CORENET X Connect:
Preparing for Mandatory Implementation

Recap and Updates on CORENET X

Content

1. Recap of CORENET X

2. Update on processes and requirements
   - Key Highlights of new RABW (Regulatory Approval Process of Building Works)
   - Reviews and refinements based on industry feedback

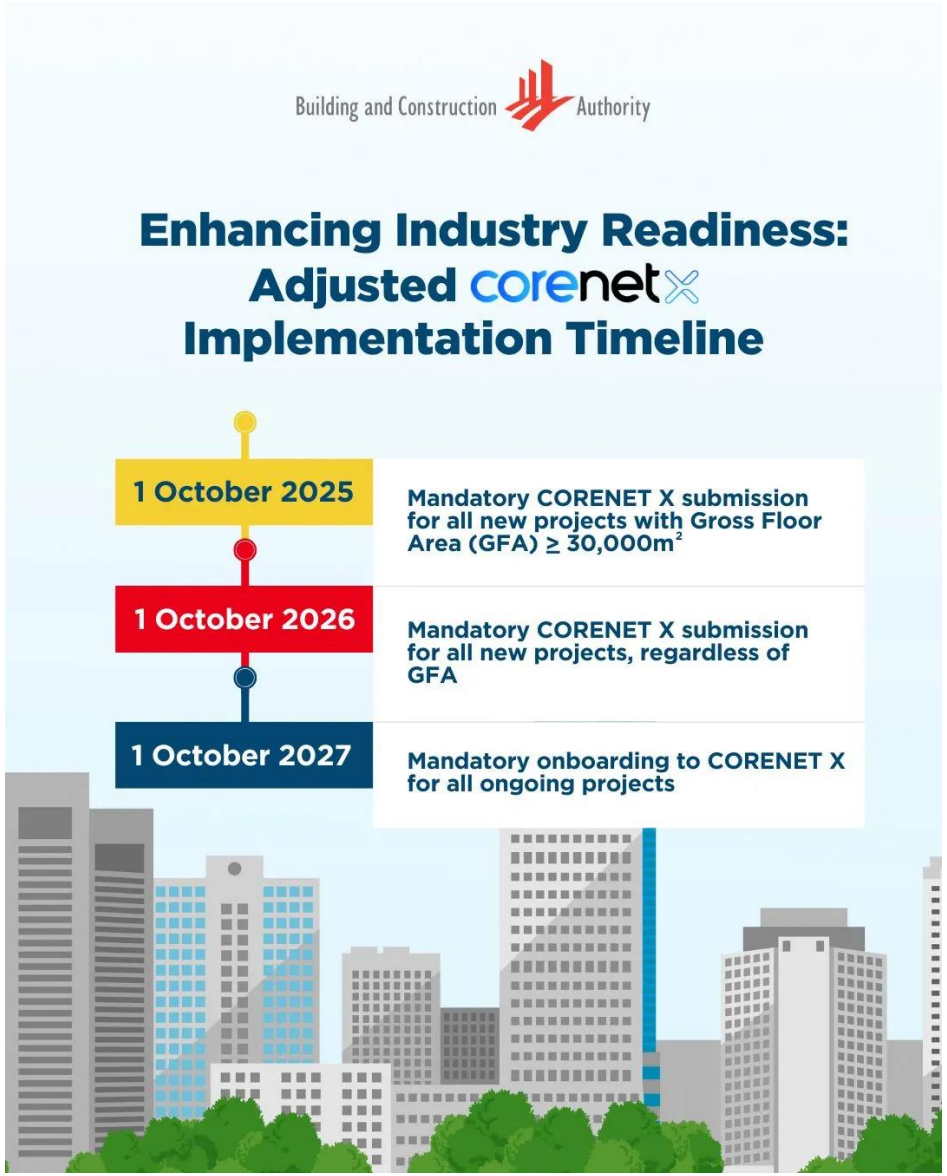
3. Update on systems
   - Key features of Submission Portal
   - Introduction to Automated Model Checker (AMC) - MVP

01

Recap of CORENET X

CORENET X Implementation Timeline

CORENET X is being introduced in phases to facilitate industry transition.



Soft Launch

18 Dec 2023 ✓ **Open to selected projects** *(by invite)*

- Industry to familiarize themselves with the new system and processes before mandatory submission kicks in.
- Industry participants who are interested to make submissions via CORENET X during this period may indicate your interest at https://go.gov.sg/cxenquiry.

Approx +6 mths

From 1 Jun 2024 **1** **Open to more voluntary submissions**

From 1 Oct 2025 **2** **Mandatory submission for all projects with GFA 30,000m²**

Approx +1 year

*From **1 Oct 2026*** **3** **Mandatory submission for all new projects, regardless of GFA**

Approx +1 year

From 1 Oct 2027 **4** **Onboard ongoing projects**

Vision of CORENET X

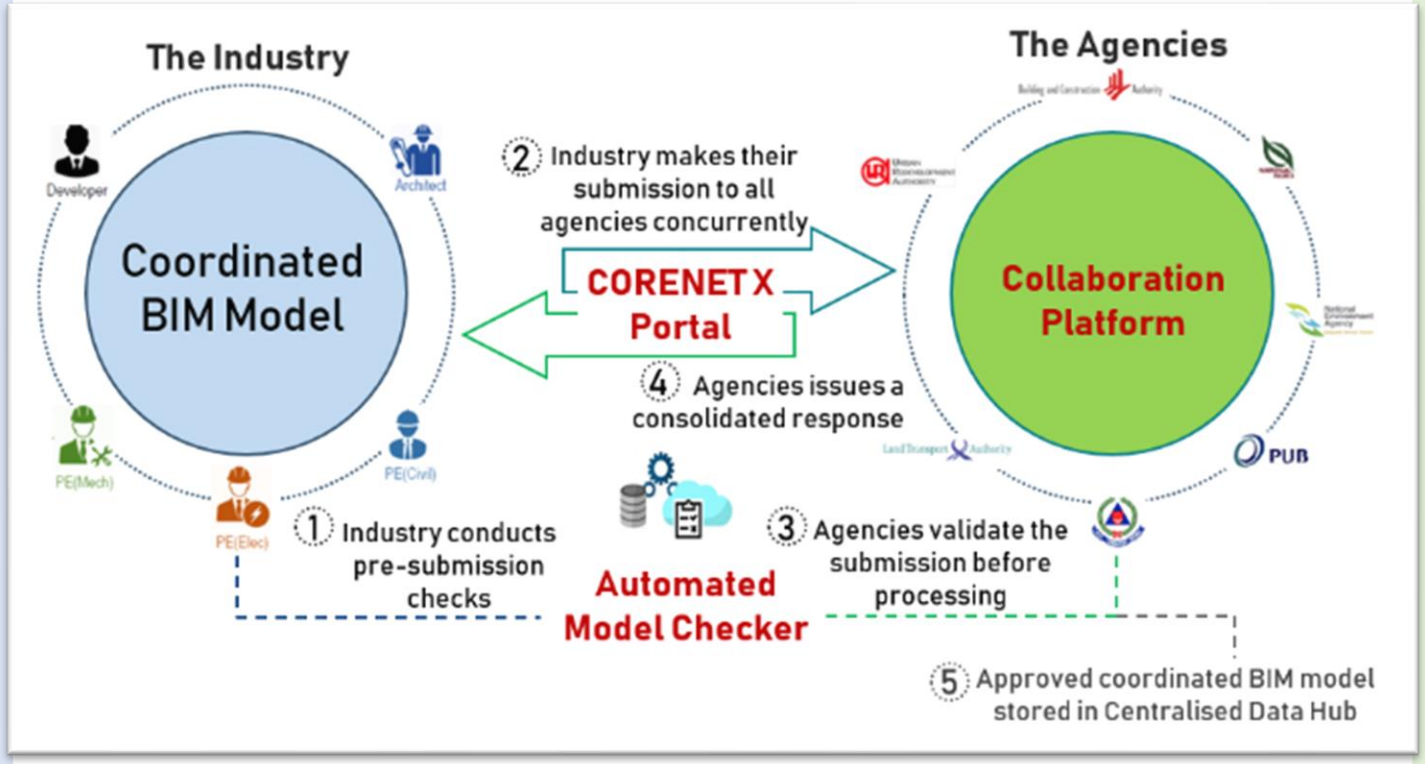
Future Ecosystem of Regulatory Approval of Building Works Transforming the Construction Industry

FIRST IN THE WORLD

One-Stop Integrated Digital Shopfront

TRANSFORMATION of INDUSTRY

- Promote design coordination and teamwork
- Promote digitalization of construction sector
- Support IPD/IDD[1] & AMA/DfMA[2] imperatives



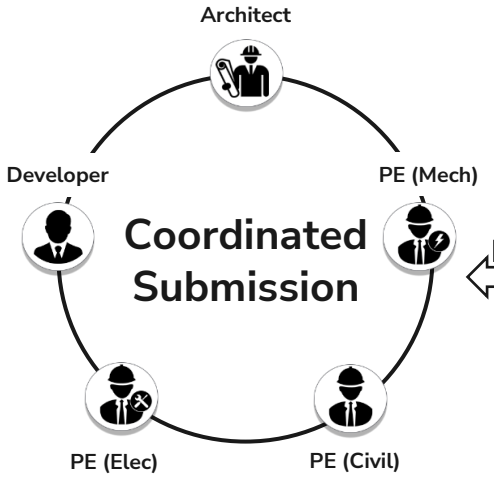
TRANSFORMATION of REGULATORY AGENCIES

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

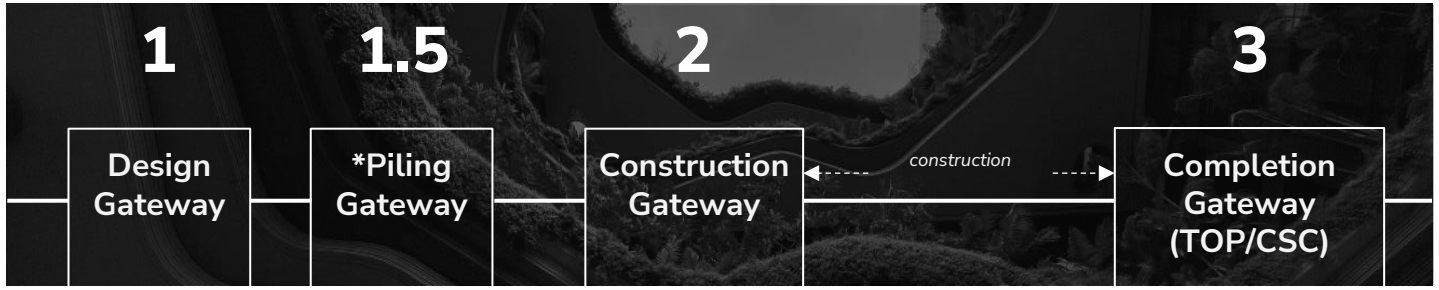
[1] IDD is the use of digital technologies to integrate work processes and connect stakeholders working on the same project throughout the construction and building life-cycle

[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.

New Regulatory Approval Process for Building Works (RABW)



CORENET X redesign our regulatory processes to streamline into **3 main gateways**



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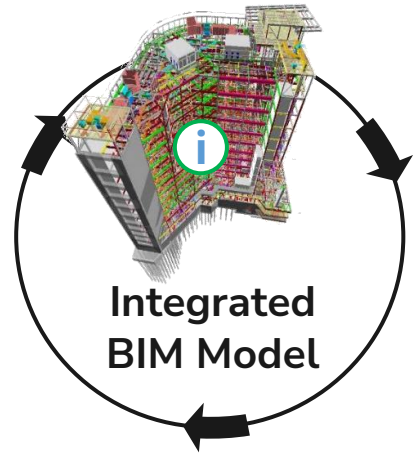


Coordinated BIM and Plans: Reduces confusion and miscommunication among stakeholders

Fewer Touchpoints with agencies: Streamlines diverse processes across agencies into a user centric journey, consolidating multi-touchpoints for more efficient regulatory clearance

Coordinated Response from agencies: Agencies review joint submission collaboratively and provide a consolidated response

Increased Transparency & Certainty: Project team have better transparency on the status of submissions with more certainty for project delivery and hence faster time-to-market

Less abortive reworks downstream: Upfront collaboration and coordination amongst project teams and agencies, allowing early detection of conflicts for early resolution, thereby save time and cost

KEY BENEFITS

- Savings in Time & Cost
- Obtain agencies' approvals in one go
- Build with confidence & certainty

New Regulatory Approval Process for Building Works (RABW)

AT THE GATEWAYS

Coordinated submissions (consisting of various disciplines) will be submitted and reviewed collectively by agencies.
This helps to ensure cross-agency issues and conflicts are identified upfront.

1

Coordinated & consolidated response

- Agencies review, deconflict & respond collectively. Comments can be location-tagged on BIM model
- Industry no longer be required to produce comments/clearances from another Agency

2

Iterations through Written Directions

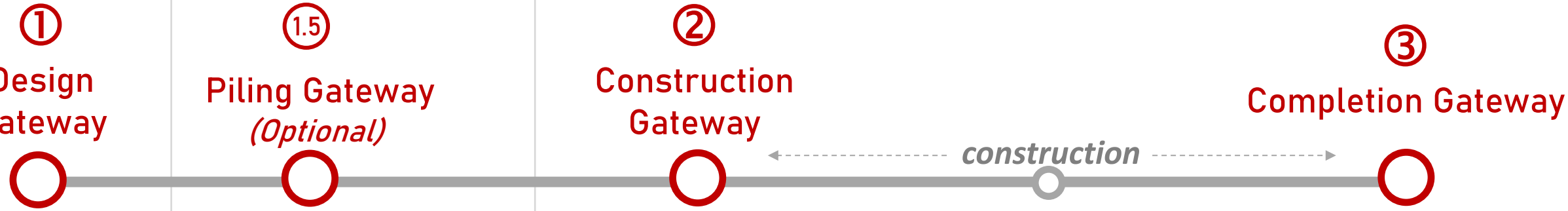
- With collective review and collaboration across Agencies, submissions should not iterate with more than 2 Written Directions at each gateway

20

Working days response time by Agencies

- Submissions go through Agencies' inter and intra-agency level reviews
- Agencies will collaborate to respond to industry collectively within 20 working days

Approvals under Consolidated CORENET X Gateways



Approvals at each Gateway consist of the following agencies' equivalent clearances today* :

- URA PP
- LTA Layout Plan, NEA and PUB DC Clearances
- NParks DG Approval including tree-cutting

- BCA ST Approvals for Permanent Piling Works
- LTA RPZ AIP for Pile Design and Layout Plan
- Independent clearances, e.g. NParks EMMP & PUB's Earth Control Measures Approval

- URA WP
- BCA BP and ST Approvals
- LTA Street Plan Clearance, BP (Parking), BP (Rails)
- NEA and PUB BP Clearance Cert
- SCDF BP Approval
- NParks CG Approval

Key Objective of Gateways
Resolve multi-agency requirements concerning design details that need to be coordinated

* Requirements at each Gateway may not be the same as requirements for clearances today. For more info, please visit https://info.corenet.gov.sg/regulatory-process/about-the-new-submission-process or refer to the Code of Practice

02

Updates on processes and requirements

Key Highlights of new RABW - Design Gateway

① Design Gateway

Critical Design Parameters

"Showstoppers, non-negotiables"

Resolve key parameters impacting design parameters & client's brief, before proceeding to detailed design

Examples
- Master Plan land use / intensity
- Building massing (e.g. height)
- Site layout, access points
- Broad planning parameters of drainage, sewerage and sanitary works
- Greenery provision

Proceed to obtain approval for next Gateway

Key Things To note

- Project teams are encouraged to carry out **pre-submission consultations** as early as possible, to clarify/enquire on agency requirements and potential deviations.
- There are some submissions (e.g. NParks EMMP, NEA NIA) that are to be submitted directly to the agencies –refer to the COP for more info.
- **Demolition application**, if required, **can proceed independently from DG submission for the new development.** It will be a joint application to URA and BCA.
- After creating the initial Design Gateway draft, the QPs can start creating **drafts for any submission at any time**.

Key Highlights of new RABW - Piling Gateway (optional)

1.5

Piling Gateway

(Optional – if project team wishes to start piling works early)

Foundation Requirements

"Must-haves before Piling"

Resolve **requirements pertaining to piling and foundation works** (e.g. piling, pile caps, raft foundation, earth retaining and stabilizing structures), excluding superstructural works

Examples
- Structural design
- Earth Control Measures
- Earthworks
- Engineering assessment for piling works within Rail Protection Zone/Rail Corridor (if applicable)

Start Piling

Piling Gateway clearance pertains to the **design of permanent piling and substructure works that do not affect internal layout.**

Key Things To note

- Project team should **assess the risk involved when opting for PG** before superstructure is approved
- **PG submission can be made after DG application is submitted and processing.** But approval will only be granted after DG approval has been obtained.
- PG and CG submissions can be made concurrently.
- Phasing for structural submissions at PG is not encouraged. A **request can only be put up at the pre-submission consultation for agencies' consideration on a case-by-case basis** if:
  - The site area covers more than 15,000sqm;
  - The project site possession are in multiple phases; or
  - The structural design involves complex building

Key Highlights of new RABW - Construction Gateway

② Construction Gateway

Detailed Design Requirements

"Must-haves before construction & Launch of Sales"

Resolve multi-agency requirements concerning design details that need to be coordinated before work commences. This seeks to **minimise abortive works on-site downstream**

Examples:

- Superstructure design
- Detailed floor layout within building (e.g. floor, fire safety, carpark)
- Accessibility and connectivity
- Household shelters

Launch sales & start construction

Key Things To note

- Preparations for CG should start as early as possible.
- The project team, including the builder where applicable, should **discuss early on how part ST submissions should be carried out** prior to pre-consultation with BCA.
- Cater **sufficient time for the engineers** to do their design and calculations, and for **AC checking** (where applicable)

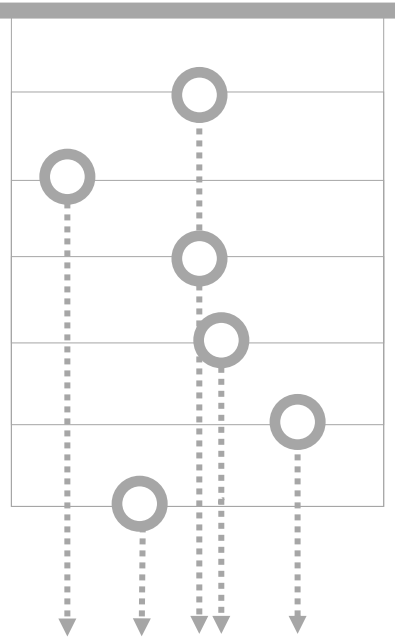
Key Highlights of new RABW – Independent submission

Independent Submissions

Technical submissions to one agency line department on **specialist details and agency-specific details** that do not affect other agencies.

Examples:

- Equipment and services (e.g. lifts, cooling tower, fire fighting system, water pumps)
- Structural details of ancillary components (e.g. barrier, cladding, curtain wall)
- C-score



Issuance of agencies' clearances/ acknowledgements

Key Things To note

- It is important to understand when and which Independent Submissions need to be submitted for your project - Please study the Code of Practice carefully.
- QP(ST) can **submit ERSS, temporary traffic decking, barrier and cladding work as independent submissions** together with permit application.
  - QP can link the independent submission with existing permit if there is no change on the project parties.
  - Else QP can apply for a fresh permit together with this independent submission.

