

CERTIFICATE COURSE IN BIM MODELLING

Architecture Track



School of Graduate Development and Management

Certificate Course in BIM Modelling (Architecture Track)

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Topic Overview

	Day 1	Day 2	Day 3	Day 4
AM	BIM Fundamentals & Revit Interface	BIM e-Submission Guidelines & Template Overview	(Assignment – 3D part finish)	(Assignment – 2D Documentation, Family)
	Starting a BIM project: Project template, Insert files, Project base point, Grids & Levels, Create views	Basic 3D modeling : staircase, railing, roof, ceiling		
PM	Site & Mass Modelling	(Assignment – 3D part)	Family editor interface & simple family creation	
	Basic 3D modeling : Wall, floor, ramp, doors & windows		Basic 2D elements: rooms, area, annotation, dimension, tags, schedule, sheets, titleblock, exporting files.	

DAY 2

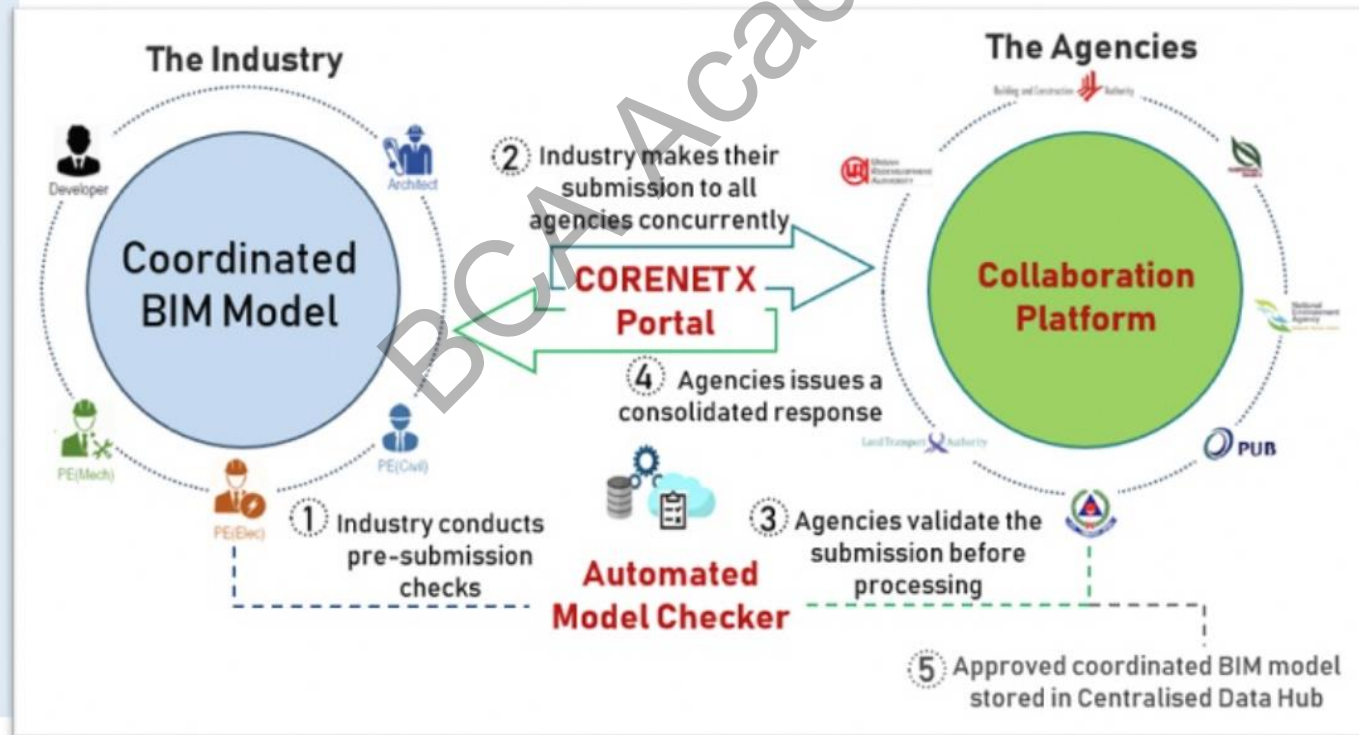
BIM e-SUBMISSION OVERVIEW

BIM e-Submission Introduction

- Corenet X is new submission portal that to replace Corenet 2.0 (<https://info.corenet.gov.sg/>)
- An innovative digitalization and technology-driven platform set to revolutionise the regulatory approval process
- Improved the whole entire regulatory process and use of OpenBIM format
- Initiated in 2018, soft-launched in Dec 2023
- This collaborative system allows project teams to review designs together, identify potential conflicts before construction, and generate a coordinated BIM model for regulatory approval.

TRANSFORMATION of INDUSTRY

- Promote design coordination and teamwork
- Promote digitalization of construction sector
- Support IDD¹ & DfMA² imperatives



TRANSFORMATION of REGULATORY AGENCIES

- Reduce silos, iterations & regulatory gateways
- Embrace collaboration & raise productivity amidst rising demands
- Improve accessibility & centralise information towards a Single Source of Truth

