



CORENET X AND GUIDE FOR STRUCTURAL SUBMISSION

By:

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Section 1: Working Together to Prepare Industry Professionals for CORENET X

1. Overview of CORENET X
2. Key Changes and Potential Impact
3. Phased Approach to Onboard Industry
4. Preparing the Industry for CORENET X

Section 2: Getting Ready for Structural Submission through CORENET X

1. Overview of Structural Submission under CORENET X
2. Structural Submission Details and Procedure
3. Preparing Structural Model in IFC-SG
4. FAQ



Section 1: Working Together to Prepare Industry Professionals for CORENET X

Yin Zili,
CORENET X Project Office



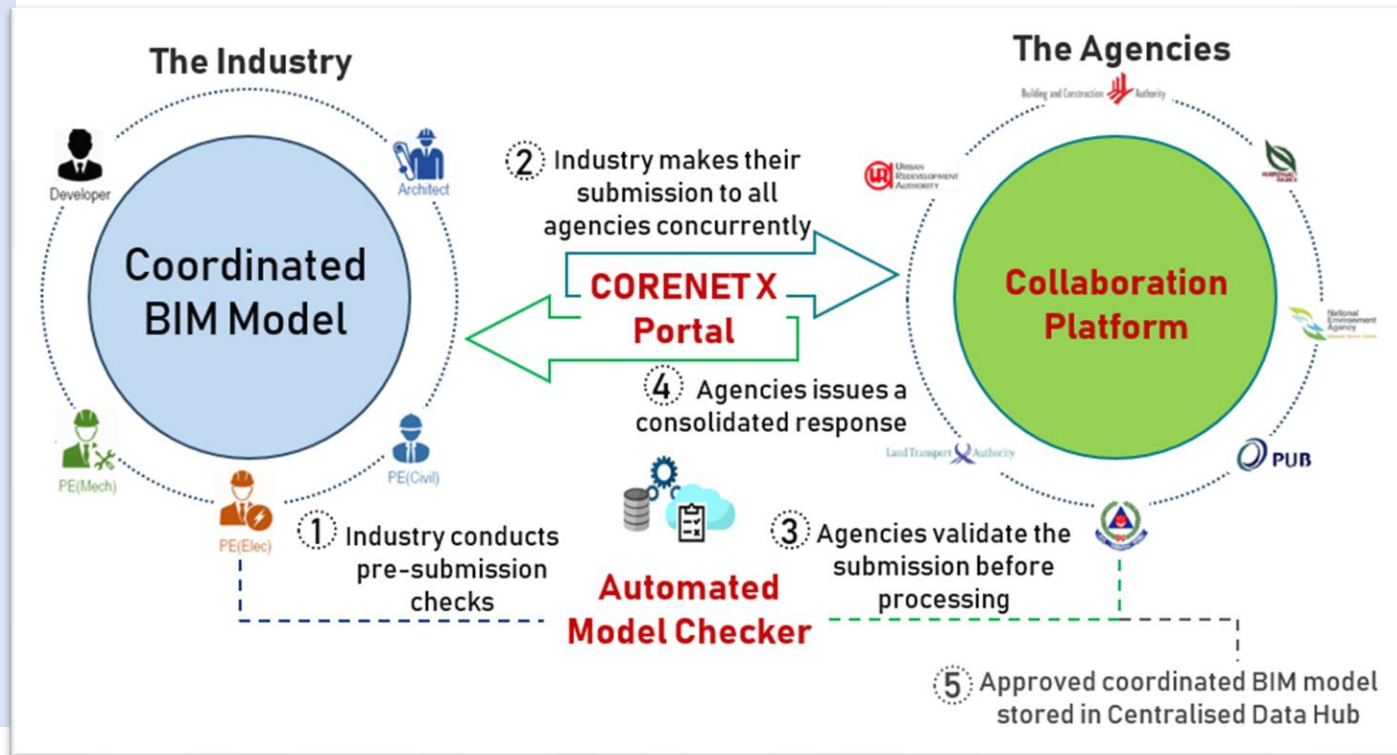
1. Overview of CORENET X

Vision: A Future Ecosystem of Regulatory Approval of Building Works that Accelerates The Transformation of the Construction Industry

FIRST IN THE WORLD One-Stop Integrated Digital Shopfront

TRANSFORMATION of INDUSTRY

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



TRANSFORMATION of REGULATORY AGENCIES

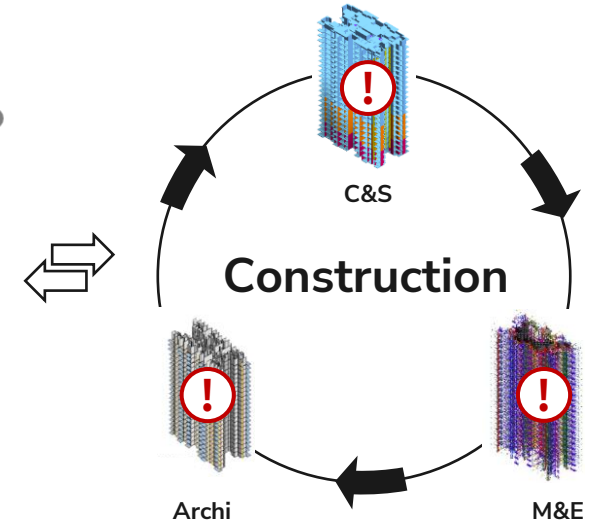
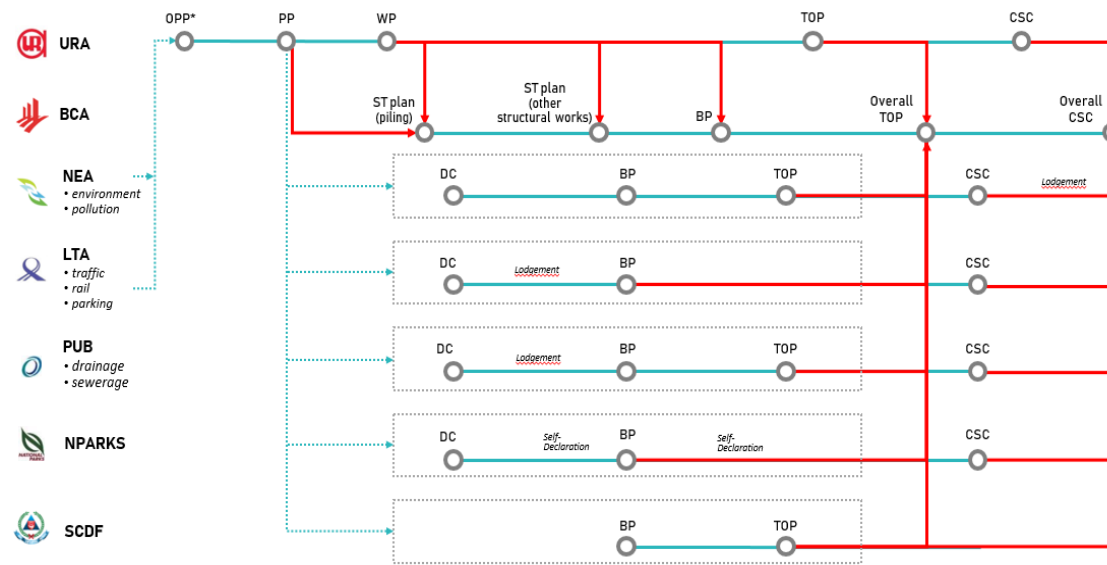
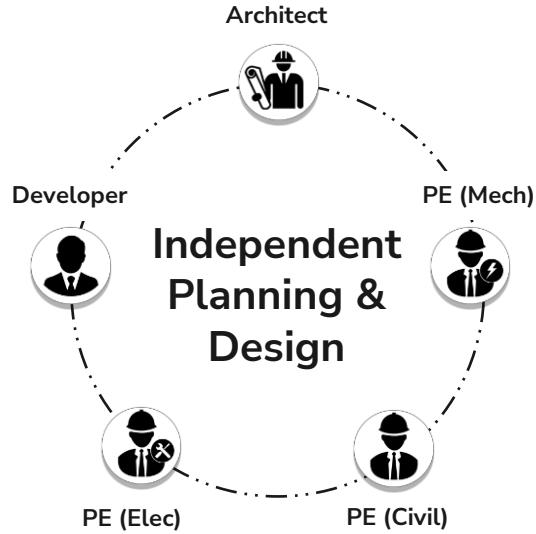
- Reduce silos, iterations & condense touchpoints
- Embrace collaboration & raise productivity amidst rising demands
- Improve accessibility & centralise information towards a Single Source of Truth