Key Highlights of new RABW - Completion

③

Completion
(TOP/CSC)

Completion & Compliance to Approved Design

- 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, obtain Statutory Completion

Key Things To note

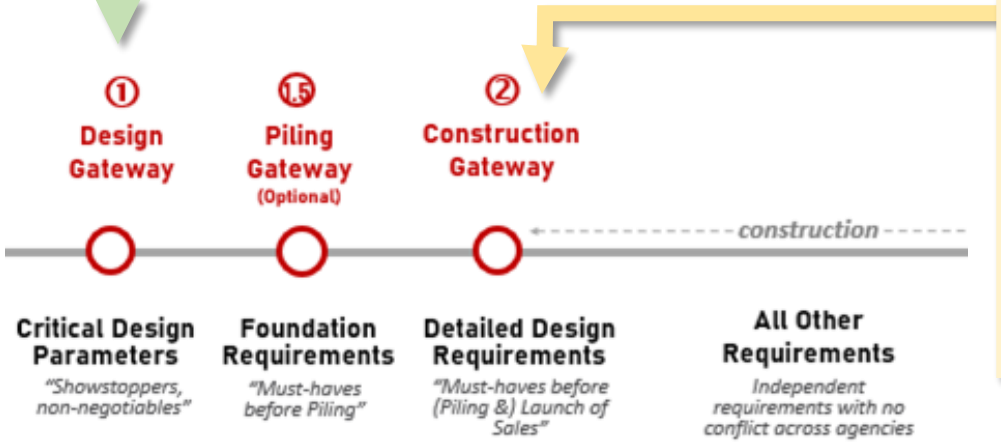
- TOP submissions are to be made to respective agencies independently and concurrently, whenever ready under Technical Clearances
- The final TOP/CSC will be issued when the project obtains all the necessary clearances from all agencies.
- A **one-stop dashboard of the project's status of TOP/CSC applications across various agencies** will be available in the CORENET X Submission Portal for **greater transparency and better tracking.**

Reviews and refinements based on industry feedback

- Potential “bottlenecks” affecting DG/CG clearance, which can lead to delay to project timeline, were identified through live submission projects & industry feedback
- Alignment across agencies on the need to phase the requirements into stages so that critical planning parameters and space provision affecting DG/CG are firmed up first and remaining details can be submitted at later stage.

① Design Gateway (DG) – Issues related to DG (start of the regulatory process)

- Certain **impact assessments (with full details)** are **required to be cleared before DG can start**. Clearance of such impact assessments typically **takes a long time**, which can cause **delay to the project**
- Some details **pertaining to operational details that developers/owners may not be able to firm up so upfront**



② Construction Gateway (CG)

- Agencies are requiring full submissions which **take time for industry to prepare and complete, resulting in a chokepoint**
- Some details **require specialists’ inputs** and **can only be furnished when they are onboard later.**

Addressing Concerns of the new RABW

Impractical to complete the full structural details of the entire development in one go

BCA will allow Part ST Submissions for qualifying large projects:

- Full coordinated structural BIM carcass model at 1st CG submission
- Detailed structural submissions (incl detailed calculations, AC/ACO report, etc.) can be submitted in parts – 1st part in CG and remaining parts after CG as independent submission

External works clearance may delay the main development

LTA, NParks and PUB have reviewed and aligned the process:

- If required, external works can be allowed to be followed up after CG with condition that the **interfacing details** between the external works and the main development is finalised and **cleared at CG**
- Remaining details can be submitted separately after CG

Difficult to provide operational details at DG/CG without builders onboard

Agencies are reviewing the submission requirements in the COP

- **Calibrate level of details required at DG and CG** to an appropriate level, in alignment of the intent of the gateways and taking into consideration general industry practices
- In the next COP edition update, there will be **clear guidelines** on which **requirements to be submitted in 2D/ 3D**

Addressing Concerns of the new RABW

update

Full Traffic Impact Assessment process prior to DG submission may delay commencement of piling

LTA will allow a 2-stage approval process (circular released 7 Mar 25):

- Part 1 with direct impact to development e.g. improvement works to junctions immediately abutting development is to be obtained prior to DG
- Part 2 with impact beyond development e.g. other junctions required for traffic analysis not affecting development boundary before CG

update

Obtaining approval for performance-based fire engineering proposals prior to CG submission may impact project timeline

SCDF has reviewed and refined their process:

- Fire Engineering Design Brief (FEDB) should be cleared, or minimally submitted before CG. **In-principle Approval must be obtained before CG clearance issuance**
- Fire engineering report (FER) and related documents can be submitted in subsequent amendment under condition that works related to performance-based design proceed only when relevant clearances for FER are obtained

update

Design Advisory Panel process may affect timeline

URA has reviewed to adopt a more "agile" approach for DAP:

- Architect can develop design details progressively through upfront pre-submission reviews
  - Pre-DG DAP + (Stage 1) : Firm up the key design parameters
  - Pre-CG DAP + (Stage 2) : Review detailed design, submitted prior to CG

Note: The new DAP approach in CX has also been tested via a live project, which has recently cleared CG

Addressing Concerns of the new RABW

update

Projects requiring Energy Efficiency Opportunity Assessments (EEOA) report submission may delay project timeline

NEA will allow for a progressive submission:

- EEOA-NV lite report to be submitted and cleared prior to DG clearance
- EEOA-NV full report to be submitted and cleared prior to CG clearance, and conditional CG approval may be issued for incomplete reports where justifications are provided

update

Impractical to furnish Pneumatic Waste Conveyance System (PWCS) specialist details as they may not be onboarded at CG

NEA may grant conditional approval through QP declarations:

- If details are not worked out at DG, QP to confirm in writing that proposed spatial dimensions can accommodate installation of PWCS and to be in compliance with SS 642:2019
- If details are not worked out at CG, QP to declare compliance to SS 642:2019 and follow up with details no more than 6 months following CG clearance

Amendment Plan Submission

- **Major deviations** from the approved DG proposal entails a re-evaluation and will **require a fresh DG submission**, along with payment of any applicable processing fees.
- **Minor deviation** to the approved DG can be **incorporated in the subsequent Gateways** (i.e. PG or CG)

- **Material changes** to approved PG / CG will require Amendment Submission to PG / CG.
- **Immaterial changes** can be captured in subsequent Amendment Submission (if any) or in record plan (as-built plans) if there is no further amendment submission

Key Things To note

- Project team should assess the impact and extent carefully before deciding to proceed with the change.
- QPs need to assess & identify which agencies are affected and require re-approval accordingly.
- For **joint submission (eg: DG, CG), all QPs involved will be notified of the amendment plan.**

Part ST Submissions

Must the full structural submission (including detailed design and calculations, AC/ACO report, etc.) for the whole project be submitted in one go at CG?

To address industry's concern that structural design takes time (especially if AC/ACO reports are required) and it is impractical to complete the full structural details in one go

- Detailed structural design and calculations of eligible projects **need not** be submitted in a single package but done through a **limited number of part ST submissions.**

Part ST Submissions – Eligible Projects

❑ Building projects:

1. Any project with a **Gross Floor Area (GFA) > 40,000sqm** is eligible for part ST submission if –
   a. the project consists of 5 or more blocks of building of at least 4 storeys high each; or
   b. the project consists of 3 or more blocks of building of at least 4 storeys high each, with common podium or basement.
2. Cluster housing projects with 40 or more landed units

❑ Infrastructure projects:

1. Infrastructure works that function like a building **with length > 150m** (e.g. MRT stations, transport nodes/ interchanges);
2. Infrastructure works that are mostly engineering works **with length > 400m** (e.g. viaducts, large scale drains, sewers)
3. Infrastructure works that are mostly coastal works **with length > 4,000m** (e.g. land reclamation, revetment, sea wall, bund wall)

Part ST Submissions – Submission Flow

First CG Submission (CG01)
(WP, all agencies' BP and C&S Part ST 01)

1. Coordinated IFC Model comprising:
   a) Full Architectural model
   b) M&E model (aspects[1] that are regulated); and
   c) Structural model (contains full structural details of structural element under Part ST 01; carcass with minimum details for structural elements in remaining Part STs)

   [1] M&E discipline consists of various services and trades. For submission at CG, only aspects of M&E that are regulated will need to be modelled as per the COERENET X Code of Practice. Examples include Drainage Aspects (PUB), Sewerage and Sanitary (PUB) and Exhaust for carpark, toilets and kitchens (NEA).

2. Supplementary structural drawing, detailed calculations, AC/ACO report for Part ST 01

Approval for **subsequent** C&S Part ST can only be obtained **after First CG is approved**.

C&S Part ST 02
(C&S only, under Independent Submission Module)

1. Structural IFC Model containing full details of structures under Part ST 02
2. Supplementary structural drawing, detailed calculations, AC/ACO report for Part ST 02

Remaining Part ST submissions (Part ST 03, ST 04, etc)

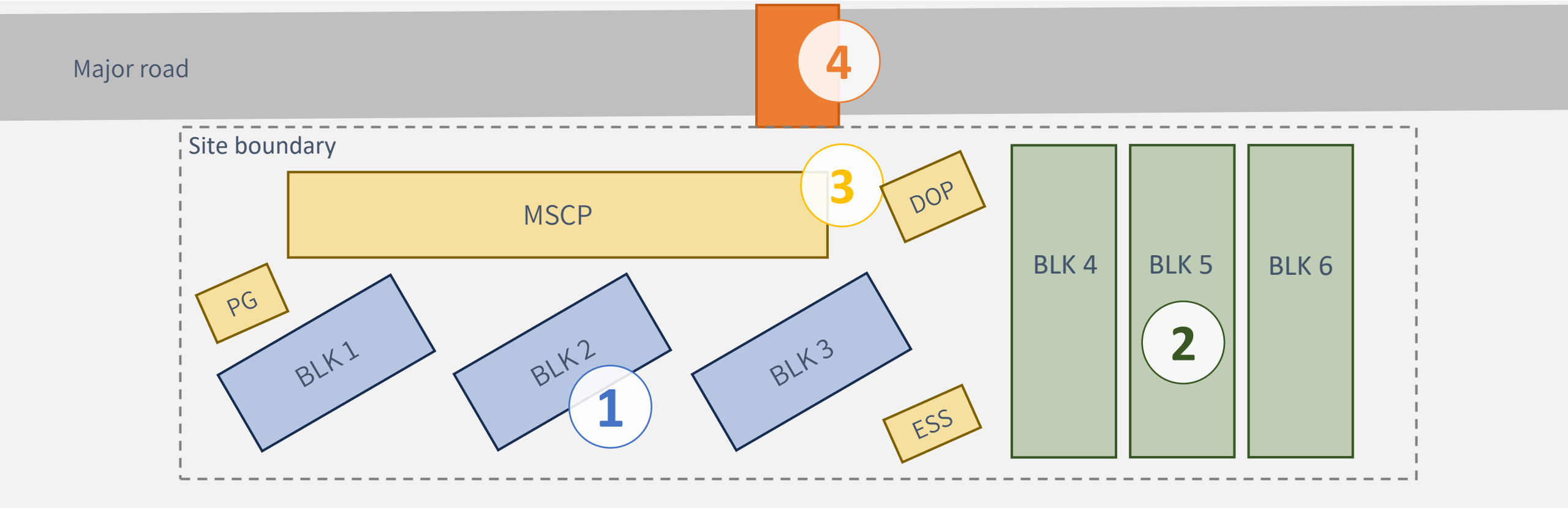
Part ST Submissions - Guidelines

Project teams should propose the Part ST Submission plan based on below guidelines and seek agencies' concurrence during pre-submission consultations, before making any submissions.

Scope of Works	Number of Part ST Submissions Allowed
Superstructure	1 no. of Part ST Submission for **every 4 blocks** (rounded to nearest unit) 1 no. of Part ST submission for **every 40 landed units** (rounded to nearest unit) Example: For a building project consisting of 9 tower blocks, 3 no. of Part ST Submissions of equal GFA is allowed. (i.e. if the total GFA is 105,000 sqm, each of the Part ST Submission should be about 35,000 sqm)
Common Basement	1 no. of Part ST Submission
Common Podium	1 no. of Part ST Submission
All ancillary works	1 no. of Part ST Submission
All external works	1 no. of Part ST Submission
ERSS	Independent submission *No change from the standard RABW (without phasing)
Cladding	
Façade	
Temporary Deck	

Part ST Submissions – Guidelines (Illustrated with Example)

Example Project: 6 HDB blocks with MSCP and ancillary works



Part ST Submission 1: Block 1 – 3

Part ST Submission 2: Block 4 – 6

Part ST Submission 3: Ancillary works within site boundary

Part ST Submission 4: External works outside site boundary

03

Updates on System

Key features of Submission Portal

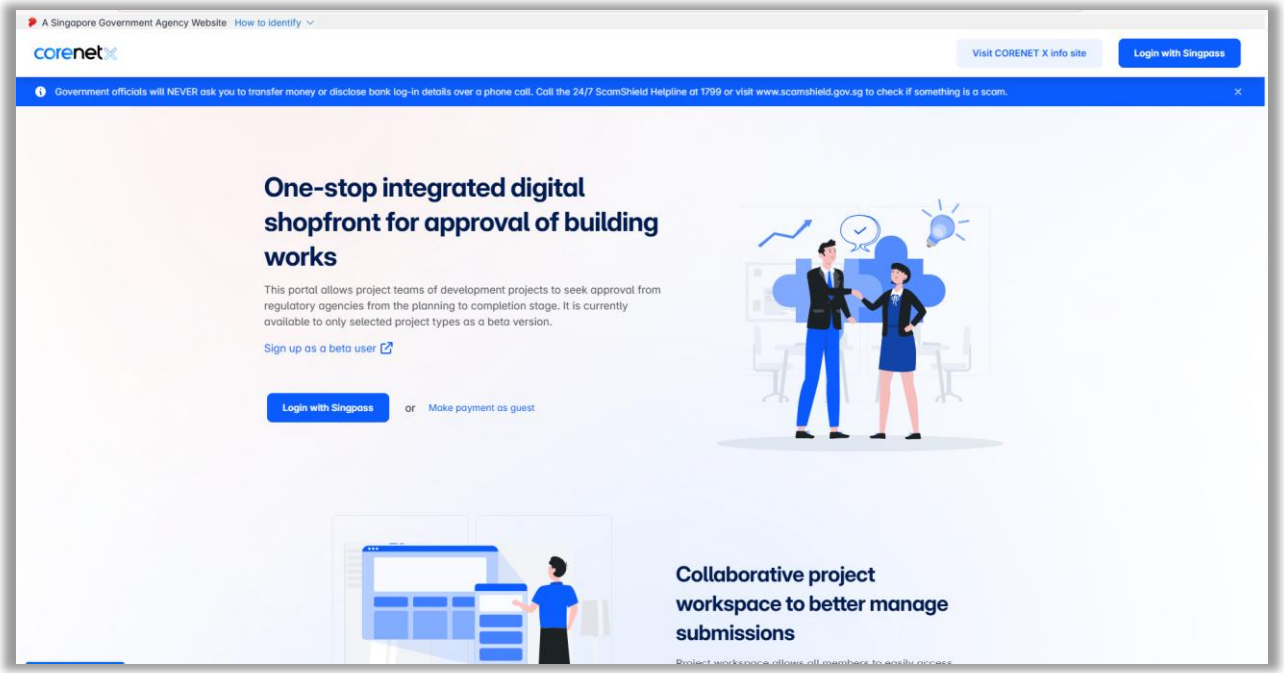
Submission Portal

Submission Portal will replace CORENET 2.0 as the platform to make submissions to agencies for approvals

- The Submission Portal is our **web-based front-facing portal** where industry practitioners and their assistants interact with to make submissions

- CORENET X is developed through agile methodology that **progressively delivers new features and improvements** to enhance the system

- The system is **designed with users at its core, intended for a guided submission process.** It incorporates regular feedback from user testing and live submission users to enhance its usability and create a more intuitive experience



