



發展局
Development Bureau

BIM HARMONISATION GUIDELINES FOR WORKS DEPARTMENTS

Version: 2.0

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TABLE OF CONTENTS

1.	Introduction	1
1.1.	Background	1
1.2.	Objectives.....	1
1.3.	Reference Documents.....	1
2.	Information Requirements and Exchange	3
2.1.	Information Ownership	3
2.2.	IT Environment	3
2.3.	BIM File Size	4
2.4.	Information Exchange Formats and Mechanism.....	4
2.5.	Data Security Classification	5
3.	BIM Object Files	6
3.1.	Principles.....	6
3.2.	CIC Production of BIM Object Guide and Portal	6
3.3.	Process of Adopting CIC BIM Objects	8
3.4.	Naming of BIM Object File	9
3.5.	Guidelines for BIM Object Authoring	12
3.6.	BIM Object Management.....	14
3.7.	Workflow for Sharing BIM Object	15
4.	Federation and BIM Model Naming.....	17
4.1.	BIM Model Naming Principle.....	17
4.2.	Information Container Identification Fields	17
4.3.	Federation Strategy	22
4.4.	BIM Model Naming	23
4.5.	Naming of Drawings Generated from BIM model.....	23
5.	LOIN Implementation	24
5.1.	Aligned BIM Standards.....	24
5.2.	BEP	24
5.3.	BIM Modelling Setting	24
5.4.	LOD-G	25
5.5.	LOD-I.....	27
5.6.	Appearance.....	27
6.	The Way Forward	29
6.1.	Regular Review and Update.....	29
6.2.	Codification Management	29
6.3.	Project Close-out Protocols	29
6.4.	BIM / GIS Integration	30
6.5.	Departmental Transition.....	30
6.6.	Information Management.....	30

List of Tables

Table 3-1 Descriptions and Guidelines for the BIM Object Naming Fields..... 10

Table 3-2 Folder Structure of BIM Object Library 15

Table 4-1 Information Container ID Fields 19

Table 5-1 LOD-G Definition..... 26

Table 5-2 Colour Appearance by Discipline for Underground Utilities 28

Table 5-3 Colour Appearance by Discipline for Above-grade 28

List of Figures

Figure 3-1 CIC BIM Portal..... 7

Figure 3-2 BIM Object Sheet 7

Figure 3-3 An Example of BIM object found on CIC BIM Portal 8

Figure 3-4 BIM Object Adoption Scenarios..... 9

Figure 3-5 Sample Simplified BIM Object based on Detailed BIM Object 13

Figure 3-6 Sample Lamp Post BIM Object Division..... 14

List of Appendices

- Appendix I – ISO 19650 Terminologies
- Appendix II – Information Responsibility Assignment Matrix
- Appendix III – Data Filtering Rule Table
- Appendix IV – Master Type List
- Appendix V – Examples of BIM Object Authoring and Importing Civil 3D BIM Objects into BIM Models
- Appendix VI – LOD-I Requirements, Creation and Extraction
- Appendix VII – Sample BIM Object Check Form
- Appendix VIII – Federation Strategy Diagrams and Naming Examples
- Appendix IX – Sample Project-Specific Codes for Naming
- Appendix X – Common Codes for Naming
- Appendix XI – Sample Spreadsheet for BIM File Name Validation
- Appendix XII – Sample Project Close-out Checklist
- Appendix XIII – Example of Project Boundary Authoring and Model File List

Abbreviation	Definition
ArchSD	Architectural Services Department
BEP	BIM Execution Plan, which is the document explaining how the information modelling aspects of a project will be carried out throughout the project life cycle
BIM	Building Information Modelling
BIM attribute	A piece of data forming a partial description of an object or entity, where entities and objects are synonyms, meaning items having a state, behaviour and unique identity, that is, a thing that can think or talk about, such as a wall. (source from PAS 1192-2:2013: Specification for information management for the capital/delivery phase of construction projects using building information modelling (now replaced by BS EN ISO 19650 Parts 1 and 2) defines the requirements for achieving building information modelling (BIM) Level 2.)
CDE	Common Data Environment: agreed source of information for any given project or asset, for collecting, managing and disseminating each information container through a managed process. A CDE workflow describes the processes to be used and a CDE solution can provide the technology to support those processes. (Source: ISO 19650-1:2018)
CEDD	Civil Engineering and Development Department
CIC	Construction Industry Council
CityGML	An open data model and XML-based format for the storage and exchange of virtual 3D city models
COBie	Construction Operations Building Information Exchange Subset of BS ISO 16739 documented as a buildingSMART model view definition (MVD) which includes operational information used to supply data to the organisation to populate decision-making tools and asset management systems. (Source: CIC BIM Dictionary December 2020)
DEVB	Development Bureau
DEVB (PLB)	Development Bureau – Planning and Lands Branch
DEVB (WB)	Development Bureau – Works Branch
DSD	Drainage Services Department
EMSD	Electrical and Mechanical Services Department
EPD	Environmental Protection Department
FME	Feature Manipulation Engine
GBDR	Government BIM Data Repository
GIS	Geographic Information System
HKSAR	Hong Kong Special Administrative Region of the People's Republic of China
HyD	Highways Department

Abbreviation	Definition
IFC	Industrial Foundation Class
ITB	Information Technology Bureau
LandsD	Lands Department
LOD	Level of Development
LOD-G	Level of Graphics
LOD-I	Level of Information
LOIN	Level of Information Need
MEP	Mechanical, Electrical and Plumbing
N/A	Not Applicable
NDA	New Development Area
OCCIO	Office of the Government Chief Information Officer
OFCA	Office of the Communications Authority
TIDP	Task Information Delivery Plan
UAT	user acceptance test
UU	Underground Utilities
WB	Works Branch
WBS	Work Breakdown Structure
WDs	Works Departments under Development Bureau
WSD	Water Supplies Department

Foreword

The Development Bureau (DEVB) is pleased to announce the publication of DEVB BIM Harmonisation Guidelines for Work Departments (the Guidelines) with the goal to align BIM implementation, delivery and management for capital works projects. Using the Guidelines for information exchange between Works Departments (WDs) and Lands Department (LandsD), it would support the Smart City planning. The industry would also benefit from the use of BIM, GIS and 3D data for more efficient design, construction, operation and asset management workflows in the project lifecycle.

At the onset of this harmonisation initiative, a consultancy study (the Study) on BIM Harmonisation for BIM/GIS Integration under First Phase Development of KTN and FLN NDA was commissioned by the Civil Engineering and Development Department (CEDD). As one of the key deliverables, it formulated a BIM Harmonisation Guidelines for WDs for the assets under the study. This harmonisation initiative was then taken further to cover capital works projects outside the scope of the study. With concerted efforts of the WDs and LandsD, the Guidelines is formulated.

The Guidelines shall be adhered to for upcoming BIM adopting capital works projects to ensure consistency when authoring, reviewing and managing BIM files, BIM models and BIM objects. The adoption of the Guidelines would facilitate the sharing and maintenance of BIM models and information exchange among WDs and LandsD. The Guidelines is to be reviewed regularly under the DEVB BIM Working Group so as to upkeep with technological advancements and industry developments.

DEVB would like to thank everyone who has contributed to the success of the Publication, in particular the Project Steering Group and Project Working Group members of the Study:

- Architectural Services Department
- Civil Engineering and Development Department
- Construction Industry Council
- Development Bureau – Planning and Lands Branch
- Development Bureau – Works Branch
- Drainage Services Department
- Electrical and Mechanical Services Department
- Highways Department
- Lands Department
- Water Supplies Department

Finally, contributions and efforts given by the consultant of the Study, AECOM Asia Company Limited, is also highly appreciated.

