CORENET X

A One-Stop Integrated Digital Shopfront for Regulatory Processes

Code of Practice

May 2023 Draft for Industry Comments

CORENET X is multi-agency effort by

corenetx

Page

PREAMBLE

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.

The Code of Practice 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.

The 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

Section 1 and 2 of 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.

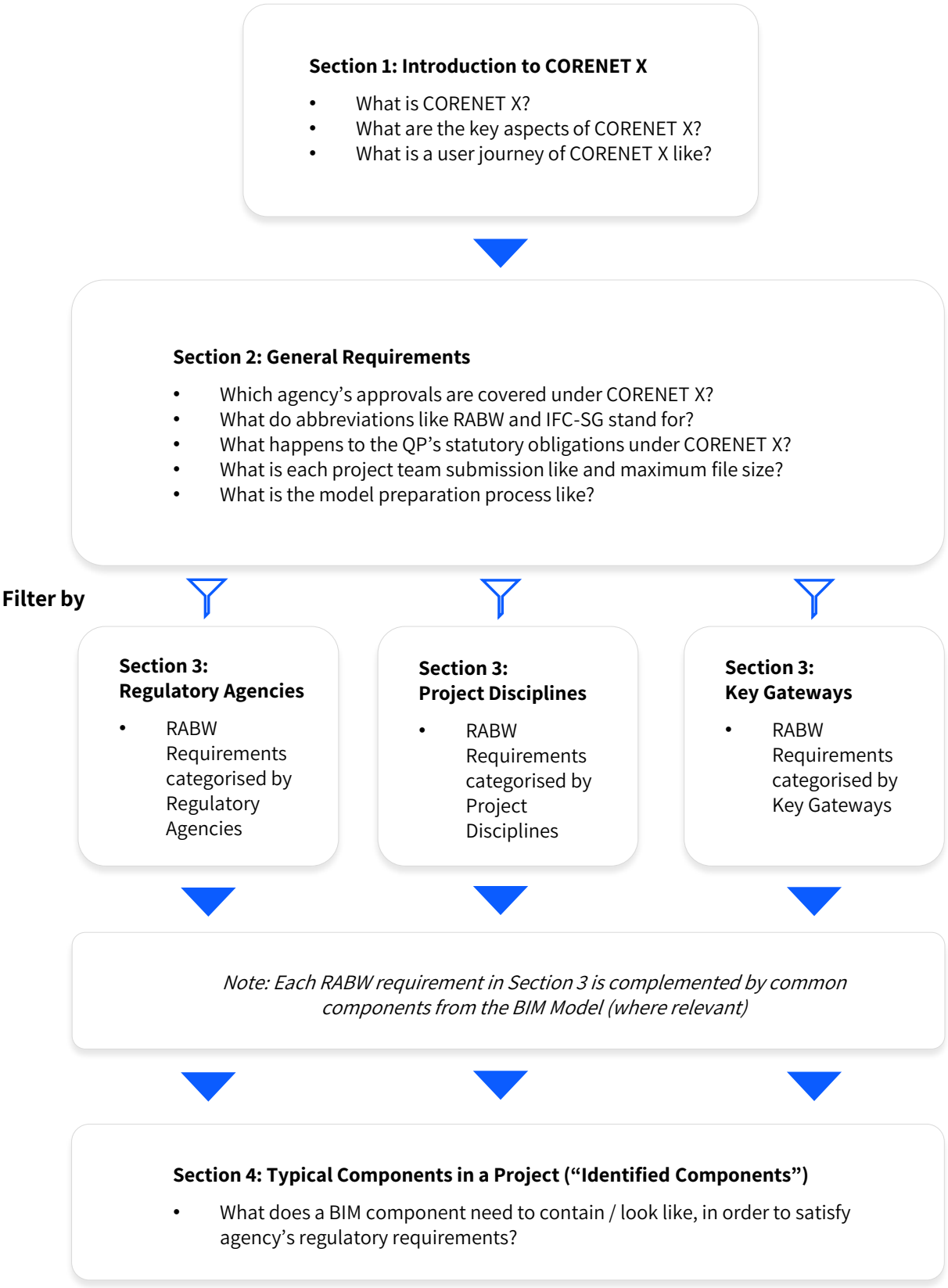
Feedback

The Code of Practice will be updated progressively from its May 2023 draft release for industry comments before Version 1 Release. 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/cx-cop-comments.

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

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

1 Introduction to CORENET X

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.

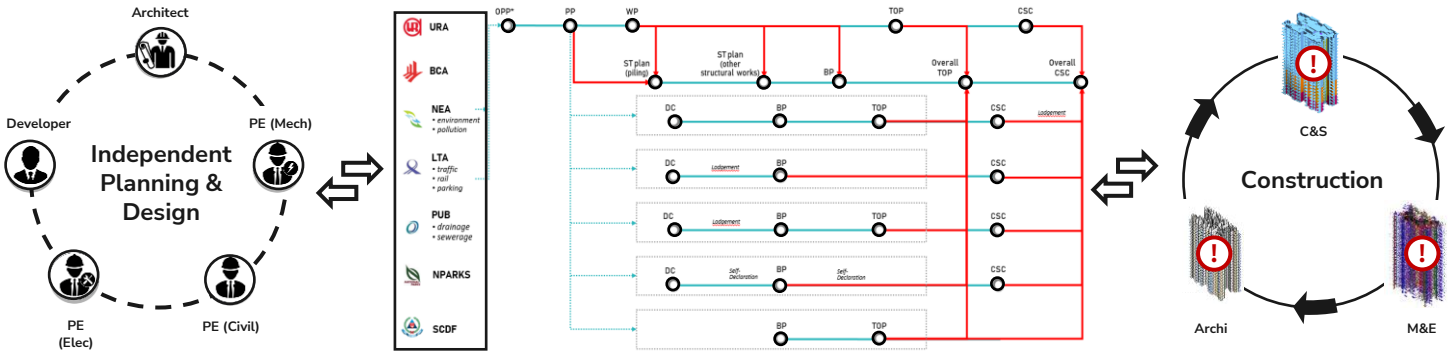
It allows the project team, which includes the QPs, to collaborate and review their designs in the model together, detect possible major conflicts before construction, and produce a coordinated BIM model for submission and regulatory approval. It changes the current practice of QPs dealing separately 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 is slated for implementation by the end of 2023.

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

[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

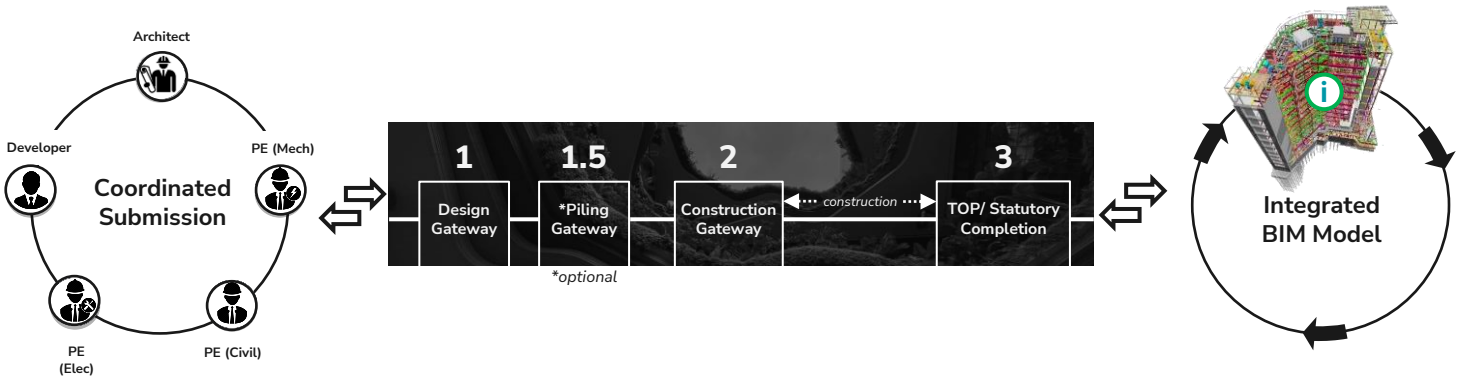
- Plans contain **conflicts that need to be resolved** during construction
- Rectifications = **Abortive Works**
- **Delayed issuance** of TOP/CSC

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

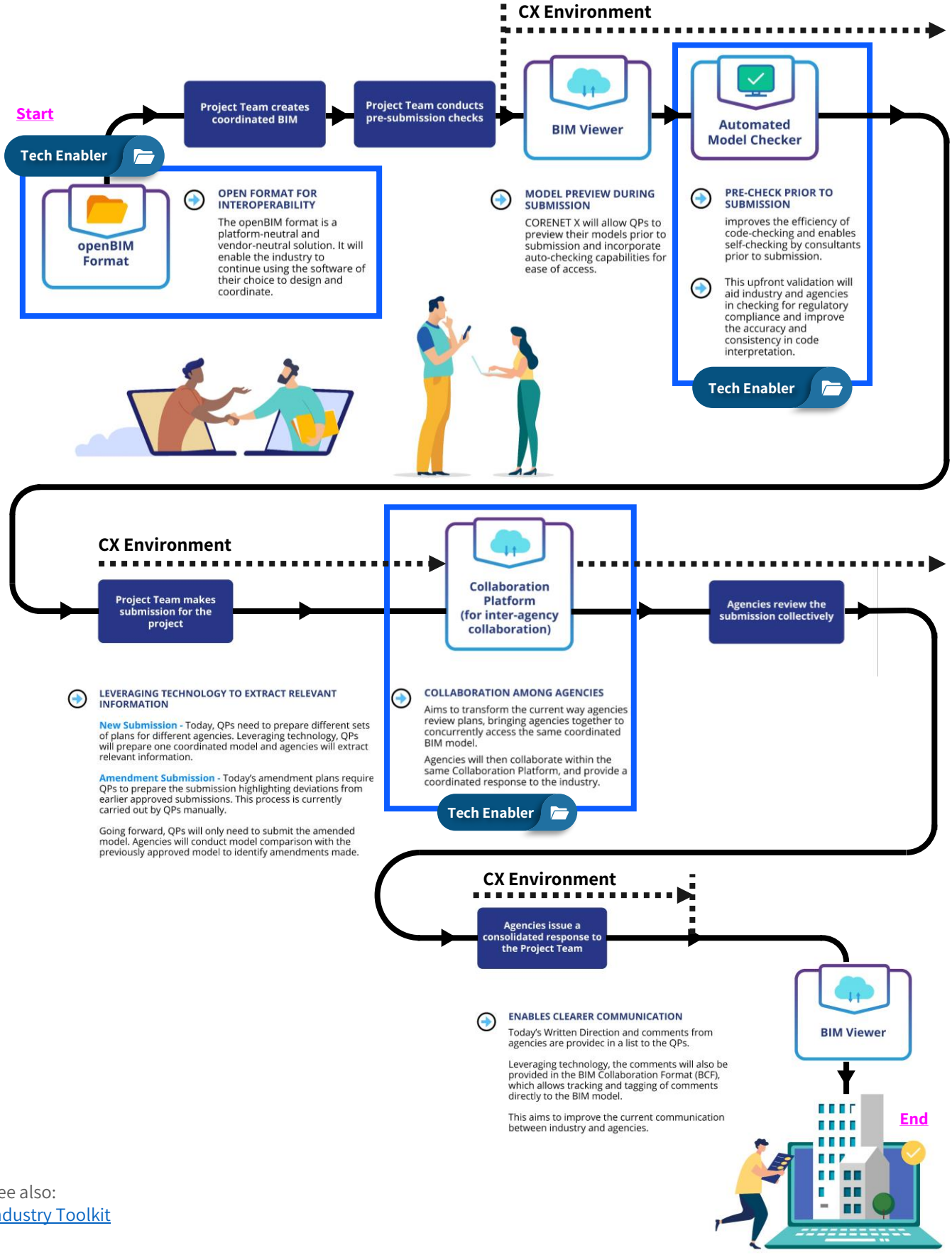
- Over 20 approval gateways have now been streamlined to **3 Key Gateways: Design, Construction, Completion**
- These gateways are major submission milestones, where the submitted design needs to comply with cross-agencies' statutory requirements.
- Agencies will review the Coordinated BIM models together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

2 General Requirements

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**.

The current Development Control ("DC") and Building Plan ("BP") submissions, typically referred to by the agencies and industry, are now being mapped and consolidated under the Gateways of the new process. The amount of information required at the respective Gateways is also being recalibrated across the regulatory agencies to ensure that it is aligned with the intent of each Gateway.

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

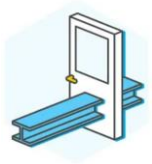
QP's Statutory Responsibilities

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.

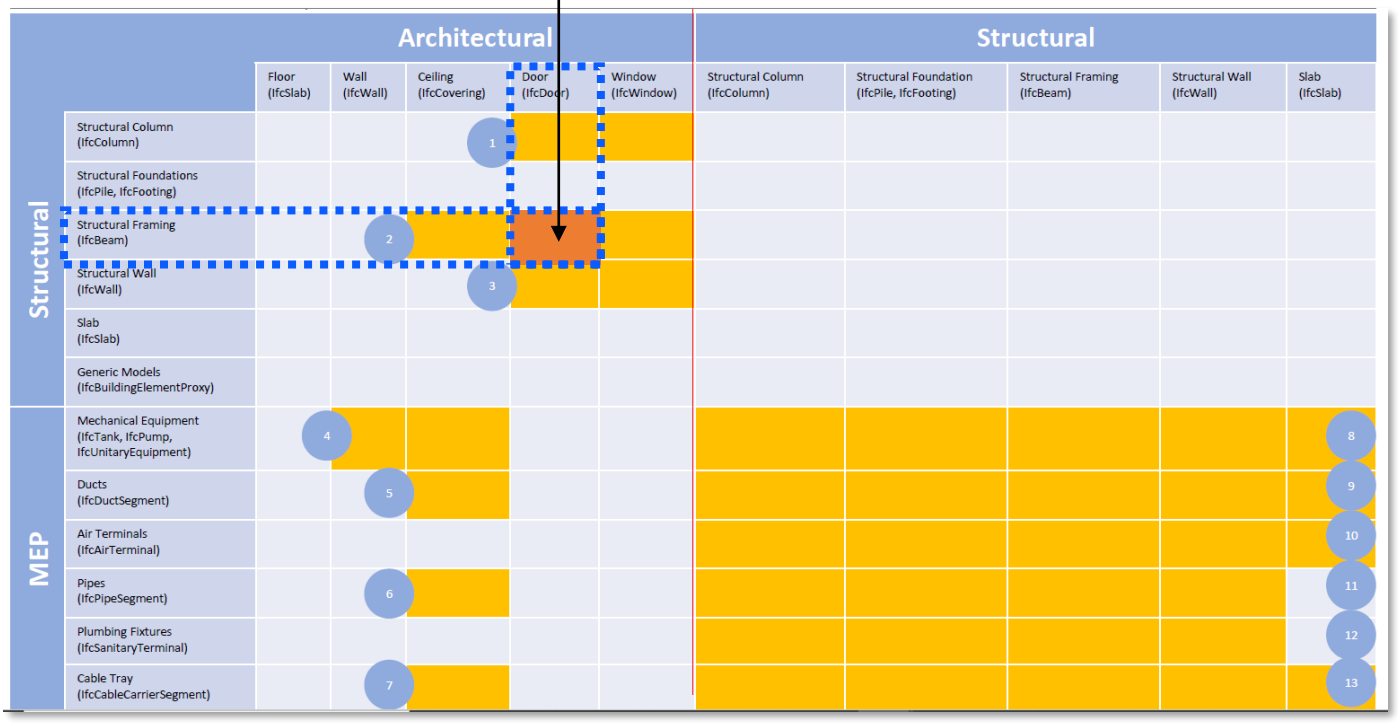
Multi-Disciplinary Coordination and Geo-Referencing

Prior to submission, models by the relevant disciplines should be coordinated, and the project team should ensure key components from each discipline do not clash with one another, as indicated in the matrix below.



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

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



S2 – Fig 2: Multi-Disciplinary Coordination

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. As a good practice, this should be agreed and documented by the project team as early as possible.

These separate BIM models should be geo-referenced, by assigning real-world coordinates from the Singapore SVY21 coordinate system (EPSG: 3414) for Easting and Northing (x,y) and the Singapore Height Datum (SHD) for Height (z).

Typical Submission Package at a Single Gateway

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

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

Preparing Models for Submission

Model Size

The total size of all models in a single submission package should not exceed 2GB. 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 / Title Block

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. It is not necessary to indicate this information in the IFC-SG model. However, all IFC-SG models shall provide the project information listed below as project parameters:

- Project reference
- Project nature (optional)
- Maximum number of building storeys
- Piling design parameters (if applicable)

Modelling in IFC-SG

- Most of the IFC parameter requirements are based on the 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 Section 4 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 IFC-SG configurator files as provided in 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

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

S2 – Fig 3: 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

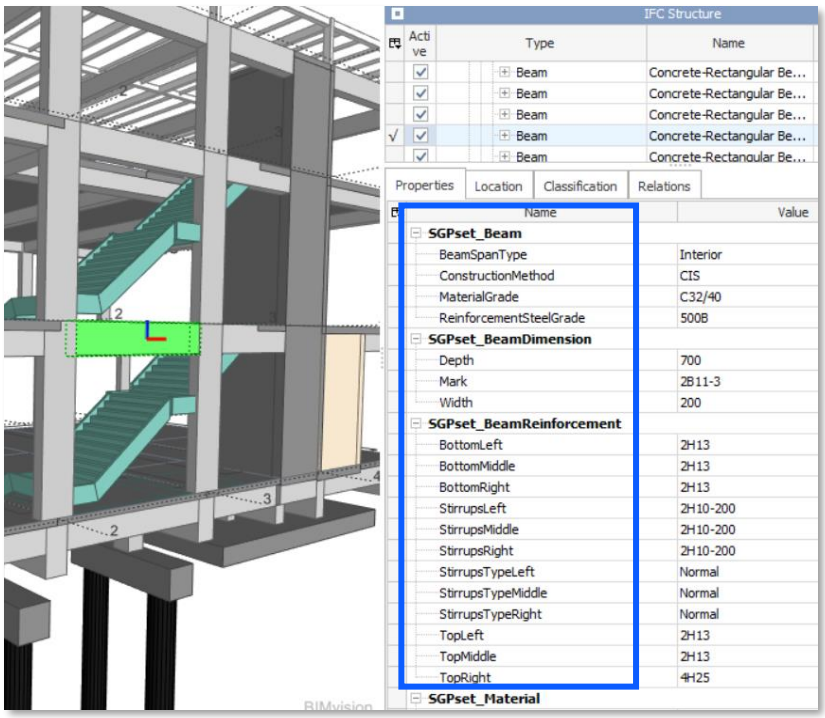
Map the existing object library properties into configuration file

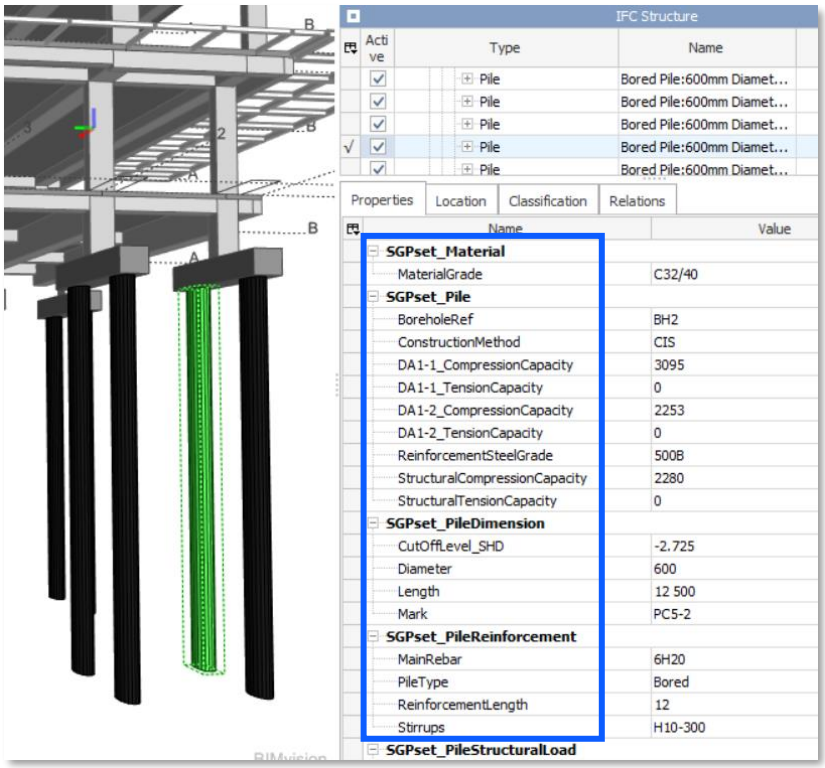
- ✓ One-time process
- ✓ Can be used into the future projects
- ✓ Eliminate duplicated work and errors
- ✓ Standard IFC exports for all your projects

Link:
IFC-SG Resource Kit

Preparing Models for Submission

Examples of IFC-SG Parameters



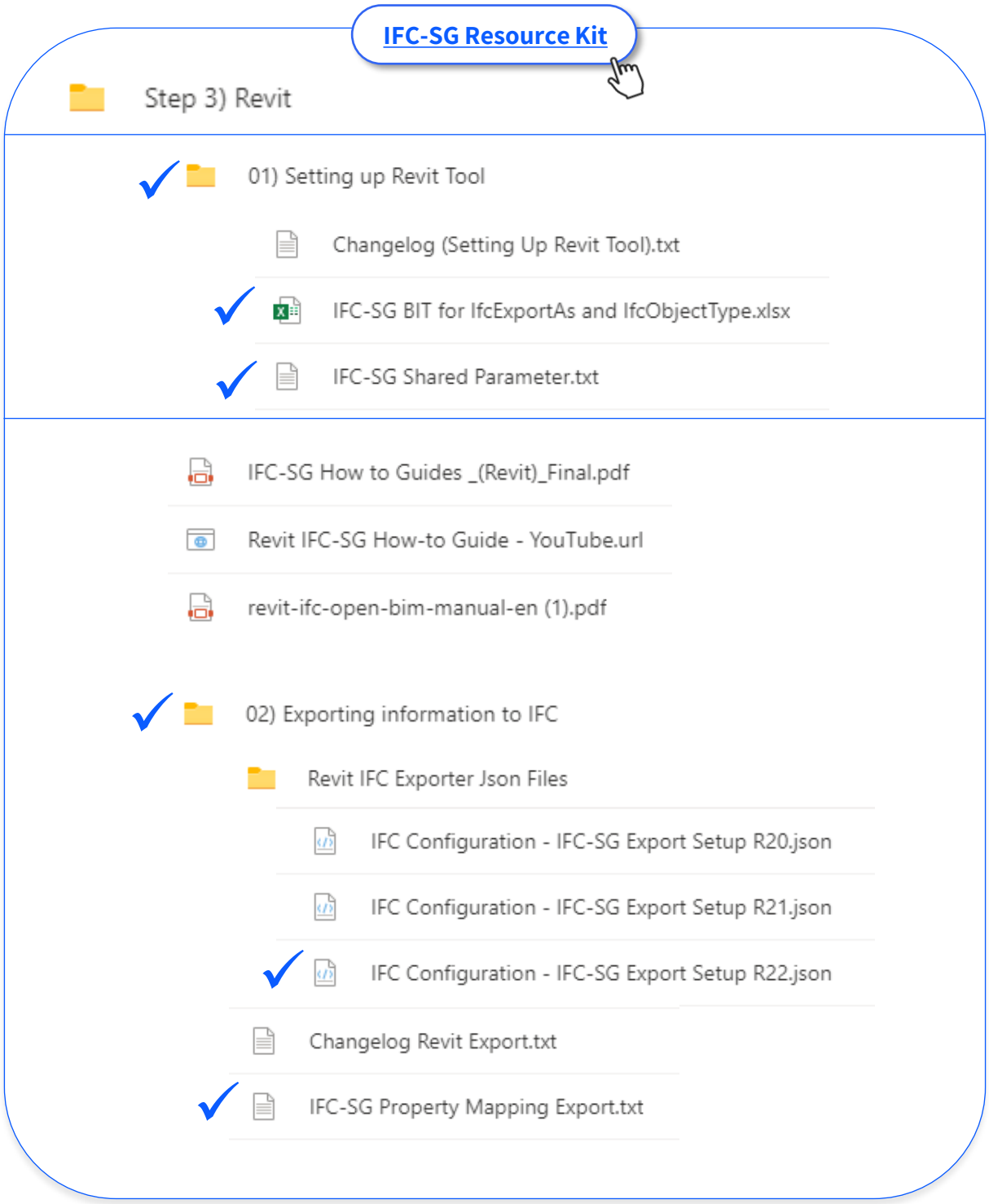


S2 – Fig 4 and 5 : Example of IFC-SG Parameters

Link:
IFC-SG Resource Kit

Preparing Models for Submission

Example using Revit Configuration File
*(*Note to readers: Archicad, Tekla and OpenBuilding examples will be shown in future for each discipline)*



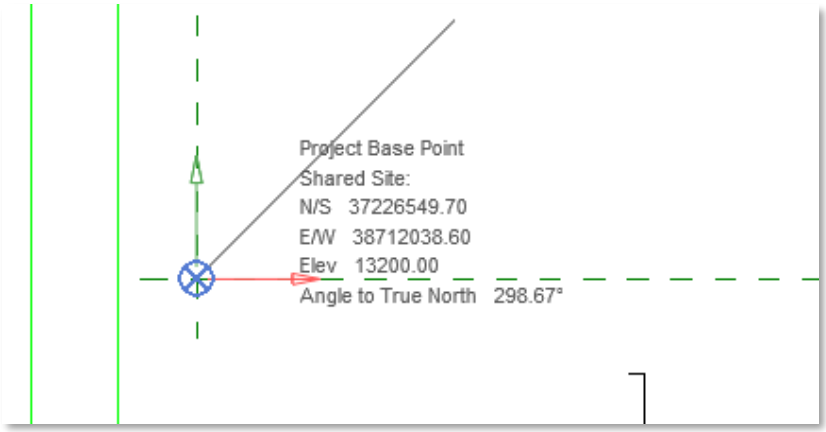
Link:
IFC-SG Resource Kit

Preparing Models for Submission

Example using Revit Configuration File
*(*Note to readers: Archicad, Tekla and OpenBuilding examples will be shown in future for each discipline)*

1. Set your model into the agreed coordinates

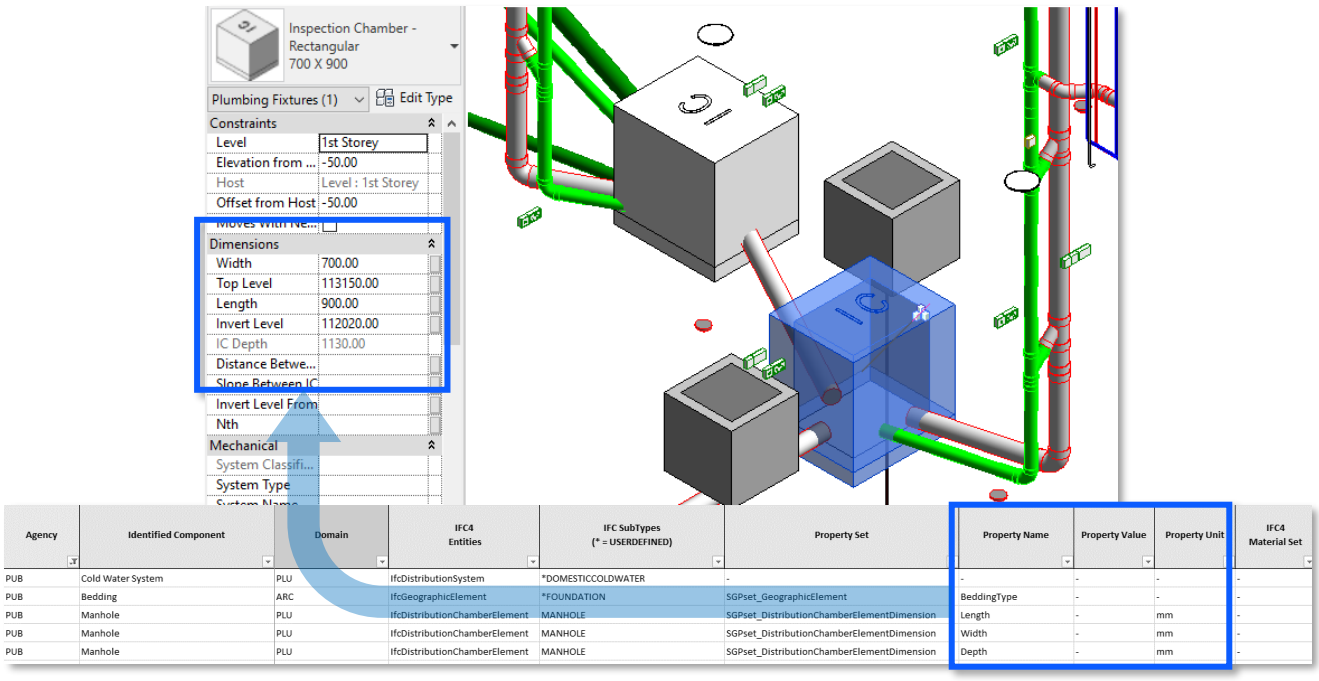
- To place model into the correct location with Architectural, Civil & Structural, Mechanical & Electrical models.



S2 – Fig 6

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

- Element's properties can be assigned while modeling.



S2 – Fig 7

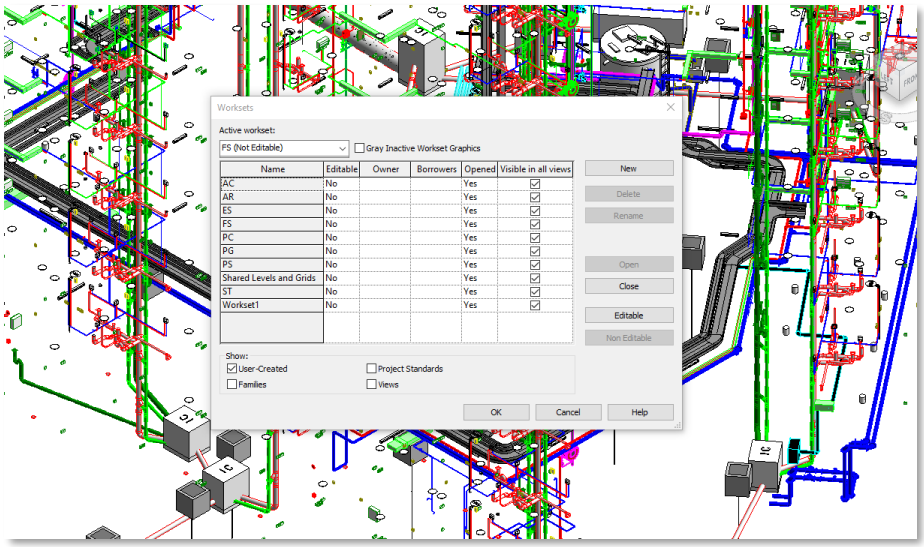
Link:
[IFC-SG Resource Kit]

Preparing Models for Submission

Example using Revit Configuration File
*(*Note to readers: Archicad, Tekla and OpenBuilding examples will be shown in future for each discipline)*

3. Set the Revit Workset

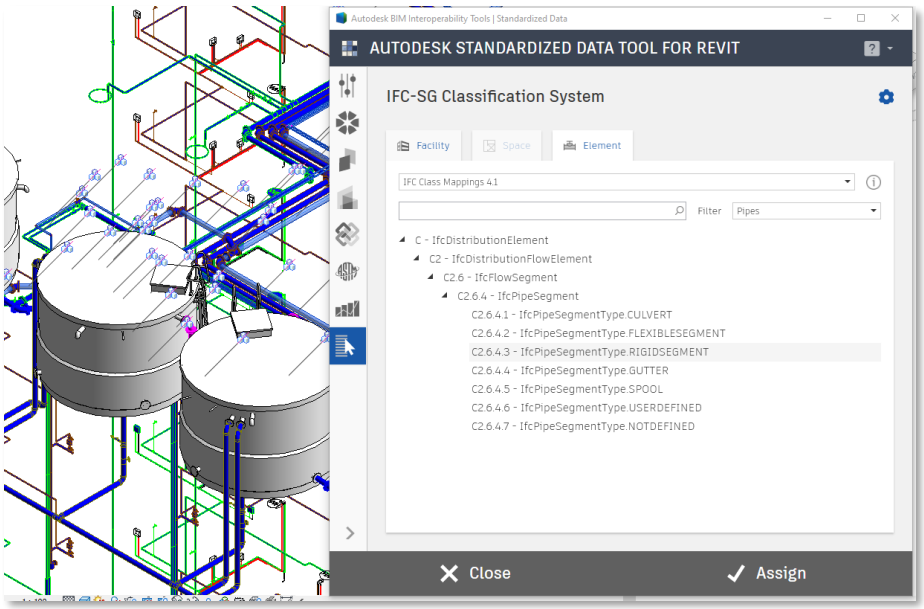
- To easily select the elements during IFC-SG Parameters mapping.
- To filter the views per Agency Submission.
- To reduce time when Exporting model in IFC format.
- To easily navigate when modeling and model auditing.



S2 – Fig 8

4. IFC-SG Mapping

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



S2 – Fig 9

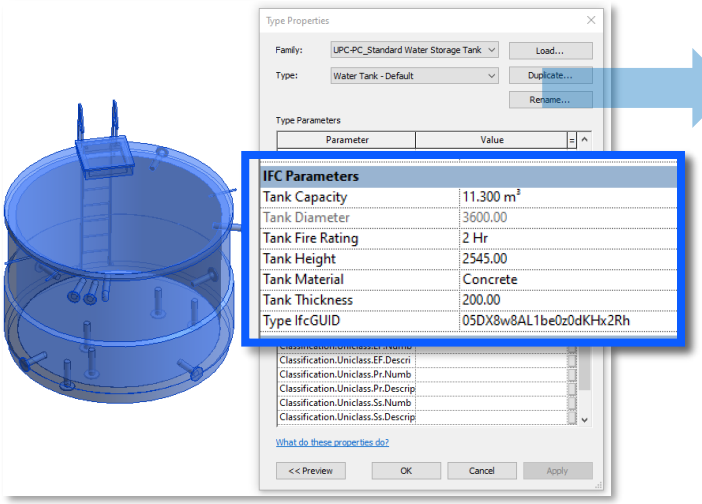
Link:
IFC-SG Resource Kit

Preparing Models for Submission

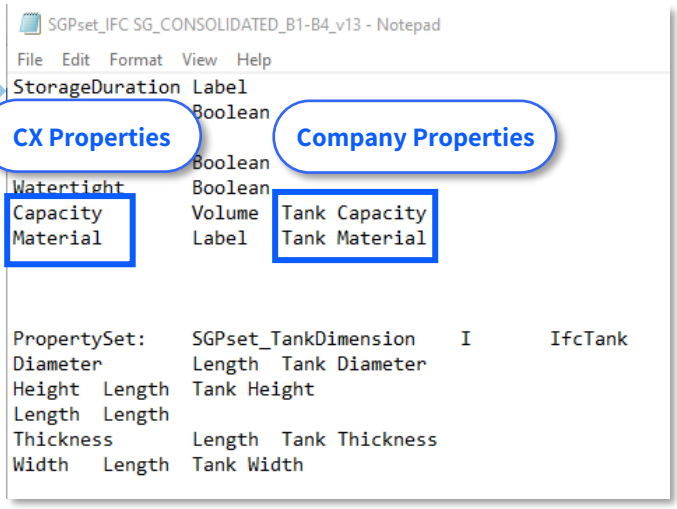
Example using Revit Configuration File
*(*Note to readers: Archicad, Tekla and OpenBuilding examples will be shown in future for each discipline)*

From Revit Library

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

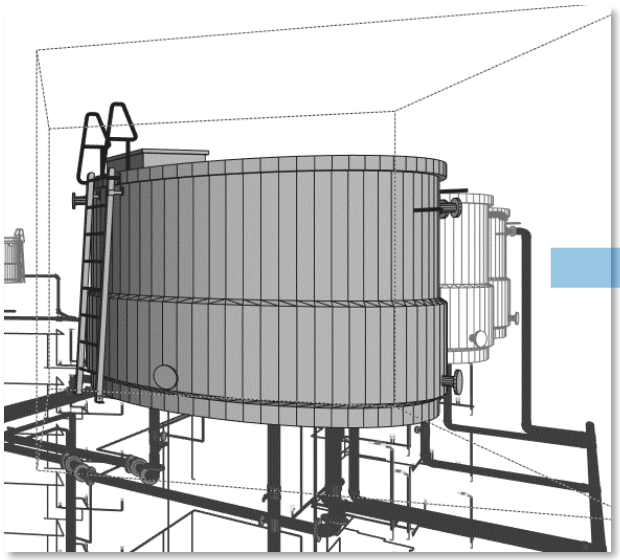


S2 – Fig 10: Revit Library

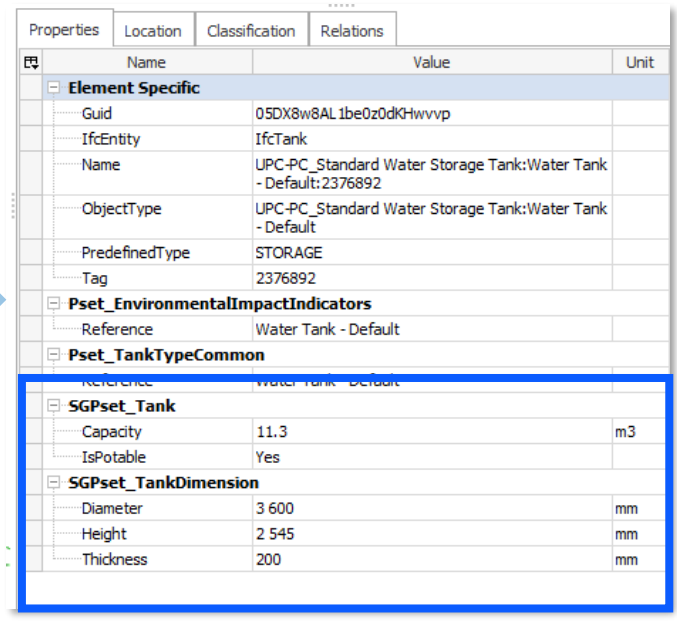


S2 – Fig 11: Configuration File

From IFC Model



S2 – Fig 12



S2 – Fig 13

Link:
IFC-SG Resource Kit

Top 3 Common Modelling Challenges and Solutions

Example using Revit Configuration File
*(*Note to readers: Archicad, Tekla and OpenBuilding examples will be shown in future for each discipline)*

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

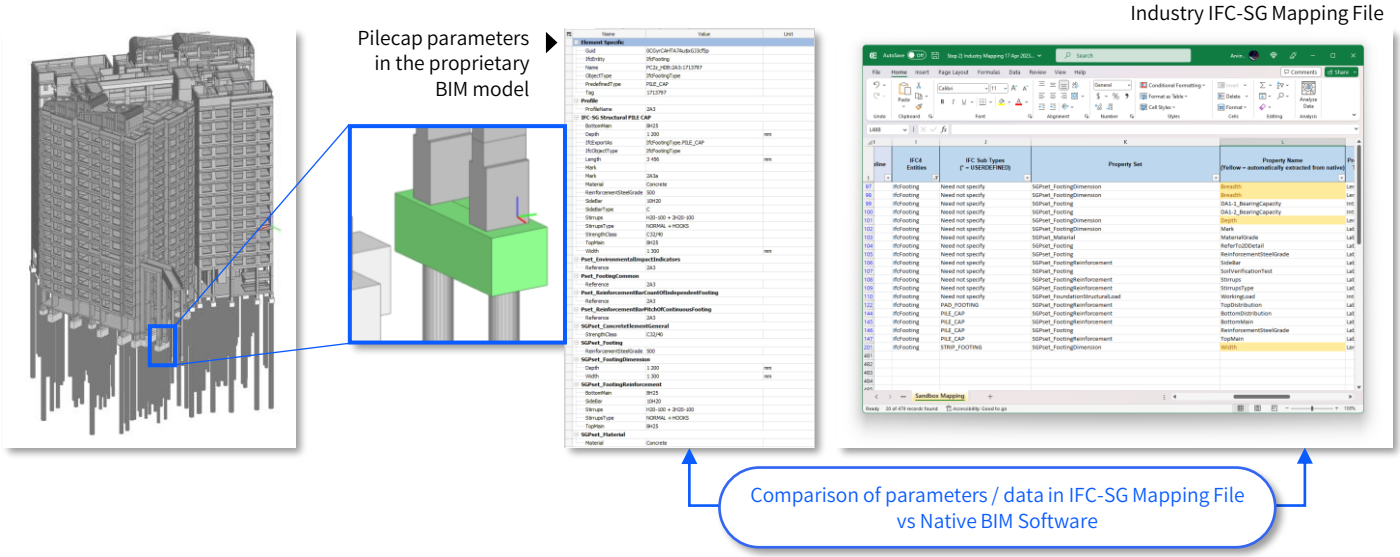
Challenge	Implications	Solutions
Cannot export Revit linked files to a federated IFC (model with multiple link files) e.g. MEP sub-discipline models	➢ **Missing data in IFC** • Assigned systems will be lost • IFC properties cannot be exported • Existing in-house properties not mapped properly (to wrong 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**

3rd Party Application to help with Preparation of IFC-SG Models

Example using IFC-SG Validator
*(*Note to readers: DiRoots and more will be shown in future)*

How does it 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 to help with Preparation of IFC-SG Models

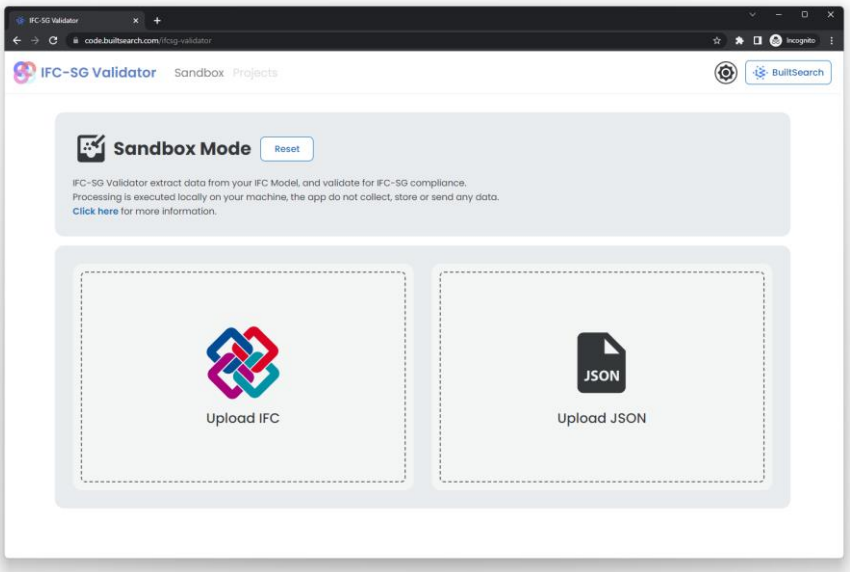
Example using IFC-SG Validator
*(*Note to readers: DiRoots and more will be shown in future)*

Guide to use the IFC-SG Validator Application

Step 1

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

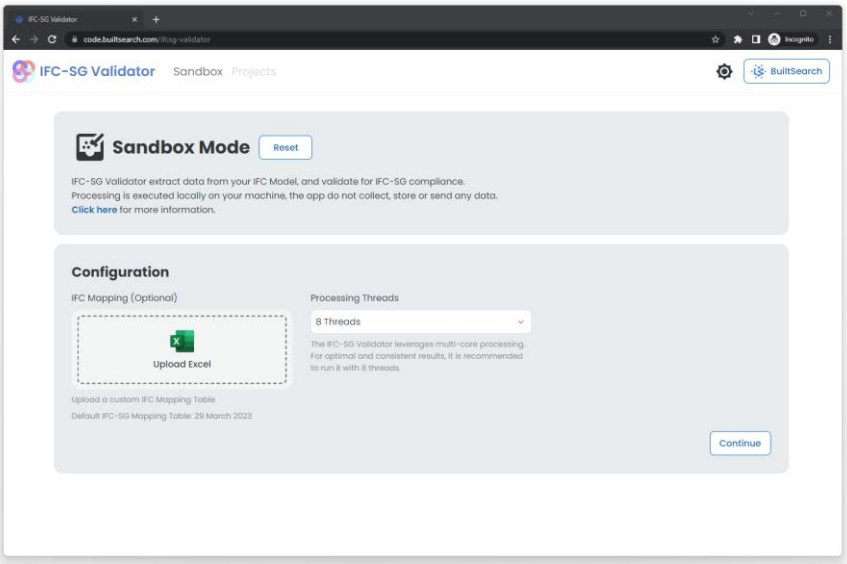
- ✓ Click on 'Upload IFC' and select an IFC Model



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

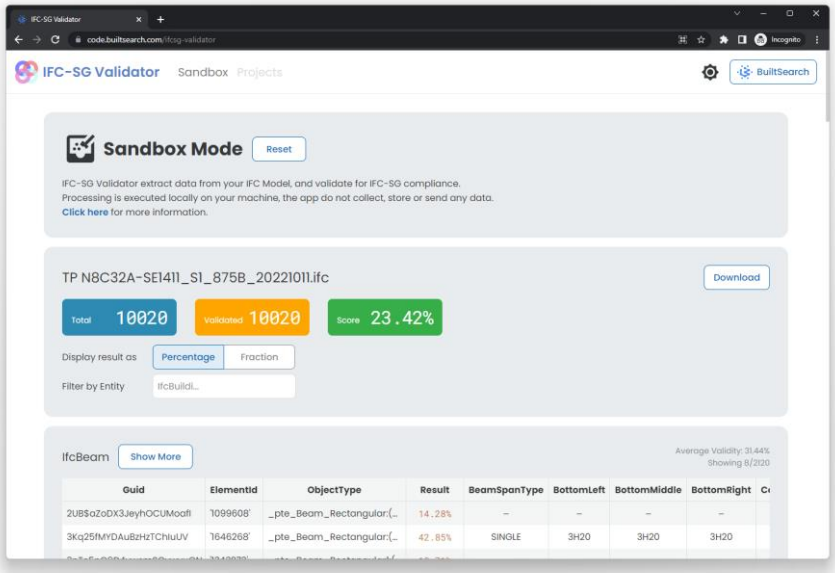
3rd Party Application to help with Preparation of IFC-SG Models

Example using IFC-SG Validator
*(*Note to readers: DiRoots and more will be shown in future)*

Guide to use the IFC-SG Validator Application

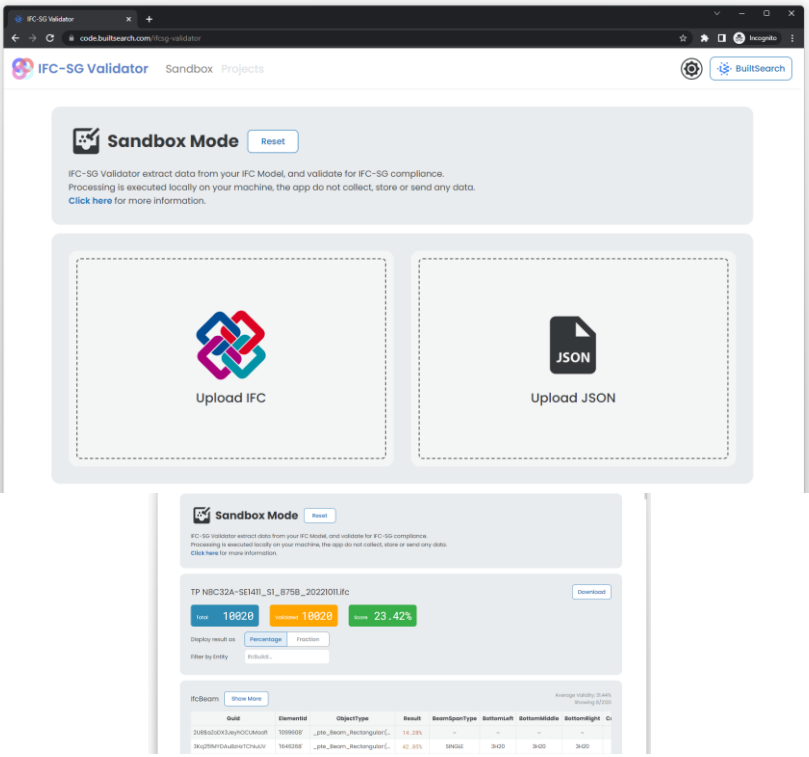
Step 3

- ✓ 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

SECTION 3

Specific Requirements by:
Regulatory Agencies

3 Specific Requirements by

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E

G1	Design Gateway		
	Key Words	**Requirement Category**	**Common Components**
	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)	-