✓**Dashboards for greater visibility**

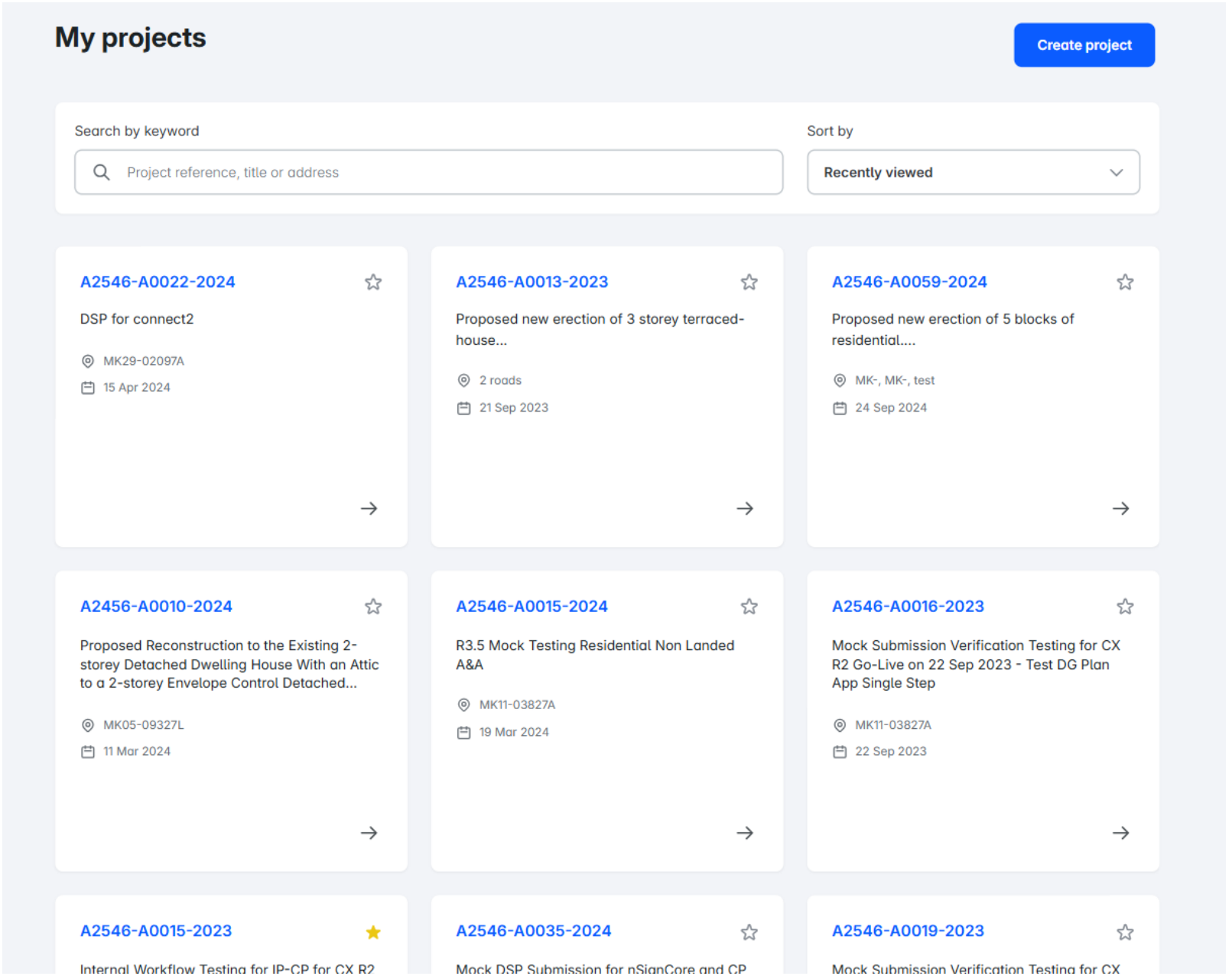
✓**Guided submission process**

✓**Auto fee computation to plan ahead**

✓**Centralised payments to all agencies**

User level view - login landing page

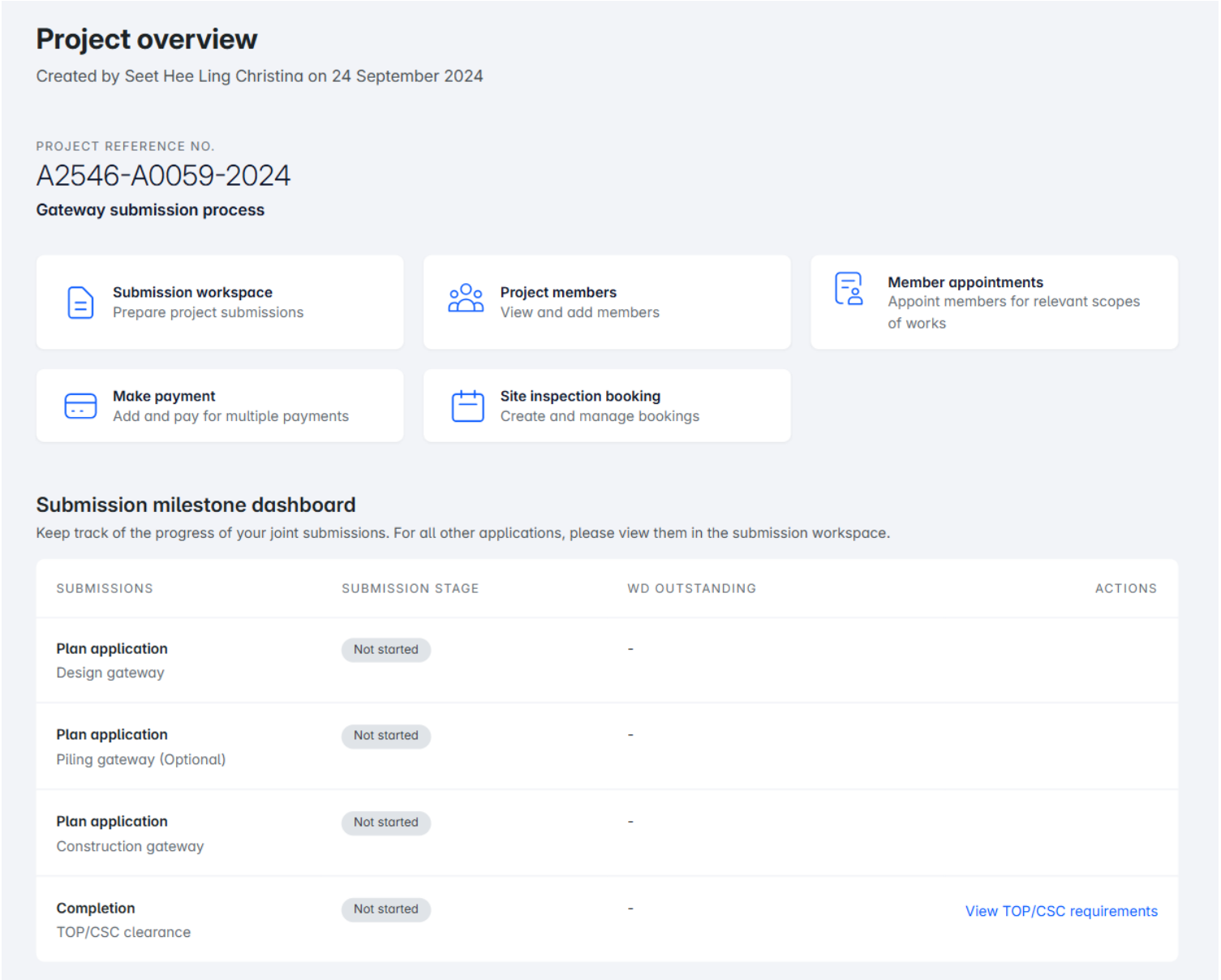
User login landing page showing all projects where they are involved as project members



Project level view - Project overview page

Project overview page showing key functionalities

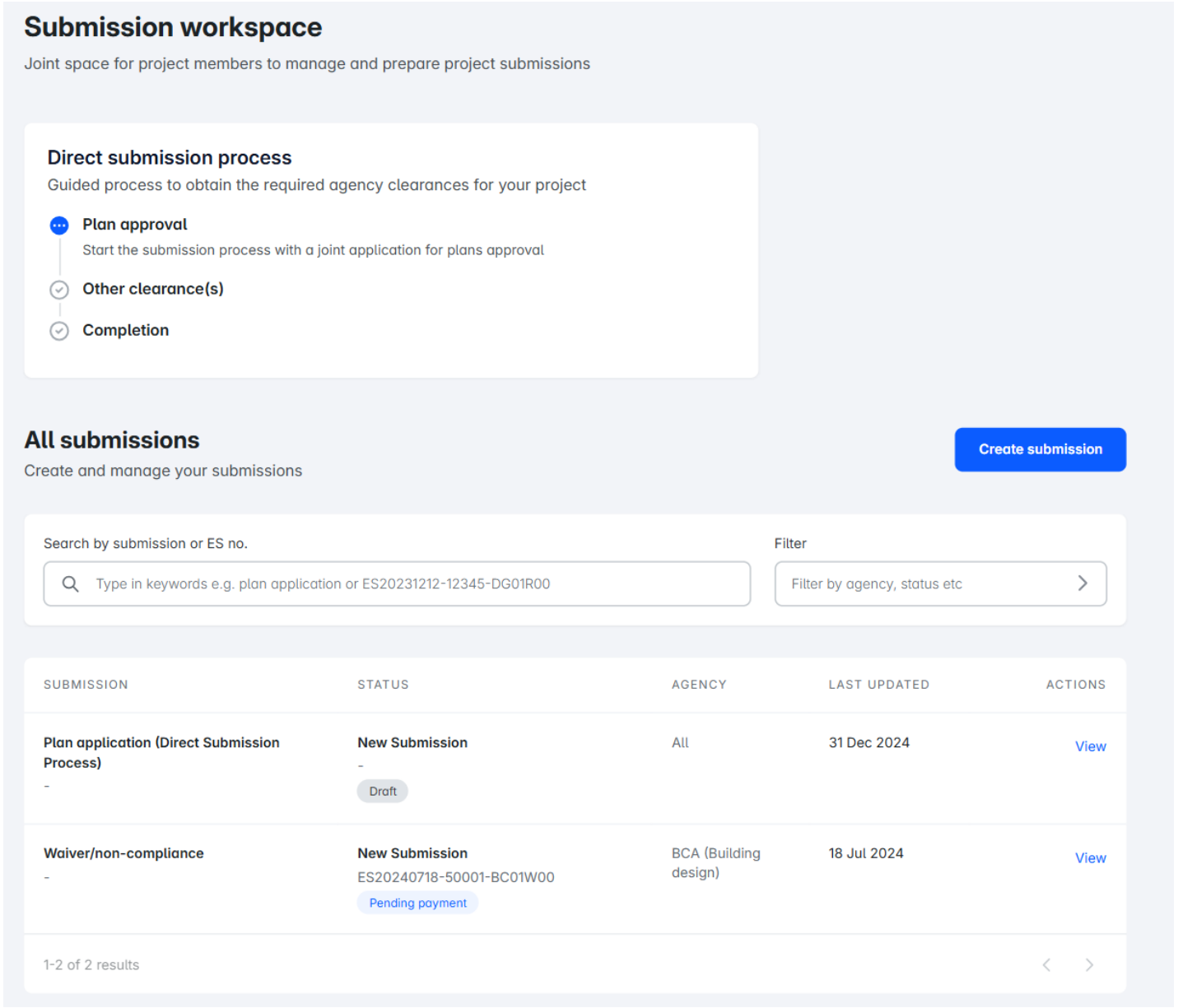
- **Submission milestone dashboard** enables user to track the main milestones at a glance



Project level view - Submission workspace

Submission workspace

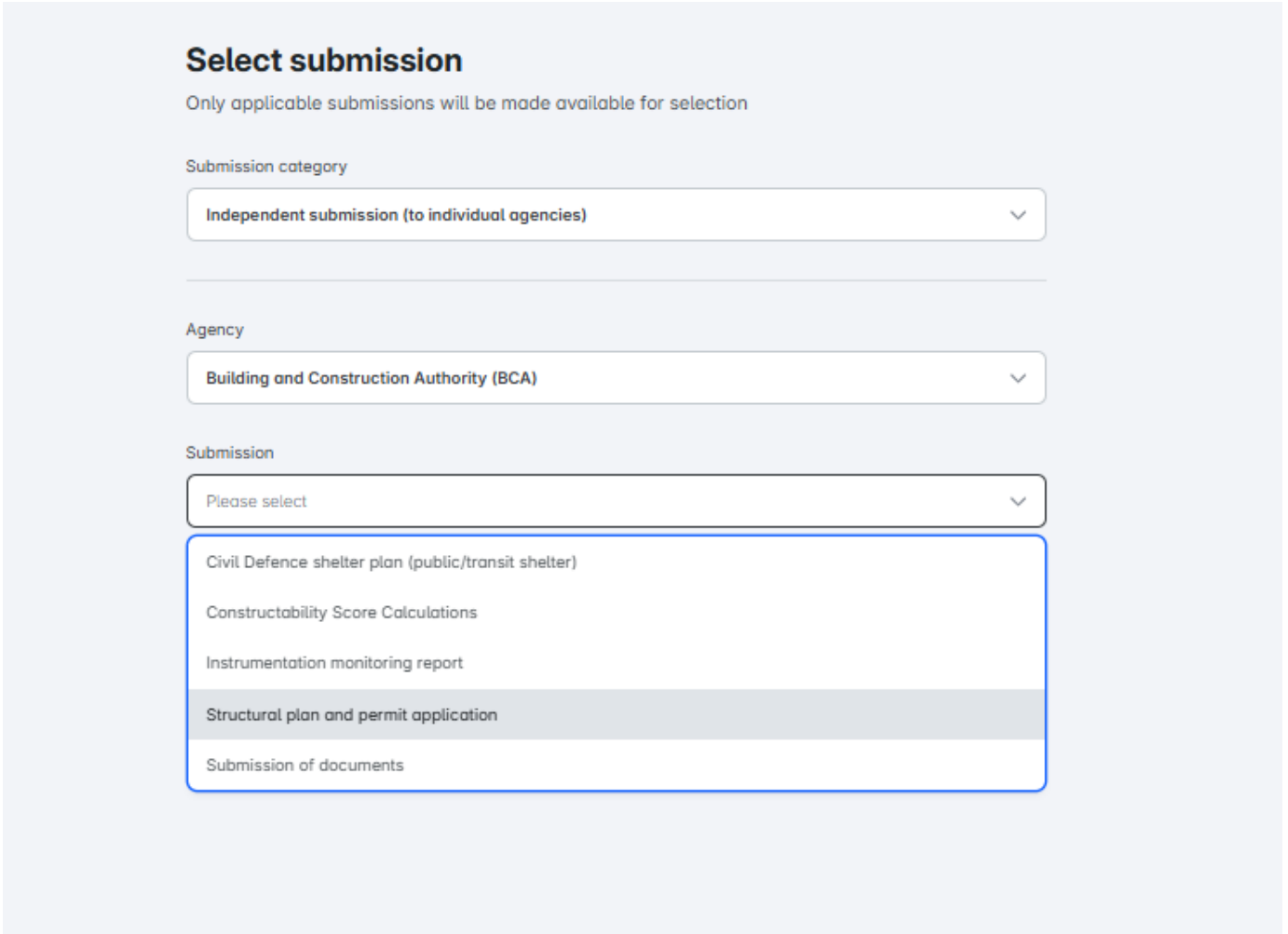
- All **submissions listing** enables user to track every submission made by all members in the project
- **Search bar** allows for submissions to be filtered by status e.g. processing, cleared and by agencies



Creating submissions – submission form listing

Create submission

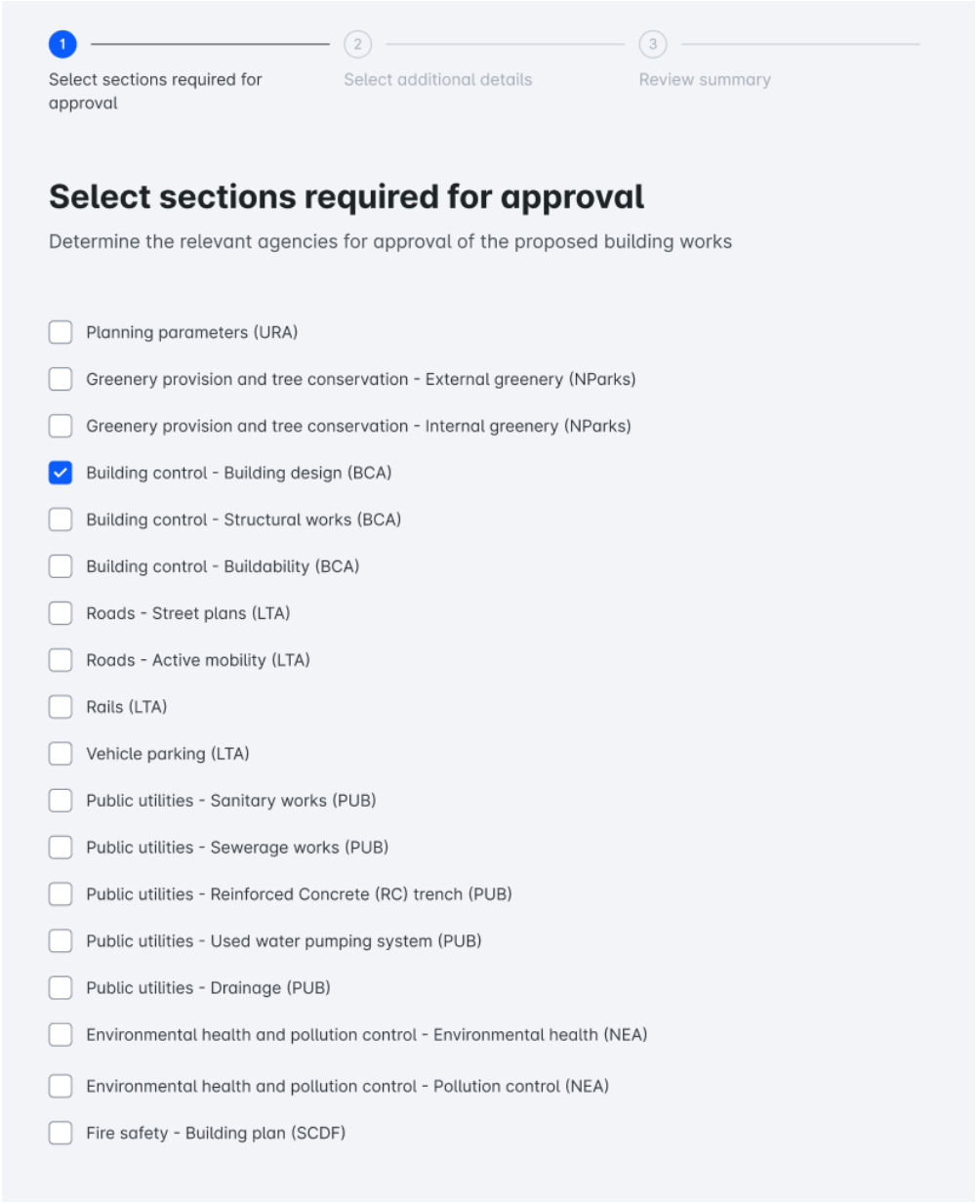
- All **submission forms in current CN2 xfdx** will be incorporated into web-forms submitted directly within the portal
- **Submission forms are arranged into various categories** e.g. Independent submission > Agency > Agency specific forms



Creating submissions – selecting required agencies

Creating a joint-submission form

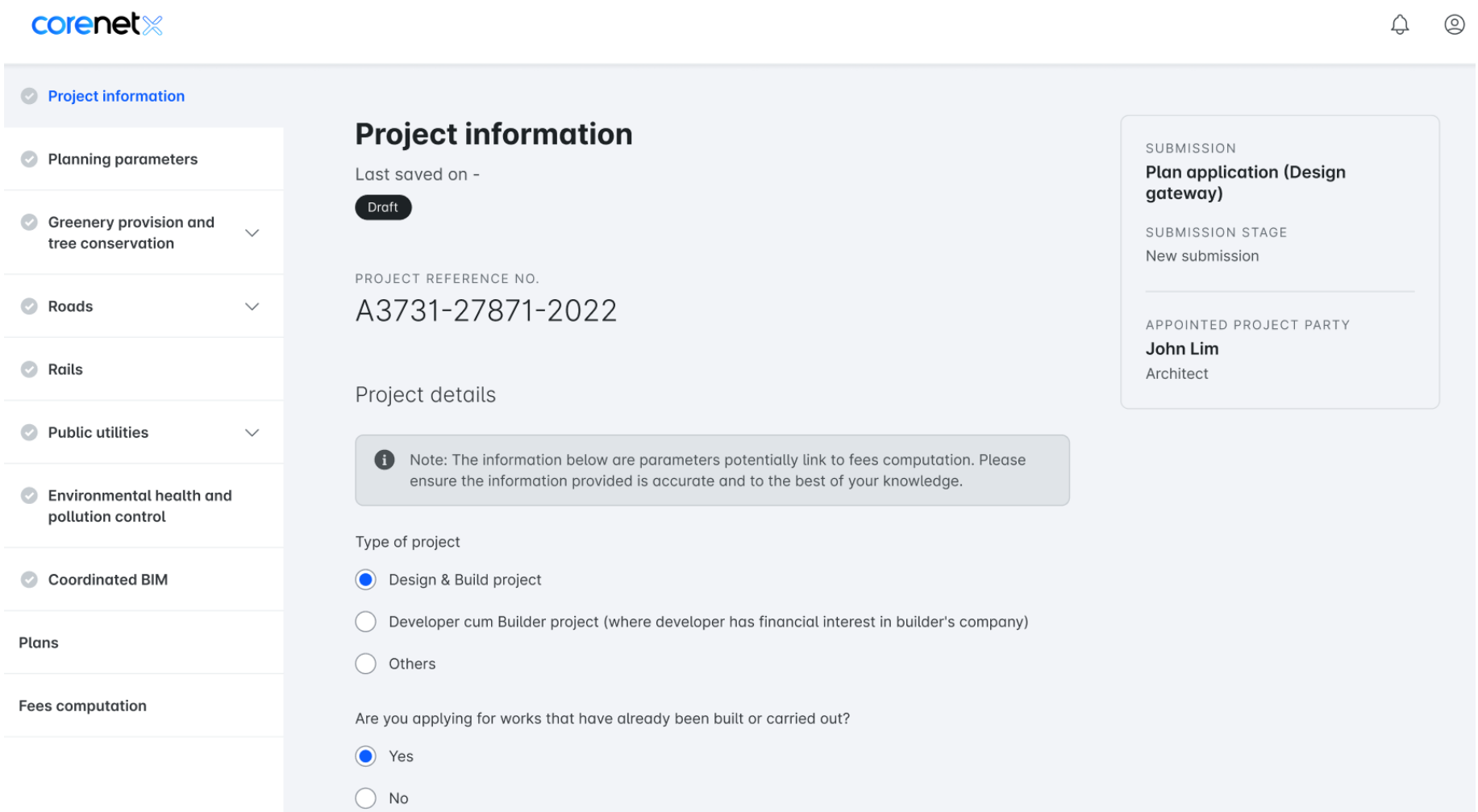
- As every project is unique, not all agencies' submissions are required in a project
- Coordinating QPs can select the relevant agencies for the joint submission
- For agencies not selected, coordinating QPs would be prompted to declare accordingly



