendix G. The principle for equipment coding should be for easy identification and drawing production. Once new code is created, same rule as set in Section 4.3.1 applies.

The equipment and coding used in a project should be agreed by all parties and documented in BEP.

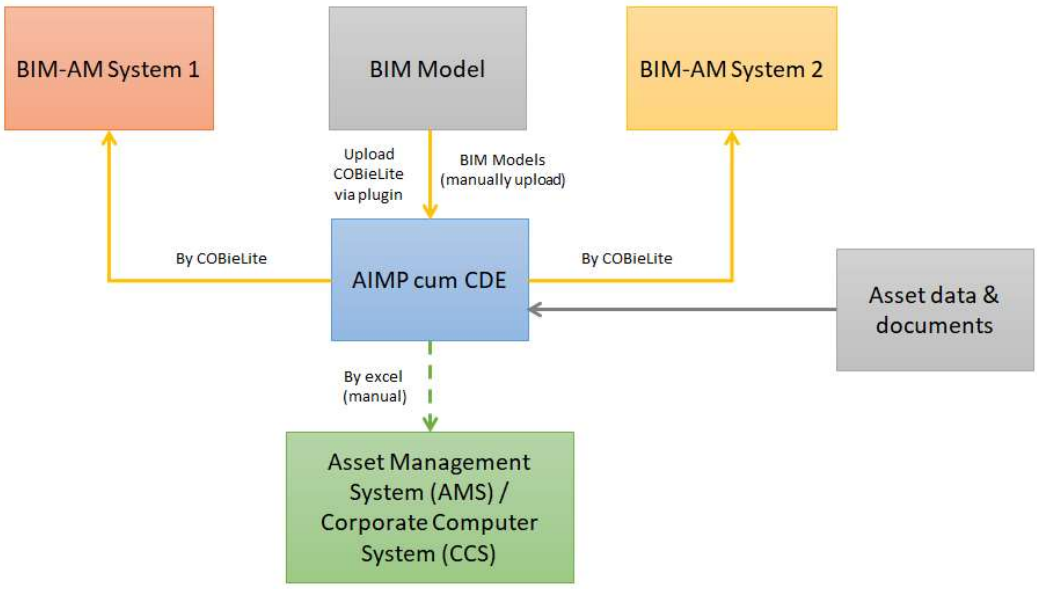
# 6. ASSET INFORMATION REQUIREMENTS

This section illustrates how the asset management concept are designed to enable the EMSD to maintain and manage assets. Contractor should prepare the BIM models to facilitate the BIM-AM standard workflow. With reference to Asset Information Requirement (AIR) in Appendix B, Contractor is required to input the asset information of EMSD parameters into the BIM models. The following workflow is to ensure project deliverables with good quality generated from the BIM models.

## 6.1 Asset Information Management Platform (AIMP)

AIMP is a web-based system developed by EMSD to manage asset information and creates corresponding asset relationship and document path for BIM-AM system. It makes use of the COBieLite to exchange information with BIM models and BIM-AM systems. It also acts as a "third party checker" on data validation, such as checking for any missing data and incorrect format of data, etc. The role of AIMP for BIM-AM system can be referred to Figure 6-1 which illustrates an overall workflow of BIM model for BIM-AM systems which is managed by EMSD. The User Guide of AIMP including the cross-system topology can be referred to Appendix C.

Figure 6-1 The Workflow of BIM Model for BIM-AM System

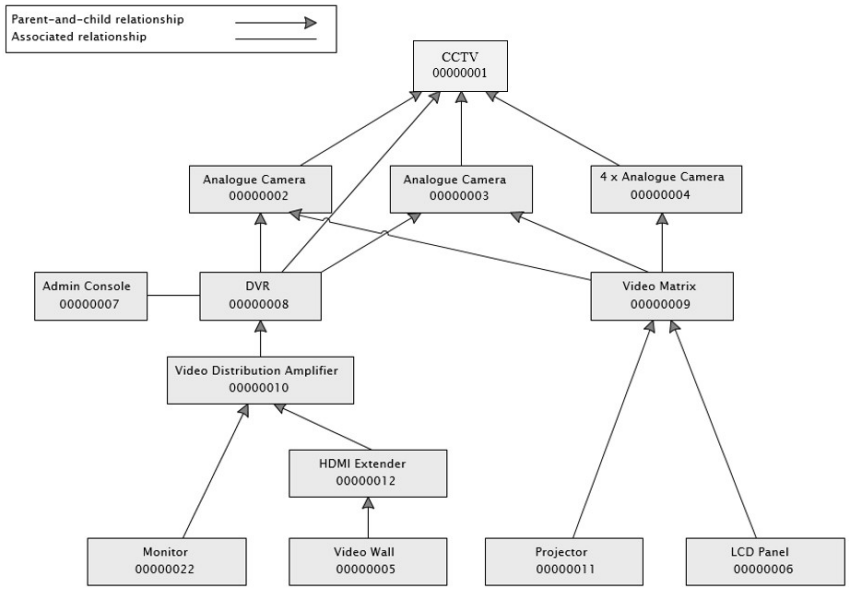



Contractor should liaise with EMSD in the sixth month (the earliest) from the start of defect liability period (DLP) to obtain login ID and passcode for the use of AIMP and they are responsible for the following tasks before the handover of as-built BIM models and document.

### 6.1.1 Creation of asset relationship (i.e. system topology) in AIMP

An example of asset relationship for CCTV system is illustrated in Figure 6-1. Contractor should submit topology for PT's approval. Topology showing the power supply for major E&M equipment among different E&M systems should be included and the details on topology requirement across E&M systems should be liaised with O&M teams to suit the operational needs. Topology can be simply inputted by means of excel templates (refer to the Appendix B for downloading the templates) and AIMP will automatically fill the asset data of "EMSD.Common.Asset Relationship".

