Building Information Modelling (BIM) Guide for Architectural Design (Version 1.0)

Architectural Branch
Architectural Services Department

Objective

The primary purpose of this Guide is to gather and present factual materials in such a manner that project officers, both professional and technical, could obtain a common reference of the various practices on the adoption of BIM in architectural design and construction for building projects undertaken by the Architectural Branch of the Architectural Services Department.

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1. Introduction

1.1 Overview

This Building Information Modelling (BIM) Guide for Architectural Design documents the general requirements of the management and production of BIM models for building projects managed by Architectural Services Department (ArchSD). It aims at providing the general requirements and practices for the processing of BIM model and related deliverables at design, construction and handover stages in order to achieve the following objectives:

- To facilitate the building up of unified data management structure
- To standardize the settings and configurations of BIM model
- To provide a common set of BIM objects

This BIM Guide for Architectural Design (hereinafter called "The Guide") is formulated base on internationally and locally recognized BIM standards, guidelines and industry practices. While BIM is under rapid development, this Guide shall be subject to regular review and update to suit the latest development of BIM.

1.2 Reference BIM Standards and Guidelines

This Guide has made referenced to the following international and local standards and guidelines:

(a) CIC Building Information Modelling Standards (Phase One) issued by Hong Kong Construction Industry Council.

(b) Computer-Aided-Drafting Standard for Works Projects (CSWP) issued by Development Bureau of the HKSAR Government.

(c) American Institute of Architects (AIA)'s G202™-2013 Project Building Information Modeling Protocol Form.

(d) BS 1192:2007+A1:2016 Collaborative production of architectural, engineering and construction information. Code of practice.

(e) BS 8536-1:2015 Briefing for design and construction. Code of practice for facilities management (Buildings infrastructure).

(f) PAS 1192-2:2013 Specification for information management for the capital/delivery phase of construction projects using building information

modelling.

(g) PAS 1192-3:2014 Specification for information management for the operational phase of assets using Building Information Modelling.

(h) BS 1192-4:2014 Collaborative production of information Part 4: Fulfilling employers information exchange requirements using COBie – Code of practice.

(i) PAS 1192-5:2015: Specification for security-minded Building Information Modelling, digital built environments and smart asset management.

(j) Building Information Modelling – Asset Management (BIM-AM) Standards and Guidelines issued by EMSD.

(k) Level of Development Specification Part I, November 2017 by BIMFORUM.

(l) Construction Industry Council Production BIM Object Guide General Requirements issued by Hong Kong Construction Industry Council.

(m) Building Information Modelling for General Building Plan Submission (Phase One) Consultancy Report, FEB 2017 by Hong Kong Construction Industry Council.

1.3 Terminology

The common terminology for BIM process are listed below:

Terminology	**Description**
3D	Three-dimensional geometry
4D	Construction sequencing information
5D	Cost information
6D	Project life-cycle information
CAD	Computer-Aided Design
Common Data Environment (CDE)	Common Data Environment (CDE), an electronic platform to manage the collection, creating, sharing and publishing of project information. This is the single source of all information relating to the project and should be set up to facilitate the

	spatial coordination and information exchange processes described in PAS 1192.
COBie	Construction Operations Building Information Exchange (COBie), an international standard to manage asset data information rather than geometric information such as equipment list and product data. COBie may take several approved formats include spreadsheet and IFC file format.
Object /Element	An occurrence of a building component in BIM software at a particular location and orientation within a model (e.g. door, windows, etc.).
Object file	A data file that contains building elements. It often contains the geometry and parameters representing the elements. It can be created or loaded into the BIM authoring software to assist design.
Federated Model	Compilation of Models from one or more programs that can define a complete or partial data set for a design.
Industry Foundation Class (IFC)	A platform neutral, open and object-based file format specification developed by building-SMART to facilitate interoperability in the architectural, engineering and construction industry, and is commonly used collaboration format in BIM based projects. The IFC model specification is registered by ISO as ISO 16739:2013.
LOD	Level of Development (LOD) defined in CIC Building Information Modelling Standards (Phase One)
Origin	The setting-out point for a project

Project Execution Plan (PXP)	Project Execution Plan (PXP) should outline the overall vision for the project and provide implementation details throughout the project. It should be created at the start of the project and updated throughout the project. The BIM requirement, BIM deliverables during the project and at the final handover should be specified.

2. Data Management Requirements

2.1 General

Prior to BIM model production, a unified data management structure must be established for collaboration and information exchange efficiently. The project setup framework should make reference to the BS1192:2007 +A2:2016 – Code of Practice for the Collaborative Production of Architectural, Engineering and Construction Information.

A typical project setup must be applied for individual project according to the framework described in Item 2.2 Project Folder Structure of this Guide and documented in the BIM Project Execution Plan.

For consistency, it is recommended to have the same project setup both in the Common Data Environment (CDE) and the individual computer workstation.

2.2 Project Folder Structure

The following folder structure is provided as an example arrangement, designed to encourage compliancy with the strategies contained within this standard.

- [Project Folder]
  - BIM [BIM data repository]
    - 01-WIP [WIP data repository]
      - CAD_Data [Imported CAD files (incl. Modified)]
      - BIM_Models [Design models (incl. Modified)]

- Sheet_Files [Sheet/dwg files]
- Export [Export data e.g. gbXML or STL]
- BIM_Objects [Components created during this project]
- Presentation [Image / Video]

- 02-Shared [Verified Shared data]
  - CAD_Data [CAD data/output files]
  - BIM_Models [Design models]
  - Coord_Models [Compilation models]

- 03-Published [Published Data]
  - + YYYYMMDD_Description [Sample submission folder]
  - + YYYYMMDD_Description [Sample submission folder]

- 04-Archived [Archived Data repository]
  - + YYYYMMDD_Description [Archive folder]
  - + YYYYMMDD_Description [Archive folder]

- 05-Incoming [Incoming Data repository]
  - Source [Data originator]
  - + YYYYMMDD_Description [Incoming folder]
  - + Source [Data originator]

- 06-Resource [Project support files]
  - + Titleblocks [Drawing borders/title blocks]
  - + Logos [Project logos]
  - + Standards [Project standards]
- 07-Others [Other documents not classified above]

No spaces are to be used in the folder naming as this can potentially interfere with certain file management tools and collaboration across the internet.

Project Folder Structure for As-built Model

Refer to the current version of Building Information Modelling (BIM) Guide for Facilities Upkeep by Property Services Branch.

2.3 Model Division

A project BIM model should be divided into separate categories and/or building blocks depending on the nature and complexity of the project. For projects with large site footprint where several building blocks existed, the model may be further divided into several zones for more efficient handling of models. The model could be divided by blocks, phases, floors or trades, etc. Once divided, the series of individual models are much easier to manage than one large file. For example:

Example: For project with a single building block:

Model Name	Building	Category
ADA-8216-ALL-AL-N-SIT	Government Offices	Site
ADA-8216-ALL-AL-N-SFA	Government Offices	Structural Framing
ADA-8216-ALL-AL-N-CLG	Government Offices	Ceiling
ADA-8216-ALL-AL-N-FRN	Government Offices	Furniture

Example: For project with 2 separated building blocks or Phases:

Model Name	Building	Category
ADA-8216-A01-AL-N-SIT	Government Offices Block/Phase 1	Site
ADA-8216-A01-AL-N-SFA	Government Offices Block/Phase 1	Structural Framing
ADA-8216-A01-AL-N-CLG	Government Offices Block/Phase 1	Ceiling
ADA-8216-A01-AL-N-FRN	Government Offices Block/Phase 1	Furniture
ADA-8216-A02-AL-N-SIT	Government Offices Block/Phase 2	Site
ADA-8216-A02-AL-N-SFA	Government Offices Block/Phase 2	Structural Framing
ADA-8216-A02-AL-N-CLG	Government Offices Block/Phase 2	Ceiling
ADA-8216-A02-AL-N-FRN	Government Offices Block/Phase 2	Furniture

Under special circumstances, a single BIM model may be acceptable depending on the nature and complexity of project. The BIM Project Execution Plan shall state the model division strategy (by categories or building blocks, etc.). File sizes of each divided BIM model shall be kept in minimum by purging of unused views, BIM objects and settings before publish or submission. In general, the maximum file size for each divided BIM model should not exceed 200Mb unless otherwise approved. The modelling practices for all divided BIM models shall be consistent so that they could be combined into federated model together with models of other disciplines in common software platform tools.

