

# Streamlining C&S Format & Workflow

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# Programme Highlight

## Items

### Part 1: CORENET X Key Concept

- Introduction to new RABW & Lodgment
- Part submission
- Project creation – appointment & acknowledgement

### Part 2: New Submission Portal

- Project planning and submission naming convention
- Create submission, amendment & resubmission
- C&S plan application & independent submissions
- Permit to commence work
- Completion of structural works

### Refreshment

### Part 3: Streamlining C&S Format & Workflow

- Update of ST declaration and BE forms
- Introduce checksum
- C&S IFC-SG model preparation
- Model review & IFC tool available in market
- CORENET X resources



# Update to Forms (effective since Sep 2024)

Streamlining of forms for Earth Retaining and Stabilising Structures (ERSS), Piling Works, Tunnelling Works and Landed House Projects





Forms		Updates
<b>BEV/ERSS</b>	Design Considerations for Earth Retaining or Stabilising Structures (ERSS)	<ul style="list-style-type: none"> <li>Removed Annexes A2, B and D</li> <li>Simplified work process in Annex C</li> </ul>
<b>BEV/GBW</b>	Design Considerations for Earth Retaining or Stabilising Structures (ERSS) for Geotechnical Building Works <b>[not in use]</b>	<ul style="list-style-type: none"> <li>Merged into BEV/ERSS</li> </ul>
<b>BEV/PC</b>	Supervision of pile load & test piling works and Monitoring of building settlement	<ul style="list-style-type: none"> <li>Removed Annexes A and C</li> </ul>
<b>BEV/TUN</b>	Site Inspection and Approval Records and Ground Movement Assessment Record for Tunnelling Works	<ul style="list-style-type: none"> <li>Merged both non-GBW and GBW Annexes.</li> <li>Simplified work process.</li> <li>Updated TUN_GBW_Annex C-2</li> </ul>
<b>BEV/LP</b>	<p><b>Communication Plan for Landed Development Projects:</b></p> <p><u>Landed House Annex 1</u></p> <ul style="list-style-type: none"> <li>Notification of Building Works to Neighbours</li> <li>Request for Consent for Access</li> </ul> <p><u>Landed House Annex 2</u></p> <ul style="list-style-type: none"> <li>Notification to CBC on Communication Plan</li> <li>Notification to CBC on Status of Pre-construction Survey</li> <li>Notification to CBC on Consent for Access</li> <li>Notification to CBC on Concreting for RC Wall Abutting Existing Party or Boundary Wall</li> </ul>	<ul style="list-style-type: none"> <li>Revised annex nomenclature</li> </ul>
<b>BEV/TC</b>	The Professional Engineer's Certificate of Inspection and Completion of Temporary Buildings in construction site <b>[not in use]</b>	-

Scan Here



# Updated Standard Plan Certifications

Following the implementation of CORENET X for regulatory plan submissions, BCA has updated the standard plan certifications which can be found in the links below.

Standard Certifications	BCA website
Structural Plan	<a href="https://www1.bca.gov.sg/regulatory-info/building-control/structural-plans-and-permit-approvals">https://www1.bca.gov.sg/regulatory-info/building-control/structural-plans-and-permit-approvals</a>  
Record Plan	<a href="https://www1.bca.gov.sg/regulatory-info/building-control/structural-plans-and-permit-approvals/record-plans-approval/submission-of-amendment-and-record-piling-plans">https://www1.bca.gov.sg/regulatory-info/building-control/structural-plans-and-permit-approvals/record-plans-approval/submission-of-amendment-and-record-piling-plans</a>  

The revised standard plan certifications come into effect on **1 November 2024**.

Submissions	Effective date
New projects submitted in CORENET X / CORENET2	1 Nov 2024 onwards
Existing projects in CORENET X / CORENET 2 should adopt the updated certifications by 1 April 2025	

# Checksum for Approved Drawings (replacing watermarks)



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# Current Approved Plans with Watermarks

## Current Approach to Identify Approved Plans

- Builders are required to build according to Approved Plans
- Site personnels verify that building works on site are constructed following Approved Plans

Current approaches adopted by some Agencies to demarcate Approved Plans (For Example)

- a) BCA – Watermark on 2D CAD plans (**does not work on BIM**)
- b) URA - Sign (“encrypt”) Approved Plans using Netrust

### Pain point(s)

Projects members want to be able to identify/verify that a particular plan is indeed the Approved Plan.

Netrust software NDS is required to decrypt file to see the approved plan and once decrypted, there is no way to verify if the plan is the one approved by the Authority.



# Introduction to Checksum

Enhancement in CORENET X

## Current Practice

Need for greater ease of verifying/identifying approved plans



- ☹ Different methods adopted by different agencies to demarcate approved plans
- ☹ Difficult to verify whether the plans are indeed the latest approved plans

## Identification of Approved Plans via Checksum on Response Letters



What is Checksum solution?

- ✓ Digital fingerprint solution  
More secure than traditional watermark
- ✓ Easy detection of changes  
Small changes produce very different looking checksums
- ✓ Files remain intact and can be viewed freely  
Checksum solution does not affect or encrypt the files

Example of checksum (digital ID) of a file –

09f0ca9916116e3a2391bc40164a7368c79ed5d91bd03b317482bd851bf0a6a6

BCA

# Benefits of Checksum

## Enhancement in CORENET X

List of Approved Drawings in agency approval letter with checksums of approved plans

### Benefits



#### Standardised approach

- For all agencies' approved plans
- For BIM and 2D files



#### Ease of access and authentication

- Digitally signed for authentication
- Can be viewed without decryption



#### Quick verification of Approved Plan whenever in doubt

- Can be done without internet
- Can be done using Netrust

List of Approved Drawings (BCA)  
(To insert instructions xxx)

Building Design			
Drawing1 Proposal plan(s) 	Drawing2 Proposal plan(s) 	Drawing3 Proposal plan(s) 	Drawing4 Proposal plan(s) 
Structural Design			
Drawing4 Proposal plan(s) 	Drawing5 Proposal plan(s) 	Drawing6 Proposal plan(s) 	Drawing7 Proposal plan(s) 
Drawing8 Proposal plan(s) 	Drawing9 Proposal plan(s) 		
Buildability			
Drawing10 Proposal plan(s) 	Drawing11 Proposal plan(s) 	Drawing12 Proposal plan(s) 	

Digitally signed with: iSign  
Netrust Sample signing  
22 Mar 24, 02:25 PM SGT



Checksum (digital ID) of file embedded in QR code

Checksum (digital ID) of file:

09f0ca9916116e3a2391bc40164a7368c79ed5d91bd03b317482bd851bf0a6a6

Note: These images are for illustration purposes only.

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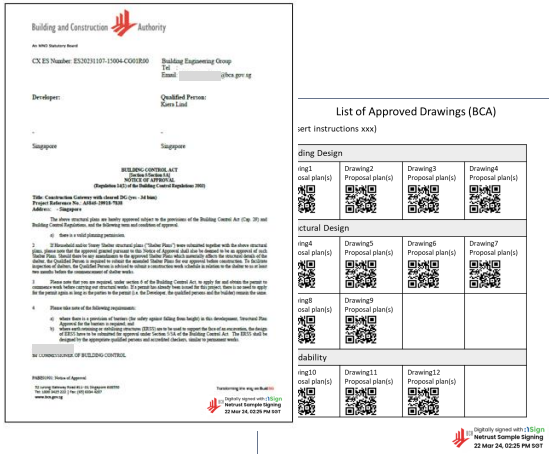


# Identifying Approved Plans for Construction

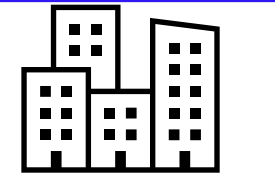
**?** How do Project Members verify the Approved Plans using Checksum?  
How do I verify that the BIM/2D file is the Approved Plans?

Verification with **Netrust Digital Signer (NDS)**[coming soon]

- ✓ Internet not required, verification on site without network is possible
- ✓ No additional software required, uses same Netrust application for digital signing by QPs



NOA Letter



IFC BIM files

**SignCore**  
DESKTOP

Netrust app used for digital signing by QPs (enhanced by CORENET X in partnership with Netrust)



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# Identifying Approved Plans for Construction

? How do Project Members verify the Approved Plans using Checksum?

How do I verify that the BIM/2D file is the Approved Plans?

Verification with **Netrust Digital Signer (NDS)**[coming soon]

The screenshot displays the Netrust Digital Signer (NDS) software interface. The 'Check Plans' button in the toolbar is highlighted with a blue box. Below the toolbar, the 'Work Area' contains a table of files to be validated:

File Name	File Path	File Size
Plans (AR).ifc	C:\Users\username\Desktop\De...	13689 KB
Plans (ST).ifc	C:\Users\username\Desktop\De...	14152 KB
Plans (ME).ifc	C:\Users\username\Desktop\De...	16142 KB
B1_ST.pdf	C:\Users\username\Desktop\De...	448 KB

A blue arrow points from a text box to this table. The text box contains the text: "Simply select the files to be validated and the 'List of Approved Plans' for verification".

Below the 'Work Area', the 'Signed/Extracted File Details Area' is visible. At the bottom of the interface, the 'Signer(s) Information / Plans Validation Result(s)' section shows the following results:

- [File 1] Plans (AR).ifc is approved in selected List of Approved Plans.pdf
- [File 2] Plans (ST).ifc is approved in selected List of Approved Plans.pdf
- [File 3] Plans (ME).ifc is approved in selected List of Approved Plans.pdf
- [File 4] Error! Checksum of B1\_ST.pdf does not match any values in selected List of Approved Plans.pdf

A blue arrow points from a text box to this section. The text box contains the text: "View the results of the validation check here".

# Identifying Approved Plans for Construction

## ? How do Project Members verify the Approved Plans using Checksum?

How do I verify that the BIM/2D file is the Approved Plans? (without Netrust)



Verification can also be done using tools online or phone QR code reader

- (a) Scan the QR code in the approval letter using any QR code reader to obtain the SHA256 checksum of the approved plan.
- (b) Obtain the SHA256 checksum of the file you wish to verify. There are many ways to obtain the SHA256 checksum of the file (e.g. online tool at [https://emn178.github.io/online-tools/sha256\\_checksum.html](https://emn178.github.io/online-tools/sha256_checksum.html)).
- (c) Compare the checksums from (a) and (b). The checksums will be the same if the file is the Approved Plan.



# Identifying Approved Plans for Construction

**?** How do Project Members verify the Approved Plans using Checksum?  
**How do I verify that the BIM/2D file is the Approved Plans? (without Netrust)**

The screenshot shows a web-based tool for calculating SHA256 file checksums. On the left is a navigation menu with categories like SHA2, SHA224, SHA256, and Cryptography. The main area is titled 'SHA256 File Checksum' and includes a description: 'This SHA256 online tool helps you calculate the hash of a file from local or URL using SHA256 without uploading the file. It also supports HMAC.' Below this are 'Settings' and 'Input' sections. The 'Settings' section has a 'Hash' dropdown set to 'SHA256', 'Auto Update' (checked), 'Remember Input' (unchecked), 'Input Type' set to 'File', 'Output Encoding' set to 'Hex (Lower Case)', and 'Enable HMAC' (unchecked). The 'Input' section is a large area with a file icon and the text: 'Drag and drop the file here or click to select a file. It will process locally and won't be uploaded.' To the right is an 'Output' section with the text 'Output here...'. The bottom of the page features a decorative architectural drawing and a footer with the text 'Restricted/ Sensitive Normal'.

# C&S IFC-SG Model Preparation & Review Tools in Market



## BIM submission requirements

- Based on the Circular issued on 26 September 2023 on CORENET X implementation plan, the requirements for BIM submissions will continue to apply to **new erections or major addition and alteration (A&A) projects with new Gross Floor Area (GFA) of 5,000m<sup>2</sup> or more**. The BIM submissions for new projects that are submitted via CORENET X will be required to be submitted in the IFC-SG format and prepared in accordance with the CORENET X COP.

