NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT CORPORATION LIMITED
(Ministry of Road Transport & Highways)
Government of India

NAME OF WORK:
Four Laning of Badarpur – Churaibari section of NH-37 & NH-8 from Design chainage 38.600 (End of proposed Badarpur Bypass) to Km. 62.800 (Start of proposed Nilambazar/Cheragi By-pass) in the state of Assam (Package-IV)

INTERNATIONAL COMPETITIVE BIDDING (ICB)
REQUEST FOR PROPOSAL (RFP)

Schedules
(A, B, C & D)

November 2023
3rd Floor, PTI Building, 4-Parliament Street, New Delhi – 110 001

Schedules

Schedule - A

(See Clause 10.1)

SITE OF THE PROJECT

1 THE SITE

1.1 The site of Four Lane Project Highway shall include land, buildings, structures & road works as described in Annex-I of this Schedule – A.

1.2 The dates of handing over the Right of Way to the Concessionaire are specified in Annex-VI of this Schedule-A.

1.3 An inventory of the Site including land, buildings, structures, road works, trees and any other immovable property on, or attached to, the site shall be prepared jointly by the Authority Representative and the Concessionaire, and such inventory shall form part of the memorandum referred to in clause 10.3.1 of the Agreement.

1.4 Additional land required for toll plaza, Traffic Aid post, medical aid post and vehicle rescue post or for construction of works specified in the Change of Scope Order issued under clause 16.2.3 of this Agreement shall be acquired in accordance with the provisions of Clause 10.3.6 of this Agreement. Upon acquisition, such land shall form part of the Site and vest in Authority.

1.5 The status of the clearances (Forest) obtained or awaited is given in Annex IV.

Annex - I
Schedule - A

Site for Project

1 Site

Site of the proposed Project Highway is a section of Silchar-Churaibari corridor under NHIDCL. Project section commences from Design chainage Km. 38.600 of NH-37 & NH-8, near end point of proposed Badarpur bypass of Karimganj district and ends at design chainage Km. 62.800 near start point of Nilambazar bypass of Karimganj district in the state of Assam. The land, carriageway and structures comprising the site are described below.

	Design Chainage (Km)	Easting#	Northing#
Start of Package	38.600	449695.133	2750501.416
End of Package	62.800	436486.599	2739102.495

#-UTM co-ordinates based on WGS 84 datum and 46N zone

An index map showing the existing features of the Project Highway is given at Annex II of Schedule -A. The design Chainage co-ordinates (centre line) at every 500m distance are given at Annex III of Schedule A.

2 Land

The Site of the Project Highway is an existing 2 lane with paved shoulder, existing ROW is 20m.

Sl.No	Design Chainage (Km)		Right of way (m)	Remarks
	From	To		
1	38.600	63.800	20	ROW is based on data collected from O/o EE, PWD, Karimganj

3 Carriageway

The details of existing carriageway are as given under:

Sl. No	Design Chainage (Km)		Length (km)	Carriageway (m)	Location
	From	To			
1	54.400	54.520	0.120	7.0m	End of Proposed Badarpur bypass to Start of Nilambazar bypass
2	55.660	62.400	6.740		

4 At Grade Intersections

Major Junctions

The details of major junctions are as follows:

Sl. No	Design Chainage (Km)	Type of Intersection	Leads To		Remarks
			Left	Right	
1	54.117	+	Hailakandi	Karimganj	Junction between NH-8 & SH-39

(NH: National Highway, SH: State Highway, MDR: Major District Road)

Minor Junctions

The details of minor junctions are as follows:

Sl.No	Design Chainage (Km)	Type of Intersection	Leads	
			LHS	RHS
1	54.759	Y	-	Karimganj
2	55.216	T	-	Saif Nagar
3	56.294	T	Road to Karim-ganj substation	-
4	57.895	T	Bhojendra nagar	-
5	58.964	T	Nairgram	Suprakandi
6	59.984	Staggered	Suprakandi Rail-way station	Suprakandi
7	60.968	T	Rampasha Pt I	-

In addition to above Minor junctions, there are crossroads (mud roads) which connect our MCW. The details are given below

Sr. No	Design Chainage (km)	Type of Intersection	Leads	
			LHS	RHS
1	38.740	T	Mud road	-
2	55.415	T	-	Mud road
3	55.520	T	Mud road	-
4	55.960	T	-	Mud road
5	56.110	T	Mud road	-
6	56.144	T	-	Mud road
7	56.929	+	Mud road	Mud road
8	57.130	T	Mud road	-
9	57.518	T	Mud road	-
10	58.121	T	Mud road	-
11	58.185	T	Mud road	-

Sr. No	Design Chainage (km)	Type of Intersection	Leads	
			LHS	RHS
12	58.214	T	Mud road	-
13	58.248	T	Mud road	-
14	58.280	+	Mud road	Mud road
15	58.396	T	Mud road	-
16	58.470	T	Mud road	-
17	58.530	T	-	Mud road
18	58.546	T	-	Mud road
19	58.572	T	Mud road	-
20	58.575	T	-	Mud road
21	58.623	T	-	Mud road
22	58.730	T	Mud road	-
23	58.864	T	Mud road	-
24	58.886	T	Mud road	-
25	58.965	+	Mud road	Mud road
26	59.110	T	Mud road	-
27	59.285	T	-	Mud road
28	60.955	T	Mud road	-
29	61.846	T	Mud road	-
30	62.615	T	Mud road	-

5 Service Roads / Slip roads

The details of Service Roads and Slip Roads are as follows.

Sl. No	Design Chainage (Km)		Roadway Width (m)	Side	Remarks
	From	To			
Nil					

6 Bypasses

The details of the bypasses are as follows.

Sl. No	Name of Bypass (Town)	Design Chainage (Km)		Length in (km)	Carriageway	
		From	To		Width (m)	Type

Nil

7 Major Bridges

The site includes the following major bridges.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length in me-tres)	Super Structure	Deck Width (m)
1	54.460	1 x 80.0	Truss Bridge	12.8

8 Minor Bridges

The site includes the following minor bridges.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length in meter)	Super Structure	Deck Width (m)
1	56.998	1 x 6.0	Box type	12.0
2	58.103	1 x 6.0	Box type	12.0
3	59.732	1 x 6.0	Box type	12.0
4	61.029	1 x 6.0	Box type	12.0

9 Causeways

The site includes the following causeways.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length)	Type of Structure	Deck Width (m)
Nil				

10 Road Over Bridge (ROB)

The site includes the following ROBs.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length in meter)	Super Structure	Deck Width (m)	Remarks
1	53.328	1 x 11.0m+1 x 24.5m+1 x 11.0m	Steel Composite	12.3	-

11 Road Under Bridge (RUB)

The site includes the following RUBs.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length)	Super Structure	Deck Width (m)	Remarks
Nil					

12 Grade Separators

The Site includes the following Grade Separators

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length)	Type of Structure	Deck Width (m)	Remarks
Nil					

13 Flyover

The Site includes the following Flyovers.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length)	Type of Structure	Deck Width (m)	Remarks
Nil					

14 Vehicular Underpasses

The Site includes the following vehicular underpasses.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length)	Type of Structure	Deck Width (m)	Remarks
Nil					

15 Vehicular Overpasses

The Site includes the following vehicular overpasses.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length)	Type of Structure	Deck Width (m)	Remarks
Nil					

16 Cattle/Pedestrian Underpasses

The Site includes the following Cattle/Pedestrian underpasses.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length)	Type of Structure	Deck Width (m)	Remarks
Nil					

17 Culverts

The Site has the following culverts.

17.1 Pipe Culverts

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Dia in meter)	Width (m)	Remarks
1	38.823	2 x 1.2	15.0	-
2	53.347	1 x 0.9	12.0	Culvert

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Dia in meter)	Width (m)	Remarks
				within ROB spans
3	53.804	1 x 0.9	25.0	-

17.2 Slab Culverts

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span in m)	Width(m)
Nil			

17.3 Box Culverts

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span in m)	Width(m)
Nil			

18 Railway Level Crossing

The Site includes the following Level Crossings:

Sl. No	Railway Chainage (Km)	Location
Nil		

19 Total number of structures

The total number of existing structures on the Project Highway is noted below:

Sl.No	Type of Structure	Nos
a	Major bridges	1
b	Minor Bridges	4
c	Causeways	0
d	ROBs	1
e	RUBs	0
f	Railway Level Crossings	0
g	Grade separators	0
h	Flyovers	0
i	Vehicular Underpasses	0
j	Vehicular Overpasses	0
k	Cattle /Pedestrian Underpasses	0
l	Pipe Culverts	3
m	Slab Culverts	0

Sl.No	Type of Structure	Nos
n	Box Culverts	0

20 Bus Bays & Truck Lay byes

The details of bus bays are as follows:

(a) No of Bus bays

Sl.No	Existing Chainage (Km)	Side	Remarks
Nil			

(b) No. of Bus Shelters

Sl.No	Design Chainage (Km)	Side	Remarks
1	55.230	RHS	-
2	57.900	LHS	-
3	58.950	RHS	-

(c) Truck Lay byes

Sl.No	Existing Chainage (Km)	Side	Remarks
Nil			

21 Wayside Amenities

The details of wayside amenities are as follows:

Sl. No	Existing Chainage (Km)	Location	Side	Remarks
Nil				

22 Toll plaza

The details of Toll Plaza are as follows:

Sl. No	Existing Chainage (Km)	Location	Side	Remarks
Nil				

23 Design Chainage corresponding to Existing Chainage

There are no visible Kilometer stones in our existing stretch. So, chainages provided in the schedule correspond to Design chainages.

24 Additional Features

a) Footpath:

Footpath of 1.5m exists along the project stretch at the following locations.

Sl. No	From (Km)	To (Km)	Side	Remarks
Nil				

b) Lined Drain:

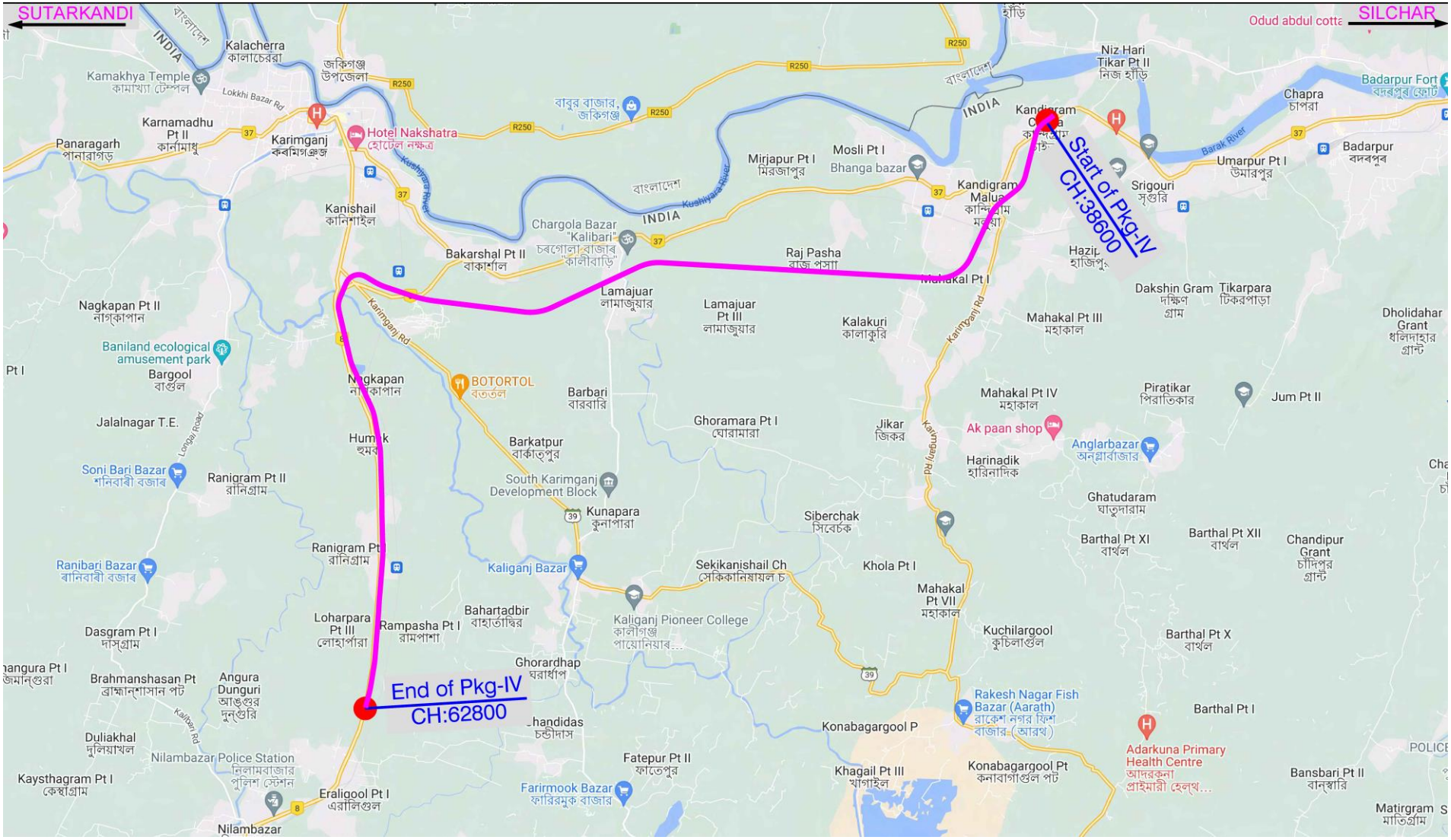
Lined Drain exists along the project stretch at the following locations.

Sl. No	From (Km)	To (Km)	Side	Remarks
1	59.752	59.811	LHS	-
2	59.760	59.992	RHS	-
3	59.833	59.970	LHS	-
4	59.989	60.026	LHS	-

25. Details of Existing Utilities

The site includes utilities Details at Annex-V of Schedule-A.

Annex II
Schedule - A



Index map of the Project Highway for Package-4

Annex III
Schedule - A

The co-ordinates of Centreline are given below: -

Centre Line Co-ordinates at every 500m Interval

S. No.	Design Chainage (Km.)	Northing	Easting
1	38.600	2750501.416	449695.133
2	39.000	2750187.293	449466.573
3	39.500	2749702.612	449343.755
4	40.000	2749234.238	449180.611
5	40.500	2748913.448	448798.305
6	41.000	2748504.101	448521.935
7	41.500	2748051.134	448310.228
8	42.000	2747626.299	448054.19
9	42.500	2747440.495	447601.391
10	43.000	2747466.058	447102.122
11	43.500	2747494.721	446602.944
12	44.000	2747523.384	446103.767
13	44.500	2747552.048	445604.589
14	45.000	2747580.711	445105.411
15	45.500	2747609.374	444606.233
16	46.000	2747638.037	444107.056
17	46.500	2747666.7	443607.878
18	47.000	2747695.364	443108.7
19	47.500	2747724.027	442609.522
20	48.000	2747745.849	442110.221
21	48.500	2747593.885	441637.886
22	49.000	2747382.491	441184.772
23	49.500	2747171.098	440731.657
24	50.000	2746959.704	440278.543
25	50.500	2746793.342	439809.804
26	51.000	2746823.042	439312.312

S. No.	Design Chainage (Km.)	Northing	Easting
27	51.500	2746884.153	438816.061
28	52.000	2746945.265	438319.81
29	52.500	2747006.576	437823.584
30	53.000	2747122.666	437338.081
31	53.500	2747281.148	436863.868
32	54.000	2747506.23	436419.113
33	54.500	2747226.34	436068.021
34	55.000	2746746.246	435996.261
35	55.500	2746259.213	436109.392
36	56.000	2745774.508	436230.9
37	56.500	2745319.137	436437.253
38	57.000	2744862.559	436640.631
39	57.500	2744372.721	436738.847
40	58.000	2743876.435	436790.209
41	58.500	2743376.646	436804.752
42	59.000	2742876.759	436812.015
43	59.500	2742376.926	436824.922
44	60.000	2741877.497	436814.713
45	60.500	2741379.036	436775.551
46	61.000	2740880.348	436739.925
47	61.500	2740381.845	436701.261
48	62.000	2739884.593	436651.446
49	62.500	2739392.743	436562.471
50	62.800	2739102.495	436486.599

Northing and Easting in UTM co-ordinates are based on WGS84 as datum and Zone 46N

Plan & Profile are attached as annexure

Annex IV
Schedule - A

Environment and Forest Clearances

1. Forest Clearance: - This package has no forest section. Forest clearance is not required in this package.

2. Environmental Clearance: - No Environmental Clearance is required for this project.

Annex V
Schedule - A
Utilities

The Site includes the following Utilities.

i) Electrical Utilities

(i) High Tension/Low Tension lines (HT/LT Lines)

S.no	Chainage		Electrical poles (Nos)			Crossings			Transformer		Re-marks
	From Km.	To Km.	11KV	33KV	LT	11KV	33KV	LT	No	Capaci-ty	
1	38.600	39.000	9		8	1					
2	40.000	41.000		2	2	1	1	1			
3	41.000	42.000		8	4		4				
4	42.000	43.000			2		1	2			
5	48.000	49.000			6		1	5			
6	50.000	51.000		6			2				
7	51.000	52.000		6			2				
8	52.000	53.000		4			1				
9	53.000	54.000	10	38		2	2				
10	54.000	55.000	14	48	5	3	6				
11	55.000	56.000	38	46		4	3		1		
12	56.000	57.000	20	62	5	3	4	2	1		
13	57.000	58.000	6	55	4		4		2		
14	58.000	59.000		48			3	5	2		
15	59.000	60.000		55	30		4	4	2		
16	60.000	61.000		64	15		4	1	2		
17	61.000	62.000		60	8		2	2	1		
18	62.000	62.800		82	10		5		3		

(ii) Extra High Tension lines (EHT Lines)

S No	Chainage		Length (in Km)				Crossings					
			400 KV	220 KV	110 KV	66 KV	800 KV	765 KV	400 KV	220KV	132 KV	66 KV
	From Km.	To Km.										
Nil												

ii) Public Health utilities (Water/Sewage Pipelines)

S No	Chainage		Length (in Km)				Crossings			
			Water Supply line		Sewage line		Water Supply line		Sewage line	
	From Km.	To Km.	With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity
1	38.600	38.850	0.250	-						
2	40.100	40.300					2			
3	40.420	40.620					2			
4	41.450	42.550					2			
5	48.315	48.540	0.225	-			2			
6	48.340	48.540	0.200	-						
7	56.050	56.140	0.090	-						
8	56.140	56.560	0.840	-						
9	56.560	56.650	0.180	-						
10	56.650	56.880	0.460	-						
11	56.950	57.050					1			
12	57.240	57.650	0.820	-						
13	57.700	57.800	0.100	-						
14	57.880	58.290	0.410	-						
15	58.300	58.530	0.460	-						
16	58.530	58.850	0.640	-						

S No	Chainage		Length (in Km)				Crossings			
			Water Supply line		Sewage line		Water Supply line		Sewage line	
	From Km.	To Km.	With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity
17	58.850	58.980	0.260	-						
18	58.980	59.700	1.440	-			1			
19	59.760	59.880	0.240	-			1			
20	59.880	59.990	0.220	-						
21	59.990	60.420	0.430	-						
22	61.000	62.800	1.800	-						

*- Details of underground utilities will be finalized with consultation of IE/NHIDCL

iii) Any other lines –

Indraprastha Gas Limited (IGL) pipeline crosses our project corridor at Km. 55+742. ROU of IGL pipeline is 20m.

Annex VI
Schedule - A
ROW

A part of the proposed alignment is construction of a new bypass, and a part is widening of existing corridor. As per the details provided by O/o EE PWD, Karimganj, the existing ROW is 20m. A minimum of 45m ROW has been proposed for the entire project corridor. LA activities are in progress. The status of 3(A) is 100% and 3D is yet to start.

Dates for providing Right of Way of Construction Zone

The dates on which the Authority shall provide Right of Way of Construction Zone to the Concessionaire on different stretches of the Site are stated below:

SL No.	From (Km)	To (Km)	Length (Km)	Date of providing RoW
1	38.600	62.800	24.200	80% RoW to be handed over on Appointed Date

SCHEDULE-B

(See Clause 2.1)

DEVELOPMENT OF THE PROJECT HIGHWAY

1. Development of the Project

Development of the Project Highway shall include detailed design, including plan & profile within available proposed ROW and construction of the project highway as described in Schedule-B and Schedule-C. The alignment plans of the Project Highway, which is minimum requirement and are for guidance only. The proposed plan and profile, locations of different structures/drains/service & slip road/RE walls, Chainages of different structures/drains/service & slip road/RE walls, length of different structures/drains/service & slip road/RE walls etc., of the Project highway as indicated in the Schedule-A, Schedule-B, Schedule-C and their Annexures, shall be treated as an approximate assessment and as minimum requirement. Based on site/design requirement, the Concessionaire shall finalise Detailed Project Report (DPR) including plan and profile of the project highway and submit the same to Authority and Independent Engineer for acceptance, before the start of the execution of Project.

Based on accepted DPR including Plan & profile prepared by the Concessionaire, the detailed work program prepared with Network Method (PERT/CPM) shall be prepared along with commensurate deployment of all resources and got approved from Engineer before start of civil work. Any required changes in scope of work given in Schedule B and Schedule C, including any variation in standard, shall be finalized by both the parties before start of actual civil work.

Requirement specifically mentioned in Schedule B and Schedule C shall prevail over general requirements given in Manual mentioned in Schedule-D.

2. Project Highway (Four-Laning)

Construction shall include Four Lane with Paved shoulders configuration from End of Badarpur Bypass (Design chainage Km. 38.600) to Start of Nilambazar/Cheragi bypass (Design chainage Km 62+800) in the state of Assam as described in Annex-I of Schedule-B and in Schedule-C.

3. Specifications & Standards

The Project Highway shall be designed and constructed by the Agency/Concessionaire in conformity with the Specifications and Standards set forth in **Annex-I** of **Schedule-D**.

Annex – I
(Schedule – B)

Description of the Project

Development of 4 lane Highway, from End of Badarpur bypass (Design Chainage. 38.600) to Start of Nilambazar bypass (Design Chainage. 62.800) of Silchar- Churaibari Corridor on HAM Mode under in the State of Assam (Package-4).

1 Development of the Project Highway

The Project Highway shall generally follow the horizontal alignment, unless otherwise specified by the Authority. Notwithstanding anything to the contrary contained in this Agreement or IRC: SP:84, the proposed plan & profile. locations of different structures/drains/service & slip road/RE walls, chainages of different structures/drains/service & slip road/RE walls, length of different structures/drains/service & slip road/RE walls etc. of the project highway as indicated in the Schedule A, Schedule B, Schedule C and their Annexures shall be treated as minimum requirement. Based on site/design requirement, the Concessionaire shall finalise their Detailed Designs (Development Stage) including plan & profile of the project highway and submit the same to Authority & its Engineer for its Consent/Approval and Safety Audit by Safety Auditor before the start of the execution of project. The designs so approved shall not be in contradiction with the scope of project. For avoidance of doubt, the provisions mentioned in schedule B & C cannot be changed, only the design of the components is to be submitted for consent/approval.
Any changes in the finally accepted DPR in respect of the proposed provision in Schedule B and Schedule C shall not constitute a change of scope, save and except any variations arising out of a change of scope expressly undertaken in accordance with the provision of Article 16.

1.1 Width of Carriageway

1.1.1 Four Laning with paved shoulders shall be undertaken. As per TCS drawings, MCW with shyness is 18.0m (including paved shoulder). The earthen shoulder shall be 2.0 metres on either side. (Circular: NHAI/ Bharatmala/ EC/ DPR/ 2016/ 143430)

1.1.2 In built-up sections/areas the width of paved carriageway shall be 19.90m for four laning (including paved shoulder)

1.1.3 Except as otherwise provided in this Agreement, the width shall be adjusted to fit into appropriate plans and cross sections developed in accordance with TCS enclosed.

1.1.4 The entire cross-sectional elements shall be accommodated in the available/proposed ROW. Consultant must mention specifically such areas in Schedule-B). If required, suitable retaining structures shall be provided to accommodate the highway cross section within the available/ proposed ROW. The details of such sections are mentioned in Schedule-B. In case of any other section not included in Schedule-B, where retaining structures are to be provided, shall constitute a Change of Scope.

1.1.5 The Project Highway shall follow the existing alignment unless otherwise specified by the Authority and shown in the alignment plan& Profile specified in Annex-III of Schedule-A. The Concessionaire shall, however, improve/upgrade the Road profile as indicated in Annex-III of Schedule A based on site/design requirement. However, in any case, the bottom of sub-grade shall be 1m above HFL/Water Table level. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for [plain/rolling] terrain to the extent land is available.

