Registration No.0107537000939

ITALIAN-THAI DEVELOPMENT PUBLIC COMPANY LIMITED

Dhaka Mass Rapid Transit Development Project Contract No. CP-03 & CP-04

14, Purana Paltan (3rd Floor), Darus Salam Arcade Dhaka, Bangladesh

Date: 8 May 2018

Ref No. : ITD/CP03-04/MS/ST 0022 Rev 04

The Engineer
NKDM Association
Employer's & Engineer's Office, Begum Rokeya Sarani,
Agargaon, Sher-e-Bangla Nagar, Dhaka-1207

For the Attention of: Mr. Hideo OMORI, Team Leader

Subject: **Re-submission of the Method Statement for the Sub-Structure Pier.**

Dear Sir,

We acknowledge receipt of your letter reference no.: NKDM-CP03/CP04-CON-2018/0757 dated 30th April 2018. We have noted your comments and have made the revision.

Please find attached resubmission of our Method Statement. It is referenced no. ITD/CP03&04/MS/ST 0022 Rev 04 dated 06th May 2018.

If you require any further information please contact the undersigned.

Yours faithfully,
For and on behalf of
Italian-Thai Development Public Company Limited

Thawit Yuenyong
Project Manager

Encl.:
1) ITD/CP03-04/MS/ST 0022 Rev 04 1 Set

CC.:
1) Mr. Md. Sarwar Uddin Khan, Deputy General Manager (TP), The Employer (DMTC)

PJ/CKW/NAKHARIN

CONSULTANCY SERVICE FOR DESIGN, CONSTRUCTION SUPERVISION, PROCUREMENT SUPPORT AND MANAGEMENT
DHAKA MASS RAPID TRANSIT DEVELOPMENT PROJECT LINE-6
NKDM ASSOCIATION (Nippon Koei-NK India-DMRC-MOTT UK- MOTT India-DDC)
Contract Packages 03 and 04 from Uttara Depot to Agargaon Station

ENGINEER'S APPROVAL / COMMENT

Our Reference No. :	NKDM-CP03/CP04-CON-2018/0757
Our Previous Reference No. :	NKDM-CP03/CP04-CON-2018/0413
Contractor's Reference No. :	ITD CP03-04 MS ST 0022 Rev.03 dated 5 April 2018
Contract Ref. Volume/Title/Page/Clause :	
Description of Request for Approval :	**Reply to - Re-submission of the Method Statement of the Sub-structure Pier - column and head**

To the Contractor :	**From the Engineer :**
Italian-Thai Development Public Company Limited	NKDM Association

The Engineer's Response to the above REQUEST FOR APPROVAL (RFA) is follows;

1. Approved / Notice of No Objection	
2. Approved with Comments as below / Notice of No Objection with Comments (With "B" and/or "C" Comments)	√
3. No Objection / No Comment	
4. Rejected with Comments as below and Resubmit / Notice of Objection (With "A" Comments)	

Engineer's Comments :

Comment number	MS / Doc Reference	Comments	Comment type
1		based on the construction practice you followed at site (P22 / P23) and the monolithic casting of column and head following are our comments - ~ section 5.2 - rebar installation - add pier head rebar must be fabricated within jig ~ section 5.5 - please mention the length of the internal vibrators. also we have notice that you are not using frequency convertors to achieve the desired frequency. please include the use of frequency convertors. further please clarify the manufacturer's name for external vibrators. presently the external vibrators you are using is not from standard manufacturer. above deficiencies is effecting the quality of concrete ~ section 5.6 - please provide detailed procedure of removal of the pier head formwork also. no it is not explained. during removal of pier head formwork of P22/23 we have observed unsafe removal of this formwork	B

Further Comments / Attachment / Total Page of Submittals (Describe / attach below / next page if required)

Note : The Engineer's Response is not valid unless signed by the Engineer's Representative. Contractor is to acknowledge receipt by signing and returning one copy to the Engineer's Representative.

Reviewed by Engineer's Assistant ;
Name : Soupayan Dutta Date : 30 April 2018
Signature :

Issued by Engineer's Resident Engineer ;
Name : Hideya OHMI Date : 30 April 2018
Signature :

Receipt Acknowledgment ; Contractor's Receipt Stamp / Date
Document Controller's Name and Signature :

Copy to: 1. Mr. Sarwar Uddin Khan, Project Manager (CP-03&CP-04), DMRTDP

Procedure for Submission of Documents

SUBMITTAL FORM

Submittal No. ITD/CP03-04/MS/ST 0022 Rev.03							Date: 06/05/2018
ITD	GS	CP03-04	Location	Type	No.	Rev.	
			ALL	MS	ST 0022	04	

Purpose ☐ R ☑ A ☐ Inf. ☐ Rec.

Title : **Method Statement for Sub-Struture Pier Construction**

To : Mr. Takayuki FUJITOMI

Discipline : **Method Statement**

Spec. Section/Clause: **Particular Specifications, Part 02**

CC : Mr. Md Aftabuddin Talukder

Sub-Contractor/Supplier: _____

For Contractor Use			For Employer or Employer's Representative Use							
Item No.	Description	Rev.	Date Received :						Date Returned	Employer / Rep
			Review Status							
			NONO		NOO		NONOC			
							B	C		
1	Method Statement For Sub-Structure Pier	1								
	Construction									
2	Method Statement For Sub-Structure Pier	2								
	Construction									
3	Method Statement For Sub-Structure Pier	3								
	Construction									
4	Method Statement For Sub-Structure Pier	4								
	Construction									

All items submitted have been checked, reviewed and co-ordinated by the Contractor. They are in conformance with the requirements of the Contract Document, except as noted, and are approved by the Contractor for this Project.

Detailed Comment Review Attached Ref.No.:

Reviewed and Status Confirmed By:

Prepared by :

(Mr. Pairoj Rakngancharng)

Date : 08 MAY 2018

Reviewed and Approved

(Mr. Thawit Yuenyong)

Project Manager

Date : 08 MAY 2018

( )

Title:

Date:

Note :

Purpose

R = For Review

A = For Approval

Inf. = For Information

Rec = For Record

☐ Approved / Notice of No Objection

☐ Approved with Comments as below /Notice of No Objection with Comments (With "B" or "C")

☐ No Objection / No Comment

☐ Rejected with Comments as below and Resubmit /Notice of Objection ("With A")

Note: Acceptance of ER does not relieve the Contractor of its Contractual Obligations

RESPONESES TO NKDM'S COMMENTS

Subject: Re Submission Method Statement for Sub-Structure Pier Construction

Our letter ref: ITD CP-03&04 MS ST 0022 Rev.03 dated 30 April 2018

Submittal no.: ITD/CP03-04/MS/ST 0022 Rev. 04

ER's previous ref: NKDM-CP03/04-CON-2018/0757 Date: 06/05/2018

No.	MS/Doc. Reference	Comments of Employer's Representative	Type	Response from Contractor's Representative
1		Based on the construction practice you followed at site (P22 / P23) and the monolithic casting of column and head following are our comments – ~ section 5.2 – rebar installation – add pier head rebar must be fabricated within jig ~ section 5.5 – please mention the length of the internal vibrators. Also we have notice that you are not using frequency convertors to achieve the desired frequency. Please include the use of frequency convertors. Further please clarify the manufacturer's name for external vibrators. Presently the external vibrators you are using is not from standard manufacturer. Above deficiencies is effing the quality of concrete. ~ section 5.6 – please provide detailed procedure of removal of the pier head formwork also. No it is not explained. During removal of pier head removal of pier head formwork of P22/23 we have observed unsafe removal of this formwork	B	~ Fabrication of pier head rebar cage is already revised in section 5.2 at page no. 5 and attachment #5 at page no. 9 ~ The length of internal vibrator, the use of frequency convertors and external vibrator information (the name of manufacturer, model and brief specification) are included in section 4 at page no. 4, section 5.1 at page no. 5 and section 5.5. at page no. 5 already. ~ Detail procedure of pier head formwork is submitted separately and the document no. (ITD/CP03-04/MS/S041) is included in section 5.4 at page no. 7.

Encl. 1/1 Ref. ITD/CP03-04/MS/ST 0022 Rev. 04
Id. 08 MAY 2018 Page 39 Pages.

DHAKA MASS RAPID TRANSIT DEVELOPMENT PROJECT
LINE 6
CONTRACT CP-03 & CP-04

METHOD STATEMENT
FOR
SUB-STRUCTURE PIER CONSTRUCTION

Document No. ITD/CP03-04/MS/ST 0022 Rev.04

PREPARED BY:

ITALIAN-THAI DEVELOPMENT PUBLIC COMPANY LIMITED

Italian-Thai Development Pcl. (ITD)	The Engineer (NKDM)
Name :	Name :
Position :	Position :
Signature :	Signature :
Date :	Date :

Status

- ☐ Approved / Notice of No Objection
- ☐ Approved with Comments as below / Notice No Objection with Comments "B" and/or "C"
- ☐ No Objection / No Comments
- ☐ Rejected with Comments as below and Resubmit / Notice of Objection "A" Comments

CONTENTS

1.0 GENERAL/SCOPE 3

2.0 SPECIFICATIONS AND REFERENCE DOCUMENTS 3

3.0 MATERIALS 3

4.0 RESOURCE, EQUIPMENT AND FACILITIES 3

5.0 PROCEDURE 4

6.0 SAFETY PROVISIONS 8

7.0 ENVIRONMENTAL PROVISIONS 9

8.0 TRAFFIC MANAGEMENT 9

9.0 ATTACHMENTS 9

Attachment 1 : Inspection and Test Plan for Sub-Structure-Pier Construction 10

Attachment 2 : Quality Control Checklist for Sub-Structure-Pier Construction 11

Attachment 3 : Inspection Sheet for Sub-Structure-Pier Construction 12

Attachment 4 : Sequences for Sub-Structure-Pier Construction 13

Attachment 5 : Organization Chart 31

1.0 GENERAL/SCOPE

The pier construction for main line described in this method statement in which the casting process is divided into three steps. Pier Column kicker shall be cast for the first step, pier column and pier head shall be cast for the second and third steps respectively. Also, this content includes relevant materials and equipment to be used for execution of the works for the Dhaka Mass Rapid Transit Development Project Contract No. CP-03 & CP-04.

2.0 SPECIFICATIONS AND REFERENCE DOCUMENTS

Relevant specifications contained in Vol.3-2 Part-2, Civil and Structure Works, are specified as per the following:

a. Section 3. Earthworks
b. Section 4. Concrete for Structures
c. Section 5. Reinforcement for Structures

3.0 MATERIALS

The materials to be utilized for pier column and pier head construction are as follows:

a. Ready-mixed concrete Grade 35 MPa or 40 MPa according to the approved shop drawings
b. Reinforcing Bar 500 kN/mm^2
c. Tie wire
d. Bar support spacers (Concrete or Plastic)
e. E&M embedded items, such as drainage pipe, electrical conduit, additional rebar for earthing, etc.
f. Form Release Agent
g. Bonding Agent or Mortar
h. Retarder
i. Curing compound or polyethylene sheet 0.25 mm.
j. Sheet pile type III (400x125x13mm.) or counter weight
k. Drain Pipe (wherever required according to the approved shop drawings)
l. Earthing terminal (wherever required according to the approved shop drawings
m. Concrete repair material (if required)

4.0 RESOURCE, EQUIPMENT AND FACILITIES

The equipment for this operation is as follows:

a. Formwork
b. Screw Jack
c. Spindle Bracing
d. Bracket Frame

e. Form Tied
f. Scaffolding / Stair and Working Platform
g. Mobile Cranes 50 Tons
h. Backhoe 0.7 m^3
i. Vibro Hammer – Excavator Mounted Type
j. Mobile Pump truck
k. Concrete Bucket with Flexible Hose 1.6 m^3
l. General Tools
m. Hammer
n. Plumb
o. Internal Vibrator (12m long)
p. External Vibrator with 6000 cycles per minute (Mikasa FJH-750)
q. Frequency Convertor (Mikasa FV-600)
r. Compactors
s. Air Compressor
t. Batching plant 120 m^3/hr. (according to the contract)
u. Survey Equipment
v. Personal Protective Equipment: helmet, safety shoes, glasses, reflective vest and masks
w. Transit Mixers 6 m^3
x. Guy Wire with Turn Buckle

5.0 PROCEDURE

5.1 Pier (column) kicker casting

If the environmental conditions of formwork and reinforcement such as cleaning and freeing from standing water, Request for Inspection of works (Form No. ITD/CP03-04/PR006/01) shall be issued and approval from the Engineer shall be given prior to concrete placement.

Formworks of Pier kicker which is already be cleaned and applied with release agent shall be installed with form temporary shoring and properly adjust its position according to the approved shop drawings. For the final check before start concreting, the form shall be thoroughly cleaned and freed from saw-dust, shavings, dust, mud, or other debris by hosing with air or water. Also needed to provide the temporary openings to drain the water and rubbish away. Rebars are also need to be cleaned and freed from any kind of dust before be placed and concreting.

Next, start concreting by using mobile concrete pump or mobile crane or direct shoot via hopper with flexible tube in order to keep 1.50m maximum height from the top of pile cap surface. Concrete vibrators which can produce not less than 12,000 cycles per minute as Internal concrete vibrator (12 m. long) or not less than 3,000 cycles per minute as external concrete vibrator shall be used to

compact concrete. To achieve the desired frequency, Frequency Converter shall be used also. All vibrating equipment are standard and pass the qualification according to the contract Vol. 3-2 Part 2: Particular Specification; Internal Vibrator with 12 m long, External Vibrator (Mikasa FJH-750) with 6000 cycles per minute and Frequency Convertor (Mikasa FV-600). At each insertion of vibrators, it shall be maintained for a sufficient duration to consolidate concrete but not too long to cause segregation.
The formwork shall be set to such lines and levels as to ensure that the tolerance is not exceeded ±6 mm but not more than 3 mm in 3 m of the structures as cast while still supported by the formwork.

After concreting is done, Retarder agent shall be applied at the construction joint between Pier kicker and 2nd portion of Pier column and suddenly clean at the same point for Green cut process, as mitigation measures in case of unforeseen stoppage of concrete, by using Water-jet washing or long-grip steel brush on the next day. Green cut process shall be done complying with Class U1 standard and also apply approved curing compound or cover with plastic sheet around the kicker for 7 days to prevent premature drying and excessively hot temperature.

5.2 Install Reinforcing Rebar for Pile Column and Pier Head

The grade, dimension, number, spacing, overlapping, length, clear covering and location of rebars shall comply with the approved shop drawings. Bars shall be cut and bent cold to the dimensions and shapes as shown on the approved shop drawings and with equipment and method approved by the Engineers. Bends shall be made around a pin having a diameter which is conform to the approved shop drawings and specification.

Fabrication of rebars shall be done in place, on the ground, for pier column and pier head according to the approved shop drawings. Bars shall be fastened to prevent displacement by construction loads during placement of concrete. The minimum clear distance between two bars shall not be less than the diameter of the bar or 25 mm or the largest size of aggregate plus 10 mm. If required, rebars shall be grit-blasted, grinded by grinder attached with brass cup brush or applied sand bath before use to remove rust, oil, grease, salt and other deleterious matter. Both pier column rebar and pier head rebar shall be fabricated in steel frame (lifting frame) but pier head rebar shall be installed within jig especially.

Projecting vertical bars which might be hazardous to human health shall be adequately protected. No concreting shall take place before inspection and approval of the reinforcement by the Engineers. Rebars shall be cleaned up after concreting by wet cloth or sponge in order to remove surplus concrete/cement paste stuck to the reinforcing bars at the construction joints and/or starter bars projected on the deck. In case of station pier, displaced affected bars equally at both sides of opening and mechanical coupler shall be installed for the connection part of the reinforcement of beam.

Pier column rebar shall be started installing at pier column kicker and then install pier head rebar after the column formwork and pier head formwork are installed respectively. If necessary, the pier column rebars shall be moved to avoid interference with pier head rebars or embedded items. Rebars couplers or

lapping may be used for rebar connection where necessary. At this stage, the rebar for pier shall be also installed & fully fixed by suitable crane and supported by 4 guy wires with turnbuckles which are tied to anchored or temporary supports.