Figure 6-2 Asset Relationship of a CCTV System




### 6.1.2 Creation of Level 1 System

AIMP Create "Level 1 System" as specified in Appendix G that cannot be shown in the BIM model by uploading the CCS templates to AIMP. Refer to Appendix C for downloading the CCS templates.

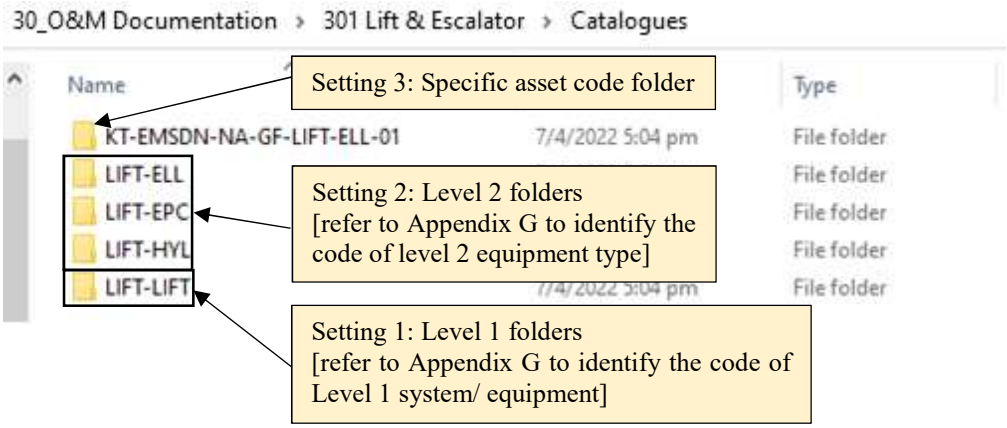
### 6.1.3 Creation of File Mapping to Asset

To facilitate the document mapping to system and asset on AIMP, all the documents shall be uploaded according to the folder structure as specified in Appendix I – Handover Package and Folder Structure, including testing and commissioning reports, catalogues, drawings, certificates, and O&M manuals, etc., under a zip file for each Level 1 System, e.g. 301 Lift & Escalator etc. AIMP will automatically assign document to asset based on the following setting:-

(a) **Setting 1**: Documents put under "Level 1" folders, e.g. LIFT-LIFT, HVAC-AS etc., will be automatically mapped to ALL the E&M equipment under **that system**.

(b) **Setting 2**: Documents put under "Level 2" folders, e.g. LIFT-ELL, HVAC-AHU etc., will be automatically mapped to ALL E&M equipment of the **designated equipment type**.

(c) **Setting 3**: Documents put under specific asset code folder will be automatically mapped to the designated equipment.




- Upon the file assignment to asset, AIMP would automatically input the data of EMSD.Common.Documentation as mentioned in the previous paragraph to corresponding Level 1 or Level 2 Equipment.

### 6.1.4 Validation of the Asset Data

AIMP could check the asset data input as well as the data format. All the wrong and missing data will be highlighted in red for easy reference.

## 6.2 From Project Information Model (PIM) to Asset Information Model (AIM)

During design and construction stage, BIM is used as a design visualisation and coordination tools. Meanwhile, asset information should be gradually built up in the BIM model so that by the end of the construction stage, the BIM model becomes an Asset Information Model (AIM) for handover to asset management.

Contractor shall work closely with PT to upload the as-built BIM model and documents to AIMP in the sixth month (the earliest) from the start of defect liability period (DLP).

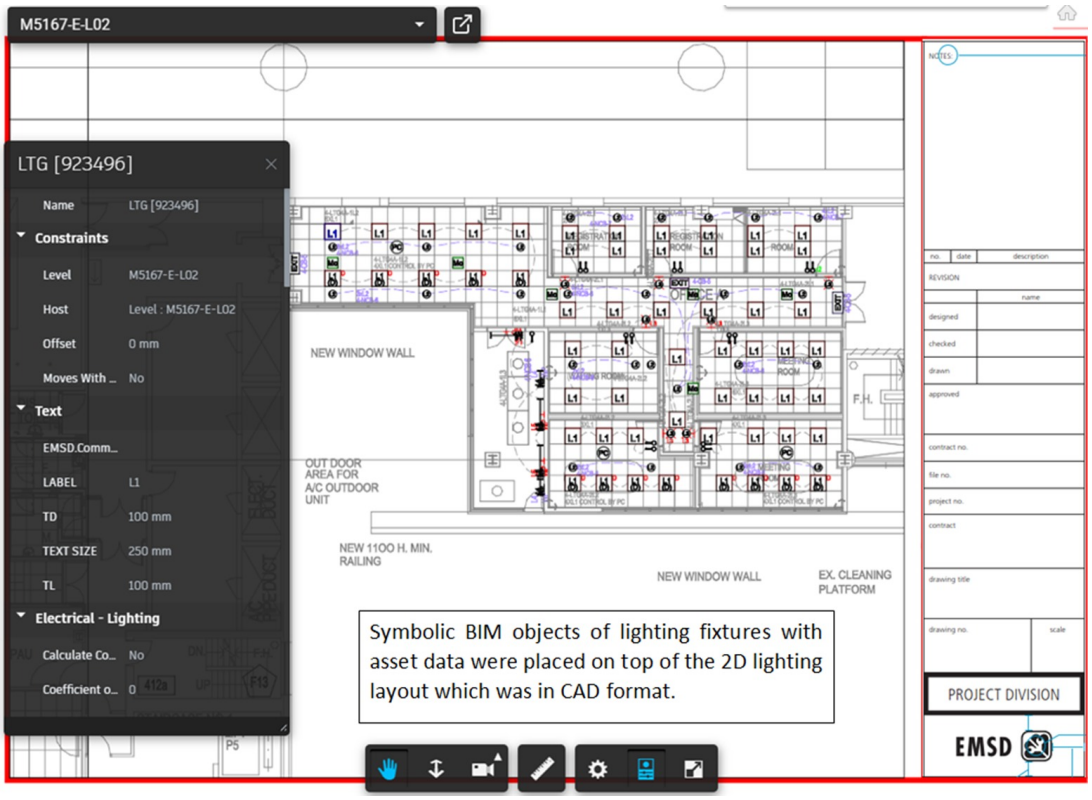
EMSD has developed the departmental CDE for BIM-AM use during operation stage. The information uploaded to AIMP would be automatically stored in CDE for EMSD's approval prior to serving operations and facility management. Detailed CDE workflow is illustrated in Section 8.

