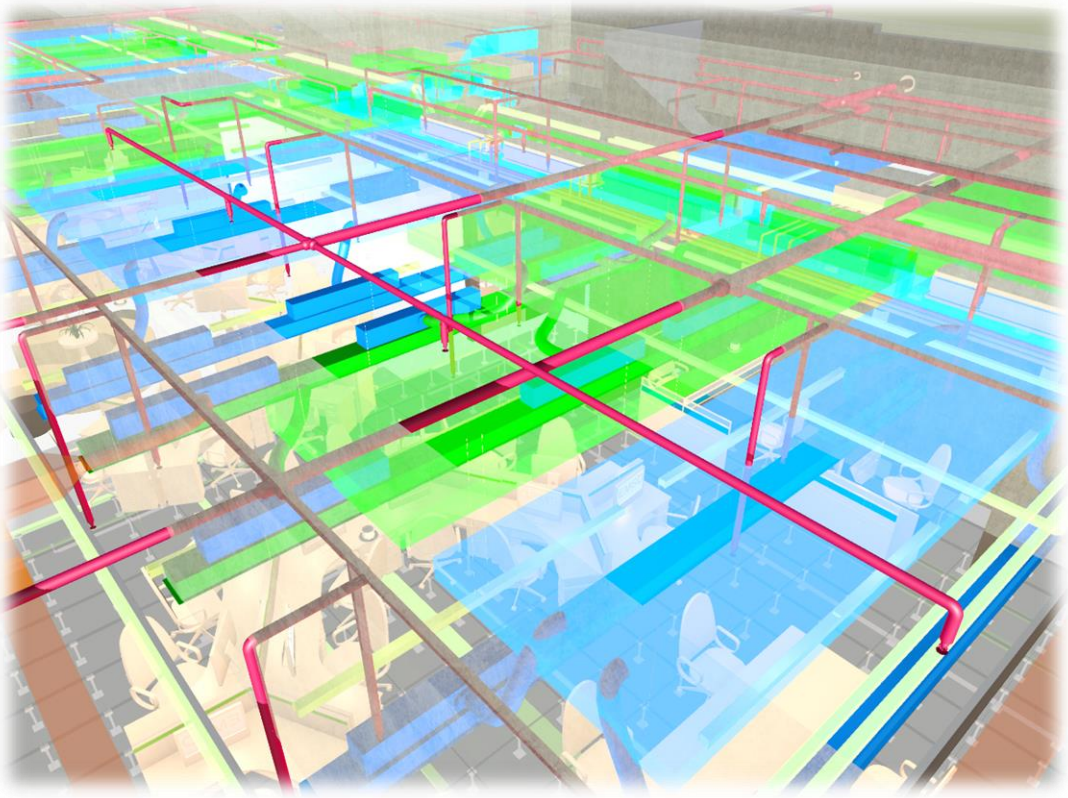
Building Information Modelling for Asset Management (BIM-AM) Standards and Guidelines



Version 2.0

2019

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

Disclaimer

The document of BIM-AM Standards and Guidelines is a reference document for EMSD managed projects and handover of as-built BIM from consultants and/or contractors. Users should carefully consider the suitability of recommendation given by this Standards and Guidelines before applying any methodology into their current project workflow.

Contents

Chapter 1

Introduction

1. Introduction

1.1. Overview and Objectives

The ***Building Information Modelling for Asset Management*** (***BIM-AM) Standards and Guidelines*** is based on the asset templates developed by Electrical & Mechanical Services Department (EMSD), which is a summary of information requirement for more than **21** types of Electrical & Mechanical (E&M) systems that need maintenance services in Hong Kong. This standard provides the Building Information Modelling (BIM) modelling standard, coding standard and the information requirement for E&M systems and assets from construction stage to handover for building operation.

During design and construction stage, BIM is used as a design visualization 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. This standard focuses on AIM, it provides guidelines on what information should be included and how it is managed. It aims at providing a standard for as-built BIM and asset information at handover stage conforming to EMSD BIM-AM (Asset Management) System.

This ***BIM-AM Standards and Guidelines*** aims to achieve the goals:

1. Standardize E&M systems, sub-systems and equipment coding
2. Specify the information requirement for E&M equipment to be inputted in the BIM model
3. Specify the modelling requirement, project settings, E&M settings and presentation style

This standard is built on the guidelines defined by world-wide standards listed in Section 1.4 as reference document.

1.2. Handover Procedure of As-built BIM Model

The following personnel are involved in the handover procedure and their tasks are as follows:

Personnel	**Task in handover procedure**
Project discipline BIM Coordinator	Leads the modelling team to produce the individual discipline as-built BIM model, he/she responsible for quality, delivery standard and accuracy for the content in the model before submitting to Project BIM Manager.
Project BIM Manager	Sets out the project level BIM workflow and modelling standard. He/she will collect individual discipline models, check the standard and publish a federated as-built model for handover to Asset Management.
Asset Management team BIM Manager	Receives and check the as-built BIM model and link up with asset management systems / facility management system.

The handover package should contain at least the following materials which should be filed in respective folders:

[Project Name] BIM 10_Admin 20_As-built 21 BIM 22 CAD 23 Objects 30_O&M Documentation 301 Lift & Escalator T&C O&M Manuals Catalogues Others 302 LV Switchboard 303 Emergyency Genertor 304 HVAC System 305 Boiler System 306 Filtration Plant 307 FS System 308 UPS 309 Burglar Alarm 310 Radar & Navigation 311 Microwave Link System 312 Timing & Display System 313 AV Electronic System 314 Audio Electronic System 315 Radio Electronics System 316 CCTV System 317 Broadcaset Reception 318 Lighting 319 Electrical Distribution Others 40_Statutory 90_Others	**10_Admin**	Stores all document for project management, including contract, project execution plans, etc.
	20_As-built	**21_BIM** Stores as-built BIM models from all discipline. Models should be in native format (e.g. .rvt) and viewer format (e.g. .nwd) **22_CAD** Stores as-built CAD drawings for all disciplines, such as installation details and system schematic etc. **23_Objects** Stores resources files such as Templates, Title Blocks, Line Styles, Fonts, Material Images and Specific Objects. Stores all documents related to operation and maintenance, e.g. testing & commissioning reports, catalogues, drawings, certificates and O&M manuals, etc.
	30_ O&M **T&C** **O&M** **Catalogues** **Others**	Stores all documents related to O&M documents, e.g. T&C reports, catalogues, drawings, certificates etc. **A zip file** with folder structure as specified in this Section shall be created for each Level 1 System. The folder path to the dedicated PDF files of each Level 2 asset in that zip file shall be assigned to the corresponding objects in BIM models. All documents in PDF format shall be searchable.
	40_ Statutory	Stores all the statutory record, e.g. WR1, ventilation Certificate, FS251, Form 5 of lift, WWO46 etc. under building level.
	90_Others	Stores all other documents which are not classified under the above folders.

1.3. Reference Software

Standards and guidelines set in this document take **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 engineer of EMSD.

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

- Most current version of Industry Foundation Classes (IFC) file format, and
- Commercially available collaborative software that provides interoperability between different software applications (e.g. Navisworks or equivalent)
- Able to carry and export all E&M asset information described in Chapter 4

1.4. Reference Standards and Specifications

Below listed standards or guidelines have been used as reference document for this Standards and Guidelines:

1) BS 1192:2007+A1:2015: Collaborative production of architectural, engineering and construction information. Code of practice.
2) BS 8536-1:2015: Briefing for design and construction. Code of practice for facilities management (Buildings infrastructure).
3) PAS 1192-2:2013: Specification for information management for the capital/delivery phase of construction projects using building information modelling. Pioneering the Building Information Modelling Standard.
4) PAS 1192-3:2014: Specification for information management for the operational phase of assets using Building Information Modelling.
5) PAS 1192-5:2015: Specification for security-minded Building Information Modelling, digital built environments and smart asset management.
6) Singapore BIM Guide. (May 2012)
7) Singapore BIM Essential Guide for Contractors (2013)
8) Singapore BIM Essential Guide for MEP Consultants (2013)
9) AEC (UK) BIM Protocol for Autodesk Revit: additional detail and enhancements for implementation of the AEC (UK) BIM Protocol for Autodesk Revit users. (September 2012)
10) AEC (UK) BIM Standard: A practical & pragmatic BIM Standard for the Architectural Engineering and Construction industry in the UK. (November 2009)
11) AEC (UK) BIM Technology Protocol: Practical implementation of BIM for the UK Architectural, Engineering and Construction (AEC) industry. (June 2015)
12) Computer-Aided-Drafting Standard for Works Projects (CSWP), Development Bureau, HKSARG
13) Construction Industry Council Production of BIM Object Guide General Requirement 2018

1.5. Interpretations and Abbreviations

List of Abbreviations:-

ACB	Air Circuit Breaker
AIM	Asset Information Management
API	Application Programming Interface
ArchSD	Architectural Services Department
BIM	Building Information Modelling
BIM-AM	Building Information Modelling – Asset Management
BMS	Building Management System
CAD	Computer-Aided Design
CAS	Call Alarm System
CCMS	Central Control and Monitoring System
CCTV	Closed-circuit Television.
CDE	Common Data Environment
CIC	Construction Industry Council
COBie	Construction Operations Building Information exchange
COBieLit	Lightweight Extensible Markup Language (XML) format of COBie data
CRAC	Computer Room Air Conditioner
DDC	Direct Digital Controller
DSD	Drainage Services Department
E&M	Electrical and Mechanical
ELV	Extra Low Voltage
F/S	Fuse Switch
IFC	Industry Foundation Classes
O&M	Operation and Maintenance
MCCB	Miniature Circuit Breaker
MEP	Mechanical, Electrical, and Plumbing
QR Code	Quick Response Code
REST	Representational State Transfer
RFID	Radio-frequency identification
SOAP	Simple Object Access Protocol
T&C	Testing and Commissioning
UHF	Ultra high frequency
XML	Extensible Markup Language

List of Interpretations:-

Attribute	It is a piece of data describing a BIM object.
Common Data Environment	Common Data Environment (CDE), an electronic platform to manage the collection, creating, sharing and publishing of project information. This is the single source of all information relating to the project and should be set up to facilitate the spatial coordination and information exchange processes described in PAS 1192.
COBie	Construction Operations Building Information Exchange (COBie), an international standard to manage asset data information. COBie may take several approved formats include spreadsheet and IFC file format.
Federated Model	A BIM model with links (does not merge) to several models. As opposed to Integrated Model, Federated Model do not merge the properties of individual models into a single model.
Industry Foundation Class (IFC)	A platform neutral, open and object-based file format specification with developed by buildingSMART to facilitate interoperability in the architectural, engineering and construction industry, and is commonly used collaboration format in BIM based projects. The IFC model specification is registered by ISO as ISO 16739:2013.
Object	It is 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.).

Chapter 2

Coding and Numbering System

2. Coding and Numbering System

Unified conventions in BIM model file naming are essential to standardize model file structure for coordination of modelling activity in project life cycle. The naming convention as stated in this Guide is for the implementation of BIM-AM System.

2.1. 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 33 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.

Requirement of Asset Coding						
1	**2**	**3**	**4**	**5**	**6**	**7**
District Code (Refer to Section 2.2)	**Building Code** (Refer to Section 2.3)	**Block Code** (Refer to Section 2.4)	**Building level**	**System Code/ Routing Code(2)** (Refer to Section 2.6)	**Equipment Code** (Refer to Section 2.7)	**Number (1)**
<= 3 characters	<= 5 characters	1-3 characters	<=3 characters	3 to 4 characters	3 to 5 characters	4 characters
KT-Kwun Tong	**EMSDN**-EMSD HQS (NEW)	**NA** - No Block **T1**-Tower 1 **B1**-Block 1 **N**-North Wing **S**-South Wing	**B02**-Basement 2 **B2M**-Basement 2 Mezzanine **B01**-Basement 1 **000**-Ground Floor **001**-1st Floor **002**-2nd Floor **003**-3rd Floor	**BLR** - Boiler System **FP –** Filtration Plant **ACS** – Access Control System **STV** – Satellite TV System	**AHU**-Air Handling Unit **FCU**- Fan Coil Unit	0001 0002 0003 0004 0005 0006

Note:
(1) The sequence should be restarted per each type of equipment on different floor.
(2) System code should be used for asset coding, except for those equipment of 9. Burglar Alarm System and 17. Broadcast Reception in which **routing code** should be adopted.

Examples:

1. Fan Coil Unit on first floor in EMSD Headquarter:

Asset Code:	**KT-EMSDN-NA-001-HVAC-FCU-0001**

2. F.S Pump on second floor in EMSD Headquarter :

Asset Code:	**KT-EMSDN-NA-002-FS-PMP-0001**

2.2. District Code

All districts in Hong Kong and their corresponding district codes are listed as follows:

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

2.3. Building Code

The list of buildings and their building code in Hong Kong can be referred to Appendix A of this document.

2.4. 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 the project execution plan.

