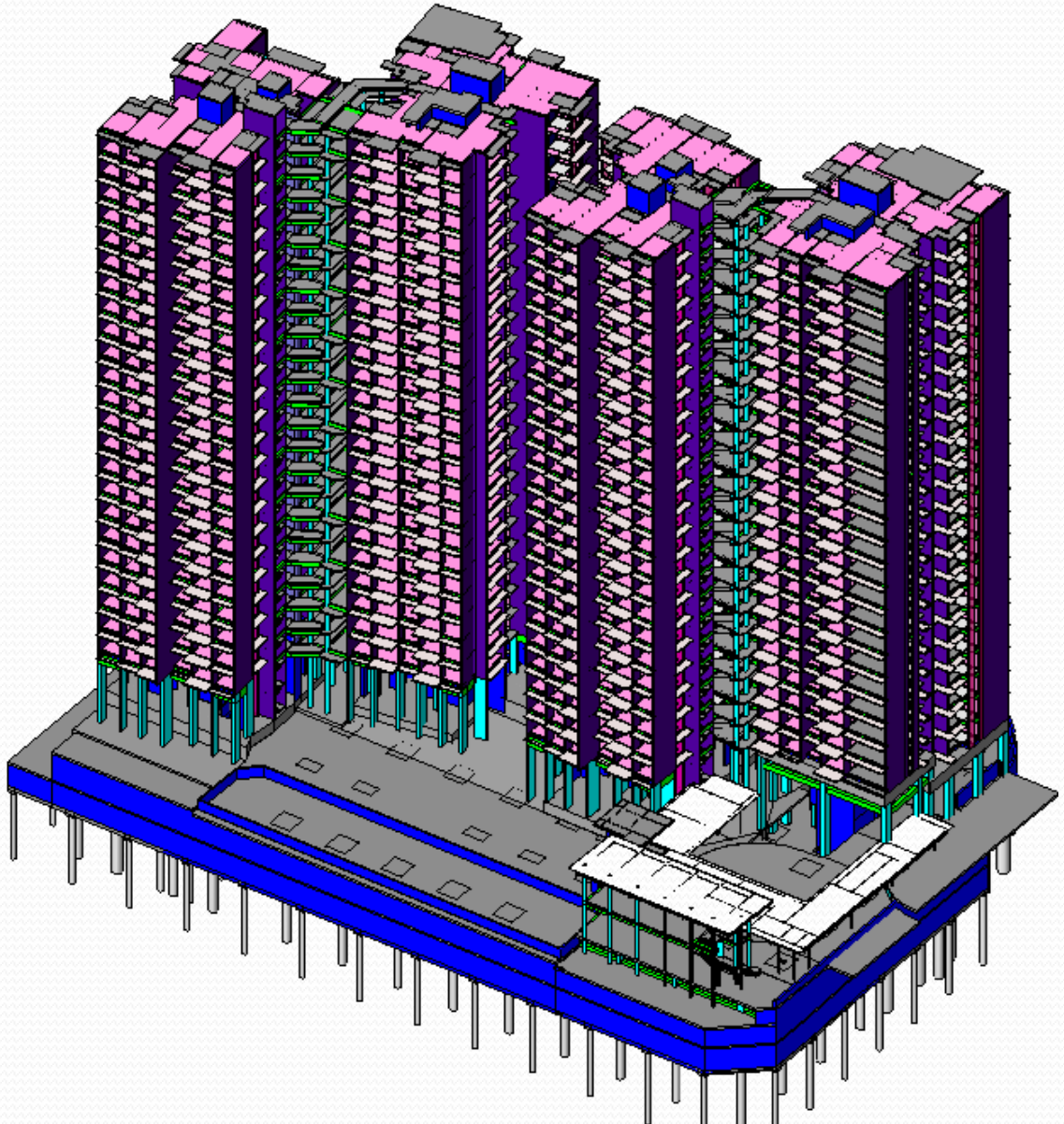
CORENET X Submission Experience of KCL

OVERALL VIEW - LYNDENWOODS



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Challenges

- Timeline and Resources Allocation
  - Isolation of Submission Packages (PG, CG (Part ST), misc. structure)
  - Recommend clients to consider ECI or award builder earlier
  - Timeline planning for DG, PG, CG, WDs.
- Coordination between different trades
  - Digital transformation
  - Freeze the design earlier
  - Waiver application earlier and deem satisfactory approach speedy CG clearance.
- Technical Solutions
  - Company Training (Team Leader, Engineer, Modeler, Submission Admin)
  - Company Script Development

Workflow

Stage 1 Project Initiation

- Architect shared master coordinate system.
- Structural Revit template used. (preloaded with IFC-SG parameters & provided ST Families)
- Coordinate aligned

Stage 2 Export Template for Engineer

- Generate & export Excel template
- Send to Engineer
- Start developing Revit model

Stage 3 Import Design Data from Engineer

- Engineer complete Excel data.
- (Dynamo Script) Modeller Import Excel Data into Model.
- (Dynamo Script) Map the important parameter (Marks, Levels) to delivered corresponding data into each elements

Stage 4 Model Authoring & Coordination

- Continue developing 2D plan view from 3D model.
  - Auto Name pile marks
  - Auto join drop panels with slab, etc
- Create Revit Schedules (IFC-SG Data of all ST Elements)

Stage 5 Export Latest Data to Engineer

- (Dynamo Script) Modeller Export the latest Revit data into Excel
- Send to Engineer

Stage 6 Comment Loop & Reimport

- Engineer inputs updated data according to Authority comments
- Re-import Excel data into Model

Stage 7 IFC Export & Submission

- Modeller tidy-up Model + sheets with all element's schedules included (data from model) + 2D typ. Notes & Detailing in Revit
- Exported IFC Model & Sheets in pdf for Engineer Checking
- Proceed to Submission

Stage 8 Submission Approval

- Archive model and files
- Store the latest version of Excel sheets data

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Challenges

Corenet X Submission

IFC-SG Format

3D (ifc model)

All Structural Elements with Parameters

+

2D (pdf)

All General Notes, Typical Details & Special Detail

Company Submission Preparation

How to Fulfil both side requirements by using BIM tool ~ REVIT ??

AC, Engineer & Construction Site

Conventional Complete Sheet set

2D

Complete Sheets including Floor Plan & Details

Example: Lyndenwoods

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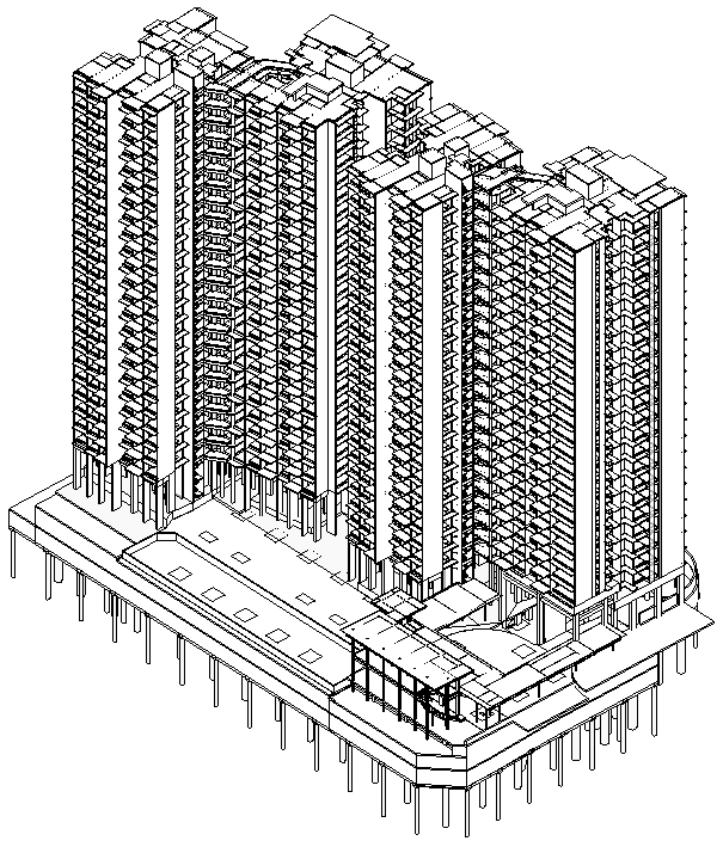
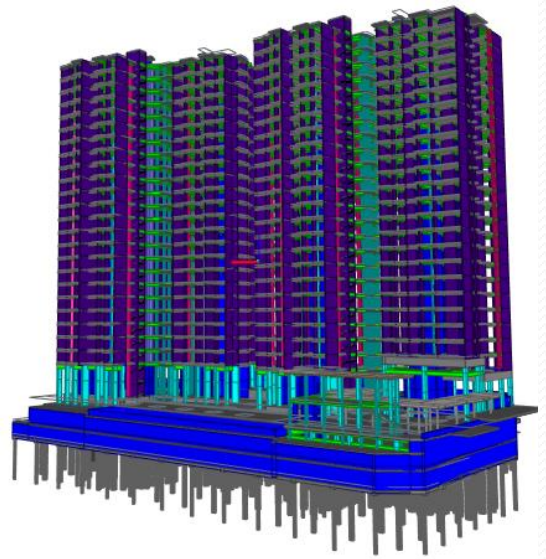