Contractor shall also note that completeness and correctness of LOD-I are important for supporting asset management and shall conduct quality check to ensure the as-built information is correct before submitting to EMSD.

## 6.3 BIM-AM Lite

BIM-AM Lite version is an alternative way to construct as-built model with the use of 2D CAD layout as the background that has already adopted in digitalisation projects for existing buildings. With BIM-AM Lite, 2D layout was used as underlay and the required asset will be modelled with native BIM objects in order to facilitate asset data input. The BIM objects overlaid with 2D drawings which can be shown in BIM-AM platform. An example of BIM-AM Lite is shown in below figure. The adoption of BIM-AM lite is subject to the PT's confirmation.

Figure 6-3 Example of BIM-AM lite with 3D objects overlaid on 2D CAD building plan for BIM-AM operation in existing buildings



## 6.4 Particular Requirements for BIM-AM System

To streamline the data exchange between BIM and asset management system, the requirements as listed below shall be followed.

- The asset attributes, i.e. the EMSD shared parameter file as shown in Appendix D, shall be created as object parameters for equipment specific parameters. Other common parameters shall be created as project parameters.
- The asset attributes shall follow the AIR in Appendix B. Irrelevant parameters shall be purged before submission, for example EMSD.AV parameters shall not be shown in HVAC objects.
- Apart from the basic / technical information of the equipment, the reference link in .zip format of the documents (Drawings, O&M Manual, Catalogues, T&C Records, certificates, etc.) of all the equipment should also be inputted under the Level 1 System. The folder path of the documents under that zipped file should be inputted into the corresponding EMSD parameters of BIM objects, i.e. "EMSD.Common.Documentation" for each Level 2 Equipment. Refer to the example as shown in Table 6-1 for details.

## 6.5 Asset Information Parameters

The BIM Shared Parameter File of the EMSD parameters described below can be referred to Appendix D. For each equipment as listed in Appendix B, the required parameters consist of two parts:

### 6.5.1 Common Parameters

The attributes with naming of "EMSD.Common" are applicable to E&M equipment. Contractor is advised to propose additional attributes with substantiation for any equipment with substantiation where deemed necessary.

Shared Project Parameters with BIM Category of "Common" shall be applied to Mechanical Equipment, Electrical Equipment, Electrical Fixtures, Pipe Accessories, Duct Accessories, Specialty Equipment, Fire Alarm Devices, and Lighting Fixtures.

The Contractor shall include location information and equipment designation in "EMSD.Common.Equipment Description" for easy searching and quick identification in addition to RFID tag scanning.

### 6.5.2 Equipment-specific Parameters

The specific parameters of each E&M equipment shall be referred to those attributes with naming of "EMSD.LV", "EMSD.HVAC", "EMSD.Boiler" and so on. The details of specific parameters for each asset should be referred to Asset Information Requirement in Appendix B. Contractor should liaise with the PT of EMSD to acquire and input the correct content of the EMSD specific fields. Specific parameters should be created in objects as object parameters and no specific parameters should be present under project parameters.

For the sake of clarity, asset information requirement of all the E&M equipment and system as specified in Appendix G are explicitly demonstrated in Asset Information Requirement in Appendix B. The templates of primary air handling

unit (PAU) as shown in the table below is taken as an example to elaborate the above information requirement.

Before model submission, all irrelevant parameters (e.g. those parameters not required by EMSD) of the objects shall be deleted and unused BIM objects in the as-built BIM models shall be also purged.

Table 6-1 Example of Asset Data Template for Primary Air Handling Unit

| Asset | Attributes Type | Attributes | Parameters Naming in BIM Model | Examples |
|---|---|---|---|---|
| PAU | Part 1: **Common Parameters** applicable to all equipment as specified in Section 6.6.1 | Asset Code | EMSD.Common.Asset Code | KT-EMSDN-NA-1F-HVAC-PAU-701 |
| | | Functional Location | EMSD.Common.Functional Location | EMSDN-AC (note 1) |
| | | Asset Relationship | EMSD.Common.Asset Relationship | To be filled using AIMP upon the upload of relationship spreadsheet |
| | | Grouped Equipment ID | EMSD.Common.Grouped Equipment ID | To be filled using AIMP upon the grouping of asset under System Topology |
| | | Asset Tag No | EMSD.Common.Asset Tag No. | EMSDN-0400000001 |
| | | Zone Tag No | EMSD.Common.Zone Tag No. | EMSDN-1F-000101 |
| | | Onsite Verified Date | EMSD.Common.Onsite Verified Date | 01.12.2000 |
| | | Authorization Group | EMSD.Common.Authorization Group | GE00(note 1) |
| | | Division | EMSD.Common.Division | 02 GESD(note 1) |
| | | Equipment No | EMSD.Common.Equipment No. | 19876000(note 1) |
| | | Main Work Centre | EMSD.Common.Main Work Centre | GK2A6H60 (note 1) |
| | | Partner ID | EMSD.Common.Partner ID | EMSTF(note 1) |
| | | Technical ID No | EMSD.Common.Technical ID No. | AHV-6-42K666A(note 1) |
| | | Acquisition Value | EMSD.Common.Acquisition Value | |
| | | CCS Equipment ID Superior | EMSD.Common.CCS Equipment ID Superior | 19999999(note 1) |
| | | Customer Warranty End | EMSD.Common.Customer Warranty End | 01.12.2000(note 1) |
| | | Customer Warranty Start | EMSD.Common.Customer Warranty Start | 01.12.1999(note 1) |
| | | Floor | EMSD.Common.Floor | 1st Floor |
| | | Inventory No | EMSD.Common.Inventory No. | B12345678(note 1) |
| | | Equipment Photo | EMSD.Common.Photo | Document link to be filled by AIMP upon the photo upload |