5.3 Install E&M Embedded Items

The embedded items for the following electrical and mechanical systems: rebar for earthing and bonding system and drainage pipe (if any) shall be installed, inspected and tested, as required by the Inspection and test plan. The approval of embedded materials is required prior to use. The positions of the items shall be installed and fixed in accordance with the approved shop drawing. The ends of pipe shall be capped in order to prevent other foreign materials from entering the pipe. Joint inspection with E&M works shall be performed and signed before covering up Works. In addition, the rebars shall be installed for the ground electrode provided for the station and viaduct. The installation details for earthing and bonding system are described in the method statement for earthing and bonding installation (Doc. No. ITD/CP03-04/MS/EE 001).

5.4 Install Formwork for Pier Column and Pier Head

Pier formwork according to the approved drawings and temporary work design calculations submitted separately shall be installed with sufficient support to withstand pressure resulting from placement or vibration of concrete and sufficient rigidity and tight enough to maintain specified dimensions & shape, prevent absorption of moisture and prevent bond with concrete. The forms shall be carefully jointed such that they present a flush surface to the concrete except where joint treatment is called for.

In addition, temporary working platform will be installed during the concrete placement. The form shall be thoroughly cleaned and freed from saw-dust, shavings, dust, mud or other debris by hosing with air or water as direct by the Engineers. The steel surfaces forming visible concrete faces shall be blast cleaned to 1st Quality in accordance with ACI 347 and the inside surfaces of forms shall be cleaned and coated with an approved release agent to prevent adhesion of the concrete. Excessive release agent shall be removed. Formwork shall be coated prior to erection. The release agent must not come in and contact with placed concrete, reinforcement or pre-stressing tendons. The same release agent shall be used in all formwork to concrete having the same class of finish for surfaces which shall be visible in the completed works. The Contractor shall make and select several combinations of release agent and skin plates of formwork for exposed surface concrete in order to make the concrete surface beautiful.

The formwork shall be set to such lines and levels as to ensure that the allowable tolerances will be achieved and no concrete shall be placed until the formwork and reinforcement are suitably prepared and approved by the Engineer. Where steel forms are used any welds on the steel linings adjacent to the concrete shall be ground flush. The thickness of the lining plates and the spacing of the stiffeners used shall be such as to prevent the occurrence of any surface rippling of the concrete. No concrete shall be placed until the formwork

and reinforcement are suitably prepared. The following tolerances shall not exceed while the structures are casting and the formwork subject shall always be equal to the minimum specified cover to the reinforcement being maintained; a.) For all buried concrete: +25mm and -12mm, b.) For edge girders and parapets: ±3mm but not more than 3mm in 3m, c.) For all other in-situ concrete: ±6mm but not more than 3mm in 3m including precast concrete piles. Civil works of Pier column and Pier head is high so the scaffolding according to the approved shop drawing shall be used at the site.

The grade, dimension, location, installation, adjustment and inspection of scaffolding shall be complied with the approved shop drawings and the Engineer's approval. The temporary works design certificate for entire formwork system shall be provided separately. Detail procedure of Pier column & Pier head formwork removal could refer from "Method Statement for Pier Head and Pier Column Formwork Dismantling" as Doc. No. ITD/CP03-04/MS/S041 for safety of the workers

5.5 Placing concrete of Pier Column and Pier Head

If concreting has not started within 24 hours of approval being given, approval shall be obtained again from the Engineer. Concrete shall be placed continuously in one single operation (without construction joint in each part itself) by using mobile concrete pump or mobile crane shooting with flexible tube in order to keep 1.50m maximum height from bottom of Pier column and then pulled up at maximum of 20-30 cm.

Fresh concrete shall not be placed against in-situ concrete after 30 minutes unless a construction joint is formed. After 4 hours of in-situ concrete be placed, no other further concrete shall be placed for a further 20 hours. Concrete vibrators with sufficient vibration amplitude shall be used to compact concrete. Types of Vibrator shall be internal vibrators (12 m long) which can produce not less than 12,000 cycles per minute or external vibrators which can produce not less than 3,000 cycles per minute. Internal Vibration shall be applied for 60 – 90 seconds to release air inside the concrete but not too long to cause segregation. To achieve the desired frequency, Frequency Converter shall be used also.

At each insertion of vibrators, it shall be maintained for a sufficient duration to consolidate concrete but not too long to cause segregation. Concrete shall be compacted in its final position within 30 minutes of discharge from the mixer. Criteria time should be within 1 hour of the introduction of cement to the mix and within 30 minutes of discharge from the agitator. Deposition of concrete should be in horizontal layers to depth, not exceeding 0.45 m for internal vibrators and 0.3 m for external vibrator.

In addition, the unformed surface finish of Pier column, Pier head shall be complied with Class U1. Concrete shall be protected from premature drying and excessively hot temperature by applying approved curing compound or cover with polyethylene sheet and sand on top of the sheet for 7 days and side of Pile column, Pier head shall be inspected.

Mitigation measures in case of unforeseen stoppage of concrete will be done by spraying the retarder agent on the surface to make a green cut at construction joint and shall continue concreting later.

5.6 Remove formwork for Pier (Column) and Repair works

Formwork shall not be removed until the concrete has sufficient strength to support itself and the external loading shall not be applied until 28 days unless otherwise approved by the Engineer. The time of side formwork shall be the Engineer's responsibility but minimum time should be struck until 12 hours.

The finished surface after remove formwork shall be as cast and all external faces shall be free from honeycombing, surfaces which show defects on the removal of the formwork shall be received such remedial treatment shall be carried out without any delay. If the defects are 2-3 mm deep, remove the surface of defective concrete by medium duty power hammer then moistening with water, followed with brush coat of ready to used repair mortar. (submitted separately) If the defects appear more than 3 mm in depth, the remedial treatment shall be done in accordance with approved remedial method submitted separately.

5.7 Curing

Curing period of concrete shall be continued for 5-7 days to make sure that concrete has improved durability, enhanced serviceability and gained enough strength to take sufficient load and be able to stand by itself without formwork and strut. After placing the concrete, it shall be maintained with minimum moisture loss at relative constant temperature and prevented from early surface drying by using Polyethylene sheets to cover the concrete and sand backfilling as final curing for a sufficient period as necessary for hydration and hardening. The curing methodology is one of the following;

a. Pier column: Formwork removal, applying polyethylene sheet or approved curing compound

b. Pier head: Formwork removal, applying polyethylene sheet or approved curing compound

5.8 Backfilling Work

After significant sequences are completed, backfilling work shall be preceded with temporary backfilling from the top of pile cap level to the existed ground. This sequence could refer to "Method Statement for the Backfilling Work" as Doc. No. ITD/CP03-04/MS/ST0032.

6.0 SAFETY PROVISIONS

a. All truck mixers, crawler cranes, or truck mounted concrete pumps that are used for concrete work shall be driven carefully.
b. Cutting rebar shall be carefully operated. Gloves shall be used during cutting rebar.
c. Welding mask shall be always used during welding procedure.
d. All persons entering the construction areas shall be provided with safety induction training.
e. All workers shall wear safety belts during working at height.
f. All workers being outdoors have to stop working during heavy raining and lightning periods.
g. Defective equipment shall be properly rectified or not to be used.
h. All slings attached to the lifting points of formwork or other lifted materials shall be properly checked before lifting.
i. No smoking in the working area.

7.0 ENVIRONMENTAL PROVISIONS

a. The work shall be carried out with sufficient environmental protection.
b. Working platforms or walkway shall be clean, not slippery, and free from debris.

8.0 TRAFFIC MANAGEMENT

a. The traffic arrangement for the first 4 work fronts was submitted to NKDM.
b. The traffic management shall be carried out, as agreed by the Traffic Police Division. Relevant approval letters.
c. The remaining traffic management shall be prepared and submitted to NKDM in a separate submission henceforth.

9.0 ATTACHMENT

Attachment 1 : Inspection and test plan for sub-structure-pier construction
Attachment 2 : Quality control checklist for sub-structure-pier construction
Attachment 3 : Inspection sheet for sub-structure-pier construction
Attachment 4 : Sequences for sub-structure-pier construction
Attachment 5 : Organization chart

ATTACHMENT 1

INSPECTION AND TEST PLAN FOR SUB-STRUCTURE-PIER CONSTRUCTION

ATTACHMENT 2

QUALITY CONTROL CHECKLIST FOR SUB-STRUCTURE-PIER CONSTRUCTION

ITD

INSPECTION AND TEST PLAN

FOR

METHOD STATEMENT FOR COLUMN AND PIER HEAD CONSTRUCTION

Project : Dhaka Mass Rapid Transit Development Project
Contract 1 : Civil Works
Item Description: N/A
Location: N/A
Specification No: Construction Specification Civil and Structure
Section 4.1 Concrete for Structures, Section 4.2 Reinforcement

Quality System : ISO 9001 : 2008
Document Type : Controlled
Date : October 30, 2017
Prepared by : Ms. Naruemon Jantavanumas
Approved by : Mr. Amnuay Pumkam
ER Approved : N/A

No.	Activity	Inspection and Tests Required	Inspection Activity				Document		Acceptance Criteria
			Subcont.	Vendor	ITD	NKDM	Form / Checklist No.	Verification/Acceptance Sign Off By	
1	Submission	- Material, Shop Drawing, Method Statement	N/A	N/A	R	W/O	N/A	N/A	Refer to relevant specification
		- Mock up Inspection	N/A	N/A	X	W/O	N/A	N/A	Refer to relevant specification
2	Materials	- Approved Ready-Mixed Concrete	X	N/A	X	W/O	ITD/CP03-04/MS/ST019/01	Engineer	Refer to Trial mix report
		- Approved Steel Reinforcement	X	N/A	X	W/O	ITD/CP03-04/MS/ST019/01	Engineer	Refer to material submission
		- Approved E&M embedded items	X	N/A	X	W/O	ITD/CP03-04/MS/ST019/01	Engineer	Refer to material submission
3	Equipment	- Crane and its equipment and related equipment	X	N/A	X	W/O	ITD/CP03-04/MS/ST019/01	Engineer	Refer to relevant specification
4	Interface Coordination	- E&M embedded items	X	N/A	X	W/O	ITD/C1/MS/S007/01	Electrical / Mechanical Engineer	Refer to relevant Drawing/Method Statement
5	In-process Inspection								
5.1	Pier Kicker Inspection								
	- Survey setting out	- Position and level	X	N/A	X	W/O	ITD/C1/MS/S007/01,02	Survey Team	Relevant Specification/Drawing
	- Height of dowel bars	- Height	X	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Relevant Specification/Drawing
	- Reinforcing steel	- Grade, dimension, number and spacing	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As shown on the drawings
		- Overlapping, length, location and concrete covering	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As shown on the drawings
	- Electrical embedded items	- Approved material, position and number	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	Electrical Engineer	Relevant Specification/Drawing
	- Mechanical embedded items	- Approved material, position and number	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	Mechanical Engineer	Relevant Specification/Drawing
	- Formwork	- Cover with coating material	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As specified
		- Cleanliness	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Sufficient clean
		- Position and level	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	Survey Team	As specified and sufficient strength, support to provide rigidity during placing and compacting

Symbol	Legend	Symbol	Legend
H	Mandatory Hold Point-Hold Until Approved	D	Document or Record Required
W/O	Witness Point-Optional	X	ITD Inspection
W	Witness Point	R	Review Point
S/.....	Surveillance Point - Random ITP/Each Quantity	N/A	Not Applicable
N	Notify ER (Request for Inspection)		

Document No.	Revision		Page No.
ITD/CP03-04/MS/ST 0022	No. 02	Date: February 28,2018	1 of 3

ITD

INSPECTION AND TEST PLAN

FOR

METHOD STATEMENT FOR PIER CONSTRUCTION

Project : Dhaka Mass Rapid Transit Development Project
Contract 1 : Civil Works
Item Description: N/A
Location: N/A
Specification No: Construction Specification Civil and Structure
Section 4.1 Concrete for Structures, Section 4.2 Reinforcement

Quality System : ISO 9001 : 2008
Document Type : Controlled
Date : October 30, 2017
Prepared by : Ms. Naruemon Jantavanumas
Approved by : Mr. Amnuay Pumkam
ER Approved : N/A

No.	Activity	Inspection and Tests Required	Inspection Activity				Document		Acceptance Criteria
			Subcont.	Vendor	ITD	NKDM	Form / Checklist No.	Verification/Acceptance Sign Off By	
	- Covering up inspection	- Request for Inspection and Testing issue and approval given	N/A	N/A	H, N, W	W	ITD/C1/MS/S007/01 ITD/C1/QP008/03	NKDM	Follow to drawings/relevant specifications
	- Concrete Placement	- Cleanliness prior to placement of concrete	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Sufficient clean
		- Composition code/slump	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As shown on the drawing/verify with concrete order form
	- Formwork	- Removal of formwork	N/A	N/A	H, N, W	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	24 hours after concrete placement
	- Concrete Curing	- Curing agent	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Approved material, AASHTO standard M148
		- Curing	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Immediate curing after removing of formwork and continue for 7 days
5.1.1	Backfilling work	- Backfill material	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Refer to material submission
		- Request for Inspection and Testing issue and approval given	N/A	N/A	H, N, W	W	ITD/C1/MS/S007/01 ITD/C1/QP008/03	NKDM	Follow to drawings/relevant specifications
5.1.2	Remove Sheet Piles	- Visual Check	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	No damage around the adjacent area
5.2	Pier Inspection (Pier and Pier Head)								
	- Height of dowel bars	- Height	X	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Relevant Specification/Drawing
	- Reinforcing steel	- Grade, dimension, number and spacing	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As shown on the drawings
		- Overlapping, length, location and concrete covering	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As shown on the drawings
	- Electrical embedded items	- Approved material, position and number	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	Electrical Engineer	Relevant Specification/Drawing
	- Mechanical embedded items	- Approved material, position and number	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	Mechanical Engineer	Relevant Specification/Drawing
	- Corrugate ducts for PT bar (for Pier Head)	- Dimension, position and level	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As shown on the drawings
	- Formwork	- Cover with coating material	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As specified
		- Cleanliness	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Sufficient clean
		- Position and level	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	Survey Team	As specified and sufficient strength, support to provide rigidity during placing and compacting

Symbol	Legend	Symbol	Legend
H	Mandatory Hold Point-Hold Until Approved	D	Document or Record Required
W/O	Witness Point-Optional	X	ITD Inspection
W	Witness Point	R	Review Point
S/.....	Surveillance Point - Random ITP/Each Quantity	N/A	Not Applicable
N	Notify ER (Request for Inspection)		

Document No.	Revision		Page No.
ITD/CP03-04/MS/ST 0022	No. 02	Date: February 28,2018	2 of 3

ITD

INSPECTION AND TEST PLAN

FOR

METHOD STATEMENT FOR PIER CONSTRUCTION

Project : The Dhaka Mass Rapid Transit Development Project Contract No.CP-03 & CP-04
Contract 1 : Civil Works
Item Description: N/A
Location: N/A
Specification No: Construction Specification Civil and Structure
Section 4.1 Concrete for Structures, Section 4.2 Reinforcement

Quality System : ISO 9001 : 2008
Document Type : Controlled
Date : October 30, 2017
Prepared by : Ms. Naruemon Jantavanumas
Approved by : Mr. Amnuay Pumkam
ER Approved : N/A

No.	Activity	Inspection and Tests Required	Inspection Activity				Document		Acceptance Criteria
			Subcont.	Vendor	ITD	NKDM	Form / Checklist No.	Verification/Acceptance Sign Off By	
	- Covering up inspection	- Request for Inspection and Testing issue and approval given	N/A	N/A	H, N, W	W	ITD/C1/MS/S007/01 ITD/C1/QP008/03	NKDM	Follow to drawings/relevant specifications
		- Composition code/slump	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	As shown on the drawing/verify with concrete order form
	- Formwork	- Removal of formwork	N/A	N/A	H, N, W	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	24 hours after concrete placement
	- Concrete Curing	- Curing agent	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Approved material, AASHTO standard M148
		- Curing	N/A	N/A	X	W/O	ITD/C1/MS/S007/01,02	QC/Engineer	Immediate curing after removing of formwork and continue for 7 days
6	Final Inspection	- Request for Inspection and Testing	N/A	N/A	H, N, W	W	ITD/C1/MS/S007/01 ITD/C1/QP008/03	NKDM	Follow to drawings/relevant specifications
7	Quality Record Submission	- Completion of documents.	D	N/A	D	R	ITD/C1/MS/S007/01, 02 ITD/C1/QP008/03	NKDM	As shown in Method Statement

Symbol	Legend	Symbol	Legend
H	Mandatory Hold Point-Hold Until Approved	D	Document or Record Required
W/O	Witness Point-Optional	X	ITD Inspection
W	Witness Point	R	Review Point
S/.....	Surveillance Point - Random ITP/Each Quantity	N/A	Not Applicable
N	Notify ER (Request for Inspection)		

Document No.	Revision		Page No.
ITD/CP03-04/MS/ST 0022	No. 02	Date: February 28,2018	3 of 3

Quality Control Checklist for Pier Construction

☐ Pier Kicker ☐ Pier (Pier and Pier Head)

Record No.:
Location:
Inspection Date.:
Drawing Ref. no.

