INTERNSHIP REPORT

ON

"BRIDGE DESIGN AND CONSTRUCTION WORKS"

Submitted to-

MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE GWALIOR

(A Govt. Aided Autonomous Institute under RGPV, Bhopal (M.P) Established in 1957)

IN PARTIAL FULFILLMENT FOR REQUIREMENT FOR THE AWARD OF THE DEGREE

OF

BACHELOR of TECHNOLOGY

IN

CIVIL ENGINEERING

2018-2022

Submitted By–

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Date: May 20th, 2022

CERTIFICATE

This is to certify that **Mr. Sourabh Kourav** Student of Bachelor of Technology, IV Year, Civil Engineering Department from **Madhav Institute of Technology and Science, Gwalior** has successfully completed his field training from January 20th, 2022 to May 20th, 2022 under the guidance of **Shanul Saxena**, **Assistant Engineer** and Naveen Malhotra , **Sub Engineer**. He has acquired a thorough knowledge of bridge design & construction works.

The overall performance of **Mr. Sourabh Kourav**, during the training period, has been found satisfactory.

Naveen Malhotra
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20/05/22
Sanjay Khandelwal
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M.P.P.W.D.

ACKNOWLEDGEMENT

When it comes to properly acknowledging someone's support and assistance, it may be a challenging undertaking, chiefly when the support offered is so wholehearted and unwavering.

I am eternally grateful to my renowned guide, **Dr. MK TRIVEDI**, Assistant Professor of Civil Engineering Department, MITS Gwalior.

Also, I would like to thank **Dr. M.K. Trivedi**, Head of Civil Engineering Department, MITS Gwalior, and all other academics and staff members of MITS Gwalior's Civil Engineering Department for their unwavering support throughout the project.

I am really grateful to **Dr. R. K. Pandit**, Director of MITS Gwalior, for establishing an outstanding institutional environment and for giving all facilities and assistance in the preparation of my dissertation.

Last but not least, I'd want to thank my supportive family for their encouragement and cooperation during this project's duration. Thank you also to all of my friends for their encouragement and support.

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(0901CE181110)
DEPARTMENT OF CIVIL ENGINEERING MITS GWALIOR (M.P.)

RECOMMENDATION

It is hereby recommended that the internship report entitled — **BRIDGE DESIGN AND CONSTRUCTION WORKS** which is being submitted by **SOURABH KOURAV** completed under the guidance of **Dr. M.K. TRIVEDI** may be accepted in the partial fulfillment of the award of the degree of Bachelor of Engineering in Civil Engineering.

Guided by

27/05/22

for Prof. and Head
Civil Engineering Department
MITS, Gwalior

for Dr. M.K. TRIVEDI
Civil Engineering Department
MITS, Gwalior

ABSTRACT

The Internship Report in broad spectrum contains the material in which I will try to explain my four months learning experience in the running project, construction of flyover from GAYATRI MANDIR to GANESH MANDIR in Bhopal. The content is made from the practical basis of the site work of weekly basis.

In this report I put all the details of the work done in same manner at the site for the completion of the project. It has feature like project details, cost involved and length of the flyover etc. This also able to explain all the machines and equipment used in the whole construction with their respective pictures.

This report explains all the related tests on the materials in the construction; the test on the aggregates, cement and concrete etc., on this basis which material is suitable for the construction process will be decided.

After reading all the content one can easily understand basics of flyover construction process.

ABSTRACT IN HINDI

व्यापक स्पेक्ट्रम में इंटर्नशिप रिपोर्ट में वह सामग्री है जिसमें मैं भोपाल में गायत्री मंदिर से गणेश मंदिर तक फ्लाईओवर के चल रहे प्रोजेक्ट में अपने चार महीने के सीखने के अनुभव को समझाने की कोशिश करूंगा। सामग्री साप्ताहिक आधार पर साइट कार्य के व्यावहारिक आधार से बनाई गई है।

इस रिपोर्ट में मैंने परियोजना को पूरा करने के लिए साइट पर एक ही तरीके से किए गए सभी कार्यों का विवरण रखा है। इसमें परियोजना विवरण, लागत शामिल और फ्लाईओवर की लंबाई आदि जैसी विशेषताएं हैं। यह पूरे निर्माण में उपयोग की जाने वाली सभी मशीनों और उपकरणों को उनके संबंधित चित्रों के साथ समझाने में सक्षम है।

यह रिपोर्ट निर्माण में सामग्री पर सभी संबंधित परीक्षणों की व्याख्या करती है; समुच्चय, सीमेंट और कंक्रीट आदि पर परीक्षण इस आधार पर तय किया जाएगा कि निर्माण प्रक्रिया के लिए कौन सी सामग्री उपयुक्त है।

सभी सामग्री को पढ़ने के बाद फ्लाईओवर निर्माण की मूल बातें आसानी से समझ सकते हैं

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INTRODUCTION

The majority the design philosophy will be based on limit state design. The requirements of the corresponding clauses of the relevant IRC codes for fatigue limit state, serviceability limit state, and ultimate limit state must be met by structural components and connections.

CLASSIFICATION

Bridges are classified by their principal function, material of construction, length, structural form, deck level, support system, and construction method in relation to the highest flood level. The broad details of bridge classification are as follows:

1.Length:

2.1 Based on Length, Structures are divided as given below.

a) Bridge

b) Culvert

2.2 The bridges are further divided as minor and major bridges as given below

a) Minor bridge having a total length of up to 60 m.

b) Major bridge having a total length of more than 60 m.

2.3 Bridges having span length (s)

If bridge span having length150 m or more than 150 are known as long span bridges

2. Superstructure:

3.1 Form of Superstructure

Based on form and type of superstructures, bridges are classified as under:

a) Single/Multi-cell Box

b) Truss

c) Suspension

d) Cable stayed

e) Box girder

f) Extra-dosed

g) T-beam and slab

h) Solid slab

i) Voided slab

j) Arch

3.2 System of Support for Superstructure

Bridges are divided on the basis of systems of support as under given below:

a) Balanced Cantilever

b) Simply Supported

c) Cable Supported

d) Continuous

e) Integral

3. Level

River Bridges/Bridges over streams are divided based on difference in roadway level and Ground Level/High Flood Level (HFL), as under:

a) Submersible bridge:

b) High Level bridge

4. Function

Based on functions, bridges are

classified as under

a) Viaduct

b) River bridge/Bridge over stream

c) Grade separator

d) Flyover

e) Road Under Bridge (RUB)

f) Road Over Bridge (ROB)

g) Foot Over Bridge (FOB)

h) Overpass

i) Subways

j) Underpasses

5. Importance

Based on the importance of a bridge in the highway system, bridges are classified as under:

a) Important

b) Normal

d) Critical

6. Construction Technology

Based on technology for construction adopted, bridges are classified as under a) Precast or prefabricated

b) Incremental Launching

c) Span by span

d) In-situ

e) Cantilever

f) Segmental

7.Material

Based on material of structure, bridges are classified as under:

a) Reinforced Concrete

b) Fibre reinforced concrete

c) Pre-stressed concrete

d) Masonry

e) Composite

f) Timber

g) Steel

SELECTION CRITERIA FOR BRIDGE SITE

The investigating engineer should undertake a reconnaissance survey to get a sense of the surroundings and establish the sort of structure

that will be built on the site before deciding on a suitable place for a large bridge.

The investigation report should include a short description of the rationale for selecting a certain site, as well as crucial facts about alternative sites that were explored and rejected, before deciding on the one that is most likely to suit the bridge's objectives at the lowest cost.

DETAILS OF OUR PROJECT

FLYOVER STRUCTURE

- **CONSTRUCTION OF FLYOVER FROM GAYATRI MANDIR TO DB MALL, BOARD OFFICE SQUARE, PRAGATI PETROL PUMP, MANSAROWAR COMPLEX UP TO GANESH MANDIR IN THE CITY OF BHOPAL (M.P.)**
- **TOTAL LENGTH OF FLYOVER: - 2.74KM**
- **ESTIMATED PROJECT COST 140 CRORES (APPROX.)**
- **PROJECT CLIENT: THE CHIEF ENGINEER, M.P. PUBLIC WORKS DEPARTMENT BRIDGE -ZONE**
- **PROOF CONSULTANT – MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL**
- **SAFETY CONSULTANT- AICONS ENGINEERING PVT.LTD, BHOPAL**
- **EPC CONTRACTOR- M/s VKSC INFRAPROJECTS LIMITED, BHOPAL**
- **DESIGN CONSULTANT- M/s STRUCTURE & HIGHWAY ENGINEERING CONSULTANT**

DETAILS OF FLYOVER

NO. OF PIERS – 91

NO. OF SPANS - 90

NO OF GURDERS – 90*5 = 450(Including PSC Girders)

LENGTH OF REINFORCED EARTH WALLS – 450 (APPROX.)

ELEMENTS OF MAIN FLYOVER STRUCTURE

- **Foundation: -** The foundation is the most important structural component of bridges, as well as the bridge's major component or segment. It receives loads from piers or abutments and transports them to the soil. The purpose of the foundation is to carry the bridge's load over a large bearing area while also providing stability against settlement and displacement. It is provided sufficient depth so that it is not altered by the scouring.

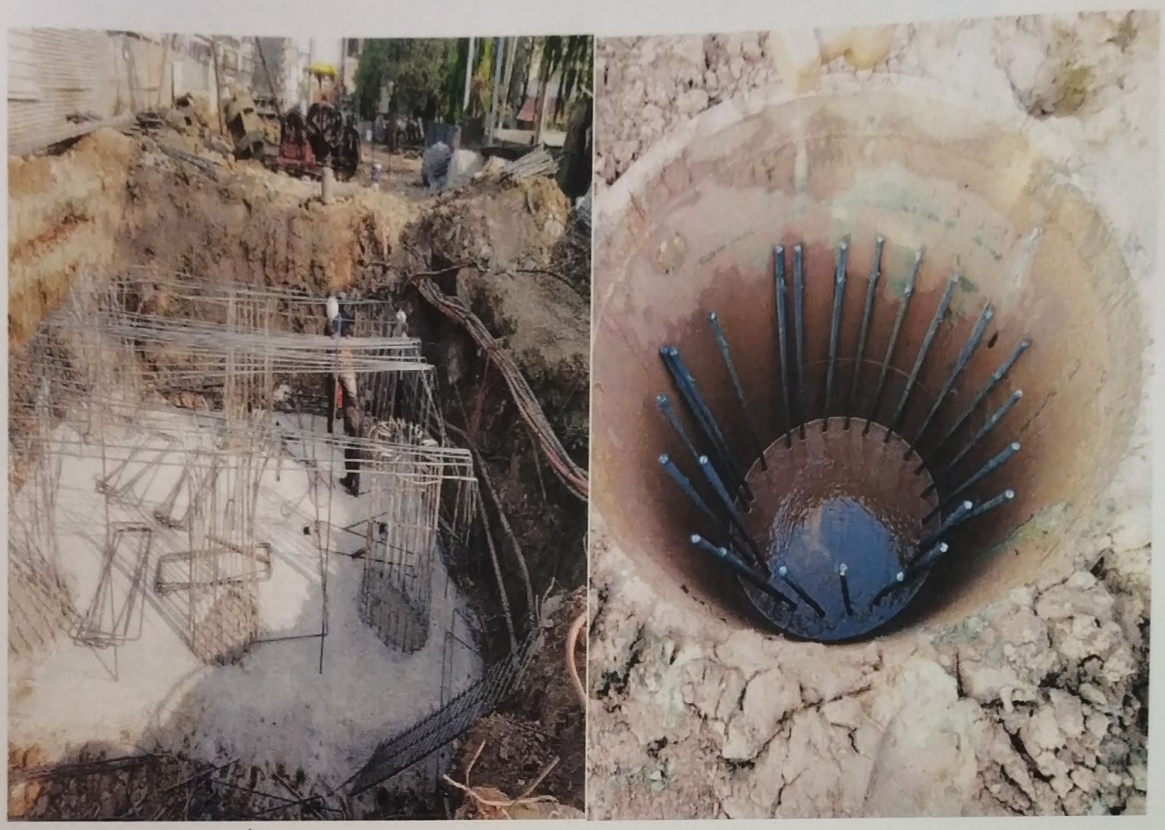


Fig 1: Foundation

- **PIER SHAFT: -** Piers are located at the extremities of bridge spans and serve as an intermediate between the abutments. The objective of the piers is to carry vertical loads from the superstructure to the foundation as well as to withstand all horizontal and transverse forces that occur on the bridge. Piers are frequently constructed from reinforced concrete or masonry. Piers add to the visual appearance of a bridge because they are one of the most visible components. They occur in a variety of shapes, depending on the superstructure's kind, size, and proportions, as well as the surrounding surroundings.

