CONSTRUCTION INDUSTRY COUNCIL
建造業議會

BIM

CIC Building Information Modelling Standards

Mechanical, Electrical and Plumbing

August 2019

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Document Revision Tracking

Issue Date	Notes
August 2019	

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Foreword

In 2015, the Construction Industry Council (CIC) published the BIM Standards (Phase One)(renamed as the CIC BIM Standards - General). These were intended to be simple and straightforward Standards that it could be easily mastered by lay persons and new BIM practitioners. Since 2015 then, BIM practitioners have gained more practical project experience, and there has been much wider adoption of BIM in various areas of the Architectural, Engineering, Construction and Operations (AECO) industry in Hong Kong. With the release of the Technical Circular (Works) Nos. 7/2017 & 18/2018 by the Development Bureau (DEVB) of The Government of the Hong Kong Special Administrative Region (HKSAR), capital works projects with project estimates more than $30 Million are mandated to use BIM technology from 1st January 2018 onwards. All along the CIC has continued to elaborate and establish the BIM Standards for specific BIM usages and disciplines, and to conduct consultations with relevant stakeholders.

With the establishment of the Task Force on BIM Standards (Phase Two) on 21 November 2017, CIC would identify and align the common practices as well as set up new standards and guidelines to facilitate better implementation and adoption of BIM technologies in project execution. The BIM Standards (Phase Two) cover the following specific BIM usages or disciplines:

(i) Statutory Plan Submission
(ii) Underground Utilities (UU)
(iii) Mechanical, Electrical and Plumbing (MEP)

This document sets out the BIM Standards for MEP and it should also be read in conjunction with the CIC BIM Standards – General.

The appropriate Level of Development (LOD) for adoption of a BIM Standards is a controversial topic, especially in the MEP discipline. The CIC view is that it is necessary to define a standard and align the industry with a consistent understanding, otherwise, this may cause misunderstanding and ambiguities among clients and project teams, and lead to additional time and cost.

This CIC BIM Standards for MEP (the ‘Standards’) is focused on LOD which is a software neutral. The LOD framework and approach set out in this Standards apply to the MEP discipline.

The CIC understands that the level and depth of BIM adoption in different AECO organisations in Hong Kong vary considerably. To facilitate and encourage wider adoption of BIM in the industry, this Standards covers the minimum requirements for reference. More advanced BIM users can further extend and develop on top of this Standards. The CIC will review the Standards regularly to suit industry demands and expectations.

Ada FUNG

Chairperson

Committee on Building Information Modelling

Construction Industry Council

August 2019

Abbreviation

AECO	Architectural, Engineering, Construction and Operations
BIM	Building Information Modelling
CAD	Computer Aided Drafting
CIC	Construction Industry Council, Hong Kong
LOD	Level of Development
MEP	Mechanical, Electrical and Plumbing
QTO	Quantity take-offs

The CIC BIM Standards for Mechanical, Electrical and Plumbing (MEP) requirements are expressed in sentences in which the principal auxiliary verb is "shall". Recommendations are expressed in sentences in which the principal auxiliary verb is "should". The use of the auxiliary verb "can" indicates that something is technically possible and the auxiliary verb "may" indicates permission.

1 Introduction

1.1 General

This Standards provides a standardised Level of Development (LOD) framework and a common language for the use of BIM in the MEP discipline in the construction industry in Hong Kong. This Standards is a reference document which states minimum requirement. Project clients / employers should adjust the details to suit their specific project requirements.

1.2 Objectives

The objectives of this Standards are:

1.2.1. To provide the approach and direction to help project clients / employers and the project team agree on the details and information on MEP elements that need to be provided in a project.

1.2.2. To assist project clients / employers and the project team to define and specify the contents of BIM models during the implementation of BIM for MEP in a project.

1.2.3. To serve as a regional level BIM standards that can be referenced by the local industry and used it as a base for further extension to suit project specific needs.

This Standards aims to enable a project team to clearly specify the content of BIM models for MEP at each stage of a project. The project clients / employers should note the following points when developing or using the LOD for MEP elements / objects;

1.2.4. The LOD should satisfy the BIM uses for each project and may vary from project to project. It is unnecessary to produce high LOD model elements as long as they fulfil the BIM uses and objectives in the project.

1.2.5. The LOD should be specified for individual model elements / objects, instead of for the entire model. For example, for as-built models, different elements may have different LOD, some elements may only need to be modelled to LOD 300 while others may need to be modelled to LOD 400 for fabrication.

1.2.6. The LOD includes not only graphical representation but also non-graphical information associated with the relevant model elements / objects. The Client and

the project team can follow the approach described in this Standards to agree on the required LOD.

At the outset, it is important to agree on the BIM uses at various project stages and then work out the elements / objects with suitable LODs to be included in the BIM models for each stage. Clear understanding and expectations of the BIM model and information details are essential for successful application of BIM in the project.

1.3 Document Structure

This Standards is divided into six main sections, as follows:

Section	Objective
1. Introduction	State the objectives and define LOD
2. Use of the Standards	Describe how to use this Standards
3. LOD Responsibility Matrix	Provide the framework for specifying/choosing elements to be included in the BIM Models and LODs to be achieved
4. LOD Elements Specification	Define criteria of various LOD graphics and information for MEP
5. Recommended Minimum LOD	Provide examples of recommended minimum MEP LOD at each project stage
6. Common Practice for BIM MEP Modelling	Describe some common practice for BIM Modelling in the MEP discipline.

1.4 Definition of Level of Development (LOD)

The LOD comprises the graphical representation and the non-graphical information contained in each BIM model element for each stage. The LOD should be defined explicitly for a project and used to facilitate team communications throughout the project life cycle.

Because of different usages of BIM, in some projects require model elements have high graphical representation but low non-graphical information, while other projects require model elements to have low graphical representation but high non-graphical information. Separating the LOD for graphical representation (LOD-Graphics) and non-graphical information (LOD-Information) allows better management of information and facilitates better communication.

