Prepared by: Constantinos Emmanouil Migiakis
December 2018

Construction Methods

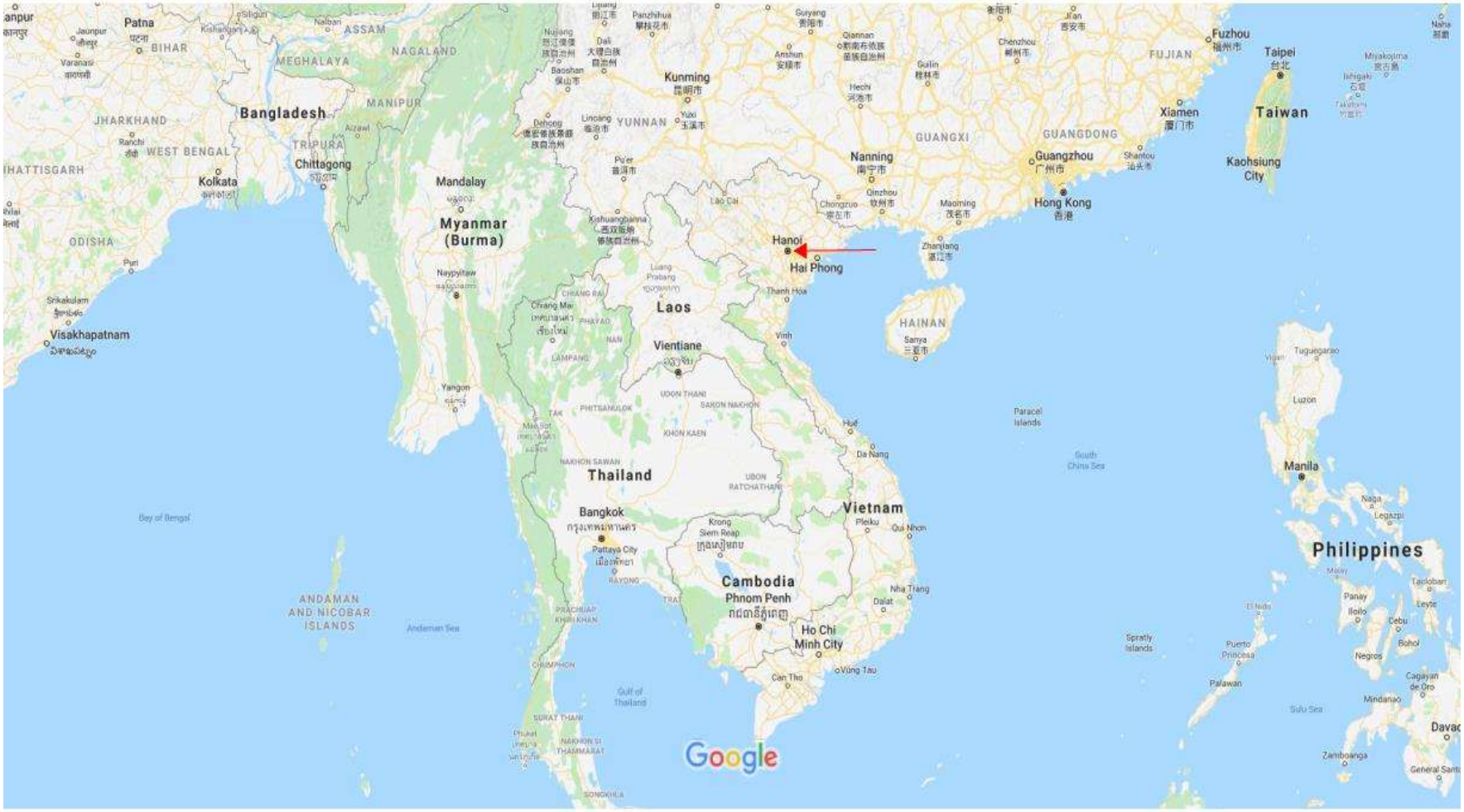
- Top-Down, for High Rise buildings with more than 3 basement floors. Construction in parallel for superstructure and basement. Use of King posts (steel columns) embedded on top of RC piles, in order to temporarily support the superstructure and basement. Construction of basement, from top to bottom, after completion of ground slab

- Semi-top down. Construction of part of basement from top to bottom, use of king posts. Remaining part of basement constructed with bottom up.

- Bottom up, open excavation

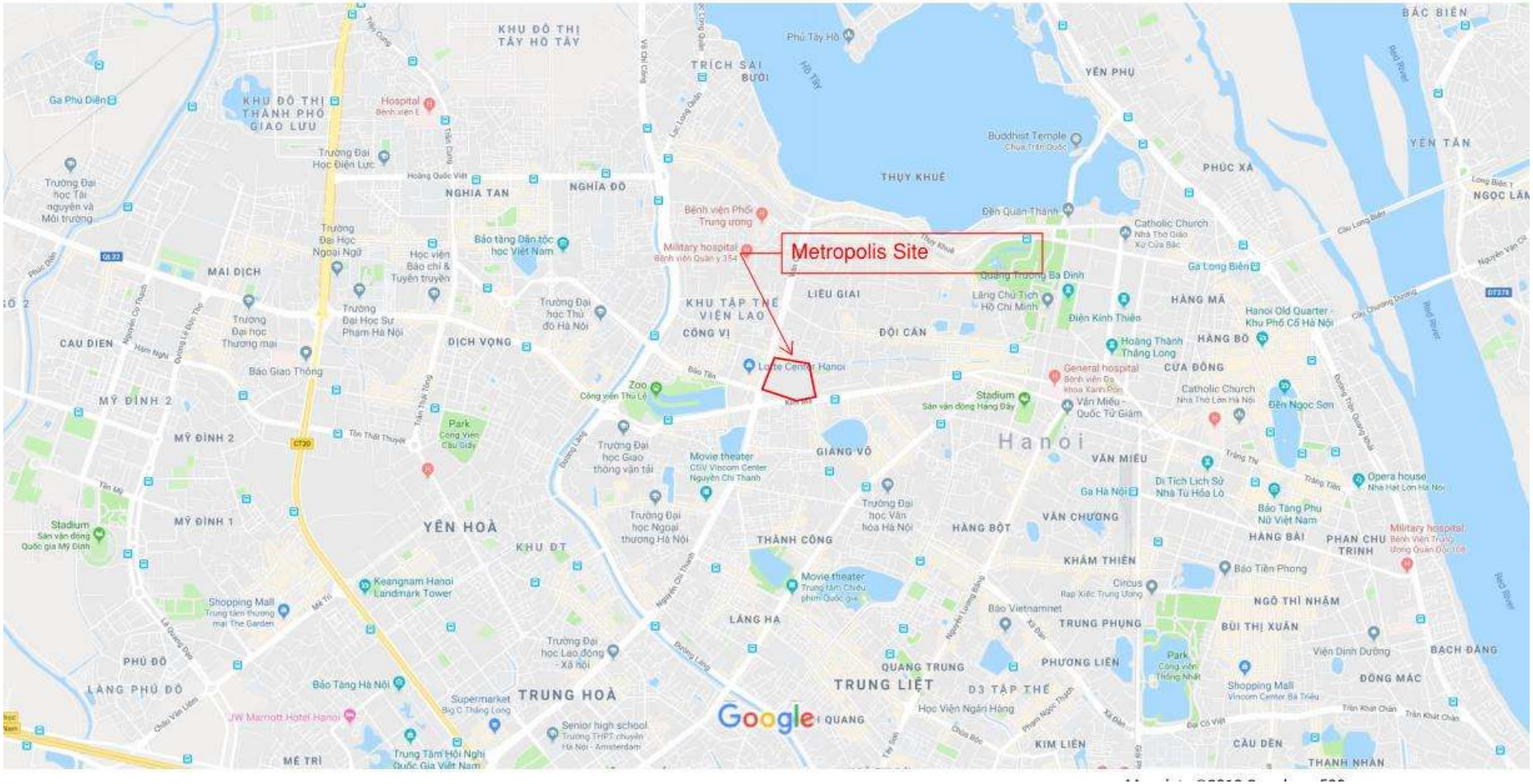
VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



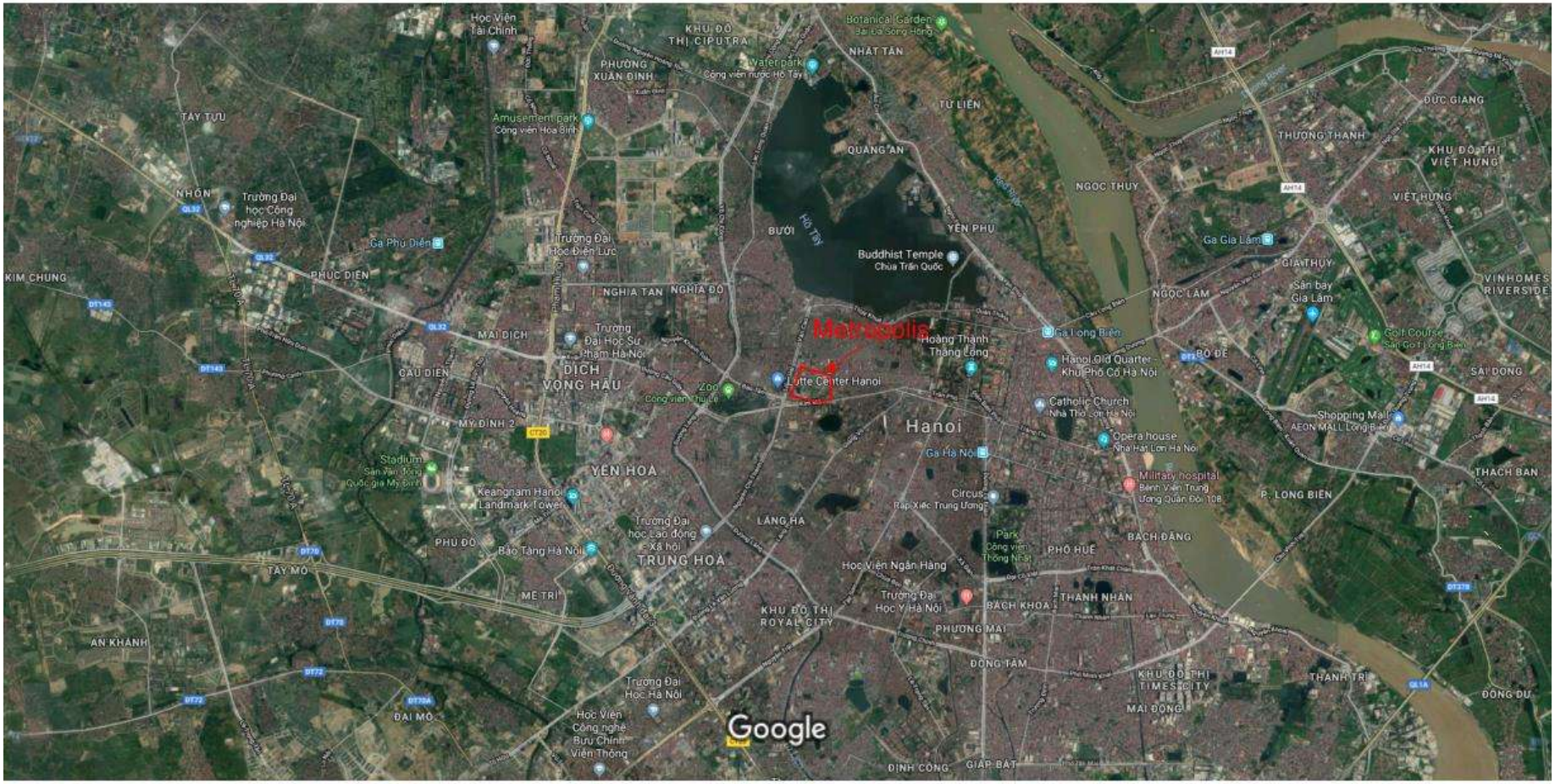
VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



PROJECT DATA

- Location: Hanoi, Vietnam
- Client/Developer: VINGROUP
- Project Description: Luxury Residential 3 Tower 45 floors. Podium: Shopping Mall 70,000 m^2, 4 Basements. School and Office towers at next Phase
- Total built up Area: 311,000 m^2, Apartments: 1800, Buildings Height 180m
- Budget: $300 ml
- Project Manager / Construction Supervision: ARTELIA
- Scope of Works: Schedule/Quality/Cost/Contract/Design Management
- Main Contractor: COTTECONS
- Subcontractor for Piling/Diaphragm Wall/King Post: TUNG FENG
- Architectural Consultant: ATKINS, Hong Kong
- Structure/ MEP: VNCC. Third party review for Structure: IBST
- Construction period: 28 Months, Start May 2016, Completion September 2018

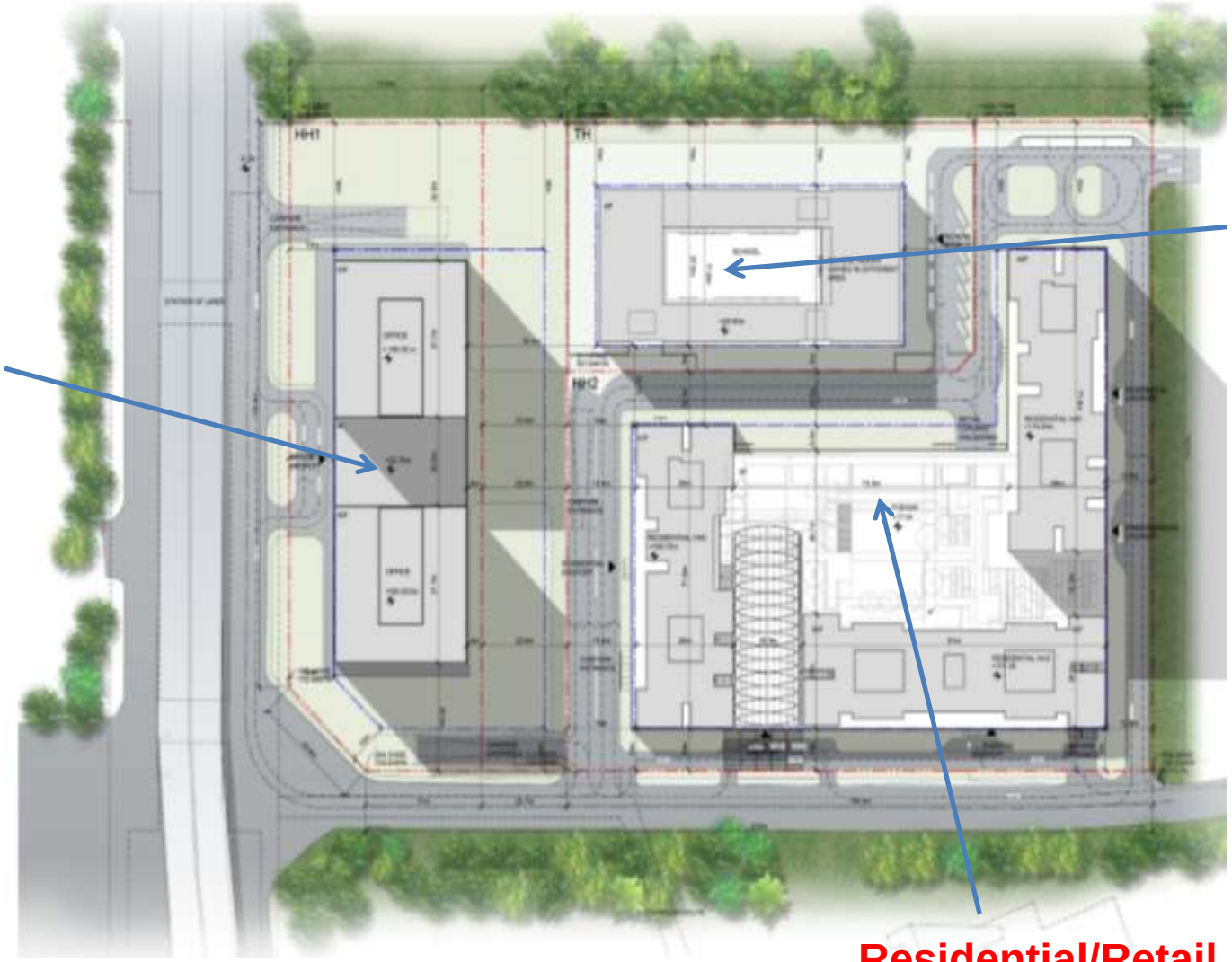
VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

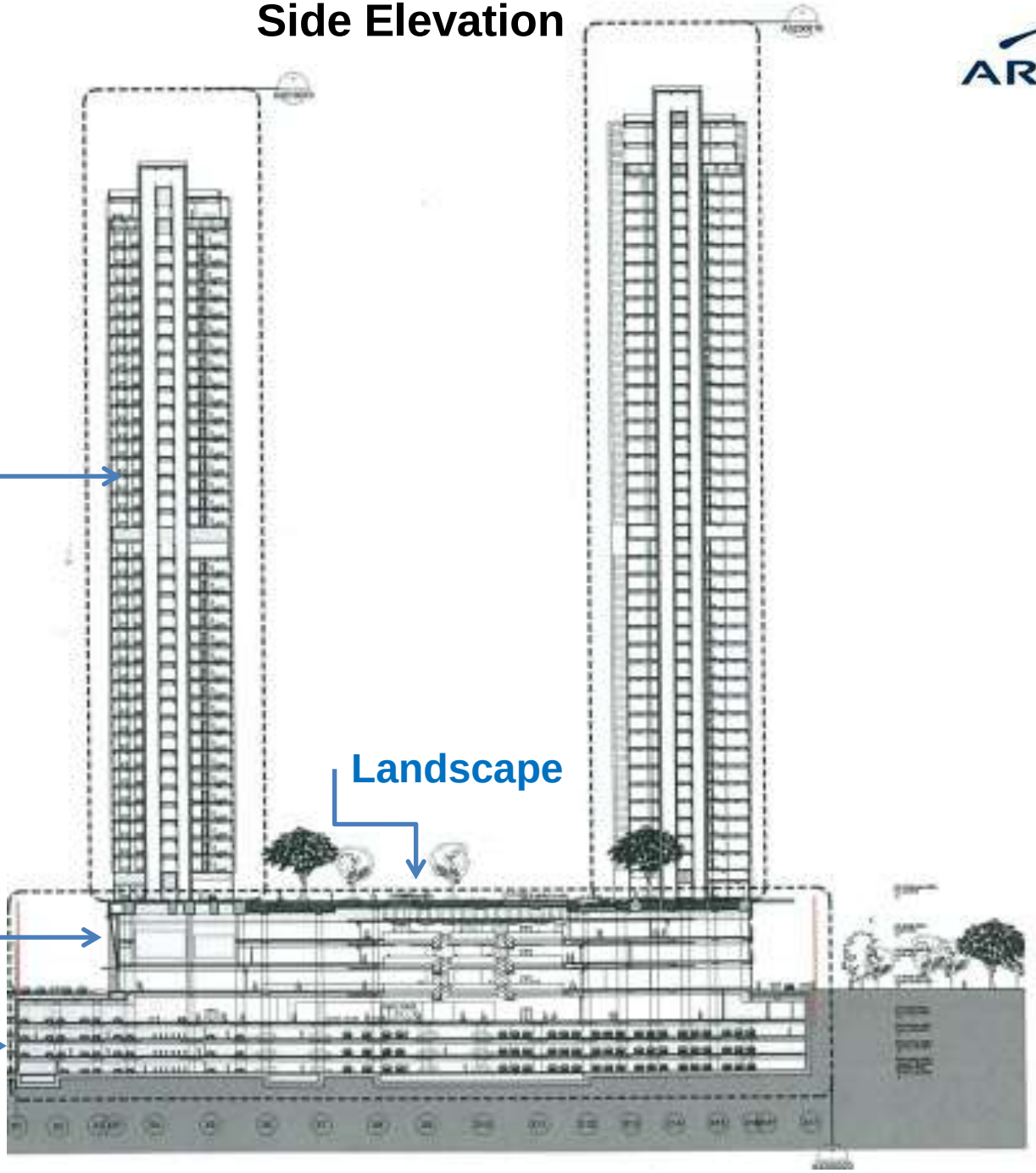
- Structural System: RC Frames and Flat Slabs with Shear Walls. Transfer floor on top of Podium (Level 4)
- Concrete Grade C45/55 fck = 45 MPa
- Construction Method: Top Down, King post carry up to 12 Floors of superstructure + 4 Basement floors (-16m)
- Foundation: Piles D 2,0m, Length 35m (Top -18m, bottom -53m), Total 305 Piles.
- Pile Capacity: Design: 38MN, Actual as per test: 85MN. Water level: -25m
- Soft soil condition between 0-25m, 25-35m medium dense soil, rock -35m
- Diaphragm Wall Length 580m, Depth: 29m, Thickness 0,8m, Segment 6,4m
- King post length: 20m, Total 150, Buckling Capacity: 7000kN, l=5,5m, k = 2,0.

