Project Planning in CORENET X

No. of Slides: 26

Recap

Criteria and guidelines for Part ST submission

Large projects that qualify for part ST Submissions

❑ Building projects:

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

❑ Infrastructure projects:

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

Guidelines on Part ST Submissions (Large Building Projects)

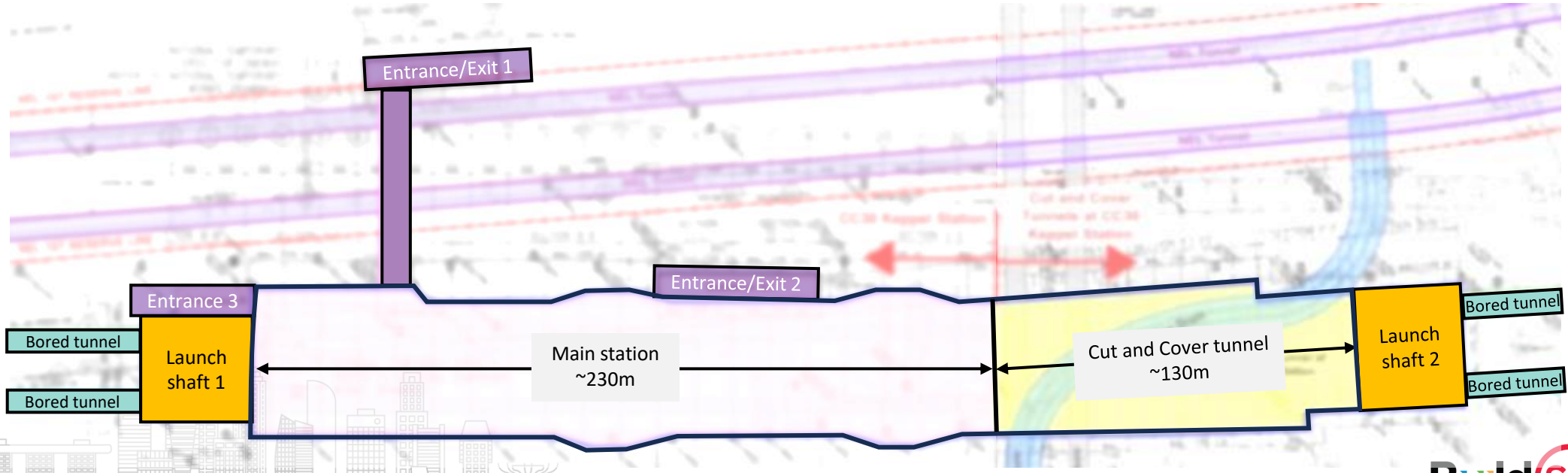
Project teams should propose the Part ST Submission plan based on below guidelines and seek agencies' concurrence during pre-submission consultations, before making any submissions.

Scope of Works	Number of Part ST Submissions Allowed
Superstructure	1 no. of Part ST Submission for **every 4 blocks** (rounded to nearest unit) 1 no. of Part ST submission for **every 40 landed units** (rounded to nearest unit) Example: For a building project consisting of 9 tower blocks, 3 no. of Part ST Submissions of equal GFA is allowed. (i.e. if the total GFA is 105,000 sqm, each of the Part ST Submission should be about 35,000 sqm)
Common Basement	1 no. of Part ST Submission
Common Podium	1 no. of Part ST Submission
All ancillary works	1 no. of Part ST Submission
All external works	1 no. of Part ST Submission
ERSS	Part ST submission not applicable (submitted under Independent submissions as per *the current arrangement under the standard RABW (without phasing) framework)*
Cladding	
Façade	
Temporary Deck	

Guidelines on Part ST Submissions (Infrastructure Projects)

Section of underground MRT Station	Number of Part ST Submissions Allowed	Number of Part ST Submissions in Example
Main station	1 no. of Part ST Submission for **every 150m** (rounded up to nearest unit)	2 no. of Part ST Submissions
Cut and cover tunnel, Open box tunnels		1 no. of Part ST Submission
Entrances/Exits	1 no. of Part ST Submission **each**	3 no. of Part ST Submissions
Launch shafts	1 no. of Part ST Submission **each**	2 no. of Part ST Submissions
Bored tunnels	1 no. of Part ST Submission **per direction**	2 no. of Part ST Submissions