## Model Size

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



# C&S IFC-SG Model Preparation

## Expectation of Structural IFC-SG models

- A complete set of IFC-SG structural model shall consist of elements as described in Section 4 of Code of Practice. For example, a structural IFC-SG model should comprise of the following:

- ❖ Piles
- ❖ Footings/ pilecaps
- ❖ Beams
- ❖ Columns
- ❖ Walls
- ❖ Slabs
- ❖ Staircases
- ❖ Boreholes

SECTION 4  
BIM Data Representation  
(IFC-SG) and Modelling Good  
Practice

- Details can be represented in 2D to supplement the IFC-SG model, such as :
  - ❖ Irregular pilecaps, raft foundation, slab elements, household shelter/ storey shelter elements, transfer plates, precast elements, prestress elements, PPVC modules, steel connections.

All the IFC-SG parameters shall follow the standard naming and units as stipulated in Code of Practice which was published on BCA CORENET X Website.

[Link- Code of Practice | Building and Construction Authority \(BCA\)](#)



## Code of Practice

### SECTION 4

BIM Data Representation (IFC-SG) and Modelling Good Practice

### Beam

### Column

#### ► Beam Property Definition ► Column Dimension and Reinforcement

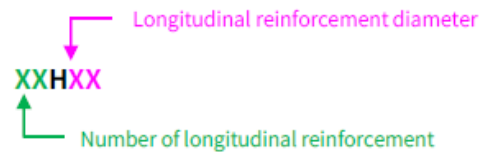
##### Beam Property Definition

1	Every beam will be detailed based on 3 (below).
2	Starting point of a beam should be the s
3	Behaviour of the beam (single, end, inte inputs for this parameter is applied. Ple

##### Column Dimension and Reinforcement Definition

1	The breadth is referring to the longest side of a despite of the column orientation.
2	QP may substantiate a set of 2D column sched illustration.
3	The input for MainRebar shall be "XXHXX" while diameter.

- Use '+' for bundle column reinforcement (e.g. 12H32+12H25)



##### IFC Entity: IfcPile

IFC SubType: N.A.

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	MaterialGrade	Text	All piles	-	Yes	Refer to list^
2	BoreholeRef	Text	All piles	-	No	BH2, BH3, BH12-2
3	ConstructionMethod	Text	All piles	-	Yes	Refer to list^
4	DA1-1_CompressionCapacity	Integer	All piles	kN	No	5683
5	DA1-1_TensionCapacity	Integer	When required / relevant	kN	No	3655
6	DA1-2_CompressionCapacity	Integer	All piles	kN	No	4823
7	DA1-2_TensionCapacity	Integer	When required / relevant	kN	No	3025
8	MinEmbedmentIntoBearingLayer_SPT_MoreThan_100N	Real	When required / relevant	m	No	16.5
9	MinEmbedmentIntoBearingLayer_SPT_MoreThan_60N	Real	When required / relevant	m	No	23.2
10	MinRockSocketingLength	Real	When required / relevant	m	No	16.5
11	ReinforcementSteelGrade	Text	RC piles#	N/mm2	Yes	500B
12	StructuralCompressionCapacity	Integer	All piles	kN	No	6525
13	StructuralTensionCapacity	Integer	When required / relevant	kN	No	3825





## Setting up the model

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

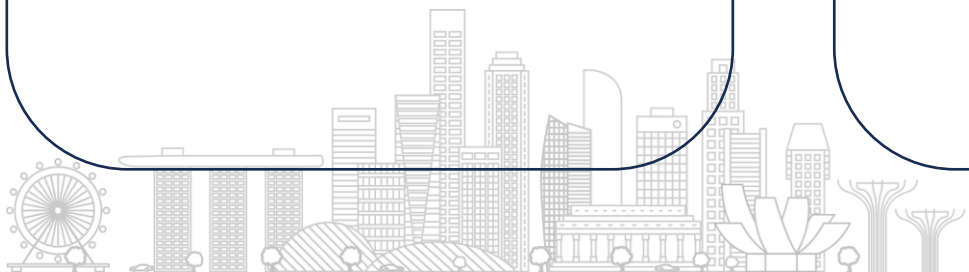
- ✓ Study the existing object properties
- ✓ Know the properties that needs to be edited in-line with the IFC Configurator

### 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

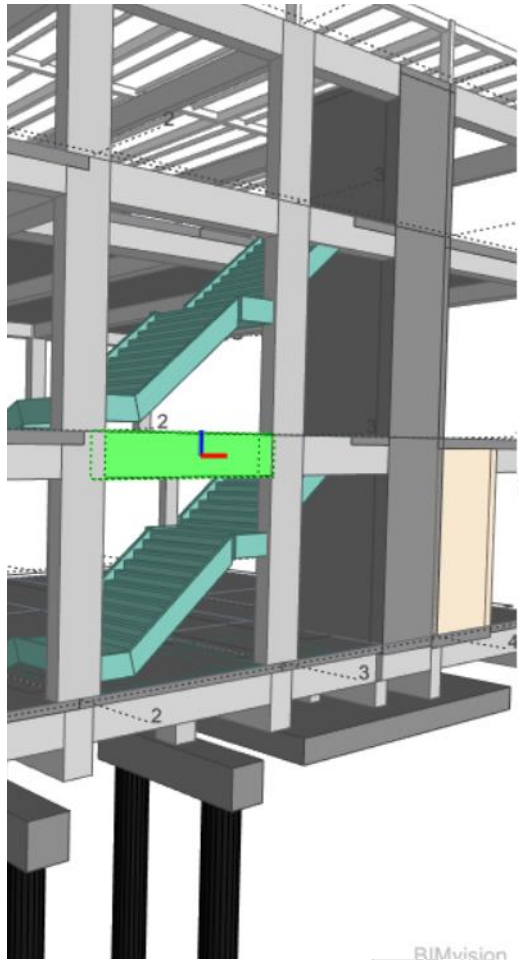
### Map the existing object library properties into configuration file

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



# C&S IFC-SG Model Preparation

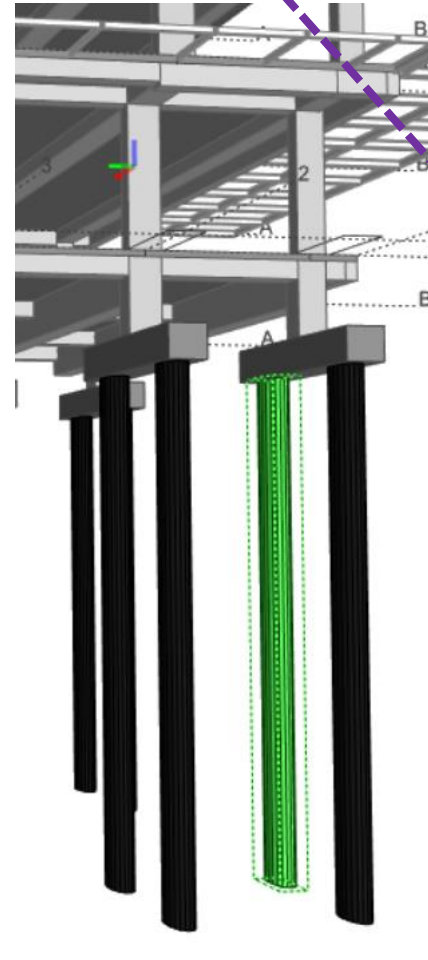
## Examples on IFC-SG parameters



Active	Type	Name
<input checked="" type="checkbox"/>	Beam	Concrete-Rectangular Be...
<input checked="" type="checkbox"/>	Beam	Concrete-Rectangular Be...
<input checked="" type="checkbox"/>	Beam	Concrete-Rectangular Be...
<input checked="" type="checkbox"/>	Beam	Concrete-Rectangular Be...
<input checked="" type="checkbox"/>	Beam	Concrete-Rectangular Be...

Name	Value
<b>SGPset_Beam</b>	
BeamSpanType	Interior
ConstructionMethod	CIS
MaterialGrade	C32/40
ReinforcementSteelGrade	500B
<b>SGPset_BeamDimension</b>	
Depth	700
Mark	2B11-3
Width	200
<b>SGPset_BeamReinforcement</b>	
BottomLeft	2H13
BottomMiddle	2H13
BottomRight	2H13
StirrupsLeft	2H10-200
StirrupsMiddle	2H10-200
StirrupsRight	2H10-200
StirrupsTypeLeft	Normal
StirrupsTypeMiddle	Normal
StirrupsTypeRight	Normal
TopLeft	2H13
TopMiddle	2H13
TopRight	4H25
<b>SGPset_Material</b>	



Active	Type	Name
<input checked="" type="checkbox"/>	Pile	Bored Pile:600mm Diamet...
<input checked="" type="checkbox"/>	Pile	Bored Pile:600mm Diamet...
<input checked="" type="checkbox"/>	Pile	Bored Pile:600mm Diamet...
<input checked="" type="checkbox"/>	Pile	Bored Pile:600mm Diamet...
<input checked="" type="checkbox"/>	Pile	Bored Pile:600mm Diamet...

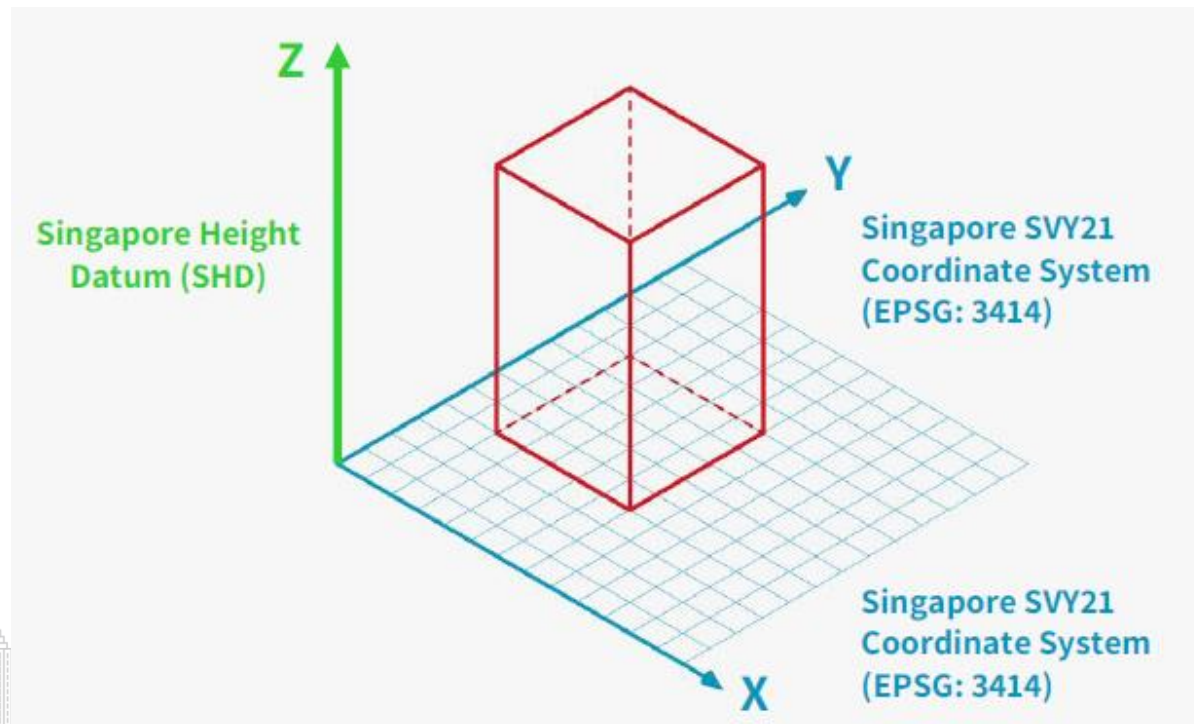
  

Name	Value
<b>SGPset_Material</b>	
MaterialGrade	C32/40
<b>SGPset_Pile</b>	
BoreholeRef	BH2
ConstructionMethod	CIS
DA1-1_CompressionCapacity	3095
DA1-1_TensionCapacity	0
DA1-2_CompressionCapacity	2253
DA1-2_TensionCapacity	0
ReinforcementSteelGrade	500B
StructuralCompressionCapacity	2280
StructuralTensionCapacity	0
<b>SGPset_PileDimension</b>	
CutOffLevel_SHD	-2.725
Diameter	600
Length	12 500
Mark	PC5-2
<b>SGPset_PileReinforcement</b>	
MainRebar	6H20
PileType	Bored
ReinforcementLength	12
Stirrups	H10-300
<b>SGPset_PileStructuralLoad</b>	



