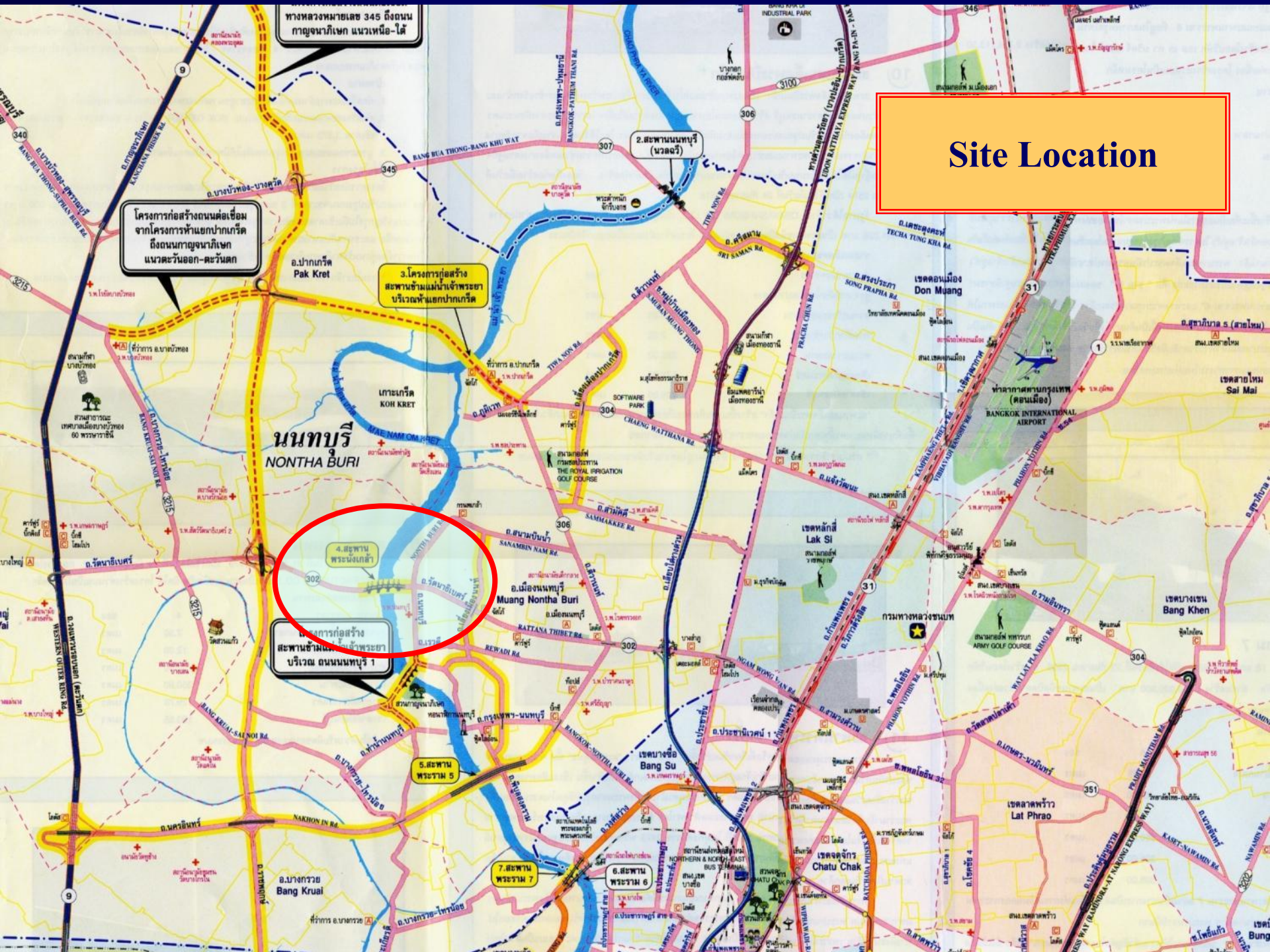
HIGHWAY ROUTE NO. 302 CONSTRUCTION PROJECT

BANGYAI – KARAI : Section 2

(Bridge Over Chao Phraya River)

Bridge Construction Bureau

Department of Highways


ทางหลวงหมายเลข 345 ถึงถนน
กาญจนาภิเษก แนวเหนือ-ใต้
โครงการก่อสร้างถนนต่อเชื่อม
จากโครงการห้าแยกปากเกร็ด
ถึงถนนกาญจนาภิเษก
แนวตะวันออก-ตะวันตก
3.โครงการก่อสร้าง
สะพานข้ามแม่น้ำเจ้าพระยา
บริเวณห้าแยกปากเกร็ด
2.สะพานนนทบุรี
(นวลจรี)
4.สะพาน
พระนั่งเกล้า
โครงการก่อสร้าง
สะพานข้ามแม่น้ำเจ้าพระยา
บริเวณ ถนนนนทบุรี 1
5.สะพาน
พระราม 5
6.สะพาน
พระราม 6
7.สะพาน
พระราม 7
นนทบุรี
NONTHA BURI
อ.ปากเกร็ด
Pak Kret
เกาะเกร็ด
KOH KRET
อ.เมืองนนทบุรี
Muang Nontha Buri
อ.บางกรวย
Bang Kruai
เขตดอนเมือง
Don Muang
เขตหลักสี่
Lak Si
เขตบางซื่อ
Bang Su
เขตจตุจักร
Chatu Chak
เขตลาดพร้าว
Lat Phrao
เขตบางเขน
Bang Khen
เขตสายไหม
Sai Mai
กรมทางหลวงชนบท
ท่าอากาศยานกรุงเทพ
(ดอนเมือง)
BANGKOK INTERNATIONAL
AIRPORT
Site Location

CONTRACT DETAILS

Contract No.	: สพ. 19/2549 (31 May 2006)
Start	: 1 June 2006
End	: 20 May 2008
Period	: 720 Days
Contract Value	: 1,306,514,343.00 Baht
Liquidate Damage for delays	: 3,266,285.86 Baht per day
Owner	: Department of Highways (DOH)
Contractor	: Unique Engineering and Construction Public Company Limited
Designer	: Norconsult Civil Engineering Co., Ltd.
Supervision	: Bridge Construction Bureau, Department of Highways

BRIDGE DETAIS

Main Bridge Details

Bridge Type : Cast-in-place Segmental Concrete Box Girder

Span Length : 130 m. + 229 m. (main span) + 130 m. = 489 m.

Construction Method : Balanced Cantilever with Form Traveler

Foundation : 14-Bored Pile Dia. 2.00 m. per pier

Depth : 12.50 m. (at pier) and 2.50 m. (mid span)

Approach Viaduct Details

Bridge Type : Span-by-Span Cast-in-place Box Girder 2.50 m. depth

Span Length : 48.50 m. (typical) and 40.0 m. (end span)

Construction Method : Span by Span on Stationary Shoring System and Movable Scaffolding System

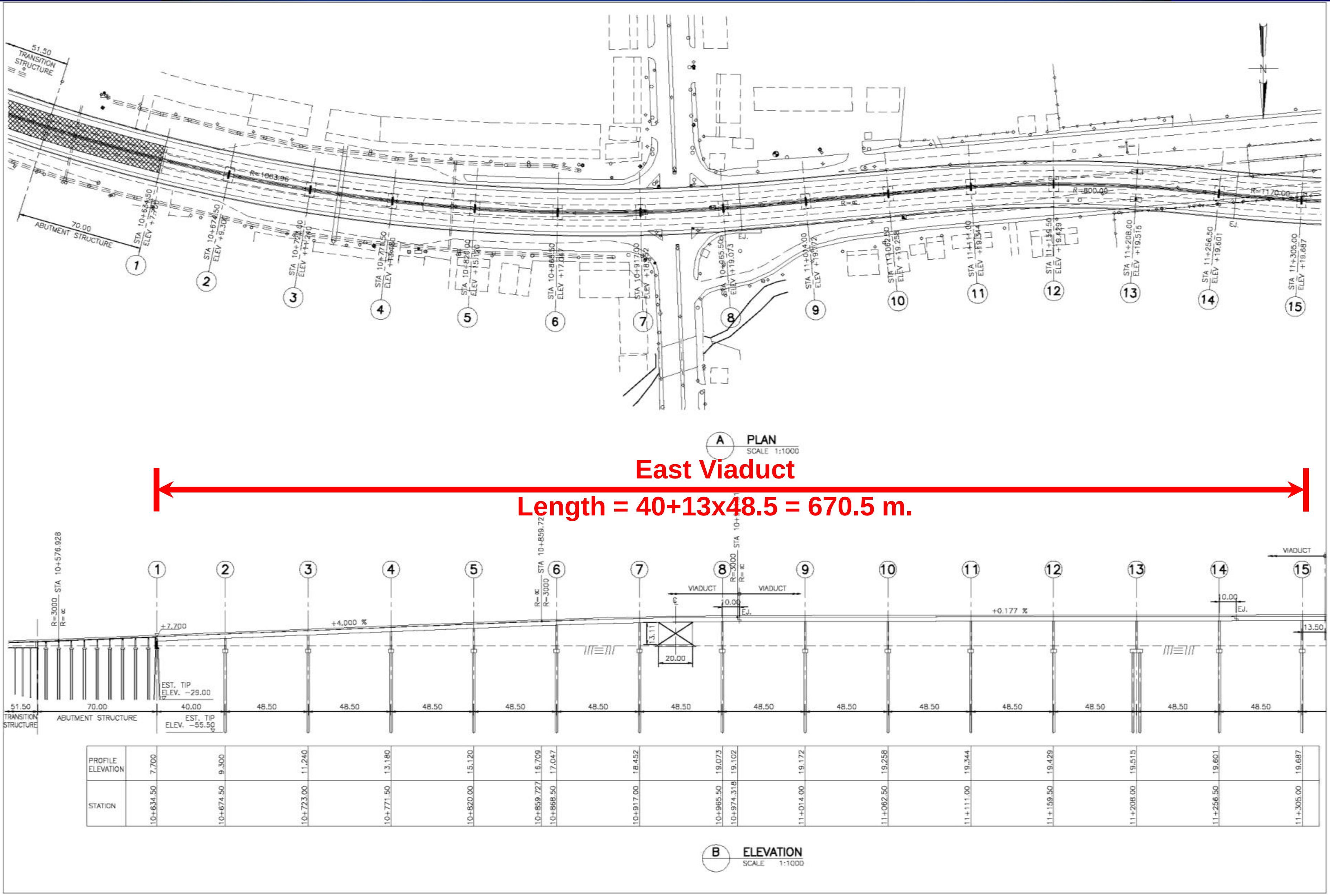
Foundation : 2-Bored Pile Dia. 2.00 m. per pier

BRIDGE PERSPECTIVE

BRIDGE PERSPECTIVE

BRIDGE PERSPECTIVE

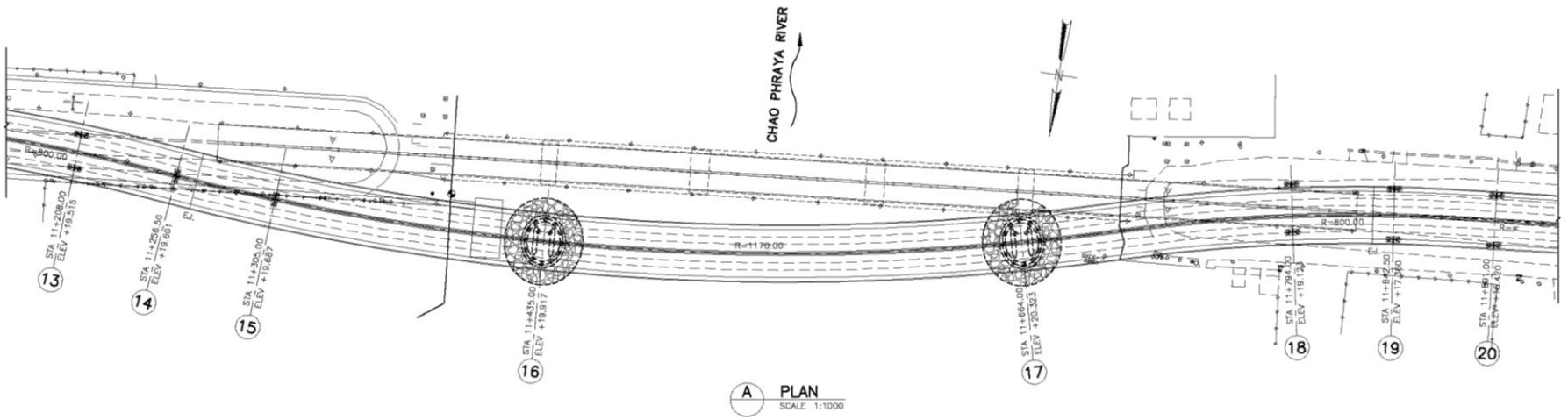
BRIDGE PLAN & ELEVATION



East Viaduct

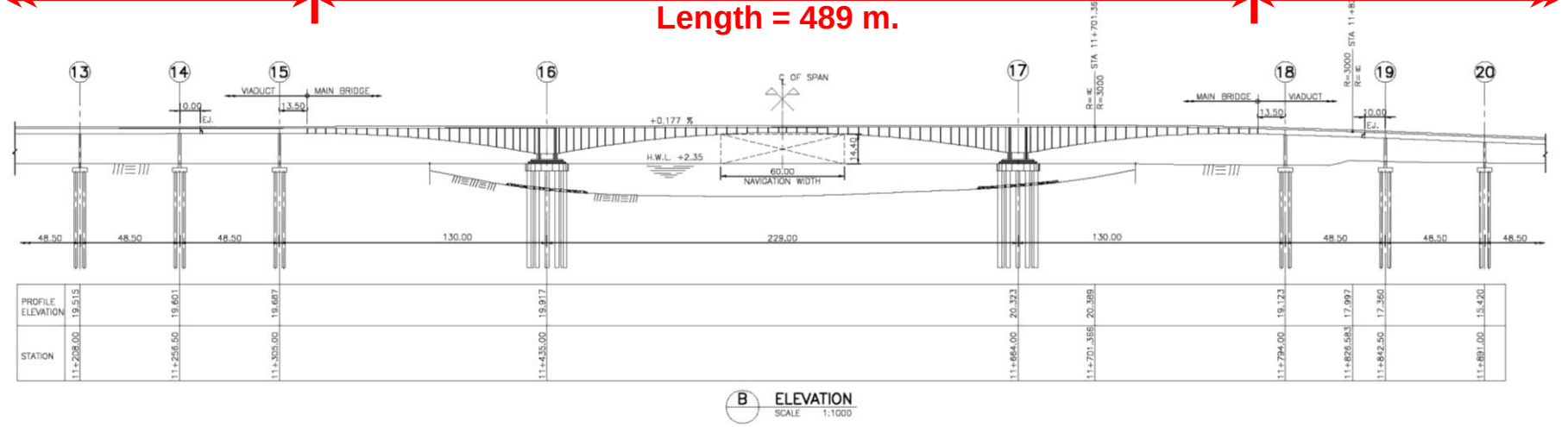
Length = 40+13x48.5 = 670.5 m.

BRIDGE PLAN & ELEVATION

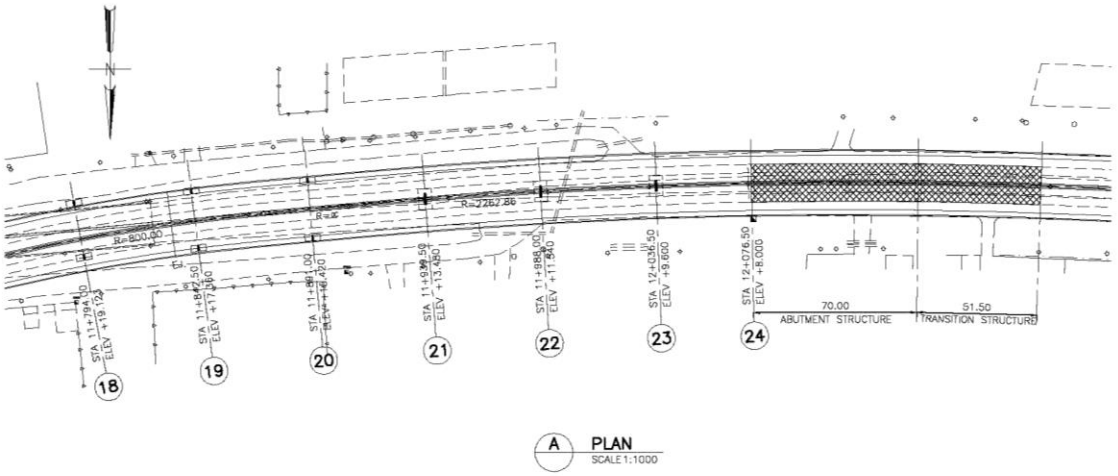


East Viaduct | **Main Bridge** | **West Viaduct**

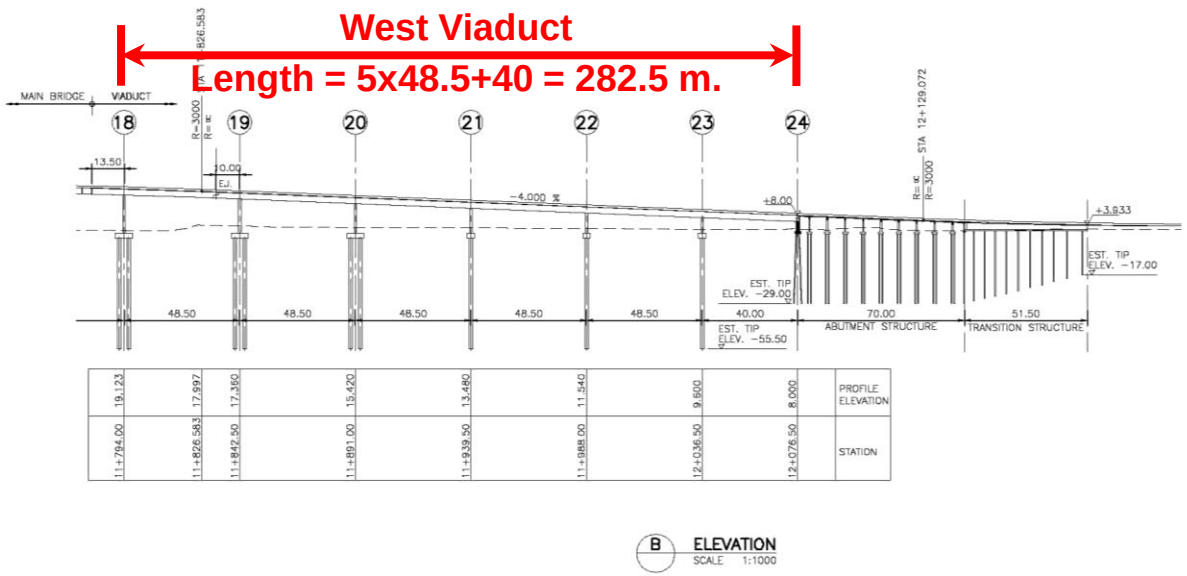
Length = 489 m.



BRIDGE PLAN & ELEVATION

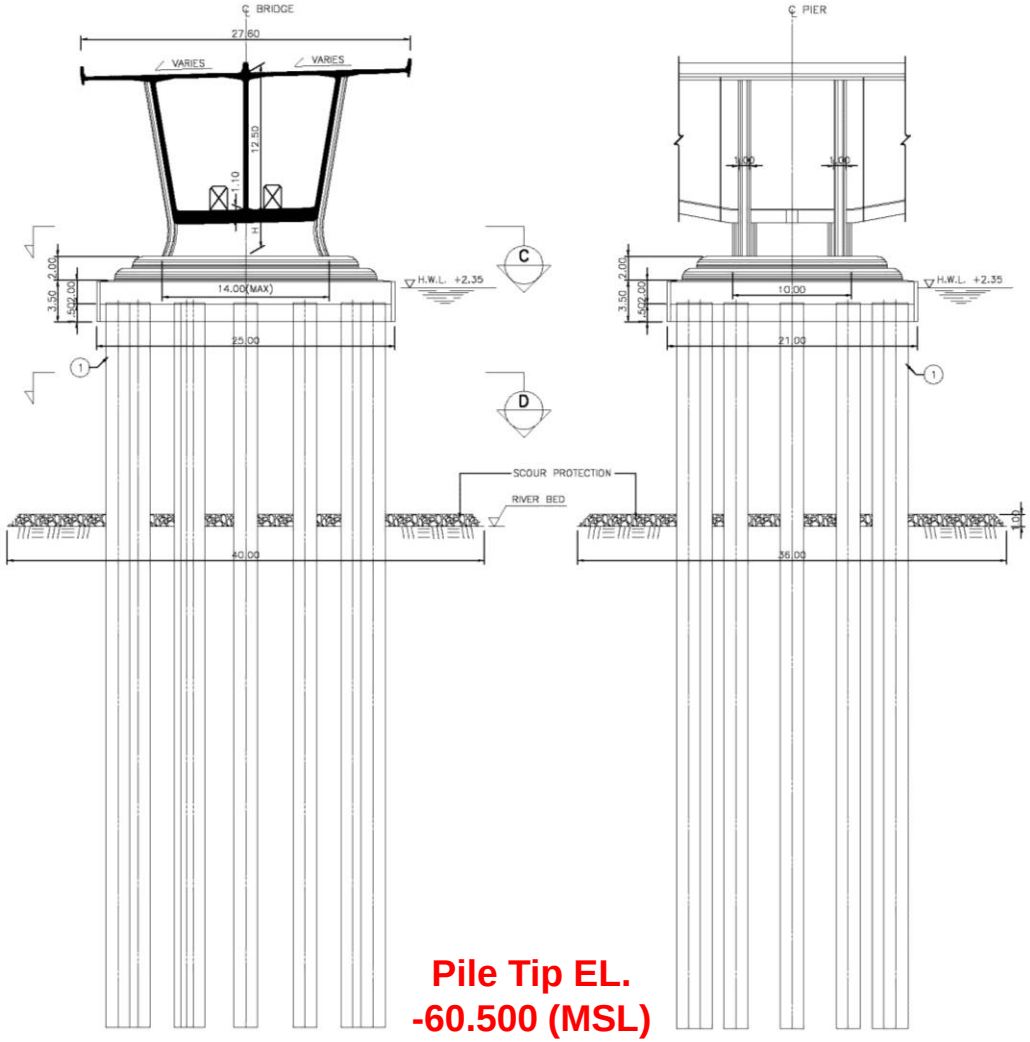


A PLAN
SCALE 1:1000



B ELEVATION
SCALE 1:1000

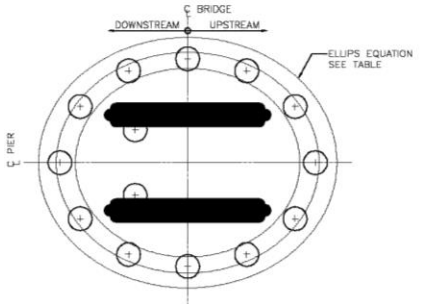
MAIN BRIDGE SECTION DETAILS



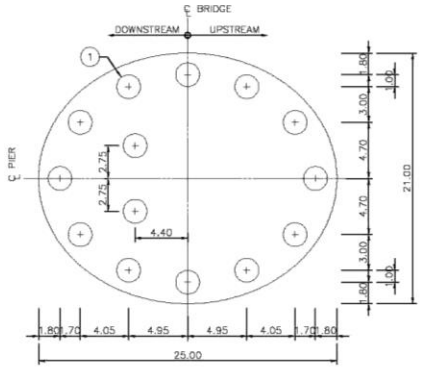
A FRONT ELEVATION
SCALE 1:200

B SIDE ELEVATION
SCALE 1:200

Pile Tip EL.
-60.500 (MSL)



C PILE CAP LAYOUT
SCALE 1:200



D PILE LAYOUT
SCALE 1:200

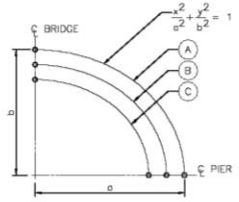


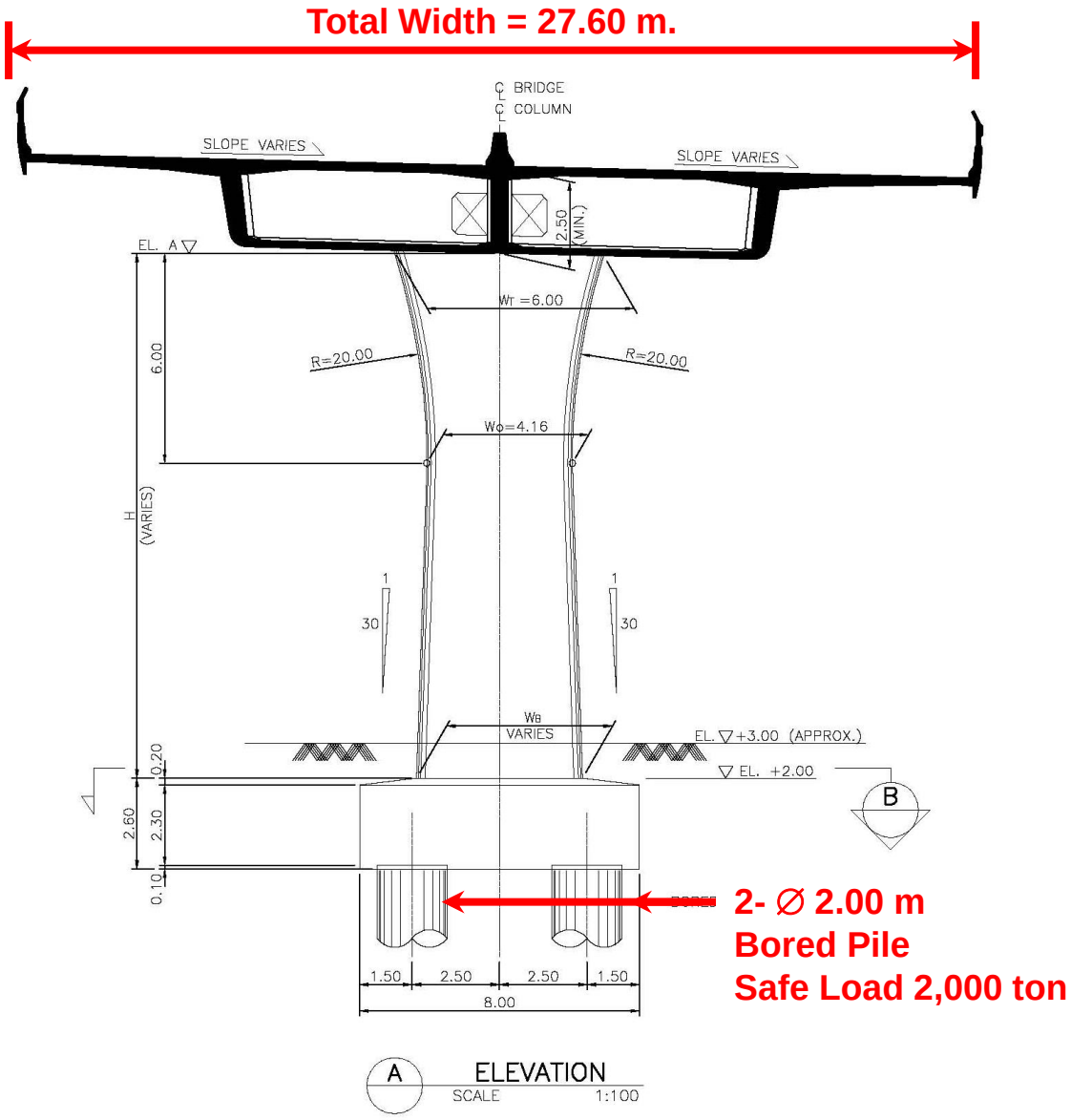
TABLE FOR ELLIPS EQUATIONS

ELLIPS NUMBER		a	b
	A	12.50	10.50
	B	11.00	9.25
	C	9.50	8.00

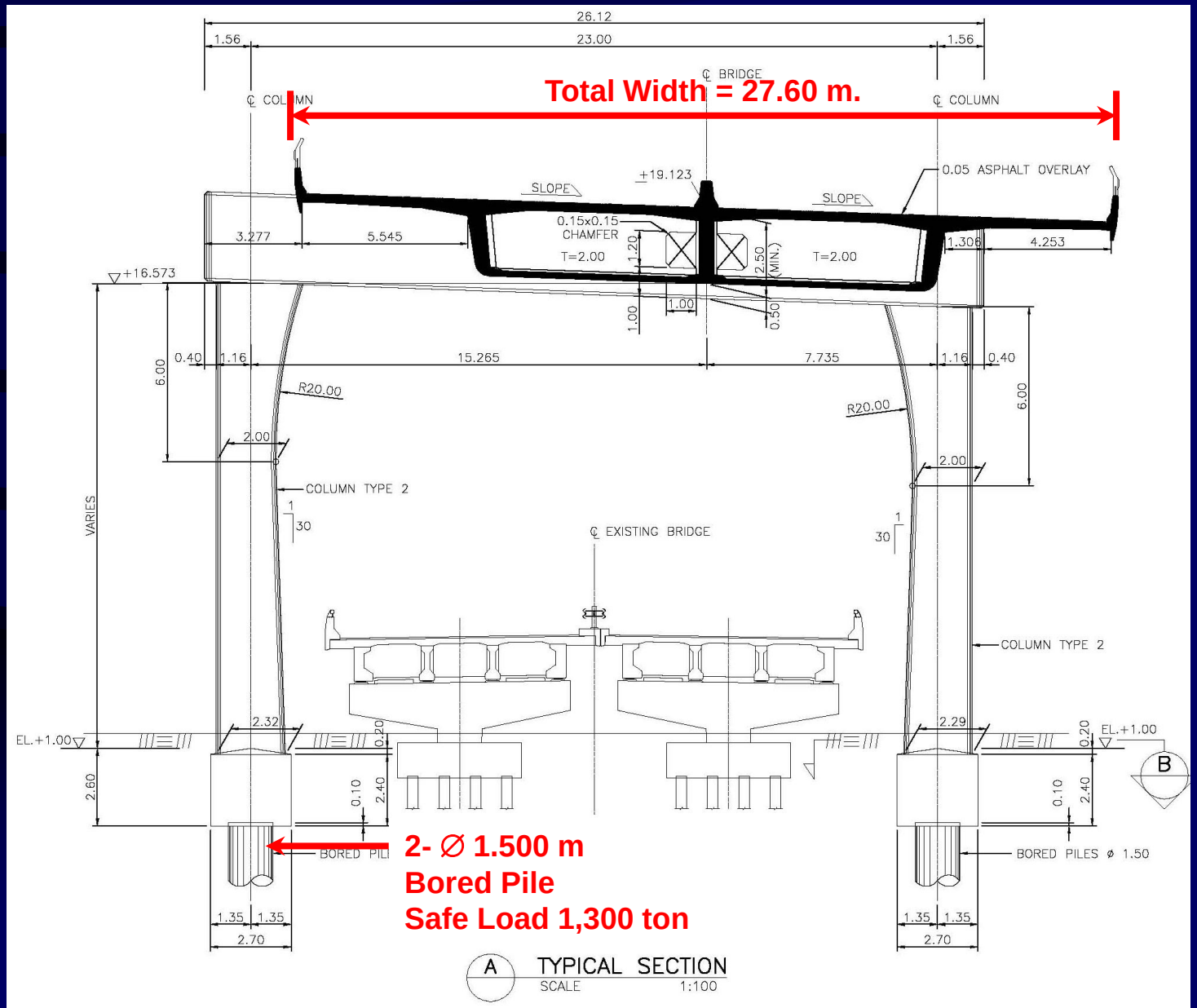
NOTES :