1.2 Width of Median

1.2.1 The width of median including kerb shyness shall be 5 metre for flush median. In built up section the width of median shall be 2.5 metre

1.2.2 A suitable paving (paver blocks, etc.) shall be proposed in case of flush median to prevent spreading of soil on carriageway (clause No. 6.3.2 IRC:SP:84-2019)

1.2.3 Suitable anti-glare measures shall be proposed. (Clause No. 2.5.6 IRC: SP:84 2019)

1.3 Project Facilities

Project Facilities shall be constructed in conformity with Annex-I of Schedule-C.

1.4 Specifications and Standards

The Project Highway shall be constructed in conformity with the Specifications and Standards specified in **Annex – I** of **Schedule – D**.

Specifications for Building works: All buildings shall be constructed in conformity with the Specifications and Standards specified in CPWD manuals /norms.

Specifications for Electrical works: All electrical works shall be constructed in conformity with the Specifications and Standards specified by Assam State Electricity department.

2 Geometric Design and General Features

2.1 **General:** Geometric design and general features of the Project Highway shall be in accordance with Section 2 of the manual. Intermediate Sight distance (Desirable Minimum Sight Distance) shall be followed for design of all vertical curves including structures as well as highways. (clause No. 2.9.5 IRC: SP:84-2019).

2.2 **Design Speed:** The project road shall be designed for 100 Kmph for plain terrain. (clause No. 2.2 IRC: SP:84-2019)

2.3 Improvement of the existing road geometrics

2.3.1 The existing road geometrics shall be improved as per the codal provisions. In the sections, where improvement of the existing road geometrics to the prescribed standards is not possible, the existing road geometrics shall be improved to the extent possible within the given right of way and appropriate road signs, pavement markings and safety measures shall be provided.

S. No	Stretch (Design Chainage Km)		Type of Deficiency	Remarks
	From	To		
1	53.870	54.400	Broken back curve	Geometry couldn't be improved due to existing MJB and ROB. Design speed – 80Kmph

2.3.2 The entire cross-sectional elements shall be accommodated in the available/proposed ROW. If required, suitable full height retaining structures shall be provided to accommodate the highway cross section within the available/ proposed ROW. The details of such sections are mentioned in Schedule-B. In case of any other section not included in Schedule-B, where retaining structures are to be provided, shall constitute a Change of Scope.

2.3.3 **Realignments:** The existing road shall be improved to the standards as specified in the manual at the following locations.

S. No	Design Chainage (Km)		Length (km)	Location
	From	To		
Nil				

2.3.4 Bypasses: The existing road shall be bypassed to the standards as specified in the manual at the following locations.

S. No	Design Chainage (Km)		Length (km)	Location
	From	To		
1	38.600	53.100	14.500	Bhanga bypass

2.4 Right of Way

Details of the Right of Way along Project Highways are given in Annexure-VI of Schedule-A and proposed ROW as given below.

S.No	Stretches		Length (in Km)	ROW width (in m)	Remarks
	From (Km)	To (Km)			
1	38.600	53.300	14.700	60	Except at proposed Rest area & proposed new lane ROB
2	53.300	62.800	9.500	45	

Note:
The Concessionaire shall design the horizontal and vertical geometrics within the available/proposed ROW as detailed in Annexure-III of Schedule A and in consultation with IE/AE.

2.5 Type of shoulders

2.5.1 The Design Specification of paved shoulders shall conform to the requirements specified in paragraph 5.10 of the manual.

2.5.2 Paved shoulders and strip on median side shall be of same specification and pavement composition as of main carriageway. (Clause No. 5.10 IRC SP:84-2019)

2.5.3 The overlay on the main carriageway pavement and on the paved shoulders shall be uniform in thickness and composition (Clause No. 5.10 IRC SP:84-2019)

2.5.4 In Built-up sections, footpaths/fully paved shoulder shall be provided with width 1.5m/2.0m respectively. (Clause No. 2.6 & clause No. 2.6 IRC: SP:84-2014)

2.5.5 In open country, paved shoulders of 1.5m width shall be provided.

2.5.6 The Design Specification of paved shoulders shall conform to the requirements specified in paragraph 5.11 of the manual.

2.5.7 The earthen shoulder of 2.0m width on shoulder side shall be provided with top 150 mm

on earthen shoulder with well graded naturals and morrum gravel crust stones or combination thereof, confirming to Clause 401 of MoRTH specification.

2.6 Lateral and Vertical Clearance at Underpasses

2.6.1 In case of VUP/ LVUP/ SVUP, the proposed structure, the Finished Road Level in VUP/ LVUP/ SVUP shall be kept 150 mm above the ground level/service road/ crossroad (whichever is higher) to ensure that these VUP/ LVUP/ SVUP don't become water accumulation points.

2.6.2 The vertical and horizontal clearance at the underpasses shall be as per Clause 2.10.2 of the manual.

2.7 Lateral and vertical clearances at Overpasses

2.7.1 Lateral and vertical clearances for overpasses shall be as per paragraph 2.11 of the Manual.

2.7.2 Lateral clearance: The width of the opening at the Overpasses shall be as follows:

Sr. No.	Location Chainage (Km)	Span/opening (m)	Remarks
NIL			

(MCW – main carriageway**, LHS** – Left Hand Side and **RHS** – Right Hand Side**)**

2.8 Service roads/Slip roads

2.8.1 Service Road: The height of embankment of service road shall confirm to clause 4.2.1 of IRC: SP 84 - 2019

2.8.2 The service roads shall be constructed at the locations and for the lengths indicated below:

Sr.No.	Design Chainage (Km)		Length (Km)		Paved Carriageway Width including shyness(m)	Total Length (kms)	Remarks
	From	To	LHS	RHS			
1	58.950	59.380	0.430	0.430	7.50	0.860	-
Sub-Total on each side (km)			0.430	0.430			
Total length on both sides (km)						0.860	

Note: Length provided here are tentative. Any increase/decrease in length from the length specified in this Clause of Schedule-B shall not constitute a Change of Scope.

2.8.3 Parking bays

The parking bays shall be provided along service road (clause no 2.12.2.1 IRC SP:84-2019)

Sr.No.	Design Chainage of Parking Bay		Remarks
	LHS Service Road	RHS Service Road	
- NIL -			

2.8.4 Slip Road: The height of embankment of slop road shall confirm to clause 4.2.1 (clause No. 4.2.1 IRC SP: 84-2019)

The slip roads shall be constructed at the locations and for the lengths indicated below:

Sr.No.	Design Chainage (Km)		Length (Km)		Paved Carriageway Width including shyness(m)	Total length (km)	Remarks
	From	To	LHS	RHS			
1	40.170	40.530	0.360	0.360	7.250	0.720	-
2	52.360	53.100	0.740	-	7.250	0.740	-
3	52.360	52.750	-	0.390	7.250	0.390	
4	54.700	55.550	0.850	0.850	7.500	1.700	-
5	59.380	60.610	1.230	1.230	7.500	2.460	
6	62.660	62.800	0.140	0.140	7.500	0.280	
Subtotal on each side in Km			3.320	2.970			
Total length on both sides (km)						6.290	

Note: Length provided here are tentative. Any increase/decrease in length from the length specified in this Clause of Schedule-B shall not constitute a Change of Scope.

2.8.5 Connecting Roads

Below Mentioned connecting roads shall be developed as Mud Road for connecting the existing crossroad/Bund Road.

S.No	Design Chainage (Km)		Length(m)	
	From	To	LHS	RHS
Nil				

2.8.6 Separator Between Main Carriageway and Service/Slip Road **(clause No. 2.15.1 IRC:SP:84-2019)**

A separator between main carriageway and service/slip road shall be provided to prevent the pedestrians, local vehicles and animals entering the highway.

Note:

a. Above length of the service/slip roads is minimum specified. The actual length of the service/slip/connecting roads shall be determined by the Concessionaire in accordance with the approved plan & profile and design approved from the Independent Engineer. **Any increase/decrease up to 5 percent length from the length specified in this Clause of Schedule-B shall not constitute a Change of Scope. Any additional length shall be dealt in Change of Scope.**

b. The Acceleration, deceleration lane, right turning storage lane, entry/exit lanes shall be constructed in addition to length given in above table and shall be deemed to be part of the scope and no Change of Scope shall be considered for the same. **(Clause No. 2.12.2 IRC: SP:84-2019)**

2.9 Grade Separated Structures

Grade separated structures shall be constructed as per paragraph 2.13 of the Manual. Proposed levels at structure locations as shown in plan & profiles are minimum requirement and only for guidance and any increase in levels shall not constitute any change of scope. Entry/Exit arrangement from main carriageway shall be 50m before/after the start/end of approach road to grade separator i.e., start/end of valley curve (clause No. 2.12.2.2 IRC:

SP:84-2019). RCC barrier shall start from start of valley curve and end after grade separator at end of valley curve. (clause No. 2.12.2.2 IRC:SP:84-2019)

The sub-structure shall be continued in the median portion with RCC barrier wherever super-structure has not been proposed in median portion. (Clause 7.1 (vii) IRC: SP:84-2019).

50m long MBCB Safety barriers on structure approaches shall be provided on all four faces of each structure. MBCB provided towards median side of each structure shall be joined on ends in semi-circular shape. (Clause No. 4.3.5 and 4.9, IRC 119)

2.5m/1.5m/0.75m wide footpaths shall be provided at grade intersection below structures for each direction of pedestrian movement (refer fig 3.1 to 3.6 IRC: SP:84-2019).

Suitable longitudinal drain connectivity shall be provided for existing crossroads at proposed underpass locations. Drain should be designed for vehicle loading.

The requisite particulars are given below:

2.9.1 Vehicle Overpass (VOP)

Sr. No.	Design Chainage (Km)	LHS Roadway Width (m)	RHS Roadway Width (m)	Super Structure Provision in Median	Span Arrangement (m)	Minimum Vertical Clearance (m)	Skew Angle (to be specified)	Remarks
Nil								

2.9.2 Vehicle Underpasses (VUP)

Sr.No.	Design Chainage (Km)	LHS Roadway Width (m)	RHS Roadway Width (m	Super Structure Provision in Median	Span Arrangement (m) (clear)	Minimum Vertical Clearance (m)	Skew Angle	Remarks
1	40.522	11.0	11.0	Open to sky	1 x 20.0	5.5	-	-
2	52.750	11.0	11.0	Open to sky	1 x 20.0	5.5	-	-
3	54.117	11.0	11.0	Open to sky	1 x 20.0	5.5	30°	-
4	55.046	11.0	11.0	Open to sky	1 x 30.0	5.5	25°	NH-37 Spur to Karimganj
5	59.983	11.0	11.0	Open to sky	1 x 20.0	5.5	-	-

*-Crossroads under Underpasses are to be developed for 50.0m on either side and shall not constitute change of scope

2.9.3 Light Vehicle Underpass (LVUP)

Sr.No.	Design Chainage (Km)	LHS Roadway Width (m)	RHS Roadway Width (m)	Super Structure Provision in Median	Span Arrangement (m)(clear)	Minimum Vertical Clearance (m)	Skew Angle(to be specified)	Remarks
1	41.468	11.5	11.5	Open to sky	1 x 12.0	4.0	20°	

Sr.No.	Design Chainage (Km)	LHS Road-way Width (m)	RHS Roadway Width (m)	Super Struc-ture Provi-sion in Median	Span Ar-range-ment (m)(clea r)	Minimum Vertical Clear-ance (m)	Skew An-gle(to be speci-fied)	Re-marks
2	42.811	11.5	11.5	Open to sky	1 x 12.0	4.0	12º	
3	46.878	11.5	11.5	Open to sky	1 x 12.0	4.0	0º	
4	50.858	11.5	11.5	Open to sky	1 x 20.0	4.0	17 º	LVUP cum Culvert

*-Crossroads under Underpasses are to be developed for 50.0m on either side and shall not constitute change of scope

2.9.4 Cattle and Pedestrian underpass

Sr.No.	Design Chainage(Km)	LHS Roadway Width (m)	RHS Roadway Width (m	Super Structure Provision in Median	Span Arrangement (m)	Minimum Vertical Clearance (m)	Skew Angle(to be specified)	Remarks
NIL								

2.9.5 Interchanges (IC) (Clause No. 3.4 IRC SP 84-2019)

Sr.No.	Design Chainage(Km)	Name of structure	Span Arrangement (m)	Typical cross section	Remarks
NIL					

Note: Layout, Geometric design and TCS of interchange shall be included by DPR consultant in Annexure-III to schedule B

2.9.6 Details of Ramps, Crossroads and Connecting Roads at Interchanges

Sr. No.	Carriageway Widths including Kerb Shyness	Length (m)	Description of Ramps, Crossroads and Connecting Roads	Remarks
- NIL -				

Note for 2.9:

- For grade separated structures(interchange and underpass), span arrangement mentioned above is tentative and may be changed based on design of structure, latest construction techniques and aesthetics. The span length mentioned in the table is the optimum and should not be further re-

duced. The actual lengths required for each structure by detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Any increase in the lengths specified in this Schedule shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.

- Lateral and vertical clearances for overpasses and provision of guardrails/crash barriers shall be as per paragraph 2.11 of the Manual.
- All structures shall be designed and constructed in accordance with Section 7 of the Manual and shall conform to all the cross-sectional features and details specified in Appendices of this Schedule.
- Finished Road levels at structure locations as shown in plan & profile of Appendix of the schedule are only for guidance. Any changes in levels shall not constitute a change of scope.
- IRC Special vehicle loading is to be considered in Design of structures as per the code guidelines. Congestion factor to be considered as per recommendation of IRC 6-2017
- Wherever liquefaction is observed, ground improvement measures shall be done to compact to improve the penetration resistance and satisfy as per clause 8.4.4 (v) of IRC114.
- Any structures falling within acceleration / deceleration lane /merging and demerging shall be constructed to meet the cross section of highway to the required width of road. These changes shall not be treated as a change of scope.
- Any additional LVUP/VUP not provided for in Schedule B but required during the execution of work will be dealt with under the provisions of Article 16.
- Expansion joints shall be minimized by deck continuity/diaphragm continuity/continuous superstructure over multiple spans. Deck length between the two expansion joints shall not be less than 120m except where structure length falls short of it. Expansion joints shall be Finger joint type in compliance with IRC:SP:69-2011, Table 5.4.1 criteria for adoption of different types of expansion joints. Concessionaires shall ensure quality control as per good industry practice and shall ensure presence of manufacturer of expansion joints at the time of installation for quality control supervision.
- The approach length of the crossroad for overpass shall be developed as per site requirement in consultation with IE/NHIDCL.
- Deck width shown in above table shall be the width perpendicular to the alignment of the roads.

2.10 Typical Cross Section (TCS) of the Project Highway

S. No.	Design Chainage (Km)		Length (m)	TCS	Remarks
	From	To			
1	38.600	40.170	1570	I	
2	40.170	40.530	360	II	
3	40.530	52.360	11830	I	
4	52.360	53.100	740	II	
5	53.100	54.380	1280	I	
6	54.380	54.520	140	IV	

7	54.520	54.700	180	I	
8	54.700	55.550	850	VI	
9	55.550	56.100	550	III	
10	56.100	58.950	2850	IV	
11	58.950	59.380	430	V	
12	59.380	60.610	1230	VI	
13	60.610	62.450	1840	IV	
14	62.450	62.660	210	III	
15	62.660	62.800	140	VI	

*-TCS drawings are attached in Annexure – II of Schedule - B.

At Structure locations, TCS of Structures mentioned in Annexure-II of Schedule B will be applicable.

The design consultant during design shall ensure the cross section confirming to the details given above.

Note:

1) Any variations in the lengths specified in the above table shall not constitute a Change of Scope
2) Lengths mentioned in the above list for cross section types concerned to structures are inclusive of structure length.
3) Retaining wall/ RE wall shall be provided for full height on all structures.
4) **Toe wall (0.6m ht) to be provided where ROW is restricted and at water bodies along the proposed highway on the sections specified in Schedule-B.**
5) Chainages may be adjusted according to location of structures as per drawings.
6) For example (The design Consultant must clearly mention the changes from the cross section shown in the manual).
7) Carriageway width tapering shall be provided 1 in 50 as per manual.

   (Clause no 2.5.4. IRC: SP:84-2019)

   Intermediate Sight Distance (Desirable Minimum Sight Distance) shall be followed for design of all vertical curves (Summit and Valley Curves) including structures as well as highways.

   (Clause No. 2.9.5 IRC: SP:84-2019)
8) Provide detailing of placement and specification of Railing, Fencing and electric poles, etc. **(Clause No. 2.17 IRC: SP:84-2019)**

3 Intersections and Grade Separated Intersections (Section 3, IRC SP 84 -2019)

All at-grade intersections and grade separated intersections shall be as per Section 3 of the manual. Existing at-grade intersections shall be improved to the prescribed standards.

The service road pavement composition shall be continued on crossroads of the intersections for the length specified for at-grade and grade separated intersections.

Properly designed intersections shall be provided at the locations and of types and features given in the tables below:

3.1 At-grade intersections:(clause no. 3.2 IRC SP 84-2019)

(a) Major Junctions:

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriage way width of crossroad	Length of crossroad to be developed (m)	
			LHS	RHS				LHS	RHS
1	38.850	T	-	Bhanga bazar	No	Y	9.40	50	50
2	52.750	T	-	Karimganj	No	T	10.00	50	50
3	55.046	T	-	Sutarkandi	No	T	15.00	50	50

Note: Layout, Geometric design of Major junction shall be included by DPR consultant in Annexure-III to schedule B

(b) Minor Junctions:

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriage way width of crossroad	Length of crossroad to be developed (m)		Remarks
			LHS	RHS				LHS	RHS	
1	54.759#	Y		Karimganj	No	MDR	7.00	15.0	15.0	Connected to Slip road
2	55.228#	T	-	Saif Nagar	No	VR	6.0	15.0	15.0	
3	56.294	T	Karimganj Substation	-	No	VR	6.50	15.0	-	
4	57.895	T	Bhojendra Nagar	-	No	VR	5.5	15.0	-	
5	58.964#	T	Nairgram	-	No	VR	5.5	15.0	-	Connected to Service road
6	59.984#	Staggered	Suprakandi Railway station	Suprakandi	No	VR	5.00	15.0	15.0	Connected to slip road
7	60.968	T	Rampasha Pt I	-	No	VR	4.00	15.0	-	

- Above mentioned crossroads are connected to Slip roads/service roads at underpass locations. There will not be any median openings at these junctions (Left in and Left out only)

Sr. No	Design Chainage (km)	Type of Intersection	Leads		Median Opening	Category of Cross Road	Carriage-way width of cross-road	Length of crossroad to be developed (m)		Remarks
			LHS	RHS				LHS	RHS	
1	38.740	T	Mud road	-	No	Mud road	6.0	15	-	

Sr. No	Design Chainage (km)	Type of Intersec-tion	Leads		Median Opening	Catego-ry of Cross Road	Car-riage-way width of cross-road	Length of crossroad to be devel-oped (m)		Re-marks
			LHS	RHS				LHS	RHS	
2	55.415*	T	-	Mud road	No	Mud road	4.0	-	15	
3	55.520*	T	Mud road	-	No	Mud road	4.0	-	15	
4	55.960	T	-	Mud road	No	Mud road	4.0	-	15	
5	56.110	T	Mud road	-	No	Mud road	4.0	-	15	
6	56.144	T	-	Mud road	No	Mud road	4.5	-	15	
7	56.929	+	Mud road	Mud road	No	Mud road	9.0	-	15	
8	57.130	T	Mud road	-	No	Mud road	3.0	15	-	
9	57.518	T	Mud road	-	No	Mud road	3.0	15	-	
10	58.121	T	Mud road	-	No	Mud road	3.0	15	-	
11	58.185	T	Mud road	-	No	Mud road	3.0	15	-	
12	58.214	T	Mud road	-	No	Mud road	3.0	15	-	
13	58.248	T	Mud road	-	No	Mud road	4.0	15	-	
14	58.280	+	Mud road	Mud road	No	Mud road	3.0	15	15	
15	58.396	T	Mud road	-	No	Mud road	3.0	15	-	
16	58.470	T	Mud road	-	No	Mud road	3.0	15	-	
17	58.530	T	-	Mud road	No	Mud road	4.0	-	15	
18	58.546	T	-	Mud road	No	Mud road	4.0	-	15	
19	58.572	T	Mud road	-	No	Mud road	3.0	15	-	
20	58.575	T	-	Mud road	No	Mud road	4.0	-	15	
21	58.623	T	-	Mud road	No	Mud road	4.0	-	15	
22	58.730	T	Mud road	-	No	Mud road	4.0	15	-	
23	58.864	T	Mud road	-	No	Mud road	4.0	15	-	
24	58.886	T	Mud road	-	No	Mud road	3.0	15	-	
25	58.965*	+	Mud road	Mud road	No	Mud	6.0	15	15	

Sr. No	Design Chainage (km)	Type of Intersec-tion	Leads		Median Opening	Catego-ry of Cross Road	Car-riage-way width of cross-road	Length of crossroad to be devel-oped (m)		Re-marks
			LHS	RHS				LHS	RHS	
						road				
26	59.110*	T	Mud road	-	No	Mud road	3.0	15	-	
27	59.285	T	-	Mud road	No	Mud road	4.0	-	15	
28	60.955	T	Mud road	-	No	Mud road	4.0	15	-	
29	61.846	T	Mud road	-	No	Mud road	4.0	15	-	
30	62.615	T	Mud road	-	No	Mud road	4.0	15	-	

*- Crossroads are connected to Slip Road/Service Road.
Others are connected to MCW.

Note:

- Type of Junction to be improved as per manual. (clause No. 3.2.5 IRC:SP:84-2019)
- The Concessionaire shall take up 'Detailed Engineering study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in section-3 of the manual. Auxiliary lanes including storage, acceleration, and deceleration lane along with physical islands to be provided. The crossroad at the junctions which are having a level difference from the main carriage-way, are to be improved at the level of main carriageway for the length of 30 metre and then to be merged with the crossroad at the gradient not more than 1:50. (Clause No. 3.2.2 IRC: SP:84-2019)
- For minor / major layout for left-in / left out arrangement with physical islands with haz-ard marking. Where there is space constraint to provide physical islands, the effect of junction kept wide opened can be avoided by ghost island with marking. (Fig 3.7, IRC: SP:84-2019)
- For U-turn, Self-Regulated U-Turn facility shall be created. (Fig 3.6 IRC:SP:84-2019)

3.2 At-Grade Intersections below Grade Separators/Interchanges: (clause No. 3.4.7 of IRC: SP:84-2019)

Sr. No	Design Chainag e (Km)	Junc-tion Type	Leads to		U-Turn provi-sion in Viaduct Spans	Catego-ry of Cross Road	Car-riage-way width of cross-road	Length of crossroad to be de-veloped (m)		Re-marks
			LHS	RHS				LHS	RHS	
1	40.522	+	-	Mokoi Bhanga	Yes	MDR	7.00	50.0	50.0	VUP
2	52.750	+	Medal	Bhatgram	Yes	NH	7.00	-	50.0	VUP
3	54.117	+	Karimganj	Barkatpur		SH	7.00	50.0	50.0	VUP

4	55.046	+	Medal	Kanisail Pt II	Yes	NH	7.00	50.0	50.0	VUP
5	59.983	+	Su-prakandi Railway Station	Krishnana-gar	Yes	NH	7.00	50.0	50.0	VUP

Note:

(i) The Concessionaire shall take up 'Detailed Engineering study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in section-3 of manual.

(ii) Junction improvement under grade separators shall be carried out as per manual with proper entry/exit to crossroads and slip/service roads, etc. Auxiliary lanes including storage, acceleration and deceleration lane along with physical islands to be provided.

(iii) Location of grade-separated structures are indicative. Exact location should be decided in consultation with Independent Engineer

(iv) Intersection Layout, Entry/Exit, Right Turning Lane, U-Turns, Geometric Design and Typical Cross Sections of Interchange shall be included by DPR consultant in Annexure to schedule-B.

(v) Only Entry or Exit shall be designed at any location (provision of entry/exit by ghost island not permitted). (Clause No. 2.13.1 IRC: SP:84-2019)

4 Road Embankment and Cut Section

Construction of road embankment/cuttings shall conform to the Specifications and Standards given in section 4 of the manual. Notwithstanding anything to the contrary contained in this Agreement or Manual, the proposed profile of the project highway as indicated in the Annex-III of Schedule B shall be treated as minimum requirement.

Based on site/design requirement, the Concessionaire shall design the alignment plans and profiles of the project highway based on site/design requirement mentioned in Schedule B with approval from the Independent Engineer/Authority Engineer within the available Right of Way. However, it is clarified that bottom of subgrade level shall be at-least 1500 mm above HFL/Existing ground level whichever is higher for a greenfield/ bypass stretch.

