CORENET X

A One-Stop Integrated Digital Shopfront for Regulatory Processes

Code of Practice

3.1 Edition | Published on 2025-12

CORENET X is a multi-agency effort by

corenetx

Page

PREAMBLE

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Preamble

This Code of Practice (COP) is intended to help industry practitioners in understanding how to prepare multi-agency regulatory submissions across the key submission gateways in CORENET X.

This Code of Practice, where relevant, will include recommended procedures and good practices to address common Building Information Modelling (BIM) issues at general project collaboration level (e.g. multi-disciplinary project set-up, geo-referencing) and specific details that vary from firm to firm today.

This Code of Practice complements the IFC+SG Resource Kit (https://go.gov.sg/ifcsg), which provides technical templates and help resources from key proprietary BIM software for the generation of IFC+SG models.

Disclaimer

This Code of Practice details the envisaged end state of CORENET X. CORENET X is developed through Agile Methodology and hence, features and requirements mentioned in this COP will be developed progressively, and its technological enhancements will be made available in phases. For the exact implementation date, please refer to official circulars.

This Code of Practice does not substitute Handbooks, Circulars or other regulatory publications of our regulatory agencies. Readers should refer to the relevant Codes, Acts and Regulations on the compliance required for their projects, before referring to this Code of Practice on how to represent the compliance information in the CORENET X submission gateways.

Readers should consult relevant agencies if they need to determine the regulatory requirements to fulfil compliance.

Feedback

This Code of Practice will be updated progressively from its Third Edition published in September 2025. Past editions and summary of changes can be found at https://go.gov.sg/cxcop. We welcome your comments and queries about the Code of Practice so that we can continue to develop and improve it. Please provide your inputs at https://go.gov.sg/cxenquiry or scan the QR code on the right.

https://go.gov.sg/cxenquiry

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Annex	:	Summary of Changes

How to use this Code of Practice

Note: CORENET X is developed through Agile Methodology and sections / requirements in this COP will be updated progressively and its technological enhancements will be made available in phases.

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 2: General Requirements

- What happens to the QP's statutory obligations under CORENET X?
- What do abbreviations like RABW and IFC+SG stand for?
- What is an example of a CORENET X Submission from project registration to Completion Gateway?

Filter by

Section 3:
Regulatory Agencies

- RABW Requirements categorised by Regulatory Agencies

Section 3:
Key Gateways

- RABW Requirements categorised by Key Gateways

Section 3:
Other Building Works

- RABW Requirements for
  - External Works
  - Direct Submission Process
  - Conservation
  - Part-ST Submissions
  - Infrastructure

Note: Each RABW requirement in Section 3 is complemented by IFC 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 1

Introduction to CORENET X

1 Introduction to CORENET X (CX)

About

Harnessing the power of digitalisation and technology, CORENET X will allow Qualified Persons (QPs, i.e. professional engineers and registered architects) to submit a three-dimensional model of a development or building - created and developed digitally through Building Information Modelling (BIM) to the regulatory agencies.

It allows the project team, which includes the QPs, to collaborate and review their designs in the model together, detect possible major conflicts before construction, and produce a coordinated BIM model for submission and regulatory approval. It changes the current practice of QPs dealing separately with multiple regulatory agencies, and producing different versions of building plans thereafter.

Led by BCA and URA and supported by GovTech, CORENET X was developed in close collaboration with the other public agencies[1] and leading built environment professionals, firms, and Trade Associations and Chambers (TACs). It was soft launched on 18 December 2023.

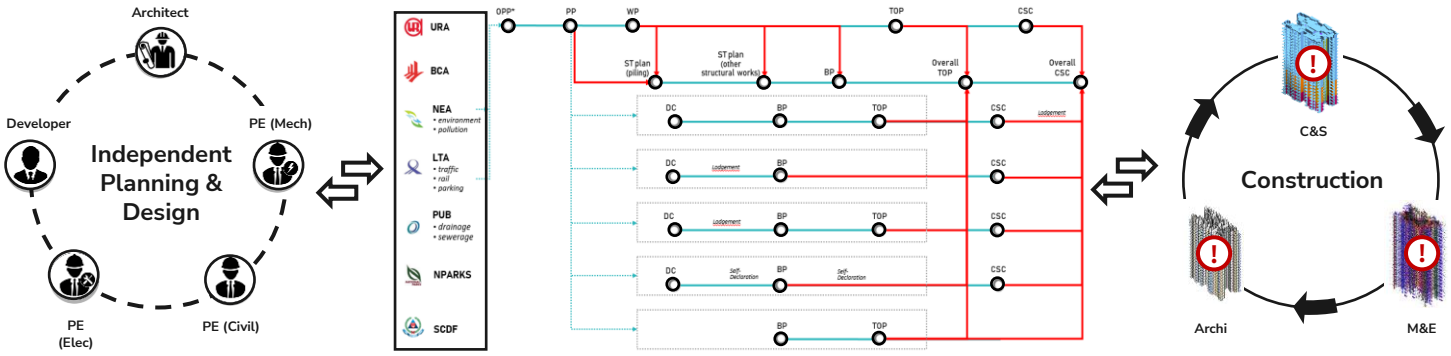
See also:

Minister (MND)'s Official Announcement of CORENET X at the International Built Environment Week 2021

CORENET X Circulars

[1] CORENET X comprises of the following public agencies: BCA, URA, GovTech, HDB, JTC, LTA, NEA, NParks, SCDF and SLA.

Today's Separate and Concurrent Regulatory Approval Process



Industry ⇄ **Agencies** ⇄ **Construction**

upstream ⟵ ⟶ downstream

- Plans are prepared by **different professionals independently**
- Plans are **submitted separately** to different agencies at different milestones concurrently

- Each of the 7 agencies has a **different regulatory mandate**
- Comments from one agency may lead to **resubmission/ amendment** to others
- Approved plans can be **conflicting**; **no single integrated view** of the approved plan

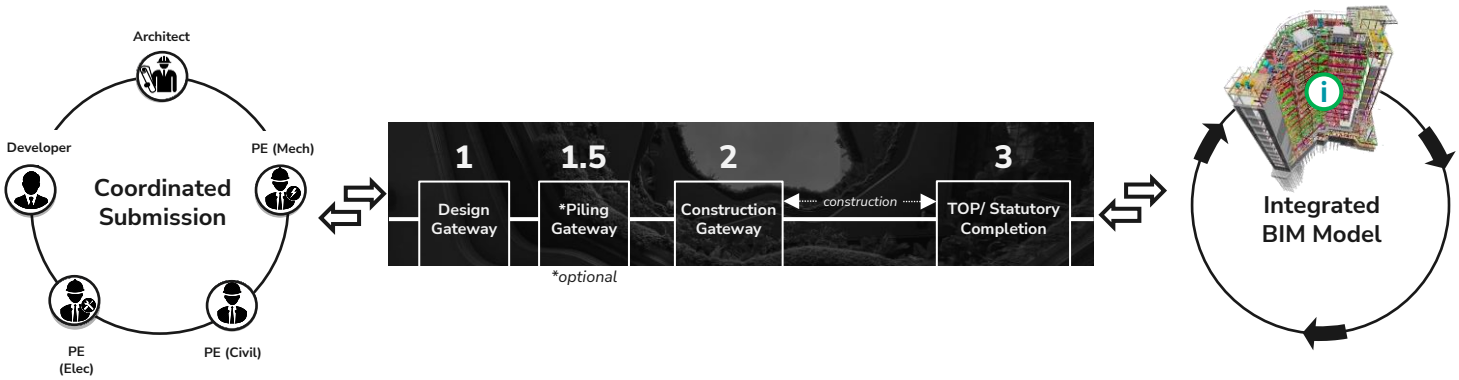
- Plans contain **conflicts that need to be resolved** during construction
- Rectifications = **Abortive Works**
- **Delayed issuance** of TOP/CSC

A key impetus for change is because of today's fragmented approval process. In today's process, the industry prepare submissions independently, and they then submit these plans separately to the different regulatory agencies.

This silo working environment is not conducive for coordinated design and regulatory reviews upstream, which often results in iterative submissions as well as conflicting or disjointed building information downstream during construction. This leads to abortive works, or resubmissions which delays TOP/CSC, ultimately affecting construction productivity.

See also:
Latest CORENET X Circulars

Tomorrow's Envisaged Streamlined Regulatory Approval Process



Industry ⇄ **Agencies** ⇄ **Construction**

upstream ---------- downstream

- Industry will need to **collaborate upfront with one another prior to submission**
- The Qualified Persons (QPs) will **submit Coordinated BIM Models** at the Gateways instead of submitting independently

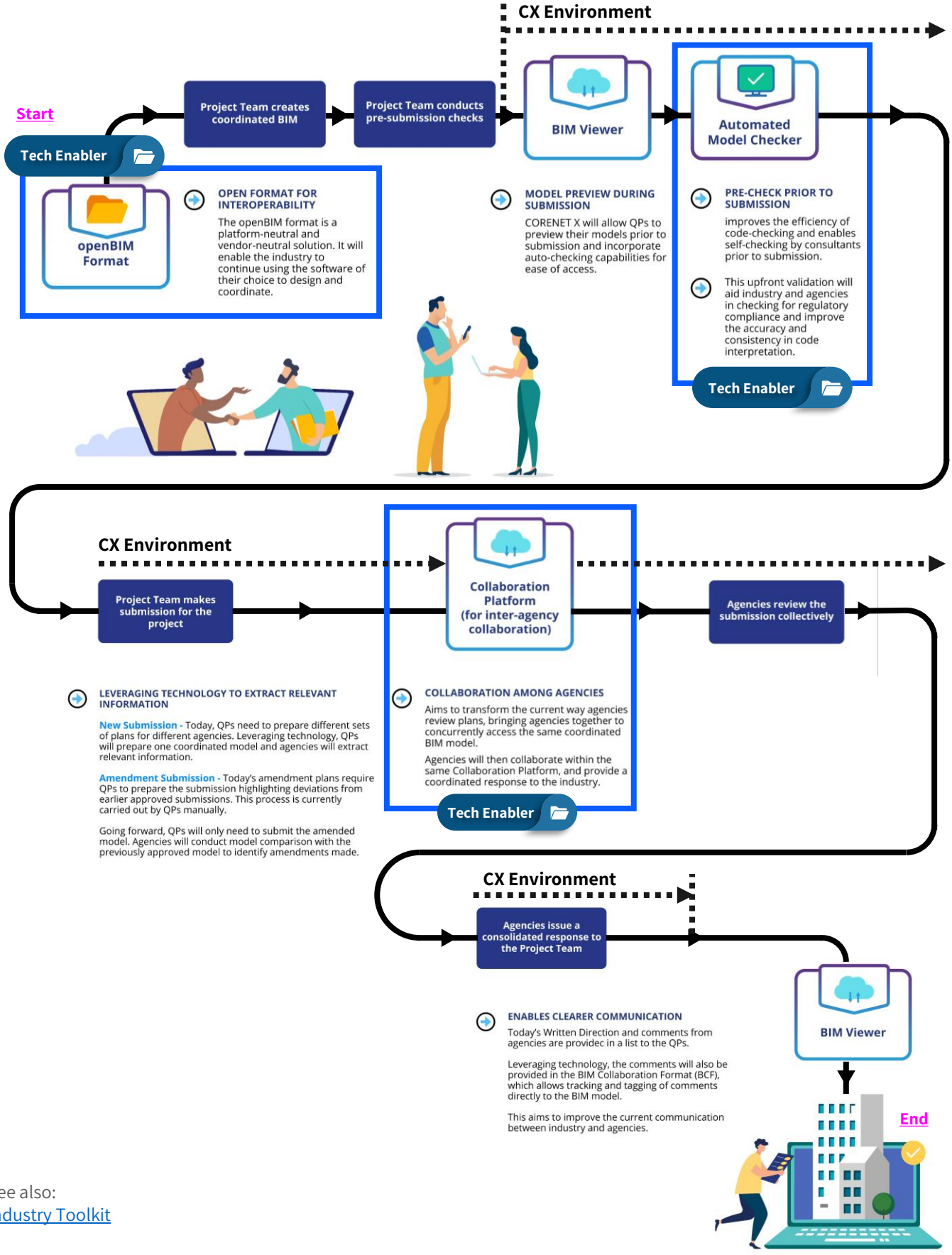
- Over 20 approval gateways have now been streamlined to **3 Key Gateways: Design, Construction, Completion**
- These gateways are major submission milestones, where the submitted design needs to comply with cross-agencies' statutory requirements.
- Agencies will review the Coordinated BIM models together in a common data environment.

- Construction rectifications arising from competing regulatory requirements would be minimised as major conflicts would have been surfaced and resolved upstream prior to construction.

We wanted to radically rethink how the regulatory services can be delivered in a project centric manner, instead of today's silo manner. In tomorrow's process, industry will submit coordinated BIM models to the agencies for review, instead of submitting independently. The earlier 20 over approval gateways have now been streamlined to **3 key gateways.**

See also:
Latest CORENET X Circulars

CORENET X User Journey



See also:
Industry Toolkit

SECTION 2

General Requirements

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2 General Requirements

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.

3D Coordinated BIM Models for Joint Submissions

The joint submission may consist of 3D coordinated BIM models. This means that all 3D BIM models from different disciplines must be properly coordinated. QPs are responsible for ensuring this coordination while maintaining compliance with all applicable Acts and Regulations.

For submissions containing both 3D BIM models and 2D plans,
1) QPs must explicitly state in their cover letter if any of the 2D plans are for approval. Without such indication, the 3D BIM models will take precedence, and the 2D plans will serve only as supplementary reference.
2) For 2D plans to be considered for approval, they must comply with agency's requirements in CORENET X Code of Practice.
3) In cases where 2D plans and 3D models are submitted for approval, QPs must ensure that information in the 3D models and 2D plans tally and do not conflict.

In addition, only the 3D BIM models(s) and 2D plan(s) for approval by the appointed QP(s) for the relevant section(s) should carry their digital signature.

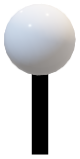
Terms and Definitions

For the purpose of this Code of Practice, the following definitions shall apply:

Term	Definitions
RABW	Abbreviation for "Regulatory Approval Process for Building Works", and refers to the new process involving 3 key sequential submission gateways to all Agencies for one collective and coordinated approval at each gateway.
Gateways	Major submission milestones in CORENET X, where the submission needs to comply with multiple agencies' statutory requirements at each Gateway. • Multiple Agency requirements listed under each regulatory agency can be found here. • Multiple Key Gateway requirements listed under each gateway can be found here.
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).

Terms and Definitions

For the purpose of this Code of Practice, the following definitions shall apply: *(continued from the previous page)*

Term	Definitions
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 supplementary drawings)

Typical Submission Package at a Single Gateway

The following tables below show samples of what are inside typical CORENET X submission packages in a Design Gateway, Piling Gateway and Construction Gateway.

The purpose of this illustration is to highlight that not everything in CORENET X will have to be modelled in 3D. For practical reasons, it may not make sense to expect complex details to be modelled, and hence the submission package will also consist of other supporting documents such as 2D detailed drawings, design calculation reports etc.

We have highlighted in the yellow boxes examples of what may be required. Note that this differs across project types and is not exhaustive.

Sample of a Design Gateway Submission Package

Examples	Architecture	C&S Engineering	M&E Engineering
IFC+SG models, all geo-referenced	• Blk 1 Model • Blk 2 Model • Site Model	• Modelling components provided by C&S, such as an entrance culvert, box drain, where applicable	• Sanitary Model indicating last Inspection Chamber and other PUB Design Gateway requirements
	Refer to Section 4, on ensuring quality (e.g. coordination) of models for submission.		
2D drawings	• Topographical Survey Plan		
Other documents	• Connectivity (Walking and Cycling) Plan • Site photographs		

Sample of a Piling Gateway Submission Package

Examples	C&S Engineering
IFC+SG models, all geo-referenced	• Substructure Model (For foundation and piling works) Note: • It is optional to submit in the Piling Gateway. • 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). • Larger projects may be eligible to make Part ST Submissions
	Refer to Section 4, on ensuring quality (e.g. coordination) of models for submission.
2D drawings	• General notes • Special details (e.g. irregular or complex footing/pilecap design (e.g. 3 pile group, stair core pile group, etc.) with the indication of drawing number in the IFC+SG parameter “ReferTo2DDetail”.)
Other documents	• Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed] • Site Investigation report in pdf & AGS format • Impact assessment report • Topography • Completion letter of pre-consultation (for complex structure only)

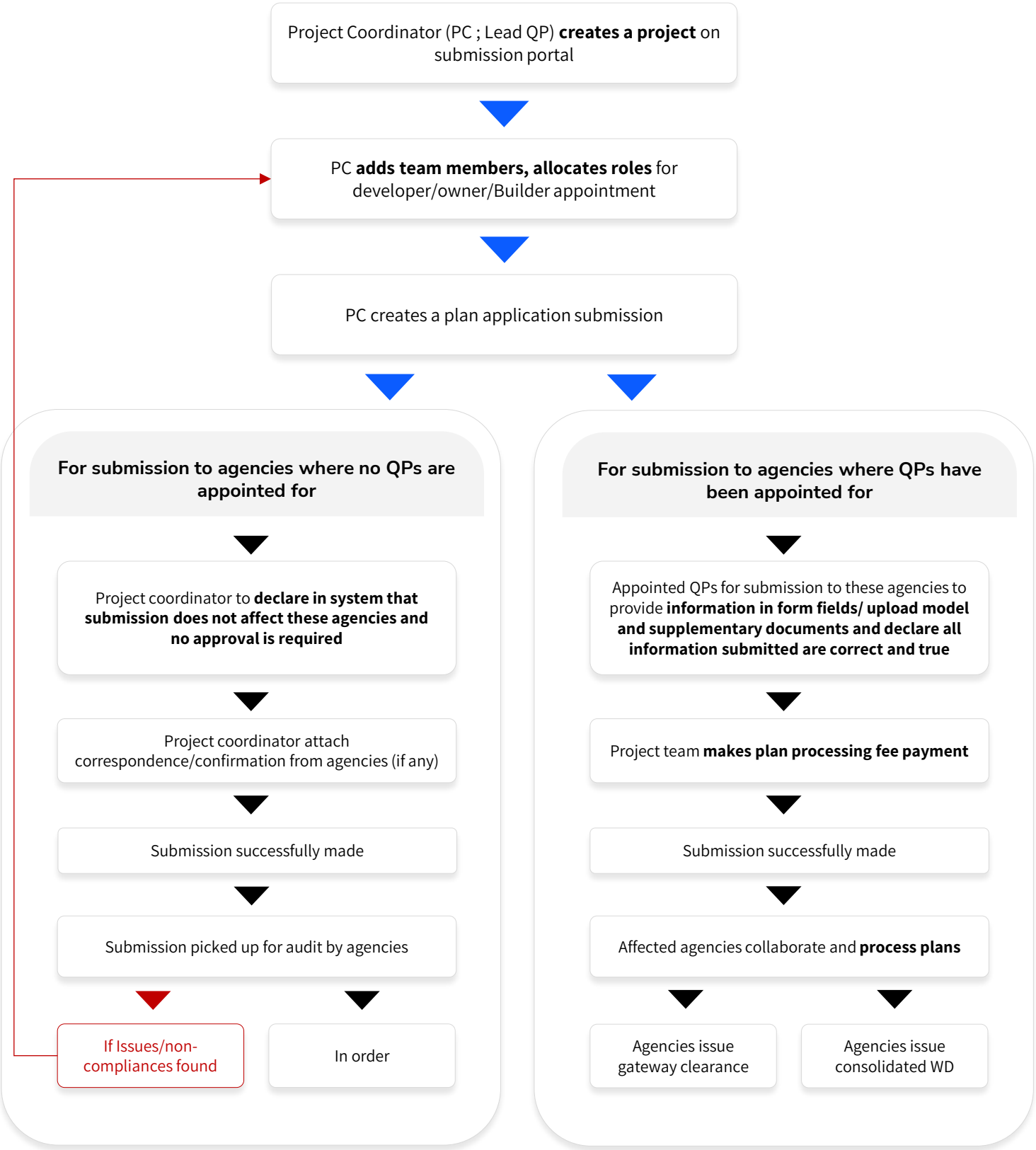
Typical Submission Package at a Single Gateway

Sample of a Construction Gateway Submission Package

Examples	Architecture	C&S Engineering	M&E Engineering
IFC+SG models, all geo-referenced	• Blk 1 Model • Blk 2 Model • Site Model	• Blk 1 Model • Blk 2 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). • Larger projects may be eligible to make Part ST Submissions	• Blk 1 Model • Blk 2 Model • Main Model (ground and substructure levels)
	Refer to Section 4, on ensuring quality (e.g. coordination) of models for submission.		
2D drawings	• Topographical Survey Plan • 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
Additional documents	• B-Score BS01 form • Public Communication Plans (if applicable)	• B-Score BS01 form • Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed] • Catchment Plan • Completion letter of pre-consultation (for complex structure only) Supporting documents for piling works: • Site Investigation report in pdf & AGS format • Impact assessment report • Topography	• B-Score BS01 form • Pollution Control Study (PCS) reports • SCDF waiver decision letter

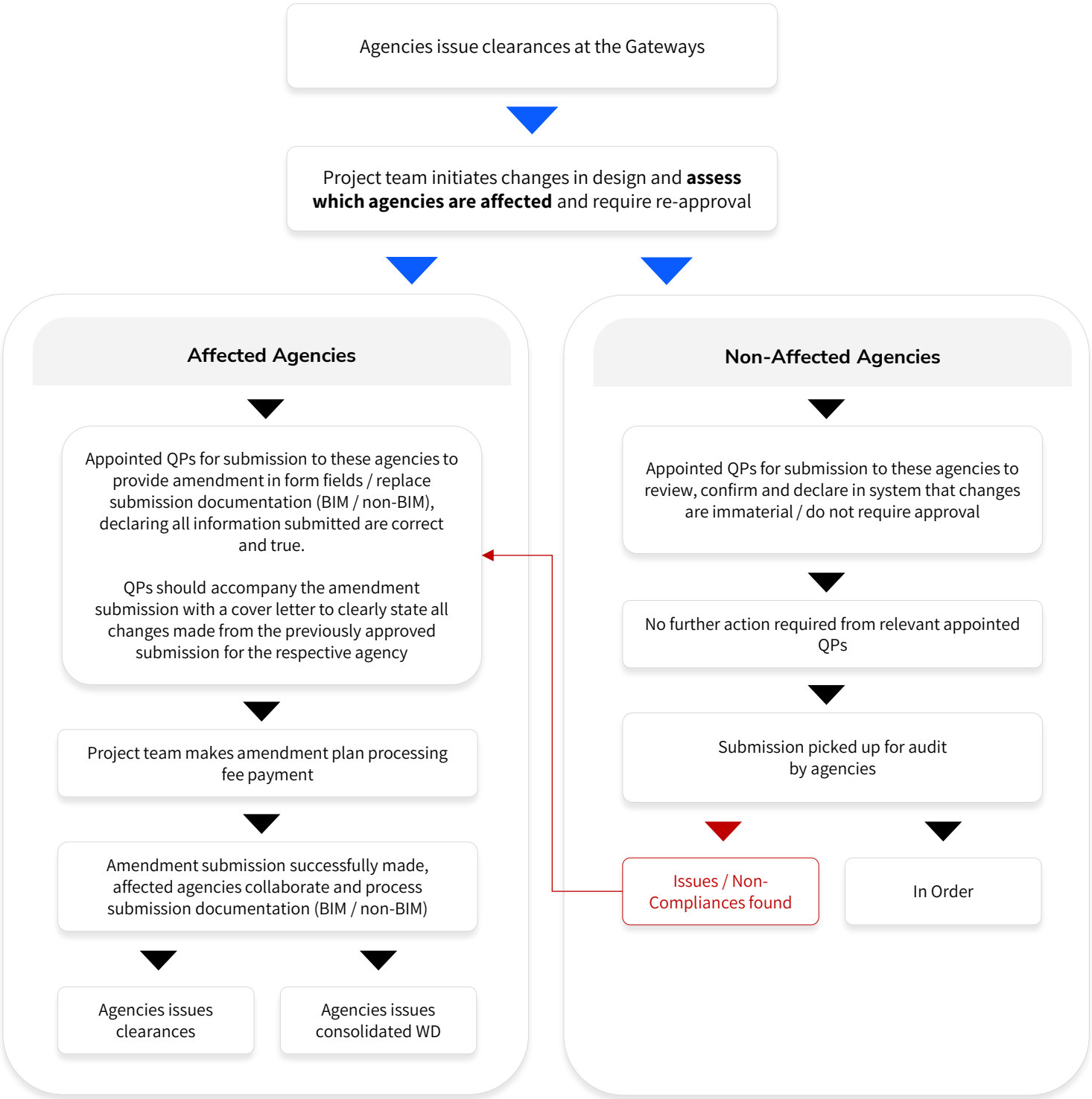
New Submission

Joint Submission Workflow



Amendment Submission

Joint Submission Workflow



Example of a Project Team's Submission Workflows

1. Register project on CORENET X Submission Portal https://portal.corenet.gov.sg/

☑ Good Practices

- ❑ Ensure all project members have set up Singpass for Business (Corppass) settings if they are representatives from an organization, including Corppass access to the CORENET X Submission Portal (https://portal.corenet.gov.sg/)
- ❑ The project team should collaborate and agree on roles and responsibilities of respective QPs required each project
- ❑ The Project Coordinator should support / receive support to/from the project team members and assistants for smooth onboarding of all submissions.
- ❑ Within each organization, ensure relevant IT and Finance colleagues are notified of the organization's roles in the project, to avoid unnecessary delay to the rest of the project team during submission preparations

ⓘ Useful References

- https://www.corppass.gov.sg/corppass/common/digitalservicelist

2. Carry out Pre-submissions and Pre-Consultations

☑ Good Practices

- ❑ All project team members should plan carefully on the types of submissions the project will undergo, and the timing, party / parties and format(s) involved in each submission
- ❑ There are Pre-Submissions (e.g. NParks EMMP, NEA NIA) that are to be submitted by email and not via CORENET X Submission Portal – read the Code of Practice carefully for more info.
- ❑ Projects requiring JTC Land Consent can apply via CORENET X.
- ❑ Projects are encouraged to carry out pre-consultations for household / storey / transit shelter compliance
- ❑ Project team members are encouraged to carry out pre-submission consultations as early as possible, to clarify or enquire on agency requirements, potential deviations.
- ❑ Do not forget to indicate your query in the CORENET X pre-consultation submission form. The more details and information you attach in the query, the more agencies can assist and expedite your query.

3. Submit for Demolition, if applicable

☑ Good Practices

- ❑ The project team should discuss the timing of demolition works in relation to when the regulatory submissions are expected to be made via CORENET X, whether through the 3-Gateway Process or Direct Submission Process.
- ❑ If the intention is to carry out demolition works prior to making any regulatory submissions for new developments, the demolition submission will be a joint submission made to both BCA and URA, with the payment of applicable fees. Do note that BCA will approve the demolition submission only where URA similarly approves such demolition, or has authorised/approved the redevelopment of the site.
- ❑ It is optional to submit in 3D.

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Example of a Project Team's Submission Workflows

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4. Submit for Design Gateway or Direct Submission Process (DSP)

☑ Good Practices

- ❑ If you are unable to find a particular agency's form for your Design Gateway or Direct Submission Process, review the respective QP's roles and responsibilities, and initiate Developer's appointment for missing scopes to open the missing form.
- ❑ After you have indicated project information in the form inputs, the Submission Portal will show whether you can submit for Lodgement.
- ❑ Utilise the "Fee Computation" feature to double-check that Submission Portal inputs for submission requiring fee payments are correctly filled in
- ❑ Fees below $10,000 are encouraged to be paid via credit card
- ❑ There is no 72-hour deadline for payment of fees after submission. However, processing will only commence after relevant fee payments have been completed by the project team and verified by relevant agencies.
- ❑ Remember to indicate and check the last I/C and minimum platform levels in the Design Gateway IFC+SG models have been indicated and are accurate, double-checking that the levels are the same as indicated in the Submission Portal form
- ❑ Where applicable, project teams are encouraged to upload models early to utilize the "Preview Model" feature on the Submission Portal, to ensure models are geo-referenced and coordinated accurately prior to submission.
- ❑ It is not necessary to indicate "Magenta", "Cyan" and "Yellow" colours to reflect "New", "Existing", and "Removed" elements in BIM models for A&A or Conservation projects. Instead, relevant IFC+SG parameters (e.g. Status parameter) should be populated for relevant elements accordingly.
- ❑ It is possible for larger projects (e.g. MRT Stations) to submit for both Design Gateway and DSP concurrently (e.g. Design Gateway for the Station Box and DSP for the Pedestrian Overhead Bridge)
- ❑ It is possible to submit for advance comments by respective agencies for Piling after the 1st Design Gateway Submission. Approval will only be granted after Design Gateway Approval has been obtained.
- ❑ Please refer to the CORENET X website for guides to submission on SP, File Tags and Notes.

5. Obtain Written Directions and Make Resubmissions

☑ Good Practices

- ❑ Relevant agencies will provide Written Directions or Approvals after a Service Level Agreement of up to a maximum of 20 working days.
- ❑ For joint submissions, only agencies with WDs will issue responses – agencies who are ready to issue approval will not respond until the subsequent resubmission where all relevant agencies are agreeable to approve
- ❑ Written Directions for BIM submissions will also include a BIM Collaboration Format (BCF) zip files. Free BCF plugins and apps are available to view the BCF files in native BIM software.
- ❑ Do not upload outdated documents (including models and plans) into the resubmissions
- ❑ Fee top-ups (e.g. after wrong form inputs or change from lodgement to processed submission) can be made during re-submissions. Agencies may also ask for fee top-ups before issuing a decision.

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Example of a Project Team's Submission Workflows

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6. Obtain Approvals and Make Amendments

☑ Good Practices

- ❑ Joint Submission approvals consist of individual approval/clearance letters of relevant agency line departments.
- ❑ When a submission is ready for approval, agencies will generate digital checksums for approved documents requiring agency authentication (as a more secure replacement for agency watermarks)
- ❑ It is possible to make amendments for all approvals except Design Gateway. Immaterial changes to Design Gateway approved submissions may be submitted in the Construction Gateway. When in doubt, the project team should clarify with the relevant agency / agencies.
- ❑ Major changes to the Design Gateway approved submission will require a re-submission to the Design Gateway

7. Submit for Piling Gateway

☑ Good Practices

- ❑ The Piling Gateway is an optional gateway for projects who require piling works to start earlier onsite prior to Construction Gateway submission
- ❑ It is possible to submit Piling Gateway and Construction Gateway concurrently.
- ❑ Piling Gateway submissions comprise of BCA (ST), and may be a joint submission with LTA (Rail) if applicable
- ❑ 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
- ❑ Ensure the Accredited Checker (AC), PE (Geo), AC (Geo) are onboarded, appointed and aware of their roles in the projects, where applicable.
- ❑ Resident Engineers (REs) and Resident Technical Officers (RTOs) can be directly added by the C&S Engineer on the Submission Portal. The Project Coordinator and Developer do not need to get involved in their additions.

8. Submit for Independent Submissions and Waivers

☑ Good Practices

- ❑ Independent Submissions are technical submissions to one agency line department without affecting other agencies (e.g. ERSS works, Fire Protection/Mechanical Ventilation Plans)
- ❑ Waivers can be applied on the CORENET X Submission Portal.
- ❑ Independent Submissions can be submitted in the non-BIM format
- ❑ It is important to understand when and which Independent Submissions can be submitted for your project. Pls study the Code of Practice carefully, and clarify with agencies early if in doubt. Wrong assumptions of Independent Submissions and Waivers may lead to delays in the project timeline.

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Example of a Project Team's Submission Workflows

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9. Submit for Construction Gateway

☑ Good Practices

- ❑ Preparations for Construction Gateway should start as early as possible, due to the number of regulatory departments involved.
- ❑ The project team, including the builder where applicable, should discuss early on how part-ST submissions should be carried out prior to preconsultation with BCA
- ❑ Regardless of part-ST submissions, the first Construction Gateway submission must include full Architectural and M&E submission models, as well as the full C&S model "carcass" (geometrically accurate model without embedded IFC+SG data)
- ❑ Besides Construction Gateway requirements as stated in the Code of Practice, project teams must remember to incorporate Design Gateway Approval instructions and notes related to Construction Gateway submissions.
- ❑ External Works should be submitted together with the first Construction Gateway Submission.

10. Completion Gateway

☑ Good Practices

- ❑ The Completion Gateway consists of a one-stop dashboard of the project's status of TOP/CSC applications across various agencies shown on the CORENET X Submission Portal which can be used to guide project team.
- ❑ TOP submissions are to be made to respective agencies independently and concurrently, whenever ready.
- ❑ The final TOP/CSC will be issued when the project obtains all the necessary technical clearances of various agencies.
- ❑ To facilitate the clearance process, project team should concurrently submit to BCA for technical clearance so that BCA's specific issues can be addressed concurrently.
- ❑ If IFC models had been submitted earlier in CORENET X for the project, as-built submissions will consist of latest updated IFC models, with IFC+SG data updated upon the earlier approved models to respective agencies.
- ❑ Verify the 2D and 3D documentation required for the Completion Gateway, especially if they are created by parties onboarded later in the project
- ❑ Note that there are submissions made to The PUB Business & Professional portal and LTA PROMPT service portal, such as the QECP Plan, submissions related to sewer corridor activities and road access opening submissions.

Always check circulars for latest CORENET X updates, changes/additions to agency requirements as well as any other initiatives that affect regulatory submissions

IMDA TFCC and City Energy submissions will continue to be submitted through CORENET 2.0. In the future, these submissions will be covered under CORENET X.

Other Processes that may be relevant to projects

Application for IRAS House and Unit Numbers

- The application can be made at the Property Name and Address e-Service.
- For projects undergoing the 3-Gateway Process, the application can be made concurrently with the first CG **re**submission or any point after. Developers should ensure that there will not be further design changes that will affect addresses / unit numbers
- For projects undergoing the Direct Submission Process, the application can be made once URA's Written Permission or Lodgment Acknowledgment has been obtained.
- Processing will take 4 weeks upon receipt of complete information. Once the application has been approved, IRAS will issue a Certificate of Numbering (CON) indicating the list of allotted house and/ or unit number(s).
- If there are any changes after the CON has been issued, a withdrawal application will have to be submitted to remove the initial approved house and/or units number(s) before submission of a new application through the Property Name and Address e-service. Processing of a new application will take 4 weeks upon receipt of complete information.
- Applicants are advised to only make the application when all necessary details (e.g. block and unit numbers) are finalised, to avoid the need for a second application.

Application for BCA Share Value Application

- BCA Share Value application is only applicable to strata-titled developments.
- Share Value Application can be made at BCA's BMSM Portal concurrently with CG application.
- Formal acceptance* of Share Value (SV) by Commissioner of Buildings (COB) will only be released following CG approval and IRAS Certificate of Numbering

* Under Section 11(7) of the B(SM)A, within 6 weeks, COB must notify owner developer whether COB accepts/rejects the Schedule of Strata Units (SSU)

For Single-Tier Use Development

- Surveyor can submit SV application concurrently during the CG stage. The SV application can be based on the submitted plan/ model at CG to BCA (for Building Plan approval).
- BCA will process the SV application concurrently with the CG submission but will only issue the SSU acceptance when CG (consisting of BCA's Building Plan) is cleared and IRAS Certificate of Numbering is submitted.
- For straightforward cases, BCA will endeavour to complete processing within 1-2 weeks after submission of IRAS Certificate of Numbering and the approved BCA's Building Plan.
- If CG clearance and IRAS Certificate of Numbering are not ready within 4 weeks upon receipt of application, BCA will return the application to surveyor for their re-submission.

For 2-tier/Mixed Use Development

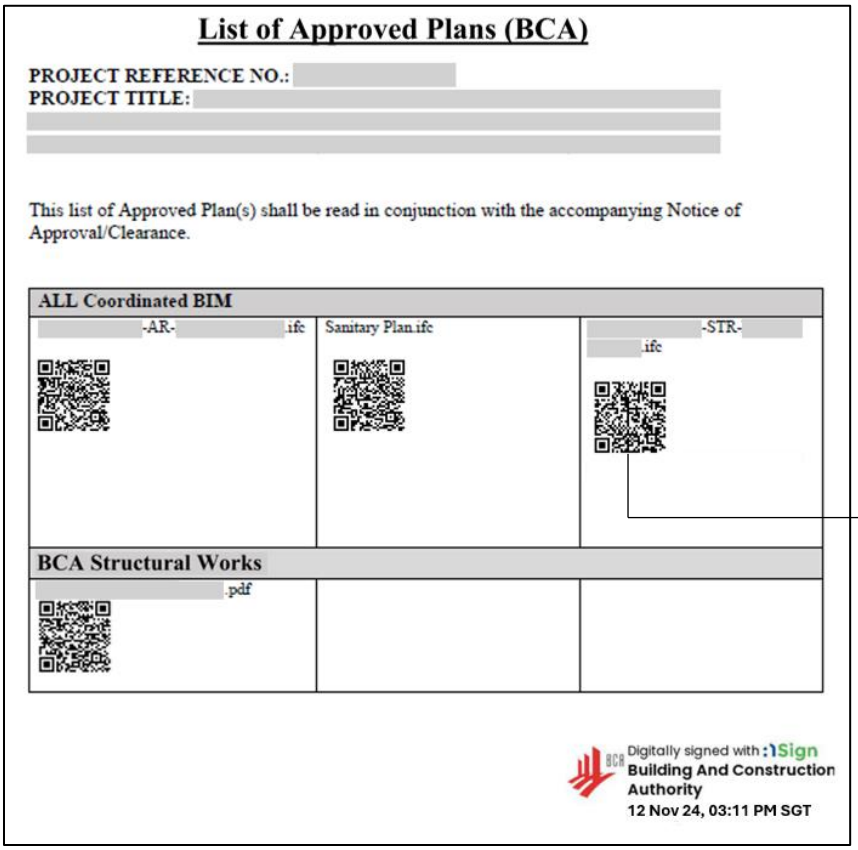
- Given the complexity, Developers/Surveyors can pre-consult BCA on SV application at Design Gateway stage separately.
- Surveyor can make an SV application when all the necessary information is ready for submission (i.e. the CG is cleared and IRAS Cert of Numbering is ready). BCA will endeavour to complete processing within 3-4 weeks upon receipt of application.

Introduction of Checksums for Approved Plans

What is a Checksum?

A checksum is an alphanumeric value that uniquely represents the contents of a file. It is akin to the digital fingerprint of the file.

In the approval response, the QP will find a "List of Approved Plans" by each agency. The QR representation of the Approved Plan's checksum will be listed in the "List of Approved Plans" (1 unique checksum per file).



List of Approved Plans (BCA)

PROJECT REFERENCE NO.:
PROJECT TITLE:

This list of Approved Plan(s) shall be read in conjunction with the accompanying Notice of Approval/Clearance.

ALL Coordinated BIM		
-AR- .ifc	Sanitary Plan.ifc	-STR- .ifc
BCA Structural Works		
.pdf		

Digitally signed with :1Sign
Building And Construction Authority
12 Nov 24, 03:11 PM SGT

- ✓ **Digital fingerprint solution**
  More secure than traditional watermarks
- ✓ **Easy detection of changes**
  Small changes produce very different looking checksums
- ✓ **Files remain intact and can be viewed freely**
  Checksum solutions do not affect nor encrypt the files

Checksum of file embedded in QR Code:

158c66b52835a57a9a9924ede9634204e3490b4197d39d40eb24a6bc05dd448b

Advantages of the Checksum approach

As compared to the current approach where different agencies adopted different methods to demarcate Approved Plans, the checksum solution offers:

Standardised approach
- Can be used for all kinds of files, e.g. BIM and 2D files
- Can be used by all agencies to demarcate Approved Plans

Ease of access and authentication
- Files and plans can be viewed without decryption

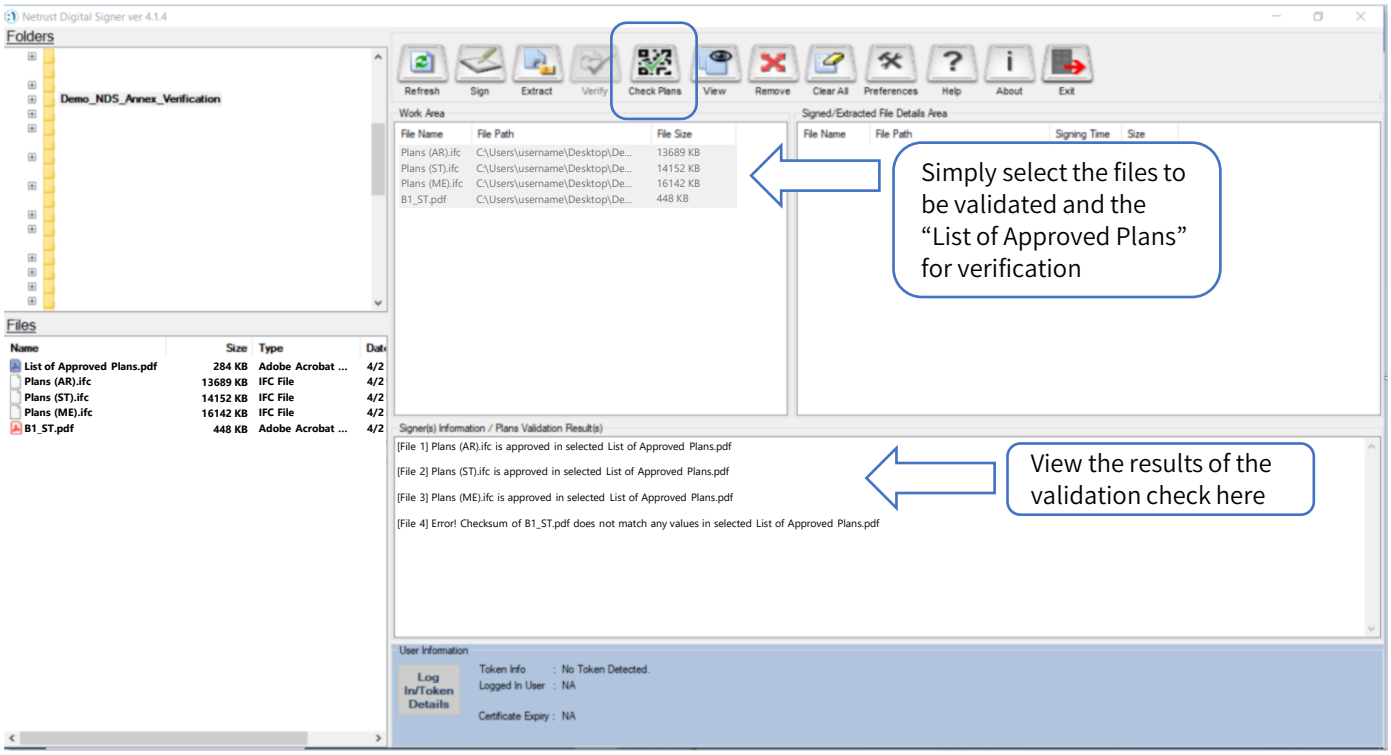
Quick verification of Approved Plans whenever in doubt
- Less likelihood of forgery
- Verification can be done easily without special apps or on the internet

Introduction of Checksums for Approved Plans

How do I verify the authenticity of an Approved Plan through its Checksum?

To verify if a file is the Approved Plan, you can compare the checksum of the file with the checksum listed on the "List of Approved Plans".

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



Verification without Netrust Digital Signer (NDS)

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

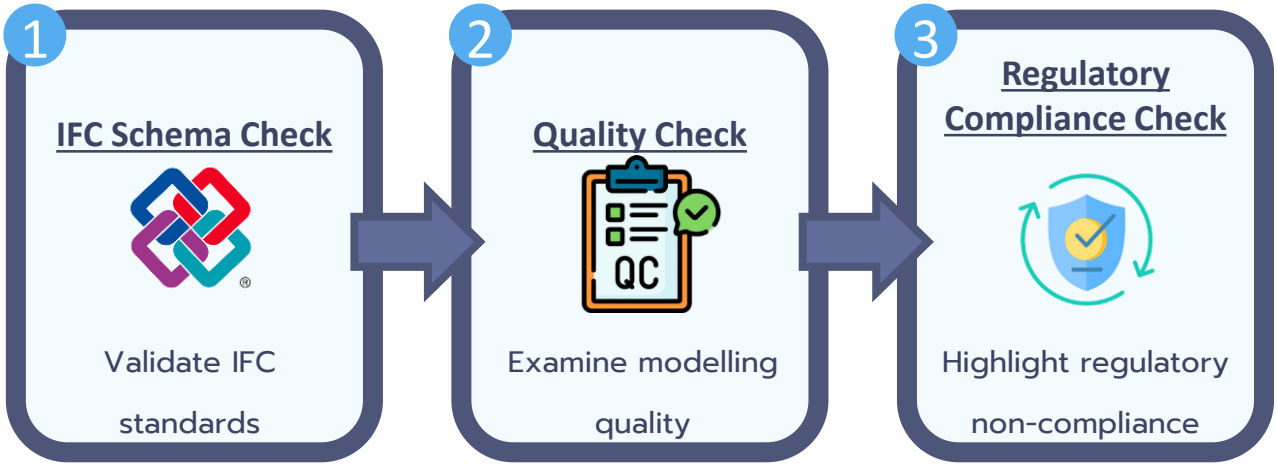
Introduction of Model Checker

Please visit CX website for more details on MC MVP and its release date.

What is Model Checker?

It is crucial that the BIM models submitted by QPs adhere to the standards outlined in the CORENET X Code of Practice (COP) for effective regulatory review by agencies. To support the Industry, the CORENET X's Model Checker (MC), a supplementary tool automatically validates BIM files in IFC+SG format against basic IFC standards, modelling standards & selected regulatory requirements.

Components of Model Checker



The MC comprises three distinct categories of checks.

1. IFC Schema Check
2. Quality Check
3. Regulatory Compliance Check

The **IFC Schema Check** serves as the first line of validation, identifying BIM models that do not meet basic Industry Foundation Classes (IFC) standards. Adherence to these standards ensures BIM models can be properly viewed and processed in subsequent stages by the Model Checker or by the Agencies.

Quality Check ensures the QPs have coordinated across disciplines and has inputted the necessary information in the BIM models for Agencies to conduct the regulatory review, by evaluating the completeness of model information against the CX COP requirements.

The **Regulatory Compliance Check** automatically assesses the BIM models for compliance against selected regulatory requirements when the necessary information is present in the BIM models.

These checks have been developed based on learning points from projects, established IFC standards, and good modelling practices from the CORENET X Community of Practice (COPr). We shared these learning points through various platforms, including seminars and the CX website. To further support QPs in ensuring BIM model quality- a common challenge in BIM model preparation - MC helps QPs to verify the BIM models against basic modelling standards. QPs should use MC to validate the BIM model during design and before submission to ensure compliance with COP and reduce iterations with the Agencies.

Introduction of Model Checker

What do the various components mean for me?

IFC schema check: This fundamental check informs QPs upfront about BIM models which do not meet basic IFC standards and would therefore prevent further processing of the BIM models. Common issues include:

- Outdated IFC schema versions
- Corrupted files

When the check returns results with issues, QPs should revise the BIM models to address the issues and upload the BIM models again.

Quality Check: This check ensures BIM models across all disciplines meet the minimum quality standards specified in the CORENET X Code of Practice for effective regulatory review. It identifies issues such as:

- Missing mandatory properties
- Improper geo-location alignment across different discipline models

When the check returns results with issues, QPs should verify the consistency and completeness of information across all discipline models before submission to facilitate efficient agency review.

Regulatory Compliance Check: This check identifies non-compliances of BIM models against agencies' regulatory requirements. Examples of common issues include:

- Insufficient headroom clearance
- Undersized bicycle parking lots

When the check returns results with issues, QPs should review and confirm regulatory compliance of their design before submission.

When and where do I get to try Model Checker?

MC will be introduced to the industry in phases, starting with the MC Minimum Viable Product (MVP). This early version of MC contains selected clauses (“rules”) from different agencies’ codebooks. It will be expanded and released to the industry progressively to include more rule checks.

MC MVP will be available on CORENET X Submission Portal to allow QPs to perform pre-submission check. This will help the project team to identify issues with BIM models and non-compliances prior to actual submission.

Please visit CX website for more details on MC MVP and its release date.

SECTION 3

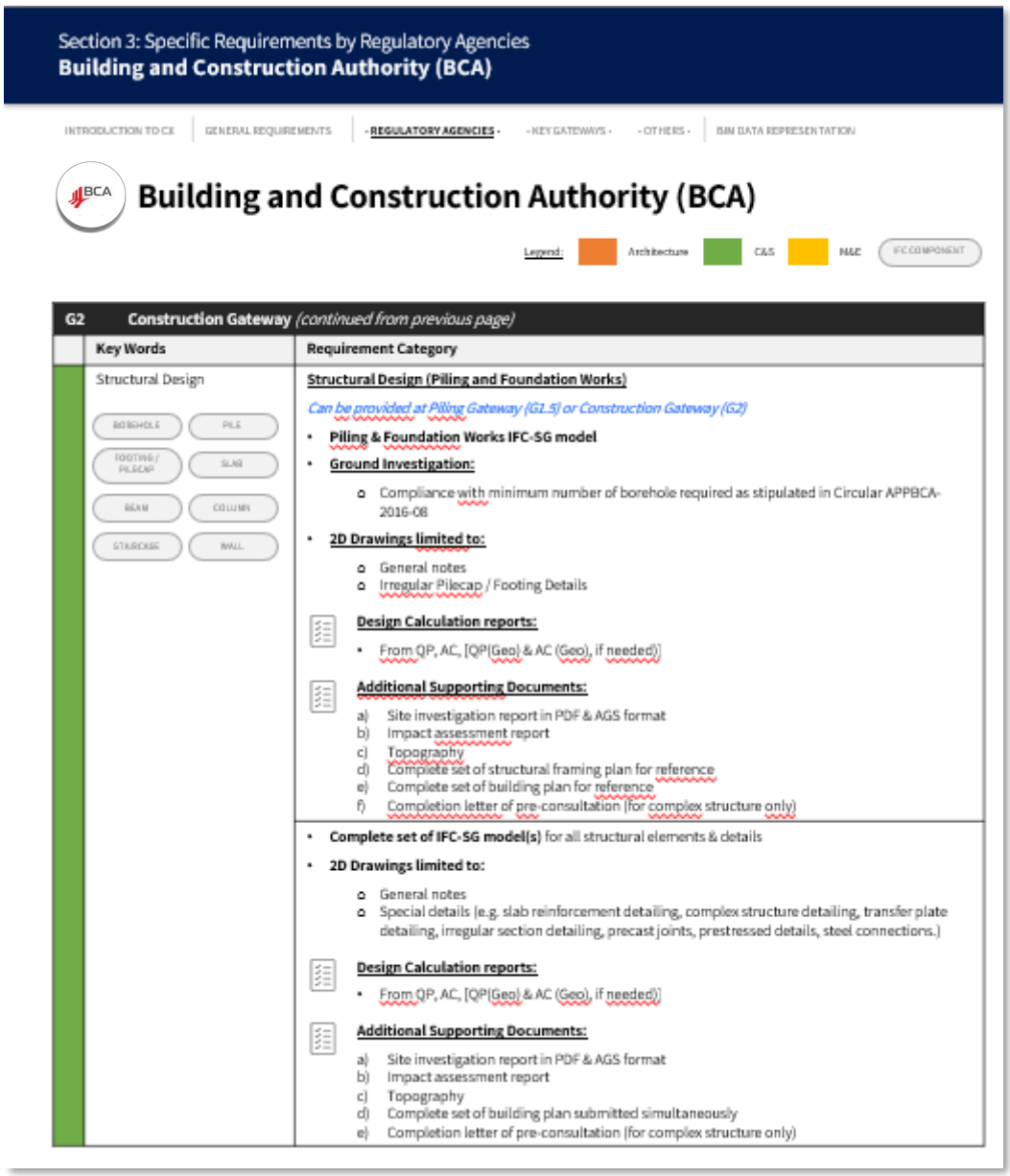
Specific Requirements by:
Regulatory Agencies

corenetx

3 Specific Requirements by

Understanding the Table Format

Note: CORENET X is developed through Agile Methodology and sections / requirements in this COP will be updated progressively and its technological enhancements will be made available in phases.



Section, Main Header, Sub-Header

Other COP Sections (Clickable Hyperlinks)

Regulatory Agency Involved

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

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

G1: Design Gateway

G1.5: Piling Gateway

G2: Design Gateway

G3: Completion Gateway

Key Words appearing in a particular Gateway

+

IFC COMPONENT **that may be required to be modelled for requirements under this keyword (linked to Section 4)**

Broad Description of requirements relating to the Key Word

+

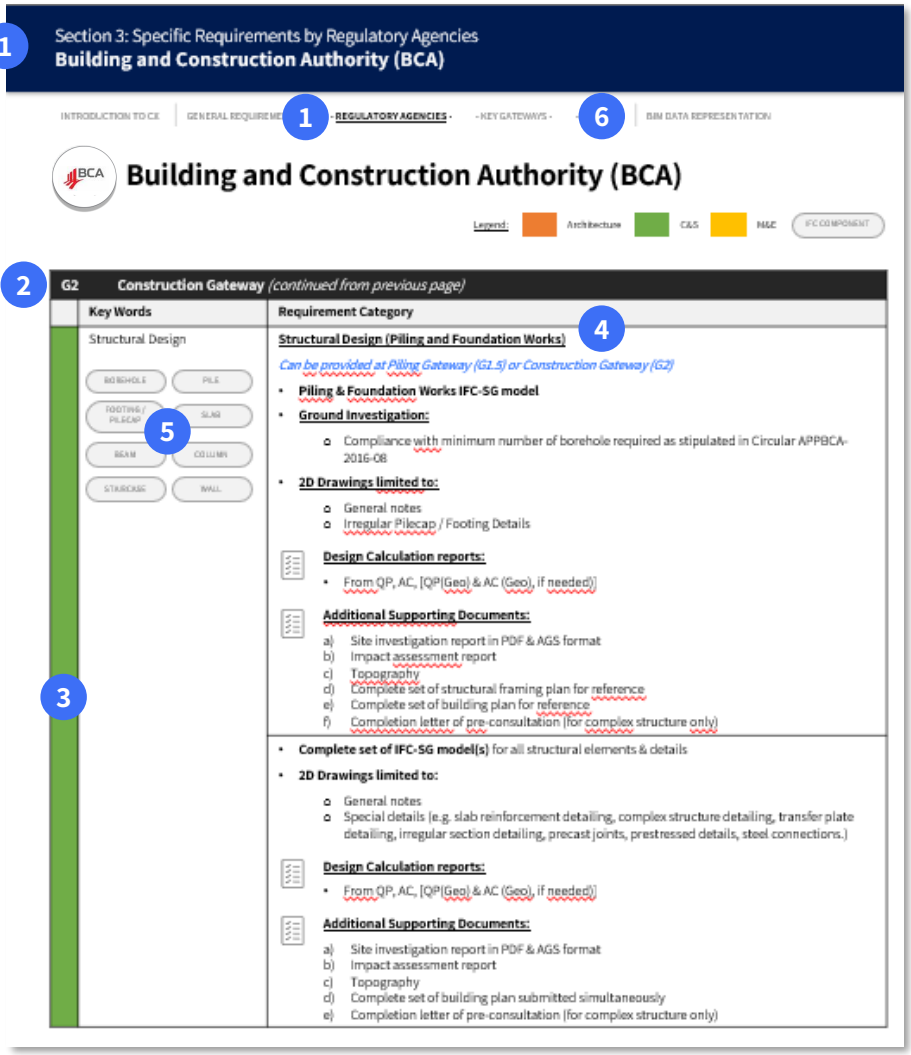
Format of Submission

3D	IFC+SG Model
2D	Examples: CAD Drawings, Reports, Supporting Documents, Supplementary Documents

Understanding the Table Format (Case Example)

Note: CORENET X is developed through Agile Methodology and sections / requirements in this COP will be updated progressively and its technological enhancements will be made available in phases.

I want to understand how to clear BCA's requirement for Structural Design under Construction Gateway (G2)



1. Go to Section 3: Specific Requirements Regulatory Agencies

2. Find which Gateway "Structural Design" 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 C&S (green). If all disciplines are involved, all three colors will be tagged.

4. Find out what are the broad requirements to comply and in what submission format. Note that QP is still required 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 "Structural Design". In this case, there are 8 IFC-Components tagged.

   For example, "Pile", "Column", "Wall" . Look for these in Section 4.

6. Click Hyperlink to navigate easily to Section 4: BIM Data Representation.

Disclaimer

As disclaimed under Page 3, this Code of Practice does not substitute Handbooks, Circulars or other regulatory publications of our regulatory agencies. Readers should refer to the relevant Codes, Acts and Regulations on the compliance required for their projects, before referring to this Code of Practice on how to represent the compliance information in the CORENET X submission gateways

Disciplines Color Tagging / QP's Responsibilities

*As stated under Section 2: Page 15, the statutory responsibilities of the appointed QPs under the respective Acts and Regulations **remains unchanged**. **The color tagging is for reference only.**

Building and Construction Authority (BCA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Buildability and Productivity	• Pre-consultation regarding buildability, constructability and productivity related matters (for example, Productivity Concept Implementation Plan (PCIP), Integrated Digital Delivery (IDD) Implementation Plan)
	Household / Storey Shelter {HS/SS)	• Pre-consultation on HS/SS shelter on architectural, structural or commissioning issues • Can occur at any stage prior to TOP, for landed and non-landed residential projects
	Public Transit Shelter (PS/TS)	• Pre-consultation on Public/Transit Shelter (PS/TS) on architectural, structural, M&E or commissioning issues • Can occur at any stage prior to TOP
	Others	**Complex Building Requirements** • Pre-submission consultation of structural concept on structural works involving complex building to be carried out during/after Design Gateway (G1) but prior to Piling Gateway (G1.5) or Construction Gateway (G2)

G1	Design Gateway	
	Key Words	**Requirement Category**
	Others	**Complex Building Requirements** • [For noting] Pre-submission consultation of structural concept on structural works involving complex building to be carried out concurrently with after Design Gateway (G1) but prior to Piling Gateway (G1.5) or Construction Gateway (G2)

G1.5	Piling Gateway (Optional)	
	Key Words	**Requirement Category**
	Lightning Protection	**Note: These requirements are currently optional and will only be required for regulatory compliance when LPS plan submission is mandated** • For big projects adopting piles or raft foundation as natural earth-termination system. Provision of rebars for connection to the down-conductor system shall be provided during the piling stage. Notes: • QP (Electrical) to provide inputs for submission by C&S • Developer or Builder is required to appoint a QP (Electrical) to supervise the LPS works before LPS Plan submission is carried out at the Construction Gateway (G2).
	Structural Design BEAM BOREHOLE FOOTING / PILECAP PILE SLAB	**Structural Design (Piling and Foundation Works)** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* *For large project meeting the critieria for part ST submissions, please refer to page 177 for more details* • **Piling & Foundation Works IFC+SG model** • **Ground Investigation:** ○ Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08

Building and Construction Authority (BCA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G1.5 Piling Gateway (Optional) *(continued from previous page)*

Key Words	Requirement Category

Structural Design
BEAM
BOREHOLE
FOOTING / PILECAP
PILE
SLAB
	Structural Design (Piling and Foundation Works) ***(continued from previous page)***
	
	• **2D Drawings limited to:**
	  ○ General notes
	  ○ Irregular Pilecap / Footing Details
	
	Design Calculation reports:
	• From QP, AC, [QP(Geo) & AC (Geo), if needed)]
	
	Additional Supporting Documents:
	a) Site investigation report in PDF & AGS format
	b) Impact assessment report
	c) Topography
	d) Complete set of structural framing plan for reference
	e) Complete set of building plan for reference
	f) Completion letter of pre-consultation (for complex structure only)

G2 Construction Gateway

Key Words	Requirement Category
Access to Site ACCESSIBLE ROUTE SLAB RAMP STAIRCASE	• Passenger Alighting and Boarding Point • Accessible Route (to the development entrance)
Access within Building only ACCESSIBLE ROUTE SLAB RAMP STAIRCASE	• All Accessible Routes and associated clear Spaces (within the development) • Accessible and elder-friendly rooms • Seating and eating spaces for wheelchair users • Resting areas for the ambulant disabled • Location of hearing enhancement systems
Barrier RAILING	• Safety from falling (ie. safety barrier height, size of any openings, kerb) • Protection from injury by vehicles in building (e.g. provision of bollards)
Buildability and Productivity BEAM SLAB COLUMN STAIRCASE DOOR WALL HOUSEHOLD SHELTER PREFAB & MEP REFUSE CHUTE / RECYCALBES CHUTE WINDOW	**Buildability Detailed Design and Implementation Plan (BDIP)** • BIM model which describes and defines the type, extent of use and details of the Design for Manufacturing (DfMA) technologies, building systems, building components, buildable features and design standardisation across the Structural, Architectural and Mechanical, Electrical and Plumbing (MEP) systems • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Buildable Design Score (B-Score)** a) BS01 Form (in Excel format) to be submitted

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	**Construction Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Buildability and Productivity *(continued from the previous page)* BEAM, SLAB, COLUMN, STAIRCASE, DOOR, WALL, HOUSEHOLD SHELTER, PREFAB & MEP, REFUSE CHUTE / RECYCALBES CHUTE, WINDOW	**Productivity Concept Implementation Plan (PCIP)** • BIM model which describes and demonstrates the types, extent of use and details of the construction methods, construction systems, construction processes, construction management, buildable features and innovative features to be implemented for the building works, for the purpose of achieving site productivity improvement • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Integrated Digital Delivery (IDD) Implementation Plan** • Plan that describe the types, extent of use and details of the integrated digital delivery essential use cases to be adopted in respect of the building works, for the purpose of enabling the digital integration of work processes
	Building Envelope	**ETTV/RETV** • ETTV/RETV computation & tabulation of design parameters in the prescribed forms & formats; • Architectural elevation drawings showing the composition of the different façade or wall systems that are relevant for the computation of the ETTV/RETV; and • Architectural plan layouts & elevations showing the mode of ventilation & location for various spaces incl. air-conditioning areas. **RTTV and Roof U-value Computation** • RTTV computation for roofs with skylight in prescribed forms and formats, where relevant; • Architectural plan layout and sectional details of different roof types as well as the roof composition and respective U-values; and • Technical material or product information and relevant calculation of U-value of the roof • *ETTV/RETV Calculation Format in respect of an Air-conditioned Building (BPD_BP04): https://www1.bca.gov.sg/docs/default-source/docs-corp-form/bp04.doc*
	Dwelling Units	• Bathrooms for future retrofitting • Design of unit entrance for wheelchair users
	Environmental Sustainability	**For Code for Environmental Sustainability of Buildings**: To submit the following: i. BC ES Appendix 1 for **Construction Gateway** https://go.gov.sg/bc-es-app1 ii. Documentary Evidence for all applicable base requirements, specifically for NRB02 air tightness and leakage as well as NRB06 maintenance of building cooling system performance. ACMV plan (for NRB02 and NRB06) drawing showing the requirement compliance in BIM. Where any of the above cannot be modelled in BIM, 2D plans can be submitted. Guidance Notes and Documentation Requirements under Code for Environmental Sustainability of Buildings: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	**Construction Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Environmental Sustainability *(continued from the previous page)*	**For Government Land Sales (GLS) programme requirement:** Refer to the following link: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda/mandatory-higher-green-mark-standard
	Headroom and Ceiling height	• Headroom of every room, access route and circulation areas • Ceiling height of rooms and spaces
	Household / Storey Shelter (HS/SS) DOOR SLAB SPACE WALL WINDOW CONTROL PANEL	**Architecture** Compliance with technical requirements on HS/SS position, area, volume, setback requirements, SS compartmentalization, HS/SS wall requirements, HS/SS door and SS blast hatch requirements, shielding wall requirements, HS/SS ventilation sleeve requirements, NS requirements, voids within HS/SS setback distance, downhang beam and trellis requirements, service risers & gas risers & refuse chute requirements, electrical power sockets outlets, telephony outlets and lighting points. Where any of the above cannot be modelled in BIM, 2D plans can be submitted **C&S** • Compliance to structural requirements stipulated in technical requirements on household shelters and storey shelters. Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Supporting Documents:** a) Submit HS/SS Shock Calculations as supplementary non-BIM documentation
	Lift and Escalators	• Lift and Escalator Provision (Number) • Location of passenger and Accessible Lifts (including platform and stair lifts) • **2D Drawings limited to:** o Buttons, Handrail, Marking of Maneuvring Space
	Lightning Protection	**Note: These requirements are currently optional and will only be required for regulatory compliance when LPS plan submission is mandated** **2D Drawings** • Location of air-termination system, down conductors, earth electrodes • Zone of lightning protection provided by the air-termination network for open roof spaces and the sides of the building • Location of the points where there is equipotential bonding between the air-termination system, down-conductor system and earthed termination system; and • Location of the points where there is equipotential bonding of the lightning protection system to electrically conductive parts of the building except M&E services. **Supporting Documents:** a) Material specification, photo, ppt, excel, words, etc. should be submitted

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	**Construction Gateway** *(continued from previous page)*		
	Key Words	**Requirement Category**	
	Materials	• Use of Glass at height • Daylight Reflectance	
	Public/Transit Shelter (PS/TS)	**Building Plan (Architecture)** The following shall be clearly illustrated in the submission: - Entrance area layout leading from opening at ground level (or elsewhere) to the EHD and PT door, including firemen staircases and exit routes. - Strike point lines and distance measured between strike points and the EHD/PT doors. - All wall and slab thickness - All air shafts and bomb pit layouts with dimensions, from opening at ground (or elsewhere) to the plantroom interface. - Location and demarcation of all dry toilet areas, net areas occupied by each cluster of dry toilets, cubicles, floor trap etc. - Demarcate net shelter area at each level, indicate the calculated areas and shelter size category in the plans. - Blast, blast and gas, and gas protected walls and slabs shall be highlighted with differentiated hatching and/or colours in a consistent manner.	**Structural Plan (C&S)** The following shall be clearly illustrated in the submission: • Entrance area layout leading from opening at ground level (or elsewhere) to the EHD and PT door, including firemen staircases and exit routes. • Strike point lines and distance measured between strike points and the EHD/PT doors. • Line load design and reinforcement details for support structures of CD doors. • All RC wall and slab thicknesses
	Staircase STAIRCASE RAILING	• Minimum Width • Tread and Riser, Handrail / Railing	
	Statistical Gross Floor Area (SGFA) SGFA refers to the total floor area of a building, regardless of the usage of the space. Details of SGFA computation can be found in the SGFA Form BCA-BP-SGFA. The updated SGFA Form can be downloaded at https://go.gov.sg/sgfa	• Provision of General Building SGFA for below and above sublevels. • Provision of Specified Building SGFA for below and above sublevels. • Form BCA-BP-SGFA **Additional Supporting Documents:** Where any of the above SGFA cannot be modelled in BIM, 2D SGFA plans can be submitted : **Site Plan** – SGFA Table with information on SGFA for General Building and Specified Building at below sublevel and above sublevel. For amendment plan, SGFA Table should include SGFA (Approved), Changes (+/-) and SGFA (Proposed). **Floor Plan** – To indicate General and Specified Building SGFA at below sublevel and above sublevel.	

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	**Construction Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Structural Design BOREHOLE PILE FOOTING / PILECAP SLAB BEAM COLUMN STAIRCASE WALL	**Structural Design (Piling and Foundation Works)** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* *For large project meeting the critieria for part ST submissions, please refer here for more details* • **Piling & Foundation Works IFC+SG model** • **Ground Investigation:** o Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08 • **2D Drawings limited to:** o General notes o Irregular Pilecap / Footing Details Design Calculation Reports: • From QP, AC, [QP(Geo) & AC (Geo), if needed)] Additional Supporting Documents: a) Site investigation report in PDF & AGS format b) Impact assessment report c) Topography d) Complete set of structural framing plan for reference e) Complete set of building plan for reference f) Completion letter of pre-consultation (for complex structure only)
		Structural Design (Main Supestructure) *For large project meeting the critieria for part ST submissions, please refer here for more details* • **Complete set of IFC+SG model(s)** for all Structural Elements & Details • **2D Drawings limited to:** o General notes o Special details (e.g. slab reinforcement detailing, complex structure detailing, transfer plate detailing, irregular section detailing, precast joints, prestressed details, steel connections.) Design Calculation Reports: • From QP, AC, [QP(Geo) & AC (Geo), if needed)] Additional Supporting Documents: a) Site investigation report in PDF & AGS format b) Impact assessment report c) Topography d) Complete set of building plan submitted simultaneously e) Completion letter of pre-consultation (for complex structure only)
	Vehicle Parking PARKING LOT ACCESSIBLE ROUTE	• Provision of Accessible and Family Lot(s)

Building and Construction Authority (BCA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G2	Construction Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Ventilation SPACE WINDOW PARKING LOT	• Provision of Ventilation (Natural Ventilation for residential development) • Minimum 5% opening for Natural Ventilation • Maximum distance (12m) from Natural Ventilating opening • Natural Ventilation (dimension of recess / airwell) • Carpark Ventilation
	Washroom SPACE CUBICLE SANITARY APPLIANCES	• Sanitary provisions for wheelchair users (including accessible changing rooms) and ambulant disabled • Sanitary provisions for young children

-	Independent Submissions	
	Key Words	**Requirement Category**
	Buildability and Productivity	**Integrated Digital Delivery (IDD) Progress Report** • Update on IDD implementation, including screenshots of adopted use cases using digital means, IDD training conducted and stakeholders involved (to be submitted under Buildability – Submission of documents)
	Constructability	**Constructability Implementation Plan (CIP)** • BIM model which describes and defines the type, extent of use and details of the construction techniques, processes and innovative methods and systems to be implemented for the building works • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Supporting Documents for CIP:** a) Documents (e.g. photos, 2D plans, etc.) on the use of construction techniques, processes, plant, equipment and innovative methods **Constructability Score (C-Score)** a) C-Score Calculations (to be computed and submitted by Builder in PDF format)
	Environmental Sustainability	**Major Energy Use Change during Operation** • Design and As-built clearance for major energy use change. • For more information, please refer to Code on Environmental Sustainability Measures for Existing Building: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-existing-buildings **Periodic Energy Audit during Operation** • Submission of Periodic Energy Audit • For more information, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-existing-buildings/mandatory-submission-of-periodic-energy-audits

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E Builder IFC COMPONENT

-	**Independent Submissions** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Public Transit Shelter (PS/TS)	• **Detailed CD Door and Services Penetration** The following shall be clearly illustrated in the submission: - EHD and PT door details - All CD door leaf and door frame details including frame anchorages and associated reinforcement. CD support structures and their line load reinforcement details, including any adjacent services penetrations. - Services penetrations - Size of openings and type of services penetrations such as MCTs, puddle flanges etc in walls or slabs next to or in the vicinity of the CD doors.
		• **Mechanical Plans (CM)** ○ **Environmental Control System (ECS), Water Supply System, Sanitary System, Drainage System, Fire Protection System** The following shall be clearly illustrated in the submission for each of the systems above: - All CD related plantrooms and ancillary rooms, locations, setting-out and performance capacities of CD related equipment, services sizes, layout and routings and their supports - CD permanent toilets and CD dry toilets - All CD related schematics, single line diagrams and typical installation details - Locations, clear dimensions and performance capacities of CD related equipment, accessories, services and their supports from ceilings, walls and floors - Size of openings and type of services penetrations such as MCTs, puddle flanges etc in walls or slabs next to or in the vicinity of the CD doors Provision of ventilation duct hinged-end doors (VDHD) at all ventilation supply and exhaust openings at the ventilation shafts/plenums
		• **Electrical Plan (CE)** ○ **Electrical Power System, CD Communications System, CD Door Monitoring System, CD Equipment Monitoring System** The following shall be clearly illustrated in the submission for each of the systems above: - CD Plans layout at ground level, station concourse, station platform and any other level or space associated with the CD shelter, such as mezzanine floors and subway connections - All CD related plantrooms and ancillary rooms, setting-out and performance capacities of CD related equipment, accessories and services sizes, layout, and routings and their related supports - All CD related single line diagrams, schematics and typical installation details - Locations, clear dimensions and performance capacities of CD related equipment, accessories, services and their supports from ceilings, walls and floors - Size of openings and type of services penetrations such as MCTs, puddle flanges etc in walls or slabs next to or in the vicinity of the CD doors

Building and Construction Authority (BCA)

Legend: Architecture | C&S | M&E | Builder | IFC COMPONENT

-	**Independent Submissions** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Public Transit Shelter (PS/TS) *(continued from previous page)*	• **Shock Design** Shock Design for Architectural & Structural (CKS), Mechanical (CKM) and Electrical (CKE) works shall be submitted with the following: 1. Cover letter 2. Shock design report 3. Shock calculations for equipment 4. Shock calculations for services 5. Detailed drawings for shock support
	Structural Design	**Structural Design (Other Works e.g. demolition, ERSS, cladding, safety barrier, temporary traffic decking)** • **2D Drawings are acceptable** for independent submissions. • Structural design of ancillary works and component such as demolition, temporary ERSS, barriers & cladding, temporary traffic decking • Structural design of localized works for ancillary structures e.g. cladding, barrier • These plans will need to make reference back to the coordinated model submitted by the Main QP at the Construction Gateway (G2). **Design Calculation Reports** • From QP, AC, [QP(Geo) & AC (Geo), if needed)] **Additional Supporting Documents:** a) Site investigation report in pdf & AGS format b) Impact assessment report c) Design consideration for Earth Retaining or Stabilisng Structures (ERSS)) – ERSS_Annex A d) QP's & AC's Certification for fixings of ancillary structures

Building and Construction Authority (BCA)

Legend: Architecture | C&S | M&E | Builder | IFC COMPONENT

G3 Completion Gateway		
	Key Words	**Requirement Category**
	Buildability, Constructability and Productivity	**Buildability Detailed Design and Implementation Plan (BDIP)** • BIM model which describes and defines the type, extent of use and details of the Design for Manufacturing (DfMA) technologies, building systems, building components, buildable features and design standardisation across the Structural, Architectural and Mechanical, Electrical and Plumbing (MEP) systems • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Buildable Design Score (B-Score)** a) BS03 Form (in Excel format) to be submitted **Final Productivity Implementation Plan (PIP)** • BIM model which describes and demonstrates the types, extent of use and details of the construction methods, construction systems, construction processes, construction management, buildable features and innovative features that have been implemented for the building works, for the purpose of achieving site productivity improvement • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Integrated Digital Delivery (IDD) Final Report** • Plan that describes the types, extent of use and details of the integrated digital delivery essential use cases that have been adopted in respect of the building works, for the purpose of enabling the digital integration of work processes.
		Constructability Implementation Plan (CIP) • BIM model which describes and defines the type, extent of use and details of the construction techniques, processes and innovative methods and systems that have been implemented for the building works • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Supporting Documents for CIP:** a) Documents (e.g. photos, 2D plans, etc.) on the use of construction techniques, processes, plant, equipment and innovative methods **Constructability Score (C-Score)** a) C-Score Calculations (to be computed and submitted by Builder in PDF format)
	Civil Defence Shelter (Non-Transit/Non-Public)	• Inspection of Civil Defence Shelter (Non-Transit/Non-Public) • Checklist for submission with Inspection of Civil Defence Shelter (Non-Transit/Non-Public)
	Completion of Structural Works	• Submission Certificate of Record Structural Plans/Calculations • Certificate of Supervision of Piling/Structural Works • Certificate of Supervision of Geotechnical Building Works • Accredited Checker's Endorsement of Record Structural Plans/Calculation • Specialist Accredited Checker's Endorsement of Record Geotechnical Building Works Plans/Calculation • Builder certificate of completion of the Building Works

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E Builder IFC COMPONENT

G3	Completion Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Environmental Sustainability	**For Code for Environmental Sustainability of Buildings**: To submit the following: i. BC ES Appendix 1 for **Completion Gateway** https://go.gov.sg/bc-es-app1 ii. Documentary Evidence based on the Guidance Notes and Documentation Requirements under Code for Environmental Sustainability of Buildings: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda **For Government Land Sales (GLS) programme requirement:** Please refer to the following link: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda/mandatory-higher-green-mark-standard
	Public/Transit Shelter (PS/TS) Technical Clearances	**Method statement for commissioning tests (CT)** 1. Internal overpressure test (IOPT) 2. Overpressure regime and airflow test (ORAT) 3. Integration system test (IST)
		Commissioning test report (CT) 1. Internal overpressure test (IOPT) 2. Overpressure regime and airflow test (ORAT) 3. Integration system test (IST)
		Notice of Approval of Commissioning (NOAC) (CN) 1. CD NOA letters of As-built plans for: • Architectural • Structural • ECS • FPS • Water Services • Sanitary • Drainage • Electrical • CD Communications • CD EMS System • CD Door Monitoring System • CD MATV 2. CD Certificate of Supervision (COS) letters for: • CD Related Architectural Works • CD Related Structural Works, MCTs, CD Valves, CD Doors • CD Electrical System • CD Door Monitoring System • CD Equipment Monitoring System • CD Communications System • CD Environment Control System & Fire Protection Systems • CD WSSDS 3. CD NOA letters for IOPT, ORAT and CDIST reports 4. CD NOA letters with summary table for all shock design submissions 5. CD NOAC Inspection Report with rectified defects list containing clear before and after colour photos and description of remedial actions taken.

Building and Construction Authority (BCA)

Legend: Architecture | C&S | M&E | Builder | IFC COMPONENT

G3	**Completion Gateway** *(continued from previous page)*		
	Key Words	**Requirement Category**	
	Record Building Plans	• Record Plans	
	Technical Clearance (TOP/CSC)	• Universal Design Index FormSG Acknowledgement • CONQUAS / QM	• Site Inspection Report/Checklist • Phasing Plan • Clearance for Environmental Sustainability • Clearance for Buildability and Constructability
		• Annex A Safety Barrier • Annex A Engineered Façade	
		• Certificate of Supervision for Lightning Protection System (LPS) • Permit to Operate (Lift & Escalator) • Certificate of Supervision for Air-Conditioning and Mechanical Ventilation System(s)	
		• Builder's Certificate (for building works without any structural works)	

End of Requirements for BCA

Land Transport Authority (LTA)

Legend: Architecture C&S M&E IFC COMPONENT

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Impact Studies only	**Transport Impact Assessment (TIA)** • A TIA submission is required if developments are of (a) mixed uses, (B) proposed uses that are non-typical (C) located in traffic sensitive areas or (d) first movers of new development areas. Requirement for TIA would be stipulated in the Technical Conditions of Tender (TCOT) of Government Land Sales (GLS) sites. Developers can also consult LTA via LTA-DBC_Registry@lta.gov.sg. • The traffic consultant shall arrange scoping meeting with LTA to discuss the scope of study, TIA classifications and confirm if Walking and Cycling Plan (WCP) is required. • The TIA report is to be set out logically with clear analyses, conclusions and recommendations. All assumptions and sources of information are to be clearly documented. Executive Summary shall be included to provide concise and clear information on the study purpose, major findings, conclusions and recommendations. Improvements recommended in the TIA are to be illustrated using appropriate plan(s) with sufficient detail to substantiate their feasibility. All the analysis files and data related to the study are to be submitted as appendices to the Report for LTA's records. • All recommended improvement works to be carried out by the developer shall be incorporated in the development plan submissions in two parts. Part one submission at Design Gateway (G1) shall incorporate the recommendations from the TIA including the details of access arrangements, proposed improvements at immediate junctions abutting the development boundary, proposed traffic ops & management plan, any provision of and connectivity to commuter facilities and active mobility layers. Part two submission at Construction Gateway (G2) shall include the recommendations from the TIA including the required improvements beyond the development boundary and any other traffic demand management measures.
		Pre-Application Feasibility Study & Recommendations • LTA should be consulted to confirm whether a PAFS is needed for the proposed residential site if they are undergoing redevelopment arising from a collective or en-bloc sales. • The traffic consultant shall arrange scoping meeting with LTA to discuss the scope of study • PAFS should assess the traffic impact on the area and propose car-lite measures/initiatives, traffic demand management measures and/or feasible transport improvement plans to support the redevelopment proposal. • All recommended improvement works to be carried out by the developer shall be incorporated in the development plan submissions at Design Gateway (G1) and Construction Gateway (G2) to LTA for clearance
		Walking and Cycling Plan (WCP) • The rigorous process of the WCP shall be demonstrated and presented in a written report that explains the rationale for the following 5 sets of plans: 1. Location and Connectivity Plan 2. Circulation Plan 3. Conflict Mitigating Plan 4. Bicycle Parking and End of Trip Facility Plan 5. Wayfinding Plan

➢ For LTA's External Works requirements, please refer to Page 160.

Land Transport Authority (LTA)

Legend: Architecture C&S M&E IFC COMPONENT

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Site Layout, Vehicle Parking	**Pre-Consultation on Mechanised Parking System Proposals** • QPs and developers are required to submit their mechanised parking system and car lifts proposals to LTA for a pre-submission consultation before a development application is submitted to the Urban Redevelopment Authority (URA) for planning permission. This will allow architects, engineers and developers to incorporate the necessary requirements into the design of the development upfront to minimise abortive work and major revisions to development proposals later. • Refer to LTA's COP for Vehicle Parking Provision in Development Proposals for the design of a proper mechanised parking system and car lifts. • As there is a variety of mechanised parking systems in the market, it is possible that some of these systems do not fully comply with LTA's guidelines. For such cases, the systems will be evaluated based on its own merits during the pre-submission consultation with LTA.
		Mechanised Parking System • To submit the detailed drawings and description for the type of mechanised parking system used in the proposal. Information on how the system operates, how cars are parked and retrieved from the system, average time taken for parking and retrieval, safety features, etc. shall be clearly illustrated. • The type of mechanised parking system and all relevant requirements/ dimensions of the parking system such as platform size, maximum load, headroom clearance, allowable car dimensions, safety features, etc. shall be clearly indicated and endorsed on plan. Ensure that the dimensions and information endorsed on plan correspond with the mechanised parking system specification. • The cross-sectional details of the parking platform showing the inner clear width of the platform, clear platform length and clear movement space between the structural supports. To ensure that the dimension for headroom clearance of minimum 2.2m and platform size of minimum 2.4m x 5.4m are cleared of obstructions e.g. structural supports, structural cage, wire rope/hoisting cable, motorised equipment, sliding gears, etc.
		Car Lifts • To submit the type of car lift system and all relevant requirements/ dimensions of the car lift system such as internal cage size, width of the entrance and exit door, maximum load, headroom clearance, allowable car dimensions, minimum speed, minimum discharge capacity, queuing spaces, safety features, etc. shall be clearly indicated and endorsed on plan. Information on how to operate the car lifts (e.g. call-button or loop detector), sequence on how cars enter/exit the car lift, provision of safety devices, etc. should be clearly illustrated. • The proposed car lift system shall comply with the guidelines for provision of car lifts in car parking places.

➢ For LTA's External Works requirements, please refer to Page 160.

Land Transport Authority (LTA)

Legend: Architecture C&S M&E IFC COMPONENT

G1	Design Gateway	
	Key Words	**Requirement Category**
	External Works	For LTA's External Works requirements, please refer to Page 180 - 189.

	Impact Studies, Site Layout, Rail Protection	**Development Proposal within Railway Protection Zone / Railway Corridor**
		• To show the proposed plan for development works
		• To provide a preliminary engineering evaluation report* accompanied by a plan for engineering works
		• To furnish the relevant Certified Survey Plans (for critical development within first reserve of underground RTS)
		
		**Key elements of a preliminary engineering evaluation report include:*
		• *Project Overview*
		  ○ *Brief description of the proposed development and its proximity to railway structures*
		• *Site Investigation*
		  ○ *Summary of geotechnical conditions and groundwater levels*
		• *Impact Analysis*
		  ○ *Assessment of potential ground movements*
		  ○ *Evaluation of effects on the Rapid Transit System*
		
		Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer for more requirements / detailed description

	Site Layout, Street Works ROAD CULVERT SPACE RAMP	**Development Proposal** • To check if project falls within LTA's exemption list and is not required to obtain a clearance from LTA DBC, i.e. LTA in-house project. • To confirm if the development falls within a road structure safety zone (RSSZ).
		Connections and Interfaces at development boundary • To indicate the road level, entrance culvert level, and the proposed development platform level. • For new roads proposed in conjunction with development(s), to develop the development platform level and proposed levels of the development access points based on the vertical alignment of the proposed carriageway (before QP confirms on the development platform level for the design of the foundation / structural works). • To show the gradient of entrance approach. • To indicate the configuration of the proposed access. • To indicate the width and turning radius of the proposed access. • To indicate the provision of tactile tiles. • To indicate any proposed relocation of existing road elements, such as trees, lamp post, signs etc, which may be affected by proposed access.
		Proposed Loading / Unloading (Within Development): U/UL Layout • To show the location of the U/UL facility • To mark out the number of U/UL bays
		Proposed Pick-Up / Drop-Off Points (Within Development): PUDO Layout • To show the location of the PUDO facility within the development site • To mark out the number of PUDO bays and indicate the queue length • Indicate width and kerb alignment of PUDO points

➢ For LTA's External Works requirements, please refer to Page 160.

Land Transport Authority (LTA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G1	Design Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Vehicle Parking SPACE PARKING LOT RAMP DRIVEWAY	**Vehicle Parking Provision** • To comply fully with the prevailing Parking Places (Provision of Parking Places and Parking Lots) Rules and other relevant guidelines of the Authority • To ensure that the number of parking lots provided is within the specified range defined by the lower and upper bound requirement. (The Range-based parking provision standard for the various development uses can be found in Annex A of the COP for Vehicle Parking Provision in Development Proposals) • Space shall be set aside for Vehicle Parking provision. Such provisions shall take into consideration the number, type & size of parking lots, direction of the carpark driveways (i.e. single-lane, double-lane), provision of sufficient headroom clearance, and the gradient of vehicular ramps.

G1.5	Piling Gateway (Optional)	
	Key Words	**Requirement Category**
	Impact Studies, Site Layout, Rail Protection	**Engineering Assessment for Piling Works within Railway Protection Zone / Railway Corridor** • To submit plan for engineering works • To submit the Engineering evaluation report • To submit the Certified Survey Plans • To submit the Construction schedule for the proposed development Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer / Guide to carrying out restricted activities within railway protection and safety zones for more requirements / detailed description

G2	Construction Gateway	
	Key Words	**Requirement Category**
	External Works	For LTA's External Works requirements, please refer to Page 180 - 189.
	Impact Studies only	**Building Proposal within Railway Protection Zone/ Railway Corridor** • To submit plans for building works. • To submit the Engineering Evaluation Report accompanied by plan for engineering works. • To submit the Construction Schedule for the proposed development. Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer for more requirements/ detailed description

➢ For LTA's External Works requirements, please refer to Page 160.

Land Transport Authority (LTA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	Construction Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Impact Studies, Site Layout, Rail Protection	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** • To submit plan for engineering works • To submit the Engineering evaluation report • To submit an Instrumentation Proposal and initial instrumentation readings • To submit a Method Statement of work • To submit a Hazard Analysis identifying all possible risks that may be posed to the rapid transit system and a description of the safety and precautionary measures to mitigate these risks • To submit the Contingency Plan and Emergency Procedure • To submit the Pre-condition Survey Report • To submit the Certified Survey Plans • To submit the Permit application form and other relevant forms • To submit the Construction schedule for the proposed development Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer / Guide to carrying out restricted activities within railway protection and safety zones for more requirements / detailed description
	Site Layout, Street Works CULVERT RAMP ROAD	**Access Point Details** • Structural details of entrance culvert at access points (reinforcement, connection to entrance approach etc.) • Levels, gradient, cross-fall • Redundant access to be sealed and reinstated to match existing side-table
		Proposed Pick-Up / Drop-Off Points (Within Development): PUDO details • To reflect all details presented at Design Gateway (G1) stage
		Street Works Deposit • For private developments with proposed major road infrastructure works (e.g. new streets, major improvement of an existing street, POB, UPN), an amount to be deposited with LTA for the execution and completion of the proposed street works
	Site Layout, Vehicle Parking PARKING LOT RAMP ROAD	**Vehicle Parking Provision** • To provide the details and critical dimensions of the parking layout such as: o Type and size of parking lots o Width of ramps and accessways o Inner turning radius and width of turning paths o Width of parking aisles o Gradient of vehicular ramps o Headroom clearance o Road and traffic arrow markings o Bicycle rack details o Location of EV Charging Station

➢ For LTA's External Works requirements, please refer to Page 160.

Land Transport Authority (LTA)

Legend: Architecture C&S M&E IFC COMPONENT

-	Independent Submissions	
	Key Words	**Requirement Category**
	Impact Studies / Site Layout, Rail Protection, Road Structure Protection	**Approval to commence engineering works within Railway Protection Zone / Railway Corridor** • To submit plan for engineering works • To submit the Engineering evaluation report • To submit an Instrumentation Proposal and initial instrumentation readings • To submit a Method Statement of work • To submit a Hazard Analysis identifying all possible risks that may be posed to the rapid transit system and a description of the safety and precautionary measures to mitigate these risks • To submit the Contingency Plan and Emergency Procedure • To submit the Pre-condition Survey Report • To submit the Certified Survey Plans • To submit the Permit application form and other relevant forms • To submit the Construction schedule for the proposed development Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer / Guide to carrying out restricted activities within railway protection and safety zones for more requirements / detailed description
		Approval to carry out restricted activities within Railway Safety Zone Note: Refer to LTA's Guide to carrying out restricted activities within railway protection and safety zones for detailed requirements / description
		Approval to commence engineering works within Road Structure Safety Zone / Notification to carry out engineering activity on land adjoining public street • To submit plan for engineering works • To submit the Engineering evaluation report • To submit an Instrumentation Proposal and initial instrumentation readings • To submit a Method Statement of work • To submit a Hazard Analysis identifying all possible risks that may be posed to the rapid transit system and a description of the safety and precautionary measures to mitigate these risks • To submit the Contingency Plan and Emergency Procedure • To submit the Pre-condition Survey Report • To submit the Certified Survey Plans • To submit the Permit application form and other relevant forms • To submit the Construction schedule for the proposed development Note: Refer to LTA's Guide to Carrying Out Engineering Works within Road Structure Safety Zone and Engineering Activity on Land adjoining Public Streets for more requirements/ detailed description

G3	Completion Gateway	
	Key Words	**Requirement Category**
	-	**Application for clearance of certificate of statutory completion for development within Railway Protection Zone / Railway Corridor** • To submit a copy as-built topographic survey plan in true coordinates. • To submit a certificate of supervision • To submit the final condition survey report

➢ For LTA's External Works requirements, please refer to Page 160.

Land Transport Authority (LTA)

Legend: Architecture C&S M&E IFC COMPONENT

G3	Completion Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	-	**For proposed developments which involve modification to RTS, development to comply with *Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations*** Note: Refer to LTA's Code of Practice for Railway Protection/ Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer for more requirements / detailed description
		For Notification of Opening of New Street to Traffic, the following shall be submitted: • Cover letter stating clearly the road opening date. • Approved traffic layout plan • Street and Building Name Board (SBNB) Approval letter of street name • Certificate of Supervisions by PE • Road Test Result • Checklist of completed Works • Photographs of completed works
		For developments that involve only the widening and alteration of existing street fronting the development (without new street), the following shall be submitted: • As-built topographic survey plan in true coordinates (in .dwg format) • Approved subdivision plan with WP from URA and Certified Plan (CP) for project with vesting of street reserve plot. • Photographs of completed works.
		For handing over of new road, the following shall be submitted: • As-built topographic survey plan in true coordinates (in .dwg format) • As-built structural and M&E plans for commuter facilities such as POB, UPN • Taking over letters from PUB, NParks and NEA • Road Declaration Plan • Approved sub-division plan • Certified plan from Chief Surveyor, SLA • Asset Master Record Input Form • Road Data Form • Audit certificate for project under Ministries or Statutory Board • Road testing results. • Documents for handing over of street lightings - as-built installation plans, electrical single line diagram, letter of supervisions, test report from SP services for new control box and underground cable insultation resistance test report • Warranties for waterproofing etc
		For Vehicle Parking submission: • Photos for open surface parking lots • As-built Drawings

End of Requirements for LTA

Click below for LTA's RABW Requirements for :
External Works

National Environment Agency (NEA)

Legend: Architecture C&S M&E IFC COMPONENT

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Impact Studies only	**Environmental Information (EI)** • Applicants are required to apply EI from NEA directly at Pre-Submission
		Environmental Impact Study (EIS-Pre) • Applicants are required to submit EIS (Pre) to NEA directly at Pre-Submission • If Pre-Submission is not possible, the EIS (Pre) process should be concluded by Design Gateway (G1)
		Energy Efficiency Opportunities Assessment (EEOA) for New Ventures • The company should refer to the checklist for preparing a **complete** EEOA-NV lite-report and EEOA-NV full-report for submission to NEA. The checklist includes brief descriptions of the requirements and is available here: Energy Efficiency Opportunities Assessment (EEOA) for New Ventures • Applicants are required to submit EEOA reports to NEA directly via email to Emissions Data Monitoring and Analysis System (EDMA) as early as possible
		Environmental Site Assessment (ESA) • Applicants should submit ESA to NEA directly and should be concluded at Pre-Submission
		Noise Impact Assessment (NIA-Pre) for Traffic • Applicants are required to submit NIA (Pre) report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission • If Pre-Submission is not possible, the NIA (Pre) process should be concluded by Design Gateway (G1) • However, applicant may submit NIA (Pre) report to NEA directly at Construction Gateway (G2) if there is no Design Gateway (G1) submission for the development
		Pollution Control Study (PCS) • For technical guidance on PCS, refer to https://www.nea.gov.sg/our-services/development-control • PCS addresses pollution impacts due to (a) Air Pollution, (b) Noise Pollution, (c) Water Pollution, and (d) Management of Hazardous Substances and Toxic Waste • The PCS assists consultants in the planning of mitigation measures (if required) to address the pollution impact. Such measures may include increased chimney stack height, changes in development layout to locate noisy equipment away from noise sensitive receptors • Where possible, industry is encouraged to submit and clear parts of PCS report pertaining to (a) Air Pollution (including air dispersion modelling) and (b) Noise Pollution (including noise impact modelling) prior to DG clearance. This approach will help to avoid the need for major rework (e.g. raising the chimney height, moving noisy equipment to other locations) in the later stages of development • Applicants to submit PCS report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission
		Quantitative Risk Assessment (QRA) • If a QRA submission is required for an industrial project, QRAs should be prepared ahead and submitted to agencies before Design Gateway to enable early identification of any siting issues • Companies and their QRA consultants to submit the QRA report to MOM (Major Hazards Department) via contact_MHD@mom.gov.sg • For more information on the preparation of QRA reports, companies can refer to the following link within NEA's website (https://www.nea.gov.sg/our-services/development-control) for the list of registered QRA consultants, and QRA submission, technical and criteria guidelines.

National Environment Agency (NEA)

Legend: Architecture C&S M&E IFC COMPONENT

-	**Pre-Submission, Planning and Other Consultations** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Site Layout only	**Environmental Health (COPEH)** • Refuse Truck Access Road (For Refuse Collection) – Swept Path Analysis • Location and Size of the Bin Centre / Refuse Room / Bin Point, refuse chute and recycling chute, refuse chute chamber and recyclables storage & its collection system • Provide total daily refuse outputs (liters/day) for the development • Pneumatic waste conveyance system (PWCS) schematic plan • Location of cooling tower and its setback distance (at least 5m) **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1) • However, applicant may submit the above information at Pre-submission if the development does not require any Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways
		Pollution Control (COPPC) • Confirm the proposed development is aligned with the prevailing URA MP land use zoning (e.g. residential to residential) • Building location and its surrounding development/amenities (such as expressway/major road, MRT/MRT station, place of worship, hospital, petrol station, industry premises etc.) • Orientation and location of nuisance sources (e.g. cooling towers, chiller plants, air handling units, air conditioning condensers, fresh air intake, exhaust outlets (ventilation shaft), etc) • 50m nuisance buffer from place of worship, petrol station, Light industry premises to the nearest residential development. • 100m nuisance buffer from General industry premises to nearest residential development. • 500m nuisance buffer from Special Industry premises to nearest residential development. • Orientation of building: Minimum building setback (m) Fronting track: 35 End-wall facing track: 25 • Setback distance within 70m from transport-related infrastructure (i.e. LTA road reserve line for expressway/major road) to the nearest residential development Lot boundary line. • Location of the chimney and BHC and MCH requirements e.g. within 30m / 100m radius of existing chimney stack height • Location changes for the storage inventory product / materials such as chemical, oil, fuel, etc • Changes in the industrial processes or production activities location • Changes of existing activity, expansion of existing activities or proposed new activity carried out on the proposed development or premises **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1) • However, applicant may submit the above information at Pre-submission if the development does not require any Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

Legend: Architecture C&S M&E IFC COMPONENT

G1	Design Gateway	
	Key Words	**Requirement Category**
	Impact Studies only	**Environmental Impact Study (EIS-Pre)** EIS (Pre) report will be required for developments or infrastructure that would have environmental impact (air, water, land or noise) or affected by environmental impact. For example, new residential / sensitive developments located within 50m from new / existing petrol stations and/or new petrol stations located within 50m from existing residential/sensitive sites **When to apply:** • Applicants are required to submit EIS (Pre) to NEA directly at Pre-Submission • If Pre-Submission is not possible, the EIS (Pre) process should be concluded by Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Noise Impact Assessment (NIA-Pre) for Land Traffic Noise NIA (Pre) report will be required for (1) New residential and noise sensitive developments located within 70m of existing land traffic noise sources/hotspots (e.g. expressways / major arterial roads / MRT tracks) on existing residential and (2) Existing noise sensitive developments located within 70m of new transport-related developments (e.g. expressway/major arterial roads / MRT tracks / bus interchanges / bus depots), inclusive of the expansion of existing transport-related infrastructures **When to apply:** • Applicants are required to submit NIA (Pre) report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission and should be concluded by Design Gateway (G1) • However, applicant may submit NIA (Pre) report to NEA directly at Construction Gateway (G2) if the development does not require any Design Gateway (G1) submission • Sufficient time shall be catered for NEA to process the NIA (Pre) • The processing of NIA (Pre) will take 1-2 months **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Energy Efficiency Opportunities Assessment (EEOA) for New Ventures EEOA will be required for new industrial facilities and major expansions of existing facilities with an estimated annual energy consumption (AEC) ≥ 54TJ must review the facility design and develop economically feasible for energy efficiency opportunities • The company should refer to the checklist for preparing a **complete** EEOA-NV lite-report and EEOA-NV full-report for submission to NEA. The checklist includes brief descriptions of the requirements and is available here: Energy Efficiency Opportunities Assessment (EEOA) for New Ventures • Applicants are required to submit EEOA reports to NEA directly via email to Emissions Data Monitoring and Analysis System (EDMA) as early as possible **When to apply:** • Applicants are required to submit EEOA to NEA directly at Pre-Submission **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

Legend: Architecture C&S M&E IFC COMPONENT

G1	**Design Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Impact Studies only *(continued from previous page)*	**Environmental Site Assessment (ESA)** ESA should be conducted when a site that is used for polluting activities is to be redeveloped, rezoned or reused for a non-polluting activity **When to apply:** • Applicants should conclude the ESA at Pre-Submission **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Pollution Control Study (PCS) Any proposed industrial development that could cause serious or substantial pollution of the environment, if mismanagement, is required to conduct a Pollution Control Study (PCS) • For technical guidance on PCS, refer to https://www.nea.gov.sg/our-services/development-control • PCS addresses pollution impacts due to (a) Air Pollution, (b) Noise Pollution, (c) Water Pollution, and (d) Management of Hazardous Substances and Toxic Waste • The PCS assists consultants in the planning of mitigation measures (if required) to address the pollution impact. Such measures may include increased chimney stack height, changes in development layout to locate noisy equipment away from noise sensitive receptors • Where possible, industry is encouraged to submit and clear parts of PCS report pertaining to (a) Air Pollution (including air dispersion modelling) and (b) Noise Pollution (including noise impact modelling) prior to DG clearance. This approach will help to avoid the need for major rework (e.g. raising the chimney height, moving noisy equipment to other locations) in the later stages of development **When to apply:** • Applicants to submit PCS report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Quantitative Risk Assessment (QRA) • Anyone intending to store or use hazardous substances will have to pre-consult MOM-MHD whether a QRA assessment is required. • For more information on the preparation of QRA reports, companies can refer to the following link within NEA's website (https://www.nea.gov.sg/our-services/development-control) for the list of registered QRA consultants, and QRA submission, technical and criteria guidelines **When to apply:** • Companies and their QRA consultants to submit the QRA report to MOM (Major Hazards Department) via contact_MHD@mom.gov.sg • If a QRA submission is required for an industrial project, QRAs should be prepared ahead and submitted to agencies before Design Gateway to enable early identification of any siting issues. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G1	Design Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Site Layout only SITE SPACE ROAD REFUSE CHUTE DOOR	**Environmental Information (EI)** • EI information such as building height constraint, health and safety buffer, etc. shall be incorporated in the building plan design to ensure that the development is able to meet the requirement. **When to apply:** • Applicants are required to apply EI from NEA directly at Pre-Submission and incorporate the information in building plan submission in Design Gateway (G1) • However, applicant may submit the above information at Pre-Submission if the development does not require any Design Gateway (G1)

		Environmental Health (COPEH)
		• Refuse Truck Access road (for refuse collection) – Swept Path Analysis
		• Location and Size of the Bin Centre /Refuse Room / Bin Point, refuse chute and recycling chute, refuse chute chamber and recyclables storage & its collection system
		• Provide total daily refuse outputs (liters / day) for the development
		• Location and dimensions of spatial provisions of Pneumatic waste conveyance system (PWCS) to meet the minimum requirements specified in Singapore Standard - Code of Practice for Pneumatic Waste Conveyance System (SS 642: 2019)
		• Location of cooling tower and its setback distance (at least 5m)
		• Pneumatic waste conveyance system (PWCS)
		  • QP should submit the spatial dimensions of the PWCS Discharge Valve Room and bin centre at DG
		  • NEA may grant conditional approval at DG if the details of the PWCS design have not been worked out. In such cases, the QP shall confirm in writing that the proposed spatial dimensions can accommodate the installation of the PWCS and that the eventual design of the PWCS will fully comply with Singapore Standard Code of Practice for Pneumatic Waste Conveyance System (SS 642: 2019). Upon receiving the confirmation letter, NEA will conditionally approve the design at DG. The QP shall submit the PWCS details at CG for full clearance

		When to apply: • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

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G1	**Design Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Site Layout only *(continued from previous page)* SITE SPACE ROAD REFUSE CHUTE DOOR	**Pollution Control (COPPC)** • Confirm the proposed development is aligned with the prevailing URA MP land use zoning (e.g. residential to residential) • Building location and its surrounding development/amenities (such as expressway / major road, MRT / MRT station, place of worship, hospital, petrol station, industry premises etc.) • Orientation and location of nuisance sources (e.g. cooling towers, chiller plants, air handling units, air conditioning condensers, fresh air intake, exhaust outlets (ventilation shaft), etc) • 50m nuisance buffer from place of worship, petrol station, Light industry premises to the nearest residential development. • 100m nuisance buffer from General industry premises to nearest residential development. • 500m nuisance buffer from Special Industry premises to nearest residential development. • Orientation of building: Minimum building setback (m) | Fronting track | 35 | | End-wall facing track | 25 | • Setback distance within 70m from transport-related infrastructure (i.e. LTA road reserve line for expressway/major road) to the nearest residential development Lot boundary line. • Location of the chimney and BHC and MCH requirements e.g. within 30m / 100m radius of existing chimney stack height • Location changes for the storage inventory product / materials such as chemical, oil, fuel, etc • Changes in the industrial processes or production activities location • Changes of existing activity, expansion of existing activities or proposed new activity carried out on the proposed development or premises
		When to apply: • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

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G2	Construction Gateway	
	Key Words	**Requirement Category**

	Impact Studies only	**Energy Efficiency Opportunities Assessment (EEOA) for New Ventures**
		
		EEOA will be required for new industrial facilities and major expansions of existing facilities with an estimated annual energy consumption (AEC) ≥ 54TJ must review the facility design and develop economically feasible for energy efficiency opportunities.
		• A **complete** EEOA-NV full-report should be submitted as early as possible directly via the Emissions Data Monitoring and Analysis System (EDMA) and NEA's clearance is required prior to CG clearance.
		• NEA may grant conditional approval for incomplete reports in order not to hold back the CG submission. Companies should submit to NEA their incomplete reports together with the request citing the reasons for seeking conditional approval. The request must be endorsed by the company's senior management. Justifiable reasons for seeking conditional approvals include but are not limited to the following:-
		  ○ Production output information, which is needed to determine the specific energy consumption of major energy consuming systems, has yet to be determined
		  ○ Detailed equipment specifications, which are needed for carrying out cost benefit analysis of energy efficiency opportunities, cannot yet be determined
		• Requests should be sent to nea_vo@nea.gov.sg. NEA will assess the request and respond to the company within 14 working days. If conditional approval is granted, NEA will require the company to submit and clear the EEOA-NV full-report no later than 6 months from CG clearance. TOP/CSC for the company will be granted only after NEA approves the EEOA-NV full-report

		Pollution Control Study (PCS) Any proposed industrial development that could cause serious or substantial pollution of the environment, if mismanagement, is required to conduct a Pollution Control Study (PCS) • For technical guidance on PCS, refer to https://www.nea.gov.sg/our-services/development-control • QPs are to submit the full PCS report at CG for clearance to ensure that recommended mitigating measures, if required, are considered before construction commences • Where the full PCS report is not submitted and cleared at CG, the QP shall submit a declaration that the design will fully comply with pollution control-related requirements stated in Singapore Standard SS593 on Code of Practice for Pollution Control and relevant statutory legislation. A conditional approval will then be granted at CG. In such cases, requests to waive SS593 requirements for reasons such as structural or space limitations will not be granted • If conditional approval is granted at CG, the QP shall submit and clear the full PCS report no later than 6 months from CG clearance. TOP/CSC for the development will be granted only after NEA approves the full PCS report Note: To submit a PCS report, please send it to DCLD_consultation@nea.gov.sg
		Quantitative Risk Assessment (QRA) Anyone intending to store or use hazardous substances will have to pre-consult MOM-MHD whether a QRA assessment is required. • Companies and their QRA consultants to submit the QRA report to MOM (Major Hazards Department) via contact_MHD@mom.gov.sg • For more information on the preparation of QRA reports, companies can refer to the following link within NEA's website (https://www.nea.gov.sg/our-services/development-control) for the list of registered QRA consultants, and QRA submission, technical and criteria guidelines • To prevent a situation where rectifications become impractical to implement, approval of the QRA report findings must be obtained prior Construction Gateway clearance

National Environment Agency (NEA)

Legend: Architecture C&S M&E IFC COMPONENT

G2 Construction Gateway

Key Words	Requirement Category
Environmental Health (COPEH) INTERCEPTOR, SENSOR, PUMP, CUBICLE, SANITARY APPLIANCES, DISTRIBUTION CHAMBER, GUTTER, SYSTEM, TANK, SPACE, SHADING DEVICE, CONTROL ELEMENT, REFUSE CHUTE / RECYCLABLES CHUTE, REFUSE HANDLING EQUIPMENT	**COPEH - Section 1 : Refuse Storage and Collection** The spatial provision set aside for Pneumatic waste conveyance system (PWCS) cleared at Design Gateway (G1) must continue to be provided at CG. Applicants are required to furnish details regarding their proposals, building upon the spatial provisions previously submitted at DG. 1.1 Objective 1.2 Refuse Output 1.3 Refuse Chute 1.4 Refuse Chute Chamber 1.5 Refuse Room 1.6 Refuse Bin Point and Refuse Bin Centre 1.7 Pneumatic Waste Conveyance System (PWCS) 1.8 Mandatory Waste Reporting Scheme 1.9 Location of Grease Trap 1.10 On-Site Food Waste Treatment System Note: PWCS • The QP shall provide the PWCS design layout details at CG to demonstrate that sufficient space has been catered for the installation of PWCS pipe/equipment and that the parameters stated in SS 642:2019 are met • Where the PWCS details are not ready at CG, the QP shall submit a declaration that the PWCS design will fully comply with SS 642:2019. A conditional approval will then be granted at CG. For such cases, requests to waive the SS 642: 2019 requirements for reasons such as lack of space or room height will not be granted • If conditional approval is granted at CG, the QP shall submit and clear the full PWCS details as an independent submission for clearance not later than 6 months from CG clearance. The installation of the PWCS shall only commence after NEA's clearance is granted. Failure to meet the above conditions will lead to a delay in the commencement of installation of PWCS which may potentially affect the overall project completion timeline **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
	COPEH - Section 2 : Public Toilet 2.1 Objective 2.2 Definition of Public Toilet 2.3 General Design Criteria 2.4 Sanitary and Water Fittings Required in Public Toilet 2.5 Amenities to be Provided 2.6 Ventilation **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

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G2	Construction Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Environmental Health (COPEH) (continued from previous page)	**COPEH - Section 3 : Ventilation, Ducting and Kitchen Exhaust Systems for Food Shop** 3.1 Objective 3.2 Design Requirements 3.3 Operations Requirements 3.4 Other Requirements and Guidelines **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). Terminals and façade louvres are to be modelled. Ducting can be in 2D or 3D. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPEH - Section 4 : Cooling Tower *(when it is provided)* 4.1 Objective 4.2 Design Requirements **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPEH - Section 5 : Aquatic Facility 5.1 Objective 5.2 Minimum Design Criteria **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). Balancing Tank is to be modelled. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPEH - Section 6 : Storage and Collection System for Recyclables at Strata-Titled properties with Residential Units 6.1 Objective 6.2 Recyclables Output 6.3 Designated Recycling Points for Recycling Receptacles 6.4 Recyclables Chute System **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	Construction Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Environmental Health (COPEH) *(continued from previous page)*	**COPEH - Section 7 : Anti-Mosquito Breeding** 7.1 Objective 7.2 Roof Gutter 7.3 Air-Conditioning Tray 7.4 Floor Trap **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
	Pollution Control (COPPC)	**COPPC - Section 2 : Judicious Siting of Industries and Other Development** 4. Objective **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPPC - Section 3 : Requirements for Industries 5. Clean Industry 6. Light Industry 7. General Industry 8. Special Industry **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPPC - Section 4 : Requirements to Operate a Factory 9. Use of Industrial premises 10. Trade effluent discharge into public sewer and watercourse **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPPC - Section 5 : Pollution Control Requirements • 11. Water Pollution • 12. Air Pollution • 13. Noise Pollution **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

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G2	Construction Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Pollution Control (COPPC) *(continued from previous page)*	**COPPC - Section 6 : Hazardous Substances and Toxic Industrial Waste Control Requirements** • 14. Hazardous Substances • 15. Toxic Industrial Waste **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

-	Independent Submissions	
	Key Words	**Requirement Category**
	Impact Studies only	**Noise Impact Assessment (NIA-Post) for Land Traffic Noise** NIA (Post) report will be required for (1) New residential and noise sensitive developments located within 70m of existing land traffic noise sources/hotspots (e.g. expressways/major arterial roads/MRT tracks) on existing residential and (2) Existing noise sensitive developments located within 70m of new transport-related developments (e.g. expressway/major arterial roads/MRT tracks/bus interchanges/ bus depots), inclusive of the expansion of existing transport-related infrastructures **When to apply:** • Applicant will need to submit NIA (Post) report to NEA directly via email to DCLD_consultation@nea.gov.sg before Completion Gateway (G3) and concluded before TOP can be granted. • Sufficient time shall be catered for NEA to process the NIA (Post) • The processing of NIA (Post) will take 1-2 months **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Noise Report for ACMV Noise report for ACMV will be required for non-industrial developments which have new air-conditioning and mechanical ventilation works, including relocations. **When to apply:** • Applicant will need to submit ACMV noise report directly to NEA before Completion Gateway (G3) and concluded before TOP could be granted. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Pollution Control Equipment (PCE) PCE submission will be required for developments involving proposed PCE/fuel burning equipment (e.g. Boiler, Thermal Oxidiser, Scrubber, Dust Collector, Spray Paint Booth, etc.) **When to apply:** • Applicant will need to submit technical details of the PCE and/or Fuel Burning Equipment to NEA directly before Completion Gateway (G3) and concluded before TOP could be granted. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

National Environment Agency (NEA)

Legend: Architecture C&S M&E IFC COMPONENT

G3	Completion Gateway	
	Key Words	**Requirement Category**
	Photo, video or reports of completed works	• QP (Arch/PEs) applies for TOP/CSC and provide photo / video evidence or reports of completed works

End of Requirements for NEA

National Parks Board (NParks)

Legend: Architecture | C&S | M&E | IFC COMPONENT

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Greenery	**Greenery Provision and Conservation of Trees** • Pre-Submission consultation of requirements for greenery provision and tree conservation for developments
	Impact Studies only	**Biodiversity Impact Assessment (under URA's Environmental Impact Assessment [EIA] framework)** • Applicable to sites that fall within the EIA framework but were not identified at Planning Stage (Pre-DG) Environmental Consultation o QP (Arch / PEs) or Consultant to submit the environmental consultation form (Form A) to URA and relevant Technical Agencies (i.e. NEA, NParks, MPA, SFA). o Details of project entities (Developer, Qualified Person and Main Contractor) as stated in Form A are provided Environmental Impact Assessment o If determined during environmental consultation that an environmental study is needed, QP (Arch / PEs) or Consultant can consult on environmental baseline study and scoping of EIA o QP (Arch / PEs) or Consultant to ensure that EIA report (for projects that have cleared environmental assessment at planning stage) are submitted for acceptance • If pre-submission is not possible, the environmental consultation process should be concluded by Piling Gateway (G1.5) or Construction Gateway (G2) • There might be requirement for detailed EMMP / wildlife management prior to site clearance
		Assessment and Reduction of Biodiversity Impact (under URA's Environmental Impact Assessment [EIA] framework) • Should be surfaced ahead of the submission • If pre-submission is not possible, the environmental consultation process should be concluded by Design Gateway (G1) or Piling Gateway (G1.5) • There might be requirement for EMMP / wildlife management prior to site clearance

G1	Design Gateway	
	Key Words	**Requirement Category**
	External works	For NParks' External Works requirements, please refer to Page 190 - 192.
	Greenery LANDSCAPE PLANTS	**Conservation of Trees** • To conserve trees identified: o In Technical Conditions of Tender (TCOT) o As Heritage Trees o Through nature group / public / residents engagement o In Environmental Impact Assessments (EIA) / Environmental Management and Monitoring Plans (EMMP) etc. **Supporting Document(s):** a) Arborist report (Please refer to NParks' Guidelines [Chapter 2])

➢ For NParks' External Works requirements, please refer to Page 190 - 192.