G1.5	Piling Gateway (Optional)		
	Key Words	**Requirement Category**	**Common Components**
	Lightning Protection	• For big projects adopting piles or rough foundation as natural earth-termination system. Provision of rebars for connection to the down-conductor system shall be provided during the piling stage. • Developer or Builder is required to appoint a QP (Electrical) to supervise the LPS works and submit the LPS Supervision Form including Test Record where piling works are carried out early, before LPS Plan submission is carried out at the Construction Gateway (G2).	-

	Structural Design	**Structural Design (Piling and Foundation Works)**
		Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
		• 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)
			• Borehole
			• Footing / Pilecap
			• Pile
			• Slab

G2	Construction Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Access to Site	Passenger alighting and boarding point	• Accessible Route • Ramp • Road • Space • Vehicular Parking
	Access within Building only	Headroom and ceiling height	• Slab • Staircase • Space

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Access within Building only *(continued from previous page)*	Accessible route and maneuvering space (within the development)	• Accessible Route • Lift • Ramp • Slab • Space • Vehicular Parking
	Barrier	Safety from falling	• Railing
		Protection from injury by vehicles in building (e.g. provision of bollards)	• Railing
	Buildability	**Buildability Design (Scoring)** • B-Score Calculations **Buildability Design Implementation Plan (BDIP)** • Connection and details of precast components and prefabricated reinforcement	• Beam • Column • Refuse Chute • Slab • Staircase • Wall
	Connectivity	• Accessible Route (to the ingress / egress development entrance)	• Accessible Route • Lift • Ramp • Slab • Space • Vehicular Parking
	Dwelling Unit	Bathrooms for future retrofitting	• Space
		Design of unit entrance for wheelchair users	• Door
	Green Mark	• Basic Green Mark requirements (Ventilation) • For the rest of Green Mark assessment, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application	• Space
	Household / Storey Shelter	**Household / Storey Shelter details** • Compliance with technical requirements on shelter position, size, setback requirements • Submit CD Shock Calculations as supplementary non-BIM documentation • M&E inputs required for Transit Shelter • Compliance to structural requirements stipulated in technical requirements on household shelters and storey shelters	• Door • Electrical fixture for Household / Storey Shelter • Slab • Space • Wall • Window
	Lifts and Escalators, Equipment	Lift and Escalator Provision (Number)	• Lift Escalator
		Lift for Wheelchair Users • Location • Type	• Lift

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Lightning Protection	**The following information are required to be modelled in BIM:** • Location of air-termination system • Location of down conductors • Zone of lightning protection provided by the air-termination network for open roof spaces and the sides of the building • Location of earth electrodes **The following LPS details do not require to be modelled in BIM:** • 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. • Non-BIM supplementary documents such as material specification, photo, ppt, excel, words, etc. should be submitted	• Space
	Materials	Energy Efficiency (ETTV and RTTV)	-
	Staircase	Minimum Width, Tread and Riser, Nosing, Handrail / Railing	• Staircase

	Structural Design	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)*
		
		• 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]
			• Footing / Pilecap
			• Pile
			• Slab

		• Complete set of IFC-SG model(s) for all structural framings & details
		• **2D drawings limited to the categories below:**
		  ○ General notes
		  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)
			• Beam
			• Column
			• Slab
			• Staircase
			• Wall

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*			
		Key Words	**Requirement Category**	**Common Components**

		Structural Design
		
		(continued from previous page)
			• 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 building plan submitted simultaneously
			• Completion letter of pre-consultation [for complex structure only]
			• **Ground Investigation**
			  ○ Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08
				• Beam
				• Column
				• Slab
				• Staircase
				• Wall

		Vehicular Parking	Provision of Accessible Lot	• Accessible Route • Vehicular Parking
		Ventilation	Provision of Ventilation (natural ventilation for residential development)	• Space
			Minimum 5% opening for natural ventilation	• Space
			Maximum distance (12m) from natural ventilating opening	• Space
			Natural ventilation (dimension of recess / airwell)	• Space
			Carpark Ventilation	• Space • Vehicular Parking
		Washroom	Sanitary provisions for wheelchair users and ambulant disabled.	• Space

-	Independent Submissions			
		Key Words	**Requirement Category**	**Common Components**
		Buildability	**Constructability Score** • C-Score Calculations • Constructability Implementation Plan (CIP)	-
		Connectivity	Provision of Signages	-
		Façade	Safety of Windows	-
		Green Mark	• Green Mark Detailed Requirements (Others) • For the rest of Green Mark assessment, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application	-

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E

-	Independent Submissions *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Infra & Utilities (Internal) only	• Lighting	-
	Lightning Protection, Equipment	• Lightning Protection System (LPS) Plan	-
	Materials	• Use of Glass at Height	-
		• Daylight Reflectance	-
	Structural Design	**Structural Design (other works e.g. demolition, ERSS, cladding, safety barrier)** • 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 • 2D Drawings are acceptable for independent submissions. • These plans will need to make reference back to the coordinated model submitted by the Main QP at the Construction Gateway (G2).	-

G3	Completion Gateway	
	Key Words	**Requirement Category**
	BP TOP / CSC	• Record Plans
	Buildability Score	• As-Built B-Score Calculations (including structural) • As-Built Buildability Design Implementation Plan (BDIP) to show connection and details of precast components and prefabricated reinforcement
	CD Shelter Notice of Approval of Commissioning	• Test Method Statement and Test Record forms
	CD Shelter Commissioning	• Application for approval of commissioning of CD Shelter • Checklist for submission with application for commissioning
	Constructability Score	• As-Built C-Score • As-Built CIP • Certificate of Compliance of C-Score
	Green Mark	• Please refer to https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application

Building and Construction Authority (BCA)

Legend: Architecture C&S M&E

G3	Completion Gateway *(continued from previous page)*	
	Item for TOP / CSC	**Brief Description**
	Lightning Protection System (LPS) Plans	• Record Plans • Certificate of Supervision of LPS • Testing Records
	Record Plans of Structural Works and Certificates	• Certificate of Supervision of Piling Works • Certificate of Supervision of Structural Works • Certificate of As-Built Structural Works (in IFC-SG structural model & 2D Drawings) • Builder Certificate
	TOP / CSC	• QP Declaration • Certificate of Supervision for Lightning • Permit to Operate (Lift & Escalator) • ACMV • CD shelter • Cable BDD (B/C-score) • Green Mark • Universal Design Index FormSG Acknowledgement • CONQUAS / QM • Photos of Rectification • Phasing Plan

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

G1	Design Gateway		
	Key Words	**Requirement Category**	**Common Components**
	External Works	**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.	-
		Architectural 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 submit architectural plans and section details for the taxi shelter. • To submit architectural checklist for the taxi shelter. • To relocate existing Manhole located on the future taxi bay, if any.	-
		Layout of Proposed Frontage Improvement Works • To determine if the frontage improvements is required such as conversion of open drain to covered drain cum footpath, setting back of drain for development affected by RRL. • To indicate the footpath width, levels and gradients. • To vest the Street Reserve Plot in State (except for A&A proposal) • To show the details and extent of road improvement works, if any. • To relocate the existing Manhole located on the future carriageway, if any. • To check if additional street lightings is required for the road improvement works.	-
	Impact Studies, Site Layout, Rail Protection	**Development Proposal within Railway Protection Zone / Railway Corridor** • Plan for development works • Engineering evaluation report accompanied by plan for engineering works • Certified Survey Plans (for critical development within first reserve of underground RTS) 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 (External), Street Works	**Architectural Layout of Bus Stop** • To show the proposed layout of the bus stop indicating the location of the bus shelter and bus pole, width and length of the bus bay. • To submit architectural plans and section details for the bus shelter. • To submit architectural checklist for the bus shelter / bus bay.	-
		Design of New Street (incl. Modifications to Existing Streets) • To establish the proposed levels of development access points to properly interface with proposed carriageway before developer confirms on the development platform levels to proceed with foundation / structural works.	-

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

G1	Design Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Infra & Utilities (External), Street Works *(continued from previous page)*	• To indicate all details determined during the planning consultation stage • To submit road alignment and junction layout plan. • To show the vertical and horizontal profile of proposed road. • To submit cross-section details to show the proposed typology of road side table and road elements (POB, linkway etc.), if any. • To submit design safety review (if applicable) • To submit layout plan and cross section details of retaining wall layout - within or abutting RRL (if applicable) • To list down the design changes from TCOT/ land use stage, if any • To identify and declare all non-compliances to design standards, if any. • To seek waiver for retention of existing manhole on future road carriageway, cycling path and footpath, if any.	-
		Architectural Layout and Column Positions of Covered Linkway / High Covered Linkway • To submit architectural layout plans and section details showing the proposed width, headroom, and alignment of the covered linkway. • To submit architectural checklist for covered linkway. • 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). • To submit interfacing connection details for linkway connecting to existing bus shelter and identify any existing bus features such as noticeboards, seats affected by the linkway connection. • To determine the extent of linkway to be handed over to LTA / maintained by developer.	-
		POB Layout • To submit architectural layout plans and section details showing the proposed width, headroom (min 5.7m), and alignment of POB. • To establish the column size and position within/ outside the road reserve. Min. lateral clearance from the road shall be provided. • To determine the extent of POB to be handed over to LTA / maintained by developer. • To show the proposed connection/ interfaces with development, if any.	-
		Pedestrian Underpass Layout • To submit cross section details showing the overburden (i.e. depth of UPN from road levels) • To submit architectural layout plans and section details showing the proposed width / ceiling height / headroom, and alignment of UPN. • To submit architectural checklist for pedestrian underpass. • Check if the provision of lifts / escalators / staircase is adequate.	-

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

G1	Design Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Site Layout, Street Works	**Development Proposal** • Ensure project is not in exemption list from obtaining DBC's clearance, i.e. LTA in-house project. • To confirm if the development falls within road structure safety zone.	-
		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.	• Road • Space • Tree
		Proposed Pick-Up / Drop-Off Points (within development): PUDO Layout • Indicate width and kerb alignment of PUDO points. • To show the location, number of PUDO bays and queue length	• Road • Space
		Proposed Loading / Unloading (within development): U/UL Layout • To show the location and number of U/UL bays	-
	Vehicular Parking	• The proposed development shall comply fully with the prevailing Parking Places (Provision of Parking Places and Parking Lots) Rules and other relevant guidelines of the Authority. • The number of parking lots provided shall be 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. • The geometric dimensions of the parking layout shall comply with the standard minimum dimensions as stipulated in the COP	• Space • Vehicular Parking

G1.5	Piling Gateway (Optional)		
	Key Words	**Requirement Category**	**Common Components**
	Impact Studies, Site Layout, Rail Protection	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** *Can be provided at Commencement of Works, Piling Gateway (G1.5) or Construction Gateway (G2)* • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work	-

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

G1.5	Piling Gateway (Optional) *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Impact Studies, Site Layout, Rail Protection *(continued from previous page)*	• 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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**	**Common Components**
	Impact Studies only	**Building Proposal within Railway Protection Zone / Railway Corridor** • Plans for building work • Engineering evaluation report accompanied by plan for engineering works • 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	-
	Impact Studies, Site Layout, Rail Protection	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** *Can be provided at Commencement of Works, Piling Gateway (G1.5) or Construction Gateway (G2)* • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report	-

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Impact Studies, Site Layout, Rail Protection *(continued from previous page)*	• Certified survey plans • Permit application form and other relevant forms • 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 (External), Street Works	**Detailed Structural Layout, and M&E provisions of Pedestrian Overhead Bridges** • To provide structural details of POB (i.e. column width, footing), materials, Roof details, Floor finishes • To provide details of ramp, staircase, handrail, tactile tile • To provide details of lighting provisions and M&E provisions • To provide details of connection/ interfaces with development/ bus stops. • Declaration of non-compliance • To determine possible road closure due to hoisting of link bridges	-
		Detailed Structural layout, and M&E provisions of Covered Linkways • To provide structural details (i.e. column width, footing), materials, • To provide details of lighting provisions and M&E provisions (if any) • To provide details of connection/interfaces with development/bus stops. • Declaration of non-compliance	-
		Detailed Structural layout, and M&E provisions of Bus Shelters • To provide structural details of bus shelter, seating arrangement, bus info panels etc. • To provide bollard and flooring details. • To provide details of lighting provisions and M&E provisions (if any) • To show bus pole position • To submit Traffic Plan • To confirm the need of temporary bus stop provision and its position. • To confirm the relocation date and commissioning of new bus stop	-
		Detailed Layout of Taxi Shelter • To submit Traffic Plan • 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 • To confirm the need of temporary taxi stand provision and its position.	-
		Details of Side Table Modifications for Addition of Auxiliary lanes, u-turns etc • To submit Traffic Plan	-

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Infra & Utilities (External), Street Works *(continued from previous page)*	• To submit street plan and cross section details showing the proposed levels, width and cross-fall of carriageway, planting verge and footpath. • New cross-culvert less than 2m wide to clear with PUB Drainage	-
		Details of External Works (Frontage Improvement Works) • To submit Traffic Plan • To submit street plan and cross section details showing the proposed levels, width and cross-fall of carriageway, planting verge and footpath. • New cross-culvert less than 2m wide to clear with PUB Drainage • To determine the streetlighting provision	-
		Details of New Street (incl. modifications to existing streets) • To submit Traffic Plan • To submit street plans, longitudinal section and cross section details. • Geotechnical details for foundation, retaining wall, slope (if any) • To submit structural and M&E details for road structures and commuter facilities	-
	Site Layout, Street Works	**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	• Culvert • Ramp • Road
		Proposed pick-up / drop-off points (within development): PUDO details • All details presented at Design Gateway (G1) stage	• Ramp • Road • Space
		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, Vehicular Parking	**All 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 • EV lots & charging stations	• Ramp • Road • Space • Vehicular Parking

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

-	Independent Submissions		
	Key Words	**Requirement Category**	**Common Components**
	Impact Studies / Site Layout, Rail Protection, Road Structure Protection	**Approval to commence engineering works within Railway Protection Zone / Railway Corridor** • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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 • Plans for engineering works • Engineering evaluation report • Instrumentation proposal • Method statement of work • Hazard analysis identifying all possible risks from the engineering works that may be posed to the road structures and a description of the safety and precautionary measures to mitigate the risks • Contingency plans and Emergency procedure • Pre-condition survey report • Certified survey plan for underground structures • Soil investigation report • Particulars of the person who carries out the work and the person for whom the works are being carried out 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 Transport Authority (LTA)

Legend: Architecture C&S M&E

G3	Completion Gateway	
	Item for TOP / CSC	**Brief Description**
	-	**Application for clearance of certificate of statutory completion for development within railway protection zone / railway corridor** • As-built plans • Certificates of supervision • Final condition survey report
		Application for clearance of certificate of statutory completion for development within railway protection zone / railway corridor • As-built plans • Certificates of supervision • 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 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. • 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 • As-built structural and M&E plans for commuter facilities such as POB, UPN. • Certified Plan (CP). • Road Declaration Plan. • Road testing results. • Asset Master Record Input Form.

Land Transport Authority (LTA)

Legend: Architecture C&S M&E

G3	Completion Gateway *(continued from previous page)*	
	Item for TOP / CSC	**Brief Description**
	-	• Road Data Form. • Taking over letters from PUB, NParks and NEA. • 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. • Audit certificate for project under Ministries or Statutory Board. • Warranties for waterproofing etc.
		For Vehicle Parking submission: • Photos for open surface parking lots • As-built Drawings

National Environment Agency (NEA)

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G1	Design Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Building Massing	**Site Layout** Indicative Access (whether there's available public access)	• Space
	Impact Studies only	**Environmental Information (EI)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or owner/developer are required to apply EI application to NEA directly to request that EI such as building height constraint, health and safety buffer, etc. be made available for their projects	-
		Environmental Impact Study (EIS) *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits EIS reports to NEA directly for premises that generated air, water and noise pollution	-
		Energy Efficiency Opportunities Assessment (EEOA) *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits EEOA reports to NEA directly for industrial developments	-
	Noise Control	**Noise Impact Assessment (NIA)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch / PEs) or Consultant submits NIA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-
	Pollution Control	**Pollution Control Study (PCS)** *Can be provided at Pre-Submission, Design Gateway (G1), or Construction Gateway (G2)* • QP (Arch/PEs) or Consultant submits PCS reports to NEA directly for industrial developments that generate pollution	-
		Quantitative Risk Assessment (QRA) *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits QRA reports to NEA directly for industrial developments with storage of hazardous substances	-
		COPPC - Section 5 : Pollution Control Requirements *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • 11. Water Pollution • 12. Air Pollution • 13. Noise Pollution	-

National Environment Agency (NEA)

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G1	Design Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Pollution Control *(continued from previous page)*	**COPPC - Section 6 : Hazardous Substances and Toxic Industrial wastes control requirements** • 14. Hazardous Substances • 15. Toxic Industrial Waste	-
	Public Health	**Site Layout** • Location and Sizes of the Bin Centre, refuse and recycling chute, refuse chute chamber and recyclables storage & its collection system • Check for refuse outputs • Location of cooling tower system and its setback distance (at least 5m)	• Space
		Air Conditioning and Mechanical Ventilation System *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust.	• Space
	Servicing (Internal Accesses)	**Site Layout** • Refuse Truck Access road (for refuse collection) - swept path analysis	• Road • Space
	Site Layout only	**Site Layout** • 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).	• Space
		Nuisance Buffers • 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. • 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. • Buffers	• Space

Fronting track	35
End-wall facing track	25

National Environment Agency (NEA)

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G1	Design Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Use & Intensity	**Land Use Zoning** • Check whether the proposed development is aligned with the prevailing URA MP land use zoning (e.g. residential to residential).	-

G1.5	Piling Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Public Health	**Air Conditioning and Mechanical Ventilation System** *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust.	• Space

G2	Construction Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Dwelling Unit	**Residential Dwelling Units** • Check for hopper siting and direction facing, which shall be site as far away as possible	• Refuse Chute
	Equipment only	Detailed design of cooling tower system (if any)	• Space
	Pollution Control	**Pollution Control Study (PCS)** *Can be provided at Pre-Submission, Design Gateway (G1) or Construction Gateway (G2)* • QP (Arch/PEs) or Consultant submits PCS reports to NEA directly for industrial developments that generate pollution	-
	Public Health	**COPEH - Section 1 : Refuse Storage and Collection** 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	• Interceptor • Refuse Chute • Refuse Handling Equipment • Sensor • Space • Sprinkler • Wall

National Environment Agency (NEA)

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G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Public Health *(continued from previous page)*	1.9 Location of Grease Trap 1.10 On-Site Food Waste Treatment System	• Interceptor • Refuse Chute • Refuse Handling Equipment • Sensor • Space • Sprinkler • Wall
		Residential Dwelling Units • Check for hopper siting and direction facing, which shall be sited far away as possible from residential dwelling units and not facing the entrance of units	• Refuse Chute
		Detailed design of Pneumatic Waste Conveyance System (PWCS) refer to SS642-2019	-
		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	• Pump • Toilet • Space • System
		Public Toilet • Total number of Sanitary Facilities provisions (where applicable)	• Toilet • Space
		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	• Interceptor • Space • System
		COPEH - Section 4 : Cooling Tower 4.1 Objective 4.2 Design Requirements	• Space
		COPEH - Section 5 : Aquatic Facility 5.1 Objective 5.2 Minimum Design Criteria	• Space

National Environment Agency (NEA)

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G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Public Health *(continued from previous page)*	**COPEH - Section 5 : Aquatic Facility** 5.1 Objective 5.2 Minimum Design Criteria	• Space
		Aquatic Facility and Swimming pool • No overhead sanitary wastepipe to be on top of balancing tanks. • Location of two pre-swim showers shall be provided around the swimming pool. • Setback of 2.2m from the planter strip to pool perimeter. • Location of swimming pools and its balancing tanks	• Tank • Space
		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	• Refuse Chute
		COPEH - Section 7 : Anti-Mosquito Breeding 7.1 Objective 7.2 Roof Gutter 7.3 Air-Conditioning Tray 7.4 Floor Trap	- Gutter - Floor Trap
		Roof Gutter and Scupper Drain • Location of roof gutter or scupper drain • Provision of permanent and safety maintenance access	• Gutter • System
		Air Conditioning and Mechanical Ventilation System • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust	-

-	Independent Submissions		
	Key Words	**Requirement Category**	**Common Components**
	Noise Control	**Mechanised Carpark System** • Noise report to be submitted for the noise generated from this system	-

National Environment Agency (NEA)

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-	**Independent Submissions** *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Noise Control *(continued from previous page)*	Detailed design of noise/pollution control abatement measures	-
		Noise Impact Assessment (NIA) – Post • QP (Arch/PEs) or Consultant submits NIA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-
		Noise Report for ACMV • QP (Arch/PEs) or Consultant submits NA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-
	Pollution Control	**COPPC - Section 2 : Judicious siting of industries and other development** 4. Objective	-
		COPPC - Section 3 : Requirements for Industries 5. Clean Industry 6. Light Industry 7. General Industry 8. Special Industry	-
		COPPC - Section 4 : Requirements to Operate Factory 9. Use of Industrial premises 10. Trade effluent discharge into public sewer and water course	-
		Clearance for Detailed Plan on Pollution Control Equipment (PCE) • QP (Arch/PEs) submits to NEA directly for Detailed Plan on Pollution Control Equipment (PCE)	-
	Vehicular Parking	**Mechanised Carpark System** • Location of mechanised carpark system with the provision of 3 sided solid walls.	-

G3	**Completion Gateway**	
	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

National Parks Board (NParks)

Legend: Architecture C&S M&E

G1	Design Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Greenery	**Encroachment into Requisite Planting Area (incl. Basement)** • Need to find out if there are encroachments beyond list of allowable structures in NParks Guidelines that might affect placement of trees and shrubs • Basement or underground structures cannot impede on the required soil depth for tree planting (they need to be recessed at least 2m)	• Space
		Indication of Fire Engine Accessways • Should be designed upfront and not added as an afterthought • Should not affect requisite planting areas and roadside green verges	• Space • Road
	Infra & Utilities (External) only	**Spatial Provision for Greenery at Covered Linkways / Pedestrian Overhead Bridge** • To secure the dimensions (width and depth) on and surrounding these structures	• Space
		Standard Roadside Greenery Provision (New Roads) (Spatial Provision) • To secure the dimensions (width and depth) for green verge (including tree planting verge) according to road category	• Space • Road
	Site Layout only	**Conservation of trees/Plants (Identification, e.g. trees within TCA/VL, heritage trees)** • Both roadside and internal • Certain trees/plants are to be conserved, e.g. spelled upfront in TCOT, or special considerations such as Heritage Tree or nominated Heritage Tree, identified upon nature group/public/residents engagement, or via recommendations of EIS/EIA report and/or EMMP	• Tree • Space
		Entrance Culvert Position • Part of roadside elements • Splay corners will also affect the green verge provision and location of roadside trees	• Culvert • Tree
		Greenery Provision for Open-Air Parking Areas at Street Level (Spatial Provision) • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)	• Space • Vehicular Parking
		New Parks / Park connector / Promenade • To ensure the design is shown upfront and accepted, e.g. in terms of spatial provision, access points, specific features that have to be fixed early on	• Space
		Peripheral Planting Verges (Spatial Provision) • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)	• Space

National Parks Board (NParks)

Legend: Architecture C&S M&E

G1	Design Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Site Layout only *(continued from previous page)*	**Securing of land for PCN/Park use and/or Impact on Neighbouring Parks (e.g. en bloc sites)** • To ensure the site boundary does not encroach into safeguarded park / park connectors shown in MP19/PWP19 • Some development applications might be received during the discussion to rezone proposed parks/park connectors thus affecting boundaries	• Site Boundary
		Access Points Location (to ensure sufficient clearance secured for the retention of mature roadside trees)	• Road
		Green Buffer (Spatial Provision)	• Space

G2	Construction Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Greenery	**Conservation of Trees / Plants (Tree Protection Specifications)** • The Certified Arborist engaged by the Developer is to provide a report of the trees to be conserved, with indication of the tree girth (minimum tree protection zone will be generated in CORENET X) • A Tree Protection Zone (TPZ) refers to an area identified to protect the entire tree, which includes its crown, trunk and roots system. The TPZ established should be able to protect the entire tree throughout the duration of construction. • The objective of the TPZ is to minimize the impact of construction activities on trees, including but not limited to mechanical injury to roots, trunks and branches due to contact with equipment, materials, debris or other activities. It also aims to minimize compaction of soil, which results in poor functioning of roots, and changes in soil levels that can cut off or suffocate roots.	• Tree • Planting Area
	Infra & Utilities (External)	Detailed designs of the park and info of the park facilities and park furniture for the new parks / park connector / promenade	-
		Planting requirements for Covered Linkways / Pedestrian Overhead Bridge	-
		Allowable structures within planting areas • Planting areas (green buffers, peripheral planting verges) should be free from any encroachment, except for allowable minor ancillary structures and landscaping features listed in NParks Guidelines (Chapter 3)	• Planting Area

National Parks Board (NParks)

Legend: Architecture C&S M&E

-	Independent Submissions		
	Key Words	**Requirement Category**	**Common Components**
	Greenery	**Green buffer (landscaping scheme)** • To show the number and species of trees and plants to be planted	-
		Peripheral planting verges (landscaping scheme) • To show the number and species of trees and plants to be planted	-
		Greenery provision for open-air parking areas at street level (landscaping scheme) • To show the number and species of trees and plants to be planted and the surface treatment of the lots (i.e. grass pavers)	-
		Landscaping scheme for roadside greenery • NParks will either undertake the landscaping or liaise with QP separately	-

Public Utilities Board (PUB)

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G1	Design Gateway			
		Key Words	**Requirement Category**	**Common Components**
		Infra & Utilities (External), Public Drains	**Roadside Drain Capacity** • For projects where drains need to be rebuilt/ entrance culvert. PUB to provide required capacity during pre-sub consultation. • Size of new culvert (will be advised by PUB)	• Culvert
			Public Drains - Drain Size and Location	-
		Infra & Utilities (External), Public Sewerage System	Sewer Connection - Connection Point, where the proposed location is	• System
			Sewerage System - Alignment of Sewers, Dimensions, Gradient	• System
		Infra & Utilities (External), Detention System	**Peak Run Off** • Calculation of peak run off factor (C value) max. 0.55 (based on code and chart) e.g. area of development of greenfield site • Key Objective: To demonstrate how this is catered for, area is set aside for detention tank provision, location, OR drain widening	• Space
		Infra & Utilities (Internal), Public Drains	Common Drain (drains receiving upstream run off/ existing [note: more common for landed housing area]) - location, width	-
		Infra & Utilities (Internal), Sanitary	Sanitary Pipes - Location	• System
			Used Water Flow Rate • 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) • Key Objective: To check that sewer can contain this flow	• System
		Platform & Crest Level, Earthworks / Topography	Minimum Platform Level - SHD	-
			Crest Level - SHD	-
			Earthworks • Minimum Platform Level / Changes to Topography	-
		Platform & Crest Level, Infra & Utilities (Internal)	**Flood Protection Measures** If crest level is not provided - location and height of protection measure	• Space
		Site Layout, Drainage Reserve	**Drainage Reserve** • Location (align to DIP), width	• Space

Public Utilities Board (PUB)

Legend: Architecture C&S M&E

G1.5	Piling Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Public Drains, Earthworks / Topography	*Can be provided at Commencement of Works or Piling Gateway (G1.5)* • Earth Control Measures	• Site
	Public Drains, Infra & Utilities (External)	**Pre-Condition CCTV of Sewers (advisable)** *Can be provided at Commencement of Works or Piling Gateway (G1.5)* • Condition to be checked at TOP stage • Project team to rectify if cracks/ damage are identified	-

G2	Construction Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Infra & Utilities (Internal)	Sanitary Drainlines	• Inspection Chamber
		Sanitary Ventilation	-
		Basement Pumped System	-
		Water Tank	• Water Tank (Potable Water) • Tank (Storage)
		Mode of Supply	• System

-	Independent Submissions		
	Key Words	**Requirement Category**	**Common Components**
	Infra & Utilities (Internal), Water Supply	Meter Location	-
		Water Supply Connection	-
		Water Reticulation System	-
		Water Pumps	-

Singapore Civil Defence Force (SCDF)

Legend: Architecture C&S M&E

G1	Design Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Greenery	**Indication of Fire Engine Accessways** • Should be designed upfront and not added as an afterthought • Should not affect requisite planting areas and roadside green verges	• Space • Road
	Servicing (Internal Accesses)	**Fire Engine Access Road / Accessway Provision** • Fire Engine Access Road / Accessway Width • Accessway Length Provision • Calculations to Derive Fire Accessway • Building Façade with Fire Engine Access Panels	• Road • Space
	Site Layout only	**Building Setback due to Unprotected Openings** • Setback between buildings or to the relevant boundary due to the unprotected openings shall be computed and provided based on the setback table	• Site Boundary • Space

G2	Construction Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Access Within Building, Lifts & Escalators	**Evacuation / Fire Lifts provision** • Number of fire lifts • Fire lift accessibility and coverage • Protected lobby / fire lift lobby	• Lift • Space
	Fire Compartmentation	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each Residential Unit to be Compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements *Provided at Construction Gateway (G2)* • Separation of transit and non-transit occupancies • Separation of public and ancillary areas • Separation of commercial spaces • Separation between viaduct and M&E plantrooms / commercial spaces • Fire rating of compartment • Compartmentation by height • Vertical fire spread	• Door • Pipe • Space • Wall

Singapore Civil Defence Force (SCDF)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Fire Compartmentation *(continued from previous page)*	*Can be provided at Piling Gateway (G1.5) or Construction Gateway(G2)* • Element of structure to check fire rating	• Beam • Borehole • Column • Footing / Pilecap • Pile • Slab • Staircase • Wall
	Fire Fighting, Equipment	**Fire Hydrant System** • Location of fire hydrant(s) • Hydrant coverage not more than 50m from fire engine access road / accessway	• Fire Hydrant • Road
		Sprinklers & System • Provision of sprinklers for basement • Provision of sprinklers for buildings having habitable height more than 24m (mixed-use residential buildings)	• Space
		Rising Mains & System • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breeching inlet location	• Breeching Inlet • Hose Reel • Landing Valve • System
		Hose Reel & System • Location of hose reel • Hose reel coverage	• Hose Reel
		Emergency Voice Communication System • One way and two way EVC	-
	Household / Storey Shelter	Shelter requirements – protected shafts (with BCA)	• Wall
	Materials	**Fire Resistance of Element of Structure** • Element of structure shall have appropriate fire resistance	• Wall
		Compartment walls and floors	• Door • Space • Wall

Singapore Civil Defence Force (SCDF)

Legend: Architecture C&S M&E

G2	**Construction Gateway** *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Rapid Transit System (RTS) Station	Exit staircases and means of escape requirements	• Staircase
		Occupant load and exit capacity of station	• Space
		Other special requirements for RTS	-
	Staircase	**Exit Staircases and Means of Escape Requirements** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Number of exit staircases provided and location • Exit capacity of exit staircase, fire rating of the enclosure, smoke free approach to exit staircase, ventilation of exit staircase etc. • Travel distances to exit staircase	• Space • Stair
	Ventilation	Airwell for staircase ventilation	• Space
		Ventilation for open-sided carpark building	• Space
		Mechanical Ventilation & Smoke Control Systems • Ventilation systems for Fire Command System (FCC), fire pump rooms, smoke-free / fire fighting lobbies, generator set rooms etc. • Smoke purging system, engineered smoke control systems	• Space • System

-	**Independent Submissions**		
	Key Words	**Requirement Category**	**Common Components**
	Fire Compartmentation	**Separating Walls** • Appropriate fire resistance	-
		Compartment Walls and Floors • Appropriate fire resistance, opening protection, pipe penetration (fire stop) etc.	-
		Protection of Openings	-
		Concealed Spaces • Provision of cavity barriers, fire protection system installed	-
		Fire stopping • Materials for fire stopping shall have the necessary fire resistance	-

Singapore Civil Defence Force (SCDF)

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-	Independent Submissions *(continued from previous page)*			
		Key Words	**Requirement Category**	**Common Components**
		Fire Fighting, Equipment	**Rising Mains & System** • Water supply, fire pump & storage tank, flowrate, pressure	-
			Secondary Power Supply • Provision of genset for fire fighting systems such as fire pumps, lifts, mechanical ventilation systems, emergency voice communication system, etc.	-
			Hose Reel • Water supply, pump, storage tank, flowrate, pressure etc.	-
			Colour Scheme of Fire Protection Systems • Equipment, fixtures and fittings for the fire protection systems shall be painted in red	-
			Redundancy of Fire Pumping System • The pumping system for wet rising mains, hose reels, sprinklers and hydrants shall be provided with redundancy such that the system performance is not affected when one of the pumps and/or the associated control system is out of operation due to routine maintenance or break-down.	-
			Exit Lighting • Provision of emergency lighting at corridors and lobbies	-
			Emergency voice communication system • Provision of 1-way EVC for mixed commercial cum residential usage	-
			Fire hydrant system • Hydrant tank & pump, flowrate and pressure	-
			Sprinklers & System • Sprinkler water tank, fire pump, sprinkler head coverage & distribution etc	-
		Materials	• Product Certification	-
			Roofs • Surface flame spread rating	-
			Plastic Material • Depending on its application, the plastic material shall meet the required acceptance criteria and pass the relevant test standards	-

Singapore Civil Defence Force (SCDF)

Legend: Architecture C&S M&E

-	**Independent Submissions** *(continued from previous page)*			
		Key Words	**Requirement Category**	**Common Components**
		Ventilation	Air-Conditioning and Mechanical Ventilation systems	-
			Mechanical Ventilation & Smoke Control Systems • Ventilation systems for Fire Command System (FCC), fire pump rooms, smoke-free / fire fighting lobbies, generator set rooms etc. • Smoke puring system, engineered smoke control systems	• Space • System

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G1	Design Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Access to Site	**Site Layout** Indicative Access (whether there's available public access)	-
		Urban Design Requirements Service and Vehicular Access (where/what it fronts)	• Road
	Building Massing	**Building Height** • Floor-to-Floor Height & Aggregate Building Height • Additional Height for Predominant Sky Terrace Storey • Urban Design Requirements – Overall Building Height Control (including building crown and M&E floor, if any) • Number of Storeys	• Building Storey • Space
		Building Length and Form	• Space
		Street Block Plans	-
	Connectivity	**Urban Design Requirements - Connectivity (UPN, EPN, TBL, Open / Covered Walkways)** • Mitigation of level differences • Alignment • Clear width • (UPN, EPN) Detailed layout of vertical circulation point – location within development, and dimensions • (UPN, EPN) KOP details (e.g. alignment, size) • (TBL) Soffit height	• Space • Soffit
		Walking and Cycling Plan • Connectivity to transport node • Description of pedestrian and cyclist connectivity between the private and public spaces	-
	Conservation	**Supplementary documents** • Business concept and furniture layout of proposed use (for change of use in HCA) • Measured survey drawing (for unrestored building) • Façade and interior photographs • Development Statement of Intent (DSI) • DAPC presentation material	-
	Earthworks / Topography	**Earthworks, Retaining Walls and Boundary Walls** Height of Retaining Wall(s), Extent of Earthfill and Impact on Surroundings	• Space • Wall
	External Works	**Urban Design Requirements – Linkway Connection to Commuter Facilities** • Indicative alignment • Clear width	-

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G1	Design Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	External Works *(continued from previous page)*	**Urban Design Requirements – Cycling Path** Provision (vesting) & alignment (to ensure it does not conflict with key pedestrian routes)	-
	Greenery	**Urban Design Requirements** LRA Provision: Indicative Extent (may affect building form)	• Space
	Infra & Utilities (Internal) only	**Urban Design Requirements** • Integration of Existing Utilities (GLS e.g. MRT pop-up, substation)	-
	Platform & Crest Level, Earthworks / Topography	**Earthworks** • Minimum Platform Level / Changes to Topography	-
	Public Space	**Urban Design Requirements – Public Spaces – POPS** • Location • Size • Layout • Shade Studies ○ Shading and Ecotect (or equivalent) sunshading studies at specified timings • Soffit Height	• Space • Soffit
	Rapid Transit System (RTS) Station	**Urban Design Requirements** • Location of station box • Design of pop-up structures (mitigation of platform levels, interfacing with neighbouring developments, within approved railway, cw provision, setback) • Land take required • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2,000sqm) • Construction method • Future integration with future structures (e.g. location / orientation / size of vents)	• Space
		National Scheme • For works interfacing with future developments (e.g. RTS) • Schematic design of future development (e.g. massing and connectivity to determine future pedestrian connection to surrounding sites)	-
	Service and Vehicular Access to Site	**Urban Design Requirements** • Location of Service Areas, Holding Bays, and Vehicular Access (where/what it fronts)	-

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G1	Design Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Site Layout only	**Building Setback from Boundary** • Road Buffer and Green Buffer • Common Boundary Setback / Party wall & Planting Strip • Building Setback for Multi-Storey Car Parks • Boundary Setback for Ancillary Structures	• Space
		Site Layout • Location of Buildings • Location of Communal Facilities (e.g. bin centre, pavilions, BBQ areas)	• Space
		Site Coverage • Declaration of Percentage	• Space
	Site Layout, Landscape Deck	**Landscape Deck** • Height of Deck - Show on Section	• Slab
	Use & Intensity	**Dwelling Units** • Maximum Number • Pre-Application Feasibility Study (together with LTA)	• Space
		Gross Plot Ratio / Gross Floor Area	• Space
		Land Alienation / Land to be Vested for Public Schemes (Drain, Road, Open Space, Park, Cycling Paths)	• Space
		Land Use / Building Uses	• Space
		Site Area	• Space
		Built Environment Transformation GFA (Bonus GFA)	-
	Vehicular Parking	**Parking** • Show location within site (e.g. underground; to check TCOT requirement for urban design requirements) • Nature (basement, surface, or podium) • Declare total number and breakdown of types	• Space • Vehicular Parking
	Others	**Urban Design Requirements** • Any other requirements that affect piling (e.g. notioning scheme to determine feasibility of future pedestrian connection to surrounding sites)	-

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G1	Design Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Others *(continued from previous page)*	**Supplementary Documents** • Topo Survey Plan • Previous approved plans	-
		Public Consultation Process • Form A	-
		Development Statement of Intent • Description of proposal (does not apply to resi-landed)	-
		Design Advisory Panel (DAP) Report • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)	-

G2	Construction Gateway		
	Key Words	**Requirement Category**	**Common Components**
	Access to Site	**Developments involving waterbodies:** • Foreshore access	• Space
		Site Layout: • Location of side gates	• Door • Space
	Access within Building only	Corridor width (for retirement housing)	• Space

	Balcony	**Balconies, Private Enclosed Spaces, Private Roof Terraces and Indoor Recreation Spaces:**
		• Balcony openness
		  ○ To demarcate open vs total perimeter on model, and declare openness percentage
		• Balcony screening
		  ○ To show design of screens illustrating that there are sufficient porosity for natural ventilation
		• Balcony width and size
			• Space

		Bonus Balcony GFA • Letter of declaration from developer on balcony screen design and provision	-
	Building / Unit Layout	Checking of strata areas / layout / voids – demarcate strata boundaries	• Space

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Building / Unit Layout *(continued from previous page)*	Dwelling Units: Unit Size and Layout (including strata area / volume)	• Space
		Unit / Floor Layout (e.g. office, retail, industrial): Unit Size and Layout	• Space
	Building Massing	Building facade is treated as main elevation – illustrate design using perspectives	-
	Connectivity	**Walking and Cycling Plan:** • Connectivity between buildings – show layout on plans, indicate width and levels • Deconflicting vehicular and pedestrian / cyclist traffic • Provision of biking lots and end-of-trip facilities – show location and GFA exemption	• Vehicular Parking
		(Covered Walkways) Soffit height	• Soffit
		(Open / Covered Walkways) Paving material (where required in UD guidelines)	-
		(Open / Covered Walkways) Level of bulk water meter chamber / inspection chamber	• Water Meter • Inspection Chamber
	Conservation	Conserved Building: Commencement of Front Facade Restoration	-
		Documents to be part of Approved Plan (Conservation) • Drawing of architectural details	-
	Dwelling Unit	Checking of strata area / layout / voids – demarcate strata boundaries	• Space
		Dwelling Units: Unit size and layout (including strata area / volume)	• Space
	Earthworks / Topography	**Developments involving Waterbodies:** • Treatment of retaining wall	• Wall
		Earthworks, Retaining Walls, and Boundary Walls: • Boundary wall – height and treatment	• Wall
	External Works	Cycling path: Design – width, levels, treatment where relevant	-
		Design treatment for public street lighting, bollards, tactile tiles (UD requirement for CBD / Marina Bay)	-
		Linkway connection to commuter facilities: design details (e.g. alignment, clear width, soffit height)	-

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Greenery	**Greenery:** • Landscape Replacement Area – Show on plans and declare % of landscape	• Space
		Greenery: • Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions – show on plans and provide details of design	• Planter Box • Space
	Night Lighting	**Night Lighting Report** • UD Areas with night lighting requirement • Concept and renders • Specifications • Location and extent • Fixture installation	-
	ORA / ODA / Kiosks	Location and extent, detailed design (e.g. structure, height, transparency)	-
	Public Communications Plans	Public Communication Plans	-
	Public Space	**Privately-Owned Public Spaces (POPS):** • Seating (design, no., location) • Amenities (type, location) • Signage (design, location) • Outdoor Refreshment Areas (ORA) (if provided, location / extent)	-
	Roofscape	Detailed treatment of rooftop as “fifth” elevation	-
		Detailed location / extent of rooftop Outdoor Refreshment Area (ORA)	-
		M&E Screening details	-
	Rapid Transit System (RTS) Station	At-grade bicycle parking	-
	Signage	**Privately-Owned Public Spaces (POPS), Through Block Link (TBL) Signage** • Location and design of signages	-
	Site Layout only	**Building Setback from Boundary** • Setback for Building Appendages – Location and width • Treatment for non-compliant Multi-Storey Car Parks • Treatment for non-compliant Ancillary Structures	• Space
	Site Layout, Attic	**Attic** • Design of attic in relation to strata unit • Height of attic - Dimension	• Space

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Site Layout, Basement	**Basements** • Basement protrusion • Screening of basement opening • Setback	• Space
	Site Layout, Landscape Deck	**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	• Space • Wall
	Site Layout, Screening	**Special and Detailed Control Plans** • Screenings under High-Rise Committee	-
	Structures in Building Setback, Green Buffer	• Location (e.g. integrated with building envelope) • Finish material (e.g. to match paving if located within covered / open walkway)	-
	Use & Intensity	Ancillary Shops (0.3% Quantum) – to declare amount of Commercial GFA within development	• Space
		Bonus GFA Incentive Schemes: Balcony / Recreational – declaration of GFA amount and %	-
		RC Flat Roofs: • Use – Indicate whether roof is accessible, and if so, for what purpose • Structures – To show on plan any proposed built structures	• Space
		Urban Design Requirements • Activity Generating Uses – Indicate location on plan and provide details on specific nature of use • Public Spaces – Indicate location, design and dimensions • Party Wall – Indicate no openings	• Space
	Vehicular Parking	Screening Details	-
	Others	**Supplementary Documents** • Topo Survey Plan • Previous approved plans	-
		Landscaping species plan (trees / shrubs / groundcover)	• Tree
		Public Consultation Process • Forms B and C	-

Urban Redevelopment Authority (URA)

Legend: Architecture C&S M&E

G2	Construction Gateway *(continued from previous page)*		
	Key Words	**Requirement Category**	**Common Components**
	Others *(continued from previous page)*	**Design Advisory Panel (DAP) Report** • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)	-

-	Independent Submissions		
	Key Words	**Requirement Category**	**Common Components**
	Conservation	**Conserved Building (remaining works to be checked)** • Painting • Signage • Lighting • 5-foot Way Material (tiles) • M&E location (aircon, screening, kitchen flue)	-

G3	Completion Gateway	
	Item for TOP / CSC	**Brief Description**
	Development Interface Report (DIR) (Final)	• Information for future developer (e.g. loading requirements, knock out panels alignment / width)

SECTION 3

Specific Requirements by:
Project Disciplines

3 Specific Requirements by

Page

Architecture

G1	Design Gateway			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Access To Site	URA	**Site Layout** Indicative Access (whether there's available public access)	-
			Urban Design Requirements Service and Vehicular Access (where/what it fronts)	• Road
	Building Massing	NEA	**Site Layout** Indicative Access (whether there's available public access)	• Space
		URA	**Building Height** • Floor-to-Floor Height & Aggregate Building Height • Additional Height for Predominant Sky Terrace Storey • Urban Design Requirements – Overall Building Height Control (including building crown and M&E floor, if any) • Number of Storeys	• Building Storey • Space
			Building Length and Form	• Space
			Street Block Plans	-
	Connectivity	URA	**Urban Design Requirements - Connectivity (UPN, EPN, TBL, Open / Covered Walkways)** • Mitigation of level differences • Alignment • Clear width • (UPN, EPN) Detailed layout of vertical circulation point – location within development, and dimensions • (UPN, EPN) KOP details (e.g. alignment, size) • (TBL) Soffit height	• Space • Soffit
			Walking and Cycling Plan • Connectivity to transport node • Description of pedestrian and cyclist connectivity between the private and public spaces	-
	Conservation	URA	**Supplementary Documents** • Business concept and furniture layout of proposed use (for change of use in HCA) • Measured survey drawing (for unrestored building) • Façade and interior photographs • Development Statement of Intent (DSI) • DAPC presentation material	-
	Earthworks / Topography	URA	**Earthworks, Retaining Walls and Boundary Walls** Height of Retaining Wall(s), Extent of Earthfill and Impact on Surroundings	• Space • Wall

Architecture

G1	Design Gateway *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	External Works	URA	**Urban Design Requirements – Linkway Connection to Commuter Facilities** • Indicative alignment • Clear width	-
			Urban Design Requirements – Cycling Path Provision (vesting) & alignment (to ensure it does not conflict with key pedestrian routes)	-
		LTA	**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.	-
			Architectural 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 submit architectural plans and section details for the taxi shelter. • To submit architectural checklist for the taxi shelter. • To relocate existing Manhole located on the future taxi bay, if any.	-
			Layout of Proposed Frontage Improvement Works • To determine if the frontage improvements is required such as conversion of open drain to covered drain cum footpath, setting back of drain for development affected by RRL. • To indicate the footpath width, levels and gradients. • To vest the Street Reserve Plot in State (except for A&A proposal) • To show the details and extent of road improvement works, if any. • To relocate the existing Manhole located on the future carriageway, if any. • To check if additional street lightings is required for the road improvement works.	-
	Greenery	NParks	**Encroachment into Requisite Planting Area (incl. Basement)** • Need to find out if there are encroachments beyond list of allowable structures in NParks Guidelines that might affect placement of trees and shrubs • Basement or underground structures cannot impede on the required soil depth for tree planting (they need to be recessed at least 2m)	• Space

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Greenery *(continued from previous page)*	NParks, SCDF	**Indication of Fire Engine Accessways** • Should be designed upfront and not added as an afterthought • Should not affect requisite planting areas and roadside green verges	• Space • Road
		URA	**Urban Design Requirements** LRA Provision: Indicative Extent (may affect building form)	• Space
	Impact Studies only	NEA	**Environmental Information (EI)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or owner/developer are required to apply EI application to NEA directly to request that EI such as building height constraint, health and safety buffer, etc. be made available for their projects	-
			Environmental Impact Study (EIS) *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits EIS reports to NEA directly for premises that generated air, water and noise pollution	-
			Energy Efficiency Opportunities Assessment (EEOA) *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits EEOA reports to NEA directly for industrial developments	-
	Impact Studies, Site Layout, Rail Protection	LTA	**Development Proposal within Railway Protection Zone / Railway Corridor** • Plan for development works • Engineering evaluation report accompanied by plan for engineering works • Certified Survey Plans (for critical development within first reserve of underground RTS) 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 (External) only	NParks	**Spatial Provision for Greenery at Covered Linkways / Pedestrian Overhead Bridge** • To secure the dimensions (width and depth) on and surrounding these structures	• Space