1. 14 BORED PILES ⌀2.00 m. IN EACH RIVER FOUNDATION WITH SAFE LOAD 20 MN/PILE
2. H = 2.42 m (AXIS 16)
   H = 2.82 m (AXIS 17)
3. PILE TIP LEVEL TO BE VERIFIED BY ENGINEER. ESTIMATED PILE TIP ELEVATION -54.00 m

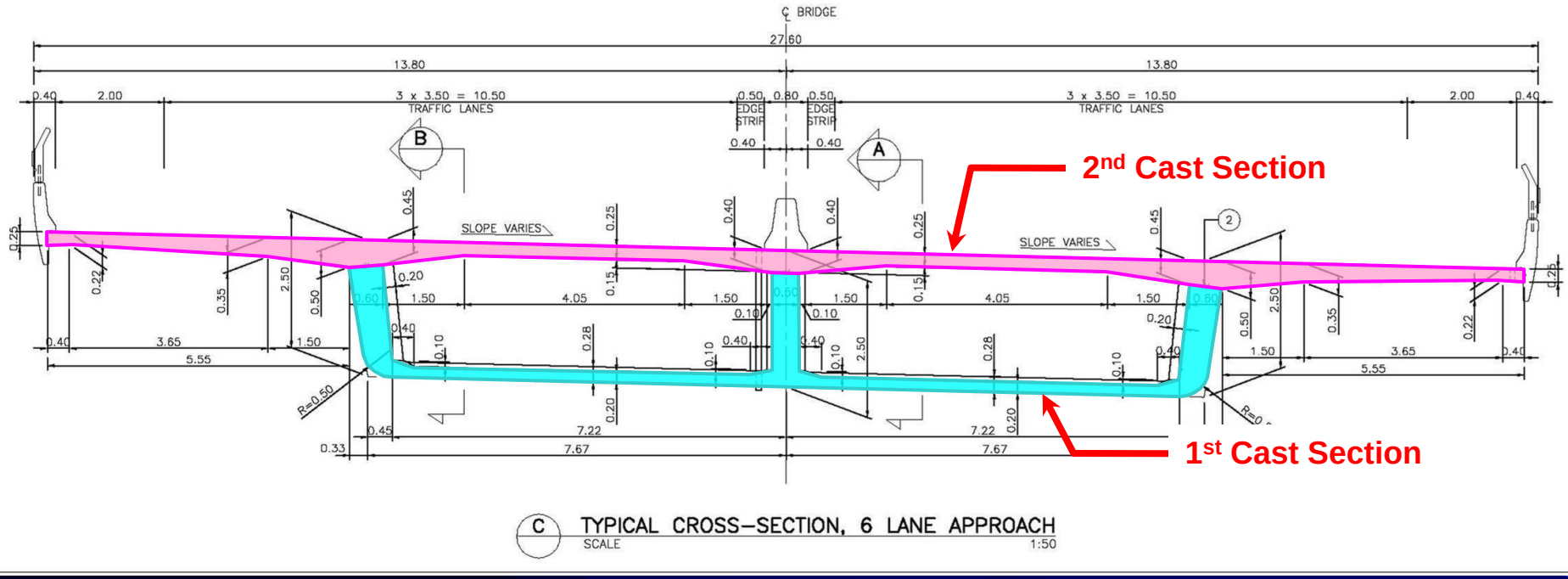
APPROACH VIADUCT SECTION DETAILS



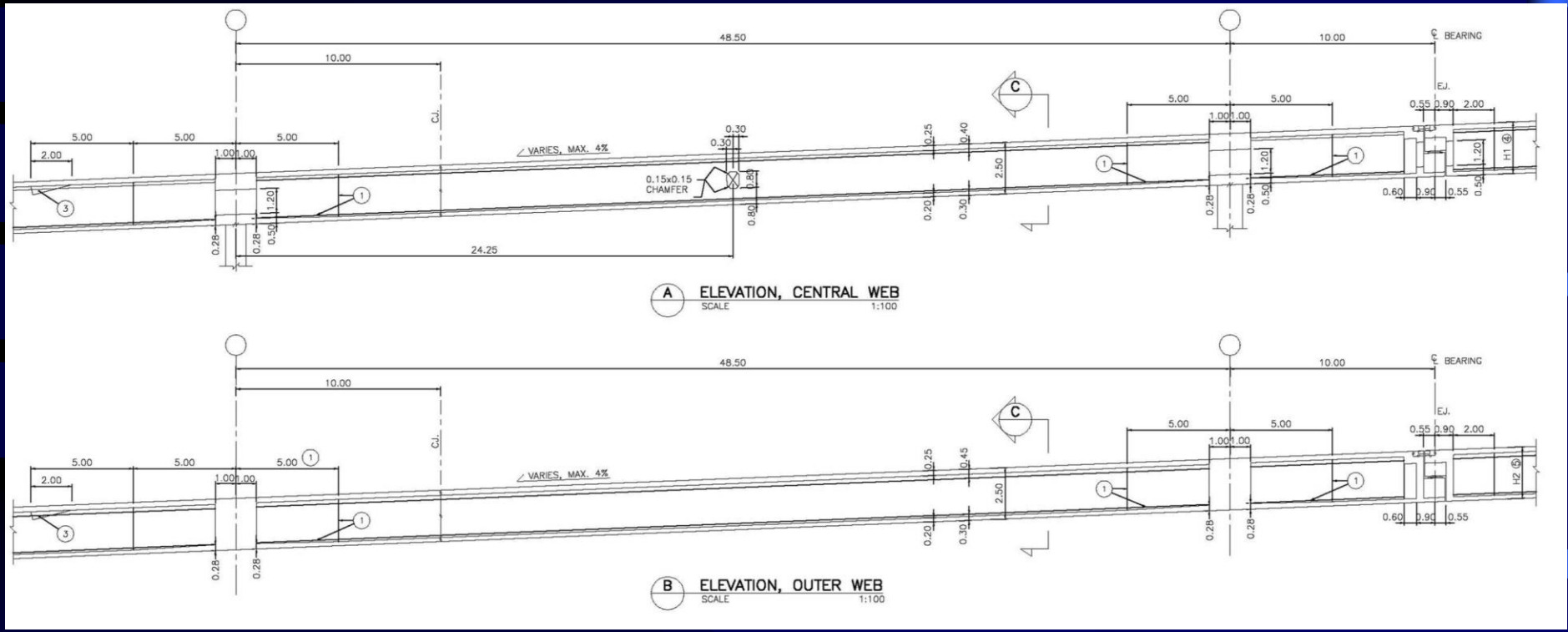
APPROACH VIADUCT SECTION DETAILS



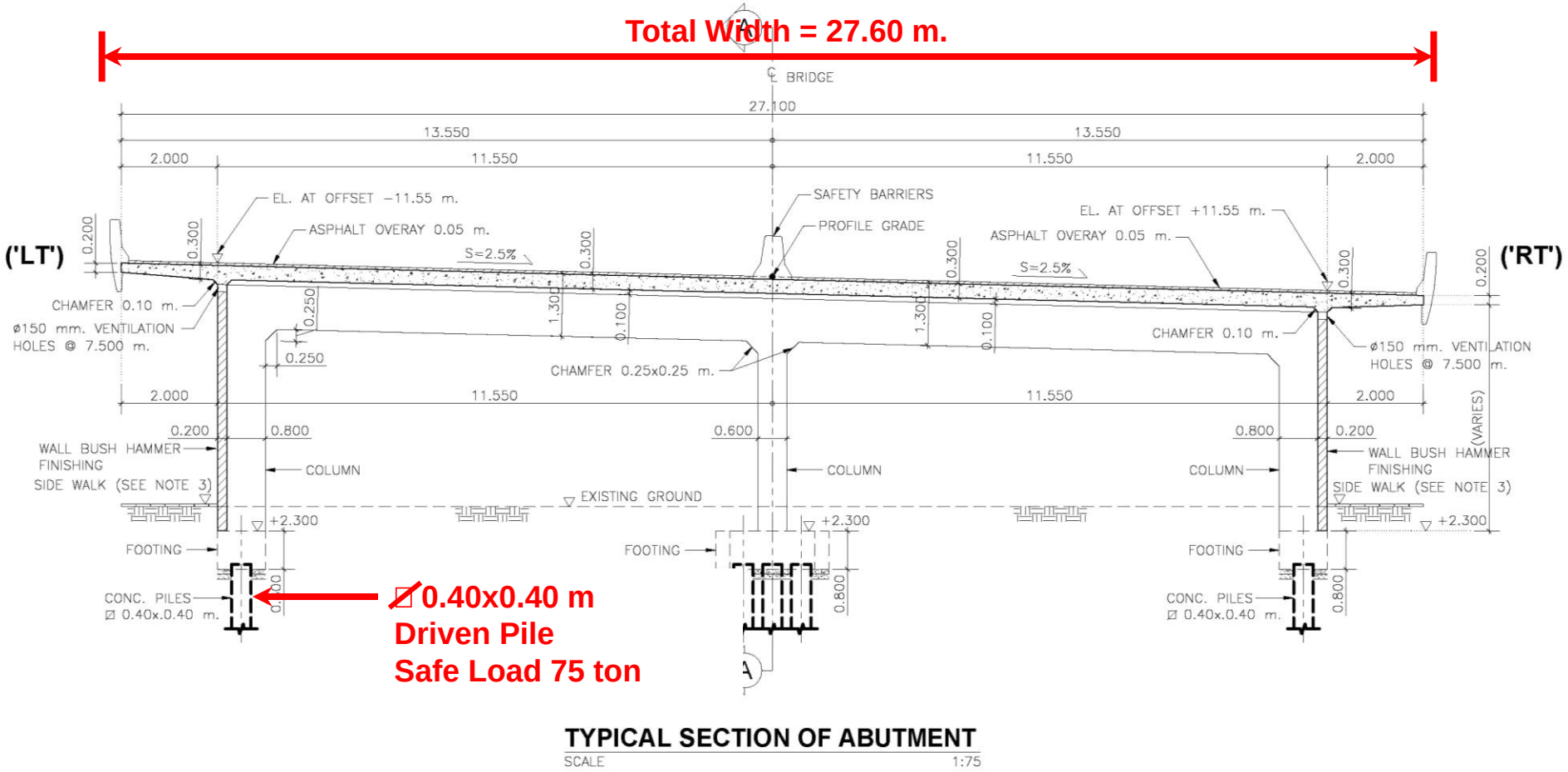
APPROACH VIADUCT TYPICAL SECTION



APPROACH VIADUCT LONGITUDINAL SECTION



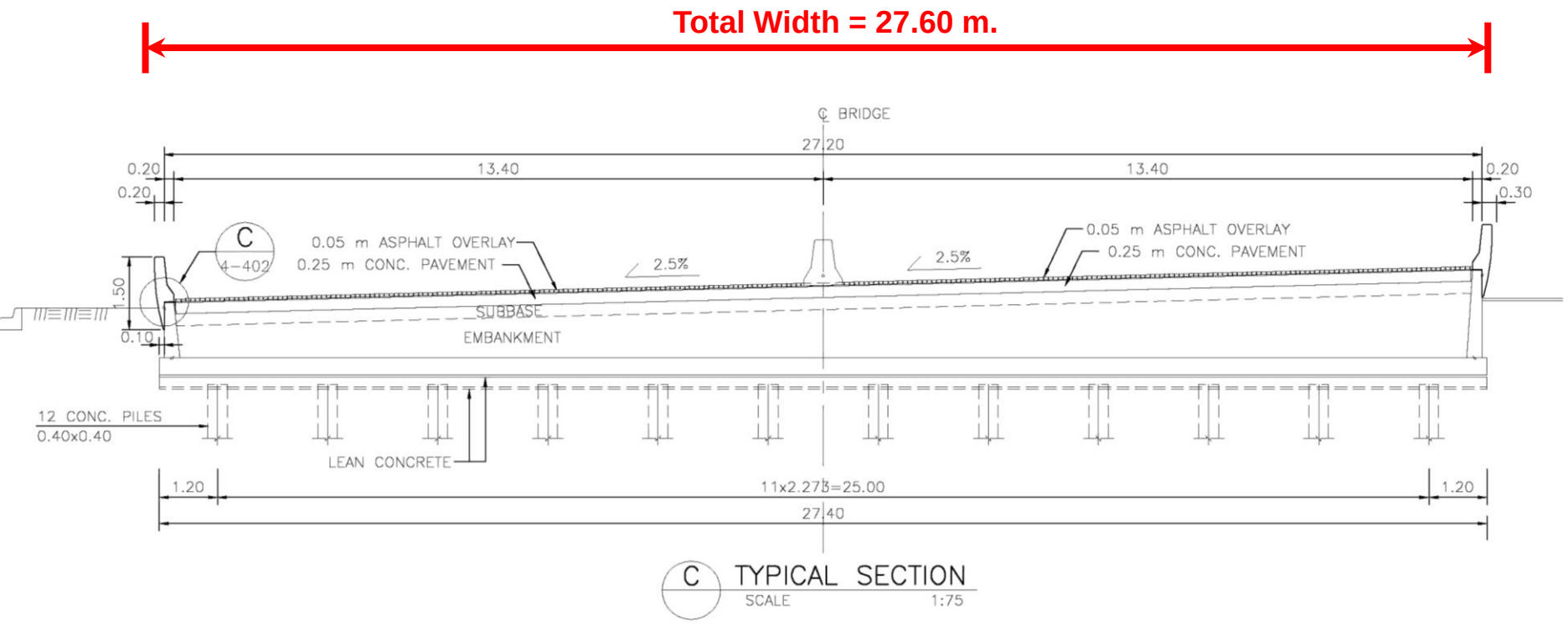
ABUTMENT STRUCTURE DETAILS



TYPICAL SECTION OF ABUTMENT

SCALE 1:75

TRANSITION STRUCTURE DETAILS

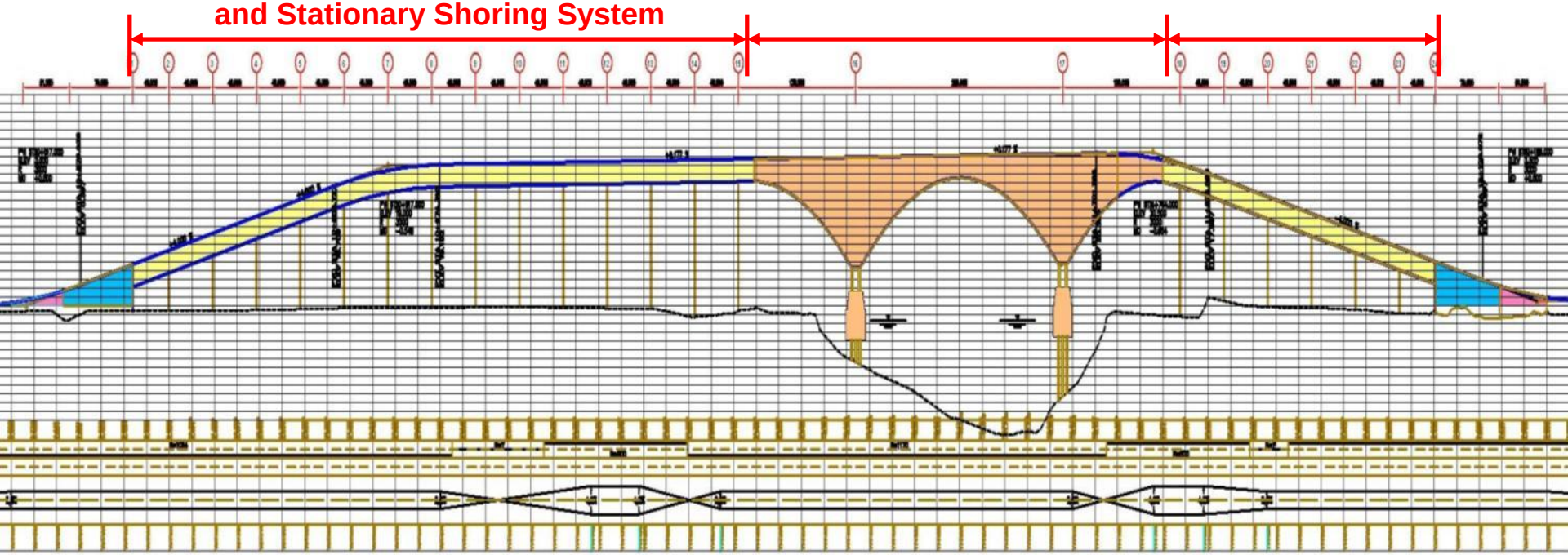


CONSTRUCTION METHODS

East Viaduct
Span by Span Cast In – situ Method
Mss : Movable Scaffolding System
and Stationary Shoring System

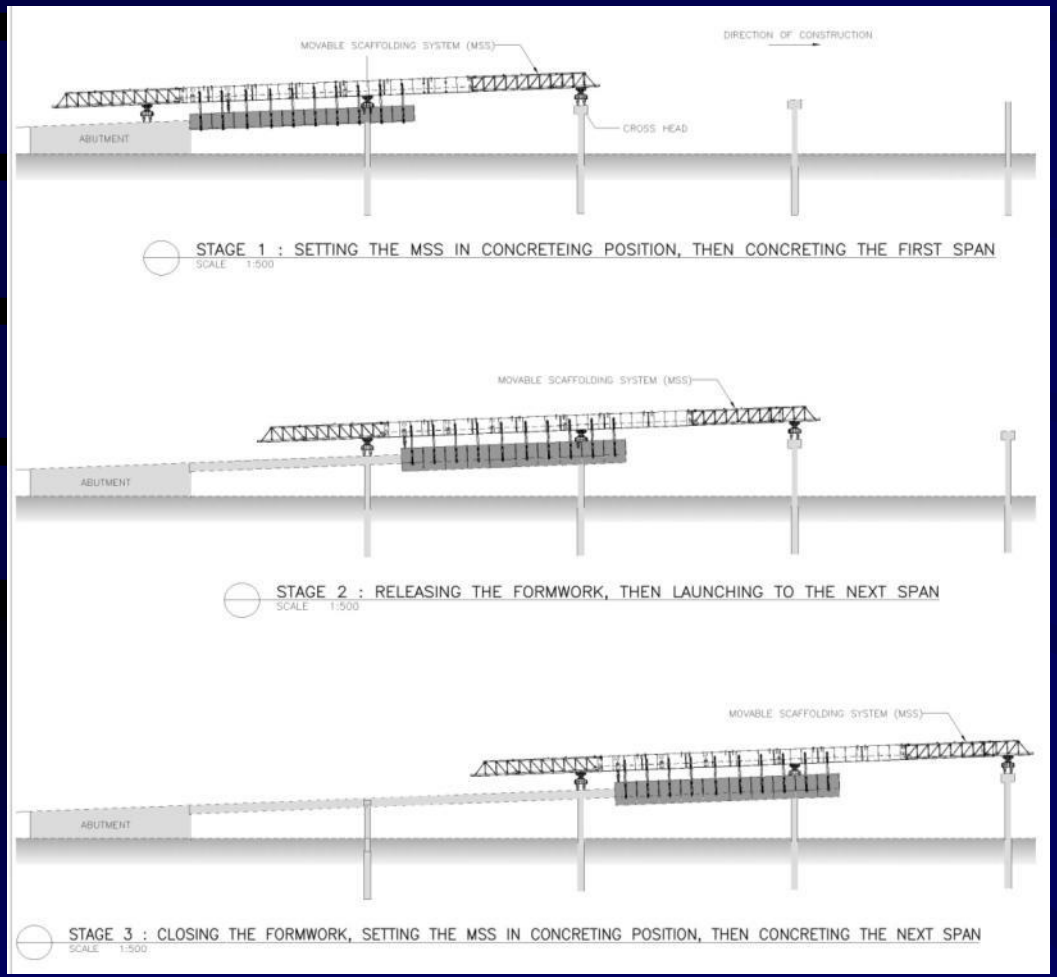
Main Bridge
Balanced Cantilever Method
Form Traveler System

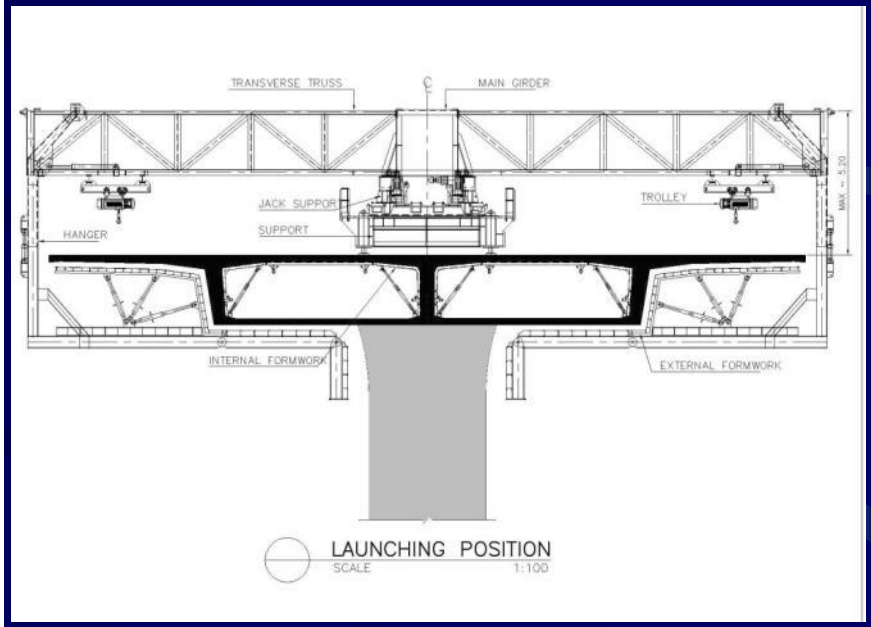
West Viaduct
Span by Span Method
Stationary Shoring System



Span by Span on Stationary Shoring System

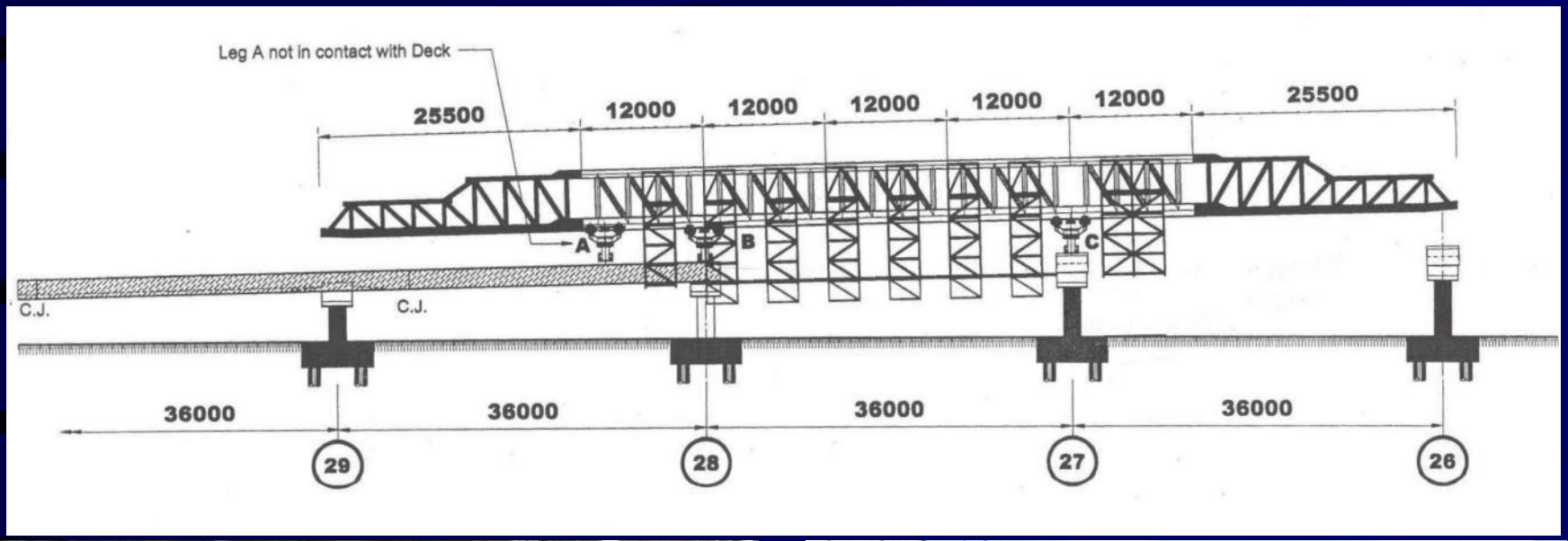
Span by Span on Movable Scaffolding System (MSS)





Movable Scaffolding System : Over Slung

Movable Scaffolding System : Over Slung



Movable Scaffolding System : Over Slung

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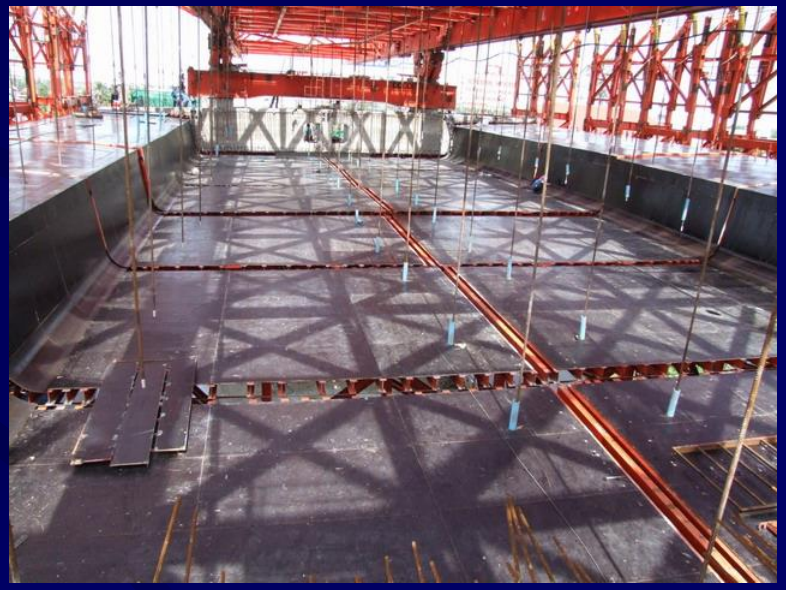
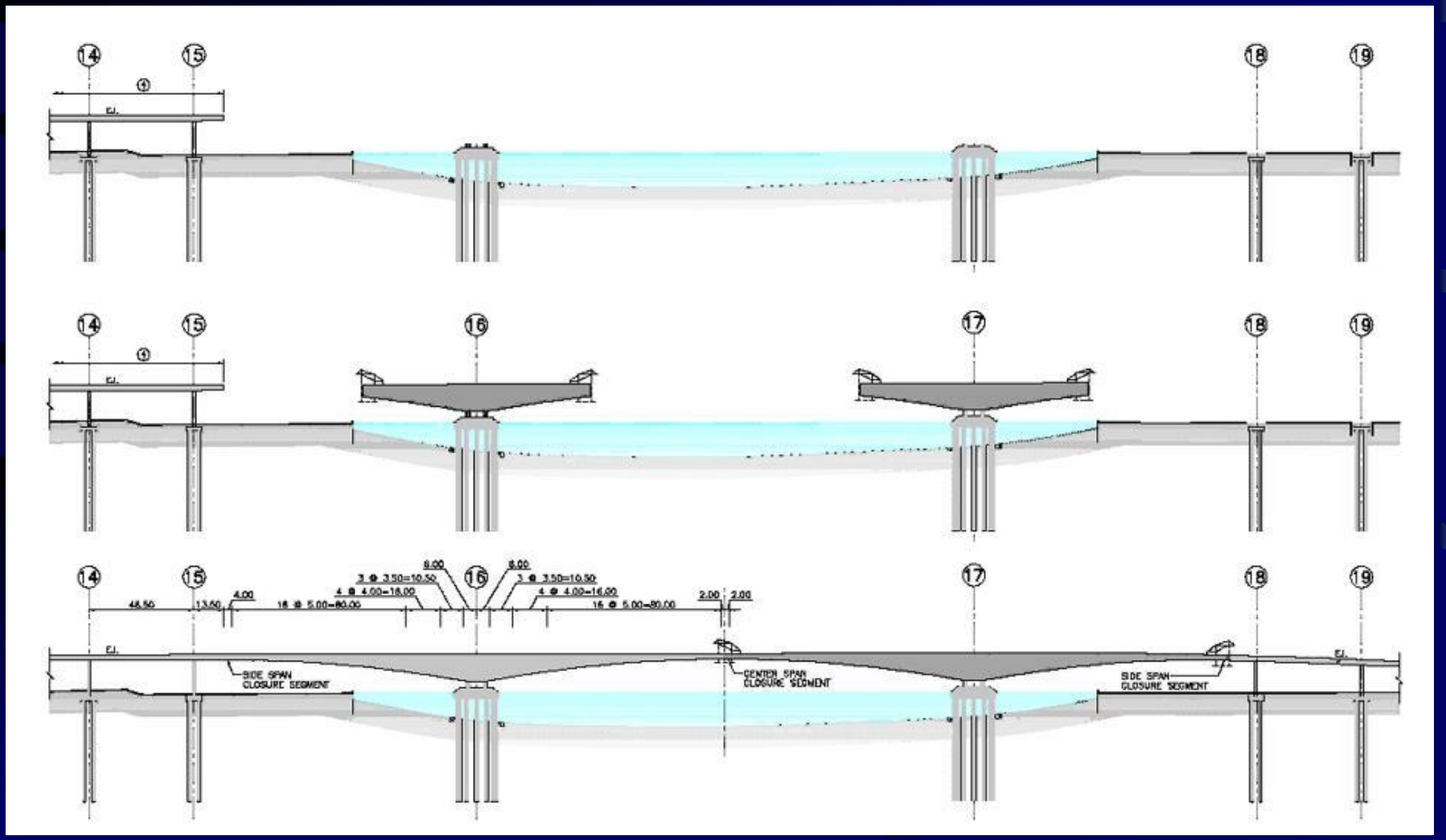