Joint submissions – form architecture

Form architecture

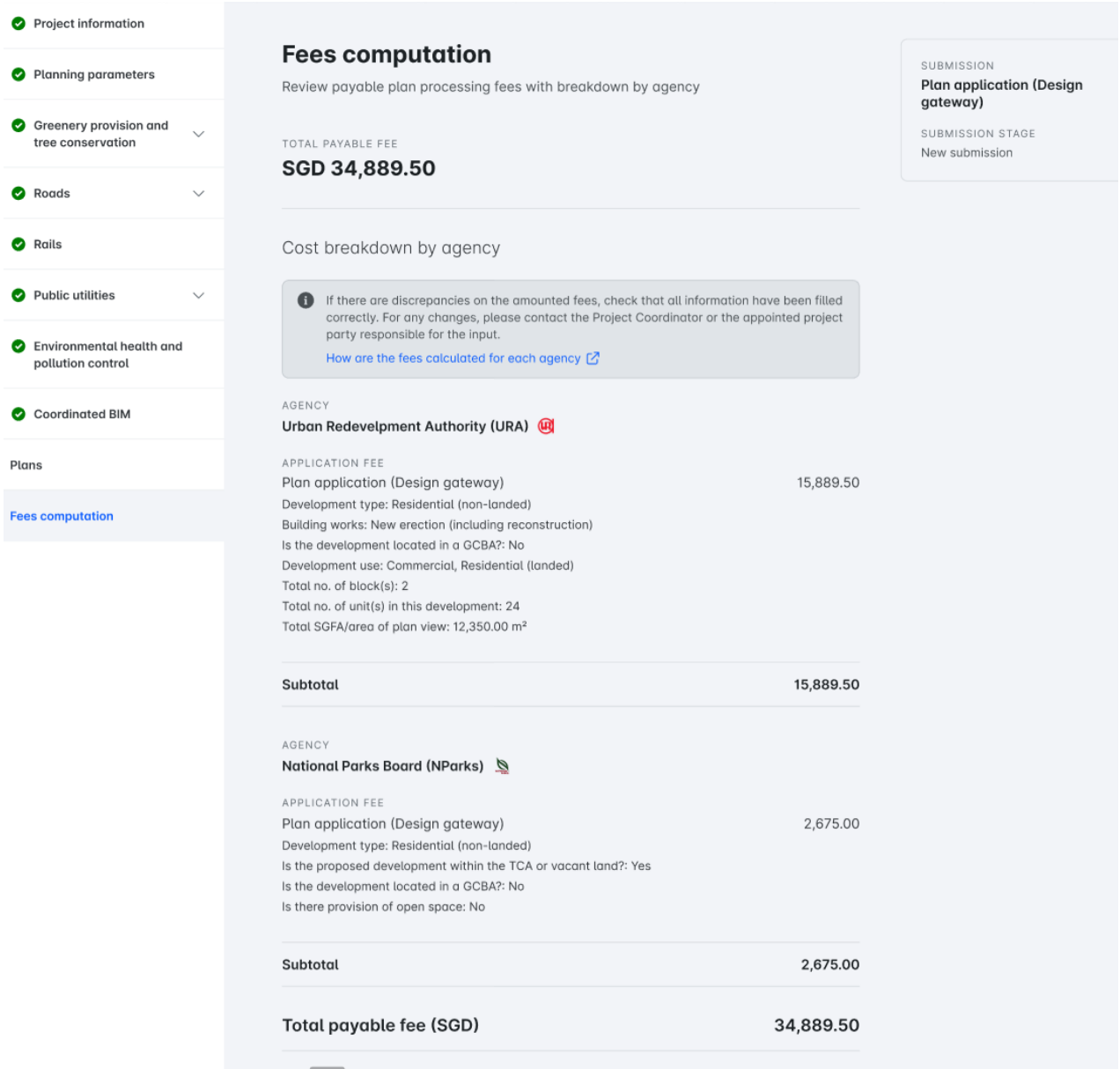
- All **key project information** will be housed in 1 section coordinated by the coordinating QP
- Other sections in a joint submission pertains to the various agencies



Joint submissions – Auto fee computation

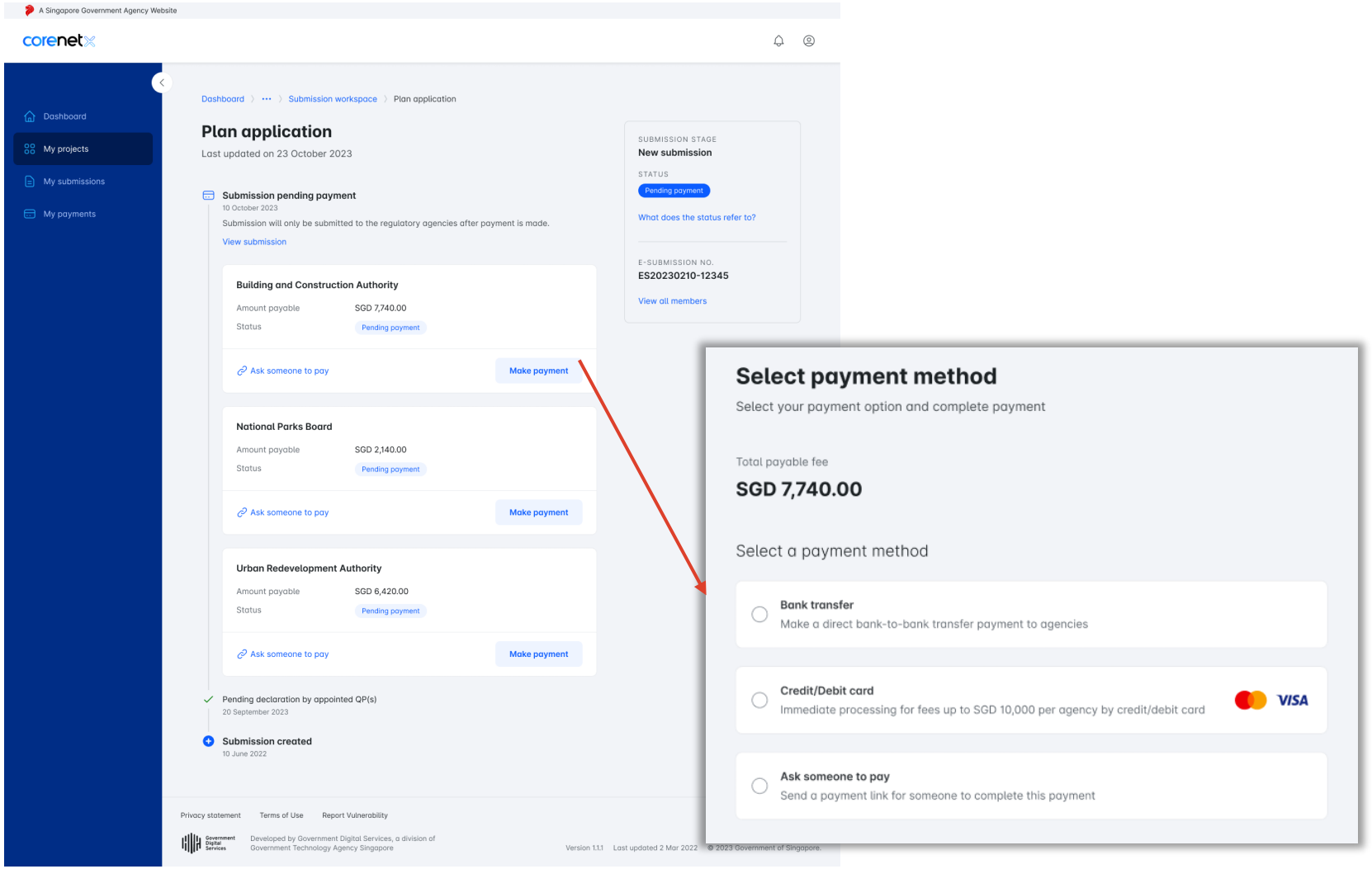
Fee computation

- Fees will be auto computed from QPs' inputs, mainly in Project Information section
- QPs can check the fee payable prior to payment



Joint submissions – Plan fee payment

Plan fee payment must be made before submission can transit to agencies for processing



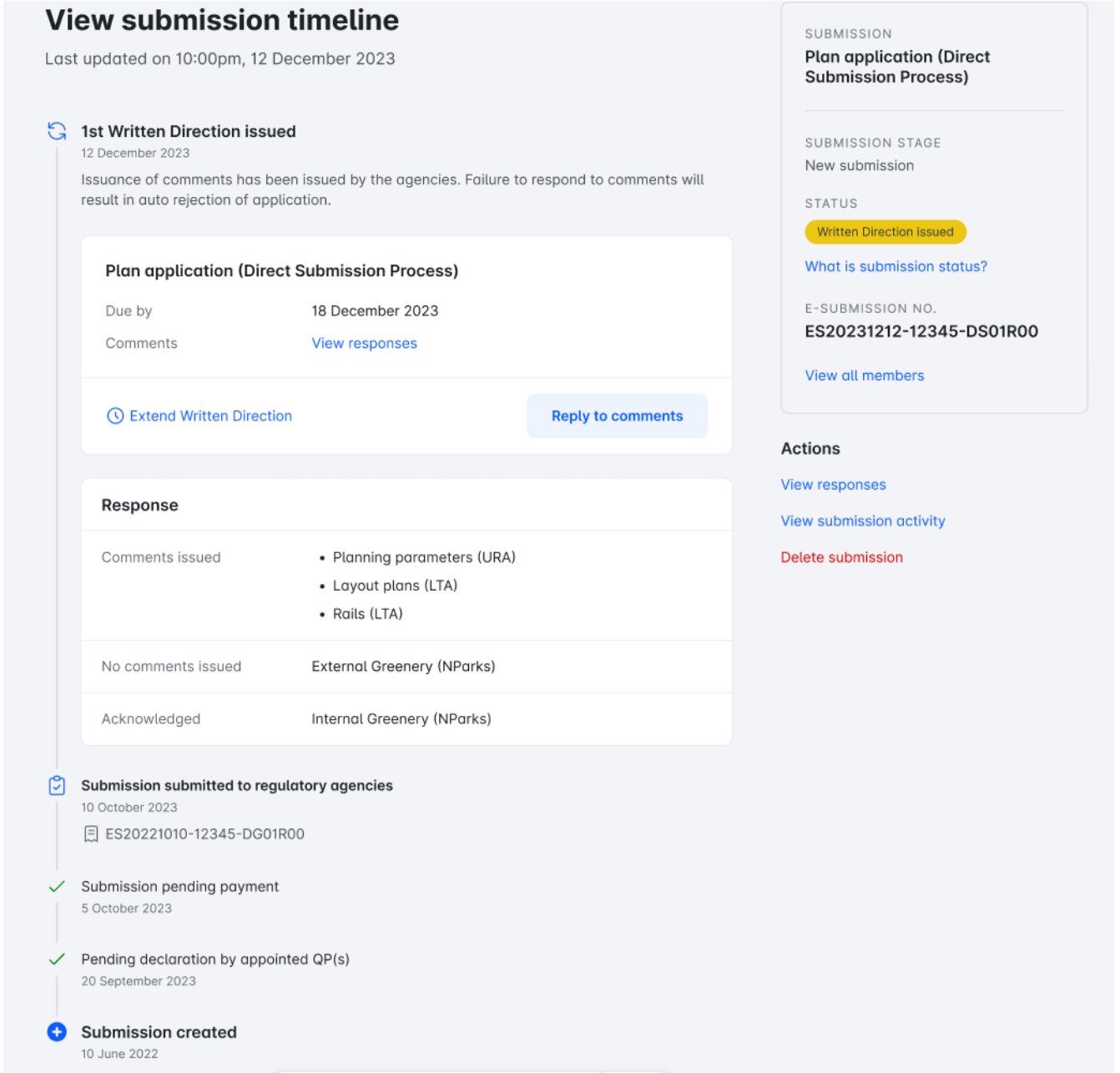
What are the available payment modes?

- Bank transfer (takes at least 2-3 working days to be processed)
- Credit card (for each transaction up to $10,000)
- Payment to agencies are to be transacted separately
- This is to avoid payment errors e.g. credit limits to affect multiple transactions at a time
- Users who receive a request to make payment via “Ask someone to pay” must login to transact

Submission level view – Submission timeline

Submission timeline

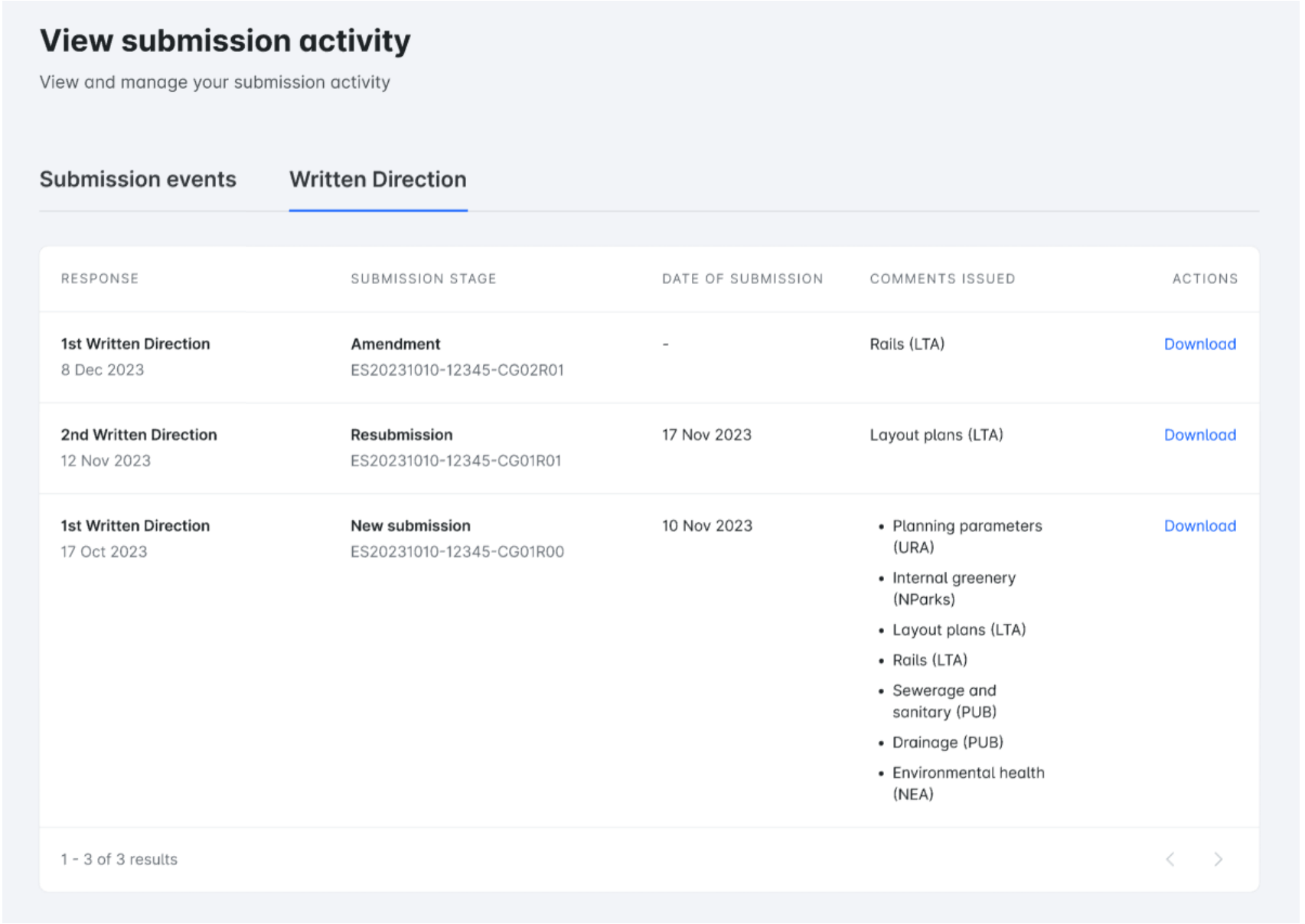
- **All details pertaining to the submission** are logged and displayed in reverse chronological order
- **Status display** allows easy tracking of progress of each submission
- **Actions show the actionable items**, e.g. apply for amendment, view responses from agencies, withdraw submission etc.



