

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

Agartala Bypass (Western) (L= 25.402 km)

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EXECUTIVE SUMMARY

0.1 Background

National Highways and Infrastructure Development Corporation (NHIDCL) has proposed the preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country in the state of Tripura.

Under this scheme, the consultancy work is awarded to M/s. Technocrats Advisory Services Pvt. Ltd. in association with Vaishnavi Infratech Services Pvt. Ltd. for preparation of Detailed Project Report of **Agartala Bypass (Western).**

The design length of this proposal is 25.402 km.

0.2 Objectives

The main objective of the consultancy service is to establish the technical, economical, and financial viability of the project and prepare detailed project reports for Agartala Bypass (Western).

The viability of the project shall be established taking into account the requirements with regard to proposed alignment of Project based on highway design, pavement design, provision of service/Slip roads, RoB, grade separator, vehicular under passes, bridges wherever necessary, type of intersections, rehabilitation and widening of existing and/or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates and economic analysis.



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0.3 Scope of Services

The Consultant is required to suggest alternative alignments (minimum 3 nos.) for proposed Bypass. The proposed bypass will be designed as 4 lane and the Consultant shall furnish land acquisition details as per revenue records/maps for further processing.

The general scope of services is given in the sections that follow.

All ready to implement 'good for construction' drawings shall be prepared.

Environmental Impact Assessment, Environmental Management Plan and Rehabilitation and Resettlement Studies shall be carried out by the Consultant meeting the requirements of MoEF / other statutory bodies.

Wherever required, consultant will liaise with concerned authorities and arrange all clarifications. Approval of all drawings including GAD and detail engineering drawings will be got done by the consultant from the Railways. However, if Railways require proof checking of the drawings prepared by the consultants, the same will be got done by NHIDCL. Consultant will also obtain 'No Objection Certificate' from Ministry of Environment and Forest and also incorporate the estimates for shifting of utilities of all types involved from concerned local authorities in the DPR. Consultant is also required to prepare all Land Acquisition papers (i.e., all necessary schedules as per L.A. act) for acquisition of land either under NH Act or State Act.

The Consultant shall prepare and submit the cost estimate and bid documents.

Consultant shall obtain all types of necessary clearances required for implementation of the project on the ground from the concerned agencies. The client shall provide the necessary supporting letters and any official fees as per the demand note issued by such concerned agencies from whom the clearances are being sought to enable implementation.



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0.4 Key Professional Staff

Table 0.1 – Key Professional staff

S. No.	Position	Name
1	Team Leader	Mr. Baban Ram
2	Geo-Technical and Pavement Expert	Mr. Brijesh Mishra
3	Environmental Specialist	Mrs. Meena Bhaduri
4	Traffic cum Safety Expert	Mr. Salil Pathak
5	Hill Road / Tunnel Expert	Mr. P.K Dubey
6	Revenue / Survey Expert	Mr. Mahaveer Singh
7	Bridge Design Engineer	Mr. D.P. Singh
8	Contract Specialist	Mr. Vir Bahadur Singh

0.5 Project Alignment Description

- This bypass is proposed to connect NH-8 (Assam – Tripura Road) with NH-108B (Agartala- Khowai road),
- The main obligatory points connected by this bypass are Agartala Airport, Tripura Institute of Technology, Police Training centre etc,
- The bypass is proposed 4 lane wide,
- This bypass starts from km 8+325 of NH-8 (near Tripura University (1.6 km from Amtali bypass towards Sabroom)), passes through Uttar Ballabhpur, Paschim Charipara, Mantoli, Joynagar, Ramnagar (near Akhaura check post), Bhubanvan, near Chinyani, Durgabari.
- The bypass ends at Lembuchhera (near existing km 6+800 (considering km 0+0 at Lichhubagan chowmuhan) of Agartala- Khowai road),
- The length of this proposed bypass is 25.402 km.
- 2 Fly over (90m long each), 1RoB, 19 bridges (new construction), 2 bridges (widening), 1 bridge on slip road, 2 VUP, 6 LVUP, 21 SVUP are proposed in this alignment.

The Project Road alignment shown in figure below-



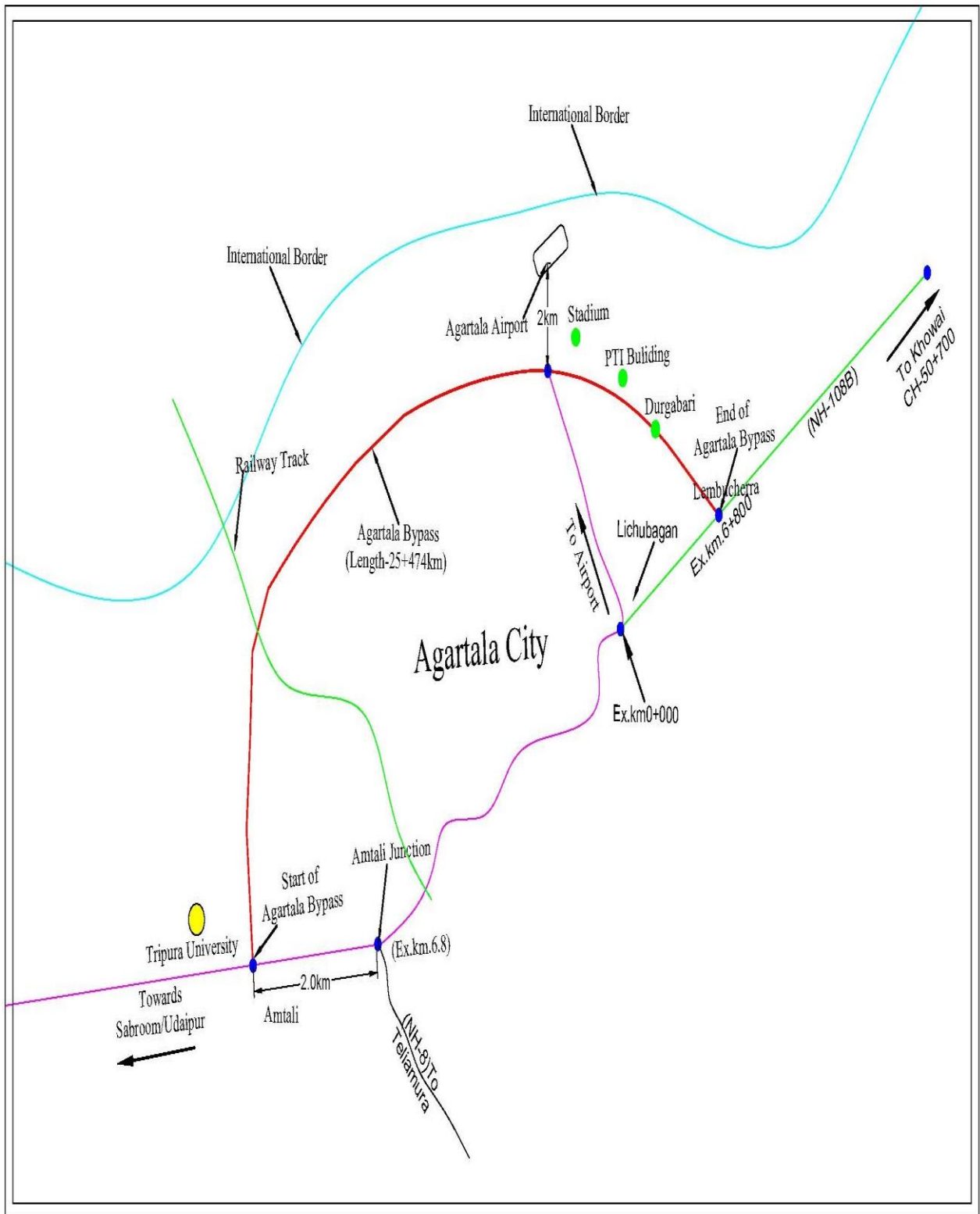
Detailed Project Report (Final)::

Executive Summary

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

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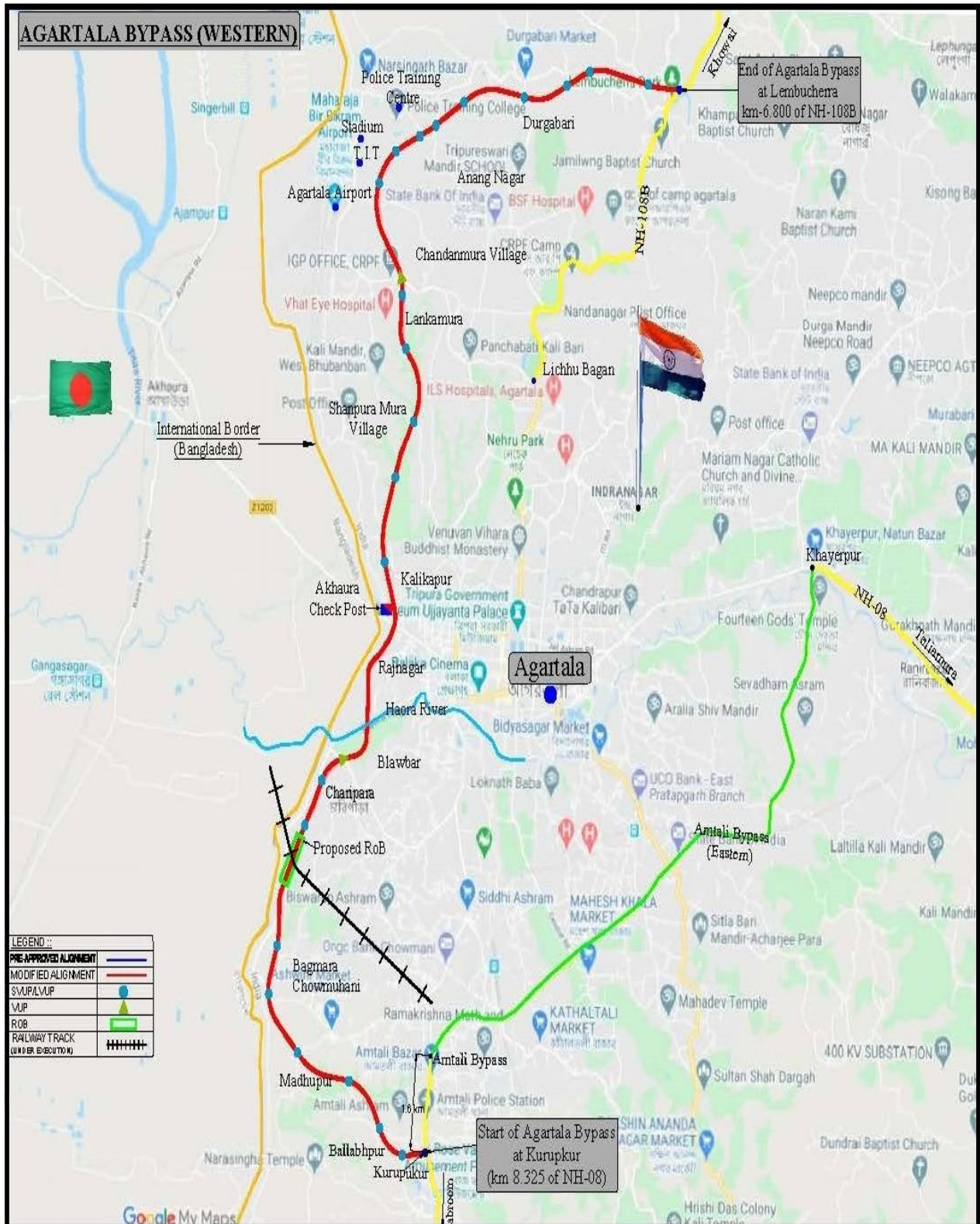


Figure 0.1– Proposed Alignment of Project Road



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0.6 Summary of Proposals-

A brief of proposals of this project is as under –

Table 0.2 – Proposals

Sl. No.	Chainage	Type	Remarks
1	0+000	Widening of Bridge on NH-8, (1 x 13.5 x 11)	
2	0+460	SVUP	
3	1+125	LVUP	
4	2+070	SVUP	
5	3+280	SVUP	
6	4+270	LVUP	
7	4+970	SVUP	
8	6+000	ROB with viaduct (30+60+30+30m)	
9	6+570	VUP	
10	6+970	SVUP	
11	7+770	SVUP	
12	8+300	VUP with bridge (20m + 10m span) connecting with bridge on slip road (B/s)	
13	8+900	Bridge 20m span	
14	9+175	Bridge on Hawra River (2 x 40m span)	
15	9+500	SVUP	
16	9+800	SVUP	
17	9+960	Bridge 30m span	
18	10+110	SVUP	
19	10+175	Bridge 20m span	
20	10+390	SVUP	
21	10+880	Flyover 90m long	
22	10+870	Bridge on R/S Service Road (1 x 13 x 9m)	
23	11+650	LVUP	
24	11+875	Bridge 30m span	
25	12+090	LVUP	
26	13+150	SVUP	
27	13+540	Bridge 20m span	
28	14+065	SVUP	
29	14+950	Bridge 20m span	
30	15+920	SVUP	



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Sl. No.	Chainage	Type	Remarks
31	16+480	Bridge 15m span on right side slip road only	
32	16+500	Flyover 90m long	
33	17+565	SVUP	
34	18+000	SVUP	
35	18+400	SVUP	
36	18+900	SVUP	
37	19+370	LVUP	
38	19+940	SVUP	
39	20+600	SVUP	
40	20+700	Bridge 30m span	
41	20+900	Bridge 35m span	
42	21+070	Bridge 30m span	
43	21+785	LVUP	
44	22+025	Bridge 30m span	
45	22+175	SVUP	
46	22+265	Bridge 25m span	
47	22+610	SVUP	
48	23+200	Bridge 30m span	
49	23+950	Bridge 30m span	
50	24+250	Bridge 30m span	
51	24+800	Bridge 30m span	
52	25+000	Bridge 30m span	
53	25+250	Bridge 35m span	

Bridge 10m span	1
Bridge 20m span	4
Bridge 25m span	1
Bridge 30m span	10
Bridge 35m span	2
Bridge 80m span	1
Widening of Bridge	1
Bridge on S/Road	2
RoB with viaduct	1
Light Vehicular Under Passes	6
Smaller Vehicular Under Passes	21
Vehicular Under Passes	2
Flyover 90m long	2

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0.7 Right of Way (ROW)

The proposed right of way is 30m - 65m in entire length of bypass. Chainage wise detail is -

Table 0.3: - Details of Proposed RoW

Sl. No	Design Chainage (Km)		Total length (m)	Adopted PROW		Proposed RoW (m)
	From	To		LHS	RHS	
1	0+000	0+340	340	22.5	22.5	45
2	0+340	1+600	1260	15	15	30
3	1+600	1+800	200	15	15	30
4	1+800	2+560	760	15	15	30
5	2+560	2+860	300	22.5	22.5	45
6	2+860	3+730	870	15	15	30
7	3+730	3+820	90	15	15	30
8	3+820	3+900	80	15	15	30
9	3+900	4+620	720	22.5	22.5	45
10	4+620	4+960	340	15	15	30
11	4+960	5+100	140	25	15	40
12	5+100	5+360	260	15	15	30
13	5+360	5+980	620	22.5	22.5	45
14	5+980	6+060	80	32.5	32.5	65
15	6+060	6+600	540	32.5	32.5	65
16	6+600	6+950	350	25	25	50
17	6+950	7+060	110	25	25	50
18	7+060	7+920	860	15	15	30
19	7+920	8+685	765	22.5	22.5	45
20	8+685	9+180	495	22.5	22.5	45
21	9+180	11+320	2140	17.5	17.5	35
22	11+320	11+650	330	25	25	50
23	11+650	11+865	215	25	25	50



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Sl. No	Design Chainage (Km)		Total length (m)	Adopted PROW		Proposed RoW (m)
	From	To		LHS	RHS	
24	11+865	12+120	255	25	25	50
25	12+120	12+380	260	15	15	30
26	12+380	12+840	460	22.5	22.5	45
27	12+840	13+780	940	15	15	30
28	13+780	14+700	920	22.5	22.5	45
29	14+700	15+050	350	15	15	30
30	15+050	15+550	500	15	15	30
31	15+550	15+980	430	15	15	30
32	15+980	17+080	1100	22.5	22.5	45
33	17+080	17+700	620	15	15	30
34	17+700	18+000	300	22.5	22.5	45
35	18+000	18+400	400	22.5	22.5	45
36	18+400	18+720	320	22.5	22.5	45
37	18+720	19+060	340	15	15	30
38	19+060	19+370	310	22.5	22.5	45
39	19+370	19+940	570	22.5	22.5	45
40	19+940	20+280	340	22.5	22.5	45
41	20+280	21+275	995	15	15	30
42	21+275	21+350	75	15	15	30
43	21+350	21+420	70	15	15	30
44	21+420	22+020	600	22.5	22.5	45
45	22+020	22+700	680	22.5	22.5	45
46	22+700	23+050	350	22.5	22.5	45
47	23+050	23+220	170	22.5	22.5	45
48	23+220	23+800	580	22.5	22.5	45
49	23+800	24+040	240	15	15	30
50	24+040	24+160	120	15	15	30
51	24+160	24+380	220	15	15	30



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Sl. No	Design Chainage (Km)		Total length (m)	Adopted PROW		Proposed RoW (m)
	From	To		LHS	RHS	
52	24+380	24+550	170	15	15	30
54	24+550	24+620	70	27.5	22.5	50
55	24+620	24+680	60	27.5	22.5	50
56	24+680	24+880	200	25	15	40
57	24+880	24+940	60	27.5	22.5	50
58	24+940	25+060	120	22.5	22.5	40
59	25+060	25+260	200	27.5	22.5	50
60	25+260	25+402	142	142	As per drawing (Junction Improvement)	
Total Length..			25402			

For Junction improvement at start & end point & connecting of slip road with cross roads, additional land to be acquired.

0.8 Abutting Land Use Pattern

Project road passing in plain & rolling terrain. Built-up and partially built-up are existing along the both side of Project road in approx. 70% of its length.



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0.9 Design standards

Following design standards have been adopted as per Indian Roads Congress (IRC) guidelines, contained in IRC SP-73: 2018, IRC SP- 84 : 2019, IRC: 37, IRC: 38, and IRC: SP: 23 and is given in Table 0.4.

Table 0.4- Design Parameters

Item	Plain / Rolling / Mountainous Terrain	Reference
Design Speed (kmph)	Ruling -100 kmph / Minimum -80 kmph	Table 2.1
Sight distance (minimum)	180 m (SSD)	Table 2.7
Proposed Land width (ROW)	30 to 65m (refer PROW table of this chapter)	
Lane configuration	4 Lane + paved shoulder	
Formation width	7.0 m of carriageway + 2.5 m Paver shoulder + 1.5m earthen shoulder on either side of median (Fig. 2.4) of four lane manual, Median – 2.0m	IRC SP- 84: 2019
Edge strip	.25m Raised median	
	.5m Depressed Median	
Camber/cross fall	2.5 %	Table 2.8
Vehicular under pass	Vertical Clearance – 5.5m (Min) Horizontal Clearance – 20m	1. For Vertical & Horizontal clearance, refer Clause 2.10.2 of IRC SP- 84: 2019, 2. For Carriageway width, refer Fig 7.12 of IRC SP-73: 2018
Light vehicular under pass (LVUP)	Vertical Clearance – 4m (Min) Horizontal Clearance – 12m	
Smaller vehicular under pass (SVUP)	Vertical Clearance – 4m (Min) Horizontal Clearance – 7m	
Shoulders	2.5 % for paved shoulder and 3.0 % for earthen shoulder	
Side Slope	1 (V): 2 (H) Fill 1 (V): 1 (H) Cut	
Maximum super-elevation	5.0 %	Refer clause 2.9.3 of IRC SP- 84: 2019,



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Item	Plain / Rolling / Mountainous Terrain	Reference	
Radii of horizontal curves in plain/hilly terrain (m)		Table 2.6	
			Plain
	Ruling Min		400 m
	Absolute Min	250 m	
Drains	“Rectangular “shape on - either side where warranted depending on Site Condition.		

