

**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

**INTERNSHIP REPORT
ON
“CONSTRUCTION OF FLEXIBLE PAVEMENT”**

Submitted By–

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Er Sachin Saini
GSCDCL, Gwalior**



Madhav Institute of Technology & Science, Gwalior

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Bhopal)



PROJECT DEVELOPMENT AND MANAGEMENT CONSULTANT
For Implementation of Smart City Mission Project
Of Gwalior City

CERTIFICATE

Date: 23.05.2022

This is in reference to the ongoing Internship of **Mr. Vivek Sharma** at IPE Global Limited under Gwalior Smart City Project from 18th January, 2022 to 23th May, 2022.

We found him sincere, hardworking, and technically sound and result oriented. He worked well as a part of the team during his tenure. We take this opportunity to thank and wish him all the best for his future.

As a part of his institute grading we would like to grade him as **Excellent** during these course of months.

For IPE Global Limited

Authorized Signatory



Address: ICC, 1st floor, Moti Mahal, Gwalior

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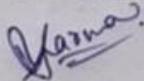
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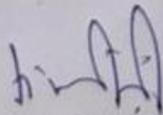
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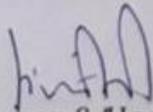
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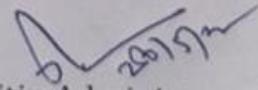
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Roll No.: 0901CE181120



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Designation: professor
Civil Engineering Department



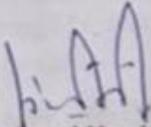
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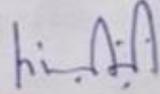


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RECOMMENDATION

It is hereby recommended that the internship report entitled — "Construction of Flexible Pavement" which is being submitted by Vivek Sharma completed under the guidance of Dr. Sanjay Tiwari may be accepted in the partial fulfillment of the award of the degree of Bachelor of Engineering in Civil Engineering.


for Prof. and Head
Civil Engineering Department
MITS, Gwalior


Dr. Sanjay Tiwari
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. Sanjay Tiwari**, Assistant Professor 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 **Smartcity Gwalior (M.P)** for providing the opportunities.

The environment of company 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 project.

Vivek Sharma

(0901CE181120)

DEPARTMENT OF CIVIL ENGINEERING

MITS GWALIOR (M.P.)

ABSTRACT

The project named “Construction of Flexible pavement” is a project under GWALIOR SMART CITY (GSCDCL) and IPE Global Gwalior.

This four-month full time internship details the work of construction of road at Mahal Road and Sevanagar, Phoolbagh Gwalior.

The elements of this report are practical as well as theoretical as per my onsite experience. This report gives the brief knowledge about the Mahal Road project, including all layers of pavement and testing of materials performed on site.

Gwalior Smart City Development Corporation Limited (GSCDCL) is the pioneer organization which is successfully implementing all construction projects and serving in Gwalior since long time. It also undertakes projects from autonomous bodies that can contribute to development of city. GSCDCL has highly qualified and experienced professionals forming a multidisciplinary team of engineers and architects who work alongside in order to make the work impeccable.

I am highly obliged to work with such esteemed personalities Er. Atul Tewari, Er. Kanchan Goswami and Er Sachin Saini who helped me throughout my internship journey and guided me at every step of the project.

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5.	Type of machinery
6.	Footpath work
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8.	Land scape area
9.	Drainage
10.	. Duct
11.	Jail fixing work
12.	Different type of road section
13.	Estimate of road
14.	conclusion

CHAPTER I

INTRODUCTION

1.1 General

During internship we learn many basic knowledge of road construction and how to use machinery and other object related to construction, generally in India we are using different type of roads and all roads are made of bitumen and of concrete, we are call flexible pavement and rigid pavement.

And in construction site we are using flexible payment. it possibles to construct thin layer atop to another layer after compaction, two stages give better strength to a road.

In road construction firstly design the road as required traffic capacity a structure engineer design the road on the basis of soil strength and load bearing capacity of soil ,in a road construction a wide range of materials required as a needed during the work like aggregate and water and crushing stone and bituminous and other needed materials, during the construction all materials checked by site engineer and other engineer like checked the size of aggregate and quality of aggregate or grade of aggregate on the basis of test.

In flexible pavement firstly provide sub-base of (GSB) Granular sub base and (WMM) wet mix macadam both layer are same and same materials used only water is mixed in WMM and the size of layer design by engineer and both the layer laying in two steps or materials used in layer is crushing stone, river sand crushing brick etc.

After WMM we use the prime coat in the form of thin layer, prime coat is used as binding materials in between sub-base or in sub-grade means between WMM OR DBM, the spray of prime coat is spray by worker as a MORTH.

After 24 hours we laying the layer of DBM (DENSILE BITUMINOUS MACADAM) as a sub -grade and DBM making process complete in hot mix plant at certain temperature, in the site engineer check the temperature of bituminous concrete.

And before the BC (BITUMINOUS CONCRETE) we applying the tack coat layer on the surface of DBM before 7 hour with requirement of spray ,because tack coat make proper binding between DBM AND BC ,BC is thin and last layer of flexible pavement.

References

- MORTH
- From site data or in drawing
- By self judgement
- By help of industries mentor

OBJECTIVE OF PAVEMENT

- To provide easy drive and safety
- To provide smooth surface and high durable
- In flexible the pavement good in climatic condition
- To keep safe lower surface for damage in flexible pavement
- To keep load sustain in road to avoid free from damage

PAVEMENT AND IT'S TYPES

Pavement is an open, generally public use the way for passage of vehicles, people, and animals.

Pavement is hard and smooth surface ,its makes durable and easy to withstand and for environment, the life of pavement is 20 to 30 years

Road pavements get destroyed over time due to-

- Particularly heavy vehicles destroy pavement
- Environmental changes such as weather, pollution

TYPES OF PAVEMENT

- Flexible pavement
- Rigid pavement

FLEXIBLE PAVEMENT:

Bitumen material used in the construction of flexible pavements for a long time, this is easy and convenient type of construction.the estimated cost used to construct 1 km is 10 to 20 lakh rupees.in some conditions however, the result of conventional bitumen may not be considered satisfactory due to some reasons-

- In summer season,the temperature is high , bitumen gives soft results in bleeding, rutting or segregation or finally causes of failure pavement.
- In winter season, the low temperature bitumen is becomes brittle result in cracking and unevenness and make a pavement unsuitable for use
- In rainy season the water enters in the pavement and make pot holes and sometimes total removal of bituminous layer.
- In hilly area due to effect of sub-zero temperature the freeze thaw and heave cycle takes place ,due to freezing void of pavement and expansion occur or make pavement failure.



