corenetx

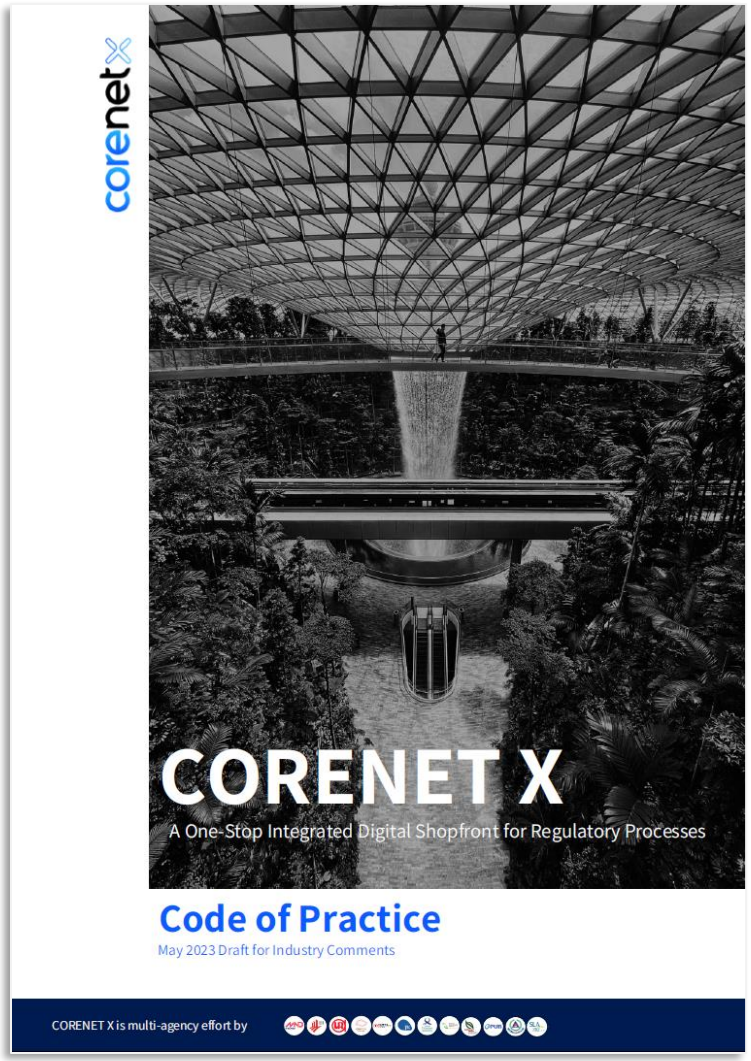
Code of Practice (COP) Webinar

15 JUNE 2023

corenetx

Code of Practice (COP) Webinar

Intent and Disclaimer of the Draft COP



- ✓ Guide on how to prepare regulatory submissions on CORENET X
- ✓ Obtain industry's feedback for refinement
- ✓ **Draft** will be continuously updated as the:
  - ➢ Team incorporates industry feedback;
  - ➢ CX features and requirements are developed progressively

How to use the COP?

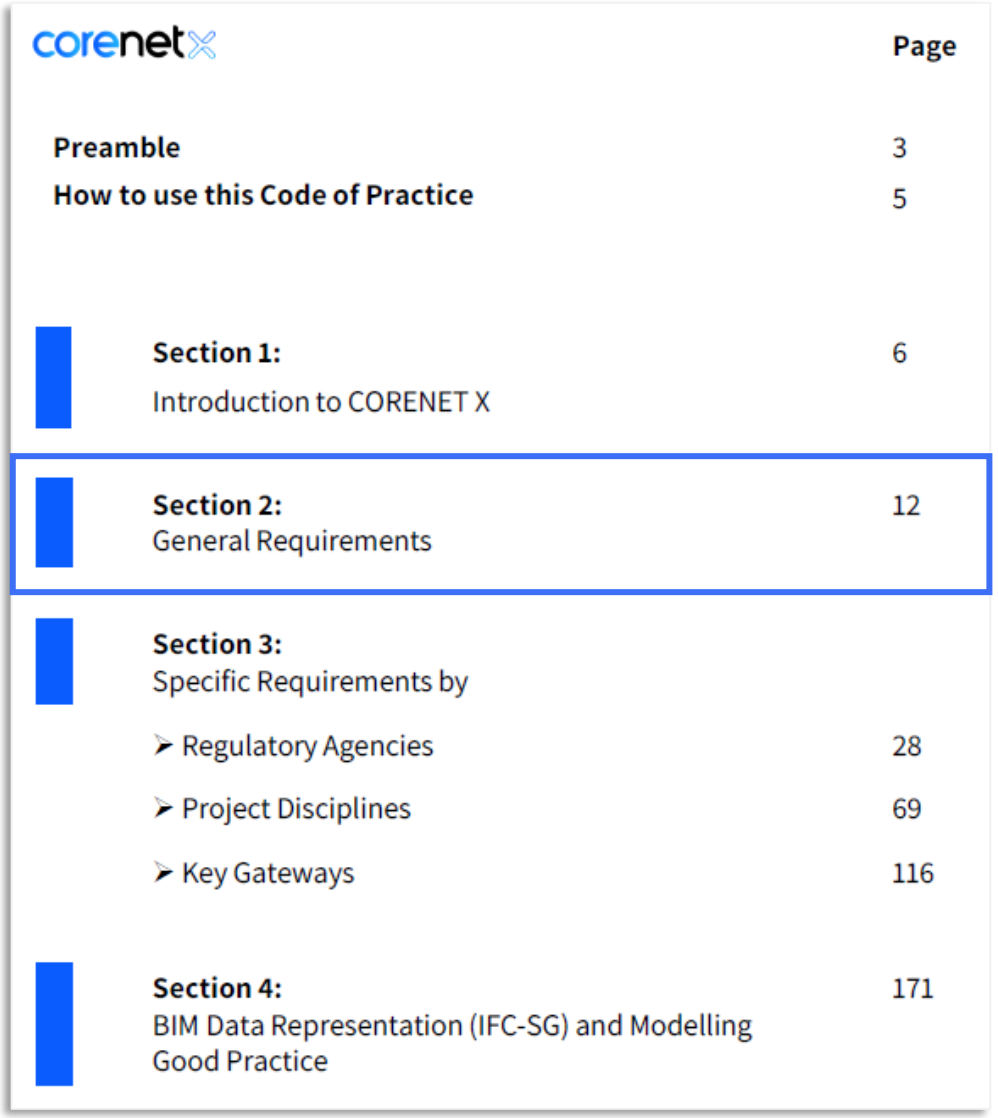
corenetX

	Page
Preamble	3
How to use this Code of Practice	5
Section 1: Introduction to CORENET X	6
Section 2: General Requirements	12
Section 3: Specific Requirements by	
➢ Regulatory Agencies	28
➢ Project Disciplines	69
➢ Key Gateways	116
Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice	171

Section 1: Introduction to CORENET X

- What is CORENET X?
- What are the key aspects of CORENET X?
- What is a user journey of CORENET X like?

How to use the COP?



corenetX

	Page
Preamble	3
How to use this Code of Practice	5
Section 1: Introduction to CORENET X	6
Section 2: General Requirements	12
Section 3: Specific Requirements by	
➢ Regulatory Agencies	28
➢ Project Disciplines	69
➢ Key Gateways	116
Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice	171

Section 2: General Requirements

- Which agency's approvals are covered under CORENET X?
- What do abbreviations like RABW and IFC-SG stand for?
- What happens to the QP's statutory obligations under CORENET X?
- What is each project team submission like and maximum file size?
- What is the model preparation process like?

How to use the COP?

corenetX

	Page
Preamble	3
How to use this Code of Practice	5
Section 1: Introduction to CORENET X	6
Section 2: General Requirements	12
Section 3: Specific Requirements by	
➢ Regulatory Agencies	28
➢ Project Disciplines	69
➢ Key Gateways	116
Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice	171

Filter CX RABW Requirements by:

Section 3: Regulatory Agencies

- RABW Requirements categorised by Regulatory Agencies

Section 3: Key Gateways

- RABW Requirements categorised by Key Gateways

Section 3: Project Disciplines

- RABW Requirements categorised by Project Disciplines

Note: Each RABW requirement in Section 3 is complemented by common components from the BIM Model (where relevant)

How to use the COP?

corenetX

	Page
Preamble	3
How to use this Code of Practice	5
Section 1: Introduction to CORENET X	6
Section 2: General Requirements	12
Section 3: Specific Requirements by	
➢ Regulatory Agencies	28
➢ Project Disciplines	69
➢ Key Gateways	116
Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice	171

Note: Each RABW requirement in Section 3 is complemented by common components from the BIM Model (where relevant)

Section 4: Typical Components in a Project ("Identified Components")

- What does a BIM component need to contain / look like, in order to satisfy agency's regulatory requirements?

corenetX

Code of Practice (COP) Webinar

15 JUNE 2023

SECTION 1:
INTRODUCTION TO CORENET X

Section 1: Introduction to CORENET X

corenetX

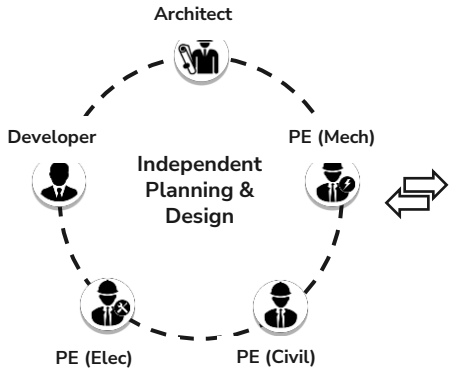
	Page
Preamble	3
How to use this Code of Practice	5
Section 1: Introduction to CORENET X	6
Section 2: General Requirements	12
Section 3: Specific Requirements by	
➢ Regulatory Agencies	28
➢ Project Disciplines	69
➢ Key Gateways	116
Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice	171

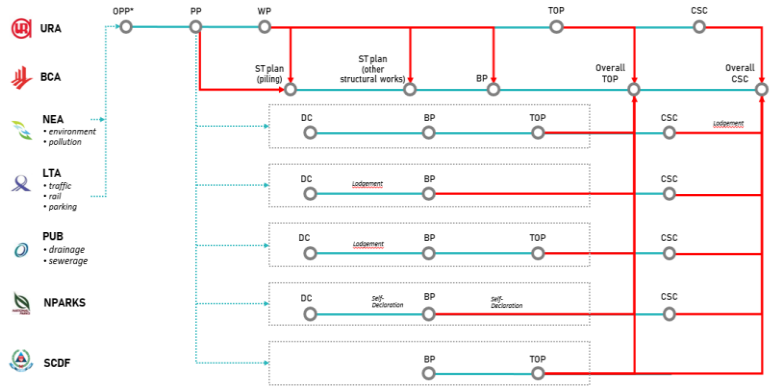
Section 1: Introduction to CORENET X

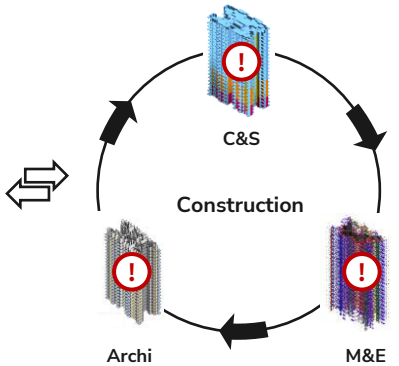
- What is CORENET X?
- What are the key aspects of CORENET X?
- What is a user journey of CORENET X like?

Section 1: Introduction to CORENET X

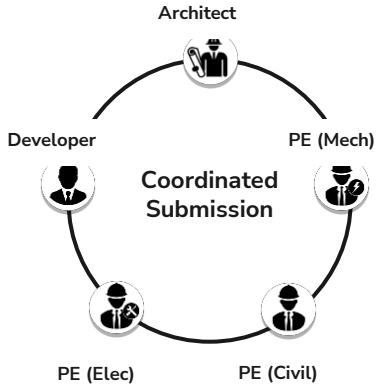
Today's Separate and Concurrent Regulatory Approval Process

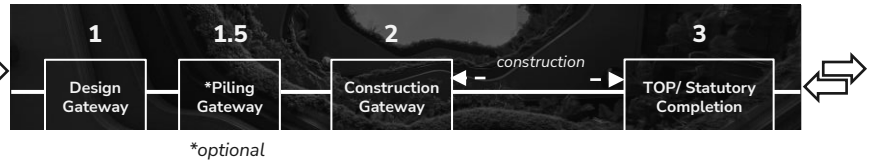


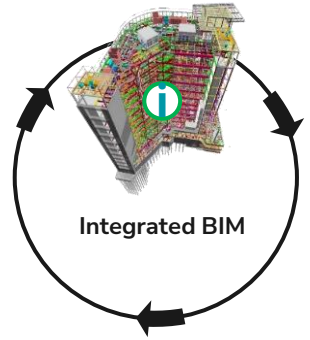




Envisaged Streamlined Regulatory Approval Process







CORENET X will transform and redesign our regulatory processes into **3 main gateways**

Section 1: Introduction to CORENET X

Envisaged User Journey in CORENET X

CORENET X Platform

Project Team creates coordinated BIM

Project Team conducts pre-submission checks

BIM Viewer

Automated Model Checker

Tech Enabler

openBIM Format

OPEN FORMAT FOR INTEROPERABILITY

The openBIM format is a platform-neutral and vendor-neutral solution. It will enable the industry to continue using the software of their choice to design and coordinate.

MODEL PREVIEW DURING SUBMISSION

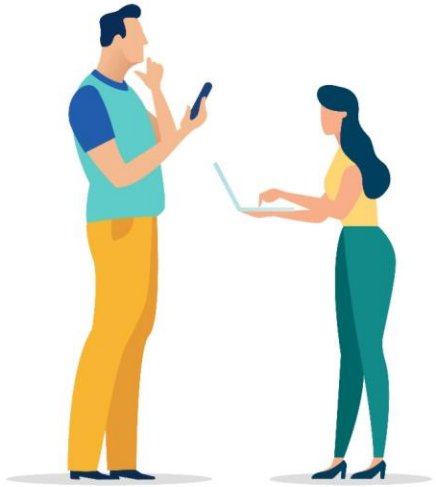
CORENET X will allow QPs to preview their models prior to submission and incorporate auto-checking capabilities for ease of access.