¹ IDD is the use of digital technologies to integrate work processes and connect stakeholders working on the same project throughout the construction and building life-cycle

² DfMA is a continuum of various technologies and methodologies that promote offsite fabrication from prefabricated components to fully integrated assemblies across the structural, architectural and Mechanical/ Electrical disciplines.

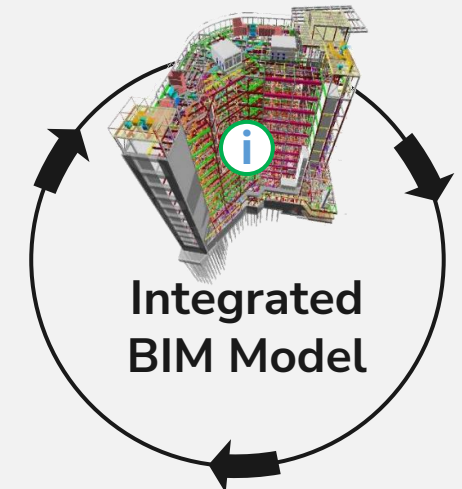
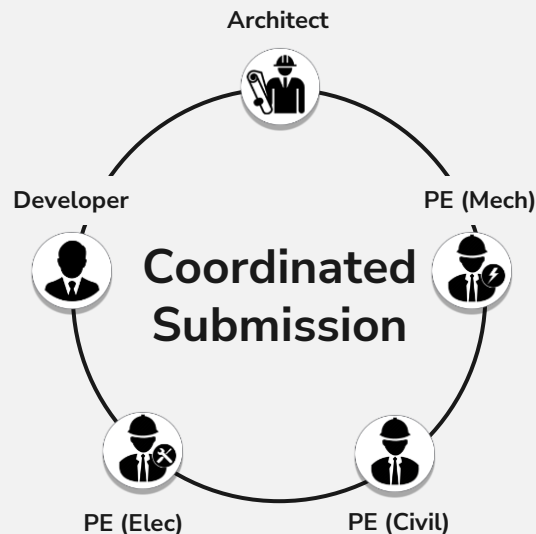
2. Key Changes and Potential Impact – New Regulatory Gateway

Today's Separate and Concurrent Regulatory Approval Process



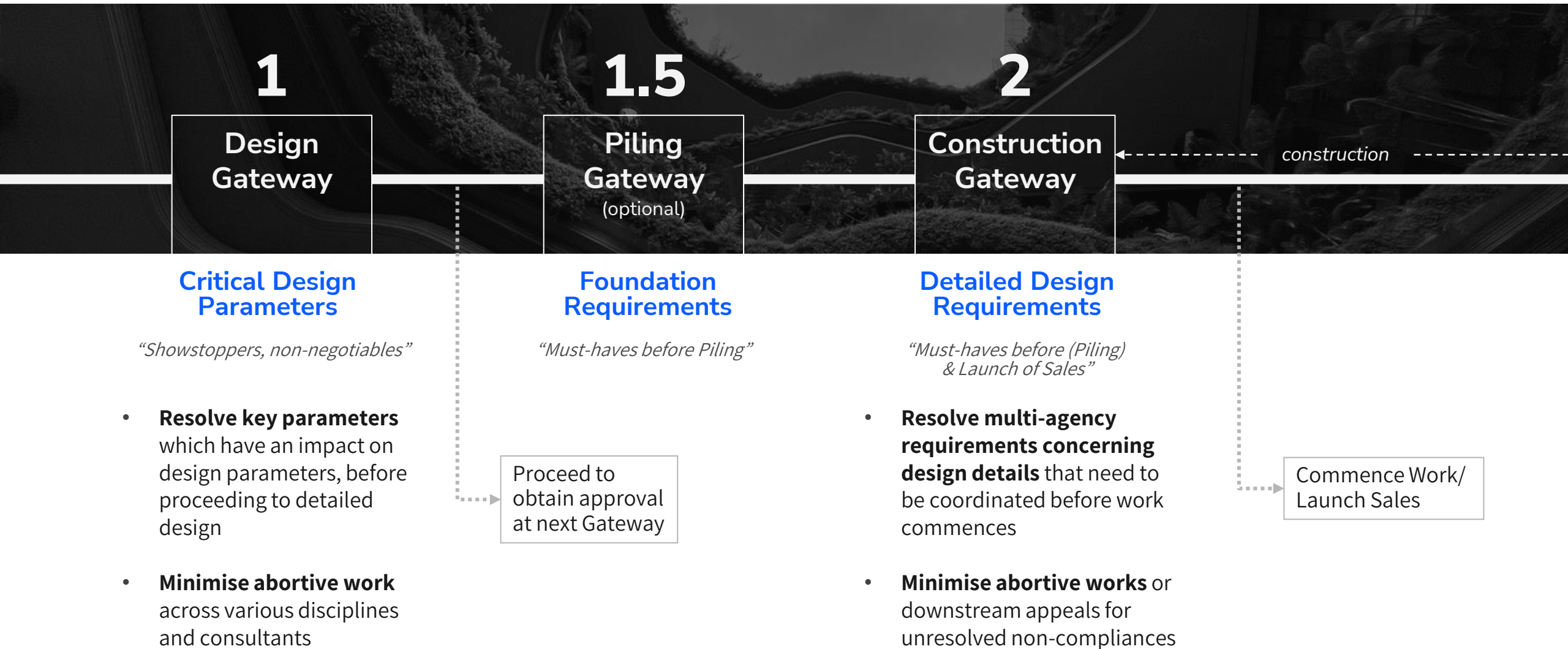
V.S.