| Asset | Attributes Type | Attributes | Parameters Naming in BIM Model | Examples |
|---|---|---|---|---|
| | **Part 1: Common Parameters** are applicable to all equipment as specified in Section 6.5.1 | Plant Section | EMSD.Common.Plant Section | 01.12.1999 (note 1) |
| | | Serial No | EMSD.Common.Manufacturer Serial No. | TECHID-999999 |
| | | Start-up Date | EMSD.Common.Start-up Date | 02.12.2019 |
| | | Technical ID No | EMSD.Common.Technical ID No. Superior | 01.12.2020 |
| | | Vendor Warranty End | EMSD.Common.Vendor Warranty End | 02.12.2019 |
| | | Vendor Warranty Start | EMSD.Common.Vendor Warranty Start | 01.12.2020 |
| | | Documentation | EMSD.Common.Documentation | File ID to be filled by AIMP upon the upload of zip file per folder structure as specified in Appendix I |
| | | Catalog Profile | EMSD.Common.Catalog Profile | AC0000001 |
| | | Equipment Description | EMSD.Common.Equipment Description | 1F-HVAC-AHU-001 |
| | | Planner Group | EMSD.Common.Planner Group | T00(note 1) |
| | | Construction Type | EMSD.Common.Construction Type | |
| | | Currency | EMSD.Common.Currency | |
| | | Manufacturer | EMSD.Common.Manufacturer | ABC Company |
| | | Manufacturer Country | EMSD.Common.Manufacturer Country | China |
| | | Model No | EMSD.Common.Model No. | A1234 |
| | | Weight | EMSD.Common.Weight | 50kg |
| | **Part 2: Specific Parameters** for particular equipment as specified in Section 6.5.2 | Equipment Location | EMSD.HVAC.Equipment Location | PAU Room 101 |
| | | First filter | EMSD.HVAC.1st Filter | Gas Filter |
| | | Second filter | EMSD.HVAC.2nd Filter | NONE |
| | | Equipment Type | EMSD.HVAC.Equipment Type | Primary Air Handling Unit |
| | | Made by which company | EMSD.HVAC.Make | ABC Company |
| | | Contain UV Sterilizing Light or not | EMSD.HVAC.UV Sterilizing Light | Y |
| | | Contain VSD or not | EMSD.HVAC.VSD | Y |
| | | Air Flow (l/s) | EMSD.HVAC.Air Flow | 6100 |
| | | Cooling Capacity (kW) | EMSD.HVAC.Cooling Capacity | 214.6 |
| | | Rated Power Input (kW) | EMSD.HVAC.Rated Power Input | 30 |

Notes:
1 The data should be advised by EMSD O&M team.

Contractor shall input the following asset attributes inside the BIM model for the E&M equipment with (*) as shown in Appendix G. The table shown below are the asset attributes requirements for E&M equipment which is not on the list of EMSD Asset Templates.

Table 6-2 Asset Attribute Requirements for E&M Equipment not on the List of EMSD Asset Templates

| E&M equipment not listed on EMSD asset Templates | Asset Attributes Required | Mandatory (M) / Optional (O) |
|---|---|---|
| E&M Equipment marked with (*) in Appendix G | EMSD.Common.Asset Code | M |
| | EMSD.Common.Zone Tag No. | M |
| | EMSD.Common.Manufacturer | O |
| | EMSD.Common.Model No. | O |
| | EMSD.Common.Equipment Description | M |
| | EMSD.Common.Documentation (note 1) | M |
| | EMSD.Common.Asset Relationship (note 1) | O |

Notes:
1. Values of EMSD.Common.Documentation and EMSD.Common.Asset Relationship to be filled using asset information input tool by AIMP

## 6.6 COBie

This Section describes EMSD's application and requirements of COBie.

### 6.6.1 Introduction of COBie

COBie is an acronym for "Construction Operations Building Information exchange", which is an information exchange specification for the life-cycle capture and delivery of information needed by facility managers. It defines the way this information is structured and formats that can be used. COBie is also a format of building data for the publication of a subset of building model information and is commonly in the format of excel spreadsheet for delivering construction handover between lifecycles.

### 6.6.2 COBieLite File Format

COBieLite, the lightweight XML version of COBie, shall be used to export data from BIM models and import to EMSD's Asset Information Management Platform (AIMP). The COBie .xml file contains both COBie and EMSD parameters, so a parameter template in JSON format shall be adopted to eliminate the unused COBie parameters prior to exporting the COBieLite files for data exchange.

The COBie xml file exported from BIM models should contain all EMSD attributes as shown below.