Submission level view – Responses from agencies

View Response

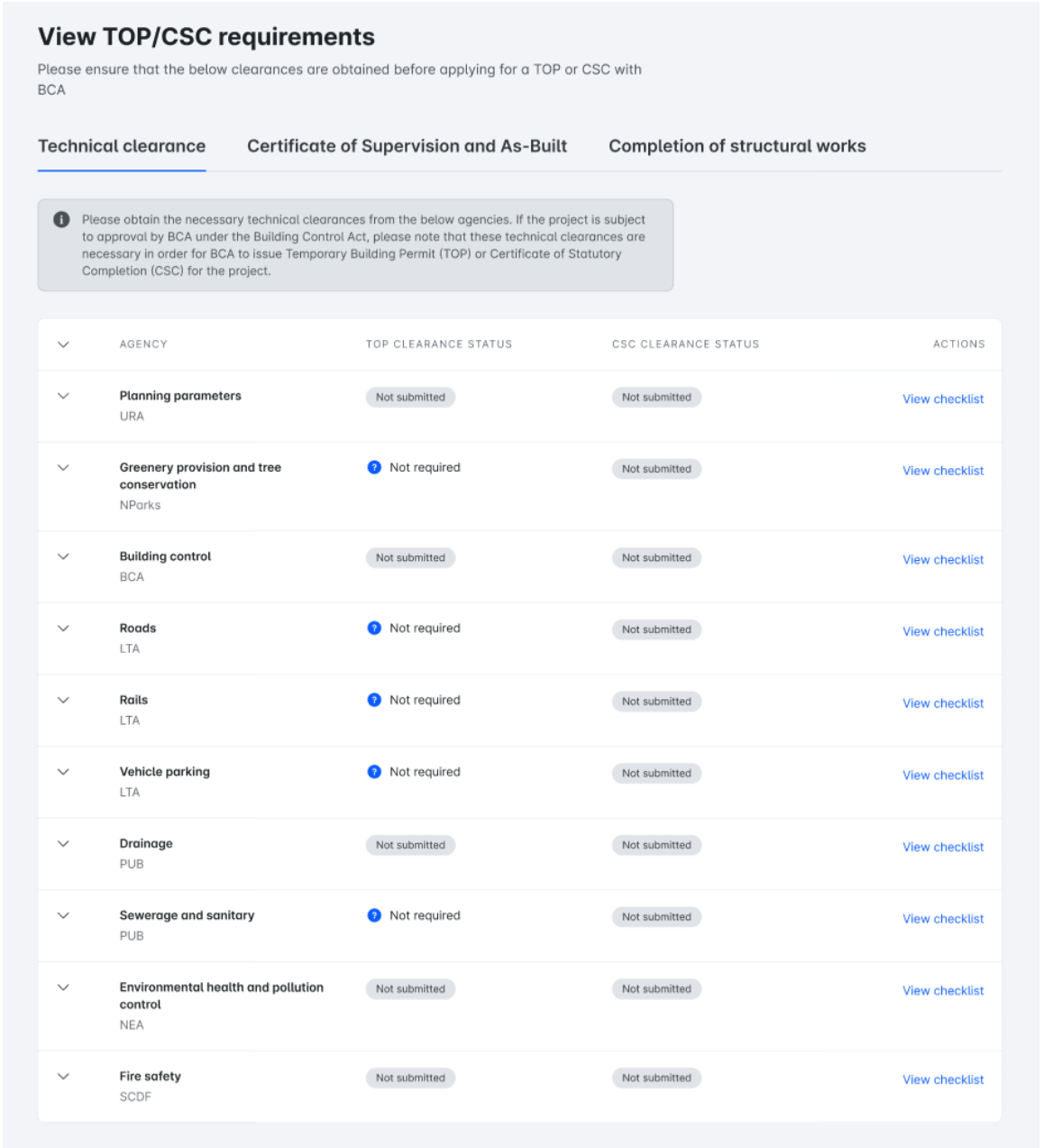
- Display of agencies' responses and iterations
- Responses can be downloaded



Project level view – TOP/CSC requirements

Track TOP/CSC items

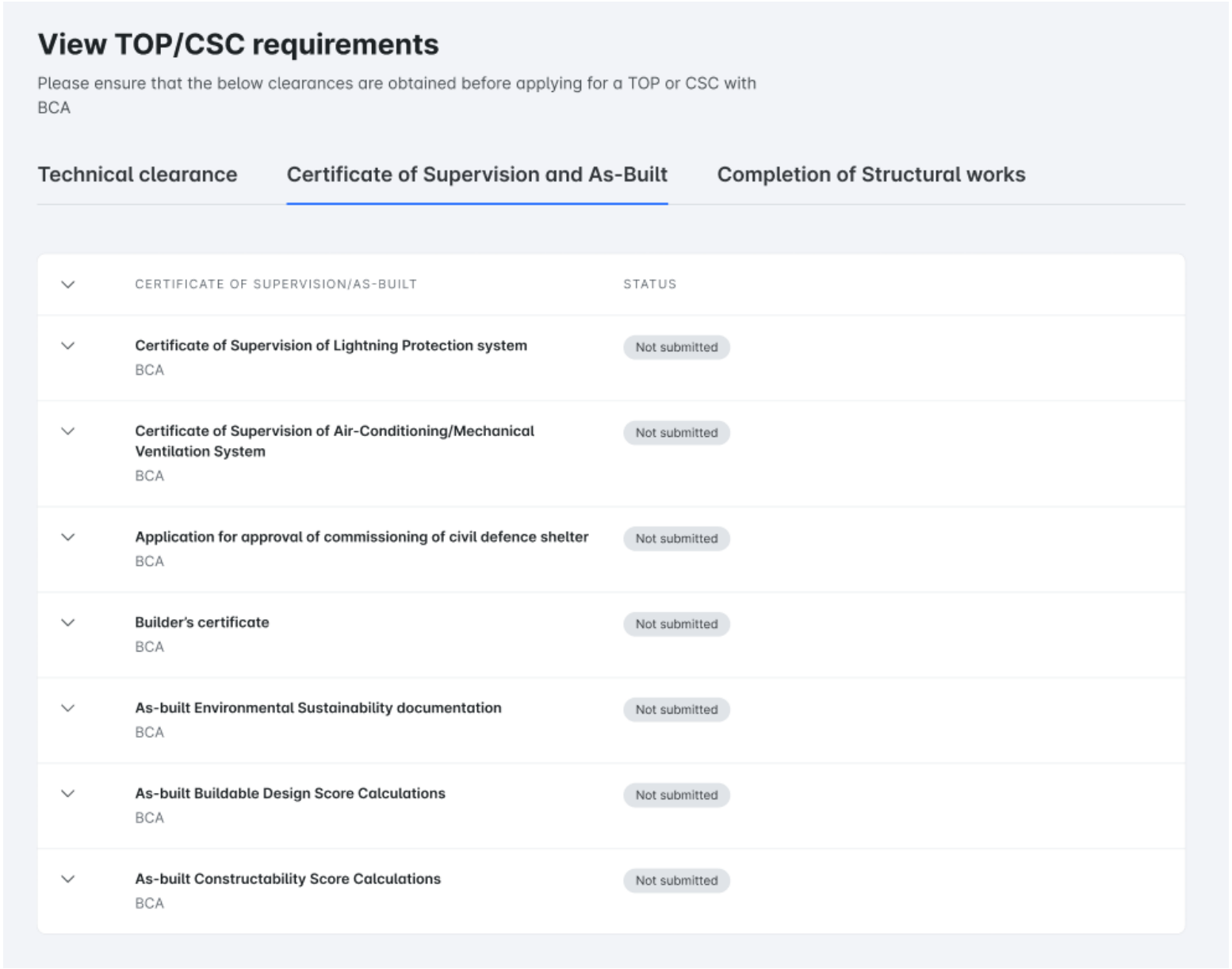
- Track your project's progress in technical clearances working towards TOP/CSC
  - As-built submissions
  - Agencies' TOP/CSC applications
  - Certificate of supervision
  - C-forms



Project level view – TOP/CSC requirements

Certificate of supervision

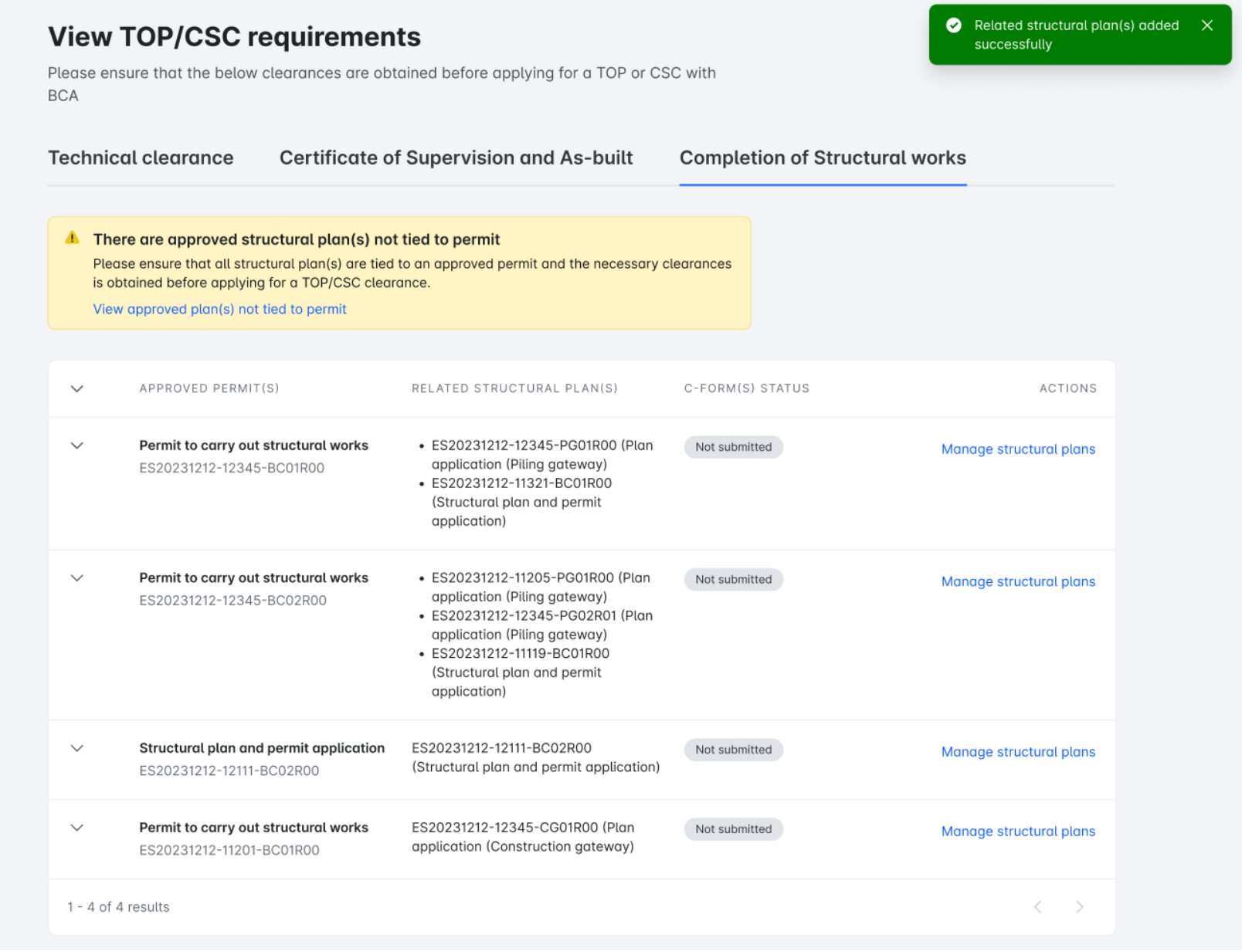
- In CORENET X, COS can be submitted directly by relevant QPs
- E.g. COS of Lightning Protection System can be made directly by the appointed PE(Elect)



Project level view – TOP/CSC requirements

Completion of Structural works

- Track the ongoing ST plans and the related permits
- CORENET X will help to flag out any outstanding STs without a permit linked to it



corenetX

Introduction of Automated Model Checker (AMC)

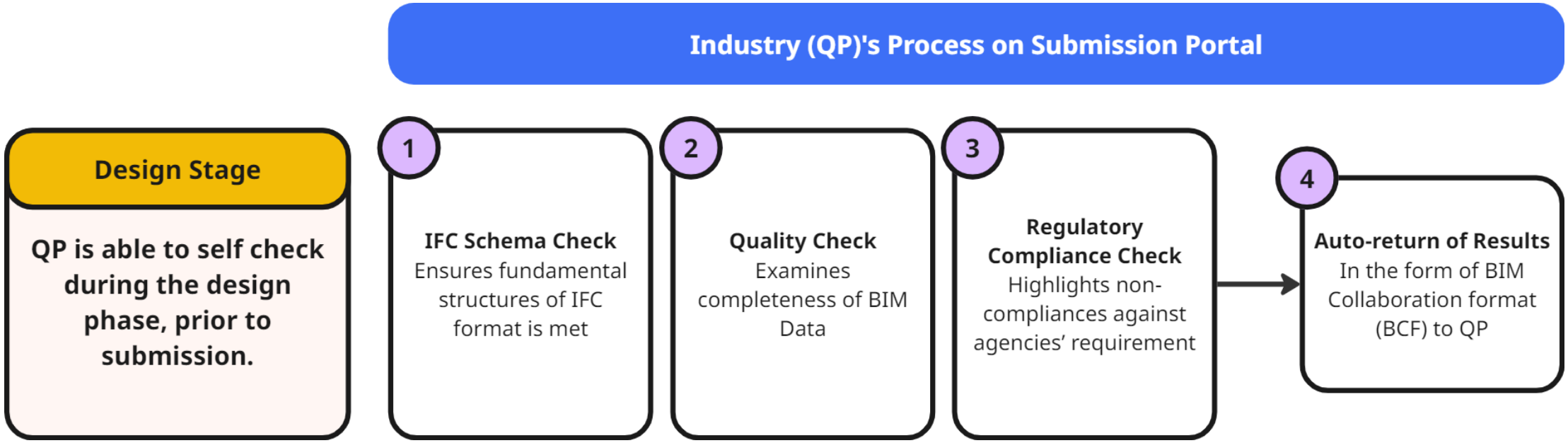
BETA

Introduction to Automated Model Checker (BETA)

MC MVP is still WIP

The CORENET X Automated Model Checker (AMC) is a rules-based engine that allows

1) The **Industry** to **validate BIM models** for quality and regulatory compliance before actual submission.
2) Upon formal submission, **Agency Processing Officers** will **review AMC-generated results** before issuing response letters to the Industry.

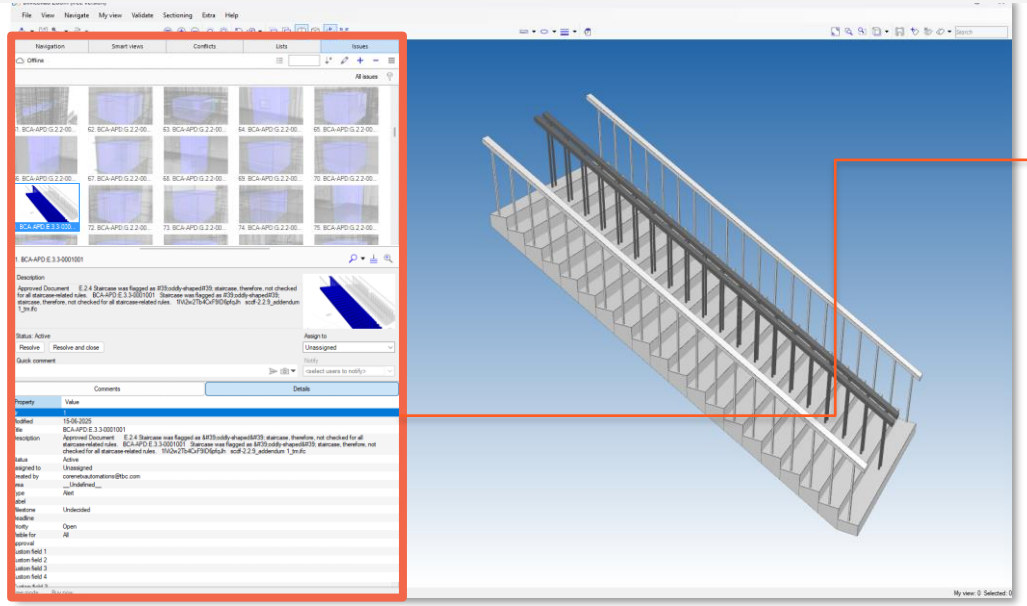


Automated Model Checker Minimum Viable Product

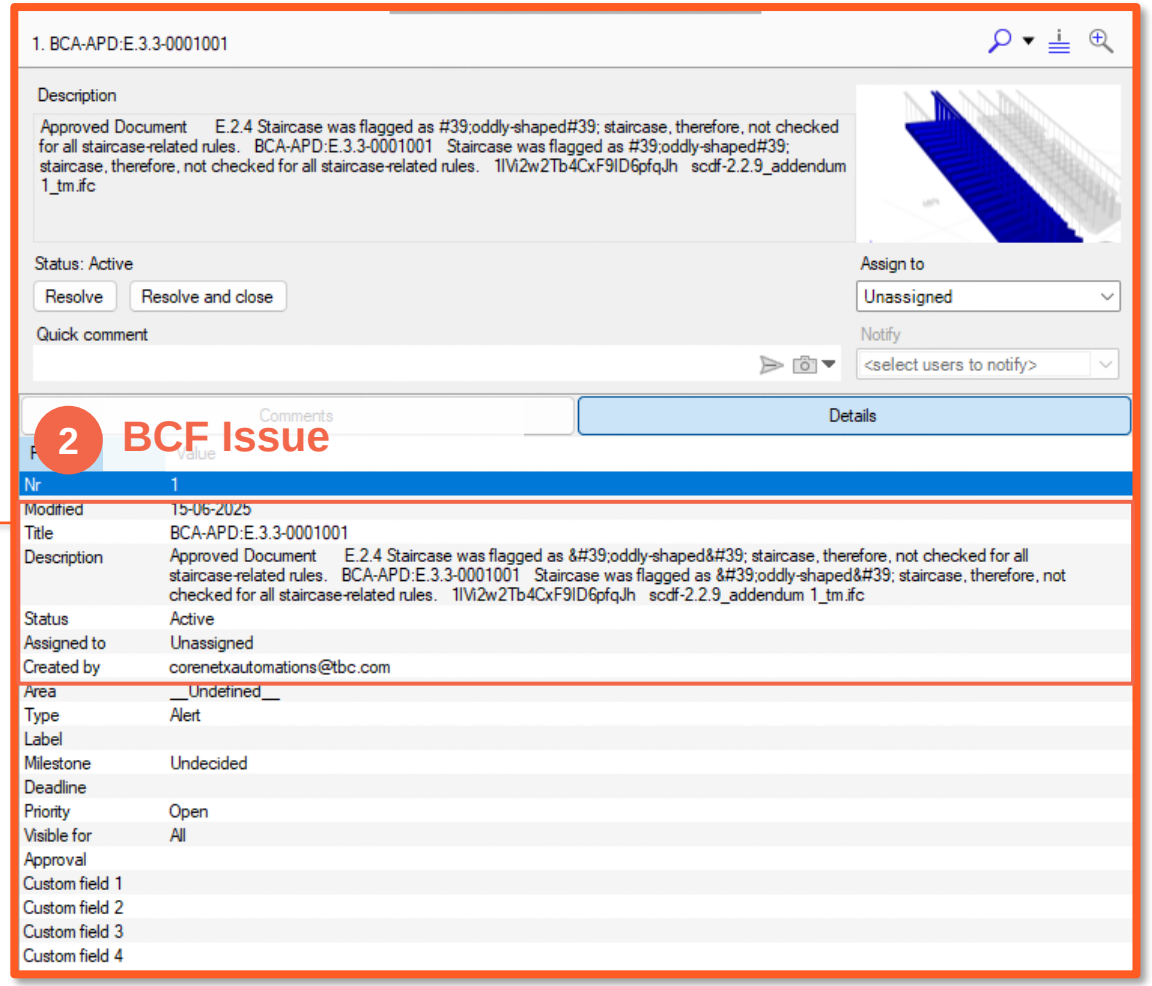
MC MVP is still WIP

- The MC Minimum Viable Product (MVP) is the **early version of the MC** and covers selected rules from the different agencies. It will be **expanded and released progressively** to include more rule checks.