Fig 2: Pier shaft

- **PIER CAP:** The loads are transferred from the superstructure to the piers by pier caps. They support the girders of the bridge on bearing pads and distribute the stresses from the bearings to the piers. Pier caps will be installed on all bridges with piers to transfer the load from the superstructure.

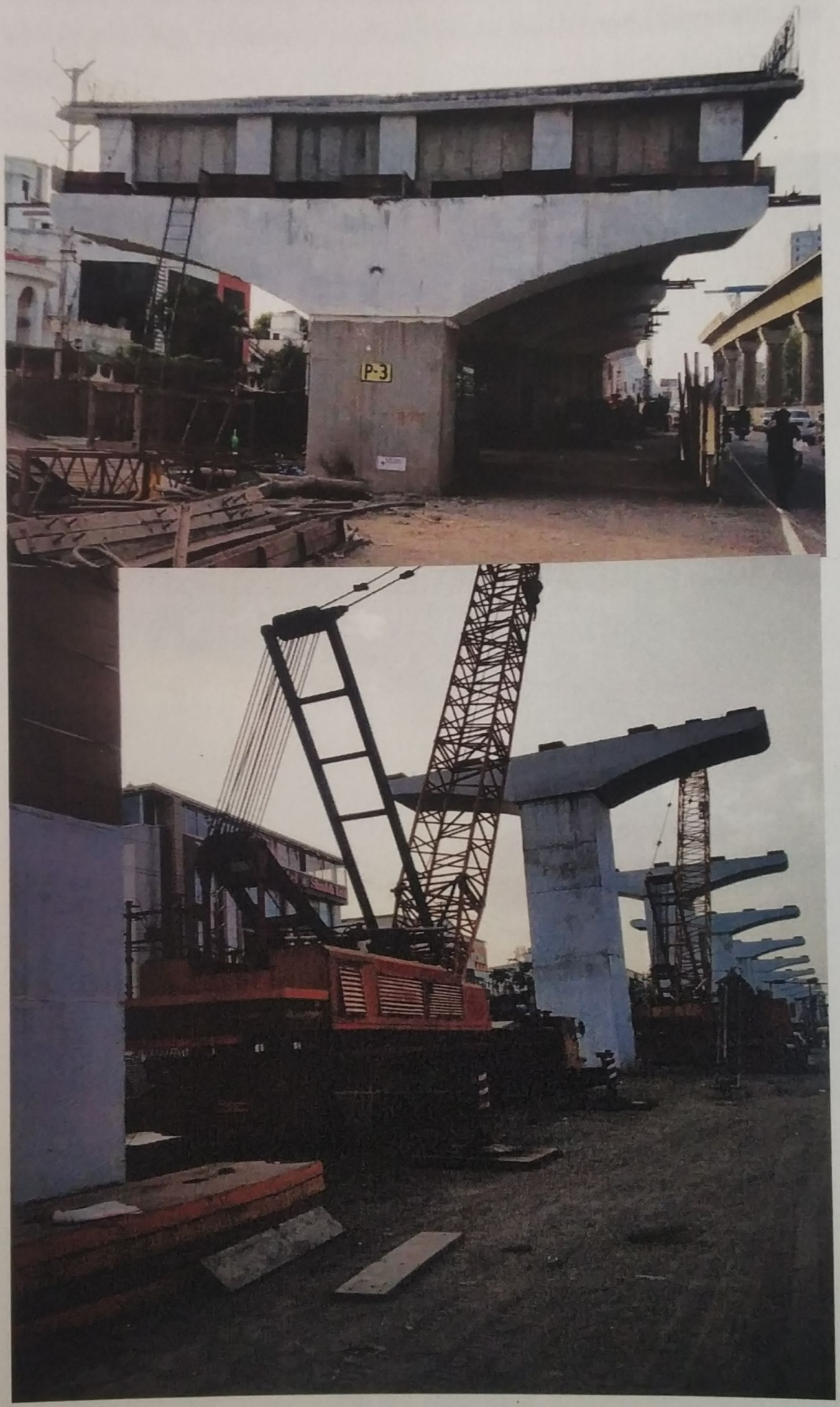


Fig 3: Pier Cap

- **PEDESTAL: -** One of the substructure components of bridges is the concrete pedestal. At the piers crosshead or abutment-top, concrete pedestals are positioned beneath the bridge. The concrete pedestal's primary role is to transfer loads from the bridge deck to the pier or abutment.

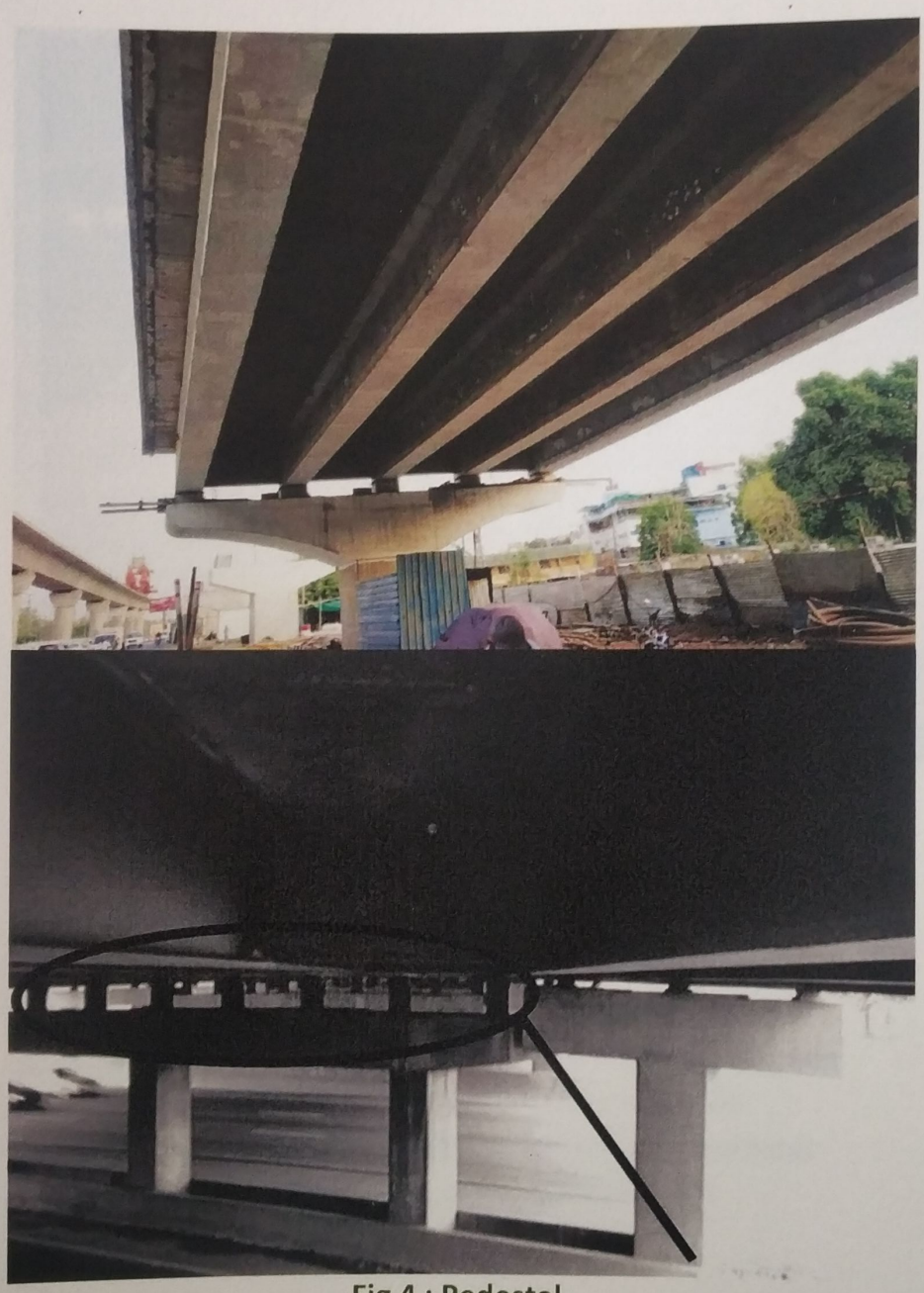


Fig 4 : Pedestal

- **BEARING: -** Between the bridge piers and the bridge deck, a bridge bearing provides a resting surface. The goal of a bearing is to allow for controlled movement, reducing stress.

Fig 5: bearing

Fig 6: Girder

- **DECK SLAB: -**The 'Deck' of the Bridge is a bridge with upper horizontal beams that carries a road or railway. In Deck Slab Bridges, the structural frame is the deck itself, or the entire deck is a thin beam operating as a single primary component. When the depth of the structure is crucial, these types are employed. A slab deck is one that is evaluated as if it were a plate. The bridge is evaluated as an orthotropic deck and is called as the Deck Slab Bridge if the slab has varying stiffness in two directions at right angles to each other.

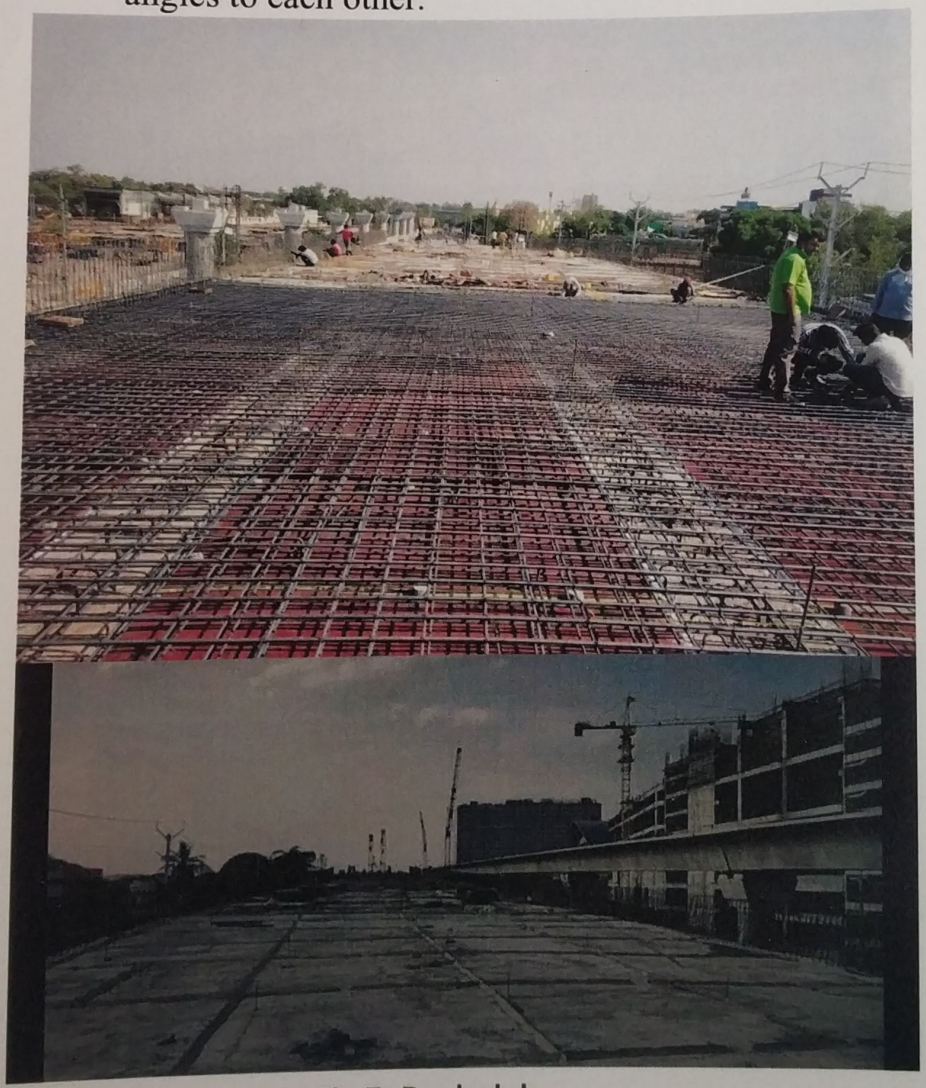


Fig 7: Deck slab

- **CRASH BARRIER: -**This is intended to prevent automobiles
from smashing into the roadway, river, or railroad below. To prevent vehicles, buses, pedestrians, and bicycles from vaulting or rolling over the barrier and tumbling over the side of the arrangement, it is usually higher than a roadside barrier.

