

INTERNSHIP REPORT

ON

BRIDGE DESIGN AND CONSTRUCTION WORKS

SUBMITTED TO: - DR. M.K. TRIVEDI

MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE GWALIOR

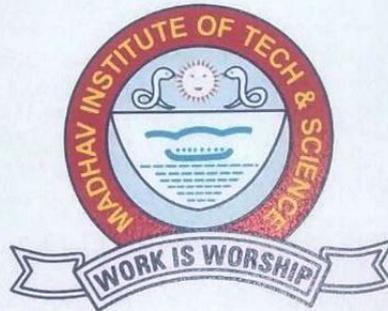
(A govt. Aided Autonomous Institute under RGPV, Bhopal (M.P) Established in 1957)

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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(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V. Bhopal)

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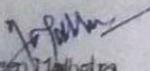
GOVERNMENT OF MADHYAPRADESH
PUBLIC WORKS DEPARTMENT
BRIDGE CONSTRUCTION ZONE
NIRMAN BHAWAN, ARERA HILLS,
BHOPAL, MADHYA PRADESH - 462004

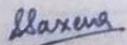
Date: May 20th, 2022

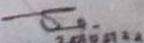
CERTIFICATE

This is to certify that **Mr. Swapnil Waskle** 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. Swapnil Waskle**, during the training period, has been found satisfactory.

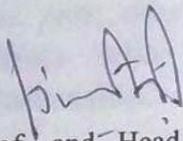

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24/05/22
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RECOMMENDATION

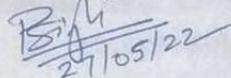
It is hereby recommended that the internship report entitled — Bridge design and construction work which is being submitted by SWAPNIL WASKLE completed under the guidance of Dr. M.K. TRIVEDI may be accepted in the partial fulfillment of the award of the degree of Bachelor of Engineering in Civil Engineering.


Prof. and Head

for Civil Engineering Department

MITS, Gwalior

Guided by

for. 
27/05/22

Dr. M.K. TRIVEDI

Civil Engineering Department

MITS, Gwalior

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.M.K. Trivedii Head of Civil Engineering Department, MITS GWALIOR.**

Also, I would like to thank **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. I also acknowledge with gratitude to our supporting **Mr. VIKRAM** for providing the facilities needed for the accomplishment of this project.

I take great pleasure for my institute **MPPWD (Bridge Division Bhopal)** for providing the opportunities.

The environment of **"PUBLIC WOKRS DEPARTMENT"** has been valuable experience for me. It has provided an opportunity to learn at our own pace in discipline of interest. I would like to thank all those who helped me during different stages of completion of this internship.

SWAPNIL WASKLE

(0901EE181114)

DEPARTMENT OF CIVIL ENGINEERING

MITS GWALIOR (M.P.)

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 equipments 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.

CONTENT

S N O.	TOPIC	PG NO.
1.	Introduction	7
2.	Classification	7-10
3.	Selection Criteria for Bridge Site	10
4.	Details Of Our Project	11
5.	Elements Of Flyover Structure	12-18
6.	Materials Used in Different Elements of Flyover Structure	18-19
7.	Quantity Take Off for Pier Footing	19-25
8.	Quantity Take Off for Pier Shaft	25-28
9.	Quantity Take Off for Pier Cap	29-33
10.	Testing of Various Materials Used in Bridge Construction	33-37
11.	Observed Defects During Site Visit	37-38
12.	Installation of Pile Foundation using Reverse Concreting	38-39
13.	Some Photos of Site Visit & Video Links	40-44
14.	Conclusion	44
15.	References	45

LIST OF TABLES

S NO.	TOPIC	PG NO.
1.	FLYOVER MATERIAL	19
2.	BAR SHAPE SCHEDULE OF FOUNDATION	23
3.	BAR SHAPE SCHEDULE FOR PIER SHAFT	28
4.	BAR SHAPE SCHEDULE FOR PIER CAP	32
5.	SLUMP VALUE	37-38

LIST OF FIGURES

S NO.	TOPIC	PG NO.
1.	PILE INSTALLATION	14
2.	FOUNDATION	15
3.	PIER SHAFT	15
4.	PIER CAP	16
5.	PEDESTAL	16
6.	BEARING	17
7.	GIRDER	17
8.	DECK SLAB	18
9.	CRASH BARRIER	18
10.	SITE VISIT	39-42

INTRODUCTION

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

2. 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) of 150 m or greater than are known as long span bridges

3. 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

4. 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

5. 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

6. Level

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

- a) Submersible bridge:
- b) High Level bridge

7. Importance

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

- a) Important
- b) Normal
- c) Critical

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 – $90 \times 5 = 450$ (Including PSC Girders)

LENGTH OF REINFORCED EARTH WALLS – 450 (APPROX.)

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



Fig 1: Pile Installation

ELEMENTS OF MAIN FLYOVER STRUCTURE

- **Foundation:** - A pile is basically a long cylinder of a strong material such as concrete that is pushed into the ground to act as a steady support for structure built into top of it.

Pile foundations are used in following situations-

When there is a layer of weak soil at the surface. This layer can't support the load of structure. So the loads of the structure have to bypass this layer and be transferred to the layer of stronger soil or rock that is below the weak layer.

When a building has very heavy concentrated loads, such as in a high rise



Fig 2: Foundation

- **PIER SHAFT:** -Piers serve as a link between the abutments and the piers and are located at the ends of bridge spans. The piers' job is to carry vertical loads from the superstructure to the foundation while also enduring all of the bridge's horizontal and transverse stresses. Piers are frequently constructed from reinforced concrete or masonry. Piers improve the aesthetic of a bridge because they are one of its most visible components. They are different shapes depending on the type, size, and proportions of the superstructure, as well as the surrounding surroundings.



Fig 3: Pier Shaft

PIER CAP: = The upper or bearing portion of a bridge pier, which is usually composed of concrete or hard stone and is meant to disperse concentrated loads equally across the pier's area.



Fig 4: Pier Cap

- **PEDESTAL:** = Pedestal is given between the bearing and pier cap
It is the support and base.
It is a mesh of TMT bars and fill with concrete.
In pedestal M40 grade of concrete is use.

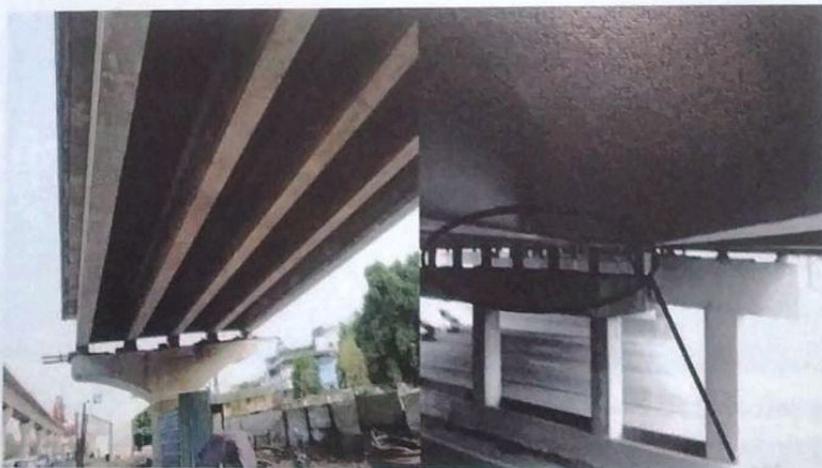


Fig 5: Pedestal

- **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 6: Bearing

- **GIRDER:** = These are the strong beams that carry load from superstructure to the sub structure. A girder is a support beam used in construction. It is the main horizontal support of the structure. Girders often have an I-beam cross section composed of two load bearing flanges separated by a stabilizing web. In our case prestressed girder is use. Girder were casted at site.

Fig 7: Girder



- **DECK SLAB:** = A bridge deck or road bed is the roadway, or the pedestrian walkway, surface of a bridge, and is one structural element of the superstructure of a bridge. It is not to be confused with any deck of a ship. The deck may be constructed of concrete, steel, open grating, or wood. Sometimes the deck is covered with asphalt concrete or other pavement. The

concrete deck will be an integral part of the bridge structure and support with I shape girder.