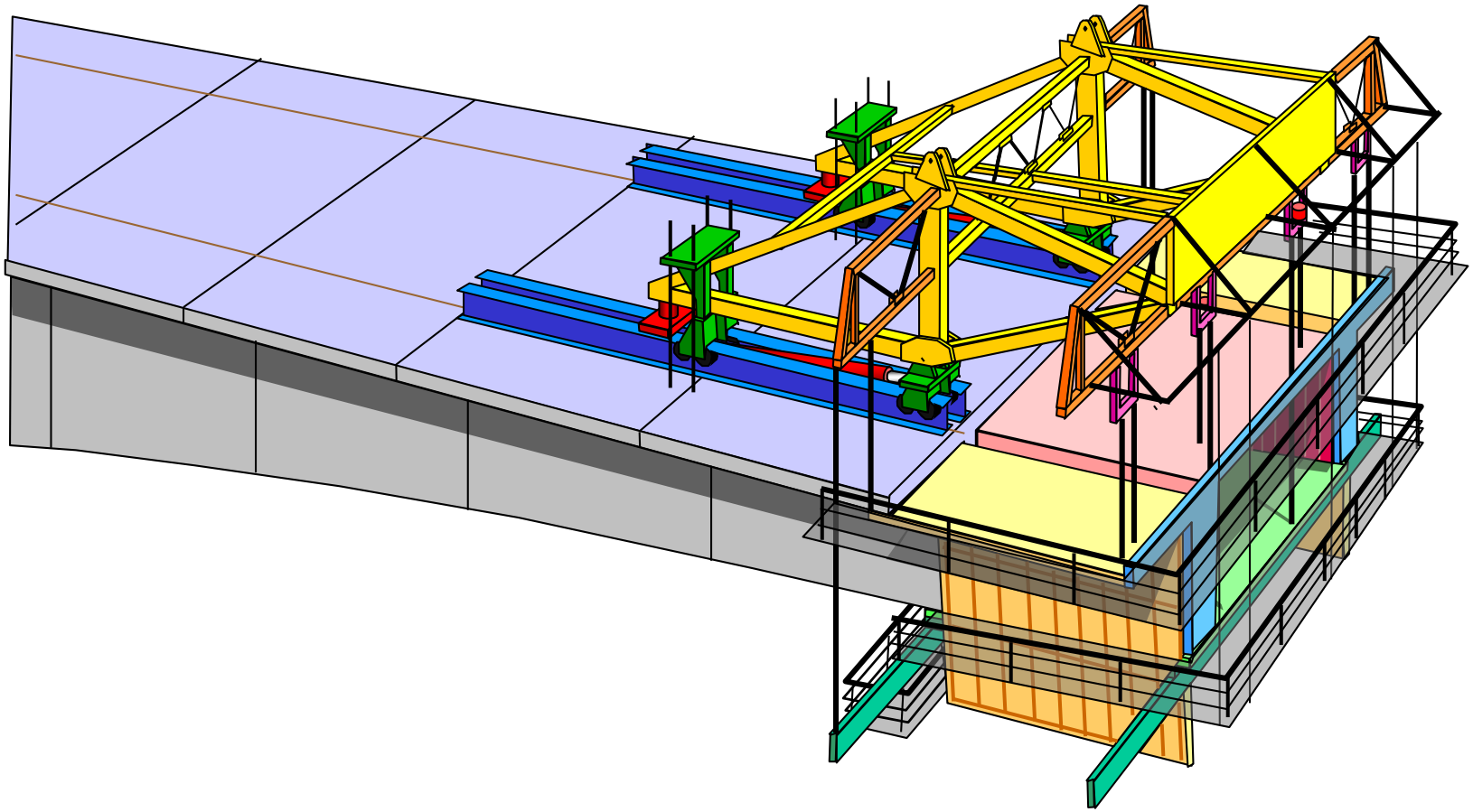
Movable Scaffolding System : Over Slung

วิธีการก่อสร้างสะพาน Main Bridge

- **Balanced Cantilever Method by Form Traveler Equipment**



Form Traveler Equipment



Form Traveler Equipment

Construction of Main Bridge

Temporary Platform : Driving of King Posts

Temporary Platform : Placing Platform Panels

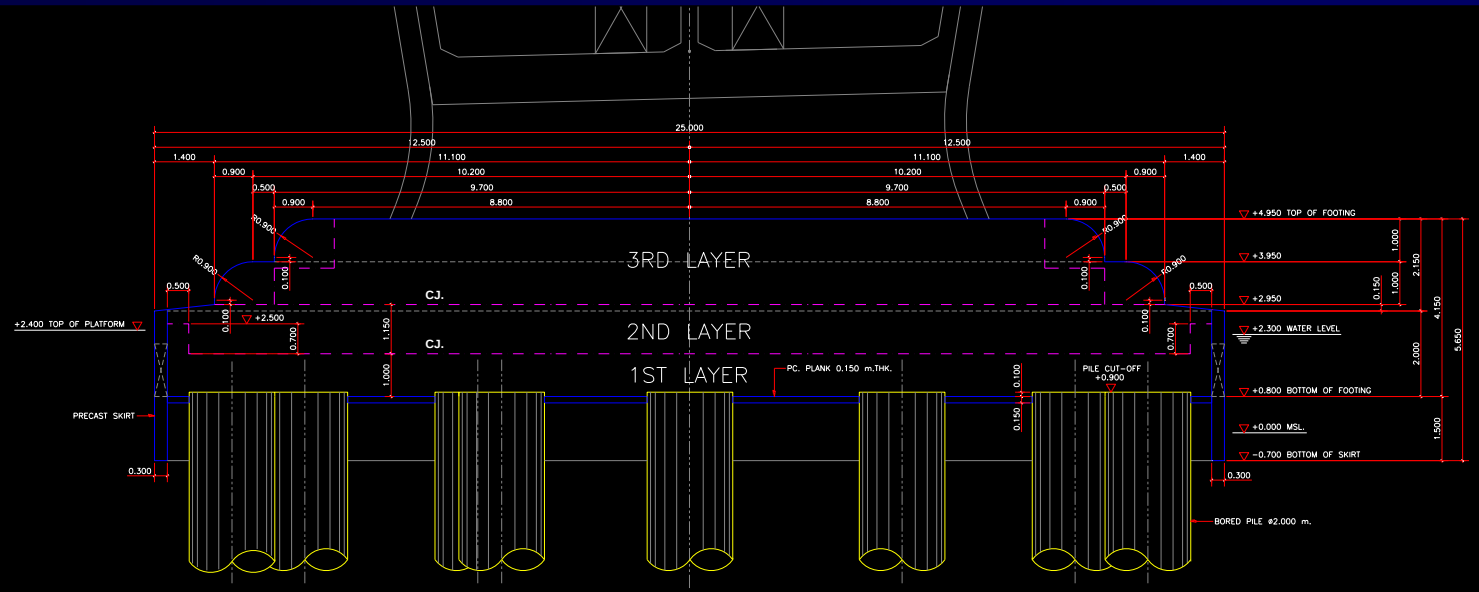
Temporary Platform : Placing Platform Panels

Bored Pile Construction

Scouring Protection Works

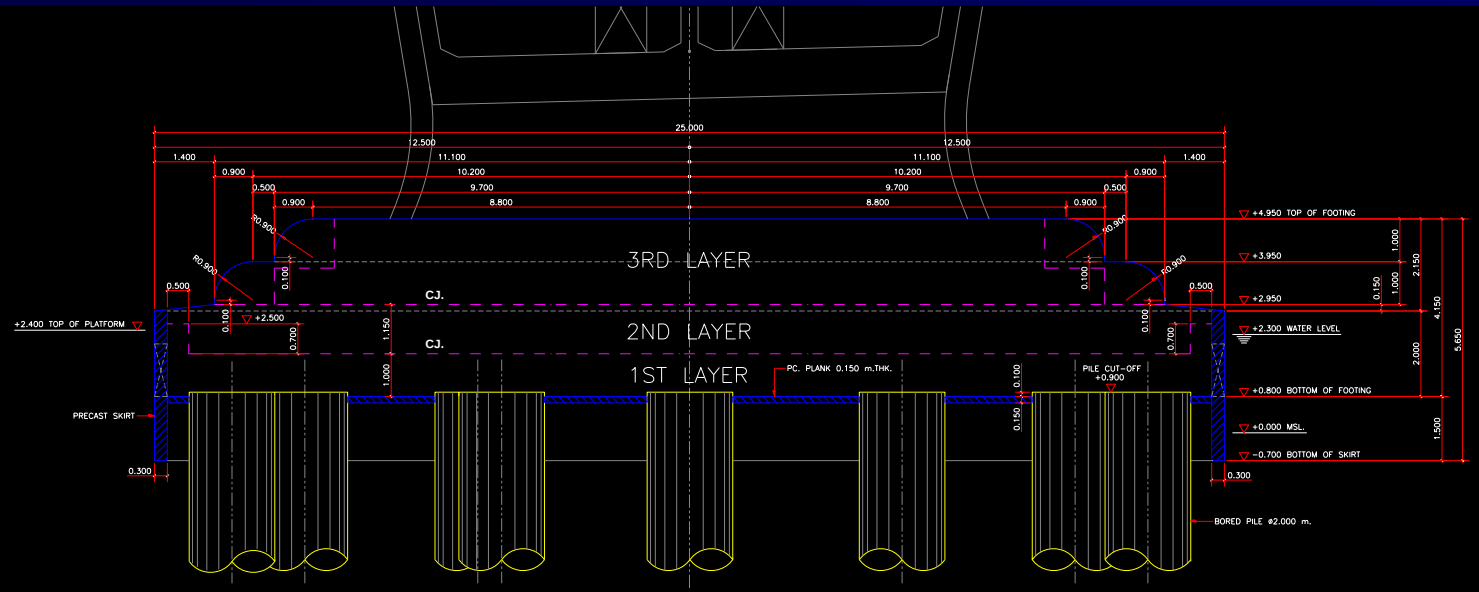
Main Bridge Pile Cap Construction Method

Pile Cap Construction Method



CONSTRUCTION STAGE OF PILE CAP

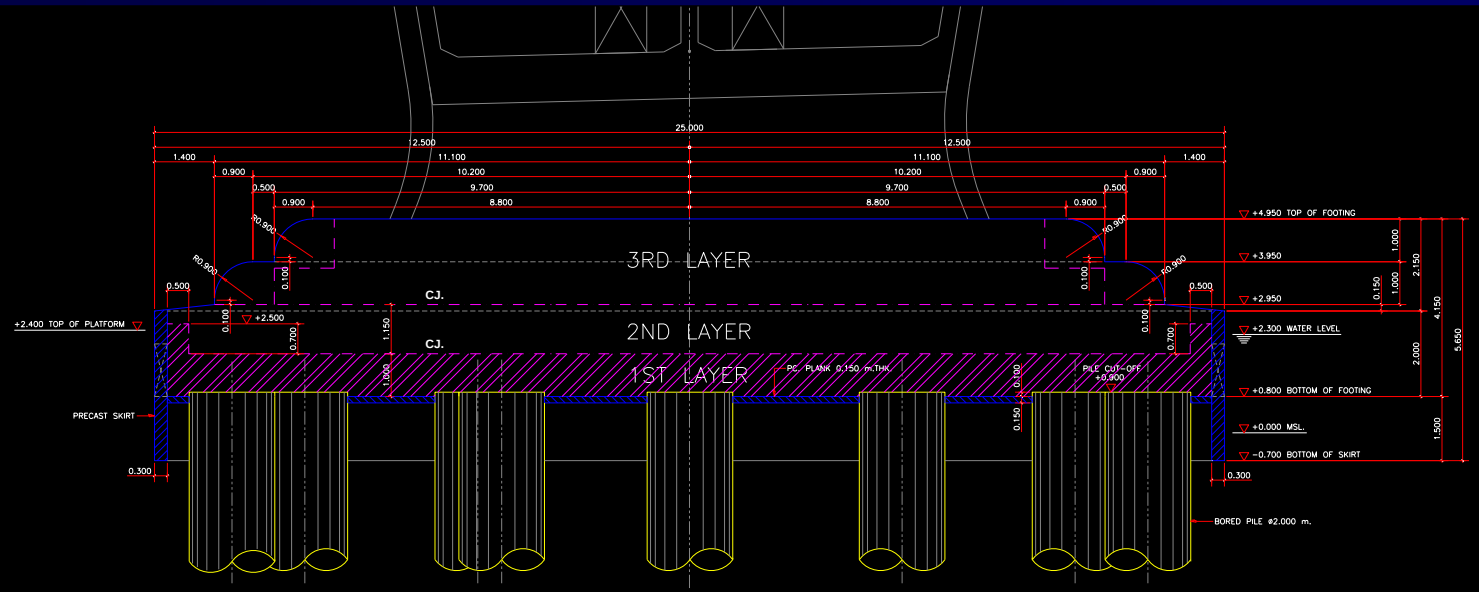
Pile Cap Construction Method



CONSTRUCTION STAGE OF PILE CAP

1. INSTALL SUPPORT BEAM, PRECAST PLANK AND RC SKIRT

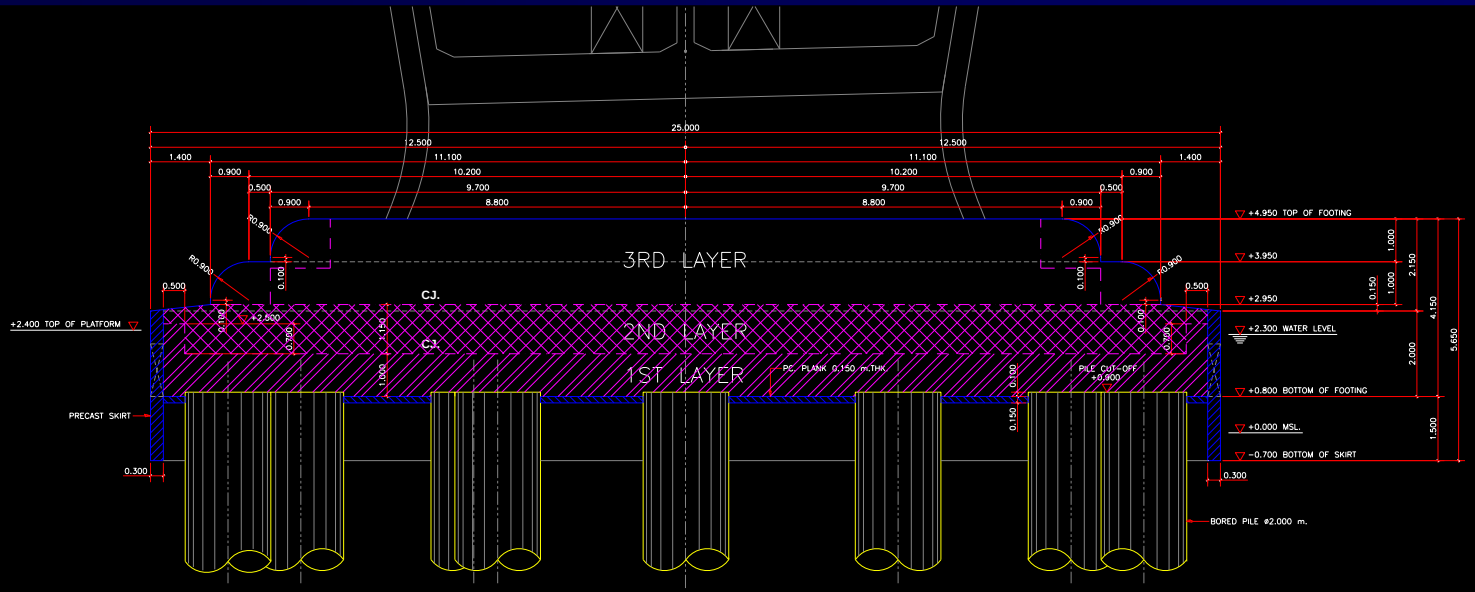
Pile Cap Construction Method



CONSTRUCTION STAGE OF PILE CAP

1. INSTALL SUPPORT BEAM, PRECAST PLANK AND RC SKIRT
2. CASTING 1ST LAYER 1.00 M THICK (SUPPORT ON PC PLANK)

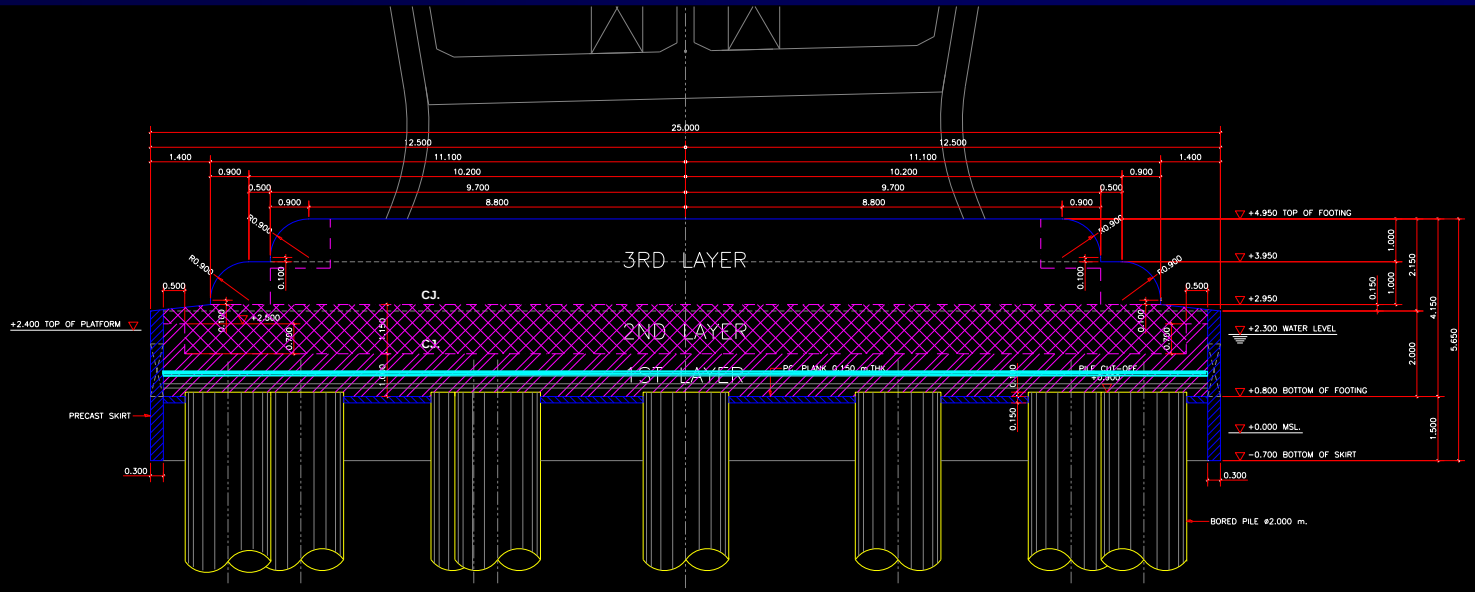
Pile Cap Construction Method



CONSTRUCTION STAGE OF PILE CAP

1. INSTALL SUPPORT BEAM, PRECAST PLANK AND RC SKIRT
2. CASTING 1ST LAYER 1.00 M THICK (SUPPORT ON PC PLANK)
3. CASTING 2ND LAYER 1.15 M THICK (SUPPORT ON 1ST LAYER CONCRETE WITH ADDITIONAL R/F PROVIDE IN 1ST LAYER)

Pile Cap Construction Method



CONSTRUCTION STAGE OF PILE CAP

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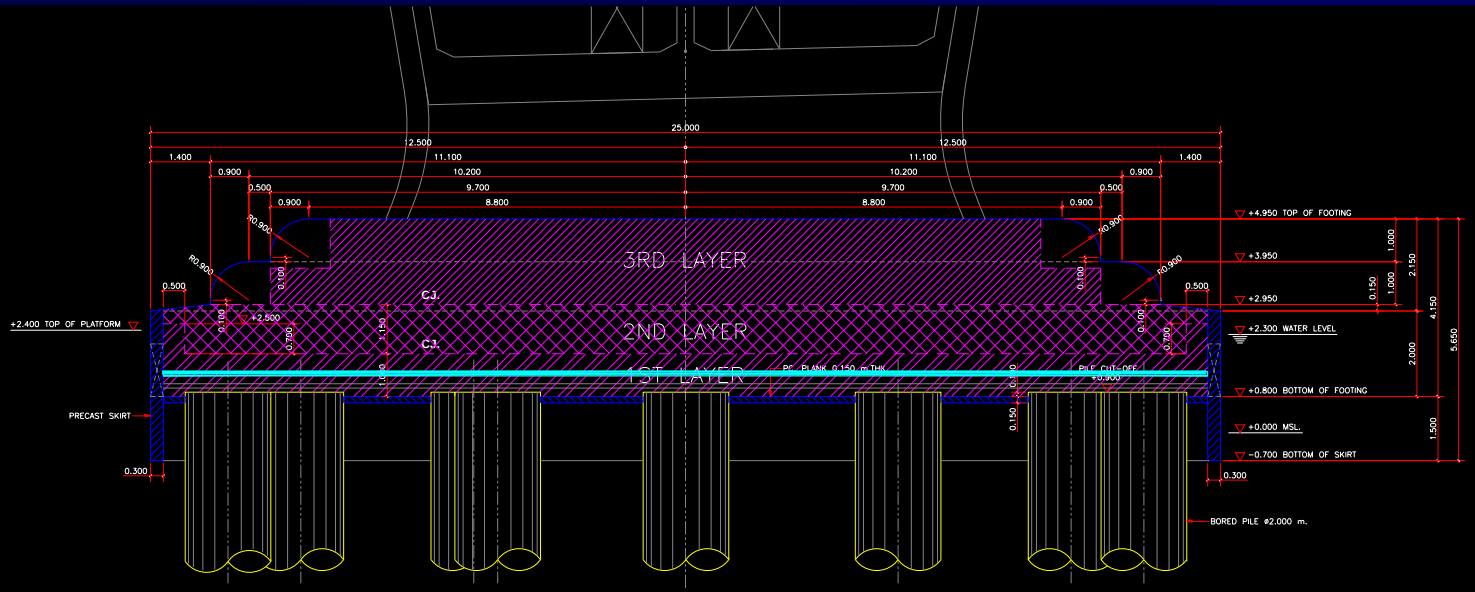
3. CASTING 2ND LAYER 1.15 M THICK (SUPPORT ON 1ST LAYER CONCRETE WITH ADDITIONAL R/F PROVIDE IN 1ST LAYER)
4. STRESSING 7 PT TENDONS

Pile Cap Construction Method



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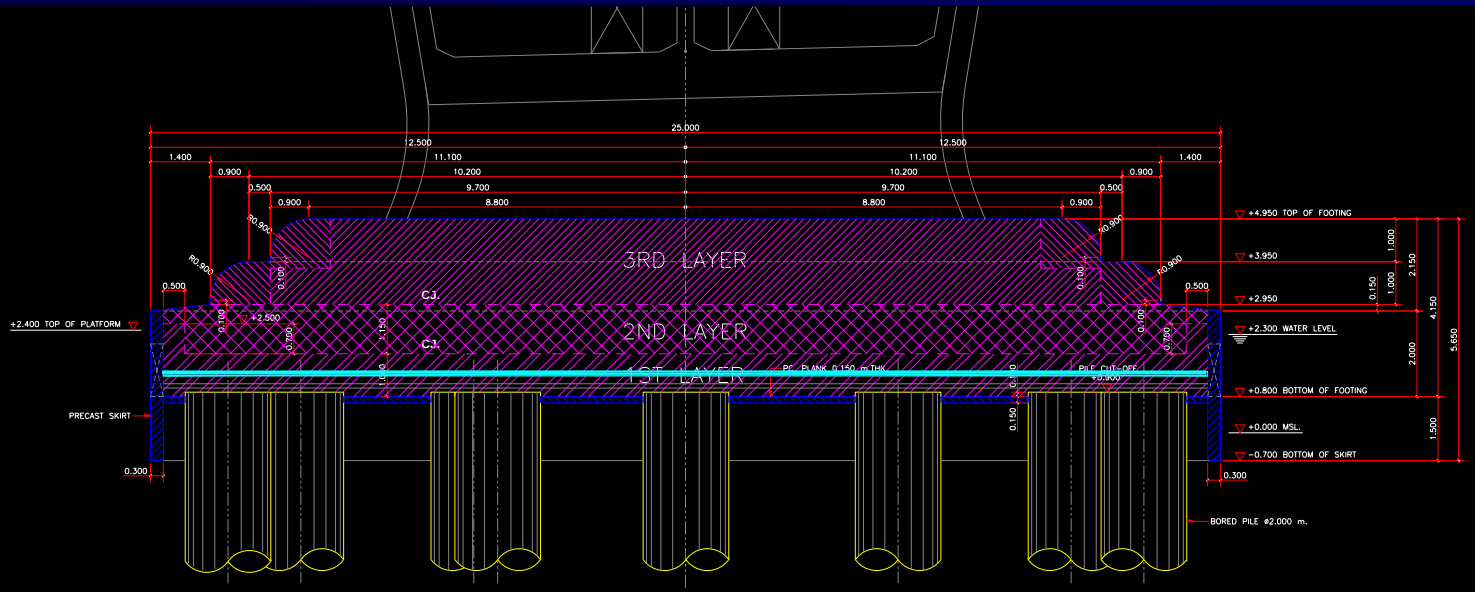
4. STRESSING 7 PT TENDONS
5. CASTING 3RD LAYER 2.00 M THICK UP TO TOP OF PILE CAP

Pile Cap Construction Method



CONSTRUCTION STAGE OF PILE CAP

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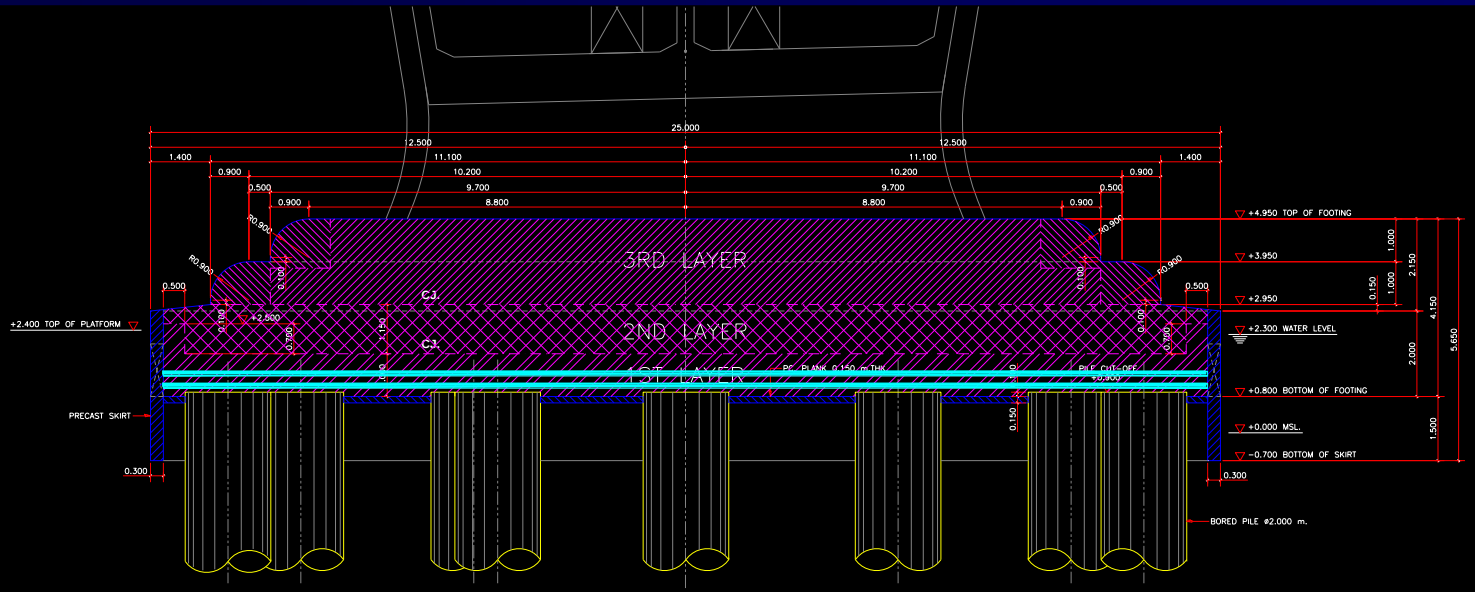
3. CASTING 2ND LAYER 1.15 M THICK (SUPPORT ON 1ST LAYER CONCRETE WITH ADDITIONAL R/F PROVIDE IN 1ST LAYER)
4. STRESSING 7 PT TENDONS
5. CASTING 3RD LAYER 2.00 M THICK UP TO TOP OF PILE CAP
6. CASTING CONCRETE ON ELLIPTICAL PARTS

Pile Cap Construction Method



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4. STRESSING 7 PT TENDONS
5. CASTING 3RD LAYER 2.00 M THICK UP TO TOP OF PILE CAP
6. CASTING CONCRETE ON ELLIPTICAL PARTS
7. STRESSING THE REMAIN TENDONS (21 TENDONS)

Installation of Supporting Beams

Installation of PC Plank and RC Skirt Panel

Installation of RC Skirt Panel

Rebar for 1st Layer of Concrete Pile Cap

Layout of Post-Tensioning Ducts in Pile Cap

Concreting of 1st Layer

Rebar for 2nd Layer of Concrete Pile Cap

2nd Layer of Concrete Pile Cap

Stressing of 7 Tendons (1st Stage)

Rebar for 3rd Layer of Concrete Pile Cap

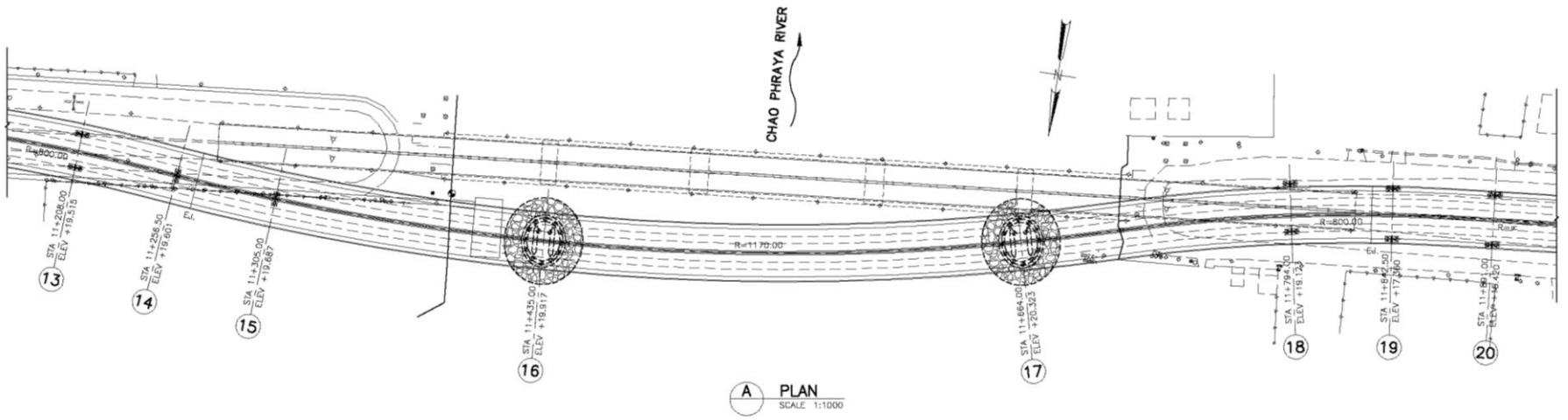
3rd Layer of Concrete Pile Cap

Stressing of 21 Tendons (Remaining Tendons)

Grouting of Tendons in Pile Cap

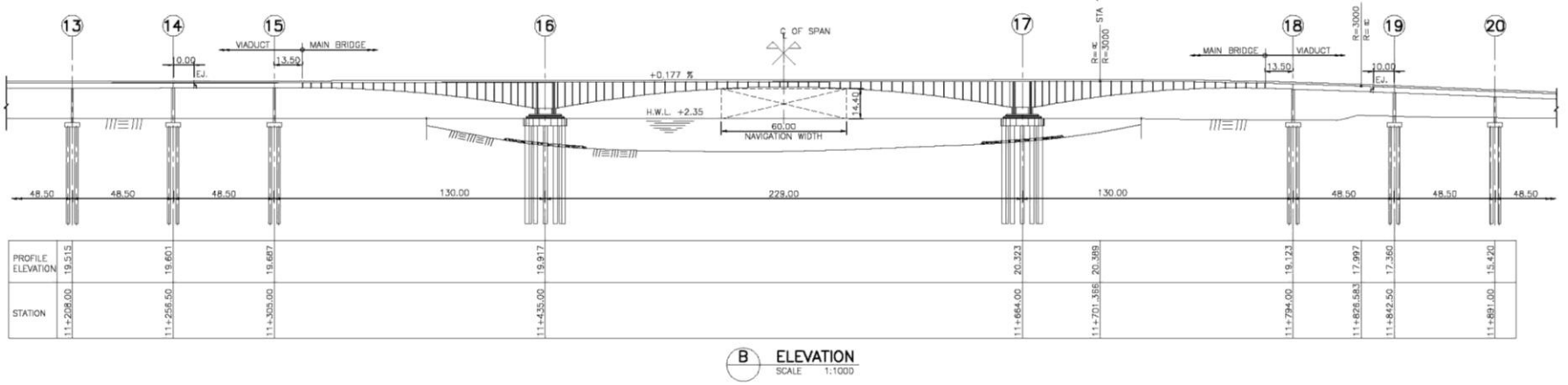
Main Bridge SuperStructure Construction Method

BRIDGE PLAN & ELEVATION



East Viaduct — **Main Bridge** — **West Viaduct**

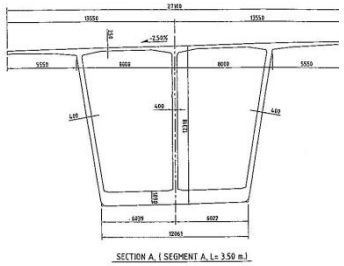
Length = 489 m.