Block	Code
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

2.5. Discipline Code

Alphabetical character represents the class of disciplines. This is applicable to the naming convention of discipline models as specified in the next Section of 3.2.1

Discipline	Code
Mechanical, Electrical and Plumbing (Combined)	MEP
Architecture	A
Structure	S
Civil Engineering	C
Landscape	L
Other Disciplines	O

2.6. Names and Codes of E&M Systems and Corresponding Routing

No.	System Name	System Code	Routing Name	Routing Code
1	**Lift and Escalator**	LAE	Trunking for Lift and Escalator	LAE
			Cable Tray for Lift and Escalator	
2	**LV Switchboard**	LVS	Trunking for LV Switchboards	LVS
			Cable Tray for LV Switchboards	
3	**Emergency Generator**	EMG	Trunking for Emergency Generator	EMG
			Cable Tray for Emergency Generator	
4	**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
5	**Boiler System**	BLR	Boiler/ Steam Pipes	BLR
			Hot Water Supply Pipe	HWSP
			Hot Water Return Pipe	HWRP
			Vent Pipe	VP
			Boiler Exhaust Pipe	BEP

No.	System Name	System Code	Routing Name	Routing Code
6	**Filtration Plant**	FP	Filtration Plant Pipes	FP
			Return Pipes	RP
			Overflow Pipe	OP
			Supply Pipe	SP
7	**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
8	**Uninterrupted Power Supply**	UPS	Trunking for UPS	UPS
			Cable Tray for UPS	
9	**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
			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	

No.	System Name	System Code	Routing Name	Routing Code
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
A1	**Plumbing** (note 1)	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** (note 1)	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** (note 1)	LDS	Water Leakage Detection Cable	LDS
A4	**Mechanical Handling & Lifting Installation** (note 1)	MHL	Services for Mechanical Handling & Lifting Installation	MHL

Note:

(1) Systems are not in the EMSD asset templates.

(2) Project BIM manager 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.

(3) The system name and coding used in a project should be agreed by all parties and documented in the project execution plan.

2.7. E&M Asset Code

The following equipment list is based on the EMSD asset templates, which are designed to suit the EMSD asset management system. Thus, the list below does not exhaustively cover all the E&M equipment.

Project BIM manager may further create other equipment coding if any equipment is not listed below. The principle for equipment coding should be for easy identification and drawing production.

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

No.	System Name	Equipment Type	Equipment Code
1	**Lift and Escalator (LAE)**	Lift and Escalator (^)	LAE
		Electric Lifts *(including the application for passenger lift, good lift, freight lift, vehicle lift, platform lift, stair-lift and dumbwaiter)*	ELL
		Hydraulic Lifts *(including the application for passenger lift, good lift, freight lift, vehicle lift, platform lift, stair-lift and dumbwaiter)*	HYL
		Escalators / Passenger Conveyors	EPC
2	**LV Switchboard (LAS)**	LV Switchboard (^)	LVS
		Battery *(including battery charger)*	BAT
		Harmonic filter	HAR
		Switchgear *(including ACB, MCCB, F/S, Contactor)*	SWG
		Relay	REL
		Capacitor	CAP
3	**Emergency Generator (EMG)**	Generator (^)	GEN
		Diesel Engine	DIE
		Alternator	ALT
		Controller	CTR
		Undervolt Relay	URE
		Fuel Tank	FUT
		Fuel Pump	FPMP
		Battery Charger	BAC
		Battery	BAT
4	**HVAC (Air Side)**	Air Side (^)	AS
		DX Unit *(including split-type DX units, VRV outdoor units, single packaged units and computer room air-conditioner)*	DXU
		VRV-IDU	IDU
		Air Handling Unit	AHU
		Primary Air Handling Unit	PAU
		Heat Wheel	HW
		Fan Coil Unit	FCU
		Fire Damper	FD
		Fresh Air Fan	FAF

No.	System Name	Equipment Type	Equipment Code
4	**HVAC (Air Side)**	Exhaust Air Fan	EAF
		VAV Box	VAV
		Local Control Panel (*)	LMCP
	HVAC (Water Side)	Water Side (^)	WS
		Chiller	CHR
		Heat Pump Type Chiller	HPC
		Cooling Tower	COT
		Heat Exchanger	HEX
		Pump *(including chilled water pumps, condenser water pumps, cooling tower bleed off pump, heating water pump and saline water pump etc.)*	PMP
		Pressurized Water Sys	PWS
		Water Treatment Sys *(including those serving chiller water, condenser water (fresh water) and condenser water (sea water)*	WTS
		Auto-strainer	ASR
		Travelling Band Screen	TBS
	HVAC (Cold Room / Store)	Cold Room/Store (^)	CRM
	HVAC (Miscellaneous)	Miscellaneous (^)	MIS
		CCMS (e.g. DDC)	CCMS
		Room Cooler	RCR
		Refrigerator *(including those for blood, food, medicine, vaccine, specimen etc.)*	RFR
		Motor Control Centre (*)	MCC
5	**Boiler System (BLR)**	Boiler System (^)	BLR
		Hot water boiler	HWB
		Steam boiler	STO
		Gas boiler (**)	GAB
		Calorifier	CAL
		Heat Exchanger	HEX
		Pump *(including the application for booster, circulation, boiler feed etc.)*	PMP
		Expansion Tank (@)	EXT
		Local Control Panel (*)	LMCP
6	**Filtration Plant (FP)**	Filtration Plant (^)	FP
		Electric Boiler	ELB
		Diesel Boiler	DIB
		Electro-Chlorinator System	ECS
		Filtration Tank *(including those sand tanks, carbon tanks and reaction tanks.)*	FIT
		Pump	PMP
		Motor	MOT
		MCC Panel	MCCP
		Ozone Generator System	OGS

No.	System Name	Equipment Type	Equipment Code
6	**Filtration Plant (FP)**	Ultraviolet Sterilizer	ULS
		Building Management System	BMS
		Controller Analyser and Sensor *(including those sensors for measuring ppm, mV, PH, ^oC and ORP)*	CAS
		Chemical Dosing Pump *(including the application for NaOCl, Soda, ALUM, Acid and Brine)*	CHP
		Air Blower *(including the application for sand tank and NaoCl tank)*	AB
		Piping System	FIL
		Air Release Valve (for filtration tanks)	ARV
		Variable Speed Drives / Soft Starter	VSD / SS
		Misc. Swimming Pool Equipment *(e.g. electric valve)*	MSP
		Heat Exchanger	HEX
		Local Control Panel (*)	LMCP
7	**Fire Services Installation (FS)**	Wet System (^)	WTS
		Pump *(including FH/HR water pump, sprinkler water pump, drencher water pump, jockey pump and fire service upfeed pump)*	PMP
		Sprinkler control valve set & accessories *(including sprinkler control valve set, sprinkler subsidiary valve, pre-action recycling sprinkler control valve set, air compressor, dry alarm sprinkler control valve, foam-water sprinkler control valve set)*	SCV
		Sprinkler Heads (#)	SPR
		Fire Hydrant (*)	FH
		Street Fire Hydrant (*)	SFH
		Hose Reel (*)	HR
		Pressure Reducing Valve (*)	PRV
		Fire Service Inlet (*)	FSI
		Sprinkler Inlet (*)	SPI
		Local Control Panel (*)	LMCP
		Automatic Fire Detection and Alarm System (^)	AFA
		Fire Alarm equipment *(including manual call point, smoke detector, flashing lighting, alarm siren, alarm bell, heat detector, optical beam smoke detector, multi-sensor detector and fire alarm panel)*	FAE
		Audio/ Visual Advisory System	AVA
		Gas Suppression System (^)	GSS
		Gas cylinder and equipment*(including gas cylinders, control panels and discharge nozzles for CO_2, FM200, NAFS III and Novec 1230 system)*	GCE
		Portable Equipment (^)	PE
		Portable fire extinguisher *(including all type of fire extinguishers, fire blanket and sand bucket)*	PFE

No.	System Name	Equipment Type	Equipment Code
7	**Fire Services Installation (FS)**	Gas Detection System (^)	GDS
		Gas detector and equipment *(including CO_2 gas detector, hydrogen gas detector, ammonia gas detector, ozone gas detector and gas detection control panel)*	GDE
		Exit sign & Directional sign (^)	EXS
8	**Uninterrupted Power Supply (UPS)**	UPS System (^)	UPS
		Battery System	BATS
		Static Transfer Switch	STS
9	**Burglar Alarm and Security Installation (Access Control system) (ACS)**	Access Control System (^)	ACS
		Panel *(including control panel, telephone door phone panel, buzzer & lighting indicator panel etc.)*	PAN
		Lock/Button/Switch *(including electro-magnetic lock, door release button, bypass key switch etc.)*	LBS
		Emergency Breakglass	EMB
		Lock Control Unit	LCU
		Smart Card Reader	SMR
		Card Reader Control	CRC
		Remote Rel. But. Receiver	RER
		Intercom (including door phone system, intercom door station and intercom master station etc.)	INM
		Computer	COM
		Turnstiles	TUR
		Network Switch (note 4)	NES
		Sounder (note 4)	SOU
		Accessories *(including keypad, UPS/battery, electro-magnetic contact, electric strike, access control converter, interface board etc.)*	ACC
	Burglar Alarm and Security Installation (Burglar Alarm System) (BAS)	Burglar Alarm System (^)	BAS
		Panel *(including zones alarm panel, alarm repeater, outdoor S.S. panel, push button wall etc.)*	PAN
		Lock/Button/Switch *(including call bell button, bypass key switch, emergency lock, push alarm E-lock etc.)*	LBS
		Intrusion Detector *(including electro-magnetic contact, wide angle duet tech detector, dual tech motion detector etc.)*	IND
		Power Mgt Unit *(including control room charge, telephone link charge, power supply unit & battery and UPS for DVR etc.)*	PMU
		Amplifier	AMP
		Controller *(including volume controller, lighting controller etc.)*	CTR
		Camera	CAM
		Audio / Video Product	AVP

No.	System Name	Equipment Type	Equipment Code
9	**Burglar Alarm and Security Installation (Burglar Alarm System) (BAS)**	Projectoring Product *(including LCD projector, visualizer etc.)*	PRP
		Screen/Monitor	SCM
		Network Switch (note 4)	NES
		Battery (note 4)	BAT
		Accessories *(including S.A. bell, video control unit, video door-phone set, wireless microphone, colume speaker, siren, transformer, buzzer light etc.)*	ACC
	Burglar Alarm and Security Installation (CCTV & Intercom System) (CCTVI)	CCTV and Intercom System (^)	CCTVI
		Intercom *(including handset with release button)*	INM
		Camera	CAM
		Video Switcher	VIS
		Multi Channel DVR / NVR	DVR/NVR
		Duplex Multiplexer	DUM
		Computer	COM
		Network Switch (note 4)	NES
		Display Unit (note 4)	DIU
		Accessories *(including backward direction control, UPS, video distribution amplifier, control keyboard, media converter, fibre transmitter/ receiver, LCD KVM switch, HDMI extender etc.)*	ACC
	Burglar Alarm and Security Installation (Smart Card System) (SCS)	Smart Card System (^)	SCS
		Security Computer	SEC
		Printer	PRI
		Access Controller	ACR
		Card Reader	CAR
		Keypad	KEP
		Lock/Button/Switch *(including door release button, electro-magnetic lock, alarm shunt key switch etc.)*	LBS
		Control Unit	COU
		Power Mgt Unit	PMU
		Battery (note 4)	BAT
		Sounder (note 4)	SOU
		Accessories *(including interfacing module, interconnection point with FS panel, alarm siren etc.)*	ACC
	Burglar Alarm and Security Installation (Call Alarm System) (CAS)	Call Alarm System (^)	CAS
		Control Panel	COP
		Alarm Siren/Bell	ASB
		Button *(including push button, emergency call button etc.)*	BUT

No.	System Name	Equipment Type	Equipment Code
9	**Burglar Alarm and Security Installation (Videophone System) (VPS)**	Videophone System (^)	VPS
		Extension Speaker	EXS
		Station *(including master station and door station etc.)*	STA
		Handset	HAN
		Videophone Control	VPC
		Network Switch (note 4)	NES
	Burglar Alarm and Security Installation (Keypad Lock System) (KLS)	Keypad Lock System (^)	KLS
		Keypad	KEP
		Backup Battery	BAB
		Door Release Button	DRB
	Burglar Alarm and Security Installation (Drop-arm Barrier) (DAB)	Drop-arm Barrier(^)	DAB
		Control Panel	COP
		Barrier Gate	BAG
		Detector *(including infrared magnetic loop etc.)*	DER
		Card Acc. Controller	CAC
		Proximity Card	PRC
		Intercom *(including intercom door station, intercom master station etc.)*	INM
		Recorder	REC
		Workstation Unit	WOU
		Accessories *(including push button, LCD monitorm UPS supply etc.)*	ACC
	Burglar Alarm and Security Installation (Electric Lock System)	Electric Lock System (^)	ELS
10	**Radar and Navigation System (RNS)**	Radar and Navigation System (^)	RNS
		Antenna	BRR
		Turning unit	TUU
		Display and processing unit	DPU
		Network Equipment *(including switch, hub, router etc.)*	NEE
		Video camera	VIC
		Accessories *(including AIS receiver, AIS transceiver, GPS receiver, fluxgate, gyrocompass, satellite compass, electronic sea chart, echo sounder, wind sensor, speed log, speed indicator, monitor, instrument display unit, control panel, digital video recorder, pan tilt head etc.)*	ACC
11	**Microwave Link System (MLS)**	Microwave Link System (^)	MLS
		Antenna	ANT
		Transceiver	TRAN
		RF Interface Unit *(including duplexer, coupler combiner, exciter, filter, splitter, waveguide etc.)*	RIU
		Processing unit *(including multiplexer, modulator etc.)*	PRU