PRE-CHECK PRIOR TO SUBMISSION

improves the efficiency of code-checking and enables self-checking by consultants prior to submission.

This upfront validation will aid industry and agencies in checking for regulatory compliance and improve the accuracy and consistency in code interpretation.

Tech Enabler



Section 1: Introduction to CORENET X

Project Team makes submission for the project

Collaboration Platform (for inter-agency collaboration)

Agencies review the submission collectively

LEVERAGING TECHNOLOGY TO EXTRACT RELEVANT INFORMATION

New Submission - Today, QPs need to prepare different sets of plans for different agencies. Leveraging technology, QPs will prepare one coordinated model and agencies will extract relevant information.

Amendment Submission - Today's amendment plans require QPs to prepare the submission highlighting deviations from earlier approved submissions. This process is currently carried out by QPs manually.

Going forward, QPs will only need to submit the amended model. Agencies will conduct model comparison with the previously approved model to identify amendments made.

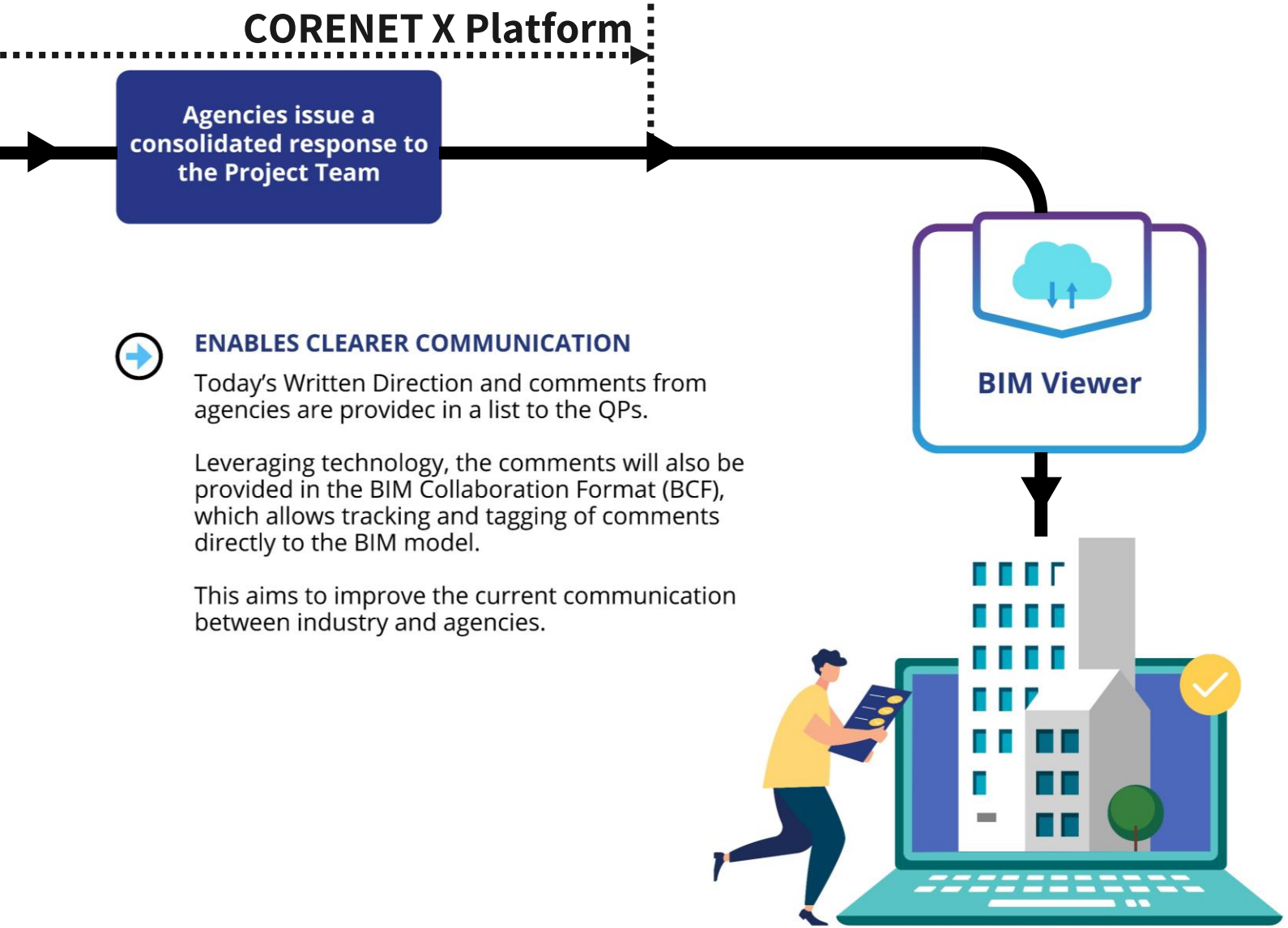
COLLABORATION AMONG AGENCIES

Aims to transform the current way agencies review plans, bringing agencies together to concurrently access the same coordinated BIM model.

Agencies will then collaborate within the same Collaboration Platform, and provide a coordinated response to the industry.

Tech Enabler

Section 1: Introduction to CORENET X



ENABLES CLEARER COMMUNICATION

Today's Written Direction and comments from agencies are providec in a list to the QPs.

Leveraging technology, the comments will also be provided in the BIM Collaboration Format (BCF), which allows tracking and tagging of comments directly to the BIM model.

This aims to improve the current communication between industry and agencies.

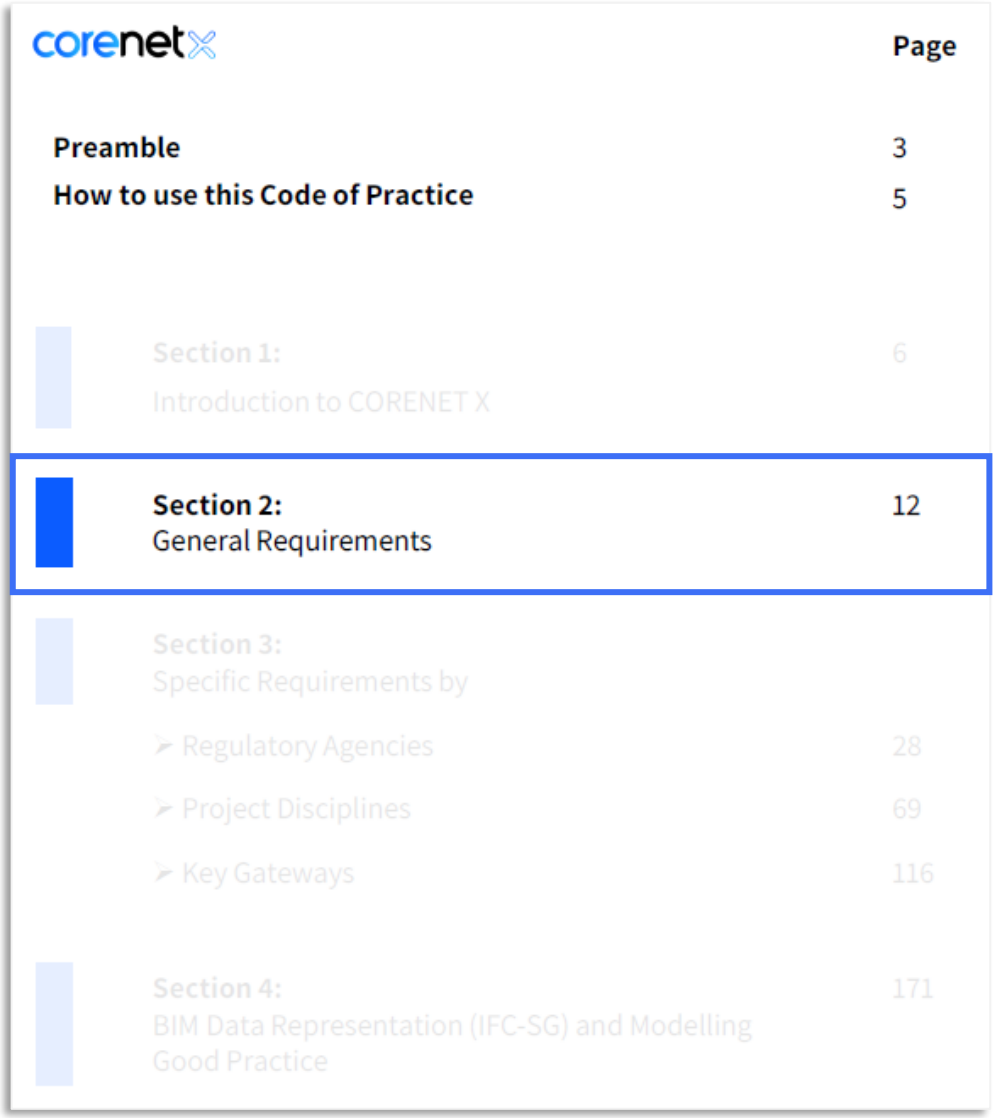
corenetX

Code of Practice (COP) Webinar

15 JUNE 2023

SECTION 2:
GENERAL REQUIREMENTS

Section 2: General Requirements



corenetX

Page

Preamble 3

How to use this Code of Practice 5

Section 1: Introduction to CORENET X 6

Section 2: General Requirements 12

Section 3: Specific Requirements by

- Regulatory Agencies 28
- Project Disciplines 69
- Key Gateways 116

Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice 171

Section 2: General Requirements

- Which agency's approvals are covered under CORENET X?
- What do abbreviations like RABW and IFC-SG stand for?
- What happens to the QP's statutory obligations under CORENET X?
- What is each project team submission like and maximum file size?
- What is the model preparation process like?

Section 2: General Requirements

Two Terms to Highlight

✓ **RABW**:

Regulatory **A**pproval Process for **B**uilding **W**orks

✓ **IFC-SG:**

Industry **F**oundation **C**lasses – Singapore (Regulatory Version)

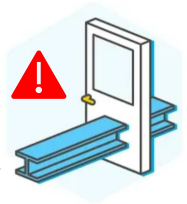
Term	Definitions
RABW	Abbreviation for "Regulatory Approval Process for Building Works" ➢ Refers to the new sequential process related to CORENET X Gateways. More information of the RABW can be found here.
Gateways	Major submission milestones in CORENET X, where the submission needs to comply with multiple agencies' statutory requirements.
Supporting Mechanisms	Similar to today, there are 3 supporting mechanisms will continue to complement the approval process: **1. Pre-Submission Consultation** • Pre-submission consultation will continue to be available for industry to consult or seek clarification prior to submission. **2. Waivers** • Where necessary, the industry may apply for waiver under the respective Act and Regulations and the respective agency will assess the applications accordingly. **3. Escalation Mechanism** • Industry can table their case to seek resolution on inter-agency regulatory conflicts at the Inter-agency Coordinating Committee (IACC)
Federated Model	Combined Building Information Model that compiles multiple models from different disciplines or sections of the project into a single, complete model of the project. • Federated models support concurrent authorship of different aspects of the project by multiple parties. • Federated models also support multi-disciplinary coordination as models are geo-referenced to coordinates from the Singapore SVY21 coordinate system (EPSG: 3414) for Easing and Northing (x,y) and Singapore Height Datum (SHD) for Height (z).
IFC-SG	New representations for local regulatory requirements, in the Industry Foundation Classes (IFC) openBIM standard. More information of the mapping and configuration files for IFC-SG can be found here.
Level of Details	As long as relevant IFC-SG data requirements are embedded in the respective BIM components and minimum dimensions represented, BIM components do not need to replicate their real-life equivalent. For example, trees can be represented as a lollipop object as long as IFC-SG parameters like "Girth", "Height" and "Status" are represented.
Non-BIM submissions	Besides BIM submissions in the IFC-SG format, CORENET X will be able to accept non-BIM submissions.
Supplementary Documents	CORENET X will be able to accept non-BIM documentations that accompany each project team's submission of IFC-SG models (e.g. design calculation reports, 2D detail drawings)

Section 2: Component Clashes Matrix

Component Clashes

- ✓ Listed 13 of the **basic** discipline components that **shall not clash** with one another for a CX submission

Note: This matrix is not exhaustive.