BIM e-Submission Introduction

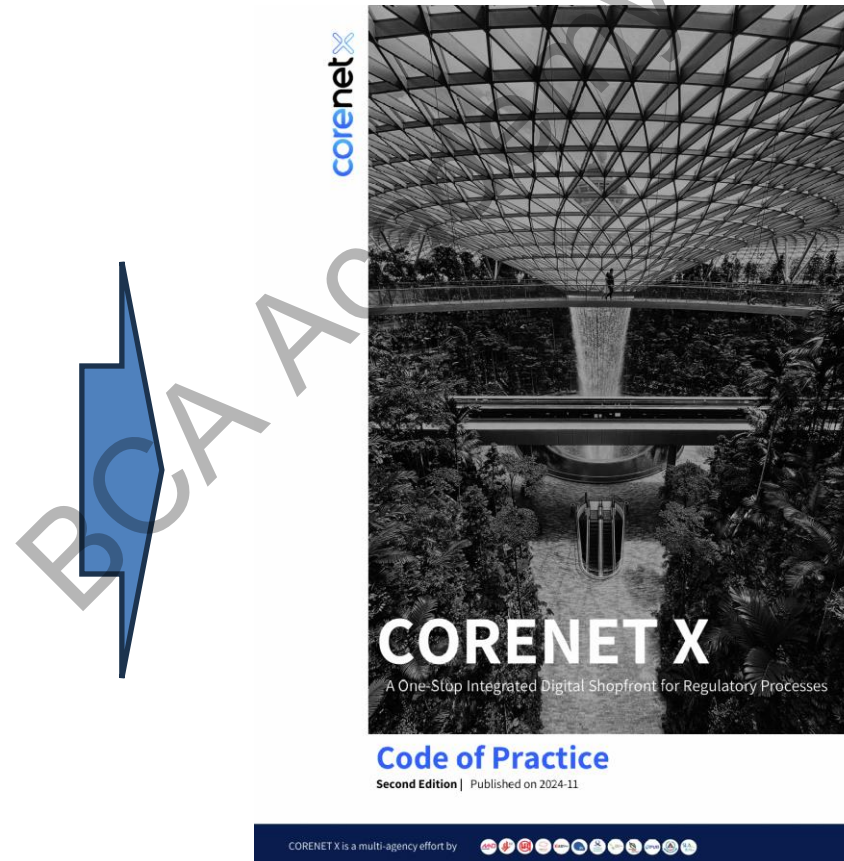
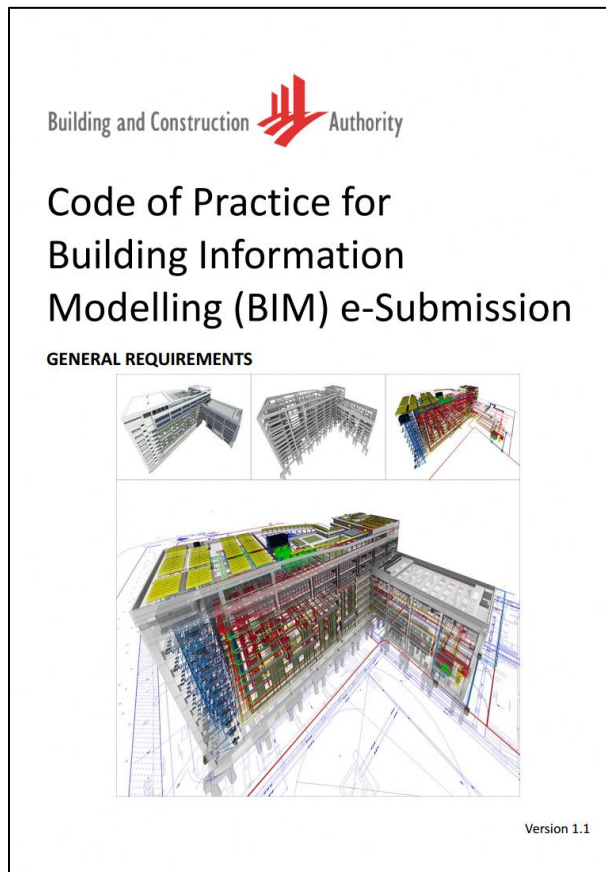
- 2024 June – Corenet X opened up a **voluntary submission portal**
- 2025 Oct – **Mandatory** submission for new projects with GFA 30,000sqm or more
- 2026 Oct – **Mandatory** submission for all new projects with GFA 5000sqm or more
- 2027 Oct – **Mandatory** submission for all ongoing projects

Understanding the new RABW Processes

- Corenet X Regulatory Approved for Building Works (**RABW**) trainings
- <https://info.corenet.gov.sg/resources/corenet-x-training---funding>

How to prepare BIM e-Submission?

1. Able to use BIM Authoring Software.
2. Understand the BIM e-Submission Requirements.

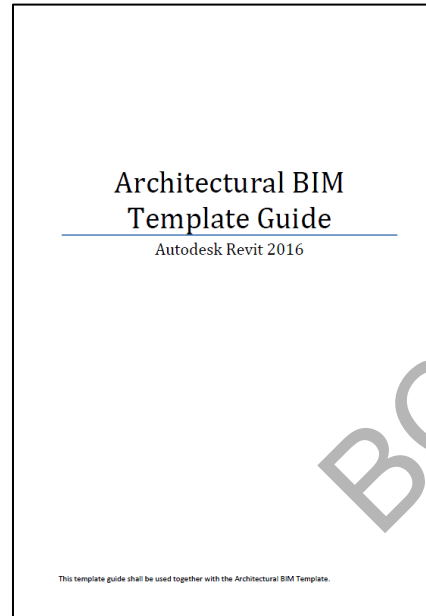
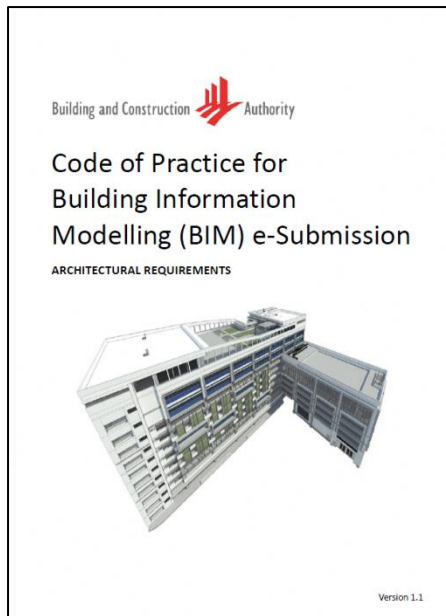