No.	System Name	Equipment Type	Equipment Code
11	**Microwave Link System (MLS)**	Network Equipment *(including switch, hub, router etc.)*	NEE
		Accessories	ACC
12	**Timing & Display System (TDS)**	Timing & Display System (^)	TDS
		Operator Control Console / Workstation, PC	OCC
		Control Unit / Server	CUS
		Sensing Unit	SEU
		Master Clock Unit	MCU
		Video Display Unit	VDU
		Video & Audio Equipment *(including monitor, camera, extender, switch/ splitter/ matrix, video player etc.)*	VAE
		Network Equipment *(including router/ switch, firewalls/ security appliances, fiber equipment, cables/ connectors, printer, dispenser etc.)*	NEE
		Queue Management Unit *(including public kiosk, counter keypad etc.)*	QMU
		Uninterruptible Power Supply	UPS
13	**Audio Video System (AV)**	Audio Video System (^)	AV
		Player	PLA
		Recorder	REC
		Console (i.e. computer)	CONS
		Miscellaneous *(including analyzer, control panel, generator, limiter, matrix, patch panel, selector/ switcher, time synchronizer etc.)*	MIS
		Distribution Amplifier	DIS
		Switch *(including the switches for HDMI, VGA, DVI, multimedia etc.)*	SW
		Splitter	SPL
		Extender	EXT
		Matrix Switcher	MAT
		Display Unit *(including digital whiteboard, TV monitor, projector, screen, video wall, visualizer etc.)*	DIU
		Audio Amplifier	AAM
		Audio Mixer	AMI
		Audio Equalizer	AEQ
		Audio Loudspeaker	ALO
		Audio Microphone	AMC
		Audio Miscellaneous *(including antenna, combiner, converter, IR emitter, IR receiver, processor, simultaneous interpretation system, sound box, UPS, transcriber etc.)*	AMS
14	**Audio Electronics System (AUS)**	Audio System (^)	AUS
		Amplifier	AMP
		Chairman Unit	CHU
		Controller	CTR

No.	System Name	Equipment Type	Equipment Code
14	**Audio Electronics System (AUS)**	Delegate Unit	DEU
		Recorder	REC
		Mixer	MIX
		PC Workstation	PCW
		Equalizer	EQU
		Loudspeaker	LOU
		Loop Amplifier	LAM
		T-coil (Hearing Aid)	TCO
		Microphone	MIC
		Intercom Master Station	IMS
		Network Switch	NES
		Intercom Slave Station	ISS
		Annunciator	ANN
		Matrix	MAT
		Interpreter Unit	INT
		Induction Loop (note 4)	ILP
		Miscellaneous *(including analyser, antenna, audio tape, players, combiner, converter, extender, IR emitter, IR receiver, monitor, processor, simulator interpretation system, sound box, splitter, switcher, tape, transcriberm UPS, zone selector etc.)*	MIS
15	**Radio System (RS)**	Radio System (^)	RS
		Base Radio/Repeater *(including transmitter, receiver, transceiver bi-directional amplifier etc.)*	BRR
		RF Interface Unit *(including duplexer, coupler combiner, exciter, filter, splitter etc.)*	RIU
		Antenna	ANT
		Power Supply (e.g. UPS, DC power supply)	POS
		Console (e.g. workstation)	CONS
		Voice logger	VLO
		Network Equipment *(including switch, router, firewall, encryptor, server, modem etc.)*	NEE
		Radio Terminals	RAT
		Accessories *(including battery charger, speaker, earpiece, microphone, multiplexer, PTT switch etc.)*	ACC
16	**Closed Circuit TV System (CCTV)**	CCTV System (^)	CCTV
		Camera	CAM
		Network Switch	NES
		Video Recorder	VIR
		Console/ Server (e.g. workstation)	CONS
		Display Unit *(including video wall, projector, monitor, LCD panel etc.)*	DIU
		Video Matrix	VIM
		Transceiver (note 4)	TRAN

No.	System Name	Equipment Type	Equipment Code
16	**Closed Circuit TV System (CCTV)**	Receiver (note 4)	REC
		Miscellaneous *(including O/E converter, E/O converter, video encoder, video decoder, VDA, HDMI extender, PoE injector, PoE splitter, selector/ switcher etc.)*	MIS
17	**Broadcast Reception Installation (UHF TV System) (UTV)**	UHF TV System (^)	UTV
		Antenna/Preamplifier *(including bandpass fitler)*	ANT/PAM
		Ch Amplifier/Amplifier	AMP
		Accessories *(including attenuator, rejection filter, CCTV modulator, RF modulator, equalizer, power supply unit, splitter, tee unit, channel optic coupler, combiner, filter optics receiver etc.)*	ACC
	Broadcast Reception Installation (Satellite TV System) (STV)	Satellite TV System (^)	STV
		Antenna / Amplifier *(including satellite dish, antenna, IF insertion amplifier, feedhorn, LNB etc.)*	ANT/AMP
		Receiver *(including satellite receiver, RF modulator, amplifier etc.)*	REC
		Converter *(including programmable controller)*	CON
		Accessories *(including satellite IF outlet, wide-band splitter, wide-band T-unit, motor control kit, sat. mulit-switch, steel frame cleaning, optical transmitter, fiber cable etc.)*	ACC
18	**Lighting System (LTG)**	Lighting System(^)	LTG
		Luminaire *(including external and exterior lighting and signs)*	LUM
		Lighting Control System *(including relay controller, lighting controller, motion sensor, control panel and occupancy sensor)*	LCS
19	**Electrical Distribution System (EL)**	Electrical Distribution System (^)	EL
		Busbar Trunking / Main Distribution Cable	BBT
		Isolating switch	ISW
		Distribution Board	DTB
		ACB	ACB
		MCCB	MCCB
		Fuse switch & Switch fuse	FSW
		MCB	MCB
		RCD/RCBO	RCD/RCBO
		Power Quality Monitoring Device (*)	PQM
		PV panels (**)	PV
20	**Medical Gas System (MG)**	Medical Gas System (^)	MG
		Compressor *(including those for medical air and surgical air)*	COM
		Receiver/ Reservoir *(including those for medical air and surgical air)*	REC

No.	System Name	Equipment Type	Equipment Code
20	**Medical Gas System (MG)**	Vacuum Pump	VP
		Blower *(for Anaesthetic Gas Scavenging System)*	AGP
		Manifold *(including those for O_2, N_2O, MA4, SA7 and compressed air)*	MAN
		Oxygen VIE Tank	VIE
21	**Pneumatic Tube Transport (PTS)**	Pneumatic Tube Transport (^)	PTS
		Sending and Receiving Station	SRS
		Blower Unit	BLW
		2-Way Diverter	2WD
		3-Way Diverter	3WD
		Empty Carrier Storage Station	ECS
		Dumping Station	DS
		Power Pack	PP
		Central Control Unit	CCU
		Master Workstation	MW
A1	**Plumbing System (PL) (notes 3)**	Plumbing System (^)	PL
		Sump Tank (@)	SUT
		Roof Tank (@)	ROT
		Booster pump (*)	BPMP
		Transfer pump (*)	TPMP
		Pressure vessel (*)	PVES
		Electric heater (*)	EHT
		Gas heater (*)	GAH
		Pressure Reducing Valve (*)	PRV
		Local Motor Control Panel (*)	LMCP
A2	**Drainage System (DR) (note 3)**	Drainage System (^)	DR
		Waste water sump pump (*)	WWSP
		Soil and waste water sump pump (*)	SWSP
		Rainwater sump pump (*)	RWSP
		Local motor control panel (*)	LMCP
A3	**Water Leakage Detection System (LDS)**	Water Leakage Detection System (^)	LDS
		Leak Detection Panel (*)	LDP
A4	**Mechanical Handling & Lifting Installation (MHL)**	Mechanical Handling & Lifting Installation (^)	MHL
		Gondola (*)	GON

Note:

(1) Equipment marked with (^) is the Level-one equipment type.
(2) Equipment marked with (*), (**), (#) and (@) is not in the EMSD asset templates. The asset information shall follow Table 4.2.
(3) Requirements for all plumbing and drainage equipment should be with reference to the related BIM standards or guidelines issued by Architectural Services Department and Drainage Services Department.
(4) The asset information for network switch and display unit etc. shall follow the asset template of “Accessories”.

Chapter 3

Modelling Standard

3. Modelling Standard

3.1. Model Management

For ease of file management and optimal model loading and display performance, it is a good practice to maintain models according to the following criteria:

1. BIM models shall be separately constructed by disciplines as specified in Section 2.5 and by systems as specified in Section 2.6.
2. Separated BIM models shall be provided for the architectural and structural disciplines respectively.
3. BIM models for mega building complex with several buildings shall be separately constructed per individual building blocks.
4. A model file size shall be controlled not more than 400MB.
5. Federated model file named as "master" shall be created to **link** all the architectural, structural and MEP models for the operation of BIM-AM system. Binding models shall **NOT** be adopted.
6. All worksets shall be removed for the handover of as-built BIM models.
7. Due to the limitation of maximum file path in windows system being less than 256 characters, it is a good practice to keep folders name in tidy and neat manner. Too many folder levels shall be avoided.
8. 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.
9. Before model submission, all irrelevant objects, views, schedules and linkages in the as-built BIM models shall be purged.
10. In addition to the BIM project files for the BIM models, all loadable objects (e.g. *rfa) that are used in the BIM models shall be separately submitted and saved in the "model" folder as specified in Section 1.2. The requirement of object can be referred to the latest "BIM Objects Creation Standard and Guidelines".
11. Hangers for E&M services and electrical cables are NOT necessary to be modelled for BIM-AM system.

3.2. Naming Convention

3.2.1. Model File Naming

Model names consist of 5 parts, it shall be in the form as shown below and separated by a hyphen "-" between fields. Please refer to Chapter 2 for coding definition for District code, Building code, Discipline and System code.

1	2	3	4	5
Building Code (refer to Section 2.3)	Building Block Code (Refer to Section 2.4)	Discipline (Refer to Section 2.5)	System (Refer to Section 2.6)	Description
Required	Required	Required	Required	Optional (e.g. HZ for high zone, LZ for low zone)

Example: EMSDN-NA-MEP-HVAC.rvt

[Building Code]-[Building Block]-[Discipline]-[System].rvt

3.2.2. Master Model File Naming

A federated "master" model shall be created for submission and coordination

Example: EMSDN-Master.rvt

[Building Code]-Master.rvt

3.2.3. Object Naming Convention

Object names consist of 4 parts, it shall be in the form as shown below and separated by a hyphen "-" between fields. The detailed requirement of object creation shall be referred to the "BIM Objects Creation Standard and Guidelines".

1	2	3	4
Category	Sub-Type	Originator	Descriptor
(Refers to System Code/ Routing Code(Note 2) as specified in Section 2.6)	(Refers to Equipment Code as specified in Section 2.7)	Name of the creator in short form	Description (Note 1)
Required	Required	Required	Optional

Note:

(1) Optional description indicating detailed character of this object different from other type of object. Including material, size, special components, etc.
(2) System code should be used for asset coding, except for those equipment of 9. Burglar Alarm System and 17. Broadcast Reception in which **routing code** should be adopted.

Example: HVAC-EAF-EMSD-PrelimDesign.rfa

[Category]-[Sub-Type]-[Originator]-[Description].rfa

3.3. Model set up

3.3.1. Unit and Symbol

The BIM model shall be modelled in metric and in consistent units. Some common model units are provided below. For units or symbols not listed below, consultants and/or contractor are advised to propose the new units and/or symbols, with substantiation and submit the mapping table, where deemed necessary.

SI Base Units

Name	Unit	Symbol
Length	Millimeter	mm
Mass	kilogram	kg
Time	second	s
Electric Current	Ampere	A
Thermodynamic Temperature	Kelvin	K
Luminous Intensity	candela	cd

SI Derived Units

Name	Unit	Symbol
Energy	joule	J
Frequency	hertz	Hz
Force	newton	N
Illuminance	lux	lux
Pressure	Pascal	Pa
Power	watt	W
Temperature	Celsius	^{o}C
Potential	volt	V
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.

Prefixes for SI Base Units and SI Derived Units

Prefix	Symbol	Factor
yotta	Y	10^{24}
zetta	Z	10^{21}
exa	E	10^{18}
peta	P	10^{15}
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
hecto	h	10^{2}
deca	da	10^{1}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}
zepto	z	10^{-21}
yocto	y	10^{-24}

SI Preferred Engineering Units

Name	Unit
Area	m^2
Apparent Power	kVA
Calorific Value	kJ/kg
Compressed Air Pressure	kPa
Cooling Power	kW
Density	kg/m^3
Sound Power	dB
Ductwork Pressure	Pa
Electric Power	kW
Enthalpy Difference	kJ/kg
Heating Power	kW
Mass Flow Rate	kg/s
Pipework Pressure	kPa
Potential	V
Rotational Speed	Rev/min
Specific Heat	kJ/kg K
Specific Volume	m^3 /kg
Thermal Resistance	m^2K/W
Velocity	m/s
Volume	m^3
Volume Flow Rate	l/s
Viscosity	$N.s./m^2$

Dates for Folder and File naming

The format should be comply with the latest ISO 8601 Data Elements and Interchange Formats Information Interchange, i.e. ***YYYYMMDD.***

3.3.2. Location and Geo-Coordination

The origin and orientation of the project and model shall be based on project location with reference to the Hong Kong 1980 Grid and Principal Datum (mPD).

3.3.3. Worksharing and Worksets

For work sharing in BIM, using Central File is recommended for large scale projects or working between remote offices.

A central model is created in server as master model, and a local copy is created in local machine when a user access to the model. The “Synchronize” process could be sent to central model if changes are made in a local copy, so users could share their latest update among the team.

Every elements in BIM model is assigned to workset and it is used to control the ownership of BIM model elements. One user can edit a workset at a time while other team members could view that workset.