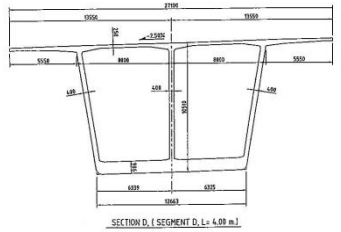


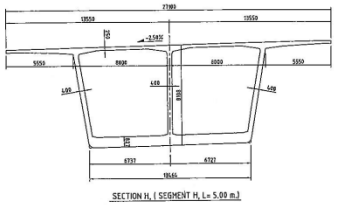
Introduction

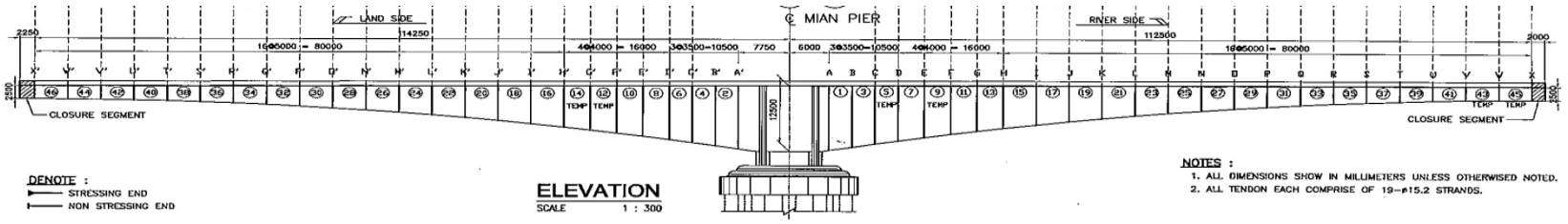
Project Description

- **Location : Highway Route No. 303 (Ratanathibeth)**
- **Bridge Geometry :**
- **The Main Bridge is Twin boxes Balanced Cantilever type consist of 3 spans, 130 m _ 229 m. _ 130m.**
- **Over all Cross section dimensions are**
  - **W = 27.6 m. at top**
  - **W bot. varies 12.06 m to 15.34 m.**
  - **Max. Segment Length = 5.00 m.**
  - **Min. Segment Length = 3.50 m.**
  - **Profile grade varies + 0.177 to -1.141%**
  - **Cross slope varies +2.5% to - 4%**
- **No of Segments Cast Using Formtraveller = 92**
- **Max. Segment weight = 359 ton (5.00 m)**
- **Max. Segment weight = 331 ton (4.00 m)**
- **Max. Segment weight = 315 ton (3.50 m)**
- **Hammer – head length = 13.75 m.**

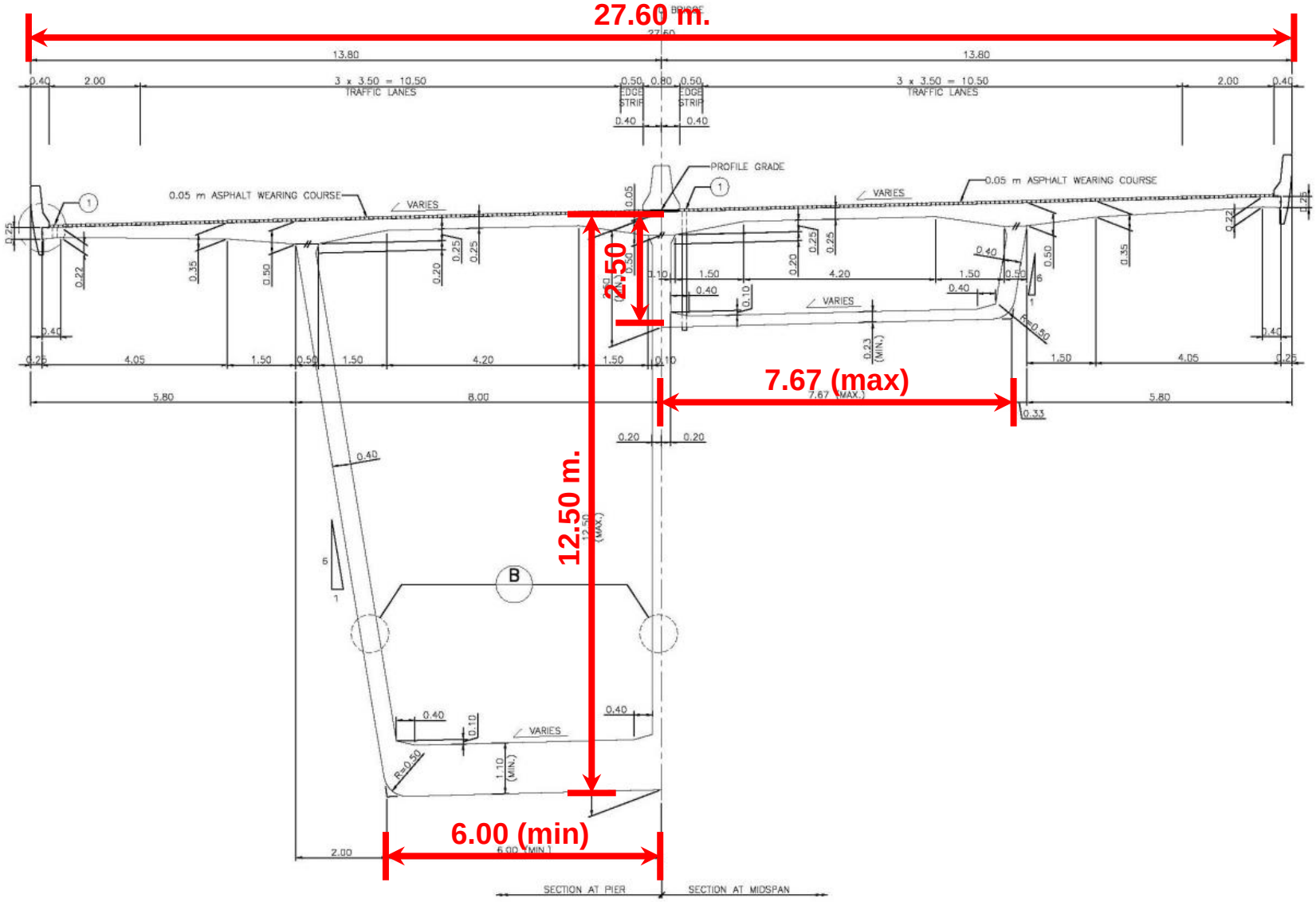






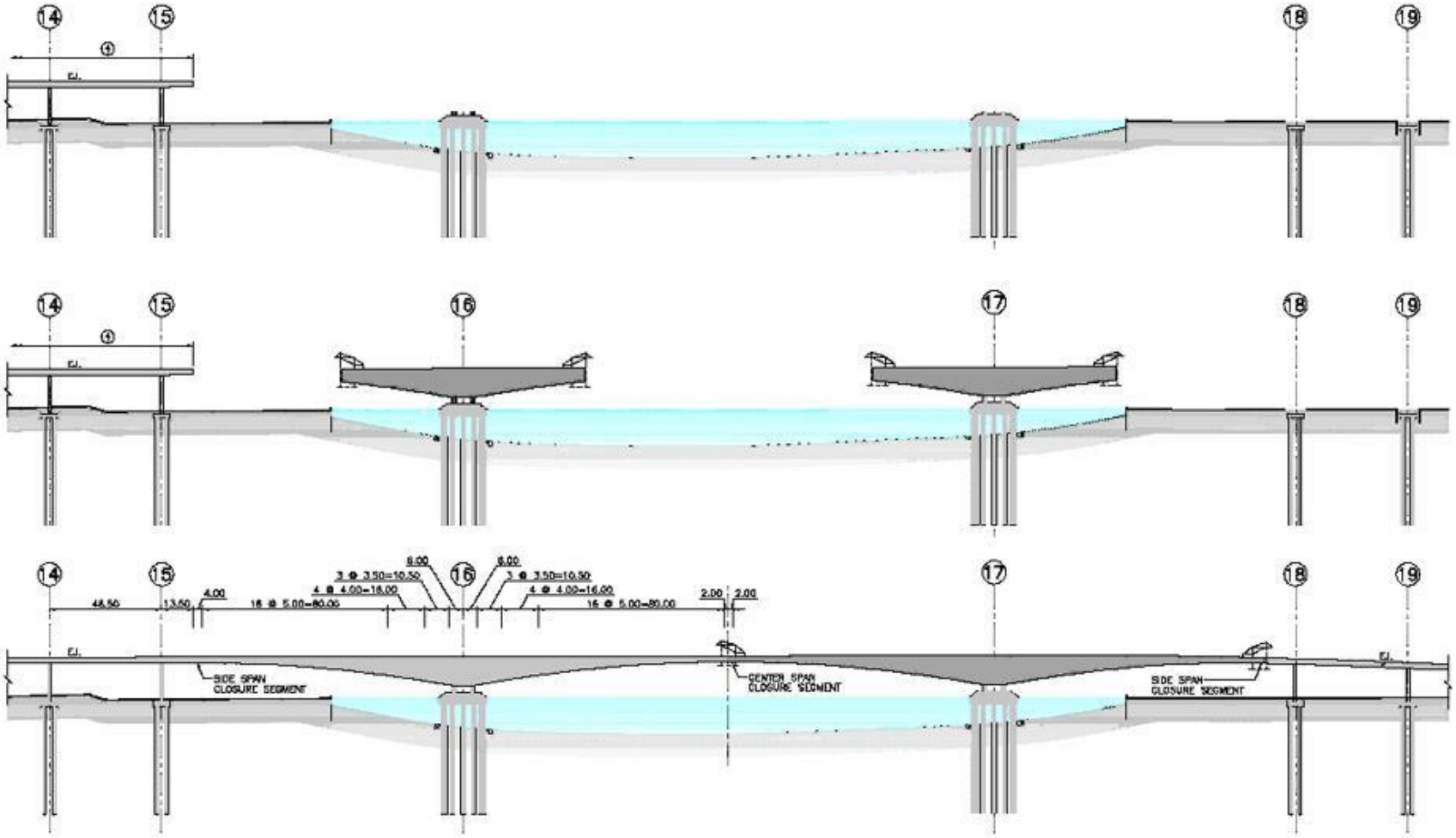


Typical cross-section Main Bridge



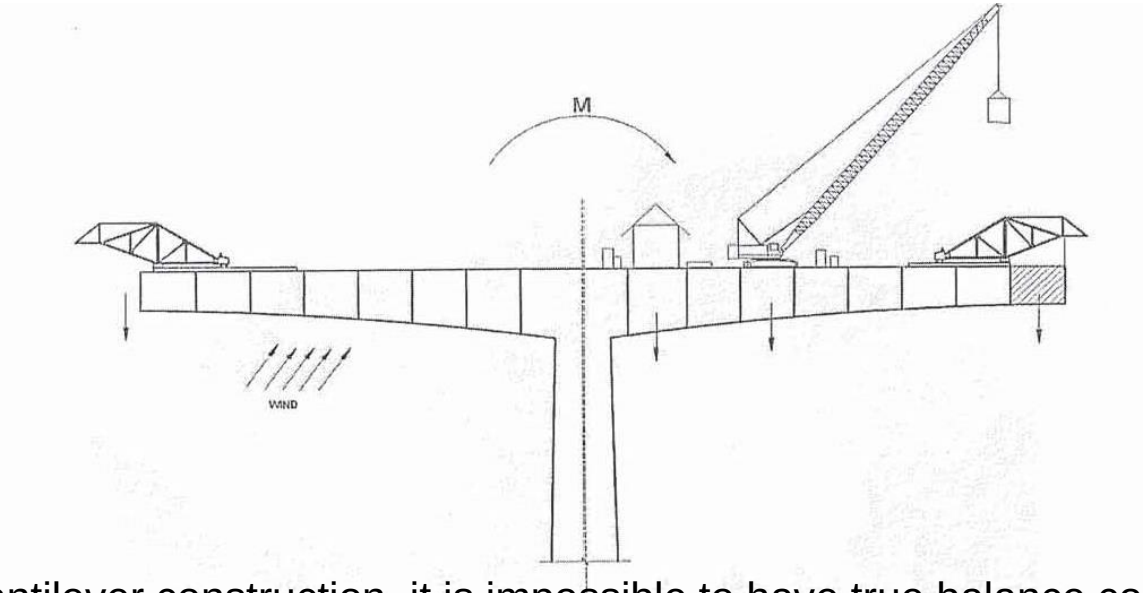
Construction Sequence

- **Balanced Cantilever Method by Form Traveler Equipment**



Balance Cantilever Bridge Construction

- **Symmetrical Construction and**
- **Non - Symmetrical Construction**
  - To reduce out of balance moment from segment dead load during construction.



During free cantilever construction, it is impossible to have true balance condition.

1. Symmetric cast balance cantilever construction.

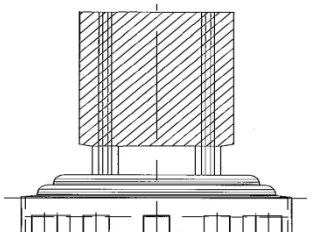
Advantages:

- **Construction completes at left and right section at the same time.**
- **Original PT layout can use for construction**
- **Minimize out of balance load effect to the pier.**
- **Deflection pattern is not complicate & easy to monitor.**

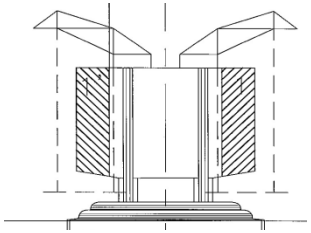
Disadvantages:

- **Required to finish many activities at the same time.**
- **Construction activities are dependable at each side.**
- **Simultaneously working at both side is difficult to control effectively.**
- **Cycle time for construction is longer**

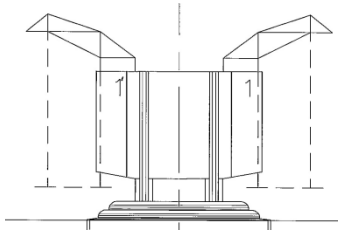
Symmetric cast balance cantilever construction.



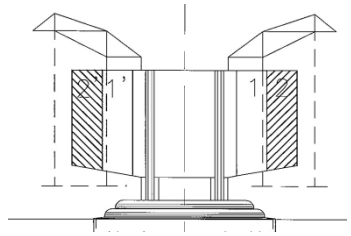
PIERHEAD (SYMM.)



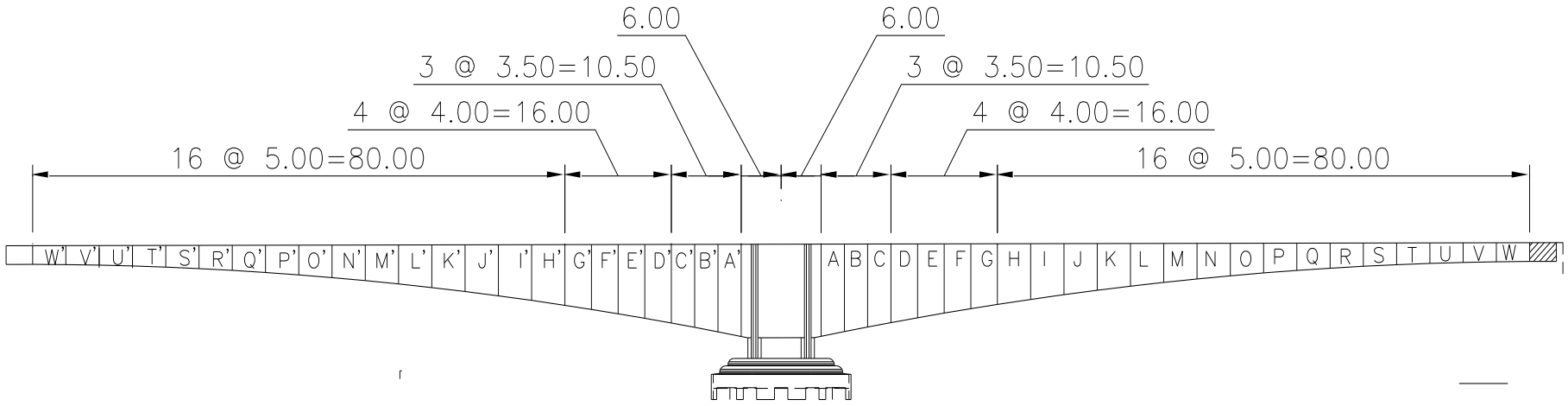
CAST – A & A'



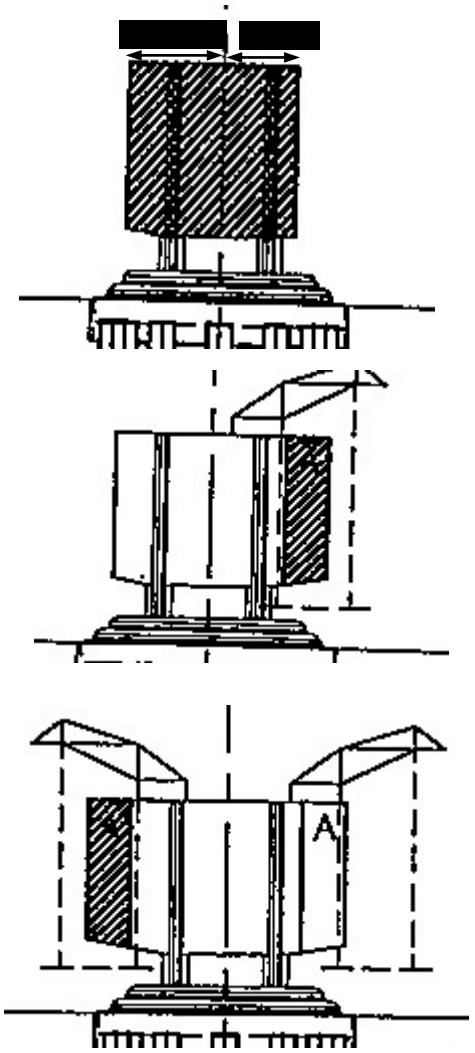
MOVE Form traveller TO B & B'



CAST – B & B'



2. Non-symmetric cast balance cantilever construction.



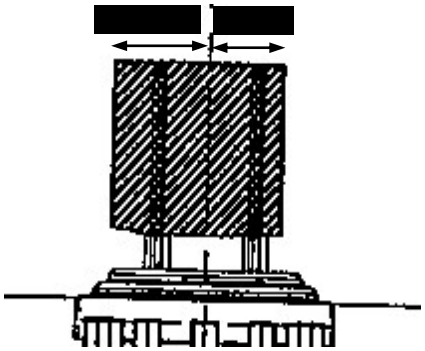
Advantages:

- **Construction on both sides are independent.**
- **Make benefit of reserved capacity of pier head for out of balance loading.**
- **Controlling of works easy and effective.**
- **Concreting can be partial or full section.**
- **Overall cycle time for the construction can be reduced.**

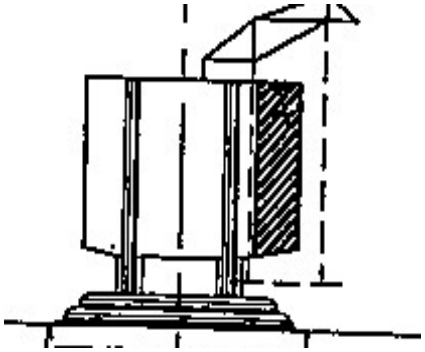
Disadvantages:

- **If not design in advance, additional temporary prestressing arrangements are required for continuous working of Formtraveller at certain section.**
- **Deflection pattern is more complicated.**

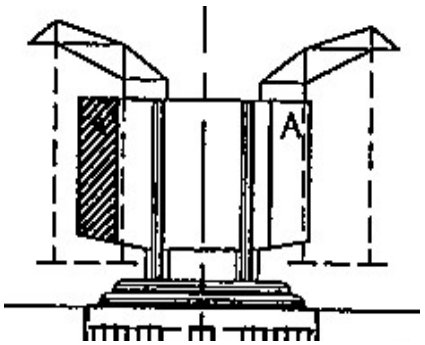
Non-symmetric cast balance cantilever construction.



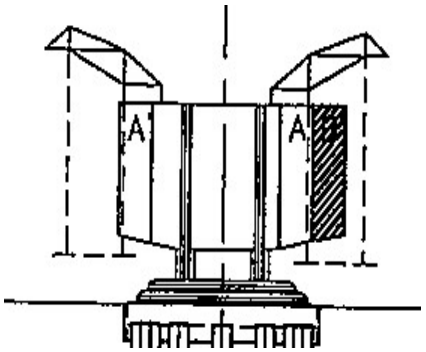
PIERHEAD (UNSYMM.)



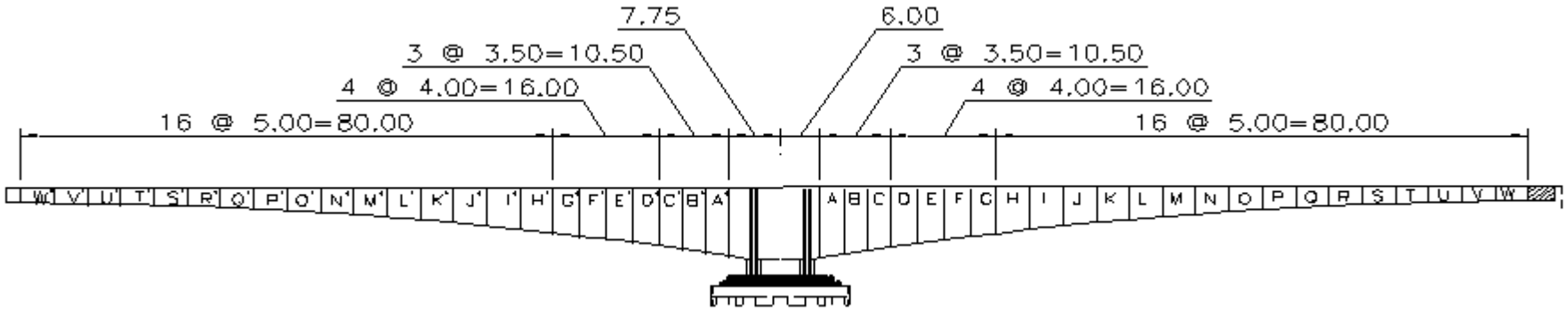
CAST – A WORK – A’



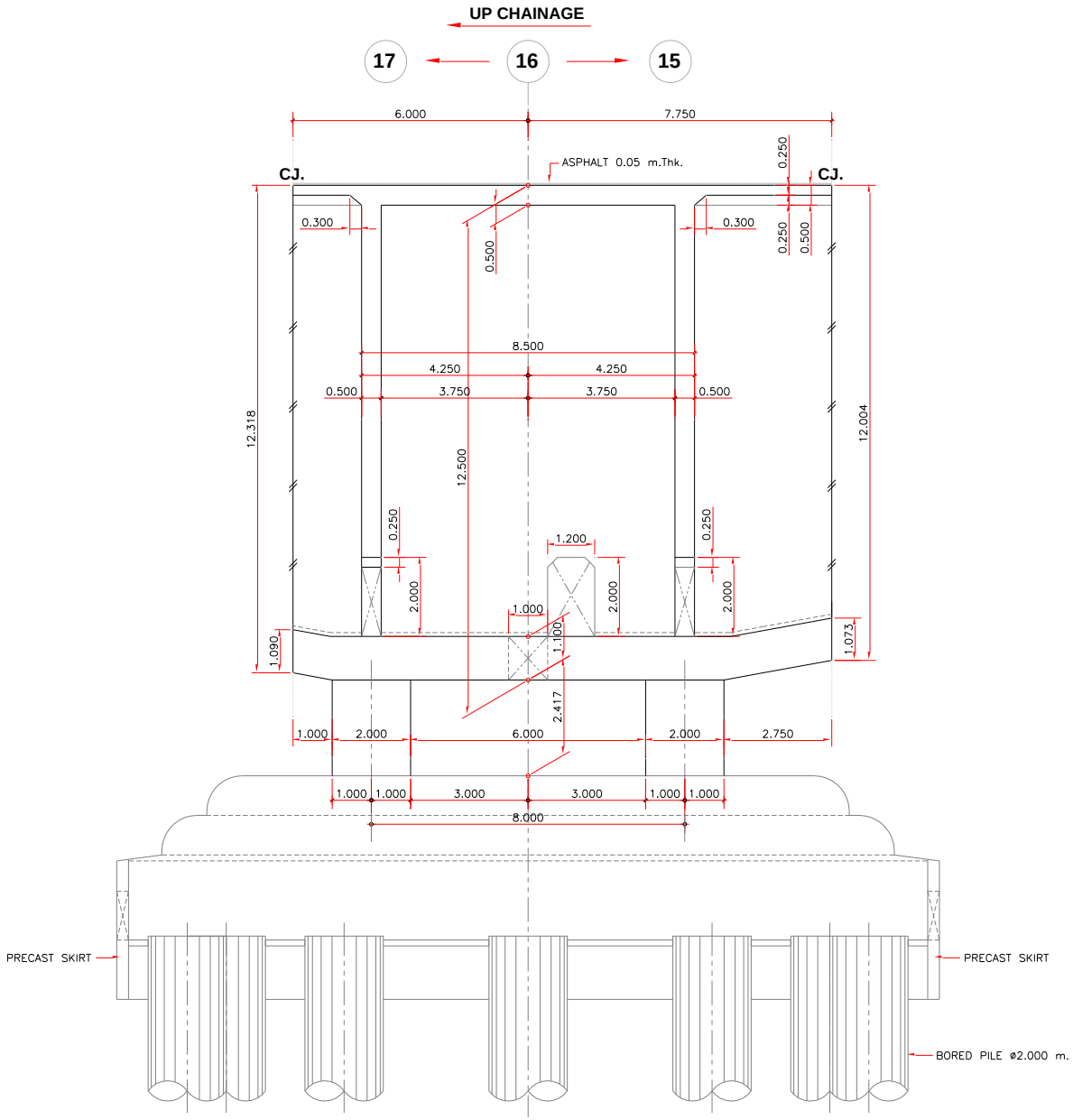
CAST – A’ WORK - B



CAST – B WORK - B’