[corenet-x-cop---2-1-edition-2024-11.pdf](#)

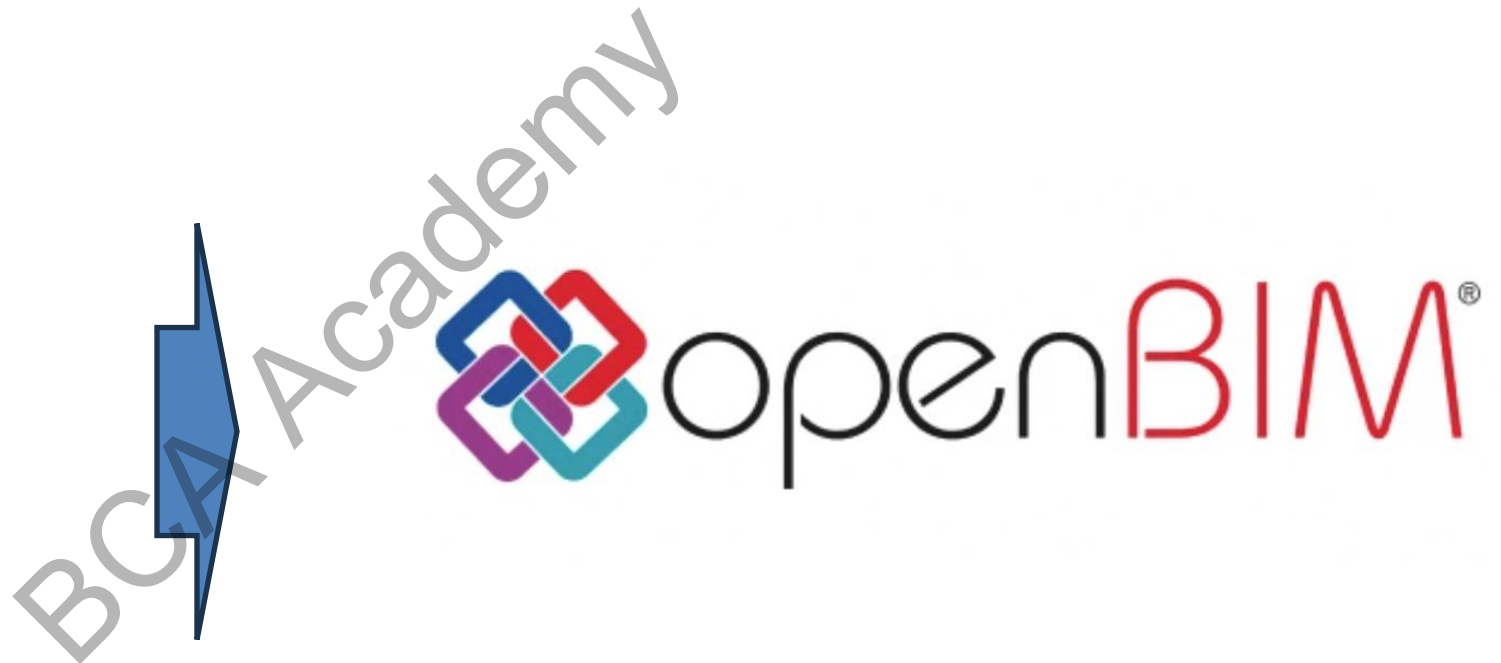


Reference Documents...

1. Code of Practice for BIM e-Submission (AR Requirements) (v1-1)
2. Architectural BIM Template Guide (2016)



Deliverables



Preparing Models for Submission (General)

More details refer to: [corenet-x-cop---2-1-edition-2024-11.pdf](#)

- Model Size

- Each model should not exceed 800MB, and be submitted by parts (i.e. 1 block per file)
- If a part model exceed 800MB, the part model should be split into smaller files
- Files compiled in zip folders are not accepted

