CONSTRUCTION OF 4-LANE CONNECTOR FROM DELHI MEERUT EXPRESSWAY (KM. 50+000 of PKG-IV) to (KM. 8+520) of NH-235 IN THE STATE OF U.P ON EPC MODE

A

PROJECT REPORT

Submitted in partial fulfilment of the requirements for the award of the degree

Of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision

Of

Dr. SAURAV (ASSISTANT PROFESSOR)

&

Dr. SAURABH RAWAT (ASSOCIATE PROFESSOR)

By

NISCHAY THAKUR (191603)

To

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

WAKNAGHAT SOLAN-173234

HIMACHAL PRADESH, INDIA

DECLARATION

I hereby declare that the work presented in the Project report entitled **"CONSTRUCTION OF 4-LANE CONNECTOR FROM DELHI MEERUT EXPRESSWAY (KM. 50+000 of PKG-IV) to (KM. 8+520) of NH-235 IN THE STATE OF U.P ON EPC MODE"** submitted for partial fulfilment of the requirements for the degree of Bachelor of Technology in Civil Engineering at **Jaypee University of Information Technology, Waknaghat** is authentic record of my work carried out under the supervision of **Dr. Saurav and Dr. Saurabh Rawat**. This work has not been submitted elsewhere for the reward of any other degree. I am fully responsible for the contents of my project report.

Nischay Thakur (191603)

Department of Civil Engineering

Jaypee University of Information

Technology, Waknaghat

CERTIFICATE

This is to certify that the work which is being presented in the project report titled "**CONSTRUCTION OF 4-LANE CONNECTOR FROM DELHI MEERUT EXPRESSWAY (KM. 50+000 of PKG-IV) to (KM. 8+520) of NH-235 IN THE STATE OF U.P ON EPC MODE**" in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering submitted to the Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by Nischay Thakur (191603) during a period from February 2023 to May 2023. During this period I was working under highway Construction Company under Delhi Meerut highway project.

The above statement made is correct to the best of our knowledge.

Date: ....

Dr. Saurav	Dr. Saurabh Rawat
Assistant Professor (Senior Grade)	Associate Professor
Department of Civil Engineering	Department of Civil Engineering
JUIT, Waknaghat	JUIT, Waknaghat

ACKNOWLEDGEMENT

First, I express my heartiest thanks and gratefulness to Lord Shiva for His divine blessing to make it possible to complete the project work successfully.

I would like to express my sincere thanks and gratitude to my entire teaching staff for letting me work on this project. I am very grateful towards my department for their support and guidance in completing this project. The success and final end of this project necessitated a great deal of direction and assistance from a large number of people, and I am really fortunate to have received it over the duration of our project. All of what I have accomplished is due to such oversight and support, and I would want to thank everyone who gave their time and expertise to this project.

I would like to express my sincere appreciation towards Dr. Saurav Kumar, Assistant professor (SG) and Dr. Saurabh Rawat , Associate Professor, Department of civil engineering Jaypee University of Information Technology, Waknaghat for their invaluable assistance and compassionate supervision during the project

The success and final end of this project necessitated a great deal of direction and assistance from a large number of people, and I am really fortunate to have received it over the duration of my project. All of what we have accomplished is due to such oversight and support, and we would want to thank everyone who gave their time and expertise to this project.

No expression of appreciation is complete without recognition of the prayers, good wishes, advice and moral support of my affectionate parents, which helped me immensely to achieve my goal.

TABLE OF CONTENT

LIST OF FIGURES

ABSTRACT

The acceleration of urbanization has promoted the increase in the number of urban highway projects, resulting in an increase of emphasis on the quality of urban highway projects. The quality and safety of highway construction directly affects the driving comfort, safety, and service life after it is put into operation. The economic growth of any country depends on transportation for its overall development. The highways in India follow heterogeneous traffic conditions in contrast to highways in other countries. India had the one of the biggest street arranges on the planet, traversing over an aggregate of 5.6 million kms. More than 64.5 for every penny of all products in the nation are transported through streets, while, 90 for each penny of the aggregate traveller activity utilizes street system to drive. More noteworthy availability between various urban areas, towns and towns has prompted expanded street activity throughout the years. Development in autos and cargo development orders a superior street arrange in India. Ascend in the quantity of 2 and 4 wheelers, expanding activity bolsters the development. The Delhi-Meerut expressway is vastly different from expressway or freeways in other countries due to its varied roadway and traffic conditions. It is a multi-lane urban road connecting nearby urban areas (Delhi and Meerut) with divided carriageway for high speed travel having partial control of access at frequent locations via basic, weaving, merge and diverge segments (at grade or grade separated). Construction of 4 Lane Connector from Delhi Meerut Expressway (KM. 50+000 of PKG-IV) to KM. 8+520 of NH-235 in the state of Uttar Pradesh on EPC mode is a 14 km expressway (PKG-IV) connecting Delhi, the national capital of India and Meerut, an important satellite city of Uttar Pradesh. It emphasizes improving road connectivity between Delhi and Meerut, by developing 4 lane divided highways between them. It is an urban multi-lane road for motorized traffic, with divided carriageways for high speed travel, having partial control of access at frequent locations via basic, weaving, merge and diverge segments.

CHAPTER 1

INTRODUCTION

1.1 GENERAL PROJECT DETIAL

Construction of 4 Lane Connector from Delhi Meerut Expressway (KM. 50+000 of PKG-IV) to KM. 8+520 of NH-235 in the state of Uttar Pradesh on EPC mode (Length 14+600 Kms)

Employer: National Highway Authority of India (NHAI)

Authority Engineer: M/s URS Scott Wilson India Pvt. Ltd.

EPC Contractor: M/s APS Hydro Pvt. Ltd. JV M/s Mathiyan Construction Pvt. Ltd.

NHAI has entrusted the development, maintenance and management of national highway no 235 including the Construction of 4 Lane Connector from Delhi Meerut Expressway (Km 50+00 of PackageIV) to Km 8.520 of NH-235 in the State of Uttar Pradesh. EPC contractor for Construction of 4 Lane Connector from Delhi Meerut Expressway (Km 50+00 of Package IV) to Km 8.520 of NH-235 in the State of Uttar Pradesh was awarded to M/s APS Hydro Pvt. Ltd. & M/s Mathiyan construction

The Consultancy Services For Authority's Engineer For Supervision of 4 Lane Connector from Delhi Meerut Expressway (Km 50+00 of Package IV) to Km 8.520 of NH-235 in the State of UttarPradesh on EPC Mode was awarded to M/s URS Scott Wilson India Pvt. Ltd. In Association with Sri Infotech.

1.2 PROJECT LOCATION

The site of four lane Project Expressway is new alignment comprises the section of Four lane connector from Delhi Meerut Expressway (km 50+00) to km 8+520 of NH 235 (Length 14.600 km) in the State of Uttar Pradesh on EPC basis.

The major purpose of four lanes is to connect Delhi-Meerut road to consume the time and to decrease the traffic related issues faced during transportation.

All work is done under the supervision of Nation Highway Authority of India (NHAI). By following proper MORTH and IRC: SP 14 -2014.

Each side paved carriageway shall be 7.5m and 3m wide paved shoulder on outer side and 0.75m wide edge strip on median side for 4-Lane Expressway excluding the median. The design speed shall be 120 km/hr. for plain terrain.

Figure 1: Location of Project

1.3 LOCATION MAP OF PROJECT

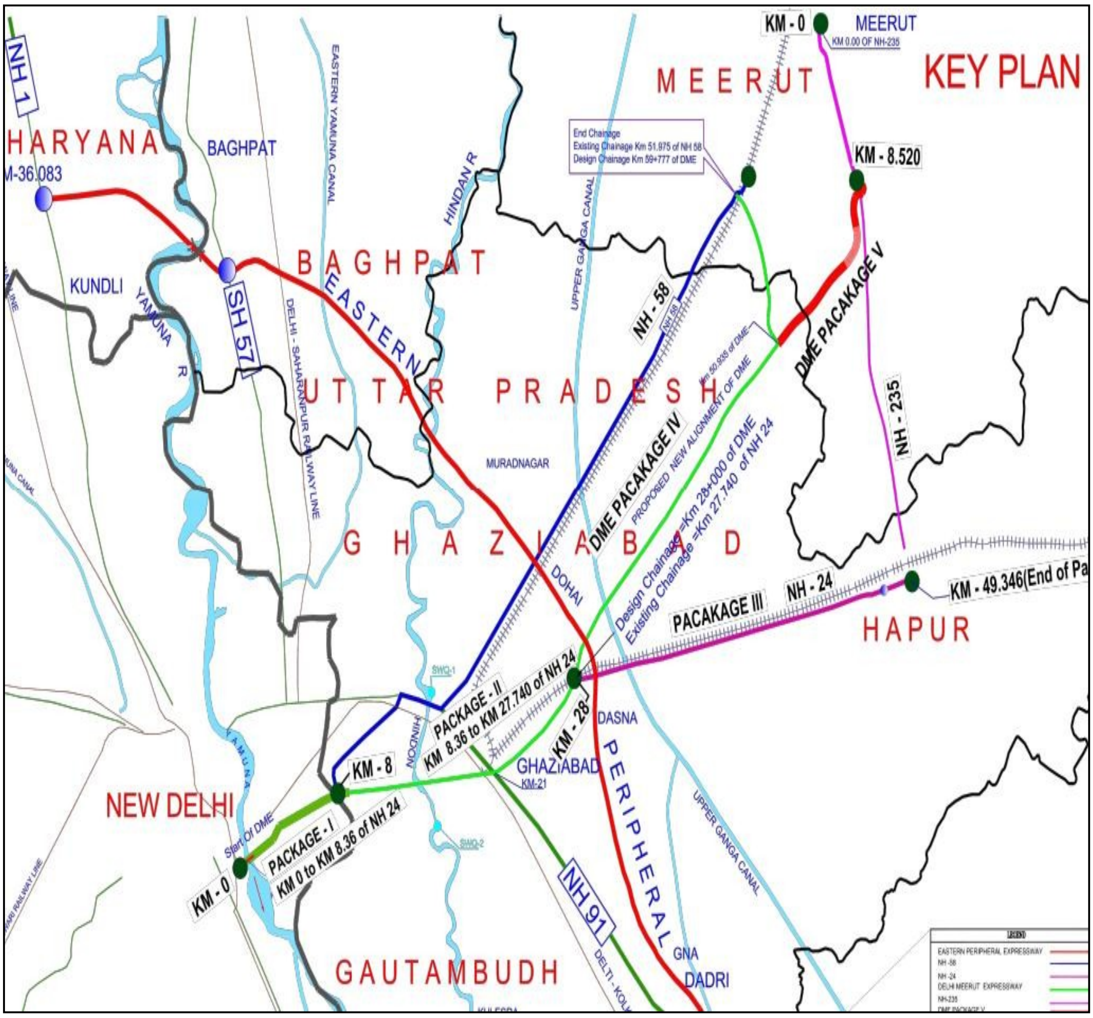


Figure 1.1: Location (Map) of the Project Highway

1.4 PROJECT TECHNICAL DETIALS

- ***A.*** **Details of Length**
- ***B.*** **List of Structures**
- ***C.*** **Protection and Traffic Control**

Figure – 1.2 Site Location

A. Details of length

Table 1.1 Length Details of Highway

Sl. No.	Type of Cross-section	Type	Length (Km)	Remarks
1	Project Length	Flexible	14.6	
2	Road Length	Flexible	13.98	14.043= (14.6- .15- .470) Reconstruction as per TCS -150 mToll Plaza Road as per TCS –470m
3	Reconstruction Length	Flexible	(03.25) + (0.15)	
4	Length of Structure	ROB, FLYOVER, VUP & MNB	0.407	

B. List Of Structure

Table 1.2 No of Structure used in Project

Sl.No	Particulars	Unit	Number as per CA	
			Recon	New
1	Box Culverts	Nos.	1	34
2	Hume Pipe Culverts (Irrigation Canal)	Nos.	-	20
2	Minor Bridges	Nos.	-	1
3	Major Bridge	Nos.	-	-
4	ROB	Nos.	-	1
5	Flyover	Nos.	-	2
6	VUP/LVUP/SVUP	Nos.	-	17

C. Protection and Traffic Control

Table 1.3 Traffic Control Management

Sl. No.	Particulars	Total Scope
1	Advanced Traffic Management Systems (ATMS) (Incl. All Items asper CA)	14.6 KM
2	Length of Toe Wall (KM 8.680 to KM 9.850)	2,340 M

3	Rain Water Harvesting (Will Be finalised in design & drawings)	62 Nos.

1.5 PROJECT DESCRIPTION

Table 1.4 Full Project Details Including all Structures

S. No.	Project Facilities	Location	Scope of Work
1	Toll Plaza	2+645	In Accordance to NHAI Circular 17.5.82 dated 24 May,2021
2	Road Side furniture/Road SafetyDevices	Will be decided after design & drawing	Traffic Signs, Permanent Road Marking, Boundary Wall, Hectare Stone & Kilometre Stone, Crash Barrier, Reflective Pavement Marker /Road Studs, Delineator, Blinker Lights
3	Lighting	Structures, At Grade & Elevated section of project highway incl. Slip /Service/MCW, Junction and Interchanges	Highway Lighting, High Mast & Solar Lighting with power backupsat Junctions & Interchanges

4	Landscaping & Tree Plantation	As per CA	Tree Plantation -12000 Nos. in double rows, Land Scaping as perCA & Median Plantation. Also Drip Irrigation for Median & Sides
5	Vehicle Rescue Post	Will be decided after design & drawing	25 Sqm
6	Medical Aid Post	Will be decided after design & drawing	30 sqm
7	Traffic Aid Post	Will be decided after design & drawing	25 sqm
8	Toilet Blocks	Will be decided after design & drawing	95 sqm
9	Use of C&D Recycle Material	Wherever, Filling of earth is required (Embankment, RE Wall,Subgrade, GSB etc.)	10 % wherever earth fill is req. inproject
10	OFC Duct	Median	50 MM HDPE pipe 8 numbers encased in 600 mm dia. Pipe with inspection chambers (Size - 1.0 mx 1.0 m Clear) at 250 m intervals with cover slabs. Along with crossing facility at 500 m intervalswith 600

			mm dia. Pipe
11	Highway Patrol Unit	Project Site	1 no. (GPS Enabled) with req. staff& maintenance unit as per CA
12	Emergency Medical Services	At Toll Plaza	1 no. Ambulance with req. staff &maintenance unit as per CA
13	Crane Services	Project Site	1 no. (GPS Enabled) with req. staff& maintenance unit as per CA

1.6 PRE-CONSTRUCTION ACTIVITY

Table 1.5 Survey Details

S. No.	Description of Work	Status of Work
1.	Traverse Survey	Total length of 14.60 km completed.
2.	Topographic Survey	Total length of 14.60 km completed.
3.	TBM Checking	Complete
4.	OGL Recording	10.00 km Completed
6.	Centre line Marking	Complete
7.	Soil Investigation	Complete
	Geo-technical Investigation for structures	Complete
	Pavement composition survey	In Progress

Figure 1.3 Embankment Work

1.7 KEY PLAN OF PROJECT

Table 1.6 Structural details w.r.t to Chainage

Pipe Culvert	0+000	Pipe Culvert
LVUP	0+280	LVUP
	0+290	
Box Culvert	0+630	Box Culvert
Pipe Culvert	0+700	Pipe Culvert
VUP	0+820	VUP
	0+830	
	0+840	
Box Culvert	0+870	Box Culvert
FLY OVER	0+940	FLY OVER
	0+950	
	0+960	
Pipe Culvert	1+200	Pipe Culvert
VUP	1+410	VUP
	1+420	
	1+430	
Box Culvert	1+570	Box Culvert
Box Culvert	1+900	Box Culvert
SVUP	2+070	SVUP
Box Culvert	2+160	Box Culvert
Pipe Culvert	2+300	Pipe Culvert
SVUP	2+470	SVUP
Pipe Culvert	2+800	Pipe Culvert
LVUP	3+080	LVUP
	3+090	
Box Culvert	3+190	Box Culvert
Box Culvert	3+420	Box Culvert
Pipe Culvert	3+590	Pipe Culvert
Box Culvert	3+710	Box Culvert
Box Culvert	4+230	Box Culvert
VUP	4+330	VUP
	4+340	
	4+350	
Pipe Culvert	4+500	Pipe Culvert
Pipe Culvert	4+900	Pipe Culvert
Pipe Culvert	5+200	Pipe Culvert
Box Culvert	5+650	Box Culvert
VUP	6+100	VUP
	6+110	
	6+120	
Pipe Culvert	6+250	Pipe Culvert
Box Culvert	6+420	Box Culvert
Box Culvert	6+750	Box Culvert
Pipe Culvert	7+000	Pipe Culvert
Box Culvert	7+100	Box Culvert

1.8 SAFETY AND TRAFFIC MANAGEMENT

Safety

Road safety has been accorded very high priority. Traffic safety measures are adopted at all construction zones. Utmost care is being taken for safety of the labour force, plant areas, equipment as well as road users while carrying out the construction activities. Construction zones have been marked.

