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-8 from Design chainage 87.700 (Chandkhira) to Km. 106.730 Churaibari (Assam-Tripura border) in the state of Assam (Package-VI)

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. 87.700 of NH-8, near Chandkhira of Karimganj district and ends at design chainage Km. 106.730 near Churaibari (Assam-Tripura Border) of Karimganj district in the state of Assam. The land, carriageway and structures comprising the site are described below.

	Design Chainage (Km)	Northing	Easting
Start of Package	87.700	2716463.658	430088.067
End of Package	106.730	2703290.904	424080.689

#-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	Chainage (Km)		Right of way (m)	Remarks
	From	To		
1	87.700	97.000	20	RoW is based on data collected from O/o EE, PWD, Karimganj
2	97.000	100.300	45	
3	100.300	106.730	20	

3 Carriageway

The details of existing carriageway are as given under:

Sl. No	Existing Chainage (Km)		Length (km)	Carriageway (m)	Location
	From	To			
1	87.700	106.730	19.03	7.0m	Chandkhira to Churaibari (Assam-Tripura Border)

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	97.000	Y	Lowairpoa	Lowairpoa Bypass	-
2	100.290	T	Lowairpoa	Churaibari	Junction between NH-8 & Lowairpoq Bypass

(NH: National Highway, SH: State Highway)

Minor Junctions

The details of minor junctions are as follows:

Sl.No	Design Chainage (Km)	Type of Intersection	Leads	
			LHS	RHS
1	89.930	T	Baithakhal Basti	-
2	90.300	T	-	Ankhappi Cherra
3	90.600	Y	-	Dhengarbond
4	92.257	T	Achairghat	-
5	92.880	T	-	Dhengarbond
6	94.570	T	Solgoi	-
7	98.587	+	Lowairpoa	Dakshin Hatikhira
8	106.444	T	-	Kacharigaon

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

Sr. No	Design Chainage (km)	Span Arrangement (m)	Leads	
			LHS	RHS
1	89.127	T	-	Mud road
2	91.448	T	-	Mud road
3	91.913	T	Mud road	-
4	92.021	T	Mud road	-
5	92.100	T	-	Mud road
6	92.700	T	-	Mud road

7	93.700	T	Mud road	-
8	96.000	T	-	Mud road
9	96.217	T	-	Mud road
10	98.120	T	Mud road	-
11	101.235	T	Mud road	-
12	101.382	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
1	Lowairpoa	97.000	100.300	3.300	10	Two lane with paved shoulder

7 Major Bridges

The site includes the following major bridges.

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

8 Minor Bridges

The site includes the following minor bridges.

Sl. No	Design Chain-age (Km)	Span Arrangement (No. x Span Length in meter)	Super Structure	Deck Width (m)
1	87.779	2 x 10.0	Solid Slab	12.6
2	90.535	2 x 6.0	Box Type	12.0
3	92.706	2 x 10.1	Solid slab	12.0
4	95.587	2 x 10.0	Solid slab	9.7

Sl. No	Design Chain-age (Km)	Span Arrangement (No. x Span Length in meter)	Super Structure	Deck Width (m)
5	97.092	1 x 6.0	Box Type	12.0
6	97.448	1 x 6.0	Box Type	12.0.
7	97.664	1 x 6.0	Box Type	12.0
8	97.774	1 x 6.0	Box Type	12.0
9	98.260	1 x 6.0	Box Type	12.0
10	98.501	1 x 6.0	Box Type	12.0
11	98.625	1 x 6.0	Box Type	12.0
12	99.041	1 x 6.0	Box Type	12.0
13	99.242	1 x 6.0	Box Type	12.0
14	102.102	2 x 3.3	Box Type	12.3
15	103.430	3 x 6.0	Box Type	12.2
16	103.777	2 x 3.0	Box Type	12.2
17	104.436	2 x 3.0	Box Type	12.2
18	105.684	1 x 16.0	Box Type	12.0
19	106.509	1 x 25.0	Box Type	12.0

9 Causeways

The site includes the following causeways.

Sl. No	Existing Chain-age (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	Existing Chain-age (Km)	Span Arrangement (No. x Span Length)	Super Structure	Deck Width (m)	Remarks

11 Road Under Bridge (RUB)

The site includes the following RUBs.