2.4 General Naming Conventions

- Use only letters A-Z, hyphen, underscore and numbers 0-9 for all fields.
- All fields shall be separated by a hyphen character "-". DO NOT use spaces.
- Within a field, either Camel Case or an underscore "_" shall be used instead of a space to separate words.
- A single period character "." shall be used to separate the file name from the extension. This character should not be used anywhere else in the file name.
- The file extension shall not be amended or deleted.
- The scheme for zone and level sub-division shall be agreed with the other project professionals at the outset and defined in the **BIM Project Execution Plan (PXP)**.
- Elements where a naming convention is not explicitly defined by this Standard shall adopt the naming convention of existing elements and prefix with a 3-character abbreviation to identify corporate author. Examples:

Line Pattern Name	Line Style Name	
ADA_Dash-1.5mm	ADA_1-Solid	} Existing elements
ADS_Dash-3mm	ADS_3-Solid	
ADB_Dash-9mm	ADB_5-Solid	
ADA_Dash-12mm	ADA_3-Hidden	--- New element

2.4.1 Model File Naming

For model file naming, recommended character restrictions should be adopted.

ADA	8282	ALL	1F	A	WIP
1	2	3	4 (optional)	5	6
Originator	Project	Zone / System	Level	Type	Description

Field 1: **Originator Code** (Recommended **3** characters)
An abbreviated code identifying the originating stakeholder, e.g.
ADA for Architectural Branch
ADS for Structural Engineering Branch
ADB for Building Services Branch

Field 2: **Project** (Recommended **4** characters)
An abbreviated code or number identifying the project, e.g. InForM no.

Field 3: **Zone/System/Block** (Recommended **3** characters)
Identifier of which building, area, phase or zone of the project, the model file relates to if the project is sub-divided by zones).
If the project has zoning, "Z01" should be added in this field.
If the project has no zoning, "ALL" should be added in this field.

Field 4: **Level** (Recommended **2** characters, ***optional***)
Identifier of which level, or group of levels, the model file relates to if the project is sub-divided by levels, e.g.:

B2	Basement Level 2
B1	Basement Level 1
LG	Lower Ground Floor
UG	Upper Ground Floor
GF	Ground Floor
MF	Mezzanine Floor
1F	1st Floor
RF	Roof
UR	Upper Roof
AL	All Levels (a single model contain all levels)

Field 5: **Type** (Recommended **1** character)
Descriptive field defines the type of the project, e.g.

A	As-built
D	Demolition Work
E	Existing
M	Maintenance Work
N	New work
T	Temporary Work
W	All work (e.g. Combination of the above)

Field 6: **Description** (Recommended **3** characters)
Descriptive field defines the use of drawing, e.g. 01 for First Submission, 02

for Second Submission, etc.

	Use of drawings	**Work Stage involved**
A01	AI Drawing	Workstage (5)
DG1	Dangerous Goods Submission	Workstage (3~5)
F01	FS Drawing for FSD	Workstage (3~5)
G01	General Building Plan	Workstage (1~6)
P01	Presentation	Workstage (1~6)
S01	SCCU Submission	Workstage (3~6)
T01	Tender Drawing	Workstage (4)
WIP	Work in Progress	Workstage (1~6)
X01	Design Options	Workstage (1~4)

Examples:

Model File Name	Description
ADS-3723-Z06-1F-N-X01.xxx	Job No. 3723, Structural model of Zone 6, Level 1, New work, Design Option 1
ADS-3723-ALL-AL-N-P01.xxx	Job No. 3723, Structural model, No zone separation, All levels, New work, Presentation Set 1
ADA-3723-Z01-AL-N-S01.xxx	Job No. 3723, Architectural model, Zone 1, All levels, New work, SCCU First Submission
ADA-7977-Z02-AL-M-T01.xxx	Job No. 7977, Architectural model, Zone 2, All levels, Maintenance Work, Tender Set 1
ADA-7977-Z03-2F-A-G01.xxx	Job No. 7977, Architectural model, Zone 3, Level 2, As-built Model, General Building Plans
ADA-8195-ALL-W-WIP.xxx	Job No. 8195, Architectural model, No zone separation, All levels, All work, Work In Progress

2.4.2 View Naming Convention

Having a view naming system can help user to find the proper views. Since one view can be used on one sheet only, same view need to be duplicated for different use of sheets. The view name to be divided into three/four fields:

GP	**50**	**1F**	**Male Toilet**
1	2	3	4 (optional)
Usage	Scale	Level	Room Name

Field 1: **Usage** (Recommended 1-2 characters)

FS (for FSD Submission), SC (for SCCU Submission), P (for Presentation), SK (for sketch drawing), GP, DL, CA, MS, CF, PE etc.

Field 2: **Scale**

1:50, 1:100, 1:2000, etc.

Field 3: **Level / Description**

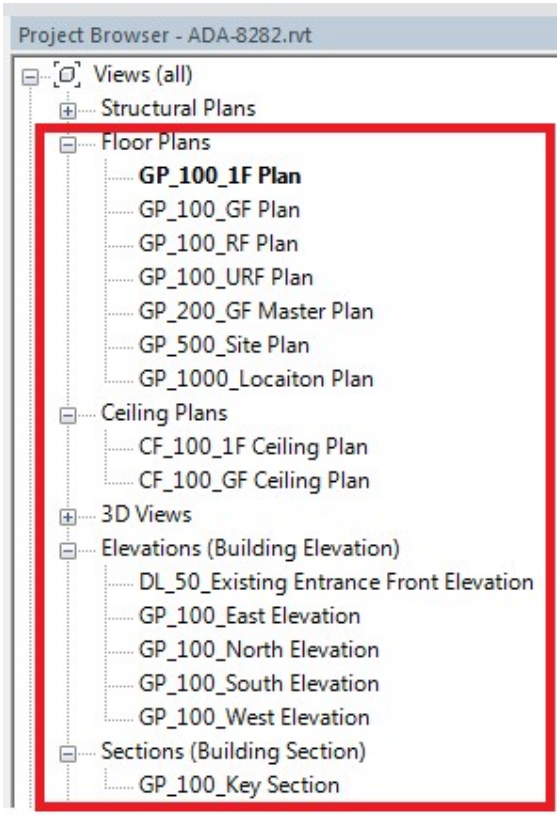
GF, 1F, 2F, RF, Site Plan, Elevation, Section, etc.

Field 4: **Room Name**

Toilet, Plant Room, etc.

Example :

GP-2000-Site Plan


Project Browser - ADA-8282.rvt
Views (all)
Structural Plans
Floor Plans
GP_100_1F Plan
GP_100_GF Plan
GP_100_RF Plan
GP_100_URF Plan
GP_200_GF Master Plan
GP_500_Site Plan
GP_1000_Locaiton Plan
Ceiling Plans
CF_100_1F Ceiling Plan
CF_100_GF Ceiling Plan
3D Views
Elevations (Building Elevation)
DL_50_Existing Entrance Front Elevation
GP_100_East Elevation
GP_100_North Elevation
GP_100_South Elevation
GP_100_West Elevation
Sections (Building Section)
GP_100_Key Section

Identification for Types of Architectural Drawings

Identifier	Types of Arch. Drawings	Drawing Elements	Remarks	Scale Recom-mended
GP	Location Drawings, General Layout	1. List of Drawings 2. Location Plan / Block Plan 3. Master Layout Plan 4. General Plans (Floor Plans, Sections & Elevations)	1. Separate identifiers can be established for **Submission Drawings** if required. 2. All external Builder's works for B.S./ main services stacks (e.g. R.W. Pipe, S.&W. Pipe & etc.) should be incorporated on Site Plan / Floor Plans unless directed otherwise.	1:100 1:200 1:500 1:1000 1:5000 1:7500 1:10000
		5. Existing Layout/ Demolition Plan/ Hoarding Plan	For Alteration & Addition Projects or New Projects where existing works should be shown.	
PE	Principal Elements	1. Architectural Features/ Wall Sections 2. Roofing Details 3. Staircases 4. Lift Shafts 5. Openings for Skylights/ Escalators/ Curtain Wall/ Cladding etc.	To show the interface of components or assemblies for construction purposes.	1:2 1:5 1:10 1:20 1:50

Identifier	Types of Arch. Drawings	Drawing Elements	Remarks	Scale Recom-mended
CA	Component Drawings/ Assembly Drawings	1. Schedules 2. Details	To show in schedule form, the range of specific components and assembly details to be used in the project, e.g. :- Door Schedules & Details Window Schedules & Details Glass / Metal Louvres Schedules Roller Shutter Schedules Finishing Schedules & Details Ironmongery Schedules Sanitary Fittings Schedules Glass Block/Grille Wall Schedules & Details etc.	1:2 1:5 1:10 1:20 1:50
CF	Suspended Ceiling System/ Special Flooring System	1. Reflected Ceiling Plans & Details 2. Raised Floors & Details		1:5 1:10 1:20 1:100
DL	Detailed Layouts	1. Layout Plans 2. Sections 3. Elevations 4. Details	To show the detailed location and precise information of components and assembly details in complex areas, e.g.:- Room types & Details of : Toilets, Changing Rooms; Lift Lobbies, Services Rooms; Cooked Food Centres, Squash Courts; Medical Wards, Surgery Wards; Libraries, Special Classroom etc.	1:5 1:10 1:20 1:50
EW	External Works	1. Layout Plans 2. Sections 3. Elevations 4. Details	To show the detailed location of components and assembly details at external areas, e.g. Details of : Project Signboards Hoarding Layout & Details Pavings, Steps & Ramps Planters, Benches, Arbours Tree Pit & Grille Perimeter Walls/ Fences, Railings, Gates	1:5 1:10 1:20 1:50 1:100 1:200