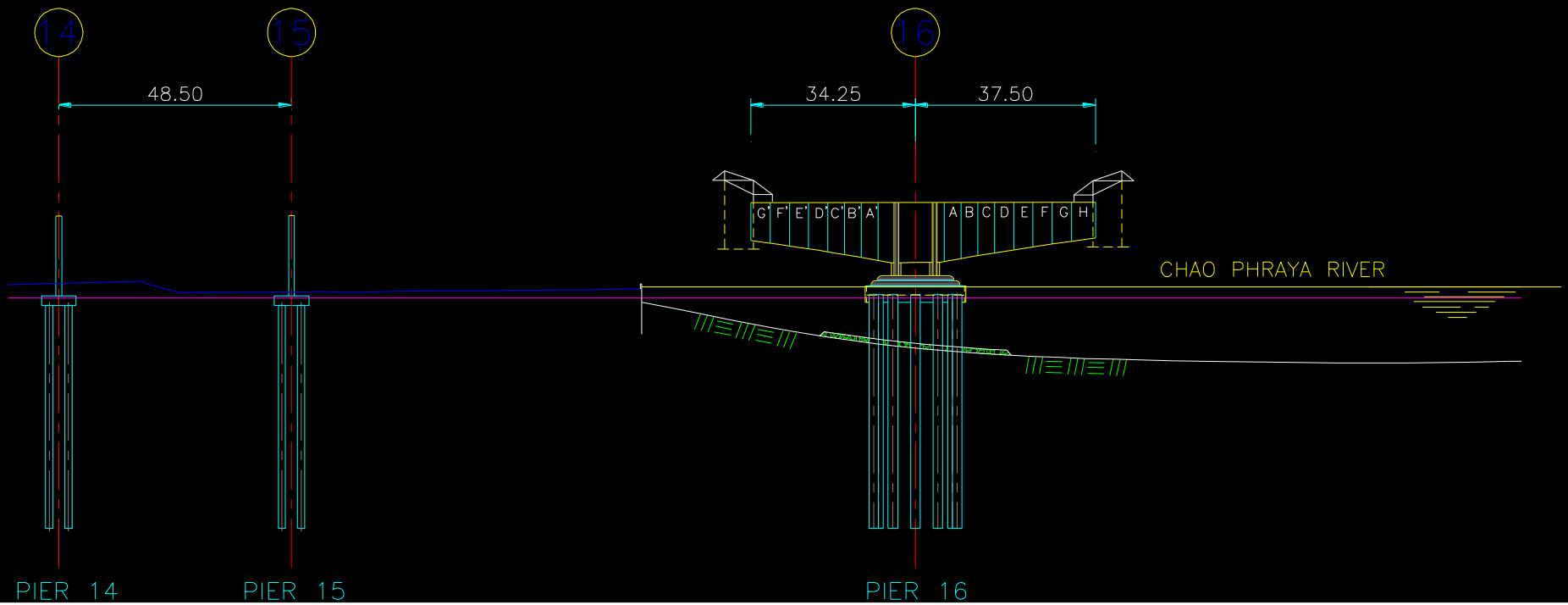
Cross-Section Pier Table



PHASE 13

13.1 MOVE BB(2) TO SEGMENT G'

13.2 MOVE BB(1) TO SEGMENT H

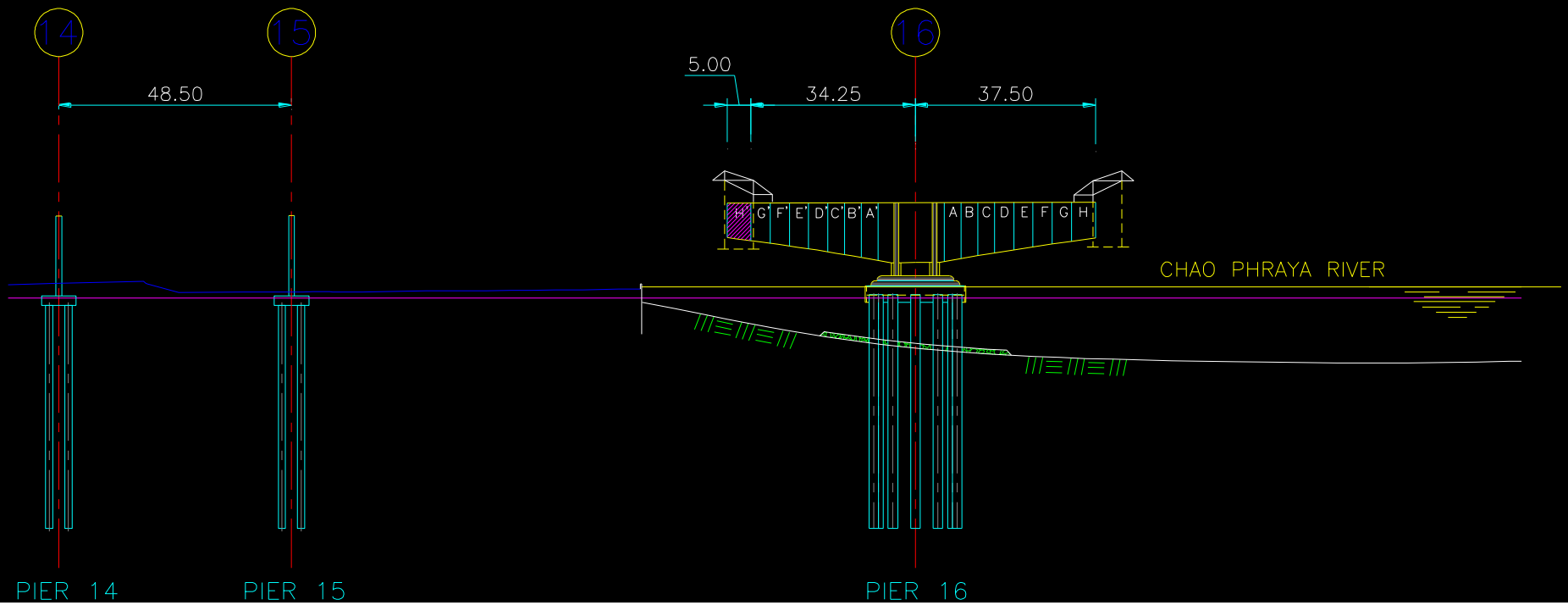


PHASE 13

13.1 MOVE BB(2) TO SEGMENT G'

13.2 MOVE BB(1) TO SEGMENT H

13.3 CASTING SEGMENT H'



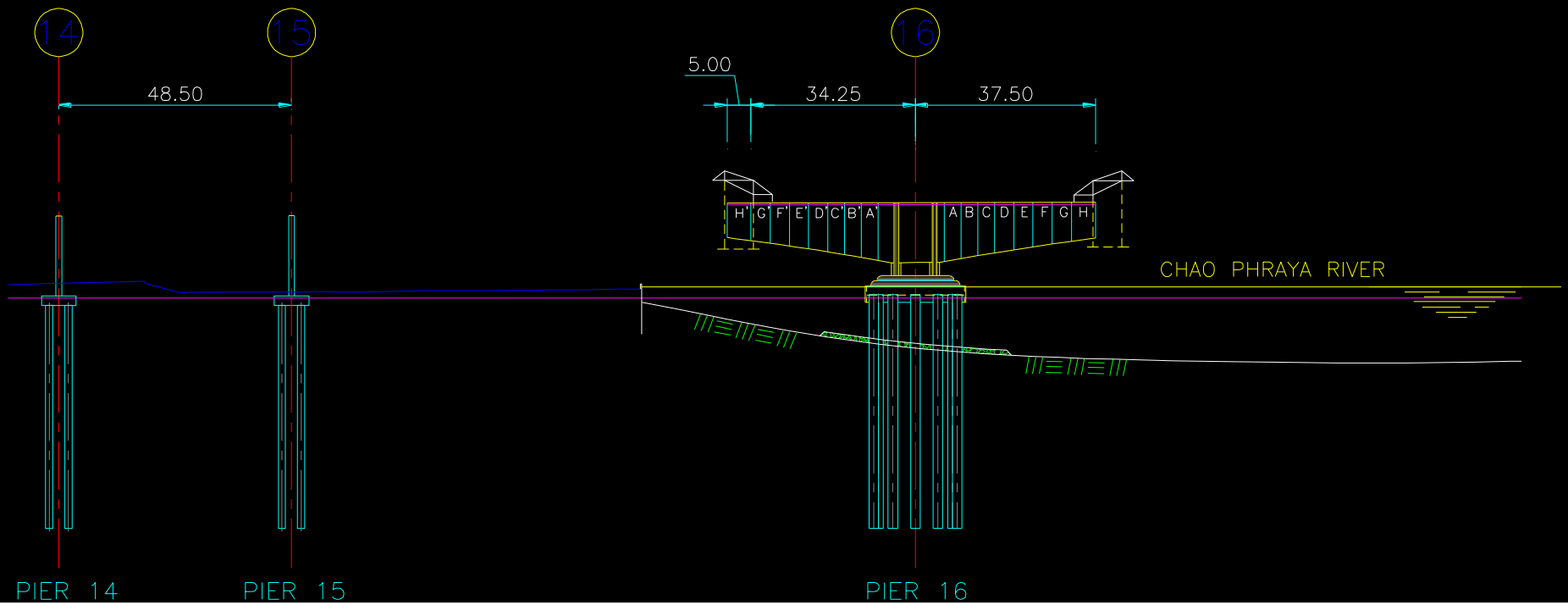
PHASE 13

13.1 MOVE BB(2) TO SEGMENT G'

13.2 MOVE BB(1) TO SEGMENT H

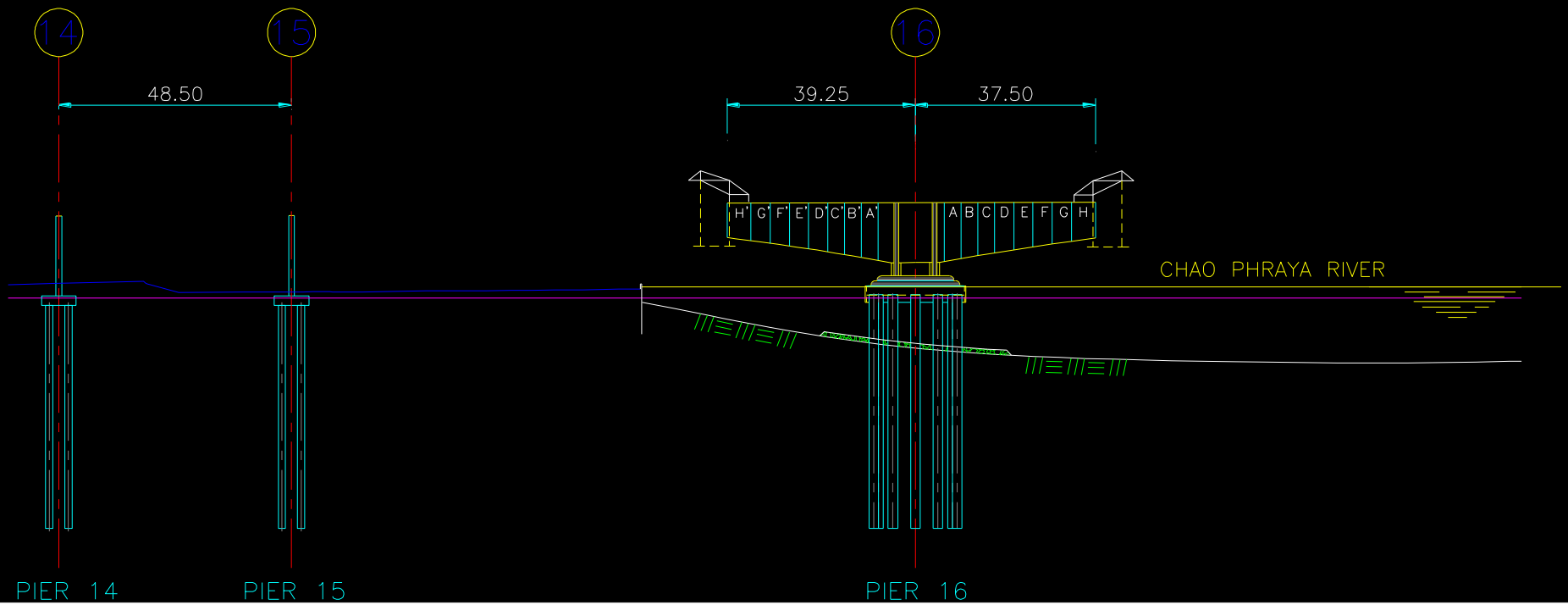
13.3 CASTING SEGMENT H'

13.4 STRESSING TENDON (S9) AND (T9) , 3 TENDONS



PHASE 14

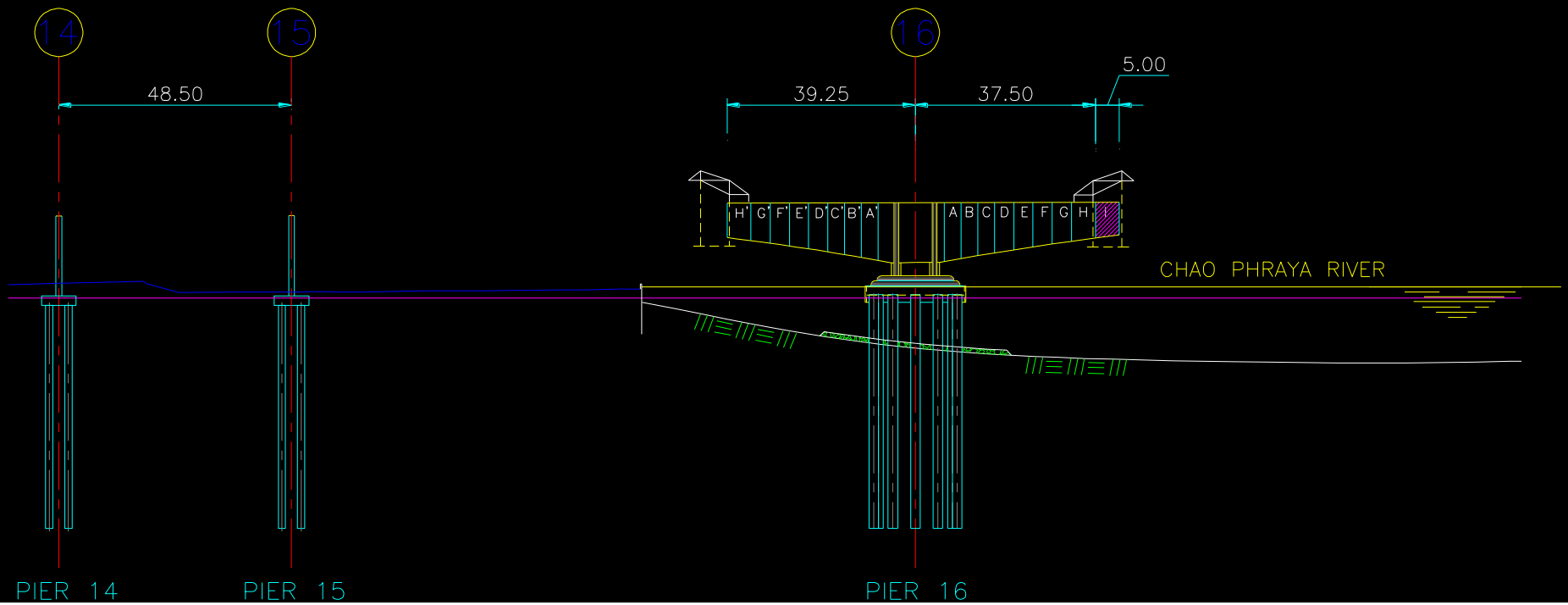
14.1 MOVE BB(2) TO SEGMENT H'



PHASE 14

14.1 MOVE BB(2) TO SEGMENT H'

14.2 CASTING SEGMENT I

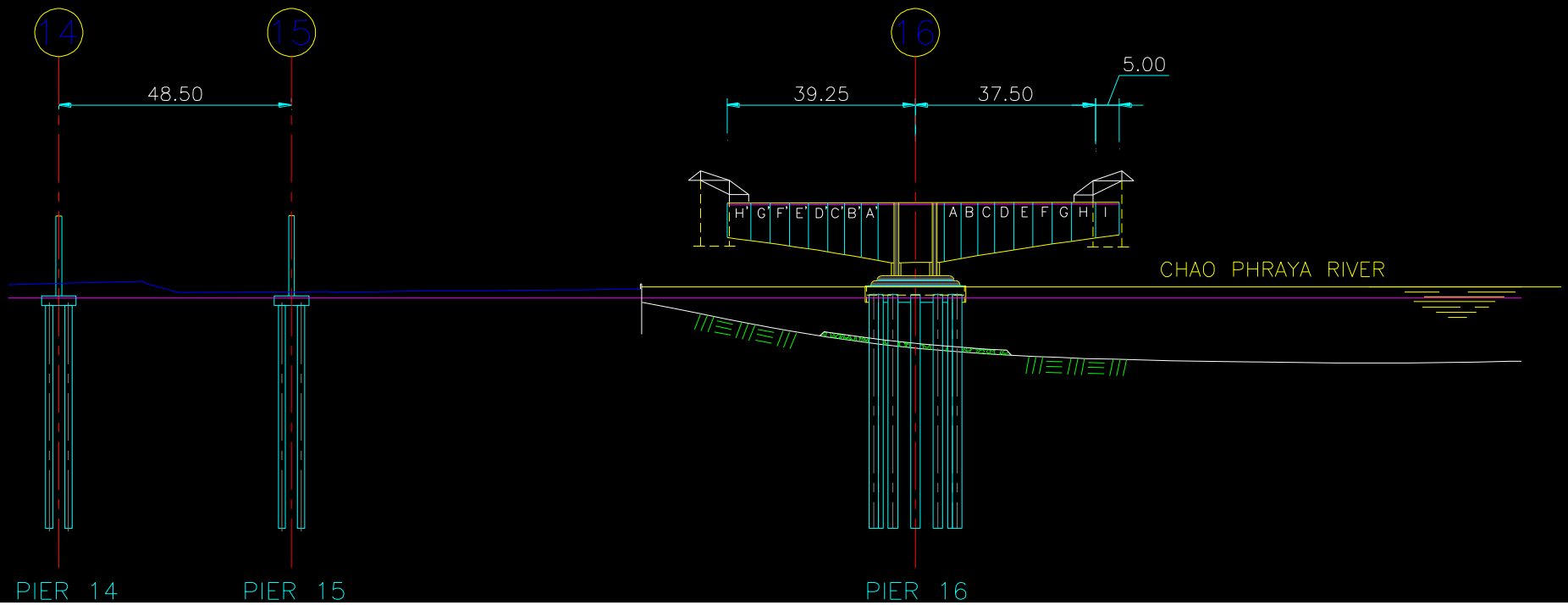


PHASE 14

14.1 MOVE BB(2) TO SEGMENT H'

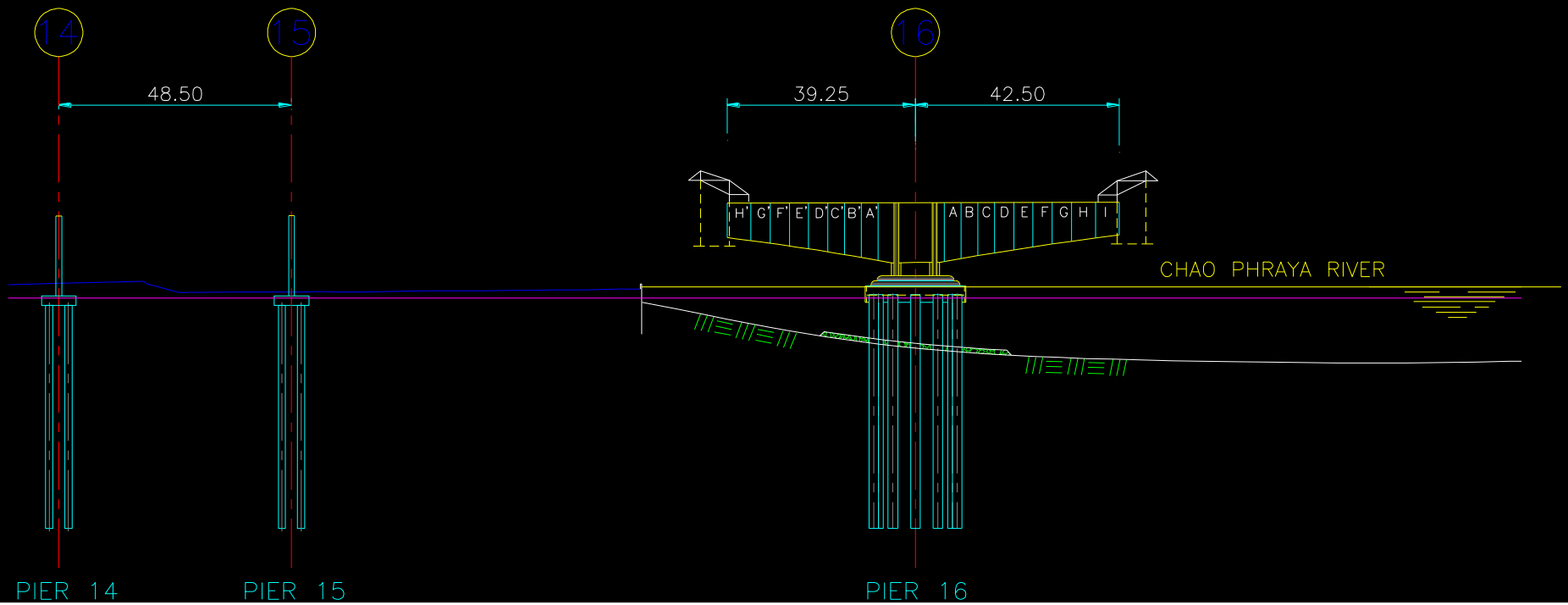
14.2 CASTING SEGMENT I

14.3 STRESSING TENDON S10 AND T10 , 3 TENDONS



PHASE 15

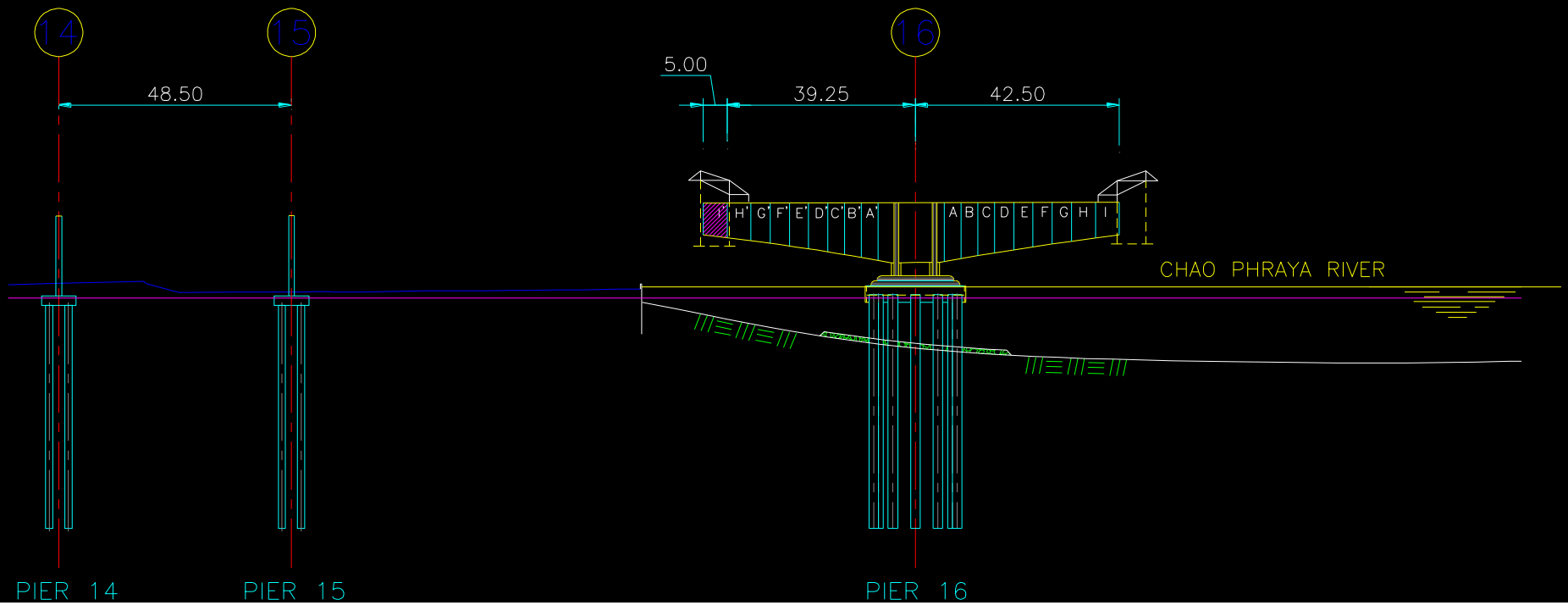
15.1 MOVE BB 1 TO SEGMENT I



PHASE 15

15.1 MOVE BB(1) TO SEGMENT I

15.2 CASTING SEGMENT I'

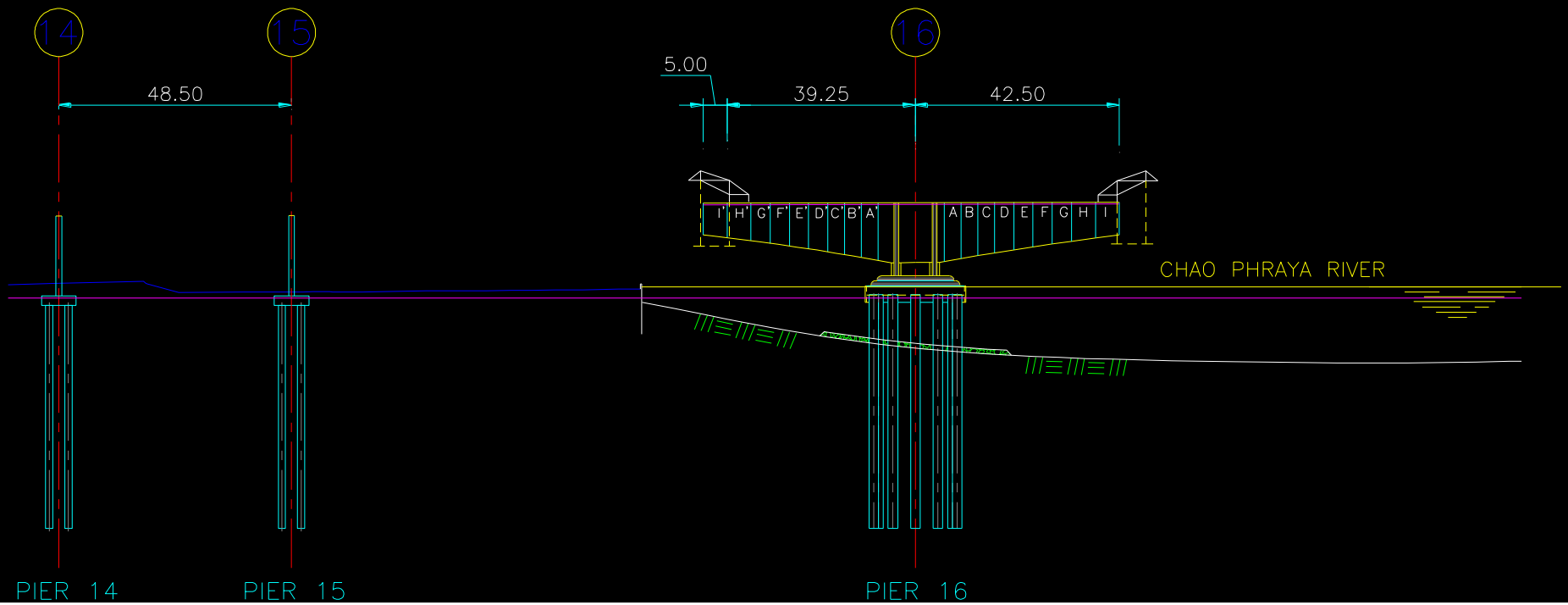


PHASE 15

15.1 MOVE BB(1) TO SEGMENT I

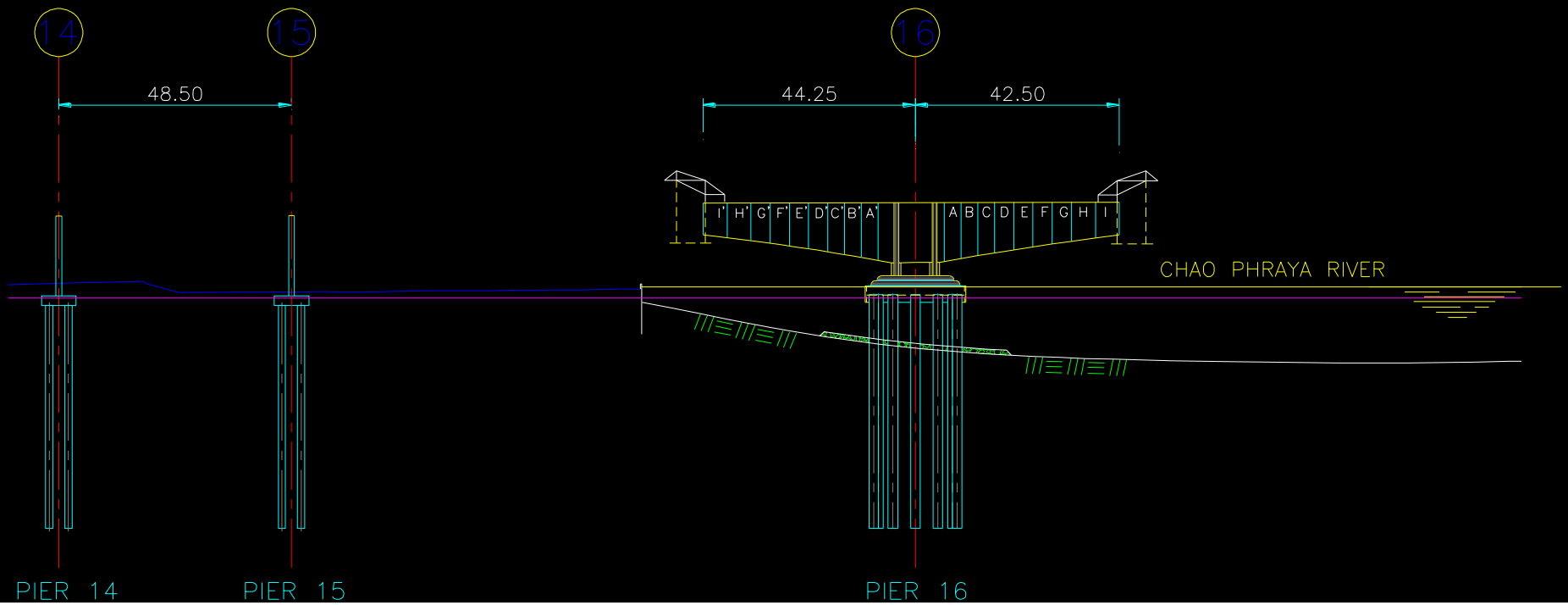
15.2 CASTING SEGMENT I'

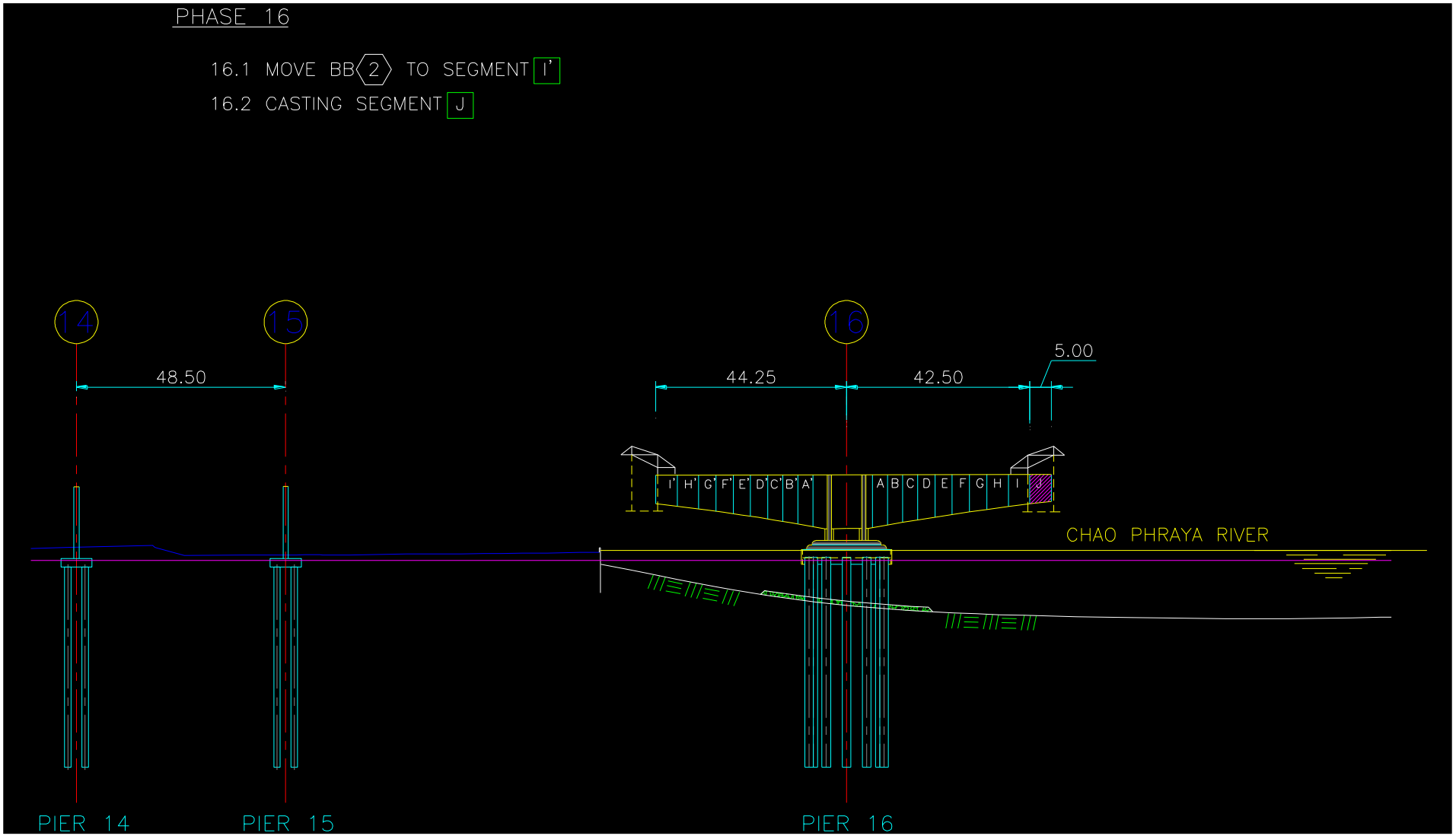
15.3 STRESSING TENDON (S11) AND (T11) , 3 TENDONS