- MC MVP will be **made available to QP (date of MVP release will be shared when firmed)** to facilitate pre-checking of submissions, to identify issues with BIM models and non-compliances upfront, prior to submission
- Results will be returned to QP in the form of **BCF**



1 BCF Export Package to QP

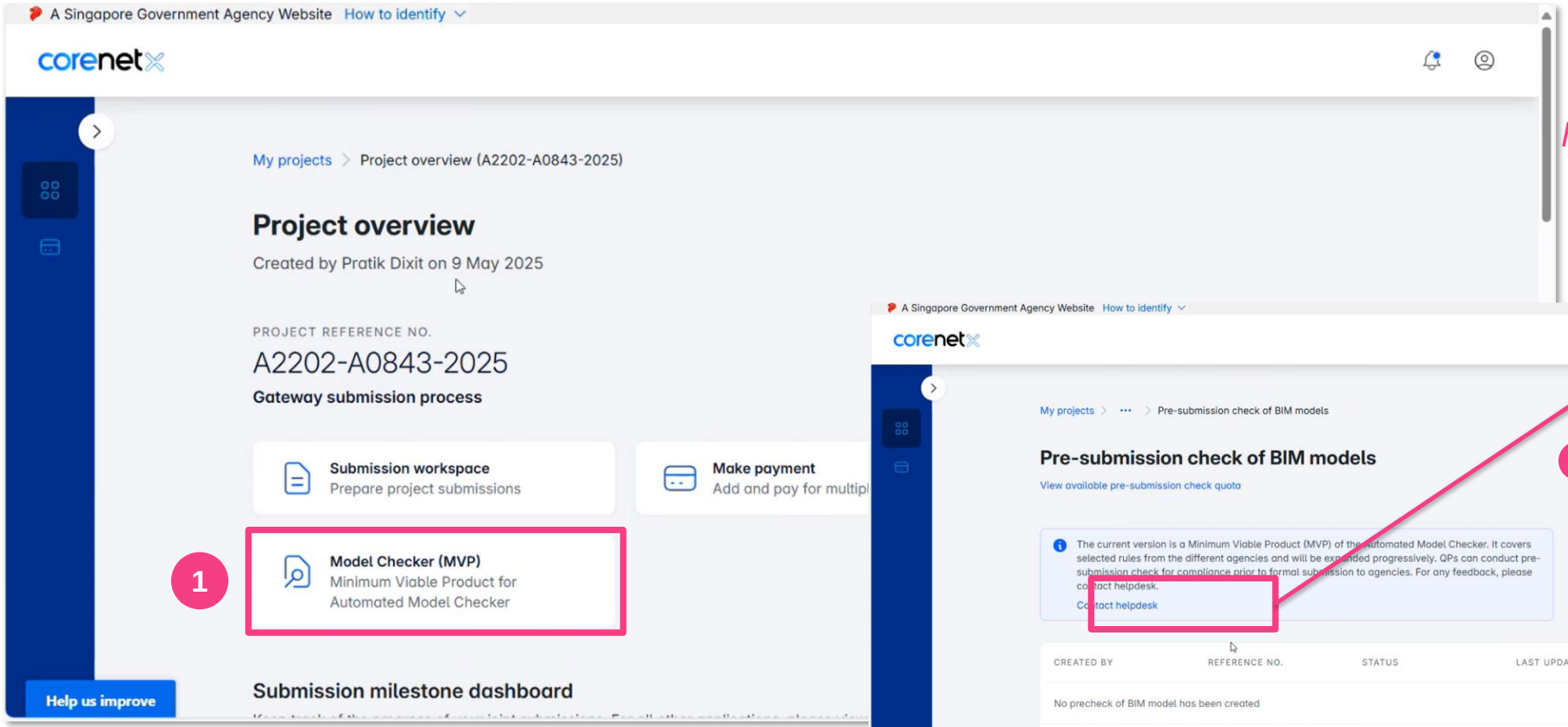


Pre-Submission Check

MC MVP is still WIP

To proceed with a pre-submission check, Industry practitioners will need to:

1. Select **Model Checker (MVP)**
2. Select **Request for pre-submission check**



Should the project team has any feedback on the BETA version, you can send your feedback to ***CORENET X Helpdesk***

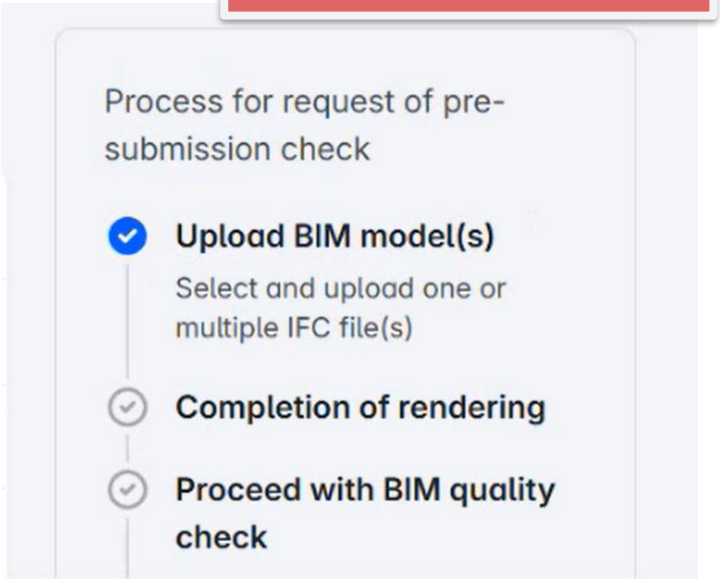
Pre-Submission Check

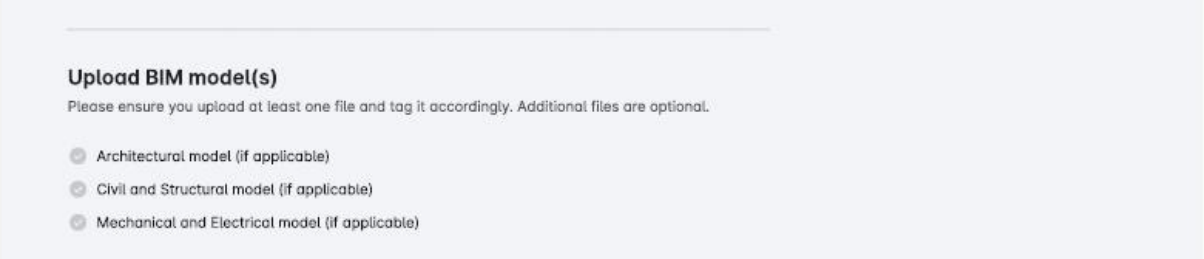
MC MVP is still WIP

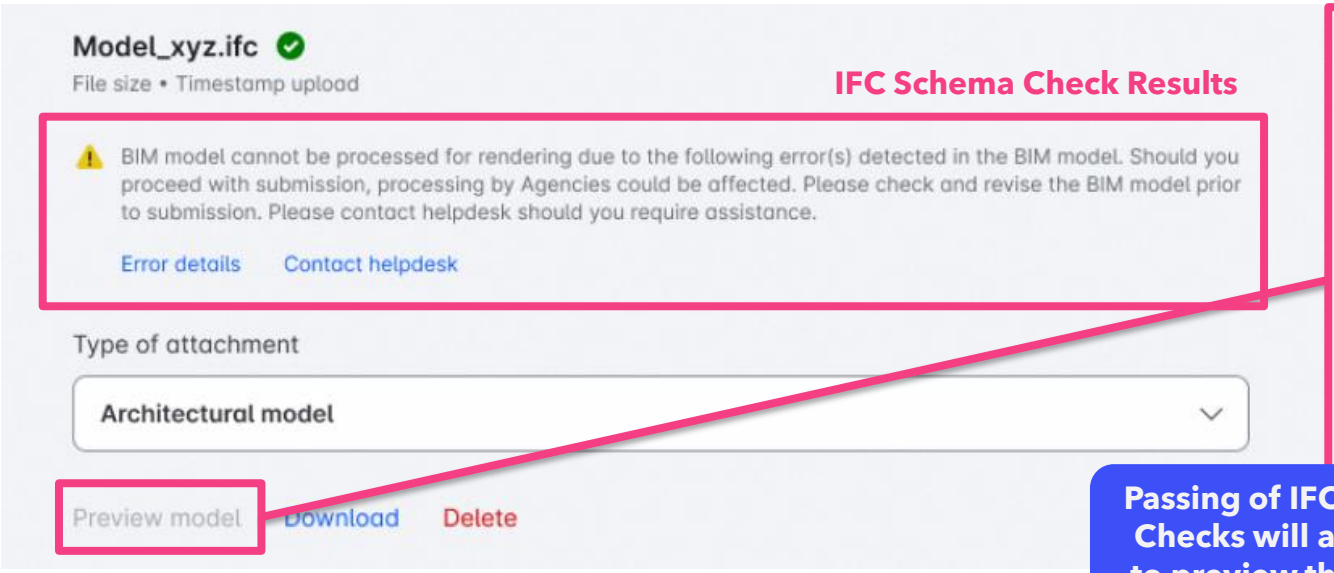
IFC Model processing and rendering upon BIM file upload

IFC Schema Checks will run automatically upon BIM file upload. Thereafter, Submission Portal will Preview model URL.

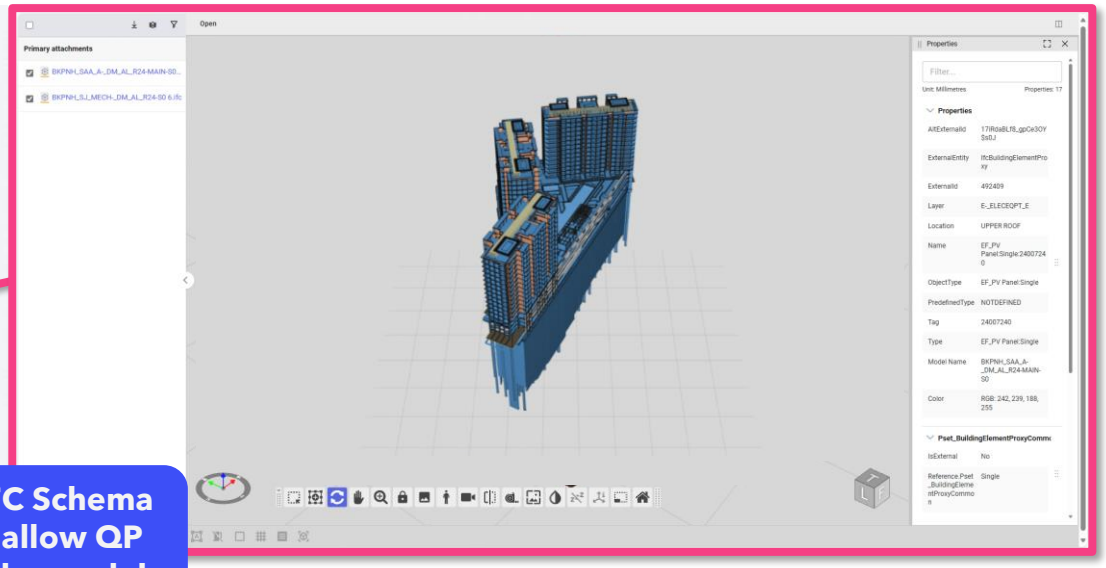
For both pre-submission and formal submission, Industry practitioners will be able to preview model on LBV by clicking on the link (selecting Preview model).







Preview of BIM model



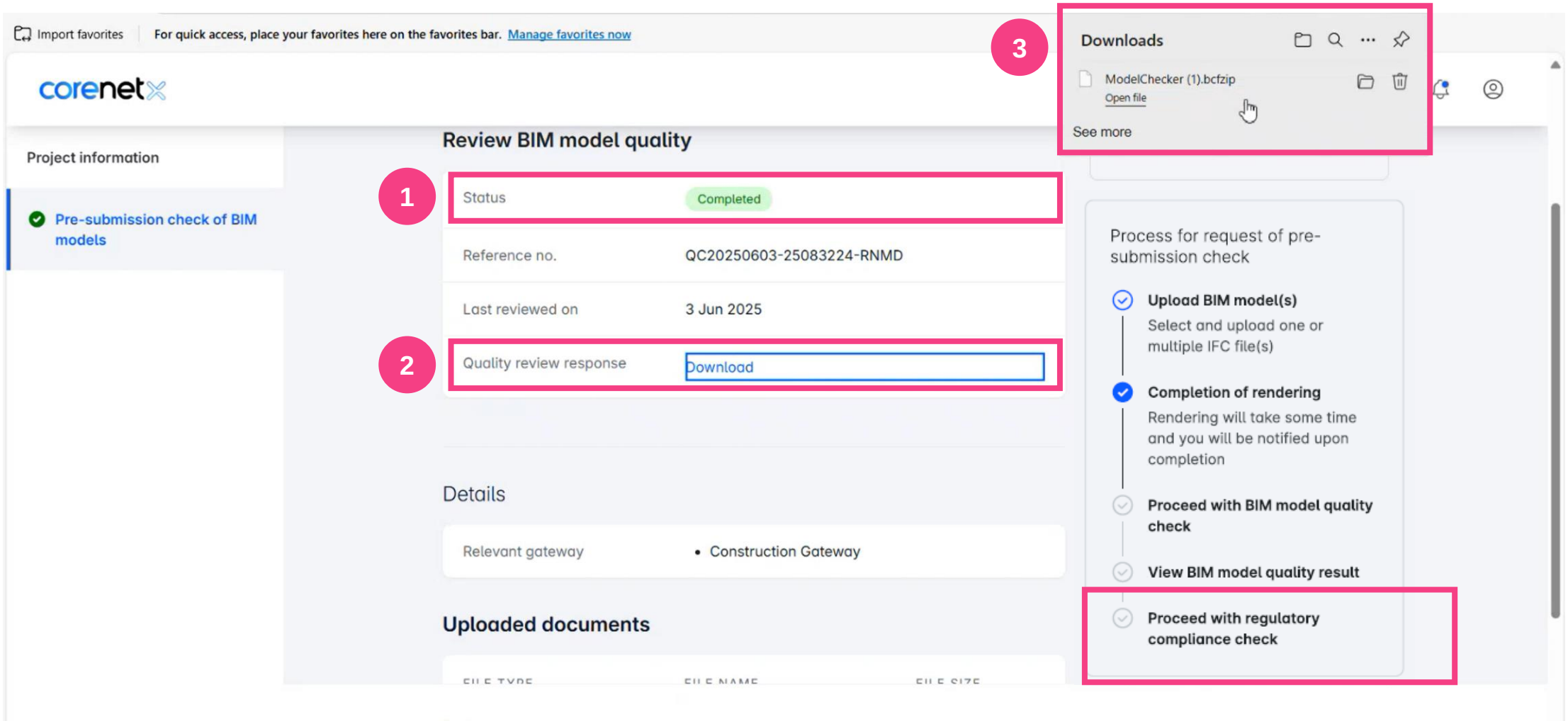
Passing of IFC Schema Checks will allow QP to preview the model

Pre-Submission Check

MC MVP is still WIP

Quality check of BIM model

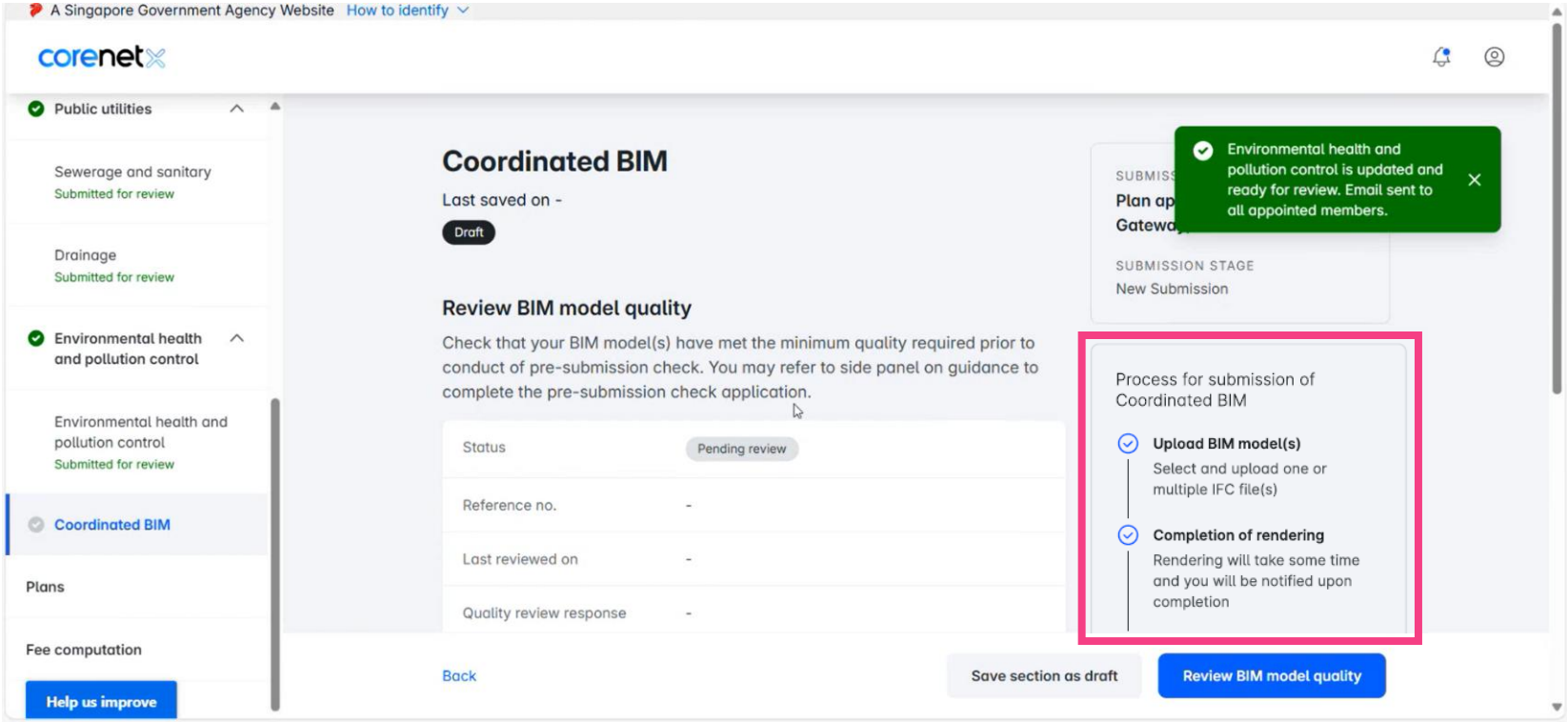
After initiating quality check, the results will be available for download as a BCF file.



Before making a Formal Submission to Agencies

MC MVP is still WIP

- **The submission process is similar to pre-submission check.** IFC Schema Checks, and Quality Checks will be run on the BIM model.
- **Regulatory Compliance Checks will be conducted** upon completion of formal submission application.
- Results for **Quality Checks** and **Regulatory Compliance Checks** will be returned in agencies' response letter to project team.



Key Insights, Learning Points and Good Practices

Key Insights from CORENET X Live Submission Projects

Mindset & Practices

INDUSTRY - Observations from live submission projects

Background

- The new regulatory process requires **upfront coordination** to minimise downstream issues faced during construction
- This is a **major shift from today's process** which allows submissions to be made in silo. Agencies' assessment and requirements are in turn conveyed in silo, often uncoordinated (or even conflicting)
- As part of CORENET X engagement efforts, the team has been engaging REDAS and key developers on the need for proper planning and to provide sufficient time for design

Observations

- While some developers have provided longer period of design, others continued to work based on **old mindset and practice, leading to rushed and low quality submissions**

  E.g.: One project catered only 1.5 months for the design of a super high-rise residential development

- Some projects continue to make design changes, causing reworks by QPs to cater for these changes

Key Insights from CORENET X Live Submission Projects

Level of collaboration

INDUSTRY - Observations from live submission projects

Background

- The new regulatory process requires **collaboration and communication among the various stakeholders**
- This ensures the design submitted for approval is coordinated and agencies will access and review a consolidated design (comprising from a set of models).

Observations

- Designs are largely still in silos & there is limited communication to achieve effective collaboration

  A shift in unit layout will mean C&S engineer needs to redo its structural design & M&E engineers to need replan its services

- **Inputs from builder is important** and it is useful for builder to be onboarded early in the project

Key Insights from CORENET X Live Submission Projects

Industry's Familiarity

INDUSTRY - Observations from live submission projects

Background

- The new regulatory process aligns agencies' level of details at key milestones, striking a balance between what is required and could reasonably be provided
- It requires coordination among the various QPs, who may each be using different authoring software
- To **ensure collaboration and interoperability, openBIM format is adopted**

Observations

- Some **project teams are unfamiliar of the level of details needed at each milestone, leading to incomplete submissions** (e.g. missing info)
- Coordinated submission requires QPs to provide correct geo-references & consistency in the storey height & naming
- Gaps observed among the various QPs (e.g. Architect, Civil and Structural Engineers)

What will be covered under the industry guidebook?