Ensuring that all necessary measures of the Occupational Health, Safety and Welfare, described are complied with throughout theduration of the contract.

Traffic Management

Traffic is being regulated by providing flagmen, signage, and diversion at various locations along the project highway. The two primary objective of temporary traffic control is to manage the traffic as efficiently and safely as possible under all work conditionsand second objective of these guidelines is to lay down procedures to be adopted by field engineers to ensure the safe and efficientmovement of traffic and also to ensure the safety of workers at site undertaking the construction.

Safety audit and traffic management as per construction site requirement is constantly monitored.

Safety Measures

Necessary Safety Measures undertaken. Safety teams appointed are constantly carrying out the safety audit ofthe sites.

- PPE distributed to all staff and Periodic Tool Box instructions conducted at site for various departments.
- Safety Sign boards installed at various site locations.
- Barricading boards, delineators and sand bags provided at various construction sites.
- Dust control measures taken at site and crusher plant by water sprinkling

method.

- Designated Flagmen placed for Road works where construction is under progress
- Deployment of marshals on road at construction site for smooth and safe movement of vehicles
- Specific training on working at height and rescue, emergency medical & CPR arranged for employees and workers.

1.9 MOBILAZTION RESOURCES

Table 1.7 Vehicles used in Project

Sr. No.	*Equipment Name*	*Make*	*Actual Quantity*
1	Tipper	TATA/AMW	80
2	Excavator	TATA	20
3	MOTOR GRADER	TATA	8
4	SOIL COMPACTOR	TATA HITACHI	7
5	WATER TANKER	Mahindra/CASE	9
6	Back Hoe Loader	L&T/CASE	6
7	Transit Mixture	-	4
8	Batching Plant CP 30	-	2

Figure 1.4 Batching plant at site

1.10 LAB EQUIPMENT DETIAL

Table 1.8 Description of Lab equipment's used

SR.NO	Equipment name	Nos
1	CT MACHINE 2000 KN	1
2	CBR MACHINE	1
3	OVEN BIG	1
4	OVEN SMALL	1
5	A I V MACHINE	1
6	CUBE MORTOR MACHINE	1
7	CBR MOULD COMEPLETE	33
8	PROVING RING 10 KN	1
9	PROVING RING 25 KN	1
10	PROVING RING 50 KN	1
11	DIAL GAUGE	3
12	PROCTOR MOULD 100 MM	2
13	PROCTOR MOULD 150 MM	1

14	REMMAR 4.890 KG	2
15	REMMAR 2.9 KG	1
16	CASAGRANDE APPARATUS	1
17	SAND POURING CYLINDER 200 MM DIA	3
18	SAND POURING CYLINDER 150 MM DIA	3
19	SAND POURING CYLINDER 100 MM DIA	3
20	MOISTURE METER 25 %	3
21	BALANCE 500 GMS	2
22	BALANCE 5 KGS	1
23	BALANCE 30 KGS	1
24	BALANCE 50 KGS	2
25	BALANCE 100 KGS	1
26	SLUMP CONE	5
27	FLAKINEES GAUGE	1
28	ELOGATION GAUGE	1
29	SPATULA	8
30	DIGITAL THERMOETER / HUMIDITY	2
31	HYDRO METER	3
32	SIEVE SHAKER 200 MM DIA	1
33	DENSITY BUKET 30 LTR	1
34	DENSITY BUKET 15 LTR	1
35	DENSITY BUKET 3 LTR	1
36	MOTOR CUBE 50*50*50 MM	24
37	VIBRATING TABLE BIG	1
38	HOT PLATE 200 MM DIA	2
39	CTSB MOULDS	9
40	SURFACE REGULRITY APPARATUS	1

41	BELCHA	1
42	TROWEL	3
43	WATER BATH	1
44	SPECIFIC GRAVITY BOTTEL 50 ML	2
45	SPECIFIC GRAVITY BOTTEL 25 ML	1
46	CONCRETE FLOW TABLE	1
47	WASH BOTTLE PVC	3
48	SCOOP 1 KG	3
49	TRAY 300 *250 MM	12
50	TRAY 200 *250 MM	8
51	TRAY 300 * 450 MM	8
52	TRAY 600* 450 MM	8
53	TRAY 600 * 600 MM	4
54	TRAY 900 * 900 MM	2
55	FSI JAR 100 ML	40
56	BOROSIL JAR 250 ML	2
57	BOROSIL JAR 500 ML	5
58	BOROSIL JAR 1000 ML	6
59	PVC JAR 250 ML	5
60	PVC JAR 500 ML	4
61	BEAKER 500 ML	6
62	PYCNOMETER 1.5 KG	2
63	VICAT APPARATUS CEMENT	1
64	CEMENT CUBE 70.6*70.5*70.6 MM	24
65	IS SIEVE 2. MM 200 MM DIA	4
66	IS SIEVE 4.25 MIC	4
67	IS SIEVE 90 MIC	2
68	IS SIEVE 75 MIC	3

69	IS SIEVE 10 MM	2
70	IS SIEVE 4.75 MM	3
71	IS SIEVE 2.36 MM	2
72	IS SIEVE 1.18 MM	3
73	IS SIEVE 600 MIC	4
74	IS SIEVE 300 MIC	2
75	IS SIEVE 15 MIC	2
76	IS SIEVE 1 MM	4
77	IS SIEVE 45 MIC	2
78	IS SIEVE 710 MIC	2
79	IS SIEVE 355 MIC	2
80	IS SIEVE 850 MIC	1
81	IS SIEVE 180 MIC	2
82	IS SIEVE 500 MIC	1
83	IS SIEVE 16 MM 450 MM DIA	1
84	IS SIEVE 37.5 MM	1
85	IS SIEVE 12.5 MM	2
86	IS SIEVE 63 MM	2
87	IS SIEVE 50 MM	1
88	IS SIEVE 25 MM	1
89	IS SIEVE 75 MM	1
90	IS SIEVE 28 MM	1
91	IS SIEVE 22.40 MM	1
92	IS SIEVE 1.40 MM	2
93	IS SIEVE 40 MM	2
94	IS SIEVE 19 MM	2
95	IS SIEVE 31.5 MM	2
96	IS SIEVE 2.36 MM	3
97	IS SIEVE 5.6 MM	2
98	IS SIEVE 4.75 MM	2
99	IS SIEVE 9.5 MM	2
100	IS SIEVE 6.3 MM	2

101	IS SIEVE 26.5 MM	2
102	IS SIEVE 10 MM	2
103	IS SIEVE 45 MM	1
104	IS SIEVE 53 MM	1
105	IS SIEVE 11.2 MM	1
106	CONTAINER SMALL	194
107	CONTAINER MEDIUM	25
108	CONTAINER 50 LARGE	80
109	PAN 200 MM DIA	4
110	PAN 450 MM DIA	2
111	HAMMMER	2
112	LPG CYLINER 5 KG	1
113	FRY PAN	1
114	CBR SPACER DISC	2
115	CUBE MOLD	100

1.11 GENERAL NOTES (IRC:SP: 84-2014)

The Codes, Standards and Technical Specifications applicable for the design and construction of project components are:

i) Indian Roads Congress (IRC) Codes and Standards.

ii) Specifications for Road and Bridge Works issued by the Ministry of Road Transport & Highways (MORTH) hereinafter referred to as MORTH or Ministry's Specifications.

iii) Any other standards referred to in the Manual and any supplement issued with the bid document.

The terms 'Ministry of Surface Transport', 'Ministry of Shipping, Road Transport & Highways' and 'Ministry of Road Transport and Highways' or any successor or substitute thereof shall be considered as synonymous.

In case of any conflict or inconsistency in the provisions of the applicable IRC Codes, Standards or MORTH Specifications, the provisions contained in this Manual shall apply.

General

i) This section lays down the standards for geometric design and general features for four-lane divided carriageway.

ii) In built-up areas, 4-lane divided carriageway along with service roads with and without footpaths shall be provided as part of 4-laning of the Project Highway. Such stretches where the requirement of footpath is dispensed with and only 4-laning with or without service road is to be provided will be as indicated in Schedule 'B' of the Concession Agreement.

Where there is constraint of ROW width, the Authority may specify construction of a bypass. The alignment of the bypasses shall be as specified in Schedule 'B' and in conformity with the site earmarked in Schedule 'A of the Concession Agreement.

iii) The geometric design of the Project Highway shall conform to the standards set out in this section as a minimum.

iv) As far as possible, uniformity of design standards shall be maintained throughout the length of the Project Highway. In case of any change, it shall be affected in a gradual manner.

v) Where the existing road geometries are deficient with respect to minimum requirements and its improvements to the prescribed standards is not feasible due to any constraint in acquisition of additional land, such stretches shall be as specified in Schedule 'B' of the Concession Agreement.

vi) Existing horizontal curves which are found deficient in radius, layout, transition lengths or super-elevation shall be corrected to the standards specified in this section.

vii) Any deficiencies in the vertical profile in respect of grades, layout of vertical curves and sight distance shall be corrected to meet the minimum requirements specified in this section.

Grade Separated Structures

i) The structures through which the traffic flows at different levels are called grade separated structures.

ii) A grade separated structure which is provided for crossing of vehicles under the Project Highway is called as Vehicular Underpass (VUP).

iii) A grade separated structure which is provided for crossing of vehicles over the Project Highway is called as Vehicular Overpass (VOP).

iv) A structure provided below the Project Highway to cross the pedestrians is called Pedestrian Underpass (PUP).

v) A structure provided below the Project Highway to cross the catties is called Cattle Underpass (CUP).

vi) A pedestrian/cattle underpass through which light vehicles of height upto 3 m can also pass is called Light Vehicular Underpass (LVUP)

vii) Flyover is synonymous to VUP/VOP/LVUP/PUP/CUP

viii) A structure provided above the Project Highway to cross pedestrians is called Foot Over bridge.

ix) A structure provided over the railway lines to carry the Project Highway is called Road over Bridge (ROB).

x) A structure provided below the railway lines to carry the Project Highway is called Road under Bridge (RUB).

xi) A Trumpet interchange is a grade separator structure provided at major T-junction facilitating uninterrupted flow of traffic in each direction.

xii) A Cloverleaf is a grade separator structure provided at a major cross road junction facilitating uninterrupted flow of traffic in each direction.

CHAPTER 2

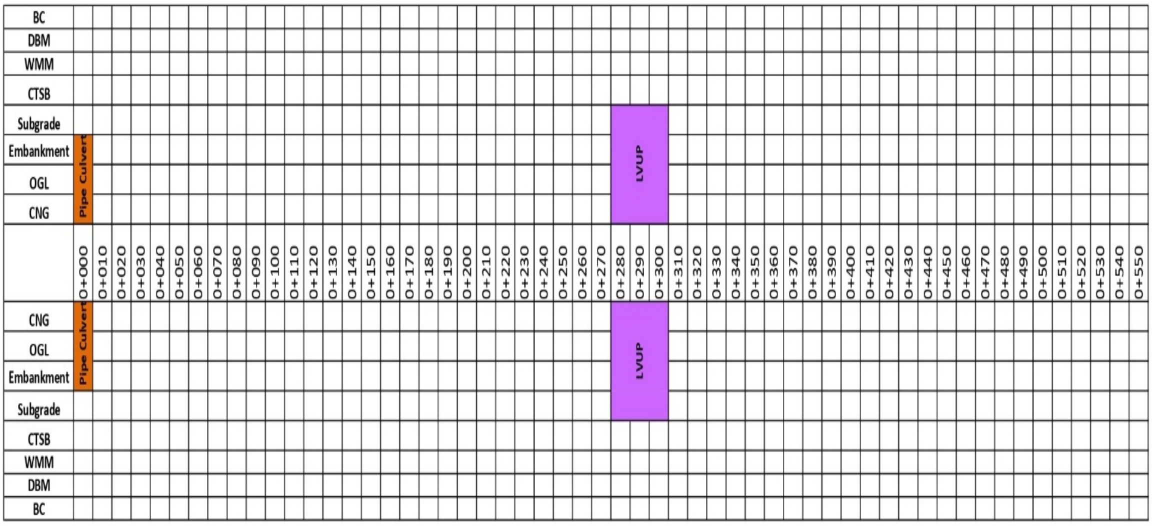
STRIP PLAN OF HIGHWAY

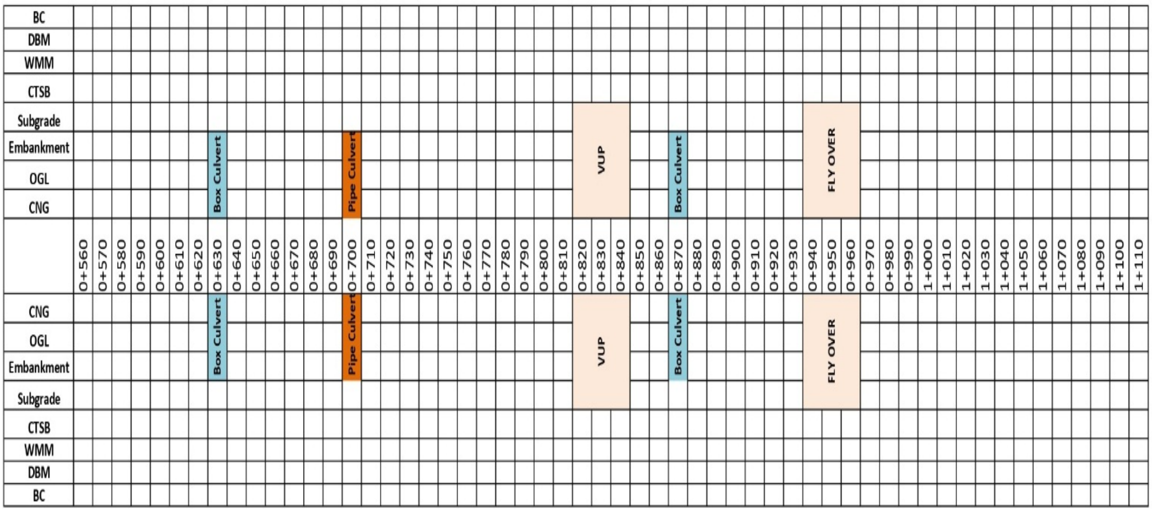
A Strip Plan typically indicates the location, lengths, quality, etc. in a graphical manner. Preparation of strip plans is a very common practice to get the feel of the project details at a glance. Strip plans are prepared for a variety of projects like, roads, railways, canals, etc. These are also prepared at various stages like desk study (includes feasibility and DPR) and execution stages.