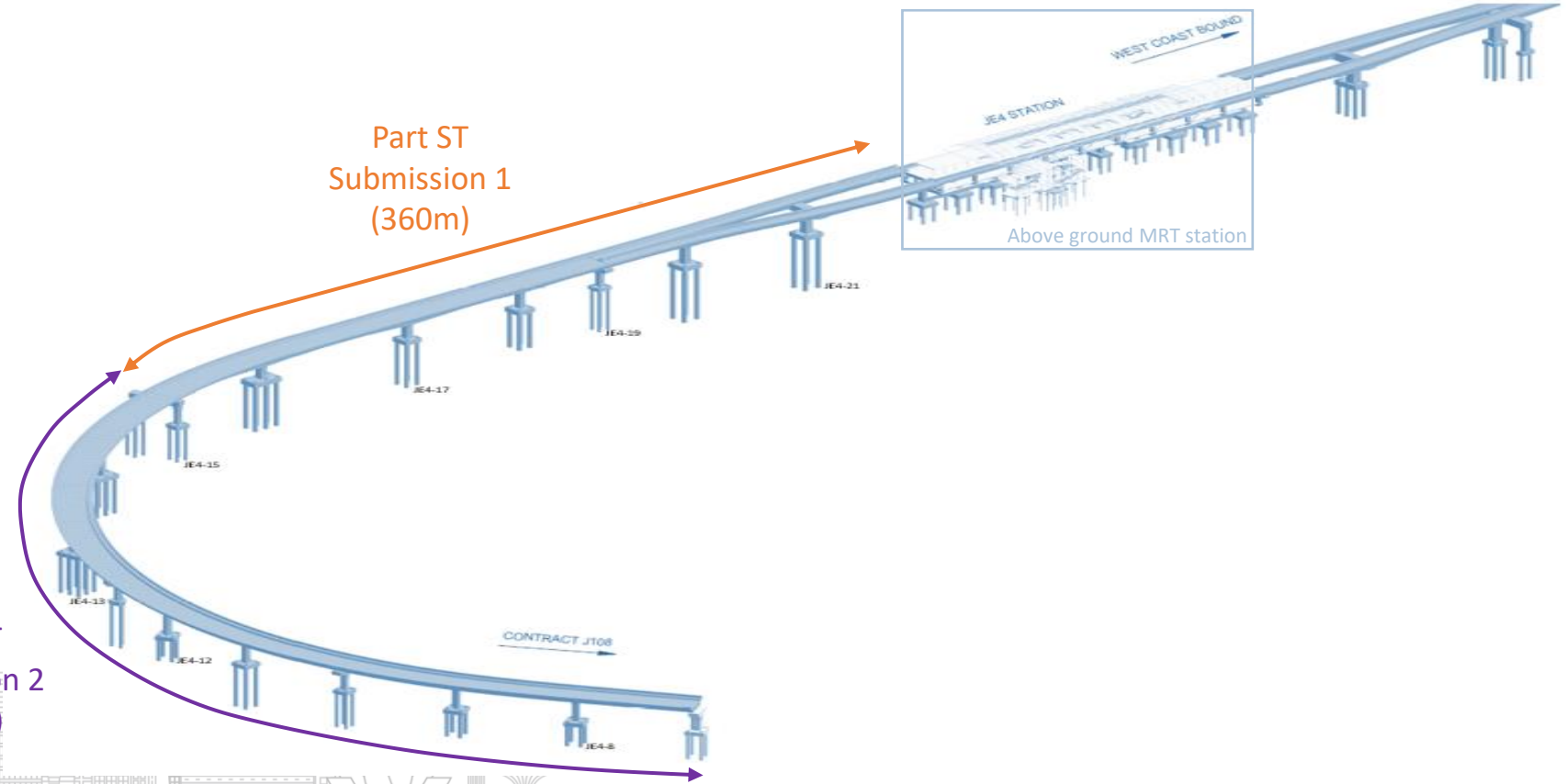
Example Project: Underground MRT station with 3 entrances/exits and 2 launch shafts



Guidelines on Part ST Submissions (Infrastructure Projects)

Infrastructures	Number of Part ST Submissions Allowed	Number of Part ST Submissions in Example
Railway tracks and viaducts	1 no. of Part ST Submission for **every 400m** (rounded up to nearest unit)	2 no. of Part ST Submissions [751 / 400 = 1.88 (rounded to 2)]

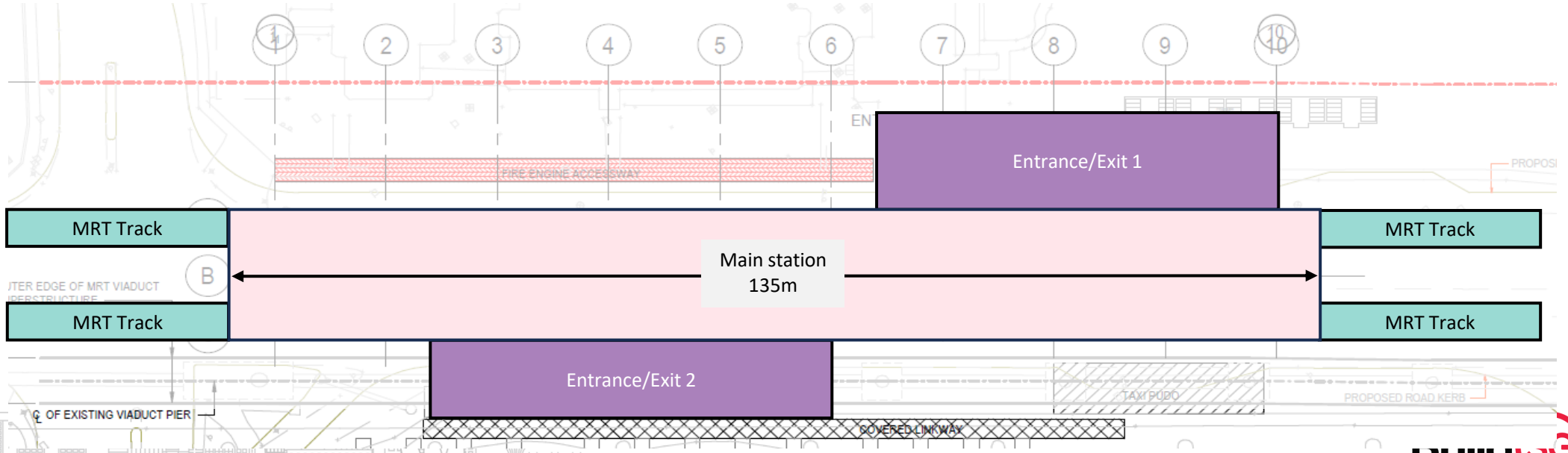
Example Project: 751m long aboveground Railway Track



Guidelines on Part ST Submissions (Infrastructure Projects)

Section of Aboveground MRT Station	Number of Part ST Submissions Allowed	Number of Part ST Submission in Example
Main station	As per underground MRT station (1 no. of Part ST Submission for every 150m)	1 no. of Part ST Submission
Entrances/Exits	As per underground MRT station (1 no. of Part ST Submission each)	2 no. of Part ST Submissions
MRT tracks	Aboveground – As per Railway Track (1 no. of Part ST Submission for every 400m) Underground – As per Bored Tunnel (1 no. of Part ST Submission per direction) or Cut and cover tunnel (1 no. of Part ST Submission for every 150m)	