Sl. No	Existing Chain-age (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	Existing Chain-age (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	Existing Chain-age (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	Existing Chain-age (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	Existing Chain-age (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	Existing Chain-age (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 m)	Width (m)
1	93.508	1 x 0.9	17.5
2	94.337	1 x 0.9	12.5
3	94.917	1 x 1.20	12.5
4	96.422	2 x 1.20	12.5
5	97.261	2 x 1.20	15.0
6	97.371	2 x 1.20	15.0
7	97.934	2 x 1.20	16.0
8	98.043	3 x 1.20	17.0
9	98.889	3 x 1.20	17.5
10	98.939	2 x 1.20	17.0
11	99.369	2 x 1.20	18.0
12	99.595	2 x 1.20	16.0
13	99.965	2 x 1.20	17.0
14	100.469	2 x 1.20	17.0
15	101.185	2 x 1.0	16.0
16	101.375	2 x 1.0	18.0
17	102.483	2 x 1.20	16.0
18	104.737	1 x 1.0	17.0
19	104.933	1 x 1.0	17.0
20	105.081	1 x 1.0	17.0

17.2 Slab Culverts

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span in m)	Width(m)
1	89.839	1 x 3.0	12.5
2	90.962	1 x 1.0	12.0
3	92.039	1 x 1.0	12.0
4	93.110	1 x 1.0	12.0
5	100.856	1 x 2.0	12.0

17.3 Box Culverts

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span in m)	Width(m)
1	88.604	1 x 2.0	12.0
2	89.041	1 x 2.0	12.0
3	90.739	1 x 3.0	12.0
4	91.341	1 x 3.7	12.0
5	92.854	1 x 3.0	12.0
6	93.346	1 x 2.0	12.0
7	94.917	1 x 2.0	12.0
8	96.684	1 x 4.0	12.0
9	96.944	1 x 4.0	12.0

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span in m)	Width(m)
10	98.368	1 x 2.0	12.0
11	98.437	1 x 2.0	12.0
12	99.438	1 x 2.0	12.0
13	99.511	1 x 2.0	12.0
14	99.688	1 x 3.0	13.0
15	99.891	1 x 3.0	18.0
16	100.659	1 x 2.0	14.0
17	101.054	1 x 4.0	14.0
18	101.468	1 x 2.0	13.0
19	101.875	1 x 2.0	14.0
20	102.962	1 x 2.0	14.0

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	0
b	Minor Bridges	19
c	Causeways	0
d	ROBs	0
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	20
m	Slab Culverts	5
n	Box Culverts	20

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	Existing Chainage (Km)	Side	Remarks
Nil			

(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	88.000	88.007	LHS	Open
2	88.010	88.124	LHS	Open
3	88.138	88.210	LHS	Open
4	88.640	88.663	RHS	Open
5	88.700	88.746	RHS	Open
6	88.776	88.934	RHS	Open
7	88.900	89.040	LHS	Open
8	88.948	89.030	RHS	Open
9	89.228	89.254	RHS	Open
10	89.260	89.391	LHS	Open
11	89.320	89.395	LHS	Open
12	89.393	89.469	RHS	Open
13	89.395	89.527	LHS	Covered
14	89.707	89.740	LHS	Open
15	89.740	89.786	LHS	Covered
16	89.800	89.870	LHS	Open
17	90.840	90.927	LHS	Open
18	91.073	91.093	RHS	Open
19	91.125	91.172	RHS	Open
20	92.039	92.188	LHS	Covered