Definition of LOD-Graphics (LOD-G):

LOD-G	Definition
100	The model element is graphically represented within the model by a symbol or generic representation or a rough 3D shape.
200	The model element is graphically represented within the model as a **generic system**, **object, or assembly** with approximate quantities, **assumed size**, shape, location, and orientation. The assumed required spaces for access and maintenance shall be indicated.
300	The model element is graphically represented within the model as a **specific system, object or assembly** in terms of quantity, size, shape, location, and orientation. The model shall include details of the required spaces for handling installation, operation and maintenance needs and the interface details for checking and coordination with other models / objects. **The graphical representation can be recognised easily without further clarification.**
350	Not used for the MEP discipline.
400	The model element is graphically represented within the model as a **specific system, object or assembly** in terms of size, shape, location, quantity, and orientation with **detailing for fabrication, assembly and installation.**
500	Not used for the MEP discipline. Refer to section 1.5 for details.

Definition of LOD-Information (LOD-I):

LOD-I is the description of non-graphical information in a model element and will evolve as the project progresses. LOD-I requirements should be defined and agreed beforehand. As the required LOD-I varies for each project, this Standards is not able to provide an exhaustive list of information for each model element, but instead indicates a suitable approach for adoption.

It is recommended that the LOD-I required for the model elements should be determined to meet their intended usage and NOT over specified. This Standards indicates a suitable approach by giving examples of minimum LOD-I associated with typical elements / objects, namely LOD-I 100, LOD-I 200, LOD-I 300, LOD-I 400, LOD-I 500.

Section 4.2 provides the details of LOD-Information requirements.

It is recommended that the project clients / employers to define and specify BOTH the LOD-Graphics and LOD-Information of the BIM model elements at each stage prior to the commencement of the project.

A BIM model typically consists of a range of LOD-Graphics and LOD-Information. For example, during the construction stage, some elements need to be modelled to LOD-G 300 to show specific geometrical details while information at LOD-I 200 level is sufficient.

However, there may be certain elements that need to be modelled to LOD-G 400 for fabrication with LOD-I 300. At the as-built stage, it may not be necessary to model the elements with full fabrication details, hence LOD-G 300 may be sufficient but the relevant elements should be “field verified”.

It is known that LOD definitions vary among different organisations and countries. Although the newly-proposed LOD definitions stated here are considered more appropriate, in particular for the MEP discipline, some practitioners have already adopted LOD definitions (LOD 100 – LOD 500) given in the CIC BIM Standards - General. The relationship between the old and new definitions are as follows:

LOD in CIC BIM Standards - General	New LOD (in this Standards)
LOD 100	LOD-G 100 + LOD-I 100
LOD 200	LOD-G 200 + LOD-I 200
LOD 300	LOD-G 300 + LOD-I 300
LOD 400	LOD-G 400 + LOD-I 400
LOD 500	LOD-G 400 + Field Verification + LOD-I 500 or LOD-G 300 + Field Verification + LOD-I 500

While this Standards does not mandate which definition of LOD should be used, the new LOD are generally encouraged. The final decision should be made and agreed by the project clients / employers.

1.5 Field Verification

Field verification of the model elements is important for most projects in Hong Kong. In most local and international BIM standards, “field verified” is the key interpretation for the definition of LOD 500. However, in terms of geometry, a model element cannot be modelled with more details than those required for fabrication (LOD-G 400). Therefore, the criterion for field verification of a model element should preferably be detached from LOD-500, e.g. a model element with LOD-G 300 can also be field verified.

In practice, it may not be possible to field verify all model elements in the project, and the methodology and grading of field verification may vary subject to the clients / employers’s considerations and requirements. Different methods of field verification should be stated in the BIM Project Execution Plan, e.g by visual inspection, measured survey, or any other measures agreed by the project clients / employers.

2 Use of the Standards

This section describes the recommended approach in defining the required LOD for MEP in a project, the approach is broken down into a number of steps in the table below, along with the responsible parties and reference to relevant sections of this or other documents. With this arrangement, the clients / employers can define their requirements step-by-step and use this Standards as guidance to the relevant LOD requirements and other details. The LOD will form a key part of the BIM Project Execution Plan.

	Recommended Approach	Who	How
1.	Define the BIM uses of the projects	Clients / Employers	Refer to the "CIC BIM Standards - General"
2.	Specify the client or employer information / asset information requirements of the project	Clients / Employers	Refer to "1.1 Client Requirement Specification" in "CIC BIM Standards - General"
3.	Understand the definition of LOD	Clients / Employers	Refer to "1.4 Definition of Level of Development (LOD)"
4.	Understand more about specification of the LOD elements	Clients / Employers, design consultants, contractors	Refer to "4 LOD Elements Specification"
5.	Define the LOD of the model elements to be specified	Clients / Employers	Refer to "5 Recommended Minimum LOD"
6.	Identify the LOD requirements (both graphics LOD-G and information LOD-I)	Clients / Employers	Refer to "3 LOD Responsibility Matrix"
7.	Identify the responsible author or party for defining / specifying the model elements LOD.	Clients / Employers, design consultants	Refer to "3 LOD Responsibility Matrix"
8.	Identify whether the model elements need to be field verified and which method of field verification to be used.	Clients / Employers	Refer to "3 LOD Responsibility Matrix"
9.	Production of BIM Models	Design consultants, contractors	Refer to "6 Common Practice for BIM MEP Modelling"

3 LOD Responsibility Matrix

The LOD responsibility matrix should be used to prepare the BIM project execution plan at different stages of a project. This involves defining both LOD-Graphics and LOD-Information to be achieved at each stage so that the project team can produce a high quality BIM models with appropriate information.

As stated in Section 1.5, the requirement for "field verification" should be defined in addition to the LOD for model elements. An additional column "V" in the LOD responsibility matrix serves this purpose. The project clients / employers or design consultants should define clearly which field verification method should be used for each model element or specify "N/A" ("Not Applicable") to indicate that field verification is not required for that model element.