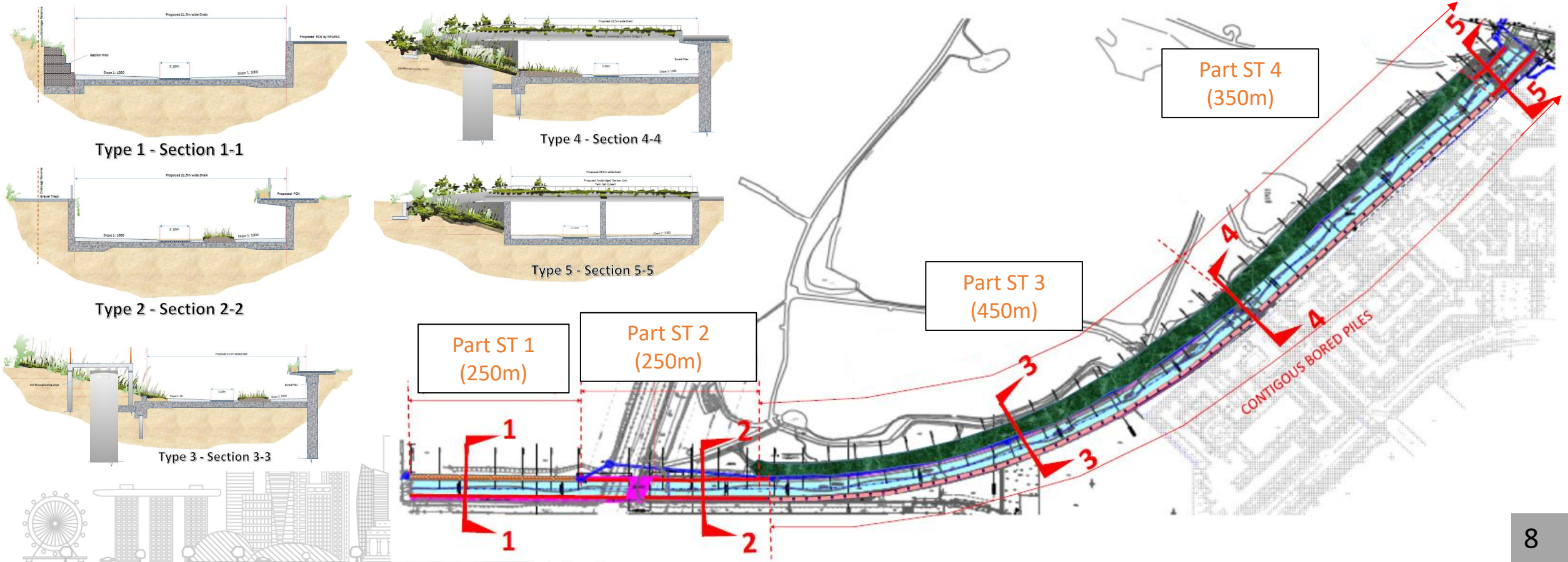
Example Project: Aboveground MRT station with 2 entrances/exits



Guidelines on Part ST Submissions (Infrastructure Projects)

Infrastructures	Number of Part ST Submissions Allowed	Number of Part ST Submissions in Example
Drainage and sewer	1 no. of Part ST Submission for **every 400m** (rounded up to nearest unit)	4 no. of Part ST Submissions [1300 / 400 = 3.25 (rounded to 4)]

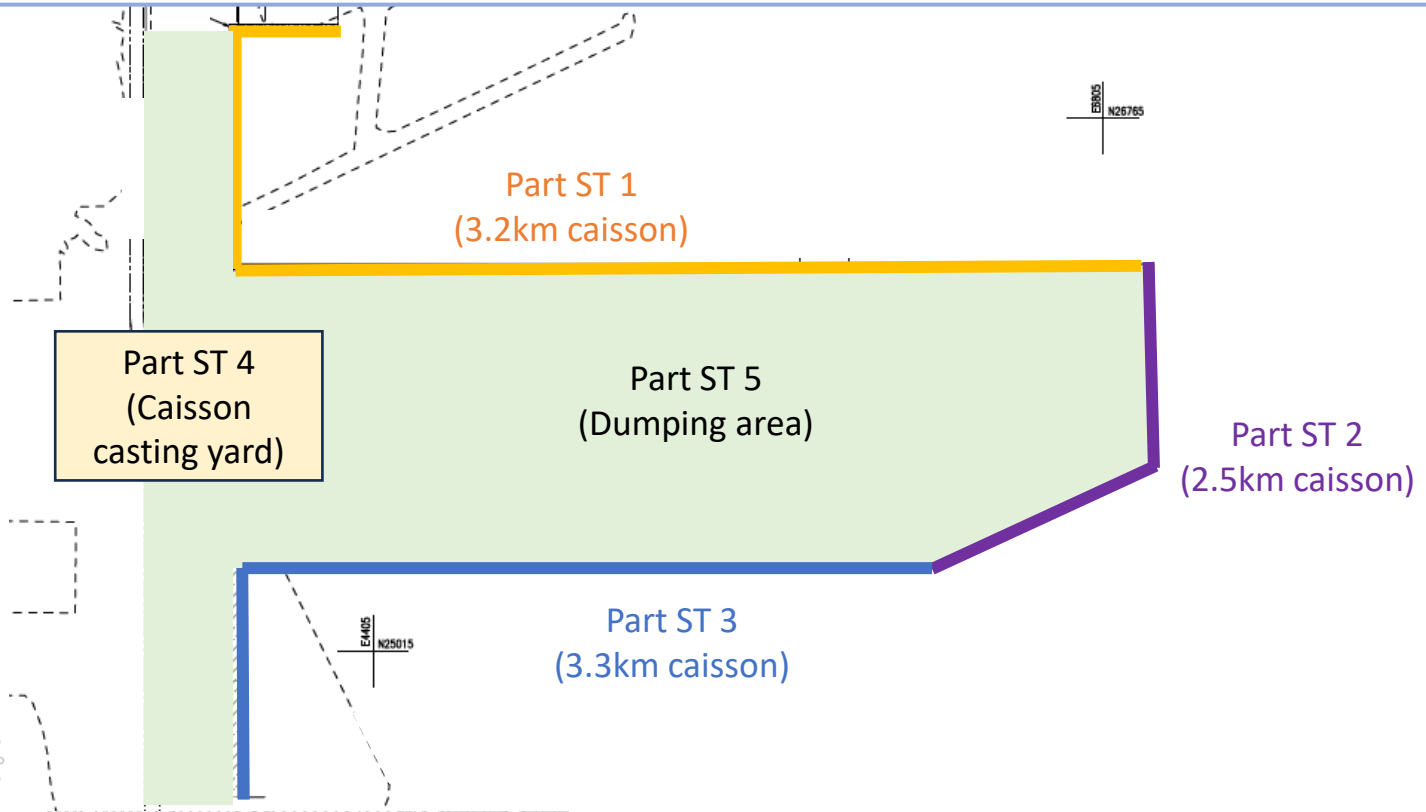
Example Project: 1300m long drainage with 5 unique drain sections



Guidelines on Part ST Submissions (Infrastructure Projects)

Infrastructures	Number of Part ST Submissions Allowed	Number of Part ST Submissions in Example
Land reclamation, revetment, sea wall, bund wall	1 no. of Part ST Submission for **every 4,000m** (rounded up to nearest unit)	3 no. of Part ST Submission [9000 / 4000 = 2.25 (rounded up to 3)]
	1 no. of Part ST Submission for **each** casting yard	1 no.
	1 no. of Part ST Submission for dumping plan	1 no.