Revit Model

SHEET NUMBER	DRAWING NUMBER	DESCRIPTION
00	K00000/S/-/-	COVER PAGE
00	K00000/S/-/-	COVER PAGE Copy 1
01	K00000/S/GN/1	GENERAL NOTES - 1
02	K00000/S/GN/2	GENERAL NOTES - 2
03	K00000/S/GN/3	GENERAL NOTES - 3
04	K00000/S/GN/4	GENERAL NOTES - 4
05	K00000/S/GN/5	GENERAL NOTES - 5
06	K00000/S/P/1	BORED PILING PLAN
07	K00000/S/PN/1	BORED PILE NOTES-1
08	K00000/S/PN/2	BORED PILE NOTES-2
09	K00000/S/PN/3	BORED PILE NOTES-3
10	K00000/S/DT/PC1	PILECAP SCHEDULE-1
11	K00000/S/DT/PC2	PILECAP SCHEDULE-2
12	K00000/S/FP/B	BASEMENT PLAN
13	K00000/S/FP/1	1ST STOREY PLAN
14	K00000/S/FP/2	2ND STOREY PLAN
15	K00000/S/FP/3	3RD STOREY PLAN
16	K00000/S/FP/T	4TH TO 14TH STOREY PLAN
17	K00000/S/FP/TC	4TH TO 14TH STOREY CEILING PLAN
18	K00000/S/DT/S	FLOOR SLAB TYPICAL REINFORCEMENT & DETAILS SCHEDULE
19	K00000/S/DT/BS1	BASEMENT SLAB ADDITIONAL TOP REINFORCEMENT PLAN
20	K00000/S/DT/BS2	BASEMENT SLAB ADDITIONAL BOTTOM REINFORCEMENT PLAN
21	K00000/S/DT/BS3	BASEMENT DROP PANEL & PILECAP ADDITIONAL REINFORCEMENT
22	K00000/S/DT/BS4	BASEMENT SLAB SHEAR HOOK ARRANGEMENT
23	K00000/S/DT/1S1	1ST STOREY SLAB ADDITIONAL TOP REINFORCEMENT PLAN
24	K00000/S/DT/1S2	1ST STOREY SLAB ADDITIONAL BOTTOM REINFORCEMENT PLAN
25	K00000/S/DT/1S3	1ST STOREY DROP PANEL & PILECAP ADDITIONAL REINFORCEMENT
26	K00000/S/DT/1S4	1ST STOREY SLAB SHEAR HOOK ARRANGEMENT
27	K00000/S/DT/2S1	2ND STOREY SLAB TOP REINFORCEMENT PLAN
28	K00000/S/DT/2S2	2ND STOREY SLAB BOTTOM REINFORCEMENT PLAN
29	K00000/S/DT/2S3	2ND STOREY DROP PANEL & PILECAP ADDITIONAL REINFORCEMENT
30	K00000/S/DT/2S4	2ND STOREY SLAB SHEAR HOOK ARRANGEMENT
31	K00000/S/DT/3S1	3RD STOREY SLAB TOP REINFORCEMENT PLAN
32	K00000/S/DT/3S2	3RD STOREY SLAB BOTTOM REINFORCEMENT PLAN
33	K00000/S/DT/3S3	3RD STOREY DROP PANEL & PILECAP ADDITIONAL REINFORCEMENT
34	K00000/S/DT/3S4	3RD STOREY SLAB SHEAR HOOK ARRANGEMENT
35	K00000/S/DT/TS1	4TH TO 14TH STOREY SLAB TOP REINFORCEMENT PLAN
36	K00000/S/DT/TS2	4TH TO 14TH STOREY SLAB BOTTOM REINFORCEMENT PLAN
37	K00000/S/DT/C1	COLUMN SCHEDULE-1
38	K00000/S/DT/C2	COLUMN SCHEDULE-2
39	K00000/S/DT/C3	COLUMN SCHEDULE-3
40	K00000/S/DT/C4	COLUMN SCHEDULE-4
40	K00000/S/DT/C4	COLUMN SCHEDULE-5
41	K00000/S/DT/B1	BEAM SCHEDULE-1
42	K00000/S/DT/B2	BEAM SCHEDULE-2
43	K00000/S/DT/B3	BEAM SCHEDULE-3
44	K00000/S/DT/B4	BEAM SCHEDULE-4
45	K00000/S/DT/B5	BEAM SCHEDULE-5
46	K00000/S/DT/BW1	BASEMENT SLAB BASEMENT WALL DETAIL-1
47	K00000/S/DT/BW2	BASEMENT SLAB BASEMENT WALL DETAIL-2
48	K00000/S/DT/W	WALL SCHEDULE & DETAILS
49	K00000/S/DT/LW	LIFT WALL PLAN
50	K00000/S/ESS/1	CABLE CHAMBER & TRANSFORMER ROOM PLAN
51	K00000/S/ESS/2	SWITCHROOM & TRANSFORMER ROOM ROOF PLAN
52	K00000/S/ESS/S1	CABLE CHAMBER & TRANSFORMER ROOM REINFORCEMENT PLAN
53	K00000/S/ESS/S2	SWITCHROOM & TRANSFORMER ROOM REINFORCEMENT PLAN
54	K00000/S/ESS/B	SUBSTATION BEAM SCHEDULE
55	K00000/S/ESS/D	SUBSTATION SECTION & DETAIL
56	K00000/S/PPVC/GN1	PPVC GENERAL NOTE-1
57	K00000/S/PPVC/GN2	PPVC GENERAL NOTE-2
58	K00000/S/PPVC/GN3	PPVC GENERAL NOTE-3
59	K00000/S/PPVC/GN4	PPVC GENERAL NOTE-4
60	K00000/S/PPVC/GN5	PPVC GENERAL NOTE-5
61	K00000/S/PPVC/CD1	TYPICAL PPVC CONNECTION PLAN
62	K00000/S/PPVC/DT-W	PPVC WALL & CIS WALL DETAILS
64	K00000/S/TANK/1	DETENTION TANK PLAN & DETAILS
65	K00000/S/TANK/DT1	DETENTION TANK SLAB REINFORCEMENT PLAN & DETAILS
66	K00000/S/SS/1	STAIRCASE STOREY SHELTER PLAN & DETAILS-1
67	K00000/S/SS/2	STAIRCASE STOREY SHELTER PLAN & DETAILS-2
68	K00000/S/SS/3	STAIRCASE STOREY SHELTER PLAN & DETAILS-3
69	K00000/S/SS/4	STAIRCASE STOREY SHELTER PLAN & DETAILS-4
70	K00000/S/SS/5	STAIRCASE STOREY SHELTER PLAN & DETAILS-5
71	K00000/S/SS/6	STAIRCASE STOREY SHELTER PLAN & DETAILS-6
72	K00000/S/SS/PC1	STAIRCASE STOREY SHELTER PRECAST FLIGHT DETAIL-1
73	K00000/S/SS/PC2	STAIRCASE STOREY SHELTER PRECAST FLIGHT DETAIL-2
74	K00000/S/HS/PC1	HOUSEHOLD SHELTER PLAN & DETAILS-1
75	K00000/S/HS/PC2	HOUSEHOLD SHELTER PLAN & DETAILS-2
76	K00000/S/HS/PC3	HOUSEHOLD SHELTER PLAN & DETAILS-3
77	K00000/S/HS/PC4	HOUSEHOLD SHELTER PLAN & DETAILS-4
78	K00000/S/HS/PC5	HOUSEHOLD SHELTER PLAN & DETAILS-5