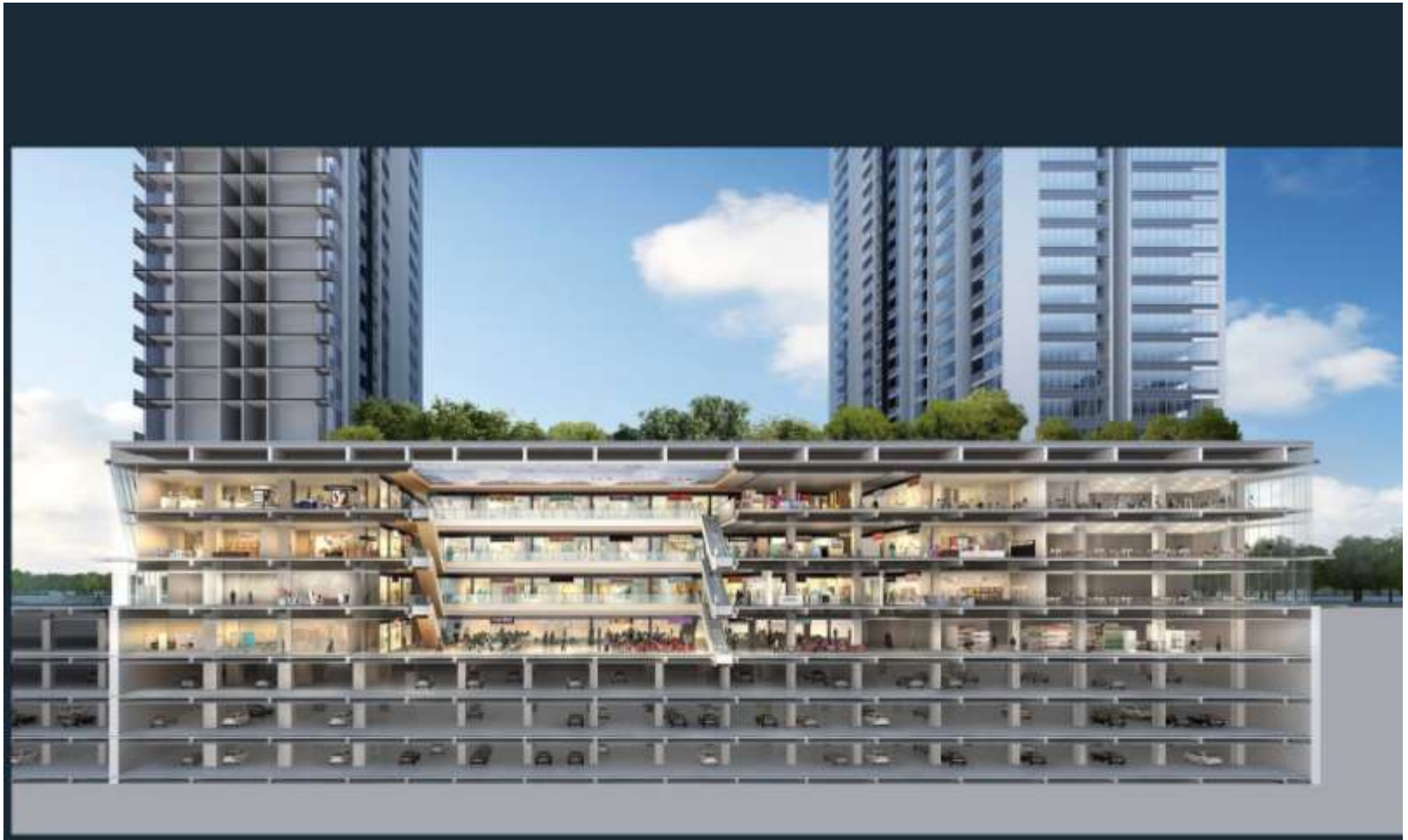
  Total weight: 2160 tn. Steel Grade S275. Size 700x700x20x40
- Excavation: 280,000m^3, Concrete: 215,000 m^3,Façade: 210,000 m^2
- Transfer Floor (Level 4) beam size: 2,8x5,0m
- Workers at peak: 2500 Engineers/Supervisors: 200

Metropolis – Master Plan



Side Elevation





Cross Section for Basement and Podium

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

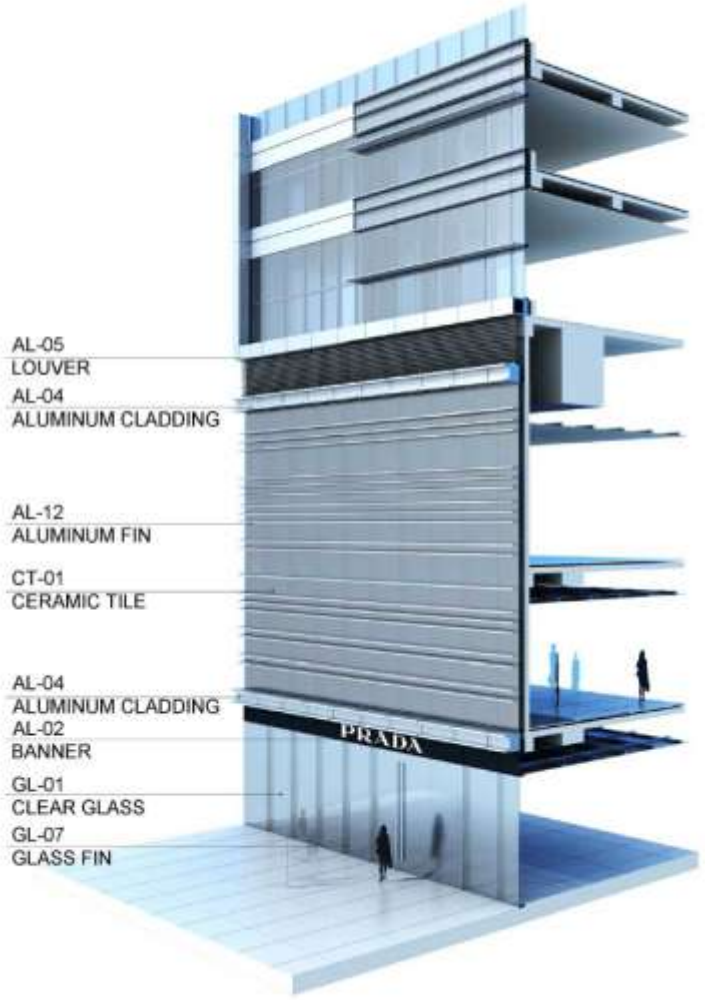
Interiors for Apartments

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

1.4 EWS-40 Penthouse façade

1.1 EWS-10 Retail Façade



VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

VINHOMES - METROPOLIS

29 LIEU GIAI - HANOI VIETNAM

LANDSCAPE FINAL DETAIL DESIGN ADDENDUM

ATKINS

5143225

2017.03.22

TOP DOWN METHOD FOR CONSTRUCTION

1. Construction of Piles and Diaphragm Wall

2. Installation of King posts (Steel Columns), embedded on top of piles. Those members provide support (temporarily) for a limited number of floors of superstructure, during the construction/completion of basement slabs/columns. Note: The strength of the King Post is neglected, in the calculation of capacity of RC column, at the permanent condition.

3. Construction of Ground floor Slab, supported on the King Post.

Sufficient slab openings and ramps must be provided, in order to ensure logistics/excavation material removal, reinforcement transport/installation to lower floors, casting concrete.

Continue with Construction of Superstructure Floors

4. Start Excavation for Basement, Construct Slab B1, then continue to B2..

5. Complete excavation

6. Complete Foundation slab, Mass Concrete casting

7. Casting Permanent RC columns/Core Walls and inject Grout on top

TOP DOWN METHOD FOR CONSTRUCTION

Assumptions:

- The king posts have the capacity to carry limited number of floors of the superstructure .
- Lateral stability of king posts in ensured through Basement Slab, Connected to the Diaphragm Walls. Monitor of deformations at all stages of construction.

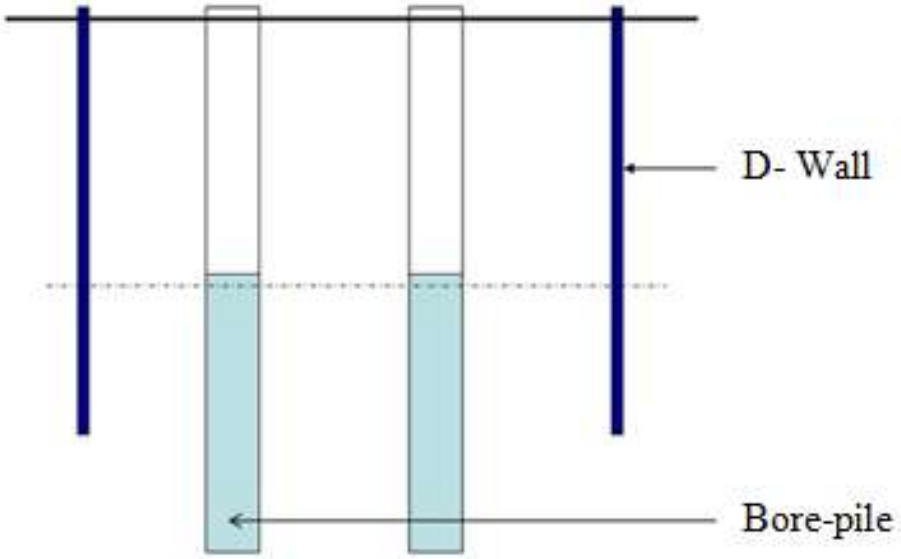
Benefits:

- Speed construction, allowing the superstructure being built as soon as the piling/king post is completed.
- Allowing the Construction for the cases where open excavation can not be executed (if neighboring structures exist) or deep excavations are required. This will require anchoring to Diaphragm Wall or heavy type steel bracing
- Economic and easier design for Diaphragm Wall, in top down the free cantilever part is limited by the basement floor slabs, which act as horizontal diaphragms.

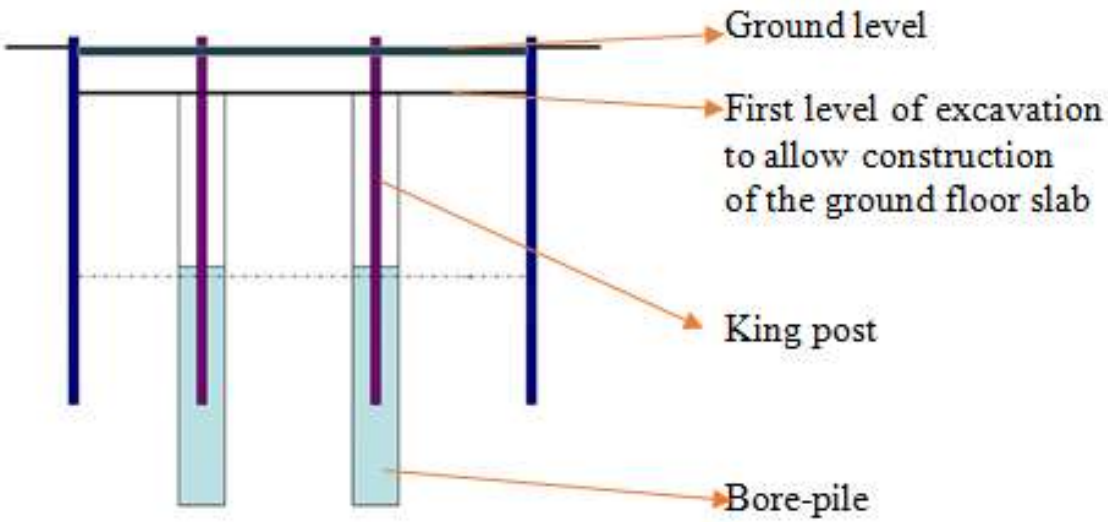
Disadvantages:

- Construction difficulties during excavation of the basement, excavators must not damage or hit the King Post, slow removal of soil material and transport/installation of reinforcement bars
- Safety of workers, sufficient ventilation must be provided/lighting
- Increased Cost

STEP FOR INSTALL KINGPOST



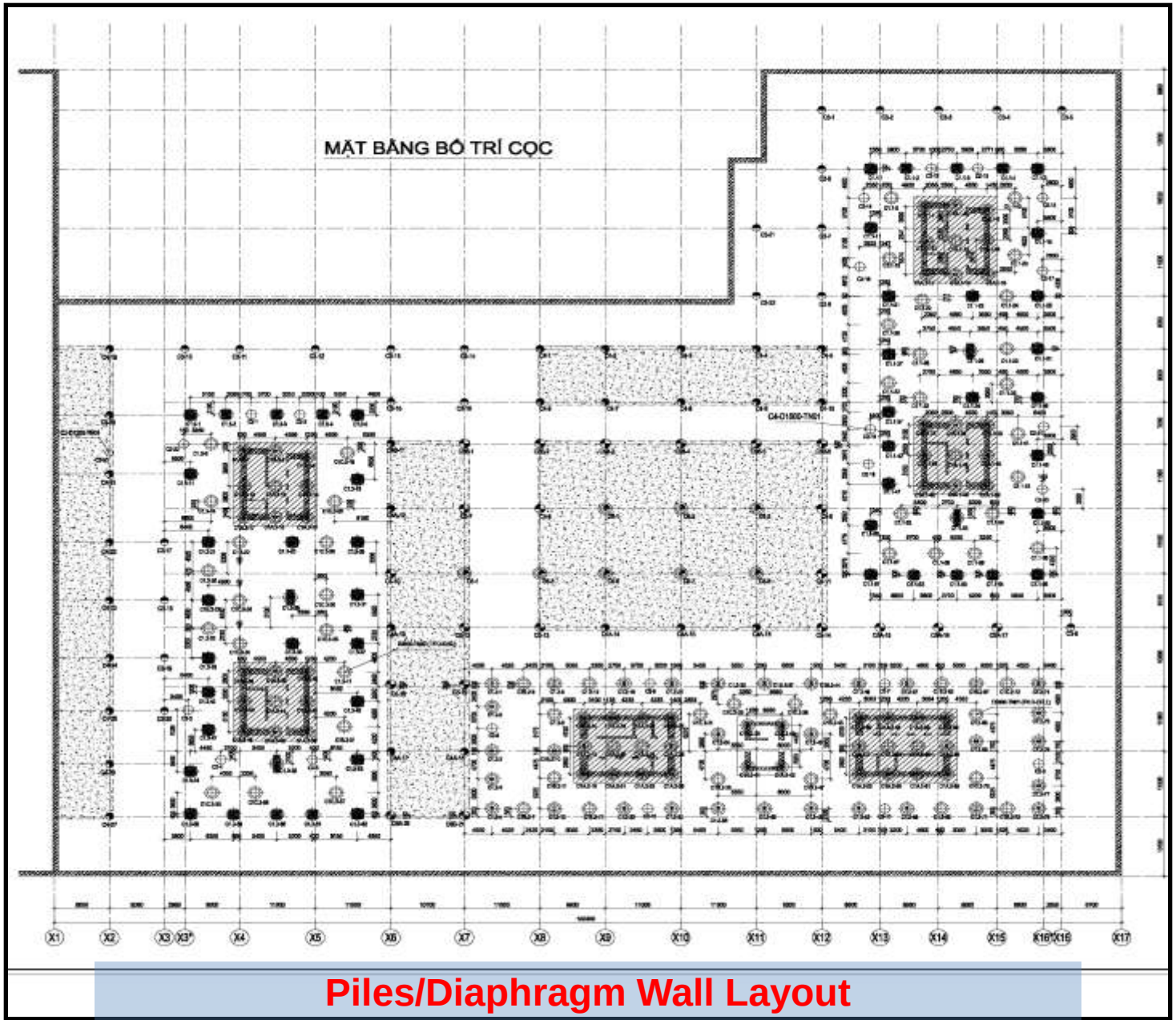
Step 1, Construction of D-wall and Bore-pile



Step 2, Installation of King Post

VINHOMES METROPOLIS

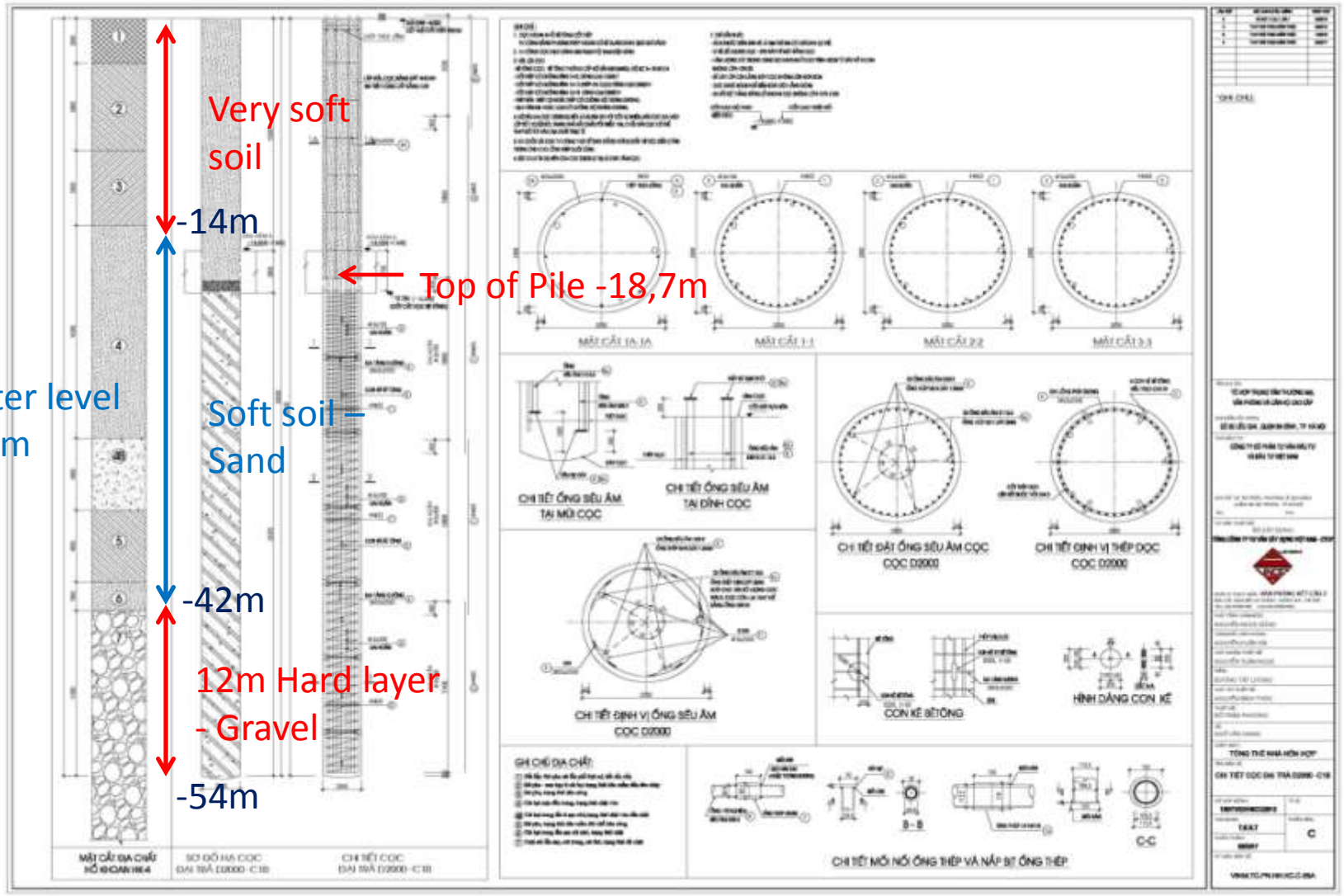
Lieu Giai - Ba Dinh - Ha Noi



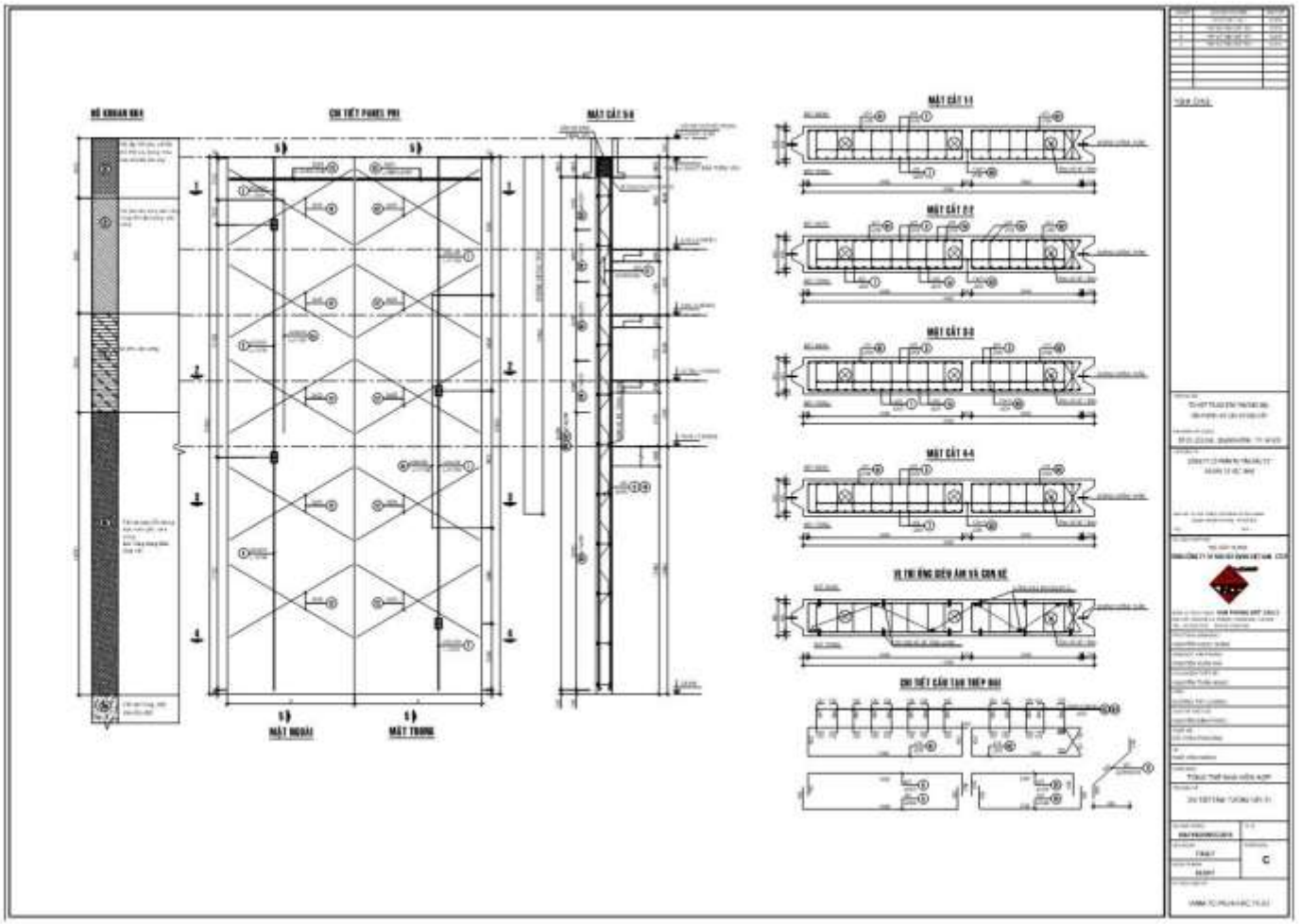
Piles/Diaphragm Wall Layout

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



Pile Cross Section



Diaphragm Wall Cross Section

VINHOMES METROPOLIS

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STATIC OF KINGPOST
HH1,HH2,HH3

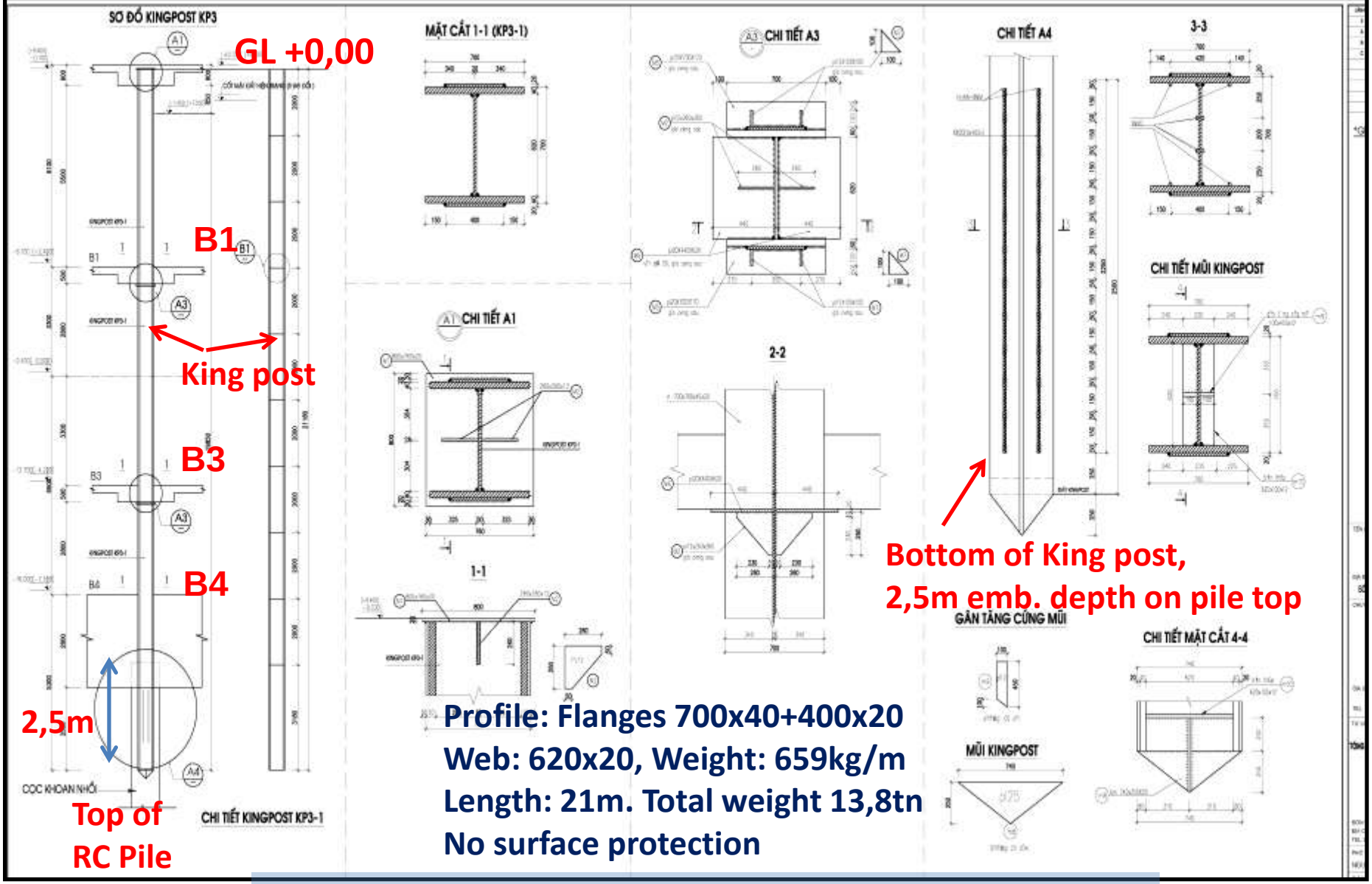
	TYPE	DIMENSION	QLT
	KP1	550X550X20X40	56
	KP1A	550X550X20X40	04
I	KP2	600X600X20X40	70
I	KP2A	600X600X20X40	08
I	KP3	700X700X20X40	12