1. Introduction

1.1. Background

1.1.1. Subsequent to the completion of the BIM harmonisation study for the First Phase Development of KTN and FLN NDA, DEVB formulated the DEVB BIM Harmonisation Guidelines for WDs (this document, thereafter referred to as the Guidelines). WDs shall adopt the Guidelines as stipulated in the DEVB TC(W) No. 8/2021.

1.1.2. The harmonization components of the Guidelines include:

- a) Information requirements and exchange (Section 2)
- b) BIM object files (Section 3)
- c) Federation and BIM model naming (Section 4)
- d) LOIN implementation (Section 5)

1.1.3. The Guidelines addresses the standardisation of the digital models comprising BIM models, objects, and attributes:

- a) BIM Models, which include native and shareable models;
- b) BIM Objects, which are parametric elements used to author BIM models. They are usually resided on the CIC BIM Portal or authored in accordance with principles of the Guidelines; and
- c) BIM Attributes, which could facilitate BIM model and object management.

1.2. Objectives

1.2.1. The objectives of the Guidelines are:

- a) To enable sharing, dissemination and maintenance of BIM models and BIM attributes across the WDs and LandsD;
- b) To support sharing of BIM object files with CIC;
- c) To form the standards to support the Government BIM Data Repository (GBDR), 3D digital map initiatives, and the forthcoming 3D Land Information System;
- d) To provide aligned BIM standards horizontally across WDs for adoption in projects with emphasis on consistent modelling approaches.

1.3. Reference Documents

1.3.1. The Guidelines makes reference to the following documents:

- a) The BIM Harmonization Guidelines for the First Phase Development of KTN and FLN NDA of the CEDD;

- b) Parts 1 and 2 (2018 version) of BS EN ISO 19650 (ISO 19650): to adopt a common approach for collaborative production of information and information exchange requirements;
- c) ISO 19650 terminologies (refer to Appendix I);
- d) WDs' BIM development, standards, documents, practice notes, guidelines, regulations and legislations, including data owners' graphical and non-graphical information (geometrical and non-geometrical information in ISO 19650 terms) requirements;
- e) DEVB's Technical Circular (Works) No. 2/2021 – Adopting of Building Information Modelling for Capital Works Projects in Hong Kong;
- f) CIC BIM Standards - General: Version 2.1 - 2021 Edition, and
- g) CIC Production of BIM Object Guide - General Requirements (Version 2 - 2021)

2. Information Requirements and Exchange

2.1. Information Ownership

- 2.1.1. Information ownership shall be defined at onset of a project.
- 2.1.2. As soon as the asset owner is identified, asset owner-specific requirements, including departmental BIM documents, should be followed and incorporated to the BIM Execution Plan (BEP).
- 2.1.3. WDs should adhere to the Guidelines when preparing the BIM models (in native and open format) and object files for sharing with others.
- 2.1.4. WDs should provide the design BIM models (after tender stage) and as-built models (after construction) to LandsD to facilitate the development of the GBDR as per stipulated in paragraph 19 of the Technical Circular (Works) No. 2/2021. The circular will be updated from time to time.
- 2.1.5. WDs are suggested to review the BIM models for project which is sensitive in nature. The BIM models might be modified/ simplified for sharing.
- 2.1.6. To facilitate information exchange, the GBDR has been launched in May 2022. The GBDR serves to host native BIM models (developed in accordance with the Guidelines), shareable BIM models (IFC) and 3D GIS Open Format (CityGML).

2.2. IT Environment

Hardware, software and internet speed should meet minimum operability requirements to optimize interdepartmental information exchange through the GBDR.

2.2.1. Software

- 2.2.1.1. A single, common or interoperable BIM modelling software that is able to generate open format files should be used for a project (composing of several contracts) as far as practicable. This is to enable seamless flow and sharing of information within the project.
- 2.2.1.2. When selecting software, project information requirements and support of open format such as IFC should be considered.
- 2.2.1.3. Segregation of BIM models and software for modelling should be practised to balance modelling efficiency, drawing generation needs and non-geometrical information interoperability. For example, the following principles could be adopted for design stage:
 - a) Stormwater drainage and sewerage were demarcated at the agreed connection point between building drainage and civil drainage.

- b) Water supply, electrical power supply, gas supply, telecommunications were demarcated at the agreed interface point between building works and civil works.
- 2.2.1.4. The software and software version adopted should be properly documented in the BEP.
- 2.2.1.5. For the shareable BIM format, IFC v4 will be used.

2.3. BIM File Size

- 2.3.1. For WDs without departmental BIM model file size limits, the maximum file size for each BIM model should be capped at 500MB. WDs should avoid, as far as practicable, large file sizes which would require substantial amount of storage, thereby unnecessarily increasing the time and cost to operate the GBDR.
- 2.3.2. To help control the BIM model file size, the maximum size of each BIM object file used should be kept at the minimum, preferably under 5MB.

2.4. Information Exchange Formats and Mechanism

- 2.4.1. To facilitate the data exchange and extraction needs of WDs, a clear set of criteria had been established. The sharing of commonly used BIM data across WDs in a self-service manner via a centrally managed GBDR is efficient with fast turnaround time. It facilitates site selection, site analysis, planning of location of services with a view to achieve design quality and efficiency, and minimise risks of clashes and time for reworks.
- 2.4.2. Appendix III – Data Filtering Rule Table shows the data required from specific departments. LandsD prefers having a full set of BIM models in native format or open format in IFC, while other WDs have certain department-specific data extraction rules.
- 2.4.3. To enable interoperability, open formats, such as IFC, shall be adopted to facilitate geometrical and non-geometrical information exchange. Geometrical information exchange aims to export BIM models to open BIM formats. Non-geometrical information exchange aims to export BIM attributes to tabular format such as COBie (Construction Operations Building Information Exchange). COBie is an international standard for data exchange, and it is the most commonly used standard for data handover from construction to operations. Through a conversion engine, the open format CityGML will be made available and stored in the GBDR.
- 2.4.4. Information exchange mechanism relies on the followings:
- a) Information container ID, which entails consistent ID field definitions and abbreviation codes to facilitate file-based data filtering;
 - b) Data filtering rules, which outlines the key criteria for data exchange and extraction; and

- c) WDs' BIM files, which shall be in compliance with the defined naming convention of the Guidelines.
- 2.4.5. Appendix XIII – Example of Project Boundary Authoring and Model File List shows the settings required for provision of project boundary and model file list of the works project when submitting BIM models to the GBDR.
- 2.5. Data Security Classification
- 2.5.1. Data security considerations include user access level and data classification.
 - 2.5.2. WDs' users are allowed to access the GBDR based on WDs' information needs. Departmental users are assigned with appropriate access rights. No restricted, sensitive or confidential data should be shared.