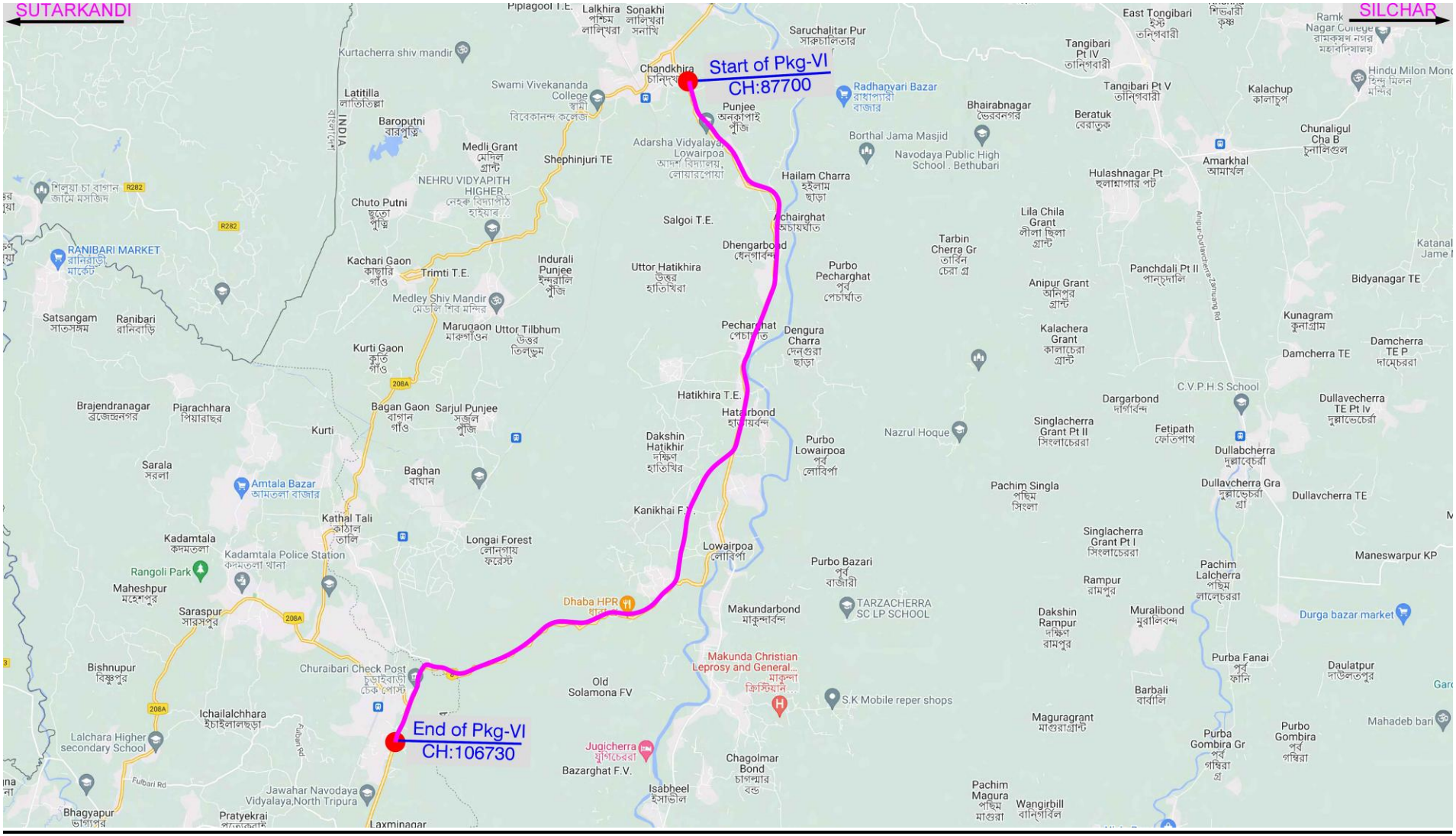
Sl. No	From (Km)	To (Km)	Side	Remarks
21	92.196	92.304	RHS	Covered
22	92.216	92.366	LHS	Covered
23	92.407	92.456	RHS	Open
24	92.500	92.585	LHS	Open
25	92.740	92.838	LHS	Covered
26	92.860	92.887	LHS	Covered
27	93.015	93.200	RHS	Open
28	93.400	93.500	RHS	Open
29	94.160	94.294	RHS	Open
30	94.175	94.410	LHS	Open
31	94.363	94.487	RHS	Open
32	94.441	94.722	LHS	Open
33	94.547	94.627	RHS	Covered
34	94.657	94.800	RHS	Covered
35	94.844	95.031	LHS	Open
36	94.923	95.174	RHS	Covered
37	95.174	95.300	LHS	Open
38	95.174	95.565	LHS	Covered
39	95.300	95.547	RHS	Covered
40	95.660	96.061	LHS	Covered
41	95.775	95.872	RHS	Covered
42	98.129	98.190	RHS	Open
43	98.165	98.255	LHS	Open
44	98.216	98.248	RHS	Open
45	100.148	100.269	LHS	Open
46	100.171	100.244	RHS	Open
47	100.927	101.047	LHS	Open
48	100.248	100.295	RHS	Open
49	101.520	101.752	LHS	Covered
50	101.753	101.954	RHS	Covered

Sl. No	From (Km)	To (Km)	Side	Remarks
51	102.850	102.950	RHS	Open
52	103.475	103.770	LHS	Open
53	104.875	105.081	LHS	Open
54	105.884	105.933	LHS	Open

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-6

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.)	Easting	Northing
1	87.700	2716463.658	430088.067
2	88.000	2716173.344	430162.425
3	88.500	2715712	430341.973
4	89.000	2715332.909	430666.354
5	89.500	2714975.558	431013.582
6	90.000	2714540.971	431258.101
7	90.500	2714173.913	431572.598
8	91.000	2713962.47	432016.712
9	91.500	2713484.373	432087.297
10	92.000	2712985.712	432058.148
11	92.500	2712486.068	432046.146
12	93.000	2711987.389	432009.918
13	93.500	2711515.745	431848.565
14	94.000	2711050.513	431665.661
15	94.500	2710586.086	431481.647
16	95.000	2710117.284	431311.127
17	95.500	2709625.771	431386.228
18	96.000	2709131.609	431326.613
19	96.500	2708643.284	431220.08
20	97.000	2708173.124	431062.413
21	97.500	2707855.414	430677.162
22	98.000	2707459.282	430377.898
23	98.500	2707011.424	430155.584
24	99.000	2706534.46	430013.458
25	99.500	2706041.465	429933.259
26	100.000	2705550.398	429843.005
27	100.500	2705105.809	429653.307
28	101.000	2704751.71	429301.791
29	101.500	2704519.666	428867.016
30	102.000	2704536.419	428369.996
31	102.500	2704367.591	427904.268
32	103.000	2704317.732	427415.592
33	103.500	2704264.225	426926.866
34	104.000	2703943.689	426544.934
35	104.500	2703655.229	426137.347
36	105.000	2703443.178	425685.222