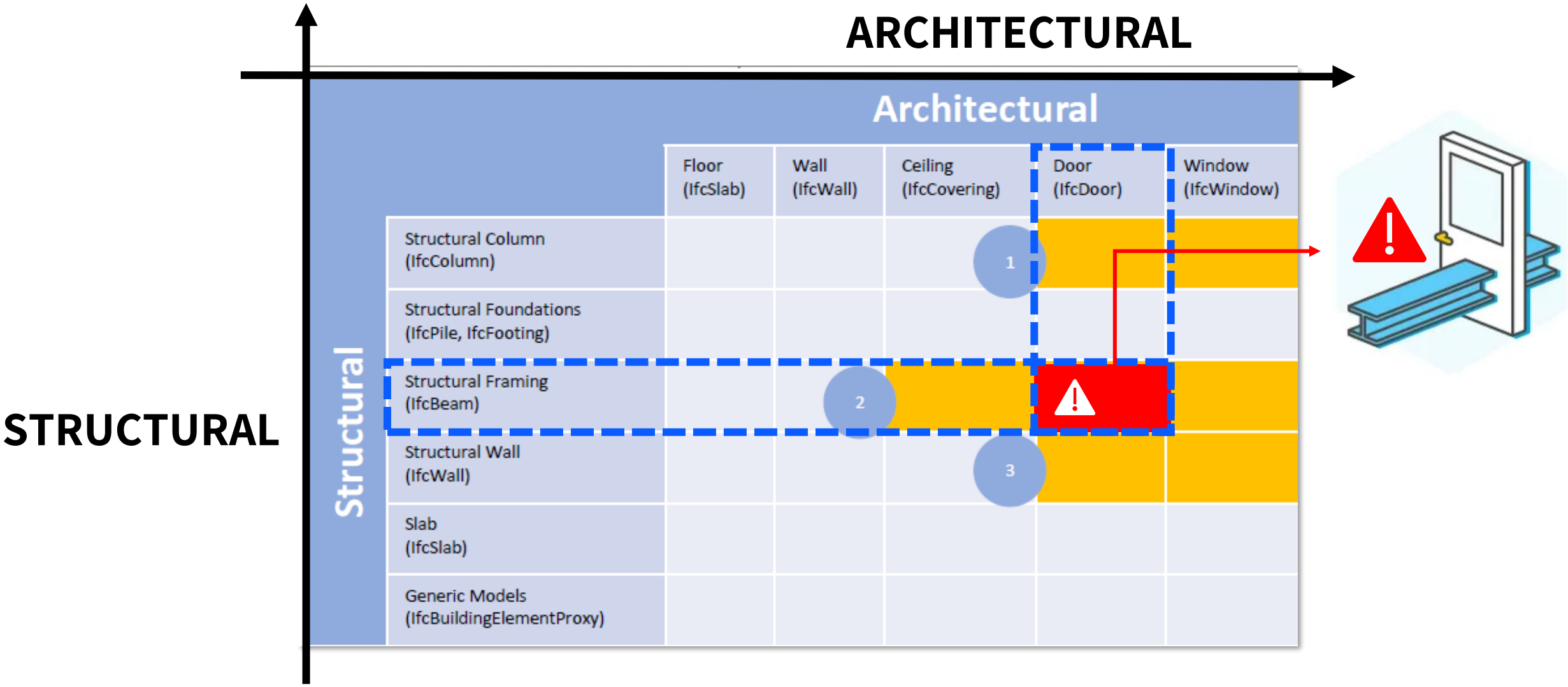


S2 – Fig 1 : Design Clash
Photo credit: https://www.bimcollab.com/en/products/bimcollab-zoom-b/

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, IfcFooting)	Structural Framing (IfcBeam)	Structural Wall (IfcWall)	Slab (IfcSlab)
Structural	Structural Column (IfcColumn)			1							
	Structural Foundations (IfcPile, IfcFooting)										
	Structural Framing (IfcBeam)		2		⚠						
	Structural Wall (IfcWall)			3							
	Slab (IfcSlab)										
	Generic Models (IfcBuildingElementProxy)										
MEP	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

Section 2: Reading the Component Clashes Matrix



Section 2: Reading the Component Clashes Matrix

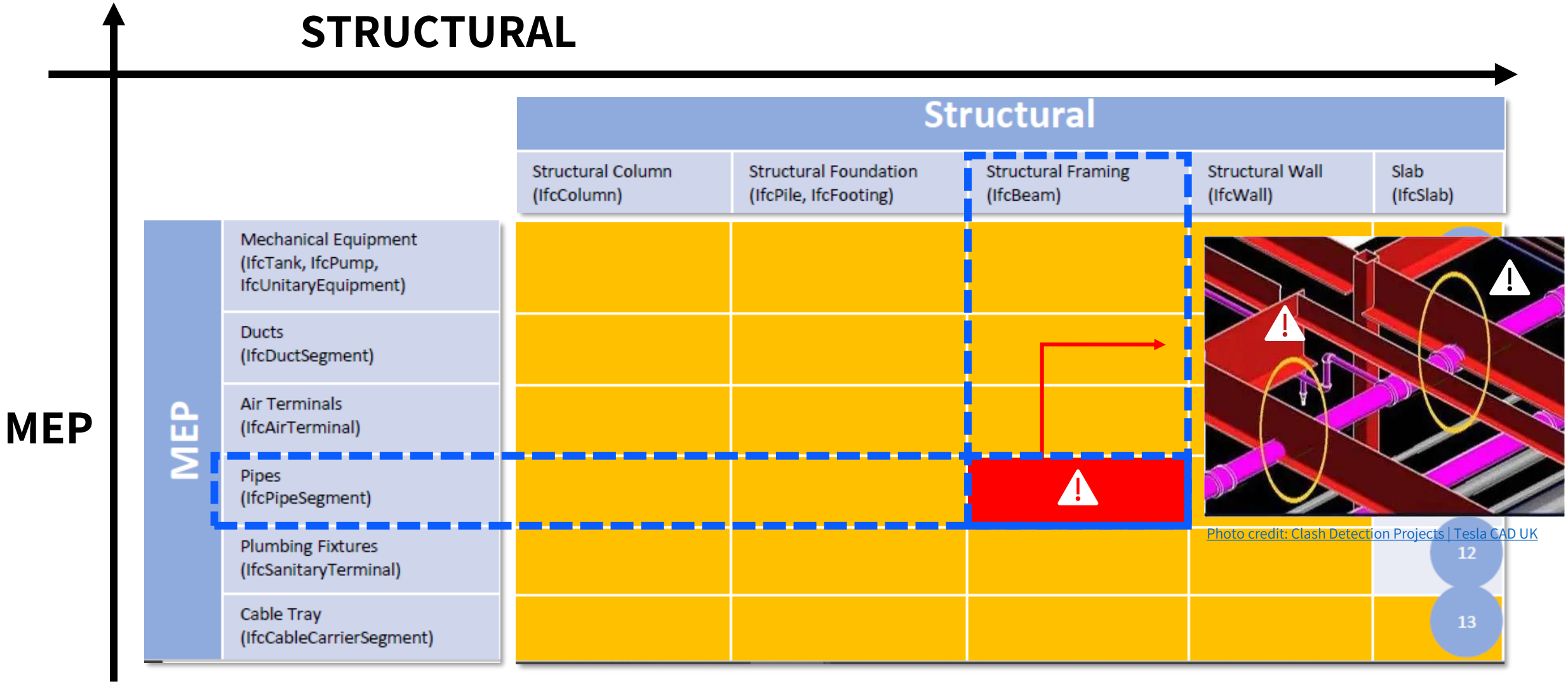


Photo credit: Clash Detection Projects | Tesla CAD UK

Section 2: Typical Submission Package

Examples	Architecture	C&S Engineering	M&E Engineering
IFC-SG models, all geo-referenced	• Blk 1 Model • Blk 2 Model • Podium Model	• Blk 1 Model • Blk 2 Model • Podium Model • Substructure Model Note: For projects which did not opt for Piling Gateway (G1.5), the project team will need to include all permanent foundation works in Construction Gateway (G2).	• Blk 1 and Substructure Model • Blk 2 and Substructure Model • Podium
2D drawings	• Details (e.g. household / storey shelter documentation and detailing) • External Works	• General notes • Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections) • External Works	• Details (e.g. cooling tower documentation and detailing) • External Works
Design Calculation reports	-	• Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed]	-
Additional supporting documents	• B-Score BDAS form • Bonus Balcony GFA Letter of Declaration • Design Advisory Panel (DAP) report • Green Mark Assessment and Score Card • Public Communication Plans	• B-Score BDAS form • Site Investigation report in pdf & AGS format • Impact assessment report • Topography	• B-Score BDAS form • Pollution Control Study (PCS) reports
Pre-consultation document	-	Completion letter of pre-consultation (for complex structure only)	-

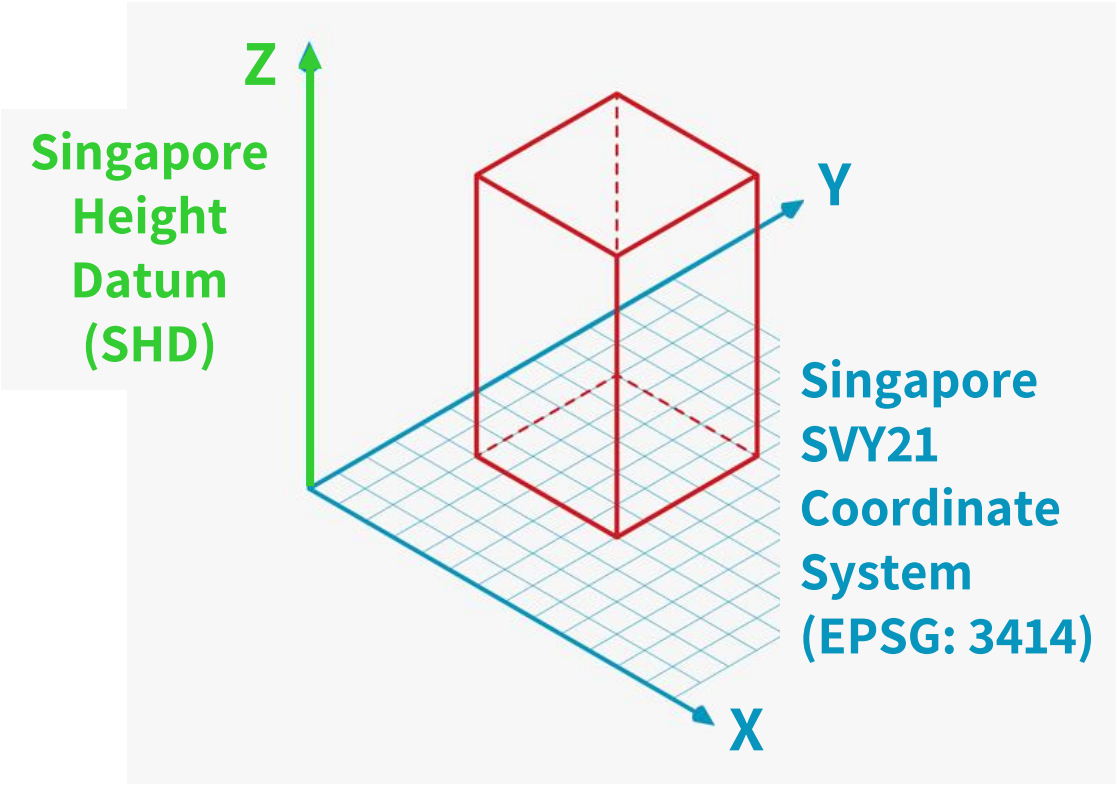
Note: This is an example of a typical submission package, and is not exhaustive.

Section 2: General Requirements

Model Size and Preparation

✓ Total size of all models in a single submission should not exceed **2GB.**

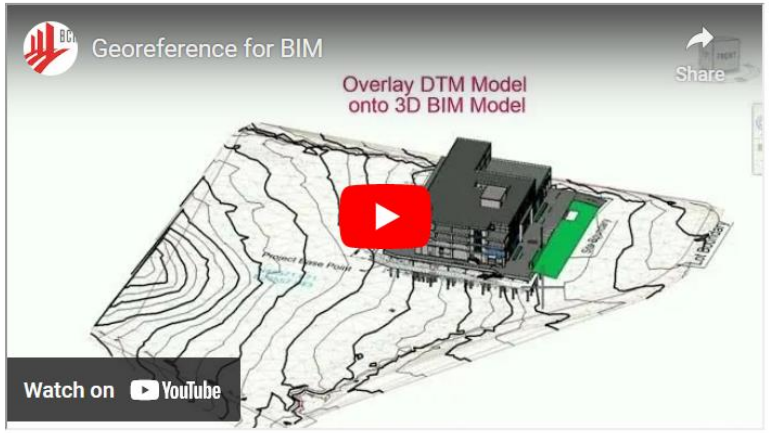
Geo-Referencing



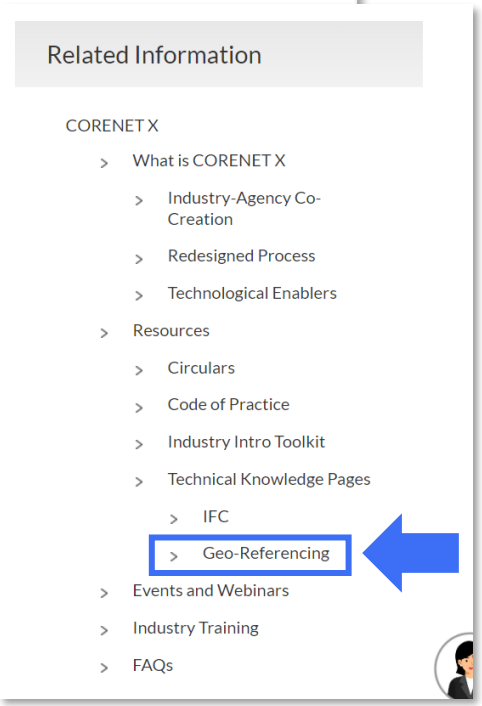
Why is there a need to Geo-Reference BIM models?

+ How do I geo-reference my BIM model?

The Singapore Institute of Surveyors and Valuers - Land Surveying Division has also come up with a video on geo-referencing, to explore how land surveyors and architects can work together to have more efficient workflow for future CORENET X submission.



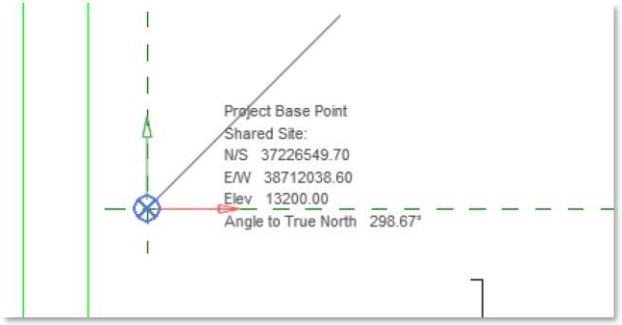
*For details and video demo on geo-referencing, please visit the CX website.



Section 2: Preparing Models for Submission

1. Set your model into the agreed coordinates

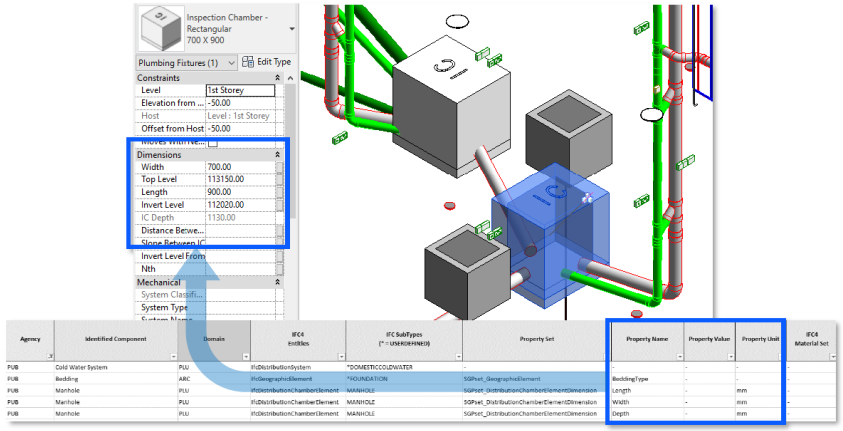
- To place model into the correct location with Architectural, Civil & Structural, Mechanical & Electrical models.