EN = Site Engineer, FM = Foreman, Lab = Laboratory, EE = Electrical Engineer, ME = Mechanical Engineer, ER = Employer's Representative,
SU = Survey, SP = Supervisor Person, QC = Quality Control, Dwg. No. = Drawing Number

Item	Description	Acceptance Criteria	By	TIC	Acceptance		Sign
					Yes	No	
1	Materials						
	- Approved Ready-Mixed Concrete	Refer to Trial mix report	EN	X			
	- Approved Steel Reinforcement	Refer to material submission	EN	X			
	- Approved E&M embedded items	Refer to material submission	EN	X			
2	Equipment						
	- Crane and its equipment and related equipment	Refer to relevant drawing/method Statement	EN	X			
3	Interface Coordination	E&M embedded items	EE/ME	X			
4	In-process Inspection						
4.1	Pier Kicker Inspection						
	- Survey setting out, check height of dowel bars, reinforcing steel/E&M embedded items, formwork installation, concrete placement, curing, backfilling work and remove sheet piles	Refer to ITP of this Method Statement	SU/EE/ME/EN/ QC/FM/NKDM	X			
4.2	Pier Inspection (Pier and Pier Head)						
	- Check height of dowel bars, reinforcing steel/E&M embedded items, formwork installation, concrete placement and curing	Refer to ITP of this Method Statement	EE/ME/EN/QC /FM/NKDM	X			
5	Final Inspection	Follow to drawings/relevant specifications	NKDM	H, N, W			
6	Quality Record Submission	As shown in Method Statement	NKDM	D			

TIC = Test & Inspection Category, H = Hold Point, W = Witness Point, R = Review Point
D = Document Required, W/O = Witness Point-Optional, X = Subcontractor Inspection, S = Surveillance Point, N = Notify ER (Request for Inspection)

Remark:

Inspected (ITD): _____ **(Engineer)**
Date : _____

Verified by (ITD): _____ **(Project Engineer)**
Date : _____

Document No.	Revision		Page No.
ITD/CP03-04/MS/ST022/02	No. 02	Date: February 28, 2018	1 of 1

ATTACHMENT 3

INSPECTION SHEET FOR SUB-STRUCTURE-PIER CONSTRUCTION

Inspection Sheet for Pier Construction

☐ **Pier Kicker** ☐ **Pier (Pier and Pier Head)**

Location:.....		**Date:** .....
Pier No.:	**Height :**..... m.	**Size :**..... m.
Drawing No./ Rev. :		

EN = Site Engineer, SU = Survey, QC = Quality Control, FM = Foreman, EE = Electrical Engineer, ME = Mechanical Engineer, NKDM = Employer's Representative

Item	Description	Acceptance Criteria	Sign Acceptance		Inspected by	Remarks
			Yes	No		
1	Survey setting out (for Pier Kicker)	Relevant Specification/Drawing			(SU)	
2	Height of dowel bars	Relevant Specification/Drawing			(QC/EN)	
3	Reinforcing steel					
	- Grade, dimension, number and spacing - Overlapping, length, location and concrete covering	As shown on the drawing			(QC/EN)	
4	Electrical embedded items					
	- Dimension, number, position and level	Relevant Specification/Drawing			(EE)	
	- Earthing and Bonding system	As shown on the drawing			(QC/EN)	
5	Mechanical embedded items					
	- Dimension, number, position and level	Relevant Specification/Drawing			(ME)	
6	Corrugate ducts for PT bar (for Pier Head)					
	- Dimension, position and level	As shown on the drawing			(QC/EN)	
7	Formwork					
	- Cover with coating material	As specified			(QC/EN)	
	- Cleanliness	Sufficient clean			(QC/EN)	
	- Position and level	As specified and sufficient strength, support to provide rigidity during placing and compacting			(SU)	
8	Covering up inspection	Follow to drawings/relevant specifications			(NKDM)	
9	Concrete Placement					
	- Cleanliness before concrete placement	Sufficient clean			(QC/EN)	
	- Concrete code mix/slump	As shown on the drawing			(EN)	

The Contractor :	NKDM:
_____ Date : _____ By ITD's Engineer/Site Engineer	_____ Date : _____ Inspector/Engineer
_____ Date : _____ Agreed by QC	_____ Date : _____ Resident Engineer, or Deputy Resident Engineer

Inspection Sheet for Pier Construction

☐ **Pier Kicker** ☐ **Pier (Pier and Pier Head)**

Location:.....		**Date:** .....
Pier No.:	**Height :**..... m.	**Size :**..... m.
Drawing No./ Rev. :		

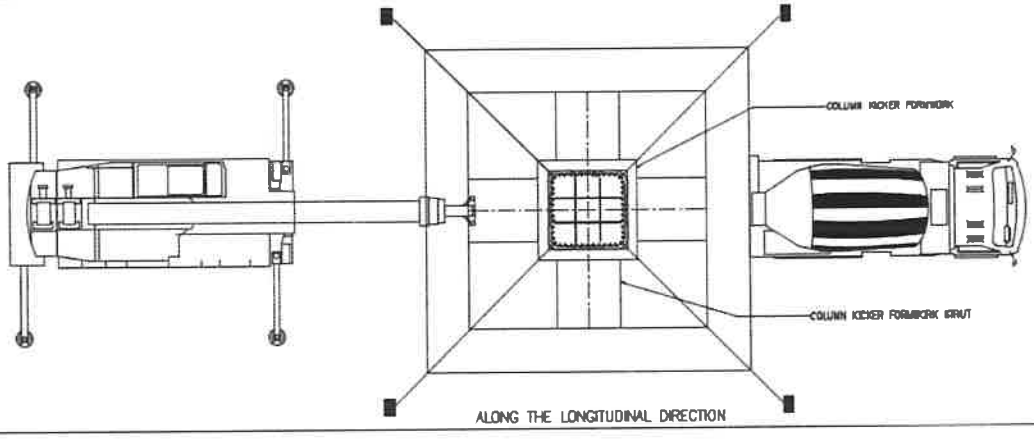
EN = Site Engineer, SU = Survey, QC = Quality Control, FM = Foreman, EE = Electrical Engineer, ME = Mechanical Engineer,
NKDM = Employer's Representative

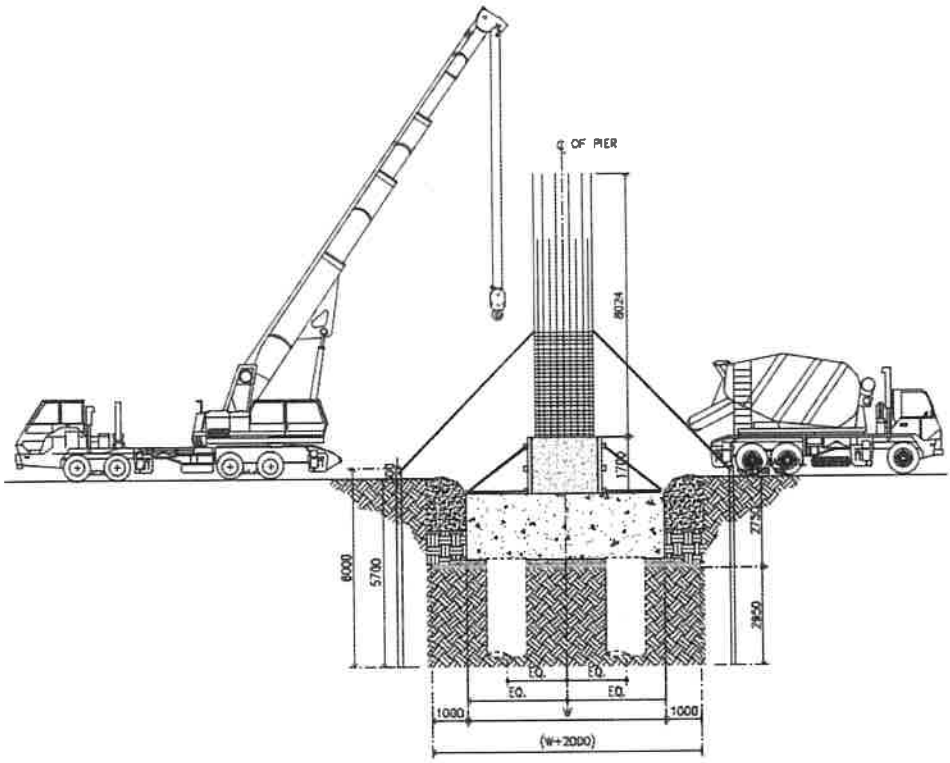
Item	Description	Acceptance Criteria	Sign Acceptance		Inspected by	Remarks
			Yes	No		
	- Cylinders & reference Nos.	As shown on the drawing			(QC)	
	- Start time of concrete placement - Completion time of Concrete placement	As shown on the drawing			(QC/EN)	
	- Volume of concrete used.....m^3 - Volume of concrete from drawing.....m^3	As shown on the drawing			(QC/EN)	
10	Formwork removal	24 hours after concrete placing, side formwork removed			(QC/EN/NKDM)	
11	Curing Concrete	Immediate curing after removing of formwork and continue for5- 7 days			(QC/EN)	
12	Backfilling work (After completion of Pier Kicker)	Refer to ITP this Method Statement			(QC/EN/NKDM)	
13	Remove Sheet Piles (After completion of Pier Kicker)	No damage around the adjacent area			(QC/EN)	
14	Final Inspection	Follow to drawings/relevant specifications			(NKDM)	

The Contractor :	NKDM:
_____ Date : _____ By ITD's Engineer/Site Engineer	_____ Date : _____ Inspector/Engineer
_____ Date : _____ Agreed by QC	_____ Date : _____ Resident Engineer, or Deputy Resident Engineer

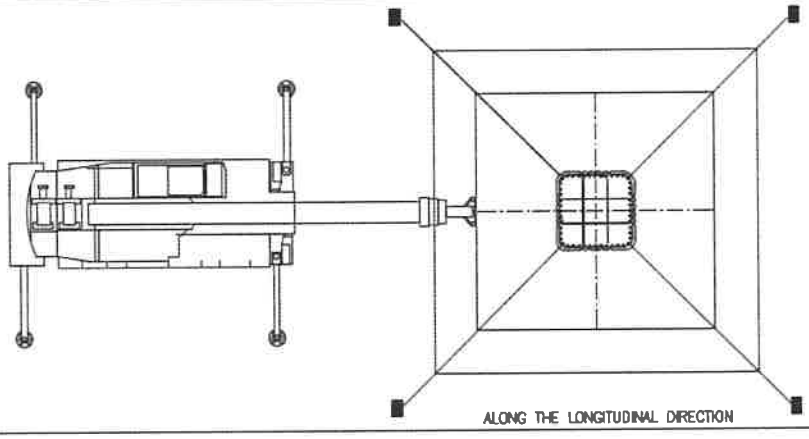
ATTACHMENT 4

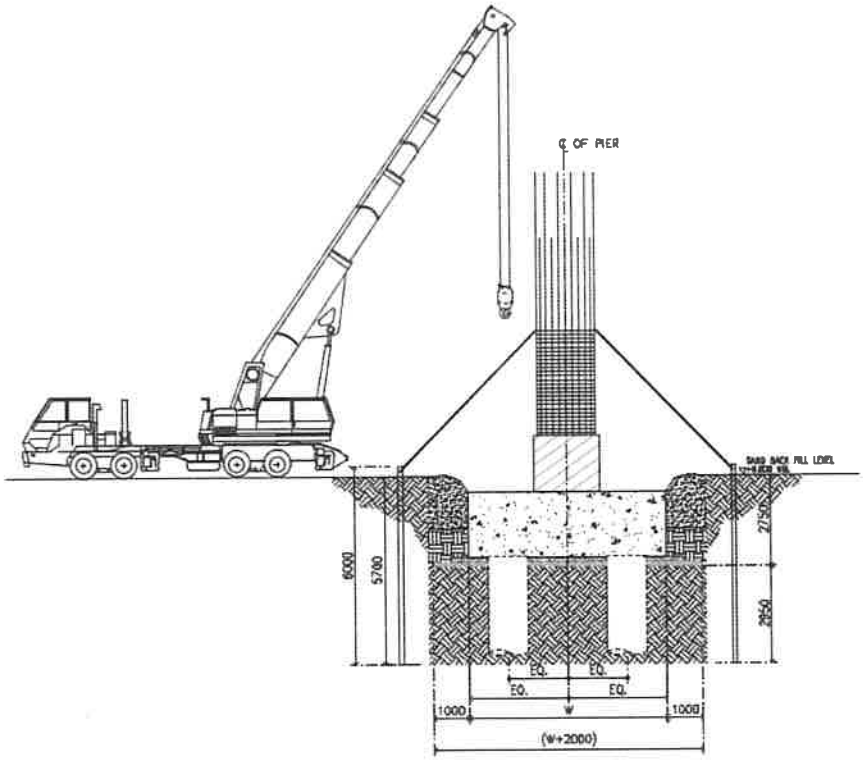
SEQUENCES FOR SUB-STRUCTURE-PIER CONSTRUCTION