Fig 8 Crash barrier

MATERIALS USED IN DIFFERENT ELEMENTS OF FLY OVER STRUCTURE:-

ELEMENTS	MATERIALS USED
FOUNDATION (OPEN+PILE)	M35
PIER SHAFT	M35
PIER CAP	M35
PEDESTAL	M40
BEARING	ELASTOMERIC + PTFE
GIRDER	M40/M45
DECK SLAB	M40
CRASH BARRIER	M40

TABLE NO.1 FLYOVER MATERIAL

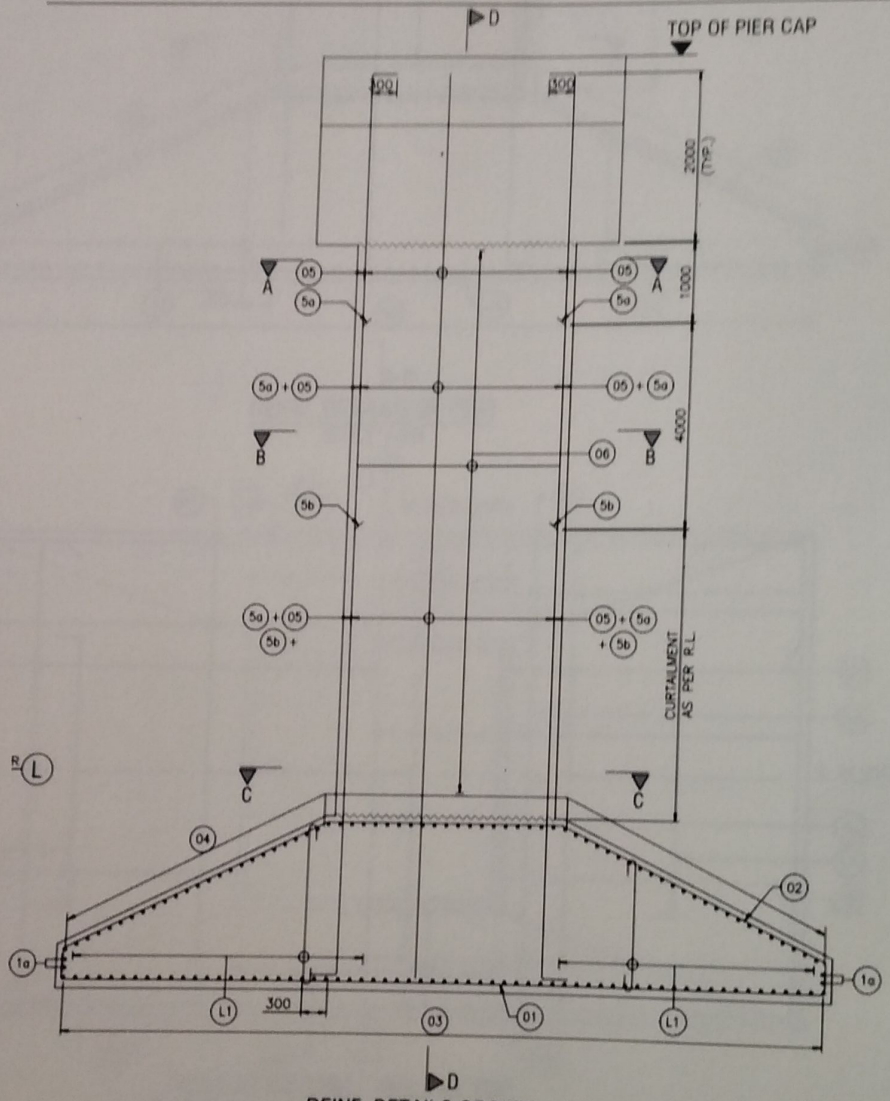
QUANTITY TAKE OFF FOR PIER FOOTING

•BBS CALCULATION OF PIER FOOTING FOR PIER NO- 65

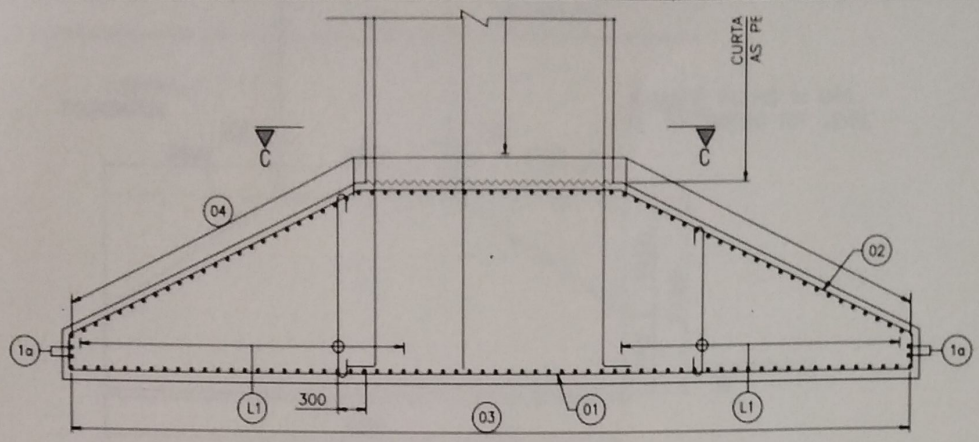
BAR SHAPE SCHEDULE

BAR MRKD.	DESCRIPTION	BAR SHAPE	REMARKS	
(01)	25 Φ @140 c/c	450 7850 450	BOTTOM LONGI.	FOUNDATION
(1a)	12 Φ @200 c/c	450 7850 450	SIDE	
(1b)	12 Φ @200 c/c	450 7850 450	SIDE	
(02)	12 Φ @140 c/c	LV 2800 LV 450	TOP LONGI.	
(2a)	12 Φ @140 C/C	LV LV LV 450	TOP LONGI.	
(03)	25 Φ @140 c/c	450 7850 450	BOTTOM TRANS.	
(04)	12 Φ @140 C/C	LV 2800 LV 450	TOP TRANS.	
(4a)	12 Φ @140 C/C	LV LV LV 450	TOP TRANS.	

TABLE NO.2 BAR SHAPE SCHEDULE OF FOUNDATION



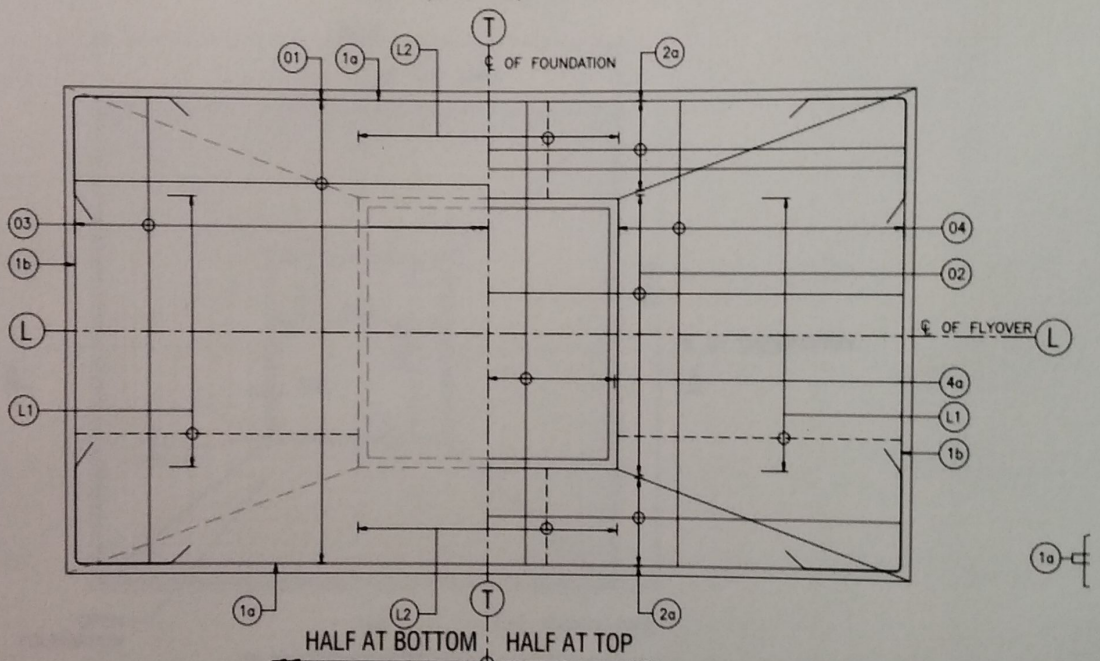
REINF. DETAILS OF PIER



D

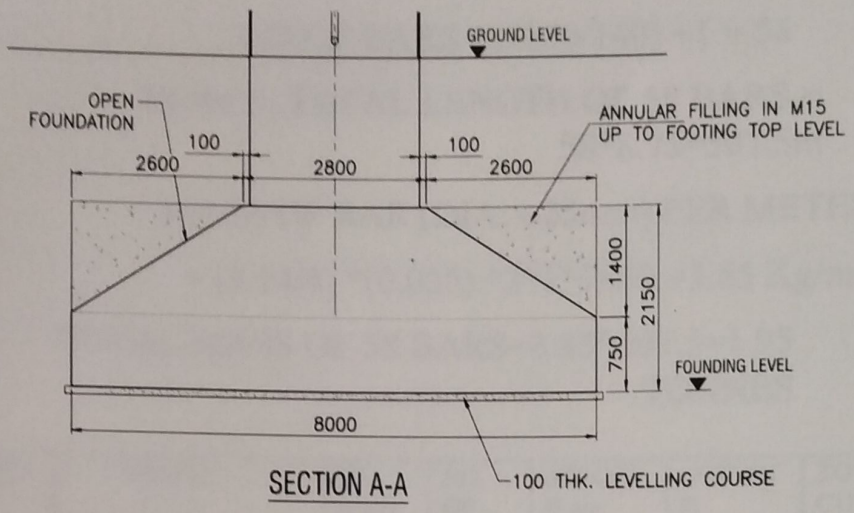
REINF. DETAILS OF PIER

(SCALE 1:40)