The setting of workets are specific to different projects, for E&M, it could be one system / sub-system, one workset.

For the handover of as-built BIM models, all worksets shall be deleted and central models instead of local models shall be submitted.

3.3.4. Cross-Disciplinary Model Coordination

To link cross-disciplinary BIM models, e.g. Architecture, Structure and MEP models, Project Base Point should be set in every BIM models to ensure the geo-locations are aligned.

The Project Base Point should be managed by BIM Manager, the setting should be agreed and documented in the BIM Project Execution Plan.

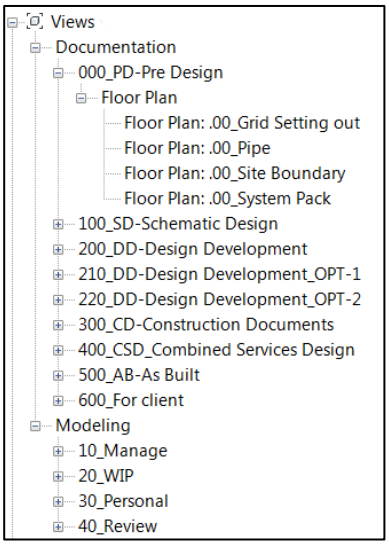
A federated model shall be created for submission and cross-disciplinary coordination.

3.4. Browser Organization

Project Browser should be designed by the Project BIM Manager so that views can be organized according to its purpose, its viewing details and types of view.

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

- The first level shows whether the view is used for Documentation (if any) or Modelling
- The second level shows the views 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 / elevation, etc

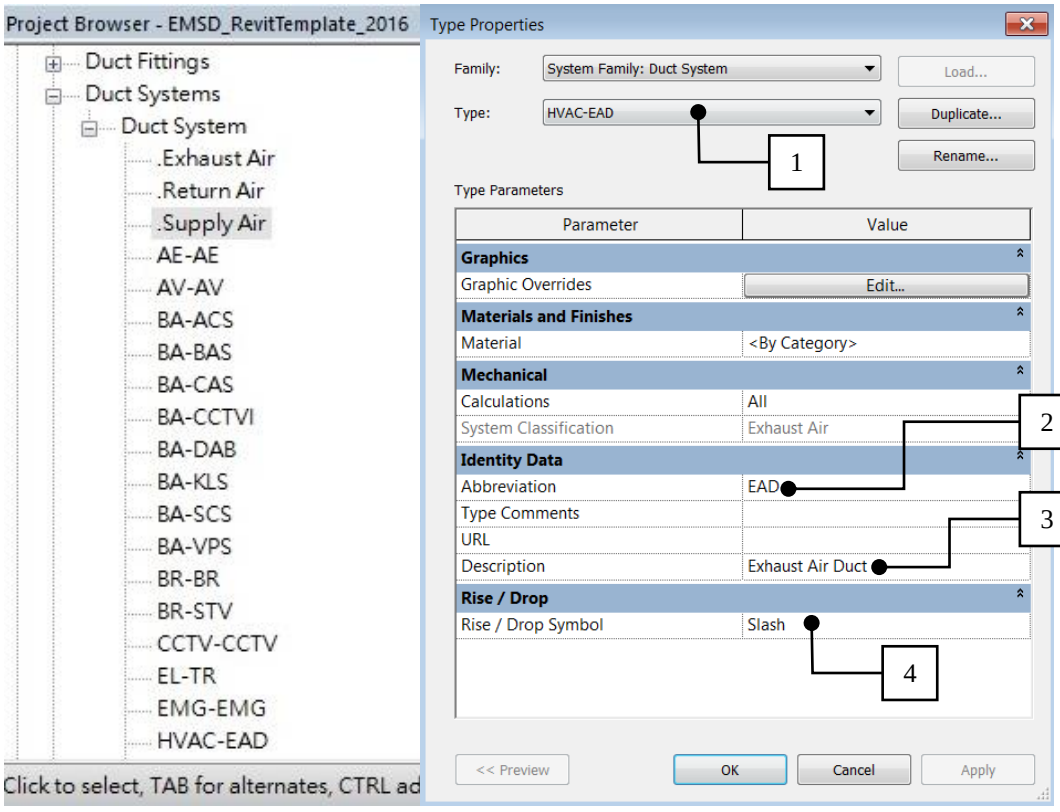


3.5. E&M System setup and modelling

3.5.1. Duct System

Duct systems listed in Section 2.6 should be created in the BIM project. Each system shall be set with the following settings:

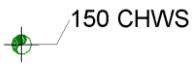
BIM Model field	Setting		Example
1. System type name	Consists of the system code and routing code separated by a hyphen "-"		**HVAC-EAD**
2. System abbreviation	Input routing code in Section 2.6		**EAD**
3. Description	Input routing name in Section 2.6		**Exhaust Air Duct**
4. Rise/ drop symbol	PAD	Slash	
	EAD	Cross - Filled	
	FAD	Wye	
	SAD	Wye	
	RAD	Backslash	
	TAD	Backslash	
	SED	Cross - Filled	
5. System colour coding	Refer to the next Section 3.7.3 for the requirement		--

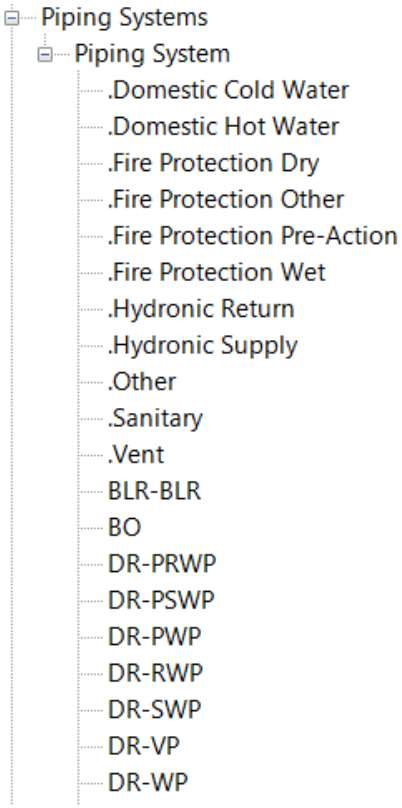


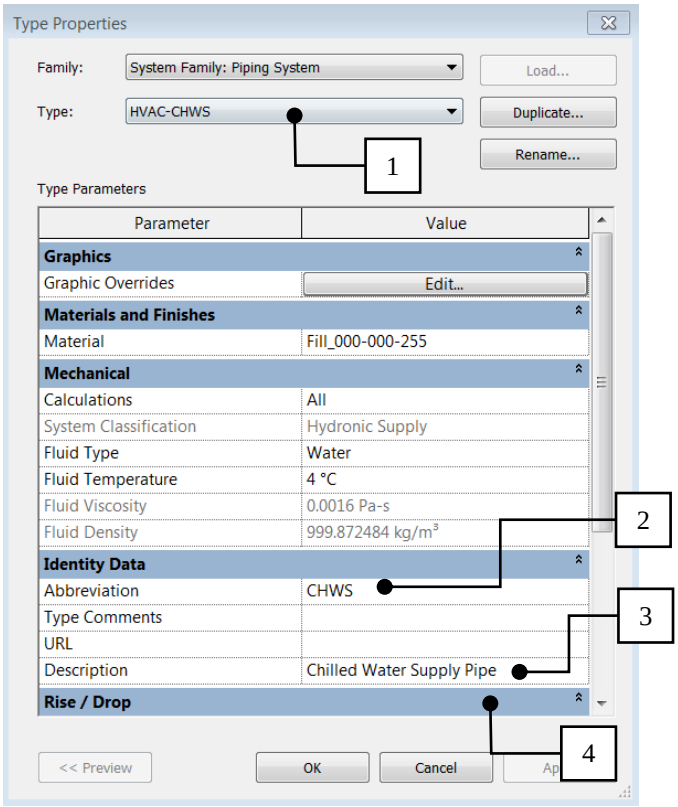
In BIM, there is no trunking objects, thus it is recommended to use duct with specific duct system to represent trunking system. For trunking serving combined ELV system, the service type should be "ELV".

3.5.2. Pipe System

Pipe systems listed in Section 2.6 should be created in the BIM project. Each system shall be with the following settings:

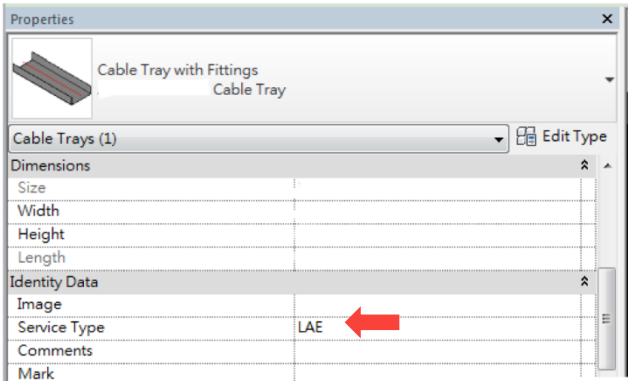
BIM Model field	Setting	Example
1. System type name	Consists of the system code and routing code separated by a hyphen "-"	**HVAC-CHWS**
2. System abbreviation	Input routing code in Section 2.6	**CHWS**
3. Description	Input routing name in Section 2.6	**Chilled Water Supply Pipe**
4. Rise / Drop symbol	Yin Yang - Filled	
5. System colour Coding	Refer to the next Section 3.7.3 for the requirement	--





3.5.3. Cable Tray

When draw a cable tray. The sub-system code as specified in Section 2.6 should be inputted in the "Service Type" field under cable tray.



3.5.4. 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:-

1. Equipment as specified in Section 2.7 that is mandatory,
2. Objects of the E&M systems which are shown on as-built schematic diagrams,
3. Objects of E&M systems which are visible on sight (e.g. air terminals of HVAC system, socket outlets of electrical distribution system, etc.)
4. Main routing of all the systems as specified in Section 2.6. Detailed system routing including all duct or pipe accessories shall be included in HVAC system.

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

Routing Type	BIM Category
Trunking	Duct
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 Section 2.7. Project BIM manager shall assign the remaining unlisted equipment in a reasonable categories. "Generic Models" should not be used for BIM category.

No.	System Name	Equipment Type	BIM Category
1	**Lift and Escalator**	(All)	Specialty Equipment
2	**LV Switchboard**	(All)	Electrical Equipment
3	**Emergency Generator**	(All except type below)	Electrical Equipment
		Fuel Pump	Mechanical Equipment
4	**HVAC**	(All except types below)	Mechanical Equipment
		Fire Damper	Duct Accessories
		Auto-strainer	Pipe Accessories
5	**Boiler System**	(All)	Mechanical Equipment
6	**Filtration Plant**	(All except type blow)	Mechanical Equipment
		Piping System	Pipes
7	**Fire Services Installation**	(All except type below)	Fire Alarm Devices
		Sprinkler Control Valve Set	Pipe Accessories
		Gas Suppression / Gas Cylinder Equipment	Specialty Equipment
		Pump	Mechanical Equipment
8	**Uninterrupted Power Supply**	(All)	Electrical Equipment
9	**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

No.	System Name	Equipment Type	BIM Category
14	**Audio Electronics System**	(All)	Communication Device
15	**Radio System**	(All)	Communication Device
16	**Closed Circuit TV System**	(All)	Communication 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
		Pump	Mechanical Equipment
21	**Pneumatic Tube Transport**	(All except types below)	Specialty Equipment
		Blower Unit	Mechanical Equipment
		Power Pack	Electrical Equipment
A1	**Drainage** (note 1)	(All, except those pipe accessories)	Mechanical Equipment
A2	**Plumbing** (note 1)	(All, except those pipe accessories)	Mechanical Equipment
A3	**Water Leakage Detection System** (note 1)	(All)	Specialty Equipment
A4	**Mechanical Handling & Lifting Installation** (note 1)	(All)	Specialty Equipment

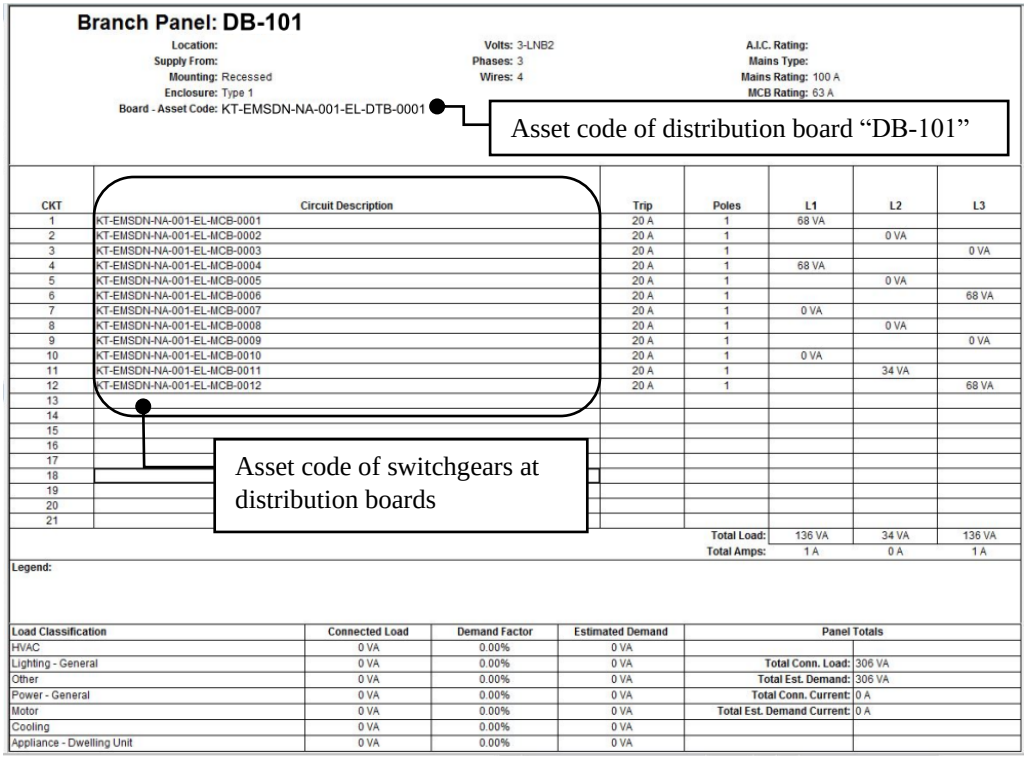
Note:

1. Systems and Equipment are not in the EMSD asset templates.

3.5.5. Panel Schedule for Distribution Boards

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

"Panel Schedule" shall be created for all electrical distribution boards in BIM models, so that all the information of circuits and the asset code of switchgears can be inputted to the schedules for data exchange between BIM models and asset management system. Otherwise, separated spreadsheets with asset codes, circuit rating etc. can be an alternative for the handover of BIM-AM models.