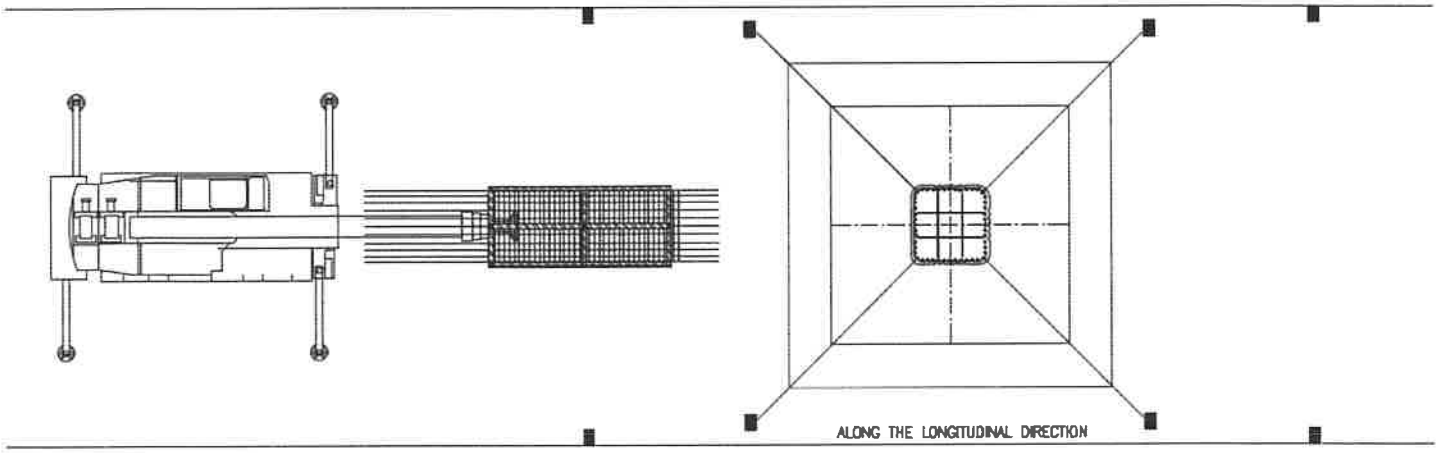


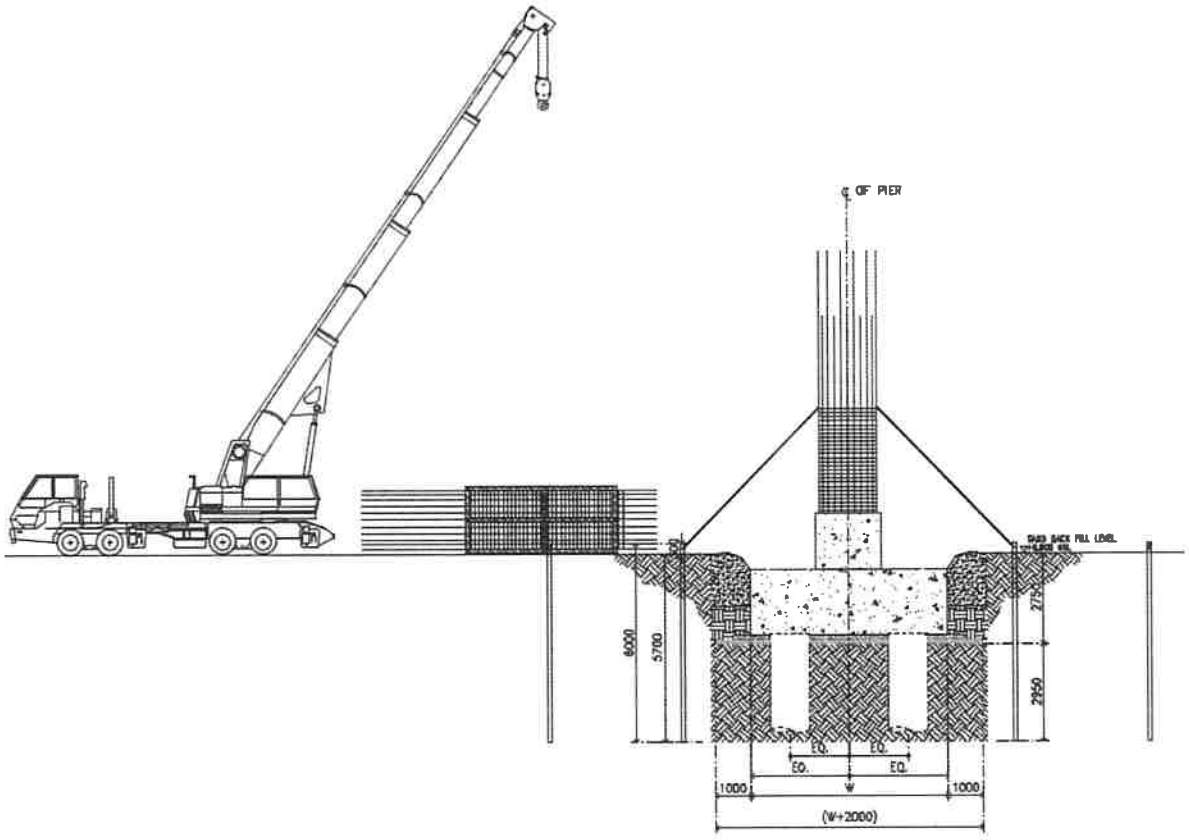
- AFTER POURING CONCRETE 7 DAYS, REMOVE THE CURING SAND OUT
- PLUMBING & ELECTRICAL SYSTEM ARE READY IN PLACE
- INSTALL KICKER FORMWORK AND SHORING
- CONCRETING THE COLUMN KICKER
- APPLY RETARDER AGENT AT TOP SURFFACE OF COLUMN KICKER



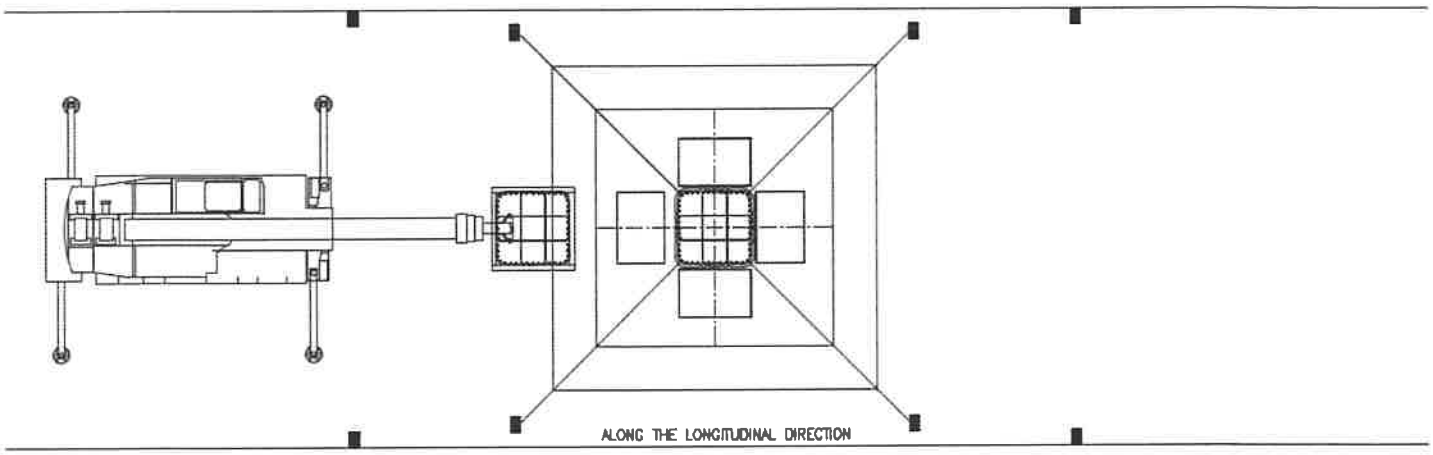


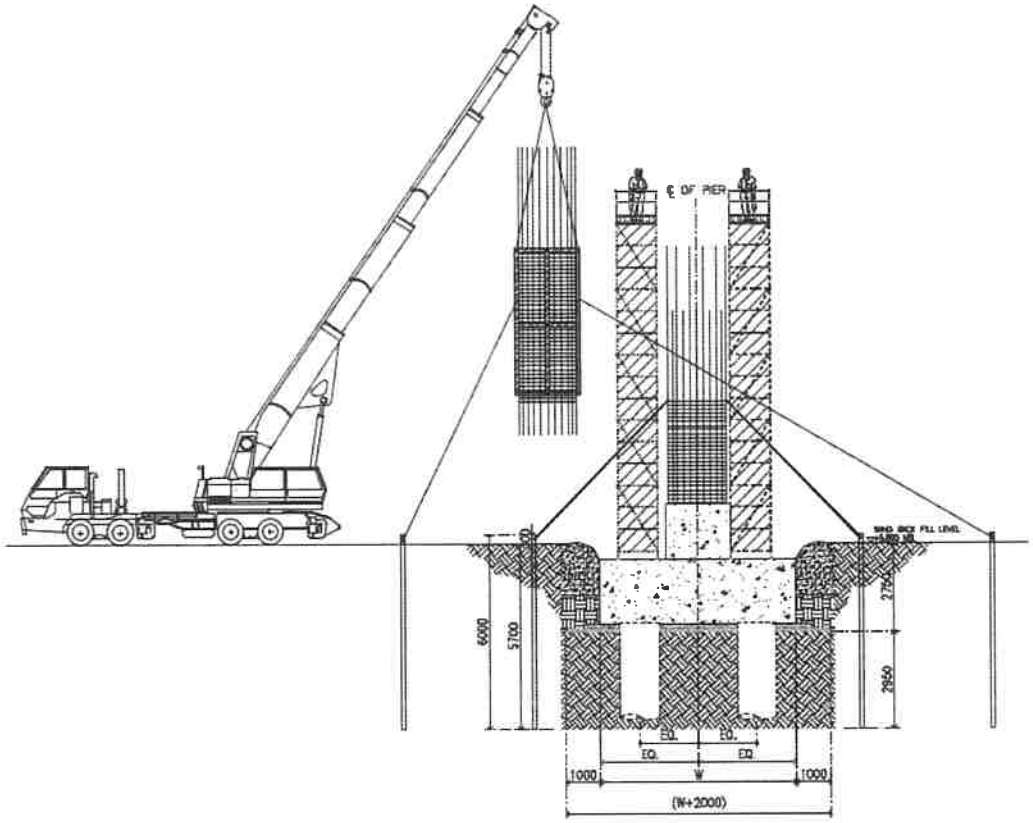
- AFTER CONCRETING 24 Hrs, APPLY WATER-JET WASHING AT TOP OF COLUMN KICKER
- REMOVE KICKER FORMWORK AND SHORING
- APPLY CONCRETE CURING BY WRAPPED PLASCTIC SHEET AROUND THE COLUMN KICKER



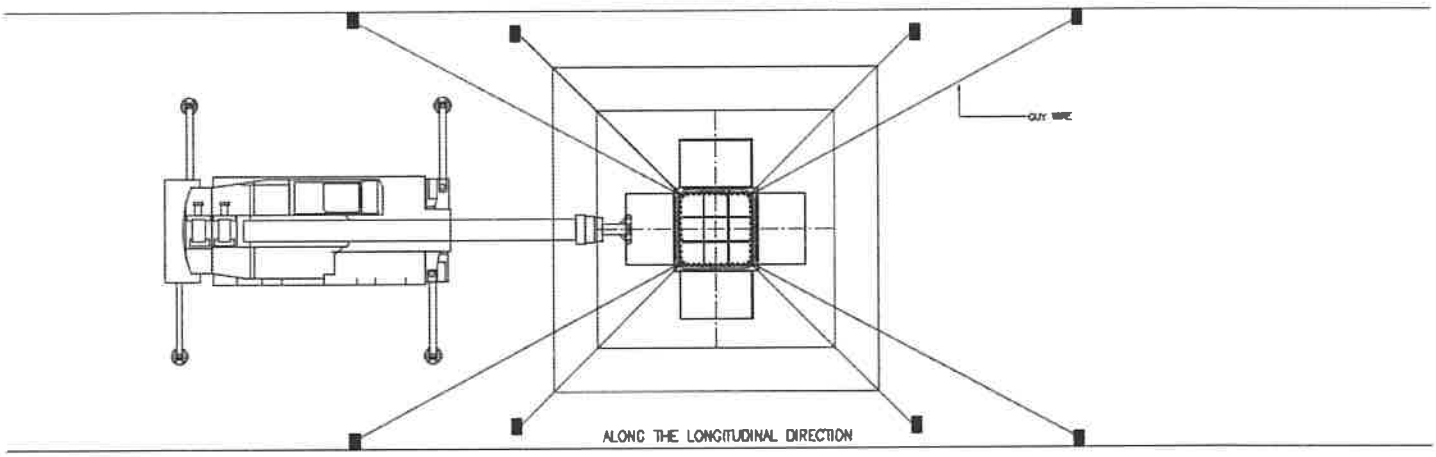


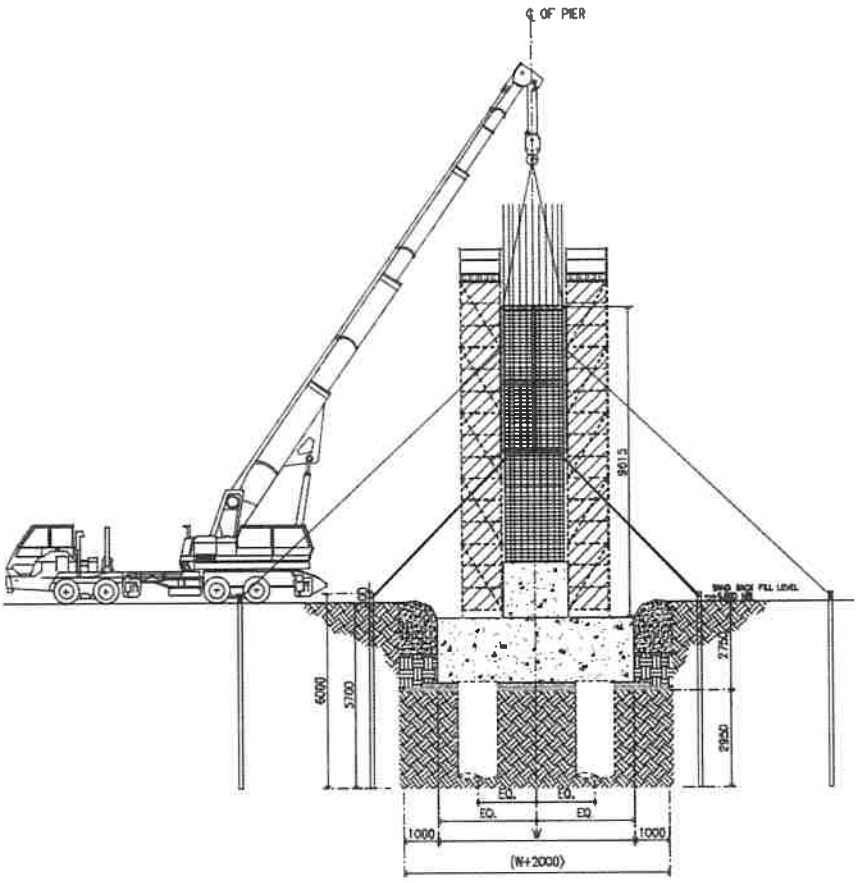
- FABRICATE REBAR OF PIER COLUMN INSIDE THE STEEL FRAME AT THE SITE
- FINISH EARTHING & GROUNDING SYSTEM
- IN CASE OF STATION PIER, DISPLACED AFFECTED AT BOTH SIDES OF OPENING EQUALLY AND MECHANICAL COUPLER SHALL BE INSTALLED FOR THE CONNECTION PART OF THE REINFORCEMENT OF BEAM



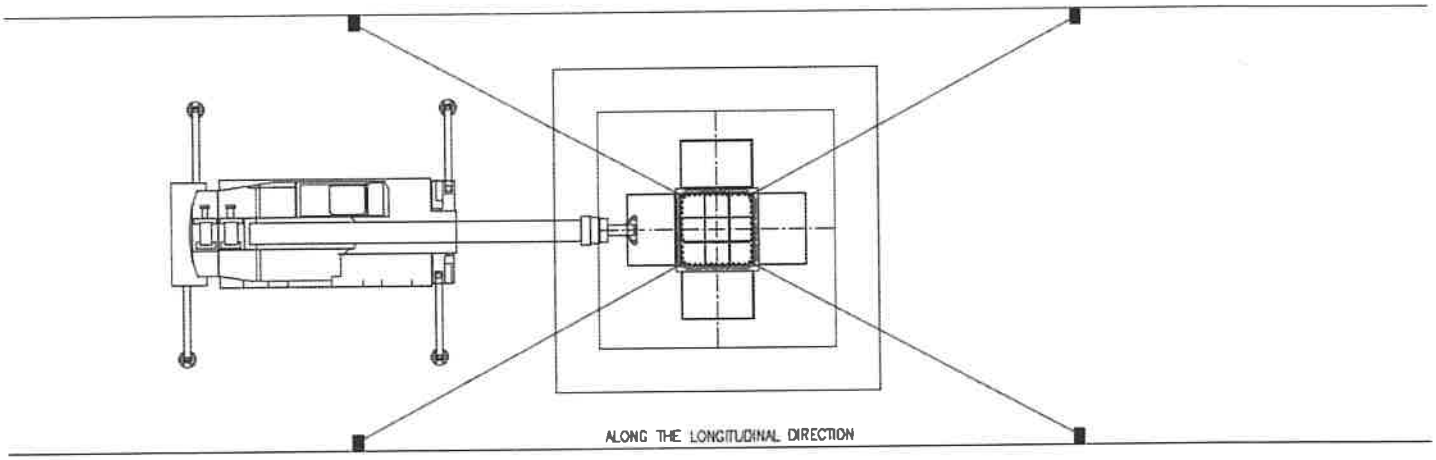


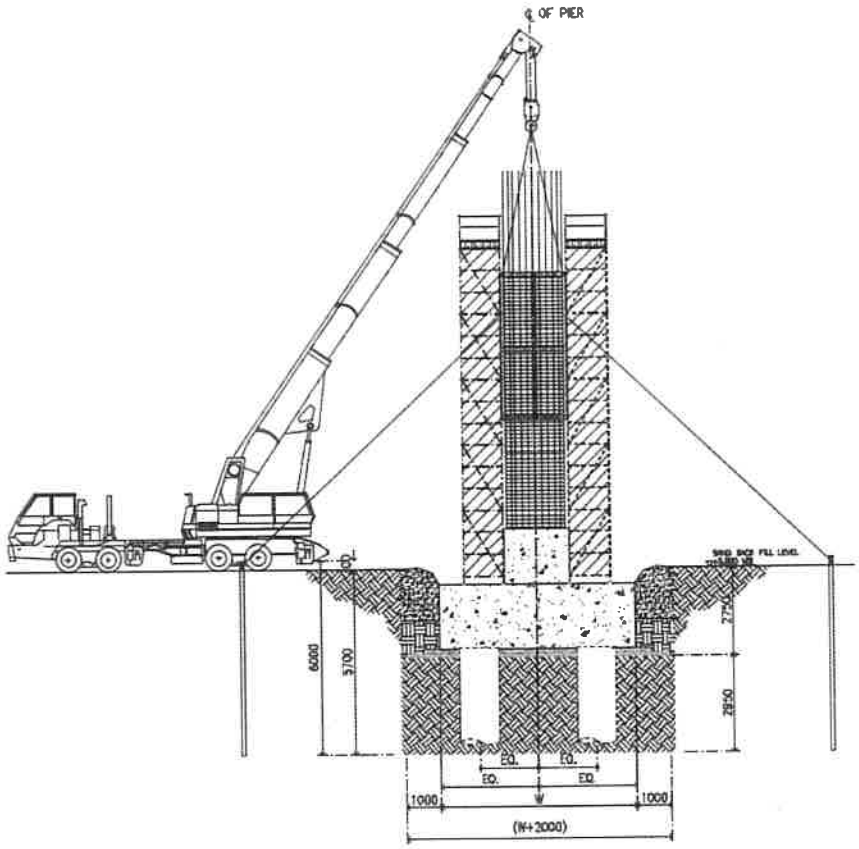
- INSTALL SCAFFOLDING INCLUDED SAFETY NET
- TIE GUY WIRE WITH THE COLUMN REBAR
- LIFT THE PRE-FABRICATED REBAR CAGE UP TO SPLICING LEVEL AND ADJUST ITS POSITION