National Parks Board (NParks)

Legend: Architecture C&S M&E IFC COMPONENT

G1	Design Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Impact Studies only	**Biodiversity Impact Assessment (under URA's Environmental Impact Assessment [EIA] framework)** • Applicable to sites that fall within the EIA Framework but were not identified at Planning Stage (Pre-DG) Environmental Consultation o QP (Arch / PEs) or Consultant to submit the environmental consultation form (Form A) to URA and Technical Agencies (e.g. NEA, NParks, MPA, SFA) o Details of project entities (Developer, Qualified Person and Main Contractor) as stated in Form A are provided Environmental Impact Assessment (EIA) o If determined during environmental consultation that an environmental study is needed, QP (Arch / PEs) or Consultant can consult on environmental baseline study and scoping of EIA o QP (Arch / PEs) or Consultant to ensure that EIA report (for projects that have cleared environmental assessment at planning stage) are submitted for acceptance
	Site Layout only SITE BOUNDARY PLANTING AREA GREEN VERGE	**Provision of Planting Areas** • To provide development boundary lines • To provide existing and proposed road reserve lines • To provide road name(s) and category of existing and proposed roads • To provide planting areas (i.e. 3.0m/5.0m-wide green buffers, 2.0m-wide peripheral planting verges, open-air parking planting areas) in compliance with NParks' Guidelines (Chapter 3) • To ensure planting areas are free from any encroachment, except for allowable minor ancillary structures and landscaping structures as listed in NParks' Guidelines (Chapter 3). To show the allowable structures within planting areas • To locate fire engine accessways and non-allowable structures outside planting areas • To recess underground structures / services at least 2.0m below planting areas, except for: o Footings of retaining / boundary walls (may encroach up to 0.5m into planting areas) o Services traversing perpendicularly across planting areas • The above information should be provided in 3D format. However, applicants may provide the same information in 2D format with other supporting documents.
		New Parks/ Park Connectors/ Promenades • To ensure design is in accordance with NParks specifications (e.g., spatial provision, access points, specific features / elements imposed at planning stage based on NParks planning conditions) • The above information should be provided in 3D format. However, applicants may provide the same information in 2D format with other supporting documents.
		Securing of Land for Parks / Park Connectors use and/or Impact on Neighbouring Parks (e.g., en bloc sites) • To ensure site boundary does not encroach into safeguarded / rezoned parks and park connectors • The above information should be provided in 3D format. However, applicants may provide the same information in 2D format with other supporting documents.

For NParks' External Works requirements, please refer to Page 190 - 192.

National Parks Board (NParks)

Legend: Architecture C&S M&E IFC COMPONENT

G1	Design Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**

	Site Layout only *(continued from previous page)*	**Green Verges**
		• To provide green verges (consisting of tree planting and service verges) for street work proposals relating to development works and for new road services according to the road category
		• To locate fire engine accessways outside green verges
		• Road and Commuter Infrastructure
		  • To comply with greenery provision for covered linkways, bus shelters, pedestrian overhead bridges, depressed road portals, road viaducts/flyovers and retaining walls etc. according to NParks' Guidelines (Chapter 4)
		• Entrance Culvert Position (at Vehicular Access Points)
		  • To ensure splay corners do not affect green verge provision and roadside trees

G1.5	Piling Gateway (Optional)	
	Key Words	**Requirement Category**
	Impact Studies only	**Applicable to sites requiring Environmental Monitoring and Management Plan (EMMP) / Wildlife Management Plan prior to commencement of works:** a) Detailed EMMP report (provided by Main Contractor) b) Acceptance letter from NParks prior to site clearance (if applicable)

G2	Construction Gateway	
	Key Words	**Requirement Category**
	External works	For NParks' External Works requirements, please refer to Page 190 - 192.

	Greenery
	LANDSCAPE PLANTS
		Conservation of Trees
		• To conserve trees identified:
		  ○ In Technical Conditions of Tender (TCOT)
		  ○ As Heritage Trees
		  ○ Through public engagement
		  ○ In Environmental Impact Assessments (EIA) / Environmental Management and Monitoring Plans (EMMP) etc.
		Supporting Document(s):
		a) Arborist report (Please refer to NParks' Guidelines [Chapter 2])

	Impact Studies only	*Applicable to sites not requiring Piling Gateway (G1.5) approval* **Applicable to sites requiring Environmental Monitoring and Management Plan (EMMP) / Wildlife Management Plan prior to commencement of works:** a) Detailed EMMP report (provided by Main Contractor) b) Acceptance letter from NParks prior to site clearance (if applicable)

National Parks Board (NParks)

Legend: Architecture C&S M&E IFC COMPONENT

G2	Construction Gateway	
	Key Words	**Requirement Category**
	Site Layout only PLANTING AREA GREEN VERGE	**Provision of Planting Areas / Green Verges** • To ensure dimensions of planting areas are compliant with NParks Guidelines (Chapter 3) or as approved by NParks during Design Gateway (G1)

-	Independent Submissions	
	Key Words	**Requirement Category**
	Greenery	**Planting Scheme (within Development Boundary)** • To show location, number and species of existing and proposed trees / shrubs for planting areas

G3	Completion Gateway	
	Key Words	**Requirement Category**
	TOP/CSC	• As-built plan • Photo evidence to demonstrate compliance with NParks' requirements/approved submission(s) at preceding Gateway(s) • Site inspections (if applicable) – may involve soil check to ensure quality of planting mixture conforms to NParks' specifications for Approved Soil Mixture (ASM)

End of Requirements for NParks

Click below for NParks RABW Requirements for :
External Works

Public Utilities Board (PUB)

Legend: Architecture C&S M&E

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Platform Levels	**Minimum Platform Level** • Levels of development, adjacent road / ground in Singapore Heigh Datum (SHD)
	Drains (Internal / External) CULVERT DRAINS	**Roadside Drain Capacity** • For projects where drains need to be rebuilt / entrance culvert. PUB to provide required size during pre-sub consultation • Size of new culvert (will be advised by PUB) • Public Drains - Drain Size and Location **Pre-Consultation for Drainage** • Drainage Discharge Point • Catchment Area
	Sewerage System (Internal / External)	**Pre-Consultation for Sewers** • Sewerage Discharge Point/location of sewer connection • Used Water Design Flow
	Sanitary (Internal)	**Pre-consultation for Sanitary** • Used water discharge volume • Sewerage Discharge Point

G1	Design Gateway	
	Key Words	**Requirement Category**
	ABC Waters	**ABC Waters Design Features** To show conceptual plan (2D) endorsed by ABCWP (landscape Architect) or ABCWP (Architect) which includes: • Overall catchment plan (e.g., sub- catchment area, treatment area for proposed ABC Waters design features, land status and demarcation of site boundary, green buffer DR, RR etc.) • Overall layout plan (e.g., location of proposed ABC Waters features (indicative location of overflow sump within the feature), how it links with the proposed and existing drainage infra i.e., location of inlet and discharge point) • Detention volume to be provided by proposed ABC Waters design features to satisfy requirements as stipulated in 7.1.5 of the Code of Practice on Surface Water Drainage (if any)*
	Detention System SPACE	**Peak Run Off** • Key Objective: To demonstrate how this is catered for, area is set aside for detention tank provision, location, OR drain widening • Calculation of peak run off factor (C value) max. 0.55 (based on code and chart) e.g. area of development of greenfield site
	External works	For PUB's External Works requirements, please refer to Page 193 - 196.

For PUB's External Works requirements, please refer to Page 193 - 196.

Public Utilities Board (PUB)

Legend: Architecture C&S M&E

G1	Design Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Infra & Utilities (Internal) SPACE	**Drainage Network** • To show conceptual plan – location, proposed discharged point, connection to existing drainage network **Basement pumped drainage system (stormwater tank)** • Location, volume **Critical Infrastructure/Key Installation** • To show location of Distribution Sub-Station
	Platform & Crest Level, Earthworks / Topography SPACE	**Minimum Platform Level and Crest Level** • Levels of development, adjacent road / ground in Singapore Heigh Datum (SHD) • Adjacent Road Levels
		Earthworks • Minimum Platform Level / Changes to Topography
		Flood Protection Measures • If crest level is not provided – location and height of protection measure
	Drains (Internal / External) SYSTEM Civil Element	**Common Drain** (Drains receiving upstream run off / existing [note: more common for landed housing area]) • Location, width **Internal Drain** • Location, width • Discharge point **External Drainage Works e.g. Entrance Culvert / Roadside Drains (If Applicable)** • Location, Width, Length • To also indicate any structure / works above drain e.g. linkway
	Sewerage System (Internal / External) SYSTEM DISTRIBUTION CHAMBER	**Sewer Connection** • Connection Point – where the proposed location is
		Sewerage System • Alignment , Dimensions, Gradient, Material, Calculation of new public Sewers • Alignment, Size, Material, Setback, Invert Level, Top Level of existing public Sewers. • Location, Top Level, Invert Level , Manhole ID of connecting Manhole • Location of Hydraulic/Vortex Drop

For PUB's External Works requirements, please refer to Page 193 - 196.

Public Utilities Board (PUB)

Legend: Architecture C&S M&E

G1	Design Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Sanitary (Internal) DISTRIBUTION CHAMBER SANITARY APPLIANCES SYSTEM	**Location(s) of Drain-line and Inspection Chamber** • Location, Top Level and Invert Level of last Inspection Chamber. • Location and Top level of remaining Inspection Chambers. • Alignment of drain-lines • Details of sewer connection (e.g., length, pipe size, material, top level, invert level, gradient). **Used Water Flow Rate** • Key Objective: To check that sewer can contain this flow • Quantity & flow rate expected to be discharged from development, where it is to be discharged (based on no. of toilets, shower head, etc. - in relation to no. of DUs). This should include any pump flow rate that is contributing to overall used water flow rate. **Used Water Pumping System** • Indicative location
	Site Layout, Drainage Reserve	**Drainage Reserve** • Location (align to DIP), width Note: Coordinated by the Architect, with inputs from C&S

G1.5	Piling Gateway (Optional)	
	Key Words	**Requirement Category**
	External works	For PUB's External Works requirements, please refer to Page 193 - 196.

G2	Construction Gateway	
	Key Words	**Requirement Category**
	ABC Waters	**ABC Waters Design Features** • Hydraulic calculations for the ABC Waters design features, endorsed by an ABC Waters Professional who is a PE (Civil). The calculation shall be -accompanied by completed relevant design templates in Excel format, available on the PUB website. • Design drawings and maintenance checklists endorsed by an ABC Waters Professional of any profession. For systems that include ABC Waters design features for peak runoff management, the detailed design, including detention volume to be provided, as endorsed by the ABC Waters Professional (who is also a PE(Civil)) shall be submitted
	Earthworks	• Slope calculation report

For PUB's External Works requirements, please refer to Page 193 - 196.

Public Utilities Board (PUB)

Legend: Architecture C&S M&E

G2 Construction Gateway		
	Key Words	**Requirement Category**
	External works	For PUB's External Works requirements, please refer to Page 193 - 196.
	Infra & Utilities (Internal) DISTRIBUTION CHAMBER WASTE TERMINAL INTERCEPTOR VALVE SYSTEM PUMP TANK (STORAGE) SPACE DRAINS	**Sanitary Network** • Drain-lines, Inspection Chamber, Used Water Pump System, Discharge Lines, etc. • Sanitary Stack System
		• Retention Tank
		• RC Trench
		Sewer Network • Minor Sewer (when applicable)
		Drainage Network **Detention Tank/Basement Pumped System** • May model a box as a placement holder. Details is to be drawn by Specialised PE • C&S: Effective tank capacity and other hydraulic details associated with the tank • M&E: For pumped detention tank, M&E to provide pump details **Internal Drains** • Location, width, Gradient • Discharge point • Top level, invert level Supplementary Documents (can be supplemented via 2D documents) **Basement Pumped Drainage System/ Detention Tank** • Plans and sections showing details of tanks and pumps, e.g., effective water depth, invert of incoming and outgoing pipes, connection to internal drains, location and invert level of swan neck, orifice size. • Standard Operating Procedure details, which includes Operation Sequence, Monitoring measures, Maintenance plan • Design Calculation **Flood Barrier/Flood Gates** • Plans and sections showing location, size, type and top level of flood barrier, platform levels (including crest level) of the development, top level of the development boundary wall • Standard Operating Procedure details, which includes Operation Sequence, Monitoring measures, Maintenance plan **Internal Drains** • Hydraulic Calculation
		Proposed Treatment of Common Drain • Longitudinal / sectional profile • Side gates

For PUB's External Works requirements, please refer to Page 193 - 196.

Public Utilities Board (PUB)

Legend: Architecture C&S M&E

-	Independent Submissions	
	Key Words	**Requirement Category**
	Drains (Internal / External)	• Earth Control Measures (ECM) Plan • Details of temporary works affecting drainage / within drainage reserve
	External works	For PUB's External Works requirements, please refer to Page 193 - 196.
	Sewerage System (Internal / External)	• Details and scope of works on manholes and sewers • Specified activities within sewer corridor
	Water Supply	• Site plans, water reticulation schematic / layout drawing of WSI design works and water requirements • Specified activities within water pipe corridor

End of Requirements for PUB

Click below for PUB's RABW Requirements for :
External Works

Singapore Civil Defence Force (SCDF)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G1 Design Gateway		
	Key Words	**Requirement Category**
	Fire Engine Accessway / Access Road ROAD SITE BOUNDARY SPACE WINDOW	**Fire Engine Accessways / Access Road** • To design upfront and not added as an afterthought • Compliance of provision of fire engine accessway / access road does not affect the requisite planting areas and roadside green verges • Indication of all the fire engine access road and accessway within project boundary • Clearly indicate if public road is used as fire engine accessway / access road • Compliance of width of fire engine accessway • Compliance of distance between fire engine accessway and fire access opening • Compliance of no obstruction between fire engine accessway and fire access opening

Note: QP has to ensure the above requirements for fire engine access shall not have any conflict with NPark requirements. Detailed checks of fire engine access requirements will be done at Construction Gateway

G2 Construction Gateway		
	Key Words	**Requirement Category**
	General	QP to indicate clearly the following in the model: - The usage in accordance with SpaceName in IfcSpaceValues. Xlsx (column M) worksheet. The SpaceName shall be tagged to the correct OccupancyType. QP should choose the specified OccupancyType if available. If a specified OccupancyType is not available, modeler can then choose OccupancyType = "Any" and choose any OccupancyType from the table. • Egress Indicator Box (EIB) which indicate the width of exit/ exit access doors shall be tagged to all exit & exit access doors that are serving as means of escape. EIB shall be indicated at the correct side of exit & exit access door and shall exclude door leaf that is bolted. - The storey name of each storey, including basement (in accordance with Fire Code definition of a basement). • The property name "DischargePoint" has to tag to IfcDoor/IfcOpeningElement/IfcBuildingElementProxy.USERDEFINED.EXITPOINT when they are designated as discharge point at discharge level - FireExit for door/opening that opens directly into exit staircase/exit passageaway and door/opening that opens directly to external at discharge level. - The fire rating/non-combustible property of material. - The % of porosity of awning, trellis, screen, roof, etc QP to submit the following when submitting the model: - Calculation to show the compliance of occupant load and exit capacity for every storey/level for PG 2 to 8 projects. i.e. SCDF BP02 excel • Elevation plans to indicate the unprotected openings for calculation of setback distance. I.e. SCDF BP02 excel - Calculation to show the compliance of perimeter required for fire engine accessway on 2-D plan - 2-D plans to show the design tonnage and material of fire engine accessway - 2-D plans to show clearly the designs of ventilation openings and the calculated % of ventilation (e.g. staircase ventilation, smoke free lobby ventilation, cross-ventilation corridor 50% ventilation). QP shall submit 2D plan if the requirements cannot be shown in the 3D model.
	Emergency Voice Communication System SPACE	**Emergency Voice Communication System and Fire Command Centre** • Declaration of one-way / two-way emergency voice communication system for the functional space

Singapore Civil Defence Force (SCDF)

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G2	Construction Gateway	
	Key Words	**Requirement Category**
	Exit STAIRCASE SPACE	**Means of Escape** • Compliance of adequate means of escape: o Adequate provision of exit staircase, exit door & exit access door o Capacity of exits and occupant load calculation o Requirements of Internal & external exit staircase o Remoteness of exit o Travel distance o Smoke-free approach to exit staircase o Discharge of exit staircase o Ventilation of exits o Staircase re-entry • Compliance of special requirements for Person With Disabilities (PWDs): o Provision of PWD holding point unless otherwise exempted o Siting of PWD holding point o Protection of PWD holding point
	Exit sign and Emergency Lighting SECURITY LIGHTING SIGNAGE	**Exit Sign (incl. low level signs), Emergency Lighting, Photoluminescent Lighting** Types of buildings / areas, and locations which require exit sign, photoluminescent lighting & emergency lighting
	Fire Alarm System FIRE ALARM BREECHING INLET LANDING VALVE SYSTEM SPACE	**Automatic Fire Alarm (Heat / Smoke Detector)** • Types of buildings / usage which require provision of automatic fire alarm • Types of buildings/ usage exempt from provision of automatic fire alarm • QP to declare automatic fire alarm system is provided for the functional space Components to be indicated: o Fire Alarm Panel
		Combined Sprinkler and Wet Riser System • Types of buildings / areas which are allowed combined sprinkler and wet riser system • QP to declare combined sprinkler and wet riser system is provided for the functional space Components to be modelled: o Location of Sprinkler Control Valve o Breeching Inlet (2-way or 4-way) o Landing Valve o Fire alarm panel
		Home Fire Alarm Device (HFAD) • Types of buildings which require HFAD • QP to declare Home Fire Alarm Device is provided for the functional space • Compliance of location and number of HFAD points

Singapore Civil Defence Force (SCDF)

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G2 Construction Gateway		
	Key Words	**Requirement Category**
	Fire Alarm System *(continued from previous page)*	**Manual Alarm System** • Types of building / usage require manual call points • QP to declare manual alarm system is provided for the functional space Components to be modelled: ○ Manual alarm call points ○ Fire alarm sounder ○ Visual alarm device ○ Fire alarm panel
		Sprinkler System • Types of buildings / usage require sprinkler system • Types of buildings / usage exempt from provision of sprinkler system • Provision of sprinklers for basement and aboveground buildings • QP to declare sprinkler system is provided for the functional space Components to be modelled: ○ Location of sprinkler control valve ○ Breeching inlet (2-way or 4-way) ○ Fire alarm panel
		Video Image Fire Detection System (VIFDS) • Types of buildings require VIFDS • QP to declare video image fire detection system is provided for the functional space **Automatic fire extinguishing system** • Rooms which allowed the use of automatic fire extinguishing system to replace automatic sprinkler • QP to declare automatic fire extinguishing system is provided for the functional space
		Water Mist System • Compliance of requirements for water mist system as a substitute of sprinkler system • QP to declare water mist system is provided for the functional space
	Fire Lift	**Fire Lift** • Compliance of buildings (other than PG 1 & 2) provided with at least two fire lifts on every storey when habitable height exceeds 24m • Basement exceeding 9m shall be provided with at least 2 fire lifts (other than PG 1) • Compliance of one fire lift for PG 2 buildings exceeding 24m. • Compliance of two fire lifts for PG 2 super hig-rise building exceeding 40 storeys. ○ Compliance of fire resistance rating for lift shaft ○ Fire lift to serve continuous throughout the building, including basements ○ Distance between fire lift landing door and exit staircase not exceeding 5m & 10m (applicable to PG 2 discharge floor only) ○ Fire lift to be accessible to any part of the storey ○ 60m coverage for fire lift (except PG 1 & 2)

Singapore Civil Defence Force (SCDF)

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G2	Construction Gateway	
	Key Words	**Requirement Category**
	Firefighting System LIFT FIRE HYDRANT HOSEREEL BREECHING INLET LANDING VALVE FIRE EXTINGUISHER SYSTEM SPACE	**Evacuation Lift** • Evacuation lift for evacuation of occupants to be modelled for building with habitable height exceeding 24m (except PG I & II): o Can double-up as PWD evacuation lift o One of fire lifts can be used as evacuation lift o Provision of means of communications & CCTVs o Provision of evacuation switch • Evacuation lift for evacuation of PWD to be modelled for buildings more than 4 storey: o At least one evacuation lift required, passenger lift can be used as evacuation lift o Provision of protected lobby
		Fire Lift Compliance of buildings (other than PG I & II) provided with at least two fire lifts on every storey o When habitable height exceeds 24m o When depth of basement exceeds 9m • Compliance of two fire lifts for super high-rise (above 40 storeys) residential building • Compliance of fire resistance rating of lift shaft • Fire lift to serve continuously throughout the building, including basements • Distance between fire lift landing door and exit staircase shall not exceeding 5m & 10m (10m is applicable to PG 2 discharge floor only) • Fire lift to be accessible to every part of the storey • Compliance of 60m coverage for fire lift (except PG I & II)
		Fire Hydrant • Indication of private and public hydrant serving the project • Hydrant coverage not more than 50m from the fire engine accessway / access road Components to be modelled o Full design of private/public hydrant, excluding underground piping.
		Hose Reel • Compliance of provision of hose reel • Number of hose reel • Coverage of hose reel (30m+6m) • Types of buildings / areas require provision of hose reel • Types of buildings / areas exempt from provision of hose reel • Siting of hose reel Components to be modelled • Hose reel cabinet/enclosure. • Hose reel drum with hose can be represented by object • Need not model the piping for hose reel  Private hydrant  Public hydrant
		Portable Fire Extinguisher • Types of buildings / areas require portable extinguisher • Types of buildings / areas exempt from provision of portable extinguisher • Siting of portable extinguisher

Singapore Civil Defence Force (SCDF)

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G2 Construction Gateway		
	Key Words	**Requirement Category**
	Firefighting System *(continued from previous page)*	**Rising Mains and System** • Type of rising main provided (Dry or Wet) • Number of rising main • Siting and coverage of landing valve Components to be modelled for Dry and Wet Riser: ○ Breeching inlet (to show 2-way or 4-way) ○ Landing valve ○ Wet riser tank (for wet riser only) ○ Wet riser pump (for wet riser only) Provision of Standby Fire Hose: ○ Types of buildings requiring standby fire hose ○ Number of standby hose ○ Located not more than 2m from landing valve Standby hose need not be modelled in full, the cabinet/enclosure for standby hose if provided shall be modelled in full. Provision of Breeching Inlet: ○ Location ○ Number
	Performance-Based project	**For projects with Performance-Based approach** QP to submit 2-D plans clearly indicating the rooms/spaces to be approved in Performance-Based submission. **Performance-Based (PB) Plan Approval Process** • For approval process, refer to https://www.scdf.gov.sg/home/fire-safety/plans-and-consultations/performance-based-approach-to-fire-safety-design/performance-based-plan-approval-process. • In general, FEDB IPA should be obtained before CG submission and FER should be submitted together with Building Plan during CG submission. This approach strives to minimise any major reworks in the later stages of development. For complex cases in which the FEDB IPA could not be obtained before CG submission, the CG submission may still proceed with the following conditions: • While the CG submission may proceed concurrently with the FEDB review, the FEDB IPA will need to be obtained before issuance of CG clearance. • If the project team is not ready with the FER during CG submission, the QP will need to exclude the affected PB fire safety works from the application and declare that no affected PB fire safety works would be carried out until FER approval is obtained. The FER should subsequently be submitted as an amendment to CG to obtain approval for the relevant PB fire safety works.
	Site Planning & External Firefighting Provisions WINDOW ROAD SPACE SIGNAGE	**Fire Access Opening** • Compliance of provision of fire access opening • Location, signage & size • Number and position of access opening • Exemption of fire access opening

Singapore Civil Defence Force (SCDF)

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G2	Construction Gateway	
	Key Words	**Requirement Category**

	Site Planning & External Firefighting Provisions
	
	(continued from previous page)
	
	WINDOW
	ROAD
	SPACE
	SIGNAGE
		Fire Command Centre (FCC)
		• FCC shall be provided if building requires:
		  ○ Fire lift
		  ○ Emergency voice communication system
		  ○ Engineered smoke control system
		• Size and Location of FCC
		• Ventilation system for FCC
		• Supporting equipment allow in FCC
		
		Fire Engine Accessway / Access Road
		• Compliance of fire engine access road requirements of PG I to VIII and mixed-use buildings:
		  ○ Indicate road serving as fire engine access road within the project boundary. To indicate on plan if public road is used as fire engine access road.
		  ○ Compliance of width, turning radii/ facilities, design load capacity, gradient, overhead clearance.
		  ○ Marking and signpost along fire engine access road.
		  ○ Compliance of no obstruction along fire engine access road
		  ○ Basement: Compliance of fire engine access road within a travel distance of 18m to the entrance of all exit staircases where landing valves (dry or wet riser) are provided.
		• Compliance of fire engine accessway requirements for PG II to VIII and mixed-use buildings:
		  ○ Indicate road serving as fire engine accessway within the project boundary. To indicate on plan if public road is used as fire engine accessway.
		  ○ Compliance of width and length of fire engine accessway. To submit separate calculations for the required length of fire engine accessway
		  ○ Compliance of turning radii/ facilities, design load capacity, gradient, overhead clearance
		  ○ Marking and signpost along fire engine accessway
		  ○ Compliance of no obstruction along and above fire engine accessway
		  ○ Basement: Compliance of fire engine accessway within a travel distance of 18m to the entrance of all exit staircases where landing valves (dry or wet riser) are provided.

	Structural Fire Precautions
	
	DOOR
	SLAB
	WALL
	LIFT
	STAIRCASE
	SPACE
	DAMPER
		Compartmentation
		• Compliance of compartmentation requirements:
		  ○ Area and cubical extent to comply with Table 3.2A (for buildings not protected with sprinkler system)
		  ○ Maximum of 3 storeys per compartment when habitable height is not exceeding 24m
		  ○ Maximum of 1 storey per compartment when habitable height exceeds 24m
		• Compliance of compartmentation requirements for Atrium space
		• Compliance of compartmentation requirements for High hazard occupancy
		
		• Compliance of compartmentation requirements for basement
		• Exemption of size limitation of compartment for car park
		• Exemption of size limitation for buildings protected with sprinkler system
		• Compliance of area / room / usage requires compartmentation
		
		Compartmentation Walls and Compartmentation Floors
		• Compliance of requirements for compartment walls or compartment floors:
		  ○ Fire resistance rating
		  ○ Non-combustible
		• Use of fire shutter as compartment wall
		• Room / space allows the use of fire rated roller shutter

Singapore Civil Defence Force (SCDF)

Legend: Architecture C&S M&E IFC COMPONENT

G2 Construction Gateway		
	Key Words	**Requirement Category**

	Structural Fire Precautions
	
	(continued from previous page)
	
	DOOR
	SLAB
	WALL
	LIFT
	STAIRCASE
	SPACE
	DAMPER
		External Wall
		• Compliance of requirements for external walls
		  ○ Fire resistance rating
		  ○ Non-combustible
		• Compliance of setback distance for unprotected opening
		• Compliance of external wall finishes
		• Compliance of vertical fire spread requirements
		• Exemption of fire resistance rating for non-load-bearing external wall
		
		Element of Structure
		• Compliance of element of structure requirements
		• Minimum periods of fire resistance in accordance with Table 3.3A
		• Exemption of fire resistance rating for single storey buildings
		• Compliance of requirements for the use of fire-rated board for protection to structural steel beams, columns
		
		Protected Shafts
		• Compliance of services running inside and/or passing through fire lift lobby and smoke-free lobby
		• Compliance of gas pipe running inside an internal corridor / lobby
		• Prohibition of other services passing through FCC, fire pump room, emergency generator room & smoke control fan room.
		
		• Compliance of requirements for protected shaft:
		  ○ Fire resistance rating
		  ○ Non-combustible
		  ○ Material of construction
		  ○ Opening in protected shaft
		  ○ Ventilation
		  ○ Fire resistance rating of doors in protected shaft
		• Compliance of protected shaft containing exit staircase:
		  ○ Compartmentation of exit staircase with masonry or drywall construction
		  ○ Fire resistance of door opening into exit staircase
		  ○ Finishes within exit staircase shall be non-combustible
		  ○ Types of services allowed in exit staircase
		• Compliance of requirements for lift shaft:
		  ○ Material of construction
		  ○ Exemption of enclosure in protected shaft located at edge of atrium
		  ○ Provision of protected lobby when lift is at basement
		  ○ Compliance of requirements for private lift for exclusive use of occupants in residential under PG II
		• Compliance of protected shaft containing other services installations:
		  ○ Electrical conduits / cable tray
		
		Separating Walls
		• Exemption of separating wall requirements for PG I & II buildings
		• Compliance of Openings in separating wall requirements
		• Compliance of requirements for separating walls
		  ○ Fire resistance rating
		  ○ Non-combustible

Singapore Civil Defence Force (SCDF)

Legend: Architecture C&S M&E IFC COMPONENT

G2	Construction Gateway	
	Key Words	**Requirement Category**
	Structural Fire Precautions *(continued from previous page)*	**Use of other fire rated material** • Compliance of requirements on use of Fire rated board • Compliance of requirement on use of intumescent paint • Compliance of requirement on use of flame retardant chemicals
	Declarations	**Fire alarm & protection system declaration** QP to declare at those functional space which are provided with the following fire alarm & protection System(s): • Manual alarm system • Automatic alarm system (heat or smoke)@ • Sprinkler system@ • Water mist system@ • Foam-water sprinkler@ • Home Fire Alarm Device *@: Details to be provided and submitted by M&E QP in Fire Protection (FP) Plan under Independent Submissions*
		Mechanical Ventilation System declaration QP to declare at those functional space which are provided with the following Ventilation System(s): • Natural ventilation (NV) • Mechanical ventilation (MV)* • Pressurisation* • Cross-ventilation • Cross-ventilation with intermediate - ventilation opening • Vapour extraction system (spray painting booth) **: Details to be provided and submitted by M&E QP in Mechanical Ventilation (MV) plan under independent submissions.*
		Smoke Control System declaration QP to declare at those functional space which are provided with the following smoke control System(s): • Ductless Jet Fan System ^ • Engineered Smoke Control System^ • Smoke Purging System^ • Smoke vent *^: Details to be provided and submitted by M&E QP in Mechanical Ventilation (MV) Plan under Independent Submissions.*
	Others	• QP shall refer to Chapter 9 for additional fire safety requirements for specific purpose groups and Chapter 10 for fire safety requirements for special installations.

Singapore Civil Defence Force (SCDF)

-	Independent Submissions	
	Key Words	**Requirement Category**

	Mechanical Ventilation & Smoke Control System	**Air-Conditioning, Mechanical Ventilation and Fire Protection Plan (MV & FP)**
		• Detailed layout and floor plan showing Fire Protection and Mechanical Ventilation system of development
		• Key features of the building in which the system is to be installed
		• Schematic diagram of the overall system showing clearly the key features and their functions, relative locations in the building, lots, sizes, capacities and other essential information incl. the air distribution design arrangement in the case of air-conditioning and mechanical ventilation systems
		• Layout of the system on every floor plan showing clearly the various parts and their functions, locations, arrangements, sizes, capacities and other essential information
		• Necessary cross-sectional views as superimposed on the building or part thereof to fully describe the details and configurations of the system
		• A colour scheme to clearly distinguish the various distinct parts of the system and the different systems from one another
		• Volumetric rate of flow of air at each point of inlet and outlet of each system including those serving protected staircases, exit passageways, lobbies, areas of refuge, the Fire Command Centre, fire pump rooms, generator rooms, rooms used for the storage of flammable liquids or gas or other areas of special risk;
		• Location of:
		  ○ Fire compartment walls, floors, air shafts, fire dampers, smoke detectors and other fire precautionary features
		  ○ Automatic Fire Alarm System
		  ○ Automatic Fire Extinguishing System
		  ○ Emergency Voice Communication System
		  ○ Smoke Control System
		  ○ Calculations and reports (where applicable)

G3	Completion Gateway	
	Item for TOP / CSC	**Requirement Category**
	-	**QP(s) shall certify that the fire safety works have been completed in accordance with the Code of Practice for Fire Precautions in Buildings, Fire Safety Act and its Regulations and relevant Codes of Practice and submit the following documents.** • Certification of Fire Safety Works • RI Engagement Form • Registered Inspector's Inspection Certificate (RI Form 1 or 2) • RI Inspection Report • RI Cessation form, where applicable • Declaration of Regulated Fire Safety Products, where applicable • CoC for Regulated Fire Safety Products, where applicable • Delivery Orders for Regulated Fire Safety Products, where applicable • FSC02 - Certification for Regulated Fire Safety Products, where applicable • FSC03 - Certification for Lift Installation & Operation, where applicable • FSC04 - Certification for Fire Engine Access Road And Accessway, where applicable

End of Requirements for SCDF

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E IFC COMPONENT

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Conservation	Refer to URA Conservation Requirements here
	Impact Studies only	**Environmental Impact Assessment (where required)** • If development projects are near to sensitive areas (such as Nature Reserves, Nature Areas, marine and coastal areas, other areas of significant biodiversity) or might have potential trans-boundary impacts, relevant technical agencies (such as the National Parks Board, National Environment Agency, Maritime and Port Authority of Singapore, and Singapore Food Agency) will need to be consulted more extensively to determine if a more thorough environmental study is required. • For affected proposals, URA will provide project teams with further instructions on how to proceed with such consultations
	Site Layout only	**Outline Application / Rezoning** Where there are deviations to Master Plan parameters (e.g. land use, GPR, height, etc), the project team should submit an outline application prior to making the Design Gateway submission, with the following details/information: • Planning proposal data (e.g. site area, GFA and use breakdown, numbers of units/rooms, etc.) • Site layout plan and form/massing schemes, where necessary • Any other studies or reports to illustrate the feasibility of the proposal, where necessary
		Pre-Application Consultation Service • Details of proposals to clarify or seek deviation from specific guidelines [Note: This is a chargeable service which will allow QPs to discuss proposals that may depart from the usual guidelines and address certain planning issues upfront. To access this service, please make an application through URA's website - https://eservice.ura.gov.sg/pacsWeb/]
	Public Communications Plan (PCP)	Please note that the PCP process will differ for submissions made through CORENET X **Non-Government Land Sale (GLS) Sites** • If a Public Communications Plan is required, it will be made known at Design Gateway submission, where URA will provide guidance on the follow up distribution of flyers to the local community and submission of relevant forms. **GLS Sites** • Public Communications Plan requirements, if any, will be clearly set out in the tender conditions. For projects that are submitted to CORENET X, the Developer/QPs can reach out to the relevant Sales Agent
	Others	**Built Environment Transformation Bonus GFA Incentive** • Submission of incentive scheme application and supporting documents

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E IFC COMPONENT

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**

	Others	**Pre-DG Submission: Stage 1 Design Advisory Panel – for selected projects**
		• The DAP materials submitted are to consist of:
		  • Technical drawings (including a full set of plans, elevations and sections)
		  • Digital and hardcopy DAP booklets (including 2 hardcopies in A3), which should not exceed 50 pages, including appendices, attached drawings and plans, with a minimum font size of 12.
		  • Presentation slides. The number of presentation slides should be comfortable for a 20-minute presentation without lengthy text, highlighting the key points with further elaboration provided in the DAP booklet.
		  • Digital models
		  • Where necessary, a physical model of the proposed development will be required, at scale of 1:400 or smaller (to be advised by the officer in charge), showing context of site] will have to be submitted.
		  • Additional reports, such as Conservation Reports, are to be included as Appendices to the A3 booklets.
		• The following aspects of the proposal will be assessed at this stage of the DAP:
		  • Stage 1 (Pre-DG DAP)
		  o Design Philosophy / Concept
		  o Form and Massing
		  o General architectural treatment (roofscape, façade in relation to context)
		  o Pedestrian Network and Vehicular Access
		  o Public Spaces and Landscape Replacement Areas / landscaping concepts

G1	Design Gateway	
	Key Words	**Requirement Category**
	Access to Site ROAD SLAB	**Site Layout** • Indicative locations of Pedestrian, Cycling, Vehicular and Service Access
	Building Massing BUILDING STOREY SPACE	**Building Form and Massing** • Development Statement of Intent (DSI) – Response to site context • Façade articulation and urban veranda (Orchard Road only)

		Building Height
		• Floor-to-Floor Height & Aggregate Building Height
		  o Number of Storeys
		  o Additional Height for Predominant Sky Terrace Storey
		• Overall Building Height Control (incl. building crown and M&E floor, if any)

		Building Edge • Alignment of building edge and percentage of building form articulation • Height of building edge • Depth of building edge

Urban Redevelopment Authority (URA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G1	Design Gateway	
	Key Words	**Requirement Category**
	Connectivity SPACE RAMP PARKING LOT SITE BOUNDARY	**Pedestrian Network** Through Block Link (TBL), Underground Pedestrian Link(UPL), Elevated Pedestrian Link (EPL), Covered Walkways (CW), Open Walkways (OW), Covered Linkways (CL), High Covered Linkways (HCL) • Layout and connections to existing / future developments • Alignment to adjacent pedestrian connections • Proposed levels and mitigation of level differences (if any) • Soffit height, overall width and clear width • Vehicular ramps to start after these Pedestrian Networks Additional requirements for the following: • (UPL, EPL) Detailed layout of vertical circulation point – location within development, and dimensions • (UPL, EPL) Knock Out Panels (KOP) details (e.g. alignment, size) where relevant
		Walking and Cycling Plan • Connectivity to transport node • Provision of measures to prevent conflict between pedestrian, cyclists and motor vehicles • Provision of bicycle parking and supporting amenities (i.e. shower facilities and lockers)
	Common Services Tunnel (CST)	**CST Integration** • Integration of CST ancillary structures such as ventilation shaft, entrance, exit & any space dedicated to CST functions – Assessment of proposed layout and alignment. • Link Chamber to CST junction box – Assessment of proposed layout of link chamber with the type of services shown. • CST manholes or installation mouths –Assessment of proposed layout and alignment
	Conservation	Refer to URA Conservation Requirements here
	Earthworks / Topography WALL EARTHWORKS	**Earthworks, Retaining Walls and Boundary Walls** • Height of retaining wall(s), extent of earth-fill and impact on surroundings where relevant
		Earthworks, Platform Level • Minimum Platform Level / Changes to site topography
	External Works SPACE	**Linkway Connection to Commuter Facilities** • Indicative alignment • Connection through existing / future development • Soffit height, overall width and clear width • Proposed levels and mitigation of level differences (if any)
		Cycling Path • Provision according to safeguarded cycling plan • Indicative location of bicycle parking and supporting amenities (i.e. shower facilities and lockers) and declared GFA
		Promenade Guidelines (UD requirements for Singapore River) • Location of walkways and landscaping

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E IFC COMPONENT

G1	**Design Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Greenery PLANTING AREA PLANTER BOX SPACE	**Landscape Provision** • Landscape Replacement Area (LRA) requirements : There is no need to provide details of LRA computation in the Design Gateway plans/models. QPs should factor in the LRA requirements as part of their design at the onset and provide the details that will be checked at Construction Gateway • Landscape Provision: Indicative Extent • Indicative location of Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions
	Infra & Utilities (Internal) only	**Urban Design Requirements** • Integration of Utilities (e.g. MRT pop-up, substation, water bulk meter) into building envelope
	Loading / Development Loading SPACE	**Loading Provisions** • Alignment and locations of loading columns • Structural system and integration with future structures (e.g. location / orientation / size of vents) • Loading calculations • (EPL) Loading provision to receive future linkways / walkways (if any) **Supporting Documents:** a) Draft Development Interface Report for future developer b) Clearance from technical agencies
	Night Lighting	**Night Lighting Report** • UD Areas with night lighting requirement • Concept and renders, Location and Extent
	ORA / ODA / Kiosks	• Location and extent, key parameters (e.g. structure, height, transparency)
	Public Space SPACE	**Privately-Owned Public Spaces (POPS)** • Indicate location, design and dimensions: o Location o Size / height o Layout / configuration o Shadow Studies o Seating provision • Activity Generating Uses: o Indicate location on plan and provide details on specific nature of use

Urban Redevelopment Authority (URA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G1	**Design Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Rapid Transit System (RTS) Station ACCESSIBLE ROUTE · SITE BOUNDARY · SPACE · SITE	**Urban Design Requirements** • Lines of Road Reserve / Site boundary of adjacent land parcels • Location of station box and its associated tunnels & structures • Land take required (footprint to be optimised to minimise the land-take) • Details of Loading Provision (e.g. Loading grid plan) • Design of pop-up & ancillary structures (within approved railway, setback, mitigation of platform levels, interfacing with neighbouring developments, CW provision) • Annotation for at-grade servicing areas (e.g. bin centre, loading / unloading bays, required to serve the retail uses within the station) • Integration approach with existing / future structures (e.g. location / orientation / size of vents) • Connectivity with other transport infra structure facilities and key pedestrian routes • Taxi stand / Vehicular drop-off • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2000 sqm), where relevant **Supporting Documents:** a) Submission of RTS Checklist b) Method of construction (cut and cover , tunnel boring) c) Copy of the relevant approvals for the proposed retail quantum Note: Coordinated by the Architect, with inputs from respective engineers
	Roofscape	• Location and extent of M&E equipment • Location and extent of Outdoor Refreshment Area (ORA)
	Service and Vehicular Access to Site ROAD · SPACE	**Vehicular Access** • Location of vehicular, pedestrian and cyclist access points, and layout of internal driveways • Integration with Building Envelope
		Service Areas • Location and integration with building envelope • Visual screening, where required
	Site Layout only SPACE · ROAD · SITE BOUNDARY · SITE	**Building Setback from Boundary** • Road Buffer • Common Boundary Setback / Party wall • Building Setback for Multi-Storey Car Parks (MSCP) • Boundary Setback for Ancillary Structures • Setback requirement for Urban Design areas
		Site Layout • Location of Buildings • Location and scale / size of Communal Facilities (e.g. bin centre, pavilions, BBQ areas)
		Site Coverage • Proposed site coverage

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E IFC COMPONENT

G1	**Design Gateway** *(continued from previous page)*	
	Key Words	**Requirement Category**
	Site Layout, Landscape Deck PLANTING AREA PLANTER BOX SPACE	**Landscape Deck** • Height of Deck in Relation to Existing Ground Levels • Location and General Layout of Deck
	Use & Intensity SPACE SITE SITE BOUNDARY	• Land Use / Building Uses - Provide breakdown by use quantum
		• Gross Plot Ratio / Gross Floor Area computation
		Bonus GFA Incentive Schemes: • Balcony / Recreational / Built Environment Transformation / Others – GFA quantum and % • Documentation to support proposed scheme (if required)
		Site Boundary • Site Area • Land to be Vested for Public Schemes (Drain, Road, Open Space, Park, Cycling Paths) • Land to be Amalgamated / Alienated
		Dwelling Units • Maximum Number • Pre-Application Feasibility Study (together with LTA)
	Vehicle Parking PARKING LOT SPACE	**Parking** • Show location within site • Declare total number and breakdown of types
	Others	**Urban Design Requirements** • Submission of DA Checklist
		Supplementary Documents • Topo Survey Plan • Previous approved plans (where requested by URA)
		Public Communications Plan (if applicable) Non-Government Land Sales (GLS) Sites • If Public Communications Plan is required, URA will inform at Design Gateway submission, for project team's follow up distribution of flyers to the local community and submission of relevant forms GLS sites • Public Communications Plan requirements, if any, will be clearly set out in the tender conditions. Flyers should have been distributed to the local community, and relevant forms already submitted.
		Development Statement of Intent • Description of proposal (for relevant development types)
		RTS Checklist • Submission of checklist for evaluation

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E IFC COMPONENT

G1	Design Gateway *(continued from previous page)*	
	Key Words	**Requirement Category**
	Others *(continued from previous page)*	**Environmental Impact Assessment (where required)** • If development projects are near to sensitive areas (such as Nature Reserves, Nature Areas, marine and coastal areas, other areas of significant biodiversity) or might have potential trans-boundary impacts, relevant technical agencies (such as the National Parks Board, National Environment Agency, Maritime and Port Authority of Singapore, and Singapore Food Agency) will need to be consulted more extensively to determine if a more thorough environmental study is required. • For affected proposals, URA will provide project teams with further instructions on how to proceed with such consultations.

G2	Construction Gateway - All Design Gateway requirements will apply, in addition to the following :-	
	Key Words	**Requirement Category**
	Access to Site ROAD SPACE	**Site Layout** • Detailed location of Pedestrian, Cycling, Vehicular and Service Access
	Access within Building only SPACE	• Corridor width
	Attic SPACE	• Design of attic • Location of attic in relation to strata unit
	Balcony SPACE	**Balconies, Private Enclosed Spaces, Private Roof Terraces and Indoor Recreation Spaces** • Balcony screening design illustrating openess and porosity for natural ventilation
		Bonus Balcony GFA • Letter of Declaration from Developer on Balcony Screen Design and Provision
	Building / Unit Layout BUILDING STOREY	**Unit / Floor Layout (All)** • Floor layout and unit size • Strata areas and boundaries / voids
		Dwelling Units (Residential) • Breakdown of units by type / size • Unit layouts with breakdown of respective internal areas including balconies and air-con ledges
	Building Facade	**Design Treatment for Building Facade** • Illustrate design using perspectives • Screening details of M&E equipment / multi-storey carpark, where required
	Common Services Tunnel	• Detailed Work sequence of CST vent shaft/entrance integration • Link chamber services connection layout and structural details including supporting structures • Ventilation shaft/entrance details including louvres/screening details and supporting structures • Waterproofing details

Urban Redevelopment Authority (URA)

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G2	Construction Gateway - All Design Gateway requirements will apply, in addition to the following :-	
	Key Words	**Requirement Category**
	Connectivity WATER METER DISTRIBUTION CHAMBER PARKING LOT SPACE FOOTPATH	**Pedestrian Network** Through Block Link (TBL), Underground Pedestrian Link(UPL), Elevated Pedestrian Link (EPL), Covered Walkways (CW), Open Walkways (OW), Covered Linkways (CL), High Covered Linkways (HCL) • Loading provision to receive future walkways / linkways (if any) • Notional scheme for future link to justify the loading (recipient)
	Connectivity *(continued from previous page)*	Additional requirements for the following: • (CW) Soffit height, overall width and clear width • (OW/CW) Paving material (where required in UD guidelines) • (OW/CW) Level of bulk water meter chamber / inspection chamber • (TBL) Location and Size of Signage • (HCL) Flashing to prevent wind driven rain
		Walking and Cycling Plan • Connectivity between buildings – show layout on plans, indicate width and levels • Segregation between vehicular and pedestrian / cyclist traffic • Provision of biking lots and end-of-trip facilities – show location and GFA exemption
	Conservation	Refer to URA Conservation Requirements here
	Earthworks / Topography WALL EARTHWORKS	**Earthworks, Retaining Walls, and Boundary Walls** • Proposed site and platform levels • Earthworks • Boundary wall • Retaining wall
	External Works FOOTPATH	• Design treatment for public street lighting, bollards, tactile tiles (UD requirement for CBD / Marina Bay)
		• Promenade Guidelines (UD requirements for Singapore River)
		• Paving Guideline for Orchard, Downtown Core and the Civic District (OW) Paving material
	Greenery PLANTER BOX SPACE PLANTING AREA LANDSCAPE PLANTS	• Landscape Replacement Area – Provide Green Plot Ratio and total % of landscape replacement, with breakdown of hardscape and softscape • Declare Location of Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions **Supplementary Documents** a) Landscape plan / species and perspectives b) Plant details of sky terrace / planter boxes / covered communal ground garden / communal pavilions
	Night Lighting	**Night Lighting Report** • Detailed concept and renders • Specifications • Fixture installation
	ORA / ODA / Kiosks	• Location and extent, detailed design

Urban Redevelopment Authority (URA)

Legend: Architecture | C&S | M&E | IFC COMPONENT

G2	Construction Gateway - All Design Gateway requirements will apply, in addition to the following :-	
	Key Words	**Requirement Category**
	Public Space SPACE	**Privately-Owned Public Spaces (POPS):** • Area verging of POPS • Seating (design, no., location) • Amenities (type, location) • Signage (design, location) • Outdoor Refreshment Areas (ORA) (if provided, location / extent)
	Roofscape	• Screening details of M&E equipment, where required • Use of RC Flat Roofs – Indicate whether roof is accessible, and if so, for what purpose • Structures (If any)
	Rapid Transit System (RTS) Station ACCESSIBLE ROUTE SITE BOUNDARY SPACE SITE	**Urban Design Requirements** • Design and location of at-grade bicycle parking
		Draft Development Interface Report a) For works interfacing with existing / future connection b) Architectural information for future developer (e.g. fire safety requirements; Knock Out Panels (KOP)) c) Structural information for future developer (e.g. Loading requirements) d) Mechanical and Electrical (M&E) information for future developer (e.g. ventilation shaft location and throw) e) Details of Loading Provision Note: Coordinated by the Architect, with inputs from respective engineers
	Signage	**Privately-Owned Public Spaces (POPS), Through Block Link (TBL) Signage** • Location and size of signages
	Site Layout only SITE SITE BOUNDARY	**Building Setback from Boundary** • Setback for Building Appendages – Location and width • Treatment for non-compliant Multi-Storey Car Parks and Ancillary Structures
	Site Layout, Basement SITE	**Basements** • Basement protrusion (if any) and location within site • Screening of basement opening
	Site Layout, Landscape Deck PLANTING AREA PLANTER BOX SPACE LANSCAPE PLANTS	**Landscape Deck** • Exposure of Basement Wall & Proposed Treatment (Berm / Vertical Greenery) • Site Coverage on Landscape Deck – declare % • Provision of Greenery on Deck – Location and % • Boundary Wall Porosity – declare % and show design
	Site Layout, Security Screening	**Security Screening (where required)** • If the site falls within a special control area, it will need to comply with security screening requirements, if any
	Strata Area	• To demarcate the strata areas on the floor plans
	Structures in Building Setback, Green Buffer	• Location (e.g. integrated with building envelope) • Finish material of manhole to match paving if located within covered / open walkway)

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	Construction Gateway - All Design Gateway requirements will apply, in addition to the following :-	
	Key Words	**Requirement Category**
	Use & Intensity	• Gross Plot Ratio / Gross Floor Area • Land Use / Building Uses – detailed breakdown by use and GFA quantum {Note: For time-being, submission of the native BIM models is required to facilitate GFA verification. The native models can be provided at the resubmission to CG i.e. where QPs expect to obtain Written Permission as part of CG Clearance]
		Bonus GFA Incentive Schemes: • Balcony / Recreational / Transformation / Others – GFA quantum and %
	Vehicle Parking PARKING LOT SPACE	• Total number of parking lots (including motorcycle parking) • Residual area within car park floors to be demarcated • Screening details for vehicle parking and service areas
	Others	**Environmental Impact Assessment (where required)** • Submission of any other documents required
		Supplementary Documents • Previous approved plans (where requested by URA)
		Public Communications Plans (if applicable) • Distribution of flyers prior to CG submission and submission of relevant forms, where required
		Form on Unit Information • To provide a tabulation on unit-level information for each submission/resubmission at CG and TOP/CSC stage. More information will be available on the URA website under DC Supplementary Forms.
		Design Advisory Panel (DAP) Report • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)
		Pre-CG Submission: Stage 2 Design Advisory Panel – for selected projects • The DAP materials submitted are to consist of : o Technical drawings (including a full set of plans, elevations and sections) o Digital and hardcopy DAP booklets (including 2 hardcopies in A3), which should not exceed 50 pages, including appendices, attached drawings and plans, with a minimum font size of 12. o Presentation slides. The number of presentation slides should be comfortable for a 20-minute presentation without lengthy text, highlighting the key points with further elaboration provided in the DAP booklet. o Digital models o Where necessary, a physical model of the proposed development will be required, at scale of 1:400 or smaller (to be advised by the officer in charge), showing context of site] will have to be submitted. o Additional reports, such as Conservation Reports, are to be included as Appendices to the A3 booklets

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E IFC COMPONENT

G2	Construction Gateway - All Design Gateway requirements will apply, in addition to the following :-	
	Key Words	**Requirement Category**
	Others *(Continued from previous page)*	**Pre-CG Submission: Stage 2 Design Advisory Panel – for selected projects** • The following aspects of the proposal will be assessed at this stage of the DAP: o Detailed building layout o Detailed architectural treatment including appropriate use of building materials and finishes o Night lighting design concept, including method statement and detailed drawings on how the night lighting intention would be achieved o Detailed landscaping design including planting palette o Detailed Design of Public Spaces o Scaled elevations and sections of the relevant details (preferably 1:50 in hardcopy), digital architectural model of part(s) of the building (if necessary), as well as material samples of the façade and roof materials are required to be submitted to show the architectural design of the development

-	Independent Submission	
	Key Words	**Requirement Category**
	Conservation	Refer to URA Conservation Requirements here
	Land / Strata Subdivision and Amalgamation	**Land / Strata Subdivision and Amalgamation** • Proposed Subdivision and/or Amalgamation plan(s) / model by Registered Surveyor
	Demolition Works (For noting)	If developers intend to proceed with demolition works ahead of obtaining DSP or DG Clearance, a demolition application for the demolition works will be required, accompanied by the payment of requisite fees to both URA and BCA. URA will not require a separate demolition application if the works to be demolished are : • Shown within the proposal granted planning permission, or • A lodgment application has been made and URA's authorisation letter has been granted for a new erection or a reconstruction proposal that necessitates the demolition of any existing building structures.

G3	Completion Gateway	
	Item for TOP / CSC	**Requirement Category**
	Development Interface Report (DIR) (Final)	• Information for future developer (e.g. loading requirements, knock out panels alignment / width) • As-built plan
	TOP / CSC	• Declaration that completed works have been supervised and built in accordance to approved plans (via EDAForm) • Photographs of completed works or rectifications (where requested) • Phasing Plan (for Partial TOP) • Inspections (where necessary)
	Record Plan (for non-conserved buildings and monuments)	• As-built plan incorporating approved amendments and as-built works that QPs declared to not have material impact to planning controls

End of Requirements for URA

SECTION 3

Specific Requirements by:
Key Gateways

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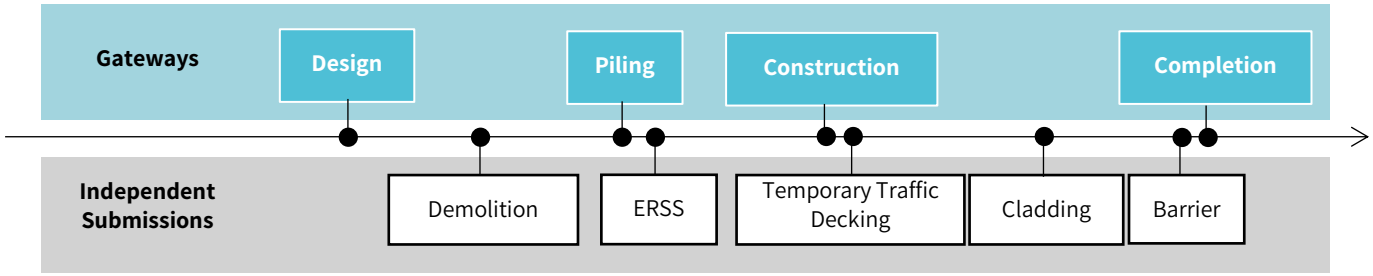
3 Specific Requirements by

Page

About the Gateways

G	Gateways	Objectives	Key Approvals
-	Pre-Submission, Planning and Other Consultations	To seek one or more agencies' guidance and/or waivers on a project's submission requirements before making a formal submission	-
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.	• URA PP • LTA, NEA and PUB DC Clearances • NParks DC Approval
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.	• BCA ST Approvals for piling and substructure works (that do not affect internal layout) • LTA RPZ AIP for Pile Design and Pile Layout Plan • NParks Acceptance of Environmental Management and Monitoring Plan (EMMP)/wildlife management plan, if applicable
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.	• URA WP • BCA BP and ST Approvals • LTA Street Plan Clearance, BP (Parking), BP (Rails) • NEA and PUB BP Clearance Certificate • SCDF BP Approval • NParks CG Approval • NParks Acceptance of Environmental Management and Monitoring Plan (EMMP)/wildlife management plan, if applicable
-	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	• PUB Earth Control Measures Approval • NParks Acceptance of Environmental Management and Monitoring Plan (EMMP)/wildlife management plan, if applicable
G3	**Completion Gateway (TOP)** Application for TOP/CSC	To document "As-Built" plans and obtain Occupancy Permit/ Statutory Completion	-
For simpler projects, please refer to the Direct Submission Process (DSP) here.			

Example of a project making regulatory submissions across CORENET X Gateways



Common Gateway Key Words

Key Words in alphabetical order		-	G1	G1.5	G2	-
		Pre-Submission & Planning Consultation	Design Gateway	Piling Gateway	Construction Gateway	Independent Submissions
A	ABC Waters		PUB		PUB	
	Access to Site		URA		BCA, URA	
	Access within Building only				BCA, URA	
	Attic				URA	
B	Balcony				URA	
	Barrier				BCA	BCA
	Buildability and Productivity				BCA	BCA
	Building / Unit Layout				URA	
	Building Envelope				BCA	
	Building Facade				URA	
	Building Massing		URA		URA	
C	Common Service Tunnel (CST)		URA		URA	
	Connectivity		URA		URA	BCA
	*Conservation	URA	URA		URA	URA
	Constructability					BCA
D	Demolition Works (For noting)					URA
	Detention System (External)		PUB			
	Drains (Internal / External*)	PUB	PUB			PUB
	Dwelling Unit				BCA	
E	Earthworks / Topography		PUB, URA		PUB, URA	
	Emergency Voice Communication System				SCDF	
	Environmental Sustainability				BCA	BCA
	Environmental Health (COPEH)		NEA		NEA	
	Exit				SCDF	
	Exit Sign and Emergency Lighting				SCDF	
	External Works		URA		URA	
F	Façade					BCA
	Fire Alarm System				SCDF	
	Firefighting System				SCDF	
	Fire Engine Accessway / Access Road		SCDF			
	Fire Lift				SCDF	
G	Greenery	NParks	NParks, URA		NParks, URA	NParks
H	Headroom and Ceiling height				BCA	
	Household / Storey Shelter (HS/SS)	BCA			BCA	

* Conservation Requirements are in a separate chapter here.
* External Works Requirements are in a separate chapter here.

Common Gateway Key Words

Key Words in alphabetical order *continued from previous page*		-	G1	G1.5	G2	-
		Pre-Submission & Planning Consultation	**Design Gateway**	**Piling Gateway**	**Construction Gateway**	Independent Submissions
I	Impact Studies only	LTA, NEA, NParks, URA	NEA, NParks	NParks	LTA, NParks	NEA
	Impact Studies, Site Layout, Rail Protection, Road Structure Protection		LTA	LTA	LTA	LTA
	*Infra & Utilities (External)	External Works Requirements are in a separate chapter here.				
	Infra & Utilities (Internal)		PUB, URA		PUB	
L	Land/Strata Subdivision & Amalgamation					URA
	Lifts and Escalators				BCA	
	Lightning Protection			BCA	BCA	BCA
	Loading / Development Loading		URA			
M	Materials				BCA	
	Mechanical Ventilation & Smoke Control System				SCDF	SCDF
N	Night Lighting		URA		URA	
O	ORA / ODA / Kiosks		URA		URA	
P	Performance Based project				SCDF	
	Platform & Crest Level only	PUB	PUB			
	Pollution Control (COPPC)				NEA	
	Public Communications Plan (PCP)	URA				
	Public Space		URA		URA	
	Public Transit Shelter (PS/TS)	BCA			BCA	BCA
R	Rapid Transit System (RTS) Station		URA		URA	
	Roofscape		URA		URA	
S	Sanitary (Internal)	PUB	PUB			
	Service & Vehicular Access to Site		URA			
	Sewerage System (Internal/ External*)	PUB		PUB		PUB
	Signage				URA	BCA
	Site Layout only	NEA, URA	NEA, NParks, URA		URA	
	Site Layout, Basement				URA	
	Site Layout, Drainage Reserve		PUB			
	Site Layout, Landscape Deck		URA		URA	

* Conservation Requirements are in a separate chapter here.
* External Works Requirements are in a separate chapter here.

Common Gateway Key Words

Key Words in alphabetical order *continued from previous page*		-	**G1**	**G1.5**	**G2**	-
		Pre-Submission & Planning Consultation	**Design Gateway**	**Piling Gateway**	**Construction Gateway**	Independent Submissions
S	Site Layout, Security Screening				URA	
	Site Layout, Street Works		LTA		LTA	
	Site Layout, Vehicle Parking	LTA			LTA	
	Site Planning & External Firefighting Provisions				SCDF	
	Smoke Control System Declaration				SCDF	
	Staircase				BCA	
	Strata Area				URA	
	Statistical Gross Floor Area (SGFA)				SCDF	
	Structural Design			BCA	BCA	BCA
	Structural Fire Precautions				SCDF	
	Structures in Building Setback, Green Buffer				URA	
U	Use & Intensity		URA		URA	
V	Vehicle Parking		LTA, URA		BCA, URA	
	Ventilation				BCA	
W	Washroom				BCA	
	Water Supply					PUB
-	*Others*	BCA, URA	BCA, URA		URA, SCDF	

* Conservation Requirements are in a separate chapter here.
* External Works Requirements are in a separate chapter here.

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Drains (Internal / External)

Agency	Requirement Category
PUB CULVERT DRAINS	**Roadside Drain Capacity** • For projects where drains need to be rebuilt / entrance culvert. PUB to provide required size during pre-submission consultation • Size of new culvert (will be advised by PUB) • Public Drains - Drain Size and Location **Pre-Consultation for Drainage** • Drainage Discharge Point • Catchment Area

Household / Storey Shelter

Agency	Requirement Category
BCA	• Pre-consultation on HS/SS shelter on architectural, structural or commissioning issues • Can occur at any stage prior to TOP, for landed and non-landed residential projects

Greenery

Agency	Requirement Category
NParks	**Greenery Provision and Conservation of Trees / Plants** • Pre-Submission consultation of requirements for greenery provision and tree conservation for developments

Impact Studies only

Agency	Requirement Category
LTA	**Transport Impact Assessment (TIA)** • A TIA submission is required if developments are of (a) mixed uses, (B) proposed uses that are non-typical (C) located in traffic sensitive areas or (d) first movers of new development areas. Requirement for TIA would be stipulated in the Technical Conditions of Tender (TCOT) of Government Land Sales (GLS). Otherwise, Developer can also consult LTA via LTA-DBC_Registry@lta.gov.sg. • The traffic consultant shall arrange scoping meeting with LTA to discuss the scope of study, TIA classifications and confirm if Walking and Cycling Plan (WCP) is required. • The TIA report is to be set out logically with clear analyses, conclusions and recommendations. All assumptions and sources of information are to be clearly documented. Executive Summary shall be included to provide concise and clear information on the study purpose, major findings, conclusions and recommendations. Improvements recommended in the TIA are to be illustrated using appropriate plan(s) with sufficient detail to substantiate their feasibility. All the analysis files and data related to the study are to be submitted as appendices to the Report for LTA's records.

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies only		
	Agency	**Requirement Category**
	LTA *(continued from previous page)*	**Transport Impact Assessment (TIA)** *(continued from previous page)* • The submission of TIA is to be done in two parts, part one approval to be obtained before the Design Gateway (G1) and part two approval before the Construction Gateway (G2). • All recommended improvement works to be carried out by the developer shall be incorporated in the development plan submissions in two parts. Part one submission at Design Gateway (G1) shall incorporate the recommendations from the TIA including the details of access arrangements, proposed improvements at immediate junctions abutting the development boundary, proposed traffic ops & management plan, any provision of and connectivity to commuter facilities and active mobility layers. Part two submission at Construction Gateway (G2) shall include the recommendations from the TIA including the required improvements that are beyond the development boundary and any other traffic demand management measures.
		Pre-Application Feasibility Study & Recommendations • LTA should be consulted to confirm whether a PAFS is needed for the proposed residential site if they are undergoing redevelopment arising from a collective or en-bloc sales. • The traffic consultant shall arrange scoping meeting with LTA to discuss the scope of study • PAFS should assess the traffic impact on the area and propose car-lite measures/initiatives, traffic demand management measures and/or feasible transport improvement plans to support the redevelopment proposal. • All recommended improvement works to be carried out by the developer shall be incorporated in the development plan submissions at Design Gateway (G1) and Construction Gateway (G2) to LTA for clearance.
		Walking and Cycling Plan (WCP) • The rigorous process of the WCP shall be demonstrated and presented in a written report that explains the rationale for the following 5 sets of plans: 1. Location and Connectivity Plan 2. Circulation Plan 3. Conflict Mitigating Plan 4. Bicycle Parking and End of Trip Facility Plan 5. Wayfinding Plan
	NEA	**Environmental Information (EI)** • Applicants are required to apply EI from NEA directly at Pre-Submission

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies only *(continued from previous page)*		
	Agency	**Requirement Category**
	NEA *(continued from previous page)*	**Environmental Impact Study (EIS-Pre)** • Applicants are required to submit EIS (Pre) to NEA directly at Pre-Submission • If Pre-Submission is not possible, the EIS (Pre) process should be concluded by Design Gateway (G1)
		Energy Efficiency Opportunities Assessment (EEOA) for New Ventures • The company should refer to the checklist for preparing a **complete** EEOA-NV lite-report and EEOA-NV full-report for submission to NEA. The checklist includes brief descriptions of the requirements and is available here: Energy Efficiency Opportunities Assessment (EEOA) for New Ventures • Applicants are required to submit EEOA reports to NEA directly via email to Emissions Data Monitoring and Analysis System (EDMA) as early as possible
		Environmental Site Assessment (ESA) • Applicants should submit ESA to NEA directly and should be concluded at Pre-Submission
		Noise Impact Assessment (NIA-Pre) for Traffic • Applicants are required to submit NIA (Pre) report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission • If Pre-Submission is not possible, the NIA (Pre) process should be concluded by Design Gateway (G1) • However, applicant may submit NIA (Pre) report to NEA directly at Construction Gateway (G2) if there is no Design Gateway (G1) submission for the development
		Pollution Control Study (PCS) • For technical guidance on PCS, refer to https://www.nea.gov.sg/our-services/development-control • PCS addresses pollution impacts due to (a) Air Pollution, (b) Noise Pollution, (c) Water Pollution, and (d) Management of Hazardous Substances and Toxic Waste • The PCS assists consultants in the planning of mitigation measures (if required) to address the pollution impact. Such measures may include increased chimney stack height, changes in development layout to locate noisy equipment away from noise sensitive receptors • Where possible, industry is encouraged to submit and clear parts of PCS report pertaining to (a) Air Pollution (including air dispersion modelling) and (b) Noise Pollution (including noise impact modelling) prior to DG clearance. This approach will help to avoid the need for major rework (e.g. raising the chimney height, moving noisy equipment to other locations) in the later stages of development • Applicants are required to submit PCS report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission
		Quantitative Risk Assessment (QRA) • If a QRA submission is required for an industrial project, QRAs should be prepared ahead and submitted to agencies before Design Gateway to enable early identification of any siting issues • Companies and their QRA consultants to submit the QRA report to MOM (Major Hazards Department) via contact_MHD@mom.gov.sg • For more information on the preparation of QRA reports, companies can refer to the following link within NEA's website (https://www.nea.gov.sg/our-services/development-control) for the list of registered QRA consultants, and QRA submission, technical and criteria guidelines

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies only *(continued from previous page)*		
	Agency	**Requirement Category**
	NParks	**Biodiversity Impact Assessment (under URA's EIA Framework)** • Applicable to sites not identified as Planning Stage (Pre-DG) to fall within the Environmental Impact Assessment Framework: Environmental Consultation o QP (Arch / PEs) or Consultant to submit the environmental consultation form (Form A) to URA and Technical Agencies (e.g. NEA, NParks, MPA, SFA) – via URA's EPACS. o Details of project entities (Developer, Qualified Person and Main Contractor) as stated in Form A are provided Environmental Impact Assessment o QP (Arch / PEs) or Consultant can consult on environmental baseline study and scoping of EIA o QP (Arch / PEs) or Consultant to ensure that EIA report (for projects that have cleared environmental assessment at planning stage) are submitted for acceptance • If Pre-Submission is not possible, the environmental consultation process should be concluded by Piling Gateway (G1.5) or Construction Gateway (G2) • There might be requirement for detailed EMMP / wildlife management prior to site clearance
		Assessment and Reduction of Biodiversity Impact (under URA's Environmental Impact Assessment [EIA] framework) • Should be surfaced ahead of the submission • If pre-submission is not possible, the environmental consultation process should be concluded by Design Gateway (G1) or Piling Gateway (G1.5) • There might be requirement for EMMP / wildlife management prior to site clearance
	URA	**Environmental Impact Assessment (where required)** • If development projects are near to sensitive areas (such as Nature Reserves, Nature Areas, marine and coastal areas, other areas of significant biodiversity) or might have potential trans-boundary impacts, relevant technical agencies (such as the National Parks Board, National Environment Agency, Maritime and Port Authority of Singapore, and Singapore Food Agency) will need to be consulted more extensively to determine if a more thorough environmental study is required. • For affected proposals, URA will provide project teams with further instructions on how to proceed with such consultations

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Platform Levels		
	Agency	**Requirement Category**
	PUB	**Minimum Platform Level** • Levels of development, adjacent road / ground in Singapore Heigh Datum (SHD)

Public Communications Plan (PCP)		
	Agency	**Requirement Category**
	URA	Please note that the PCP process will differ for submissions made through CORENET X **Non-Government Land Sale (GLS) Sites** • If a Public Communications Plan is required, it will be made known at Design Gateway submission, where URA will provide guidance on the follow up distribution of flyers to the local community and submission of relevant forms. **GLS Sites** • Public Communications Plan requirements, if any, will be clearly set out in the tender conditions. For projects that are submitted to CORENET X, the Developer/QPs can reach out to the relevant Sales Agent

Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Public Transit Shelter (PS/TS)		
	Agency	**Requirement Category**
	BCA	• Pre-consultation on Public/Transit Shelter (PS/TS) on architectural, structural, M&E or commissioning issues • Can occur at any stage prior to TOP

Sanitary (Internal)		
	Agency	**Requirement Category**
	PUB	**Pre-consultation for Sanitary** • Sewerage Discharge Point • Used water discharge volume

Sewerage System (Internal / External)		
	Agency	**Requirement Category**
	PUB	**Pre-Consultation for Sewers** • Sewerage Discharge Point • Used water design flow

Site Layout only		
	Agency	**Requirement Category**
	NEA	**Environmental Health (COPEH)** • Refuse Truck Access Road (For Refuse Collection) – Swept Path Analysis • Location and Size of the Bin Centre / Refuse Room / Bin Point, refuse chute and recycling chute, refuse chute chamber and recyclables storage & its collection system • Provide total daily refuse outputs (liters/day) for the development • Pneumatic waste conveyance system (PWCS) schematic plan • Location of cooling tower and its setback distance (at least 5m) **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1) • However, applicant may submit the above information at Pre-submission if the development does not require any Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways
		Pollution Control (COPPC) • Confirm the proposed development is aligned with the prevailing URA MP land use zoning (e.g. residential to residential) • Building location and its surrounding development/amenities (such as expressway/major road, MRT/MRT station, place of worship, hospital, petrol station, industry premises etc.) • Orientation and location of nuisance sources (e.g. cooling towers, chiller plants, air handling units, air conditioning condensers, fresh air intake, exhaust outlets (ventilation shaft), etc.) • 50m nuisance buffer from place of worship, petrol station, Light industry premises to the nearest residential development.

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout only *(continued from previous page)*

	Agency	Requirement Category
	NEA	**Pollution Control (COPPC) (continued from previous page)** • 100m nuisance buffer from General industry premises to nearest residential development. • 500m nuisance buffer from Special Industry premises to nearest residential development. • Orientation of building: Minimum building setback (m) • Setback distance within 70m from transport-related infrastructure (i.e. LTA road reserve line for expressway/major road) to the nearest residential development Lot boundary line. • Location of the chimney and BHC and MCH requirements e.g. within 30m / 100m radius of existing chimney stack height • Location changes for the storage inventory product / materials such as chemical, oil, fuel, etc • Changes in the industrial processes or production activities location • Changes of existing activity, expansion of existing activities or proposed new activity carried out on the proposed development or premises **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1) • However, applicant may submit the above information at Pre-submission if the development does not require any Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
	URA	**Outline Application / Rezoning** Where there are deviations to Master Plan parameters (e.g. land use, GPR, height, etc), the project team should consider submitting an outline application with the following details: • Planning proposal data (e.g. site area, GFA and use breakdown, numbers of units/rooms) • Site layout plan and form/massing schemes, where necessary **Pre-Application Consultation Service** • Details of proposals to clarify or seek deviation from specific guidelines [Note: This is a chargeable service which will allow QPs to discuss proposals that may depart from the usual guidelines and address certain planning issues upfront. To access this service, please make an application through URA's website - https://eservice.ura.gov.sg/pacsWeb/]

Site Layout, Vehicle Parking		
	Agency	**Requirement Category**
	LTA	**Pre-Consultation on Mechanised Parking System Proposals** • QPs and developers are required to submit their mechanised parking system and car lifts proposals to LTA for a pre-submission consultation before a development application is submitted to the Urban Redevelopment Authority (URA) for planning permission. This will allow architects, engineers and developers to incorporate the necessary requirements into the design of the development upfront to minimise abortive work and major revisions to development proposals later. • Refer to LTA's COP for Vehicle Parking Provision in Development Proposals for the design of a proper mechanised parking system and car lifts.

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout, Vehicle Parking *(continued from previous page)*		
	Agency	**Requirement Category**
	LTA *(continued from the previous page)*	**Pre-Consultation on Mechanised Parking System Proposals *(continued from previous page)*** • As there is a variety of mechanised parking systems in the market, it is possible that some of these systems do not fully comply with LTA's guidelines. For such cases, the systems will be evaluated based on its own merits during the pre-submission consultation with LTA.
		Mechanised Parking System • To submit the detailed drawings and description for the type of mechanised parking system used in the proposal. Information on how the system operates, how cars are parked and retrieved from the system, average time taken for parking and retrieval, safety features, etc. shall be clearly illustrated. • The type of mechanised parking system and all relevant requirements/ dimensions of the parking system such as platform size, maximum load, headroom clearance, allowable car dimensions, safety features, etc. shall be clearly indicated and endorsed on plan. Ensure that the dimensions and information endorsed on plan correspond with the mechanised parking system specification. • The cross-sectional details of the parking platform showing the inner clear width of the platform, clear platform length and clear movement space between the structural supports. To ensure that the dimension for headroom clearance of minimum 2.2m and platform size of minimum 2.4m x 5.4m are cleared of obstructions e.g. structural supports, structural cage, wire rope/hoisting cable, motorised equipment, sliding gears, etc.
		Car Lifts • To submit the type of car lift system and all relevant requirements/ dimensions of the car lift system such as internal cage size, width of the entrance and exit door, maximum load, headroom clearance, allowable car dimensions, minimum speed, minimum discharge capacity, queuing spaces, safety features, etc. shall be clearly indicated and endorsed on plan. Information on how to operate the car lifts (e.g. call-button or loop detector), sequence on how cars enter/exit the car lift, provision of safety devices, etc. should be clearly illustrated. • The proposed car lift system shall comply with the guidelines for provision of car lifts in car parking places.

Others		
	Agency	**Requirement Category**
	BCA	**Complex Building Requirements** • Pre-submission consultation of structural concept on structural works involving complex building to be carried out during / after Design Gateway (G1) but prior to Piling Gateway (G1.5) or Construction Gateway (G2)

	URA	**Built Environment Transformation Bonus GFA Incentive**
		• Submission of incentive scheme application and supporting documents
		
		Pre-DG Submission: Stage 1 Design Advisory Panel – for selected projects
		• The DAP materials submitted are to consist of:
		  • Technical drawings (including a full set of plans, elevations and sections)
		  • Digital and hardcopy DAP booklets (including 2 hardcopies in A3), which should not exceed 50 pages, including appendices, attached drawings and plans, with a minimum font size of 12.
		  • Presentation slides. The number of presentation slides should be comfortable for a 20-minute presentation without lengthy text, highlighting the key points with further elaboration provided in the DAP booklet.
		  • Digital models
		  • Where necessary, a physical model of the proposed development will be required, at scale of 1:400 or smaller (to be advised by the officer in charge), showing context of site] will have to be submitted.
		  • Additional reports, such as Conservation Reports, are to be included as Appendices to the A3 booklets.

- Pre-Submission, Planning and Other Consultations

Legend: Architecture C&S M&E IFC COMPONENT

Others (continued from previous page)		
	Agency	**Requirement Category**

	URA	**Pre-DG Submission: Stage 1 Design Advisory Panel – for selected projects *(continued from previous page)***
		
		• The following aspects of the proposal will be assessed at this stage of the DAP:
		  • Stage 1 (Pre-DG DAP)
		  ○ Design Philosophy / Concept
		  ○ Form and Massing
		  ○ General architectural treatment (roofscape, façade in relation to context)
		  ○ Pedestrian Network and Vehicular Access
		  ○ Public Spaces and Landscape Replacement Areas / landscaping concepts

Submission to be done outside of CORENET X		
	Agency	**Requirement Category**
	MHA/SPF	**Special Requirements** • Compliance with Security By Design (SBD) requirements, if applicable. Applicants may refer to the SBD criteria and requirements at the following website: https://info.corenet.gov.sg/docs/default-source/others/implementation-of-ipa-to-enhance-building-security_corenetv6march.pdf?sfvrsn=54851136_1
	CAAS/DSTA	**Height Control Requirements** Project teams should take into consideration the technical height controls administered by CAAS and DSTA, as part of their upstream design study, before proceeding to make their formal submissions in CORENET X. This will help to avoid abortive work and design changes downstream. For details, please refer to the Circular to Professional Institutes titled JOINT IACC-CAAS-RSAF ADVISORY (Ref: APPBCA-2023-10) released on 01 Jun 2023. Non-Government Land Sale (GLS) Sites To consult CAAS and DSTA on the following requirements before making the Design Gateway (DG) submission: • DSTA: To consult DSTA at height_control@defence.gov.sg on the maximum allowable height for the proposed site (i.e. Singapore Height Datum), inclusive of all structures and fixtures on the roof tops, whether permanent, temporary, transient or stationary (including but not limited to the building superstructure, TV antennae, water tanks, lift motor rooms, cranes, maintenance equipment, lightning conductors, solar panels, moving objects, vegetation, etc) and all construction equipment and temporary structures (including but not limited to cranes, piling riles, etc). For certain sites, DSTA may also require other information, such as site layout and vehicular access points, and will advise applicants accordingly. • CAAS: To consult CAAS at caas_ansp_ols@CAAS.gov.sg on height control limits for the proposed site. Respective clearances from CAAS and/or DSTA should be attached in the DG submission. GLS Sites There is no need for pre-consultation, as the height controls and other related requirements will be clearly set out in the tender conditions. Applicants may engage CAAS and/or DSTA directly for clearance with the detailed design prior to submission at Construction Gateway.

End of Requirements for Pre-Submission, Planning and Other Consultations

G1 Design Gateway

Agency	Summary of Design Gateway Requirements	Common Gateway Key Words
BCA	NIL Note: If building design involves complex buildings, consultation with BCA to be held before Piling Gateway (G1.5).	-
LTA	Compliance to traffic operations and safety requirements. **Key Evaluation Areas include:** • Location and provision of access points, pick-up/drop-off and loading/unloading area • Parking provision and layout • Extent of frontage improvement • Improvement needed to existing traffic scheme • Adequacy of connection to commuter facilities • Vesting of road reserve plot, if any • For developments with TIA, the outcomes and recommendations which are approved by LTA under the Part one submission are to be incorporated. This includes the approved details of access arrangements, proposed improvements at immediate junctions abutting the development boundary, proposed traffic ops & management plan, any provision of and connectivity to commuter facilities and active mobility layers. For proposed new street, horizontal and vertical alignment, road typology and connection to existing road shall be established to determine the Road Reserve Line required. For proposed/relocation of commuter facilities, architectural layout to be evaluated to establish alignment, headroom and column positions, along with declaration to non-compliance with LTA's standards and requirements (if any). Railway protection details should be provided to facilitate the review of the QP's assessment of the overall impact of the development with respect to the RTS, including: • Plan for development works • Engineering evaluation report • Certified survey plans etc.	• External Works • Impact Studies • Infra & Utilities (External) • Rail Protection • Site Layout • Street Works • Vehicle Parking
NEA	**Compliance with pollution control and environmental health requirements, including:** • Refuse and recyclables collection, storage and removal • Analysis of how surrounding developments/amenities affect subject site • Proposed orientation and location of emission (noise, air and odour) sources and ventilation/discharge systems within and around subject site • Location for storage for materials such as chemical, oil, fuel, etc. • Industrial processes or production activities or changes to existing activities • Building Height Constraint (BHC) and Minimum Chimney Height (MCH) requirements as stated in SS593 • Energy Efficiency Opportunities Assessment (EEOA) declaration for industrial development Reports for Pollution Control Study/Air Dispersion Model Study, Quantitative Risk Assessment, Noise Impact Assessment, Environmental Site Assessment etc. may be submitted separately	• Building Massing • Impact Studies • Noise Control • Pollution Control • Public Health • Servicing (Internal Accesses) • Site Layout • Use & Intensity

See also: Latest CORENET X Circulars

G1 Design Gateway

Agency	Summary of Design Gateway Requirements *(continued from previous page)*	Common Gateway Key Words
NParks	Greenery provision and tree conservation for developments, and the impact to existing, or provision of new, park / park connector. **Provision of:** • Details indicating spatial provision for greenery (i.e. width and depth of planting areas and green verges • Information of trees/plants to be conserved (i.e. species, girth, height along roadside and/or within development boundary) • Entrance position(s), fire engine accessways, open air parking areas at street level and other structures (such as covered linkways and pedestrian overhead bridges) etc. For provision of new park/park connector/promenade, conceptual design to be reviewed early	• Greenery • Impact Studies only • Site Layout only
PUB	Broad planning parameters of drainage, sewerage and sanitary works (e.g. Minimum Platform Level, maximum allowable peak runoff, sewer setback, connection to public sewer etc.) **Key Evaluation Areas include:** • Storm water drainage works, erection or placement of any structures or objects in, above or across any drain or drainage reserve • Temporary structure/works/services over, across or adjacent to any drain or storm water drainage system • Proposed realignment of Drainage Reserve or Drainage Reserve to be set aside and vested to State • Works which could affect any public sewers/sewerage system or public drains including common drains directly or indirectly; • Buildings or structures to be erected over, across or adjacent to any public sewerage system; • Proposed connection of the development/premises to the public sewers/sewerage system	• ABC Waters • Detention System • Drainage Reserve • Drains (Internal / External) • Earthworks / Topography • Infra & Utilities (External) • Infra & Utilities (Internal) • Platform & Crest Level • Sewerage System (Internal / External) • Sanitary (Internal) • Site Layout only
SCDF	Note: Location of fire engine accessway and access road to be included	• Fire Engine Accessway / Access Road
URA	Schematic details of key planning parameters (e.g. Masterplan (MP) land use/height/intensity) pertaining to the overall building form, site layout, how development relates to surroundings e.g. connectivity provisions Note: Where there are deviations to MP zoning controls, applicants should submit an Outline ahead of Design Gateway, where rezoning (if supported) can be carried out prior.	• Access to Site • Building Massing • Common Services Tunnel • Connectivity • Conservation • Earthworks / Topography • External Works • Greenery • Infra & Utilities (Internal) only • Landscape Deck • Platform & Crest Level • Public Space • Rapid Transit System (RTS) Station • Service and Vehicular Access to Site • Site Layout • Use & Intensity • Vehicle Parking • Others

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

ABC Waters		
	Agency	**Requirement Category**
	PUB	**ABC Waters Design Features** To show conceptual plan endorsed by ABCWP (landscape Architect) or ABCWP (Architect) which includes: • Overall catchment plan (e.g., sub- catchment area, treatment area for proposed ABC Waters design features, land status and demarcation of site boundary, green buffer DR, RR etc.) • Overall layout plan (e.g., location of proposed ABC Waters features (indicative location of overflow sump within the feature), how it links with the proposed and existing drainage infra i.e., location of inlet and discharge point) • Detention volume to be provided by proposed ABC Waters design features to satisfy requirements as stipulated in 7.1.5 of the Code of Practice on Surface Water Drainage (if any)*

Access to Site		
	Agency	**Requirement Category**
	URA ROAD SLAB	**Site Layout** • Indicative locations of Pedestrian, Cycling, Vehicular and Service Access

Allowable Structures within Planting Areas		
	Agency	**Requirement Category**
	NParks	• Planting areas are free from any encroachment, except for allowable minor ancillary structures and landscaping structures as listed in NParks' Guidelines (Chapter 3). To show the allowable structures within planting areas.

Building Massing		
	Agency	**Requirement Category**
	URA BUILDING STOREY SPACE	**Building Form and Massing** • Development Statement of Intent (DSI) – Response to site context • Façade articulation and urban veranda (Orchard Road only)

		Building Height
		• Floor-to-Floor Height & Aggregate Building Height
		  ○ Number of Storeys
		  ○ Additional Height for Predominant Sky Terrace Storey
		• Overall Building Height Control (incl. building crown and M&E floor, if any)

		Building Edge • Alignment of building edge and percentage of building form articulation • Height of building edge • Depth of building edge

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Common Services Tunnel (CST)		
	Agency	**Requirement Category**
	URA	**CST Integration** • Integration of CST ancillary structures such as ventilation shaft, entrance, exit & any space dedicated to CST functions – Layout, alignment, notional work sequence, airflow calculations • Link Chamber to CST junction box – Layout, services connection details • Alteration of CST manholes or installation mouths - Layout and Alignment

Connectivity		
	Agency	**Requirement Category**
	URA SITE BOUNDARY SPACE RAMP PARKING LOT	**Pedestrian Network** Through Block Link (TBL), Underground Pedestrian Link(UPL), Elevated Pedestrian Link (EPL), Covered Walkways (CW), Open Walkways (OW), Covered Linkways (CL), High Covered Linkways (HCL) • Layout and connections to existing / future developments • Alignment to adjacent pedestrian connections • Proposed levels and mitigation of level differences (if any) • Soffit height, overall width and clear width • Vehicular ramps to start after these Pedestrian Networks Additional requirements for the following: • (UPL, EPL) Detailed layout of vertical circulation point – location within development, and dimensions • (UPL, EPL) Knock Out Panels (KOP) details (e.g. alignment, size) where relevant
		Walking and Cycling Plan • Connectivity to transport node • Provision of measures to prevent conflict between pedestrian, cyclists and motor vehicles • Provision of bike parking and supporting amenities (i.e. shower facilities and lockers)

Conservation		
	Agency	**Requirement Category**
	URA	Refer to URA Conservation Requirements here

Detention System		
	Agency	**Requirement Category**
	PUB SPACE	**Peak Run Off** • Key Objective: To demonstrate how this is catered for, area is set aside for detention tank provision, location, OR drain widening • Calculation of peak run off factor (C value) max. 0.55 (based on code and chart) e.g. area of development of greenfield site

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Earthworks / Topography		
	Agency	**Requirement Category**
	PUB SPACE	**Earthworks** • Minimum Platform Level / Changes to Topography
	URA WALL EARTHWORKS	**Earthworks, Retaining Walls and Boundary Walls** • Height of retaining wall(s), extent of earth-fill and impact on surroundings where relevant **Earthworks, Platform Level** • Minimum Platform Level / Changes to site topography
	NParks	**Earthworks, Platform Level** • Changes to platform level and site topography • Extent of earth-fill/earth-cut and impact to surroundings where relevant **Conservation of Trees** • To conserve trees identified: o In Technical Conditions of Tender (TCOT) o As Heritage Trees o Through nature group / public / residents engagement o In Environmental Impact Assessments (EIA) / Environmental Management and Monitoring Plans (EMMP) etc. **Supporting Document(s):** a) Arborist report (Please refer to NParks' Guidelines [Chapter 2])

External Works		
	Agency	**Requirement Category**
	URA SPACE	**Linkway Connection to Commuter Facilities** • Indicative alignment • Connection through existing / future development • Soffit height, overall width and clear width • Proposed levels and mitigation of level differences (if any) **Cycling Path** • Provision according to safeguarded cycling plan • Indicative location of bicycle parking and supporting amenities (i.e. shower facilities and lockers) and declared GFA **Promenade Guidelines (UD requirements for Singapore River)** • Location of walkways and landscaping
	LTA, NParks, PUB	For LTA, NParks and PUB's External Works requirements, please refer to Page 178 - 196.

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Fire Engine Accessway / Access Road

Agency	Requirement Category
SCDF ROAD SITE BOUNDARY SPACE WINDOW	**Fire Engine Accessways / Access Road** • To design upfront and not added as an afterthought • Compliance of provision of fire engine accessway / access road does not affect the requisite planting areas and roadside green verges • Indication of all the fire engine access road and accessway within project boundary • Clearly indicate if public road is used as fire engine accessway / access road • Compliance of width of fire engine accessway • Compliance of distance between fire engine accessway and fire access opening • Compliance of no obstruction between fire engine accessway and fire access opening

Greenery

Agency	Requirement Category
NParks LANDSCAPE PLANTS	**Conservation of Trees** • To conserve trees identified: o In Technical Conditions of Tender (TCOT) o As Heritage Trees o Through nature group / public / residents engagement o In Environmental Impact Assessments (EIA) / Environmental Management and Monitoring Plans (EMMP) etc. **Supporting Document(s):** a) Arborist report (Please refer to NParks' Guidelines [Chapter 2])
URA PLANTING AREA PLANTER BOX SPACE	**Landscape Provision** • Landscape Replacement Area (LRA) requirements : There is no need to provide details of LRA computation in the Design Gateway plans/models. QPs should factor in the LRA requirements as part of their design at the onset and provide the details that will be checked at Construction Gateway • Landscape Provision: Indicative Extent • Indicative location of Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions

Impact Studies only

Agency	Requirement Category
NEA	**Environmental Impact Study (EIS-Pre)** EIS (Pre) report will be required for developments or infrastructure that would have environmental impact (air, water, land or noise) or affected by environmental impact. For example, new residential / sensitive developments located within 50m from new / existing petrol stations and/or new petrol stations located within 50m from existing residential/sensitive sites **When to apply:** • Applicants are required to submit EIS (Pre) to NEA directly at Pre-Submission • If Pre-Submission is not possible, the EIS (Pre) process should be concluded by Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies only		
	Agency	**Requirement Category**
		Noise Impact Assessment (NIA-Pre) for Land Traffic Noise NIA (Pre) report will be required for (1) New residential and noise sensitive developments located within 70m of existing land traffic noise sources/hotspots (e.g. expressways / major arterial roads / MRT tracks) on existing residential and (2) Existing noise sensitive developments located within 70m of new transport-related developments (e.g. expressway/major arterial roads / MRT tracks / bus interchanges / bus depots), inclusive of the expansion of existing transport-related infrastructures **When to apply:** • Applicants are required to submit NIA (Pre) report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission and should be concluded by Design Gateway (G1) • However, applicant may submit NIA (Pre) report to NEA directly at Construction Gateway (G2) if the development does not require any Design Gateway (G1) submission • Sufficient time shall be catered for NEA to process the NIA (Pre) • The processing of NIA (Pre) will take 1-2 months **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Energy Efficiency Opportunities Assessment (EEOA) for New Ventures EEOA will be required for new industrial facilities and major expansions of existing facilities with an estimated annual energy consumption (AEC) ≥ 54TJ must review the facility design and develop economically feasible for energy efficiency opportunities • The company should refer to the checklist for preparing a **complete** EEOA-NV lite-report and EEOA-NV full-report for submission to NEA. The checklist includes brief descriptions of the requirements and is available here: Energy Efficiency Opportunities Assessment (EEOA) for New Ventures • Applicants are required to submit EEOA reports to NEA directly via email to Emissions Data Monitoring and Analysis System (EDMA) as early as possible **When to apply:** • Applicants are required to submit EEOA to NEA directly at Pre-Submission **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Environmental Site Assessment (ESA) ESA should be conducted when a site that is used for polluting activities is to be redeveloped, rezoned or reused for a non-polluting activity **When to apply:** • Applicants should conclude the ESA at Pre-Submission **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies only *(continued from previous page)*

	Agency	Requirement Category
	NEA *(continued from previous page)*	**Pollution Control Study (PCS)** Any proposed industrial development that could cause serious or substantial pollution of the environment, if mismanagement, is required to conduct a Pollution Control Study (PCS) • For technical guidance on PCS, refer to https://www.nea.gov.sg/our-services/development-control • PCS addresses pollution impacts due to (a) Air Pollution, (b) Noise Pollution, (c) Water Pollution, and (d) Management of Hazardous Substances and Toxic Waste • The PCS assists consultants in the planning of mitigation measures (if required) to address the pollution impact. Such measures may include increased chimney stack height, changes in development layout to locate noisy equipment away from noise sensitive receptors • Where possible, industry is encouraged to submit and clear parts of PCS report pertaining to (a) Air Pollution (including air dispersion modelling) and (b) Noise Pollution (including noise impact modelling) prior to DG clearance. This approach will help to avoid the need for major rework (e.g. raising the chimney height, moving noisy equipment to other locations) in the later stages of development **When to apply:** • Applicants to submit PCS report to NEA directly via email to DCLD_consultation@nea.gov.sg at Pre-Submission **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Quantitative Risk Assessment (QRA) • Anyone intending to store or use hazardous substances will have to pre-consult MOM-MHD whether a QRA assessment is required. • For more information on the preparation of QRA reports, companies can refer to the following link within NEA's website (https://www.nea.gov.sg/our-services/development-control) for the list of registered QRA consultants, and QRA submission, technical and criteria guidelines **When to apply:** • Companies and their QRA consultants to submit the QRA report to MOM (Major Hazards Department) via contact_MHD@mom.gov.sg • If a QRA submission is required for an industrial project, QRAs should be prepared ahead and submitted to agencies before Design Gateway to enable early identification of any siting issues **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
	NParks	**Biodiversity Impact Assessment (under URA's Environmental Impact Assessment [EIA] framework)** • Applicable to sites that fall within the EIA Framework but were not identified at Planning Stage (Pre-DG) Environmental Consultation ○ QP (Arch / PEs) or Consultant to submit the environmental consultation form (Form A) to URA and Technical Agencies (e.g. NEA, NParks, MPA, SFA) ○ Details of project entities (Developer, Qualified Person and Main Contractor) as stated in Form A are provided Environmental Impact Assessment (EIA) ○ If determined during environmental consultation that an environmental study is needed, QP (Arch / PEs) or Consultant can consult on environmental baseline study and scoping of EIA ○ QP (Arch / PEs) or Consultant to ensure that EIA report (for projects that have cleared environmental assessment at planning stage) are submitted for acceptance

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies, Site Layout, Rail Protection *(continued from previous page)*		
	Agency	**Requirement Category**
	LTA	**Development Proposal within Railway Protection Zone / Railway Corridor** • To show the proposed plan for development works • To provide an engineering evaluation report accompanied by a plan for engineering works • To furnish the relevant Certified Survey Plans (for critical development within first reserve of underground RTS) *If the QP deems the impact from the development to be negligible, an engineering assessment outlining the method of analysis, assumptions and projected impact to the RTS will suffice at this stage. This is subject to LTA's acceptance. Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer for more requirements / detailed description

Infra & Utilities (Internal) only		
	Agency	**Requirement Category**
	PUB	**Drainage Network** • To show conceptual plan – location, proposed discharged point, connection to existing drainage network
	URA	**Urban Design Requirements** • Integration of Utilities (e.g. MRT pop-up, substation, water bulk meter) into building envelope **Basement pumped drainage system (stormwater tank)** • Location, volume **Critical Infrastructure/Key Installation** • To show location of Distribution Sub-Station

Loading / Development Loading		
	Agency	**Requirement Category**
	URA SPACE	**Loading Provisions** • Alignment and locations of loading columns • Structural system and integration with future structures (e.g. location / orientation / size of vents) • Loading calculations • (EPL) Loading provision to receive future linkways / walkways (if any) **Supporting Documents:** a) Draft Development Interface Report for future developer b) Clearance from technical agencies

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Night Lighting		
	Agency	**Requirement Category**
	URA	**Night Lighting Report** a) UD Areas with night lighting requirement b) Concept and Renders, Location and Extent

ORA / ODA / Kiosks		
	Agency	**Requirement Category**
	URA	• Location and extent, key parameters (e.g. structure, height, transparency)

Platform & Crest Level only		
	Agency	**Requirement Category**
	PUB SPACE	**Minimum Platform Level, Crest Level** • Levels of development, adjacent road / ground in Singapore Heigh Datum (SHD) • Adjacent Road Levels
		Flood Protection Measures • If crest level is not provided - location and height of protection measure

Drains (Internal / External)		
	Agency	**Requirement Category**
	PUB SYSTEM Civil Element	**Common Drain** (Drains receiving upstream run off / existing [note: more common for landed housing area]) • Location, width **Internal Drain** • Location, width • Discharge point **External Drainage Works e.g. Entrance Culvert / Roadside Drains (If Applicable)** • Location, width, length • To also indicate any structure / works above drain e.g. linkway

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Public Space

Agency	Requirement Category

URA	**Privately-Owned Public Spaces (POPS)**
	• Indicate location, design and dimensions:
	  ○ Location
	  ○ Size / height
	  ○ Layout / configuration
	  ○ Shadow Studies
	  ○ Seating provision
	• Activity Generating Uses:
	  ○ Indicate location on plan and provide details on specific nature of use

Sewerage System (Internal / External)

Agency	Requirement Category
PUB SYSTEM	**Sewer Connection** • Connection Point – where the proposed location is
	Sewerage System • Alignment , Dimensions, Gradient, Material, Calculation of new public Sewers • Alignment, size, material, setback, Invert Level, Top Level of existing public Sewers. • Location, Top Level, Invert Level , Manhole ID of connecting Manhole • Location of Hydraulic/Vortex Drop

Rapid Transit System (RTS) Station

Agency	Requirement Category
URA SPACE SITE SITE BOUNDARY ACCESSIBLE ROUTE	**Urban Design Requirements** • Lines of Road Reserve / Site boundary of adjacent land parcels • Location of station box and its associated tunnels & structures • Land take required (footprint to be optimized to minimize the land-take) • Details of Loading Provision (e.g. Loading grid plan) • Design of pop-up & ancillary structures (within approved railway, setback, mitigation of platform levels, interfacing with neighbouring developments, CW provision) • Annotation for at-grade servicing areas (e.g. bin centre, loading / unloading bays, required to serve the retail uses within the station) • Integration approach with existing / future structures (e.g. location / orientation / size of vents) • Connectivity with other transport infra structure facilities and key pedestrian routes • Taxi stand / Vehicular drop-off • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2000 sqm), where relevant **Supporting Documents:** a) Submission of RTS Checklist b) Method of construction (cut and cover , tunnel boring) c) Copy of the relevant approvals for the proposed retail quantum Note: Coordinated by the Architect, with inputs from respective engineers

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Roofscape		
	Agency	**Requirement Category**
	URA	• Location and extent of M&E • Location and extent of Outdoor Refreshment Area (ORA)

Sanitary (Internal)		
	Agency	**Requirement Category**
	PUB DISTRIBUTION CHAMBER SANITARY APPLIANCES SYSTEM	**Location(s) of Drain-line and Inspection Chamber** • Location, Top Level and Invert Level of last Inspection Chamber. • Location and Top level of remaining Inspection Chambers. • Alignment of drain-lines • Details of sewer connection (e.g., length, pipe size, material, top level, invert level, gradient). **Used Water Flow Rate** • Key Objective: To check that sewer can contain this flow • Quantity & flow rate expected to be discharged from development, where it is to be discharged (based on no. of toilets, shower head and floor traps - in relation to no. of DUs). This should include any pump flow rate that is contributing to overall used water flow rate. **Used Water Pumping System** • Indicative Location

Service and Vehicular Access to Site			
	Agency	**Requirement Category**	
	URA ROAD SPACE	**Vehicular Access** • Location of vehicular, pedestrian and cyclist access points, and layout of internal driveways • Integration with Building Envelope	**Service Areas** • Location and integration with building envelope • Visual Screening

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout only		
	Agency	**Requirement Category**
	NEA SITE SPACE REFUSE CHUTE DOOR ROAD	**Environmental Information (EI)** • EI information such as building height constraint, health and safety buffer, etc. shall be incorporated in the building plan design to ensure that the development is able to meet the requirement. **When to apply:** • Applicants are required to apply EI from NEA directly at Pre-Submission and incorporate the information in building plan submission in Design Gateway (G1) • However, applicant may submit the above information at Pre-Submission if the development does not require any Design Gateway (G1)

		Environmental Health (COPEH)
		• Refuse Truck Access road (for refuse collection) – Swept Path Analysis
		• Location and Size of the Bin Centre/Refuse Room/Bin Point, refuse chute and recycling chute, refuse chute chamber and recyclables storage & its collection system
		• Provide total daily refuse outputs (liters/day) for the development
		• Location and dimensions of spatial provisions of Pneumatic waste conveyance system (PWCS) to meet the minimum requirements specified in Singapore Standard - Code of Practice for Pneumatic Waste Conveyance System (SS 642: 2019)
		• Location of cooling tower and its setback distance (at least 5m)
		• Pneumatic waste conveyance system (PWCS)
		  • QP should submit the spatial dimensions of the PWCS Discharge Valve Room and bin centre at DG
		  • NEA may grant conditional approval at DG if the details of the PWCS design have not been worked out. In such cases, the QP shall confirm in writing that the proposed spatial dimensions can accommodate the installation of the PWCS and that the eventual design of the PWCS will fully comply with Singapore Standard Code of Practice for Pneumatic Waste Conveyance System (SS 642: 2019). Upon receiving the confirmation letter, NEA will conditionally approve the design at DG. The QP shall submit the PWCS details at CG for full clearance
		
		When to apply:
		• Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1)
		• However, applicant may submit the above information at Pre-Submission if the development does not require any Design Gateway (G1)
		
		Who to submit:
		• QP appointed should submit the above information and keep other relevant QPs in the loop.
		• The same QP should follow through the submissions for all gateways.