Factors considered in arriving at final alignment of Agartala bypass -

- Deficiencies of the existing road (s) –
- Local traffic congestion in Agartala city
- Open route for through traffic from NH-8 to NH-108 B
- Connecting Agartala Airport to NH-8 & NH-108 B,
- Need for better connectivity & future expansion
- Strength, safety & stability requirements
- Requirement as per O-D survey & Local public demand



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0.10 Surveys & Investigation

0.10.1 Traffic Surveys

Traffic survey has been conducted at km 9+500 of NH-8 & at km 10+000, Km 21+300 of NH -108B.

Table 0.5- Homogenous section

Sl. No.	Homogenous Section	Location	Remarks to Capture
1	Section I	Km 9.500 of NH-8 <u>From 03.03.2021 to 09.03.2021</u>	Traffic coming from Sabroom, Shanti bazar, Udaipur, Agartla & moving towards Agartala, Khowai, Teliamura, Ambassa, & rest of Tripura and Assam (both ways)
2	Section I	Km 10.00 (near Kamalghat) <u>From 03.03.2021 to 09.03.2021</u>	Traffic coming from Agartala & moving towards simna, Khowai, Bijoy nagar, Agartala and South Tripura etc (both ways)
3	Section I	Km 21.300 (near Tarapur) <u>From 11.02.2021 to 17.02.2021</u>	Traffic coming from Agartala & moving towards simna, Khowai, Bijoy nagar, Agartala and South Tripura etc (both ways)

Growth Rate

The Adopted Traffic Growth rate is taken an average of 5% for all type of vehicles.



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AADT, CVPD & Projected Traffic (Traffic year – 2021)

Table 0.6- Commercial Vehicle Per day

Sl. No.	Location	AADT	PCU	CVPD	%Age diverted on Agartala Bypass	Diverted PCU on Agartala Bypass
1	Km 9.500 of NH-8	12229	14994	2923	35%	5248
2	Km 10.00 (near Kamalghat)	4085	3803	516	40%	1580
3	Km 21.300 (near Tarapur)	4257	3949	476		
				Total... (Average)		6828

Sl. No.	Traffic Details	Unit	PCU	Remarks
1	Plying on NH -8 (km 9+500)	PCU	14994	
2	Plying on NH 108B	PCU	3949	
3	Consider 35% traffic of NH -8 diverted on bypass	PCU	5248	
4	Consider 40% traffic of NH -8 diverted on bypass	PCU	1580	
5	Total traffic on Bypass	PCU	6828	Year 2021
6	consider induced traffic & traffic growth	PCU	10350	Year 2026

- **5% traffic growth is considered per year,**
- **20% induced traffic of passenger vehicle considered after development of bypass coming from local areas, railway station, AKhaura check post, Airport etc,**
- **25% induced traffic of commercial vehicle considered after development of bypass coming from railway station, AKhaura check post, Airport etc,**

After induced traffic, the outcome is traffic will trigger to capacity of four lane (10000 PCU) immediate after construction of bypass i.e. in year 2026.



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0.10.2 O-D Survey for Agartala bypass:**Summary****Table 0.7 –**

<u>Sl. No.</u>	<u>Location</u>	<u>Direction</u>	<u>Average Daily Traffic</u>			<u>%age of Movement</u>		<u>Average %age of Diverted Traffic on NH 108 B after connecting with NH-8</u>		
			<u>Vehicle</u>	<u>PCU</u>	<u>CVP D</u>	<u>Passenger</u>	<u>Commercial</u>	<u>%age</u>	<u>ADT (Vehicle)</u>	<u>ADT (PCU)</u>
<u>1</u>	Km 9.500 of NH 8	<u>Agartala to Khowai</u>	12229	14994	2923	<u>13%</u>	<u>2%</u>	approx 40% of Traffic on NH-8	4892	5998
<u>2</u>		<u>Khowai to Agartala</u>				<u>11%</u>	<u>1%</u>			
<u>3</u>		<u>Agartala to Mohanpur</u>				<u>24%</u>	<u>8%</u>			
<u>4</u>		<u>Mohanpur to Agartala</u>				<u>18%</u>	<u>6%</u>			
<u>5</u>		<u>Agartala to Teliamura</u>				<u>3%</u>	<u>2%</u>			
<u>6</u>		<u>Teliamura to Agartala</u>				<u>1%</u>	<u>2%</u>			
<u>7</u>		<u>NH-8 to Mohanpur / Khowai</u>				<u>3%</u>	<u>1%</u>			
<u>8</u>		<u>Mohanpur / Khowai to NH-8</u>				<u>4%</u>	<u>1%</u>			



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Agartala Bypass (Western) (L= 25.402 km)

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Expansion Factor

Table 0.8 –

Location 1 : At KM 9.500												
Vehicle type	O - D Sample size		Total	Volume count data		Total	Expansion factors		Total	% of sample collected		Total
	R to L	L to R		R to L	L to R		R to L	L to R		R to L	L to R	
Cars	433	288	721	2165	1680	3845	5.00	5.83	5.33	20.0%	17.1%	18.8%
Mini Bus	58	45	103	365	311	676	6.29	6.91	6.56	15.9%	14.5%	15.2%
Bus	61	42	103	163	232	395	2.67	5.52	3.83	37.4%	18.1%	26.1%
LCV	67	62	129	188	298	486	2.81	4.81	3.77	35.6%	20.8%	26.5%
2-Axle Trucks	122	161	283	583	715	1298	4.78	4.44	4.59	20.9%	22.5%	21.8%
3-Axle Trucks	245	218	463	880	1234	2114	3.59	5.66	4.57	27.8%	17.7%	21.9%
MAV	95	111	206	546	484	1030	5.75	4.36	5.00	17.4%	22.9%	20.0%
TOTAL =	1081	927	2008	4890	4954	9844	4.52	5.34	4.90	22.1%	18.7%	20.4%

Location 1 : At KM 10.000 of NH 108 B												
Vehicle type	O - D Sample size		Total	Volume count data		Total	Expansion factors		Total	% of sample collected		Total
	R to L	L to R		R to L	L to R		R to L	L to R		R to L	L to R	
Cars	125	105	230	435	465	900	3.48	4.43	3.91	28.7%	22.6%	25.6%
Mini Bus	20	22	42	72	68	140	3.60	3.09	3.33	27.8%	32.4%	30.0%
Bus	5	5	10	13	13	26	2.60	2.60	2.60	38.5%	38.5%	38.5%
LCV	8	8	16	29	29	58	3.63	3.63	3.63	27.6%	27.6%	27.6%
2-Axle Trucks	10	10	20	31	33	64	3.10	3.30	3.20	32.3%	30.3%	31.3%
3-Axle Trucks	5	5	10	9	14	23	1.80	2.80	2.30	55.6%	35.7%	43.5%
MAV	0	0	0	0	0	0	0.00	0.00	0.00	0.0%	0.0%	0.0%
TOTAL =	173	155	328	589	622	1211	3.40	4.01	3.69	29.4%	24.9%	27.1%



Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

Agartala Bypass (Western) (L= 25.402 km)

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0.10.3 Commodity Trip Length –

KM 9.50 of NH 8

Table 0.9 –

Kilometer	LCV	2 XLE	3 XLE	M XLE	Average	
25	2.3%	0.0%	0.0%	0.0%	0.6%	
50	7.0%	2.0%	0.0%	0.0%	2.3%	
75	9.3%	6.8%	0.0%	0.0%	4.0%	
100	7.8%	8.8%	2.4%	1.9%	5.2%	
150	17.1%	18.4%	5.0%	4.4%	11.2%	
200	20.2%	21.8%	10.8%	11.2%	16.0%	
250	18.6%	24.5%	16.0%	12.1%	17.8%	
300	15.5%	17.7%	9.7%	12.6%	13.9%	
350	2.3%	0.0%	12.5%	9.7%	6.1%	
> 350	0.0%	0.0%	43.6%	48.1%	22.9%	

Kilometre	Car	Bus	Average
25	2.6%	0.0%	1.3%
50	9.0%	0.0%	4.5%
75	10.7%	3.9%	7.3%
100	10.4%	1.5%	5.9%
150	35.0%	5.8%	20.4%
200	32.3%	16.0%	24.2%
250	0.0%	13.6%	6.8%
300	0.0%	13.6%	6.8%
350	0.0%	14.6%	7.3%
> 350	0.0%	31.1%	15.5%



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Table 0.10

KM 10.0 of NH 108 B

Kilometre	LCV	2 XLE	3 XLE	M XLE	Average
25	6.3%	5.0%	0.0%	0.0%	2.8%
50	31.3%	20.0%	10.0%	0.0%	15.3%
75	12.5%	25.0%	20.0%	0.0%	14.4%
100	0.0%	0.0%	0.0%	0.0%	0.0%
150	18.8%	25.0%	10.0%	0.0%	13.4%
200	18.8%	10.0%	0.0%	0.0%	7.2%
250	6.3%	10.0%	50.0%	0.0%	16.6%
300	6.3%	5.0%	0.0%	0.0%	2.8%
350	0.0%	0.0%	10.0%	0.0%	2.5%
> 350	0.0%	0.0%	0.0%	0.0%	0.0%

Kilometre	Car	Bus	Average
25	2.6%	9.6%	6.1%
50	9.0%	28.8%	18.9%
75	10.7%	9.6%	10.1%
100	10.4%	1.9%	6.2%
150	35.0%	1.9%	18.4%
200	32.3%	0.0%	16.2%
250	0.0%	3.8%	1.9%
300	0.0%	9.6%	4.8%
350	0.0%	7.7%	3.8%
> 350	0.0%	26.9%	13.5%



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Agartala Bypass (Western) (L= 25.402 km)

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0.10.4 Passenger Distribution of commodity flows –

Km 9.50 of NH 8

Table 0.11 –

SI No	Commodity Type	LCV	2-Axle Trucks	3-Axle Trucks	M-Axle Trucks
1	FOOD GRAINS / PULSES & SPICES	5%	4.2%	3.7%	2.5%
2	MILK, FRUITS & VEGETABLES	3%	6.7%	4.5%	4.9%
3	PROCESSED /PACKAGED FOOD / EDIBLE OIL	2%	3.1%	4.6%	2.9%
4	COTTON / CLOTHING or SYNTHETIC YARN / FIBRES	7%	3.1%	4.7%	6.9%
5	TEXTILES / CLOTHING / READYMADE GARMENTS	4%	6.1%	4.3%	5.3%
6	LEATHER PRODUSCTS	6%	4.4%	5.0%	2.5%
7	HANDICRAFTS	5%	4.5%	4.3%	2.0%
8	PETROLEIM PRODUCTS / HSD / PETROL	3%	5.1%	5.4%	4.2%
9	MINERALS and ORES	3%	3.9%	5.6%	6.8%
10	IRON & STEEL (ALUMINUM or METAL) ROAD / BARS / SHEETS	3%	5.4%	4.7%	4.7%
11	METAL SETRAP	5%	3.3%	3.7%	3.5%
12	TIMBER / WOOD and PRODUCTS	5%	1.9%	3.3%	3.5%
13	PAPER/PARCEL	2%	2.1%	4.5%	2.9%
14	COKE / COAL	4%	3.5%	3.9%	4.5%
15	AUTOMOBILES & AUTO SPARE PARTS	8%	5.6%	2.6%	5.3%
16	MACHINES & AUTO SPARE PARTS	2%	3.5%	2.6%	4.4%
17	RUBBER / PLASTICS	4%	4.6%	5.7%	5.3%
18	TYRES	1%	1.9%	2.6%	3.8%
19	CHEMICALS / FERTILIZERS	7%	3.0%	4.8%	2.9%
20	PHARMACEUTICAL PRODUCTS	3%	6.3%	5.4%	5.3%



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SI No	Commodity Type	LCV	2-Axle Trucks	3-Axle Trucks	M-Axle Trucks
21	BUILDING MATERIALS	5%	4.1%	4.1%	3.5%
22	ELECTRONIC / COMPUTERS/ ELECTRICAL APPLIANCES	2%	5.5%	3.9%	5.5%
23	OTHERS	5%	3.5%	3.5%	2.9%
24	EMPTY	6%	4.8%	2.8%	4.4%

Km 10.0 of NH 108-B**Table 0.12 –**

Sl. No.	Commodity Type	LCV	2-Axle Trucks	3-Axle Trucks	M-Axle Trucks
1	FOOD GRAINS / PULSES & SPICES	6%	10.0%	0.0%	0.0%
2	MILK, FRUITS & VEGETABLES	0%	10.0%	10.0%	0.0%
3	PROCESSED /PACKAGED FOOD / EDIBLE OIL	0%	0.0%	0.0%	0.0%
4	COTTON / CLOTHING or SYNTHETIC YARN / FIBRES	13%	5.0%	10.0%	0.0%
5	TEXTILES / CLOTHING / READYMADE GARMENTS	0%	5.0%	10.0%	0.0%
6	LEATHER PRODUSCTS	0%	10.0%	0.0%	0.0%
7	HANDICRAFTS	6%	0.0%	10.0%	0.0%
8	PETROLEIM PRODUCTS / HSD / PETROL	6%	0.0%	10.0%	0.0%
9	MINERALS and ORES	13%	5.0%	0.0%	0.0%
10	IRON & STEEL (ALUMINUM or METAL) ROAD / BARS / SHEETS	6%	5.0%	10.0%	0.0%
11	METAL SETRAP	13%	5.0%	0.0%	0.0%
12	TIMBER / WOOD and PRODUCTS	0%	10.0%	0.0%	0.0%
13	PAPER/PARCEL	13%	0.0%	10.0%	0.0%
14	COKE / COAL	0%	0.0%	0.0%	0.0%
15	AUTOMOBILES & AUTO SPARE PARTS	0%	10.0%	0.0%	0.0%
16	MACHINES & AUTO SPARE PARTS	6%	0.0%	0.0%	0.0%
17	RUBBER / PLASTICS	0%	5.0%	10.0%	0.0%



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Sl. No.	Commodity Type	LCV	2-Axle Trucks	3-Axle Trucks	M-Axle Trucks
18	TYRES	0%	0.0%	0.0%	0.0%
19	CHEMICALS / FERTILIZERS	0%	0.0%	10.0%	0.0%
20	PHARMACEUTICAL PRODUCTS	13%	10.0%	0.0%	0.0%
21	BUILDING MATERIALS	0%	5.0%	0.0%	0.0%
22	ELECTRONIC / COMPUTERS/ ELECTRICAL APPLIANCES	0%	5.0%	10.0%	0.0%
23	OTHERS	6%	0.0%	0.0%	0.0%
24	EMPTY	0%	0.0%	0.0%	0.0%
	Total=	100%	100%	100%	0%

0.10.5 Distribution of Commodity Types by Weight

KM 9.50 of NH 8

Table 0.13 –

Sl. No.	Commodity Type	Average Weight per LCV/Trucks (Tonnes)			
		LCV(%)	2-Axle Trucks (%)	3-Axle Trucks (%)	M-Axle Trucks (%)
1	FOOD GRAINS / PULSES & SPICES	12.00	18.44	21.76	24.33
2	MILK, FRUITS & VEGETABLES	11.50	20.01	20.93	21.70
3	PROCESSED /PACKAGED FOOD / EDIBLE OIL	4.83	19.00	20.92	24.63
4	COTTON / CLOTHING or SYNTHETIC YARN / FIBRES	15.48	20.17	20.70	20.10
5	TEXTILES / CLOTHING / READYMADE GARMENTS	10.25	21.21	20.72	19.90
6	LEATHER PRODUCTS	11.97	20.04	20.35	21.83
7	HANDICRAFTS	15.85	23.56	22.40	24.25
8	PETROLEIM PRODUCTS / HSD / PETROL	10.50	23.17	20.15	18.79
9	MINERALS and ORES	11.33	20.25	20.47	22.31
10	IRON & STEEL (ALUMINUM or METAL) ROAD / BARS / SHEETS	9.17	23.58	21.76	20.42
11	METAL SETRAP	13.00	22.55	21.15	15.65



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Sl. No.	Commodity Type	Average Weight per LCV/Trucks (Tonnes)			
		LCV(%)	2-Axle Trucks (%)	3-Axle Trucks (%)	M-Axle Trucks (%)
12	TIMBER / WOOD and PRODUCTS	14.71	10.75	23.03	27.15
13	PAPER/PARCEL	14.50	17.88	23.71	22.88
14	COKE / COAL	13.92	17.96	19.90	19.25
15	AUTOMOBILES & AUTO SPARE PARTS	13.92	23.38	23.70	22.80
16	MACHINES & AUTO SPARE PARTS	4.50	22.54	20.83	20.03
17	RUBBER / PLASTICS	9.17	22.62	20.90	21.43
18	TYRES	6.00	26.67	21.44	23.00
19	CHEMICALS / FERTILIZERS	12.86	22.37	20.49	18.75
20	PHARMACEUTICAL PRODUCTS	18.67	20.86	22.00	19.55
21	BUILDING MATERIALS	11.88	21.13	19.77	21.08
22	ELECTRONIC / COMPUTERS/ ELECTRICAL APPLIANCES	20.50	19.13	20.80	20.59
23	OTHERS	14.50	21.04	20.31	24.63
24	EMPTY	5.00	10.60	12.50	7.00
Average Weight carried (T) =		11.92	20.37	20.86	20.92

KM 10.0 of NH 108 B**Table 0.14 –**

Sl. No.	Commodity Type	Average Weight per LCV/Trucks (Tonnes)			
		LCV(%)	2-Axle Trucks (%)	3-Axle Trucks (%)	M-Axle Trucks (%)
1	FOOD GRAINS / PULSES & SPICES	5.00	26.00	0.00	0.00
2	MILK, FRUITS & VEGETABLES	0.00	12.25	7.50	0.00
3	PROCESSED /PACKAGED FOOD / EDIBLE OIL	0.00	0.00	0.00	0.00
4	COTTON / CLOTHING or SYNTHETIC YARN / FIBRES	17.50	7.50	9.50	0.00
5	TEXTILES / CLOTHING / READYMADE GARMENTS	0.00	5.50	11.00	0.00
6	LEATHER PRODUSCTS	0.00	9.75	0.00	0.00
7	HANDICRAFTS	5.50	0.00	11.50	0.00
8	PETROLEIM PRODUCTS / HSD / PETROL	4.50	0.00	9.00	0.00



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Sl. No.	Commodity Type	Average Weight per LCV/Trucks (Tonnes)			
		LCV(%)	2-Axle Trucks (%)	3-Axle Trucks (%)	M-Axle Trucks (%)
9	MINERALS and ORES	8.00	5.00	0.00	0.00
10	IRON & STEEL (ALUMINUM or METAL) ROAD / BARS / SHEETS	4.50	13.00	15.50	0.00
11	METAL SETRAP	10.00	6.50	0.00	0.00
12	TIMBER / WOOD and PRODUCTS	0.00	10.25	0.00	0.00
13	PAPER/PARCEL	14.50	0.00	9.00	0.00
14	COKE / COAL	0.00	0.00	0.00	0.00
15	AUTOMOBILES & AUTO SPARE PARTS	0.00	15.25	0.00	0.00
16	MACHINES & AUTO SPARE PARTS	5.50	0.00	0.00	0.00
17	RUBBER / PLASTICS	0.00	9.50	4.00	0.00
18	TYRES	0.00	0.00	0.00	0.00
19	CHEMICALS / FERTILIZERS	0.00	0.00	10.00	0.00
20	PHARMACEUTICAL PRODUCTS	19.50	21.50	0.00	0.00
21	BUILDING MATERIALS	0.00	8.50	0.00	0.00
22	ELECTRONIC / COMPUTERS/ ELECTRICAL APPLIANCES	0.00	15.00	11.00	0.00
23	OTHERS	3.50	0.00	0.00	0.00
24	EMPTY	0.00	0.00	0.00	0.00
Average Weight carried (T) =		4.08	6.90	4.08	0.00

0.11 Axle load survey:

The default values of VDF as per table 4.2 of IRC - 37:2018 is considered 5.0 for CVPD more than 1500.



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0.12 Testing of soil from existing embankment

The soil samples from various locations have been collected and the report is being submitted as separate volume with this report. The CBR resulted here as under –

Table 0.15 –

Sl. No.	Location	CBR
1	Km 1+000	13.41
2	Km 2+400	9.86
3	Km 5+000	9.57
4	Km 6+000	3.32
5	Km 6+500	4.11
6	Km 7+000	15.43
7	Km 7+400	12.50
8	Km 8+050	14.36
9	Km 12+000	10.59
10	Km 17+000	11.60
11	Km 22+000	17.86

It is found that average CBR found along the Project alignment is 12 except from km 6+000 to km 6+500 where CBR is less than 5.