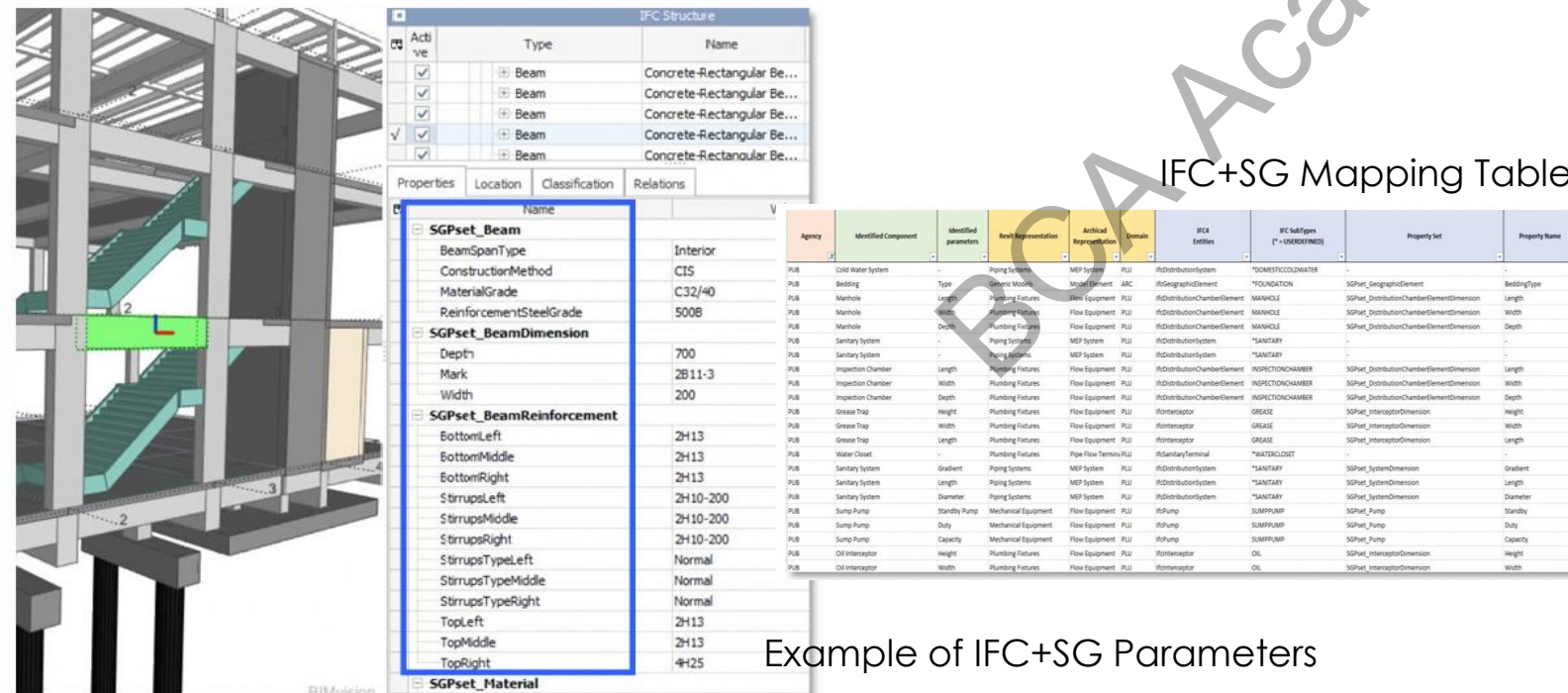
- Setting up Project Information

- The Project Title, Address QP Name & Professional Registration Number, and if applicable, Name and Professional Registration number of Specialist QPs will be provided on Corenet X Portal

Preparing Models for Submission (General)

- Model in IFC+SG & Reading the IFC+SG Mapping Table

- A set of IFC+SG standards was developed to address specific regulatory requirements in Singapore cannot be found in the international IFC standards
- Industry practitioners shall use the [https://info.corenet.gov.sg/ifc-sg/bim-data-\(ifc-sg\)/ifc-sg-resource-toolkit](https://info.corenet.gov.sg/ifc-sg/bim-data-(ifc-sg)/ifc-sg-resource-toolkit) to convert Native BIM models into IFC+SG models to verify no data loss occurred during the exporting
- Other details refer to: [corenet-x-cop---2-1-edition-2024-11.pdf](https://info.corenet.gov.sg/corenet-x-cop---2-1-edition-2024-11.pdf)



The image shows a BIM model of a staircase on the left and a table of IFC+SG parameters on the right. The table is titled "IFC+SG Mapping Table" and lists various parameters for different building components.

Agency	Identified Component	Identified Parameters	Architect Representation	Artificial Representation	IFC Entities	IFC SubTypes (* = USERDEFINED)	Property Set	Property Name
PUB	Cold Water System	Piping Systems	MEP System	PLU	AdDistributionSystem	DOMESTIC COLD WATER		
PUB	Bedding	Generic Models	Model Element	ARC	IFcGeographicElement	FOUNDATION	SGPset_GeographicElement	BeddingType
PUB	Manhole	Plumbing Features	Flow Equipment	PLU	AdDistributionChamberElement	MANHOLE	SGPset_DistributionChamberElementDimension	Length
PUB	Manhole	Plumbing Features	Flow Equipment	PLU	AdDistributionChamberElement	MANHOLE	SGPset_DistributionChamberElementDimension	Width
PUB	Manhole	Plumbing Features	Flow Equipment	PLU	AdDistributionChamberElement	MANHOLE	SGPset_DistributionChamberElementDimension	Depth
PUB	Sanitary System	Piping Systems	MEP System	PLU	AdDistributionSystem	SANITARY		
PUB	Sanitary System	Piping Systems	MEP System	PLU	AdDistributionSystem	SANITARY		
PUB	Inspection Chamber	Plumbing Features	Flow Equipment	PLU	AdDistributionChamberElement	INSPECTIONCHAMBER	SGPset_DistributionChamberElementDimension	Length
PUB	Inspection Chamber	Plumbing Features	Flow Equipment	PLU	AdDistributionChamberElement	INSPECTIONCHAMBER	SGPset_DistributionChamberElementDimension	Width
PUB	Inspection Chamber	Plumbing Features	Flow Equipment	PLU	AdDistributionChamberElement	INSPECTIONCHAMBER	SGPset_DistributionChamberElementDimension	Depth
PUB	Grease Trap	Plumbing Features	Flow Equipment	PLU	Interceptor	GREASE	SGPset_InterceptorDimension	Height
PUB	Grease Trap	Plumbing Features	Flow Equipment	PLU	Interceptor	GREASE	SGPset_InterceptorDimension	Width
PUB	Grease Trap	Plumbing Features	Flow Equipment	PLU	Interceptor	GREASE	SGPset_InterceptorDimension	Length
PUB	Water Closet	Plumbing Features	Pipe Flow Terminal	PLU	AdSanitaryTerminal	WATERCLOSET		
PUB	Sanitary System	Piping Systems	MEP System	PLU	AdDistributionSystem	SANITARY	SGPset_SystemDimension	Gradient
PUB	Sanitary System	Piping Systems	MEP System	PLU	AdDistributionSystem	SANITARY	SGPset_SystemDimension	Length
PUB	Sanitary System	Piping Systems	MEP System	PLU	AdDistributionSystem	SANITARY	SGPset_SystemDimension	Diameter
PUB	Sump Pump	Standby Pump	Mechanical Equipment	PLU	IFcPump	SUMP PUMP	SGPset_Pump	Standby
PUB	Sump Pump	Standby Pump	Mechanical Equipment	PLU	IFcPump	SUMP PUMP	SGPset_Pump	Duty
PUB	Sump Pump	Standby Pump	Mechanical Equipment	PLU	IFcPump	SUMP PUMP	SGPset_Pump	Capacity
PUB	Oil Interceptor	Plumbing Features	Flow Equipment	PLU	Interceptor	OIL	SGPset_InterceptorDimension	Height
PUB	Oil Interceptor	Plumbing Features	Flow Equipment	PLU	Interceptor	OIL	SGPset_InterceptorDimension	Width