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Infra & Utilities (External) only *(continued from previous page)*	NParks	**Standard Roadside Greenery Provision (New Roads) (Spatial Provision)** • To secure the dimensions (width and depth) for green verge (including tree planting verge) according to road category	• Space • Road
	Infra & Utilities (External), Street Works	LTA	**Architectural Layout of Bus Stop** • To show the proposed layout of the bus stop indicating the location of the bus shelter and bus pole, width and length of the bus bay. • To submit architectural plans and section details for the bus shelter. • To submit architectural checklist for the bus shelter / bus bay.	-
			Design of New Street (incl. Modifications to Existing Streets) • To establish the proposed levels of development access points to properly interface with proposed carriageway before developer confirms on the development platform levels to proceed with foundation / structural works. • To indicate all details determined during the planning consultation stage • To submit road alignment and junction layout plan. • To show the vertical and horizontal profile of proposed road. • To submit cross-section details to show the proposed typology of road side table and road elements (POB, linkway etc.), if any. • To submit design safety review (if applicable) • To submit layout plan and cross section details of retaining wall layout - within or abutting RRL (if applicable) • To list down the design changes from TCOT/ land use stage, if any • To identify and declare all non-compliances to design standards, if any. • To seek waiver for retention of existing manhole on future road carriageway, cycling path and footpath, if any.	-
			Architectural Layout and Column Positions of Covered Linkway / High Covered Linkway • To submit architectural layout plans and section details showing the proposed width, headroom, and alignment of the covered linkway. • To submit architectural checklist for covered linkway. • 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).	-

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Infra & Utilities (External), Street Works *(continued from previous page)*	LTA	• To submit interfacing connection details for linkway connecting to existing bus shelter and identify any existing bus features such as noticeboards, seats affected by the linkway connection. • To determine the extent of linkway to be handed over to LTA / maintained by developer.	-
			POB Layout • To submit architectural layout plans and section details showing the proposed width, headroom (min 5.7m), and alignment of POB. • To establish the column size and position within/ outside the road reserve. Min. lateral clearance from the road shall be provided. • To determine the extent of POB to be handed over to LTA / maintained by developer. • To show the proposed connection/ interfaces with development, if any.	-
			Pedestrian Underpass Layout • To submit cross section details showing the overburden (i.e. depth of UPN from road levels) • To submit architectural layout plans and section details showing the proposed width / ceiling height / headroom, and alignment of UPN. • To submit architectural checklist for pedestrian underpass. • Check if the provision of lifts / escalators / staircase is adequate.	-
	Infra & Utilities (External), Public Drains	PUB	**Roadside Drain Capacity** • For projects where drains need to be rebuilt/ entrance culvert. PUB to provide required capacity during pre-sub consultation. • Size of new culvert (will be advised by PUB)	• Culvert
			Public Drains - Drain Size and Location	-
	Infra & Utilities (External), Public Sewerage System	PUB	Sewer Connection - Connection Point, where the proposed location is	• System
			Sewerage System - Alignment of Sewers, Dimensions, Gradient	• System
	Infra & Utilities (Internal) only	URA	**Urban Design Requirements** • Integration of Existing Utilities (GLS e.g. MRT pop-up, substation)	-

Architecture

G1	Design Gateway *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Infra & Utilities (Internal), Detention System	PUB	**Peak Run Off** • Calculation of peak run off factor (C value) max. 0.55 (based on code and chart) e.g. area of development of greenfield site • Key Objective: To demonstrate how this is catered for, area is set aside for detention tank provision, location, OR drain widening	• Space
	Infra & Utilities (Internal), Public Drains	PUB	Common Drain (drains receiving upstream run off/ existing [note: more common for landed housing area]) - location, width	-
	Infra & Utilities (Internal), Sanitary	PUB	Sanitary Pipes - Location	• System
			Used Water Flow Rate • 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) • Key Objective: To check that sewer can contain this flow	• System
	Noise Control	NEA	**Noise Impact Assessment (NIA)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch / PEs) or Consultant submits NIA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-
	Platform & Crest Level, Earthworks / Topography	PUB	Minimum Platform Level - SHD	-
			Crest Level - SHD	-
		PUB, URA	**Earthworks** • Minimum Platform Level / Changes to Topography	-
	Platform & Crest Level, Infra & Utilities (Internal)	PUB	**Flood Protection Measures** If crest level is not provided - location and height of protection measure	• Space
	Pollution Control	NEA	**Pollution Control Study (PCS)** *Can be provided at Pre-Submission, Design Gateway (G1), or Construction Gateway (G2)* • QP (Arch/PEs) or Consultant submits PCS reports to NEA directly for industrial developments that generate pollution	-

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Pollution Control *(continued from previous page)*	NEA	**Quantitative Risk Assessment (QRA)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits QRA reports to NEA directly for industrial developments with storage of hazardous substances	-
			COPPC - Section 5 : Pollution Control Requirements *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • 11. Water Pollution • 12. Air Pollution • 13. Noise Pollution	-
			COPPC - Section 6 : Hazardous Substances and Toxic Industrial wastes control requirements • 14. Hazardous Substances • 15. Toxic Industrial Waste	-
	Public Health	NEA	**Site Layout** • Location and Sizes of the Bin Centre, refuse and recycling chute, refuse chute chamber and recyclables storage & its collection system • Check for refuse outputs • Location of cooling tower system and its setback distance (at least 5m)	• Space
			Air Conditioning and Mechanical Ventilation System *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust.	• Space
	Public Space	URA	**Urban Design Requirements – Public Spaces – POPS** • Location • Size • Layout • Shade Studies ○ Shading and Ecotect (or equivalent) sunshading studies at specified timings • Soffit Height	• Space • Soffit

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Rapid Transit System (RTS) Station	URA	**Urban Design Requirements** • Location of station box • Design of pop-up structures (mitigation of platform levels, interfacing with neighbouring developments, within approved railway, cw provision, setback) • Land take required • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2,000sqm) • Construction method (e.g. extent of ERSS) • Future integration with future structures (e.g. location / orientation / size of vents)	• Space
			National Scheme • For works interfacing with future developments (e.g. RTS) • Schematic design of future development (e.g. massing and connectivity to determine future pedestrian connection to surrounding sites)	-
	Service and Vehicular Access to Site	URA	**Urban Design Requirements** • Location of Service Areas, Holding Bays, and Vehicular Access (where/what it fronts)	-
	Servicing (Internal Accesses)	NEA	**Site Layout** • Refuse Truck Access Road (for refuse collection) ○ Swept Path Analysis	• Road • Space
		SCDF	**Fire Engine Access Road / Accessway Provision** • Fire Engine Access Road / Accessway Width • Accessway Length Provision • Calculations to Derive Fire Accessway • Building Façade with Fire Engine Access Panels	• Road • Space
	Site Layout only	NEA	**Site Layout** • 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.)	• Space

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Site Layout only *(continued from previous page)*	NEA	**Nuisance Buffers** • 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. • 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. • Buffers	• Space
		NParks	**Conservation of trees/Plants (Identification, e.g. trees within TCA/VL, heritage trees)** • Both roadside and internal • Certain trees/plants are to be conserved, e.g. spelled upfront in TCOT, or special considerations such as Heritage Tree or nominated Heritage Tree, identified upon nature group/public/residents engagement, or via recommendations of EIS/EIA report and/or EMMP	• Tree • Space
			Entrance Culvert Position • Part of roadside elements • Splay corners will also affect the green verge provision and location of roadside trees	• Culvert • Tree
			Entrance Culvert Position • Part of roadside elements • Splay corners will also affect the green verge provision and location of roadside trees	• Culvert • Tree
			Greenery Provision for Open-Air Parking Areas at Street Level (Spatial Provision) • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)	• Space • Vehicular Parking
			New Parks / Park connector / Promenade • To ensure the design is shown upfront and accepted, e.g. in terms of spatial provision, access points, specific features that have to be fixed early on	• Space

Architecture

G1	Design Gateway *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Site Layout only *(continued from previous page)*	NParks	**Peripheral Planting Verges (Spatial Provision)** • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)	• Space
			Securing of land for PCN/Park use and/or Impact on Neighbouring Parks (e.g. en bloc sites) • To ensure the site boundary does not encroach into safeguarded park / park connectors shown in MP19/PWP19 • Some development applications might be received during the discussion to rezone proposed parks/park connectors thus affecting boundaries	• Site Boundary
			Access Points Location (to ensure sufficient clearance secured for the retention of mature roadside trees)	• Road
			Green Buffer (Spatial Provision)	• Space
		SCDF	**Building Setback due to Unprotected Openings** • Setback between buildings or to the relevant boundary due to the unprotected openings shall be computed and provided based on the setback table	• Site Boundary • Space
		URA	**Building Setback from Boundary** • Road Buffer and Green Buffer • Common Boundary Setback / Party wall & Planting Strip • Building Setback for Multi-Storey Car Parks • Boundary Setback for Ancillary Structures	• Space
			Site Layout • Location of Buildings • Location of Communal Facilities (e.g. bin centre, pavilions, BBQ areas)	• Space
			Site Coverage • Declaration of Percentage	• Space
	Site Layout, Drainage Reserve	PUB	**Drainage Reserve** • Location (align to DIP), width	• Space
	Site Layout, Landscape Deck	URA	**Landscape Deck** • Height of Deck - Show on Section	• Slab

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Site Layout, Street Works	LTA	**Development Proposal** • Ensure project is not in exemption list from obtaining DBC's clearance, i.e. LTA in-house project. • To confirm if the development falls within road structure safety zone.	-
			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.	• Road • Space • Tree
			Proposed Pick-Up / Drop-Off Points (within development): PUDO Layout • Indicate width and kerb alignment of PUDO points. • To show the location, number of PUDO bays and queue length	• Road • Space
			Proposed Loading / Unloading (within development): U/UL Layout • To show the location and number of U/UL bays	-
	Use & Intensity	NEA	**Land Use Zoning** • Check whether the proposed development is aligned with the prevailing URA MP land use zoning (e.g. residential to residential).	-
		URA	**Dwelling Units** • Maximum Number • Pre-Application Feasibility Study (together with LTA)	• Space
			Gross Plot Ratio / Gross Floor Area	• Space
			Land Alienation / Land to be Vested for Public Schemes (Drain, Road, Open Space, Park, Cycling Paths)	• Space
			Land Use / Building Uses	• Space
			Site Area	• Space
			Built Environment Transformation GFA (Bonus GFA)	-

Architecture

G1	**Design Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Vehicular Parking	LTA	• The proposed development shall comply fully with the prevailing Parking Places (Provision of Parking Places and Parking Lots) Rules and other relevant guidelines of the Authority. • The number of parking lots provided shall be 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. • The geometric dimensions of the parking layout shall comply with the standard minimum dimensions as stipulated in the COP	• Space • Vehicular Parking
		URA	**Parking** • Show location within site (e.g. underground; to check TCOT requirement for urban design requirements) • Nature (basement, surface, or podium) • Declare total number and breakdown of types	• Space • Vehicular Parking
	Others	URA	**Urban Design Requirements** • Any other requirements that affect piling (e.g. notioning scheme to determine feasibility of future pedestrian connection to surrounding sites)	-
			Supplementary Documents • Topo Survey Plan • Previous approved plans	-
			Public Consultation Process • Form A	-
			Development Statement of Intent • Description of proposal (does not apply to resi-landed)	-
			Design Advisory Panel (DAP) Report • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)	-

Architecture

G1.5	Piling Gateway (Optional)			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Fire Compartmentation	SCDF	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each Residential Unit to be Compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements	• Door • Pipe • Space • Wall
	Lightning Protection	BCA	• For big projects adopting piles or rough foundation as natural earth-termination system. Provision of rebars for connection to the down-conductor system shall be provided during the piling stage. • Developer or Builder is required to appoint a QP (Electrical) to supervise the LPS works and submit the LPS Supervision Form including Test Record where piling works are carried out early, before LPS Plan submission is carried out at the Construction Gateway (G2).	-
	Public Drains, Earthworks / Topography	PUB	*Can be provided at Commencement of Works or Piling Gateway (G1.5)* • Earth Control Measures	• Site
	Public Drains, Infra & Utilities (External)	PUB	**Pre-Condition CCTV of Sewers (advisable)** *Can be provided at Commencement of Works or Piling Gateway (G1.5)* • Condition to be checked at TOP stage • Project team to rectify if cracks/ damage are identified	-
	Staircase	SCDF	**Exit Staircases and Means of Escape Requirements** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Number of exit staircases provided and location • Exit capacity of exit staircase, fire rating of the enclosure, smoke free approach to exit staircase, ventilation of exit staircase etc. • Travel distances to exit staircase	• Space • Stair

Architecture

G2	Construction Gateway			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Access to Site	BCA	Passenger alighting and boarding point	• Accessible Route • Ramp • Road • Space
		URA	**Developments involving waterbodies:** • Foreshore access	• Space
			Site Layout: • Location of side gates	• Door • Space
	Access within Building only	BCA	Headroom and ceiling height	• Slab • Space • Staircase
			Accessible route and maneuvering space (within the development)	• Accessible Route • Lift • Ramp • Slab • Space • Vehicular Parking
		URA	Corridor width (for retirement housing)	• Space
	Access within Building, Lifts & Escalators	SCDF	**Evacuation / Fire Lifts Provision** *Can be provided at Piling Gateway (G1.5) or Construction Gateway(G2)* • Number of fire lifts • Fire lift accessibility and coverage • Protected lobby / fire lift lobby	• Lift • Space

	Balcony	URA	**Balconies, Private Enclosed Spaces, Private Roof Terraces and Indoor Recreation Spaces:**
			• Balcony openness
			  • To demarcate open vs total perimeter on model, and declare openness percentage
			• Balcony screening
			  • To show design of screens illustrating that there are sufficient porosity for natural ventilation
			• Balcony width and size
				• Space

			Bonus Balcony GFA • Letter of declaration from developer on balcony screen design and provision	-

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Buildability	BCA	**Buildability design (Scoring)** • B-Score Calculations	• Beam • Column • Refuse Chute • Slab • Staircase • Wall
	Building / Unit Layout	URA	Checking of strata areas / layout / voids – demarcate strata boundaries	• Space
			Dwelling Units: Unit Size and Layout (including strata area / volume)	• Space
			Unit / Floor Layout (e.g. office, retail, industrial): Unit Size and Layout	• Space
	Building Massing	URA	Building facade is treated as main elevation – illustrate design using perspectives	-
	Connectivity	BCA	Accessible Route (to the ingress / egress development entrance)	• Accessible Route • Lift • Ramp • Slab • Space • Vehicular Parking
		URA	**Walking and Cycling Plan:** • Connectivity between buildings – show layout on plans, indicate width and levels • Deconflicting vehicular and pedestrian / cyclist traffic • Provision of biking lots and end-of-trip facilities – show location and GFA exemption	• Vehicular Parking
			(Covered Walkways) Soffit height	• Soffit
			(Open / Covered Walkways) Paving material (where required in UD guidelines)	-
			(Open / Covered Walkways) Level of bulk water meter chamber / inspection chamber	• Water Meter • Inspection Chamber
	Conservation	URA	Conserved Building: Commencement of front facade restoration	-
			Documents to be part of Approved Plan (Conservation) • Drawing of architectural details	-

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Dwelling Unit	BCA	Bathrooms for future retrofitting	• Space
			Design of unit entrance for wheelchair users	• Door
		URA	Checking of strata area / layout / voids – demarcate strata boundaries	• Space
			Dwelling Units: Unit size and layout (including strata area / volume)	• Space
		NEA	**Residential Dwelling Units** • Check for hopper siting and direction facing, which shall be site as far away as possible	• Refuse Chute
	Earthworks / Topography	URA	**Developments involving Waterbodies:** • Treatment of retaining wall	• Wall
			Earthworks, Retaining Walls, and Boundary Walls: • Boundary wall – height and treatment	• Wall
	External Works	URA	Cycling path: Design – width, levels, treatment where relevant	-
			Design treatment for public street lighting, bollards, tactile tiles (UD requirement for CBD / Marina Bay)	-
			Linkway connection to commuter facilities: design details (e.g. alignment, clear width, soffit height)	-
	Fire Compartmentation	SCDF	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each Residential Unit to be Compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements	• Door • Pipe • Space • Wall

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Fire Compartmentation *(continued from previous page)*	SCDF	**Compartmentation** *Provided at Construction Gateway (G2)* • Separation of transit and non-transit occupancies • Separation of public and ancillary areas • Separation of commercial spaces • Separation between viaduct and M&E plantrooms / commercial spaces • Fire rating of compartment • Compartmentation by height • Vertical fire spread	• Door • Space • Wall
	Fire Fighting, Equipment	SCDF	**Fire Hydrant System** • Location of fire hydrant(s) • Hydrant coverage not more than 50m from fire engine access road / accessway	• Fire Hydrant • Road
			Sprinklers & System • Provision of sprinklers for basement • Provision of sprinklers for buildings having habitable height more than 24m (mixed-use residential buildings)	• Space
			Rising Mains & System • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breeching inlet location	• Breeching Inlet • Hose Reel • Landing Valve • System
			Hose Reel & System • Location of hose reel • Hose reel coverage	• Hose Reel
			Emergency Voice Communication System • One way and two way EVC	-
	Green Mark	BCA	• Basic Green Mark requirements (Ventilation) • For the rest of Green Mark assessment, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application	• Space

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Greenery	NParks	**Conservation of Trees / Plants (Tree Protection Specifications)** • The Certified Arborist engaged by the Developer is to provide a report of the trees to be conserved, with indication of the tree girth (minimum tree protection zone will be generated in CORENET X) • A Tree Protection Zone (TPZ) refers to an area identified to protect the entire tree, which includes its crown, trunk and roots system. The TPZ established should be able to protect the entire tree throughout the duration of construction. • The objective of the TPZ is to minimize the impact of construction activities on trees, including but not limited to mechanical injury to roots, trunks and branches due to contact with equipment, materials, debris or other activities. It also aims to minimize compaction of soil, which results in poor functioning of roots, and changes in soil levels that can cut off or suffocate roots.	• Tree • Planting Area
		URA	**Greenery:** • Landscape Replacement Area – Show on plans and declare % of landscape	• Space
			Greenery: • Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions – show on plans and provide details of design	• Planter Box • Space
	Household / Storey Shelter	BCA	**Household / Storey Shelter details** • Compliance with technical requirements on shelter position, size, setback requirements • Submit CD Shock Calculations as supplementary non-BIM documentation • M&E inputs required for Transit Shelter	• Door • Electrical fixture for Household / Storey Shelter • Slab • Space • Wall • Window
		SCDF	• Shelter requirements – protected shafts (with BCA)	• Wall
	Infra & Utilities (External), Street Works	LTA	**Detailed Structural Layout, and M&E provisions of Pedestrian Overhead Bridges** • To provide structural details of POB (i.e. column width, footing), materials, Roof details, Floor finishes • To provide details of ramp, staircase, handrail, tactile tile • To provide details of lighting provisions and M&E provisions	-

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Infra & Utilities (External), Street Works *(continued from previous page)*	LTA	• To provide details of connection/ interfaces with development/ bus stops. • Declaration of non-compliance • To determine possible road closure due to hoisting of link bridges	-
			Detailed Structural layout, and M&E provisions of Covered Linkways • To provide structural details (i.e. column width, footing), materials, • To provide details of lighting provisions and M&E provisions (if any) • To provide details of connection/interfaces with development/bus stops. • Declaration of non-compliance	-
			Detailed Structural layout, and M&E provisions of Bus Shelters • To provide structural details of bus shelter, seating arrangement, bus info panels etc. • To provide bollard and flooring details. • To provide details of lighting provisions and M&E provisions (if any) • To show bus pole position • To submit Traffic Plan • To confirm the need of temporary bus stop provision and its position. • To confirm the relocation date and commissioning of new bus stop	-
			Detailed Layout of Taxi Shelter • To submit Traffic Plan • 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 • To confirm the need of temporary taxi stand provision and its position.	-
			Details of Side Table Modifications for Addition of Auxiliary lanes, u-turns etc • To submit Traffic Plan • To submit street plan and cross section details showing the proposed levels, width and cross-fall of carriageway, planting verge and footpath.	-

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Infra & Utilities (External), Street Works *(continued from previous page)*	LTA	• New cross-culvert less than 2m wide to clear with PUB Drainage	-
			Details of External Works (Frontage Improvement Works) • To submit Traffic Plan • To submit street plan and cross section details showing the proposed levels, width and cross-fall of carriageway, planting verge and footpath. • New cross-culvert less than 2m wide to clear with PUB Drainage • To determine the streetlighting provision	-
			Details of New Street (incl. modifications to existing streets) • To submit Traffic Plan • To submit street plans, longitudinal section and cross section details. • Geotechnical details for foundation, retaining wall, slope (if any) • To submit structural and M&E details for road structures and commuter facilities	-
		NParks	Detailed designs of the park and info of the park facilities and park furniture for the new parks / park connector / promenade	-
			Planting requirements for Covered Linkways / Pedestrian Overhead Bridge	-
			Allowable structures within planting areas • Planting areas (green buffers, peripheral planting verges) should be free from any encroachment, except for allowable minor ancillary structures and landscaping features listed in NParks Guidelines (Chapter 3)	• Planting Area
	Lift and Escalators, Equipment	BCA	Lift and Escalator Provision (number)	• Lift
			Lift for Wheelchair Users • Location • Type	• Lift
	Lightning Protection	BCA	**The following information are required to be modelled in BIM:** • Location of air-termination system • Location of down conductors • Zone of lightning protection provided by the air-termination network for open roof spaces and the sides of the building • Location of earth electrodes	• Space • Placeholder items for LPS equipment to be explored

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Lightning Protection *(continued from previous page)*	BCA	**The following LPS details do not require to be modelled in BIM:** • 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. • Non-BIM supplementary documents such as material specification, photo, ppt, excel, words, etc. should be submitted	• Space • Placeholder items for LPS equipment to be explored
	Materials	BCA	Energy Efficiency (Thermal Envelope)	-
		SCDF	**Fire Resistance of Element of Structure** • Element of structure shall have appropriate fire resistance	• Wall
			Compartment walls and floors	• Door • Space • Wall
	Night Lighting	URA	**Night Lighting Report** • UD Areas with night lighting requirement • Concept and renders • Specifications • Location and extent • Fixture installation	-
	ORA / ODA / Kiosks	URA	Location and extent, detailed design (e.g. structure, height, transparency)	-
	Pollution Control	NEA	**Pollution Control Study (PCS)** *Can be provided at Pre-Submission, Design Gateway (G1) or Construction Gateway (G2)* • QP (Arch/PEs) or Consultant submits PCS reports to NEA directly for industrial developments that generate pollution	-
	Public Communications Plans	URA	Public Communication Plans	-

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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	• Interceptor • Refuse Chute • Refuse Handling Equipment • Sensor • Space • Sprinkler • Wall
			Residential Dwelling Units • Check for hopper siting and direction facing, which shall be sited far away as possible from residential dwelling units and not facing the entrance of units	• Refuse Chute
			Detailed Design of Pneumatic Waste Conveyance System (PWCS). Refer to SS642-2019.	-
			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	• Pump • Toilet • Space • System
			Public Toilet • Total number of Sanitary Facilities provisions (where applicable)	• Toilet • Space
			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	• Interceptor • Space • System
			COPEH - Section 4 : Cooling Tower 4.1 Objective 4.2 Design Requirements	• Space
			COPEH - Section 5 : Aquatic Facility 5.1 Objective 5.2 Minimum Design Criteria	• Space

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Public Health *(continued from previous page)*	NEA	**Aquatic Facility and Swimming pool** • No overhead sanitary wastepipe to be on top of balancing tanks. • Location of two pre-swim showers shall be provided around the swimming pool. • Setback of 2.2m from the planter strip to pool perimeter. • Location of swimming pools and its balancing tanks	• Tank • Space
			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	• Refuse Chute
			COPEH - Section 7 : Anti-Mosquito Breeding 7.1 Objective 7.2 Roof Gutter 7.3 Air-Conditioning Tray 7.4 Floor Trap	• Gutter • Floor Trap
			Roof Gutter and Scupper Drain • Location of roof gutter or scupper drain • Provision of permanent and safety maintenance access	• Gutter • System
			Air Conditioning and Mechanical Ventilation System • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust	-
	Public Space	URA	**Privately-Owned Public Spaces (POPS):** • Seating (design, no., location) • Amenities (type, location) • Signage (design, location) • Outdoor Refreshment Areas (ORA) (if provided, location / extent)	-
	Roofscape	URA	Detailed treatment of rooftop as “fifth” elevation	-
			Detailed location / extent of rooftop Outdoor Refreshment Area (ORA)	-
			M&E Screening details	-

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Rapid Transit System (RTS) Station	URA	At-grade bicycle parking	-
		SCDF	Exit staircases and means of escape requirements	• Staircase
			Occupant load and exit capacity of station	• Space
			Other special requirements for RTS	-
	Signage	URA	**Privately-Owned Public Spaces (POPS), Through Block Link (TBL) Signage** • Location and design of signages	-
	Site Layout only	NParks	Alternative configuration of Planting Areas	• Planting Area
		URA	**Building Setback from Boundary** • Setback for Building Appendages – Location and width • Treatment for non-compliant Multi-Storey Car Parks • Treatment for non-compliant Ancillary Structures	• Space
	Site Layout, Attic	URA	**Attic** • Design of attic in relation to strata unit • Height of attic - Dimension	• Space
	Site Layout, Basement	URA	**Basements** • Basement protrusion • Screening of basement opening • Setback	• Space
	Site Layout, Landscape Deck	URA	**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	• Space • Wall
	Site Layout, Screening	URA	**Special and Detailed Control Plans** • Screenings under High-Rise Committee	-
	Site Layout, Street Works	LTA	**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	• Culvert • Ramp • Road

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Site Layout, Street Works *(continued from previous page)*	LTA	**<u>Proposed pick-up / drop-off points (within development): PUDO details</u>** • All details presented at Design Gateway (G1) stage	• Ramp • Road • Space
			<u>Street Works Deposit</u> • 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, Vehicular Parking	LTA	**<u>All details and critical dimensions of the parking layout such as:</u>** • 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 • EV lots & charging stations	• Ramp • Road • Space • Vehicular Parking
	Staircase	SCDF	**<u>Exit Staircases and Means of Escape Requirements</u>** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Number of exit staircases provided and location • Exit capacity of exit staircase, fire rating of the enclosure, smoke free approach to exit staircase, ventilation of exit staircase etc. • Travel distances to exit staircase	• Space • Stair
		BCA	Minimum Width, Tread and Riser, Nosing, Handrail / Railing	• Staircase
	Structures in Building Setback, Green Buffer	URA	• Location (e.g. integrated with building envelope) • Finish material (e.g. to match paving if located within covered / open walkway)	-
	Use & Intensity	URA	Ancillary Shops (0.3% Quantum) – to declare amount of Commercial GFA within development	• Space
			<u>Bonus GFA Incentive Schemes:</u> Balcony / Recreational – declaration of GFA amount and %	-

Architecture

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Use & Intensity *(continued from previous page)*	URA	**RC Flat Roofs:** • Use – Indicate whether roof is accessible, and if so, for what purpose • Structures – To show on plan any proposed built structures	• Space
			Urban Design Requirements • Activity Generating Uses – Indicate location on plan and provide details on specific nature of use • Public Spaces – Indicate location, design and dimensions • Party Wall – Indicate no openings	• Space
	Vehicular Parking	BCA	Accessible Vehicle Parking	• Accessible Route • Vehicular Parking
		URA	Screening Details	-
	Ventilation	BCA	Provision of ventilation (natural ventilation for residential development)	• Space
			Minimum 5% opening for natural ventilation	• Space
			Maximum distance (12m) from natural ventilating opening	• Space
			Natural ventilation (dimension of recess / airwell)	• Space
			Carpark Ventilation	• Space • Vehicular Parking
		SCDF	Airwell for staircase ventilation	• Space
			Ventilation for open-sided carpark building	• Space
	Washroom	BCA	Sanitary provisions for wheelchair users	• Space
			Sanitary provisions for ambulant disabled	• Space
	Others	URA	**Supplementary Documents** • Topo Survey Plan • Previous approved plans	-
			Landscaping Species Plan (trees / shrubs / groundcover)	• Tree
			Public Consultation Process • Forms B and C	-
			Design Advisory Panel (DAP) Report • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)	-

Architecture

-	Independent Submissions			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Buildability	BCA	**Buildability Design Implementation Plan (BDIP)** • Connection and details of precast components and prefabricated reinforcement	-
			Constructability Score • C-Score Calculations • Constructability Implementation Plan (CIP)	-
	Connectivity	BCA	Provision of Signages	-
	Conservation	URA	**Conserved Building (remaining works to be checked)** • Painting • Signage • Lighting • 5-foot Way Material (tiles) • M&E location (aircon, screening, kitchen flue)	-
	Façade	BCA	• Safety of Windows	-
	Green Mark	BCA	• Green Mark Detailed Requirements (Others) • For the rest of Green Mark assessment, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application	-
	Greenery	NParks	**Green buffer (landscaping scheme)** • To show the number and species of trees and plants to be planted	-
			Peripheral planting verges (landscaping scheme) • To show the number and species of trees and plants to be planted	-
			Greenery provision for open-air parking areas at street level (landscaping scheme) • To show the number and species of trees and plants to be planted and the surface treatment of the lots (i.e. grass pavers)	-
			Landscaping scheme for roadside greenery • NParks will either undertake the landscaping or liaise with QP separately	-
	Household / Storey Shelter	BCA	**CD Shelter Shock Design Calculations** • Pre-test: Method statements and application forms • Post-test: Test reports	-

Architecture

-	**Independent Submissions** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Infra & Utilities (Internal) only	BCA	Lighting	-
	Lightning Protection, Equipment	BCA	Lightning Protection System (LPS) Plan	-
	Materials	BCA	Use of Glass at Height	-
			Daylight Reflectance	-
		SCDF	Product Certification	-
			Roofs • Surface flame spread rating	-
			Plastic Material • Depending on its application, the plastic material shall meet the required acceptance criteria and pass the relevant test standards	-
	Noise Control	NEA	**Mechanised Carpark System** • Noise report to be submitted for the noise generated from this system	-
			Detailed design of noise/pollution control abatement measures	-
			Noise Impact Assessment (NIA) – Post • QP (Arch/PEs) or Consultant submits NIA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-
			Noise Report for ACMV • QP (Arch/PEs) or Consultant submits NA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-
	Pollution Control	NEA	**COPPC - Section 2 : Judicious siting of industries and other development** 4. Objective	-
			COPPC - Section 3 : Requirements for Industries 5. Clean Industry 6. Light Industry 7. General Industry 8. Special Industry	-

Architecture

-	**Independent Submissions** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Pollution Control *(continued from previous page)*	NEA	**COPPC - Section 4 : Requirements to Operate Factory** 9. Use of Industrial premises 10. Trade effluent discharge into public sewer and water course	-
			Clearance for Detailed Plan on Pollution Control Equipment (PCE) • QP (Arch/PEs) submits to NEA directly for Detailed Plan on Pollution Control Equipment (PCE)	-
	Vehicular Parking	NEA	**Mechanised Carpark System** • Location of mechanised carpark system with the provision of 3 sided solid walls.	-

G3	**Completion Gateway (TOP / CSC)** ➢ **BCA**		
	Item for TOP / CSC	**Brief Description**	
	BP TOP / CSC	• Record Plans	
	Buildability Score	• As-Built B-Score Calculations (including structural) • As-Built Buildability Design Implementation Plan (BDIP) to show connection and details of precast components and prefabricated reinforcement	
	CD Shelter Notice of Approval of Commissioning	• Test Method Statement and Test Record forms	
	CD Shelter Commissioning	• Application for approval of commissioning of CD Shelter • Checklist for submission with application for commissioning	
	Constructability Score	• As-Built C-Score • As-Built CIP • Certificate of Compliance of C-Score	
	Green Mark	Please refer to https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application	
	Lightning Protection System (LPS) Plans	• Record Plans • Certificate of Supervision of LPS • Testing Records	
	TOP / CSC	• QP Declaration • Certificate of Supervision for Lightning • Permit to Operate (Lift & Escalator) • ACMV • CD shelter • Cable BDD (B/C-score) • Green Mark	• Universal Design Index FormSG Acknowledgement • CONQUAS / QM • Photos of Rectification • Phasing Plan

Architecture

G3	**Completion Gateway (TOP / CSC)** ➢ **LTA**	
	Item for TOP / CSC	**Brief Description**
	-	**Application for clearance of certificate of statutory completion for development within railway protection zone / railway corridor** • As-built plans • Certificates of supervision • 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 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. • 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 • As-built structural and M&E plans for commuter facilities such as POB, UPN. • Certified Plan (CP). • Road Declaration Plan. • Road testing results. • Asset Master Record Input Form. • Road Data Form. • Taking over letters from PUB, NParks and NEA. • 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. • Audit certificate for project under Ministries or Statutory Board. • Warranties for waterproofing etc.

Architecture

G3	**Completion Gateway (TOP / CSC)** ➢ **LTA** (continued from previous page)	
	Item for TOP / CSC	**Brief Description**
	-	**For Vehicle Parking submission:** Photos for open surface parking lots As built Drawings

G3	**Completion Gateway (TOP / CSC)** ➢ **NEA**	
	Photo, video or reports of completed works	• QP (Arch/PEs) applies for TOP/CSC and provide photo / video evidence or reports of completed works
	Completion Gateway (TOP / CSC) ➢ **URA**	
	Development Interface Report (DIR) (Final)	• Structural information for future developer (e.g. loading requirements) • Architectural information for future developer (e.g. Knock Out Panels alignment / width) etc.

Civil and Structural

G1	Design Gateway			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Impact Studies, Site Layout, Rail Protection	LTA	**Development Proposal within Railway Protection Zone / Railway Corridor** • Plan for development works • Engineering evaluation report accompanied by plan for engineering works • Certified Survey Plans (for critical development within first reserve of underground RTS) 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	-
	Rapid Transit System (RTS) Station	URA	**Urban Design Requirements** • Location of station box • Design of pop-up structures (mitigation of platform levels, interfacing with neighbouring developments, within approved railway, cw provision, setback) • Land take required • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2,000sqm) • Construction method (e.g. extent of ERSS) • Future integration with future structures (e.g. location / orientation / size of vents)	• Space
			National Scheme • For works interfacing with future developments (e.g. RTS) • Schematic design of future development (e.g. massing and connectivity to determine future pedestrian connection to surrounding sites)	-

Civil and Structural

G1.5	Piling Gateway (Optional)			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Impact Studies, Site Layout, Rail Protection	LTA	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** *Can be provided at Commencement of Works, Piling Gateway (G1.5) or Construction Gateway (G2)* • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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	-

	Structural Design	BCA	**Structural Design (Piling and Foundation Works)**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• 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)
				• Footing / Pilecap
				• Pile
				• Slab

Civil and Structural

G2	Construction Gateway			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Buildability	BCA	**Buildability design (Scoring)** • B-Score Calculations	• Beam • Column • Refuse Chute • Slab • Staircase • Wall
	Household / Storey Shelter details	BCA	**Household / Storey Shelter details** • Compliance to structural requirements stipulated in technical requirements on household shelters and storey shelters	• Slab • Wall
		SCDF	Shelter requirements – protected shafts (with BCA)	• Wall
	Impact Studies only	LTA	**Building Proposal within Railway Protection Zone/ Railway Corridor** • Plans for building work • Engineering evaluation report accompanied by plan for engineering works • 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	-
	Impact Studies, Site Layout, Rail Protection	LTA	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** *Can be provided at Commencement of Works, Piling Gateway (G1.5) or Construction Gateway (G2)* • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms	-

Civil and Structural

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Impact Studies, Site Layout, Rail Protection *(continued from previous page)*	LTA	• 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	-

	Structural Design	BCA	**<u>Structural Design (Piling and Foundation Works)</u>**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• 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)
				• Footing / Pilecap
				• Pile
				• Slab

			<u>Structural Design (Main Structural Elements of Building excl. Piling)</u>
			• Complete set of IFC-SG model(s) for all structural framings & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)
			• 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 building plan submitted simultaneously
			• Completion letter of pre-consultation [for complex structure only]
			• **<u>Ground Investigation</u>**
			  ○ Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08
				• Beam
				• Column
				• Slab
				• Staircase
				• Wall

Civil and Structural

-	Independent Submissions			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Buildability	BCA	**Buildability Design Implementation Plan (BDIP)** • Connection and details of precast components and prefabricated reinforcement	-
	Impact Studies / Site Layout, Rail Protection, Road Structure Protection	LTA	**Approval to commence engineering works within Railway Protection Zone / Railway Corridor** • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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 • Plans for engineering works • Engineering evaluation report • Instrumentation proposal • Method statement of work • Hazard analysis identifying all possible risks from the engineering works that may be posed to the road structures and a description of the safety and precautionary measures to mitigate the risks • Contingency plans and Emergency procedure • Pre-condition survey report • Certified survey plan for underground structures	-

Civil and Structural

-	**Independent Submissions**			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Impact Studies / Site Layout, Rail Protection, Road Structure Protection *(continued from previous page)*	LTA	• Soil investigation report • Particulars of the person who carries out the work and the person for whom the works are being carried out 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	-

	Structural Design	BCA	**Structural Design (other works e.g. demolition, ERSS, cladding, safety barrier)**
			
			• These plans will need to make reference back to the coordinated model submitted by the Main QP at the Construction Gateway (G2).
			• 2D drawings are acceptable for independent submissions.
			• **Examples of Independent Submission:**
			  ○ Demolition,
			  ○ Temporary ERSS,
			  ○ Structural details of ancillary components (e.g. barriers and claddings)
			  ○ Temporary Traffic Decking
				-

G3	**Completion Gateway (TOP / CSC)** ➢ **BCA**	
	Item for TOP / CSC	**Brief Description**
	Buildability Score	• As-Built B-Score Calculations (including structural) • As-Built Buildability Design Implementation Plan (BDIP) to show connection and details of precast components and prefabricated reinforcement
	Record Plans of Structural Works and Certificates	• Certificate of Supervision of Piling Works • Certificate of Supervision of Structural Works • Certificate of As-Built Structural Works (in IFC-SG structural model & 2D Drawings) • Builder Certificate
	TOP / CSC and Permits	• QP Declaration • Certificate of Supervision for Lightning • Permit to Operate (Lift & Escalator) • ACMV • CD shelter • Cable BDD (B/C-score) • Green Mark • Universal Design Index FormSG Acknowledgement • CONQUAS / QM • Photos of Rectification • Phasing Plan

Civil and Structural

G3	**Completion Gateway (TOP / CSC)** ➢ **LTA**	
	Item for TOP / CSC	**Brief Description**
	-	**Application for clearance of certificate of statutory completion for development within railway protection zone / railway corridor** • As-built plans • Certificates of supervision • 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 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. • 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 • As-built structural and M&E plans for commuter facilities such as POB, UPN. • Certified Plan (CP). • Road Declaration Plan. • Road testing results. • Asset Master Record Input Form. • Road Data Form. • Taking over letters from PUB, NParks and NEA. • 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. • Audit certificate for project under Ministries or Statutory Board. • Warranties for waterproofing etc.

Civil and Structural

G3	**Completion Gateway (TOP / CSC)** ➢ **LTA** (continued from previous page)	
	Item for TOP / CSC	**Brief Description**
	-	**For Vehicle Parking submission:** Photos for open surface parking lots As built Drawings

G3	**Completion Gateway (TOP / CSC)** ➢ **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
	Completion Gateway (TOP / CSC) ➢ **URA**	
	Development Interface Report (DIR) (Final)	• Structural information for future developer (e.g. loading requirements) • Architectural information for future developer (e.g. Knock Out Panels alignment / width) etc.

Mechanical and Electrical

G1	Design Gateway			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Rapid Transit System (RTS) Station	URA	**Urban Design Requirements** • Location of station box • Design of pop-up structures (mitigation of platform levels, interfacing with neighbouring developments, within approved railway, cw provision, setback) • Land take required • Details of Loading Provision (DIR - WIP) • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2,000sqm) • Construction method (e.g. extent of ERSS) • Future integration with future structures (e.g. location / orientation / size of vents)	• Space
			National Scheme • For works interfacing with future developments (e.g. RTS) • Schematic design of future development (e.g. massing and connectivity to determine future pedestrian connection to surrounding sites)	-

G1.5	Piling Gateway (Optional)			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Lightning Protection	BCA	• For big projects adopting piles or rough foundation as natural earth-termination system. Provision of rebars for connection to the down-conductor system shall be provided during the piling stage. • Developer or Builder is required to appoint a QP (Electrical) to supervise the LPS works and submit the LPS Supervision Form including Test Record where piling works are carried out early, before LPS Plan submission is carried out at the Construction Gateway (G2).	-

Mechanical and Electrical

G2	Construction Gateway			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Equipment Only	NEA	Detailed design of cooling tower system (if any)	• Space
	Fire Fighting, Equipment	SCDF	**Fire Hydrant System** • Location of fire hydrant(s) • Hydrant coverage not more than 50m from fire engine access road / accessway	• Fire Hydrant • Road
			Sprinklers & System • Provision of sprinklers for basement • Provision of sprinklers for buildings having habitable height more than 24m (mixed-use residential buildings)	• Space
			Rising Mains & System • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breeching inlet location	• Breeching Inlet • Hose Reel • Landing Valve • System
			Hose Reel & System • Location of hose reel • Hose reel coverage	• Hose Reel
			Emergency Voice Communication System • One way and two way EVC	-
	Household / Storey Shelter	BCA	**Household / Storey Shelter details** • M&E inputs required for Transit Shelter	• Door • Electrical fixture for Household / Storey Shelter • Slab • Space • Wall • Window
	Infra & Utilities (Internal)	PUB	Sanitary Drainlines	• Inspection Chamber
			Sanitary Ventilation	-
			Basement Pumped System	-
			Water Tank	• Water Tank (Potable Water) • Tank (Storage
			Mode of Supply	• System

Mechanical and Electrical

G2	**Construction Gateway** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Ventilation	SCDF	Air-Conditioning and Mechanical Ventilation systems	-
			Mechanical Ventilation & Smoke Control Systems • Ventilation systems for Fire Command System (FCC), fire pump rooms, smoke-free / fire fighting lobbies, generator set rooms etc • Smoke puring system, engineered smoke control systems	• Space • System

-	**Independent Submissions**			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Fire Compartmentation	SCDF	**Separating Walls** • Appropriate fire resistance	-
			Compartment Walls and Floors • Appropriate fire resistance, opening protection, pipe penetration (fire stop) etc.	-
			Protection of Openings	-
			Concealed Spaces • Provision of cavity barriers, fire protection system installed	-
			Fire stopping • Materials for fire stopping shall have the necessary fire resistance	-
	Fire Fighting, Equipment	SCDF	**Rising Mains & System** • Water supply, fire pump & storage tank, flowrate, pressure	-
			Secondary Power Supply • Provision of genset for fire fighting systems such as fire pumps, lifts, mechanical ventilation systems, emergency voice communication system, etc.	-
			Hose Reel • Water supply, pump, storage tank, flowrate, pressure etc.	-
			Colour Scheme of Fire Protection Systems • Equipment, fixtures and fittings for the fire protection systems shall be painted in red	-

Mechanical and Electrical

-	**Independent Submissions** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Fire Fighting, Equipment *(continued from previous page)*	SCDF	**Redundancy of Fire Pumping System** • The pumping system for wet rising mains, hose reels, sprinklers and hydrants shall be provided with redundancy such that the system performance is not affected when one of the pumps and/or the associated control system is out of operation due to routine maintenance or break-down.	-
			Exit Lighting • Provision of emergency lighting at corridors and lobbies	-
			Emergency voice communication system • Provision of 1-way EVC for mixed commercial cum residential usage	-
			Fire hydrant system • Hydrant tank & pump, flowrate and pressure	-
			Sprinklers & System • Sprinkler water tank, fire pump, sprinkler head coverage & distribution etc	-
	Impact Studies / Site Layout, Rail Protection, Road Structure Protection	LTA	**Approval to commence engineering works within Railway Protection Zone / Railway Corridor** • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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	-

Mechanical and Electrical

-	**Independent Submissions** *(continued from previous page)*			
	Key Words	**Agency**	**Requirement Category**	**Common Components**
	Impact Studies / Site Layout, Rail Protection, Road Structure Protection *(continued from previous page)*	LTA	**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 • Plans for engineering works • Engineering evaluation report • Instrumentation proposal • Method statement of work • Hazard analysis identifying all possible risks from the engineering works that may be posed to the road structures and a description of the safety and precautionary measures to mitigate the risks • Contingency plans and Emergency procedure • Pre-condition survey report • Certified survey plan for underground structures • Soil investigation report • Particulars of the person who carries out the work and the person for whom the works are being carried out 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	-
	Infra & Utilities (Internal), Water Supply	PUB	Meter Location	-
			Water Supply Connection	-
			Water Reticulation System	-
			Water Pumps	-
	Ventilation	SCDF	Air-Conditioning and Mechanical Ventilation systems	-
			Mechanical Ventilations & Smoke Control Systems • Air-change ventilation systems for FCC, fire pump rooms, smoke-free/fire fighting lobbies, genset rooms etc • Redundancy of ventilation systems	-

SECTION 3

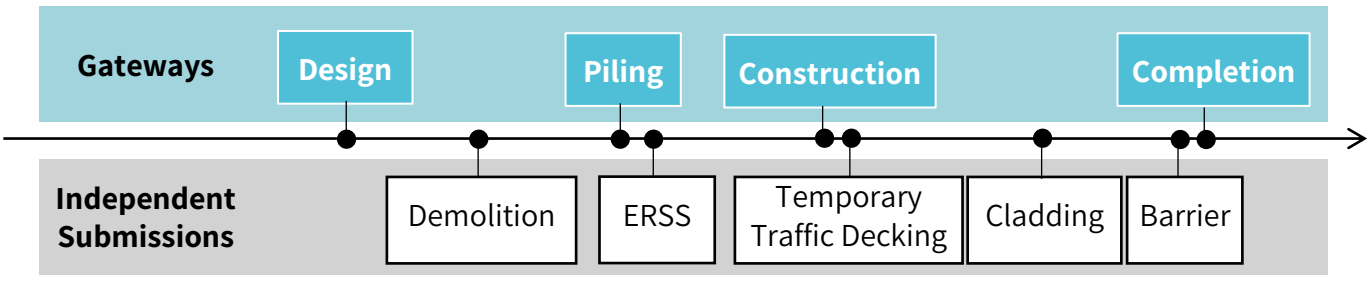
Specific Requirements by:
Key Gateways

3 Specific Requirements by

About the Gateways

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

Example of a project making regulatory submissions across CORENET X Gateways



Common Gateway Key Words

Key Words in alphabetical order		G1 Design Gateway	G1.5 Piling Gateway	G2 Construction Gateway	- Independent Submissions
A	Access to Site	URA		BCA, URA	
	Access within Building			BCA, SCDF, URA	
	Attic			URA	
B	Balcony			URA	
	Barrier			BCA	BCA
	Basement			URA	
	Buildability			BCA	BCA
	Building / Unit Layout			URA	
	Building Massing	NEA, URA		URA	
C	Connectivity	URA		BCA, URA	BCA
	Conservation	URA		URA	URA
D	Detention System	PUB			
	Drainage Reserve	PUB			
	Dwelling Unit			BCA, NEA, URA	
E	Earthworks / Topography	PUB, URA	PUB	URA	
	Equipment			BCA, NEA, SCDF	BCA, SCDF
	External Works	LTA, URA		URA	
F	Façade				BCA
	Fire Compartmentation			SCDF	SCDF
	Fire Fighting			SCDF	SCDF
G	Green Mark			BCA	BCA
	Greenery	NParks , SCDF, URA		NParks, URA	NParks
H	Household / Storey Shelter			BCA, SCDF	BCA
I	Impact Studies	LTA, NEA	LTA	LTA	LTA
	Infra & Utilities (External)	LTA, NParks, PUB	PUB	LTA	
	Infra & Utilities (Internal)	PUB, URA		PUB	BCA, PUB
L	Landscape Deck	URA		URA	
	Lifts and Escalators			BCA, SCDF	
	Lightning Protection		BCA	BCA	BCA
M	Materials			BCA, SCDF	BCA, SCDF
N	Night Lighting			URA	
	Noise Control	NEA			NEA