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout only *(continued from the previous page)*

	Agency	Requirement Category
	NEA *(continued from the previous page)* SITE SPACE REFUSE CHUTE DOOR ROAD	**Pollution Control (COPPC)** • Confirm the proposed development is aligned with the prevailing URA MP land use zoning (e.g. residential to residential) • Building location and its surrounding development/amenities (such as expressway/major road, MRT/MRT station, place of worship, hospital, petrol station, industry premises etc.) • Orientation and location of nuisance sources (e.g. cooling towers, chiller plants, air handling units, air conditioning condensers, fresh air intake, exhaust outlets (ventilation shaft), etc) • 50m nuisance buffer from place of worship, petrol station, Light industry premises to the nearest residential development. • 100m nuisance buffer from General industry premises to nearest residential development. • 500m nuisance buffer from Special Industry premises to nearest residential development. • Orientation of building: Minimum building setback (m) Fronting track: 35 End-wall facing track: 25 • Setback distance within 70m from transport-related infrastructure (i.e. LTA road reserve line for expressway/major road) to the nearest residential development Lot boundary line. • Location of the chimney and BHC and MCH requirements e.g. within 30m / 100m radius of existing chimney stack height • Location changes for the storage inventory product / materials such as chemical, oil, fuel, etc • Changes in the industrial processes or production activities location • Changes of existing activity, expansion of existing activities or proposed new activity carried out on the proposed development or premises **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Design Gateway (G1) • However, applicant may submit the above information at Pre-submission if the development does not require any Design Gateway (G1) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout only *(continued from the previous page)*

	Agency	Requirement Category
	NParks PLANTING AREA SITE BOUNDARY GREEN VERGE	**Provision of Planting Areas** • To provide development boundary lines • To provide existing and proposed road reserve lines • To provide road name(s) and category of existing and proposed roads • To provide planting areas (i.e. 3.0m/5.0m-wide green buffers, 2.0m-wide peripheral planting verges, open-air parking planting areas) in compliance with NParks' Guidelines (Chapter 3) • To ensure planting areas are free from any encroachment, except for allowable minor ancillary structures and landscaping structures as listed in NParks' Guidelines (Chapter 3) • To show the allowable structures within planting areas • To locate fire engine accessways and non-allowable structures outside planting areas • To recess underground structures / services at least 2.0m below planting areas, except for: o Footings of retaining / boundary walls (may encroach up to 0.5m into planting areas) o Services traversing perpendicularly across planting areas • The above information should be provided in 3D format. However, applicants may provide the same information in 2D format with other supporting documents
		New Parks/ Park Connectors/ Promenades • To ensure design is in accordance with NParks specifications (e.g., spatial provision, access points, specific features / elements imposed at planning stage based on NParks planning conditions) • The above information should be provided in 3D format. However, applicants may provide the same information in 2D format with other supporting documents.
		Securing of Land for Parks / Park Connectors use and/or Impact on Neighbouring Parks (e.g., en bloc sites) • To ensure site boundary does not encroach into safeguarded / rezoned parks and park connectors • The above information should be provided in 3D format. However, applicants may provide the same information in 2D format with other supporting documents.
		Green Verges • To provide green verges (consisting of tree planting and service verges) for street work proposals relating to development works and for new road services according to the road category • To locate fire engine accessways outside green verges • Road and Commuter Infrastructure • To comply with greenery provision for covered linkways, bus shelters, pedestrian overhead bridges, depressed road portals, road viaducts/flyovers and retaining walls etc. according to NParks' Guidelines (Chapter 4) • Entrance Culvert Position (at Vehicular Access Points) • To ensure splay corners do not affect green verge provision and roadside trees

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout only *(continued from previous page)*		
	Agency	**Requirement Category**
	URA ROAD SITE SPACE SITE BOUNDARY	**Building Setback from Boundary** • Road Buffer • Common Boundary Setback / Party wall & Planting Strip • Building Setback for Multi-Storey Car Parks (MSCP) • Boundary Setback for Ancillary Structures • Setback requirement for Urban Design areas **Site Layout** • Location of Buildings • Location and scale / size of Communal Facilities (e.g. bin centre, pavilions, BBQ areas) **Site Coverage** • Proposed site coverage

Site Layout, Drainage Reserve		
	Agency	**Requirement Category**
	PUB	**Drainage Reserve** • Location (align to DIP), width Note: Coordinated by the Architect, with inputs from C&S

Site Layout, Landscape Deck		
	Agency	**Requirement Category**
	URA PLANTING AREA PLANTER BOX SPACE	**Landscape Deck** • Height of Deck in relation to Existing Ground levels • Location and General Layout of Deck

Site Layout, Street Works		
	Agency	**Requirement Category**
	LTA ROAD SPACE CULVERT RAMP	**Development Proposal** • To check if project falls within LTA's exemption list and is not required to obtain a clearance from LTA DBC, i.e. LTA in-house project. • To confirm if the development falls within a road structure safety zone (RSSZ).

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout, Street Works (continued from the previous page)		
	Agency	**Requirement Category**
	LTA *(continued from the previous page)* ROAD SPACE CULVERT RAMP	**Connections and Interfaces at development boundary** • To indicate the road level, entrance culvert level, and the proposed development platform level. • For new roads proposed in conjunction with development(s), to develop the development platform level and proposed levels of the development access points based on the vertical alignment of the proposed carriageway (before QP confirms on the development platform level for the design of the foundation / structural works). • To show the gradient of entrance approach. • To indicate the configuration of the proposed access. • To indicate the width and turning radius of the proposed access. • To indicate the provision of tactile tiles. • To indicate any proposed relocation of existing road elements, such as trees, lamp post, signs etc, which may be affected by proposed access. **Vehicular Access Points** • To indicate the levels of entrance culvert and gradient of entrance approach • To indicate the radius of turning road kerb • To show the provision of tactile tiles and shifting of existing road elements (incl. trees, lamp post, signs, etc.) affected by proposed access **Proposed Pick-Up / Drop-Off Points (Within Development): PUDO Layout** • To show the location of the PUDO facility within the development site • To mark out the number of PUDO bays and indicate the queue length • Indicate width and kerb alignment of PUDO points **Proposed Loading / Unloading (Within Development): U/UL Layout** • To show the location of the U/UL facility • To mark out the number of U/UL bays

Use & Intensity		
	Agency	**Requirement Category**
	URA SPACE SITE SITE BOUNDARY	• Land Use / Building Uses - Provide breakdown by use quantum • Gross Plot Ratio / Gross Floor Area computation **Bonus GFA Incentive Schemes:** • Balcony / Recreational / Built Environment Transformation / Others – GFA quantum and % • Documentation to support proposed scheme (if required) **Site Boundary** • Site Area • Land to be Vested for Public Schemes (Drain, Road, Open Space, Park, Cycling Paths) • Land to be Amalgamated / Alienated **Dwelling Units** • Maximum Number • Pre-Application Feasibility Study (together with LTA)

G1 Design Gateway

Legend: Architecture | C&S | M&E | IFC COMPONENT

Vehicle Parking

Agency	Requirement Category

LTA
PARKING LOT
SPACE
RAMP
DRIVEWAY
	Vehicle Parking Provision
	• To comply fully with the prevailing Parking Places (Provision of Parking Places and Parking Lots) Rules and other relevant guidelines of the Authority
	• To ensure that the number of parking lots provided is within the specified range defined by the lower and upper bound requirement. (The Range-based parking provision standard for the various development uses can be found in Annex A of the COP for Vehicle Parking Provision in Development Proposals)
	• To ensure that the geometric dimensions of the parking layout complies with the standard minimum dimensions as stipulated in the COP
	• To provide the details and critical dimensions of the parking layout as stipulated in the COP such as:
	  • Type and size of parking lots
	  • Width of ramps and accessways
	  • Inner turning radius and width of turning paths
	  • Width of parking aisles
	  • Gradient of vehicular ramps
	  • Headroom clearance
	  • Road and traffic arrow markings
	  • Bicycle rack details
	  • Location of EV Charging Station

URA PARKING LOT SPACE	**Parking** • Show location within site • Declare total number and breakdown of types

Others

Agency	Requirement Category
BCA	**Complex Building Requirements** • Pre-submission consultation of structural concept on structural works involving complex building to be carried out during/after Design Gateway (G1) but prior to Piling Gateway (G1.5) or Construction Gateway (G2)
URA	**Urban Design Requirements** • Submission of DA Checklist
	Supplementary Documents • Topo Survey Plan • Previous approved plans (where requested by URA)
	Public Communications Plan (if applicable) Non-Government Land Sales (GLS) Sites • If Public Communications Plan is required, URA will inform at Design Gateway submission, for project team's follow up distribution of flyers to the local community and submission of relevant forms GLS sites • Public Communications Plan requirements, if any, will be clearly set out in the tender conditions. Flyers should have been distributed to the local community, and relevant forms already submitted.

G1 Design Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Others		
	Agency	**Requirement Category**
	URA	**Development Statement of Intent** • Description of proposal (for relevant development types)
		RTS Checklist • Submission of checklist for evaluation
		Environmental Impact Assessment (where required) • If development projects are near to sensitive areas (such as Nature Reserves, Nature Areas, marine and coastal areas, other areas of significant biodiversity) or might have potential trans-boundary impacts, relevant technical agencies (such as the National Parks Board, National Environment Agency, Maritime and Port Authority of Singapore, and Singapore Food Agency) will need to be consulted more extensively to determine if a more thorough environmental study is required. • For affected proposals, URA will provide project teams with further instructions on how to proceed with such consultations.

End of Requirements for Design Gateway (G1)

G1.5 Piling Gateway

Agency	Summary of Piling Gateway Requirements * Piling Gateway is optional	Common Gateway Key Words

BCA	• Piling & Foundation Works IFC+SG model
	• **2D drawings limited to the categories below:**
	  ○ General notes
	• Design calculation reports from QP, AC, [QP(Geo) & AC (Geo), if needed]
	• **Additional supporting documents:**
	  ○ Site investigation report in pdf & AGS format
	  ○ Impact assessment report
	  ○ Topography
	• Complete set of structural framing plan for reference
	• Complete set of building plan for reference
	• Completion letter of pre-consultation [for complex structure only]
		• Structural Design

LTA	**Railway Protection Details (if applicable):** • Plan for engineering works • Engineering evaluation report • Instrumentation proposal • Method statement of work • Emergency procedure • Pre-condition survey report • Certified survey plan, relevant forms etc.	• Impact Studies • Rail Protection • Site Layout
NEA	NIL	NIL
NParks	Applicable to sites requiring Environmental Monitoring and Management Plan (EMMP) / wildlife management plan prior to commencement of works: • No-objection/acceptance prior to site clearance	NIL
PUB	**To apply separately for relevant works where applicable prior to commencement of works:** • Specified activities near water and sewer pipes • Temporary works affect drainage/within drainage reserve etc.	• Public Sewerage System (External)
SCDF	NIL	NIL
URA	NIL	NIL

Piling Gateway Clearances

Works affecting Permanent Structures
- **BCA's ST Approvals for Piling & Relevant Substructure Works**
- **LTA's Approval in-principle (AIP) for Pile Design and Pile Layout Plan (only within the Railway Protection Zone)**

Parallel Processes (Other clearances to be obtained before commencement of respective works)

Site Clearance
- PUB's Approval to Commence Works Requiring Earth Control Measures
- NParks' no-objection for specific sites with environmental mitigation and monitoring plan (EMMP) / wildlife management, prior to site clearance

Commencement of Works
- BCA's Permit to Commence Piling & relevant Substructure Works
- LTA's Rail Engineering Works Permit / Restricted Activity Approval
- PUB's Approval for Works Within Public Sewer / Water Pipe Corridor

G1.5 Piling Gateway

Legend: Architecture C&S M&E IFC COMPONENT

External Works		
	Agency	**Requirement Category**
	LTA, NParks, PUB	For LTA, NParks and PUB's External Works requirements, please refer to Page 178 - 196.

Impact Studies only		
	Agency	**Requirement Category**
	NParks	**Applicable to sites requiring Environmental Monitoring and Management Plan (EMMP) / Wildlife Management Plan prior to commencement of works:** a) Detailed EMMP report (provided by Main Contractor) b) Acceptance letter from NParks prior to site clearance (if applicable)

Impact Studies, Site Layout, Rail Protection		
	Agency	**Requirement Category**
	LTA	**Engineering Assessment for Piling Works within Railway Protection Zone / Railway Corridor** • To submit plan for engineering works • To submit the Engineering evaluation report • To submit the Certified Survey Plans • To submit the Construction schedule for the proposed development Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer / Guide to carrying out restricted activities within railway protection and safety zones for more requirements / detailed description

Lightning Protection		
	Agency	**Requirement Category**
	BCA	**Note: These requirements are currently optional and will only be required for regulatory compliance when LPS plan submission is mandated** • For big projects adopting piles or raft foundation as natural earth-termination system. Provision of rebars for connection to the down-conductor system shall be provided during the piling stage. Notes: • QP (Electrical) to provide inputs for submission by C&S • Developer or Builder is required to appoint a QP (Electrical) to supervise the LPS works before LPS Plan submission is carried out at the Construction Gateway (G2).

G1.5 Piling Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Structural Design		
	Agency	**Requirement Category**
	BCA BEAM BOREHOLE FOOTING / PILECAP PILE SLAB	**Structural Design (Piling and Foundation Works)** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • **Piling & Foundation Works IFC+SG model** • **Ground Investigation:** o Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08 • **2D Drawings limited to:** o General notes o Irregular Pilecap / Footing Details **Design Calculation reports:** • From QP, AC, [QP(Geo) & AC (Geo), if needed)] **Additional Supporting Documents:** a) Site investigation report in PDF & AGS format b) Impact assessment report c) Topography d) Complete set of structural framing plan for reference e) Complete set of building plan for reference f) Completion letter of pre-consultation (for complex structure only)

End of Requirements for Piling Gateway (G1.5)

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 • Materials (e.g. use of glass at height, daylight reflectance) • 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 • Environmental Sustainability • Household / Storey Shelter • Lifts & Escalators • Lightning Protection • Materials • Public / Transit Shelter • Staircase • Statistical Gross Floor Area • Structural • Vehicle 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 **For developments with TIA** The outcomes and recommendations which are approved by LTA under the Part two submission are to be incorporated within the street plans and traffic plans as necessary. This includes the approved required improvements that are beyond the development boundary and any other traffic demand management measures. The final completed and approved TIA report with supporting documents to be submitted	• Impact Studies • Infra & Utilities (External) • Rail Protection • Site Layout • Street Works • Vehicle Parking

See also:
Latest CORENET X Circulars

G2 Construction Gateway

Agency	Summary of Construction Gateway Requirements	Common Gateway Key Words
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: • Refuse Storage and Collection • Sanitary facilities change to Public Toilet • Ventilation, Ducting and Kitchen Exhaust Systems for Food Shop • Cooling Tower • Aquatic Facility • Storage and Collection System for Recyclables at Strata-Titled properties with Residential Units • Anti-Mosquito Breeding • Technical Guidelines for Air Conditioning and Mechanical Ventilation system • SS593: COPPC • SS649: COPWCS	• Dwelling Unit • Equipment • Pollution Control • Public Health
NParks	• Interfacing Aspects (from within Development Boundary) • Dimensions of planting areas and green verges compliant with standard requirements • Review of allowable structures within planting areas and possibly alternative configuration of planting areas • Detailed design of facilities and furniture for new Park/Park Connector/Promenade • Planting requirements/specifications for covered linkways/pedestrian overhead bridges	• Greenery • Site Layout
PUB	**Detailed plans of proposed drainage / sewerage / sanitary works including:** • Works affecting sanitary (e.g. sanitary drainage and plumbing work including last IC connection to public sewer) • Works affecting Sanitary M&E (used water pumping system, sewerage ejector) • Works affecting Sewer (e.g. proposed sewer/manhole, pump sumps/pumping main, abandon sewers/manhole) • RC Trench for housing the public sewer • Works affecting Drainage (e.g. common drain, basement pump drainage system, detention tank, entrance culvert/roadside drain, flood protection measures, slab over drain for meter compartment)	• ABC Waters • Earthworks • Infra & Utilities (Internal)

See also:
Latest CORENET X Circulars

G2 Construction Gateway

Agency	Summary of Construction Gateway Requirements *(continued from previous page)*	Common Gateway Key Words
SCDF	**Building Plan (BP)** Detailed layout and floor plan of the development and building showing: • Fire safety provisions • Means of escape • Structural precautions • Building's setback distances (with detailed calculations) • Fire engine accessibility • Rising mains & hydrants • Type of fire protection systems for every storey/spaces • Mode of ventilation for spaces required ventilation • Type of smoke control systems for spaces required such system • Emergency voice communication system for every storey/spaces	• Access within Building • Equipment • Fire Compartmentation • Fire Fighting • Lifts & Escalators • Materials • Performance-Based project • Staircase • Ventilation
URA	**Detailed layout and floor plan of development including:** • Strata boundaries (for strata-titled developments) • Elevation details • Exact floor area quantum of various uses and facilities • GFA details e.g. proposed exemptions Depending on the location and special schemes that may apply to the site, the model will have to cater to details relevant to urban design and/or conservation requirements	• Access to Site • Access within Building • Attic • Balcony • Basement • Building / Unit Layout • Building Massing • Common Service Tunnel • Connectivity • Conservation • Dwelling Unit • Earthworks / Topography • External Works • Greenery • Landscape Deck • Night Lighting • ORA / ODA / Kiosks • Public Communications Plan • Public Space • Rapid Transit System (RTS) Station • Roofscape • Screening • Signage • Site Layout • Structures in Building Setback • Use & Intensity • Vehicle Parking • Others

See also:
Latest CORENET X Circulars

G2 Construction Gateway

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ABC Waters		
	Agency	**Requirement Category**
	PUB	**ABC Waters Design Features** • Hydraulic calculations for the ABC Waters design features, endorsed by an ABC Waters Professional who is a PE (Civil). The calculation shall be -accompanied by completed relevant design templates in Excel format, available on the PUB website. • Design drawings and maintenance checklists endorsed by an ABC Waters Professional of any profession. For systems that include ABC Waters design features for peak runoff management, the detailed design, including detention volume to be provided, as endorsed by the ABC Waters Professional (who is also a PE(Civil)) shall be submitted

Access to Site		
	Agency	**Requirement Category**
	BCA ACCESSIBLE ROUTE SLAB RAMP STAIRCASE	• Passenger Alighting and Boarding Point • Accessible Route (to the development entrance)
	URA ROAD SPACE	**Site Layout** • Detailed location of Pedestrian, Cycling, Vehicular and Service Access

Access within Building only		
	Agency	**Requirement Category**
	BCA ACCESSIBLE ROUTE SLAB RAMP STAIRCASE	• All Accessible Routes and associated clear Spaces (within the development) • Accessible and elder-friendly rooms where relevant • Seating and eating spaces for wheelchair users • Resting areas for the ambulant disabled • Location of hearing enhancement systems
	URA SPACE	• Corridor Width

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Attic

Agency	Requirement Category
URA SPACE	• Design of attic • Location of attic in relation to strata unit

Balcony

Agency	Requirement Category
URA SPACE	**Balconies, Private Enclosed Spaces, Private Roof Terraces and Indoor Recreation Spaces** • Balcony screening design illustrating openness and porosity for natural ventilation
	Bonus Balcony GFA • Letter of Declaration from Developer on Balcony Screen Design and Provision

Barrier

Agency	Requirement Category
BCA RAILING	• Safety from falling (ie. safety barrier height, size of any openings, kerb) • Protection from injury by vehicles in building (e.g. provision of bollards)

Buildability and Productivity

Agency	Requirement Category
BCA	**Buildability Detailed Design and Implementation Plan (BDIP)** • BIM model which describes and defines the type, extent of use and details of the Design for Manufacturing (DfMA) technologies, building systems, building components, buildable features and design standardisation across the Structural, Architectural and Mechanical, Electrical and Plumbing (MEP) systems • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Buildable Design Score (B-Score)** a) BS01 Form (in Excel format) to be submitted **Productivity Concept Implementation Plan (PCIP)** • BIM model which describes and demonstrates the types, extent of use and details of the construction methods, construction systems, construction processes, construction management, buildable features and innovative features to be implemented for the building works, for the purpose of achieving site productivity improvement • Where any of the above cannot be modelled in BIM, 2D plans can be submitted

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Legend: Architecture C&S M&E IFC COMPONENT

Buildability and Productivity *(continued from previous page)*

Agency	Requirement Category
BCA	**Integrated Digital Delivery (IDD) Implementation Plan** • Plan that describe the types, extent of use and details of the integrated digital delivery essential use cases to be adopted in respect of the building works, for the purpose of enabling the digital integration of work processes

Building / Unit Layout

Agency	Requirement Category
URA BUILDING STOREY	**Unit / Floor Layout (All)** • Floor layout and unit size • Strata areas and boundaries / voids
	Dwelling Units (Residential) • Breakdown of units by type / size • Unit layouts with breakdown of respective internal areas including balconies and air-con ledges

Building Facade

Agency	Requirement Category
URA	**Design Treatment for Building Facade** • Illustrate design using perspectives • Screening details of M&E equipment / multi-storey carpark, where required

Building Envelope

Agency	Requirement Category	
BCA	**ETTV** • ETTV computation & tabulation of design parameters in the prescribed forms & formats; • Architectural elevation drawings showing the composition of the different façade or wall systems that are relevant for the computation of the ETTV; and • Architectural plan layouts & elevations showing the mode of ventilation & location for various spaces incl. air-conditioning areas.	**RTTV and Roof U-value Computation** • RTTV computation for roofs with skylight in prescribed forms and formats, where relevant; • Architectural plan layout and sectional details of different roof types as well as the roof composition and respective U-values; and • Technical material or product information and relevant calculation of U-value of the roof
	ETTV / RETV Calculation Format in respect of an Air-conditioned Building (BPD_BP04): https://www1.bca.gov.sg/docs/default-source/docs-corp-form/bp04.doc	

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Legend: Architecture C&S M&E IFC COMPONENT

Common Services Tunnel		
	Agency	**Requirement Category**
	URA	• Detailed Work sequence of CST vent shaft/entrance integration • Link chamber services connection layout and structural details including supporting structures • Ventilation shaft/entrance details including louvres/screening details and supporting structures • Waterproofing details

Connectivity		
	Agency	**Requirement Category**
	URA DISTRIBUTION CHAMBER WATER METER PARKING LOT SPACE FOOTPATH	**Pedestrian Network** Through Block Link (TBL), Underground Pedestrian Link(UPL), Elevated Pedestrian Link (EPL), Covered Walkways (CW), Open Walkways (OW), Covered Linkways (CL), High Covered Linkways (HCL) • Loading provision to receive future walkways / linkways (if any) • Notional scheme for future link to justify the loading (recipient) Additional requirements for the following: • (CW) Soffit height, overall width and clear width • (OW/CW) Paving material (where required in UD guidelines) • (OW/CW) Level of bulk water meter chamber / inspection chamber • (TBL) Location and Size of Signage • (HCL) Flashing to prevent wind driven rain
		Walking and Cycling Plan • Connectivity between buildings – show layout on plans, indicate width and levels • Segregation between vehicular and pedestrian / cyclist traffic • Provision of biking lots and end-of-trip facilities – show location and GFA exemption

Conservation		
	Agency	**Requirement Category**
	URA	Refer to URA Conservation Requirements here

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Dwelling Units		
	Agency	**Requirement Category**
	BCA	• Bathrooms for future retrofitting • Design of unit entrance for wheelchair users

Earthworks / Topography		
	Agency	**Requirement Category**
	PUB	• Slope calculation report
	URA WALL EARTHWORKS	**Earthworks, Retaining Walls, and Boundary Walls** • Proposed site and platform levels • Earthworks • Boundary wall • Retaining wall

Emergency Voice Communication System		
	Agency	**Requirement Category**
	SCDF SPACE	**Emergency Voice Communication System and Fire Command Centre** • Declaration of one-way / two-way emergency voice communication system for the functional space

Environmental Sustainability		
	Agency	**Requirement Category**
	BCA	**For Code for Environmental Sustainability of Buildings**: To submit the following: i. BC ES Appendix 1 for **Construction Gateway** https://go.gov.sg/bc-es-app1 ii. Documentary Evidence for all applicable base requirements, specifically for NRB02 air tightness and leakage as well as NRB06 maintenance of building cooling system performance. iii. ACMV plan (for NRB02 and NRB06) drawing showing the requirement compliance. in BIM. Where any of the above cannot be modelled in BIM, 2D plans can be submitted. Guidance Notes and Documentation Requirements under Code for Environmental Sustainability of Buildings: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda
		For Government Land Sales (GLS) programme requirement: Refer to the following link: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda/mandatory-higher-green-mark-standard

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Environmental Health

Agency	Requirement Category
NEA INTERCEPTOR PUMP SANITARY APPLIANCES GUTTER TANK SYSTEM SPACE REFUSE HANDLING EQUIPMENT SENSOR SHADING DEVICE CONTROL ELEMENT REFUSE CHUTE / RECYCLABLES CHUTE DISTRIBUTION CHAMBER	**COPEH - Section 1 : Refuse Storage and Collection** The spatial provision set aside for Pneumatic waste conveyance system (PWCS) cleared at Design Gateway (G1) must continue to be provided at CG. Applicants are required to furnish details regarding their proposals, building upon the spatial provisions previously submitted at DG. 1.1 Objective 1.2 Refuse Output 1.3 Refuse Chute 1.4 Refuse Chute Chamber 1.5 Refuse Room 1.6 Refuse Bin Point and Refuse Bin Centre 1.7 Pneumatic Waste Conveyance System (PWCS) 1.8 Mandatory Waste Reporting Scheme 1.9 Location of Grease Trap 1.10 On-Site Food Waste Treatment System Note: PWCS • The QP shall provide the PWCS design layout details at CG to demonstrate that sufficient space has been catered for the installation of PWCS pipe/equipment and that the parameters stated in SS 642:2019 are met • Where the PWCS details are not ready at CG, the QP shall submit a declaration that the PWCS design will fully comply with SS 642:2019. A conditional approval will then be granted at CG. For such cases, requests to waive the SS 642: 2019 requirements for reasons such as lack of space or room height will not be granted • If conditional approval is granted at CG, the QP shall submit and clear the full PWCS details as an independent submission for clearance not later than 6 months from CG clearance. The installation of the PWCS shall only commence after NEA's clearance is granted. Failure to meet the above conditions will lead to a delay in the commencement of installation of PWCS which may potentially affect the overall project completion timeline **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
	COPEH - Section 2 : Public Toilet 2.1 Objective 2.2 Definition of Public Toilet 2.3 General Design Criteria 2.4 Sanitary and Water Fittings Required in Public Toilet 2.5 Amenities to be Provided 2.6 Ventilation **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
	COPEH - Section 3 : Ventilation, Ducting and Kitchen Exhaust Systems for Food Shop 3.1 Objective 3.2 Design Requirements 3.3 Operations Requirements 3.4 Other Requirements and Guidelines **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). Terminals and façade louvres are to be modelled. Ducting can be in 2D or 3D. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Environmental Health *(continued from previous page)*

	Agency	Requirement Category
	NEA *(continued from previous page)*	**COPEH - Section 4 : Cooling Tower *(when it is provided)*** 4.1 Objective 4.2 Design Requirements **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPEH - Section 5 : Aquatic Facility 5.1 Objective 5.2 Minimum Design Criteria **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). Balancing Tank is to be modelled. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPEH - Section 6 : Storage and Collection System for Recyclables at Strata-Titled properties with Residential Units 6.1 Objective 6.2 Recyclables Output 6.3 Designated Recycling Points for Recycling Receptacles 6.4 Recyclables Chute System **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPEH - Section 7 : Anti-Mosquito Breeding 7.1 Objective 7.2 Roof Gutter 7.3 Air-Conditioning Tray 7.4 Floor Trap **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Exit

	Agency	Requirement Category
	SCDF STAIRCASE SPACE	**Means of Escape** • Compliance of adequate means of escape: ○ Adequate provision of exit staircase, exit door & exit access door ○ Capacity of exits and occupant load calculation ○ Requirements of Internal & external exit staircase ○ Remoteness of exit ○ Travel distance ○ Smoke-free approach to exit staircase ○ Discharge of exit staircase ○ Ventilation of exits ○ Staircase re-entry • Compliance of special requirements for Person With Disabilities (PWDs) are provided: ○ Provision of PWD holding point unless otherwise exempted ○ Siting of PWD holding point ○ Protection of PWD holding point

Exit Sign and Emergency Lighting

	Agency	Requirement Category
	SCDF SECURITY LIGHTING SIGNAGE	**Exit Sign (incl. low level signs), Emergency Lighting, Photoluminescent Lighting** • Types of buildings / areas, and locations require exit sign, photoluminescent lighting & emergency lighting

External Works

	Agency	Requirement Category
	URA FOOTPATH	• Design treatment for public street lighting, bollards, tactile tiles (UD requirement for CBD / Marina Bay)
		• Promenade Guidelines (UD requirements for Singapore River)
		• Paving Guideline for Orchard, Downtown Core and the Civic District (OW) Paving material
	LTA, NParks, PUB	For LTA, NParks and PUB's External Works requirements, please refer to Page 178 - 196.

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Fire Alarm System *(continued from previous page)*

Agency	Requirement Category
SCDF FIRE ALARM BREECHING INLET SPRINKLER WATER TANK VALVE SYSTEM SPACE	**Automatic Fire Alarm (Heat / Smoke Detector)** • Types of buildings / usage require provision of automatic fire alarm • Type of buildings/ usage exempt from provision of automatic fire alarm • QP to declare automatic fire alarm system is provided for the functional space Components to be indicated: o Fire Alarm Panel
	Combined Sprinkler and Wet Riser System • Types of buildings / areas allow combined sprinkler and wet riser system • QP to declare combined sprinkler and wet riser system is provided for the functional space Components to be modelled: o Location of Sprinkler Control Valve o Breeching Inlet (2-way or 4-way) o Landing Valve o Fire alarm panel
	Home Fire Alarm Device (HFAD) • Types of building require HFAD • QP to declare Home Fire Alarm Device is provided for the functional space • Compliance of location and number of HFAD points
	Manual Alarm System • Types of building / usage require manual call points • QP to declare manual alarm system is provided for the functional space Components to be modelled: o Manual alarm call points o Fire alarm sounder o Visual alarm device o Fire alarm panel
	Sprinkler System • Types of buildings / usage require sprinkler system • Types of buildings / usage exempt from provision of sprinkler system • Provision of sprinklers for basement and aboveground buildings • QP to declare sprinkler system is provided for the functional space Components to be modelled: o Location of sprinkler control valve o Breeching inlet (2-way or 4-way) o Fire alarm panel
	Video Image Fire Detection System (VIFDS) • Types of buildings require VIFDS • QP to declare video image fire detection system is provided for the functional space

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Fire Alarm System *(continued from previous page)*

Agency	Requirement Category
SCDF FIRE ALARM BREECHING INLET SPRINKLER WATER TANK VALVE SYSTEM SPACE	**Water Mist System** • Compliance of requirements for water mist system as a substitute of sprinkler system • QP to declare water mist system is provided for the functional space

Fire Lift

Agency	Requirement Category

SCDF	**Fire Lift**
	• Compliance of buildings (other than PG I & II) provided with at least two fire lifts on every storey when habitable height exceeds 24m
	• Basement exceeding 9m shall be provided with at least 2 fire lifts (other than PG I)
	• Compliance of one fire lift for PG II buildings exceeding 24m.
	• Compliance of two fire lifts for PG II super hig-rise building exceeding 40 storeys.
	  ○ Compliance of fire resistance rating for lift shaft
	  ○ Fire lift to serve continuous throughout the building, including basements
	  ○ Distance between fire lift landing door and exit staircase not exceeding 5m & 10m (applicable to PG II discharge floor only)
	  ○ Fire lift to be accessible to any part of the storey
	  ○ 60m coverage for fire lift (except PG I & II)

Firefighting System

Agency	Requirement Category

SCDF
LIFT
HOSEREEL
VALVE
SYSTEM
SPACE
	Evacuation Lift
	• Evacuation lift for evacuation of occupants to be modelled for building with habitable height exceeding 24m (except PG 1 & 2):
	  ○ Can double-up as PWD evacuation lift
	  ○ One of fire lifts can be used as evacuation lift
	  ○ Provision of means of communications & CCTVs
	  ○ Provision of evacuation switch
	• Evacuation lift for evacuation of PWD to be modelled for buildings more than 4 storey:
	  ○ At least one evacuation lift required, passenger lift can be used as evacuation lift
	  ○ Provision of protected lobby

FIRE HYDRANT BREECHING INLET FIRE EXTINGUISHER	**Fire Hydrant** • Indication of private and public hydrant serving the project • Hydrant coverage not more than 50m from the fire engine accessway / access road Components to be modelled ○ Full design of private/public hydrant, excluding underground piping.  Private hydrant  Public hydrant

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Firefighting System *(continued from previous page)*	
Agency	**Requirement Category**
SCDF *(continued from previous page)* LIFT HOSEREEL VALVE SYSTEM SPACE FIRE HYDRANT BREECHING INLET FIRE EXTINGUISHER	**Hose Reel** • Compliance of provision of hose reel • Number of hose reel • Coverage of hose reel (30m+6m) • Types of buildings / areas require provision of hose reel • Types of buildings / areas exempt from provision of hose reel • Siting of hose reel Components to be modelled • Hose reel cabinet/enclosure. • Hose reel drum with hose can be represented by object • Need not model the piping for hose reel **Portable Fire Extinguisher** • Types of buildings / areas require portable extinguisher • Types of buildings / areas exempt from provision of portable extinguisher • Siting of portable extinguisher **Rising Mains and System** • Type of rising main provided (Dry or Wet) • Number of rising main • Siting and coverage of landing valve Components to be modelled for Dry and Wet Riser: o Breeching inlet (to show 2-way or 4-way) o Landing valve o Wet riser tank (for wet riser only) o Wet riser pump (for wet riser only) Provision of Standby Fire Hose: o Types of buildings requiring standby fire hose o Number of standby hose o Located not more than 2m from landing valve Standby hose need not be modelled in full, the cabinet/enclosure for standby hose if provided shall be modelled in full. Provision of Breeching Inlet: o Location o Number

Greenery	
Agency	**Requirement Category**
NParks LANDSCAPE PLANTS	**Conservation of Trees** • To conserve trees identified: o In Technical Conditions of Tender (TCOT) o As Heritage Trees o Through public engagement o In Environmental Impact Assessments (EIA) / Environmental Management and Monitoring Plans (EMMP) etc. **Supporting Document(s):** a) Arborist report (Please refer to NParks' Guidelines [Chapter 2])

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Greenery *(continued from previous page)*

Agency	Requirement Category
URA PLANTER BOX PLANTING AREA SPACE LANDSCAPE PLANTS	• Landscape Replacement Area – Provide Green Plot Ratio and total % of landscape replacement, with breakdown of hardscape and softscape • Declare Location of Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions **Supplementary Documents** a) Landscape plan / species and perspectives b) Plant details of sky terrace / planter boxes / covered communal ground garden / communal pavilions

Headroom and Ceiling Height

Agency	Requirement Category
BCA	• Headroom of every room, access route and circulation areas • Ceiling height of rooms and spaces

Household / Storey Shelter (HS/SS)

Agency	Requirement Category	
BCA	**Architecture** Compliance with technical requirements on HS/SS position, area, volume, setback requirements, SS compartmentalization, HS/SS wall requirements, HS/SS door and SS blast hatch requirements, shielding wall requirements, HS/SS ventilation sleeve requirements, NS requirements, voids within HS/SS setback distance, downhang beam and trellis requirements, service risers & gas risers & refuse chute requirements, electrical power sockets outlets, telephony outlets and lighting points. Where any of the above cannot be modelled in BIM, 2D plans can be submitted	**C&S** • Compliance to structural requirements stipulated in technical requirements on household shelters and storey shelters. Where any of the above cannot be modelled in BIM, 2D plans can be submitted
	Supporting Documents: a) Submit HS/SS Shock Calculations as supplementary non-BIM documentation	

Impact Studies only

Agency	Requirement Category
LTA	**Building Proposal within Railway Protection Zone/ Railway Corridor** • To submit plans for building works. • To submit the Engineering Evaluation Report accompanied by plan for engineering works. • To submit the Construction Schedule for the proposed development. Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer for more requirements/ detailed description

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies only *(continued from previous page)*

	Agency	Requirement Category

	NEA	**Energy Efficiency Opportunities Assessment (EEOA) for New Ventures**
		
		EEOA will be required for new industrial facilities and major expansions of existing facilities with an estimated annual energy consumption (AEC) ≥ 54TJ must review the facility design and develop economically feasible for energy efficiency opportunities.
		• A **complete** EEOA-NV full-report should be submitted as early as possible directly via the Emissions Data Monitoring and Analysis System (EDMA) and NEA's clearance is required prior to CG clearance
		• NEA may grant conditional approval for incomplete reports in order not to hold back the CG submission. Companies should submit to NEA their incomplete reports together with the request citing the reasons for seeking conditional approval. The request must be endorsed by the company's senior management. Justifiable reasons for seeking conditional approvals include but are not limited to the following:-
		  ○ Production output information, which is needed to determine the specific energy consumption of major energy consuming systems, has yet to be determined
		  ○ Detailed equipment specifications, which are needed for carrying out cost benefit analysis of energy efficiency opportunities, cannot yet be determined
		• Requests should be sent to nea_vo@nea.gov.sg. NEA will assess the request and respond to the company within 14 working days. If conditional approval is granted, NEA will require the company to submit and clear the EEOA-NV full-report no later than 6 months from CG clearance. TOP/CSC for the company will be granted only after NEA approves the EEOA-NV full-report

		Pollution Control Study (PCS) Any proposed industrial development that could cause serious or substantial pollution of the environment, if mismanagement, is required to conduct a Pollution Control Study (PCS) • For technical guidance on PCS, refer to https://www.nea.gov.sg/our-services/development-control • QPs are to submit the full PCS report at CG for clearance to ensure that recommended mitigating measures, if required, are considered before construction commences • Where the full PCS report is not submitted and cleared at CG, the QP shall submit a declaration that the design will fully comply with pollution control-related requirements stated in Singapore Standard SS593 on Code of Practice for Pollution Control and relevant statutory legislation. A conditional approval will then be granted at CG. In such cases, requests to waive SS593 requirements for reasons such as structural or space limitations will not be granted • If conditional approval is granted at CG, the QP shall submit and clear the full PCS report no later than 6 months from CG clearance. TOP/CSC for the development will be granted only after NEA approves the full PCS report Note: To submit a PCS report, please send it to DCLD_consultation@nea.gov.sg
		Quantitative Risk Assessment (QRA) Anyone intending to store or use hazardous substances will have to pre-consult MOM-MHD whether a QRA assessment is required. • Companies and their QRA consultants shall submit the QRA report to MOM (Major Hazards Department) via contact_MHD@mom.gov.sg • For more information on the preparation of QRA reports, companies can refer to the following link within NEA's website (https://www.nea.gov.sg/our-services/development-control) for the list of registered QRA consultants, and QRA submission, technical and criteria guidelines • To prevent a situation where rectifications become impractical to implement, approval of the QRA report findings must be obtained prior Construction Gateway clearance
	NParks	*Applicable to sites not requiring Piling Gateway (G1.5) approval* **Applicable to sites requiring Environmental Monitoring and Management Plan (EMMP) / Wildlife Management Plan prior to commencement of works:** a) Detailed EMMP report (provided by Main Contractor) b) Acceptance letter from NParks prior to site clearance (if applicable)

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies, Site Layout, Rail Protection		
	Agency	**Requirement Category**
	LTA	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** • To submit plan for engineering works • To submit the Engineering evaluation report • To submit an Instrumentation Proposal and initial instrumentation readings • To submit a Method Statement of work • To submit a Hazard Analysis identifying all possible risks that may be posed to the rapid transit system and a description of the safety and precautionary measures to mitigate these risks • To submit the Contingency Plan and Emergency Procedure • To submit the Pre-condition Survey Report • To submit the Certified Survey Plans • To submit the Permit application form and other relevant forms • To submit the Construction schedule for the proposed development Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer / Guide to carrying out restricted activities within railway protection and safety zones for more requirements / detailed description

Infra & Utilities (Internal)		
	Agency	**Requirement Category**
	PUB INSPECTION CHAMBER PUMP INTERCEPTOR WASTE TERMINAL SYSTEM VALVE TANK (STORAGE) SPACE DRAINS	**Sanitary Network** • Drain-lines, Inspection Chamber, Used Water Pump System, Discharge Lines, etc. • Sanitary Stack System • Retention Tank • RC Trench **Sewer Network** • Minor Sewer (when applicable)

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Infra & Utilities (Internal) *(continued from previous page)*		
	Agency	**Requirement Category**
	PUB INSPECTION CHAMBER INTERCEPTOR SYSTEM TANK (STORAGE) DRAINS PUMP WASTE TERMINAL VALVE SPACE	**Drainage Network** **Detention Tank/Basement Pumped System** • May model a box as a placement holder. Details is to be drawn by Specialised PE • C&S: Effective tank capacity and other hydraulic details associated with the tank • M&E: For pumped detention tank, M&E to provide pump details **Internal Drains** • Location, width, Gradient • Discharge point • Top level, invert level Supplementary Documents (can be supplemented via 2D documents) **Basement Pumped Drainage System/ Detention Tank** • Plans and sections showing details of tanks and pumps, e.g., effective water depth, invert of incoming and outgoing pipes, connection to internal drains, location and invert level of swan neck, orifice size. • Standard Operating Procedure details, which includes Operation Sequence, Monitoring measures, Maintenance plan • Design Calculation **Flood Barrier/Flood Gates** • Plans and sections showing location, size, type and top level of flood barrier, platform levels (including crest level) of the development, top level of the development boundary wall • Standard Operating Procedure details, which includes Operation Sequence, Monitoring measures, Maintenance plan **Internal Drains** • Hydraulic Calculation
		Proposed Treatment of Common Drain • Longitudinal / sectional profile • Side gates

Lifts and Escalators		
	Agency	**Requirement Category**
	BCA	• Lift and Escalator Provision (Number) • Location of passenger and Accessible Lifts (including platform and stair lifts) • **2D Drawings limited to:** ○ Buttons, Handrail, Marking of Maneuvring Space

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Lightning Protection		
	Agency	**Requirement Category**
	BCA	**Note: These requirements are currently optional and will only be required for regulatory compliance when LPS plan submission is mandated** **2D Drawings** • Location of air-termination system, down conductors, earth electrodes • Zone of lightning protection provided by the air-termination network for open roof spaces and the sides of the building • Location of the points where there is equipotential bonding between the air-termination system, down-conductor system and earthed termination system; and • Location of the points where there is equipotential bonding of the lightning protection system to electrically conductive parts of the building except M&E services. **Supporting Documents:** a) Material specification, photo, ppt, excel, words, etc. should be submitted

Materials		
	Agency	**Requirement Category**
	BCA	• Use of Glass at height • Daylight Reflectance

Mechanical Ventilation & Smoke Control System		
	Agency	**Requirement Category**
	SCDF SPACE	**QP to declare at those functional space which are provided with the following Ventilation System(s):** • Natural ventilation (NV) • Mechanical ventilation (MV)* • Pressurisation* • Cross-ventilation • Cross-ventilation with intermediate - ventilation opening • Vapour extraction system (spray painting booth) *Note: Details to be provided and submitted by M&E in Mechanical Ventilation (MV) Plan under Independent Submissions*

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Night Lighting		
	Agency	**Requirement Category**
	URA	**Night Lighting Report** • Detailed concept and renders • Specifications • Fixture installation

ORA / ODA / Kiosks		
	Agency	**Requirement Category**
	URA	• Location and extent, detailed design

Performance Based Projects		
	Agency	**Requirement Category**
	SCDF	**For projects with Performance-Based approach** QP to submit 2-D plans clearly indicating the rooms/spaces to be approved in Performance-Based submission. **Performance-Based (PB) Plan Approval Process** • For approval process, refer to https://www.scdf.gov.sg/home/fire-safety/plans-and-consultations/performance-based-approach-to-fire-safety-design/performance-based-plan-approval-process. • In general, FEDB IPA should be obtained before CG submission and FER should be submitted together with Building Plan during CG submission. This approach strives to minimise any major reworks in the later stages of development. For complex cases in which the FEDB IPA could not be obtained before CG submission, the CG submission may still proceed with the following conditions: • While the CG submission may proceed concurrently with the FEDB review, the FEDB IPA will need to be obtained before issuance of CG clearance. • If the project team is not ready with the FER during CG submission, the QP will need to exclude the affected PB fire safety works from the application and declare that no affected PB fire safety works would be carried out until FER approval is obtained. The FER should subsequently be submitted as an amendment to CG to obtain approval for the relevant PB fire safety works.

Pollution Control		
	Agency	**Requirement Category**
	NEA	**COPPC - Section 2 : Judicious Siting of Industries and Other Development** 4. Objective **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2). **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Pollution Control *(continued from previous page)*		
	Agency	**Requirement Category**
	NEA *(continued from previous page)*	**COPPC - Section 3 : Requirements for Industries** 5. Clean Industry 6. Light Industry 7. General Industry 8. Special Industry **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPPC - Section 4 : Requirements to Operate a Factory 9. Use of Industrial premises 10. Trade effluent discharge into public sewer and watercourse **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPPC - Section 5 : Pollution Control Requirements • 11. Water Pollution • 12. Air Pollution • 13. Noise Pollution **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		COPPC - Section 6 : Hazardous Substances and Toxic Industrial Waste Control Requirements • 14. Hazardous Substances • 15. Toxic Industrial Waste **When to apply:** • Applicants should provide the above information (either in 2D, 3D or supporting documents) and should be concluded by Construction Gateway (G2) **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

Public Space		
	Agency	**Requirement Category**
	URA SPACE	**Privately-Owned Public Spaces (POPS):** • Area verging of POPS • Seating (design, no., location) • Amenities (type, location) • Signage (design, location) • Outdoor Refreshment Areas (ORA) (if provided, location / extent)

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Public/Transit Shelter (PS/TS)

Agency	Requirement Category	
BCA	**Building Plan (Architecture)** The following shall be clearly illustrated in the submission: - Entrance area layout leading from opening at ground level (or elsewhere) to the EHD and PT door, including firemen staircases and exit routes. - Strike point lines and distance measured between strike points and the EHD/PT doors. - All wall and slab thickness - All air shafts and bomb pit layouts with dimensions, from opening at ground (or elsewhere) to the plantroom interface. - Location and demarcation of all dry toilet areas, net areas occupied by each cluster of dry toilets, cubicles, floor trap etc. - Demarcate net shelter area at each level, indicate the calculated areas and shelter size category in the plans. - Blast, blast and gas, and gas protected walls and slabs shall be highlighted with differentiated hatching and/or colours in a consistent manner.	**Structural Plan (C&S)** The following shall be clearly illustrated in the submission: - Entrance area layout leading from opening at ground level (or elsewhere) to the EHD and PT door, including firemen staircases and exit routes. - Strike point lines and distance measured between strike points and the EHD/PT doors. - Line load design and reinforcement details for support structures of CD doors. - All RC wall and slab thicknesses

Roofscape

Agency	Requirement Category
URA	• Screening details of M&E equipment, where required • Use of RC Flat Roofs – Indicate whether roof is accessible, and if so, for what purpose • Structures (If any)

Rapid Transit System (RTS) Station

Agency	Requirement Category
URA SPACE SITE SITE BOUNDARY ACCESSIBLE ROUTE	**Urban Design Requirements** • Design and location of at-grade bicycle parking **Draft Development Interface Report** • For works interfacing with existing / future connection • Architectural information for future developer (e.g. fire safety requirements; Knock Out Panels (KOP)) • Structural information for future developer (e.g. Loading requirements) • Mechanical and Electrical (M&E) information for future developer (e.g. ventilation shaft location and throw) • Details of Loading Provision Note: Coordinated by Architect, with inputs from respective engineers

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Signage		
	Agency	**Requirement Category**
	URA	**Privately-Owned Public Spaces (POPS), Through Block Link (TBL) Signage** • Location and size of signages

Site Layout only		
	Agency	**Requirement Category**
	NParks PLANTING AREA GREEN VERGE	**Provision of Planting Areas / Green Verges** • To ensure dimensions of planting areas are compliant with NParks Guidelines (Chapter 3) or as approved by NParks during Design Gateway (G1)
	URA SITE BOUNDARY SITE	**Building Setback from Boundary** • Setback for Building Appendages – Location and width • Treatment for non-compliant Multi-Storey Car Parks and Ancillary Structures

Site Layout, Basement		
	Agency	**Requirement Category**
	URA SITE	**Basements** • Basement protrusion (if any) and location within site • Screening of basement opening

Site Layout, Landscape Deck		
	Agency	**Requirement Category**
	URA PLANTING AREA PLANTER BOX SPACE LANDSCAPE PLANTS	**Landscape Deck** • Exposure of Basement Wall & Proposed Treatment (Berm / Vertical Greenery) • Site Coverage on Landscape Deck – declare % • Provision of Greenery on Deck – Location and % • Boundary Wall Porosity – declare % and show design

Site Layout, Security Screening		
	Agency	**Requirement Category**
	URA	**Security Screening (where required)** • If the site falls within a special control area, it will need to comply with security screening requirements, if any

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Site Layout, Street Works

Agency	Requirement Category
LTA CULVERT RAMP ROAD	**Access Point Details** • Structural details of entrance culvert at access points (reinforcement, connection to entrance approach etc.) • Levels, gradient, cross-fall • Redundant access to be sealed and reinstated to match existing side-table
	Proposed Pick-Up / Drop-Off Points (Within Development): PUDO details • All details presented at Design Gateway (G1) stage
	Street Works Deposit • For private developments with proposed major road infrastructure works (e.g. new streets, major improvement of an existing street, POB, UPN), an amount to be deposited with LTA for the execution and completion of the proposed street works

Site Layout, Vehicle Parking

Agency	Requirement Category

LTA
RAMP
ROAD
PARKING LOT
	Vehicle Parking Provision
	• To provide the details and critical dimensions of the parking layout such as:
	  ○ Type and size of parking lots
	  ○ Width of ramps and accessways
	  ○ Inner turning radius and width of turning paths
	  ○ Width of parking aisles
	  ○ Gradient of vehicular ramps
	  ○ Headroom clearance
	  ○ Road and traffic arrow markings
	  ○ Bicycle rack details
	  ○ Location of EV Charging Station

Site Planning & External Firefighting Provisions

Agency	Requirement Category
SCDF WINDOW ROAD SPACE SIGNAGE	**Fire Access Opening** • Compliance of provision of fire access opening • Location, signage & size • Number and position of access opening • Exemption of fire access opening

	Fire Command Centre (FCC)
	• FCC shall be provided if building requires:
	  ○ Fire lift
	  ○ Emergency voice communication system
	  ○ Engineered smoke control system
	• Size and Location of FCC
	• Ventilation system for FCC
	• Supporting equipment allow in FCC

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Site Planning & External Firefighting Provisions *(continued from previous page)*		
	Agency	**Requirement Category**
	SCDF *(continued from previous page)*	**Fire Engine Accessway / Access Road** • Compliance of fire engine access road requirements of PG I to VIII and mixed-use buildings: o Indicate road serving as fire engine access road within the project boundary. To indicate on plan if public road is used as fire engine access road. o Compliance of width, turning radii/ facilities, design load capacity, gradient, overhead clearance. o Marking and signpost along fire engine access road. o Compliance of no obstruction along fire engine access road o Basement: Compliance of fire engine access road within a travel distance of 18m to the entrance of all exit staircases where landing valves (dry or wet riser) are provided. • Compliance of fire engine accessway requirements for PG II to VIII and mixed-use buildings: o Indicate road serving as fire engine accessway within the project boundary. To indicate on plan if public road is used as fire engine accessway. o Compliance of width and length of fire engine accessway. To submit separate calculations for the required length of fire engine accessway o Compliance of turning radii/ facilities, design load capacity, gradient, overhead clearance o Marking and signpost along fire engine accessway o Compliance of no obstruction along and above fire engine accessway o Basement: Compliance of fire engine accessway within a travel distance of 18m to the entrance of all exit staircases where landing valves (dry or wet riser) are provided.

Smoke Control System declaration		
	Agency	**Requirement Category**
	SCDF	**QP to declare at those functional space which are provided with the following smoke control System(s):** • Ductless Jet Fan System ^ • Engineered Smoke Control System^ • Smoke Purging System^ • Smoke vent ^: Details to be provided and submitted by M&E QP in Mechanical Ventilation (MV) Plan under Independent Submissions.

Staircase		
	Agency	**Requirement Category**
	BCA STAIRCASE RAILING	• Minimum Width, • Tread and Riser, Handrail / Railing

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Statistical Gross Floor Area (SGFA)		
	Agency	**Requirement Category**
	BCA	SGFA refers to the total floor area of a building, regardless of the usage of the space. Details of SGFA computation can be found in the SGFA Form BCA-BP-SGFA. The updated SGFA Form can be downloaded at https://go.gov.sg/sgfa. • Provision of General Building SGFA for below and above sublevels. • Provision of Specified Building SGFA for below and above sublevels. • Form BCA-BP-SGFA **Additional Supporting Documents:** Where any of the above SGFA cannot be modelled in BIM, 2D SGFA plans can be submitted : **Site Plan** – SGFA Table with information on SGFA for General Building and Specified Building at below sublevel and above sublevel. For amendment plan, SGFA Table should include SGFA (Approved), Changes (+/-) and SGFA (Proposed). **Floor Plan** – To indicate General and Specified Building SGFA at below sublevel and above sublevel.

Structural Design		
	Agency	**Requirement Category**

	BCA
	BOREHOLE PILE
	FOOTING / PILECAP SLAB
	BEAM COLUMN
	STAIRCASE WALL
		Structural Design (Piling and Foundation Works)
		
		Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
		
		• **Piling & Foundation Works IFC+SG model**
		• **Ground Investigation:**
		  ○ Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08
		• **2D Drawings limited to:**
		  ○ General notes
		  ○ Irregular Pilecap / Footing Details
		
		Design Calculation Reports:
		a) From QP, AC, [QP(Geo) & AC (Geo), if needed)]
		
		Additional Supporting Documents:
		a) Site investigation report in PDF & AGS format
		b) Impact assessment report
		c) Topography
		d) Complete set of structural framing plan for reference
		e) Complete set of building plan for reference
		f) Completion letter of pre-consultation (for complex structure only)

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Structural Design *(continued from previous page)*		
	Agency	**Requirement Category**

	BCA
	
	(continued from previous page)
		• **Complete set of IFC+SG model(s)** for all structural elements & details
		• **2D Drawings limited to:**
		  ○ General notes
		  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, transfer plate detailing, irregular section detailing, precast joints, prestressed details, steel connections.)
		
		Design Calculation Reports:
		• From QP, AC, [QP(Geo) & AC (Geo), if needed)]
		
		Additional Supporting Documents:
		a) Site investigation report in PDF & AGS format
		b) Impact assessment report
		c) Topography
		d) Complete set of building plan submitted simultaneously
		e) Completion letter of pre-consultation (for complex structure only)

Structural Fire Precautions		
	Agency	**Requirement Category**

	SCDF
	SLAB WALL LIFT STAIRCASE DOOR SPACE DAMPER
		Compartmentation
		• Compliance of compartmentation requirements:
		  ○ Area and cubical extent to comply with Table 3.2A (for buildings not protected with sprinkler system)
		  ○ Maximum of 3 storeys per compartment when habitable height is not exceeding 24m
		  ○ Maximum of 1 storey per compartment when habitable height exceeds 24m
		• Compliance of compartmentation requirements for Atrium space
		• Compliance of compartmentation requirements for High hazard occupancy
		
		• Compliance of compartmentation requirements for basement
		• Exemption of size limitation of compartment for car park
		• Exemption of size limitation for buildings protected with sprinkler system
		• Compliance of area / room / usage requires compartmentation
		
		Compartmentation Walls and Compartmentation Floors
		• Compliance of requirements for compartment walls or compartment floors:
		  ○ Fire resistance rating
		  ○ Non-combustible
		• Use of fire shutter as compartment wall
		• Room / space allows the use of fire rated roller shutter
		
		External Wall
		• Compliance of requirements for external walls
		  ○ Fire resistance rating
		  ○ Non-combustible
		• Compliance of setback distance for unprotected opening
		• Compliance of external wall finishes
		• Compliance of vertical fire spread requirements
		• Exemption of fire resistance rating for non-load-bearing external wall

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Structural Fire Precautions *(continued from previous page)*

	Agency	Requirement Category	
	SCDF *(continued from previous page)*	**Element of Structure** • Compliance of element of structure requirements • Minimum periods of fire resistance in accordance with Table 3.3A • Exemption of fire resistance rating for single storey buildings	• Compliance of requirements for the use of fire-rated board for protection to structural steel beams, columns
		Protected Shafts • Compliance of services running inside and/or passing through fire lift lobby and smoke-free lobby • Compliance of gas pipe running inside an internal corridor / lobby • Prohibition of other services passing through FCC, fire pump room, emergency generator room & smoke control fan room. • Compliance of roof construction requirements: o Surface spread of flame rating o Composite panel as roofing covering o Roof covering containing plastic o Exemption of roof construction material • Compliance of requirements for protected shaft: o Fire resistance rating o Non-combustible o Material of construction o Opening in protected shaft o Ventilation o Fire resistance rating of doors in protected shaft • Compliance of requirements for lift shaft: o Material of construction o Exemption of enclosure in protected shaft located at edge of atrium o Provision of protected lobby when lift is at basement o Compliance of requirements for private lift for exclusive use of occupants in residential under PG II	• Compliance of protected shaft containing exit staircase: o Compartmentation of exit staircase with masonry or drywall construction o Fire resistance of door opening into exit staircase o Finishes within exit staircase shall be non-combustible o Types of services allowed in exit staircase • Compliance of protected shaft containing other services installations: o Electrical conduits / cable tray
		Separating Walls • Exemption of separating wall requirements for PG I & II buildings • Compliance of Openings in separating wall requirements • Compliance of requirements for separating walls o Fire resistance rating o Non-combustible	
		Use of other fire rated material • Compliance of requirements on use of Fire rated board • Compliance of requirement on use of intumescent paint • Compliance of requirement on use of flame retardant chemicals	

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Structures in Building Setback, Green Buffer		
	Agency	**Requirement Category**
	URA	• Location (e.g. integrated with building envelope) • Finish material of manhole to match paving if located within covered / open walkway)

Use & Intensity		
	Agency	**Requirement Category**
	URA	• Gross Plot Ratio / Gross Floor Area • Land Use / Building Uses – detailed breakdown by use and GFA quantum {Note: For time-being, submission of the native BIM models is required to facilitate GFA verification. The native models can be provided at the resubmission to CG i.e. where QPs expect to obtain Written Permission as part of CG Clearance]
		Bonus GFA Incentive Schemes: Balcony / Recreational / Transformation / Others – GFA quantum and %

Vehicle Parking		
	Agency	**Requirement Category**
	BCA PARKING LOT	• Provision of Accessible and Family Lot(s)
	URA PARKING LOT	• Total number of parking lots (including motorcycle parking) • Residual area within car park floors to be demarcated • Screening details for vehicle parking and service areas

Ventilation		
	Agency	**Requirement Category**
	BCA SPACE PARKING LOT	• Provision of Ventilation (Natural Ventilation for residential development) • Minimum 5% opening for Natural Ventilation • Maximum distance (12m) from Natural Ventilating opening • Natural Ventilation (dimension of recess / airwell) • Carpark Ventilation

Washroom		
	Agency	**Requirement Category**
	BCA SANITARY APPLIANACES SPACE	• Sanitary provisions for wheelchair users (including accessible changing rooms) and ambulant disabled • Sanitary provisions for young children

G2 Construction Gateway

Legend: Architecture C&S M&E IFC COMPONENT

Others		
	Agency	**Requirement Category**
	SCDF	**Other fire safety requirements** QP shall refer to Chapter 9 for additional fire safety requirements for specific purpose groups and Chapter 10 for fire safety requirements for special installations.
	URA	**Environmental Impact Assessment (where required)** • Submission of any other documents required
		Supplementary Documents • Previous approved plans (where requested by URA)
		Public Communications Plans (if applicable) • Distribution of flyers prior to CG submission and submission of relevant forms, where required
		Form on Unit Information • To provide a tabulation on unit-level information for each submission/resubmission at CG and TOP/CSC stage. More information will be available on the URA website under DC Supplementary Forms.
		Design Advisory Panel (DAP) Report • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)
		Pre-CG Submission: Stage 2 Design Advisory Panel – for selected projects • The DAP materials submitted are to consist of : o Technical drawings (including a full set of plans, elevations and sections) o Digital and hardcopy DAP booklets (including 2 hardcopies in A3), which should not exceed 50 pages, including appendices, attached drawings and plans, with a minimum font size of 12. o Presentation slides. The number of presentation slides should be comfortable for a 20-minute presentation without lengthy text, highlighting the key points with further elaboration provided in the DAP booklet. o Digital models o Where necessary, a physical model of the proposed development will be required, at scale of 1:400 or smaller (to be advised by the officer in charge), showing context of site] will have to be submitted. o Additional reports, such as Conservation Reports, are to be included as Appendices to the A3 booklets • The following aspects of the proposal will be assessed at this stage of the DAP: o Detailed building layout o Detailed architectural treatment including appropriate use of building materials and finishes o Night lighting design concept, including method statement and detailed drawings on how the night lighting intention would be achieved o Detailed landscaping design including planting palette o Detailed Design of Public Spaces o Scaled elevations and sections of the relevant details (preferably 1:50 in hardcopy), digital architectural model of part(s) of the building (if necessary), as well as material samples of the façade and roof materials are required to be submitted to show the architectural design of the development

End of Requirements for Construction Gateway (G2)

Independent Agency Submissions

Agency	Summary of Independent Agency Submissions	Common Gateway Key Words
BCA	• Structural design of localized works with design calculations of ancillary structures e.g. cladding, barrier • Structural design of ancillary works and component such as demolition, temporary ERSS, barriers & cladding, temporary traffic decking • Building design details of specialized works such as • Details of lift equipment and escalators • Constructability Implementation Plan • Environmental Sustainability Detailed Requirements • Outdoor Advertising Sign or Signboard License	• Buildability • Connectivity • Equipment • Façade • Environmental Sustainability • Household / Storey Shelter • Infra & Utilities (Internal) • Lightning Protection • Public / Transit Shelter • Signage • Structural Design
LTA	Railway protection/Road structure protection details for engineering work/ restricted activities apart from aspects cleared in Piling Gateway / Construction Gateway: • Plan for engineering works • Engineering evaluation report • Instrumentation proposal • Method statement of work • Emergency procedure	• Impact Studies • Rail Protection • Road Structure Protection • Site Layout
NEA	• Temporary Sanitary Facilities at Construction site • Detailed Plan on Pollution Control Equipment, Pollution Control Study (PCS) • Noise Impact Assessment (NIA)	• Noise Control • Pollution Control • Vehicle Parking
NParks	• Planting/Landscaping scheme of planting areas within development, including open air parking areas at street level, and of green verges along roadside (i.e. number and species of trees and plants to be planted) • Details of new tree planting and reinstatement works for green verge affected by entrance culvert	• Greenery
PUB	• Application for specified activities near Water and Sewer pipes • Earth Control Measures (ECM) • Temporary works affecting drainage/within drainage reserve (e.g. drain diversion, soil investigation works) • Notification and completion of minor sewer/sanitary works • Notification and CSC of Water Service Installation works • Notification and CSC of Water Service Installation Works involves pumping equipment or water tank (site plans, water reticulation schematic/layout drawing of WSI design works, water requirements, SP Water Utilities Account number) Separate submission may be made for Rainwater Collection System in developments for non-potable water use	• Infra & Utilities (Internal) • Water Supply

See also:
Latest CORENET X Circulars

- Independent Agency Submissions

Agency	Summary of Independent Agency Submissions	Common Gateway Key Words

SCDF	**Air-Conditioning, Mechanical Ventilation and Fire Protection Plan (MV & FP)**
	• Detailed layout and floor plan showing Fire Protection and Mechanical Ventilation system of development
	• Key features of the building in which the system is to be installed
	• Schematic diagram of the overall system showing clearly the key features and their functions, relative locations in the building, lots, sizes, capacities and other essential information incl. the air distribution design arrangement in the case of air-conditioning and mechanical ventilation systems
	• Layout of the system on every floor plan showing clearly the various parts and their functions, locations, arrangements, sizes, capacities and other essential information
	• Necessary cross-sectional views as superimposed on the building or part thereof to fully describe the details and configurations of the system
	• A colour scheme to clearly distinguish the various distinct parts of the system and the different systems from one another
	• Volumetric rate of flow of air at each point of inlet and outlet of each system including those serving protected staircases, exit passageways, lobbies, areas of refuge, the Fire Command Centre, fire pump rooms, generator rooms, rooms used for the storage of flammable liquids or gas or other areas of special risk;
	• Location of:
	  ○ Fire compartment walls, floors, air shafts, fire dampers, smoke detectors and other fire precautionary features
	  ○ Automatic Fire Alarm System
	  ○ Automatic Fire Extinguishing System
	  ○ Emergency Voice Communication System
	  ○ Smoke Control System
	  ○ Calculations and reports (where applicable)
		• Equipment
		• Fire Compartmentation
		• Fire Fighting
		• Materials

URA	• Painting (for conserved buildings) • Signage (for conserved buildings)	• Conservation • Demolition

Agency	Summary of Independent Agency Submissions	Common Gateway Key Words
SLA + URA	**Strata / Land Subdivision and/or Amalgamation** • As-built plans and/or 3D cadastre model. More details will be released in future regarding the latter.	-

See also:
Latest CORENET X Circulars

- Independent Agency Submissions

Legend: Architecture C&S M&E Builder IFC COMPONENT

Buildability and Productivity		
	Agency	**Requirement Category**
	BCA	**Integrated Digital Delivery (IDD) Progress Report** • Update on IDD implementation, including screenshots of adopted use cases using digital means, IDD training conducted and stakeholders involved (to be submitted under Buildability – Submission of documents)

Constructability		
	Agency	**Requirement Category**
	BCA	**Constructability Implementation Plan (CIP)** • BIM model which describes and defines the type, extent of use and details of the construction techniques, processes and innovative methods and systems to be implemented for the building works • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Supporting Documents for CIP:** a) Documents (e.g. photos, 2D plans, etc.) on the use of construction techniques, processes, plant, equipment and innovative methods **Constructability Score (C-Score)** a) C-Score Calculations (to be computed and submitted by Builder in PDF format)

Conservation		
	Agency	**Requirement Category**
	URA	Refer to URA Conservation Requirements here

Demolition Works (For noting)		
	Agency	**Requirement Category**
	URA	If developers intend to proceed with demolition works ahead of obtaining DSP or DG Clearance, a demolition application for the demolition works will be required, accompanied by the payment of requisite fees to both URA and BCA. URA will not require a separate demolition application if the works to be demolished are : • Shown within the proposal granted planning permission, or • A lodgment application has been made and URA's authorisation letter has been granted for a new erection or a reconstruction proposal that necessitates the demolition of any existing building structures.

Drains (Internal)		
	Agency	**Requirement Category**
	PUB	• Earth Control Measures (ECM) Plan • Details of temporary works affecting drainage / within drainage reserve

Independent Agency Submissions

Legend: Architecture C&S M&E Builder IFC COMPONENT

Environmental Sustainability		
	Agency	**Requirement Category**
	BCA	**Major Energy Use Change during Operation** • Design and As-built clearance for major energy use change. • For more information, please refer to Code on Environmental Sustainability Measures for Existing Building: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-existing-buildings
		Periodic Energy Audit during Operation • Submission of Periodic Energy Audit • For more information, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-existing-buildings/mandatory-submission-of-periodic-energy-audits

External Works		
	Agency	**Requirement Category**
	LTA, NParks, PUB	For LTA, NParks and PUB's External Works requirements, please refer to Page 178 - 196.

Greenery		
	Agency	**Requirement Category**
	NParks	**Planting Scheme (within Development Boundary)** • To show location, number and species of existing and proposed trees / shrubs for planting areas

- Independent Agency Submissions

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies only		
	Agency	**Requirement Category**
	NEA	**Noise Impact Assessment (NIA-Post) for Land Traffic Noise** NIA (Post) report will be required for (1) New residential and noise sensitive developments located within 70m of existing land traffic noise sources/hotspots (e.g. expressways/major arterial roads/MRT tracks) on existing residential and (2) Existing noise sensitive developments located within 70m of new transport-related developments (e.g. expressway/major arterial roads/MRT tracks/bus interchanges/ bus depots), inclusive of the expansion of existing transport-related infrastructures **When to apply:** • Applicant will need to submit NIA (Post) report to NEA directly via email to DCLD_consultation@nea.gov.sg before Completion Gateway (G3) and concluded before TOP can be granted.. • Sufficient time shall be catered for NEA to process the NIA (Post) • The processing of NIA (Post) will take 1-2 months **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Noise Report for ACMV Noise report for ACMV will be required for non-industrial developments which have new air-conditioning and mechanical ventilation works, including relocations. **When to apply:** • Applicant will need to submit ACMV noise report directly to NEA before Completion Gateway (G3) and concluded before TOP could be granted. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.
		Pollution Control Equipment (PCE) PCE submission will be required for developments involving proposed PCE/fuel burning equipment (e.g. Boiler, Thermal Oxidiser, Scrubber, Dust Collector, Spray Paint Booth, etc.) **When to apply:** • Applicant will need to submit technical details of the PCE and/or Fuel Burning Equipment to NEA directly before Completion Gateway (G3) and concluded before TOP could be granted. **Who to submit:** • QP appointed should submit the above information and keep other relevant QPs in the loop. • The same QP should follow through the submissions for all gateways.

Impact Studies / Site Layout, Rail Protection, Road Structure Protection		
	Agency	**Requirement Category**
	LTA	**Approval to commence engineering works within Railway Protection Zone / Railway Corridor** • To submit plan for engineering works • To submit the Engineering evaluation report • To submit an Instrumentation Proposal and initial instrumentation readings • To submit a Method Statement of work • To submit a Hazard Analysis identifying all possible risks that may be posed to the rapid transit system and a description of the safety and precautionary measures to mitigate these risks • To submit the Contingency Plan and Emergency Procedure • To submit the Pre-condition Survey Report • To submit the Certified Survey Plans • To submit the Permit application form and other relevant forms • To submit the Construction schedule for the proposed development

- Independent Agency Submissions

Legend: Architecture C&S M&E IFC COMPONENT

Impact Studies / Site Layout, Rail Protection, Road Structure Protection *(continued from previous page)*		
	Agency	**Requirement Category**
	LTA *(continued from previous page)*	Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer / Guide to carrying out restricted activities within railway protection and safety zones for more requirements / detailed description
		Approval to carry out restricted activities within Railway Safety Zone Note: Refer to LTA's Guide to carrying out restricted activities within railway protection and safety zones for detailed requirements / description
		Approval to commence engineering works within Road Structure Safety Zone / Notification to carry out engineering activity on land adjoining public street • To submit plan for engineering works • To submit the Engineering evaluation report • To submit an Instrumentation Proposal and initial instrumentation readings • To submit a Method Statement of work • To submit a Hazard Analysis identifying all possible risks that may be posed to the rapid transit system and a description of the safety and precautionary measures to mitigate these risks • To submit the Contingency Plan and Emergency Procedure • To submit the Pre-condition Survey Report • To submit the Certified Survey Plans • To submit the Permit application form and other relevant forms • To submit the Construction schedule for the proposed development Note: Refer to LTA's Guide to Carrying Out Engineering Works within Road Structure Safety Zone and Engineering Activity on Land adjoining Public Streets for more requirements/ detailed description

Land / Strata Subdivision and Amalgamation		
	Agency	**Requirement Category**
	URA	**Land/Strata Subdivision and Amalgamation** • Proposed Subdivision and/or Amalgamation plan(s) / model by Registered Surveyor

Mechanical Ventilation & Smoke Control System		
	Agency	**Requirement Category**
	SCDF	**Air-Conditioning, Mechanical Ventilation and Fire Protection Plan (MV & FP)** • Automatic Fire Alarm System • Automatic Fire Extinguishing System • Emergency Voice Communication System • Smoke Control System • Calculations and reports (where applicable)

- Independent Agency Submissions

Legend: Architecture C&S M&E IFC COMPONENT

Mechanical Ventilation & Smoke Control System *(continued from previous page)*		
	Agency	**Requirement Category**
	SCDF *(continued from previous page)*	**Air-Conditioning, Mechanical Ventilation and Fire Protection Plan (MV & FP)** • Detailed layout and floor plan showing Fire Protection and Mechanical Ventilation system of development • Key features of the building in which the system is to be installed • Schematic diagram of the overall system showing clearly the key features and their functions, relative locations in the building, lots, sizes, capacities and other essential information incl. the air distribution design arrangement in the case of air-conditioning and mechanical ventilation systems • Layout of the system on every floor plan showing clearly the various parts and their functions, locations, arrangements, sizes, capacities and other essential information • Necessary cross-sectional views as superimposed on the building or part thereof to fully describe the details and configurations of the system • A colour scheme to clearly distinguish the various distinct parts of the system and the different systems from one another • Volumetric rate of flow of air at each point of inlet and outlet of each system including those serving protected staircases, exit passageways, lobbies, areas of refuge, the Fire Command Centre, fire pump rooms, generator rooms, rooms used for the storage of flammable liquids or gas or other areas of special risk; • Location of: ○ Fire compartment walls, floors, air shafts, fire dampers, smoke detectors and other fire precautionary features **Mechanical Ventilation System** QP to declare at those functional space which are provided with the following Ventilation System(s): • Natural ventilation (NV) • Mechanical ventilation (MV)* • Pressurisation* • Cross-ventilation • Cross-ventilation with intermediate - ventilation opening • Vapour extraction system (spray painting booth) *: Details to be provided and submitted by M&E QP in Mechanical Ventilation (MV) Plan under Independent Submissions

Sewerage System (Internal / External)		
	Agency	**Requirement Category**
	PUB	• Details and scope of works on manholes and sewers • Specified activities within sewer corridor

- Independent Agency Submissions

Legend: Architecture C&S M&E IFC COMPONENT

Public Transit Shelter (PS/TS)	
Agency	**Requirement Category**
BCA	**Detailed CD Door and Services Penetration** The following shall be clearly illustrated in the submission: o EHD and PT door details - All CD door leaf and door frame details including frame anchorages and associated reinforcement. CD support structures and their line load reinforcement details, including any adjacent services penetrations. o Services penetrations - Size of openings and type of services penetrations such as MCTs, puddle flanges etc in walls or slabs next to or in the vicinity of the CD doors.
	Mechanical Plans (CM) • **Environmental Control System (ECS), Water Supply System, Sanitary System, Drainage System, Fire Protection System** The following shall be clearly illustrated in the submission for each of the systems above: o All CD related plantrooms and ancillary rooms, locations, setting-out and performance capacities of CD related equipment, services sizes, layout and routings and their supports o CD permanent toilets and CD dry toilets o All CD related schematics, single line diagrams and typical installation details o Locations, clear dimensions and performance capacities of CD related equipment, accessories, services and their supports from ceilings, walls and floors o Size of openings and type of services penetrations such as MCTs, puddle flanges etc in walls or slabs next to or in the vicinity of the CD doors o Provision of ventilation duct hinged-end doors (VDHD) at all ventilation supply and exhaust openings at the ventilation shafts/plenums
	Electrical Plan (CE) • **Electrical Power System, CD Communications System, CD Door Monitoring System, CD Equipment Monitoring System** The following shall be clearly illustrated in the submission for each of the systems above: o CD Plans layout at ground level, station concourse, station platform and any other level or space associated with the CD shelter, such as mezzanine floors and subway connections o All CD related plantrooms and ancillary rooms, setting-out and performance capacities of CD related equipment, accessories and services sizes, layout, and routings and their related supports o All CD related single line diagrams, schematics and typical installation details o Locations, clear dimensions and performance capacities of CD related equipment, accessories, services and their supports from ceilings, walls and floors o Size of openings and type of services penetrations such as MCTs, puddle flanges etc in walls or slabs next to or in the vicinity of the CD doors
	Shock Design Shock Design for Architectural & Structural (CKS), Mechanical (CKM) and Electrical (CKE) works shall be submitted with the following: 1. Cover letter 2. Shock design report 3. Shock calculations for equipment 4. Shock calculations for services 5. Detailed drawings for shock support

Independent Agency Submissions

Legend: Architecture C&S M&E IFC COMPONENT

Signage		
	Agency	**Requirement Category**
	BCA	• License for Outdoor Advertising Sign or Signboard

Structural Design		
	Agency	**Requirement Category**
	BCA	**Structural Design (Other Works e.g. demolition, ERSS, cladding, safety barrier, temporary traffic decking)** • **2D Drawings are acceptable** for independent submissions. • Structural design of ancillary works and component such as demolition, temporary ERSS, barriers & cladding, temporary traffic decking • Structural design of localized works for ancillary structures e.g. cladding, barrier • These plans will need to make reference back to the coordinated model submitted by the Main QP at the Construction Gateway (G2). **Design Calculation Reports** • From QP, AC, [QP(Geo) & AC (Geo), if needed)] **Additional Supporting Documents:** a) Site investigation report in pdf & AGS format b) Impact assessment report c) Design consideration for Earth Retaining or Stabilisng Structures (ERSS)) – ERSS_Annex A d) QP's & AC's Certification for fixings of ancillary structures

Water Supply		
	Agency	**Requirement Category**
	PUB	• Site plans, water reticulation schematic / layout drawing of WSI design works and water requirements • Specified activities within water pipe corridor

End of Requirements for Independent Agency Submissions

G3 Completion (TOP/CSC) Gateway

Agency	Summary of Completion Gateway Requirements	
	TOP	**CSC**
BCA	• Completion of structural works • Notice of Completion • Test records (if applicable) • Household / Storey Shelter commissioning • Site inspection (if applicable) • Technical agencies' clearance	Technical agencies' clearances
LTA	NIL	• Declaration that completed works have been supervised and built according to the approved street plans • Site inspection (if necessary) • As-built topographic survey plans **Railway protection details:** • Endorsed as-built plans for foundation, structural, M&E (where applicable) • Building plans/details • Certificates of supervision • Final condition survey with reports **For handing over:** • Road data form • Asset master input form • Road test reports • Declaration plan • As-built M&E plans • O&T
NEA	• Photo evidence to demonstrate compliance in Design and Construction Gateways • Reports of completed works • Site inspection for selected projects and noise assessment report (ACMV) / Noise Impact assessment	
NParks	NIL	• As-built plan • Photo evidence to demonstrate compliance with NParks' requirements/approved submission(s) at preceding Gateway(s) • Site inspections (if applicable) – may involve soil check to ensure quality of planting mixture conforms to NParks' specifications for Approved Soil Mixture (ASM)

G3 Completion (TOP/CSC) Gateway

Agency	Summary of Completion Gateway Requirements	
	TOP	**CSC**
PUB	• Declaration that completed works have been supervised and built according to approved plans • Application for Compliance Certificate for Sanitary/Sewerage and TOP clearance for Drainage • Site inspections (if necessary) **To provide the following:** • As-built plans/survey plans/schematic sanitary drawing • Form B1 clearance • Relevant reports where applicable (hydrostatic test reports for sewer/sanitary, RC Trench reports, Pre DLP CCTV/Post-construction sewer CCTV survey report, air test report for sanitary plumbing system, design calculations etc)	For handing over of drainage or sewerage works for PUB's maintenance, works to be satisfactorily completed and taken over by PUB prior to clearance: • Taking over letter (issued by PUB) **To provide the following:** • As-built plans/survey plans/schematic sanitary drawing • Form B1 clearance • PE endorsed handing over form for completed public drains • Common drain assessment report
SCDF	Temporary Fire Permit (TFP) application	Fire Safety Certificate (FSC) application
URA	**To provide the following:** • Declaration that completed works have been supervised and built in accordance to approved plans • As-built plan incorporating approved amendments and as-built works that QPs declared to not have material impact to planning controls • Photographs and/or inspections (where requested / necessary)	

Application for Completion of Works

A set of TOP / CSC checklists pertaining to agencies' requirements will be provided to guide the project teams on the list of requirements for TOP / CSC applications. This includes as-built plan submissions, record plans, certificate of supervision, post-construction reports e.g. hydrostatic tests, RC trench report etc.

Site Inspections

Similar to today's practice, inspections would be carried out separately by agencies. Once agencies are notified on the project's readiness for TOP / CSC, agencies will inform the project team if an audit/inspection is required. This is to help project teams plan / prepare their site early.

TOP/CSC application

The status of each agencies' TOP / CSC would be tracked through CORENET X where the overall TOP / CSC by BCA will only be released when all agencies' respective clearances are obtained.

See also:
Latest CORENET X Circulars

G3 Completion (TOP/CSC) Gateway

Legend: Architecture C&S M&E Builder IFC COMPONENT

BCA		
	Item for TOP / CSC	**Brief Description**
	Buildability, Constructability and Productivity	**Buildability Detailed Design and Implementation Plan (BDIP)** • BIM model which describes and defines the type, extent of use and details of the Design for Manufacturing (DfMA) technologies, building systems, building components, buildable features and design standardisation across the Structural, Architectural and Mechanical, Electrical and Plumbing (MEP) systems • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Buildable Design Score (B-Score)** a) BS03 Form (in Excel format) to be submitted **Final Productivity Implementation Plan (PIP)** • BIM model which describes and demonstrates the types, extent of use and details of the construction methods, construction systems, construction processes, construction management, buildable features and innovative features that have been implemented for the building works, for the purpose of achieving site productivity improvement • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Integrated Digital Delivery (IDD) Final Report** • Plan that describes the types, extent of use and details of the integrated digital delivery essential use cases that have been adopted in respect of the building works, for the purpose of enabling the digital integration of work processes.
		Constructability Implementation Plan (CIP) • BIM model which describes and defines the type, extent of use and details of the construction techniques, processes and innovative methods and systems that have been implemented for the building works • Where any of the above cannot be modelled in BIM, 2D plans can be submitted **Supporting Documents for CIP:** a) Documents (e.g. photos, 2D plans, etc.) on the use of construction techniques, processes, plant, equipment and innovative methods **Constructability Score (C-Score)** a) C-Score Calculations (to be computed and submitted by Builder in PDF format)

G3 Completion (TOP/CSC) Gateway

Legend: Architecture C&S M&E Builder IFC COMPONENT

BCA		
	Item for TOP / CSC	**Brief Description**
	Civil Defence Shelter (Non-Transit/Non-Public)	• Inspection of Civil Defence Shelter (Non-Transit/Non-Public) • Checklist for submission with Inspection of Civil Defence Shelter (Non-Transit/Non-Public)
	Completion of Structural Works	• Submission Certificate of Record Structural Plans/Calculations • Certificate of Supervision of Piling/Structural Works • Certificate of Supervision of Geotechnical Building Works • Accredited Checker's Endorsement of Record Structural Plans/Calculation • Specialist Accredited Checker's Endorsement of Record Geotechnical Building Works Plans/Calculation • Builder certificate of completion of the Building Works
	Environmental Sustainability	**For Code for Environmental Sustainability of Buildings**: To submit the following: i. BC ES Appendix 1 for **Completion Gateway** https://go.gov.sg/bc-es-app1 ii. Documentary Evidence based on the Guidance Notes and Documentation Requirements under Code for Environmental Sustainability of Buildings: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda **For Government Land Sales (GLS) programme requirement:** Please refer to the following link: https://www1.bca.gov.sg/buildsg/sustainability/regulatory-requirements-for-new-buildings-existing-buildings-undergoing-major-aanda/mandatory-higher-green-mark-standard
	Façade	• Submit the Certificate of Completion of works (i.e. Form D, Form SB) • For more information, please refer to: Industry requirement for installation, retrofitting, replacement or reinstatement of Windows | Building and Construction Authority (BCA)

G3 Completion (TOP/CSC) Gateway

Legend: Architecture | C&S | M&E | Builder | IFC COMPONENT

BCA

	Item for TOP / CSC	Brief Description
	Public/Transit Shelter (PS/TS) Technical Clearances	**Method statement for commissioning tests (CT)** 1. Internal overpressure test (IOPT) 2. Overpressure regime and airflow test (ORAT) 3. Integration system test (IST)
		Commissioning test report (CT) 1. Internal overpressure test (IOPT) 2. Overpressure regime and airflow test (ORAT) 3. Integration system test (IST)
		Notice of Approval of Commissioning (NOAC) (CN) 1. CD NOA letters of As-built plans for: • Architectural • Structural • ECS • FPS • Water Services • Sanitary • Drainage • Electrical • CD Communications • CD EMS System • CD Door Monitoring System • CD MATV 2. CD Certificate of Supervision (COS) letters for: • CD Related Architectural Works • CD Related Structural Works, MCTs, CD Valves, CD Doors • CD Electrical System • CD Door Monitoring System • CD Equipment Monitoring System • CD Communications System • CD Environment Control System & Fire Protection Systems • CD WSSDS 3. CD NOA letters for IOPT, ORAT and CDIST reports 4. CD NOA letters with summary table for all shock design submissions 5. CD NOAC Inspection Report with rectified defects list containing clear before and after colour photos and description of remedial actions taken.
	Record Building Plans	• Record Plans
	Technical Clearance (TOP/CSC)	• Universal Design Index FormSG Acknowledgement • CONQUAS / QM • Waiver Approval • Site Inspection Report/Checklist • Phasing Plan • Clearance for Environmental Sustainability • Clearance for Buildability and Constructability
		• Annex A Safety Barrier • Annex A Engineered Façade
		• Certificate of Supervision for Lightning Protection System (LPS) • Permit to Operate (Lift & Escalator) • Certificate of Supervision for Air-Conditioning and Mechanical Ventilation System(s)
		• Builder's Certificate (for building works without any structural works)

G3 Completion (TOP/CSC) Gateway

Legend: Architecture C&S M&E IFC COMPONENT

LTA		
	Item for TOP / CSC	**Brief Description**
	-	**Application for clearance of certificate of statutory completion for development within Railway Protection Zone / Railway Corridor** • To submit a copy as-built topographic survey plan in true coordinates • To submit a certificate of supervision • To submit the final condition survey report
		For proposed developments which involve modification to RTS, development to comply with *Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations* Note: Refer to LTA's Code of Practice for Railway Protection / Guidebook for Carrying Out Modification Work to Rapid Transit System (RTS) Stations or Railway by Private Developer for more requirements / detailed description
		For developments that involve only the widening and alteration of existing street fronting the development (without new street), the following shall be submitted:- • As-built topographic survey plan in true coordinates • To submit an approved subdivision plan with WP from URA and Certified Plan (CP) for project with vesting of street reserve plot • Photographs of completed works
		For Notification of Opening of New Street to Traffic, the following shall be submitted: • Cover letter clearly stating the new street opening date. • Street and Building Name Board (SBNB) Approval letter of street name • Approved traffic layout plan • Certificate of Supervisions by PE • Road Test Result • Checklist of completed works • Photographs of completed works
		For handing over of new road, the following shall be submitted: • As-built topographic survey plan in true coordinates (in .dwg format) • As-built structural and M&E plans for commuter facilities such as POB, UPN • Taking over letters from PUB, NParks and NEA • Road Declaration Plan • Approved sub-division plan • Certified plan from Chief Surveyor, SLA • Asset Master Record Input Form • Road Data Form • Audit certificate for project under Ministries or Statutory Board • Road testing results • Documents for handing over of street lightings - as-built installation plans, electrical single line diagram, letter of supervisions, test report from SP services for new control box and underground cable insultation resistance test report • Warranties for waterproofing etc.
		For Vehicle Parking submission: • Photos for open surface parking lots • As built Drawings

G3 Completion (TOP/CSC) Gateway

Legend: Architecture C&S M&E IFC COMPONENT

NEA		
	Item for TOP / CSC	**Brief Description**
	Photo, video or reports of completed works	• QP (Arch/PEs) applies for TOP/CSC and provide photo / video evidence or reports of completed works

NParks		
	Item for TOP / CSC	**Brief Description**
	TOP/CSC	• As-built plan • Photo evidence to demonstrate compliance with NParks' requirements/approved submission(s) at preceding Gateway(s) • Site inspections (if applicable) – may involve soil check to ensure quality of planting mixture conforms to NParks' specifications for Approved Soil Mixture (ASM)

SCDF		
	Item for TOP / CSC	**Brief Description**
	-	**QP(s) shall certify that the fire safety works have been completed in accordance with the Code of Practice for Fire Precautions in Buildings, Fire Safety Act and its Regulations and relevant Codes of Practice and submit the following documents:** • Certification of Fire Safety Works • RI Engagement Form • Registered Inspector's Inspection Certificate (RI Form 1 or 2) • RI Inspection Report • RI Cessation form, where applicable • Declaration of Regulated Fire Safety Products, where applicable • CoC for Regulated Fire Safety Products, where applicable • Delivery Orders for Regulated Fire Safety Products, where applicable • FSC02 - Certification for Regulated Fire Safety Products, where applicable • FSC03 - Certification for Lift Installation & Operation, where applicable • FSC04 - Certification for Fire Engine Access Road And Accessway, where applicable

URA		
	Item for TOP / CSC	**Brief Description**
	Development Interface Report (DIR) (Final)	• Information for future developer (e.g. loading requirements, knock out panels alignment / width) • As-built plan
	TOP / CSC	• Declaration that completed works have been supervised and built in accordance to approved plans (via EDAForm) • Photographs of completed works or rectifications (where requested) • Phasing Plan (for Partial TOP) • Inspections (where necessary)
	Record Plan (for non-conserved buildings and monuments)	• As-built plan incorporating approved amendments and as-built works that QPs declared to not have material impact to planning controls

End of Requirements for Completion Gateway (G3)

SECTION 3

Specific Requirements by:
Other Building Works

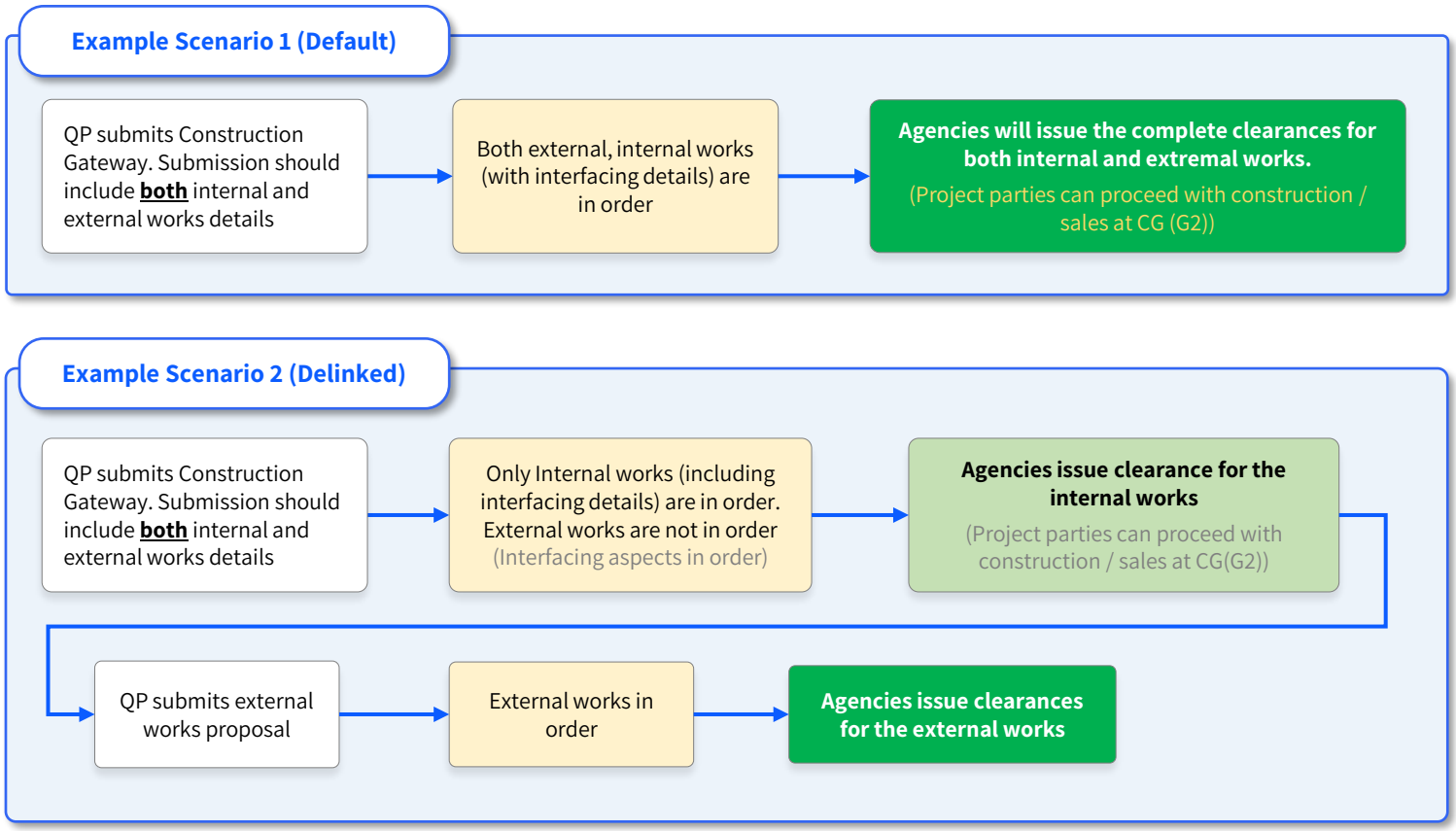
3 Specific Requirements by

External Works

Delinking Clearance of Development (Internal) and External Works at CG

- External works of a development typically involve external agencies, i.e. LTA, PUB and NParks and could involve lengthy process depending on the scope and complexity. To minimise the potential impact to the clearance of CG, agencies will not hold back the CG clearance if the submission has satisfied the requirements of agencies at CG and the interfacing details of the external works and the development are in order.

- **By default, the submission at Construction Gateway shall include details of the proposed external works under CORENET X.** However, in a scenario where the proposed works within the development boundary, including the interfacing details, are in order, and the only outstanding issues are the details of the external works, the agencies will proceed to issue the conditional clearances for internal works. QPs are required to follow up with the comments and obtain the agencies' full external works clearances.



External Works

Delinking Clearance of Development (Internal) and External Works where feasible

Note: The submission format for proposed works within the development boundary shall follow the prevailing BIM submission requirements. Design proposals for external works can be submitted in 2D (CAD). Notwithstanding, agencies are open to reviewing infrastructure models prepared in 3D.

Development (Internal) and External Works

Under CORENET X, LTA, NParks and PUB require:

a) Proposed works within the development boundary; and
b) Proposed external works to be submitted a single package across the regulatory gateways to ensure that both works are well coordinated. For example, for LTA:

i. Works within the development boundary pertain to:

- Vehicle parking layout/ Bicycle parking lots
- Layout of pick-up/ drop-off (PUDO) points
- Internal driveways
- EV charging infrastructure

ii. External works pertain to works within the road reserve, such as:

- Street improvement works
- Commuter facilities
- Active mobility infrastructure

S3 – Fig4 :
Example of development (internal) work – PUDO layout

S3 – Fig 5:
Example of external work – Road infra improvement

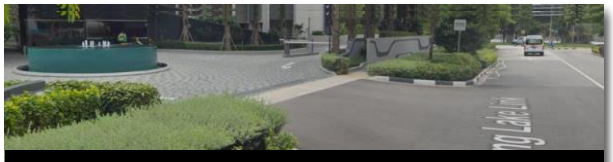
Interfacing Aspects to be cleared as part of Development (Internal) Works

1. It is common for a development to propose connections (serving various users such as motorists, pedestrians, cyclist etc) from within the development leading to the surrounding road network. These connections form interfaces at the development boundary. Such interfaces have to be well co-ordinated to ensure that the development platform level ties in properly with the existing roads. For new roads proposed in conjunction with development(s), the vertical profile of the roads (designed to comply with LTA design requirements) has to be established before other development interfacing details are considered. Additionally, interfaces usually demarcate the extent of maintenance ownership between the developer and the State.

2. The layout and cross-sections of interfaces between the development boundary and the road reserve shall be clearly reflected in the external works design proposal.

S/N	LTA and NParks Interfacing Aspects
1	Vehicular Access Points
2	Pedestrian Access Points
3	Cyclist accesses
4	Covered Linkway / Walkway Connections
5	Pedestrian Overhead Bridge Connections
6	Pedestrian Underpass Connections
7	Bus Stops (If directly interfacing with the development building)
8	Taxi Stands (If directly interfacing with the development building)
9	Vertical Profile of New Street (If proposal involves construction of a new street or widening of existing roads)

S/N	PUB Interfacing Aspects
1	Connection of internal drain to road drain/ drain outlet
2	MPL, adj road/ ground level, and outlet discharge point levels
3	Point of proposed sewer connection

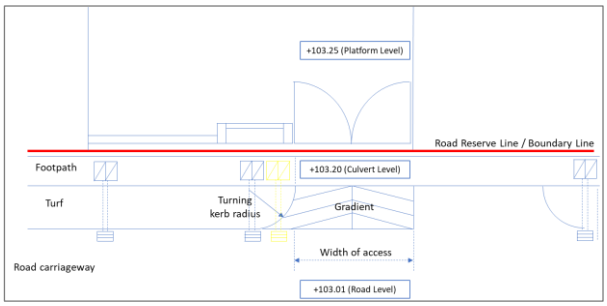
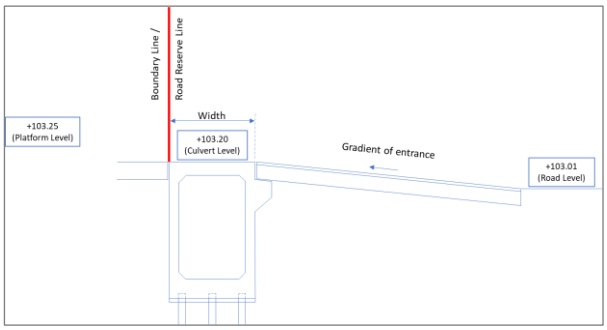
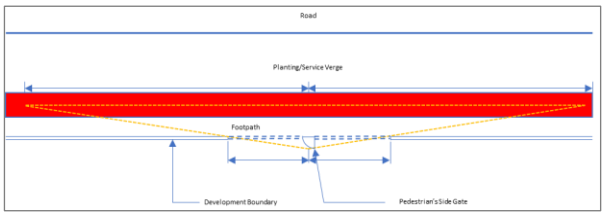
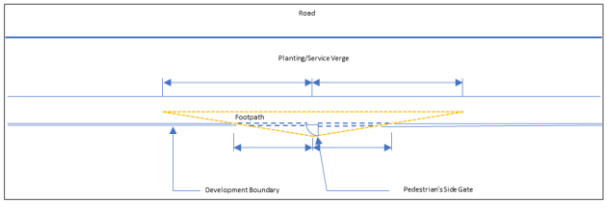
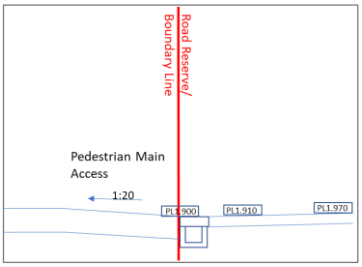


S3 – Fig 6

LTA's Interfacing Aspects

Interfacing Aspects to be cleared as part of Development (Internal) Works

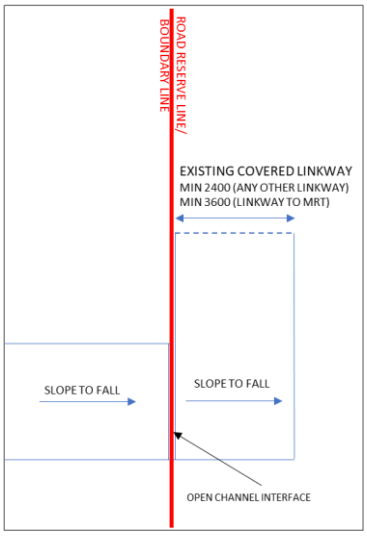
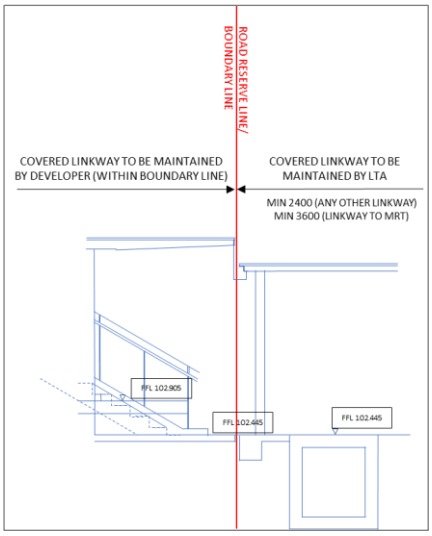
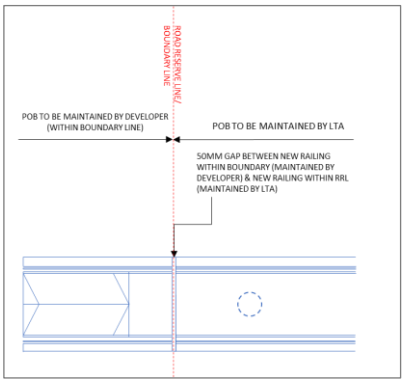
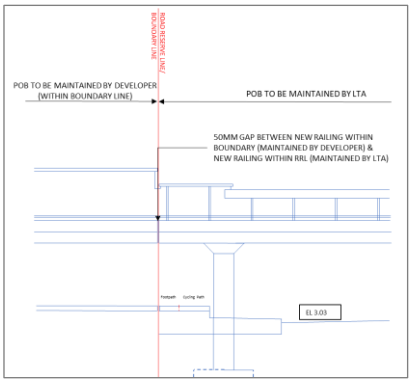
LTA considers the following as interfacing aspects:

S/N	Interfacing Aspect	Remarks
1	**Vehicular Access Points**  	Vehicular accesses have a significant impact on the development layout and has to be co-ordinated with the proposed Minimum Platform Level imposed. -- S3 – Fig 7 (top): Plan view of an access S3 – Fig 8 (bottom): Cross Section view of an access
2	**Pedestrian Access Points**   	Pedestrian accesses have to be designed with respect to the internal layout and the external amenities of interest to development users -- S3 – Fig 9 (top): Plan view of pedestrian access interfacing with footpath & cycling path (with sight visibility triangle) S3 – Fig 10 (middle): Plan view of pedestrian access interfacing with a shared path (with sight visibility triangle) S3 – Fig 11 (bottom): Cross section of a pedestrian access interfacing with a footpath

LTA's Interfacing Aspects

Interfacing Aspects to be cleared as part of Development (Internal) Works

LTA considers the following as interfacing aspects:

S/N	Interfacing Aspect	Remarks
3	Cyclist Accesses (Please refer to typical section and plan view in S/N 4.)	Cyclist accesses have to be designed with respect to internal bicycle parking facilities and the surrounding road network. One of the important design issues is the provision of adequate sight distance at the development accesses and inner radius of road bends.
4	**Covered Linkways** (At-grade connections between the development and road reserve)  	Covered linkways have to be designed with respect to the internal layout and the external amenities of interest to development users -- S3 – Fig 12 (left): Roof plan of a sheltered walkway interfacing with an existing covered linkway (within the road reserve) S3 – Fig 13 (right): Cross section of a sheltered walkway interfacing with an existing covered linkway (within the road reserve)
5	**Pedestrian Overhead Bridges (POBs)** (Elevated connections between the development and road reserve)  	Direct linkages between POBs and developments have to be designed to ensure that the levels of the POB and development can match -- S3 – Fig 14 (left): Plan view of an elevated walkway interfacing with an existing POB (within the road reserve) S3 – Fig 15 (right): Cross section of an elevated walkway interfacing with an existing POB (within the road reserve)
6	**Pedestrian Underpasses (PUPs)**(Subterranean connections between the development and road reserve)	Direct linkages between PUPS and developments have to be designed to ensure that the levels of the PUP and development can match
7	**Bus Stops** (If directly interfacing with the development)	Interfacing (if any) between bus stops and developments have to be co-ordinated

LTA's Interfacing Aspects

Interfacing Aspects to be cleared as part of Development (Internal) Works

LTA considers the following as interfacing aspects:

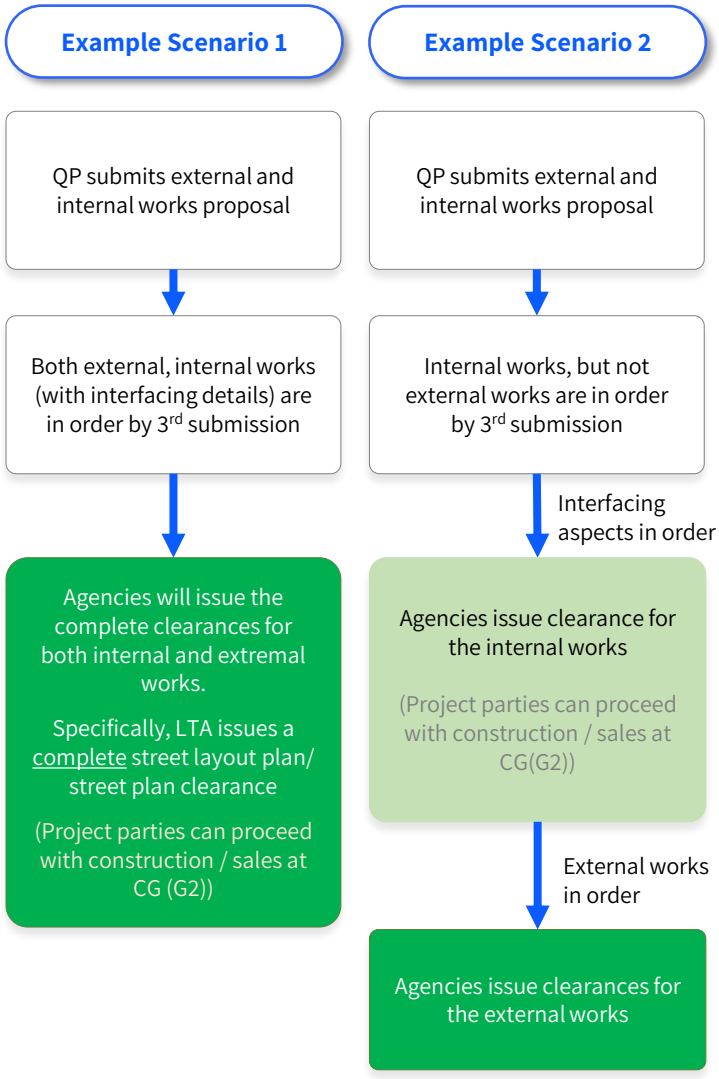
S/N	Interfacing Aspect	Remarks
8	**Taxi Stands** (If directly interfacing with the development)	Interfacing (if any) between taxi stands and Developments have to be co-ordinated
9	**Covered Walkways**	Covered walkways have to be designed in relation to the open walkways for barrier-free access
10	**Vertical Profile of New Street** (If the proposal involves the construction of a new street and / or widening of existing roads)	It is important to establish the vertical profile of the new street / widened street which determines all other interfacing aspects, such as development platform levels, drainage levels, access levels, as well as the levels of any existing structures (while complying to the current design requirements)

Clearances and Conditional Approvals

1. LTA will issue a **Layout Plan Clearance (Street & Parking)** at the Design Gateway (G1), as well as a **Street Plan Clearance** and **Vehicle Parking Building Plan Clearance** at the Construction Gateway (G2), when both the proposed works within the development boundary and external works are designed in accordance with the prevailing standards.