Identifier	Types of Arch. Drawings	Drawing Elements	Remarks	Scale Recom-mended
			Draw Pit, Earth Pit etc.	
MS	Miscellaneous	Other Unclassified Elements	To show precise information of components and assemblies for workshop manufacture or on site fabrication, e.g. Details of : Notice Board, Cat Ladders, Trap Doors, Flagpoles, Signage System, F.S. Inlet/ HR Cabinets etc.	1:5 1:10 1:20 1:50
SC	Statutory Compliance Checking Unit Submission	1. List of Drawings 2. Location Plan / Block Plan 3. Site Plan 4. General Plan (Floor Plans, Sections & Elevations) 5. Schedules 6. Calculations 7. Schematic Drawings 8. Other prescribed plans as required under B(A)R	To show essential information e.g. site parameter, fire safety, means of escape, fire resisting constructions, light and ventilation, access and facilities for persons with a disability, modification table and other information as required by SCCU for processing of plans	1:50 1:100 1:200 1:500 1:1000 1:5000 1:7500 1:10000
FS	Fire Services Department Submission	1. List of Drawings 2. Location Plan/ Block Plan 3. Site Plan 4. General Plan (Floor Plans,		1:50 1:100 1:200 1:500 1:1000 1:5000 1:7500 1:10000

Identifier	Types of Arch. Drawings	Drawing Elements	Remarks	Scale Recom-mended
		Sections & Elevations)		
SK	Sketch Drawing	1. Layout Plans 2. Sections 3. Elevations 4. Details		

3. BIM Uses

3.1 General

The scope of BIM Uses in public works projects shall be according to the Development Bureau (DEVB) Technical Circular (Works) No. 7/2017. The following sections describe the general requirements and acceptable deliverables for various BIM Uses for architectural design.

3.2 Design Authoring

The process of using BIM software to create and develop a Building Information Model of a project which includes a database of properties, quantities, means and methods, costs and schedules. Project team shall use the authoring tools to produce plan, elevation, section, detail, fabrication and shop drawings. The tools may also be used to produce schedules (GFA, UFA, NOFA, room, door, window, finishes, etc).

3.3 Design Reviews

A process for stakeholders to view a model, images from the models or animated walk-throughs of a project, provide feedback and validate numerous design aspects such as meeting client requirements and previewing spaces and layouts in 3D. The reviewer can check layout, sightlines, lighting, security, disabled access and egress, way finding, ergonomics, acoustics, textures and colours, etc. There are numerous ways for carrying out design review process. Apart from regular workshop or meeting to review the

federated BIM model by project team, some other examples are animated walk-throughs in BIM software platform, virtual mock-up by BIM software platform and virtual mock-up by using virtual reality technology, etc. where project team may consider to plan and specify if appropriate.

3.4 Existing Conditions Modelling

It is a process of 3D digital survey and production of BIM model for an existing site to facilitate design planning. The digital survey may be carried out by photogrammetry or laser scanning technology to generate Point Cloud model which is later transformed to an editable BIM model. The deliverables should at least include BIM model(s) indicating the existing architectural, building services and structure elements as appropriate, and character-defining elements for projects involving historic buildings. Where specified, the 3D digital survey model should meet the following requirements:

(a) Georeferenced to the absolute coordinate system;

(b) Referenced and generated from the digital Point Cloud survey result;

(c) With colour schemes applied to various architectural, building services and structure elements for differentiation; and

(d) Capable to serve as a base model for different design stage authoring use.

3.5 Site Analysis

A process in which BIM and GIS tools are used to evaluate a site to determine the most optimal location, position and orientation for a future project. The analysis may include master planning, sun and shadow studies, daylight analysis, wind flow analysis and solar envelope analysis, etc.

3.6 3D Coordination

The process of using Clash Detection software tools to identify conflicts by analysing 3D models of the different building systems. The goal of the coordination process is to eliminate clashes before construction of the project. The 3D coordination process shall include checks for headroom requirements, working spaces for building operations and maintenance activities. The following deliverables should be

provided in design and construction stage as minimum:

(a) Clash analysis reports for individual zones /floors;

(b) Action plan with target completion schedule to handle and eliminate detected clashes.

3.7 Space Programming

A process in which the design layout model is used to efficiently and accurately assess the compliance of client's spatial requirements, such as approved schedule of accommodation, reference plot ratio, site coverage of greenery and other spatial requirements as considered appropriate.

3.8 Phase Planning (4D Modelling)

A process of linking a programme to the model which is used to plan the phased occupancy in a renovation or to show the construction sequence and space requirements on a construction site. The following deliverables should be provided in construction stage as minimum:

(a) Overall building construction 4D work sequence model;

(b) The 4D work sequence model shall link up the construction master programme to demonstrate the compatibility of the installation works sequences of the major building components; and

(c) The model shall be assigned with the delivery path of major building components to demonstrate the feasibility and effectiveness of the installation method statements of the works. All temporary works and site logistic arrangements shall be modelled to demonstrate the feasibility and prove the constructability and buildability of the proposed method statement.

3.9 As-built Modelling

The process of preparing an accurate record of the physical conditions and assets of a project. The As-Built model should contain information relating to the architectural elements with links to operation, maintenance, and asset data. Additional information

and data for equipment and space planning may be included. For the deliverables to be provided for As-built Model, refer to the current version of BIM Guide for Facilities Upkeep by Property Services Branch.

3.10 Drawing Generation (Drawing Production)

It is a process of producing drawing sheets from the BIM model source. By setting various drawing views (layout or section) in the BIM software tools, drawing sheets could be automatically generated base on the BIM model information.

As far as it is practicable to generate 2D drawings from the BIM authoring software, non-BIM authoring software should not be used to generate drawings. The 2D drawings generated from BIM model does not need to follow the CAD Standard for Works Projects (CSWP). On the other hand, it is acceptable that certain architectural components, the building services schematic /control logic diagrams /drawings, reinforcement details are not generated directly from the BIM model.

4. Modelling Requirements

4.1 Model Origin Point and Orientation

The origin point and orientation of a BIM model shall be defined and coordinated with all disciplines as follows:

(a) Eastings and Northings shall refer to Hong Kong 1980 Grid System; and
(b) Elevations shall refer to Hong Kong Principal Datum (HKPD).

If a model is produced in a local co-ordinate system due to software functionality or limitations, the BIM coordinator or modeller shall be responsible for providing clear instruction and documentation as to the origin x, y, z and bearing translations accompanying their BIM submission.

4.2 Linking to Structure, Building Services and Landscape Models

The general rules for model linking are as follows:

(a) The coordinates of the structural and/or building services models should be checked before linking. Same coordinates should be adopted for models to be linked.

(b) Do not link to model under working (WIP).

(c) The linked model should be a detached copy of the central model.

4.3 Unit of Measurement

BIM model should be modelled in metric system (International System of Units or SI Units).

4.4 Date Format

Date format should follow ISO 8601 Data elements and interchange formats - Information interchange - Representation of dates and times as follow:

Year				Month		Date	
Y	Y	Y	Y	M	M	D	D

4.5 Scope of Modelling

Modelling shall be carried out at each stage of the project and level of development of the elements produced at each stage will be specified in the BIM PXP.

The building or feature elements shall be created using the appropriate software tools and components for walls, slabs, doors, windows etc. If the features of the BIM authoring tool are not sufficient for modelling an element then it shall be created using other appropriate objects and defined with an appropriate “Type” name.

2D lines and symbols may be used to complement the model when smaller elements are not modelled in 3D. For example, some elements smaller than 50mm may not need to be modelled. 2D standard details may be used on drawings produced using BIM authoring tools to complement overall drawing packages.

If an architect models structural elements, the size and location shall be as per the information from the structural engineers. It is recommended that the architect uses

the structural model as a reference within the architectural model to avoid duplication of building elements.

Whenever possible, the architect should use the actual dimension, thickness or detail to model an element accurately. The model elements shall contain the information and data available at each stage.

4.6 Level of Development (LOD)

Building Information Models will be developed from preliminary design to final as-built models with a number of distinct phases and stages throughout the process. The level of development required at each stage of the design, construction and as-built phases should be different to accurately portrait the work.

Level of Development (LOD) Specification as stipulated in CIC Building Information Modelling Standards (Phase One) should be referred and adopted to enable clients, architects, engineers, contractors, quantity surveyors and facility managers to clearly specify the content of models at each stage of a project, and incorporated into the Design Stage and Construction Stage BIM PXPs so as to define what Levels of Development are to be achieved at each stage of a project and what will be delivered by the project teams.