3. BIM Object Files

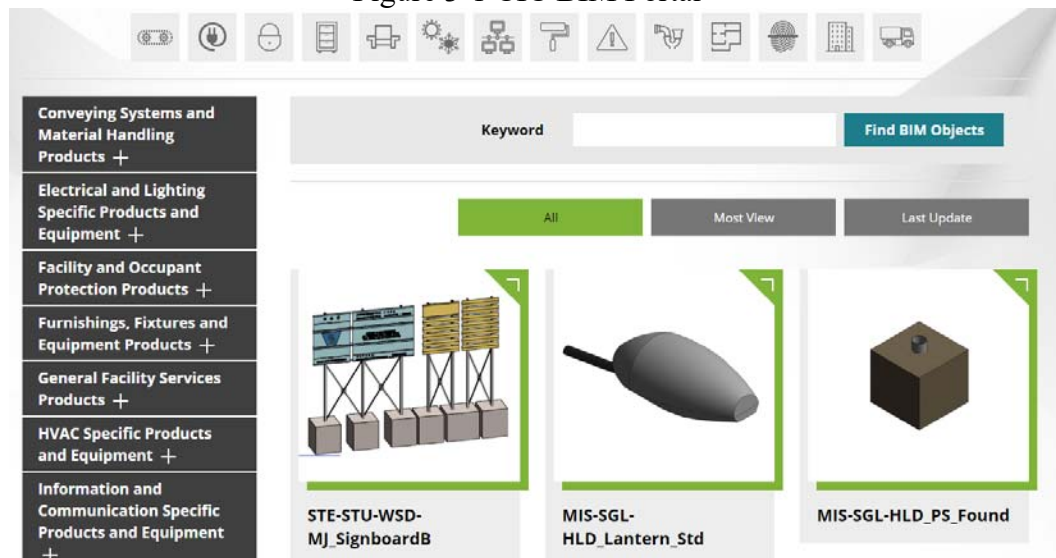
3.1. Principles

- 3.1.1. The principles of authoring BIM objects should follow the latest version of the CIC Production of BIM Object Guide, which contains LOD-G (graphical) and LOD-I (non-graphical) requirements. In addition, Appendix V and Appendix VI provide further examples for handling BIM objects' LOD-G and LOD-I.
- 3.1.2. CIC BIM Portal has provided an industry-wide, centralised and publicly accessible platform for sharing of BIM object files. BIM objects authored by the WDs or from capital works projects should be incorporated into the CIC BIM Portal upon certification by CIC. WDs should follow Section 3.7 to provide BIM object files to CIC. WDs should notify project awardees to utilise BIM object files shared at CIC BIM Portal as far as practicable and make reference to WDs' BIM object files that have been internally certified for use.
- 3.1.3. BIM object files' naming convention should follow Section 3.4, which in line with the CIC Production of BIM Object Guide.
- 3.1.4. To minimise information loss during conversion, the appropriate category type for the BIM objects should be defined. The use of generic model for BIM object authoring should be minimised as far as practicable.
- 3.1.5. To optimise information management within BIM models, replicable BIM objects (e.g. windows, doors, signage, fittings) should be used to compose BIM models as far as practicable.

3.2. CIC Production of BIM Object Guide and Portal

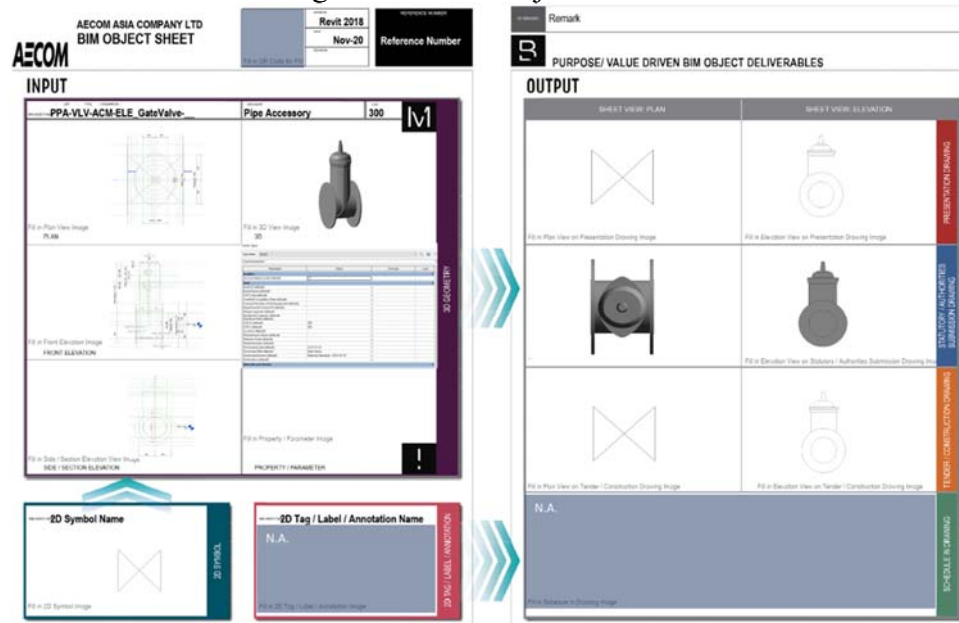
- 3.2.1. Since 2019, CIC has set up a BIM portal for public to access the BIM object files. A BIM objects library has been established on the CIC BIM Portal, and it contains BIM object files under OmniClass classifications. Refer to Figure 3-1 for CIC BIM Portal (located at https://www.bim.cic.hk/en/resources/bim_objects).

Figure 3-1 CIC BIM Portal



3.2.2. Each BIM object file is accompanied by a BIM object sheet which contained 3D geometry and 2D presentation. To fulfil drawing generation needs, 2D presentation may be in the form of layout, elevation view, sectional view, 2D symbols, and tag / label / annotations. The BIM object sheet serves to indicate that the BIM object has been completed and satisfied all requirements and functions for drawing production (refer to Figure 3-2).

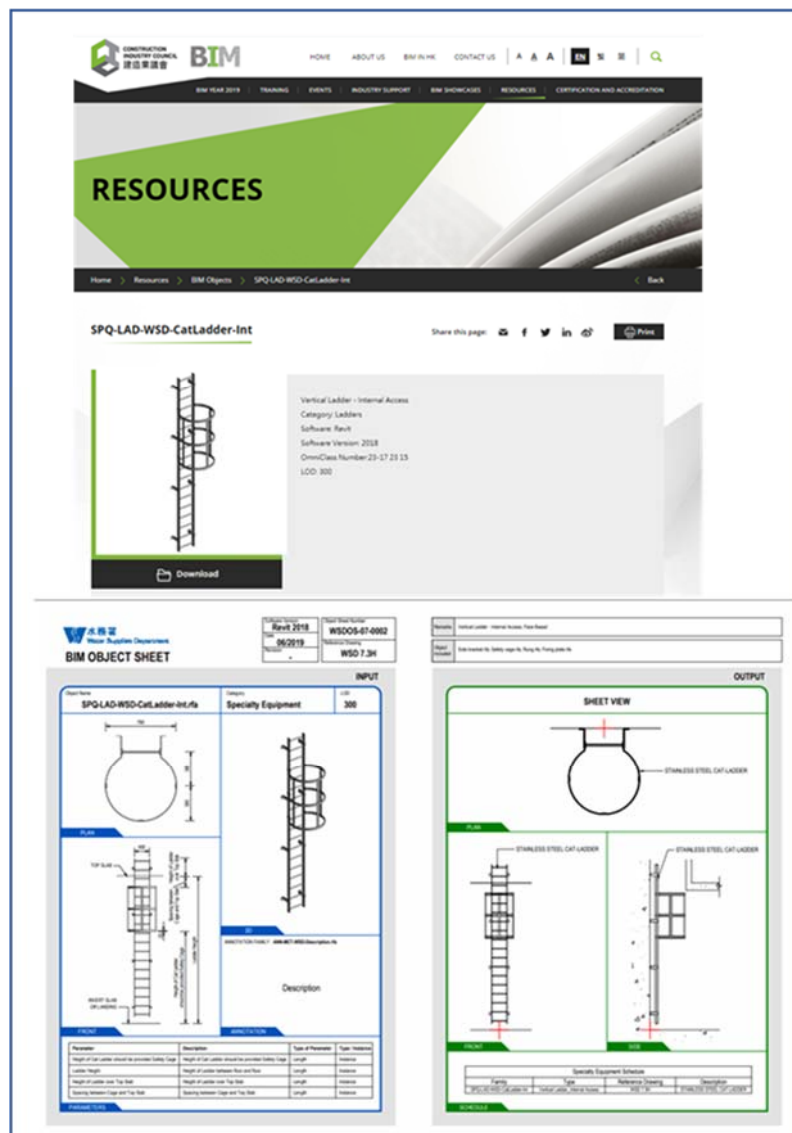
Figure 3-2 BIM Object Sheet



3.3. Process of Adopting CIC BIM Objects

3.3.1. In order to utilise the CIC BIM objects as far as practicable, a process has been developed to adopt CIC BIM objects. Refer to Figure 3-3 below for an example of BIM object found on CIC BIM Portal.