2. In a scenario where the proposed works within the development boundary are in order, whereas the external works are still under review, **LTA may issue separate Layout Plan and Street Plan Approvals**, for internal and external works. For LTA to issue a conditional approval, all interfacing aspects shown within the external works proposal must be designed in accordance with the prevailing standards.

3. The approvals for internal works granted by LTA once the interfacing aspects have been agreed, will help to expedite the clearance and completion of the projects, notwithstanding the requirement for combined submission under CORENET X. QPs are required to follow up and **obtain the agencies' full external works clearances**, before advancing to the next regulatory gateway.



Overview of LTA's External Works

Note that External Works is undergoing further refinements. More updates will be released in future COP versions.

Key Gateways	Objective	Road alignment details to be prepared (other details to be prepared and submitted as required)	Supporting Information required
Pre-DG (Land Use, TCOT, PAFS, TIA)	To establish RRL and development boundary	1. Horizontal alignment 2. Junction layout 3. Commuter facilities 4. Cycling path 5. Road typology 6. Development access 7. RRL / ADR	1. Topo survey 2. Traffic study / TIA
Pre-Submission, Planning and Other Consultations	To seek clarifications for details to be submitted at DG stage	As required by Agency / QP to seek clarification from LTA	1. Traffic study / TIA
Design Gateway (G1)	To establish development platform level and development access that will properly interface with the proposed carriageway	1. All details as per Pre-DG Stage 2. Development access levels to tie in with development platform level * 3. Road vertical profile * (applicable to new streets and widening of existing carriageways) 4. Cross-section and details plan 5. Tree affected plan. 6. Layout of retaining wall. 7. Extent of proposed cut / fill slopes with existing ground level including impact on existing trees 8. Layout of drains, sumps and box culvert including drain top level and invert level 9. Layout of major structural works that will affect the road vertical and horizontal alignment. 10. Layout for Commuter Facilities (e.g. bus stop, covered linkways, POB) * 11. Layout of Active Mobility Infrastructure (i.e. cycling path) 12. Layout of street elements (e.g. lamppost, traffic schemes) that needs to be modified. (Applicable for existing streets)	1. Topo survey 2. Utilities / services plan
Piling Gateway (G1.5) (Optional)	Piling gateway also includes earth retaining structures (slope, retaining wall, CBP etc.) within the road reserve	-	-
Construction Gateway (G2)	To finalise all other details necessary for construction of the road and related infrastructure works	1. All details as per DG stage 2. Details for access points * 3. Geotechnical details for foundation works, retaining wall, slope etc. 4. Structural details for road structures and roadside features e.g. POB, drain, box culvert, sump etc. 5. Architectural & Engineering details for Commuter Facilities (structural and foundation details) *	-
Independent Submissions	To finalise individual agency requirements after construction gateway that do not have any impact on other agencies requirements	Approval to commence engineering works/ restricted activities within the Railway Protection Zone	-

* These aspects include (the necessary) interfacing works with the internal layout. Proposed interfacing works should be submitted as part of the external works design proposal and cleared in tandem with internal layout.

LTA's External Works Requirements

Legend: Architecture C&S M&E

G1 Design Gateway	
Objective: ✓ To establish development platform level and development access that will properly interface with the proposed carriageway	
	✓ **Requirements for Road Infrastructure and Vehicle Access**
	Vehicular Access Points **Connections and Interfaces at Development Boundary** • To indicate the road level, entrance culvert level, and the proposed development platform level. • For new roads proposed in conjunction with development(s), to develop the development platform level and proposed levels of the development access points based on the vertical alignment of the proposed carriageway (before QP confirms on the development platform level for the design of the foundation / structural works). • To show the gradient of entrance approach. • To indicate the configuration of the proposed access. • To indicate the width and turning radius of the proposed access. • To indicate the provision of tactile tiles. • To indicate any proposed relocation of existing road elements, such as trees, lamp post, signs etc, which may be affected by proposed access.
	Layout of Proposed Frontage Improvement Works • To determine the extent of improvement works required along the road sidetable, such as conversion of open drain to covered drain cum footpath, setting back of drain for development affected by RRL • To indicate the proposed footpath width, level, and its gradient • To determine the extent of improvement works required along the road carriageway, such as localised road widening etc. • To relocate any existing Manholes located on the future carriageway • To check if additional street lightings are required • To vest the Street Reserve Plot in State (except for A&A proposal)
	Design of New Street (incl. Modifications to Existing Streets) • To indicate all details determined during the planning consultation stage, and clearly list down the design changes from TCOT / land use stage. • To identify and declare all non-compliances to design standards. • To submit the road alignment and junction layout plan. • To develop and submit the horizontal alignment and vertical profile of the proposed carriageway (new or widening / realignment of existing carriageway) connecting to the existing junction / carriageway. The horizontal alignment includes the superelevation along the road bends. • To show the drainage layout plan (drain, box culvert and sump) and the drainage vertical profile, drain top level and invert level in the profile / longitudinal section drawing. • To show the extent of cut / fill slopes with existing ground level and indicate the impact on existing trees (identify to trees to be fell, retained etc.). • To show the location and layout of commuter facilities and major structural works that will affect the road vertical and horizontal alignment in the plan view, longitudinal section drawing and cross-section drawing. • To show the extent of retaining wall to be provided (within or abutting the RRL) in the layout plan, and the layout and height of the retaining wall in the longitudinal section plan and cross-section drawings. • To show the tree affected plan (trees to be fell, retained etc). • To show cross-section details of the proposed typology of road sidetable and roadside features and structures (POB, linkway, bus-stop, drain, box-culvert etc. • To relocate any existing Manholes located on the future carriageway. • To seek waiver for retention of existing manhole on future road carriageway, cycling path and footpath, if any.

LTA's External Works Requirements

Legend: Architecture C&S M&E

G1 Design Gateway
Objective:
✓ To establish development platform level and development access that will properly interface with the proposed carriageway
✓ **Requirements for Road Infrastructure and Vehicle Access**
Connections and Interfaces at Development Boundary • To develop the development platform level and proposed levels of the development access points based on the vertical alignment of the proposed carriageway (before developer confirms on the development platform level for the design of the foundation / structural works). • To show the extent of retaining wall to be provided (within or abutting the RRL) in the layout plan, and the layout and height of the retaining wall in the longitudinal section plan and cross-section drawings.
✓ **Requirements for Commuter Facilities**
Layout of Covered Linkway / High Covered Linkway • To show the proposed layout i.e. alignment, width, and headroom of the covered linkway / high covered linkway. • To show the location where the covered linkway linkway connects with the existing bus shelter, and identify any existing bus features such as noticeboards, seats affected by the linkway connection, which would have an impact on the layout of the covered linkway. **Connections and Interfaces at Development Boundary** • For covered linkways connecting to within the development site, to submit layout plans and section details at the interface, showing the RRL, alignment, floor levels, and headroom. • To delineate the portion of linkway to be maintained by developer. Handed over to LTA for management.
POB Layout • To show the proposed alignment, width, and headroom (min 5.7m), of the POB. • To establish the column size and position within / outside the road reserve. Min. lateral clearance from the road shall be provided. **Connections and Interfaces at Development Boundary** • Where the POB connects to within the development site, to submit layout plans and section details at the interface, showing the RRL, alignment, floor levels and headroom. • To delineate the portion of POB to be maintained by developer / handed over to LTA for management.
Pedestrian Underpass Layout • To submit cross section details showing the overburden i.e. depth of UPN from road levels. • To show the proposed alignment, width, ceiling height / headroom, of the UPN. • To ensure that the provision of lifts / escalators / staircase is adequate. **Connections and Interfaces at Development Boundary** • To submit layout plans and section details at the interface, where the UPN connects to within the development site. • To delineate the portion of UPN to be maintained by developer. handed over to LTA for management.
Layout of Bus Stop • To show the location of the bus stop. • To show the position, and dimensions of the bus bay/ bus box. • To show the proposed location, alignment, and dimensions of the bus shelter. • To indicate the location of the bus pole. • To relocate existing Manhole located on the future bus bay, if any. **Connections and Interfaces at Development Boundary** • For bus stops directly integrating with the development infrastructure, to submit layout plans and sectional details of the bus shelter and bus bay/ bus box.

LTA's External Works Requirements

Legend: Architecture C&S M&E

G1 Design Gateway	
Objective: ✓ To establish development platform level and development access that will properly interface with the proposed carriageway	
	✓ **Requirements for Commuter Facilities**
	Layout of Taxi Shelter • To show the proposed layout of the taxi stand indicating the location of the taxi shelter, width and length of the taxi bay. • To relocate existing Manhole located on the future taxi bay, if any. **Connections and Interfaces at Development Boundary** • For taxi shelters directly integrating with the development infrastructure, to submit layout plans and sectional details of the taxi shelter.
	✓ **Requirements for Active Mobility Infrastructure**
	Cycling Path Layout • To show the proposed layout, width, and alignment of the cycling path. • To indicate the gradient of cycling path if it is steeper than 1:25. • To determine if widening of existing pedestrian crossing is required. • To determine if additional lightings are required.

LTA's External Works Requirements

Legend: Architecture C&S M&E

G2 Construction Gateway	
Objective: ✓ To finalise all other details necessary for construction of the road and related infrastructure works	
	✓ **Requirements for Road Infrastructure and Vehicle Access**
	Vehicular Access Point Details **Connections and Interfaces at Development Boundary** • To reflect the details presented at Design Gateway (G1) Stage. • To show the structural details of entrance culvert at access points i.e., reinforcement, connection to entrance approach etc. • To indicate the position of the 'Stop' line and 'Stop' sign (if required) • To indicate the position of the '1-way' arrow (if required) • To show that any redundant accesses are sealed and reinstated to match the existing side-table.
	Details of External Works (Frontage Improvement Works) • To reflect all details presented at Design Gateway (G1) stage. • To submit the Traffic Plan. • To submit the street plan and cross section details showing the proposed levels, width and cross-fall of carriageway, planting verge and footpath. • To clearly specify the size of proposed cross-culverts, and establish maintenance agreements with the relevant agencies (for cross-culverts less than 2m wide, to seek concurrent clearance with PUB Drainage) • To submit the streetlighting plan (if applicable).
	Details of Side Table Modifications for Addition of Auxillary Lanes, u-turns etc • To incorporate all details presented at Design Gateway (G1) stage. • To submit the Traffic Plan • To submit the street plan, clearly indicating the layout plan, longitudinal section and cross section details, such as the proposed levels, width and cross-fall of carriageway, planting verge and footpath. • To clearly specify the size of proposed cross-culverts, and establish maintenance agreements with the relevant agencies (for cross-culverts less than 2m wide, to seek concurrent clearance with PUB Drainage) • To submit the streetlighting plan (if applicable).
	Details of New Street (incl. modifications to existing streets) • To incorporate all details presented at Design Gateway (G1) stage. • To submit the Traffic Plan • To submit the street plans, clearly indicating the layout plan, longitudinal section, and cross section details. • To submit geotechnical details for foundation, retaining wall, slope (if any) • To submit structural and M&E details for road structures and associated commuter facilities. • To submit the street lighting plan.
	Street Works Deposit • For private developments with proposed major road infrastructure works (e.g. new streets, major improvement of an existing street, POB, UPN), to determine, and furnish the amount to be deposited with LTA for the execution and completion of the proposed street works.

LTA's External Works Requirements

Legend: Architecture C&S M&E

G2 Construction Gateway
Objective:
✓ To finalise all other details necessary for construction of the road and related infrastructure works
✓ **Requirements for Commuter Facilities**
Detailed Architectural / Structural Layout, and M&E provisions of Covered Linkways • To reflect all details presented at Design Gateway (G1) stage. **Architectural Details** • To submit the 'Architectural Checklist for Covered Linkways'. • To ensure that the proposed architectural design complies with the architectural requirements listed within the checklist. • For covered linkways connecting/ interfacing with bus stops, to provide details of connection/bus stops, e.g, relocation of bus shelter elements. **Structural Details** • To provide structural details (i.e. column width, footing), materials. • To establish the column size and position within the road reserve. • To determine if column footing will impact the top slab of the box drain, and coordinate (with PUB). **M&E Details** • To submit the 'M&E Checklist for Bus Shelter, Taxi/ Passenger Pick-Up Shelter, Pedestrian Overhead Bridge (POB) and Covered Linkway' • To ensure that the proposed design complies with the M&E requirements listed in the checklist. **Connections and Interfaces at Development Boundary** • For covered linkways connecting to within the development site, to provide details of connection/interfaces with development. Note: Refer to LTA's infrastructure Design Criteria, M&W Specification, Architectural Design Checklist for Covered Linkways, and M&E Checklist for a full list of requirements/ detailed description
Detailed Structural Layout, and M&E provisions of Pedestrian Overhead Bridges • To reflect all details presented at Design Gateway (G1) stage. **Architectural & Structural Details** • To submit the architectural checklist for the Pedestrian Overhead Bridge. • To ensure that the proposed architectural design complies with the architectural requirements listed within the checklist. • To provide structural details of POB (i.e. column width, footing). **M&E Details** • To submit the 'M&E Checklist for Bus Shelter, Taxi / Passenger Pick-Up Shelter, Pedestrian Overhead Bridge (POB) and Covered Linkway' • To ensure that the proposed M&E lighting design complies with the M&E requirements listed in the checklist. **Connections and Interfaces at Development Boundary** • For POBs connecting to within the development site, to provide details of connection/interfaces with development, in accordance to the guidelines listed in the checklist. • To determine and advise possible road closure due to hoisting of link bridges. Note: refer to LTA's infrastructure Design Criteria, M&W Specification, Architectural Design Checklist for Pedestrian Overhead Bridge (POB), and M&E Checklist for a full list of requirements/ detailed description

LTA's External Works Requirements

Legend: Architecture C&S M&E

G2 Construction Gateway
Objective:
✓ To finalise all other details necessary for construction of the road and related infrastructure works
✓ **Requirements for Commuter Facilities**
Detailed Structural Layout, and M&E Provisions of Bus Shelters **Architectural & Structural Details** • To submit architectural checklist for pedestrian underpass • To ensure that the proposed architectural design complies with the architectural requirements listed within the checklist. • To provide structural details of bus shelter, seating arrangement, bus info panels etc. • To provide bollard and flooring details • For covered linkways connecting/ interfacing with bus stops, to provide details of connection/bus stops, e.g., relocation of bus shelter elements **M&E Details** • To submit the 'M&E Checklist for Bus Shelter, Taxi / Passenger Pick-Up Shelter, Pedestrian Overhead Bridge (POB) and Covered Linkway' • To ensure that the proposed M&E lighting design complies with the M&E requirements listed in the checklist **Connections and Interfaces at Development Boundary** • For bus stops directly integrating with the development infrastructure, to submit layout plans and sectional details of the bus shelter and bus bay / bus box **Other Requirements** • To submit the Traffic Plan • To confirm the need of temporary bus stop provision and its position. • To confirm the relocation date and commissioning of the new bus stop.
Detailed Layout of Taxi Shelter **Architectural & Structural Details** • To submit Traffic Plan • To submit architectural plans and section details for the taxi shelter • To submit architectural checklist for the taxi shelter • To provide structural details of taxi shelter, seating arrangement, etc. • To provide bollard and flooring details • To provide details of lighting provisions and M&E provisions (if any) • Taxi pole **M&E Details** • To submit the 'M&E Checklist for Bus Shelter, Taxi / Passenger Pick-Up Shelter, Pedestrian Overhead Bridge (POB) and Covered Linkway' • To ensure that the proposed M&E lighting design complies with the M&E requirements listed in the checklist **Connections and Interfaces at Development Boundary** • For taxi stands directly integrating with the development infrastructure, to submit layout plans and sectional details of the taxi stand and bay. • To confirm the need of temporary taxi provision and its position.

End of External Works Requirements for LTA

For the rest of LTA's requirements, please refer to Page 56.

Overview of NParks' External Works

Note that External Works is undergoing further refinements. More updates will be released in future COP versions.

Key Gateways	Objective	Details to be prepared (other details to be prepared and submitted as required)	Supporting Information required

Pre-DG (Land Use, TCOT, PAFS, TIA)	• To ensure RRL can accommodate standard roadside tables and additional commuter infrastructure
	• To conserve specific roadside trees
	• To ensure existing / proposed park / park connector is safeguarded
		• Width of Road Reserve (incl. planting verge within side table)
		• Proposed road alignment
		• Proposed cycling path alignment as safeguarded on SDCP under MP19
		• If applicable:
		  ○ URA/MND's conveyance on Form B
		  ○ EIA report
		  ○ EMMP
		  ○ Wildlife management plan
			• Topo Survey (if applicable)

Pre-Submission, Planning and Other Consultations	• To clarify how proposal may affect roadside verges and trees, and/or existing / proposed parks / park connectors
	• To advise on greenery provisions and tree conservation
		• Proposal with safeguarded RRL and indicative entrance position and road alignment
		• Proposal with Walking & Cycling Plan
		• If applicable:
		  ○ URA/MND's conveyance on Form B
		  ○ EIA report
		  ○ EMMP
		  ○ Wildlife management plan
			• Topo Survey Plan

Design Gateway (G1)	• To secure greenery provisions and to comment on conservation of trees (may require Certified Arborist report, e.g. recommendations pertaining to works near to, but may not be directly impacting trees) • To assess impact to existing, or safeguard provision of new, park / park connector	• Standard roadside greenery provision (especially new roads), i.e. gradient, width and depth of green verge (incl. tree planting verge) according to road category including interfacing with internal works • Spatial provision (width and depth) for greenery at Covered Linkways / Pedestrian Overhead Bridge • Conservation of trees / plants (identification, e.g. trees within road reserve, heritage trees, trees identified in TCOT) • Entrance(s) position and access point (s) location (e.g. for FEA, maintenance and pedestrians, to ensure sufficient clearance secured for the retention of mature roadside trees) • New Parks / Park connector / Promenade	• Topo survey plan • Arborist report (Please refer to NParks' Guidelines [Chapter 2]) • Services detection plan • Photos of existing trees (if not in Arborist report)
Piling Gateway (G1.5) (Optional)	-	-	-
Construction Gateway (G2)	To ensure dimensions of green verges are compliant with standard requirements / accepted by NParks at Design Gateway (G1)	• Dimensions of green verges compliant with standard requirements / as approved by NParks at Design Gateway (G1) • Landscaping scheme for roadside greenery by Applicant	-
Independent Submissions	To finalise details on roadside tree planting and landscaping works, as well as transplanting works	• Reinstatement works for green verge (without tree planting) • Landscaping scheme for roadside greenery undertaken by NParks • Planting Requirements for Covered Linkways / Pedestrian Overhead Bridge	• Dimensions (length, width) of green verges to aid cost estimate for landscaping works (only if NParks were to undertake works) • Specifications for trellis planting, green roof, planter boxes for covered linkways / POB (where applicable).

Useful Link(s):
NParks' Guidelines
NParks Flora and Fauna Web

NParks' External Works Requirements

G1 Design Gateway	
Objective: ✓ **To secure greenery provisions and to comment on conservation of trees (may require Certified Arborist report, e.g. recommendations pertaining to works near to, but may not be directly impacting trees)** ✓ **To assess impact to existing, or safeguard provision of new, park / park connector**	
Requirements	**Supporting Documents**

Conservation of Trees
• To conserve trees identified:
  • In Technical Conditions of Tender (TCOT)
  • As Heritage Trees
  • Through nature group / public / residents engagement
  • In Environmental Impact Assessment (EIA)/ Environmental Management and Monitoring Plan (EMMP) etc.
	Arborist report (Please refer to NParks' Guidelines [Chapter 2])

Green Verges
• To provide green verges (consisting of tree planting and service verges) for street work proposals relating to development works and for new road services according to the road category
• To locate fire engine accessways outside green verges
• Road and Commuter Infrastructure
  o To comply with greenery provision for covered linkways, bus shelters, pedestrian overhead bridges, depressed road portals, road viaducts/flyovers and retaining walls etc. according to NParks' Guidelines (Chapter 4)
• Entrance Culvert Position (at Vehicular Access Points)
  o To ensure splay corners do not affect green verge provision and roadside trees
	-

Biodiversity Impact Assessment (under URA's Environmental Impact Assessment [EIA] framework)
• Applicable to sites that fall within the EIA Framework but were not identified at Planning Stage (Pre-DG)
• Environmental Consultation
  o QP (Arch / PEs) or Consultant to submit the environmental consultation form (Form A) to URA and Technical Agencies (e.g. NEA, NParks, MPA, SFA)
  o Details of project entities (Developer, Qualified Person and Main Contractor) as stated in Form A are provided
• Environmental Impact Assessment (EIA)
  o If determined during environmental consultation that an environmental study is needed, QP (Arch / PEs) or Consultant can consult on environmental baseline study and scoping of EIA
  o QP (Arch / PEs) or Consultant to ensure that EIA report (for projects that have cleared environmental assessment at planning stage) are submitted for acceptance
	-

Useful Link(s):
NParks' Guidelines
NParks Flora and Fauna Web

NParks' External Works Requirements

G2 Construction Gateway		
Objective: ✓ **To ensure dimensions of green verges are compliant with standard requirements / accepted by NParks at Design Gateway (G1)**		
	Requirements	**Supporting Documents**

	Conservation of Trees
	• To conserve trees identified:
	  • In Technical Conditions of Tender (TCOT)
	  • As Heritage Trees
	  • Through nature group / public / residents engagement
	  • In Environmental Impact Assessment (EIA)/ Environmental Management and Monitoring Plan (EMMP) etc.
		Arborist report (Please refer to NParks' Guidelines [Chapter 2])

	Provision of Green Verges • To ensure dimensions of green verges are compliant with NParks' Guidelines (Chapter 3) or as approved by NParks during Design Gateway (G1)	-
	Interfacing Aspects (from within Development Boundary) • To show layouts and cross-sections of interfaces in external works design proposal	-
	Applicable to sites not requiring Piling Gateway (G1.5) approval **Applicable to sites requiring Environmental Monitoring and Management Plan (EMMP) / Wildlife Management Plan prior to commencement of works:** a) Detailed EMMP report (provided by Main Contractor) b) Acceptance letter from NParks prior to site clearance (if applicable)	-

- Independent Submissions		
Objective: ✓ **To finalise details on roadside tree planting and landscaping works, as well as transplanting works**		
	Requirements	**Supporting Documents**
	Planting Scheme (Outside Development Boundary) • To show location, number and species of existing and proposed trees/shrubs for green verges and planter troughs along pedestrian overhead bridges/ road viaducts/ flyovers	-

End of External Works Requirements for NParks

For the rest of NParks requirements, please refer to Page 63.

Overview of PUB's External Works

Note that External Works is undergoing further refinements. More updates will be released in future COP versions.

Key Gateways	Objective	Details to be prepared (other details to be prepared and submitted as required)	Supporting Information required
Pre-DG (Land Use, TCOT, PAFS, TIA)	To establish development boundary, any Drainage Reserve (DR), drain size for affected / proposed public drain and sewer connection, water pipe diversion requirements	Site plan overlay with PUB Services Plans (Drainage Interpretation Plan, Sewerage Information Plan and Water Service Plan) showing the drainage reserves or land reserved for future drainage schemes, common drain, location and alignment of public sewers or pumping mains, and approximate position of the water mains and raw water mains in the vicinity of the development.	• Site plan with drainage, sewerage and water main information • Sewer discharge quantity • Water demand
Pre-Submission, Planning and Other Consultations	To seek clarifications for details to be submitted at Design Gateway (G1) stage	Key evaluation areas include: • Any storm water drainage works, erection or placement of any structures or object in, above or across any drain or drainage reserve • Any temporary structure / works / services over, across or adjacent to any drain or storm water drainage system • Any proposed realignment of Drainage Reserve or Drainage Reserve to be set aside and vested to State; • Any works which could affect any public sewers / sewerage system or public drains including common drains directly or indirectly; • Any buildings or structures to be erected over, across or adjacent to any public sewerage system; and • Proposed connection of the development / premises to the public sewers / sewerage system	• Architectural / Engineering drawings • Topo Survey Plan
Design Gateway (G1)	• To establish MPL requirements • To assess proposed works affecting drainage (e.g. management of maximum allowable peak runoff, discharge point of internal drains) and linkages to underground Special Facilities (e.g. Rapid Transit System) • To assess proposed works affecting sewer (e.g., capacity, setback, sewer connection, alignment and size for diversions)	Key evaluation areas include: • Any storm water drainage works, erection or placement of any structures or object in, above or across any drain or drainage reserve • Any temporary structure / works / services over, across or adjacent to any drain or storm water drainage system • Any proposed realignment of Drainage Reserve or Drainage Reserve to be set aside and vested to State; • Any works which could affect any public sewers / sewerage system or public drains including common drains directly or indirectly; • Any buildings or structures to be erected over, across or adjacent to any public sewerage system; and • Proposed connection of the development / premises to the public sewers / sewerage system	• Architectural / Engineering drawings • Topo Survey Plan
Piling Gateway (G1.5) (Optional)	Prior to commencement of piling works, QP / PE shall obtain approval for relevant works (works requiring Earth Control Measures, specified activities within water and sewer pipe corridor)	Details of specified activities within water and sewer pipe corridor, temporary works affecting drains, within drainage reserve etc. where applicable as listed under "Independent Submissions"	• Engineering drawings • Topo Survey Plan • Method Statement • Engineering calculations • PE endorsed reports

Overview of PUB's External Works

Note that External Works is undergoing further refinements. More updates will be released in future COP versions.

Key Gateways	Objective	Details to be prepared (other details to be prepared and submitted as required)	Supporting Information required
Construction Gateway (G2)	To evaluate the detailed plans showing the proposed drainage (e.g. upgrading, new construction) and sewerage works (e.g. sewer diversion)	• Works affecting Sewer (e.g. proposed sewers / manhole, pump sumps / pumping main, abandon sewers/manhole, RC Trench for housing the public sewer • Works affecting Drainage (e.g. common drain, Drainage Reserve entrance culvert / roadside drain, slab over drain for meter compartment)	• Engineering drawings • Engineering calculations • PE endorsed reports
Independent Submissions	To obtain PUB's approval for works / site activities within RRL affecting drainage, sewerage or water services (where applicable)	<u>Drainage</u> ○ Earth Control Measures (ECM) Plan ○ Details of temporary works affecting drainage/within drainage reserve <u>Sewerage / Sanitary</u> ○ Details and scope of works on manholes and sewers ○ Specified activities within sewer corridor <u>Water</u> ○ Site plans, water reticulation schematic / layout drawing of WSI design works and water requirements ○ Specified activities within water pipe corridor	• Engineering drawings • Topo Survey Plan • Method Statement • Engineering Calculations • PE endorsed reports

PUB's External Works Requirements

G1 Design Gateway		
Objective: ✓ **To assess whether the proposed drainage and sewerage works are in compliance with broad planning parameters (e.g. maximum allowable peak runoff, sewer setback, connection to public sewer etc.)**		
	Requirements	**Supporting Documents**
	Peak Run Off • Key Objective: To demonstrate how this is catered for, area is set aside for detention tank provision, location, OR drain widening • Calculation of peak run off factor (C value) max. 0.55 (based on code and chart) e.g. area of development of greenfield site	-
	Roadside Drain Capacity • For projects where drains need to be rebuilt / entrance culvert. PUB to provide required capacity during Pre-Submission consultation • Size of new culvert (will be advised by PUB) • Public Drains - Drain Size and Location	-
	Sewer Connection • Connection Point – where the proposed location is	-
	Sewerage System • Alignment of Sewers, Dimensions, Gradient	-
	Drainage Reserve • Location (align to DIP), width	-

G1.5 Piling Gateway (Optional)		
Objective: ✓ **Prior to commencement of piling works, QP / PE shall obtain approval for relevant works (works requiring Earth Control Measures, specified activities within water and sewer pipe corridor)**		
	Requirements	**Supporting Documents**
	Pre-Condition CCTV of Sewers (advisable) *To be submitted via independent submission to PUB* • Condition to be checked at TOP stage • Project team to rectify if cracks / damage are identified	-

PUB's External Works Requirements

G2	**Construction Gateway**	
Objective: ✓ **To evaluate the detailed plans showing the proposed drainage (e.g. upgrading, new construction) and sewerage works (e.g. sewer diversion)**		
	Requirements	**Supporting Documents**
	Public Drains (External) • Details of Roadside Drains based on PUB's requirements	-
	Public Sewerage System (External) • Details of Sewerage System based on PUB's requirements	

-	**Independent Submissions**	
Objective: ✓ **To evaluate the detailed plans showing the proposed drainage (e.g. upgrading, new construction) and sewerage works (e.g. sewer diversion)**		
	Requirements	**Supporting Documents**
	• Site plans, water reticulation schematic / layout drawing of WSI design works and water requirements • Specified activities within water pipe corridor	-
	• Earth Control Measures (ECM) Plan • Details of temporary works affecting drainage / within drainage reserve	-
	• Details and scope of works on manholes and sewers • Specified activities within sewer corridor	-

End of External Works Requirements for PUB

For the rest of PUB's requirements, please refer to Page 67.

Direct Submission Process (DSP)

About

- While the multi-gateway RABW will be the default regulatory process for most applications, simpler development typologies (e.g. single-unit residential development, standalone pavilion / linkway, racking system, etc.) need not be subjected to the typical RABW 3-Gateway Process, and can be approved through a more direct process.
- Instead of multiple touchpoints at Design Gateway, Piling Gateway (optional) and Construction Gateway, the Direct Submission Process (DSP) is developed as a **single-stage approval** prior to TOP/CSC.
- Industry can carry out pre-submission consultations with Agencies before proceeding with DSP with greater certainty
- Eligible projects will be put under DSP. Through the guided submission process, projects will also be put through lodgement / self-declaration / simplified submission scheme if eligible.
- If developers intend to proceed with demolition works ahead of clearing DSP, a demolition application to URA and BCA for the demolition works will be required (refer to details here).

Collapsed into single-stage approval

System will auto-channel the applications based on the details provided

One Stage Lodgement / Self-Declaration

- Models/drawings submitted, together with **QP declarations** on compliance with regulatory requirements
- Once received, the relevant agencies will issue acknowledgement(s) of the submission
- Audits may be conducted by agencies
- In the event the submission is not in order or assessed to be ineligible for lodgement/ self-declaration scheme, the relevant agency will issue Written Direction. The submission will then be placed under 'Plan Application' during re-submission

One Stage Plan Check for Approval

- **Agencies directly assess plan application** submission. Work will not be allowed to commence until after such approvals are granted

Direct Submission Process (DSP) for Landed Houses (Single Unit)

Landed Houses

- Direct Submission Process (DSP) will be the default application process for single-unit landed houses.

URA's Plan Lodgment Scheme

- Under URA's Plan Lodgment Scheme, qualifying additions and alterations (A&A) or new erection (NE) proposals for an existing single landed[1] house are not required to apply for planning approval. Qualified Persons (QP) can simply lodge the proposal plans with URA and declare compliance with the prevailing development control guidelines and lodgment criteria. Planning approval would be deemed granted under the terms of the lodgment. An existing landed house within land zoned Residential in the Master Plan, excluding Conservation Areas and Good Class Bungalow Areas (GCBAs), will qualify for this scheme.

- Proposals can also deviate from prevailing development control guidelines:

    - For new structures that deviate from guidelines or street block plan applicable to the development, the QP must first obtain URA's approval for the deviation via a waiver application. QP can then submit the proposal via lodgment and include URA's approval for the deviation as a supporting document in the lodgment application.

    - For existing approved structures that do not comply with prevailing guidelines and are proposed to be retained, a Professional Engineer's (PE) certification is to be submitted as a supporting document in the lodgment application and satisfy URA's retention requirements[2].

One Stage Plan Check for Approval

- Applications that do not qualify for lodgment will be processed under a single-stage plan check. Such applications include conserved houses and good class bungalows, which are assessed based on the merits of their specific design in their respective site context.

3-Gateway RABW

- Applications involving 2 or more houses will be processed through the 3-Gateway RABW.

Modelling of Envelope Control form/massing

- Refer to Section 4 for modelling guide on Envelope Control.

[1] Lodgment is for works carried out to an existing single landed house with its own land title i.e. one house within one land lot.

[2] URA's retention guidelines include retaining at least 25% of the existing floor plate. In addition, a PE needs to certify that the approved structure(s) to be retained is/are structurally sound, can accommodate the new works and will not be damaged in the construction process.

Conservation

Legend: Architecture C&S M&E IFC COMPONENT

Note that Conservation projects are in the exploratory phase of CORENET X submissions and do not need to be submitted in IFC+SG. More updates will be released in future COP versions.

-	Pre-Submission, Planning and Other Consultations	
	Key Words	**Requirement Category**
	Conservation	**Monument** Applicant is to obtain Preservation of Sites and Monuments (PSM)'s endorsement of the proposal prior to making the Design Gateway submission.

G1	Design Gateway	
	Key Words	**Requirement Category**
	Conservation SITE BOUNDARY SLAB BUILDING STOREY WALL SPACE SITE	**Building Form** • Building height • Building profile and extent of conserved building and/or monument • Building profile of new extension and new envelop control developments • Setback of new extension from conserved building and/or monument • Interfacing zone and linkage to conserved building and/or monument **Levels** • Five-footway and internal building finished floor levels • Existing and proposed levels of surrounding open walkway or compound **Party-wall Developments** • Height levels (i.e. Roof ridge and eave, covered and open walkways) of immediately adjacent party wall developments **Roof** • Profile, pitch and height • Rooftop structure on existing flat roof, if any • Mono-pitched link for Secondary Settlement **Site Layout** • Location of conserved extent of building **Supplementary Documents:** a) Business concept and furniture layout of proposed use for change of use in Historic Conservation Area (HCA) b) (For non-BIM submission) Measured survey drawing (for unrestored building) c) (For BIM submissions) BIM model of existing building for unrestored building or BIM model of approved plan for restored building * d) Façade and interior photographs e) Development Statement of Intent (DSI) f) Design Advisory Panel (Conservation) (DAPC) presentation material, if required g) Documentation of existing buildings, if required Note: Extent of proposals to the above should be clearly indicated e.g. repair of existing, retention of existing, reinstatement of missing elements, 1-for-1 replacements or proposed removal. * A restored building is a conserved building which has been restored according to the conservation guidelines and has been issued a Certificate of Statutory Completion (CSC) clearance.

Conservation

Legend: Architecture C&S M&E IFC COMPONENT

Note that Conservation projects are in the exploratory phase of CORENET X submissions and do not need to be submitted in IFC+SG. More updates will be released in future COP versions.

G2	Construction Gateway - All Design Gateway requirements will apply, in addition to the following :-	
	Key Words	**Requirement Category**
	Conservation COLUMN DOOR WALL WINDOW SPACE	• Architectural features (e.g. windows, doors, plaster moulding, roof and floor finishes) • New Structural works (e.g. strengthening) • Interventions (e.g. new roof mezzanine, lift, openings) • M&E installations (e.g. A/C units, flue) Note: Extent of proposals to the above should be clearly indicated e.g. repair of existing, retention of existing, reinstatement of missing elements, 1-for-1 replacements or deletions. **Documents to be part of Approved Plan (Conservation)** a) Drawing or model of architectural details (e.g. decorative ornaments, doors, windows) **Supplementary Documents** a) Structural report, method statement, protective measure, PE's endorsement (for new structural works) b) Structural drawing (for new structural works) c) Design Advisory Panel (Conservation) (DAPC) presentation material, if required d) (For non-BIM submission) Measured survey drawing (for unrestored building) (if not already submitted in full in Design Gateway (G1)) e) (For BIM submissions) BIM model of existing building for unrestored building or BIM model of approved plan for restored building (if not already submitted in full in Design Gateway (G1)) f) Heritage interpretation plan, if required

-	Independent Submission	
	Key Words	**Requirement Category**
	Conservation	**Conserved Building (remaining works to be checked)** • Painting • Signage

End of Conservation Requirements for URA

For the rest of URA's RABW requirements, please refer to Page 83.

Part ST Submissions

About

Note that Part ST Submissions is undergoing further refinements. More updates will be released in future COP versions.

- Under the new Regulatory Approval for Building Works, project teams are required to collaborate and submit a set of coordinated models. Requirements imposed at each gateway are often major requirements that have cross agencies' dependencies.
- Agency specific requirements may be submitted as independent submissions subsequently. Some examples of structural submissions that can be submitted as an independent submission includes:
    - Structural submissions for ancillary works (eg: cladding, barrier)
    - Structural submissions for temporary works (eg: ERSS)
- Industry has raised concerns that while overall design can be done upfront, detailed structural calculations and AC/ACO reports take time to develop. Projects may face significant delay in commencement of works if everything must be submitted and cleared before the relevant approval and permit can be issued.
- To address these concerns, detailed structural design and calculations of eligible projects **need not** be submitted in a single attempt but done through a **limited number of part ST submissions**

Criteria on Eligible Projects for Part ST Submissions

- **Building projects (non-infrastructure 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 works**
    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)

Flow of Part ST Submissions (Construction Gateway)

First CG Submission (CG01) (All agencies BP, WP and C&S Part ST 01)
1. Coordinated IFC Model comprising: *a. Full Architectural model* *b. Full M&E model; and* *c. Structural model (containing full structural details of structural elements under Part ST 01; carcass with minimum details for structural elements in Supplementary structural drawing, detailed calculations, AC/ACO report for Part ST 01*

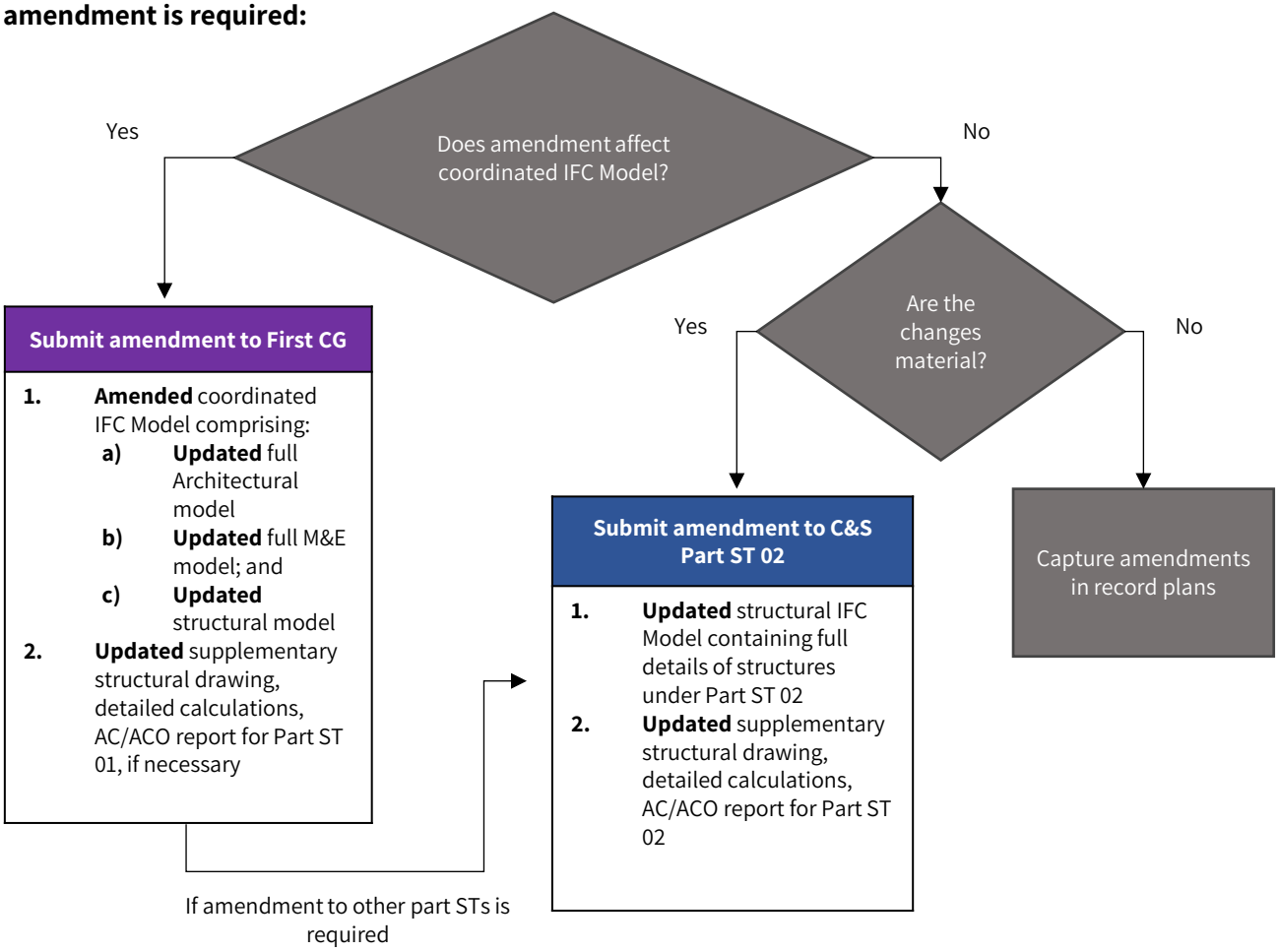
C&S Part ST02 (C&S only)
1. Structural IFC Model containing full details of structures under Part ST 02 *2. Supplementary structural drawing, detailed calculations, AC/ACO report for Part ST 02*

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

Part ST Submissions

Flow of Part ST Submissions (Construction Gateway) *(continued from previous page)*

When amendment is required:



All amendments must be made to the original submission

Part ST Submissions

Guidelines for Part ST Submissions (Large Building Projects)

Note that Part ST Submissions is undergoing further refinements. More updates will be released in future COP versions.

Scope/Scale of Works	Number of Packages Allowed
Superstructure • E.g. consisting of **9 blocks**	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 is allowed.
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	Part ST submission not applicable (submitted under Independent submissions as per the current arrangement under the standard RABW (without phasing) framework)
Cladding	
Façade	
Demolition	
Temporary Deck	

The project team should propose a phasing plan for structural submissions based on this guideline and seek agencies' concurrence at the pre-submission consultation module (Agency specific requirement → BCA → Structural Works) before making submissions.

Part ST Submissions

Guidelines for Part ST Submissions (Infrastructure Works)

Note that Part ST Submissions is undergoing further refinements. More updates will be released in future COP versions.

For more information on Infrastructure works, please refer here.

- Infrastructure Works: Section of underground MRT Station

Section of underground MRT Station	Number of Part ST Submissions Allowed
Main station	1 no. of Part ST Submission for **every 150m** (rounded up to nearest unit)
Cut and cover tunnel, Open box tunnels	
Entrances/Exits	1 no. of Part ST Submission **each**
Launch shafts	1 no. of Part ST Submission **each**
Bored tunnels	1 no. of Part ST Submission **per direction**

- Infrastructure Works: Section of underground MRT Station

Section of Aboveground MRT Station	Number of Part ST Submissions Allowed
Main station	As per underground MRT station (1 no. of Part ST Submission for every 150m)
Entrances/Exits	As per underground MRT station (1 no. of Part ST Submission each)
MRT tracks	Aboveground – As per Railway Track (1 no. of Part ST Submission for every 400m) Underground – As per Bored Tunnel (1 no. of Part ST Submission per direction) or Cut and cover tunnel (1 no. of Part ST Submission for every 150m)

- Infrastructure Works: Railway tracks and viaducts

Infrastructures	Number of Part ST Submissions Allowed
Railway tracks and viaducts	1 no. of Part ST Submission for **every 400m** (rounded up to nearest unit)

- Infrastructure Works: Drainage and sewer

Infrastructures	Number of Part ST Submissions Allowed
Drainage and sewer	1 no. of Part ST Submission for **every 400m** (rounded up to nearest unit)

Part ST Submissions

Guidelines for Part ST Submissions (Infrastructure Works)

Note that Part ST Submissions is undergoing further refinements. More updates will be released in future COP versions.

For more information on Infrastructure works, please refer here.

- Infrastructure Works: Land reclamation, revetment, sea wall, bund wall

Infrastructures	Number of Part ST Submissions Allowed
Land reclamation, revetment, sea wall, bund wall	1 no. of Part ST Submission for **every 4,000m** (rounded up to nearest unit)
	1 no. of Part ST Submission for **each** casting yard
	1 no. of Part ST Submission for dumping plan

The project team should propose a phasing plan for structural submissions based on this guideline and seek agencies' concurrence at the pre-submission consultation module (Agency specific requirement → BCA → Structural Works), before making submissions.

End of Part ST submission for BCA

Infrastructure Works

About

Other than building projects, our built environment involves infrastructure projects supporting the various needs for our population. While similar, infrastructure projects face different sets of challenges from building projects. This section aims to guide the industry through the regulatory approval for infrastructure works.

Categorisation of Infrastructure Works

Infrastructure works can be grouped into different categories:

Infrastructure that functions like a building

Infrastructure works that function like buildings

Examples include
- MRT Station (including exits)
- Transport nodes/ interchange
- Electrical substation
- Underground (UG) buildings such as UG MRT Station, UG substation

Intended Workflow

The workflow for this category will follow that of a building (i.e. 3 Gateway Process)

Refer to Section 3 for details

Civil Engineering Works that is external to a development

External works for new developments

To support a new development, it is important to ensure its integration with the surroundings and that the capacity of our public infrastructure meets the increasing demand brought by the new development

Intended Workflow

The workflow for this category will follow that of external works

Refer to details here

Public Infrastructure Works

Public infrastructure works undertaken by public agencies

Examples include:
- Precinct level infrastructure works carried out by developing agencies (e.g.: HDB, JTC)
- Railway track/ tunnels
- Viaducts

Intended Workflow

The workflow for this category will largely follow that of the 3 Gateway Process.

Refer to details below

Regulatory Process for Public Infrastructure Works

The relevance of Design Gateway (in terms of the number of agencies involved) depends on various factors:

- The nature of the works
- The site condition and extent of infrastructure works
- Pre-submission consultations that might have taken place earlier

For instance, for a developing agency (such as JTC and HDB) carrying out precinct level infrastructure works to prepare the site for future developments, regulatory agencies such as LTA, PUB and NParks would be involved in the Design Gateway to align the various aspects such as the alignment of roads, drains, green verge, platform level etc.

On the other hand, in the case of underground railway tracks, fewer agencies would be involved as advance works such as service/traffic diversion and cutting of trees would have been carried out earlier as part of site preparation.

In gist, the Design Gateway and 3 gateway submission workflow remain relevant and viable to accommodate the range of infrastructure works. Depending on the works involved, the extent of details required at Design Gateway varies.

Infrastructure Works

Regulatory Agencies' Requirements relevant for Public Infrastructure Works

The below table summarises the type of approvals required by the key regulatory agencies.

Note: This is not meant to be an exhaustive list. If clarifications are required, please contact CORENET X helpdesk and relevant agency for clarification.

	Others (e.g.: Pre-sub process/consultation, Independent)	**Design Gateway**	**Piling Gateway** (optional)	**Construction Gateway**
URA	Must seek land use approval for the infra alignment prior to DG. For new roads & rail, proposed road/rail must keep within approved road reserve/railway area	• Buildings above and below ground e.g. ventilation buildings, MRT station boxes, entrances and associated structures. • Proposals that deviate from the approved land use approval	NIL	• Buildings above and below ground e.g. ventilation buildings, MRT station boxes, entrances and associated structures. • Proposals that deviate from the approved land use approval
LTA	Submission via LTA Prompt	• If within existing railway protection zone • If works within road reserve/ affected by road structure safety zone	If within existing railway protection zone	• If within existing railway protection zone • If works within road reserve/ affected by road structure safety zone
NParks	EIA, EMMP, advanced works e.g. tree cutting/ earthworks	• If new/affecting existing roadside trees, green verges and/or existing park/ Park connector/ nature area/ nature reserve/ heritage road green buffer, etc.	NIL	• If new/affecting existing roadside trees, green verges and/or existing park/ Park connector/ nature area/ nature reserve/ heritage road green buffer, etc.
PUB	• Access to sewers (Form B) • Submission via B&P Portal (POWS)	• If new/ affecting existing sewer works • If new/ affecting existing drainage works	NIL	• If new/ affecting existing sewer works • If new/ affecting existing drainage works
NEA	EIA, NIA (for projects within 70m of resi/ noise sensitive developments)	• If within 70m of resi/ noise sensitive developments • For any environmental health/ pollution control requirements	NIL	• If within 70m of resi/ noise sensitive developments • For any environmental health/ pollution control requirements
BCA	Complex structures, ERSS etc.	NIL	If piling works involved	• For main structural works
SCDF	Performance-based fire engineering	NIL	NIL	• For underground tunnels

Infrastructure Works

Illustration of agencies' involvement at the various Gateways

The below table serves to give an illustration of possible types of projects and correspondingly the agencies' approvals required.

Note: This is not meant to be an exhaustive list. If clarifications are required, please contact CORENET X helpdesk and relevant agency for clarification.

	Type of infra works and site condition	**DG**	**PG** (optional)	**CG**	**Independent**
1	JTC/HDB precinct level involving new roads/drains, overhead bridge affecting green verge and trees	LTA, PUB, NParks	BCA	LTA, BCA, PUB, NParks	
2	LTA at-grade road construction/ viaduct by LTA, affecting green verge & drains/sewers more than 1.5m deep	PUB, NParks	BCA	PUB, BCA, NParks	-
3	PUB construction of drains within railway protection zone, affecting green verge, less than 1.5m depth	NParks, LTA Rails	LTA Rails	LTA Rails, NParks	-
4	LTA aboveground railway viaduct affecting some existing drains & green verge/trees within 70m of residential development	PUB, NEA, NPARKS	BCA	PUB, BCA, NEA, NParks	Agency-specific requirements e.g. NEA noise assessment
5	LTA cut and cover road tunnel affecting green verge requiring diversion of sewer > 1.5m deep	NParks, PUB	BCA	PUB, BCA, SCDF, NParks	-
6a	LTA underground rail bored tunnel/ common service tunnels within road reserve affecting green verge & trees	NParks	-	BCA, SCDF, NParks	
6b	LTA underground rail bored tunnel/ common service tunnels within road reserve affecting existing sewer	PUB	-	BCA, SCDF, PUB	Agency-specific requirements e.g. performance-based FE
7	PUB DTSS affecting trees and existing sewer	PUB, NParks	-	BCA, NParks	

End of Infrastructure Works

SECTION 4

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

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

Preparing Models for Submission (General)

Model Size

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

For huge developments that need to arrange their projects into different packages, please carry out a pre-submission consultation to seek agencies' concurrence for the proposal.

To help all project members understand the timing and delivery of data for every CORENET X submission, it is important to define the submission preparation and delivery details in the BIM Execution Plan. For more information, please refer to the BIM Essential Guide for BIM Execution Plan here.

Setting up Project Information

The Project Title, Address, QP Name & Professional Registration Number, and if applicable, Name & Professional Registration Number of Specialist QPs will be provided on the CORENET X Portal.

Modelling in IFC+SG

- Industry practitioners shall adopt and export the BIM model to international IFC 4 standards. A set of IFC+SG standards was developed to address specific regulatory requirements in Singapore that currently cannot be found in the international IFC standards.
- There are also IFC+SG parameters that had been defined & standardized to incorporate the current 2D drawings information and embedded in 3D models.
- A complete set of IFC+SG model shall consist of elements as described in this section of this COP. For example, a structural model can comprise of the following :
    - Piles
    - Footings / Pilecaps
    - Beams
    - Columns
    - Walls
    - Slabs
    - Staircases
    - Boreholes
- Industry practitioners shall use the IFC+SG Resource Kit to convert Native BIM models into IFC+SG models and verify no data loss occurred during the exporting.
- 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.

Link:
IFC+SG Resource Kit

Preparing Models for Submission (General)

Reading the IFC+SG Mapping

- ✓ Know the element and its category
- ✓ What system it belongs to?
- ✓ What are the IFC Parameters that needs to map into it?
- ✓ To what Agency it will be submitted?

Agency	Identified Component	Identified parameters	Revit Representation	Archicad Representation	Domain	IFC4 Entities	IFC SubTypes (* = USERDEFINED)	Property Set	Property Name
PUB	Cold Water System	-	Piping Systems	MEP System	PLU	IfcDistributionSystem	*DOMESTICCOLDWATER	-	-
PUB	Bedding	Type	Generic Models	Model Element	ARC	IfcGeographicElement	*FOUNDATION	SGPset_GeographicElement	BeddingType
PUB	Manhole	Length	Plumbing Fixtures	Flow Equipment	PLU	IfcDistributionChamberElement	MANHOLE	SGPset_DistributionChamberElementDimension	Length
PUB	Manhole	Width	Plumbing Fixtures	Flow Equipment	PLU	IfcDistributionChamberElement	MANHOLE	SGPset_DistributionChamberElementDimension	Width
PUB	Manhole	Depth	Plumbing Fixtures	Flow Equipment	PLU	IfcDistributionChamberElement	MANHOLE	SGPset_DistributionChamberElementDimension	Depth
PUB	Sanitary System	-	Piping Systems	MEP System	PLU	IfcDistributionSystem	*SANITARY	-	-
PUB	Sanitary System	-	Piping Systems	MEP System	PLU	IfcDistributionSystem	*SANITARY	-	-
PUB	Inspection Chamber	Length	Plumbing Fixtures	Flow Equipment	PLU	IfcDistributionChamberElement	INSPECTIONCHAMBER	SGPset_DistributionChamberElementDimension	Length
PUB	Inspection Chamber	Width	Plumbing Fixtures	Flow Equipment	PLU	IfcDistributionChamberElement	INSPECTIONCHAMBER	SGPset_DistributionChamberElementDimension	Width
PUB	Inspection Chamber	Depth	Plumbing Fixtures	Flow Equipment	PLU	IfcDistributionChamberElement	INSPECTIONCHAMBER	SGPset_DistributionChamberElementDimension	Depth
PUB	Grease Trap	Height	Plumbing Fixtures	Flow Equipment	PLU	IfcInterceptor	GREASE	SGPset_InterceptorDimension	Height
PUB	Grease Trap	Width	Plumbing Fixtures	Flow Equipment	PLU	IfcInterceptor	GREASE	SGPset_InterceptorDimension	Width
PUB	Grease Trap	Length	Plumbing Fixtures	Flow Equipment	PLU	IfcInterceptor	GREASE	SGPset_InterceptorDimension	Length
PUB	Water Closet	-	Plumbing Fixtures	Pipe Flow Termini	PLU	IfcSanitaryTerminal	*WATERCLOSET	-	-
PUB	Sanitary System	Gradient	Piping Systems	MEP System	PLU	IfcDistributionSystem	*SANITARY	SGPset_SystemDimension	Gradient
PUB	Sanitary System	Length	Piping Systems	MEP System	PLU	IfcDistributionSystem	*SANITARY	SGPset_SystemDimension	Length
PUB	Sanitary System	Diameter	Piping Systems	MEP System	PLU	IfcDistributionSystem	*SANITARY	SGPset_SystemDimension	Diameter
PUB	Sump Pump	Standby Pump	Mechanical Equipment	Flow Equipment	PLU	IfcPump	SUMPPUMP	SGPset_Pump	Standby
PUB	Sump Pump	Duty	Mechanical Equipment	Flow Equipment	PLU	IfcPump	SUMPPUMP	SGPset_Pump	Duty
PUB	Sump Pump	Capacity	Mechanical Equipment	Flow Equipment	PLU	IfcPump	SUMPPUMP	SGPset_Pump	Capacity
PUB	Oil Interceptor	Height	Plumbing Fixtures	Flow Equipment	PLU	IfcInterceptor	OIL	SGPset_InterceptorDimension	Height
PUB	Oil Interceptor	Width	Plumbing Fixtures	Flow Equipment	PLU	IfcInterceptor	OIL	SGPset_InterceptorDimension	Width

S4 – Fig 1: IFC+SG Mapping

Setting up the Model

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

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

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

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

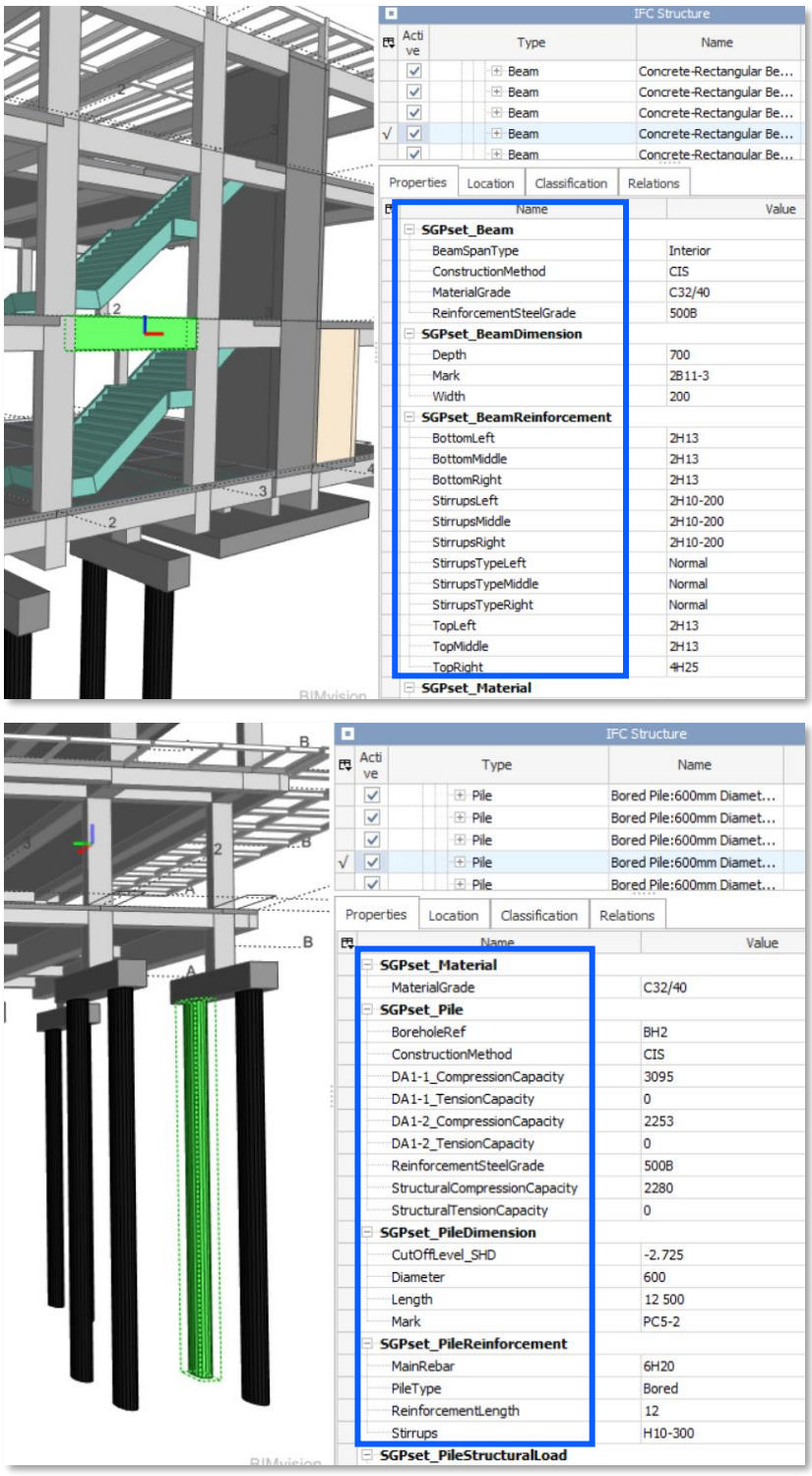
Map the existing object library properties into configuration file

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

Link:
IFC+SG Resource Kit

Preparing Models for Submission (General)

Examples of IFC+SG Parameters



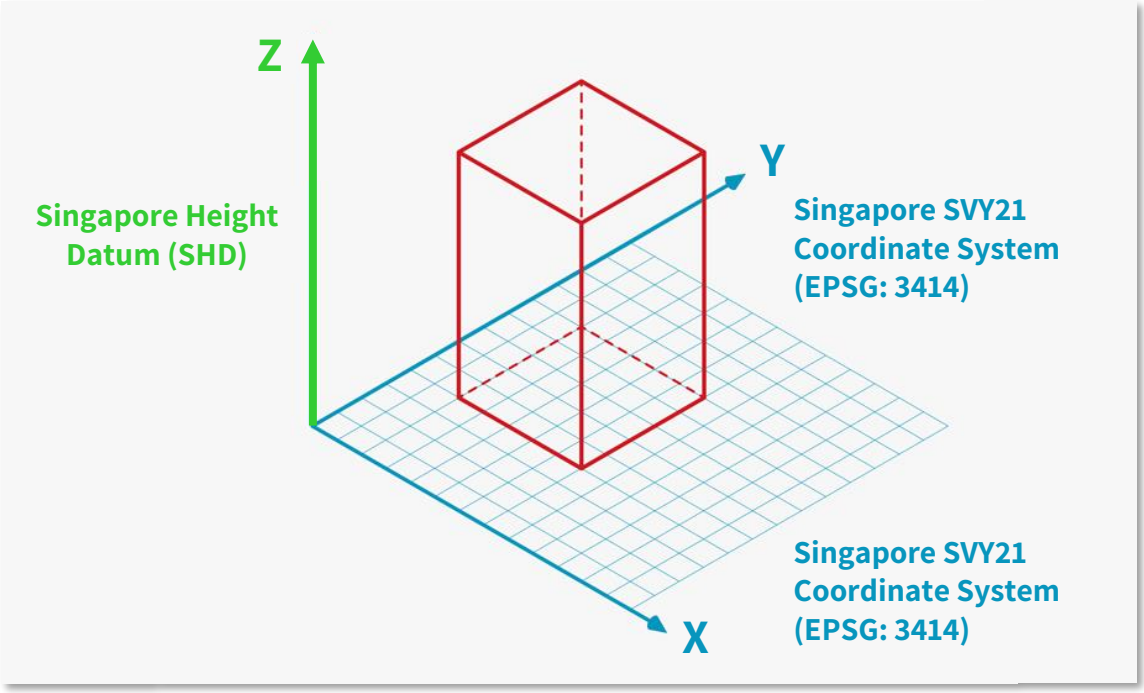
S4 – Fig 2 and 3 : Example of IFC+SG Parameters

Link:
IFC+SG Resource Kit

Multi-Disciplinary Coordination

Geo-Referencing

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



S4 – Fig 4: Geo-Referencing

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 demonstration on geo-referencing, please visit the CORENET X website here.

Basic Geo-Referencing Checks

1. Open a third-party IFC viewer and select a point to check the coordinates.
2. Compare the coordinates with the expected real-life coordinates as specified by the project team.

Advanced Troubleshooting

1. Revit Users in the same project team with wrongly geo-referenced files: https://www.autodesk.com/support/technical/article/caas/sfdcarticles/sfdcarticles/How-to-manage-Revit-linked-models-while-exporting-with-IFC-SG-schema.html

2. Revit and Archicad Users in the same project team with wrongly geo-referenced files: https://graphisoft.sharefile.com/public/share/web-s743946e891c34b9db46bf5c41f1ec42d

Multi-Disciplinary Coordination

Block Management for IFC Export

Besides discipline-specific models, it may be necessary to divide the project into separate parts, zones and levels for better management of the model sizes, especially for larger and more complex projects.

- Where the project involves multiple buildings, to ensure that the file size is manageable, QP should export each block as one IfcSite in a separate IFC file.

- Each block can be identified via the IfcSite “Name” attribute. Please refer here for further guidelines on how to provide IfcSite “Name” and export to IFC.

Except for linked (or hotlink) files which are repetitive modules, any linked file should not be moved in the container file (or host file) in any directions (x,y,z). The position of the linked file in relation to the project site should be set up correctly at start of the project. Any change to the position of the linked file in related to the project site should be adjusted in the linked file itself.

Multi-Disciplinary Coordination

Alignment of Levels and Zones Across All Disciplines' Models

As part of the coordinated BIM model submitted by the QPs, BIM models from all disciplines MUST adopt a coordinated set of levels and zones and name the levels and zones identically. **In addition, project teams can ensure better coordination by following the same set of established naming conventions for building levels.**

➢ **Only multi-disciplinary models with identical names and "Z" values for levels will be processed by Processing Officers in the CORENET X Collaboration Platform.**

Building storeys with same storey naming should have the same "Z" value. This ensure clarity and prevents confusion that could arise from differences in naming yet referring to the same level.

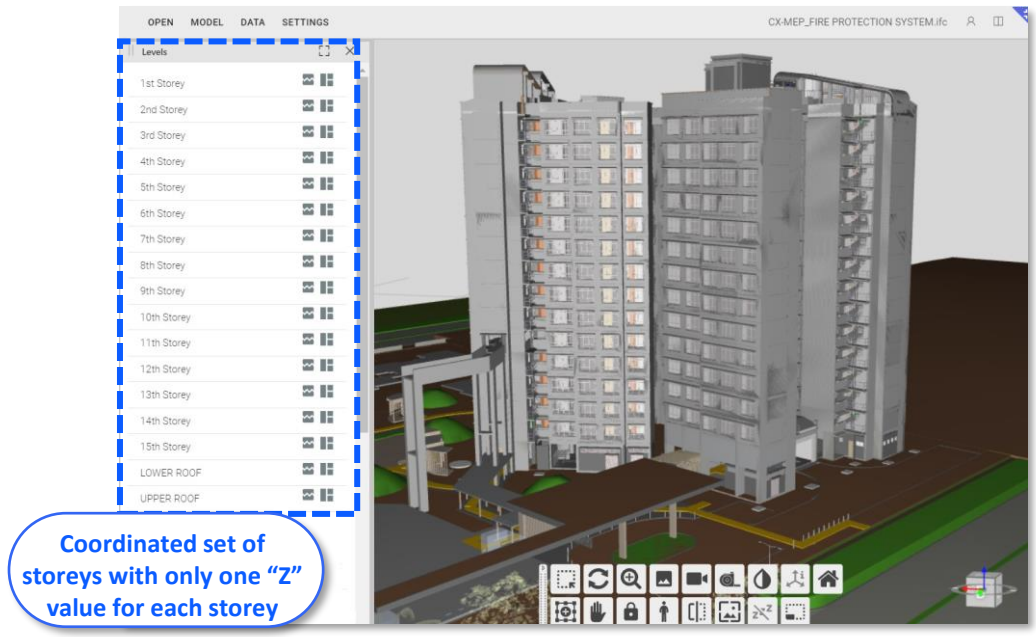
- For example: In a project where the modelling standard was not aligned:

Inconsistency in naming across disciplines can potentially lead to confusion, as illustrated in below table:.

Disciple	Storey Naming	Level height
Architectural	1st Storey	3.000
M&E	Level 1	3.000
Structural	Storey 1st	2.950

Consistent set of naming for each level and different naming for other heights ensure clarity, as illustrated in below table.

Disciple	Storey Naming	Level height
Architectural	1st Storey	3.000
M&E	1st Storey	3.000
Structural	1st Storey _SFL	2.950



S4 – Fig 5: Multi-Disciplinary Coordination

Multi-Disciplinary Coordination

Alignment of Levels and Zones Across All Disciplines' Models

At the same time, IFC standard recommends that elements in the BIM models, including storey, retain a unique GlobalId (Globally Unique Identifier) across all models to support data integrity and accurate model referencing. Please refer to here for further guidelines on how to ensure consistency in levels and achieve unique GlobalId across all BIM models for your project.

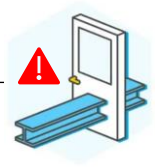
An example of unique GlobalId across all models:

- File A (Architecture): "1st Storey" - GlobalId: 3f7c4e8a-9b2d-11ed-a8fc
- File B (Structure): "1st Storey" - GlobalId: 8d2e5f9b-3c4a-12fg-b9de
- File C (MEP): "1st Storey" - GlobalId: 2k7h4j5l-6m8n-09op-q1rs

Multi-Disciplinary Coordination

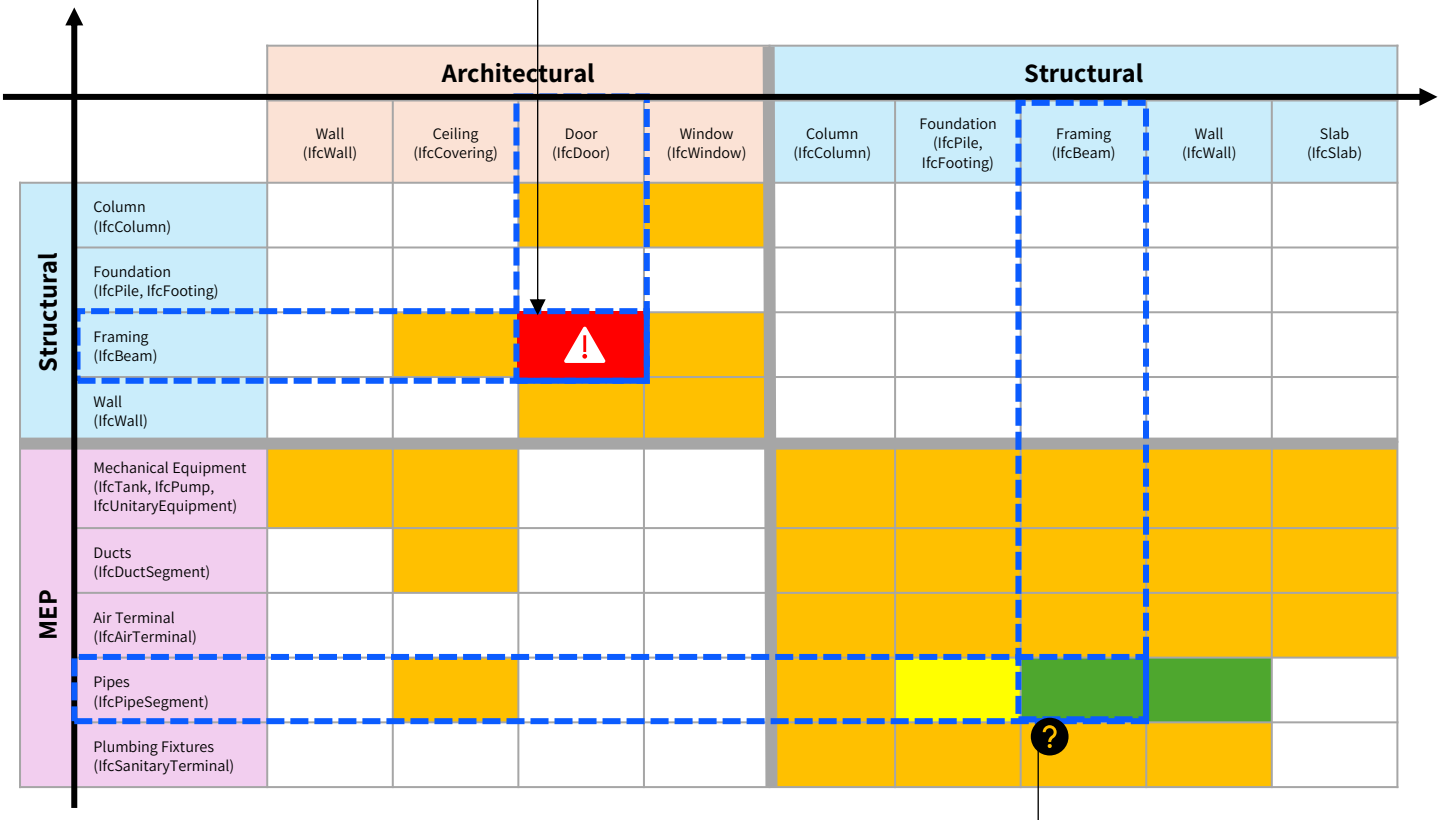
Clash Detection

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



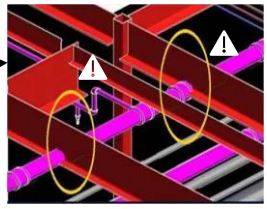
S4 – Fig 6 : Design Clash
Source: https://www.bimcollab.com/en/products/bimcollab-zoom-b/

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



S4 – Fig 7: Multi-Disciplinary Coordination

For example, the MEP Pipes can have a design clash with the Structural Beam if the diameter/width is ≤ 100mm



S4 – Fig 8 : Design Clash
Photo credit: Clash Detection Projects | Tesla CAD UK

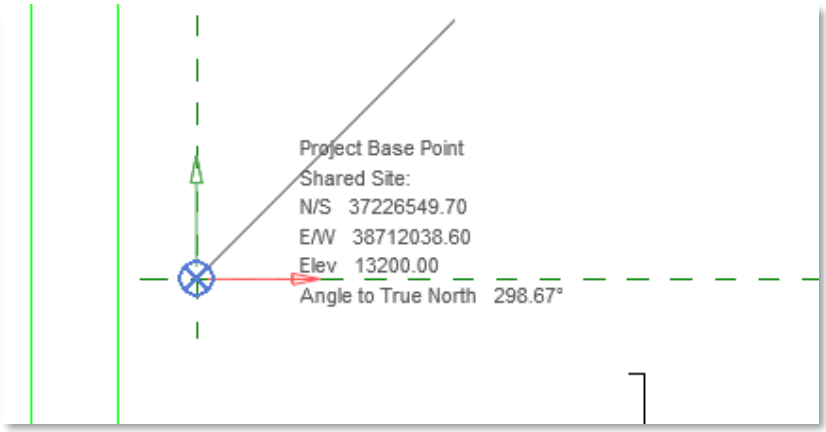
Note: Clash tolerance for specialist equipment such as an active chilled beam is acceptable.

Preparing Models for Submission (Revit)

Example using Revit Configuration File

1. Set your model into the agreed coordinates

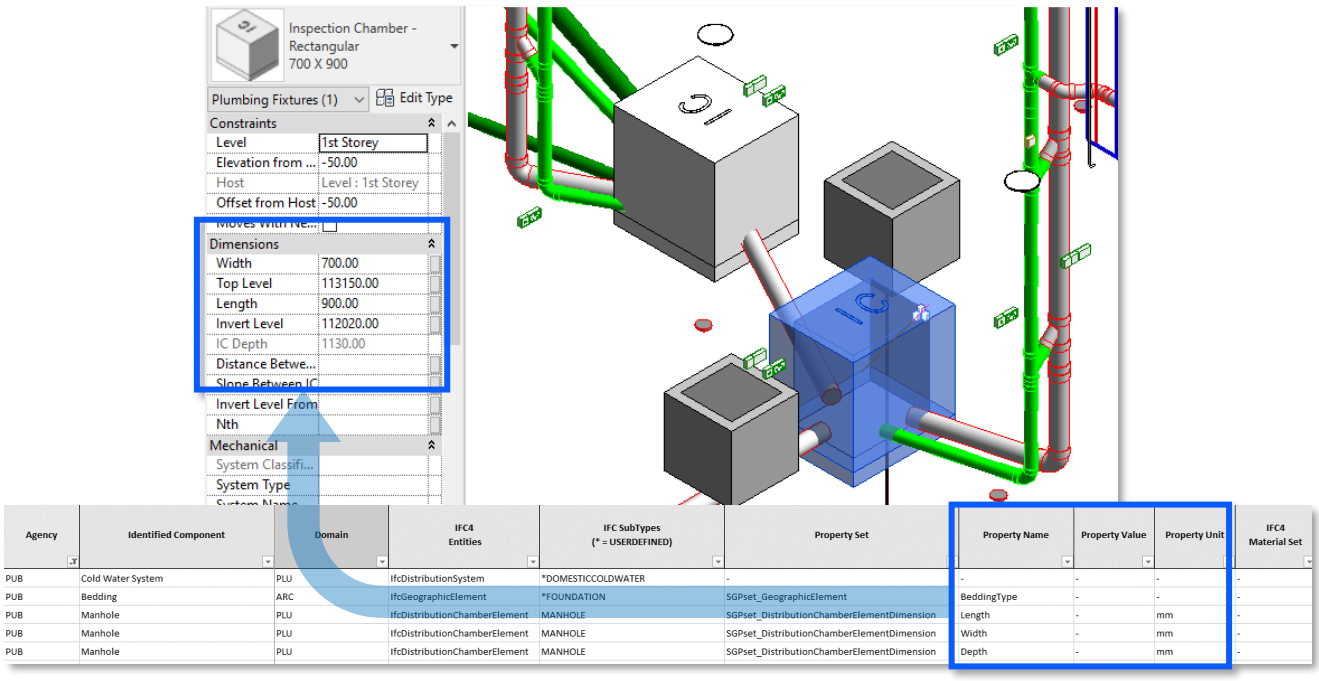
- To place model into the correct location with Architectural, Civil & Structural, Mechanical & Electrical models.



S4 – Fig 9

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

- Element's properties can be assigned while Modelling.



S4 – Fig 10

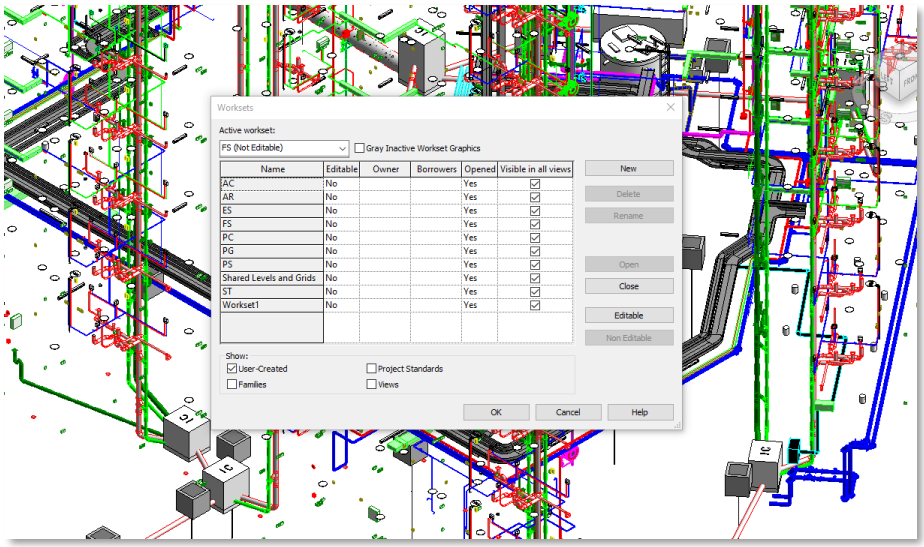
Link:
IFC+SG Resource Kit

Preparing Models for Submission (Revit)

Example using Revit Configuration File

3. Set the Revit Workset

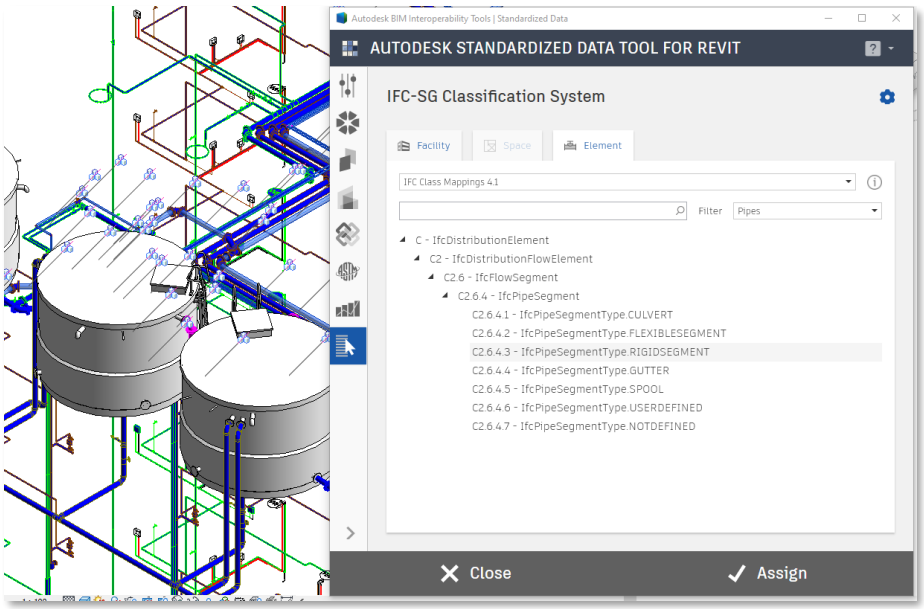
- To easily select the elements during IFC+SG Parameters mapping.
- To filter the views per Agency Submission.
- To reduce time when Exporting model in IFC format.
- To easily navigate when Modelling and model auditing.



S4 – Fig 11

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.



S4 – Fig 12

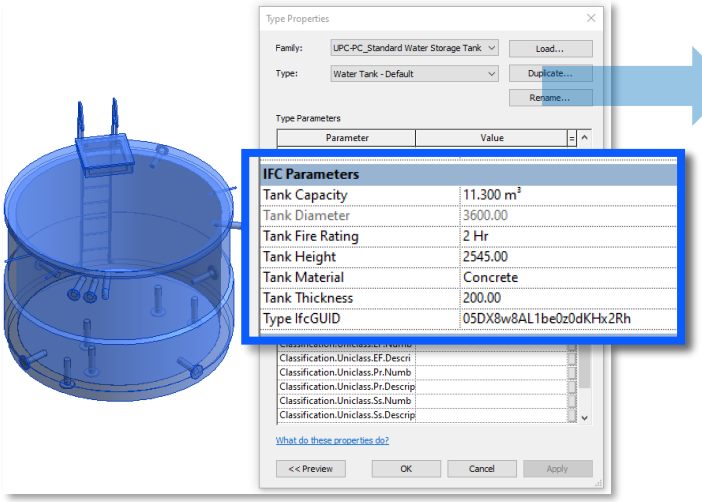
Link:
[IFC+SG Resource Kit]

Preparing Models for Submission (Revit)

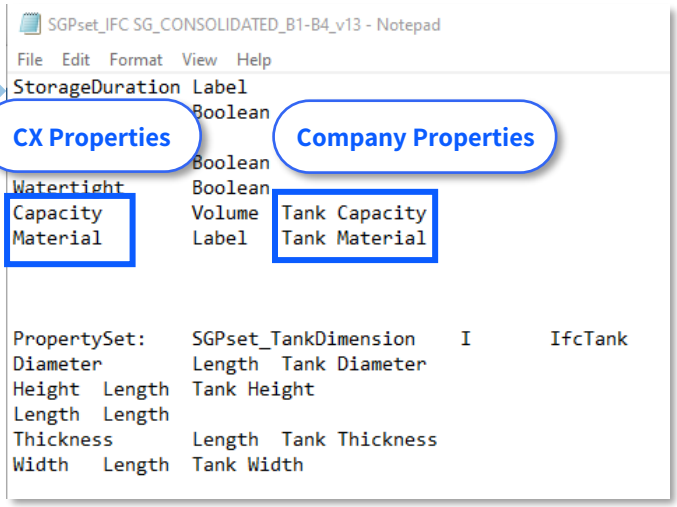
Example using Revit Configuration File

From Revit Library

- Editing the Configuration File to Adapt In-house Company Properties

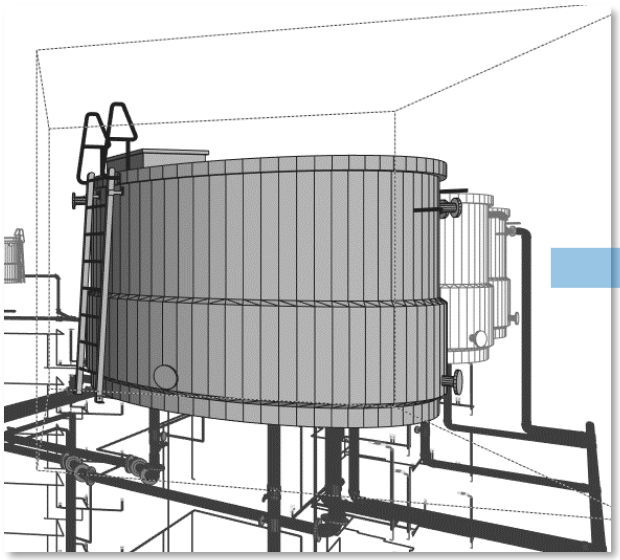


S4 – Fig 13: Revit Library

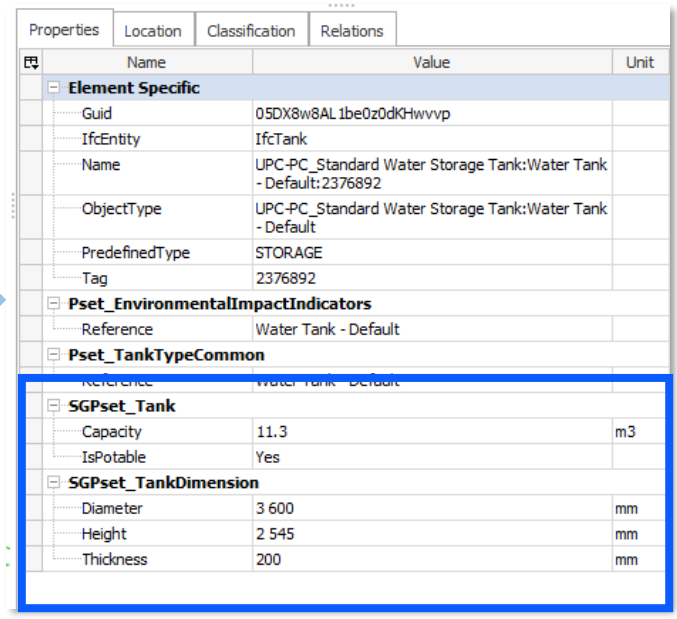


S4 – Fig 14: Configuration File

From IFC Model



S4 – Fig 15



S4 – Fig 16

Link:
IFC+SG Resource Kit

Top 3 Common Modelling Challenges and Solutions (Revit)

Example using Revit Configuration File

Challenge 1

Challenge	Implications	Solutions
Accidentally spelling IFC property wrongly e.g. ✓ IfcTank × IfcTanl × ifctank	➢ **Missing data in IFC** • IFC properties cannot be exported • Existing in-house properties not mapped properly (to wrong IFC properties), thus also can't be exported	✓ **Avoid manual typing where possible** • Use BIM Interoperability Tool, select from drop down list • Copy Paste the information from IFC+SG Industry Mapping (.XLS file from GovTech)

Challenge 2

Challenge	Implications	Solutions
Forgetting to update IFC after changes / modifications to model	➢ **Missing data in IFC** • IFC properties cannot be exported • Existing in-house properties not mapped properly (to wrong IFC properties), thus also can't be exported	✓ **Check Mapping** • Redo the mapping • Use Schedule to cross check if all elements were tagged properly. ✓ **Avoid manual typing where possible** • Use BIM Interoperability Tool, select from drop down list • Copy Paste the information from IFC+SG Industry Mapping (.XLS file from GovTech)

Challenge 3

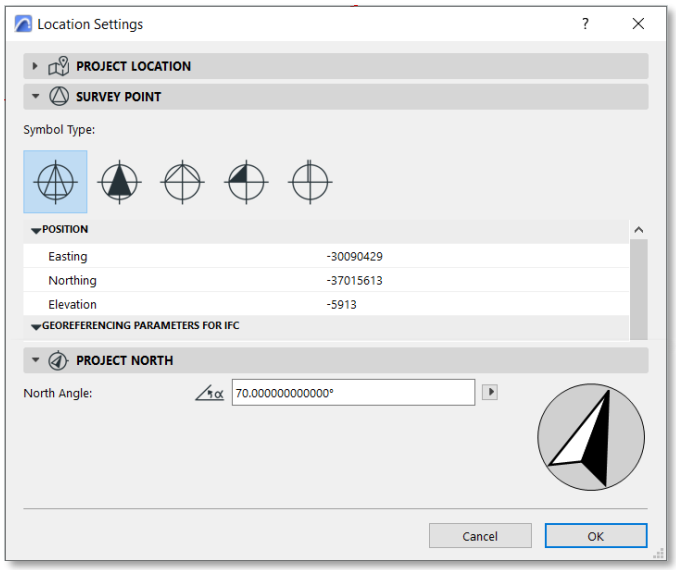
Challenge	Implications	Solutions
Cannot export Revit linked files to a federated IFC (model with multiple link files) e.g. MEP sub-discipline models	➢ **Missing data in IFC** • Assigned systems will be lost • IFC properties cannot be exported • Existing in-house properties not mapped properly (to wrong IFC properties), thus also can't be exported	✓ **Today** • Tag information after binding models • Use Group Models instead of Binding • Avoid binding if possible (i.e. export linked files one by one) ✓ **Future** • Through CORENET X community of practice, we have feedback to Autodesk to enable export of federated IFC • **Autodesk shared that this is part of the Revit Roadmap and will be included progressively in early 2023**

Preparing Models for Submission (Archicad)

Example using Archicad Configuration File

1. Geo-reference the project

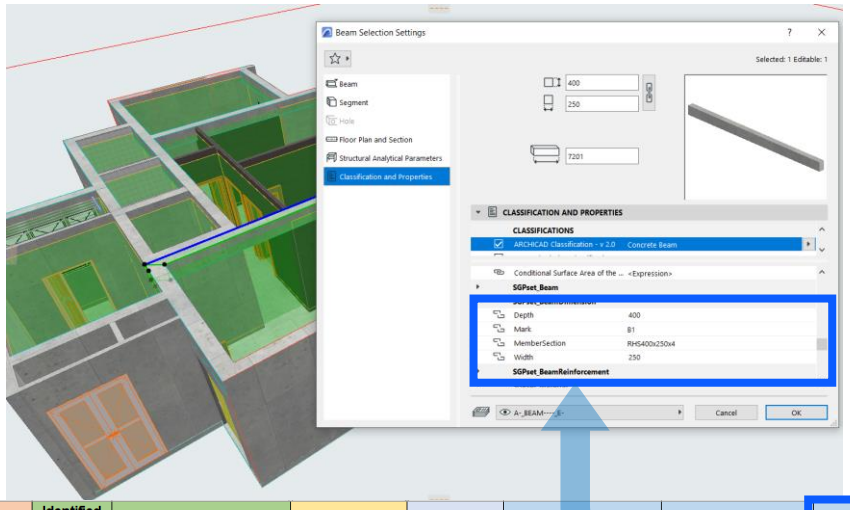
- To geo reference the project for Architectural, Civil & Structural, Mechanical & Electrical Model, refer here.



S4 – Fig 17

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

- Element's properties can be assigned while modeling. Note: some parameters can be auto-filled using expressions.



Agency	Identified Component	Identified parameters	Archicad Representation	Discipline	IFC4 Entities	IFC Sub Types (* = USERDEFINED)	Property Set	Property Name	Property Type	Property Unit	IFC4 Material Set
BCA	Beam	Depth	Beam	STR	IfcBeam	Need not specify	SGPset_BeamDimension	Depth	Length	mm	N.A
BCA	Beam	Mark	Beam	STR	IfcBeam	Need not specify	SGPset_BeamDimension	Mark	Label	N.A	N.A
BCA	Beam	Member Section	Beam	STR	IfcBeam	Need not specify	SGPset_BeamDimension	MemberSection	Label	N.A	N.A
BCA	Beam	Width	Beam	STR	IfcBeam	Need not specify	SGPset_BeamDimension	Width	Length	mm	N.A

S4 – Fig 18

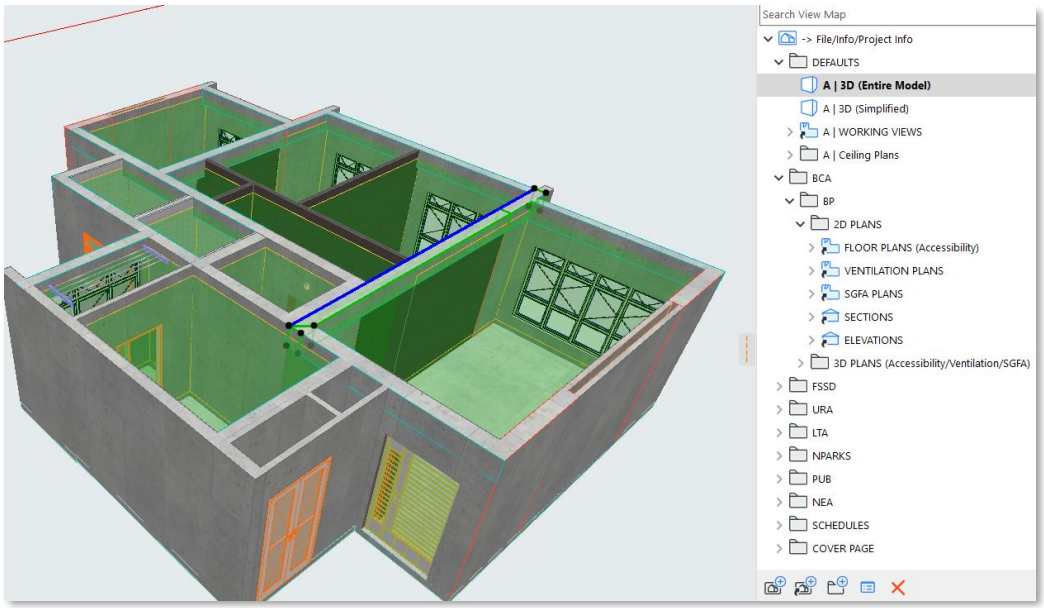
Link:
IFC+SG Resource Kit

Preparing Models for Submission (Archicad)

Example using Archicad Configuration File

3. Set the View for Export from Navigator

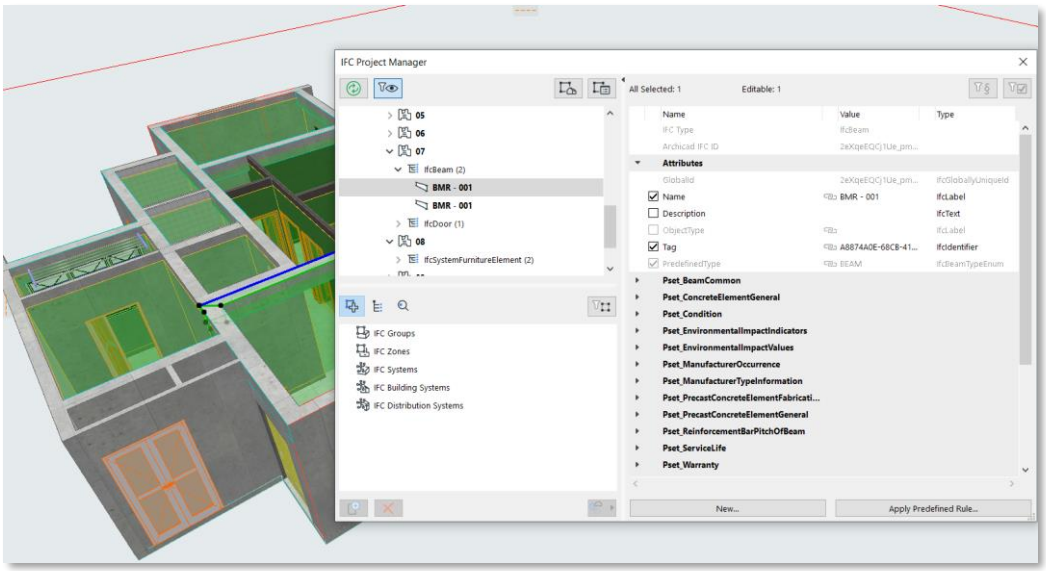
- To easily view and select the elements while modelling.
- To easily navigate while modeling and checking.
- To filter the views as per Agency Submission.
- To easily export only elements visible on the current view.



S4 – Fig 19

4. Model Verification using IFC Project Manager

- IFC Project Manager for Model Verification before export
- Assign or edit IFC+SG Property Values.
- Create custom IFC Property, Groups (Zones, Systems)



S4 – Fig 20

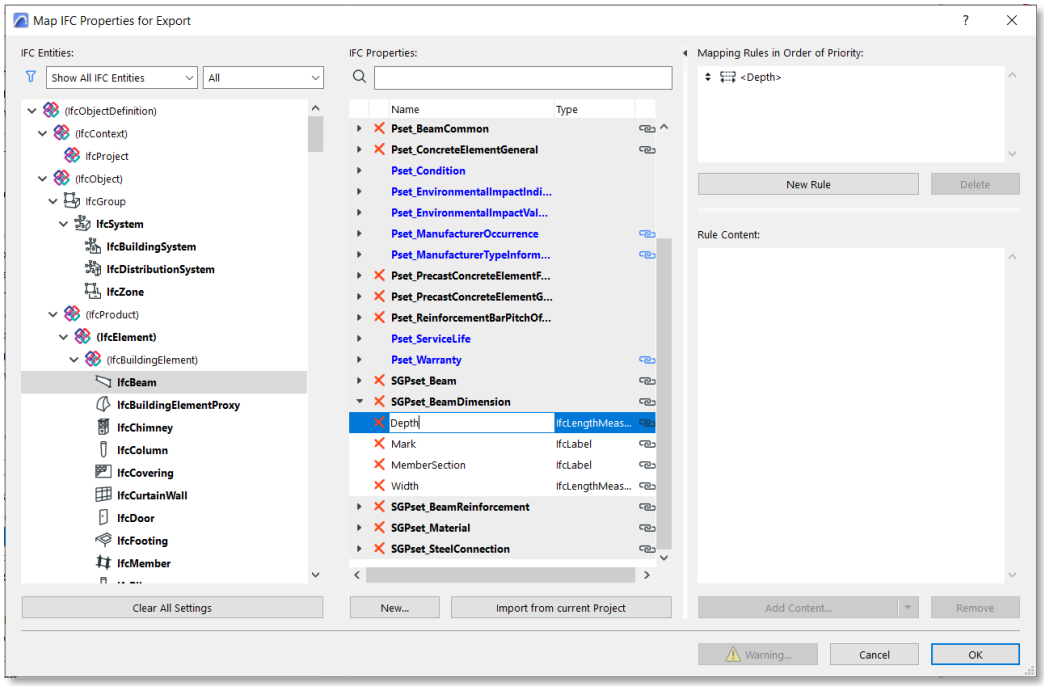
Link:
IFC+SG Resource Kit

Preparing Models for Submission (Archicad)

Example using Archicad Configuration File

5. IFC+SG Property Mapping

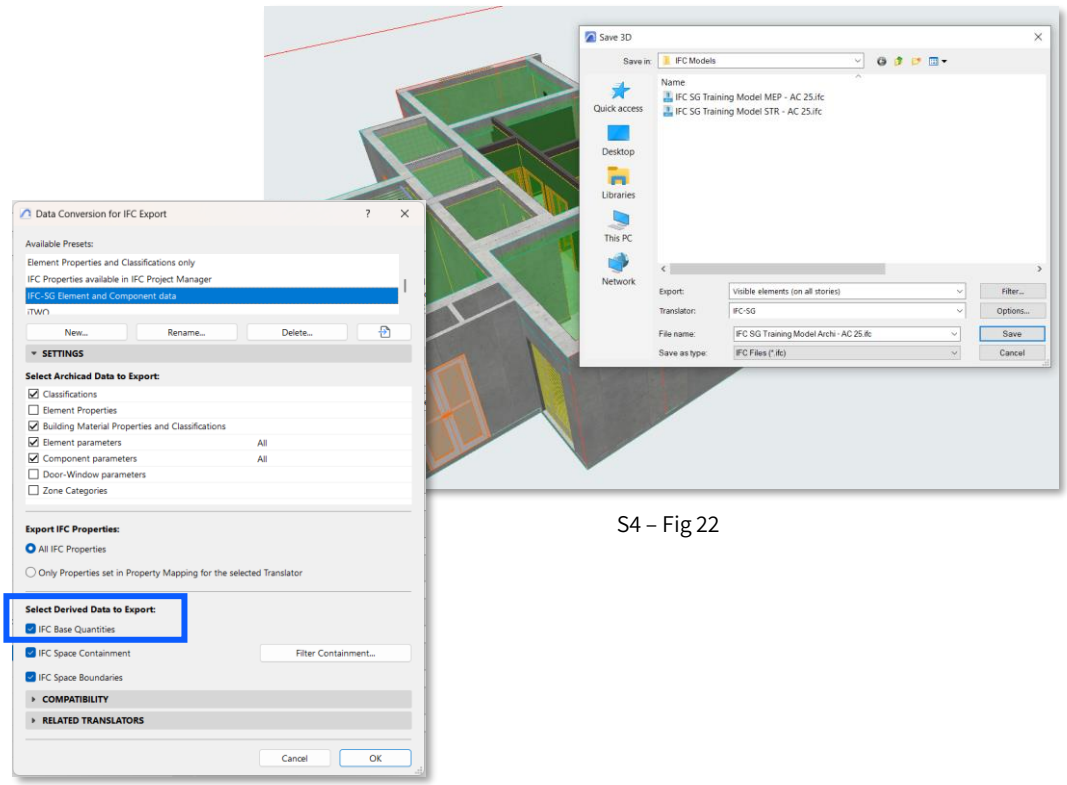
- IFC+SG Properties are already mapped in the IFC+SG Export Translator.



S4 – Fig 21

6. Export IFC Model

- Export visible elements (in all stories)
- Make sure to chose IFC+SG Translator
- Ensure that IFC Base Quantities are exported
- Verify the IFC model in BIM Vision or Solibri Anywhere after exporting.



S4 – Fig 22

Link:
[IFC+SG Resource Kit]

Top 3 Modelling Tips (Archicad)

Example using Archicad Configuration File

Tip 1

Scenario	Implications	Solutions
Updating latest IFC+SG requirements in Archicad project.	➢ **Missing data in IFC**	✓ **Import latest config files**
	• Not importing latest IFC+SG requirements (config files) into the project.	For ongoing project: • If expressions are used in properties, make sure to export those properties definitions (xml files). • If IFC+SG parameters are populated with values, make sure to export those element parameters (Excel export from Schedules) • Import the config files using the Import IFC+SG Classifications and Properties add-on. • Import (merge) the properties xml exported in step 1. • Import the excel schedule exported in step 2. For new project: • Import the config files using the Import IFC+SG Classifications and Properties add-on.

Tip 2

Scenario	Implications	Solutions
Update IFC+SG parameter values of non geometric entities. E.g.: IfcSite, IfcBuilding, IfcStorey	➢ **Missing data in IFC**	✓ **Import latest config files**
	• Missing values of IFC+SG Parameters of Non geometric entities.	• Use IFC Project Manager to update the values of IFC+SG Parameters of spatial entities like IfcSite, IfcBuilding, IfcStorey

Tip 3

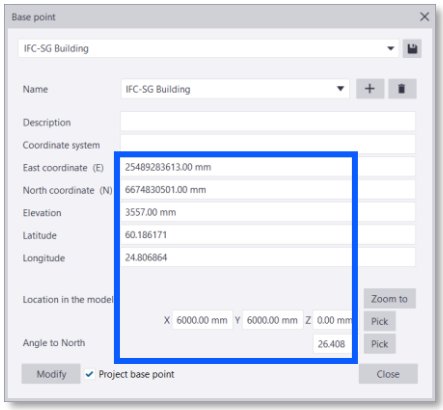
Scenario	Implications	Solutions
Update parameter values of IFC Systems, Groups, Building Systems, Distribution Systems	➢ **Missing data in IFC**	✓ **Import latest config files**
	• Missing values of IFC+SG Parameters of IFC Systems, Groups, Building Systems, Distribution Systems	• Use IFC Project Manager to update the values of IFC+SG Parameters of IFC Systems, Groups, Building Systems, Distribution Systems.