Fig 8: Deck Slab

- **CRASH BARRIER:** -Crash barriers keep vehicles within their roadway and prevent vehicles from colliding with dangerous obstacles such as boulders, sign supports, trees, bridge abutments, buildings, walls, and large storm drains. Traffic barriers are also installed at the roadside to prevent errant vehicles from traversing steep (non-recoverable) slopes or entering deep water. Traffic barriers are installed within medians of divided highways to prevent errant vehicles from entering the opposing carriageway of traffic and help to reduce head-on collisions. Some of these barriers, designed to be struck from either side, are called median barriers. Crash barriers can also be used to protect vulnerable areas like school yards, pedestrian zones, and fuel tanks from errant vehicles



Fig 9: Crash Barrier

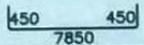
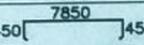
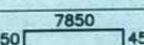
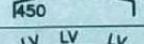
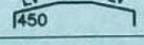
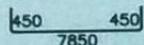
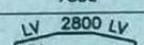
MATERIALS USED IN DIFFERENT ELEMENTS OF FLYOVER STRUCTURE: -

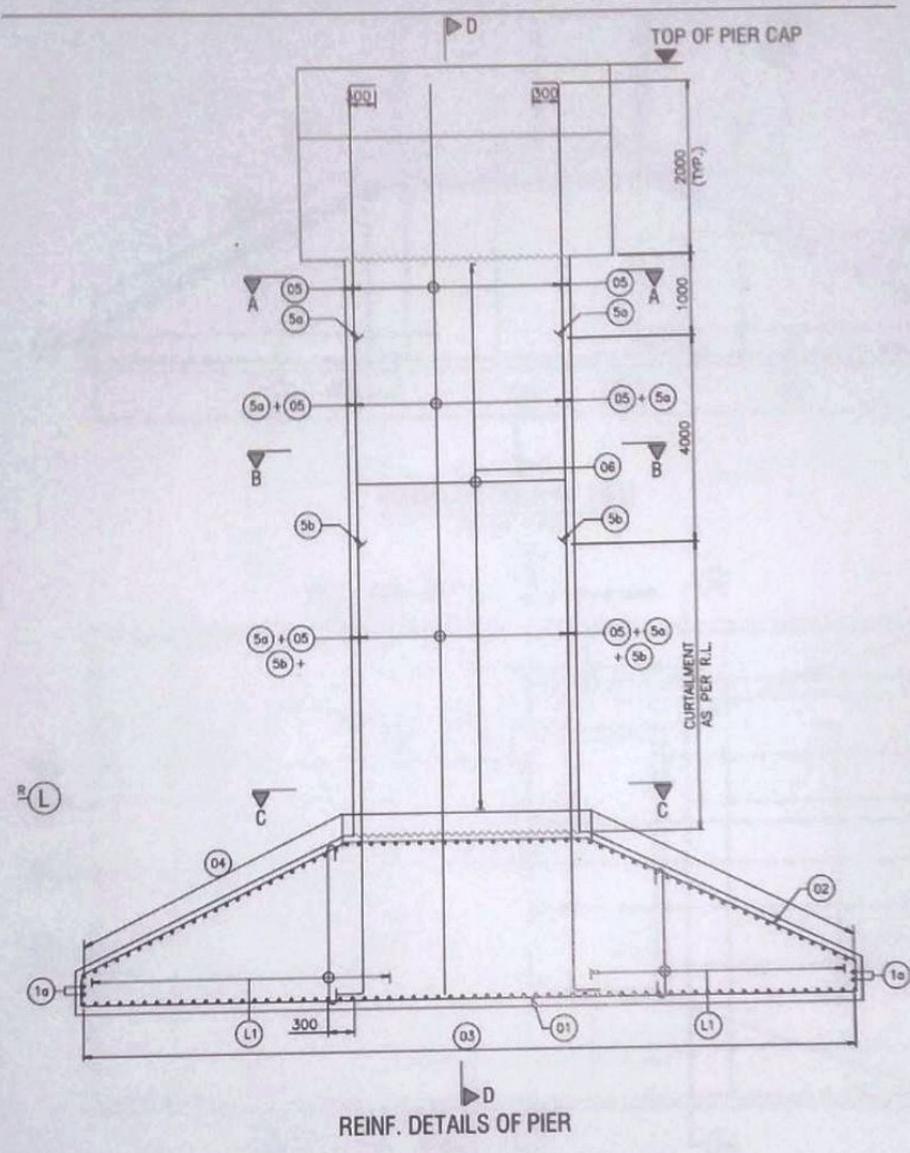
<u>ELEMENTS</u>	<u>MATERIALS USED</u>
<u>FOUNDATION</u> <u>(OPEN+PILE)</u>	<u>M35</u>
<u>PIER SHAFT</u>	<u>M35</u>
<u>PIER CAP</u>	<u>M35</u>
<u>PEDESTAL</u>	<u>M40</u>
<u>BEARING</u>	<u>ELASTOMERIC + PTFE</u>
<u>GIRDER</u>	<u>M40/M45</u>
<u>DECK SLAB</u>	<u>M40</u>
<u>CRASH BARRIER</u>	<u>M40</u>