PHASE 16

16.1 MOVE BB(2) TO SEGMENT I'



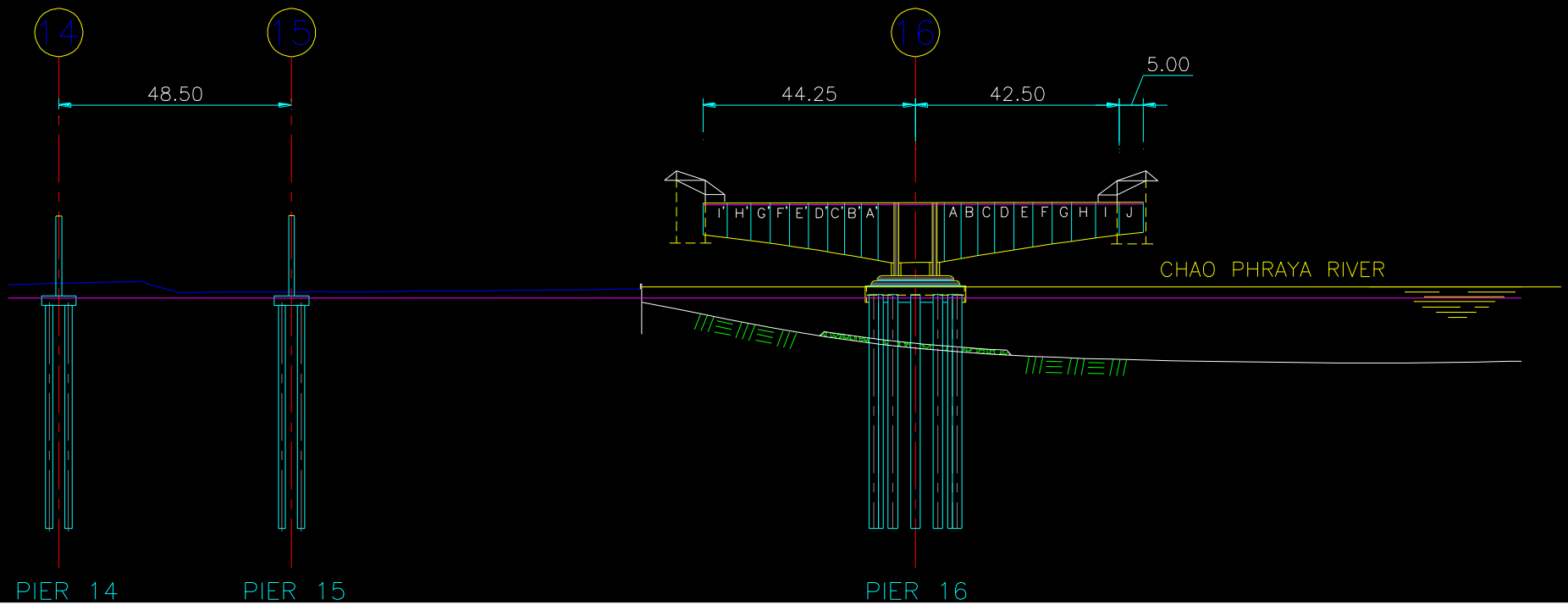

PHASE 16
16.1 MOVE BB 2 TO SEGMENT I'
16.2 CASTING SEGMENT J
14
15
16
48.50
44.25
42.50
5.00
I' H' G' F' E' D' C' B' A'
A B C D E F G H I J
CHAO PHRAYA RIVER
PIER 14
PIER 15
PIER 16

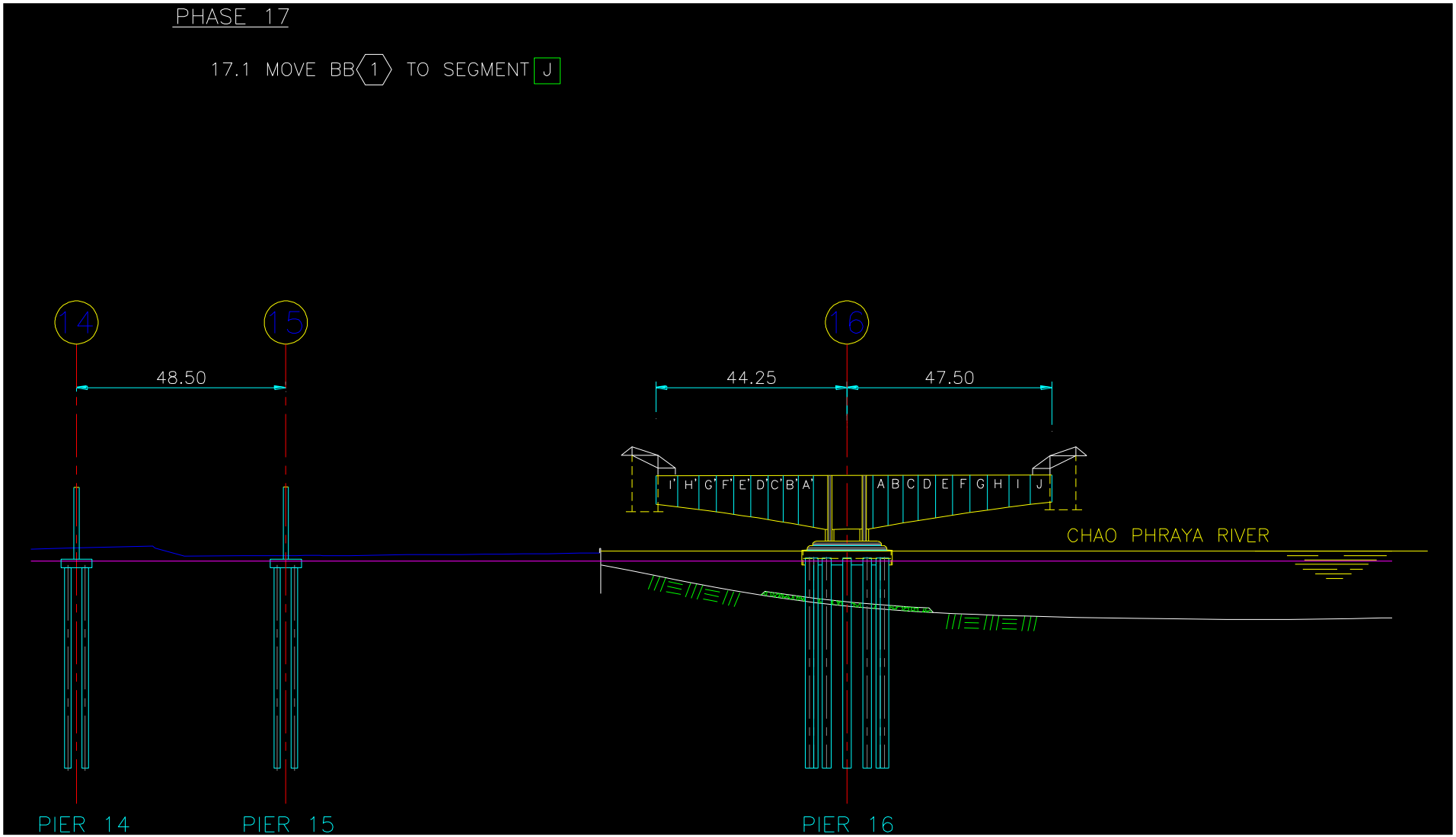
PHASE 16

16.1 MOVE BB(2) TO SEGMENT I'

16.2 CASTING SEGMENT J

16.3 STRESSING TENDON (S12) AND (T12) , 3 TENDONS

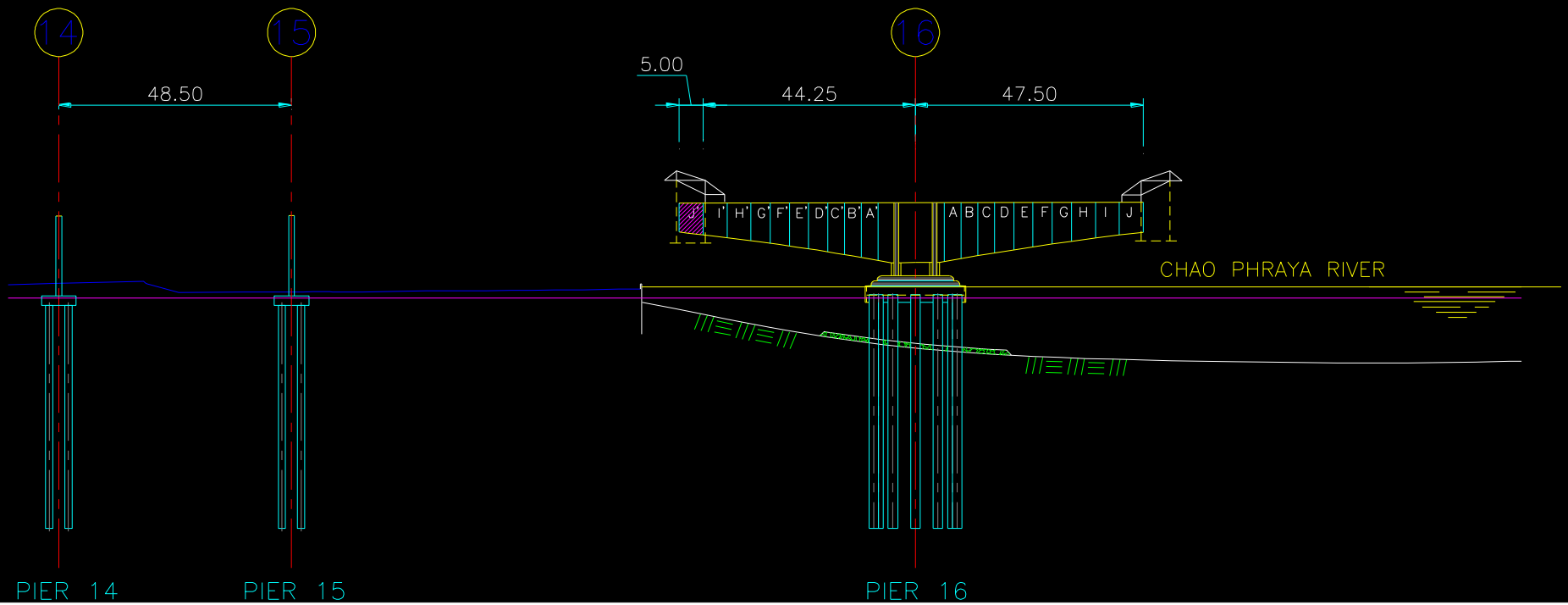



PHASE 17
17.1 MOVE BB 1 TO SEGMENT J
14
15
16
48.50
44.25
47.50
I' H' G' F' E' D' C' B' A'
A B C D E F G H I J
CHAO PHRAYA RIVER
PIER 14
PIER 15
PIER 16

PHASE 17

17.1 MOVE BB(1) TO SEGMENT J

17.2 CASTING SEGMENT J'

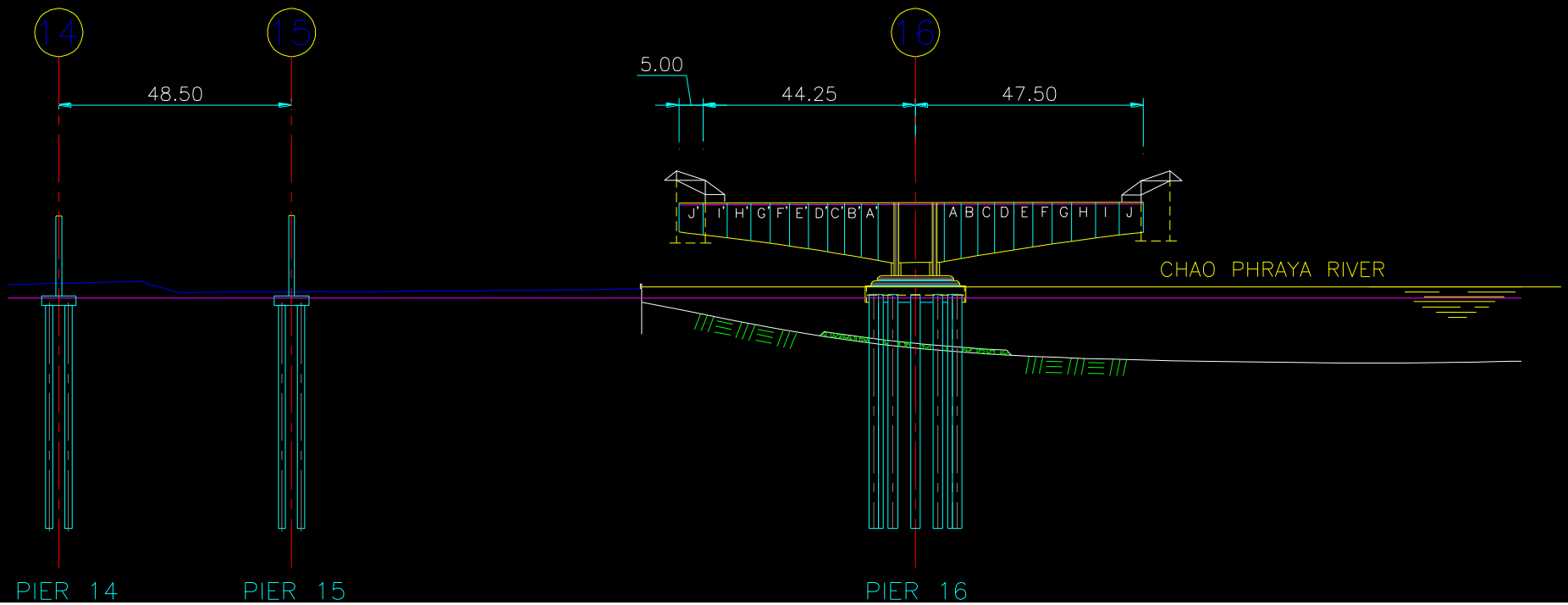


PHASE 17

17.1 MOVE BB(1) TO SEGMENT [J]

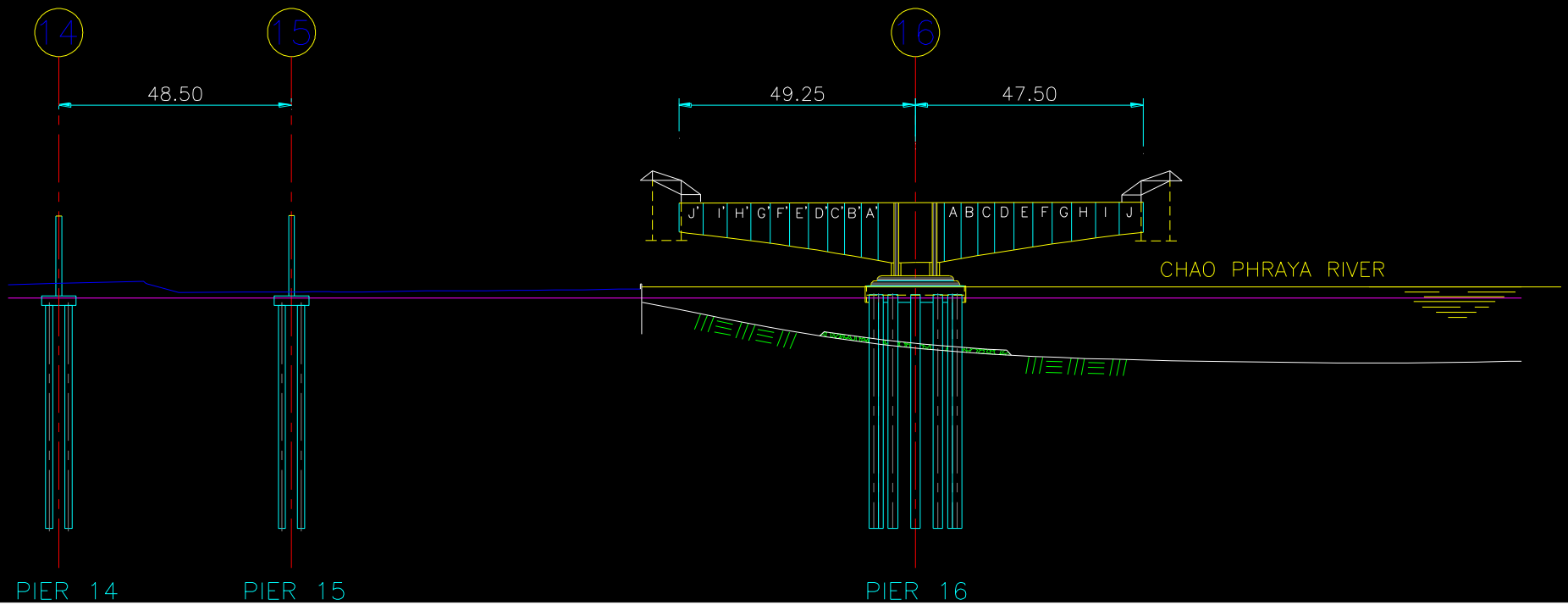
17.2 CASTING SEGMENT [J']

17.3 STRESSING TENDON (S13) AND (T13) , 3 TENDONS



PHASE 18

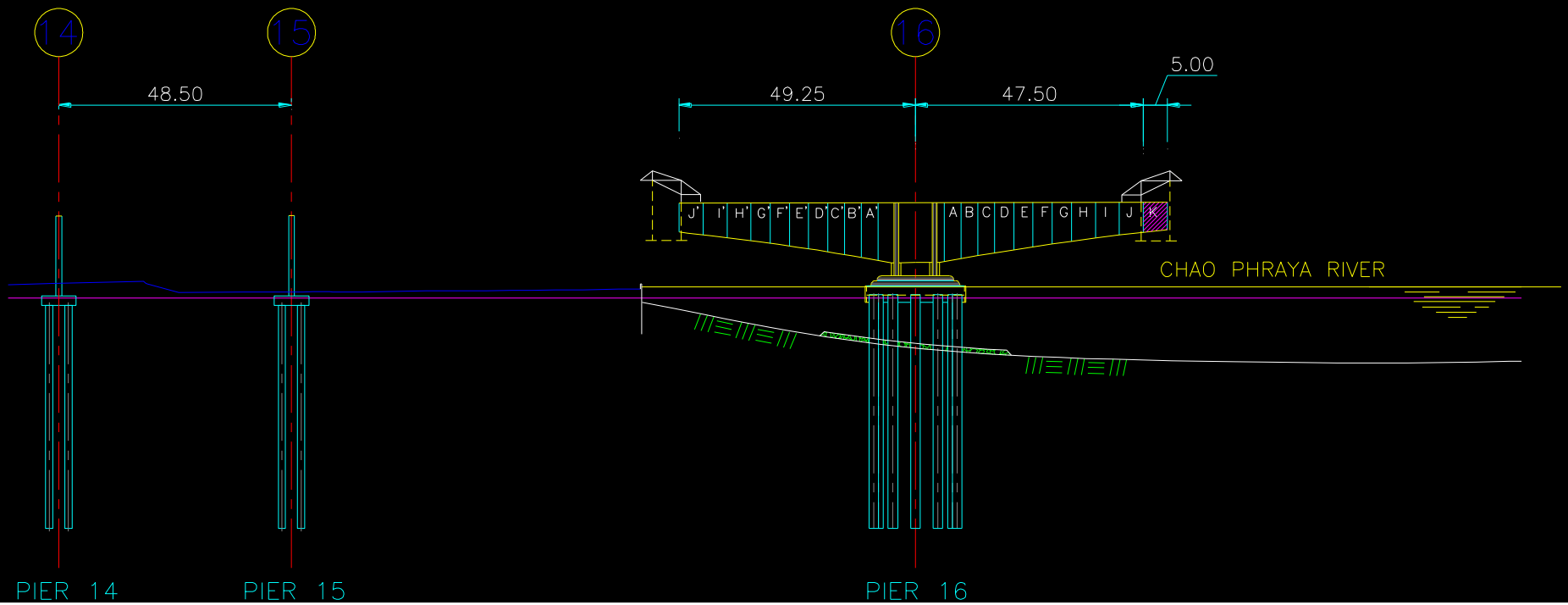
18.1 MOVE BB(2) TO SEGMENT J'



PHASE 18

18.1 MOVE BB(2) TO SEGMENT J'

18.2 CASTING SEGMENT K

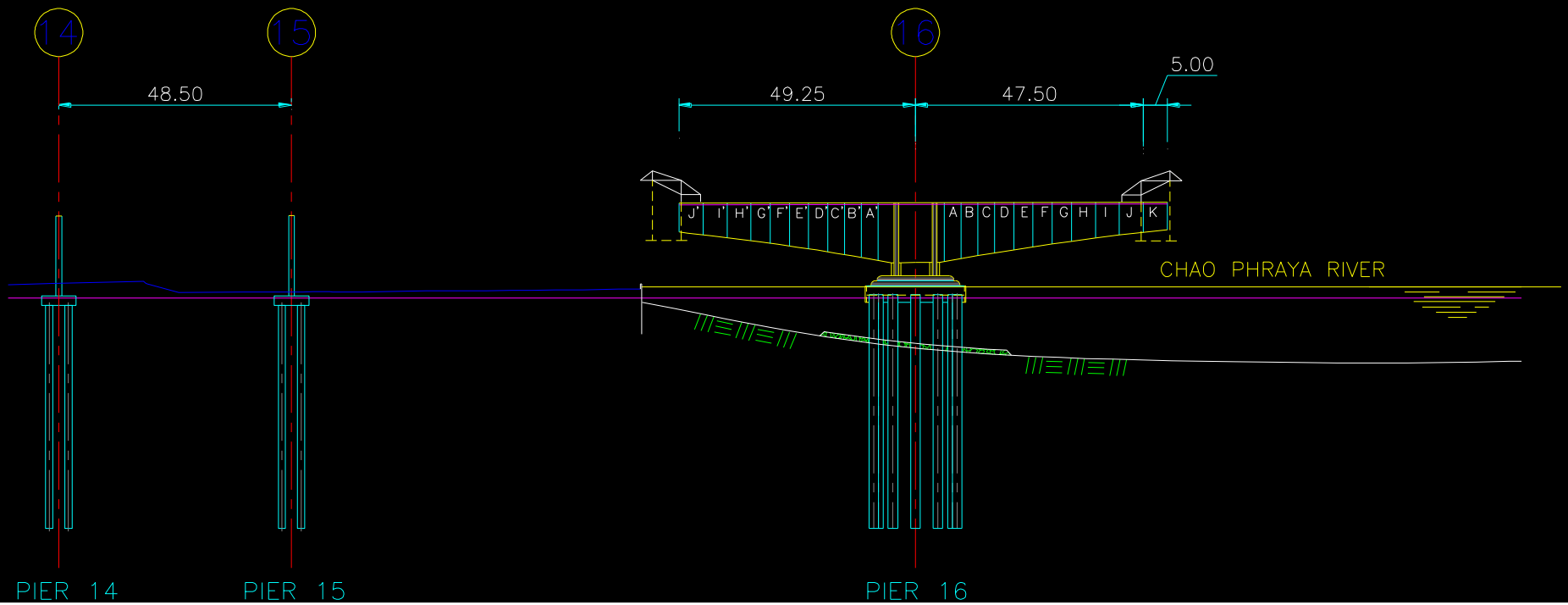


PHASE 18

18.1 MOVE BB(2) TO SEGMENT [J']

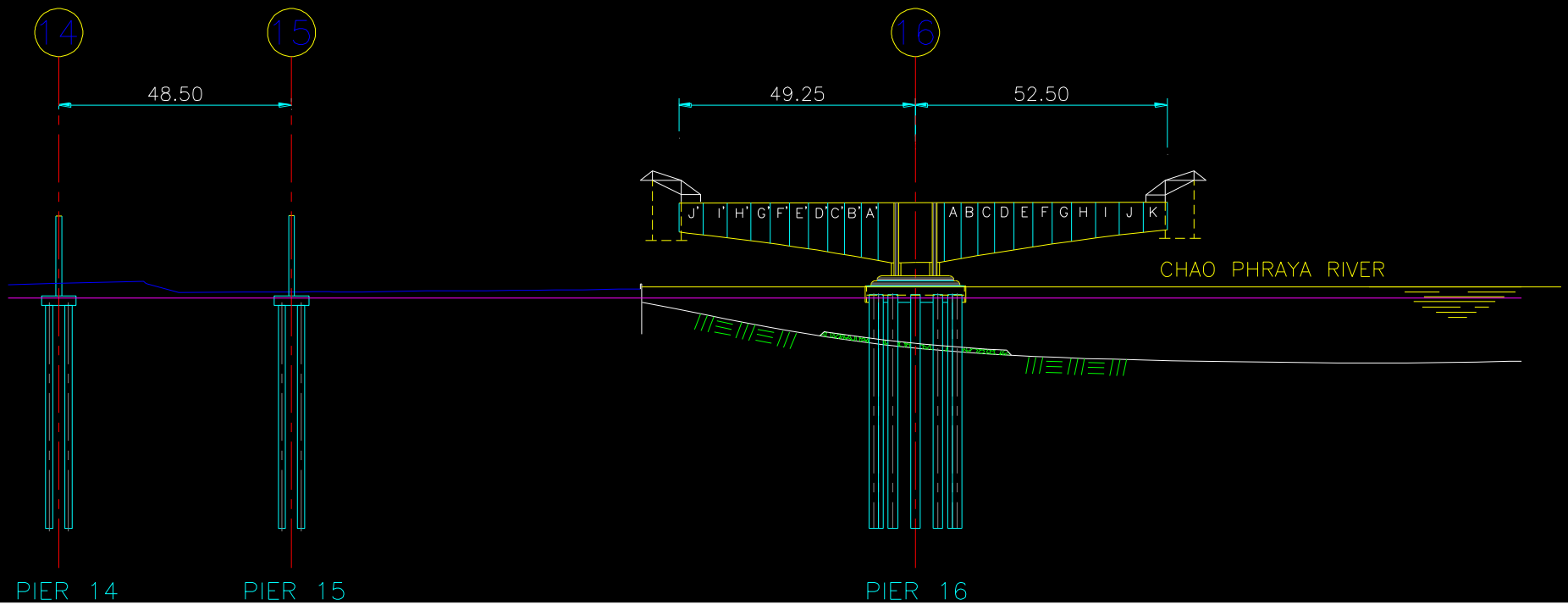
18.2 CASTING SEGMENT [K]