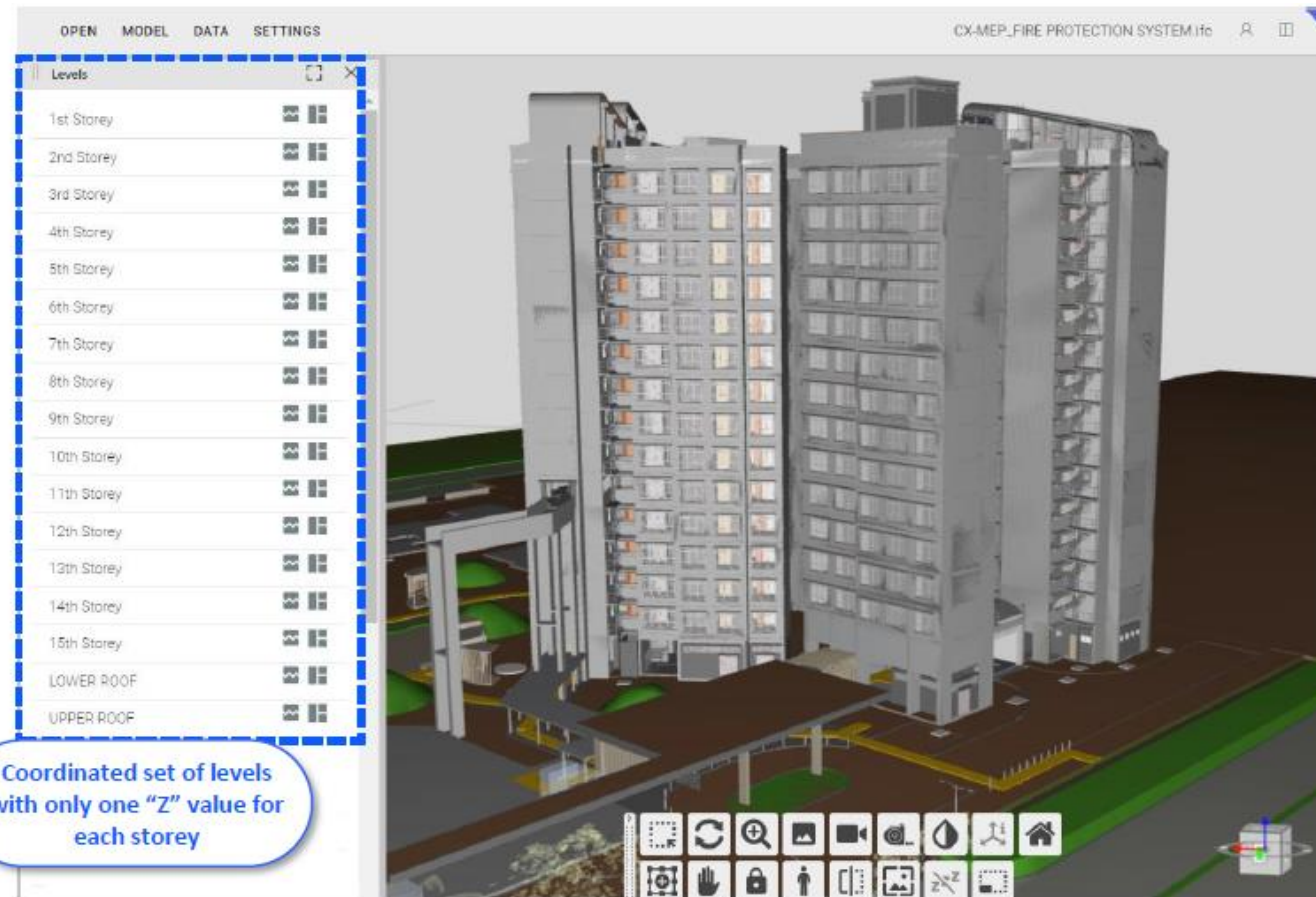
## Geo-Referencing

- Models should be correctly geo-referenced and assigned real-world coordinates from the **Singapore SVY21 coordinate system (EPSG: 3414)** for Easting and Northing (x,y), including dimensions between grids. The layout of each model shall be presented in True North or real-world orientation, and the elevation levels or Height (z) of the model shall be set up based on the **Singapore Height Datum (SHD)**.



## Alignment of Levels and Zones Across All Disciplines' Models

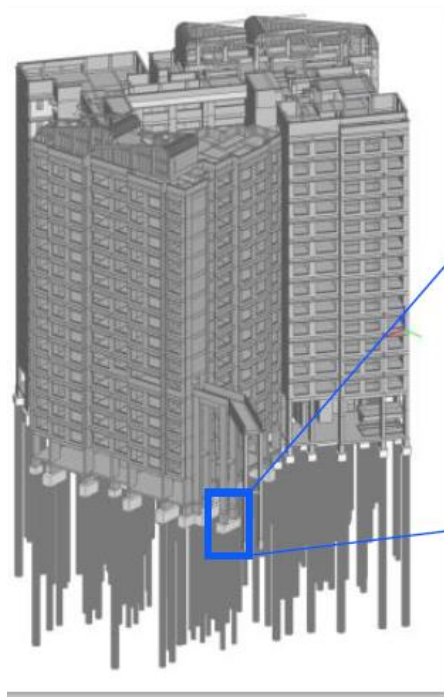
- Models from all disciplines **MUST** adopt a coordinated set of levels and zones and name the levels and zones **identically**.



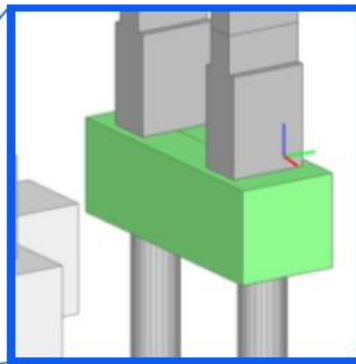
# C&S IFC-SG Model Preparation

## IFC-SG validator

- The IFC-SG Validator extracts all elements from the model and check whether IFC-SG parameters have been added to the corresponding BIM components in the model. This helps to check whether the QP have missed out any IFC-SG parameters when mapping IFC-SG data into the proprietary BIM model earlier.



Pilecap parameters in the proprietary BIM model



Name	Value	Unit
<b>Element Specific</b>		
Code	ICSI/CAP/TA/96/03/20	
IddFile	IFooting	
Name	PILE_CAP	
ObjectType	IFootingType	
PredefinedType	PILE_CAP	
Tag	171797	
<b>Profile</b>		
ProfileName	2d3	
<b>IFC-SG Structural PILE CAP</b>		
BottomFlan	8H25	
Depth	1.200	
ISupports	IFootingType_PILE_CAP	yes
ISupportType	IFootingType	
Length	3.450	yes
Mark	2d3a	
Material	Concrete	
ReinforcementSteelGrade	300	
Slider	10420	
SliderType	C	
Straps	103-100 + 3H25-300	
StrapType	NORMAL + HOOKS	
StrengthClass	C32/40	
TopFlan	8H25	
Width	1.200	yes
<b>Pset_EnvironmentImpactIndicators</b>		
Reference	2d3	
<b>Pset_FootingCommon</b>		
Reference	2d3	
<b>Pset_ReinforcementCaseOfIndependentFooting</b>		
Reference	2d3	
<b>Pset_ReinforcementForPileOfContinuousFooting</b>		
Reference	2d3	
<b>SGPset_ConcreteElementGeneral</b>		
StrengthClass	C32/40	
<b>SGPset_Footing</b>		
ReinforcementSteelGrade	300	
<b>SGPset_FootingDimension</b>		
Depth	1.200	yes
Width	1.200	yes
<b>SGPset_FootingReinforcement</b>		
BottomFlan	8H25	
Slider	10420	
Straps	103-100 + 3H25-300	
StrapType	NORMAL + HOOKS	
TopFlan	8H25	
<b>SGPset_Material</b>		
Material	Concrete	

Industry IFC-SG Mapping File

Line	IFC Entities	IFC Sub Types (I = USERDEFINED)	Property Set	Property Name (Follow = automatically extracted from native)	Pr
87	IFooting	Need not specify	SGPset_FootingDimension	Breadth	Ler
88	IFooting	Need not specify	SGPset_FootingDimension	Breadth	Ler
90	IFooting	Need not specify	SGPset_Footing	DA3-1_BearingCapacity	Int
100	IFooting	Need not specify	SGPset_Footing	DA3-2_BearingCapacity	Int
101	IFooting	Need not specify	SGPset_FootingDimension	Depth	Ler
102	IFooting	Need not specify	SGPset_Material	Mark	Ler
103	IFooting	Need not specify	SGPset_Material	MaterialGrade	Ler
104	IFooting	Need not specify	SGPset_Footing	ReferToDetail	Ler
105	IFooting	Need not specify	SGPset_Footing	ReinforcementSteelGrade	Ler
106	IFooting	Need not specify	SGPset_FootingReinforcement	Slider	Ler
107	IFooting	Need not specify	SGPset_Footing	SoilVerificationTest	Ler
108	IFooting	Need not specify	SGPset_FootingReinforcement	Straps	Ler
109	IFooting	Need not specify	SGPset_FootingReinforcement	StrapsType	Ler
110	IFooting	Need not specify	SGPset_FoundationStructuralLoad	WorkingLoad	Int
112	IFooting	PA0_FOOTING	SGPset_FootingReinforcement	TopDistribution	Ler
144	IFooting	PILE_CAP	SGPset_FootingReinforcement	BottomDistribution	Ler
145	IFooting	PILE_CAP	SGPset_FootingReinforcement	BottomMain	Ler
146	IFooting	PILE_CAP	SGPset_Footing	ReinforcementSteelGrade	Ler
147	IFooting	PILE_CAP	SGPset_FootingReinforcement	TopMain	Ler
207	IFooting	STRIP_FOOTING	SGPset_FootingDimension	Width	Ler

<https://www.code.builtsearch.com/ifcsg-validator>

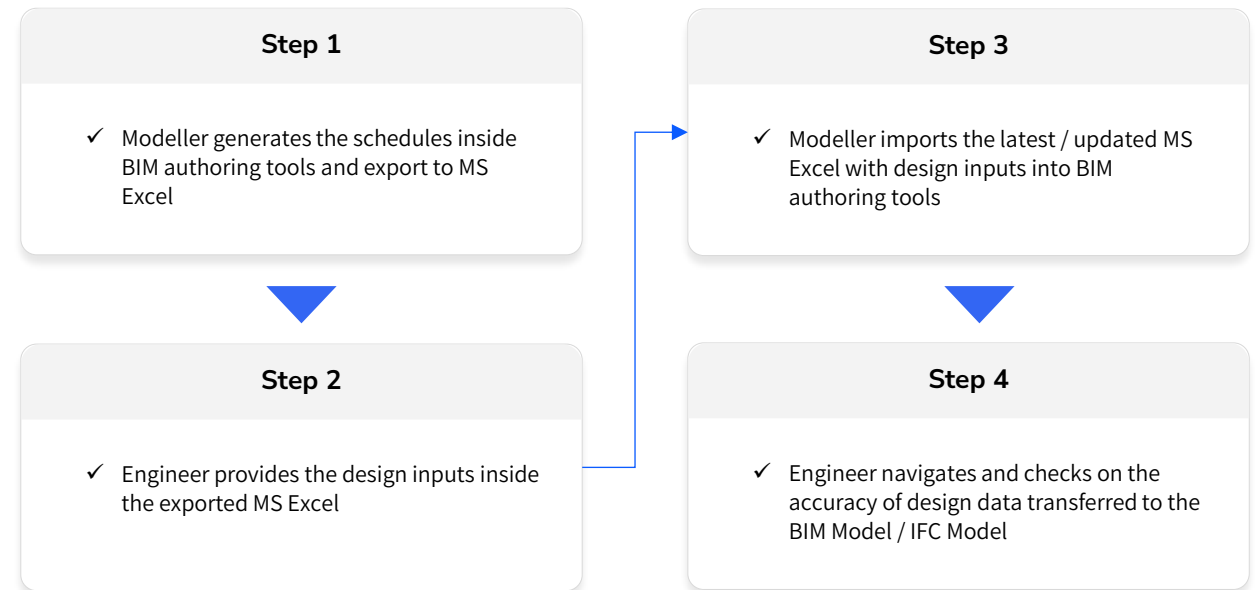
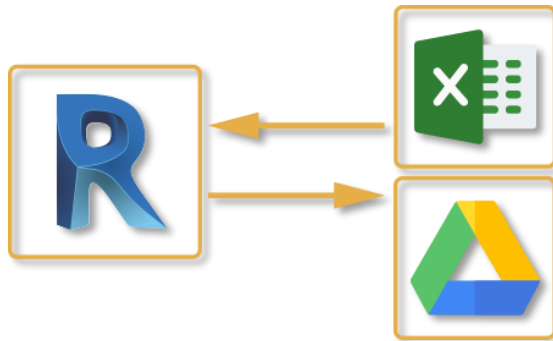
Comparison of parameters / data in IFC-SG Mapping File vs Native BIM Software

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# C&S IFC-SG Model Preparation

## Diroots

- DiRoots is a free plug-in to export BIM data (Model and Annotation Categories, Elements and Schedules) from Revit to Excel or Google Spreadsheets, and import it back to update the model.