Sample templates of LOD Responsibility Matrix are shown in **Appendix A.** The model elements included in the matrix are not exhaustive.

The classification of the model elements recommended in this Standards is the OmniClass table 23 (http://www.omniclass.org/). Project BIM manager should add or remove any model elements from the matrix to suit project specific needs and make reference to the OmniClass table 23 if no project specific classification system is used.

Description of the fields in the LOD Responsibility Matrix is shown in the table below.

Field	Description
Required	Yes (Y) or No (N)
UOM	Unit of Measurement
CAT Code	This code can be used for QA and review of models. OmniClass Table 23 system code* can be used for this field if no other specific requirements from the project client.
AUT	Model Author
G	LOD-Graphics
I	LOD-Information
V	Method for field verification of the object/equipment. It is subject to the agreement of the project client. Refer to Section 1.5 for the details of field verification.

* China Guobiao (China GB), UK Uniclass and US Onmiclass have been considered to be the classification system of model elements

LOD Responsibility Matrix

Field										
Model elements	**Required**	**UOM**	**CAT Code**	**Project stage e.g. Detailed Design**			**Project stage e.g. As-Built**			
				AUT	G	I	AUT	G	I	V
Element 1	Y / N									
Element 2	Y / N									
Element …	Y / N									

The tender stage specified in the LOD Responsibility Matrix is assumed to be that from a traditional “Design-Tender-Build” contract type / procurement method. If another contract type / procurement method is used, the matrix should be adjusted accordingly to suit the project.

4 LOD Elements Specification

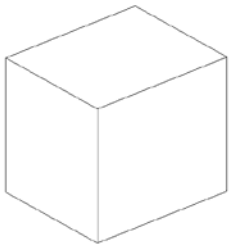
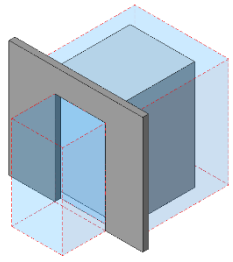
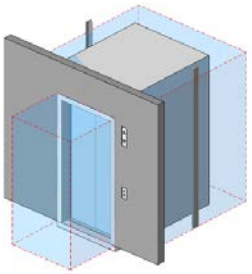
This section describes the minimum acceptable requirements for LOD-Graphics and LOD-Information for different MEP model elements / objects. As there are innumerable types of individual model elements, only commonly used MEP model elements are included. In this way users should be able to understand the principles involved and apply them in defining LOD-Graphics and LOD-Information for other elements as required.

4.1 LOD-Graphics Requirements

The main MEP elements / objects requiring LOD-Graphics specification are classified in the following table:

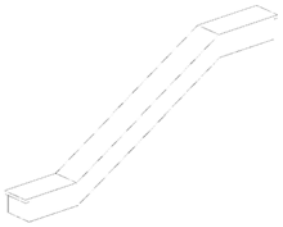
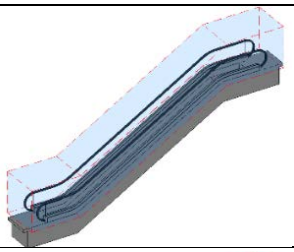
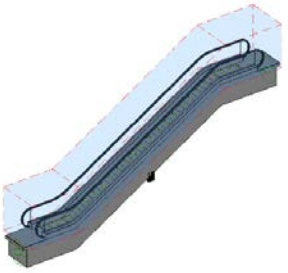
Elements (classified according to OmniClass table 23)
Conveying Systems and Material Handling Products • Elevators • Escalators
General Facility Services Products • Pumps • Piping • Air Treatment Components
Facility and Occupant Protection Products • Fire Hydrants • Fire Hose Equipment
HVAC Specific Products and Equipment • Commercial Boilers • Chillers • Cooling Towers • Fans • Fan Coil Units • Ventilation Ducts • Hangers for Air Ductwork
Electrical and Lighting Specific Products and Equipment • Electrical Generators • Uninterrupted Power Supply (UPS) Units • Electrical Distribution Control Panels • Switchboards

(Conveying Systems and Material Handling Products) Elevators

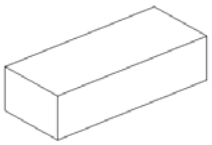
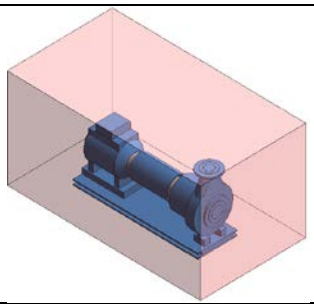
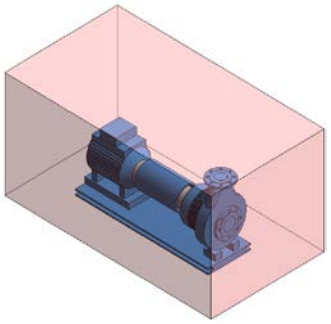
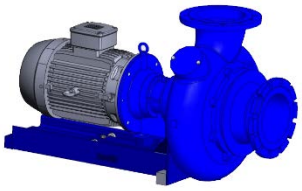
LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shape	
200	- Generic element - Nominal size, dimensions	Overall shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Lift car size, door frame, indication panel, power provision, lighting, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow product catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Lift car size, door frame, indication panel, power provision, lighting, finishes, space for access & maintenance, sufficient graphical details for fabrication	

(Conveying Systems & Material Handling Products)

Escalators

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shape	
200	- Generic element - Nominal size, dimensions	Overall shape, space for access & maintenance	
300	- Generic element - Actual size, dimensions & orientation - Proposed location	Steps, handrail, balustrade, equipment pit, power provision, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow product catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Steps, handrail, balustrade, equipment pit, power provision, space for access & maintenance, sufficient graphical details & dimensions for fabrication	