Fig no:1.1



Fig no :1.2

RIGID PAVEMENT

RIGID PAVEMENT

- the construction of rigid pavement is very costly in initially and cheap after construct because the maintenance cost is very cheap in rigid pavement generally we used (concrete pavement),
- We get bituminous by the help of petroleum crude, but in present time the rate of fossil fuel is high and available in low quantity so bituminous is not easy available but cement have in much quantity in India so we easy get and construct rigid pavement.
- Cement easy available so we use rigid pavement because this is maintenance free.
- Rigid pavement save fuel during drive so help in savings and save 14 to 20 % fuel.
- Rigid pavement economic in nature or easy for construct.
- Rigid pavement easily or varies in nature not get more effect of climate.



Fig no :1.2.1

LAYER OF FLEXIBLE PAVEMENT

- Bituminous concrete
- Dense bitumen macadam
- Tack coat
- Prime coat
- Wet mix macadam
- Granular sub base

BITUMINOUS CONCRETE (B C) (40MM)

Bituminous concrete using for wearing course and material use is small compare to dbm materials and work of these layer complete in one layer of bituminous concrete atop of dense bituminous concrete.

Material:

Bitumen, coarse, aggregate, fine aggregate, filter

CONSTRUCTION

- the layer of bituminous concrete was layed over DBM when surface free from water and dust free and check climate condition,
- Before bituminous concrete the surface was completely sprayed with prime coat in required quantity .
- Or provide asphalt layer in another asphaltic layer provide tack coat in uniformly with rule in dense bituminous concrete

- And before laying bituminous concrete we checked the temperature and proper compaction was done with suitable roller.



Fig no :1.3.1



Fig no :1.3.2

DENSE BITUMINOUS MACADAM (DBM) (115MM)

Dense bituminous macadam is binder course used in road for more commercial vehicle and it is used to close graded premix materials have a void content in 5 to 10 percent

WHY DBM REQUIRED

- The materials used in dbm is durable in all conditions and make surface smooth.
- Available for all types pavement layers and for all types traffic conditions.
- improved skid resistance

CONSTRUCTION

DBM is second last layer of flexible pavement, DBM is mixture of hot bituminous concrete and DBM materials are prepared in hot mix plant by different processes as a rule.

After prepared materials of DBM is transported by truck and other transports as a requirement in site or as an order.

The temperature of DBM in plant was approx. 145°C to 160°C and in site the temperature of DBM was above than 90° c.

The DBM constitution in road was completed in two layer , the layer of DBM was layed over WMM with proper alignment.

After one layer, layer was compacted by high pressure roller quickly after laying and another layer of DBM was layed over the first layer and compacted again.



Fig no :1.4.1



Fig no 1.4.2



Fig no : 1.4.3

TACK COAT :

Before laying asphaltic layer to over another layer the tack coat was used to make bonding and generate bonding properties between layers ,before the laying or spraying of tack coat the surface was made free from garbage and free from dust or soil by washing and sweeping the road. It is done so that the materials used is not wasted. Also the material used in tack coat was sprayed before 7 hour and in given quantities like as morth 200 to 300 gm per square meter.



Fig no:1.5.1

PRIME COAT:

Prime coat is thin or low viscosity asphalt provide in granular base to make prepare for over another asphalt layer ,this material was used to provide adhesion between base course and asphalt layer, before use of prime coat the time should be minimum 48 to 72 hour before asphalt layer(on site it was 48 hrs). 700-900 gm/sq. space was occupied by prime coat.



Fig no:1.6.1



Fig no:1.6.2

WET MIX MACADAM(WMM) (250MM)

The work of wet mix macadam shall consist of laying and compacting clean or crushed aggregate and granular material and premixed with water, and the base should be prepared as previous layer or as sub base and The material laid in one or more layers or necessary to lines the layer and grades or cross sections shown in drawing given or verified by the engineer.

The thickness of a single compacted layer of wet mix macadam should not be less than 75 mm according to morth and when vibrating or other types of compacting roller are used to compact the depth of a single layer or the sub base course should be up to 200mm with the approval of the engineer.

- Materials.
- Aggregates.
- Physical requirements.

Coarse aggregates is crushed stone and if crushed gravel used should not less than 90 percent by weight of the gravel pieces retained in 4.75mm sieves should have at least two fractured faces or the aggregates should confirm to the physical requirement.

Coarse aggregate should have greater than 2 percent water absorption, value of the soundness test should depend the materials carried in site.



Fig no:1.7.1



Fig no:1.7.2

GRANULAR SUB BASE (GSB) (200MM)

The work of GSB collection of laying and compacting materials as a grade on prepared of sub grade according to requirement of the specification. The materials should be laid down in one or more layers as given drawing and aline as given order , grades of materials or the weight or cross-section decided as a drawing or as directed by engineers.

MATERIALS :

The materials used in GSB for work is l sand, crushed gravel, crushed materials , slag, or other materials as requirement

Construction :

The layer of GSB was laid down in two layer.

The materials provided in construction were not more than 150 mm and the compacting layer was not more than 100 mm.

After laying down the layer, it was quickly compacted by the help of 80 to 100 KN vibrator roller .



Fig no :1.8

TYPES OF TEST :

Strength of aggregate

Hardness of aggregate

Shape of aggregate

Adhesion of bitumen

Sand replacement test

Moisture content test with the help of RMC

Bitumen extractor

Specific gravity and water absorption test

PERFORMED TEST:

1. Moisture test:

Test of moisture content determine the water present in the soil ,because water change the behavior of soil ,like make loose and decrease the bearing capacity of soil.

So generally we check the water content of soil to build ,construct structure or road.

