Building Information Modelling (BIM) Guide for Structural Engineering

(Version 3.0)

Structural Engineering 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 design and construction for structural engineering in building projects undertaken by the Structural Engineering Branch of the Architectural Services Department.

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Revision No. -		1	Issue Date -	10.12.2019
Clause	**Page No.**	**Revision Details**		
1-5	All	Line up document formatting and file convention with other branch		

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1-2, 4	All	General update of Clause 1.2 Update of Clause 2.2 on Project Folder Structure General update of Clause 2.3 Clause 2.4 added General update of 2.5 and delete type naming in Clause 2.5 General update of Clause 4.18 & 4.21 Clause 4.3 added		

1 Introduction

1.1 Overview

With the implementation of ***DEVB Technical Circular (Works) No. 2/2021 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong*** on 20 December 2021, this guide aims to achieve the following objectives for delivering projects in ArchSD adopting BIM in relation to Structural Engineering discipline.

- To standardize the settings and configurations of BIM structural model
- To facilitate a more standardized output with high quality
- To outline the procedures for using BIM software to prepare a BIM structural model
- To facilitate the production of common set of BIM objects

The primary purpose of this Guide is to provide a common reference on the adoption of BIM for structural engineering in projects undertaken by the Structural Engineering Branch of the Architectural Services Department.

1.2 Reference BIM Standards and Guidelines

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

(a) Development Bureau Technical Circular (Works) No. 2/2021 - Adoption of Building Information Modelling for Capital Works Projects in Hong Kong.
(b) Development Bureau Technical Circular (Works) No. 8/2021 – Building Information Modelling Harmonisation Guidelines for Capital Works Projects in Hong Kong.
(c) CIC BIM Standards for Architecture and Structural Engineering (Version 2.1 - 2021).
(d) CIC BIM Standards for Preparation of Statutory Plan Submissions (December 2020).
(e) CIC BIM Standards - General (Version 2.1 - 2021).
(f) CIC Production of BIM Object Guide - General Requirements (Version 2 - 2021).
(g) CIC BIM Dictionary (2021).
(h) Computer-Aided-Drafting Standard for Works Projects (CSWP) issued by Development Bureau of the HKSAR Government.
(i) Computer-Aided-Drafting Manual for ArchSD Projects issued by Architectural Services Department
(j) BS EN ISO 19650-1:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 1: Concepts and principles.
(k) BS EN ISO 19650-2:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 2: Delivery phase of the assets.
(l) BS EN ISO 19650-3:2020 Organization and digitization of information about buildings and civil engineering works, incuding building information modelling (BIM) – Information management using building information modelling, Part 3: Operational phase of the assets.
(m) BS EN ISO 19650-5:2020 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 5: Security-minded approach to information management.

(n) American Institute of Architects (AIA)'s G202™-2013 Project Building Information Modeling Protocol Form.
(o) SEBGL-DD2 Drafting Manual for R.C. Structures (Revision 3) issued by Structural Engineering Branch of Architectural Services Department.
(p) BIM Guide for Facilities Upkeep issued by Property Services Branch of Architectural Services Department.
(q) BIM Guide for Cost Estimation issued by Quantity Surveying Branch of the Architectural Services Department.

1.3 Terminology

The common terminology for BIM process are listed below:

Terminology	Definition
3D	The use of software tools to generate three-dimensional geometries, either as surfaces or non-parametric solids.
BEP (BIM PXP)	BIM Execution Plan - Document to explain how the information modelling aspects of a project will be carried out throughout the project life cycle.
BIM	Building Information Modelling is the process of generating and managing building data during the building or assets life cycle.
CAD	Computer-aided design (CAD) software
CDE	Common Data Environment (CDE) It represents the centralised digital/electronic document management system which is used for BIM collaboration, storing and exchange digital data.
CIC	Construction Industry Council
ID	Information Container Identification
IFC	Industry Foundation Class (IFC), Federated Model. An international specification for product data exchange and sharing.
ISO 19650-1	Organisation of Information about Construction Works - Information Management using Building Information Modelling - Part 1: Concepts and Principles (ISO 19650-1:2018).
ISO 19650-2	Organisation of Information about Construction Works - Information Management using Building Information Modelling - Part 2: Delivery Phase of the Assets (19650-2:2018).
Object /Element	An occurrence of a building component in BIM software at a particular location and orientation within a model (e.g. Beam, Slab, etc.).

Model 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.
LOD	Level of Development (LOD) defined a BIM metric to identify what information to include in a model during the design and construction process. The LOD abbreviation refers to multiple terms, definitions, and numbering systems even within CICBIMS.
LOD-G	Level of Development – Geometry (LOD-G) is the geometry representation of a model element.
LOD-I	Level of Development – Information (LOD-I) is the description of non-graphical information in a model element.
LOIN	Level of Information Need is the framework which defines the extent and granularity of information.
OmniClass	OmniClass is a classification system for organising library materials, product literature and project information. OmniClass has 15 'classification tables'; some of which are incorporated from other classification systems including: MasterFormat (a classification for 'work results') and UniFormat (a classification of 'construction elements'). OmniClass is an open standard developed by the Construction Specifications Institute (CSI).
Parameter	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, behavior and unique identity, that is, a thing we can think or talk about, such as a wall.
WIP	Work in progress

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 BS EN ISO 19650-1:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling, Part 1: Concepts and principles.

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 Execution Plan (BEP).

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

Project folder structures for BIM operation in the design and construction stage are recommended as follows:

Folder Structure	Description
[Project Name / Code /Identity, e.g. InForM no.]	
01 General	Folder to share general information such as contact list, project information, templates, title block, reference materials, etc.
02 WIP	
10 Architectural	Folders to store work in progress (WIP) models /information being developed by individual discipline teams for internal collaboration. Usually the access is restricted to the individual discipline teams.
20 Building Services	
30 Structural	
40 Landscape Architecture	
50 Quantity Surveying	
60 Project Management	
03 Shared	
10 Architectural	Folders to share approved models /information by individual discipline team for collaboration. Only current models /information should be stored and outdated/ obsolete files should be moved to the "05 Archive" folder.
20 Building Services	
30 Structural	
40 Landscape Architecture	
50 Quantity Surveying	
60 Project Management	

Folder Structure	Description
04 Published	
10 Architectural	Folders to share authorized models /information for publishing at milestones (usually in non-editable format) where they are ready for submission, procurement and construction (e.g. GPB, Tender DWG etc.).
20 Building Services	
30 Structural	
40 Landscape Architecture	
50 Quantity Surveying	
60 Project Management	
05 Archive	
10 Architectural	Folders to store historical records of file transaction such as previously shared /published models which were outdated.
20 Building Services	
30 Structural	
40 Landscape Architecture	
50 Quantity Surveying	
60 Project Management	
06 As-built	
10 Admin	Folders to store as-built models /information with structure referenced to BIM Guide for Facilities Upkeep.
20 BIM Library	
30 As-built BIM	
40 O&M Documentation	
50 Photo	
60 Drawing Sheet	
70 Inspection	
80 Statutory	
90 Others	

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 discipline 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
1233-ADS-XX-ZZ-ST-CM_N	Government Offices	Structural Framing
5240-ADS-XX-ZZ-SF-M3_T	Government Offices	Site Formation

Example: For project with 3 separated building blocks:

Model Name	Building	Category
5578-ADS-BK1-ZZ-ST-CM_N	Government Offices Block 1	Structural Framing
5578-ADS-BK2-ZZ-ST-CM_N	Government Offices Block 2	Structural Framing
5578-ADS-BK3-ZZ-ST-CM_N	Government Offices Block 3	Structural Framing

Under special circumstances, a single BIM model may be acceptable depending on the nature and complexity of project. The BIM Execution Plan shall state the model division strategy (by discipline 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 500Mb unless otherwise approved, and the maximum BIM object file size should be kept at the minimum, preferably under 5MB. 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 Information Exchange Formats

To facilitate information exchange, a BIM Data Repository (BIM DR) serves to host native BIM models and shareable BIM models. For the shareable BIM format, IFC v4 will be used. Building Information Modelling Harmonisation Guidelines for Works Departments should be referred to when preparing the BIM models in native and open format and object for sharing with others.