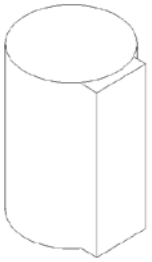
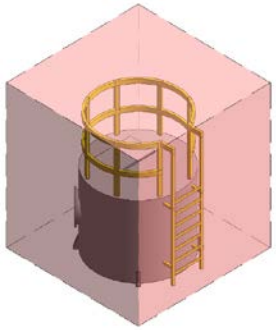
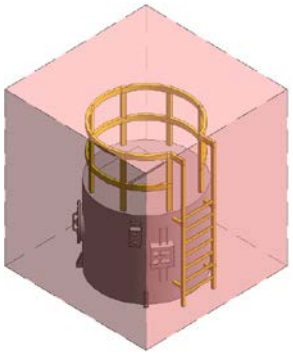
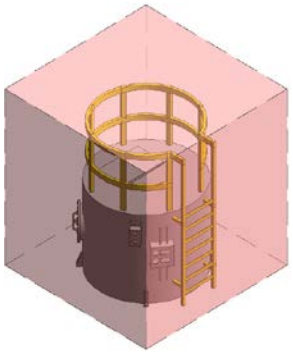
(General Facility Services Products)
Pumps

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shape	
200	- Generic element - Nominal size, dimensions	Overall shape, water inlet / outlet, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Power provision, water inlet / outlet size, anti-vibration footing, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow product catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Power provision, water inlet / outlet size, anti-vibration footing, space for access & maintenance, sufficient graphical details for fabrication	

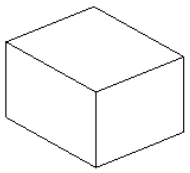
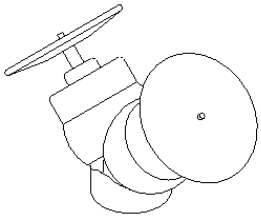
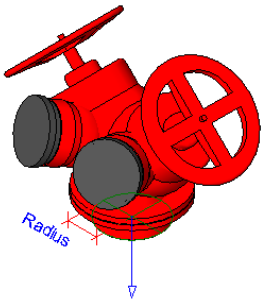
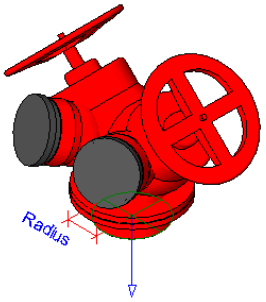
(General Facility Services Products)
Piping

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	N/A	
200	- Generic element - Nominal size, dimensions	Overall shape	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location - According to product catalogue / BS EN standard nominal, outside, inside diameter	Overall shape	
400	- Specific elements - Actual dimensions & orientation - Follow product catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Overall shape, exact segment length, all flanges, space for access & maintenance, sufficient graphical details for fabrication	

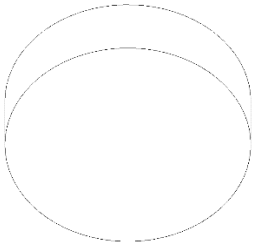
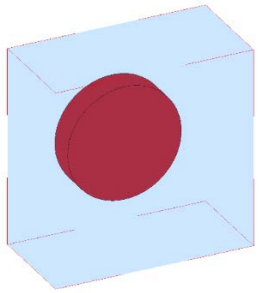
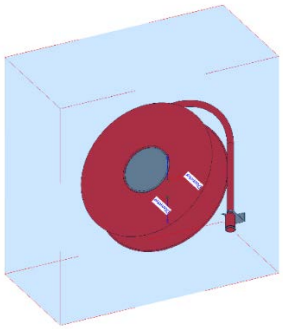
(General Facility Services Products)
Air Treatment Components

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	N/A	
200	- Generic element - Nominal size, dimensions	Overall shape, cat ladder, hand railing, access panel, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Cat ladder, hand railing, detailed access panel, control panel, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow Product Catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Cat ladder, hand railing, detailed access panel, control panel, space for access & maintenance, sufficient graphical details for fabrication	

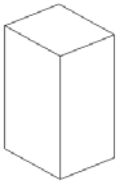
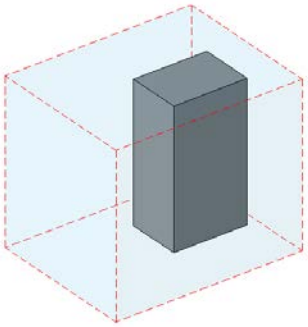
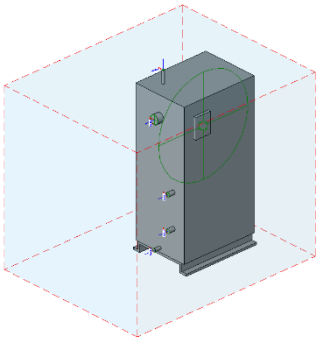
(Facility and Occupant Protection Products)
Fire Hydrants

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shape	
200	- Generic element - Nominal size, dimensions	Overall shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Water inlet, outlet & wheel size, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow Product Catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Water inlet, outlet & wheel size, space for access & maintenance, sufficient graphical details for fabrication	

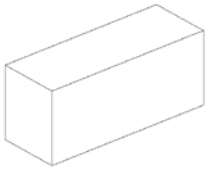
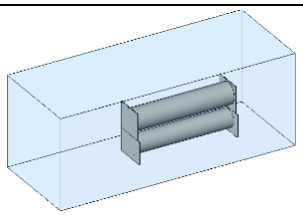
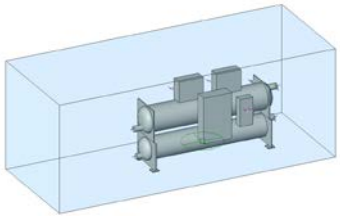
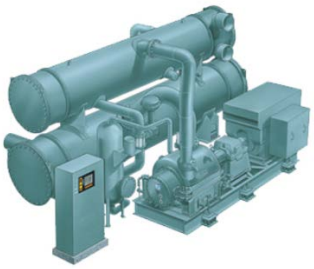
(Facility and Occupant Protection Products)
Fire Hose Equipment