INSTRUMENT USED: RAPID MOISTURE METER

PARTS OF INSTRUMENT: steel balls, pressure gauge ,metallic bottle, calcium carbide bottle ,selling cup.

Process of finding moisture content: Firstly we take the sample of soil in 5 to 6 gm in site and go for weight, after this the sample should be filled in metallic bottle or put the metallic ball in vessel and fill the some amount of calcium carbide and close the vessel by selling for make air tight inside the vessel.

And shake 2 to 3 time fastly so gas produced inside the vessel and give the faster result in side in 5 to 10 minute.

RESULT: the percentage come in pressure is 4 % means the water content in soil is only 4 %.



Fig no :1.9.1



Fig no :1.9.2

2. Sieve analysis:

Sieve analysis is used to determine or select best fine or course aggregate and the test is done by sieving aggregate by different size of sieve as give in IS code .

The materials used in site is good or sufficient or not we check by the help of sieve analysis and we get different size of particle by different sieves.

Apparatus used :

Sieve of different size like 80 mm, 63 mm, 40 mm, 50 mm, 2.5 mm, 31.5 mm, 20 mm , 16 mm 12mm , 10 mm, 4.75 mm, 6.3 mm, 3.35 mm, 2.36 mm, 1.18 mm, 600 micron ,300 micron, 150 micron or 75 micron .

METHOD:

1. test sample is dry and weighed at 110 +5 degree calcuis
2. And sieve the sample as given in set
3. After completing sieve the materials of each sieve weight properly

4. the cumulative passing weight of each sieve calculate the total percentage of sample weight.

5. Fineness modulus calculate as adding the cumulative percentage weight retained in each sieve or divided by 100 .



Fig no :1.10.1



Fig no :1.10.2



Fig no :1.10.3

SIEVE ANALYSIS TEST RESULTS

L&T Construction <small>Water & Effluent Treatment</small>		LARSEN & TOUBRO CONSTRUCTION				
Project Name:-Gwalior Smart City Project		SL NO: 000				
Format No : QMSG-CIVIL-9						
SIEVE ANALYSIS REPORT OF WET MIX MACADAM [As per MoSRT & H]						
Laboratory Job No.	LE20MIS9	Date Of Sample	06/11/2021			
Type of Material	W M M	Sampled By	VKV			
Source	Bilouva	Date of Testing	06/11/2021			
Location	Kotadryal, RO.	Tested By	Kanubhai			
Proposed Use	B T ROAD WORKS	Testing Method	Dry sieve Analysis			
grams Total Weight of sample 9340						
Sieve size	Wt. Retained (gm)	% wt. Retained (gm)	Cum. % Retained	Cum. % Passing	% Passing as per Specification MoSRT&H	Remarks
53.00 MM	0	0	0	100	100	WMM is As per MoSRT & H limits
45.00 MM	370	3.96	3.96	96.04	95-100	
22.40 MM	3160	33.83	37.79	62.21	60-80	
11.20 MM	1810	19.38	57.17	42.83	40-60	
4.75 MM	1430	15.31	72.48	27.52	25-40	
2.36 MM	1050	11.24	83.73	16.27	15-30	
600 MIC	390	4.18	87.90	12.10	08-22	
75 MIC	1120	11.99	99.89	0.11	0-8	
Pan wt.	10	0.11	100	—		
Total wt.	9340	100				

V.K. VISHNUP

Manager

L&T CONSTRUCTION

Gwalior

QA/QC

Kanubhai

Ch-PMU

CLIENT



LARSEN & TOUBRO CONSTRUCTION

Project Name:-Gwalior Smart City Project

SL NO: 000

Format No : QMSG-CIVIL-9

SIEVE ANALYSIS REPORT OF WET MIX MACADAM [As per MoSRT & H]

Laboratory Job No.	LE120M159	Date Of Sample	23/12/21
Type of Material	W M M	Sampled By	VKV
Source	Bilauy	Date of Testing	25/12/21
Location		Tested By	Karmel
Proposed Use	B T ROAD WORKS	Testing Method	Dry sieve Analysis

15424 grams Total Weight of sample

Sieve size	Wt. Retained (gm)	% wt. Retained (gm)	Cum. % Retained	Cum. % Passing	% Passing as per Specification MoSRT&H	Remarks
53.00 MM	0	0	0	100	100	WMM is As per MoSRT & H limits
45.00 MM	0	0	0	100	95-100	
22.40 MM	2402	15.08	15.08	84.92	60-80	
11.20 MM	3832	24.06	39.15	60.85	40-60	
4.75 MM	3736	23.46	62.61	37.39	25-40	
2.36 MM	1772	11.13	73.74	26.26	15-30	
600 MIC	2008	12.61	86.35	13.65	08-22	
75 MIC	2118	13.30	99.65	0.35	0-8	
Pan wt.	56					
Total wt.	15424					

Karmel
L&T

V.K. Shivhare
CLIENT

SIEVE ANALYSIS REPORT OF DENSE BITUMINOUS MACADAM [As per MoSRT & H]

Laboratory Job No.	LE20M159	Date Of Sample	21/12/21
Type of Material	DBM	Sampled By	LT/POMC
Source	BT Plant	Date of Testing	21/12/21
Location	Khetiyar ^{Material ID} Ch. - 135-230	Tested By	LT/POMC
Proposed Use	B T ROAD WORKS	Testing Method	Dry sieve Analysis

5200 grams Total Weight of sample

Sieve size	Wt. Retained (gm)	% wt. Retained (gm)	Cum. % Retained	Cum. % Passing	% Passing as per Specification MoSRT&H	Remarks
37.5 MM	0	0	0	100	95-100	DBM GRADE-I is As per MoRTH
26.5 MM	400	7.69	7.69	92.31	63-93	
13.2 MM	1236	23.77	31.46	68.54	55-75	
4.75 MM	764	14.69	46.15	53.85	38-54	
2.36 MM	814	15.65	61.81	38.19	28-42	
300 Mic	950	18.27	80.08	19.92	7-21	
75 MIC	800	15.38	95.46	4.54	2-8	
Pan wt.	230	4.42	99.88	0.12		
Total wt.	5194					

[Signature]
Rajesh
L&T

[Signature]
V.K. Shrivastava
Bd Be Manger

[Signature]
POMC

[Signature]
CLIENT
[V.K. Shrivastava]