The specification of LOD allows BIM coordinators and modellers to define what their models can be relied on for and allows other stakeholders to understand the usability and the limitations of models they are receiving. LOD defines the extent to which a model element has been developed from design to construction to operation.

LOD should only be used to describe model elements and not models as a whole. An element has only progressed to a given LOD when all the stated requirements have been met. There is no direct link between LODs and design phases. Building systems are developed at different progress through the design process. For example, the design of the structural system proceeds ahead of the design of interior layouts. At the end of scheme design, the model may include many elements at LOD 200, but will also include many at LOD 100, as well as some at 300.

The client and/or BIM Manager shall specify in the design stage BIM PXP, what the LOD for each model element shall be when models will be handed over from the design team to the contractor.

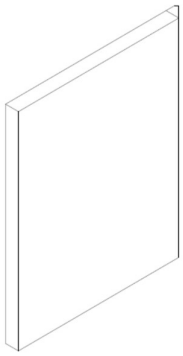
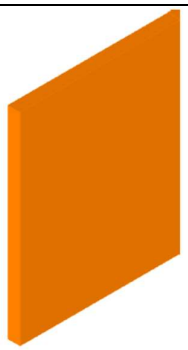
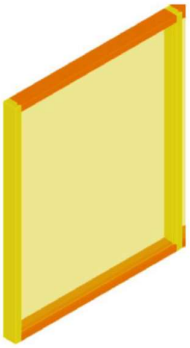
LOD Definitions

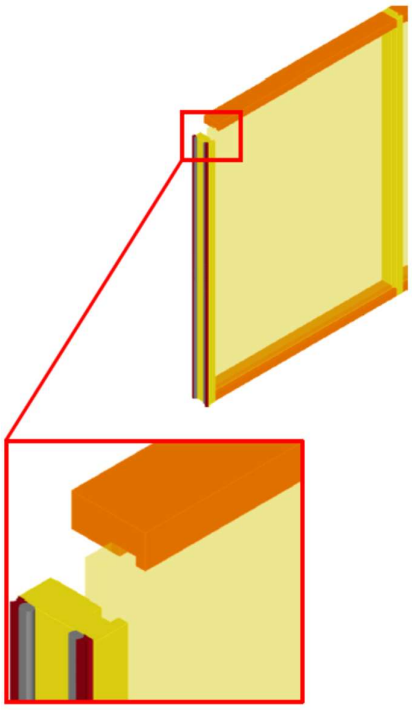
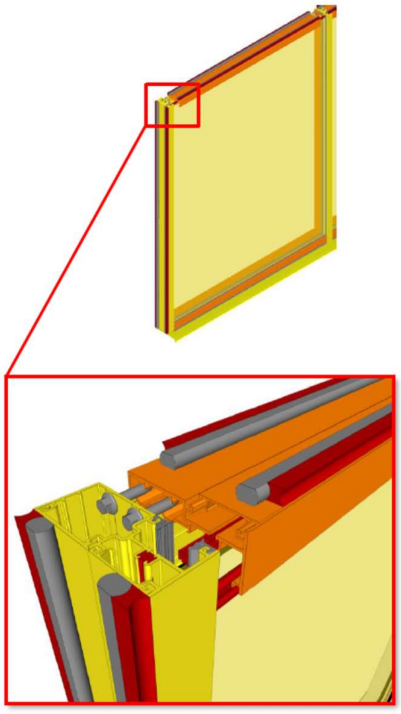
LOD	Minimum Acceptable Criteria	Reference Workstage
100	The Model Element may be graphically represented in the Model with a symbol or other generic representation. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.	Workstage 1 - 2
200	The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation.	Workstage 2 - 3
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.	Workstage 3 - 4
350	The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of quantity, size, shape, orientation and interfaces with other building systems.	Workstage 3 - 4
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, fabrication, assembly, and installation information.	Workstage 5 – 6
500	The Model Element is a field verified representation in terms of size, shape, location, quantity, and orientation.	Workstage 5 - 6

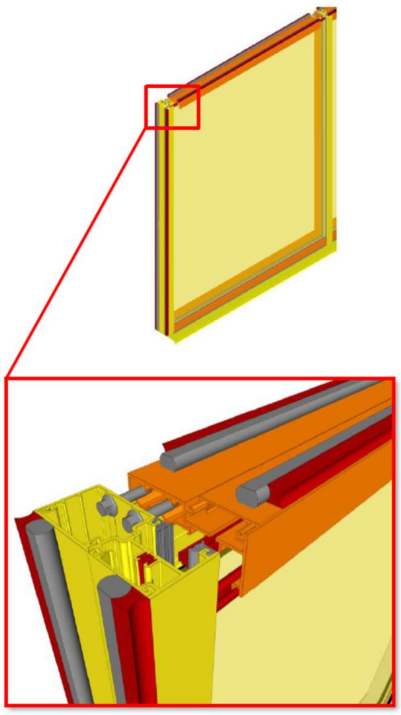
For LOD 200 to 500, non-graphic information and data may also be attached to the Model Elements.

An example of the minimum object geometry shapes (images) and the corresponding object information for architectural elements at different LODs are illustrated as follows:

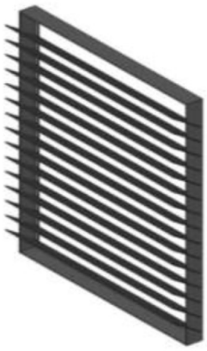
Example of Object Geometry Image for an Exterior Window

LOD	Description	Example Image
100	**Pre Design** Solid mass model representing overall building volume; or, schematic wall elements that are not distinguishable by type or material. Assembly depth/thickness and locations still flexible.	
200	**Schematic Design** Generic wall objects representing major types of proposed window wall assemblies. Overall window wall assembly depth represented by a single model object. Layouts and locations still flexible.	
300	**Design Development** Specified location and orientation of face of glass. Nominal face dimensions and thickness of glazing. Spacing, location, size and orientation of mullions. Operable components defined (windows, louvers and doors) and included in model.	

LOD	Description	Example Image
350	**Construction Documentation** Mullion shapes and geometry defined. Actual anchorage layouts and types defined and modeled. Actual panel dimensions (including seating).	
400	**Construction Stage** Complete mullion extrusion profiles. Interface details between wall systems (within) and wall and support systems including sealants, end dams, flashings and membranes.	

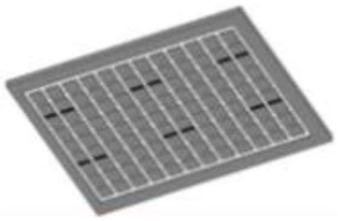
LOD	Description	Example Image
500	**As-built window model**	

Example of Object Geometry Image for a Louver

LOD	Description	Example Image
100	**Pre Design** N/A	
200	**Schematic Design** Generic model element that is indicative of approximate area and location of intended louver or vent.	
300	**Design Development** Louver assembly modelled by type, indicative of area and location of intended louver/vent and includes accurate frame (boundary dimensions) and blades. Opening for louver is cut from host wall. Performance level defined in non-graphic information associated with model elements (e.g. storm proof or not, free air).	

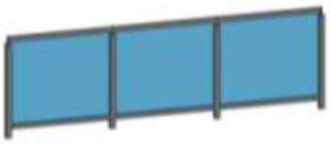
LOD	Description	Example Image
350	**Construction Documentation** Brackets, embeds, fixings, cast-ins, secondary sub-frames shall be modelled for coordination with structure.	
400	**Construction Stage** Update with specific manufacturers information including frame profiles, blade profiles and sub-components.	
500	**As-built louvre model**	

Example of Object Geometry Image for a False Ceiling System

LOD	Description	Example Image
100	**Pre Design** N/A	
200	**Schematic Design** Model ceiling approximately to show overall scope and thickness or system depth of suspended ceiling.	
300	**Design Development** Overall assembly modelled to specific system thickness including framing. Major penetrations are modelled. Location of expansion or control joints may be indicated, but not modelled.	
350	**Construction Documentation** Ceiling suspension grid is modelled. Fixtures & housings for light fixtures shall be included for coordination with electrical system. Structural backing members including bracing/lateral framing/kickers are modelled.	

LOD	Description	Example Image
	Expansion or control joints are modelled to indicate specific width.	
400	**Construction Stage** All assembly components are modelled including tees, hangers, support structure and ceiling tiles.	
500	**As-installed model**	

Example of Object Geometry Image for Railing and Balustrade

LOD	Description	Example Image
100	**Pre Design** Approximate alignment and location of the element using standard symbol	
200	**Schematic Design** Generic model elements without articulation of materials of structures	
300	**Design Development** Model assemblies by type to include railings, posts and supports. Element modelling to include: - Accurate horizontal alignment - Accurate length and height of railings Required non-graphic information associated with model elements includes: - Railing Type - Material Type - Spacing and clearance requirements	
350	**Construction Documentation** Secondary railing support elements are modelled including bracing or supports.	

LOD	Description	Example Image
400	**Construction Stage** All elements are modelled to support fabrication and installation.	
500	As-built model.	