KINGPOST LAYOUT PLAN

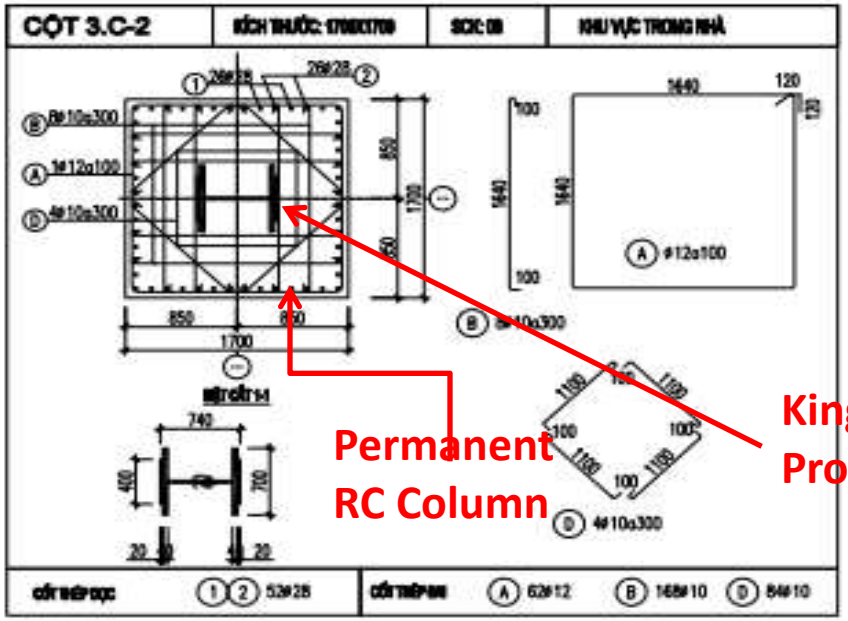
KINGPOST PLAN

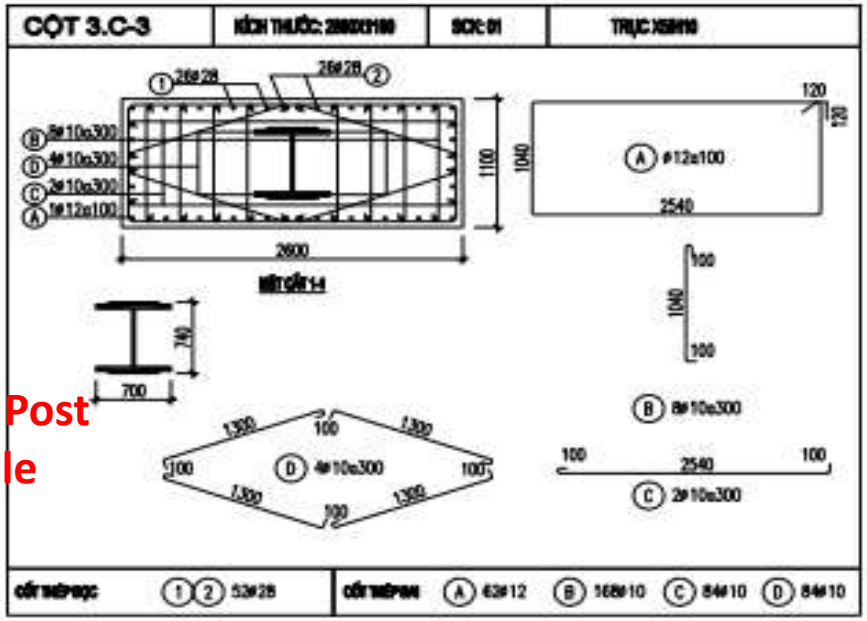
VINHOMES METROPOLIS

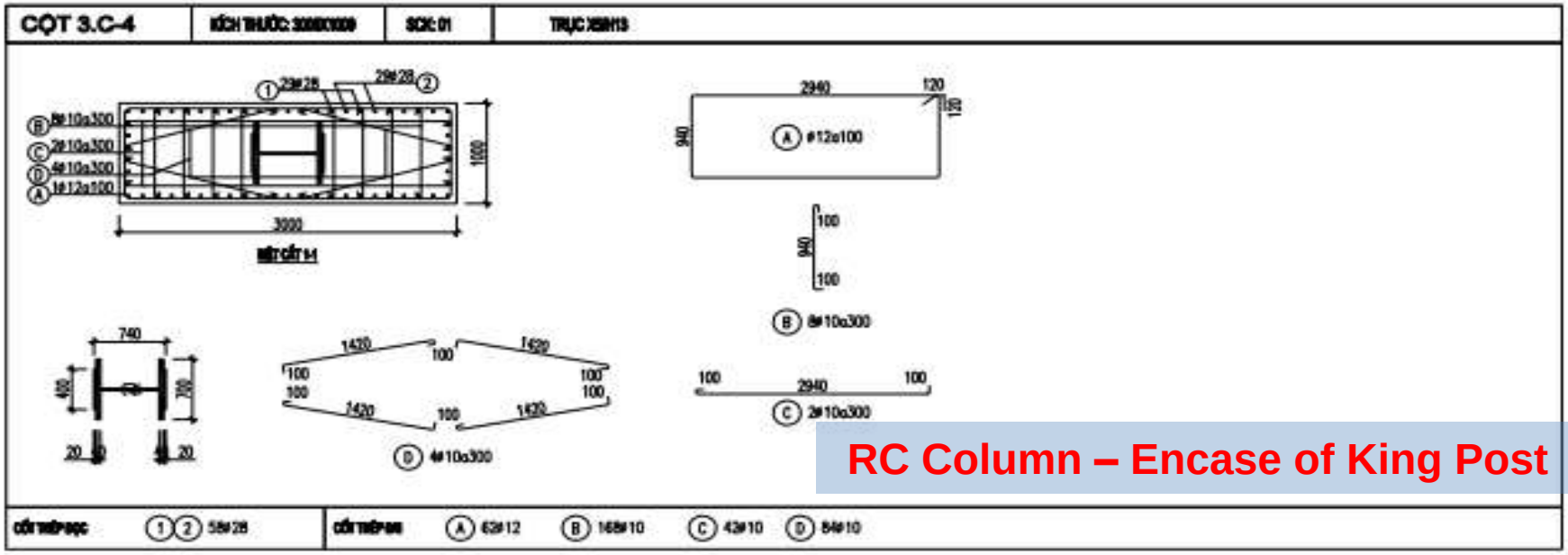
Lieu Giai - Ba Dinh - Ha Noi



Kingpost Cross Section


CỘT 3.C-2
Permanent
RC Column
King Post
Profile


CỘT 3.C-3


CỘT 3.C-4
RC Column – Encase of King Post

VINHOMES METROPOLIS

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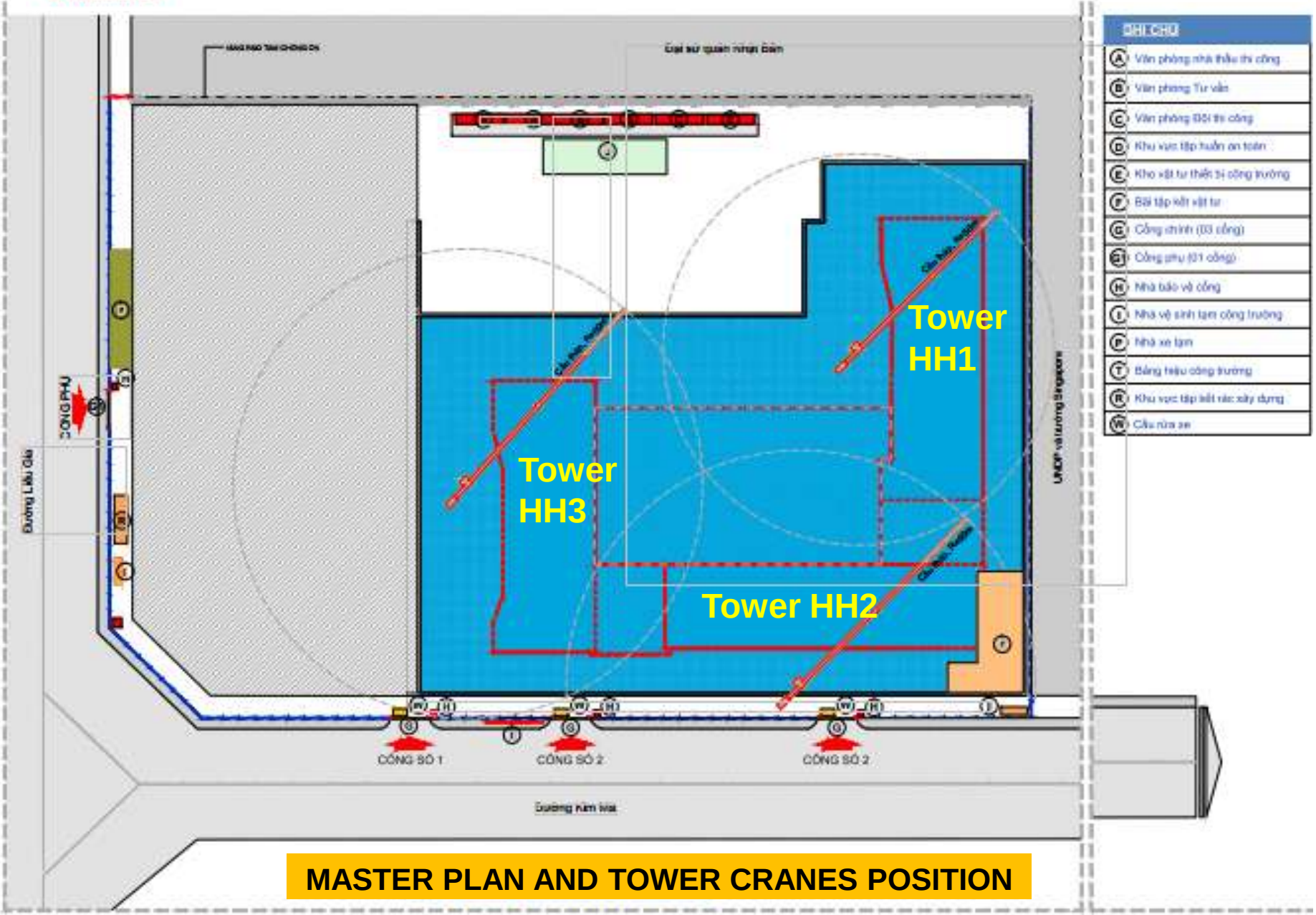
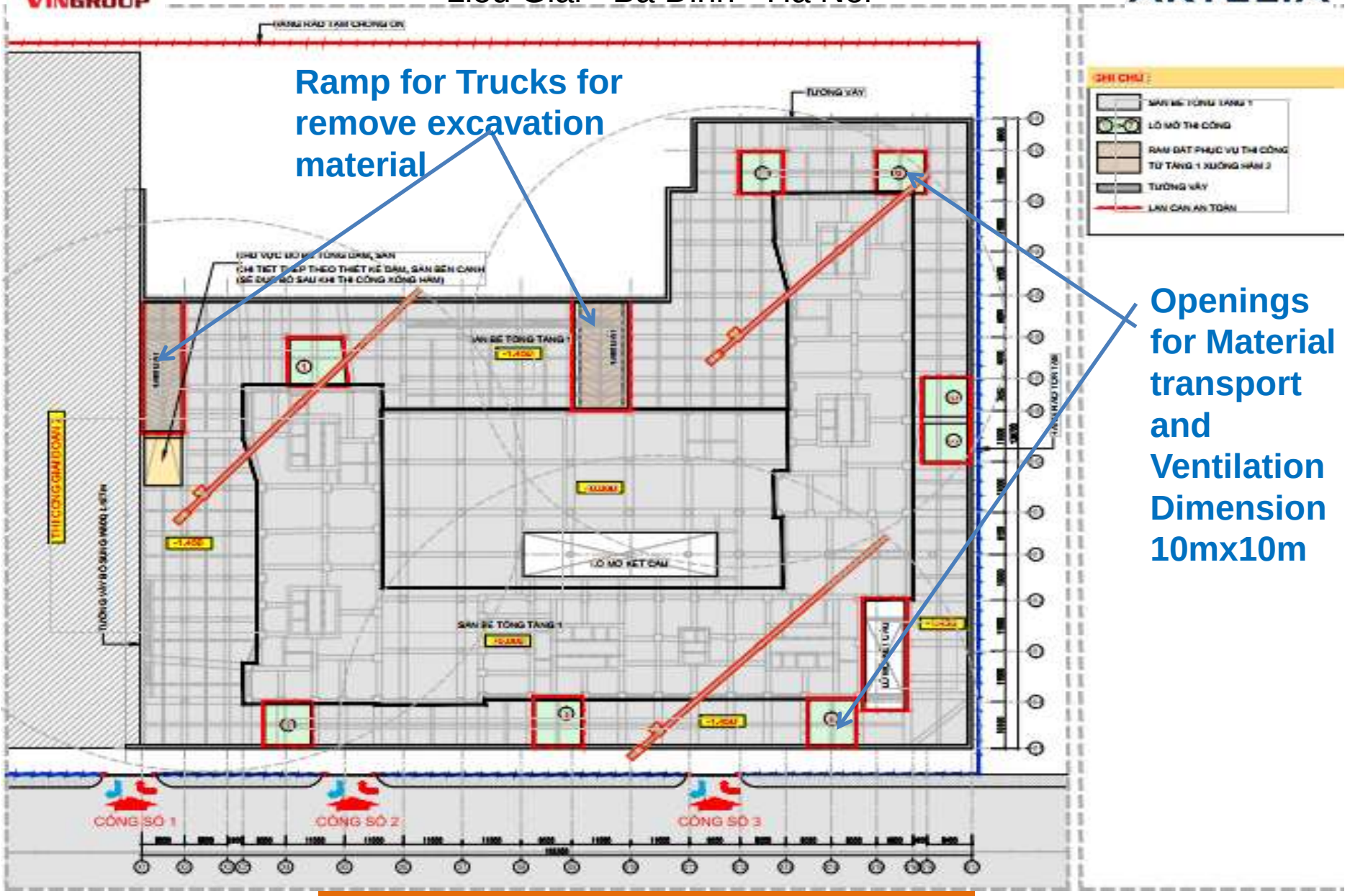


MASTER PLAN AND TOWER CRANES POSITION

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



Ground floor Plan – Slab Openings

VINHOMES METROPOLIS

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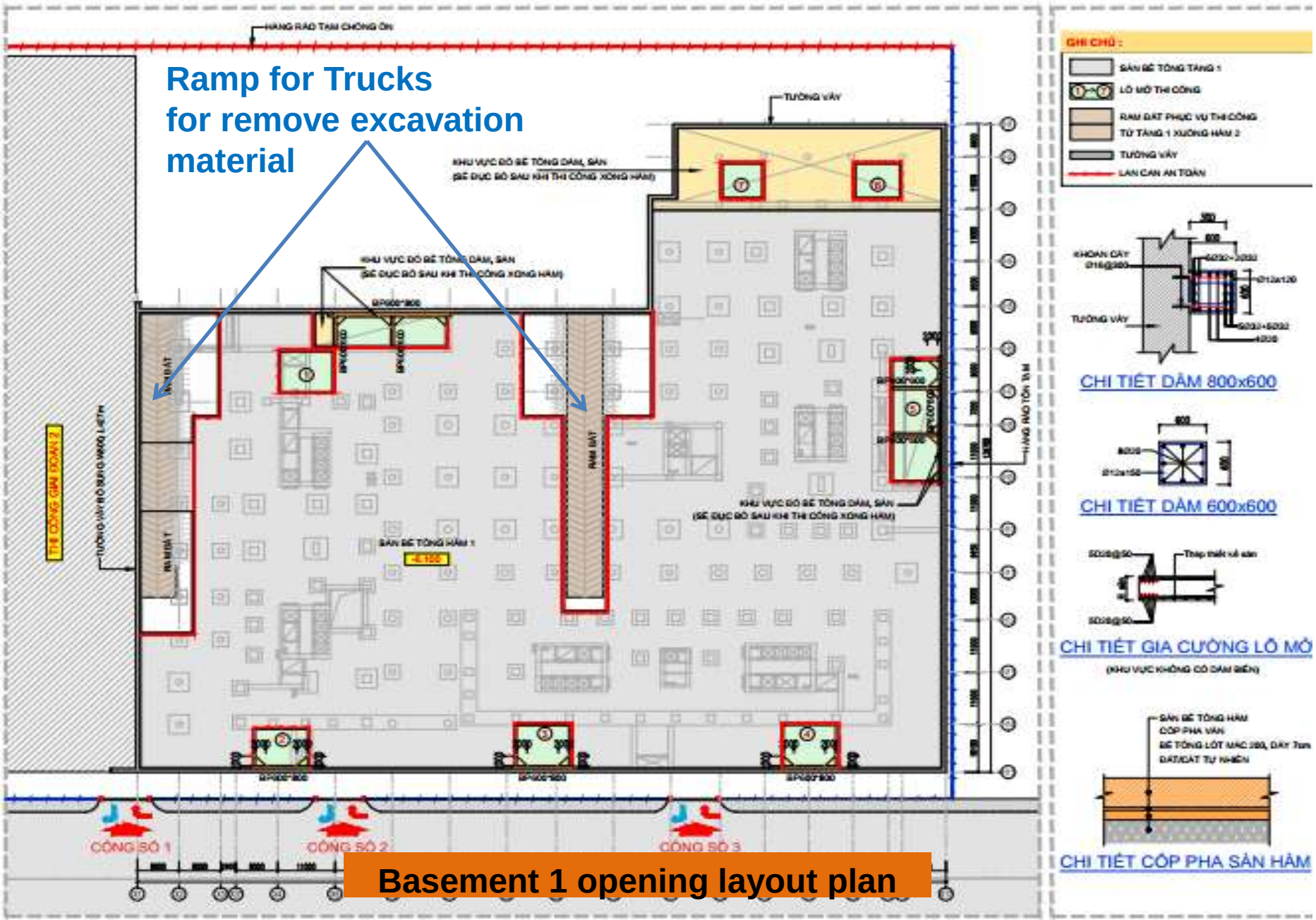
VINGROUP

ARTELIA



Basement 1 opening layout plan

VINHOMES METROPOLIS

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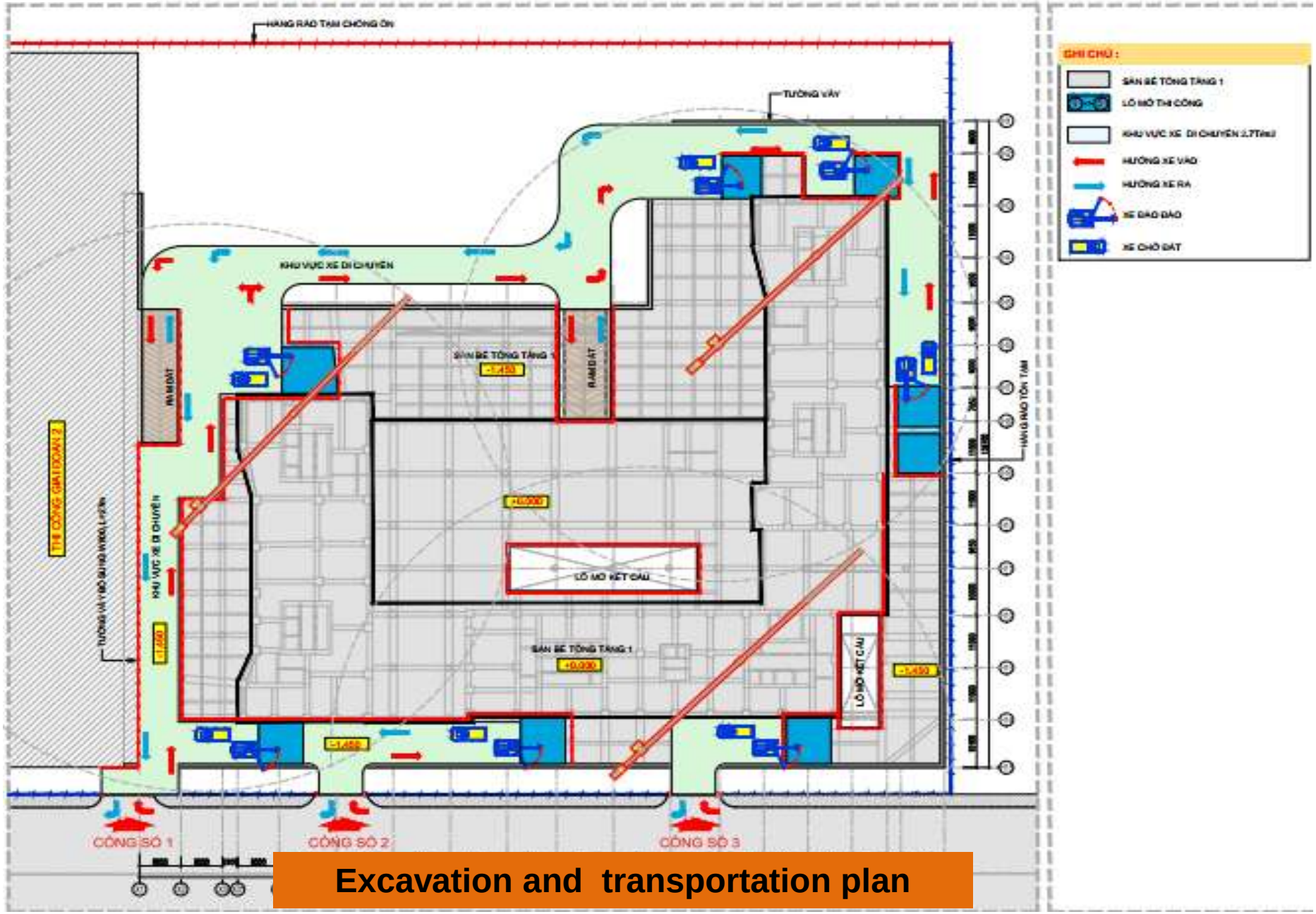