The side slopes shall not be steeper than 2H:1V. In case, there is a ROW constraint than, suitable soil retaining structures shall be provided. **(Clause No. 4.2 IRC: SP:84-2019)**

For stability of slope upto 3 metre height the turfing can be adapted. For the slope from 3-6 metre suitable, geocell, geo-grid, geo-green etc. can be provided with suitable drainage chutes as per IRC 56. For the slope more than 6 metre height, a complete slope stability analysis as per IRC:75 shall be done, and the slopes shall be compulsory protected with stone pitching within stone masonry grid structure of 4x4 metre and suitable drains/chutes etc. shall be provided for effective drainage of the water.

Use of Pond Ash and Design of Pond Ash embankment shall be specified (Clause No. 4.2.4 & 4.4.4.i (d) IRC: SP:84-2019)

5 Pavement design

5.1 Pavement design shall be carried out in accordance with Section 5 of the Manual.

5.2 Type of Pavement and Design requirement (Clause No. 5.4 IRC: SP:84-2019/ IRC: SP:87-2019)

The pavement shall be flexible/rigid type for entire length of project highway except for toll plaza locations where rigid pavement shall be provided.

5.2.1 Design Period and Strategy Pavement shall be constructed for the entire length of Project Highway including paved shoulders. Flexible Pavement shall be designed for a minimum design period of 20 years and minimum effective CBR of 8%.

5.2.2 Recommended Pavement Design Notwithstanding anything to the contrary contained in this Agreement or the manual, the Concessionaire shall design the pavement of main carriageway for design traffic of 90 MSA.

5.2.3 The pavement for service road/slip roads shall be designed for projected traffic 20 MSA subject to minimum as follows. (Clause No. 5.5.4 IRC: SP:84-2019)

(i) Service Roads in Built up areas for minimum 20 MSA.

(ii) Slip Roads for minimum 20 MSA.

5.3 In order to meet the intended functional requirement of respective pavement layers on main carriageway, the minimum thickness of respective pavement layers for main carriageway and connecting crossroads/ service roads/ slip roads/ entry/exit locations, acceleration/ deceleration lane, right turning lanes shall, however, in no case be less than as given below:

5.3.1 Main carriageway, paved shoulder, median side paved strip, right turning lanes (Flexible) shall be designed for 90MSA.

5.3.2 Toll Plaza location to be designed with rigid pavement.

5.3.3 Crossroads/Service roads/Slip Roads are to be designed for 20MSA.

*-For Slip/Service Road with chainage Km. 54.700 to Km. 55.550, Pavement composition of MCW (clause 5.3.1) will be applicable.

5.4 Reconstruction of Stretches with New pavement (Clause No 5.9.4 IRC SP 84-2019)

S. No	Design chainage (Km.)		Pavement Composition	Remarks
	From	To		
1	54.380	54.520	Same as Main carriageway clause 5.3.1	On RHS of MCW
2	55.550	56.100		On LHS of MCW
3	56.100	58.950		On RHS of MCW
4	58.950	59.380		On Both sides of MCW
5	60.610	62.450		On RHS of MCW
6	62.450	62.660		On LHS of MCW

The following stretches of the existing road shall be dismantled/milled and reconstructed. These shall be designed as new pavement.

5.5 Bituminous Mix for Overlay

The following stretches of the existing road shall be provided bituminous overlay as follows:

Sr. No.	Design Chainage		Overlay Pavement Composition	Remarks
	From	To		
Nil				

(Clause No. 5.9.8 IRC: SP:84-2019)

6 Roadside Drainage

6.1 Drainage system including surface and subsurface drains for the Project Highway including crossroads shall be provided as per section 6 of the manual. RCC Drain cum footpaths shall conform to the cross- sectional features and other details as given in Annexures to Schedule-B and shall be provided as under:

Details of RCC Drain Cum Footpath (Clause No 2.13 & 6.2.6 IRC SP 84-2019)

Sr. No.	Design Chainage (Km)		Length (m)		Width of Drain (m)	Total Length (m)
	From	To	LHS	RHS		
1	54.700	55.550	850	850	1.5	1700
2	58.950	59.380	430	430	1.5	860
3	59.380	60.610	1230	1230	1.5	2460
4	62.660	62.800	140	140	1.5	280
	Sub Total on each side		**2650**	**2650**	**1.5**	
	Total					**5300**

*-Including structure length.
Drain should be designed for vehicle loading.

6.2 Unlined Drains

Unlined Drains other than above mentioned locations shall be provided in the entire project length which gets terminated at all crossroad locations. In case the definite outfall is not available, a rainwater harvesting system shall be provided at the deepest location for dispersal of water.

6.3 Drainage arrangement between Main Carriageway and Service/Slip Roads

A suitable drainage arrangement for draining storm water of the main carriageway shall be provided. Drain of Storm water of main carriageway to service road is not permitted. (Clause No. 2.15 IRC: SP:84-2019)

6.4 Drainage where Embankment Height is more than 6m.

Chute drain shall be provided at suitable intervals on embankment slopes. The drainage arrangement shall include kerb, cement concrete drainage channel at the edge roadway, Cement Concrete Chutes, CC bedding, energy dissipation basin, etc. Mountable Kerb shall be provided beyond the post of MBCB to channelize storm water into chute. (Clause No. 6.8.2.4 of IRC: SP:84-2019)

6.5 Drainage for Structures

A suitable drainage arrangement for storm water from deck slab shall be provided. Falling of water on any surface of the structures, flow of underneath or remain standing or flowing over the road below the structure is not permitted in any circumstances. (Clause No. 6.8 IRC: SP:84-2019)

6.6 Drainage for Underpass and Subways Structures

A suitable drainage arrangement for the flow of storm water from the Underpass and Subways

shall be provided. (Clause No. 6.8.3 IRC: SP:84-2019)

6.7 Drainage arrangement of Retaining Structures

Vertical Drop-down drainage pipes with suitable cleaning provision shall be provided at suitable interval. Drainage fixtures and dropdown pipes shall be of rigid, corrosion resistant material with diameter not less than 100mm. The Storm water drainage from main carriageway to service road is not permitted.

7 Design of Structures

7.1 General

Project Highway in the improvement plan is to be constructed to four lane configurations. As such, superstructures of all bridges, culverts and other structures shall be designed for edge movement of the vehicle considering stitching of new superstructure in future during widening to additional lanes. IRC Special vehicle loading is to be considered in the design of all bridges, culverts and structures.

All structures except wherever expansion joints have been provided, the pavement layers shall be continued over the structures so as to ensure smooth riding quality in project highway. These structures shall be designed considering the dead load of pavement layers .

All major structures shall be designed preferably with continuous structure to reduce the number of expansion joints on the MJB/ ROBs/ flyover/ Interchange etc.

7.1.1 Bridges, culverts and structures shall be designed for IRC class Special Vehicle (SV) loading as per recommendation of IRC: 6 and constructed in accordance with section-7 of the manual. All structures shall conform to the cross-sectional features and other details specified therein.

7.1.2 The overall width of the structures shall be given in Annex-I of Schedule-B (Clause No.7.3 IRC SP:84 2019).

7.1.3 The Safety Barrier and Footpath on Bridges and RoB shall continue on approaches. The footpath shall be provided with paved surface & railing till the embankment height is more than 3m. (Clause No. 7.17 IRC: SP:84-2019)

Details of Structures with footpaths

Sr. No.	Location at km	Skew Angle	Footpath Width (m)		Remarks
			Left	Right	
1	ROB at 40.978	-	1.5	1.5	-
2	Major Bridge at 48.557	-	1.5	1.5	-
3	ROB at 53.328	-	1.5	1.5	-
4	Major Bridge at 54.460	-	1.5	1.5	-
5	Minor Bridge at 59.732	-	1.5	1.5	-

7.1.4 Bridges in the improvement proposal need to be of high level bridge.

7.1.5 All structures shall be designed to carry utility services on the outer side of RCC barrier/Railing as per site requirement.

7.1.6 Cross section of the new culverts and bridges at deck level for the Project Highway shall conform to the typical cross sections given in Section 2.10 of the Schedule-B.

7.1.7 In bypass/realignment locations if the structure in existing crossroads is replaced to new locations. No change of scope shall be allowed.

7.1.8 If any new structures are proposed at canal cum bund roads along the project highway in consultation with concerned irrigation department/IE/NHIDCL. No change of scope shall be applicable.

7.1.9 Wherever liquefaction is observed, ground improvement shall be done by replacing suitable material and compacting the soil to increase the penetration resistance to satisfy the clause 8.4.4 (v) of IRC114.

7.1.10 Proposed levels at structure locations as shown in plan & profile specified in Appendix B-II of schedule B are only for guidance and any changes in levels shall not constitute change of scope provided at any location of bridges and grade separated structures the FRL as in drawing shall not be lowered.

7.1.11 The structures falling within acceleration / deceleration lane /taper shall be constructed to the required width at the location. These changes shall not be treated as a change of scope.

7.1.12 An effective drainage system for bridge decks shall be provided as specified in the Manual.

7.1.13 Repairs and rehabilitation of all existing bridges shall include but not limited to general cleaning of bridge and area around bridge, restoration of slopes and protective works, removal and relaying of existing wearing coat, repair and replacement of drainage spouts, construction of new crash barriers in place of old railing, providing of new expansion joints and bearings in place of old ones wherever required and repair and rehabilitation of damaged concrete, if any, and providing floor protection with rigid and flexible apron and embankment slope protection if any etc. to the complete satisfaction and as per directions of Independent Engineer/Authority. All the repairs and rehabilitation works shall be carried out as per standards and manuals.

7.1.14 The structures proposed to be retained, the FRL of those structures shall be maintained as per existing structure, widening/New construction shall be done as per the designed Finished Road level provided in any circumstances soffit level of proposed new bridge shall not be less than soffit of the existing bridge.

7.2 Culverts (Clause No. 7.3 in IRC: SP:84-2019)

7.2.1 The overall width of all culverts/box underpasses shall be equal to the roadway width of the approaches. The overall width of culverts shall be including width of main carriageway and slip/service roads/Entry ramps/Exit Ramps/ Acceleration/Deceleration lanes, etc. All culverts shall also be continued in median and in gap between main carriageway and service road. The locations, vents and type of Culverts are tentative and Changes in the locations, vents and type of Culverts, if any shall be finalized as per site conditions in consultation with Authority / IE, which shall not constitute COS.

Changes in the location of culverts, if any shall be finalized as per site conditions in consultation with Authority / IE which shall not be considered as Change of Scope.

For Box underpasses over crossroads/cart tracks, minimum vent height specified above shall be measured from FRL of crossroad.

Invert level of proposed Box type structure at cart track/Cross drainage locations shall be finalized as per site conditions.

Floor protection works shall be as specified in the relevant IRC Codes and Specifications.

7.2.2 New/ Reconstruction of existing RCC pipe culverts:

The existing culverts at the following locations shall be re-constructed as new culverts:

Sr. No	Design Chainage	Culvert Type	Skew Angle	Span/ Opening (m)	New/ Reconstruction	Culvert Crossing Type (Balancing/Stream, etc)	Remarks
Nil							

*- Box - Box Culvert

7.2.3 Widening of existing RCC pipe culverts

All existing culverts which are to be retained shall be widened to the proposed roadway width of the Project Highway as per the typical cross section given in section 7 of the Manual. Repairs and strengthening of existing structures where required shall be carried out.

Sr. No	Design Chainage	Culvert Type	Skew Angle	Span/ Opening (m)	Repairs / Rehabilitation proposals	Culvert Crossing Type (Balancing/ Stream, etc)	Remarks
1	53.347	HPC	-	1 x 0.9	Yes	Drain	No widening required

*-HPC – Hume Pipe culvert

7.2.4 Reconstruction of New Culverts/Structures:

Sr. No	Design Chainage	Culvert Type	Skew Angle	Span/ Opening (m)	New/ Reconstruction	Culvert Crossing Type (Balancing/Stream, etc)	Remarks
Nil							

7.2.5 Construction of Box culverts

New culverts (given in table below) shall be constructed for width equal to the proposed roadway width of the Project Highway & as per typical cross-section given in schedule B. The details are given as under:

Sr No	Design Chainage (Km)	Proposed Span Arrangement (m)	Skew Angle	Road/Culvert Crossing type	Remarks
1	38.823	1 x 3.0	-	-	-
2	39.194	1 x 2.0	-	-	
3	39.726	1 x 2.0	-	-	-
4	40.040	1 x 2.0	16^0	Drain	-
5	40.240	1 x 2.0		Drain	
6	40.780	1 x 2.0		-	
7	41.166	1 x 2.0	-	-	-
8	41.300	1 x 2.0		Drain	
9	41.666	1 x 2.0	-	-	-
10	41.903	1 x 2.0	-	-	-
11	42.300	1 x 2.0		-	
12	42.577	1 x 3.0	-	Stream	-
13	43.028	1 x 2.0	-	-	-
14	43.165	1 x 2.0	-	-	
15	43.506	1 x 5.0	-	Stream	-
16	43.872	1 x 2.0	-	Stream	-

Sr No	Design Chainage (Km)	Proposed Span Arrangement (m)	Skew Angle	Road/Culvert Crossing type	Remarks
17	43.959	2 x 4.0	-	Stream	Stream +Road
18	44.105	1 x 2.0	-	-	-
19	44.488	1 x 2.0	-	-	-
20	44.670	1 x 2.0	-	-	
21	44.945	1 x 2.0	-	-	
22	45.184	1 x 2.0	-	Stream	-
23	45.340	1 x 2.0	-	-	
24	45.606	1 x 2.0	-	-	-
25	45.855	1 x 2.0	-	-	-
26	46.195	1 x 3.0	-	-	-
27	46.406	1 x 2.0	-	-	
28	46.980	1 x 2.0	-	-	-
29	47.211	1 x 3 .0	-	Stream	-
30	47.483	1 x 2.0	-	-	
31	47.714	1 x 2.0	-	-	-
32	48.232	1 x 2.0	-	-	
33	48.930	1 x 2.0	-	-	
34	49.364	1 x 2.0	-	-	
35	49.635	1 x 3.0	20^0	-	
36	50.288	1 x 2.0	-	-	
37	50.471	1 x 5.0	-	Stream	-
38	50.700	1 x 2.0		-	
39	51.045	1 x 2.0		-	
40	51.294	1 x 5.0	-	Stream	-
41	52.130	1 x 2.0	-	-	
42	52.390	1 x 2.0	-	-	-
43	53.804	1 x 3.0	-	-	-

7.2.6 Widening of existing box culverts.

All existing culverts which are to be retained shall be widened to the proposed roadway width of the Project Highway as per the typical cross section given in Schedule-B. Repairs and strengthening of existing structures where required shall be carried out.

Sr. No	Design Chainage	Culvert Type	Skew Angle	Span/ Opening (m)	Repairs / Rehabilitation proposals	Culvert Crossing Type (Balancing/ Stream, etc)	Remarks
NIL							

7.2.7 Culverts on Crossroads:

Sr. No	Design Chainage (km)	Span Arrangement (m)	Type (Box/Pipe)	Length of Culvert	Remarks	Junction type
1	38.740	1 x 1.2	Pipe	7.5	LHS	T
2	55.415	1 x 1.2	Pipe	5.0	RHS	T

Sr. No	Design Chainage (km)	Span Arrange-ment (m)	Type (Box/Pipe)	Length of Culvert	Remarks	Junction type
3	55.520	1 x 1.2	Pipe	5.0	LHS	T
4	55.960	1 x 1.2	Pipe	5.0	RHS	T
5	56.110	1 x 1.2	Pipe	5.0	LHS	T
6	56.144	1 x 1.2	Pipe	5.0	LHS	T
7	56.929	1 x 1.2	Pipe	5.0	RHS	T
8	57.157	1 x 1.2	Pipe	5.0	LHS	T
9	57.518	1 x 1.2	Pipe	5.0	LHS	T
10	58.121	1 x 1.2	Pipe	5.0	LHS	T
11	58.185	1 x 1.2	Pipe	5.0	LHS	T
12	58.214	1 x 1.2	Pipe	5.0	LHS	T
13	58.248	1 x 1.2	Pipe	5.0	LHS	T
14	58.280	1 x 1.2	Pipe	5.0	BHS	+
15	58.396	1 x 1.2	Pipe	5.0	LHS	T
16	58.470	1 x 1.2	Pipe	5.0	LHS	T
17	58.530	1 x 1.2	Pipe	5.0	RHS	T
18	58.546	1 x 1.2	Pipe	5.0	RHS	T
19	58.572	1 x 1.2	Pipe	5.0	LHS	T
20	58.575	1 x 1.2	Pipe	5.0	RHS	T
21	58.623	1 x 1.2	Pipe	5.0	RHS	T
22	58.730	1 x 1.2	Pipe	5.0	LHS	T
23	58.864	1 x 1.2	Pipe	5.0	LHS	T
24	58.886	1 x 1.2	Pipe	5.0	LHS	T
25	58.965	1 x 1.2	Pipe	7.5	BHS	+
26	59.110	1 x 1.2	Pipe	3.0	LHS	T
27	59.285	1 x 1.2	Pipe	5.0	RHS	T
28	60.955	1 x 1.2	Pipe	5.0	LHS	T
29	61.846	1 x 1.2	Pipe	5.0	LHS	T
30	62.615	1 x 1.2	Pipe	5.0	LHS	T

*In addition to these, structures if any on existing crossroads shall be shifted to suitable location and new culverts shall be added on crossroads if necessary.
This shall not constitute a change of scope. Design should be for vehicle loading.

7.2.8 Construction of Box Underpasses

New underpasses (given in table below) shall be constructed for width equal to the proposed roadway width of the Project Highway & as per typical cross-section given in schedule B. The details are given as under:

Sr No	Design Chainage (Km)	Proposed Span Arrangement (m)	Skew Angle	Road/Culvert Crossing type	Remarks
1	39.123	1 x 4.0	-	-	
2	39.360	1 x 4.0	13^0	-	
3	42.165	1 x 4.0	51^0	-	-
4	43.430	1 x 4.0	19^0	-	-
5	48.695	1 x 4.0	28^0	Road	-
6	49.508	1 x 4.0	-	-	
7	51.725	1 x 4.0	-	-	-

7.2.9 Utility ducts in bypasses

Greenfield as well as Brownfield projects which are being upgraded. NP-4 RCC Pipe dia 600 mm shall be provided across the Project Highway @ 0.50 km c/c and along with inspection chamber were directed for crossing of utilities anywhere requirements.

7.2.10 Details of Additional New Culverts:

Additional box culverts with 1 x 4m x3m clear opening shall be provided as per site requirement for field channels/cart track as decided by the IE/NHIDCL restricting to a maximum of 20 no. s
Additional pipe culverts restricting to a maximum of 20 nos with size 1 row of 1.2m dia shall be provided as per site requirement for field channels/across crossroads as decided by the IE/NHIDCL.

7.3 Bridges

7.3.1 Existing bridges to be re-constructed/widened:

I. Existing Major bridges proposed for reconstructed as new structures:

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle
				MCW	SR		
Nil							

II. Existing Major bridges proposed to be retained and new construction in 4 lane proposal:

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
1	54.460	80	River	12.5	-	VII	-	RHS-Retained, LHS-New

III. Existing Minor bridges proposed for reconstructed as new construction in the 4 lane proposal:

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
1	59.732	6.0	Stream	11.0 +M + 11.0	2 x 10.0	VI	-	BHS

*M - Median

IV. Existing Minor bridges proposed to be retained and widened:

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
1	56.998	6.0	Stream	11.50	-	VIII	-	RHS- Retained, LHS- New
2	58.103	6.0	Stream	11.50	-	VIII	-	RHS- Retained, LHS- New
3	61.029	6.0	Stream	11.50	-	VIII	-	RHS- Retained, LHS- New

7.3.2 Additional New Bridges

New bridges at the following locations on the Project Highway shall be constructed. GADs for the new bridges are attached in the drawings folder.

Major Bridges:

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
1	48.557	105	River cum Road	12.50 + M + 12.50	-	VII	-	New, BHS

*M - Median

Minor Bridges:

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
1	40.344	20.0	Stream	11.0+M+11.0	2 x 9.25	X	10°	MIB, BHS
2	42.120	6.0	Stream	11.50+M+ 11.50	-	VIII	25°	Box MIB, BHS
3	44.798	10.0	Stream	11.50+M+ 11.50	-	VIII	20°	Box MIB cum UP, BHS
4	46.572	20.0	Stream	11.50+M+ 11.50	-	VIII	44°	MIB, BHS
5	49.807	6.0	Stream	11.50+M+ 11.50	-	VIII	43°	Box MIB, BHS
6	51.988	6.0	-	11.50+M+ 11.50		VIII		Box MIB, BHS

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
7	53.067	6.0	Stream	11.00+M+ 11.00	9.25	X		No SR on RHS
8	53.200	6.0m	Stream	11.50+M+ 11.50	-	VIII	58^0	Box MIB, BHS
9	55.742	20.0	Gas pipe line	11.50+M+ 11.50	-	VIII	-	MIB for Gas pipeline with clear opening 20m

*- MIB – Minor Bridge, UP- Underpass, M- Median

The railings of existing bridges shall be replaced by crash barriers at the following locations:

Sr.No	Design Chainage		Length (m)	Remarks
	From	To		
1	53.304	53.351	93	ROB
2	54.420	54.500	160	Major Bridge
3	56.995	57.001	12	-
4	58.100	58.106	12	-
5	59.729	59.735	12	-
6	61.026	61.032	12	-

7.3.3 The existing bridges/ RoB/ Grade Separators/ RUB retained on the project highway shall be upgraded and rehabilitation measures/proposals shall be specified as follows:

Sr. No.	Location at km	Rehabilitation Proposals	Remarks
Nil			

7.3.4 Structures in marine environment:

The specific locations are to be mentioned by DPR Consultant.

Sr. No.	Location at km	Span	Remarks
Nil			

Note for Appendix Clause 7.3:

- Width is excluding Median (M) gap and the gap between Main Carriageway (MCW) & Service/Slip Road (SR).
- Location and span are indicative. Exact location may be decided in consultation with Authority/IE and the same shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
- Span arrangement mentioned above is tentative and may be changed based on design of structure, latest construction techniques and aesthetics of structures. The span lengths mentioned are optimum required span and should not be reduced. The actual lengths as

required on the basis of detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Any increase in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.

- In Case of bridges proposed for widening/repair as per details above, the same shall be re-constructed if the design shows that these are unsafe for design loads. No change of scope shall be considered in such cases.
- Expansion joints shall be minimized by deck continuity/ continuous superstructure over multiple spans. Deck length between two expansion joints shall not be less than 120m except where structure length falls short of it. Expansion joints shall be Finger joint type in compliance with IRC: SP:69-2011, Table 5.4.1 criteria for adoption of different types of expansion joints. Concessionaire shall ensure quality control as per good industry practice and shall ensure presence of manufacturer of expansion joints at the time of installation for quality control supervision.

7.4 Railroad Bridges (ROB/RUB)

7.4.1 Design, construction & detailing of ROB/RUB shall be as specified in Section 7 of the manual.

7.4.2 Road over bridges (road over rail) shall be provided at the following locations, as per GAD drawings attached:

Sr. No.	Design Chainage (Km)	Proposed Span Arrangement (m) (clear)	Type of super-structure (i.e. Bow string, simply supported composite structure etc.	Name of crossing	Total Width m)	Skew Angle	Remarks
1	40.978	1 x 25.0m+1 x 37.28m + 1 x 25.0m	PSC I Girder + Steel Composite Girder	Railway track	12.30+M+ 12.30	-	New- BHS
2	53.328	1 x 25.0m + 2 x 37.280m	PSC I Girder + Steel Composite Girder	Railway track	12.30	-	Retained LHS, New-RHS

*M-Median

Note:

The details of span and type of super-structure have to be mentioned by the DPR Consultant as per approved GAD by the railways. If the length/width of the span/ type of super-structure is changed due to any reason the COS shall be considered.

I. ROB shall be designed, constructed, and maintained as per the requirements of Railway authorities. The construction plan shall be prepared in consultation with the concerned railway authority.

II. The ROB shall be constructed and maintained by the concessionaire under supervision of the Railways.

III. All charges payable to the Railways like D&G, Capitalized maintenance, signalling, cabling, OHE modification, earthing etc. except P&E charges shall be borne by the Concessionaire.

IV. The proposed span arrangements of the RUBs are tentative and subject to change as per availability of railway boundaries/requirement of the railways.

7.4.3 Road under bridges (road under railway line) shall be provided at the following level

crossings, as per GAD drawings attached:

Sr. No.	Design Chainage	Proposed Span Arrangement (m)	Name of crossing	Total Width (m)	Skew Angle	Remarks
Nil						

The DPR Consultant should exercise the caution that wherever the ROB is being provided in lieu of existing level crossing, the RUB must be proposed so that the existing railway crossing must be closed.