Branch Panel: DB-101

Location:
Supply From:
Mounting: Recessed
Enclosure: Type 1
Board - Asset Code: KT-EMSDN-NA-001-EL-DTB-0001

Volts: 3-LNB2
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type:
Mains Rating: 100 A
MCB Rating: 63 A

Asset code of distribution board "DB-101"

CKT	Circuit Description	Trip	Poles	L1	L2	L3
1	KT-EMSDN-NA-001-EL-MCB-0001	20 A	1	68 VA		
2	KT-EMSDN-NA-001-EL-MCB-0002	20 A	1		0 VA	
3	KT-EMSDN-NA-001-EL-MCB-0003	20 A	1			0 VA
4	KT-EMSDN-NA-001-EL-MCB-0004	20 A	1	68 VA		
5	KT-EMSDN-NA-001-EL-MCB-0005	20 A	1		0 VA	
6	KT-EMSDN-NA-001-EL-MCB-0006	20 A	1			68 VA
7	KT-EMSDN-NA-001-EL-MCB-0007	20 A	1	0 VA		
8	KT-EMSDN-NA-001-EL-MCB-0008	20 A	1		0 VA	
9	KT-EMSDN-NA-001-EL-MCB-0009	20 A	1			0 VA
10	KT-EMSDN-NA-001-EL-MCB-0010	20 A	1	0 VA		
11	KT-EMSDN-NA-001-EL-MCB-0011	20 A	1		34 VA	
12	KT-EMSDN-NA-001-EL-MCB-0012	20 A	1			68 VA
13						
14						
15						
16						
17						
18						
19						
20						
21						
			Total Load:	136 VA	34 VA	136 VA
			Total Amps:	1 A	0 A	1 A

Asset code of switchgears at distribution boards

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	0 VA	0.00%	0 VA		
Lighting - General	0 VA	0.00%	0 VA	Total Conn. Load:	306 VA
Other	0 VA	0.00%	0 VA	Total Est. Demand:	306 VA
Power - General	0 VA	0.00%	0 VA	Total Conn. Current:	0 A
Motor	0 VA	0.00%	0 VA	Total Est. Demand Current:	0 A
Cooling	0 VA	0.00%	0 VA		
Appliance - Dwelling Unit	0 VA	0.00%	0 VA		

The naming convention of distribution board shall be set as follows.

1	2	3	4
Distribution Board Type	**Separator**	**Building Level**	**Distribution Board No.**
⩽4 characters	1 character	⩽3 characters	2 characters
DB	-	**1** – 1/F **R** – Roof **B1** – B1/F	01 02 03

3.6. Modelling Architecture and Building Structure

The methodology and requirement of architectural and structural modelling shall follow the latest CIC Building Information Modelling Standards (Phase One).

Room or Space shall be created with labels in the as-built architectural models for assignment of zone tagging as specified in Section 5.2.2. Ceiling voids and raised floor voids should be included when defining the room or space in architectural model, if applicable, so that the parameter of "zone tag number" of each E&M objects can be automatically filled by the AM system. Otherwise, manual input of "zone tag number" to BIM model is also acceptable.

Reflected ceiling plans showing the location of access panels for MEP services shall be also included in the architectural models.

3.7. Presentation Style

This section addresses the BIM model elements display setting for 2D and 3D presentation.

3.7.1. Line Weight

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

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

3.7.2. E&M Object Colour

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

3.7.3. E&M Systems Colour Coding

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 below, consultants or contractors are advised to propose new colour coding for new system types with substantiation, where deemed necessary.

No.	System Name	Routing	Presentation (2D)		Presentation (3D)			
			Line weight	Line type	Red	Green	Blue	Color Palette
1	Lift and Escalator	Cable containment for lift and escalator	0.25	Continuous	128	0	128	
2	LV Switchboards	Cable containment for LV Switchboards	0.35	Divide2	128	128	0	
3	Emergency Generator	Cable containment for Emergency Generator	0.35	Continuous	255	0	64	
4	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	

No.	System Name	Routing	Presentation (2D)		Presentation (3D)			
			Line weight	Line type	Red	Green	Blue	Color Palette
4	HVAC	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	
		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	
5	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	
		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	
6	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	
7	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	
8	Uninterrupted Power Supply	Cable containment for Uninterrupted Power Supply	0.35	Continuous	128	64	64	
9	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	
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	

No.	System Name	Routing	Presentation (2D)		Presentation (3D)			
			Line weight	Line type	Red	Green	Blue	Color Palette
15	Radio System	Cable containment for Radio System	0.25	Continuous	204	153	255	
16	Closed Circuit TV System	Cable containment for CCTV System	0.25	Continuous	255	153	102	
17	Boardcast 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	
		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	
21	Pneumatic Tube Transport	Piping for Pneumatic Tube Transport System	0.25	Continuous	196	89	17	
A1	Plumbing System (note 1)	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	
		Irrigation Water Pipe	0.25	Dash dot dot dot	0	255	255	
		Grey Water Pipe	0.25	Continuous	0	128	255	
A2	Drainage System (note 1)	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	

No.	System Name	Routing	Presentation (2D)		Presentation (3D)			
			Line weight	Line type	Red	Green	Blue	Color Palette
		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 (note 1)	Leak Detection Cable	0.35	Continuous	122	48	160	

Note:

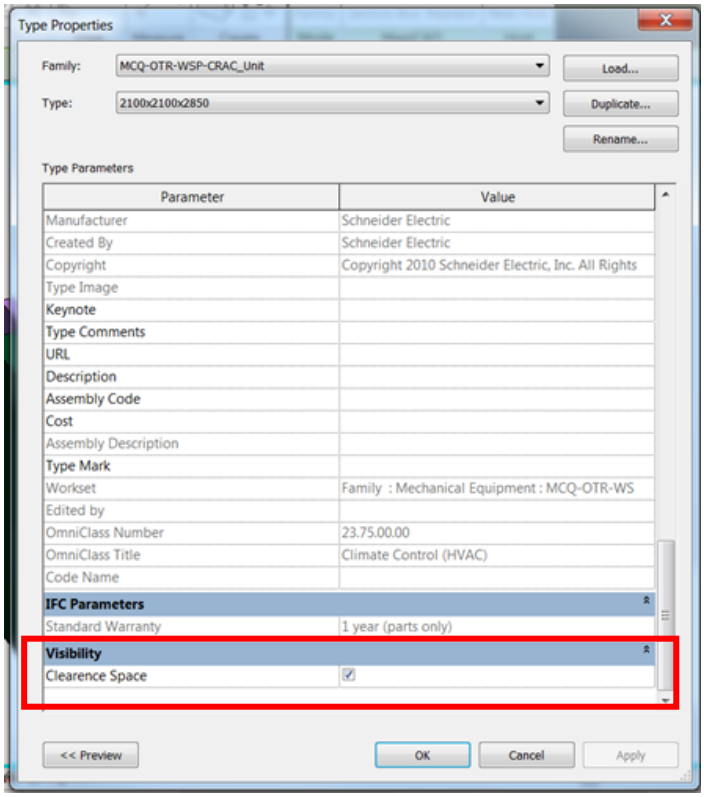
1. Systems and Equipment are not in the EMSD asset templates.

3.8. Maintainability

The equipment objects are created with clearance space in BIM model. The clearance space should be reflected in the BIM model for operation and maintenance purpose.

Clearance space is modelled in BIM equipment objects, so that it will be taken into consideration during the design, construction and maintenance of the equipment.

Examples of clearance space with visibility on and off are shown in Fig. 3.1 and 3.2.



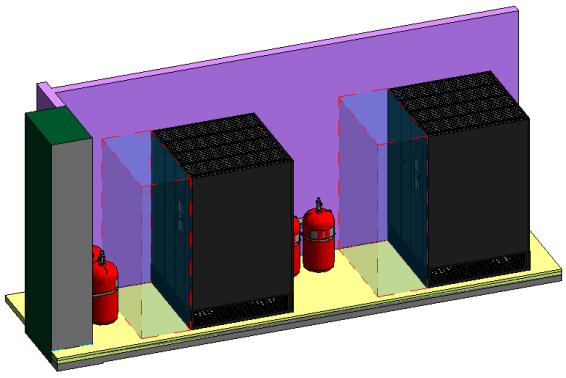


Fig. 3.1 Clearance space with visibility "ON"

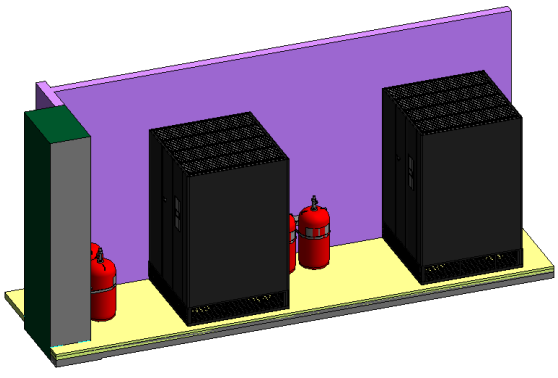


Fig. 3.2 Clearance space with visibility "OFF"

Chapter 4

E&M Asset Information

4. E&M Asset Information

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

The workflow is applicable to asset management which is managed by EMSD.

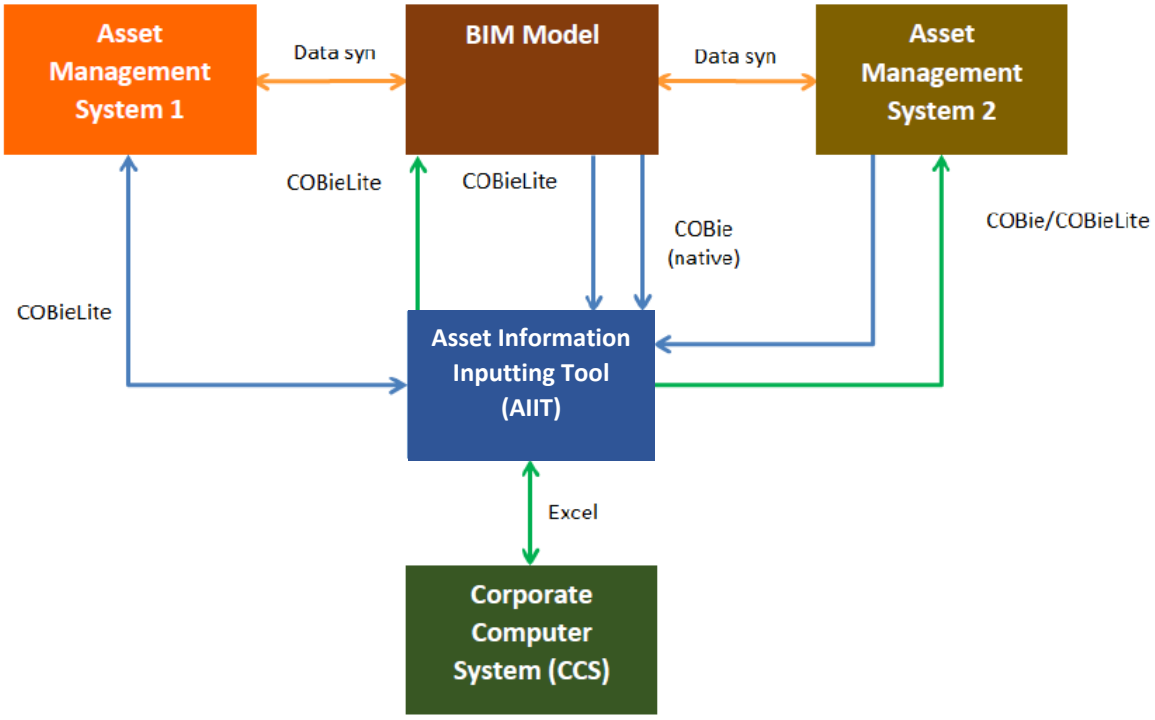


Fig 4.1 The workflow of BIM model for BIM-AM system.

4.1. Particular Requirement for BIM-AM System

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

a. The asset parameters, i.e. the EMSD shared parameter file as shown in Appendix D, shall be created as object parameters instead of project parameters.
b. The asset parameters shall follow the asset information requirement in Appendix B. Irrelevant parameters shall be purged before submission, for example EMSD.AV parameters shall not be shown in HVAC objects.
c. 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 zip should be inputted into the corresponding EMSD parameters of BIM objects, i.e. *"EMSD.Common.Documentation"* for each Level 2 asset (refer to the example as shown in Table 4.1 for details).