Figure 3-3 An Example of BIM object found on CIC BIM Portal



3.3.2. There are three scenarios for adopting CIC BIM objects, which depend on whether the four criteria, including appearance, 2D presentation, attributes (LOD-I) and naming convention, are fulfilled:

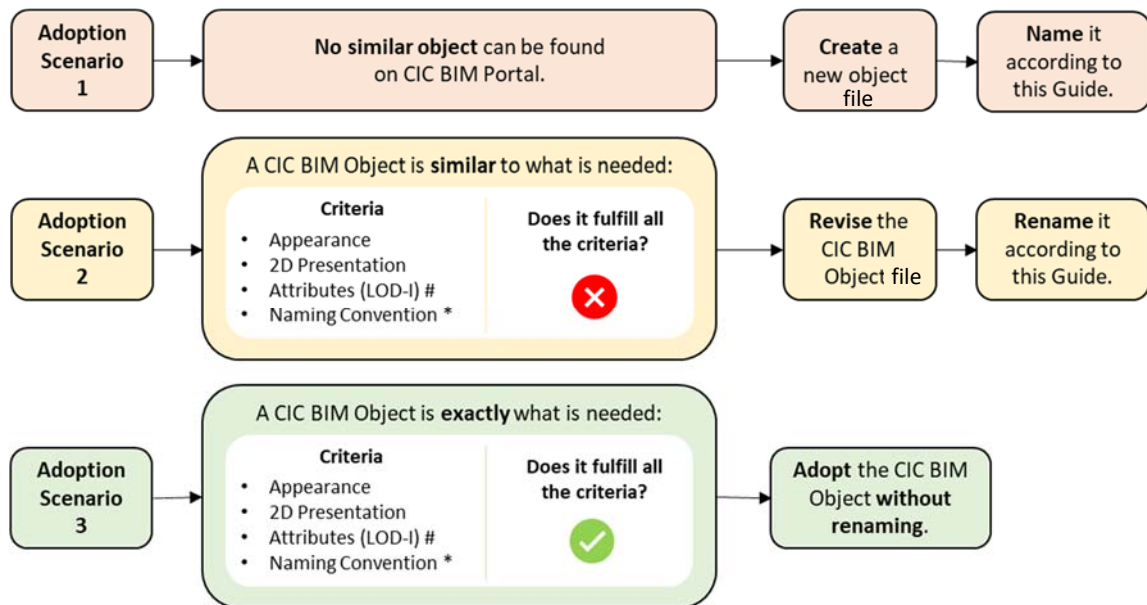
Adoption Scenario 1: If no similar CIC BIM object is found, a new object file shall be created and named according to the Guidelines.

Adoption Scenario 2: If a CIC BIM object is similar to what is needed but does not fulfil all the four criteria, it shall be revised and the file shall be renamed according to the Guidelines.

Adoption Scenario 3: If a CIC BIM object is exactly what is needed and fulfils all the four criteria, it shall be adopted without renaming.

Refer to Figure 3-4 below for BIM object adoption scenarios.

Figure 3-4 BIM Object Adoption Scenarios



Remarks:

- Refer to Appendix VI

* - Refer to Section 3.4

3.4. Naming of BIM Object File

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

In accordance with the CIC Production of BIM Object (Version 2 -2021), BIM object naming should be in the format as shown below.

<Category>-<Functional Type>-<Originator>-<Descriptor 1>-<Descriptor 2>.<File Format Extension>

3.4.2. Based on the CIC Production of BIM Object Guide, the following principles are set:

Table 3-1 Descriptions and Guidelines for the BIM Object Naming Fields

Field No.	BIM Object Naming Fields	Obligation	Field Length and Format	Guidelines
1	Category	Required	3 alpha- numeric	These two fields shall follow CIC Master Type List. (https://www.bim.cic.hk/en/resources/master_list).
2	Functional Type	Required	3 alpha- numeric	<ul style="list-style-type: none"> a) Field 1 shall be kept unique in value and meaning (e.g. ECD, SCH) b) Value of Field 2 could be the same for different meaning (e.g. 3PH means three phase isolator when it is under Field 1 “EIS”. 3PH means 16A 3 phase 5 pin switched socket outlet when it is under Field 1 “ESO”). c) Fields 2 can have the same value as Field 1 if Field 2 has different meaning and is necessary to describe the BIM object at the second level. d) When Field 2 is not necessary to describe at the second level, three underscores (___) should be used.
3	Originator	Required	3 alpha- numeric	For BIM objects originating from WDs, corresponding department names should be used as originator names. However, other consultant or contractors who create the new BIM objects should follow Agent Responsible Code (ARC) list for originator. For those consultant or contractors, this field shall follow the up-to-date version of the ARC published by DEVB under the CAD Standard for Works Projects (ARC full list can be found at:

Field No.	BIM Object Naming Fields	Obligation	Field Length and Format	Guidelines
				<p>https://www.devb.gov.hk/en/construction_sector_matters/electronic_services/cad_standard/computer_aided_drafting/cad/index.html)</p> <p>If a BIM object is fully adopted without change, its name should be maintained. However, if the BIM object is modified, its originator code should be updated and saved as another BIM object file.</p>
4	Descriptor 1	Required	1-15 alpha-numeric	<p>Descriptor 1 contains information about primary use and material when applicable.</p> <ul style="list-style-type: none"> a) Duplicate information with the Category and Functional Type should be avoided. For example, if category is “WDW” (means window), “window” should not be used in this field. If functional type is “DBL” (means double), then “double” should not be used in this field. b) Capital letters should be used for first letter of each word (e.g. WallMounted, GlobalValve). c) All-capital short forms should be used to indicate materials when applicable (e.g. CONC for concrete, WD for Wood). If Descriptor 1 starts with all-capital short form, an underscore () should be used to separate the short form and the following word (e.g. CONC_Kerb, WD_Slash). d) If Descriptor 1 is blank, three nos. of underscores () should be used in place of

Field No.	BIM Object Naming Fields	Obligation	Field Length and Format	Guidelines
				<p>Descriptor 1 (e.g. SFM-RCB-ACM-__-01.rfa).</p> <p>e) Descriptor 1 should be kept as concise as practicable with the maximum length of 15 characters in order to reserve space for 2 digit sequential number in Descriptor 2 for potential future expansion.</p>
5	Descriptor 2	Required	2 alphanumeric	<p>Descriptor 2 is a 2-digit sequential number (e.g. 01 to 99) to distinguish different types that cannot be sufficiently identified by preceding fields. (e.g. STE-STA-ACM-NB_Pier-01.rfa)</p> <p>If Descriptor 2 is blank, two underscores (__) should be used in place of Descriptor 2. (e.g. PPF-UPV-ACM-BendSocket-__.rfa)</p>

3.4.3. The file name length of BIM objects should be 30 characters maximum, including delimiters but excluding the file extension. BIM object file name is expected to be as short as possible and should comply with the CIC Production of BIM Object Guide.