S2 – Fig 6

2. Identify the IFC properties to be tagged into each element of your model

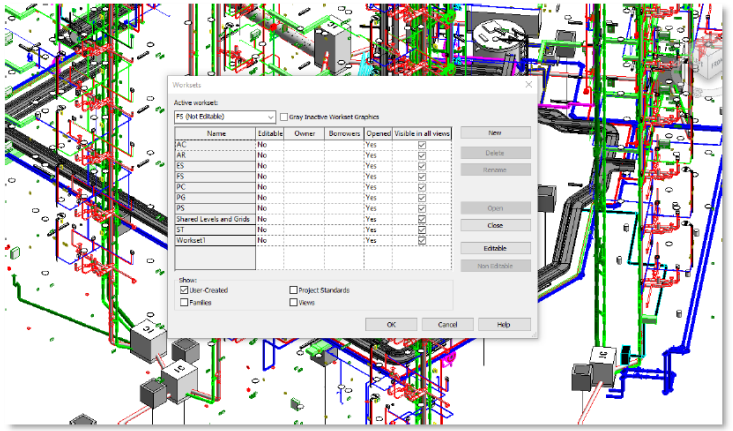
- Element's properties can be assigned while modeling.



S2 – Fig 7

3. Set the Revit Workset

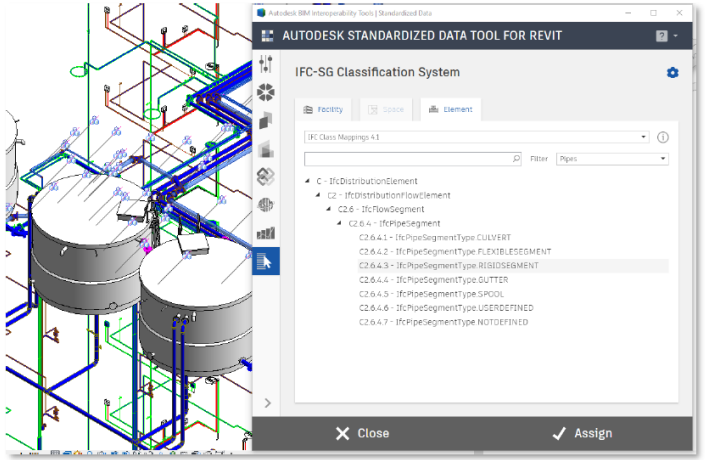
- To easily select the elements during IFC-SG Parameters mapping.
- To filter the views per Agency Submission.
- To reduce time when Exporting model in IFC format.
- To easily navigate when modeling and model auditing.



S2 – Fig 8

4. IFC-SG Mapping

- **Use BIM Interoperability Tools to assign IFC parameters**
- To avoid misspelled IFC parameters (misspelled parameters will not be exported).
- Faster than manual parameter key-in.
- Elements will be exported into the correct IFC category.



S2 – Fig 9

✓ Step-By-Step Tips (from Industry partners)

QP's Statutory Responsibilities

While the regulatory approval process is being redesigned to improve the current user experience to navigate across multiple regulatory agencies, the regulatory agencies' respective mandate and regime remains unchanged. Hence, the statutory responsibilities of the appointed QPs under the respective Acts and Regulations **remains unchanged**.

Under the RABW, part of the process requires joint submission by the relevant QPs within the project teams to the relevant regulatory agencies. To ensure clear delineation of responsibilities, the developer (or whoever is required under the respective Acts and Regulations) needs to first appoint the QP for the respective areas of work at the start of a project. The appointed QP will then be responsible for the relevant aspects of the submission.

corenetX

Code of Practice (COP) Webinar

15 JUNE 2023

SECTION 3:
SPECIFIC REQUIREMENTS BY

- Regulatory Agencies
- Project Disciplines
- Key Gateways

Section 3: Specific Requirements

corenetX

	Page
Preamble	3
How to use this Code of Practice	5
Section 1: Introduction to CORENET X	6
Section 2: General Requirements	12
Section 3: Specific Requirements by	
➢ Regulatory Agencies	28
➢ Project Disciplines	69
➢ Key Gateways	116
Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice	171

Filter CX RABW Requirements by:

Section 3: Regulatory Agencies

- RABW Requirements categorised by Regulatory Agencies

Section 3: Key Gateways

- RABW Requirements categorised by Key Gateways

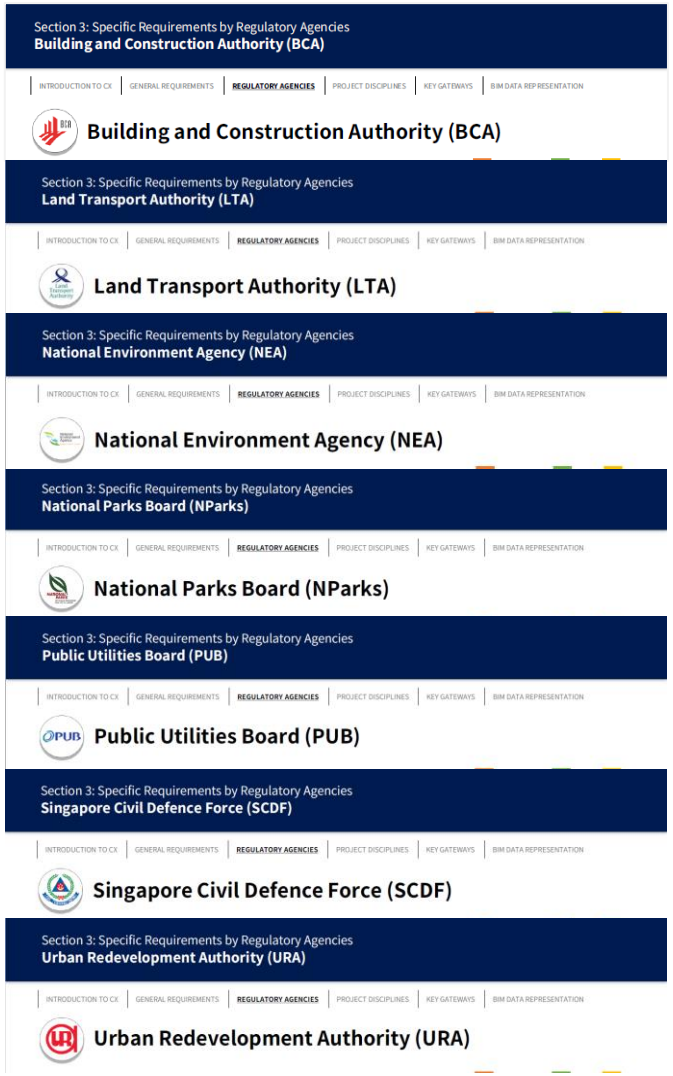
Section 3: Project Disciplines

- RABW Requirements categorised by Project Disciplines

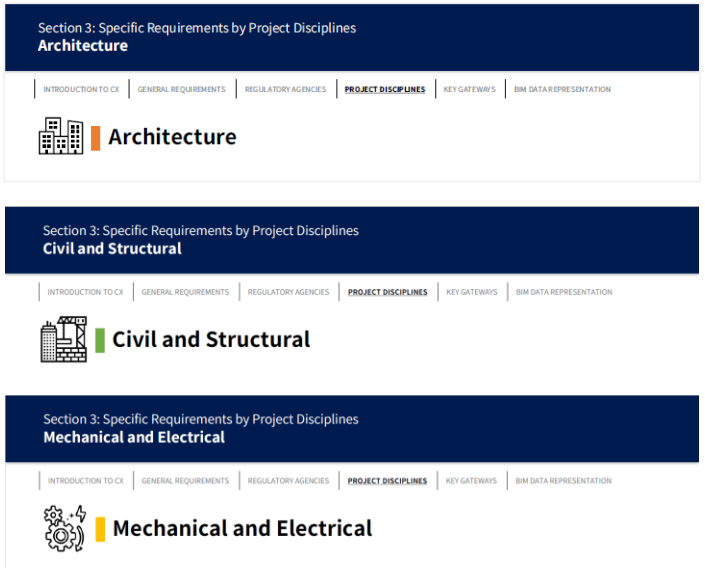
Note: Each RABW requirement in Section 3 is complemented by common components from the BIM Model (where relevant) + IFC -SG

Section 3: Specific Requirements

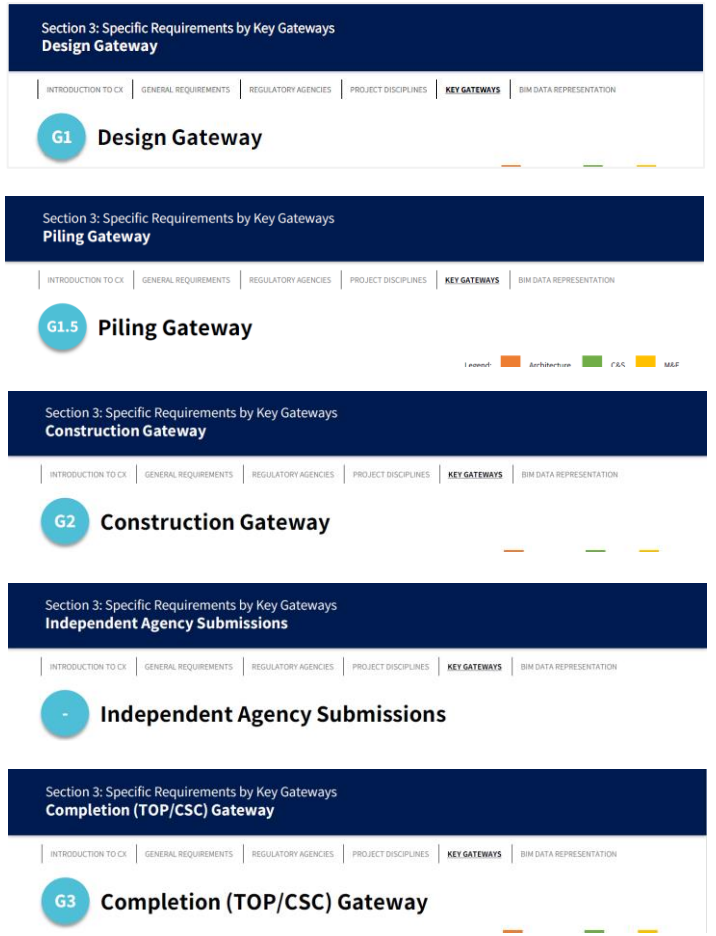
Regulatory Agencies



Project Disciplines

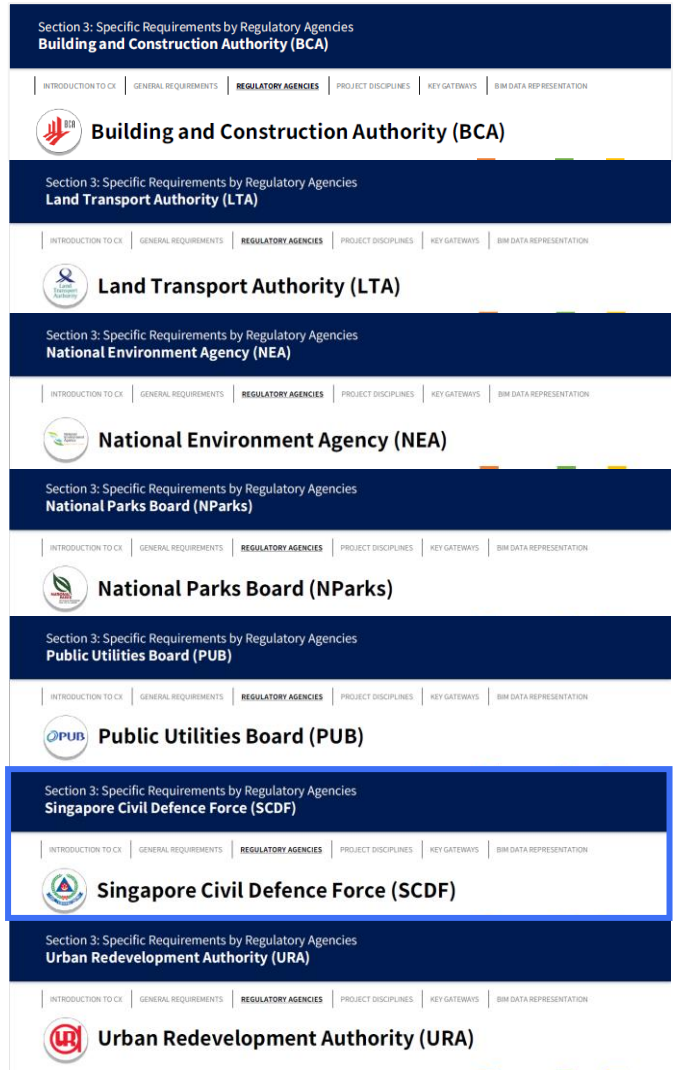


Key Gateways



Section 3: Specific Requirements

Regulatory Agencies



Project Disciplines

Key Gateways

Understanding the Page and Table format (Regulatory Agencies)

Section 3: Specific Requirements by Regulatory Agencies
Singapore Civil Defence Force (SCDF)

INTRODUCTION TO CX | GENERAL REQUIREMENTS | REGULATORY AGENCIES | PROJECT DISCIPLINES | KEY GATEWAYS | BIM DATA REPRESENTATION

Singapore Civil Defence Force (SCDF)

Legend: Architecture C&S M&E

G2 **Construction Gateway** *(continued from previous page)*

Key Words	Requirement Category	Common Components
Fire Fighting, Equipment	**Fire Hydrant System** • Location of fire hydrant(s) • Hydrant coverage not more than 50m from fire engine access road / accessway	• Fire Hydrant • Road
	Sprinklers & System • Provision of sprinklers for basement • Provision of sprinklers for buildings having habitable height more than 24m (mixed-use residential buildings)	• Space
	Rising Mains & System • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breeching inlet location	• Breeching Inlet • Hose Reel • Landing Valve • System
	Hose Reel & System • Location of hose reel • Hose reel coverage	• Hose Reel
	Emergency Voice Communication System • One way and two way EVC	-

Key Words appearing in a particular Gateway

Brief Description of requirements relating to the Key Word

BIM Components that may be required to be modelled for this requirement and key word

Section, Main Header, Sub-Header

Other COP Sections (Clickable Hyperlinks)

Regulatory Agency Involved

Legend (Archi, C&S, M&E)

Requirements under the Key Gateways (corresponds to the Gateway No.)