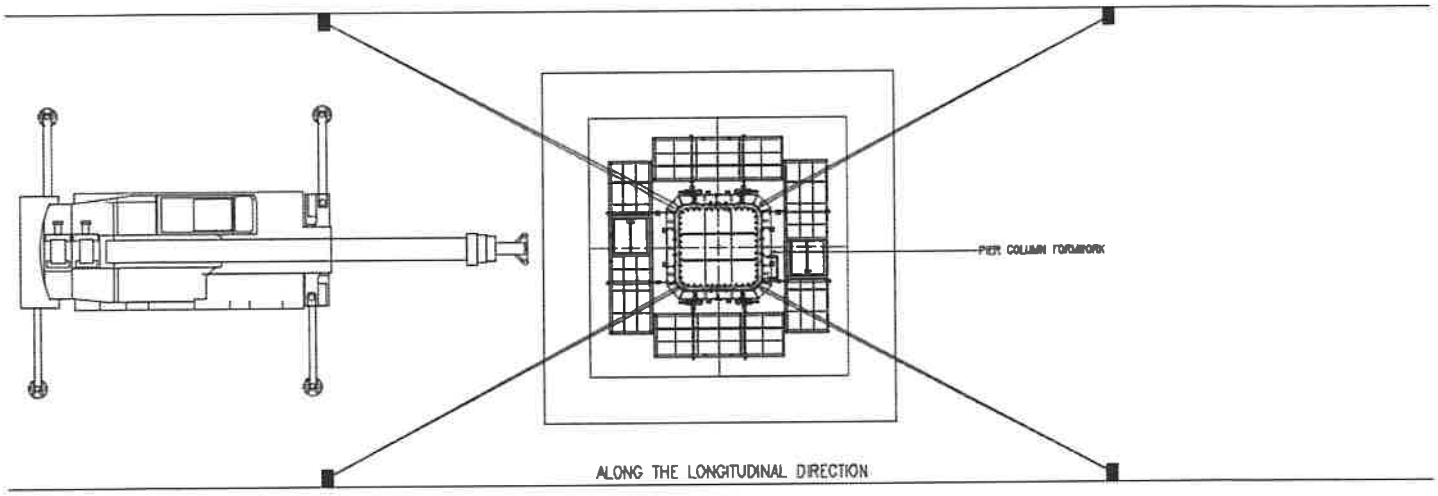


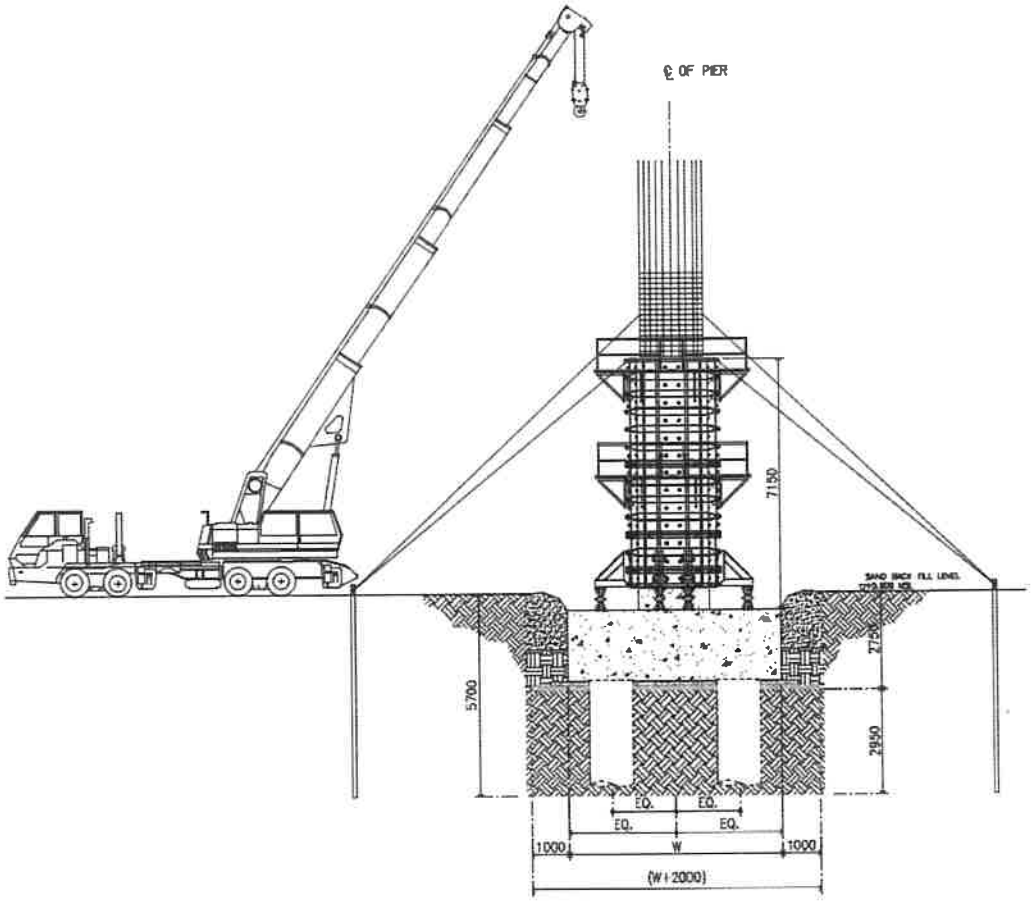
- TIE U-CLIP AT LAP POSITION



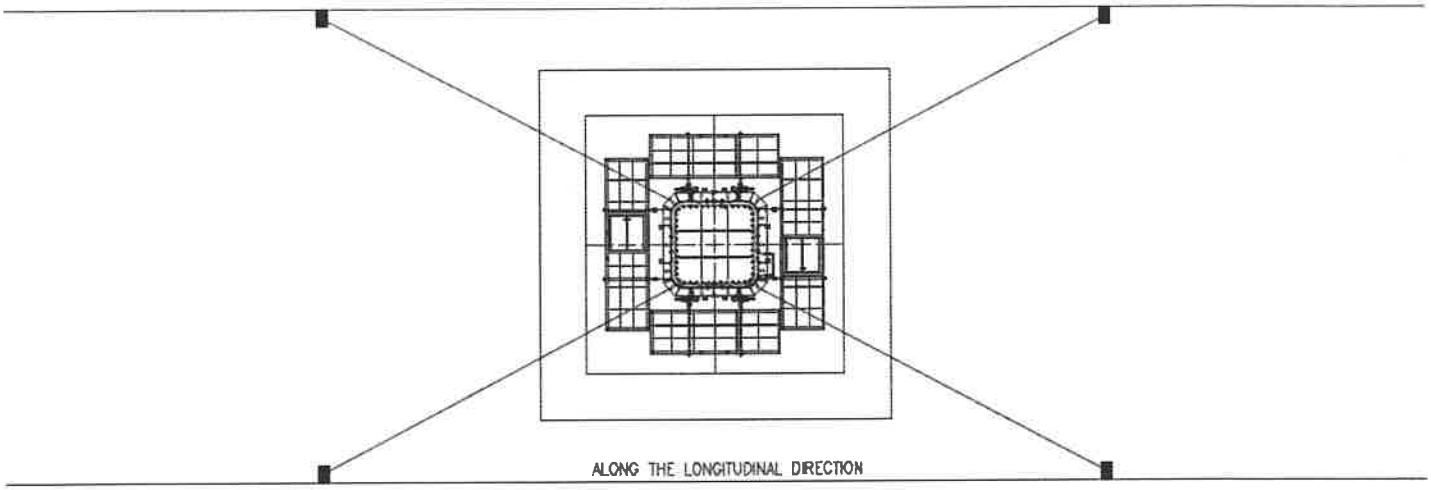


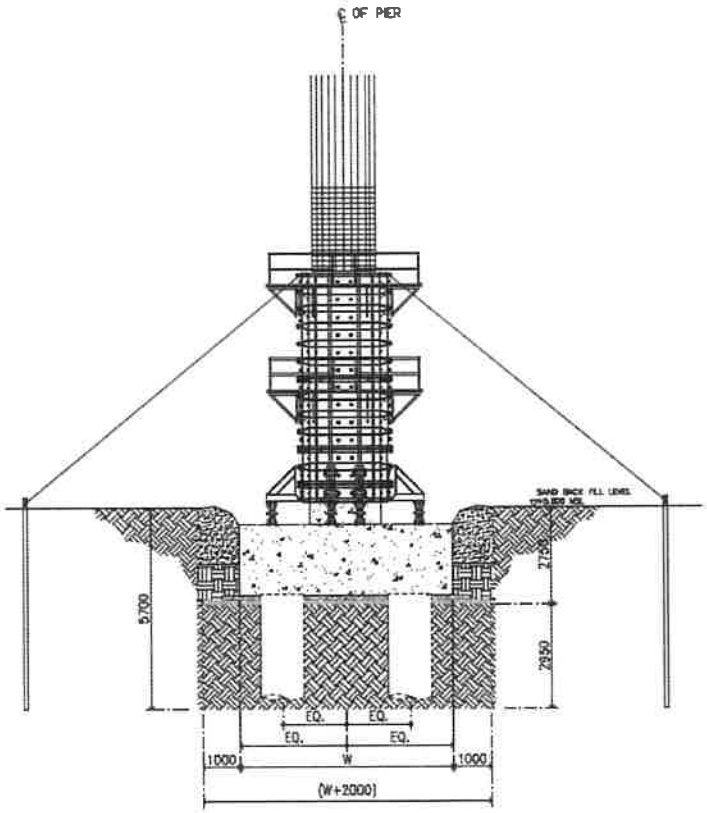
- REMOVE GUY WIRE FROM THE KICKER REBAR AND TEMPORARY SHORING
- ALSO REMOVE THE SCAFFOLDINGS



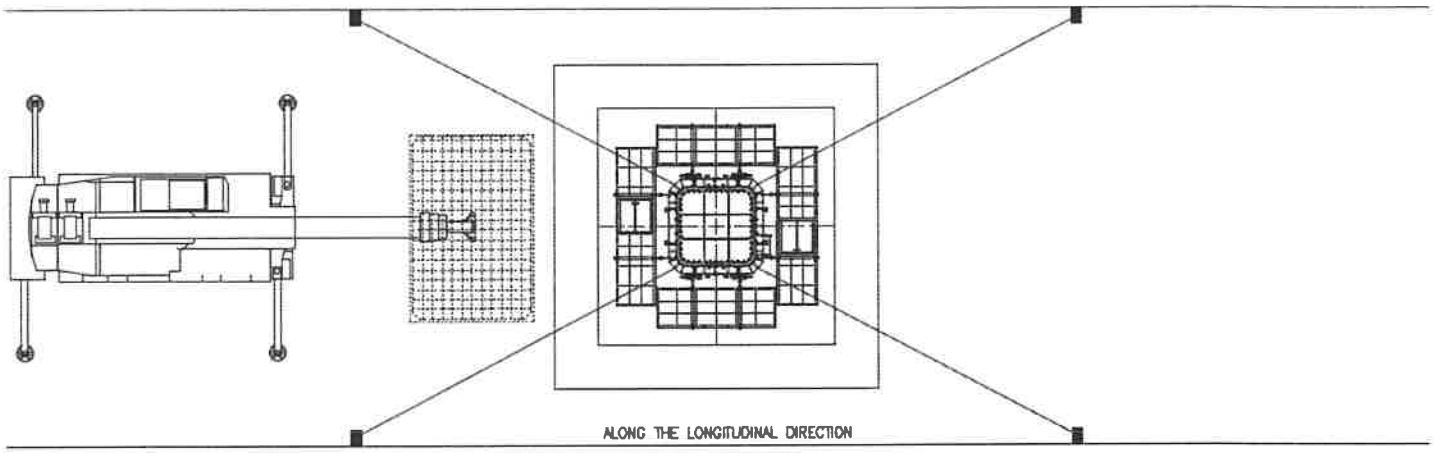


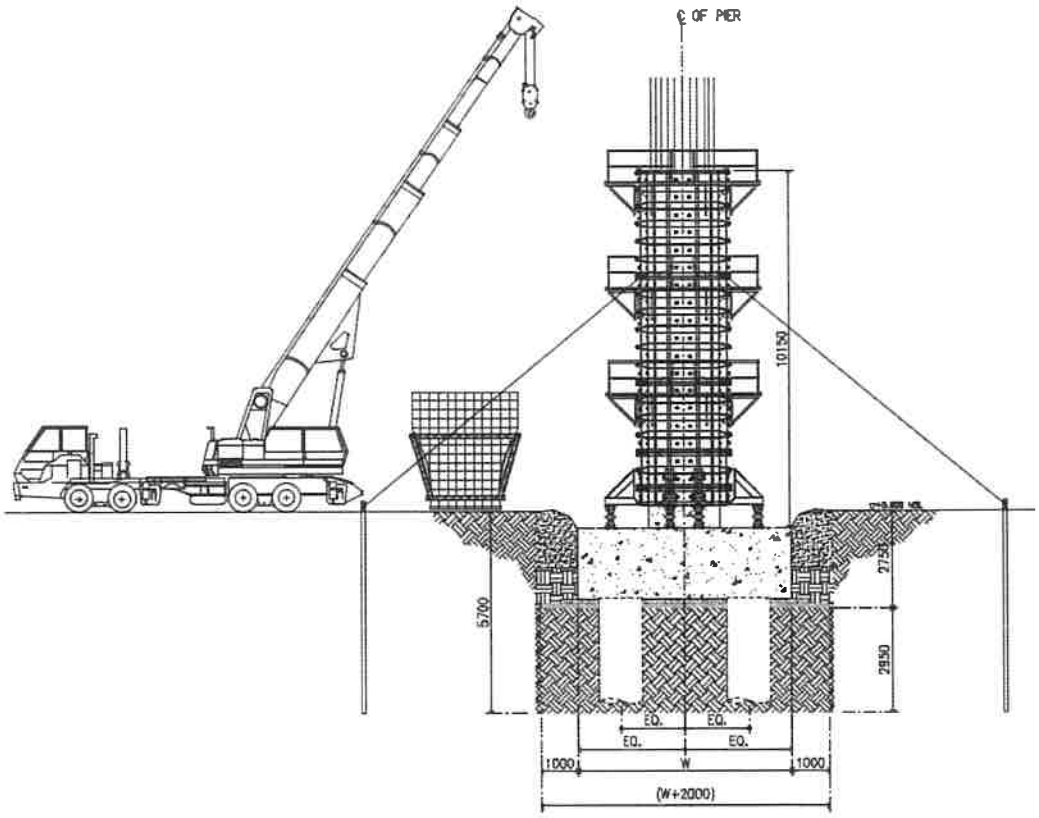
- INSTALL SCREW JACK BESIDE THE KICKER
- INSTALL PIER COLUMN FORMWORK TO THE LEVEL BY LIFTING UP & ADJUST LEVEL AND VERTICALITY BY USING PLUMB (OR EQUAL)
- TIE GUY WIRE WITH FORMWORK BY USING ANCHOR SHACKLE (OR EQUAL)