L&T Construction
Water & Effluent Treatment

LARSEN & OUBRO CONSTRUCTION

Project Name:-Gwalior Smart City Project

SL NO: 000

SIEVE ANALYSIS REPORT FOR GRANULAR SUB BASE [As per MoSRT & H]

Laboratory Job No.	LE20M150	Date Of Sample	23/12/21
Type of Material	GSB GRADE	Sampled By	VKV
Source	Biloum / Plant	Date of Testing	25/12/21
Location		Tested By	Karmal
Proposed Use	Roof water id	Testing Method	dry sieve analysis

22566 grams Total Weight of sample

Sieve size	Wt. Retained (gm)	% wt. Retained (gm)	Cum. % Retained	Cum. % Passing	% Passing as per Specification MoRTH			Remarks
					Grading 1	Grading 2	Grading 3	
53.00 MM	0	0	0	0	80-100	100	100	GSB is As per MoRTH limits Grading
25.5 MM	3230	14.31	14.31	85.69	55-90	70-100	55-75	
9.5 MM	7098	31.45	45.76	54.24	35-65	50-80	-	
4.75 MM	3098	13.72	59.48	40.52	25-55	40-65	10-30	
2.36 MM	2320	10.28	69.76	30.24	20-40	30-50	-	
425 MIC	5126	22.71	92.47	7.53	10-15	10-15	-	
75 MIC	1576	6.98	99.45	0.55	0-5	0-5	0-5	
Pan wt.	118							
Total wt.	22566							

L&T CONSTRUCTION
Gwalior
Karmal

Client [V.K. Shivhare]

3.SAND REPLACEMENT TEST :

This test is used to determine the dry density of soil and the help of the test we determine the future report of soil like wearing capacity of soil and how much water content present in soil and when we apply pressure after compacted how much load wear during construction or after complete the work.

Apparatus used for test:

- 1. Sand pouring cylinder**
- 2. 300 mm square metal tray and with 40 mm deep or 100 mm diameter hole in centre .**
- 3. Calibrating cylinder with 100mm diameter and 150 mm height**
- 4. Metal tray for soil collecting**
- 5. Tools for soil excavation**

Procedure:

Firstly clear the space in about 450 mm square in site and place the metal tray over the clean soil and excavate the soil in hole given in centre about depth of 150 mm soil and collect the all soil in empty metal tray and weight the sample, and square metal tray remove from hole and filled the weighed sand inside the hole till not full and after weight the cylinder with remaining sand, and find the density of soil in two to three time repetition for better result.

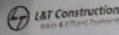


Fig no :1.11.1



Fig no : 1.11.2

TEST RESULTS FOR MOISTURE CONTENT AND MAX.FIELD DENSITY



LARSEN & TOUBRO CONSTRUCTION

Project Name:-Gwalior Smart City Project

SL NO: 000
Format No : QMSG-CIVIL-6

Layer No.	C/S:R Top	Tested On	17/12/21
Stretch of testing	R/W Mehar Road ch. - 135 to 230	Tested By	L&T/PMC Joshi
Source of Material	Mehar Road	MDD of Material	2.15
Density of Sand, γ_s	1.378		

FIELD DENSITY MEASUREMENT

TEST PIT LOCATION

OFFSET FROM MEDIAN CENTRE LINE	m	1	1
POURING CYLINDER NO	no	150	150
DEPTH OF HOLE	mm	3900	3872
WT. OF MATERIAL FROM HOLE, W_w	gm	6694	6702
WT. OF SAND + CYLINDER BEFORE POURING, W_1	gm	3930	3960
WT. OF SAND + CYLINDER AFTER POURING, W_2	gm	310	310
WT. OF SAND IN CONE, W_3	gm	2454	2432
WT. OF SAND IN HOLE, $W_4 = (W_1 - W_2 - W_3)$	gm	1780	1765
VOLUME OF PIT, $V = (W_4 / \gamma_s)$	cc	2.191	2.193
WET DENSITY OF MATERIAL, $\gamma_b = (W_w / V)$	gm/cc	2.148	2.140

MOISTURE CONTENT MEASUREMENT: (By Rapid Moisturemeter Method)

MOISTUREMETER GAUGE READING	%	2	2.5
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RESULTS

FIELD MAX. DRY DENSITY OF MATERIAL $\gamma_d = 100 \times \gamma_b / (100 + W)$	gm/cc	2.148	2.140
RELATIVE COMPACTION OBTAINED = $(100 \times \gamma_d / MDD)$	%	99.90	99.54

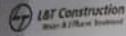
VPASS/FAIL

Handwritten signatures and initials:
 [Signature]
 [Signature]
 [Signature]

L&T

CLIENT

L&T CONSTRUCTION
Gwalior
QA/QC



LARSEN & TOUBRO CONSTRUCTION

Project Name:-Gwalior Smart City Project

SL NO: 000

Format No: QMSG-CIVIL-6

Tested On: 19/12/21

Tested By: JBT/P.D.Mc

Layer No. WMM Top

Stretch of testing Madh. Road - 130 to 220

Source of Material

MDD of Material

2.15

Density of Sand, γ_s 1.378

FIELD DENSITY MEASUREMENT

TEST PIT LOCATION

OFFSET FROM MEDIAN CENTRE LINE	m				
Pouring Cylinder NO	no	1			
DEPTH OF HOLE	mm	150			
Wt. OF MATERIAL FROM HOLE, W_w	gm	2734			
Wt. OF SAND + CYLINDER BEFORE POURING, W_1	gm	6738			
Wt. OF SAND + CYLINDER AFTER POURING, W_2	gm	4746			
Wt. OF SAND IN CONE, W_3	gm	310			
Wt. OF SAND IN HOLE, $W_4=(W_1-W_2-W_3)$	gm	1682			
VOLUME OF PIT, $V=(W_4/\gamma_s)$	cc	1220			
WET DENSITY OF MATERIAL, $\gamma_b=(W_w/V)$	gm/cc	2.20			

MOISTURE CONTENT MEASUREMENT:- (By Rapid Moisturemeter Method)

MOISTUREMETER GAUGE READING	%	31.			
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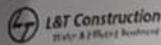
RESULTS

FIELD MAX. DRY DENSITY OF MATERIAL $\gamma_d=100 \times \gamma_b / (100+W)$	gm/cc	2.175			
RELATIVE COMPACTION OBTAINED = $(100 \times \gamma_d / MDD)$	%	101.			