Envisaged Streamlined Regulatory Approval Process



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

2. Key Changes and Potential Impact – New Regulatory Gateway



2. Key Changes and Potential Impact – New Regulatory Gateway



Occupation Permit/ Statutory Completion

Completion & Compliance to Approved Design

All other Requirements

Independent (agency specific) technical requirements

- Check for **compliance of specialist details**
- **Expedite clearance of agency-exclusive requirements** from various disciplines and consultants

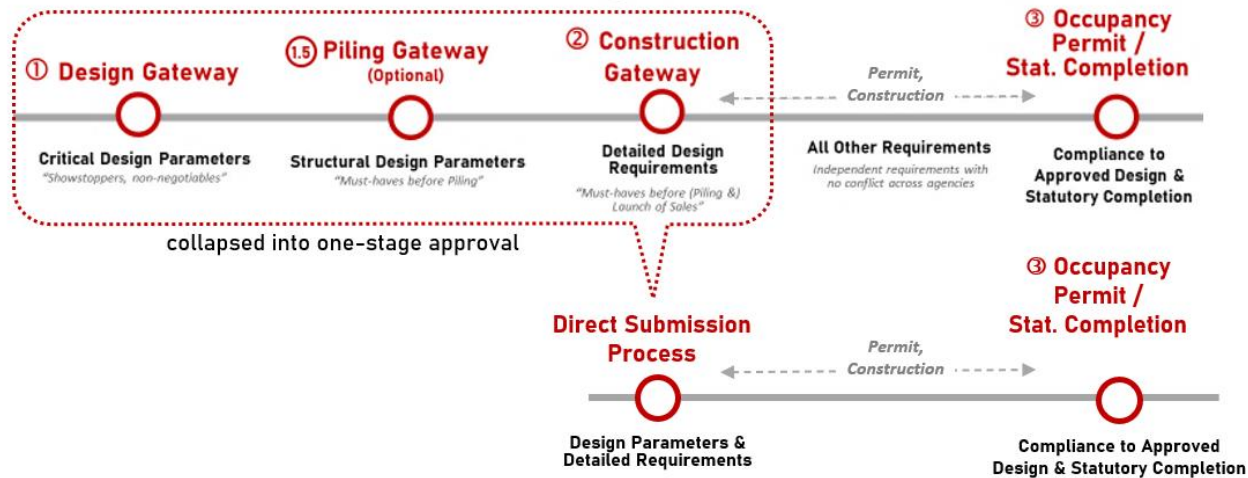
Start building respective component

- Site inspection to ensure building works are **constructed as per approved plans and comply with requirements**
- **Ensure completed building is fit for occupation**

Start occupation and obtain statutory completion

2. Key Changes and Potential Impact – New Regulatory Gateway

Direct Submission Process: Differentiated approach for less complex building works that need not be subjected to the typical 3-Gateway process

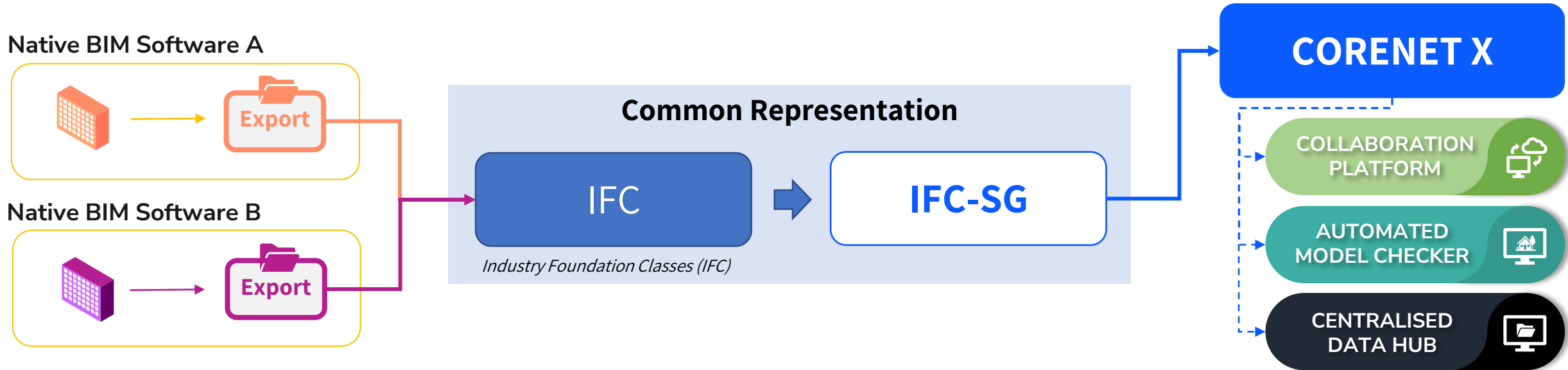


Examples of eligible type of building works: single-unit residential landed development, standalone pavilion/ linkway/ racking system)

- Developing a single stage approval prior to TOP/CSC, instead of multiple touchpoints at Design Gateway, Piling Gateway (optional) and Construction Gateway.
- Rationalising and consolidating existing Lodgement, Self-declaration and Simplified Submission schemes.