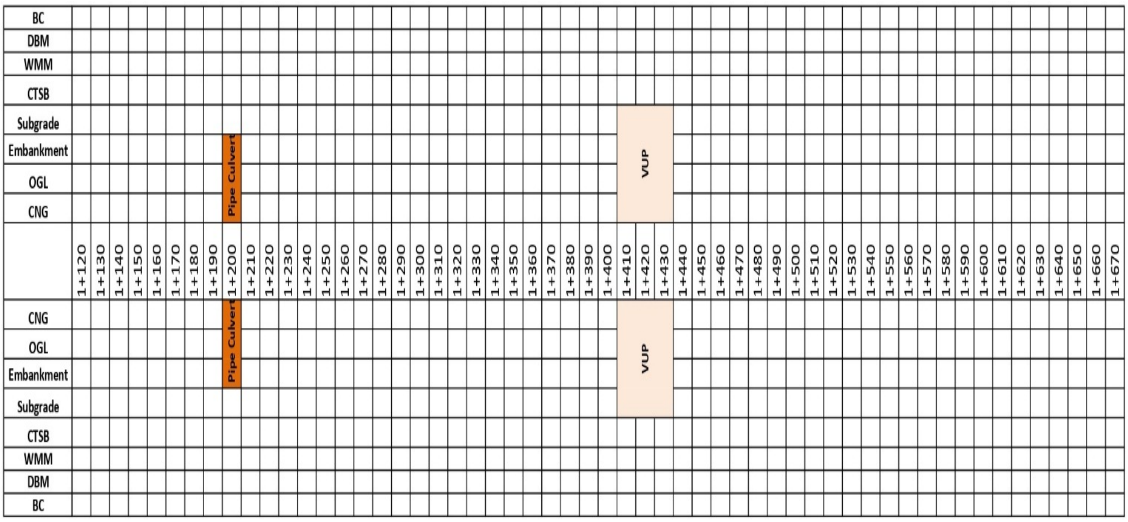
Considering a typical road project, the stages of preparation of the strip plan are described here.

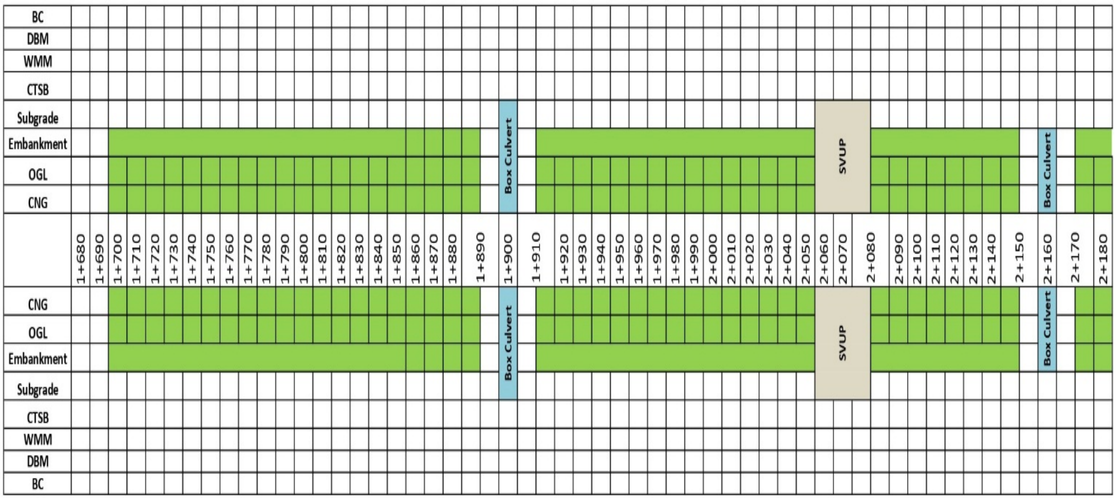
1. Initially, the details of the Road are collected and commonly referred to as Road Inventory Survey. Here all the details like the road condition, road width, drain details, village limits, road appurtenances, religious structures, monuments, cross drainage structures, bridges, etc. are indicated.
2. The Road centre-line is assumed to be straight and plotted according to the length of the project.
3. All the collected details are generally classified as linear features which include roads, bridges, village limits, drains, etc. and point features which include electric poles, culverts, telephone poles, bore wells, etc.
4. All the linear features are plotted with reference to the center line on either side. All the point features are drawn judiciously to indicate this at the most possible correct location.
5. Sometimes even the details are tabulated below the drawing to indicate features and locations.

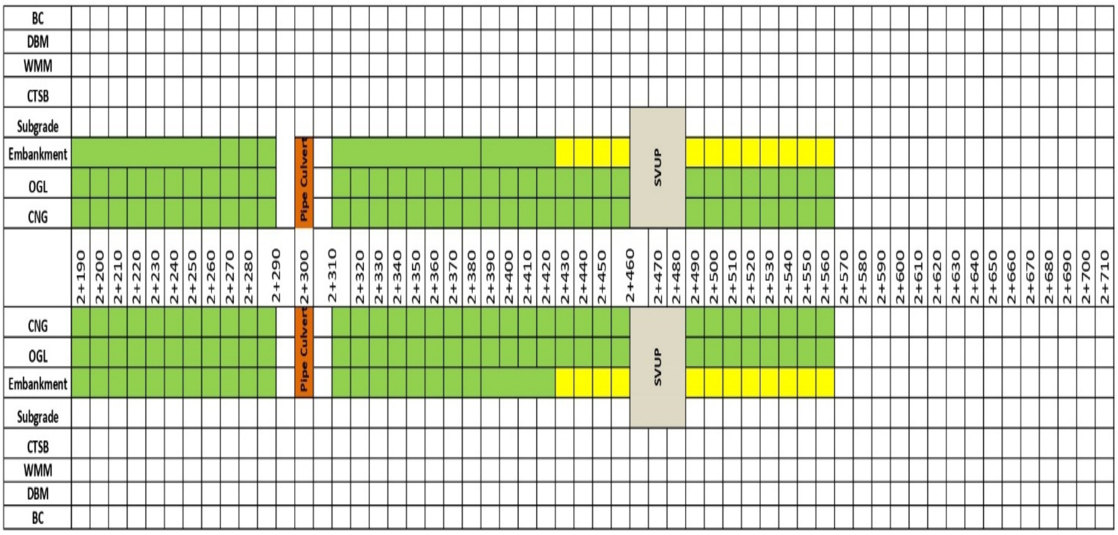
2.1 Planning from Chainage (0+000 - To – 2+710)

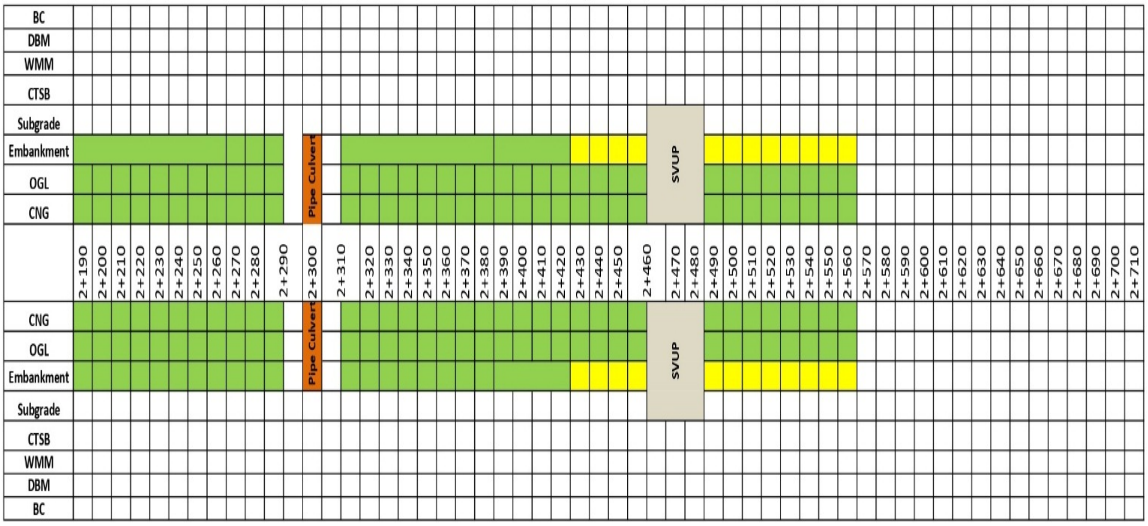




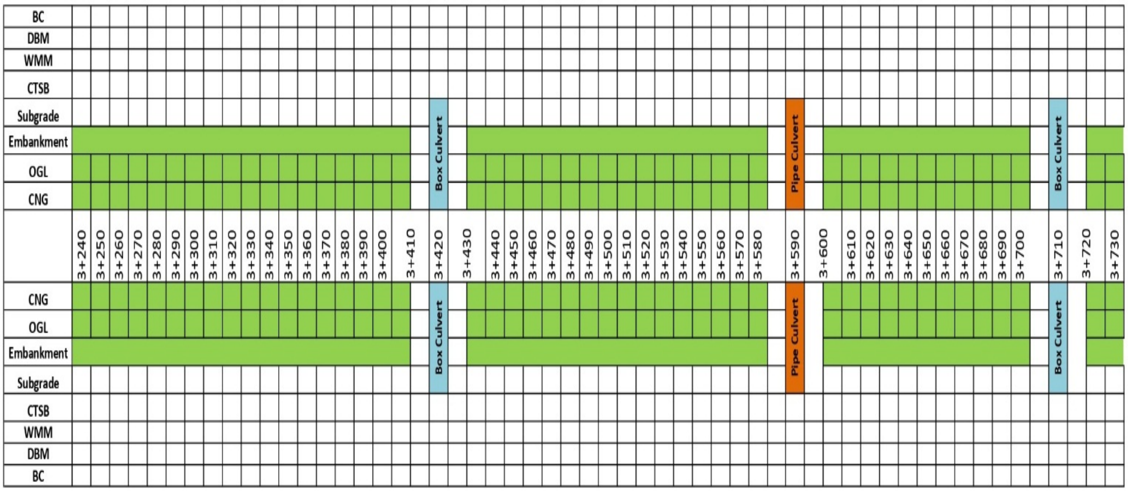

BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Pipe Culvert
VUP
1+120
1+130
1+140
1+150
1+160
1+170
1+180
1+190
1+200
1+210
1+220
1+230
1+240
1+250
1+260
1+270
1+280
1+290
1+300
1+310
1+320
1+330
1+340
1+350
1+360
1+370
1+380
1+390
1+400
1+410
1+420
1+430
1+440
1+450
1+460
1+470
1+480
1+490
1+500
1+510
1+520
1+530
1+540
1+550
1+560
1+570
1+580
1+590
1+600
1+610
1+620
1+630
1+640
1+650
1+660
1+670
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Pipe Culvert
VUP

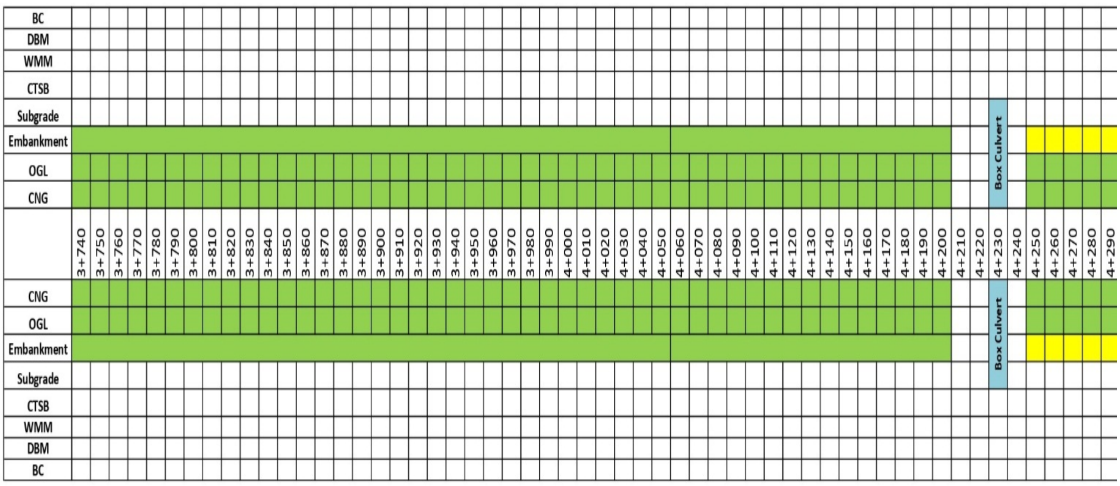

BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Box Culvert
SVUP
Box Culvert
1+680
1+690
1+700
1+710
1+720
1+730
1+740
1+750
1+760
1+770
1+780
1+790
1+800
1+810
1+820
1+830
1+840
1+850
1+860
1+870
1+880
1+890
1+900
1+910
1+920
1+930
1+940
1+950
1+960
1+970
1+980
1+990
2+000
2+010
2+020
2+030
2+040
2+050
2+060
2+070
2+080
2+090
2+100
2+110
2+120
2+130
2+140
2+150
2+160
2+170
2+180
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Box Culvert
SVUP
Box Culvert

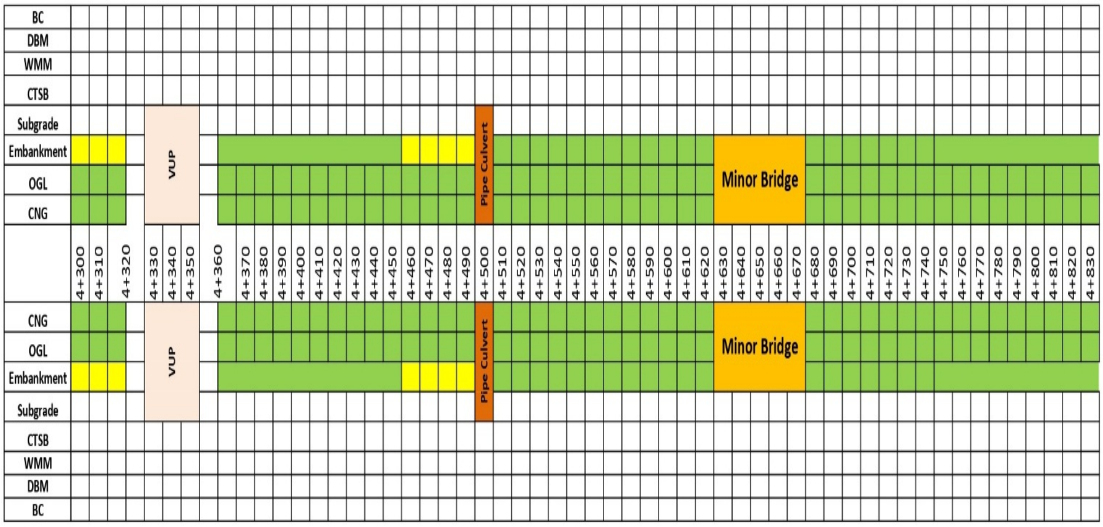

BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Pipe Culvert
SVUP
2+190
2+200
2+210
2+220
2+230
2+240
2+250
2+260
2+270
2+280
2+290
2+300
2+310
2+320
2+330
2+340
2+350
2+360
2+370
2+380
2+390
2+400
2+410
2+420
2+430
2+440
2+450
2+460
2+470
2+480
2+490
2+500
2+510
2+520
2+530
2+540
2+550
2+560
2+570
2+580
2+590
2+600
2+610
2+620
2+630
2+640
2+650
2+660
2+670
2+680
2+690
2+700
2+710
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Pipe Culvert
SVUP