- Compilation of key learning points and best practices from observations made from live projects
- Intended to help industry practitioners in **understanding potential areas to look out for, recommended good practices as well as common pitfalls to avoid**

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1 Industry onboarding checklist

- Submission Portal
- IFC+SG

2 Key Takeaways

Planning your project

- Planning and coordination
- Timeline management
- Dependencies

Making a submission

- Navigating Submission Portal
- Submission Process & statutory responsibility
- Submission Quality
- Level of details for M&E Submissions

Modelling for IFC+SG

- Model federation
- Alignment of levels and zones
- Modelling Quality

Common Pitfalls and Adopting Good Practices

Key Findings on Workflow and Process

Project Planning & Coordination

Common Pitfalls Observed

➢ **Insufficient Clarity on the Scope of Work**

No consensus over who is leading the overall coordinator. In some cases, Architect and Builder each felt that the other party should be the coordinator.

➢ **Design Coordination Gaps**

No discussion among QPs over design change and its potential impacts.

➢ **Lack of Overall Project Coordination**

QP viewed that it is not their responsibility to ensure submissions by other QPs (e.g. Specialist QPs) are completed, resulting in coordination gaps and delayed project approval.

EXAMPLE

Architect repositioned building blocks and modified the layout after Piling Gateway (PG) approval. Such design changes results in:

- Structural Engineer having to redo structural calculations
- M&E Engineer needed to redesign the building services to align with the revised layout.

Recommended Practices

✓ Establish **clear roles** over whom should lead the design and overall project coordination respectively; this should be viewed as a **collective responsibility**

✓ To identify two key roles at start of project :
1.The **Overall Lead Coordinator(s)**
2.Representative from each firm to work with Lead Coordinator(s) and ensure internal alignment

Common Pitfalls and Adopting Good Practices

Timeline Management

Common Pitfalls Observed

- **Insufficient Time Catered for Submission Preparation**

Unrealistic timelines lead to rushed submissions, compromising quality and causing unnecessary iterations

- **Late Applications for Waiver/Pre-Consultation**

If there is intent to deviate from the requirements, it is important to factor time for waiver application or pre-submission consultation.

EXAMPLE

QP relied on past experiences and presumed that waivers would be granted at a later stage. The QP's approach of "*agency will accept it anyway*" demonstrated misunderstanding of proper submission procedures and poor timeline management.

Recommended Practices

- ✓ Timeline should be agreed within the entire project team
- ✓ **Allocate realistic timeframes** for design development
- ✓ **Plan sufficient coordination periods** between disciplines
- ✓ Account for **potential revision cycles** in the project schedule
- ✓ **Include buffer time** for pre-submission consultations and waivers, if required

Common Pitfalls and Adopting Good Practices

Design Changes

Common Pitfalls Observed

- **Frequent design changes during submission**

Design changes introduced during resubmissions lead to extended approval timelines

- **Builders engaged after commencement of design and submission phases**

Contractor was involved halfway when the design was near completion, which resulted in consultants having to redesign to incorporate the contractor's inputs, resulting in abortive works.

Recommended Practices

- ✓ Establish **clear design freeze milestones,** project team should discuss and align on the timeline when design freeze should happen.
- ✓ **Early builder engagement** is important if design input is required from the builder

Common Pitfalls and Adopting Good Practices

Dependency that affect Site Progress

Common Pitfalls Observed

- **Fail to understand the dependency between submissions and submissions that affect site progress**
- **Project planning did not cater for submissions needed for off-site activities**

To carry out off-site activities such as pre-cast, BCA's Structural submissions and Permit to commence structural works are required. Projects may face delays if they do not cater for this in their planning for part ST submission.

Recommended Practices

- ✓ Understand these dependencies and make **plan for your project timeline/ schedule**.
- ✓ **Start the preparation early** and this requires **close coordination between the consultants**.
- ✓ If extensive off-site activities are involved and lead time is required, consider covering the scope early in the submission timeline.

Navigating the Submission Portal

Aspect	Current CORENET 2.0	CORENET X
Appointment	QPs attach authorisation letters documenting the appointment of members in submissions	Appointment of members must be done before QPs can access submission forms of their respective scope of works
Submission Responsibilities	QPs indicate their own scope of works in authorisation letters	Project Coordinator (lead QP) of the system to collate respective QPs' submission scopes and indicate them as part of appointment process
Joint submissions vs independent submissions	Each submission made separately to different agencies	At key gateways, submissions (DC and BP) are prepared and made jointly to all applicable regulatory agencies All other submissions remain independent
Project members	Parties such as developer, RE/RTO, Accredited Checker do not interact with CORENET	Developer, RE/RTO, Accredited Checker to login and interact with the system to perform appointment and submission inputs

Common Pitfalls and Adopting Good Practices

Navigating the Submission Portal

- Project members who currently do not need to use CORENET 2.0 but will need to access CORENET X will need to familiarise themselves with Singpass for Business (Corppass).
- As regulatory forms have digitalised on CORENET X, the appointment of QPs and the subsequent workflows such as creation of submissions will be delayed if Corppass for each firm's representatives has not been set up.

Good Practice

- For corporate entities, industry stakeholders **should set up their Corppass accounts as early as possible** including Corppass access to the CORENET X Submission Portal so that any issues that may arise can be addressed with their Corppass Admin (e.g. internal clearances required, Corppass Admin is away on leave, etc.)
- Corppass admins should **authorise their staff (Developer/Builder/QP and their assistants) to represent the company and be able to access "CORENET X Industry Portal" (https://portal.corenet.gov.sg/)** e-Service.

Common Pitfalls and Adopting Good Practices

Plan the Project TOP/CSC Journey Early

Common Pitfalls Observed

- **QP was informed late to make his/ her submission required for TOP/ CSC**

Currently, some of the project members may not be users of CORENET 2. However, with CORENET X, they will need to log in to make online declarations. Therefore, it is important to ensure they are aware of these requirements to minimise potential delays.

- **Late Submission to BCA for TOP requirements, after all other technical clearances are obtained**

EXAMPLE

PEs assumed that COS would still be via hardcopy forms and the project team overlooked the involvement of PE(Electrical) in submitting the Certification of Supervision for Lightning Protection System. This oversight led to additional time and delay the TOP/CSC process.

Recommended Practices

- ✓ Inform the relevant project members of the actions required early
- ✓ Utilise the **TOP/CSC status dashboard** in CORENET X Submission Portal to track technical clearances/ documentation, and plan your TOP/CSC process.
- ✓ For partial TOP, **make a pre-submission consultation** to the agencies for alignment

Common Pitfalls and Adopting Good Practices

Submission Process & Statutory Responsibility

Common Pitfalls Observed

- **Lack of Clarity over who should be responsible for an agency submission**

QP Assistant (QPA) may not be clear on the agreed scope of work and statutory responsibility. As the assigned scope will affect access to respective parts of the submission, it is important to ensure clarity in this.

- **Initiating multiple requests to developer for members' appointments**
- **Missing Digital Signing/ Expired Netrust Digital Signing Certification**
- **Long filepath**

File located in multiple levels of sub-folders may cause error during encryption

Recommended Practices

- ✓ Align within the project team to ensure there is **clarity over each project members' scope**
- ✓ **Consolidate the request and send only 1 email notification** to the intended party
- ✓ Ensure the timely renewal of the Netrust Digital Signing Certificate

Common Pitfalls and Adopting Good Practices

Submission Quality

Common Pitfalls Observed

- **Lack of clarity in correspondence**

Generic replies such as 'complied with' or 'noted' are insufficient and may lead to additional queries.

- **Skipped model checks before submission**

Project teams who skip quality checks often submit models with obvious issues.

EXAMPLE

Common errors that could be visually identified and resolved before submission such as:

- Models submitted with missing files result in incomplete elements (e.g. roof)
- Federation issues e.g. building elements (e.g. drains) to appear “floating” and disjointed tower block and podium

Recommended Practices

✓ To conduct thorough **quality checks before submission**.
✓ Provide **clear responses** that detail the changes made and where to find them to facilitate processing

Common Pitfalls and Adopting Good Practices

Model Federation

Common Pitfalls Observed

- **Lack of Coordination in Initial Setup**

Fails to establish and document agreed-upon coordinate settings during project kick-off leads to models being created with different reference points and orientations, causing significant coordination issues downstream.

- **Poor Communication of Reference Point Changes**

When project reference points are modified without proper notification to all stakeholders, teams continue working with outdated coordinates, resulting in misaligned models.

Recommended Practices

- ✓ Establish a **common project reference point at project start**, ensuring all discipline models align within the same coordinate system for accurate federation.
- ✓ Any changes to the reference point require **immediate notification to the BIM teams to maintain coordination accuracy** across all models.

Alignment of Levels and Zones

Common Pitfalls Observed

- **Lack of communication between project team**

Inconsistent storey names and FFL across models, often caused by poor communication between disciplines and the absence of a shared storey reference.

- **Overlooked workflow to manage changes**

No proper workflow in place to manage changes in storey name, FFL, and height, which can lead to inconsistencies across discipline.

Recommended Practices

- ✓ To **define and maintain a centralized standard** for **storey naming, height ("Z" value) and Finished Floor Levels (FFL)** that all disciplines consistently apply throughout the project.
- ✓ Using shared reference files help prevent discrepancies and ensures alignment across all models

Common Pitfalls and Adopting Good Practices

Model Quality

Common Pitfalls Observed

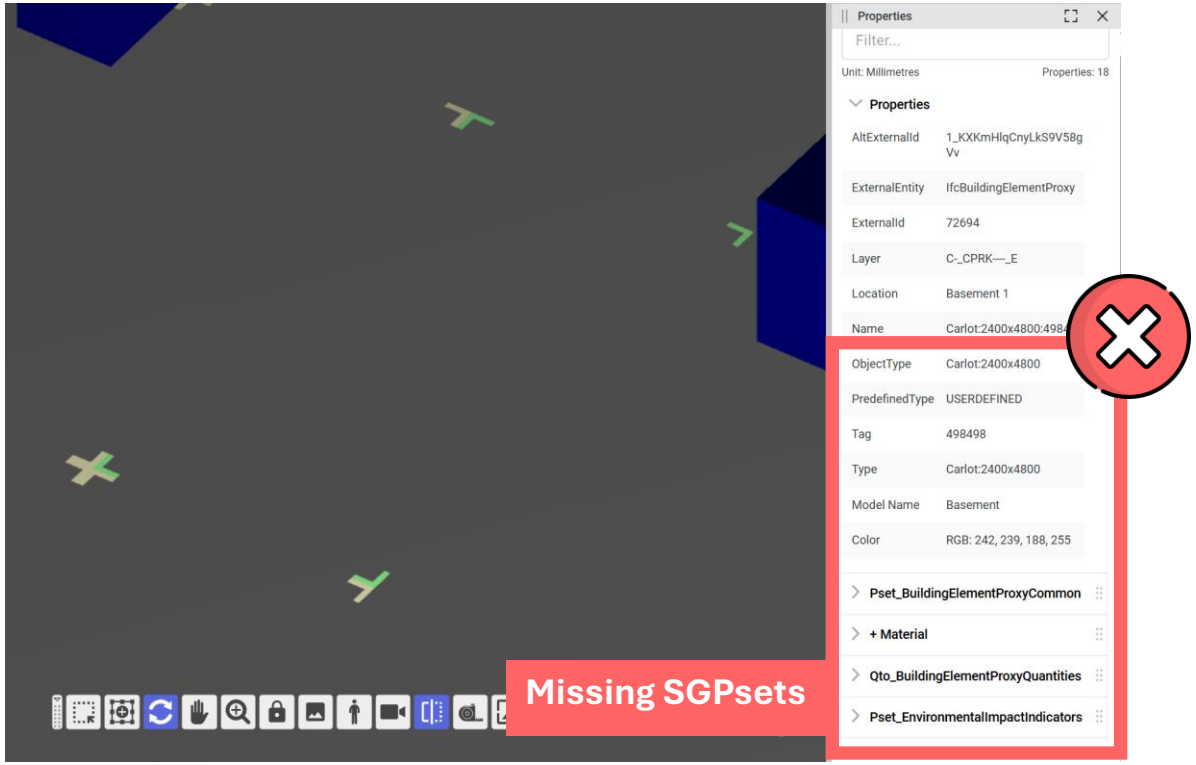
- ✓ **BIM teams across different disciplines often work in silos**
- ✓ **Apply outdated practices to current CORENET X requirements**
- ✓ **Weak Collaboration Between QPs and BIM Teams**

QPs are not actively engaged with the BIM team, there is a risk of misinterpreting design intent or overlooking compliance issues.

Recommended Practices

- ✓ BIM teams should **jointly plan modelling workflows**, avoiding siloed efforts that lead to inconsistent outputs.
- ✓ Open mindset is needed to adapt to **updated workflows aligned with IFC+SG** requirements.
- ✓ QPs must stay engaged with the BIM team to ensure models reflect design intent and meet regulatory expectations.

Examples of poor modelling observed



Agency	Identified Compone	Identified parameters	Discipline	IFC4 Entities	IFC Sub Types (* = USERDEFINE	Property Set	Property Name	Property Type	Property Unit	IFC4 Material S	Sample Value for Referen
BCA	Parking Lot	Barrier Free Accessibility	ARC	IfcBuildingElementProxy	*CARLOT	SGPset_BuildingElementProxy	BarrierFreeAccessibility	Boolean	N.A	N.A	TRUE/FALSE
BCA	Parking Lot	Family Parking Lot	ARC	IfcBuildingElementProxy	*CARLOT	SGPset_BuildingElementProxy	FamilyLot	Boolean	N.A	N.A	TRUE/FALSE
BCA	Parking Lot	Length	ARC	IfcBuildingElementProxy	*CARLOT	SGPset_BuildingElementProxyDimension	Length	Length	mm	N.A	N.A
BCA	Parking Lot	Width	ARC	IfcBuildingElementProxy	*CARLOT	SGPset_BuildingElementProxyDimension	Width	Length	mm	N.A	N.A
LTA	Parking Lot	Car Parking Served By Car Lift	ARC	IfcBuildingElementProxy	*CARLOT	SGPset_BuildingElementProxy	CarParking_ServedByCarLift	Boolean	N.A	N.A	TRUE/FALSE
LTA	Parking Lot	Mechanised Parking System	ARC	IfcBuildingElementProxy	*CARLOT	SGPset_BuildingElementProxy	MechanisedParkingSystem	Boolean	N.A	N.A	TRUE/FALSE
LTA	Parking Lot	Length	ARC	IfcBuildingElementProxy	*CARLOT	SGPset_BuildingElementProxyDimension	Length	Length	mm	N.A	N.A
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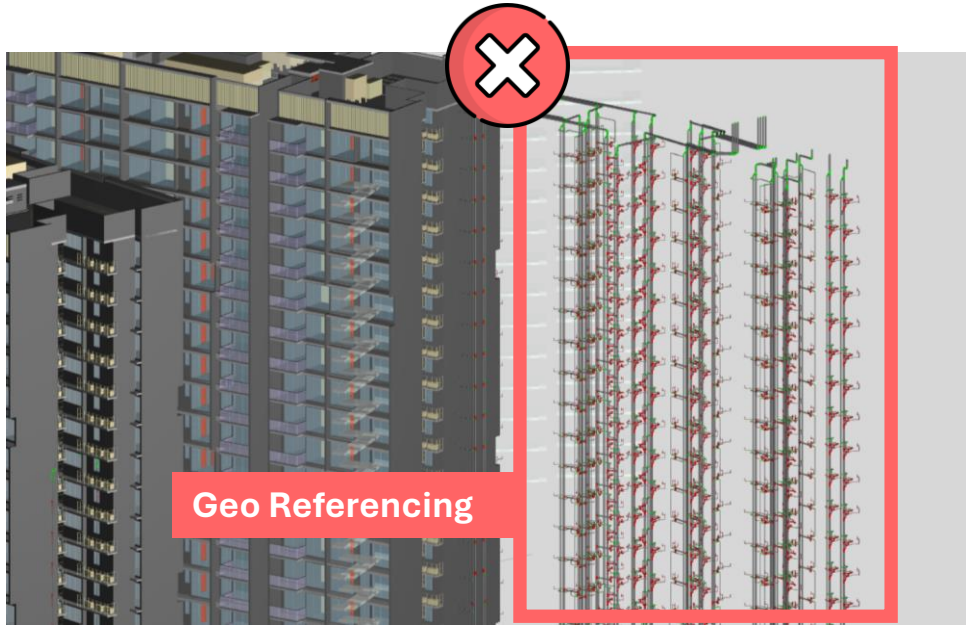
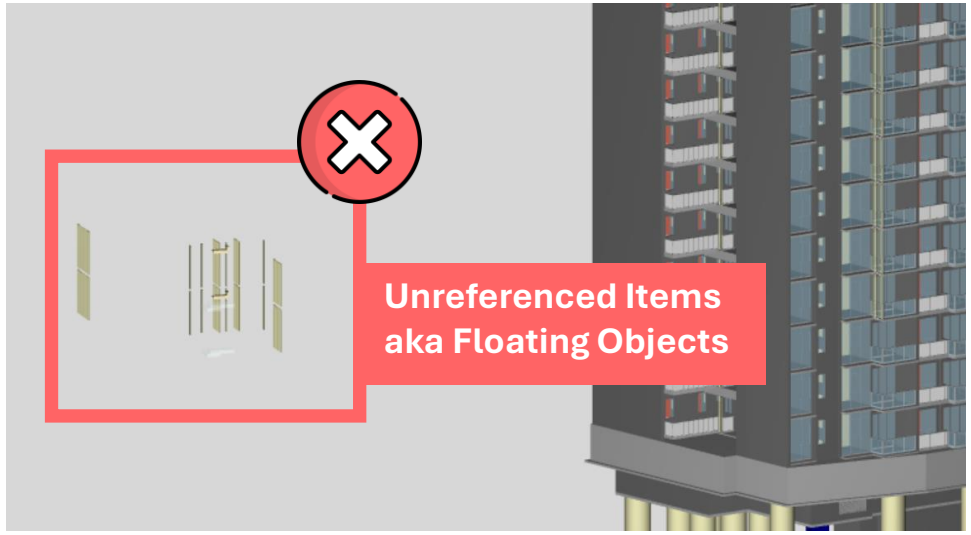
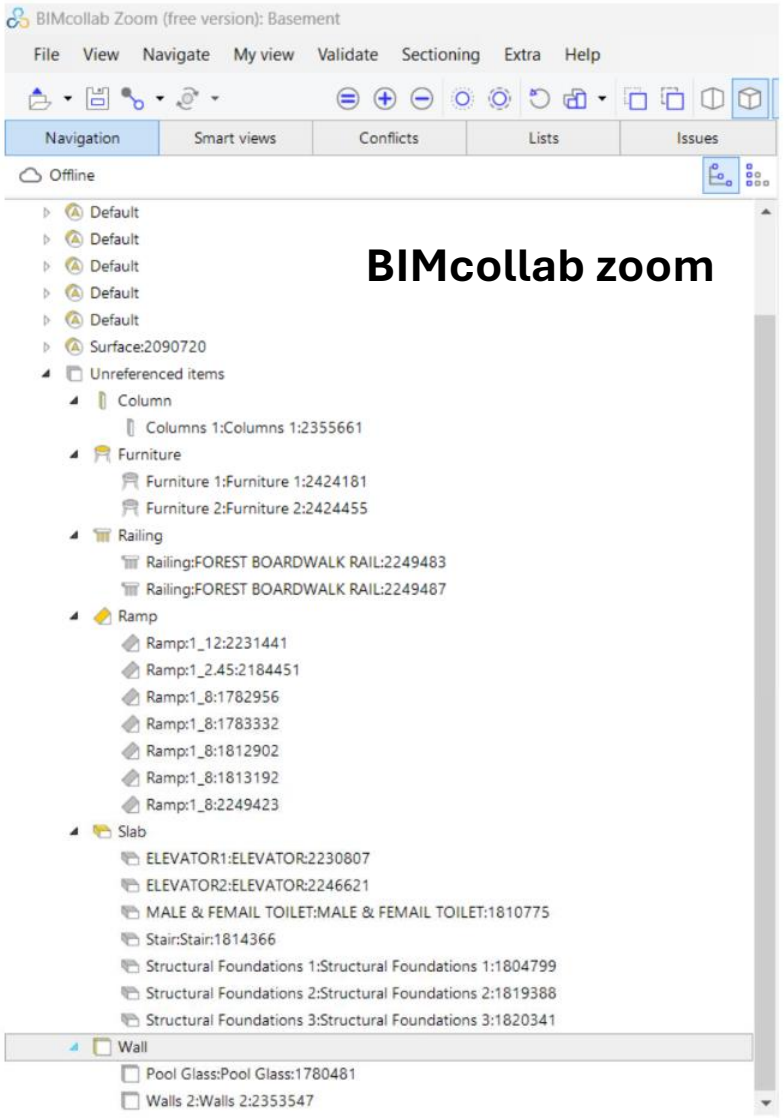
Industry mapping file