Full 2D Sheets

+



IFC Model

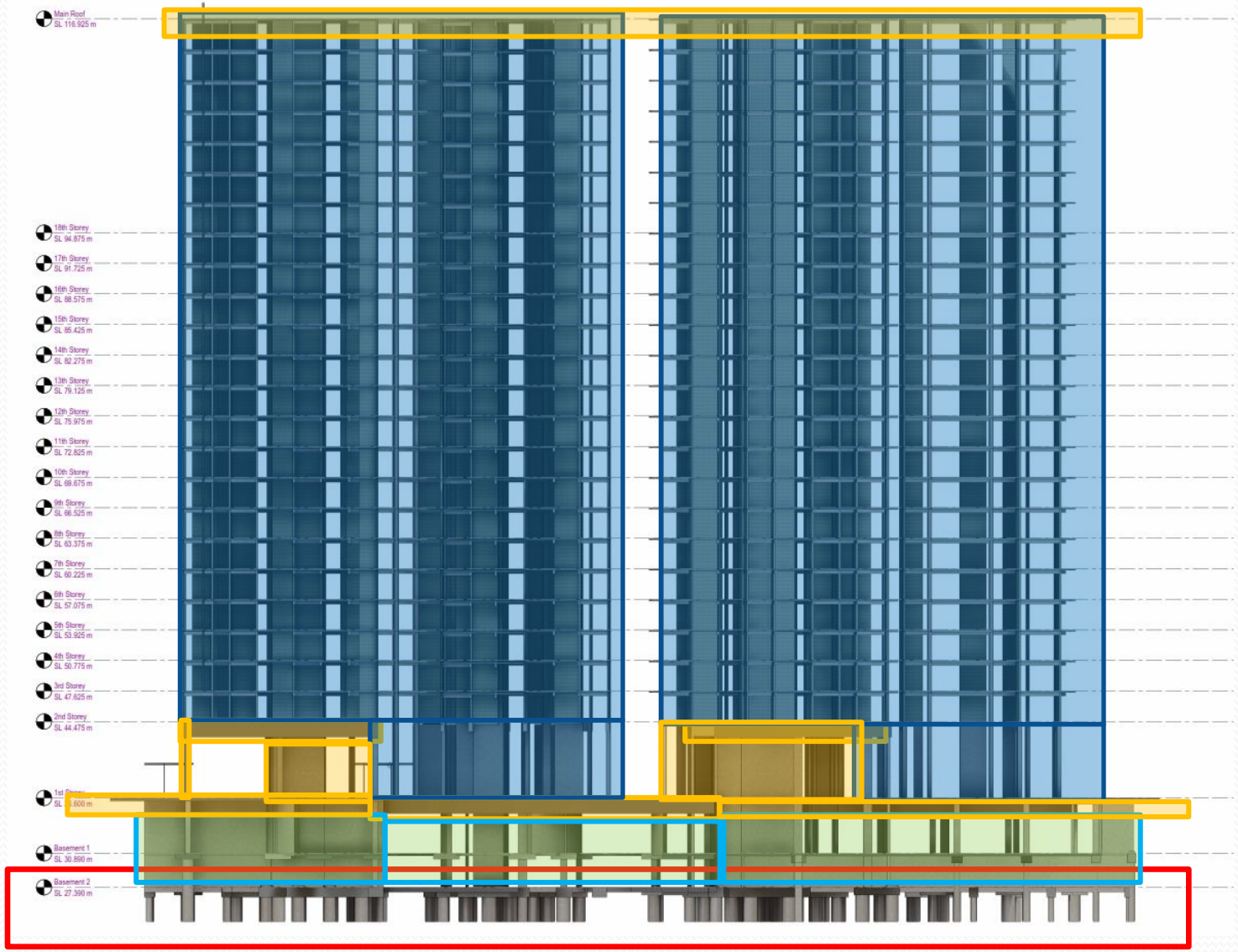
Structural Submission Packages

Piling Gateway:

- Piling – Conventional Piling Gateway
- PC/B2 PC/B1 (contact with soil)

Construction Gateway:

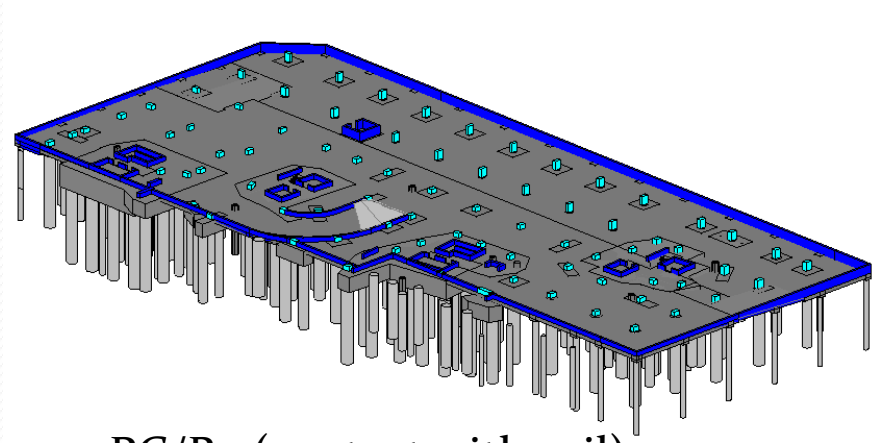
- CG01/ST01: Superstructure
- ST02: B1/B2
- ST03: E-Deck/L1 Transfer/L2/Roof



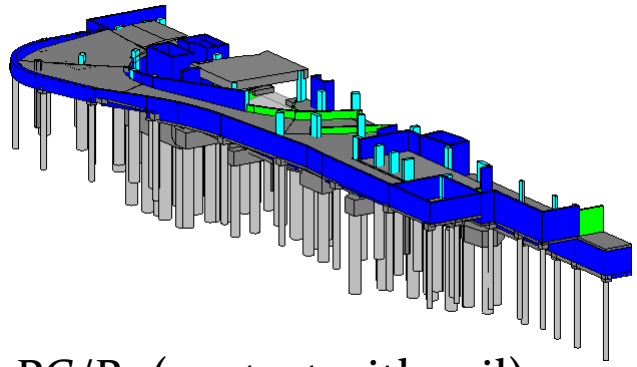
Structural Submission Packages

Piling Gateway:

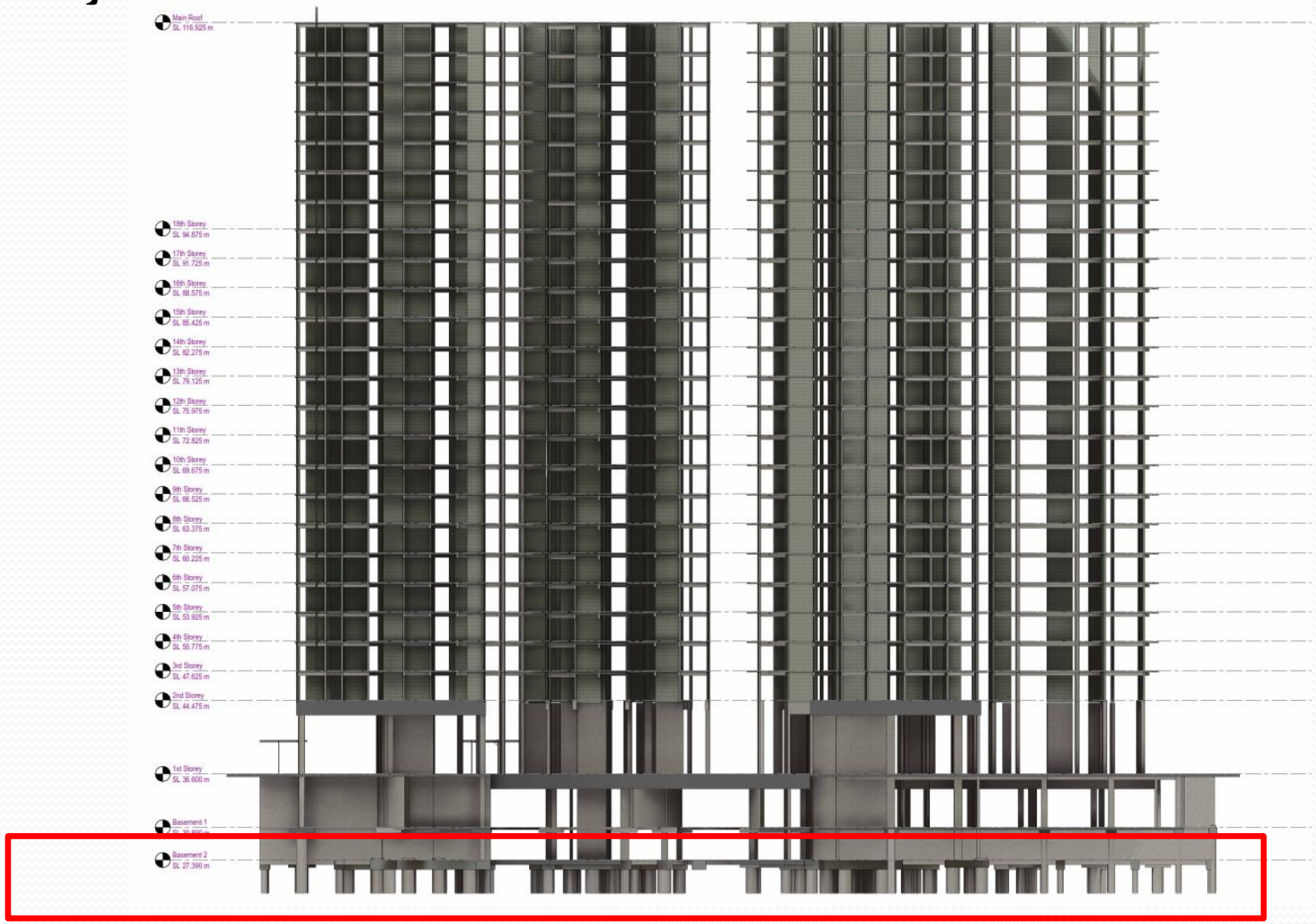
- Piling – Conventional Piling Gateway
- PC/B2 PC/B1 (contact with soil)