2. Key Changes and Potential Impact – Submission of OpenBIM Format

IFC-SG: An OpenBIM format customised for local context



01

Non-Standard Format

- Multiple solutions/ systems needed to process different formats
- Increased costs and maintenance
- Does not fully cater to gov regulatory requirements

02

IFC

- ISO standard specifications for digital construction info
- Enables info exchange in a consistent and repeatable way

03

IFC-SG

- Adapting IFC to **cater for local Regulatory Requirements**
- Leverage existing eco-system acceptance and support

04

IFC-SG in CX

- **Localised information of interest**
- Supports CP and AMC

3. Phased Approach to Onboard Industry

*Soft launch
Dec 2023*

1

Transitional period

- Soft launch in Dec 2023
- Submissions on a voluntary basis
- Allow the industry to familiarise with the new platform and processes

1H 2025

2

Mandatory submission for new projects

1H 2026

3

Onboarding of ongoing projects



4. Preparing the Industry for CORENET X

1 Learning Phase

Equip industry with basic skills

- **Self-help resources and step-by-step videos** on how to prepare a CX submission
- **Training courses**
 - **1-day IFC-SG training** on creating an IFC submission
 - **1-day RABW training** on the new approval process with case study
- **Funding support**
 - New package under Productivity Solutions Grant (PSG) – up to 50% funding support for qualifying digital solutions and training programmes



Self-help Resources & Basic CX Training

Guide & tools for industry in preparation of submissions

2 Practising Phase



Code of Practice

- Provide **clarity in CX submission requirements** for all agencies across every gateway

May 2023 Draft released for industry feedback

Q3 2023 Official release of Version 1



IFC-SG Tools

- IFC-SG Validator to help industry to validate the completeness of the IFC-SG model content
- Worked with BIM software vendors to develop additional IFC-SG tools

3 Troubleshoot

Provide support channels



Clinics/ Tutorials

Partner with training providers to provide clinics/ tutorials to assist and hand-hold



Helpdesk

- Provide frontline support, manage queries, issues and feedback from industry
- Track cases and issues to ensure follow-up actions are carried out promptly

Thank you!



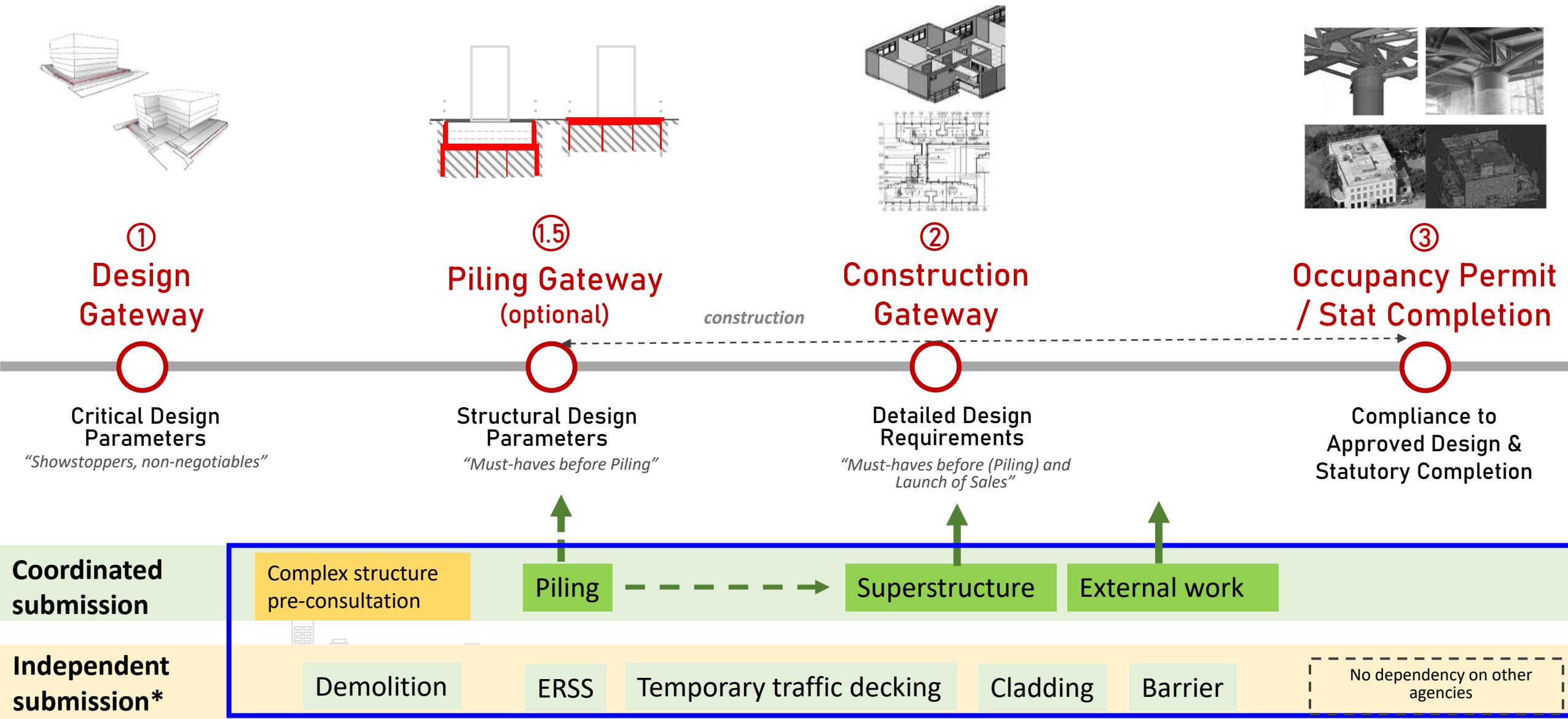
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Section 2: Getting Ready for Structural Submission

Er. Lee Xuan Yen,
Policy & Regulation Department



Key Principles of CX Gateway Approval Process



(*can be submitted any time after design gateway or DSP and before Completion gateway)

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Scope of submission for project members (Structural)



Main Qualified Person (QP)

- Respective QPs* or their delegated assistants **apply** for plan approval in CORENET X Industry Portal (web portal) & **upload** the followings:
 - IFC-SG models
 - QP design calculation reports
 - Other supporting documents & supplementary 2D drawings
- The respective QPs are to **make declaration personally** on the web portal

*QPs of different disciplines are responsible for uploading their own models.



AC/QP(Geo)/AC(Geo)

Upload the followings thru web portal:

- Submit AC/QP(Geo)/AC(Geo) design calculation reports & checklist
- Attached other supporting documents (if any)

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Roles and responsibility of project members (Structural)

Permit Submission workflow

Qualified Person (QP)



- Apply for permit to commence structural works
- Register the appointment of resident site supervisor(s)
 - Update of site supervisor(s) if necessary

Select submission

Only applicable submissions will be made available for selection

Submission category

Permit application (to carry out works)

Agency

Building & Construction Authority (BCA)

Submission

Permit to carry out structural works

Application for

ES20231010-00100-JS01R00 (Full demolition application)

ES20231010-00100-JS01R00 (Full demolition application)

ES20230111-00003-PG01R00 (Plan application (Piling Gateway))

ES20230401-002103-CG01R00 (Plan application (Construction Gateway))

Indicate submission details

Complete the following details

QP for supervision of Geotechnical Building Works for this submission

ONG MENG HUAT - 2013 (Specialist Professional Engineer(Geotechnical))

Licensed Builder for this worksite

ABC CONSTRUCTION PTE LTD - U1231241N (Licensed Builder)

Supervision of works

Appointed project party will supervise the structural works

RE/RTO will be the site supervisor

RE/RTO selected from the list below will be notified to complete declaration as a site supervisor(s). If RE/RTO is not in the list, please add them as a project member.