Example Project: 9km long land reclamation project with 1 caisson casting yard



Due to the complexity and scale of such projects, factors that can be considered for part ST submissions quota adjustments include:

a. Variation of soil types;
b. Retaining structure types; and
c. Foundation types.

Case study 1

Development with multiple blocks of building

Case study 1

Development with multiple blocks of building and ancillary structures (Project A)

- 5 no. of 25-storey blocks, 2 no. of 32-storey blocks and a 7-storey carpark.
- Ancillary structures such as precinct pavilion, electrical substation, playground and drop off points.
- Bus stop and linkway to be constructed beyond the site boundary (i.e. external works).
- The total GFA is 50,000sqm.
- Involves PPVC modules

Qualifies for Part ST submission:

✓ GFA > 40,000sqm

✓ 5 or more blocks of building of at least 4 storeys high each

No. of allowable part STs in **Construction Gateway (CG)**

➔ 2no. part ST for superstructure (for main buildings and MCPS)

➔ 1no. part ST for all ancillary works

➔ 1no. part ST for all external works

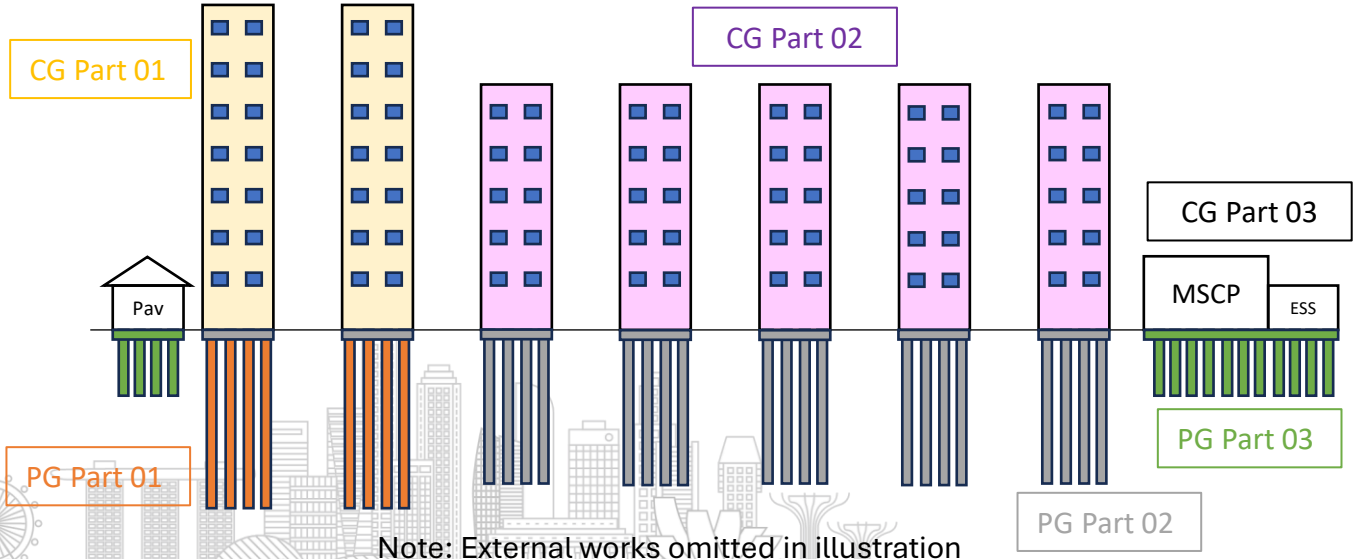
No. of allowable part STs in **Piling Gateway (PG)**

➔ 4no. part ST for Piling gateway (PG), mapped to allowable part STs in CG

Lessons from Case Study 1

Proposed part ST packages by project team

Gateway	Part ST	Scope in each part ST
Piling Gateway (PG)	PG Part 01	Piling for **2 no. 32-storey blocks** (GBW)
	PG Part 02	Piling for **5 no. 25-storey blocks** Pile cap, base slab and ground beam for **all 7 blocks**
	PG Part 03	Substructure of **ancillary structures and external works**, including piling, pile cap, base slab and ground beam
Construction Gateway (CG)	CG Part 01	Superstructure for **2 no. 32-storey blocks**
	CG Part 02	Superstructure for **5 no. 25-storey blocks**
	CG Part 03	**Ancillary works** (carpark. pavilion, substation, playground, drop off point)
	CG Part 04	**External works** (bus stops and linkway)



Note: External works omitted in illustration

Project parties are encouraged to combine part ST packages to achieve higher degree of synchronization.

In this case for example, project parties utilised only 3 no. of part STs instead of the allowed 4 nos.

Part ST submission for projects involving GBW, LTA RPZ in PG

Part ST submission is allowed in Piling Gateway (PG) for projects involving GBW or LTA Railway Protection Zone (RPZ) even if the project does not qualify for part ST submission in Construction Gateway (CG).