PC/B2 (contact with soil)



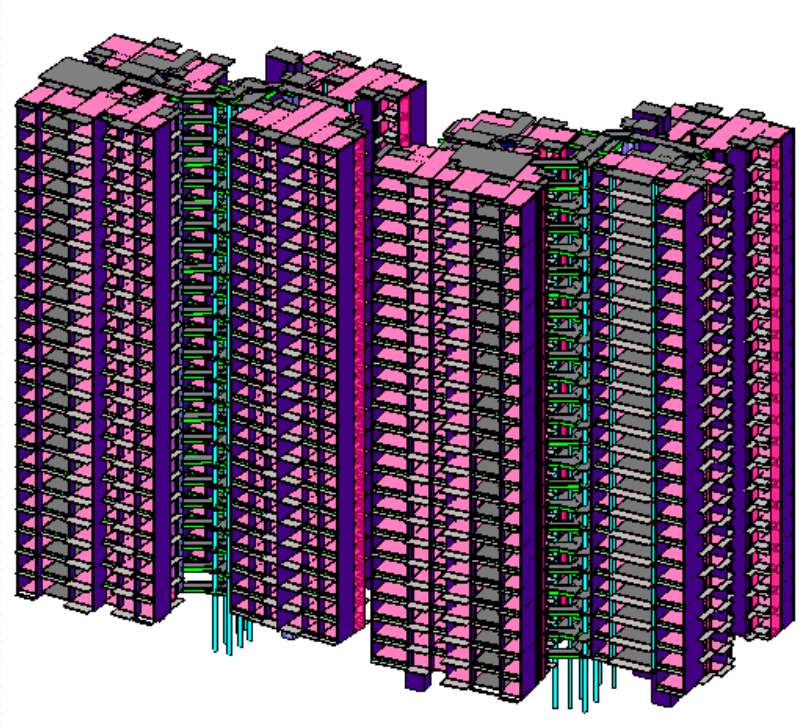
PC/B1 (contact with soil)

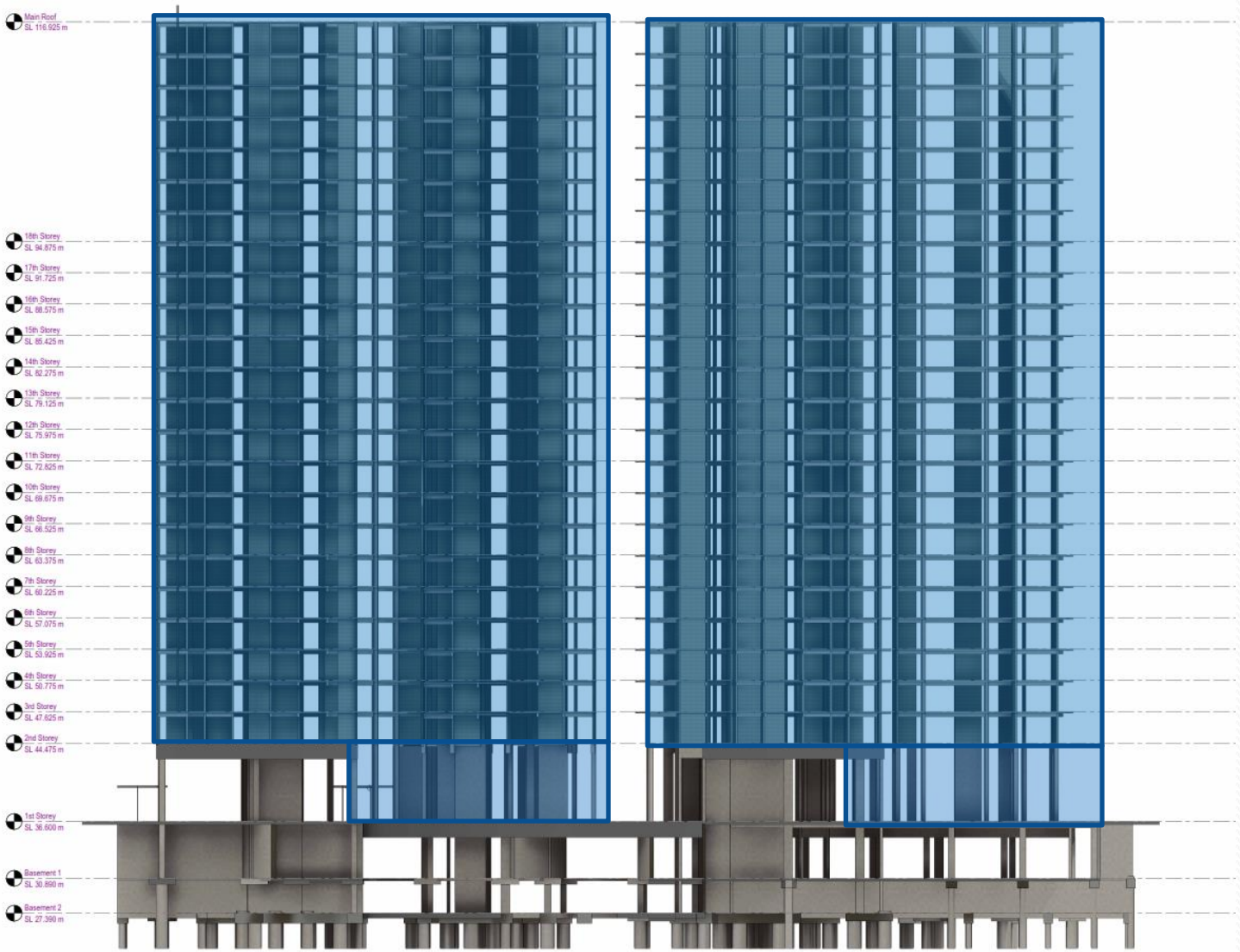


Structural Submission Packages

Construction Gateway:

- Part 1: Superstructure

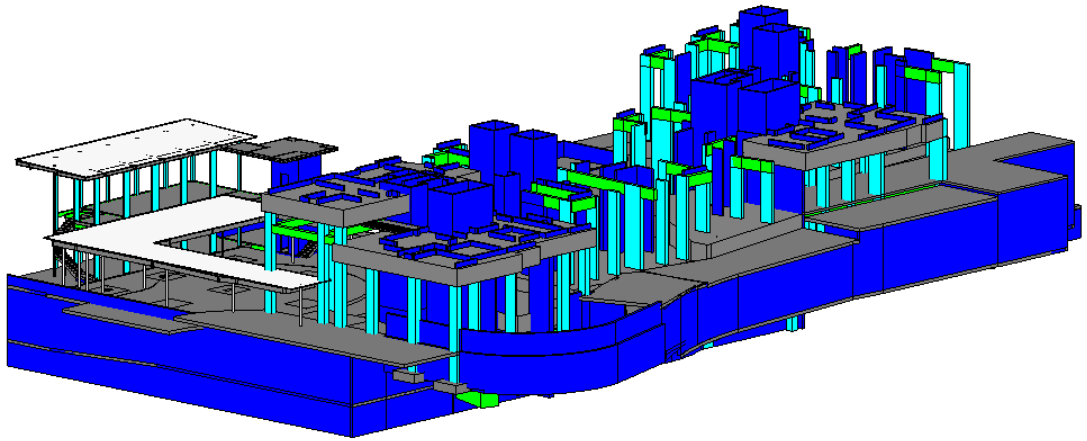


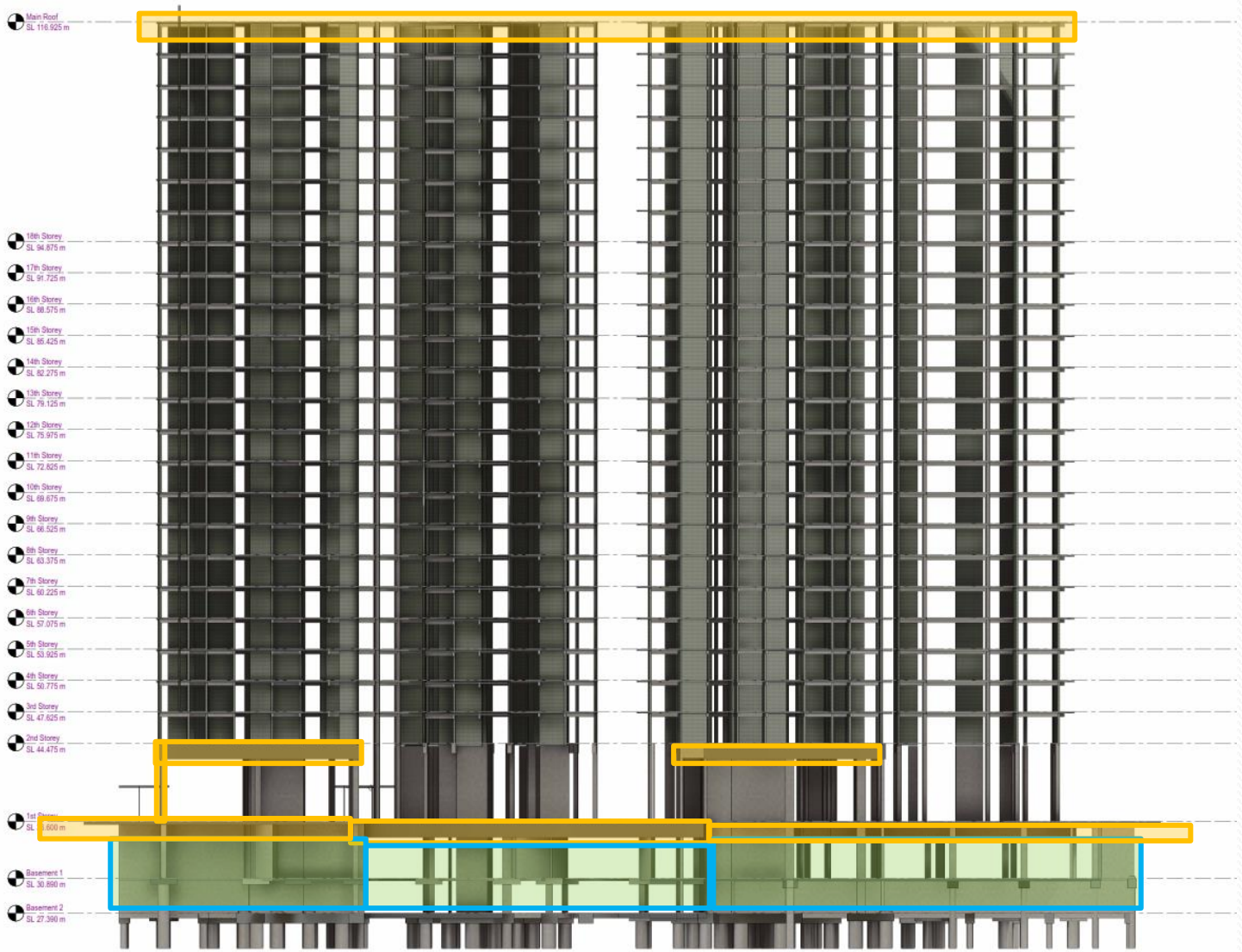


Structural Submission Packages

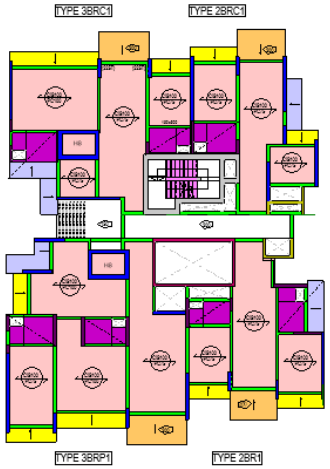
Construction Gateway:

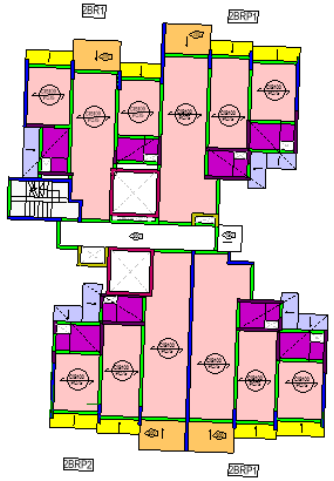
- Part 2: B1/B2
- Part 3: E-Deck/L1 Transfer/L2/Roof

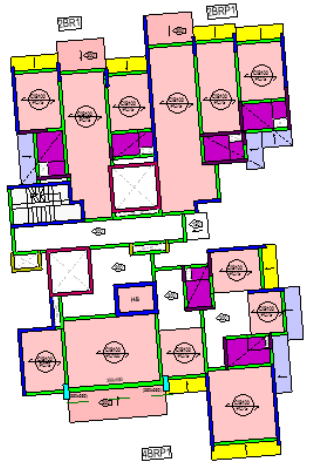




Structural System – APCS – TYPICAL FLOOR







LEGENDS	
PRECAST SLAB	Large Panel Precast Slab with Topping (APCS)
PRECAST PBU SLAB	PBU units
PRECAST BALCONY	Large Panel Precast Slab
PRECAST AC LEDGE	Large Panel Precast Slab
PRECAST RC LEDGE	System Formwork
CAST IN-SITU SLAB	Precast Unit
PRECAST REFUSE CHUTE WALL	
PRECAST STAIR FLIGHT	
PRECAST LIFT WALL	Precast Wall with Mechanical Connection
APCS WALL	
PBU WALL	PBU units
CAST IN-SITU WALL	Jump System Formwork
RC COLUMN	
RC BEAM	

WALL LENGTH_TYPICAL

Type	Width	Length (mm)
Staircase Shelter Wall_200_T1A	200	3700
Staircase Shelter Wall_200_T2A	200	5781
Staircase Shelter Wall_300_T2A	300	16650
Staircase Shelter Wall_T1A	300	18602
CIS: 19		44733
APCS Wall 200_T1A	200	43878
APCS Wall 200_T1B	200	56546
APCS Wall 200_T2A	200	45166
APCS Wall 200_T2B	200	63212
APCS Wall 225_T1A	225	4800
APCS Wall 225_T2A	225	4800
APCS Wall 250_T1A	250	15800
APCS Wall 250_T2A	250	15800
APCS Wall 250_T2B	250	8500
Precast Lift Wall_W200_T1A	200	15799
Precast Lift Wall_W200_T1B	200	22500
Precast Lift Wall_W200_T2A	200	15901
Precast Lift Wall_W200_T2B	200	22399
Precast Refuse Chute_W200_T1A	200	8722
Precast Refuse Chute_W200_T1B	200	7030
Precast Refuse Chute_W200_T2A	200	4030
Precast Refuse Chute_W200_T2B	200	5630
Precast: 149		360514
Grand total: 168		405247

FLOOR AREA_TYPICAL

Type	Area
CIS150_T1A	9 m²
CIS150_T1B	2 m²
CIS150_T2A	4 m²
CIS150_T2B	2 m²
CIS175_T2A	1 m²
CIS200_T1A	17 m²
CIS200_T1B	16 m²
CIS200_T2A	19 m²
CIS200_T2B	52 m²
CIS: 10	122 m²
PBU S125_T1A	8 m²
PBU S125_T1B	9 m²
PBU S125_T2A	7 m²
PBU S125_T2B	7 m²
PBU S150_T1A	24 m²
PBU S150_T1B	27 m²
PBU S150_T2A	27 m²
PBU S150_T2B	21 m²
PCS 150-AC ledge_T1A	16 m²
PCS 150-AC ledge_T1B	16 m²
PCS 150-AC ledge_T2A	17 m²
PCS 150-AC ledge_T2B	15 m²
PCS 150-RC ledge_T1A	26 m²