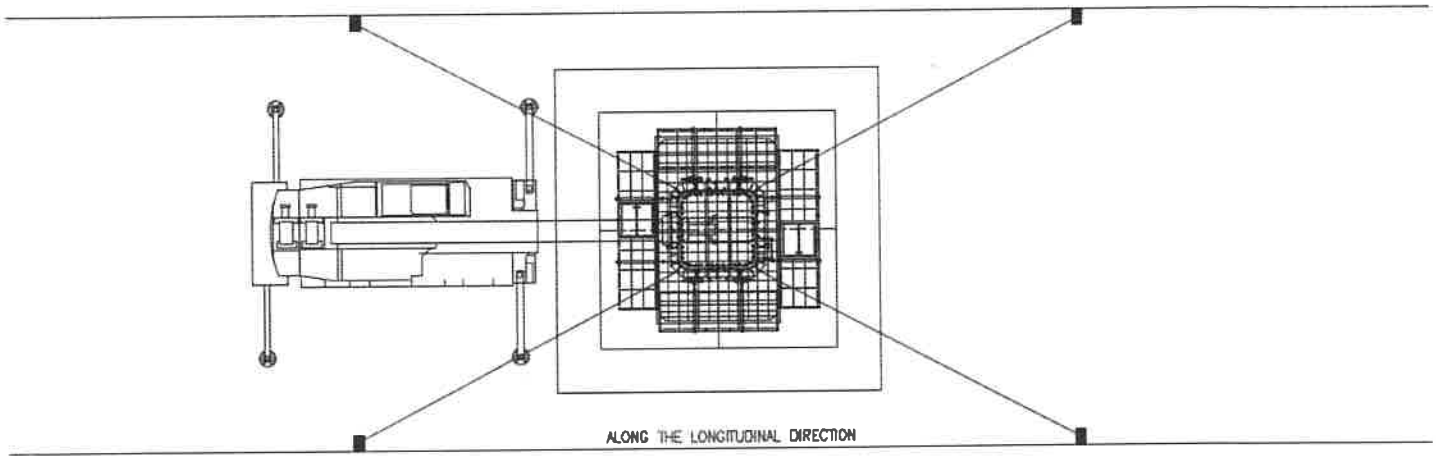


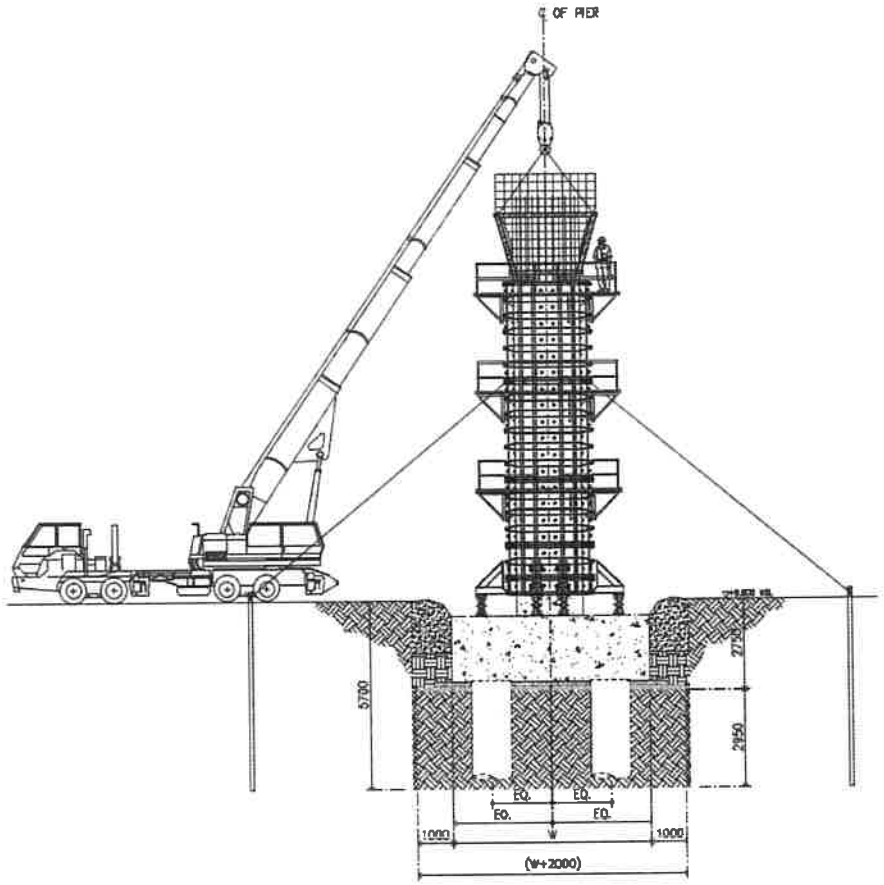
- REMOVE GUY WIRE FROM THE REBAR COLUMN AND TEMPORARY SHORING



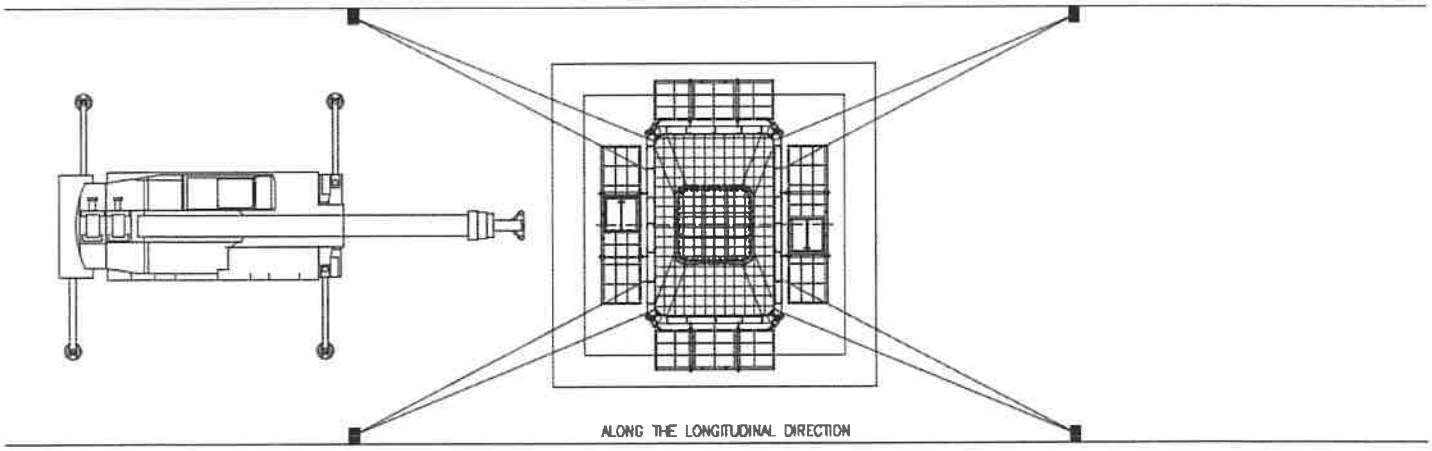


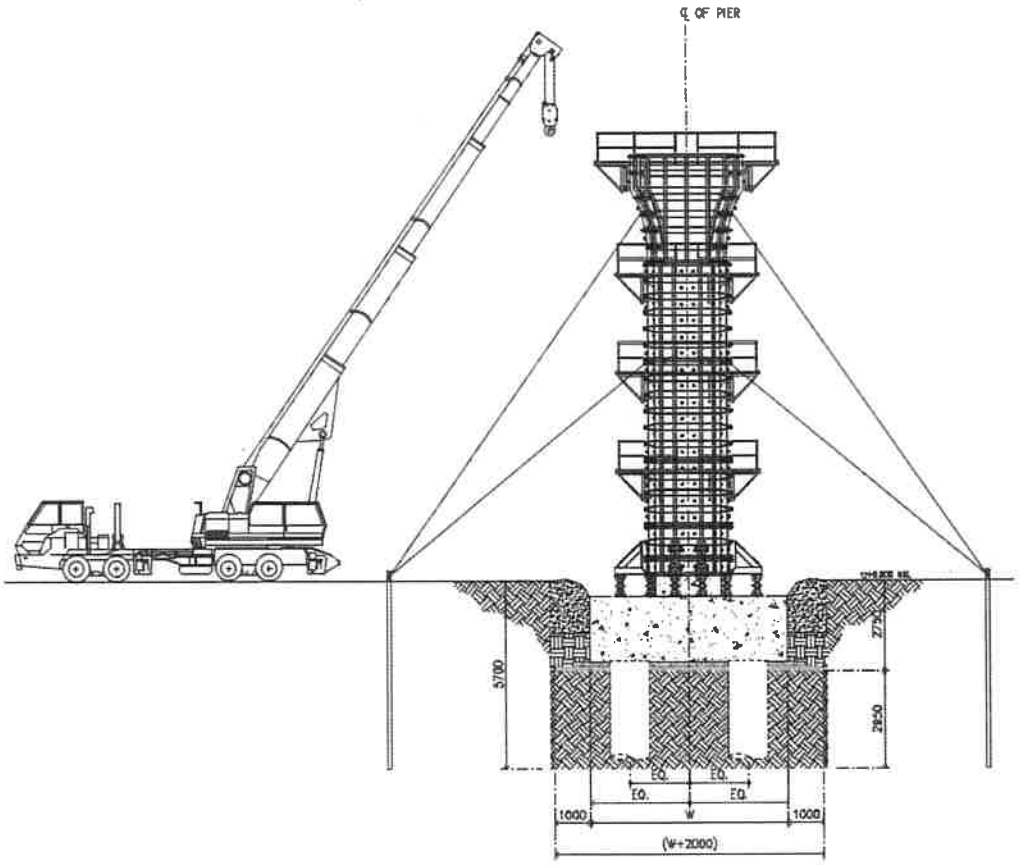
- CONTINUE TO INSTALL THE FORMWORK TO TOP LEVEL OF PIER COLUMN
- FABRICATE THE REBAR CAGE OF PIER HEAD INSIDE THE STEEL FRAME WITHIN JIG AT THE GROUND
- FINISH EARTHING & GROUNDING SYSTEM



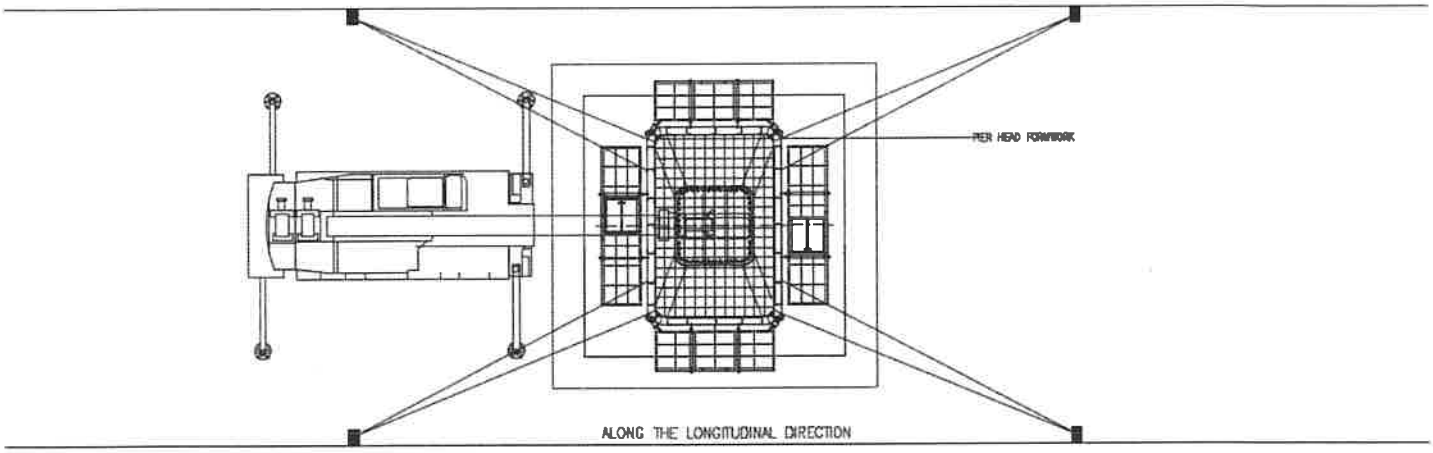


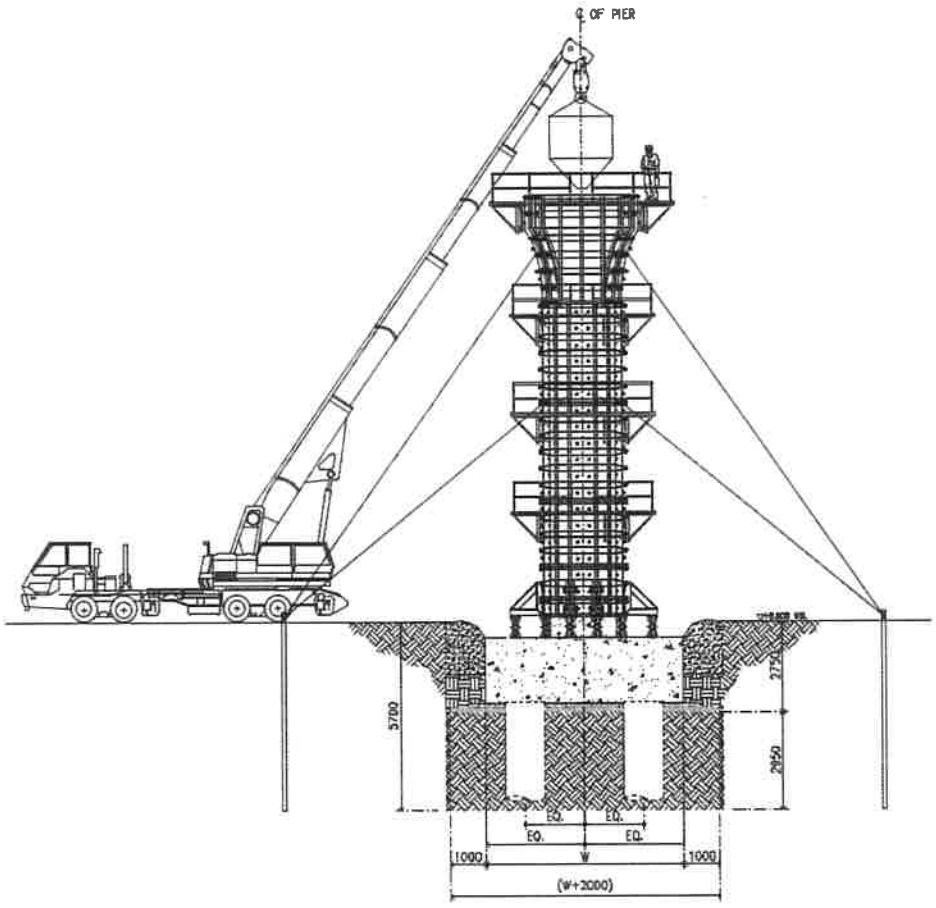
- CLEAN THE REBAR AT THE TOP OF PIER COLUMN
- LIFT THE PRE-FABRICATED PIER HEAD REBAR CAGE UP TO SPLICING LEVEL, INSTALL AND ADJUST ITS POSITION