Figure 6-3 Example of COBieLite XML file with EMSD Specified Attributes

```
<?xml version="1.0" encoding="UTF-8"?>
- <Facility externalSystemName="n/a" externalID="" externalEntityName=""
xmlns:core="http://docs.buildingsmartalliance.org/nbims03/cobie/core"
xmlns:cob="http://docs.buildingsmartalliance.org/nbims03/cobie/cobielite">
    <FacilityName>West Kowloon Government Office</FacilityName>
    <FacilityCategory>n/a</FacilityCategory>
    <FacilityDefaultMeasurementStandard>n/a</FacilityDefaultMeasurementStandard>
    <FacilityDescription xsi:nil="true" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"/>
    <FacilityDeliverablePhaseName xsi:nil="true" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"/>
  - <AssetTypes>
    - <AssetType>
        <AssetTypeName>HVAC (Air Side)-HVAC-FD</AssetTypeName>
        <AssetTypeCategory>HVAC-FD</AssetTypeCategory>
        <AssetTypeDescription>HVAC (Air Side)-HVAC-FD</AssetTypeDescription>
        <AssetTypeAccountingCategory xsi:nil="true" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"/>
      - <Assets>
        - <Asset externalSystemName="AIIT" externalID="0df70d43-e3ed-4395-b1ac-d218474e1d5a-002c41b9">
            <AssetName>YTM-WKGON-003-RM05-HVAC-FD-0002</AssetName>
          - <AssetAttributes>
            - <Attribute externalSystemName="AIIT" externalID="EDSM-ASSET-34655" propertySetName="n/a">
                <AttributeName>EMSD.Common.Weight</AttributeName>
                <AttributeCategory>Approved</AttributeCategory>
              </Attribute>
            - <Attribute externalSystemName="AIIT" externalID="EDSM-ASSET-34669" propertySetName="n/a">
                <AttributeName>EMSD.Common.Vendor Warranty Start</AttributeName>
                <AttributeCategory>Approved</AttributeCategory>
              </Attribute>
            - <Attribute externalSystemName="AIIT" externalID="EDSM-ASSET-34670" propertySetName="n/a">
                <AttributeName>EMSD.Common.Vendor Warranty End</AttributeName>
                <AttributeCategory>Approved</AttributeCategory>
              </Attribute>
```

### 6.6.3 COBieLite files generated from BIM models to AIMP

Refer to Figure 6-3, Contractor should liaise with EMSD for the installation of COBieLite Plugin and use the EMSD's plugin to export the asset data in models for generating COBieLite files per system. Definition files should be downloaded from AIMP (refer to Section 2.5.3 of H/O Guide) and loaded to plugin for the first-time use of the plugin. The COBieLite files shall be uploaded to AIMP for the creation of asset on the AIMP for the next stage of data input, including the topology and document path, etc.

### 6.6.4 COBieLite files generated from AIMP for BIM-AM operation

After the completion of data input on AIMP as specified in Section 6.1 in this Guide, the finalised COBieLite files with completed asset data should be exported from AIMP for BIM-AM operation. Procedures for data migration and model conversion between AIMP and two BIM-AM systems are found in H/O Guide Section 2.6.1 and 2.6.2 respectively.

# 7. INTERFACING / INTEGRATING BIM-AM SYSTEM WITH OTHER SYSTEMS

The requirement under this section is applicable to the project only if they are stipulated in the project requirements.

## 7.1 Interfacing with Other Systems

EMSD's BIM-AM system is capable to interface with other systems, including Central Control and Monitoring System (CCMS), integrated Building Management System (iBMS), Regional Digital Control Center (RDCC), Real Time Location System (RTLS), Internet-of-Things (IoT) devices, and Long Range Radio (LoRA) network.

In general, the upstream systems can provide data to BIM-AM Systems in either providing (1) application programming interface (API) for scheduled data call; (2) webpage with organised user interface with deep-linking; or (3) information exchange via Government Wide IoT Network (GWIN). Details of each approach are stated in Sections 7.1.1 to 7.1.3. Contractors shall liaise with PT on the detail requirement of the interface, including interface approach, time interval of scheduled data etc., to suit the operation and prepare the mapping table of sensor points together with associated asset by using the templates in Appendix H. Without the loss of generality, Contractors shall follow the H/O Guide and other EMSD corporate guidelines or specifications for interfacing with RDCC, iBMS, GWIN, etc.

Example of EMSD point coding requirement is shown below (Table 7-1) for reference. Contractor shall liaise with EMSD O&M team to enquire the exact requirement of point coding and assign the point codes for approval.

Table 7-1 EMSD BMS Point Coding Requirement

| Field 1 | Field 2 | Field 3 | Field 4 | Field 5 | |
|---|---|---|---|---|---|
| **Building & Block Code** | **Floor Code** | **Equipment Code / System Code / Room Code** | **Equipment ID / System ID / Room ID** | **Function or Status Code** | **Function or Status ID (Optional)** |
| <= 7 characters | <= 4 characters | <= 6 characters | 2 to 4 characters | <= 6 characters | <= 2 characters |

Remarks: A point abbreviation consists of 4 to 5 fields, each separated by a hyphen "-" with a maximum 35 characters.

### 7.1.1 Interface by API approach

For API approach, when real time system is required to be monitored / controlled directly from BIM-AM System, web services API, such as RESTful, for data exchange in XML/JSON format should be developed at the real time systems according to EMSD's iBMS and/or RDCC related standards and guidelines.

The BMS (Building Management System) connects major EMABS (Electrical Mechanical, Air-Conditioning, Building Services) systems to collect and consolidate asset operation data. BMS sensor readings shall be mapped to the associated asset codes and the data would be then visualised in models on the BIM-AM Systems which would arrange scheduled data call from EMSD corporate systems, including iBMS / RDCC, for displaying the related sensor data.