2.5 General Naming Convention

The role of the Local Annex of ISO 19650-2:2018 is to clarify its implementation within a country or local region, but it should not preclude international cooperation and agreement. ISO 19650-2:2018 (5.1.7.a) states: 'The project's Common Data Environment shall enable each information container to have a unique ID, based upon an agreed and documented convention fields separated by a delimiter'.

The following delimiters are to be used:

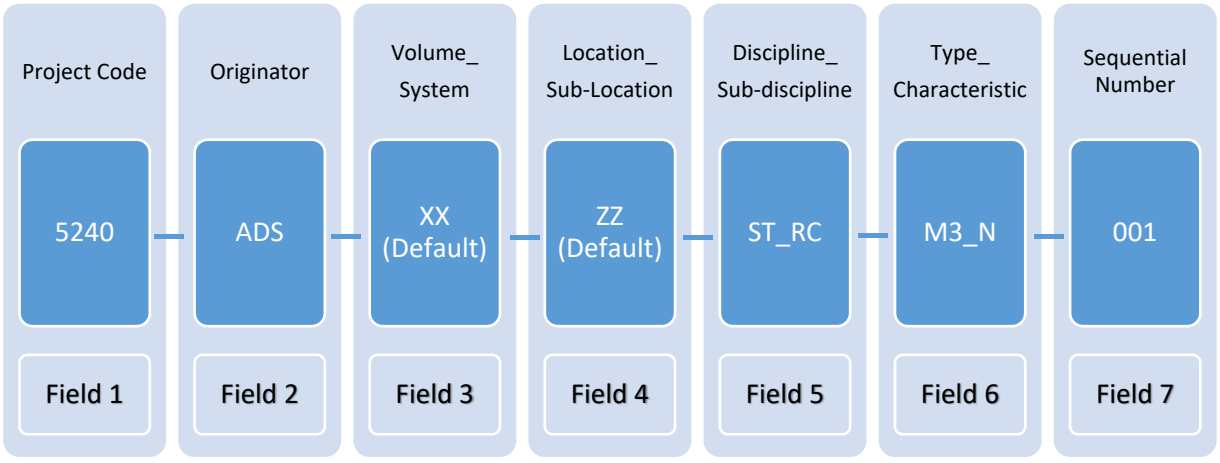
- For a delimiter between Main Fields the Hyphen (-) or Minus character using Unicode Reference U+002D shall be used; and

- Where a delimiter is required between Main Fields and Sub-Fields if Sub-Field is required, then the Underscore (_) character using Unicode reference U+0332 shall be used.

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

ISO 19650-2:2018 (5.1.7.b) states: 'The project's common data environment shall enable each field to be assigned a value from an agreed and documented codification standard'. In Hong Kong, the codification for each field for file identification should be defined from the following codifications.

2.5.1 Model File Naming



Items	Field Description	
Field 1 (4~8 characters)	Project Code InForM No. (Project Number)	
Field 2 (3 characters) (All Uppercase)	Originator Agent Responsible Code **ADS** = Architectural Services Department, Structural Engineering Branch	
Field 3 (2~7 characters) (All Uppercase)	Volume (2~3 Characters)	System (Optional) (2~3 Characters)
	Required if project is subdivided by zone or block (default=**XX**) **XX** = no volume / system applicable **ZZ** = all volumes / systems	An optional identifier to indicate a collection of interconnected model elements across main disciplines under a system

Field 4 (2~7 characters) (All Uppercase)	Location (2~4 Characters)	Sub-Location (Optional) (1~2 Characters)
	Required if project is subdivided by level or location (default=**ZZ**) **XX** = no level / location applicable **ZZ** = multiple level / locations	An optional identifier to indicate a sub-location (e.g. level) within the same location
Field 5 (2~5 characters) (All Uppercase)	Discipline (2 Characters)	Sub-Discipline (Optional) (2 Characters)
	SF = Site Formation	**GI** = Ground Investigation
	ST = Structural	**FD** = Foundation **PC** = Pile Cap **PW** = Planter Wall **RC** = Reinforced Concrete **RW** = Retaining Structure **SS** = Structural Steel **SU** = Superstructure
Field 6 (2~4 characters) (All Uppercase)	Type (2 Characters)	Characteristic (Optional) (1 Character)
	M3 = 3D Model File **DR** = 2D Drawing **CM** = Combined Model	**E** = Existing, to remain **T** = Temporary Works **N** = New Works **A** = As-built **M** = Maintenance or record **D** = Demolition **W** = All Works (combination of above works)
Field 7 (Optional) (3 numeric)	Sequential number Assign to further distinguish from other models	

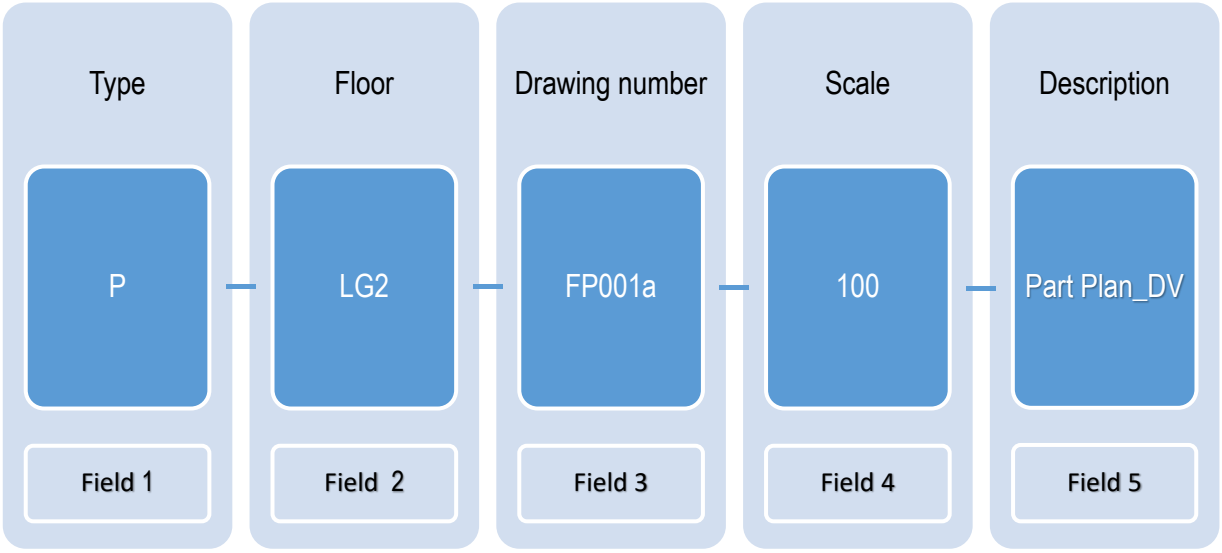
The maximum total length of model names is 43 characters, including delimiters and information dividers but excluding file extension.

Note: A metadata text file including the software version should be provided for data exchange and collaboration.

Example:

Model File Name	Description
1233-ADS-XX-ZZ-ST-M3_N.rvt	InForM No. 1233, Agent Responsible Code, Not applicable for Volume or system, Multiple exist Level within a BIM model, Structural Discipline, 3D Model File with New Works Project
5578-ADS-BKA-ZZ-ST-CM_N.rvt	InForM No. 5578, Agent Responsible Code, Block A, Multiple exist Level within a BIM model, Structural Discipline, Combined Model with New Works Project
5240-ADS -XX-ZZ-SF_GI-M3_T.rvt	InForM No. 5240, Agent Responsible Code, Not applicable for Volume or system, Multiple exist Level within a BIM model, Site Formation with Ground Investigation discipline, 3D Model File with Temporary Works