It is recommended to design the pavement with subgrade having value of minimum 10 CBR & treatment of embankment soil of marshy land sections.

0.13 Material survey

Aggregate quarry for structure and road works is identified at Churaibari (Assam) which is approx 180 km away from Agartala.

Sand source has been located from local river with average lead of 30 km.

Borrow earth can be obtained from number of locations along the project alignment.

Cement for concrete works may purchase from local vendors of different grades of OPC & PPC.

Steel for concrete work may also use from local suppliers.

Bitumen supply is considered from Guwahati with lead of approx. 550 Km.





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0.14 Geotechnical Investigations

Geotechnical Investigations being carried out at site and the results have been attached as separate volume with this submission.

 ISO 9001:2015 Certified	<h1 style="margin: 0;">NORTH EAST SOIL TESTING (NEST)</h1> <p style="margin: 0;">Regd. Office: Ujan Abhoynagar Opp. Post Office, Agartala, West Tripura, PIN - 799005 Registration No: 2/15/185, Mobile: 9402137417, Email: nest_debnath@yahoo.com</p>														
	<h3>3. TEST REPORT SUMMARY</h3>														
Job No.	: NEST/2021/A-103					Ref. No.	: Mail Dated: 05.03.2021								
Project Description	: Agartala Bypass					Page No	: 4 of 32								
SL No.	Date of Sampling	Date of Testing	ID/ Location/ Chainage	FSI (%)	Grain Size Analysis				Atterberg Limit			Proctor Test		CBR (%)	Remark
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	LL (%)	PL (%)	PI (%)	MDD (g/cc)	OMC (%)		
1.	02/04/2021	10/04/2021	Ch: 1.00 km Sample No-1	13.33	-	5	63	32	40.43	21.43	19.00	1.841	15.01	13.41	
2.	02/04/2021	12/04/2021	Ch: 5.00 km Sample No-1	10.00	-	10	60	30	36.91	20.85	16.06	1.782	17.40	9.57	
3.	03/04/2021	17/04/2021	Ch: 7.00 km Sample No-1	8.33	-	19	59	22	28.98	15.95	13.03	1.870	15.25	15.43	
4.	03/04/2021	19/04/2021	Ch: 12.00 km Sample No-1	13.33	-	5	57	38	46.02	26.53	19.49	1.800	15.59	10.59	
5.	05/04/2021	24/04/2021	Ch: 17.00 km Sample No-1	8.33	-	16	58	26	30.36	16.91	13.45	1.832	16.20	11.60	
6.	05/04/2021	26/04/2021	Ch: 22.00 km Sample No-1	0.00	-	47	30	23	27.23	16.24	10.99	1.938	12.20	17.86	



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3. TEST REPORT SUMMARY

Job No. : NESI/2021/A-103

Ref. No. : Nil Dated: 24.06.2021

Project Description : Agartala Bypass

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SL No.	Date of Sampling	ID/ Location/ Chainage	FSI (%)	Grain Size Analysis				Atterberg Limit			Proctor Test		CBR (%)	Remark
				Organic (%)	Sand (%)	Silt (%)	Clay (%)	LL (%)	PL (%)	PI (%)	MDD (g/cc)	OMC (%)		
1.	28/06/2021	Ch: 2+400 km Sample No-1	9.09	-	35	21	44	36.44	21.26	15.18	1.795	13.45	9.86	
2.	28/06/2021	Ch: 6+000 km Sample No-1	-	44	15	16	25	79.80	-	-	1.253	42.53	3.32	
3.	01/07/2021	Ch: 6+500 km Sample No-1	-	39	10	23	28	65.12	-	-	1.306	35.40	4.11	
4.	01/06/2021	Ch: 7+400 km Sample No-1	8.33	-	14	61	25	33.26	17.21	16.05	1.845	14.70	12.50	
5.	05/07/2021	Ch: 8+050 km Sample No-1	8.33	-	33	49	18	30.48	18.28	12.20	1.910	13.00	14.36	



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Agartala Bypass (Western) (L= 25.402 km)

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0.15 Traffic Projection / MSA

Year	Car/Jeep/Taxi/Van	2-W	3-W/Auto Rickshaw	Mini Buses	Std. Buses	LCV (Passenger)	LCV (Goods)		Trucks			Agriculture		Others	Cycle	Cycle Rickshaw	Hand Cart	Animal drawn		Other	Vehicles	PCUs	
							3-W h	4-W h	2-A T	3-A T	M AV	Tractor	Tractor+ Trailer					Bull ock Cart	Ho rse				
PCU Factor	1	0.5	1	1.5	3	1.5	1	1.5	3	3	4.5	1.5	4.5	4	0.5	2	3	8	4	1			
2021	2004	2152	176	92	64	58	43	181	66	96	76	0	0	7	0	0	0	0	0	0	0	5615	6828
2022	2104	2260	185	97	67	61	45	190	69	101	80	0	0	7	0	0	0	0	0	0	0	5896	6975
2023	2209	2373	194	102	70	64	47	200	73	106	84	0	0	7	0	0	0	0	0	0	0	6190	7322
2024	2319	2492	204	107	74	67	49	210	77	111	88	0	0	7	0	0	0	0	0	0	0	6499	7686
2025	2435	2617	214	112	78	70	51	221	81	117	92	0	0	7	0	0	0	0	0	0	0	6824	8070
Induced Traffic	20%	20%	20%	20%	20%	20%	25%	25%	25%	25%	25%												
2025	2922	3140	257	134	94	84	64	276	1013	146	115	0	0	7	0	0	0	0	0	0	0	8252	9857
2026	3068	3297	270	141	98	88	67	290	1063	154	121	0	0	7	0	0	0	0	0	0	0	8664	10350



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Year	Car/Jeep/Taxi/Van	2-W	3-W/Auto Rickshaw	Mini Buses	Std. Buses	LCV (Passgr)	LCV (Goods)		Trucks			Agriculture		Others	Cycle	Cycle Rickshaw	Hand Cart	Animal drawn		Other	Vehicles	PC Us
							3-W h	4-W h	2-A T	3-A T	M AV	Tractor	Tractor+ Trailer					Bull ock Cart	Ho rse			
PCU Factor	1	0.5	1	1.5	3	1.5	1	1.5	3	3	4.5	1.5	4.5	4	0.5	2	3	8	4	1		
2027	3221	34 62	284	14 8	103	92	70	30 5	11 16	16 2	127	0	0	7	0	0	0	0	0	0	9097	108 66
2028	3382	36 35	298	15 5	108	97	74	32 0	11 72	17 0	133	0	0	7	0	0	0	0	0	0	9551	114 06
2029	3551	38 17	313	16 3	113	102	78	33 6	12 31	17 9	140	0	0	7	0	0	0	0	0	0	1003 0	119 79
2030	3729	40 08	329	17 1	119	107	82	35 3	12 93	18 8	147	0	0	7	0	0	0	0	0	0	1053 3	125 80
2031	3915	42 08	345	18 0	125	112	86	37 1	13 58	19 7	154	0	0	7	0	0	0	0	0	0	1105 8	132 06
2032	4111	44 18	362	18 9	131	118	90	39 0	14 26	20 7	162	0	0	7	0	0	0	0	0	0	1161 1	138 67
2033	4317	46 39	380	19 8	138	124	95	41 0	14 97	21 7	170	0	0	7	0	0	0	0	0	0	1219 2	145 59
2034	4533	48 71	399	20 8	145	130	10 0	43 1	15 72	22 8	179	0	0	7	0	0	0	0	0	0	1280 3	152 90
2035	4760	51 15	419	21 8	152	137	10 5	45 3	16 51	23 9	188	0	0	7	0	0	0	0	0	0	1344 4	160 54
2036	4998	53 71	440	22 9	160	144	11 0	47 6	17 34	25 1	197	0	0	7	0	0	0	0	0	0	1411 7	168 57



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Agartala Bypass (Western) (L= 25.402 km)

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Year	Car/Jeep/Taxi/Van	2-W	3-W/Auto Rickshaw	Mini Buses	Std. Buses	LCV (Passgr)	LCV (Goods)		Trucks			Agriculture		Others	Cycle	Cycle Rickshaw	Hand Cart	Animal drawn		Other	Vehicles	PC Us
							3-W	4-W	2-A	3-A	M AV	Tractor	Tractor+Trailer					Bull cart	Horse			
PCU Factor	1	0.5	1	1.5	3	1.5	1	1.5	3	3	4.5	1.5	4.5	4	0.5	2	3	8	4	1		
2037	5248	56 40	462	24 0	168	151	11 6	50 0	18 21	26 4	207	0	0	7	0	0	0	0	0	0	1482 4	177 01
2038	5510	59 22	485	25 2	176	159	12 2	52 5	19 12	27 7	217	0	0	7	0	0	0	0	0	0	1556 4	185 82
2039	5786	62 18	509	26 5	185	167	12 8	55 1	20 08	29 1	228	0	0	7	0	0	0	0	0	0	1634 3	195 13
2040	6075	65 29	534	27 8	194	175	13 4	57 9	21 08	30 6	239	0	0	7	0	0	0	0	0	0	1715 8	204 83
2041	6379	68 55	561	29 2	204	184	14 1	60 8	22 13	32 1	251	0	0	7	0	0	0	0	0	0	1801 6	215 06
2042	6698	71 98	589	30 7	214	193	14 8	63 8	23 24	33 7	264	0	0	7	0	0	0	0	0	0	1891 7	225 82
2043	7033	75 58	618	32 2	225	203	15 5	67 0	24 40	35 4	277	0	0	7	0	0	0	0	0	0	1986 2	237 09
2044	7385	79 36	649	33 8	236	213	16 3	70 4	25 62	37 2	291	0	0	7	0	0	0	0	0	0	2085 6	248 95
2045	7754	83 33	681	35 5	248	224	17 1	73 9	26 90	39 1	306	0	0	7	0	0	0	0	0	0	2189 9	261 42
2046	8142	87 50	715	37 3	260	235	18 0	77 6	28 25	41 1	321	0	0	7	0	0	0	0	0	0	2299 5	274 49



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

a) At km 9+500 of NH 208 (Agartala – Udaipur Section) :: MSA

Table 0.19 –

Year	CVPD					No. Repetitions of Standard Axles					MSA	CMSA
	Std. Bus	LCV	2-AT	3-AT	MAV	Std. Bus	LCV	2-AT	3-AT	MAV		
2021	18	257	629	69	74	23953	351631	860396	94375	100603	1.43	
2022	18	269	660	72	77	24637	368193	903375	98550	105393	1.50	2.93
2023	19	283	693	76	81	26006	387356	948543	104025	110868	1.58	3.08
2024	22	327	801	88	94	30112	447170	1096095	120450	127978	1.82	4.90
2025	23	343	841	92	98	31481	469481	1151118	125925	134137	1.91	6.81
2026	24	360	883	97	103	32850	492750	1208606	132768	140981	2.01	8.82
2027	25	378	927	102	108	34218	517387	1268831	139612	147825	2.11	10.93
2028	26	397	973	107	113	35587	543393	1331793	146456	154668	2.21	13.14
2029	27	417	1022	112	119	36956	570768	1398862	153300	162881	2.32	15.46
2030	28	438	1073	118	125	38325	599512	1468668	161512	171093	2.44	17.90
2031	29	460	1127	124	131	39693	629625	1542581	169725	179306	2.56	20.46
2032	30	483	1183	130	138	41062	661106	1619231	177937	188887	2.69	23.15
2033	32	507	1242	137	145	43800	693956	1699987	187518	198468	2.82	25.97
2034	34	533	1304	144	152	46537	729543	1784850	197100	208050	2.97	28.94
2035	36	560	1369	151	160	49275	766500	1873818	206681	219000	3.12	32.05
2036	38	587	1437	159	168	52012	803456	1966893	217631	229950	3.27	35.32
2037	40	617	1509	167	176	54750	844518	2065443	228581	240900	3.43	38.76
2038	42	648	1584	175	185	57487	886950	2168100	239531	253218	3.61	42.36
2039	44	680	1663	184	194	60225	930750	2276231	251850	265537	3.78	46.15
2040	46	715	1746	193	204	62962	978656	2389837	264168	279225	3.97	50.12
2041	48	751	1833	203	214	65700	1027931	2508918	277856	292912	4.17	54.30
2042	50	788	1925	213	225	68437	1078575	2634843	291543	307968	4.38	58.68
2043	53	828	2021	224	236	72543	1133325	2766243	306600	323025	4.60	63.28
2044	56	869	2122	235	248	76650	1189443	2904487	321656	339450	4.83	68.11
2045	59	912	2228	247	260	80756	1248300	3049575	338081	355875	5.07	73.18



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

b) At km 21+300 of NH 108 B (Agartala – Khowai Section)

Table 0.20 –

Year	CVPD					No. Repetitions of Standard Axles					MSA	CMSA
	Std. Bus	LCV	2-AT	3-AT	MAV	Std. Bus	LCV	2-AT	3-AT	MAV		
2021	116	181	91	65	4	111142	173420	87189	62278	3832		
2022	122	190	96	68	4	116891	182043	91980	65152	3832		0.90
2023	128	200	101	71	4	122640	191625	96770	68026	3832	0.48	0.94
2024	162	254	128	91	5	155029	242956	122635	86770	4627	0.61	1.55
2025	170	266	134	95	5	162881	254861	128388	91021	4790	0.64	2.20
2026	179	280	141	100	5	171504	268275	135095	95812	4790	0.68	2.87
2027	188	294	148	105	5	180127	281688	141802	100603	4790	0.71	3.58
2028	197	309	155	110	5	188750	296060	148509	105393	4790	0.74	4.32
2029	207	324	163	116	5	198331	310432	156174	111142	4790	0.78	5.11
2030	217	341	171	122	5	207913	326720	163839	116891	4790	0.82	5.93
2031	228	358	180	128	5	218452	343008	172462	122640	4790	0.86	6.79
2032	239	376	189	134	5	228991	360255	181085	128388	4790	0.90	7.69
2033	251	395	198	141	5	240489	378459	189708	135095	4790	0.95	8.64
2034	264	415	208	148	5	252945	397621	199290	141802	4790	1.00	9.64
2035	277	436	218	155	5	265400	417742	208871	148509	4790	1.05	10.68
2036	291	458	229	163	5	278814	438821	219410	156174	4790	1.10	11.78
2037	306	480	240	171	5	293186	459900	229950	163839	4790	1.15	12.93
2038	321	504	252	180	5	307558	482895	241447	172462	4790	1.21	14.14
2039	337	529	265	189	5	322888	506848	253903	181085	4790	1.27	15.41
2040	354	556	278	198	5	339176	532717	266358	189708	4790	1.33	16.74
2041	372	583	292	208	5	356422	558586	279772	199290	4790	1.40	18.14
2042	391	612	307	218	5	374626	586372	294144	208871	4790	1.47	19.61
2043	411	643	322	229	5	393789	616074	308516	219410	4790	1.54	21.15
2044	432	675	338	240	5	413910	646734	323846	229950	4790	1.62	22.77
2045	454	709	355	252	5	434988	679310	340134	241447	4790	1.70	24.47



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c) Traffic on Agartala Bypass (35% of NH -8 & 40% of NH-108B)

Table 0.21 –

Year	CVPD					No. Repetitions of Standard Axles					MSA	CMSA
	Std. Bus	LCV	2-AT	3-AT	MAV	Std. Bus	LCV	2-AT	3-AT	MAV		
2021	64	331	666	96	76	68328	353383	711038	102492	81139	1.32	
2022	67	348	699	101	80	71530	371533	746269	107830	85410	1.38	2.70
2023	70	366	734	106	84	74733	390750	783636	113168	89680	1.45	2.83
2024	81	422	848	122	97	86904	450964	905452	130357	103346	1.68	4.51
2025	85	444	891	128	102	90748	474025	951253	136656	108897	1.76	6.27
2026	89	466	936	134	107	95018	497513	999297	143061	114235	1.85	8.12
2027	93	490	983	141	112	99289	523136	1049475	150535	119574	1.94	10.06
2028	98	514	1032	148	118	104627	548759	1101789	158008	125979	2.04	12.10
2029	103	539	1084	155	124	109965	575449	1157305	165481	132385	2.14	14.24
2030	108	567	1138	163	130	115303	605343	1214957	174022	138791	2.25	16.49
2031	113	596	1195	171	137	120641	636304	1275811	182563	146264	2.36	18.85
2032	119	625	1255	180	144	127047	667265	1339869	192172	153738	2.48	21.33
2033	125	656	1318	189	151	133453	700362	1407129	201781	161211	2.60	23.94
2034	131	689	1384	198	159	139858	735593	1477593	211389	169752	2.73	26.67
2035	138	724	1453	208	167	147332	772960	1551259	222066	178293	2.87	29.54
2036	145	760	1526	218	175	154805	811395	1629195	232742	186834	3.01	32.56
2037	152	799	1602	229	184	162279	853032	1710335	244486	196443	3.17	35.73
2038	160	839	1682	240	193	170820	895737	1795745	256230	206051	3.32	39.05
2039	168	881	1766	252	203	179361	940577	1885425	269041	216727	3.49	42.54
2040	176	925	1854	265	213	187902	987553	1979376	282920	227404	3.67	46.21
2041	185	971	1947	278	224	197510	1036663	2078665	296799	239148	3.85	50.06
2042	194	1020	2044	292	235	207119	1088977	2182225	311746	250891	4.04	54.10
2043	204	1071	2146	307	247	217795	1143426	2291123	327760	263703	4.24	58.34
2044	214	1124	2253	322	259	228471	1200010	2405359	343775	276514	4.45	62.79
2045	225	1181	2366	338	272	240215	1260865	2526000	360857	290394	4.68	67.47



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0.16 Development Proposals

0.16.1 PAVEMENT DESIGN

Considering a growth rate of 5.0 % and VDF as 5.0 obtained from the IRC, design of pavement as per IRC 37 -2018 for a design life of minimum 15 years.

Accordingly design traffic has been worked out as 45 MSA (as per NH-8 Traffic & NH-108 B traffic diversion) and considering sub-grade construction with soil of 10 CBR
The Pavement compositions for Project road as per IRC 37-2018 is as under:

For Main Carriage way

Table 0.22 –

Conventional Method with soil CBR of 10%	With CT Sub base & base & Sami Layer with 10% CBR
BC - 40mm	BC - 40mm
DBM - 100mm	DBM - 60mm
WMM - 250mm	Sami Layer
GSB - 200mm	CT Base - 140mm
Total - 590mm	CT Sub base - 200mm
	Total - 440mm
Ref. - IRC 37-2018 Plate 6, page 40	Ref. - IRC 37-2018 Plate 22, page 48

For Slip road & Service road :: 10msa (refer clause 5.5.4 of Four lane manual IRC SP-84:2019

Table 0.23 –

Conventional Method with soil CBR of 10%	With CT Sub base & base & Sami Layer with 10% CBR
BC - 30mm (Considered 40mm)	BC - 50mm
DBM - 50mm	Sami Layer
WMM - 250mm	CT Base - 160mm
GSB - 200mm	CT Sub base - 200mm
Total - 540mm as per 40mm BC	Total - 410mm
Ref. - IRC 37-2018 Plate 6, page 40	Ref. - IRC 37-2018 Plate 22, page 48

For Cost estimate of Project, the pavement crust of CT Base & CT Sub Base is considered.



Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

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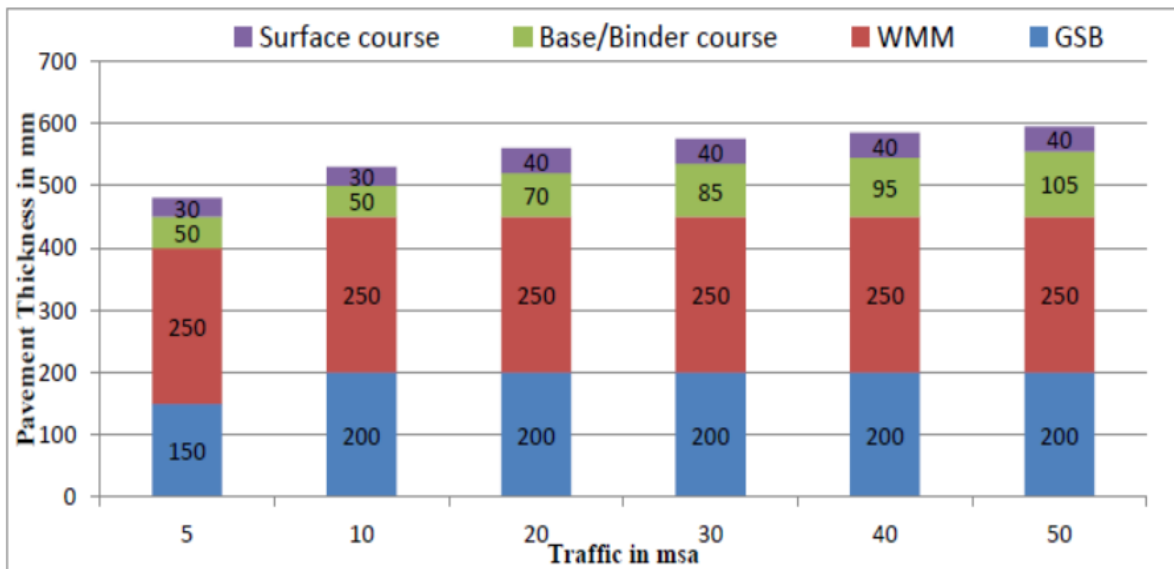


Figure 12.6 Catalogue for pavement with bituminous surface course with granular base and sub-base - Effective CBR 10% (Plate-6)

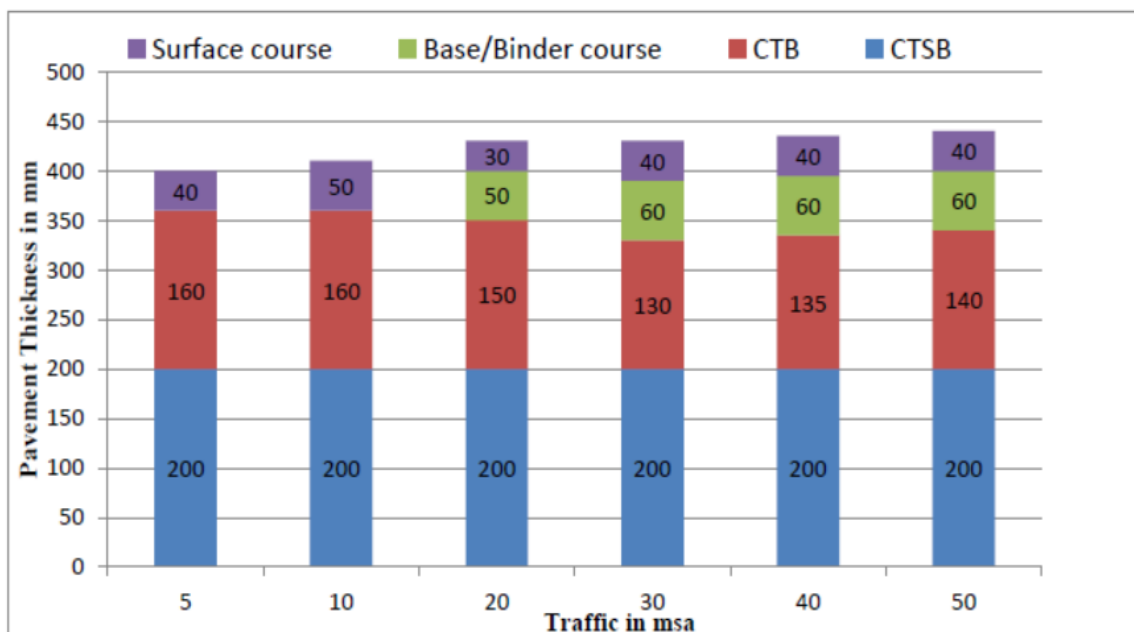


Figure 12.22 Catalogue for pavement with bituminous surface course with CTSB, CTB and SAMI - Effective CBR 10% (Plate-22)

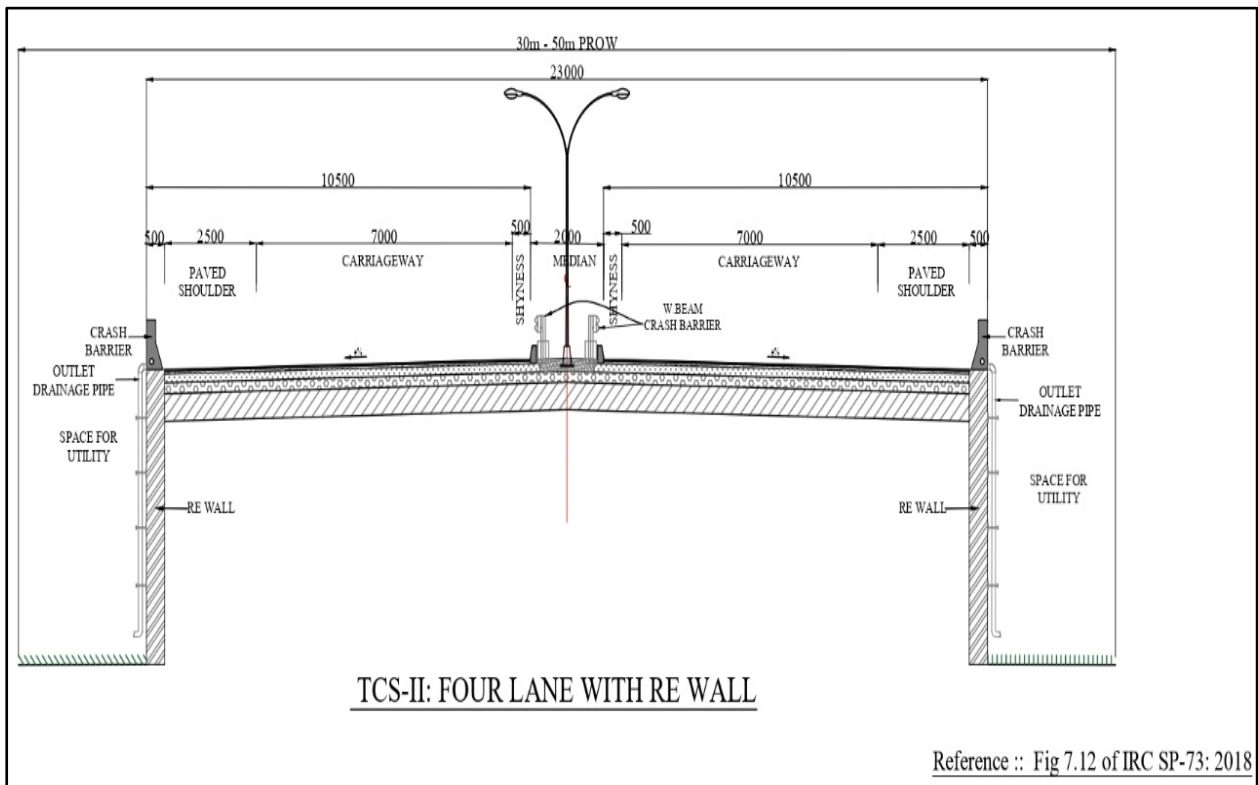
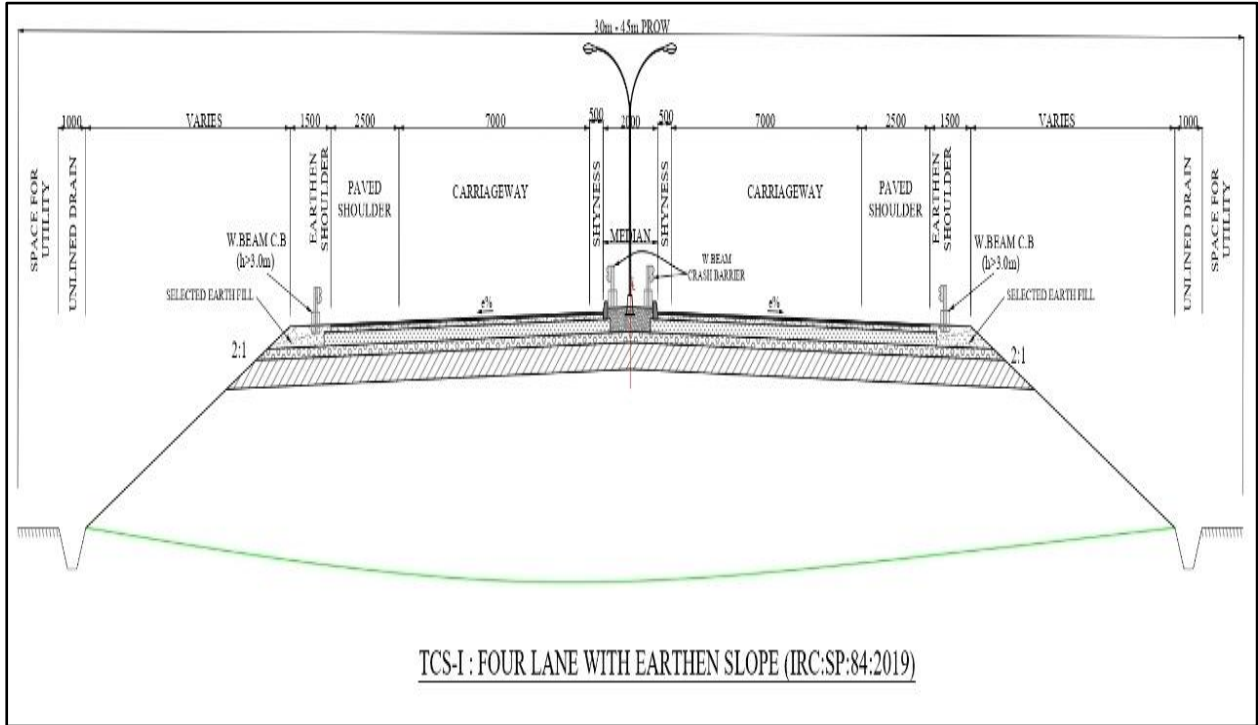


Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

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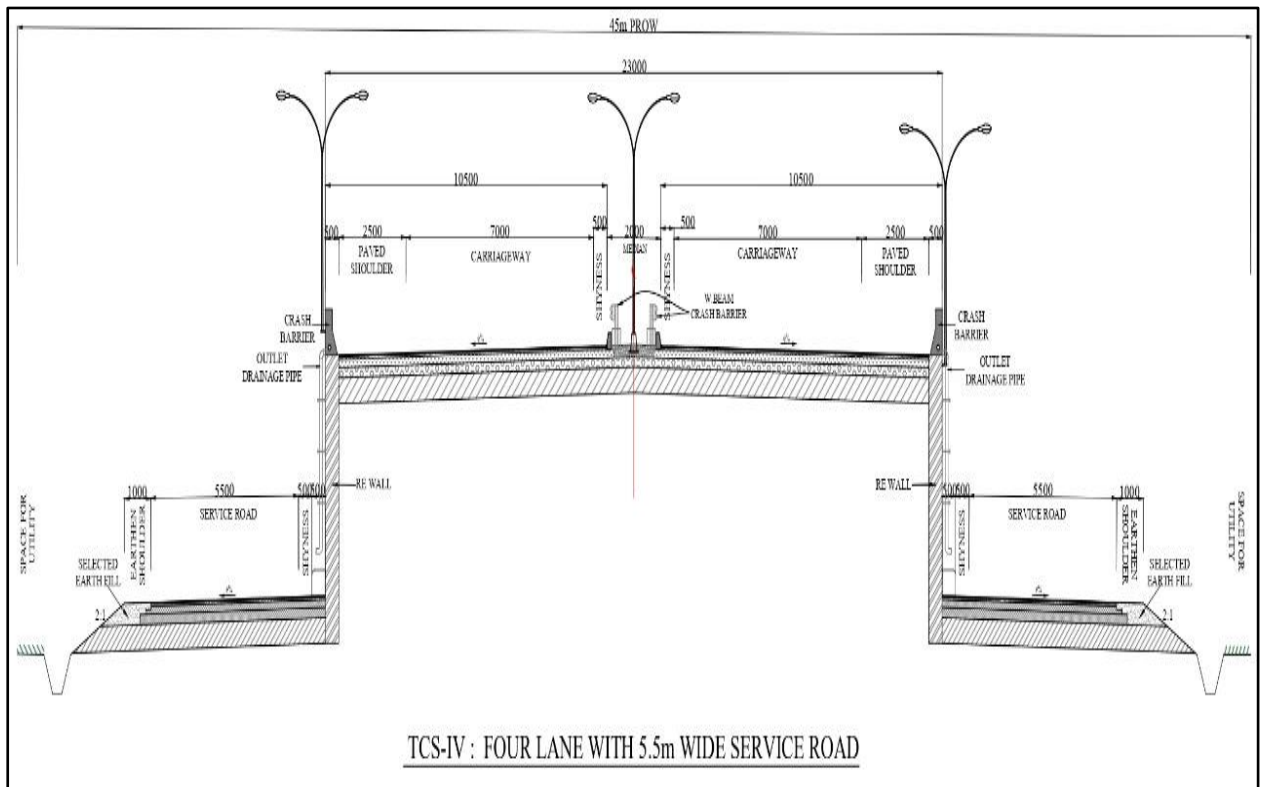
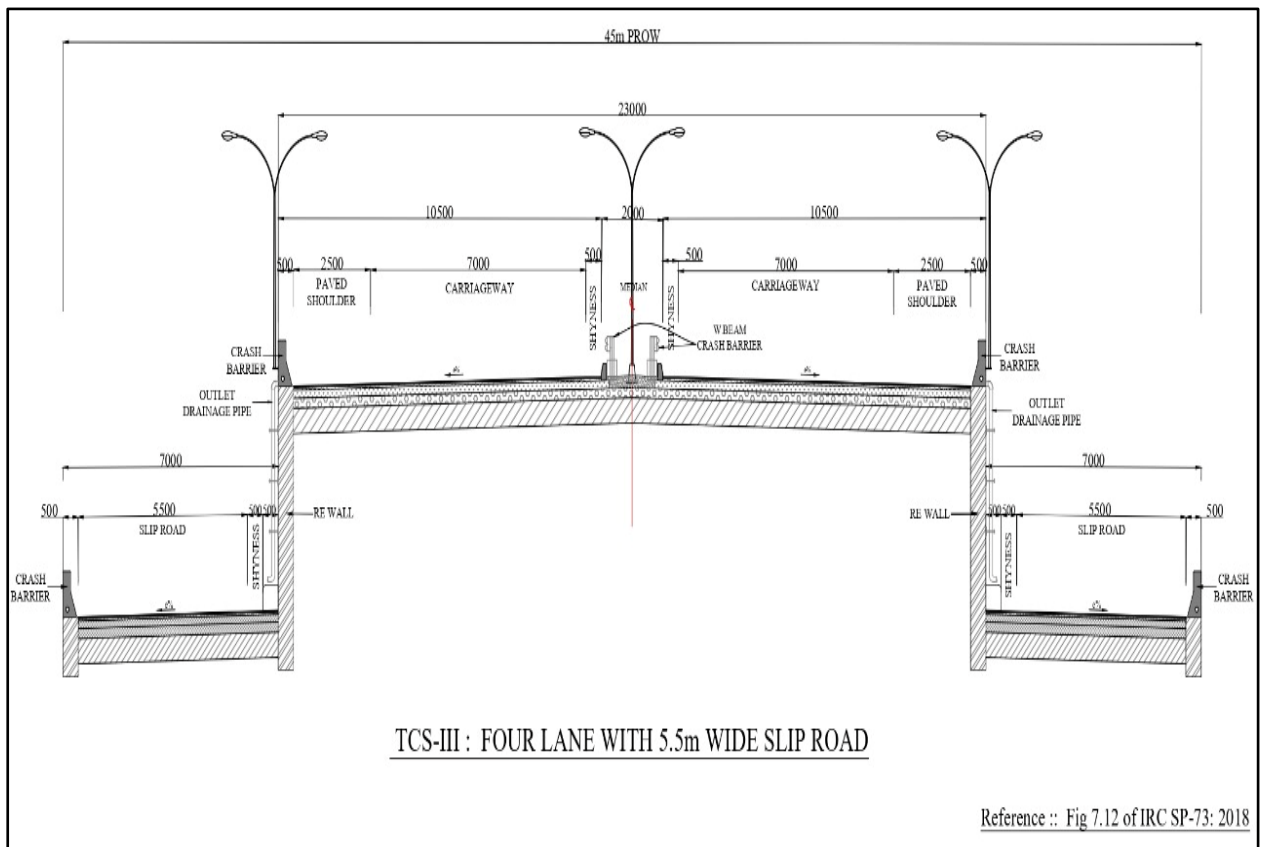
0.16.2 Typical Cross Section and Widening Scheme



Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

Agartala Bypass (Western) (L= 25.402 km)

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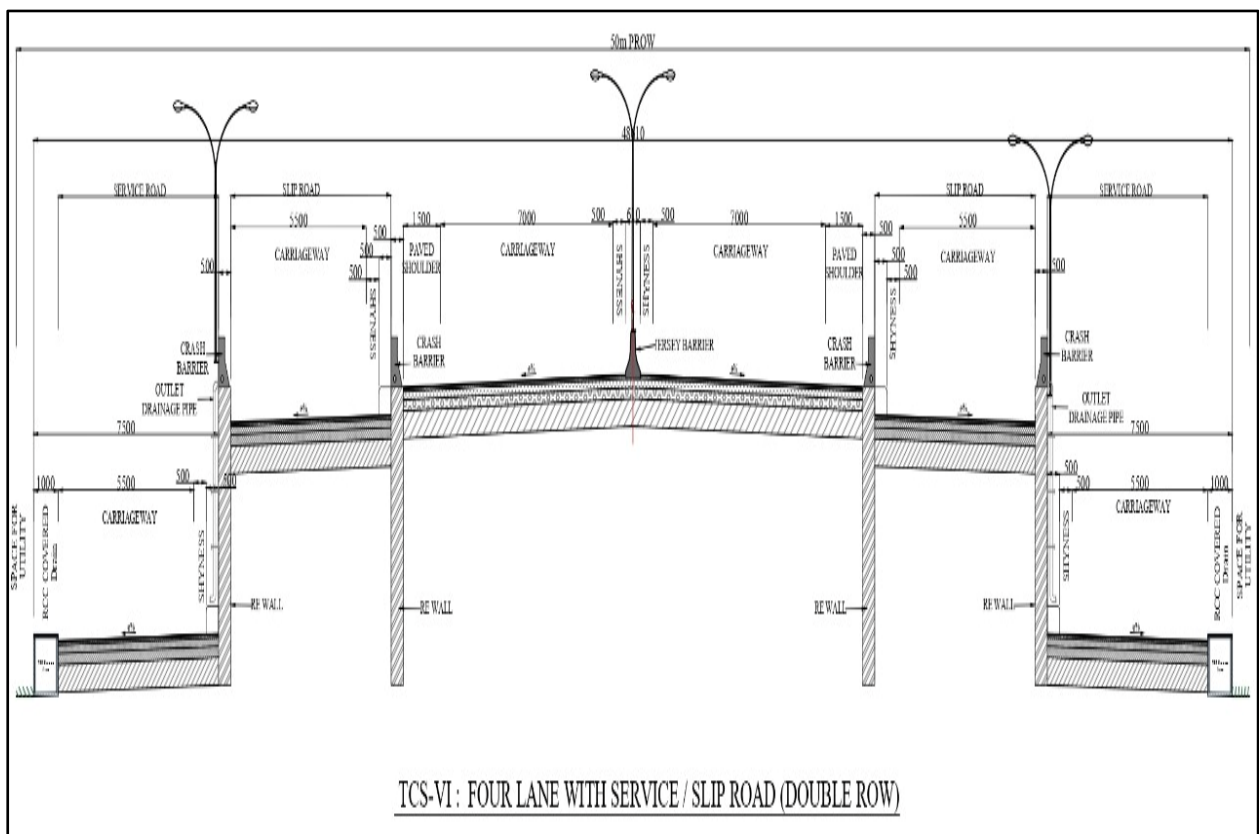
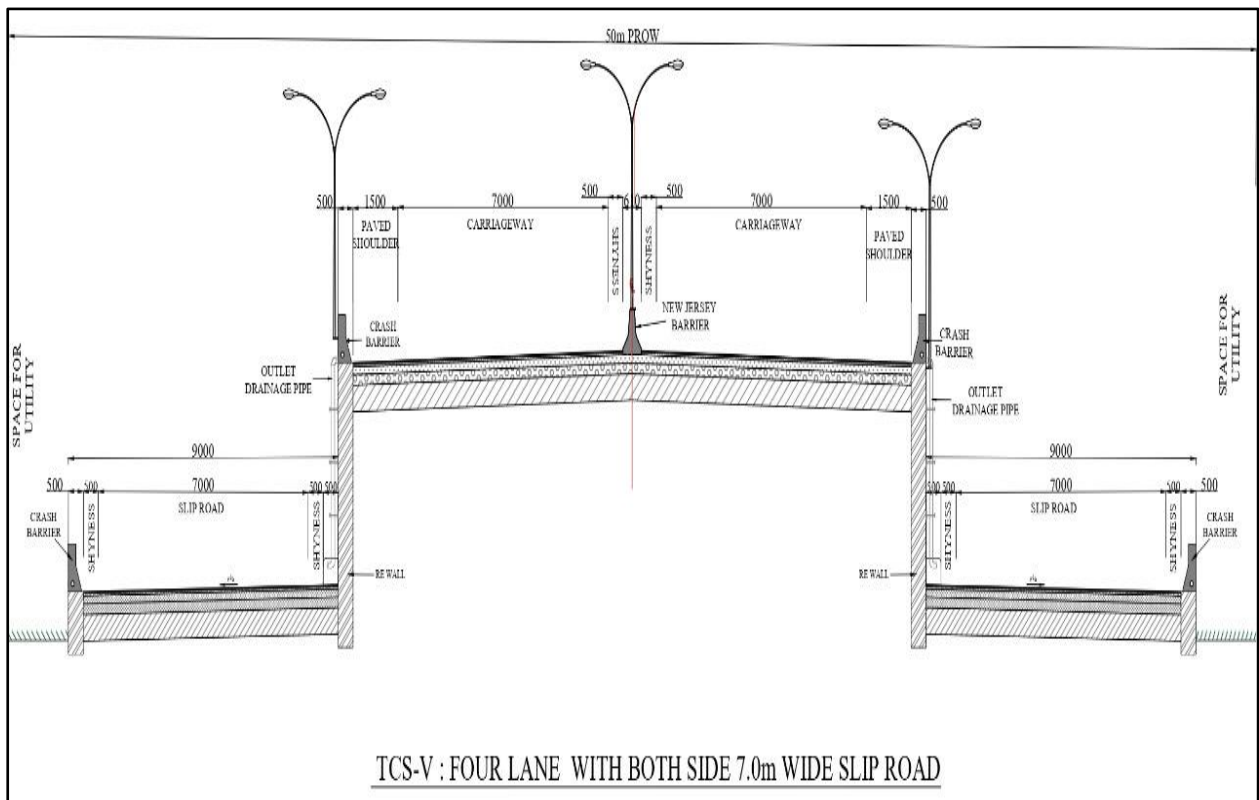
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Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