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shape	
200	- Generic element - Nominal size, dimensions	Overall shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Front panel, back panel, stop cock valve, fire hose pipe, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow Product Catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Front panel, back panel, stop cock valve, fire hose pipe, space for access & maintenance, sufficient graphical details for fabrication	

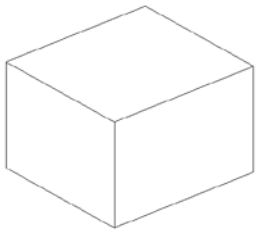
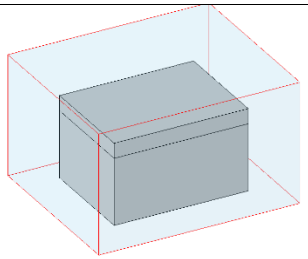
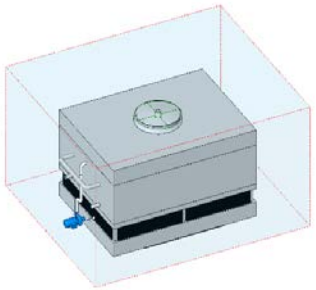
(HVAC Specific Products and Equipment)
Commercial Boilers

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shape	
200	- Generic element - Nominal size, dimensions	Overall shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Power provision, water inlet / outlet, gas connection, chimney, relief pipe, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication - Follow Product Catalogue for graphical detail	Power provision, water inlet / outlet, gas connection, chimney, relief pipe, space for access & maintenance, sufficient graphical details for fabrication	

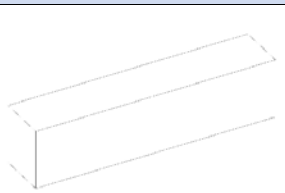
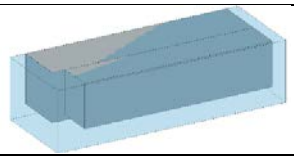
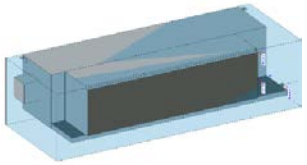
(HVAC Specific Products and Equipment)
Chillers

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shape	
200	- Generic element - Nominal size, dimensions	Overall shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Chilled water inlet / outlet, condense water inlet / outlet, anti-vibration footing, power provision, compressor, evaporator, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication - Follow product catalogue for graphical detail	Chilled water inlet / outlet, condense water inlet / outlet, anti-vibration footing, power provision, compressor, evaporator, space for access & maintenance, sufficient graphical details for fabrication	

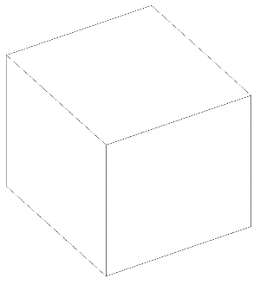
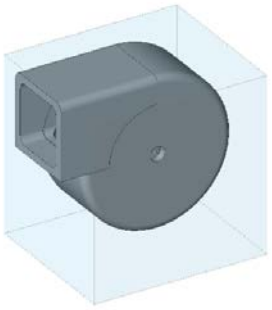
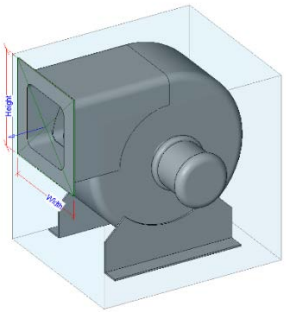
(HVAC Specific Products and Equipment)
Cooling Towers

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall Shape	
200	- Generic element - Nominal size, dimensions	Overall Shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Water inlet / outlet, power provision, fill, fan, drift eliminator, supporting legs, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow product catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Water inlet / outlet, power provision, fill, fan, drift eliminator, supporting legs, space for access & maintenance, sufficient graphical details for fabrication	

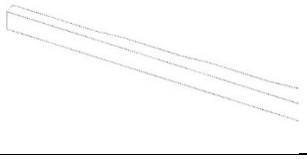
(HVAC Specific Products and Equipment)
Fan Coil Units

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall Shape	
200	- Generic element - Nominal size, dimensions	Overall Shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Water inlet / outlet, power provision, fan, drip tray & connection for condensate drain, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow product catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Water inlet / outlet, power provision, fan, drip tray & connection for condensate drain, space for access & maintenance, sufficient graphical details for fabrication	

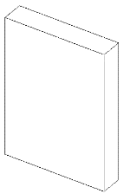
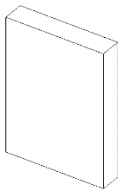
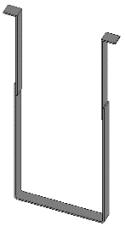
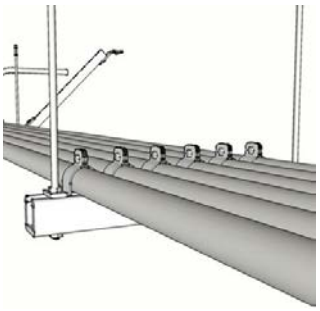
(HVAC Specific Products and Equipment)
Fans

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall Shape	
200	- Generic element - Nominal size, dimensions	Overall Shape, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Fan housing, impellers fan casing, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Follow product catalogue for graphical detail - Sufficient detail & accuracy for fabrication	Fan housing, impellers fan casing, space for access & maintenance, sufficient graphical details for fabrication	