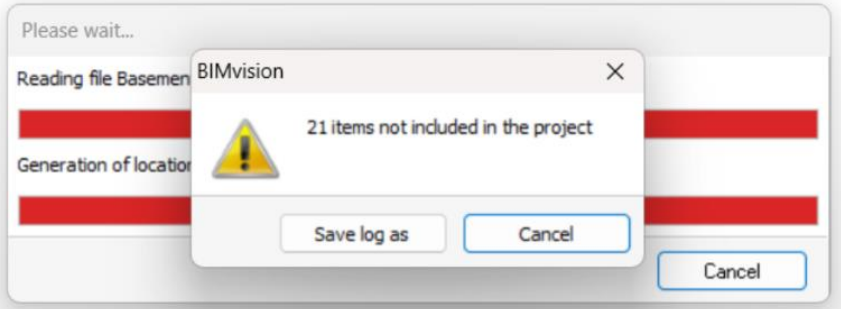


Examples of poor modelling observed

Addressing the unreferenced items



BIMcollab zoom

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      2424455
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21
```

BIMvision

Onboarding IFC+SG Checklist

S/N	Task	Status	Remarks
BIM Authoring Software and Features			
1.	Ensure the latest Revit patch is installed	☐	Refer to link for details
2.	Ensure the latest Revit interoperability tool is installed	☐	Refer to link for details
3.	Ensure the Revit-IFC app is installed For Revit 2025 user > Please uninstall the above if you have issue activating the Revit-IFC dialog box > refer to link for details	☐	Refer to link for details
4.	Ensure the Revit IFC exporter is the latest version	☐	Refer to link for details
Component Creation and IFC+SG Information Population			
5.	Study the IFC+SG regulatory requirements for different gateways	☐	Refer to link for key gateways details Refer to link for Code of Practice (COP) details
6.	Study how to prepare an IFC+SG model Please refer to link for Glossary of Identified Components	☐	Refer to link for details
7.	Ensure you download relevant IFC+SG toolkits and resource files	☐	Refer to link for details
8.	Use third-party applications to help in IFC+SG model preparation	☐	Refer to link for details
Multi-disciplinary Coordination and Model Quality			
9.	Be sure to read through the model submission good practice guide	☐	Refer to link for details
10.	Be sure to read through the multi-disciplinary coordination good practice guide	☐	Refer to link for details
11.	Be sure to read through the checking levels (z-coordinates) good practice guide	☐	Refer to link for details
12.	Be sure to review the exported federated IFC files before submission When using an IFC Viewer (BIMVision or BIMCollab Zoom), make sure it is the latest build. (Note: Registration may be required, but both viewers are free.) BIMVision > Click link to download BIMCollab Zoom > Click link to download Essential Points for Model Quality: - • Ensure IFC models can be federated together as intended. • Ensure components are exported to the correct IFC entity and subtype with the relevant IFC+SG properties and property sets. • Ensure there is only one IfcSite per IFC file when exporting with linked files. (Tip for Revit user: In the Revit IFC exporter > Additional Content tab > linked files, select 'Export in same IfcSite') • Ensure there are no unreferenced items. (Tip: Make sure all elements created in Revit are referenced to a level datum) ○ If you notice any unreferenced items, locate and resolve their referencing issues. (Tip for Revit User: When you encounter this warning while opening an IFC file in BIMVision, download the log and use the element ID (tag) or GUID to locate the elements in Revit) • Ensure all level datums are aligned across all models (i.e. datum names must be unique (including the GUIDs), with the same Finished Floor Level)	☐	Refer to link for details

Industry Support, Resources & Upcoming Events

Internal checklist for firms

People

- ✓ **Building a CORENET X core team** – equip CORENET X experts as "go-to" persons
- ✓ **Manage the change & evaluate effectiveness of the training plan** – track KPIs
- ✓ **Plan for the manpower and resources needed** - support the changes

Process

- ✓ **Understand the RABW process & Agencies' requirements** –
  - Attend RABW training
  - Study the Code of Practice
  - Make a voluntary submission
  - Map the new RABW into internal workflows & conduct impact assessment

Technology

- ✓ **Ensure system readiness** –
  - Attend IFC+SG training, create and map internal templates to meet IFC+SG requirements
  - Familiarise with the Submission Portal Training Environment

Trainings and Courses for Industry

1

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

2

	Software	Trainers
IFC+SG Training *Preparing OpenBIM submissions using IFC+SG*	Revit	AcePLP Pte Ltd, BIMAGE consulting, SP Pace Academy, Innocom
	Tekla	AcePLP Pte Ltd
	Archicad	Graphisoft
	Bentley	Bentley, AcePLP(AIA)

Please scan the QR code below to find out more:

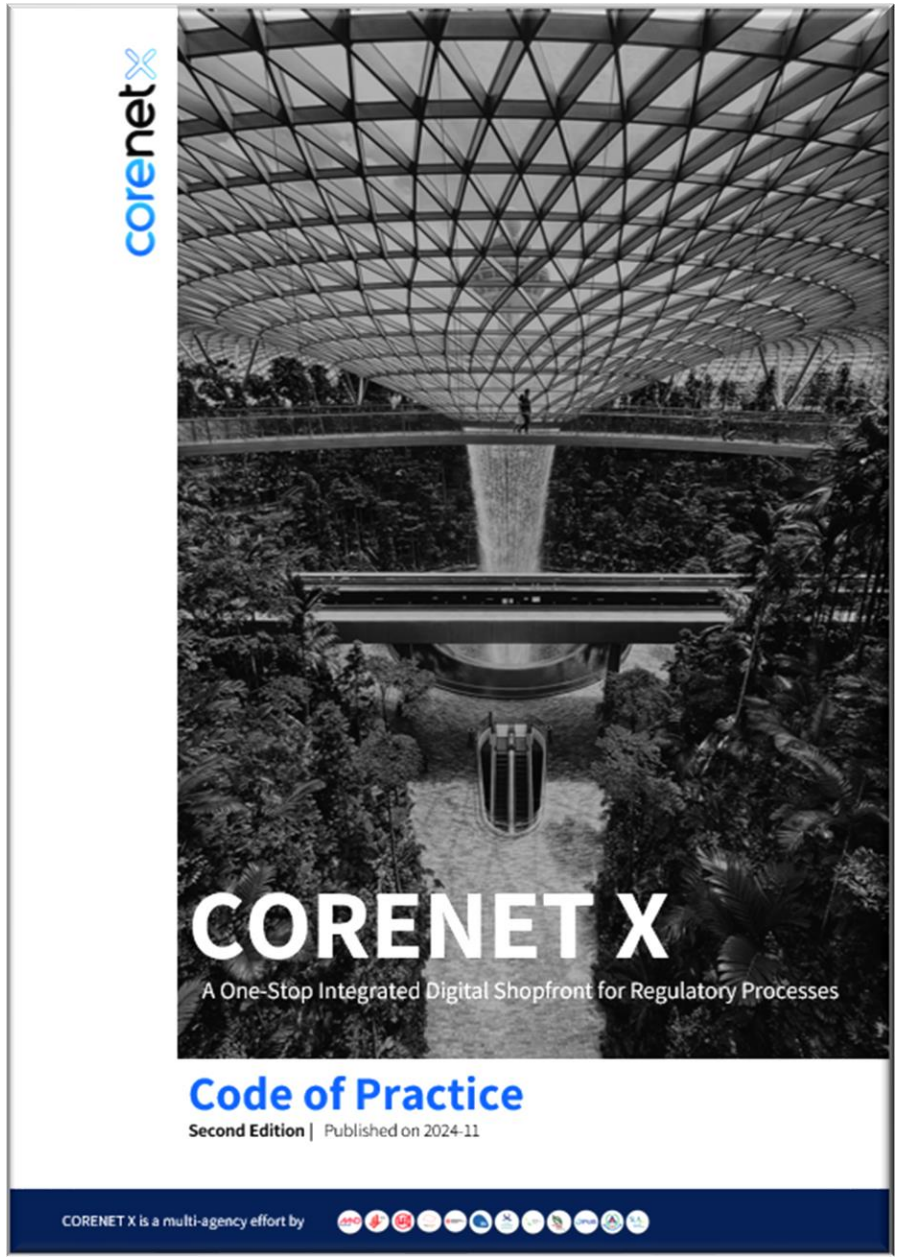
https://go.gov.sg/cxtrainingcourses

CORENET X Code of Practice

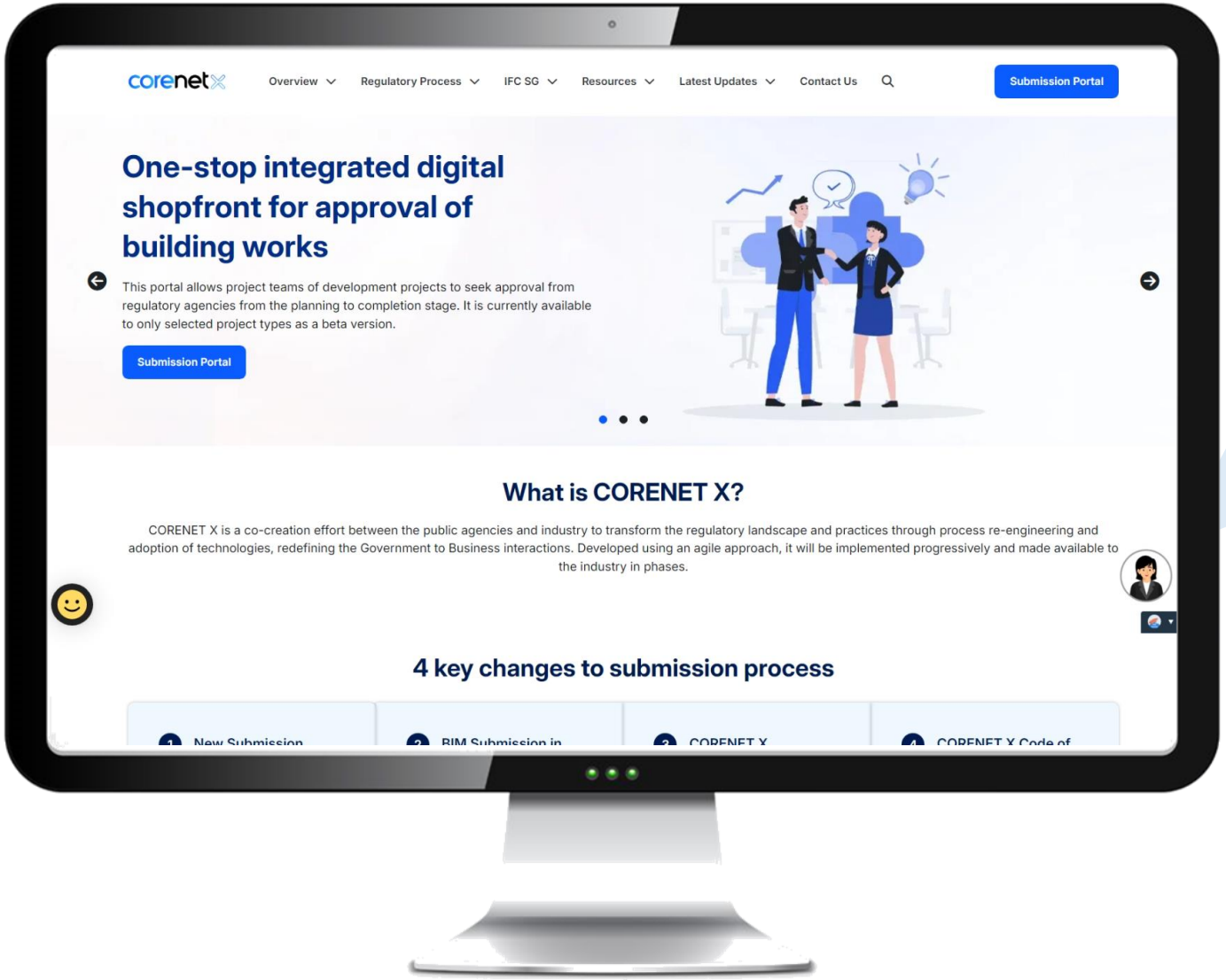
- First edition was **released on September 2023**
- Intended to help industry practitioners in understanding **how to prepare multi-agency regulatory submissions across the key submission gateways in CORENET X**
- Includes **recommended procedures** and **good practices** to address common BIM issues
- 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

[Latest Version Here]

The 2nd edition is now available!



CORENET X Website & Self-Help Resources



- Interactive COP
- Submission Portal Guides
- IFC+SG
- Training & Funding
- Past Events & Material
- Circulars
- NEW List of firms that have onboarded CORENET X

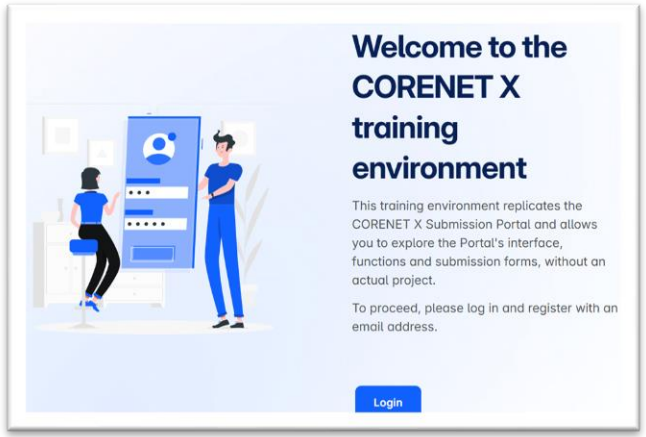
More details on CORENET X can be found at:
https://go.gov.sg/cx

SCAN ME

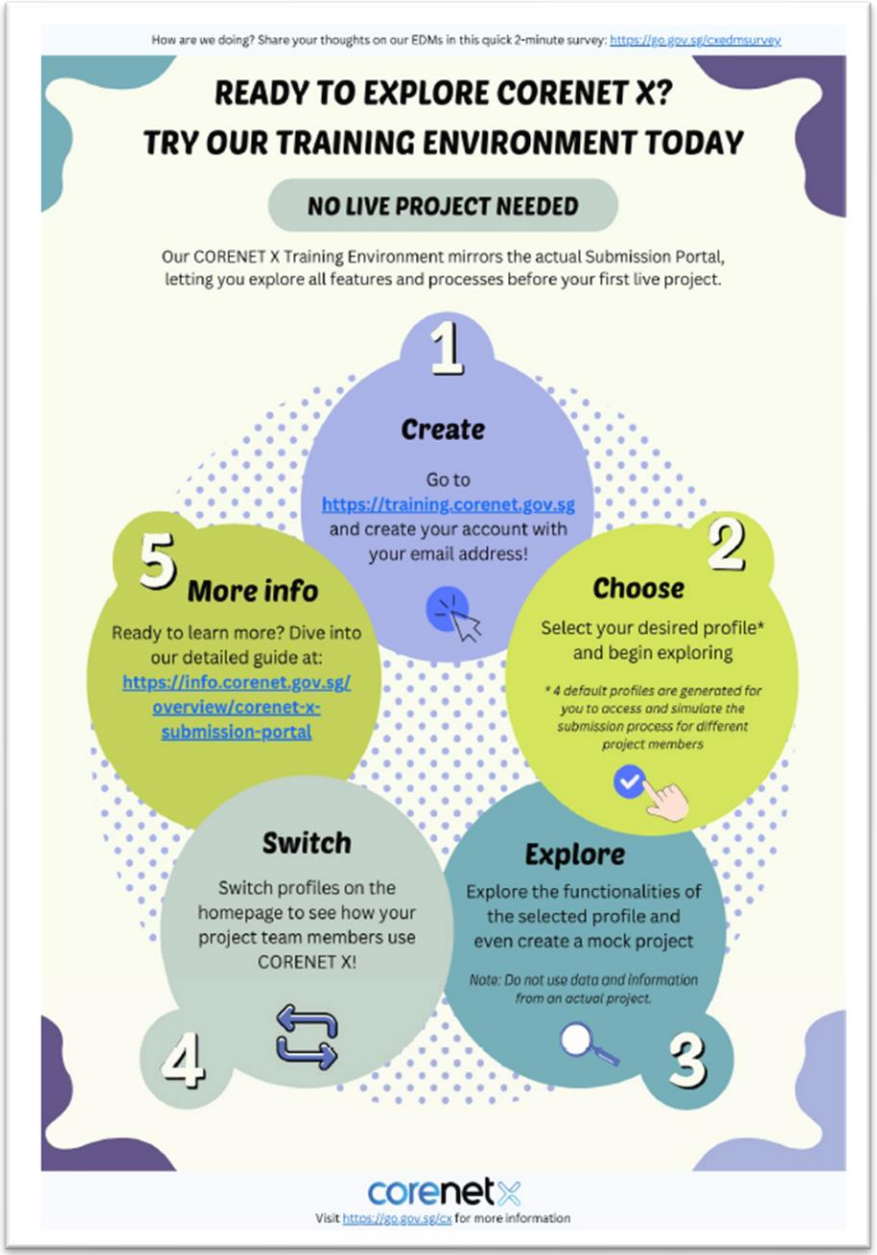
CORENET X Training Environment

Training Environment for Simulated Hands-on

- Training environment replicates the CORENET X Submission Portal
- Allow industry users to explore the Submission Portal's interface, functions and submission forms without an actual project.
- Training guide provided to help industry navigate the simulation environment (https://info.corenet.gov.sg/overview/corenet-x-submission-portal)



https://training.corenet.gov.sg



CORENET X Helpdesk, Clinic & FAQ

To provide troubleshooting channels and FAQ resources for industry support and reference

Clinic-Dedicated Platform for CORENET X Consultations

- Platform to provide support for CORENET X and RABW queries
- Address project-specific submission and regulatory requirements
- Deliver hands-on guidance in partnership with BIM training providers

Helpdesk-Specialised Technical Support for Issue Resolution

- Serve as first point of contact for industry users
- To provide frontline support, managing queries, issues and feedback from industry
- Diagnose and resolve technical problems and track issues through to completion

FAQ - For Immediate Solutions and Quick Reference

- Updated regularly with latest CORENET X information and developments
- Enable quick access to standard solutions and resolution guidance
- Serve as comprehensive knowledge repository for industry

Thank You