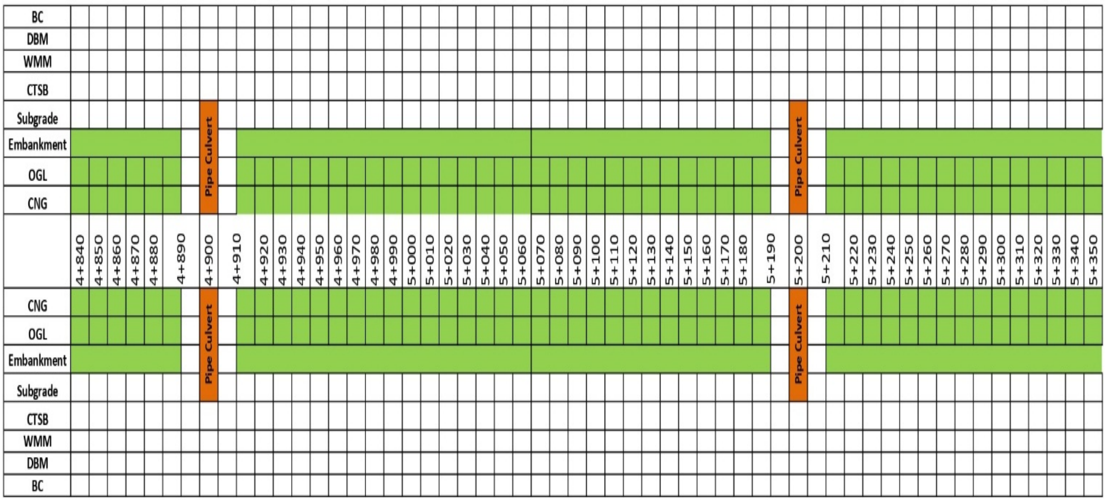
2.2 From Chainage (3+240 - To - 6+420)



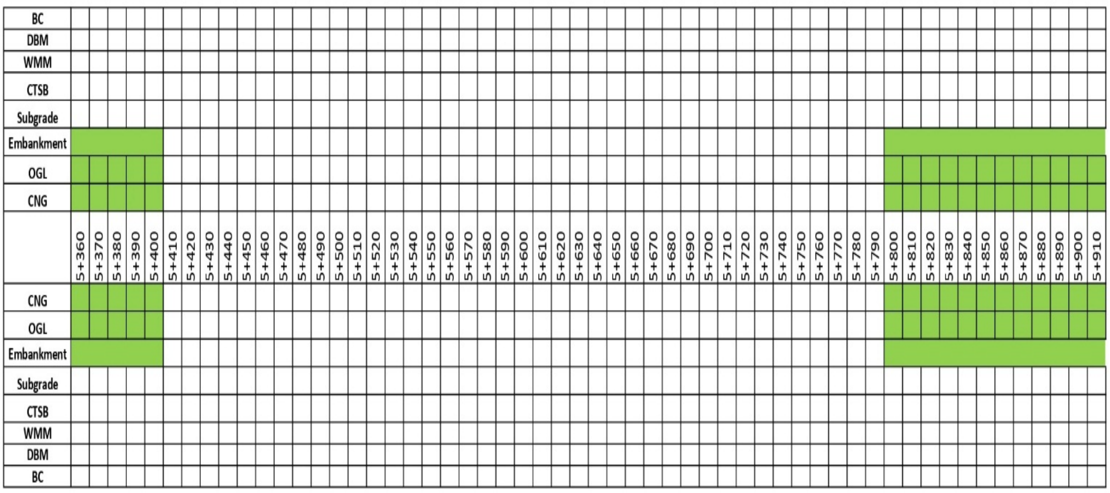




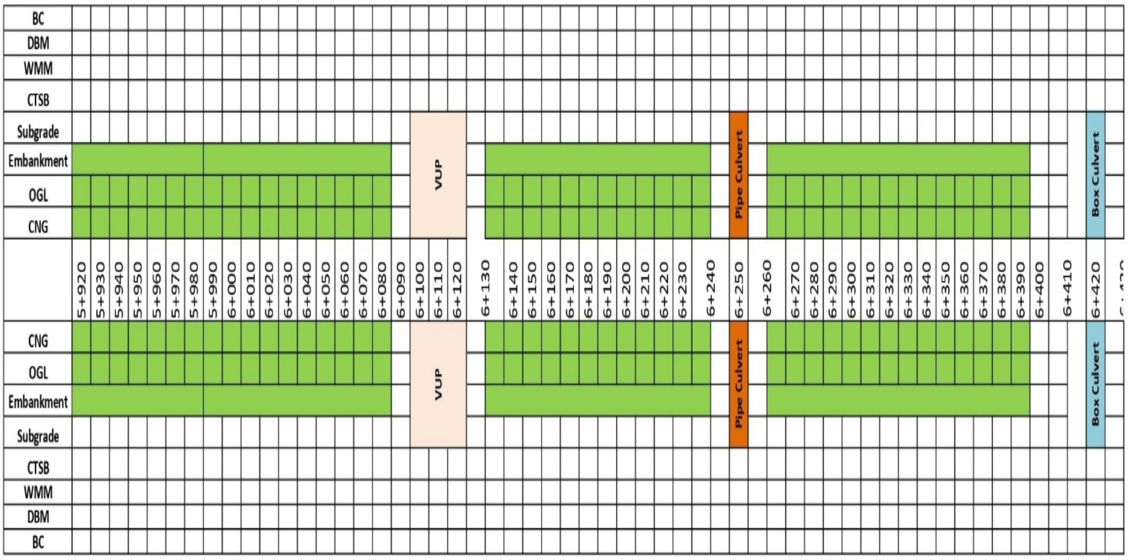
BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
VUP
Pipe Culvert
Minor Bridge
4+300 4+310 4+320 4+330 4+340 4+350 4+360 4+370 4+380 4+390 4+400 4+410 4+420 4+430 4+440 4+450 4+460 4+470 4+480 4+490 4+500 4+510 4+520 4+530 4+540 4+550 4+560 4+570 4+580 4+590 4+600 4+610 4+620 4+630 4+640 4+650 4+660 4+670 4+680 4+690 4+700 4+710 4+720 4+730 4+740 4+750 4+760 4+770 4+780 4+790 4+800 4+810 4+820 4+830
CNG
OGL
Embankment
VUP
Pipe Culvert
Minor Bridge
Subgrade
CTSB
WMM
DBM
BC



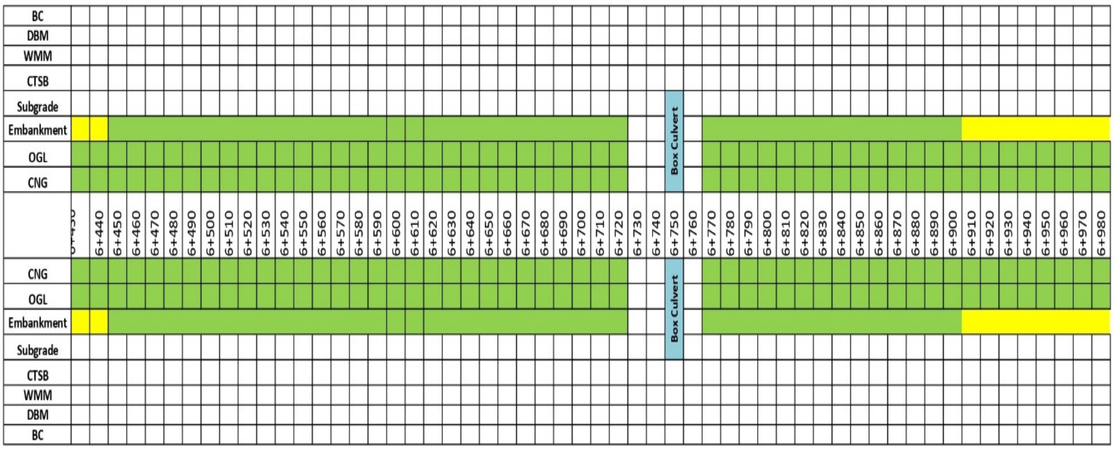
BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Pipe Culvert
Pipe Culvert
4+840 4+850 4+860 4+870 4+880 4+890 4+900 4+910 4+920 4+930 4+940 4+950 4+960 4+970 4+980 4+990 5+000 5+010 5+020 5+030 5+040 5+050 5+060 5+070 5+080 5+090 5+100 5+110 5+120 5+130 5+140 5+150 5+160 5+170 5+180 5+190 5+200 5+210 5+220 5+230 5+240 5+250 5+260 5+270 5+280 5+290 5+300 5+310 5+320 5+330 5+340 5+350
CNG
OGL
Embankment
Pipe Culvert
Pipe Culvert
Subgrade
CTSB
WMM
DBM
BC

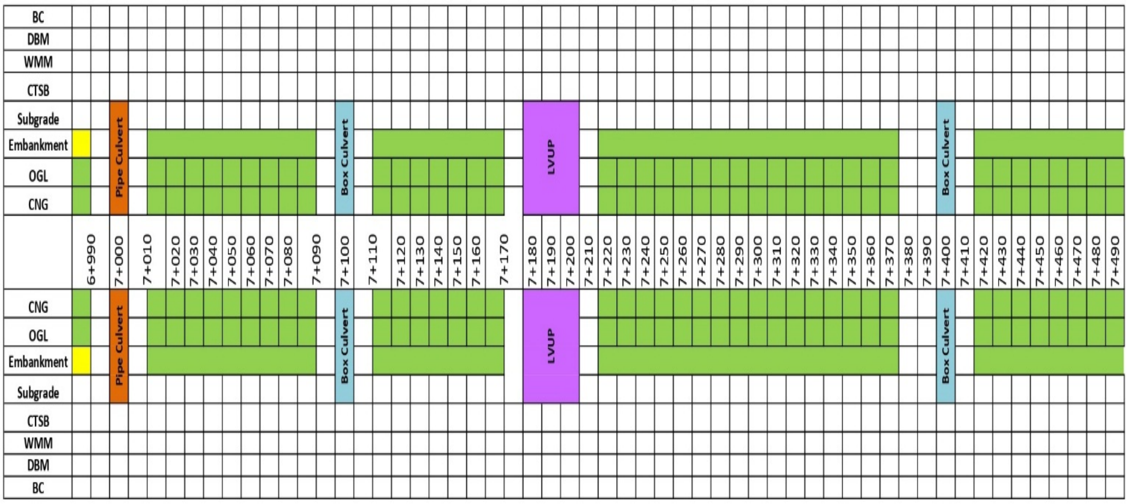


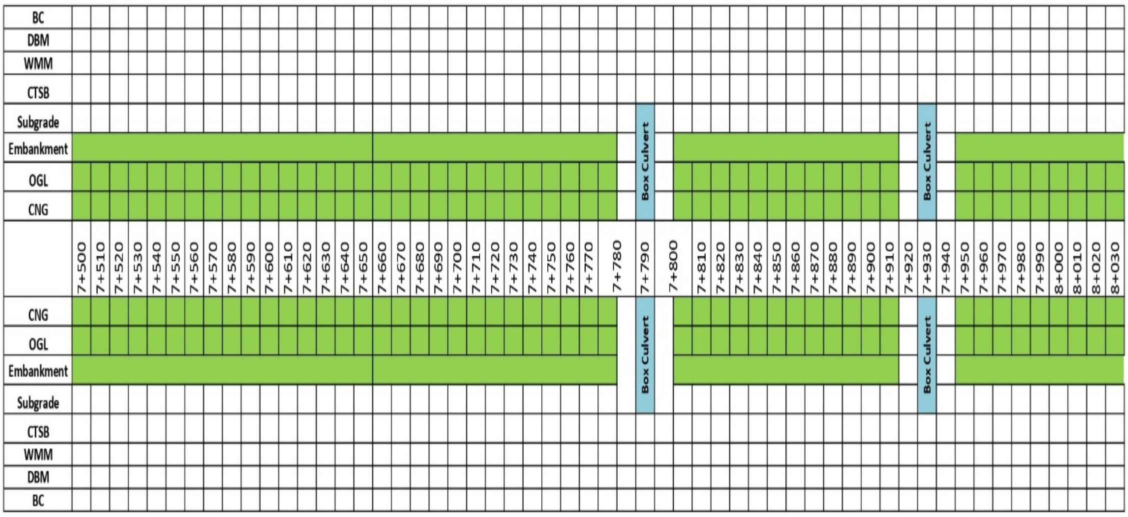
BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
5+360 5+370 5+380 5+390 5+400 5+410 5+420 5+430 5+440 5+450 5+460 5+470 5+480 5+490 5+500 5+510 5+520 5+530 5+540 5+550 5+560 5+570 5+580 5+590 5+600 5+610 5+620 5+630 5+640 5+650 5+660 5+670 5+680 5+690 5+700 5+710 5+720 5+730 5+740 5+750 5+760 5+770 5+780 5+790 5+800 5+810 5+820 5+830 5+840 5+850 5+860 5+870 5+880 5+890 5+900 5+910
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC

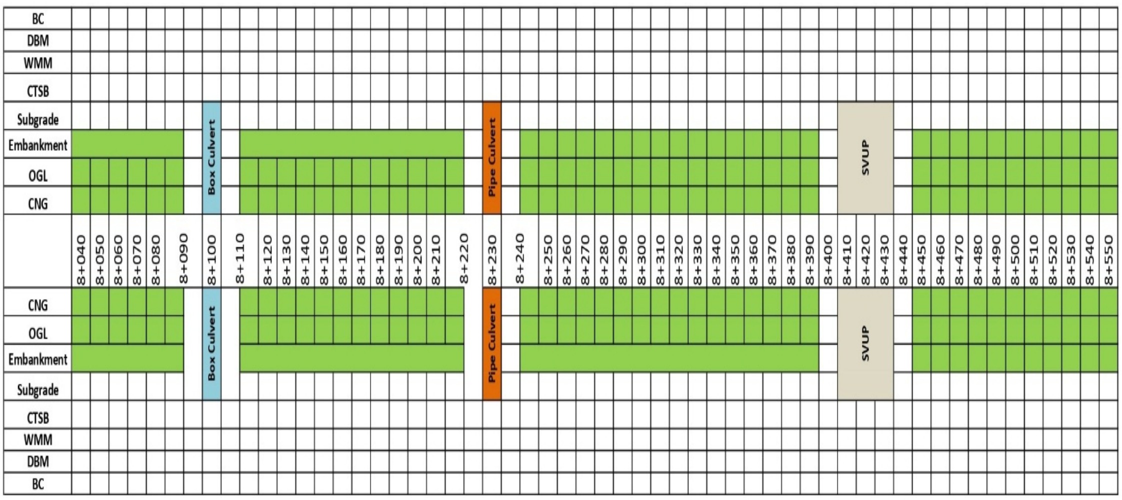


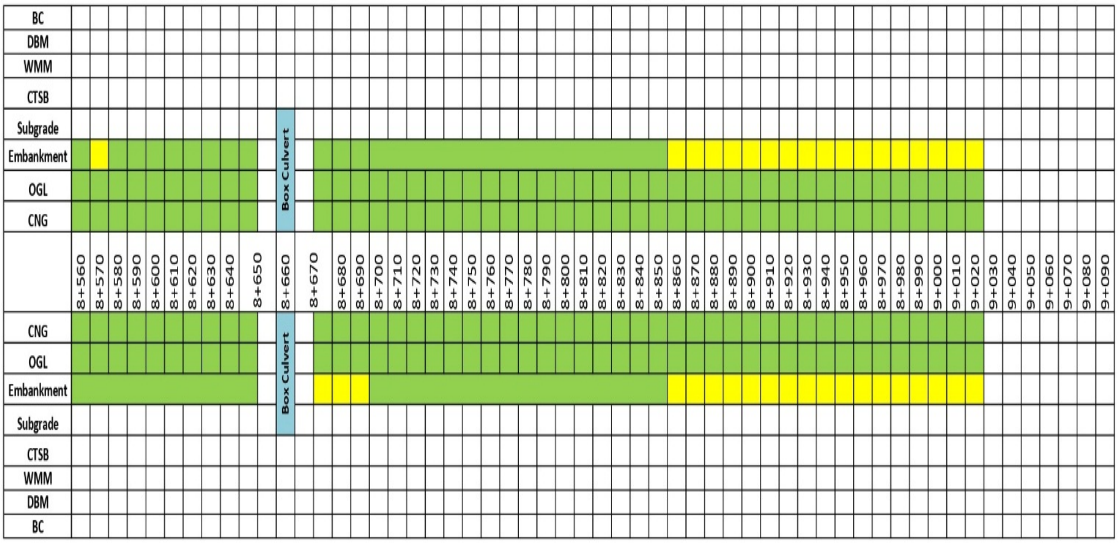
2.3 From Chainage (6+440 – To – 9+650)