VPASS/FAIL

CLIENT

Handwritten signatures and notes:
 L&T CONSTRUCTION Gwalior QA/QC
 19/12/21 8:00 PM
 JBT/P.D.Mc
 19/12/21



LARSEN & TOUBRO CONSTRUCTION

Project Name:-Gwalior Smart City Project

SL NO: 000

Format No : QMSG-CIVIL-6

Layer No.	Subgrade 2nd	Material	Tested On	11/12/21
Stretch of testing	Ch. 130 to 240 (R.H.S)		Tested By	Kamlesh Vikram & PDMC
Source of Material		MDD of Material		2.047
Density of Sand, Ys	1.378	OMC of Material		11.05

FIELD DENSITY MEASUREMENT

TEST PIT LOCATION

OFFSET FROM MEDIUM CENTRE	m				
POURING CYLINDER NO	no	1			
DEPTH OF HOLE	mm	150			
WT. OF MATERIAL FROM HOLE, Ww	gm	2188			
WT. OF SAND + CYLINDER BEFORE POURING, W1	gm	6248			
WT. OF SAND + CYLINDER AFTER POURING, W2	gm	4736			
WT. OF SAND IN CONE, W3	gm	310			
WT. OF SAND IN HOLE, W4=(W1-W2-W3)	gm	1402			
VOLUME OF PIT, V=(W4/Ys)	cc	1017.41			
WET DENSITY OF MATERIAL, Yb=(Ww/V)	gm/cc	2.150			

MOISTURE CONTENT MEASUREMENT:(By Rapid Moisturemeter Method)

MOISTUREMETER GAUGE READING	%	7			
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RESULTS

FIELD MAX.DRY DENSITY OF MATERIAL $Yd=100 \times Yb / (100+W)$	gm/cc	2.009			
RELATIVE COMPACTION OBTAINED = $(100 \times Yd / MDD)$	%	98.14			

VPASS/FAIL

U. K. VISINKA
 QA/QC
 L&T

S. P. Me
 CLIENT

L&T CONSTRUCTION
 GWALIOR
 QA/QC

TEMPERATURE TEST:

Temperature test of DBM is mandatory for work because laying of layer this test must compulsory to check the temperature because the strength and binding properties of these material depend on temperature, the minimum temperature of DBM required is 90 degree Celsius and the temperature in hot mix plant should be 145 to 160 degree Celsius .



Fig no :1.12.1

FAILURE IN PAVEMENT:

The common failure in pavement is

- 1. Fatigue failure**
- 2. rutting failure**
- 3. Thermal cracking**

1: fatigue failure:

Fatigue failure create in pavement due to distress of pavement in road due to some reason like heavy or unnecessary traffic and not proper compaction during construction.



Fig no :2.1

Rutting failure:

Rutting failure occur due to shear failure of bituminous concrete and heavy load vehicles make longitudinal path of and displaced the material in road these all are reason of rutting failure.



Fig no : 2.2

THERMAL CRACKING:

Thermal cracking occurs due to change in temperature or temperature change in climate because some parts of materials should not vary the temperature because due to heat of hydration crack occur in pavement.



Fig no 2.3

TYPES OF MACHINERY USED IN CONSTRUCTION:

- 1. HAND ROLLER**
- 2. VIBRATOR ROLLER**
- 3. ROLLER**
- 4. ROAD PAVER MACHINE**
- 5. CONCRETE MIXER**
- 6. BACKHOE**
- 7. GRADER**

__HAND ROLLER:

Hand roller is used for compaction surface, and the size of hand roller is small but heavy in weight and this is used in small places, there big compactor not work small roller work easily.



Fig n o 3.1

VIBRATOR ROLLER:

This roller used in where high compaction required with pressure like in DBM and in BC layer with 8 to 10 tons.



Fig no 3.2

ROAD PAVER MACHINE:

Road paver machine used for laying layer in roads with suitable requirement like level sensor or this machine automatic detect after set and the layer in road laying in one time with help of machine.



Fig no 3.3

GRADER:

Grader machine used as a road paver machine but this is used for level the surface and removing extra materials in layer and in surface or it used for laying layer in absence of road paver machine.



Fig no 3.4

FOOTPATH:

Road often has a designated footpath for pedestrian traffic, called the sidewalk. A footpath design by the engineers according to the pedestrian traffic for pedestrian walk and it used only for pedestrian for important work or for walk not for personal vehicles like motor cycle or cycle.

Footpath work at site:

Material used in footpath work at site -

1. Concrete block are used in footpath and size of concrete block is 400mm. The Concrete block is settled down 300mm from the road level and 100mm above the road level and at some places concrete block is the level of road because of entrance in the college, hospital and others
2. Different color of Cobble stone are used in footpath color of cobble is white, red, grey and size of cobble stone is 75mm
3. Stone dust are used below the cobble stone



Fig no :4.1



Fig no 4.2

PLACE MAKING AREA :

Place making area is refers to point of attraction in any place or in city for attract people by and help of art and by famous building and by the many things and in my city the place making area is in theme road is fountain with red stone design and other fountain or selfie point and red stone place in basement.



Fig no.5.1



Fig no .5.2



Fig no .5.3

LAND SCAPE AREA :

Land scape area means to provide a design and beautiful view in area to attract people by the help of combination of trees stone and by horticulture in a place ,but in our project land scape area materials for design is the combination of small plant and red stone in for beautiful view in selfie point.



Fig no.6.1



Fig no .6.3

LATTICE FIXING :

Lattice fixing is the fitting of white stone design in median for given a beautiful view ,the material used in lattice fixing is a big lattice with good or beautiful design of art in between and pillar ,the pillar is in rectangular shape with circular in head and the size of lattice is 1 meter and pillar size is 5 inches.