[Add member](#)

RE/RTO

Please select

TAN SEW PENG - RE-2781 (Resident Engineer)

JASON PONG - RTO-3268 (Resident Technical Officer)

Declaration under Building Control Act and its Regulations

I declare that:

- ✓ The information contained in the forms, documents, drawings and plans which are submitted for this application are true and correct in all material particulars
- ✓ The building plans do not deviate from the plans submitted to the rest of the regulatory agencies in this joint submission

I confirm that I have been appointed under section 8(1)(a) of the Act as the qualified person in respect of the building works herein describe. I certify that the building works shown in the plans submitted with this application are in accordance with the Act and the building regulations, subject to such waiver/modification granted under section 6A of the Act.

I certify that the building works as shown in the plans submitted with this application have been designed in accordance with the "Technical Requirements for Household or Storey Shelters" subject to such waiver granted by SCDF under Civil Defence Shelter Act.

I confirm that only approved blast doors, fragmentation plates and ventilation sleeves will be installed for HS/SS.

Declaration by

Name	Thomas Chu
Role	Professional Engineer (Structural)
Registration	2351
NRIC/FIN no.272K

DATE

1 April 2022

[Cancel](#)

[Declare and Submit](#)

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Roles and responsibility of project members (Structural)

Permit Submission workflow

Builder/Specialist Builder(s)



Email subject
CORENET X: You have been added to project A7654-32100-2022



John Doe, you have been added to project A7654-32100-2022

You have been added to this project by the project coordinator or his/her assistant. To access the project, please confirm your addition to the project.

If you are a business user, please login using Singpass Business for your firm.

Upon confirmation, you will be formally added to the project in CORENET X and could view the project details.

[Confirm addition](#)

Resident site supervisor(s)



Project details

PROJECT REFERENCE NO.
A7654-32100-2022

PROJECT TITLE
Proposed additions and alterations to basement 1, 1st to 3rd storey of existing Knightsbridge building on lots 01007W, 01325T, 01322W, 01323V, TS27 At 270 Orchard road

This is a computer generated email. If you need help or have questions, please [contact us](#).

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All project parties will need to use SingPass to acknowledge appointment for CORENET X, including RE/RTO. SingPass (Business) is the preferred login mechanism.

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Structural submission package

Scope of structural works in Piling Gateway (Optional*)

Works affecting **Permanent Structures**



LTA's Approval in-principle (AIP) for Pile Design and Pile Layout Plan (only within Railway Protection Zone)



BCA's Approvals for Piling & relevant Substructure Works

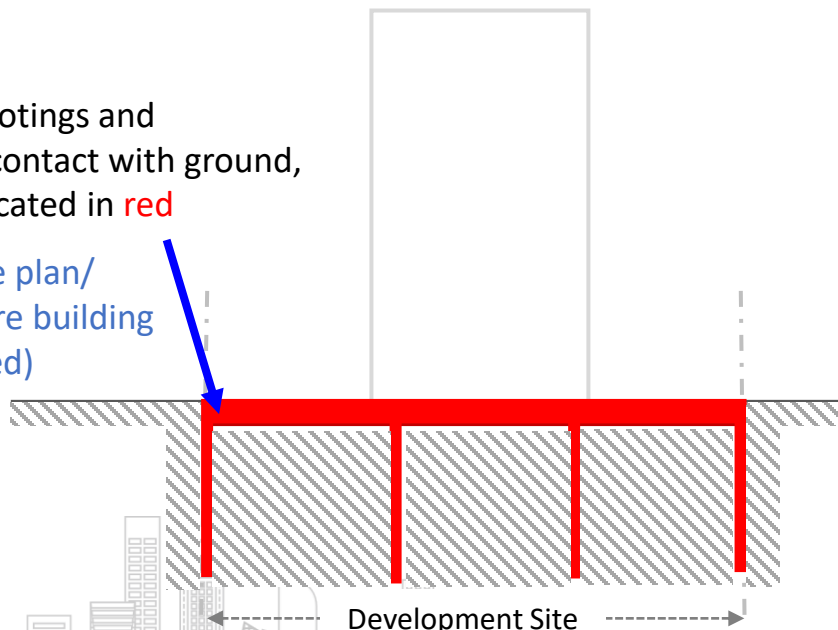
**QPs are to assess the risk involved when opting for piling gateway before superstructure is approved.*

Piling Gateway is deemed to be cleared when all these clearances are obtained as a package

Conventional foundation system

Piling, pilecap/ footings and substructures in contact with ground, i.e. Elements indicated in **red**

(a set of reference plan/ model of the entire building should be provided)



- The Piling Gateway clearance pertains to the design of permanent piling and substructure works (that do not affect internal layout), where its **clearance is for design approval and not for commencement of works**
- Other site works (e.g. for site clearance, temporary protection, etc), which do not form part of the permanent structures but still require agencies' clearances, can be cleared in parallel and need not be tied to the Piling Gateway approval

❖ Column starter bars can be included

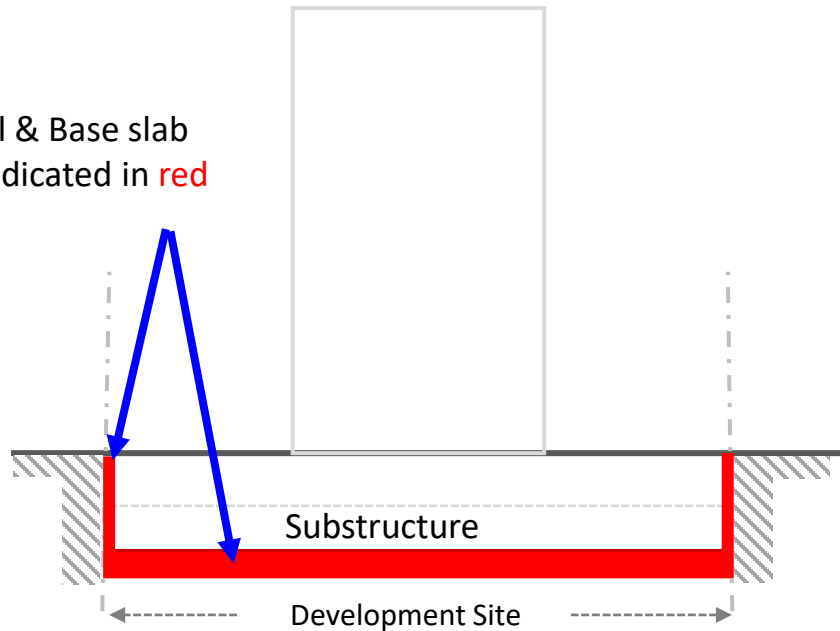
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Structural submission package