Excavation and transportation plan

VINHOMES METROPOLIS

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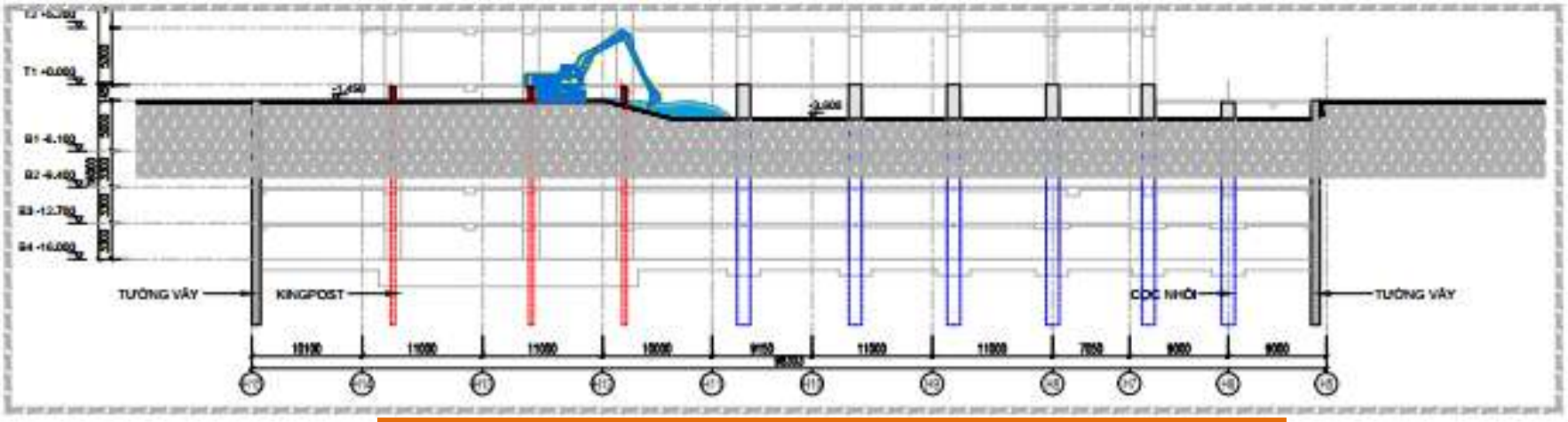
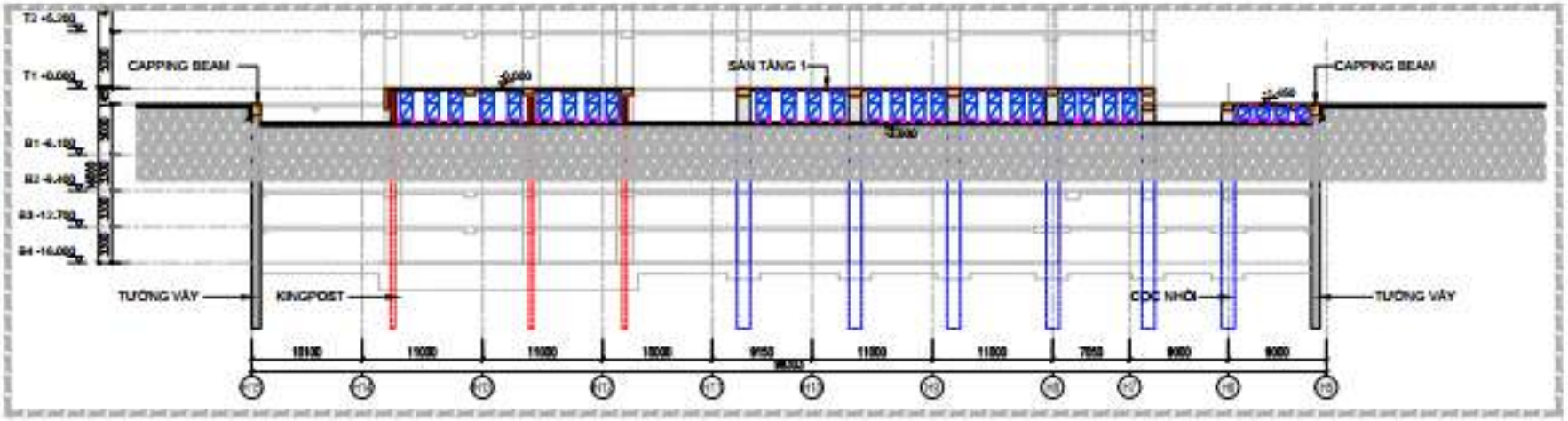


TOP-DOWN: Excavation and Lean concrete



TOP-DOWN: Install scafolding & Formwork for Ground floor

VINHOMES METROPOLIS
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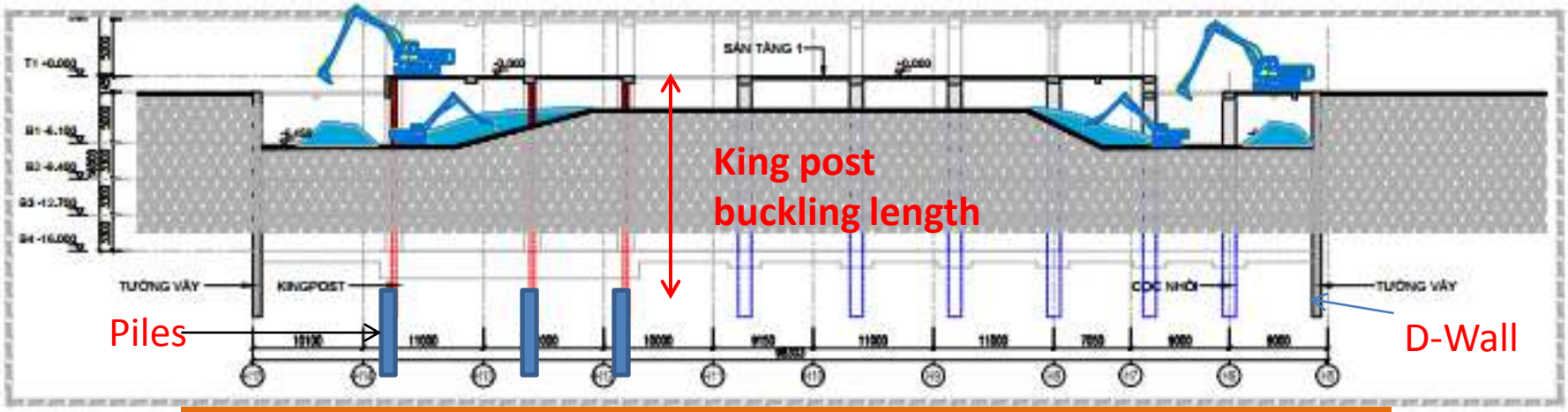
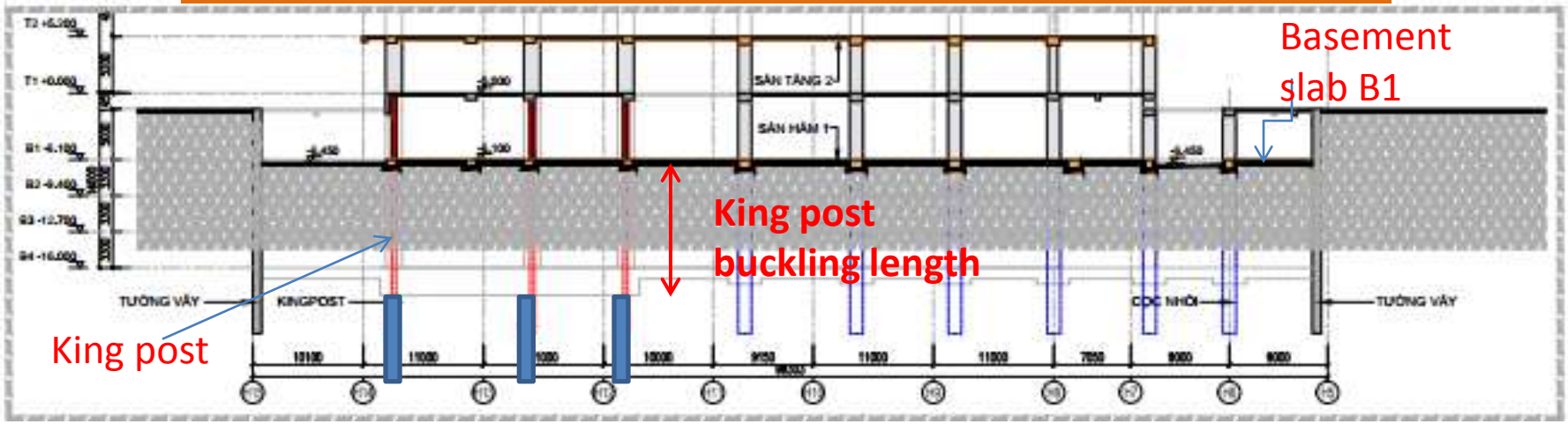


TOP-DOWN Casting Ground Floor and Start Excavation B1



TOP-DOWN Casting L2 and B1

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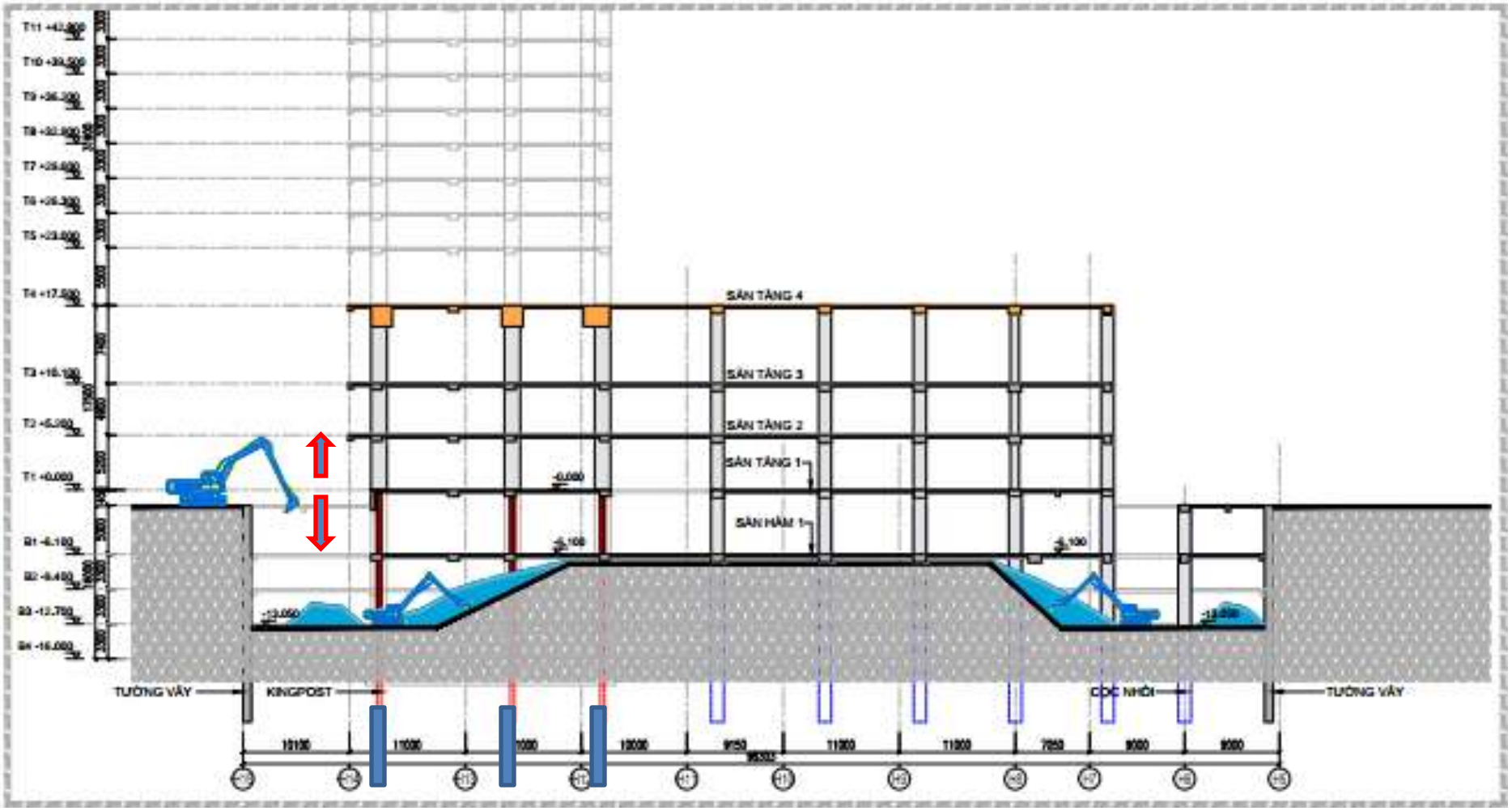

TOP-DOWN Continue super structure and Excavation B3

VINHOMES METROPOLIS

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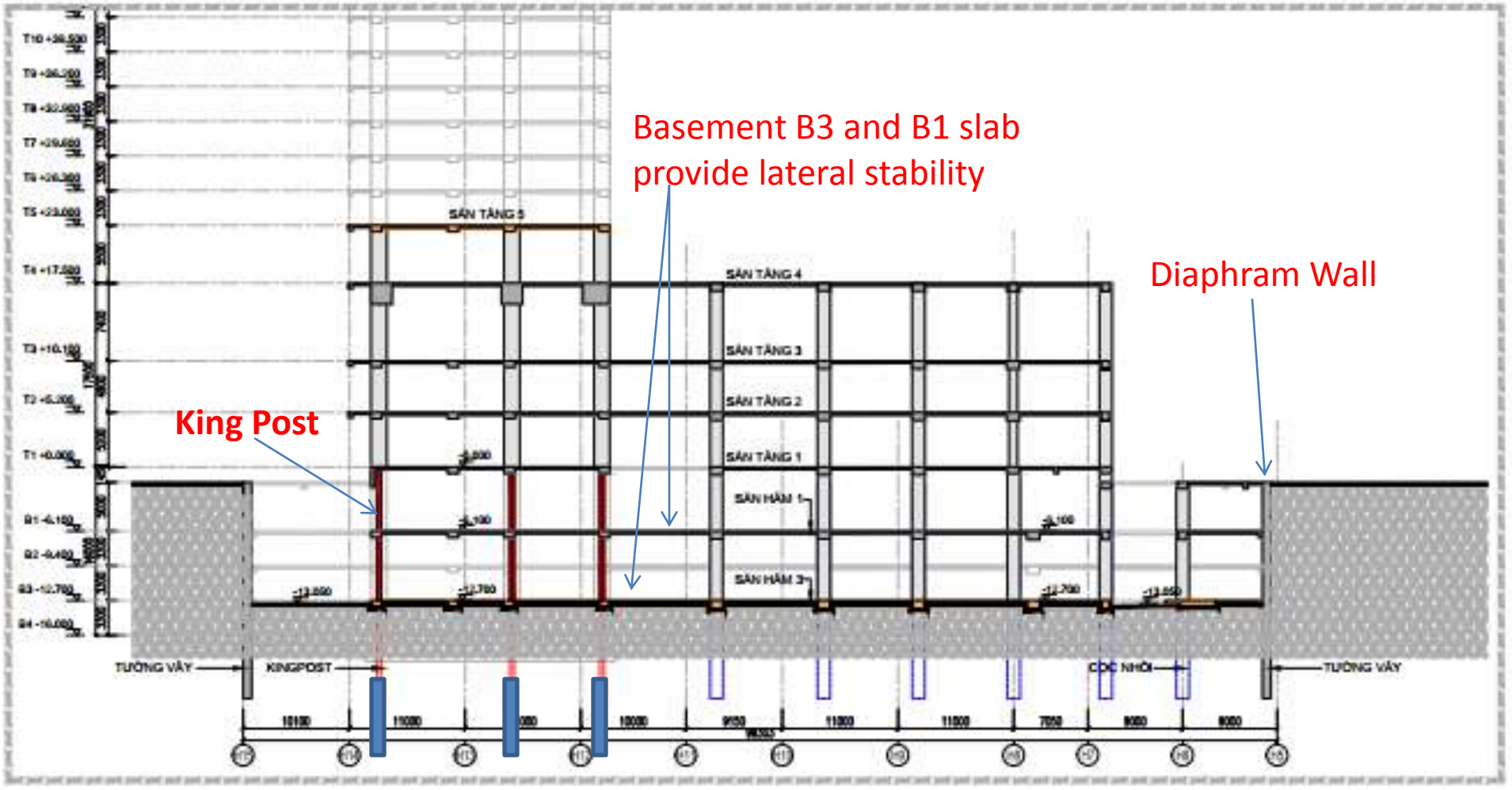

TOP-DOWN Casting B3 and L5

VINHOMES METROPOLIS

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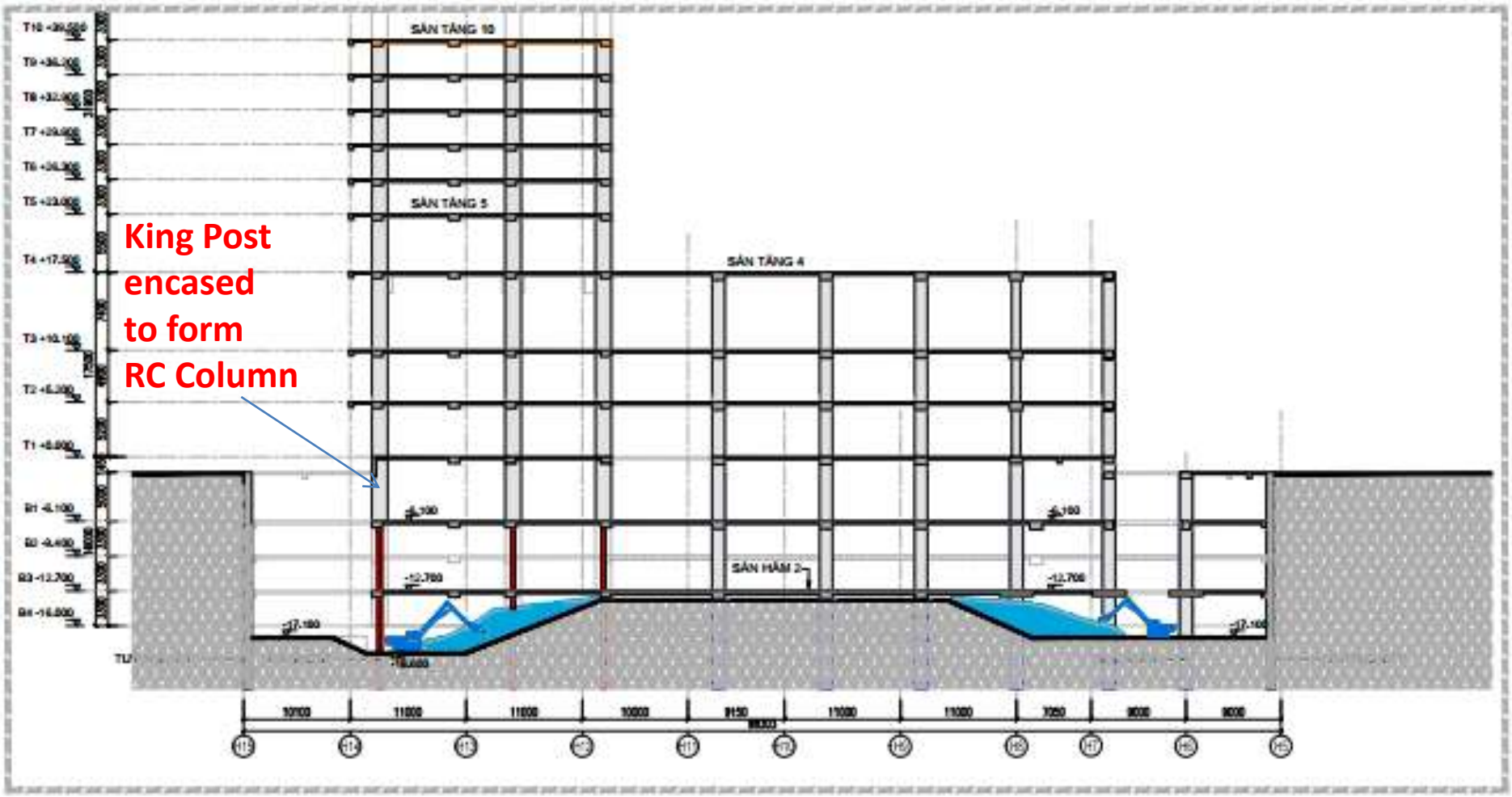

TOP-DOWN Excavation B4 and Casting up to L10

VINHOMES METROPOLIS

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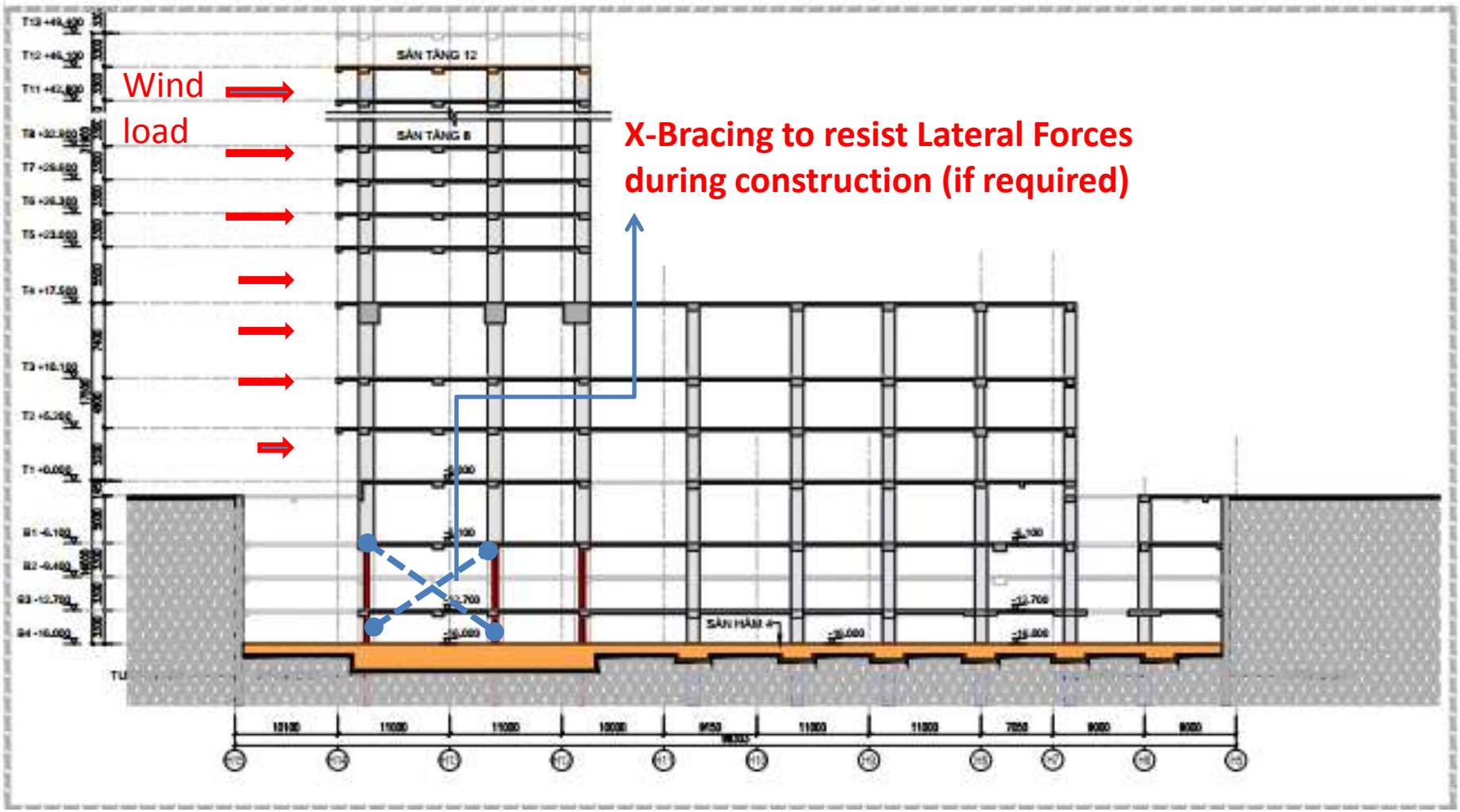
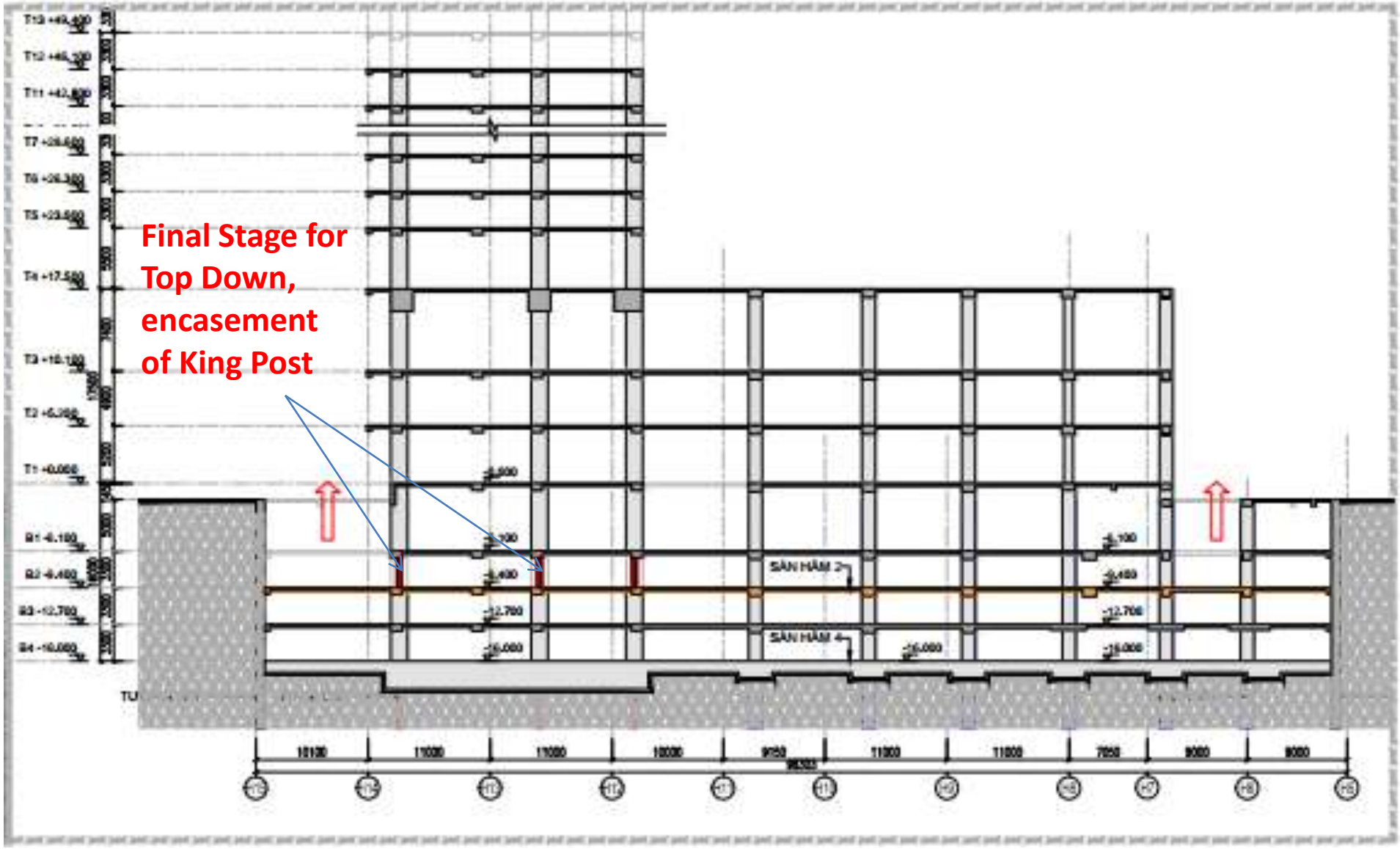