Common Gateway Key Words

Key Words in alphabetical order *continued from previous page*		G1 Design Gateway	G1.5 Piling Gateway	G2 Construction Gateway	- Independent Submissions
O	ORA / ODA / Kiosks			URA	
P	Public Communications Plans			URA	
	Platform & Crest Level	PUB, URA			
	Pollution Control	NEA		NEA	NEA
	Public Drains	PUB	PUB		
	Public Health	NEA		NEA	
	Public Sewerage System	PUB			
	Public Space	URA		URA	
R	Rail Protection	LTA	LTA	LTA	LTA
	Roofscape			URA	
	Rapid Transit System (RTS) Station	URA		URA	
	Road Structure Protection				LTA
S	Sanitary	PUB			
	Screening			URA	
	Service and Vehicular Access to Site	URA			
	Servicing (Internal Accesses)	NEA, SCDF			
	Signage			URA	
	Site Layout	LTA, NEA, NParks, PUB, SCDF, URA	LTA	LTA, NParks , URA	LTA
	Staircase			BCA, SCDF	
	Street Works	LTA		LTA,	
	Structural Design		BCA	BCA	BCA
	Structures in Building Setback, Green Buffer			URA	
U	Use & Intensity	NEA, URA		URA	
V	Vehicular Parking	LTA, URA		BCA, LTA, URA	NEA
	Ventilation			BCA, SCDF	SCDF
W	Washroom			BCA	
	Water Supply				PUB
*	Others	BCA, URA		URA	

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 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 • Vehicular 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 • Infra & Utilities (External) • Site Layout
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	• Detention System • Drainage Reserve • Earthworks / Topography • Infra & Utilities (External) • Infra & Utilities (Internal) • Platform & Crest Level • Public Drains • Public Sewerage System • Sanitary • Site Layout
SCDF	Note: Location of fire engine accessway and hard standing area to be included	• Greenery • Servicing (Internal Accesses) • Site Layout
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 • 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 • Vehicular Parking • Others

G1 Design Gateway

Legend: Architecture C&S M&E

Access to Site			
	Agency	**Requirement Category**	**Common Components**
	URA	**Site Layout** Indicative Access (whether there's available public access)	-
		Urban Design Requirements Service and Vehicular Access (where/what it fronts)	• Road

Building Massing			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Site Layout** Indicative Access (whether there's available public access)	• Space
	URA	**Building Height** • Floor-to-Floor Height & Aggregate Building Height • Additional Height for Predominant Sky Terrace Storey • Urban Design Requirements – Overall Building Height Control (including building crown and M&E floor, if any) • Number of Storeys	• Building Storey • Space
		Building Length and Form	• Space
		Street Block Plans	-

Connectivity			
	Agency	**Requirement Category**	**Common Components**
	URA	**Urban Design Requirements - Connectivity (UPN, EPN, TBL, Open / Covered Walkways)** • Mitigation of level differences • Alignment • Clear width • (UPN, EPN) Detailed layout of vertical circulation point – location within development, and dimensions • (UPN, EPN) KOP details (e.g. alignment, size) • (TBL) Soffit height	• Space • Soffit
		Walking and Cycling Plan • Connectivity to transport node • Description of pedestrian and cyclist connectivity between the private and public spaces	-

G1 Design Gateway

Legend: Architecture C&S M&E

Conservation			
	Agency	**Requirement Category**	**Common Components**
	URA	**Supplementary documents** • Business concept and furniture layout of proposed use (for change of use in HCA) • Measured survey drawing (for unrestored building) • Façade and interior photographs • Development Statement of Intent (DSI) • DAPC presentation material	-

Earthworks / Topography			
	Agency	**Requirement Category**	**Common Components**
	URA	**Earthworks, Retaining Walls and Boundary Walls** Height of Retaining Wall(s), Extent of Earthfill and Impact on Surroundings	• Space • Wall

External Works			
	Agency	**Requirement Category**	**Common Components**
	URA	**Urban Design Requirements – Linkway Connection to Commuter Facilities** • Indicative alignment • Clear width	-
		Urban Design Requirements – Cycling Path Provision (vesting) & alignment (to ensure it does not conflict with key pedestrian routes)	-
	LTA	**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.	-
		Architectural 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 submit architectural plans and section details for the taxi shelter. • To submit architectural checklist for the taxi shelter. • To relocate existing Manhole located on the future taxi bay, if any.	-

G1 Design Gateway

Legend: Architecture C&S M&E

External Works *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Layout of Proposed Frontage Improvement Works** • To determine if the frontage improvements is required such as conversion of open drain to covered drain cum footpath, setting back of drain for development affected by RRL. • To indicate the footpath width, levels and gradients. • To vest the Street Reserve Plot in State (except for A&A proposal) • To show the details and extent of road improvement works, if any. • To relocate the existing Manhole located on the future carriageway, if any. • To check if additional street lightings is required for the road improvement works.	-

Greenery			
	Agency	**Requirement Category**	**Common Components**
	NParks	**Encroachment into Requisite Planting Area (incl. Basement)** • Need to find out if there are encroachments beyond list of allowable structures in NParks Guidelines that might affect placement of trees and shrubs • Basement or underground structures cannot impede on the required soil depth for tree planting (they need to be recessed at least 2m)	• Space
	NParks, SCDF	**Indication of Fire Engine Accessways** • Should be designed upfront and not added as an afterthought • Should not affect requisite planting areas and roadside green verges	• Space • Road
	URA	**Urban Design Requirements** LRA Provision: Indicative Extent (may affect building form)	• Space

Impact Studies only			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Environmental Information (EI)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or owner/developer are required to apply EI application to NEA directly to request that EI such as building height constraint, health and safety buffer, etc. be made available for their projects	-
		Environmental Impact Study (EIS) *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits EIS reports to NEA directly for premises that generated air, water and noise pollution	-

G1 Design Gateway

Legend: Architecture C&S M&E

Impact Studies only *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Energy Efficiency Opportunities Assessment (EEOA)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits EEOA reports to NEA directly for industrial developments	-

Impact Studies, Site Layout, Rail Protection			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Development Proposal within Railway Protection Zone/ Railway Corridor** • Plan for development works • Engineering evaluation report accompanied by plan for engineering works • Certified Survey Plans (for critical development within first reserve of underground RTS) 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 (External) only			
	Agency	**Requirement Category**	**Common Components**
	NParks	**Spatial Provision for Greenery at Covered Linkways / Pedestrian Overhead Bridge** • To secure the dimensions (width and depth) on and surrounding these structures	• Space
		Standard Roadside Greenery Provision (New Roads) (Spatial Provision) • To secure the dimensions (width and depth) for green verge (including tree planting verge) according to road category	• Space • Road

Infra & Utilities (External), Street Works			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Architectural Layout of Bus Stop** • To show the proposed layout of the bus stop indicating the location of the bus shelter and bus pole, width and length of the bus bay. • To submit architectural plans and section details for the bus shelter. • To submit architectural checklist for the bus shelter/bus bay.	-

G1 Design Gateway

Legend: Architecture C&S M&E

Infra & Utilities (External), Street Works *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Design of New Street (incl. Modifications to Existing Streets)** • To establish the proposed levels of development access points to properly interface with proposed carriageway before developer confirms on the development platform levels to proceed with foundation / structural works. • To indicate all details determined during the planning consultation stage • To submit road alignment and junction layout plan. • To show the vertical and horizontal profile of proposed road. • To submit cross-section details to show the proposed typology of road side table and road elements (POB, linkway etc.), if any. • To submit design safety review (if applicable) • To submit layout plan and cross section details of retaining wall layout - within or abutting RRL (if applicable) • To list down the design changes from TCOT/ land use stage, if any • To identify and declare all non-compliances to design standards, if any. • To seek waiver for retention of existing manhole on future road carriageway, cycling path and footpath, if any.	-
		Architectural Layout and Column Positions of Covered Linkway / High Covered Linkway • To submit architectural layout plans and section details showing the proposed width, headroom, and alignment of the covered linkway. • To submit architectural checklist for covered linkway. • 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). • To submit interfacing connection details for linkway connecting to existing bus shelter and identify any existing bus features such as noticeboards, seats affected by the linkway connection. • To determine the extent of linkway to be handed over to LTA/ maintained by developer.	-
		POB Layout • To submit architectural layout plans and section details showing the proposed width, headroom (min 5.7m), and alignment of POB. • To establish the column size and position within/ outside the road reserve. Min. lateral clearance from the road shall be provided. • To determine the extent of POB to be handed over to LTA/ maintained by developer. • To show the proposed connection/ interfaces with development, if any.	-
		Pedestrian Underpass Layout • To submit cross section details showing the overburden (i.e. depth of UPN from road levels) • To submit architectural layout plans and section details showing the proposed width / ceiling height / headroom, and alignment of UPN. • To submit architectural checklist for pedestrian underpass. • Check if the provision of lifts / escalators / staircase is adequate	-

G1 Design Gateway

Legend: Architecture C&S M&E

Infra & Utilities (External), Public Drains			
	Agency	**Requirement Category**	**Common Components**
	PUB	**Roadside Drain Capacity** • For projects where drains need to be rebuilt/ entrance culvert. PUB to provide required capacity during pre-sub consultation. • Size of new culvert (will be advised by PUB)	• Culvert
		Public Drains - Drain Size and Location	-

Infra & Utilities (External), Public Sewerage System			
	Agency	**Requirement Category**	**Common Components**
	PUB	Sewer Connection - Connection Point, where the proposed location is	• System
		Sewerage System - Alignment of Sewers, Dimensions, Gradient	• System

Infra & Utilities (Internal) only			
	Agency	**Requirement Category**	**Common Components**
	URA	**Urban Design Requirements** • Integration of Existing Utilities (GLS e.g. MRT pop-up, substation)	-

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

Infra & Utilities (Internal), Public Drains			
	Agency	**Requirement Category**	**Common Components**
	PUB	Common Drain (drains receiving upstream run off/ existing [note: more common for landed housing area]) - location, width	-

G1 Design Gateway

Legend: Architecture C&S M&E

Infra & Utilities (Internal), Sanitary			
	Agency	**Requirement Category**	**Common Components**
	PUB	Sanitary Pipes - Location	• System
		Used Water Flow Rate • 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) • Key Objective: To check that sewer can contain this flow	• System

Noise Control			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Noise Impact Assessment (NIA)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch / PEs) or Consultant submits NIA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-

Platform & Crest Level, Earthworks / Topography			
	Agency	**Requirement Category**	**Common Components**
	PUB	Minimum Platform Level - SHD	-
		Crest Level - SHD	-
	PUB, URA	**Earthworks** • Minimum Platform Level / Changes to Topography	-

Platform & Crest Level, Infra & Utilities (Internal)			
	Agency	**Requirement Category**	**Common Components**
	PUB	**Flood Protection Measures** If crest level is not provided - location and height of protection measure	• Space

Pollution Control			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Pollution Control Study (PCS)** *Can be provided at Pre-Submission, Design Gateway (G1), or Construction Gateway (G2)* • QP (Arch/PEs) or Consultant submits PCS reports to NEA directly for industrial developments that generate pollution	-

G1 Design Gateway

Legend: Architecture C&S M&E

Pollution Control *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Quantitative Risk Assessment (QRA)** *Can be provided at Pre-Submission or Design Gateway (G1)* • QP (Arch/PEs) or Consultant submits QRA reports to NEA directly for industrial developments with storage of hazardous substances	-
		COPPC - Section 5 : Pollution Control Requirements *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • 11. Water Pollution • 12. Air Pollution • 13. Noise Pollution	-
		COPPC - Section 6 : Hazardous Substances and Toxic Industrial wastes control requirements • 14. Hazardous Substances • 15. Toxic Industrial Waste	-

Public Health			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Site Layout** • Location and Sizes of the Bin Centre, refuse and recycling chute, refuse chute chamber and recyclables storage & its collection system • Check for refuse outputs • Location of cooling tower system and its setback distance (at least 5m)	• Space
		Air Conditioning and Mechanical Ventilation System *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust.	• Space

Public Space			
	Agency	**Requirement Category**	**Common Components**
	URA	**Urban Design Requirements – Public Spaces – POPS** • Location • Size • Layout • Shade Studies ○ Shading and Ecotect (or equivalent) sunshading studies at specified timings • Soffit Height	• Space • Soffit

G1 Design Gateway

Legend: Architecture C&S M&E

Rapid Transit System (RTS) Station			
	Agency	**Requirement Category**	**Common Components**
	URA	**Urban Design Requirements** • Location of station box • Design of pop-up structures (mitigation of platform levels, interfacing with neighbouring developments, within approved railway, cw provision, setback) • Land take required • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2,000sqm) • Construction method • Future integration with future structures (e.g. location / orientation / size of vents)	• Space
		National Scheme • For works interfacing with future developments (e.g. RTS) • Schematic design of future development (e.g. massing and connectivity to determine future pedestrian connection to surrounding sites)	-

Service and Vehicular Access to Site			
	Agency	**Requirement Category**	**Common Components**
	URA	**Urban Design Requirements** • Location of Service Areas, Holding Bays, and Vehicular Access (where/what it fronts)	-

Servicing (Internal Accesses)			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Site Layout** • Refuse Truck Access road (for refuse collection) - swept path analysis	• Road • Space
	SCDF	**Fire Engine Access Road / Accessway Provision** • Fire Engine Access Road / Accessway Width • Accessway Length Provision • Calculations to Derive Fire Accessway • Building Façade with Fire Engine Access Panels	• Road • Space

G1 Design Gateway

Legend: Architecture C&S M&E

Site Layout only

	Agency	Requirement Category	Common Components
	NEA	**Site Layout** • 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.)	• Space
		Nuisance Buffers • 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. • 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. • Buffers	• Space
	NParks	**Conservation of trees/Plants (Identification, e.g. trees within TCA/VL, heritage trees)** • Both roadside and internal • Certain trees/plants are to be conserved, e.g. spelled upfront in TCOT, or special considerations such as Heritage Tree or nominated Heritage Tree, identified upon nature group/public/residents engagement, or via recommendations of EIS/EIA report and/or EMMP	• Tree • Space
		Entrance Culvert Position • Part of roadside elements • Splay corners will also affect the green verge provision and location of roadside trees	• Culvert • Tree
		Greenery Provision for Open-Air Parking Areas at Street Level (Spatial Provision) • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)	• Space • Vehicular Parking
		New Parks / Park connector / Promenade • To ensure the design is shown upfront and accepted, e.g. in terms of spatial provision, access points, specific features that have to be fixed early on	• Space
		Peripheral Planting Verges (Spatial Provision) • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)	• Space

G1 Design Gateway

Legend: Architecture C&S M&E

Site Layout only *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	NParks	**Securing of land for PCN/Park use and/or Impact on Neighbouring Parks (e.g. enbloc sites)** • To ensure the site boundary does not encroach into safeguarded park / park connectors shown in MP19/PWP19 • Some development applications might be received during the discussion to rezone proposed parks/park connectors thus affecting boundaries	• Site Boundary
		Access Points Location (to ensure sufficient clearance secured for the retention of mature roadside trees)	• Road
		Green Buffer (Spatial Provision)	• Space
	SCDF	**Building Setback due to Unprotected Openings** • Setback between buildings or to the relevant boundary due to the unprotected openings shall be computed and provided based on the setback table	• Site Boundary • Space
	URA	**Building Setback from Boundary** • Road Buffer and Green Buffer • Common Boundary Setback / Party wall & Planting Strip • Building Setback for Multi-Storey Car Parks • Boundary Setback for Ancillary Structures	• Space
		Site Layout • Location of Buildings • Location of Communal Facilities (e.g. bin centre, pavilions, BBQ areas)	• Space
		Site Coverage • Declaration of Percentage	• Space

Site Layout, Drainage Reserve			
	Agency	**Requirement Category**	**Common Components**
	PUB	**Drainage Reserve** • Location (align to DIP), width	• Space

Site Layout, Landscape Deck			
	Agency	**Requirement Category**	**Common Components**
	URA	**Landscape Deck** • Height of Deck - Show on Section	• Slab

G1 Design Gateway

Legend: Architecture C&S M&E

Site Layout, Street Works			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Development Proposal** • Ensure project is not in exemption list from obtaining DBC's clearance, i.e. LTA in-house project. • To confirm if the development falls within road structure safety zone.	-
		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 (including trees, lamp post, signs etc) affected by proposed access.	• Road • Space • Tree
		Proposed Pick-Up / Drop-Off Points (within development): PUDO Layout • Indicate width and kerb alignment of PUDO points. • To show the location, number of PUDO bays and queue length	• Road • Space
		Proposed Loading / Unloading (within development): U/UL Layout • To show the location and number of U/UL bays	-

Use & Intensity			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Land Use Zoning** • Check whether the proposed development is aligned with the prevailing URA MP land use zoning (e.g. residential to residential).	-
	URA	**Dwelling Units** • Maximum Number • Pre-Application Feasibility Study (together with LTA)	• Space
		Gross Plot Ratio / Gross Floor Area	• Space
		Land Alienation / Land to be Vested for Public Schemes (Drain, Road, Open Space, Park, Cycling Paths)	• Space
		Land Use / Building Uses	• Space
		Site Area	• Space
		Built Environment Transformation GFA (Bonus GFA)	-

G1 Design Gateway

Legend: Architecture C&S M&E

Vehicular Parking			
	Agency	**Requirement Category**	**Common Components**
	LTA	• The proposed development shall comply fully with the prevailing Parking Places (Provision of Parking Places and Parking Lots) Rules and other relevant guidelines of the Authority. • The number of parking lots provided shall be 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. • The geometric dimensions of the parking layout shall comply with the standard minimum dimensions as stipulated in the COP	• Space • Vehicular Parking
	URA	**Parking** • Show location within site (e.g. underground; to check TCOT requirement for urban design requirements) • Nature (basement, surface, or podium) • Declare total number and breakdown of types	• Space • Vehicular Parking

Others			
	Agency	**Requirement Category**	**Common Components**
	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** • Any other requirements that affect piling (e.g. notioning scheme to determine feasibility of future pedestrian connection to surrounding sites)	-
		Supplementary Documents • Topo Survey Plan • Previous approved plans	-
		Public Consultation Process • Form A	-
		Development Statement of Intent • Description of proposal (does not apply to resi-landed)	-
		Design Advisory Panel (DAP) Report • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)	-

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]
		• Lightning Protection
		• Structural

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.	• Earthworks / Topography • Infra & Utilities (External) • Public Drains
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

Impact Studies, Site Layout, Rail Protection			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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**	**Common Components**
	BCA	• For big projects adopting piles or rough foundation as natural earth-termination system. Provision of rebars for connection to the down-conductor system shall be provided during the piling stage. • Developer or Builder is required to appoint a QP (Electrical) to supervise the LPS works and submit the LPS Supervision Form including Test Record where piling works are carried out early, before LPS Plan submission is carried out at the Construction Gateway (G2).	-

Public Drains, Earthworks / Topography			
	Agency	**Requirement Category**	**Common Components**
	PUB	*Can be provided at Commencement of Works or Piling Gateway (G1.5)* • Earth Control Measures	• Site

G1.5 Piling Gateway

Legend: Architecture C&S M&E

Public Drains, Infra & Utilities (External)			
	Agency	**Requirement Category**	**Common Components**
	PUB	**Pre-Condition CCTV of Sewers (advisable)** *Can be provided at Commencement of Works or Piling Gateway (G1.5)* • Condition to be checked at TOP stage • Project team to rectify if cracks / damage are identified	-

Public Health			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Air Conditioning and Mechanical Ventilation System** *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust.	• Space

Structural Design			
	Agency	**Requirement Category**	**Common Components**

	BCA	**Structural Design (Piling and Foundation Works)**
		Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
		• 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)
			• Footing / Pilecap
			• Pile
			• Slab

G2 Construction Gateway

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

See also:
Latest CORENET X Circulars

G2 Construction Gateway

Agency	Summary of Construction Gateway Requirements *(continued from previous page)*	Common Gateway Key Words
NParks	• 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)	• Infra & Utilities (Internal)
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 • Type of smoke control systems • Emergency voice communication system	• Access within Building • Equipment • Fire Compartmentation • Fire Fighting • Household / Storey Shelter • Lifts & Escalators • Materials • 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 • 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 • Vehicular Parking • Others

See also:
Latest CORENET X Circulars

G2 Construction Gateway

Key milestone in the new Regulatory Approval Process for Building Works (RABW)

The Construction Gateway (G2) is a consolidated clearance containing agencies' building plan and detailed plan approvals in a single coordinated submission. The Written Permission (WP), Building Plan (BP) approval and Structural (ST) approval for all permanent super-structural design are issued in this gateway.

Construction Gateway (G2) Clearance is also required for the launch of sales and commencement of super-structural works.

External Works

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

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

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

See also:
Latest CORENET X Circulars

G2 Construction Gateway

Legend: Architecture C&S M&E

Access to Site			
	Agency	**Requirement Category**	**Common Components**
	BCA	Passenger alighting and boarding point	• Accessible Route • Road • Ramp • Space
	URA	**Developments involving waterbodies:** • Foreshore access	• Space
		Site Layout: • Location of side gates	• Door • Space

Access within Building only			
	Agency	**Requirement Category**	**Common Components**
	BCA	Headroom and ceiling height	• Slab • Staircase • Space
		Accessible route and maneuvering space (within the development)	• Accessible Route • Slab • Lift • Space • Ramp • Vehicular Parking
	URA	Corridor width (for retirement housing)	• Space

Access Within Building, Lifts & Escalators			
	Agency	**Requirement Category**	**Common Components**
	SCDF	**Evacuation / Fire Lifts provision** • Number of fire lifts • Fire lift accessibility and coverage • Protected lobby / fire lift lobby	• Lift • Space

Balcony			
	Agency	**Requirement Category**	**Common Components**

	URA	**Balconies, Private Enclosed Spaces, Private Roof Terraces and Indoor Recreation Spaces:**
		• Balcony openness
		  ○ To demarcate open vs total perimeter on model, and declare openness percentage
		• Balcony screening
		  ○ To show design of screens illustrating that there are sufficient porosity for natural ventilation
		• Balcony width and size
			• Space

G2 Construction Gateway

Legend: Architecture C&S M&E

Balcony *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	URA	**Bonus Balcony GFA** • Letter of declaration from developer on balcony screen design and provision	-

Barrier			
	Agency	**Requirement Category**	**Common Components**
	BCA	Safety from falling	• Railing
		Protection from injury by vehicles in building (e.g. provision of bollards)	• Railing

Buildability			
	Agency	**Requirement Category**	**Common Components**
	BCA	**Buildability design (Scoring)** • B-Score Calculations	• Beam • Column • Refuse Chute • Slab • Staircase • Wall

Building / Unit Layout			
	Agency	**Requirement Category**	**Common Components**
	URA	Checking of strata areas / layout / voids – demarcate strata boundaries	• Space
		Dwelling Units: Unit Size and Layout (including strata area / volume)	• Space
		Unit / Floor Layout (e.g. office, retail, industrial): Unit Size and Layout	• Space

Building Massing			
	Agency	**Requirement Category**	**Common Components**
	URA	Building facade is treated as main elevation – illustrate design using perspectives	-

Connectivity			
	Agency	**Requirement Category**	**Common Components**
	BCA	Accessible Route (to the ingress / egress development entrance)	• Accessible Route • Lift • Ramp • Slab • Space • Vehicular Parking

G2 Construction Gateway

Legend: Architecture C&S M&E

Connectivity *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	URA	**Walking and Cycling Plan:** • Connectivity between buildings – show layout on plans, indicate width and levels • Deconflicting vehicular and pedestrian / cyclist traffic • Provision of biking lots and end-of-trip facilities – show location and GFA exemption	• Vehicular Parking
		(Covered Walkways) Soffit height	• Soffit
		(Open / Covered Walkways) Paving material (where required in UD guidelines)	-
		(Open / Covered Walkways) Level of bulk water meter chamber / inspection chamber	• Water Meter • Inspection Chamber

Conservation			
	Agency	**Requirement Category**	**Common Components**
	URA	Conserved Building: Commencement of Front Facade Restoration	-
		Documents to be part of Approved Plan (Conservation) * Drawing of architectural details	-

Dwelling Unit			
	Agency	**Requirement Category**	**Common Components**
	BCA	Bathrooms for future retrofitting	• Space
		Design of unit entrance for wheelchair users	• Door
	URA	Checking of strata area / layout / voids – demarcate strata boundaries	• Space
		Dwelling Units: Unit size and layout (including strata area / volume)	• Space
	NEA	**Residential Dwelling Units** • Check for hopper siting and direction facing, which shall be site as far away as possible	• Refuse Chute

Earthworks / Topography			
	Agency	**Requirement Category**	**Common Components**
	URA	**Developments involving Waterbodies:** • Treatment of retaining wall	• Wall
		Earthworks, Retaining Walls, and Boundary Walls: • Boundary wall – height and treatment	• Wall

G2 Construction Gateway

Legend: Architecture C&S M&E

Equipment only			
	Agency	**Requirement Category**	**Common Components**
	NEA	Detailed design of cooling tower system (if any)	• Space

External Works			
	Agency	**Requirement Category**	**Common Components**
	URA	Cycling path: Design – width, levels, treatment where relevant	-
		Design treatment for public street lighting, bollards, tactile tiles (UD requirement for CBD / Marina Bay)	-
		Linkway connection to commuter facilities: design details (e.g. alignment, clear width, soffit height)	-

Fire Compartmentation			
	Agency	**Requirement Category**	**Common Components**
	SCDF	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each Residential Unit to be Compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements • Separation of transit and non-transit occupancies • Separation of public and ancillary areas • Separation of commercial spaces • Separation between viaduct and M&E plantrooms / commercial spaces • Fire rating of compartment • Compartmentation by height • Vertical fire spread	• Door • Pipe • Space • Wall
		• Element of structure to check fire rating	• Beam • Borehole • Column • Footing / Pilecap • Pile • Slab • Staircase • Wall

G2 Construction Gateway

Legend: Architecture C&S M&E

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

Green Mark			
	Agency	**Requirement Category**	**Common Components**
	BCA	• Basic Green Mark requirements (Ventilation) • For the rest of Green Mark assessment, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application	• Space

Greenery			
	Agency	**Requirement Category**	**Common Components**
	NParks	**Conservation of Trees / Plants (Tree Protection Specifications)** • The Certified Arborist engaged by the Developer is to provide a report of the trees to be conserved, with indication of the tree girth (minimum tree protection zone will be generated in CORENET X) • A Tree Protection Zone (TPZ) refers to an area identified to protect the entire tree, which includes its crown, trunk and roots system. The TPZ established should be able to protect the entire tree throughout the duration of construction.	• Tree • Planting Area

G2 Construction Gateway

Legend: Architecture C&S M&E

Greenery *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	NParks	• The objective of the TPZ is to minimize the impact of construction activities on trees, including but not limited to mechanical injury to roots, trunks and branches due to contact with equipment, materials, debris or other activities. It also aims to minimize compaction of soil, which results in poor functioning of roots, and changes in soil levels that can cut off or suffocate roots.	• Tree • Planting Area
	URA	**Greenery:** • Landscape Replacement Area – Show on plans and declare % of landscape	• Space
		Greenery: • Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions – show on plans and provide details of design	• Planter Box • Space

Household / Storey Shelter			
	Agency	**Requirement Category**	**Common Components**
	BCA	**Household / Storey Shelter details** • Compliance with technical requirements on shelter position, size, setback requirements • Submit CD Shock Calculations as supplementary non-BIM documentation • M&E inputs required for Transit Shelter • Compliance to structural requirements stipulated in technical requirements on household shelters and storey shelters	• Door • Electrical fixture for Household / Storey Shelter • Slab • Space • Wall • Window
	SCDF	Shelter requirements – protected shafts (with BCA)	• Wall

Impact Studies only			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Building Proposal within Railway Protection Zone / Railway Corridor** • Plans for building work • Engineering evaluation report accompanied by plan for engineering works • 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

Impact Studies, Site Layout, Rail Protection			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Approval to Commence Piling Works within Railway Protection Zone / Railway Corridor** • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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 (External)			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Detailed Structural Layout, and M&E provisions of Pedestrian Overhead Bridges** • To provide structural details of POB (i.e. column width, footing), materials, Roof details, Floor finishes • To provide details of ramp, staircase, handrail, tactile tile • To provide details of lighting provisions and M&E provisions • To provide details of connection/ interfaces with development/ bus stops. • Declaration of non-compliance • To determine possible road closure due to hoisting of link bridges	-
		Detailed Structural layout, and M&E provisions of Covered Linkways • To provide structural details (i.e. column width, footing), materials, • To provide details of lighting provisions and M&E provisions (if any) • To provide details of connection/interfaces with development/bus stops. • Declaration of non-compliance	-
		Detailed Structural layout, and M&E provisions of Bus Shelters • To provide structural details of bus shelter, seating arrangement, bus info panels etc. • To provide bollard and flooring details. • To provide details of lighting provisions and M&E provisions (if any) • To show bus pole position • To submit Traffic Plan • To confirm the need of temporary bus stop provision and its position. • To confirm the relocation date and commissioning of new bus stop	-

G2 Construction Gateway

Legend: Architecture C&S M&E

Infra & Utilities (External) *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Detailed Layout of Taxi Shelter** • To submit Traffic Plan • 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 • To confirm the need of temporary taxi stand provision and its position.	-
		Details of Side Table Modifications for Addition of Auxiliary lanes, u-turns etc • To submit Traffic Plan • To submit street plan and cross section details showing the proposed levels, width and cross-fall of carriageway, planting verge and footpath. • New cross-culvert less than 2m wide to clear with PUB Drainage	-
		Details of External Works (Frontage Improvement Works) • To submit Traffic Plan • To submit street plan and cross section details showing the proposed levels, width and cross-fall of carriageway, planting verge and footpath. • New cross-culvert less than 2m wide to clear with PUB Drainage • To determine the streetlighting provision	-
		Details of New Street (incl. modifications to existing streets) • To submit Traffic Plan • To submit street plans, longitudinal section and cross section details. • Geotechnical details for foundation, retaining wall, slope (if any) • To submit structural and M&E details for road structures and commuter facilities	-
	NParks	Detailed designs of the park and info of the park facilities and park furniture for the new parks / park connector / promenade	-
		Planting requirements for Covered Linkways / Pedestrian Overhead Bridge	-
		Allowable structures within planting areas • Planting areas (green buffers, peripheral planting verges) should be free from any encroachment, except for allowable minor ancillary structures and landscaping features listed in NParks Guidelines (Chapter 3)	• Planting Area

Infra & Utilities (Internal)			
	Agency	**Requirement Category**	**Common Components**
	PUB	Sanitary Drainlines	• Inspection Chamber
		Sanitary Ventilation	-

G2 Construction Gateway

Legend: Architecture C&S M&E

Infra & Utilities (Internal) *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	PUB	Basement Pumped System	-
		Water Tank	• Water Tank (Potable Water) • Tank (Storage)
		Mode of Supply	• System

Lifts and Escalators, Equipment			
	Agency	**Requirement Category**	**Common Components**
	BCA	Lift and escalator provision (number)	• Lift • Escalator
		Lift for wheelchair users (a) location (b) type	• Lift

Lightning Protection			
	Agency	**Requirement Category**	**Common Components**
	BCA	**The following information are required to be modelled in BIM:** • Location of air-termination system • Location of down conductors • Zone of lightning protection provided by the air-termination network for open roof spaces and the sides of the building • Location of earth electrodes **The following LPS details do not require to be modelled in BIM:** • 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. • Non-BIM supplementary documents such as material specification, photo, ppt, excel, words, etc. should be submitted	• Space • Placeholder items for LPS equipment to be explored

Materials			
	Agency	**Requirement Category**	**Common Components**
	BCA	Energy Efficiency (ETTV and RTTV)	-
	SCDF	**Fire Resistance of Element of Structure** • Element of structure shall have appropriate fire resistance	• Wall
		Compartment walls and floors	• Space • Door • Wall

G2 Construction Gateway

Legend: Architecture C&S M&E

Night Lighting			
	Agency	**Requirement Category**	**Common Components**
	URA	**Night Lighting Report** • UD Areas with night lighting requirement • Concept and renders • Specifications • Location and extent • Fixture installation	-

ORA / ODA / Kiosks			
	Agency	**Requirement Category**	**Common Components**
	URA	Location and extent, detailed design (e.g. structure, height, transparency)	-

Pollution Control			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Pollution Control Study (PCS)** *Can be provided at Pre-Submission, Design Gateway (G1) or Construction Gateway (G2)* • QP (Arch/PEs) or Consultant submits PCS reports to NEA directly for industrial developments that generate pollution	-

Public Communications Plans			
	Agency	**Requirement Category**	**Common Components**
	URA	Public Communication Plans	-

Public Health			
	Agency	**Requirement Category**	**Common Components**
	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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	• Interceptor • Refuse Chute • Refuse Handling Equipment • Sensor • Space • Sprinkler • Wall

G2 Construction Gateway

Legend: Architecture C&S M&E

Public Health *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Residential Dwelling Units** • Check for hopper siting and direction facing, which shall be sited far away as possible from residential dwelling units and not facing the entrance of units	• Refuse Chute
		Detailed design of Pneumatic Waste Conveyance System (PWCS) refer to SS642-2019	-
		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	• Pump • Toilet • Space • System
		Public Toilet • Total number of Sanitary Facilities provisions (where applicable)	• Toilet • Space
		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	• Interceptor • Space • System
		COPEH - Section 4 : Cooling Tower 4.1 Objective 4.2 Design Requirements	• Space
		COPEH - Section 5 : Aquatic Facility 5.1 Objective 5.2 Minimum Design Criteria	• Space
		Aquatic Facility and Swimming pool • No overhead sanitary wastepipe to be on top of balancing tanks. • Location of two pre-swim showers shall be provided around the swimming pool. • Setback of 2.2m from the planter strip to pool perimeter. • Location of swimming pools and its balancing tanks	• Tank • Space
		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	• Refuse Chute

G2 Construction Gateway

Legend: Architecture C&S M&E

Public Health *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	NEA	**COPEH - Section 7 : Anti-Mosquito Breeding** 7.1 Objective 7.2 Roof Gutter 7.3 Air-Conditioning Tray 7.4 Floor Trap	- Gutter - Floor Trap
		Roof Gutter and Scupper Drain • Location of roof gutter or scupper drain • Provision of permanent and safety maintenance access	• Gutter • System
		Air Conditioning and Mechanical Ventilation System • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust	-

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

Roofscape			
	Agency	**Requirement Category**	**Common Components**
	URA	Detailed treatment of rooftop as “fifth” elevation	-
		Detailed location / extent of rooftop Outdoor Refreshment Area (ORA)	-
		M&E Screening details	-

Rapid Transit System (RTS) Station			
	Agency	**Requirement Category**	**Common Components**
	URA	At-grade bicycle parking	-
	SCDF	Exit staircases and means of escape requirements	• Staircase
		Occupant load and exit capacity of station	• Space
		Other special requirements for RTS	-

G2 Construction Gateway

Legend: Architecture C&S M&E

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

Site Layout only			
	Agency	**Requirement Category**	**Common Components**
	NParks	Alternative configuration of planting areas	• Planting Area
	URA	**Building Setback from Boundary** • Setback for Building Appendages – Location and width • Treatment for non-compliant Multi-Storey Car Parks • Treatment for non-compliant Ancillary Structures	• Space

Site Layout, Attic			
	Agency	**Requirement Category**	**Common Components**
	URA	**Attic** • Design of attic in relation to strata unit • Height of attic - Dimension	• Space

Site Layout, Basement			
	Agency	**Requirement Category**	**Common Components**
	URA	**Basements** • Basement protrusion • Screening of basement opening • Setback	• Space

Site Layout, Landscape Deck			
	Agency	**Requirement Category**	**Common Components**
	URA	**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	• Space • Wall

G2 Construction Gateway

Legend: Architecture C&S M&E

Site Layout, Screening			
	Agency	**Requirement Category**	**Common Components**
	URA	**Special and Detailed Control Plans** • Screenings under High-Rise Committee	-

Site Layout, Street Works			
	Agency	**Requirement Category**	**Common Components**
	LTA	**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	• Culvert • Ramp • Road
		Proposed pick-up / drop-off points (within development): PUDO details • All details presented at Design Gateway (G1) stage	• Ramp • Road • Space
		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, Vehicular Parking			
	Agency	**Requirement Category**	**Common Components**
	LTA	**All 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 • EV lots & charging stations	• Ramp • Road • Space • Vehicular Parking

G2 Construction Gateway

Legend: Architecture C&S M&E

Staircase			
	Agency	**Requirement Category**	**Common Components**
	SCDF	**Exit Staircases and Means of Escape Requirements** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Number of exit staircases provided and location • Exit capacity of exit staircase, fire rating of the enclosure, smoke free approach to exit staircase, ventilation of exit staircase etc. • Travel distances to exit staircase	• Space • Stair
	BCA	Minimum Width, Tread and Riser, Nosing, Handrail / Railing	• Staircase

Structural Design			
	Agency	**Requirement Category**	**Common Components**

	BCA	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)*
		• 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]
			• Footing / Pilecap
			• Pile
			• Slab

		• Complete set of IFC-SG model(s) for all structural framings & details
		• **2D drawings limited to the categories below:**
		  ○ General notes
		  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)
		• 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 building plan submitted simultaneously
		• Completion letter of pre-consultation [for complex structure only]
		• **Ground Investigation**
		  ○ Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08
			• Beam
			• Borehole
			• Column
			• Slab
			• Staircase
			• Wall

G2 Construction Gateway

Legend: Architecture C&S M&E

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

Use & Intensity			
	Agency	**Requirement Category**	**Common Components**
	URA	Ancillary Shops (0.3% Quantum) – to declare amount of Commercial GFA within development	• Space
		Bonus GFA Incentive Schemes: Balcony / Recreational – declaration of GFA amount and %	-
		RC Flat Roofs: • Use – Indicate whether roof is accessible, and if so, for what purpose • Structures – To show on plan any proposed built structures	• Space
		Urban Design Requirements • Activity Generating Uses – Indicate location on plan and provide details on specific nature of use • Public Spaces – Indicate location, design and dimensions • Party Wall – Indicate no openings	• Space

Vehicular Parking			
	Agency	**Requirement Category**	**Common Components**
	BCA	Provision of Accessible Lot	• Accessible Route • Vehicular Parking
	URA	Screening Details	-

Ventilation			
	Agency	**Requirement Category**	**Common Components**
	BCA	Provision of ventilation (natural ventilation for residential development)	• Space
		Minimum 5% opening for natural ventilation	• Space
		Maximum distance (12m) from natural ventilating opening	• Space
		Natural ventilation (dimension of recess / airwell)	• Space
		Carpark Ventilation	• Space • Vehicular Parking

G2 Construction Gateway

Legend: Architecture C&S M&E

Ventilation *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	SCDF	Airwell for staircase ventilation	• Space
		Ventilation for open-sided carpark building	• Space
		Mechanical Ventilation & Smoke Control Systems • Ventilation systems for Fire Command System (FCC), fire pump rooms, smoke-free / fire fighting lobbies, generator set rooms etc. • Smoke purging system, engineered smoke control systems	• Space • System

Washroom			
	Agency	**Requirement Category**	**Common Components**
	BCA	Sanitary provisions for wheelchair users and ambulant disabled	• Space

Others			
	Agency	**Requirement Category**	**Common Components**
	URA	**Supplementary Documents** • Topo Survey Plan • Previous approved plans	-
		Landscaping species plan (trees / shrubs / groundcover)	• Tree
		Public Consultation Process • Forms B and C	-
		Design Advisory Panel (DAP) Report • Urban design and architectural information for DAP to assess (e.g. renders; diagrams showing sheltered pedestrian route)	-

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 • Material (use of glass at height, daylight reflectance) • Details of lift equipment and escalators • Buildability Design Implementation Plan • Green Mark Detailed Requirements	• Buildability • Connectivity • Equipment • Façade • Green Mark • Household / Storey Shelter • Infra & Utilities (Internal) • Lightning Protection • Materials • 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 • Vehicular 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	**Fire Protection (FP) and Mechanical Ventilation (MV) Plans** • Detailed layout and floor plan showing Fire Protection and Mechanical Ventilation system of development • Automatic Fire Alarm System • Automatic Fire Extinguishing System • Emergency Voice Communication System • Smoke Control System • Schematic diagram for the proposed system • Calculations and reports (where applicable)	• Equipment • Fire Compartmentation • Fire Fighting • Materials • Ventilation
SLA	As-built 3D cadastres submission. More details will be released.	-
URA	• Night Lighting/Arts incentive schemes (if applicable) • Strata/Land Subdivision and Amalgamation (if applicable	• Conservation

See also:
Latest CORENET X Circulars

- Independent Agency Submissions

Legend: Architecture C&S M&E

Buildability			
	Agency	**Requirement Category**	**Common Components**
	BCA	**Buildability Design Implementation Plan (BDIP)** • Connection and details of precast components and prefabricated reinforcement	-
		Constructability Score • C-Score Calculations • Constructability Implementation Plan (CIP)	-

Connectivity			
	Agency	**Requirement Category**	**Common Components**
	BCA	Provision of Signages	-

Conservation			
	Agency	**Requirement Category**	**Common Components**
	URA	**Conserved Building (remaining works to be checked)** • Painting • Signage • Lighting • 5-foot Way Material (tiles) • M&E location (aircon, screening, kitchen flue)	-

Façade			
	Agency	**Requirement Category**	**Common Components**
	BCA	Safety of Windows	-

Fire Compartmentation			
	Agency	**Requirement Category**	**Common Components**
	SCDF	**Separating Walls** • Appropriate fire resistance	-
		Compartment Walls and Floors • Appropriate fire resistance, opening protection, pipe penetration (fire stop) etc.	-
		Protection of Openings	-
		Concealed Spaces • Provision of cavity barriers, fire protection system installed	-

- Independent Agency Submissions

Legend: Architecture C&S M&E

Fire Compartmentation *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	SCDF *(continued from previous page)*	**Fire stopping** • Materials for fire stopping shall have the necessary fire resistance	-

Fire Fighting, Equipment			
	Agency	**Requirement Category**	**Common Components**
	SCDF	**Rising Mains & System** • Water supply, fire pump & storage tank, flowrate, pressure	-
		Secondary Power Supply • Provision of genset for fire fighting systems such as fire pumps, lifts, mechanical ventilation systems, emergency voice communication system, etc.	-
		Hose Reel • Water supply, pump, storage tank, flowrate, pressure etc.	-
		Colour Scheme of Fire Protection Systems • Equipment, fixtures and fittings for the fire protection systems shall be painted in red	-
		Redundancy of Fire Pumping System • The pumping system for wet rising mains, hose reels, sprinklers and hydrants shall be provided with redundancy such that the system performance is not affected when one of the pumps and/or the associated control system is out of operation due to routine maintenance or break-down.	-
		Exit Lighting • Provision of emergency lighting at corridors and lobbies	-
		Emergency voice communication system • Provision of 1-way EVC for mixed commercial cum residential usage	-
		Fire hydrant system • Hydrant tank & pump, flowrate and pressure	-
		Sprinklers & System • Sprinkler water tank, fire pump, sprinkler head coverage & distribution etc	-

- Independent Agency Submissions

Legend: Architecture C&S M&E

Green Mark			
	Agency	**Requirement Category**	**Common Components**
	BCA	Green Mark Detailed Requirements (Others)	-
		For the rest of Green Mark Assessment and Score Card, please refer to: https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application	-

Greenery			
	Agency	**Requirement Category**	**Common Components**
	NParks	**Green buffer (landscaping scheme)** • To show the number and species of trees and plants to be planted	-
		Peripheral planting verges (landscaping scheme) • To show the number and species of trees and plants to be planted	-
		Greenery provision for open-air parking areas at street level (landscaping scheme) • To show the number and species of trees and plants to be planted and the surface treatment of the lots (i.e. grass pavers)	-
		Landscaping scheme for roadside greenery • NParks will either undertake the landscaping or liaise with QP separately	-

Impact Studies / Site Layout, Rail Protection, Road Structure Protection			
	Agency	**Requirement Category**	**Common Components**
	LTA	**Approval to commence engineering works within Railway Protection Zone / Railway Corridor** • Plan for engineering works • Engineering evaluation report • Instrumentation proposal and initial instrumentation readings • Method statement of work • 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 • Contingency Plan and Emergency procedure • Pre-condition survey report • Certified survey plans • Permit application form and other relevant forms • 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	-

- Independent Agency Submissions

Legend: Architecture C&S M&E

Impact Studies / Site Layout, Rail Protection, Road Structure Protection			
	Agency	**Requirement Category**	**Common Components**
	LTA	**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 • Plans for engineering works • Engineering evaluation report • Instrumentation proposal • Method statement of work • Hazard analysis identifying all possible risks from the engineering works that may be posed to the road structures and a description of the safety and precautionary measures to mitigate the risks • Contingency plans and Emergency procedure • Pre-condition survey report • Certified survey plan for underground structures • Soil investigation report • Particulars of the person who carries out the work and the person for whom the works are being carried out 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	-

Infra & Utilities (Internal) only			
	Agency	**Requirement Category**	**Common Components**
	BCA	Lighting	-

Infra & Utilities (Internal), Water Supply			
	Agency	**Requirement Category**	**Common Components**
	PUB	Meter Location	-
		Water Supply Connection	-
		Water Reticulation System	-
		Water Pumps	-

Lightning Protection, Equipment			
	Agency	**Requirement Category**	**Common Components**
	BCA	Lightning Protection System (LPS) Plan	-

- Independent Agency Submissions

Legend: Architecture C&S M&E

Materials			
	Agency	**Requirement Category**	**Common Components**
	BCA	Use of Glass at Height	-
		Daylight Reflectance	-
	SCDF	Product Certification	-
		Roofs • Surface flame spread rating **Plastic Material** • Depending on its application, the plastic material shall meet the required acceptance criteria and pass the relevant test standards	-

Noise Control			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Mechanised Carpark System** • Noise report to be submitted for the noise generated from this system	-
		Detailed design of noise/pollution control abatement measures	-
		Noise Impact Assessment (NIA) – Post • QP (Arch/PEs) or Consultant submits NIA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-
		Noise Report for ACMV • QP (Arch/PEs) or Consultant submits NA reports to NEA directly when the residential development is sited near to noise source (or vice versa)	-

Pollution Control			
	Agency	**Requirement Category**	**Common Components**
	NEA	**COPPC - Section 2 : Judicious siting of industries and other development** 4. Objective	-
		COPPC - Section 3 : Requirements for Industries 5. Clean Industry 6. Light Industry 7. General Industry 8. Special Industry	-

- Independent Agency Submissions

Legend: Architecture C&S M&E

Pollution Control *(continued from previous page)*			
	Agency	**Requirement Category**	**Common Components**
	NEA	**COPPC - Section 4 : Requirements to Operate Factory** 9. Use of Industrial premises 10. Trade effluent discharge into public sewer and water course	-
		Clearance for Detailed Plan on Pollution Control Equipment (PCE) • QP (Arch/PEs) submits to NEA directly for Detailed Plan on Pollution Control Equipment (PCE)	-

Structural Design			
	Agency	**Requirement Category**	**Common Components**
	BCA	**Structural Design (other works e.g. demolition, ERSS, cladding, safety barrier)** • 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 • 2D Drawings are acceptable for independent submissions. • These plans will need to make reference back to the coordinated model submitted by the Main QP at the Construction Gateway (G2).	-

Vehicular Parking			
	Agency	**Requirement Category**	**Common Components**
	NEA	**Mechanised Carpark System** • Location of mechanised carpark system with the provision of 3 sided solid walls.	-

Ventilation			
	Agency	**Requirement Category**	**Common Components**
	SCDF	Air-Conditioning and Mechanical Ventilation systems	-
		Mechanical Ventilations & Smoke Control Systems • Air-change ventilation systems for FCC, fire pump rooms, smoke-free/fire fighting lobbies, genset rooms etc • Redundancy of ventilation systems	-