## IFC model viewer

- IFC viewer – has capabilities and tools to help the users read and understand the IFC Model
- Industry can try different brands of IFC viewer for checking of information embedded in the IFC-SG model.

### ► Importance of reviewing IFC models before submission

- It is strongly encouraged to review your project team’s models in an IFC viewer to ensure the models did not experience errors during the export process from their respective BIM software.

	Name	View IFC4	Federation of IFC(s)	Viewing of System Entities *	View IfcGrid	Search Query	Remarks
1	BIMCollab Zoom	○	○	✗	✗	○	Suitable for federation of IFC files, handle large files well
2	BIMVision	○	Up to 2 files	○	○	○	Suitable for quick visualization of IFC files
3	Kit Model Viewer (replacing FZK Viewer)	○	✗*	○	○	○	Suitable for analysing smaller files (< 200 MB)
4	ODA (Open Design Alliance) Open IFC Viewer	○	○	✗	○	✗	-
5	Solibri Anywhere	○	✗*	○	○	○	-

\* To view multiple IFC files in FOC viewers that are unable to federate IFC models, the “IFC-SG Integrator” could be used, available at the [IFC-SG Resource Kit](#). This application is based on C# and is able to bind multiple IFC files

### Benefits of 3D BIM processing:

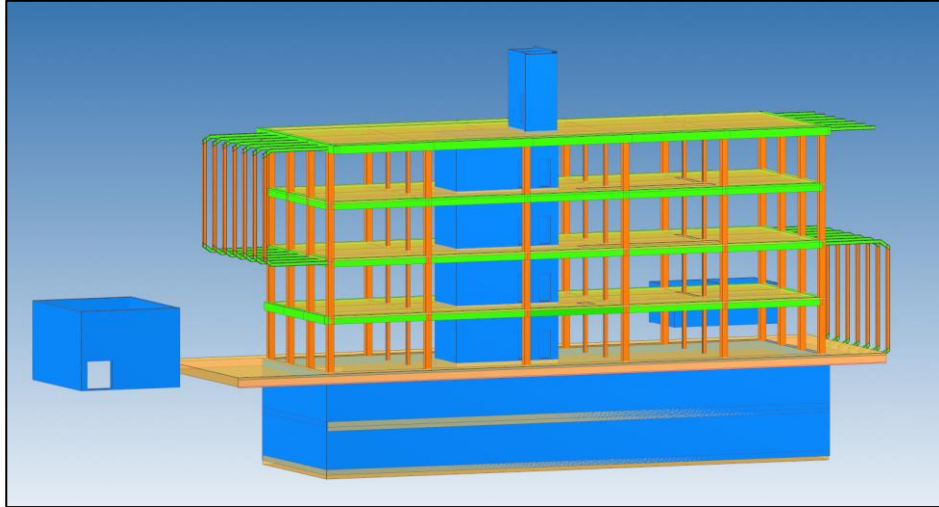
- 360 visualisation of the entire building
- One consolidated model file floors and elements
- Quick search and filter only the elements required for review
- Easy to visualise clashed elements
- Able to measure and check the elements directly on the model



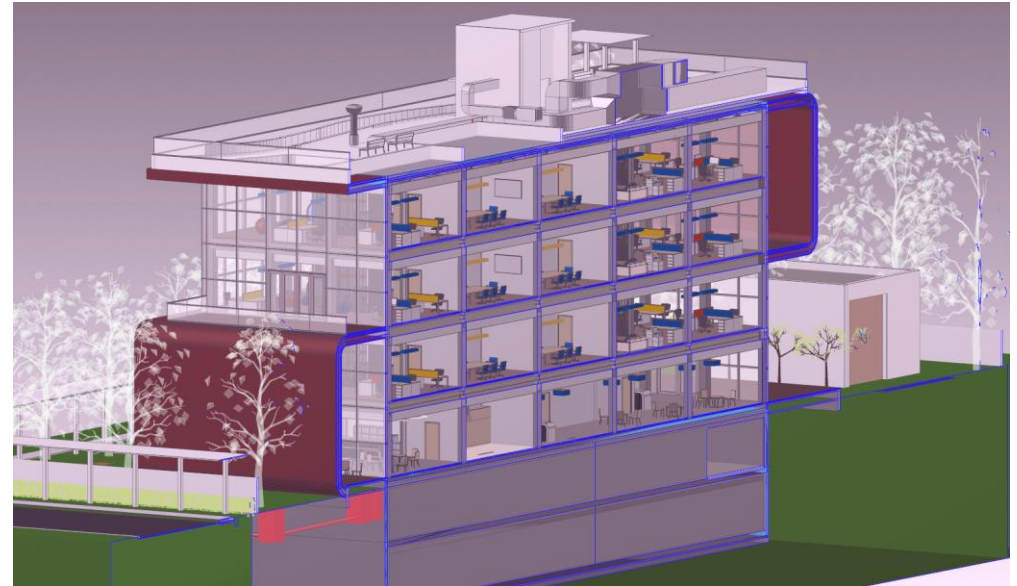
# IFC-SG model viewer

## Common features of IFC viewer

✓ Check and view the IFC Model



✓ Section cut and slicing of model



Name: Structural Elements only

List type: Property table

Source set: [Icons]

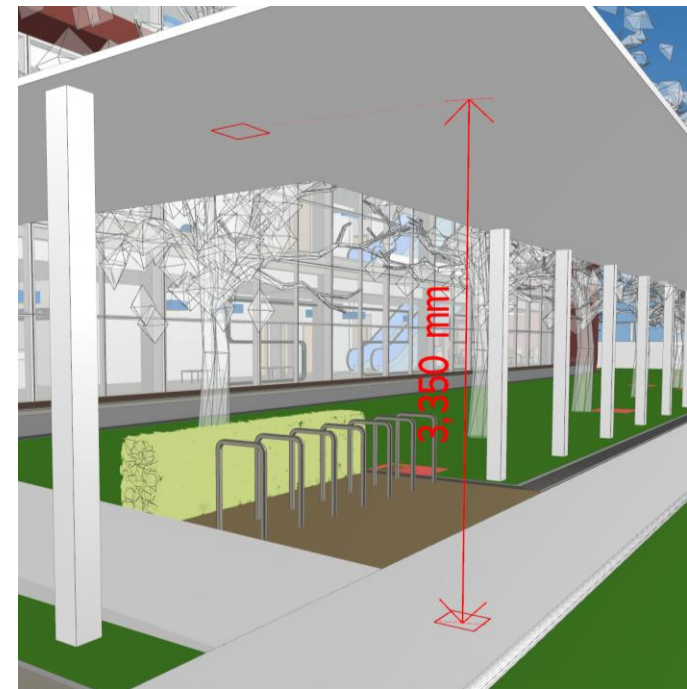
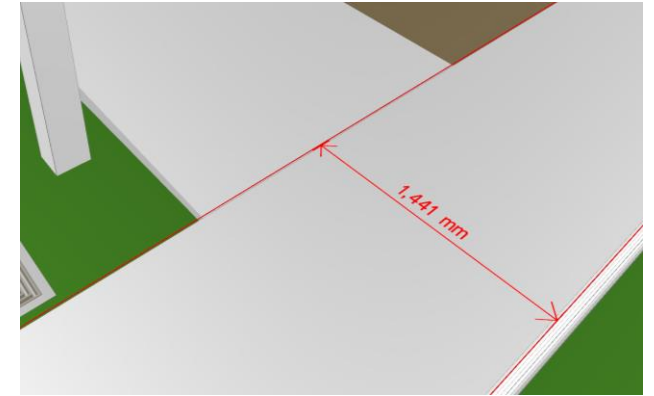
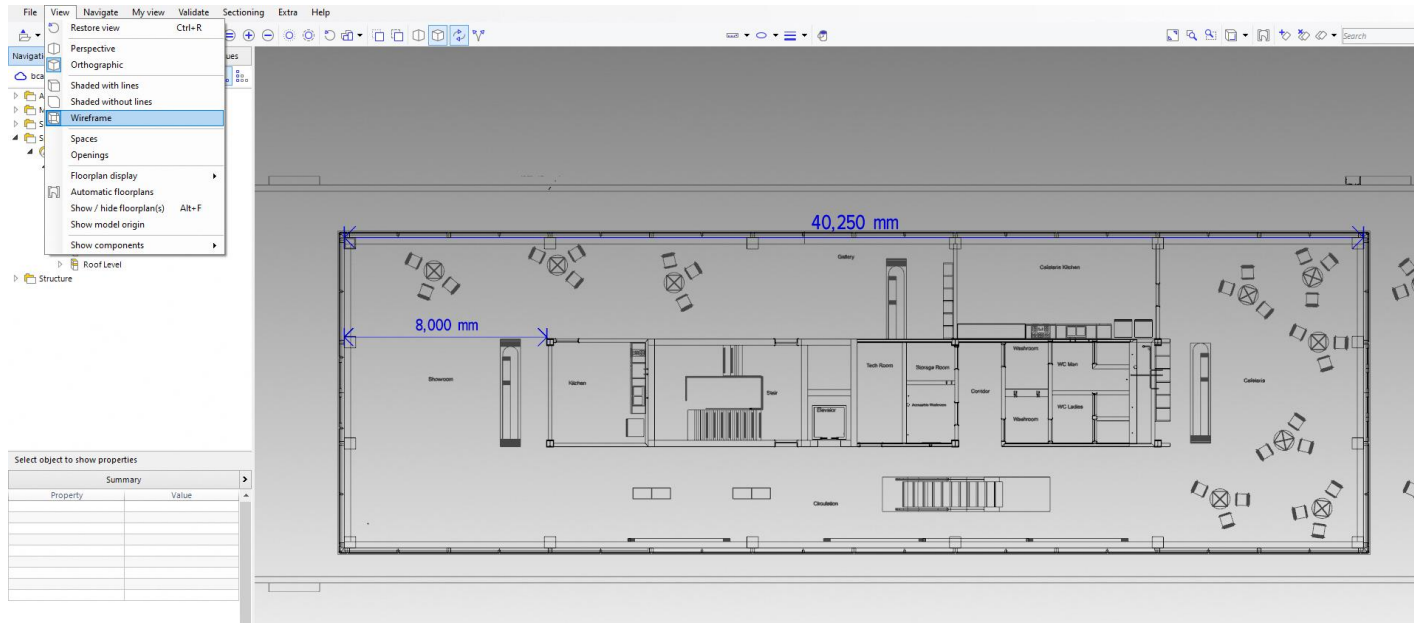
Element Type	Property	Operator	Value	Action	Color	Icons
Any element	Load Bearing	Is true		Add & set colored	Orange	Up/Down
Beam	None			Set colored	Green	Up/Down
Slab	None			Set colored	Yellow	Up/Down
Column	None			Set colored	Orange	Up/Down
Wall	None			Set colored	Blue	Up/Down