Agartala Bypass (Western) (L= 25.402 km)

Main Report



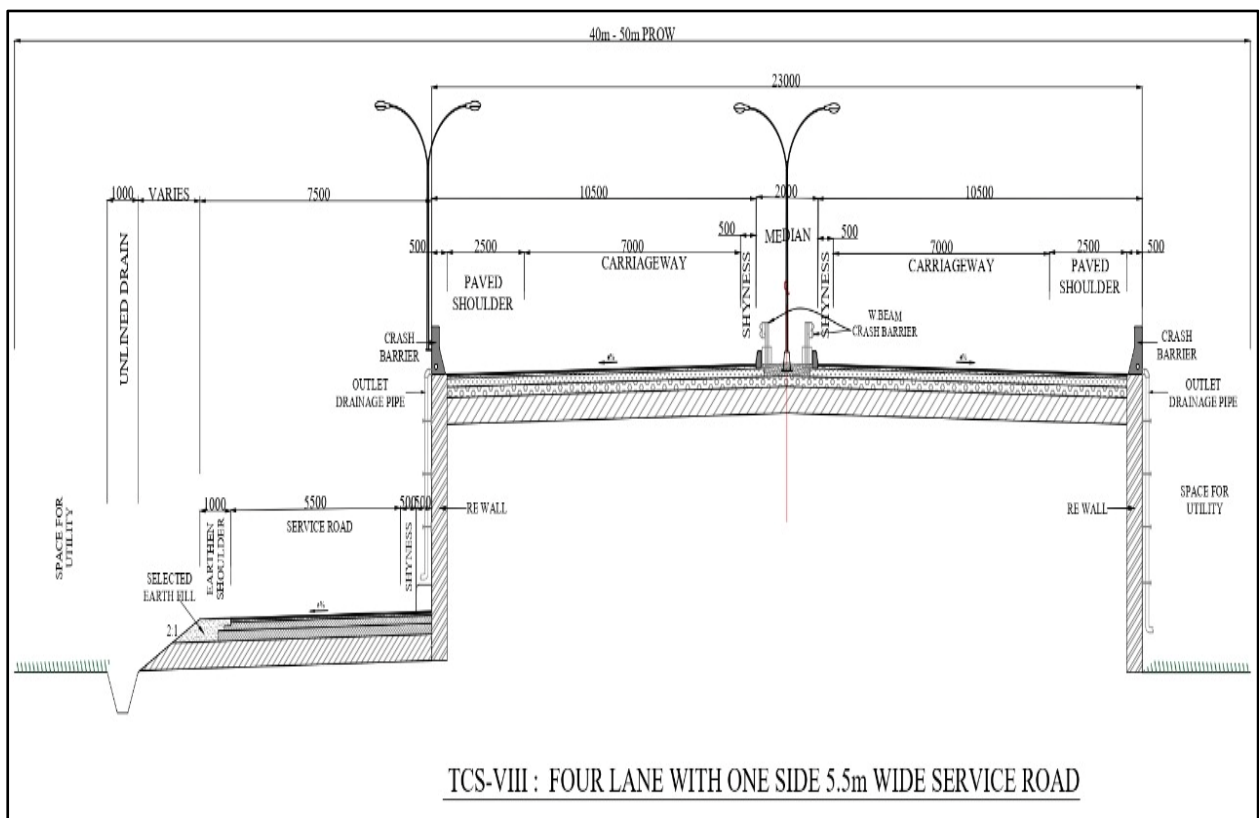
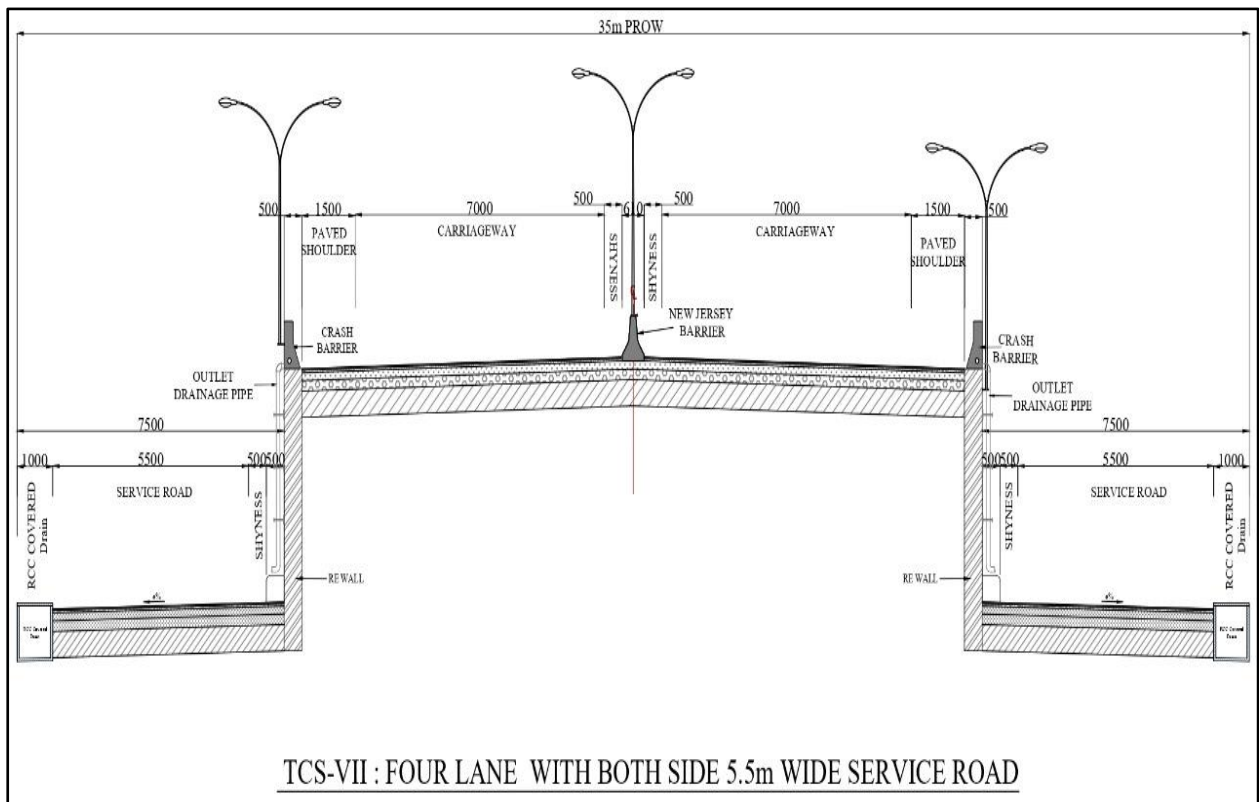
Detailed Project Report (Final)::

Executive Summary

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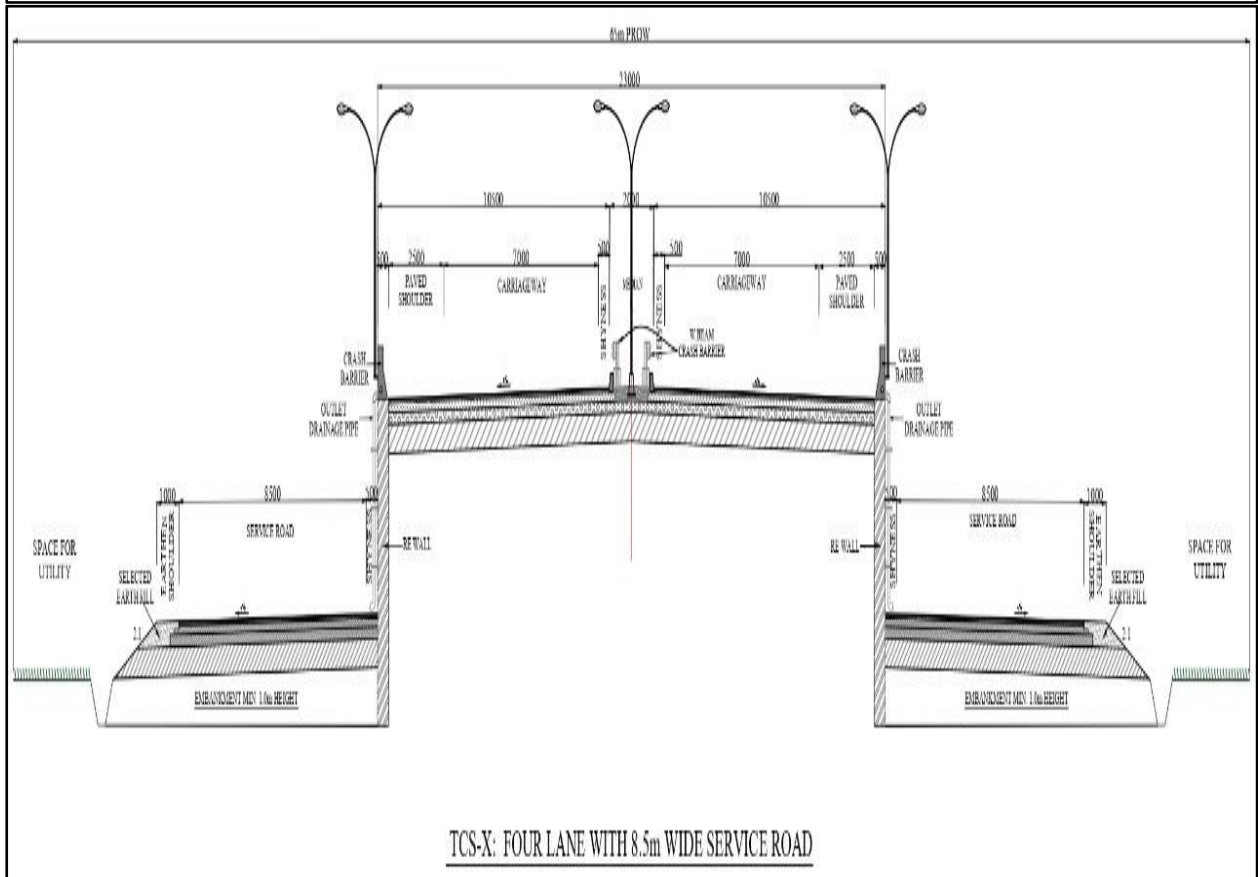
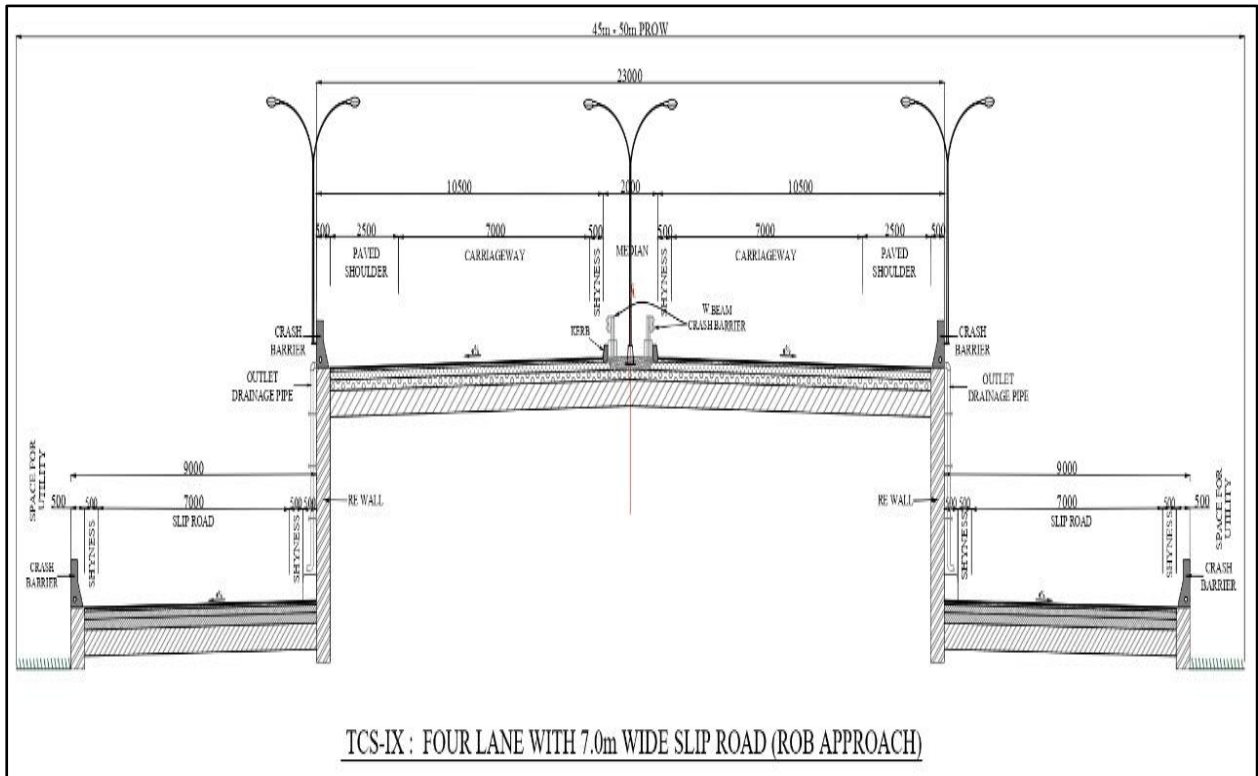
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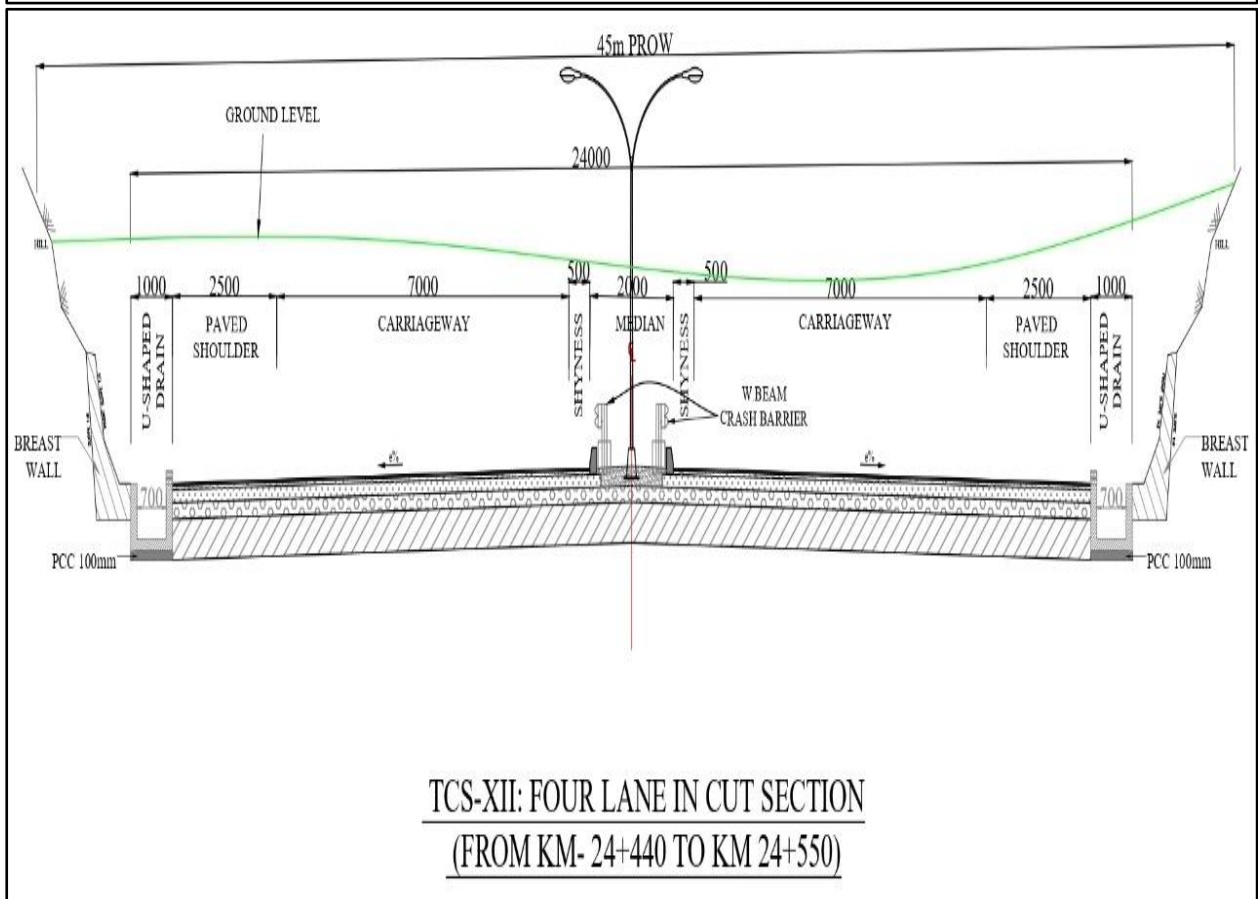
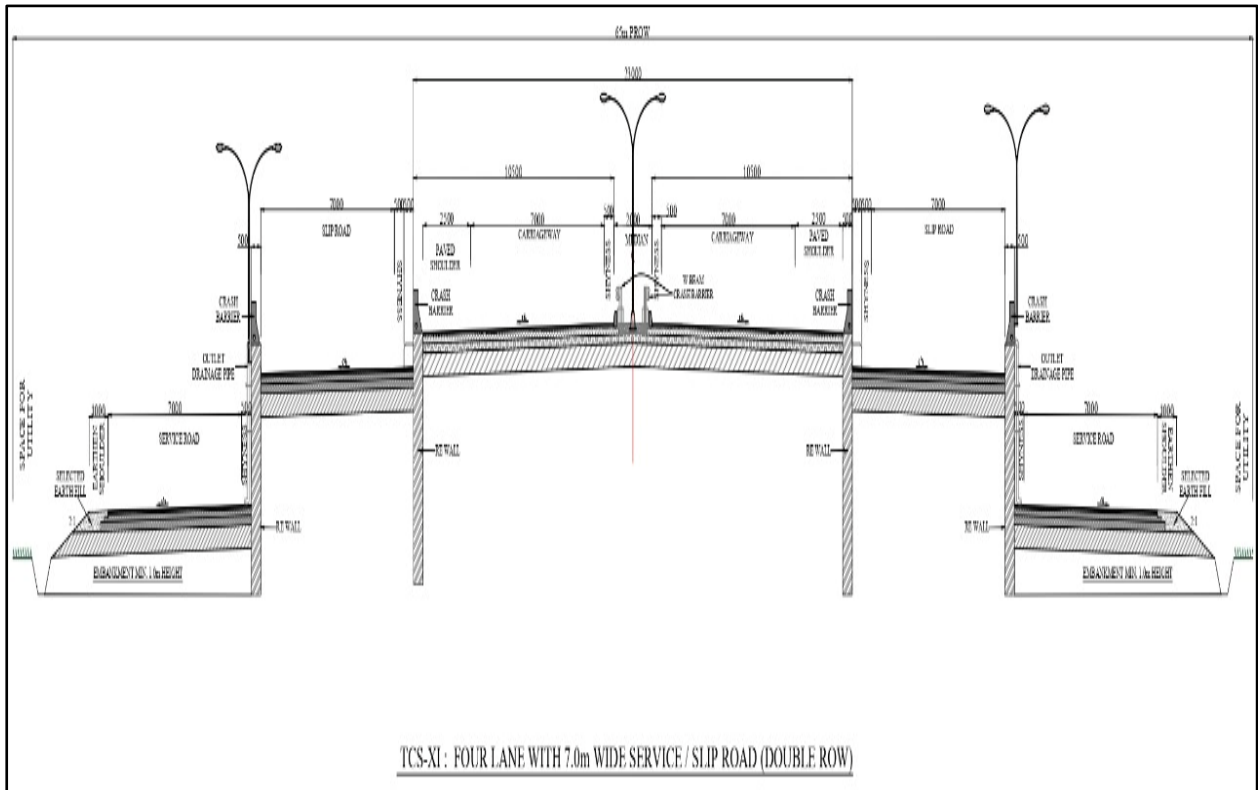
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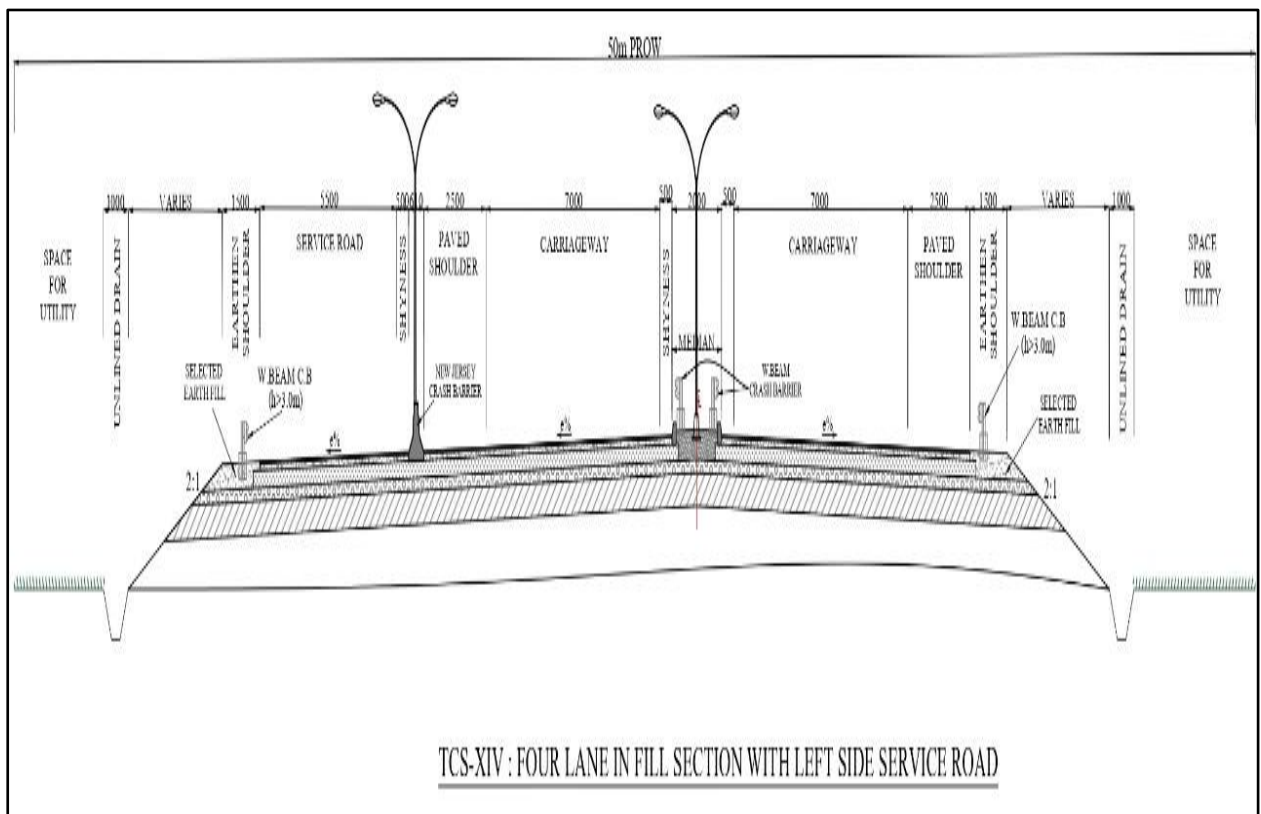
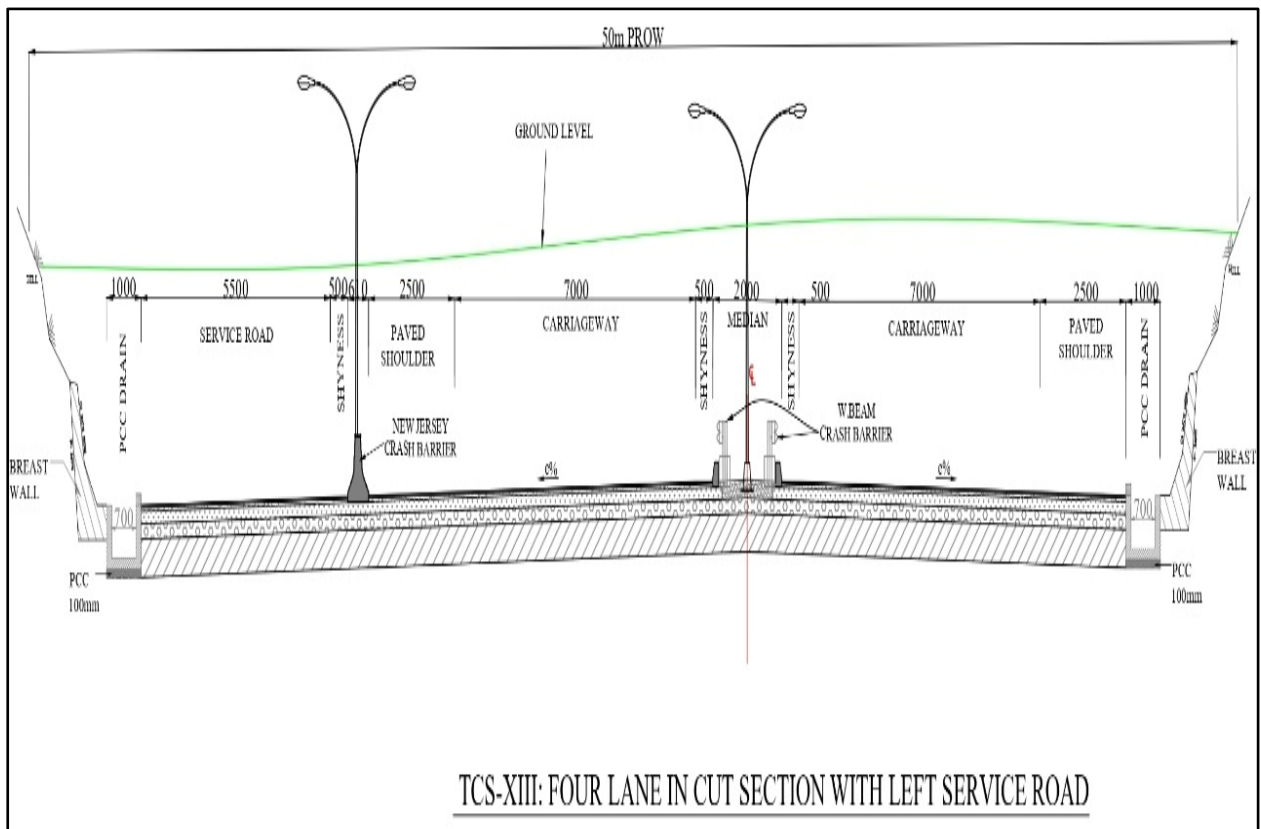
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Agartala Bypass (Western) (L= 25.402 km)