FLOOR AREA_TYPICAL

Type	Area
PCS 150-RC ledge_T1B	20 m²
PCS 150-RC ledge_T2A	28 m²
PCS 150-RC ledge_T2B	18 m²
PCS 200-balcony_T1A	24 m²
PCS 200-balcony_T1B	22 m²
PCS 200-balcony_T2A	24 m²
PCS 200-balcony_T2B	23 m²
Precast Plank S175 (100CIS+75PC)_T1A	185 m²
Precast Plank S175 (100CIS+75PC)_T1B	220 m²
Precast Plank S175 (100CIS+75PC)_T2A	207 m²
Precast Plank S175 (100CIS+75PC)_T2B	162 m²
Precast Plank S200 (100CIS+100PC)_T1A	66 m²
Precast Plank S200 (100CIS+100PC)_T2A	44 m²
Precast Plank S200 (100CIS+100PC)_T2B	27 m²
Precast: 155	1291 m²
Grand total: 165	1413 m²

Technical Solutions

Company BIM Softwares

IFC VIEWER

- BIMvision
- Open IFC

For engineer checking 3D model

RVT

PLUG-IN

- DiRoots.One
  - Pilecap & Footing
- Dynamo
  - Borehole
  - Pile
  - Built-in Wall
  - PPVC Wall
  - Built-in Slab
  - Beam
  - Staircase
  - Column

IFC PARAMETER CHECK

- IFC-SG Validator

For engineer checking parameter req. by Corenet X COP

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Technical Solutions: Plug-in – Dynamo

- Self-Creating Scripts to comply limitation of functions in Revit

➢ Parameters Import to Revit (Instance Parameter)

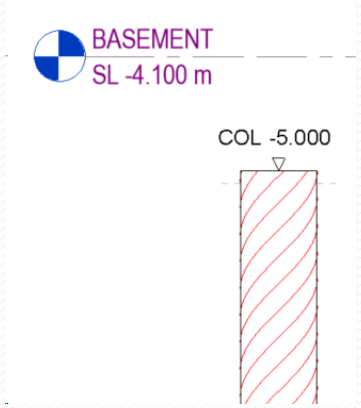
CSV. FILE

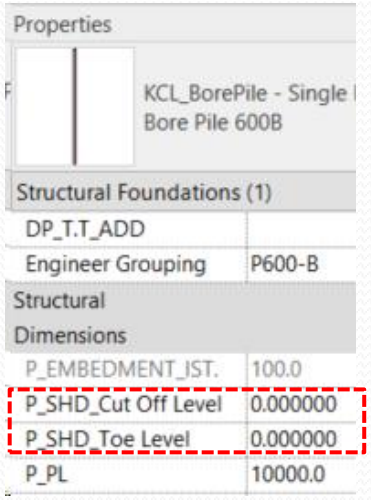
Dynamo

Run Dynamo Script
Direct Transfer
(Mapping by Element's Mark)

REVIT FILE

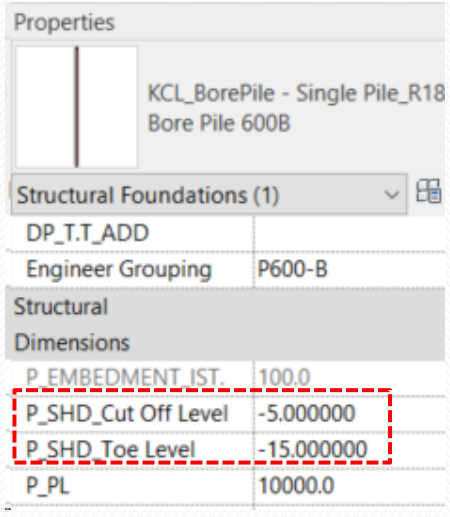
➢ Generate SHD Level Value in created Parameters





Dynamo

Run Dynamo Script
(Auto create SHD Level based on modelled elements)



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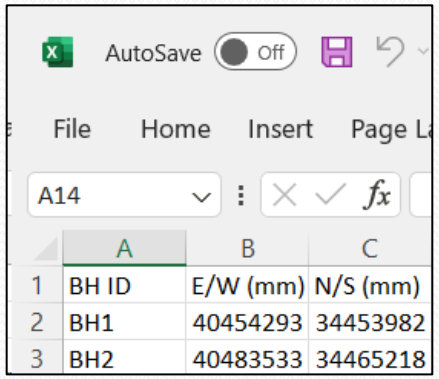
Technical Solutions: Plug-in – Dynamo

BOREHOLES' COORDINATES

BH No	Northing	Easting	Elevation
1	34453.982	40454.293	4.35
2	34465.218	40483.533	4.37

SI Report

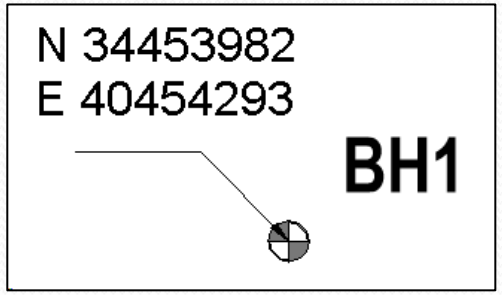
- Auto create & position borehole location to correct coordinate.



Csv. file

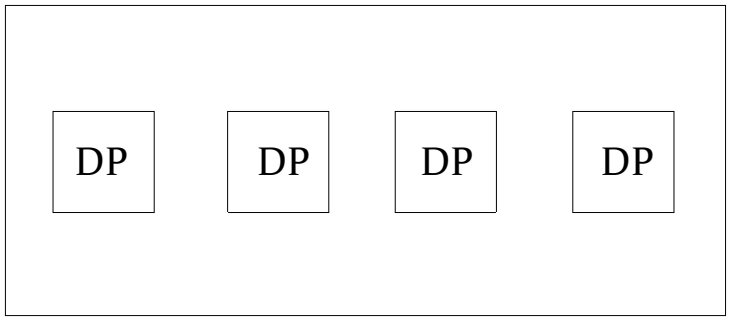
Dynamo

Run Dynamo Script
(Auto create & position borehole)



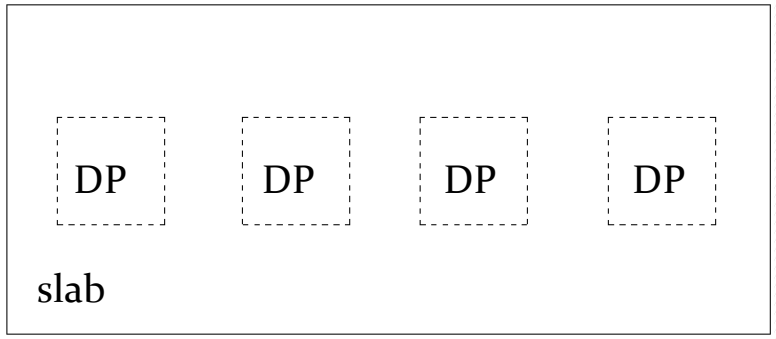
Revit file

- Fast join between 2 different types of element.



Dynamo

Run Dynamo Script
(Join all Drop Panels in one time)



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Technical Solutions: Plug-in – Dynamo Script for KCL