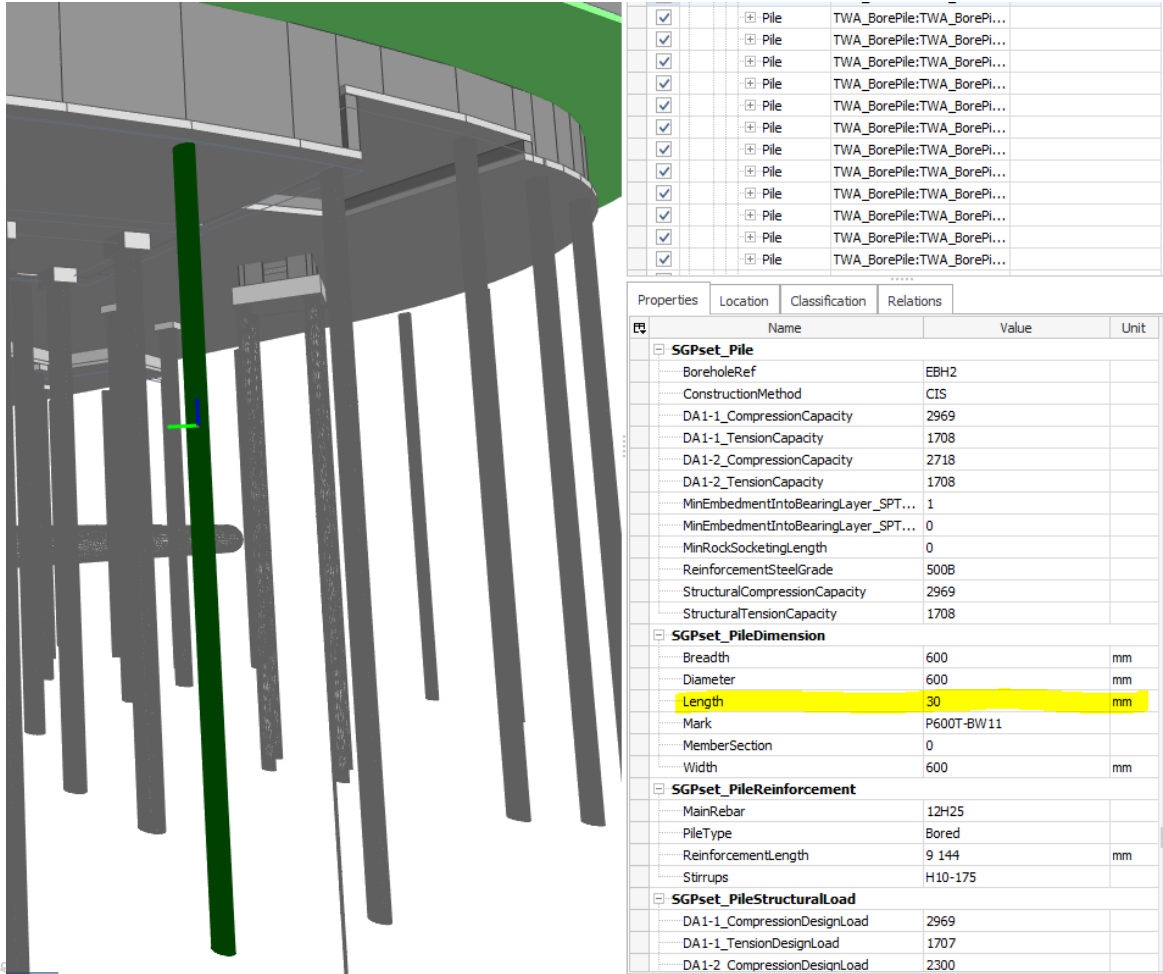
## Common features of IFC viewer

- ✓ Actual dimensioning and measurement in IFC Model

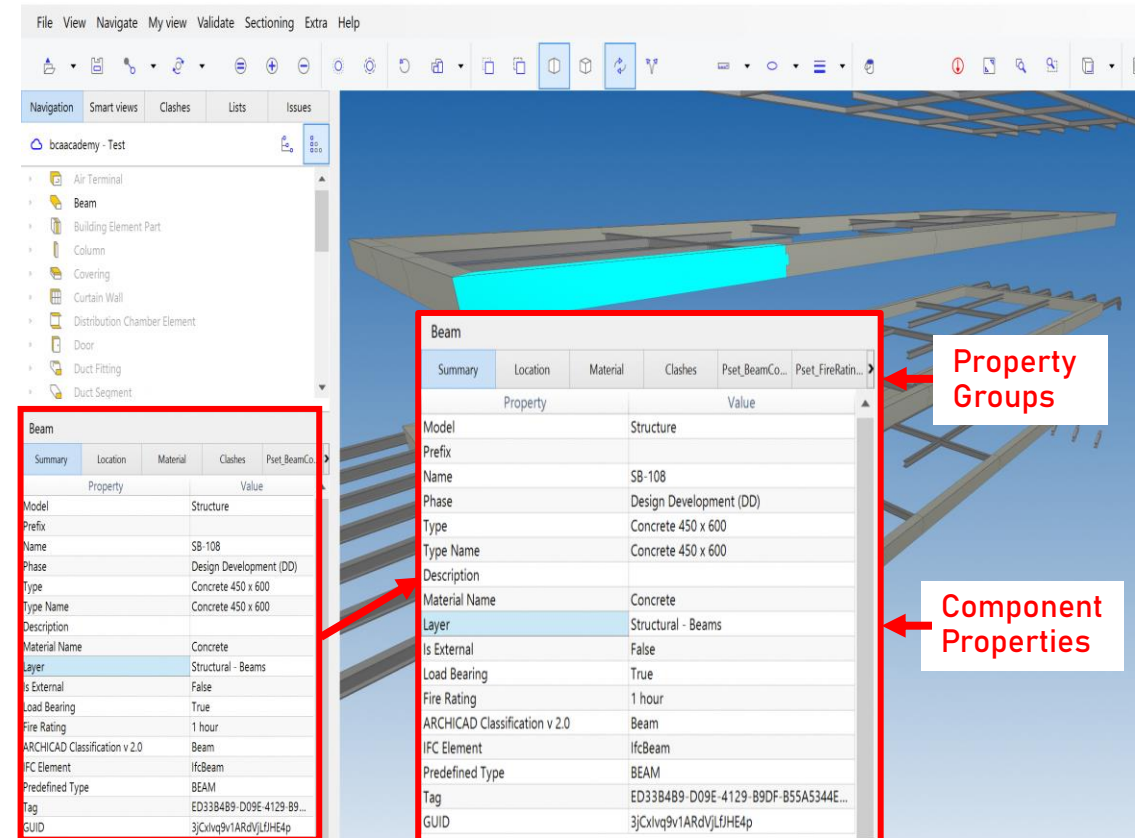


## Common features of IFC viewer

- ✓ Check properties of element



Name	Value	Unit
<b>SGPset_Pile</b>		
BoreholeRef	EBH2	
ConstructionMethod	CIS	
DA1-1_CompressionCapacity	2969	
DA1-1_TensionCapacity	1708	
DA1-2_CompressionCapacity	2718	
DA1-2_TensionCapacity	1708	
MinEmbedmentIntoBearingLayer_SPT...	1	
MinEmbedmentIntoBearingLayer_SPT...	0	
MiniRockSocketingLength	0	
ReinforcementSteelGrade	500B	
StructuralCompressionCapacity	2969	
StructuralTensionCapacity	1708	
<b>SGPset_PileDimension</b>		
Breadth	600	mm
Diameter	600	mm
Length	30	mm
Mark	P600T-BW11	
MemberSection	0	
Width	600	mm
<b>SGPset_PileReinforcement</b>		
MainRebar	12H25	
PileType	Bored	
ReinforcementLength	9 144	mm
Stirrups	H10-175	
<b>SGPset_PileStructuralLoad</b>		
DA1-1_CompressionDesignLoad	2969	
DA1-1_TensionDesignLoad	1707	
DA1-2_CompressionDesignLoad	2300	



Property Groups

Component Properties

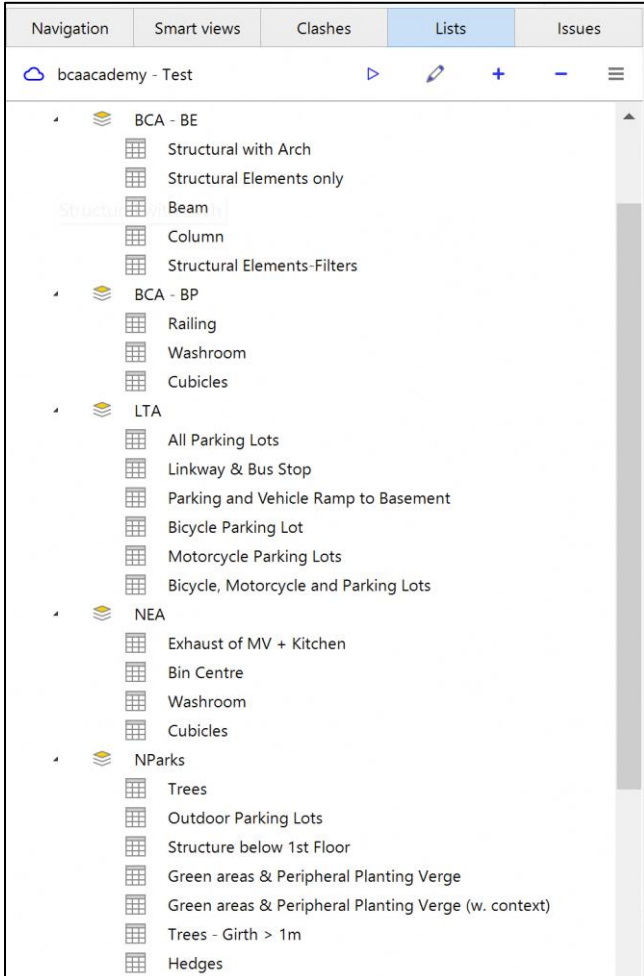
Property	Value
Model	Structure
Prefix	
Name	SB-108
Phase	Design Development (DD)
Type	Concrete 450 x 600
Type Name	Concrete 450 x 600
Description	
Material Name	Concrete
Layer	Structural - Beams
Is External	False
Load Bearing	True
Fire Rating	1 hour
ARCHICAD Classification v 2.0	Beam
IFC Element	IfcBeam
Predefined Type	BEAM
Tag	ED33B4B9-D09E-4129-B9DF-B55A5344E...
GUID	3JcXlvq9v1ARdVlJfHE4p