Preparing Models for Submission (Tekla)

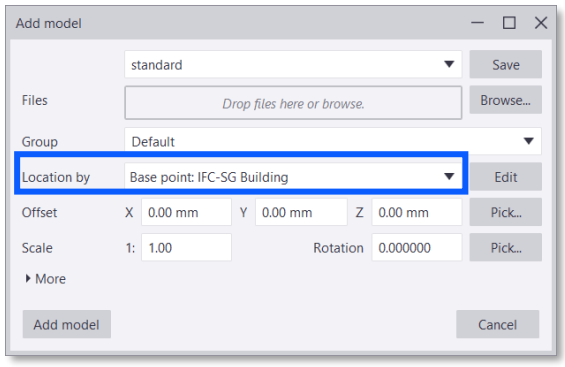
Example using Tekla Configuration File

1. Geo-reference the project

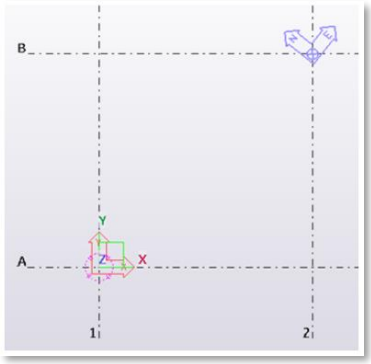
- To place model relative to the selected project base point using the coordinate system values.



S4 – Fig 23 :
Example of Base Point Dialog Box



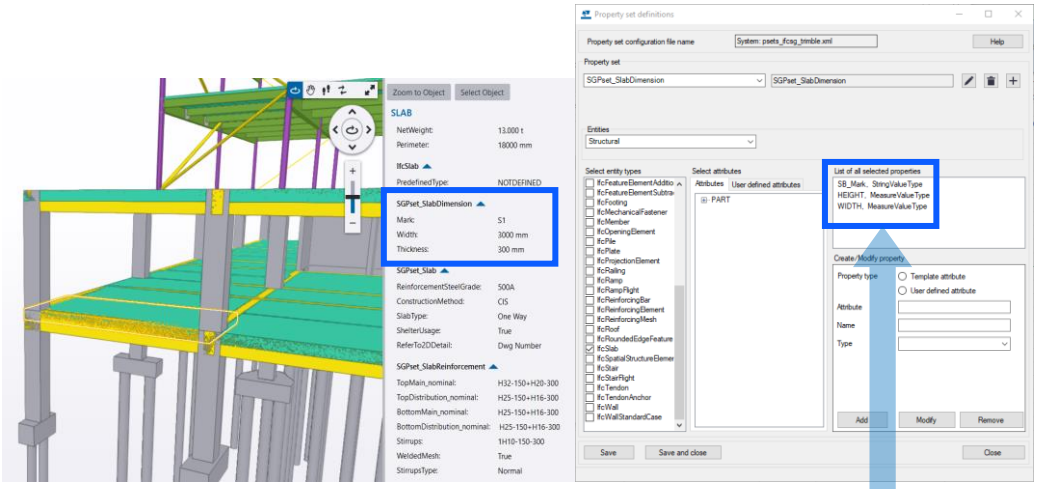
S4 – Fig 24 :
Example of Add model Dialog Box



S4 – Fig 25 :
Example of Base Point on model

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

- Element's properties are automatically populated as measure type while modeling, no need to fill-in manually.



Discipline	IFC4 Entities	IFC Sub Types (* = USERDEFINED)	Property Set	Property Name	Property Type	Property Unit	IFC4 Material Set
STR	IfcSlab	Need not specify	SGPset_Slab	SlabType	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_Slab	ConstructionMethod	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_Slab	ReferTo2DDetail	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_Slab	ReinforcementSteelGrade	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_Slab	ShelterUsage	Boolean	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabDimension	Mark	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabDimension	Thickness	Length	mm	N.A
STR	IfcSlab	Need not specify	SGPset_SlabReinforcement	WeldedMesh	Boolean	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabReinforcement	BottomDistribution_nominal	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabReinforcement	BottomMain_nominal	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabReinforcement	TopDistribution_nominal	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabReinforcement	TopMain_nominal	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabReinforcement	Stirrups	Label	N.A	N.A
STR	IfcSlab	Need not specify	SGPset_SlabReinforcement	StirrupsType	Label	N.A	N.A

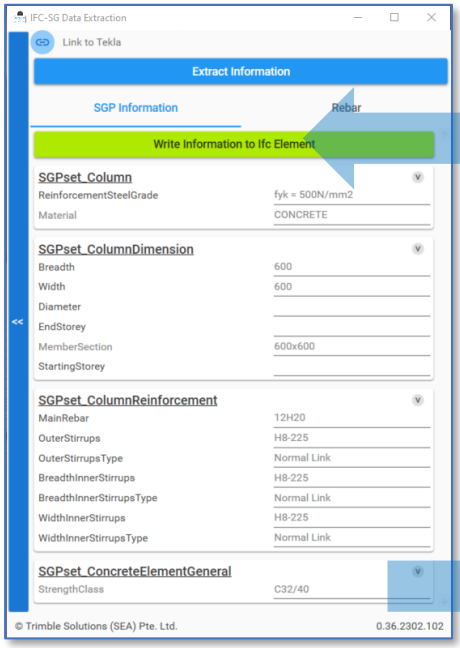
S4 – Fig 26

Preparing Models for Submission (Tekla)

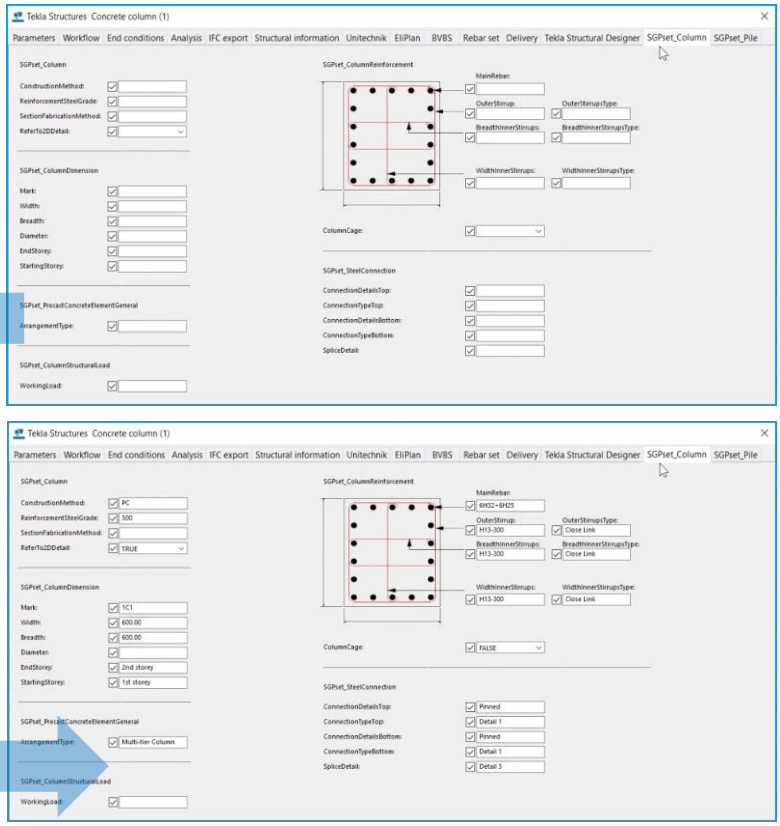
Example using Tekla Configuration File

3. IFC+SG Mapping

- Use IFC Data Extractor (Auto-Filler) Tool to assign IFC parameters
- Faster than keying in manual parameters



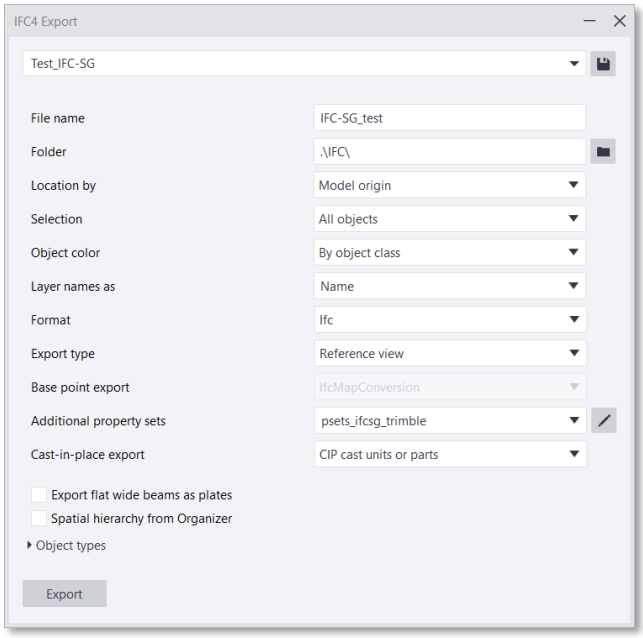
S4 – Fig 27



S4 – Fig 28 & 29

4. IFC Export Setup

- To simplify the process of choosing elements while mapping IFC+SG parameters
- To streamline the process of exporting a mode in IFC format and save time

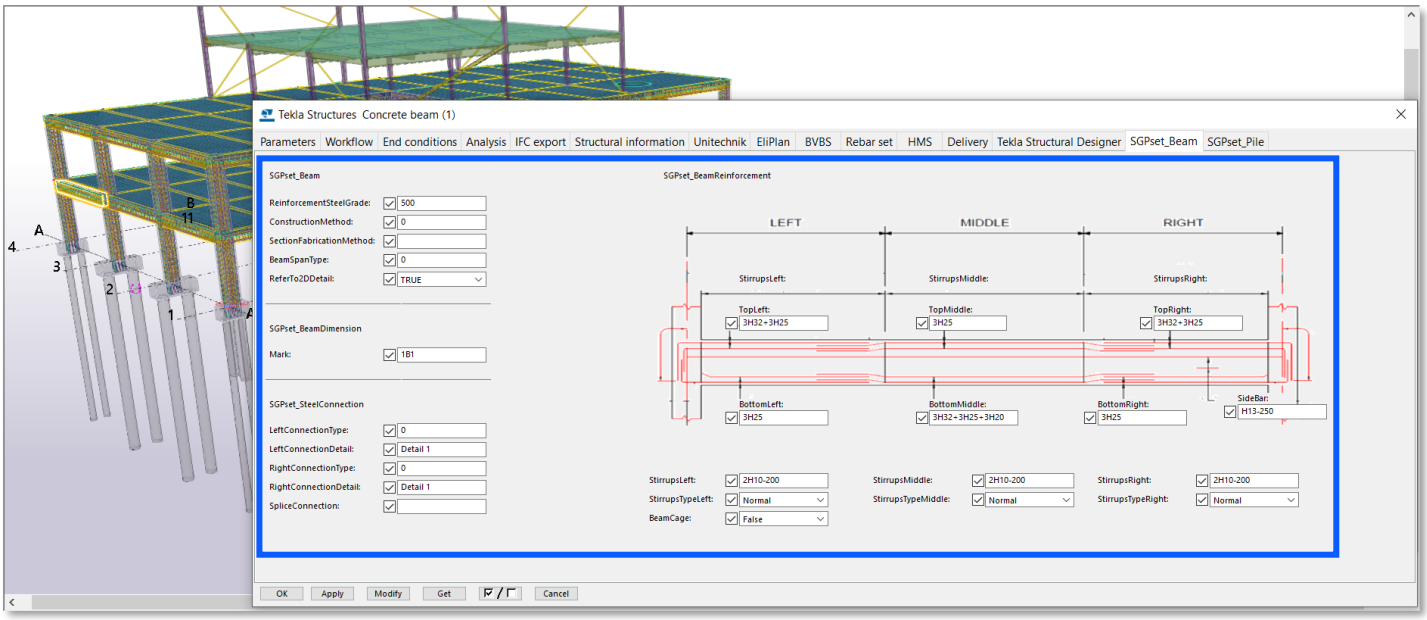


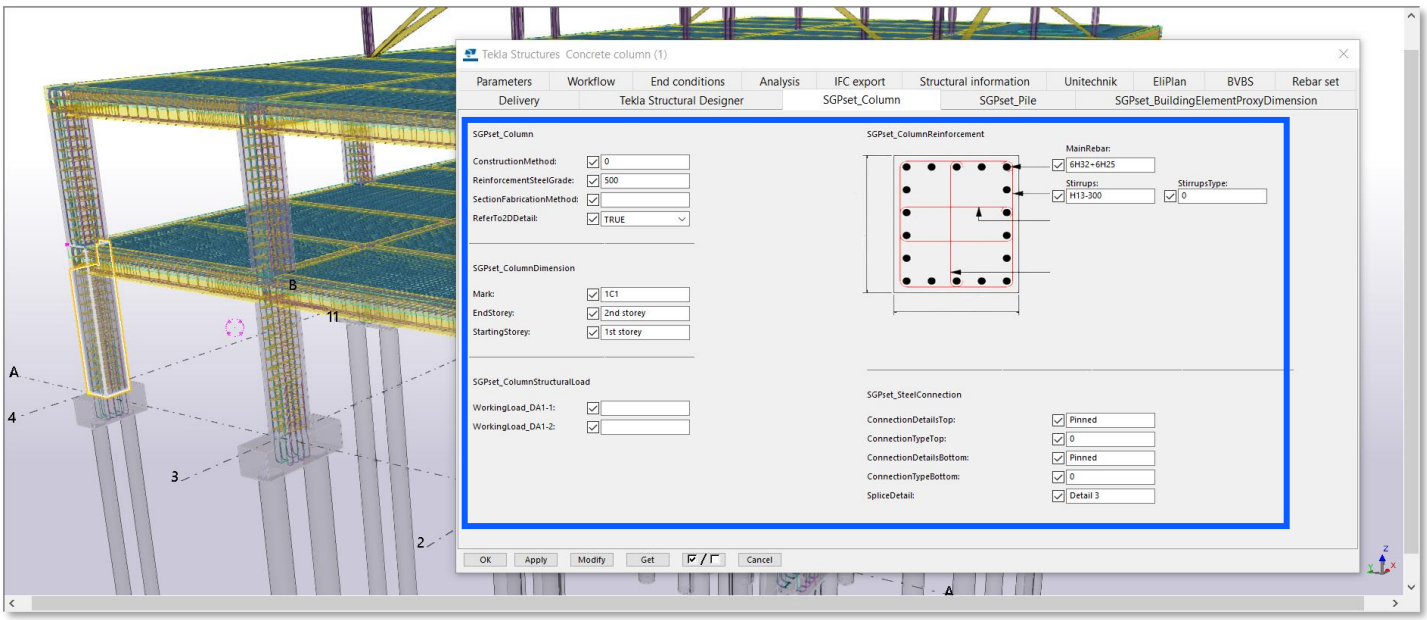
S4 – Fig 30

Preparing Models for Submission (Tekla)

Example using Tekla Configuration File

Examples of IFC+SG Parameters





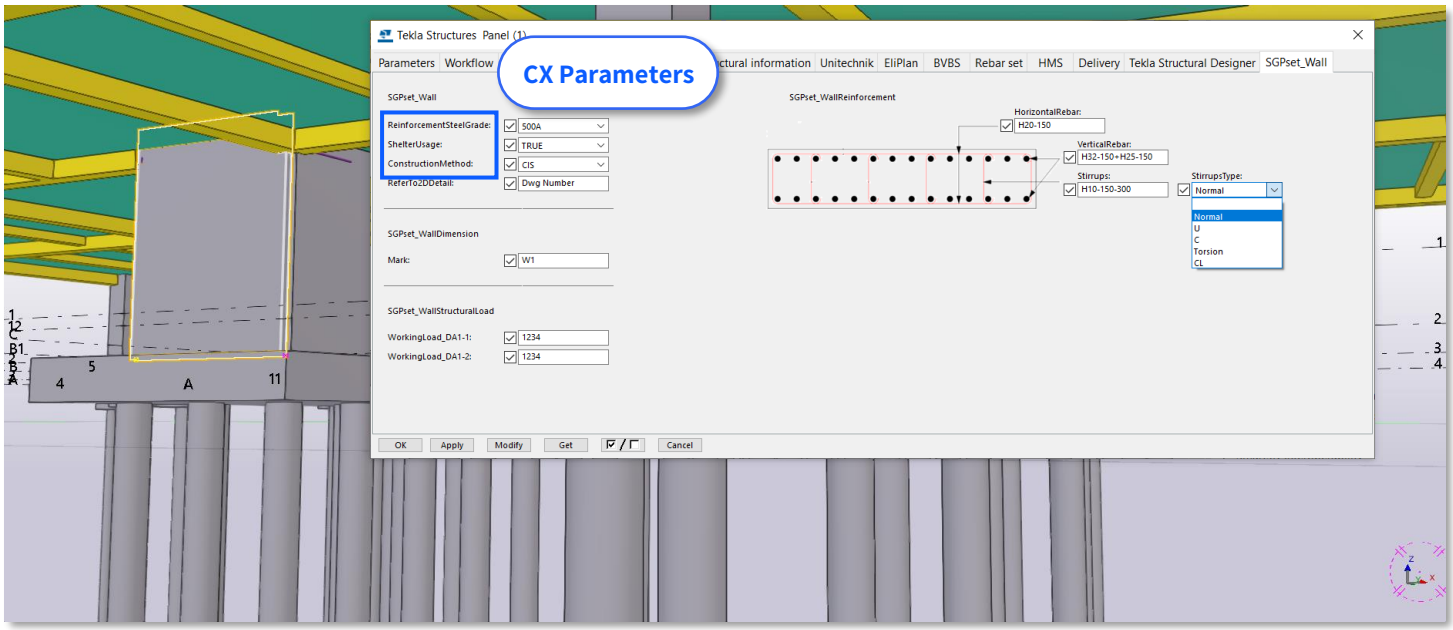
S4 – Fig 31 & 32 : Example of IFC+SG Parameters

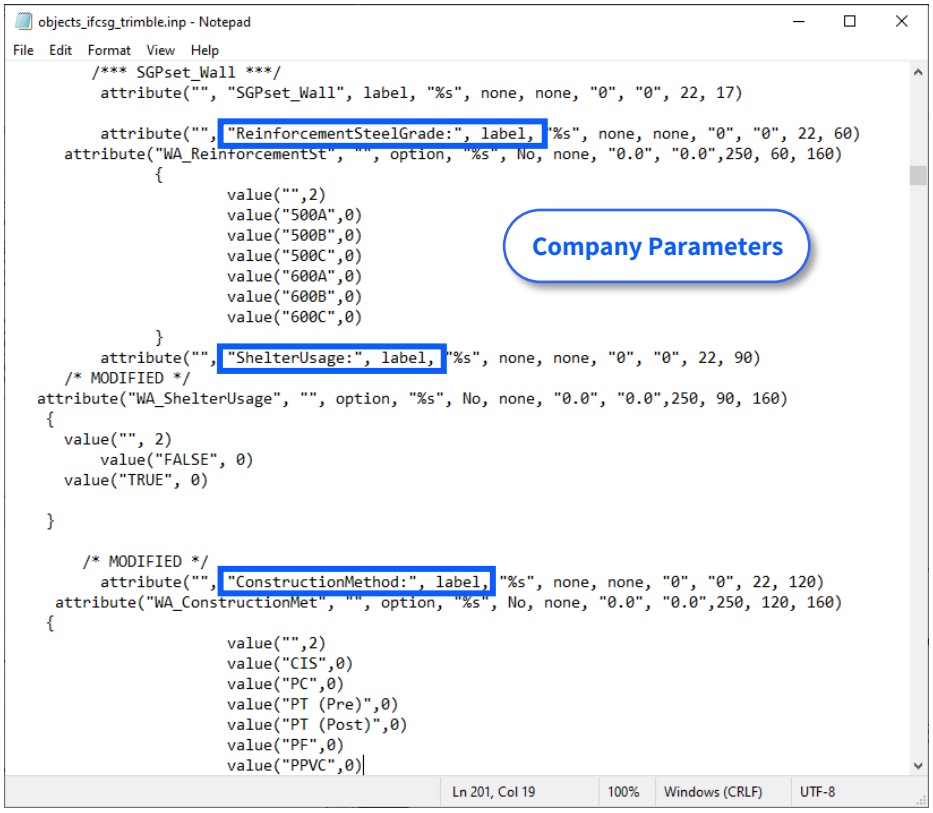
Preparing Models for Submission (Tekla)

Example using Tekla Configuration File

From Tekla User-Defined Attribute (UDA) Parameters

- Editing configuration file to adapt in-house properties



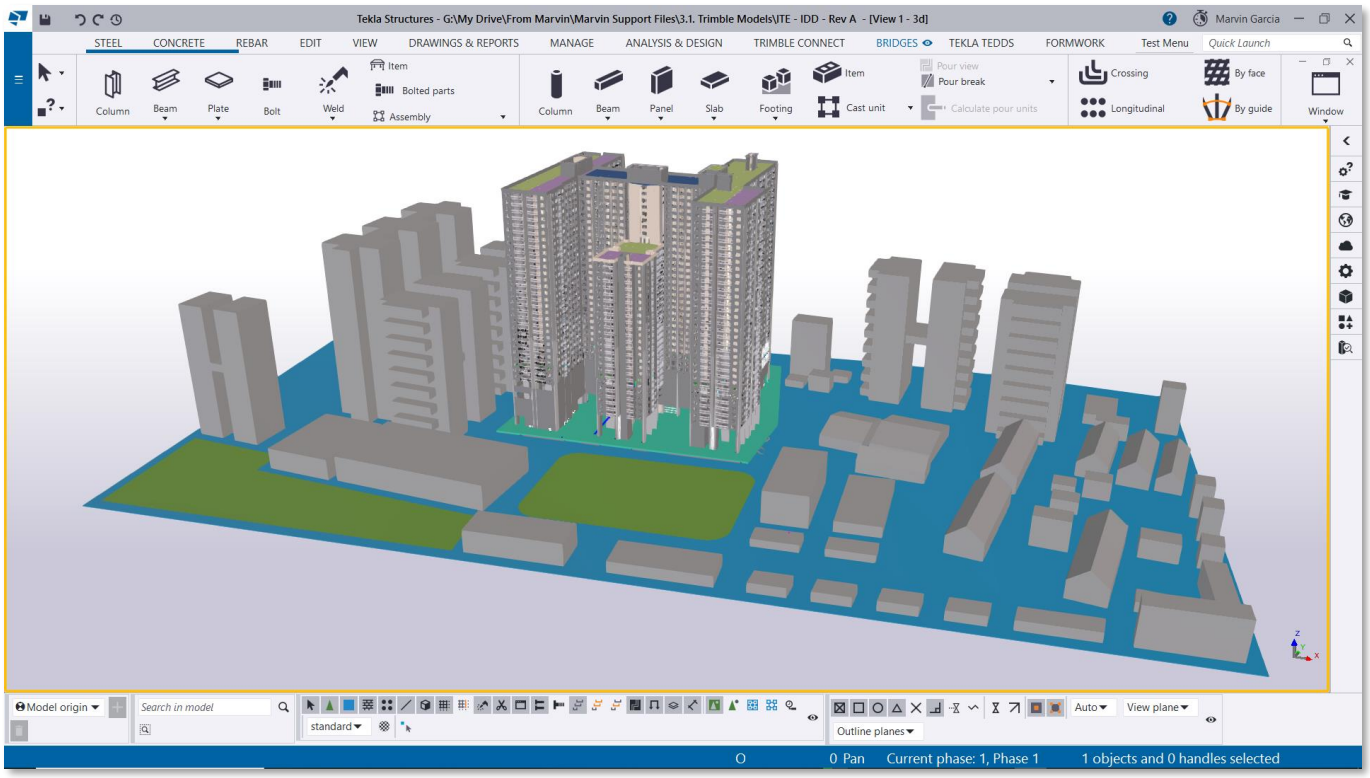


S4 – Fig 33 & 34

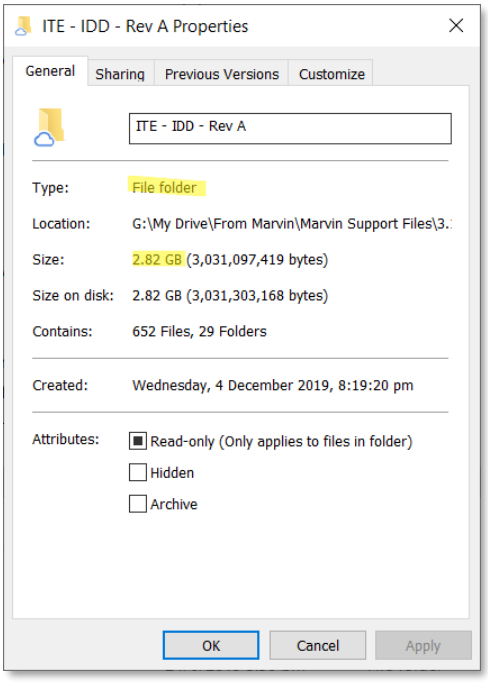
Preparing Models for Submission (Tekla)

Example using Tekla Configuration File

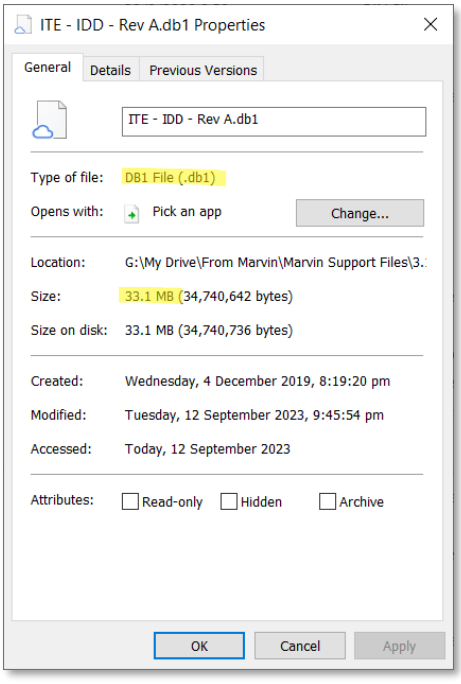
Sample (Large) Tekla Structure Model and File Size



S4 – Fig 35 : Example of Large Tekla Model



S4 – Fig 36 : Example of a Tekla Model folder

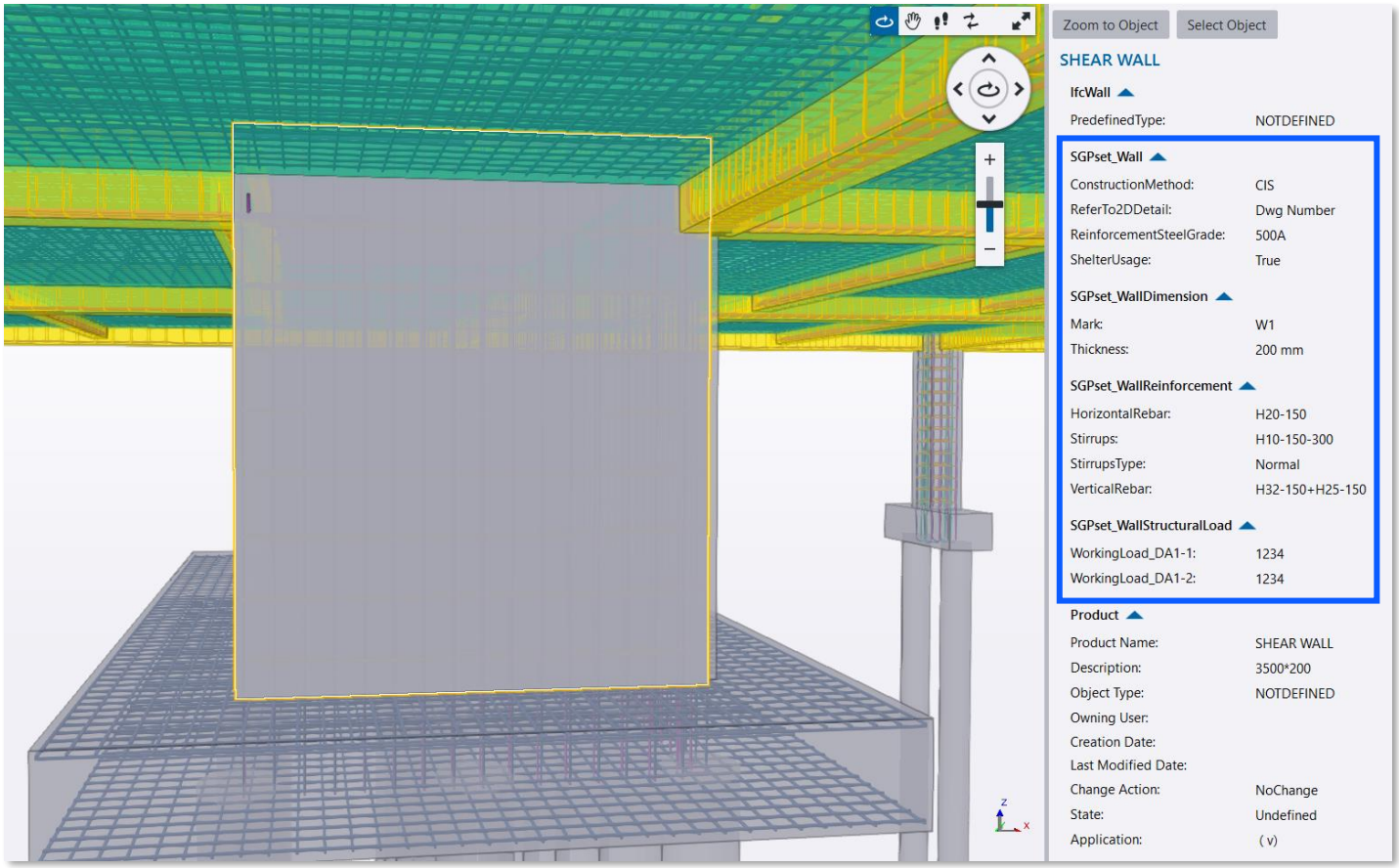


S4 – Fig 37 : Example of a Tekla model database *.db1

Preparing Models for Submission (Tekla)

Example using Tekla Configuration File

From IFC Model Property Set (SGPset)



S4 – Fig 38

Top 3 Common Modelling Challenges and Solutions (Tekla)

Example using Tekla Configuration File

Challenge 1

Challenge	Implications	Solutions
Forgetting to update the definitions of user-defined attribute after modifying the objects.inp	➢ **Incorrect data in IFC**	✓ **Avoid modifying the label unless necessary**
	• Previously set in-house properties weren't correctly matched with the right IFC properties	• Use Diagnose & Repair to detect and repair the incorrect UDA value types • Do not modify unless an experienced user

Challenge 2

Challenge	Implications	Solutions
Forgetting to update IFC after changes / modifications to model	➢ **Missing or incorrect data in IFC**	✓ **Re-Export IFC**
	• Previously set in-house properties weren't correctly matched with the right IFC properties	• Load the pre-defined setting for IFC export • Use filter when selecting an object if not meant for all objects

Challenge 3

Challenge	Implications	Solutions
Forgetting to set Subtype (IFC4)	➢ **Missing or incorrect data in IFC**	✓ **Check IFC Subtype (IFC4)**
	• Previously set in-house properties weren't correctly matched with the right IFC properties	• Set and define the needed IFC Subtype • Load the pre-defined types of the entity in the list of available drop-down option

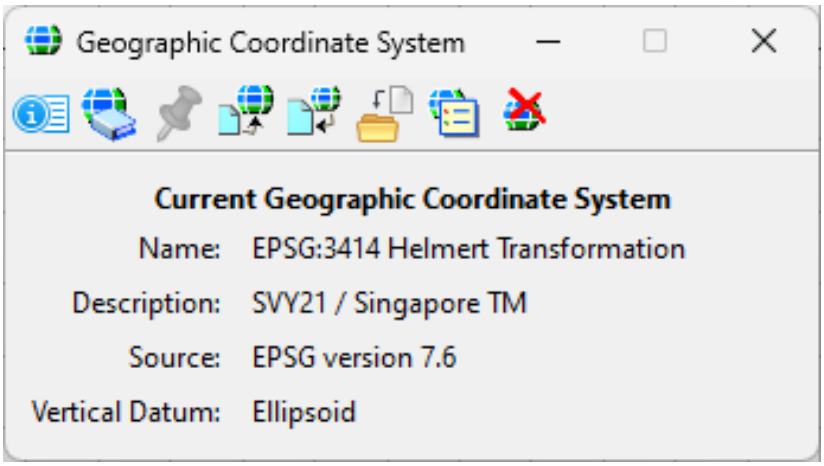
Link:
IFC+SG Resource Kit

Preparing Models for Submission (OpenBuildings Designer)

Example using OpenBuildings Designer Configuration File

1. Geo-coordinate your project.

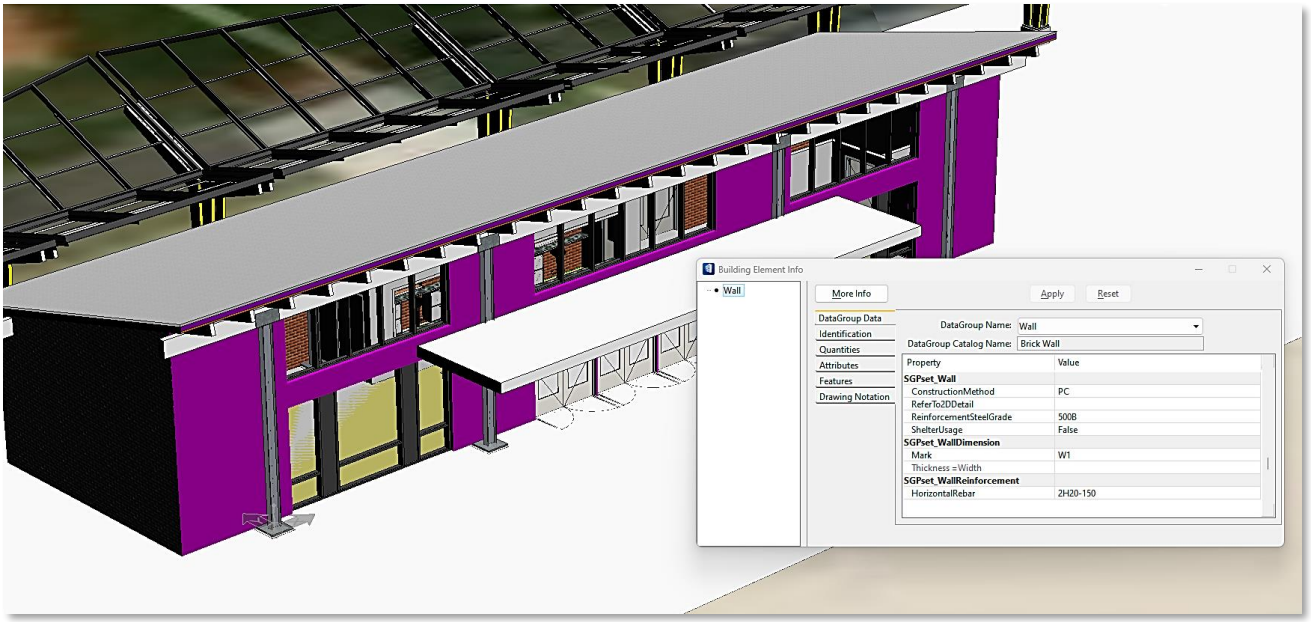
- To geo reference the project for Architectural, Civil & Structural, Mechanical & Electrical Model, refer here



S4 – Fig 39

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

- Element's properties can be assigned while Modelling.



S4 – Fig 40

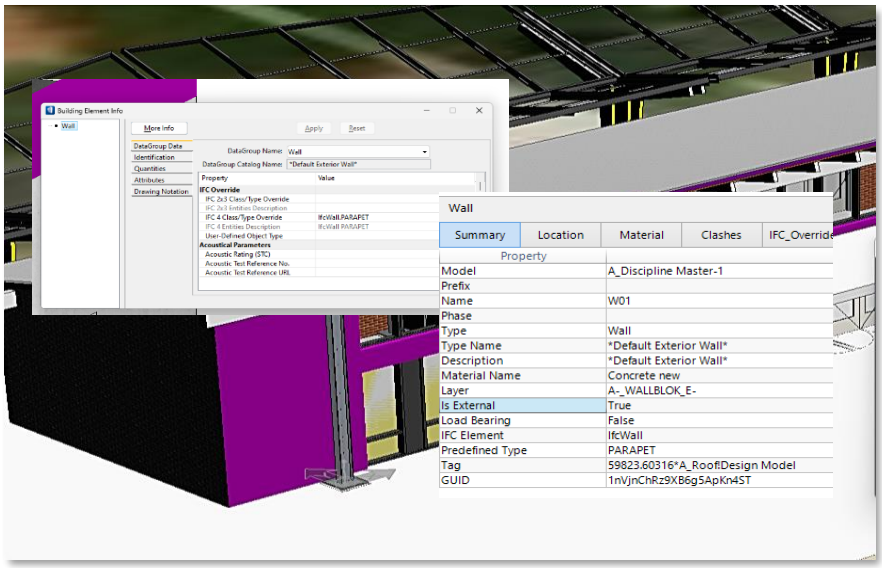
Link:
IFC+SG Resource Kit

Preparing Models for Submission (OpenBuildings Designer)

Example using OpenBuildings Designer Configuration File

3. IFC+SG Mapping

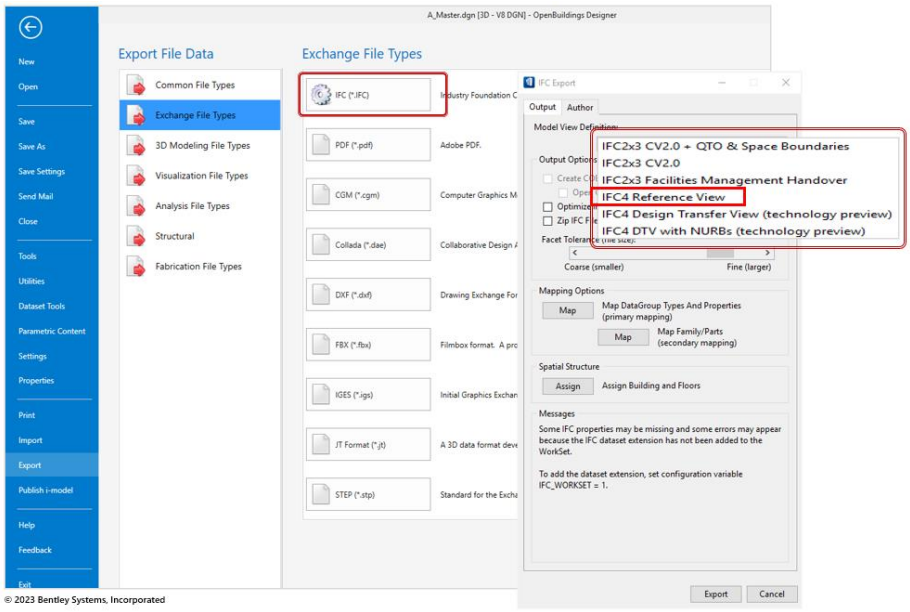
- The IFC category of elements are automatically assigned for default elements.
- IFC4Override is to be assigned for elements with different IFC Entity.
- If necessary, default mapping of datagroup can be modified (CAD Admin level)



S4 – Fig 41

4. Export IFC Model

- Edit the IFC4_PropertyMapping.set to map the properties for company or project components to reduce manual typing



S4 – Fig 42

Link:
IFC+SG Resource Kit

Preparing Models for Submission (OpenBuildings Designer)

Example using OpenBuildings Designer Configuration File

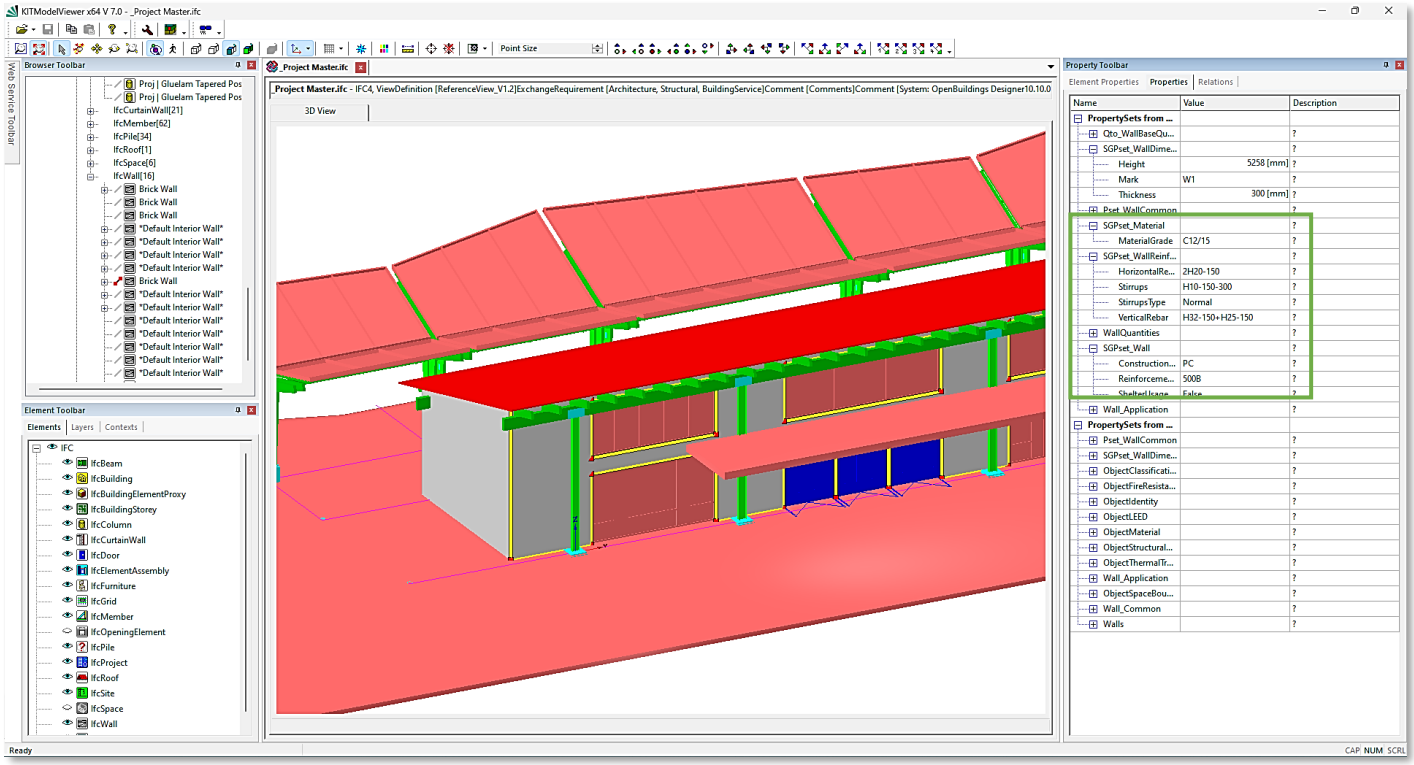
From OpenBuildings Designer

- Edit the IFC4_PropertyMapping.set to map the properties for company or project components to reduce manual typing.

```
69  Concrete Beam    *   Pset_BeamCommon FireRating  IfcLabel    ObjectFireResistance/@Rating
70  Concrete Beam    *   Pset_BeamCommon IsExternal  IfcBoolean  ObjectThermalTransmittance/@IsExternal
71  Concrete Beam    *   Pset_BeamCommon LoadBearing IfcBoolean  EVALUATE_DG("ObjectStructuralUsage/@StructuralFunction") EQ "STRUCTURAL_VALUE";
72  Concrete Beam    *   SGPset_BeamDimension    MemberSection   IfcLabel    StructuralFramingCommon/@sectionname
73  Concrete Column  *   Pset_ColumnCommon   FireRating  IfcLabel    ObjectFireResistance/@Rating
74  Concrete Column  *   Pset_ColumnCommon   IsExternal  IfcBoolean  ObjectThermalTransmittance/@IsExternal
75  Concrete Column  *   Pset_ColumnCommon   LoadBearing IfcBoolean  EVALUATE_DG("ObjectStructuralUsage/@StructuralFunction") EQ "STRUCTURAL_VALUE";
76  Concrete Column Circular Column SGPset_ColumnDimension  Diameter    IfcLengthMeasure    StructuralFramingCommon/@sectionname
77  Concrete Column  *   SGPset_ColumnDimension  Height  IfcLengthMeasure    StructuralQuantities/@Length
78  Concrete Column  *   SGPset_ColumnDimension  MemberSection   IfcLabel    StructuralFramingCommon/@sectionname
79  Concrete Pier    *   Pset_MemberCommon   FireRating  IfcLabel    ObjectFireResistance/@Rating
80  Concrete Pier    *   Pset_MemberCommon   IsExternal  IfcBoolean  ObjectThermalTransmittance/@IsExternal
81  Concrete Pier    *   Pset_MemberCommon   LoadBearing IfcBoolean  EVALUATE_DG("ObjectStructuralUsage/@StructuralFunction") EQ "STRUCTURAL_VALUE";
82  Concrete Pile    *   Pset_MemberCommon   FireRating  IfcLabel    ObjectFireResistance/@Rating
83  Concrete Pile    *   Pset_MemberCommon   IsExternal  IfcBoolean  ObjectThermalTransmittance/@IsExternal
84  Concrete Pile    *   Pset_MemberCommon   LoadBearing IfcBoolean  EVALUATE_DG("ObjectStructuralUsage/@StructuralFunction") EQ "STRUCTURAL_VALUE";
```

S4 – Fig 43

From IFC Model



S4 – Fig 44

Link:
IFC+SG Resource Kit

Top 3 Common Modelling Challenges and Solutions (OpenBuildings Designer)

Example using OpenBuildings Designer Configuration File

Challenge 1

Challenge	Implications	Solutions
Unable to see IFC Psets	➢ **Missing data in IFC**	✓ **Set IFC_Workset=3**
	• Model could export to IFC4x3 but unable to see default psets & sgpsets.	• Open the workset cfg file and set IFC_Workset=3 to see the IFC Psets & SGPsets. For on-going projects: • Apply a schema upgrade for on-going projects

Challenge 2

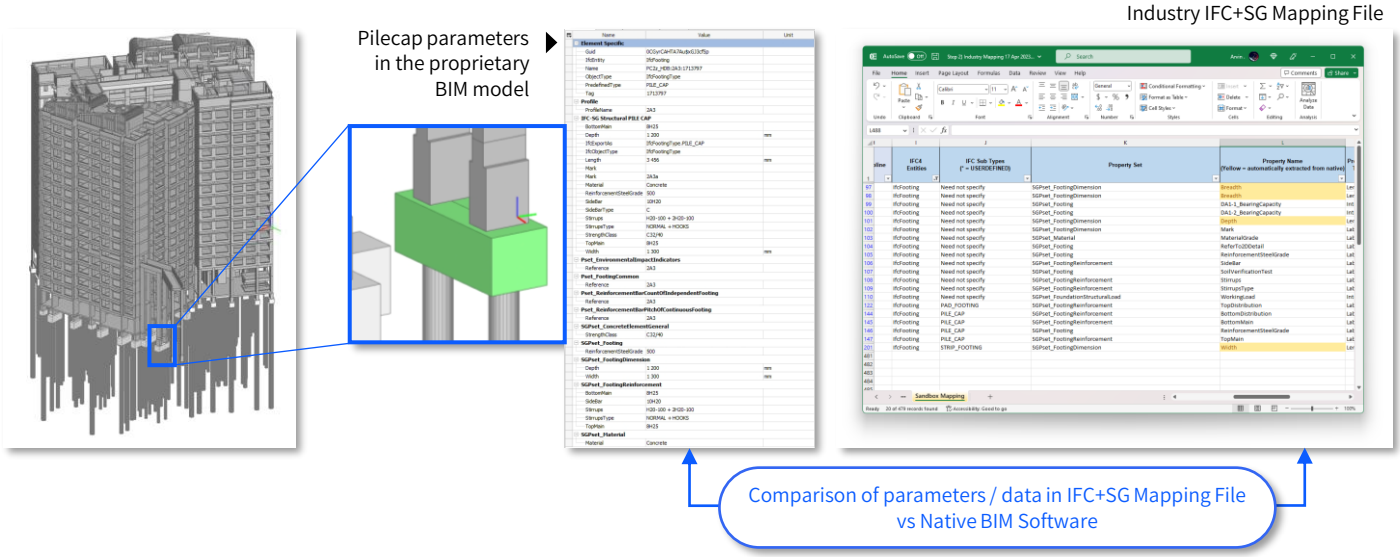
Challenge	Implications	Solutions
Values of properties could not be applied	➢ **Missing data in IFC**	✓ **Apply Schema Upgrade**
	• Able to see the SGPset properties in the model but values are empty and won't be exported	For on-going projects: • Apply a schema upgrade for on-going projects

3rd Party Application(s) to help with Preparation of IFC+SG Models (IFC+SG Validator)

Example using IFC+SG Validator
(Free to Use)

How does the IFC+SG Validator work?

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



Setting up the IFC Model

Pre-Requisite

- ✓ IFC Model
- ✓ IFC+SG Mapping File (Optional). Can be found in the IFC+SG resource kit.

Preparing the Model

- ✓ Input parameters into model.
- ✓ Instructions can be found in the IFC+SG resource kit.

Validation Overview

Go to:
https://www.code.builtsearch.com/ifcsg-validator

- ✓ Upload IFC Model
- ✓ Upload IFC+SG Mapping file (Optional)
- ✓ View Result

Link:
IFC+SG Resource Kit

3rd Party Application(s) to help with Preparation of IFC+SG Models (IFC+SG Validator)

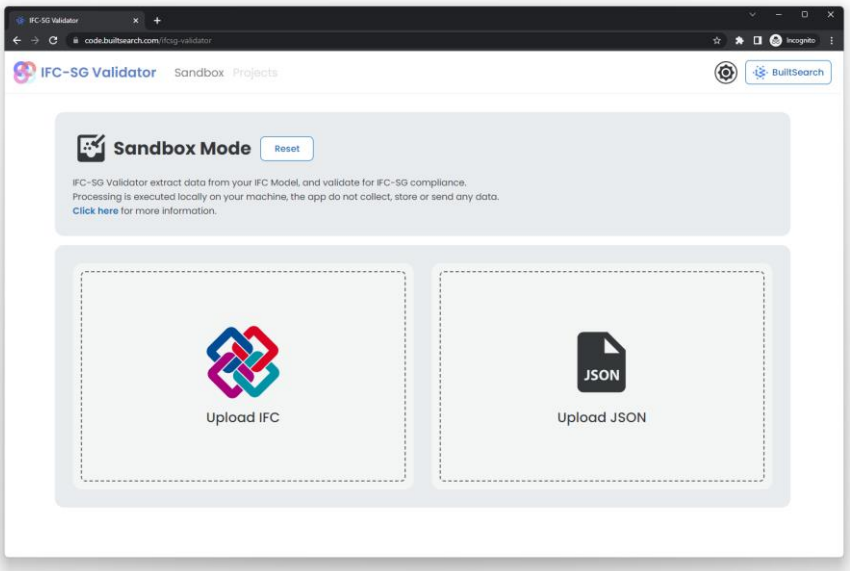
Example using IFC+SG Validator
(Free to Use)

Guide to use the IFC+SG Validator Application

Step 1

Go to:
https://www.code.builtsearch.com/ifcsg-validator

✓ Click on 'Upload IFC' and select an IFC Model



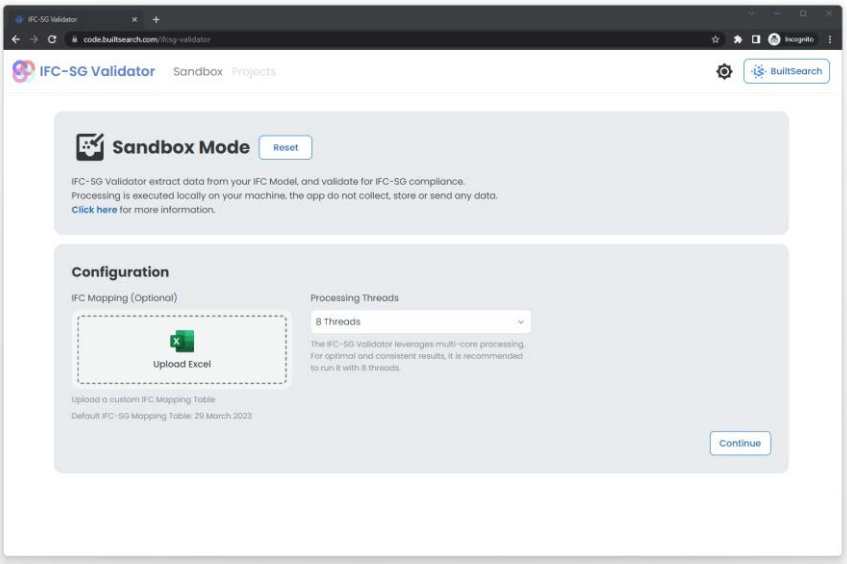
Note:
Work best on chromium-based browser (Microsoft Edge, Chrome, Brave, etc.) and Mozilla Firefox. For extremely large model >400mb, Firefox is preferred to avoid memory limit for chromium browser. All versions of Internet Explorer is not supported.

Step 2

✓ By default, IFC+SG Validator uses the latest IFC+SG Mapping file from IFC+SG resource kit

✓ To use a different Mapping table, upload your version of IFC+SG Mapping file.

✓ Leave processing threads as default for consistent results.



Note:
For extremely large model >400mb and when using chromium browser, lower processing threads to 2-3 to avoid hitting memory limit, which will crash the browser.

Link:
IFC+SG Resource Kit

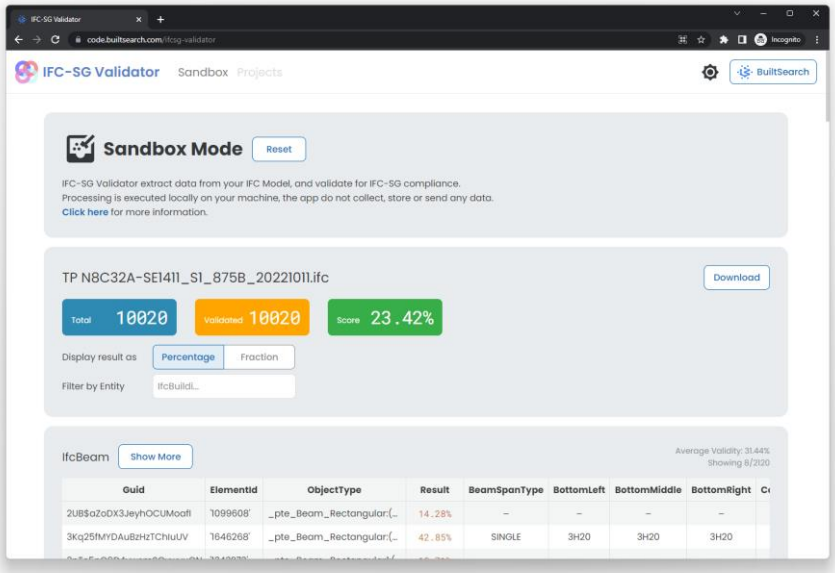
3rd Party Application(s) to help with Preparation of IFC+SG Models (IFC+SG Validator)

Example using IFC+SG Validator
(Free to Use)

Guide to use the IFC+SG Validator Application

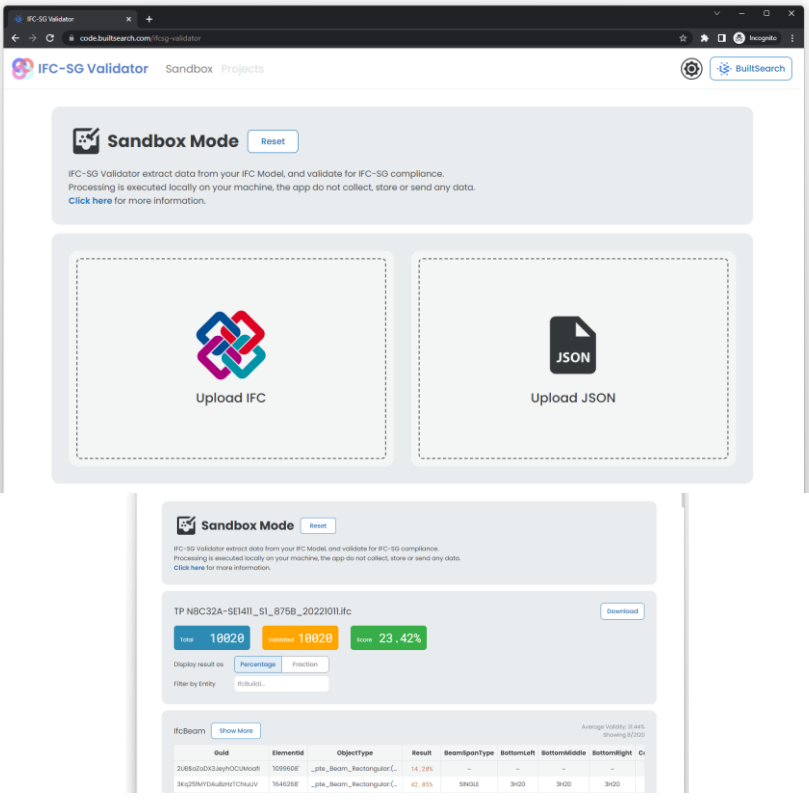
Step 3

- ✓ View results
- ✓ The score should not be taken at face value, as the score is calculated by the presence of each element for each entity property in your IFC Model as compared to IFC+SG properties listed in the mapping file.
- ✓ Depending on your project's nature, it may not be relevant to have certain missing elements, therefore the score should only be used as an estimation.



Step 4

- ✓ By clicking on the download button, you will download a JSON file of this model's IFC+SG Validator result, which can then be uploaded on the home page.
- ✓ This will load the result immediately without processing the model again.



Note: By using the IFC+SG Validator Application, users will have to agree with the terms of use and privacy notice as stated in the website.

Link:
IFC+SG Resource Kit

3rd Party Application(s) to help with Preparation of IFC+SG Models (DiRoots)

Example using DiRoots Plugin
(Free Plugin)

How does the Plugin work?

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

Example of Workflow using the Plugin

Step 1

✓ Modeller generates the schedules inside BIM authoring tools and export to MS Excel

Step 2

✓ Engineer provides the design inputs inside the exported MS Excel

Step 3

✓ Modeller imports the latest / updated MS Excel with design inputs into BIM authoring tools

Step 4

✓ Engineer navigates and checks on the accuracy of design data transferred to the BIM Model / IFC Model

Link:
IFC+SG Resource Kit
DiRoots Sheet Link Tutorial

3rd Party Application(s) to help with Preparation of IFC+SG Models (DiRoots)

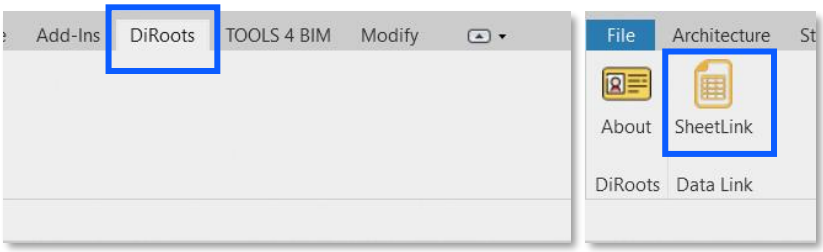
Example using DiRoots Plugin
(Free Plugin)

Guide to use DiRootsOne Plugin

***** Note user interface may differ for different versions of DiRoots

Step 1

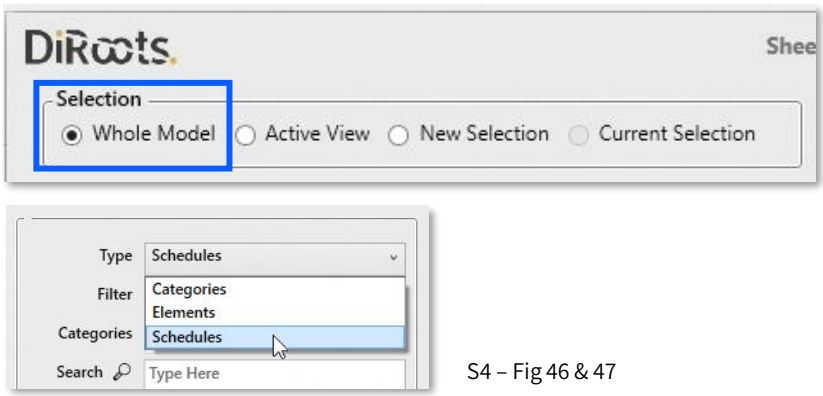
- ✓ Generate the IFC+SG schedules using 'DiRoots - SheetLink', in preparation to export it as MS Excel



S4 – Fig 45

Step 2

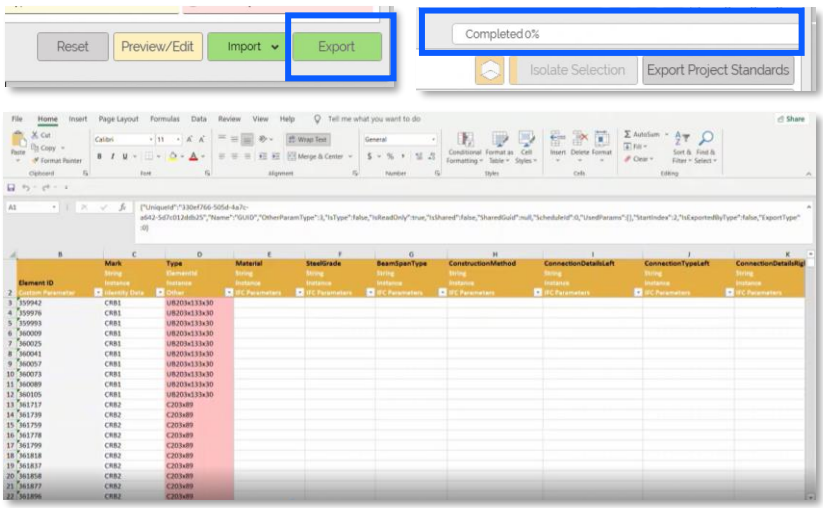
- ✓ Ensure that selection is 'Whole Model'
- ✓ Go to 'Schedules' and select the schedules accordingly (e.g. Wall, Beam)
- ✓ The values in the 'Schedules' are default parameter values which are automatically generated and referenced from the name that is set in the schedule header



S4 – Fig 46 & 47

Step 3

- ✓ 'Export' schedule to Excel or Google Sheet. There's a completion bar that tracks the exporting progress



S4 – Fig 48

Link:
IFC+SG Resource Kit
DiRoots Sheet Link Tutorial

3rd Party Application(s) to help with Preparation of IFC+SG Models (DiRoots)

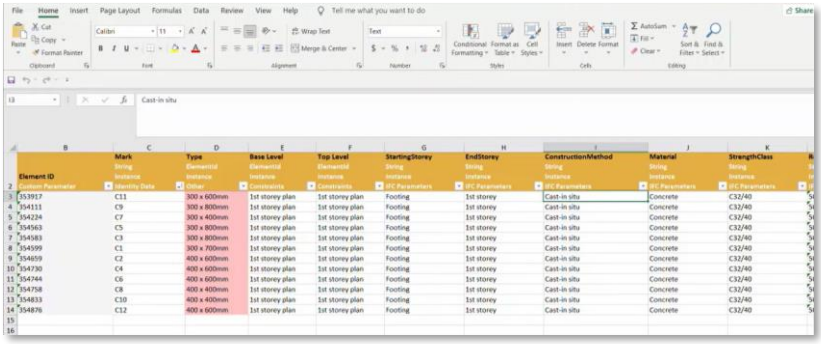
Example using DiRoots Plugin
(Free Plugin)

Guide to use DiRoots Plugin

***** Note user interface may differ for different versions of DiRoots

Step 4

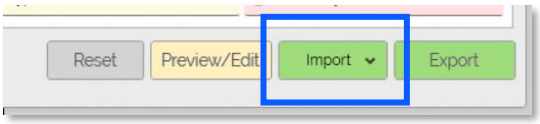
✓ Design Engineer provides the design inputs (i.e. project specific parameters) into the exported 'Schedules' Excel



S4 – Fig 49

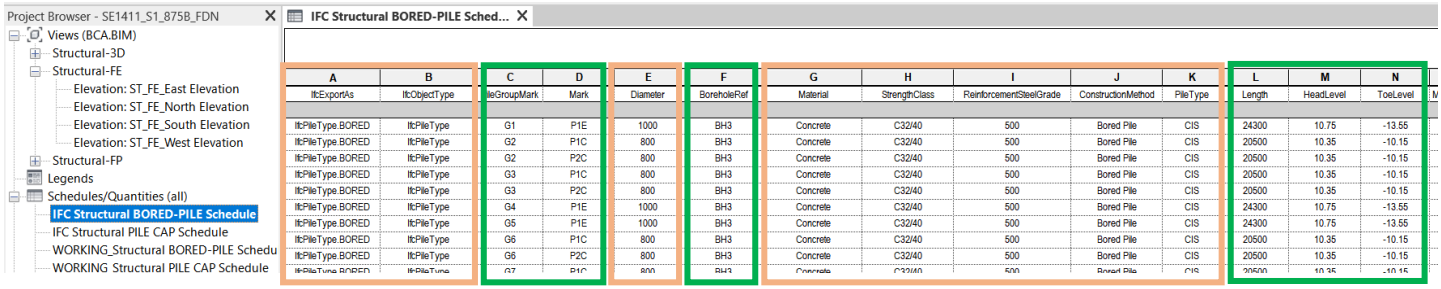
Step 5

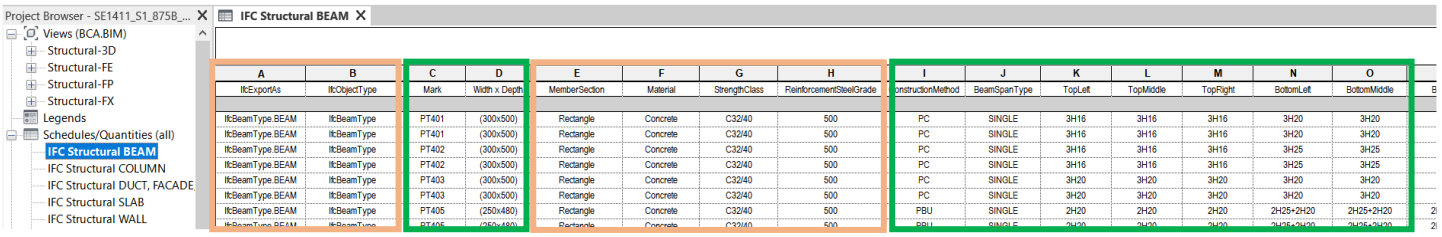
✓ 'Import' the updated 'Schedules' Excel back into DiRoots and the parameters will be updated accordingly



S4 – Fig 50

[Automated] Default Parameter Values populated by Revit Families
[Imported from Excel] Project Specific Parameter Values by Design Engineer





S4 – Fig 51 & 52

Link:
[IFC+SG Resource Kit]
[DiRoots Sheet Link Tutorial]

List of Recommended IFC Viewers

Note that this list is not exhaustive
(Free to use)

Importance of reviewing IFC models before submission

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

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

***** To view multiple IFC files in FOC viewers that are unable to federate IFC models, the "IFC+SG Integrator" could be used, available at the IFC+SG Resource Kit . This application is based on C# and is able to bind multiple IFC files

Link:
IFC+SG Resource Kit

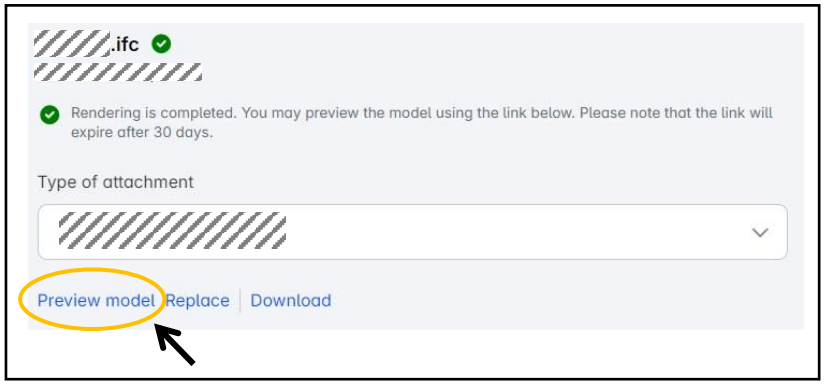
Model Quality Quick Checklist

Use openBIM viewer on Submission Portal to verify your model quality

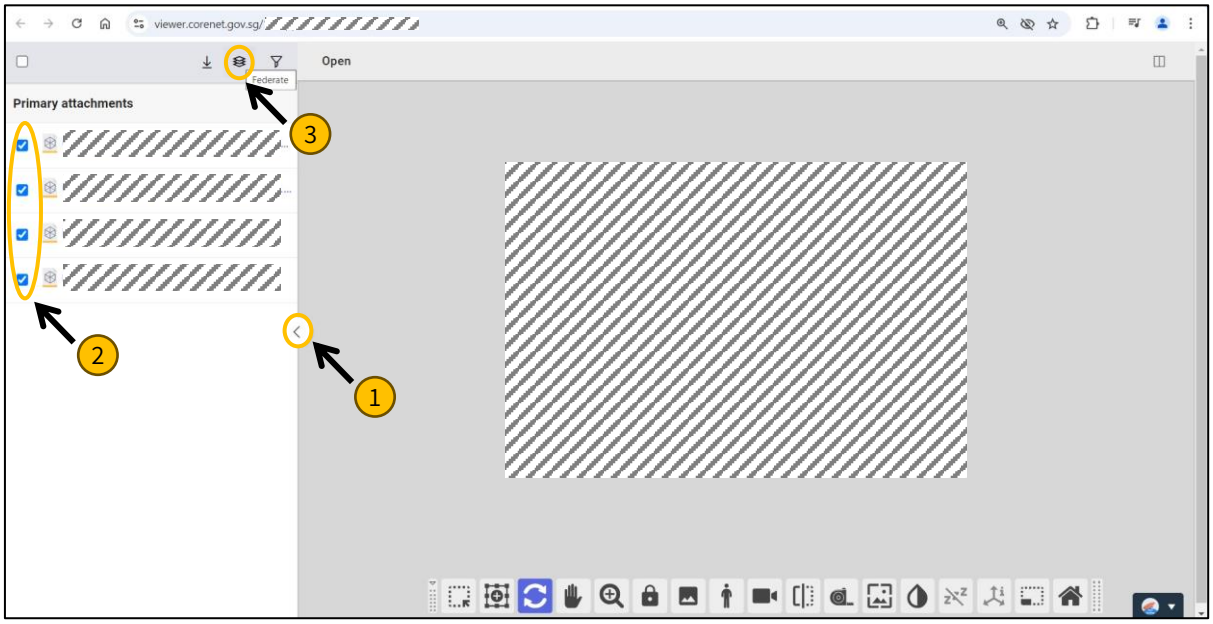
Create high-quality models to reduce the likelihood of withdrawals, minimise delays, and accelerate your project's approval process.

Upload your models in the openBIM Viewer on the CORENET X Submission Portal

- ☐ Files should not experience any error prompt during or after export from the native BIM software
- ☐ Under the "Coordinated BIM" tab in the CORENET X Submission Portal, upload BIM files and "preview (your) model" in the Lightweight BIM Viewer. This is a simplified version of the CORENET X Collaboration Platform used by officers



- ☐ Select the models you wish to combine on the left-hand panel. Verify that these selected models appear correctly aligned and visible in the openBIM Viewer display on the right side of the screen.



- ☐ Larger files may take longer to upload and render in the openBIM Viewer. (Ensure sufficient buffer time is allocated to this model preview in your submission timeline)

Model Quality Quick Checklist

Check areas and spaces in your IFC models

- ☐ Check that storey-specific gross area does not deviate significantly from sum totals of the storey
- ☐ Do a tabulation of gross area by storey on the native BIM software
- ☐ Check against the sum totals of gross area before the export to IFC

- ☐ Ensure that attributes about cadastral lots, such as area, lot numbers as provided in the Project Information on the CORENET X Submission Portal are present
- ☐ Critical information like cadastral lot, lot numbers etc should be exported successfully into the IFC format
- ☐ There is no gap between boundaries of cadastral lots

- ☐ Check that spaces are directly adjacent to other space components, surrounding walls or floors below
- ☐ Check that each of the common boundary of any strata lots with another lot or with the common property are in the centre of the floor, wall or ceiling

Check areas and data in your IFC Structural models

- ☐ Check that the model is correctly geo-referenced
- ☐ Ensure that IFC+SG parameters follow the IFC+SG property set, property type and the standardized naming as described in Section 4 Code of Practice.
- ☐ All IFC+SG structural models shall provide the project information as project parameters stated in code of practice.
- ☐ Ensure that IFC+SG structural model elements consist of IfcPile, IfcFooting, IfcBeam, IfcSlab, IfcColumn, IfcWall, IfcStairs and IfcBuildingProxy (borehole) elements.
- ☐ Ensure that the element geometry representation tallies with its geometry inputs.
- ☐ Check that all the input for IFC+SG structural parameters are in correct units and input format.
- ☐ Ensure that working load input value for 1st storey column, 1st storey wall elements and pile elements have been provided.

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

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

Link:
IFC+SG Resource Kit

Glossary of "Identified Components"

Glossary of "Identified Components"

Notes

***** Distribution Chamber includes Inspection Chambers, Manholes, Meter Chambers, Sampling Sumps and Sumps.

****** As 'IfcSpace' is the most common component across all agencies, it is broken down into 2 sub-sections for ease of understanding. 'IfcSpace' consists of:

- Space (Area Schemes)
- Space (Usage)

Modelling IFC+SG for Structural Submission

List of inputs for IFC+SG Structural Parameters

Structural Parameters	
IFC+SG Property	**List**
BeamSpanType	• Single • End • Interior • Cantilever
ConnectionTypeBottom, ConnectionTypeTop, LeftConnectionType, or RightConnectionType	• Pinned • Fixed • Free
ConstructionMethod	• CIS • PC • PT (Pre) • PT (Post) • PF • PPVC • Spun [for pile element only]
MaterialGrade	• C12/15 • C20/25 • C30/37 • C32/40 • C35/45 • C40/50 • C50/60 • C55/67 • C60/75* • C70/85* • C80/95* • S235 • S275 • S355 • S460
PileType	• Driven • Bored • Jacked in

Structural Parameters	
IFC+SG Property	**List**
ReinforcementLength	• Fully reinforced • Unreinforced • Any numerical value [up to 1 decimal place]
ReinforcementSteelGrade	• 500A • 500B • 500C • 600A • 600B • 600C
SectionFabricationMethod	• Hot rolled • Cold formed
SlabType	• One way • Two way • Cantilever • Flat slab • Flat slab with drop panel • Transfer Slab
StirrupsType, StirrupsTypeLeft, StirrupsTypeMiddle, or StirrupsTypeRight	• Normal • U • C • CL [for civil defence shelter] • Torsion

*Note: C60/75 and above consider as high strength concrete

Abbreviation List:

CIS	- Cast in situ
PC	- Precast works
PT (Pre)	- Pre-tensioning works
PT (Post)	- Post-tensioning works
PF	- Prefabrication (e.g. steel, MET, etc.)
PPVC	- Prefabricated Prefinished Volumetric Construction

Link: IFC+SG Resource Kit
See also: Preparing models for submission

Modelling IFC+SG for SCDF Submission

The following fire safety equipment / provision need not be shown in the model.
• Equipment, furniture, fixture (e.g. lighting, fans) • Wiring connecting various system in building

The following fire safety equipment / provision need not be modelled in full. They can be represented by suitable objects. If the equipment / provision is applicable only to Independent Submission, they can be represented in 2D.	
• Signage (exit staircase numbering, evacuation lift, re-entry floor, etc) • Signage for "PWD Holding Point" • Mean of communication between PWD holding point and FCC/24 hourly manned station. • Override device • Fire stopping material (for filling gap) • Composite panel • Hose reel drum (excluding cabinet/enclosure) • Breathing apparatus cabinet/enclosure (for Total flooding fire extinguishing system) • Generator/emergency generator/standby generator • transformer • Fire extinguisher • Housing cabinet/enclosure • Main fire alarm panel/cabinet • Sub fire alarm panel/cabinet • Manual call point • Standby hose cabinet/enclosure • Bell for manual alarm • Vision alarm – strobe light • Smoke/heat detector • Home Fire Alarm Device (HFAD) • Video Image Fire Detection System (VIFDS) • Sprinkler head • Sprinkler control valve	• Fire pump & control panel • Fire water tank • Compressed cylinders & discharge nozzle for Water mist system • Compressed cylinders & discharge nozzle for fixed automatic fire extinguishing systems (e.g kitchen suppression system, GM200, etc) • Fire lift switch • Evacuation switch • Intercom system in fire lift • CCTV camera • Lift control panel • Lift car • Standby fans/ multiple fans • Fire damper • Smoke damper • Air-handling unit • Air conditioner compressor + unit • Exit/directional exit sign (high level and low level) • Need to provide arrow if for directional exit sign • Emergency lighting • Photoluminescent marking • Equipment/services in Fire Command Centre mentioned in Cl. 8.2.4b. • Speakers for public address system/emergency voice communication system • Handset/cabinet/enclosure (for emergency voice communication system)

Link:
IFC+SG Resource Kit

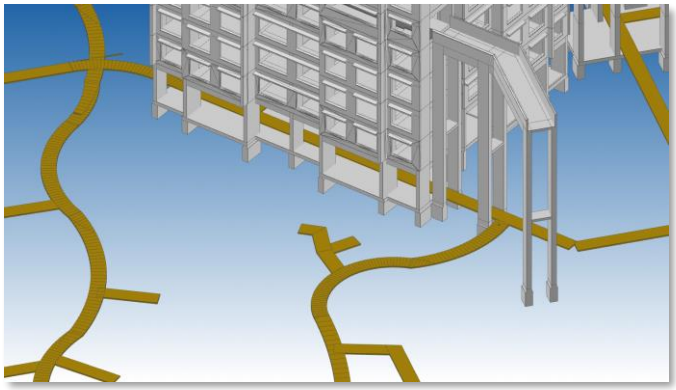
See also:
Preparing models for submission

Accessible Route

Modelling Accessible Route in IFC+SG

- This component can be modelled with Generic Models (Revit), Model Element (ArchiCAD), or Object (OpenBuildings) functions in the respective Native BIM software
- Other components that could be viewed with Accessible Route may include: Lift, Ramp, Space, Vehicle Parking, if they contain a positive BarrierFreeAccessibility property

S4 – Fig 1: Accessible Route within BIM model

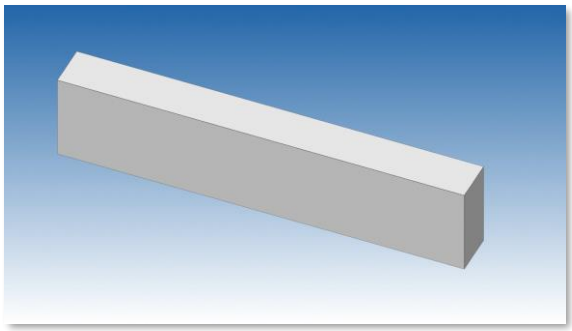


S4 – Fig 2: Accessible Route with BIM model hidden

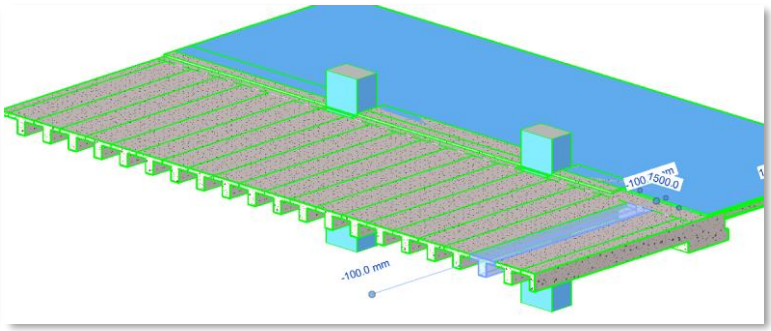
By IFC Representation

IFC Entity: IfcSpace					
IFC SubType: ACCESSIBLEROUTE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	BarrierFreeAccessibility	Boolean	-	Yes	TRUE / FALSE
2	Width	Length	mm	No	1200

Beam



S4 – Fig 3 : Beam



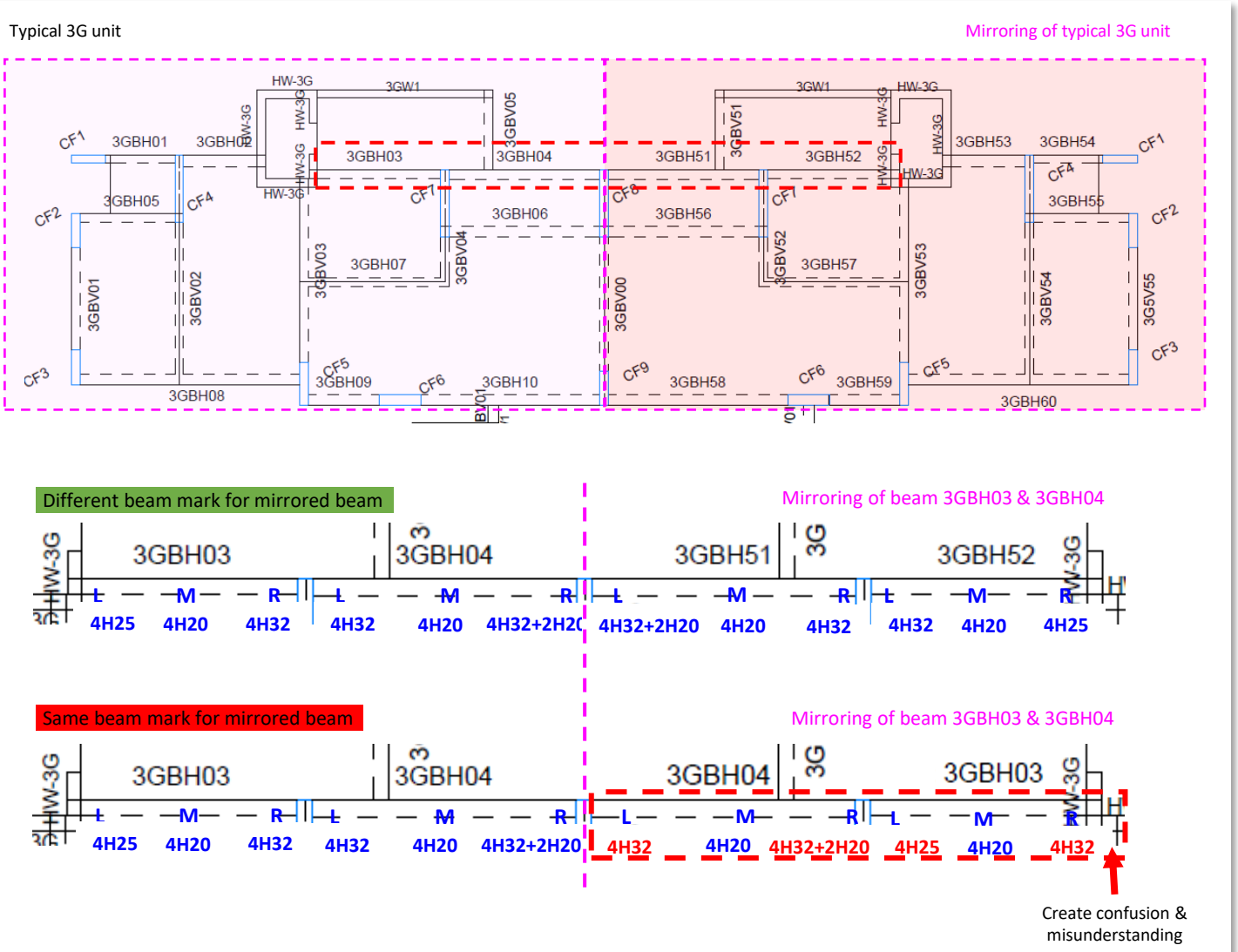
S4 – Fig 4 : Concrete Rectangular Beam

Modelling Beam in IFC+SG

- All the beam elements shall be modelled in IFC+SG model with the necessary information required as stipulated in the tables below.
    - Typical beams are allowed to have same marks and design information. All marks and design information have to be embedded in every beam element.
    - Multiple beams elements shall be modelled from support to support for beams with continuous spans.
- 2D detail drawings are allowed for any irregular, cranked, or complex beam design (e.g. transfer beams, precast beams, prestressed beams, cold-form steel beams, etc.) with the indication of drawing number or any comments in the IFC+SG parameter "ReferTo2DDetail".
- IFC+SG parameters to be included for any irregular, cranked, or complex beam element:
    - BeamSpanType
    - ConstructionMethod
    - ReferTo2DDetail
    - Mark
    - MaterialGrade
    - Width (for RC beam)
    - Depth (for RC beam)
    - MemberSection (for steel beam)
    - SectionFabricationMethod (for steel beam)
- Using of same beam mark for mirrored beam is disallowed as it will create the confusion and mis-understanding on the reinforcement provided. Thus, new beam marking is needed for mirrored typical beam elements. (Refer to Figure 5)

Beam

▶ Modelling Beam in IFC+SG (continued from previous page)



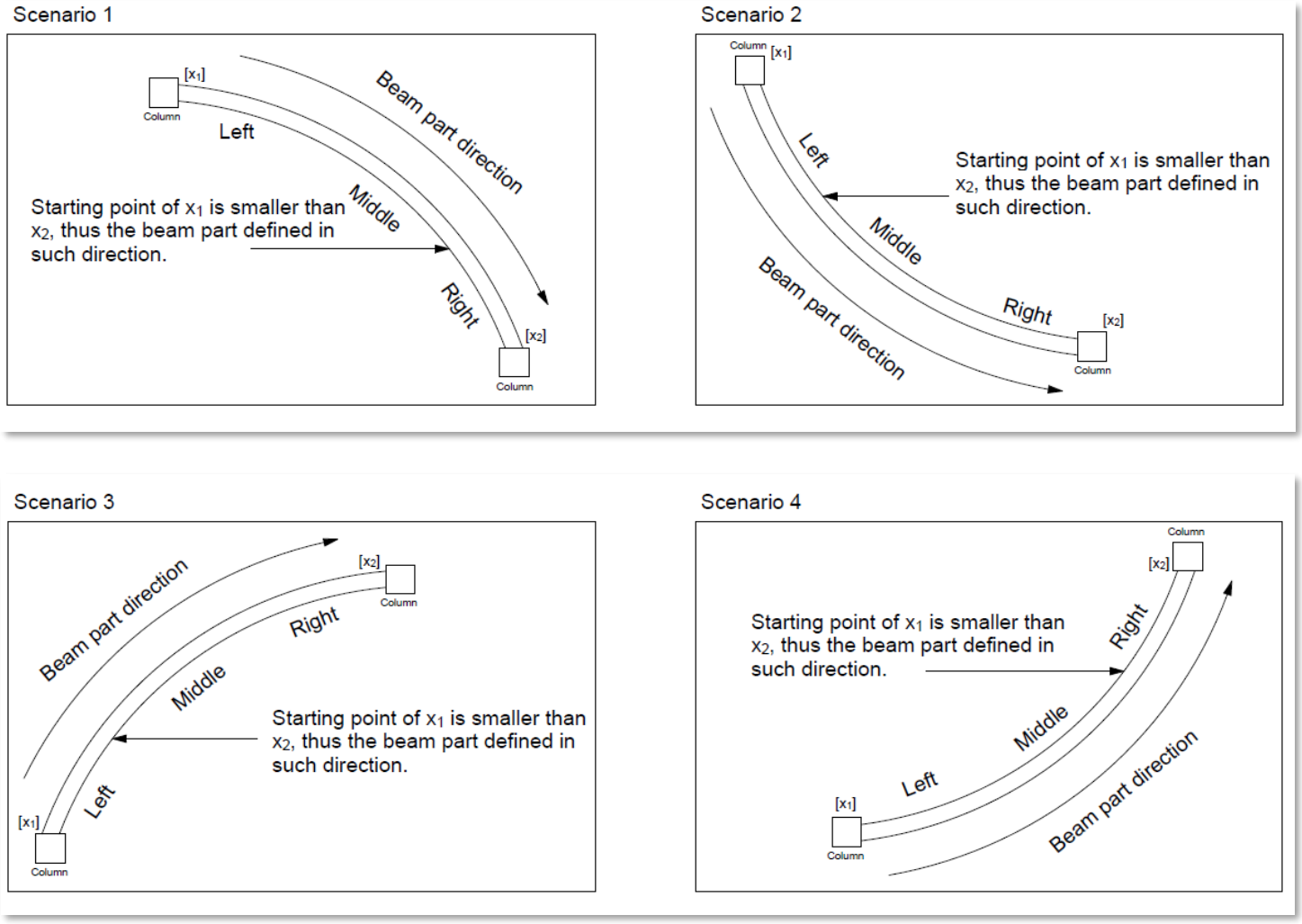
Beam mark	Left (L)	Middle (M)	Right (R)
3GBH03	4H25	4H20	4H32
3GBH04	4H32	4H20	4H32+2H20
3GBH51	4H32+2H20	4H20	4H32
3GBH52	4H32	4H20	4H25

S4 – Fig 5: Disallowed for beam mark mirroring

Beam

Beam Property Definition

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 6 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. (refer to Figure 7).
3	Behaviour of the beam (single, end, interior & cantilever span) shall be indicated in the parameters called "BeamSpanType" (refer to Figure 8). Limitation of inputs for this parameter is applied. Please refer to list of input.

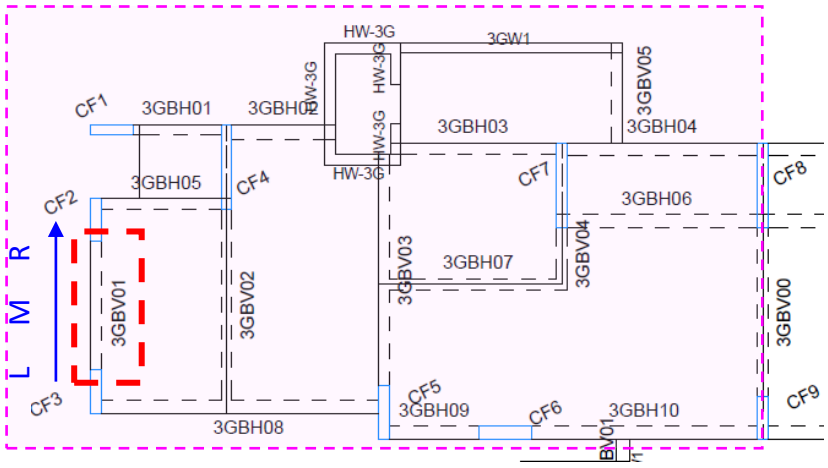


S4 – Fig 6 : Beam Part Definition

Beam

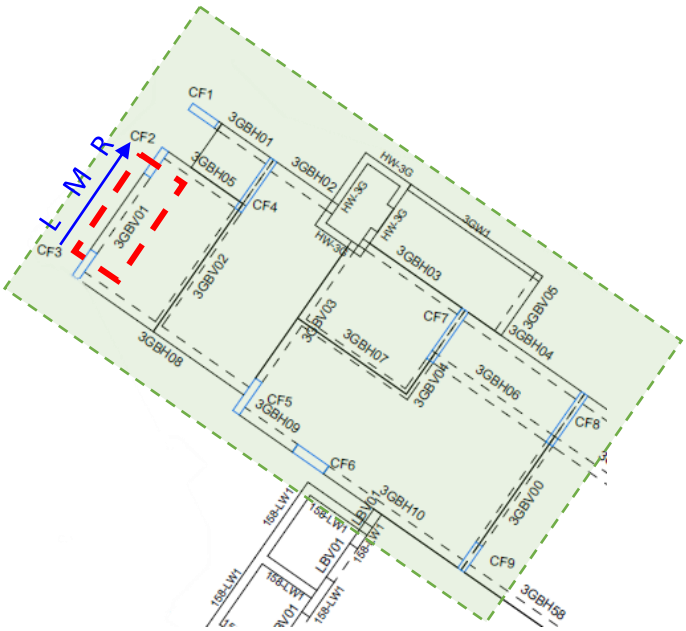
▶ Beam Property Definition (continued from previous page)

Original -typical 3G unit (0 rotation)

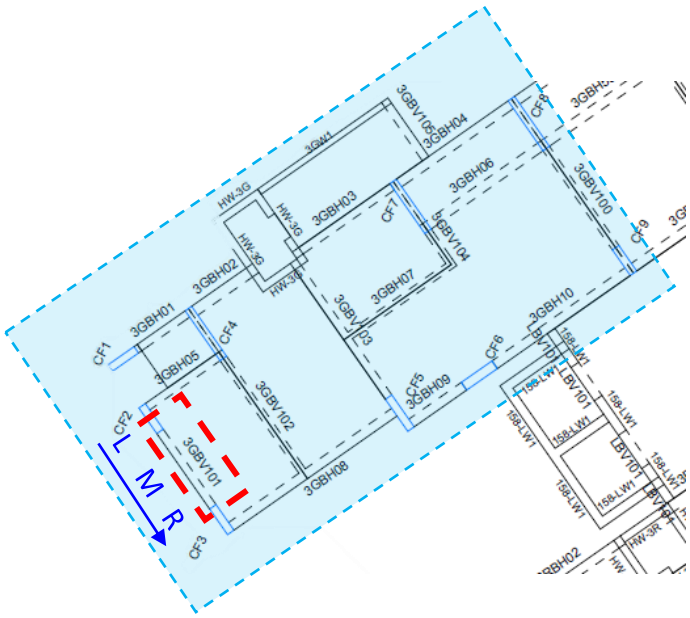


- The building angle is playing a role in determining the beam orientation for the reinforcement detailing in IFC+SG model
- The vertical beam in case 2 will have different beam orientation compared with Original and Case 1

Case 1 – Building rotate at clockwise angle



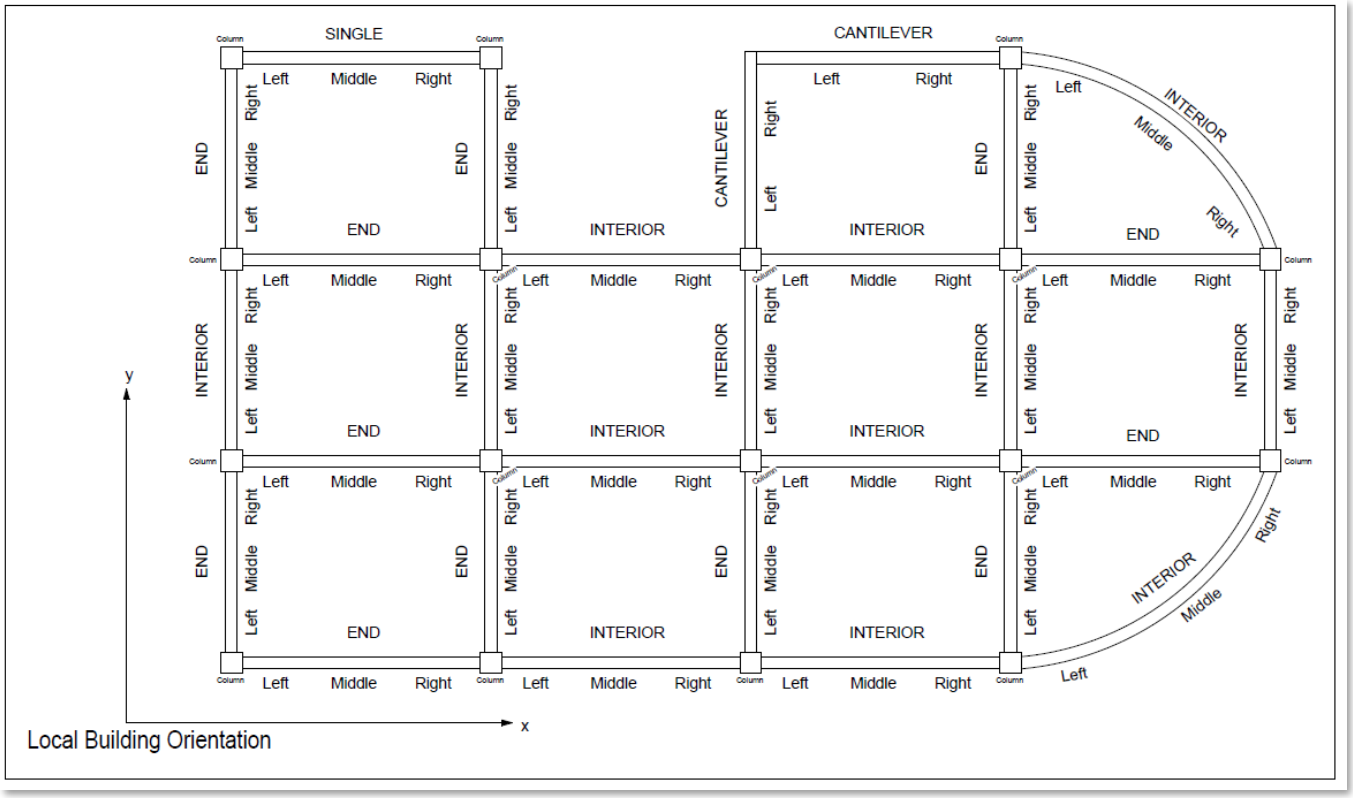
Case 2 – Building rotate at anti-clockwise angle



S4 – Fig 7: Building angle might change the beam orientation

Beam

Beam Property Definition (continued from previous page)

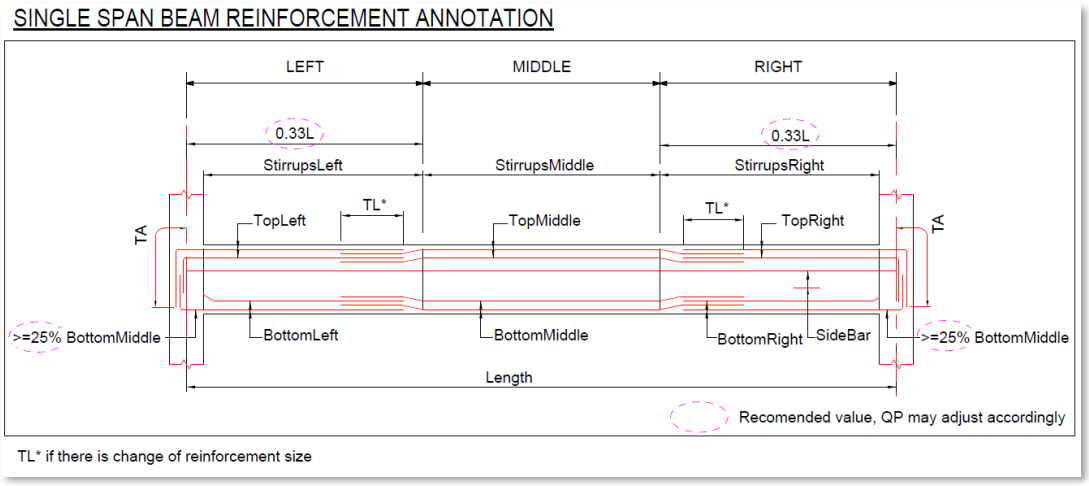


S4 – Fig 8: Beam Sequencing and Span Definition

Beam

Beam Reinforcement Definition

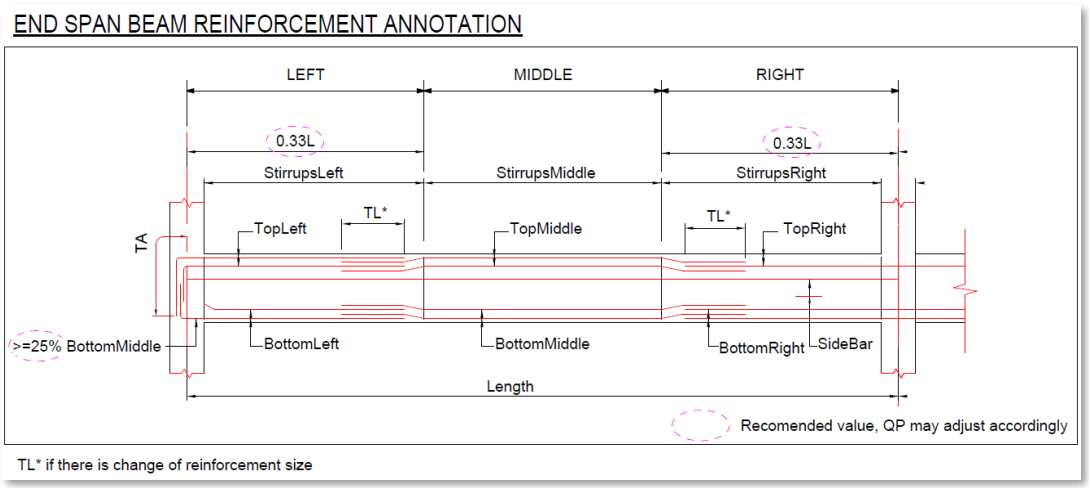
Beam Reinforcement Definition	
1	A set of typical beam reinforcement annotation is provided for reference.
2	QP may provide a set of 2D typical drawings to present typical beam reinforcement annotation based on the standardised IFC+SG parameter names.
3	The input for TopLeft, TopMiddle, TopRight, BottomLeft, 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
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. This parameter is optional for input.



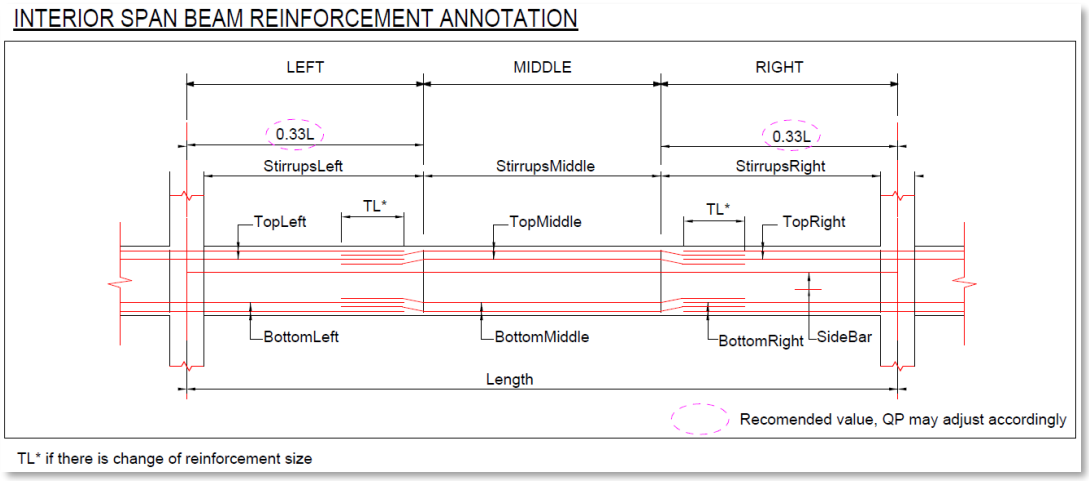
S4 – Fig 9: Beam Annotation Single Span

Beam

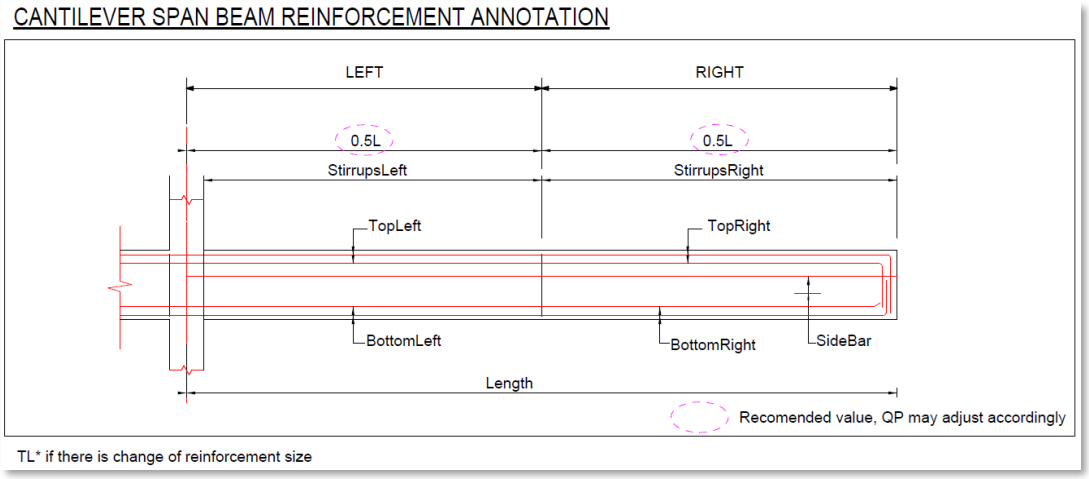
Beam Reinforcement Definition (continued from previous page)



S4 – Fig 10: Beam Annotation End Span



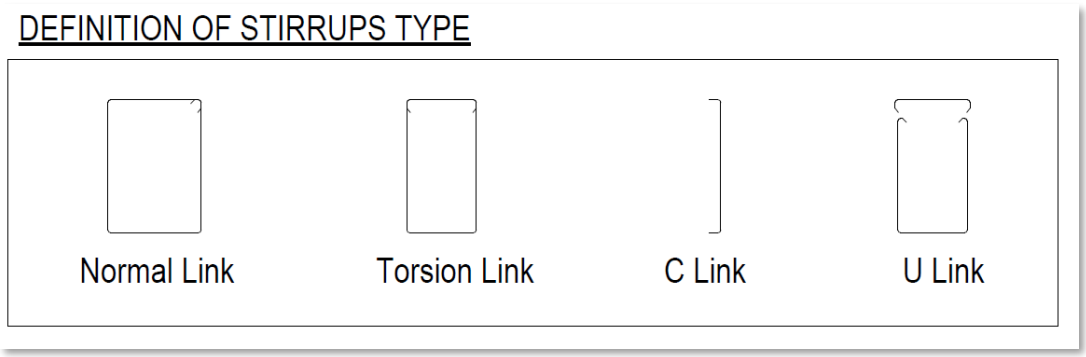
S4 – Fig 11: Beam Annotation Interior Span



S4 – Fig 12: Beam Annotation Cantilever Span

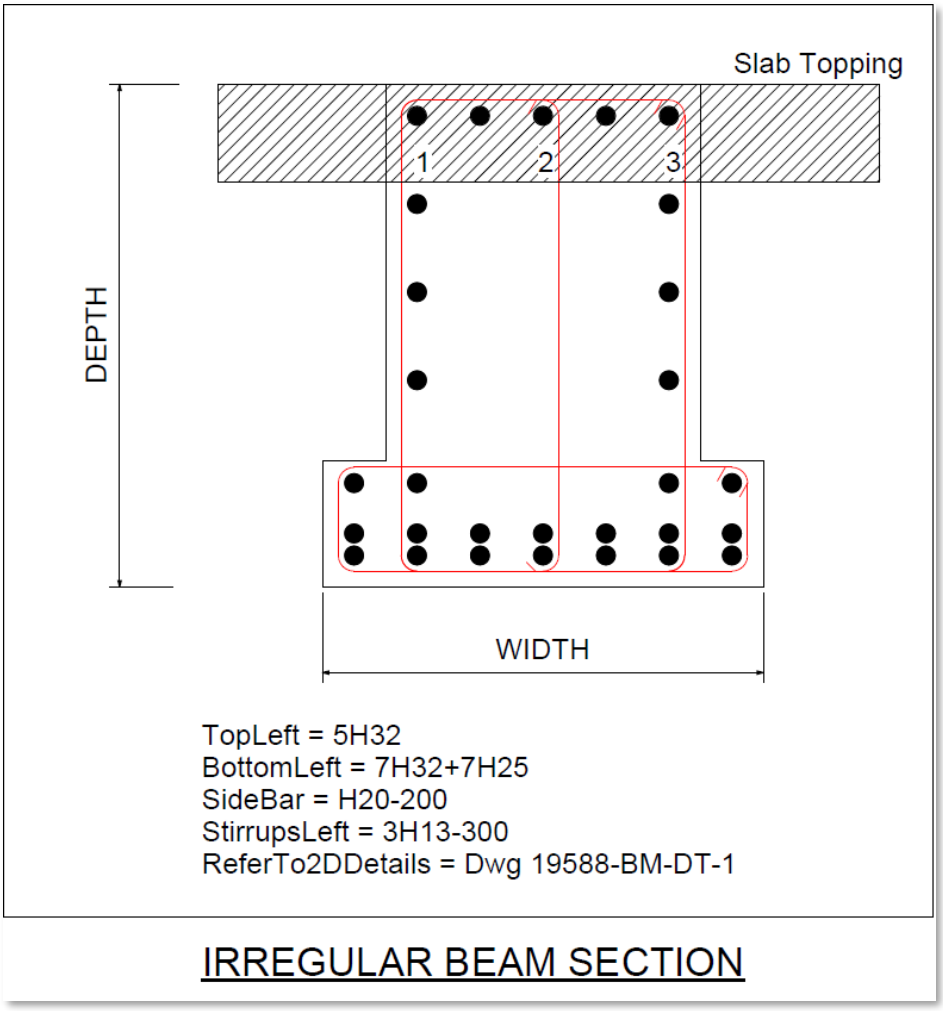
Beam

Beam Reinforcement Definition (continued from previous page)



S4 – Fig 13: Beam Annotation Stirrups

Example of Irregular Beam Section



S4 – Fig 14: Irregular Beam Section

Beam

By IFC Representation

IFC Entity: IfcBeam						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	BeamSpanType	Text	All beams	-	Yes	*Refer to list^*
2	BottomLeft	Text	RC beam	-	No	3H25
3	BottomMiddle	Text	RC beam	-	No	3H32+3H25+3H20
4	BottomRight	Text	RC beam	-	No	3H25
5	ConstructionMethod	Text	All beams	-	Yes	*Refer to list^*
6	Depth	Length	RC beam	mm	No*	600
7	LeftConnectionDetail	Text	Steel beam	-	No	Detail 1
8	LeftConnectionType	Text	Steel beam	-	Yes	*Refer to list^*
9	Mark	Text	All beams	-	No	HB1, VB1, B1
10	MaterialGrade	Text	All beams	-	Yes	*Refer to list^*
11	MechanicalConnectionType	Text	-	-	Yes	telescopic beam connector, grouted sleeves, lotus-root system
12	MemberSection	Text	Steel beam	-	No	RHS600x30x4, CHS500x3.0, 254x254x63kg/m
13	PrefabricatedReinforcementCage	Boolean	-	-	Yes	TRUE / FALSE
14	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
15	ReinforcementSteelGrade	Text	RC beam	-	Yes	*Refer to list^*
16	RightConnectionDetail	Text	Steel beam	-	No	Detail 1
17	RightConnectionType	Text	Steel beam	-	Yes	*Refer to list^*
18	SectionFabricationMethod	Text	Steel beam	-	Yes	*Refer to list^*
19	SideBar	Text	When required / relevant	-	No	H13-250
20	StirrupsLeft	Text	RC beam	-	No	4H13-300
21	StirrupsMiddle	Text	RC beam	-	No	4H13-300
22	StirrupsRight	Text	RC beam	-	No	4H13-300
23	StirrupsTypeLeft	Text	RC beam	-	Yes	*Refer to list^*
24	StirrupsTypeMiddle	Text	RC beam	-	Yes	*Refer to list^*
25	StirrupsTypeRight	Text	RC beam	-	Yes	*Refer to list^*

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.