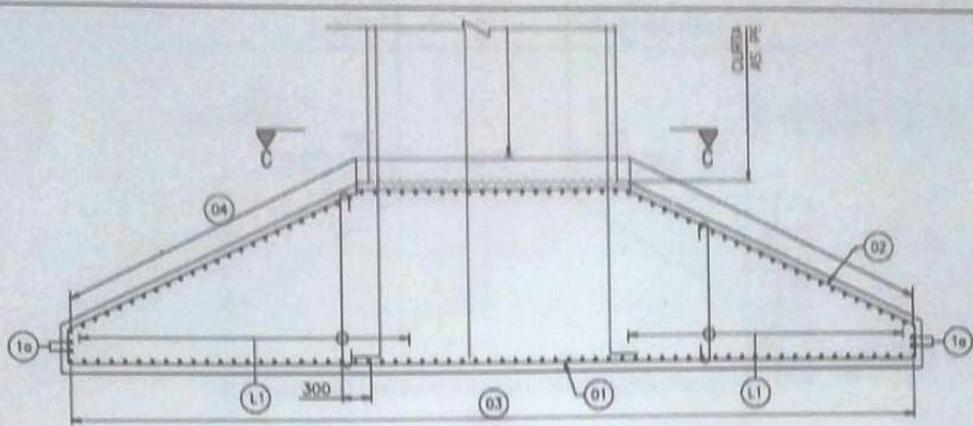
QUANTITY TAKE OFF FOR PIER FOOTING

•BBS CALCULATION OF PIER FOOTING FOR PIER NO 65-

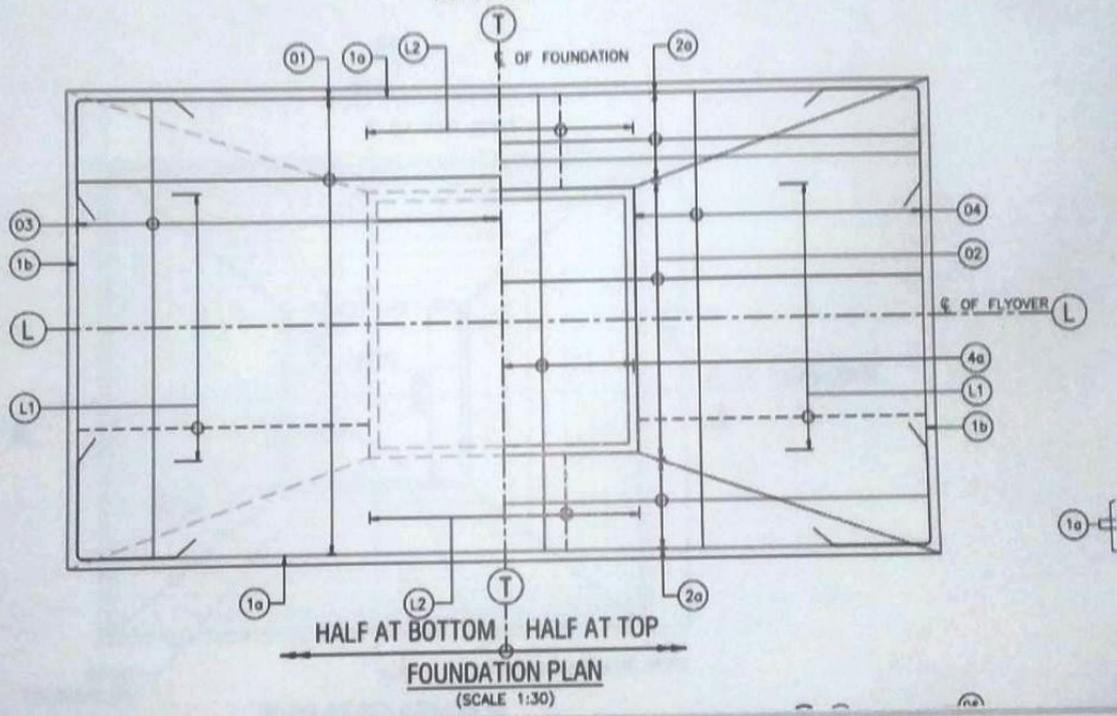
BAR SHAPE SCHEDULE

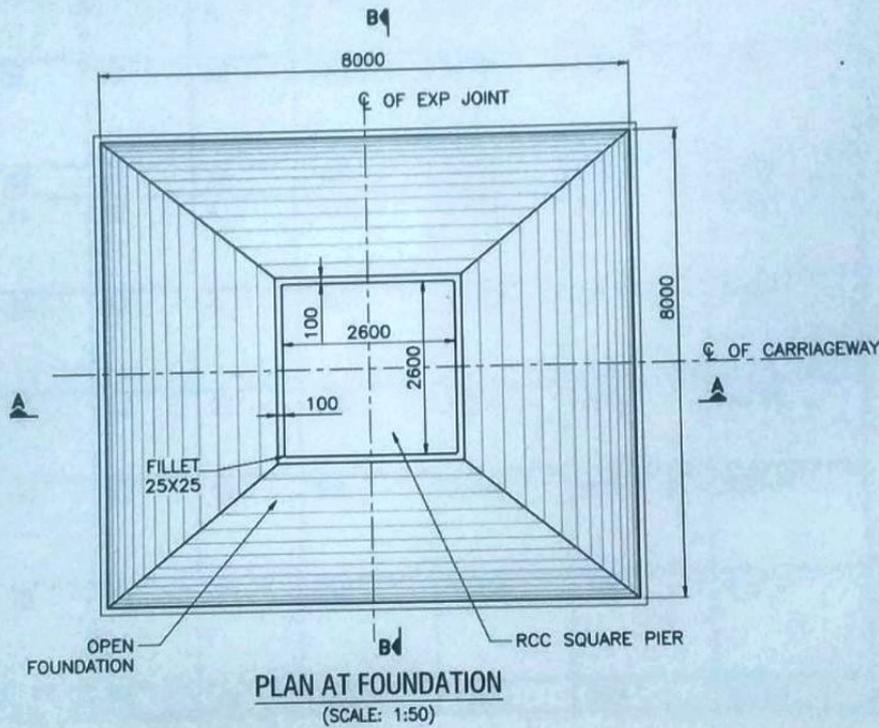
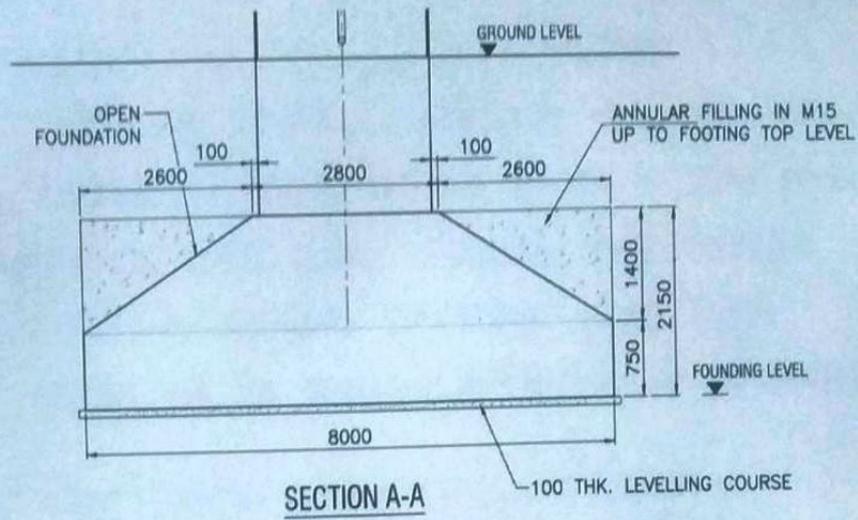
BAR MRKD.	DESCRIPTION	BAR SHAPE	REMARKS	
①	25 Φ @140 c/c		BOTTOM LONGI.	FOUNDATION
1a	12 Φ @200 c/c		SIDE	
1b	12 Φ @200 c/c		SIDE	
②	12 Φ @140 c/c		TOP LONGI.	
2a	12 Φ @140 C/C		TOP LONGI.	
③	25 Φ @140 c/c		BOTTOM TRANS.	
④	12 Φ @140 C/C		TOP TRANS.	
4a	12 Φ @140 C/C		TOP TRANS.	





REIN. DETAILS OF PIER
(SCALE 1:40)





STEEL QUANTITY CALCULATION FOR (01) MKD

TOTAL LENGTH OF ONE BAR = $7850 + 450 + 450 = 8750\text{mm}$

$$=8.75\text{m}$$

$$\text{NO OF BARS} = (7850/140) + 1 = 58$$

$$\text{HENCE, TOTAL LENGTH OF 58 BARS} = 58 * 8.75 = 507.5\text{m}$$

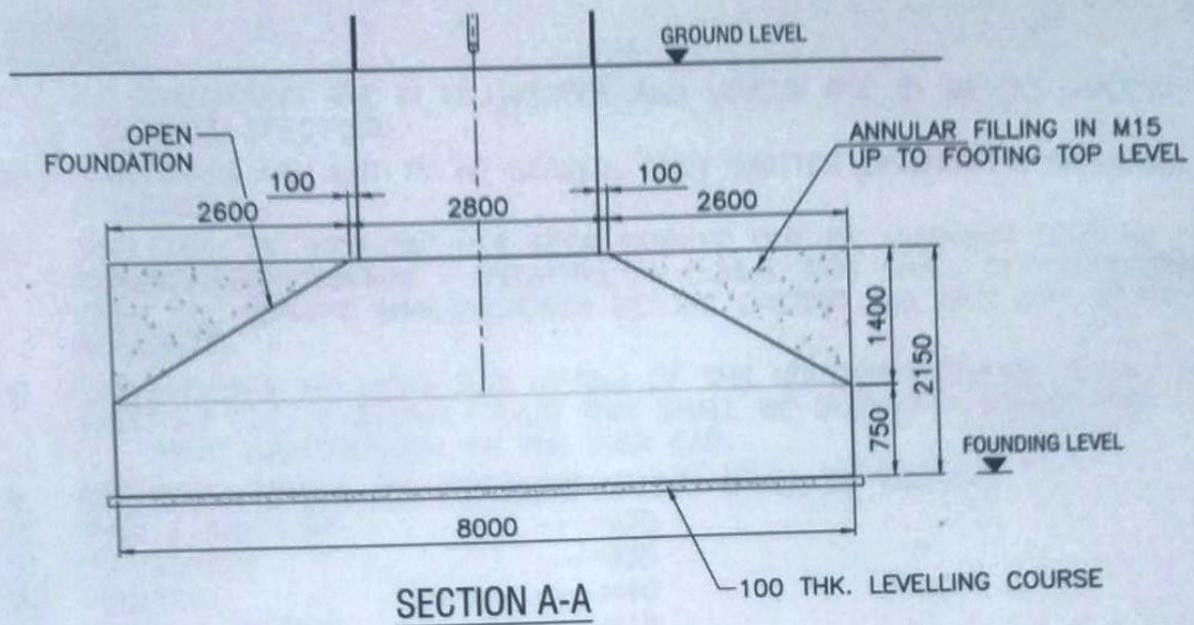
$$\text{MASS OF BAR (DIA. - 25mm) PER METER}$$

$$= (3.14/4) * (0.025)^2 * 1 * 7850 = 3.85 \text{ Kg/m}$$

$$\text{TOTAL MASS OF 58 BARS} = 3.85 * 507.5 = 1.95 \text{ TONNES}$$

MKD	DIA (mm)	NO, OF BARS	SPACIN G c/c (mm)	CUTTIN G LENG TH (m)	TOTAL CUTTI NG LENG T H (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