4.7 Presentation Style

The line weight and line pattern in 2D drawing presentation should be standardized and follow the recommendations in Annex A. Samples of drawings and drawing sheets are included in Annex B for reference. The recommended line style should be applied for design, construction and as-built models.

4.8 Object File

Object file is a data file contains architectural, structural or building services element and should include geometry and parameters to represent the element's characteristics. The creation of object file should refer to relevant section in this Guide and make reference with the BS 8541, a series of code of practices for objects creation, COBie and the BuildingSMART IFC schema. Object file created should be stored in specific folder as detailed in this Guide.

4.8.1 General Requirements for Object Creation

The following general requirements should be followed in creation of object:

(a) The object file should include information of physical dimension for coordination of BIM model.

(b) Drawing symbol should be included in an object file for 2D drawing output and complied with the latest version of Drawing Practice Manual of ArchSD. The shape and size of symbol should be coordinated for easy reading in the drawing output.

(c) Symbolic 2D annotation (drawing symbol) should be visible while the 3D geometry should be invisible in drawing output of plan view.

(d) 3D geometry shall be visible for rendering in 3D view.

(e) Object file should include the material /equipment information.

(f) Nesting object file should be limited to 2 levels except for drawing symbol. It is important to understand that nesting object file increases the file size and affects performance, specifically the regeneration process of the object file views.

(g) Host object file should be allowed.

(h) The LOD, line styles, line weight, line pattern, text style and unit of measurement for modelling of object shall refer to relevant sections of this Guide.

(i) To minimize the object file size, only essential connectors should be used and the object file should be created directly from an object file template to reduce extra information in an object file

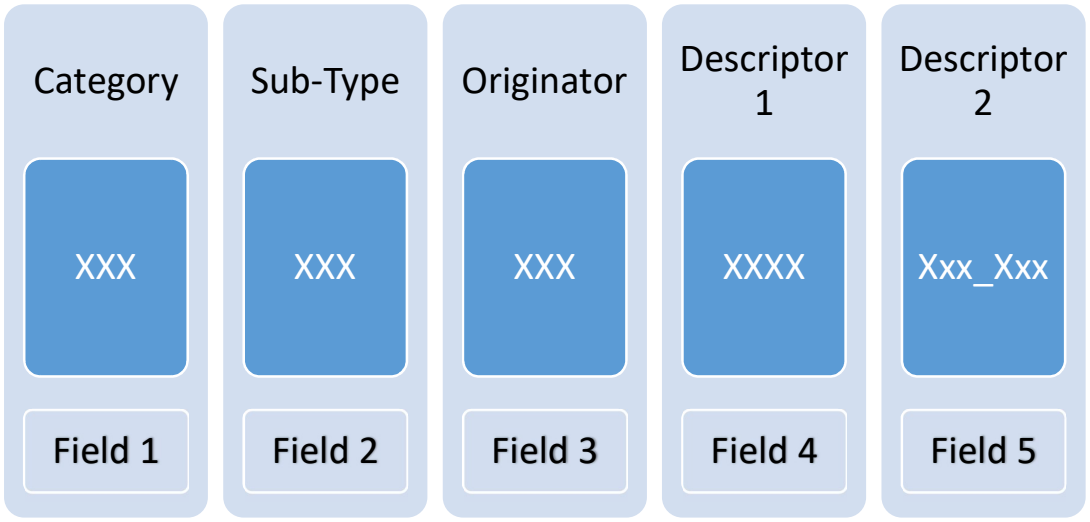
(j) Level of the insertion / origin point of the object file is recommended at the centre point at the bottom level of the object.

4.8.2 Object File Naming Convention

Object file naming conventions ensure that objects created can be easily identified. The naming conventions include short forms of the object category and description that allow the user to search for objects more systematically (Refer to Annex C). The proposed naming convention is as follow:

Format

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



Limitation on Number of Characters

- 3 characters for Category, Sub-Type and Originator field
- 25 characters for entire name including hyphen mark

Example

Field	DOR-SGL-ADA-Wood-w_Louver.xxx	Descriptions
Category (Field 1)	**DOR**-SGL-ADA-Wood-w_Louver.xxx	A Door, DOR is the short form of the category / classification / catalog "door"
Sub-Type (Field 2)	DOR-**SGL**-ADA-Wood-w_Louver.xxx	A Single Door, SGL is the short form of the sub-type "single"
Originator (Field 3)	DOR-SGL-**ADA**-Wood-w_Louver.xxx	3 characters (alphanumeric) for Agent Responsible Code, e.g.: ADA for architectural discipline of ArchSD ADB for building services discipline of ArchSD ADS for structural discipline of ArchSD
Descriptor 1 (Field 4)	DOR-SGL-ADA-**Wood**-w_Louver.xxx	A door is made of **Wood** (Material). An optional descriptive text.
Descriptor 2 (Field 5)	DOR-SGL-AEC-Wood-**w_Louver**.xxx	A door is built **with Louver.** This text further describes the Object
File Extension	DOR-SGL-AEC-Wood-w_Louver.**xxx**	File Format Extension

1. The BIM object shall be named systematically and logically for the understanding of the users and for easy BIM objects management.

2. The methodology of naming conventions including Format, Field Definition and Limitation shall be applied to the BIM object libraries of all projects.

3. The naming conventions include abbreviations of category, sub-type, originator and descriptor fields.

4. The category field shall indicate the BIM object category / classification / catalog as it may differ from the BIM software. Further detail classification shall use the descriptor field as necessary.

5. The sub-type field shall indicate sub-category / functional type under its category, e.g. Category "Door" can classify sub-category by door panel quantity "Single Door" or "Double Door".

6. The originator field shall indicate who own or create the BIM object.

7. The descriptor fields shall indicate the critical characteristics of the BIM object.

8. The abbreviation shall be unique from each other.

4.8.3 Type Naming Conventions

Type Naming Conventions shall primarily follow Object File Naming Convention. If necessary, further detail naming format with the following general rules should apply:

All Objects must include one predefined type. Unless they represent nominal sizes, type names should include units or capacity, and include a unit indicator. (Refer to Annex D)

When naming an Object type, use the format and rules below:

Guidelines

- Do not include the Object name or category in the type name.
- Type names should mirror actual usage.
- Type names should indicate the key differences between types (size, count, material) and, when applicable, reflect standard sizes. In some cases, you may base names on size difference, but use common terms rather than numbers.
- When types are named by size, use dimensions only. Avoid the use of characters or words. (h, w, d, or height, width, depth).
- Type names should include units or capacity and a unit indicator, unless they represent nominal sizes.

- Metric types should reflect the local unit standard, unless the types are intended to be generic.
- Keep type names as short as possible. Type names must display in dialogs and in the Type Selector.

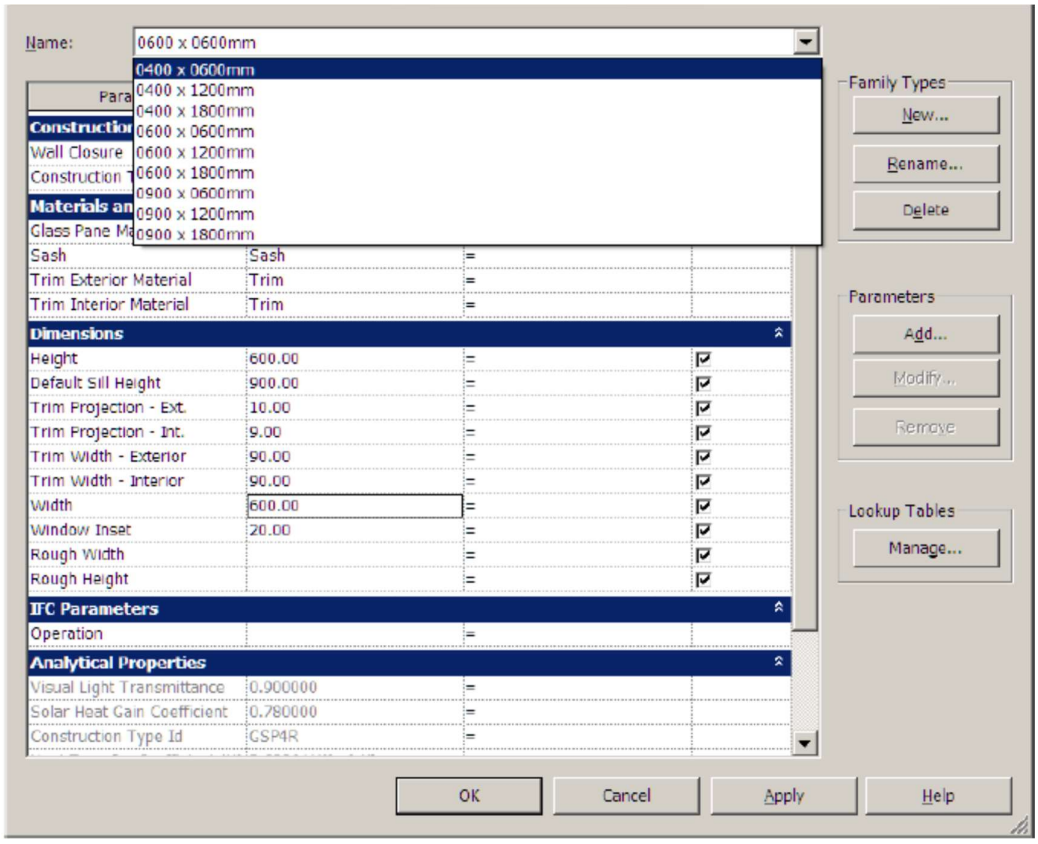
Format

Unless there is a market-specific reason to do otherwise, use the following general order in type names:

For doors and windows: <width> x <height>

For casework and furniture: <width> x <depth> x <height>

Below is an example of a Window Object with different Object Types



For objects that feature nominal sizes or industry-standard terms:

In type names, drop the dimension indicators (mm) and/or use industry-standard naming conventions.