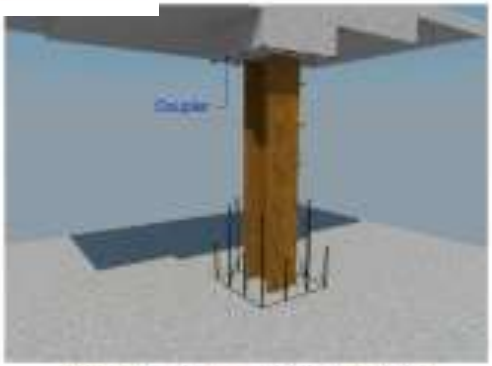
TOP-DOWN Continue up to L12 (Kingpost capacity) and Complete B4 Foundation Slab

VINHOMES METROPOLIS

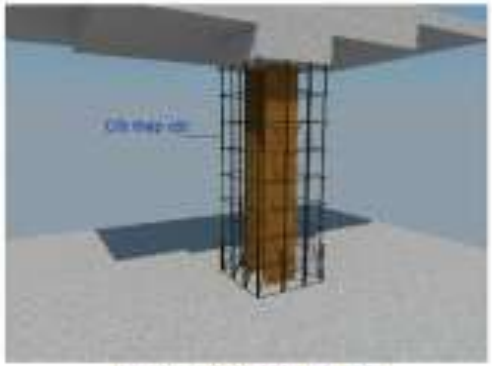
Lieu Giai - Ba Dinh - Ha Noi



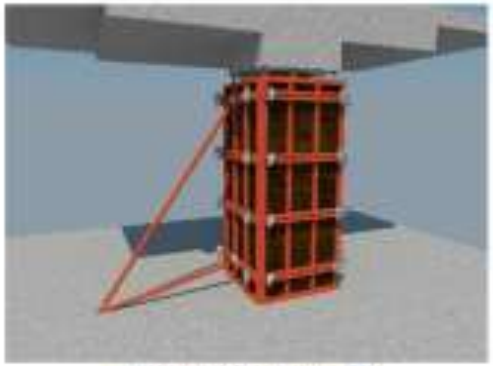
TOP-DOWN Casting RC Column/Grout at King post and Continue above L12



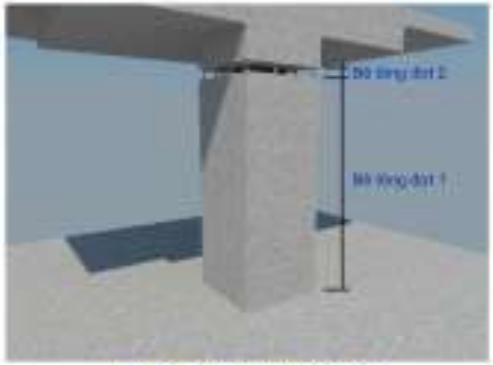
BƯỚC 1 : VỆ SINH CỐT THÉP CHỜ VÀ KINGPOST



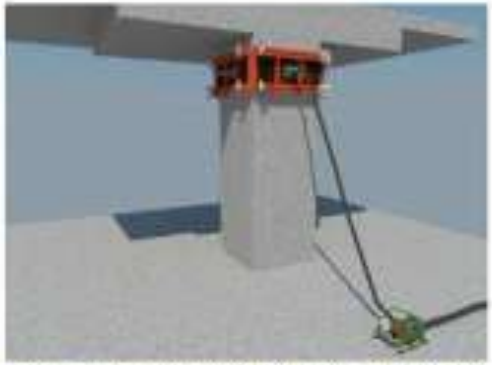
BƯỚC 2 : LẮP ĐẶT CỐT THÉP CỘT



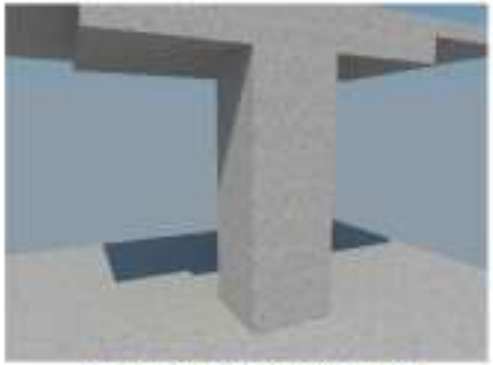
BƯỚC 3 : LẮP ĐẶT CỐP PHA CỘT



BƯỚC 4 : ĐỔ BÊ TÔNG CỘT ĐỢT 1



BƯỚC 5 : LẮP ĐẶT CỐT PHA, ĐỔ SIKA GROUT, EPOXY ĐẦU CỘT



BƯỚC 6 : THÁO CỐP PHA, CỘT HOÀN THÀNH

COMPLETION OF TOP DOWN: CONSTRUCTION OF RC COLUMNS-ENCASE KINGPOST AND FINAL GROUTING

TOP DOWN METHOD FOR CONSTRUCTION

Schedule:

- Construction of Diaphragm Wall, Piles and King Post Installation: 2 1/2months
- Average: 5 Piles/day and 3 King post/day, 10m of DW/day.
- Completion of Ground Floor Slab: 4 months after start of works
- Excavation rate: 1200 m^3/ day
- Completion of Top Down, All 4 Basements/Columns/CoreWalls and Foundation Slab: 14 Months after start of works.
- Superstructure, Completion of typical floor 1/5-6 days, 5 floors/month

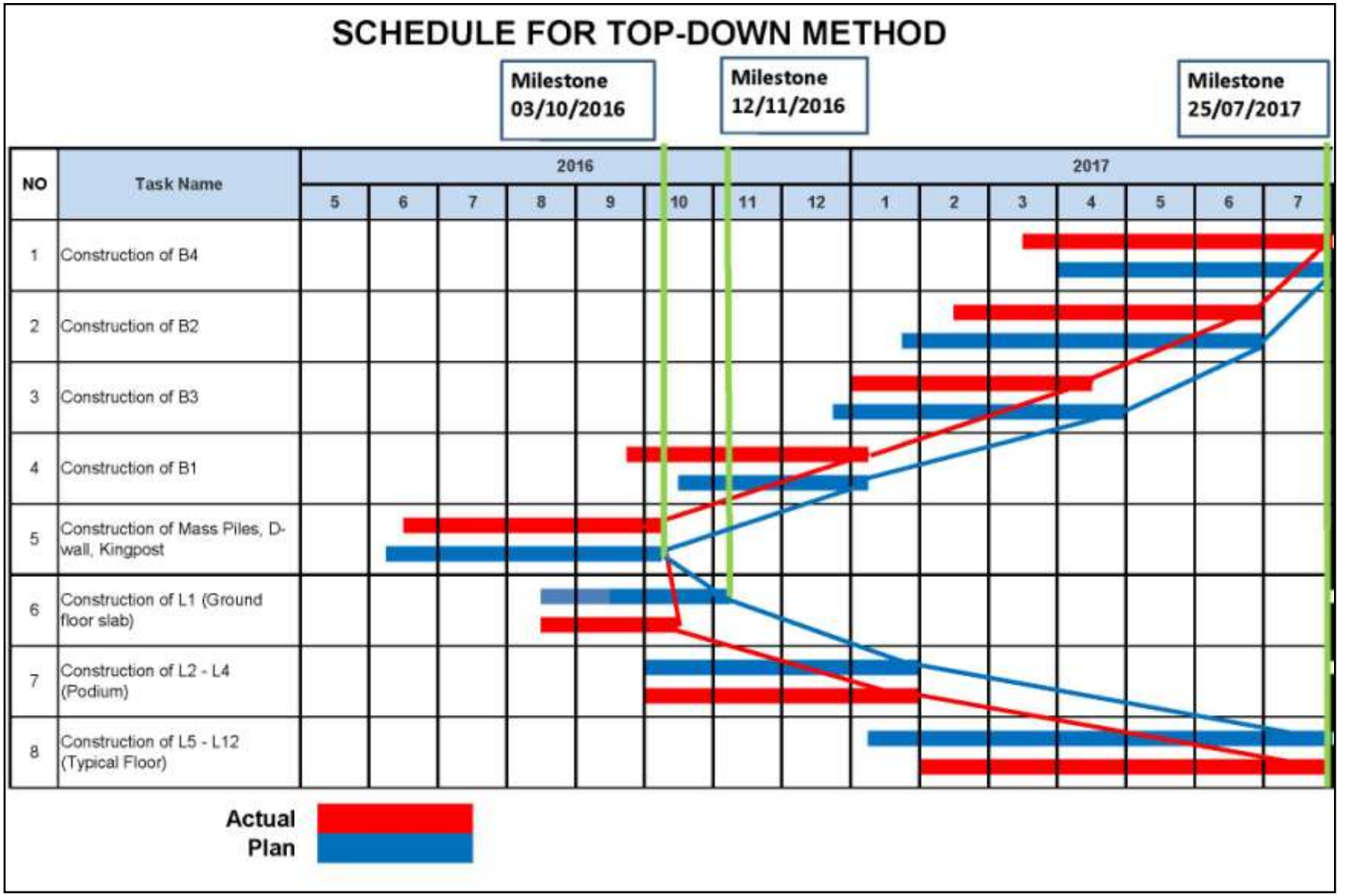
Cost:

- King Post: Approx 2160 T, 1,8ml US (800 US/tn)Excl Installation
- Piles/Diaphragm Wall/King Post: 8%
- Structure, Basement and Superstructure: 36%
- Finishing Works: 18%, Facade: 6%, Landscape: 1%
- MEP Works: 31%

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

SCHEDULE FOR TOP-DOWN METHOD



VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Site….Before Start of Works…

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Excavation Works Start Early May 2016

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Aerial View from Site – Piling Equipment Mobilization

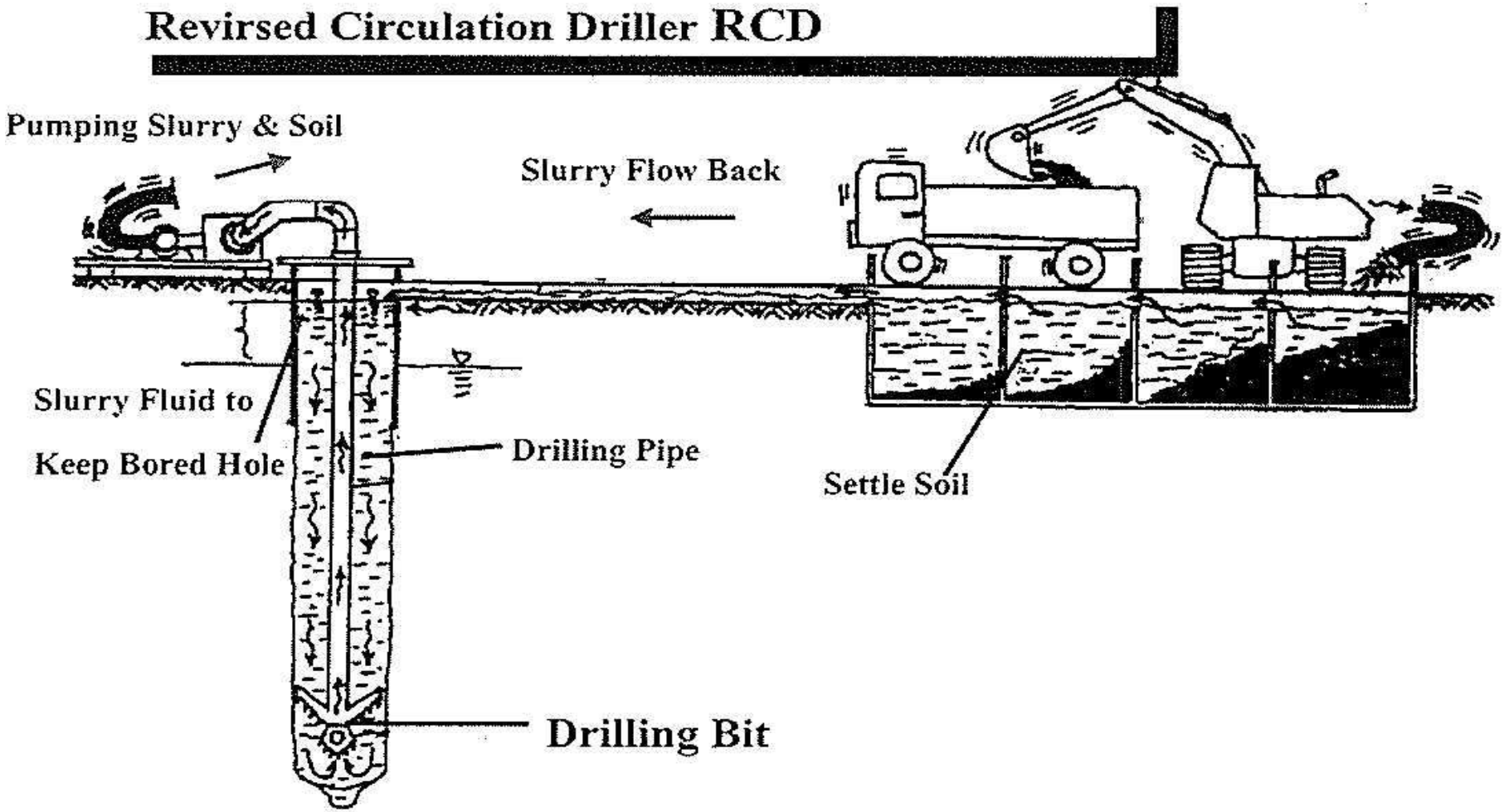
TOP DOWN METHOD

1. *Piling and Diaphragm Wall Construction*

CONSTRUCTION OF PILES

- Surveying and layout
- Installation of Standing Casing
- Start Drilling using RCD method and Verticality Inspection
- RCD is reversed circulation Method, of water to drill a hole, mixed with Polymer. Polymer is primarily used to stabilize the soil during the excavation. The water level shall be kept at a certain level (-1m) to avoid the wall from collapse.
- Polymer/water are kept in suitable (slurry) ponds
- Check depth of pile, depth meter
- Fabrication/Installation of Rebar Cage
- Installation of Tremie pipes to enable casting of Concrete
- Bottom Sludge Treatment, cleaning with by air compressor
- Casting Concrete
- Backfilling and sonic integrity testing (At least 7 days after concreting)

CONSTRUCTION OF PILES



VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Mobilization of Equipment for piling works

Drilling of bored piles/ RCD Method

Installation of pile reinforcement

Casting Concrete for bore piles

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Drilling with RCD for piling

VINHOMES METROPOLIS

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Pile Testing – Conventional Method for 1,5m D Piles

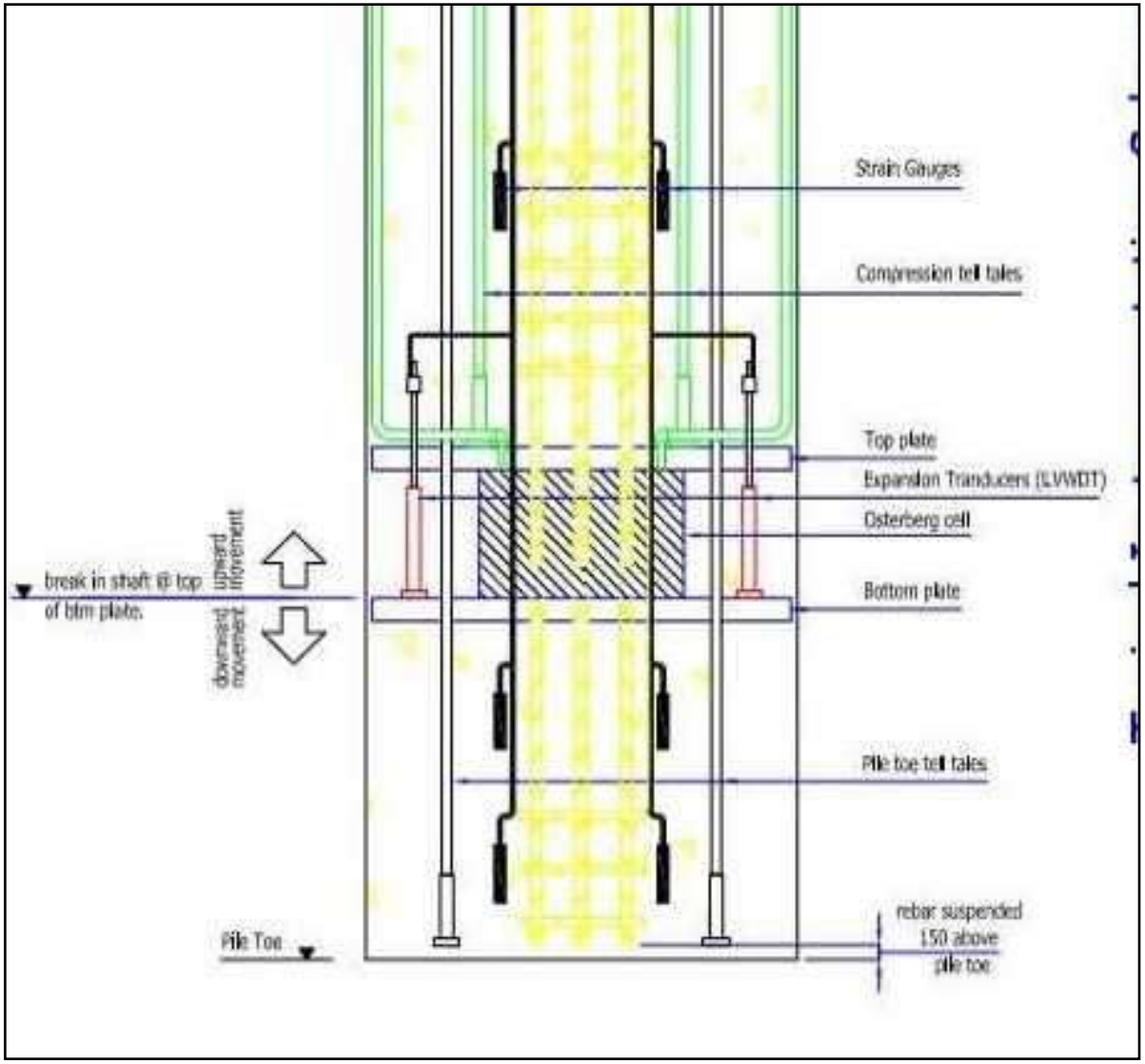
Monitor of pile settlement

TESTING OF LARGE DIAMETER PILES 2,0M – O'CELL METHOD

- Test full sized bored piles to their ultimate capacity, more conveniently, economically and safety
- The O-cell is a hydraulically driven, calibrated, sacrificial jacking device installed within the foundation unit.
- The Osterberg Cell loads the test pile in compression, similar to a conventional top load test. The only significant difference is that the O-cell Provides two load versus movement curves, one for shear and one for end bearing.
- For the preliminary test piles, the primary objective is to obtain ultimate skin friction and end bearing data for bored piles
- This load test indicated a displacement of 45mm, under a force of 85MN, which was considered satisfactory.