G1: Design Gateway

G1.5: Piling Gateway

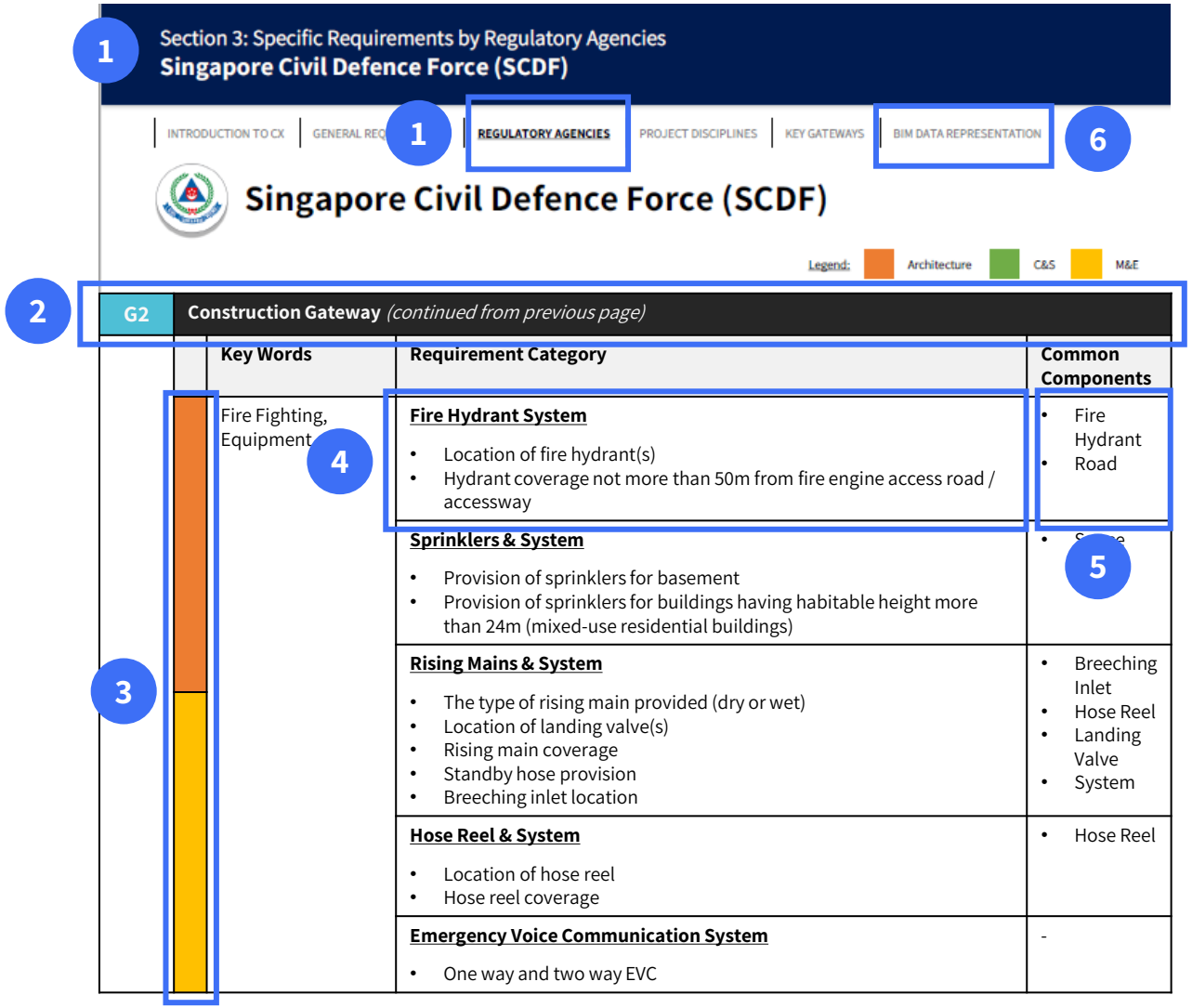
G2: Design Gateway

G3: Completion Gateway

IFC -SG

Directly linked to Section 4 on BIM Data Representation

Case Example (Regulatory Agencies)



I want to understand how to clear SCDF's requirement for Fire Hydrant

1. Go to Section 3: Specific Requirements Regulatory Agencies
2. Find which Gateway "Fire Hydrant" falls under. In this case, it's required under Construction Gateway (G2).
3. Find which discipline is responsible for compliance. In this case, it's Architecture and M&E (orange and yellow).
4. Find out what are the broad requirements to comply. However, QP is to refer to detailed codes & requirements in the appropriate docs (e.g. BC Act & Regulations)
5. Find out what BIM Data Representation is required to be modelled for "Fire Hydrant". Look for "Fire Hydrant" in Section 4.
6. Click Hyperlink to navigate easily to Section 4: BIM Data Representation.

Case Example (Regulatory Agencies)

7

Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice
Typical Components in a Project ("Identified Components")

INTRODUCTION TO CX | GENERAL REQUIREMENTS | REGULATORY AGENCIES | PROJECT DISCIPLINES | KEY GATEWAYS | BIM DATA REPRESENTATION

8

Fire Hydrant

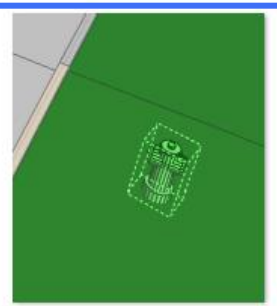
Legend: Architecture C&S M&E

▶ By Key Gateways

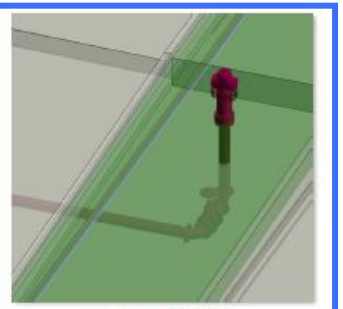
9

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	**Fire Hydrant System** • Location of Fire Hydrant(s) • Hydrant Coverage not more than 50m from Fire Engine Access Road / Accessway

10



S4 – Fig 32 : Fire Hydrant



S4 – Fig 33 : Fire Hydrant

▶ Modelling Fire Hydrant in IFC-SG

- Details for technical clearance is not part of Gateway approval and is to be submitted as individual SCDF clearance in 2D. 3D is optional.

▶ By IFC Representation

11

IFC Entity: IfcFireSuppressionTerminal						
IFC USER-DEFINED SubType: FIREHYDRANT						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	ID	Text	-	-	-	N.A.
2	Private	Boolean	-	-	Yes	TRUE / FALSE
3	Public	Boolean	-	-	Yes	TRUE / FALSE

I want to understand how to clear SCDF's requirement for Fire Hydrant

7 Go to Section 4: BIM Data Representation.

8 Ensure it's the correct BIM Component.

9 Find out the Gateways, Agency and Requirements. These are replicated from earlier sections for ease of reference. In this case, only SCDF is involved at the Construction Gateway (G2).

10 Find out pictorial examples of "Fire Hydrant" modelling representation in BIM. QP may wish to model in even greater detail as compared to the examples shown.

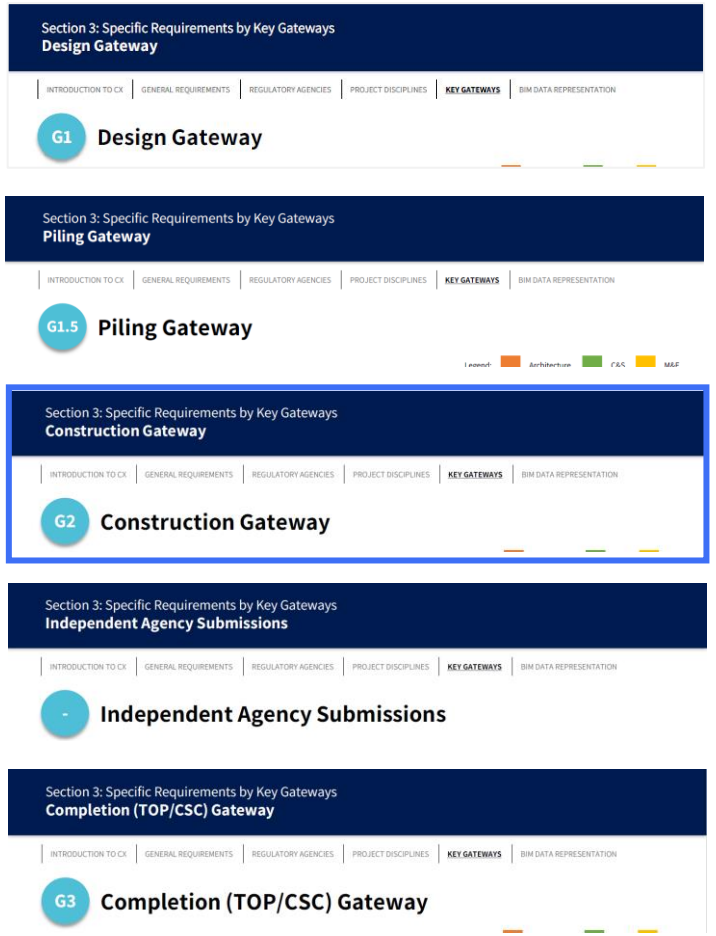
11 Find out the data and IFC-SG inputs required in the BIM Model and component.

Section 3: Specific Requirements

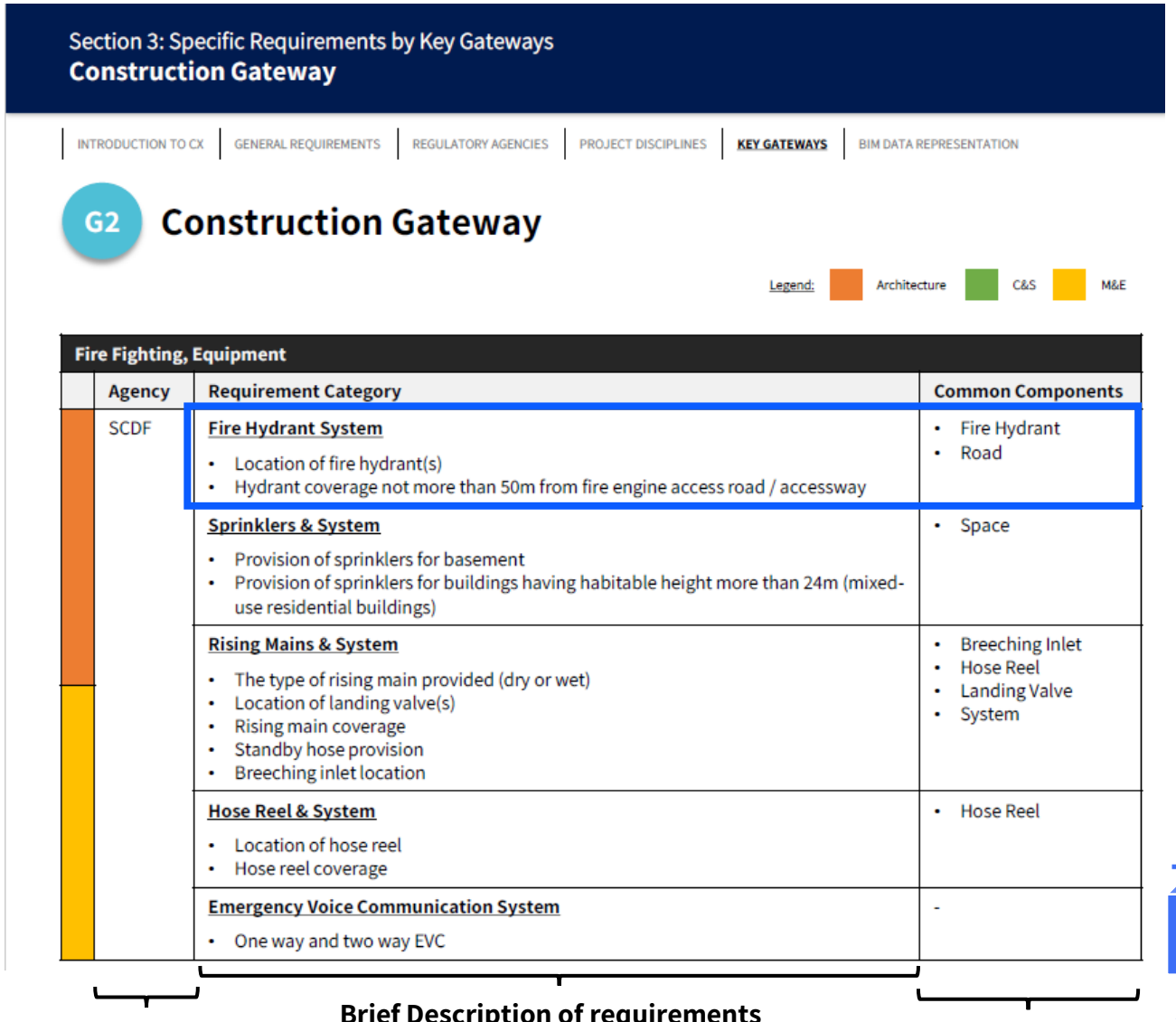
Regulatory Agencies

Project Disciplines

Key Gateways



Understanding the Page and Table format (Key Gateways)



Section 3: Specific Requirements by Key Gateways
Construction Gateway

INTRODUCTION TO CX | GENERAL REQUIREMENTS | REGULATORY AGENCIES | PROJECT DISCIPLINES | KEY GATEWAYS | BIM DATA REPRESENTATION

G2 **Construction Gateway**

Legend: Architecture C&S M&E

Fire Fighting, Equipment

	Agency	Requirement Category	Common Components
	SCDF	**Fire Hydrant System** • Location of fire hydrant(s) • Hydrant coverage not more than 50m from fire engine access road / accessway	• Fire Hydrant • Road
		Sprinklers & System • Provision of sprinklers for basement • Provision of sprinklers for buildings having habitable height more than 24m (mixed-use residential buildings)	• Space
		Rising Mains & System • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breeching inlet location	• Breeching Inlet • Hose Reel • Landing Valve • System
		Hose Reel & System • Location of hose reel • Hose reel coverage	• Hose Reel
		Emergency Voice Communication System • One way and two way EVC	-

Agencies involved for "Fire Hydrant"

Brief Description of requirements relating to the Key Word for that particular agency

BIM Components that may be required to be modelled for this requirement and key word

Section, Main Header, Sub-Header

Other COP Sections (Clickable Hyperlinks)

Key Gateway with corresponding Gateway No.