7.5 Grade Separated Structures

The grade separated structures shall be provided at the locations and of the type and length specified in paragraphs 2.9,2.10 and 3 of Annexure-I of Schedule-B.

7.6 FOB/ Skywalks

FoB/Skywalks shall be provided in built up areas/ near schools. DPR Consultant to provide detailed drawings of FoB in schedule B.

Sr. No.	Location at km	FoB Type	Remarks
Nil			

7.7 A summary of Culverts, Bridges and Structures shall be presented as follows:

Sr. No.	Name of the Structure	Total Numbers	Remarks
1	Major Bridge	2	-
2	Minor Bridge	13	-
3	ROB	2	-
4	VUP (Single Span)	5	-
5	VUP (Multi Span)	0	-
6	LVUP	4	-
7	FOB	0	-
8	Box underpasses	7	-
9	Box Culverts	43+20	20 Newly Added Structures
10	Pipe Culverts	0+20	20 Newly Added Structures

8 Traffic Control Devices and Road Safety Works

8.1 Traffic control devices and road safety works shall be provided in accordance with Section 9 of the IRC:SP: 84

8.2 Traffic Signs:

Traffic signs shall be provided as per IRC 67 as mentioned in Schedule-C.

8.3 Pavement Marking:

Pavement markings shall be completed as per IRC 35 as mentioned in Schedule-C.

8.4 Safety Barrier:

The safety barriers shall be provided in accordance with Section-9 of the Clause 9.7 of the manual. The Safety Barrier length proposed are excluding the safety barrier already proposed on Culverts, Grade Separated Structures, Interchange, Bridges, RoB and RUB as applicable cross sections respectively.

End Treatment of Steel barriers/Rope Barrier shall be specified i.e. MELT or P-4 confirming to EN 1317-4, TT, MBCB barrier to Concrete Barrier (Clause No. 9.7.2 (b) IRC: SP:84-2019)

End Treatment to Concrete barrier shall be done as specified in **Clause No. 9.7.3 (b) IRC: SP:84-2019**.

The details of the location are as below:

S.No.	Item	LHS		RHS		Total Length (m)	Remarks
		(From in m.)	(To in m.)	(From in m.)	(To in m.)		
1	W-beam Single faced metal crash barrier	38610	39640	38610	39640	1930	Excluding structure locations & approaches to underpasses. In addition to these, additional 299m "W" beam crash barrier is required in between these chainages.
		40000	40130	40000	40130	260	
		40540	40940	40540	40940	805	
		41030	44190	41030	44190	6158	
		44420	48510	44420	48510	8091	
		48610	52360	48610	52360	7389	
		53110	53280	53110	53280	304	
		53380	54420	53380	54420	2002	
		54510	54700	54510	54700	400	
		55560	56040	55560	56040	850	
		56660	56760	56660	56760	100	
		56790	57110	56790	57110	315	
		57150	57870	57150	57870	710	
		57990	58350	57990	58350	304	
		58390	58590	58390	58590	160	
		58830	58940	58830	58940	100	
		58950	59380	58950	59380	860	
		60890	60950	60890	60950	60	
		61000	61150	61000	61150	164	
		61900	61960	61900	61960	60	
		62490	62580	62490	62580	70	
2	Thrie-beam Single faced metal crash barrier	Nil					
3	wire rope safety barrier	Nil					
4	W-beam Double faced metal crash barrier	Nil					
5	Thrie-beam Double faced metal crash barrier	Nil					
6	New Jersey Crash Barrier	54700	55550	54700	55550	2582	Structure locations & approaches to underpasses to be excluded from chainges mentioned to arrive at total length
		58950	59380	58950	59380		
		59380	60610	59380	60610		
		62660	62800	62660	62800		
7	Crash barrier with Friction slab	40240	40520	40240	40520	4928	Excluding structure locations & approaches to underpasses
		52450	53020	52450	53020		
		54760	55420	54760	55420		
		59510	60480	59510	60480		

		62670	62800	62670	62800		
8	Pedestrian guardrails	54700	55550	54700	55550	5300	Excluding structure locations & approaches to underpasses
		58950	59380	58950	59380		
		59380	60610	59380	60610		
		62660	62800	62660	62800		
9	End Treatment for Steel Barriers	Nil					

Providing and laying of 179589 sqm Geocell with turfing for slope stabilization and furnishing and laying of the 250830 Sqm live sods of perennial turf forming grass on embankment slope

9 Roadside Furniture

9.1 It shall be provided as per the details mentioned in Schedule-C.

10 Hazardous Locations

10.1 The safety barriers shall be provided at the following hazardous location such as ponds, well, electric sub-station, Electric tower, spilt carriageway, etc.

Sr. No.	Location Stretch		Type of Safety Barrier	LHS/ RHS
	From (Km)	To (Km)		

11 Special Requirement:

Retaining Structure and protection works shall be provided at locations as indicated below.

Sr. No.	Design Chainage (Km)		Length (m)	Side	Height above ground level (m)	Retaining Structure/ Toe Wall	Type of Safety Barrier	Remarks
	From	To						
1	40.540	40.930	390	LHS	4.50	Toe Wall	-	Average height is mentioned
2	41.030	41.480	450	LHS	4.50		-	
3	48.300	48.500	200	LHS	1.50		-	
4	48.620	48.800	180	LHS	1.50		-	
5	53.100	53.290	190	LHS	5.00		-	
6	53.360	53.700	340	LHS	5.00		-	
7	54.300	54.400	100	LHS	5.50		-	
8	54.500	54.700	200	LHS	5.00			
9	55.550	56.020	470	LHS	3.00		-	
10	56.850	57.120	270	LHS	2.00		-	
11	57.660	57.880	220	LHS	1.50		-	
12	58.090	58.220	130	LHS	1.50		-	
12	40.540	40.930	390	RHS	5.50		-	
13	41.030	41.480	450	RHS	4.00		-	
14	48.300	48.500	200	RHS	2.00		-	
15	48.620	48.800	180	RHS	1.50		-	
16	52.760	53.200	440	RHS	3.50		-	
17	53.360	54.400	1040	RHS	6.50		-	
18	54.500	54.700	200	RHS	5.00		-	

Sr. No.	Design Chainage (Km)		Length (m)	Side	Height above ground level (m)	Retaining Structure/ Toe Wall	Type of Safety Barrier	Remarks
	From	To						
19	55.550	56.020	470	RHS	2.50		-	
Total Length=			**6510**					

Note: Length provided here are tentative. Any increase/decrease in length from the length specified in this Clause of Schedule-B shall not constitute a Change of Scope.

12 Open Well within RoW

The Open well shall be identified and appropriate treatment shall be provided.

Sr. No.	Design Chainage	Well Dimension	Well Depth	Filling Material for Well	Slab on Top of Well Yes/No	Remarks
NIL						

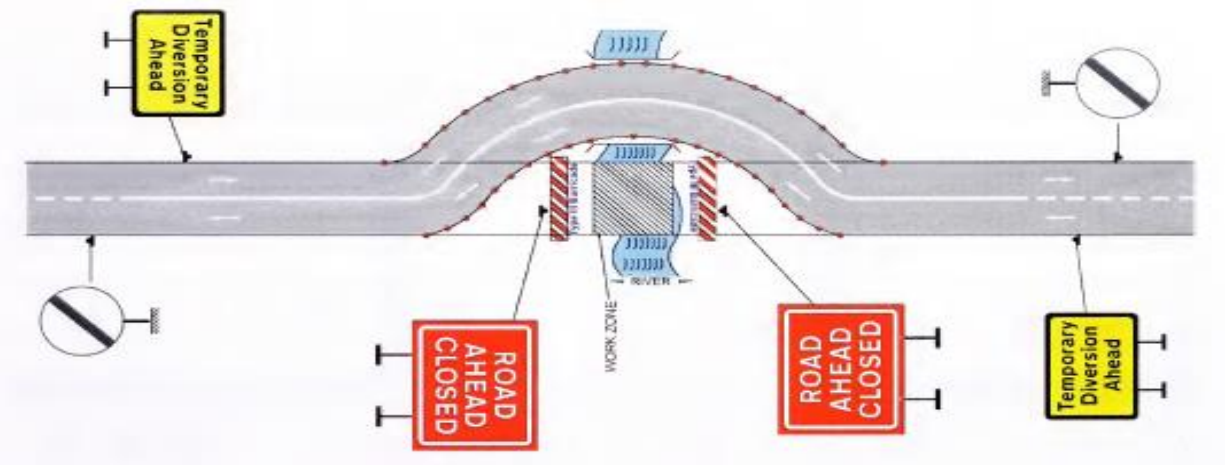
13 Shifting of Utilities

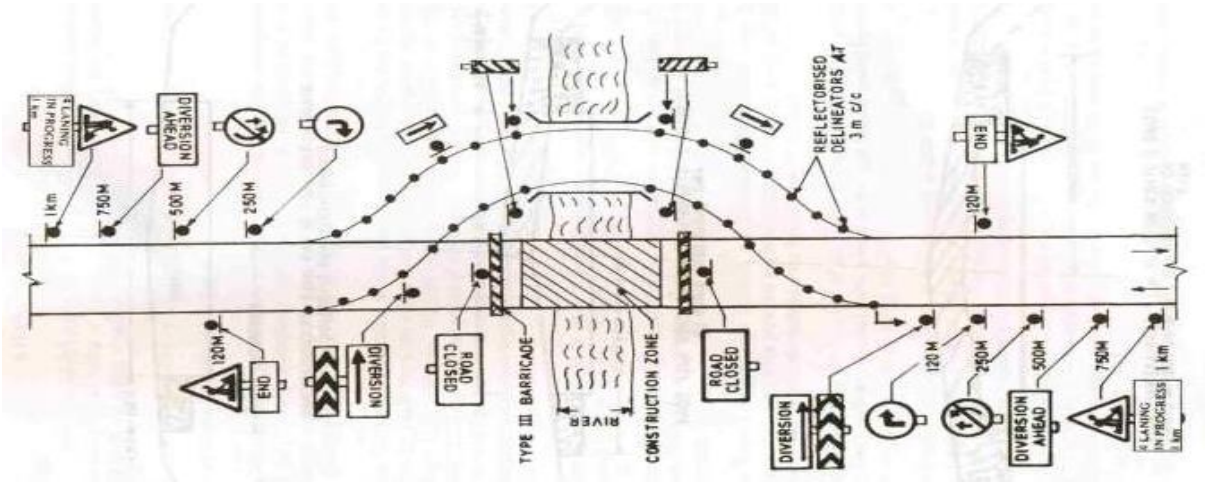
The Concessionaire shall undertake the work of shifting of any utility (including electric lines, water pipes, gas pipelines and telephone cables) to an appropriate location or alignment, in accordance with the provisions of Concession Agreement.

14 Work Zone Traffic Management Plans

The traffic diversion plans shall be prepared as per IRC SP 55 for smooth flow of traffic and safety. A diversion plan shall be proposed for construction of Culvert, Grade Separated Structures, Bridges, RoB/RUB, etc. and traffic management plan for widening/ reconstruction of carriageway. **(Clause No. 7.19 IRC: SP:84-2019)**

Sr. No.	Design Chainage (Km)		Construction Activity	Diversion	Traffic Management Plan	Barricading Type - III/IV/CC Barrier with lighting along barrier	Deployment of Flagman in Habitation/ Schools/ Hospital, etc.	Remarks
	From	To						
Traffic Diversion for the works executing in existing road shall be followed as per drawings given below								





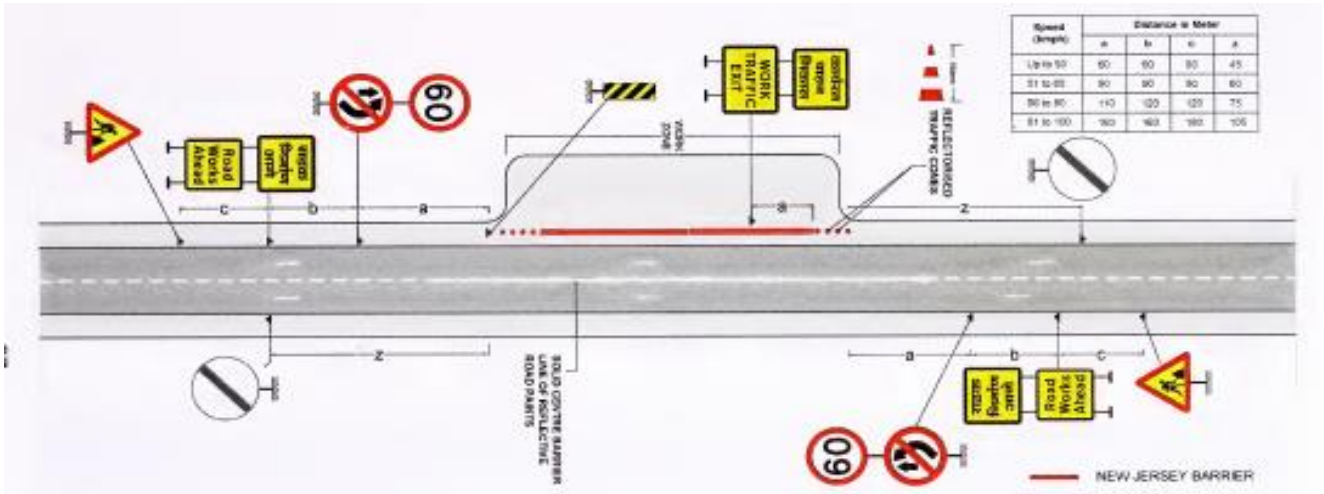
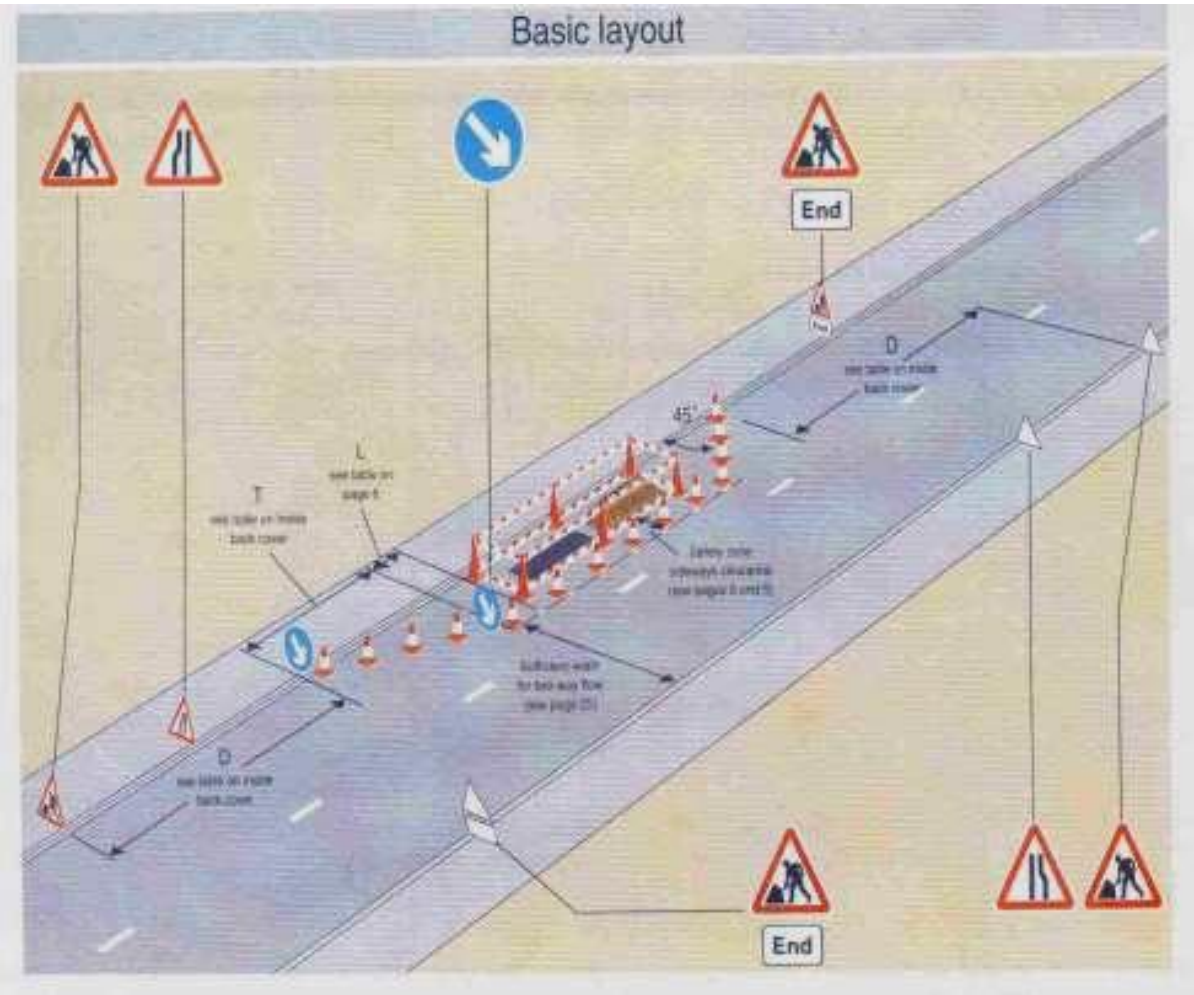


Fig. 10.1 Two Lane to Four Lane (Eccentric Widening)

APPLICATION :

The layout shown is applicable when a two lane highway is upgraded to 4-lane, with eccentric widening. In the first stage, the new carriageway would be constructed on the sides. While the new carriageway is being constructed, the traffic will continue to ply through the existing road. Layout of signs and barriers would be as shown.



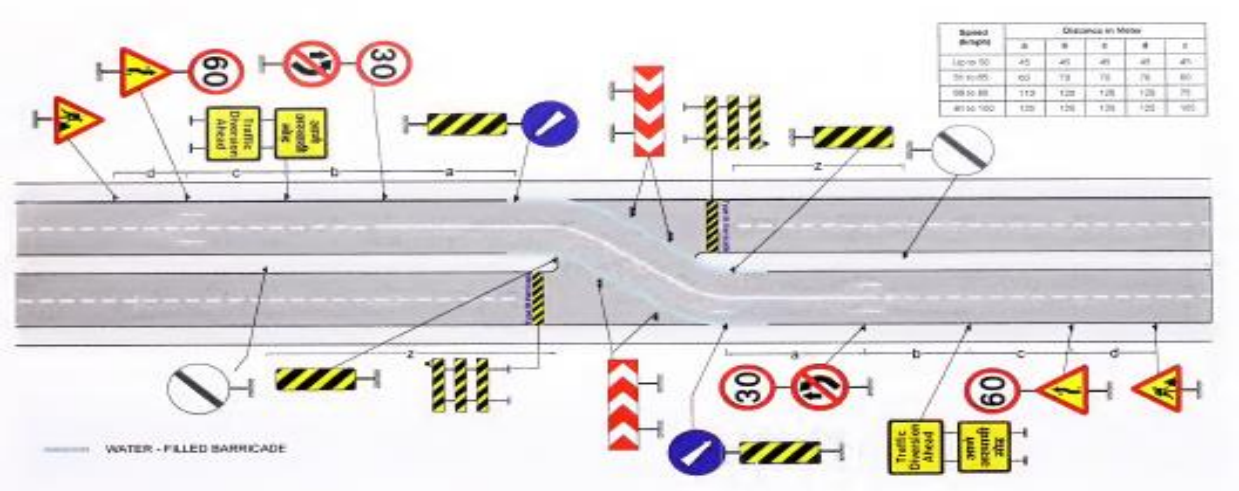
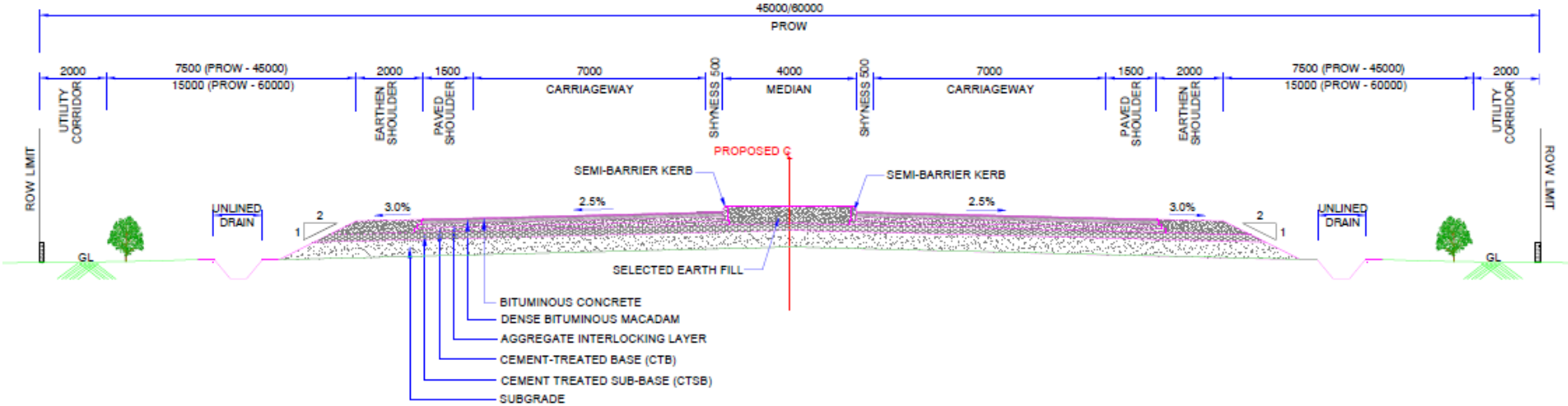


Fig. 10.2 Two Lane to Four Lane (Shifting of Traffic from One Carriageway to Other)

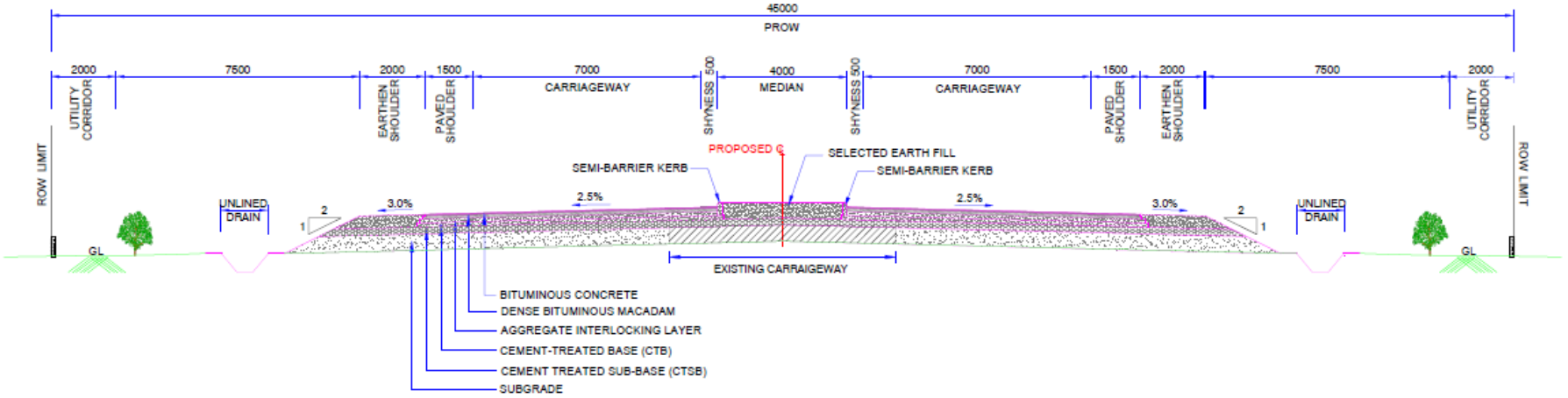
APPLICATION :

The layout is applicable for the second stage of eccentric widening when new carriageway has been constructed and existing carriageway is taken up for strengthening or overlay, where traffic has to be shifted from one carriageway to other. In shifting traffic from one carriageway to other, the cross over length is critical and shall be carefully provided, meeting the site requirements such that the layout is clearly visible with adequate signs and markings in a well guided way, to be visible both day and night . In the cross over length the camber also shall be properly given for safe transfer to avoid overturn due to reverse camber. It would be advisable to bring about gradual reduction in speed. Layout of signs and barriers would be as shown.