Fig no .7.1



Fig no..7.2

Drainage system:

- The drainage system design in road for proper arrangement of water flow in road and other water and the drainage should make road durable and keep stability in road or make dry surface of road because road surface is wet and chance of slipping and of accident occur more. and suppose we construct the road but water interrupted between so firstly divert the water but where so only drainage is possible to divert and safe for damage pavement due to fill rainy water and flood condition.
- The structure of drainage depend upon the drawing or soil capacity or in requirement in road.

Height of Drainage at site is 1500mm(1.5m) and width is 900mm(0.9m)



Fig no 8.1



Fig no 8.2

Power Duct:

- A Duct is underground piping which is used for electrical cables, sewer and communication lines like internet cables, telephone cables and television cables etc.
- Duct is laying down just like piping however they carried the pipes from which cables are passing through it and cables are not damaged, if any of cables is faulty then new cable can be laid in its place.

Height of power duct at site is 1500mm(1.5m) and width is 2000mm(2.0m)



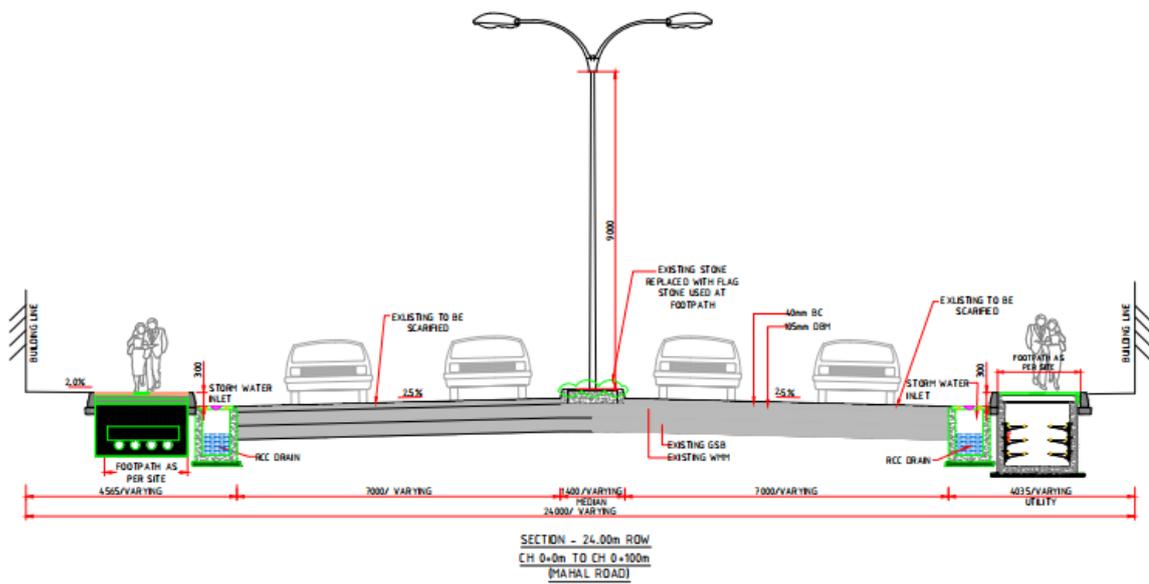
Fig no 9.1



Fig no 9.2

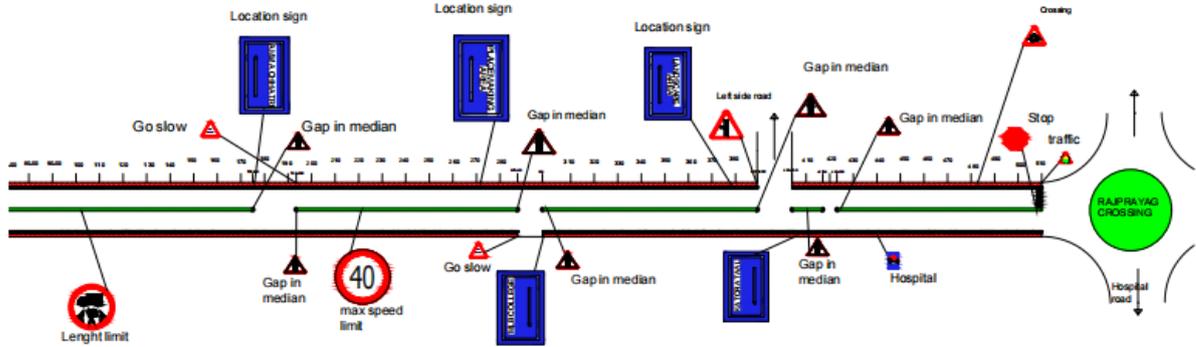
SECTIONS OF ROAD

Mahal road section



KATORA TAAL ROAD SIGN

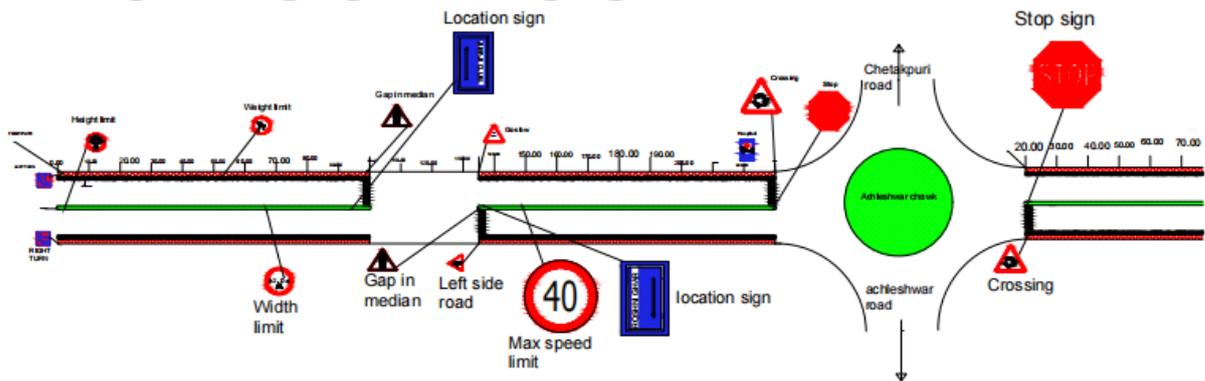
ROAD SIGN DESIGN



KATORA TAAL ROAD

Mahal road sign

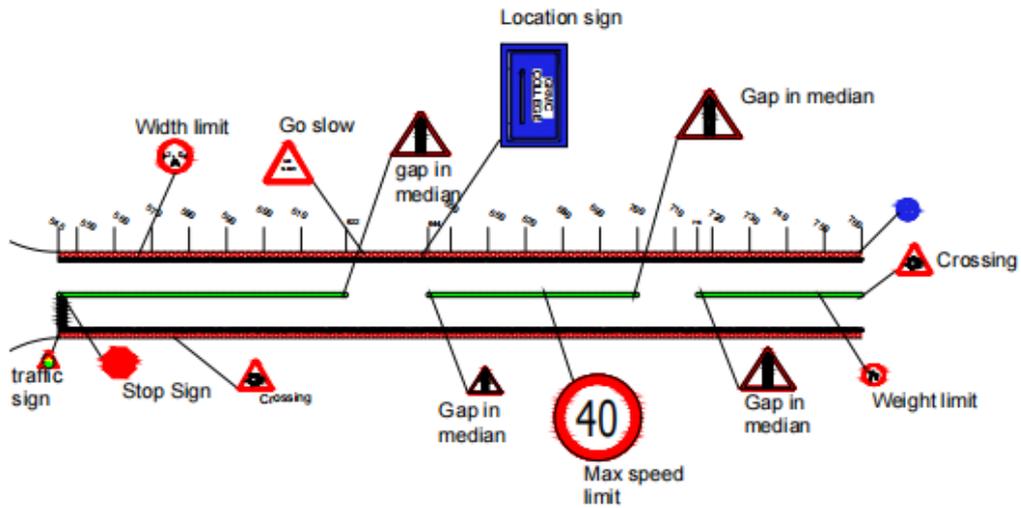
ROAD SIGN DESIGN



MAHAL ROAD

Gajraja medical college road sign

ROAD SIGN DESIGN



GRMC COLLEGE ROAD

ESTIMATE OF MAHAL ROAD

MAHAL ROAD ESTIMATE

SNO	DESCRIPTION	NO	LENGTH	BREATH	HEIGHT	QUANTITY	UNIT	
1	DISMANTLING							
	Dismantling of bc layer and dbm layer in (RHS)	1	1005	8.4	0.08	675.36	CUM	
	Dismantling of bc layer and dbm layer in (LHS)	1	1005	8.4	0.08	675.36	CUM	
	Dismantling of GSB layer (RHS)	1	1005	8.4	0.200	1688.4	CUM	
	Dismantling of GSB layer (LHS)	1	1005	8.4	0.200	1688.4	CUM	
TOTAL						4727.52	CUM	
2	EXCAVATION							
	Road excavation in (RHS)	1	1005	8.4	0.325	2743.65	CUM	
	Road excavation in (LHS)	1	1005	8.4	0.325	2743.65	CUM	
	Drain excavation in (RHS)	1	1005	0.900	1.50	1356.75	CUM	
	Drain excavation in (LHS)	1	1005	0.900	1.50	1356.75	CUM	
	Power duct in (RHS)	1	1005	2.0	1.50	301.5	CUM	
	Concrete block excavation in footpath(RHS)	1	960	0.100	0.200	19.2	CUM	