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



O'Cell Testing – Instrumentation Detail

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

O'Cell Method for testing

2,0m Diameter piles

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Pile Reinforement Cages

Sonic Pile Testing

Diaphragm Wall Reinforcement Cage

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Excavation for Diaphragm Wall of Basement

Lifting of steel cage

Excavation of Diaphragm Wall

Installation of Reinforcement Cage - Diaphragm Wall

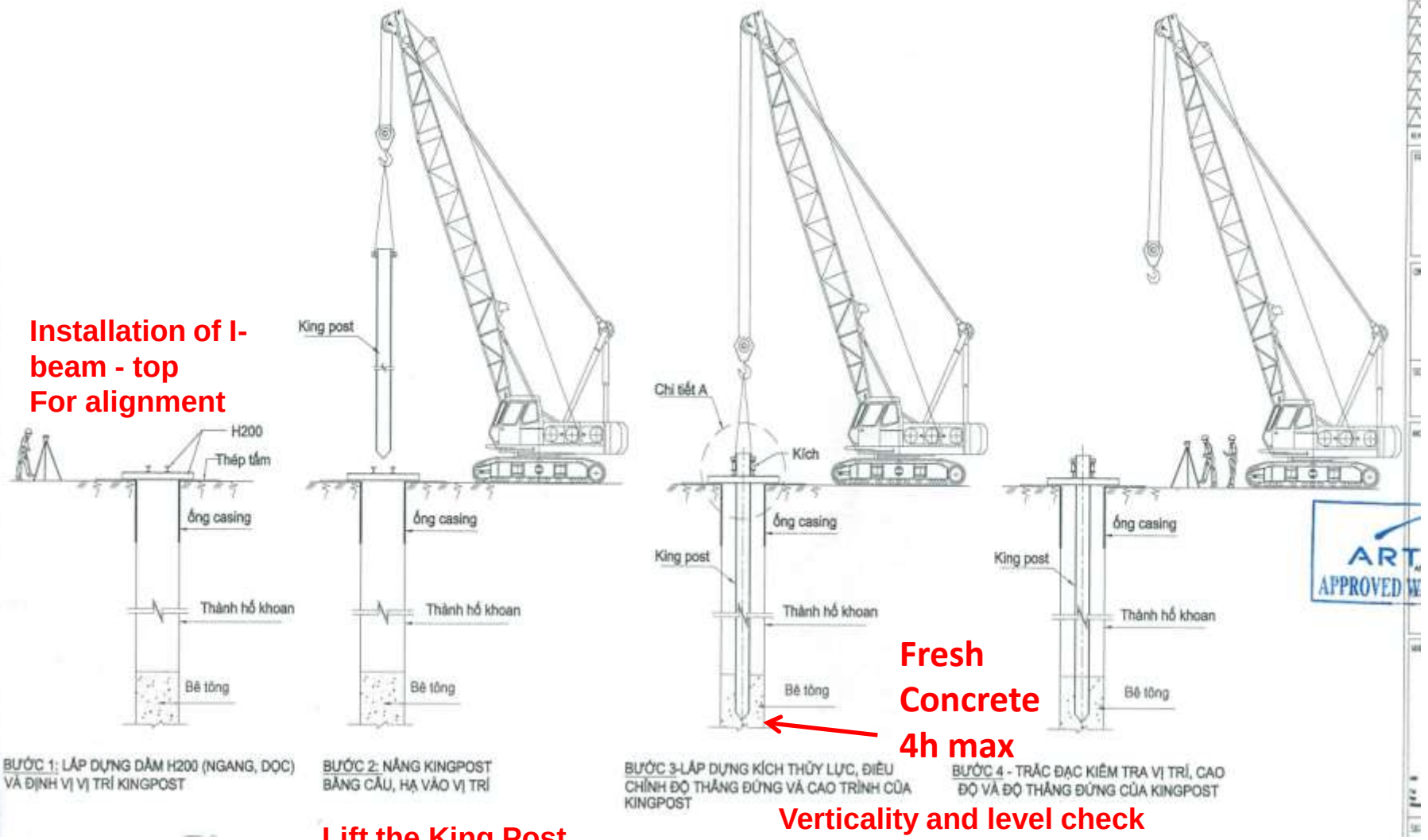
VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Casting of Diaphragm Wall

TOP DOWN METHOD

2. *Installation of King Post (Steel Columns) on top of piles*



Installation of I-beam - top For alignment

Lift the King Post

Fresh Concrete 4h max

Verticality and level check Adjust by jack equipment – Remove after 24h

TOP-DOWN / KING POST INSTALLATION SEQUENCE

King post – prior to installation

Lifting of King post

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

King post installation on top of pile

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Installation of King Post

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi


King post alignment


King post driven into final position

King post final position

TOP DOWN METHOD

3. *Ground floor Slab Construction*

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Start excavation below ground level

Lean concrete below level 0,00

Installation of scaffoding

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Preparation for Ground slab

Scaffolding Installation

Reinforcement installation

King post Connection with RC beam

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Preparation for Ground slab

King-Post RC Beam Connection

Reinforcement installation

VINHOMES METROPOLIS

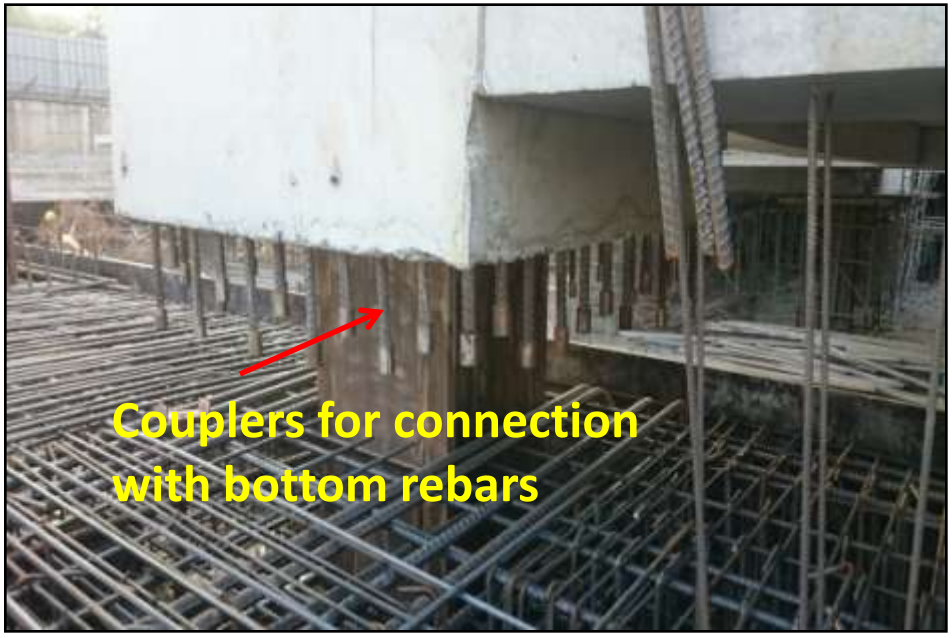
Lieu Giai - Ba Dinh - Ha Noi

Casting Concrete of Ground Slab

Top view

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



TOP DOWN METHOD

4. *Excavation and Basement Slab B1 Construction*

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Excavation works ongoing for Basement B1

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Levelling of soil and installation of formwork

Basement B1 formwork completed

Soil load testing following compaction

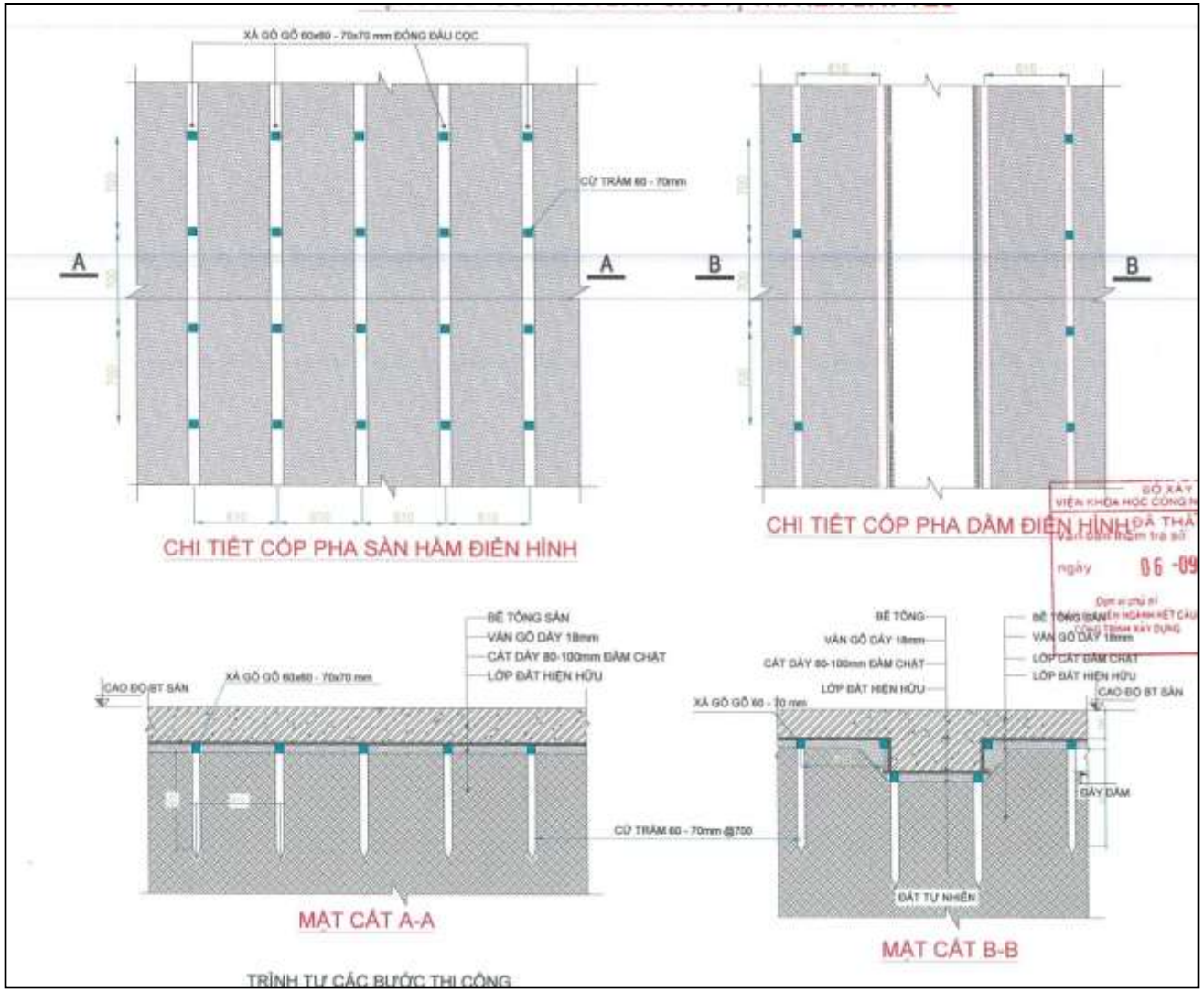
VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Installation of Wood Post for Soil Improvement

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



Support of Soil formwork on wooden posts

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Welding Steel Plates for King Post Connection to RC Beam

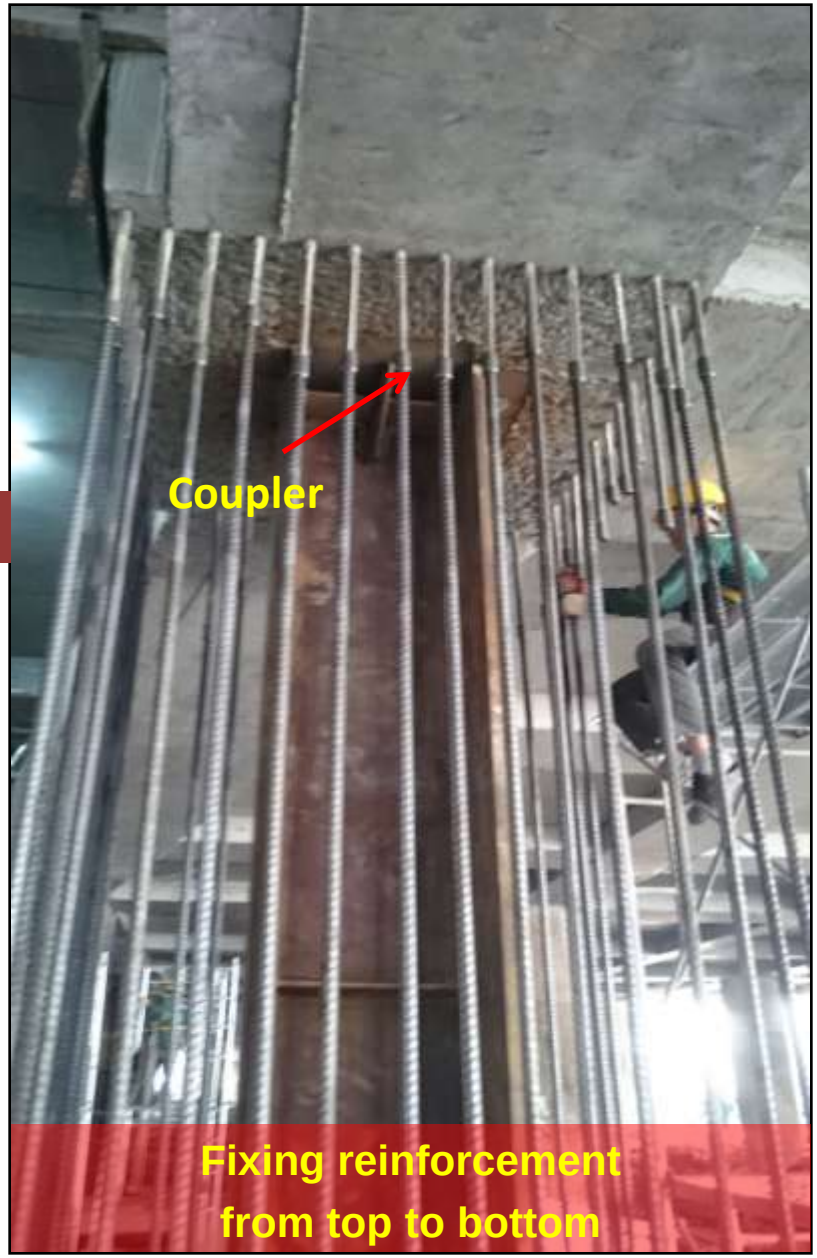
King post/RC Beam connection

Installation of rebars for columns top down

Installation of reinforcement of slab

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Starter bars for connection with RC Column Bars



Fixing reinforcement
from top to bottom

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

RC Pile/ slab connection

Basement Slab Reinforcement

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Casting of slab

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Casting Basement B1 Slab@Top Down

TOP DOWN METHOD

5. *Continue Excavation to Lower Basement levels*

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

View of Basements B1,B2,B3

Ventilation

Excavation for B4

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Continue Excavation from top to bottom

B3 Installation of Formwork

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi


Construction of Foundation Slab B4


Excavation and Breaking of top of pile


Excavation


Casting Lean Concrete at bottom

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Excavation for Basement B4 and foundation slab@Top Down

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Excavation for Basement B4 and foundation slab@Top Down

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Excavation for Basement B4 and foundation slab@Top Down

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Material transfer to Basement 4 through slab opening


Slab Opening for excavation, material transport and ventilation

TOP DOWN METHOD

6. Reinforcement Installation and Casting Mass Concrete for foundation slab
Total: 27,500 m^3

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi


Installation of Reinforcement in Lift Pit


Fixing of couplers for column reinforcement


Encasement of King Post / Installation Column Reinforcement

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Fixing rebars with couplers encasing King Post

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha No

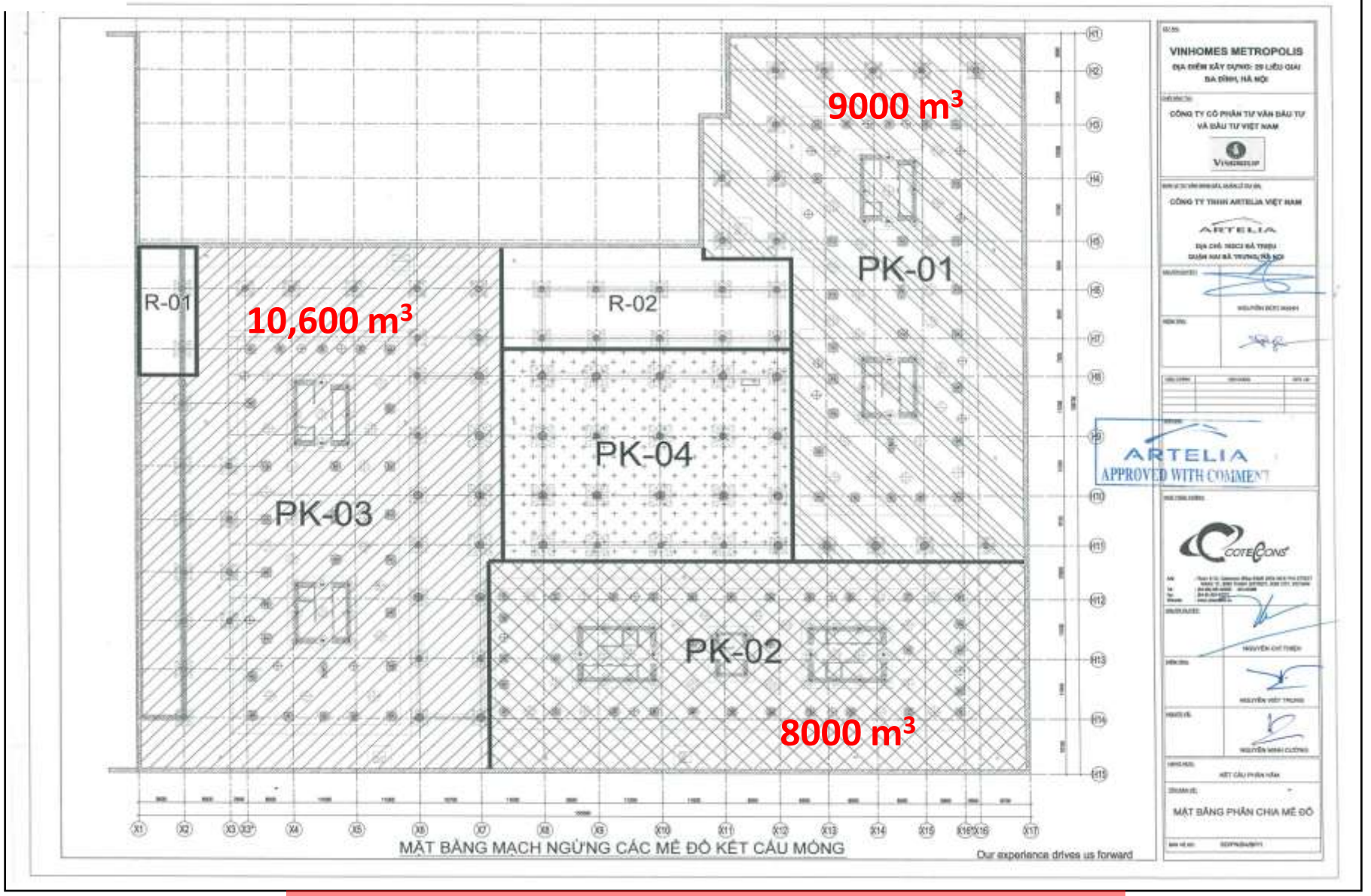
Connection between DW and Slab

Fun for air ventilation

Installation top Reinforcement

VINHOMES METROPOLIS

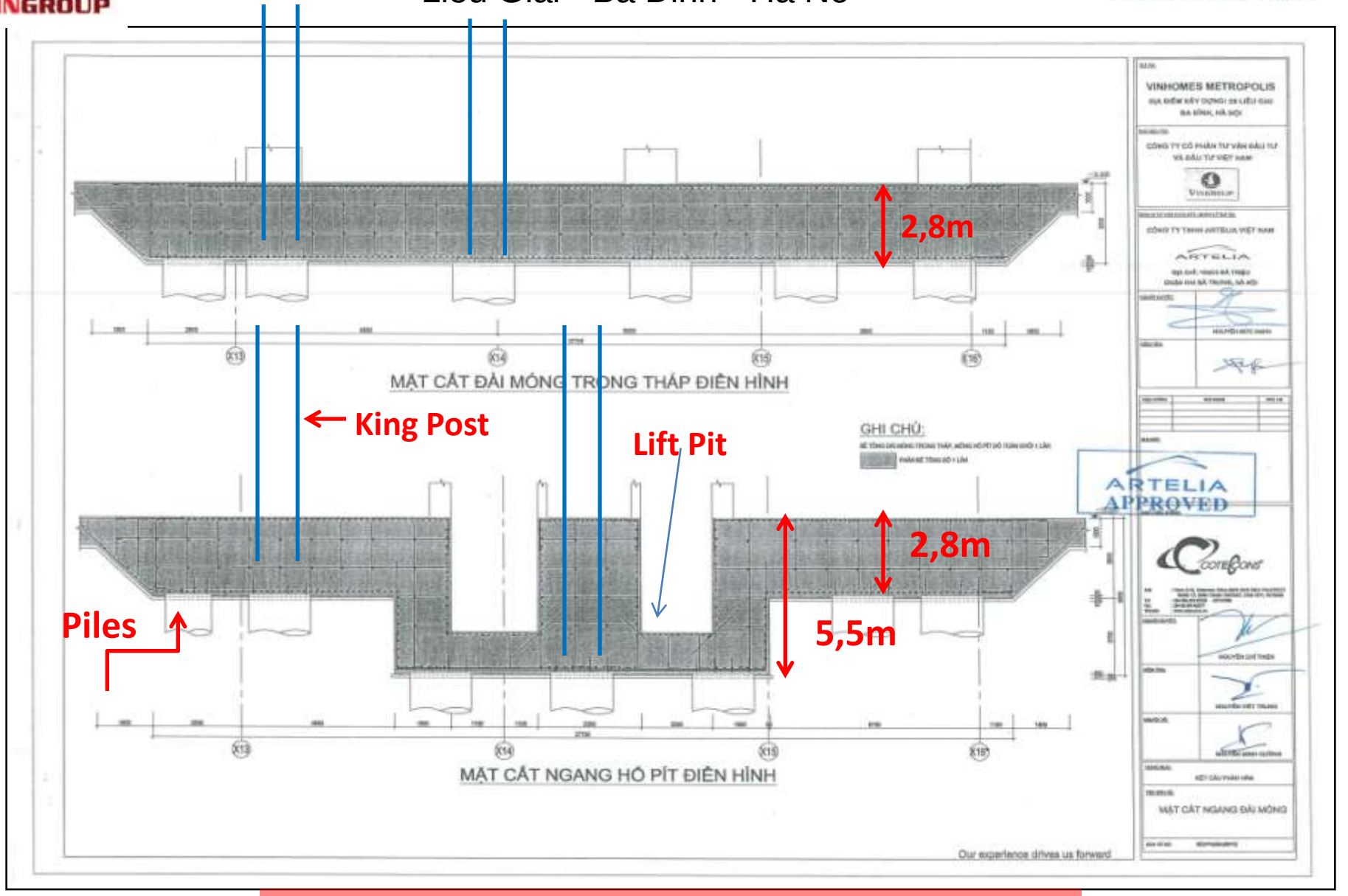
Lieu Giai - Ba Dinh - Ha No



Plan for Foundation Slab at B4

VINHOMES METROPOLIS

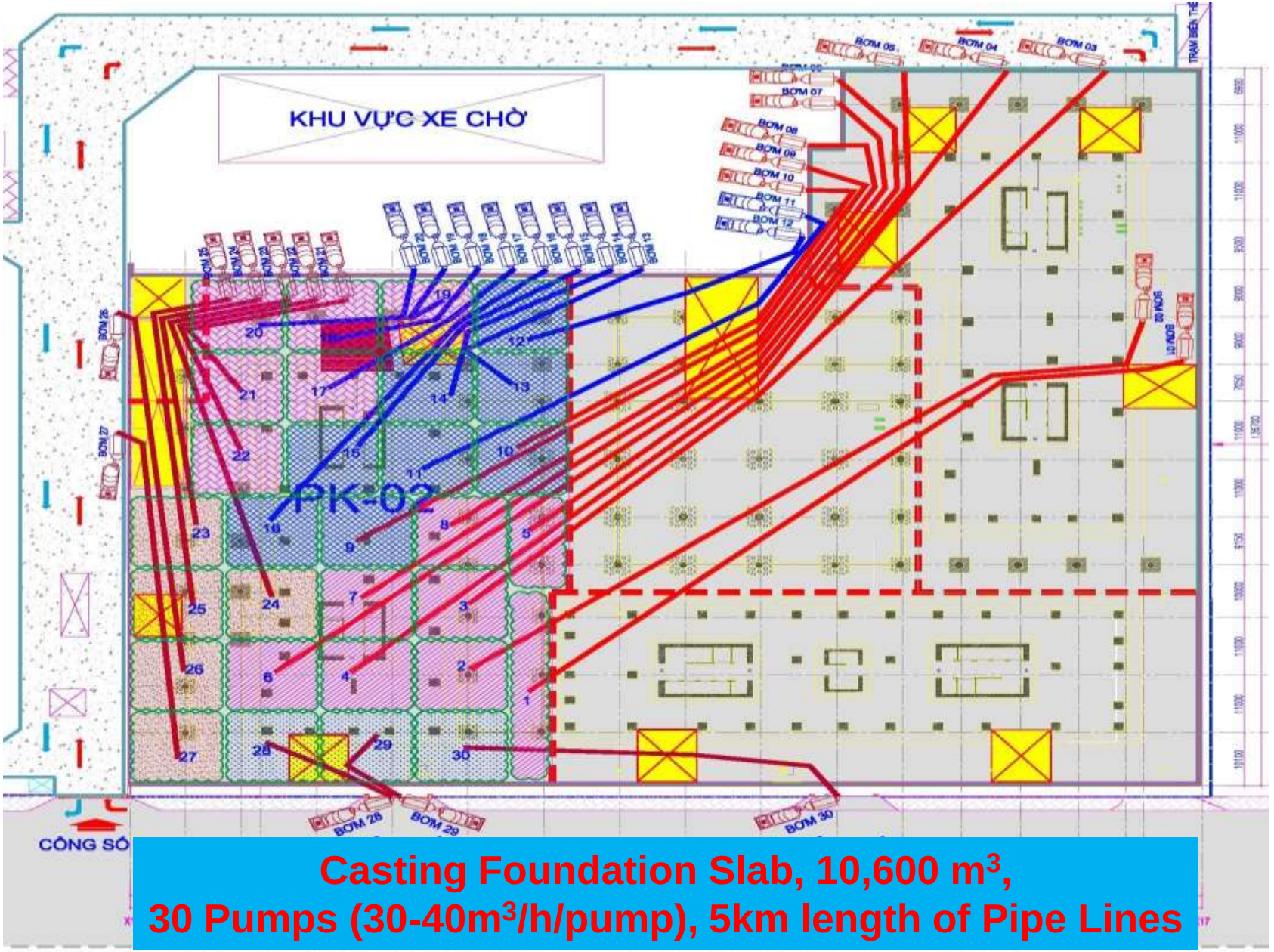
Lieu Giai - Ba Dinh - Ha No



Cross Section for Foundation Slab, B4

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

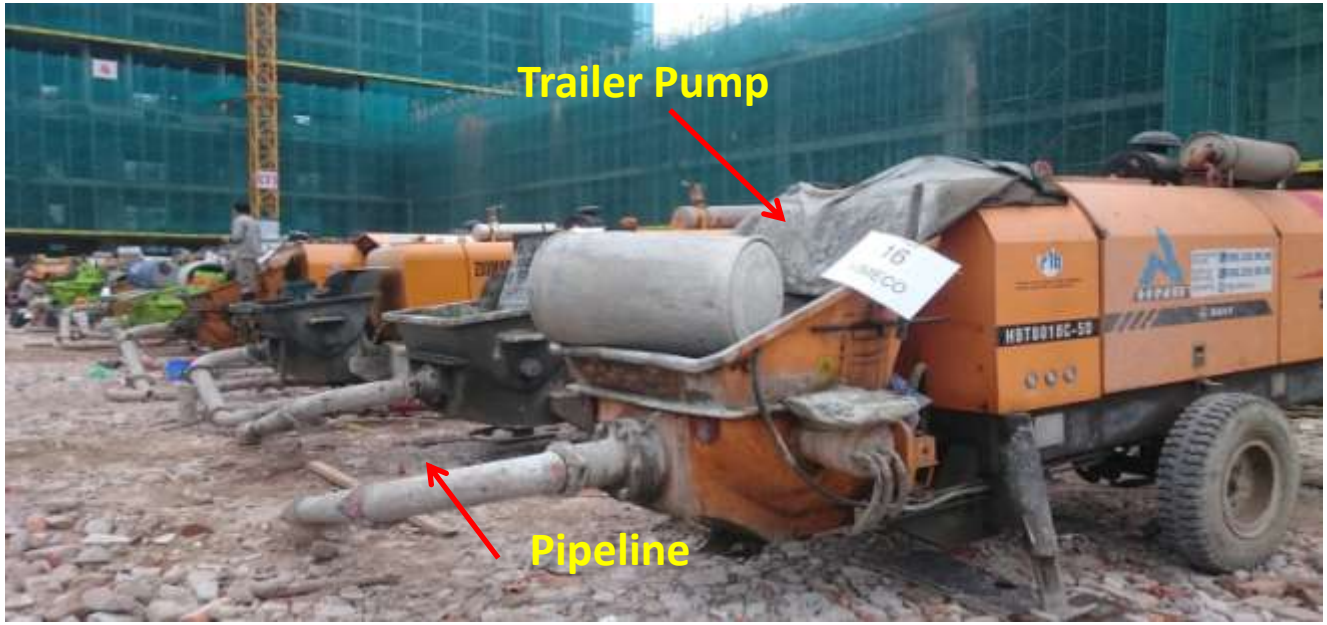


Casting Foundation Slab, 10,600 m³,
30 Pumps (30-40m³/h/pump), 5km length of Pipe Lines