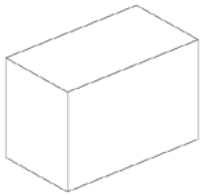
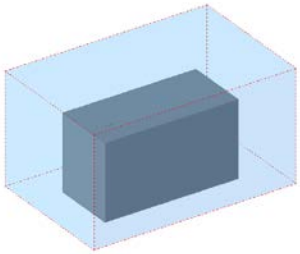
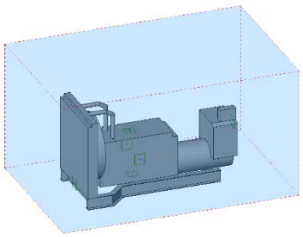
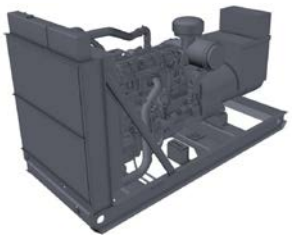
(HVAC Specific Products and Equipment)
Ventilation Ducts

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	N/A	
200	- Generic element - Nominal size, dimensions	Overall shape	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Overall shape	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication	Overall shape, exact segment length, all flanges, space for access & maintenance, sufficient graphical details for fabrication	

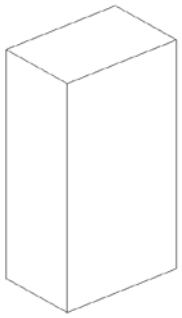
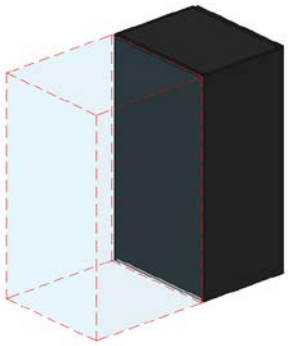
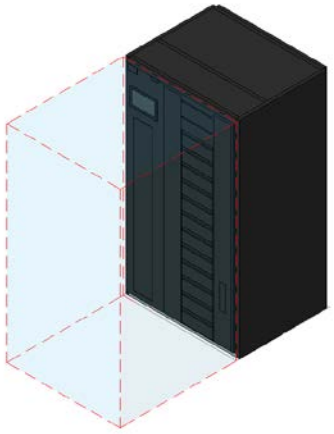
(HVAC Specific Products & Equipment)
Hangers for Air Ductwork

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	N/A	
200	- Generic element - Spatial requirement of the hangers	Overall space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Specific components with actual dimension, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication - Follow product catalogue for graphical detail	Specific components with actual dimension, exact location, space for access & maintenance, sufficient graphical details for fabrication	

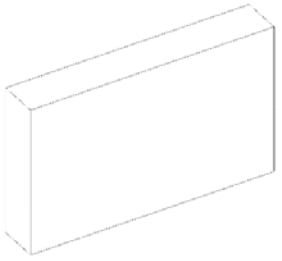
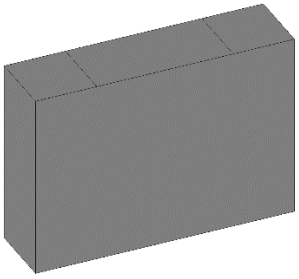
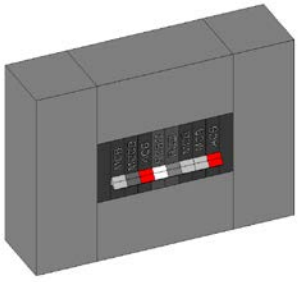
(Electrical and Lighting Specific Products and Equipment)
Electrical Generators

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shapes	
200	- Generic element - Nominal size, dimensions	Overall shapes, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Engine, alternator, regulator, radiator, fuel tank, exhaust gas, power connection, silencer, exhaust pipe, battery charger, anti-vibration footing, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication - Follow product catalogue for graphical detail	Engine, alternator, regulator, radiator, fuel tank, exhaust gas, power connection, silencer, exhaust pipe, battery charger, anti-vibration footing, space for access & maintenance, sufficient graphical details for fabrication	

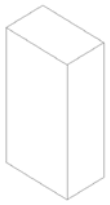
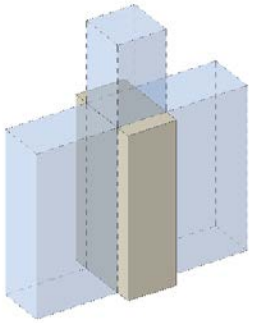
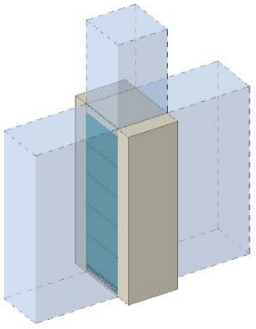
(Electrical and Lighting Specific Products and Equipment) Uninterrupted Power Supply (UPS) Units

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shapes	
200	- Generic element - Nominal size, dimensions	Overall shapes, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Overall shapes, battery, power provision, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication - Follow product catalogue for graphical detail	Overall shapes, battery, power provision, space for access & maintenance, sufficient graphical details for fabrication	

(Electrical and Lighting Specific Products and Equipment)
Electrical Distribution Control Panels

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shapes	
200	- Generic element - Nominal size, dimensions	Overall shapes	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Overall shapes	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication - Follow product catalogue for graphical detail	Overall shapes, sufficient graphical details for fabrication	

(Electrical and Lighting Specific Products and Equipment) Switchboards

LOD-Graphics	Requirements		Sample Image
100	- Conceptual, schematic element or symbol	Overall shapes	
200	- Generic element - Nominal size, dimensions	Overall shapes, space for access & maintenance	
300	- Specific elements - Actual size, dimensions & orientation - Proposed location	Overall shapes, power provision, space for access & maintenance	
400	- Specific elements - Actual dimensions & orientation - Sufficient detail & accuracy for fabrication - Follow product catalogue for graphical detail	Overall shapes, power provision, space for access & maintenance, sufficient graphical details for fabrication	

For the production of individual BIM model elements / objects, refer to the latest “CIC Production of BIM Object Guide - General Requirements”.