3.4.4. Only alphanumeric characters, hyphen (-) and underscore () are allowed. Hyphens should be used as the delimiter between each naming field.

3.4.5. Space, special symbols and invalid characters (including ~ " # % & * : < > ? / \ { | } .) shall not be used within BIM object file names.

3.5. Guidelines for BIM Object Authoring

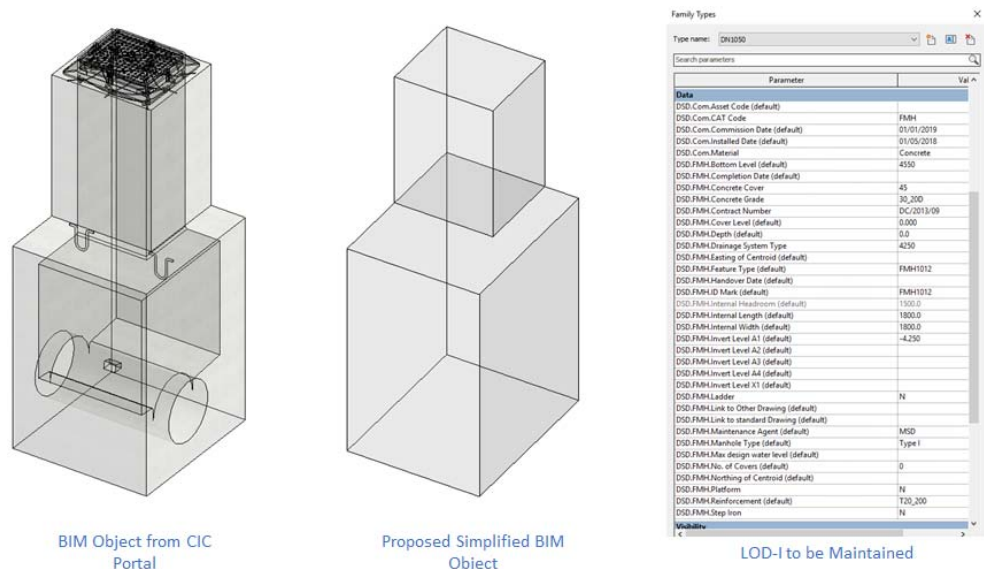
While the principles of authoring BIM object should follow the CIC Production of BIM Object Guide, this section provides further guidelines for handling BIM objects.

3.5.1. Simplifying and Enhancing BIM Objects

Before using a BIM object, BIM authors should check if it could be simplified or modified to meet the project requirements. The basic principle when using the BIM objects should be as follows:

- a) At the same LOD-G, utilising the same BIM object without change as far as practicable.
- b) When the LOD-G is too detailed for the project, simplifying the BIM object should be considered while ensuring that the same LOD-I is maintained. The naming of the simplified object should follow Section 3.4 for details and Field 3 of the BIM object file naming shall be renamed after the Originator who altered the BIM object. Refer to Figure 3-5 below for a sample simplified BIM object.

Figure 3-5 Sample Simplified BIM Object based on Detailed BIM Object

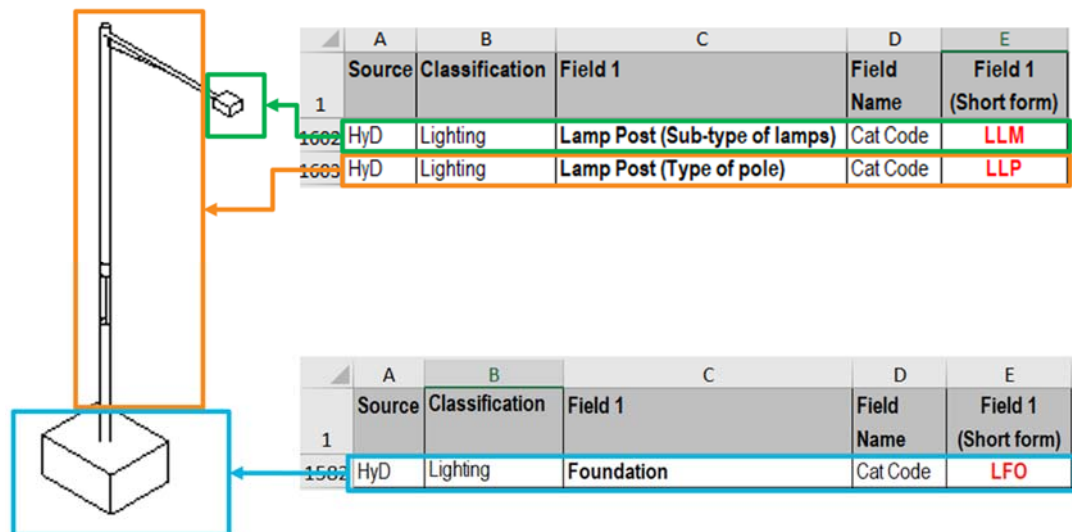


- c) When the LOD-G is insufficient to meet the project requirement, a new BIM object should be developed based on original BIM object file.

3.5.2. BIM Object Division

The CIC Master Type List shows the current set of classification and codifications. A model element may be authored using more than one BIM object. For example, a lamp post may contain three BIM objects: type of pole, sub type of lamps and foundation (refer to Figure 3-6).

Figure 3-6 Sample Lamp Post BIM Object Division



3.5.3. LOD-G and LOD-I for different model elements may vary but should ultimately facilitate project needs. The attributes “LOD-G” and “LOD-I” should be added to the newly created BIM objects to indicate the LOD level number. Refer to Appendix VI for details.

3.5.4. Common BIM software have built-in templates or tools to facilitate the authoring of BIM objects. These templates or tools have the capability to embed 2D presentation, but the methods may vary. After inserting BIM objects into BIM models, project-specific attributes should be added and populated. Refer to Appendix V for examples of BIM object authoring.

3.6. BIM Object Management

3.6.1. CIC BIM Portal supports OmniClass classification. To facilitate logical BIM object organisation and searching, BIM objects could be organised in a folder structure as the first level of OmniClass according to “OmniClass version 2012 Table 23” (<https://www.csiresources.org/standards/omniclass/standards-omniclass-about>). Table 3-2 below shows an example for the corresponding Level 1 title with OmniClass numbers as folder names.

Table 3-2 Folder Structure of BIM Object Library

OmniClass Table 23	Products
Folder Name	Level 1 Title
23-11	Site Products
23-13	Structural and Exterior Enclosure Products
23-15	Interior and Finish Products
23-17	Openings, Passages, and Protection Products
23-19	Specialty Products
23-21	Furnishings, Fixtures and Equipment Products
23-23	Conveying Systems and Material Handling Products
23-25	Medical and Laboratory Equipment
23-27	General Facility Services Products
23-29	Facility and Occupant Protection Products
23-31	Plumbing Specific Products and Equipment
23-33	HVAC Specific Products and Equipment
23-35	Electrical and Lighting Specific Products and Equipment
23-37	Information and Communication Specific Products and Equipment
23-39	Utility and Transportation Products

3.6.2. In addition to managing the folder structure, OmniClass classification information should also be inputted in BIM objects' classification attributes, in accordance with OmniClass version 2012 Table 23. Refer to Appendix VI for details.