Preparing OpenBIM submissions using IFC+SG

- IFC+SG trainings
(<https://info.corenet.gov.sg/resources/corenet-x-training---funding>)
- Resource toolkit is provided with recommended steps and materials to prepare an IFC+SG model for submission via Corenet X
([https://info.corenet.gov.sg/ifc-sg/bim-data-\(ifc-sg\)/ifc-sg-resource-toolkit](https://info.corenet.gov.sg/ifc-sg/bim-data-(ifc-sg)/ifc-sg-resource-toolkit))

Example of IFC+SG Parameters

Preparing Models for Submission (General)

- Setting up the Model

Upgrading the current in-house BIM Template into CORENET X Template

- ✓ Study the existing object properties
- ✓ Know the properties that needs to be edited in-line with the IFC Configurator

Pull out the common properties and assign as the object type properties

- ✓ To avoid re-entering of properties.
- ✓ To avoid duplication of property when exported into IFC

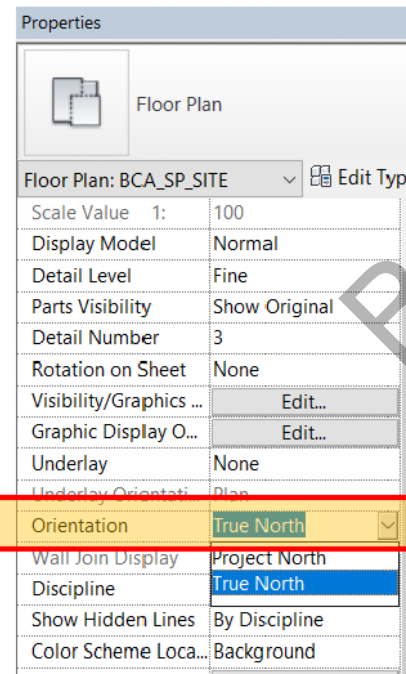
Map the existing object library properties into configuration file

- ✓ One-time process
- ✓ Can be used into the future projects
- ✓ Eliminate duplicated work and errors
- ✓ Standard IFC exports for all your projects

Multi-Disciplinary Coordination

- Geo-referencing

- Model should be correctly geo-referenced and assigned to real-world coordinates from **Singapore SVY21 coordinate system (EPSG: 3414)** for Easting and Northing (x,y).
- Site Model layout to be aligned to **True North or real-world orientation**.
- Elevation Datum must be aligned to '**Singapore Height Datum**' (SHD) of 0.000m.
- 3D Model to be prepared in **scale 1:1** only. (Do not confuse between model scale and drawing scale)



Multi-Disciplinary Coordination

- Alignment of Levels and Zones Across All Disciplines' Models

- Only multi-disciplinary models with **identical names and “Z” values** for levels will be processed by Processing officers in the Corenet X collaboration platform




S4 – Fig 5: Multi-Disciplinary Coordination

Multi-Disciplinary Coordination

- Clash Detection

- The project team should ensure that in-principle, basic / key components from each discipline do not clash with one another, as indicated in the component clash matrix



S4 – Fig 6 : Design Clash
Source: <https://www.bimcollab.com/en/products/bimcollab-zoom-b/>

For example, the Architectural Door should **not** have a design clash with the Structural Beam

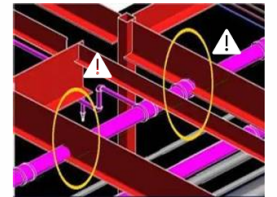
		Architectural					Structural				
		Floor (IfcSlab)	Wall (IfcWall)	Ceiling (IfcCovering)	Door (IfcDoor)	Window (IfcWindow)	Structural Column (IfcColumn)	Structural Foundation (IfcPile, IfcFootings)	Structural Framing (IfcBeam)	Structural Wall (IfcWall)	Slab (IfcSlab)
Structural	Structural Column (IfcColumn)				1						
	Structural Foundations (IfcPile, IfcFootings)										
	Structural Framing (IfcBeam)				2						
	Structural Wall (IfcWall)				3						
	Slab (IfcSlab)										
MEP	Generic Models (IfcBuildingElementProxy)										
	Mechanical Equipment (IfcTank, IfcPump, IfcUnitaryEquipment)		4								8
	Ducts (IfcDuctSegment)			5							9
	Air Terminals (IfcAirTerminal)										10
	Pipes (IfcPipeSegment)			6							11
	Plumbing Fixtures (IfcSanitaryTerminal)										12
	Cable Tray (IfcCableCarrierSegment)			7							13