	Concrete block excavation in footpath(LHS)	1	905	0.100	0.400	36.2	CUM	
	Concrete block excavation in footpath(LHS)	1	100	0.100	0.500	5	CUM	
TOTAL						11276.2	CUM	
3	PLAIN CEMENT CONCRETE (PCC)							
	Footpath(LHS)	1	1005	1.4	0.100	140.7	CUM	
	Drain(RHS)	1	1005	0.900	0.100	90.45	CUM	
	Drain(LHS)	1	1005	0.900	0.100	90.45	CUM	
	Power duct(RHS)	1	1005	2.0	0.100	201	CUM	
	PCC bed below the concrete block(RHS)	1	1005	0.100	0.100	10.05	CUM	
	PCC bed below the concrete block(LHS)	1	1005	0.100	0.100	10.05	CUM	
TOTAL						542.7	CUM	
4	RCC WORK							
	4(a)	Drain (RHS)						
		wall	2	1005	0.150	1.100	331.65	CUM
		Top slab	1	1005	0.900	0.150	135.675	CUM
	Bottom slab	1	1005	0.900	0.150	135.675	CUM	
	4(b)	Drain (LHS)						
		Wall	2	1005	0.150	1.100	331.65	CUM
		Top slab	1	1005	2.000	0.150	301.5	CUM
	Bottom slab	1	1005	2.000	0.150	301.5	CUM	
	4(c)	Power duct						
wall		2	1005	0.150	1.100	331.65	CUM	
Top slab		1	1005	2.000	0.150	301.5	CUM	
Bottom slab	1	1005	2.000	0.150	301.5	CUM		
TOTAL						2472.3	CUM	
5	LAYERS							
	GRANULAR SUB-BASE layers(GSB) in RHS	1	1005	8.4	0.200	1688.4	CUM	
	GRANULAR SUB-BASE layers(GSB) in LHS	1	1005	8.4	0.200	1688.4	CUM	
	Wet mix macadam(WMM) in RHS	1	1005	8.4	0.250	2110.5	CUM	
	Wet mix macadam(WMM) in LHS	1	1005	8.4	0.250	2110.5	CUM	
	Dense Bituminous Macadam(DBM) in RHS	1	1005	8.4	0.115	970.83	CUM	
	Dense Bituminous Macadam(DBM) in LHS	1	1005	8.4	0.115	970.83	CUM	
	Bituminous Concrete(BC) in RHS	1	1005	8.4	0.40	3376.8	CUM	
	Bituminous Concrete(BC) in LHS	1	1005	8.4	0.40	3376.8	CUM	
TOTAL						16293.06	CUM	
6	Tack Coat in RHS and LHS	2	1005	8.4		16884	SQM	
	Prime Coat in RHS and LHS	2	1005	8.4		16884	SQM	
TOTAL						33768	SQM	
7	Cobble Stone in RHS	1	1005	1.7	0.075	128.1375	CUM	
	Cobble Stone in LHS	1	1005	1.4	0.075	105.525	CUM	
TOTAL						233.6625	CUM	
8	Concrete Block Use in footpath (RHS)	1	1005	0.100	0.400	40.2	CUM	
	Concrete block use in footpath (LHS)	1	1005	0.100	0.400	40.2	CUM	
TOTAL						80.4	CUM	
9	Stone dust in RHS	1	1005	2	0.025	50.25	CUM	
	Stone Dust in LHS	1	1005	2	0.025	50.25	CUM	
TOTAL						100.5	CUM	

CONCLUSION:

This Internship program is proves a bond between the professional life and student life. The various types of tasks and training that we have been performing during this internship and the office work that's enhanced our knowledge in Road construction.