Beam

By IFC Representation (continued from previous page)

IFC Entity: IfcBeam						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
26	SpliceConnection	Text	When required / relevant	-	No	Detail 3
27	TopLeft	Text	RC beam	-	No	3H32+3H25
28	TopMiddle	Text	RC beam	-	No	3H25
29	TopRight	Text	RC beam	-	No	3H32+3H25
30	Width	Length	RC beam	mm	No*	300

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.

Example of Beam (RC Beam) Structural Element Input

RC Beam (600x1200mm RC Precast Beam)

- Mark – 4HB52
- Concrete grade C32/40
- Interior span
- Top Rebar at support 6H32
- Bottom Rebar at support 6H20
- Top rebar at midspan 6H20
- Bottom Rebar at midspan 6H32+6H20
- Stirrups at support 3 leg H10-150
- Stirrups at midspan 3 leg H10-300
- Sidebar H16-200

IFC Entity: IfcBeam

IFC SubType: N.A.

S/N	**IFC+SG Property**	**Examples**
1	BeamSpanType	Interior
2	ConstructionMethod	PC
3	ReinforcementSteelGrade	500B
4	Depth	1200
5	Mark	4HB52
6	Width	600
7	BottomLeft	6H20
8	BottomMiddle	6H32+6H20
9	BottomRight	6H20
10	SideBar	H16-200

Beam

Example of Beam (RC Beam) Structural Element Input

continued from previous page

RC Beam (600x1200mm RC Precast Beam)	**IFC Entity:** IfcBeam		
	IFC SubType: N.A.		
• Mark – 4HB52 • Concrete grade C32/40 • Interior span • Top Rebar at support 6H32 • Bottom Rebar at support 6H20 • Top rebar at midspan 6H20 • Bottom Rebar at midspan 6H32+6H20 • Stirrups at support 3 leg H10-150 • Stirrups at midspan 3 leg H10-300 • Sidebar H16-200	**S/N**	**IFC+SG Property**	**Examples**
	11	StirrupsLeft	3H10-150
	12	StirrupsMiddle	3H10-300
	13	StirrupsRight	3H10-150
	14	StirrupsTypeLeft	Normal+C
	15	StirrupsTypeMiddle	Normal+C
	16	StirrupsTypeRight	Interior
	17	TopLeft	6H32
	18	TopMiddle	6H20
	19	TopRight	6H32
	20	MaterialGrade	C32/40

Example of Beam (Steel Beam) Structural Element Input

Steel Beam (UC254x254x63kg/m Steel Beam)	**IFC Entity:** IfcBeam		
	IFC SubType: N.A.		
• Mark – SB1 • Steel Grade S355 Hot Rolled • Cantilever Span • Fixed Connection to column at right part (Typical connection of SB1 to C1)	**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

Borehole

Modelling Borehole in IFC+SG

- All the boreholes shall be modelled as per true coordinates in the IFC+SG structural model with the necessary information required as stipulated in the tables below.
    - The borehole elements shall be modelled with reasonable visibility for its location.
- The SI report for all boreholes shall be included and submitted in PDF & AGS format.

By IFC Representation

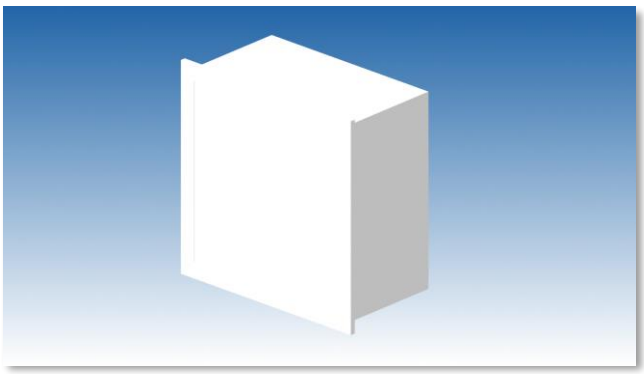
IFC Entity: IfcBuildingElementProxy						
IFC SubType: BOREHOLE						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Depth	Length	All boreholes	mm	No*	14560
2	Mark	Text	All boreholes	-	No	BH1
3	SHDLevel_SPT_MoreThan_100N	Real	All boreholes	SHD m	No	-27.5
4	SHDLevel_SPT_MoreThan_60N	Real	All boreholes	SHD m	No	-15.0
5	TerminationLevel	Real	All boreholes	SHD m	No	-50.5
6	TopLevel	Real	All boreholes	SHD m	No	1.8

* Parameter is populated from the dimensions of BIM elements modelled.

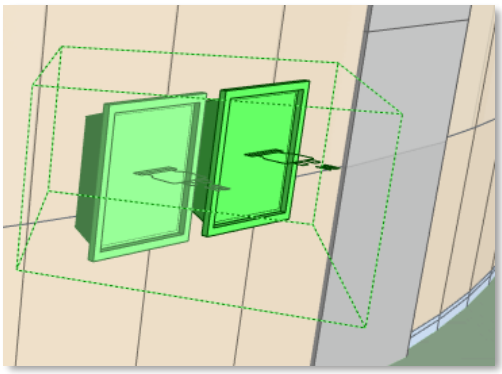
Example of Borehole Structural Element Input

Borehole	**IFC Entity:** IfcBuildingElementProxy		
	IFC SubType: BOREHOLE		
• Mark – BH1 • Starting level SHD 1.50 • Termination level SHD -45.80 • Starting of soil layer with SPT>60N at SHD -16.80 • Starting of soil layer with SPT>100N at SHD -35.60	**S/N**	**IFC+SG Property**	**Examples**
	1	Depth	47300
	2	Mark	BH1
	3	SHDLevel_SPT_MoreThan_100N	-35.6
	4	SHDLevel_SPT_MoreThan_60N	-16.8
	5	TerminationLevel	-45.8

Breeching Inlet



S4 – Fig 15: Breeching Inlet



S4 – Fig 16: Breeching Inlet

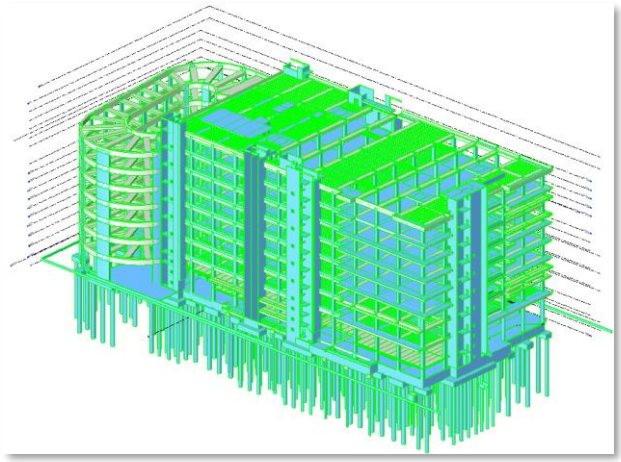
By IFC Representation

IFC Entity: IfcFireSuppressionTerminal					
IFC SubType: BREECHINGINLET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Hose_NominalDiameter	Text	mm	No	-
2	ID	Text	-	No	-
3	SystemType	Text	-	No	Dry Riser, Wet Riser, Foam Sprinkler, Sprinkler
4	SystemName	Text	-	No	-

Notes

- Besides modelling the individual Breeching Inlet as an individual component, also ensure each Breeching Inlet is exported as part of the Dry Riser, Wet Riser, Foam Sprinkler or Sprinkler System respectively.
- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Building Storey



S4 – Fig 17: Building Storey

S4 – Fig 18: Building Storey with First Storey Plan selected

Modelling Building Storey in IFC+SG

- Different levels of the building development are automatically exported to the IfcBuildingStorey entity in the IFC model.
- All disciplines must have be aligned in naming and z-value of the building storeys when geo-referencing their models for coordination
- If difficulties are encountered in the naming of a building storey due to site conditions, we encourage industry practitioners to carry out pre-consultation with relevant agencies early before modelling starts.
- Examples of building storey names: Storey 1, Level 20, Storey 4 Mezzanine 2, Basement 1, Attic, Upper Roof

By IFC Representation

IFC Entity: IfcBuildingStorey					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Notes

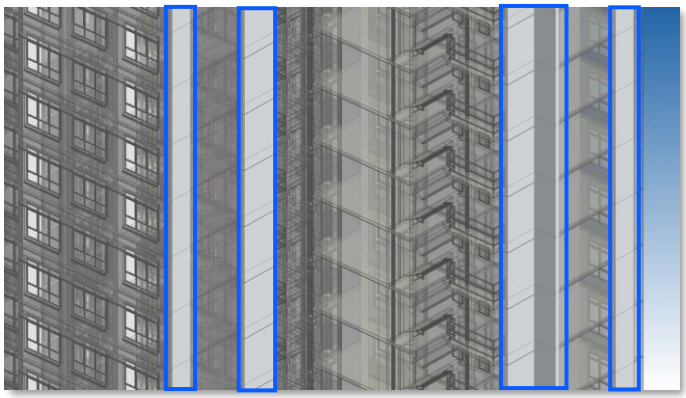
- Different levels of the building development are automatically exported to the IFC model
- Roof level is required to be separately represented as a property to meet URA requirements

Ceiling

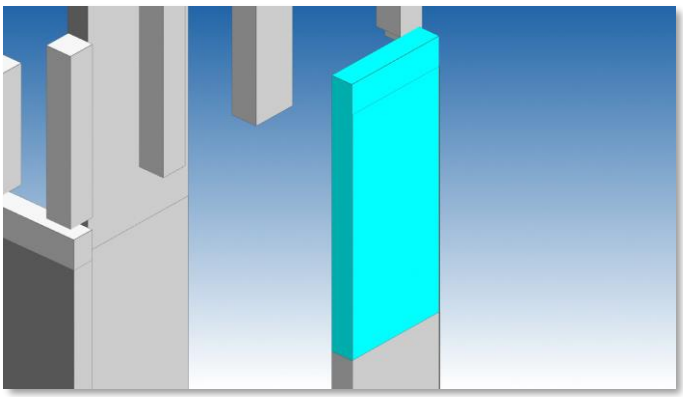
By IFC Representation

IFC Entity: IfcCovering					
IFC SubType: CEILING					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	FireRating	Text	hr	Yes	0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4
2	Material	Text	-	No	Sand, Corey Dust, Granite Dust, Gravel, Crusher Run, Recycled Aggregates, Intumescent Paint, Steel, Timber, Engineered Timber, Concrete, Wood, Brick, Reinforced Concrete, MET, Galvanized Mild Steel Heavy Duty, Plastic, Plastered, Fair-Faced Brickwall, Samples of Concrete Elements

Column



S4 – Fig 19: Columns in relation to the Building



S4 – Fig 20: Column

Modelling Column in IFC+SG

- All the column elements shall be modelled in IFC+SG model with the necessary information required as stipulated in the tables below.
    - Typical columns are allowed to have same marks and design information. The marks and design information have to be embedded in every column element.
    - Multiple columns elements shall be modelled from support to support (storey to storey) for continuous column.
    - Column working load is required for 1st storey column only.

- 2D detail drawings are allowed for any irregular or complex column section (e.g. L shape column, inclined column, composite column, cold-form steel column, etc.) with the indication of drawing number in the IFC+SG parameter "ReferTo2DDetail".

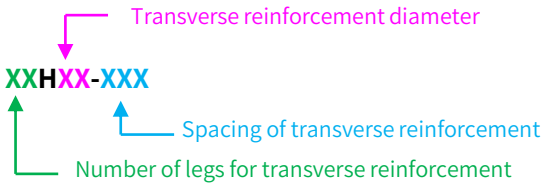
- IFC+SG parameters to be included for any irregular, or complex column element:
    - ConstructionMethod
    - ReferTo2DDetail
    - Mark
    - MaterialGrade
    - StartingStorey
    - EndStorey
    - Breadth (for RC column)
    - Width (for RC column)
    - Diameter (if applicable)
    - MemberSection (for steel column)
    - SectionFabricationMethod (for steel column)

Column Dimension and Reinforcement Definition

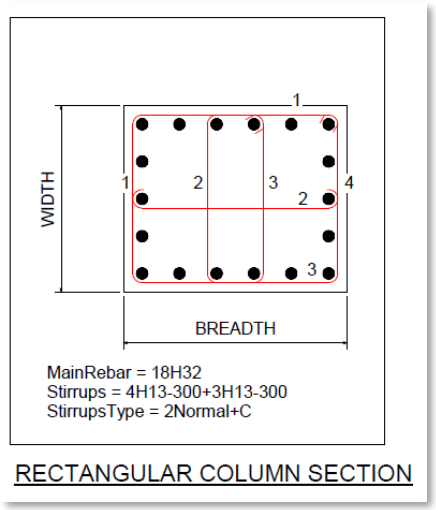
Column Dimension and Reinforcement Definition	
1	The breadth is referring to the longest side of a rectangular column while width is referring to the shorter side of a rectangular column, despite of the column orientation.
2	QP may substantiate a set of 2D column schedule drawings to present the orientation and arrangement of column reinforcement for illustration.
3	The input for MainRebar shall be "XXHXX" while "H" is a must, 1st XX is number of longitudinal reinforcement & 2nd XX is the reinforcement diameter. • Use '+' for bundle column reinforcement (e.g. 12H32+12H25) Longitudinal reinforcement diameter XXHXX Number of longitudinal reinforcement

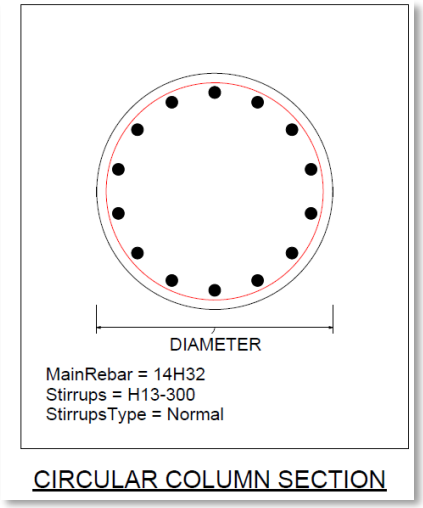
Column

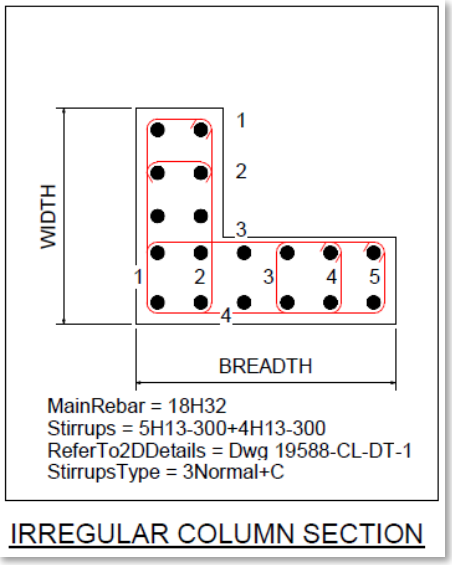
Column Dimension and Reinforcement Definition (continued from previous page)

Column Dimension and Reinforcement Definition	
4	The input for Stirrups shall be "XHXX-XXX" while "H" is a must, X is number of legs for transverse reinforcement, XX are the reinforcement diameter and XXX is the spacing of transverse reinforcement (e.g. 4H10-150). • Use '+' for more than 1 layer of reinforcement (e.g. 4H10-100+4H8-100, [4 denotes 4 legs]) 
5	Type of the column stirrup (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. This parameter is optional for input.

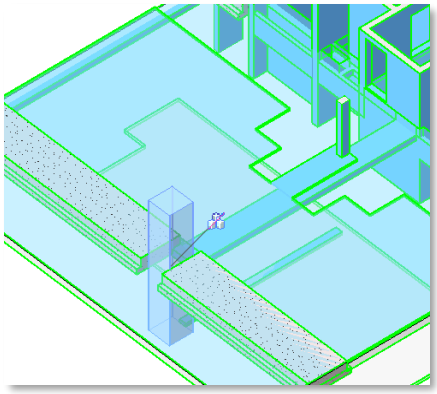
Example of Column Sections



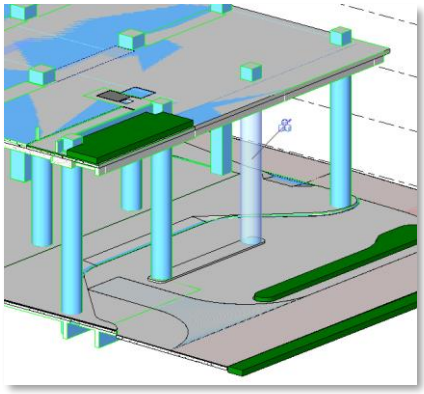




S4 – Fig 23 : Irregular Column Section



S4 – Fig 21: Rectangular Column



S4 – Fig 22 : Circular Column

Column

By IFC Representation

IFC Entity: IfcColumn

IFC SubType: N.A.

S/N	IFC+SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	ArrangementType	Text	-	-	No	Multi-Tier
2	Breadth	Length	RC column	mm	No*	300
3	ConnectionDetailsBottom	Text	Steel column	-	No	Detail 1
4	ConnectionDetailsTop	Text	Steel column	-	No	Detail 1
5	ConnectionTypeBottom	Text	Steel column	-	Yes	*Refer to list^*
6	ConnectionTypeTop	Text	Steel column	-	Yes	*Refer to list^*
7	ConstructionMethod	Text	All columns	-	Yes	*Refer to list^*
8	Diameter	Length	When required / relevant	mm	No*	600
9	EndStorey	Text	All columns	-	No	2nd Storey, Roof Storey
10	MainRebar	Text	RC column	-	No	6H32+6H25
11	Mark	Text	All columns	-	No	C1, TC1
12	MaterialGrade	Text	All columns	-	Yes	*Refer to list^*
13	MechanicalConnectionType	Text	-	-	Yes	column shoes, grouted sleeves, spiral connector
14	MemberSection	Text	Steel column	-	No	RHS600x30x4, CHS500x3.0, 254x254x63kg/m
15	PrefabricatedReinforcementCage	Boolean	-	-	Yes	TRUE / FALSE
16	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
17	ReinforcementSteelGrade	Text	RC column	-	Yes	*Refer to list^*
18	SectionFabricationMethod	Text	Steel column	-	Yes	*Refer to list^*
19	SpliceDetail	Text	When required / relevant	-	No	Detail 3
20	StartingStorey	Text	All columns	-	No	1st Storey, Lower Roof Storey
21	Stirrups	Text	RC column	-	No	4H13-300
22	StirrupsType	Text	When required / relevant	-	Yes	*Refer to list^*
23	Width	Length	RC column	mm	No*	600
24	WorkingLoad_DA1-1	Integer	When required / relevant	kN	No	1234
25	WorkingLoad_DA1-2	Integer	When required / relevant	kN	No	1234

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.

Column

Example of Column (RC CIS Column) Structural Element Input

RC Column (600x600mm RC Cast-In-Situ Column)

- Mark – C2
- Concrete grade C32/40
- From 1st storey to 2nd storey
- Main rebar 8H20
- 2 nos H10-300 link (total 4 legs)
- Load for DA1-1: 4536kN
- Load for DA1-2: 3864kN

IFC Entity: IfcColumn

IFC SubType: N.A.

S/N	IFC+SG Property	Examples
1	ConstructionMethod	CIS
2	ReinforcementSteelGrade	500B
3	Breadth	600
4	EndStorey	2nd storey
5	Mark	C2
6	StartingStorey	1st storey
7	Width	600
8	MainRebar	8H20
9	Stirrups	4H10-300
10	StirrupsType	2Normal
11	WorkingLoad_DA1-1	4536
12	WorkingLoad_DA1-2	3864
13	MaterialGrade	C32/40

Example of Column (Steel Column) Structural Element Input

Steel Column (UC305x305x118kg/m Steel Column)

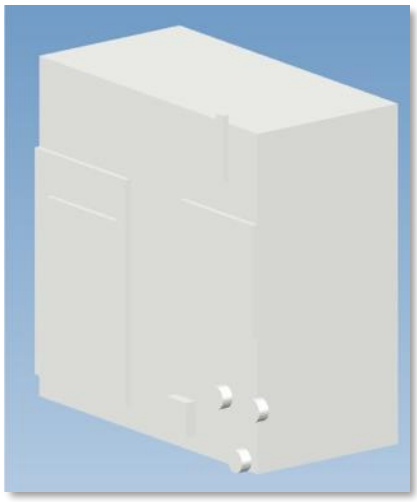
- Mark – SC1
- Steel grade S355 hot rolled
- From 6th storey to roof storey
- Pinned connection to RC column at bottom part (Typical SC1 baseplate details) and support a steel frame (Typical connection of SB1 to SC1)

IFC Entity: IfcColumn

IFC SubType: N.A.

S/N	IFC+SG Property	Examples
1	ConstructionMethod	PF
2	SectionFabricationMethod	Hot Rolled
3	EndStorey	Roof Storey
4	Mark	SC1
5	MemberSection	UC305x305x118kg/m
6	StartingStorey	6th Storey
7	MaterialGrade	S355
8	ConnectionDetailsBottom	Typical SC1 baseplate details on dwg 19588-ST-DT-6
9	ConnectionDetailsTop	Typical connection of SB1 to SC1 on dwg 19588-ST-DT-6
10	ConnectionTypeBottom	Pinned
11	ConnectionTypeTop	Pinned

Control Element

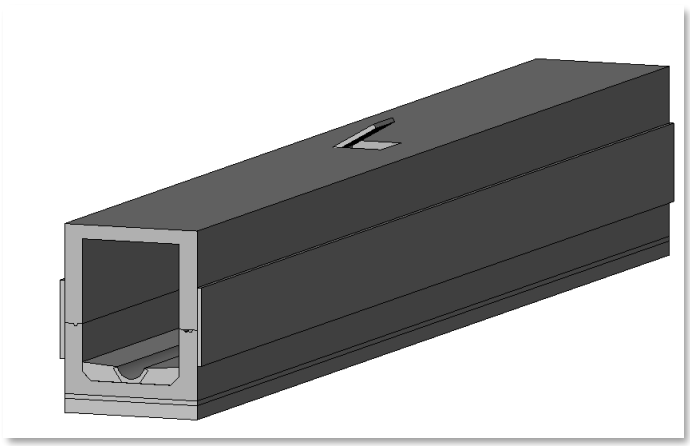


S4 – Fig 24: Control Panel

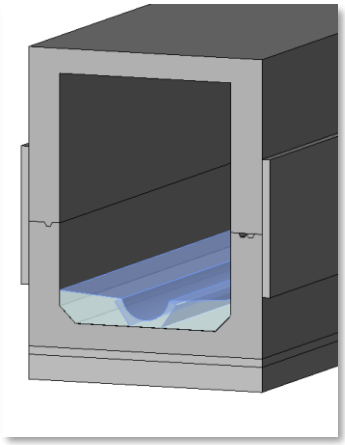
By IFC Representation

IFC Entity: IfcUnitaryControlElement					
IFC SubType: CONTROLPANEL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Purpose	Text	-	No	Main Panel, Sub Panel
2	PWCS_Flushing	Boolean	-	Yes	TRUE / FALSE

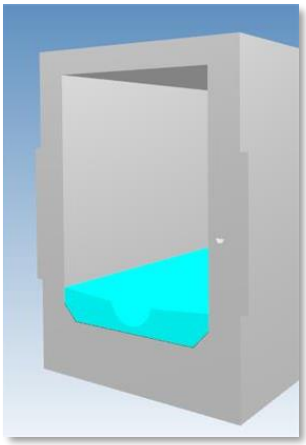
Culvert/ Drains



S4 – Fig 25: Culvert



S4 – Fig 26: Culvert



S4 – Fig 27: Culvert

By IFC Representation

IFC Entity: IfcCivilElement					
IFC SubType: COMMONDRAIN, CROSSCULVERT, CULVERT, ENTRANCECULVERT, EXTERNALDRAIN, INTERNALDRAIN, OUTLETDRAIN, ROADSIDEDRAIN, TRENCH					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Diameter	Length	mm	No	-
2	Gradient	Text	-	No	-
3	Height	Length	mm	No	-
4	Length	Length	mm	No	-
5	LoadBearing	Boolean	-	Yes	TRUE / FALSE
6	Material	Text	-	No	-
7	SystemName	Text	-	No	-
8	SystemType	Text	-	No	Rainwater, Drainage
9	Thickness	Length	mm	No	-
10	Width	Length	mm	No	-

IFC Entity: IfcBuildingElementProxy					
IFC SubType: DROPINLETCHAMBER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Notes

- Sanitary drain-lines are to be submitted as schematic and/or 2D drawings. If industry would like to submit in 3D, it is optional and will also be accepted.
- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Curtain Wall

By IFC Representation

IFC Entity: IfcCurtainWall					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Damper

By IFC Representation

IFC Entity: IfcDamper					
IFC SubType: FIREDAMPER, FIRESMOKEDAMPER, SMOKEDAMPER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	FireRating	Text	hr	Yes	0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4

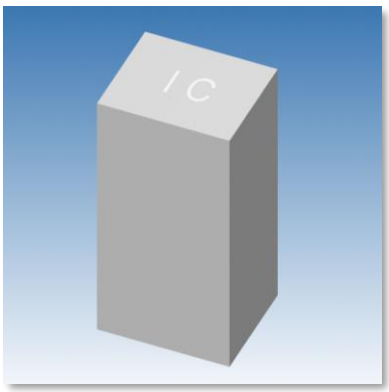
Notes

- Modelling Damper is voluntary.
- Refer here for fire safety equipment / provisions that need not be modelled in full and can be represented by suitable modelling objects / components.

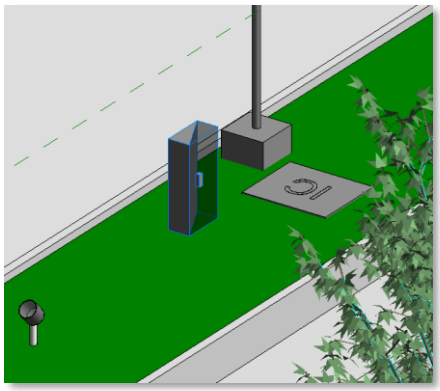
Distribution Chamber

Modelling Distribution Chamber in IFC+SG

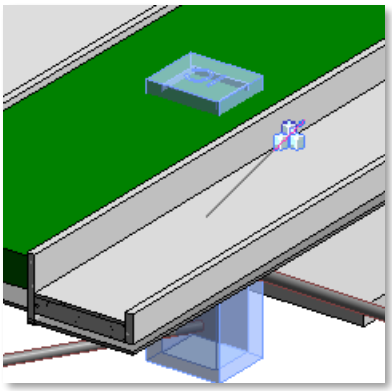
- Distribution Chambers include Inspection Chambers, Manholes, Meter Chambers, Sampling Sumps and Sumps.
    - Refer to other Distribution Chambers in IFC SubTypes on the next page
- For Inspection Chambers and manhole, dimensional parameters such as "Diameter", "Length" and "Width" refer to the internal dimensions, as shown in diagram S4-Fig 32 below. Internal dimensions shall be accurately provided in the model.
- Depth of an Inspection Chamber and manhole refers to the vertical distance measured from the Top Level to the Invert Level. Depth, TopLevel and InvertLevel shall be accurately provided in the model.
- Manhole ID shall be provided for manhole within the model.



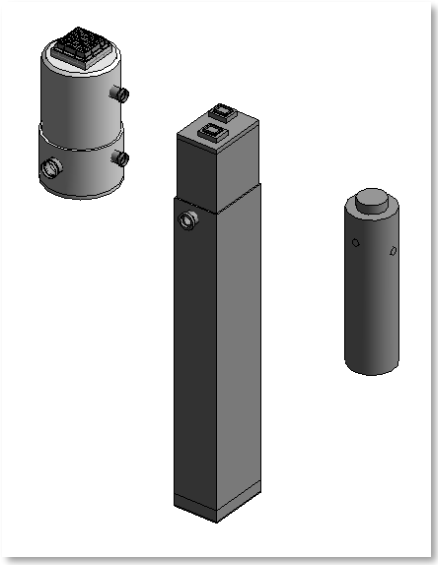
S4 – Fig 28: Inspection Chamber



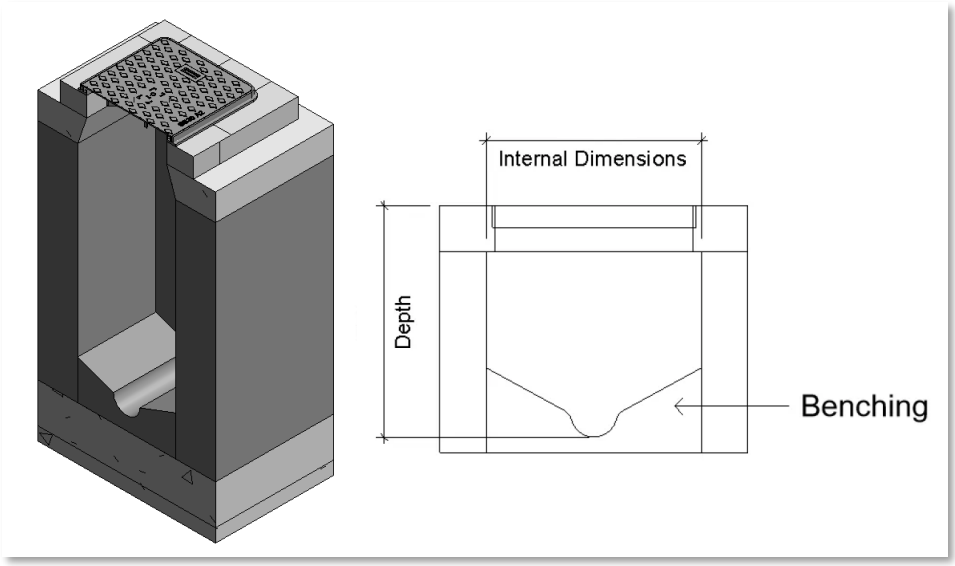
S4 – Fig 29: Inspection Chamber



S4 – Fig 30: Inspection Chamber



S4 – Fig 31: Manhole



S4 – Fig 32: Inspection Chamber Dimensions

Distribution Chamber

By IFC Representation

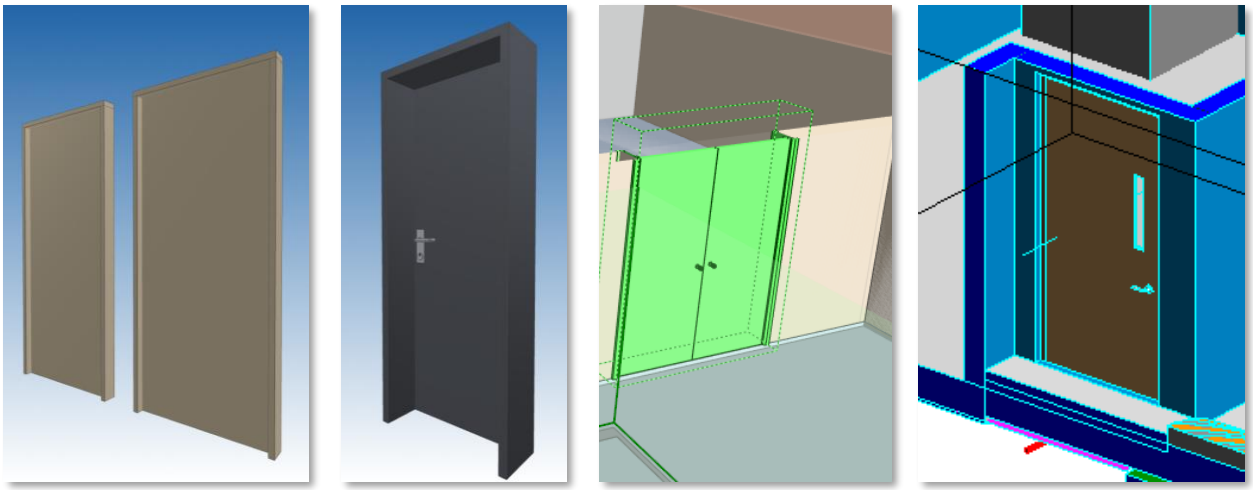
IFC Entity: IfcDistributionChamberElement					
IFC SubType: INSPECTIONCHAMBER, MANHOLE, METERCHAMBER, PWCSINSPECTIONCHAMBER, PWCSMANHOLE, SCREENCHAMBER, SAMPLINGSUMP, SUMP, TRENCH					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Diameter	Length	mm	No	-
2	Depth	Length	mm	No	-
3	Height	Length	mm	No	-
4	ID	Text	-	No	
5	InvertLevel	Real	SHD m	No	-
6	Length	Length	mm	No	-
7	Material	Text	-	No	-
8	Status	Text	-	Yes	Existing, Proposed, To Be Removed, Abandoned, New, Temporary, Demolished
9	SystemName	Text	-	No	-
10	SystemType	Text	-	No	Sanitary, Sewerage
11	TopLevel	Real	SHD m	No	-50, 3.423
12	TradeEffluent	Boolean	-	Yes	TRUE / FALSE
13	Width	Length	mm	No	-

IFC Entity: IfcCovering					
IFC SubType: PWCSINSPECTIONCHAMBERCOVER, PWCSMANHOLECOVER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Watertight	Boolean	-	Yes	TRUE / FALSE
2	ExternalReference	Text	-	No	SS 30 Manhole Tops and Surface-box Tops

Notes

- Sanitary drain-lines are to be submitted as schematic and/or 2D drawings. If industry would like to submit in 3D, it is optional and will also be accepted.
- Refer to **System** for full list of system types that can be provided under "SystemType" property.

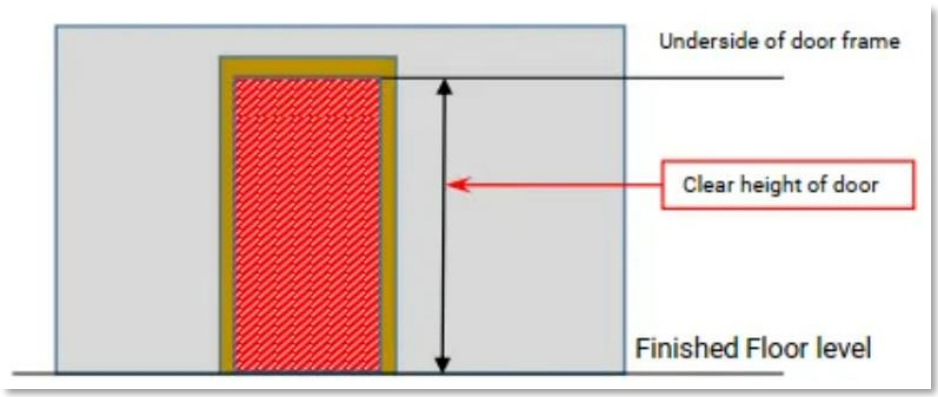
Door



S4 – Fig 33 to 36: Doors

Modelling Door in IFC+SG

- All the door elements must indicate "ClearHeight" in its properties, to facilitate headroom checks.



S4 – Fig 37: Door clear height

Door

By IFC Representation

IFC Entity: IfcDoor					
IFC SubType: DOOR, GATE, BLASTDOOR, ROLLERSHUTTER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ClearWidth	Length	mm	No	1200
2	ClearHeight	Length	mm	No	N.A.
3	FireAccessOpening	Boolean	-	Yes	TRUE / FALSE
4	FireExit	Boolean	-	Yes	TRUE / FALSE
5	FireRating	Text	hr	Yes	0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4
6	MainEntrance	Boolean	-	Yes	TRUE / FALSE
7	Material	Text	-	No	-
8	OneWayLockingDevice	Boolean	-	Yes	TRUE / FALSE
9	OperationType	Text	-	Yes	*Pls refer to the next page*
10	OverallWidth	Length	mm	No	-
11	PowerOperated	Boolean	-	Yes	TRUE / FALSE
12	SelfClosing	Boolean	-	Yes	TRUE / FALSE
13	StructuralHeight	Length	mm	No	710
14	StructuralWidth	Length	mm	No	490
15	Thickness	Length	mm	No	N.A.
16	VisionPanel	Boolean	-	Yes	TRUE / FALSE

Door

Door Operation Types

To facilitate viewing of door swings and other operation movements in IFC format, inputs or values for the "OperationType" parameter should be provided with reference to the table below. More info can be found at https://standards.buildingsmart.org/IFC/RELEASE/IFC4/ADD1/HTML/schema/ifcsharedbldgelements/lexical/ifcdoortypeoperationenum.htm

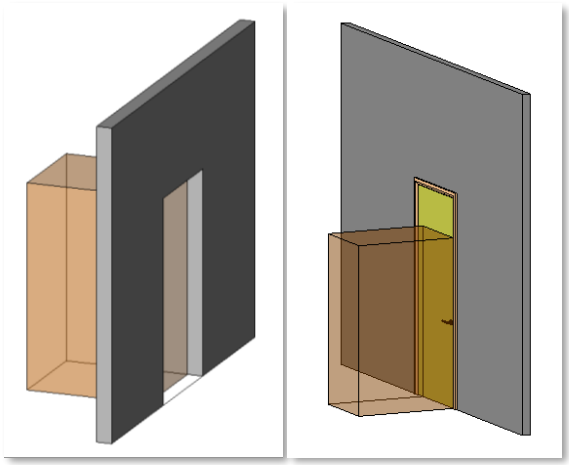
"OperationType" parameter values	Description
SINGLE_SWING_LEFT	• Door with one panel that opens (swings) to the left. • The hinges are on the left side as viewed in the direction of the positive y-axis
SINGLE_SWING_RIGHT	• Door with one panel that opens (swings) to the right. • The hinges are on the right side as viewed in the direction of the positive y-axis
DOUBLE_DOOR_SINGLE_SWING	• Door with two panels, one opens (swings) to the left, the other opens (swings) to the right
DOUBLE_DOOR_SINGLE_SWING_OPPOSITE_LEFT	• Door with two panels that both open to the left, one panel swings in one direction and the other panel swings in the opposite direction
DOUBLE_DOOR_SINGLE_SWING_OPPOSITE_RIGHT	• Door with two panels that both open to the right, one panel swings in one direction and the other panel swings in the opposite direction
DOUBLE_SWING_LEFT	• Door with one panel that swings in both directions and to the left in the main traffic direction, also called double acting door
DOUBLE_SWING_RIGHT	• Door with one panel that swings in both directions and to the right in the main traffic direction, also called double acting door
DOUBLE_DOOR_DOUBLE_SWING	• Door with two panels • One panel swings in both directions and to the right in the main traffic direction • The other panel swings also in both directions and to the left in the main traffic direction
SLIDING_TO_LEFT	• Door with one panel that is sliding to the left
SLIDING_TO_RIGHT	• Door with one panel that is sliding to the right
DOUBLE_DOOR_SLIDING	• Door with two panels • One is sliding to the left, the other is sliding to the right
FOLDING_TO_LEFT	• Door with one panel that is folding to the left
FOLDING_TO_RIGHT	• Door with one panel that is folding to the right
DOUBLE_DOOR_FOLDING	• Door with two panels • One is folding to the left, the other is folding to the right
REVOLVING	• An entrance door consisting of four leaves set in a form of a cross • Revolves around a central vertical axis
ROLLING UP	• Door that opens by rolling up
SWING_FIXED_LEFT	• Door with one panel that opens (swings) to the left and one fixed panel • The hinges of the swinging panel are on the left side as viewed in the direction of the positive y-axis
SWING_FIXED_RIGHT	• Door with one panel that opens (swings) to the right and one fixed panel • The hinges of the swinging panel are on the right side as viewed in the direction of the positive y-axis

Door

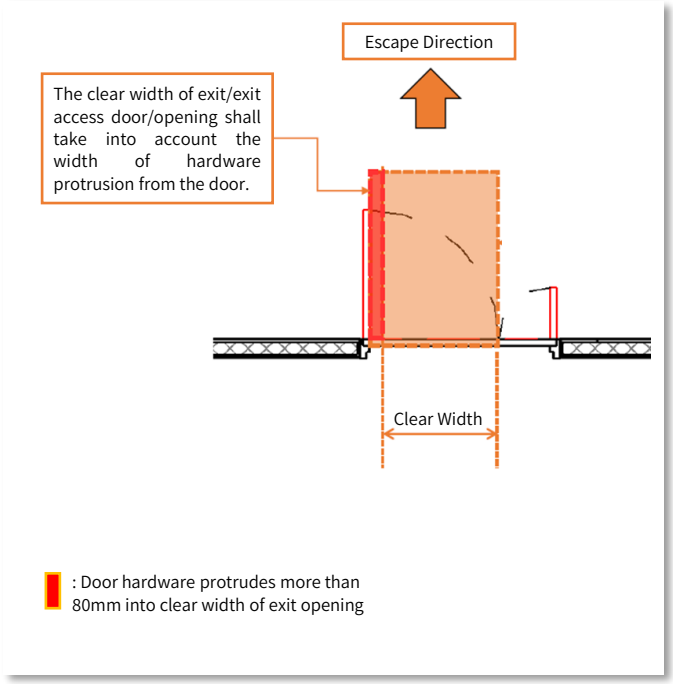
Egress Indicator Box

Optional (For Model Checker)

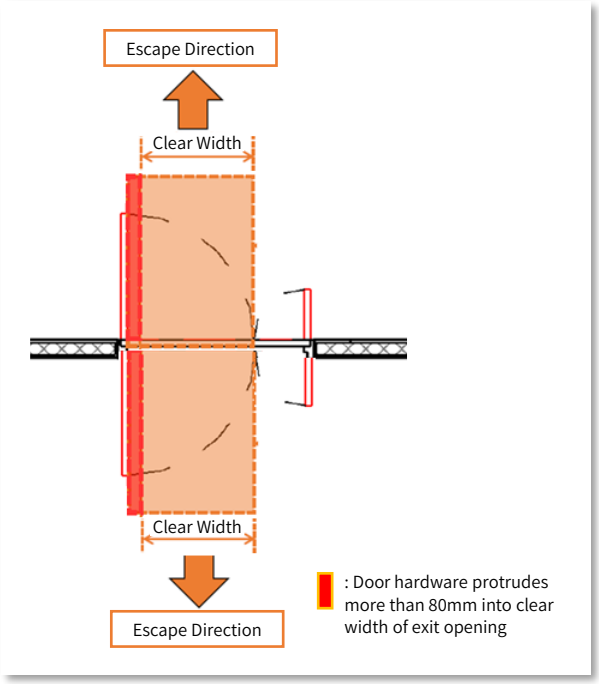
- Egress Indicator Box (EIB) shall be modelled at each exit/exit access door/opening designated for escape to indicate the direction of escape and clear width of exit opening/ exit door/ operable panel. EIB can be located either on one side (see Figure B) or both sides (see Figure C for bi-directional egress) of IfcDoor, IfcOpening or IfcOpeningElement.
- The width of the EIB shall be the declared clear width of the door. The height shall be set at a default value of 2m, and the depth at 1.2m. QP shall amend the height and width of EIB accordingly.



S4 – Fig A: Egress Indicator Box



S4 – Fig B



S4 – Fig C

- The clear width of exit/exit access door/opening shall take into account the width of hardware protrusion from the door. Thus, for the case where hardware protrusion is factored into clear width calculation, EIB shall be placed such that the hardware protrusion does not encroach the EIB*. If the door could not open up to 90o, the width of the EIB shall take into account the maximum opening angle of the door. (*Note: Door hardware which do not protrude more than 80mm into the clear width of exit opening can be disregarded.)

Note

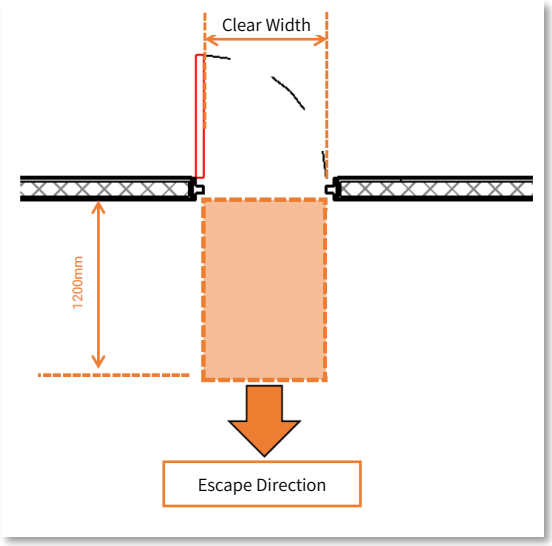
EIB is not required for:
- Doors within Purpose Group I residential building except those along the means of escape from the basement (including the discharge door)
- Doors within toilet
- Doors to shafts

Door

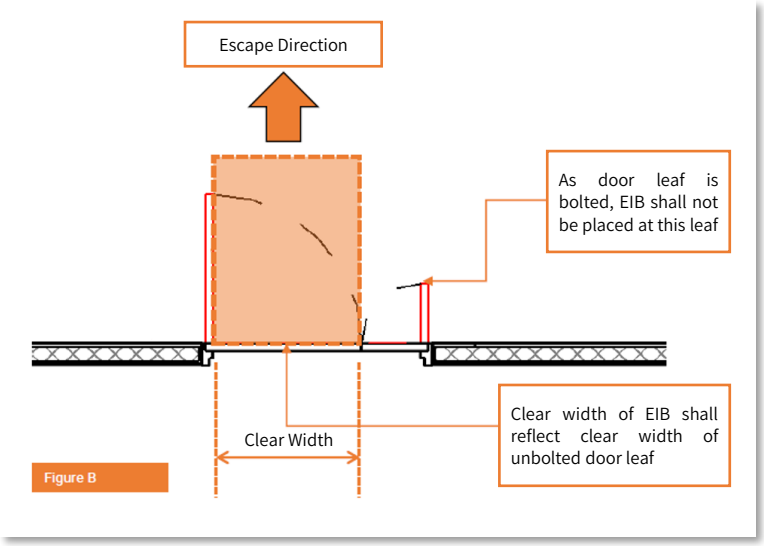
Egress Indicator Box (continued from previous page)

Optional (For Model Checker)

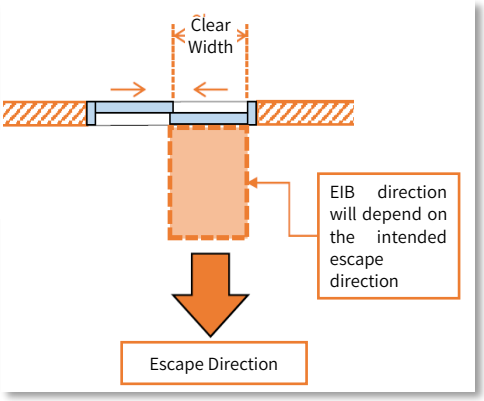
- **Correct placement of EIB**
    - For a functional space (excluding exit facilities and common areas) abutting a common area, the EIB shall be drawn at the common area.
    - For an exit facility (exit staircase, exit ramp, exit passageway) abutting any other spaces, the EIB shall be drawn at the exit facility.
- EIB shall be placed in the direction of egress. EIB is possible to be on the opposite side of door swing if this is the manner of egress declared by QP (see Figure D).
- For double-leaf fire exit door where only one panel is operable. EIB shall be placed at the operable panel and reflect its clear width (see Figure E).
- For sliding door, see Fig F, G and H for placement of EIB.

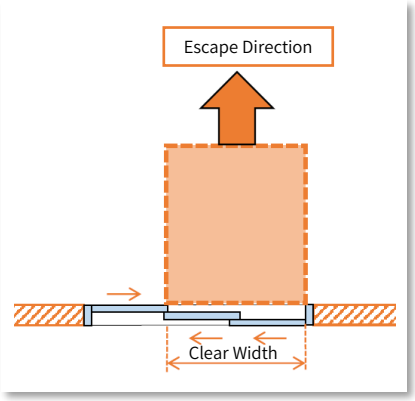


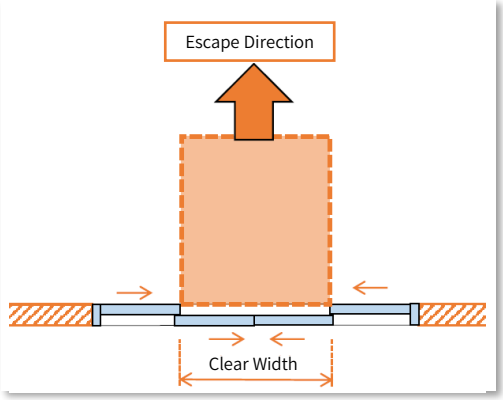
S4 – Fig D



S4 – Fig E







S4 – Fig F - H

Earthworks

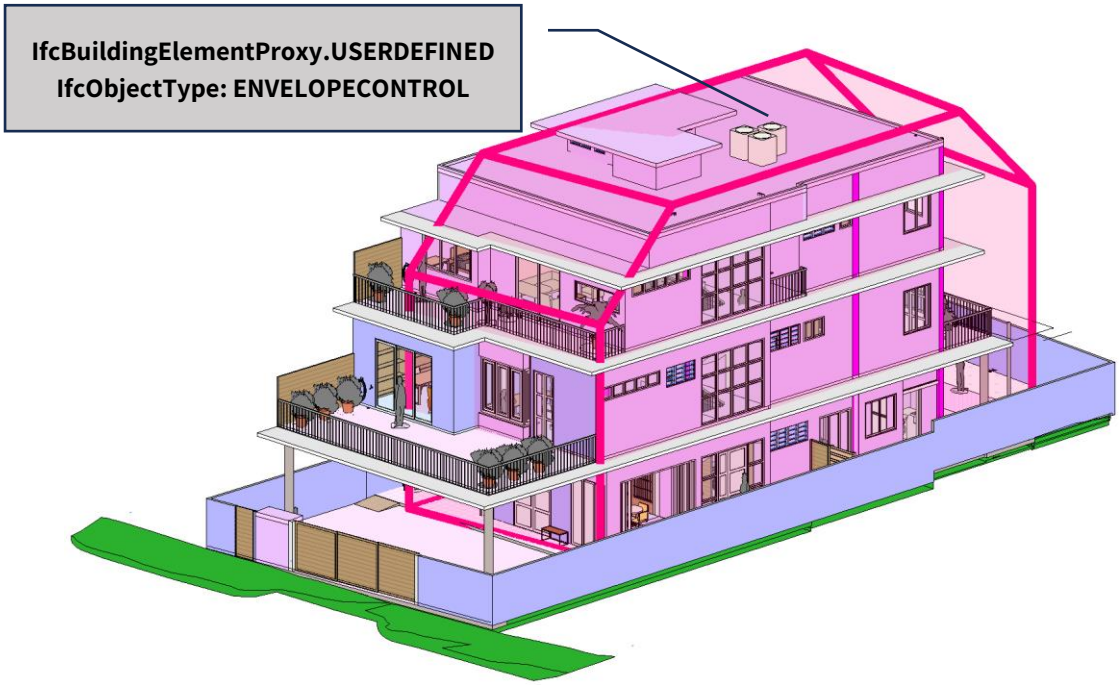
By IFC Representation

IFC Entity: IfcGeographicElement					
IFC SubType: TERRAIN					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Area	Area	m^2	No	-
2	Status	Text	-	Yes	Existing, Proposed

Envelope Control

Modelling Envelope Control in IFC+SG

- Like sections/elevations drawn in 2D CAD, the envelope control form/massing allows the QP to convey how the 3D design proposal is compliant, in the context of the site's topography, platform levels, and required setbacks.
- The envelope control form/massing can be modelled as a volumetric object(s) with some transparency; object(s) should be exported to "IfcBuildingElementProxy. USERDEFINED; IfcObjectType: ENVELOPECONTROL"



S4 – Fig 38: Envelope Control

By IFC Representation

IFC Entity: IfcBuildingElementProxy					
IFC SubType: ENVELOPECONTROL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Escalator

By IFC Representation

IFC Entity: IfcTransportElement					
IFC SubType: ESCALATOR					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Family-Friendly Furniture

By IFC Representation

IFC Entity: IfcFurniture					
IFC SubType: CHANGINGBED, CHILDPROTECTIONSEAT, DIAPERCHANGINGTABLE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Finishes

By IFC Representation

IFC Entity: IfcCovering					
IFC SubType: CLADDING, FIRECURTAIN, FLOORING, PIPESLEEVE, SOFFIT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	FireRating	Text	hr	Yes	0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4
2	Material	Text	-	No	-

IFC Entity: IfcBuildingElementProxy					
IFC SubType: TACTILETILE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

- Note: Tactile Tiles are included as part of the Footpath component only

Fire Access Opening

By IFC Representation

IFC Entity: IfcOpeningElement, IfcDoor, IfcWindow					
IFC SubType: OPENING					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	FireAccessOpening	Boolean	-	Yes	TRUE / FALSE

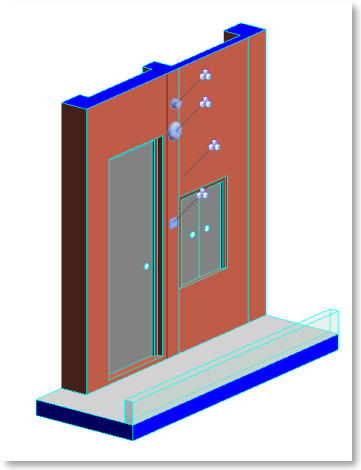
Modelling Fire Access Opening in IFC+SG

- This component can be modelled using IfcOpeningElement, IfcDoor or IfcWindow, where relevant.

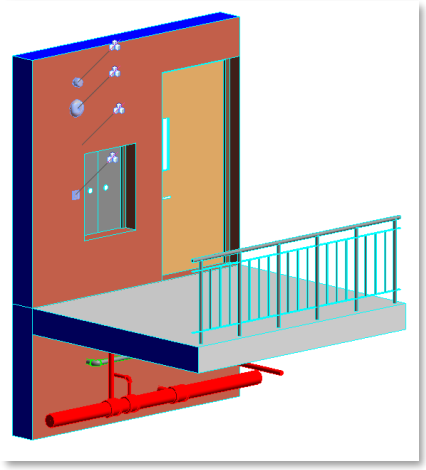
Fire Alarm

Modelling Fire Alarm in IFC+SG

- For Manual Fire Alarm, it will be shown together with BP at Construction Gateway (G2) as it is under the purview of the Architect.
- Design of automatic fire alarm system will be submitted in Independent Gateway as it is submitted by the Professional Engineer (optional in 3D).



S4 – Fig 39: Fire Alarm



S4 – Fig 40: Fire Alarm

S4 – Fig 41: Fire Alarm

By IFC Representation

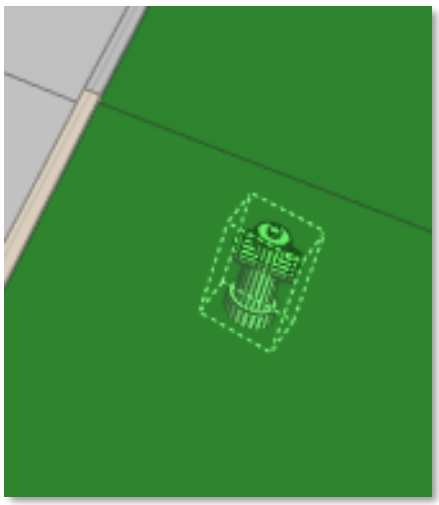
IFC Entity: IfcAlarm					
IFC SubType: FIREALARMPANEL, HOMEFIREALARMDEVICE, MANUALALARMCALLPOINT, SOUNDER, VISUALALARM					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Fire Extinguisher

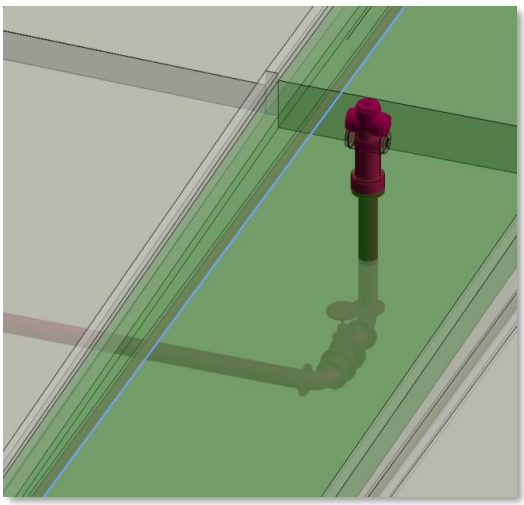
By IFC Representation

IFC Entity: IfcBuildingElementProxy					
IFC SubType: PORTABLEFIREEXTINGUISHER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	FireExtinguisherRating	Text	-	No	-

Fire Hydrant



S4 – Fig 42: Fire Hydrant



S4 – Fig 43: 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

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

Foam Inlet / Outlet

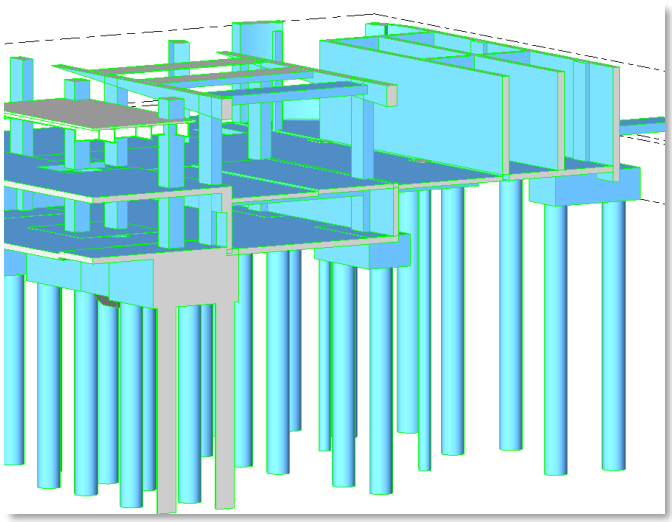
By IFC Representation

IFC Entity: IfcFireSuppressionTerminal					
IFC SubType: FOAMINLET, FOAMOUTLET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Foam Fire Extinguishing, Foam Sprinkler
2	SystemName	Text	-	No	-

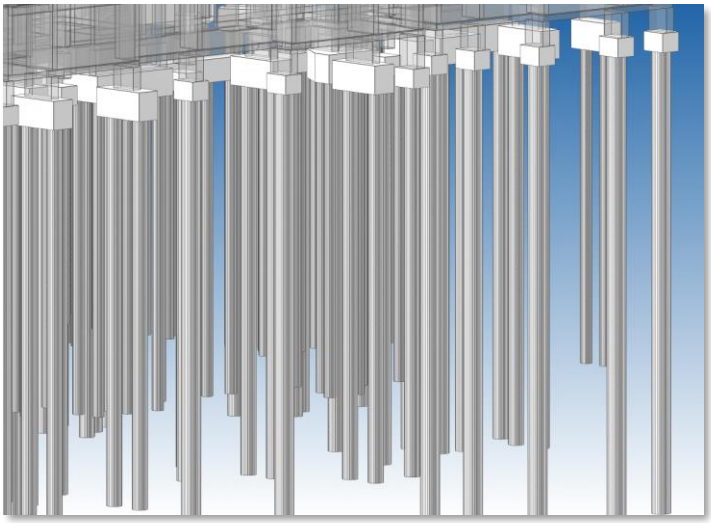
Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Footing / Pilecap



S4 – Fig 44: Footing / Pilecap



S4 – Fig 45: Footing / Pilecap

Modelling Footing / Pilecap in IFC+SG

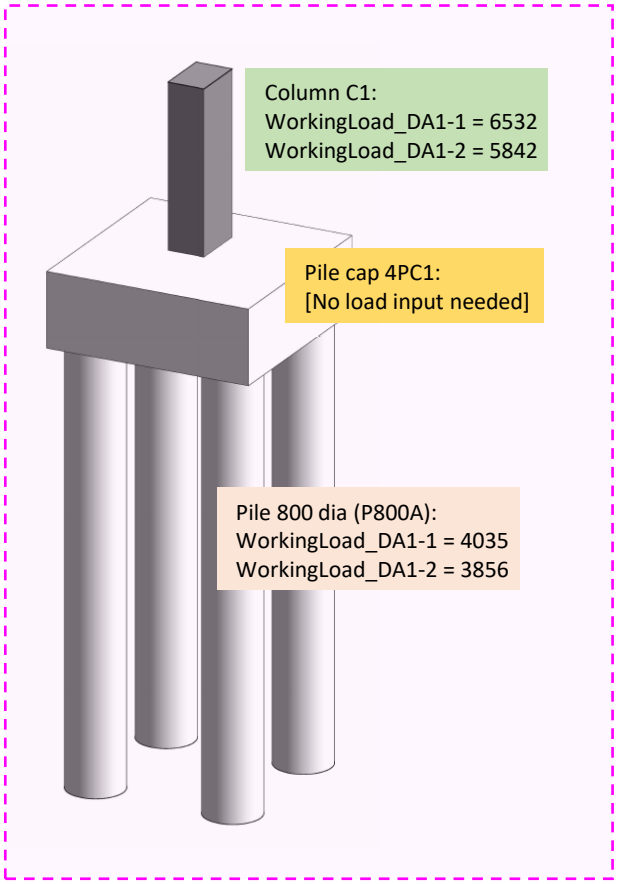
- All the footing / pilecap elements shall be modelled as independent elements* in IFC+SG model with the necessary information required as stipulated in the tables below.
    - For footing and pilecap with the same foundation design, they are allowed to have same marks and design information. All marks and design information have to be embedded in every footing / pilecap element.
- 2D detail drawings are allowed for any irregular or complex footing/pilecap design (e.g. 3 pile group, stair core pile group, etc.) with the indication of drawing number in the IFC+SG parameter "ReferTo2DDetail".
- IFC+SG parameters to be included for any irregular, or complex footing/pilecap element:
    - ConstructionMethod
    - ReferTo2DDetail
    - Mark
    - MaterialGrade
- The following pile-related parameters do not need to be provided for individual piles. Instead, they are to be provided in general (refer to the "Project Information" component in Section 4)
    - Pile Model Factor, Shaft R4 Design Factor, End Bearing R4 Design Factor
    - Number of ULT Tests, Number of Working Load Tests – Maintained Load Tests and Rapid Load Tests, Number of Non Destructive Test Piles

** Independent elements refers to elements with no combining or grouping of piles, pilecaps, footings or columns as one family type or generic element*

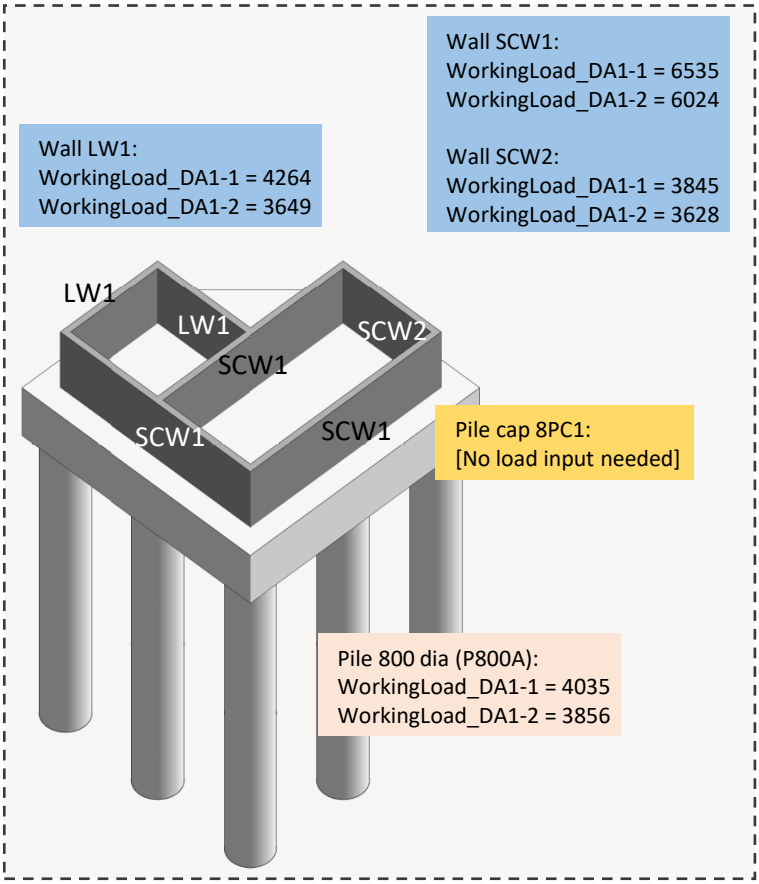
Footing / Pilecap

▶ **Modelling Footing / Pilecap in IFC+SG** (continued from previous page)

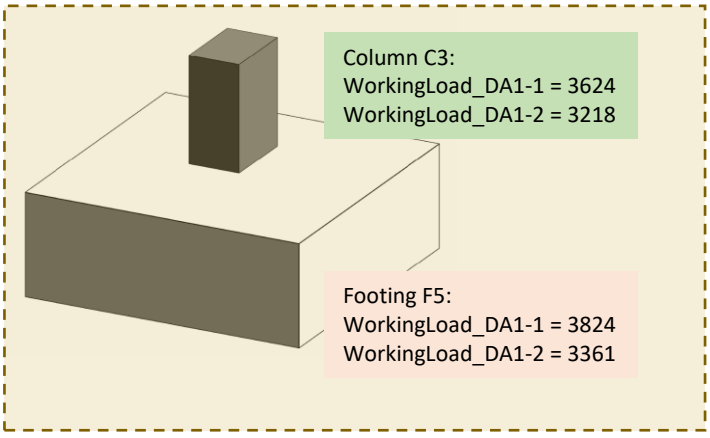
Column support by piles



Wall support by piles



Column support by footing



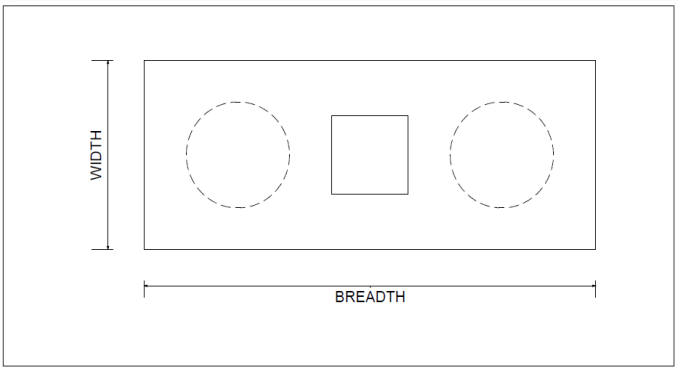
- Foundation load inputs (DA1-1 & DA1-2) are only applicable to pile and footing. No loading input is required for pile cap.
- Structural design load inputs (DA1-1 & DA1-2) are only applicable to 1st storey column/stump and wall only.

S4 – Fig 46: Examples of load input for structural elements

Footing / Pilecap

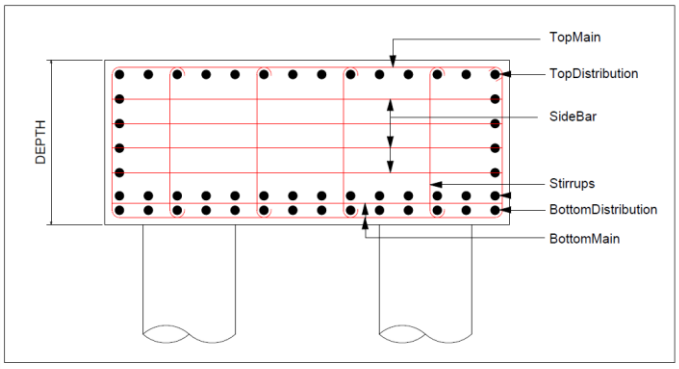
Footing / Pilecap Dimension and Reinforcement Definition

Footing / Pilecap Dimension and Reinforcement Definition	
1	The breadth is referring to the longest side of a footing / pilecap while width is referring to the shorter side of a footing / pilecap, despite of its element orientation.
2	The input for TopMain, TopDistribution, BottomMain & BottomDistributionshall be "HXX-XXX" while "H" is a must, XX is the longitudinal reinforcement diameter and XXX is the spacing of longitudinal reinforcement. • Use '+' for more than 1 layer of reinforcement (e.g. H32-150+H25-150) Longitudinal reinforcement diameter HXX-XXX Spacing of longitudinal reinforcement
3	The input for Stirrups shall be "HXX-XXX-XXX" while "H" is a must, XX are the transverse reinforcement diameter and XXX is the spacing of transverse reinforcement. • Indicate the longitudinal spacing (main direction) and follow with transverse spacing (distribution direction) (e.g. H8-100-100) Transverse reinforcement diameter HXX-XXX-XXX Spacing of transverse reinforcement diameter (transverse direction) Spacing of transverse reinforcement (longitudinal direction)



FOOTING/PILECAP DIMENSION

S4 – Fig 47: Dimension Definitions for Footing / Pilecap



FOOTING/PILECAP REINFORCEMENT ANNOTATION

S4 – Fig 48: Dimension Definitions for Footing / Pilecap

Footing / Pilecap

By IFC Representation

IFC Entity: IfcFooting						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	BottomDistribution	Text	All footings & pilecap	-	No	H16-150
2	BottomMain	Text	All footings & pilecap	-	No	H25-150
3	Breadth	Length	All footings & pilecap	mm	No*	6200
4	DA1-1_BearingCapacity	Integer	All footings	kN/m^2	No	150
5	DA1-2_BearingCapacity	Integer	All footings	kN/m^2	No	120
6	Depth	Length	All footings & pilecap	mm	No*	300
7	Mark	Text	All footings & pilecap	-	No	F1, F2, PC1, PC2, PC4_1
8	MaterialGrade	Text	All footings & pilecap	-	Yes	*Refer to list^*
9	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
10	ReinforcementSteelGrade	Text	All footings & pilecap	-	Yes	*Refer to list^*
11	SideBar	Text	All footings & pilecap	-	No	H13-250
12	SoilVerificationTest	Text	When required / relevant	-	No	2 nos Plate load Test
13	Stirrups	Text	When required / relevant	-	No	H13-200-300
14	StirrupsType	Text	Optional	-	Yes	*Refer to list^*
15	TopDistribution	Text	All footings & pilecap	-	No	H16-150
16	TopMain	Text	All footings & pilecap	-	No	H25-150
17	Width	Length	All footings & pilecap	mm	No*	300
18	WorkingLoad_DA1-1	Integer	All footings	kN	No	4321
19	WorkingLoad_DA1-2	Integer	All footings	kN	No	4321

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.

Footing / Pilecap

Example of Footing / Pilecap (RC Pile Cap) Structural Element Input

5900 x 1900 x 1250mm Depth Pilecap

- Mark – 2PC1600A
- Concrete grade C32/40
- Top Rebar (main) H32-200
- Top Rebar (distribution) H20-200
- Bottom Rebar (main) H32-200+H16-200
- Bottom Rebar (distribution) H20-200
- Binder bar H16-150

IFC Entity: IfcFooting

IFC SubType: N.A.

S/N	IFC+SG Property	Examples
1	ReinforcementSteelGrade	500B
2	Breadth	5900
3	Depth	1250
4	Mark	2PC1600A
5	Width	1900
6	BottomDistribution	H20-200
7	BottomMain	H32-200+H16-200
8	SideBar	H16-150
9	TopDistribution	H20-200
10	TopMain	H32-200
11	MaterialGrade	C32/40

Footing / Pilecap

Example of Footing / Pilecap (RC Footing) Element Input

1250 x 800 x 450mm Depth Footing

- Mark – F2
- Concrete grade C32/40
- Top Rebar (main) H13-200
- Top Rebar (distribution) H10-200
- Bottom Rebar (main) H16-200
- Bottom Rebar (distribution) H10-200
- Binder bar H10-200
- Allowable soil bearing pressure
  - DA1-C1: 150kN/m2
  - DA1-C2: 120kN/m2
- 1 no of plate load test (for whole project)
- Working Load (DA1-1) 1286kN
- Working Load (DA1-2) 1025kN

IFC Entity: IfcFooting

IFC SubType: N.A.

S/N	IFC+SG Property	Examples
1	DA1-1_BearingCapacity	150
2	DA1-2_BearingCapacity	120
3	ReinforcementSteelGrade	500B
4	SoilVerificationTest	1 no of plate load test
5	Breadth	1250
6	Depth	450
7	Mark	F2
8	Width	800
9	BottomDistribution	H10-200
10	BottomMain	H16-200
11	SideBar	H10-200
12	TopDistribution	H10-200
13	TopMain	H13-200
14	WorkingLoad_DA1-1	1286
15	WorkingLoad_DA1-2	1025
16	MaterialGrade	C32/40

Footpath

By IFC Representation

IFC Entity: IfcCivilElement					
IFC SubType: FOOTPATH					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Material	Text	-	No	-
2	Width	Length	mm	No	-

IFC Entity: IfcBuildingElementProxy					
IFC SubType: TACTILETILE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Grating

By IFC Representation

IFC Entity: IfcDiscreteAccessory					
IFC SubType: GRATING					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Drainage
2	SystemName	Text	-	No	-

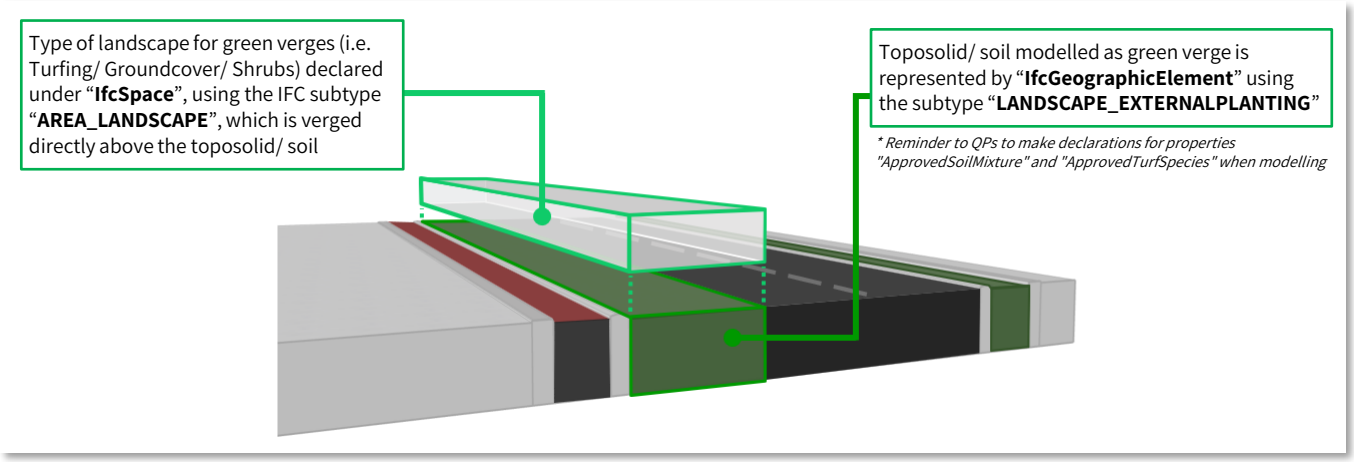
Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Green Verges

Modelling Green Verges in IFC+SG

- Green Verges refer to the area along the centre median or side of a road, or a traffic island within a road, which is provided for the growing of trees and other plants. The term "Green Verges" is distinct and not interchangeable with regulated **"Planting Areas"** (Green buffers and 2.0m wide Peripheral Planting Verges) within the development premises.
- Please note that the IFC representation requirements for the Identified Component "Green Verges" include both sets of properties under IfcGeographicElement and IfcSpace (see tables below).
- The standard minimum soil depth requirement is 2.0m. Hence, please ensure that the soil depth shown in the model is at least 2.0m.
- For other IFC representation requirements under IfcSpace not relating to Green Verge, please refer to pages 362.



S4 – Fig 49: IFC Representation for Green Verges

By IFC Representation

IFC Entity: IfcGeographicElement					
IFC SubType: GREENVERGES					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Area	Area	m^2	No	-
2	ApprovedSoilMixture	Boolean	-	Yes	TRUE / FALSE
3	ApprovedTurfSpecies	Boolean	-	Yes	TRUE / FALSE
4	Status	Text	-	Yes	Proposed, Existing, To be removed
5	ShrubSpecies	Text	-	No	-

IFC Entity: IfcSpace					
IFC SubType: AREA_GFA					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ALS_LandscapeType	Text	-	Yes	Turfing, Groundcover, Shrubs
2	ALS_GreeneryFeatures	Text	-	Yes	Green Verge
3	ALS_Status	Text	-	Yes	Proposed, Existing, To be removed

Gutter

By IFC Representation

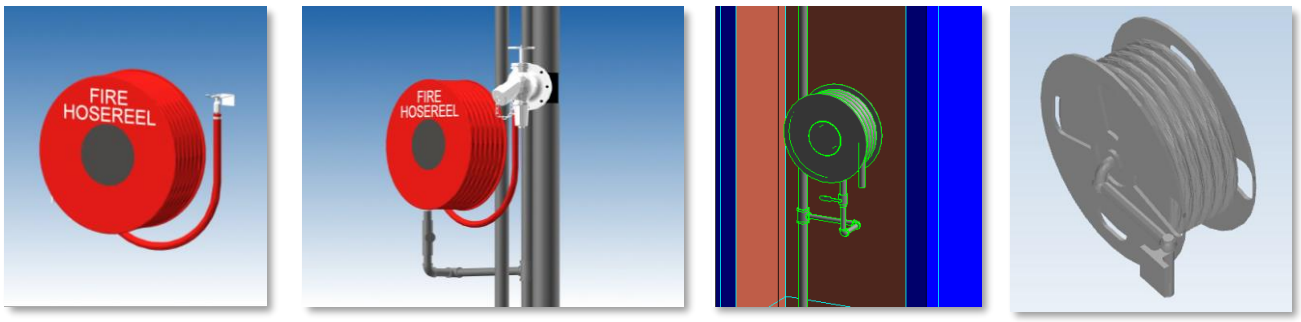
IFC Entity: IfcPipeSegment					
IFC SubType: GUTTER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Drainage
2	SystemName	Text	-	No	-

IFC Entity: IfcCivilElement					
IFC SubType: GUTTER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text		No	-
2	Height	Length	mm	No	-
3	Length	Length	mm	No	-
4	Thickness	Length	mm	No	-
5	Width	Length	mm	No	-
6	Public	Boolean	-	Yes	TRUE / FALSE
7	SystemType	Text	-	No	Drainage
8	SystemName	Text	-	No	-

Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Hose Reel



S4 – Fig 50 to 53: Hose Reel

By IFC Representation

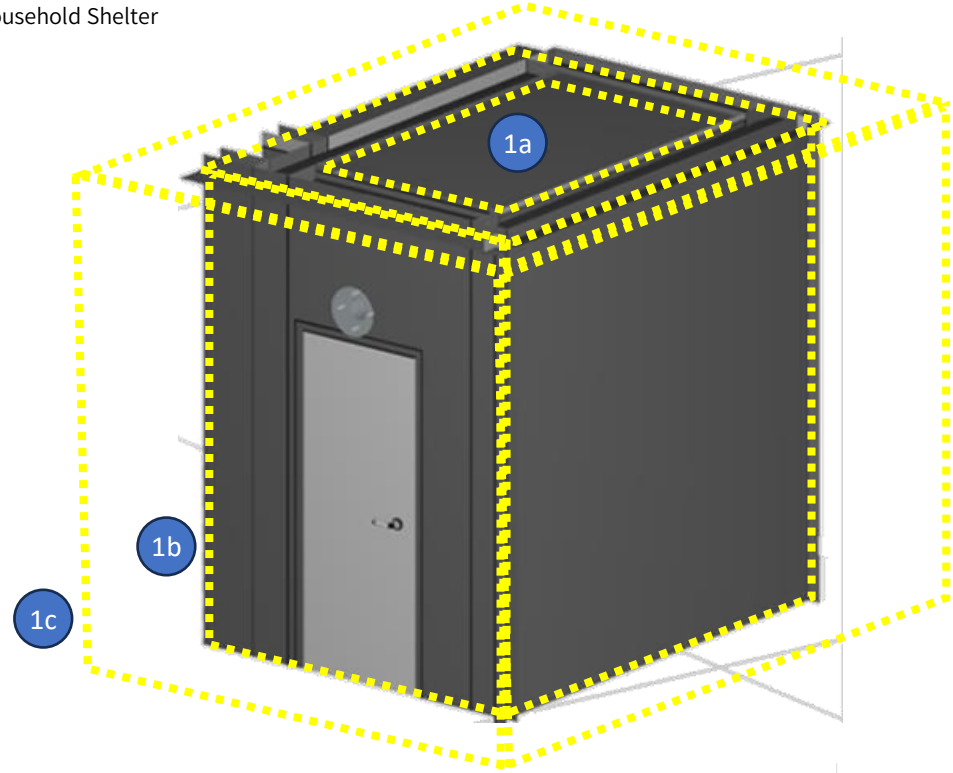
IFC Entity: IfcFireSuppressionTerminal					
IFC SubType: HOSEREEL, STANDBYFIREHOSE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Hose_NominalDiameter	Length	mm	No	-

Household Shelter

Modelling Household Shelters in IFC+SG

- There are 8 types of IFC Entities in a Household Shelter

1) IfcSpace
   a) Internal
   b) External
   c) Setback



2) IfcSlab
3) IfcWall
4) IfcWindow (Refer to "Window" component)
5) IfcDoor (Refer to "Door" component)
6) IfcLightFixture
7) IfcSwitchingDevice
8) IfcOutlet

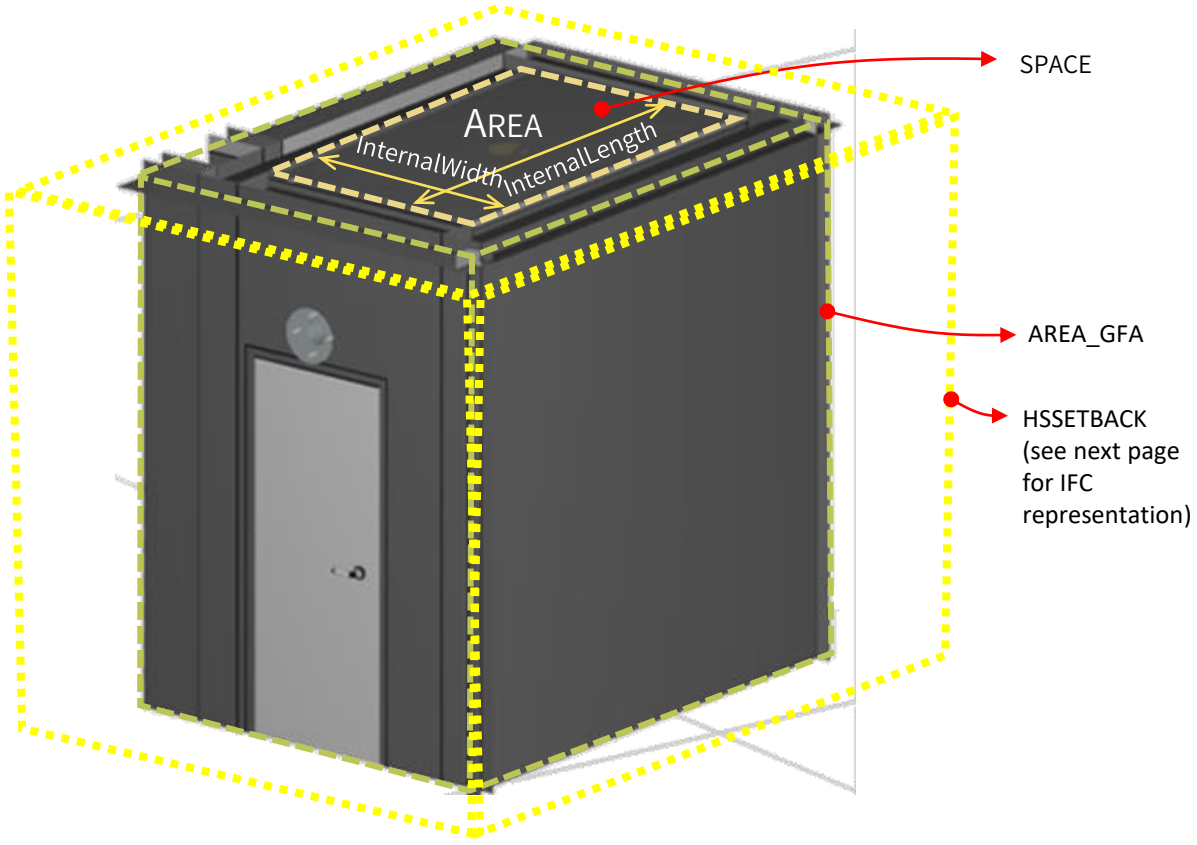
Details of the Household Shelter can be shown through 2D supplementary drawings.

Household Shelter

By IFC Representation

➢ **Parameters below refer to the internal space of the Household Shelter**

IFC Entity: IfcSpace					
IFC SubType: SPACE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SpaceName	Text	-	Yes	Household Shelter, Setback
2	ConstructionMethod	Text	-	No	Precast, Prefab, CIS
3	Area	Area	m^2	No	-
4	InternalLength	Length	mm	No	-
5	InternalWidth	Length	mm	No	-



➢ **Parameters below refer to the external "shell" of the Household Shelter**

IFC Entity: IfcSpace					
IFC SubType: AREA_GFA					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	AGF_Name	Text	-	Yes	Household Shelter

Household Shelter

By IFC Representation (continued from previous page)

➢ **Parameters below refer to the internal space and the setback of the Household Shelter**

IFC Entity: IfcSpace

IFC SubType: HSSETBACK

S/N	IFC+SG Property	Property Type	Unit	Input Limitation	Examples
No IFC+SG properties required.					

➢ **ST requirements for Wall and Slab components should be added in addition to the household shelter ST requirements below.**

IFC Entity: IfcWall, IfcSlab

IFC SubType: N.A.

S/N	IFC+SG Property	Property Type	Unit	Input Limitation	Examples
1	ConstructionMethod	Text	-	Yes	*Refer to list^*
2	Thickness	Length	mm	No*	300
3	ShelterUsage	Boolean	-	Yes	TRUE / FALSE

IFC Entity: IfcLightFixture

IFC SubType: N.A.

S/N	IFC+SG Property	Property Type	Unit	Input Limitation	Examples
No IFC+SG properties required.					

IFC Entity: IfcOutlet

IFC SubType: COMMUNICATIONSOUTLET, DATAOUTLET, POWEROUTLET

S/N	IFC+SG Property	Property Type	Unit	Input Limitation	Examples
No IFC+SG properties required.					

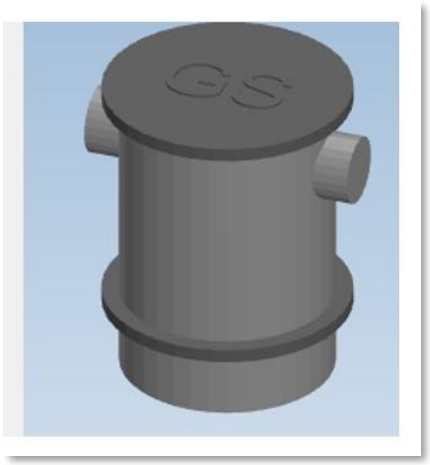
IFC Entity: IfcSwitchingDevice

IFC SubType: N.A.

S/N	IFC+SG Property	Property Type	Unit	Input Limitation	Examples
No IFC+SG properties required.					

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.

Interceptor



S4 – Fig 54: Interceptor (Grease)

By IFC Representation

IFC Entity: IfcInterceptor					
IFC SubType: GREASE, OIL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ComplyToPUBStandardDrawing	Boolean	-	Yes	TRUE / FALSE
2	ReferToDrawingNumber	Text	-	No	-
3	InvertLevel	Text	-	No	-
4	TopLevel	Text	-	No	-
5	Diameter	Length	mm	No	-
6	Height	Length	mm	No	-
7	Length	Length	mm	No	-
8	Width	Length	mm	No	-
9	TradeEffluent	Boolean	-	Yes	TRUE / FALSE
10	SystemType	Label	-	No	Sanitary, Sewerage
11	SystemName	Label	-	No	-

Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Lamp Post

By IFC Representation

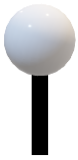
IFC Entity: IfcCivilElement					
IFC SubType: LAMPPOST					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Notes

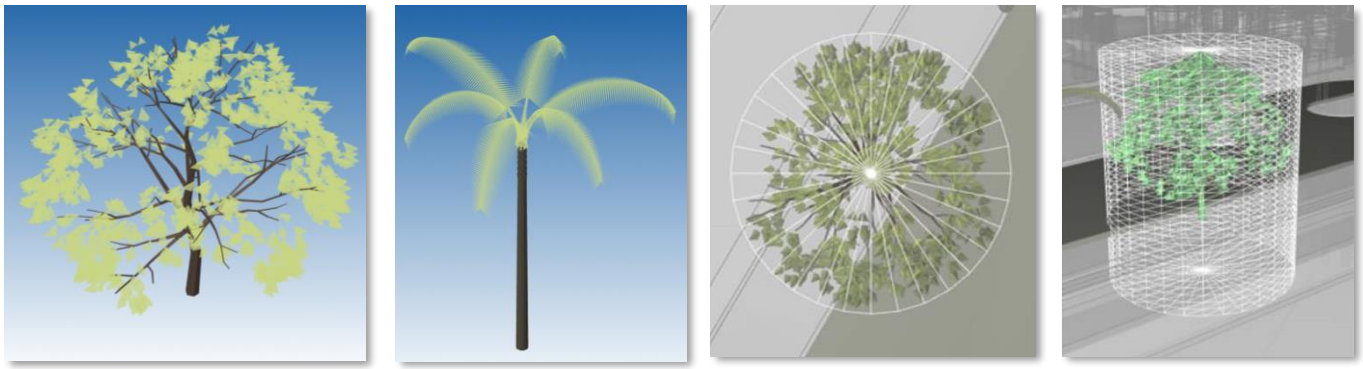
- Only lamp post within the site boundary will need to be modelled, using placeholder objects. It is not necessary to replicate details of actual lamp posts.

Landscape Plants

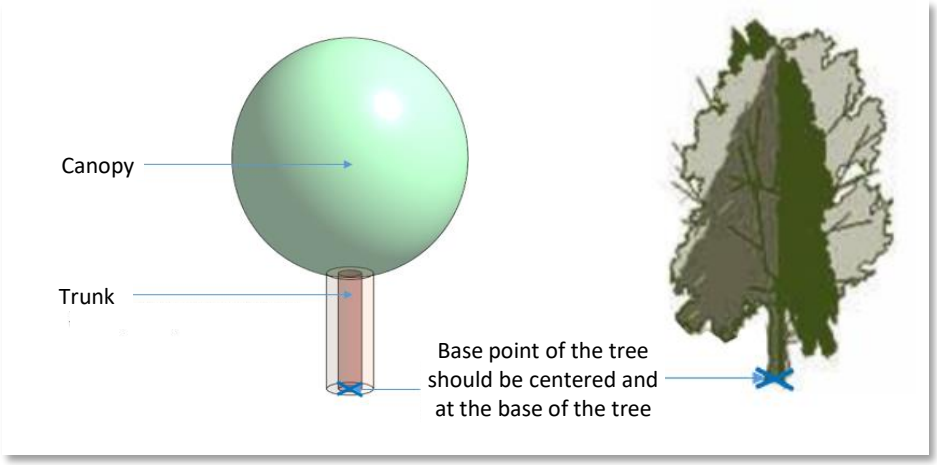
Modelling Landscape Plants in IFC+SG



- Proposed and existing trees should be represented using the default library from BIM platforms (Revit/ArchiCAD). If this is not possible due to file size restrictions, trees may be modelled as simplified lollipop BIM components, provided that relevant IFC+SG requirements are embedded in the tree object.
- When modelling trees and palms, ensure that the base point of the tree block is centered at the base of the tree.
- Girth value shall be accurately input.



S4 – Fig 55 to 58: Tree representations



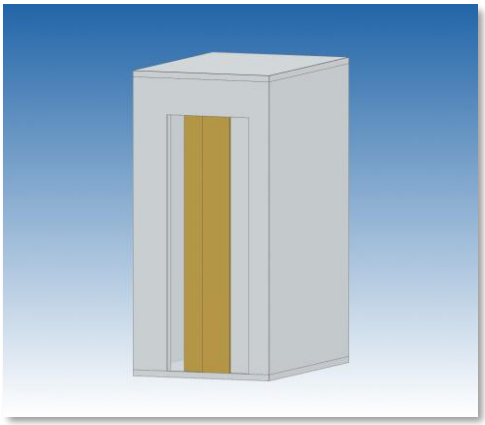
S4 – Fig 59: Tree base point

Landscape Plants

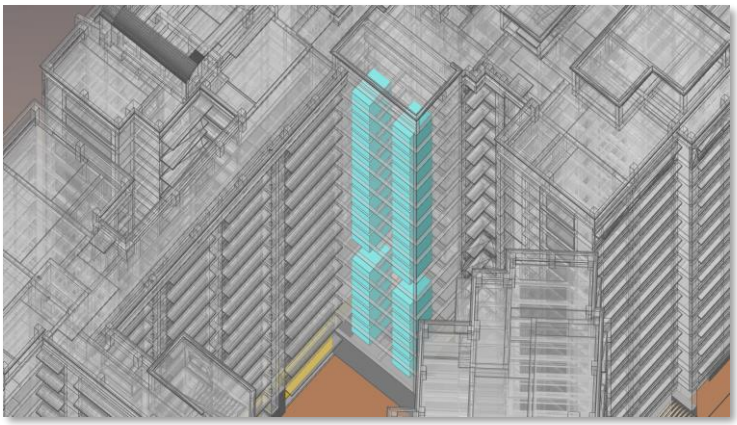
By IFC Representation

IFC Entity: IfcGeographicElement					
IFC SubType: LANDSCAPE_TREE, LANDSCAPE_PALM, LANDSCAPE_HEDGE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Girth	Length	mm	No	100, 300, 1000
2	HedgeNumber	Text	-	No	H001, H002, H003
3	Height	Length	mm	No	2500, 10000
4	ReasonForRemoval	Text	-	No	-
5	Roadside	Boolean	-	Yes	TRUE / FALSE
6	SingleStem	Boolean	-	Yes	TRUE / FALSE
7	Species	Text	-	No	Samanea saman, Cyrtostachys renda, Gardenia tubifera
8	Status	Text	-	Yes	Proposed, Existing, To be removed, To be transplanted
9	TreeNumber	Text	-	No	T001, T002, T003
10	TreeSize	Text	-	No	Small to medium, Large
11	Turf	Boolean	-	Yes	TRUE / FALSE

Lift



S4 – Fig 60: Lift



S4 – Fig 61: Lift Stack in relation to Building

By IFC Representation

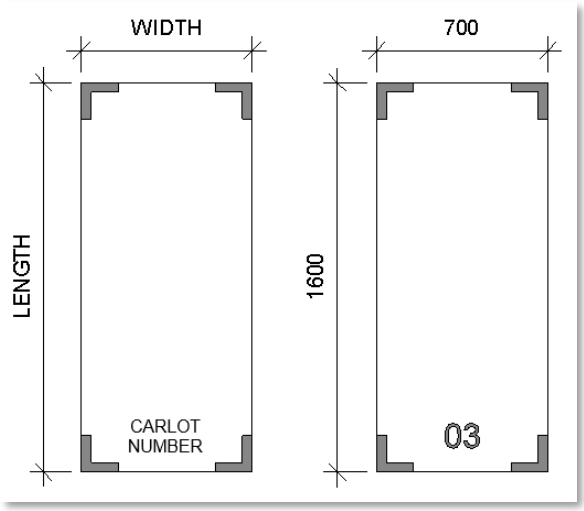
IFC Entity: IfcTransportElement					
IFC SubType: LIFT, CARLIFT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	BarrierFreeAccessbility^	Boolean	-	Yes	TRUE / FALSE
2	Length	Length	mm	No	-
3	Width	Length	mm	No	-
4	ClearDepth^	Length	mm	No	-
5	ClearHeight^	Length	mm	No	-
6	ClearWidth^	Length	mm	No	-
7	FireFightingLift^	Boolean	-	Yes	TRUE / FALSE
8	LiftType^	Text	-	No	Goods Lift, Platform Lift, Bin Lifter, Bed Lift

^Note: Properties to be provided for LIFT only.

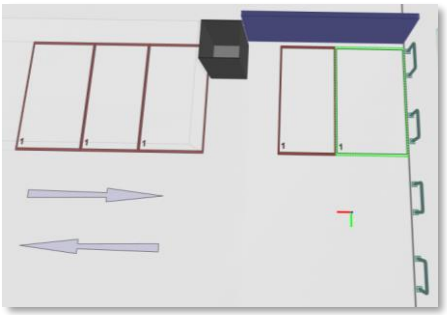
Parking Lot

Modelling Parking Lots in IFC+SG

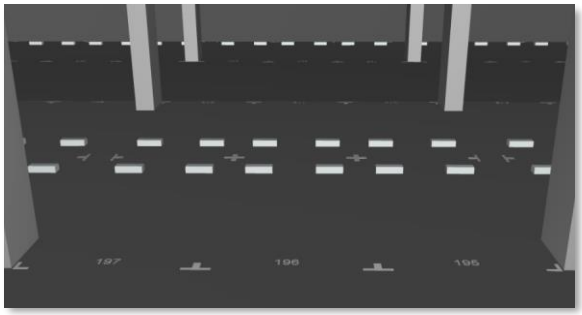
- Parking lot objects should be placed on the surface of land, slab, road or ramp and to be modelled concurrently with reference to Road and Ramp component
- Each parking lot should be accurately defined with clear edges or boundary to enable accurate geometric measurement of its width and length.
- Lot numbers should be placed inside the lot, not outside
- Electric Vehicle (EVs) Parking Lots are not specifically modelled out. Instead, they are indicated by modelling the EV charger. See Fig 65.