G3 Completion (TOP/CSC) Gateway

Agency	Summary of Completion Gateway Requirements	
	TOP	**CSC**

BCA	• **Record Plans of Building Works consists of:**
	  ○ Certificate of Supervision of Piling Works
	  ○ Certificate of Supervision of Structural Works
	  ○ Certificate of As-Built Structural Works in IFC-SG structural model & 2D drawings
	• 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 **For handing over to PUB (if applicable):** • Taking over letter	
NParks	NIL	• As-built plan • Site inspections (if applicable) – may involve soil check to ensure quality of planting mixture conforms to NParks' specifications for Approved Soil Mixture (ASM) **For handing over to PUB (if applicable):** • Taking over letter

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 **To provide the following:** • As-built plans/survey plans/schematic sanitary drawing • Form B1 clearance • PE endorsed handing over form for completed public drains
SCDF	Temporary Fire Permit (TFP) application	Fire Safety Certificate (FSC) application
URA	• Declaration that completed works have been supervised and built in accordance to approved plans • Inspections (where necessary)	

Application for Completion of Works

A set of TOP / CSC checklist pertaining to agencies' requirements are provided to guide the project teams on the list of requirements for TOP / CSC application. 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

BCA		
	Item for TOP / CSC	**Brief Description**
	BP TOP / CSC	• Record Plans
	Buildability Score	• As-Built B-Score Calculations (including structural) • As-Built Buildability Design Implementation Plan (BDIP) to show connection and details of precast components and prefabricated reinforcement
	CD Shelter Notice of Approval of Commissioning	• Test Method Statement and Test Record forms
	CD Shelter Commissioning	• Application for approval of commissioning of CD Shelter • Checklist for submission with application for commissioning
	Constructability Score	• As-Built C-Score • As-Built CIP • Certificate of Compliance of C-Score
	Green Mark	Please refer to https://www1.bca.gov.sg/buildsg/sustainability/green-mark-certification-scheme/green-mark-assessment-criteria-and-online-application
	Lightning Protection System (LPS) Plans	• Record Plans • Certificate of Supervision of LPS • Testing Records
	Record Plans of Structural Works and Certificates	• Certificate of Supervision of Piling Works • Certificate of Supervision of Structural Works • Certificate of As-Built Structural Works (in IFC-SG structural model & 2D Drawings) • Builder Certificate
	TOP / CSC	• QP Declaration • Certificate of Supervision for Lightning • Permit to Operate (Lift & Escalator) • ACMV • CD shelter • Cable BDD (B/C-score) • Green Mark • Universal Design Index FormSG Acknowledgement • CONQUAS / QM • Photos of Rectification • Phasing Plan

G3 Completion (TOP/CSC) Gateway

Legend: Architecture C&S M&E

LTA		
	Item for TOP / CSC	**Brief Description**
	-	**Application for clearance of certificate of statutory completion for development within railway protection zone / railway corridor** • As-built plans • Certificates of supervision • 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 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. • 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 • As-built structural and M&E plans for commuter facilities such as POB, UPN. • Certified Plan (CP). • Road Declaration Plan. • Road testing results. • Asset Master Record Input Form. • Road Data Form. • Taking over letters from PUB, NParks and NEA. • 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. • Audit certificate for project under Ministries or Statutory Board. • 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

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

URA		
	Item for TOP / CSC	**Brief Description**
	Development Interface Report (DIR) (Final)	• Structural information for future developer (e.g. loading requirements) • Architectural information for future developer (e.g. Knock Out Panels alignment / width) etc

SECTION 4

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

corenetX

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

Page

Glossary of "Identified Components"

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

Modeling 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 • 12 • 18 • 24 • 30 • 36
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 • Torsion

Abbreviation List:

CIS	- Cast in situ
PW	- Precast works
PT (Pre)	- Pre-tensioning works
PT (Post)	- Post-tensioning works
PF	- Prefabrication (e.g. steel, MET, etc.)
PPVC	- Precast-Prefabricate-Volumetric Component

Link:
IFC-SG Resource Kit

See also:
Preparing models for submission

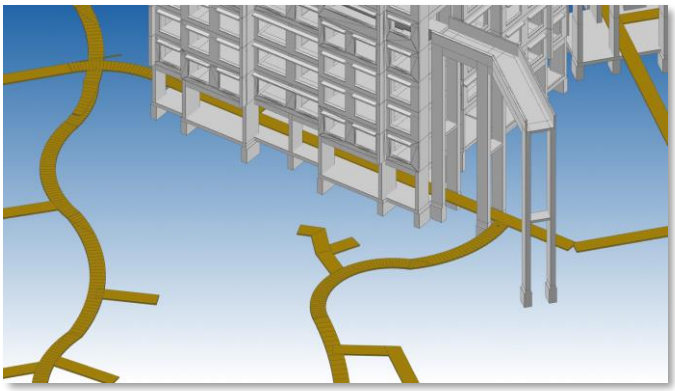
Accessible Route

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access to Site	BCA	Passenger Alighting and Boarding Point
	Access within Building Only		Accessible Route and Maneuvering Space (Within the Development)
	Connectivity		Accessible Route (To the Ingress / Egress of the Development Entrance)
	Vehicular Parking		Accessible Vehicle Parking

S4 – Fig 1: Accessible Route within BIM model



S4 – Fig 2: Accessible Route with BIM model hidden

Modeling 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, Slab, Space, Vehicular Parking, if they contain a positive BarrierFreeAccessibility property

By IFC Representation

IFC Entity: IfcBuildingElementProxy

IFC USER-DEFINED SubType: ACCESSIBLEROUTE

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	BarrierFreeAccessibility	Boolean	-	-	Yes	TRUE / FALSE
2	Width	Auto-generated from BIM	-	mm	No	1200

Bath

By IFC Representation

IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: BATH						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	-	-	-	-	-	-

Beam

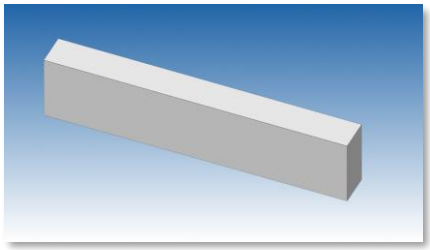
Legend: Architecture C&S M&E

By Key Gateways

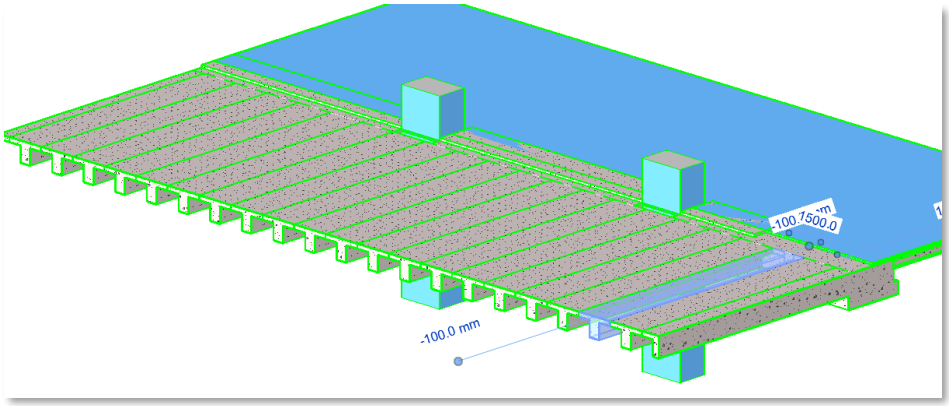
G1.5	Piling Gateway (optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating
	Structural Design	BCA	Structural Design (Piling and Foundation Works)

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating
	Buildability	BCA	**Buildability Design (Scoring)** • B-Score Calculations

	Structural Design		**Structural Design (Main Structural Elements of Building excl. Piling)**
			• Complete set of IFC-SG model(s) for all structural framings & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)



S4 – Fig 3 : Beam



S4 – Fig 4 : Concrete Rectangular Beam

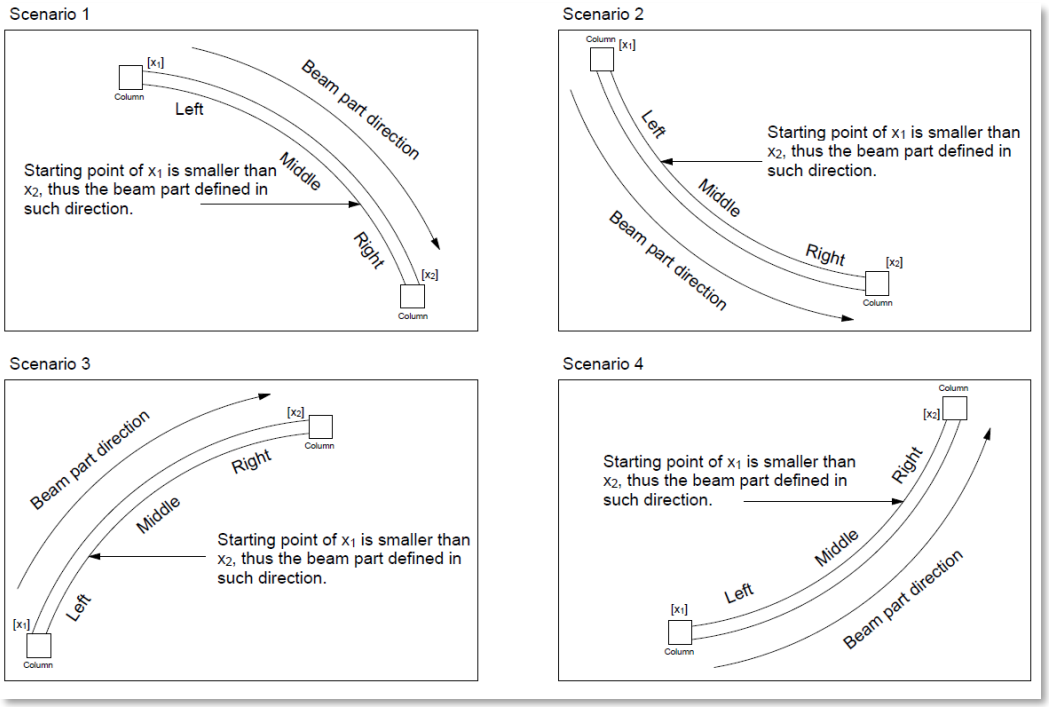
Beam

Modeling 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 or complex beam design (e.g. transfer beams, precast beams, prestressed beams, cold-form steel beams, etc.) with the indication of drawing number in the IFC-SG parameter "ReferTo2DDetail".

Beam Property Definition

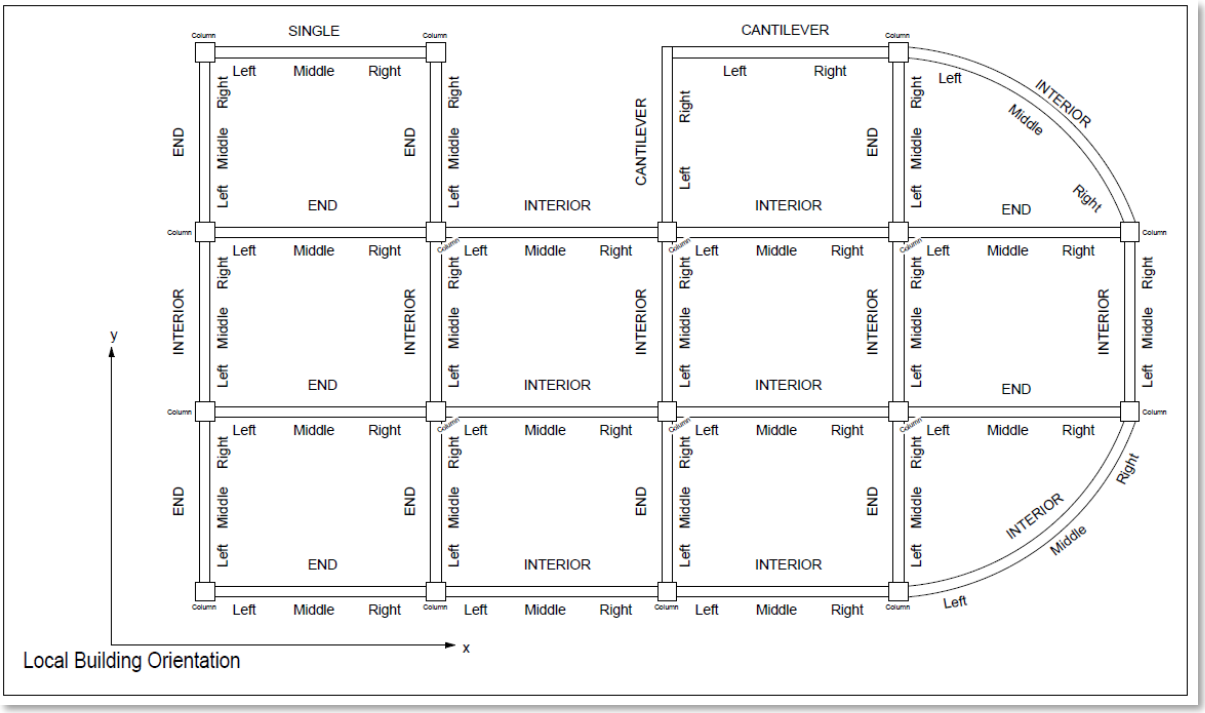
Beam Property Definition	
1	Every beam will be detailed based on 3 parts (left, middle & right) in accordance to its local building axis orientation (refer to Figure 5 below).
2	Starting point of a beam should be the smallest x coordinate of local building axis orientation in a span and denoted as left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



S4 – Fig 5 : Beam Part Definition

Beam

Beam Property Definition (continued from previous page)



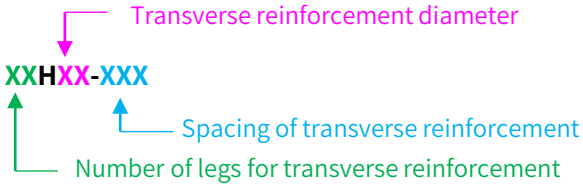
S4 – Fig 6 : Beam Sequencing and Span Definition

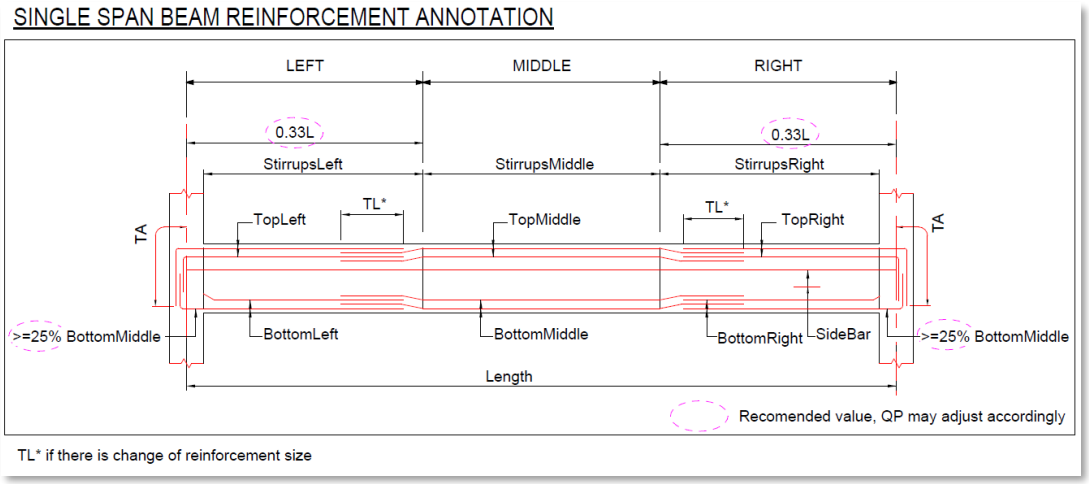
Beam Reinforcement Definition

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

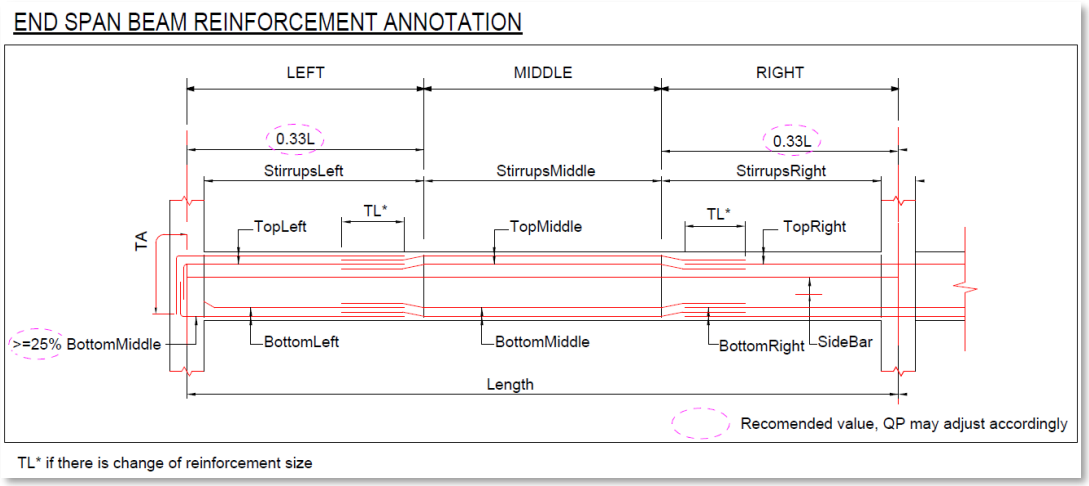
Beam

Beam Reinforcement Definition (continued from previous page)

Beam Reinforcement Definition	
4	The input for StirrupsLeft, StirrupsMiddle & StirrupsRight shall be "XXHXX-XXX" while "H" is a must, 1st XX is number of legs for transverse reinforcement, 2nd XX is the reinforcement diameters and XXX is the spacing of transverse reinforcement. • Use '+' for more than 1 layer of reinforcement (e.g. 4H10-100 : [4 denotes 4 legs]) 
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.



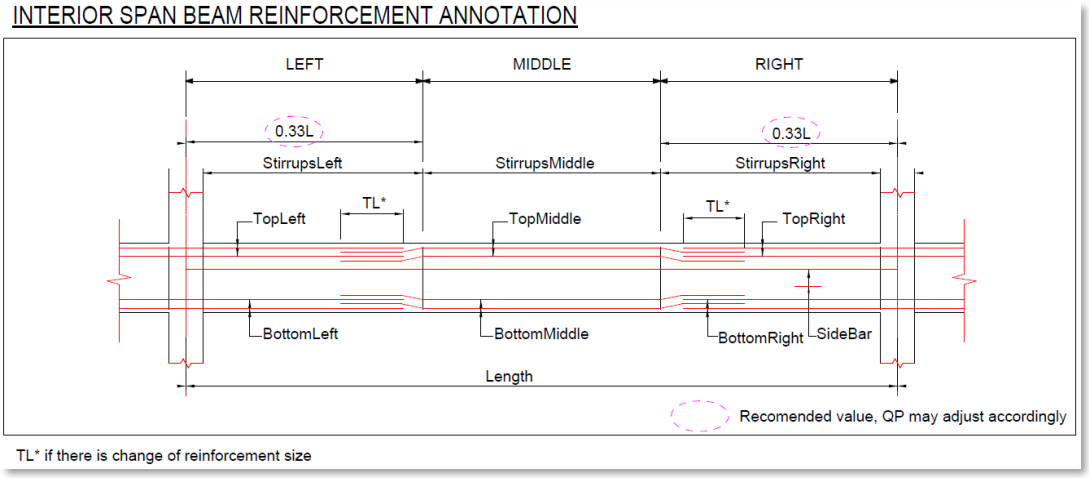
S4 – Fig 7: Beam Annotation Single Span



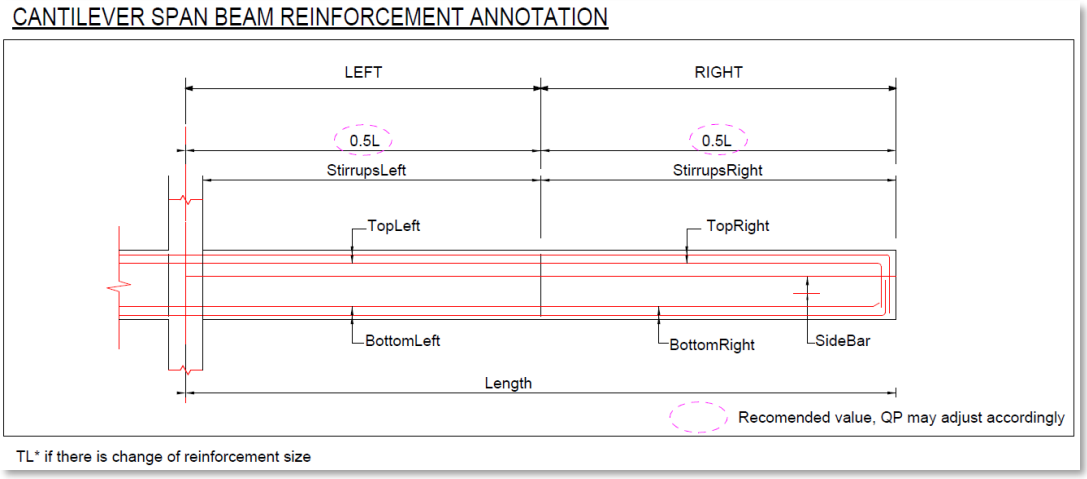
S4 – Fig 8 : Beam Annotation End Span

Beam

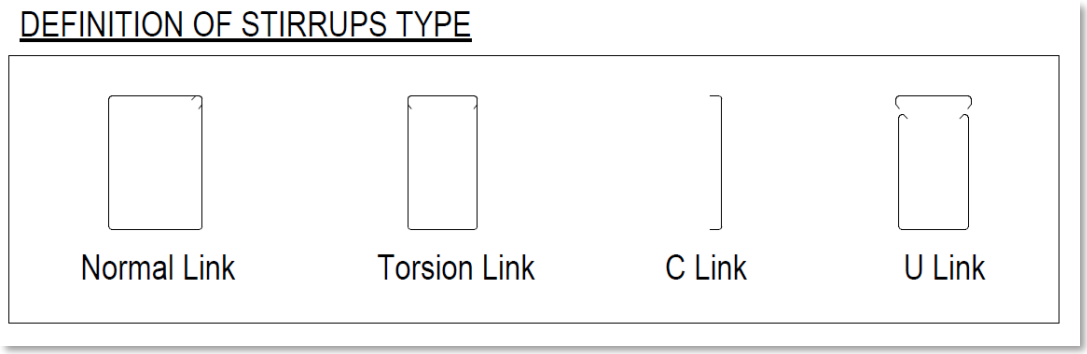
Beam Reinforcement Definition (continued from previous page)



S4 – Fig 9 : Beam Annotation Interior Span



S4 – Fig 10 : Beam Annotation Cantilever Span



S4 – Fig 11 : Beam Annotation Stirrups

Beam

By IFC Representation

IFC Entity: IfcBeam						
IFC USER-DEFINED 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	ConstructionMethod	Text	RC beam	-	Yes	Refer to list^
3	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
4	ReinforcementSteelGrade	Text	RC beam	-	Yes	Refer to list^
5	SectionFabricationMethod	Text	Steel beam	-	Yes	Refer to list^
6	Depth	Length	RC beam	mm	No*	600
7	Mark	Text	All beams	-	No	HB1, VB1, B1
8	MemberSection	Text	Steel beam	-	No	RHS600x30x4, CHS500x3.0, 254x254x63kg/m
9	Width	Length	RC beam	mm	No*	300
10	BottomLeft	Text	RC beam	-	Yes	3H25
11	BottomMiddle	Text	RC beam	-	Yes	3H32+3H25+3H20
12	BottomRight	Text	RC beam	-	Yes	3H25
13	SideBar	Text	When required / relevant	-	Yes	H13-250
14	StirrupsLeft	Text	RC beam	-	Yes	4H13-300
15	StirrupsMiddle	Text	RC beam	-	Yes	4H13-300
16	StirrupsRight	Text	RC beam	-	Yes	4H13-300
17	StirrupsTypeLeft	Text	RC beam	-	Yes	Refer to list^
18	StirrupsTypeMiddle	Text	RC beam	-	Yes	Refer to list^
19	StirrupsTypeRight	Text	RC beam	-	Yes	Refer to list^
20	TopLeft	Text	RC beam	-	Yes	3H32+3H25
21	TopMiddle	Text	RC beam	-	Yes	3H25
22	TopRight	Text	RC beam	-	Yes	3H32+3H25
23	BeamSpanType	Text	All beams	-	Yes	Refer to list^
24	ConstructionMethod	Text	RC beam	-	Yes	Refer to list^
25	Material	Text	All beams	-	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 USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
26	LeftConnectionDetail	Text	Steel beam	-	No	Detail 1
27	LeftConnectionType	Text	Steel beam	-	Yes	Refer to list^
28	RightConnectionDetail	Text	Steel beam	-	No	Detail 1
29	RightConnectionType	Text	Steel beam	-	Yes	Refer to list^
30	SpliceConnection	Text	Steel beam	-	No	Detail 1

* 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 USER-DEFINED 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
11	StirrupsLeft	3H10-150
12	StirrupsMiddle	3H10-300
13	StirrupsRight	3H10-150
14	StirrupsTypeLeft	Normal+C
15	StirrupsTypeMiddle	Normal+C

Beam

Example of Beam (RC Beam) Structural Element Input

RC Beam (600x1200mm RC Precast Beam)	**IFC Entity:** IfcBeam		
	IFC USER-DEFINED 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**
	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 USER-DEFINED 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

Bed

By IFC Representation

IFC Entity: IfcFurniture						
IFC USER-DEFINED SubType: BED, CHANGING BED						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	-	-	-	-	-	-

Bench

By IFC Representation

IFC Entity: IfcFurniture						
IFC USER-DEFINED SubType: BENCH						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	IsBuiltIn	Boolean	-	-	Yes	TRUE / FALSE
2	Capacity	Text	-	-	-	-

Bidet

By IFC Representation

IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: BIDET						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	-	-	-	-	-	-

Borehole

Legend: Architecture C&S M&E

By Key Gateways

G1.5	Piling Gateway (optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating
	Structural Design	BCA	**Ground Investigation** • Compliance with minimum number of borehole required as stipulated in Circular APPBCA-2016-08

Borehole Picture

Borehole Picture

Modeling 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.

Borehole

By IFC Representation

IFC Entity: IfcBuildingElementProxy						
IFC USER-DEFINED SubType: N.A.						
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 Level	No	-27.5
4	SHDLevel_SPT_MoreThan_60N	Real	All boreholes	SHD Level	No	-15
5	TerminationLevel	Real	All boreholes	SHD Level	No	-50.45
6	TopLevel	Real	All boreholes	SHD Level	No	1.8

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

Example of Borehole Structural Element Input

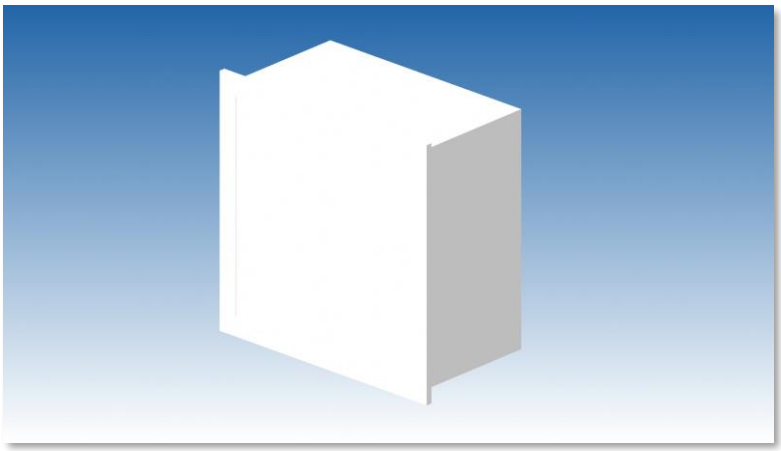
Borehole	**IFC Entity:** IfcBuildingElementProxy		
	IFC USER-DEFINED SubType: BOREHOLE		
• Mark – BH1 • Starting level SHD 1.50 • Termination level SHD -45.80 • Starting of soil layer with SPT>60N at SHD -16.80 • Starting of soil layer with SPT>100N at SHD -35.60	**S/N**	**IFC-SG Property**	**Examples**
	1	Depth	47.3
	2	Mark	BH1
	3	SHDLevel_SPT_MoreThan_100N	-35.6
	4	SHDLevel_SPT_MoreThan_60N	-16.8
	5	TerminationLevel	-45.8

Breeching Inlet

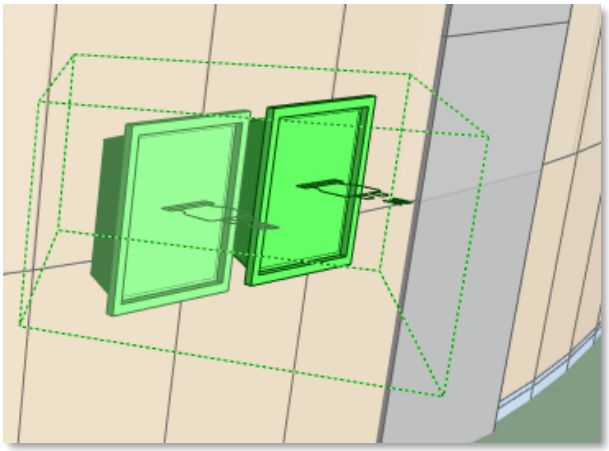
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	**Rising Mains & System** • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breech inlet location



S4 – Fig 12 : Breeching Inlet



S4 – Fig 13 : Breeching Inlet

By IFC Representation

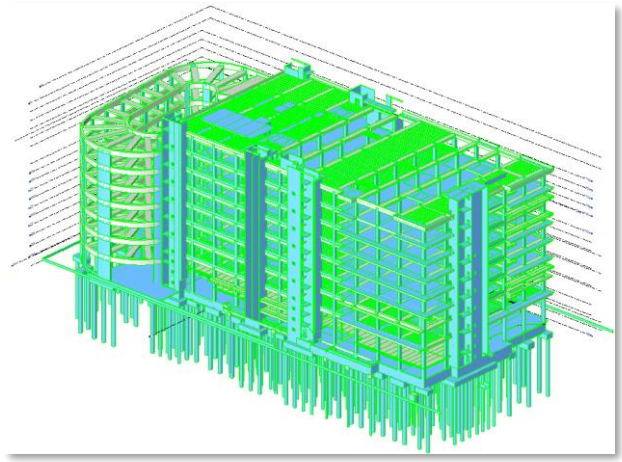
IFC Entity: IfcFireSuppressionTerminal						
IFC USER-DEFINED SubType: BREECHINGINLET, FIREHYDRANT, HOSEREEL						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Hose_NominalDiameter	Auto-generated from BIM	-	mm	No	-
2	ID	Text	-	-	No	-

Building Storey

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Building Massing	URA	**Building Height** • Floor-to-Floor Height & Aggregate Building Height • Additional Height for Predominant Sky Terrace Storey • Overall Building Height Control (incl. building crown and M&E floor, if any) • Number of Storey



S4 – Fig 14 : Building Storey

S4 – Fig 15 : Building Storey with First Storey Plan selected

By IFC Representation

IFC Entity: IfcBuildingStorey						
IFC USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	RoofLevel	Boolean	-	-	Yes	TRUE / FALSE

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

Column

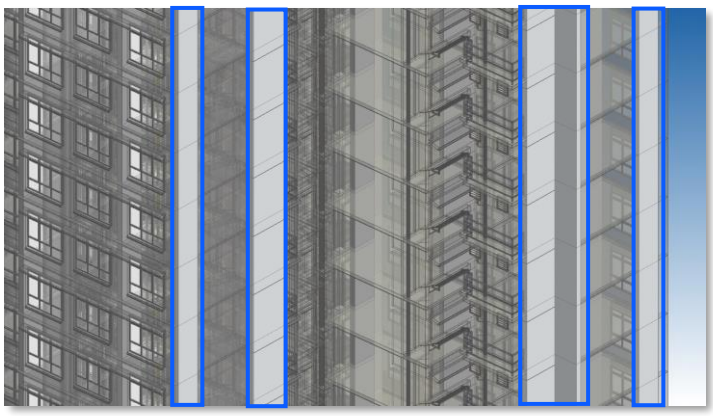
Legend: Architecture C&S M&E

By Key Gateways

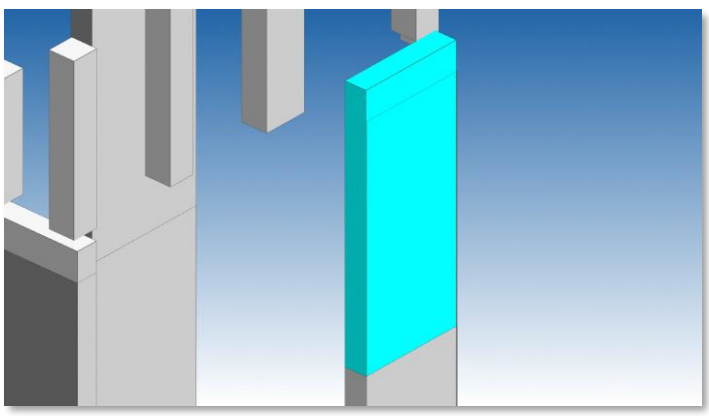
G1.5	Piling Gateway (Optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Buildability	BCA	**Buildability Design (Scoring)** • B-Score Calculation
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

	Structural Design	BCA	**Structural Design (Main Structural Elements of Building excl. Piling)**
			• Complete set of IFC-SG model(s) for all structural framings & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)



S4 – Fig 16: Columns in relation to the Building



S4 – Fig 17 : Column

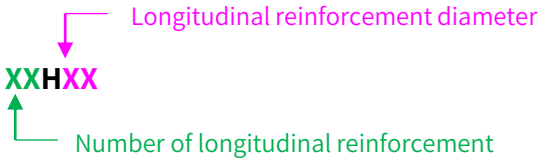
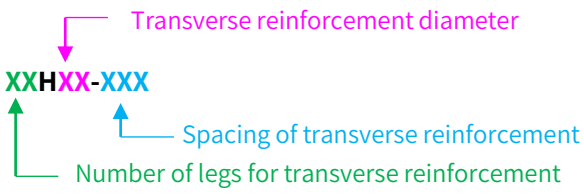
Column

Modeling 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".

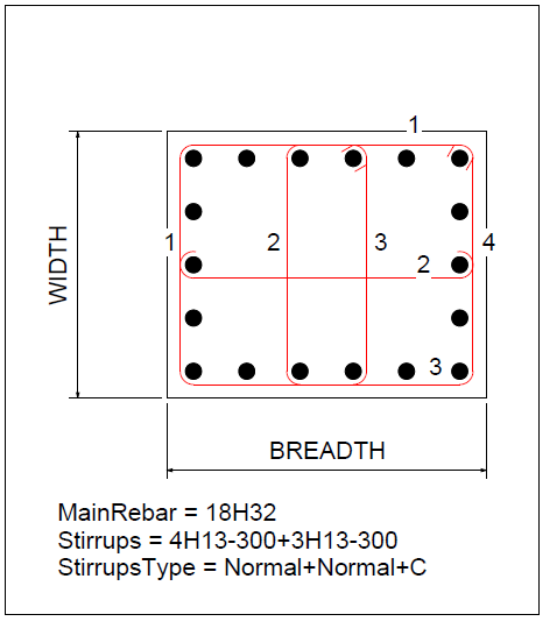
Column Dimension and Reinforcement Definition

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) 
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]) 

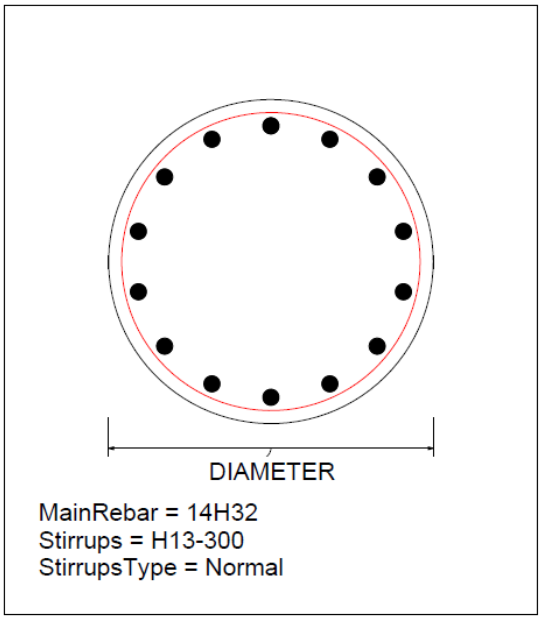
Column

Column Dimension and Reinforcement Definition (continued from previous page)

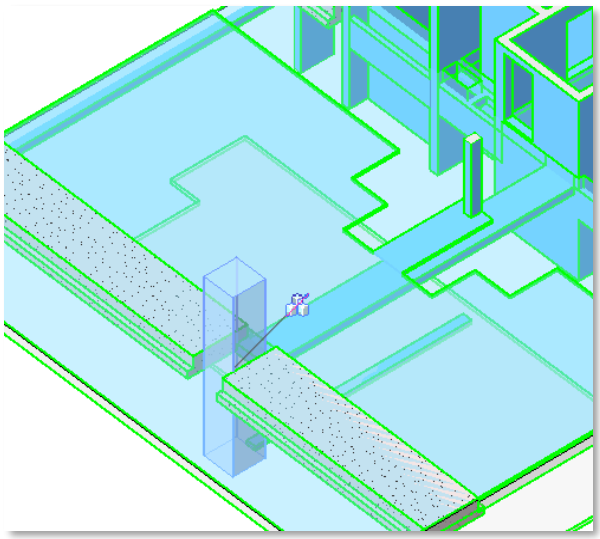
Column Dimension and Reinforcement Definition	
5	Type of the column stirrup (Normal link, U-link, C-link or torsion link) shall be indicated in the parameters called "StirrupType" based on beam part. Limitation of inputs for this parameter is applied. Please refer to list of input.



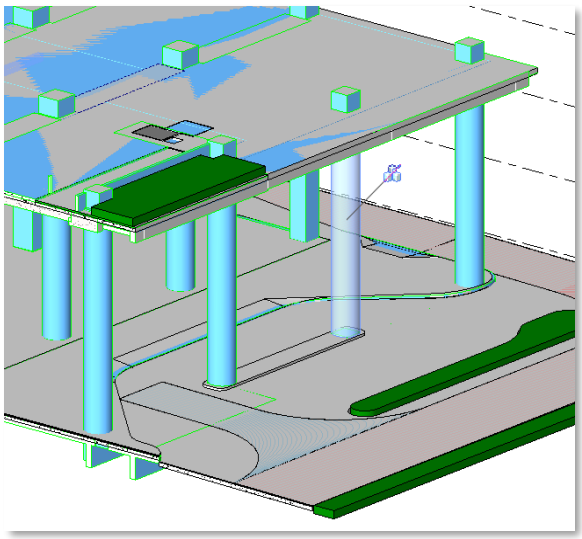
RECTANGULAR COLUMN SECTION



CIRCULAR COLUMN SECTION



S4 – Fig 18: Rectangular Column



S4 – Fig 19 : Circular Column

Column

By IFC Representation

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

* 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 USER-DEFINED 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	Normal
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 USER-DEFINED 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

Column

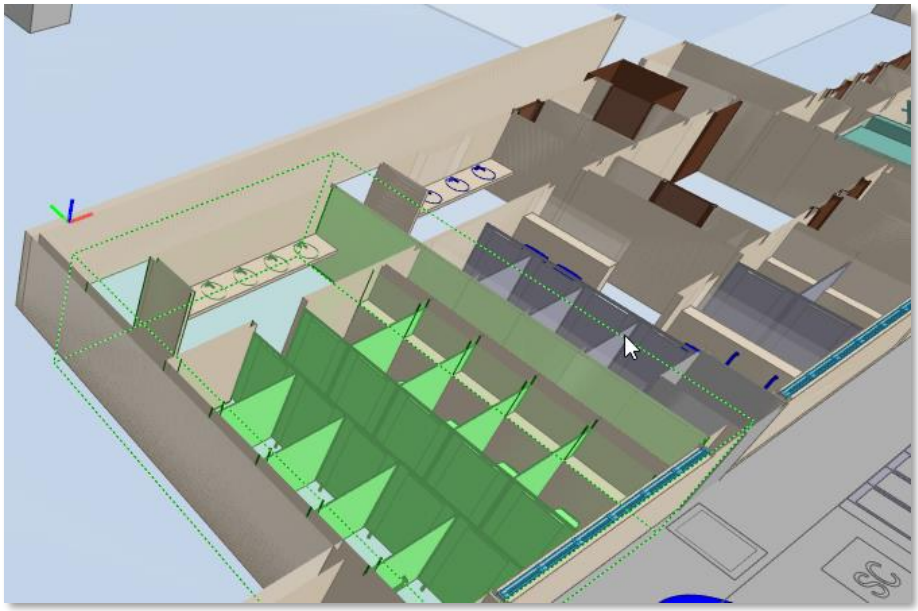
▶ Example of Column (Steel Column) Structural Element Input (continued from previous page)

Steel Column (UC305x305x118kg/m Steel Column)	**IFC Entity:** IfcColumn **IFC USER-DEFINED SubType:** N.A.		
• 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)	**S/N**	**IFC-SG Property**	**Examples**
	7	MaterialGrade	S355
	8	ConnectionDetailsBottom	Pinned
	9	ConnectionDetailsTop	Pinned
	10	ConnectionTypeBottom	Typical SC1 baseplate details on dwg 19588-ST-DT-6
	11	ConnectionTypeTop	Typical connection of SB1 to SC1 on dwg 19588-ST-DT-6

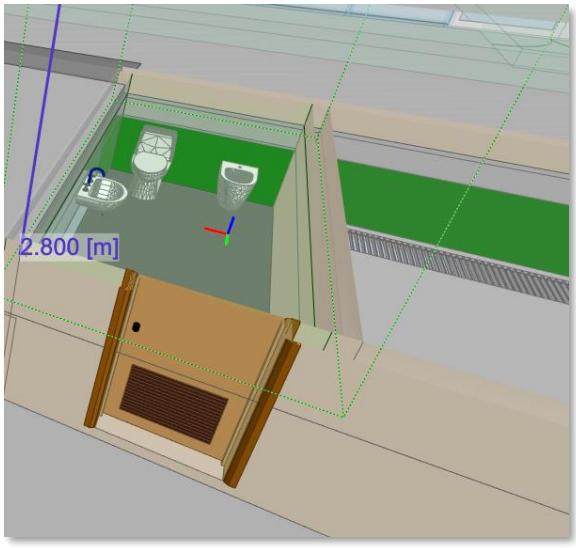
Cubicle

By IFC Representation

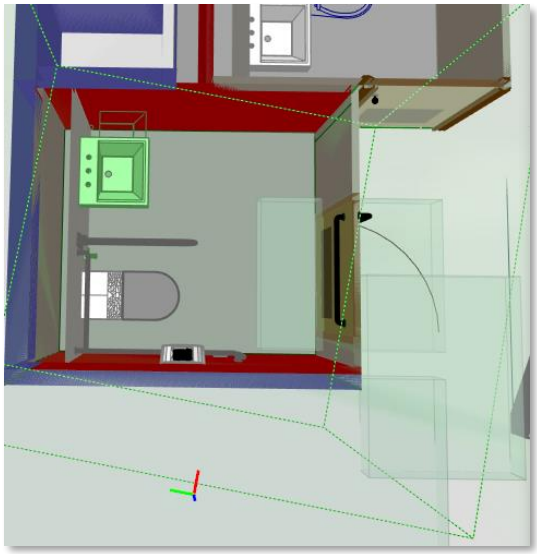
IFC Entity: IfcFurniture						
IFC USER-DEFINED SubType: CUBICLE						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	BarrierFreeAccessiblity	Boolean	-	-	Yes	TRUE / FALSE
2	AmbulantDisabeld	Boolean	-	-	Yes	TRUE / FALSE



S4 – Fig 20 : Cubicle



S4 – Fig 21 : Cubicle



S4 – Fig 22 : Cubicle

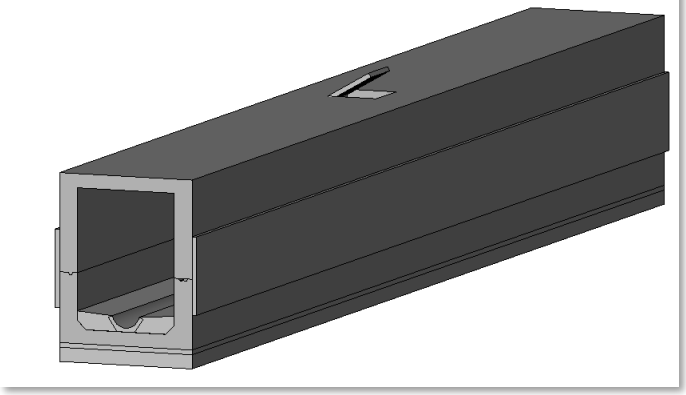
Culvert

Legend: Architecture C&S M&E

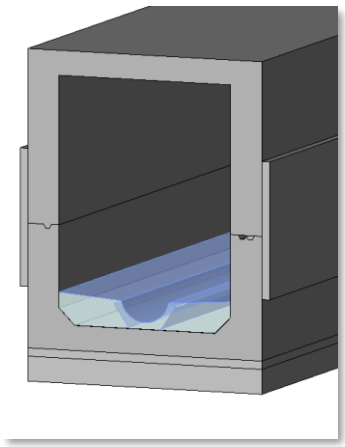
By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Infra & Utilities (External), Public Drains	PUB	**Roadside Drain Capacity** • For projects where drains need to be rebuilt / entrance culvert. PUB to provide required capacity during pre-sub consultation. • Size of new culvert (will be advised by PUB)
	Site Layout Only	NParks	**Entrance Culvert Position** • Part of roadside elements • Splay corners will also affect the green verge positions and location of roadside trees

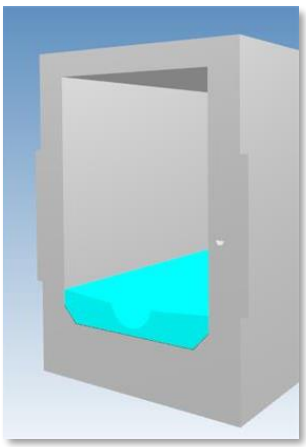
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout, Street Works	LTA	**Access Point Details** • Structural details of entrance culvert at access points (reinforcement, connection to entrance approach etc.) • Levels, gradients, cross-fall • Redundant access to be sealed and reinstated to match existing side-table



S4 – Fig 23 : Culvert



S4 – Fig 24 : Culvert



S4 – Fig 25 : Culvert

Culvert

By IFC Representation

IFC Entity: IfcPipeSegment						
IFC USER-DEFINED SubType: CULVERT, ENTRANCECULVERT						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	LoadBearing	Boolean	-	-	Yes	TRUE / FALSE
2	Diameter	Auto-generated from BIM	-	mm	No	-
3	Height	Auto-generated from BIM	-	mm	No	-
4	Length	Auto-generated from BIM	-	mm	No	-
5	Thickness	Auto-generated from BIM	-	mm	No	-
6	Width	Auto-generated from BIM	-	mm	No	-
7	Footpath	Text	-	-	No	-
8	Public	Boolean	-	-	Yes	TRUE / FALSE

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.