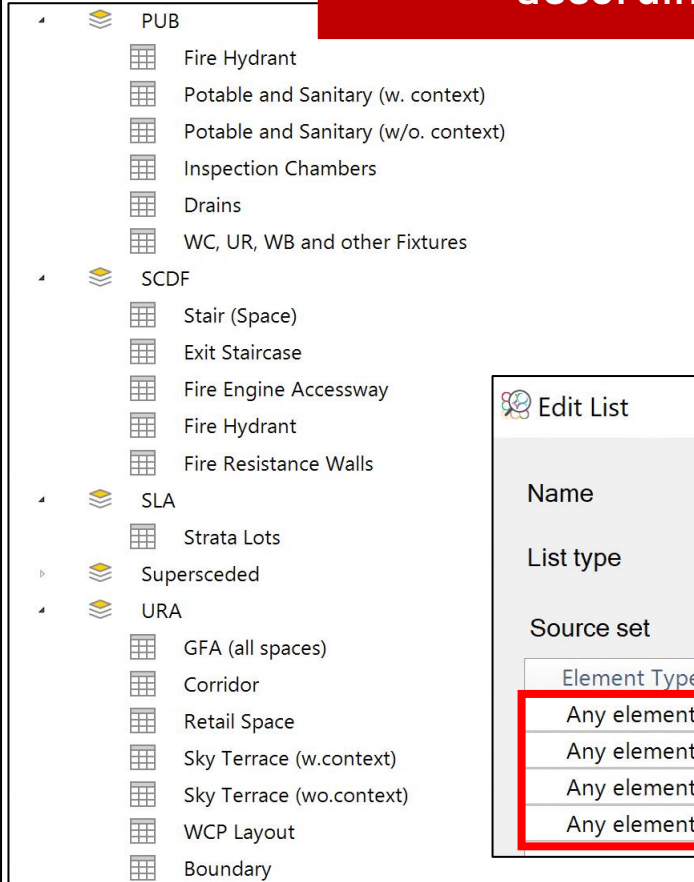
# IFC-SG model viewer

## Common features of IFC viewer

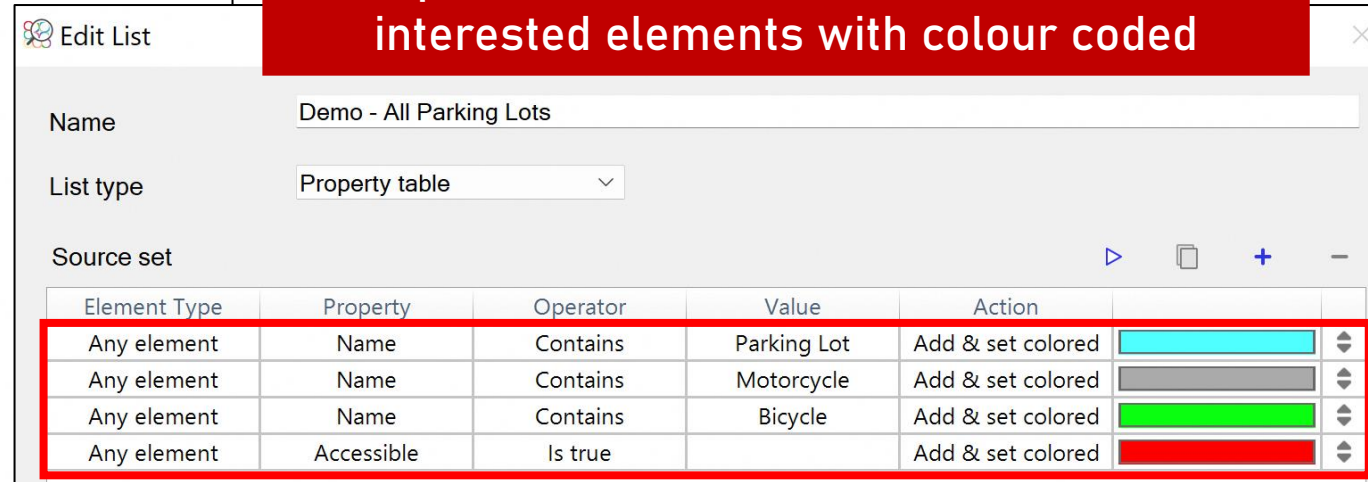
### ✓ Predefined schedules



Predefined views are created in "Lists" according to use cases

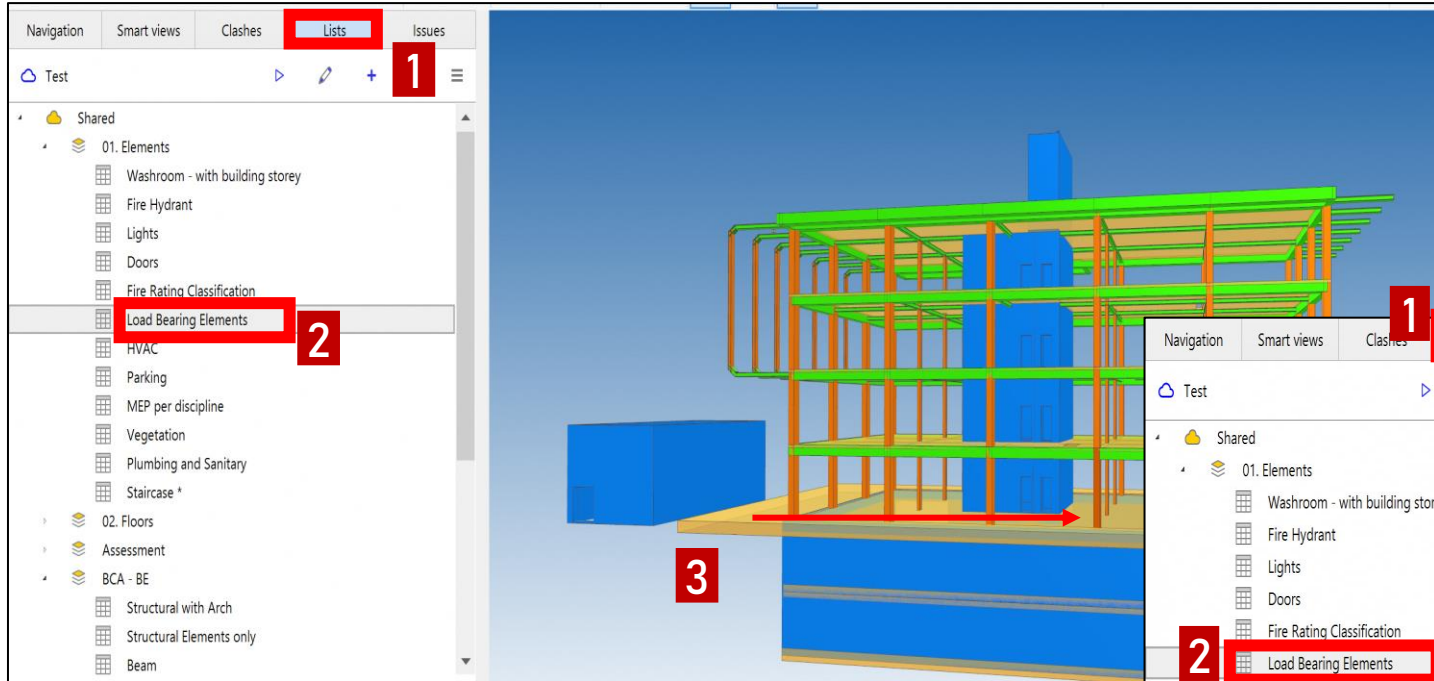


Admin can easily create Predefined view to capitalise on the BIM data, to check the interested elements with colour coded

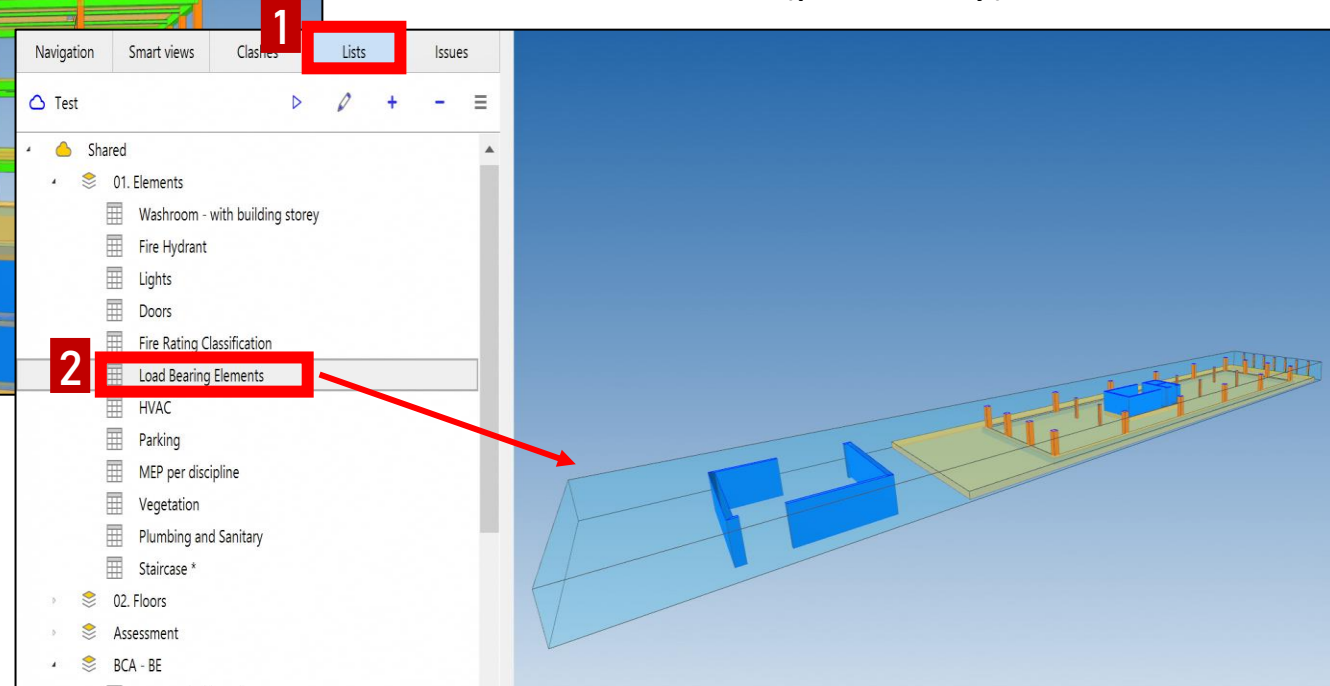


## Common features of IFC viewer

### ✓ Predefined views (3D framing)



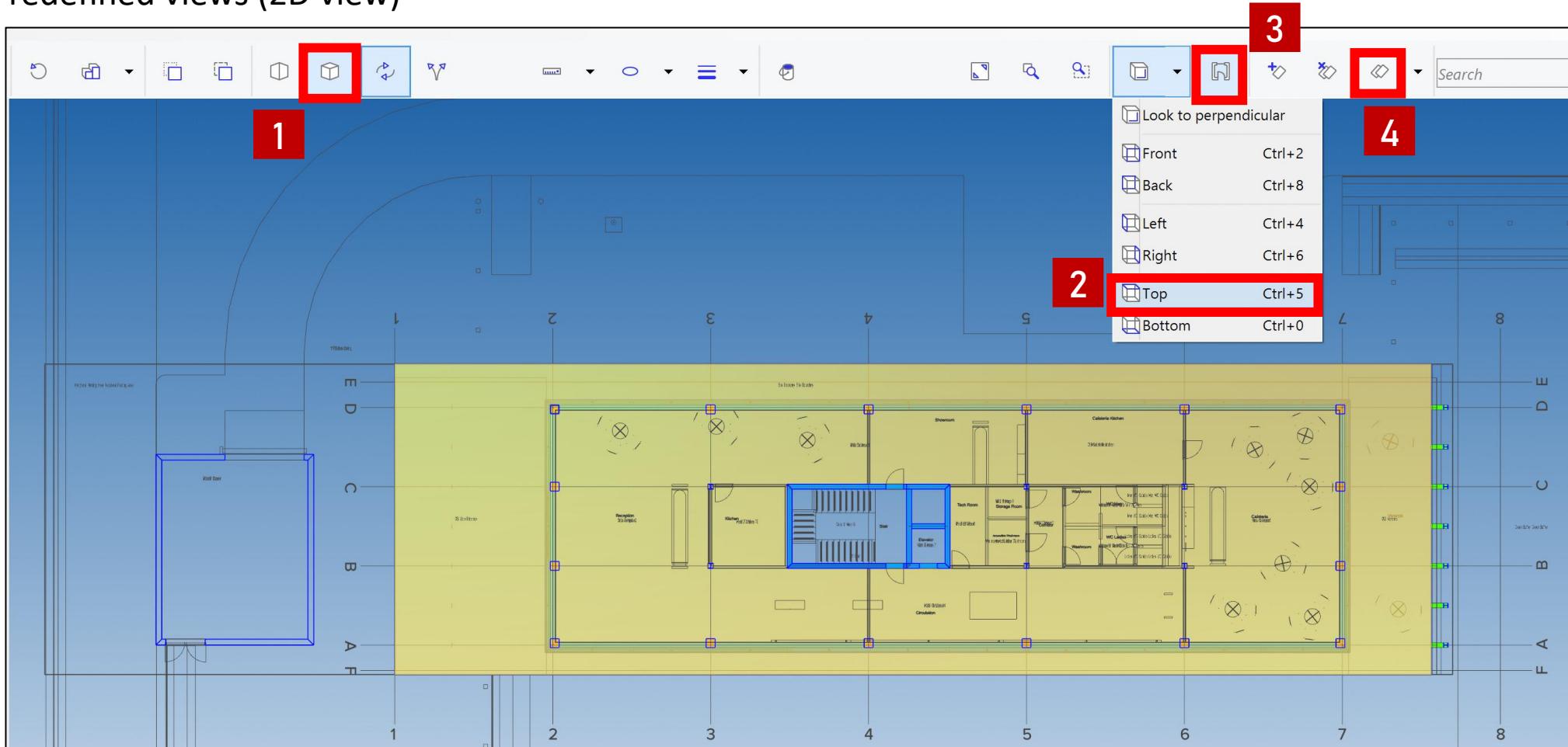
### ✓ Predefined views (per storey)