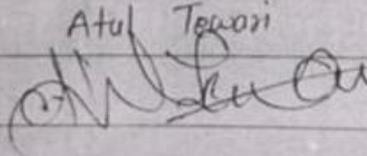
This internship program played an important role on facing real challenges. We are achieving a high level of confidence, that how to deal with problems that arise on a site. By working with **GSCDCL**, we learnt study of designing and office work . we achieved a lots of knowledge & experience.

In this internship, we have been able to see the important theoretical and practical aspects of Road construction. And we are sure of that we will achieve a lots of experiences and knowledge which is helpful for me in future.

Dear internship Mentor, I would like to thank you for providing me a valuable experience during my internship at GSCDCL as an "**FLEXIBLE PAVEMENT AND CONSTRUCTION**"

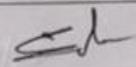
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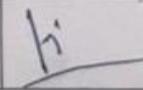
FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Vivek Sharma		Department	Civil	
Industry/Organization	GSCDCL		Date/Duration	DD/MM/YR - DD/MM/YR 18/01/2022 - 15/02/2022	
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	Building work good work				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	Atul Tewari				
<u>Signature of Industry Mentor</u>	 				
Receiving Date	16/02/22	Name of Faculty Mentor	Dr. Sanjay Tewari	Sign	

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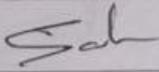
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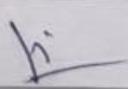
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Industry/Organization	GSCDCL		Date/Duration	16/02/2022 to 28/02/2022		
Criterion	Poor	Average	Good	Very Good	Excellent	
Punctuality/Timely completion of assigned work			✓			
Learning capacity/Knowledge up gradation			✓			
Performance/Quality of work			✓			
Behaviour/Discipline/Team work				✓		
Sincerity/Hard work				✓		
Comment on nature of work done/Area/Topic	Const. of Road, Storm water Drain, Power duct for underground Electric cables.					
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>					
<u>Name of Industry Mentor</u>	SACHIN SHARMA					
<u>Signature of Industry Mentor</u>						

Receiving Date	 01/03/2022	Name of Faculty Mentor	Dr. Sanjay Tiwari	Sign	
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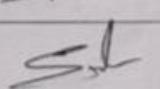
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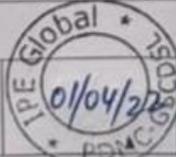
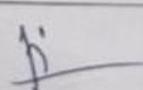
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Industry/Organization	GSCDCL		Date/Duration	1/03/2022 to 15/03/2022	
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Punctuality/Timely completion of assigned work			✓		
Learning capacity/Knowledge up gradation			✓		
Performance/Quality of work			✓		
Behaviour/Discipline/Team work				✓	
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	Const of Road, SLD & Power Duct.				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	SACHIN SM				
<u>Signature of Industry Mentor</u>					

Receiving Date		Name of Faculty Mentor	Dr. Sanjiv Tiwari	Sign	
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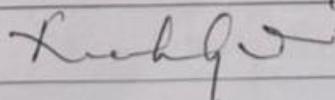
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Industry/Organization	GSCDCL		Date/Duration	16/03/2022 to 31/03/2022	
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Learning capacity/Knowledge up gradation			✓		
Performance/Quality of work			✓		
Punctuality/ Discipline/ Team work				✓	
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	Contd. of Rod Contd. of Power Duct Contd. of SUD				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	SACHIN SR				
<u>Signature of Industry Mentor</u>					

Receiving Date		Name of Faculty Mentor	Dr. Sanjay Tiwari	Sign	
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FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

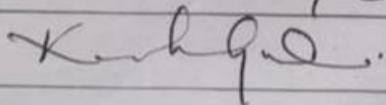
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Industry/Organization	GSCDCL	Date/Duration	01/04/2022 to 15/04/2022		
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/Timely completion of assigned work				✓	
Learning capacity/Knowledge up gradation				✓	
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	Road construction flexible pavement				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	RANJAN GOSWAMI				
<u>Signature of Industry Mentor</u>					



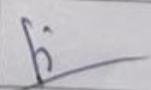
Receiving Date	16/04/22	Name of Faculty Mentor	Dr. Sanjay Tiwari	Sign	
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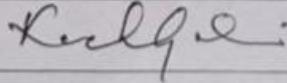
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Industry/Organization	GSCDCL		Date/Duration	16/04 to 30/04/2022	
Criterion	Poor	Average	Good	Very Good	Excellent
Punctuality/Timely completion of assigned work				✓	
Learning capacity/Knowledge up gradation				✓	
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	Road construction Flexible Pavement				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	KANCHAN GOSWAMI				
<u>Signature of Industry Mentor</u>					

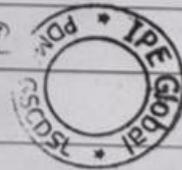


Receiving Date	01/05/22	Name of Faculty Mentor	Dr. Sanjay Tiwari	Sign	
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FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Vivek Sharma		Department	Civil Engg.	
Industry/Organization	GSCDCL		Date/Duration	01/05 to 23/05/2022	
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	Road construction flexible pavement				
<u>OVERALL GRADE (Any one)</u>	<u>POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT</u>				
<u>Name of Industry Mentor</u>	KANCHAN GOSWAMI				
<u>Signature of Industry Mentor</u>					



Receiving Date	24/05/22	Name of Faculty Mentor	Dr. Sarjay Tiwari	Sign	
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