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



IN CUBOIDAL SECTION $V_1 = 8 \times 8 \times 0.75 = 48 \text{ m}^3$

IN PRISMOIDAL SECTION $V_2 = \frac{1.4}{3} \{64 + 7.84 + (64 \times 7.84)^{1/2}\}$

$V_2 = 43.978 \text{ m}^3$

FORMULA USED FOR CALCULATION OF VOLUME = $\frac{H}{3} \{A_1 + A_2 + (A_1 \times A_2)^{1/2}\}$

TOTAL CONCRETE = $V_1 + V_2 = 48.000 + 43.978 = 91.978 \text{ m}^3$

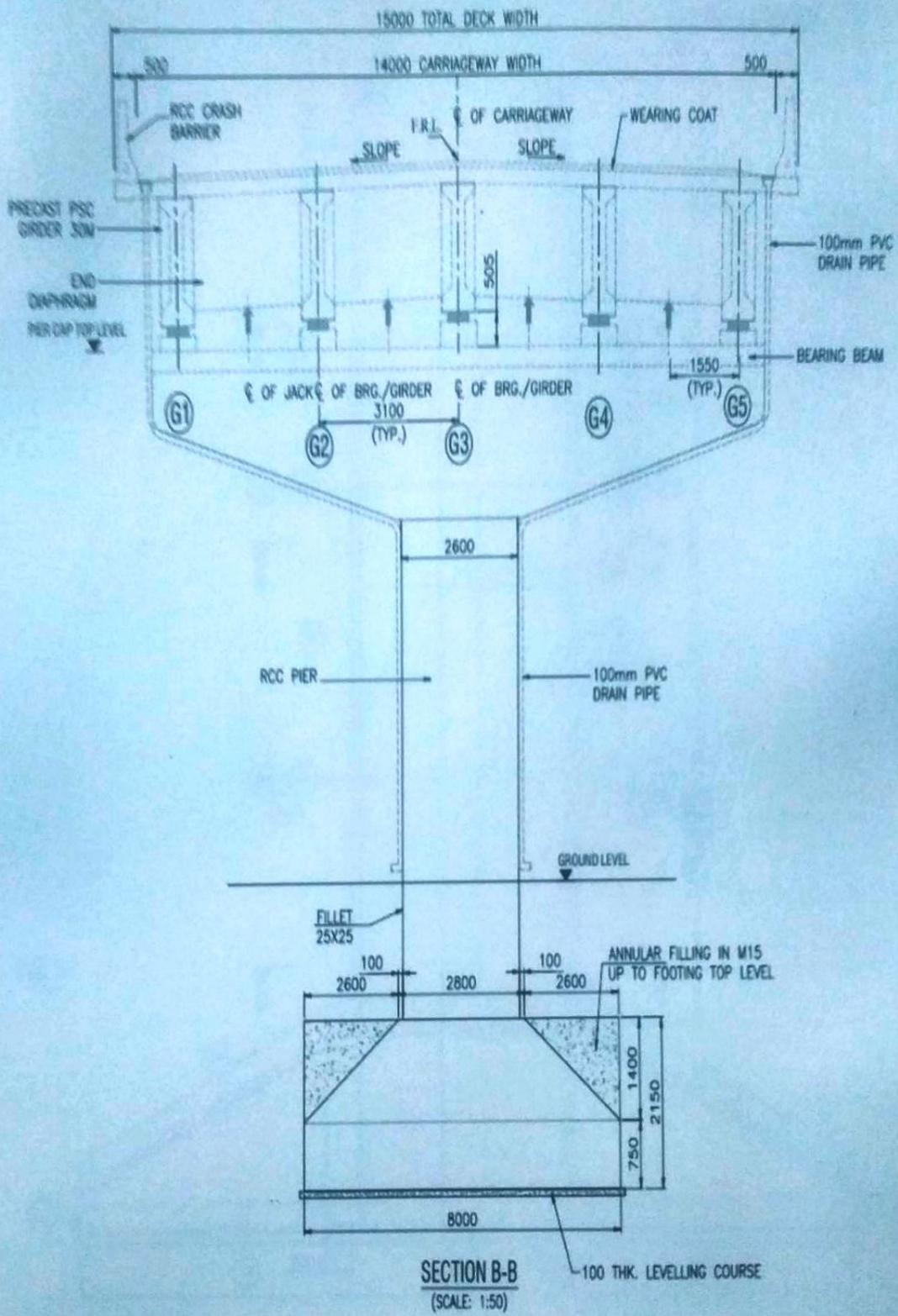
NOTES:-

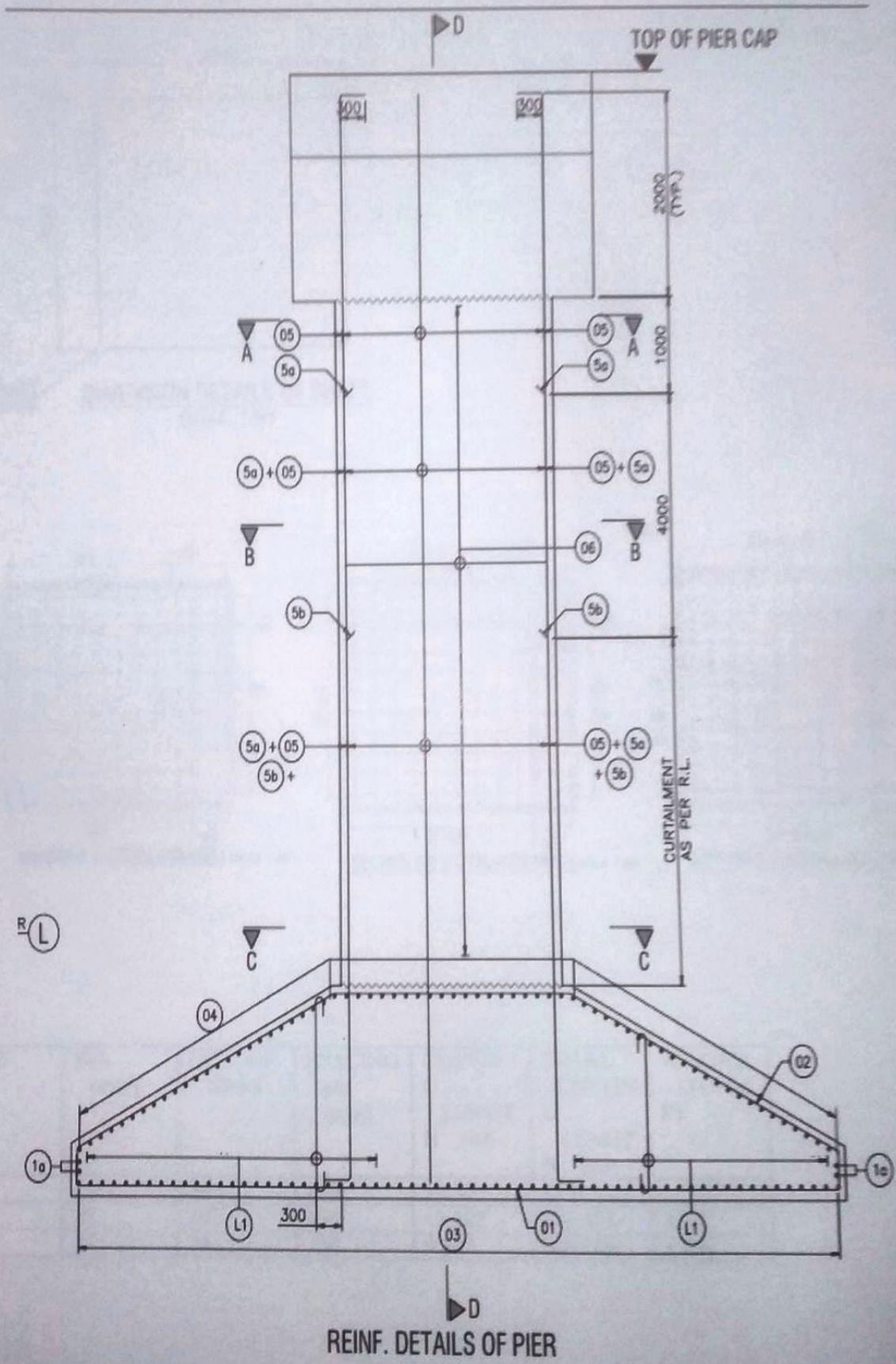
1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. DIMENSIONS ARE NOT TO BE SCALED. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. TOP LEVEL OF PIER CAP HAS BEEN WORKED OUT BY ASSUMING MINIMUM THICKNESS OF BEARING + PEDESTAL AS 0.35m. THIS SHALL BE RECONFIRMED 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
 - iii) 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. 100 ϕ 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.