3.6.3. WDs are recommended to adopt and customise Appendix VII – Sample BIM Object Check Form for departmental use. The corresponding BIM Support Team should upkeep their own check forms in the future.

3.7. Workflow for Sharing BIM Object

3.7.1. WD's BIM Support Team should collect, review and register BIM object packages (BIM object files, CIC BIM Object Sheets and CIC BIM Object Check Forms) for submission to CIC.

3.7.2. If CIC deems the BIM object file not ready to be accepted, comments would be provided to the BIM Support Team concerned for following up. After CIC certifies and accepts the BIM objects, the BIM object files would be made available on CIC BIM Portal. Feedback regarding the acceptance status would be provided to the respective BIM Support Team within three months after receiving the BIM object packages.

- 3.7.3. WDs should notify project awardees to utilise BIM objects shared at CIC BIM Portal as far as practicable and make reference to WDs' BIM objects that have been internally accepted for use.

4. Federation and BIM Model Naming

4.1. BIM Model Naming Principle

4.1.1. This section provides the principle to set out the BIM model naming (information container ID) and federation strategy to achieve consistent BIM model federation. A hierarchical and logical model organisation can serve to facilitate BIM management and subsequent LOIN implementation such as LOD-I management and colour appearance.

4.1.2. ISO 19650-2:2018 Part 2 Section 5.1.7(a) states that each information container shall have a unique ID, based upon agreed and documented convention comprising fields separated by a delimiter, within a project Common Data Environment (CDE). Unique ID should be consistent among WDs to facilitate interdepartmental information exchange via the GBDR. The hierarchy should include the following descriptions:

- a) What asset is the BIM model related to;
- b) Who is the originator of information;
- c) Which geospatial zone and system(s) it belongs to;
- d) Where it is located;
- e) Which discipline it is related to;
- f) What type of information the model contains; and
- g) What unique information is necessary to further distinguish the model from others.

4.1.3. ISO 19650-2:2018 Part 2 Section 5.1.7(b) states that the project's common data environment shall enable each field to be assigned a value from an agreed and documented codification standard. The codification standard would set out:

- a) Field sequence;
- b) Information container ID fields (and sub-fields if applicable);
- c) Description of each information container ID field and sub-field;
- d) Whether the field is required or optional;
- e) Format which defines length and alphabetic, numeric or alphanumeric;
- f) Whether the codification is common or project-specific; and
- g) Where the detailed list of codification information can be located.

4.1.4. Information container ID, model division, federation and corresponding abbreviation codes should be sustainable and consider the future potential use of metadata.

4.2. Information Container Identification Fields

4.2.1. Model naming shall follow the information container ID fields sequence and corresponding abbreviation codes. The arrangement of information container ID fields

is primarily derived from the principles in ISO 19650 to suit the common practices within WDs. Naming convention should follow Section 4 of the Guidelines.

- 4.2.1.1. The maximum total length of model names is 43 characters (including delimiters and information dividers; excluding file extension). Appendix VIII – Federation Strategy Diagrams and Naming Examples shows examples for reference.
- 4.2.1.2. Information container ID fields are reserved for information pertinent to information exchange between WDs. To ensure that the total length of model naming is manageable, metadata should only be used when:
 - a) The information container ID field is only relevant to individual WDs;
 - b) The identification does not facilitate work breakdown structure;
 - c) The length of the information container ID field is relatively long; or
 - d) The detailed descriptions would lose the meaning and adversely affect information exchange if abbreviated.

The input format for metadata that facilitate data filtering (e.g. security code) should be consistent. Flexibility on the input format is allowed for other cases.

4.2.2. Table 4-1 describes the Information Container ID Fields.

Table 4-1 Information Container ID Fields

Field No.	Information Container ID Field	Sub-field No.	Information Container ID Field Description	Obligation	Field Length and Format	Nature of Codification
1	Project	N/A	A unique identifier should be used to serve as the project code (e.g. agreement, contract, future asset categorisation). A unique code should be assigned to each project stage (e.g. design, construction and operations) to determine the relationship with a particular asset.	Required	1-8 alphanumeric	Project-specific (Appendix IX, Table App IX-1)
2	Originator	N/A	A unique identifier based on Agent Responsible Code (ARC) should be used to indicate the model's responsible authoring party. The ARC is updated from time to time, which could be found at https://www.devb.gov.hk/en/construction_sector_matters/electronic_services/cad_standard/computer_aided_drafting/cad/index.html	Required	3 alphanumeric	Common (Agent Responsible Codes)
3	Volume (and System when applicable)	3.1	A unique identifier should be used to indicate specific geospatial zone or volume within a project.	Required	1-3 alphanumeric	Project-specific (Appendix IX, Table App IX-2)

Field No.	Information Container ID Field	Sub-field No.	Information Container ID Field Description	Obligation	Field Length and Format	Nature of Codification
		3.2	An identifier should be used to indicate a collection of interconnected model elements across main disciplines under a system (e.g. sewerage system, water supply system, highway). System is used to facilitate data sharing instead of creating multiple interdisciplinary data sets.	Optional	1-3 alphanumeric	Common (Appendix X, Table App X-1)
4	Location (and Sub-location when applicable)	4.1	An identifier should be used to indicate a specific location (e.g. slope number, feature code, building code) for geospatial coordination and future asset management. Common abbreviation codes should be used as far as practicable.	Required	1-4 alphanumeric	Common (Appendix X, Table App X-2) and Project-specific (Appendix IX, Table App IX-3)
		4.2	An identifier should be used to indicate a sub-location (e.g. level) within the same location. Additional sub-locations, if any, should be defined in the project information standard. This field's value should not duplicate that of Field 4.1.	Optional	1-2 alphanumeric	Common (Appendix X, Table App X-3 and X-4)
5	Discipline (and Sub-discipline when applicable)	5.1	An identifier should be defined for each primary discipline to facilitate appearance settings and information filtering for interdepartmental coordination. In the case that data filtering and collaboration is required, BIM models should be authored separately for each sub-discipline.	Required	1-2 alphabetic	Common (Appendix X, Table App X-5)
		5.2	An identifier should be used to indicate each sub-discipline appointment. Additional sub-disciplines, if any, should be defined in the project information standard.	Optional	1-2 alphabetic	Common (Appendix X, Table App X-6)

Field No.	Information Container ID Field	Sub-field No.	Information Container ID Field Description	Obligation	Field Length and Format	Nature of Codification
			Additional abbreviations should be based on those currently used by WDs as far as practicable.			
6	Type (and Characteristic when applicable)	6.1	An identifier should be used to indicate the information held within the container. As ISO 19650 states “this list can be expanded with project-specific codes,” Type is not limited to information unique to BIM models.	Required	1-2 alphanumeric	Common (Appendix X, Table App X-7)
		6.2	An identifier should be used to indicate the model’s characteristic when relevant.	Optional	1 alphabetic	Common (Appendix X, Table App X-8)
7	Sequential Number	7	A sequential number should be assigned when it is necessary to further distinguish the model from the others. It can also be used to distinguish other documents such as drawings. Refer to Appendix VIII for details.	Optional	3 numeric	Project-specific

4.2.3. Required and Optional Information Container ID Fields

The column “Obligation” in Table 4-1 indicates whether the field is required or optional. Optional information container ID could be omitted at the discretion of the WDs.

4.2.4. Abbreviation Codes

4.2.4.1. The column “Nature of Codification” in Table 4-1 indicates whether the field is project-specific pertaining to individual projects, or common which could be applicable universally to all projects.