18.3 STRESSING TENDON (S14) AND (T14) , 3 TENDONS



PHASE 19

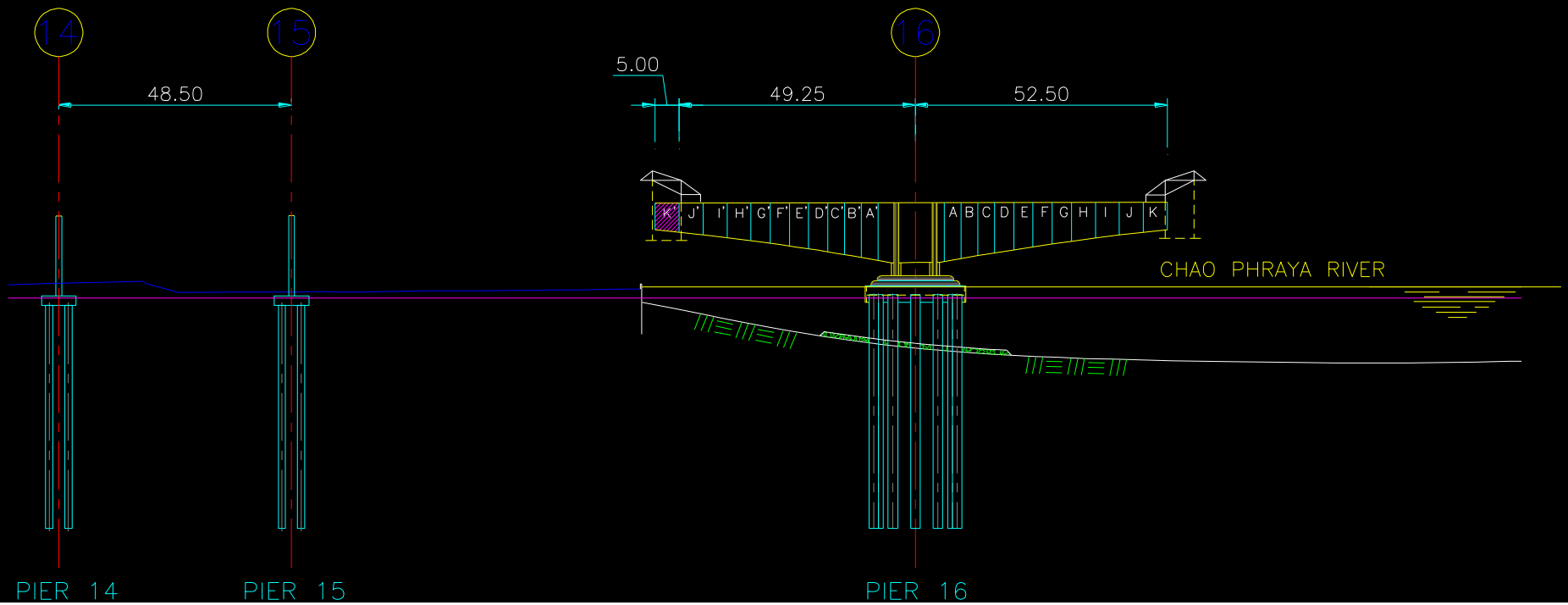
19.1 MOVE BB 1 TO SEGMENT K



PHASE 19

19.1 MOVE BB(1) TO SEGMENT K

19.2 CASTING SEGMENT K'

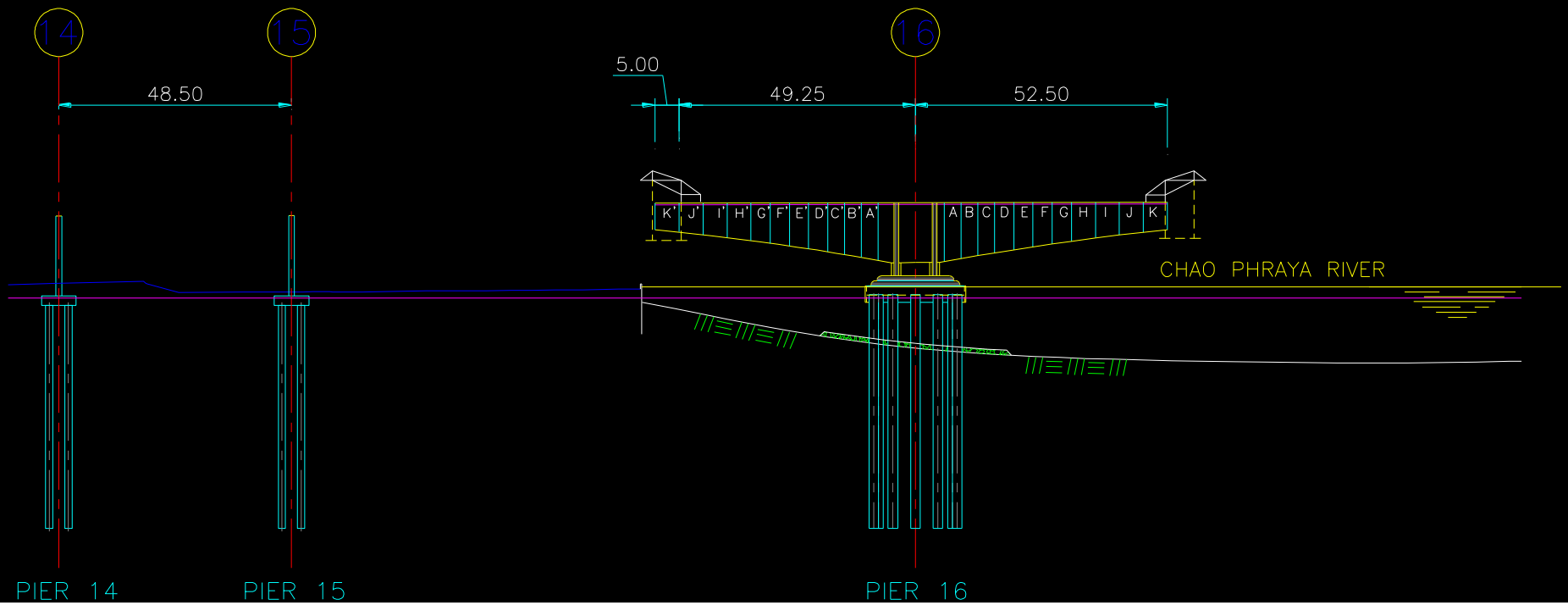


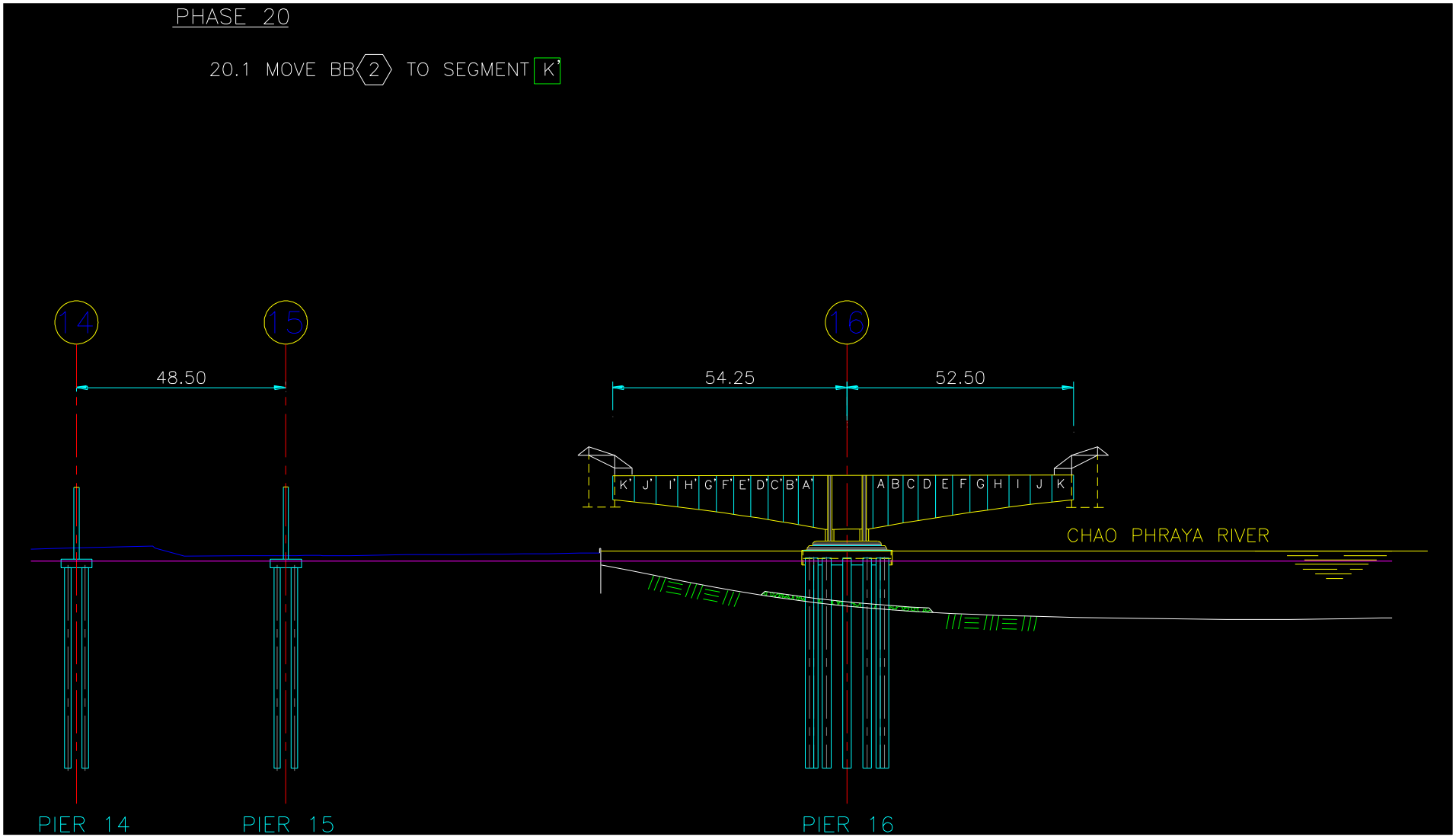
PHASE 19

19.1 MOVE BB(1) TO SEGMENT K

19.2 CASTING SEGMENT K'

19.3 STRESSING TENDON (S15) AND (T15) , 3 TENDONS




PHASE 20
20.1 MOVE BB 2 TO SEGMENT K'
14
15
16
48.50
54.25
52.50
K' J' I' H' G' F' E' D' C' B' A'
A B C D E F G H I J K
CHAO PHRAYA RIVER
PIER 14
PIER 15
PIER 16

Construction of Main Bridge Columns

Pier Head Segment : Bottom Formwork Installation

Pier Head Segment : Bottom Slab & Kicker (Stage 1)

Pier Head Segment : Web & Diaphragm (Stage 2)

Pier Head Segment : Web & Diaphragm (Stage 3)

Pier Head Segment : Web & Diaphragm (Stage 4)

Pier Head Segment : Web & Diaphragm (Stage 5)

Pier Head Segment : Top Slab (Stage 6)

Assembly of 1st Bridge Builder (Form Traveler) on Pier Head Segment

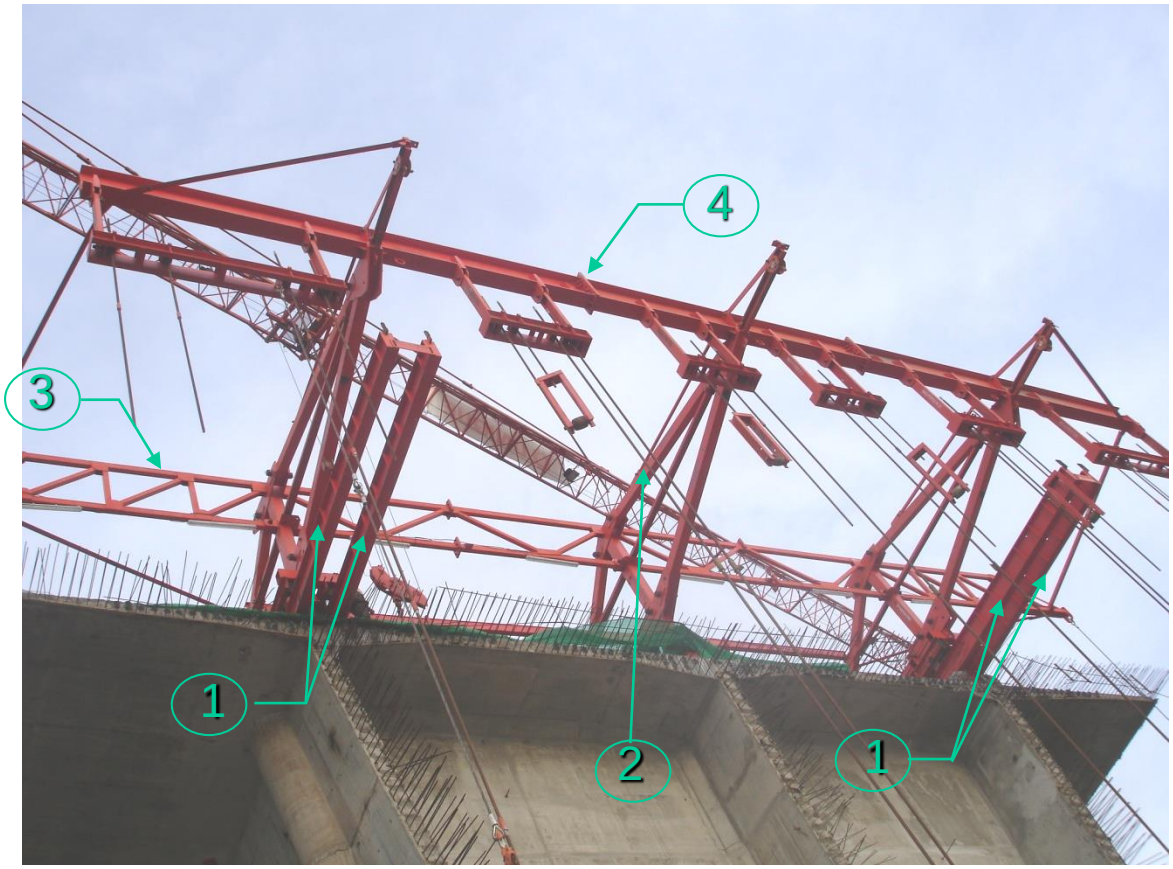
Formtraveller

- **The formtraveller is a comprehensive movable formwork system for balance cantilever Bridge construction.**

Main Components of the Form Traveller

Main Components of Formtraveller

1. Main Rail
2. Main Frame
3. Rear Frame
4. Front Beam
5. Internal Beam
6. Bottom Slab
7. Internal Deck Slab
8. External Deck Slab
9. External Web, Internal Web
10. Main Jack
11. Launching Cylinder
12. Pull Down Cylinder
13. Formtraveller Tie Down System
14. Main Rail Tie Down System
15. Hanging Bar System



Main Components of the Formtraveller

Main Components of Formtraveller

1. Main Rail
2. Main Frame,
3. Rear Frame
4. Front Beam
5. Internal Beam
6. Bottom Slab
7. Internal Deck Slab
8. External Deck Slab
9. External Web, Internal Web
10. Main Jack
11. Launching Cylinder
12. Pull Down Cylinder
13. Formtraveller Tie Down System
14. Main Rail Tie Down System
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Main Components of the Formtraveller

Main Components of Formtraveller

1. Main Rail
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3. Rear Frame
4. Front Beam
5. Internal Beam
6. Bottom Slab
7. Internal Deck Slab
8. External Deck Slab
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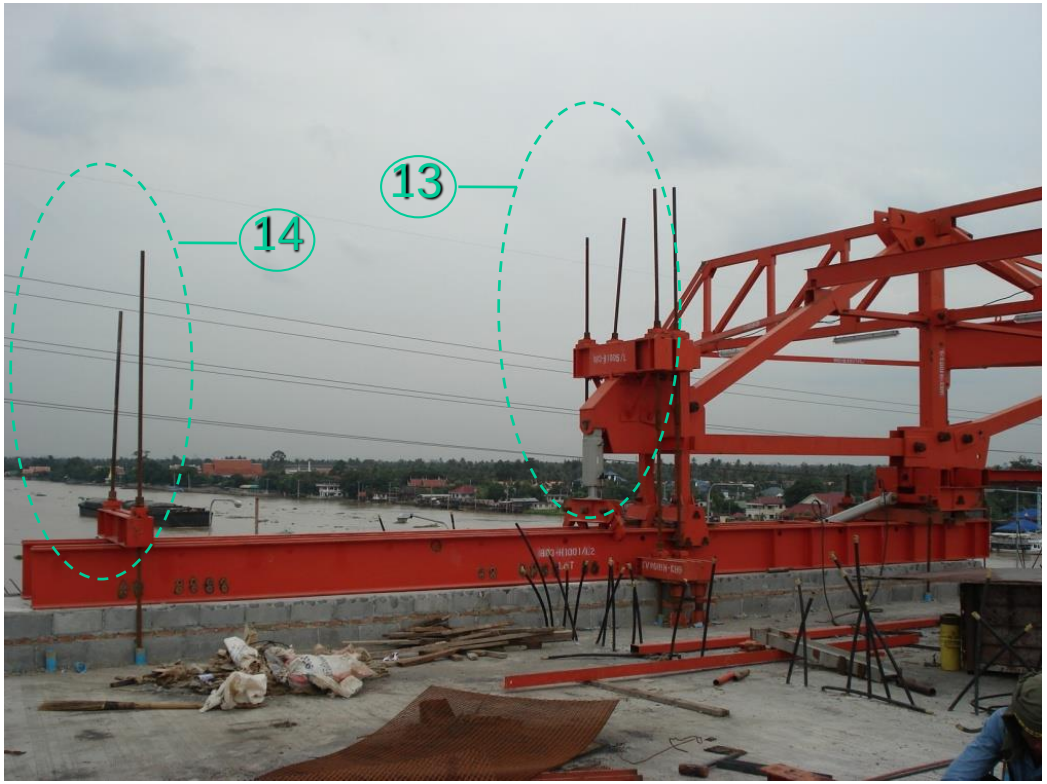
10. Main Jack
11. Launching Cylinder
12. Pull Down Cylinder
13. Formtraveller Tie Down System
14. Main Rail Tie Down System
15. Hanging Bar System

Main Components of the Formtraveller

Main Components of Formtraveller

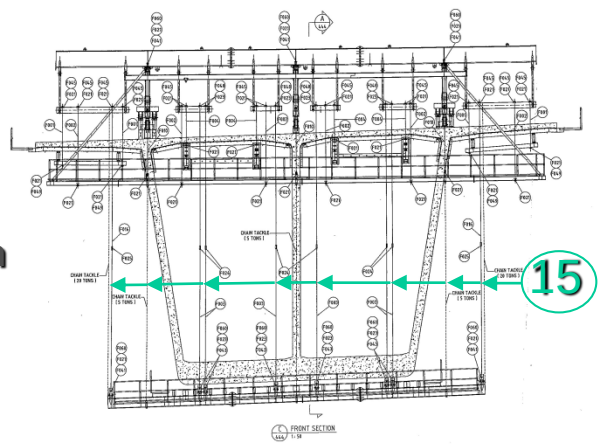
1. Main Rail
2. Main Frame,
3. Rear Frame
4. Front Beam
5. Internal Beam
6. Bottom Slab
7. Internal Deck Slab
8. External Deck Slab
9. External Web, Internal Web
10. Main Jack
11. Launching Cylinder
12. Pull Down Cylinder
13. Formtraveller Tie Down System
14. Main Rail Tie Down System
15. Hanging Bar System

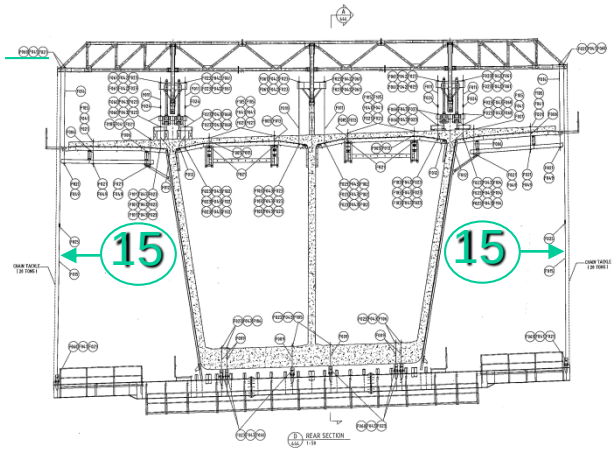


Main Components of the Formtraveller

Main Components of Formtraveller

1. Main Rail
2. Main Frame,
3. Rear Frame
4. Front Beam
5. Internal Beam
6. Bottom Slab
7. Internal Deck Slab
8. External Deck Slab
9. External Web, Internal Web
10. Main Jack
11. Launching Cylinder
12. Pull Down Cylinder
13. Formtraveller Tie Down System
14. Main Rail Tie Down System
15. Hanging Bar System



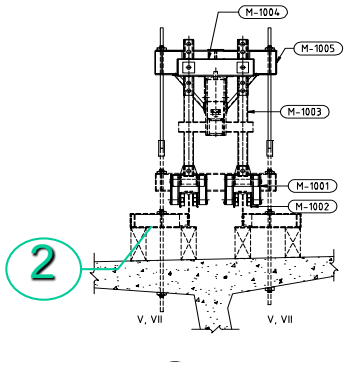


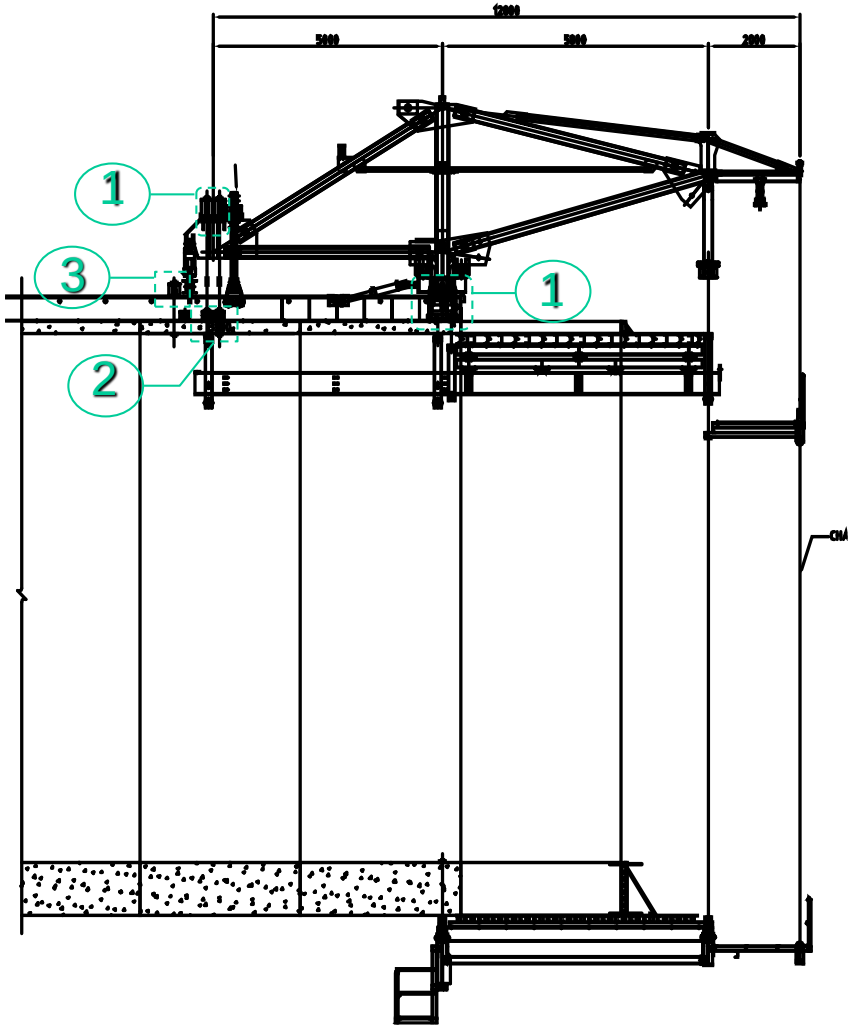
Operation of Formtraveller

Step 1. **Ensure Formtraveller supported on main Jack** and rear tie down system and express roller are free from Main Rail.

Step 2. Remove lower tie down of Main Rail

Step 3. Loosened upper tie down of Main Rail



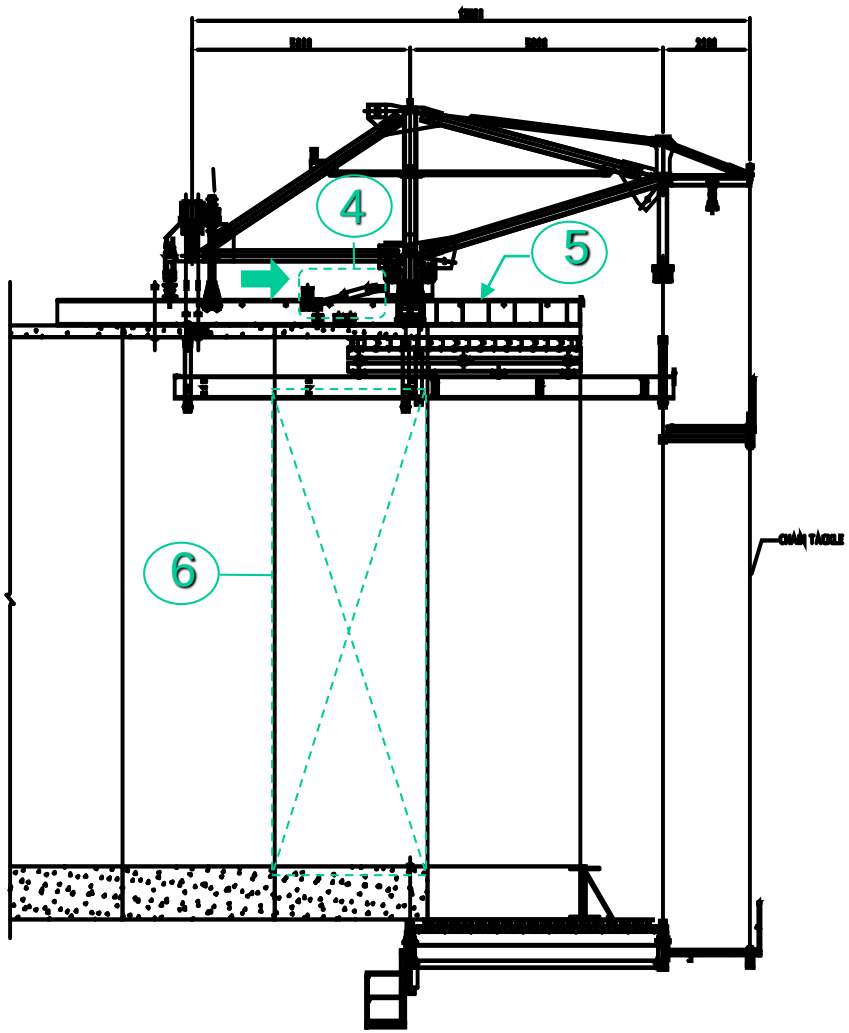


Operation of Formtraveller

Step 4. **Move Main Rail forward** by Launching Cylinder up to the CJ of the finished construction.

Step 5. Levelled the Main Rail and secure it with upper tie down at rear.

Step 6. Remove all the horizontal tie bars between webs.



Launching of Formtraveller

Step 7. Remove rear thread bars at bottom slab.

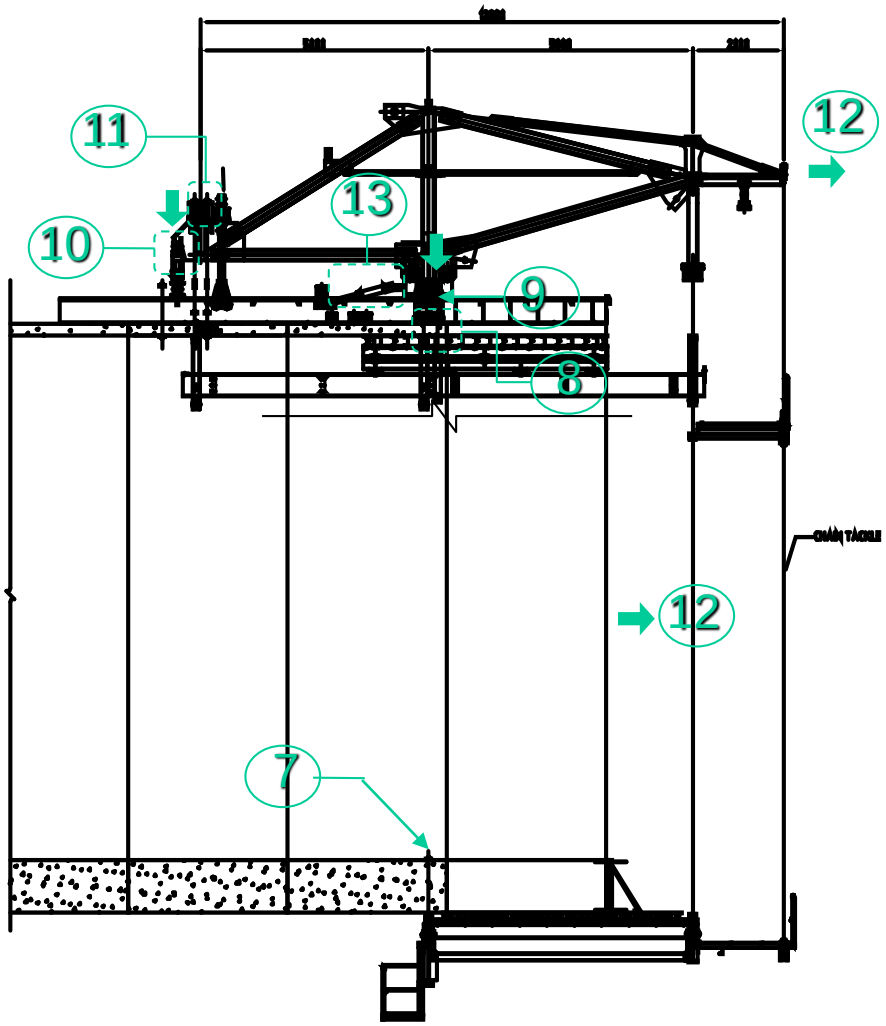
Step 8. Remove rear thread bars of top slab formwork

Step 9. Lower Formtraveller on to the Main Rail at front Bogie

Step 10. Lower the Pull Down Cylinder and clamped to Main Rail

Step 11. Remove Rear Tie down System of Formtraveller and activate Rear Bogie.

Step 12. Use Launching Cylinder to launch Formtraveller and external formwork system



Operation of Formtraveller

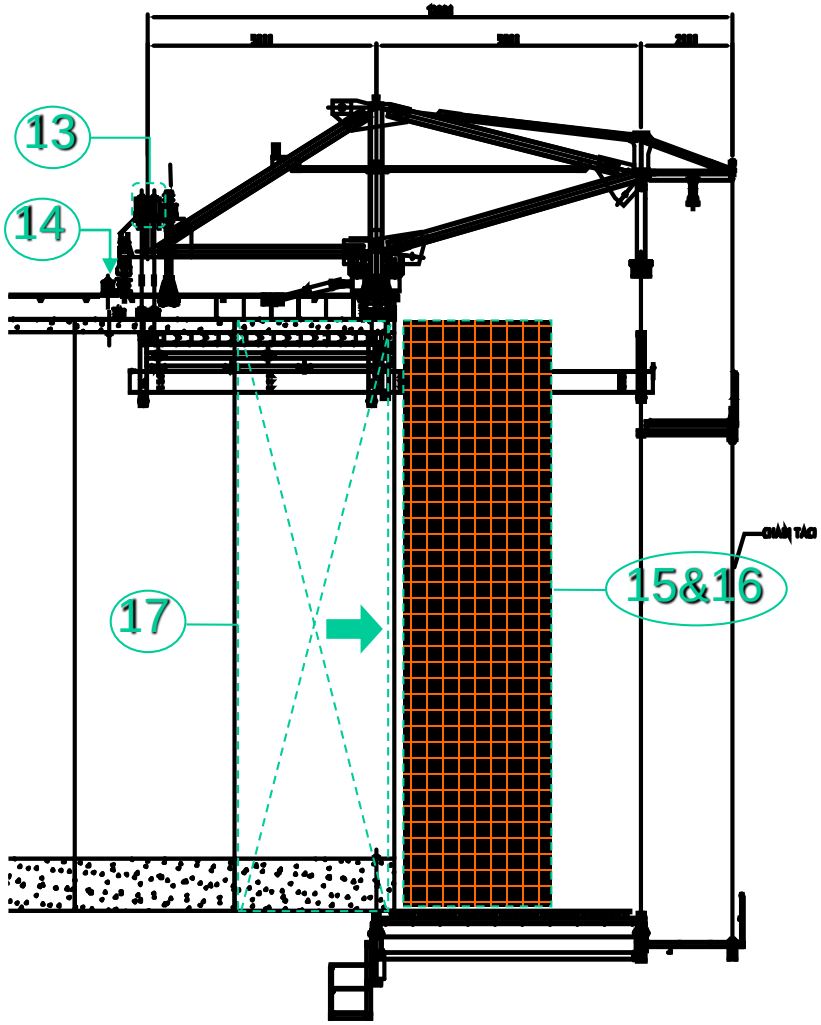
Step 13. Setup and fixed lower tie down for Main Rail and rear tie down system for Formtraveller with Thread Bar Dia. 36 mm.

Step 14. Release the thread bars of Main Rail Held down and shift forward to set behind the pull down cylinder

Step 15. **Setup External Formwork system**

Step 16. **Install Reinforcement for bottom slab and webs**.

Step 17. **Move forward internal formwork** and install tie bars for the webs.