Scope of structural works in Piling Gateway

Bottom up Construction & Foundation

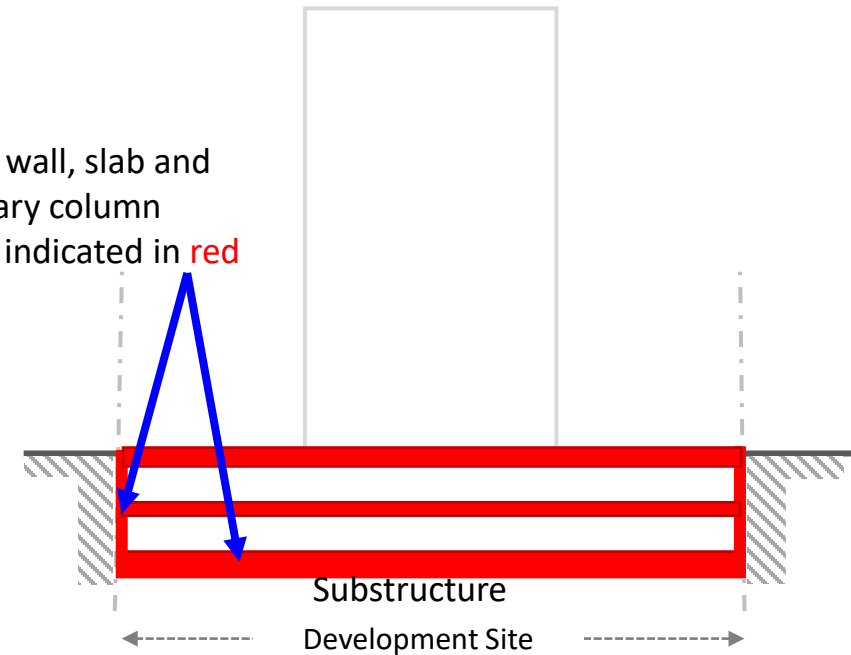
Diaphragm wall & Base slab
i.e. Elements indicated in red



- ❖ Column starter bars can be included

Top down Construction & Foundation

Diaphragm wall, slab and temporary column
i.e. Elements indicated in red



- ❖ Any temporary structures to support top down construction must be included.
- ❖ For any permanent structures required to be included, QPs must ensure their works will not lead to non-compliances later on (eg: circulation and headroom).

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Structural submission package

Structural submission package

S/N	Piling Gateway package	Construction Gateway package
1	Piling & Foundation Works IFC-SG model	Complete set of IFC-SG model(s) for all structural elements & details
2	2D drawings limited to the categories below: <ol style="list-style-type: none"> i. General notes ii. Irregular Pilecap/Footing details 	2D drawings limited to the categories below: <ol style="list-style-type: none"> i. General notes ii. Special details (e.g. slab reinforcement detailing, complex structure detailing, transfer plate detailing, irregular section detailing, precast joints, prestressed details, steel connections.)
3	Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed]	Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed]
4	Additional supporting documents: <ol style="list-style-type: none"> i. Site investigation report in pdf & AGS format ii. Impact assessment report iii. Topography iv. Relevant annex/forms 	Additional supporting documents: <ol style="list-style-type: none"> i. Site investigation report in pdf & AGS format ii. Impact assessment report iii. Topography iv. Relevant annex/forms
5	Complete set of structural framing plan for reference	Complete set of building plan submitted simultaneously
6	Complete set of building plan for reference	Completion letter of pre-consultation [for complex structure only]
7	Completion letter of pre-consultation [for complex structure only]	

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Structural submission package

Structural submission package

S/N	Completion Gateway package	Independent submission package
1	Complete set of As-Built IFC-SG model(s) for all structural elements & details	-
2	2D drawings limited to the categories below: <ol style="list-style-type: none"> i. General notes ii. Special details (e.g. slab reinforcement detailing, complex structure detailing, transfer plate detailing, irregular section detailing, precast joints, prestressed details, steel connections.) 	2D drawings with reference back to the coordinated model submitted by the main QP at the Construction Gateway
3	Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed]	Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed]
4	Additional supporting documents: <ol style="list-style-type: none"> i. Certificate of Supervision of Piling Works ii. Certificate of Supervision of Structural Works iii. Relevant annex/forms 	Additional supporting documents: <ol style="list-style-type: none"> i. Site investigation report in pdf & AGS format ii. Impact assessment report iii. Relevant annex/forms

All these submission package and requirements are stipulated in Code of Practice which published in BCA CORENET X Website.



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Structural submission package

Code of Practice



- **“When/What/How” to provide info for CORENET X submissions**
- **The Code of Practice provides the following:**
 - Overview of submission process
 - Overview of technological enablers
 - How to create, prepare and configure a model for IFC-SG submission
 - Information on submission requirements
- **Information on submission requirements are categorised by:**
 - Disciplines (Architecture, C&S, M&E)
 - Agency’s requirements
 - Gateways
 - Building aspects (e.g. structural design, materials etc.)
 - Components (e.g. staircase, road, tree etc.)

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

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Structural IFC-SG models

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:

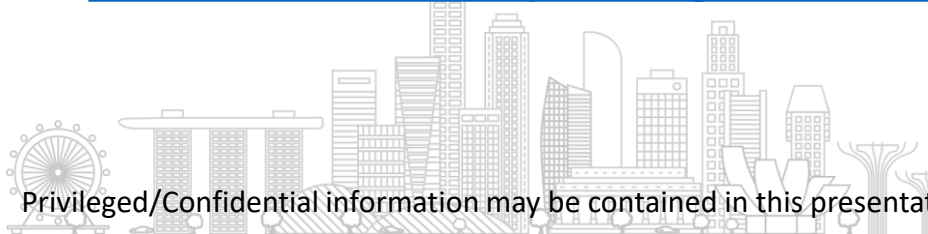
- ❖ Piles
- ❖ Footings/ pilecaps
- ❖ Beams
- ❖ Columns
- ❖ Walls
- ❖ Slabs
- ❖ Staircases
- ❖ Boreholes

- 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.