- Brick (industry-standard naming): **Common, Norman, CSR, Metric Modular**

- Lumber (nominal sizes): **2x4**
- Structure (industry-standard naming): **W12 x 204**

4.8.4 BIM Object Sheet

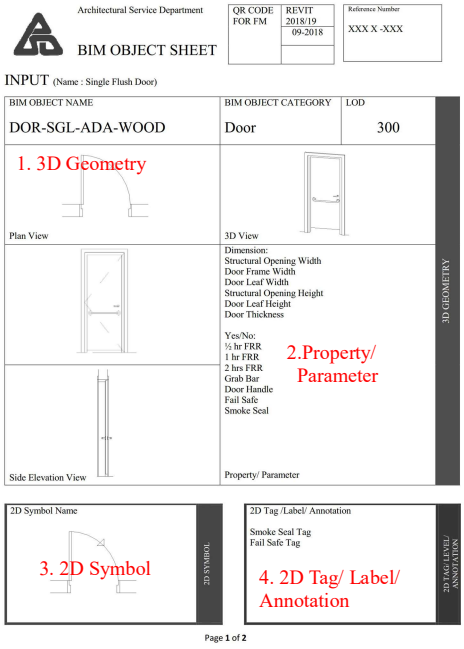
The BIM object shall contain 3D component of geometry, 2D component of symbol and **tag / label / annotation**. All of these contents are intended for drawing production of presentation drawing, statutory submission drawing and tender / construction drawing. In addition, the BIM object shall be able to schedule in project environment with proper information. The drawing production and schedule production shall follow industry practice and the requirement of project.

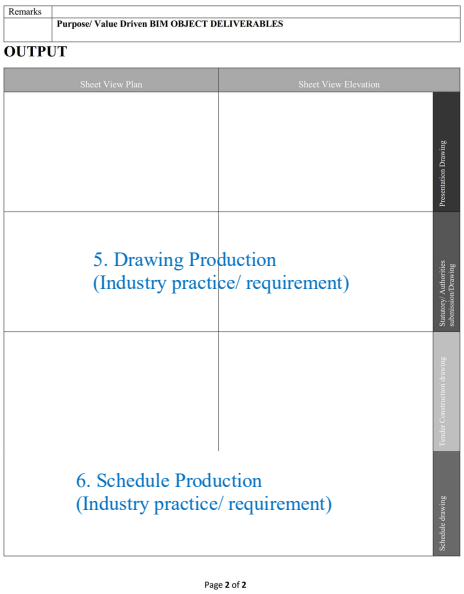
Comprehensive BIM object sheet shall be provided after completion of object creation. It enables clients, administrators and users of the BIM object to easily identify the properties, functions and outputs of the BIM object in drawing production.

The BIM object sheet shall contain following items:

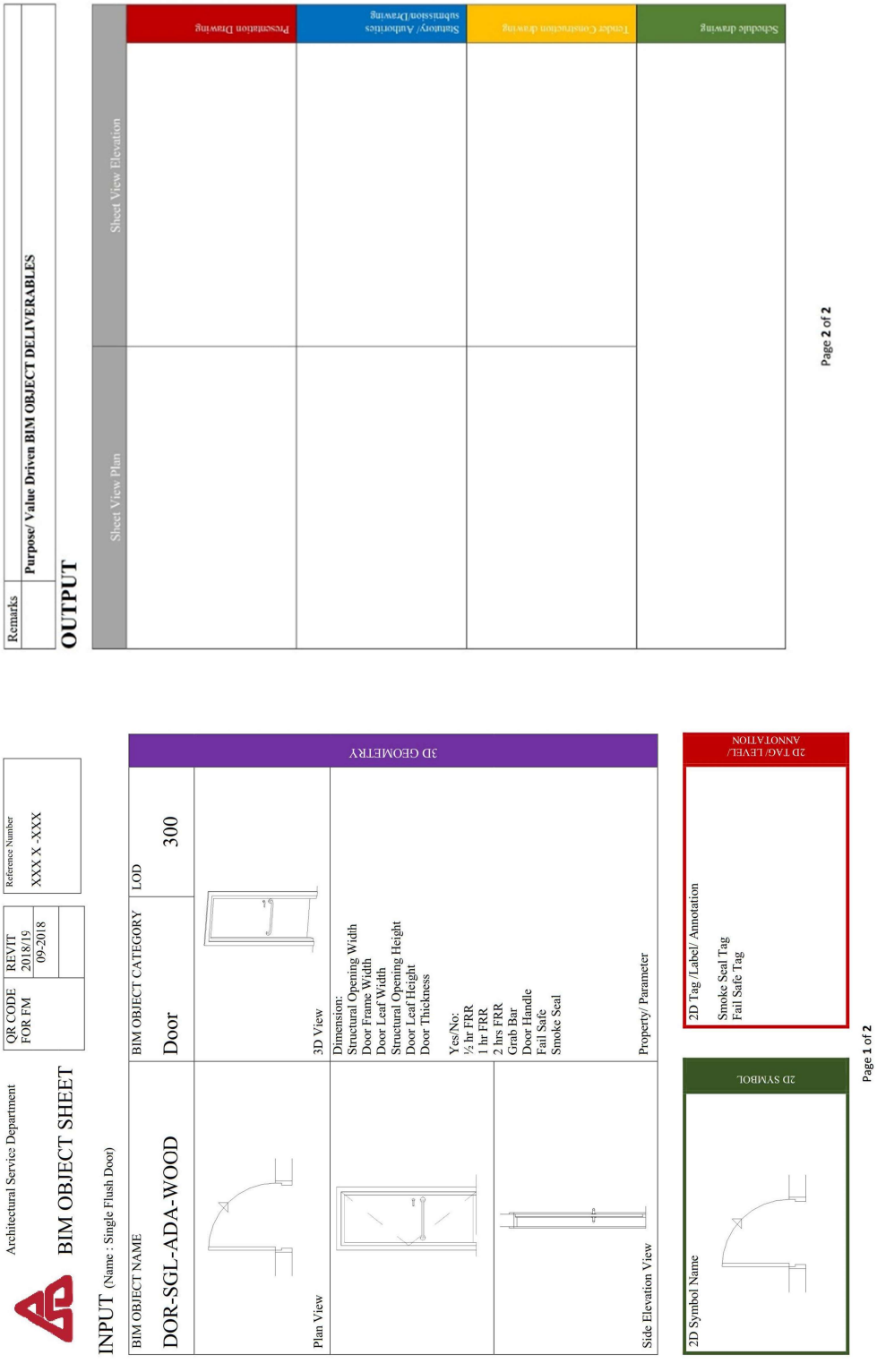
Item	**Description**
1. 3D Geometry	- Views to be shown in the sheet (plan view, front and side elevation view, 3D view) - (2D symbolic items do not show in this part)
2. Property / Parameter	- Property / Parameter set and value
3. 2D – Symbol	- 2D symbolic item for drawing production
4. 2D – Tag / Label / Annotation	- 2D symbolic item for drawing production

5. Drawing Production	- Plan view and elevation view for presentation purpose - Plan view and elevation view for statutory / authority submission purpose - Plan view and elevation view for tender / construction purpose
6. Schedule Production	- Schedule with appropriate property / parameter





The BIM Object Sheet shall follow the following layout:



5. Data Requirements for Asset Management

5.1 Data Format of As-built Information

As-built information relevant to asset management should be stored in a standardized file folder structure as mentioned in Section 2.2 of this Guide.

The requirements of BIM file coding, naming convention, model presentation style (colour code, line type, line weight, etc.) and unit of measurement of the as-built BIM model should make reference to the latest version of BIM Guide for Facilities Upkeep by Property Services Branch.