4.2.4.2. Abbreviation codes serve to facilitate information container ID generation and BIM model upload validation for the GBDR. WDs should utilise these codes for model naming. There are two types of abbreviation codes, including:

- a) Common codes should be used as far as practicable. Refer to Appendix X for details.
- b) Project-specific codes should be documented in BEP. Refer to Appendix IX which contains examples of project-specific codes.

4.2.4.3. The universal codes of ZZ and XX for required information container ID fields shall be used when the conditions below exist. Appendix X for applying the universal codes in different information container ID fields for details.

- a) ZZ – multiple exist within a BIM model.
- b) XX – none or not applicable.

4.2.5. Delimiter and Information Divider

4.2.5.1. Hyphen (-, also known as minus) should be used as the delimiter to separate information container ID fields.

4.2.5.2. Underscore (_) should be used as an information divider between the sub-fields within each field when applicable.

4.2.5.3. When optional field is not required, it should be left empty, and the preceding delimiter “-” (hyphen) or information divider “_” (underscore) should be eliminated.

4.2.6. Space and Special Symbols

Space, special symbols and invalid characters (including ~ " # % & * : < > ? / \ { | } .) shall not be used within information container IDs.

4.3. Federation Strategy

4.3.1. In coherence with the sequence of information container ID fields, federation diagrams are established to describe the federation structure in a WBS as shown in Appendix VIII.

4.3.2. In accordance with principles stated in Sections 4.1 and 4.2, federation strategy should ensure:

- a) The information container breakdown (model division) conforms to requirements from departmental information owners (if known);
- b) The breakdown is sufficient to facilitate data filtering for information sharing according to Appendix III for details;
- c) File size limitation conforms to the maximum as stated in Section 2.3.1; and
- d) The information is clearly grouped.

4.4. BIM Model Naming

In accordance with Sections 4.1 – 4.3, model naming should be in the format as shown below.

<project code> - <originator> - <volume_system> - <location_sub-location> - <discipline_subdiscipline> - <type_characteristic> - <sequential number> . <file extension>

Refer to Appendix VIII for examples.

4.5. Naming of Drawings Generated from BIM model

WDs should consider adopting the model naming format for drawing file naming. Refer to Appendix VIII for an example.

5. LOIN Implementation

To enable information exchange using the GBDR, WDs shall follow the subsequent principles when authoring BIM files.

5.1. Aligned BIM Standards

5.1.1. The Guidelines should serve as the aligned standards for information exchange.

5.2. BEP

5.2.1. Referring to Section 2.1.2, BEP should incorporate requirements from asset owner. BEP should specify the BIM standards applicable to the project in addition to the Guidelines.

5.2.2. BEP should be authored in accordance with departmental BEP templates or DEVB's BEP reference template (if the former is unavailable). In addition, BEP should document the following:

- a) Information owner's identification;
- b) Project information requirements (e.g. element-specific LOD-I attributes in table or list formats);
- c) Project-specific federation strategy; and
- d) Project-specific codes for BIM model naming (e.g. project code(s), location codes).

5.3. BIM Modelling Setting

5.3.1. Coordinate System

All BIM files shall be authored and annotated directly with reference to the Hong Kong 1980 Grid (HK 1980 Grid) and Hong Kong Principal Datum (HKPD).

5.3.2. Model Unit

The model unit in all BIM files should be metric (i.e. metre for Civil 3D and millimetre for Revit) and based on a decimal system.

5.3.3. BIM Template

Project-specific BIM template could be prepared for the software commonly used. The template could include:

- a) Coordinate system and unit setting;
- b) Setting for drawing generation; and
- c) Common attributes.

5.3.4. Mandatory Requirements for BIM modelling

- a) Use the object at the CIC BIM Objects library, instead of creating own object, as far as practicable to maintain the consistency, such as inserting point and BIM attributes of the object.
- b) If new object is developed, register the object file in the CIC BIM objects library timely.
- c) Do not add user defined parameter with the same name as the system built-in parameters. Use a prefix such as departmental abbreviation code to differentiate the system built-in parameters from the user-defined parameters.
- d) Linked files will not be exported to IFC by default, keep them in the native file format for conversion, if needed.
- e) Use the common object types for modelling. For example, object type as listed below could be used when modelling in Civil 3D:

Item no.	Recommended object type	Remark
1	Tin surface	<ul style="list-style-type: none"> - These object types can be exported to IFC - Technical details of these types can be maintained when exporting to IFC
2	Pipe	
3	Structure	
4	Pressure pipe	
5	Fitting	
6	Appurtenance	
7	3D solid (Extracted from corridor)	

- f) Do not add IFC classes in the user defined attribute as this will mix up the mapping to IFC conversion.
- g) Only objects exist in the last phase will be exported to IFC by default. Do not set the Properties - “Phase Created” and “Phase Demolished” to the same value, otherwise it would be treated as temp or not exist feature and will not be exported to IFC.
- h) When preparing IFC for submission to the GBDR, Reference View v1.2 in ArchiCAD, OpenBuildings Designer, and Revit; or Coordination View v2.0 in Civil 3D should be set as Model View Definitions.

5.4. LOD-G

5.4.1. LOD-G Requirements

The table below describes LOD-G requirements of LOD 100 to 500 which are consistent with the principles of CIC BIM Standards (the latest version). LOD-G refers to the graphical representation which deals with geometric representation, symbology, and visualisation. This is generally related to the deliverable (scale of documentation) which controls the graphical precision of the elements represented. This in turn enables identification of which parts of the objects can be disregarded or simplified while keeping the object functional to meet the BIM Uses.

Table 5-1 LOD-G Definition

LOD-G	Description
100	The model element is graphically represented within the model by a symbol or generic representation or 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 spaces required 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 spaces required for handling installation, operation and maintenance, and the interface details for checking and coordinating with other models / objects.
400	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 with detailing for fabrication, assembly, and installation.
500	Not used. Refer to the latest version of CIC BIM Standards - General for details.

5.4.2. Overlapping Elements

Overlapping elements should be avoided and minimised. When overlapping elements cannot be eliminated, the reason and associated parameter for filtering should be documented in the BEP.

5.4.3. Large Spanning Continuous Elements

Model elements spanning over one level (e.g. walls spanning over 1 storey high) or across buildings (e.g. floor plates spanning between buildings through connection bridges) should be split into separate model elements.

5.4.4. Complex Geometry

For constructability, especially for design-stage considerations, complex geometries such as two-way curves and non-uniform rational basis spline surfaces shall be avoided whenever possible. When complex geometries cannot be eliminated, its modelling method shall be documented in BEP.

5.4.5. Room

To facilitate spatial identification, drawing generation and subsequent mapping works for spatial data (e.g. display of room tags), room should be modelled as far as

practicable for spaces bounded by architectural and structural elements, such as public access area of Government buildings. It may also be modelled by either manually assigning the centre point or drawing an enclosed boundary.

5.4.6. Operation and Maintenance Space

For building services and mechanical type of BIM elements, the operation and maintenance space are concerned information for asset owner. It is suggested to model the operation and maintenance space for these kinds of BIM elements, such as control panel/switch box with panel door, vent relief valve (VRV) unit with control valve set, etc.

5.5. LOD-I

5.5.1. LOD-I Grouping

Attributes (LOD-I) could be grouped by general properties, design properties, classification properties (e.g. OmniClass) and installation information. Under each grouping, the list of attributes may differ due to WDs' LOD-I requirements. The creation methods of attributes for BIM objects would vary by software. Refer to Appendix VI for details.