Legend (Archi, C&S, M&E)

Key Words appearing in a particular Gateway
Help to show how different agency requirements can share the same requirement in different locations within the project

IFC -SG

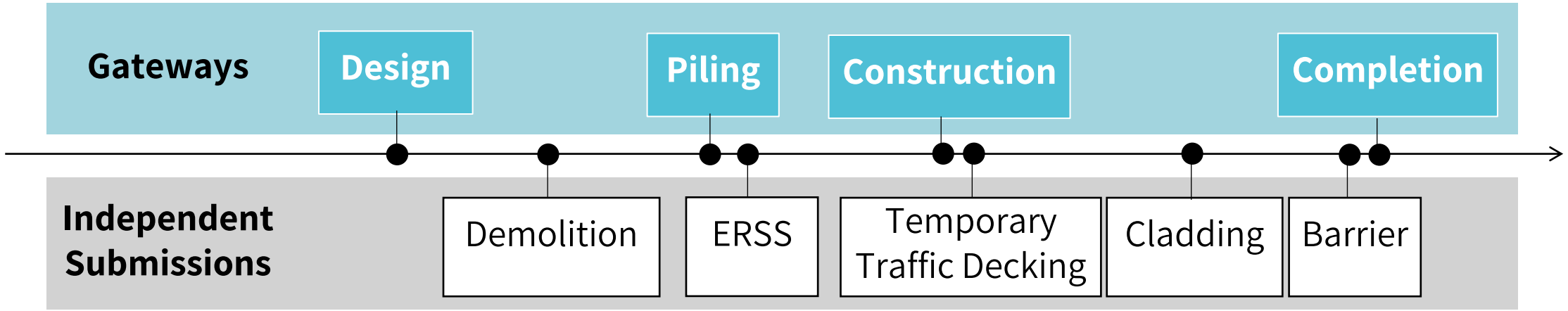
Directly linked to Section 4 on BIM Data Representation

Understanding the Page and Table format (Key Gateways)

G	Gateways	Objectives
G1	**Design Gateway (DG)** For Design Parameters	To resolve multi-agency key parameters which have impact on design parameters and client's brief, before proceeding to detailed design.
G1.5	**Piling Gateway (PG)** *optional	To resolve requirements pertaining to piling and foundation works (e.g. pile caps, raft foundation, earth retaining and stabilising structures), excluding superstructural works.
G2	**Construction Gateway (CG)**	To resolve multi-agency requirements concerning design details that need to be coordinated before commencement of main structural works and launch of Sales.
-	**Independent Submissions (IDP)** *if applicable	To clear agency-specific requirements with no cross-agency dependencies (i.e. typically affecting only one relevant agency). E.g. structural submission of ancillary structures such as barriers/ claddings to BCA
G3	**Completion Gateway (TOP)** Application for TOP/CSC	To document "As-Built" plans and obtain Occupancy Permit/ Statutory Completion

✓ Understanding the Key Gateway(s) outcomes

Example of a project making regulatory submissions



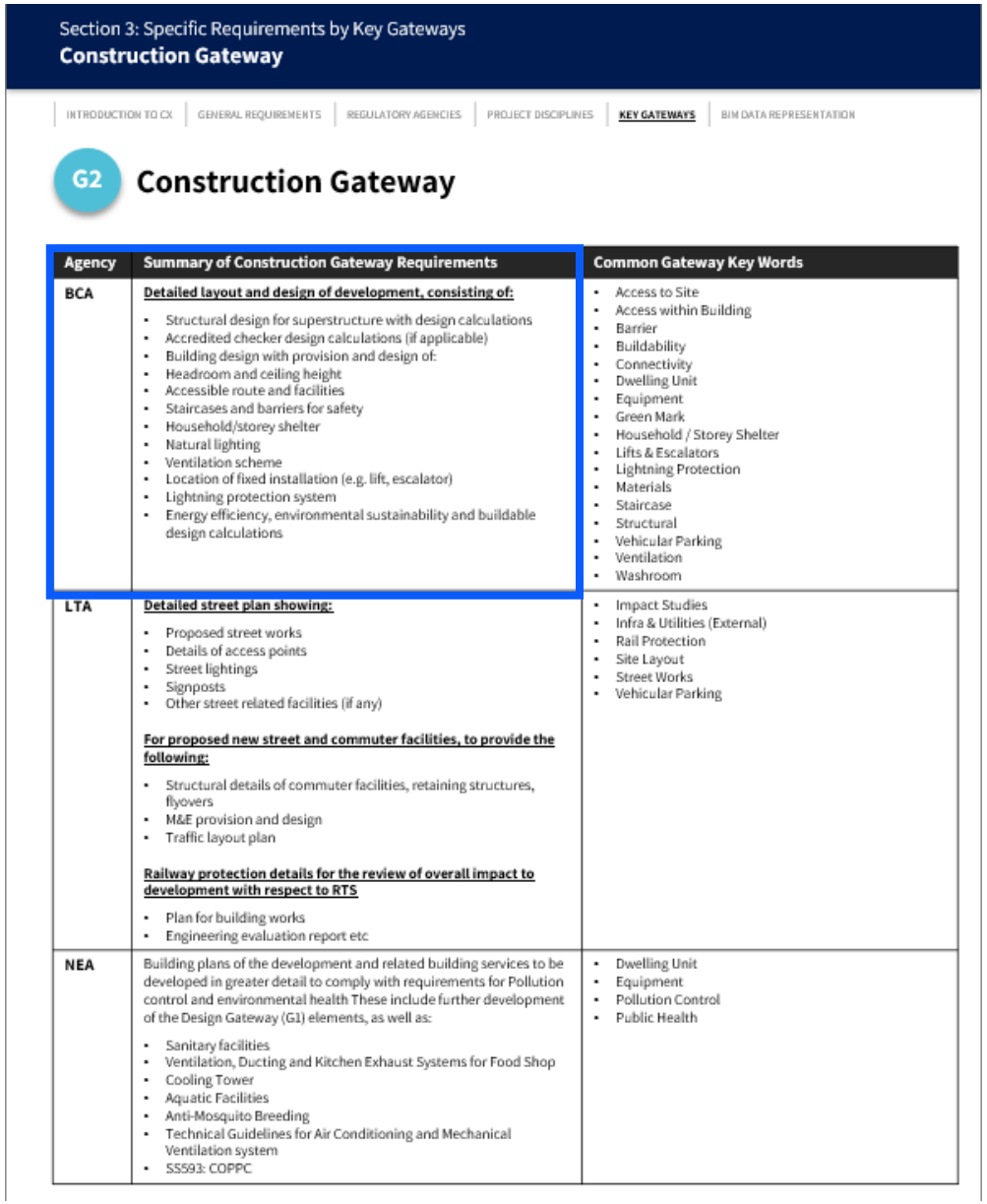
External Works

External works (works adjacent to the site boundary) are to be coordinated and submitted as part of the Construction Gateway (G2) to agencies. Details include:

- Drainage and sewer improvements
- Roadside planting, reinstatement of landscaping
- Road improvement, provision of pedestrian facilities

External works details can be submitted in the 2D CAD format.

Example of a project making regulatory submissions



Section 3: Specific Requirements by Key Gateways
Construction Gateway

INTRODUCTION TO CX | GENERAL REQUIREMENTS | REGULATORY AGENCIES | PROJECT DISCIPLINES | KEY GATEWAYS | BIM DATA REPRESENTATION

G2 **Construction Gateway**

Agency	Summary of Construction Gateway Requirements	Common Gateway Key Words
BCA	**Detailed layout and design of development, consisting of:** • Structural design for superstructure with design calculations • Accredited checker design calculations (if applicable) • Building design with provision and design of: • Headroom and ceiling height • Accessible route and facilities • Staircases and barriers for safety • Household/storey shelter • Natural lighting • Ventilation scheme • Location of fixed installation (e.g. lift, escalator) • Lightning protection system • Energy efficiency, environmental sustainability and buildable design calculations	• Access to Site • Access within Building • Barrier • Buildability • Connectivity • Dwelling Unit • Equipment • Green Mark • Household / Storey Shelter • Lifts & Escalators • Lightning Protection • Materials • Staircase • Structural • Vehicular Parking • Ventilation • Washroom
LTA	**Detailed street plan showing:** • Proposed street works • Details of access points • Street lightings • Signposts • Other street related facilities (if any) **For proposed new street and commuter facilities, to provide the following:** • Structural details of commuter facilities, retaining structures, flyovers • M&E provision and design • Traffic layout plan **Railway protection details for the review of overall impact to development with respect to RTS** • Plan for building works • Engineering evaluation report etc	• Impact Studies • Infra & Utilities (External) • Rail Protection • Site Layout • Street Works • Vehicular Parking
NEA	Building plans of the development and related building services to be developed in greater detail to comply with requirements for Pollution control and environmental health These include further development of the Design Gateway (G1) elements, as well as: • Sanitary facilities • Ventilation, Ducting and Kitchen Exhaust Systems for Food Shop • Cooling Tower • Aquatic Facilities • Anti-Mosquito Breeding • Technical Guidelines for Air Conditioning and Mechanical Ventilation system • SS593: COPPC	• Dwelling Unit • Equipment • Pollution Control • Public Health

Agency	Summary of Construction Gateway Requirements
BCA	**Detailed layout and design of development, consisting of:** • Structural design for superstructure with design calculations • Accredited checker design calculations (if applicable) • Building design with provision and design of: • Headroom and ceiling height • Accessible route and facilities • Staircases and barriers for safety • Household/storey shelter • Natural lighting • Ventilation scheme • Location of fixed installation (e.g. lift, escalator) • Lightning protection system • Energy efficiency, environmental sustainability and buildable design calculations

corenetX

Code of Practice (COP) Webinar

15 JUNE 2023

SECTION 4:
BIM Data Representation

Section 4: BIM Data Representation

corenetX

	Page
Preamble	3
How to use this Code of Practice	5
Section 1: Introduction to CORENET X	6
Section 2: General Requirements	12
Section 3: Specific Requirements by	
➢ Regulatory Agencies	28
➢ Project Disciplines	69
➢ Key Gateways	116
Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice	171

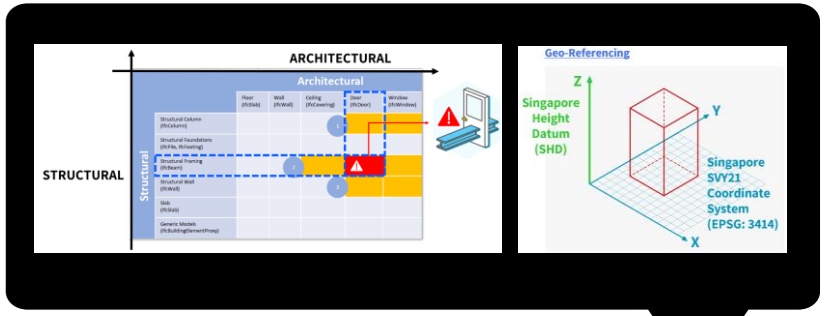
Note: Each RABW requirement in Section 3 is complemented by common components from the BIM Model (where relevant)

Section 4: Typical Components in a Project ("Identified Components")

- What does a BIM component need to contain / look like, in order to satisfy agency's regulatory requirements?

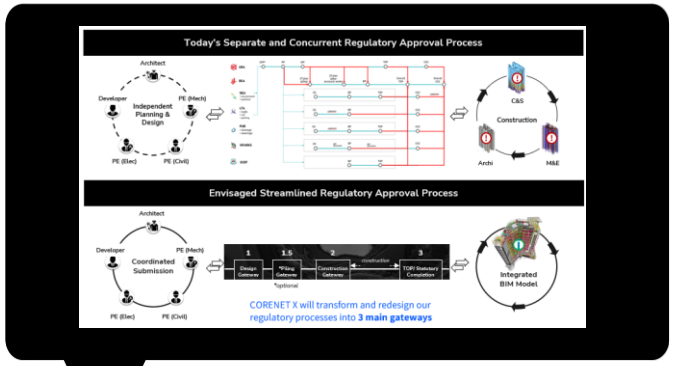
Section 4: BIM Data Representation

"I understand the general requirements and preparation required as a team for a coordinated CX submission"



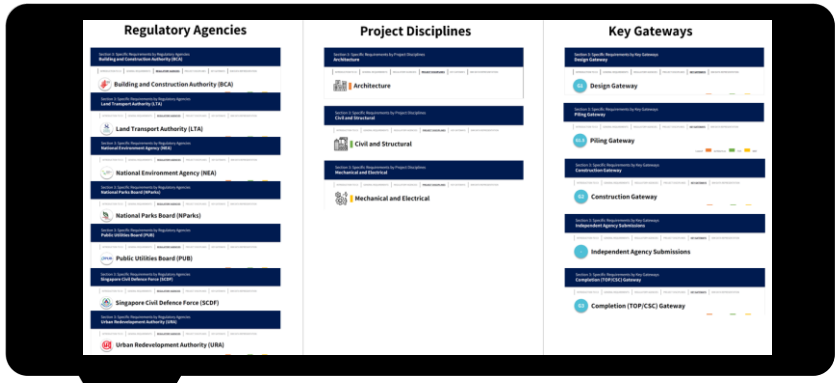
Section 2

"I understand the key impetus for change that CX seeks to bring forth"



Section 1

"I understand the new RABW requirements for compliance"