# IFC-SG model viewer

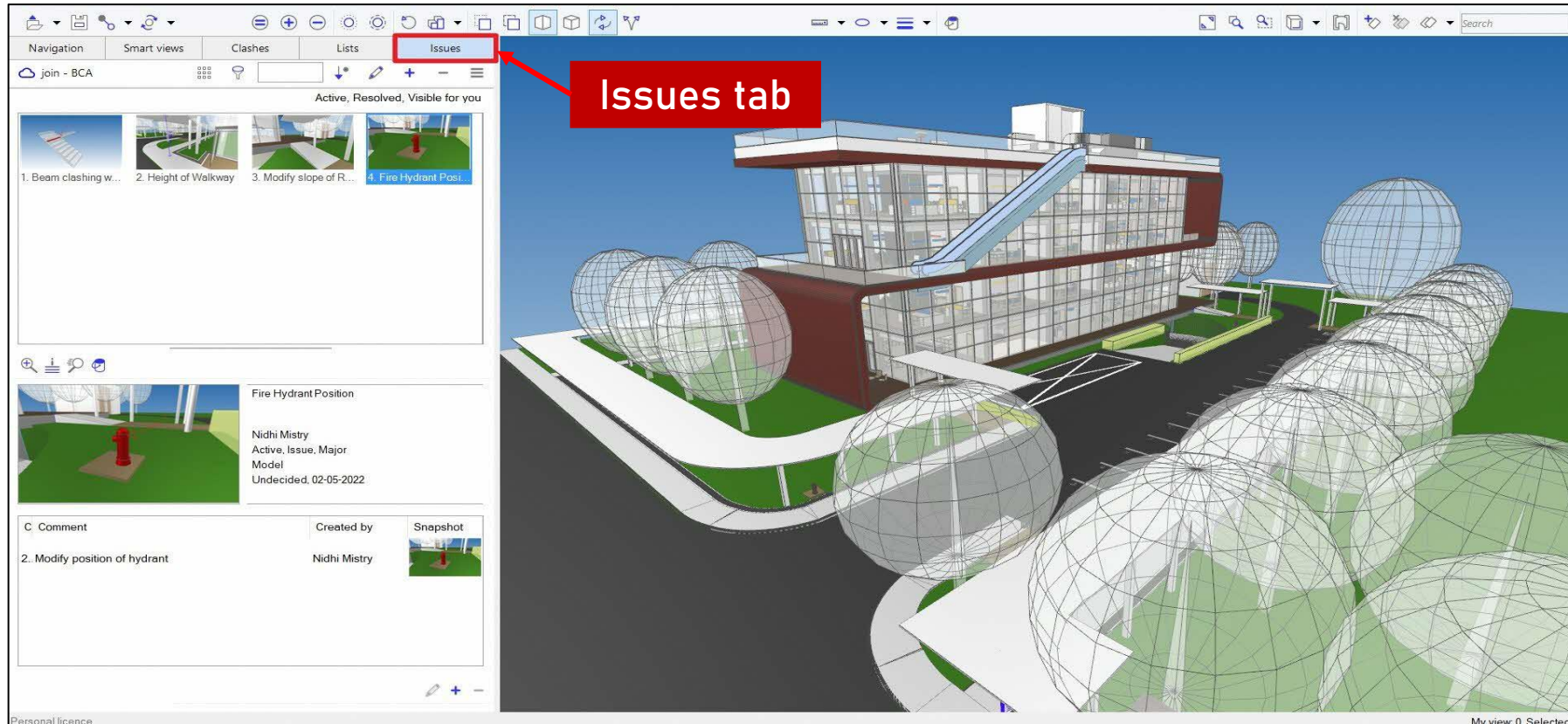
## Common features of IFC viewer

- ✓ Predefined views (2D view)



## Common features of IFC viewer

- ✓ Mark-up and save screenshot



## Model quality checklist

- A good quality model will reduce the likelihood of being issued with a Written Direction (WD) for your project, shortening time towards a faster approval



### Check areas and spaces in your IFC models

- Check that storey-specific gross area does not deviate significantly from sum totals of the storey
- Do a tabulation of gross area by storey on the native BIM software
- Check against the sum totals of gross area before the export to IFC
- Ensure that attributes about cadastral lots, such as area, lot numbers as provided in the Project Information on the CORENET X Submission Portal are present
- Critical information like cadastral lot, lot numbers etc should be exported successfully into the IFC format
- There is no gap between boundaries of cadastral lots
- Check that spaces are directly adjacent to other space components, surrounding walls or floors below
- Check that each of the common boundary of any strata lots with another lot or with the common property are in the centre of the floor, wall or ceiling

— Extract from CORENET X Code of Practice (2<sup>nd</sup> Edition)



## Model quality checklist

- A good quality model will reduce the likelihood of being issued with a Written Direction (WD) for your project, shortening time towards a faster approval



Ensure the whole project team adopts model preparation and multi-disciplinary coordination good practices

- The project team should plan for sufficient time to align model coordination, planning and management workflows throughout the project
- Follow model preparation and multi-disciplinary good practice as elaborated in this section of the Code of Practice, as well as on the CORENET X IFC-SG Resource Toolkit (<https://go.gov.sg/ifcsg>) and respective BIM vendor websites
- Do not leave the export and review of your IFC models to the last minute – models that are perfectly geo-referenced and mapped in the native BIM software may encounter unexpected problems after exported into IFC

— Extract from CORENET X Code of Practice (2<sup>nd</sup> Edition)





# Viewing BCF File

Today's Written Direction and comments from agencies are provided in a list to the QPs.  
Leveraging of technology, the comments will be provided in the BIM Collaboration Format (BCF)

**Agencies:**  
WD comments with  
element tagging



BIM Collaboration Format

**Industry:**  
To view WD issues by  
importing BCF into model  
viewer.

## Written Directions:

- Issue and comment tag to BIM model.
- Exported as BCF file as part of WD attachment.

## To open BCF with:

- BIMcollab
- Naviswork Manage
- Revit
- And more..

- To import BCF file into model.
- BCF will direct the issues highlighted in the model.



# Viewing BCF File

## View responses

Manage responses from regulatory agencies

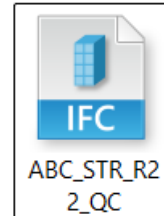
Written Direction Clearance Not approved

RESPONSE	SUBMISSION TYPE	AGENCY	ISSUED ON	ACTIONS
1st Written Direction	New Submission ES20240313-50003-BC01W00	BCA	23 Mar 2024	<a href="#">Download</a>

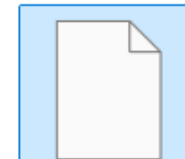
1-1 of 1 results

### To view Written Direction Responses:

- Download the attachments
- It will contain **IFC model** and **BCF file**.