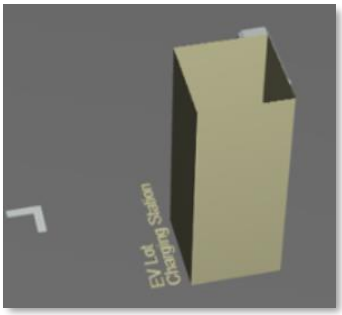
S4 – Fig 62 : Parking lot with clearly defined boundary and lot number



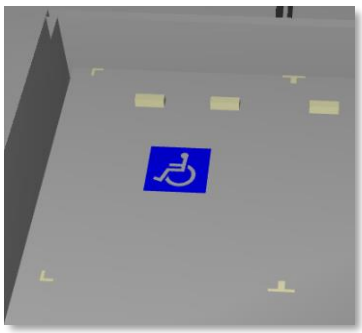
S4 – Fig 63 : Vehicle Parking Lots



S4 – Fig 64 : Vehicle Parking Lots with numbering in sequential order



S4 – Fig 65 : EV Charging Station



S4 – Fig 66 : Accessible Parking Lots

S4 – Fig 67 : Motorcycle Lots

Parking Lot

By IFC Representation

IFC Entity: IfcBuildingElementProxy					
IFC SubType: CARLOT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	BarrierFreeAccessibility	Boolean	-	Yes	TRUE / FALSE
2	FamilyLot	Boolean	-	Yes	TRUE / FALSE
3	Length	Length	mm	No	N.A.
4	Width	Length	mm	No	N.A.
5	LotNumber	Text	-	No	123
6	CarParking_ServedByCarLift	Boolean	-	Yes	TRUE / FALSE
7	MechanisedParkingSystem	Boolean	-	Yes	TRUE / FALSE
8	Perforated	Boolean	-	Yes	TRUE / FALSE
9	OpenAtGrade	Boolean	-	Yes	TRUE / FALSE

IFC Entity: IfcBuildingElementProxy					
IFC SubType: MOTORCYCLELOT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Length	Length	mm	No	N.A.
2	Width	Length	mm	No	N.A.
3	LotNumber	Text	-	No	123
4	Perforated	Boolean	-	Yes	TRUE / FALSE
5	OpenAtGrade	Boolean	-	Yes	TRUE / FALSE

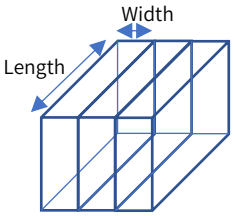
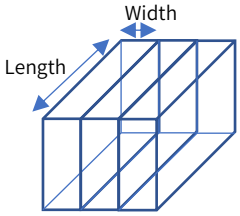
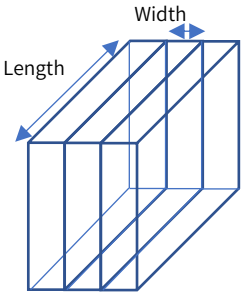
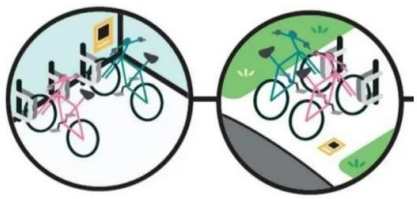
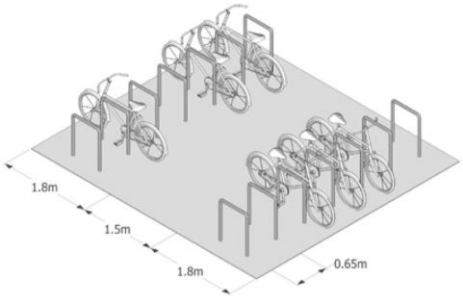
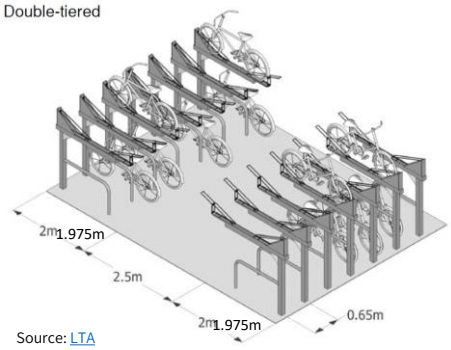
IFC Entity: IfcBuildingElementProxy					
IFC SubType: LORRYLOT, COACHLOT, ARTICULATEDVEHICLELOT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Length	Length	mm	No	N.A.
2	Width	Length	mm	No	N.A.
3	LotNumber	Text	-	No	123
4	VehicleType	Text	N.A.	No	Rigid-framed vehicle
5	ParkingUse	Text	-	No	Electric Vehicle, Oil Tanker, Buggy, Vacuum Truck, Mobile Tanker
6	Perforated	Boolean	-	Yes	TRUE / FALSE
7	OpenAtGrade	Boolean	-	Yes	TRUE / FALSE

Parking Lot

By IFC Representation

IFC Entity: IfcBuildingElementProxy					
IFC SubType: BICYCLELOT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Width	Length	mm	No	650mm
2	Length	Length	mm	No	1800mm, 1975mm
3	LotNumber	Text	-	No	123
4	BicycleRack_Type	Text	-	Yes	Single-Tier Wheel Rack, Single-Tier U-Bar, Double-Tier

3 Examples of Bicycle Racks

Single-Tier Wheel Rack	**Single-Tier U-Bar**	**Double-Tier**
		
 Source: LTA	 Source: LTA	 Source: LTA
Width : 650 mm Length : 1800 mm BicycleRack_Type : Single-Tier Wheel Rack	Width : 650 mm Length : 1800 mm BicycleRack_Type : Single-Tier U-Bar	Width : 650 mm Length : 1975 mm BicycleRack_Type : Double-Tier

S4 – Fig 68 : Types of Bicycle Parking Lots

Parking Lot

By IFC Representation (continued from previous page)

➢ **The following representations pertain to spaces and other elements relevant to parking lots.**

IFC Entity: IfcSpace					
IFC SubType: SPACE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	VentilationMode	Text	-	Yes	Natural Ventilation, Air Conditioning Mechanical Ventilation
2	SpaceName	Text	-	Yes	Parking place
3	Area	Length	m^2	No	-

IFC Entity: IfcSpace					
IFC SubType: AREA_GFA					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	AGF_Name	Text	-	Yes	Car Parking Lot (Mechanised)

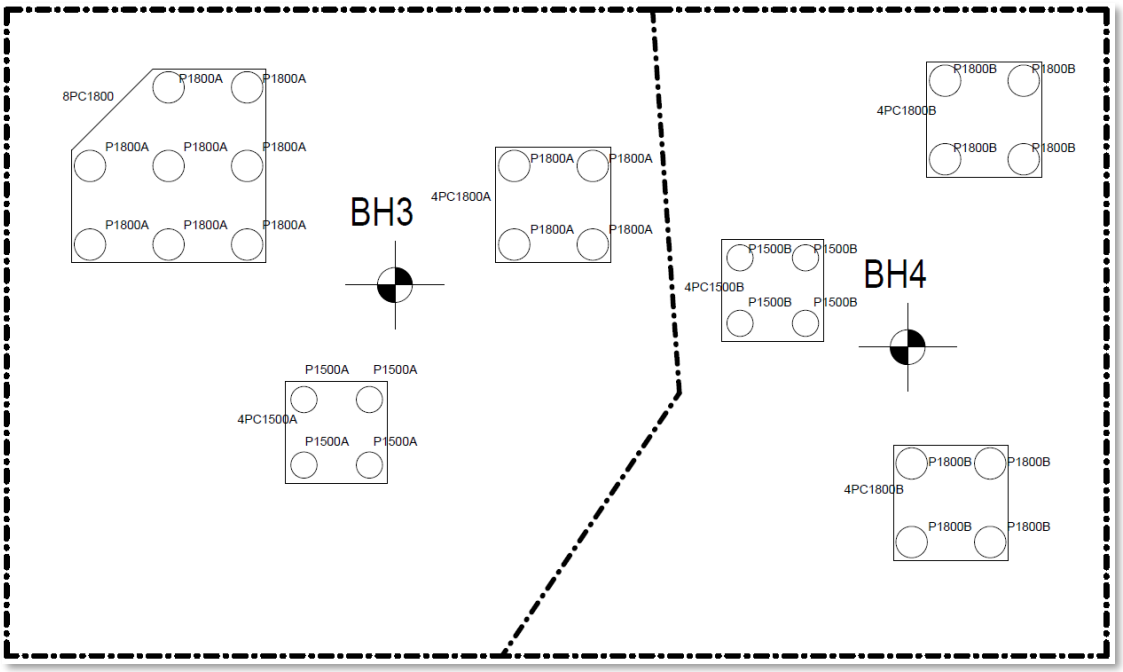
IFC Entity: IfcTransportElement					
IFC SubType: CARLIFT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Width	Length	mm	No	600mm, 650mm
2	Length	Length	mm	No	1800mm, 2000mm

IFC Entity: IfcBuildingElementProxy					
IFC SubType: HOLDINGBAY, QUEUINGSPACE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Width	Length	mm	No	-
2	Length	Length	mm	No	-

Pile

Modelling Pile in IFC+SG

- All the pile elements shall be modelled as per true coordinates in the IFC+SG model with the necessary information required as stipulated in the tables below.
    - Piles with same foundation design are allowed to have same pile marks and design information. All the pile marks and design information have to be embedded in every pile element.
- The following pile-related parameters do not need to be provided for individual piles. Instead, they are to be provided in general.
    - Pile Model Factor, Shaft R4 Design Factor, End Bearing R4 Design Factor
    - Number of ULT Tests, Number of Working Load Tests – Maintained Load Tests and Rapid Load Tests, Number of Non Destructive Test Piles
    - For pile performance-based design, the project team must submit separate sets of IFC+SG models for each distinct pile design parameter. For example, if there are two different pile design parameter sets, the QP needs to submit two corresponding sets of IFC+SG piling model.
- Piles with same foundation design are allowed to have same pile marks and design information. All the pile marks and design information have to be embedded in every pile element.



S4 – Fig 69 : Pile Grouping

Mark	Diameter	BoreholeRef	MaterialGrade	Reinforcement SteelGrade	Construction Method	PileType	Length	CutOffLevel _SHD	ToeLevel_ SHD	SHDLevel_SPT_ MoreThan_100N	MainRebar	Stirrups
P1500A	1500	BH3	C32/40	500B	CIS	Bored	35450	-2.75	-38.2	6.5	12H25	H10-300
P1500B	1500	BH4	C32/40	500B	CIS	Bored	43650	-2.75	-46.4	7.6	12H25	H10-300
P1800A	1800	BH3	C32/40	500B	CIS	Bored	38650	-2.75	-41.4	5.5	18H20	H10-300
P1800B	1800	BH4	C32/40	500B	CIS	Bored	42450	-2.75	-45.2	7.1	18H20	H10-300

Mark	Reinforcement Length	NegativeSkin Friction	DA1-1_Compression DesignLoad	DA1-2_Compression DesignLoad	DA1-1_Compression Capacity	DA1-2_Compression Capacity	StructuralCompression Capacity	No of piles
P1500A	24	437	6593	6124	6897	6537	7250	4
P1500B	24	635	6872	6539	7153	6872	7250	4
P1800A	24	513	8326	7934	8652	8257	8932	12
P1800B	24	670	8436	7964	8594	8136	8932	8

Pile

By IFC Representation

- **Individual Pile**

IFC Entity: IfcPile						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	BoreholeRef	Text	All piles	-	No	BH2, BH3, BH12-2
2	Breadth	Length	RC non-circular piles	mm	No*	300
3	ConstructionMethod	Text	All piles	-	Yes	*Refer to list^*
4	CutOffLevel_SHD	Real	All piles	SHD m	No	-1.35
5	DA1-1_CompressionCapacity	Integer	All piles	kN	No	5683
6	DA1-1_CompressionDesignLoad	Integer	All piles	kN	No	5515
7	DA1-1_TensionCapacity	Integer	When required / relevant	kN	No	3655
8	DA1-1_TensionDesignLoad	Integer	When required / relevant	kN	No	3255
9	DA1-2_CompressionCapacity	Integer	All piles	kN	No	4823
10	DA1-2_CompressionDesignLoad	Integer	All piles	kN	No	4650
11	DA1-2_TensionCapacity	Integer	When required / relevant	kN	No	3025
12	DA1-2_TensionDesignLoad	Integer	When required / relevant	kN	No	2850
13	Diameter	Length	RC circular piles	mm	No*	600
14	Length	Length	All piles	mm	No*	40500
15	MainRebar	Text	RC piles#	-	No	10H32+10H16
16	Mark	Text	All piles	-	No	P156
17	MaterialGrade	Text	All piles	-	Yes	*Refer to list^*
18	MemberSection	Text	Steel piles	-	No	CHS500x3.0, 254x254x63 kg/m
19	MinEmbedmentIntoBearingLayer_SPT_MoreThan_100N	Real	When required / relevant	m	No	16.5
20	MinEmbedmentIntoBearingLayer_SPT_MoreThan_60N	Real	When required / relevant	m	No	23.2
21	MinRockSocketingLength	Real	When required / relevant	m	No	16.5
22	NegativeSkinFriction	Integer	When required / relevant	kN	No	135
23	PileType	Text	RC piles#	-	Yes	*Refer to list^*
24	ReinforcementLength	Text	RC piles#	m	Yes	*Refer to list^*
25	ReinforcementSteelGrade	Text	RC piles#	N/mm2	Yes	*Refer to list^*

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.
# RC piles denotes to RC precast pile, cast-in situ bored pile or spun pile

Pile

By IFC Representation (continued from previous page)

IFC Entity: IfcPile						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
26	Stirrups	Text	RC piles#	-	No	H16-250
27	StructuralCompressionCapacity	Integer	All piles	kN	No	6525
28	StructuralTensionCapacity	Integer	When required / relevant	kN	No	3825
29	ToeLevel_SHD	Real	All piles	SHD m	No	-63.35
30	Width	Length	RC non-circular piles	mm	No*	600

➢ **Parameters below can be added as project information for piles in general. It is not necessary to input them in individual piles**

IFC Entity: IfcBuilding						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	PileModelFactor	Real	when required / relevant	-	No	1.35 / 1.55
2	ShaftR4DesignFactor	Real	when required / relevant	-	No	-
3	EndBearingR4DesignFactor	Real	when required / relevant	-	No	-
4	NoOfULTTest	Integer	when required / relevant	-	No	2
5	NoOfWorkingLoadTest_MaintainedLoadTest	Integer	when required / relevant	-	No	3
6	NoOfWorkingLoadTest_RapidLoadTest	Integer	when required / relevant	-	No	3
7	NoOfNonDestructiveTestPile	Integer	when required / relevant	-	No	8

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.
# RC piles denotes to RC precast pile, cast-in situ bored pile or spun pile

Pile

Example of Pile (RC Bored Pile) Structural Element Input

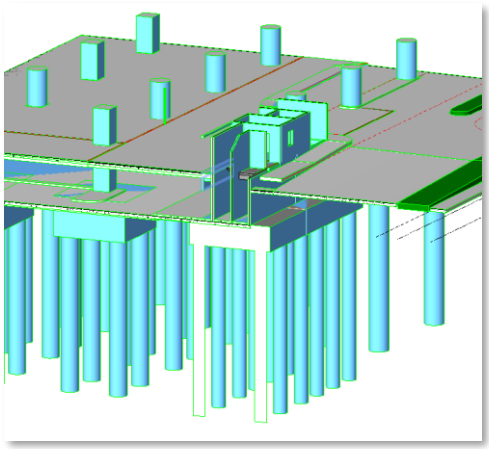
1600mm Diameter Bored Piles

- Pile mark – P-1600
- Borehole - BH3
- Concrete grade C35/45
- Pile length 35.45m
- Main rebar 8H16
- 24m length reinforcement cage
- Embedded to SPT100 for 6.5m
- Not subject to negative skin friction and tension load

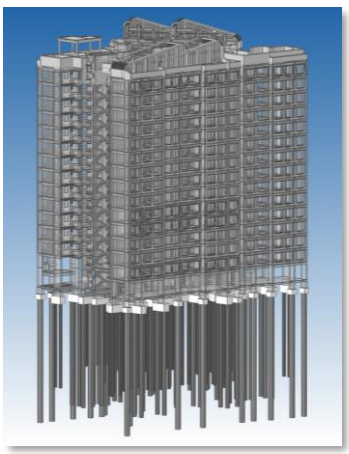
IFC Entity: IfcPile

IFC SubType: N.A.

S/N	IFC+SG Property	Examples
1	ReinforcementSteelGrade	500B
2	MaterialGrade	C35/45
3	BoreholeRef	BH3
4	ConstructionMethod	CIS
5	DA1-1_CompressionCapacity	5683
6	DA1-2_CompressionCapacity	4823
7	MinEmbedmentIntoBearingLayer_SPT_MoreThan_100N	6.5
8	StructuralCompressionCapacity	6525
9	CutOffLevel_SHD	-1.55
10	Diameter	1600
11	Length	35450
12	Mark	P-1600
13	ToeLevel_SHD	-37.00
14	MainRebar	8H16
15	PileType	Bored
16	ReinforcementLength	24
17	Stirrups	H10-300
18	DA1-1_CompressionDesignLoad	5515
19	DA1-2_CompressionDesignLoad	4650



S4 – Fig 70 : Pile



S4 – Fig 71 : Pile in relation to Building

Pile

Example of Pile (RC Jacked In Pile) Structural Element Input

250mm x 250mm Jacked In Piles

- Pile mark – 250x250
- Borehole – BH1
- Concrete grade C35/45
- Pile length 18m
- Main rebar 4H13
- 12m length reinforcement cage
- Embedded to SPT60 for 3.3m
- Not subject to negative skin friction and tension load

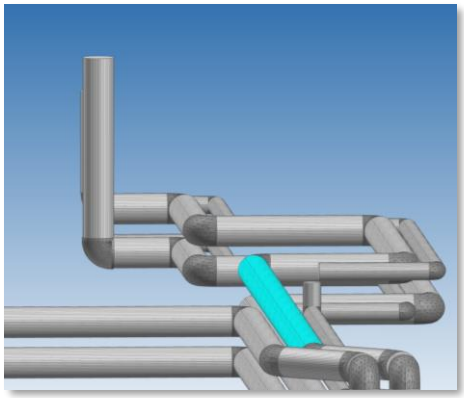
IFC Entity: IfcPile

IFC SubType: N.A.

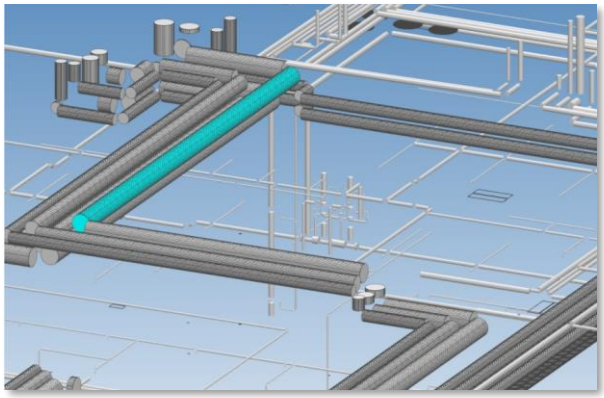
S/N	IFC+SG Property	Examples
1	ReinforcementSteelGrade	500B
2	MaterialGrade	C35/45
3	BoreholeRef	BH1
4	ConstructionMethod	PC
5	DA1-1_CompressionCapacity	1315
6	DA1-2_CompressionCapacity	1153
7	MinEmbedmentIntoBearingLayer_SPT_MoreThan_60N	3.3
8	StructuralCompressionCapacity	2085
9	Breadth	250
10	CutOffLevel_SHD	-0.8
11	Length	18000
12	Mark	250x250
13	ToeLevel_SHD	-18.8
14	Width	250
15	MainRebar	4H13
16	PileType	Jacked in
17	ReinforcementLength	12
18	Stirrups	H10-300
19	DA1-1_CompressionDesignLoad	1207
20	DA1-2_CompressionDesignLoad	1058

Pipes/ Ducts

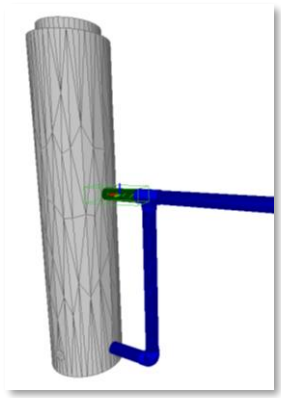
Modelling Pipes in IFC+SG



S4 – Fig 72 : Pipes



S4 – Fig 73 : Pipes



S4 – Fig 74 : Pipe Connections

- Pipe connections to manholes and inspection chambers should be properly established by providing connector element ("pipe connector") between pipes and manhole/ inspection chamber.
- Alternatively, QPs can create an interface by simply modelling the pipe into the manhole/ inspection chamber.
- Pipe size, location and gradient shall be accurately modelled.
- InnerDiameter, NominalDiameter and Thickness of Pipes shall be accurately provided.

By IFC Representation

IFC Entity: IfcPipeSegment					
IFC SubType: RIGIDSEGMENT, FLEXIBLESEGMENT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	PreInsulated	Boolean	-	Yes	TRUE / FALSE
2	Perforated	Boolean	-	Yes	TRUE / FALSE
3	ConstructionMethod	Text	-	-	-
4	Material	Text	-	-	-
5	Gradient	Text	-	No	1:100
6	InnerDiameter	Length	mm	No	-
7	Length	Length	mm	No	-
8	Thickness	Length	mm	No	-
9	TradeEffluent	Boolean	-	Yes	TRUE / FALSE
10	DemountableStructureAbovePipe	Boolean	-	Yes	TRUE / FALSE
11	SystemType	Text	-	No	Sanitary, Sewerage
12	SystemName	Text	-	No	-

Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Pipes/ Ducts

By IFC Representation (continued from previous page)

IFC Entity: IfcDuctSegment, IfcDuctFitting					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	PreInsulated	Boolean	-	Yes	TRUE / FALSE
2	ConstructionMethod	Text	-	-	-
3	TradeEffluent	Boolean	-	Yes	TRUE / FALSE
4	SystemType	Text	-	No	Sanitary, Sewerage, Kitchen Exhaust Air, Genset Exhaust Air, ACMV Exhaust Air, ACMV Fresh Air Intake, Pollution Control Equipment Exhaust Air, PWCS Exhaust Air, PWCS Air Intake, Carpark Exhaust Air, Carpark Fresh Air Intake
5	SystemName	Text	-	No	-

IFC Entity: IfcPipeFitting					
IFC SubType: BEND, DRAINCHANNELBEND, ENTRY, EXIT, FLANGEADAPTOR, FLEXIBLECOUPLING, JUNCTION, OBSTRUCTION, PIPESILENCER, SHORTPIECE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	InnerDiameter	Length	mm	No	-
2	NominalDiameter	Length	mm	No	-
3	OuterDiameter	Length	mm	No	-
4	Thickness	Length	mm	No	-
5	SystemType	Text	-	No	Sanitary, Sewerage
6	SystemName	Text	-	No	-

Notes

- Under the Covering component, Pipe Sleeves should be indicated where relevant.
- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Pipes/ Ducts

By IFC Representation (continued from previous page)

IFC Entity: IfcAirTerminal					
IFC SubType: GRILLE, LOUVRE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Sanitary, Sewerage, Kitchen Exhaust Air, Genset Exhaust Air, ACMV Exhaust Air, ACMV Fresh Air Intake, Pollution Control Equipment Exhaust Air, PWCS Exhaust Air, PWCS Air Intake, Carpark Exhaust Air, Carpark Fresh Air Intake
2	SystemName	Text	-	No	-

IFC Entity: IfcPipeSegment					
IFC SubType: SCUPPERDRAIN, SPOOL, FLARESTACK, RAINWATEROUTLET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Planter Box/ Planting Trough

By IFC Representation

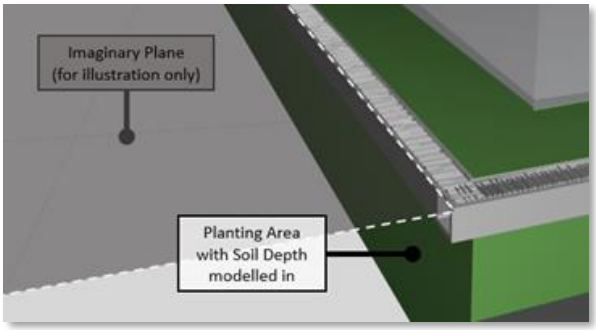
IFC Entity: IfcFurniture					
IFC SubType: PLANTERBOX					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

IFC Entity: IfcBuildingElementProxy					
IFC SubType: LANDSCAPE_PLANTINGTROUGH					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

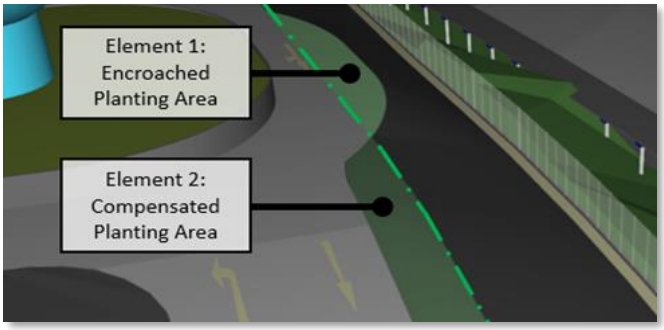
Planting Areas

Modelling Planting Areas in IFC+SG

- Planting Areas refer to regulated planting spaces (Green buffers, 2.0m wide Peripheral Planting Verges) located within a development premises. The term "Planting Areas" is distinct and not interchangeable with **"Green Verges"**, which refers instead to the area along the centre median or side of a road, or a traffic island within a road, which is provided for the growing of trees and other plants.
- The standard minimum soil depth requirement is 2.0m. Hence, please ensure that the soil depth shown in the model is at least 2.0m.
- For alternative green buffer configurations, the compensated and encroached planting areas should be modelled as separate elements. See Fig 76.
- Planting Area Setbacks (e.g. 3.0/5.0m for Green Buffers and 2.0m for Peripheral Planting Verges) should be modelled as planes.



S4 – Fig 75: Planting Areas modelled with Soil Depth



S4 – Fig 76 : Compensated and Encroached Planting Areas modelled as separate elements

By IFC Representation

IFC Entity: IfcGeographicElement					
IFC SubType: PLANTINGAREAS					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Area	Area	m^2	No	-
2	ApprovedSoilMixture	Boolean	-	Yes	TRUE / FALSE
3	Status	Text	-	Yes	Existing, Proposed, New, To be Removed
4	Turf	Boolean	-	Yes	TRUE / FALSE
5	TurfSpecies	Text	-	No	-
6	Compensated	Boolean	-	Yes	TRUE / FALSE
7	Encroachment	Boolean	-	Yes	TRUE / FALSE
8	CarparkProvision	Boolean	-	Yes	TRUE / FALSE

Notes

- QPs are to separately submit calculation for compensated green buffer area.

Pollution Control

Modelling Pollution Control Emissions

- Only substances and items that are analysed by the relevant equipment or device will be required in the IFC+SG properties. For example, if Chlorine is analysed, an IFC+SG value will need to be added for the Chlorine IFC+SG Property. If Chlorine is not analysed, it is not necessary to add the property.

By IFC Representation

IFC Entity: IfcUnitaryEquipment					
IFC SubType: AIRIMPURITIESSENSOR, FUELBURNINGEQUIPMENT, INCINERATOR, POLLUTIONCONTROLEQUIPMENT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1 - 23	AI_"Type of Air Impurity" *(Refer to IFC+SG Property List below)*	Text	-	No	*to follow Annex List of Air Impurities and Emission Limits*
24 - 58	TED_"Type of Trade Effluent" *(Refer to IFC+SG Property List below)*	Text	-	No	*to follow Annex List of Air Impurities and Emission Limits*

IFC+SG Properties

S/N	IFC+SG Property	S/N	IFC+SG Property	S/N	IFC+SG Property
1	AI_AmmoniaAndAmmonium	21	AI_SulphurTrioxideAndAcidGases	41	TED_Magnesium
2	AI_Antimony	22	AI_SulphurTrioxideOrSulphuricAcidMist	42	TED_Manganese
3	AI_Arsenic	23	AI_VinylChlorideMonomer	43	TED_Mercury
4	AI_Benzene	24	TED_Arsenic	44	TED_MetalsInTotal
5	AI_Cadmium	25	TED_Barium	45	TED_Nickel
6	AI_CarbonMonoxide	26	TED_Beryllium	46	TED_Nitrate
7	AI_Chlorine	27	TED_BiochemicalOxygenDemand	47	TED_PHValue
8	AI_Copper	28	TED_Boron	48	TED_PhenolicCompound
9	AI-DioxinsAndFurans	29	TED_Cadmium	49	TED_Phosphate
10	AI_EthyleneOxide	30	TED_Calcium	50	TED_Selenium
11	AI_FlourineAndHydrofluoricAcid	31	TED_ChemicalOxygenDemand	51	TED_Silver
12	AI_Formaldehyde	32	TED_Chloride	52	TED_Sulphate
13	AI_HydrogenChloride	33	TED_Chromium	53	TED_Sulphide
14	AI_HydrogenSulphide	34	TED_Colour	54	TED_TemperatureOfDischarge
15	AI_Lead	35	TED_Copper	55	TED_Tin
16	AI_Mercury	36	TED_Cyanide	56	TED_TotalDissolvedSolid
17	AI_OxidesOfNitrogen	37	TED_Detergent	57	TED_TotalSuspendedSolid
18	AI_ParticulateSubstances	38	TED_GreaseAndOil	58	TED_Zinc
19	AI_StyreneMonomer	39	TED_Iron		
20	AI_SulphurDioxide	40	TED_Lead		

Prefabricated Building Systems and MEP Components

S4 – Fig 77 Prefabricated Bathroom Unit

By IFC Representation

IFC Entity: IfcSpace					
IFC SubType: PREFABRICATEDBATHROOMUNIT, PREFABRICATEDPUMPSKID, PREFABRICATEDMEPVERTICALMODULE, PREFABRICATEDMEPPLANTMODULE, PREFABRICATEDMEPHORIZONTALMODULE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SpaceName	Text	-	Yes	Master Bath, Maid Bath, Yard Bath
2	InternalLength	Length	mm	No	-
3	InternalWidth	Length	mm	No	-
4	ConstructionMethod	Text	-	No	Prefab, CIS, PC, PBU
5	Accreditation_MAS	Boolean	-	Yes	TRUE / FALSE
6	MechanicalConnectionType	Text	-	No	-

IFC Entity: IfcWall, IfcSlab					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text	-	Yes	*Refer to list^*
2	Thickness	Length	mm	No*	300

Notes

- IfcSpace components refer to APCS and Prefabricated MEP Systems
- Other components refer to Prefabricated MEP Components
  - Every element in the M&E system in the BIM models can be identified via a unique system name with a system classification based on the two key parameters "SystemName" and "SystemType".
- * Parameter is populated from the dimensions of BIM elements modelled.
- ^ List can be found here.

Prefabricated Building Systems and MEP Components

By IFC Representation (continued from previous page)

IFC Entity: IfcPipeSegment, IfcDuctSegment					
IFC SubType: RIGIDSEGMENT, FLEXIBLESEGMENT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	PreInsulated	Boolean	-	Yes	TRUE / FALSE
2	ConstructionMethod	Text	-	Yes	Prefabricated
3	SystemName	Text	-	No	-
4	SystemType	Text	-	Yes	Chilled Water

IFC Entity: IfcPipeFitting, IfcDuctFitting					
IFC SubType: N.A					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	PreInsulated	Boolean	-	Yes	TRUE / FALSE
2	ConstructionMethod	Text	-	Yes	Prefabricated
3	SystemName	Text	-	No	-
4	SystemType	Text	-	Yes	Chilled Water

IFC Entity: IfcDiscreteAccessory					
IFC SubType: PIPESUPPORT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	IsCommon	Boolean	-	Yes	TRUE / FALSE
2	SystemName	Text	-	No	-
3	SystemType	Text	-	Yes	Chilled Water

Notes

- IfcSpace components refer to APCS and Prefabricated MEP Systems
- Other components refer to Prefabricated MEP Components
    - Every element in the M&E system in the BIM models can be identified via a unique system name with a system classification based on the two key parameters "SystemName" and "SystemType".
    - Refer to **System** for full list of system types that can be provided under "SystemType" property.

Project Development Type

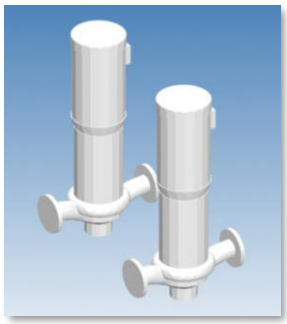
By IFC Representation

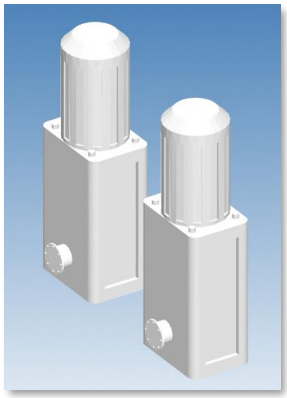
IFC Entity: IfcBuilding					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	OwnerBuiltOwnerStay	Boolean	-	Yes	TRUE / FALSE
2	ProjectDevelopmentType	Text	-	Yes	Residential (landed), Residential (non-landed), Mixed Development, Commercial, Industrial, Healthcare, Institutional, Agriculture, Transport Stations, Civil engineering works / Infrastructure, Free-standing structures, Others

Notes

- Only one Project Development Type property applies to the entire IFC model

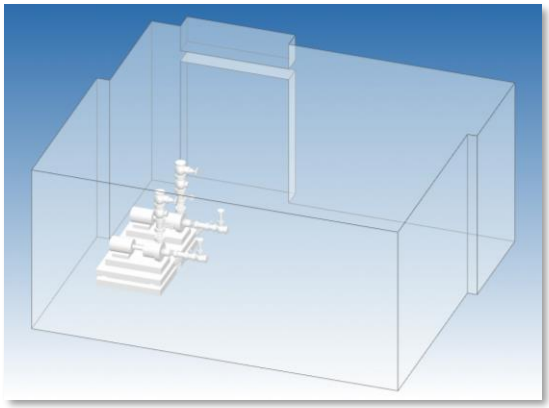
Pump





S4 – Fig 78 : Pump

S4 – Fig 79 : Pump



S4 – Fig 80 : Pump

By IFC Representation

IFC Entity: IfcPump					
IFC SubType: SUMPPUMP					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Capacity	VolumetricFlowRate	L/s	No	-
2	Duty	Boolean	N.A.	Yes	TRUE / FALSE
3	Standby	Boolean	N.A.	Yes	TRUE / FALSE
4	PumpHead	Length	m	No	1, 2
5	SystemName	Text	-	No	-
6	SystemType	Text	-	No	-

Notes

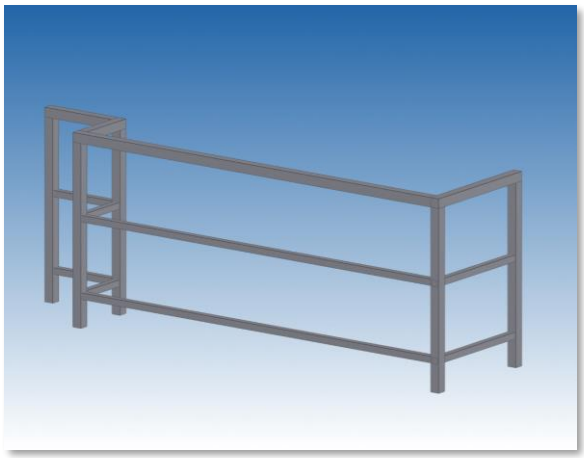
- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Racking System

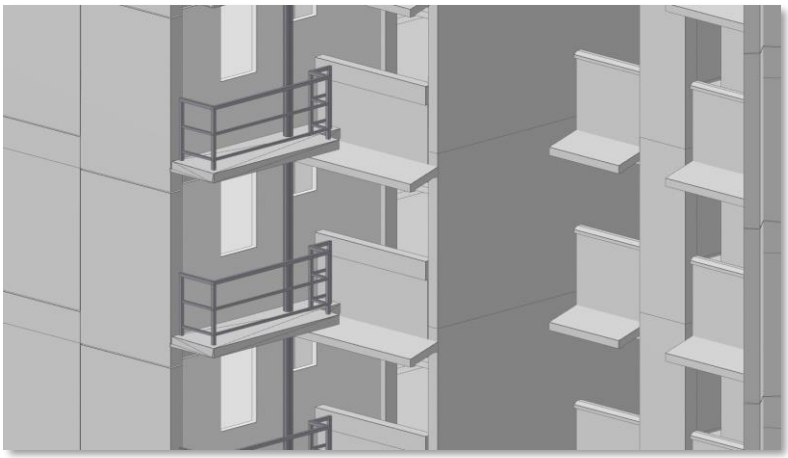
By IFC Representation

IFC Entity: IfcFurniture					
IFC SubType: RACK					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Railing



S4 – Fig 81 : Railing

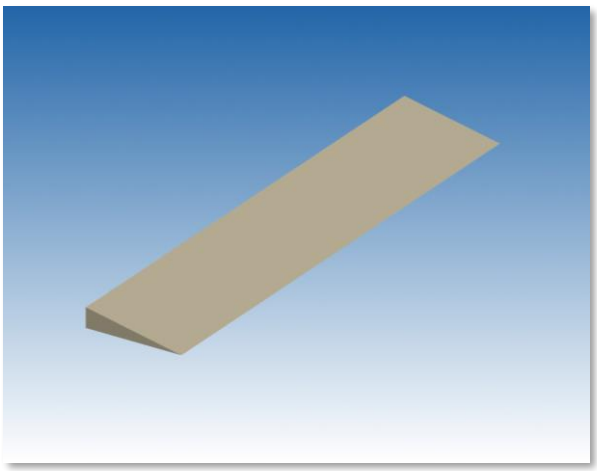


S4 – Fig 82 : Railing on AC Ledge (in relation to Building)

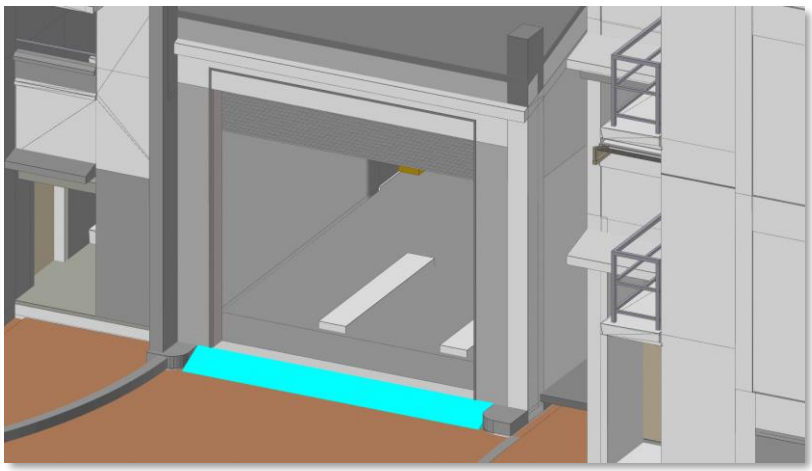
By IFC Representation

IFC Entity: IfcRailing					
IFC SubType: N.A., BOLLARD, GUARDRAIL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Height	Length	mm	No	1000
2	Material	Text	-	No	-
3	SafetyBarrier	Boolean	-	Yes	TRUE / FALSE
4	TypeOfBarrier	Text	-	No	-
5	IsLaminated	Boolean	-	Yes	TRUE / FALSE

Ramp



S4 – Fig 83 : Ramp



S4 – Fig 84 : Ramp in relation to Building

By IFC Representation

IFC Entity: IfcRamp					
IFC SubType: CURVEDRAMP, FLAREDKERBRAMP, STRAIGHT_RUN_RAMP					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Gradient	Text	-	No	1:16
2	Width	Length	mm	No	1200
3	BarrierFreeAccessibility	Boolean	-	Yes	TRUE / FALSE
4	TransitionRamp	Boolean	-	Yes	TRUE / FALSE
5	Accessway	Boolean	-	Yes	TRUE / FALSE
6	Egress	Boolean	-	Yes	TRUE / FALSE
7	Ingress	Boolean	-	Yes	TRUE / FALSE
8	Vehicular	Boolean	-	Yes	TRUE / FALSE
9	Material	Text	-	No	-

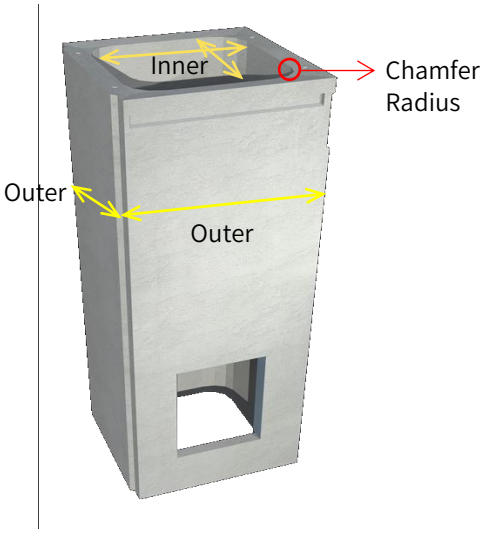
Notes

- Any horizontal slab whose gradient is required for regulatory compliance purposes, including kerb ramp.
- It is possible to model the ramp in another default component in the native BIM software (e.g. SLAB or FLOOR component), and map it specially to the IfcRamp for submission purposes. Please refer to the IFC+SG Resource Kit for more info.

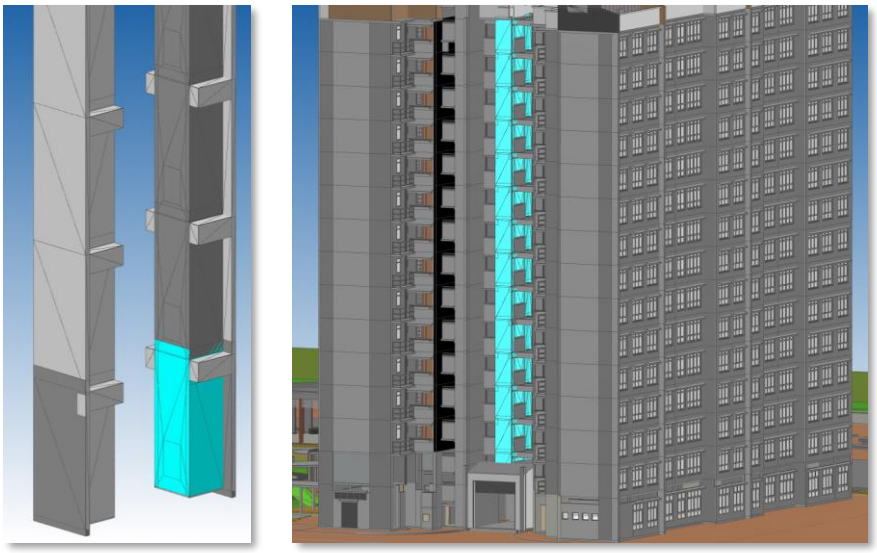
Refuse Chute / Recyclables Chute

Modelling Refuse Chute/ Recyclables Chute in IFC+SG

- Refuse Chute/ Recycables Chute space may be modelled as one continuous space.



S4 – Fig 85 : Singular Refuse Chute



S4 – Fig 86 & 87 : Refuse Chute Stack in relation to Building

By IFC Representation

IFC Entity: IfcSpace					
IFC SubType: SPACE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SpaceName	Text	-	Yes	Refuse Chute, Recyclables Chute
2	ConstructionMethod	Text	-	No	Precast, Prefab, CIS
3	InnerLength	Length	mm	-	-
4	InnerWidth	Length	mm	-	-
5	OuterLength	Length	mm	-	-
6	OuterWidth	Length	mm	-	-
7	ChamferRadius	Length	mm	-	-

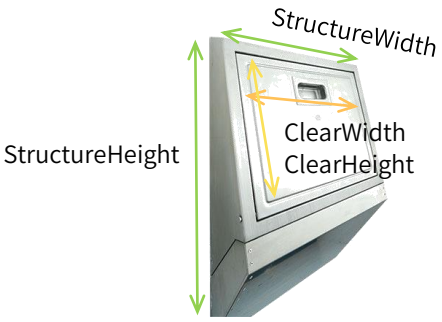
IFC Entity: IfcWall					
IFC SubType: REFUSECHUTE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text	-	Yes	*Refer to list^*

^ List can be found here.

Refuse Chute / Recyclables Chute

By IFC Representation (continued from previous page)

IFC Entity: IfcDoor					
IFC SubType: ACCESSHATCH, RECYCLABLESCHUTEACCESSPANEL, RECYCLABLESCHUTEHOPPER, REFUSECHUTEACCESSPANEL, REFUSECHUTEHOPPER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	AirTight	Boolean	-	Yes	TRUE / FALSE
2	FireRating	Text	hr	No	½-hr , 1-hr etc.
3	SelfClosing	Boolean	-	Yes	TRUE / FALSE
4	VolumeControlled	Boolean	-	Yes	TRUE / FALSE
5	ClearWidth	Length	mm	No	335
6	ClearHeight	Length	mm	No	335
7	StructuralWidth	Length	-	mm	No
8	StructuralHeight	Length	-	mm	No
9	Material	Text	-	-	No
10	Thickness	Length	-	mm	No



S4 – Fig 88 : Dimensions for Refuse Chute

Refuse Chute / Recyclables Chute

By IFC Representation (continued from previous page)

IFC Entity: IfcTank					
IFC SubType: REFUSECONTAINER, REFUSECOMPACTOR, RECYCLABLECONTAINER, RECYCLABLECOMPACTOR, REFUSEHANDLINGEQUIPMENT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	CompactionRatio	Real	-	No	1:3
2	NominalCapacity^	Volume	m^3	No	-
3	ColourCode	Text	-	No	Pantone 350c (for green colour general waste container/compactor), RAL 5005 (for blue colour recyclables container/compactor)
4	BasePlateMaterial	Text	-	No	Mild Steel
5	BasePlateThickness	Length	mm	No	6
6	TailGateOrientation	Text	-	No	Inward Facing
7	HookUpPoint	Text	-	No	Outward Facing
8	EquipmentType	Text	-	Yes	RORO Compactor, RORO Container, Dust Screw Compactor, Rotary Drum Compactor

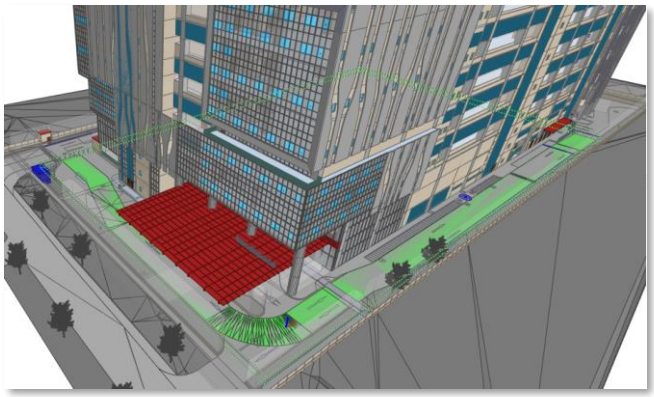
^Note: NominalCapacity refers to the volume of waste before compaction. For example, if the capacity of the equipment is $6m^3$, the NominalCapacity is $18m^3$ due to compaction ratio of 1:3.

Refuse Handling Equipment

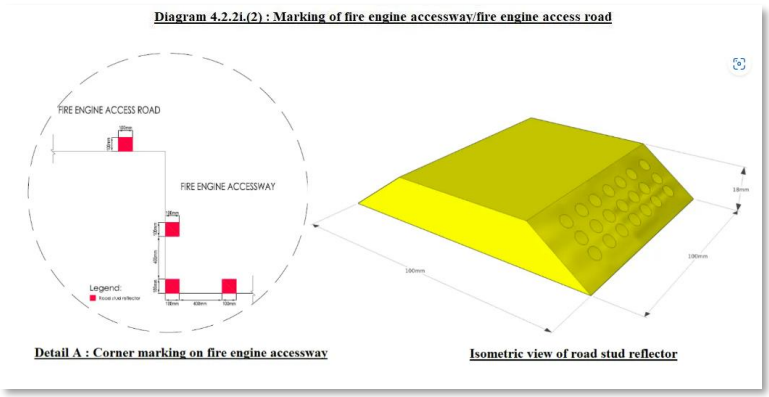
By IFC Representation

IFC Entity: IfcTank					
IFC SubType: REFUSEBIN, RECYCLINGBIN					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Litre	Real	L	No	660

Road



S4 – Fig 89 : Fire Engine Accessway



S4 – Fig 90 : Marking of Fire Engine Accessway

Modelling Roads in IFC+SG

- Refers to driveways, carriageways, fire engine accessways, fire engine access roads and vehicular service roads for refuse collection vehicles, differentiated by IFC+SG properties
    - NEA's Refuse Truck Access
    - NParks' Green Verges
    - SCDF's Fire Engine Accessway / Access Road
- To complement LTA Roads, which are modelled under 'IfcCivilElement'
    - IfcSpace is used for designated essential/service accesses on the Road under NEA and SCDF to reduce difficulties in modelling the road in multiple parts for multiple agencies
    - For NParks' representation requirements within the road reserve, refer to "Green Verges" component
- It is optional to indicate 3D arrows on the road as Egress and Ingress properties must be accurately indicated
- Refer to "Ramp" component for sloping roads

By IFC Representation

IFC Entity: IfcCivilElement					
IFC SubType: DRIVEWAY					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	DesignedVehicleMass	Real	-	No	-
2	Egress	Boolean	-	Yes	TRUE / FALSE
3	Ingress	Boolean	-	Yes	TRUE / FALSE
4	Material	Text	-	No	-
5	RoadCategory	Text	-	No	-

IFC Entity: IfcBuildingElementProxy					
IFC SubType: HUMP					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Road

By IFC Representation (continued from previous page)

IFC Entity: IfcCivilElement					
IFC SubType: CARRIAGEWAY					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Egress	Boolean	-	Yes	TRUE / FALSE
2	Ingress	Boolean	-	Yes	TRUE / FALSE
3	RoadCategory	Text	-	No	-
4	Material	Text	-	No	-

IFC Entity: IfcSpace					
IFC SubType: PARKINGACCESSWAY*, FIREENGINEACCESSROAD, FIREENGINEACCESSWAY, VEHICULARSERVICEROAD					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	LoadingCapacity^	Real	tonnes	Yes	24, 30, 50
2	Material	Text	-	No	-

*Note: PARKINGACCESSWAY refers to LTA's accessway to parking place
^Note: for FIREENGINEACCESSROAD and FIREENGINEACCESSWAY only

IFC Entity: IfcBuildingElementProxy					
IFC SubType: ACCESSPOINT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Width	Length	mm	No	-
2	Egress	Boolean	-	Yes	TRUE / FALSE
3	Ingress	Boolean	-	Yes	TRUE / FALSE
4	Vehicular	Boolean	-	Yes	TRUE / FALSE

IFC Entity: IfcCivilElement					
IFC SubType: ROADKERB					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	KerbType	Text	-	No	K2A
2	Thickness	Length	mm	No	-
3	Height	Length	mm	No	-
4	Material	Text	-	No	-

Roof

By IFC Representation

IFC Entity: IfcRoof					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text	-	No	-
2	Material	Text	-	No	-

IFC Entity: IfcSlab					
IFC SubType: ROOF					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text	-	Yes	*Refer to list^*
2	Material	Text	-	No	-

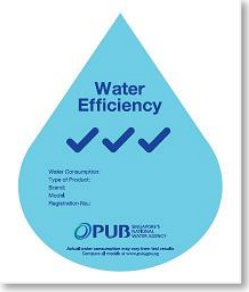
IFC Entity: IfcCovering					
IFC SubType: ROOFING					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text	-	No	-
2	Material	Text	-	No	-

^ List can be found here.

Sanitary Appliances

Modelling Sanitary Appliances in IFC+SG

- For WELS (True / False), it refers to a minimum of **two ticks and above**. For more information, please refer to PUB's Water Efficiency Label Rating here: https://www.pub.gov.sg/wels/labelratings/typesoflabel



S4 – Fig 91 :
PUB WELS Rating

By IFC Representation

• Bath

IFC Entity: IfcSanitaryTerminal					
IFC SubType: BATH					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	WELS	Boolean	-	Yes	TRUE / FALSE
2	SystemType	Text	-	No	Sanitary
3	SystemName	Text	-	No	-

• Bidet

IFC Entity: IfcSanitaryTerminal					
IFC SubType: BIDET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	WELS	Boolean	-	Yes	TRUE / FALSE
2	SystemType	Text	-	No	Sanitary
3	SystemName	Text	-	No	-

• Shower

IFC Entity: IfcSanitaryTerminal					
IFC SubType: SHOWER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	WELS	Boolean	-	Yes	TRUE / FALSE
2	SystemType	Text	-	No	Sanitary
3	SystemName	Text	-	No	-

Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Sanitary Appliances

By IFC Representation (continued from previous page)

• Urinal

IFC Entity: IfcSanitaryTerminal					
IFC SubType: URINAL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	AmbulantDisabled	Boolean	-	Yes	TRUE / FALSE
2	ChildrenFriendly	Boolean	-	Yes	TRUE / FALSE
3	Mounting	Text	-	No	-
4	Waterless	Boolean	-	Yes	TRUE / FALSE
5	WELS	Boolean	-	Yes	TRUE / FALSE
6	SystemType	Text	-	No	Sanitary
7	SystemName	Text	-	No	-

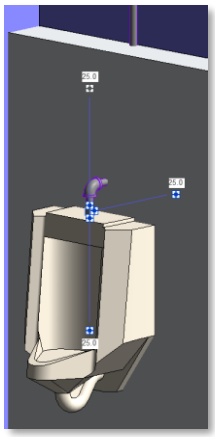
• Wash Basin

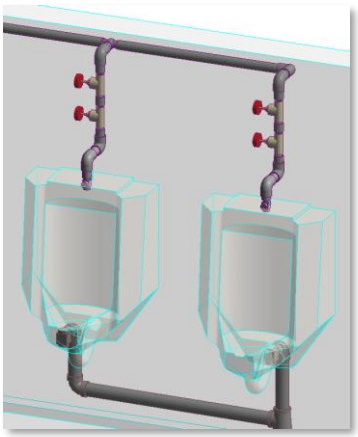
IFC Entity: IfcSanitaryTerminal					
IFC SubType: WASHHANDBASIN					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ChildrenFriendly	Boolean	-	Yes	TRUE / FALSE
2	Mounting	Text	-	No	-
3	WELS	Boolean	-	Yes	TRUE / FALSE
4	SystemType	Text	-	No	Sanitary
5	SystemName	Text	-	No	-

• Water Closet

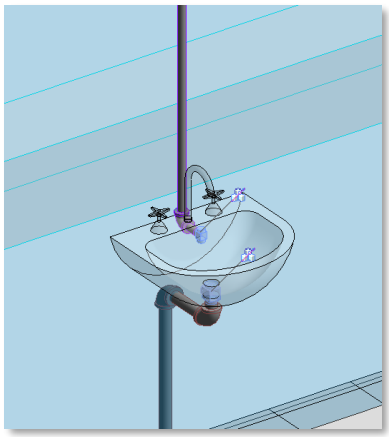
IFC Entity: IfcSanitaryTerminal					
IFC SubType: WATERCLOSET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	AmbulantDisabled	Boolean	-	Yes	TRUE / FALSE
2	BarrierFreeAccessibility	Boolean	-	Yes	TRUE / FALSE
3	ChildrenFriendly	Boolean	-	Yes	TRUE / FALSE
4	PanMounting	Text	-	No	-
5	ToiletPanType	Boolean	-	Yes	TRUE / FALSE
6	WELS	Boolean	-	Yes	TRUE / FALSE
7	SystemType	Text	-	No	Sanitary
8	SystemName	Text	-	No	-

Sanitary Appliances

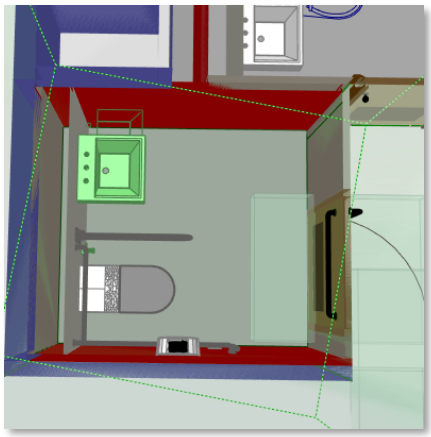




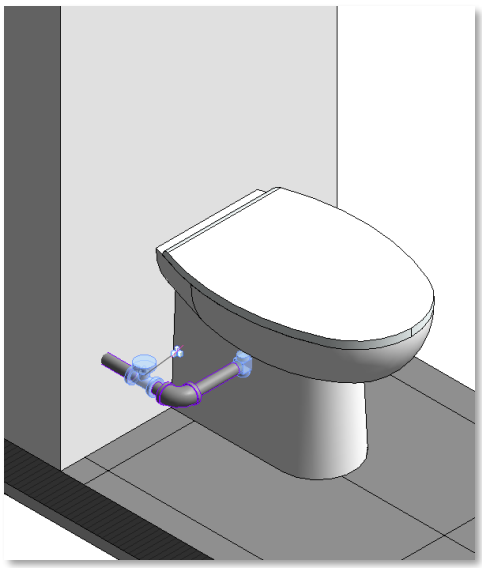
S4 – Fig 92 to 93 : Urinal



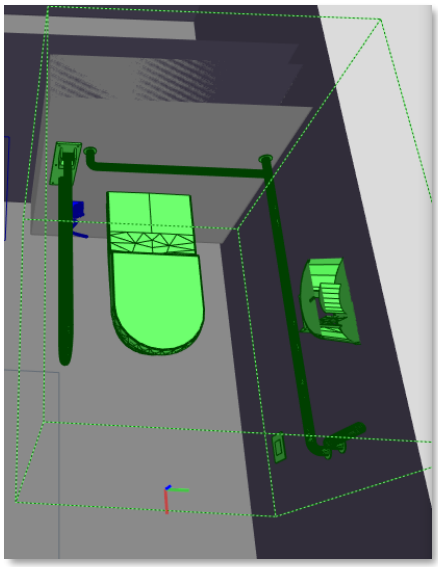
S4 – Fig 94: Wash Basin



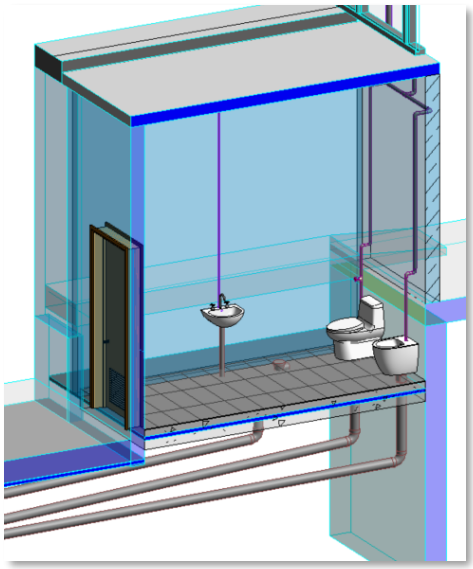
S4 – Fig 95:
Wash Basin highlighted in Green



S4 – Fig 96: Water Closet



S4 – Fig 97:
Water Closet for Ambulant Disabled



S4 – Fig 98 : Water Closet

Seating

By IFC Representation

IFC Entity: IfcFurniture					
IFC SubType: BENCH					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SeatingCapacity	Text	-	No	-

IFC Entity: IfcFurniture					
IFC SubType: CHAIR					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Notes

- To determine Occupancy Load for Assembly Spaces (e.g. Auditorium, Theatre), it is necessary to indicate the type of seating

Security Lighting

By IFC Representation

IFC Entity: IfcLightFixture					
IFC SubType: SECURITYLIGHTING					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Notes

- Refers to emergency lighting to fulfil SCDF requirements

Sensor

Modelling Sensor in IFC+SG

- Level Sensor refers to sensors for monitoring refuse collected at the refuse chute.

By IFC Representation

IFC Entity: IfcSensor					
IFC SubType: LEVELSENSOR					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Notes

- Automatic sensors for fire protection (e.g. smoke detector, heat detector, flame detector etc.) do not need to be modelled. They are represented as a Space parameter under "Automatic Fire Alarm System".

Shading Device

By IFC Representation

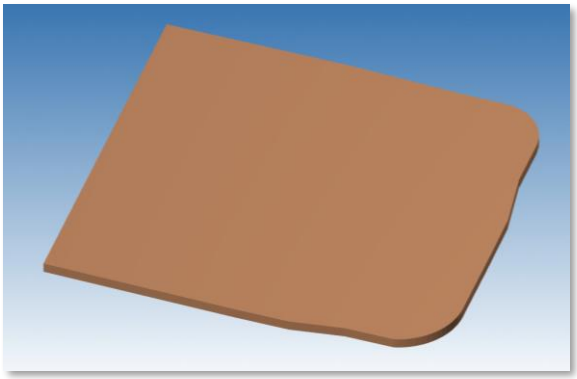
IFC Entity: IfcShadingDevice					
IFC SubType: LOUVREDPANEL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	ShadingDevice	Text	-	No	-

Signage

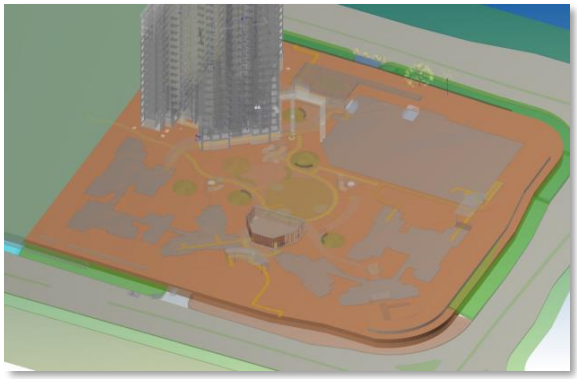
By IFC Representation

IFC Entity: IfcBuildingElementProxy					
IFC SubType: SIGNAGE_EXIT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	MountingHeight	Length	mm	No	-

Site



S4 – Fig 99 : Site / Site Boundary

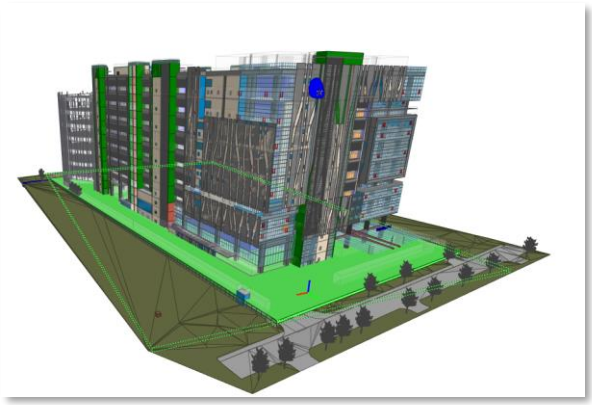


S4 – Fig 100 :
Site / Site Boundary in relation to Building

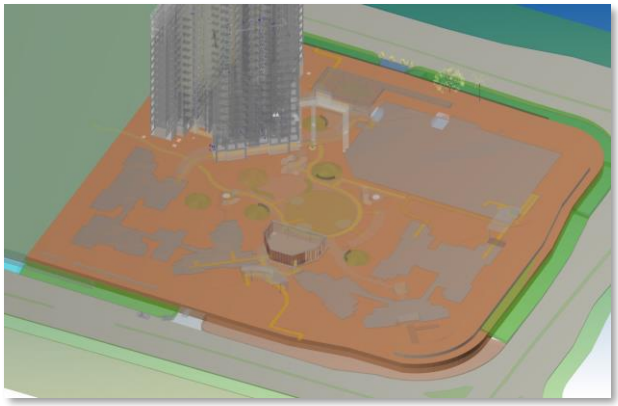
By IFC Representation

IFC Entity: IfcSite					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	NumberOfWorkers	Integer	-	No	-

Site Boundary



S4 – Fig 101 : Site / Site Boundary highlighted in Green



S4 – Fig 102 : Site / Site Boundary in Brown

Hierarchy of Space

IfcSpace Sub-Type	Property Name	Definition
AREA_GFA	Name	The name of the area
	Development Use	URA development use of the area in question
	Building Typology	The building typology where the area is in
SPACE	Space Name	The name of the space
	Occupancy Type	SCDF definition of occupancy type for the space
SITEBOUNDARY	Broad Land Use	Referring to the broad land use of the entire site

Site Boundary Dimension in IFC+SG

- The measurement of the site boundary will be extracted from the perimeter of the object.

By IFC Representation

IFC Entity: IfcGeographicElement

IFC SubType: SITEBOUNDARY, CADASTRALLOT

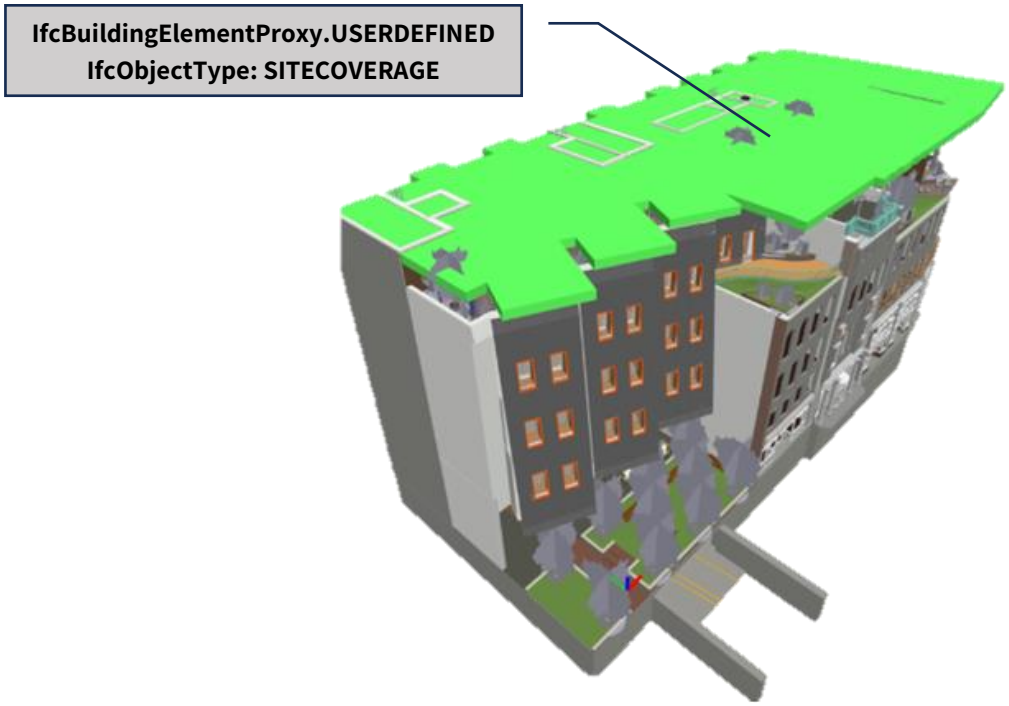
S/N	IFC+SG Property	Property Type	Unit	Input Limitation	Examples
1	Area	Area	m^2	No	N.A.
2	BroadLandUse*	Text	-	Yes	Agriculture, Beach Area, Business 1, Business 1- White, Business 2, Business 2- White, Business Park, Business Park- White, Cemetery, Civic & Community Institution, Commercial, Commercial & Residential, Commercial/Institution, Educational Institution, Health & Medical Care, Hotel, Open Space, Park, Place of Worship, Port/Airport, Rapid Transit, Reserve Site, Residential, Residential with Commercial at 1st storey, Residential/Institution, Road, Special Use, Sports & Recreation, Transport Facilities, Utility, Waterbody, White
3	VacantLand*	Boolean	N.A.	Yes	TRUE / FALSE

*These properties are only applicable for the IFC SubType = SITEBOUNDARY

Site Coverage

Modelling Site Coverage in IFC+SG

- To be modelled as object(s), exported to "IfcBuildingElementProxy.USERDEFINED; IfcObjectType: SITECOVERAGE"
- For example, the Site Coverage of Block A, Block B, Pavillion C and Guardhouse D should be modelled as four (4) objects, mapped and exported to "IfcBuildingElementProxy.USERDEFINED; IfcObjectType: SITECOVERAGE". However, if any of these structures overlap from Site View (e.g. Block A overlaps with Pavillion C), then the QP may aggregate the Site Coverage of Block A and Pavillion C.

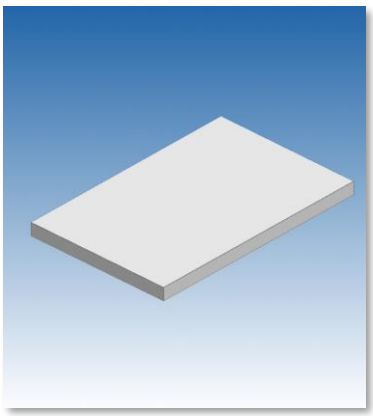


S4 – Fig 103 : Site Coverage

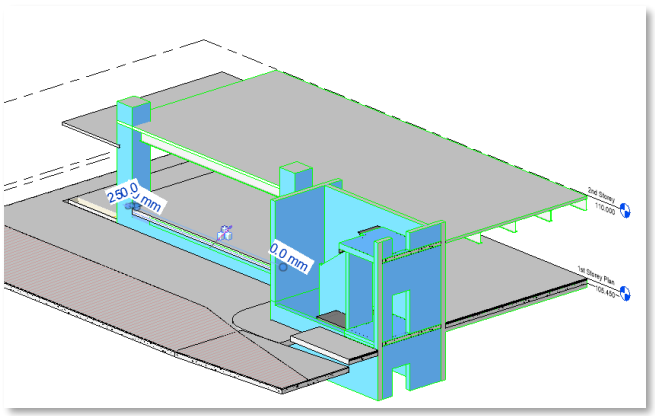
By IFC Representation

IFC Entity: IfcBuildingElementProxy					
IFC SubType: SITECOVERAGE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
No IFC+SG properties required.					

Slab



S4 – Fig 104 : Slab



S4 – Fig 105 : Concrete Rectangular Slab

Modelling Slab in IFC+SG

- All the slab elements shall be modelled in IFC+SG model with the necessary information required as stipulated in the tables below.
    - The nominal reinforcement for slab shall be indicated in IFC+SG parameters. Additional reinforcement to be presented in 2D drawings.
    - Civil defence shelter slab will need to be indicated as "Yes" in IFC+SG parameter "ShelterUsage" and substantiate with civil defence shelter reinforcement details in 2D drawings.

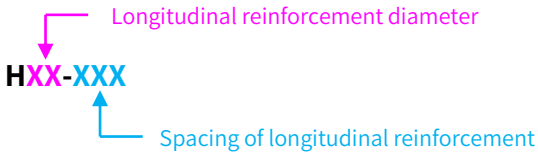
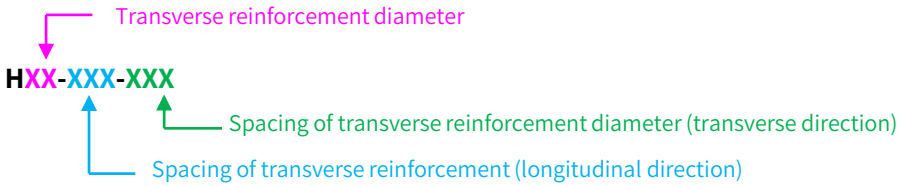
- 2D detail drawings are allowed for all slab reinforcement drawings with the indication of drawing number in the IFC+SG parameter "ReferTo2DDetail".

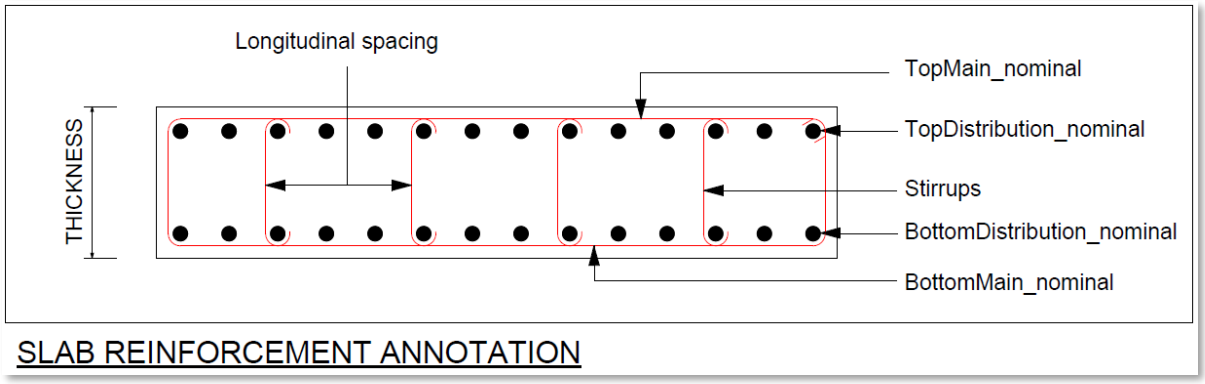
- IFC+SG parameters to be included for any irregular, or complex slab element:
    - ConstructionMethod
    - ReferTo2DDetail
    - Mark
    - MaterialGrade
    - ReinforcementSteelGrade
    - ShelterUsage
    - SlabType
    - Thickness
    - WeldedMesh (if applicable)

- Cantilevered RC ledges should be modelled

Slab

Slab Dimension and Reinforcement Definition

Slab Dimension and Reinforcement Definition	
1	QP can produce a set of 2D slab reinforcement drawings to present the arrangement of slab reinforcement for submission.
2	The input for TopMain_nominal, TopDistribution_nomimal, BottomMain_nominal & BottomDistribution_nominal shall be "HXX-XXX" while "H" is a must, XX is the longitudinal reinforcement diameter and XXX is the spacing of longitudinal reinforcement (e.g. H32-150) 
3	The input for Stirrups shall be "HXX-XXX-XXX" while "H" is a must, XX are the transverse reinforcement diameter, 1st XXX is the longitudinal spacing of transverse reinforcement and 2nd XXX is the transverse spacing of transverse reinforcement. • Indicate the longitudinal spacing (main direction) and follow with transverse spacing (distribution direction) (e.g.H8-100-100) 



S4 – Fig 106 : Slab Reinforcement Annotation

Slab

By IFC Representation

IFC Entity: IfcSlab						
IFC SubType: N.A., FLOOR, LANDING						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Accreditation_MAS	Boolean	When required / relevant	-	Yes	TRUE / FALSE
2	BottomDistribution_nominal	Text	When required / relevant	-	No	H25-150+H16-300
3	BottomMain_nominal	Text	When required / relevant	-	No	H25-150+H16-300
4	ConstructionMethod	Text	All slabs	-	Yes	*Refer to list^*
5	LatticeGirderReinforcement	Boolean	When required / relevant	-	Yes	TRUE / FALSE
6	LoadBearing	Boolean	When required / relevant	-	Yes	TRUE / FALSE
7	Mark	Text	All slabs	-	No	S1, S01, PS01
8	MaterialGrade	Text	All slabs	-	Yes	*Refer to list^*
9	MechanicalConnectionType	Text	-	-	No	-
10	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
11	ReinforcementSteelGrade	Text	All slabs	-	Yes	*Refer to list^*
12	ShelterUsage	Boolean	When required / relevant	-	Yes	TRUE / FALSE
13	SlabType	Text	All slabs	-	Yes	*Refer to list^*
14	Stirrups	Text	When required / relevant	-	No	H10-150-300
15	StirrupsType	Text	Optional	-	Yes	*Refer to list^*
16	Thickness	Length	All slabs	mm	No*	300
17	TopDistribution_nominal	Text	When required / relevant	-	No	H25-150+H16-300
18	TopMain_nominal	Text	When required / relevant	-	No	H32-150+H20-300
19	TypeDesignator	Text	-	-	No	Double T Slab, Hollowcore
20	WeldedMesh	Boolean	All slabs	-	Yes	TRUE / FALSE

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.

Slab

Example of Slab (RC Household Shelter Slab) Element Input

250mm thick RC Cast-In-Situ Household Shelter Slab	**IFC Entity:** IfcSlab		
	IFC SubType: N.A.		
• Mark – HS1 • Concrete grade C32/40 • Two way slab • Top Reinforcement H10-100 bothway • Bottom Reinforcement H10-100 bothway • Shear link H8-600	**S/N**	**IFC+SG Property**	**Examples**
	1	MaterialGrade	C32/40
	2	ConstructionMethod	CIS
	3	ReferTo2DDetail	Dwg 19588-HS-DT-1
	4	ReinforcementSteelGrade	500B
	5	ShelterUsage	Yes
	6	SlabType	Two way
	7	Mark	HS1
	8	Thickness	200
	9	BottomDistribution_nominal	H10-100
	10	BottomMain_nominal	H10-100
	11	Stirrups	H8-600
	12	StirrupsType	CL
	13	TopDistribution_nomimal	H10-100
	14	TopMain_nominal	H10-100

Soffit

By IFC Representation

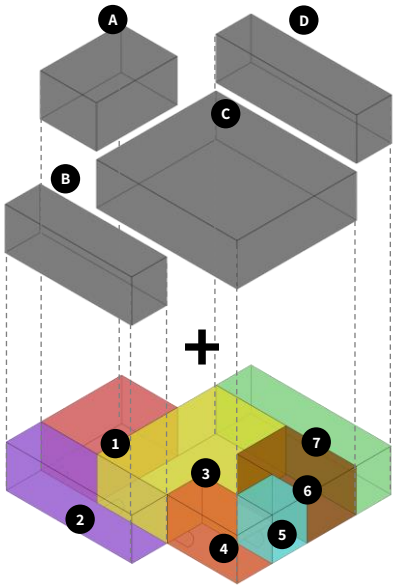
IFC Entity: IfcCovering					
IFC SubType: SOFFIT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	FireRating	Text	hr	No	0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4

Space

About

As 'IfcSpace' is the most common component across all agencies, it is broken down into 2 sub-sections for ease of understanding. 'IfcSpace' consists of:

- Space (Area Schemes)
- Space (Usage)

	Space Definition	Requirements Involved	Definition	Conceptual Illustration (Not to Scale)
1	**Space (Area Schemes)**	• URA's GFA calculations • NEA's refuse output • LTA's parking provisions	Area Schemes in Revit and ArchiCAD corresponds to Area Schemes and Zones respectively. They shall be exported to Space with IFC Sub-type "AREA_GFA". The Space contains information related to: a) GFA b) Strata c) Landscape d) Connectivity Properties and other information on Space (Area Schemes) can be found on Page 359	Residential (Non-Landed) Unit *See input example on subsequent pages* SPACE (AREA SCHEME)  SPACE (USAGE)
2	**Space (Usage)**	• BCA's Accessibility requirements • LTA's Minimum Driveway Width • NEA's Sanitary Provisions • PUB's Minimum Platform Levels • SCDF's Exit Requirements	• For checks based on Occupancy Type, Building Typology and Space Usage • As cross-agency spaces have been harmonized and standardised, each space only require 2 'IfcSpace' properties to address their usage requirements: 1) SpaceName 2) Occupancy Type Properties and other information on Space (Usage) can be found at Page 373	

S4 – Fig 107: Space Conceptual Illustration

Hierarchy of Space

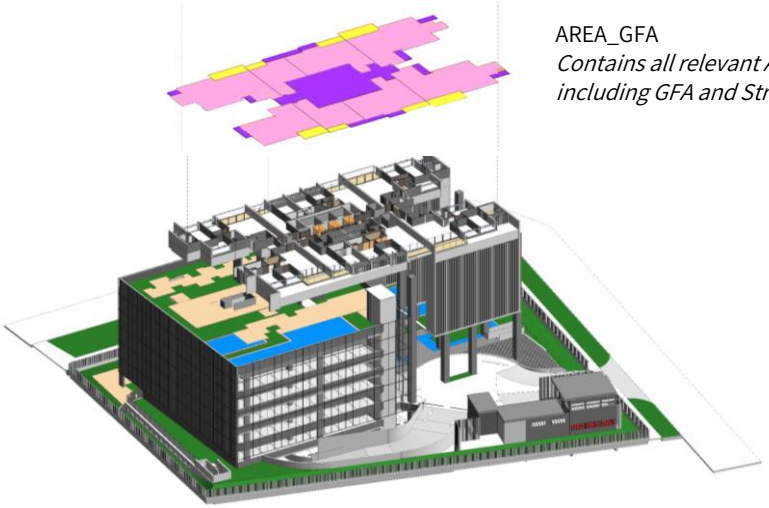
IfcSpace Sub-Type	Property Name	Definition
SPACE	Space Name	The name of the space
	Occupancy Type	SCDF definition of occupancy type for the space
SITEBOUNDARY	Broad Land Use	Referring to the broad land use of the entire site

Space (Area Requirements)

The Area Requirements categorisation facilitates the organization of drawings within a BIM model. Within this layer, there are containers for data, also referred to as properties. When these properties are accurately populated, they facilitate the computation of information and rule-checking, such as aggregate GFA, GFA quantum, and the refuse output corresponding to the proposed development.

Example of Space (Area Requirements)

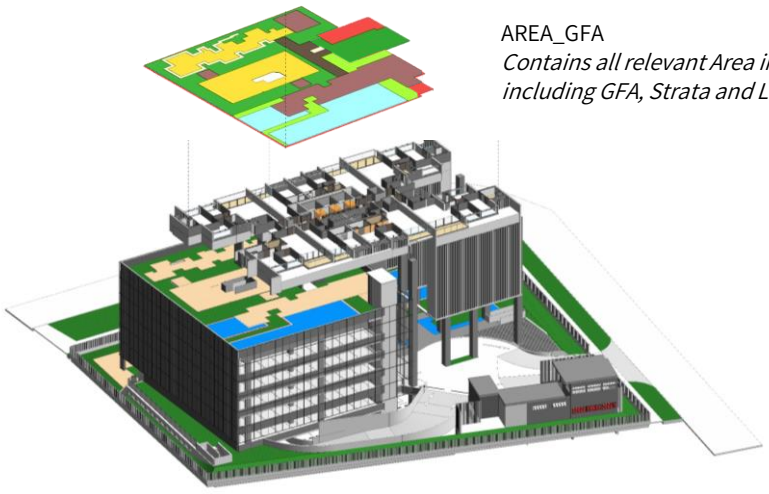
- **Typical Residential Floor**



AREA_GFA
Contains all relevant Area information including GFA and Strata.

S4 – Fig 108 : Example of Space (Area Requirement) modelling

- **Sky Terrace Floor**



AREA_GFA
Contains all relevant Area information including GFA, Strata and Landscape.

S4 – Fig 109 : Example of Space (Area Requirement) modelling

Space (Area Requirements)

Whilst Space(Usage) represents the more granular usage of rooms, Space (Area Requirements) represents the design intent of an area, specifically for the evaluation of:

- GFA
- Strata
- Landscape
- Connectivity

The prefixes "AVF", "AGF", "AST", "ALS" and "ACN" are used to organize the information of Space (Area Requirements).

Space (Area Requirements) property prefix

AVF – Verifying GFA to be included/excluded

"AVF_IncludeAsGFA" is the only property marked with prefix "AVF".

This property is required to be checked/unchecked for purposes of verifying if the Space is including/excluding GFA.

AVF_IncludeAsGFA must be checked for all areas that are proposed to be included as GFA and AGF_DevelopmentUse must be keyed in for all areas in relation to GFA evaluation.

AGF - GFA information

All GFA related information are marked with prefix "AGF".

These properties are required to be captured for purposes of GFA related regulatory checks. For example - determination of development intensity, assessment of proposed uses in relation to planning controls, GFA exemption / bonus criteria.

AST – Strata information

All Strata related information are marked with prefix "AST" and carries information related to ownership.

A key property to this layer is AST_AreaType, as it provides information on whether a space is intended to be private strata or common area.

ALS – Landscape information

All landscape related information are marked with prefix "ALS" and carries information related to landscape areas (such as Green Buffer and Peripheral Planting Strip).

It facilitates the assessment of policies such as Landscape Replacement Areas (LRA) and LUSH incentives. It also differentiates the types of landscaping (such as shrubs or footpaths) within greenery features, such as Sky Terraces or Communal Ground Gardens.

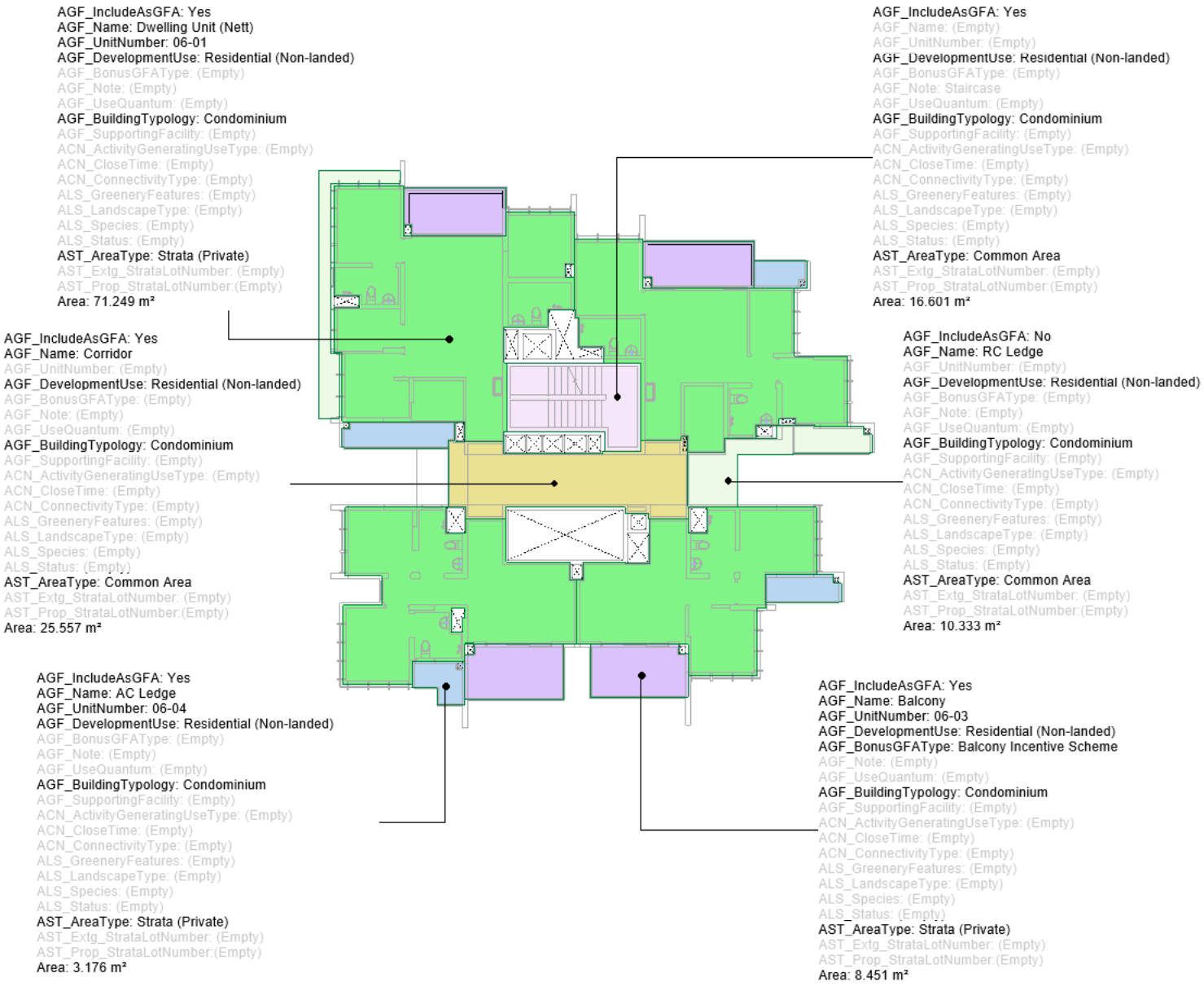
ACN – Connectivity Information

All connectivity related information are marked with prefix "ACN".

It facilitates the assessment of pedestrian/cyclist access within and around the development. It also helps to identify public spaces, such as Privately-Owned Public Spaces (POPS) which is registered as "PublicSpaceNode" under ACN_ConnectivityType.

Space (Area Requirements)

Example of Space (Area Requirements)

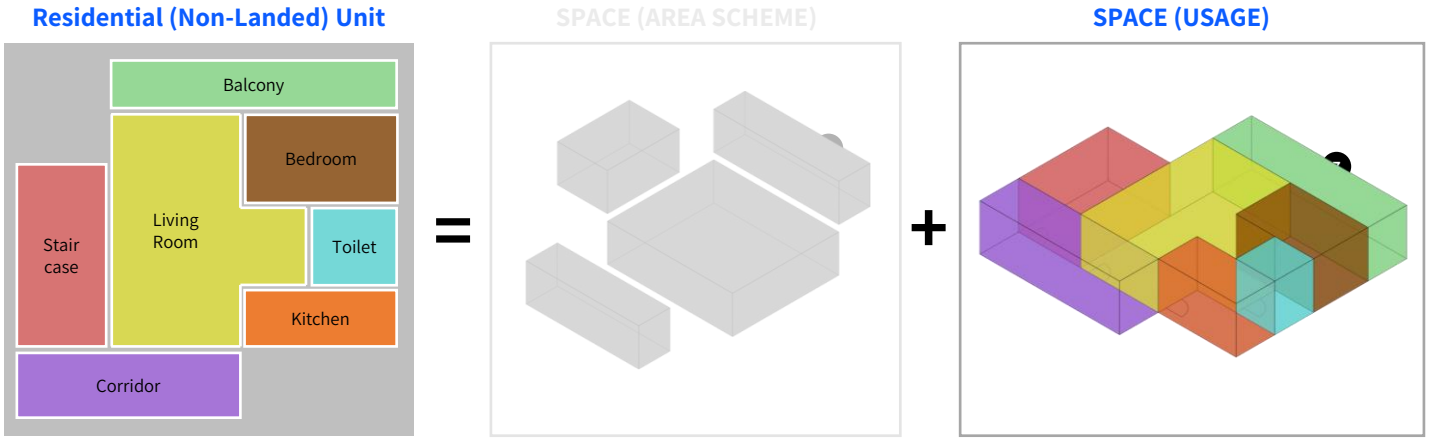


S4 – Fig 110 : Example of Area Plan for a typical floor in residential (non-landed) development

Space (Usage)

Example of Space (Usage) Input

Conceptual Diagrams (Not To Scale)



Residential (Non-Landed) Unit Space (Usage) 1. Staircase 	IFC Entity: IfcSpace		
	IFC SubType: SPACE		
	S/N	IFC+SG Property	Value
	1	SpaceName	Staircase
	2	OccupancyType	Multi-Unit Residential

Residential (Non-Landed) Unit Space (Usage) 2. Corridor 	IFC Entity: IfcSpace		
	IFC SubType: SPACE		
	S/N	IFC+SG Property	Value
	1	SpaceName	Corridor
	2	OccupancyType	Multi-Unit Residential

Residential (Non-Landed) Unit Space (Usage) 3. Living Room 	IFC Entity: IfcSpace		
	IFC SubType: SPACE		
	S/N	IFC+SG Property	Value
	1	SpaceName	Living Room
	2	OccupancyType	Multi-Unit Residential

Residential (Non-Landed) Unit Space (Usage) 4. Kitchen 	IFC Entity: IfcSpace		
	IFC SubType: SPACE		
	S/N	IFC+SG Property	Value
	1	SpaceName	Kitchen
	2	OccupancyType	Multi-Unit Residential

Space (Usage)

Example of Space (Usage) Input

Continued from previous page

Residential (Non-Landed) Unit

Space (Usage)

5. Toilet

IFC Entity: IfcSpace

IFC SubType: SPACE

S/N	IFC+SG Property	Value
1	SpaceName	Toilet
2	OccupancyType	Multi-Unit Residential

Residential (Non-Landed) Unit

Space (Usage)

6. Bedroom

IFC Entity: IfcSpace

IFC SubType: SPACE

S/N	IFC+SG Property	Value
1	SpaceName	Bedroom
2	OccupancyType	Multi-Unit Residential

Residential (Non-Landed) Unit

Space (Usage)

7. Balcony

IFC Entity: IfcSpace

IFC SubType: SPACE

S/N	IFC+SG Property	Value
1	SpaceName	Balcony
2	OccupancyType	Multi-Unit Residential

Modelling IFC+SG (Space – Area Requirement)

IFC Entity: IfcSpace					
IFC SubType: AREA_GFA					
	IFC+SG Property	**Actual Values / Example**			
1	**AGF_DevelopmentUse [Text]**	• Agriculture • Beach Area • Business Park • Business 1 • Business 2 • Cemetery • Civic & Community Institution • Commercial	• Educational Institution • Health & Medical Care • Hotel • Open Space • Park • Place of Worship • Port/Airport • Rapid Transit	• Reserve Site • Residential (Landed) • Residential (Non-landed) • Road • Special Use • Sports & Recreation • Transport Facilities	• Utility • Waterbody
2	**AGF_Name [Text]**	Please see pg 364 to 372 for list of AGF_Name recommended per development use.			
3	**AGF_UnitNumber [Text]**	• B3-01a (Example) • B2M-120D (Example) • B1M-05A (Example)		• 01-03A (Example) • 01-03b (Example) • 10-04ab (Example)	
4	**AGF_BonusGFAType [Text]**	• Balcony Incentive Scheme • Conserved Bungalows Scheme	• Indoor Recreation Spaces Scheme • Built Environment Transformation Scheme • Community and Sports Facilities Scheme	• Rooftop ORA on Landscaped Roofs • ORA within Privately-Owned Public Spaces (POPS) • CBD Incentive Scheme	• Strategic Development Incentive (SDI) Scheme • Facade Articulation Scheme
5	**AGF_Note [Text]**	Accompanying notes for QP to elaborate on use and purpose of spaces. If "Others" have been entered under AGF_Name, to fill in actual use of the area /space.			
6	**AGF_UseQuantum [Text]**	• Predominant • Ancillary			
7	**AGF_BuildingTypology [Text]**	• Flats • Condominium • Shophouse • Terrace House • Detached House • Semi-Detached House • Good Class Bungalow • Strata-Landed • Housing • Serviced Apartments	• Polyclinic • Data Centre • Community Club / Centre • Adult Disability Home • Medical Centre • Public Acute Hospital • Public Community Hospital	• Private Hospital • Assisted Living Facility • Confinement Centre • Service Apartment II • Adventure Centre / Campsite • Farm • Airport • Port	• Light Industry • Clean Industry • General Industry • Special Industry
8	**AGF_SupportingFacility [Text]**	• Electrical Substation • Vehicular Parking Area			

Modelling IFC+SG (Space – Area Requirement)

IFC Entity: IfcSpace		
IFC SubType: AREA_GFA		
	IFC+SG Property	**Actual Values / Example**
1	**AST_AreaType [Text]**	• Strata (Private) • Strata (Communal) • Common Area
2	**AST_LegalArea [Number]**	• 101.01 (Example) • 99.23 (Example)
3	**AST_Prop_StrataLotNumber [Text]**	• MK02-U017049L (Example)
4	**AST_Extg_StrataLotNumber [Text]**	• MK02-U017646Z (Example)

IFC Entity: IfcSpace			
IFC SubType: AREA_GFA			
	IFC+SG Property	**Actual Values / Example**	
1	**ACN_ConncectivityType [Text]**	• Open Walkway • Covered Walkway • Covered Linkway • Through Block Link • Elevated Pedestrian Link	• Underground Pedestrian Link • Sky Bridge • Public Space Node • Cycling Path
2	**ACN_ActivityGeneratingUseType [Text]**	• Single Side • Double Side	
3	**ACN_IsPavingSpecified [Boolean]**	• Yes/No	
4	**ACN_PavingSpecification [Text]**	• <UDAREA> PavingSpecification (Example)	
5	**ACN_IsOpen24HoursToPublic [Boolean]**	• Yes/No	
6	**ACN_OpenTime [Text]**	• 23:59:59 (Example)	
7	**ACN_CloseTime [Text]**	• 23:59:59 (Example)	

Modelling IFC+SG (Space – Area Requirement)

IFC Entity: IfcSpace			
IFC SubType: AREA_GFA			
	IFC+SG Property	**Actual Values / Example**	
1	**ALS_LandscapeType [Text]**	• Turfing • Groundcovers • Shrubs[1] • Decked/ Patterned Floor	• Water Feature • Landscaped Footpath • Playground • BBQ Pit
2	**ALS_GreeneryFeatures [Text]**	• Green Buffer • Peripheral Planting Verge • Landscape Deck - Vertical Greenery • Landscape Deck - Surface Greenery • Communal Ground Garden • Sky Terrace	• Roof Top Landscaping • Ground Landscaping • Urban Farm / Greenhouse • Vertical Greenery • Extensive Green Roof • Green Verge
3	**ALS_Species [Text]**	• *Ophiopogon jaburan (Example)* • *Codiaeum variegatum (Example)* • *Dracaena marginata (Example)* • *Murraya paniculata (Example)*	

[1]Note that Shrubs will include both within Site boundary and outside Site Boundary (in Green Verge)

IFC Entity: IfcSpace		
IFC SubType: AREA_GFA		
	IFC+SG Property	**Actual Values**
1	**AVF_IncludeAsGFA [Boolean]**	• Yes/No

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2a	**Residential (Non-landed)**	• AC Ledge • Airwell • ATM Kiosk • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Car Parking Lot (Mechanised) • Car Porch/Garage • Conserved Bungalow • Control Room/ Centre • Corridor • Courtyard • Discharge Valve Chamber • Driveways • Dwelling Unit (Nett)	• Entrance Canopy • Gondola and working platform • Guardhouse / Sentry Post • Indoor Recreation Space • Letter Box Area • Lift Lobby • Lift Motor Room • Loft • M&E Room (enclosed) • M&E Services (non-load bearing covering above) • M&E Space (unenclosed)	• Pavilion • Pick-up/ Drop-off Point • Private Enclosed Space • Privately Owned Public Space • RC Ledge • Refuse Chute Chamber • Refuse Room • Residual Area and Corridor (Carpark Floor) • Roof Terrace	• Serviced Apartment Unit (Nett) • Storey Shelter • Students' Hostel • Swimming Pool • Tennis Court • Vending Machine Kiosk • Visitors' Hostel
2b	**Residential (Landed)**	• AC Ledge • Airwell • Balcony • Bathroom • Bedroom • Bin Centre • Bin Point • Bomb Shelter	• Car Porch/Garage • Courtyard • Corridor • Dining Room • Discharge Valve Chamber • Family area • Household Shelter	• Lift Lobby • Lift Motor Room • Living Room • Meter Compartment • Roof Terrace • RC Ledge • Storey Shelter • Swimming Pool	• Kitchen

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2c	**Business 1**	• AC Ledge • Airwell • ATM Kiosk • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Car Parking Lot (Mechanised) • Cloud Kitchen • Control Room/ Centre • Core Media • Corridor • Courtyard • Server areas/ IT equipment • Discharge Valve Chamber • Driveways	• E-Business • End of Trip Facilities • Entrance Canopy • Gondola and working platform • Guardhouse / Sentry Post • Industrial Canteen • Industrial Training Room • Kitchen/ Pantry/ Food Preparation area/ Food Stall • Letter Box Area • Lift Lobby • Lift Motor Room • Loading and Unloading Bay • Loft	• M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above) • M&E Space (unenclosed) • Media/ Audio Visual/ Filming/ Streaming • Meeting Room • Office • On-Site Food Waste Treatment Area • Pavilion • Pick-up/ Drop-off Point • Printing / Publishing • Privately Owned Public Space • RC Ledge • Refuse Chute Chamber	• Refuse Room • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Storey Shelter • Swimming Pool • Vending Machine Kiosk • Warehouse/ Storage / Staging • Workshop/ Manufacturing / Production/ Processing/ Yard
2d	**Business 2**	• AC Ledge • Airwell • Assembly • ATM Kiosk • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Car Parking Lot (Mechanised) • Cloud Kitchen • Control Room/ Centre • Core Media • Corridor • Courtyard • Server areas/ IT equipment	• Discharge Valve Chamber • Driveways • E-Business • End of Trip Facilities • Entrance Canopy • Gondola and working platform • Guardhouse / Sentry Post • Industrial Canteen • Industrial Training Room • Kitchen/ Pantry/ Food Preparation area/ Food Stall • Letter Box Area • Lift Lobby	• Lift Motor Room • Loading and Unloading Bay • Loft • M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above) • M&E Space (unenclosed) • Media/ Audio Visual/ Filming/ Streaming • Meeting Room • Office • On-Site Food Waste Treatment Area • Pavilion • Pick-up/ Drop-off Point • Printing / Publishing • Privately Owned Public Space	• RC Ledge • Refuse Chute Chamber • Refuse Room • Repair / Servicing • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Storey Shelter • Swimming Pool • Self-Storage • Vending Machine Kiosk • Warehouse/ Storage / Staging • Workshop/ Manufacturing / Production/ Processing/ Yard

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2e	**Business Park**	• AC ledge • Airwell • ATM Kiosk • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Car Parking Lot (Mechanised) • Central Distribution Centre • Cloud Kitchen • Control Room/ Centre • Core media • Courtyard • Corridor • Server areas/ IT equipment • Data processing • Discharge Valve Chamber	• Driveways • E-Business • End of Trip Facilities • Entrance Canopy • Gondola and working platform • Guardhouse / Sentry Post • Industrial Canteen • Industrial Training Room • Kitchen/ Pantry/ Food Preparation area/ Food Stall • Letter Box Area • Lift Lobby • Lift Motor Room • Loading and Unloading Bay • Loft • M&E Floor • M&E Room (enclosed)	• M&E Services (non-load bearing covering above) • M&E Space (unenclosed) • Manufacturing (High Tech) • Office • On-Site Food Waste Treatment Area • Outdoor Refreshment Area • Outdoor Refreshment Kiosk • Pavilion • Pick-up/ Drop-off Point • Privately Owned Public Space • Product Design / Development	• RC Ledge • Refuse Chute Chamber • Refuse Room • Research / Research & Development • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Stage • Storey Shelter • Swimming Pool • Test Laboratory • Vending Machine Kiosk • Warehouse/ Storage / Staging • Workrooms/ Meeting Area/ Collaboration

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2f	**Civic & Community Institution**	• AC Ledge • Active Ageing Centre / Senior Care Centre • Airwell • Arts Centre • Association • ATM Kiosk • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Boys' / Girls' Home • Bunk/ Resting • Cable Chamber • Child Care Centre • Classroom • Columbarium • Corridor • Community Club / Centre • Control Room/ Centre • Court/ Pitch/ Field • Courtroom • Courtyard • Cultural Centre / Heritage Centre • Discharge Valve Chamber • Driveways • Educational / Training Institutions	• Embalming Facilities • Embassy / Consulate / High Commision • Entrance Canopy • Equipment/ Storage • Evidence Room • Examination Room • Exhibit Area • Façade Articulation • Family Service Centre • Foreign Domestic Workers Hostel • Function Room • Funeral Parlour • Funeral-related Uses • Gondola and working platform • Government Building / Office • Guardhouse / Sentry Post • Holding Area/ Cell • Inmate Dayrooms • Interview Room • Judge Chambers • Kitchen/ Pantry/ Food Preparation area	• Letter Box Area • Library • Lift Lobby • Lift Motor Room • Loading and Unloading Bay • M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above) • M&E Space (unenclosed) • Meditation Space • Meeting Room • Museum • Office • Outdoor Refreshment Area • Outdoor Refreshment Kiosk • Pavilion • Performance/ Theatre/ Auditorium • Pick-up/ Drop-off Point • Privately Owned Public Space	• RC Ledge • Refuse Chute Chamber • Refuse Room • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Secondary Workers Dormitory • Secure Visiting Room • Security /Control • Social Services Facilities • Stage • Storey Shelter • Student Care Centre • Swimming Pool • Vending Machine Kiosk • Welfare Home • Workers' Dormitory

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2g	**Commercial**	• AC Ledge • Airwell • Amusement Centre • ATM Kiosk • Auto Accessories/Tyre & Battery Shop • Balcony • Bank • Bar/Pub • Beauty Salon • Betting Centre • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Car Parking Lot (Mechanised) • Car Polishing & Waxing • Casino • Cinema • Coffin Shop • Corridor • Commercial School • Control Room/ Centre • Convention Centre / Exhibition • Court/ Pitch/ Field • Courtyard • Discharge Valve Chamber • Driveways • End of Trip Facilities • Entrance Canopy • Equipment/ Storage	• Façade Articulation • Foot Reflexology • Function Room • Gondola and working platform • Guardhouse / Sentry Post • Gym/Fitness Centre • Hawker/Food Centre/Canteen • Karaoke Lounge • Kiosk (Retail) • Kitchen/ Pantry/ Food Preparation area/ Food Stall • Laundromat • Letter Box Area • Lift Lobby • Lift Motor Room • Living Quarter • Loading and Unloading Bay • Loft • M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above) • M&E Space (unenclosed) • Market • Massage Establishment • Medical Clinic	• Medical Clinic/ Suites • Meditation Centre • Meeting Room • Minimart • Nightclub • Motor Vehicle Showroom • Office • On-Site Food Waste Treatment Area • Outdoor Refreshment Area • Outdoor Refreshment Kiosk • Pavilion • Pet Boarding/Pet Day Care • Pet Shop/Pet Grooming • Petrol Station • Pick-up/ Drop-off Point • Private Commercial Foreign System School • Privately Owned Public Space • RC Ledge • Refuse Chute Chamber • Refuse Room • Residual Area and Corridor (Carpark Floor)	• Restaurant • Restaurant and bar • Restaurant and bar with live entertainment • Restaurant with live entertainment • Roof Terrace • Shop • Showroom • Stage • Storey Shelter • Supermarket • Swimming Pool • Takeaway Food Shop • Traditional Chinese Medicine • Tyre Battery Shop • Vending Machine Kiosk • Vet Clinic/ Animal Hospital • Visitor Centre • Wholesale and Distribution Centre • Work Booth

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2h	**Educational Institution**	• AC Ledge • Airwell • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Classroom • Computer room • Control Room/ Centre • Corridor • Court/ Pitch/ Field • Courtyard • Discharge Valve Chamber • Driveways • End of Trip Facilities	• Entrance Canopy • Equipment/ Storage • Façade Articulation • Gondola and working platform • Guardhouse / Sentry Post • Home Economics/ Cooking • Kindergarten • Laboratory • Lecture Theatre • Leisure Room • Letter Box Area • Lift Lobby • Lift Motor Room • Loading and Unloading Bay	• M&E Room (enclosed) • M&E Services (non-load bearing covering above) • M&E Space (unenclosed) • Multipurpose Hall/ Sports Hall • Music room • Pavilion • Pick-up/ Drop-off Point • Privately Owned Public Space • RC Ledge • Refuse Chute Chamber • Refuse Room • Religious Facilities	• Residual Area and Corridor (Carpark Floor) • Roof Terrace • School Canteen • School Gym • School Library • Special Needs • Stage • Storey Shelter • Students' Hostel • Studio • Study Area • Swimming Pool • Teachers / Staff room • Vending Machine Kiosk • Workshop
2i	**Health & Medical Care**	• AC Ledge • Airwell • ATM Kiosk • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Car Parking Lot (Mechanised) • Consulting rooms • Control Room/ Centre • Corridor • Courtyard • Discharge Valve Chamber • Driveways • End of Trip Facilities • Entrance Canopy • Equipment/ Storage • Façade Articulation	• First aid rooms • Function Room • Gondola and working platform • Guardhouse / Sentry Post • Hospice • Intensive care units • Isolation units • Kitchen/ Pantry/ Food Preparation area • Letter Box Area • Lift Lobby • Lift Motor Room • Loading and Unloading Bay • Lounge • M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above)	• M&E Space (unenclosed) • Medical Clinic/ Suites • Medical scanning and x-ray rooms • Medical treatment rooms • Meeting Room • Nursing Home • Occupational therapy rooms • Office • Operating theatres • Outdoor Refreshment Area • Outdoor Refreshment Kiosk • Pavilion • Pharmacy • Phototherapy • Physiotherapy	• Pick-up/ Drop-off Point • Privately Owned Public Space • RC Ledge • Refuse Chute Chamber • Refuse Room • Rehabilitation rooms • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Staff Quarters • Stage • Storey Shelter • Swimming Pool • Vending Machine Kiosk • Wards

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2j	**Hotel**	• AC Ledge • Airwell • ATM Kiosk • Audio Visual Room • Back of House • Backpackers' Hostel • Balcony • Banquet Hall/ Ballroom • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Car Parking Lot (Mechanised) • Clubhouse • Conserved Bungalow • Control Room/ Centre • Corridor • Courtyard	• Discharge Valve Chamber • Driveways • End of Trip Facilities • Entrance Canopy • Equipment/ Storage • Façade Articulation • Function Room • Gondola and working platform • Guardhouse / Sentry Post • Guest Room/ Hotel Room • Gym/Fitness Centre (for Hotel guests only) • Kitchen/ Food Preparation area • Letter Box Area • Lift Lobby	• Lift Motor Room • Loading and Unloading Bay • Lounge • M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above) • M&E Space (unenclosed) • Meeting/ Board/ Conference Room • Outdoor Refreshment Area • Outdoor Refreshment Kiosk • Pavilion • Pick-up/ Drop-off Point	• Privately Owned Public Space • RC Ledge • Reflexology/ Massage (for Hotel guests only) • Refuse Chute Chamber • Refuse Room • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Staff Quarters • Stage • Storey Shelter • Swimming Pool • Vending Machine Kiosk
2k	**Place of Worship**	• AC Ledge • Airwell • ATM Kiosk • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Chapel • Columbarium • Control Room/ Centre • Corridor • Courtyard • Cultural • Discharge Valve Chamber • Driveways • End of Trip Facilities • Entrance Canopy	• Equipment/ Storage • Function Room • Gondola and working platform • Guardhouse / Sentry Post • Kitchen/ Pantry/ Food Preparation area • Letter Box Area • Library • Lift Lobby • Lift Motor Room • Loading and Unloading Bay • M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above)	• M&E Space (unenclosed) • Meeting Room • Non-religious Use • Office • Pavilion • Pick-up/ Drop-off Point • Praying Area • Quarters • RC Ledge • Refuse Chute Chamber • Refuse Room • Religious School • Religious Teachings • Religious Use • Residual Area and Corridor (Carpark Floor)	• Roof Terrace • Shrine • Stage • Storey Shelter • Swimming Pool • Theatre/ Auditorium • Vending Machine Kiosk

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2l	**Rapid Transit**	• AC Ledge • Airwell • ATM Kiosk • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Cleaning Area • Control Room/ Centre • Corridor • Courtyard	• Discharge Valve Chamber • Driveways • End of Trip Facilities • Entrance Canopy • Equipment/ Storage • Gondola and working platform • Inspection • Letter Box Area • Lift Lobby • Lift Motor Room	• Loading and Unloading Bay • M&E Floor • M&E Room (enclosed) • M&E Space (unenclosed) • Office • Pick-up/ Drop-off Point • Platform Area • Privately Owned Public Space	• RC Ledge • Refuse Chute Chamber • Refuse Room • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Station Control • Storey Shelter • Vending Machine Kiosk
2m	**Sports & Recreation**	• AC Ledge • Airwell • ATM Kiosk • Audio Visual Room • Back of House • Balcony • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Chalet / Bungalow • Clubhouse • Control Room/ Centre • Corridor • Court/ Pitch/ Field • Courtyard • Discharge Valve Chamber	• Dressroom • Driveways • Entrance Canopy • Equipment/ Storage • Exhibition Room • Function Room • Guardhouse / Sentry Post • Gym/Fitness Centre • Letter Box Area • Lift Lobby • Lift Motor Room • Loading and Unloading Bay • Lounge • M&E Floor • M&E Room (enclosed) • M&E Services (non-load bearing covering above)	• M&E Space (unenclosed) • Meeting Room • Multipurpose Hall/ Sports Hall • Office • Outdoor Refreshment Area • Outdoor Refreshment Kiosk • Pavilion • Pick-up/ Drop-off Point • Privately Owned Public Space • RC Ledge • Recreational Club • Refuse Chute Chamber	• Refuse Room • Residual Area and Corridor (Carpark Floor) • Roof Terrace • Security / Control • Stage • Storey Shelter • Studio • Swimming Pool • Theatre/ Auditorium • Theme Park • Vending Machine Kiosk • Viewing Gallery

Modelling IFC+SG (Space – Area Requirement)

AGF Name per Development Use

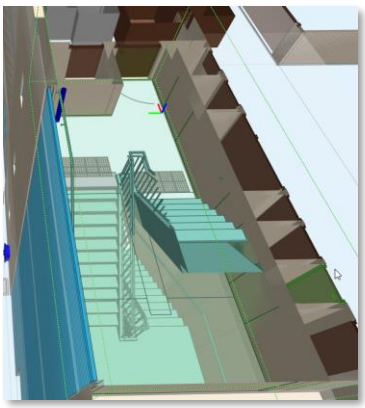
Below recommended values for AGF_Names sorted based on their associated development use. These values shall be used as much as possible before alternatives are considered.