Door

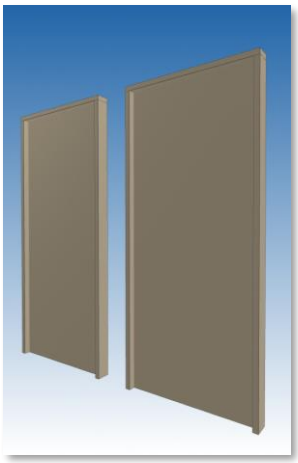
Legend: Architecture C&S M&E

By Key Gateways

G1.5	Piling Gateway (Optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each residential unit to be compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements

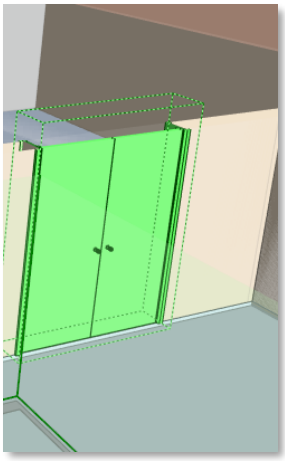
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access to Site	URA	**Site Layout** • Location of Side Gates
	Dwelling Unit	BCA	Design of Unit Entrance for Wheelchair Users
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each Residential Unit to be Compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements *Provided at Construction Gateway (G2)* • Separation of transit and non-transit occupancies • Separation of public and ancillary areas • Separation of commercial spaces • Separation between viaduct and M&E plantrooms / commercial spaces • Fire rating of compartment • Compartmentation by height • Vertical fire spread
	Household / Storey Shelter	BCA	**Household / Storey Shelter Details** • Compliance with technical requirements on shelter position, size, setback requirements • Submit CD Shock Calculations as supplementary non-BIM documentation • M&E inputs required for Transit Shelter
	Materials	SCDF	Compartment Walls and Floors

Door

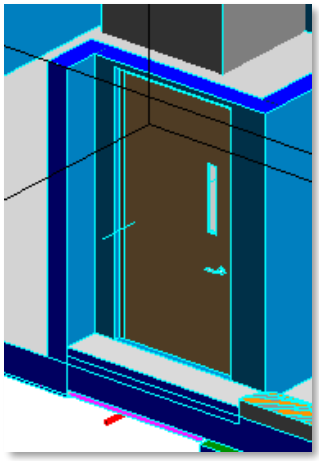


S4 – Fig 26 : Door

S4 – Fig 27 : Door



S4 – Fig 28 : Door



S4 – Fig 29 : Door

By IFC Representation

IFC Entity: IfcDoor

IFC USER-DEFINED SubType: ACCESSHATCH, DOOR, GATE, BLASTDOOR, RECYCLABLESCHUTEACCESSPANEL, RECYCLABLESCHUTEACCESSPANEL, REFUSECHUTEACCESSPANEL, REFUSECHUTEHOPPER

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	AirTight	Boolean	-	-	Yes	TRUE / FALSE
2	BarrierFreeAccessiblity	Boolean	-	-	Yes	TRUE / FALSE
3	ClearWidth	Auto-generated from BIM	-	mm	No	1200
4	ClearHeight	Auto-generated from BIM	-	mm	No	N.A.
5	FireExit	Boolean	-	-	Yes	TRUE / FALSE
6	FireRating	Text	-	hr	No	½-hr , 1-hr etc.
7	MainEntrance	Boolean	-	-	Yes	TRUE / FALSE
8	OperationType	Text	-	-	No	For Roller Shutter Door. (OperationType = ROLLINGUP)
9	OverallWidth	Auto-generated from BIM	-	mm	No	-
10	PanelDepth	Auto-generated from BIM	-	mm	No	-
11	PanelWidth	Auto-generated from BIM	-	mm	No	-
12	SelfClosing	Boolean	-	-	Yes	TRUE / FALSE
13	StructuralWidth	Auto-generated from BIM	-	mm	No	N.A.
14	StructuralHeight	Auto-generated from BIM	-	mm	No	N.A.
15	VisionPanel	Boolean	-	-	Yes	TRUE / FALSE
16	VolumeControlled	Boolean	-	-	Yes	TRUE / FALSE

Escalator

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Lifts & Escalators, Equipment	BCA	Lift and Escalator Provision (Number)

Escalator Picture

Escalator Picture

By IFC Representation

IFC Entity: -							
IFC USER-DEFINED SubType: -							
S/N	**IFC-SG Property**	**IFC-SG PropertySet**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
-	-	-	-	-	-	-	-

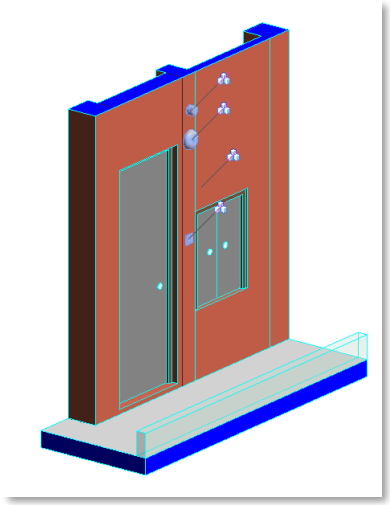
Fire Alarm

Legend: Architecture C&S M&E

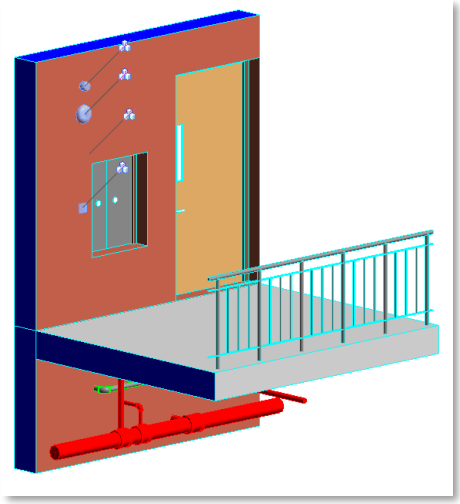
By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	To be confirmed with SCDF.

-	Independent Submissions		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	To be confirmed with SCDF.



S4 – Fig 30 : Fire Alarm



S4 – Fig 31 : Fire Alarm

Modelling Fire Alarm in IFC-SG

- For 3D Manual Alarms in Construction Gateway (G2), detects should be shown for alarm bells extending to the residential floor.
- For Manual Alarm, it will be together with BP at Construction Gateway (G2) as it is under the purview of the Architect.
- For Automatic Alarm , it will be in Independent Gateway as it is submitted by the Professional Engineer (optional in 3D).

By IFC Representation

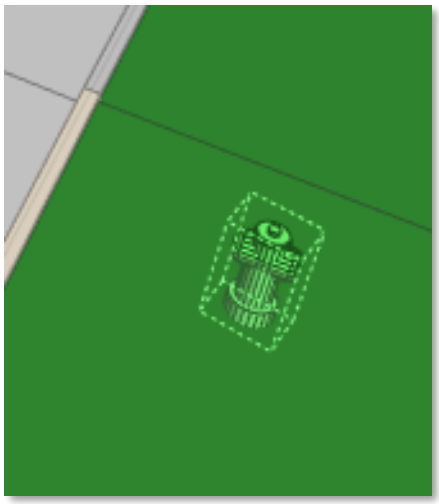
IFC Entity: IfcAlarm						
IFC USER-DEFINED SubType: BELL, STROBELIGHT, SIREN						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
-	-	-	-	-	-	-

Fire Hydrant

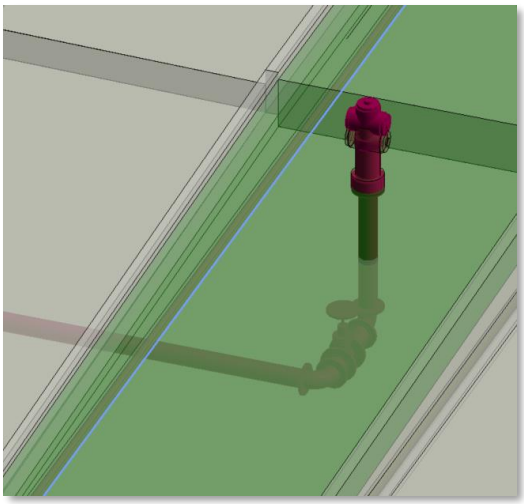
Legend: Architecture C&S M&E

By Key Gateways

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



S4 – Fig 32 : Fire Hydrant



S4 – Fig 33 : Fire Hydrant

Modelling Fire Hydrant in IFC-SG

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

By IFC Representation

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

Footing / Pilecap

Legend: Architecture C&S M&E

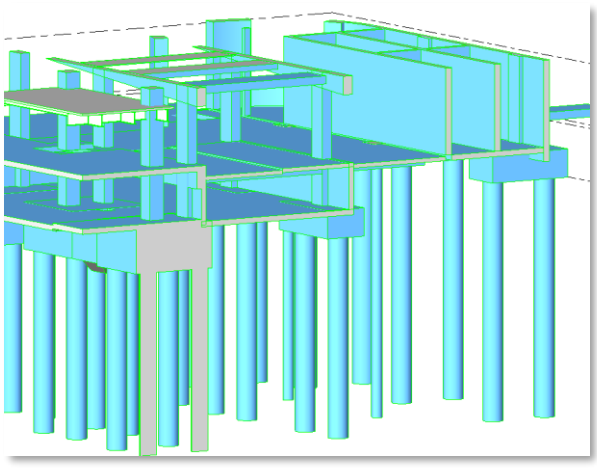
By Key Gateways

G1.5	Piling Gateway (Optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

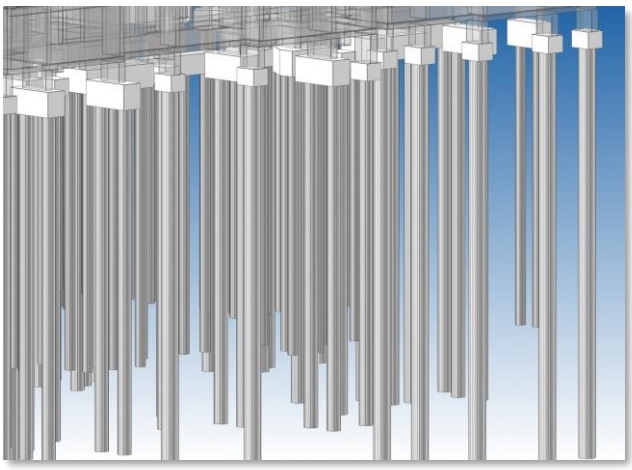
	Structural Design	BCA	**Structural Design (Piling and Foundation Works)**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• Complete set of IFC-SG model(s) for all structural foundation system & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. irregulat footing/pilecap detailing, raft detailing)

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

	Structural Design	BCA	**Structural Design (Piling and Foundation Works)**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• Complete set of IFC-SG model(s) for all structural foundation system & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. irregulat footing/pilecap detailing, raft detailing)



S4 – Fig 34 : Footing / Pilecap



S4 – Fig 35 : Footing / Pilecap

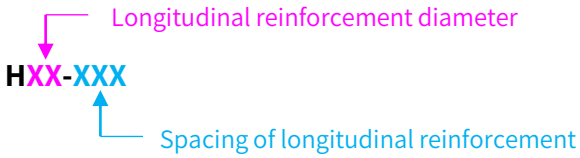
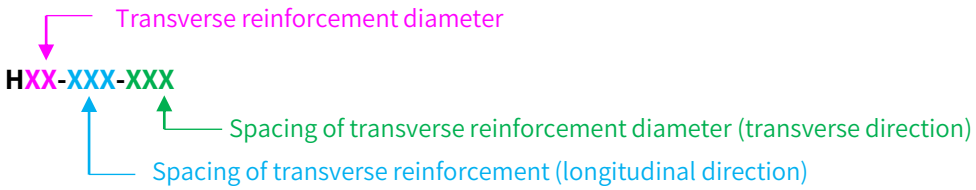
Footing / Pilecap

Modeling Footing / Pilecap in IFC-SG

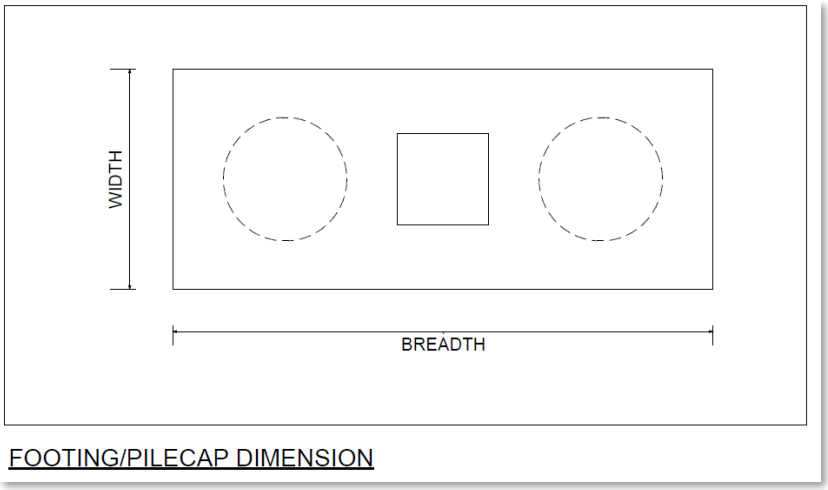
- All the footing / pilecap elements shall be modelled as independent elements* in IFC-SG model with the necessary information required as stipulated in the tables below.
    - For footing and pilecap with the same foundation design, they are allowed to have same marks and design information. All marks 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".

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

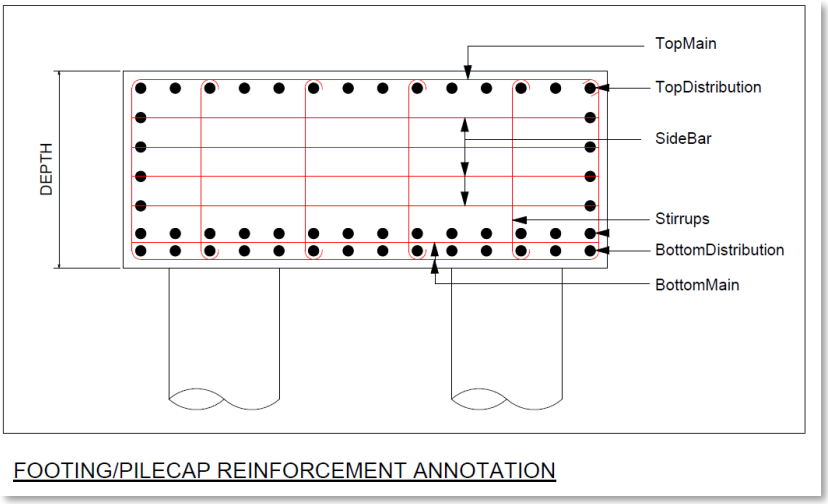
Footing / Pilecap Dimension and Reinforcement Definition

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) 
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) 

Footing / Pilecap



S4 – Fig 36 : Dimension Definitions for Footing / Pilecap



S4 – Fig 37 : Dimension Definitions for Footing / Pilecap

By IFC Representation

IFC Entity: IfcFooting						
IFC USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	DA1-1_BearingCapacity	Integer	All footings	kN/m²	No	150
2	DA1-2_BearingCapacity	Integer	All footings	kN/m²	No	120
3	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
4	ReinforcementSteelGrade	Text	All footings & pilecap	-	Yes	Refer to list^
5	SoilVerificationTest	Text	When required / relevant	-	No	2 nos Plate load Test

^ List can be found here.

Footing / Pilecap

By IFC Representation (continued from previous page)

IFC Entity: IfcFooting						
IFC USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
6	Breadth	Length	All footings & pilecap	mm	No*	6200
7	Depth	Length	All footings & pilecap	mm	No*	300
8	Mark	Label	All footings & pilecap	-	No	F1, F2, PC1, PC2, PC4_1
9	Width	Length	All footings & pilecap	mm	No*	300
10	BottomDistribution	Text	All footings & pilecap	-	Yes	H16-150
11	BottomMain	Text	All footings & pilecap	-	Yes	H25-150
12	SideBar	Text	All footings & pilecap	-	Yes	H13-250
13	Stirrups	Text	When required / relevant	-	Yes	H13-200-300
14	StirrupsType	Text	When required / relevant	-	Yes	Refer to list^
15	TopDistribution	Text	All footings & pilecap	-	Yes	H16-150
16	TopMain	Text	All footings & pilecap	-	Yes	H25-150
17	WorkingLoad	Integer	All footings & pilecap	kN	No	4321
18	MaterialGrade	Text	All footings & pilecap	-	Yes	Refer to list^

* 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
- Working Load (SLS) 6589kN

IFC Entity: IfcFooting

IFC USER-DEFINED 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	WorkingLoad	6589
12	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 (SLS) 1286kN

IFC Entity: IfcFooting

IFC USER-DEFINED 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	1286
15	MaterialGrade	C32/40

Gutter

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Health	NEA	**Roof Gutter and Scupper Drain** • Location of Roof Gutter or Scupper Drain • Provision of Permanent and Safety Maintenance Access

Gutter Picture

By IFC Representation

IFC Entity: IfcPipeSegment

IFC USER-DEFINED SubType: GUTTER

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	ConstructionMethod	Text	-	-	-	-
2	Height	Auto-generated from BIM	-	mm	-	-
3	Length	Auto-generated from BIM	-	mm	-	-
4	Thickness	Auto-generated from BIM	-	mm	-	-
5	Width	Auto-generated from BIM	-	mm	-	-
6	Public	Boolean	-	-	Yes	TRUE / FALSE

Hose Reel

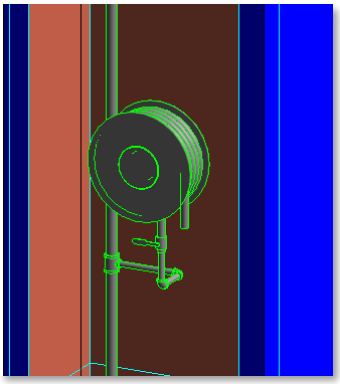
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	**Rising Mains & System** • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breech inlet location
	Hose Reel & System		Hose Reel

S4 – Fig 38: Hose Reel

S4 – Fig 39: Hose Reel



S4 – Fig 40: Hose Reel

By IFC Representation

IFC Entity: IfcFireSuppressionTerminal						
IFC USER-DEFINED SubType: HOSEREEL, STANDBYFIREHOSE						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Hose_NominalDiameter	Auto-generated from BIM	-	mm	No	-

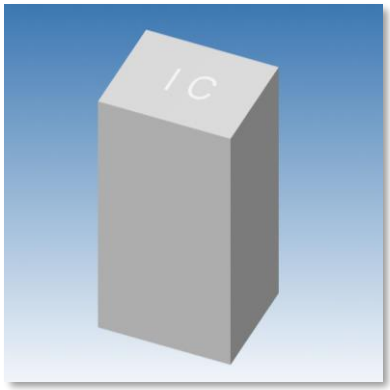
IFC Entity: IfcDistributionSystem						
IFC USER-DEFINED SubType: HOSEREEL						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
-	-	-	-	-	-	-

Inspection Chamber

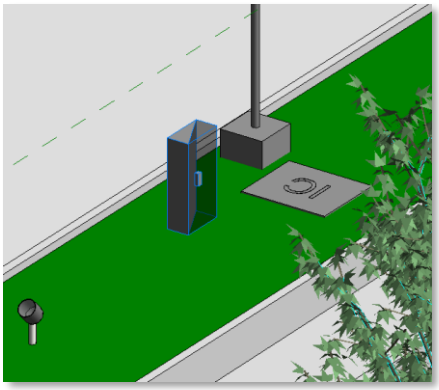
Legend: Architecture C&S M&E

By Key Gateways

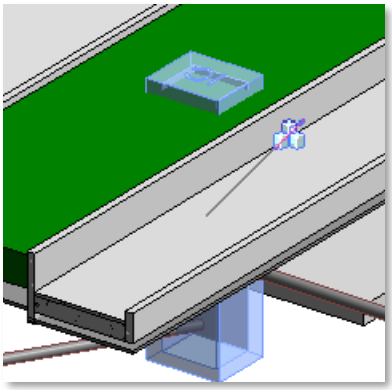
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Connectivity	URA	**Open / Covered Walkways** • Level of Bulk Water Meter Chamber / Inspection Chamber
	Infra & Utilities (Internal)	PUB	Sanitary Drainlines



S4 – Fig 41: Inspection Chamber



S4 – Fig 42: Inspection Chamber



S4 – Fig 43: Inspection Chamber

By IFC Representation

IFC Entity: IfcDistributionChamberElement

IFC USER-DEFINED SubType: INSPECTIONCHAMBER, PWCSINSPECTIONCHAMBER, ACCESSCHAMBER, AIRVALVECHAMBER, METERCHAMBER, SCREENSCHAMBER, WASHOUTCHAMBER, SUMP, TRENCH, MANHOLE, SAMPLINGSUMP

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	TopLevel	Text	-	-	No	-
2	InvertLevel	Text	-	-	No	-
3	ID	Text	-	-	No	-
4	Diameter	Auto-generated from BIM	-	mm	No	-
5	Depth	Auto-generated from BIM	-	mm	No	-
6	Height	Auto-generated from BIM	-	mm	No	-
7	Length	Auto-generated from BIM	-	mm	No	-
8	Width	Auto-generated from BIM	-	mm	No	-

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.

Interceptor

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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
	Infra & Utilities (Internal)		**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

Interceptor Picture

Interceptor Picture

By IFC Representation

IFC Entity: IfcInterceptor

IFC USER-DEFINED SubType: GREASE, OIL

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	ComplyToPUBStandardDrawing	Boolean	-	-	Yes	TRUE / FALSE
2	ReferToDrawingNumber	Text	-	-	No	-
3	InvertLevel	Text	-	-	No	-
4	TopLevel	Text	-	-	No	-

Interceptor

By IFC Representation (continued from previous page)

IFC Entity: IfcInterceptor						
IFC USER-DEFINED SubType: GREASE, OIL						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
5	Diameter	Auto-generated from BIM	-	mm	No	-
6	Height	Auto-generated from BIM	-	mm	No	-
7	Length	Auto-generated from BIM	-	mm	No	-
8	Width	Auto-generated from BIM	-	mm	No	-

Landing Valve

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	**Rising Mains & System** • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breech inlet location

Landing Valve Picture

By IFC Representation

IFC Entity: IfcValve

IFC USER-DEFINED SubType: LANDINGVALVE, SPRINKLERCONTROL, DOUBLECHECK, MIXING, REFLUXVALVE, AIRADMITTANCE, DRAINOFFCOCK, CHECK, ISOLATING

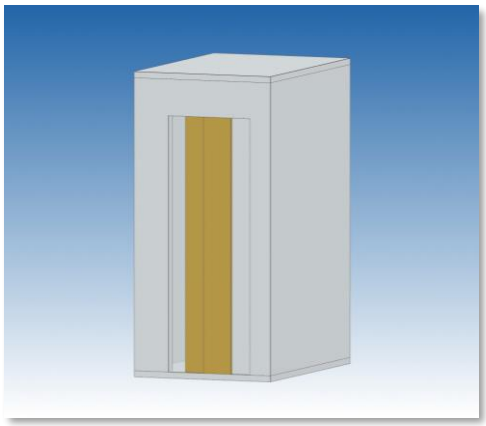
S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
-	-	-	-	-	-	-

Lift

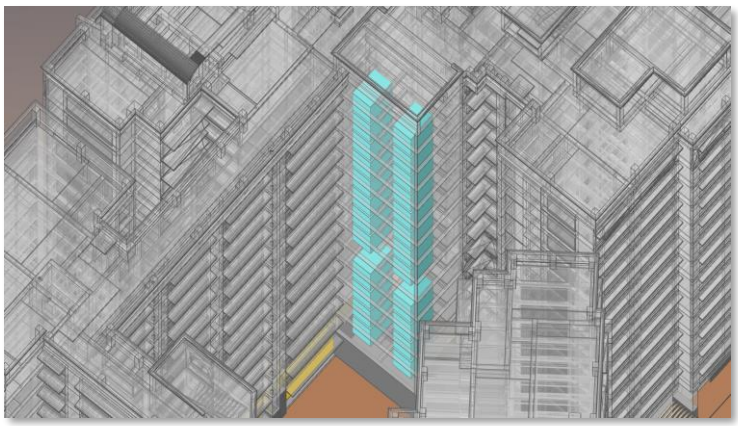
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access within Building Only	BCA	Accessible Route and Maneuvering Space (Within the Development)
	Access within Building, Lifts & Escalators	SCDF	**Evacuation / Fire Lifts Provision** • Number of Fire Lifts • Fire Lift Accessibility and Coverage • Protected Lobby / Fire Lift Lobby
	Connectivity	BCA	Accessible Route (To the Ingress / Egress Development Entrance)
	Lifts & Escalators, Equipment	BCA	Lift and Escalator Provision (Number)
			Lift for Wheelchair Users – (a) Location (b) Type



S4 – Fig 44 : Lift



S4 – Fig 45 : Lift Stack in relation to Building

By IFC Representation

IFC Entity: IfcTransportElement						
IFC USER-DEFINED SubType: LIFT, PLATFORMLIFT, GOODSLIFT, BINLIFTER						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	BarrierFreeAccessbility	Boolean	-	-	Yes	TRUE / FALSE
2	Length	Auto-generated from BIM	-	mm	No	-
3	Width	Auto-generated from BIM	-	mm	No	-
4	ClearDepth	Auto-generated from BIM	-	mm	No	-
5	ClearHeight	Auto-generated from BIM	-	mm	No	-
6	ClearWidth	Auto-generated from BIM	-	mm	No	-
7	FireFightingLift	Boolean	-	-	Yes	TRUE / FALSE

Pile

Legend: Architecture C&S M&E

By Key Gateways

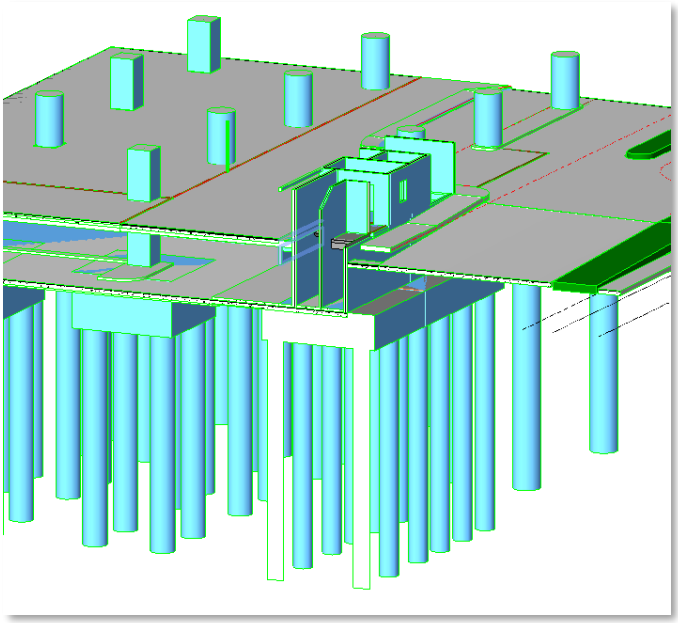
G1.5	Piling Gateway (Optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

	Structural Design	BCA	**Structural Design (Piling and Foundation Works)**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• Complete set of IFC-SG model(s) for all structural foundation system & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. irregulat footing/pilecap detailing, raft detailing)

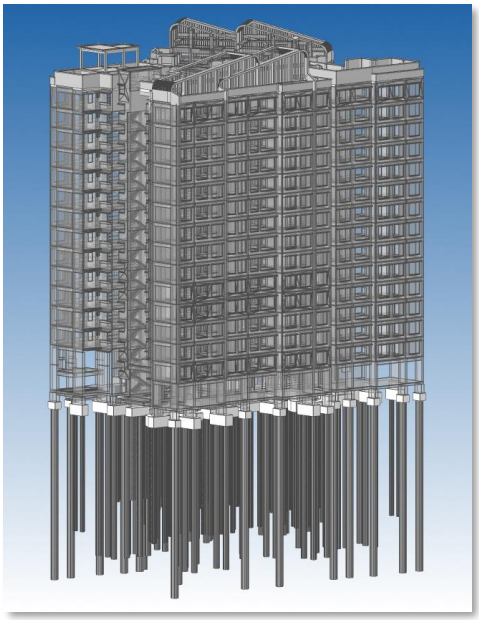
G1.5	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

	Structural Design	BCA	**Structural Design (Piling and Foundation Works)**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• Complete set of IFC-SG model(s) for all structural foundation system & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. irregulat footing/pilecap detailing, raft detailing)

Pile



S4 – Fig 46 : Pile



S4 – Fig 47 : Pile in relation to Building

Modeling 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.

By IFC Representation

IFC Entity: IfcPile

IFC USER-DEFINED SubType: N.A.

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	MaterialGrade	Text	All piles	-	Yes	Refer to list^
2	BoreholeRef	Text	All piles	-	No	BH2, BH3, BH12-2
3	ConstructionMethod	Text	All piles	-	Yes	Refer to list^
4	DA1-1_CompressionCapacity	Integer	All piles	kN	No	5683
5	DA1-1_TensionCapacity	Integer	When required / relevant	kN	No	3655
6	DA1-2_CompressionCapacity	Integer	All piles	kN	No	4823
7	DA1-2_TensionCapacity	Integer	When required / relevant	kN	No	3025

^ List can be found here.

Pile

By IFC Representation (continued from previous page)

IFC Entity: IfcPile

IFC USER-DEFINED SubType: N.A.

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
8	MinEmbedmentIntoBearingLayer_SPT_MoreThan_100N	Real	When required / relevant	m	No	16.5
9	MinEmbedmentIntoBearingLayer_SPT_MoreThan_60N	Real	When required / relevant	m	No	23.2
10	MinRockSocketingLength	Real	When required / relevant	m	No	16.5
11	ReinforcementSteelGrade	Text	RC piles	N/mm2	Yes	500B
12	StructuralCompressionCapacity	Integer	All piles	kN	No	6525
13	StructuralTensionCapacity	Integer	When required / relevant	kN	No	3825
14	Breadth	Length	RC non-circular piles	mm	No*	300
15	CutOffLevel_SHD	Real	All piles	SHD Level	No	-1.35
16	Diameter	Length	RC circular piles	mm	No*	600
17	Length	Length	All piles	mm	No*	40500
18	Mark	Text	All piles	-	No	P156
19	MemberSection	Text	Steel piles	-	No	CHS500x3.0, 254x254x63 kg/m
20	ToeLevel_SHD	Real	All piles	SHD Level	No	-63.35
21	Width	Length	RC non-circular piles	mm	No*	600
22	MainRebar	Text	RC piles	-	Yes	10H32+10H16
23	PileType	Text	RC piles	-	Yes	Refer to list^
24	ReinforcementLength	Text	RC piles	m	Yes	Refer to list^
25	Stirrups	Text	RC piles	-	Yes	H16-250
26	DA1-1_CompressionDesignLoad	Integer	All piles	kN	No	5515
27	DA1-1_TensionDesignLoad	Integer	When required / relevant	kN	No	3255
28	DA1-2_CompressionDesignLoad	Integer	All piles	kN	No	4650
29	DA1-2_TensionDesignLoad	Integer	When required / relevant	kN	No	2850
30	NegativeSkinFriction	Integer	When required / relevant	kN	No	135

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

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 USER-DEFINED 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
14	MainRebar	8H16
15	PileType	Bored
16	ReinforcementLength	24
17	Stirrups	H10-300
18	DA1-1_CompressionDesignLoad	5515
19	DA1-2_CompressionDesignLoad	4650

Pile

Example of Pile (RC Jacked In Pile) Structural Element Input

250mm x 250mm Jacked In Piles	**IFC Entity:** IfcPile		
	IFC USER-DEFINED SubType: N.A.		
• 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	**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

Planter Box

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Greenery	URA	**Landscape Replacement Area** • Show on plans and declare % of landscape

Planter Box Picture

By IFC Representation

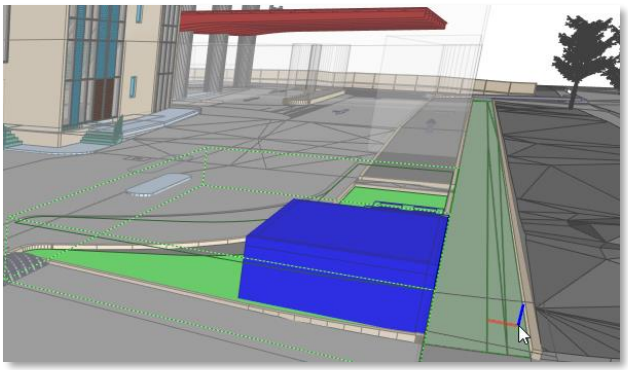
IFC Entity: IfcFurniture						
IFC USER-DEFINED SubType: PLANTERBOX						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
-	-	-	-	-	-	-

Planting Area

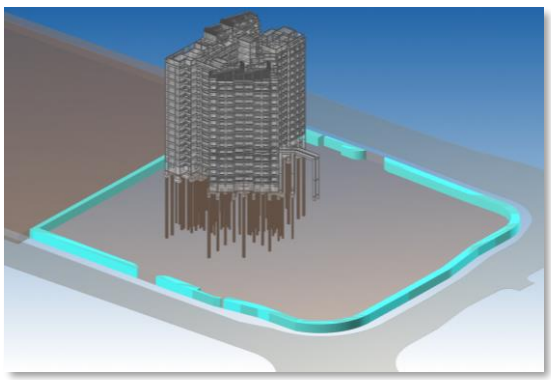
Legend: Architecture C&S M&E

By Key Gateways

G2	Constriction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Greenery	NParks	**Conservation of Trees /Plants (Tree Protection Specifications)** • The Certified Arborist engaged by the Developer is to provide a report of the trees to be conserved, with indication of the tree girth (minimum tree protection zone will be generated in CORENET X) • A Tree Protection Zone (TPZ) refers to an area identified to protect the entire tree, which includes its crown, trunk and roots system. The TPZ established should be able to protect the entire tree throughout the duration of construction. • The objective of the TPZ is to minimize the impact of construction activities on trees, including but not limited to mechanical injury to roots, trunks and branches due to contact with equipment, materials, debris or other activities. It also aims to minimize compaction of soil, which results in poor functioning of roots, and changes in soil levels that can cut off or suffocate roots.
	Infra & Utilities (External)		**Allowable Structures within Planting Areas** • Planting Areas (green buffers, peripheral planting verges) should be free from any encroachment, except for allowable minor ancillary structures and landscaping features listed in NParks Guidelines (Chapter 3)
	Site Layout Only		Alternative configuration of planting areas



S4 – Fig 48 : Planting Area highlighted in Green



S4 – Fig 49 : Planting Area

By IFC Representation

IFC Entity: IfcGeographicElement						
IFC USER-DEFINED SubType: PLANTINGAREA, GREENVERGE, CADASTRALLOT, NEIGHBOURINGLOT						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Area	Auto-generated from BIM	-	mm	No	-

Planting Area

By IFC Representation (continued from previous page)

IFC Entity: IfcGeographicElement						
IFC USER-DEFINED SubType: PLANTINGAREA, GREENVERGE, CADASTRALLOT, NEIGHBOURINGLOT						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
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	CarparkProvision	Boolean	-	-	Yes	TRUE / FALSE

Notes

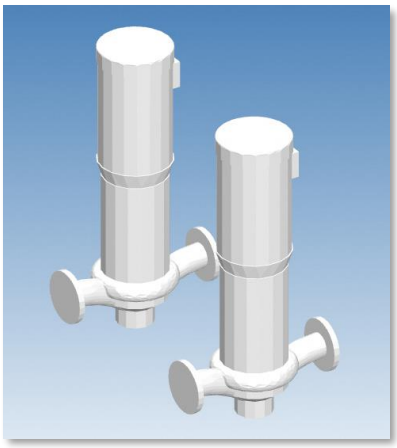
- QPs are to separately submit calculation for compensated green buffer area.

Pump

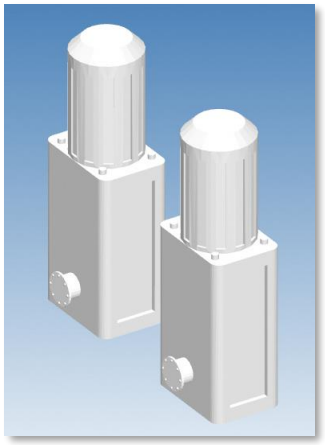
Legend: Architecture C&S M&E

By Key Gateways

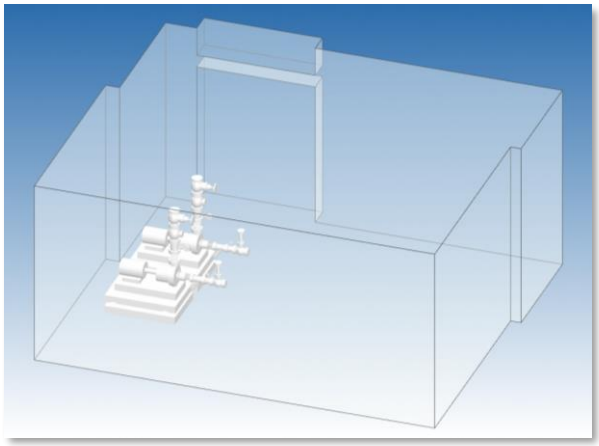
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Health	NEA	**COPEH – Section 2: Public Toilet** 2.1 – Objective 2.2 – Definition of Public Toilet 2.3 – General Design Criteria 2.4 – Sanitary and Water Fittings Required in Public Toilet 2.5 – Amenities to be provided 2.6 – Ventilation



S4 – Fig 50 : Pump



S4 – Fig 51 : Pump



S4 – Fig 52 : Pump

By IFC Representation

IFC Entity: IfcPump

IFC USER-DEFINED SubType: SUMPPUMP

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	Capacity	Volume	-	L	-	-
2	Duty	Boolean	-	N.A.	Yes	TRUE / FALSE
3	Standby	Boolean	-	N.A.	Yes	TRUE / FALSE
4	FlowRate	VolumetricFlowRate	-	L	-	-

Notes

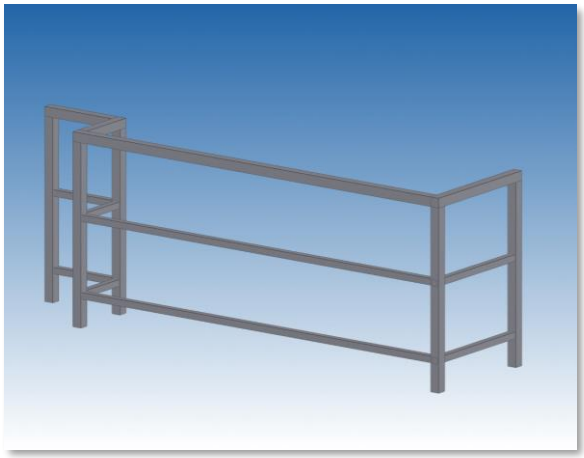
- Sanitary drain-lines are to be submitted as schematic and/or 2D drawings. If industry would like to submit in 3D, it is optional and will also be accepted.

Railing

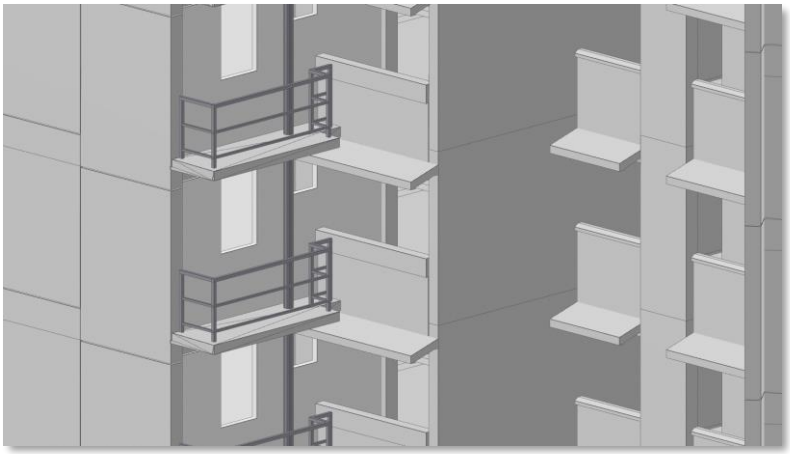
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Barrier	BCA	Safety from Falling
			Protection from injury by vehicles in building (e.g. provision of bollards)



S4 – Fig 53 : Railing



S4 – Fig 54 : Railing on AC Ledge (in relation to Building)

By IFC Representation

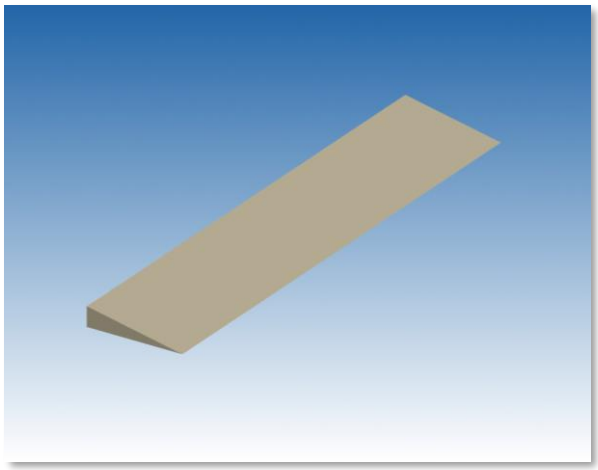
IFC Entity: IfcRailing						
IFC USER-DEFINED SubType: BALAUSTRADE, BOLLARD, GUARDRAIL, HANDRAIL						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Height	Auto-generated from BIM	-	mm	No	1000
2	KerbWidth	Auto-generated from BIM	-	mm	No	-
3	KerbHeight	Auto-generated from BIM	-	mm	No	-
4	SafetyBarrier	Boolean	-	-	Yes	TRUE / FALSE
5	TypeOfBarrier	Text	-	-	No	-
6	TypeOfGlass	Text	-	-	No	-

Ramp

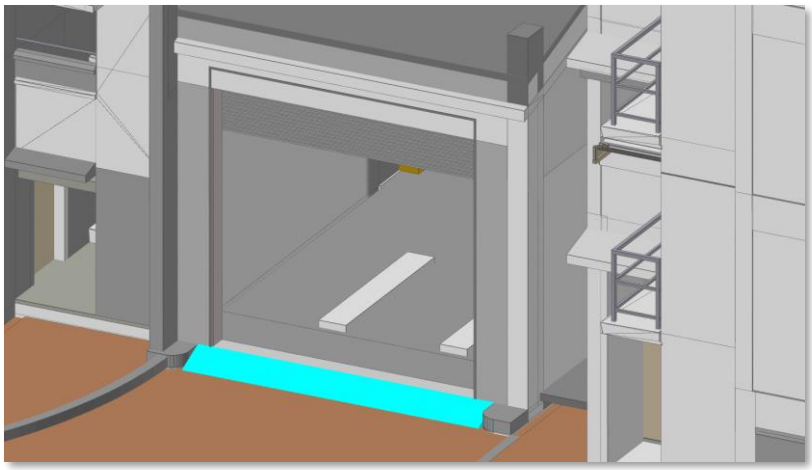
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access to Site	BCA	Passenger Alighting and Boarding Point
	Access within Building only	BCA	Accessible Route and Maneuvering Space (Within the Development)
	Connectivity	BCA	Accessible Route (To the Ingress / Egress of the Development Entrance)
	Site Layout, Street Works	LTA	**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
		LTA	**Proposed Pick-Up / Drop-Off Points (Within Development): PUDO details** • All details presented at Design Gateway (G1) stage
	Site Layout, Vehicular Parking	LTA	**General Provision of Car Parking / Bicycle Parking Facilities** *All details presented at Design Gateway (G1) stage* • Car park lot dimensioning • Car park lot headroom • Car park aisle width • Car park ramp width • Car park ramp gradient



S4 – Fig 55 : Ramp



S4 – Fig 56 : Ramp in relation to Building

Ramp

By IFC Representation

IFC Entity: IfcRamp						
IFC USER-DEFINED SubType: CURVEDRAMP, DRIVEWAY, FLAREDKERBRAMP, STRAIGHT_RUN_RAMP						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Gradient	Text	-	-	No	1:16
2	Width	Auto-generated from BIM	-	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	KerbHeight	Auto-generated from BIM	-	mm	No	-

Notes

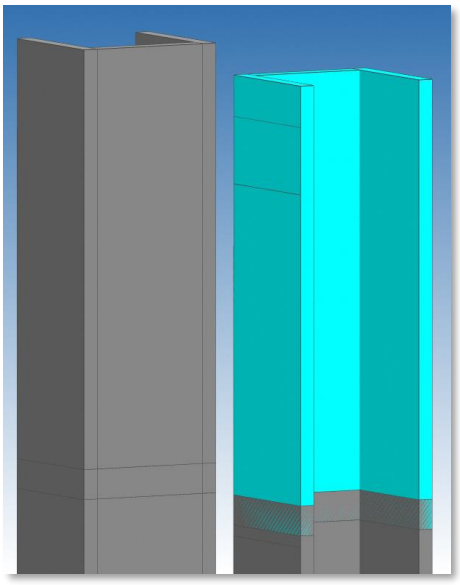
- Any horizontal slab whose gradient is required for regulatory compliance purposes, including kerb ramp.
- It is optional to map to IFC Subtypes - PREDEFINED: STRAIGHT_RUN_RAMP; USER-DEFINED: CURVEDRAMP.
- It is possible to model the ramp in another default component in the native BIM software (e.g. 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

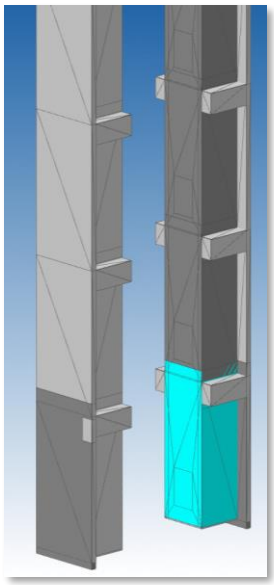
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Buildability	BCA	**Buildability Design (Scoring)** • B-Score Calculations
	Dwelling Unit	NEA	**Residential Dwelling Units** • Check for hopper siting and direction facing, which shall be site as far away as possible
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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
			Residential Dwelling Units • Check for hopper siting and direction facing, which shall be sited far away as possible from residential dwelling units and not facing the entrance of units.