### 7.1.2 Interface by deep-linking approach

For deep-linking approach, the building management system shall provide a web interface with dedicated URL to show the operational status of assets and/or system. The URL should be compatible with mobile and desktop browsers in Edge, Firefox, Chrome, iOS and Android. Such simple interface with building management systems without storing historical data in the BIM-AM Systems is preferred.

### 7.1.3 Interface by GWIN Approach

For GWIN approach, IoT sensors shall be connected to low-powered wide area network (LPWAN) developed by EMSD, named GWIN. In this case, Contractor shall coordinate with dedicated EMSD GWIN team for installation, interfacing and testing requirement during project stage.

## 7.2 Integrating Mobile BIM-AM System with RFID Reader

### 7.2.1 RFID Readers

Only selected models of handheld UHF RFID readers with iOS and/ Android APIs would be supported by the mobile BIM-AM System. Contractor should liaise with EMSD to enquire the exact models of RFID readers supported and propose the suitable RFID readers with different coverage ranges.

### 7.2.2 Provision of Passive Asset Tags and Zone Tags

The RFID readers as specified in Section 7.2.1 can read the passive UHF RFID tags compatible with EPC Class 1 Gen2. Contractor shall be responsible for securely affixing the RFID tags onto major equipment which are identified by the EMSD.

Generally, major E&M equipment, such as chillers, pumps etc., as stipulated under Appendix G should be mounted with a RFID asset tag. QR codes instead of RFID tags shall be adopted for the E&M equipment with small physical size and located at sight level, such as intercom and AV player, etc.

For assets with a large number of quantity (e.g. lighting panels, cameras, loudspeakers, antennae), zone tag by means of QR code should be provided based on their spatial proximity (e.g. zone, area or room). The zone tag (i.e. the QR code) will act as the location identifier in which all the assets within the same zone shall be assigned to the same QR code. The zone tag shall be adhered to floor boxes, door frames or at faceplates which is subject to approval by PT of EMSD.

Details of tagging requirement for each “EMSD Level 2 Equipment” are illustrated in Appendix G.

Specifications of the RFID (metal large tag) and paper tags are listed in below tables: which are also mentioned in Particular Specification for BIM-AM Implementation:

Table 7-2 Specifications of Passive RFID Metal Tag

| | | |
|---|---|---|
| a) | Air Interface Protocol | EPC Class 1 Gen 2; and<br>ISO 18000-6C |
| b) | Device Type | Passive metal tag |
| c) | Operating Frequency | 860MHz - 960MHz |
| d) | Read Range | Over 12-meter on metal surface in air space within the 902MHz - 928MHz frequency range; and<br><br>Over 8-meter on non-metal surface in air space within the 902MHz - 928MHz frequency range. |
| e) | Memory | 496 EPC bits or better;<br>128 bits user memory or better; and<br>48-bit serialized TID. |
| f) | Data Storage | Not less than 10 years |
| g) | Read/ Write Cycle | 100,000 or better |
| h) | Operation Temperature | -20°C to +85°C or better |
| i) | IP Rating | IP68 compliance |
| j) | Size | 135mm x 36mm x 9mm or smaller |
| k) | Material | PET / ABS |
| l) | Attachment | Two rivet/screw holes for mounting;<br>Available for adhesive option. |

Table 7-3

Specifications of Printable Flexible RFID Tag

| | | |
|---|---|---|
| a) | Air Interface Protocol | EPC Class 1 Gen 2; and<br>ISO 18000-6C |
| b) | Device Type | Passive anti-metal tag |
| c) | Operating Frequency | 902MHz - 928MHz |
| d) | Read Range | Over 2-meter on metal surface in air space within the 902MHz - 928MHz frequency range; and<br><br>Over 2-meter on non-metal surface in air space within the 902MHz - 928MHz frequency range. |
| e) | Memory | 128 EPC bits or better; and 512 bits user memory or better |
| f) | Read/ Write Cycle | 100,000 or better |

| | | |
|---|---|---|
| g) | Data Storage | Not less than 10 years |
| h) | Operation Temperature | -40°C to +85°C or better |
| i) | IP Rating | IP68 compliance |
| j) | Size | 100mm x 25mm x 1.5mm or smaller |
| k) | Material | Paper / PET |
| l) | Attachment | Self-adhesive |

### 7.2.3 Installation Requirement of RFID Tag and QR code

Generally, the distance between RFID tags should be provided in approximately 4m interval, and the distance between RFID readers and tags should be within 4m during operation. Thus, RFID tags are optional for the E&M equipment with bottom level higher than 6m above finished floor level. Alternatively, in some venues, contractor may choose to place the tag on the wall nearby if equipment whose bottom level is higher than 6m above. Adhesive label with RFID asset code and the associated QR code shall be adhere to the RFID tag as shown in Figure 7-1 and the size of QR code label shall not be smaller than 2.4cm x 2.4cm as shown in Figure 7-2.

Figure 7-1 Requirement of RFID Tag Labels

Figure 7-2 Recommended Size for QR Code Label


Contractor should note that the scanning performance of RFID tags depends on a number of factors, e.g. metal blockage/absorption/reflection, orientation of tag, mounting surface (e.g. metal/non-metal surface), distance between RFID reader and tags, types of RFID tag (e.g. metal tag or paper tag), size of RFID tag antenna and other site constraints (e.g. metal ceiling). Examples of RFID tag and zone tag installation are shown below (Figure 7-3 - Figure 7-10) for reference and the exact location shall be subject to approval by PT.