Section 3

Andy
Architect

Cindy
C&S Engineer

Martin
M&E Engineer

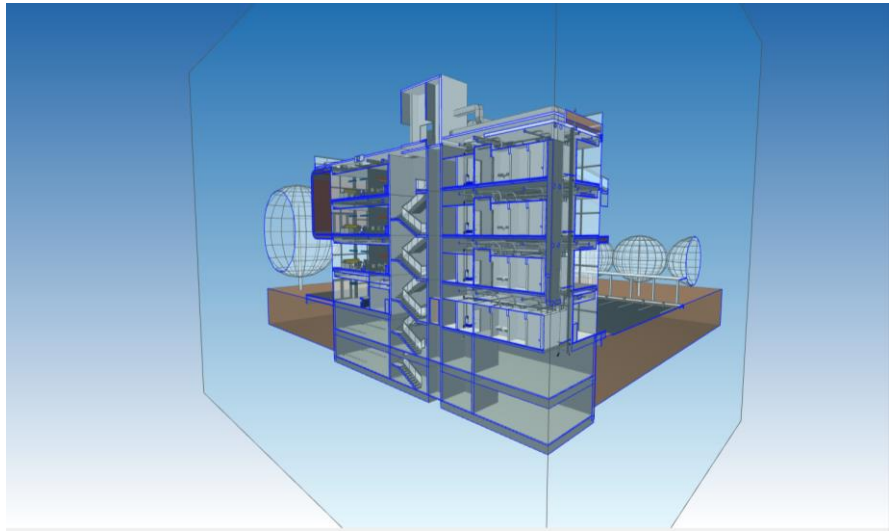
Section 4: BIM Data Representation

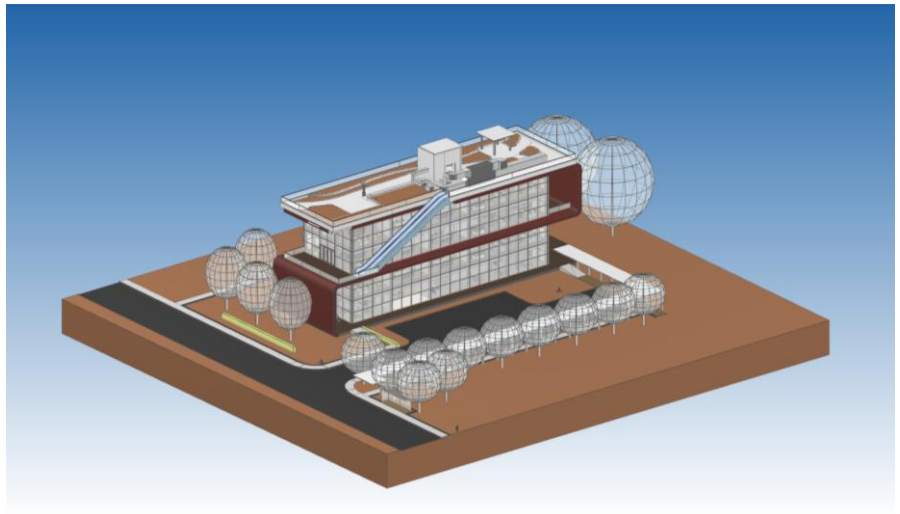
We now want to know how it should be represented in the BIM model for compliance

Andy
Architect

Cindy
C&S Engineer

Martin
M&E Engineer

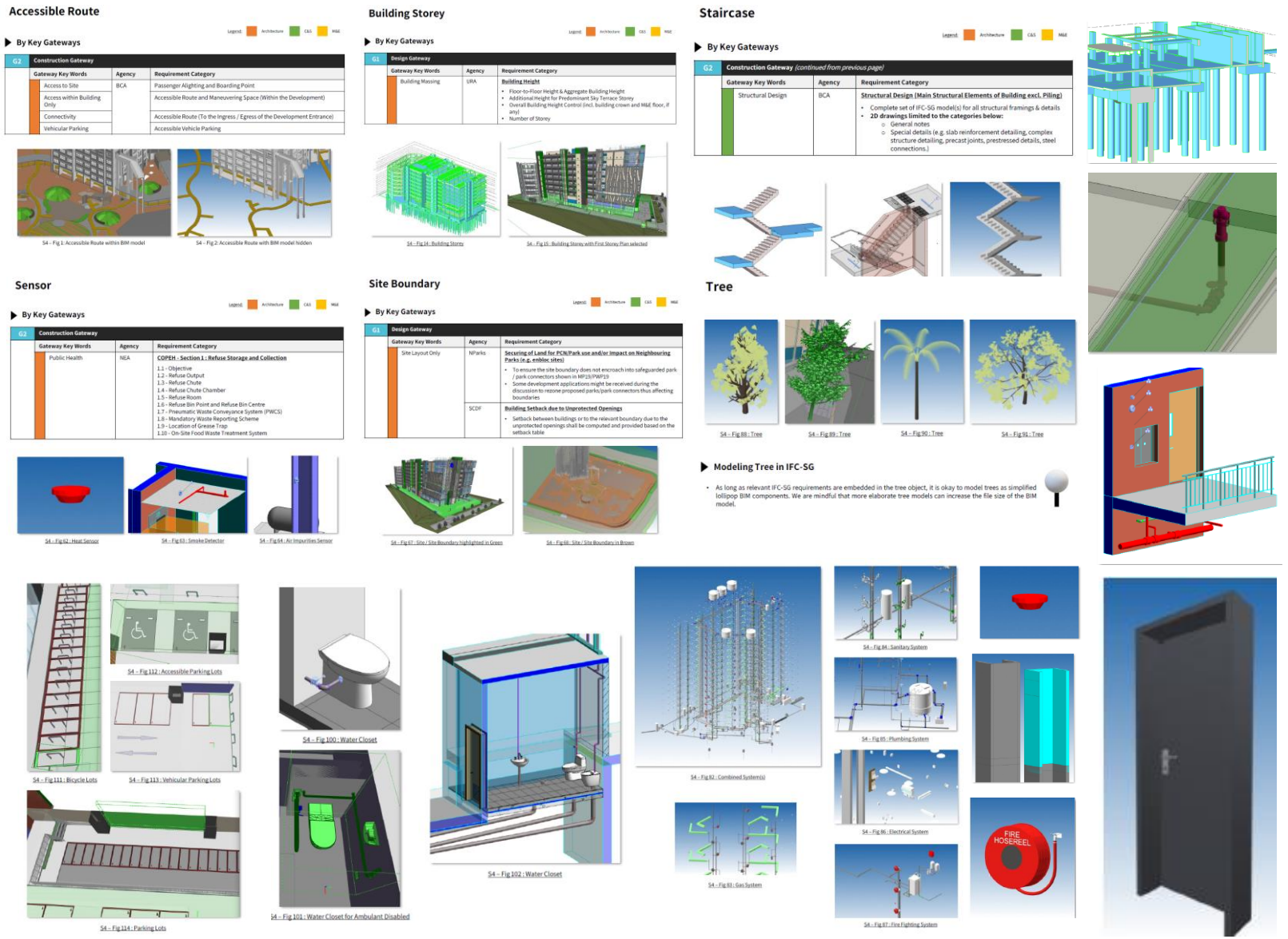




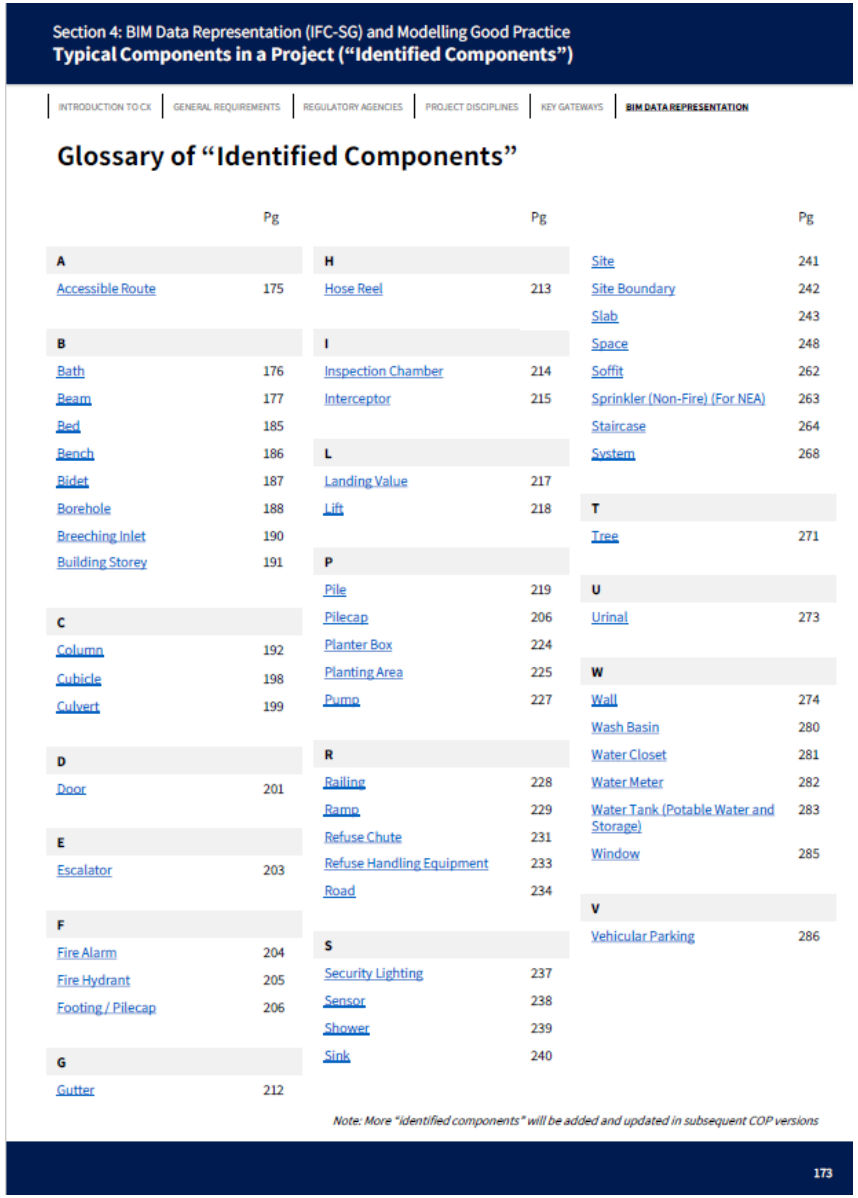
Section 4: BIM Data Representation

Identified Components

- ✓ Also known as “BIM Objects”, “Project Elements”
- ✓ List in the Draft COP is **not exhaustive**. More identified components will be added progressively.



Section 4: Glossary of Identified Components



Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice
Typical Components in a Project ("Identified Components")

INTRODUCTION TO CX | GENERAL REQUIREMENTS | REGULATORY AGENCIES | PROJECT DISCIPLINES | KEY GATEWAYS | BIM DATA REPRESENTATION

Glossary of "Identified Components"

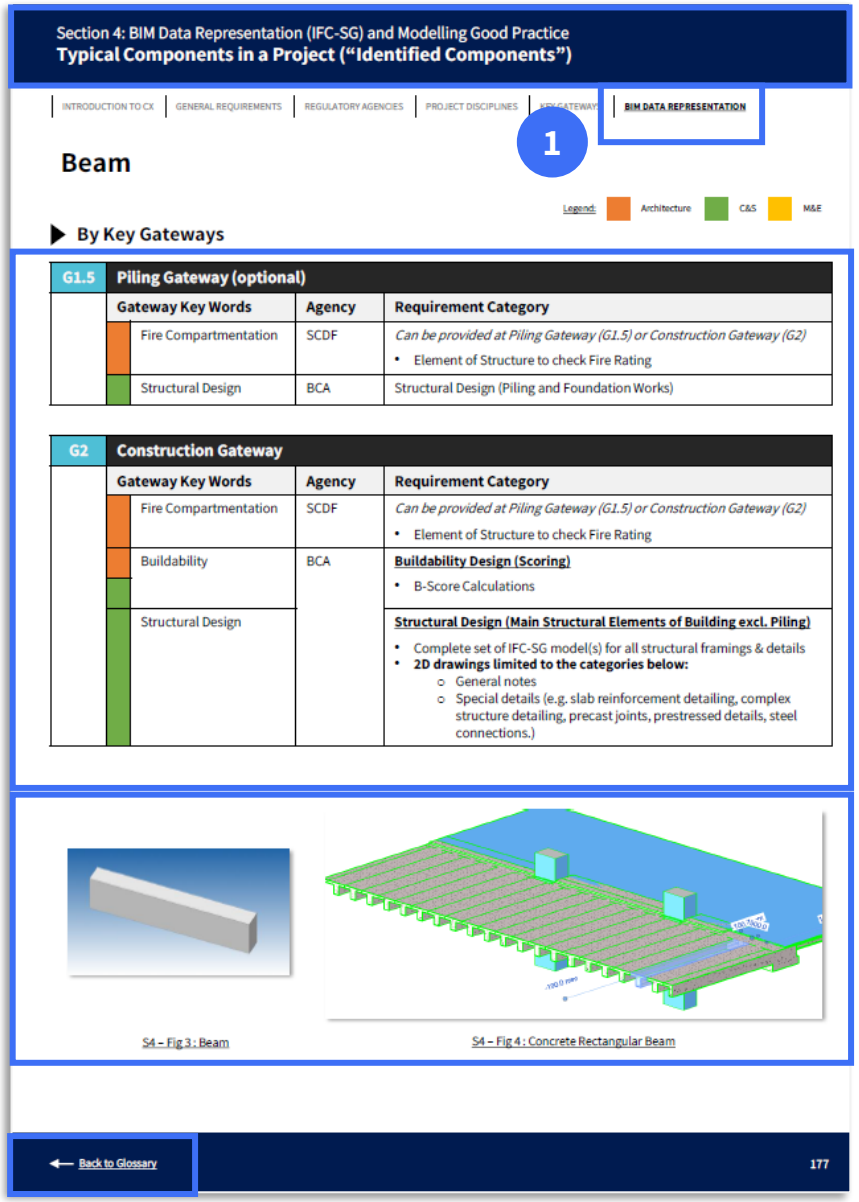
	Pg
A	
Accessible Route	175
B	
Bath	176
Beam	177
Bed	185
Bench	186
Bidet	187
Borehole	188
Breeching Inlet	190
Building Storey	191
C	
Column	192
Cubicle	198
Culvert	199
D	
Door	201
E	
Escalator	203
F	
Fire Alarm	204
Fire Hydrant	205
Footing / Pilecap	206
G	
Gutter	212
H	
Hose Reel	213
I	
Inspection Chamber	214
Interceptor	215
L	
Landing Value	217
Lift	218
P	
Pile	219
Pilecap	206
Planter Box	224
Planting Area	225
Pump	227
R	
Railing	228
Ramp	229
Refuse Chute	231
Refuse Handling Equipment	233
Road	234
S	
Security Lighting	237
Sensor	238
Shower	239
Sink	240
Site	241
Site Boundary	242
Slab	243
Space	248
Soffit	262
Sprinkler (Non-Fire) (For NEA)	263
Staircase	264
System	268
T	
Tree	271
U	
Urinal	273
W	
Wall	274
Wash Basin	280
Water Closet	281
Water Meter	282
Water Tank (Potable Water and Storage)	283
Window	285
V	
Vehicular Parking	286