For the 2D representative symbols of the BIM model elements / objects, refer to the “CAD Standard for Works Projects” by Development Bureau (DEVB).

It is well noted that project clients / organisations may request the primary model elements / objects to be further broken down into several individual model element / object for asset management e.g. the “pump” break down into “pump casing", "pump motor", "pump impeller”, the project team should consider and agree with the clients / employers the approach whether the required information could be attached in the primary model element / object instead of breaking it down, otherwise the project team should agree and define clearly the individual model elements / objects in the responsibility matrix.

4.2 LOD-Information Requirements

This section describes the LOD-information required for a BIM model, it is well noted that project clients / organisations may have their own requirement for LOD-Information. This section sets out a software-neutral approach for determining LOD-I, using samples instead of attempting to giving an exhaustive list of requirement. The BIM standards developed by HKSAR Works Departments should be referred to for further details. These and other relevant publications are given in the CIC BIM Portal https://www.bim.cic.hk/en/resources/publications for relevant publications.

The following table lists the attributes commonly attached to individual model elements / objects.

Type	Information / Attributes	Data Type	Unit	Example	Descriptions	LOD-Information				
						100	200	300	400	500
General Properties	Equipment Type	Text	N/A	Pump	Equipment type (e.g. pump, valves)	R	R	R	R	R
	Equipment Name	Text	N/A	AHU-1F-01	Equipment name* (Follow the rule by the project clients / employers)		R	R	R	R
	Locations	Text	N/A	AHU Room	Locations* (Follow the rule by the project clients / employers)		R	R	R	R
Design Properties	Design properties of the equipment, using a Chiller as an example						R	R	R	R
	Cooling Capacity	Number	kW	214	Cooling capacity of chiller		R	R	R	R
	Rated Power Input	Number	kVA	30	Rated power input		R	R	R	R
Classification Properties	Classification Title	Text	N/A	Chillers	Classification title agreed by project clients / employers if necessary			R	R	R
	Classification Code	Number	N/A	23-33 21 00	Classification coding agreed by project clients / employers if necessary			R	R	R
Manufacturer Properties	Brand	Text	N/A	ABC	Name of the brand				R	R
	Manufacturer	Text	N/A	DEF	Name of the manufacturer				R	R
	Model No.	Text	N/A	234	Model number of the equipment				R	R
	Serial No.	Text	N/A	B5678	Serial number of the equipment				R	R
	Weight	Number	kg	50	Weight of the equipment				R	R
Condition Properties	Commission Date	Text	N/A	05/05/2016	Date of equipment commission				R	R
	Installation Date	Text	N/A	03/03/2016	Date of the equipment installation				R	R
	Life expectancy	Number	Year	5	Life expectancy of the equipment				R	R
Specification Properties	Product Specification	Hyperlink	N/A	http://www.cic.hk	Hyperlink of the specification or technical documents. The file path/directory should be agreed by project clients / employers				R	R
Verification Properties	Verification Method	Text	N/A	Laser Scanning	The field verification method used for verifying the as-built elements					R

R: Required

* If no naming convention is provided by the project clients / employers, the naming conventions stated in the latest EMSD BIM-AM Standards and Guidelines are recommended.

It is recommended that a full list of element-specific LOD-I should be clearly defined before a project commences.

When defining the LOD-Information, it is recommended that the Information / Attributes under "**General Properties"** should be inputted at the project Preliminary and Schematic stage while "**Design Properties"** during the detailed design stage, **"Manufacturer Properties", "Condition Properties", "Specification Properties"** during the Construction stage, and **"Verification Properties**" at the As-Built stage.

For the **"Classification Properties",** it is optional and the OmniClass Table 23 coding system is recommended to be used if no specific requirement is stated by the project clients / employers. Alternatively, another classification system for the Quantity Take Off (QTO) may be developed by the Quantity Surveyor as per the project requirement.

Design Properties should be defined in line with any agreement or clients / employers Information Requirements provided for individual projects.

5 Recommended Minimum LOD

This section recommends a minimum LOD to be used at different stages of a project. The LOD defined should fit the purpose and care should be taken to avoid over specification. Users can adjust or define a higher LOD for required model elements to suit their project needs. Users should be aware that creating model elements with higher LOD-G or LOD-I than the recommended minimum will require more effort and time. Appropriate LOD that fits the purpose and are not over-specified are the most effective.

The minimum LOD described in this section are a combination of LOD-G and LOD-I, the final decision on LOD requirements will depend on the availability of relevant information and should be confirmed by the project clients / employers.

An example of recommended minimum LOD for HVAC Products and Equipment is given on the following pages. The following points should be noted:

a) The same principle and approach should be applied to set out the LOD for other elements which are not included or listed.
b) The appropriate Unit of Measurement (UOM) for each model element / object depends on the project specification / requirement to enable correct QTO from the BIM model, and should be decided by project clients / employers.
c) Major items of equipment should be defined by the project clients / employers, e.g. for the HVAC class of equipment
    - Commercial Boilers, Heat Pumps, Chillers, Cooling Towers, Air Handling Units, Fans, Fan Coil Units, Air Conditioners, HVAC Condenser Units, HVAC Coolers, etc.
d) Field verification methods used for the project should be defined by the project clients / employers, e.g.:

Method	Description
A	Field verified by visual inspection
B	Field verified by a measured survey

e) The tolerance of the field verification results should be defined / confirmed by the project clients / employers.