Figure 7-3 RFID Tag for VAV Box


Figure 7-4 RFID Tag for AHU (Next to the Nameplate)


Figure 7-5 RFID Tag for Fire Dampers


Figure 7-6 RFID Tag for Control Valve Set

Figure 7-7 Zone Tag at Floor Box

Figure 7-8 Zone Tag at Faceplates


Figure 7-9 Paper Tag Underneath the "Use Permit" of Lift and Escalator


Figure 7-10 RFID Tag Next to the Bracket of Fire Extinguisher

### 7.2.4 Coding Requirement of Asset Tags and Zone Tags

The naming convention of asset tags and zone tags as well as their mounting methodology should be proposed by Contractor for approval by the EMSD. Contractor shall follow the coding requirement as shown below. The coding of asset and zone tags shall be in the format of ASCII.

The encoding of RFID tags should tally with the compatibility of the RFID readers in the format ASCII.

Asset tag code consists of 5 parts as shown below with **maximum 16 characters**. Due to the limitation that RFID tags' encoding could only contain even numbers,

Field 5's length is subject to if Field 1 has even/ odd characters so that the total number of characters is even. For example, if Field 1 is 2 or 4 characters long, then Field 5 should be 8 characters in length; if Field 1 is 1, 3 or 5 characters long, then Field 5 should be 7 characters in length.

Table 7-4 Asset Tag Coding Requirement

| **Field 1** | **Field 2** | **Field 3** | **Field 4** | **Field 5** |
|---|---|---|---|---|
| **Building Code** | **Separator** | **System No.** | **Type of Asset Tags** note 1 | **Sequence** |
| 1-5 characters<br>(refer to Appendix A) | 1 character | 2 characters<br>(refer Section 5.5) | 1 character | 7 characters (if field 1 has 1, 3, or 5 characters); or<br>8 characters (if field 1 has 2 or 4 characters) |
| e.g. EMSDN | - | 01 – Lift & Escalator<br>02 – LV Switchboard<br>…<br>…<br>25 – Automatic Refuse Collection System<br>…<br>…<br>A4 – Mechanical Handling & Lifting Installation | 0 – RFID Tag<br>1 – QR Code | 0000001<br>0000002<br>…<br>…<br>9999999 |

Notes:-

1. Type of asset tags shall refer to the provisional requirement of asset tag in Appendix G.

Examples:

- Fan Coil Unit in EMSD Headquarter in which building code is in **ODD number**:

| | |
|---|---|
| RFID Asset Tag Coding: | EMSDN-040**0000000**1 |

- Fan Coil Unit in West Kowloon Government Office in which building code is in **EVEN number**:

| | |
|---|---|
| RFID Asset Tag Coding: | WKGO-040**00000000**1(*) |

** One more zero is packed to field 5 sequence.*

- Intercom of Access Control System in EMSD Headquarter:

| | |
|---|---|
| QR Code Asset Tag Coding: | EMSDN-0910000001 |

Table 7-2 Zone Tag Coding Requirement (QR Code)

| Field 1 | Field 2 | Field 3 | Field 4 | Field 5 |
|---|---|---|---|---|
| **Building Code** | **Separator** | **Building Level** | **Separator** | **Sequence** |
| 1-5 characters | 1 character | 1-4 characters | 1 character | 6 characters |
| e.g. EMSDN | - | B2F – Basement 2<br>B1F – Basement 1<br>GF – Ground Floor<br>LG1F – Lower Ground Floor 1<br>UG1F – Upper Ground Floor 1<br>1F – 1st Floor<br>1MF – 1st Mezzanine Floor<br>2F – 2nd Floor<br>RF – Roof Floor | - | 000001<br>000002<br>…<br>999999 |

### 7.2.5 Zone Tag (QR Code) Record Plan

The boundary of the zone tags and “room” or “space” covering ceiling voids and raised floor voids shall be created and clearly indicated in as-built architectural models.

## 7.3 Interfacing with CCTV system/camera

The interface between BIM-AM System and CCTV system / camera should be achieved by a web link of the video recorder for CCTV system / individual URL of camera via iOS and/ Android browsers. CCTV system for remote monitoring shall be provided for critical plant rooms, including chiller water pump room, chiller plant, and main LV switch room etc.