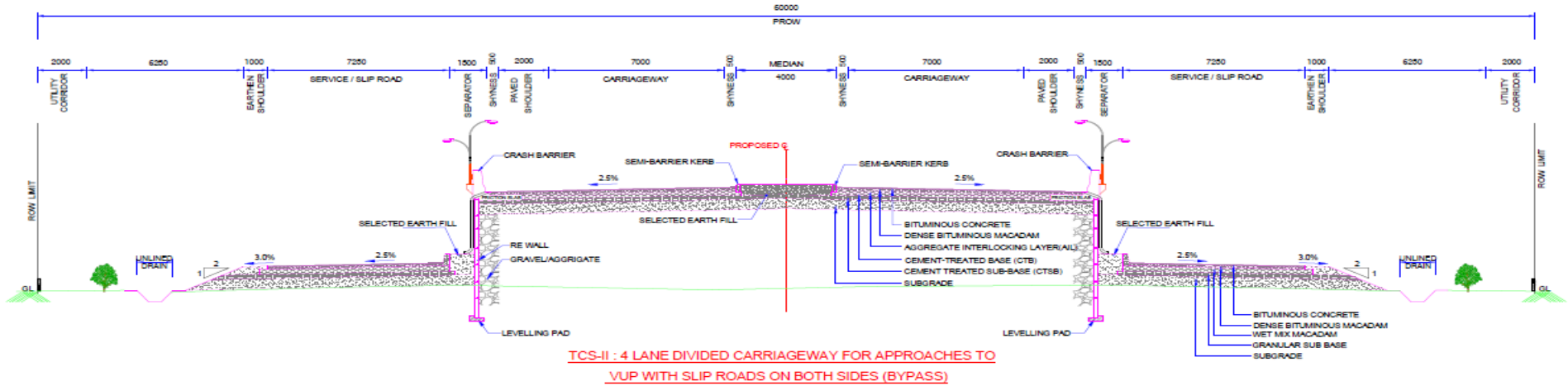
Annex-II
(Schedule B)
Typical Cross Section



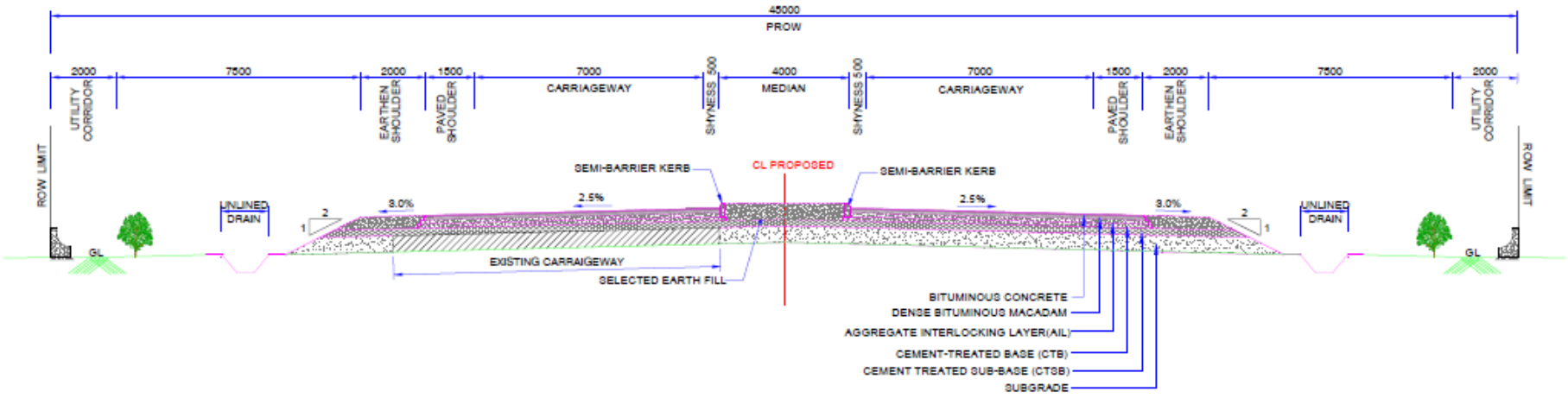
TCS-I: 4 LANE DIVIDED CARRIAGEWAY WITH FLUSH MEDIAN (BYPASS)



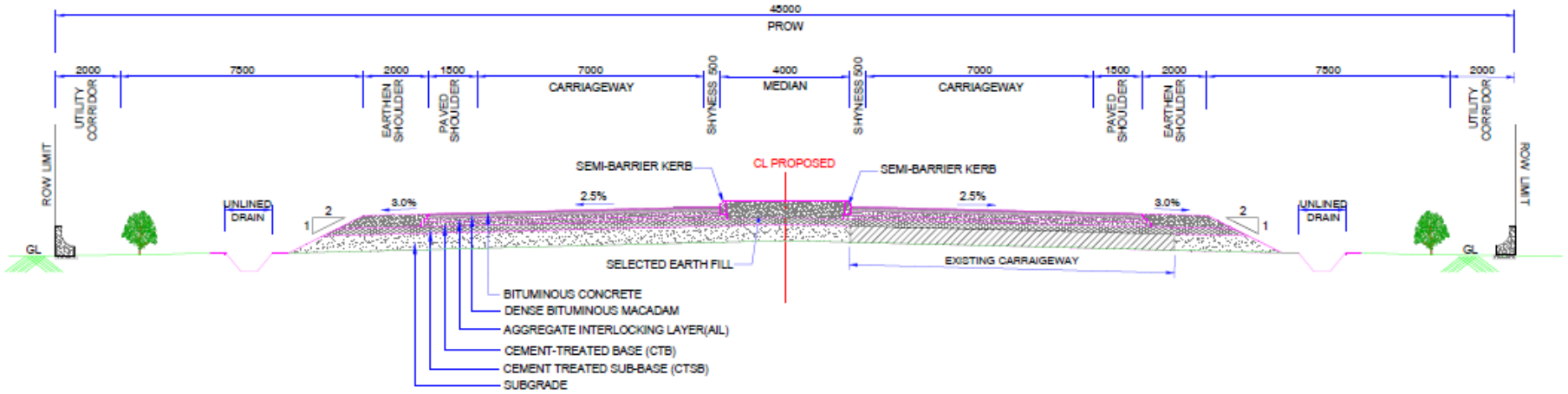
TCS-IA: 4 LANE DIVIDED CARRIAGEWAY CONCENTRIC WIDENING



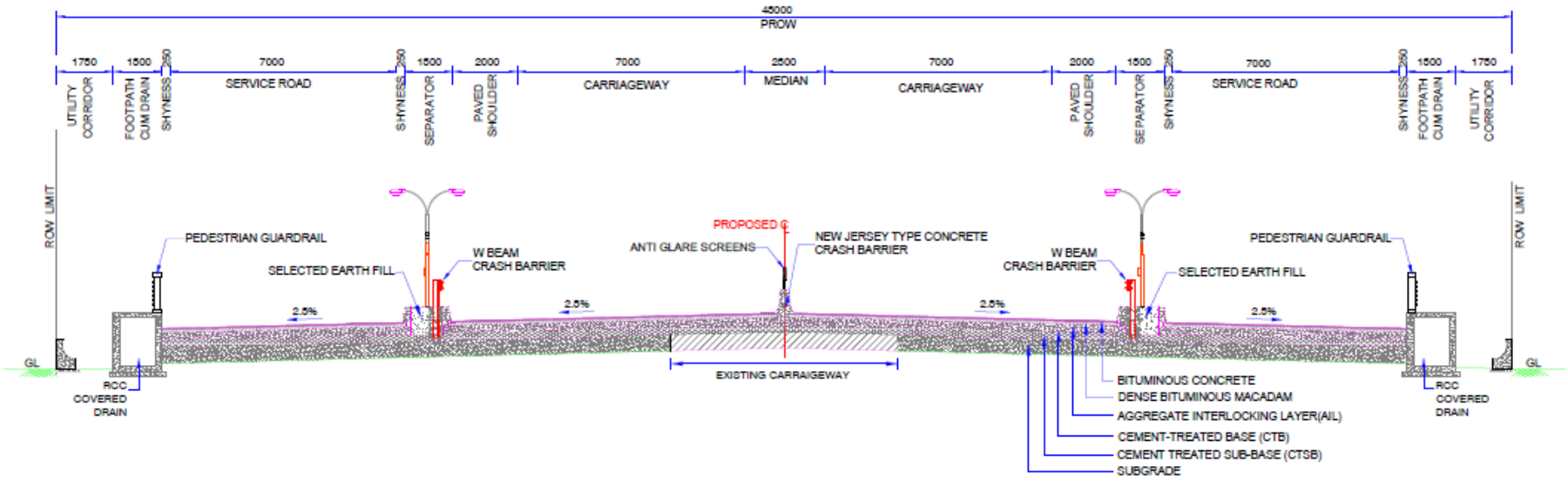
TCS-II : 4 LANE DIVIDED CARRIAGEWAY FOR APPROACHES TO VUP WITH SLIP ROADS ON BOTH SIDES (BYPASS)



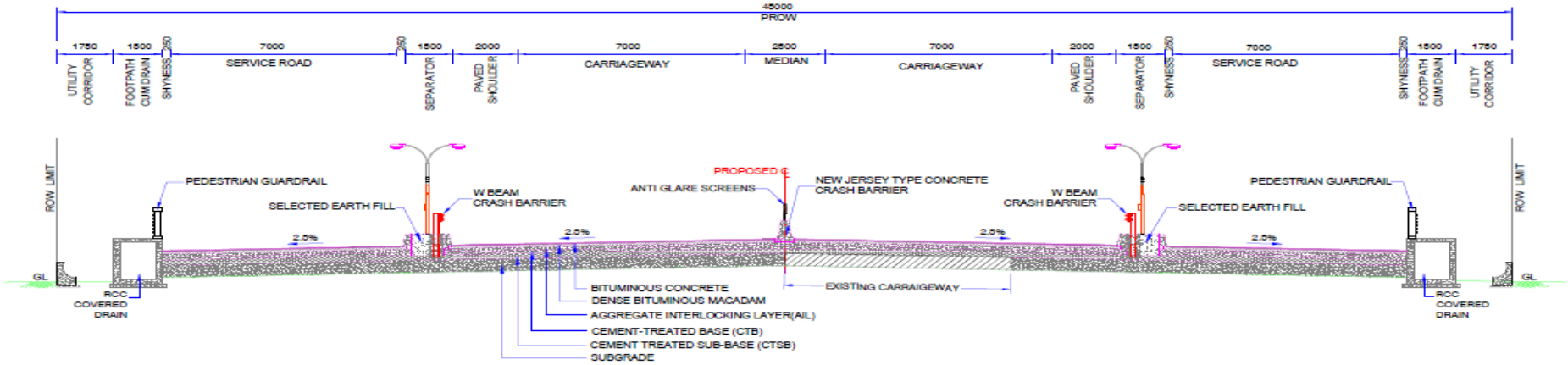
TCS-III: 4 LANE DIVIDED CARRIAGEWAY ECCENTRIC WIDENING (RHS)



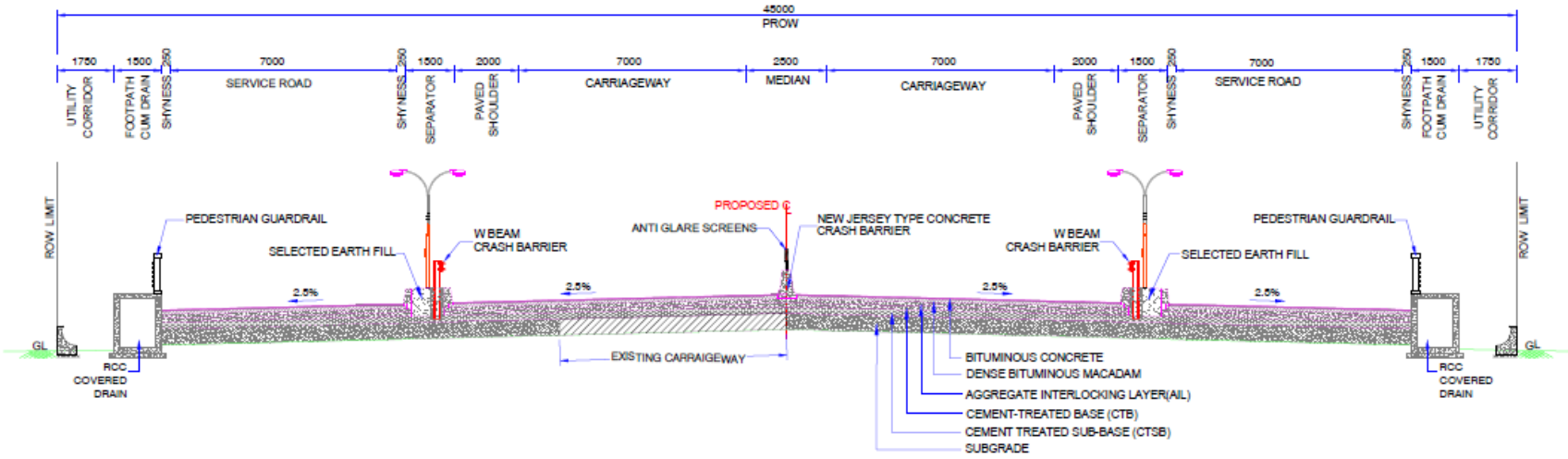
TCS-IV: 4 LANE DIVIDED CARRIAGEWAY ECCENTRIC WIDENING (LHS)



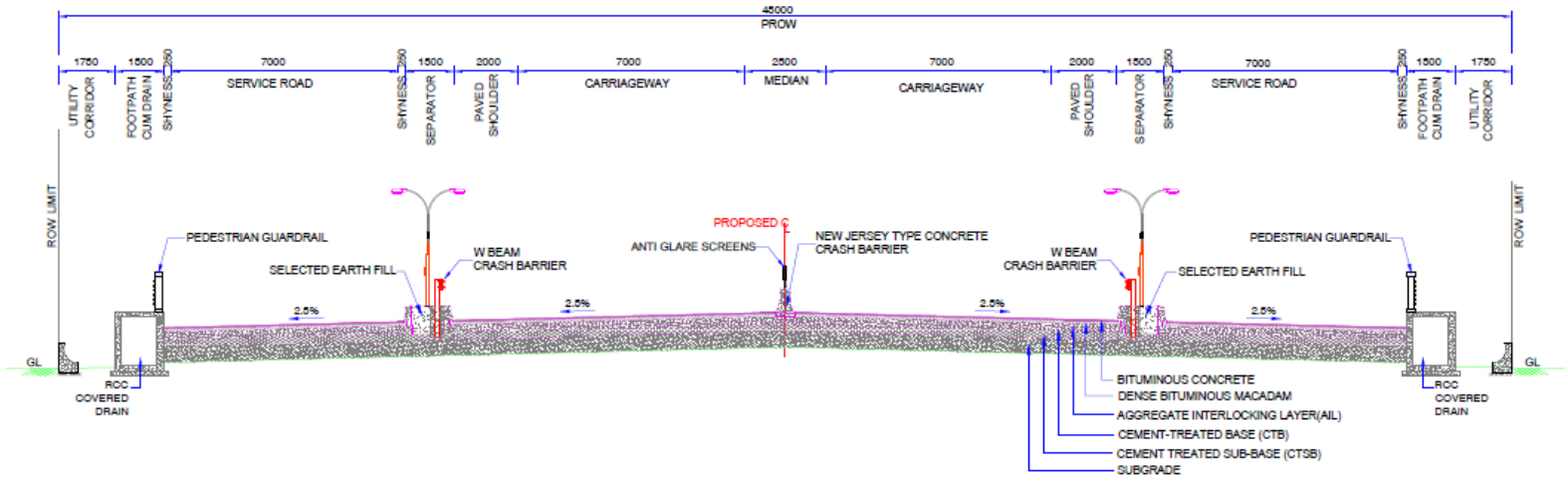
TCS-V:4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (EXISTING ROAD)



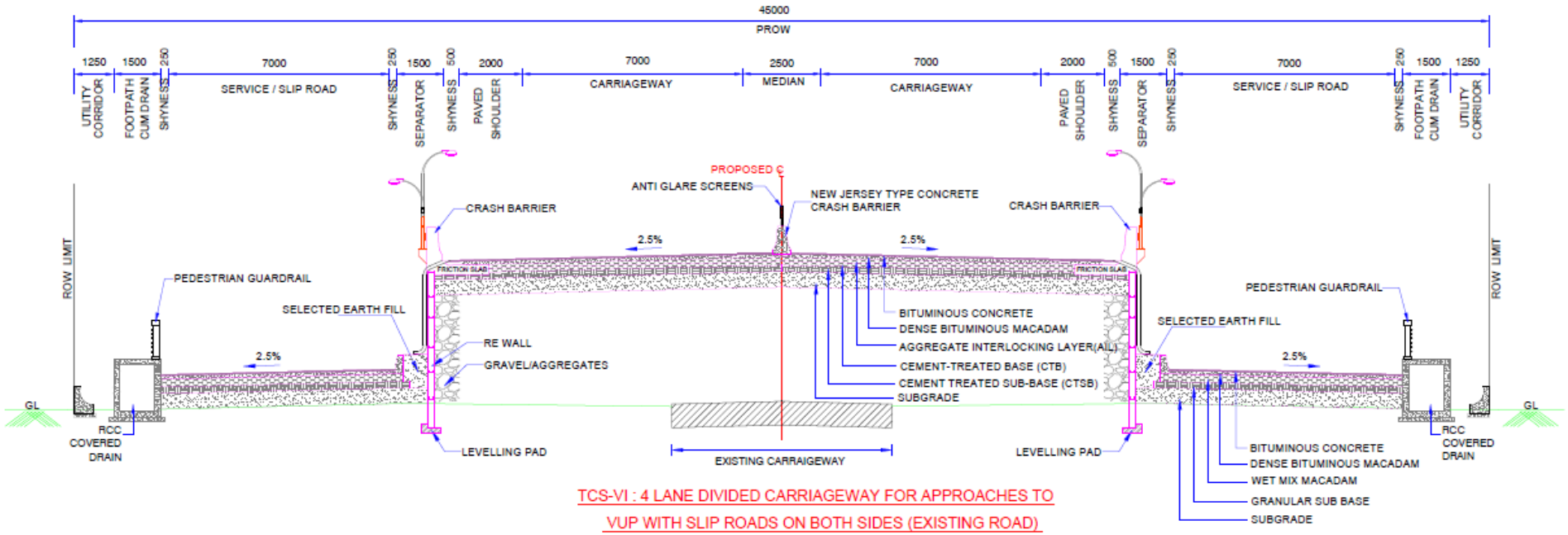
TCS-VA :4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (LHS WIDENING)



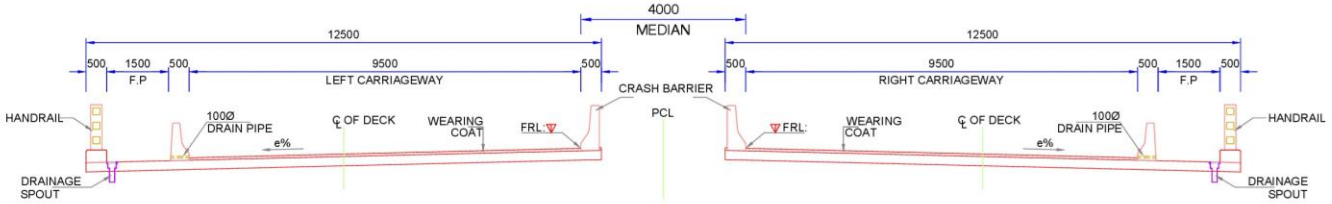
TCS-V B :4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (RHS WIDENING)



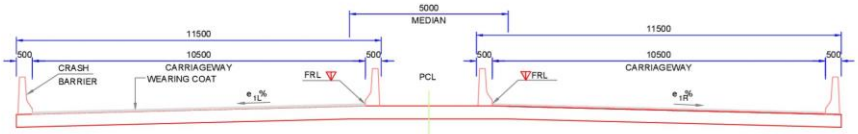
TCS-VC:4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (RE CONSTRUCTION)



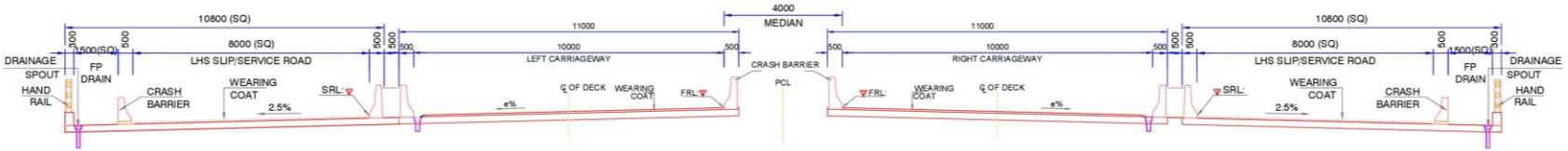
TCS-VI : 4 LANE DIVIDED CARRIAGEWAY FOR APPROACHES TO VUP WITH SLIP ROADS ON BOTH SIDES (EXISTING ROAD)



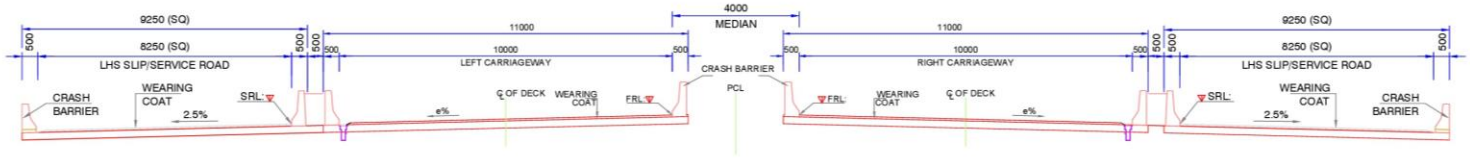
TCS:VII CROSS SECTION OF BRIDGE / ROB AT DECK LEVEL - WITH FOOTPATH
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)



TCS:VIII CROSS SECTION OF STRUCTURE AT DECK LEVEL - WITHOUT FOOTPATH
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)



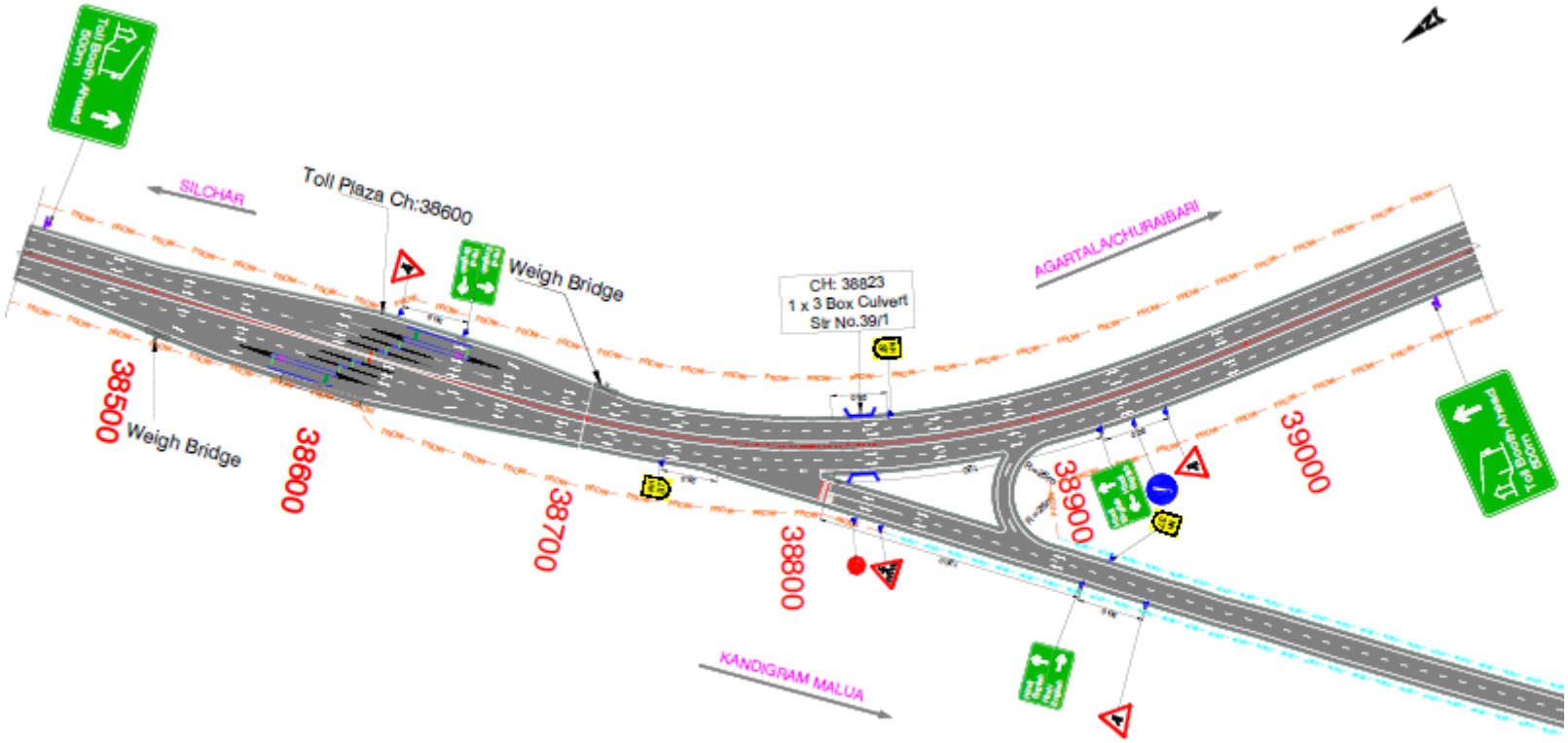
TCS:IX CROSS SECTION OF STRUCTURE AT DECK LEVEL - WITH FOOTPATH FOR SLIP/SERVICEROAD
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)