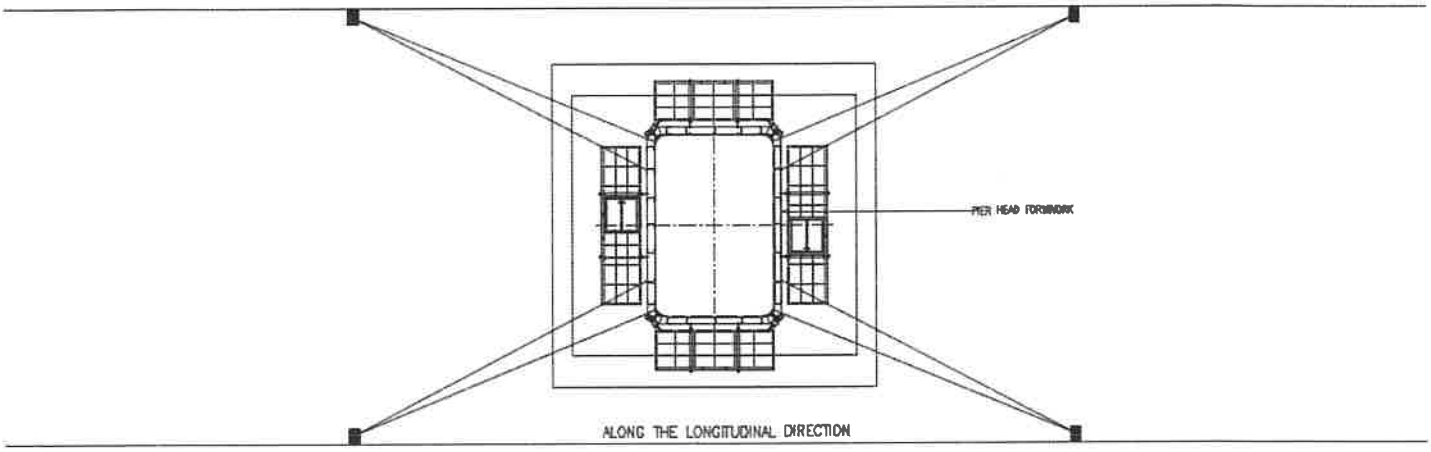


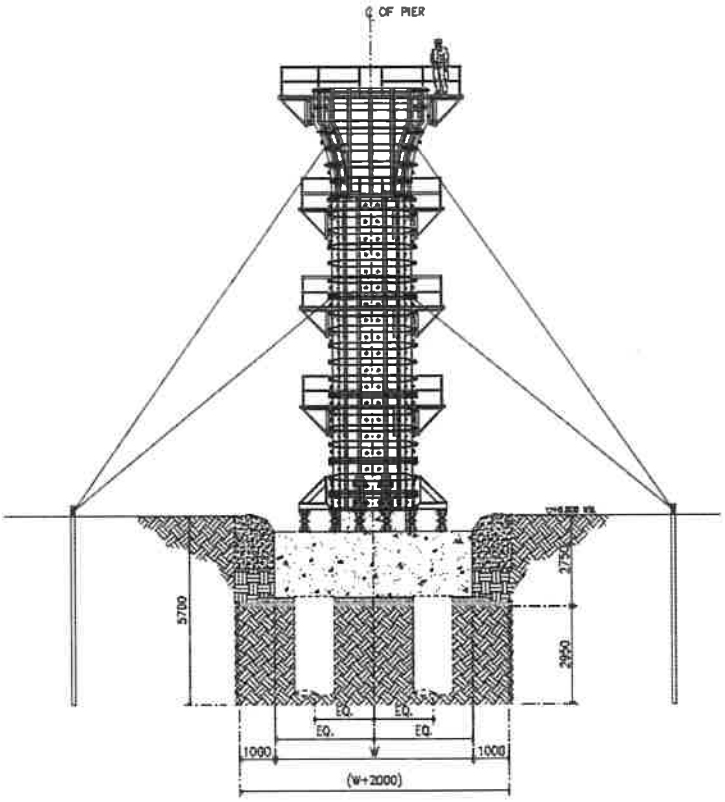
- INSTALL PIER HEAD FORMWORK
- TIE GUY WIRE WITH PIER HEAD FORMWORK
- FORMWORM MUST BE CHECKED, ADJUSTED AND MAINTAINED DEPTH LEVEL AND VERTICALITY



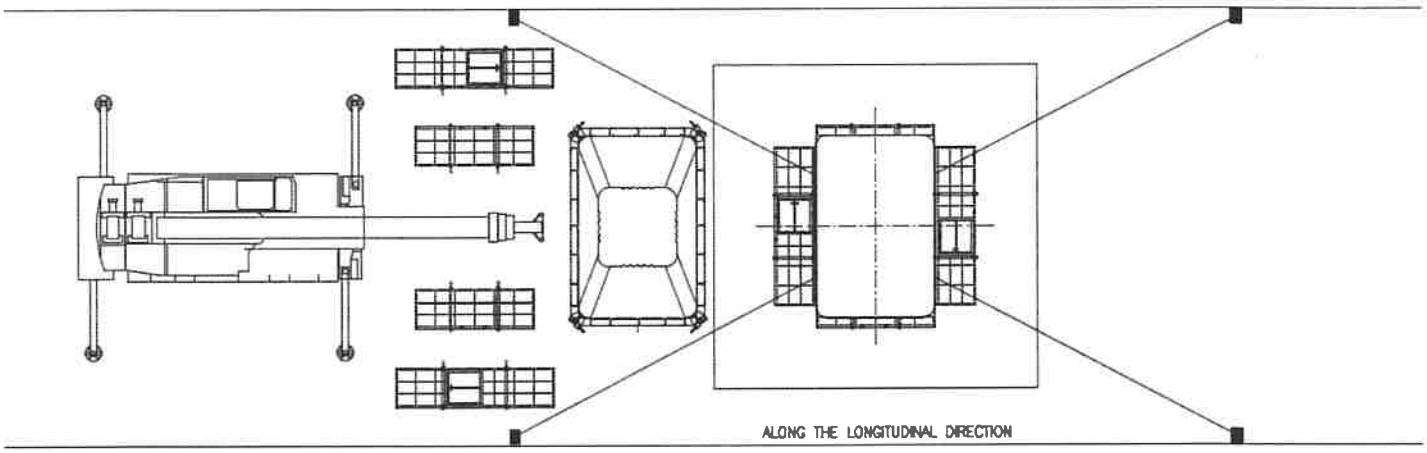


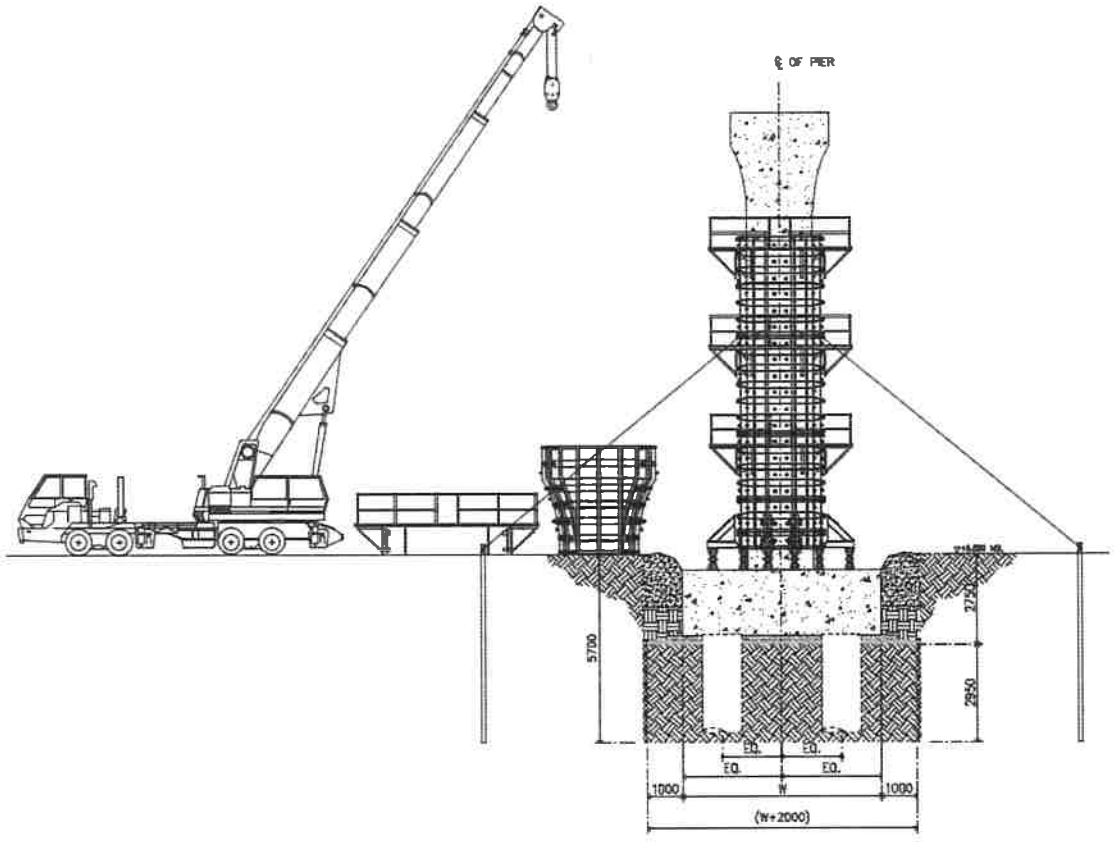
- POUR MORTAR OR APPROVED BONDING AGENT BEFORE CONCRETING TO AVOID CONCRETE SEGREGATION AT THE CONNECTION BETWEEN HARDEN CONCRETE AND NEW FRESH CONCRETE PROPERLY
- CONCRETING BY BUCKET WITH FLEXIBLE HOSE UNTIL CONCRETE IS AT THE REQUIRED LEVEL WITHOUT SEGREGATION OR DISPLACEMENT OF THE REINFOCEMENT, EMBEDDED ITEMS AND FORMWORK



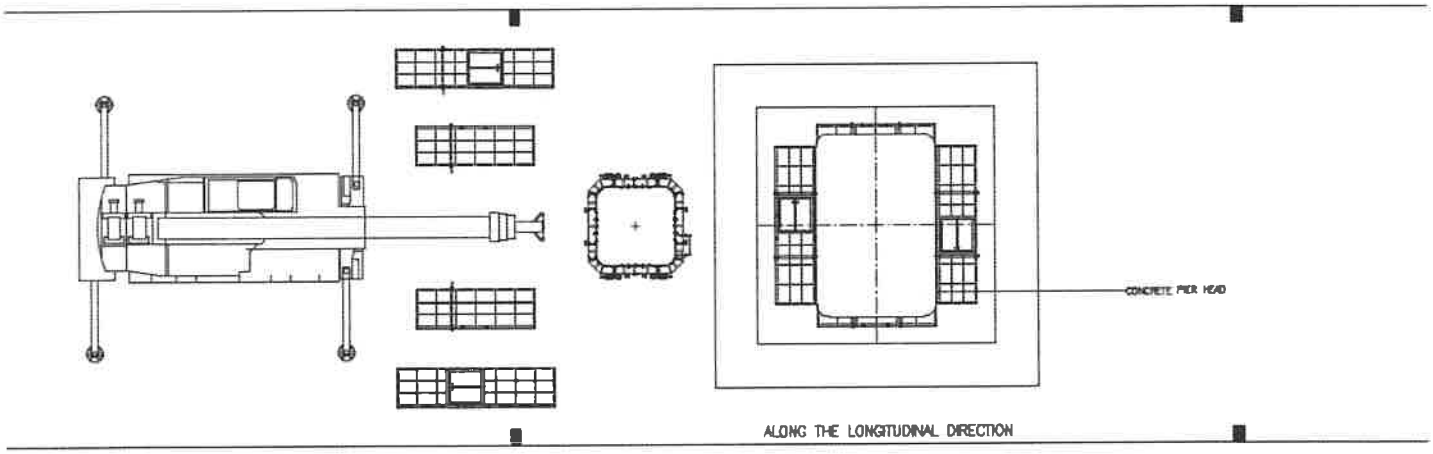


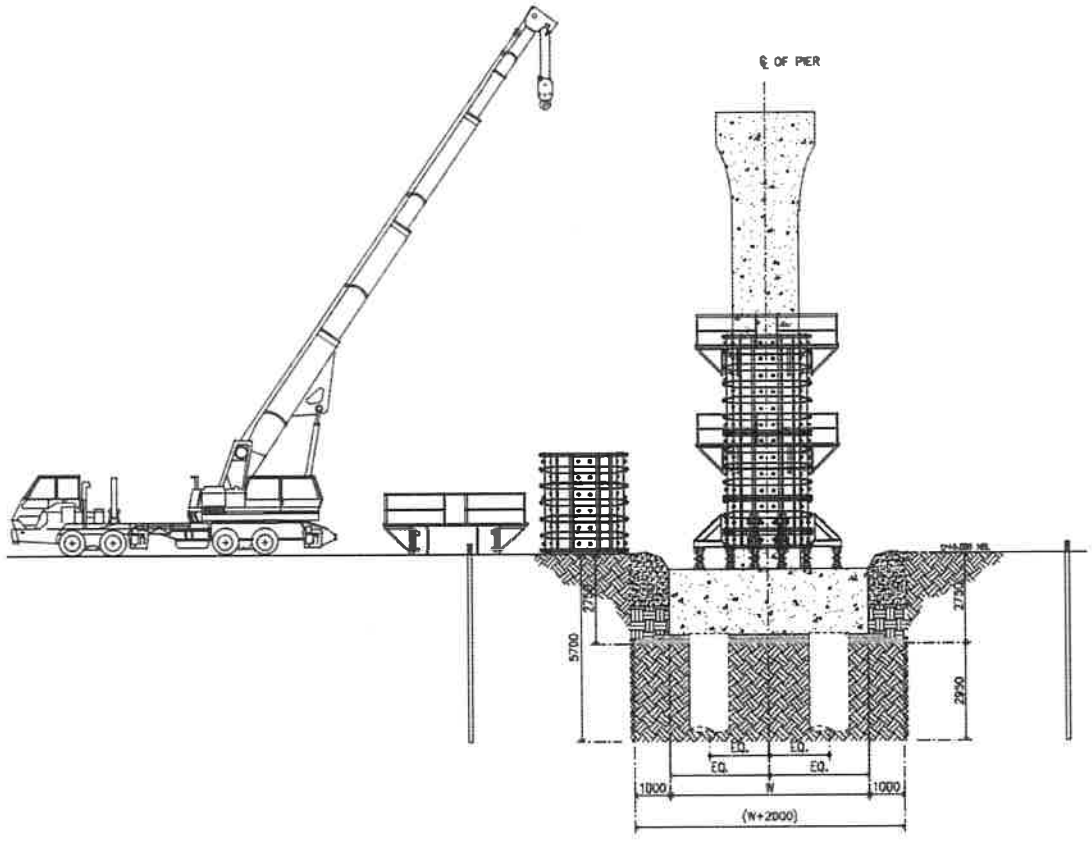
- ALSO USE EXTERNAL OR INTERNAL VIBRATOR (12 m. LONG) WITH FREQUENCY CONVERTOR TO SPREAD FRESH CONCRETE UNIFORMLY
- WHEN CONCRETING IS FINISHED, APPLY RETARDER AGENT AT TOP OF COLUMN FOR GREEN CUT AT THE CONSTRUCTION JOINT I.E. SEISMIC BUFFER, BEARING BASE



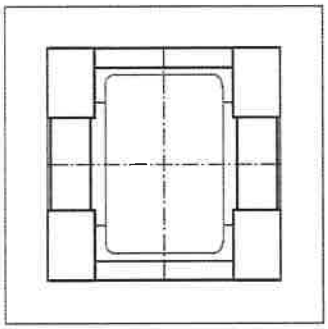


- AFTER CONCRETING 24 Hrs. OR UNTIL THE CONCRETE HAS SUFFICIENTLY HARDENED IN ORDER THAT IT CAN CARRY ITS OWN WEIGHT AND ANY OTHER LIVE LOADS IT IS TO SUBJECTED, REMOVE GUY WIRE AND DISMANTLE PIER HEAD FORMWORK