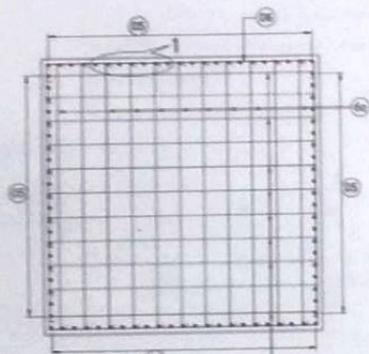
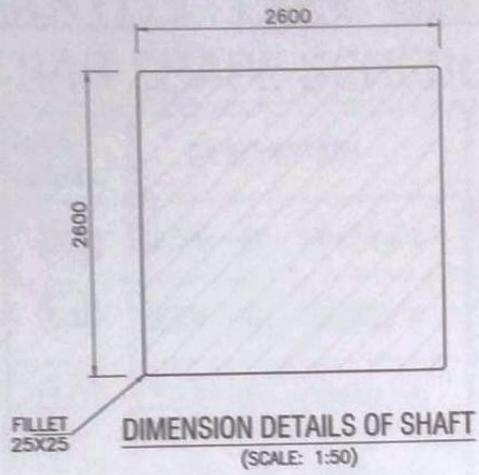
QUANTITY TAKE OFF FOR PIER SHAFT

•BBS CALCULATION OF PIER SHAFT FOR PIER NO- 65

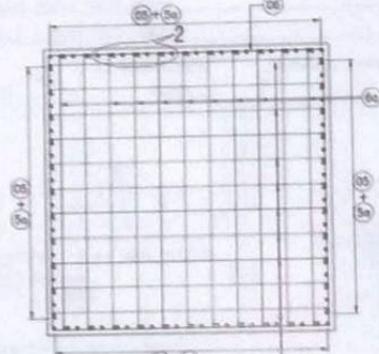
05	25 ϕ -88 Nos.	300 300 VARIES	VERTICAL (ALL FACE)	PIER SHAFT
5a	25 ϕ -44 Nos.	300 VARIES	VERTICAL (ALL FACE)	
5b	25 ϕ -44 Nos.	300 VARIES	VERTICAL (ALL FACE)	
06	2L-16 ϕ @90c/c	2500 2500	OUTER RING	
6a	24L-12 ϕ @180c/c	2500 } LINKS BOTH DIR.		
07	NOT IN USE			



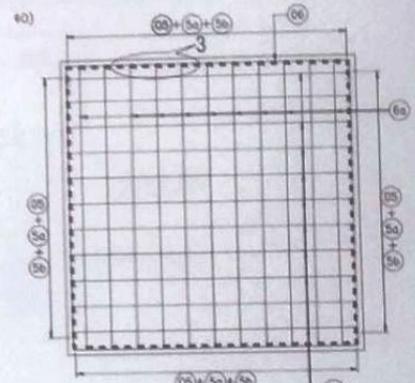




SECTION A-A (TOTAL = 88 NOS.) (SCALE 1:20)



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



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

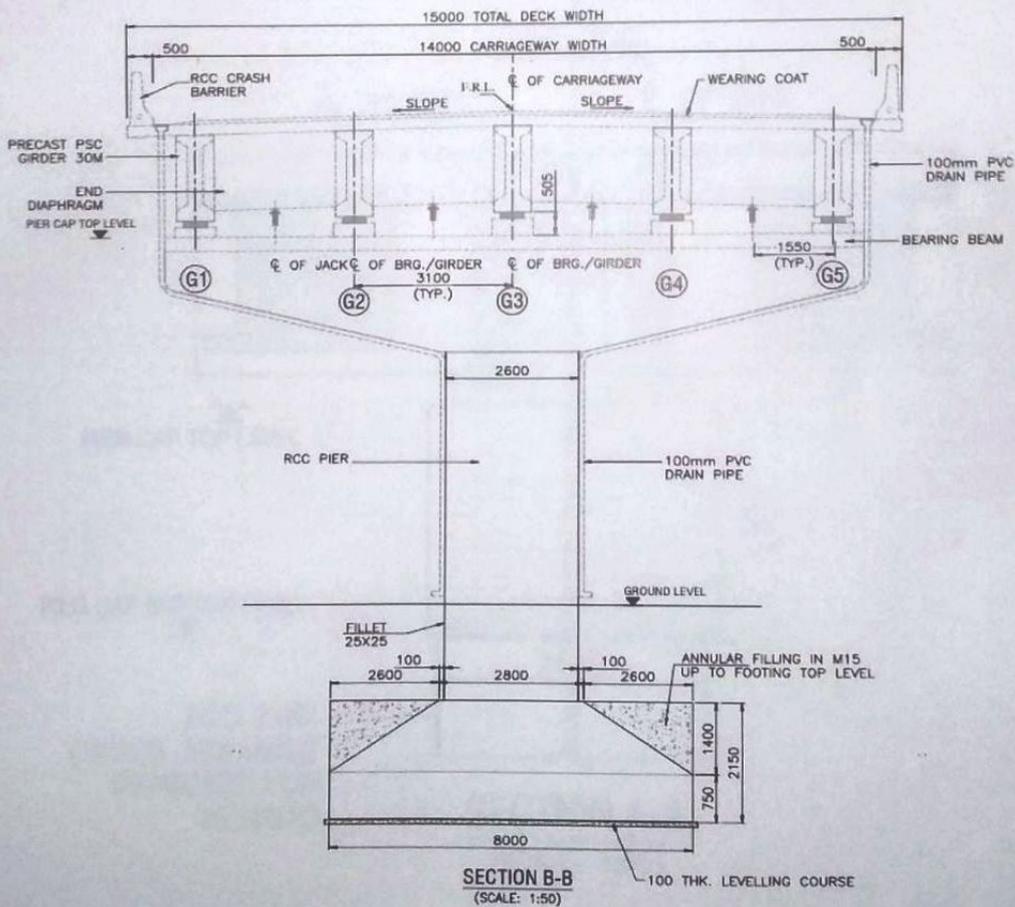
MKD	DIA (mm)	NO. OF BARS	SPACING c/c (mm)	CUTTIN G LENGT H (m)	TOTAL CUTTIN G LENGT H (m)	WEIGHT (TONN E)
05	25	88	110	16.507	1452.616	5.592
5a	25	44	230	13.207	581.108	2.237
5b	25	44	230	9.207	405.108	1.559