IFC model

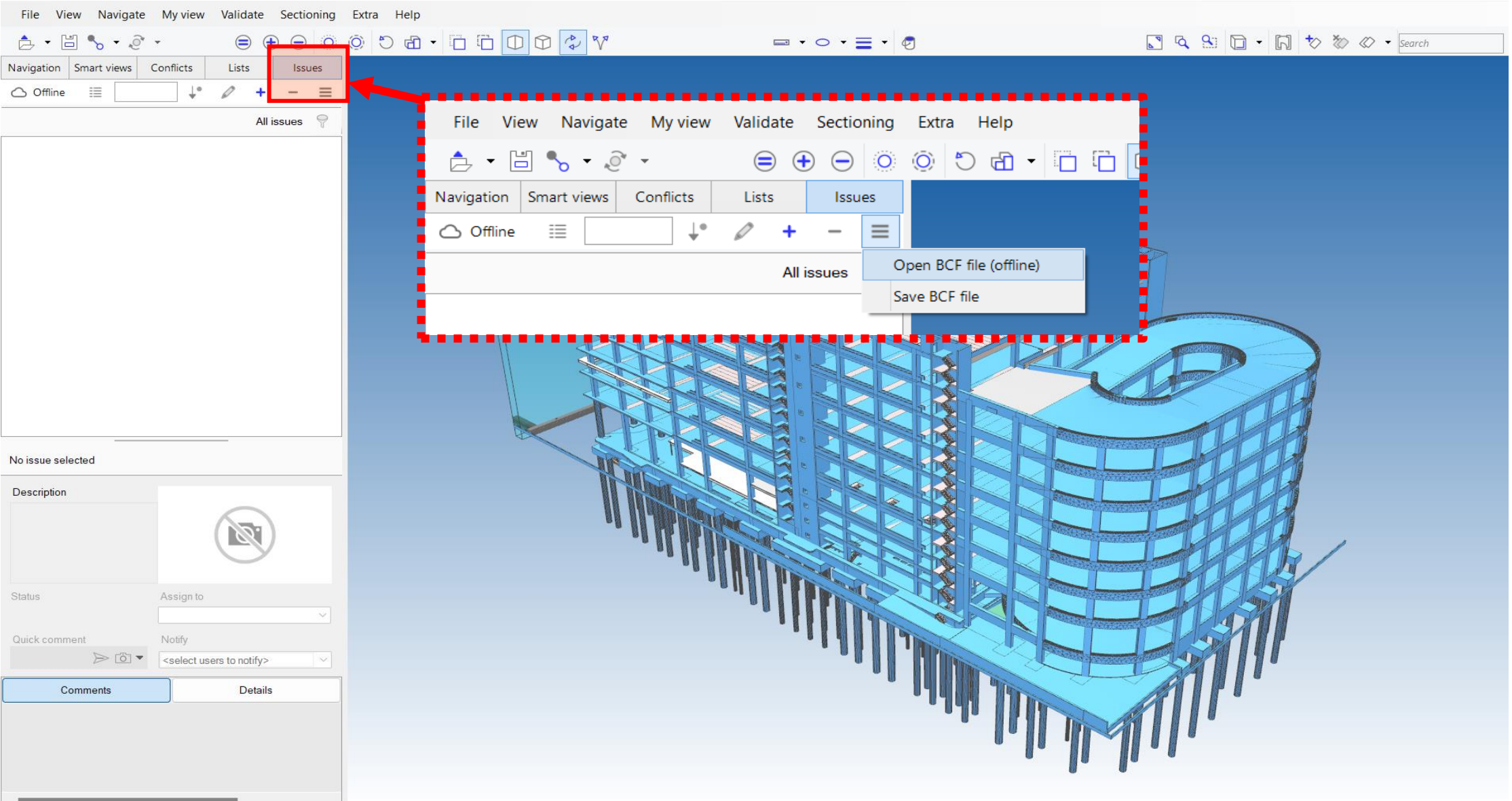


2024-11-14  
BCF BCA  
ES20240409  
-00200-  
DG01R00 -  
Copy.bcfzip

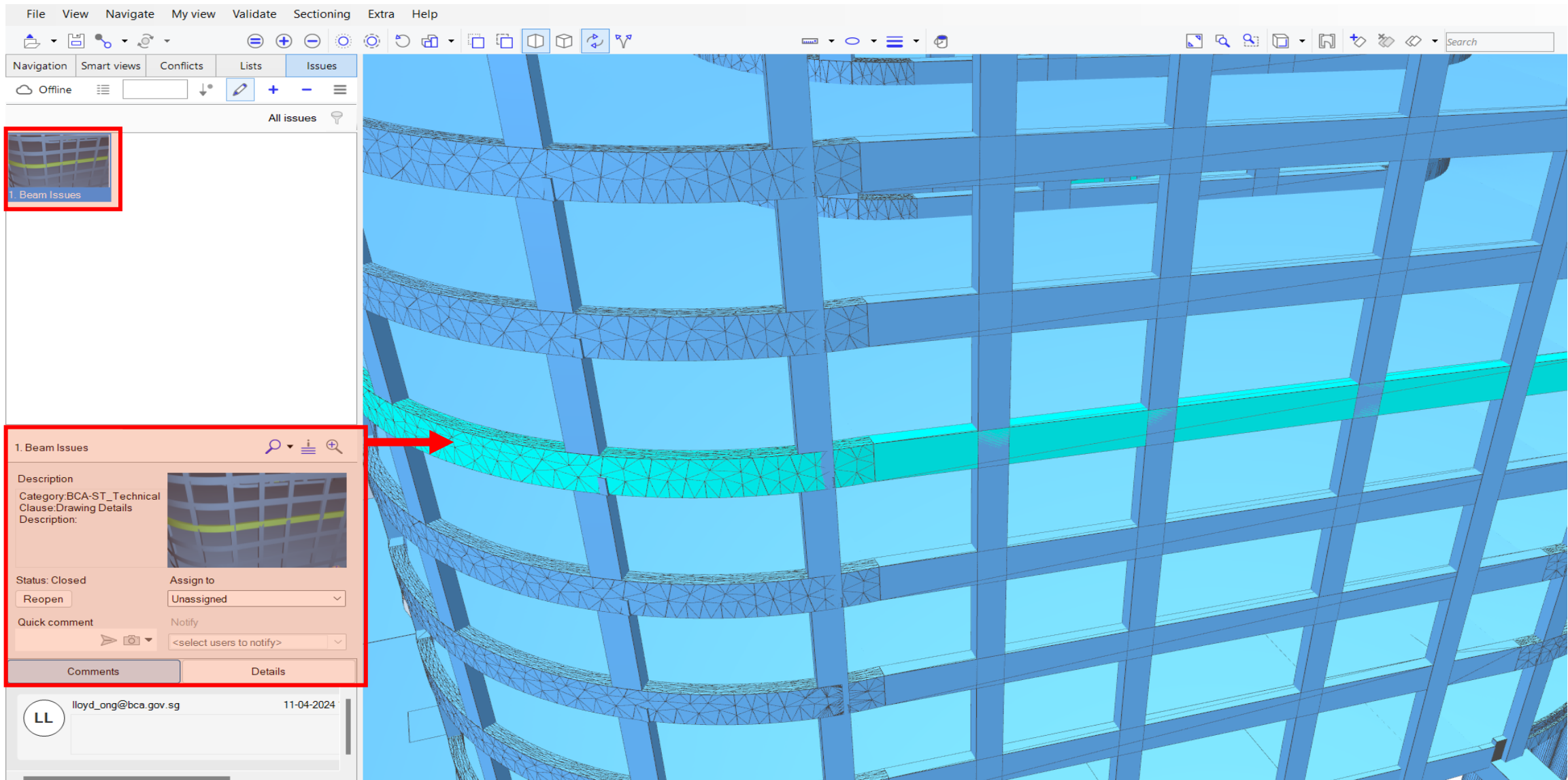
BCF File

Restricted/ Sensitive Normal

# Viewing BCF File in IFC Viewer



# Viewing BCF File in IFC Viewer



# Viewing BCF File in Native BIM

The screenshot displays a BIM software interface with the following components:

- Properties Panel (Left):** Shows 'Direct Shape 1500 x 3-1500 x 800' and 'Structural Framing (1)'. It includes sections for Constraints, Materials and Finishes, Structural (Camber Size, Number of stu..., Rebar Cover, Rebar Cover 1 ...), Dimensions (Volume), and Identity Data. An 'Apply' button is visible.
- Project Browser (Bottom Left):** Lists 'Views (all)' including Floor Plans (Level 0, Level 1, Site), Ceiling Plans, 3D Views, and Elevations (12mm Circle) (East, North, South, West). It also includes Legends and Schedules/Quantities (all).
- 3D View (Center):** A perspective view of a cylindrical structure with a blue beam highlighted. A red arrow points from the beam to the BCF Manager window.
- BIMcollab BCF Manager (Right):** Shows 'Offline' status and 'All issues'. A card for '1. Beam Issues' is displayed, containing:
  - Description:** Category:BCA-ST\_Technical, Clause:Drawing Details, Description: (with a thumbnail image).
  - Status:** Closed. Buttons: Reopen.
  - Assign to:** Unassigned (dropdown).
  - Quick comment:** (with a camera icon).
  - Notify:** <select users to notify> (dropdown).
  - Comments/Details:** Buttons for 'Comments' and 'Details'.
  - User/Time:** lloyd\_ong@bca.gov.sg, 11-04-2024 15:...

# CORENET X Resources



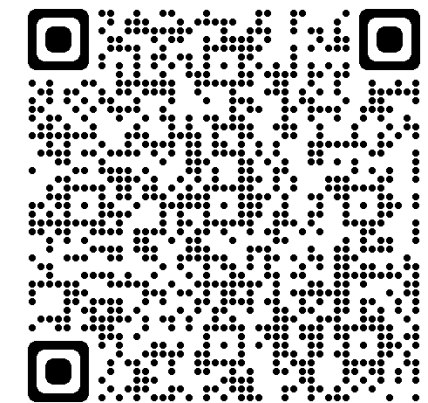
# Training Courses

1

	Mode of Lessons	Trainers
<b>CORENET X Regulatory Approval for Building Works (RABW) Course</b>  <i>Understanding the new RABW Processes</i>	Physical	BCA Academy
		The Architect's Academy by Singapore Institute of Architects (SIA)
		BIMAGE
		AcePLP(AIA)
	Self-paced Online Learning	Bluskai

> **1300** professionals from  
 > **450** Industry firms  
 have attended the courses

You may scan the QR code below to register for CORENET X training:



2

	Software	Trainers
<b>1 Day IFC-SG Training</b>  <i>Preparing OpenBIM submissions using IFC-SG</i>	Revit	AcePLP Pte Ltd, BIMAGE, SP Pace Academy, Innocom
	Tekla	AcePLP Pte Ltd, BIMAGE, Trimble
	Archicad	Graphisoft
	Bentley	Bentley, AcePLP(AIA)

# CORENET X Code of Practice (COP) & Self-Help Resources

## Self-Help Resources

Get ready for submission via CORENET X with these self-help resources!



### New Regulatory Approval Process for Building Works

Discover the new regulatory approval process for building works, Direct Submission Process, independent submissions and more.



### CORENET X Code of Practice

Master multi-agency regulatory submissions across key submission gateways in CORENET X with the CORENET X Code of Practice.



### IFC-SG Resource Toolkit

Uncover the recommended steps and materials required to prepare an IFC-SG model for submission via CORENET X.



### IFC-SG Resource Toolkit

Welcome to the IFC-SG Resource Toolkit.

This resource toolkit comprises the recommended steps and materials to prepare an IFC-SG model for submission via CORENET X.

#### Step 1

+ Introduction to IFC-SG, key data structures and mapping

#### Step 2

+ Latest Industry Mapping Excel Files

+ Further info on the Industry Mapping Excel

#### Step 3

Step-by-step resources on how to apply the requirements in the Industry Mapping Excel into your respective BIM software and how to export to IFC.

Notes:

1. These resources in Step 3 are optional templates created to help users embed and export IFC-SG regulatory data requirements as indicated in Step 2. Firms may use their own in-house templates instead, as long as your CORENET X submission models contain the relevant data in Step 2.
2. To download .bit and .xml files on this webpage, please right click on the URL and 'Save link as..'

+ a) Archicad

+ b) OpenBuildings Designer

+ c) Revit

+ d) Tekla

#### Step 4

+ Quick Start Exercises before You Start Modelling

+ List of Recommended IFC Viewers

#### Step 5

+ IFC-SG Validator (BIMLife)

+ IFC-SG Validator (Solibri)

+ IFC-SG Validator (AcePLP)

+ 3rd Party Apps to Expedite the IFC-SG Workflow



# What is the Code of Practice?

- First edition was **released in September 2023**
- Intended to help industry practitioners in understanding **how to prepare multi-agency regulatory submissions across the key submission gateways in CORENET X**
- Includes **recommended procedures** and **good practices** to address common BIM issues
- This Code of Practice does not substitute Handbooks, Circulars or other regulatory publications of our regulatory agencies.
- **Complements other resources on the CORENET X website**, including the IFC-SG Resource Toolkit

**[NEW]** The 2<sup>nd</sup> edition  
has just been published!



# CORENET X Website



Home > Regulatory Info > Building Control > CORENET X



CORENET X is a co-creation effort led by BCA and URA in close collaboration with regulatory agencies, leading built environment professionals, firms and Trade Associations and Chambers (TACs).

CORENET X transforms the current regulatory landscape and practices through adoption of BIM technologies and collaborative workflows. The integrated process under CORENET X will enhance regulatory governance, promote synergy among agencies, and offer a streamlined One-Stop Integrated Digital Shopfront experience.

CORENET X will bring about 3 key changes to the submission process

1. New regulatory approval process for building works (RABW)
2. BIM submissions in IFC-SG format
3. CORENET X submission portal

For a full introduction to CORENET X, download these infographics in a ZIP folder (5 MB) or in PDF (21 MB)

Watch this 2-minute clip for a quick overview of CORENET X!

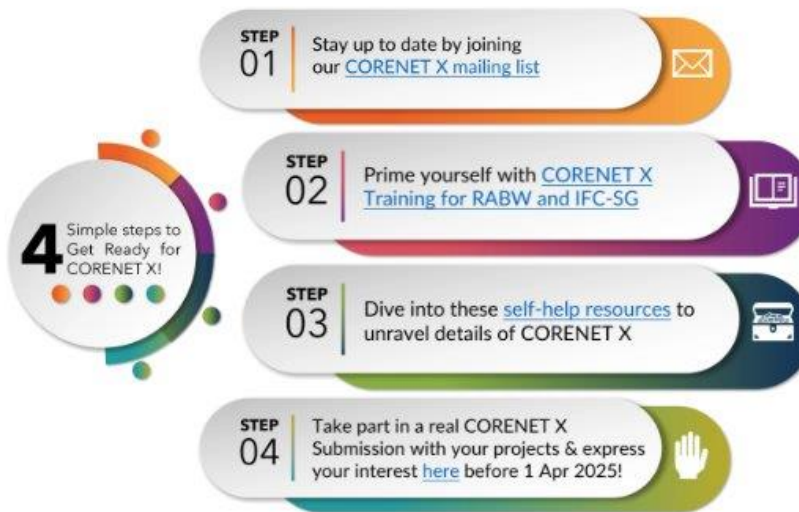


CORENET X Implementation Timeline



View the Circular on CORENET X Implementation Plan for full details!

## Getting Ready for CORENET X



## Highlights and Announcements



## Navigation

- CORENET X
  - Events and Webinars
    - Industry Training
    - Circulars
  - CORENET X FAQ
    - General Information
    - New Regulatory Approval Process
    - New Data Requirements and Technology
    - Getting Ready
    - Agency-Specific Queries and Others
  - Self-Help Resources
    - Re-designed Process
    - Code of Practice
    - IFC
    - IFC-SG Resource Toolkit
    - Geo-Referencing of BIM Model
  - More Information
    - Industry-Agency Co-Creation
    - Technological Enablers

You may scan the QR code below to access CORENET X website:



# Supporting SMEs in BIM Adoption



## Funding Support for Local SMEs

- ✓ A new package under **the Productivity Solutions Grant (PSG)** for local SMEs in the Built Environment, which consists of:
  - BIM authoring solution supporting IFC-SG
  - CORENET X industry training
- ✓ **Co-fund up to 50% of the qualifying costs of pre-approved digital solutions**
- ✓ Application details can be found at: <https://www1.bca.gov.sg/buildsg/buildsg-transformation-fund/productivity-solutions-grant>



## Registry of Shared Services

- ✓ STAS has set up a **registry of consultancy firms providing BIM shared services** that industry can tap on to help scale up BIM/IDD capability
- ✓ SMEs may access the BIM shared services registry at <https://stas.org.sg/idd/shared-services-programme/>