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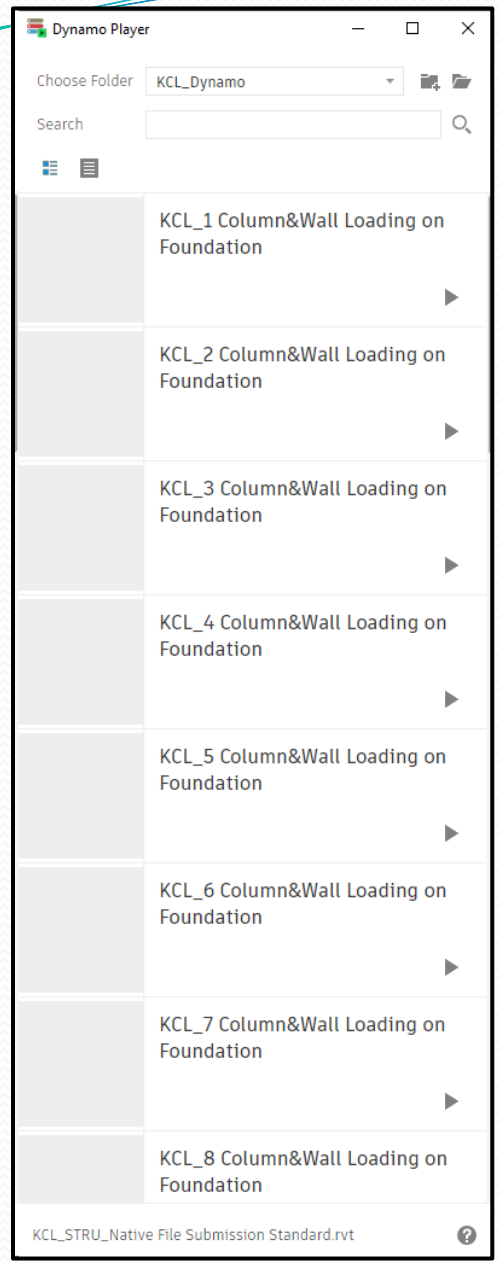
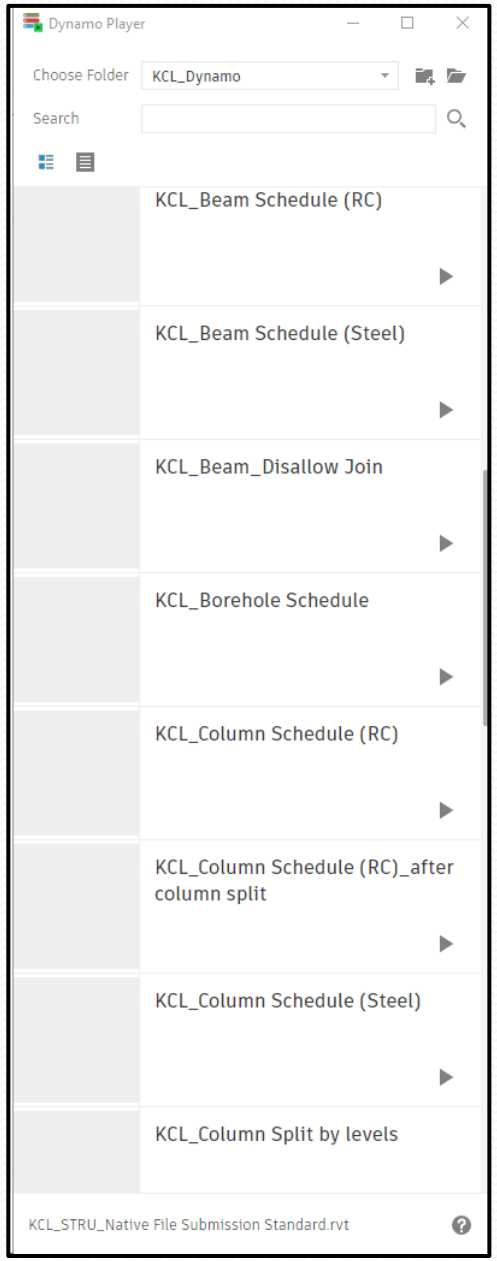
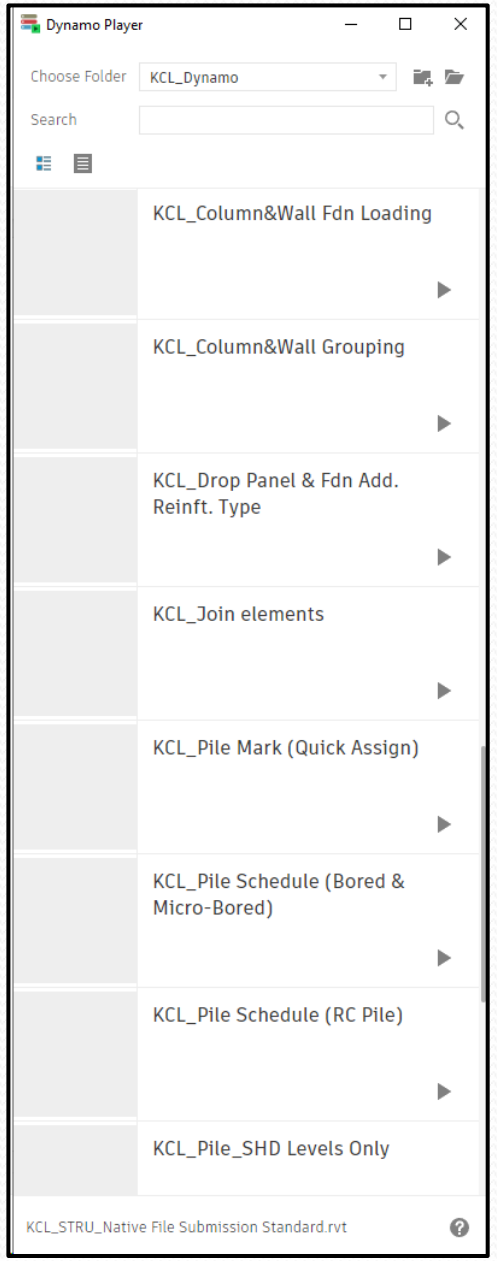
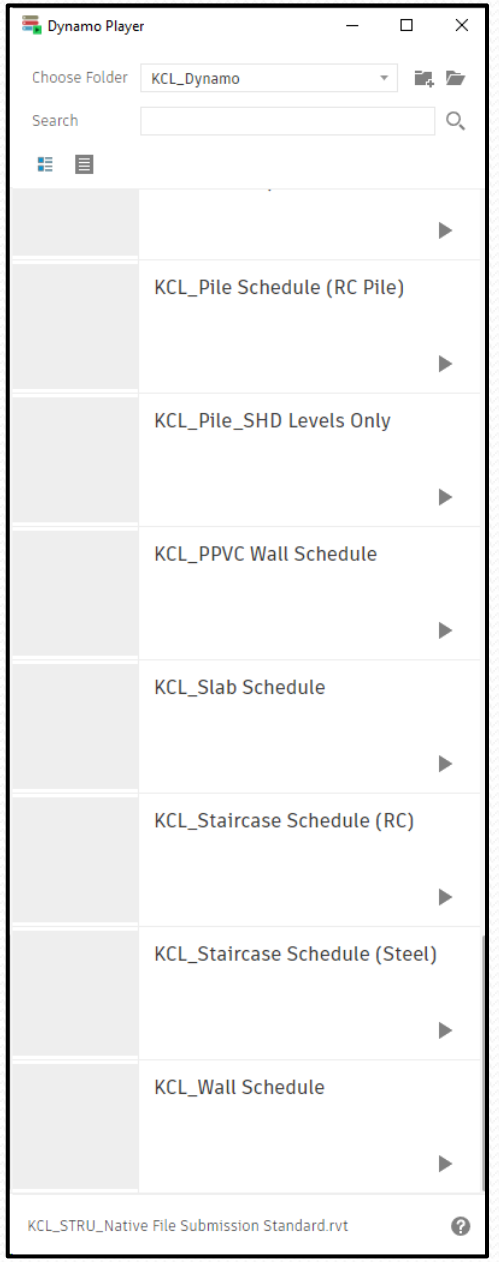
Technical Solutions: Plug-in – Dynamo Script for KCL









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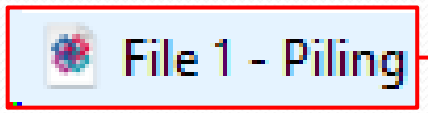
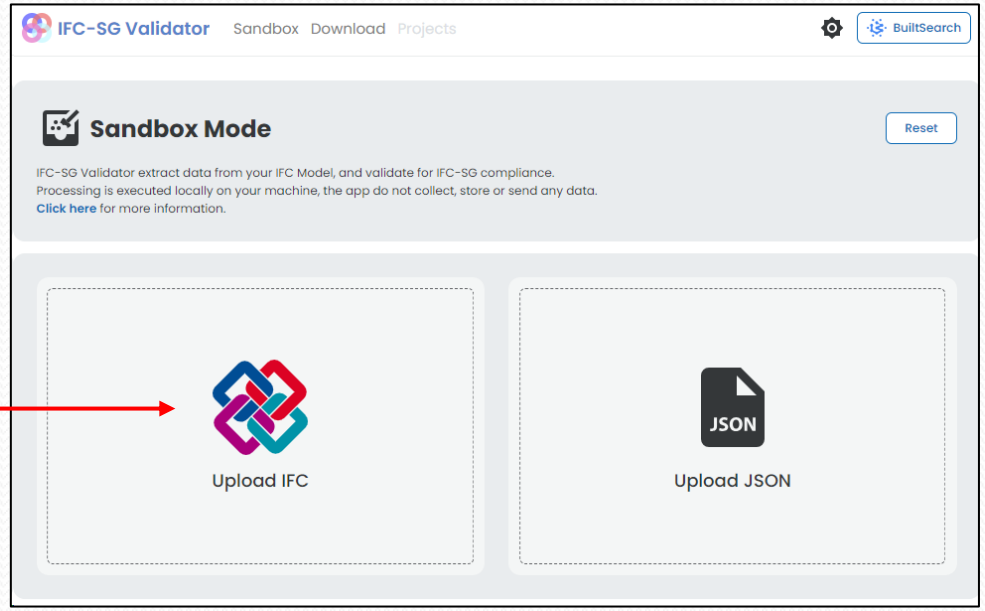
IFC PARAMETER CHECK – IFC-SG VALIDATOR (Used before export full set of ifc)