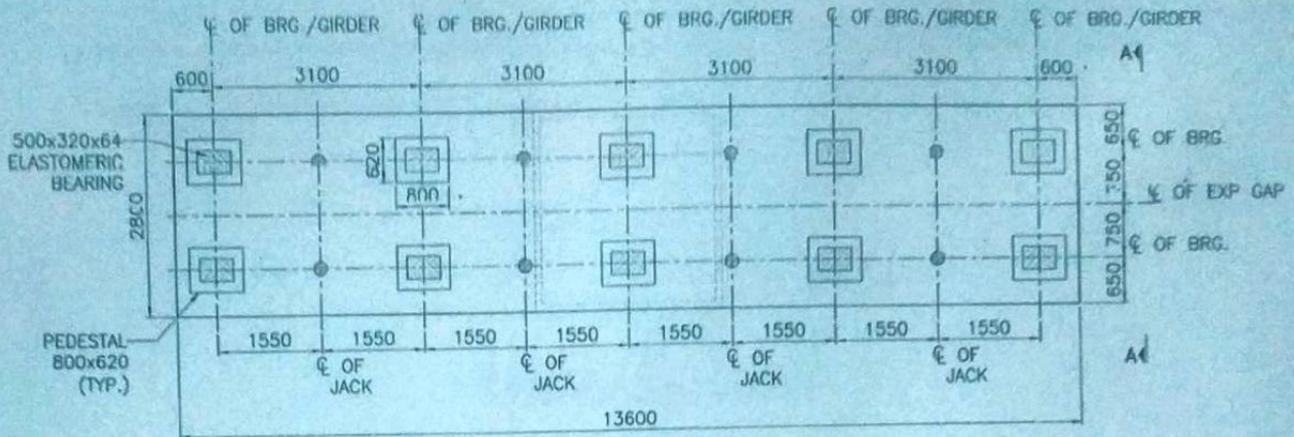
QUANTITY TAKE OFF FOR PIER CAP

BAR SHAPE SCHEDULE

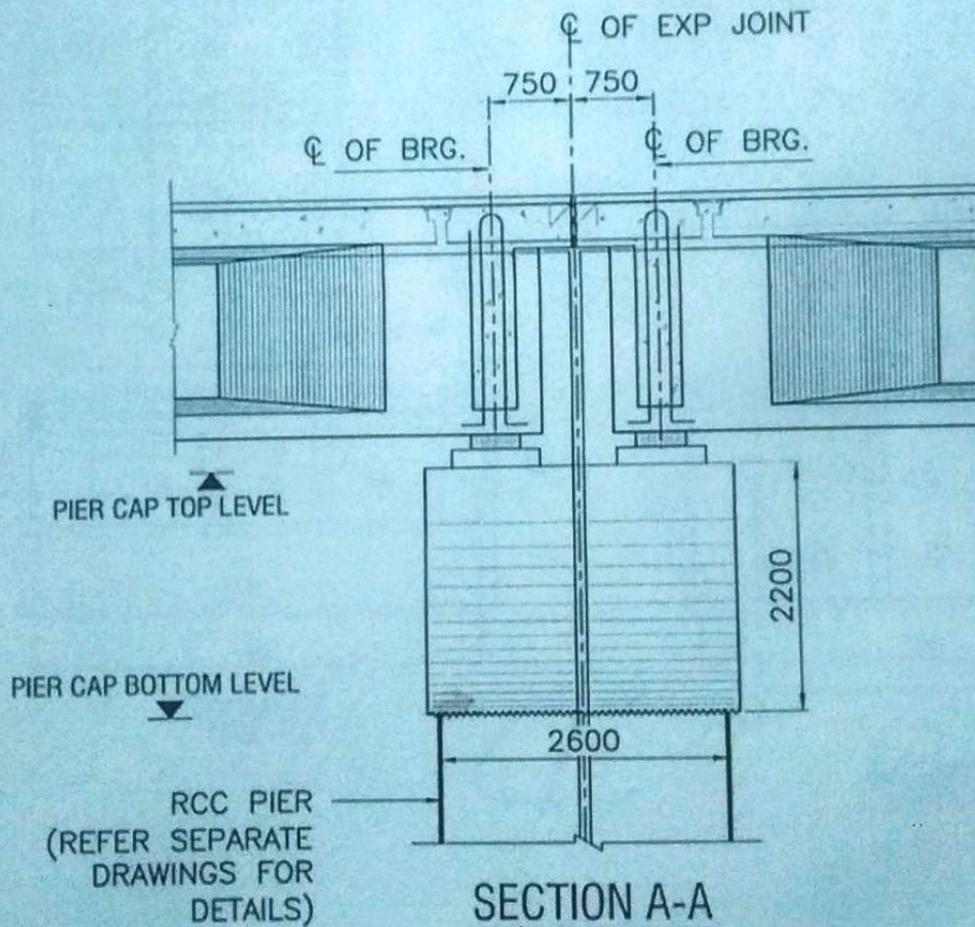
BAR MRKD.	DESCRIPTION	BAR SHAPE	REMARKS
08	25 $\bar{\Phi}$ - @ 190c/c		BOTTOM
09	32 $\bar{\Phi}$ - @ 190c/c		TOP
10	32 $\bar{\Phi}$ - @ 190c/c		TOP
11	12 $\bar{\Phi}$ - @ 200c/c.		SIDE
12	2L-16 $\bar{\Phi}$ @125c/c		OUTER RING

PIER CAP

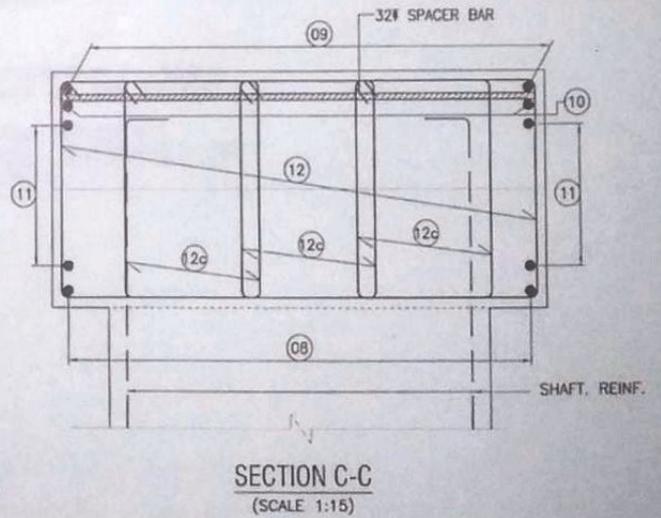
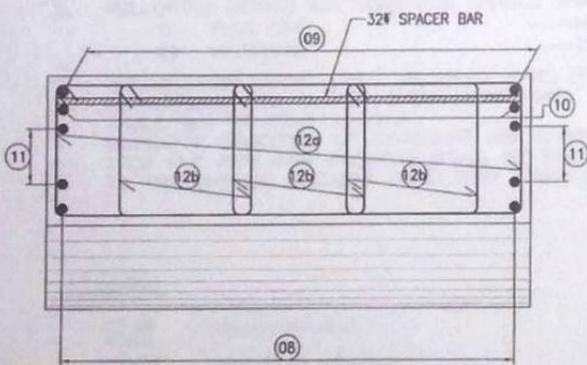
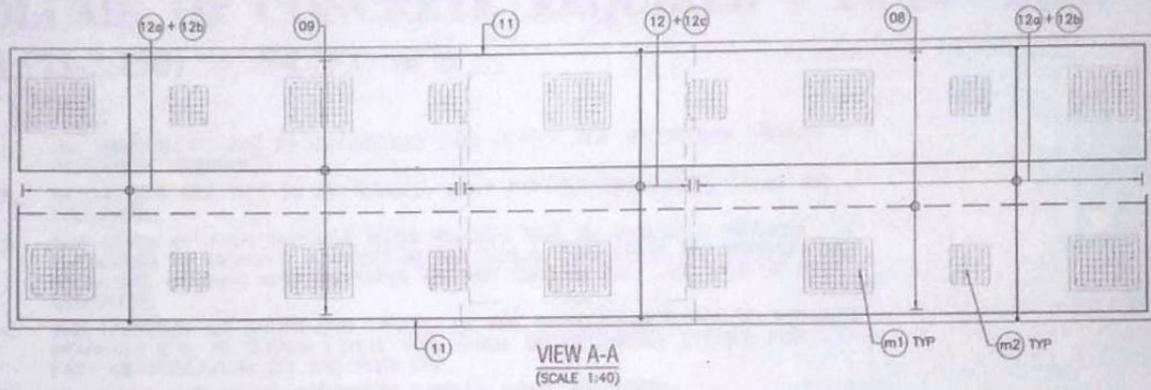
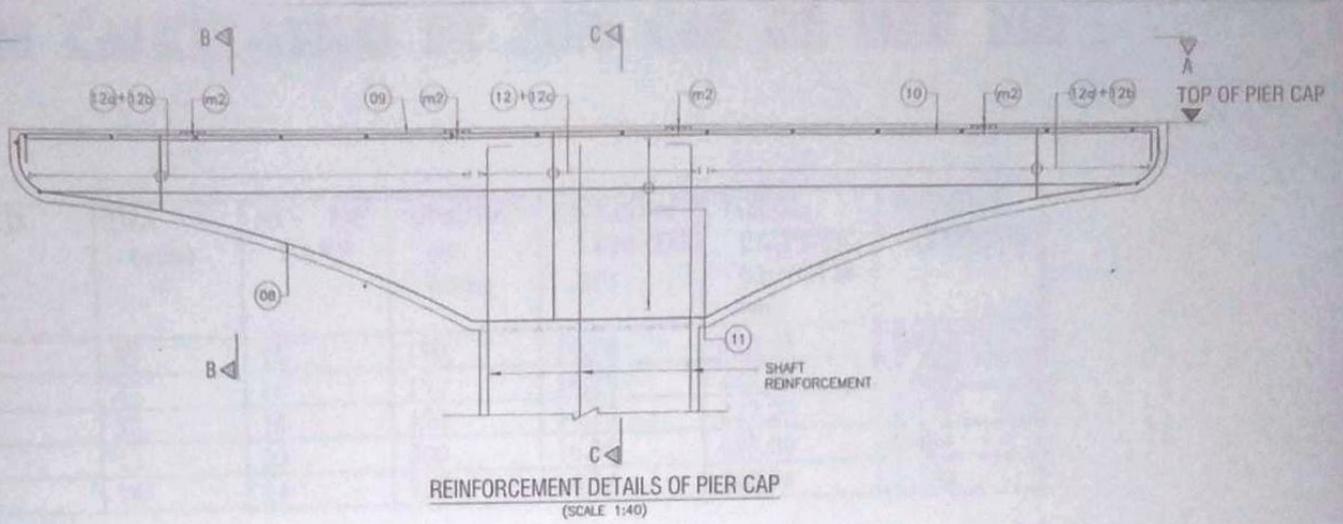