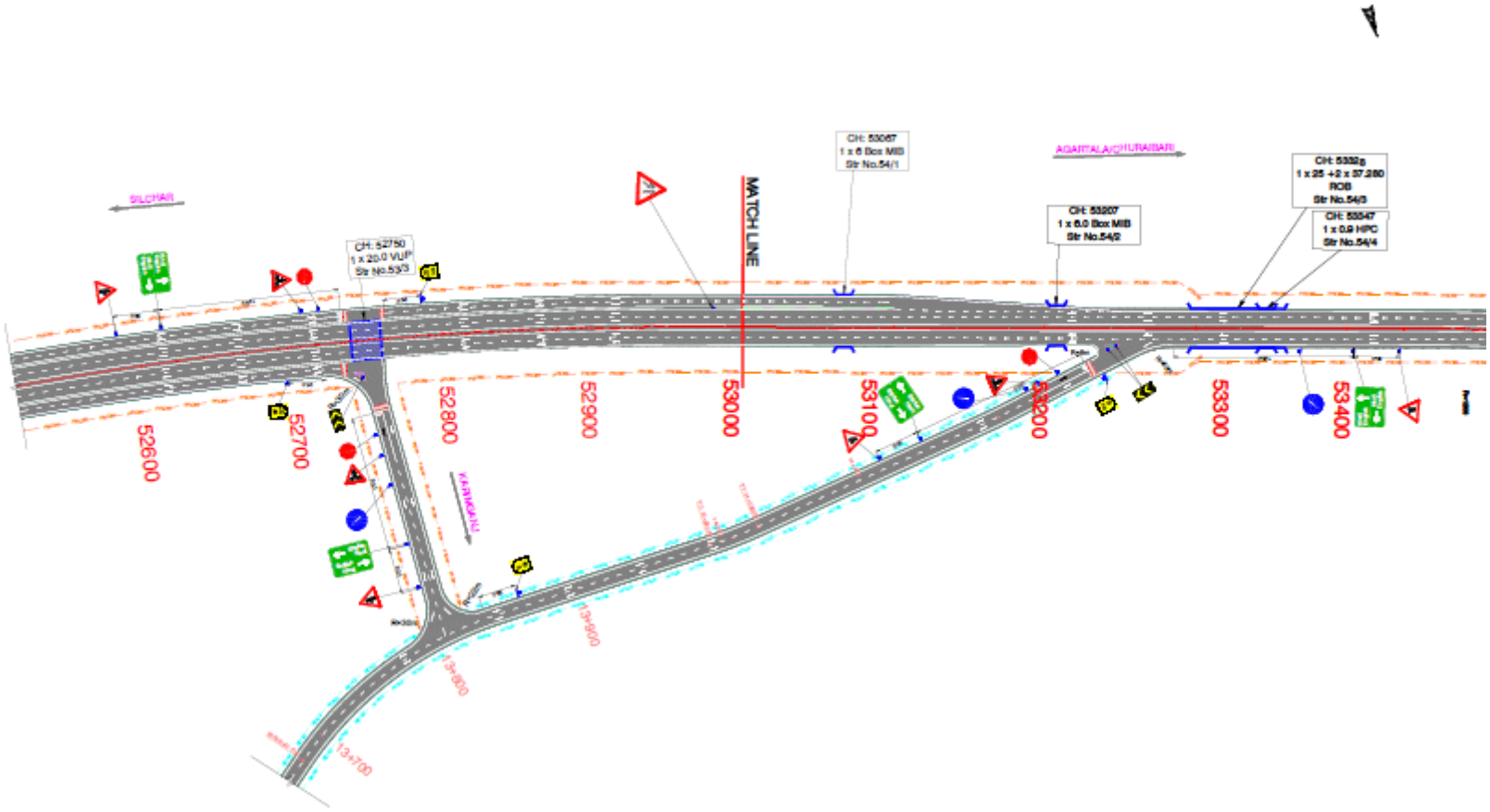
TCS:X CROSS SECTION OF STRUCTURE AT DECK LEVEL - WITHOUT FOOTPATH FOR SLIP/SERVICE ROAD
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)

Annex-III Major Junction Drawings

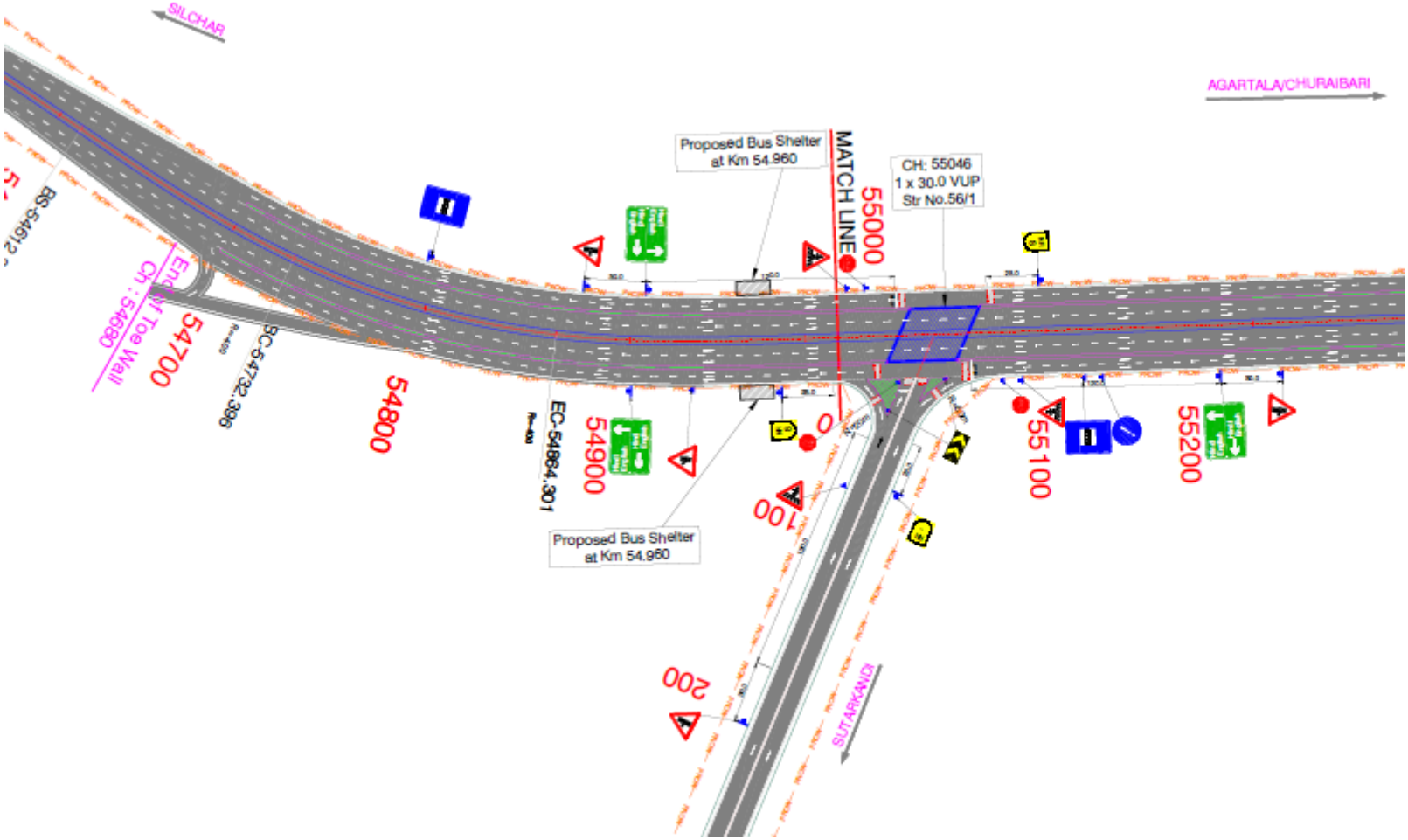
Major Junction Drawing at Km. 38+850



Major Junction Drawing at Km. 52+750



Major Junction Drawing at Km. 55+046



Annexure-I SCHEDULE –C
(See Clause 2.1)
PROJECT FACILITIES

1 Project Facilities

The Concessionaire shall construct the project facilities in accordance with the provisions of this agreement. Such Project facilities shall include:

- **a)** Toll Plaza
- **b)** Roadside furniture
  - i. Kilometer and Hectometre Stones
  - ii. Traffic Signs
  - iii. Overhead Signs
  - iv. Road Marking
  - v. Road Delineators
  - vi. Reflective Pavement Markers & Solar Studs
  - vii. Traffic Impact Attenuators
  - viii. Boundary wall and Fencing
- **c)** Operation and Maintenance centres
- **d)** Way side Amenities / Service Areas
- **e)** Truck lay-byes.
- **f)** Bus Bay and Bus shelter
- **g)** Pedestrian Facilities
- **h)** Highway Lighting
- **i)** Rainwater Harvesting
- **j)** Environmental Management Plan
- **k)** Land Scaping and Tree Plantation
- **l)** Advanced Traffic Management System (ATMS)
- **m)** Highway Patrol Units
- **n)** Emergency medical services
- **o)** Crane Service

1.1 Project Facilities to be completed on or before project completion date have been described in Annexure-I of this Schedule-C.

Annexure – II
(Schedule-C)
PROJECT FACILITIES

1. Project Facilities

The Concessionaire shall construct the Project Facilities described in this Annexure-I to form part of the Project Highway. The Project Facilities shall include:

- **a)** Toll Plaza
- **b)** Roadside furniture
  - i. Kilometer and Hectometer Stones
  - ii. Traffic Signs
  - iii. Overhead Signs
  - iv. Road Marking
  - v. Road Delineators
  - vi. Reflective Pavement Markers & Solar Studs
  - vii. Traffic Impact Attenuators
  - viii. Boundary wall and Fencing
- **c)** Operation and Maintenance centers
- **d)** Way side Amenities / Service Areas
- **e)** Truck lay-byes
- **f)** Bus Bay and Bus shelter
- **g)** Pedestrian Facilities
- **h)** Highway Lighting
- **i)** Rainwater Harvesting
- **j)** Environmental Management Plan
- **k)** Land Scaping and Tree Plantation
- **l)** Advanced Traffic Management System (ATMS)
- **m)** Highway Patrol Units
- **n)** Emergency medical services
- **o)** Crane Service

Description of Project Facilities

Each of the Project Facilities is briefly described below:

1 Toll Plaza

Tolling system shall be provided in entire length of the project and the same is integrated with the adjoining packages. The Toll Plazas shall be provided as per NHAI circular No. 17.5.82 dated 24/5/2021 and Schedule D. Minimum Lane requirement in the opening year are as follows.

Toll Plaza shall be provided confirming to **(Clause No. 10.2 IRC: SP:84-2019)** at the following locations:

S.No	Location of Toll Plaza (Km)		Direction (Entry: to high-way, Exit: from Highway)	Minimum number of Toll Lanes	
	Existing Chainage	Design Chainages		Entry	Exit
1	-	38.600	On MCW	4	4

The Sub Items of toll Plaza are as follows.

S.No.	Item	Number	Remarks
1	No. of toll lane	4+4	
2	toll Booth complex	2	1 One on RHS and 2 One on LHS
3	weigh bridges	2	
4	electrical systems		Sufficient for all equipment placed on Toll Plaza
5	Highway Nest with toilet facility	0	-
6	Internet facility	0 Locations	-

Note:

(i) The Toll Plaza shall be constructed as per Manual (Schedule D) considering the modification as per NHAI Circular NHAI/Policy Guidelines/Management of Toll Plaza/2021 Policy Circular No. 17.5.82 dated 24th May, 2021. However, layout as mentioned in Schedule-C shall be followed.

(ii) Based on the toll lanes as given above, toll Booth complex, weigh bridges, electrical systems, and all other facilities required/ mentioned in manual shall be provided as per specification mentioned in Schedule D

(iii) No. of toll lane specified above are to be provided. The Concessionaire shall design and provide toll lane as per Manual (Schedule D) & NHAI Circular NHAI/Policy Guidelines/Management of Toll Plaza/2021 Policy Circular No.17.5.82 dated 24th May, 2021 subject to as specified above.

(iv) All Toll Lanes to be equipped with Hybrid ETC equipment's as per NHAI/Policy Guidelines/Management of Toll Plaza/2021 Policy Circular No. 17.5.82 dated 24th May, 2021. DPR consultant to specify details of equipment's with their numbers. **(Clause No. 10.5 IRC: SP:84-2019)**

(v) A separate Highway Nest with toilet facility for road users shall be provided near toll plaza location along with parking facility. One toilet block on each direction shall be provided. These toilet facilities shall follow CPWD specifications for sanitary ware items and fittings such as WC, wash basin, Wash basin-Under counter, Urinal flat back, PVC Cistern, IWC Orissa Pan, Flush Value –CP, Wash Basin pillar cock-CP, Bib Cock—CP, Health Faucet, W/c Bib cock, Wash Basin angle cock. One WC shall be provided for specially challenged persons.

(vi) Point of Sale (POS) with card swapping machines shall be provided.

(vii) Provide Lane markings and Traffic Signs as per IRC: SP: 84-2019, IRC 35 and IRC 67 **(Clause No. 10.8 & 10.9 of IRC: SP:84-2019)**

(viii) Solar panels shall be erected over the either on FOB or over Toll plaza / Admin building to generate the green energy. Same shall be utilized for toll plaza lighting and other energy requirement within toll plaza area along with conventional lighting.

(ix) Medium speed Weigh in Motion (MSWIM) devices shall be provided in all toll lanes at Toll plaza Location. In addition to MSWIM, Static weigh Bridge (SWBs) shall be provided on each direction as per manual. **(Clause No. 10.6, IRC: SP:84-2019)**

(x) Provide Impact Attenuators on Toll Plaza islands in the direction of traffic. Impact attenuators shall be self-restoring confirm to section 10.6 of IRC SP 99 i.e. Manual of Specifications and Standards for Expressways. **(Clause No9.6, IRC: SP:84-2019)**

(xi) Provide Staircase on either side of the FoB at Median Island location by widening the island appropriately.

2 Roadside furniture

2.1 Kilometer and Hectometer Stones

(CLAUSE NO. 12.3 IRC: SP:84-2019/ IRC: SP:87-2019)

S.No.	Item	Number	Remarks
1	Kilometer Marker/ Stones	40	The KM/ Hectometer stones/ marker can be Concrete/ Stones and shall be placed on both outer side of the earthen shoulder. In case KM/ Hectometer marker are to be fixed on separator between Main Carriageway & Service Road then these should be fixed as reflective signs. In case of Access Control Highway/ Expressway, KM/ Hectometer marker should be fixed as reflective signs. Km/ Hectometer stones are required to provide on main carriageway and Service Road, both if continuous service road is provided throughout project length (Service Road length is more than 1 Km).
2	Hectometer Marker/ Stones	192	
3	5th Kilometer Stone	10	

2.2 Traffic Signs

Traffic Signs include roadside signs, overhead signs and kerb mounted signs etc. shall be provided along the entire Project Highway and on all Side, Roads joining the main carriageway/service road. A QR code shall be marked on back of each sign as per IRC 67.

(Clause No. 9.2 IRC: SP:84-2019)

All signs shall be of Micro Prismatic Grade Sheeting Corresponding to Class C sheeting as per ASTM D 4956 Type VIII, IX and XI. **(Clause No. 9.2.3 IRC: SP:84-2019)**

All shoulder mounted signs shall be supported on GI Pipes. Overhead Signs shall be placed on a structurally sound gantry or cantilever structure made of GI pipes. **(Clause No. 9.2.4 IRC: SP:84-2019)**

The siting of signs shall confirm to Table 4.1 and Fig 4.1 of IRC 67. (Clause No. 4.7 IRC: SP:84-2019/ IRC: SP:87-2019). The two successive signs shall be placed at a minimum distance of 0.6 x V metre (V is design speed in Kmph). **(Clause No. 4.8 IRC 67 2022).**

The overhead gantry signs shall be placed as given below: (**Clause No. 16.3.2 of IRC 67 2022)**

S.No.	Item	Carriageway (Left, Right, Both)
1	Overhead Gantry signs	
a	Start of Project	Both
b	End of project	Both
c	Toll plaza location on both side	Both, 1 no on each side
2	Overhead Cantilever Gantry signs	
a	At all major locations of crossroads i.e NH, SH, MDR (start of grade separated structure/at grade interchange)	Either left or right
b	At major trauma centre, roads leading to religious places or any other important location	-
3.	Double/Butterfly Cantilever	-

The detailed minimum number of signages indicating places, direction, distances, and other features shall be marked on the alignment plan and submitted, which are as mentioned below.

S.No.	Road Signs	Number	Remarks
I	**Mandatory/Regulatory**		
1	Stop signs	11	
2	Give Way Signs	-	
3	Prohibitory signs	-	
4	No Parking signs	-	
5	No Stopping signs	-	
6	Speed Limit signs (Circular)	-	
7	Speed Limit signs (Vehicle Type)	-	
8	Vehicle Control signs	-	
9	Restriction Ends sign	-	
10	Compulsory Direction Control and other signs	-	
II	**Cautionary/Warning**		
1	Left/Right Curve	15	
2	Left / Right Curve with side road	-	
2	Right/Left Hairpin Bend	-	
3	Right/Left Reverse Bend	-	
4	Series of Bends	4	

S.No.	Road Signs	Number	Remarks
5	270 Degree Loop	-	
6	Side Road	-	
7	Y-intersection	12	
8	Cross Road	-	
9	Roundabout	-	
10	Traffic Signals	-	
11	T-lntersection	-	
12	Major Road Ahead	-	
13	Staggered Inter-section	-	
14	Merging Traffic Ahead	8	
15	Narrow Road Ahead	-	
16	Road Widens	-	
17	Narrow Bridge Ahead	-	
18	Steep Ascent/Descent	-	
20	Reduced Carriageway	-	
21	Start /End of Dual Carriageway	-	
23	Gap in Median	-	
24	Pedestrian Crossing	16	
25	Pedestrian crossing with backing board	-	
26	School Ahead	-	
27	Built Up Area	-	
28	Two Way Operation (on main carriage way /service road	-	
29	Two Way Traffic on Cross Road Ahead	-	
30	Danger Warning Sign	-	
31	Deaf or Blind Persons Likely on Road Ahead	-	
32	Cycle Crossing	-	
33	Cycle Route Ahead (Warning for Cycles on road ahead)	-	
34	Dangerous Dip	-	
35	Speed Breaker	4	
36	Rumble Strip	-	
37	Rough Road	-	
38	Dangerous Ditch	-	
39	Slippery Road	-	
40	Slippery Road because of Ice	-	
41	Opening or Swing Bridge	-	
42	Overhead Cable	-	
43	Playground Ahead	-	

S.No.	Road Signs	Number	Remarks
44	Quay Side or Riverbank	-	
45	Sudden Side Winds	-	
46	Tunnel Ahead Warning	-	
47	Falling Rocks	-	
48	Cattle Crossing	-	
49	Wild Animals likely to be on Road Ahead	-	
50	Queues Likely Ahead	-	
51	Low flying Aircraft	-	
52	Unguarded Railway Crossing	-	
53	Guarded Railway Crossing	-	
54	Crash prone area ahead	-	
55	U- Turn	-	
III	**Chevron Signs**		
1	Single Chevron	197	
2	Double Chevron	-	
3	Triple Chevron	-	
IV	**Object Hazard Marker Sign**		
1	Left /Right side Object Hazard Marker	194	
2	Two-way Object Hazard Marker	-	
V	**Informatory/Guide**		
1	Direction and Place Identification signs	30	
2	Stack Type Advance Direction Sign (Shoulder Mounted)	-	
3	Stack Type Advance Direction Sign with cautionary / regulatory signs (Shoulder Mounted)	-	
4	Map Type Advance Direction Sign (Shoulder Mounted)	-	
5	Map Type Advance Direction Sign for roundabout (Shoulder Mounted)	-	
6	Flag Type Direction Sign	-	
7	Reassurance Sign	-	
8	Place Identification Sign	12	
9	Truck Lay -By	-	
10	Toll Booth Ahead	6	
11	Weigh Bridge Ahead	-	
12	Shoulder Mounted Sign in Advance of a Grade Separated Junction/ Interchange	-	
13	Expressway Sign	-	
14	Gantry Mounted advance Direction Sign Ahead of a Flyover in Urban/City Roads	-	

S.No.	Road Signs	Number	Remarks
15	Gantry Mounted advance Direction Sign Ahead of a Grade Separated Junction	-	
16	Gantry Mounted advance Direction Sign Ahead of a At Grade Intersection	16	
17	Gantry Mounted Advance Direction Sign for Interchange	-	
18	Cantilever Gantry Mounted Advance Direction Sign for Interchange	-	
19	Lane Dedicated Gantry Sign	-	
20	Definition/Supplementary Plates	-	
21	Tourism Related Sign	-	
22	Tourist Destination Direction Information Signs Without Photograph	-	
23	Tourist Destination Direction Information Signs With Photograph	-	
24	Finger Destination direction Information Sign for Pedestrians	-	
25	Tourist Map Information Sign	-	
26	Boundary Sign at Entrance to a City/Place	-	
27	Boundary Sign at Entrance to a Tourist Destination	-	
VI	**Facility Information signs**		
1	Eating Place	-	
2	Light Refreshment	-	
3	Resting Place	-	
4	First Aid Post	-	
5	Toilet	-	
6	Filling Station(Fuel Pump)	-	
7	Hospital	-	
9	U-Turn Ahead	-	
10	Pedestrian Subway	-	
11	Police Station	-	
12	Picnic Site	-	
13	Repair Facility	-	
14	Railway Station/Metro Station/Monorail Station	-	
15	Industrial Area	-	
16	Cycle Rickshaw Stand	-	
17	Taxi Stand	-	
18	Auto Rickshaw Stand	-	
19	Home Zone	-	
20	Camp Site	-	

S.No.	Road Signs	Number	Remarks
21	Airport	-	
22	Golf Course	-	
23	National Heritage	-	
24	No Through Road	-	
25	No Through Side Road	-	
26	Toll Road Ahead	-	
27	Guide Sign on Toll Lane Portal	-	
28	Country Border	-	
29	Entry Ramp for Expressway	-	
30	Exit Ramp for Expressway	-	
31	Expressway Symbol	-	
32	End of Expressway	-	
33	Bus Stop	12	
34	Bus Lane	-	
35	Contra Flow Bus Lane	-	
36	Cycle Lane	-	
37	Contra Flow Cycle Lane	-	
38	Holiday Chalets	-	
39	Emergency Exit	-	
VII	**Other Useful Information Signs**		
1	Signs For Persons With Disabilities	-	
2	International symbol of Accessibility	-	
3	Parking Information	-	
4	Parking Areas	-	
5	Ramped Entrance to Subway/Over Bridge	-	
6	Telephone Facilities	-	
7	Toilet Facilities	-	
8	Way Finding	-	
9	Parking Signs	-	
10	Auto Rickshaw Parking	-	
11	Cycle Parking	-	
12	Cycle Rickshaw Parking	-	
13	Scooter and Motorcycle Parking	-	
14	Taxi Parking	-	
15	Park and Ride	-	
16	Parking Restrictions Signs for Traffic Management	-	
17	Flood Gauge Sign	-	
VIII	**Route Maker Signs**		

S.No.	Road Signs	Number	Remarks
1	State Highway Route Marker Sign	-	
2	National Highway Route Marker Sign	14	
3	Asian Highway Route Marker Sign	-	
4	Expressway Route Marker Sign	-	

Note: The locations of the placement of signages shall be finalized in consultation with Independent Engineer/ NHIDCL, as per site requirement.