2.5.2 View Naming Convention

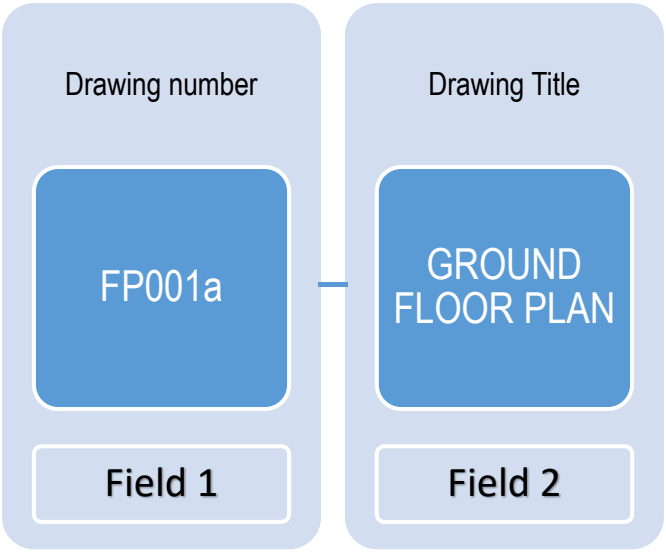


Items	Content
Field 1 (1 character) (All Uppercase)	Type of view **P** = Plan **S** = Section **E** = Elevation **D** = Detail **I** = Isometric **3** = 3D View
Field 2 (2~3 characters) (All Uppercase)	Particular name of floor (abbreviation defined as follows) **KE** = Key/ Location Plan **SI** = Site Plan **GF** = Ground Floor **MF** = Mezzanine Floor **01-99** = 1st to 99th Floor **RF** = Roof **UR** = Upper Roof **LR** = Lower Roof **UG** = Upper Ground Floor **LG** = Lower Ground Floor **LG2** = Lower Ground Floor 2 **B0** = Basement **B1** = Basement Level 1 **P0** = Podium Level **P1** = Podium Level 1 **C0** = Carpark Level **C1** = Carpark Level 1 **00** = Unspecified Floor
Field 3 (2~6 characters) (All Uppercase)	Drawing number where applicable and Revision status (use **XX** instead if no specific drawing number)
Field 4 (1~4 characters)	Scale **100** = 1:100, **50** = 1:50, **20** = 1:20, ……etc.
Field 5 (Sentence case)	Descriptions Divide into two parts: - Part 1: General Description of View (Use “Space” for separation) - Part 2 (Optional) : Suffix for Relational View only **PV** = Primary View with dependant View **DV** = Dependant View

Example:

View Name	Description
P-FN-FP002-50-GT	Foundation plan in 1:50
P-RF-FP003a-100-B1	Block 1 roof (revision a) in 1:100
S-GF-FP008-100-S1	Shelter 1 section in 1:100
D-GF-FP008-10-S1 DetailA1	Shelter 1 joint detail in 1:10
S-GF-XX-10-Trellis	Trellis temp section in 1:10
P-FN-XX-100-Part Plan_PV	Foundation part plan in model file (parent) in 1:100
P-FN-FP002-100-Part Plan_DV	Foundation part plan in sheet file (dependent) in 1:100

2.5.3 Sheet Naming

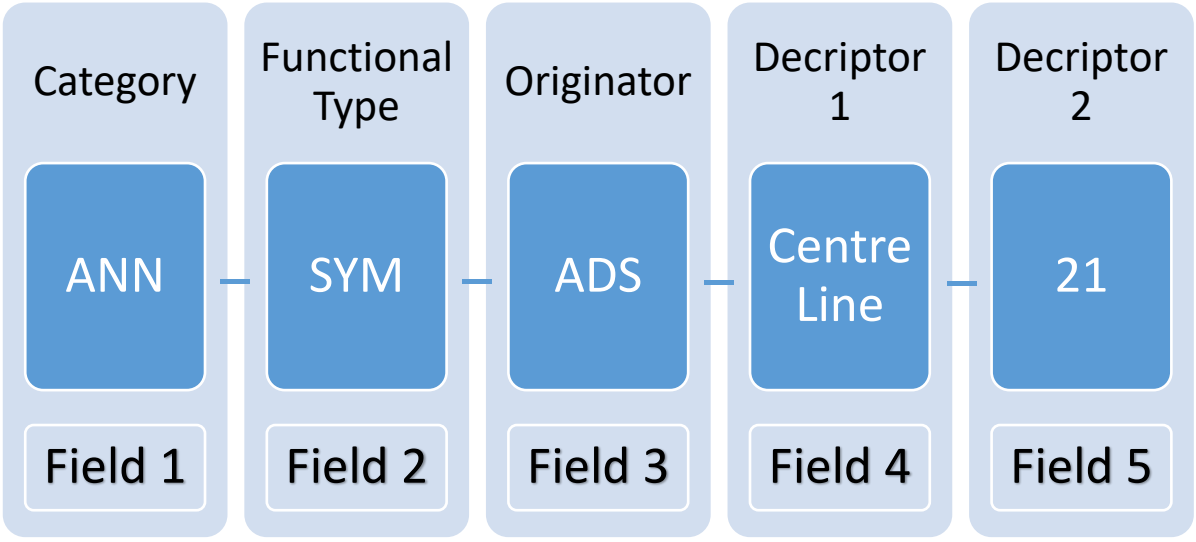


Items	Content
Field 1 (5~6 characters) (All Uppercase)	Drawing Number Character for revision to be added at the end
Field 2 (All Uppercase)	Drawing Title (Use **Space** for separation)

Example:

FP001-GROUND FLOOR PLAN
FP002a-FIRST FLOOR PLAN

2.5.4 Object Naming



Items	Content
Field 1 (3 characters) (All Uppercase)	Category of Object / Element Category: **ANN** = Annotation **FLO** = Slab, Floor **STS** = Stair **SCL** = Structural Column **SCO** = Structural Steel Connection **SFN** = Structural Foundation **SBM** = Structural Beam **STF** = Structural Steel Stiffener **STR** = Structural Steel Truss **GMD** = Generic Model **MAS** = Conceptual Massing (for Massing & Site Object) **WAL** = Wall
Field 2 (3 characters) (All Uppercase)	Functional Type under previous category Type: **SYM** = Symbol (under ANN) **DTL** = Detail item (under ANN) **TAG** = Annotation tag (under ANN) **TBK** = Title Block (under ANN) **CON** = Concrete (under SCL/SFN/SBM/MAS) **STE** = Steel (Under SCL/SCO/SBM/STF/STR) **OTH** = Materials other than concrete/steel (under GMD/MAS)
Field 3 (3 characters) (All Uppercase)	Originator **ADS** = Architectural Services Department, Structural Engineering Branch
Field 4 (1~15 characters) (Capitalized case)	Descriptor contains information about primary use and material when applicable. Capital letters should be used for first letter of each word (e.g. CrankedBeam, BasePlate). All-capital short forms should be used to indicate materials when applicable. An underscore (_) should be used to separate the short form and the following word (e.g. CONC_Kerb).

Field 5 (2 characters)	Software Version **21** = version 2021

The file name length of BIM objects should be 30 characters maximum, including delimiters but excluding the file extension.

Example:

Object Name	Description
ANN-SYM-ADS-CentreLine-19	Annotation item-Centre line
ANN-TBK-ADS-B1V-20	B1 size title block (vertical)
SFN-CON-ADS-Rect_PileCap_3P-20	Rectangular foundation with 3 piles
SBM-STE-ADS-TaperedT_Beam-21	Steel tapered T-section beam
SCO-STE-ADS-BracingTie_Conn-21	Steel connection of bracing

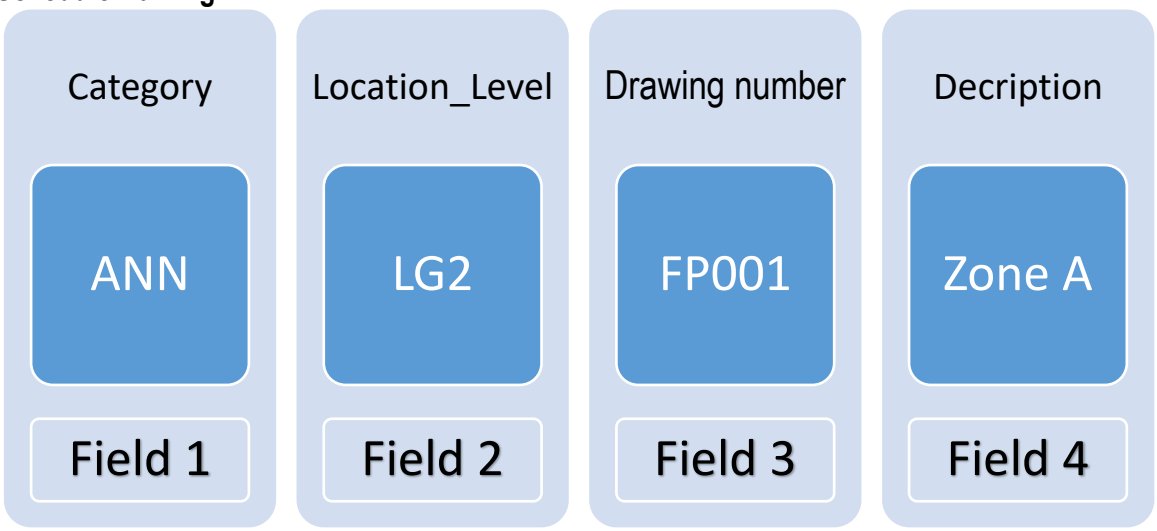
2.5.5 Shared Parameters Naming

All custom shared parameter group naming should start with "**ADS-**" and shared parameter naming should start with "**s**".