# 8. CDE WORKFLOW FOR BIM VENUES

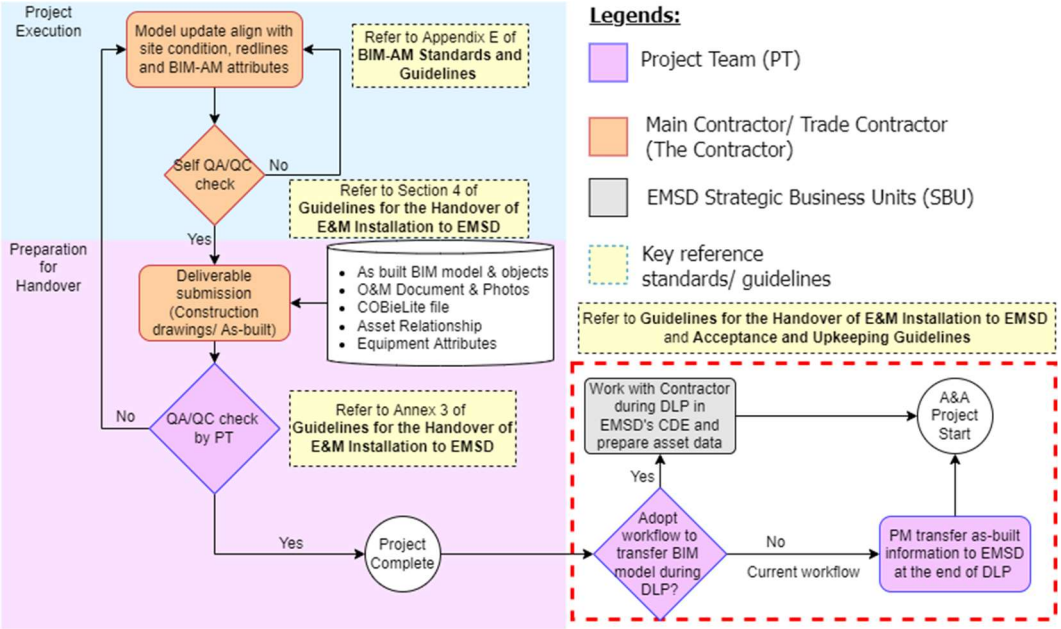
## 8.1 Background

EMSD has developed a departmental electronic hub, i.e. CDE which is fully compliant with ISO 19650. As a single source of truth to manage models and documents submitted by Contractor. Upon project completion, EMSD would grant the access of CDE to Contractor to facilitate the submission of as-built documents before the end of DLP. AIMP is the front-end of CDE for Contractor to upload BIM-AM deliverables for EMSD comment.

## 8.2 CDE Workflow

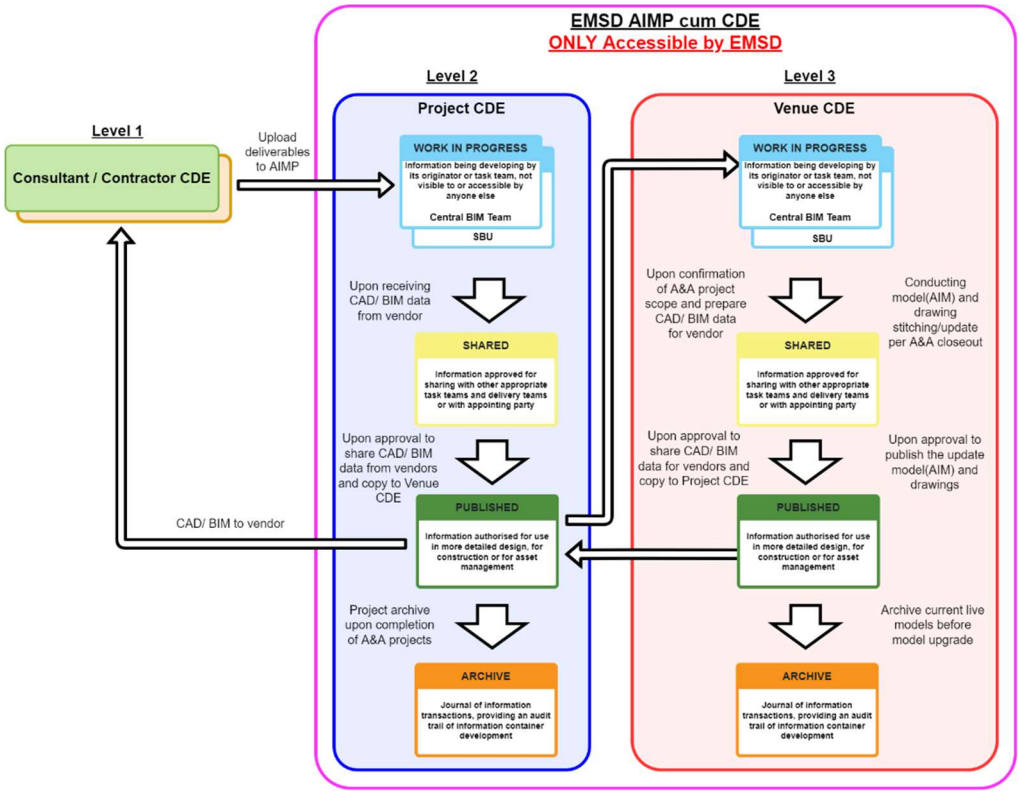
The following diagram shown the submission and approval logic of different states in construction stage.

Figure 8-1 Submission Workflows at Different Stages



Once the as-built BIM model and data are acceptable by EMSD, the package will be uploaded to EMSD CDE by Contractor. The following diagram shown the overall workflow and change of states within EMSD's CDE named Project CDE and Venue CDE for Operation.

Figure 8-2 Overall CDE Workflow




Starting from the sixth month after DLP commencement, Contractor will be able to upload the finalised as-built BIM to EMSD's AIMP for O&M Team to comment. During this period, EMSD's O&M team will work collaboratively with Contractor to complete the asset data on the AIMP. The models and data will be automatically synchronised to EMSD CDE for approval process.

Once an A&A project started, O&M team shall copy the existing model to CDE and trim down the model as per A&A scope. A set of record model with trim area will be stored in Published folder.

The A&A Contractor is required to update models based on the as-built situation of A&A works. The models and data will be reviewed by EMSD O&M team for approval to next stage.

Once the as-built models for the A&A works are accepted, the model will be combined to the existing AIM for O&M use.

# 9. HANDOVER AND ACCEPTANCE

This section outlines EMSD's handover and acceptance framework with reference to H/O Guide.

## 9.1 Handover Roles and Responsibilities

Contractor shall refer to Section 1 of H/O Guide for roles and responsibilities of personnel involved in the handover process.

## 9.2 Handover Procedures

Contractor shall refer to Section 2 of H/O Guide for the overall workflow and each step of the three handover stages and Section 3 for workflows and procedures specific to A&A projects.

## 9.3 QA/QC for Handover

Contractor shall refer to Section 4 of H/O Guide for detailed QA/QC procedures within handover stages.

## 9.4 Handover Package

Contractor shall follow the folder structure outlined in Appendix I and upload all the handover package onto AIMP. Refer to H/O Guide for details.

## 9.5 Acceptance Procedures

EMSD would conduct its internal acceptance procedures upon receiving final deliverables from Contractor during and by the end of DLP. EMSD's internal guidelines should be followed to check and accept the deliverable by Contractor.