Main Report



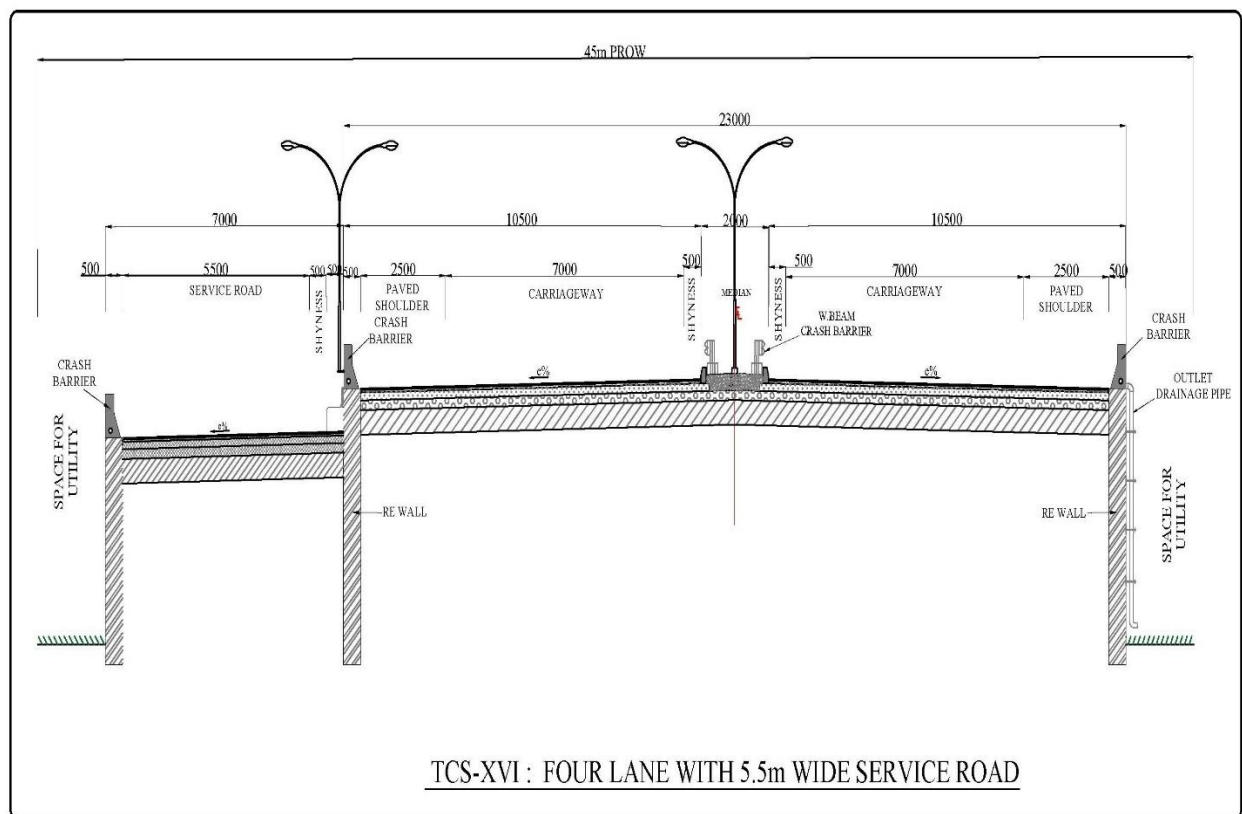
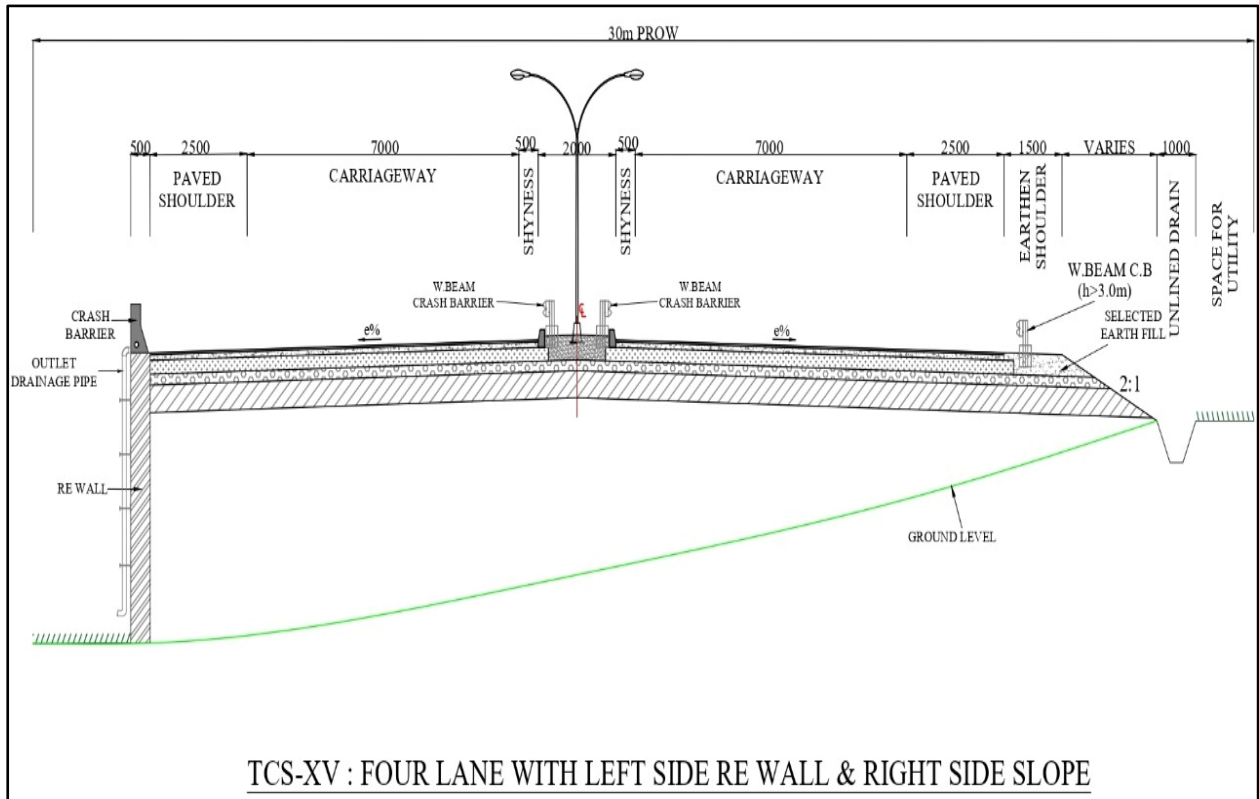
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Agartala Bypass (Western) (L= 25.402 km)

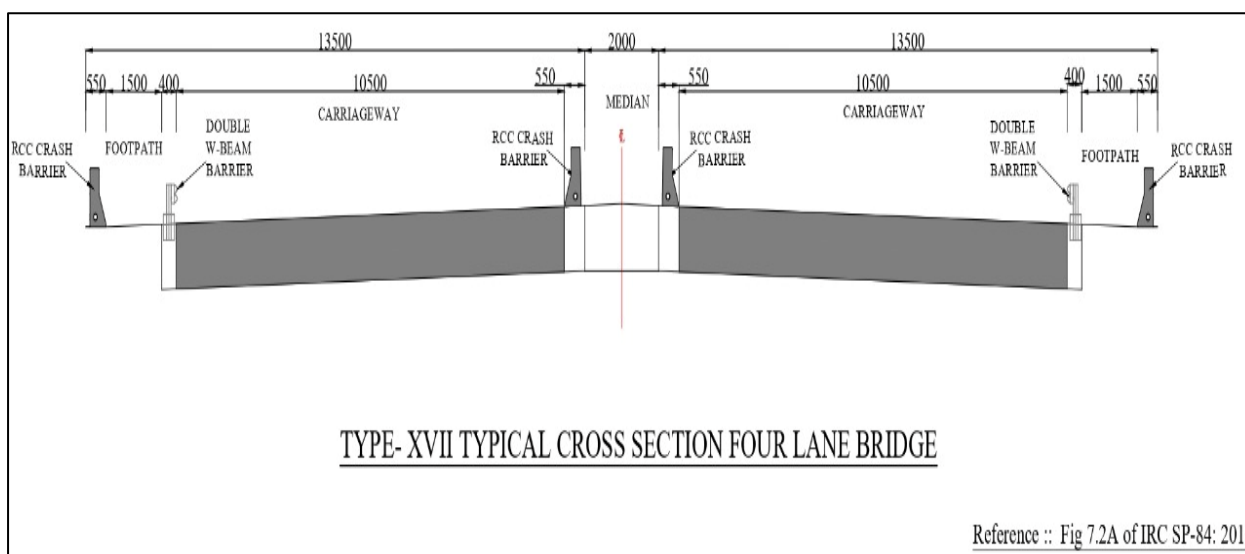
Main Report



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Agartala Bypass (Western) (L= 25.402 km)

Main Report



The widening schedule as per Typical cross section is as hereunder –

Table 0.24 –

Sl. No	Design Chainage (Km)		Structure Length (m)	Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To					
1	0	340	0		340	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
2	340	1600	19		1241	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
3	1600	1800	0		200	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
4	1800	2560	7		753	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
5	2560	2860	0		300	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction



Detailed Project Report (Final)::**Executive Summary**

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Agartala Bypass (Western) (L= 25.402 km)

Main Report

Sl. No	Design Chainage (Km)		Structure Length (m)	Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To					
6	2860	3730	7		863	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
7	3730	3820	0		90	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
8	3820	3900	0		80	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
9	3900	4600	12		688	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
10	4600	4960	0		360	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
11	4960	5100	7		133	TCS 8	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Service road (5.5m wide LHS)
12	5100	5360	0		260	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
13	5360	5980	90		530	TCS 9	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Slip road (7.0m wide BHS)
14	5980	6060	60		20	TCS 10	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Service road (8.5m wide BHS)
15	6060	6600	20		520	TCS 11	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Slip road (7.0m wide BHS) + Service road (7.0m wide BHS)



Detailed Project Report (Final)::**Executive Summary**

Consultancy services for feasibility study, preparation of DPR & providing pre-construction services for up-gradation of selected road stretches/corridors to Two lane with paved shoulder NH configuration under BHARATMALA Project and National Highways connectivity to Backward areas/Religious/Tourist places of the country **in the state of Tripura.**

Agartala Bypass (Western) (L= 25.402 km)

Main Report

Sl. No	Design Chainage (Km)		Structure Length (m)	Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To					
16	6600	6950	0		350	TCS 9	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Slip road (7.0m wide BHS)
17	6950	7025	7		68	TCS 8	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Service road (5.5m wide LHS)
18	7025	7900	7		868	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
19	7900	8685		30	755	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
20	8685	9200	0	100	415	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
21	9200	11310	<u>118</u>	<u>50</u>	1942	TCS 7	Four lane (1.5m paved shoulder with new jersey barrier) with RE Wall Construction + Service road (5.5m wide BHS)
22	11310	11650	0		340	TCS 6	Four lane (1.5m paved shoulder with new jersey barrier) with RE Wall Construction + Slip road (5.5m wide BHS) + Service road (5.5m wide BHS)
23	11650	11865	12		203	TCS 5	Four lane (1.5m paved shoulder with new jersey barrier) with RE Wall Construction + Slip road (7.0 m wide BHS)
24	11865	12120	12	30	213	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
25	12120	12380	0		260	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