5.5.2. Project Information

To facilitate conversion engine's processes, all relevant project information (such as Organisation Name, Project Issue Date, Client Name, Project Address, Project Name and Project Number) should be inputted in all BIM files as part of the LOD-I for metadata extraction and geolocation. Refer to Appendix VI which shows the project information input methods of Revit and Civil 3D.

5.5.3. BIM Attributes (Attributes)

BIM models and BIM objects should be authored with required general properties and attributes. Refer to Appendix VI for details.

5.5.4. Language

Unless specifically required by the BEP, all project information and attributes should be in the English language.

5.6. Appearance

5.6.1. Within each WD, model elements' shading colours shall follow RGB codes specified based on the prevailing systems in WDs' guidelines for design authoring. For 3D coordination, WDs' own colour standards may be adopted. Deviations, if any, should be documented in BEP.

5.6.2. For interdepartmental 3D coordination between WDs, colour appearance should be based on Discipline (Field 5.1 of the naming convention) as specified in Section 4.2. GBDR will be capable of setting the colour appearance of various Disciplines in accordance with Tables 5-2 and 5-3.

Table 5-2 Colour Appearance by Discipline for Underground Utilities

Codes	Discipline	Colour (RGB)	Reference	Colour Appearance
CD	Chilled Water Distribution	0-255-0	ArchSD, EMSD	
FO	Sewerage	255-0-0	DSD	
FW	Fresh Water System	228-232-225	WSD	
GS	Gas Supply	255-0-255	N/A	
IR	Irrigation	0-255-255	ArchSD, EMSD	
PS	Electrical Power Supply	93-173-115	DSD, WSD	
RW	Raw Water System	77-166-190	WSD	
SD	Stormwater Drainage	0-0-255	DSD	
SW	Salt Water System	106-108-60	WSD	
TC	Telecommunication	230-205-255	N/A	
WR	Recycled Water System	0-128-255	ArchSD, EMSD	

Table 5-3 Colour Appearance by Discipline for Above-grade

Codes	Discipline	Colour (RGB)	Reference	Colour Appearance
AR	Architectural	255-255-255	N/A	
BS	Building Services	255-128-0	N/A	
EL	Electrical	93-173-115	DSD, WSD	
FS	Fire Services	255-0-0	ArchSD, EMSD	
LA	Landscape	0-255-0	N/A	
ME	Mechanical	233-193-0	DSD	
RD	Road	191-191-191	N/A	
SF	Site Formation	226-183-120	N/A	
SL	Slope	143-91-63	N/A	
ST	Structural	119-104-93	DSD	

6. The Way Forward

The Guidelines provides harmonised BIM standards for the use by WDs in capital works projects adopting BIM. The Guidelines and its appendices may be subject to change and adaptation to be applicable across all WDs' projects. It is therefore important to set out the recommended upkeeping and project close-out protocols.

6.1. Regular Review and Update

6.1.1. DEVB(WB) is the responsible party of the Guidelines. Corresponding BIM Support Teams of the WDs shall coordinate any departmental comments and recommendations for necessary discussion at the DEVB BIM Work Group Meeting.

6.1.2. The Guidelines should be up kept and updated periodically. The appendices that would need updating include:

- a) Appendix III – Data Filtering Rule Table should be reviewed when the WDs’ data requirements have been changed.
- b) Appendix X – Common Codes for Naming should be centrally managed and updated. Additional codes should be added to the list when commonly used. Obsolete codes should be removed from active use but kept reference for back tracing, if and when needed.
- c) Appendix VIII – Federation Strategy Diagrams and Naming Examples should be reviewed and updated as necessary to support proper data filtering.
- d) Appendix VI – LOD-I Requirements, Creation and Extraction may be subject to update if more LOD-I is required in the future (especially for asset management), or if information creation and extraction are changed due to technological advancement.

6.2. Codification Management

6.2.1. Each project would have its project specific codes, which, together with the common codes listed in Appendix X, could be used to facilitate validation of the BIM file names. It is recommended to conduct validation processes through CDEs, GBDR or other relevant systematic methods. Appendix XI contains a Sample Spreadsheet for BIM File Name Validation of the Guidelines for a sample spreadsheet to validate BIM file names.

6.3. Project Close-out Protocols

In accordance with Section 5.8.3 of ISO 19650-2:2018, project close-out activities include “archiving the project information model” and “compiling lessons learned for future projects”. This section contains recommended project close-out protocols for WDs’ consideration.

6.3.1. A project-specific checklist could be authored and included in each project’s BEP, with reference to:

- a) Asset owners' checklists of BIM attributes (which may have detailed LOD-I requirements);
- b) WDs' and project awardees' own checklists;
- c) Sample BIM Object Check Form (refer to Appendix VII); and
- d) Sample Project Close-out Checklist (refer to Appendix XII).

6.4. BIM / GIS Integration

6.4.1. A geospatial-based federation strategy and open format should be adopted to ensure coherence amongst BIM models. These BIM models should conform to requirements outlined in previous sections to facilitate open format conversion for the GBDR, as well as BIM / GIS integration amongst WDs and LandsD.

6.4.2. Going forward, consistent BIM data could facilitate interdepartmental and intradepartmental BIM / GIS integration and applications via a standard approach. The success of such integration would be contingent upon consistent approaches, including the adoption of:

- a) Information container sequence and code;
- b) Availability to share more information to the extent that it does not conflict with restricted or confidential information; and
- c) Support of open format use.

6.5. Departmental Transition

6.5.1. The Guidelines aims to facilitate information exchange between WDs and LandsD. WDs are suggested to reconcile the differences within their respective departmental standards.

6.6. Information Management

6.6.1. As BIM maturity increases among WDs, information management conforming to ISO 19650 will become more relevant.

6.6.2. It is suggested to dedicate a section in the BEP on Project Information Standard, which sets out the standards and protocols that the project should be followed. It should contain the following:

- a) A list of the standards that are to be followed;
- b) Naming conventions that are to be used or any specific project codes;
- c) Method(s) to generate applicable 2D / CAD drawings from the relevant BIM object / models;
- d) Define what classification of WBS and Task Information Delivery Plan (TIDP) should be used in detail, which relates to information container breakdown structure on project-specific basis; and

- e) How LOIN should be described.

6.6.3. Information Delivery Plan

- 6.6.3.1. While BEPs have already been prevalently used by most WDs as one of the information management tools in BIM projects, in accordance with ISO 19650, an information delivery plan is required in addition to BEP to manage information in the lifecycle of a project. Information delivery plan should not only outline the principles of information management using BIM, but also be applicable to other information management aspects of a project, such as drawings, data files, visualisation and simulations.
- 6.6.3.2. The conversion engine utilises a common key approach to link attributes and geometries. This could facilitate LandsD's 3D digital map development and allow single query for 3D models. To maintain the attributes in tabular format in the long term, the common key approach should be regularly reviewed.

6.6.4. Data Security Classification

- 6.6.4.1. There are three security tiers, namely unclassified, restricted and confidential. If GBDR access expands beyond WDs, additional security definitions may be created by adding abbreviation codes to the "Security" metadata field or CDE folder management.

6.6.5. CDE

- 6.6.5.1. Establishment of project-CDE, as an overarching CDE for its constituent consultancy studies and works contracts, if appropriate, should take into consideration of information security issues. As per ISO19650, CDE is an "agreed source of information for any given project or asset, for collecting, managing and disseminating each information container through a managed process". CDE may serve more functions than data repositories. CDE capabilities could ultimately surpass those defined in ISO 19650 to fulfil project needs as the single source of truth (e.g. central information depository and lifecycle management for documents, contracts, reports, bids and model information).

End of the Guidelines