2.3 Road Marking

Road Markings shall be Hot applied thermoplastic materials with reflectorized beads to achieve visibility confirming to clause 2.7.2 of IRC 35. **(Clause No. 2.2 IRC: 35)**

The cold applied plastics pavement markings shall be used for School Zone Markings, Audible Raised Profile Edge Lines and Block Markings (BM 01/02/03). **(Clause No. 2.4 of IRC: 35)**

S.No.	Item	Unit		Remarks
		Length (m)	Number	
1	Longitudinal Marking			
2	Transverse Marking			
3	Hazard Marking			
4	Block Marking			
5	Arrow Marking			
6	Directional Marking			
7	Facility Marking			
8	Center Line			
9	Traffic Lane Lines	6437		
10	No Overtaking Lines			
11	Warning Lines			
12	Border or Edge Lines	31972		
13	Longitudinal Markings for Undivided Roads			
14	Longitudinal Markings for divided Roads	17763		
15	Longitudinal Markings for Ramps/Slip Roads/One Way Streets	7772		
16	Stop Line	23		
17	Give Way Lines			
18	Diagonal Markings			
19	Chevron Markings			
20	Continuity Line			
21	Word Messages			
22	Lane Change			
23	Merging/Diverging Markings			
24	Hatch Markings			
25	Raised Profile Edge Lines			
26	Lane Reduction / Narrowing Situations and Transitions (lane Balancing)			
27	Directional Arrows		14	
28	Mandatory Turn Arrows			

S.No	Item	Unit		Remarks
29	Guidance Arrows			
30	Deflection Arrows			
31	Bifurcation Arrows			
32	Arrows on Side Road Approaches			
33	Arrows on Main Road Approaches			
34	Word Messages			
35	Yellow Box Markings			
36	Ghost Island			
37	Marking for Speed Breakers			
38	Pedestrian Crossing	196		
39	Markings when highway passes through set-tlement fig 9.4 of IRC SP 84/87			
40	Transverse Bar Markings			
41	Busbay Marking		2	
42	Truck Lay-by Markings			
43	Toll Plaza Marking	273.5		
44	School Zone Markings			
45	Object Markings within Carriageway			
46	Objects Markings Adjacent to Carriageway			
47	i. Subway Piers, Abutments, Culverts Head Walls, Concrete Barrier			
48	ii. Electrical Poles			
49	iii. Guard Rails			
50	iv. Trees			
51	v. Kerbs			
52	Directional Markings as per Annexure: A 6			
53	Facility Markings as per Annexure A.7 of IRC 35			

Note: The locations of the marking shall be finalized in consultation with Independent Engineer/NHIDCL, as per site requirement.

2.4 Road Delineators

(CLAUSE NO. 9.4 IRC: SP:84-2019)

S.No.	Item	Number/ Length (m)	Remarks
1	Roadway Indicators	64 no.	
2	Median Marker on Median/RCC Barrier **(Clause 4 of IRC 79 2019)**		Anti-glare screens are used on Medians
3	Object Markers	16 nos	-
4	Flexible Object Markers **(Clause 6 of IRC 79 2019)** i. On Metal Beam Barrier ii. On Toll Booth/Toll Island iii. On Entry/Exit of Tunnel iv. On Exit from Main carriageway	ii) 8	

S.No.	Item	Number/ Length (m)	Remarks
5.	Solar Blinkers on Median Opening, on exit from main carriageway and traffic islands of grade separated intersections	-	

Note: The locations of the marking shall be finalized in consultation with Independent Engineer/NHIDCL, as per site requirement.

2.5 Reflective Pavement Markers & Solar Studs

THE PRISMATIC RETRO-REFLECTIVE TYPE CONFIRMING TO ASTM D-4280 PAVEMENT MARKERS & SOLAR POWER STUDS ON HIGHWAY SHALL BE PROVIDED IN ACCORDANCE WITH SCHEDULE - D. (CLAUSE NO. 9.5 IRC: SP:84-2019)

S.No.	Item	Number	Location	Remarks
A.	**For 4 Lane Projects**			
1	White Colour one coloured face Road Studs		Traffic lane line & center of carriageway	Bi-directional Carriageway
2	Red Colour one coloured face Road Studs	1344	Left hand edge of the carriageway, entry to truck lay bye / bus bay, start of service road, chevron/diagonal markings on gorge	
3	Yellow / Amber Colour one coloured face Road Studs	1344	Median side edge line, zebra crossing	
4	Green Colour one coloured face Road Studs	0	Lay byes, left hand side of the carriageway in case of multilane divided carriageways, crossable continuous line like in acceleration/deceleration lanes involving lane changing	
B- For 2 Lane PS Projects				
5	White Colour Two coloured face Road Studs	NA	Traffic lane line & center of carriageway	Uni-directional Carriageway
6	Red Colour Two coloured face Road Studs	NA	Left hand edge of the carriageway, entry to truck lay bye / bus bay, start of service road, chevron/diagonal markings on gorge	
7	Green Colour Two coloured face Road Studs	NA	Lay byes, left hand side of the carriageway in case of multilane divided carriageways, crossable continuous line like in acceleration/ deceleration lanes involving lane changing	

S.No.	Item	Number	Location	Remarks
8.	Solar Studs on Major/Minor bridge, RoB, and all structures (Interchange/Flyover/VUP) and Builtup areas, In storage lane of median opening and Exit/Entry from main carriageway	NA		

2.6 Traffic Impact Attenuators (CLAUSE NO. 9.6 IRC: SP:84-2019)

2.6.1 Provide Impact Attenuators in Gore Areas

It shall be self-restoring confirming to section 10.6 of IRC SP 99 i.e. Manual of Specifications and Standards for Expressways at following locations

S.No.	Item	Chainage / Number	Remarks
1	On flyover/grade separated structure at exit from main carriageway	-	
2	On Island of Toll Plaza	-	
3	Any other location which Safety Hazard	-	

2.6.2 Providing End Terminals (Clause No. -----, IRC SP 99)

Provide End Terminals P-4 type confirming to EN 1317-4 to Parapet Walls of Culverts, Structures ends for the safety of approaching traffic etc.

S.No.	Item	Chainage / Number	Remarks
1	Culvert Ends	-	
2	Structures Ends	-	
3	Any other location which Safety Hazard	-	

2.7 Boundary wall and Fencing

Boundary wall shall be provided along the entire length on either side (including transverse requirements at structure locations) as per the detail given below in accordance with IRC: SP:84. Road boundary walls shall be provided at the boundary on both sides of the right of way available under the control of the Authority, except at ingress and egress points. The boundary walls shall be of Precast panel fencing as per figure enclosed as Annexure A of Schedule C.

At all CD structure locations, the boundary wall shall be discontinued by turning and joining it with the wing/return wall to allow crossing through these structures during dry seasons.

In case of Precast panel fencing, provide cast in situ coping beam on top of fencing. provide detailed drawings as Annexure-A **(Clause No. 12.2 IRC: SP:84-2019)**

3 Operation and Maintenance centers

There shall be operation and maintenance center(s) as per Clause 12.15 of Schedule-D, either near the toll plaza location or at any other location along the Project Highway, as identified by the Concessionaire. The minimum land for O & M center shall be 2000 sq.m and shall be acquired by the Concessionaire at his own cost and risk. Dedicated operation and maintenance center shall be provided in accordance to Schedule D. (Clause No. 12.15 IRC: SP:84-2019)

4 Rest Area (Wayside Amenities):

Development of site for wayside amenities and rest area along with approach road shall be at the following location.

S.No	Item	Design Chainage (Km)	Side	Remarks
1	Rest Area	43.300	LHS	-
2	Rest Area	51.600	RHS	-

The connectivity from highway shall be provided. The facilities shall conform to clause 12.6 of Manual:

Adequate cross drainage structures (culvert) shall be provided.

Specifications & Standards for above facilities:

The project shall be constructed in conformity with the specifications and standards specified in this Schedule –D.

Scope of Work:

The project scope would include the following major activities:

Design & Construction of Project:

Geo-technical investigations

Original proposal – The concessionaire/ contractor will be required to develop the access road/slip road to way side amenities along with basic development as mentioned below. Contractor shall complete these with-in 1 year from appointed date and handover WSA site to the NHIDCL.

Project facilities development:

The project facilities may include the following activities; however, the final detailed set of activities to be performed shall be submitted to the Independent Engineer/A.E and NHIDCL for approval prior to initiating development on the site:

S.No	Description
I	Site Development
	Site Clearance & Area development
	Leveling, Cutting & Filling Soil (Total Plot Area)
	a. Cutting of Trees – As required to match site specific Layouts.
	b. Dismantling/Demolishing including disposal
	c. Rerouting of EB, Water & telephone Service (Above/Below ground)
	d. Additional Filling/Cutting – To match levels indicated in the Site

	Specifications Drawings
	1. Construction of Retaining wall/ Slope Stability Arrangements
	2. Compound wall, Culvert, Deceleration Zone, Acceleration Zone, Buffer Zone and service/ Access Road
	a. Compound wall (Height 3.0m with barbed wire fencing)
	b. RCC Slab/Pipe Culvert (Outside the Premises)
	c. Access Road (Outside the Premises)/ Approach Road
	d. Deceleration Zone (Outside the Premises)
II	Toilet block shall be provided as per drawing provided in annexure.
III	Approach road to Fuel station shall be provided.

5 Truck lay-byes:

5.1 The truck lay-bye shall be provided at the given location and as per the design mentioned in Schedule-D.

Sr. No.	Design Chainage	Side	Remarks
NIL			

5.2 Toilet block

Toilet block along with Janitor room on each Truck Lay bye shall be provided. The toilet block shall consist of atleast 1 block for bathing, atleast 2 fixtures each for urinals, WC and wash basin. There shall be 24-hour lighting facility in toilet block. These toilets facilities must be functional round the clock including proper maintenance. For arrangement of water, 1 no. of boring along with water pump shall be provided to keep the toilet clean. For upkeep and maintenance of Toilet, 3 Safai wale (1 in each 8 hour shift) shall be engaged and is in the scope throughout contract period.

5.3 Truck Lay Bye Pavement

Pavement Composition (Flexible/Rigid/ Paver Blocks)
Flexible Pavement (Same as Main Carriageway)

6 Bus Bay and Bus shelter:

Provision of Busbay and bus shelter on highways as per IRC 80 : 2022 including paving of layby, signs, markings, speed calming measures, drainage, lighting etc., in builtup areas, intersections of NH/SH/MDR and roads leading to large settlements is as follows: **(Clause No. 12.7 IRC: SP:84-2019)**

6.1 Bus Bays

Bus Bays with tapers shall be provided along with passenger's shelters shall be constructed at the following locations.

Sr. No.	Design (Existing) Chainage (Km)		Entry Taper Length	Bus Bay Length	Exit Taper Length	Remark
	Left	Right				
1	62.100	62.160	60	5	25	-

6.2 Kerb Side Bus Stop with Pedestrian shelter

Kerb Side Bus Stop with Pedestrian shelter shall be provided at the following locations.

Sr. No.	Design (Existing) Chainage (Km)		Pedestrian Shelter Length (m)	Remark
	Left	Right		
1	54.960	54.960	15.0	-
2	59.030	59.070	15.0	-
3	59.930	60.030	15.0	-

6.3 Bus Bay Pavement

Provide pavement composition (Flexible/Rigid/ Paver Blocks) as follows:

Pavement Composition (Flexible/Rigid/ Paver Blocks)
Flexible

7 Pedestrian Facilities

Pedestrian Facilities shall be provided in accordance with the Manual of Specifications and Standards as referred in Clause 9.8 of Schedule D and IRC 103 2022. This shall consist of footpath (sidewalks), pedestrian guard rails and pedestrian crossing. **(Clause No. 9.8 IRC: SP:84-2019/ IRC: SP:87-2019)**

The details are as mentioned below:

S.No.	Pedestrian facilities	Chainage		Side	Remarks
		From	To		
1	Pedestrian guardrails shall be 150 mm from Carriageway/Paved Shoulder i. Hazardous Locations on Straight Stretches ii. At Junctions/Intersections iii. Schools iv. Bus Stop/Railway Stations v. Overpass, Subway vi. Central Reserve	38.700 52.700 55.000	38.900 52.800 55.100	BS	At Junction
2	Footpath paving including fixing of Tactile pavers	-	-	-	-
3	Pedestrian Crossing i. With Zebra Marking ii. With Tabletop Crossing iii. At Intersections iv. At Schools	i)12			At bus shelter locations with Zebra markings

8 Highway Lighting

The street light poles shall be 1 piece, continuous-tapered, octagonal poles and shall be manufactured from one length of steel sheet, formed in continuous tapered tube, with one continuous arc-welded vertical seam. The minimum wall thickness for lighting poles shall not be less than 4 mm. The Bottom Diameter shall be minimum 175 mm. The Top Diameter shall be

minimum 75 mm. The door on window of pole shall be antitheft. All electrical cable should be concealed. All electrical lighting fixers shall be LED. The fixtures shall be concealed except on poles. Lighting poles shall be fixed on outer side of steel/concrete barrier. The lighting shall be providing at the following locations: (Clause No. 12.5 IRC: SP:84-2019)

S.No.	Lighting facilities	Chainage		Side	Lighting Source: Electricity Board/ Generator/ Solar
		From	To		
1	**Toll Plaza area:** The lighting in and around toll plaza, toll booths, office building, on the approach road, etc. shall be as per Section 12 of the Manual. In addition to at least two high mast light shall be provided on either side of toll plaza	36.550	36.850	BHS	Electricity Board
2	**Rest Areas:** The entire Rest areas shall be provided with lighting with average illumination to 40 Lux	51.500	51.700	RHS	Electricity Board
		44.200	44.400	LHS	Electricity Board
3	**Truck lay-bye:** The entire area of truck lay-byes and 50m length of the project highway on its either side shall be illuminated at night to provide an average illumination of 40Lux. Suitable designed electric poles having aesthetic appeal and energy saving bulbs (LED) may be used to provide required illumination. Alternatively, photo voltaic lamps may be used	-	-	-	
4	**Bus Bay & bus shelter locations**: The entire bus bay & bus shelter area shall be provided with Lighting (Average illumination of 40Lux.).	54.910	54.960	LHS	Electricity Board
		58.970	59.080	LHS	
		59.880	59.990	LHS	
		62.050	62.150	LHS	
		54.860	54.960	RHS	
		59.020	59.120	RHS	
		59.980	60.030	RHS	
		62.110	62.210	RHS	
5	**Grade separated structures, interchanges, flyovers, underpasses (vehicular/ pedestrian) and Vehicle overpass-**	40.170	40.530	BHS	

S.No.	Lighting facilities	Chainage		Side	Lighting
	es: Lighting requirement shall be as per section 12 of the manual. The top and underside of the grade separated structures including service road/ slip road, interchange area at the ground level up to 50m beyond the point from were flaring of the main carriageway takes place shall be provided with lighting. Also, on all legs of at grade interchange/ crossings the lighting shall be provided 50m beyond the point of Centre on all legs. The minimum illumination shall be 40 Lux., at the extreme edge of the Highway.	52.360	53.100	BHS	
		54.700	55.550	BHS	
		58.950	59.380	BHS	
		59.380	60.610	BHS	
		62.660	62.800	BHS	
6	**Built-up sections** on the project highway on the service roads on both sides	40.170	40.530	BHS	
		52.360	52.750	BHS	
		52.750	53.100	LHS	
		54.700	55.550	BHS	
		58.950	59.380	BHS	
		59.380	60.610	BHS	
		62.660	62.800	BHS	
7	**On Median Openings provide 1 no. high mast lighting of 25m height**	-	-	-	-
8	**On Major Bridges and its approaches higher than 3m**	48.504	48.609	BHS	
		54.350	54.550	BHS	

9 Rainwater Harvesting

The provision of rainwater harvesting shall be provided at every 500m staggered in the entire project length and shall be executed as per requirement of IRC SP: 42-2014 and IRC SP: 50-2013. Additionally, wherever urban drains are provided, which do not have a definite outfall for discharge of water, at such location one pit for rainwater harvesting shall be provided along the side drains at the lowest point/ where the water stagnates. The type and location of rain water harvesting is as follows:

S.No.	Rainwater Harvesting Type	Chainage	Side	Depth of Recharge Structure
1	Type 1 confirming to clause 10.7.2 of IRC SP 42			
2	Type 2 confirming to clause 10.7.3 of IRC SP 42			
3	Type 3 confirming to clause 10.7.4 of IRC SP 42			
4	Type 4 confirming to clause 10.7.5 of IRC SP 42	@500 m staggered in the entire pro-	Both Side	As per Fig.10.6 of IRC SP 42

S.No.	Rainwater Harvesting Type	Chainage	Side	Depth of Recharge Structure
		ject length		

10 Environmental Management Plan

The Concessionaire shall implement the Environmental Management plan & action Plan for undertaking possible mitigation measures in accordance with environmental clearance accorded by Ministry of Environment and Forests and climate change. The conditions & directions stipulated by the MOEF shall be complied by the contractor/ concessionaire.

11 Land Scaping and Tree Plantation

The Concessionaire shall plant trees and shrubs of required numbers and types at the appropriate locations within Right of Way and in the land earmarked by the Authority for afforestation as per Schedule D at the following areas.

Sl. No.	Types of Plantations	Location (Km)	Number of trees to be planted	Remarks
Nil				

*- As per NHAI Policy circular No. 7.4.9 dated 15th March 2023, Avenue plantation is delinked from EPC/HAM/BOT toll projects.

12 Advanced Traffic Management System (ATMS)

The Concessionaire is required to design, install, operate and maintain Advanced Traffic Management System (ATMS) as part of the project facilities. Advanced Traffic Management System shall be provided as per standards and specifications specified in the manual and as per NHAI circular dated 10.10.2023 and shall be maintained throughout the contract period. (NHAI Policy Circular No 11.53/2023)

The ATMS components to be deployed shall inter alia include:

12.1 General

The ATMS Project shall broadly include the following sub-systems to be provided as per the standards & specifications mentioned in NHAI Policy Circular No11.53/2023.

12.1.1 Video Surveillance System / Traffic Monitoring Camera System (TMCS)
12.1.2 Video Incident Detection System (VIDS)
12.1.3 Vehicle Actuated Speed Display System (VASDS)
12.1.4 Fixed and Portable Variable Message Sign (VMS) System
12.1.5 Communication Network with OFC Backbone
12.1.6 Common ATMS Command & Control Center for Km. 38.600 to Km.62.800.
12.1.7 Power Supply for Field Equipment as well as for ATMS Command & Control Center
12.1.8 Operation & Maintenance (O&M) of the entire ATMS Facility
12.1.9 Maintenance Vehicle

The requirements stated herein shall be construed as minimum requirement and meeting the respective requirements individually shall not relieve the Contractor from the responsibility.

The entire system should function efficiently as an integrated solution during the entire O&M period.

12.1.1 Video Surveillance System / Traffic Monitoring Camera System (TMCS)

(i) The system monitors vehicular and other road related activity along the highway stretch through PTZ Camera mounted on Poles. Generally, the camera should be placed at a distance not greater than 1km so as to effectively monitor all the lanes of the entire stretch of Highway. In case certain stretches include regular curves, ramps etc not allowing central line of sight, then additional TMCS camera shall be put to ensure effective surveillance of the entire stretch. The TMCS cameras should also be placed on the following Junctions below the Grade Separated Structure.

*- As per TCS drawings attached in Annex-II of Schedule B, 1 TMCS/km will be provided in median in TCS-I, III & IV. For TCS II, V, VA, VB and VI 2 TMCS/km will be provided. These shall be placed on Electric poles on separators.

(ii) The TMCS should also be provided at the following Junctions to monitor the traffic at the following junctions:

Sl No	Location (Km)	LHS/ RHS/ BHS	Remarks
1	40.522	BHS	-
2	41.468	BHS	-
3	42.811	BHS	-
4	46.878	BHS	-
5	50.858	BHS	-
6	52.750	BHS	-
7	54.117	BHS	-
8	55.046	BHS	-
9	59.983	BHS	-

12.1.2 Video Incident Detection System (VIDS)

The VIDS include Gantry Mounted ANPR Cameras, Overview Cameras and associated incident detection software system to effectively detect pre-defined actionable incidents which triggers enforcement and incident response system. The VIDS should also act as Automatic Traffic Counting and Classifying (ATCC) system. The VIDS should be provided at following locations:

Sl No	Location (Km)	Remarks	Availability of Full Gantry**
1	38.600	2 No. (one of LHS & RHS)	To be provided
2	62.800	2 No. (one of LHS & RHS)	To be provided

** [VIDS system requires full Gantry on both LHS & RHS].

12.1.3 Vehicle Actuated Speed Display (VASD) System

The VASD system shall include gantry mounted Radar and Speed Display system for each lane to warn the road users of their speed. The system shall act as a Speed Calming Measure. VASD System should be provided at following locations along the Expressways:

Sl No	Location (Km)	Remarks	Availability of Full Gantry**

1	38.600	2 No. (one on LHS & one on RHS)	To be provided

** [VIDS system requires full Gantry on both LHS & RHS]

12.1.4 Variable Message Sign (VMS) System

The VMS shall provide road users advance information of road conditions ahead and shall be controlled from the local ATMS Control centre. The VMS shall be installed at following locations:

12.1.4.1 Fixed VMS

12.1.4.1.1 Gantry (M Type)

Sl No	Location (Km)	Remarks	Availability of Full Gantry**
1	38.600	2 No. (one of LHS & RHS)	To be provided
2	62.800	2 No. (one of LHS & RHS)	To be provided

** [VIDS system requires full Gantry on both LHS & RHS]

12.1.4.1.2 Cantilever (L Type)

Sl No	Location (Km)	Remarks	Availability of Full Gantry**

** [VIDS system requires full Gantry on both LHS & RHS]

12.1.4.2 Portable VMS

Details of Trolley Mounted Portable VMS signs shall be finalised by the concessionaire in consultation with IE /NHIDCL

12.1.5 Communication Network with OFC Backbone

The entire Expressway stretch shall be provided with minimum 24 Core OFC Backbone as per the standards & specifications. The short haul connections like between field equipment to access points, access points to OFC backbone etc shall be done with minimum 12 Core cable. The OFC shall be laid strictly as per the Standards and Specification.

12.1.6 ATMS Command and Control Center

The ATMS Command and Control Centre structure will be constructed by Civil Contractor of NHIDCL at Km 44.500. The ATMS Contractor shall set up and operate the ATMS Command And Control Center as per the Standards and Specification. The ATMS Contractor shall undertake any additional civil works, interior works, MEP works, for setting up the Command Center, including all additional related electrical, lighting, electrical connection, DG set, power backup, HVAC works, access control, building CCTV, PTZ cameras outside building, fire-fighting system, alarm, fire extinguishers, raised floor, housekeeping, building cleaning, maintenance, recurring charges including electricity bills, telephone bills, DG fuel, servicing, security.

12.1.7 Power Supply for ATMS Command & Control Center and Field Equipment

The Contractor shall ensure 24x7 supply for the ATMS Command and Control Centre and Field Equipment with supply power from Electricity Department as primary source supported by UPS renewable power (solar etc) and DG Set of adequate capacity.

There shall be NO obligation of NHIDCL with regard to providing power/ electricity supply/connections for testing commission, operation & maintenance of any component of the ATMS. Further, the following points are to also be observed by the ATMS contractor:

a. The Contractor shall perform all the necessary application procedures to the Power Company required for the power to be supplied to the Traffic Management Centre, Sub-Centre and the field equipment in their own name. All the expenses charged by Power Companies regarding such applications and execution of work shall be borne by the Contractor as part of the scope of this contract. Any damage to the highway during such execution of work shall have to be repaired by the ATMS Contractor to the pre-existing condition without any cost implications to NHIDCL.

b. The Contractor shall make all necessary arrangements for the electricity needed for the execution of the Works and O&M period for the entire period of the Contract. In case electricity is not made available through electricity companies, alternate electricity arrangement such as through renewable energy/DG Set should be made by the Contractor. Under no circumstances NHIDCL shall grant an extension of time for achieving the milestones if the contractor is unable to make the electricity arrangement either for the execution of the work or for the O&M activities.

c. The fixed charges, installation charges, recurring charges, electricity bill, DG set fuel, maintenance etc. for each field equipment, TMC, Control Centre, Sub-centre, Contractor's site office, or any other facility being used by the Contractor under the scope of this Contract shall be in the scope of the Contractor only for the entire Contract period i.e., Design phase, procurement, installation, testing, trail-run, commissioning, operations, and maintenance period. The Authority shall not be responsible for any provision for power supply during implementation as well as operations and maintenance period.

12.1.8 Operation & Maintenance (O&M) of the entire ATMS Facility.

a. The O&M period after the successful completion of works shall include Operation & Maintenance of the entire ATMS Facility as per the Service Level Agreement (SLA) with Qualified Manpower mentioned in Standards & Specifications including supply of adequate spares, parts, consumables and maintenance equipment required for the facility. The Contractor shall maintain required spare parts to maintain required service levels.

b. The Contractor shall have sufficient infrastructure and capability to keep/store spares required for maintenances and will at all times during the contract period maintain sufficient inventory of spares and consumables for operating and maintaining the ATMS and to meet the Service Level requirements.

c. Before the start of O&M Period, the Contractor shall deploy the O&M Personal mentioned at Appendix-C of Standards & Specification with prior approval of the Authority.

12.1.9 Maintenance Vehicle

The ATMS Contractor shall keep adequate numbers of dedicated vehicles (minimum 1 vehicle per 50km) to attend the maintenance requirement during the Operation & Maintenance period.