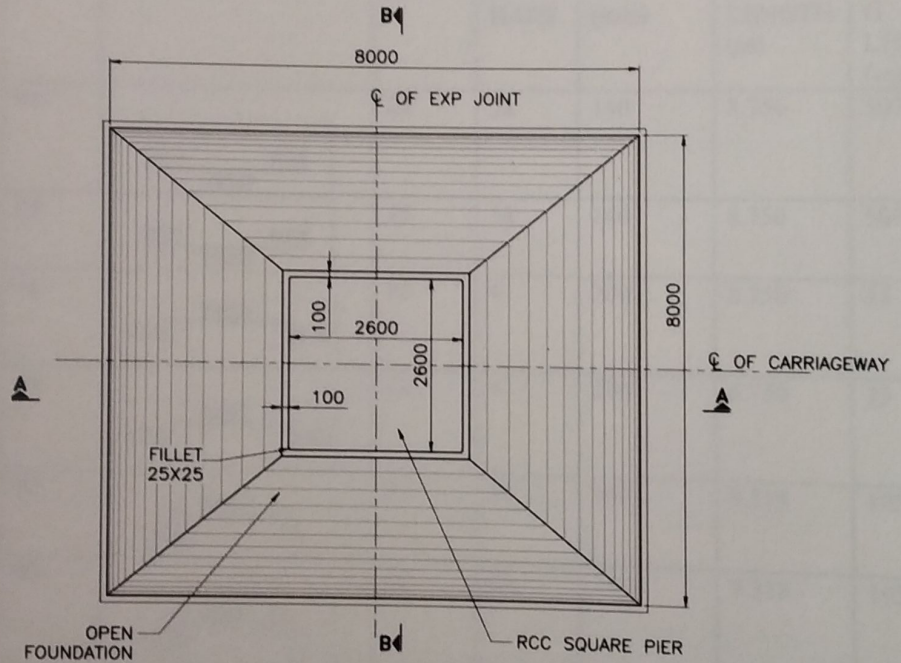


FOUNDATION PLAN

(SCALE 1:30)



SECTION A-A



PLAN AT FOUNDATION
(SCALE: 1:50)

STEEL QUANTITY CALCULATION FOR (01)MKD

TOTAL LENGTH OF ONE BAR = 7850+450+450= 8750mm

=8.75m

NO OF BARS= (7850/140) +1 = 58

HENCE, TOTAL LENGTH OF 58 BARS = 58*8.75=507.5m

MASS OF BAR (DIA. - 25mm) PER METER

= (3.14/4) *(0.025) ^2*1*7850 =3.85 Kg/m

TOTAL MASS OF 58 BARS=3.85*507.5=1.95 TONNES

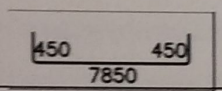
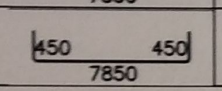
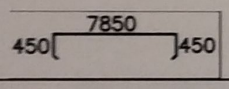
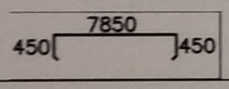
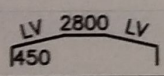
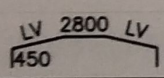
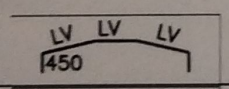
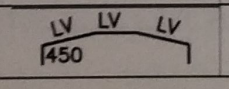
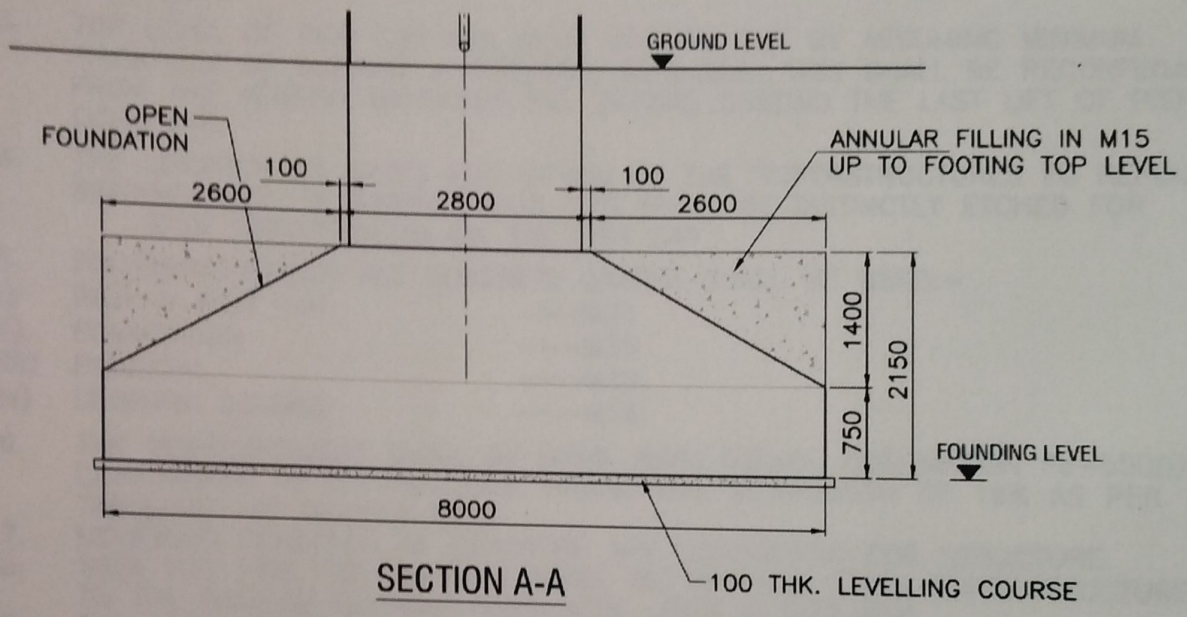
MKD	SHAPE	DIA (mm)	NO, OF BARS	SPACING c/c (mm)	CUTTING LENGTH (m)	TOTAL CUTTING LENGTH (m)	WEIGHT (TONNE)
01		25	58	140	8.750	507	1.950
03		25	58	140	8.750	507	1.950
1a		12	4	200	8.750	35	0.031
1b		12	4	200	8.750	35	0.031
02		12	21	140	9.318	195	0.174
04		12	21	140	9.318	195	0.174
2a		12	42	140	5.410	589	0.524
4a		12	42	140	7.612	589	0.524

TABLE NO.3 CALCULATION OF STEEL FOR PIER FOOTING

•CALCULATION OF CONCRETE FOR PIER FOOTING FOR PIER NO-65



SECTION A-A

IN CUBOIDAL SECTION V1= 8*8*0.75

=48 m^3

IN PRISMOIDAL SECTION V2 = 1.4/3 {64+7.84+

(64*7.84) ^1/2} V2 =43.978 m^3

FORMULA USED FOR CALCULATION OF VOLUME = H/3 {A1 +A2 +

(A1*A2) ^1/2}

TOTAL CONCRETE = V1+ V2

= 48.000+43.978

= 91.978 m^3

NOTES:-

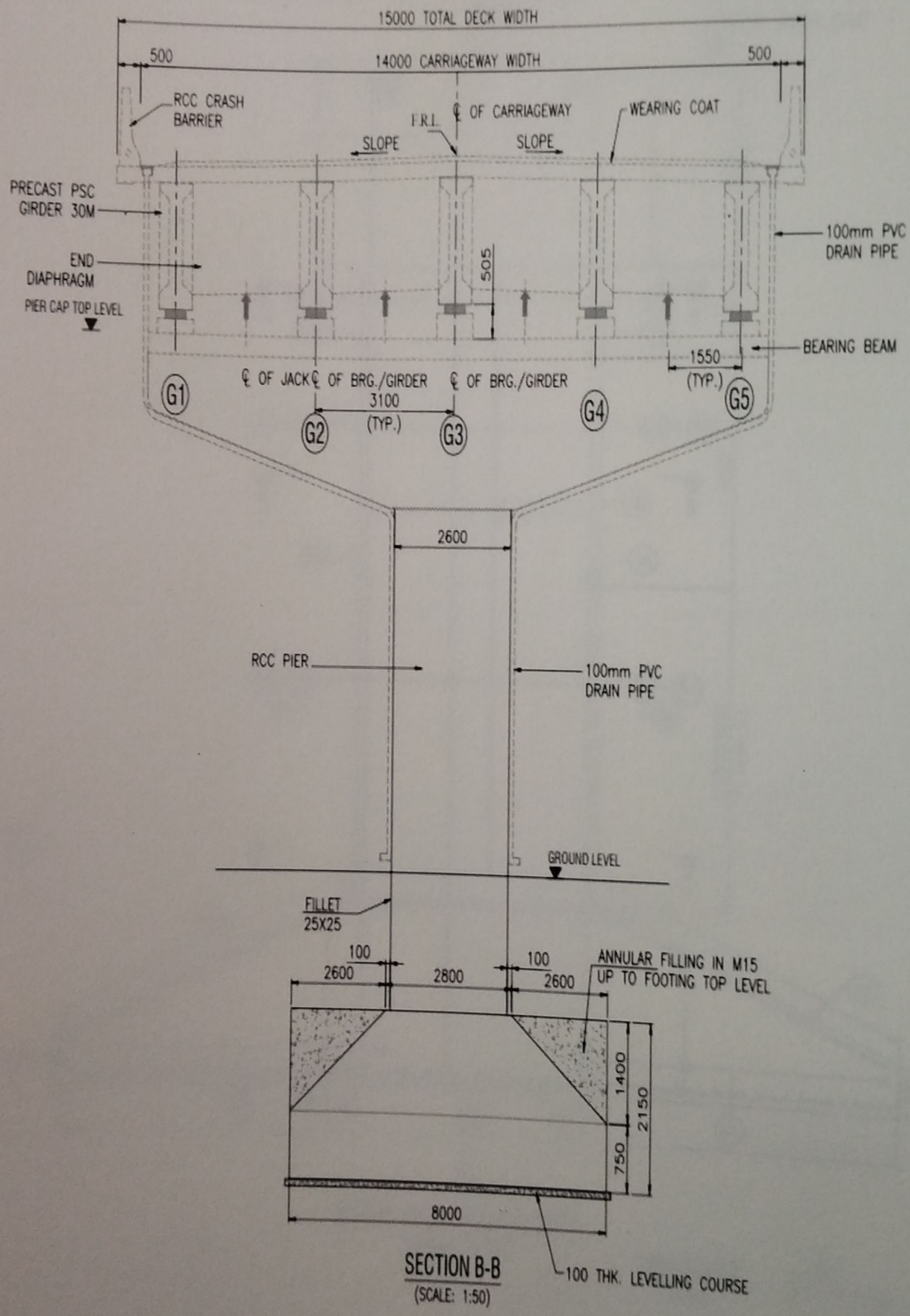
1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS ARE NOT TO BE SCALED. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. TOP LEVEL OF PIER CAP HAS BEEN WORKED OUT BY ASSUMING MINIMUM THICKNESS OF BEARING + PEDESTAL AS 0.35m. THIS SHALL BE RECONFIRMED FROM THE BEARING MANUFACTURER BEFORE CASTING THE LAST LIFT OF PIER CONCRETE.
4. THE LOCATION OF JACKS FOR LIFTING OF THE SUPERSTRUCTURES TO REPLACE BEARINGS ETC. IS SHOWN ↑ THUS THIS SHALL BE DISTINCTLY ETCHED FOR EASY IDENTIFICATION ON THE PIER CAP.
5. FOLLOWING DESIGN MIX CONCRETE GRADES SHALL BE USED:-
   - i) PIER & PIER CAP ---M35
   - ii) FOUNDATION ---M35
   - iiii) PEDESTAL ---M40
   - iv) LEVELING COURSE ---M15
6. THE REINFORCEMENT SHALL BE HYSD. BARS (GRADE DESIGNATION Fe-550D) CONFORMING TO IS:1786-2008. HAVING MIN. ELONGATION OF 16% AS PER TABLE:18.1 OF IRC:112-2019
7. MODERATE CONDITION OF EXPOSURE ARE CONSIDERED FOR STRUCTURE.
8. 100ø PVC PIPE FOR DRAINAGE SHALL BE PROVIDED FROM SUPERSTRUCTURE TO THE GROUND SUITABLY FIXED WITH PIER & PIER CAP.
9. THE SBC HAS BEEN RE-VERIFIED BY THE PLATE LOAD TEST AND FOUND 73.00 T/SQM AT FOUNDATION LEVEL.