Clarifications:

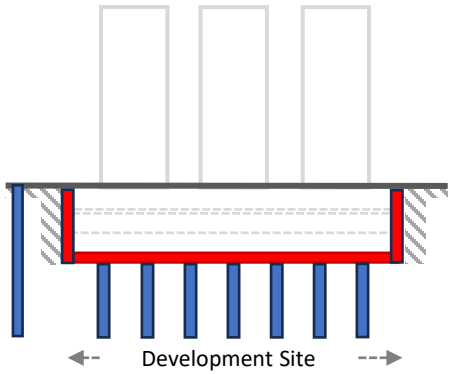
Streamline submission process to allow parallel submission of packages comprising of:

a) GBW (e.g. piles of buildings that are 30 storeys or more) vs non-GBW (e.g. pile cap, base slab, basement wall)

b) Buildings within the RPZ vs outside RPZ

Horizontal cut

(for projects involving mixture of GBW and non-GBW)



PG Part 01
Perm ERSS, piling which are GBW

PG Part 02
Pile cap, base slab, ground beam, basement wall which are non GBW

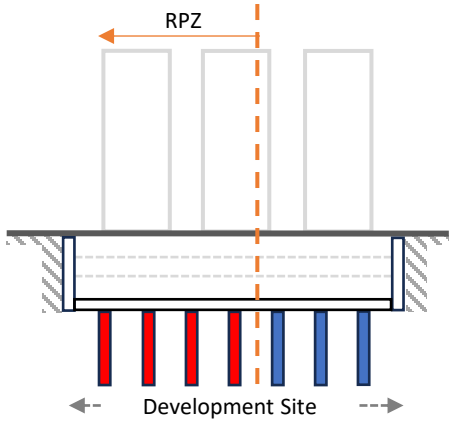
Pros

- Facilitates on-site construction progress
- Clear packaging of works enabling more efficient design preparation

OR

Vertical cut

(for projects involving progressive site access or RPZ)



Part ST 01
Piling outside RPZ

Part ST 02
Piling inside RPZ

Perm ERSS, pile cap, base slab, ground beam, to be included in either Part ST 01 or Part ST 02

Pros

- Introduces flexibility for sites with progressive access or sites partially within RPZ, facilitates on-site construction progress

Lessons from Case Study 1

Insufficient time allocated for structural design and AC checking caused further delay in approvals and abortive works due to unsafe design, multiple amendments, many Written Directions.

- Part ST packages are larger in CORENET X compared to the ST packages in CORENET 2
- BCA gathered that many ACs were given insufficient time for design checking (e.g. ACs given only 2 weeks instead of the required 4 weeks for checking of a part PG submission)
- Frequent design changes during structural design and checking phase led to abortive works and extension of programme timeline was not granted.

Recommended duration for AC checking works

- Developed with input from practicing ACs.
- Duration covers typical AC scope of works, from design freeze, sharing of structural design with AC, QP-AC discussion, design amendments, to AC report preparation.
- Duration should be adjusted based on the complexity of the project and scope of part ST.

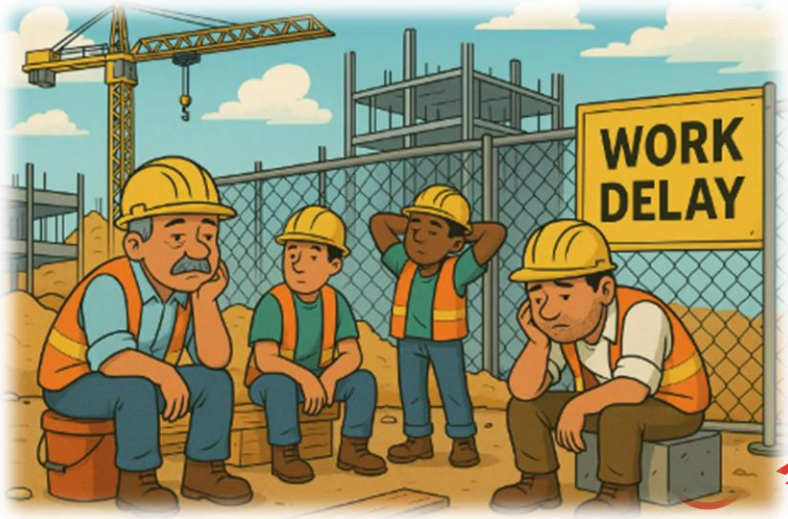
3.5 Gateway	Current industry norm	BCA's recommended duration	Remarks
Piling Gateway	2 – 4 weeks	3 – 5 weeks after design freeze	Significantly insufficient time given overall, more time needed for AC to develop Analysis & Design (A&D) model of building
Construction Gateway	3 – 5 weeks		Project programme should take into account scope and scale of works in part STs

Lessons from Case Study 1

Poor estimation of construction duration and time required for design approvals led to machinery and workers idling on site.

Some helpful questions to ask when planning construction programme include:

- ❑ Are there sufficient work on site before the subsequent submission packages obtain approval?
- ❑ Will a smaller ST package that is designed and approved quicker lead to delays in construction progress due to insufficient works approved for construction?
- ❑ When should I onboard the various project parties including builder and AC so that they can have sufficient time to execute the required works?
- ❑ When should we finalise the design so that sufficient time is allocated for QPs and ACs to deliver their tasks and avoid delays?
- ❑ What is the duration required for instrumentation and monitoring (I&M) works?
- ❑ Have I considered the input from my builders on their capacity and construction feasibility?



Case Study 2

Infrastructure works – Underground MRT station

Lessons from Case Study 2

Infrastructure works involving top-down basement construction (Project B)

- underground MRT station project of 400m long main station
- constructed using top-down method
- 3 entrances/exits to the station
- tunnels connected to both ends of the MRT station.