PLAN AT PIER CAP
(SCALE: 1:50)



SECTION A-A
(SCALE: 1:50)



Q1

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

MKD	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

VOLUME OF CONCRETE REQUIRED = $2.6 \times 2.6 \times (513.267 - 498.573 - 2.150) = 84.797 \text{ m}^3$

NOTES:-

- ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
- DIMENSIONS ARE NOT TO BE SCALED. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
- 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.
- 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.
- FOLLOWING DESIGN MIX CONCRETE GRADES SHALL BE USED:-
 - PIER CAP ---M35
 - PEDESTAL ---M40
- 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
- MODERATE CONDITION OF EXPOSURE ARE CONSIDERED FOR STRUCTURE.
- 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

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

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. The consistency of the "standard" is defined as "VICAT'S PLUNGER" of 10 mm diameter is possible using cement paste depth of 33-35 mm from the top or a height of 50 mm to pierce in the

mould (5 -7mm from bottom). This test is carried out at a temperature of 27°C and a humidity of 90%. The goal of this test is to determine how much water is needed to make a standard consistency cement paste. In 500 gramme of cement sample is mixed with 24% of water to accomplish this test.

In the first experiment, water by weight is added to the paste, which is then placed into the mould. The depth of plunger penetration in the mould is also documented. The examination is repeated.

penetration of 33-35 mm peak is visible. The water content is measured and labelled "P."

- **Setting time test**

- This test is performed to check the extent of deterioration of quality of cement during storage.
- Setting time of cement is classified as -
 - (a) Initial setting time (IST)
 - (b) Final setting time (FST)
- **(a) Initial setting time (IST)**- is the time between when water is added to the cement and when it starts to lose its plasticity
- **(b) Final setting time (FST)**- is the period of time measured from the moment water is applied to the cement until it totally loses its fluidity and achieves adequate firmness to withstand specific loading.
- There is no clear demarcation between the final setting and initial setting time.
- 500 gm of cement sample to be tested is mixed with "0" to do this test "85 P [where P is the amount of water needed to make a paste of standard consistency], and the paste is then placed into Vicat's mould. The time when a square

needle of size 1mm is initially placed is referred to as the initial setting time "penetrates the Mould from 33-35 mm above the top or [5-7 mm below the bottom].

- Final setup time refers to the time when the needle in the annular collar's centre is able to produce an impression over the Mould, but annular collars are not used.
- Temperature during the performance of this test is $27 \pm 2^\circ\text{C}$ and humidity during the preparation of Mould is $65 \pm 5\%$ and during test in Laboratory is 90 %.

• Testing of Aggregates: -

• **Toughness of aggregate**

- Toughness of aggregate directly governs the toughness of concrete in which it is used for construction.
- It is defined as the ability of aggregates to resist impact loading
- It is determined by executing a "aggregate impact value test" and is represented in terms of the parameter "aggregate impact value."
- This test sample of aggregate was retained after passing through a 12.5 mm sieve. Over 10 mm sieve is subjected to impact loading using a 14 kg hammer that is permitted to fall freely from a height of 38 cm 15 times over the sample. • The sample is then passed through a 2.36 mm screen, and the weight of aggregates passing through this sieve is recorded, and the aggregate impact value is represented in terms of the initial weight of aggregate.
- For aggregate to be used in pavement construction it must not exceed 30% & for general construction it must not exceed 45%.
- $AIV = \frac{B}{A} \times 100$

- Where, B= Weight of fraction passing through 2.36 mm sieve
- A= Weight of over dry sample
- AIV is indirectly proportional to Toughness.

•Flakiness Index Test:

- Flakiness of aggregates is measured in terms of parameter flakiness index. This test is not applicable for aggregates having size smaller than 6.3 mm. Flaky particles are those, least lateral dimension of which is smaller than 0.6 (3/5) times of its mean dimension.
- Flakiness is defined as % of flaky particles in the sample and is determined using flakiness index test.
- In order to perform this test, sufficient quantity of aggregates must be considered, such that 200 pieces of each fraction can be gauged.
- Particles of each fraction are passed turn by turn through the respective opening over the "THICKNESS GAUGE" and weight of aggregates passing through these openings is noted and when expressed in terms of original weight of aggregates 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 greater 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 g-auger & 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

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 quality of surface.



Fig 10: Laitance

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.