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Preparation Works for Casting – Installation of Pipe Lines

Preparation Works for Casting – Installing Pipe Lines



VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Transit Mixers arrival to site

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Arrival of Concrete Mixers and Start Casting Foundation Slab

Aerial View/setting out of Concrete Mixers

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Casting Foundation Slab Mass Concrete

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Casting Foundation Slab Mass Concrete

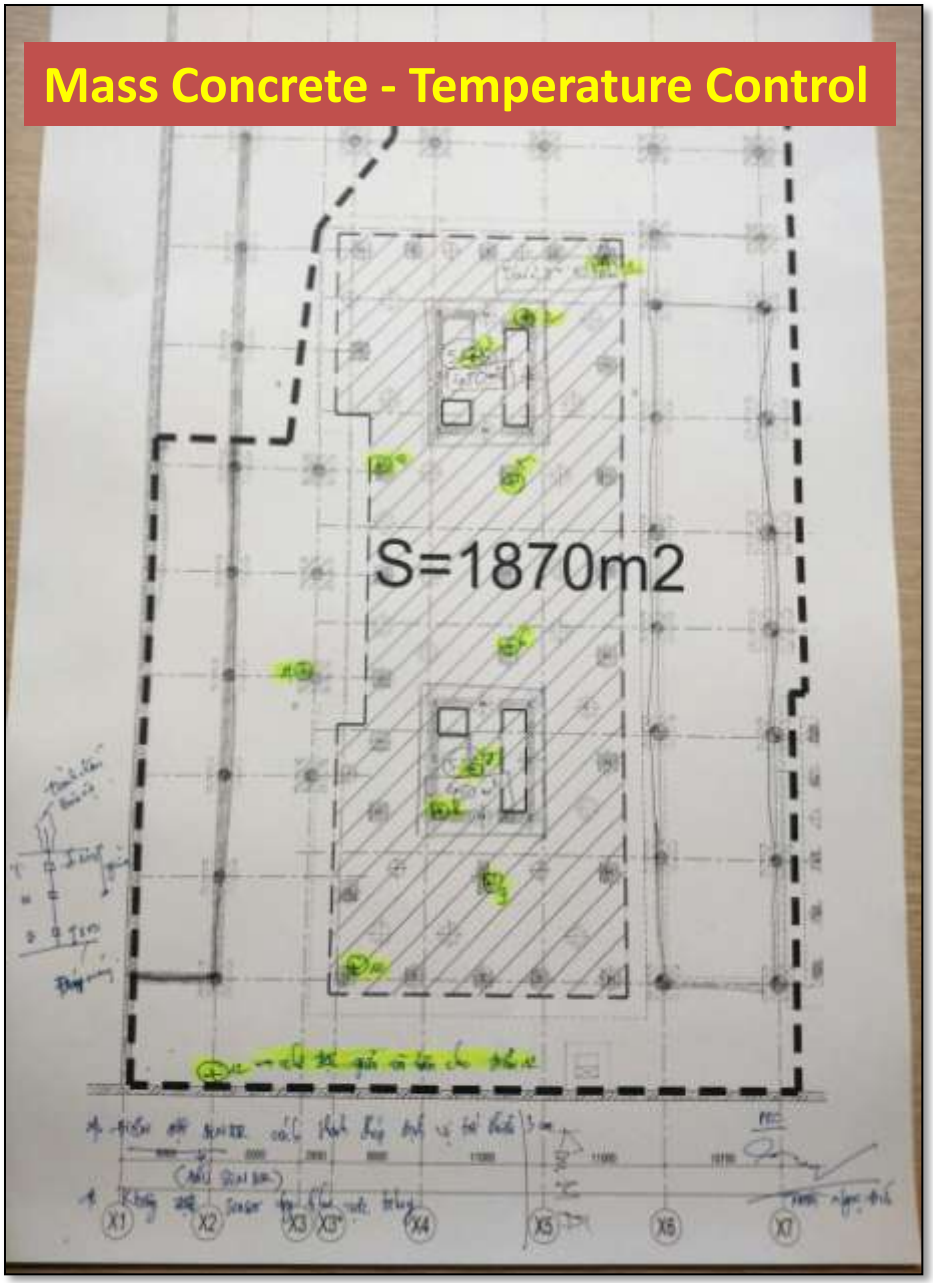
Casting Foundation Slab@top down

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Casting Foundation Slab@top down

Mass Concrete - Temperature Control



VINHOMES METROPOLIS

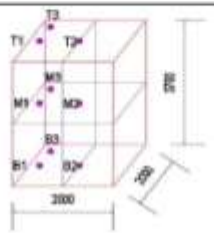
Lieu Giai - Ba Dinh - Ha Noi

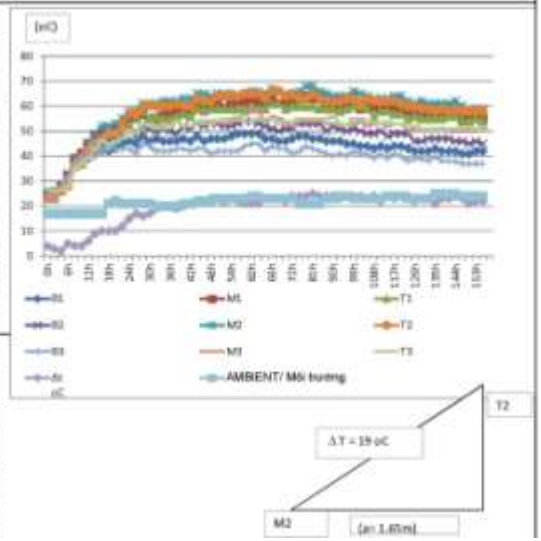
MASSIVE CONCRETE TEMPERATURE MONITORING RECORD

Customer/ Khách hàng	D'CAPITALE
Grade of Concrete/ Mác	B30
Date of Casting/ Ngày đúc	12/01/2017
Structures/ Cấu kiện	VD-01
Ambient Temperature (°C	
Fresh Concrete Temperat	

No./ stt	Hours / giờ	Date/ Times (ngày/ giờ)		Temperature (°C) of mock up/ Nhiệt độ tại các vị trí của Mockup									Tmax	Tmin	Δt °C	AMBIENT / Môi trường
				Vị trí 1/ location 1			Vị trí 2/ location 2			Vị trí 3/ location 3						
				B1	M1	T1	B2	M2	T2	B3	M3	T3				
1	0h	5:30:00 PM	12/01/2017	25	25	24	24	23	23	25	23	27	27	23	4	17
2	2h	7:30:00 PM	12/01/2017	26	25	23	26	25	23	25	23	26	26	23	3	17
3	4h	9:30:00 PM	12/01/2017	28	28	26	28	27	26	28	28	26	28	26	2	17
4	6h	11:30:00 PM	12/01/2017	32	32	29	33	30	28	32	33	28	33	28	5	17
5	8h	1:30:00 AM	13/01/2017	37	39	36	36	39	36	36	38	35	39	35	4	17
6	10h	3:30:00 AM	13/01/2017	37	41	37	39	40	37	38	40	37	41	37	4	17
7	12h	5:30:00 AM	13/01/2017	39	45	40	42	45	42	39	44	39	45	39	6	17
8	14h	7:30:00 AM	13/01/2017	45	48	43	49	49	45	40	46	43	49	40	9	17
9	16h	9:30:00 AM	13/01/2017	42	50	46	45	52	47	42	47	46	52	42	10	17
10	18h	11:30:00 AM	13/01/2017	42	49	46	46	52	49	43	49	45	52	42	10	21
11	20h	1:30:00 PM	13/01/2017	43	51	47	47	53	49	43	49	46	53	43	10	22
12	22h	3:30:00 PM	13/01/2017	45	53	49	49	55	51	43	49	47	55	43	12	21
13	24h	5:30:00 PM	13/01/2017	46	53	52	50	58	57	43	51	50	58	43	15	21
14	26h	7:30:00 PM	13/01/2017	45	55	55	48	58	57	43	50	49	58	41	17	21
15	28h	9:30:00 PM	13/01/2017	48	57	58	52	61	60	45	53	53	61	45	16	21
16	30h	11:30:00 PM	13/01/2017	46	55	55	51	61	60	44	52	52	61	44	17	21
17	32h	1:30:00 AM	14/01/2017	47	55	56	50	61	60	42	52	53	61	42	19	20
18	34h	3:30:00 AM	14/01/2017	46	56	55	51	62	60	42	52	53	62	42	20	20
19	36h	5:30:00 AM	14/01/2017	46	57	55	50	62	60	42	52	52	62	42	20	20
20	38h	7:30:00 AM	14/01/2017	46	58	56	49	62	62	43	54	54	62	43	19	20
21	40h	9:30:00 AM	14/01/2017	47	59	57	52	63	60	43	52	52	63	43	20	21
22	42h	11:30:00 AM	14/01/2017	46	58	56	51	63	60	42	52	52	63	42	21	21
23	44h	1:30:00 PM	14/01/2017	48	61	59	53	65	61	43	53	54	65	43	22	22
24	46h	3:30:00 PM	14/01/2017	46	61	58	52	65	62	43	54	53	65	43	21	22

MÔ HÌNH LẮP ĐẶT SENSOR/ LOCATION SET UP THE SENSOR





Mass Concrete -Temperature Monitor During Casting

Max Temperature 70C, Differential (height) ΔT 25C

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Curing of Mass Concrete

TOP DOWN METHOD

7. Casting RC Columns/Walls at King Post and Sika Grout injection of top Completion of Top Down Method

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Cheaping on top of Column

Installation of Formwork/Tie Rods

Fixing Piping on the top for casting concrete

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi


Casting concrete and use of Vibrator


Checking level of Concrete during casting

Column Casting Completed

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

TOP DOWN METHOD

Casting RC Columns/Walls, encasing the King Post

TOP DOWN METHOD

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Formwork installation for Grouting

Application of sealant to avoid leakage

Hose to check completion /overflow

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Grout mixing and application with pump for high pressure

Completion of grouting

VINHOMES METROPOLIS

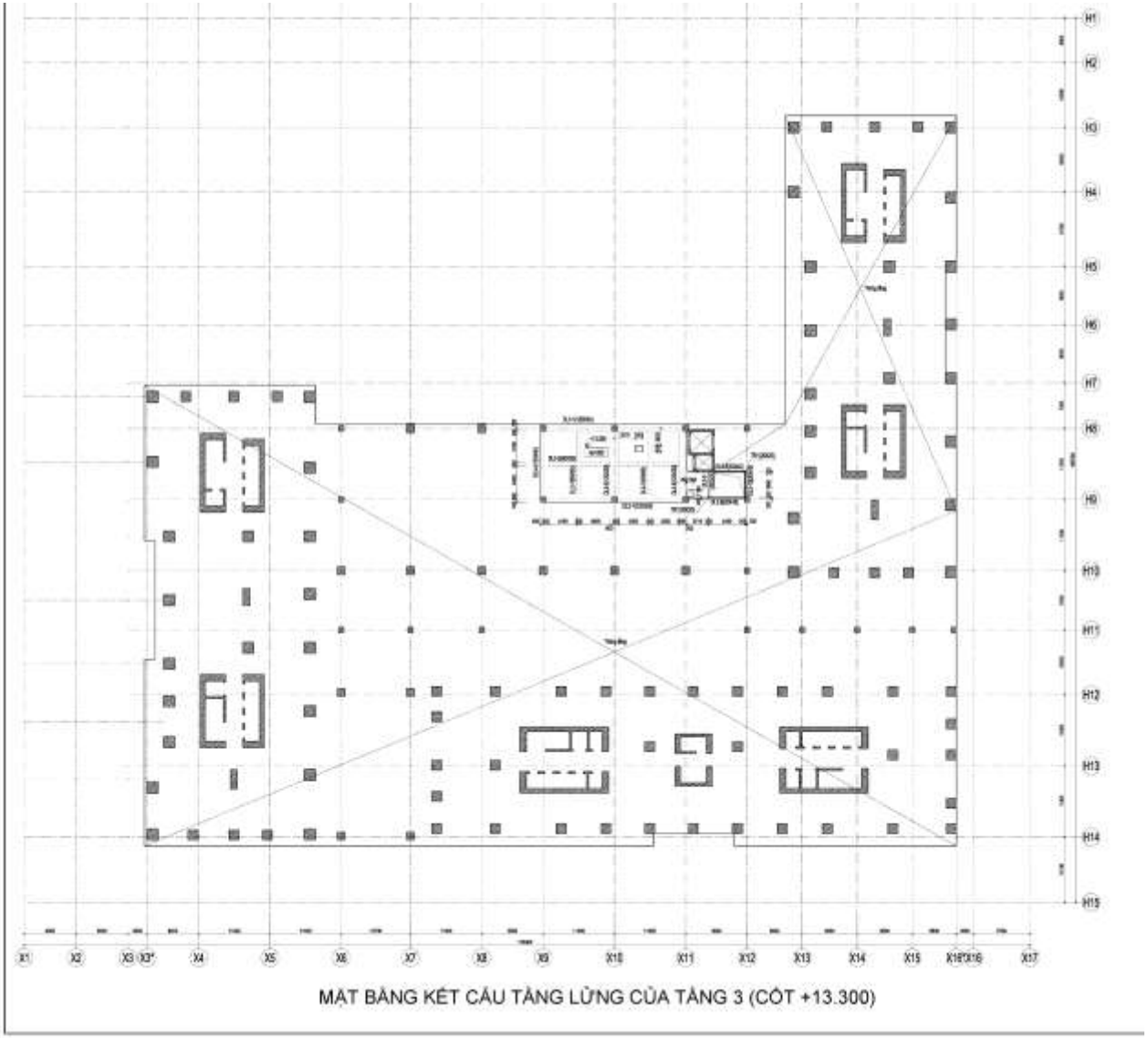
Lieu Giai - Ba Dinh - Ha Noi

COMPLETION OF TOP DOWN

Superstructure Construction
Casting Transfer Floor Beam at Level 4, total 12,000 m3