2.5.6 Type and Instance Parameters Naming

Custom Type and instance parameters should start with "**t**" and "**z**" respectively:

2.5.7 Schedule Naming



Items	Content
Field 1 (3 characters) (All Uppercase)	Category of Object / Element Category: **ANN** = Annotation **FLO** = Slab, Floor **SSL** = Stair Landing **SSR** = Stair Run **SCL** = Structural Column **SCO** = Steel Connection **SFN** = Structural Foundation **SBM** = Structural Beam **STF** = Structural Steel Stiffener **STR** = Structural Steel Truss **GMD** = Generic Model **MAS** = Conceptual Massing (for Massing & Site Object) **WAL** = Wall **VIE** = Views **SHE** = Sheets
Field 2 (2~3 characters) (All Uppercase)	Location/Level Required if project is subdivided by specific location/level (default=**ZZ**)
Field 3 (2~5 characters) (All Uppercase)	Drawing number Specific Drawing number of schedule show (use **XX** instead if no specific drawing number)
Field 4 (Capitalized case)	Descriptions (Use **Space** for separation) Any descriptions about the schedule such as purpose (e.g. for measurement of QS), properties (fields, sorting, filter, etc…)

Example:

Schedule Name	Description
SBM-LG2-FP007-Zone A	Structural framing schedule on zone A of LG2/F
SBM-GFB-XX-Sort By Mark	Structural framing schedule on zone B of G/F

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. 2/2021 and the current version of CIC BIM Standards - General. The following sections describe the general requirements and acceptable deliverables for various BIM Uses to facilitate structural engineering 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, section, and details as far as practicable.

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 ad previewing spaces and layouts in 3D. The reviewer can check structural arrangement, layout, spaces and 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 BIM software platform and virtual mock-up using reality technology, etc. where project team may consider to plan and specify if appropriate.

3.4 Engineering Analysis

A process which uses the BIM model to analysis and assess design options to facilitate the provision of effective engineering solution. Where engineering analysis related to structural designs is considered appropriate in the building project, the method and principle of analysis should be agreed by the project team.

3.5 Digital Fabrication

The use of models to facilitate the fabrication of modular construction units including those for MiC, DfMA, prefabrication of BS/MEP installations; and other construction materials or assemblies such as sheet metal fabrication, structural steel fabrication and pipe cutting. The models can also be used for prototyping with 3D printers as part of a design intent review process.

3.6 Cost Estimation

Accurate Quantity-Take-Off (QTO) may be extracted from models and used by quantity surveyors to develop cost estimates for a project. The quantity surveyors shall extract the data from the models provided by the architects and engineers. For the general requirements, guidelines and practice for QTO by BIM models, refer to the current version of BIM Guide for Cost Estimation by Quantity Surveying Branch.

3.7 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.

3.8 Drawing Generation (Drawing Production)

Drawing Generation is a process of using BIM to produce 2D drawings, which shall be adopted in both design stage and construction stage. 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 Methodology and 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) The location of city should be set as Hong Kong, China (i.e. Latitude: 22.2833°; Longitude: 114.15°)

(c) The rotation angle of the project should reflect True North. Where Project North is created it should only be used for identified sheet views and not used for any model coordination.

(d) 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 Architectural, Building Services and Landscape Models

The general rules for model linking are as follows:

(a) The coordinates of the architectural 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 Language

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

4.4 Unit of Measurement

BIM model should be modelled in metric system (International System of Units or SI Units). All of the BIM elements shall be modelled in consistent units, for example, in millimetres (mm) for buildings and angles (e.g.: degrees / radians measured clockwise or counter-clockwise).

Project Units shall be set as below:

Units	Format
Length	mm in 3 decimal places
Area	m^2 in 2 decimal places
Volume	m^3 in 2 decimal places
Angle	degree in 3 decimal places
Slope	degree in 3 decimal places
Mass Density	Kg/m^3 in 2 decimal places

4.5 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

4.6 Level Head Style

Specific properties of level should be set as below:

Parameter	Value
Line Weight	1
Colour	RBG 127-127-127
Line Pattern	ADS-CenterLine
Information to be included	Name & Elevation of Level
Text Height	2 mm

4.7 Grid Style

Specific properties of grid should be set as below:

Parameter	Value
Line Weight	1
Colour	RBG 127-127-127
Line Pattern	ADS-CenterLine
Information to be included	Name of Grid
Text Height	5 mm

4.8 Line weight

Basically, 8 numbers of Model Line Weights should be set in SEB's project as shown below:

Line Weight	Purpose
0.13	Grid
0.18	Dimension, Drawing symbols in varies sizes (thin) and Hatching
0.25	Drawing sheet outline, Symbol insertion, Member outline and hidden outline
0.35	Member sectional outline, Drawing symbols in varies sizes (medium) and Steelwork outline in framing
0.50	Drawing symbols in varies sizes (thick)
0.70	Site boundary line
1.00	For layer imported from AutoCAD drawing in CSWP format
2.00	For layer imported from AutoCAD drawing in CSWP format

4.9 Line Pattern

3 types of line pattern will be created, i.e. Hidden, Hidden_R and Center line.

Example of settings about ADS-Hidden, ADS-Hidden_R and ADS-CenterLine are shown below:

a) ADS-Hidden

	Type	Value
1	Dash	2.5 mm
2	Space	1.25 mm

b) ADS-Hidden_R

	Type	Value
1	Dash	7.5 mm
2	Space	3.75 mm

c) ADS-CenterLine

	Type	Value
1	Dash	12.5 mm
2	Space	2.5 mm
3	Dash	2.5 mm
4	Space	2.5 mm

4.10 Line Style

The line styles are suggested to be created for objects shown in 2D Structural Drawing:

Name of Line Style	Drawing Element	Line Weight	Line Colour	RGB Reference	Line Pattern
ADS020__	Grid line	0.13		101-101-101	Center Line
ADS030__	Dimension and leader	0.18		103-165-082	Solid
ADS050__	Block and symbol insertion	0.25		127-063-063	Solid
ADS0501_	Drawing symbols in varies sizes (thin)	0.18		165-145-082	Solid
ADS0502_	Drawing symbols in varies sizes (medium)	0.35		165-082-103	Solid
ADS0503_	Drawing symbols in varies sizes (thick)	0.5		145-165-082	Solid
ADS060__	Hatching	0.18		102-102-102	Solid
ADS080__	Construction line and red-lining (do not print)	0.25		255-000-000	Solid
ADS280__	Concrete outline	0.25		095-063-127	Solid
ADS280_B	Concrete horizontal member shown on plan	0.25		000-255-191	Hidden
ADS280_C	Concrete vertical member shown on plan	0.35		165-124-000	Solid
ADS280_H	Concrete hidden outline	0.25		000-124-165	Hidden
ADS280_S	Concrete sectional outline	0.35		255-127-223	Solid
ADS292__	Steelwork outline	0.35		159-255-127	Solid
ADS292_B	Steelwork horizontal member	0.35		082-165-165	Solid
ADS292_C	Steelwork vertical member	0.35		255-255-127	Solid
ADS294__	Steelwork details outline	0.25		127-255-159	Solid
ADS294_H	Steelwork details hidden outline	0.25		127-191-255	Hidden
ADS294_S	Steelwork details sectional outline	0.35		255-000-255	Solid
ADS2941_	Steelwork details welding elevation	0.35		159-127-255	Solid
ADS2941S	Steelwork details welding section	0.35		255-127-191	Solid
ADS2942_	Steelwork details bolt	0.25		191-255-127	Solid
ADS2943_	Steelwork details hole	0.25		063-255-000	Solid