	AGF_DevelopmentUse [Text] Value	Recommended Values for AGF_Name [Text]			
2n	**Transport Facilities**	• Airwell • ATM Kiosk • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Cleaning Area • Control Room/ Centre • Courtyard • Depot	• Discharge Valve Chamber • Driveways • Entrance Canopy • Equipment Storage • Fuelling Space • Gondola and working platform • Letter Box Area • Lift Lobby	• Lift Motor Room • Loading and Unloading Bay • M&E Floor • M&E Room (enclosed) • M&E Space (unenclosed) • Motorcycle Parking Lot • Office • Pick-up/ Drop-off Point • Refuse Chute Chamber • Refuse Room • Repair Yard	• Residual Area and Corridor (Carpark Floor) • Roof Terrace • Servicing and Testing • Standing space (Vehicular) • Storey Shelter • Vending Machine Kiosk
2o	**Utility**	• Airwell • ATM Kiosk • Bicycle Parking Space • Bin Centre • Bin Point • Cable Chamber • Control Room/ Centre • Courtyard • Discharge Valve Chamber	• Driveways • End of Trip Facilities • Entrance Canopy • Gondola and working platform • Letter Box Area • Lift Lobby • Lift Motor Room • Loading and Unloading Bay	• M&E Floor • M&E Room (enclosed) • M&E Space (unenclosed) • Motorcycle Parking Lot • Office • Pick-up/ Drop-off Point • Privately Owned Public Space • Receiving/ Transmitting • Refuse Chute Chamber • Refuse Room	• Residual Area and Corridor (Carpark Floor) • Roof Terrace • Storey Shelter • Treatment Area • Vending Machine Kiosk • Voltage/ Transformer

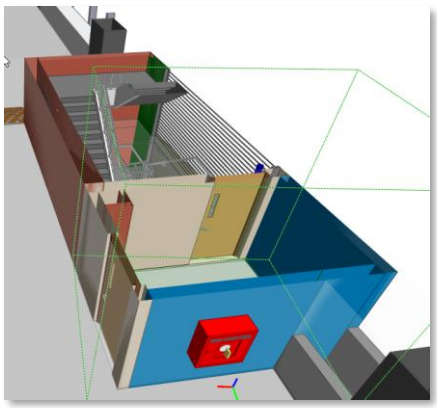
Modelling IFC+SG (Space Usage)

Modelling Space (Usage) in IFC+SG

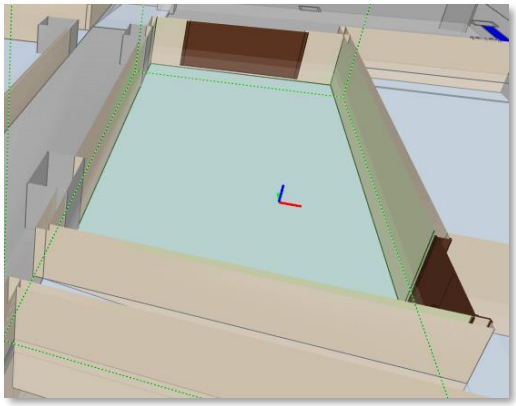
- Every space in the development shall be modelled and tagged as a space in the BIM model. This includes spaces which will not be occupied or for maintenance only.
- Rooms (in Revit) or Zones (in ArchiCAD) shall be computed to middle of the wall to align with circular "Harmonisation of Floor Area definitions by URA, SLA BCA and SCDF" published on 1st September 2022.
- For typical habitable spaces (space with single and consistent FFL) the space should start from floor slab and end before the ceiling slab.
- For spaces with various horizontal levels (e.g. bathroom with dropped shower area, car park on slopes), the space shall should start from dominant FFL of the space or lowest FFL. For spaces with various horizontal levels (e.g. bathroom with dropped shower area, car park on slopes). The space shall start from dominant FFL of the space or lowest FFL.
- Spaces across BCA, LTA, NEA, PUB and SCDF have been harmonized and standardized for checks into **Occupancy Types** and **Space Name** categories**.** All of these spaces are based on the IFC Entity "IfcSpace" and SubType "SPACE". Every space component should include inputs for **both Occupancy Type and Space Name parameters.** Some space components may require additional parameters listed at here.



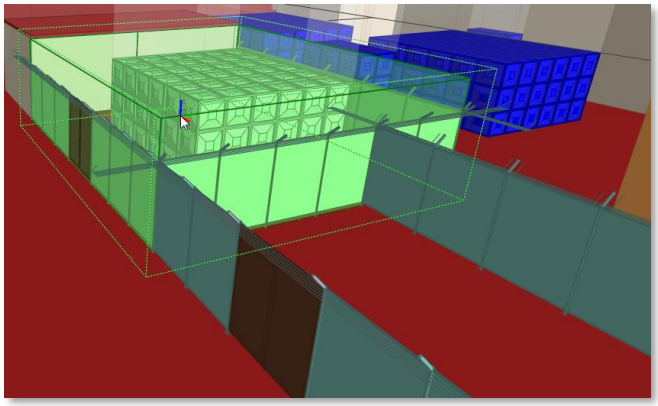
S4 – Fig 114 : Fire Exit Staircase



S4 – Fig 115 : Smoke Stop Lobby



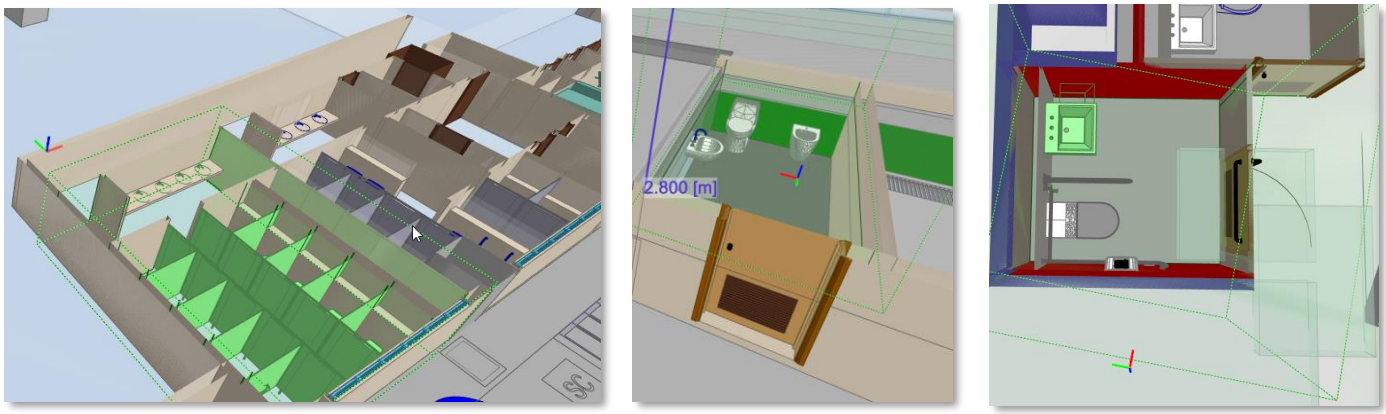
S4 – Fig 116 : Bin Centre



S4 – Fig 117 : Water Pump Room

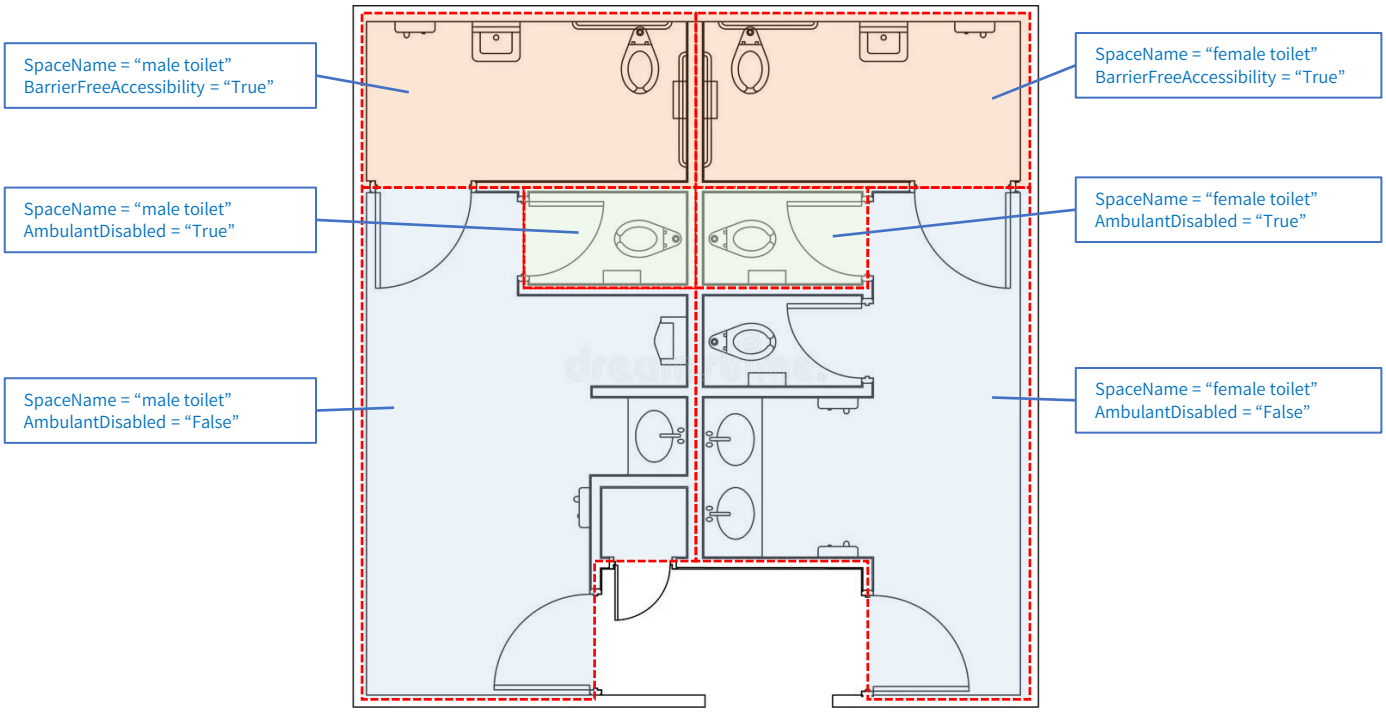
Modelling IFC+SG (Space Usage)

Modelling Space (Usage) in IFC+SG



S4 – Fig 118 to 120 : Toilet

- For toilet or shower clusters, accessible toilet or shower cubicles shall be modelled as a separate space from the rest of the toilet clusters. The same applies to ambulant-disabled toilet cubicles.
- Toilets or shower cubicles intended to be accessible, for ambulant disabled use, child-friendly or retrofitting shall be identified through SpaceName and the following properties:
    - BarrierFreeAccessibility
    - AmbulantDisabled
    - ChildrenFriendly
    - LargerAccessible
    - Retrofit



S4 – Fig 121 : Example showing how to model toilet spaces

Modelling IFC+SG (Space Usage)

Spaces across BCA, LTA, NEA, PUB and SCDF have been harmonized and standardized for checks into **Occupancy Types** and **Space Name** categories**.** All of these spaces are based on the IFC Entity "IfcSpace" and do not require any IfcSubType. Every space component should include inputs for **both Occupancy Type and Space Name parameters.** Some space components may require additional parameters listed at here.

Occupancy Types

Small Residential

1) Single dwelling residential

Other Residential

2) Multi-unit residential

Institutional

3) Supervisory care facility
4) Supervisory care facility (detention)
5) Nursing care facilities
6) Hospital with A&E services
7) Hospital without A&E services
8) Ambulatory care facility
9) Ambulatory care facility (standalone)
10) Custodian care facility
11) Primary school
12) Secondary school
13) Custodian care facility (nursery)
14) Tertiary Education Institution
15) Public education institution
16) Private education institution
17) Tuition centre
18) Worker dormitory

Office

19) Office
20) Telephone exchange/central office
21) Factory office

Shop

22) Shop
23) ODA
24) Outpatient clinic
25) Polyclinic
26) Market
27) Temporary showflat
28) Factory showroom

Factory

29) Petrol station
30) Factory
31) Food production factory
32) M&E area
33) Wafer fabrication plant
34) Trade effluent treatment plant
35) Waste management and recycling
36) Embalming facility
37) Agriculture
38) Animal related facility
39) High containment facility
40) Electrical and gas facility

Place of Public Resort

41) Body treatment place
42) Entertainment place
43) Assembly place
44) Cinema
45) Recreational place
46) Sky terrace
47) F&B outlet
48) Fast food outlet
49) Outdoor Refreshment Area (ORA)
50) Food centre
51) Educational place
52) Serviced apartment
53) Hostel
54) Hotel
55) Backpacker hotel
56) Capsule hotel
57) Community club
58) Social club
59) Religious place
60) Park
61) Sports facility
62) Sports facility (ancillary)
63) Residential amenities
64) Train interchange station
65) Airport
66) Ferry terminal
67) Bus interchange
68) Train station
69) Bus terminal

Storage

70) Rail depot
71) Bus depot
72) Parking
73) Fully Automated Mechanized Car Park Buildings (FAMCP)
74) Warehouse
75) Chemical/ hazmat storage
76) Storage

Other

77) Airbase
78) Live firing area
79) Training area
80) Road tunnel
81) Campsite
82) Wet play field
83) Reservoir
84) River
85) Canal
86) Major drain
87) Pond
88) Lake
89) Other waterbody
90) Nature reserve*
91) Nature area*
92) School field
93) Promenade
94) Marina
95) Quarry

Modelling IFC+SG (Space Usage)

Occupancy Type for Small Residential Spaces

1) Single dwelling residential

Applicable for a bungalow, detached house, semi-detached house, or terrace house:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
I	Small residential	Detached, semi-detached, terrace house, including townhouse	-	*Exempted*	-	Residential
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

Occupancy Type for Other Residential Spaces

2) Multi-unit residential

Applicable for an apartment, condominium, flat, maisonette, or studio apartment:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
II	Other residential	Block of flats, maisonettes	1	Residential	Multi-story residential building	Residential
			Accessibility Code 2025 Table 1 Building Type			
			1	Residential		

Occupancy Types for Institutional Spaces

3) Supervisory care facility

Applicable for a detention centre, correction centre, dementia centre, psychiatric rehabilitation home, rehabilitation centre, home for the spastic, children's home, home for the intellectually disabled, pre/post-natal care centre, welfare home, orphanage, voluntary children home, boys'/ girls' home, adult disability home, sheltered home or assisted living facility:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (supervisory care facility)	Healthcare facility (inpatient)	15	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes	-	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			17	Nursing homes, homes for the aged and welfare homes		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Institutional Spaces

4) Supervisory care facility (detention)

Applicable for a prison holding area or police station holding area (with overnight stay):

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (supervisory care facility)	Healthcare facility (inpatient)	17	Worker Dormitories	-	Special use
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

5) Nursing care facilities

Applicable for a convalescent home, home for the aged, hospice or nursing home:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (nursing care facility)	Healthcare facility (inpatient)	15	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes	-	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			17	Nursing homes, homes for the aged and welfare homes		

6) Hospital with A&E services
7) Hospital without A&E services

Applicable for a public hospital, private hospital, community hospital or psychiatric hospital:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (hospital facility)	Healthcare facility (inpatient)	15	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes	Hospital, medical clinic, centre	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			15	Hospitals		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Institutional Spaces

8) Ambulatory care facility

Applicable for an aesthetic clinic, endoscopy clinic, non-mental rehabilitation day centre or renal dialysis day centre located within a complex:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (ambulatory care facility)	Healthcare facility (outpatient)	4	Shopping complexes and multi-purpose complexes	-	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			16	Polyclinics, health-care centres and specialist outpatient clinics		

9) Ambulatory care facility (standalone)

Applicable for a standalone building consisting of mainly ambulatory care facilities:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (ambulatory care facility)	Healthcare facility (inpatient)	15	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes	-	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			17	Nursing homes, homes for the aged and welfare homes		

10) Custodian care facility

Applicable for a mental rehabilitation day care centre, daycare centre, mentally/ intellectually disabled day care centre, senior activity centre, senior care centre, school for the spastic or psychiatric day care centre:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (custodian care facility)	Healthcare facility (outpatient)	15	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes	-	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			16	Polyclinics, health-care centres and specialist outpatient clinics		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Institutional Spaces

11) Primary school
Applicable for a primary school:

12) Secondary school
Applicable for a secondary school:

13) Custodian care facility (nursery)
Applicable for a childcare day centre, infant-care day centre or kindergarten for children under 6 years of age:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (custodian care facility)	Healthcare facility (outpatient)	13	Pre-schools, schools, colleges, universities and institutions of learning	Commercial (childcare)	Educational / institution
			Accessibility Code 2025 Table 1 Building Type			
			14a	Schools (a) Preschools, primary and secondary school		

14) Tertiary Education Institution
Applicable for a college, university, polytechnic, ITE:

15) Public education institution
Applicable for a public training institution or test centre:

16) Private education institution
Applicable for a commercial school or training institution:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (education / training)	Schools and educational buildings	13	Pre-schools, schools, colleges, universities and institutions of learning	-	Educational / institution
			Accessibility Code 2025 Table 1 Building Type			
			14b	Schools (b) Colleges, universities and other institutions of learning		

17) Tuition centre
Applicable for a tuition centre or enrichment centre:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (education / training)	Schools and educational buildings	-	*Follow Dominant Use*	Commercial (tuition centre)	Educational / institution
			Accessibility Code 2025 Table 1 Building Type			
			-	*Follow Dominant Use*		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Institutional Spaces

18) Worker dormitory

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
III	Institutional (worker lodging)	Hotels, boarding houses, serviced apartments, hostels, backpacker hotel, dormitories	17	Worker dormitories	-	Worker dormitories
			Accessibility Code 2025 Table 1 Building Type			
			19	Purpose-built workers' dormitories		

Occupancy Type for Office Spaces

19) Office

Applicable for a bank, stock broker, telephone/ telegraph operator, publisher, insurance / finance / real estate / advertising / employment / marketing agency, embassy (administrative office):

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
IV	Office	Offices	3	Office building	-	Office
			Accessibility Code 2025 Table 1 Building Type			
			3	Office buildings including Business Parks		

20) Telephone exchange/central office

Applicable for offices use for telecommunication purposes:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
IV	Office	Offices	3	Office building	-	-
			Accessibility Code 2025 Table 1 Building Type			
			3	Office buildings including Business Parks		

21) Factory office

Applicable for factory, utility, or warehouse buildings only:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
IV	Office	Offices	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	Office
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office/showroom areas in warehouses		

Modelling IFC+SG (Space Usage)

Occupancy Type for Shop Spaces

22) Shop

Applicable for a beauty salon, hairdressing salon, book store, boutique, confectionery outlet, gift shop, jewellery shop, laundry, laundromat, pawnshop, provisional shop, ticketing agency, travel agency, drugstore, pet clinic, vet clinic, pet hospital, vet hospital, animal hospital, pet shop, pet grooming , pet boarding, pet day care, take-away food kiosk (small trade / business involving sale of goods, retail, service) or showroom not located in warehouse/ factories:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
V	Shop	Shop, healthcare facility (outpatient)	4	Shopping complexes and multi-purpose complexes	Commercial (retail shops, dry shops)	Shop or shopping mall
			Accessibility Code 2025 Table 1 Building Type			
			4	Shopping centres and multi-purpose complexes		

23) ODA

Applicable for outdoor display area only:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
V	Shop	Shop, healthcare facility (outpatient)	4	Shopping complexes and multi-purpose complexes	-	-
			Accessibility Code 2025 Table 1 Building Type			
			4	Shopping centres and multi-purpose complexes		

24) Outpatient clinic

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
V	Shop	Shop, healthcare facility (outpatient)	4	Shopping complexes and multi-purpose complexes	-	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			16	Shopping centres and multi-purpose complexes		

25) Polyclinic

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
V	Shop	Shop, healthcare facility (outpatient)	15	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes	-	Hospitals, healthcare centres, clinics, nursing homes, homes for the aged and welfare homes
			Accessibility Code 2025 Table 1 Building Type			
			16	Polyclinics, health-care centres and specialist outpatient clinics		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Shop Spaces

26) Market

Applicable for a wet market:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
V	Shop	Shop, healthcare facility (outpatient)	11	Markets, hawker or food centres	Market	Supermarket / wet market
			Accessibility Code 2025 Table 1 Building Type			
			12	Markets, hawker or food centres and eating establishments		

27) Temporary showflat

Applicable for a standalone showflat:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
V	Shop	Shop, healthcare facility (outpatient)	-	*Exempted*	-	Temporary showflat
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

28) Factory showroom

Applicable for factory, utility, or warehouse buildings only:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
V	Shop	Shop, healthcare facility (outpatient)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	Factory showroom
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office/showroom areas in warehouses		

Modelling IFC+SG (Space Usage)

Occupancy Type for Factory Spaces

29) Petrol station

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	-	*Exempted*	-	Petrol Station
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

30) Factory

Applicable for an aircraft hangar, data centre, telecommunication exchange, vehicle repair / woodwork workshop, or factory for chemicals / consumable products / fireworks / glassware / metalwork / highly combustible substances / highly flammable products / incineration / oil refinery / pharmaceutical / rubber / ship building:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	Factories, workshops, industrial buildings and office / showroom areas in warehouses
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office / showroom areas in warehouses		

31) Food production factory

Applicable for a central kitchen, food production facility:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	Food Production Factory
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office / showroom areas in warehouses		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Factory Spaces

32) M&E area

Applicable for an M&E area within a building:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	-	*Exempted*	-	M&E area
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

33) Wafer fabrication plant

34) Trade effluent treatment plant

Applicable for a disinfection plant:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	-
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office / showroom areas in warehouses		

35) Waste management and recycling

36) Embalming facility

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	-
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office / showroom areas in warehouses		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Factory Spaces

37) Agriculture

Applicable for a farm or plant nursery (no visitor area):

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	Agriculture
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office / showroom areas in warehouses		

38) Animal related facility

Applicable for a pet crematorium, animal shelter, quarantine facilities (no visitor area):

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	Animal related facility
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office / showroom areas in warehouses		

39) High containment facility

Applicable for a containment lab of biosafety level 3 and 4:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	High containment facility
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

40) Electrical and gas facility

Applicable for a power generation plant, gas transmission or receiving station:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VI	Factory	Industrial buildings (factories, workshops, godowns, warehouses)	-	*Exempted*	-	-
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

Modelling IFC+SG (Space Usage)

Occupancy Type for Place of Public Resort Spaces

41) Body treatment place

Applicable for a massage establishment, foot reflexology, spa, gymnasium, fitness centre:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (body treatment)	Places of public resort and carpark	4	Shopping complexes and multi-purpose complexes	-	-
			Accessibility Code 2025 Table 1 Building Type			
			4	Shopping complexes and multi-purpose complexes		

42) Entertainment place

Applicable for an arcade, computing gaming / game machine area, karaoke lounge, night club or casino:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (entertainment)	Places of public resort and carpark	4	Shopping complexes and multi-purpose complexes	-	-
			Accessibility Code 2025 Table 1 Building Type			
			4	Shopping complexes and multi-purpose complexes		

43) Assembly place

Applicable for an auditorium, theatre or concert hall:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (entertainment)	Places of public resort and carpark	4	Shopping complexes and multi-purpose complexes	-	Conference hall, cinema, theatre, convention hall, exhibition hall
			Accessibility Code 2025 Table 1 Building Type			
			8	Places of public resort		

44) Cinema

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (entertainment)	Places of public resort and carpark	4	Shopping complexes and multi-purpose complexes	-	-
			Accessibility Code 2025 Table 1 Building Type			
			8	Places of public resort		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Place of Public Resort Spaces

45) Recreational place

Applicable for bowling / billiard / snooker / dart (leisure sport) facilities or an indoor play park:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (recreational)	Places of public resort and carpark	7	Places of public resort	-	-
			Accessibility Code 2025 Table 1 Building Type			
			8	Places of public resort		

46) Sky terrace

Applicable for garden or terrace within a building but not on-grade, roof, or mid level, excluding those in residential units:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (recreational)	Places of public resort and carpark	-	*Follow dominant use*	-	-
			Accessibility Code 2025 Table 1 Building Type			
			-	*Follow dominant use*		

47) F&B outlet

Applicable for a pub, bar, restaurant, coffee shop or café:

48) Fast food outlet

Applicable for a fast food outlet's queuing and dining areas:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (F&B)	Places of public resort and carpark	10	Restaurants and eating establishments	Food establishment	-
			Accessibility Code 2025 Table 1 Building Type			
			12	Markets, hawker or food centres and eating establishments		

49) Outdoor Refreshment Area (ORA)

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (F&B)	Places of public resort and carpark	10	Restaurants and eating establishments	-	-
			Accessibility Code 2025 Table 1 Building Type			
			12	Markets, hawker or food centres and eating establishments		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Place of Public Resort Spaces

50) Food centre

Applicable for a food court, hawker centre or canteen:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (F&B)	Places of public resort and carpark	11	Markets, hawker or food centres	Food establishment	-
			Accessibility Code 2025 Table 1 Building Type			
			12	Markets, hawker or food centres and eating establishments		

51) Educational place

Applicable for a museum, exhibition centre, convention centre, art centre, gallery or library:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (educational)	Places of public resort and carpark	7	Places of public resort	-	-
			Accessibility Code 2025 Table 1 Building Type			
			8	Places of public resort		

52) Serviced apartment

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (accommodation)	Hotels, boarding houses, serviced apartments, hostels, backpacker hotels, dormitories	6	Serviced apartments	-	-
			Accessibility Code 2025 Table 1 Building Type			
			6	Serviced apartments		

53) Hostel

Applicable for a student hostel, visitor hostel or staff quarter:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (accommodation)	Hotels, boarding houses, serviced apartments, hostels, backpacker hotels, dormitories	14	Hostels, halls of residence or dormitories	-	Residential
			Accessibility Code 2025 Table 1 Building Type			
			14c	Schools (c) Hostels, halls of residence and dormitories		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Place of Public Resort Spaces

54) Hotel

Applicable for a hotel, resort or boarding house:

55) Backpacker hotel

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (accommodation)	Hotels, boarding houses, serviced apartments, hostels, backpacker hotels, dormitories	5	Hotel, boarding houses, chalets and backpacker hotels	-	-
			Accessibility Code 2025 Table 1 Building Type			
			5	Hotel, boarding houses, chalets and backpacker hotels		

56) Capsule hotel

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (accommodation)	Hotels, boarding houses, serviced apartments, hostels, backpacker hotels, dormitories	5	Hotel, boarding houses, chalets and backpacker hotels	-	-
			Accessibility Code 2025 Table 1 Building Type			
			5	Hotel, boarding houses, chalets and backpacker hotels		

57) Community club

58) Social club

Applicable for a private club or association:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (social)	Places of public resort and carpark	7	Places of public resort	-	-
			Accessibility Code 2025 Table 1 Building Type			
			8	Places of public resort		

59) Religious place

Applicable for a church, mosque, temple, synagogue, funeral parlour, columbarium or crematorium visitor area:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (religious)	Places of public resort and carpark	7	Places of public resort	-	-
			Accessibility Code 2025 Table 1 Building Type			
			8	Places of public resort		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Place of Public Resort Spaces

60) Park

Applicable for an on-grade park, playground, but not part of or surrounded by building(s):

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
-	-	-	8	Parks and open spaces including zoos, civic plazas, etc	-	-
			Accessibility Code 2025 Table 1 Building Type			
			10	Parks and open spaces including civic plazas		

61) Sports facility

Applicable for a public sport complex, public swimming complex, swimming complex, stadium, indoor sports hall:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (recreational)	Places of public resort and carpark	9	Sports complexes and public swimming pools	-	Public swimming pool / stadium
			Accessibility Code 2025 Table 1 Building Type			
			7	Sports facilities and public swimming pools		

62) Sports facility (ancillary)

Applicable for a sport facility within a school:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (recreational)	Places of public resort and carpark	-	*Follow dominant use*	-	-
			Accessibility Code 2025 Table 1 Building Type			
			7	Sports facilities and public swimming pools		

63) Residential amenities

Applicable to amenities for use by residents in residential developments such as clubhouse, function room, reading room, BBQ pit, gym, swimming pool, but excluding sky terrace:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (recreational)	Places of public resort and carpark	1	Residential	-	-
			Accessibility Code 2025 Table 1 Building Type			
			1	Residential		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Place of Public Resort Spaces

64) Train interchange station
Applicable for a rapid transit system interchange station such as MRT interchange or LRT interchange:

65) Airport
Applicable for an airport terminal:

66) Ferry terminal
Applicable for a ferry terminal or a cruise center:

67) Bus interchange
Applicable for a bus interchange (in close proximity to MRT):

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (transportation)	Places of public resort and carpark	12	Transport stations, interchanges, and passenger terminals	-	-
			Accessibility Code 2025 Table 1 Building Type			
			13b	Transport terminals and stations(b) Major transport terminals/interchanges		

68) Train station
Applicable for a rapid transit system (MRT or LRT) station (with single line):

69) Bus terminal
Applicable for a bus terminal (standalone):

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VII	Place of public resort (transportation)	Places of public resort and carpark	16	Factories, workshops, industrial buildings and office/ showroom areas in warehouses	-	-
			Accessibility Code 2025 Table 1 Building Type			
			13a	Transport terminals and stations(a) Standalone transport terminals		

Occupancy Type for Storage Spaces

70) Rail depot
71) Bus depot

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VIII	Storage	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	-
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office/showroom areas in warehouses		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Storage Spaces

72) Parking

Applicable for non-mechanized vehicle parking:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VIII	Storage	Places of public resort and carpark	18	Vehicle parks	-	-
			Accessibility Code 2025 Table 1 Building Type			
			-	*Follow dominant use*		

73) Fully Automated Mechanized Car Park Buildings (FAMCP)

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VIII	Storage	Industrial buildings (factories, workshops, godowns, warehouses	18	Vehicle parks	-	-
			Accessibility Code 2025 Table 1 Building Type			
			-	*Follow dominant use*		

74) Warehouse

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VIII	Storage	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	-
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office/showroom areas in warehouses		

75) Chemical/ hazmat storage

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VIII	Storage	Industrial buildings (factories, workshops, godowns, warehouses)	16	Factories, workshops, industrial buildings and office / showroom areas in warehouses	-	-
			Accessibility Code 2025 Table 1 Building Type			
			18	Factories, workshops, industrial buildings and office/showroom areas in warehouses		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Place of Storage Spaces

76) Storage

Applicable for all other storage spaces:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
VIII	Storage	Follow dominant use	-	*Follow dominant use*	-	-
			Accessibility Code 2025 Table 1 Building Type			
			-	*Follow dominant use*		

Occupancy Type for Other Spaces

77) Airbase

78) Live firing area

79) Training area

80) Road Tunnel

Applicable for all underground road network:

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
-	Exempted	-	-	*Exempted*	-	-
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

81) Campsite

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
-	Exempted	-	8	Parks and open spaces	-	-
			Accessibility Code 2025 Table 1 Building Type			
			10	Parks and open spaces including civic plazas		

Modelling IFC+SG (Space Usage)

(Continued) Occupancy Type for Other Spaces

82) Wet play field
83) Reservoir
84) River
85) Canal
86) Major drain
87) Pond
88) Lake
89) Other waterbody
90) Nature reserve*
91) Nature area*

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
-	Exempted	-	8	Parks and open spaces	-	-
			Accessibility Code 2025 Table 1 Building Type			
			10	*Parks and open spaces including civic plazas - Exempted*		

92) School field

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
-	Exempted	-	8	Parks and open spaces	-	-
			Accessibility Code 2025 Table 1 Building Type			
			10	Parks and open spaces including civic plazas - Education		

93) Promenade
94) Marina

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
-	Exempted	-	8	Parks and open spaces	-	-
			Accessibility Code 2025 Table 1 Building Type			
			10	Parks and open spaces including civic plazas		

95) Quarry

SCDF			BCA		PUB	NEA
Table 1.4A Purpose Group		Table 2.2A Type of Occupancy	Accessibility Code 2019 Table 1 Building Type		Sewerage and Sanitary Works (SSW)	
-	Exempted	-	8	Parks and open spaces	-	-
			Accessibility Code 2025 Table 1 Building Type			
			-	*Exempted*		

*Code requirements only apply where there are buildings

Modelling IFC+SG (Space Usage)

Space Name Categories

Space Names have been standardized from spaces required across BCA, LTA, NEA, PUB and SCDF requirements, into the following categories:

1) Living spaces
2) Temporary residences
3) Non-residential toilet Spaces (for spaces with WC)
4) Resting, care, hygiene spaces (for spaces without WC)
5) Commercial, work, institutional spaces
6) F&B spaces
7) Medical, healthcare spaces
8) Assembly spaces
9) Supporting spaces for performing
10) Entertainment, recreation spaces
11) Open spaces and open-sided spaces
12) M&E spaces
13) Storage spaces
14) Commuter facilities
15) Circulation spaces
16) Other non-simultaneous spaces

There are identical Space Names duplicated across different Space Name Categories, e.g. Bedroom is listed under 1) Living spaces and 2) Temporary residences. This is because the SCDF Occupancy Load (OL) will differ depending on where the Bedroom is located.

Thus, all Spaces should be accompanied by both **SpaceName** and **OccupancyType** parameters.

1) Living spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Balcony	**12**	Household Shelter	Apartment (Residential) Maisonettes (Residential)
2	Bedroom	**13**	Kitchen	
3	Master Bedroom	**14**	Living Room	
4	Maid Room	**15**	Living Area	
5	Guestroom	**16**	Loft	
6	Bathroom	**17**	Private Lift Lobby	
7	Master Bath	**18**	Private Enclosed Space	
8	Maid Bath	**19**	Service Yard	
9	Yard Bath	**20**	Study	
10	Dining Room	**21**	Toilet	
11	Dining Area	**22**	Walk-in Wardrobe	

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

2) Temporary residences

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Guestroom**	Guestroom/ Accommodation Unit - (Backpacker Hotel, Hostel)
2		Guestroom, Accommodation Unit - (Boarding House, Hotel, Serviced Apartment, Student Hostel, Staff Hostel / Quarter)
3		Guestroom, Accommodation Unit - (Capsule Hotel)
4	Bedroom	Guestroom/ Accommodation Unit - (Dormitory)
5	Student Bedroom Individual	Guestroom, Accommodation Unit - (Boarding House, Hotel, Serviced Apartment, Student Hostel, Staff Hostel / Quarter)
6	Student Bedroom Multipax	Guestroom/ Accommodation Unit - (Backpacker Hotel, Hostel)
7	Staff Quarters	Guestroom, Accommodation Unit - (Boarding House, Hotel, Serviced Apartment, Student Hostel, Staff Hostel / Quarter)
8	Housekeeping	Housekeeping

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL Factor of Guestroom Space will depend on what is indicated in its Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - AmbulantDisabled, BarrierFreeAccessibility, ChildrenFriendly, LargerAccessible and Retrofit .**

3) Non-residential toilet spaces (for spaces with WC)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Bathroom^	-	-	Bathroom
2	Toilet	**8**	Common Toilet	Toilet
3	Isolation Ward Toilet	**9**	Individual Family Washroom	
4	Accessible Washroom	**10**	Washroom with Shower^^	
5	Male Toilet	**11**	Powder Room	
6	Female Toilet	**12**	Accessible Changing Room	
7	Unisex Toilet	-	-	

4) Resting, care, hygiene spaces (for spaces without WC)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Bathroom	**3**	Male Shower Room	Bathroom
2	Shower Stall^^	**4**	Female Shower Room	
5	Changing Room	**7**	Female Changing Room	Changing Room
6	Locker Room	**8**	Male Changing Room	
9	Sick Room	-	-	Sickroom
10	Restroom	**12**	Lactation Room	Toilet
11	Nursing Room	**13**	Wash Area	

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
^ NEA's Bathroom refers to a Bathroom with Bench (BR) only
^^ NEA's Washroom with Shower and Shower Stall refers only to a Bathroom with Bench (BR) or Bench with Hanger (BH).

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

5) Commercial, work, institutional spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Archive Room (Reading)	Archive Room - (Reading Area)
2	Archive Room (Stack)	Archive Room - (Stack Area)
3	Ball Room	Ball Room
4	Banking Hall	Banking Hall
5	Bazaar	Bazaar
6	Business Centre	Business Centre/ Business Office
7	Business Office	
8	Cashier	Office - (Admin/ General)
9	Classroom	Classroom
10	Clean Room	Production Area
11	Computer Classroom	Computer Classroom
12	Common Room	Common Room
13	Computer Room	Computer Room
14	Conference Room	Conference Room
15	Concierge	Reception Area
16	Consultant Room	Consultant Room
17	Crematoria	Crematoria
18	Dance Studio	Dance Studio
19	Department Store	Department Store
20	Design Studio	Design Studio
21	Detention Room	Detention Room
22	Exposition	Exposition/ Trade Fair Area
23	Trade Fair Area	
24	Filing Room	Filing Room/ Store
25	Store	Storage/ Store Room
26	Fire Command Centre	Office - (Admin/ General)
27	Function Room	Function Room
28	Guard House	Office - (Admin/ General)
29	Hobby Room	Hobby Room

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

5) Commercial, work, institutional spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
30	Exhibits Gallery	Gallery - (Exhibits)
31	Choir Gallery	Gallery - (Choir)
32	Prayer Gallery	Gallery - (Prayer)
33	Seating Gallery	Gallery - (Seating)
34	Trading Gallery	Gallery - (Trading)
35	Viewing Gallery	Gallery - (Viewing)
36	Kiosk	Shop
37	Laboratory**	Laboratory – (Schools/ Colleges/ Tertiary Institutions)
		Laboratory – (Others)
38	Laundry	Laundry – (With Machine Operation)
39	Laundry	Laundry - (Others)
40	Library Room (Stack)	Library Room - (Stack Area)
41	Library Room (Reading)	Library Room - (Reading Area)
42	Lounge	Lounge
43	Machine/ Printing Room	Machine/ Printing Room
44	Mailroom	Office – (Admin/ General)
45	Meeting Room	Meeting Room
46	Music Studio	Dance Studio
47	Night Club	Night Club
48	Admin Office	Office – (Admin/ General)
49	General Office	
50	Ancillary Office	
51	Director Office	Office – (Director/ Manager Room)
52	Manager Office	
53	Drafting Office	Office – (Drafting Room/ Area)
54	Outdoor Display Area	Shop
55	Packing Area	Packing Area/ Distribution Area
56	Distribution Area	
57	Pantry	Pantry

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL Factor of Laboratory Space will depend on what is indicated in its Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

5) Commercial, work, institutional spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
58	Prayer Hall	Prayer Hall
59	Prayer room	
60	Male prayer room	
61	Female prayer room	
62	Pre-Function Room	Pre-Function Room
63	Production Area	Production Area
64	Promotion Area	Promotion Area
65	Reading Room	Reading Room
66	Reception Area	Reception Area
67	Seminar Room	Seminar Room
68	Security Room	Office – (Admin/ General)
69	Service Area	Service Area
70	Shed	Multi-purpose hall/room - (Others)
71	Shop	Shop
72	Showflat	Showroom
73	Showroom	Showroom
74	Society Room	Society Room
75	Spray Painting Room	Workshop – (Industrial Buildings)
76	Staff Office	Staff Office
77	Staff Lounge	Staff Lounge
78	Supermarket	Supermarket
79	Therapy Centre	Therapy Centre
80	Ticketing Office	Ticketing Office
81	Trading Floor	Trading Floor
82	Visitors Lounge	Visitors Lounge
83	Waiting Area	Waiting Area
84	Workshop**	Workshop – (Institutional Buildings)
85		Workshop – (Industrial Buildings)

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL Factor of Workshop Space will depend on what is indicated in its Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

6) F&B spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Bar	Bar/ Pub
2	Pub	
3	Cafe	Cafeteria
4	Cafeteria	
5	Canteen	Canteen
6	Dining Area**	Dining Area – (Hawker Centre)
		Dining Area – (Fast Food Outlet)
		Dining Area - (Others)^ *^that are not Hawker Centre or Fast Food Outlet*
7	Food Stall	Shop
8	Kiosk	
9	Kitchen	Kitchen/ Service Area
10	Service Area	
11	Service Counter	
12	Restaurant	Restaurant
13	Snack Bar	Snack Bar
14	Staff Canteen	Staff Canteen

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL Factor of Dining Area Space will depend on what is indicated in its Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

7) Medical, healthcare spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Area of Refuge**	Area of Refuge – (Ambulatory Care Facility)
		Area of Refuge – (Custodian Care Facility)
		Area of Refuge – (Custodian Care Facility (Nursery))
		Area of Refuge – (Hospital)
		Area of Refuge – (Hospital without Patient Accommodation)
		Area of Refuge – (Nursing Care Facility)
		Area of Refuge – (Nursing Care Facility without Patient Accommodation)
		Area of Refuge – (Supervisory Care Facility)
		For Area of Refuge which do not fall within the above Functional Spaces, please refer to *Fire Code Cl.2.2.15a.*
2	Clinic	Shop
3	Consultation Room	Consultant Room
4	Examination Room	Examination Room
5	Surgical Viewing Gallery	Gallery – (Surgical Viewing)
6	Laboratory	Laboratory – (Healthcare Occupancy)
7	Nurse Station	Nurse Station
8	Operation Theatre	Operation Theatre
9	Outpatient Waiting Area	Outpatient Waiting Area
10	Patient Accommodation Intensive Care	Patient Accommodation – (Intensive Care)
11	Patient Accommodation Ward	Patient Accommodation – (Ward)
12	Isolation Ward	
13	Pharmacy Staff Area	Pharmacy – (Staff Area)
14	Pharmacy Waiting Area	Pharmacy – (Public Waiting Area)
15	Treatment Room	Treatment Room

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL Factor of Area of Refuge Space will depend on what is indicated in its Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.** For spaces that require indication of benches or seating in the Assembly Space, please model these components. Refer to Seating.

8) Assembly Spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Amphitheatre	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
2	Amphitheatre without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
3	Auditorium	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
4	Auditorium without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
5	Cinema	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
6	Cinema without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
7	Grandstand**	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
8	Grandstand without fixed seating**	Auditorium/ Theatre – (without Individual Fixed Seating)
9	Assembly Hall	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
10	Assembly Hall without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
11	Concert Hall	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
12	Concert Hall without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
13	Exhibition Hall	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
14	Exhibition Hall without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
15	Conference Hall	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
16	Conference Hall without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
17	Function Hall	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
18	Function Hall without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** NEA's Grandstand-related Spaces refer to Stadium Spaces only

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.** For spaces that require indication of benches or seating in the Assembly Space, please model these components. Refer to Seating.

8) Assembly Spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
19	Lecture Room	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
20	Lecture Room without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
21	Spectator Area	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
22	Spectator Area without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
23	Theatre	Auditorium/ Theatre – (with Fixed Bench Seating)
		Auditorium/ Theatre – (with Individual Fixed Seating)
24	Theatre without fixed seating	Auditorium/ Theatre – (without Individual Fixed Seating)
25	Indoor Sports Hall**	Indoor Sports Hall – (School With Multi-Purpose Hall)
		Indoor Sports Hall – (School Without Multi-Purpose Hall)
		Indoor Sports Hall – (Others)
26	Multi-purpose Hall**^	Multi-purpose Hall/ Room – (School/ Colleges)
		Multi-purpose Hall/ Room – (Others)
27	Multi-Purpose Room**^	Multi-purpose Hall/ Room – (School/ Colleges)
		Multi-purpose Hall/ Room – (Others)
28	Multi-purpose Sports Hall**^	Multi-purpose Sports Hall – (Public Sports Complex)
		Multi-purpose Sports Hall – (Public Swimming Complex)
		Multi-purpose Sports Hall – (Stadium)
		Multi-purpose Sports Hall – (Others)

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL of Indoor Sports Hall, Multi-purpose Hall, Multi-purpose Room, Multi-purpose Sports Hall Spaces will depend on what is indicated in each Space's Occupancy Type
^ NEA's Multi-purpose Hall, Multi-purpose Room and Multi-purpose Sports Hall Spaces refer to Stadium Spaces only

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

9) Supporting spaces for performing

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Audio Visual Area	Audio Visual Control Room for Theatres / Cinemas / Concert Halls
2	Audio Visual Control Room	
3	Audio Visual Lighting Control Room	
4	Live Entertainment	Visitors Lounge
5	Live Performance	
6	Orchestral Pit	Orchestral Pit
7	Projection Room	Projection Room – (Theatres / Cinemas / Concert Halls)
		Projection Room – (Others)
8	Back Stage**	Stage, Front / Back – (Schools / Colleges / Tertiary Institutions)
		Stage, Front / Back – (Theatres / Cinemas / Concert Halls)
9	Front Stage**	Stage, Front / Back – (Schools / Colleges / Tertiary Institutions)
		Stage, Front / Back – (Theatres / Cinemas / Concert Halls)

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL of Back Stage and Front Stage will depend on what is indicated in each Space's Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

10) Entertainment, recreation spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName" +	SCDF Functional Space*
1	Amusement Park	Amusement Park - (excluding Machine Area)
2	Billiards Room	Billiards Room
3	Body Massage	Spa
4	Bowling Alley	Bowling Alley - (excluding Bowling Lane)
5	Bowling Lane	Lobby
6	Casino	Indoor Games Room
7	Children Playground	Children Playground - (including Playground Equipment)
8	Water Playground	
9	Interactive Water Fountain	
10	Club Room	Club Room
11	Discotheque Dancing Area	Discotheque – (including Dine & Dance Area)
12	Discotheque Dining Area	
13	Foot Reflexology	Spa
14	Hockey Field	Field – (Hockey / Soccer)
15	Hockey Pitch	
16	Rugby Field	Field – (Rugby)
17	Rugby Pitch	
18	Soccer Field	Field – (Hockey / Soccer)
19	Soccer Pitch	
20	Fitness Corner	Fitness Club / Centre
21	Fitness Club	
22	Fitness Centre	
23	Gaming Centre	Indoor Games Room
24	Gymnasium	Gymnasium
25	Health Club	Health Club/ Health Centre
26	Health Centre	
27	Indoor Games Room	Indoor Games Room
28	Karaoke Lounge	Karaoke Lounge
29	Karaoke Dining Area	

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

10) Entertainment, recreation spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName" +	SCDF Functional Space*
30	Recreation Room	Recreation Room
31	Refreshment Area	Refreshment Area
32	Skating Rink	Skating Rink – (Rink Area)
33	Skating Rink – Spectator Area	Skating Rink – (Spectator Area)
34	Spa	Spa
35	Hot Tub	
36	Jacuzzi	
37	Badminton Court	Sports Court – Badminton Court
38	Basketball Court	Sports Court – Basketball Court
39	Basketball Half Court	Sports Court – Basketball Court (Half-court)
40	Futsal Court	Sports Court – Futsal Court
41	Netball Court	Sports Court - Netball Court
42	Netball Half Court	Sports Court - Netball Court (Half-court)
43	Squash Court	Sports Court – Squash Court
44	Sepak Takraw Court	Sports Court – Sepak Takraw Court
45	Tennis Court	Sports Court –Tennis Court
46	Tennis Half Court	Sports Court – Tennis Court (Half-court)
47	Volleyball Court	Sports Court – Volleyball Court
48	Swimming Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment
49	Family Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

10) Entertainment, recreation spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName" +	SCDF Functional Space*
50	Hydrotherapy Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment
51	Kids Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment
52	Lap Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment
53	Leisure Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL of Swimming Pool and Swimming Pool Deck will depend on what is indicated in its Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

10) Entertainment, recreation spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName" +	SCDF Functional Space*
54	Spa Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment
55	Wading Pool**	Swimming Pool – Condominium/ Apartment
		Swimming Pool – Hotel
		Swimming Pool – Private Club
		Swimming Pool – Public Sports Complex
		Swimming Pool – Public Swimming Complex
		Swimming Pool – Serviced Apartment
56	Swimming Pool Deck**	Swimming Pool Deck – Condominium/ Apartment
		Swimming Pool Deck – Hotel
		Swimming Pool Deck – Private Club
		Swimming Pool Deck – Public Sports Complex
		Swimming Pool Deck – Public Swimming Complex
		Swimming Pool Deck – Serviced Apartment
57	Training Area	Training Area– Public Sports Complex
		Training Area – Public Swimming Complex
		Training Area - Stadium

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL of Swimming Pool and Swimming Pool Deck will depend on what is indicated in its Occupancy Type

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

11) Open spaces and open-sided spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Backyard	Lobby
2	Courtyard	Lobby
3	Service Yard	Service Area
4	Outdoor Refreshment Area	Dining Area – (Others)
5	Pavilion	Multi-purpose Hall / Room – (Others)
6	Roof	Roof (Access for Maintenance only)
7	Green Roof (public)	Roof Garden/ Roof Terrace, Public – (Other Areas)
	Green Roof (access for maintenance only)	Mechanical plant room
8	Private Roof Garden	Roof Garden/ Roof Terrace, Private (Non-Simultaneous Part of Individual Residential Unit)
9	Jogging Track	Roof Garden/ Roof Terrace, Public (Jogging Track/ Designated Foot Path ≤ 3m in width)
10	Footpath	
11	Roof Garden***	Roof Garden/ Roof Terrace, Public (Planter Box < 300mm High)
		Roof Garden/ Roof Terrace, Public (Planter Box ≥ 300mm (covered fully with trees/shrubs))
		Roof Garden/ Roof Terrace, Public (Planter Box ≥ 300mm, ≤ 500mm High (Turf))
		Roof Garden/ Roof Terrace, Public (Planter Box > 500mm High (Without Step or Ramp Access))
		Roof Garden/ Roof Terrace, Public (Sunken / Elevated Water Feature < 300mm in Depth or Height)
		Roof Garden/ Roof Terrace, Public (Sunken / Elevated Water Feature ≥300mm in Depth or Height)
12	Sunken Planting Area***	Roof Garden/ Roof Terrace, Public (Sunken Planting Area (Fully Covered with Trees or Shrubs))
		Roof Garden/ Roof Terrace, Public (Sunken Planting Area (Turf))
13	Roof Garden**	Roof Garden/ Roof Terrace, Public (Other Areas)
14	Garden	

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the OL of Roo Garden Spaces will depend on what is indicated in each Space's Occupancy Type
*** Note that the Roof Garden spaces must ensure the following:
(i) Planter Boxes and Water Features are indicated if applicable
(ii) "TRUE/FALSE" have been indicated for the following IFC+SG properties – FullyCoveredWithTreesShrub, StepRampAccess

Modelling IFC+SG (Space Usage)

12) M&E spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Battery Room	29	Hydraulic Lift Motor Room	Mechanical Plant Room
2	Cooling Tower	30	Lift Machine Room	
3	Equipment Disinfection Room	31	Lift Motor Room	
4	Equipment Washing Bay	32	Low Voltage Switch Room	
5	Lubrication Bay	33	Oil Tank Room	
6	Pulley Room	34	Sprinkler Tank Room	
7	Mechanical Plant Room	35	Telecommunication Room,	
8	AC Plant Room	36	Equipment Room	
9	AHU Room	37	Transformer Room	
10	Boiler Room	38	Wet Riser Tank Room	
11	Boiler Room (Oil Fired)	39	Electrical Switchgear Room	
12	Chiller Room	40	PABX Room	
13	Discharge Valve Room	41	Server Room	
14	Electric Lift Motor Room	42	MDF Room	
15	Electrical Room	43	Mobile Installation Space	
16	Essential Fan Room	44	Mobile Deployment Space	
17	Fire Pump Room	45	Electronics Parking System Room	
18	Balancing Pump Room	46	Police Equipment Room	
19	Domestic Pump Room	47	Vent Room	
20	Irrigation Pump Room	48	Substation	
21	Potable Water Pump Room	49	Meter Compartment	
22	Sprinkler Pump Room	50	Domestic Transfer Tank Room	
23	Pumped Sanitary Pump Room	51	Hosereel Tank Room	
24	Pumped Drainage System Room	52	Hydrant Tank Room	
25	Ejector Room	53	NEWater Tank Room	
26	Emergency Generator Room	54	Non-potable Water Tank Room	
27	Generator Room	55	Potable Water Tank Room	
28	High Voltage Switch Room	-	-	

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.

Modelling IFC+SG (Space Usage)

12) M&E spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
56	Balancing Tank	**62**	NEWater Tank	Water Tank
57	Detention Tank	**63**	Potable Water Tank	
58	Domestic Water Tank	**64**	Pneumatic Tank	
59	Domestic Booster Tank	**65**	Rainwater Harvesting Tank	
60	Hot Water Tank	**66**	Irrigation Tank	
61	Make Up Water Tank	**67**	Sprinkler Tank	

13) Storage spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Bin Centre	**7**	Refuse Room	Storage / Store Room
2	Bin Point	**8**	Refuse Chute Chamber	
3	Recycling Point	**9**	Recyclables Chute Chamber	
4	Main Recycling Point	**10**	Storage	
5	Coldroom	**11**	Storeroom	
6	Deposit Room	**12**	Strong Room	
13	Mortuary	**-**	-	Mortuary
14	Hazardous Waste Storage Area	**15**	Industrial Waste Storage Area	General Storage
16	Warehouse	**-**	-	

14) Commuter facilities

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Driveway	**3**	Parking Place**	Car Parking Area
2	Garage	**4**	Vehicle Washing Bay	
5	Loading/ Unloading Bay	**6**	Loading Platform/ Unloading Platform	Loading / Unloading Area
7	Alighting Point	**11**	Bus Stop	Lobby
8	Boarding Point	**12**	Taxi Bay	
9	Car Lobby	**13**	Taxi Shelter	
10	Drop Off Point	-	-	

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** Note that the vehicle type of Parking Place Spaces shall be declared in IFC+SG property "ParkingType".

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

15) Circulation spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Bed Lift Lobby	**7**	Passenger Lift Lobby	Lobby
2	Cargo Lift Lobby	**8**	Protected Lobby	
3	Common Lobby	**9**	Smoke-Free Lobby	
4	Evacuation Lift Lobby	**10**	Service Lift Lobby	
5	Goods Lift Lobby	**11**	Private Lift Lobby	
6	Fire Lift Lobby	-	-	
12	Equipment Platform	**19**	External Corridor	Corridor
13	Promenade	**20**	Open Walkway	
14	Boardwalk	**21**	Covered Walkway	
15	Through-Block Link	**22**	Footway	
16	Access Aisle	**23**	Pathway	
17	Private Corridor	**24**	Veranda	
18	Corridor	**25**	Void Deck	
26	External Exit Passageway	**30**	External Exit Staircase**	*Refer to Fire Code Cl.2.2.4*
27	Internal Exit Passageway	**31**	Internal Exit Staircase**	
28	External Exit Ramp***	**32**	Staircase**	
29	Internal Exit Ramp***	-	-	

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.
** All Staircase Spaces must include modelling of staircase components (IfcStair). IfcStair components representing Hardwood Staircases should indicate "Hardwood" for the Material parameter.
*** All Ramp Spaces must include modelling of ramp components (IfcRamp).

Modelling IFC+SG (Space Usage)

➢ **For the spaces below, please indicate "TRUE/FALSE" for the IFC+SG properties - BarrierFreeAccessibility, ElderlyFriendly.**

15) Circulation spaces (continued from previous page)

S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
33	Atrium	Atrium Floor
34	Concourse	Concourse
35	Foyer	Foyer – (Bus / Airport / Ferry Terminal or Station)
36	Passenger Arrival Area	Passenger Arrival / Departure Areas – (Bus / Airport / Ferry)
37	Passenger Departure Area	
38	Pedestrian Linkway (with commercial activities)	Pedestrian linkways (aboveground or underground) - with commercial activities
39	Pedestrian Linkway (building to Rapid Transit Stations without commercial activities)	Pedestrian linkways (aboveground or underground) - building to Rapid Transit Stations (e.g., Mass Rapid Transit (MRT)) without commercial activities
40	Pedestrian Linkway (building to building without commercial activities)	Pedestrian linkways (aboveground or underground) - building to building without commercial activities
41	Pedestrian Linkway (standalone type without commercial activities)	Pedestrian linkways (aboveground or underground) - standalone type without commercial activities

16) Other non-simultaneous spaces

S/N	Property Values to input for the IFC+SG Property "SpaceName"	S/N	Property Values to input for the IFC+SG Property "SpaceName"	SCDF Functional Space*
1	Airlock	**10**	Chilled Water Shaft	Corridor
2	Dry Riser Shaft	**11**	Sewerage Shaft	
3	Electrical Shaft	**12**	Exhaust Shaft	
4	Gas Shaft	**13**	Refuse Chute	
5	Ventilation Shaft	**14**	Recyclables Chute	
6	Water Shaft	**15**	Household non-Shelter	
7	Wet Riser Shaft	**16**	Storey Shelter	
8	Lift Shaft	**17**	Storey non-Shelter	
9	Telecommunication Shaft	-	-	
18	Airwell (non-accessible)	**19**	Letter Box	Lobby
20	Staircase Storey Shelter	**21**	Staircase Storey non-Shelter	*Refer to Fire Code Cl.2.2.4*
22	Rest Area	-	-	Restroom

*For the corresponding OL Factors, please refer to TABLE 1.4B: OCCUPANT LOAD FACTORS of the SCDF Fire Code, or unless otherwise stated.

Modelling IFC+SG (Space Usage)

Other Space Usage IFC+SG parameters

In addition to Occupancy Type and Space Name parameters and values listed earlier, some space components may require additional parameters listed below.

IFC Entity: IfcSpace					
IFC SubType: SPACE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Accreditation_MAS	Boolean	-	Yes	TRUE / FALSE
2	AmbulantDisabled	Boolean	-	Yes	TRUE / FALSE
3	Area	Area	m^2	No*	-
4	BarrierFreeAccessibility	Boolean	-	Yes	TRUE / FALSE
5	ChildrenFriendly	Boolean	-	Yes	TRUE / FALSE
6	CValue	Text	-	No	0.45 - 1
7	ElderlyFriendly	Boolean	-	Yes	TRUE / FALSE
8	EmergencyVoiceCommunicationSystem	Text	-	Yes	1-way EVC System, 2-way EVC System, Public Address System.
9	FireDetectionAndSuppressionSystem	Text	-	Yes	Automatic Fire Alarm System, Automatic Sprinkler System, Water Mist System, Video Image Fire Detector System, Kitchen Hood Fire Extinguishing System, Clean Agent Fire Extinguishing System, Automatic Foam Sprinkler System, Foam Extinguisher System
10	FireEmergencyVentilationMode	Text	-	Yes	Natural Ventilation, Mechanical Ventilation, Pressurisation, Cross-ventilation, Cross-ventilation with Intermediate Ventilation Opening, Vapour Extraction System (for spray painting room)
11	FireExit	Boolean	-	Yes	TRUE / FALSE
12	FullyCoveredWithTreesShrubs	Boolean	-	Yes	TRUE / FALSE
13	HearingEnhancement	Boolean	-	Yes	TRUE / FALSE
14	Height	Length	mm	No*	-
15	LargerAccessible	Boolean	-	Yes	TRUE / FALSE
16	OccupancyLoad	Real	-	No	-
17	OccupancyType	Text	-	Yes	Refer to list of Occupancy Types in Modelling IFC+SG (Space Usage) chapter
18	ParkingType	Text	-	No	Bicycle, Motorcycle
19	PurposeGroup	Text	-	No	I, II, III
20	RefuseOutput	Real	-	No	120, 200-

* Parameter is populated from the dimensions of BIM elements modelled.

Modelling IFC+SG (Space Usage)

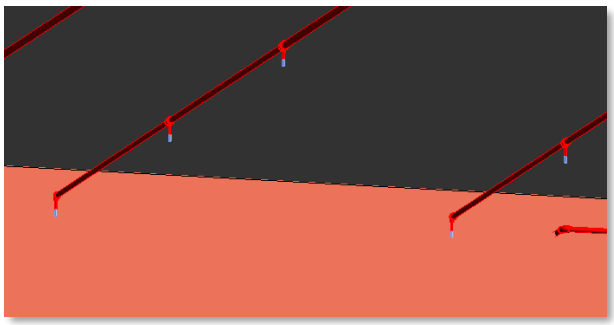
Other Space Usage IFC+SG parameters (continued from previous page)

In addition to Occupancy Type and Space Name parameters and values listed earlier, some space components may require additional parameters listed below.

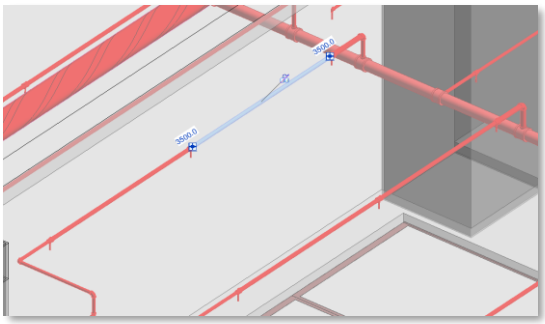
IFC Entity: IfcSpace					
IFC SubType: SPACE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
21	Retrofit	Boolean	-	Yes	TRUE / FALSE
22	SmokeControlSystem	Text	-	Yes	Smoke Vent, Smoke Purging System, Ductless Jet Fan System, Engineered Smoke Control System
23	SoundPowerLevel	Text	-	No	-
24	SoundPressureLevel	Text	-	No	-
25	SpaceName	Text	-	Yes	Refer to list of Space Names in Modelling IFC+SG (Space Usage) chapter
26	StepRampAccess	Boolean		Yes	TRUE / FALSE
27	TwentyFourHourMannedStation	Boolean		Yes	TRUE / FALSE
28	UnitNumber	Text	-	No	-
29	VentilationMode	Text	-	Yes	Natural Ventilation, Air Conditioning, Mechanical Ventilation
30	VentilationType	Text	-	No	Cross Ventilation
31	Volume	Volume	m^3	No*	-

* Parameter is populated from the dimensions of BIM elements modelled.

Sprinkler (Non-Fire; For NEA)



S4 – Fig 122 : Exposed Sprinkler



S4 – Fig 123 : Sprinkler

S4 – Fig 124 : Sprinkler

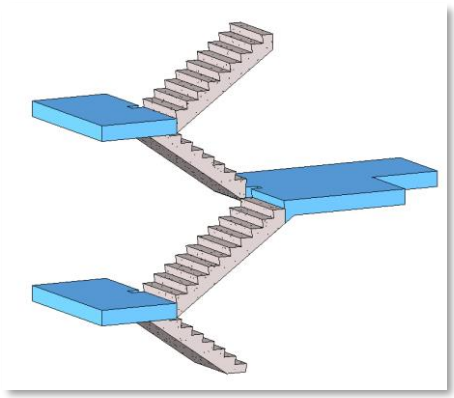
By IFC Representation

IFC Entity: IfcSanitaryTerminal					
IFC SubType: SPRINKLER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	-
2	SystemName	Text	-	No	-

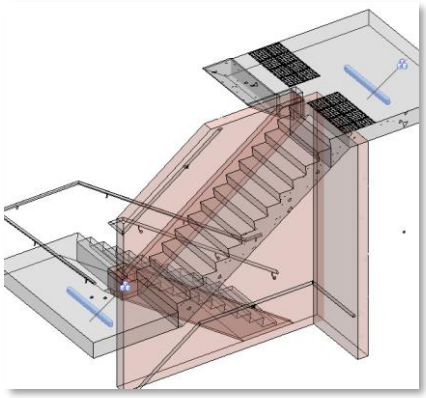
Notes

- Refer to **Space Usage (Others)** for representation of Sprinkler for Fire Protection purposes
- Refer to **System** for full list of system types that can be provided under "SystemType" property.

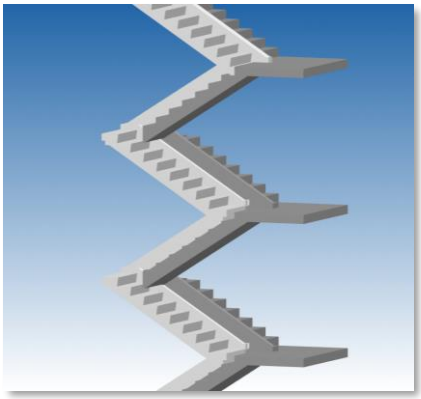
Staircase



S4 – Fig 125 : Precast Staircase



S4 – Fig 126 : Staircase



S4 – Fig 127 : Staircase

Modelling Staircase in IFC+SG

- All the stair elements shall be modelled in IFC+SG model with the necessary information required as stipulated in the tables below.
    - The reinforcement for stair shall be indicated in IFC+SG parameters and substantiate with stair reinforcement details in 2D drawings.
- 2D detail drawings are allowed for the connection details of stairs with the indication of drawing number in the IFC+SG parameter "ReferTo2DDetail".
- IFC+SG parameters to be included for any irregular, or complex staircase element:
    - ConstructionMethod
    - ReferTo2DDetail
    - Mark
    - MaterialGrade
    - Thickness (if applicable)

Staircase

By IFC Representation

➢ **Parameters below are intended for architectural model**

IFC Entity: IfcStair						
IFC SubType: CURVED_RUN_STAIR, SPIRAL_STAIR, STRAIGHT_RUN_STAIR, DOUBLE_RETURN_STAIR, HALF_TURN_STAIR, QUARTER_TURN_STAIR, THREE_QUARTER_TURN_STAIR						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	FireExit	Boolean	When required / relevant	-	Yes	TRUE / FALSE

IFC Entity: IfcStairFlight						
IFC SubType: CURVED, SPIRAL, WINDER, STRAIGHT						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	NumberOfRisers	Integer	All staircase	-	No	-
2	RiserHeight	Length	All staircase	mm	No	-
3	NumberOfTreads	Integer	All staircase	-	No	-
4	TreadLength	Length	All staircase	mm	No	-
5	MaterialGrade	Text	All staircase	-	Yes	*Refer to list^*
6	ConstructionMethod	Text	All staircase	-	Yes	*Refer to list^*

IFC Entity: IfcSpace						
IFC SubType: SPACE						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	SpaceName	Text	-	-	Yes	external exit staircase, internal exit staircase, staircase

^ List can be found here.
* Parameter is populated from the dimensions of BIM elements modelled.

Staircase

By IFC Representation (continued from previous page)

➢ **Parameters below are intended for structural model**

IFC Entity: IfcStair						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	BottomDistribution	Text	RC staircase	-	No	H25-150+H16-300
2	BottomMain	Text	RC staircase	-	No	H25-150+H16-300
3	ConnectionDetailsBottom	Text	When required / relevant	-	No	Detail 1
4	ConnectionDetailsTop	Text	When required / relevant	-	No	Detail 1
5	ConnectionTypeBottom	Text	When required / relevant	-	Yes	*Refer to list^*
6	ConnectionTypeTop	Text	When required / relevant	-	Yes	*Refer to list^*
8	Mark	Text	All staircase	-	No	ST1, ST-A1
10	MemberSection	Text	Steel staircase	-	No	RHS600x30x4, CHS500x3.0, 254x254x63kg/m
11	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg number
12	ReinforcementSteelGrade	Text	RC staircase	-	Yes	*Refer to list^*
13	SectionFabricationMethod	Text	Steel staircase	-	Yes	*Refer to list^*
14	Thickness	Length	RC staircase	mm	No*	150
15	TopDistribution	Text	RC staircase	-	No	H25-150+H16-300
16	TopMain	Text	RC staircase	-	No	H32-150+H20-300
17	Width	Length	RC staircase	mm	No*	2200

IFC Entity: IfcStairFlight						
IFC SubType: N.A.						
S/N	**IFC+SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text	All staircase	-	Yes	*Refer to list^*
2	MaterialGrade	Text	All staircase	-	Yes	*Refer to list^*
3	MechanicalConnectionType	Text	-	-	No	-

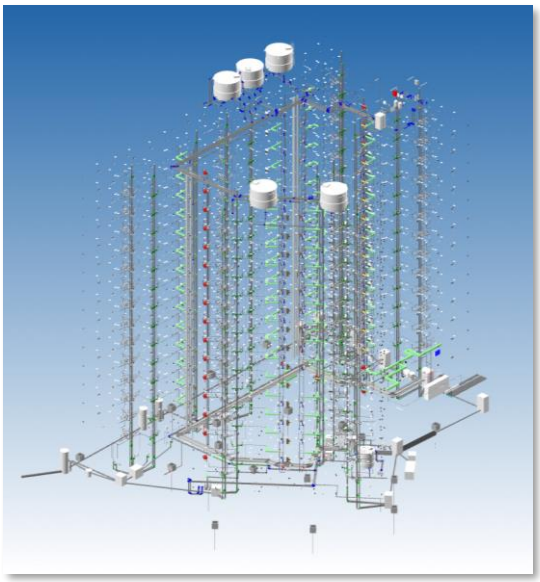
^ List can be found here.
* Parameter is populated from the dimensions of BIM elements modelled.

Staircase

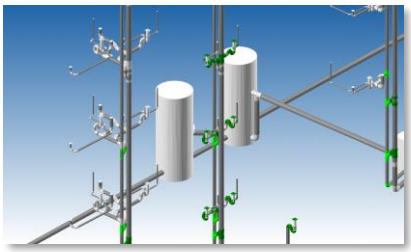
Example of Staircase (RC Staircase) Structural Element Input

150mm thick RC Precast Stair Flight	**IFC Entity:** IfcStair		
	IFC SubType: N.A.		
• Mark – SC2 • Width – 1.6m • Concrete grade C32/40 • From 1st storey to 2nd storey • Main rebar H10-200 top & bottom • Distribution bar H10-200 top & bottom • Typical precast staircase connection	**S/N**	**IFC+SG Property**	**Examples**
	1	MaterialGrade	C32/40
	2	Mark	SC2
	3	ReinforcementSteelGrade	500B
	4	ConstructionMethod	PC
	5	Thickness	150
	6	Width	1600
	7	BottomDistribution	H10-200
	8	BottomMain	H10-200
	9	TopDistribution	H10-200
	10	TopMain	H10-200
	11	ConnectionDetailsBottom	Typical precast staircase connection
	12	ConnectionDetailsTop	Typical precast staircase connection
	13	ConnectionTypeBottom	Pinned
	14	ConnectionTypeTop	Pinned

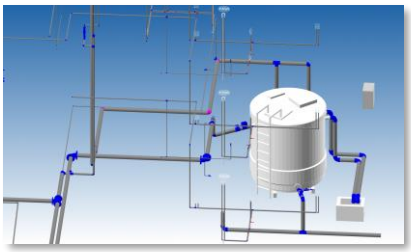
System



S4 – Fig 128 : Combined System(s)



S4 – Fig 129 : Sanitary System



S4 – Fig 130 : Plumbing System

- As part of the efforts to streamline modelling requirements, elements in the M&E system in the BIM models are now identified via its system classification and system name based on the two key parameters "SystemType" and "SystemName" which are readily available in the BIM authoring software and commonly used by the industry.
    - Examples of "SystemType" are "Drainage", "Sanitary", "Sewerage", "Potable Water", "Sprinkler", "Wet Riser". For ACMV system, the "SystemType" should typically follow the format – "{spacename} / {equipment} + Fresh Air/ Exhaust Air"
    - "SystemName" is the unique name given to each system based on individual project requirements.

- **Example of System Types:**
    - Sanitary
    - Sewerage
    - Drainage
    - Rainwater
    - Potable Water
    - Sprinkler
    - Foam Sprinkler
    - Foam Fire Extinguishing
    - Wet Riser
    - Dry Riser
    - Trade Effluent
    - Kitchen Fresh Air
    - Parking Place Exhaust Air
    - Staircase Pressurisation Air
    - Genset Exhaust Air
    - Pollution Control Equipment Exhaust Air
    - Kitchenhood Exhaust Air
    - PWCS Fresh Air

System

By IFC Representation (continued from previous page)

IFC Entity: IfcPipeSegment					
IFC SubType: RIGIDSEGMENT, FLEXIBLESEGMENT, GUTTER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcPipeFitting					
IFC SubType: BEND, DRAINCHANNELBEND, ENTRY, EXIT, FLANGEADAPTOR, FLEXIBLECOUPLING, JUNCTION, OBSTRUCTION, PIPESILENCER, SHORTPIECE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcDuctSegment					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcDuctFitting					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcInterceptor					
IFC SubType: GREASE, OIL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

System

By IFC Representation (continued from previous page)

IFC Entity: IfcDistributionChamberElement					
IFC SubType: INSPECTIONCHAMBER, MANHOLE, PWCSINSPECTIONCHAMBER, PWCSMANHOLE, METERCHAMBER, SCREENCHAMBER, SUMP, SAMPLINGSUMP, TRENCH					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcDiscreteAccessory					
IFC SubType: PIPESUPPORT, GRATING					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcPump					
IFC SubType: SUMPPUMP					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcAirTerminal					
IFC SubType: GRILLE, LOUVRE					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcSanitaryTerminal					
IFC SubType: BATH, BIDET, SHOWER, URINAL, WASHHANDBASIN, WATERCLOSET, SPRINKLER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	Yes	Please see List of System Types
2	SystemName	Text	-	No	-

System

By IFC Representation (continued from previous page)

IFC Entity: IfcCivilElement					
IFC SubType: COMMONDRAIN, CROSSCULVERT, CULVERT, ENTRANCECULVERT, EXTERNALDRAIN, INTERNALDRAIN, OUTLETDRAIN, ROADSIDEDRAIN, TRENCH, GUTTER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcValve					
IFC SubType: LANDINGVALVE, SPRINKLERCONTROL, DOUBLECHECK, MIXING, AIRADMITTANCE, DRAINOFFCOCK, CHECK, ISOLATING, FAUCET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcWasteTerminal					
IFC SubType: FLOORTRAP, FLOORWASTE, GULLYSUMP, GULLYTRAP, WASTETRAP, WASTESUMP					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

IFC Entity: IfcFlowMeter					
IFC SubType: WATERMETER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

System

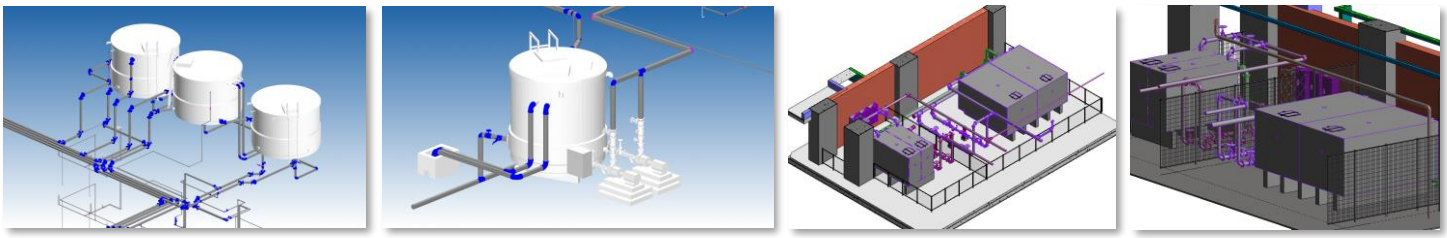
By IFC Representation (continued from previous page)

IFC Entity: IfcFireSuppressionTerminal					
IFC SubType: BREECHINGINLET, FOAMINLET, FOAMOUTLET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	Please see List of System Types
2	SystemName	Text	-	No	-

Notes

- The Foam Fire Extinguishing System should include Foam Inlet and Foam Outlet components.
- The Wet Riser System and Dry Riser System should include Breeching Inlet and Landing Valve components.
- The Foam Sprinkler System and Sprinkler System should include Breeching Inlet components.
- Refer to **Space Usage (Others)** for representation of rest of Fire Protection Systems

Tank



S4 – Fig 131 to 134 : Water Tank

By IFC Representation

➢ **Parameters below are intended for object tanks**

IFC Entity: IfcTank					
IFC SubType: STORAGE, DETENTIONTANK, RAINWATERHARVESTINGTANK, IRRIGATIONTANK, SPRINKLERTANK, BALANCINGTANK, SECTIONAL, VESSEL, RECHARGEWELL					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	IsPotable	Boolean	-	Yes	TRUE / FALSE
2	NominalCapacity	Real	m^3	No	-
3	EffectiveCapacity	Real	m^3	No	-
4	Diameter	Length	mm	No	-
5	Height	Length	mm	No	-
6	Length	Length	mm	No	-
7	Thickness	Length	mm	No	-
8	Width	Length	mm	No	-
9	TradeEffluent	Boolean	-	Yes	TRUE / FALSE
10	EquipmentType	Text	-	No	-

➢ **Parameters below are intended for RC tanks**

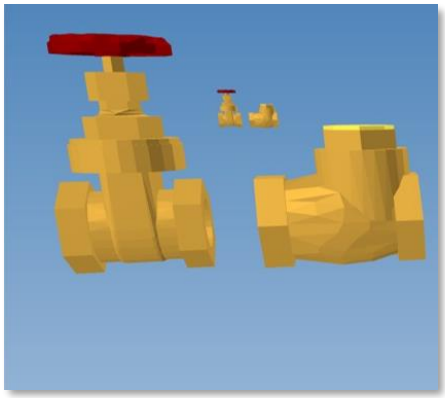
IFC Entity: IfcSpace					
IFC SubType: N.A.					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SpaceName	Text	-	Yes	oil tank room, balancing tank, detention tank, domestic water tank, rainwater harvesting tank, sprinkler tank
2	Area	Length	m^2	No	-
3	Height	Length	mm	No	-
4	Thickness	Length	mm	No	-
5	NominalCapacity	Real	-	No	-
6	EffectiveCapacity	Real	-	No	-
7	IsPotable	Boolean	-	Yes	TRUE / FALSE

Type Bedding for Pipe

By IFC Representation

IFC Entity: IfcPipeSegment					
IFC SubType: FOUNDATION					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	BeddingType	Text	-	-	Type 1, Type 2, Type 3

Valve



S4 – Fig 135: Valve

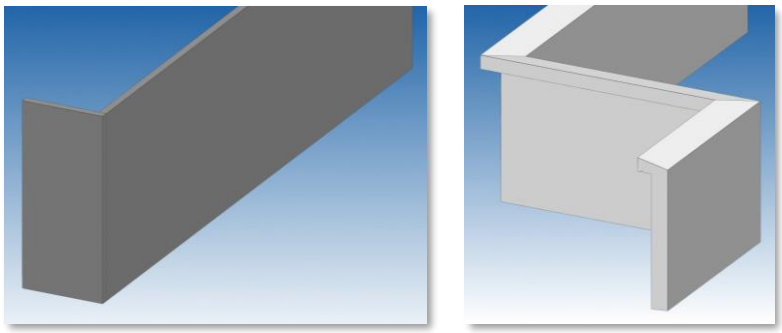
By IFC Representation

IFC Entity: IfcValve					
IFC SubType: LANDINGVALVE, SPRINKLERCONTROL, DOUBLECHECK, MIXING, AIRADMITTANCE, DRAINOFFCOCK, CHECK, ISOLATING, FAUCET					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	SystemType	Text	-	No	-
2	SystemName	Text	-	No	-

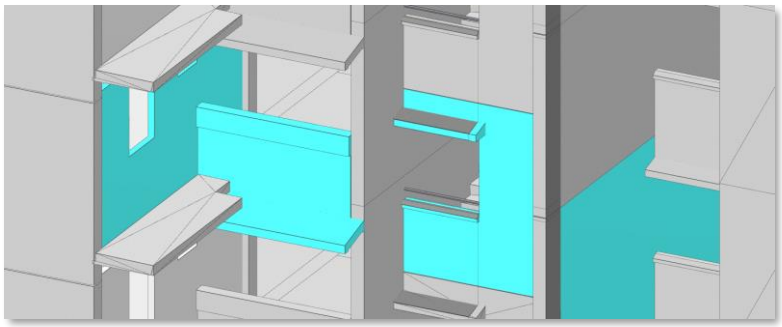
Notes

- Ensure the Landing Valve is also exported as part of the Wet Riser System and Dry Riser System
- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Wall



S4 – Fig 136 : Wall (Parapet)



S4 – Fig 137 : Various Wall Types in relation to Building

Modelling Wall in IFC+SG

- All the wall elements shall be modelled in IFC+SG model with the necessary information required as stipulated in the tables below.
    - Typical wall are allowed to have same marks and design information. The marks and design information have to be embedded in every wall element.
    - Multiple wall elements shall be modelled from storey to storey for continuous wall.
    - Civil defence shelter wall will need to be indicated as "Yes" in IFC+SG parameter "ShelterUsage" and substantiate with civil defence shelter reinforcement details in 2D drawings.

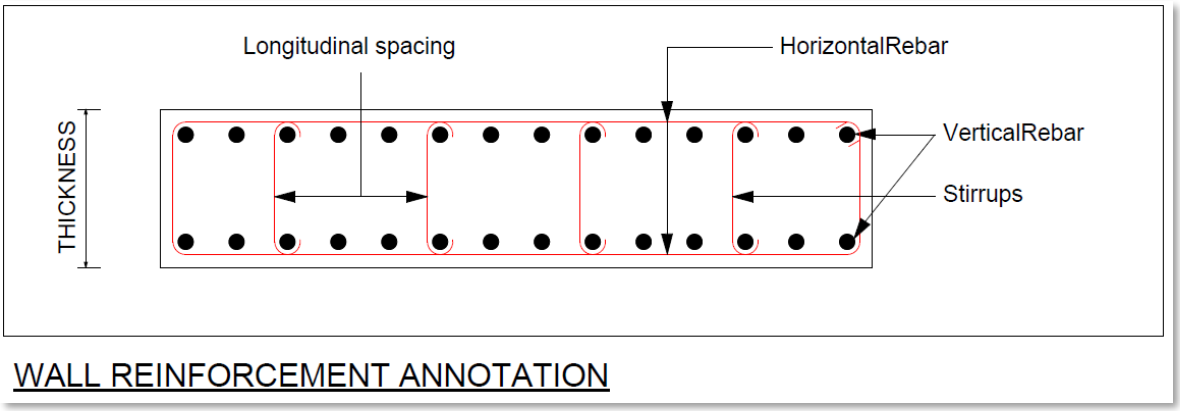
- 2D detail drawings are allowed for any irregular or complex wall section (e.g. L shape wall, D wall, retaining wall, etc.) with the indication of drawing number in the IFC+SG parameter "ReferTo2DDetail".

- IFC+SG parameters to be included for any irregular, or complex wall element:
    - ConstructionMethod
    - ReferTo2DDetail
    - Mark
    - MaterialGrade
    - ReinforcementSteelGrade
    - ShelterUsage
    - Thickness

Wall

Wall Dimension and Reinforcement Definition

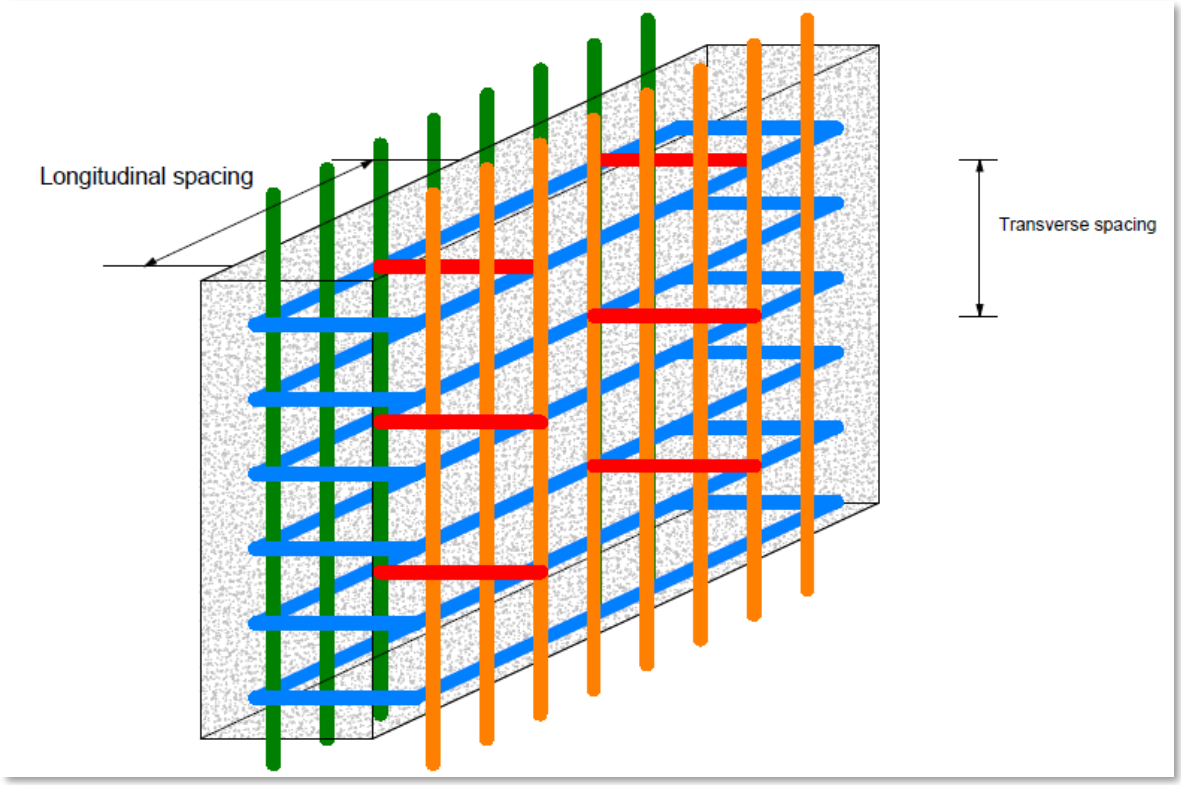
Column Dimension and Reinforcement Definition	
1	QP may substantiate a set of 2D wall schedule drawings to present the orientation and arrangement of wall reinforcement for illustration.
2	The input for VerticalRebar & HorizontalRebar shall be "HXX-XXX" while "H" is a must, XX is the longitudinal reinforcement diameter and XXX is the spacing of longitudinal reinforcement. • Use '2' for similar reinforcement provided for 2 faces (e.g. 2H16-200) • Use '+' for more than 1 layer of reinforcement Longitudinal reinforcement diameter HXX-XXX Spacing of longitudinal reinforcement
3	The input for Stirrups shall be "HXX-XXX-XXX" while "H" is a must, XX are the transverse reinforcement diameter, 1st XXX is the longitudinal spacing of transverse reinforcement and 2nd XXX is the transverse spacing of transverse reinforcement. • Indicate the longitudinal spacing and follow with transverse spacing (e.g.H8-100-100) Transverse reinforcement diameter HXX-XXX-XXX Spacing of transverse reinforcement diameter (transverse direction) Spacing of transverse reinforcement (longitudinal direction)



S4 – Fig 138 : Wall Reinforcement Annotation

Wall

Wall Dimension and Reinforcement Definition (continued from previous page)

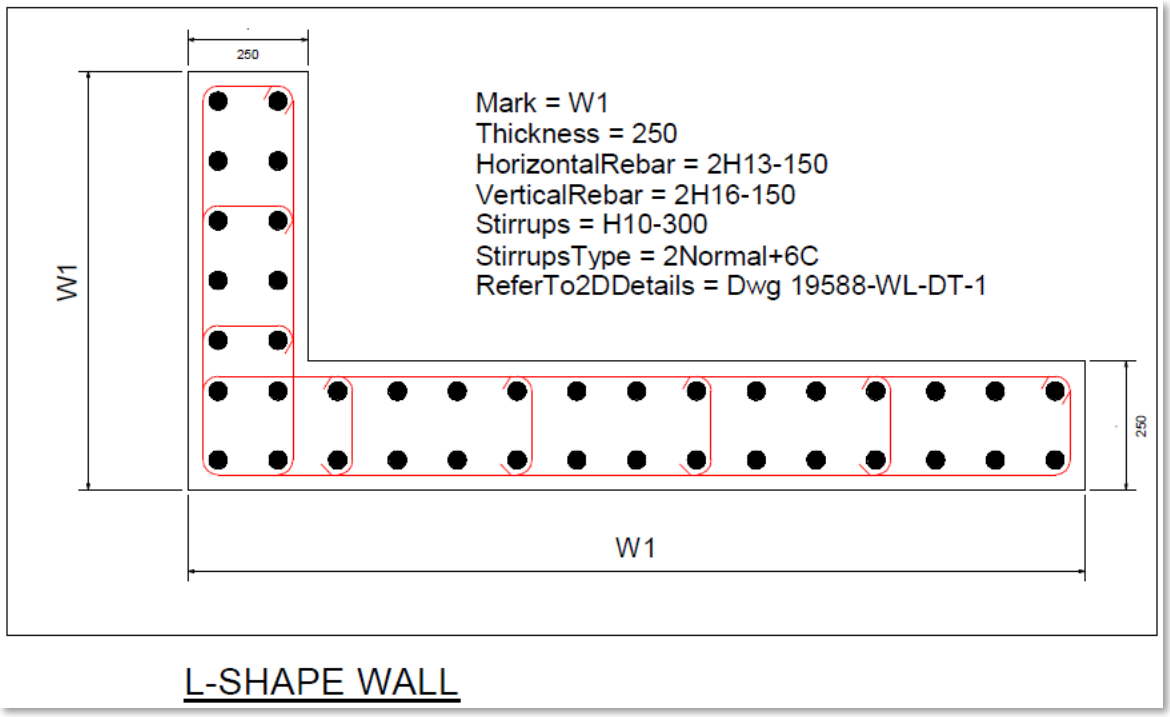


S4 – Fig 139 : Wall Reinforcement Annotation

Wall

L-Shape Wall

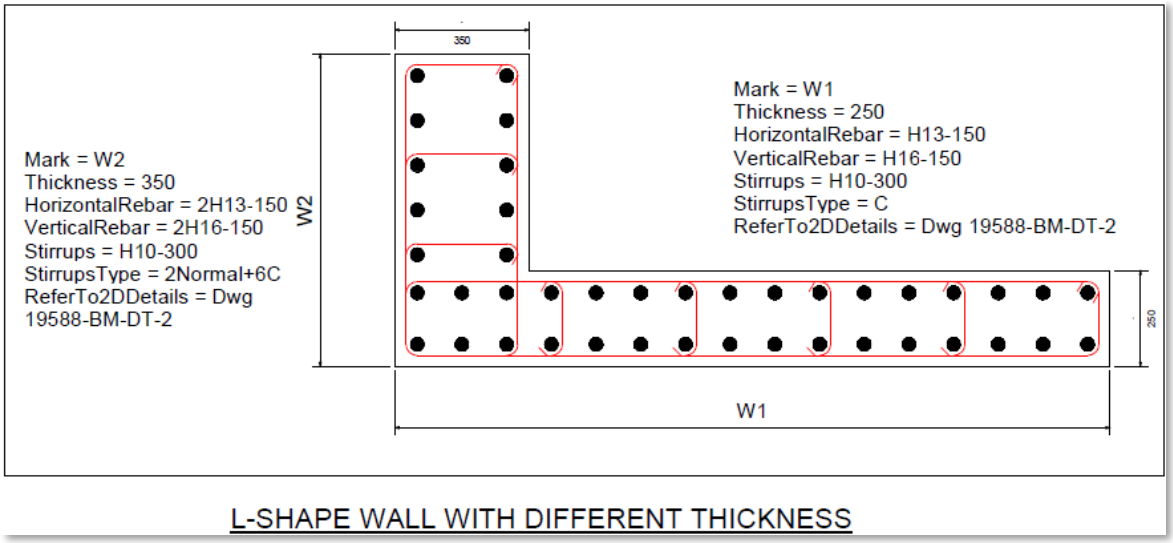
- Typical wall are allowed to have same marks and design information. The marks and design information have to be embedded in every wall element.



S4 – Fig 140 : L-Shape Wall

L-Shape Wall with Different Thickness

- Different wall thickness should have different wall marks even the design information are the same.



S4 – Fig 141 : L-Shape Wall with Different Thickness

Wall

By IFC Representation

➢ **Parameters below are intended for architectural model**

IFC Entity: IfcWall

IFC SubType: PARAPET, RETAININGWALL, BOUNDARYWALL

S/N	IFC+SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	ConstructionMethod	Text	All walls	-	Yes	*Refer to list^*
2	IsPartyWall	Boolean	-	-	Yes	TRUE / FALSE

➢ **Parameters below are intended for structural model**

IFC Entity: IfcWall

IFC SubType: N.A.

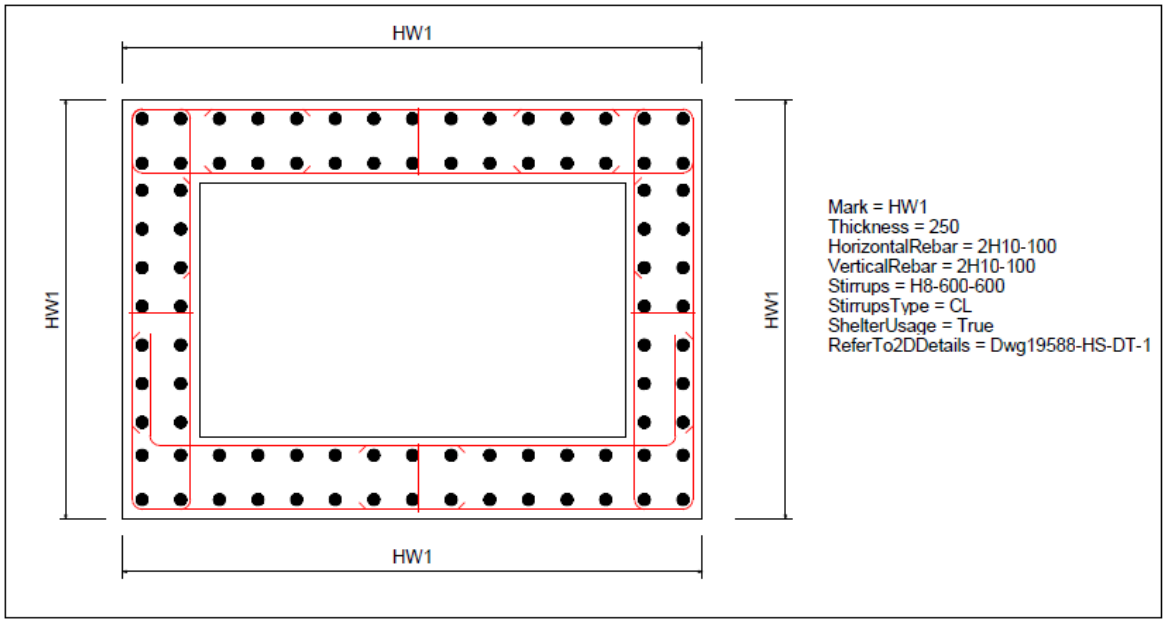
S/N	IFC+SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	ArrangementType	Text	-	-	Yes	Multi-Tier
2	BeamFacade	Boolean	-	-	Yes	TRUE / FALSE
3	ConstructionMethod	Text	All walls	-	Yes	*Refer to list^*
4	DoubleBayFacade	Boolean	-	-	Yes	TRUE / FALSE
5	HorizontalRebar	Text	All walls	-	No	2H20-150
6	IsExternal	Boolean	-	-	Yes	TRUE / FALSE
7	LoadBearing	Boolean	-	-	Yes	TRUE / FALSE
8	Mark	Text	All walls	-	No	W1, W2
9	MaterialGrade	Text	All walls	-	Yes	*Refer to list^*
10	MechanicalConnectionType	Text	-	-	No	flexible loops, grouted sleeves, spiral connector
11	PrefabricatedReinforcementCage	Boolean	-	-	Yes	TRUE / FALSE
12	PrefinishedFacade	Boolean	-	-	Yes	TRUE / FALSE
13	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
14	ReinforcementSteelGrade	Text	All walls	-	Yes	*Refer to list^*
15	ShelterUsage	Boolean	When required / relevant	-	Yes	TRUE / FALSE
16	Stirrups	Text	When required / relevant	-	No	H10-150-300
17	StirrupsType	Text	When required / relevant	-	Yes	*Refer to list^*
18	Thickness	Length	All walls	mm	No*	300
19	VerticalRebar	Text	All walls	-	No	H32-150+H25-150
20	WorkingLoad_DA1-1	Integer	When required / relevant	kN	No	1234
21	WorkingLoad_DA1-2	Integer	When required / relevant	kN	No	1234

* Parameter is populated from the dimensions of BIM elements modelled.
^ List can be found here.

Wall

Household Shelter Wall

- Typical wall are allow to have same marks and design information. The marks and design information have to be embedded in every wall element.



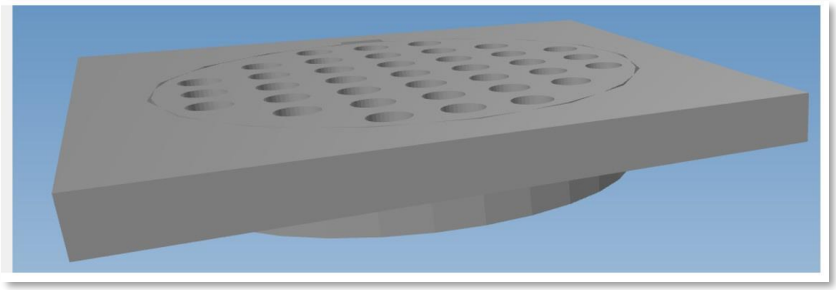
LANDED HOUSEHOLD SHELTER WALL LAYOUT

S4 – Fig 142 : Household Shelter Wall

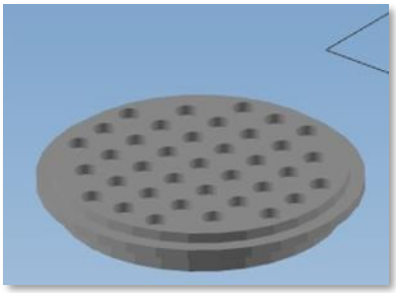
Example of Wall (RC Household Shelter Wall) Structural Element Input

250mm thick RC Precast Household Shelter Wall	**IFC Entity:** IfcWall		
	IFC SubType: N.A.		
• Mark – HS1 • Concrete grade C32/40 • From 1st storey to 2nd storey • Vertical rebar H13-100 • Horizontal rebar H13-100 • Shear link H8-600	**S/N**	**IFC+SG Property**	**Examples**
	1	MaterialGrade	C32/40
	2	ConstructionMethod	PC
	3	ReferTo2DDetail	Dwg 19588-HS-DT-1
	4	ReinforcementSteelGrade	500B
	5	ShelterUsage	Yes
	6	Mark	HS1
	7	Thickness	250
	8	HorizontalRebar	2H13-100
	9	Stirrups	H8-600-600
	10	StirrupsType	CL
	11	VerticalRebar	2H13-100

Waste Terminal



S4 – Fig 143 : Floor Trap



S4 – Fig 144 : Floor Trap

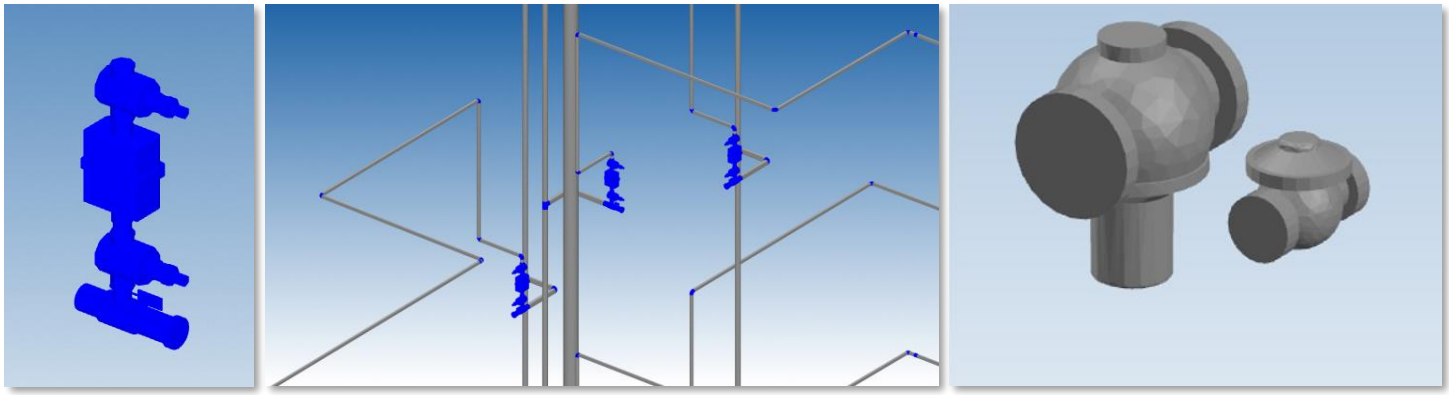
By IFC Representation

IFC Entity: IfcWasteTerminal					
IFC SubType: FLOORTRAP, FLOORWASTE, GULLYSUMP, GULLYTRAP, WASTETRAP, WASTESUMP					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Material	Text	-	-	-
2	TradeEffluent	Boolean	-	Yes	TRUE / FALSE
3	SystemType	Text	-	No	Sanitary, Sewerage
4	SystemName	Text	-	No	-

Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Water Meter



S4 – Fig 145 to 147 : Water Meter

By IFC Representation

IFC Entity: IfcFlowMeter					
IFC SubType: WATERMETER					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	Capacity	Volumetric Flow Rate	L/s	No	-
2	Diameter	Length	mm	No	-
3	Length	Length	mm	No	-
4	Purpose	Text	-	No	Private
5	UnitNumber	Text	-	No	-
6	UnitNumberTag	Boolean	-	Yes	TRUE / FALSE
7	WaterSupplySource	Text	-	No	-
8	SystemType	Text	-	No	-
9	SystemName	Text	-	No	-

Notes

- Refer to **System** for full list of system types that can be provided under "SystemType" property.

Window

S4 – Fig 148 : Window

S4 – Fig 149 : Window in relation to Building

By IFC Representation

IFC Entity: IfcWindow					
IFC SubType: BAYWINDOW, VENTILATIONSLEEVE, LOUVRE, WINDOW, SKYLIGHT					
S/N	**IFC+SG Property**	**Property Type**	**Unit**	**Input Limitation**	**Examples**
1	InnerDiameter	Length	mm	No	-
2	OuterDiameter	Length	mm	No	-
3	FireAccessOpening	Boolean	N.A.	Yes	TRUE / FALSE
4	StructuralWidth	Length	mm	No	-
5	StructuralHeight	Length	mm	No	-
6	Material	Text	-	No	-
7	SafetyBarrierHeight	Length	mm	No	-
8	PercentageOfOpening	Real	-	No	-

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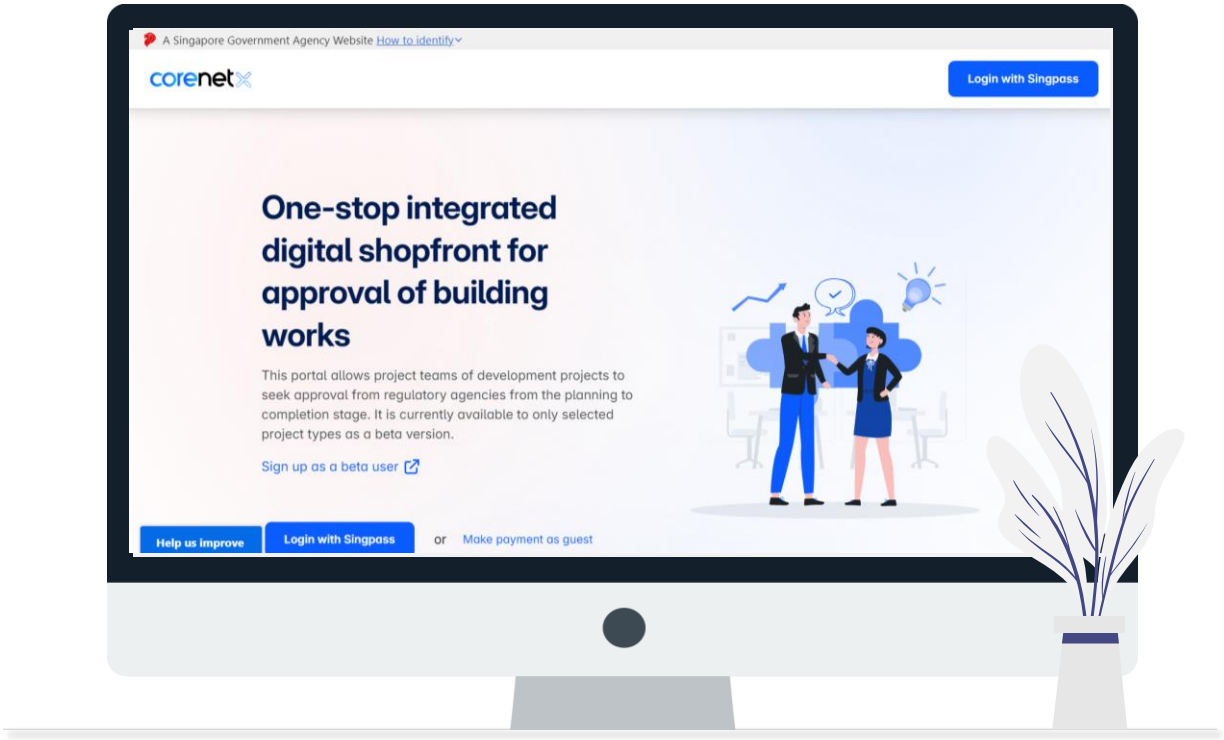

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