Sl. No	Design Chainage (Km)		Structure Length (m)	Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To					
26	12380	12840	0		460	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
27	12840	13780	7	20	913	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
28	13780	14700	7		913	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
29	14700	15050	0	20	330	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
30	15050	15550	0		500	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
31	15550	15970	7		413	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
32	15970	17000	90		940	TCS 9	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Slip road (7.0m wide BHS)
33	17000	17700	7		693	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
34	17700	18000	7		293	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
35	18000	18400	7		393	TCS 4	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Service road (5.5m wide BHS)



Detailed Project Report (Final)::**Executive Summary**

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Agartala Bypass (Western) (L= 25.402 km)

Main Report

Sl. No	Design Chainage (Km)		Structure Length (m)	Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To					
36	18400	18700	0		300	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
37	18700	19040	7		333	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
38	19040	19370	12		318	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
39	19370	19940	7		563	TCS 4	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Service road (5.5m wide BHS)
40	19940	20240	0		300	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
41	20240	21275	7	95	933	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
42	21275	21350	0		75	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
43	21350	21440	0		90	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
44	21440	22020	12		568	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
45	22020	22700	14	55	611	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

Sl. No	Design Chainage (Km)		Structure Length (m)	Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To					
46	22700	23050	0		350	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
47	23050	23220	0	30	140	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
48	23220	23800	0		580	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
49	23800	24040	0	30	210	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
50	24040	24160	0		120	TCS 15	Four lane (2.5m paved shoulder + 2m median) with RE wall construction on LHS & Earthen slope on RHS
51	24160	24380	0	30	190	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction
52	24380	24440	0		60	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
53	24440	24550	0		110	TCS 12	Four lane in cut section (2.5m paved shoulder + 2m median)
54	24550	24620	0		70	TCS 13	Four lane in cut section (2.5m paved shoulder + 2m median) + Service road (5.5m wide LHS)
55	24620	24680	0		60	TCS 14	Four lane in fill section (2.5m paved shoulder + 2m median) + Service road (5.5m wide LHS)



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

Sl. No	Design Chainage (Km)		Structure Length (m)	Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To					
56	24680	24880	0	30	170	TCS 16	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + service road (5.5m wide on LHS)
57	24880	24940	0		60	TCS 14	Four lane in fill section (2.5m paved shoulder + 2m median) + Service road (5.5m wide LHS)
58	24940	25060	0	30	90	TCS 16	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + service road (5.5m wide on LHS)
59	25060	25220	0		160	TCS 14	Four lane in fill section (2.5m paved shoulder + 2m median) + Service road (5.5m wide LHS)
60	25220	25320	0	35	65	TCS 16	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + service road (5.5m wide on LHS)
61	25320	25402	0		82	TCS 14	Four lane in fill section (2.5m paved shoulder + 2m median) + Service road (5.5m wide LHS)
Total Length..			569	585	24+248		

Summary of TCS :

Length	TCS Type	TCS Description
4+283	TCS 1	Four lane (2.5m paved shoulder + 2m median) with embankment construction
9+754	TCS 2	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

Length	TCS Type	TCS Description
3+222	TCS 3	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Slip road (5.5m wide BHS)
0+956	TCS 4	Four lane (2.5m paved shoulder + 2m median) with RE Wall Construction + Service road (5.5m wide BHS)
0+203	TCS 5	Four lane (1.5m paved shoulder with new jersey barrier) with RE Wall Construction + Slip road (7.0 m wide BHS)
0+340	TCS 6	Four lane (1.5m paved shoulder with new jersey barrier) with RE Wall Construction + Slip road (5.5 m wide BHS) + Service road (5.5m wide BHS)
1+942	TCS 7	Four lane (1.5m paved shoulder with new jersey barrier) with RE Wall Construction + Service road (5.5m wide BHS)
0+201	TCS 8	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Service road (5.5m wide LHS)
1+820	TCS 9	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Slip road (7.0m wide BHS)
0+020	TCS 10	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Service road (8.5m wide BHS)
0+520	TCS 11	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + Slip road (7.0m wide BHS) + Service road (7.0m wide BHS)
0+110	TCS 12	Four lane in cut section (2.5m paved shoulder + 2m median)
0+070	TCS 13	Four lane in cut section (2.5m paved shoulder + 2m median) + Service road (5.5m wide LHS)
0+362	TCS 14	Four lane in fill section (2.5m paved shoulder + 2m median) + Service road (5.5m wide LHS)
0+120	TCS 15	Four lane (2.5m paved shoulder + 2m median) with RE wall construction on LHS & Earthen slope on RHS
0+325	TCS 16	Four lane (2.5m paved shoulder + 2m median) with RE wall construction + service road (5.5m wide on LHS)



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

0.16.3 Horizontal Design of Project road

The horizontal alignment design report is tabulated below.

Table 0.25: Horizontal Report

Curve No.	HORIZONTAL CURVE				Terrain	Transition length	Speed (Kmph)
	Start Chainage	End Chainage	Radius	Direction			
1	0+411.244	1+037.993	600	Right	Plain	80	100
2	1+596.482	2+268.320	800	Left	Plain	60	100
3	2+588.554	3+218.693	1000	Right	Plain	50	100
4	3+947.989	4+603.300	700	Right	Plain	70	100
5	5+078.370	5+382.255	1500	Left	Plain	35	100
6	5+715.141	5+822.136	400	Right	Plain	55	80
7	6+092.248	6+119.926	400	Left	Plain	55	80
8	6+418.560	6+561.972	900	Right	Plain	55	100
9	6+889.284	6+952.252	2000	Right	Plain	0	100
10	7+376.295	7+584.337	2000	Left	Plain	0	100
11	7+823.923	8+385.039	600	Right	Plain	80	100
12	8+633.374	8+993.114	300	Left	Plain	75	80
13	9+420.180	9+473.529	2000	Right	Plain	0	100
14	9+876.192	10+097.473	400	Right	Plain	55	80
15	10+587.815	10+637.303	600	Left	Plain	35	80
16	10+752.468	11+060.033	400	Left	Plain	55	80
17	11+807.365	12+515.612	1200	Right	Plain	40	100
18	13+488.455	13+515.379	600	Right	Plain	80	100
19	14+304.923	14+857.436	500	Left	Plain	95	100
20	15+508.827	16+211.243	500	Right	Plain	45	80
21	16+642.189	17+307.820	400	Left	Plain	55	80
22	17+615.035	18+892.570	600	Right	Plain	80	100
23	19+676.285	19+823.114	1500	Left	Plain	35	100
24	20+743.620	21+055.852	1000	Right	Plain	50	100



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Agartala Bypass (Western) (L= 25.402 km)

Main Report

Curve No.	HORIZONTAL CURVE				Terrain	Transition length	Speed (Kmph)
	Start Chainage	End Chainage	Radius	Direction			
25	21+397.612	21+636.442	400	Left	Plain	55	80
26	21+868.149	22+459.969	600	Right	Plain	35	80
27	23+576.454	23+753.454	2000	Right	Plain	0	100
28	24+849.673	25+009.186	1500	Left	Plain	35	100

No any curve is coming below minimum radius & minimum design speed as per IRC SP

84-2019.

Vertical Alignment – Vertical design report is tabulated below.

Table 0.26: Vertical Report

PVI No	PVI Design Chainage (m)	Level (m)	Curve Length	Grade		Diff. in Grade (%)	Type of Curve	K Value
				IN (%)	OUT (%)			
1	0+225.000	11.068	80	1.444	-0.624	2.068	Sag	38.683
2	0+367.465	13.125	125	0	1.444	-1.444	Hog	86.569
3	0+545.000	13.125	100	-1.636	0	-1.636	Hog	61.108
4	0+728.554	10.121	125	2.464	-1.636	4.101	Sag	30.483
5	1+000.000	16.81	150	0	2.464	-2.464	Hog	60.874
6	1+190.000	16.81	150	-2.469	0	-2.469	Hog	60.764
7	1+400.000	11.626	100	0.148	-2.469	2.617	Sag	38.214
8	1+700.000	12.071	100	-0.184	0.148	-0.332	Hog	300.872
9	2+010.000	11.5	60	0	-0.184	0.184	Sag	325.884
10	2+150.000	11.5	150	-2.037	0	-2.037	Hog	73.62
11	2+323.652	7.962	100	0.106	-2.037	2.144	Sag	46.644
12	2+876.334	8.55	150	2.322	0.106	2.215	Sag	67.712
13	3+180.000	15.6	150	0	2.322	-2.322	Hog	64.609
14	3+380.000	15.6	150	-1.192	0	-1.192	Hog	125.889



Detailed Project Report (Final)::**Executive Summary**

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Agartala Bypass (Western) (L= 25.402 km)

Main Report

PVI No	PVI Design Chainage (m)	Level (m)	Curve Length	Grade		Diff. in Grade (%)	Type of Curve	K Value
				IN (%)	OUT (%)			
15	3+903.446	9.363	150	2.4	-1.192	3.591	Sag	41.766
16	4+180.000	16	150	0	2.4	-2.4	Hog	62.503
17	4+380.000	16	150	-2.472	0	-2.472	Hog	60.68
18	4+597.600	10.621	60	-0.295	-2.472	2.177	Sag	27.567
19	4+722.843	10.251	80	2.449	-0.295	2.745	Sag	29.148
20	4+880.000	14.1	150	0	2.449	-2.449	Hog	61.246
21	5+060.000	14.1	150	-2.493	0	-2.493	Hog	60.173
22	5+242.564	9.549	100	1.299	-2.493	3.791	Sag	26.376
23	5+442.494	12.145	150	0.328	1.299	-0.971	Hog	154.482
24	5+662.859	12.867	80	2.179	0.328	1.851	Sag	43.218
25	5+860.000	17.162	200	0	2.179	-2.179	Hog	91.8
26	6+130.000	17.162	200	-2.445	0	-2.445	Hog	81.797
27	6+312.489	12.7	80	0.666	-2.445	3.111	Sag	25.714
28	6+507.661	14	80	0	0.666	-0.666	Hog	120.106
29	6+626.817	14	80	1.125	0	1.125	Sag	71.132
30	6+870.000	16.735	150	0	1.125	-1.125	Hog	133.373
31	7+070.000	16.735	150	-2.454	0	-2.454	Hog	61.122
32	7+393.416	8.798	100	1.185	-2.454	3.639	Sag	27.479
33	7+540.000	10.535	80	2.496	1.185	1.311	Sag	61.039
34	7+700.000	14.528	150	0	2.496	-2.496	Hog	60.105
35	7+855.000	14.528	150	-2.42	0	-2.42	Hog	61.974
36	7+976.634	11.584	70	0.021	-2.42	2.441	Sag	28.673
37	8+048.355	11.599	70	2.474	0.021	2.453	Sag	28.541
38	8+200.000	15.35	150	0	2.474	-2.474	Hog	60.642
39	8+400.000	15.35	150	-1.502	0	-1.502	Hog	99.865
40	8+742.158	10.211	80	0.113	-1.502	1.615	Sag	49.532
41	8+990.000	10.491	60	0.924	0.113	0.811	Sag	73.984
42	9+120.000	11.692	100	0.192	0.924	-0.732	Hog	136.662
43	9+280.000	12	100	0.129	0.192	-0.064	Hog	1571.614
44	9+836.566	12.716	150	-0.002	0.129	-0.13	Hog	1151.768



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PVI No	PVI Design Chainage (m)	Level (m)	Curve Length	Grade		Diff. in Grade (%)	Type of Curve	K Value
				IN (%)	OUT (%)			
45	10+435.866	12.707	150	0.79	-0.002	0.792	Sag	189.426
46	10+750.000	15.19	150	0	0.79	-0.79	Hog	189.791
47	10+980.000	15.19	150	-2.437	0	-2.437	Hog	61.552
48	11+252.617	8.546	100	-0.045	-2.437	2.392	Sag	41.802
49	11+419.023	8.472	100	2.219	-0.045	2.264	Sag	44.179
50	11+560.000	11.6	150	0	2.219	-2.219	Hog	67.604
51	11+730.000	11.6	125	-1.526	0	-1.526	Hog	81.908
52	11+857.743	9.651	80	1.01	-1.526	2.537	Sag	31.539
53	12+020.000	11.29	125	0	1.01	-1.01	Hog	123.711
54	12+180.000	11.29	150	-2.478	0	-2.478	Hog	60.542
55	12+339.613	7.335	100	0.362	-2.478	2.84	Sag	35.213
56	12+807.128	9.029	100	2.44	0.362	2.078	Sag	48.119
57	13+060.000	15.2	150	0	2.44	-2.44	Hog	61.465
58	13+240.000	15.2	150	-2.463	0	-2.463	Hog	60.898
59	13+504.223	8.692	100	0.055	-2.463	2.519	Sag	39.704
60	13+664.247	8.781	150	0.116	0.055	0.06	Sag	2486.247
61	13+978.963	9.145	150	0.258	0.116	0.142	Sag	1054.43
62	14+155.281	9.6	150	0.023	0.258	-0.235	Hog	637.247
63	14+395.419	9.654	100	1.407	0.023	1.385	Sag	72.223
64	14+660.000	13.378	150	-1.003	1.407	-2.41	Hog	62.232
65	14+984.408	10.124	200	0.656	-1.003	1.659	Sag	120.571
66	15+583.788	14.054	100	2.355	0.656	1.7	Sag	58.834
67	15+815.000	19.5	150	0	2.355	-2.355	Hog	63.683
68	16+010.000	19.5	150	0.113	0	0.113	Sag	1323.056
69	16+408.681	19.952	200	0	0.113	-0.113	Hog	1764.075
70	16+665.699	19.952	150	-0.267	0	-0.267	Hog	562.374
71	17+115.973	18.751	200	0.389	-0.267	0.656	Sag	304.868
72	17+565.247	20.5	200	-0.342	0.389	-0.731	Hog	273.45
73	18+112.825	18.627	150	1.191	-0.342	1.533	Sag	97.838
74	18+405.235	22.109	200	-2.322	1.191	-3.513	Hog	56.936



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				IN (%)	OUT (%)			
75	18+570.014	18.284	80	-0.545	-2.322	1.777	Sag	45.017
76	18+785.386	17.111	80	1.697	-0.545	2.242	Sag	35.689
77	18+976.788	20.359	200	-0.844	1.697	-2.541	Hog	78.705
78	19+361.571	17.111	200	1.002	-0.844	1.846	Sag	108.313
79	19+860.077	22.108	100	0.036	1.002	-0.966	Hog	103.483
80	20+000.000	22.158	100	-2.465	0.036	-2.501	Hog	39.984
81	20+113.560	19.359	80	-0.034	-2.465	2.431	Sag	32.903
82	20+270.416	19.306	80	2.471	-0.034	2.505	Sag	31.935
83	20+524.074	25.575	200	-0.317	2.471	-2.789	Hog	71.723
84	20+800.000	24.7	150	-2.469	-0.317	-2.152	Hog	69.706
85	21+026.716	19.102	100	0	-2.469	2.469	Sag	40.507
86	21+156.213	19.102	100	-0.429	0	-0.429	Hog	233.154
87	21+455.872	17.816	150	2.125	-0.429	2.554	Sag	58.728
88	21+704.542	23.1	150	0	2.125	-2.125	Hog	70.589
89	21+933.419	23.1	150	-0.064	0	-0.064	Hog	2360.865
90	22+251.352	22.898	100	-0.516	-0.064	-0.452	Hog	221.116
91	22+728.534	20.437	150	1.736	-0.516	2.252	Sag	66.608
92	23+211.450	28.821	100	1.065	1.736	-0.671	Hog	148.945
93	24+024.059	37.474	150	2.484	1.065	1.419	Sag	105.692
94	24+447.809	48	100	0	2.484	-2.484	Hog	40.257
95	24+619.692	48	100	-2.497	0	-2.497	Hog	40.044
96	24+881.622	41.459	150	1.924	-2.497	4.421	Sag	33.931
97	25+092.588	45.517	200	-1.186	1.924	-3.109	Hog	64.319

No any curve is coming below minimum gradient as per IRC SP 84-2019.



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0.17 Design Deviation from IRC standards

The following deviations adopted in proposals of this bypass-

Table 0.27

Sl. No.	Item	Location	As per IRC	Adopted
1	RoB Structure	Km 6+0	Width – 2 x 13 = 26m as per Fig 7.9 of IRC SP 73: 2018, Page no. 71	2x 12.5 = 25width as per RDSO approved drawings
3	RCC Drain	For TCS 6 & TCS 7	-	In service road section, 1.0m wide RCC drain adopted on both side
4	Design Speed	10 locations, refer Horizontal report shown above in this report	Ruling – 100 kmph & Minimum – 80 kmph	Adopted minimum speed of 80 kmph at 10 locations due to land/alignment restrictions, refer table 0.25 of this report.
5	Taper at merger	Km 11+850	1 in 15, Clause 2.12.3 of IRC SP 84-2019	1 in 10 due to bridge
6	Gradient in slip road	From km 21+800 to km 22+020	1 in 40	1 in 33 due to bridge
7	Paved Shoulder	From km 9+200 to km 11+865	Paved shoulder should be 2.5 m wide	Paved shoulder considered 1.5m wide as per land availability



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0.18 Road Junctions/ Intersections

The Project alignment is crossing the major / minor approach roads at 34 different locations where Flyover/VUP/LVUP/SVUP are proposed to connect nearby approach roads, service road provided where no any underpasses are proposed (refer design plan of Project Road).

Improvement of cross road with service/ slip road has also been improved at grade, the detail of junction improvement is shown below –

Table 0.28

S. No.	Chainage	Structure Type	Area (Sqm)		Total	Remarks
			LHS	RHS		
1	0+000	At Grade	1795.307	1795.307	3590.614	
2	4+270	LVUP	448.054	514.115	962.169	Page No. 20
3	4+970	SVUP	82.777	0	82.777	
4	5+085		34.5		34.5	
5	6+970	SVUP	35.976	0	35.976	
6	7+025		35.976	0	35.976	
7	8+300	VUP	596.974	415.411	1012.385	Page No. 20
8	11+650	LVUP	162.962	619.928	782.89	
9	16+540	Flyover	836.85	835	1671.85	Page No. 20
10	16+700		35		35	
11	19+370	LVUP	615.634	576.771	1192.405	Slip/Service road
12	21+785	LVUP	929.463	573.123	1502.586	Slip road
13	24+950		110		110	
14	25+200		110		110	
15	25+402	At Grade	8000	8000	16000	
		Total (Sqm)			27159.128	LA Area
					21727.302	Paved Area

Ha. 2.7159128



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Details of underpasses proposals are given clause 0.6 of this report.

**** - addition to above junctions, 400m long connecting road including junction development shall be developed at km 24+500 in 3 m width with 10msa & 5 CBR design consideration**

0.19 Railway Track & Proposals

One Railway track exists on this Project alignment near km 6+000, the railway track starts from Agartala Railway station crosses international boundary of India – Bangladesh.

A four lane RoB (60m span & 30m viaduct on left side & 30+30m viaduct on right side of railway track) (with both side viaduct & slip road connectivity) is proposed at this location.