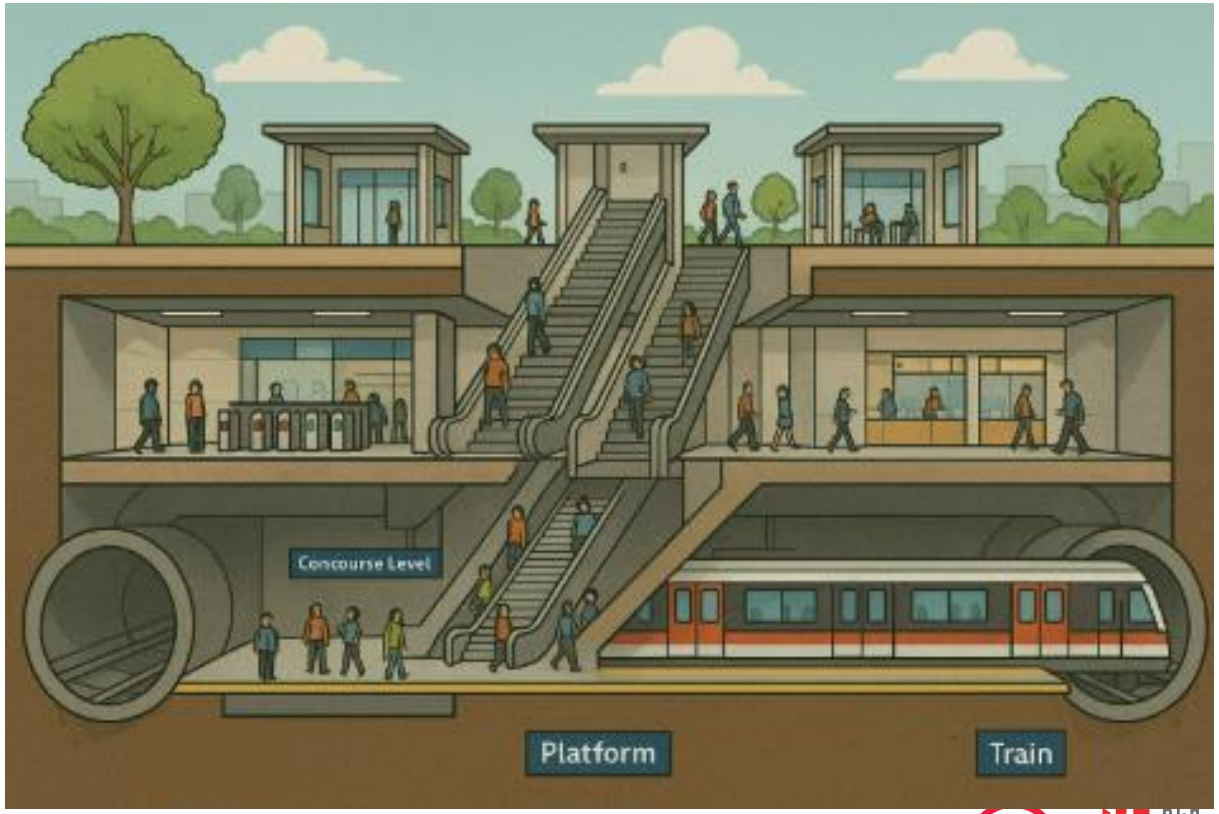
As per current industry practice, the project was split into two project references:

Project B1 - main station and entrances/exits

- Qualifies for part ST submission as the main station is >150m long
- PG qualifies for 3 no. of part STs

(see next slide on part ST on top-down construction)

Project B2 - tunnels at both ends of the station



Lessons from Case Study 2

Proposed part ST packages by project team

Project B1 - Main station and entrances/exits

Part ST submissions	Scope in each part ST
PG Part 01	Pile foundation
PG Part 02	CBP wall and sections, plunged-in columns, king posts, ground improvement, instrumentation & monitoring, complete basement construction sequence, impact assessment, slab/steel strutting layout
PG Part 03	Details of RC slab acting as ERSS struts and steel struts
CG Part 01	Station internal structures
CG Part 02	Entrance 1
CG Part 03	Entrance 2
CG Part 04	Entrance 3

Project B1 - Main station and entrances/exits

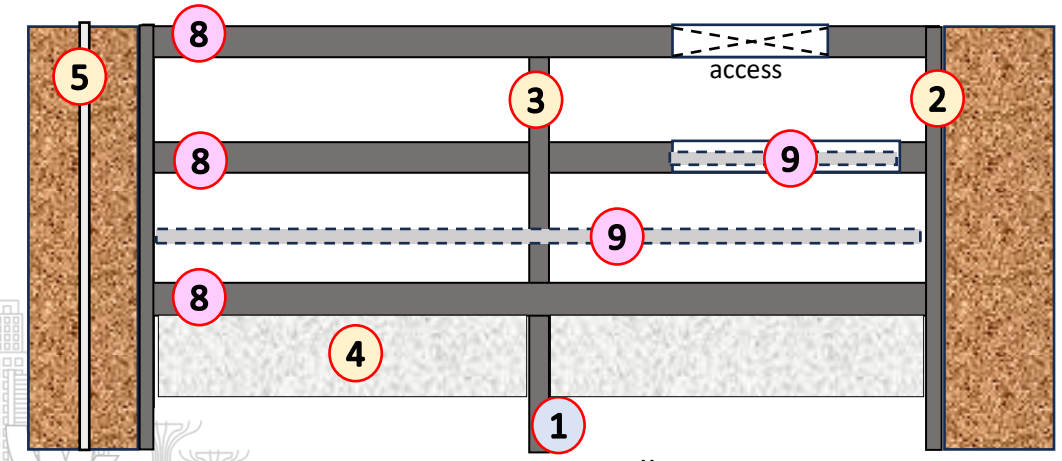
Part ST submissions	Scope in each part ST
PG Part 01	**Tunnels at West end** of station, including tunnel lining, Instrumentation and monitoring plan
PG Part 02	**Tunnels at East end** of station, including tunnel lining, Instrumentation and monitoring plan

Part ST submission for Top-Down basement construction

Illustration to provide clarity on part ST submission for top-down basement construction.

No change to current practice.

Part ST packaging	Label	Items to be submitted	QP arrangements
Part ST01	1	Pile foundation	QP1(ST) + QP2(Geo)
Part ST02	2	ERSS wall and section	QP1(ST) + QP2(Geo) -or- QP2(ST + Geo)
	3	Plunged-in columns / King posts	
	4	Ground improvement	
	5	Instrumentation & Monitoring	
	6	Complete construction sequence	
	7	Impact assessment	
	8.1, 9.1	Slab/ steel strutting **layout**	
Part ST03 (in PG or in CG) (Can be combined with part ST02)	8.2	Permanent RC slab **details**	
	9.2	Temporary steel strut **details**	