4.2. Asset Information Requirement

The BIM Shared Parameter File of the EMSD parameters described below can be referred to Appendix D. For each equipment as listed in Section 2.7, the required parameters consists of two parts:

a. Common parameters applicable to all equipment
   - The attributes with naming of "EMSD.Common" are applicable to **all** equipment. Consultants or contractors are advised to propose additional attributes with substantiation for any equipment with substantiation where deemed necessary.
   - Shared Parameter with BIM Category of "Common" have to be applied to Mechanical Equipment, Electrical Equipment, Electrical Fixtures, Pipe Accessories, Duct Accessories, Specialty Equipment, Fire Alarm Devices, and Lighting Fixtures.

b. Equipment specific parameters
   - The specific parameters of each E&M equipment should 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. Contractors should liaise with the subject officer(s) of EMSD to acquire and input the correct content of the EMSD specific fields.

For the sake of clarity, asset information requirement of all the E&M equipment and system as specified in Section 2.7 are explicitly demonstrated in Asset Information Requirement in Appendix B. The templates of primary air handling unit (PAU) as shown below is taken as an example to elaborate the above information requirement.

Table 4.1 : 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 4.2 (a)	Asset Code	EMSD.Common.Asset Code	KT-EMSDN-NA-001-HVAC-AHU-0001
		Functional Location	EMSD.Common.Functional Location	CHB-LF
		Asset Relationship	EMSD.Common.Asset Relationship	To be filled using Asset Information Input Tool
		Grouped Equipment ID	EMSD.Common.Grouped Equipment ID	To be filled using Asset Information Input Tool
		Asset Tag No	EMSD.Common.Asset Tag No.	EMSDN-0000000001
		Zone Tag No	EMSD.Common.Zone Tag No.	
		Onsite Verified Date	EMSD.Common.Onsite Verified Date	01.12.2000
		Authorization Group	EMSD.Common.Authorization Group	TS04
		Division	EMSD.Common.Division	05 PD
		Equipment No	EMSD.Common.Equipment No.	19876000
		Main Work Centre	EMSD.Common.Main Work Centre	MK14E80
		Partner ID	EMSD.Common.Partner ID	CSD
		Technical ID No	EMSD.Common.Technical ID No.	TEQ-150430-02
		Acquisition Value	EMSD.Common.Acquisition Value	
		CCS Equipment ID	EMSD.Common.CCS Equipment ID Superior	19999999
		Customer Warranty End	EMSD.Common.Customer Warranty End	01.12.2000
		Customer Warranty Start	EMSD.Common.Customer Warranty Start	01.12.1999
		Floor	EMSD.Common.Floor	1st Floor
		Inventory No	EMSD.Common.Inventory No.	B12345678

PAU	**Part 1: Common Parameters** are applicable to all equipment as specified in Section 4.2 (a)	Equipment Photo	EMSD.Common.Photo	..... "Project Name"\Photo\ HVAC-PAU
		Plant Section	EMSD.Common.Plant Section	01.12.1999
		Serial No	EMSD.Common.Serial No.	TECHID-999999
		Start-up Date	EMSD.Common.Start-up Date	01.12.2000
		Technical ID No	EMSD.Common.Technical ID No. Superior	01.12.1999
		Vendor Warranty End	EMSD.Common.Vendor Warranty End	B12345678
		Vendor Warranty Start	EMSD.Common.Vendor Warranty Start	01.12.1999
		Documentation	EMSD.Common.Documentation	..... "Project Name"\30_O&M Documentation\304 HVAC System\O&M\AHU.pdf
		Catalog Profile	EMSD.Common.Catalog Profile	AC0000001
		Equipment Description	EMSD.Common.Equipment Description	
		Planner Group	EMSD.Common.Planner Group	T00
		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 4.2(b)	Equipment Location	EMSD.HVAC.Equipment Location	AHUR
		First filter	EMSD.HVAC.1st Filter	Gas Filter
		Second filter	EMSD.HVAC.2nd Filter	NONE
		Equipment Type	EMSD.HVAC.Equipment Type	Air Handling Unit
		Made by which company	EMSD.HVAC.Make	ABC Company
		Contain UV Sterilizing	EMSD.HVAC.UV Sterilizing Light	Y
		Contain VSD or not	EMSD.HVAC.VSD	Y
		Air Flow	EMSD.HVAC.Air Flow	6100
		Cooling Capacity	EMSD.HVAC.Cooling Capacity	214.6
		Rated Power Input	EMSD.HVAC.Rated Power Input	30

The Contractor shall input the following asset attributes inside the BIM model for those E&M equipment not listed on EMSD asset templates as shown in Appendix B.

Table 4.2 : Requirement of asset attributes 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 Section 2.7	(i) EMSD.Common.Asset Code (ii) EMSD.Common.Zone Tag No. (iii) EMSD.Common.Manufacturer (iv) EMSD.Common.Model No. (v) EMSD.Common.Equipment Description (vi) EMSD.Common.Documentation	M M O O M O
E&M Equipment marked with (**) in Section 2.7	(i) EMSD.Common.Asset Code (ii) EMSD.Common.Asset Tag No. (iii) EMSD.Common.Zone Tag No. (iv) EMSD.Common.Manufacturer (v) EMSD.Common.Model No. (vi) EMSD.Common.Equipment Description (vii) EMSD.Common.Documentation (viii) EMSD.Common.Asset Relationship	M M M M O M O M

E&M equipment not listed on EMSD asset Templates	Asset Attributes Required	Mandatory (M) / Optional (O)
E&M Equipment, i.e. sprinkler, marked with (#) in Section 2.7	(i) EMSD.Common.Asset Code (ii) EMSD.Common.Manufacturer (iii) EMSD.Common.Model No. (iv) EMSD.Common.Equipment Description (v) EMSD.Common.Documentation (vi) EMSD.FS.Upstream Asset Code (vii) EMSD.Common.Asset Relationship	M O O M O M M
E&M Equipment marked with (@) and not shown in Section 2.7	No asset attributes required	n/a

4.3. COBie

This section describes the concept and the application of COBie.

4.3.1. 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.

4.3.2. COBieLite Files

COBieLite is used to integrate the data in BIM model into EMSD's Asset Management System. The COBie xml file will contain 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 model should involve all EMSD attributes as shown in Fig. 4.2.

Fig 4.2 Example of COBieLite xml file with EMSD specified attributes

4.3.3. Asset Information Inputting Tool (AIIT)

AIIT is a web-based system developed by EMSD to manage asset information and create corresponding asset relationship 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 AIIT for BIM-AM system can be referred to Fig 4.1.

The Contractors should liaise with EMSD to obtain login ID and passcode for the use of AIIT and they are responsible to the following tasks before the handover of as-built BIM models.

(a) Create asset relationship (i.e. system topology) in AIIT and an example of asset relationship for CCTV system is illustrated in Fig 4.3.

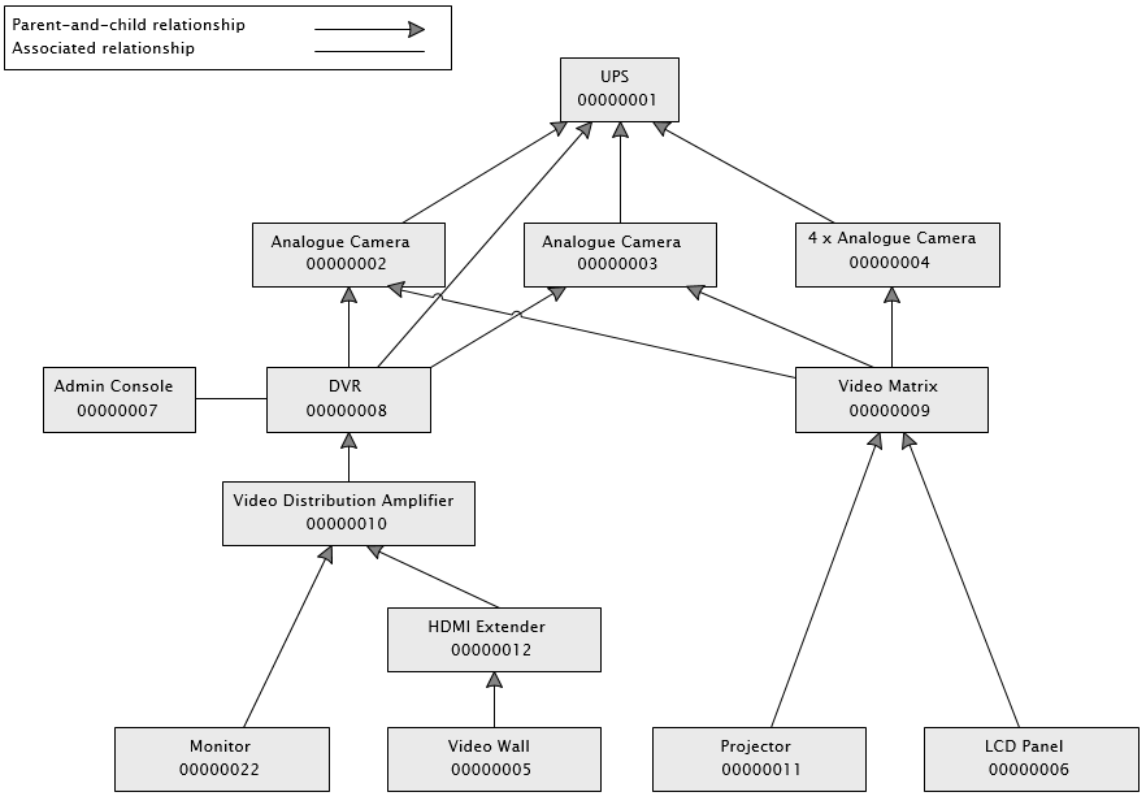


Fig 4.3 Asset Relationship of a CCTV system

(b) Create “Level 1 system” as specified in Section 2.7 that cannot be shown in the BIM model.
(c) Validate the asset data input and format.
(d) Upload all the documents as specified in Section 1.2, including testing and commissioning reports, catalogues, drawings, certificates and O&M manuals etc., under a zip file for each Level 1 System.
(e) Assign the document path of dedicated files, e.g. PDF, words etc., in the zip file as mentioned in (d) to corresponding Level 2 assets.

The User Guide of AIIT can be referred to Appendix C.

Chapter 5

Interfacing/Intergrating BIM-AM System with other systems

5. 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.

5.1. Interfacing with Building Management System (BMS) / Central Control and Monitoring System (CCMS) / Real Time Location System (RTLS) / Internet-of-Things (IoT) devices / Long Range Radio (LoRA) network

When real time system is required to be monitored / controlled directly from BIM-AM System, **web services** application programming interface (API), such as RESTful or SOAP, for data exchange in XML/JSON format should be developed at both sides of the real time systems and the BIM-AM System. BMS sensor readings should be mapped to the associated Level 2 asset for the operation of BIM-AM System.

Simple monitoring /control of real time system without storing historical data in the BIM-AM System is preferred. The interface of BIM-AM with real time systems should be by means of **web link** in which the web application of the real time system should be equipped with accessible web links of iOS and/ or Android browser.

5.2. Integrating Mobile BIM-AM System with RFID Reader

5.2.1 RFID Readers

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

5.2.2 Provision of Passive Asset Tags and Zone Tags

The RFID readers as specified in Section 5.2.1 can read the passive UHF RFID tags compatible with EPC Class 1 Gen2. The 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 Section 2.7 should be mounted with a RFID asset tag. QR codes instead of RFID tags shall be adopted for those 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. sprinkler heads, 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 stuck at floor boxes, door frames or at faceplates which is subject to approval by Project Engineer/ EMSD.

Details of tagging requirement for each “EMSD Level 2 Asset” are illustrated in Table 5.1.