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

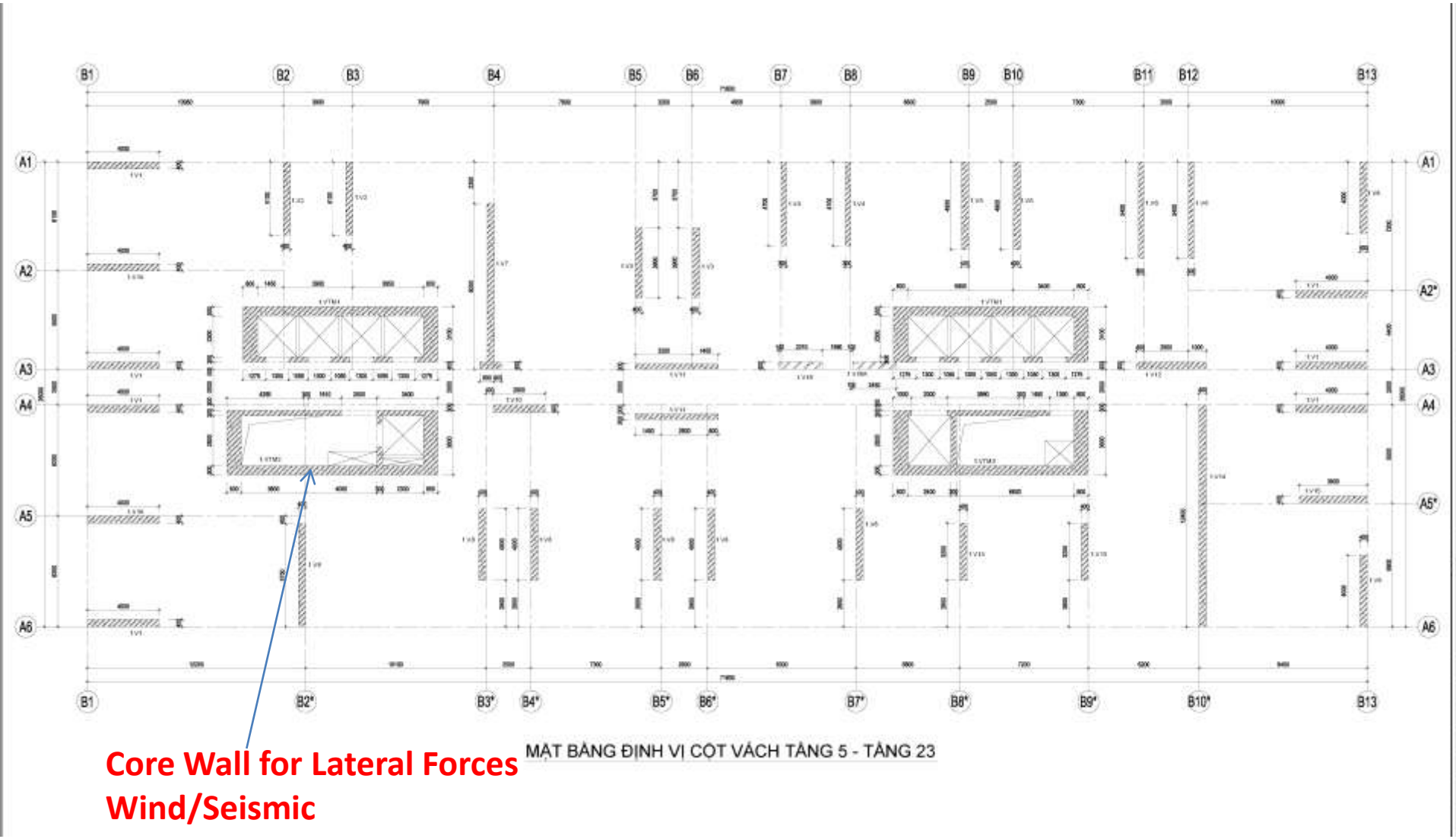


Podium – Column/Wall Layout

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Transfer Floor at Level 4

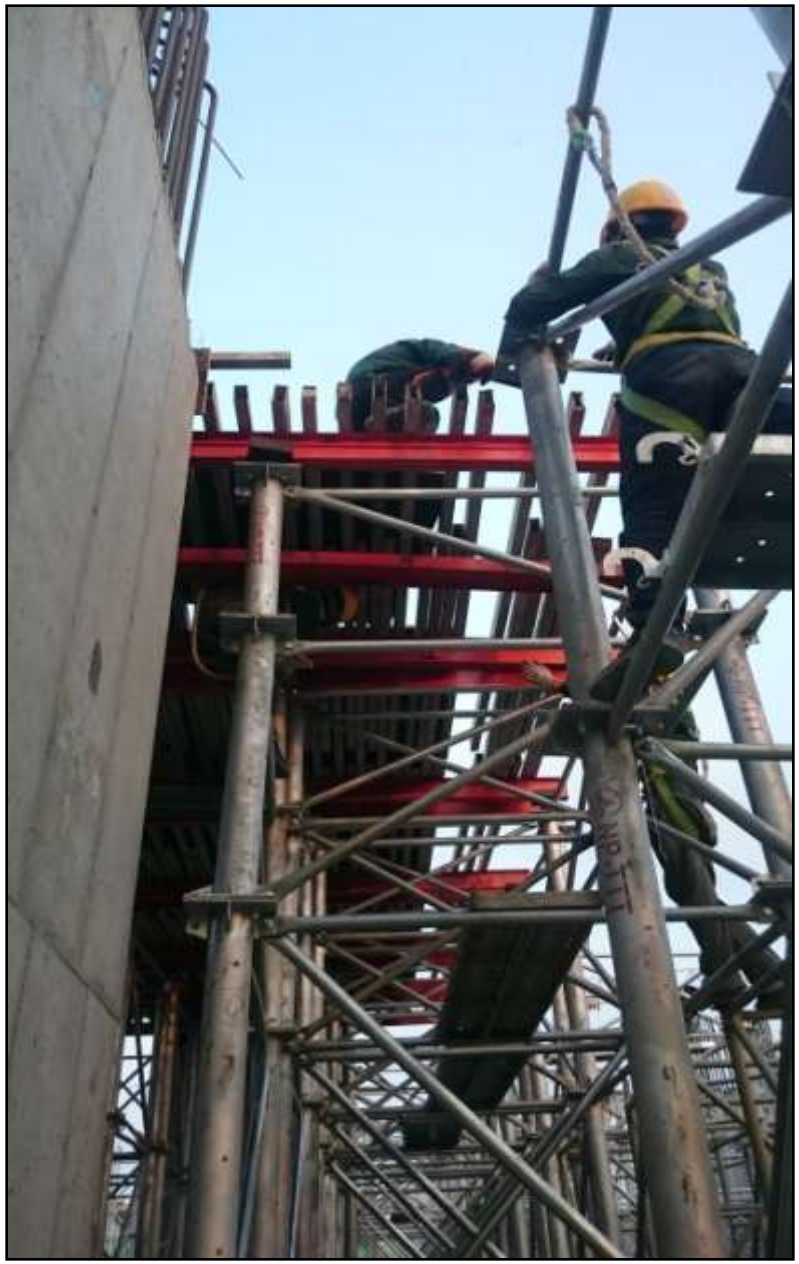


Core Wall for Lateral Forces Wind/Seismic

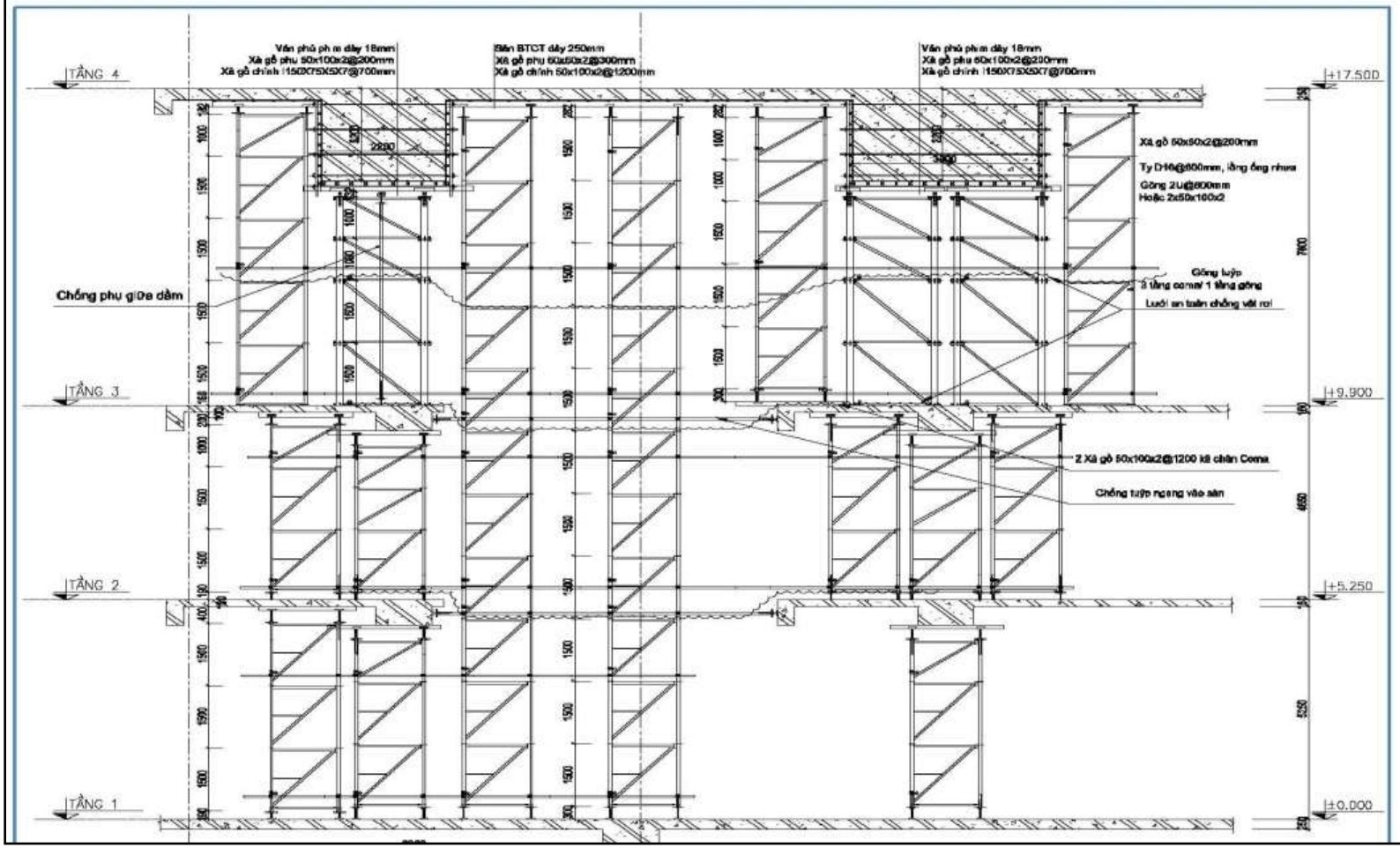
Typical floor L5-L45 columns/wall layout

VINHOMES METROPOLIS
Lieu Giai - Ba Dinh - Ha Noi

Heavy Steel Scaffolding for Transfer Beam L4 Floor



Công trình : TRUNG TÂM THƯƠNG MẠI, VĂN PHÒNG VÀ CĂN HỘ CAO CẤP

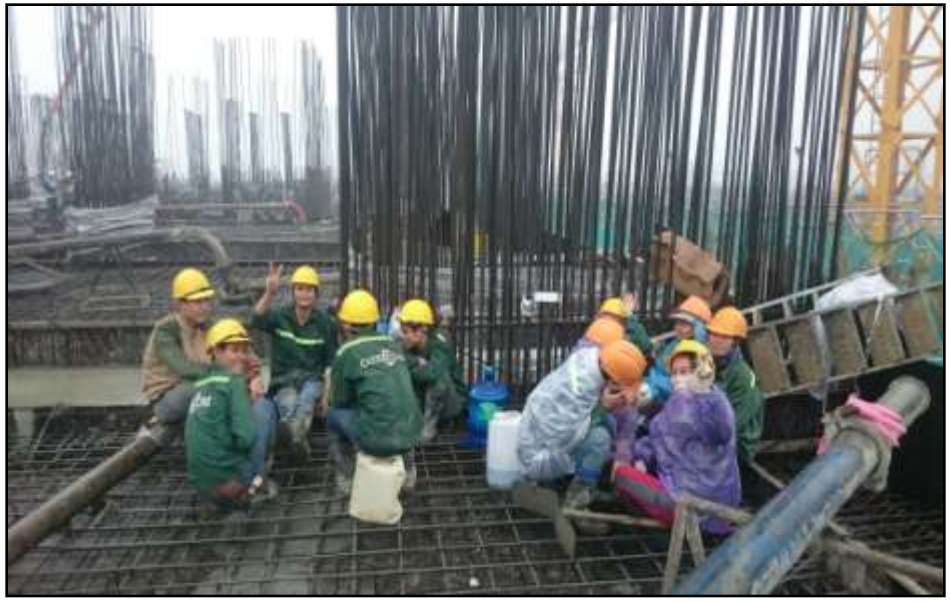


Scaffolding Layout for Transfer Beams

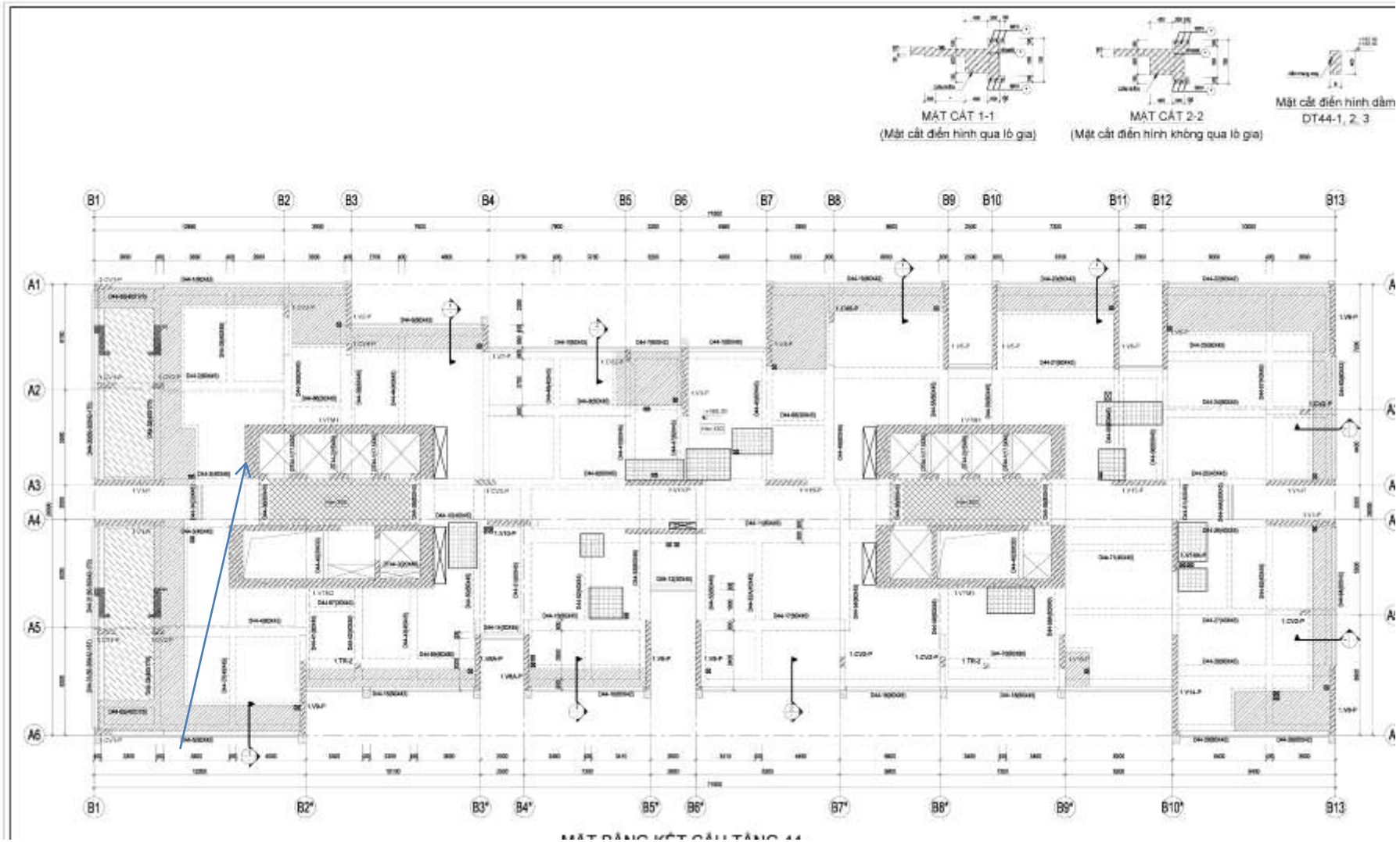
VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Casting Concrete of Transfer Floor Level L4



Superstructure Construction
Alouminum Formwork for Typical Floors 5-45 Floor



Typical floor L5-L45 slab/beams layout

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Alounimun Formwork and Scaffolding for Typical Floor L5-L45

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Alounimun Formwork and Scaffolding for Typical Floor L5-L45

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Superstructure at Level 10/ Construction of Basement B4 and Foundation

VINHOMES METROPOLIS

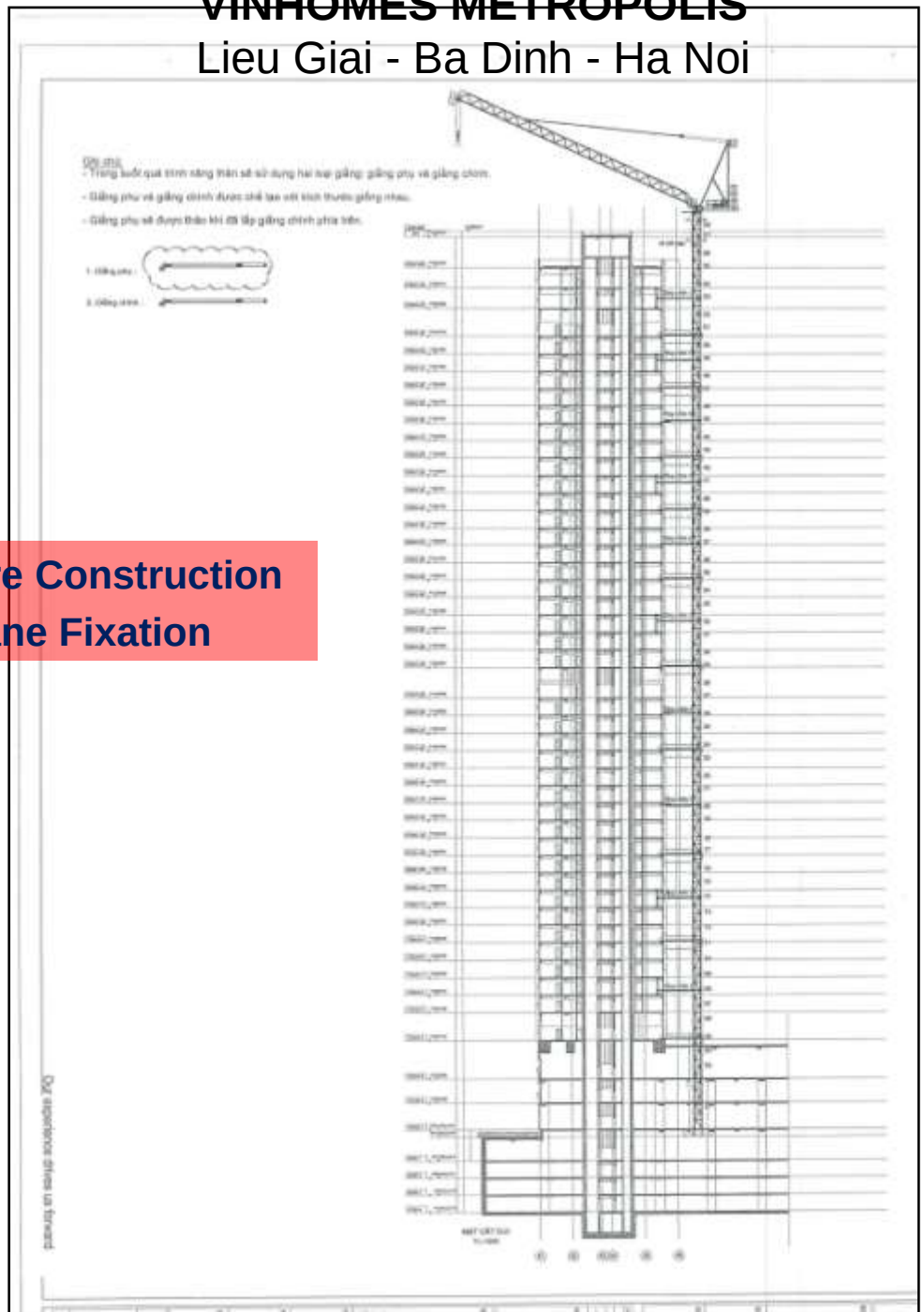
Lieu Giai - Ba Dinh - Ha Noi

Superstructure at Level 10/ Construction of Basement B4 and Foundation

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Superstructure Construction
Tower Crane Fixation



Team and Project Pictures

VINGROUP Project Director: Bui Trung Dung

ARTELIA Project Director: Bruno D' Arcangues

ARTELIA Project Manager: Constantinos Emm. Migiakis

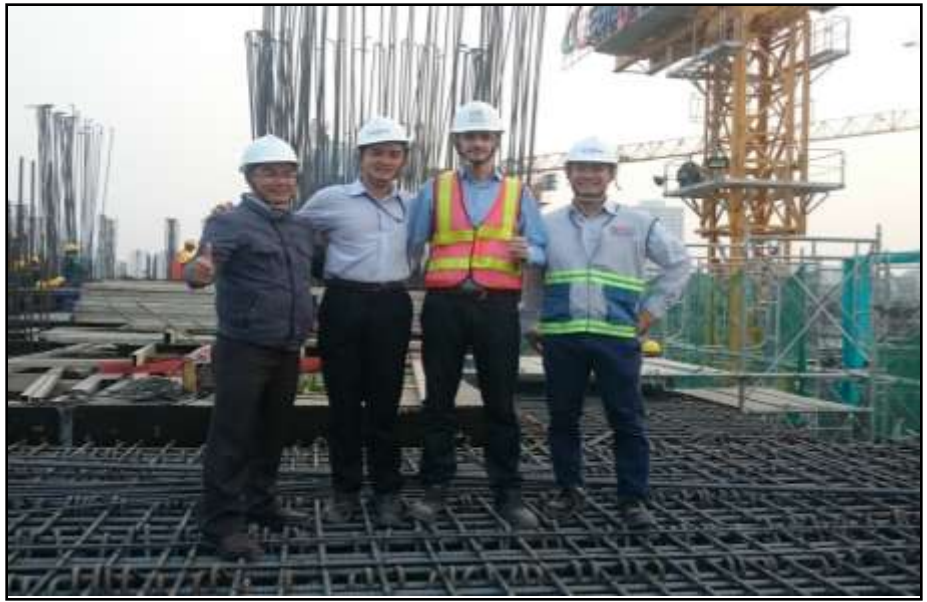
COTECCONS Site Manager: Nguyen Chi Thien

VNCC Structural Designer: Nguyen Dinh Thuc

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

TEAM PICTURES-ARTELIA-COTTECONS



VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

TEAM PICTURES – VINGROUP-ARTELIA-COTTECONS

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

ARTELIA Team Picture – During TET (January) 2017

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

August 2016 – Piling Ongoing

October 2016 – Ground Floor Completed

December 2016 – B1/L3 Completed

March 2017 – B3/L4 Completed

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Areal View July 2017

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

TOP DOWN COMPLETION

Superstructure at Level 12/ Basement B4, Foundation and RC Columns Completed

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

TOP DOWN COMPLETION

Superstructure at Level 25, October 2017

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

STRUCTURE COMPLETION

Superstructure at Level 45/ January 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

STRUCTURE COMPLETION

Superstructure at Level 45

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

STRUCTURE COMPLETION

Superstructure at Level 45/ January 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

STRUCTURE COMPLETION

Superstructure at Level 45/ January 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

FACADE COMPLETION

Facade Installation on Progress/ April 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

FACADE COMPLETION

Facade at Podium – Water Barrier/ April 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

FACADE COMPLETION

Facade at Level 45/ May 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

FACADE COMPLETION

Facade Completed/ July 2018

VINHOMES METROPOLIS

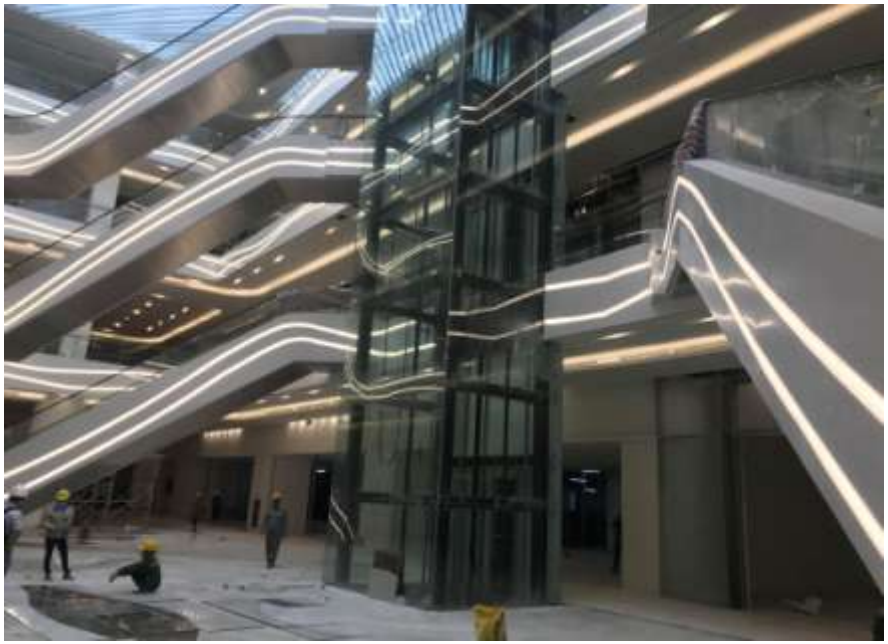
Lieu Giai - Ba Dinh - Ha Noi

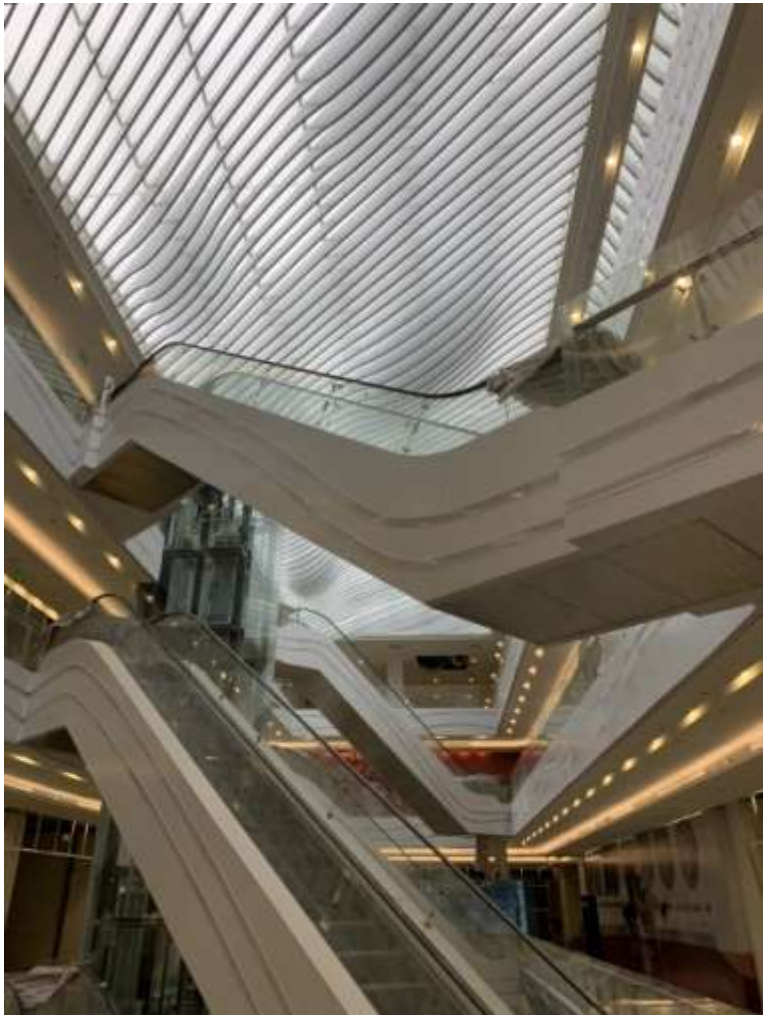
FACADE COMPLETION

Podium Facade Completed/ August 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

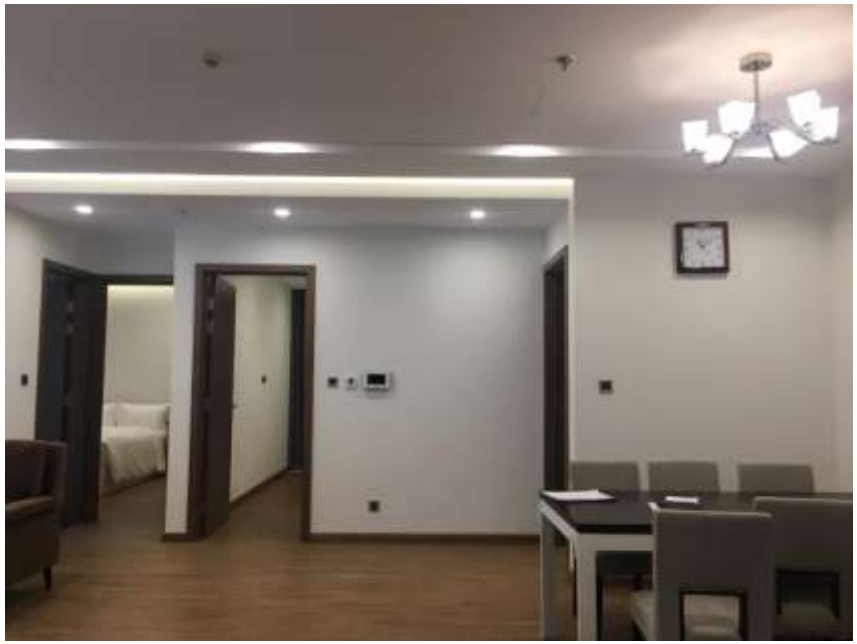




Podium Interiors / August 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi



Typical Apartment Interiors / August 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

Project Completion / September 2018

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

PROJECT COMPLETION

Areal View from Top of Tower

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

PROJECT COMPLETION

Areal View from Top of Tower

VINHOMES METROPOLIS

Lieu Giai - Ba Dinh - Ha Noi

PROJECT COMPLETION

Opening Ceremony December 2018

Thank You for your attention