4.11 Arrowhead Style for Text and Dimension Settings

Arrowhead may be set as below:

a) For leader of Text

Parameter	Value
Style	Arrow
Arrow Width Angle	19°
Tick Size	2 mm

b) For dimension

Parameter	Value
Style	Diagonal
Tick Size	2 mm

4.12 Text Assignment and Style

All text shall be assigned as per the following table:

Type Name	Height	Font Name	Width Factor	Colour	RGB Ref.
ADS-2.00-ArialNarrow	2.00 mm	Arial Narrow	1.0		000-127-255
ADS-2.50-ArialNarrow	2.50 mm	Arial Narrow	1.0		217-000-217
ADS-3.50-ArialNarrow	3.50 mm	Arial Narrow	1.0		233-079-000
ADS-5.00-ArialNarrow	5.00 mm	Arial Narrow	1.0		000-159-063
ADS-3.00-MingLiU-Chinese	3.00 mm	MingLiU (細明體)	1.0		000-000-000
ADS-3.75-MingLiU-Chinese	3.75 mm	MingLiU (細明體)	1.0		000-000-000
ADS-5.25-MingLiU-Chinese	5.25 mm	MingLiU (細明體)	1.0		000-000-000

The line weight for all leader of text should be set as 3.

Text sizes are recommended for the following typical applications:

Application	English	Chinese
	Height	Height
Titles, numbering	5.00 mm	5.25 mm
	3.50 mm*	3.75 mm*
Names of rooms, key descriptions	3.50 mm	3.75 mm
	2.50 mm	3.00 mm
Dimensions, notes, descriptions	2.00 mm	3.00 mm

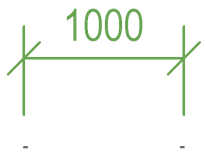
* Recommended for A3 and A4 size drawings only.

4.13 Dimensioning Style

For dimensioning style, settings for angular, radial and diameter are similar to linear dimension style as below table:

Parameter	Value
Tick Mark	Arrowhead style for Dimension to be applied
Line Weight	2
Tick Mark Line Weight	2
Witness Line Gap to Element	2.0 mm
Witness Line Extension	2.0 mm
Centerline Symbol	None (Duplicate dimension type if need)
Colour	RGB 103-165-082
Width Factor	1.0
Text Size	2.0 mm
Text Offset	0.45 mm
Text Font	Arial Narrow
Units Format	No decimal

Example:



4.14 Fill patterns

One custom fill pattern for Drafting should be added as below.

Line angle	45°
Line spacing	0.625 mm
Pattern	Parallel lines

4.15 Filled region

Two filled region should be set as below:

Type	Fill Pattern
Filled region for Weld Section	Solid fill for drafting
Filled region for Fillet Weld	Fill pattern added in Section 3.11

4.16 Revision Cloud

The numbering of revision should be alphanumeric and the arc length of cloud should be 10.

4.17 Phasing

Graphic setting of phasing for existing status should be halftone where applicable.

4.18 Object style (Layer Coding System) on 2D Drawing

Object style in BIM may be set according to Layer Coding System in *CAD Manual for ArchSD Projects*, some major principles are show below:

4.18.1 Model objects:

Model Object	Line Weight (Outline)	Line Weight (Cut Plane)	Line Colour	RGB Reference
Slabs, Floors	0.25	0.35		255-127-255
Ramps	0.25	0.35		000-191-000
Stairs (steps, risers, threads, landings)	0.25	0.35		239-063-031
Structural Columns, posts, hangers	0.35#	0.35		255-095-015
Structural Steel Connections	0.25	0.35		079-127-063
Structural Foundations (piles, pile caps & footings)	0.25	0.35		127-079-255
Structural Beams	0.25	0.35		000-191-000
Structural Rebars	0.50	0.50		255-000-000
Structural Steel Trusses	0.25	0.35		047-207-127
Walls	0.35#	0.35		127-000-255

#Line weight to be set to 0.25 for elements shown on Section View.

4.18.2 Annotation Objects:

Some annotation objects (e.g. Callout, Grid, Level Head, Revision Cloud, Section Line & Mark and Title Block) can be defined in object style and should be refer to Layer Coding System in *CAD Manual for ArchSD Projects*. Details are shown below:

Annotation Object	Line Weight	Line Colour	RGB Reference	Line Pattern
Callout Symbols	0.35		165-082-103	Solid
Grid Lines & Heads	0.13		127-127-127	Solid
Floor Level Symbols	0.35		000-000-255	Solid
Revision Clouds	0.18		255-000-000	Solid
Section Lines	0.35		145-165-082	Solid
Section Marks	0.35		000-000-000	Solid
Span Direction Symbols & Spot Elevation Symbols	0.35		165-082-103	Solid
Stair Tread/Riser Numbers	0.13		165-082-103	Solid
Title Blocks	0.25		063-127-127	Solid

4.18.3 Imported Objects

An example for imported layers from 2D Structural Drawing in CSWP format to BIM Model:

Layer name	Line Weight	Line Colour	RGB Reference	Line Pattern
ADS010__	0.25		063-127-127	Solid
ADS020__	0.13		101-101-101	Center Line
ADS030__	0.18		103-165-082	Solid
ADS050__	0.25		127-063-063	Solid
ADS060__	0.18		102-102-102	Solid
ADS080__	0.25		255-000-000	Solid
ADS280__	0.25		095-063-127	Solid
ADS280_B	0.25		000-255-191	Hidden
ADS280_C	0.35		162-124-000	Solid
ADS280_H	0.25		000-124-165	Hidden
ADS280_S	0.35		255-127-223	Solid
ADS291__	0.50		191-255-000	Solid
ADS291_T	0.25		127-159-255	Solid
ADS292__	0.35		159-255-127	Solid
ADS292_B	0.35		082-165-165	Solid
ADS292_C	0.35		255-255-127	Solid
ADS292__	0.25		127-255-159	Solid
ADS294_H	0.25		127-191-255	Hidden
ADS294_S	0.35		255-000-255	Solid
ADS294_T	0.25		255-223-127	Solid
ADS0501_	0.18		165-145-082	Solid
ADS0502_	0.35		165-082-103	Solid
ADS0503_	0.50		145-165-082	Solid
ADS2941_	0.35		159-127-255	Solid
ADS2941S	0.35		255-127-191	Solid
ADS2942_	0.25		191-255-127	Solid
ADS2943_	0.25		063-255-000	Solid
ADS04011	0.25		255-223-127	Solid
ADS04012	0.25		223-255-127	Solid
ADS04013	0.35		255-127-159	Solid
ADS04014	0.50		255-255-000	Solid
ADS04015	0.70		165-082-000	Solid
ADS04016	1.00		255-159-127	Solid
ADS04017	2.00		124-165-000	Solid
ADS04021	0.25		255-223-127	Solid
ADS04022	0.25		223-255-127	Solid
ADS04023	0.35		255-127-159	Solid
ADS04024	0.50		255-255-000	Solid
ADS04025	0.70		165-082-000	Solid
ADS04026	1.00		255-159-127	Solid
ADS04027	2.00		124-165-000	Solid

4.19 3D colour scheme

A colour scheme for 3D views:

Model Object	Colour	RGB reference	Pattern	Transparency
Slabs		143-143-079	Solid Fill	5%
Ramps		000-111-000	Solid Fill	5%
Stairs (steps, risers, threads, landings)		063-191-191	Solid Fill	-
Structural Columns, posts, hangers		255-159-047	Solid Fill	-
Structural Steel Connections		079-127-063	Solid Fill	-
Structural Foundations (piles, pile caps & footings)		175-143-239	Solid Fill	-
Structural Beams		127-233-175	Solid Fill	-
Structural Rebars		255-255-000	Solid Fill	-
Walls		047-047-159	Solid Fill	5%

4.20 Project Information

Project Information can be identified as two types of parameter, i.e. project parameters and shared parameters. Most of them would be shown on sheets/title block.