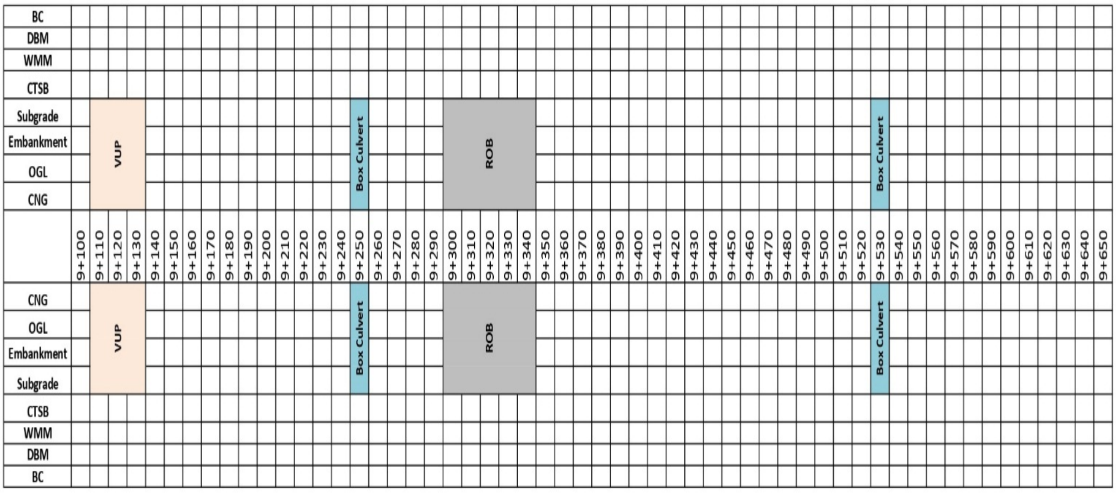



BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Pipe Culvert
Box Culvert
LVUP
Box Culvert
6+990 7+000 7+010 7+020 7+030 7+040 7+050 7+060 7+070 7+080 7+090 7+100 7+110 7+120 7+130 7+140 7+150 7+160 7+170 7+180 7+190 7+200 7+210 7+220 7+230 7+240 7+250 7+260 7+270 7+280 7+290 7+300 7+310 7+320 7+330 7+340 7+350 7+360 7+370 7+380 7+390 7+400 7+410 7+420 7+430 7+440 7+450 7+460 7+470 7+480 7+490
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Pipe Culvert
Box Culvert
LVUP
Box Culvert

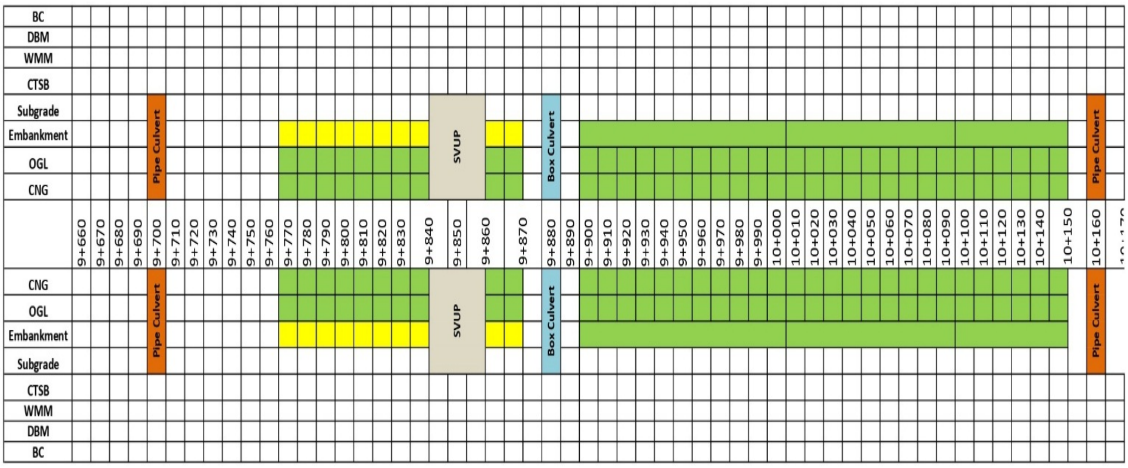

BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Box Culvert
Box Culvert
7+500 7+510 7+520 7+530 7+540 7+550 7+560 7+570 7+580 7+590 7+600 7+610 7+620 7+630 7+640 7+650 7+660 7+670 7+680 7+690 7+700 7+710 7+720 7+730 7+740 7+750 7+760 7+770 7+780 7+790 7+800 7+810 7+820 7+830 7+840 7+850 7+860 7+870 7+880 7+890 7+900 7+910 7+920 7+930 7+940 7+950 7+960 7+970 7+980 7+990 8+000 8+010 8+020 8+030
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Box Culvert
Box Culvert

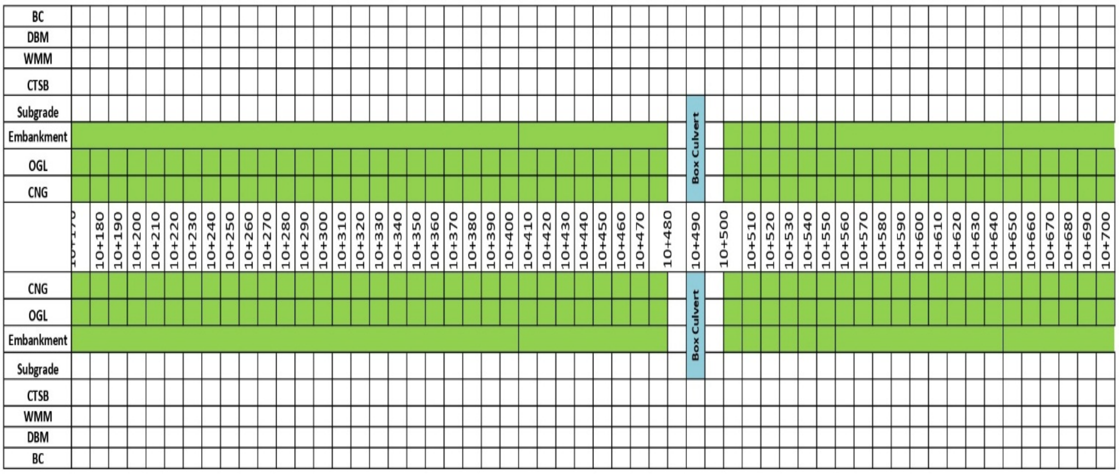

BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Box Culvert
Pipe Culvert
SVUP
8+040 8+050 8+060 8+070 8+080 8+090 8+100 8+110 8+120 8+130 8+140 8+150 8+160 8+170 8+180 8+190 8+200 8+210 8+220 8+230 8+240 8+250 8+260 8+270 8+280 8+290 8+300 8+310 8+320 8+330 8+340 8+350 8+360 8+370 8+380 8+390 8+400 8+410 8+420 8+430 8+440 8+450 8+460 8+470 8+480 8+490 8+500 8+510 8+520 8+530 8+540 8+550
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Box Culvert
Pipe Culvert
SVUP

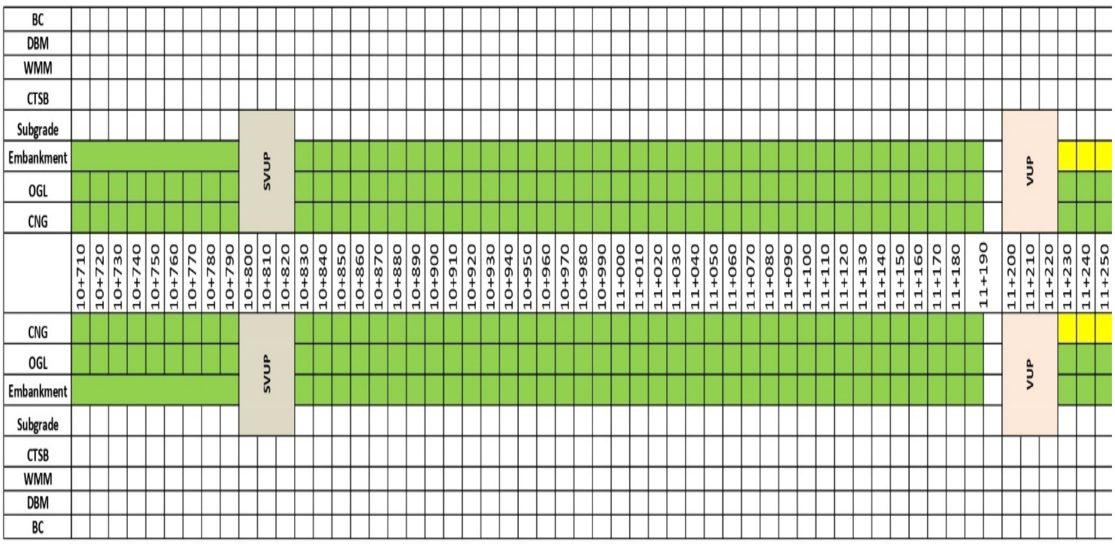

BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Box Culvert
8+560
8+570
8+580
8+590
8+600
8+610
8+620
8+630
8+640
8+650
8+660
8+670
8+680
8+690
8+700
8+710
8+720
8+730
8+740
8+750
8+760
8+770
8+780
8+790
8+800
8+810
8+820
8+830
8+840
8+850
8+860
8+870
8+880
8+890
8+900
8+910
8+920
8+930
8+940
8+950
8+960
8+970
8+980
8+990
9+000
9+010
9+020
9+030
9+040
9+050
9+060
9+070
9+080
9+090
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Box Culvert

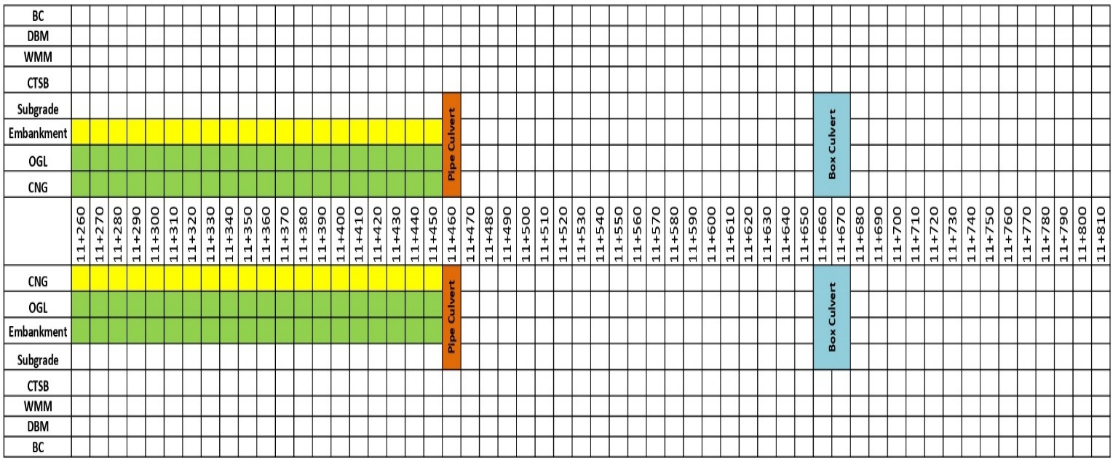

BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
VUP
Box Culvert
ROB
Box Culvert
9+100
9+110
9+120
9+130
9+140
9+150
9+160
9+170
9+180
9+190
9+200
9+210
9+220
9+230
9+240
9+250
9+260
9+270
9+280
9+290
9+300
9+310
9+320
9+330
9+340
9+350
9+360
9+370
9+380
9+390
9+400
9+410
9+420
9+430
9+440
9+450
9+460
9+470
9+480
9+490
9+500
9+510
9+520
9+530
9+540
9+550
9+560
9+570
9+580
9+590
9+600
9+610
9+620
9+630
9+640
9+650
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
VUP
Box Culvert
ROB
Box Culvert

2.4 From Chainage (9+660 - To – 12+880)

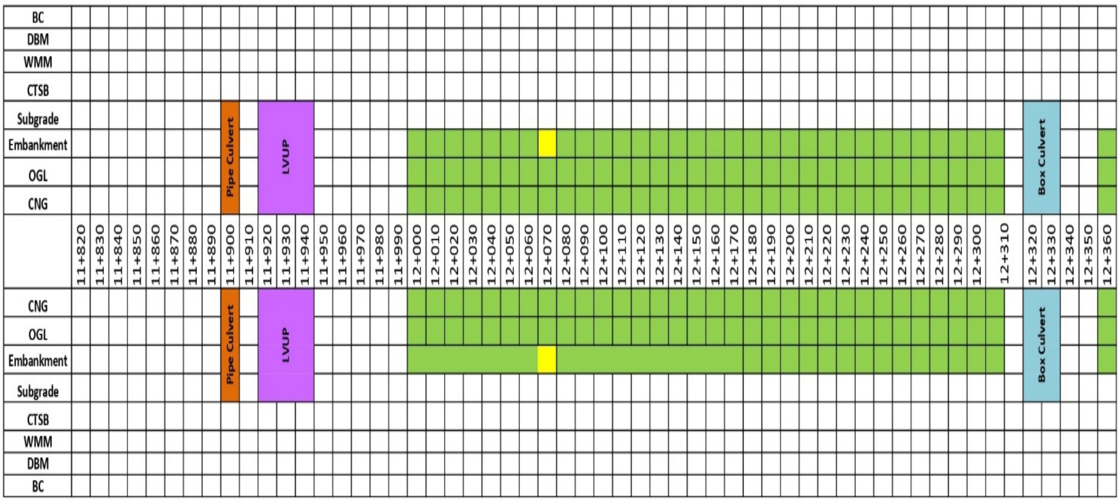




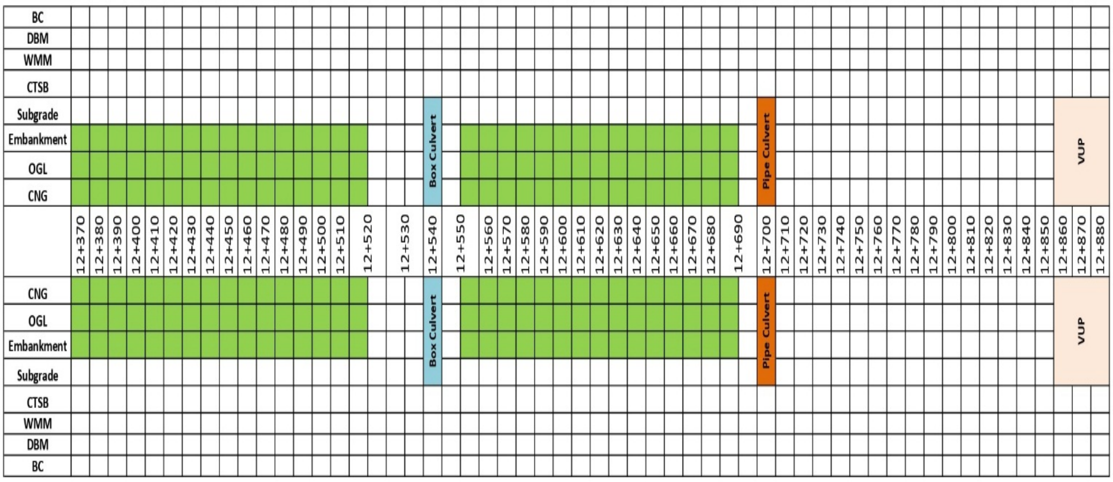




BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Pipe Culvert
Box Culvert
11+260 11+270 11+280 11+290 11+300 11+310 11+320 11+330 11+340 11+350 11+360 11+370 11+380 11+390 11+400 11+410 11+420 11+430 11+440 11+450 11+460 11+470 11+480 11+490 11+500 11+510 11+520 11+530 11+540 11+550 11+560 11+570 11+580 11+590 11+600 11+610 11+620 11+630 11+640 11+650 11+660 11+670 11+680 11+690 11+700 11+710 11+720 11+730 11+740 11+750 11+760 11+770 11+780 11+790 11+800 11+810
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Pipe Culvert
Box Culvert