S4 – Fig 7: Multi-Disciplinary Coordination

For example, the MEP Pipes should **not** have a design clash with the Structural Beam

S4 – Fig 8 : Design Clash

Photo credit: Clash Detection Projects | Tesla CAD UK

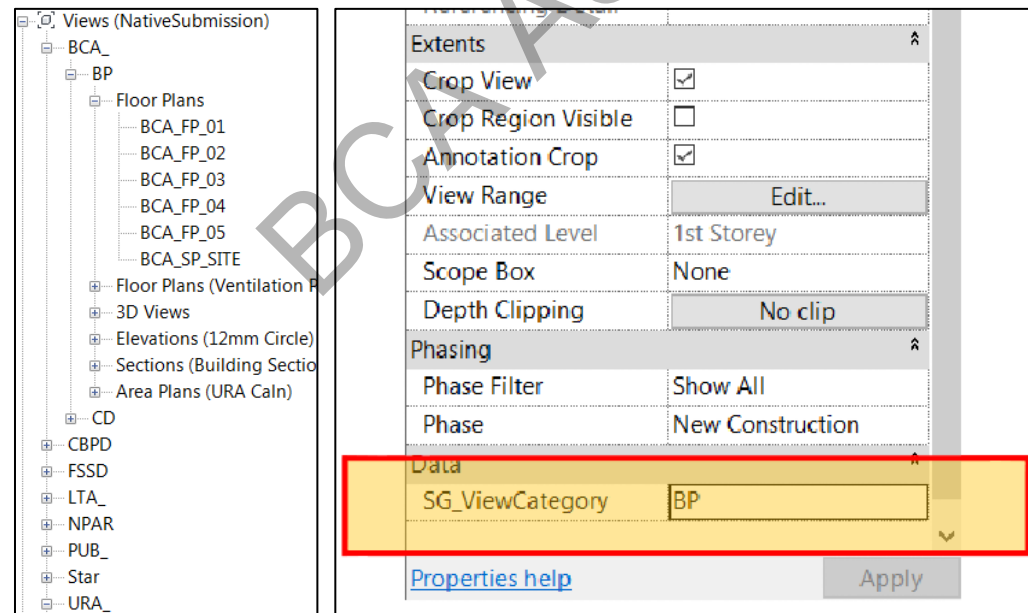


Note: Clash tolerance for specialist equipment such as an active chilled beam is acceptable.

For reference

View Naming – for reference

- In BCA BIM e-Submission Template, **View Name Organisation** in Project Brower follows types of submission to Authorities.
- Each view name indicated different **View Category** for different project stage. (DC/BP/CD)
 - DC – refers to **G1.Design Gateway**
 - BP – refers to **G2. Construction Gateway**
 - CD – refers to **G3. Completion Gateway (TOP/CSC)**

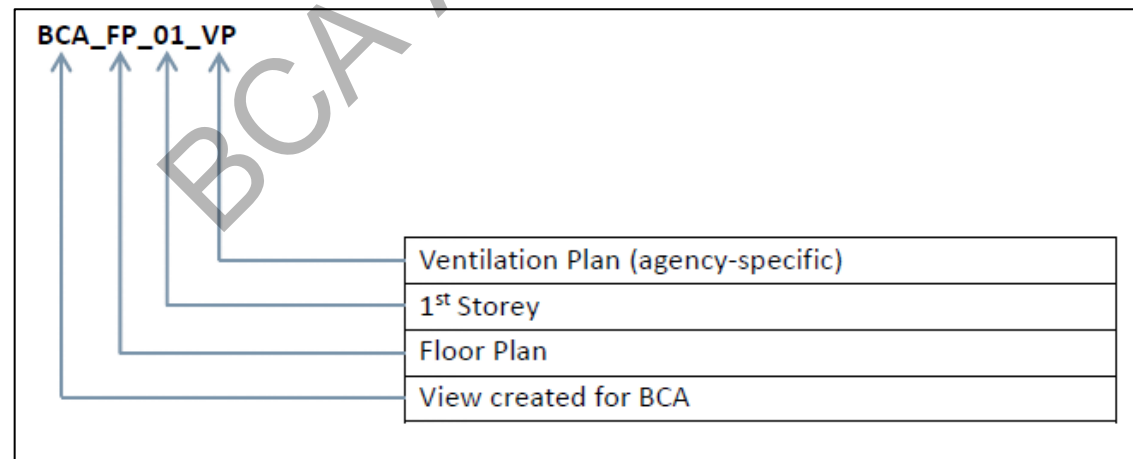
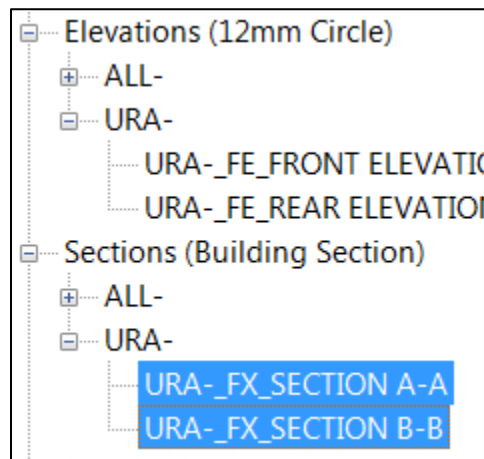


View Naming – for reference

- Each View Name to consist 3-4 fields
- Description and Codes must follow BIM e-Submission COP.