QUANTITY TAKE OFF FOR PIER SHAFT

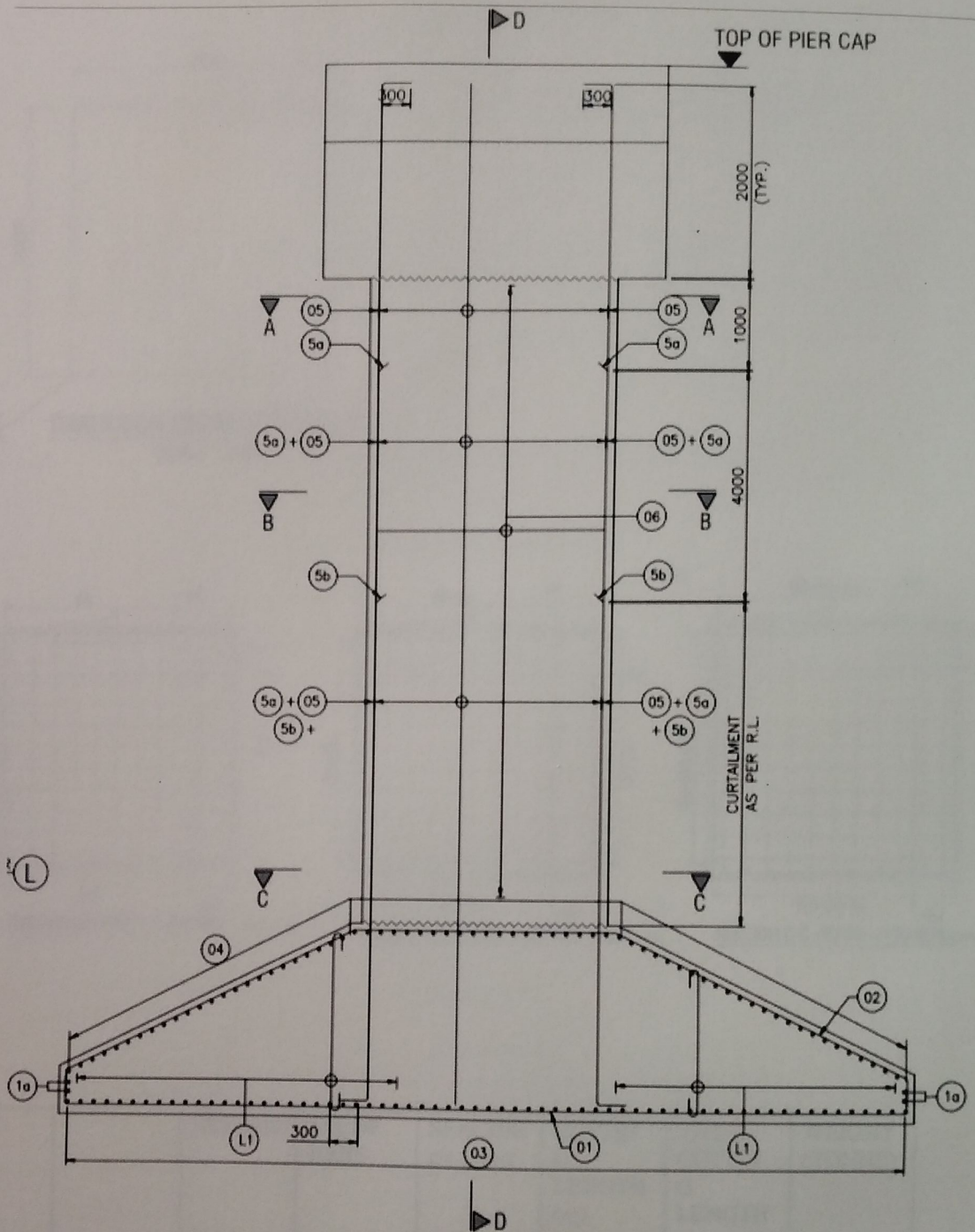
•BBS CALCULATION OF PIER SHAFT FOR PIER NO- 65

05	25ϕ–88 Nos.	300 VARIES 300	VERTICAL (ALL FACE)	PIER SHAFT
5a	25ϕ–44 Nos.	300 VARIES	VERTICAL (ALL FACE)	
5b	25ϕ–44 Nos.	300 VARIES	VERTICAL (ALL FACE)	
06	2L–16ϕ @90c/c	2500 2500	OUTER RING	
6a	24L–12ϕ @180c/c	2500	LINKS BOTH DIR.	
07	NOT IN USE			

TABLE NO.4 BAR SHAPE SCHEDULE FOR PIER SHAFT

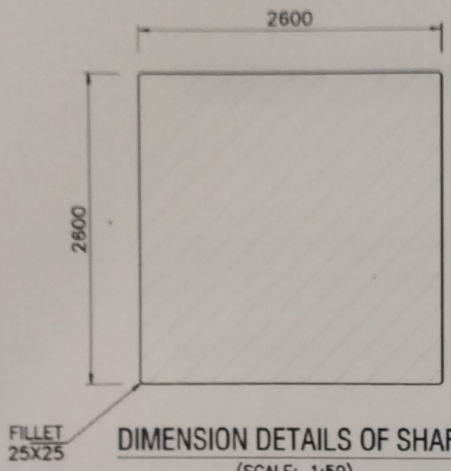


SECTION B-B
(SCALE: 1:50)

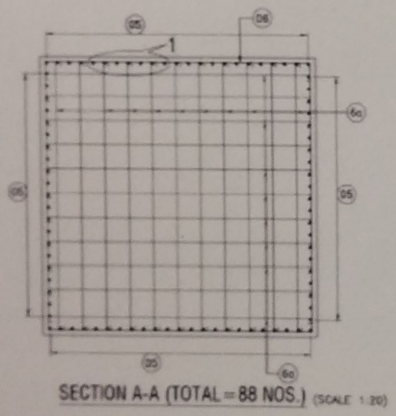


REINF. DETAILS OF PIER

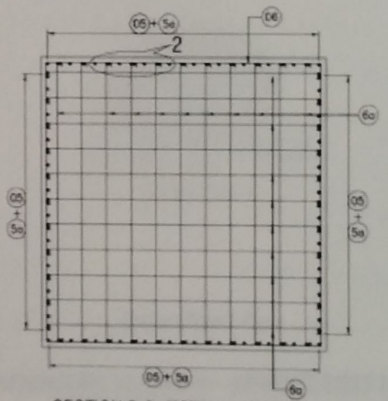
(SCALE 1:40)



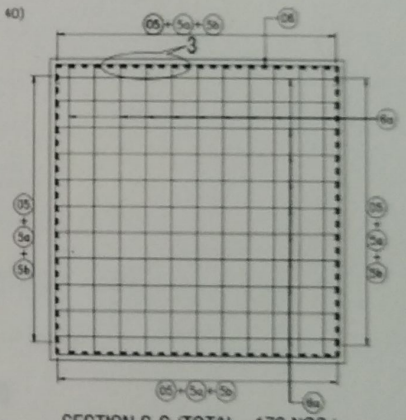
DIMENSION DETAILS OF SHAFT
(SCALE: 1:50)



SECTION A-A (TOTAL = 88 NOS.) (SCALE 1:20)



SECTION B-B (TOTAL = 132 NOS.) (SCALE 1:20)



SECTION C-C (TOTAL = 176 NOS.) (SCALE 1:20)

MKD		DIA (mm)	NO, OF BARS	SPACING c/c (mm)	CUTTING LENGTH (m)	TOTAL CUTTING LENGTH (m)	WEIGHT (TONNE)
05		25	88	110	16.507	1452.616	5.592
5a		25	44	230	13.207	581.108	2.237
5b		25	44	230	9.207	405.108	1.559

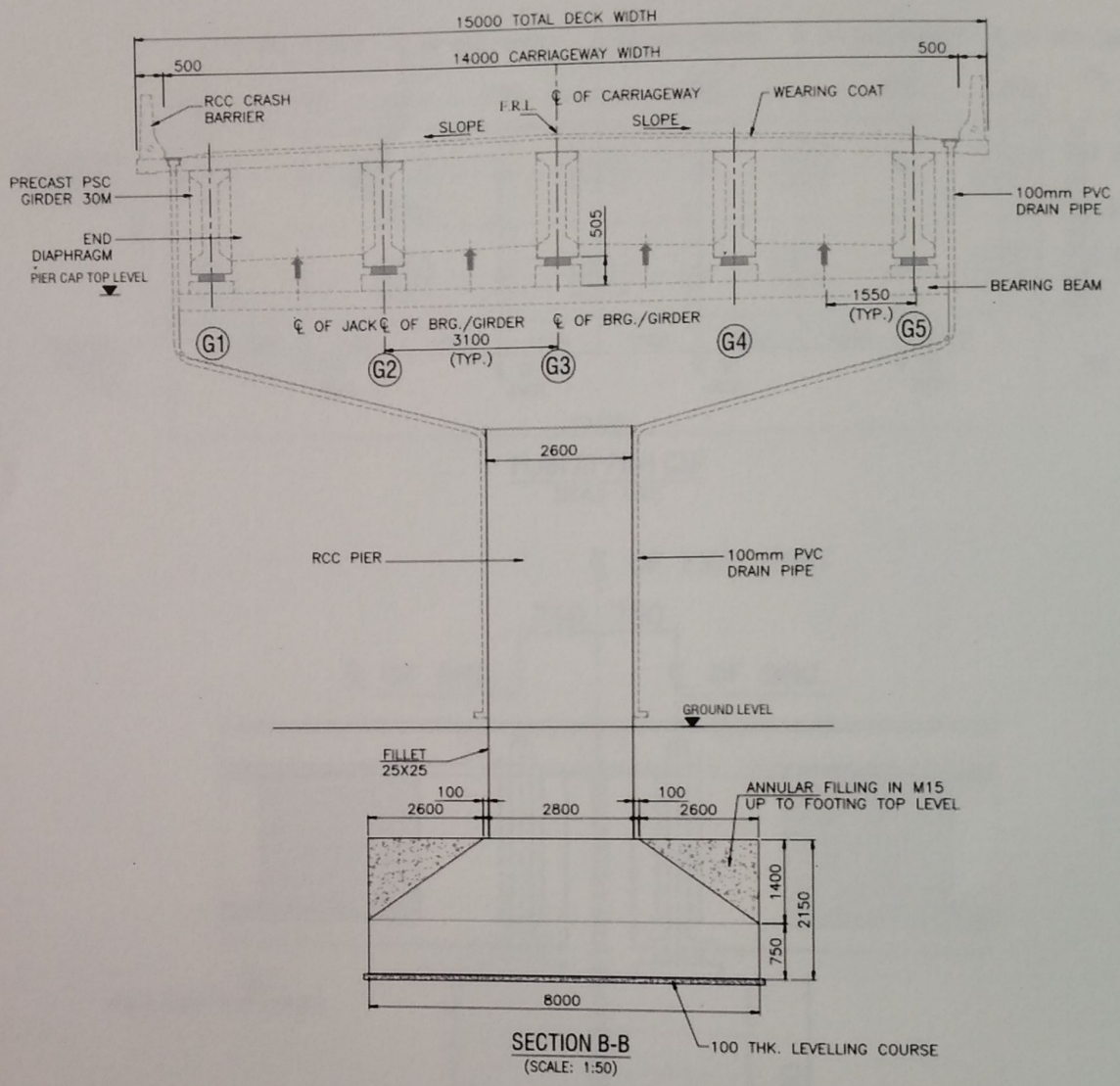
TABLE NO.5 STEEL CALCULATION FOR PIER SHAFT