4.20.1 Project Parameters

Project parameters as shown below should be added in a project. These values will be updated on all title block once they are changed.

Parameter	Discipline	Type	Group	Position in Title Block
sContract_No	Common	Text	General	M
sFile_No	Common	Text	General	N
sInform_No	Common	Text	General	Q
Project Number	(*Default Project Parameter*)			O
Project Name	(*Default Project Parameter*)			P

Remark: position refer to the example of title block on page 26

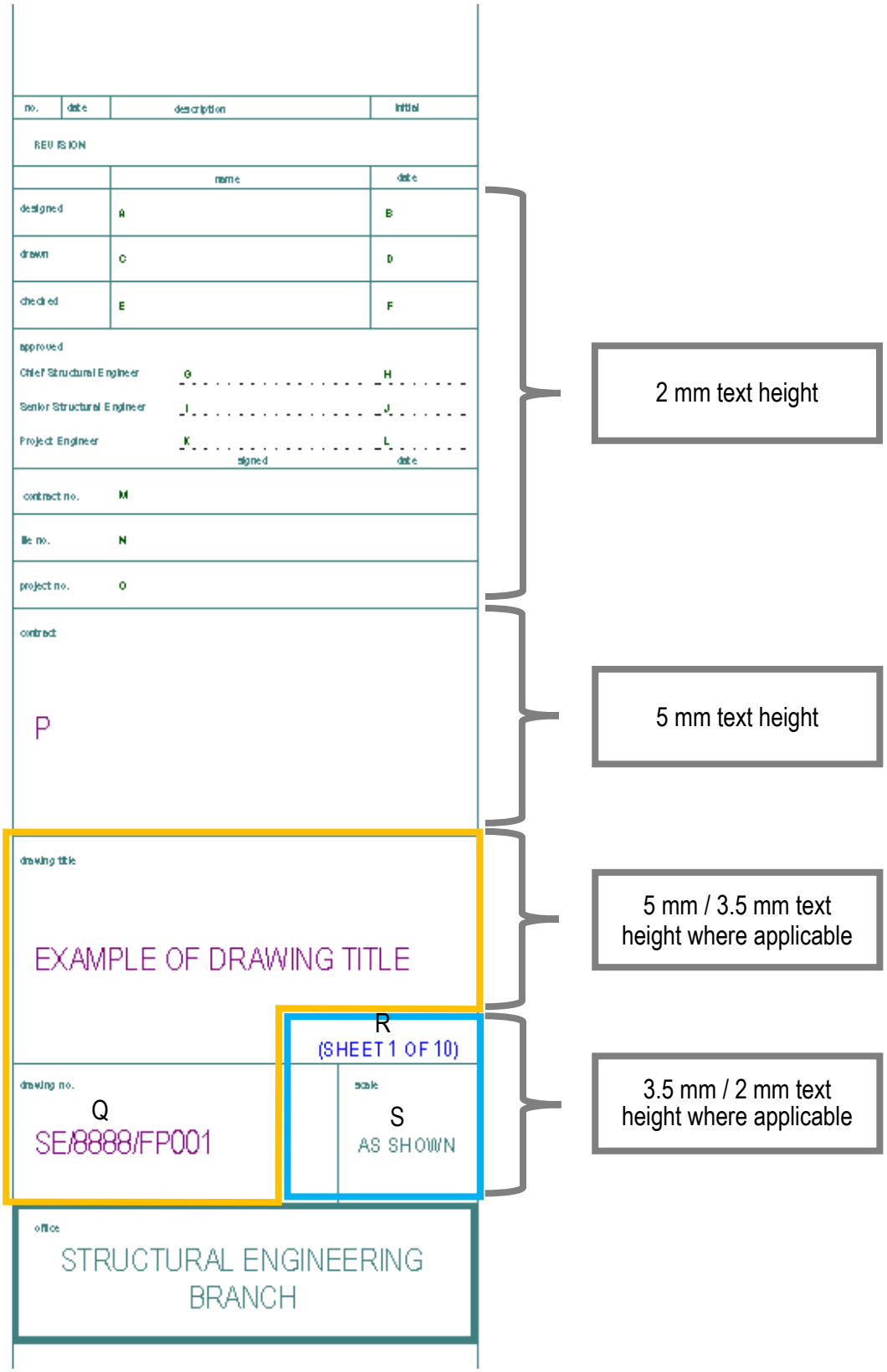
4.20.2 Shared Parameters

Some shared parameters should be defined in a project according to the project details show on title block. The display control of shared parameters is different from project parameters. It should be changed one by one on title block/sheet properties. Examples are shown below:

Parameter	Discipline	Type	Group	Position in Title Block
sDate_Checked	Common	Text	General	F
sDate_Designed	Common	Text	General	B
sDate_Drawn	Common	Text	General	D
sDate_Signed_CSE	Common	Text	General	H
sDate_Signed_PSE	Common	Text	General	L
sDate_Signed_SSE	Common	Text	General	J
sDWG_Title_Suffix	Common	Text	General	R
sName_Checked	Common	Text	General	E
sName_CSE	Common	Text	General	G
sName_Designed	Common	Text	General	A
sName_Drawn	Common	Text	General	C
sName_PSE	Common	Text	General	K
sName_SSE	Common	Text	General	I
sScalerow1	Common	Text	General	S
sScalerow2	Common	Text	General	
sScalerow3	Common	Text	General	

Remark: position refer to the example of title block on page 26.

Example of project and shared parameters arrangement.



4.21 View Setting

View should be created and applied on specific views.

4.21.1 Plan

Scale	1:100
Detail level	Coarse
Visual Style	Hidden Line

4.21.2 Section

Scale	1:50
Detail level	Coarse
Visual Style	Hidden Line

4.21.3 Detail

Scale	1:20 / 1:10 / 1:5
Detail level	Fine
Visual Style	Hidden Line

4.21.4 Site Location Plan

Scale	1:1000
Detail level	Coarse
Visual Style	Hidden Line

4.21.5 3D view

Scale	1:100
Detail level	Fine
Visual Style	Shaded

Remark: self-defined view setting may be applied for specific purpose.

4.22 Customized Object Library for Structural Engineering

When a new object is created in a project, details of the new object should be recorded using the template as attached in Appendix A. 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.

4.23 Schedule

Pre-defined schedules are created for BIM operation as below:

Schedule Type	Scheduled fields (in order)	Sorting/ Grouping	Formatting
Slab	1) Object Name 2) Type 3) Level 4) Type Mark 5) Mark 6) Volume	1) Level (Ascending) 2) Mark (Ascending)	Volume (Calculate totals)
Stair Landing	1) Object Name 2) Type 3) Monolithic Thickness 4) Type Mark 5) Mark	1) Mark (Ascending)	N/A
Stair Run	1) Object Name 2) Type 3) Actual Number of Risers 4) Actual Number of Treads 5) Actual Run Width 6) Actual Tread Depth 7) Run Height 8) Structural Depth 9) Type Mark 10) Mark	1) Mark (Ascending)	N/A
Column	1) Object Name 2) Type 3) Top Level 4) Top Offset 5) Base Level 6) Base Offset 7) Column Location Mark 8) Mark 9) Length 10) Volume	1) Base Level (Ascending) 2) Column Location Mark (Ascending)	Volume (Calculate totals)

Foundation	1) Object Name 2) Type 3) Elevation at Bottom 4) Elevation at Top 5) Foundation Thickness 6) Default Thickness 7) Type Mark 8) Mark 9) Width Volume	1) Elevation at Bottom (Ascending) 2) Mark (Ascending)	Volume (Calculate totals)
Beam	1) Object Name 2) Type 3) Structural Usage 4) Reference Level 5) Level 6) Type Mark 7) Mark 8) Length 9) Cut Length 10) Volume	1) Reference Level (Ascending) 2) Mark (Ascending)	Volume (Calculate totals)
Wall	1) Object Name 2) Type 3) Structural Usage 4) Base Constraint 5) Base Offset 6) Top Constraint 7) Top Offset 8) Type Mark 9) Mark 10) Length 11) Width 12) Volume	1) Base Constraint (Ascending) 2) Mark (Ascending)	Volume (Calculate totals)
View List	1) Object Name 2) Type 3) Associated Level 4) Detail Level 5) Scale Value 1: 6) Sheet Name 7) Sheet Number 8) Title on Sheet 9) View Name	1) Object Name (Descending) 2) Associated Level (Ascending) 3) View Name (Ascending)	N/A

Sheet List	1) Sheet Name 2) Sheet Number 3) Current Revision	1) Sheet Number (Ascending)	N/A

Notes: Other available fields may be added to suit project's needs.