S4 – Fig 57 : Singular Refuse Chute



S4 – Fig 58 : Refuse Chute Stack

S4 – Fig 59 : Refuse Chute in relation to Building

Refuse Chute

By IFC Representation

IFC Entity: IfcBuildingSystem						
IFC USER-DEFINED SubType: REFUSECHUTE						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	ConstructionMethod	Text	-	-	Yes	Precast
2	OuterDimensions	Auto-generated from BIM	-	mm	-	-
3	InnerDimensions	Auto-generated from BIM	-	mm	-	-
4	ChamferRadius	Auto-generated from BIM	-	mm	-	-

IFC Entity: IfcWall						
IFC USER-DEFINED SubType: REFUSECHUTE						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
-	-	-	-	-	-	-

IFC Entity: IfcSpace						
IFC USER-DEFINED SubType: REFUSECHUTE						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	SpaceName	Text	-	-	Yes	Refuse Chute Chamber

Refuse Handling Equipment

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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

RFE Picture

By IFC Representation

IFC Entity: IfcTank

IFC USER-DEFINED SubType: REFUSEHANDLINGEQUIPMENT

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	NominalCapacity	Auto-generated from BIM	-	-	-	-
2	CompactionRatio	Text	-	-	-	-
3	EquipmentType	Text	-	-	-	-

Road

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access to Site	URA	**Urban Design Requirements** • Service and Vehicular Access (where / what it fronts)
	Greenery	NParks, SCDF	**Indication of Fire Engine Accessways** • Should be designed upfront and not added as an afterthought • Should not affect requisite planting areas and roadside green verges
	Infra & Utilities (External) Only	NParks	**Standard Roadside Greenery Provision (New Roads)(Spatial Provision)** • To secure the dimension (width and depth) for green verge (incl. tree planting verge (according to the road category)
	Servicing (Internal Access)	NEA	**Site Layout** • Refuse Truck Access road (for refuse collection) - swept path analysis
		SCDF	**Fire Engine Access Road/ Accessway Provision** • Fire Engine Access Road/ Accessway Width • Accessway Length Provision • Calculations to Derive Fire Accessway • Building Façade with Fire Engine Access Panels
	Site Layout Only	NParks	Access Points Location (to ensure sufficient clearance secured for the retention of mature roadside trees)
	Site Layout, Street Works	LTA	**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 (including trees, lamp post, signs etc) affected by proposed access.
			Proposed Pick-Up / Drop-Off Points (Within Development): PUDO Layout • Indicate width and kerb alignment of PUDO points. • To show the location, number of PUDO bays and queue length
			Proposed Loading/unloading (within development): U/UL Layout • To show the location and number of U/UL bays

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access to Site	BCA	Passenger Alighting and Boarding Point

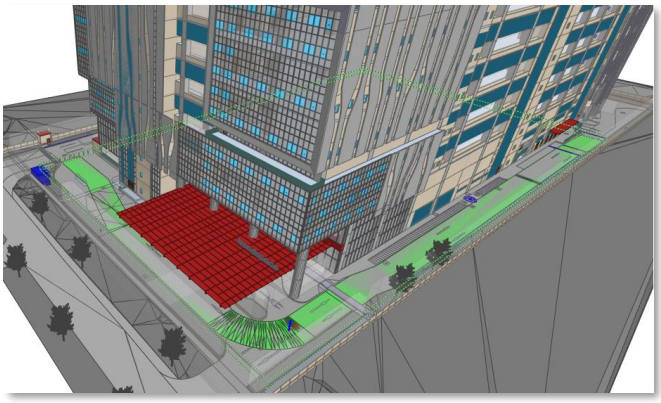
Road

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	**Fire Hydrant System** • Location of Fire Hydrant(s) • Hydrant Coverage not more than 50m from Fire Engine Access Road / Accessway
	Site Layout, Street Works	LTA	**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, Vehicular Parking	LTA	**All 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 • EV lots & charging stations

S4 – Fig 60 : Road in relation to Building



S4 – Fig 61 : Fire Engine Accessway

Road

By IFC Representation

IFC Entity: IfcCivilElement						
IFC USER-DEFINED SubType: DRIVEWAY, ROADKERB, GIS_ROADKERB, FOOTPATH						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	AccessRoad	Boolean	-	-	Yes	TRUE / FALSE
2	FireEngineAccessRoad	Boolean	-	-	Yes	TRUE / FALSE
3	LoadingCapacity	Real	-	tonnes	No	30 tonnes
4	DesignedVehicleMass	Real	-	-	-	-
5	Accessway	Boolean	-	-	Yes	TRUE / FALSE
6	Egress	Boolean	-	-	Yes	TRUE / FALSE
7	Ingress	Boolean	-	-	Yes	TRUE / FALSE
8	VehicularServiceRoad	Boolean	-	-	Yes	TRUE / FALSE
9	KerbType	Text	-	-	-	K2A
10	Thickness	Auto-generated from BIM	-	mm	-	-

IFC Entity: IfcSpace						
IFC USER-DEFINED SubType: ACCESSROAD, FIREENGINEACCESS ROAD, VEHICULARSERVICEROAD						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	AccessRoad	Boolean	-	-	Yes	TRUE / FALSE
2	FireEngineAccessRoad	Boolean	-	-	Yes	TRUE / FALSE
3	VehicularServiceRoad	Boolean	-	-	Yes	TRUE / FALSE

Notes

- Refers to for carriageways, driveways, fire engine accessways, fire engine access roads and vehicular service roads for refuse collection vehicles, differentiated by IFC-SG properties
- The IFC Subtype for roads in the development should be defined as "DRIVEWAY"
- For "RoadCategory" property, the IFC Subtype "GIS_CARRIAGEWAY" is optional
- It is optional to indicate 3D arrows on the road as Egress and Ingress properties must be accurately indicated
- There are ongoing studies on replacing the IFC entity from IfcCivilElement to IfcSpace due to the changing gradients in a road component.

Security Lighting

By IFC Representation

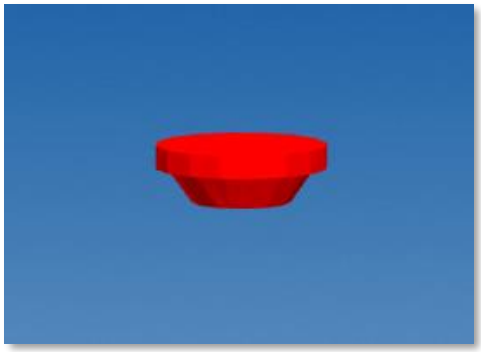
IFC Entity: IfcLightingFixtures						
IFC USER-DEFINED SubType: SECURITYLIGHTING						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	-	-	-	-	-	-

Sensor

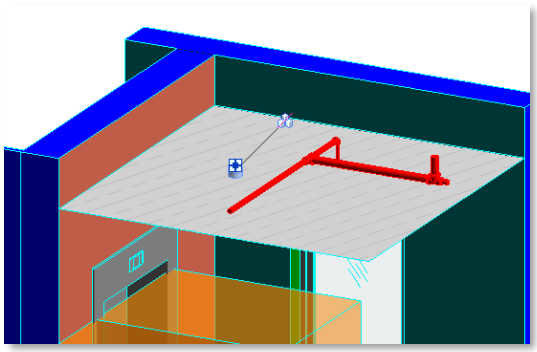
Legend: Architecture C&S M&E

By Key Gateways

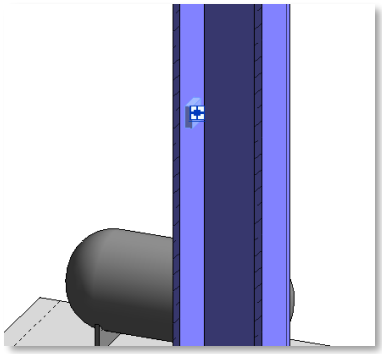
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 1.1 - Objective 1.2 - Refuse Output 1.3 - Refuse Chute 1.4 - Refuse Chute Chamber 1.5 - Refuse Room 1.6 - Refuse Bin Point and Refuse Bin Centre 1.7 - 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



S4 – Fig 62 : Heat Sensor



S4 – Fig 63 : Smoke Detector



S4 – Fig 64 : Air Impurities Sensor

By IFC Representation

IFC Entity: IfcSensor						
IFC USER-DEFINED SubType: FIRESENSOR, GASSENSOR, HEATSENSOR, MOVEMENTSENSOR, SMOKESENSOR, TEMPERATURESENSOR, FLAMEDETECTOR, HEATDECTECTOR, SMOKEDETECTOR, LEVELSENSOR						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	SmokeDetectorType	Text	-	-	-	Point Type / Original
2	Declaration	Text	-	-	-	-
3	EngineeredSmokeControlSystem	Boolean	-	-	Yes	TRUE / FALSE

Shower

By IFC Representation

IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: SHOWER						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	-	-	-	-	-	-

Sink

By IFC Representation

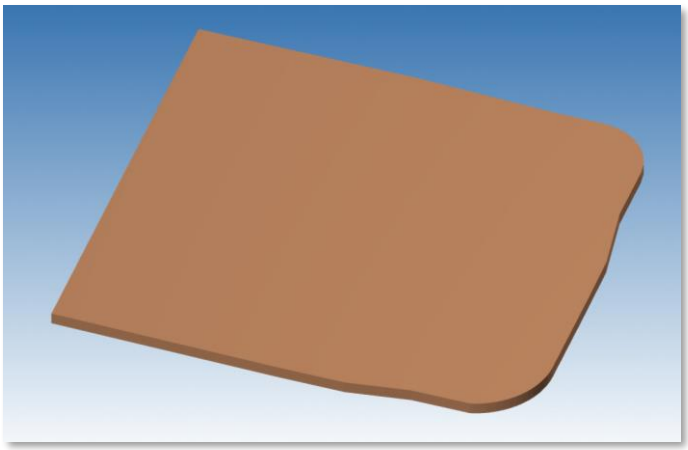
IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: SINK						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	-	-	-	-	-	-

Site

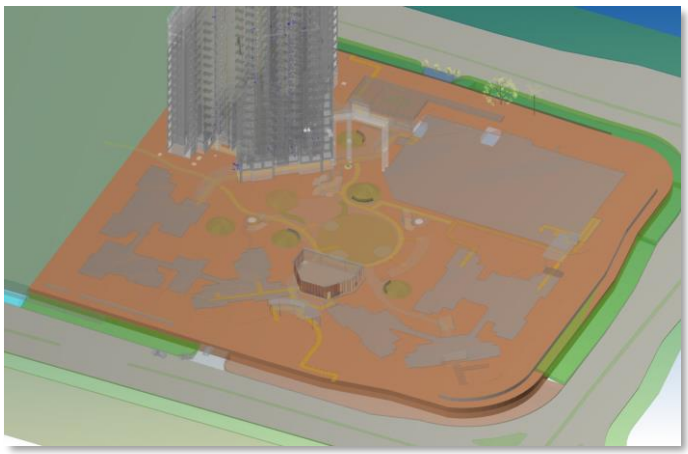
Legend: Architecture C&S M&E

By Key Gateways

G1.5	Piling Gateway (optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Drains, Earthworks / Topography	PUB	*Can be provided at Commencement of Works or Piling Gateway (G1.5)* • Earth Control Measures



S4 – Fig 65 : Site / Site Boundary



S4 – Fig 66 : Site / Site Boundary in relation to Building

By IFC Representation

IFC Entity: IfcSite

IFC USER-DEFINED SubType: N.A.

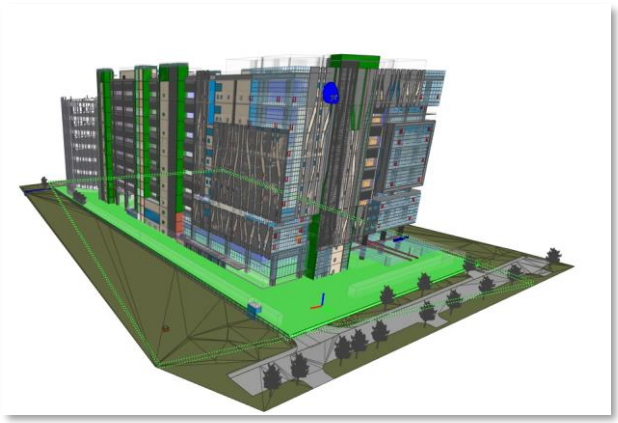
S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	ProjectDevelopmentType	Text	-	-	No	Holiday Resort, Children's Home, Civic and Community Institution, Sports and Recreation 2, Security Office, Community Centre, Serviced Apartment, Factory
2	NumberOfWorkers	Integer	-	-	-	-
3	TotalArea	Area	-	m^2	No	-

Site Boundary

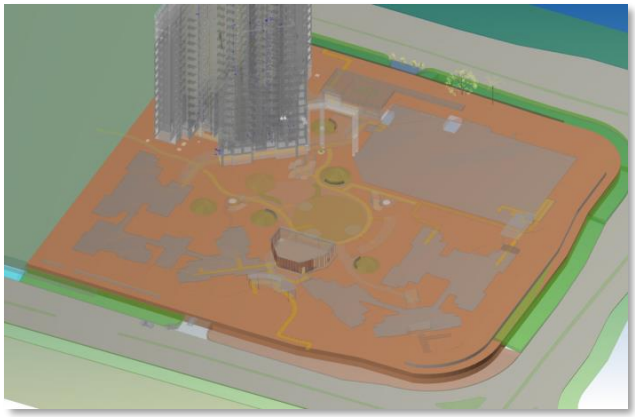
Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout Only	NParks	**Securing of Land for PCN/Park use and/or Impact on Neighbouring Parks (e.g. enbloc sites)** • To ensure the site boundary does not encroach into safeguarded park / park connectors shown in MP19/PWP19 • Some development applications might be received during the discussion to rezone proposed parks/park connectors thus affecting boundaries
		SCDF	**Building Setback due to Unprotected Openings** • Setback between buildings or to the relevant boundary due to the unprotected openings shall be computed and provided based on the setback table



S4 – Fig 67 : Site / Site Boundary highlighted in Green



S4 – Fig 68 : Site / Site Boundary in Brown

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 USER-DEFINED SubType: CADASTRALLOT						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	ApprovedSoilMixture	Boolean	-	N.A.	Yes	TRUE / FALSE
2	Area	Area	-	m^2	No	N.A.

Slab

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout, Landscape Deck	URA	**Landscape Deck** • Height of Deck – Show on Section

G1.5	Piling Gateway (optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

	Structural Design	BCA	**Structural Design (Piling and Foundation Works)**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• Complete set of IFC-SG model(s) for all structural framings & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access within Building	BCA	Headroom and Ceiling Height
			Accessible Route and Maneuvering Space (within the development)
	Buildability	BCA	**Buildability Design (Scoring)** • B-Score Calculations
	Connectivity	BCA	Accessible Route (to the ingress / egress of the development's entrance)
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating
	Household / Storey Shelter	BCA	**Household / Storey Shelter Details** • Compliance to structural requirements stipulated in technical requirements on household shelters and storey shelters

Slab

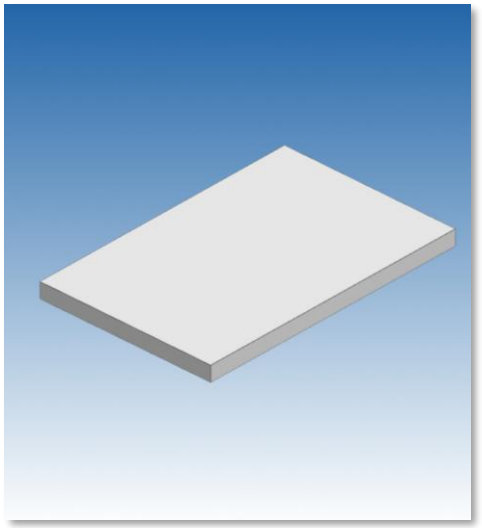
Legend: Architecture C&S M&E

By Key Gateways

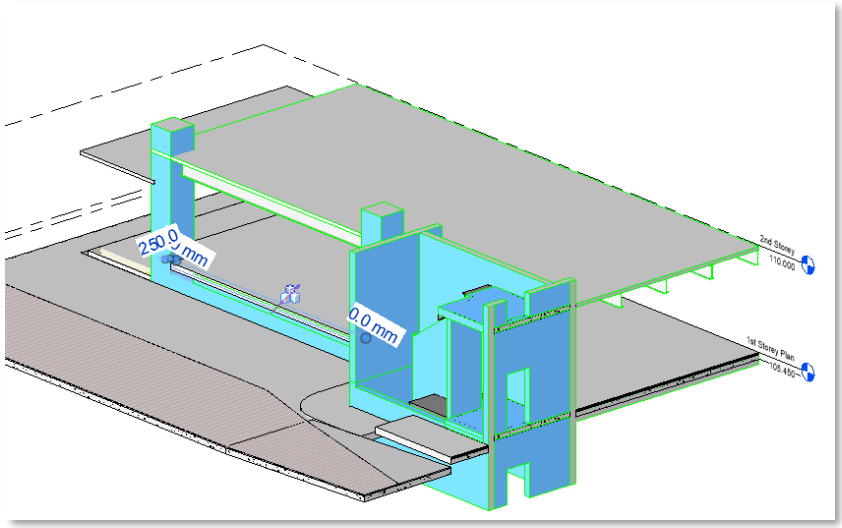
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**

	Structural Design	BCA	**Structural Design (Piling and Foundation Works)**
			Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)
			• Complete set of IFC-SG model(s) for all structural foundation system & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. irregulat footing/pilecap detailing, raft detailing)
			• Pre-Consultation clearance letter (for complex building projects)

			Structural Design (Main Structural Elements of Building excl. Piling)
			• Complete set of IFC-SG model(s) for all structural framings & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)



S4 – Fig 69 : Slab



S4 – Fig 70 : Concrete Rectangular Slab

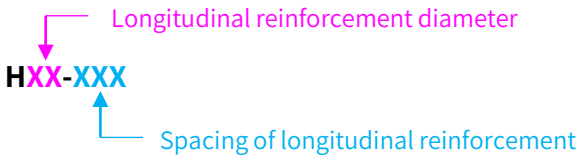
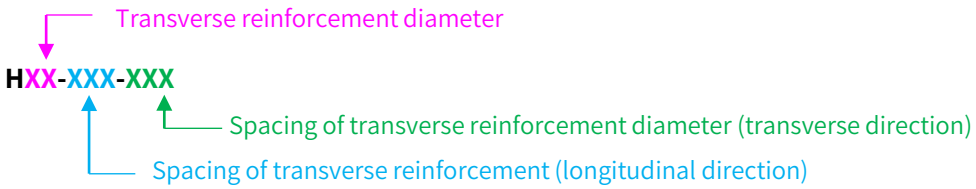
Slab

Modeling 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.

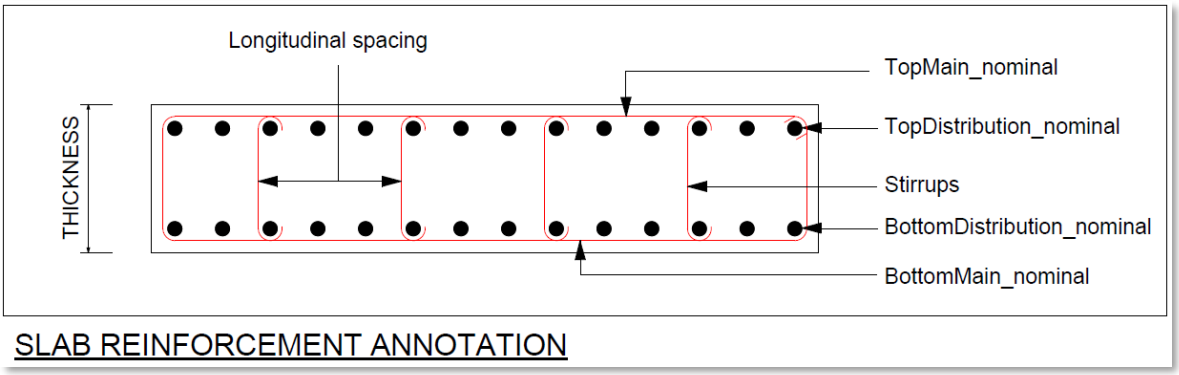
- 2D detail drawings are allowed for all slab reinforcement drawings with the indication of drawing number in the IFC-SG parameter "ReferTo2DDetail".

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) 

Slab

Slab Dimension and Reinforcement Definition (continued from previous page)



S4 – Fig 71 : Slab Reinforcement Annotation

By IFC Representation

IFC Entity: IfcSlab						
IFC USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	MaterialGrade	Text	All slabs	-	Yes	Refer to list^
2	ConstructionMethod	Text	All slabs	-	Yes	Refer to list^
3	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
4	ReinforcementSteelGrade	Text	All slabs	-	Yes	Refer to list^
5	ShelterUsage	Boolean	When required / relevant	-	Yes	TRUE / FALSE
6	SlabType	Text	All slabs	-	Yes	Refer to list^
7	Mark	Text	All slabs	-	No	S1, S01, PS01
8	Thickness	Length	All slabs	mm	No*	300
9	BottomDistribution_nominal	Text	When required / relevant	-	Yes	H25-150+H16-300
10	BottomMain_nominal	Text	When required / relevant	-	Yes	H25-150+H16-300
11	Stirrups	Text	When required / relevant	-	Yes	H10-150-300
12	StirrupsType	Text	When required / relevant	-	Yes	Refer to list^
13	TopDistribution_nominal	Text	When required / relevant	-	Yes	H25-150+H16-300
14	TopMain_nominal	Text	When required / relevant	-	Yes	H32-150+H20-300

* 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 USER-DEFINED 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	C
	13	TopDistribution_nomimal	H10-100
	14	TopMain_nominal	H10-100

Space

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Building Massing	NEA	**Site Layout** • Indicative Access (whether there's available public space)
		URA	**Building Height** • Floor-to-Floor Height & Aggregate Building Height • Additional Height for Predominant Sky Terrace Storey • Urban Design Requirements – Overall Building Height Control (including building crown and M&E floor, if any) • Number of Storeys
			• Building Length and Form
	Connectivity	URA	**Urban Design Requirements - Connectivity (UPN, EPN, TBL, Open / Covered Walkways)** • Mitigation of level differences • Alignment • Clear width • (UPN, EPN) Detailed layout of vertical circulation point – location within development, and dimensions • (UPN, EPN) KOP details (e.g. alignment, size) • (TBL) Soffit height
	Earthworks / Topography	URA	**Earthworks, Retaining Walls and Boundary Walls** • Height of Retaining Wall(s), Extent of Earthfill and Impact on Surroundings
	Greenery	NParks	**Encroachment into Requisite Planting Area (incl. Basement)** • Need to find out if there are encroachments beyond list of allowable structures in NParks Guidelines that might affect placement of trees and shrubs • Basement or underground structures cannot impede on the required soil depth for tree planting (they need to be recessed at least 2m)
		NParks, SCDF	**Indication of Fire Engine Accessways** • Should be designed upfront and not added as an afterthought • Should not affect requisite planting areas and roadside green verges
		URA	**Urban Design Requirements** LRA Provision: Indicative Extent (may affect building form)
	Infra & Utilities (External) only	NParks	**Spatial Provision for Greenery at Covered Linkways / Pedestrian Overhead Bridge** • To secure the dimensions (width and depth) on and surrounding these structures

Space

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Infra & Utilities (External) only	NParks	**Standard Roadside Greenery Provision (New Roads) (Spatial Provision)** • To secure the dimensions (width and depth) for green verge (including tree planting verge) according to road category
	Infra & Utilities (Internal), Detention System	PUB	**Peak Run Off** • Calculation of peak run off factor (C value) max. 0.55 (based on code and chart) e.g. area of development of greenfield site • Key Objective: To demonstrate how this is catered for, area is set aside for detention tank provision, location, OR drain widening
	Platform & Crest Level, Infra & Utilities (Internal)	PUB	**Flood Protection Measures** If crest level is not provided – location and height of protection measure
	Public Health	NEA	**Site Layout** • Location and Sizes of the Bin Centre, refuse and recycling chute, refuse chute chamber and recyclables storage & its collection system • Check for refuse outputs • Location of cooling tower system and its setback distance (at least 5m)
			Air Conditioning and Mechanical Ventilation System *Can be provided at Design Gateway (G1) or Piling Gateway (G1.5)* • Noise report to be submitted for the noise generated from this system • Location of generator (standby) and the direction of air flow from inlet and outlet exhaust.
	Public Space	URA	**Urban Design Requirements – Public Spaces – POPS** • Location • Size • Layout • Shade Studies ○ Shading and Ecotect (or equivalent) sun-shading studies at specified timings • Soffit Height

Space

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Rapid Transit System (RTS) Station	URA	**Urban Design Requirements** • Location of station box • Design of pop-up structures (mitigation of platform levels, interfacing w neighbouring developments, within approved railway, cw provision, setback) • Land take required • Details of Loading Provision (DIR - WIP) • KOP details (e.g. exact alignment, size) • Retail quantum (capped at 2,000sqm) • Construction method (e.g. extent of ERSS) • Future integration with future structures (e.g. location / orientation / size of vents)
	Servicing (Internal Accesses)	NEA	**Site Layout** • Refuse Truck Access road (for refuse collection) - swept path analysis
		SCDF	**Fire Engine Access Road / Accessway Provision** • Fire Engine Access Road / Accessway Width • Accessway Length Provision • Calculations to Derive Fire Accessway • Building Façade with Fire Engine Access Panels
	Site Layout Only	NEA	**Site Layout** • 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).
			Nuisance Buffers • 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. • 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. • Buffers

Fronting track	35
End-wall facing track	25

Space

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout Only	NParks	**Conservation of trees/Plants (Identification, e.g. trees within TCA/VL, heritage trees)** • Both roadside and internal • Certain trees/plants are to be conserved, e.g. spelled upfront in TCOT, or special considerations such as Heritage Tree or nominated Heritage Tree, identified upon nature group/public/residents engagement, or via recommendations of EIS/EIA report and/or EMMP
			Greenery Provision for Open-Air Parking Areas at Street Level (Spatial Provision) • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)
			New Parks / Park Connector / Promenade • To ensure the design is shown upfront and accepted, e.g. in terms of spatial provision, access points, specific features that have to be fixed early on
			Peripheral Planting Verges (Spatial Provision) • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)
			Green Buffer (Spatial Provision)
		SCDF	**Building Setback due to Unprotected Openings** • Setback between buildings or to the relevant boundary due to the unprotected openings shall be computed and provided based on the setback table
		URA	**Building Setback from Boundary** • Road Buffer and Green Buffer • Common Boundary Setback / Party wall & Planting Strip • Building Setback for Multi-Storey Car Parks • Boundary Setback for Ancillary Structures
			Site Layout • Location of Buildings • Location of Communal Facilities (e.g. bin centre, pavilions, BBQ areas)
			Site Coverage • Declaration of Percentage
	Site Layout, Drainage Reserve	PUB	**Drainage Reserve** • Location (align to DIP), width

Space

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout, Street Works	LTA	**Vehicular Access Details** (levels, turning radius, connection to adjacent footpaths, tactile provisions, shifting of existing road elements (including trees, lamp post, signs etc)
			Proposed Pick-Up/ Drop-Off Points (within development): PUDO Layout • Indicate width and kerb alignment of PUDO points • Number of PUDO bays and queue length
	Use & Intensity	URA	**Dwelling Units** • Maximum Number • Pre-Application Feasibility Study (together with LTA)
			Gross Plot Ratio / Gross Floor Area
			Land Alienation / Land to be Vested for Public Schemes (Drain, Road, Open Space, Park, Cycling Paths)
			Land Use / Building Uses
			Site Area
	Vehicular Parking	LTA	• The proposed development shall comply fully with the prevailing Parking Places (Provision of Parking Places and Parking Lots) Rules and other relevant guidelines of the Authority. • The number of parking lots provided shall be 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. • The geometric dimensions of the parking layout shall comply with the standard minimum dimensions as stipulated in the COP
		URA	**Parking** • Show location within site (e.g. underground; to check TCOT requirement for urban design requirements) • Nature (basement, surface, or podium) • Declare total number and breakdown of types

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access to Site	BCA	Passenger Alighting and Boarding Point
		URA	**Developments involving Waterbodies:** • Foreshore access

Space

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access to Site	URA	**Site Layout:** • Location of side gates
	Access within Building only	BCA	Headroom and Ceiling Height
			Accessible Route and Maneuvering Space (Within the Development)
			Corridor Width (for retirement housing)
	Access within Building, Lifts & Escalators	SCDF	**Evacuation / Fire Lifts provision** *Can be provided at Piling Gateway (G1.5) or Construction Gateway(G2)* • Number of Fire Lifts • Fire Lift Accessibility and Coverage • Protected Lobby / Fire Lift Lobby

	Balcony	URA	**Balconies, Private Enclosed Spaces, Private Roof Terraces and Indoor Recreation Spaces:**
			• Balcony Openness
			  ○ To demarcate open vs total perimeter on model, and declare openness percentage
			• Balcony Screening
			  ○ To show design of screens illustrating that there are sufficient porosity for natural ventilation
			• Balcony Width and Size

	Building / Unit Layout	URA	Checking of strata areas / layout / voids – demarcate strata boundaries
			Dwelling Units: Unit Size and Layout (including strata area / volume)
			Unit / Floor Layout (e.g. office, retail, industrial): Unit Size and Layout
	Connectivity	BCA	Accessible Route (to the ingress / egress development entrance)
	Dwelling Unit	BCA	Bathrooms for future retrofitting
		URA	Checking of strata area / layout / voids – demarcate strata boundaries
			Dwelling Units: Unit size and layout (including strata area / volume)
	Equipment Only	NEA	Detailed design of cooling tower system (if any)
	Fire Compartmentation	SCDF	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each Residential Unit to be Compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements

Space

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	**Compartmentation** • Separation of transit and non-transit occupancies • Separation of public and ancillary areas • Separation of commercial spaces • Separation between viaduct and M&E plantrooms / commercial spaces • Fire rating of compartment • Compartmentation by height • Vertical fire spread
	Fire Fighting, Equipment	SCDF	**Sprinklers & System** • Provision of sprinklers for basement • Provision of sprinklers for buildings having habitable height more than 24m (mixed-use residential buildings)
	Green Mark	BCA	Basic Green Mark requirements (Ventilation)
	Greenery	URA	**Greenery:** • Landscape Replacement Area – Show on plans and declare % of landscape
			Greenery: • Sky Terrace / Planter Boxes / Covered Communal Ground Garden / Communal Pavilions – show on plans and provide details of design
	Household / Storey Shelter	BCA	**Household / Storey Shelter details** • Compliance with technical requirements on shelter position, size, setback requirements • Submit CD Shock Calculations as supplementary non-BIM documentation • M&E inputs required for Transit Shelter
	Lightning Protection	BCA	**The following information are required to be modelled in BIM:** • Location of air-termination system • Location of down conductors • Zone of lightning protection provided by the air-termination network for open roof spaces and the sides of the building • Location of earth electrodes

Space

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Lightning Protection *(continued from previous page)*	BCA	**The following LPS details do not require to be modelled in BIM:** • 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. • Non-BIM supplementary documents such as material specification, photo, ppt, excel, words, etc. should be submitted
	Materials	SCDF	Compartment Walls and Floors
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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
			Public Toilet • Total number of Sanitary Facilities provisions (where applicable)
			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
			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
			COPEH - Section 4 : Cooling Tower 4.1 Objective 4.2 Design Requirements

Space

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Health	NEA	**COPEH - Section 4 : Cooling Tower** 4.1 Objective 4.2 Design Requirements
			COPEH - Section 5 : Aquatic Facility 5.1 Objective 5.2 Minimum Design Criteria
			Aquatic Facility and Swimming Pool • No overhead sanitary wastepipe to be on top of balancing tanks. • Location of two pre-swim showers shall be provided around the swimming pool. • Setback of 2.2m from the planter strip to pool perimeter. • Location of swimming pools and its balancing tanks
	Rapid Transit System (RTS) Station	SCDF	Occupant Load and Exit Capacity of Station
	Site Layout Only	URA	**Building Setback from Boundary** • Setback for Building Appendages – Location and width • Treatment for non-compliant Multi-Storey Car Parks • Treatment for non-compliant Ancillary Structures
	Site Layout, Attic	URA	**Attic** • Design of attic in relation to strata unit • Height of attic – Dimension
	Site Layout, Basement	URA	**Basements** • Basement protrusion • Screening of basement opening • Setback
	Site Layout, Landscape Deck	URA	**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, Street Works	LTA	**Proposed Pick-up / Drop-Off Points (Within Development): PUDO Details** • All details presented at Design Gateway (G1) stage

Space

Legend: Architecture C&S M&E

By Key Gateways

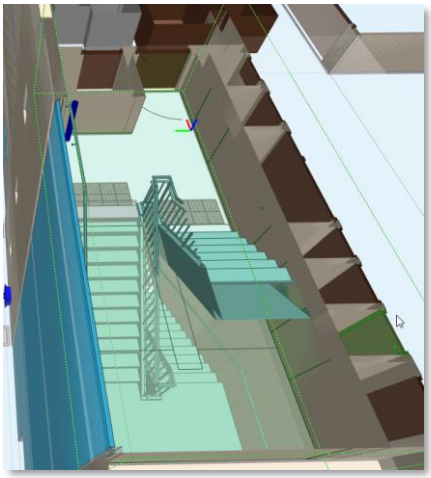
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout, Vehicular Parking	LTA	**All details and critical dimensions of the parking layout such as:** • Type and size of parking lots • Width of ramps and accessways • Inner turning radius and width of turning paths • Width of parking aisles • Gradient of vehicular ramps • Headroom clearance • Road and traffic arrow markings • Bicycle rack details • EV lots & charging stations
	Staircase	SCDF	**Exit Staircases and Means of Escape Requirements** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Number of exit staircases provided and location • Exit capacity of exit staircase, fire rating of the enclosure, smoke free approach to exit staircase, ventilation of exit staircase etc. • Travel distances to exit staircase
	Use & Intensity	URA	Ancillary Shops (0.3% Quantum) – to declare amount of Commercial GFA within development
			RC Flat Roofs: • Use – Indicate whether roof is accessible, and if so, for what purpose • Structures – To show on plan any proposed built structures
			Urban Design Requirements • Activity Generating Uses – Indicate location on plan and provide details on specific nature of use • Public Spaces – Indicate location, design and dimensions • Party Wall – Indicate no openings
	Ventilation	BCA	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
		SCDF	Airwell for Staircase Ventilation
			Ventilation for open-sided carpark building
			Mechanical Ventilation & Smoke Control Systems • Ventilation systems for Fire Command System (FCC), fire pump rooms, smoke-free / fire fighting lobbies, generator set rooms etc • Smoke puring system, engineered smoke control systems

Space

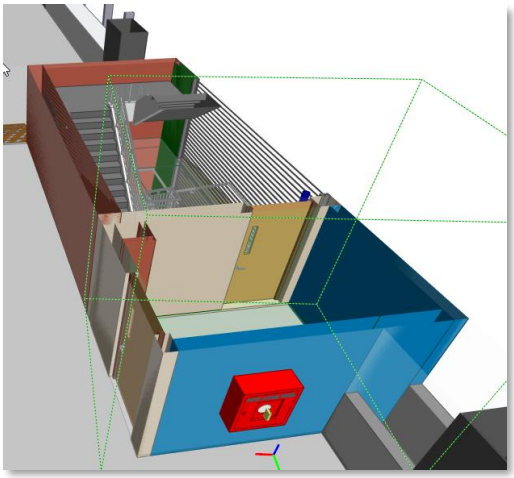
Legend: Architecture C&S M&E

By Key Gateways

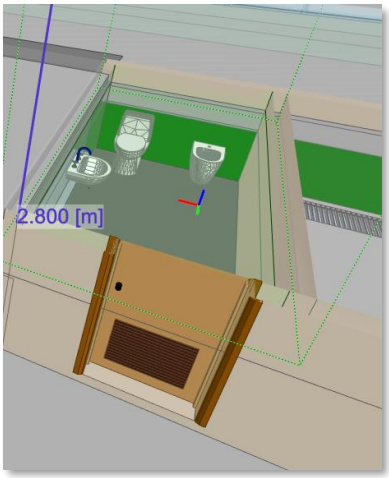
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Washroom	BCA	Sanitary provisions for wheelchair users
			Sanitary provisions for ambulant disabled



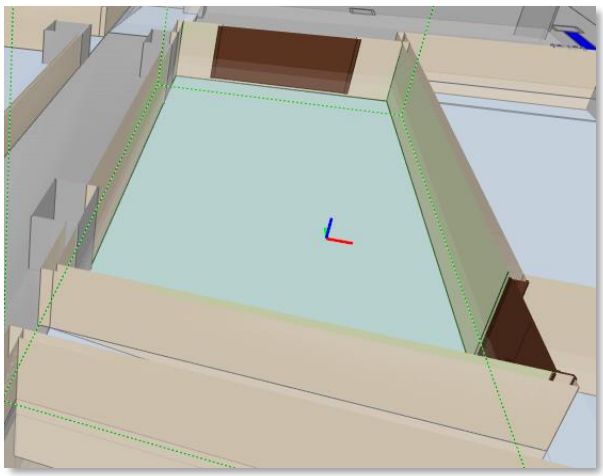
S4 – Fig 72 : Fire Exit Staircase



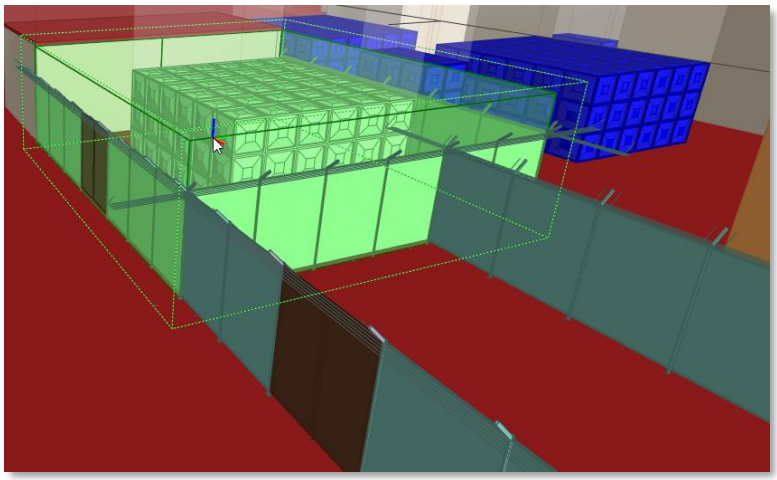
S4 – Fig 73 : Smoke Stop Lobby



S4 – Fig 74 : Toilet



S4 – Fig 75 : Bin Centre



S4 – Fig 76 : Water Pump Room

Space

By IFC Representation

IFC Entity: IfcSpace

IFC USER-DEFINED SubType: ACCESSROAD, ACCESSWAY, AREA_CONNECTIVITY, AREA_GFA, AREA_LANDSCAPE, AREA_STRATA, AREA_VERIFICATION, EGRESS, FIREENGINEACCESSROAD, FIREENGINEACCESSWAY, INGRESS, VEHICULARSERVICEROAD

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	BarrierFreeAccessibility	Boolean	-	-	Yes	TRUE / FALSE
2	Area	Auto-generated from BIM	-	m^2	-	-
3	ACN_ActivityGeneratingUseType	Text	-	-	-	-
4	ACN_CloseTime	Text	-	-	-	-
5	ACN_ConnectivityType	Text	-	-	-	-
6	ACN_IsOpen24HoursToPublic	Boolean	-	-	Yes	TRUE / FALSE
7	ACN_IsPavingSpecified	Boolean	-	-	Yes	TRUE / FALSE
8	ACN_OpenTime	Text	-	-	-	-
9	ACN_PavingSpecification	Text	-	-	-	-
10	AGF_AreaID	Text	-	-	-	-
11	AGF_BonusGFAType	Text	-	-	-	-
12	AGF_DetailedUse	Text	-	-	-	-
13	AGF_DevelopmentUse	Text	-	-	-	-
14	AGF_FacilityType	Text	-	-	-	-
15	AGF_GreeneryFeatures	Text	-	-	-	-
16	AGF_RefuseChuteID	Text	-	-	-	-
17	AGF_RecyclablesChuteID	Text	-	-	-	-
18	AGF_PublicToiletID	Text	-	-	-	-
19	AGF_Name	Text	-	-	-	-
20	AGF_Note	Text	-	-	-	-
21	AGF_UnitNumber	Text	-	-	-	-
22	AGF_UseQuantum	Text	-	-	-	-
23	Area	Auto-generated from BIM	-	m^2	-	-
24	ALS_GreeneryFeatures	Text	-	-	-	-
25	ALS_LandscapeType	Text	-	-	-	-
26	Area	Auto-generated from BIM	-	m^2	-	-
27	AST_AreaType	Text	-	-	-	-
28	AST_AssociatedTo	Text	-	-	-	-
29	AST_Extg_StrataLotNumber	Text	-	-	-	-

Space

By IFC Representation (Continued from previous page)

IFC Entity: IfcSpace

IFC USER-DEFINED SubType: ACCESSROAD, ACCESSWAY, AREA_CONNECTIVITY, AREA_GFA, AREA_LANDSCAPE, AREA_STRATA, AREA_VERIFICATION, EGRESS, FIREENGINEACCESSROAD, FIREENGINEACCESSWAY, INGRESS, VEHICULARSERVICEROAD

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
30	AST_LegalArea	Auto-generated from BIM	-	-	-	-
31	AST_Prop_StrataLotNumber	Text	-	-	-	-
32	AVF_AreaType	Text	-	-	-	-
33	AVF_BonusGFAType	Text	-	-	-	-
34	AVF_DetailedUse	Text	-	-	-	-
35	AVF_DevelopmentUse	Text	-	-	-	-
36	AVF_Name	Text	-	-	-	-
37	AVF_UseQuantum	Text	-	-	-	-
38	NormalVentilationMode	Text	-	-	Yes	Natural Ventilation, Air Conditioning, Mechanical Ventilation, Mechanical Ventilation
39	VentilationType	Text	-	-	-	Cross Ventilation
40	Retrofit	Boolean	-	-	Yes	TRUE / FALSE
41	SpaceName	Text	-	-	-	Car Washing Bay, Exit Staircase, Family Washroom, Fire Command Centre, Fire Lift Lobby, Kitchen Space, Lactation Room, Linkway, Refuse Chute Chamber, Refuse Chute Room, Storage Room
42	TwentyFourHourMannedStation	Boolean	-		Yes	TRUE / FALSE
43	Height	Auto-generated from BIM	-	mm	-	-
44	Volume	Auto-generated from BIM	-	-	-	-
45	OccupantLoad	Integer	-	-	-	-
46	OccupancyType	Text	-	-	-	-
47	Accreditation_PAS	Boolean	-	-	Yes	TRUE / FALSE
48	ElderlyFriendly	Boolean	-	-	Yes	TRUE / FALSE
49	FireEmergencyVentilationMode	Text	-	-	Yes	Natural Ventilation, Mechanical Ventilation, Pressurisation, Smoke Purging, Engineered Smoke Control, Jetfan

Space

By IFC Representation (Continued from previous page)

IFC Entity: IfcSpace						
IFC USER-DEFINED SubType: ACCESSROAD, ACCESSWAY, AREA_CONNECTIVITY, AREA_GFA, AREA_LANDSCAPE, AREA_STRATA, AREA_VERIFICATION, EGRESS, FIREENGINEACCESSROAD, FIREENGINEACCESSWAY, INGRESS, VEHICULARSERVICEROAD						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
50	FireExit	Boolean	-	-	Yes	TRUE / FALSE
51	HearingEnhancement	Boolean	-	-	Yes	TRUE / FALSE
52	LargerAccessible	Boolean	-	-	Yes	TRUE / FALSE
53	PurposeGroup	Text	-	-	No	I, II, III
54	MasterPlanUseType	Text	-	-	-	-
55	SprinklerProtectionAutomatic	Boolean	-	-	Yes	TRUE / FALSE
56	UnitNumber	Text	-	-	-	-

Soffit

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Connectivity	URA	**Urban Design Requirements - Connectivity (UPN, EPN, TBL, Open / Covered Walkways)** • Mitigation of Level Differences • Alignment • Clear Width • (UPN, EPN) Detailed Layout of Vertical Circulation Point – Location within Development, and Dimensions • (UPN, EPN) KOP Details (e.g. alignment, size) • (TBL) Soffit height
	Public Space	URA	**Urban Design Requirements – Public Spaces (POPS)** • Location • Size • Layout • Shade Provision • Soffit Height

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Connectivity	URA	**Covered Walkways** • Soffit Height

Soffit Picture

Soffit Picture

By IFC Representation

IFC Entity: IfcCovering

IFC USER-DEFINED SubType: N.A.

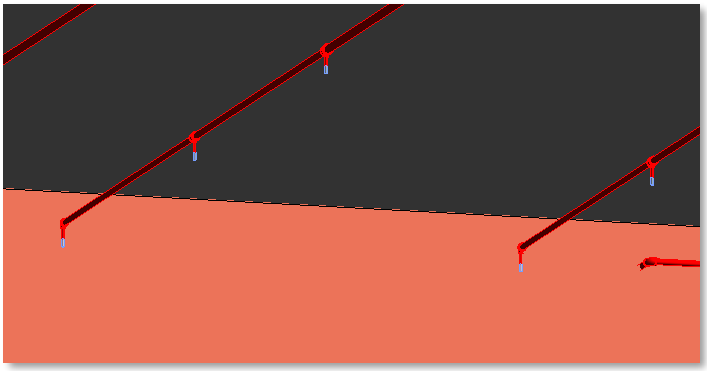
S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	FireRating	Text	-	-	No	-

Sprinkler (Non-Fire; For NEA)

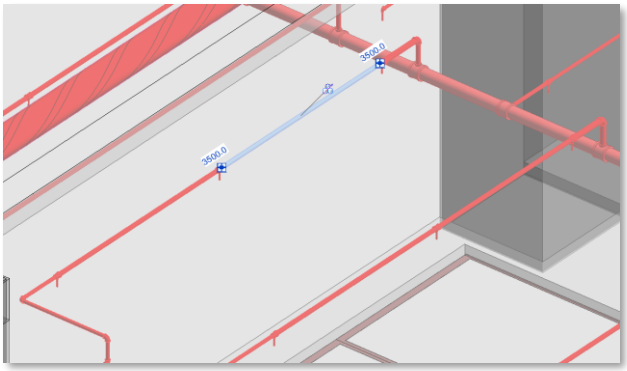
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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



S4 – Fig 77 : Exposed Sprinkler



S4 – Fig 78 : Sprinkler

By IFC Representation

IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: SPRINKLER						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
-	-	-	-	-	-	-

Legend: Architecture C&S M&E

By Key Gateways

G1.5	Piling Gateway (optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating
	Staircase	SCDF	**Exit Staircases and Means of Escape Requirements** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Number of Exit Staircases provided and Location • Exit capacity of exit staircase, fire rating of the enclosure, smoke free approach to exit staircase, ventilation of exit staircase etc. • Travel Distances to Exit Staircase

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access within Building Only	BCA	Headroom and Ceiling Height
	Buildability	BCA	**Buildability Design (Scoring)** • B-Score Calculations
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* Element of Structure to check Fire Rating
	Rapid Transit System (RTS) Station	SCDF	Exit Staircase and Means of Escape Requirements
	Staircase	SCDF	**Exit Staircases and Means of Escape Requirements** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Number of Exit Staircases provided and Location • Exit capacity of exit staircase, fire rating of the enclosure, smoke free approach to exit staircase, ventilation of exit staircase etc. • Travel Distances to Exit Staircase
		BCA	Minimum Width, Tread and Riser, Nosing, Handrail / Railing

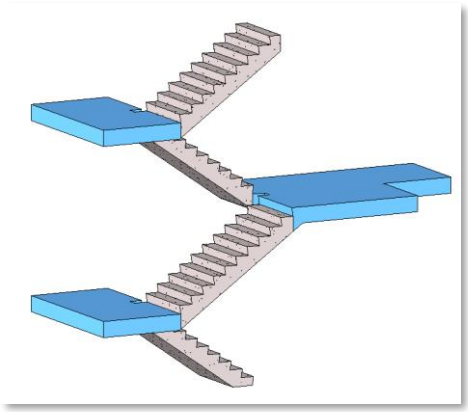
Staircase

Legend: Architecture C&S M&E

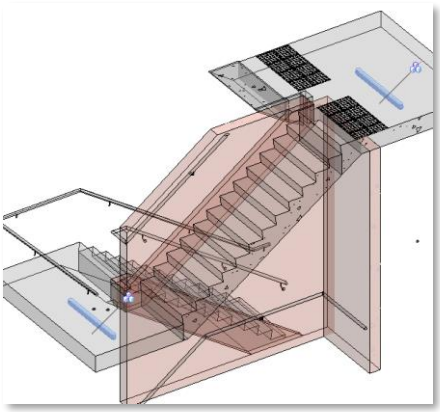
By Key Gateways

G2	Construction Gateway *(continued from previous page)*		
	Gateway Key Words	**Agency**	**Requirement Category**

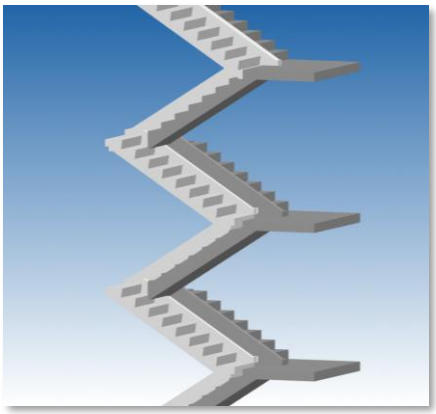
	Structural Design	BCA	**Structural Design (Main Structural Elements of Building excl. Piling)**
			• Complete set of IFC-SG model(s) for all structural framings & details
			• **2D drawings limited to the categories below:**
			  ○ General notes
			  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)



S4 – Fig 79 : Precast Staircase



S4 – Fig 80 : Staircase



S4 – Fig 81 : Staircase

Modeling 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".