5.2 Deliverables

The As-Built information shall be contained in a prescribed folder system including but not limited to the following deliverables:

(a) BIM Project Execution Plan indicating the adopted modelling methodology and details;
(b) As-built BIM models for all disciplines and 2D drawing files for architectural details;
(c) Design authoring tools' templates, title block, BIM object files and other necessary resources for viewing of the as-built BIM model;
(d) Testing and Commissioning reports;
(e) Operation and Maintenance manuals;
(f) Relevant statutory certificates, approval documents and forms; and
(g) Other relevant project information as required.

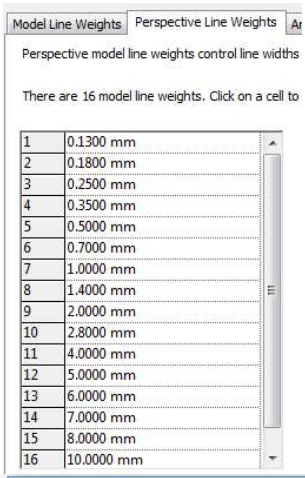
Annex A – Line weight & Line pattern

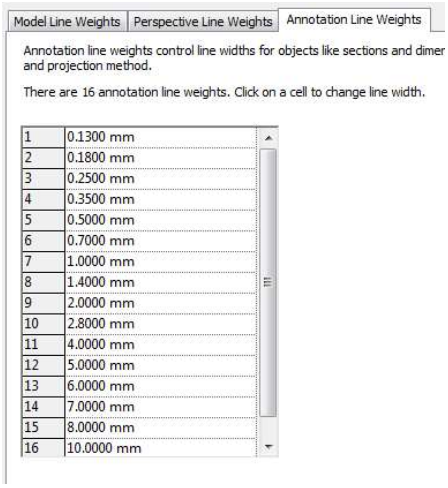
Model Line Weights | Perspective Line Weights | Annotation Line Weights

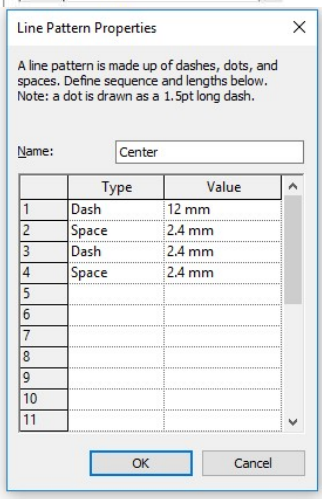
Model line weights control line widths for objects like walls and windows in orthographic views. They depend on view scale.

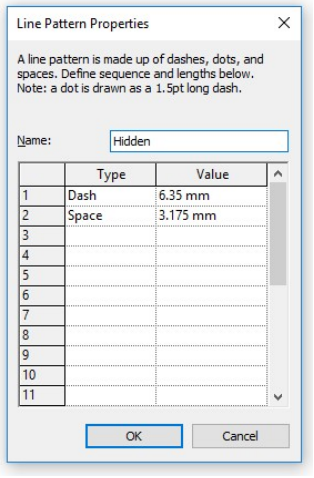
There are 16 model line weights. Each can be given a size for each view scale. Click on a cell to change line width.

	1 : 10	1 : 20	1 : 50	1 : 100	1 : 200	1 : 500	1 : 1000
1	0.1300 mm	0.1300 mm	0.1300 mm	0.1300 mm	0.0600 mm	0.0600 mm	0.0600 mm
2	0.1800 mm	0.1800 mm	0.1800 mm	0.1800 mm	0.1300 mm	0.1300 mm	0.1300 mm
3	0.2500 mm	0.2500 mm	0.2500 mm	0.2500 mm	0.1800 mm	0.1800 mm	0.1800 mm
4	0.3500 mm	0.3500 mm	0.3500 mm	0.3500 mm	0.2500 mm	0.2500 mm	0.2500 mm
5	0.5000 mm	0.5000 mm	0.5000 mm	0.5000 mm	0.3500 mm	0.3500 mm	0.3500 mm
6	0.7000 mm	0.7000 mm	0.7000 mm	0.7000 mm	0.5000 mm	0.5000 mm	0.5000 mm
7	1.0000 mm	1.0000 mm	1.0000 mm	1.0000 mm	0.7000 mm	0.7000 mm	0.7000 mm
8	2.8000 mm	2.0000 mm	2.0000 mm	1.4000 mm	1.0000 mm	1.0000 mm	1.0000 mm
9	4.0000 mm	2.8000 mm	2.8000 mm	2.0000 mm	1.4000 mm	1.4000 mm	1.4000 mm
10	5.0000 mm	4.0000 mm	4.0000 mm	2.8000 mm	2.0000 mm	2.0000 mm	2.0000 mm
11	6.0000 mm	5.0000 mm	5.0000 mm	4.0000 mm	2.8000 mm	2.8000 mm	2.8000 mm
12	7.0000 mm	6.0000 mm	6.0000 mm	5.0000 mm	4.0000 mm	4.0000 mm	4.0000 mm
13	8.0000 mm	7.0000 mm	7.0000 mm	6.0000 mm	5.0000 mm	5.0000 mm	5.0000 mm
14	9.0000 mm	8.0000 mm	8.0000 mm	7.0000 mm	6.0000 mm	6.0000 mm	6.0000 mm
15	9.0000 mm	9.0000 mm	9.0000 mm	8.0000 mm	7.0000 mm	7.0000 mm	7.0000 mm
16	9.0000 mm	9.0000 mm	9.0000 mm	9.0000 mm	8.0000 mm	8.0000 mm	8.0000 mm