Note: More "identified components" will be added and updated in subsequent COP versions

173

	Pg
A	
Accessible Route	175
B	
Bath	176
Beam	177
Bed	185
Bench	186
Bidet	187
Borehole	188
Breeching Inlet	190
Building Storey	191
C	
Column	192
Cubicle	198
Culvert	199
T	
Tree	271
U	
Urinal	273
W	
Wall	274
Wash Basin	280
Water Closet	281
Water Meter	282
Water Tank (Potable Water and Storage)	283
Window	285
V	
Vehicular Parking	286

Section 4 Case Example: Beam

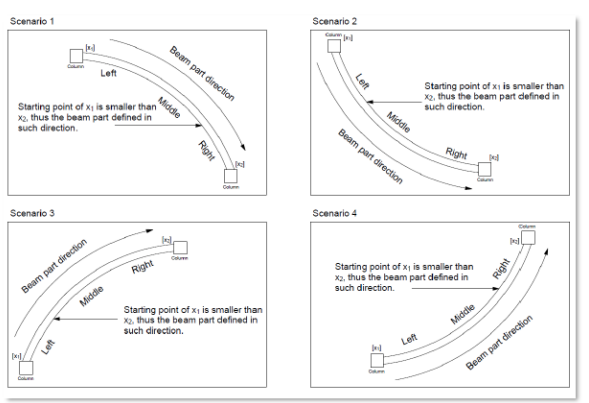


I want to understand how to model a "Beam" in my Native BIM software to satisfy IFC-SG requirements for CX submission

1. Go to Section 4: BIM Data Representation (IFC-SG) and Modelling Good Practice
2. Find out the Gateways, Agency and Requirements. These are replicated from earlier sections for ease of reference. In this case, "Beam" is required in Piling Gateway (G1.5) or Construction Gateway (G2) and is checked by BCA and SCDF.
3. Find out the recommended "Beam" modelling representation or good practice. As mentioned, QPs may model or represent in greater detail.
4. Clickable Hyperlink if one wishes to go back to the full glossary of "Identified Components".

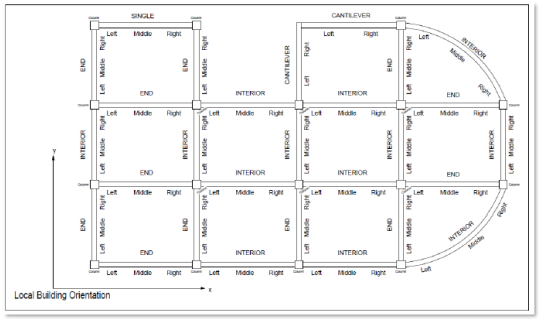
Section 4 Case Example: Beam

Beam Property Definition	
1	Every beam will be detailed based on 3 parts (left, middle & right) in accordance to its local building axis orientation (refer to Figure 5 below).
2	Starting point of a beam should be the smallest x coordinate of local building axis orientation in a span and denoted as left part of a beam.
3	Behaviour of the beam (single, end, interior & cantilever span) shall be indicated in the parameters called "BeamSpanType". Limitation of inputs for this parameter is applied. Please refer to list of input.

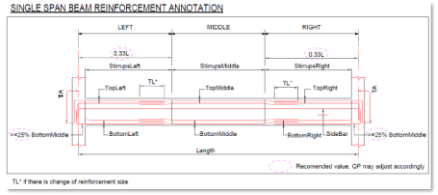


S4 – Fig 5 : Beam Part Definition

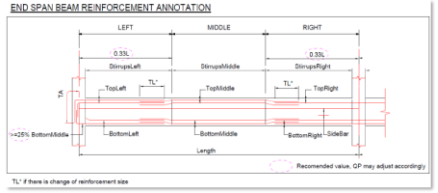
▶ **Beam Property Definition** (continued from previous page)

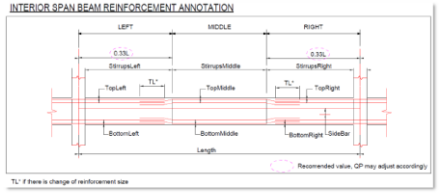


S4 – Fig 6 : Beam Sequencing and Span Definition

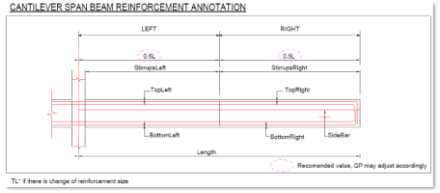


S4 – Fig 7: Beam Annotation Single Span





S4 – Fig 9 : Beam Annotation Interior Span



S4 – Fig 10 : Beam Annotation Cantilever Span

Beam Reinforcement Definition	
1	A set of typical beam reinforcement annotation is provided for reference.
2	QP may provide a set of 2D typical drawings to present typical beam reinforcement annotation based on the standardised IFC-SG parameter names.
3	The input for TopLeft, TopMiddle, TopRight, BottomLeft, BottomMiddle & BottomRight shall be "XXHXX" while "H" is a must, 1st XX is number of longitudinal reinforcement & 2nd XX is the reinforcement diameter • Use '+' for more than 1 layer of reinforcement (e.g. 12H32+6H20) Longitudinal reinforcement diameter XXHXX Number of longitudinal reinforcement

Beam Reinforcement Definition	
4	The input for StirrupsLeft, StirrupsMiddle & StirrupsRight shall be "XXHXX-XXX" while "H" is a must, 1st XX is number of legs for transverse reinforcement, 2nd XX is the reinforcement diameters and XXX is the spacing of transverse reinforcement • Use '+' for more than 1 layer of reinforcement (e.g. 4H10-100 : [4 denotes 4 legs]) Transverse reinforcement diameter XXHXX-XXX Spacing of transverse reinforcement Number of legs for transverse reinforcement
5	Type of the beam stirrups (Normal link, U-link, C-link or torsion link) shall be indicated in the parameters called "StirrupType" based on beam part. Limitation of inputs for this parameter is applied. Please refer to list of input.

✓ Definitions and Diagrams to help the layman understand representation of a component in IFC-SG

Section 4 Case Example: Beam

Example of Beam (Steel Beam) Structural Element Input

Steel Beam (UC254x254x63kg/m Steel Beam)

- Mark – SB1
- Steel Grade S355 Hot Rolled
- Cantilever Span
- Fixed Connection to column at right part (Typical connection of SB1 to C1)

IFC Entity: IfcBeam

IFC USER-DEFINED SubType: N.A.

S/N	IFC-SG Property	Examples
1	BeamSpanType	Cantilever
2	ConstructionMethod	PF
3	SectionFabricationMethod	Hot Rolled
4	Mark	SB1
5	MemberSection	UC254x254x63kg/m
6	MaterialGrade	S355
7	LeftConnectionDetail	-
8	LeftConnectionType	Free
9	RightConnectionDetail	Typical connection of SB1 to C1 on dwg 19588-ST-DT-3
10	RightConnectionType	Fixed

✓ Examples to further guide readers on specific IFC-SG parameters

corenetX

Code of Practice (COP) Webinar

15 JUNE 2023

What's Next ?

COP as part of CORENET X Training

RABW Training

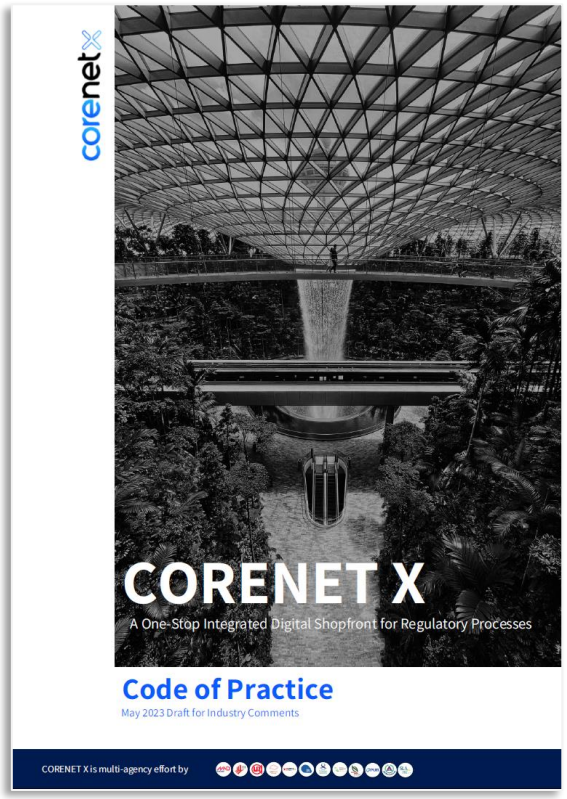
Introduction to the Regulatory Approval Process via CORENET X

First run conducted on 05 May ’23

- ✓ WHY the key gateways are made in such a way
- ✓ Case studies on HOW a firm goes through the Design Gateway and Construction Gateway

WHAT are the details of 2D and 3D content needed in each RABW gateway

Understand the RABW outcomes in order to understand the requirements in the COP



How an IFC-SG BIM modelling component (e.g. slab, refuse chute) matters during a CX submission, in which particular gateway, to obtain what approval / compliance

Submission-related info

IFC-SG Training (Technical)

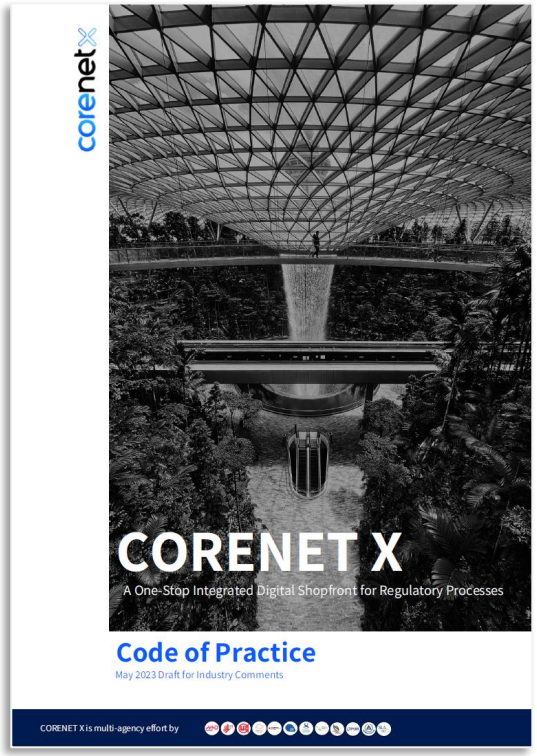
1-day course conducted by AcePLP, BIMAGE Consulting, Graphisoft

Kick-started since Aug ‘22

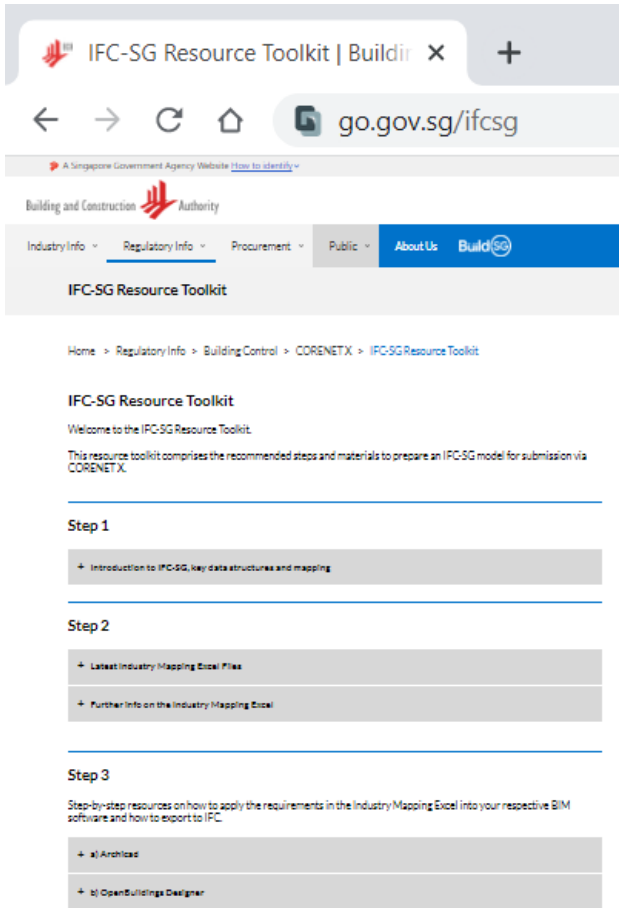
- ✓ Step-Sy-Step Modelling Guidance using Revit/ArchiCAD/Tekla
- ✓ How to read IFC-SG mapping requirements, creating the data in BIM software and exporting it into IFC successfully

Using COP together with the IFC-SG Resource Kit

Process & Information Required for each CORENET X Submission



BIM Templates to Embed Information for IFC-SG Models



https://go.gov.sg/ifcsg

We Welcome Industry Feedback

https://go.gov.sg/cx-cop-comments

https://go.gov.sg/cx-cop-comments

- Missing / More details for agency requirements in Sections 3 and 4
- New additions and adjustments to Sections 3 and 4
- Accuracy in indication of project disciplines in Section 3
- Virtual / Printable Version / Multiple Booklets for easier access
- Why / How / When to Use the COP
- CORENET X Queries
- Training

corenetX

Code of Practice (COP) Webinar

15 JUNE 2023

Thank you.