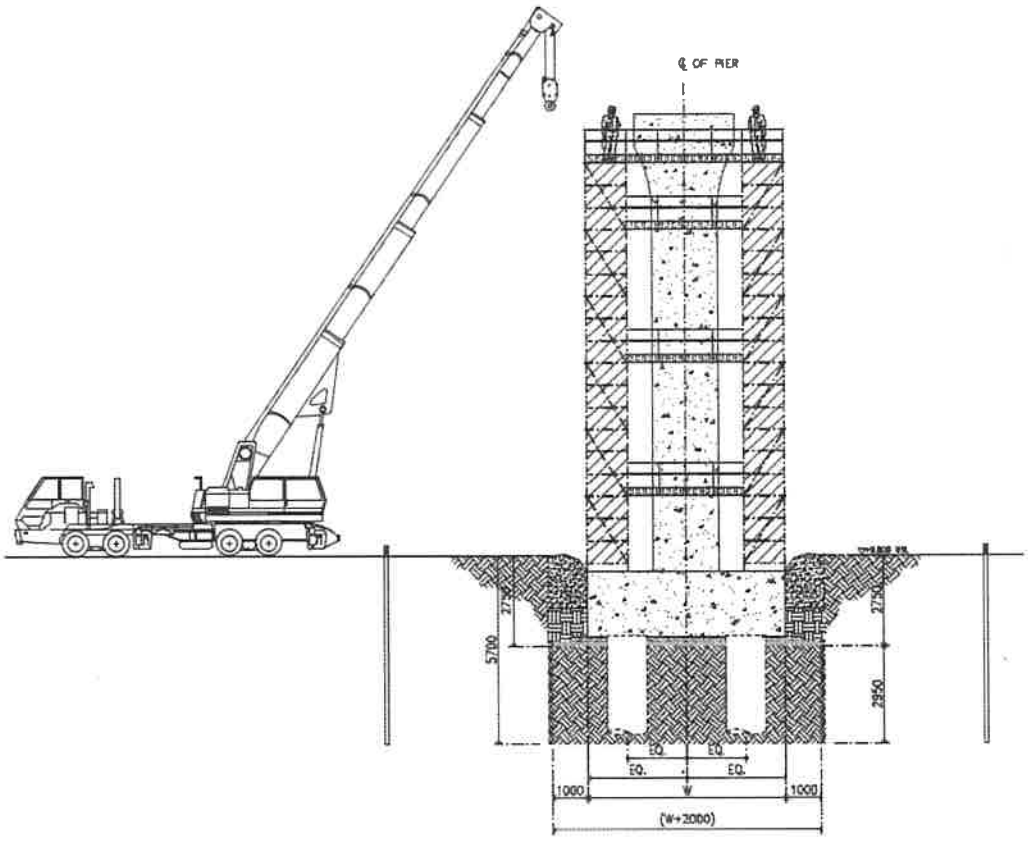




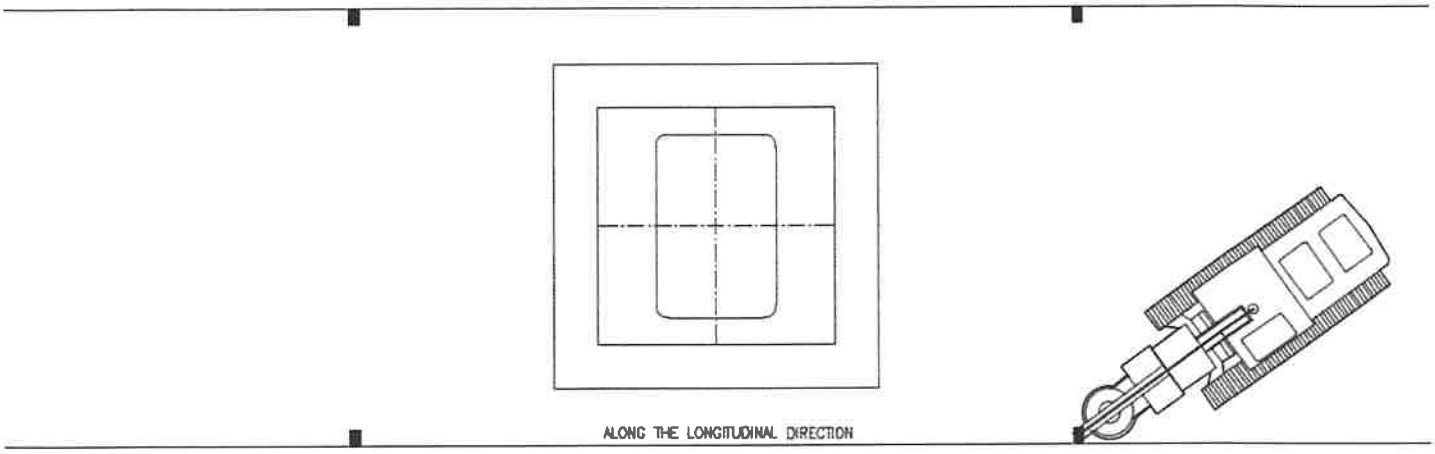
- REMOVE GUY WIRE FROM PIER COLUMN FORMWORK
- DISMANTLE PIER COLUN FORMWORK

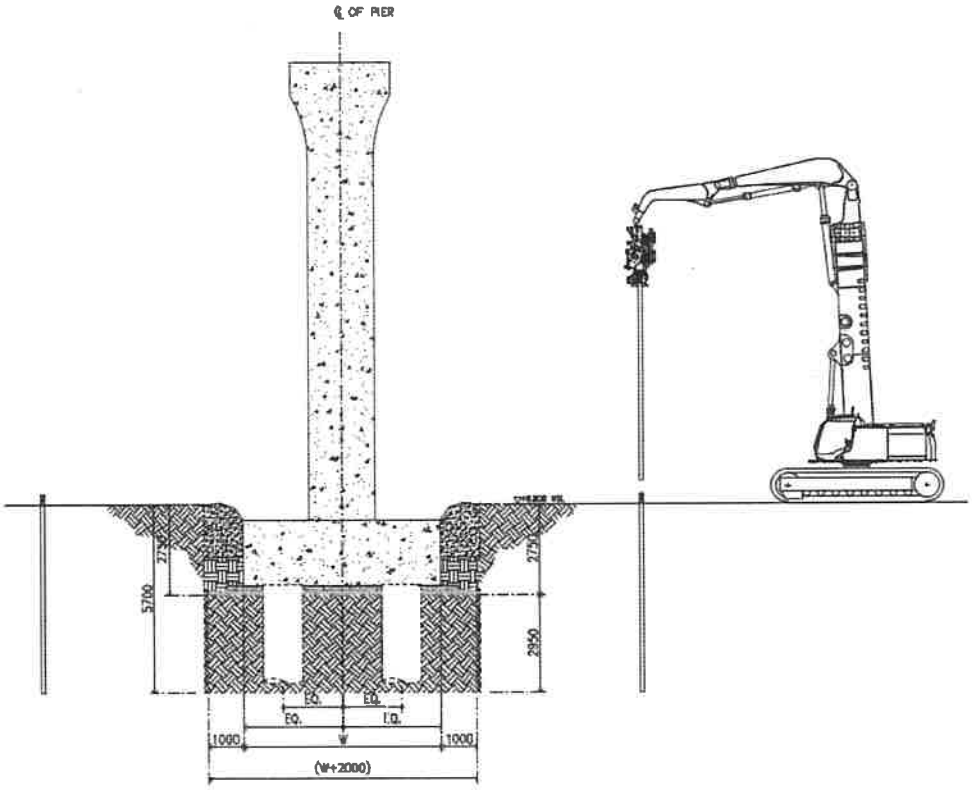


ALONG THE LONGITUDINAL DIRECTION



- INSTALL THE SCAFFOLDING ATTACHED WITH SAFETY NET
- APPLY CURING WITH PLASTIC SHEET FOR 7 DAYS AFTER DISMANTLING OF THE FORMWORKS

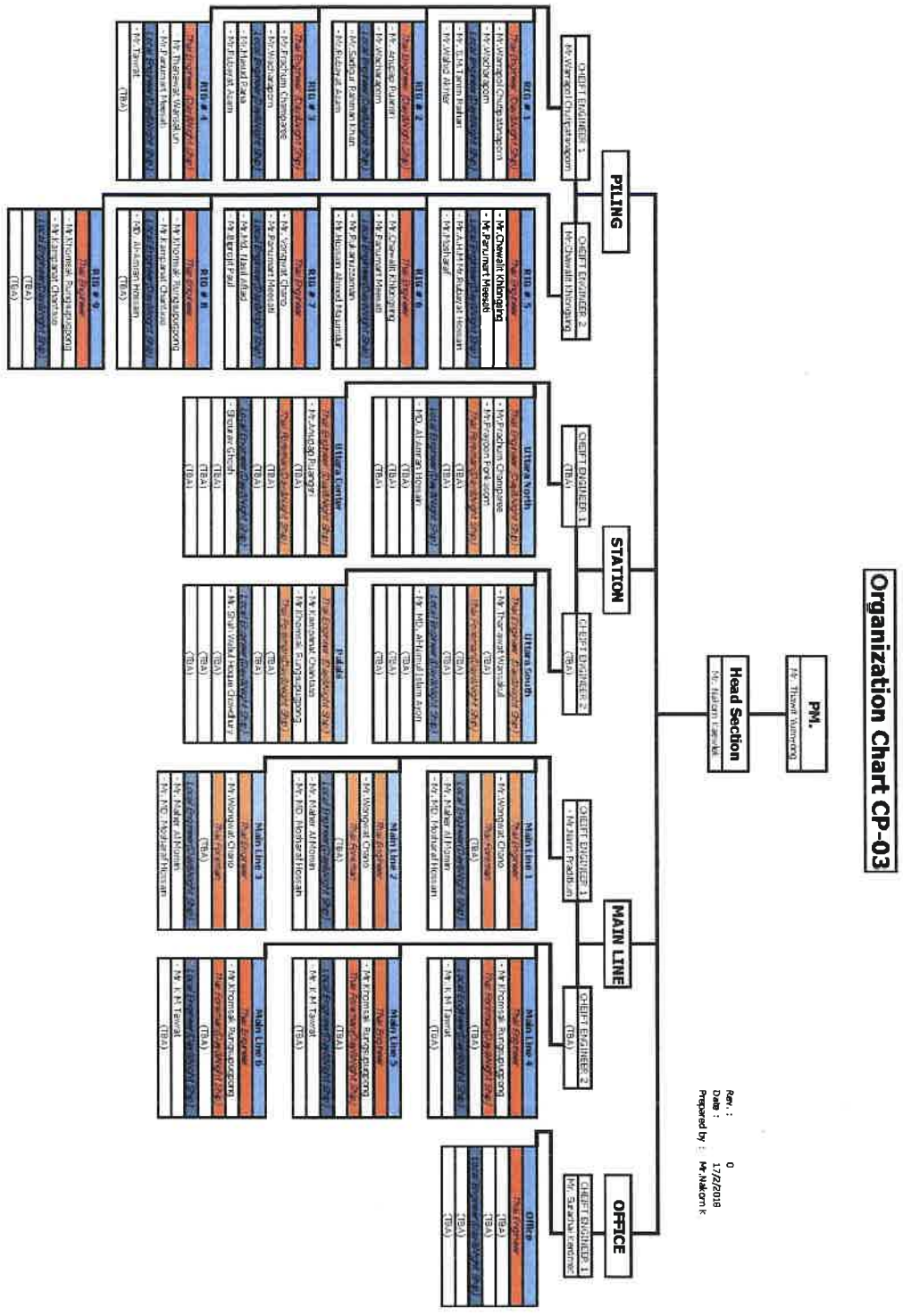


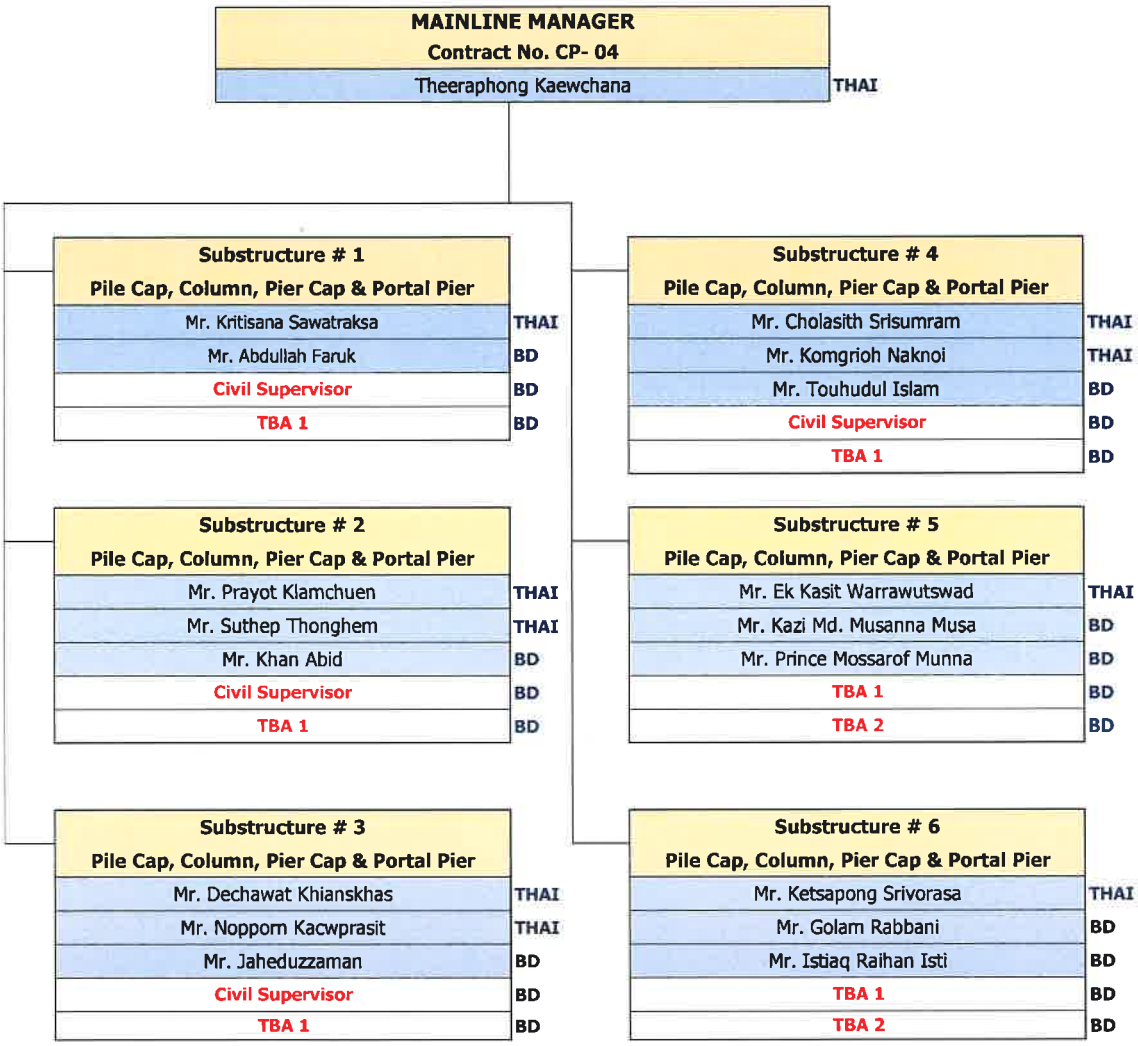


- REMOVE THE REST TEMPORARY SHORINGS

ATTACHMENT 5

ORGANIZATION CHART


Organization Chart CP-03
PM.
Mr. Thawit Jumroog
Head Section
Mr. Nakorn Laewkit
PILING
STATION
MAIN LINE
OFFICE
CHIEF ENGINEER 1
Mr.Wanapol Chuenpongpon
CHIEF ENGINEER 2
Mr.Chawalit Khongpeng
CHIEF ENGINEER 1
(TBA)
CHIEF ENGINEER 2
(TBA)
CHIEF ENGINEER 1
Mr.Narin Pradidan
CHIEF ENGINEER 2
(TBA)
CHIEF ENGINEER 1
Mr. Saranon Kanchanasut
Rev. : 0
Date : 17/2/2018
Prepared by : Mr.Nakorn K



ITD Main Line Manpower

Sl No.	Description	Expected:	Current:	Balance
1	Thai Engineers:	28	25	3
2	Local Engineers:	74	50	24
3	Supervisor	6	6	0
4	Secretary & Document Controller	2	1	1
	Total	110	82	28