QUANTITY TAKE OFF FOR PIER CAP

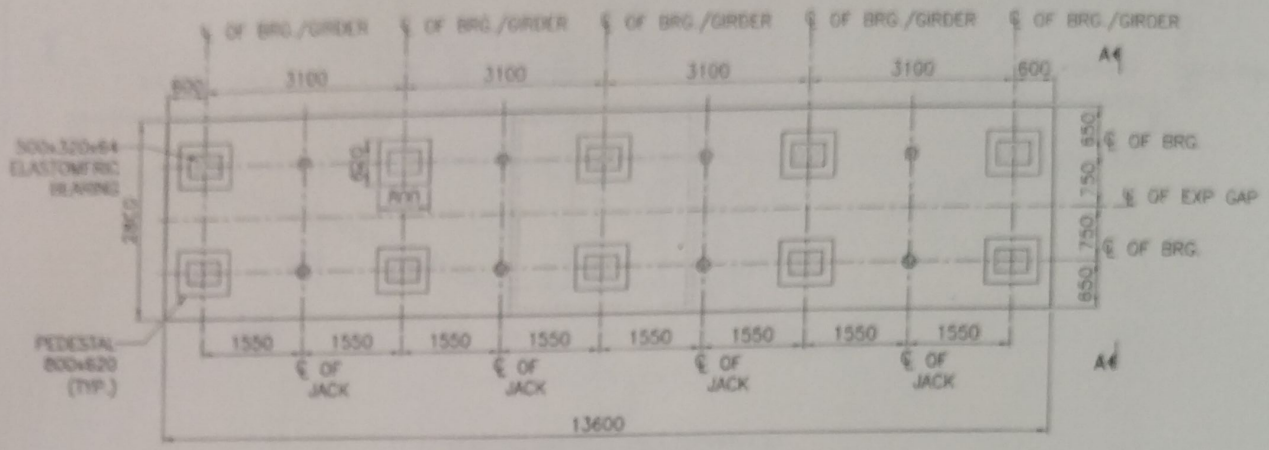
BAR SHAPE SCHEDULE

BAR MRKD.	DESCRIPTION	BAR SHAPE	REMARKS	
08	25ϕ–@ 190c/c	200 600 2800 600 200 5190 5190	BOTTOM	PIER CAP
09	32ϕ–@ 190c/c	13500 350 350	TOP	
10	32ϕ–@ 190c/c	13500 250 250	TOP	
11	12ϕ–@ 200c/c.	1400 LV LV 1400	SIDE	
12	2L–16ϕ @125c/c	2700 2100	OUTER RING	

TABLE NO.6 BAR SHAPE SCHEDULE FOR PIER CAP

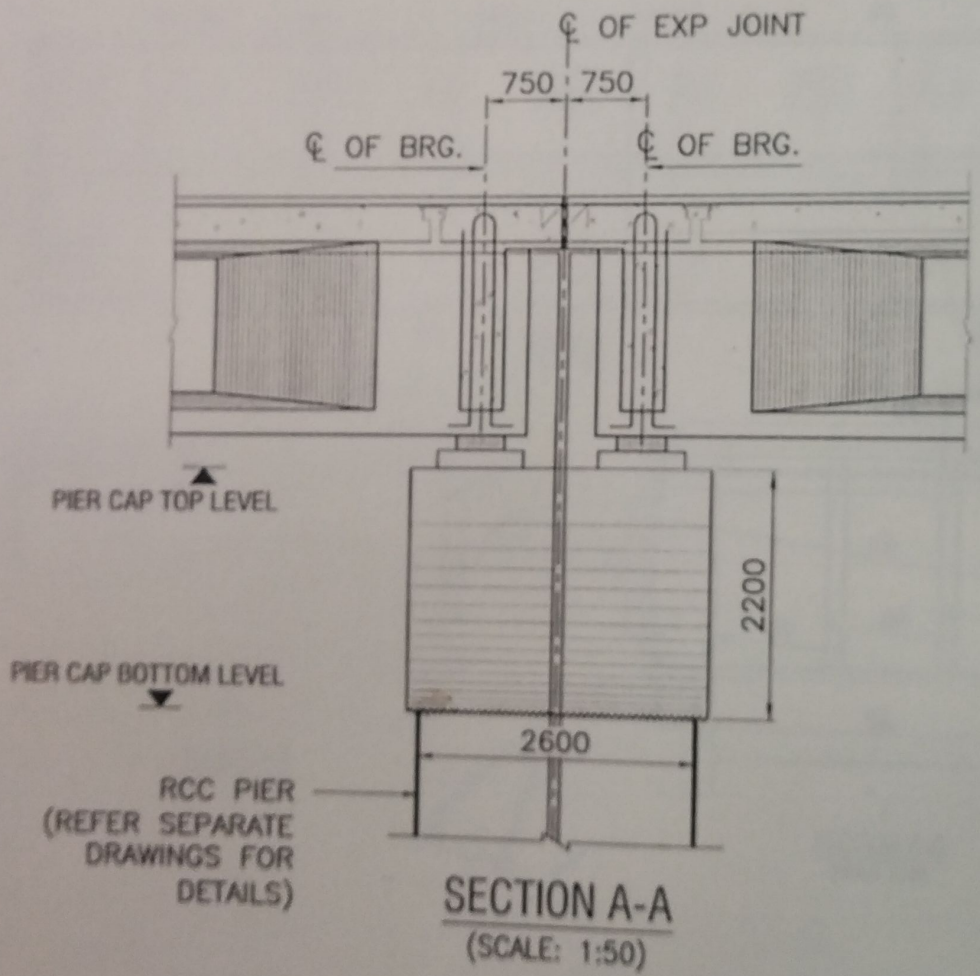


SECTION B-B
(SCALE: 1:50)



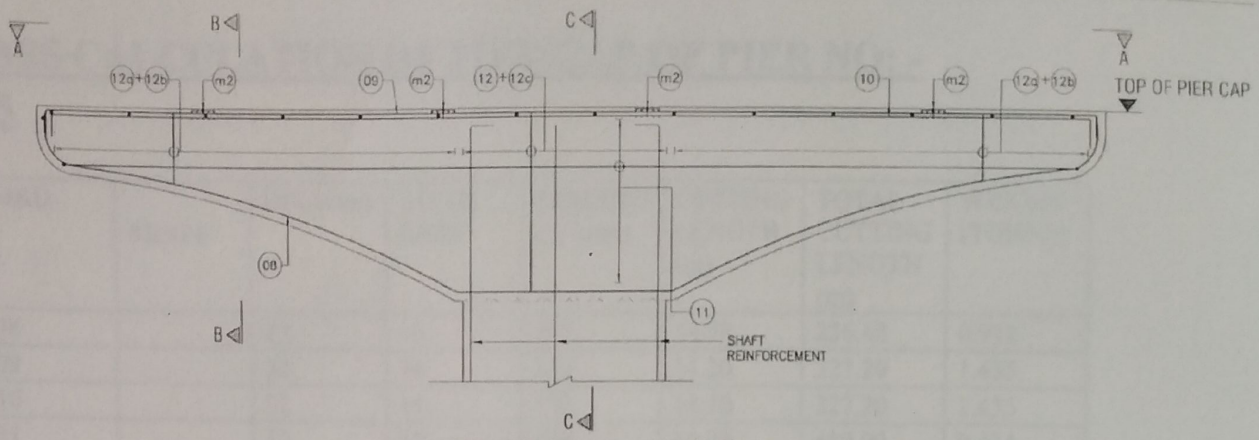
PLAN AT PIER CAP

(SCALE: 1:50)

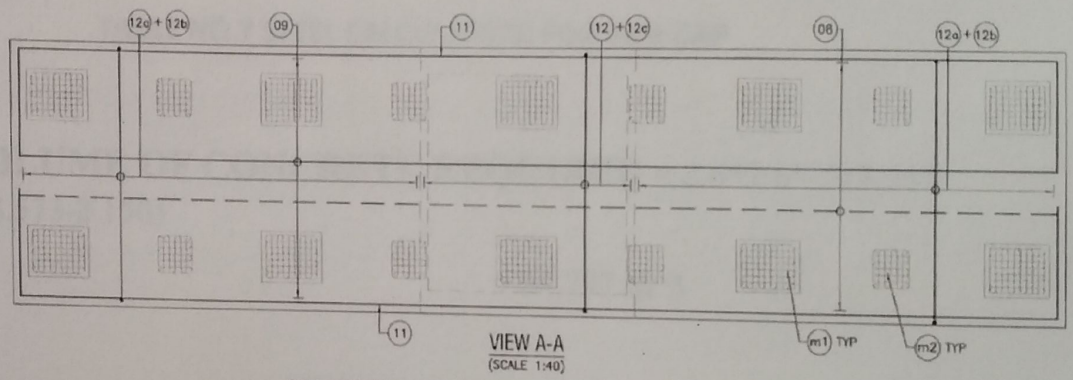


SECTION A-A

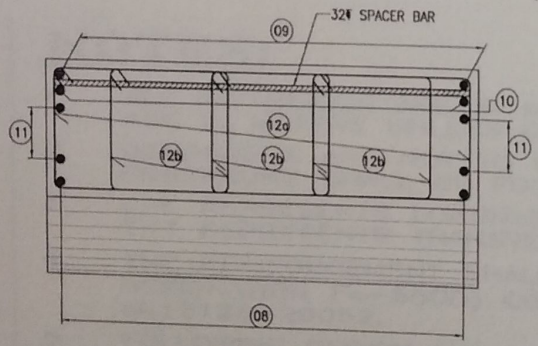
(SCALE: 1:50)



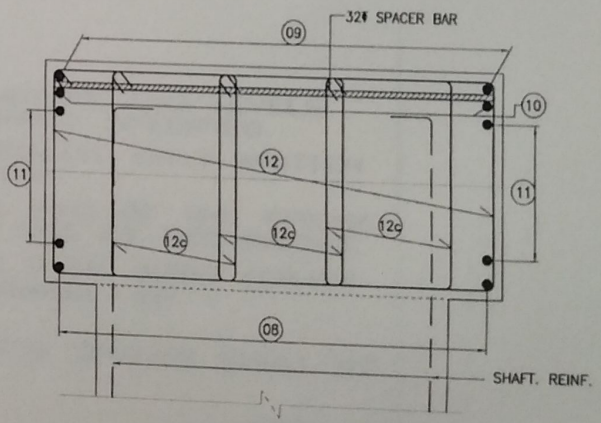
REINFORCEMENT DETAILS OF PIER CAP
(SCALE 1:40)



VIEW A-A
(SCALE 1:40)



SECTION B-B
(SCALE 1:15)



SECTION C-C
(SCALE 1:15)

•BBS CALCULATION OF PIER CAP OF PIER NO: - 65

MKD	SHAPE	DIA (mm)	NO, OF BARS	SPACING c/c (mm)	CUTTING LENGTH (m)	TOTAL CUTTING LENGTH (m)	WEIGHT (TONNE)
08		25	16	190	14.78	236.48	0.912
09		32	16	190	14.20	227.20	1.435
10		32	16	190	14.20	227.20	1.435
11		12	30	200	16.30	489.00	0.434
12		16	24	125	10.16	243.84	0.385

TABLE NO.7 STEEL CALCULATION FOR PIER CAP

VOLUME OF CONCRETE REQUIRED = 2.6*2.6*(513.267-498.573-2.150)

= 84.797 m^3

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS ARE NOT TO BE SCALED. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. L–L REPRESENTS LONGITUDINAL AXIS OF THE BRIDGE. T–T REPRESENTS TRANSVERSE AXIS OF THE BRIDGE.
4. THE REINFORCEMENT SHALL BE HYSD. BARS (GRADE DESIGNATION Fe–550D) CONFORMING TO IS:17126–20052.
5. FOLLOWING DESIGN MIX CONCRETE GRADES SHALL BE USED:–
   PIER AND PIER CAP AND PIER FOUNDATION ---M35
   R.C.C CRASH BARRIER ---M40
   PEDESTAL ---M40
   LEVELING COURSE ---M15
6. REINFORCEMENT OF PIER SHAFT IS TO BE ANCHORED IN THE FOUNDATION BEFORE IT'S CONCRETING.
7. CLEAR COVER TO THE OUTERMOST STEEL SHALL BE
   50mm -- NON EARTH FACE
   75mm -- EARTH FACE

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS ARE NOT TO BE SCALED. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. TOP LEVEL OF PIER CAP HAS BEEN WORKED OUT BY ASSUMING MINIMUM THICKNESS OF BEARING + PEDESTAL AS 0.35m. THIS SHALL BE RECONFIRMED FROM THE BEARING MANUFACTURER BEFORE CASTING THE LAST LIFT OF PIER CONCRETE.
4. THE LOCATION OF JACKS FOR LIFTING OF THE SUPERSTRUCTURES TO REPLACE BEARINGS ETC. IS SHOWN ↑ THUS THIS SHALL BE DISTINCTLY ETCHED FOR EASY IDENTIFICATION ON THE PIER CAP.
5. FOLLOWING DESIGN MIX CONCRETE GRADES SHALL BE USED:-
   i) PIER CAP ---M35
   ii) PEDESTAL ---M40
6. THE REINFORCEMENT SHALL BE HYSD. BARS (GRADE DESIGNATION Fe-550D) CONFORMING TO IS:1786-2008. HAVING MIN. ELONGATION OF 16% AS PER TABLE:18.1 OF IRC:112-2019
7. MODERATE CONDITION OF EXPOSURE ARE CONSIDERED FOR STRUCTURE.
8. 100ø PVC PIPE FOR DRAINAGE SHALL BE PROVIDED FROM SUPERSTRUCTURE TO THE GROUND SUITABLY FIXED WITH PIER & PIER CAP.