- Use to check any left out IFC Parameters export from Revit





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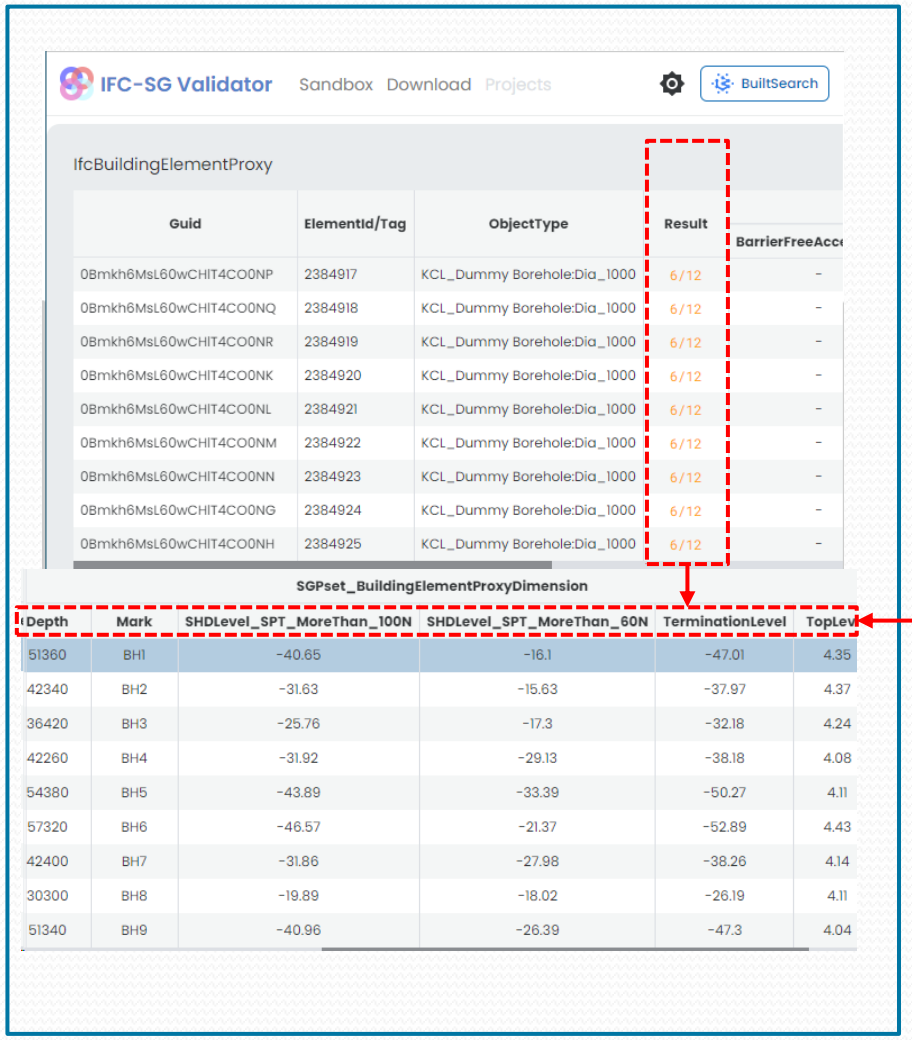
BIM SOFTWARE – IFC-SG VALIDATOR

Example : Borehole Parameters Check



Compare to

Part Print from Code of Practice (Borehole)

By IFC Representation

IFC Entity: IfcBuildingElementProxy

IFC SubType: BOREHOLE

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

Make sure all 6 parameters required from code (structural parameters) successfully exported to ifc parameters

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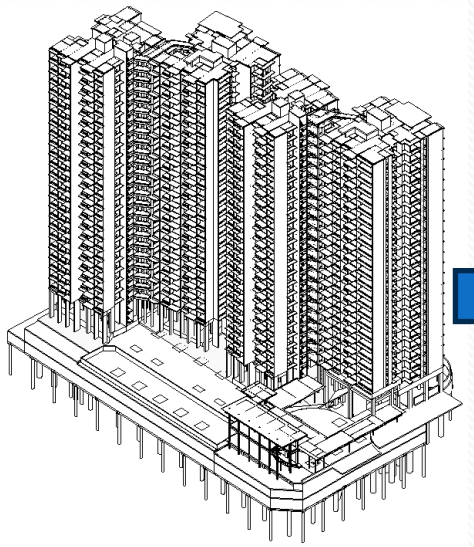
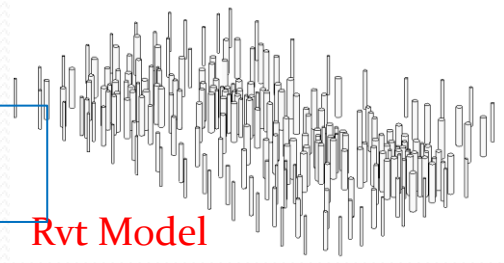
BIM SOFTWARE – IFC-SG VALIDATOR

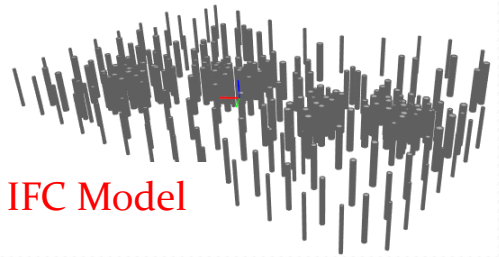


Rvt Model

Piling File



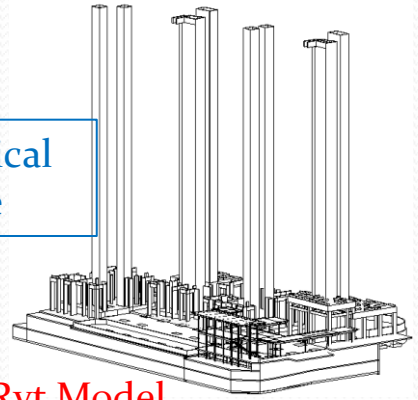
Rvt Model



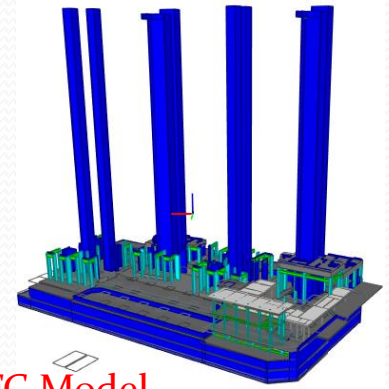
IFC Model

* Single IFC file checking easier to amend before combined.

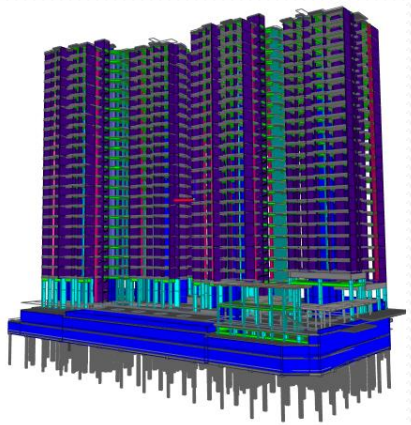
Non-Typical Floor File



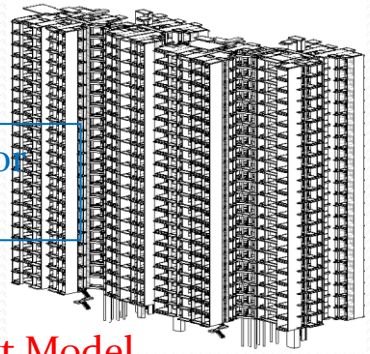
Rvt Model



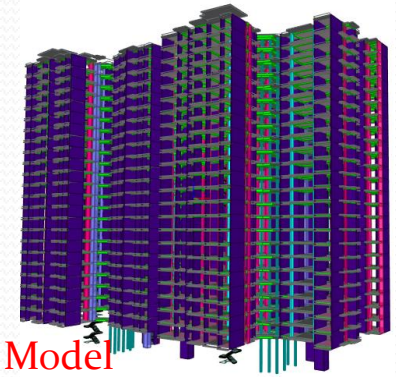
IFC Model



Typical Floor File



Rvt Model



IFC Model

IFC-SG VALIDATOR (CHECKING)

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THANK YOU