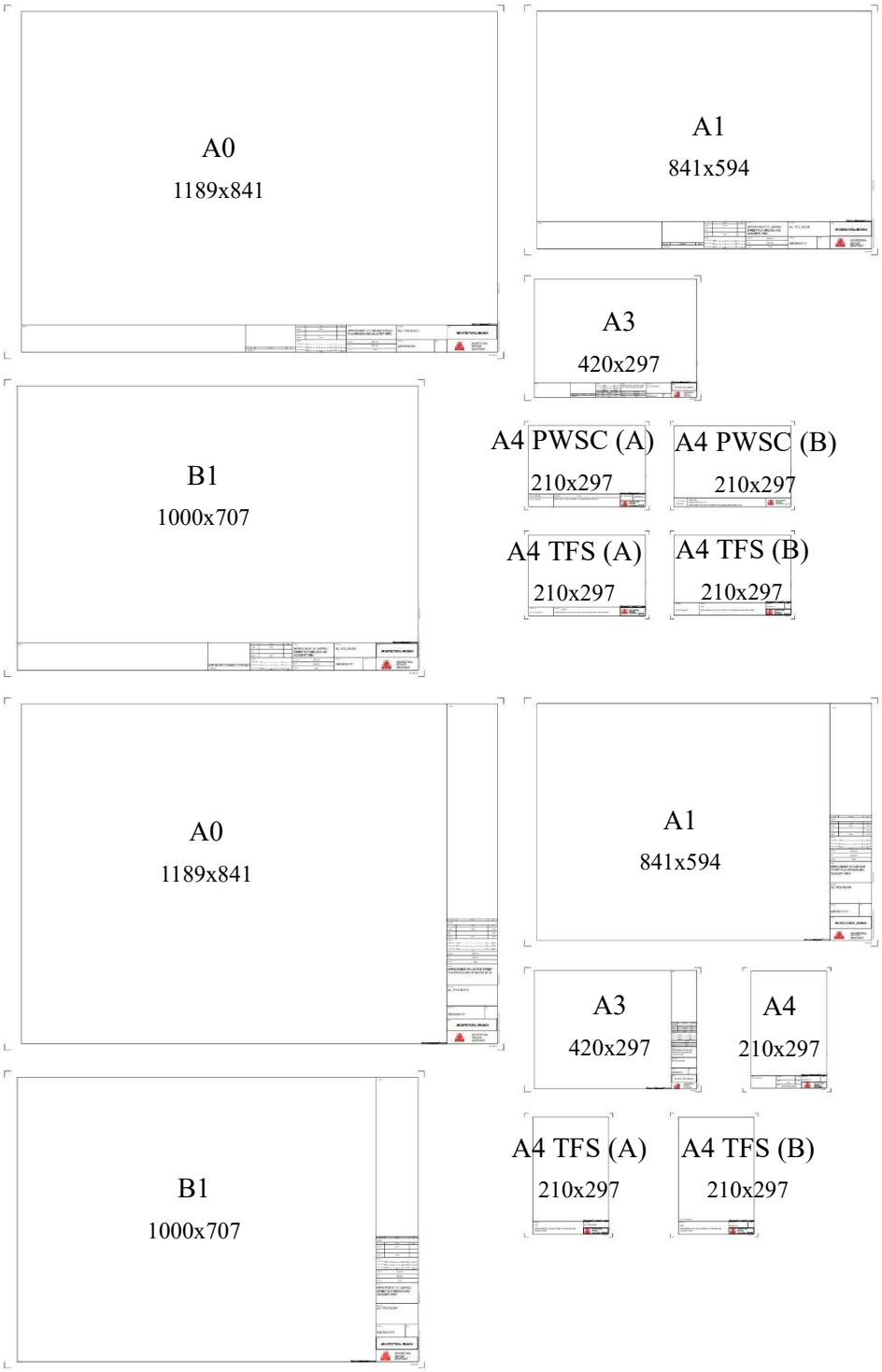


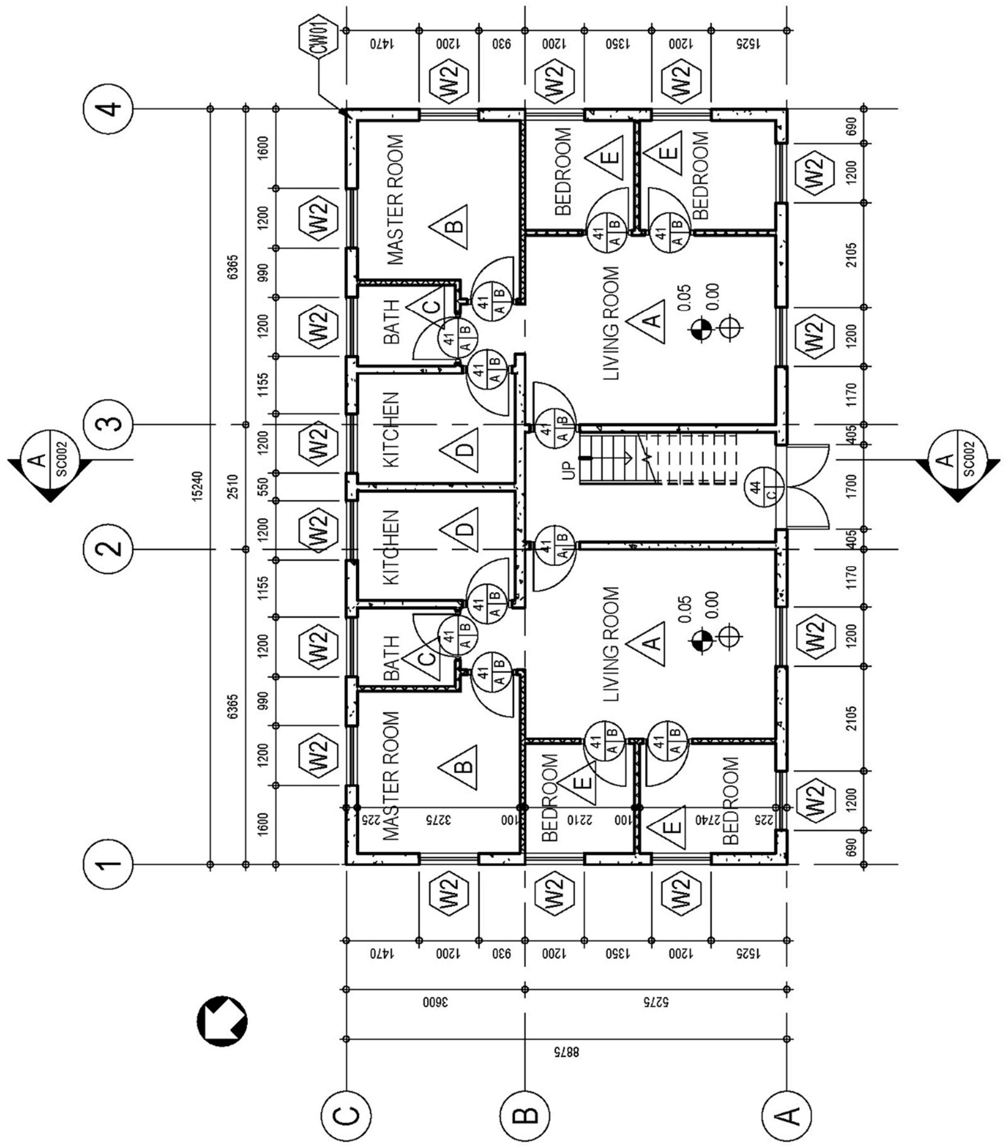


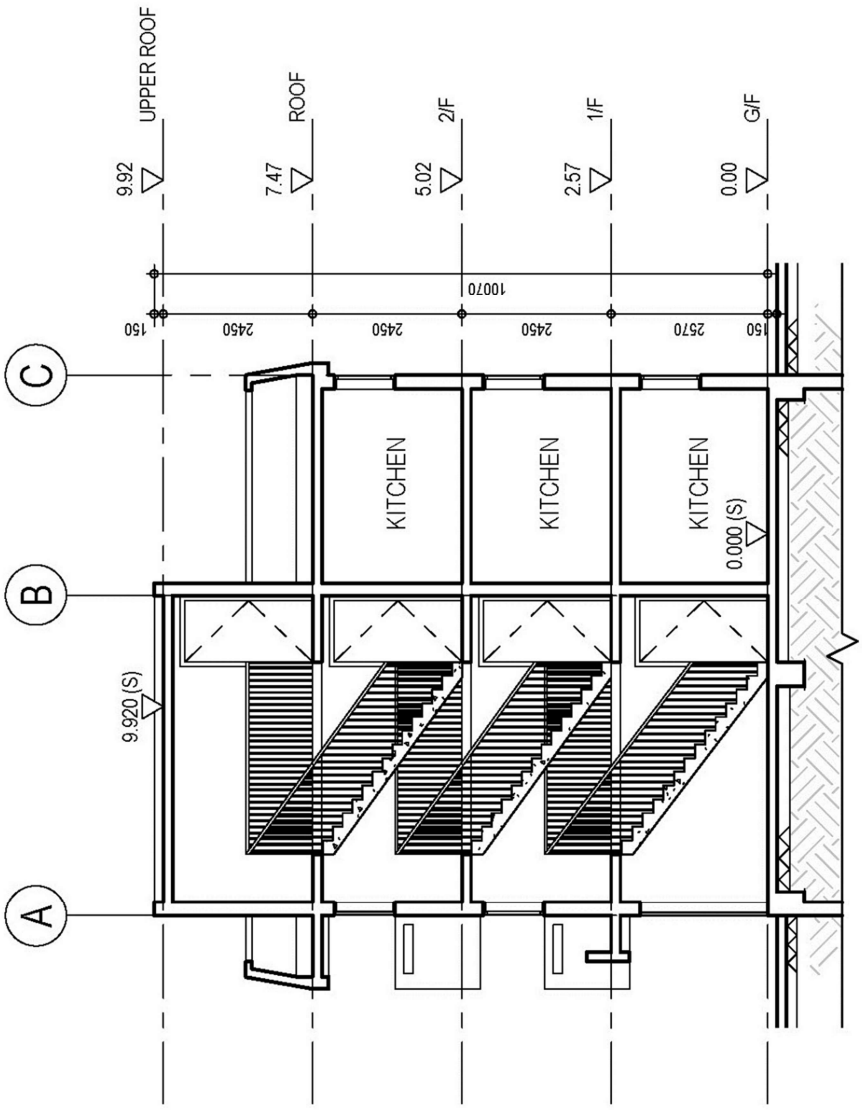




Annex B - Samples of drawings and drawing sheets




MASTER ROOM
BATH
KITCHEN
LIVING ROOM
BEDROOM
UP
W2
CW01
SC002
15240
6365
2510
8875
3600
5275


UPPER ROOF
ROOF
2/F
1/F
G/F
9.92
7.47
5.02
2.57
0.00
10070
150
2450
2450
2450
2570
150
C
B
A
KITCHEN
KITCHEN
KITCHEN
0.000 (S)
9.920 (S)

Annex C – Recommended Short Form of Object Category

Items	Content
Category (Field 1)	**ANN** for Annotations **COL** for Columns **DOR** for Doors **FUR** for Furniture **LDS** for Landscaping **Prk** for Parking **RAL** for Railings **STE** for Site **WDW** for Windows
Sub-Type (Field 2)	**CBN** for Cabinet **CHN** for Channel **CLD** for Cladding **CTT** for Counter Top **CWL** for Curtain_Wall **DRN** for Drain **DRW** for Door_Window **GNL** for General **MCD** for Metal_Clad **SLB** for Slab **SGL** for Single **SWK** for Sitework **URN** for Urinal **WDT** for Wood_Timber

Annex D – Recommended Type Name Conventions

1100mm	steel	storage	GF	w. hand grip	
1	2 (optional)	3 (optional)	4 (optional)	5 (optional)	6 (optional)
Dimension	Material	Function	Level	1st description	2nd description

Example

Cabinet

- 1100mm_steel_storage_GF_w. hand grip_w. glass panel
- 2000mm_wood_display

Railing

- 1100mm_Mesh wire
- 1100mm_Glass panel
- 900mm_handrail
- 1200mm_steel_w. handrail
- 1100mm_steel_w. 150mm kerb
- 1100mm_steel_internal_w. 200mm kerb
- 1100mm_steel_internal_RF_w. 200mm kerb

Abbreviation

with	w.
without	w/o
fire resistance rating	FRR
wood	Timber
glazed	Glass