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
1	**Lift and Escalator**	Lift and Escalator (^)	LAE			✓	
		Electric Lifts *(including the application for passenger lift, good lift, freight lift, vehicle lift, platform lift, stair-lift and dumbwaiter)*	ELL	✓ (Note 1)			
		Hydraulic Lifts *(including the application for passenger lift, good lift, freight lift, vehicle lift, platform lift, stair-lift and dumbwaiter)*	HYL	✓ (Note 1)			
		Escalators / Passenger Conveyors	EPC	✓ (Note 2)			✓
2	**LV Switchboards**	LV Switchboard (^)	LVS	✓			✓
		Battery *(including battery charger)*	BAT			✓	✓
		Harmonic filter	HAR			✓	✓
		Switchgear *(including ACB, MCCB, F/S, Contactor)*	SWG			✓	✓
		Relay	REL			✓	✓
		Capacitor	CAP			✓	✓
3	**Emergency Generator**	Generator (^)	GEN	✓			✓
		Diesel Engine	DIE			✓	✓
		Alternator	ALT			✓	✓
		Controller	CTR			✓	✓
		Undervolt Relay	URE			✓	✓
		Fuel Tank	FUT	✓			✓
		Fuel Pump	FPMP	✓			✓
		Battery Charger	BAC			✓	✓
		Battery	BAT			✓	✓
4	**HVAC (Air Side)**	Air Side (^)	AS			✓	
		DX Unit *(including split-type DX units, VRV outdoor units, single packaged units and computer room air-conditioner)*	DXU	✓			✓
		VRV-IDU	IDU	✓			✓
		Air Handling Unit	AHU	✓			✓
		Primary Air Handling Unit	PAU	✓			✓
		Heat Wheel	HW			✓	✓
		Fan Coil Unit	FCU	✓			✓
		Fire Damper	FD	✓			✓
		Fresh Air Fan	FAF	✓			✓
		Exhaust Air Fan	EAF	✓			✓
		VAV Box	VAV	✓			✓
		Local Control Panel (*)	LMCP			✓	✓
	HVAC (Water Side)	Water Side (^)	WS			✓	
		Chiller	CHR	✓			✓
		Heat Pump Type Chiller	HPC	✓			✓
		Cooling Tower	COT	✓			✓
		Heat Exchanger	HEX	✓			✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
4	HVAC (Water Side)	Pump *(including chilled water pumps, condenser water pumps, cooling tower bleed off pump, heating water pump and saline water pump etc.)*	PMP	✓			✓
		Pressurized Water Sys	PWS	✓			✓
		Water Treatment Sys *(including those serving chiller water, condenser water (fresh water) and condenser water (sea water)*	WTS	✓			✓
		Auto-strainer	ASR	✓			✓
		Travelling Band Screen	TBS	✓			✓
	HVAC (Cold Room / Store)	Cold Room/Store (^)	CRM	✓			✓
	HVAC (Miscellane-ous)	CCMS (e.g. DDC)	CCMS			✓	✓
		Room Cooler	RCR	✓			✓
		Refrigerator *(including those for blood, food, medicine, vaccine, specimen etc.)*	RFR	✓			✓
		Motor Control Centre (*)	MCC			✓	✓
5	Boiler System	Boiler System (^)	BLR			✓	
		Hot water boiler	HWB	✓			✓
		Steam boiler	STO	✓			✓
		Gas boiler (**)	GAB	✓			✓
		Calorifier	CAL	✓			✓
		Heat Exchanger	HEX	✓			✓
		Pump *(including the application for booster, circulation, boiler feed etc.)*	PMP	✓			✓
		Expansion Tank (@)	EXT			✓	
		Local Control Panel (*)	LMCP			✓	✓
6	Filtration Plant	Filtration Plant (^)	FP			✓	
		Electric Boiler	ELB	✓			✓
		Diesel Boiler	DIB	✓			✓
		Electro-Chlorinator System	ECS	✓			✓
		Filtration Tank *(including those sand tanks, carbon tanks and reaction tanks.)*	FIT	✓			✓
		Pump	PMP	✓			✓
		Motor	MOT			✓	✓
		MCC Panel	MCCP	✓			✓
		Ozone Generator System	OGS	✓			✓
		Ultraviolet Sterilizer	ULS	✓			✓
		Building Management System	BMS			✓	✓
		Controller Analyser and Sensor *(including those sensors for measuring ppm, mV, PH, ^oC and ORP)*	CAS			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
6	Filtration Plant	Chemical Dosing Pump *(including the application for NaOCl, Soda, ALUM, Acid and Brine)*	CHP	✓			✓
		Air Blower *(including the application for sand tank and NaoCl tank)*	AB	✓			✓
		Piping System	FIL			✓	
		Air Release Valve (for filtration tanks)	ARV			✓	✓
		Variable Speed Drives / Soft Starter	VSD/ SS			✓	✓
		Misc. Swimming Pool Equipment *(e.g. electric valve)*	MSP			✓	✓
		Heat Exchanger	HEX	✓			✓
		Local Control Panel (*)	LMCP			✓	✓
7	Fire Services Installation	Wet System (^)	WTS			✓	
		Pump *(including FH/HR water pump, sprinkler water pump, drencher water pump, jockey pump and fire service upfeed pump)*	PMP	✓			✓
		Sprinkler control valve set & accessories *(including sprinkler control valve set, sprinkler subsidiary valve, pre-action recycling sprinkler control valve set, air compressor, dry alarm sprinkler control valve, foam-water sprinkler control valve set)*	SCV	✓			✓
		Sprinkler Heads (#)	SPR			✓	
		Fire Hydrant (*)	FH			✓	✓
		Street Fire Hydrant (*)	SFH			✓	✓
		Hose Reel (*)	HR			✓	✓
		Pressure Relief Valve (*)	PRV			✓	✓
		Fire Service Inlet (*)	FSI			✓	✓
		Sprinkler Inlet (*)	SPI			✓	✓
		Local Control Panel (*)	LMCP			✓	✓
		Automatic Fire Detection and Alarm System (^)	AFA			✓	
		Fire Alarm equipment *(including manual call point, smoke detector, flashing lighting, alarm siren, alarm bell, heat detector, optical beam smoke detector, multi-sensor detector and fire alarm panel)*	FAE			✓	✓
		Audio/ Visual Advisory System	AVA			✓	✓
		Gas Suppression System (^)	GSS			✓	
		Gas cylinder and equipment *(including gas cylinders, control panels and discharge nozzles for CO_2, FM200, NAFS III and Novec 1230 system)*	GCE	✓ *(for cylinders)*		✓ *(for control panel & nozzles)*	✓
		Portable Equipment (^)	PE			✓	

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
7	Fire Services Installation	Portable fire extinguisher *(including all type of fire extinguishers, fire blanket and sand bucket)*	PFE	✓			✓
		Gas Detection System (^)	GDS			✓	
		Gas detector and equipment *(including CO_2 gas detector, hydrogen gas detector, ammonia gas detector, ozone gas detector and gas detection control panel)*	GDE	✓ *(for control panel)*		✓ *(for all detectors)*	✓
		Exit sign & Directional sign (^)	EXS			✓	✓
8	UPS	UPS System (^)	UPS			✓	
		Battery System	BATS	✓			✓
		Static Transfer Switch	STS	✓			✓
9	Burglar Alarm and Security Installation (Access Control system)	Access Control System (^)	ACS			✓	
		Panel *(including control panel, telephone door phone panel, buzzer & lighting indicator panel etc.)*	PAN	✓			✓
		Lock/Button/Switch *(including electro-magnetic lock, door release button, bypass key switch etc.)*	LBS			✓	✓
		Emergency Breakglass	EMB			✓	✓
		Lock Control Unit	LCU			✓	✓
		Smart Card Reader	SMR			✓	✓
		Card Reader Control	CRC	✓			✓
		Remote Rel. But. Receiver	RER			✓	✓
		Intercom *(including door phone system, intercom door station and intercom master station etc.)*	INM		✓		✓
		Computer	COM		✓		✓
		Turnstiles	TUR			✓	✓
		Network Switch (note 3)	NES			✓	✓
		Sounder (note 3)	SOU			✓	✓
		Accessories *(including keypad, UPS/battery, electro-magnetic contact, electric strike, access control converter, interface board etc.)*	ACC			✓	✓
	Burglar Alarm and Security Installation (Burglar Alarm System)	Burglar Alarm System (^)	BAS			✓	
		Panel *(including zones alarm panel, alarm repeater, outdoor S.S. panel, push button wall etc.)*	PAN	✓			✓
		Lock/Button/Switch *(including call bell button, bypass key switch, emergency lock, push alarm E-lock etc.)*	LBS			✓	✓
		Intrusion Detector *(including electro-magnetic contact, wide angle duet tech detector, dual tech motion detector etc.)*	IND			✓	✓
		Power Mgt Unit *(including control room charge, telephone link charge, power supply unit & battery and UPS for DVR etc.)*	PMU			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
9	**Burglar Alarm and Security Installation (Burglar Alarm System)**	Amplifier	AMP		✓		✓
		Controller *(including volume controller, lighting controller etc.)*	CTR	✓			✓
		Camera	CAM			✓	✓
		Audio / Video Product (e.g. player, record)	AVP		✓		✓
		Projecting Product *(including LCD projector, visualizer etc.)*	PRP		✓		✓
		Screen/Monitor	SCM		✓		✓
		Network Switch (Note 3)	NES			✓	✓
		Battery (note 3)	BAT			✓	✓
		Accessories *(including S.A. bell, video control unit, video door-phone set, wireless microphone, colume speaker, siren, transformer, buzzer light etc.)*	ACC			✓	✓
	Burglar Alarm and Security Installation (CCTV and Intercom System)	CCTV and Intercom System (^)	CCTVI			✓	
		Intercom *(including handset with release button)*	INM		✓		✓
		Camera	CAM			✓	✓
		Video Switcher	VIS		✓		✓
		Multi-Channel DVR / NVR	DVR/ NVR		✓		✓
		Duplex Multiplexer	DUM		✓		✓
		Computer	COM		✓		✓
		Network Switch (note 3)	NES			✓	✓
		Display Unit (note 3)	DIU		✓		✓
		Accessories *(including backward direction control, UPS, video distribution amplifier, control keyboard, media converter, fibre transmitter/ receiver, LCD KVM switch, HDMI extender etc.)*	ACC			✓	✓
	Burglar Alarm and Security Installation (Smart Card System)	Smart Card System (^)	SCS			✓	
		Security Computer	SEC		✓		✓
		Printer	PRI		✓		✓
		Access Controller	ACR	✓			✓
		Card Reader	CAR			✓	✓
		Keypad	KEP			✓	✓
		Lock/Button/Switch *(including door release button, electro-magnetic lock, alarm shunt key switch etc.)*	LBS			✓	✓
		Control Unit	COU	✓			✓
		Power Mgt Unit	PMU			✓	✓
		Battery (note 3)	BAT			✓	✓
		Sounder (note 3)	SOU			✓	✓
		Accessories *(including interfacing module, interconnection point with FS panel, alarm siren etc.)*	ACC			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
9	Burglar Alarm and Security Installation (Call Alarm System)	Call Alarm System (^)	CAS			✓	
		Control Panel	COP	✓			✓
		Alarm Siren/Bell	ASB			✓	✓
		Button *(including push button, emergency call button etc.)*	BUT			✓	✓
	Burglar Alarm and Security Installation (Videophone System)	Videophone System (^)	VPS			✓	
		Extension Speaker	EXS			✓	✓
		Station *(including master station and door station etc.)*	STA	✓			✓
		Handset	HAN			✓	✓
		Videophone Control	VPC	✓			✓
		Network Switch (note 3)	NES			✓	✓
	Burglar Alarm and Security Installation (Keypad Lock System)	Keypad Lock System (^)	KLS			✓	
		Keypad	KEP			✓	✓
		Backup Battery	BAB	✓			✓
		Door Release Button	DRB			✓	✓
	Burglar Alarm and Security Installation (Drop-arm Barrier)	Drop-arm Barrier(^)	DAB			✓	
		Control Panel	COP	✓			✓
		Barrier Gate	BAG			✓	✓
		Detector *(including infrared magnetic loop etc.)*	DER			✓	✓
		Card Acc. Controller	CAC	✓			✓
		Proximity Card	PRC			✓	✓
		Intercom *(including intercom door station, intercom master station etc.)*	INM		✓		✓
		Recorder	REC		✓		✓
		Workstation Unit	WOU		✓		✓
		Accessories *(including push button, LCD monitor, UPS supply etc.)*	ACC			✓	✓
	Burglar Alarm and Security Installation (Electric Lock System)	Electric Lock System (^)	ELS			✓	
10	Radar and Navigation System	Radar and Navigation System (^)	RNS			✓	
		Antenna	BRR			✓	✓
		Turning unit	TUU		✓		✓
		Display and processing unit	DPU		✓		✓
		Network Equipment *(including switch, hub, router etc.)*	NEE			✓	✓
		Video camera	VIC			✓	✓
		Accessories *(including AIS receiver, AIS transceiver, GPS receiver, fluxgate, gyrocompass, satellite compass, electronic sea chart, echo sounder, wind sensor,*	ACC			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
		speed log, speed indicator, monitor, instrument display unit, control panel, digital video recorder, pan tilt head etc.)					
11	**Microwave Link System**	Microwave Link System (^)	MLS			✓	
		Antenna	ANT			✓	✓
		Transceiver	TRAN			✓	✓
		RF Interface Unit *(including duplexer, coupler combiner, exciter, filter, splitter, waveguide etc.)*	RIU		✓		✓
		Processing unit *(including multiplexer, modulator etc.)*	PRU		✓		✓
		Network Equipment *(including switch, hub, router etc.)*	NEE		✓		✓
		Accessories	ACC			✓	✓
12	**Timing & Display System**	Timing & Display System (^)	TDS			✓	
		Operator Control Console / Workstation, PC	OCC		✓		✓
		Control Unit / Server	CUS		✓		✓
		Sensing Unit	SEU			✓	✓
		Master Clock Unit	MCU			✓	✓
		Video Display Unit	VDU			✓	✓
		Video & Audio Equipment *(including monitor, camera, extender, switch/ splitter/ matrix, video player etc.)*	VAE			✓	✓
		Network Equipment *(including router/ switch, firewalls/ security appliances, fiber equipment, cables/ connectors, printer, dispenser etc.)*	NEE			✓	✓
		Queue Management Unit *(including public kiosk, counter keypad etc.)*	QMU			✓	✓
		Uninterruptible Power Supply	UPS	✓			✓
13	**Audio Video System**	Audio Video System (^)	AV			✓	
		Player	PLA		✓		✓
		Recorder	REC		✓		✓
		Console (i.e. computer)	CONS	✓			✓
		Miscellaneous *(including analyzer, control panel, generator, limiter, matrix, patch panel, selector/ switcher, time synchronizer etc.)*	MIS			✓	✓
		Distribution Amplifier	DIS		✓		✓
		Switch *(including the switches for HDMI, VGA, DVI, multimedia etc.)*	SW			✓	✓
		Splitter	SPL			✓	✓
		Extender	EXT			✓	✓
		Matrix Switcher	MAT			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
13	Audio Video System	Display Unit *(including digital whiteboard, TV monitor, projector, screen, video wall, visualizer etc.)*	DIU		✓		✓
		Audio Amplifier	AAM			✓	✓
		Audio Mixer	AMI			✓	✓
		Audio Equalizer	AEQ			✓	✓
		Audio Loudspeaker	ALO			✓	✓
		Audio Microphone	AMC			✓	✓
		Audio Miscellaneous *(including antenna, combiner, converter, IR emitter, IR receiver, processor, simultaneous interpretation system, sound box, UPS, transcriber etc.)*	AMS			✓	✓
14	Audio Electronics System	Audio System (^)	AUS			✓	
		Amplifier	AMP		✓		✓
		Chairman Unit	CHU			✓	✓
		Controller	CTR	✓			✓
		Delegate Unit	DEU			✓	✓
		Recorder	REC		✓		✓
		Mixer	MIX		✓		✓
		PC Workstation	PCW		✓		✓
		Equalizer	EQU		✓		✓
		Loudspeaker	LOU			✓	✓
		Loop Amplifier	LAM		✓		✓
		T-coil (Hearing Aid)	TCO			✓	✓
		Microphone	MIC			✓	✓
		Intercom Master Station	IMS		✓		✓
		Network Switch	NES			✓	✓
		Intercom Slave Station	ISS		✓		✓
		Annunciator	ANN			✓	✓
		Matrix	MAT			✓	✓
		Interpreter Unit	INT		✓		✓
		Induction Loop (note 4)	ILP			✓	✓
		Miscellaneous *(including analyser, antenna, audio tape, players, combiner, converter, extender, IR emitter, IR receiver, monitor, processor, simulator interpretation system, sound box, splitter, switcher, tape, transcriberm UPS, zone selector etc.)*	MIS			✓	✓
15	Radio System	Radio System (^)	RS			✓	
		Base Radio/Repeater *(including transmitter, receiver, transceiver bi-directional amplifier etc.)*	BRR		✓		✓
		RF Interface Unit *(including duplexer, coupler combiner, exciter, filter, splitter etc.)*	RIU		✓		✓
		Antenna	ANT			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
15	Radio System	Power Supply (e.g. UPS, DC power supply)	POS	✓			✓
		Console (e.g. workstation)	CONS	✓			✓
		Voice logger	VLO		✓		✓
		Network Equipment *(including switch, router, firewall, encryptor, server, modem etc.)*	NEE			✓	✓
		Radio Terminals	RAT			✓	✓
		Accessories *(including battery charger, speaker, earpiece, microphone, multiplexer, PTT switch etc.)*	ACC			✓	✓
16	Closed Circuit TV System	CCTV System (^)	CCTV			✓	
		Camera	CAM			✓	✓
		Network Switch	NES			✓	✓
		Video Recorder	VIR		✓		✓
		Console (e.g. workstation)	CONS	✓			✓
		Display Unit *(including video wall, projector, monitor, LCD panel etc.)*	DIU		✓		✓
		Video Matrix	VIM		✓		✓
		Transceiver (note 3)	TRAN			✓	✓
		Receiver (note 3)	REC			✓	✓
		Miscellaneous *(including O/E converter, E/O converter, video encoder, video decoder, VDA, HDMI extender, PoE injector, PoE splitter, selector/ switcher etc.)*	MIS			✓	✓
17	Broadcast Reception Installations (UHF TV System)	UHF TV System (^)	UTV			✓	
		Antenna/Preamplifier *(including bandpass fitler)*	ANT/ PAM		✓		✓
		Ch Amplifier/Amplifier	AMP		✓		✓
		Accessories *(including attenuator, rejection filter, CCTV modulator, RF modulator, equalizer, power supply unit, splitter, tee unit, channel optic coupler, combiner, filter optics receiver etc.)*	ACC			✓	✓
	Broadcast Reception Installations (Satellite TV System)	Satellite TV System (^)	STV			✓	
		Antenna / Amplifier *(including satellite dish, antenna, IF insertion amplifier, feedhorn, LNB etc.)*	ANT/AMP			✓	✓
		Receiver *(including satellite receiver, RF modulator, amplifier etc.)*	REC		✓		✓
		Converter *(including programmable controller)*	CON		✓		✓
		Accessories *(including satellite IF outlet, wide-band splitter, wide-band T-unit, motor control kit, sat. mulit-switch, steel frame cleaning, optical transmitter, fiber cable etc.)*	ACC			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
18	Lighting System	Lighting System(^)	LTG				✓
		Luminaire *(including external and exterior lighting and signs)*	LUM			✓	✓
		Lighting Control System *(including relay controller, lighting controller, motion sensor, control panel and occupancy sensor)*	LCS	✓ *(for control panel)*		✓ *(for sensors)*	✓
19	Electrical Distribution System	Electrical Distribution System (^)	EL			✓	
		Busbar Trunking / Main Distribution Cable	BBT			✓	
		Isolating switch	ISW			✓	✓
		Distribution Board	DTB	✓			✓
		ACB	ACB			✓	✓
		MCCB	MCCB			✓	✓
		Fuse switch & Switch fuse	FSW			✓	✓
		MCB	MCB			✓	✓
		RCD/RCBO	RCD/RCBO			✓	✓
		Power Quality Monitoring Device (*)	PQM			✓	✓
		PV panels (**)	PV			✓	✓
20	Medical Gas System (MG)	Medical Gas System (^)	MG			✓	
		Compressor	COM	✓			✓
		Receiver / Reservoir	REC	✓			✓
		Vacuum Pump	VP	✓			✓
		Blower *(for Anaesthetic Gas Scavenging System)*	AGP	✓			✓
		Manifold	MAN	✓			✓
		Oxygen VIE Tank	VIE	✓(note 6)			
21	Pneumatic Tube Transport (PTS)	Pneumatic Tube Transport (^)	PTS			✓	
		Sending and Receiving Station	SRS	✓			✓
		Blower Unit	BLW	✓			✓
		2-Way Diverter	2WD	✓			✓
		3-Way Diverter	3WD	✓			✓
		Empty Carrier Storage Station	ECS	✓			✓
		Dumping Station	DS	✓			✓
		Power Pack	PP	✓			✓
		Central Control Unit	CCU		✓		✓
		Master Workstation	MW		✓		✓
A1	Plumbing System	Plumbing System (^)				✓	
		Sump Tank (@)	SUT			✓	✓
		Roof Tank (@)	ROT			✓	✓
		Booster pump (*)	BPMP			✓	✓
		Transfer pump (*)	TPMP			✓	✓
		Pressure vessel (*)	PVES			✓	✓
		Electric heater (*)	EHT			✓	✓