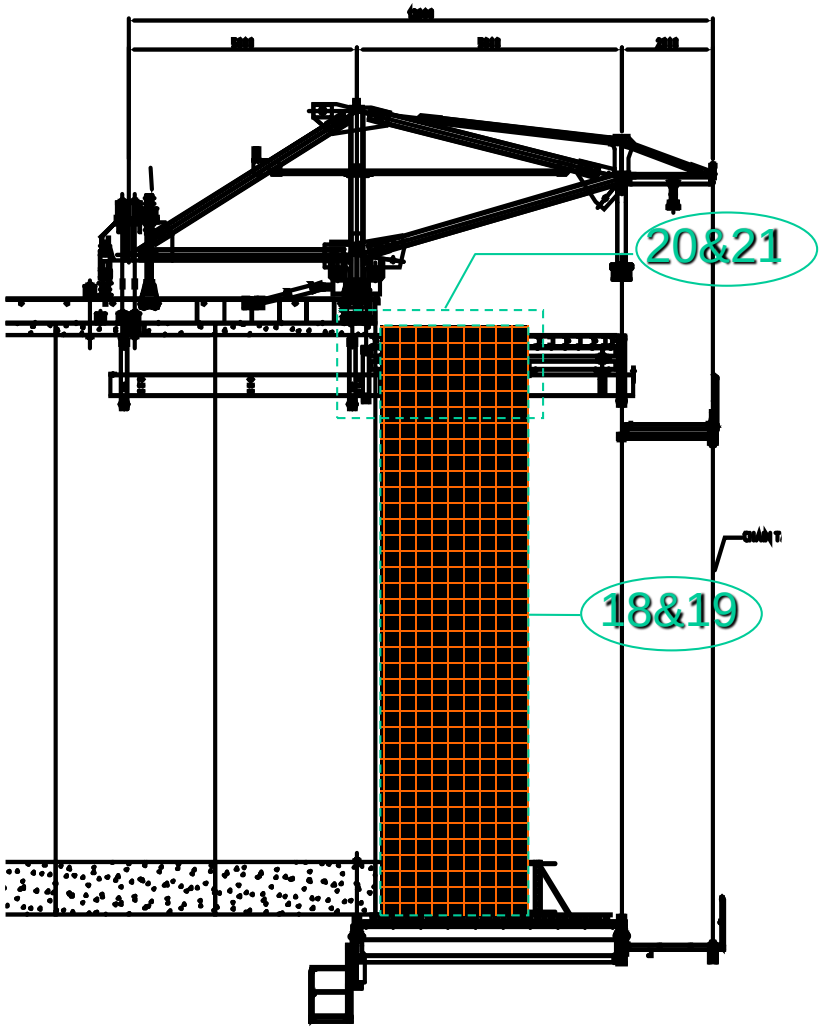
Operation of Formtraveller

Step 18. **Install top slab reinforcement**

Step 19. Final check for concreting

Step 20. Pouring concrete.

Step 21. Post tensioning after the concrete reach required strength.



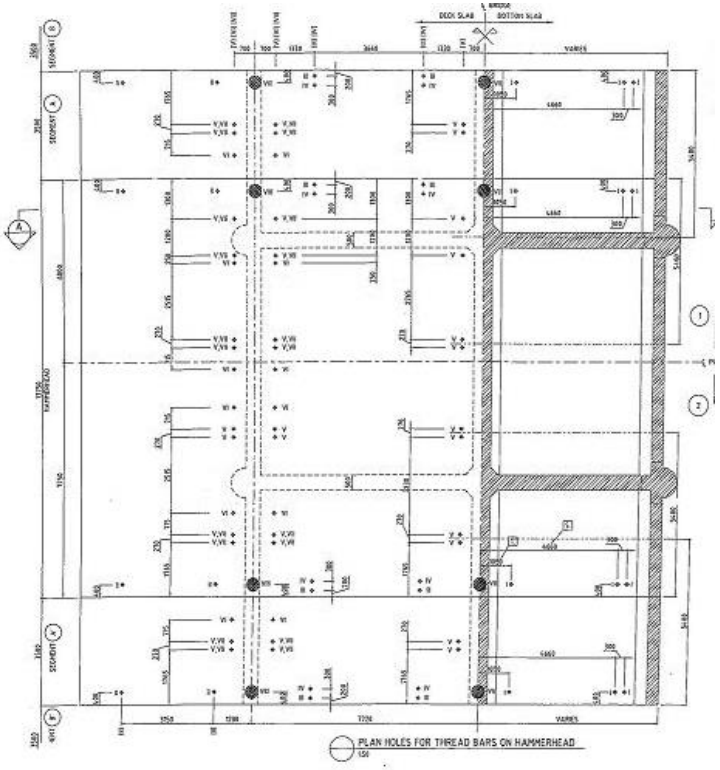
Block- out at the Bridge

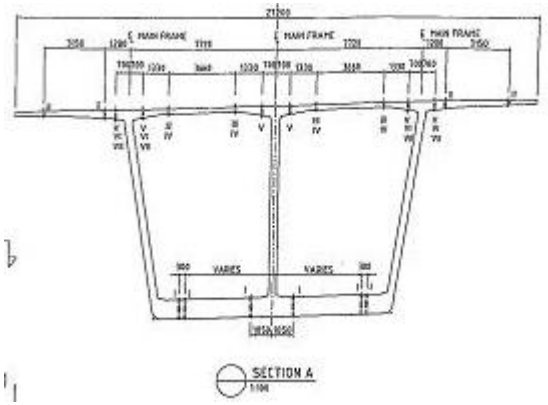
Block-out Holes for Formtraveller System

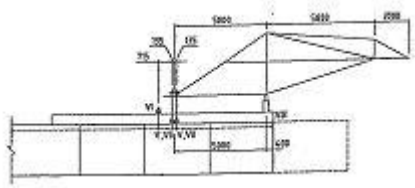
- **Location of each holes at every segments to be concreted are specifically provided for fixing bridge builder system.**

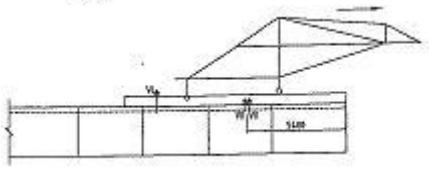
Designated Holes are used as follows:

Hole No. I - Fixing Bottom Slab during Concreting
Hole No. II - Fixing Ext. Formwork during Concreting
Hole No. III - Fixing Int. Formwork during Concreting
Hole No. IV - Fixing Int. Formwork during moving
Hole No. V - Fixing Rear Tie Down System
Hole No. VI - Fixing of Main Rail , Upper
Hole No. VII - Fixing of Main Rail , Lower









Form Traveler

Assembly of 1st Bridge Builder (Form Traveler) on Pier Head Segment

Assembly of 1st Bridge Builder (Form Traveler) on Pier Head Segment

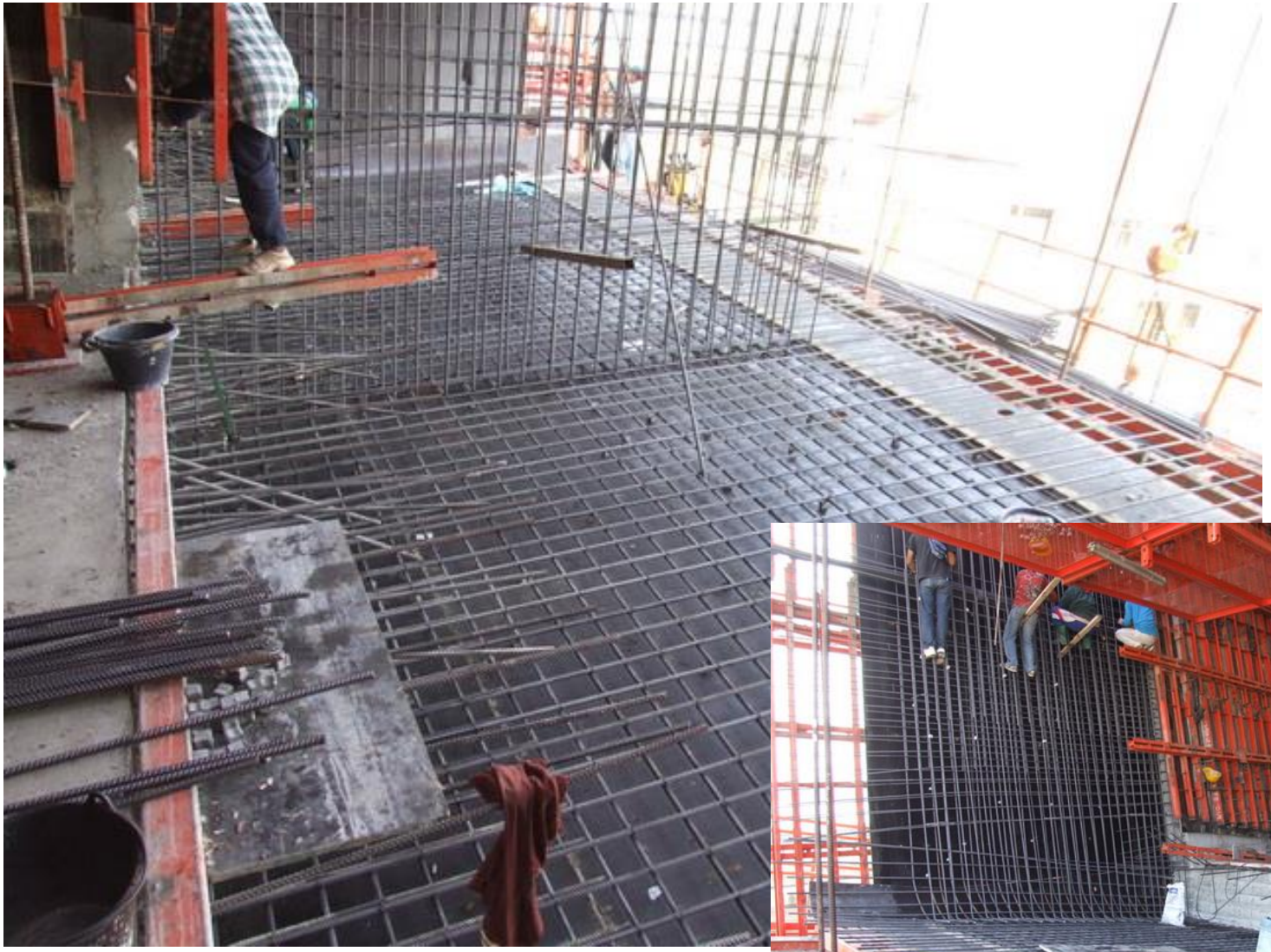
Assembly of Form Traveler (Bridge Builder)

Construction Cycle

Launching Bridge Builder (Form Traveler) to New Segment

Set up Outer Web Formwork

Set up Outer Deck Formwork



Placing Bottom Slab Rebar and Web Rebar

Move and Set up Inner Formwork

Placing Top Slab Rebar and Prestressing Tendon

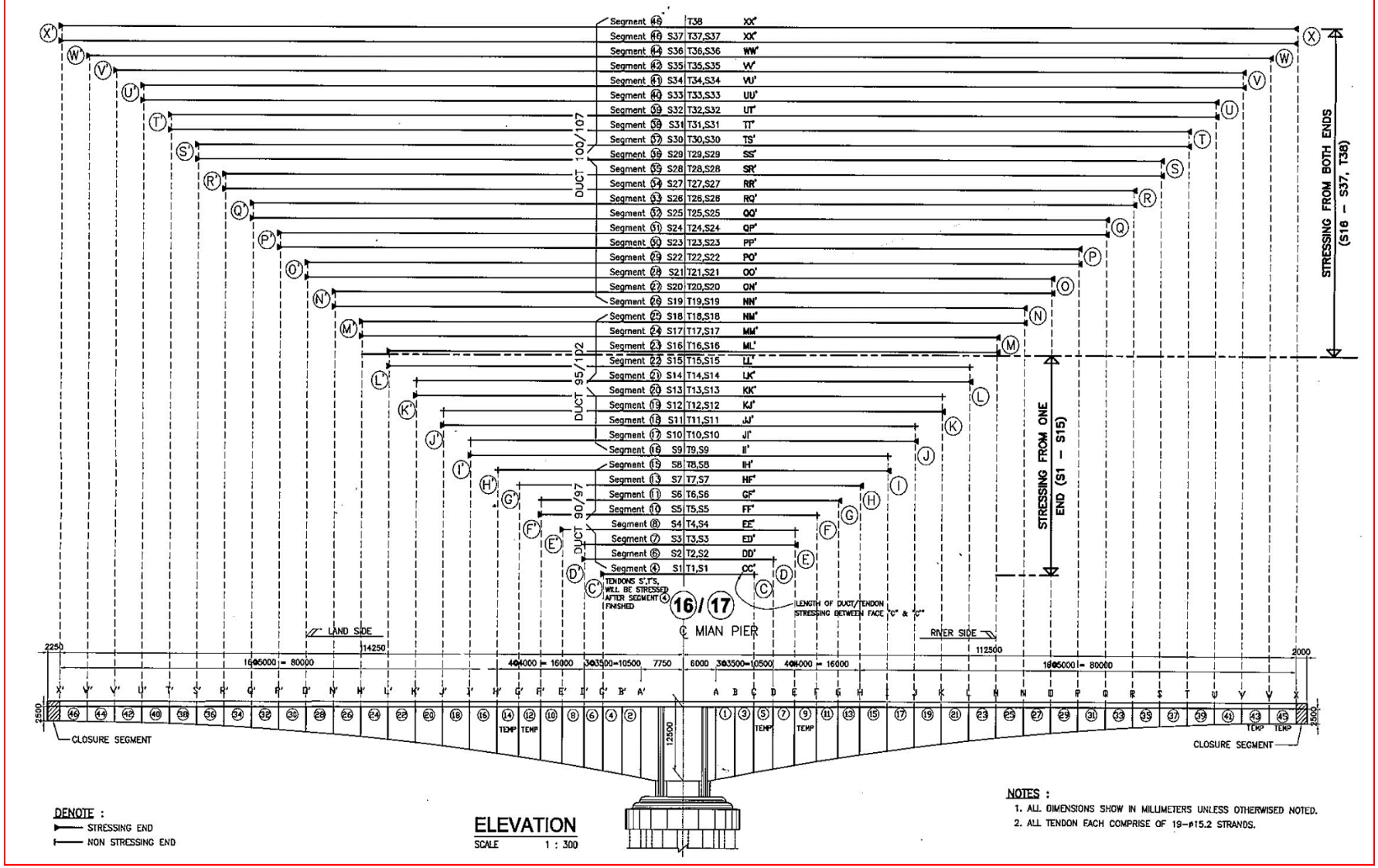
Casting Main Bridge Segment (Bottom Slab)

Casting Main Bridge Segment (Web)

Casting Main Bridge Segment (Top Slab)

Stressing Transverse Prestressing Tendon

Stressing Longitudinal Prestressing Tendon


MAIN BRIDGE POST TENSIONING SEQUENCE
DUCT 100/107
DUCT 95/102
DUCT 90/97
STRESSING FROM BOTH ENDS (S16 – S37, T38)
STRESSING FROM ONE END (S1 – S15)
TENDONS S',T'S, WILL BE STRESSED AFTER SEGMENT 4 FINISHED
LENGTH OF DUCT/TENDON STRESSING BETWEEN FACE 'C' & 'C'
16/17
℄ MIAN PIER
LAND SIDE
RIVER SIDE
CLOSURE SEGMENT
CLOSURE SEGMENT
TEMP
DENOTE :
STRESSING END
NON STRESSING END
ELEVATION
SCALE 1 : 300
NOTES :
1. ALL DIMENSIONS SHOW IN MILLIMETERS UNLESS OTHERWISED NOTED.
2. ALL TENDON EACH COMPRISE OF 19–ϕ15.2 STRANDS.

46 segments

Cast Segment A & A’

Cast Segment B & B’


UNIQUE
กรมทางหลวง
UNIQUE

New Pranangklow Bridge

New Pranangklow Bridge

Bored Pile Construction
Dia. 2.00 m. and 1.50m.

Construction of Bored Pile

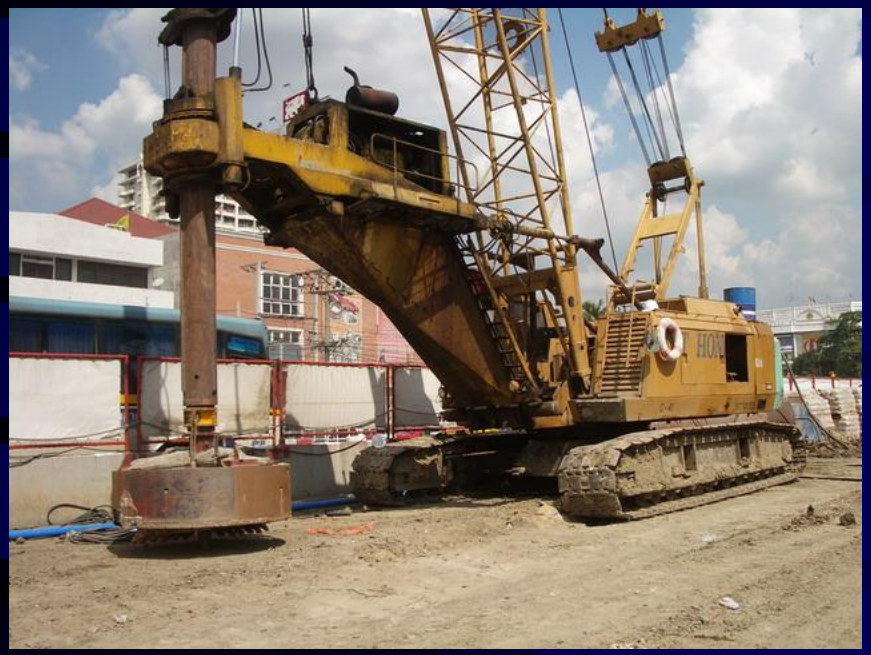
- Setting out Pile Location
- Install Temporary Casing
- Drilling the Hole
- Cleaning and Drilling Monitoring
- Rebar Cage Installation
- Install Tremie Pipe and Casting Concrete
- Sonic Logging Test
- Toe Grout

River Pile

Land Pile

Casing Installation

Checking of Casing Position during Driving



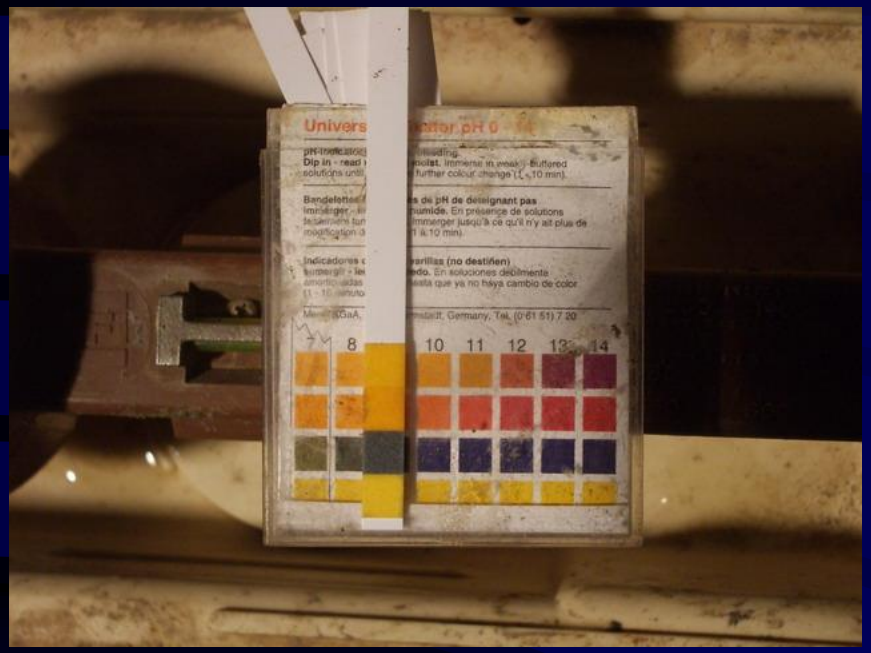
Bucket and Drilling Equpment

During Drilling

Density < 1.10g/ml during drilling
1.05g/ml before concreting

Viscosity > 40sec. after mixing
37sec. during drilling
37sec. before concreting

Testing of Drill Hole Slurry : Polymer-based Slurry



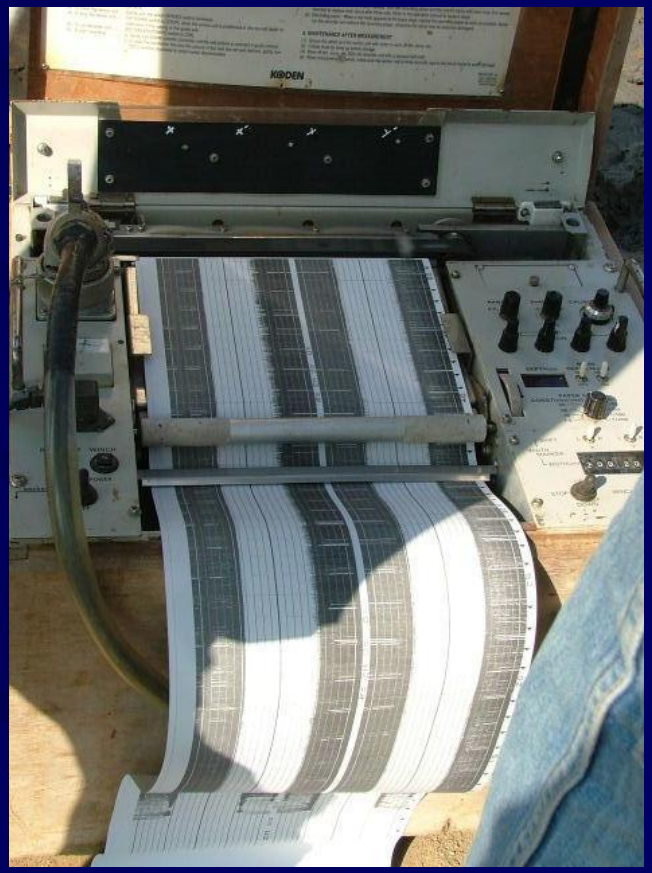
pH < 9 - 10 during drilling

9 - 10 before concreting

Sand content < 5% before concreting

Testing of Drill Hole Slurry : Polymer-based Slurry

Drilling Monitor Equipment



Test Results

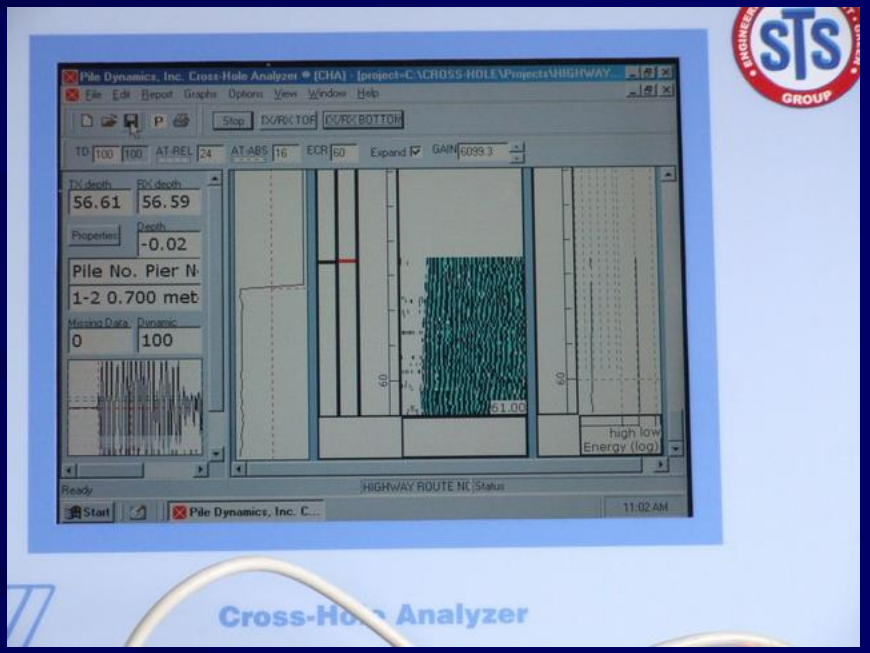
Drilling Monitoring of Bored Hole

Installation of Rebar Cage

Tremie Pipe Installation

During Casting

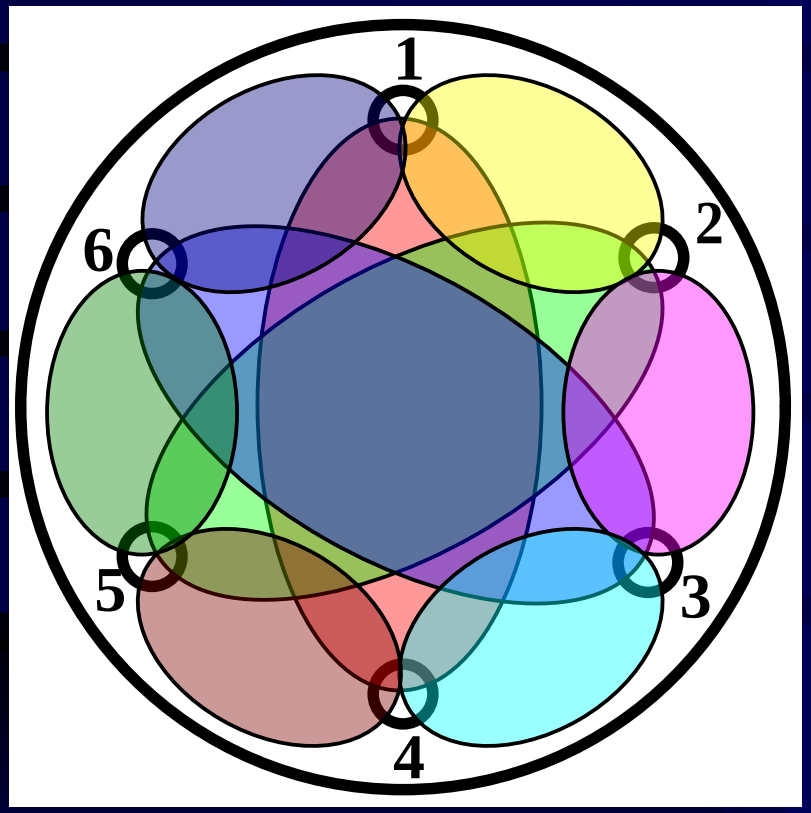
Concreting of Bored Pile



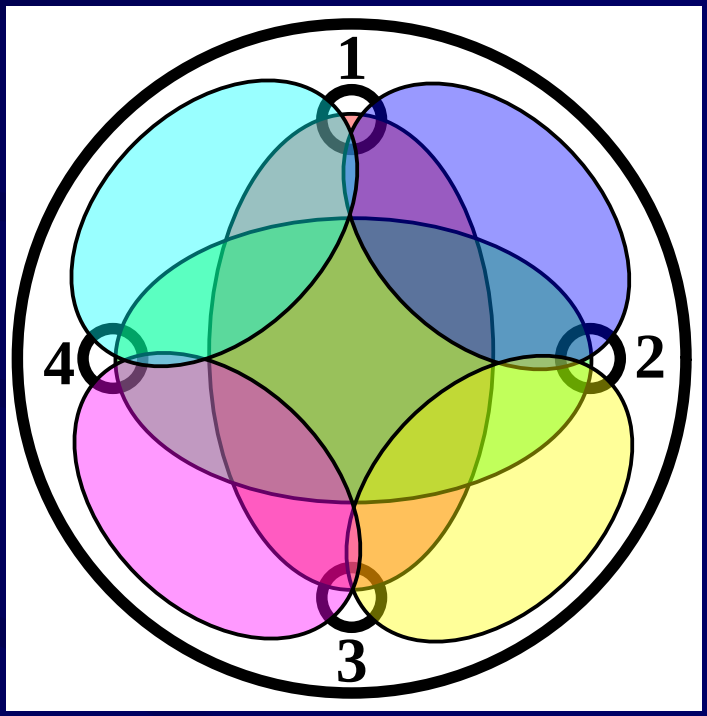
During Testing

Test Results

Pile Integrity Test of Concrete Pile



ϕ 2.00 ม.



ϕ 1.50 ม.

Graphic Patterns of Pile Integrity Test

Coring Equipment

During Grout (60 bars for 5 min.)

Compaction Grouting at Pile Toe

Hydraulic Jacks for Pile Load Test **Setting of Pile Load Test Instruments**

Test Load : 4,000 ton (Dia. 2.00 m.)

2,600 ton (Dia. 1.50 m.)

Static Load Test of Bored Pile

Construction of Approach Viaduct

Pile Cap Construction

Lean Concrete

Rebar

Pile Cap Construction

Concrete of Pile Cap and Column Starter Bar

Cross Beam Construction

Column Rebar

Concreting by Bucket

Cross Beam Construction

Temporary Falsework

Rebar

Cross Beam Construction

Main Tendons

Transverse Tendon in Top Slab

Cross Beam Construction

Stressing of Main Tendons

Stressing of Transverse Tendons

Cross Beam Construction

Finished Cross Beam

Cross Beam Construction

Cement Grouting Mixer

Flow Test

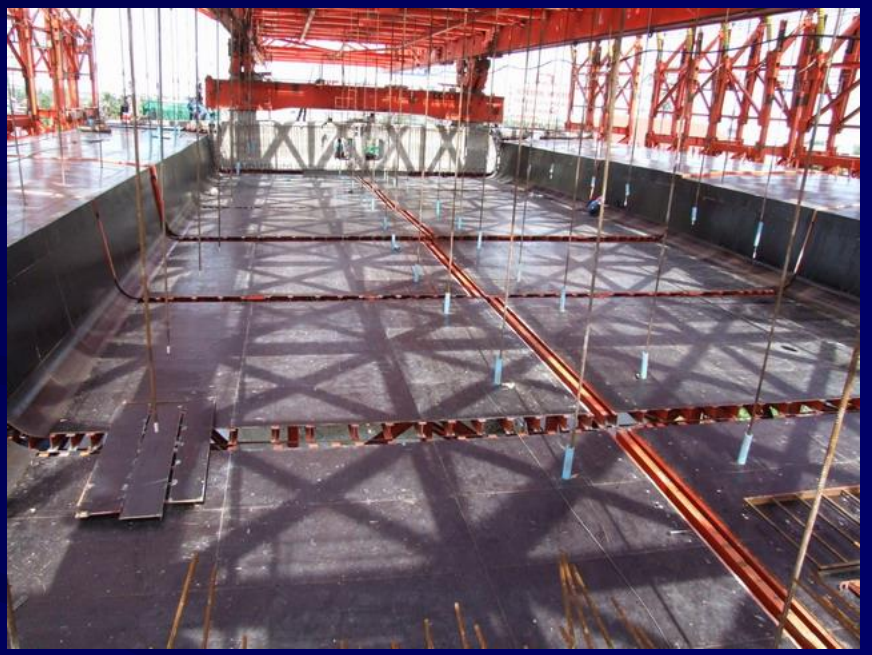
Superstructure Construction

False works

Bottom and Side Formworks

Span by Span on Stationary Shoring System

Superstructure Construction



Movable Scaffolding System

Bottom and Side Formworks

Span by Span on Movable Scaffolding System (MSS)

Superstructure Construction

Rebar and Post-Tension Ducts

Inner Formworks

Superstructure Construction

Stationary Shoring System

Movable Scaffolding System

Concrete Casting Method

Superstructure Construction

Bottom Formwork for Top Slab

Rebar and Transverse Tendon

Superstructure Construction

Top Slab

Curing Method

Superstructure Construction

Stressing of Tendons in Top Slab

Stressing of Longitudinal Tendons

Superstructure Construction

Cement Grouting Mixer

Grouting in Longitudinal Tendon

Thank you