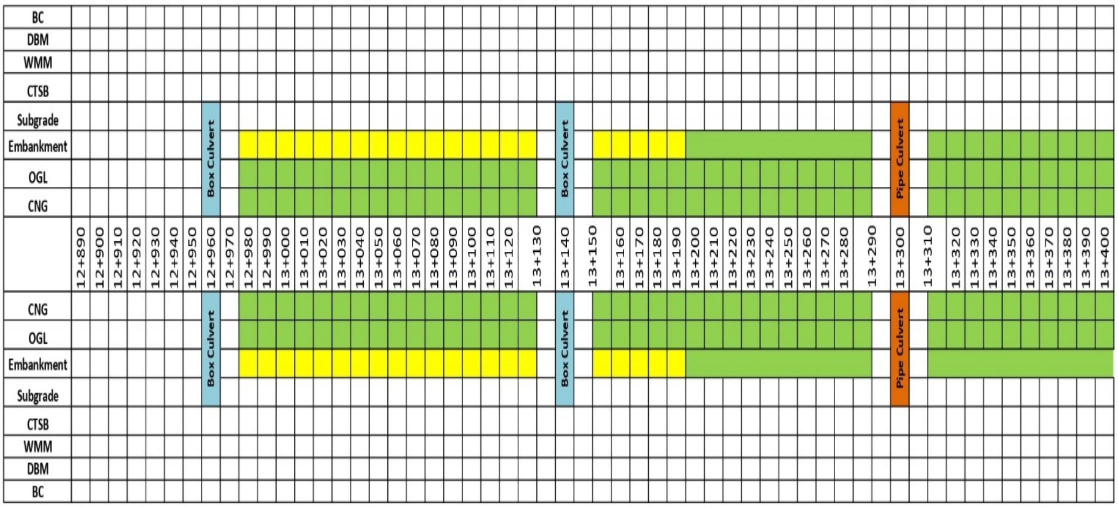


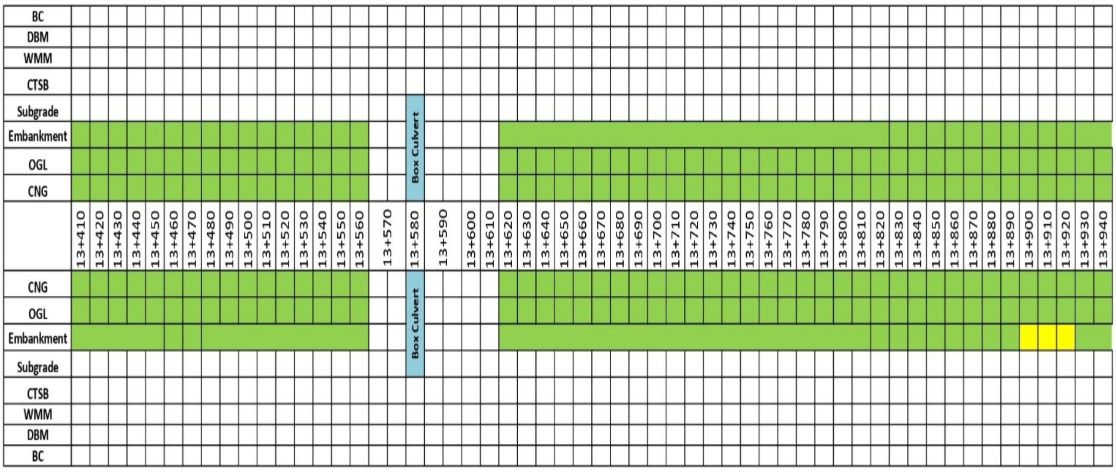
BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Pipe Culvert
LVUP
Box Culvert
11+820 11+830 11+840 11+850 11+860 11+870 11+880 11+890 11+900 11+910 11+920 11+930 11+940 11+950 11+960 11+970 11+980 11+990 12+000 12+010 12+020 12+030 12+040 12+050 12+060 12+070 12+080 12+090 12+100 12+110 12+120 12+130 12+140 12+150 12+160 12+170 12+180 12+190 12+200 12+210 12+220 12+230 12+240 12+250 12+260 12+270 12+280 12+290 12+300 12+310 12+320 12+330 12+340 12+350 12+360
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Pipe Culvert
LVUP
Box Culvert

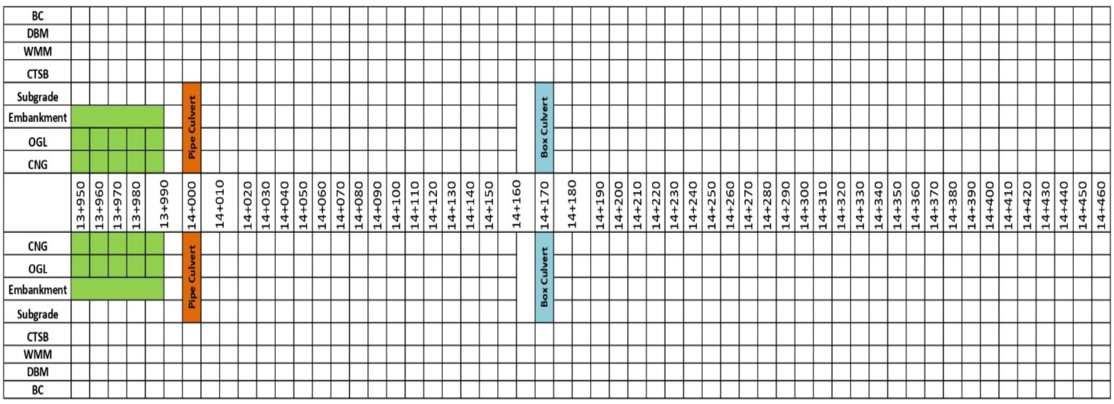


BC
DBM
WMM
CTSB
Subgrade
Embankment
OGL
CNG
Box Culvert
Pipe Culvert
VUP
12+370 12+380 12+390 12+400 12+410 12+420 12+430 12+440 12+450 12+460 12+470 12+480 12+490 12+500 12+510 12+520 12+530 12+540 12+550 12+560 12+570 12+580 12+590 12+600 12+610 12+620 12+630 12+640 12+650 12+660 12+670 12+680 12+690 12+700 12+710 12+720 12+730 12+740 12+750 12+760 12+770 12+780 12+790 12+800 12+810 12+820 12+830 12+840 12+850 12+860 12+870 12+880
CNG
OGL
Embankment
Subgrade
CTSB
WMM
DBM
BC
Box Culvert
Pipe Culvert
VUP

2.5 From Chainage (12+890 - To – 14+490)







BC																																																
DBM																																																
WMM																																																
CTSB																																																
Subgrade																																																
Embankment											FLY OVER																																					
OGL																																																
CNG																																																
	14+470	14+480	14+490	14+500	14+510	14+520	14+530	14+540	14+550	14+560	14+570	14+580	14+590	14+600	14+610	14+620	14+630	14+640	14+650	14+660	14+670	14+680	14+690	14+700	14+710	14+720	14+730	14+740	14+750	14+760	14+770	14+780	14+790	14+800	14+810	14+820	14+830	14+840	14+850	14+860	14+870	14+880	14+890	14+900	14+910	14+920	14+930	14+940
CNG																																																
OGL											FLY OVER																																					
Embankment																																																
Subgrade																																																
CTSB																																																
WMM																																																
DBM																																																
BC																																																

CHAPTER 3

STRUCTURAL DRAWINGS AND WORK AT SITE

3.1 VEHICULAR UNDER PASS (VUP)

VUP at chainage 6+112, a vehicular underpass, also known as an underpass, is a type of road or transportation infrastructure that allows vehicular traffic to pass underneath an obstruction, such as a railway line, a busy road, or a river. It is essentially a tunnel that is built under the obstruction, which provides a safe and efficient way for vehicles to move from one side to the other without any interruption to traffic flow.

Vehicular underpasses are typically constructed using reinforced concrete or steel, and are designed to accommodate the size and weight of various types of vehicles, including cars, trucks, and buses. They are usually built with multiple lanes to allow for higher traffic volumes and can also have pedestrian sidewalks for pedestrians.

One of the main advantages of vehicular underpasses is that they help to reduce traffic congestion by allowing vehicles to bypass busy intersections or roads. This helps to improve traffic flow and reduce travel times, which can ultimately lead to improved productivity and economic growth in the surrounding area.

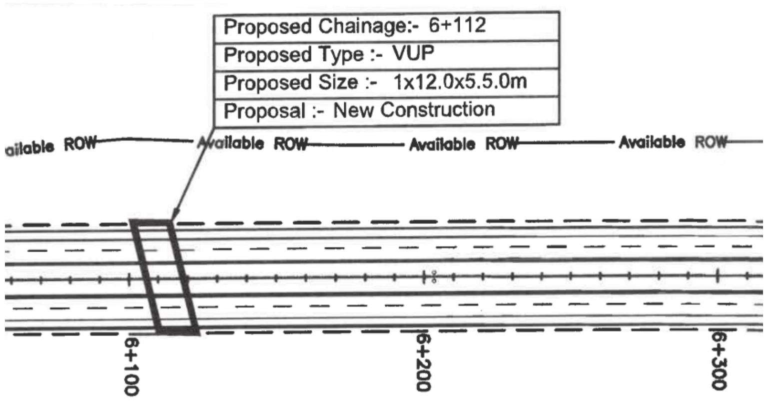


Figure 3.1 – VUP detailing and planning

Figure 3.1.1 Staging of VUP(A)

Figure 3.1.1 Staging of VUP(B)

3.1.1 PLANING OF VUP

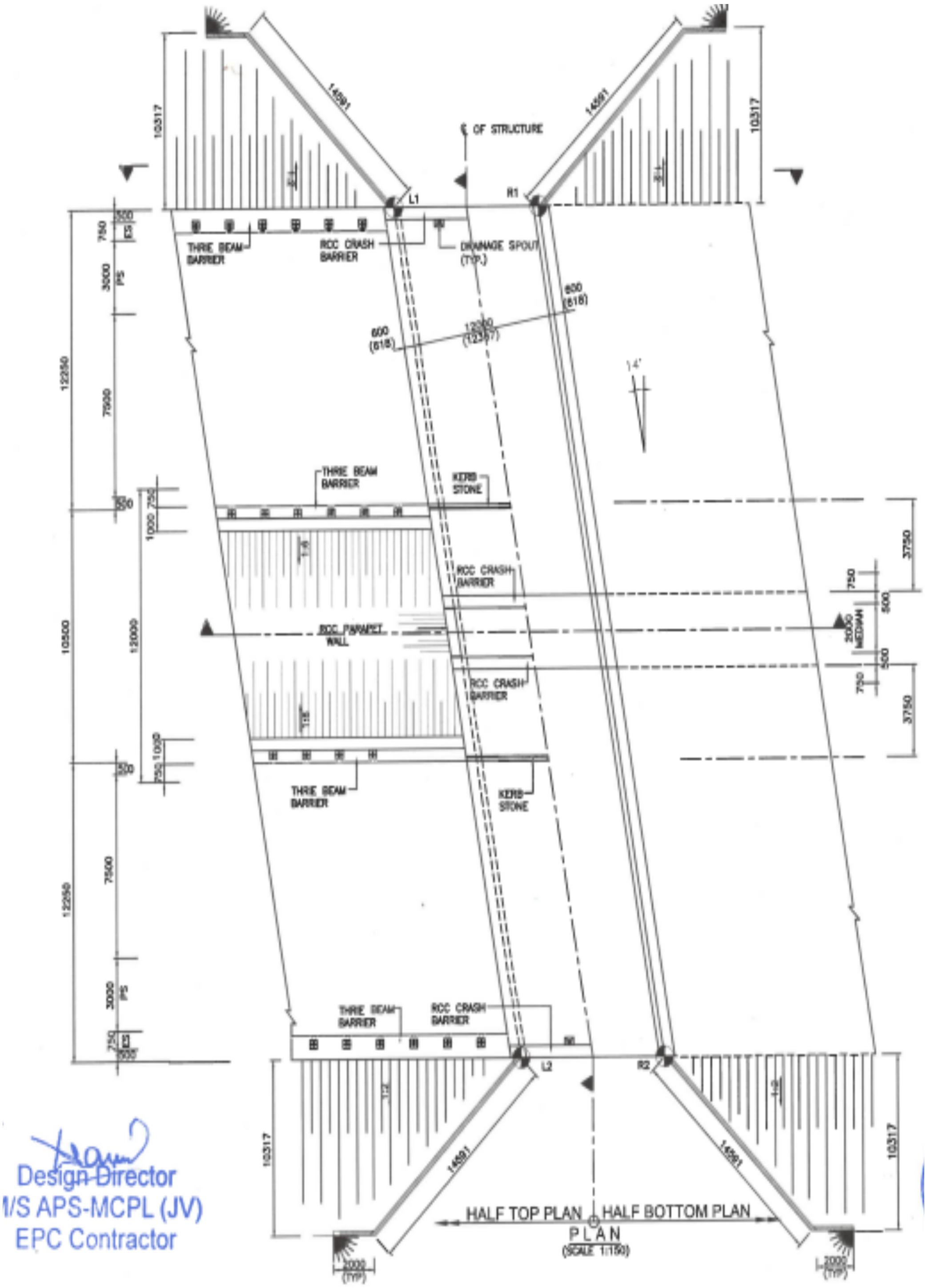


Figure 3.1.2 Plan of VUP (TOP VIEW)

3.1.2 SECTION C-C of VUP

Side view of vehicular under pass, designing and dimensions are followed on site throughout the construction of VUP as shown in given figure.

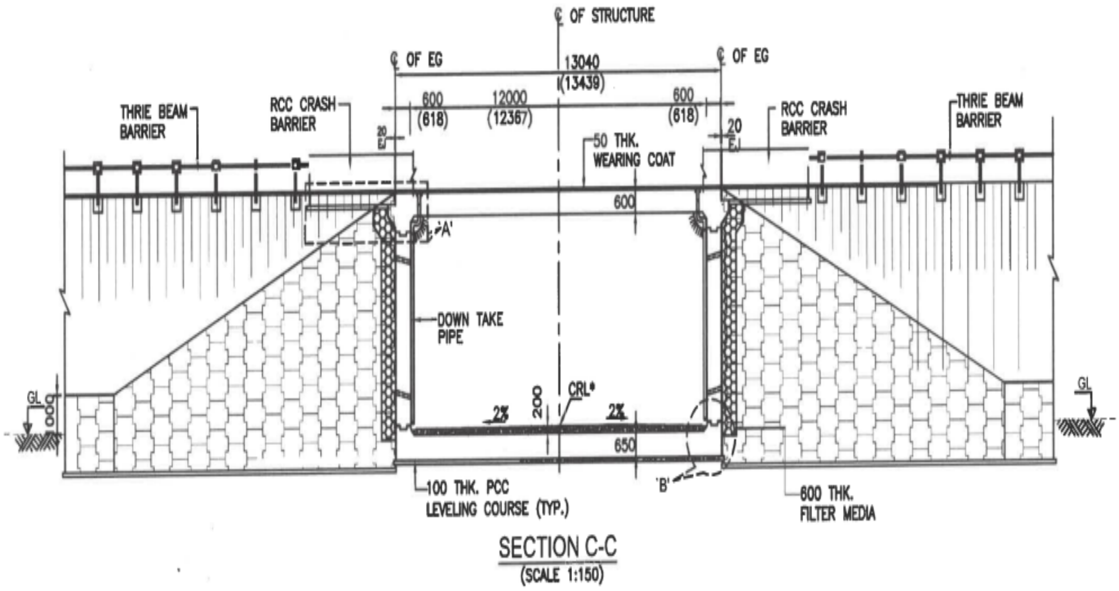


Figure 3.1.3 Section C-C of VUP

Table 3.1 Finished road level (FRL) and Ground level(GL)

FRL	LHS	223.77	223.77	223.77	223.79	223.79
FRL	RHS	223.77	223.77	223.77	223.77	223.77

GL	LHS	217.150	217.170	217.170	217.170	217.170
FOUN. LEVEL	RHS	213.300	213.300	213.300	213.300	213.300

3.1.3 CONSTRUCTION OF HAUNCH

Haunch is commonly used to refer to the inclined portion of a concrete beam or slab that connects the top and bottom flanges or slabs. The haunch helps to distribute the load from the concentrated point loads and reactions to the supporting structure. The height of the haunch is usually calculated based on the shear and moment diagram of the beam or slab.