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

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

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

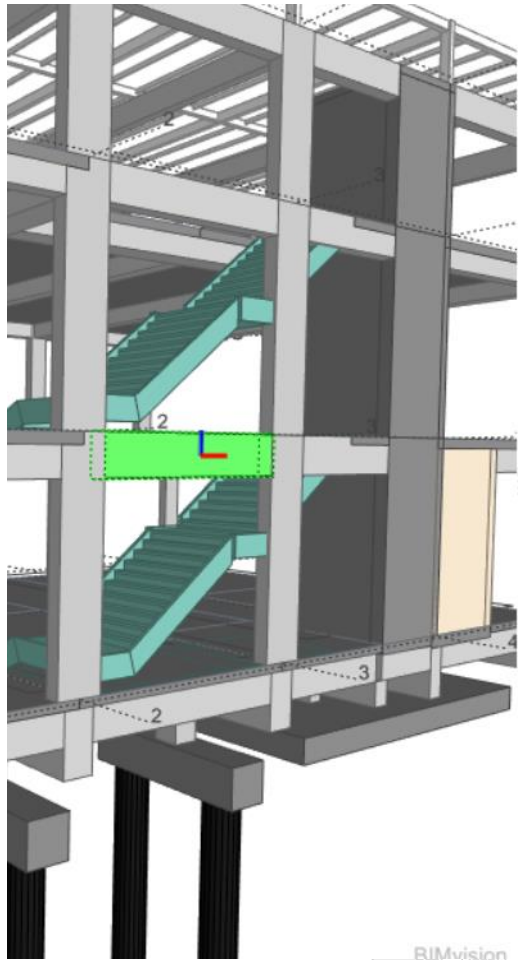


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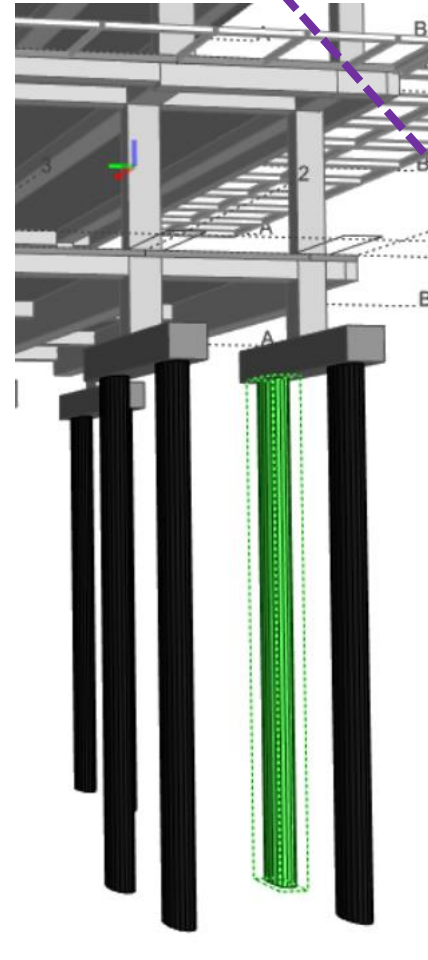
Structural IFC-SG models

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
SGPset_Beam	
BeamSpanType	Interior
ConstructionMethod	CIS
MaterialGrade	C32/40
ReinforcementSteelGrade	500B
SGPset_BeamDimension	
Depth	700
Mark	2B11-3
Width	200
SGPset_BeamReinforcement	
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
SGPset_Material	



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
SGPset_Material	
MaterialGrade	C32/40
SGPset_Pile	
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
SGPset_PileDimension	
CutOffLevel_SHD	-2.725
Diameter	600
Length	12 500
Mark	PC5-2
SGPset_PileReinforcement	
MainRebar	6H20
PileType	Bored
ReinforcementLength	12
Stirrups	H10-300
SGPset_PileStructuralLoad	

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Industry's Frequent Ask Questions

Pre-consultation on structural concept



When should the project team to seek BCA pre-consultation for the structural framing for the complex structure project?

The project consists of multiple blocks of residential developments, how can the project team plans for the submission?

- Pre-submission consultation of structural concept on structural works involving complex building needs to be carried out during/after Design Gateway (G1) but prior to Piling Gateway (G1.5) or Construction Gateway (G2)
- For large developments (e.g. iconic developments, >10 blocks residential developments and etc) that need to arrange their projects into different packages, the project team can carry out a pre-submission consultation to seek agencies' concurrence for the proposal

HOW TO



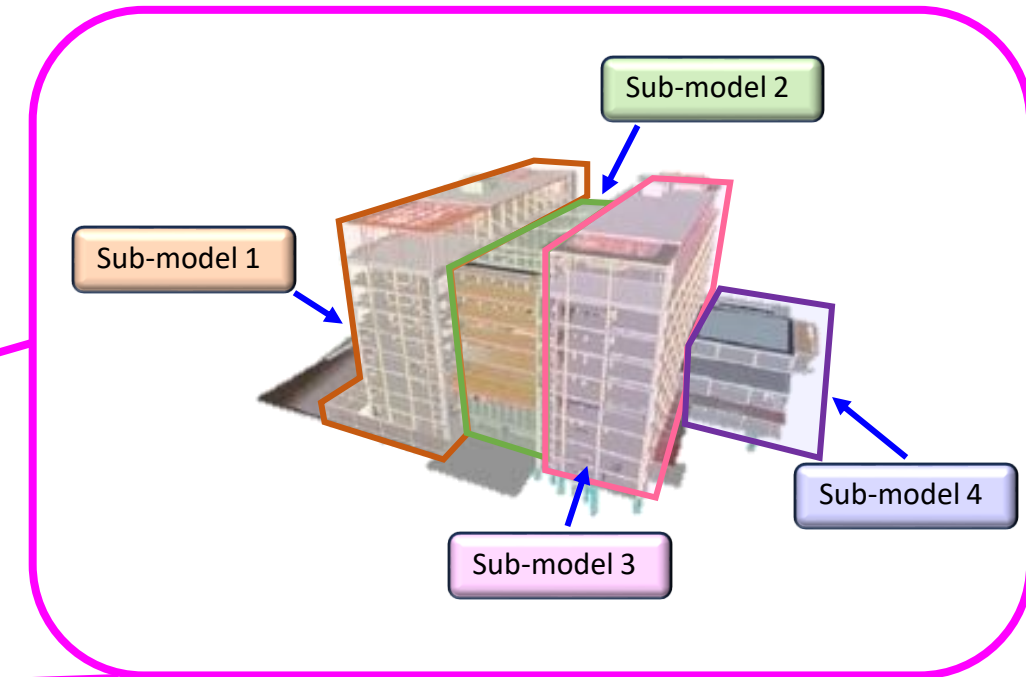
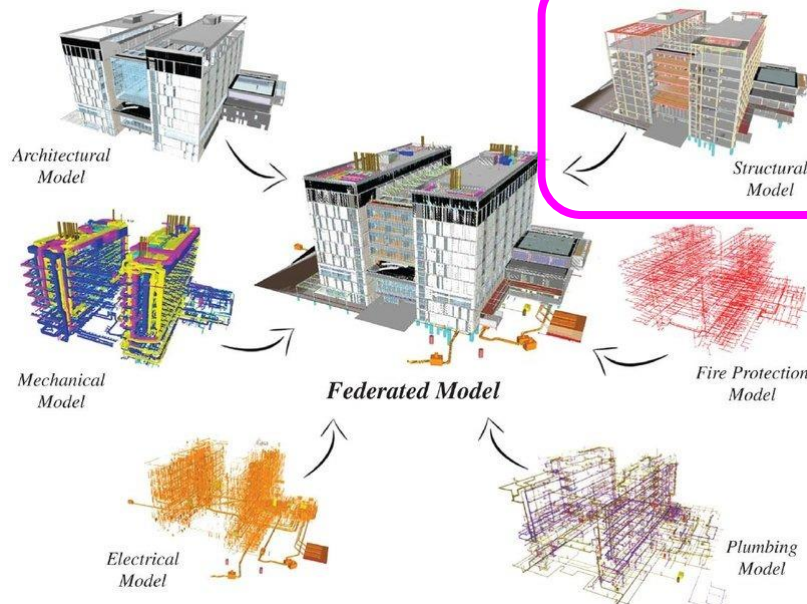
Project team can submit their request thru CORENET X pre-submission consultation