Example LOD Responsibility Matrix

HVAC Specific Products and Equipment

Model elements	Required	UOM	CAT Code	Concept, Feasibility, Planning			Preliminary, Scheme			Detailed design			Submission to approval authority			Tender			Construction			As-Built			
				AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	V
Commercial Boilers	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
Furnaces	N																								
HVAC Heating Units	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Heat Pumps	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
Chillers	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
Cooling Towers	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
Air Handling Units	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
Air Humidity Control Equipment	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
HVAC Dampers	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Air Circulators	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Fans	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
Exhaust Hoods	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Power Ventilators	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Fan Coil Units	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
HVAC Coils	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Refrigerant Condensing Units	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Air Conditioners	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
High Pressure Air Conditioning Units	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A

HVAC Specific Products and Equipment

Model elements	Required	UOM	CAT Code	Concept, Feasibility, Planning			Preliminary, Scheme			Detailed design			Submission to approval authority			Tender			Construction			As-Built			
				AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	AUT	G	I	V
Make Up Air Units	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
HVAC Air Terminals	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
HVAC Condenser Units	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
HVAC Coolers	Y			ABC	100	100	ABC	200	200	ABC	200	200	ABC	200	300	ABC	200	300	DEF	300	400	DEF	300	500	B
Ventilation Ducts	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300*	/	DEF	300*	/	A
Ventilation Diffusers	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Duct Access Panels	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Duct Insulation	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Grilles	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Hangers for Air Ductwork	Y			ABC	/	/	ABC	/	/	ABC	200#	/	ABC	200#	/	ABC	200#	/	DEF	300#	/	DEF	300#	/	A
Supports for Air Ductwork	Y			ABC	100	/	ABC	100	/	ABC	200#	/	ABC	200#	/	ABC	200#	/	DEF	300#	/	DEF	300#	/	A
Solar Water Heating Equipment	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A
Heat Wheels	Y			ABC	100	/	ABC	200	/	ABC	200	/	ABC	200	/	ABC	200	/	DEF	300	/	DEF	300	/	A

* The LOD-G of Ventilation Ducts should be 400 if the BIM is intended to enable duct or pipe fabrication in the project.
# NOT COMPULSORY. The final decision for modelling hangers should be made by and agreed with the project team.

6 Common Practice for BIM MEP Modelling

This section briefly summarises the key steps commonly practised for high-quality MEP modelling in Hong Kong:

1. The origin point and orientation of the Model should refer to the HK1980 Grid System defined by the HKSAR Lands Department.
2. Elevations should refer to Hong Kong Principal Datum.
3. The BIM model should be set up using the metric system.
4. To ensure accuracy of the BIM model and enhance multidisciplinary coordination, the tolerances between disciplines and model elements should be defined and agreed among the whole project team.
5. Creation of BIM model elements / objects should follow the “CIC Production of BIM Object Guide - General Requirements”.
6. All unused views should be purged and unused BIM model elements / objects removed before submission or publishing.
7. BIM files should be kept to the minimum size, with due consideration given to the capability and performance of the project software and hardware.
8. The BIM models can be divided into zones, disciplines or systems by agreement among the project team.
9. The presentation style should follow the colour scheme according to the client / employer’s requirement, or as agreed among the project team. If no specific requirements from the project client/employer are given, the colour scheme stated in the latest “EMSD BIM-AM Standards and Guidelines” is recommended for MEP BIM Models.
10. The equipment / pipework / ductwork / cabling of each system should be connected as completely as practicable in the BIM Models.

7 References

1. Electrical and Mechanical Services Department
   BIM-AM Standards and Guidelines v2.0
2. Architectural Services Department
   BIM Guide for BS Installation Ver1.0_Jun18
3. Drainage Services Department
   BIM _Modelling Manual (First Edition)
4. Water Supplies Department
   BIM Standards for Asset Management
5. Hong Kong Housing Authority and Housing Department
   BIM Standards Manual, version 1.0
6. BCA Singapore BIM Guide Version 2
7. Singapore BIM Essential Guides
8. CAD Standard for Works Project (CSWP), Development Bureau
9. BIM Forum LOD Specification 2019
10. AEC (UK) BIM Protocol
11. Handbook for the introduction of Building Information Modelling by the European Public Sector
    EU_BIM_Task_Group_Handbook_FINAL
12. NATSPEC National BIM Guide
    NATSPEC_National_BIM_Guide_v1.0_Sep_2011

8 Acknowledgement

The CIC would like to acknowledge the assistance of the following organisations in the production of this Standards:

- Airport Authority Hong Kong
- Architectural Services Department
- Buildings Department
- Development Bureau
- Drainage Services Department
- Electrical and Mechanical Services Department
- Hong Kong General Building Contractors Association
- Hong Kong Housing Authority
- Hong Kong Housing Society
- Hospital Authority
- Lands Department
- The Association of Consulting Engineers of Hong Kong
- The Hong Kong Construction Association
- The Hong Kong Institute of Architects
- The Hong Kong Institution of Engineers
- The Hong Kong Institute of Surveyors
- The Hong Kong Institute of Building Information Modelling
- The Hong Kong University of Science and Technology
- Urban Renewal Authority
- Water Supplies Department

The CIC would also like to acknowledge Electrical and Mechanical Services Department and Drainage Services Department for providing valuable graphics for the Standards.

The CIC thanks all stakeholders who have participated in the Stakeholders Consultation Seminars and/or Forums and offered opinions.

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Appendix A LOD Responsibility Matrix

(Please refer to separate document)

CONSTRUCTION INDUSTRY COUNCIL
建造業議會

Feedback Form

CIC Building Information Modelling Standards for Mechanical, Electrical and Plumbing (MEP)

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

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

1. As a whole, I feel that the publication is:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Informative	❑	❑	❑	❑	❑
Comprehensive	❑	❑	❑	❑	❑
Useful	❑	❑	❑	❑	❑
Practical	❑	❑	❑	❑	❑

2. Does the publication enable you to understand more about the subject?	Yes	No	No Comment
	❑	❑	❑

3. Have you made reference to the publication in your work?	Quite Often	Sometimes	Never
	❑	❑	❑

4. To what extent have you incorporated the recommendations of the publication in your work?	Most	Some	None
	❑	❑	❑

5. Overall, how would you rate our publication?	Excellent	Very Good	Satisfactory	Fair	Poor
	❑	❑	❑	❑	❑

6. Other comments and suggestions, please specify (use separate sheets if necessary).

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