In addition to providing load distribution, haunches can also help to increase the stiffness of a beam or slab, particularly at its ends. This can help to prevent excessive deflection and cracking due to concentrated loads or settlement.

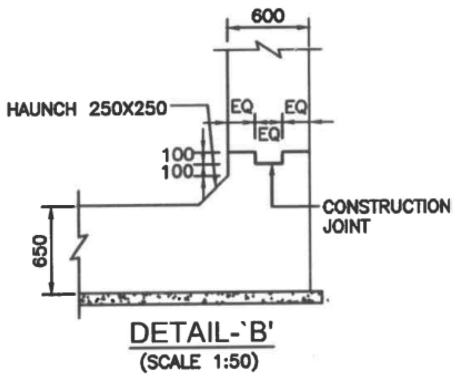


Figure 3.1.4 Detailing of Haunch

Figure 3.1.5 Concreting of Haunch (250X250mm)

3.1.4 SITE DETAILS

Figure 3.1.6 Curing of Slab and wall

Figure 3.1.7 Curing of Slab and wall

Figure 3.1.8 Tran mixer (7 cum^2) and Concreting of side wall, using vibrator

3.1.5 NOTES

1. All dimensions are in millimetres, levels are in meters unless otherwise mentioned.
2. No dimension shall be measured from the drawings. only written dimensions shall be followed.
3. The drawing shall be read in conjunction with relevant highway plan and profile drawings. FRL, bed level, camber/superelevation and layout shall also be verified site before execution. discrepancies shall be brought the notice of the engineer for revision in drawings,
4. Chainage of the structure is at the centre line of the proposed structure.
5. The reinforcement shall be bars of grade designation Fe 500d conforming to is 1786-2008.
6. Concrete shall be design mix with a minimum 28 days characteristic cube strength for different elements as follows:
    a) RCC box structure M35
    b) RCC crash barrier M40
    c) RCC approach slab M30
    d) PCC levelling course M15

e) U type median wall M35

7. Clear cover to outer steel shall be as follows:-

a)	Superstructure	45mm
b)	Vertical face in contact with earth	75mm
c)	Vertical face not in contact with earth	45mm
d)	Foundation	75mm

8. Back filling behind walls/abutment shall consists of selected earth conforming to appendix 6 of irc:78-2014
   Having properties C= 0, @>=30°, y=2.0t/cu.m.

9. 50mm wearing coat shall be adopted in conformity with section 2702 of Morth specifications.

10. All solid walls retaining the earth shall be provided with weep holes (100mm dia and slope 1v:20h) starting 150mm above the ground level and spaced 1000mm c/c both horizontally and vertically in staggered manner.
11. 600mm thick filter media shall be provided behind box, side wall & u type median wall.

12. Drainage spout 100mm dia spaced 5000mm c/c shall be provided in superstructure.

13. Condition of exposure is severe.

14. This structure les in seismic zone IV.

15. The maximum base pressure as per design is 6.901/m° which is less than the SBC as per geotechnical report at founding level.

3.2 LIGHT VEHICLE UNDERPASS (LVUP)

Light Vehicle Underpass, At Chainage 7+193.5

A light vehicle underpass (LVUP) is a type of road underpass that is designed specifically for light vehicles such as cars, pickup trucks, and SUVs. LVUP are typically used to improve traffic flow and reduce congestion at busy intersections by allowing vehicles to pass underneath an intersecting road or railway line without stopping for a traffic signal or crossing gate.

They typically have a clearance height of around 4.5 to 5 meters, which is sufficient for most light vehicles, and a width of around 6 to 7 meters, which is enough to accommodate two lanes of traffic.

Overall, light vehicle underpasses are an effective way to improve traffic flow and reduce congestion at busy intersections. They provide a safe and efficient alternative to traditional at-grade crossings and can help to improve the overall safety and efficiency of the road network.

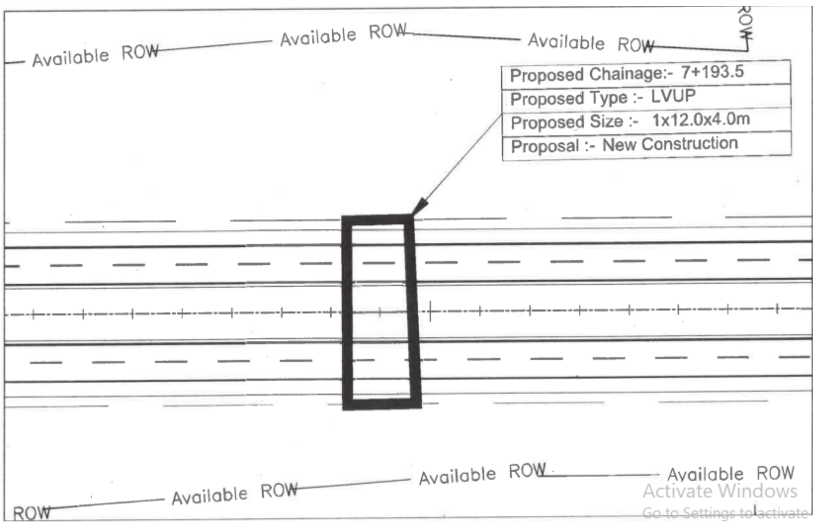


Figure 3.2 Plan of LVUP, at 7+193.5

3.2.1 CROSS SECTION, FRONT AND SIDE VIEW OF LVUP

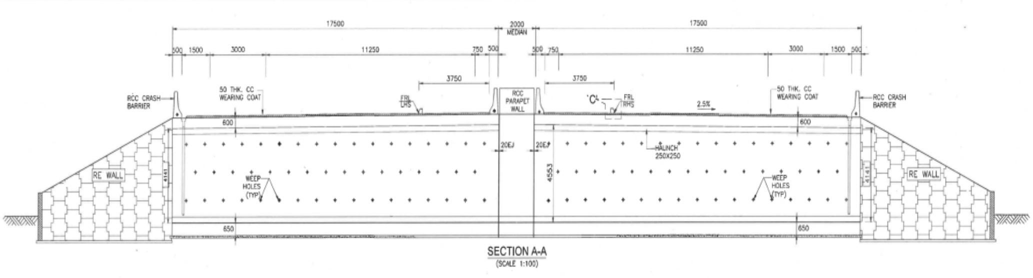


Figure 3.2.1 (A) Cross Section of Underpass

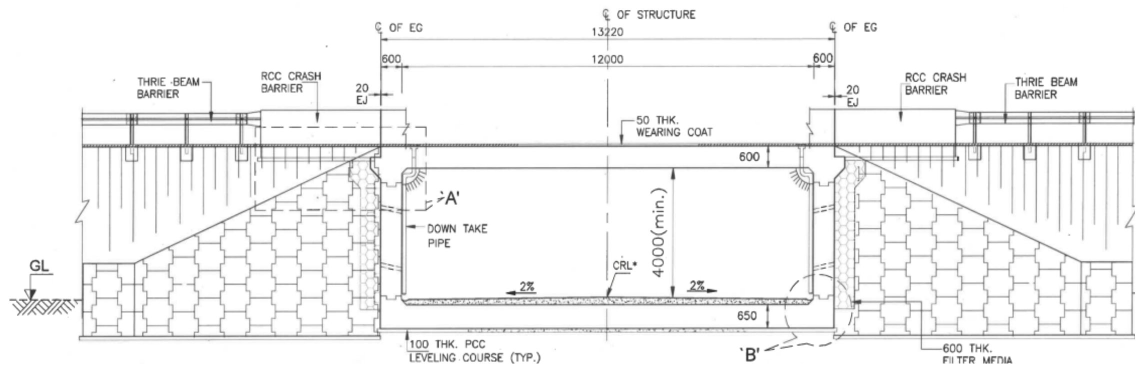


Figure 3.2.1 (B) Front view of LVUP

3.2.2 SITE VIEW (SIDE &FRONT) OF LUVP

Figure 3.2.2 Side view (A)

Figure 3.2.2 Front view (B)

3.2.3 CONCRETING OF RAFT FOUNDATION

A raft foundation, also known as a mat foundation, is a type of foundation used in building construction to spread the weight of a building and its load over a large area. It is a large, solid concrete slab that sits on top of the soil and supports the entire building.

Raft foundations are constructed by excavating the soil to a predetermined depth, and then filling the excavation with concrete. The concrete is typically reinforced with steel bars or mesh to provide additional strength and stability. The surface of the raft foundation is then levelled and finished to provide a smooth surface for building construction. The raft foundation is designed to distribute the weight of the building or structure evenly across the entire area of the foundation.

In order to design a raft foundation, soil testing and analysis is typically carried out to determine the load-bearing capacity of the soil. The design of the raft foundation will depend on factors such as the size and weight of the building or structure, the soil conditions.

Overall, raft foundations provide a strong, stable base for Structure and are a reliable choice for a variety of construction projects.

Figure 3.2.3 Concreting of Rafting (Total concrete used = 33 cum.s)

3.2.4 WEEP HOLES AND HEAD WALL

Weep Holes

A weep hole is a small opening or gap in a building component that allows for the drainage of water that may accumulate or penetrate the component. Weep holes are commonly used in construction to prevent the accumulation of water in masonry walls, retaining walls, and other structures.

Weep holes are typically located near the bottom of the wall, above the flashing layer, and are often placed at regular intervals. These openings allow any water that has penetrated the wall to drain out, preventing it from accumulating and causing damage to the structure. Weep holes can also be used to allow ventilation to pass through the wall cavity, preventing moisture build-up and reducing the risk of mold growth.

In retaining walls, weep holes are used to relieve the water pressure that builds up behind the wall, preventing the wall from becoming destabilized or damaged.

Overall, weep holes are an important part of many construction projects, as they help to prevent moisture build-up, water damage, cracking and structural instability.

Figure 3.2.4 (A) Weep hole at Side wall

Head wall

A head wall is a vertical or slightly sloping retaining wall that is built at the end of a Structure or culvert to provide support and stability to the embankment or roadway. Head walls are commonly used in construction to prevent soil erosion, control drainage, and provide a level foundation for the roadway or bridge.

The head wall typically consists of a concrete structure that extends down into the ground and provides a solid base for the bridge or culvert. It is usually built in a trapezoidal shape, with the wider end facing the roadway or embankment and the narrower end facing the waterway.

The head wall is designed to resist the lateral pressure exerted by the soil and water on the bridge or culvert, and to transfer the loads from the superstructure to the foundation. It also serves as a barrier to prevent erosion of the soil behind the wall, and to control the flow of water and sediment.

Overall, head walls play an important role in ensuring the safety and durability of bridges and culverts, and in preserving the natural environment by preventing erosion and controlling water flow.

Figure 3.2.4 (B) Head wall

3.3 BOX CULVERT AT CHAINAGE (13+600) AND (12+970)

Box Culvert

A box culvert is a structure commonly used in highway engineering for conveying water under a roadway or other transportation infrastructure. It is a rectangular or square-shaped concrete structure with open ends that are designed to fit together to form a longer conduit. Box culverts are generally constructed using reinforced concrete and are known for their durability, strength, and versatility.

Box culverts are typically used in locations where a bridge or a larger structure is not necessary, but where water needs to be conveyed under a roadway. They are also used in locations where there is limited vertical clearance, such as in urban areas or under existing infrastructure. Box culverts can be constructed in a variety of sizes and shapes to accommodate different water flow rates and site conditions. They can be designed to carry pedestrian and bicycle traffic, as well as heavy vehicular traffic. They are also commonly used in storm water management systems to transport and store water during heavy rain events.

In summary, box culverts are an essential component of modern highway engineering and are used to convey water under roadways and other transportation infrastructure. They are designed to be durable and strong, and can be constructed in a variety of sizes and shapes to accommodate different site conditions and traffic volumes.

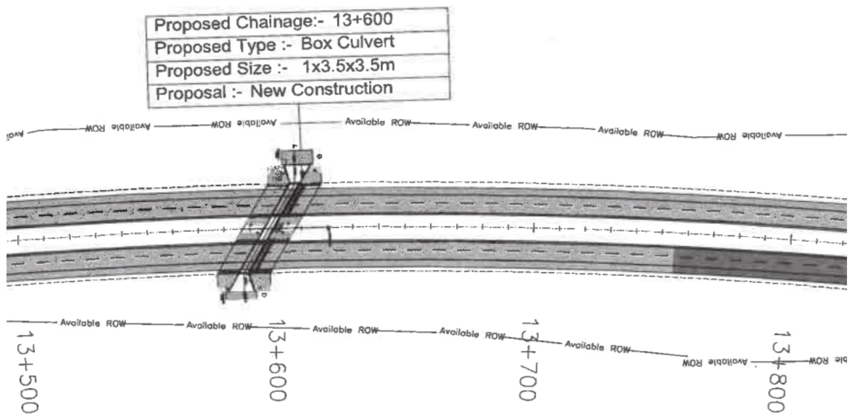


Figure 3.3. Detail and plan of Box Culvert

3.3.1 BOX CULVERT SECTIONAL PLAN (13+600)

Section A-A

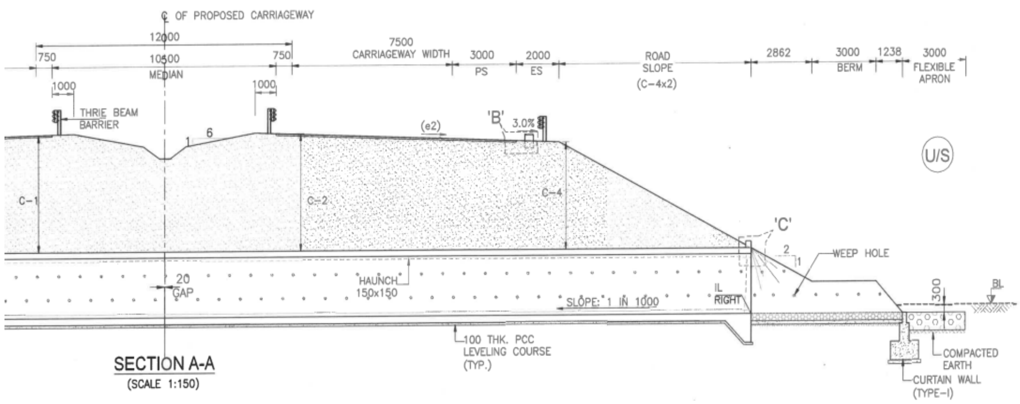


Figure 3.3.1 (A) – Side view provides us length of Raft

Section B-B

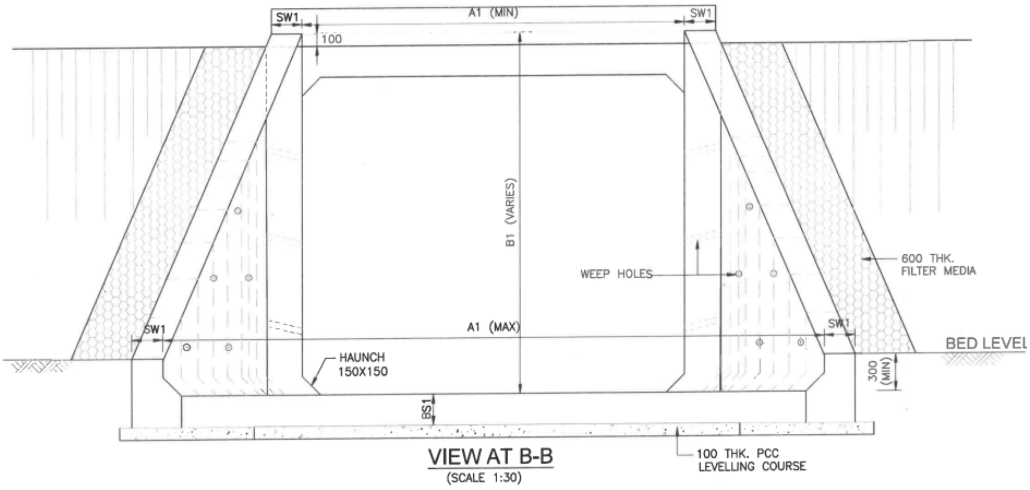


Figure 3.3.1 (B) – Front view providing details of Haunch, Wall and Slab

3.3.2 CONSTRUCTION AT SITE

Box culvert Structure, concreting of raft and wall are needed to be done, horizontal support are provided to structure to avoid running of shuttering plate and for avoiding risk of failure of structure.