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Industry's Frequent Ask Questions

Federated structural IFC-SG models

Does the submission need to be in an integrated model which consists of architectural, structural & M&E discipline?



- Project team can submit multiple IFC-SG models in accordance to discipline and based on block basis for better design controls and documentations.
- These multiple IFC-SG models should be geo-referenced accurately and can be federated into a single multi-disciplinary model for agencies' review.
- The total size of all models in a single submission package should not exceed 2 GB

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Industry's Frequent Ask Questions

Technical FAQs related to IFC-SG model

Structural elements information



- Element grouping based on design information
- Definition of local building orientation
- Typical storey/units and mirroring of typical units
- Changing of beam orientation due to different building orientation angle

Upcoming CORENET X structural seminar

IFC-SG export configuration



- Manual guide of IFC-SG export
- IFC-SG mapping files

Resources: [IFC-SG Resource Toolkit](#)

Data transfers into native BIM model



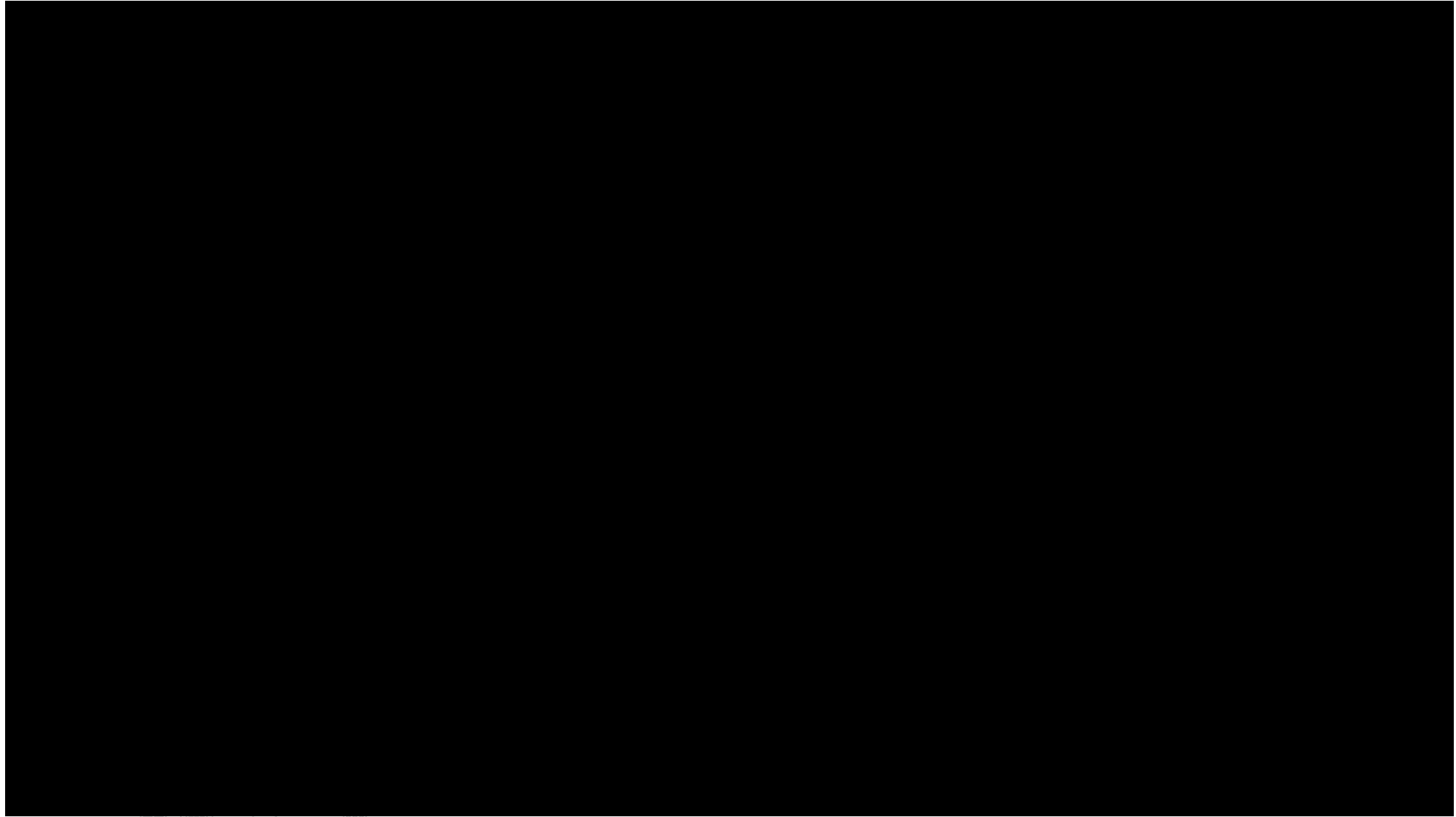
- Plug-ins available (provided by BIM vendors)
- BIM modelling techniques
- Industry future workflow & practice
- Navigation of IFC-SG models
- Binding of IFC-SG models (if needed)
- Data extraction

Resources: [CORENET X Industry Training](#)

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Let's get ready for CORENET X



<https://go.gov.sg/cx>

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Thank you!

More details on CORENET X can be found at

<https://go.gov.sg/cx>