0.20 Cross Drainage Works

0.20.1 Bridges

- Total 22 bridges (19 new construction + 2 widening of existing bridge + 1 new bridge on slip road) are proposed at this alignment. The Details are-

Table 0.29: Proposal of Bridges (New Bridges)

Sl. No.	Chainage (km)	Span Arrangement (m)	Total span Length (m)	Type	Structure width (m)
1	Minor Bridge at Km 8+300 with service road	1 x 10	10m	RCC Slab with Pile Foundation	41
2	Minor Bridge at Km 8+900	1 x 20	20m	RCC Girder with Pile foundation	27
3	Major Bridge at km 9+175	2 x 40	80m	PSC Girder with Pile foundation	27
4	Minor Bridge at Km 9+960	1 x 30	30m	PSC Girder with Pile foundation	37
5	Minor Bridge at Km 10+175	1 x 20	20m	RCC Girder with Pile foundation	37
6	Minor Bridge at Km 11+875	1 x 30	30m	PSC Girder with Pile foundation	19.6
7	Minor Bridge at Km 13+540	1 x 20	20m	RCC Girder with Pile foundation	27



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Sl. No.	Chainage (km)	Span Arrangement (m)	Total span Length (m)	Type	Structure width (m)
8	Minor Bridge at Km 14+950	1 x 20	20m	RCC Girder with Pile foundation	27
9	Minor Bridge at Km 20+700	1 x 30	30m	PSC Girder with Pile foundation	27
10	Minor Bridge at Km 20+900	1 x 35	35m	PSC Girder with Pile foundation	27
11	Minor Bridge at Km 21+070	1 x 30	30m	PSC Girder with Pile foundation	27
12	Minor Bridge at Km 22+025	1 x 30	30m	PSC Girder with Pile foundation	27
13	Minor Bridge at Km 22+265	1 x 25	25m	RCC Girder with Pile foundation	27
14	Minor Bridge at Km 23+200	1 x 30	30m	PSC Girder with Pile foundation	27
15	Minor Bridge at Km 23+950	1 x 30	30m	PSC Girder with Pile foundation	27
16	Minor Bridge at Km 24+250	1 x 30	30m	PSC Girder with Pile foundation	27
17	Minor Bridge at Km 24+800	1 x 30	30m	PSC Girder with Pile foundation	31.5
18	Minor Bridge at Km 25+000	1 x 30	30m	PSC Girder with Pile foundation	31.5
19	Minor Bridge at Km 25+250	1 x 35	35m	PSC Girder with Pile foundation	31.5

Table 0.30: Proposal of Bridges (Widening)

Sl. No.	Chainage (km)	Span Arrangement (m)	Total span Length (m)	Type	Structure width (m)
1	At km 0+00	1 x 13.5	13.5m	RCC Girder with Pile foundation	11
2	At km 10+900 (R/s)	1 x 13	13m	RCC Girder with Pile foundation	9

Table 0.31: Proposal of Bridges (on Slip road)

Sl. No.	Chainage (km)	Span Arrangement (m)	Total span Length (m)	Type	Structure width (m)
1	At km 16+425	1 x 15	15m	RCC Girder with Pile foundation	9



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0.20.2 Flyover

2 new flyovers are proposed on this alignment, the details are -

Table 0.32 – Proposal of Fly over

Sl. No.	Chainage (km)	Size (m)	Type	Width (m)
1	10+880	3x30	PSC Girder with Pile foundation	19.6
2	16+500	3x30	PSC Girder with Pile foundation	23

0.20.3 Culverts

Total 36 new culverts are proposed on this alignment, the details are -

Table 0.33 – Proposal of Culverts

Sl No.	Chainage (Km)	Size (m)	Type	Width (m)
1	0+850	1x3x6	Box Culvert	23
2	1+350	1x3x3	Box Culvert	23
3	1+990	1x6x6	Box Culvert	23
4	2+400	1x3x3	Box Culvert	23
5	2+800	1x2x2	Box Culvert	23
6	3+200	1x6x6	Box Culvert	23
7	3+880	1x3x4	Box Culvert	23
8	4+700	1x4x5	Box Culvert	23
9	5+200	1x4x5	Box Culvert	23
10	5+700	1x2x2	Box Culvert	41
11	6+100	1x2x5	Box Culvert	48
12	6+640	1x4x5	Box Culvert	41
13	7+480	1x3x3	Box Culvert	23
14	7+680	1x4x5	Box Culvert	23
15	7+900	1x4x4	Box Culvert	23
16	11+300	1x3x3	Box Culvert	35
17	12+700	1x3x3	Box Culvert	25
18	13+250	1x4x5	Box Culvert	23
19	13+650	1x3x3	Box Culvert	23
20	14+150	1x3x4	Box Culvert	25



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Sl No.	Chainage (Km)	Size (m)	Type	Width (m)
21	14+650	1x2x2	Box Culvert	25
22	15+070	1x2x2	Box Culvert	25
23	15+820	1x3x4	Box Culvert	23
24	16+000	1x3x3	Box Culvert	30
25	16+300	1x4x5	Box Culvert	41
26	16+960	1x3x3	Box Culvert	30
27	17+750	1x3x3	Box Culvert	30
28	18+100	1x2x2	Box Culvert	39
29	18+550	1x3x3	Box Culvert	37
30	19+620	1x2x2	Box Culvert	39
31	20+100	1x3x4	Box Culvert	37
32	20+200	1x3x3	Box Culvert	30
33	20+280	1x4x4	Box Culvert	23
34	20+420	1x4x4	Box Culvert	23
35	21+250	1x2x2	Box Culvert	25
36	23+700	1x3x3	Box Culvert	25

0.21 VUP, LVUP & SVUP

Total 29 under passes are proposed at this alignment, the details are –

- a) Vehicular under pass – 2,
- b) Light vehicular under pass - 6,
- c) Smaller vehicular under pass - 21

The locations are -

Table 0.34- Proposed underpasses

Sl. No.	Chainage	Type	Opening (m)	Structure Width
VUPs				
1	6+570	VUP	2 x 10 x 5.5	23 m
2	8+300	VUP	2 x 10 x 5.5	23 m
LVUPs				
1	1+125	LVUP	1 x 12 x 4	23 m
2	4+270	LVUP	1 x 12 x 4	23 m
3	11+650	LVUP	1 x 12 x 4	19.61 m
4	12+090	LVUP	1 x 12 x 4	23 m
5	19+370	LVUP	1 x 12 x 4	23 m



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Sl. No.	Chainage	Type	Opening (m)	Structure Width
6	21+785	LVUP	1 x 12 x 4	23 m
SVUPs				
1	0+460	SVUP	1 x 7 x 4	23 m
2	2+070	SVUP	1 x 7 x 4	23 m
3	3+280	SVUP	1 x 7 x 4	23 m
4	4+970	SVUP	1 x 7 x 4	23 m
5	6+970	SVUP	1 x 7 x 4	23 m
6	7+770	SVUP	1 x 7 x 4	23 m
7	9+500	SVUP	1 x 7 x 4	19.61 m
8	9+800	SVUP	1 x 7 x 4	19.61 m
9	10+110	SVUP	1 x 7 x 4	19.61 m
10	10+390	SVUP	1 x 7 x 4	19.61 m
11	13+150	SVUP	1 x 7 x 4	23 m
12	14+065	SVUP	1 x 7 x 4	23 m
13	15+920	SVUP	1 x 7 x 4	23 m
14	17+565	SVUP	1 x 7 x 4	23 m
15	18+000	SVUP	1 x 7 x 4	23 m
16	18+400	SVUP	1 x 7 x 4	23 m
17	18+900	SVUP	1 x 7 x 4	23 m
18	19+940	SVUP	1 x 7 x 4	23 m
19	20+600	SVUP	1 x 7 x 4	23 m
20	22+175	SVUP	1 x 7 x 4	23 m
21	22+610	SVUP	1 x 7 x 4	23 m

The locations may change slightly as per site / cross road location.

0.22 Truck Lay Bye

- No Truck lay bye proposed on this alignment.

The proposed bypass is passing in/along built-up locations & International border in maximum length and a truck lay bye is proposed at km 19+750 of NH-108B (Agartala- Khowai road), so no truck lay bye is proposed in this section.



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0.23 Bus Bays

- No Bus Bays proposed on this alignment.

The bypass is designed with proposal of underpasses at each cross road connecting with slip/service roads with RE wall in almost entire length. Due to high land cost, no separate bus bays is proposed.

0.24 Toll Plaza

No Toll Plaza is proposed on this bypass alignment due to –

- 1) The proposed bypass crosses the local streets/ town roads at several locations and connecting roads are provided (refer TCS III, TCS V, TCS VI, TCS IX & TCS XI),
- 2) Project Cost is very high and financially not viable with Toll as per traffic,
- 3) Minimum 2 Toll Plaza on Main Carriageway & 48 Toll booth need to provide to capture complete traffic of bypass which may civil cost of approx. Rs 90 Cr. & additional land acquisition may cost of Rs 80.0 Cr (Approximate)

0.25 ATMS (Advance Traffic Management System)

As per IRC 67-2001 & IRC SP 84-2019, Provision of other facilities if required may be made in similar manner.

Minimum provisions of ATMS shall be as follows -

Table 0.35

Sl. No.	Equipment	Unit	Qty
1	Emergency Call Box		
a	Emergency call box Systems IP Based (Master-Master) with Solar power backup	Set	24
b	Protection Barrier	Nos	24
c	ECB Control Room Equipment	Nos	1
d	ECB Workstation	Nos	1
2	Variable message Signs		
a	VMS Board Full Matrix, True Colour, Amber Display Sign Dimension -800mm x 2500min x 200mm	Nos	4



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Sl. No.	Equipment	Unit	Qty
b	Full Gantry For Fixed VMS	Nos	4
c	UPS-6KVA UPS with cabinet & 60 mins Back up	Nos	4
d	Interface cards and accessories at field side for connecting all field equipment to fiber backbone	Nos	4
e	VMS Workstation with OEM license	Nos	1
f	Mobile VMS with trolley	Nos	2
3	Video Surveillance System		
a	PTZ CCTV Camera system - 30x Zoom, with all required accessories	Nos	5
b	Octagonal Pole For Camera	Nos	5
c	Interface cards and accessories at Field side for connecting all field equipment to fiber backbone	Nos	5
d	CCTV Workstation with OEM license	Nos	1
e	PTZ Joy Stick	Nos	1
f	Solar Power backup system with mounting arrangement	Nos	5
4	Meteorological Data System		
a	Meteorological data system with Humidity sensor, wind speed sensor, rain gauge sensor, road surface sensor, temperature sensor, protection enclosure, Power & data cable including all accessories and Foundation work	Nos	1
5	Automatic Traffic centre-cum-Classifier		
a	ATTCC Piezo Loop Piezo Configuration with solar power backup	Nos	4
b	Interface cards and accessories at Field side for connecting all field equipment to fiber backbone	Nos	4
c	ATCC Workstation	Nos	4
6	ATMS Control system & ATMS Software		
a	Servers	Nos	5
b	Database Oracle-Standard Edition-2(NUP)	Nos	5
c	Windows Server 2016 Standard Edition	Nos	5



Detailed Project Report (Final)::**Executive Summary**

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Sl. No.	Equipment	Unit	Qty
d	ATMS Control Software	Nos	1
e	NMS Software	Nos	1
f	Rack 42u	Nos	1
g	Antivirus 20 user Pack	Nos	1
h	Network Laser Printer	Nos	1
i	UPS with 60 mins backup	Nos	4
j	3x2 m videowall with controller	Nos	1
k	Outdoor technical cabinet	Nos	1
l	32 CH NVR with 2*8TB Storage with 2 SATA	Nos	1
m	NMS storage workstation	Nos	1
n	Networking (Switches, Media convertors, Interface cards with power supply, accessories for field equipment & control room etc)	LS	1
7	Video Incident detection system		
a	VIDS Fixed camera with related accessories	Nos	8
b	VIDS Workstation	Nos	1
c	Solar Power backup system with mounting arrangement	Nos	8
d	Interface cards and accessories at Field side for connecting all field equipment to fiber backbone	Nos	8
e	Pole with Mounting Arrangement	Nos	8
8	Fibre cable - OFC		
a	OFC-24 core single mode armoured	Mtr	25000
b	HDPE PLB Duct	Mtr	25000
c	Above items include all related accessories such as: Joint Enclosure : Optical switch with SFP Module : Loaded LIU Port (as Per site Requirement) , Patchcord Simplex, Pigtail 1.5 Meter	Mtr	1
d	Trenching of 1.5Mtr. Laying & backfilling for PLB Duct, cable Pulling etc	Mtr	25000
9	Mobile Radio Communication System		
a	Base Stations	Set	1



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Sl. No.	Equipment	Unit	Qty
b	Repeater Station	Nos	1
10	Weigh in motion for Axle load measurement		
a	Portable weigh in Motion system with weigh pads & power backup	Sets	2

0.27 School

- The following schools are coming within proposed alignment of bypass –

Table 0.36

Sl. No.	Design Chainage (Km)	Side	Remarks
1	1+300	RHS	School
2	2+000	LHS	School
3	4+250	RHS	Madhabpur High School, IC Nagar
4	4+300	LHS	Aganwadi School
5	5+700	LHS	Aanganbari school Nimn Buniyadi Vidyalaya (West Charipara)
6	9+600	RHS	Aganwadi School Rajnagar
7	9+840	LHS	Joypur Junior Basic School
8	10+950	LHS	Aganwadi School
9	12+400	LHS	Shanpura Mura SB School
10	17+100	RHS	Palli Nimn Buniyadi Vidyalaya
11	21+800	RHS	Bamutiya Primary School



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Sl. No.	Design Chainage (Km)	Side	Remarks
12	24+100	RHS	Bagbari School

0.28 RE Wall

On following locations, the RE wall shall be provided –

Table 0.37

Providing reinforced earth wall					
A	Main Road	Unit	Nos	Length	Total Length (m)
a)	For the TCS-II	m	2	9,754	19508.00
b)	For the TCS-III	m	2	3222	6444.00
c)	For the TCS-IV	m	2	956	1912.00
d)	For the TCS-V	m	2	203	406.00
e)	For the TCS-VI	m	2	340	680.00
f)	For the TCS-VII	m	2	1,942	3884.00
g)	For the TCS-VIII	m	2	201	402.00
h)	For the TCS-IX	m	2	1,820	3640.00
i)	For the TCS-X	m	2	20	40.00
j)	For the TCS-XI	m	2	520	1040.00
k)	For the TCS-XV	m	1	120	120.00
l)	For the TCS-XVI	m	2	325	650.00
Total reinforced earth wall for Main Road					38726.00
B	Slip/Service Road				
a)	For the TCS-III	m	2	3222	6444.00
b)	For the TCS-V	m	2	203	406.00
c)	For the TCS-VI	m	2	340	680.00
d)	For the TCS-IX	m	2	1,820	3640.00
e)	For the TCS-XI	m	2	520	1040.00
f)	For the TCS-XVI	m	1	325	325.00
Total reinforced earth wall for Slip/Service Road					12535.00



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0.29 Service / Slip Road

On following locations, the service / slip road is proposed

Table 0.38: Slip Road

Slip Road					
Sl. No.	TCS Type	Unit	Side/No	Length (m)	Total Length (m)
a)	TCS III 5.5m wide	Rm	2	3,285	6,570
b)	TCS V 7.0m wide	Rm	2	215	430
c)	TCS VI 5.5m wide	Rm	2	340	680
d)	TCS IX 7.0m wide	Rm	2	2,000	4,000
e)	TCS XI 7.0m wide	Rm	2	540	1,080
Total Slip road length (m)					12,760

Table 0.39: Service Road

Service Road					
Sl. No.	TCS Type	Unit	Side/No	Length (m)	Total Length (m)
a)	TCS IV 5.5m wide	Rm	2	970	1,940
b)	TCS VI 5.5m wide	Rm	2	340	680
c)	TCS VII 5.5m wide	Rm	2	2,060	4,120
d)	TCS VIII 5.5m wide	Rm	1	215	215
e)	TCS X 8.5m wide	Rm	2	80	160
f)	TCS XI 7.0m wide	Rm	2	540	1,080
g)	TCS XIII 5.5m wide	Rm	1	70	70
h)	TCS XIV 5.5m wide	Rm	1	362	362
i)	TCS XVI 5.5m wide	Rm	1	325	325
Total Service road length (m)					8952



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0.30 RCC Drain

RCC lined covered drain is proposed at following locations –

Table 0.40 – RCC covered Drain

Sl. No	Design Chainage (Km)		Bridge Length (m)	Total length (m)	TCS Type	Description
	From	To				
1	9200	11310	50	2060	TCS 7	Four lane with both side 5.5m wide Service road
2	11310	11650	0	340	TCS 6	Four lane with both side Slip & Service road (5.5m wide)
	Drain length on One side			2400		
	Drain length on both side			4800		

PCC U Shape drain – From km 24+400 to km 24+620, PCC U shaped drain is proposed on main road & connecting road in minimum 560m length.

Table 0.41 – PCC Drain

PCC U Shape Drain				
From km 24+440 to km 24+620 (on Main road)	Rm	2	180	360.00
On connecting road at km 24+500 (Both side of connecting road)	Rm	2	100	200.00
				560.00



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0.31 Other Protective works

- A- Unlined Surface drain – 12.723 km,
- B - W Beam Crash Barrier – 52.936 km,
- C - New Jersey crash barrier – 2.917 km,
- D - RCC Crash Barrier - 51.261 km,
- E - Cement concrete kerb at median – 43.526 km,
- F - PCC kerb cum Footpath – 2.161 km,
- G - Breast wall - 360m (km 24+440 to km 24+620 B/s),
- H - Stone pitching over emb slope – 925m (For TCS 1 only having 30m PROW)
- I - Diversion of Nala with River training works – Near km 0+200 & km 16+450

0.32 River Training works

Near km 0+240 & km 16+450, the existing nala will divert and new flow alignment will be protected by appropriate provisions of river training works.

0.33 Marshy area

During site visit, it is found that from km 5+300 to km 6+700 (length – 1.4km) & from km 20+000 to 25+000 (for length of approx. 600m at different locations) is marshy land (De-composed soil) and need to soil treatment for base of embankment.

The details of Protection measures at this stretch is attached separately.

0.34 High Flood Level

With the enquiry of local people & irrigation/Flood department, it is observed that the maximum flood level found at site is approximate 1.2 m high than ground level, accordingly as per clause 4.2 (ii), page no. 42 of IRC SP-84: 2019, the bottom of subgrade kept minimum 1.0 high than HFL.

So the minimum height of FRL from ground level kept around 3.0m as detailed below –

- HFL from ground level – 1.20m



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- Subgrade bottom from Ground level – 2.20m
- Pavement crust including subgrade - 1.00m approx.

0.35 Rain water Harvesting

As per Ministry of Environment and Forests Notification, New Delhi dated 14/01/1997 (as amended on 13/01/1998, 05/01/1999 & 6/11/2000), the construction of Rain water, harvesting structure is mandatory in and around Water Crisis area, notified by the Central Ground Water Board.

Total 25 nos of Rain water Harvesting are proposed along the alignment.

0.36 Highway Lighting

The lighting work is proposed in entire length of alignment at median and road edge as shown in typical cross sections & shall be provided as per four lane manual.

0.37 Road Side furniture

Road side furniture shall be provided in accordance with Section 11 of the Manual of Specification and Standards for Four Laning of Highways through PPP.

0.38 Landscaping and Tree Plantation

Landscaping and tree plantation shall be provided in accordance with Section 12 of the Manual of specification and Standards for Four Laning of Highways through PPP.

0.39 Safety

Keeping view of these all features, a proper safety precautions are recommended on roadway width, the safety items to be provided are –

- i) W Beam Crash Barrier/ Concrete Crash Barrier on either side of carriageway,
- ii) Pavement Marking on Centre and edges lines,
- iii) Provide adequate warning of hazards,
- iv) Providing Bio-turfing for Slope protection,



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0.40 Utilities

The detail of utilities to be shifted is enclosed with drawing volume and the estimate of relocation will be submitted after obtaining it from concerned departments.

The Major Utilities to be relocated are Electric lines/ Poles, HT Tower, Hand pumps / water pipe lines etc.

The tentative cost for shifting of Utility is considered 32 Cr.

The HT line crossing the proposed alignment at following locations –

Chainage (HT Line Crossing)	FRL	OGL	Diff. In m	Height of HT wire from ground (m)	Diff. between proposed road top & HT wire (m)	Remarks
CH 2500.00	8.149	4.475	3.674	11.178	7.504	
CH 2960.00	10.492	4.921	5.571	13.04	7.469	
CH 5680.00	13.301	6.509	6.792	17.702	10.91	
CH 6260.00	13.983	4.008	9.975	30.219	20.244	
CH 8440.00	14.688	7.240	7.448	7.328	-0.12	
CH 8980.00	10.507	7.515	2.992	10.215	7.223	
CH 10260.00	12.710	7.223	5.487	10.843	5.356	
CH 11340.00	8.507	5.335	3.172	12.97	9.798	