LEGEND:-

- BEARING IN PLAN

- BEARING IN ELEVATION

- JACK LOCATION IN PLAN

- JACK LOCATION IN ELEVATION

TESTING OF VARIOUS MATERIALS USED IN BRIDGE CONSTRUCTION

•Testing of Cement-

•Consistency Test

A characteristic known as standard consistency is required in order to determine initial setting time, final setting time, strength, and soundness of cement.
VICAT Apparatus is used to determine consistency of cement depth of mould 40mm and 80 mm diameter.
300 gm sample with 23-25% of water by weight is mixed to prepare the paste.
10mm diameter needle is used to check the consistency of cement Paste is made at Temperature of (27 ±2) °C and humidity (65 ±5)% .
Needle should penetrate 33-35mm from Top and 5-7mm from bottom.
This percentage of water is known as normal consistency of cement and the water content is measured and labelled "P."

Setting time test

•Setting time of cement is classified as -

(a) Initial setting time (IST)

(b) Final setting time (FST)

(a) Initial setting time (IST)- When cement loosing its plasticity to deform is called as initial setting time .

(b) Final setting time (FST)- When cement paste is not going ton deform or modification in cement paste is not possible due to force applied or when plasticity in cement ends is called as final setting time.

VICAT Mould is filled with "0.85P" cement paste for testing purpose. Sample is prepared at (27 ±2) °C and (65 ±5) % humidity.

But test is performed at 90% humidity.

For initial setting time square 1mm² needle is used to penetrate 33-35from top. Initial setting time should not be less than 30mins.

For final setting time Annular collar Needle is used and there should not be marking on the cement paste in VICAT Mould and that time for OPC cement should not be less than 10hr or 600 mins.

•Testing of Aggregates: -

Strength of aggregate:-

This test is done by gradual loading loading on the aggregate. Sample of aggregate is passed through 12.5mm sieve and retained over 10mm sieve is taken for testing purpose.

Retained aggregate is subjected for 40 tones gradual load for 10 min

After test Sample is passed through 2.36mm sieve and passed aggregate is used for result

Aggregate crushing value is the ratio of weight of aggregate passed through 2.36mm sieve to retained weight on 10mm sieve.

For pavement construction aggregate impact value should not be more than 30%

For general construction aggregate impact value should not be more than 45%.

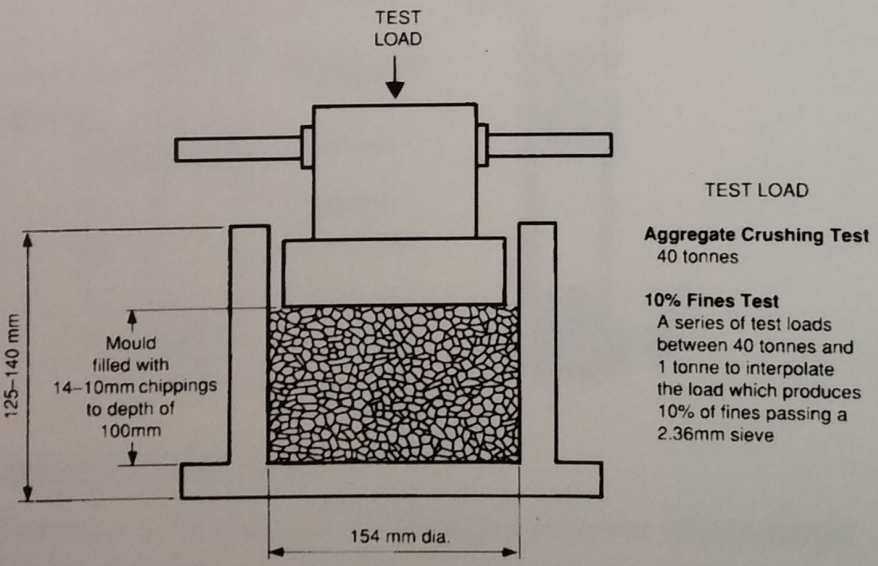


Figure 2. Apparatus for the 10% fines test and aggregate crushing test (Millard, 1993)

Toughness of aggregate

It is calculated on the basis of impact loading.

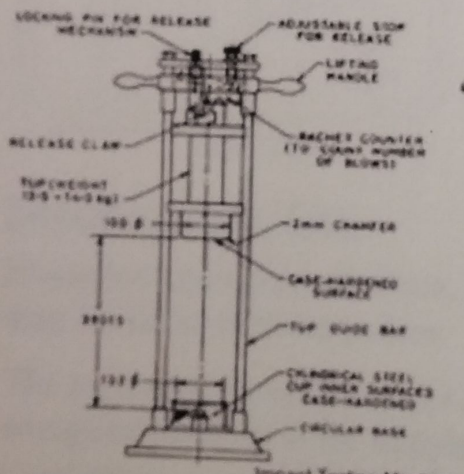
Sample of aggregate passing through 12.5mm sieve and retained over 10mm sieve.

A sudden loading of 14kg is used as a free fall from a height of 38cm for 15 times.

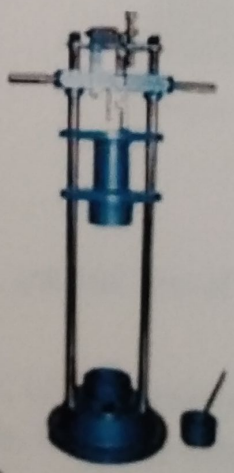
Sample after test is passed through 2.36mm sieve and passed aggregate weight is taken for result purpose.
Aggregate impact value is the ratio of weight of aggregate passed through 2.36mm sieve to retained weight on 10mm sieve.

For pavement construction aggregate impact value should not be more than 30%

For general construction aggregate impact value should not be more than 45%.



Impact Testing Machine



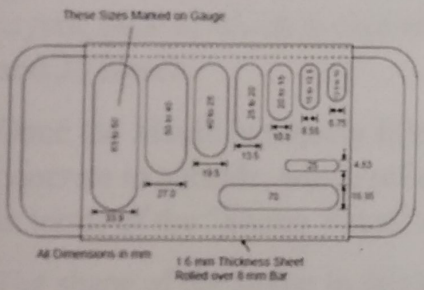
Flakiness Index Test:

Flakiness of aggregates is measured in terms of parameter flakiness index.
Flaky particles are those whose least lateral dimension are less than.6 times of mean size

Flakiness is defined as % of flaky particles in the sample and is determined using flakiness index test.

200 pieces are considered to test this flaky index. This test is not applicable for particles having size smaller than 6.3mm

Particles of each fraction are passed through the opening over the "THICKNESS GAUGE" and weight of aggregates passing through these openings is noted and ratio of passed aggregate to original weight of aggregate is termed as flakiness Index. Flaky aggregates must not be more than 15% in general to be used for preparation of concrete.



Elongation Index Test:

Elongated aggregates are those, greatest size of which is more than 1.8 times of its mean size.

The parameter elongation index, which measures the percent of elongated particles in the sample, is used to measure aggregate elongation.

Aggregates with a size of less than 6.3 mm are not suitable for this test.

Enough aggregates must be taken for this test so that 200 pieces of each fraction may be gauged.

After that, particles are fed through the appropriate openings on the length gauge & aggregates retained over these openings is weighted.

Testing of Concrete: -

Slump test

This test is appropriate for concrete having a medium to high workability, but not for concrete with a very high or very low workability.

A metallic Mould in the shape of a frustum and a tamping rod are used in this test
To carry out this examination, The mould is set on the levelled ground, and the concrete which is to be tested filled in it in four layers, each of which is correctly compacted using a tamping rod and 25 blows.

Once the Mould is entirely filled, it is raised upwards, causing the concrete to subside, which reflects the workability of the concrete in terms of the "Slump Value" metric.

The shape of the slump in this test further indicates the property of concrete in terms of its cohesiveness.

Workability of concrete required in a particular type of construction is as follow-

TYPE OF CONSTRUCTION	SLUMP (mm)
CONCRETE FOR ROAD CONSTRUCTION	20-40
PARAPET WALL, SLAB, PIERS	40-50
CONCRETE FOR CANAL LINING	70-80
CONCRETE FOR ARCH OR WALL OF TUNNEL	90-100
NORMAL RCC WORK	80-150
MASS CONCRETING WORK	25-50

CONCRETE TO BE VIBRATED	10-25

TABLE NO.8 SLUMP VALUE

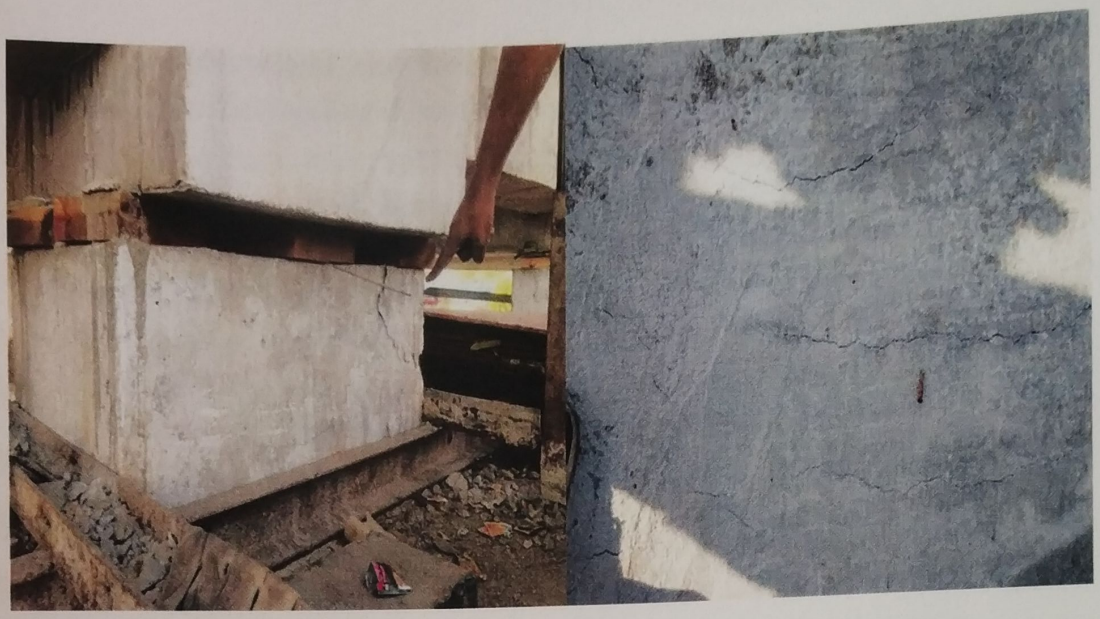
Observed Defects During Site Visit:

Laitance: because of bleeding water comes in upper portion and accumulates at surface along with cement in some cases and it forms a layer termed as "Laitance", which reduces the strength between two successive lift and degrades the wearing qualify of surface.