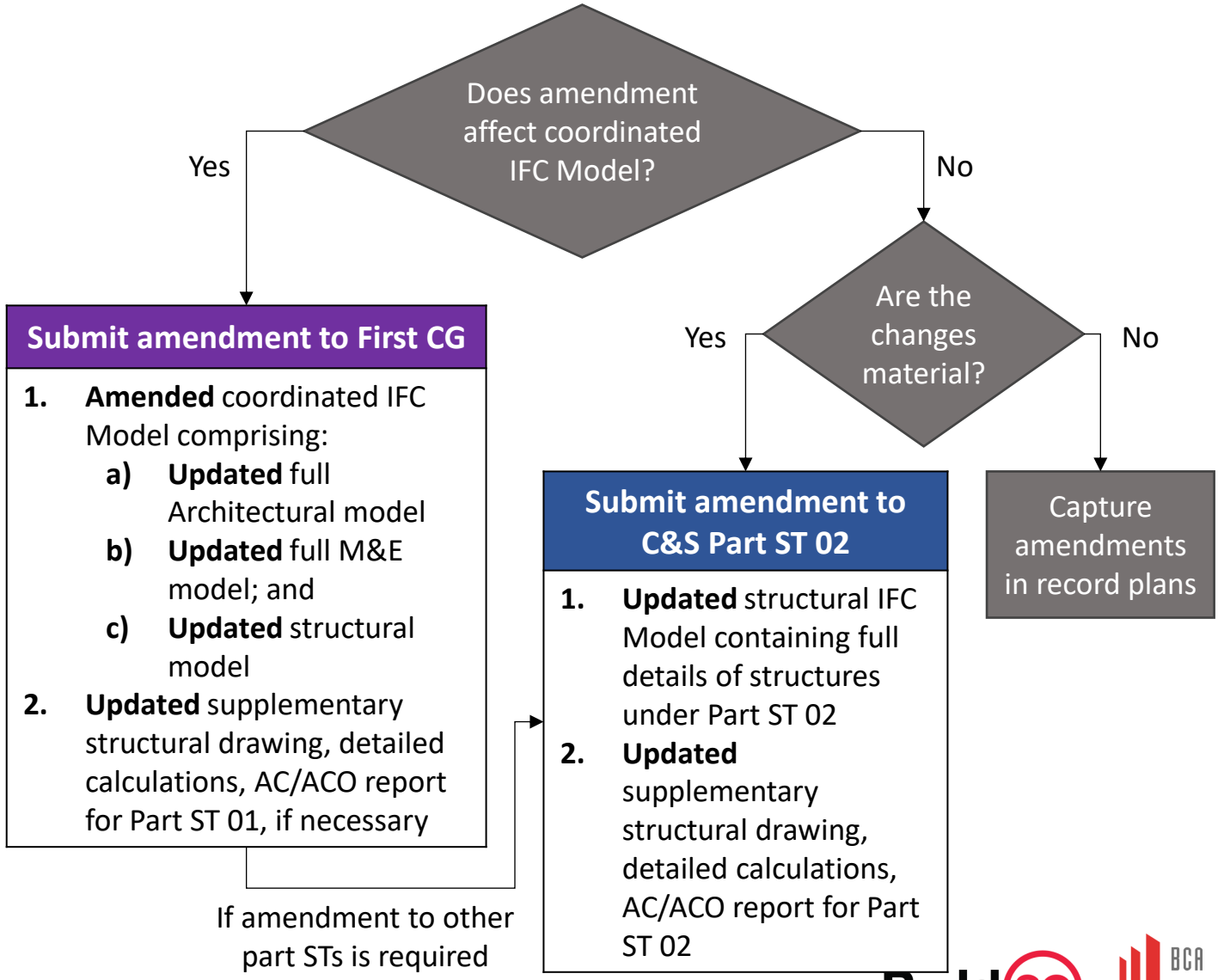


Top-Down Construction Illustration

Lessons from Case Study 2

Amendments must be made to the original submission and the carcass (if carcass is affected by the amendment)

- While the project parties were performing CG Part 02 submissions, amendments to the slab openings was necessary.
- As the slab (acting as struts to ERSS) were submitted and approved in PG Part 03, the amendment had to be made to the same PG Part 03 and not in CG Part 02 which is the current submission package.
- As the openings also affects the carcass submitted in CG 01, an amendment to CG 01 was also required.



Case Study 3

Mixed development with common podium and basement

Lessons from Case Study 3

10 blocks of buildings with shared podium (Project C)

- 10 blocks of 15-storey development and a common podium with communal facilities including pavilion, gym, swimming pool and playground.
- bus stop and linkway to be constructed beyond the site boundary.
- Part of the plot is located within LTA Railway Protection Zone (RPZ).
- The total GFA for this project is about 62,000sqm.
- The project also involves demolition of existing low-rise buildings occupying the site.

✓ Qualifies for Part ST submission:

1) GFA > 40,000sqm
2) 3 or more blocks of building of at least 4 storeys high each, with common podium or basement

No. of allowable part STs in **Construction Gateway (CG)**

➔ 3no. part ST for superstructure (for main buildings)
➔ 1no. part ST for common podium
➔ 1no. part ST for all external works