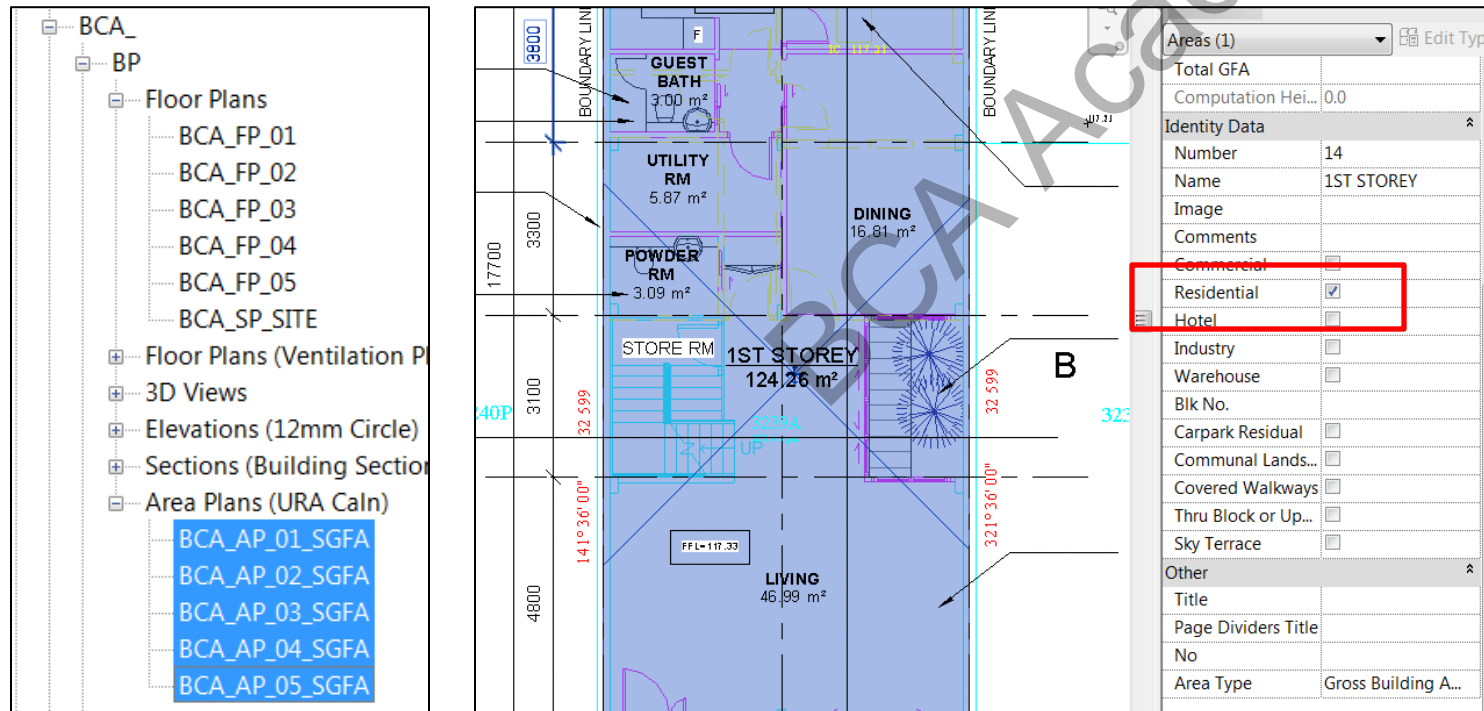
Fig. 3 - View Naming Format: (3 fields required; 1 field agency-specific)

Agency							Type of View			View Name (User-defined)			Additional Information (Agency-specific)	
						–			–			–		



Area Plan – for reference






- Area Plans are required in URA & BCA submission. (GFA & SGFA)
- Area Plan (AP) & Floor Plan (FP)
- Use Area Boundary & Area Tag
- Define Area type into the required Identity Data (under Properties)
- The GFA table will be auto-tabulated based on defined ID.






<URA-_LV_SUMMARY OF GROSS FLOOR

A	B	C	D	E	F
Blk No.	Storey	GFA (m2)	Commercial Ar	Residential Are	H
	Not Placed	0.00 m²	0.00 m²	0.00 m²	
	1st Storey	124.26 m²	0.00 m²	124.26 m²	
	2nd Storey	125.43 m²	0.00 m²	125.43 m²	
Grand total: 6		249.69 m²	0.00 m²	249.69 m²	

-
- Table 14a - Colours for Amendment to Approve**
- | Colour & Line Type | |
|-----------------------------------------------------------------------------------------------------------|------|
| Magenta (Solid) | |
| Yellow (Hidden) OR
Orange (Hidden) |
 |
| Overlapping of:
Magenta (Solid) and
Yellow (Hidden)
OR
Magenta (Solid) and
Orange (Hidden) |
 |

Colour & Line Type		RGB Values			Usage
		R	G	B	
Magenta (Solid)		255	0	255	Proposed elements
Yellow (Hidden) OR		255	225	0	Deleted elements
Orange (Hidden)		255	204	0	
Overlapping of: Magenta (Solid) and Yellow (Hidden) OR Magenta (Solid) and Orange (Hidden)	 				Approved elements

Colour & Line Type		RGB Values			Usage
		R	G	B	
Magenta (Solid)		255	0	255	Proposed elements
Cyan (Solid)		0	255	255	Existing elements
Yellow (Hidden)		255	255	0	Deleted elements

Title Block – for reference

- The BIM e-Submission Title Block to include:

1. Submission Authority & QP endorsements and declaration
2. Project Information
3. List of views, schedules and sheets for approval

Fig. 4 - Example of Cover Page (as provided in the BIM e-submission template)

The figure shows a sample cover page for BIM e-submission. It is divided into three main sections, numbered 1, 2, and 3, corresponding to the requirements listed on the left.