Cracks: We had observed cracks during inspection. It may be due to following reasons: -

(a) Excess water
(b) Early loss of water
(c) Alkali aggregate reaction
(d) Improper Curing etc.

Development of cracks Reduces load carrying capacity of concrete.



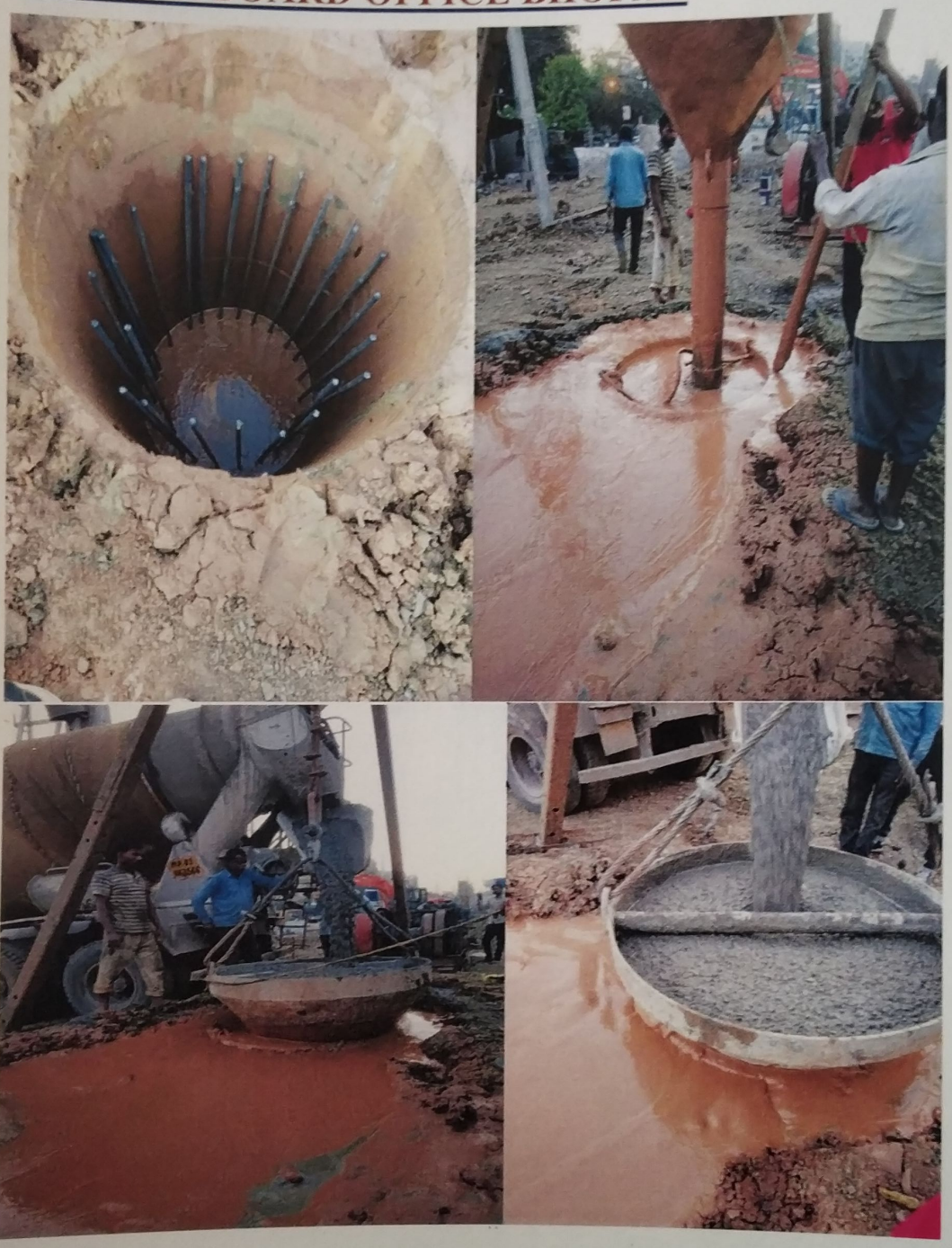
INSTALLATION OF PILE FOUNDATION USING REVERSE CONCRETING

- "For bored cast-in-situ piles, the Direct Mud Circulation method of pile foundation placement is used. When working space is limited, the direct mud circulation approach is the best option.
- DMC comes to the rescue in industries and power plants with a maze of pipelines snaking all over the place. While the other ways are more expensive, DMC is a somewhat less expensive method of installing piles.
- The apparatus consists of a Tripod with pulley, winch machine, wire rope, Chisel, drill pipes, tremie pipes, and a pit where bentonite powder and fresh water are mixed.
- A tripod, as the name implies, is a three-legged construction with a pulley at the apex that is used to manoeuvre the chisel that bores the soil. It is also used to drill pipelines in conjunction with a wire rope that is eventually knotted to the winch machine. To keep it simple, the chisel is the primary

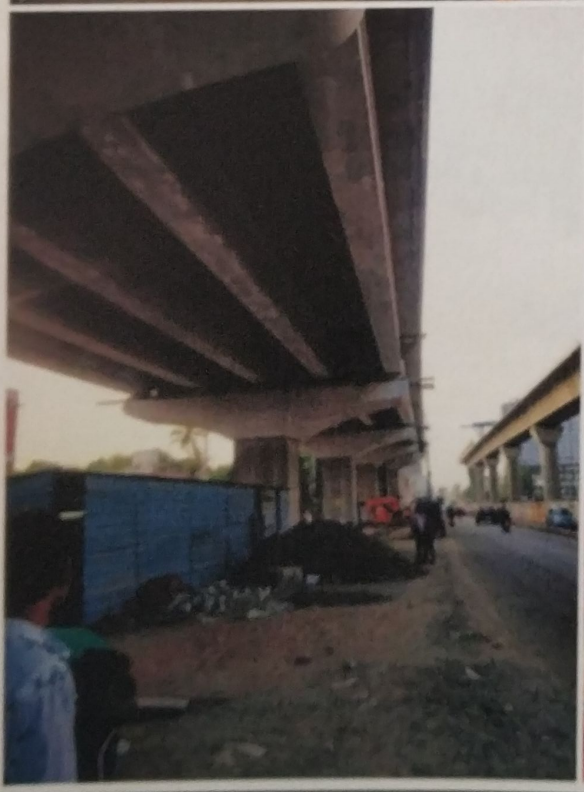
boring instrument, and the drill pipes are merely appendages that provide depth and bentonite suspension to the bore.

- The number of drill pipes required varies according to the bore depth required. A vertical pump is also installed in the bentonite pit, which pumps the bentonite solution into the borehole via drill pipes and a chisel.
- The process is called Direct Mud Circulation because it includes pumping mud directly from the pile bore to the bentonite pit, where the bentonite slurry is reused and the settled mud is left alone."

PILE FOUNDATION INSTALLATION OF PIER NO –63 NEAR BOARD OFFICE BHOPAL



SOME PHOTOS OF SITE VISIT& VIDEO LINKS



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- **https://drive.google.com/file/d/1IXhj-kxDjZFRv2nWYVG0V6SoYMC1HQqr/view?usp=drivesdk**

CONCLUSION:-

This training enabled me to obtain information through observing various work activities on the job site. This in plant training provided me with the opportunity to observe various situations on the job site and to solve them in a practical and innovative manner. I also learned about various new construction technologies and, most importantly , I witnessed the entire process of laying out a girder bridge span. This aid ed me in resolving several theoretical and practical questions, as well as giving me a better understanding of civil engineering's future potential.

REFERENCES :-

Indian Roads Congress :5, (2015), Standard Specifications and Code of Practice for Road Bridges

Indian Roads Congress :112, (2011), Code of Practice for Concrete Road Bridges

Indian Road Concrete: SP :13, (2004), Guidelines for The Design of Small Bridges and Culvert

Indian Standard: 516, (1959), Method for Test for The Strength of Concrete

Indian Standard: 650, (1991), Specification for Standard Sand for Testing of Cement

Indian Standard: 1199, (1959), method Of Sampling and Analysis of Concrete

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for Professor & Head of
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Industry/Organization	P.W.D Bridge (Bhpl)		Date/Duration	20 Jan – 3 Feb	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Understanding procedure of hydraulic survey Compilation of survey report and hyd. design calculations				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Shanul Saxena				
Signature of Industry Mentor	Saxena				

Receiving Date		**Name of Faculty Mentor**	Dr Mk Trivedi	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Saurabh Kaurav		Department	Civil Engineering	
Industry/Organization	P.W.D Bridge (Bhpl)		Date/Duration	4th Feb – 18th Feb	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Learning basics of structural bridge design				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Shanul saxena				
Signature of Industry Mentor	Saxena				

Receiving Date		**Name of Faculty Mentor**	Dr MK Trivedi for	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Saumbh kaumv		Department	Civil Engineering	
Industry/Organization	P.W.D bridge (Bhpl)		Date/Duration	19th feb - 5th March	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Understanding the concept of general arrangement drawings, components of bridges and introduction to various IRC codes.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Shanul saxena				
Signature of Industry Mentor	Saxena				

Receiving Date		**Name of Faculty Mentor**	Dr. MK Trivedi	Sign for.	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Saurabh Kawrak		Department	Civil Engineering	
Industry/Organization	P.W.D Bridge (Bhpl)		Date/Duration	6th March - 20th March	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Structural design and analysis of different components of bridge - foundation.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Shanul saxena				
Signature of Industry Mentor	Saxena				

Receiving Date		**Name of Faculty Mentor**	Dr. MK Trivedi	**Sign**	for.

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Sourabh kaurav		Department	Civil Engineering	
Industry/Organization	Construction / MPPWD Bridge division Bhopal		Date/Duration	21 march - 04 April	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	1) Testing of various materials a) Aggregate • Flakiness and Elongation test • strength of aggregates • Toughness of aggregates • Hardness of aggregates				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Naveen Malhotra / Jai Prakash Sharma				
Signature of Industry Mentor	06/04/2022				

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Comment on nature of work done / area / topic

(b) Cement
- Consistency test
- setting time

2) Workability of Concrete

3) Compressive strength of concrete

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Saurabh Kowrav		Department	Civil Engineering	
Industry/Organization	Construction/MPPWD Bridge division Bhopal		Date/Duration	05 April - 20 April	
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	1. Quantity take off for Pier footing • BBS calculation of pier footing for pier no. -65 • Calculation of concrete for pier footing for pier no-65				
OVERALL GRADE (Any one)	POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT				
Name of Industry Mentor	Naveen Malhotra/JAI PRAKASH SHARMA				
Signature of Industry Mentor	Jai 22/04/2022				

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Comment on nature of workdone/Area/Topic

2. Defects observed during site visit
   - Surface Cracks on concrete of deck slab
   - Laitance

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Saurabh kaviav		Department	Civil Engineering	
Industry/Organization	PWD bridge (Bhopal)		Date/Duration	21st April - 4th May	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	1) Learning pile foundation of pier no-63 2) Calculation of BBS of deck slab				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Shanul saxena				
Signature of Industry Mentor	Shaxena				

for.

Receiving Date		**Name of Faculty Mentor**	Dr. M.k Trivedi	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Sourabh Kaurav		Department	Civil Engineering	
Industry/Organization	PWD Bridge (Bpl)		Date/Duration	05 may – 20 may	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	– Classification of projects - Concrete calculations for pier shaft - Bar bending schedule (BBS) for pier shaft - Site visit during form work + concrete work				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor					
Signature of Industry Mentor	Sharma				

for.

Receiving Date		**Name of Faculty Mentor**	Dr. M.K Trivedi	**Sign**	