4.24 Export Setup

For exporting from BIM Model to 2D drawing format, settings are as follows.

4.24.1 Layers-Model categories

The layer settings for all structural elements should comply with the structural discipline requirement in CAD Manual for ArchSD Projects.

4.24.2 Layers-Annotation categories

The layer settings for annotation related to structural elements should comply with the structural discipline requirement in CAD Manual for ArchSD Projects.

4.24.3 Layers-Others

The layer settings for others (e.g. Grid, Level,Viewport, etc) should comply with the structural discipline requirement in CAD Manual for ArchSD Projects.

4.24.4 Colours

The colours should export as Index colour (255 colours) .

4.24.5 Units & Coordinates

The 2D drawing unit should be millimeter and the coordinate system basis should refer to project internal.

4.25 Level of Information Need (LOIN)

The following Level of Graphics (LOD-G) and Level of information (LOD-I), based on the notations defined in CIC BIM Standards for Architecture and Structural Engineering Model excluding non-graphical information and reinforcement details, unless otherwise specified, should apply.

Model Element	OmniClass	Level of Information Need (LOIN)							
		WS2		WS3		WS4		WS5	
		LOD-G	LOD-I	LOD-G	LOD-I	LOD-G	LOD-I	LOD-G	LOD-I
Foundations (piles, pile caps, tie/ground beams & footings)	23-13 29 00	100	100	200	200	300	300	400	400
Diaphragm walls, retaining walls	23-11 17 13	100	100	200	200	300	300	400	400
Excavation & lateral stability systems	23-11 11 00	N/A	N/A	200	200	300	300	400	400
Beams	23-13 35 11 13 13	N/A	N/A	200	200	300	300	400	400
Columns, posts, hangers	23-13 35 11 13 11 02	N/A	N/A	200	200	300	300	400	400
Walls	23-13 35 21	N/A	N/A	200	200	300	300	400	400
Slabs, floors, ramps, roofs	23-13 35 11 13	N/A	N/A	200	200	300	300	400	400
Transfer Structure (transfer plate, truss)	23-13 35 19 01	N/A	N/A	200	200	300	300	400	400
Stairs (steps, risers, threads, landings)	23-17 23 17	N/A	N/A	200	200	300	300	400	400

Bracing	23-13 35 15 11	N/A	N/A	200	200	300	300	400	400
Temporary works, temporary structures, platforms	23-23 25 00	100	100	200	200	300	300	400	400
Tunnel Structure (Tunnel Box, Subway, Utilities Tunnel)	23-39 13 00	100	100	200	200	300	300	400	400

4.26 BIM Object Sheet

The BIM object shall contain 3D components of geometry and 2D components of symbols and tag / label / annotations. All of these contents are intended for production of presentation drawings, statutory / authorities submission drawings, and tender / construction drawings. In addition, the BIM object shall be capable of being scheduled in the project environment with correct information. The production of drawings and schedules shall follow industry practice and requirements of the project and client.

The BIM object shall be provided together with a comprehensive cover sheet to convince clients, receivers and users that the BIM object is complete and satisfies all requirements and functions for drawing production.

The BIM object cover sheet shall contain the items shown in the Appendix A.

5 Data Requirement

5.1 Data Format of Structural Modelling for Cost Estimation and Facilities Upkeep

The requirements of BIM file coding, naming convention, model presentation style (colour code, line type, line weight, etc.) and unit of measurement of the cost estimation model or as-built BIM model should make reference to the current version of BIM Guide for Cost Estimation issued by Quantity Surveying Branch or BIM Guide for Facilities Upkeep issued by Property Services Branch respectively.

5.2 Data-driven BIM object requirements

A Data-driven BIM Object contains BIM Object with graphical presentation of the geometry, 'Graphical Information' in relation to the colour, shape and size of geometry, and 'Non-graphical Information' not related to the geometry.

Non-graphical Information is the information or parameter values with no link/control to the colour, shape and size of the geometry. Non-graphical Information covers many types of information from material specifications to physical properties, or simply the label of an object and hyperlink. If the detailed shape of an object is not needed in the early stages of a project, or only at a low Level of Development (LOD) requirements, objects that are not modelled with the geometry can be described by Non-graphical Information.

Details of Data-driven BIM Object requirements shall follow to the Appendix B.