Section 1: Submission Authority & QP endorsements and declaration (Top right)

Section 2: Project Information (Bottom right)

Section 3: List of views, schedules and sheets for approval (Center)

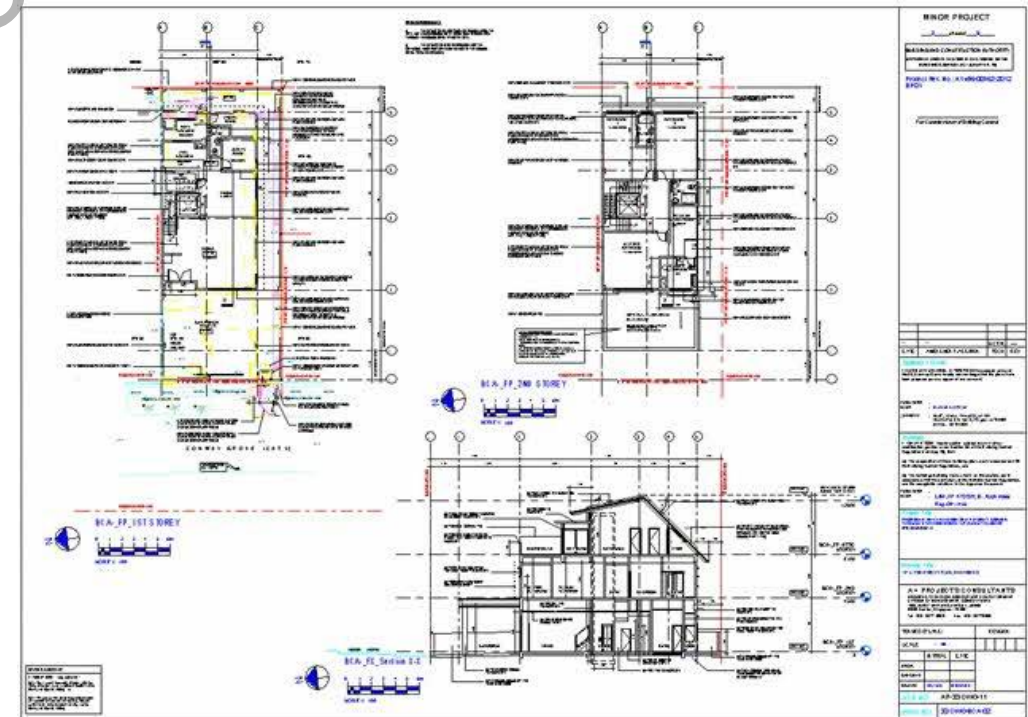
The central section (3) is titled "VIEWS, SCHEDULES AND SHEETS FOR APPROVAL" and contains a table with columns for Item No., Description, and Status. The table lists various items, including views, schedules, and sheets, with their respective descriptions and status (e.g., "Not for Approval", "For Approval").

The right side of the page contains a vertical column of information, including a declaration box, project information, and a table for the submission authority and QP endorsements.

Last Saved View – for reference

- Make sure to insert **completed views** into submission title block.
- Authority will base on the concept 'Last Saved Views' for approval.
- QP to ensure the following items are checked before submission:

- Maximum extent is saved for each view.
- There are no hidden objects or annotations.
- All external files that form part of the submission can be loaded when opened.
- There shall be no missing/unreadable external files.
- All other external references, irrelevant drawing layers, objects, annotations, drafting work and construction lines, which are not part of the proposed building elements or submission, are to be removed or purged before submission.
- Unnecessary federated or linked files shall be purged before submission.
- No proprietary fonts are used for annotations and all the fonts should be legible.
- All objects and annotations in each phase are displayed in the last saved view.



File Naming – for reference

- File Name to consist 6 fields
- Description and Codes must follow BIM e-Submission COP.

Fig. 1 - File Naming Format

Project ID (User-defined)	Author	Model Part	Submission Version	Software Version	Additional Information (User- defined)

Examples of File Naming (Architectural)

BR15_A_B1_A_A20/ R15/ v8i_MAIN (.pla/ .rvt/ .dgn)

↑	Additional Information (indication of the MAIN project file)
↑	Software version used
↑	1st BP Submission to BCA
↑	Block 1
↑	Created by Architect
↑	Braddell Project in the year 2015

Table 6 - Description of fields for File Naming

Field	Description	Maximum number of characters
Project ID	User-defined project reference identification or reference number.	6
Author	Discipline responsible for creating the model. (Refer to Table 7 for the codes)	2
Model Part	Zones, Blocks, Levels or Trades	6
Submission Version	Refers to the version number submitted to each regulatory agency. (Refer to Table 8 for the codes)	1
Software Version	Refers to the software version used and submitted to each regulatory agency. The last 3 characters of the software version shall be used. (Refer to Table 9 for the codes)	3
Additional Information	When submitting federated models, this field indicates the MAIN file.	6

BIM e-Submission Template – for reference

- 4 types for BIM e-submission template available in BCA website:
 - 1) .rte (Autodesk Revit)
 - 2) .tpl (Graphisoft ArchiCAD)
 - 3) .dgn (Bentley AECOsim)
 - 4) Tekla
- Modification of the template is possible.
- **Purpose** of BIM Submission Template :-
 - 1) Standardize the requirements & practices
 - 2) Regularize different view template for different authority department.