Figure 3.3.2 Structure ready for concreting (3.5 x 3.5m) (A)

Figure 3.3.2 Structure completed, removing of staging left (B)

Structure completed, Curing too be done for 28 days

Figure 3.3.2 Box culvert at 13+600 (C)

Figure 3.3.2 Box Culvert at 12+970 (D)

3.3.3 CURING OF STRUCTURE

Structures are often designed to withstand a certain level of load and stresses, but over time they may be subjected to additional loads, environmental factors, or other conditions that can cause damage or deterioration. If left unchecked, this damage can compromise the structural integrity of the building, putting people and property at risk.

Therefore, the curing of structures is important to ensure that any damage or deterioration is repaired before it becomes a safety hazard. This may involve repairing cracks in concrete or masonry, replacing corroded or damaged steel members, or reinforcing weakened or overloaded sections of the structure.

Additionally, curing of structures can also improve their performance and extend their lifespan. Proper maintenance can help prevent future damage, reduce the need for costly repairs, and ensure that the structure remains safe and functional for its intended purpose.

Proper curing of structure should be done to gain complete and proper strength.

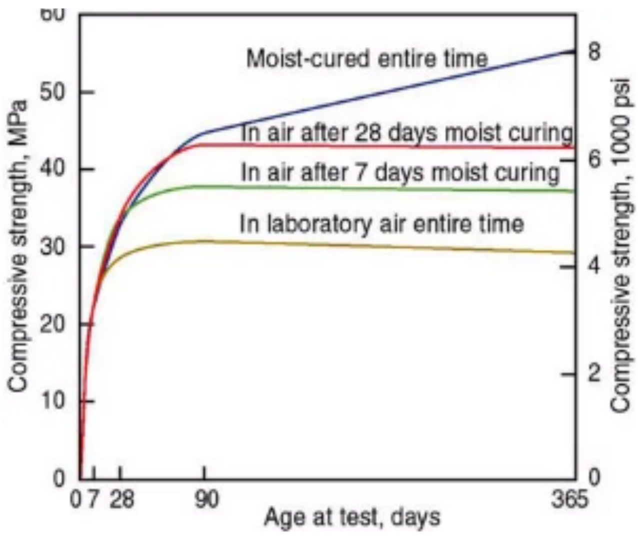


Figure 3.3.3 Concrete Strength Development versus Moist Curing of Concrete

Curing done at Site (Box Culvert)

3.4 PIPE CULVERT

Pipe Culvert at Chainage 13+300

A pipe culvert is a type of drainage structure commonly used in highways and other transportation infrastructure. It is essentially a pipe that is installed under a roadway or embankment to allow water to flow from one side of the roadway to the other.

Pipe culverts are typically made of materials such as concrete, steel, or plastic, and come in a variety of shapes and sizes depending on the specific application and requirements of the roadway. They can be circular, elliptical, or rectangular in shape, and are often designed to withstand heavy loads and resist corrosion.

The installation of a pipe culvert in a highway involves excavating a trench underneath the roadway or embankment, and then laying the pipe in the trench. The pipe is then backfilled with soil and compacted to ensure that it can support the weight of the roadway above it.

Pipe culverts are an important component of highway drainage systems, as they allow water to flow freely under the roadway, reducing the risk of flooding and damage to the roadway itself. They are often used in conjunction with other drainage structures such as catch basins, inlets, and channels to manage stormwater runoff from the roadway and surrounding areas.

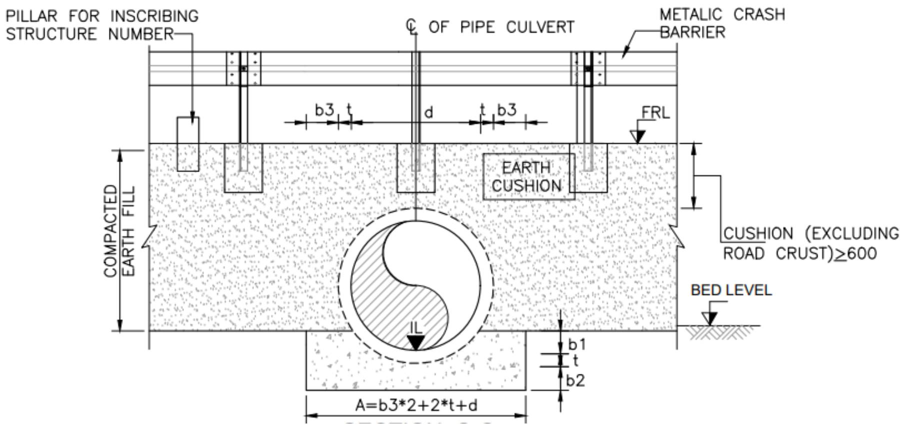


Figure 3.4 Pipe Culvert drawing

3.4.1 PLANING OF PIPE CULVERT LAYOUT

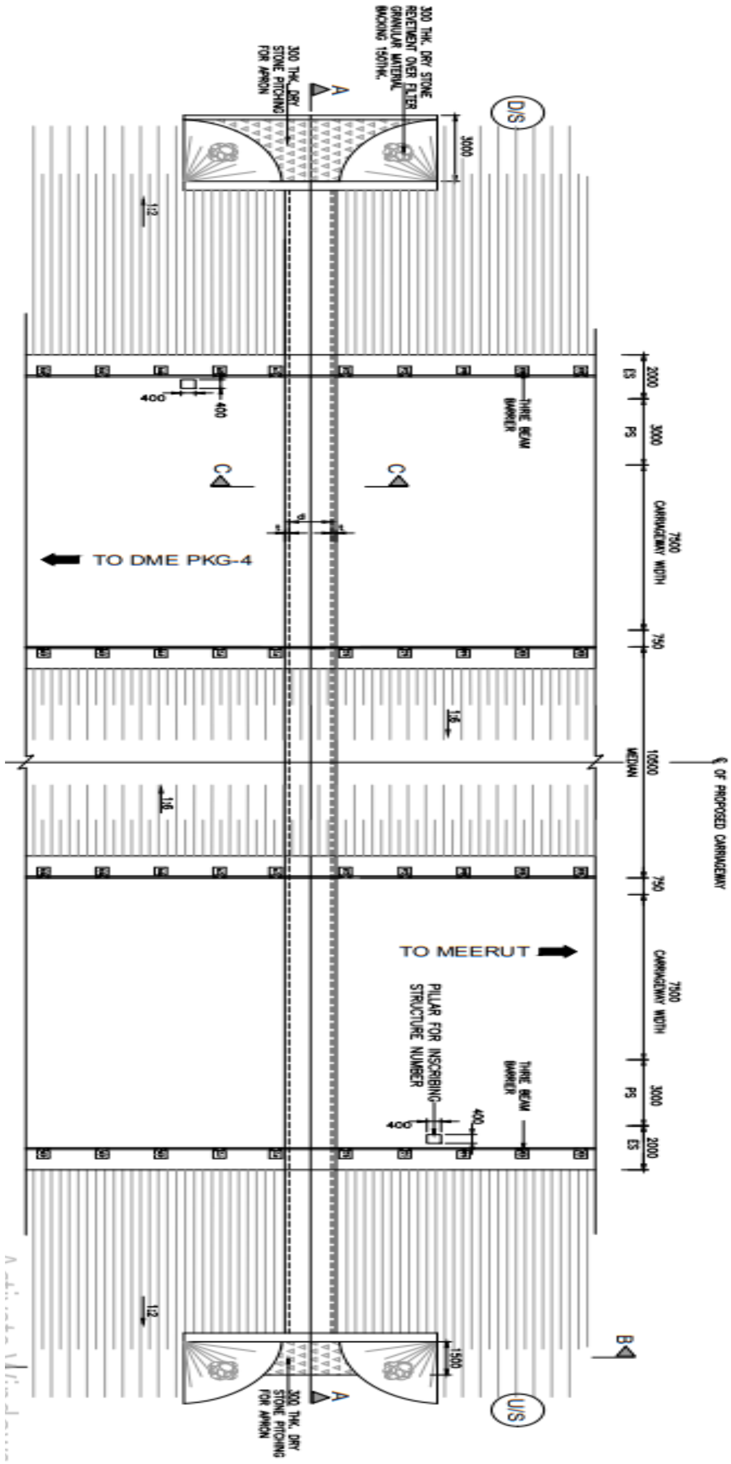


Figure 3.4.1 Planning of Pipe Culvert

3.4.2 CONSTRUCTION OF PIPE CULVERT

Laying of pipe culvert, total 21 pipes are laid under this pipe culvert.

Laying of pipe culvert refers to the process of installing pipes to allow water to flow under a roadway, railway, or other type of infrastructure. Culverts can be made of a variety of materials such as concrete, steel, or plastic, and can come in various shapes and sizes depending on the project requirements.

The process of laying a pipe culvert involves several steps, including:

1. Ecavation: First, a trench is dug where the culvert will be installed. The size of the trench will depend on the size of the culvert being installed.
2. Bedding: Once the trench is excavated, a layer of bedding material, such as crushed stone, is placed at the bottom of the trench to provide a stable foundation for the culvert.
3. Installation: The culvert pipes are then lowered into the trench and properly aligned to ensure a smooth flow of water. Connections between pipes are made using various techniques such as welding or using rubber seals.
4. Backfilling: After the pipes are installed, the trench is filled with backfill material such as gravel or soil. The backfill material is then compacted to ensure the culvert is properly supported.
5. Finishing: The final step in laying a pipe culvert involves finishing the surface of the roadway or railway to restore it to its original condition.

It is important to ensure that proper safety measures are taken during the installation of a pipe culvert, such as providing traffic control to protect workers and equipment, and ensuring that the excavation is properly shored to prevent collapse. Additionally, proper drainage must be provided to prevent erosion and damage to the culvert.

Figure 3.4.2 Laying of Pipe Culvert

Figure 3.4.2 (A) Head wall of pipe culvert

Figure 3.4.2 (B) Head wall of pipe culvert

CHAPTER 4

RESULT AND SITE WORK PROGRESS

4.1 STRUCTURE PROGRESS

Table 4.1 (A) ROB, FLYOVER, Major Bridge, Minor Bridge, VUP/LVUP

S. No.	Type of Structure	SCOPE (No)	Foundation		Sub structure		Super structure	
			Complete	WIP	Complete	WIP	Complete	WIP
1	ROB	1	-	-	-	-	-	-
2	FLYOVER	2	-	-	-	-	-	-
3	MINOR BRIDGE	1	-	-	-	-	-	-
5	VUP/LVUP/SUP	18	1/3/5	1/1/1	1/2/3	0/1/2	1/0.5/1	0/1.5/1

Table 4.1 (B) Box Culverts details

S. No.	Type of Structure	Scope (No)	Status					
			Excavation	PCC	Raft	Wall	Deck Slab	Remarks
1	Box Culvert	35	26	26	22	20	16	

Table 4.1 (C) Hume Pipe Culvert (Irrigation Channel)

S. No.	Type of Structure	Scope (No)	Status					
			Excavation	PCC	Pipe Laying	Concreting	Backfill	Remarks
1	**HPC**	**20**	**19**	**19**	**17**	**17**	**-**	

4.2 PHYSICAL PROGRESS

Table 4.2 (Percentage of Work done at site)

Component	% Weightage	Physical Progress (Cumulative, Up to Current Month)
Road Works	48.98%	16.00%
MNB, SVUP, LVUP, VUP Works	18.050%	22.00%
ROB	4.410%	0.00%
Box Culvert Works	3.98%	65.00%
Other Works	24.58%	10.00%

4.3 ROAD WORK PROGRESS

Table 4.3 (A) Road Work Status (Main Carriageway)

Sr. No.	Description	Unit	Total Scope (Km)	Started (Km)	Completed (Km)	% Work completed
1	C&G	Km	13.89	10.9	9.8	70.55%
2	Earthwork	Km	13.89	10.9	6.5	46.8 %
3	Subgrade	Km	13.89	-	-	
4	CTSB (DL/SL)	Km	13.89	-	-	
5	WMM	Km	13.89	-	-	
6	DBM	Km	13.89	-	-	
7	BC	Km	13.89	-	-	

Table 4.3 (B) Road Work Status (Reconstruction)

Sr. No.	Description	Unit	Total Scope (Km)	Started (Km)	Completed (Km)
1	C&G	Km	3.40	-	-
2	Earthwork	Km	3.40	-	-
3	Subgrade	Km	3.40	-	-
4	CTSB (DL/SL)	Km	3.40	-	-
5	WMM	Km	3.40	-	-
6	DBM	Km	3.40	-	-
7	BC	Km	3.40	-	-

PLAGIARISM CERTIFICATE

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

PLAGIARISM VERIFICATION REPORT

Date: ....

Type of Document (Tick): PhD Thesis | M.Tech Dissertation/ Report | B.Tech Project Report | Paper

Name: _________________________ __**Department:** _______________ **Enrolment No** ________

Contact No. ___________________________**E-mail.** ___________________________________

Name of the Supervisor: ____

Title of the Thesis/Dissertation/Project Report/Paper (In Capital letters): ______________________

____

____

UNDERTAKING

I undertake that I am aware of the plagiarism related norms/ regulations, if I found guilty of any plagiarism and copyright violations in the above thesis/report even after award of degree, the University reserves the rights to withdraw/revoke my degree/report. Kindly allow me to avail Plagiarism verification report for the document mentioned above.

Complete Thesis/Report Pages Detail:

– Total No. of Pages =
– Total No. of Preliminary pages =
– Total No. of pages accommodate bibliography/references =

(Signature of Student)

FOR DEPARTMENT USE

We have checked the thesis/report as per norms and found **Similarity Index** at ....(%). Therefore, we are forwarding the complete thesis/report for final plagiarism check. The plagiarism verification report may be handed over to the candidate.

(Signature of Guide/Supervisor) **Signature of HOD**

FOR LRC USE

The above document was scanned for plagiarism check. The outcome of the same is reported below:

Copy Received on	**Excluded**	**Similarity Index (%)**	**Generated Plagiarism Report Details** (Title, Abstract & Chapters)	
	• All Preliminary Pages • Bibliography/Images/Quotes • 14 Words String		Word Counts	
Report Generated on			Character Counts	
		Submission ID	Total Pages Scanned	
			File Size	

Checked by
Name & Signature **Librarian**

....

Please send your complete thesis/report in (PDF) with Title Page, Abstract and Chapters in (Word File) through the supervisor at plagcheck.juit@gmail.com