6 Appendix A – BIM Object Sheet for recording details of new objects

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

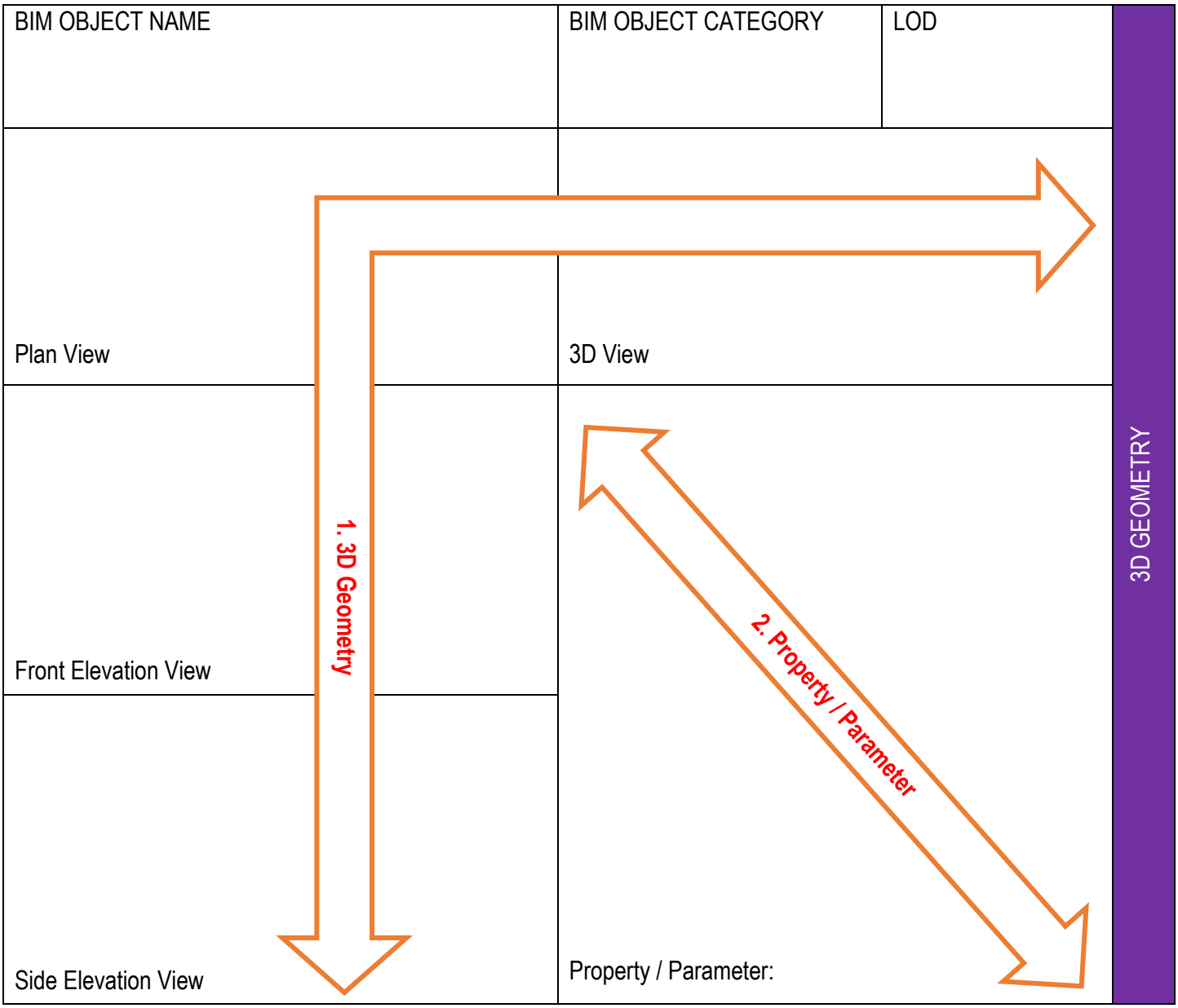
Architectural Service Department

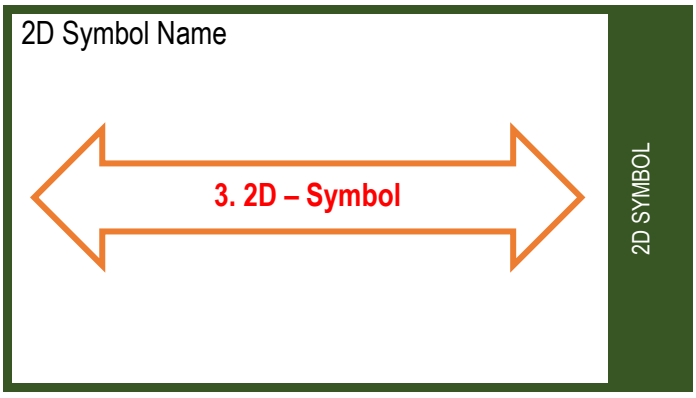
BIM OBJECT SHEET

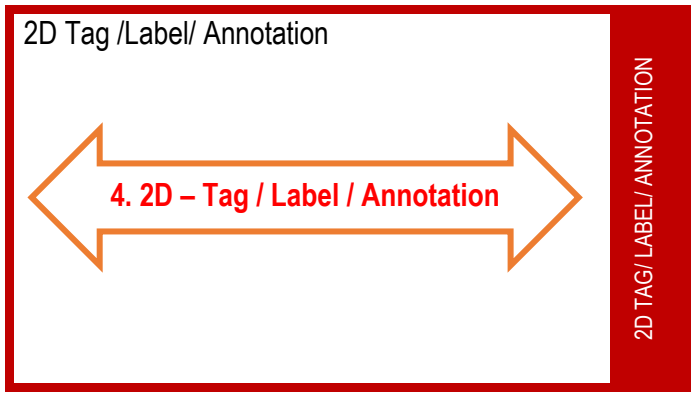
QR CODE FOR FM	Version: Date:	Reference Number

INPUT

BIM OBJECT NAME	BIM OBJECT CATEGORY	LOD



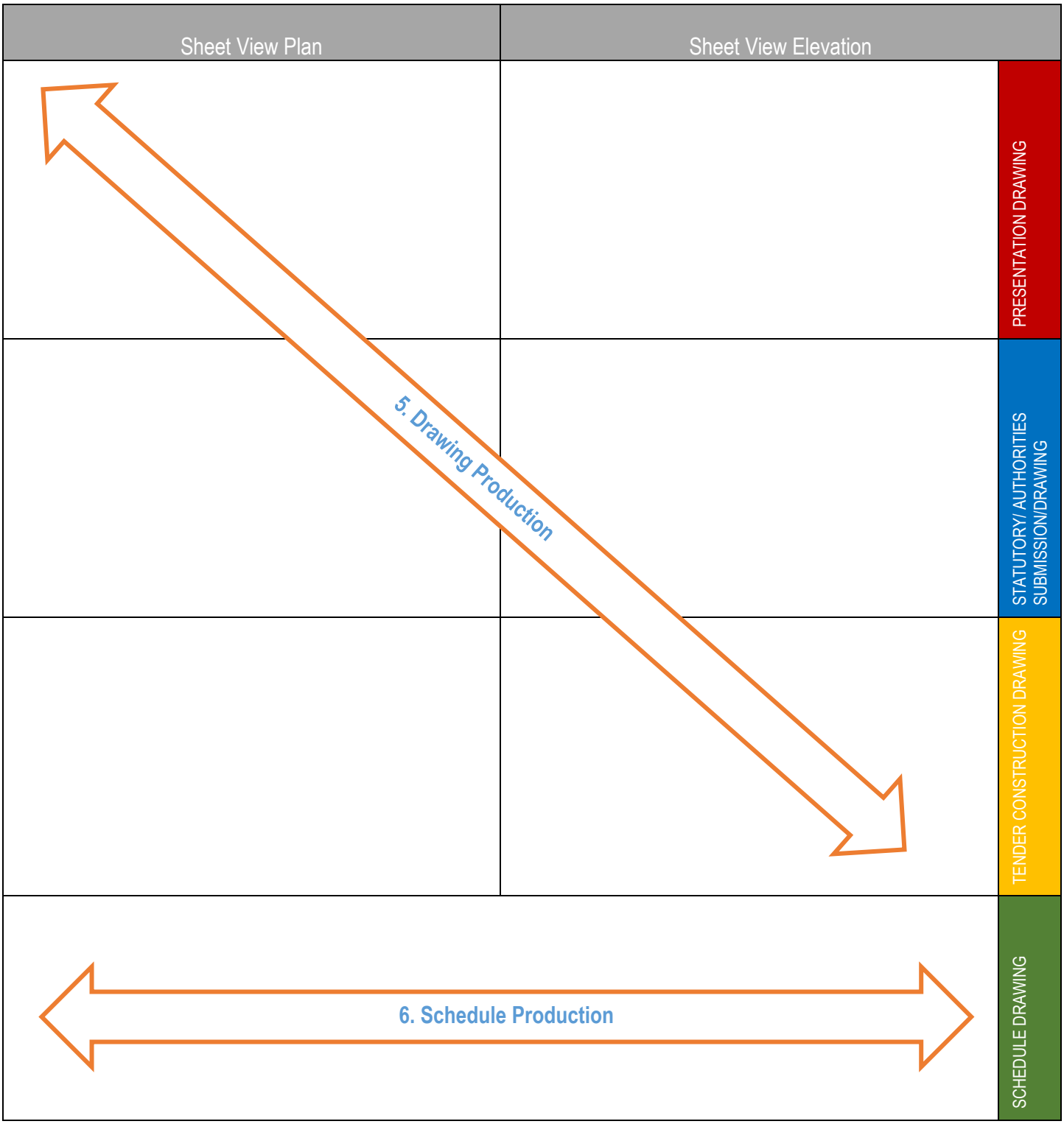




Remarks	

	Purpose/ Value Driven BIM OBJECT DELIVERABLES

OUTPUT



7 Appendix B – Data-driven BIM object requirements

Model Element	Explanatory Note	Graphical Information	Non-graphical Information
Foundations (piles, pile caps, tie/ground beams & footings)	- Intelligent object indexed / categorised as 'foundation' with tally for foundation plan - Top level of pile cap/ ground beams should be modelled to structural floor level	- Thickness - Width (for tie/ground beams) - Depth (for tie/ground beams)	- Concrete grade - Object mark - Slope / curve element - Water retaining structure
Beams (concrete / steel)	- Intelligent object indexed / categorised as 'Structural Beam' with tally for framing plan - Structural beam should be modelled to the full structural size of its width and depth	- Width - Depth - Thickness of flange / web	- Concrete grade - Object mark - Slope / curve element - Water retaining structure - Tapered element - Type mark (for steel) - Steel grade
Columns, posts, hangers (concrete / steel)	- Intelligent object indexed / categorised as 'Structural Column' with tally for framing plan. - Structural column should be modelled to the full structural size of its width and depth	- Width - Depth - Height - Thickness of flange / web	- Concrete grade - Object mark - Water retaining structure - Type mark (for steel) - Steel grade
Walls	- Intelligent object indexed / categorised as 'Structural Wall' with tally for framing plan - Structural wall should be modelled to the full structural size of its thickness and length	- Length - Thickness	- Concrete grade - Object mark - Curve element - Water retaining structure
Slabs, floors, ramps, roofs	- Intelligent object indexed / categorised as 'Structural Slab' with tally for framing plan - Top level of slab should be modelled to structural floor level - Thickness of slab should only be the thickness of the cast in situ part	- Thickness	- Concrete grade - Object mark - Slope / curve element - Water retaining structure
Stairs (steps, risers, threads, landings)	- Intelligent object indexed / categorised as 'Stair' with tally for framing plan - Top level of landing and flight should be modelled to the structural floor level of the item	- Thickness	- Concrete grade - Object mark