Fig 11: Cracks

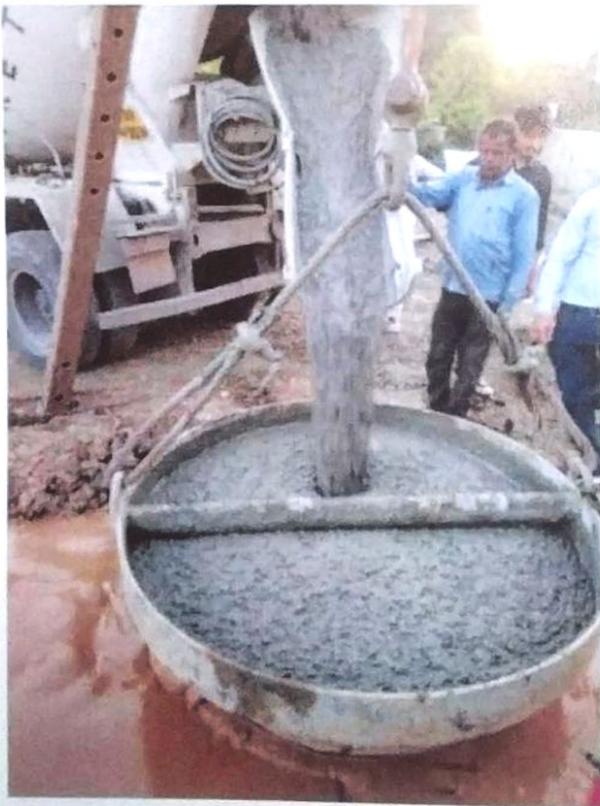
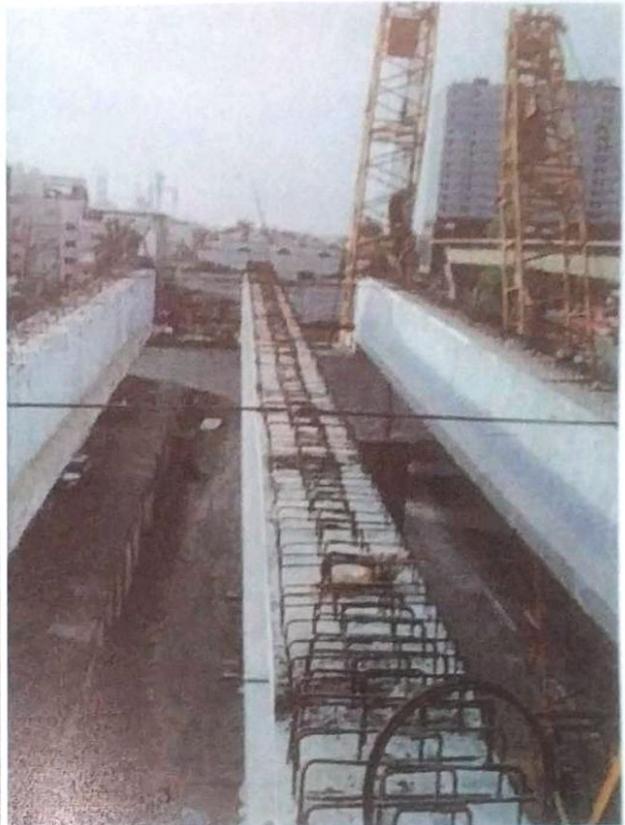
SOME PHOTOS OF SITE VISIT& VIDEO LINKS



SITE VISIT

Fig 12: Site Visit







- https://drive.google.com/file/d/1Rav9F4bR_MpheZvoxqzmvCRC4WpRQ82n/view?usp=drivesdk
- <https://drive.google.com/file/d/1I1pnklnyzVwvZkdXJynGjwo7KBEckfWa/view?usp=drivesdk>
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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 inplant 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 aided 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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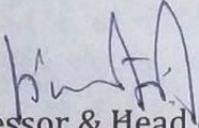
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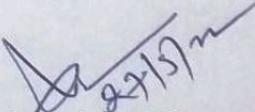
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Roll No.: 0901EE181114

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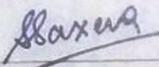
Guide name: Dr. M.K. Trinechi
Designation: Professor
Civil Engineering Department

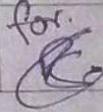
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Professor & Head of
Civil Engg. Deptt.


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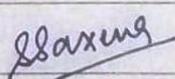
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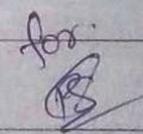
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Industry/Organization	PWD BHOPAL BRIDGE		Date/Duration	20 th Jan - 3 rd Feb	
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of 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				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	Shanw Saxena				
<u>Signature of Industry Mentor</u>					

Receiving Date		Name of Faculty Mentor	DR. M. K. TRIVEDI	Sign	
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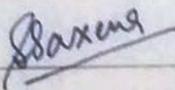
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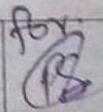
Name of student	SWAPNIL WASKLE		Department	CIVIL ENGINEERING	
Industry/Organization	PWD BHOPAL BRIDGE		Date/Duration	4 th Feb - 18 th Feb	
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Learning basics of structural bridge design.				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	Shanul Saxena				
<u>Signature of Industry Mentor</u>					

Receiving Date		Name of Faculty Mentor	Dr. M.K. TRIVEDI	Sign	
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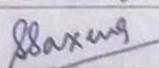
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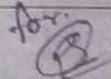
Name of student	SWARNIL WASKLE		Department	CIVIL ENGINEERING	
Industry Organization	PWD BHOPAL BRIDGE		Date/Duration	19 th Feb - 5 th March	
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/ Timely completion of assigned work					✓
Learning capacity/ Knowledge up gradation					✓
Performance/ Quality of work					✓
Behaviour/ Discipline/ Team work					✓
Sincerity/ Hard work					✓
Comment on nature of work done/ Area/ Topic	Understanding the concepts of general arrangement drawings. Components of bridge and introduction to various IRC codes				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	Shanul Saxena				
<u>Signature of Industry Mentor</u>					

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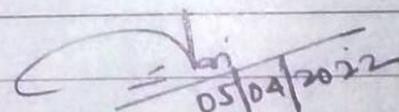
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Name of student	SWAPNIL WASKLE		Department	CIVIL ENGINEERING	
Industry Organization	PWD BHOPAL BRIDGE		Date/Duration	6 th March - 20 th March	
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/Timely completion of assigned work					✓
Learning 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)	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
Name of Industry Mentor	Shanul Saxena				
Signature of Industry Mentor					

Receiving Date	Name of Faculty Mentor	DR. M.K TRIVEDI	Sign	
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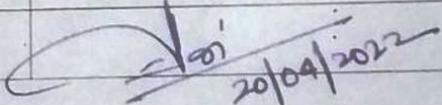
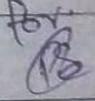
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Name of student	SWAPNIL WASKLE		Department	CIVIL ENGINEERING	
Industry/Organization	Construction/MPWD Bridge division - Bhubli		Date/Duration	21 st March - 4 th April	
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/Timely completion of 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	→ Testing of various material used in Bridge Construction - • Testing of cement → Testing of Aggregates & Concrete - Consistency test → Toughness of aggregate - Setting time test → Flakiness Index Test 1- Initial setting test → Elongation Index test 2- Final setting test → Swamp Value test				
OVERALL GRADE (Any one)	POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT				
Name of Industry Mentor	Naveen Malhotra / Jai Poakesh Sharma				
Signature of Industry Mentor	 05/04/2022				
Receiving Date	Name of Faculty Mentor	Dr. MK Trivedi	Sign		

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Name of student	SWAPNIL WASKIE		Department	CIVIL Engineering		
Industry/Organization	Construction/MPPWD Bridge division		Date/Duration	5th April - 19th 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	→ Classification of project → Concrete calculation for Pier shaft → Bar Bending schedule (BBS) for Pier shaft → Site visit during form work & concrete work.					
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>					
<u>Name of Industry Mentor</u>	Naveen Malhotra / Jai Prakash Sharma					
<u>Signature of Industry Mentor</u>	 20/04/2022					
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Name of student	SWAPNIL WASKLE		Department	CIVIL ENGINEERING	
Industry/Organization	PWD BHOPAL BRIDGE		Date/Duration	20 th APRIL - 4 th 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	Site visiting during pile foundation of pier NO-P-69				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/BETTER/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	Shanul Saxena				
<u>Signature of Industry Mentor</u>	<i>Saxena</i>				

Receiving Date	Name of Faculty Mentor	DY. P. K. TRIVEDI	Sign	<i>for</i>
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FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	XXXXXXXXXXXXX SWAPNIL WASKIE	Department	XXXX CIVIL ENGINEERING
Industry/Organization	XXXXXXXXXXXXX PWD Bridge division, Bhopal	Date/Duration	DD/MM/YR - DD/MM/YR 05/05/22 - 20/05/22
Criterion	Poor	Average	Good
Punctuality/Timely completion of assigned work			Very Good
Learning capacity/Knowledge up gradation			Excellent
Performance/Quality of work			✓
Behaviour/Discipline/Team work			✓
Sincerity/Hard work			✓
Comment on nature of work done/Area/Topic	→ Concrete Calculation for Pier footing → Bar Bending schedule (BBS) for Pier footing. ✓		
OVERALL GRADE (Any one)	POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT		
Name of Industry Mentor	Shanul Saxena		
Signature of Industry Mentor	<i>Saxena</i>		

Receiving Date	xxxx	Name of Faculty Mentor	xxx DR. MANOJ TRINEM	Sign	<i>for</i> <i>[Signature]</i>
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