Staircase

By IFC Representation

IFC Entity: IfcStair						
IFC USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	MaterialGrade	Text	All staircase	-	Yes	Refer to list^
2	Mark	Text	All staircase	-	No	ST1, ST-A1
3	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg number
4	ReinforcementSteelGrade	Text	RC staircase	-	No	Refer to list^
5	SectionFabricationMethod	Text	Steel staircase	-	No	Refer to list^
6	ConstructionMethod	Text	RC staircase	-	No	Refer to list^
7	MemberSection	Text	Steel staircase	-	No	RHS600x30x4, CHS500x3.0, 254x254x63kg/m
8	Thickness	Length	All staircase	mm	No*	150
9	Width	Length	All staircase	mm	No*	2200
10	BottomDistribution	Text	RC staircase	-	Yes	H25-150+H16-300
11	BottomMain	Text	RC staircase	-	Yes	H25-150+H16-300
12	TopDistribution	Text	RC staircase	-	Yes	H25-150+H16-300
13	TopMain	Text	RC staircase	-	Yes	H32-150+H20-300
14	ConnectionDetailsBottom	Text	When required / relevant	-	No	Detail 1
15	ConnectionDetailsTop	Text	When required / relevant	-	No	Detail 1
16	ConnectionTypeBottom	Text	When required / relevant	-	Yes	Refer to list^
17	ConnectionTypeTop	Text	When required / relevant	-	Yes	Refer to list^

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

Staircase

Example of Staircase (RC Staircase) Structural Element Input

150mm thick RC Precast Stair Flight	**IFC Entity: IfcStair**		
	IFC USER-DEFINED 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

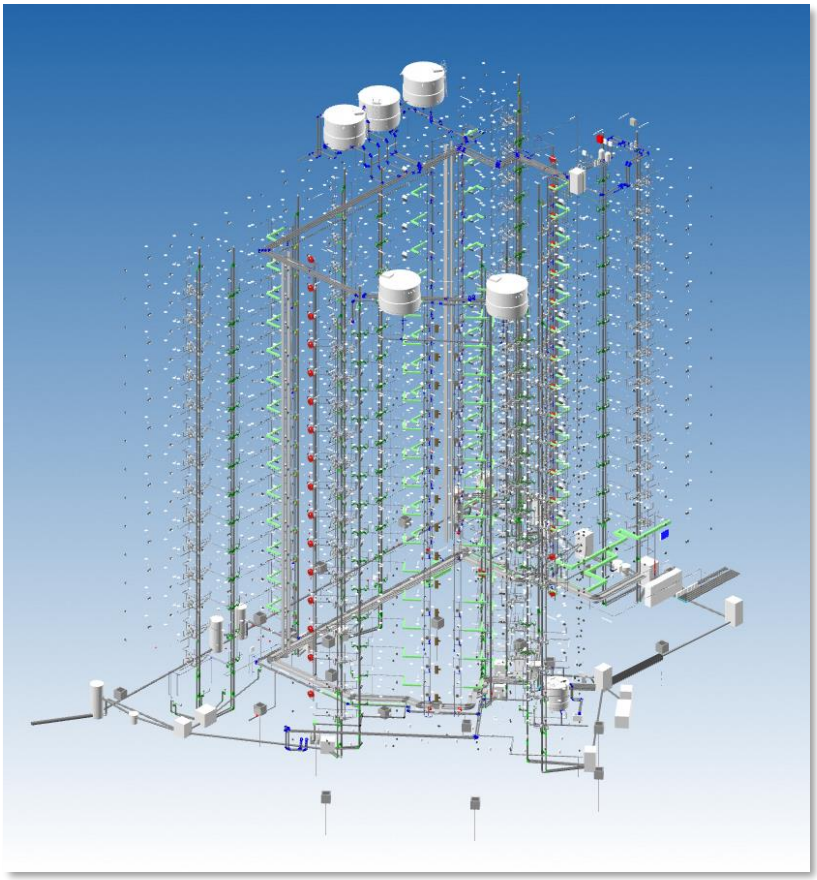
Legend: Architecture C&S M&E

By Key Gateways

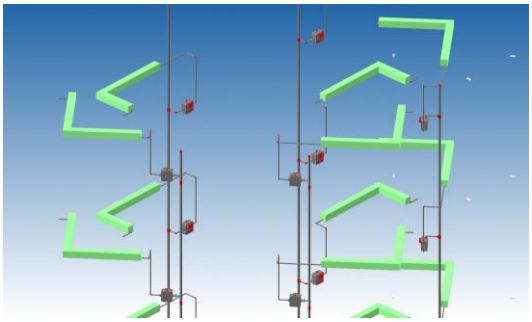
G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Infra & Utilities (External), Public Sewerage System	PUB	**Sewer Connection** Connection Point, where the proposed location is
			Sewerage System Alignment of Sewers, Dimensions, Gradient

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Fighting, Equipment	SCDF	**Rising Mains & System** • The type of rising main provided (dry or wet) • Location of landing valve(s) • Rising main coverage • Standby hose provision • Breech inlet location
	Infra & Utilities	PUB	Mode of Supply
	Public Health	NEA	**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
			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
			Roof Gutter and Scupper Drain • Location of Roof Gutter or Scupper Drain • Provision of Permanent and Safety Maintenance Access
	Ventilation	SCDF	**Mechanical Ventilation & Smoke Control Systems** • Ventilation systems for Fire Command System, Fire Pump Rooms, Smoke-Free / Fire Fighting Lobbies, Generator Set Rooms etc. • Smoke Puring System, Engineered Smoke Control System

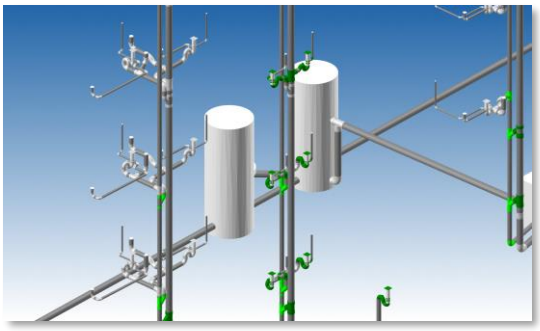
System



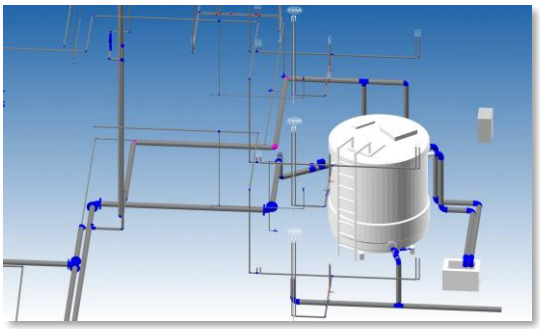
S4 – Fig 82 : Combined System(s)



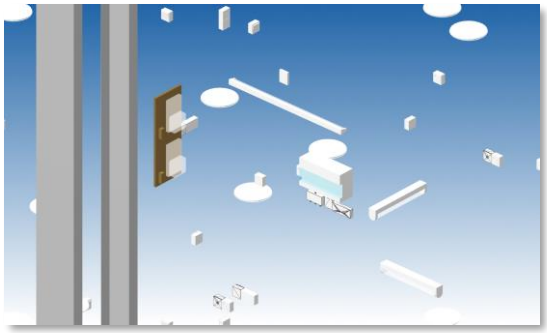
S4 – Fig 83 : Gas System



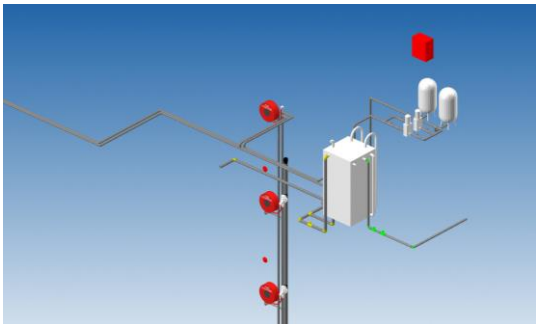
S4 – Fig 84 : Sanitary System



S4 – Fig 85 : Plumbing System



S4 – Fig 86 : Electrical System



S4 – Fig 87 : Fire Fighting System

System

By IFC Representation

IFC Entity: IfcDistributionSystem						
IFC USER-DEFINED SubType: CHILLEDWATER, POTABLEWATER, RAINWATER, DOMESTICCOLDWATER, DRAINAGE, DRYRISER, FIREPROTECTION, HOSEREEL, SANITARY, SMOKECONTROL, SMOKEVENT, SMOKEPURGING, SPRINKLER, WATERSUPPLY, WETRISER						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	Material	Text	-	-	-	-
2	Diameter	Auto-generated from BIM	-	mm	-	-
3	Gradient	Text	-	-	-	-
4	Length	Auto-generated from BIM	-	mm	-	-

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.

Tree

Legend: Architecture C&S M&E

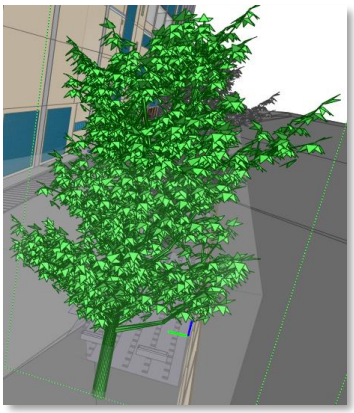
By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout Only	NParks	**Conservation of Trees / Plants (Identification, e.g. trees within TCA/VL, heritage trees)** • Both roadside and internal • Certain trees/plants are to be conserved, e.g. spelled upfront in TCOT, or special considerations such as Heritage Tree or nominated Heritage Tree, identified upon nature group/public/residents engagement, or via recommendations of EIS/EIA report and/or EMMP
			Entrance Culvert Position • Part of roadside elements • Splay corners will also affect the green verge positions and location of roadside trees
	Site Layout, Street Works	LTA	**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 (including trees, lamp post, signs etc) affected by proposed access.

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Greenery	NParks	**Conservation of Trees /Plants (Tree Protection Specifications)** • The Certified Arborist engaged by the Developer is to provide a report of the trees to be conserved, with indication of the tree girth (minimum tree protection zone will be generated in CORENET X) • A Tree Protection Zone (TPZ) refers to an area identified to protect the entire tree, which includes its crown, trunk and roots system. The TPZ established should be able to protect the entire tree throughout the duration of construction. • The objective of the TPZ is to minimize the impact of construction activities on trees, including but not limited to mechanical injury to roots, trunks and branches due to contact with equipment, materials, debris or other activities. It also aims to minimize compaction of soil, which results in poor functioning of roots, and changes in soil levels that can cut off or suffocate roots.

Tree

S4 – Fig 88 : Tree



S4 – Fig 89 : Tree

S4 – Fig 90 : Tree

S4 – Fig 91 : Tree

Modeling Tree in IFC-SG

- As long as relevant IFC-SG requirements are embedded in the tree object, it is okay to model trees as simplified lollipop BIM components. We are mindful that more elaborate tree models can increase the file size of the BIM model.

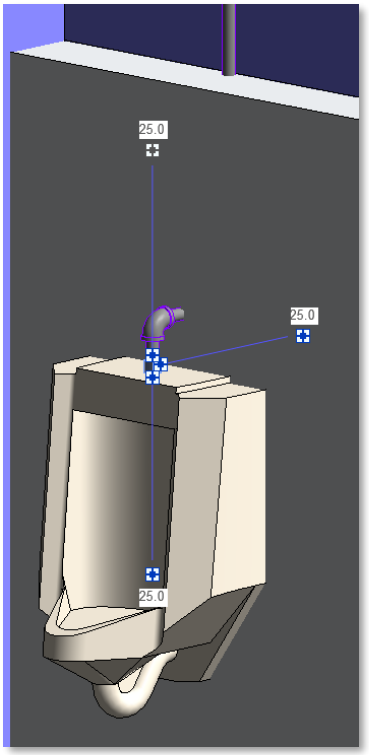
By IFC Representation

IFC Entity: IfcGeographicElement						
IFC USER-DEFINED SubType: LANDSCAPE_TREE, LANDSCAPE_HEDGE, LANDSCAPE_PALM, LANDSCAPE_SHRUBS, LANDSCAPE_EXTERNALPLANTING						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	ReasonForRemoval	Text	-	-	-	-
2	Species	Text	-	-	-	-
3	Status	Text	-	-	-	Existing, To be Removed, Proposed/New
4	TreeNumber	Text	-	-	-	-
5	Girth	Length	-	mm	-	-
6	TreeHeight	Length	-	mm	-	-
7	ApprovedSoilMixture	Boolean	-	-	Yes	TRUE / FALSE
8	PalmType	Text	-	-	-	-
9	SingleStem	Text	-	-	-	-
10	TreeSize	Text	-	-	-	-
11	Turf	Boolean	-	-	Yes	TRUE / FALSE

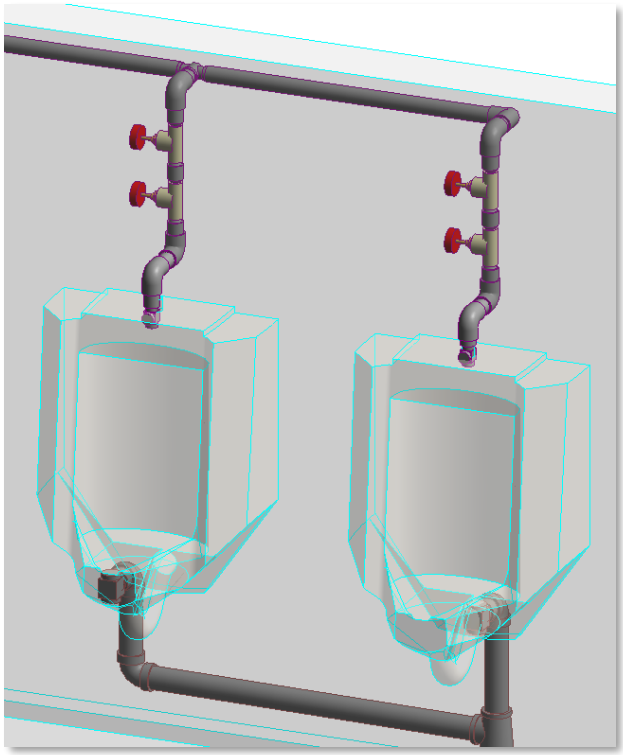
Urinal

By IFC Representation

IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: URINAL						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	AmbulantDisabled	Boolean	-	-	Yes	TRUE / FALSE
2	ChildrenFriendly	Boolean	-	-	Yes	TRUE / FALSE
3	Mounting	Text	-	-	-	-
4	Waterless	Boolean	-	-	Yes	TRUE / FALSE



S4 – Fig 92 : Urinal



S4 – Fig 93 : Urinal

Wall

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Earthworks / Typography	URA	**Earthworks, Retaining Walls and Boundary Walls** Height of Retaining Wall(s), Extent of Earthfill and Impact on Surroundings

G1.5	Piling Gateway (optional)		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each residential unit to be compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Buildability	BCA	**Buildability Design (Scoring)** • B-Score Calculations
	Earthworks / Typography	URA	**Developments involving Waterbodies** • Treatment of Retaining Wall **Earthworks, Retaining Walls and Boundary Walls** • Boundary Wall – Height and Treatment
	Fire Compartmentation	SCDF	**Compartmentation** *Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Each residential unit to be compartmented • Separation of Purpose Groups • Fire Rating of Compartment • Compartmentation by Height • Vertical Fire Spread Requirements

Wall

Legend: Architecture C&S M&E

By Key Gateways

G2	**Construction Gateway** *(continued from previous page)*		
	Gateway Key Words	**Agency**	**Requirement Category**
	Fire Compartmentation	SCDF	*Can be provided at Piling Gateway (G1.5) or Construction Gateway (G2)* • Element of Structure to check Fire Rating
			Compartmentation • Separation of transit and non-transit occupancies • Separation of public and ancillary areas • Separation of commercial spaces • Separation between viaduct and M&E plantrooms / commercial spaces • Fire rating of compartment • Compartmentation by height • Vertical fire spread
	Household / Storey Shelter	BCA	**Household / Storey Shelter Details** • Compliance with technical requirements on shelter position, size, setback requirements • Submit CD Shock Calculations as supplementary non-BIM documentation • M&E inputs required for Transit Shelter
	Household / Storey Shelter	SCDF	**Shelter Requirements** • Protected shafts (with BCA)
	Materials	SCDF	**Fire Resistance of Element of Structure** • Element of structure shall have appropriate fire resistance
			Compartment Walls and Floors
	Public Health	NEA	**COPEH - Section 1 : Refuse Storage and Collection** 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

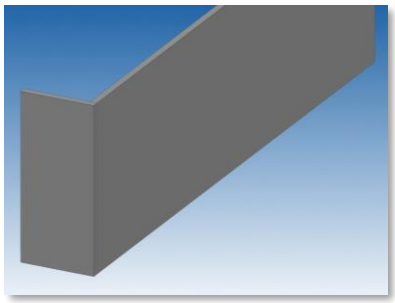
Wall

Legend: Architecture C&S M&E

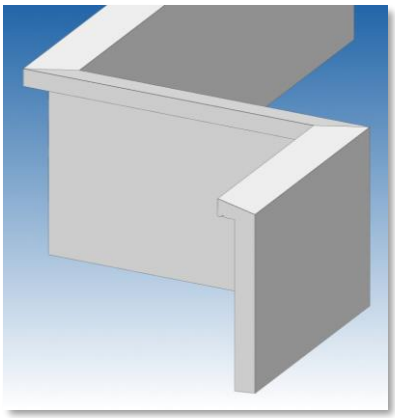
By Key Gateways

G2	Construction Gateway *(continued from previous page)*		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout, Landscape Deck	URA	**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

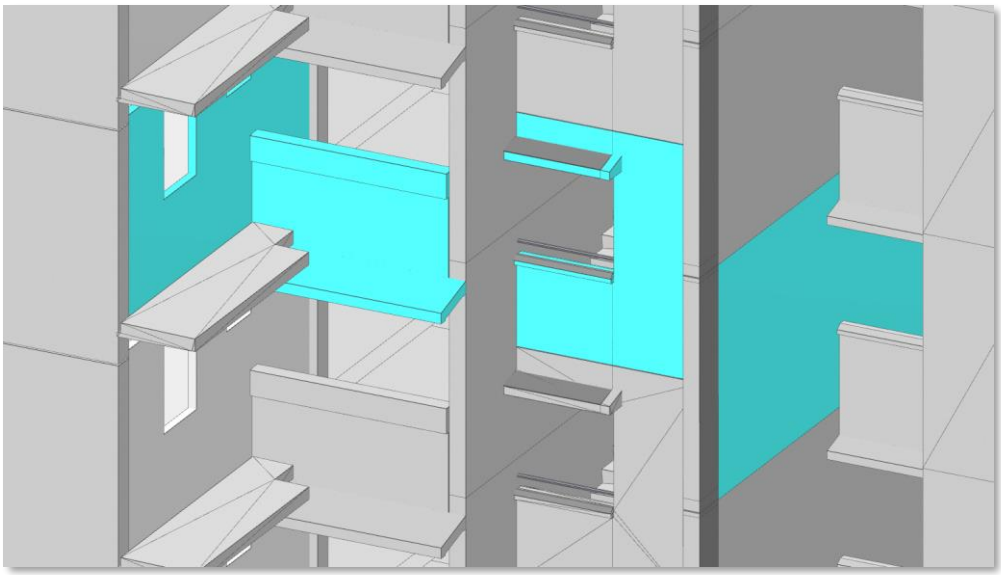
	Structural Design	BCA	**Structural Design (Main Structural Elements of Building excl. Piling)**
			• Complete set of IFC-SG model(s) for all structural framings & details
			• 2D drawings limited to the categories below:
			  ○ General notes
			  ○ Special details (e.g. slab reinforcement detailing, complex structure detailing, precast joints, prestressed details, steel connections.)



S4 – Fig 94 : Wall



S4 – Fig 95 : Wall (Parapet)



S4 – Fig 96 : Various Wall Types in relation to Building

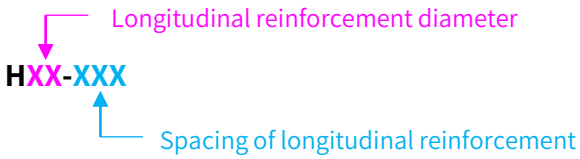
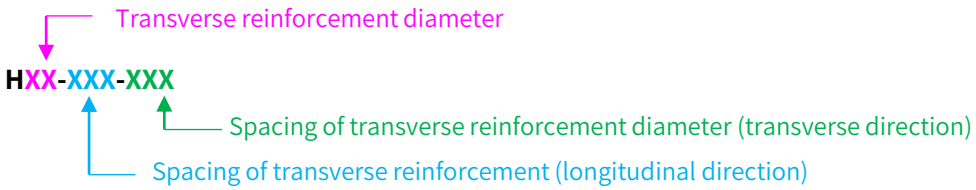
Wall

Modeling 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.

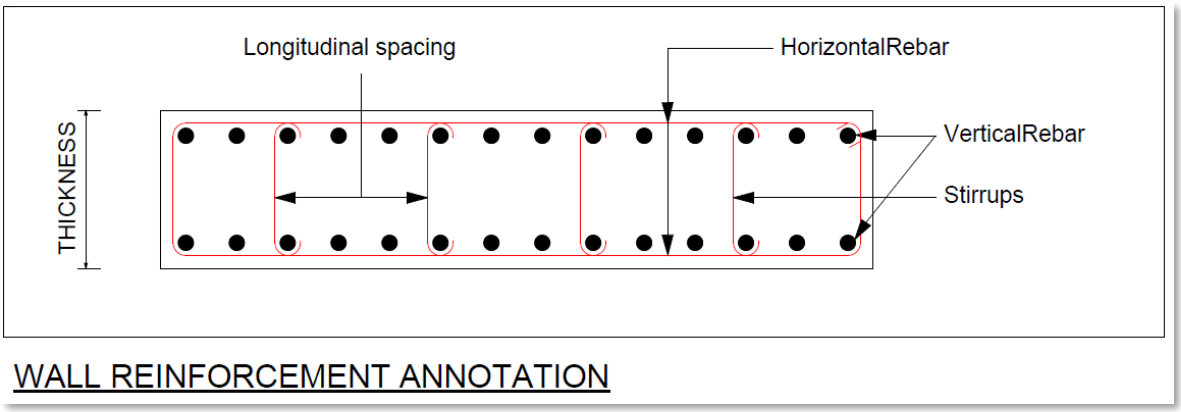
- 2D detail drawings are allowed for any irregular or complex wall section (e.g. L shape wall, D wall, retaining wall, etc.) with the indication of drawing number in the IFC-SG parameter "ReferTo2DDetail".

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 
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 (vertical direction) and follow with transverse spacing (horizontal direction) (e.g.H8-100-100) 

Wall

Wall Dimension and Reinforcement Definition (continued from previous page)



S4 – Fig 97 : Wall Reinforcement Annotation

By IFC Representation

IFC Entity: IfcWall						
IFC USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	MaterialGrade	Text	All walls	-	Yes	Refer to list^
2	ConstructionMethod	Text	All walls	-	Yes	Refer to list^
3	ReferTo2DDetail	Text	When required / relevant	-	No	Dwg Number
4	ReinforcementSteelGrade	Text	All walls	-	No	Refer to list^
5	ShelterUsage	Boolean	When required / relevant	-	Yes	TRUE / FALSE
6	Mark	Text	All walls	-	No	W1, W2
7	Thickness	Length	All walls	mm	No*	300
8	HorizontalRebar	Text	All walls	-	Yes	2H20-150
9	Stirrups	Text	All walls	-	Yes	H10-150-300
10	StirrupsType	Text	All walls	-	Yes	Refer to list^
11	VerticalRebar	Text	All walls	-	Yes	H32-150+H25-150
12	WorkingLoad_DA1-1	Integer	When required / relevant	kN	No	1234
13	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

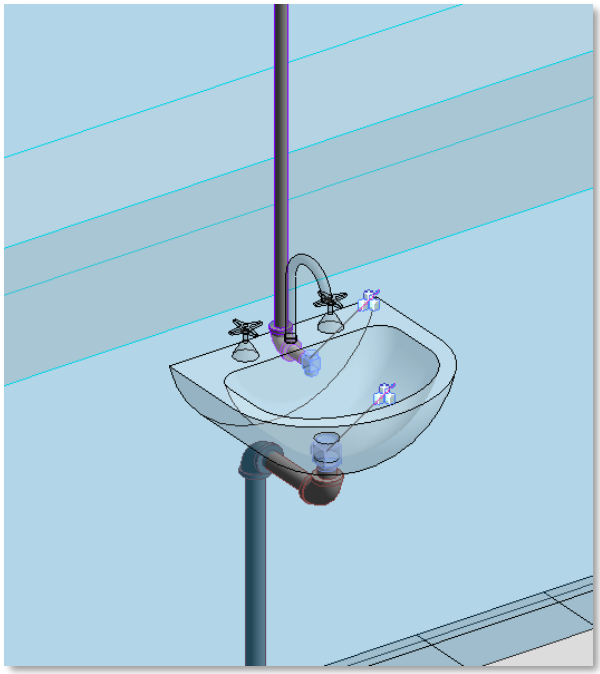
Example of Wall (RC Household Shelter Wall) Structural Element Input

250mm thick RC Precast Household Shelter Wall	**IFC Entity: IfcWall**		
	IFC USER-DEFINED 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	H13-100
	9	Stirrups	H8-600
	10	StirrupsType	C
	11	VerticalRebar	H13-100

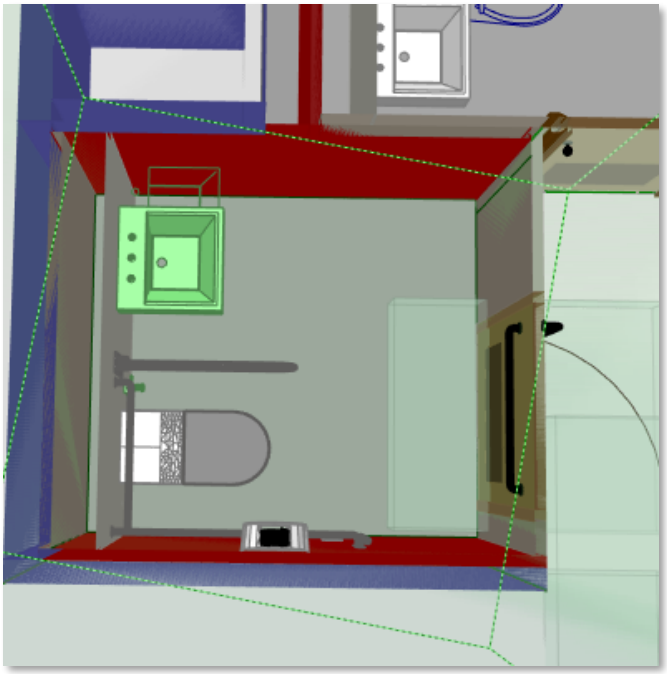
Wash Basin

By IFC Representation

IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: WASH HAND BASIN						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
2	ChildrenFriendly	Boolean	-	-	Yes	TRUE / FALSE
3	Mounting	Text	-	-		



S4 – Fig 98 : Wash Basin

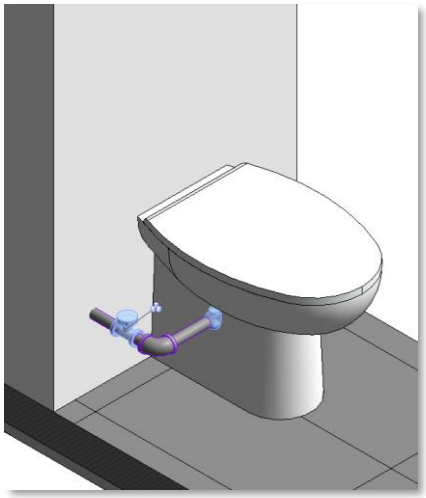


S4 – Fig 99 : Wash Basin highlighted in Green

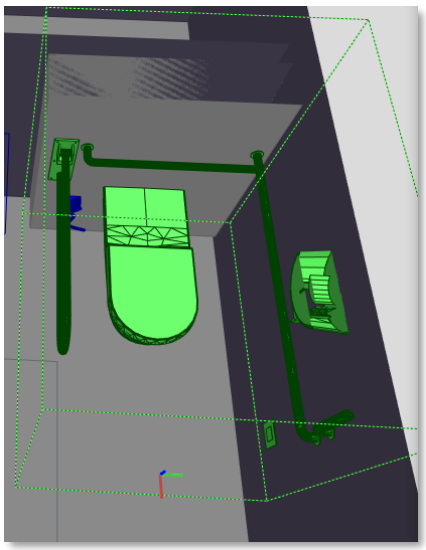
Water Closet

By IFC Representation

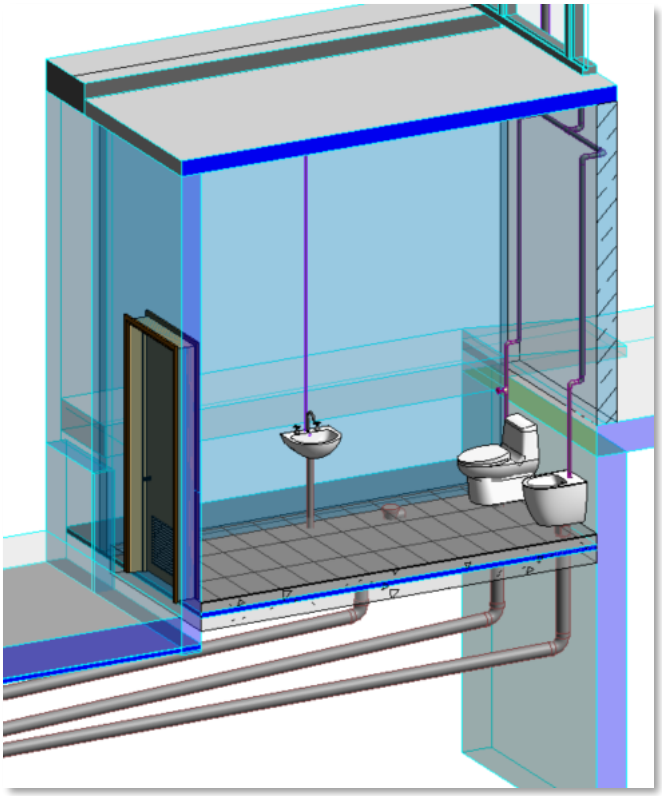
IFC Entity: IfcSanitaryTerminal						
IFC USER-DEFINED SubType: URINAL						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	AmbulantDisabled	Boolean	-	-	Yes	TRUE / FALSE
2	BarrierFreeAccessibility	Boolean	-	-	Yes	TRUE / FALSE
3	ChildrenFriendly	Boolean	-	-	Yes	TRUE / FALSE
4	PanMounting	Text	-	-	-	-
5	ToiletPanType	Boolean	-	-	Yes	TRUE / FALSE



S4 – Fig 100 : Water Closet



S4 – Fig 101 : Water Closet for Ambulant Disabled



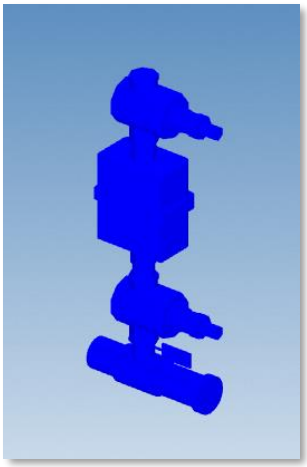
S4 – Fig 102 : Water Closet

Water Meter

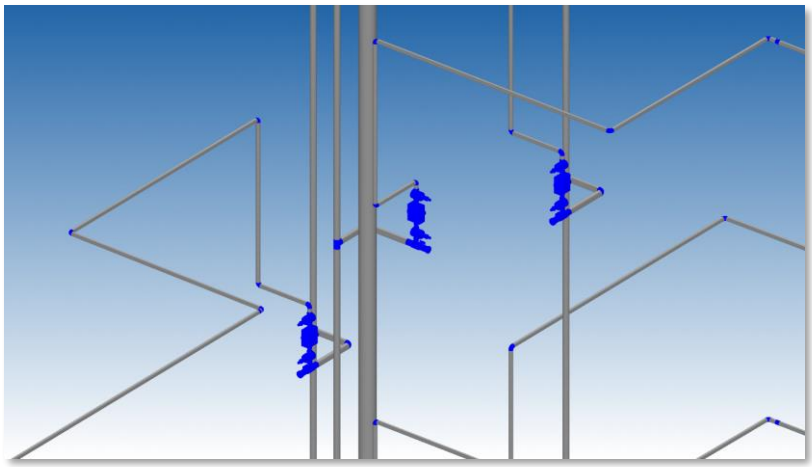
Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Connectivity	URA	**Open / Covered Walkways** • Level of Bulk Water Meter Chamber / Inspection Chamber



S4 – Fig 103 : Water Meter



S4 – Fig 104 : Water Meter

By IFC Representation

IFC Entity: IfcFlowMeter

IFC USER-DEFINED SubType: WATERMETER

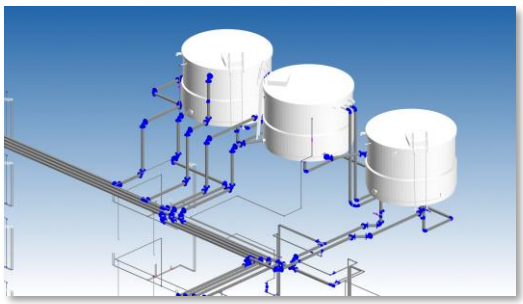
S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	Capacity	Volume	-	L	No	-
2	Diameter	Auto-generated from BIM	-	mm	No	-
3	Length	Auto-generated from BIM	-	mm	No	-
4	Purpose	Text	-	-	No	Private
5	UnitNumber	Text	-	-	-	-
6	UnitNumberTag	Boolean	-	-	Yes	TRUE / FALSE
7	WaterSupplySource	Text	-	-	-	-

Water Tank (Potable and Storage)

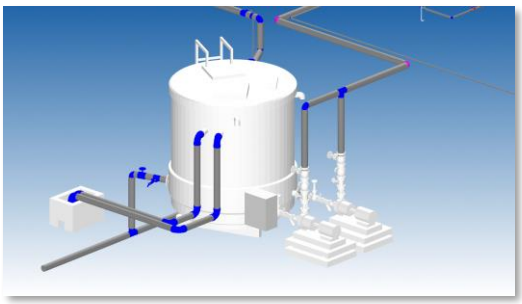
Legend: Architecture C&S M&E

By Key Gateways

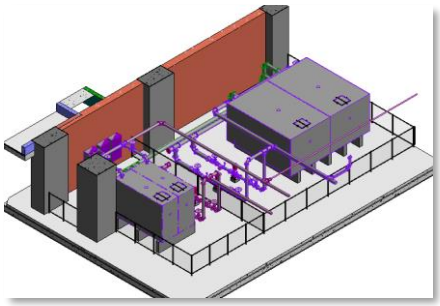
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Infra & Utilities (Internal)	PUB	Water Tank



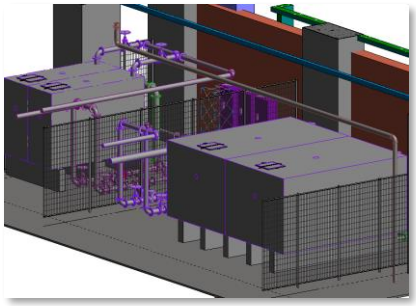
S4 – Fig 105 : Water Tank



S4 – Fig 107: Water Tank



S4 – Fig 106 : Water Tank



S4 – Fig 108 : Water Tank

By IFC Representation

IFC Entity: IfcTank

IFC USER-DEFINED SubType: STORAGE, DETENTIONTANK, BALANCINGTANK, SECTIONAL, REFUSEHANDLINGEQUIPMENT, VESSEL, EJECTORTANK, POTABLEWATER, RECHARGEWELL

S/N	IFC-SG Property	Property Type	Type of Elements	Unit	Input Limitation	Examples
1	IsPotable	Boolean	-	-	Yes	TRUE / FALSE
2	NominalCapacity	Real	-	-	-	-
3	Diameter	Auto-generated from BIM	-	mm	No	-
4	Height	Auto-generated from BIM	-	mm	No	-
5	Length	Auto-generated from BIM	-	mm	No	-

Water Tank (Potable and Storage)

By IFC Representation (continued from previous page)

IFC Entity: IfcTank						
IFC USER-DEFINED SubType: STORAGE, DETENTIONTANK, BALANCINGTANK, SECTIONAL, REFUSEHANDLINGEQUIPMENT, VESSEL, EJECTORTANK, POTABLEWATER, RECHARGEWELL						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
6	Thickness	Auto-generated from BIM	-	mm	No	-
7	Width	Auto-generated from BIM	-	mm	No	-
8	TradeEffluent	Boolean	-	-	Yes	TRUE / FALSE
9	CompactionRatio	Text	-	-	No	-
10	EquipmentType	Text	-	-	No	-

Window

Legend: Architecture C&S M&E

By Key Gateways

G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Household / Storey Shelter	BCA	**Household / Storey Shelter Details** • Compliance with technical requirements on shelter position, size, setback requirements • Submit CD Shock Calculations as supplementary non-BIM documentation • M&E inputs required for Transit Shelter

S4 – Fig 109 : Window

S4 – Fig 110 : Window in relation to Building

By IFC Representation

IFC Entity: IfcWindow						
IFC USER-DEFINED SubType: BAYWINDOW, VENTILATIONSLEEVE, SKYLIGHT, WINDOW						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	InnerDiameter	Length	-	mm	-	-
2	OuterDiameter	Length	-	mm	-	-
3	StructuralWidth	Length	-	mm	-	-
4	StructuralHeight	Length	-	mm	-	-
5	FireAccessOpening	Boolean	-	N.A.	Yes	TRUE / FALSE

Vehicular Parking

Legend: Architecture C&S M&E

By Key Gateways

G1	Design Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Site Layout Only	NParks	**Greenery Provision for Open-Air Parking Areas at Street Level (Spatial Provision)** • To secure the dimensions (width and depth) and requirements for the planting areas according to NParks Guidelines (Chapter 3)
	Vehicular Parking	LTA	• The proposed development shall comply fully with the prevailing Parking Places (Provision of Parking Places and Parking Lots) Rules and other relevant guidelines of the Authority. • The number of parking lots provided shall be 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. • The geometric dimensions of the parking layout shall comply with the standard minimum dimensions as stipulated in the COP
		URA	**Parking** • Show location within site (e.g. underground; to check TCOT requirement for urban design requirements) • Nature (basement, surface, or podium) • Declare total number and breakdown of types

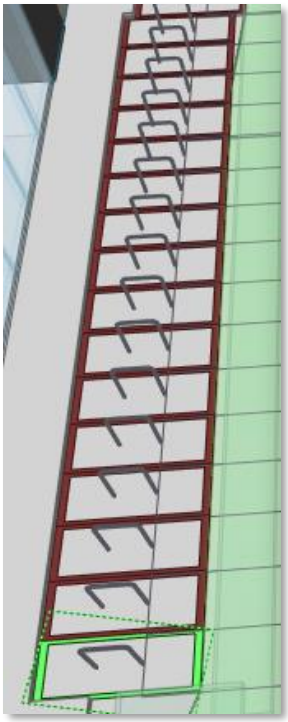
G2	Construction Gateway		
	Gateway Key Words	**Agency**	**Requirement Category**
	Access within Building	BCA	Accessible Route / Maneuvering Space (within the development)
	Connectivity	BCA	Accessible Route (to the ingress / egress development entrance)
		URA	**Walking and Cycling Plan** • Connectivity between buildings – show layout on plans, indicate width and levels • Deconflicting vehicular and pedestrian / cyclist traffic • Provision of biking lots and end-of-trip facilities – show location and GFA exemption
	Site Layout, Vehicular Parking	LTA	**All 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 • EV lots & charging stations

Vehicular Parking

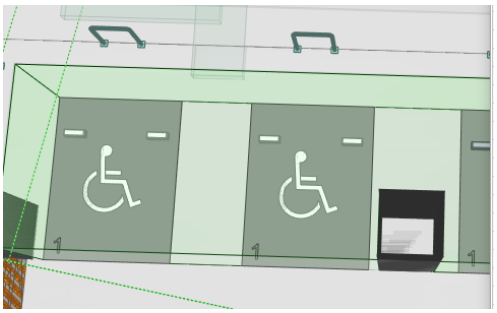
Legend: Architecture C&S M&E

By Key Gateways

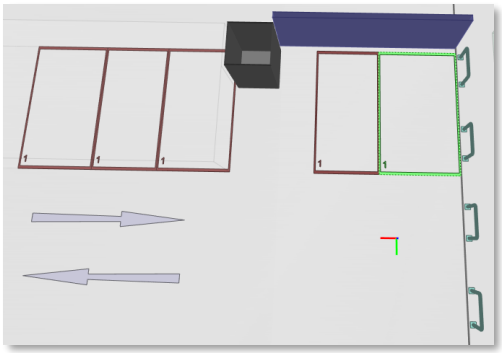
G2	**Construction Gateway** *(continued from previous page)*		
	Gateway Key Words	**Agency**	**Requirement Category**
	Vehicular Parking	BCA	Accessible Vehicle Parking
	Ventilation	BCA	Carpark Ventilation



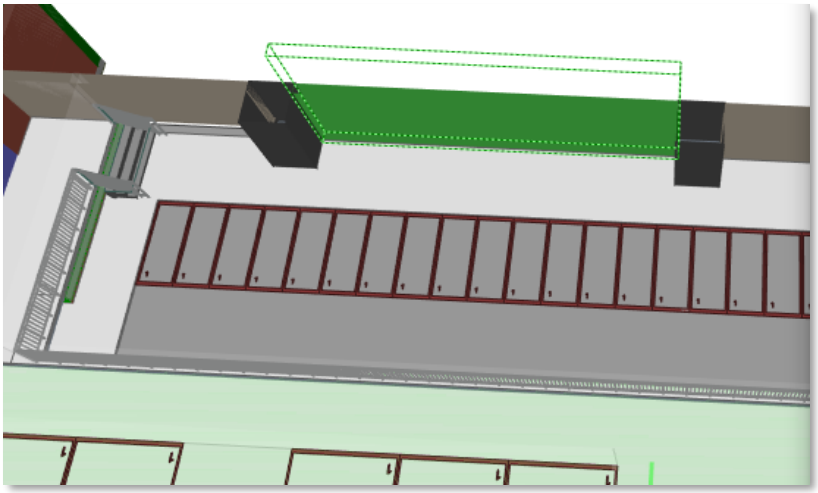
S4 – Fig 111 : Bicycle Lots



S4 – Fig 112 : Accessible Parking Lots



S4 – Fig 113 : Vehicular Parking Lots



S4 – Fig 114 : Parking Lots

Vehicular Parking

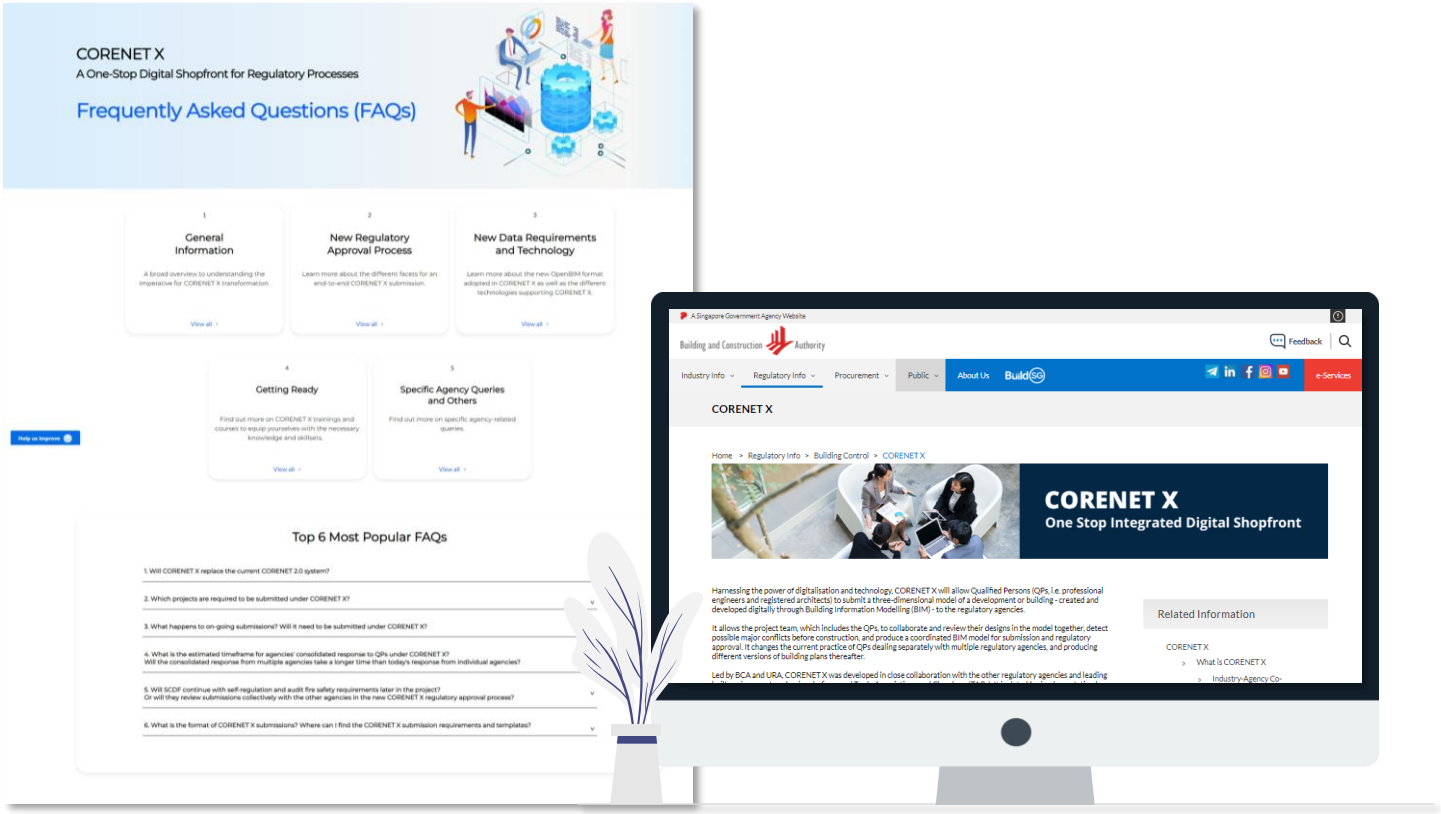
By IFC Representation

IFC Entity: IfcBuildingElementProxy						
IFC USER-DEFINED SubType: ACCESSIBLEROUTE, CARLOT, MOTOR-CYCLELOT, BICYCLELOT, BICYCLERACK, LORRYLOT, COACHLOT, BUSLOT, FIREENGINEACCESSWAY						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	BarrierFreeAccessibility	Boolean	-	-	Yes	TRUE / FALSE
2	FamilyParkingLot	Boolean	-	-	Yes	TRUE / FALSE
3	Length	Auto-generated from BIM	-	mm	No	N.A.
4	Width	Auto-generated from BIM	-	mm	No	N.A.
5	BicycleLotCount	Integer	-	-	No	N.A.
6	BicycleParkingRack_Type	Text	-	-	Yes	Single Tier, Double Tier
7	EVLot	Boolean	-	-	Yes	TRUE / FALSE
8	CarParking_ServedByCarLift	Boolean	-	-	Yes	TRUE / FALSE
9	ParkingUse	Text	-	-	No	Electric Vehicle, Oil Tanker, Buggy, Vacuum Truck, Mobile Tanker
10	Perforated	Boolean	-	-	Yes	TRUE / FALSE
11	OpenAtGrade	Boolean	-	-	Yes	TRUE / FALSE
12	LoadingCapacity	Real	-	Tonnes	No	24 tonnes
13	VehicleType	Text	-	N.A.	No	Rigid-framed vehicle

IFC Entity: IfcSpace						
IFC USER-DEFINED SubType: N.A.						
S/N	**IFC-SG Property**	**Property Type**	**Type of Elements**	**Unit**	**Input Limitation**	**Examples**
1	NormalVentilationMode	Text	-	-	Yes	Natural Ventilation, Air Conditioning Mechanical Ventilation, Mechanical Ventilation
2	Area	Auto-generated from BIM	-	m^2	No	-

CORENET X Website and FAQs

CORENET X website was launched on 07 Sep 2021 at the Opening Ceremony of the International Built Environment (IBEW) 2021 during Minister Desmond Lee's announcement. The website contains one-stop information on future regulatory process, FAQs, infographics and resource toolkits.



Scan here to access CORENET X website or go to https://go.gov.sg/cx

corenetX

Regulatory Agencies

Building and Construction Authority
(BCA)

Urban Redevelopment Authority
(URA)

Land Transport Authority
(LTA)

National Environment Agency
(NEA)

National Parks Board
(NParks)

Public Utilities Board
(PUB)

Singapore Civil Defence Force
(SCDF)

Singapore Land Authority
(SLA)

Industry Partners

ECAS Consultants Pte Ltd

P&T Consultants Pte Ltd

United Projects Consultants Pte Ltd

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