Table 5.1 Provisional Requirement of RFID tags and QR codes for EMSD Level 1 and Level 2 Assets

No.	System Name	Equipment Type	Equip. Code	Asset Tag (to be tagged on asset)			Zone Tag
				RFID tag with QR Code Label	QR Code Label	Tagging is NOT required	QR Code Label
		Gas heater (*)	GAH			✓	✓
		Pressure Relief Valve (*)	PRV			✓	✓
		Local Motor Control Panel (*)	LMCP			✓	✓
A2	Drainage System	Drainage System (^)	DR			✓	
		Waste water sump pump (*)	WWSP			✓	✓
		Soil & waste water sump pump (*)	SWSP			✓	✓
		Rainwater sump pump (*)	RWSP			✓	✓
		Local motor control panel (*)	LMCP			✓	✓
A3	Water Leakage Detection System	Water Leakage Detection System (^)	LDS			✓	
		Leak Detection Panel (*)	LDP			✓	✓
A4	Mechanical Handling & Lifting Installation	Mechanical Handling & Lifting Installation (^)	MHL			✓	
		Gondola (*)	GON			✓	✓

Note:

1. **Paper** asset tags for lifts shall be provided underneath the “use permit” inside lift cars.
2. **Paper** asset tags for escalators shall be provided underneath the “use permit”.
3. The asset information for network switch and display unit shall follow the asset template of “Accessories” or “Miscellaneous”.
4. Equipment marked with (^) is the Level-one equipment type.
5. Equipment marked with (*), (**) (#) and (@) is not in the EMSD asset templates.
6. The RFID tag should be tied to the metal fencing outside the concrete enclosure of oxygen VIE tank.

5.2.3 Installation Requirement of RFID Tag and QR code

Generally, the distance between RFID tags should be provided in approximate 4-meter interval and the distance between RFID readers and tags should be also within 4 meters during operation. Thus, RFID tags are not necessarily required for those E&M equipment with bottom level higher than 6m above finished floor level. Adhesive label with RFID asset code and the associated QR code shall be stuck on the RFID tag as shown in Fig 5.1 and the size of QR code label shall not be smaller than 2.4cm x 2.4cm as shown in Fig 5.2.

Fig 5.1 Requirement of label on RFID tag

Fig 5.2 Recommended size of QR code label

The 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 in Table 5.2 for reference and the exact location shall be subject to approval by Project Engineer.

Table 5.2 Examples of asset tags and zone tags installation on site

 RFID Tag for VAV Box	 RFID Tag for AHU (next to nameplate)

Table 5.2 Examples of asset tags and zone tags installation on site (Cont'd)

RFID Tag for fire dampers

RFID Tag for control valve set

Zone Tag at floor box

Zone Tag at faceplates

Paper Tag underneath the "Use Permit" of Lift and Escalator

RFID Tag for Fire Extinguisher

5.2.4 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 the 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 of either Hexadecimal (HEX) or ASCII, if applicable.

Table 5.3 Asset Tag Coding Requirement

Asset tag code consists of 5 parts as shown below with **maximum 16 characters**.

Building Code	Separator	System No.	Type of Asset Tags	Sequence
<= 5 characters (refer Section 2.3)	1 character	2 characters (refer Section 2.6)	1 character	7 characters
e.g. EMSDN	-	01 – Lift & Escalator 02 – LV Switchboard … … 19 – Electrical Distribution	0 – RFID Tag 1 – QR Code	0000001 0000002 … … 9999999

Examples:

1. Fan Coil Unit in EMSD Headquarter:

RFID Asset Tag Coding:	**EMSDN-0410000001**

2. Intercom of Access Control System in EMSD Headquarter:

QR Code Asset Tag Coding:	**EMSDN-0900000001**

Table 5.4 Zone Tag Coding Requirement (QR Code)

Building Code	Separator	Level	Separator	Sequence
<= 5 characters	1 character	3 characters	1 character	6 characters
e.g. EMSDN	-	B01 – Basement 1 G00 – Ground L01 – Level 1	-	000001 000002 … 999999

5.2.5 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.

5.3 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 with accessible web link 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.

Chapter 6

BIM-AM Deliverables Checklist

6. BIM-AM Deliverable Checklist

To ensure the completeness of BIM model submission and streamline the handover process, the deliverable checklist serves to assist contractors to check and provide necessary information as specified in this BIM-AM Standard.

BIM-AM Deliverable Checklist			
Deliverables	**Items**		**Comments / Remarks**
BIM Model			
1. BIM Project Model	**1.1 Model Management**		
	(a) Separated Models by disciplines and systems as specified in Section 2.6	☐	
	(b) Each model file size around 400Mb	☐	
	(c) "Master" federated model with link to all system models	☐	
	(d) Handover the file structure as specified in Section 1.2	☐	
	(e) Central models instead of local models shall be submitted.	☐	
	1.2 Naming Convention		
	(a) Model naming	☐	
	(b) Object naming	☐	
	1.3 Model Setup		
	(a) Editable BIM project files in native formats	☐	
	(b) Unit and symbol	☐	
	(c) Location and Geo-Coordination	☐	
	(d) Delete all the worksets for handover	☐	
	(e) Set "Fine" view and "Consistent colour" for handover	☐	
	1.4 E&M System		
	(a) Modelling with system standard	☐	
	(b) Create "Panel Schedules" for all electrical distribution boards	☐	
	1.5 **Architectural & Structural Model**		
	(a) Architectural model with reflected ceiling plans and access panels	☐	
	(b) Space should be created in architectural model for zone tagging	☐	

BIM-AM Deliverable Checklist			
Deliverables	**Items**		**Comments / Remarks**
BIM Model			
	(c) Structural BIM Modelling per CIC standard	☐	
	1.6 Presentation Style		
	(a) System coloring	☐	
	(b) Object texture or surface colour	☐	
	1.7 Maintainability		
	(a) Clearance spacing	☐	
	(b) Editable BIM object files in native formats	☐	
	1.8 Object Parameter Setup		
	(a) For those equipment with EMSD asset templates, the parameters as shown in Appendix D, shall be created as object parameters.	☐	
	(b) For those equipment not on the list of EMSD asset templates, the parameters as shown in Table 4.2 shall be created as object parameters.	☐	
2. BIM viewing software for multidisciplinary coordination *(Note 1)*	(a) Model naming	☐	
	(b) One Federated model with linked models	☐	
	(c) Clash checking reports, if applicable	☐	
Asset Information			
3. BIM Model Information	**4. Asset Information**		
	(a) EMSD level 1 and 2 asset parameters input per Asset Information Requirement in Appendix B.	☐	
	(b) Asset parameter input as specified in Table 4.2 for those E&M equipment NOT listed on the EMSD asset templates	☐	

Note:

1. The submission, such as Navisworks, is applicable to EMSD Addition & Alteration (A&A) projects.

Appendices

Appendix A - Building Code

List of buildings in Hong Kong and their corresponding building code.

Appendix B – Asset Information Requirement

The asset data templates for all equipment information required for EMSD maintenance services of the 21 E&M systems.

Appendix C – Asset Information Input Tool (AIIT) User Guide

Appendix D – Shared Parameters File for EMSD BIM-AM