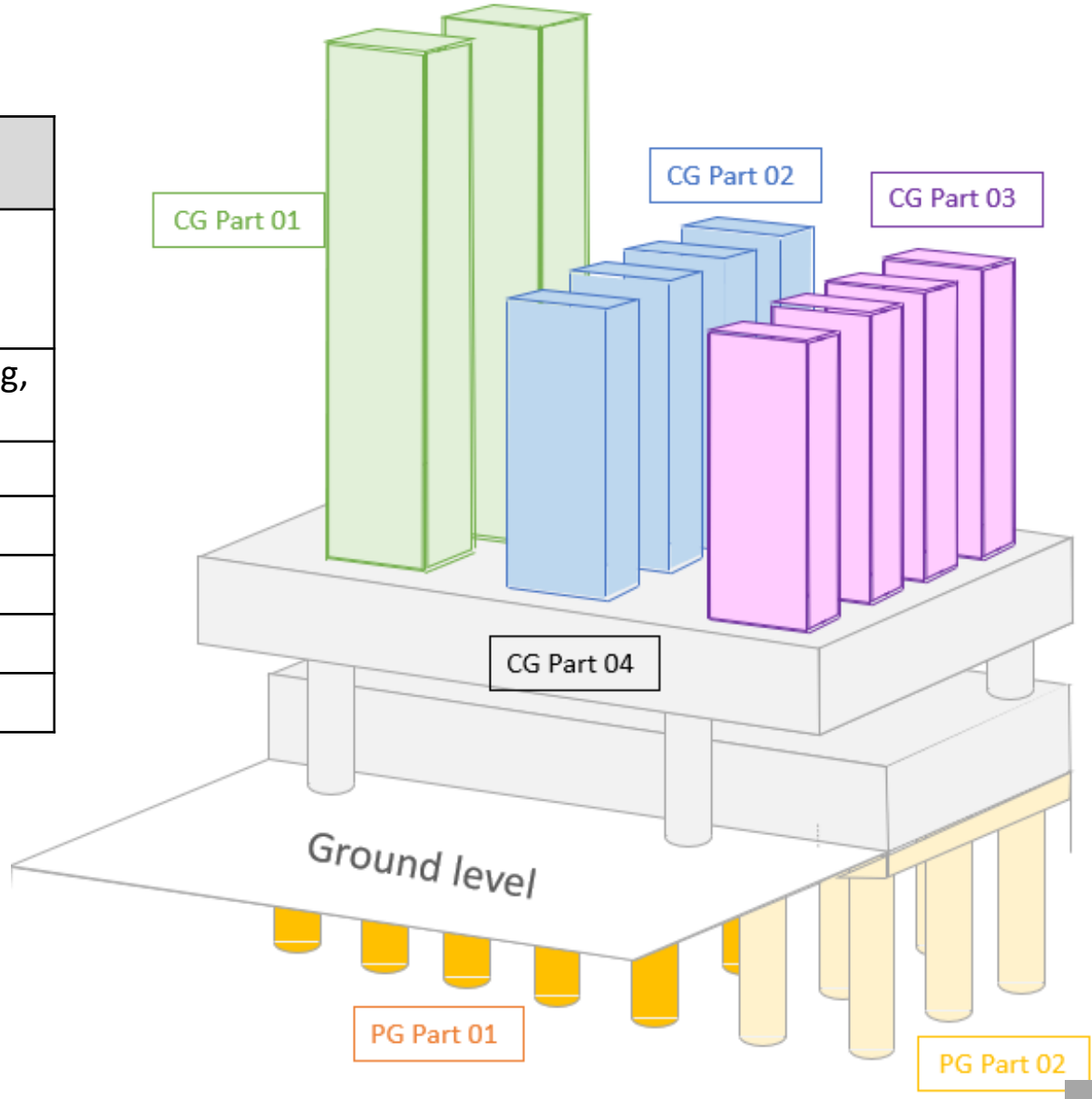
No. of allowable part STs in **Piling Gateway (PG)**

➔ 5no. part ST for Piling gateway (PG), mapped to allowable part STs in CG

Lessons from Case Study 3

Proposed part ST packages by project team

Gateway	Part ST submissions	Scope in each part ST
Piling Gateway (PG)	PG Part 01	Substructures **outside** RPZ, including piling, pile cap, 1st Sty slab and ground beam
	PG Part 02	Substructures **within** RPZ, including piling, pile cap, 1st Sty slab and ground beam
Construction Gateway (CG)	CG Part 01	Superstructure – Blocks 1 to 2
	CG Part 02	Superstructure – Blocks 3 to 6
	CG Part 03	Superstructure – Blocks 7 to 10
	CG Part 04	Common podium
	CG Part 05	External works - bus stops and linkway



Note: External works omitted in illustration

Lessons from Case Study 3

Submission of part STs without builders onboard

- In a hurry to obtain authority's approval, the project parties had attempted to submit CG Part 02 before the builders were onboard the project.
- Part submissions have a shorter SLA for BCA and aims to facilitate the commencement of site works besides alleviating structural design and checking workload. Thus, part submissions will require details of the builders.
- While Part STs can be submitted concurrently with CG 01 submissions, part STs can only obtain approval after the CG 01 is approved.

Submission of demolition works

- Full demolition works must be submitted under demolition submission module in CORENET X Submission Platform instead of combining them with CG or DSP submissions.
- This submission flow allows demolition works to obtain approval and commence first, facilitating the progress of works on site.
- The plan fee for demolition works is also collected separately from new erection works.
- However, localised demolition works for A&A should be submitted under CG or DSP.

Performance Based pile design

The procedure for obtaining CBC's approval for performance-based pile design is summarized in the six stages for CORENET X project.

Stage	Type of Submission	CORENET X Submission package
Stage 1: Submit pile design parameters and piling plan for approval	Piling Gateway	Submit 3 sets of IFC models with different pile length for approval (tagged as C&S structural model) ➢ PG model_set 1 ➢ PG model_set 2 ➢ PG model_set 3 For **each set** of the proposed pile design parameters, QP(D) shall carry out the geotechnical design, prepare and submit the design calculations and drawings for approval in compliance with the requirements as stipulated under code or practice and Building Control Regulations 2003. QP(D) could use a separate sheet of drawing for each set of pile design parameters.
Stage 2: Carry out ULT	NA	NA
Stage 3: Verify pile design parameters	NA	NA

Performance Based pile design (Con't)

Stage	Type of Submission	CORENET X Submission package
Stage 4: Obtain CBC's written approval to commence working pile installation	Submission of Documents	Once the set of pile design parameters to be adopted for construction has been verified and subsequently selected by QP(D) with concurrence of AC, QP(D) shall submit the following to BCA via "Submission of Documents" in respect of the approved piling ST submission and email to the BCA's officer: a) Form Pile_PB_Annex B1 appending the ULT interpretation report, Form Pile_PB_Annex B2 and ULT factual report; and b) Administratively mark-up drawings clearly showing the adopted pile design set for construction (See Fig A.3 for sample). Written approval from CBC shall be obtained before commencing the installation of working piles on site. Refer to Appendix D for the additions to the conditions of the Permit, which are applicable to projects adopting performance-based pile design.
Stage 5: Working pile installation on site	NA	NA
Stage 6: Submit as-built piling record plan	Completion of Structural Works	Within 28 days upon completion of piling works, QP(S) shall submit the as-built pile record plans together with the correct set of IFC structural model and administratively mark-up drawings issued by QP(D) clearly showing the adopted pile design set for construction.

Thank you

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