13 Highway Patrol Units

Highway Patrol units shall be established and operate at toll plaza location as per Schedule-D Clause 12.10 (strictly as per details mentioned in Annexure-C), which shall continuously patrol the highway in a stretch not exceeding 50 km (if the stretch is more than 50 km additional 1 number of patrol vehicle per 50 km or less shall be provided). The vehicle shall be brand new with fuel, driver, and insurance all-inclusive for the entire contract period. Highway Patrol units shall be fitted with GPS and GSM based vehicle tracker system. Highway Patrol Vehicles shall be stationed on layby constructed on Project Highway @ every 20 km of each Toll Plaza. (Clause No. 12.10 IRC: SP:84-2019)

14 Emergency medical services

The Contractor shall, at its own cost, construct a medical aid post at each toll plaza with a minimum size of 5 x 5 sq.m with a toilet (to be used for the patients of minimum size of 3 x3 sq.m) and hand it over to the Authority, no later than 30 (thirty) days prior to PCOD/COD. The Medical Aid Post(s) shall be deemed to be part of the project and shall vest in the Authority. Medical Aid Post shall be set up at Administrative Block with round-the-clock services for victims of accidents on the Project Highway.

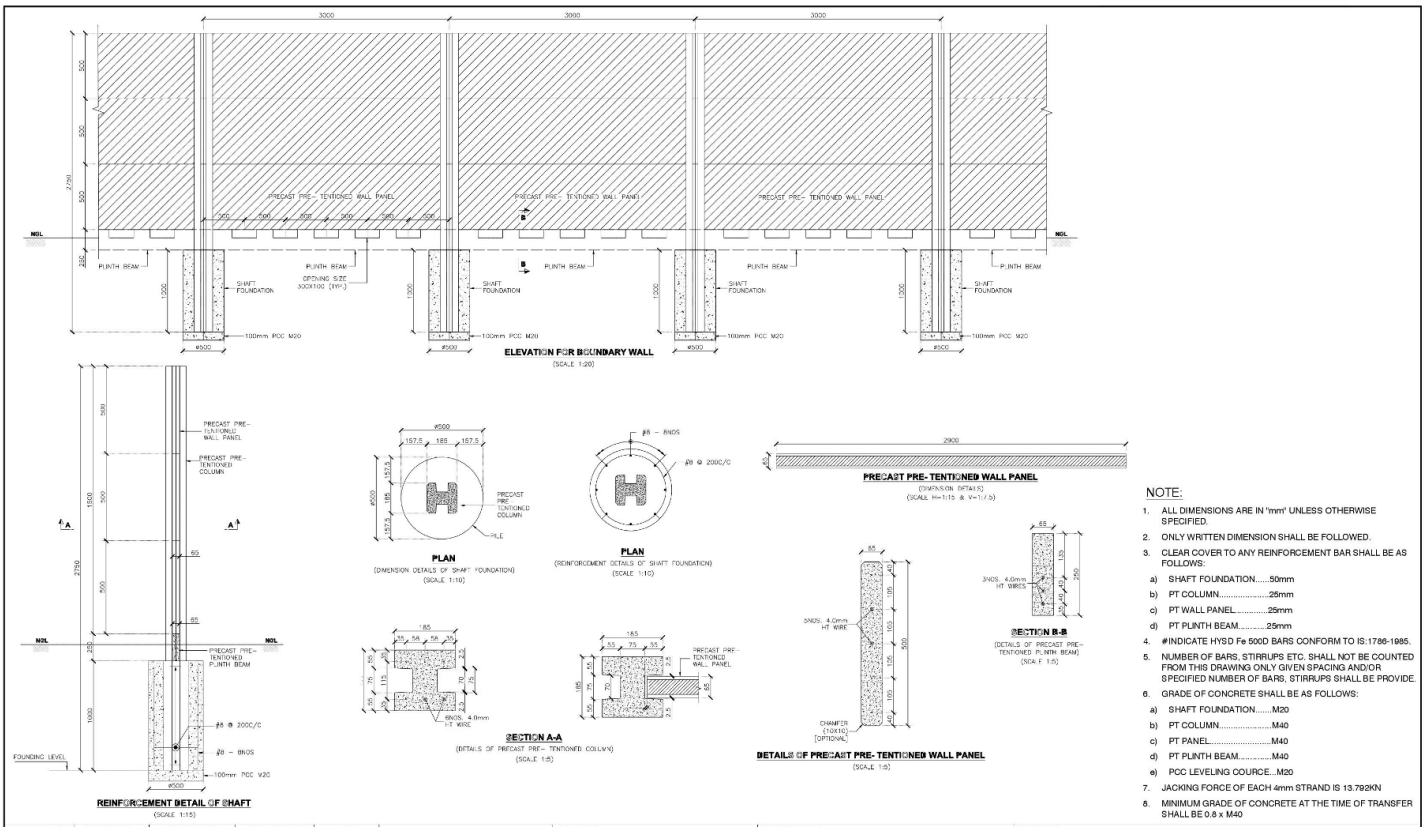
One number Ambulance shall be provided in a stretch not exceeding 50 km (if the stretch is more than 50 km additional 1 number of ambulances per 50 km or less shall be provided). The Ambulance shall be brand new with fuel, driver, medical staff and insurance all-inclusive for the entire contract period. Ambulance fitted with GPS and GSM based vehicle tracker system shall be provided to be integrated with the Video Incident Detection System with ATMS, as per Schedule-D, Clause 12.11 (strictly as per details mentioned in Annexure-D), along with all necessary manpower (including paramedical staff), medicines, equipment's etc. and shall be maintained in an effective manner throughout the contract period starting from the appointed date. Ambulance shall be stationed on layby constructed on Project Highway @ every 20 km of each Toll Plaza **(Clause No. 12.11 IRC: SP:84-2019) & NHAI Circular NHAI/Incident Management/ 2021 Policy Circular No. 18.6/2021 dated 11th March 2021.**

15 Crane Service:

Crane Service shall be provided on project highway, as specified in the manual Clause 12.12. One number crane shall be provided in a stretch not exceeding 50 km (if the stretch is more than 50 km additional 1 number of crane per 50 km or less shall be provided). Crane having capacity of minimum 20T shall be made available. The crane shall be brand new with fuel, driver, and insurance all-inclusive for the entire contract period. Cranes shall be stationed on layby constructed on Project Highway @ every 20 km of each Toll Plaza. **(Clause No. 12.12 IRC: SP:84-2019)**

Annexure A of Schedule C

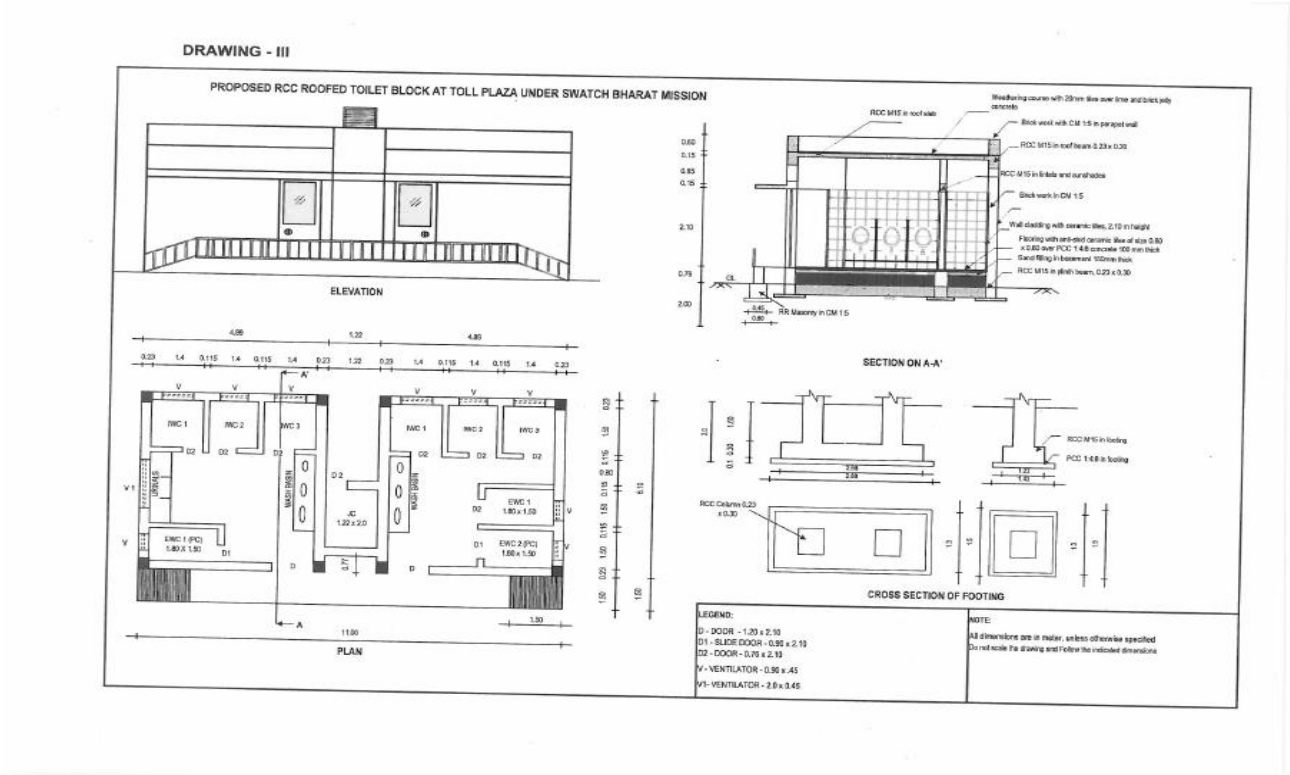
(Schedule-C)



Typical Drawing of Boundary Wall

Note: Above mentioned typical drawing is for reference, Concessionaire shall finalize the detailed drawing as per manual in consultation with Independent Engineer/ NHIDCL.

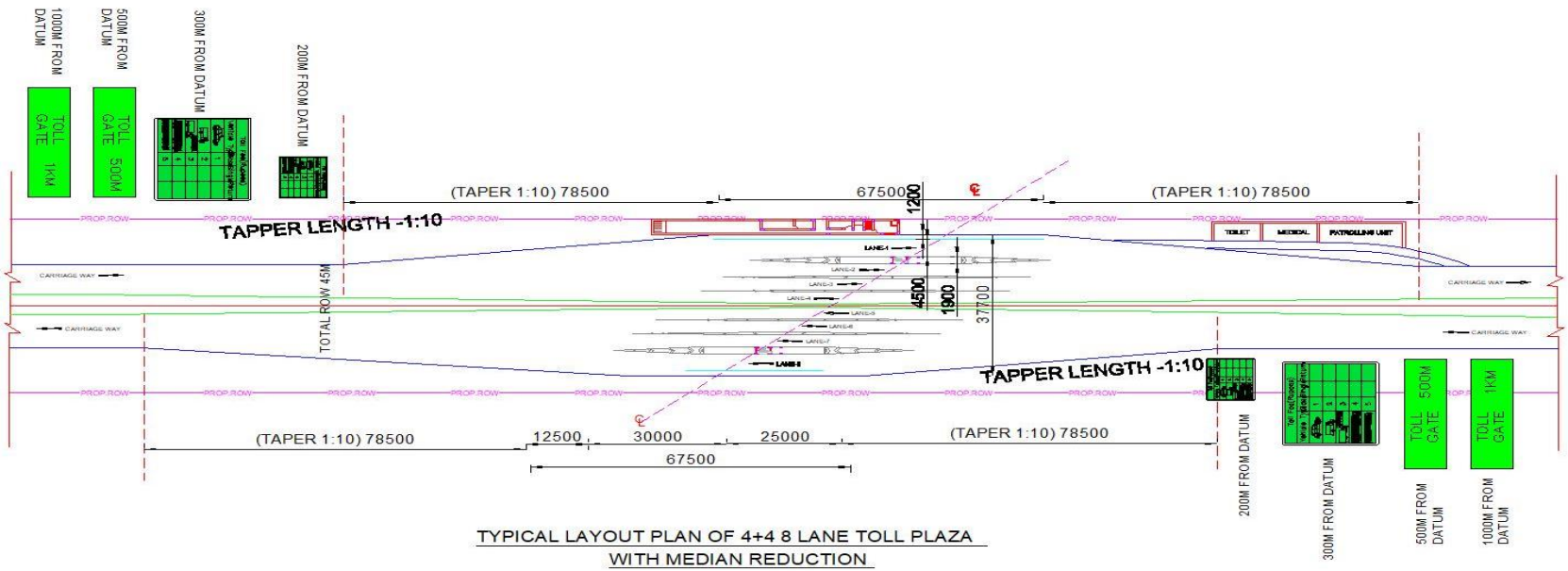
Annexure-II
Schedule C Standard Drawing for Toilet



Annexure-III

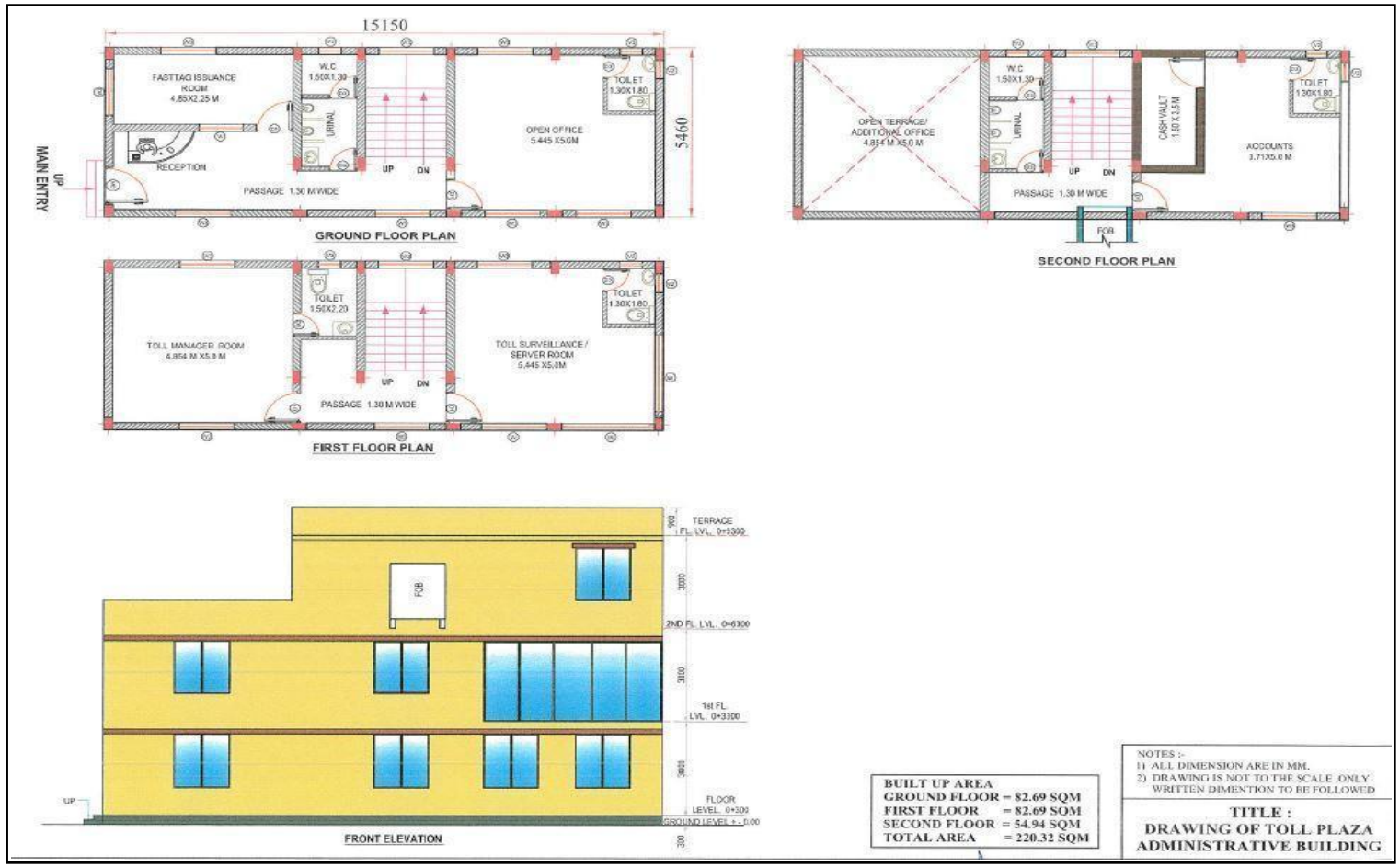
(Schedule-C)

Typical Drawing for Toll Plaza



TYPICAL LAYOUT PLAN OF 4+4 8 LANE TOLL PLAZA
WITH MEDIAN REDUCTION

Note: Above mentioned typical drawing is for reference, Concessionaire shall finalize the detailed drawing as per manual consultation with Independent Engineer/ NHIDCL



Typical drawing for Toll Plaza Administrative building

Note: Above mentioned typical drawing is for reference, Concessionaire shall finalize the detailed drawing as per manual in consultation with Independent Engineer/ NHIDCL.

SCHEDULE- D

(SeeClause2.1)

D. SPECIFICATIONS AND STANDARDS

1 Construction

The Concessionaires shall comply with the Specifications and Standards set forth in Annex-I of this Schedule-D for construction of the Project Highway.

2 Design Standards

The Project Highway including Project Facilities shall conform to design requirements set out in the following documents:

Manual of Specifications & Standards for four laning of Highways IRC: SP: 84-2019, referred to herein as the manual.

As regards to work of utility shifting, the relevant specifications, relevant rules, regulation, and acts of Utility owning Department / Agencies shall be applicable.

Annex – I
(Schedule – D)
Specifications and Standards for Four-Laning

Manual of specifications and standards to apply.

Four– Laning of the Project shall conform to the Manual of Specifications and Standards for Four – Laning of Highways through Public Private Partnership published by the IRC (IRC: SP: 84-2019, Referred as 4-laning manual) with all amendments and additions till date. (Referred to as "Manuals" in this Schedule) and MORTH Specifications for Road & Bridge Works (5th revision). Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Independent Engineer.

Deviations from the Manual
Notwithstanding anything to the contrary contained in the aforesaid Manual, the following Specifications and Standards shall apply to the construction of the Project Highway, and for purposes of this agreement, the aforesaid manual shall be deemed to be amended to the extent set forth below:

Sl. No.	Item	Manual Clause reference	Provision as per Manual / Circular / Minutes	Modified Provision
1	Typical cross section	Clause 2.17 of IRC SP: 84-2019	Typical cross section	Typical Cross section shall be followed as per Clause 2.10 of Schedule B and drawings as per Annex-II of Schedule B
2	Median	Clause 2.5 of IRC SP:84-2019	Raised OR depressed median	Median shall be proposed as per drawings in Annex-II of Schedule-B
3	Width Shoulder	Clause 2.6 of IRC SP:84-2019	a. Paved Shoulders 1.5m b. Earthen Shoulder 2.0m	a. Paved and Earthen shoulders width to be adopted as per (Circular: NHAI/ Bharatmala/ EC/ DPR/ 2016/ 143430) and shall be followed as per Clause 2.10 of Schedule B and drawings as per Annex-II of Schedule B
4	Side Slopes	Clause 4.2.3.2	Not steeper than 2H : 1V	Side slopes shall be 1.5H : 1V with Geocell and turfing
5	Toll Plaza	Policy Circular No. 17.5.82 dated 24.05.2021	Fig 10.4.1 para -Typical layout for Toll plaza	All lanes must be ETC equipped with Hybrid ETC equipment as per NHAI circular No. 17.5.82 dated 24-05-2021.
6	Structures	Clause 7.3 of IRC SP:84-2019	Deck width of bridges	Major bridges, ROBs and Minor bridges in urban areas will be having footpath, Minor Bridges in Non

Sl. No.	Item	Manual Clause reference	Provision as per Manual / Circular / Minutes	Modified Provision
				urban areas will be having no footpath. Deck width to be calculated as per RW/NH-330441/10/2021-S&R (P&B) 06.02.2023
7	Underpasses	Clause 2.13 of IRC SP:84-2019	VUP - 11.0m deck width per direction LVUP – 11.5m deck width direction	Width of VUP, LVUP is based on TCS drawings modified according to Circular: NHAI/ Bharatmala/ EC/ DPR/ 2016/ 143430 and shall be followed as per Clause 2.10 of Schedule B and drawings as per Annex-II of Schedule B
8	Boundary Wall	Clause 12.2 of IRC SP:84-2019	Road Wall Boundary	Boundary Wall shall be provided as per Schedule-C drawings
9	Lighting	Clause 12.5 of IRC SP:84-2019	Street Lighting	In addition to Locations provided as per Manual, Lighting shall be provided also as per Schedule-C.
10	Traffic Signs	Clause 9.2 of IRC SP:84-2019	Road Signs	In addition to Manual, Schedule-C shall be followed.
11	Longitudinal Drain	IRC SP:84-2019	Drainage	As per clause 4.14 of Schedule-B
12	Expansion Joints	Clause 7.13 of IRC SP:84-2019	Expansion Joints	In addition to Manual, Schedule-B shall be followed.
13	Utility Corridor	Clause 2.16 of IRC SP: 84-2019	Built-up locations	Entire Stretch
14	Landscaping and Tree Plantation	Section 11 of IRC SP: 84-2019	Landscaping and Tree Plantation	NHAI Policy circular No. 7.4.9 dated 15th March 2023, Avenue plantation is delinked from EPC/HAM/BOT toll projects. The aforesaid manual shall be applicable except for the provision/scope of avenue plantations. However, specifications for plantations shall be followed as per IRC: SP-21, i.e., Guidelines on Landscaping and Tree Plantation.

*- As per NHAI Policy circular No. 7.4.9 dated 15th March 2023, Avenue plantation is delinked from EPC/HAM/BOT toll projects.

Specifications and standards for development of buildings

- **General: National Building Code of India – 2005**
- **Code for Structural design and details:**

CODE OF PRACTICE FOR LOADS AND COMBINATIONS	
IS 875 Part I	Dead Loads - Unit weights of building Materials and stored materials.
IS 875 Part II	Imposed loads.
IS 875 Part III	Wind Loads.
IS 875 Part V	Special Loads and Combinations.
CODES OF DESIGN AND FABRICATION FOR PRE ENGINEERED BUILDING	
IS 800 : 2007	General construction in steel
IS 808 : 1989	Dimensions for hot Rolled steel sections.
IS 801 : 1975	Code of Practice for use of Cold Formed light gauge steel structural members in general building
IS 811	Code of Practice for use of Cold Formed light gauge structural steel sections
AISC : 2000	Design Code
IBC : 2002	Building Code
AISI : 2001	Purlin Code
ANS : 2006	Welding Code
SP - 38 (S&T): 1987	Handbook of typified designs for structures with steel Roof trusses
IS 816 : 1969	Code of Practice for use of metal arc welding for general construction in mild steel
IS 456 : 2000	Plain and Reinforced Concrete Code of Practice.
IS 1893: 2002	Criteria for Earthquake resistant design of structures
IS 6403: 1981	Code of Practice for determination of bearing capacity of shallow foundations
IS 1786: 2008	Specification for high strength deformed steel bars and wires for concrete reinforcement
IS 13920: 1983	Code of practice for ductile detailing of reinforced concrete Structures subjected to seismic forces.
SP - 16 (Design Aids for Reinforced Concrete) :1978	Design aids for reinforced concrete to IS 456.
SP - 34:1987	Hand book on concrete reinforcement and detailing

- All relevant BIS Code of India for Civil, Electrical, Water Supply, Sanitary, HVAC and Solar Panels.
- Energy Conservation Code - 2007.
- Roads / Driveway / Parking: IRC 37-1984 / MORTH specifications.
- Indian Electricity Rules / State Electricity Rules.

- ASHRAE Standards.
- All local bylaws.
- Hand Book of Water Supply and Drainage, BIS, SP-35.
- CPWD - Specifications published by Director General (Works) CPWD, New Delhi including subsequent amendments, upto date correction slips, revisions.

  - CPWD Specifications 2009 (Volume I & II)
  - CPWD General Specifications for Electrical Works Part IV Sub Station - 2013
  - CPWD General Specifications for Electrical Works Part IV Sub Station - 2013.
  - CPWD General Specifications for Electrical Works Part VII D.G. Sets - 2013.
  - General Specifications for Heating, Ventilation & Air-Conditioning (HVAC) - 2004

- Specifications published by Director General (Works), MES, E-in-C branch, Kashmere House New Delhi, including subsequent amendments, upto date correction slips, revisions

  a. MES SSR Part I 2009,
  b. TI's issued by E-in-C branch for specified purpose from time to time

  Note: Any reference to codes and standards shall be deemed to include all subsequent revisions, upto date corrections slips, updates, amendments etc.