S. No.	Design Chainage (Km.)	Easting	Northing
37	105.500	2703258.996	425220.462
38	106.000	2703195.362	424744.539
39	106.500	2703338.069	424273.112
40	106.730	2703290.904	424080.689

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

Plan & Profile is attached as annexure

Annex IV
Schedule - A

Environment and Forest Clearances

1. Forest Clearance: - This package has forest section from Km. 102.000 to Km. 106.730. Forest clearance is 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 (km.)		Electric poles (Nos)			Crossings			Transformer		Remarks
	From Km.	To Km.	33KV	11KV	LT	33KV	11 KV	LT	No	Capacity	
1	87.700	89.000		45	9		3	3			
2	89.000	90.000		32	4		2	1	2		
3	90.000	91.000		32	8		5	2	2		
4	91.000	92.000		20	13		2	2			
5	92.000	93.000		56	18		4	4			
6	93.000	94.000		42	2		2		1		
7	94.000	95.000		45	28		4	6	2		
8	95.000	96.000		30	25		2	5	2		
9	96.000	97.000		46			1				
10	98.000	99.000		6			1				
12	99.000	100.000		4			2				
13	100.000	101.000		34	12		3	3	2		
14	101.000	102.000		30	8		1				

15	102.000	103.000		30	12		1	2			
16	103.000	104.000		32							
17	104.000	105.000		40	4		1	1			
18	105.000	106.000		35			2				
19	106.000	107.000		16	12			2			

(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.										
1	90.700	90.900									1	
2	93.000	93.100									1	
3	93.800	93.900							1			
4	97.800	97.900							1			
5	98.300	98.500									1	
6	99.800	100.000									1	
7	101.000	101.100									1	
8	106.300	106.400									1	

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	85.000	85.200					1			
2	87.700	87.740	0.040	-						
3	87.780	88.140	0.720	-						
4	87.780	88.300	1.040	-						
5	88.480	88.680	-	-			2			
6	88.650	88.900	0.500	-						
7	88.920	89.450	1.060	-						
8	90.080	90.280					2			
9	90.400	90.450	0.100	-						
10	90.950	91.320	0.740	-						
11	91.320	93.750	4.860	-			9			
12	93.900	96.100	4.400	-						
13	93.900	96.100	4.400	-						
14	93.900	96.100	4.400	-			4			
15	100.300	101.350	2.100	-						
16	101.320	101.520					3			

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	101.600	102.000	0.800	-						
18	102.100	102.380	0.280	-						
19	102.100	102.380	0.280	-						
20	102.11	102.380	0.270	-						
21	102.11	102.380	0.270	-						
22	102.550	102.700	0.150	-						
23	102.550	102.700	0.150	-						
24	102.54	102.75	0.210	-						
25	102.54	102.75	0.210	-						
26	106.400	106.600					2			
27	107.150	107.350					1			

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

iii) Any other lines - Nil

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	87.700	106.730	19.030	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 Chandkhira (Design chainage Km. 87.700) to Churaibari village near Assam-Tripura border (Design Chainage Km. 106.730) 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 Chandkhira (Ch. 87.700) to Churaibari, Assam-Tripura Border (Ch.106.730) of Silchar- Churaibari Corridor on HAM Mode under in the State of Assam (Package-6).

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 and Kerb shyness)

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 has to 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	106.250	106.284	Sub Standard curve	80Kmph
2	106.432	106.448	Sub Standard curve	65Kmph
3	106.601	106.648	Sub Standard curve	40Kmph

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 (the design consultant has to mention specifically such areas in Schedule-B).

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)
	From	To	
1	87.700	88.630	0.930
2	89.200	89.700	0.500
3	90.240	91.000	0.760
4	91.400	91.900	0.500
5	92.750	93.050	0.300
6	94.800	94.900	0.100
7	95.150	95.300	0.150
8	95.540	95.640	0.100
9	96.900	97.050	0.150
10	100.450	101.050	0.600
11	101.400	101.700	0.300
12	101.940	103.370	1.430
13	103.520	104.930	1.410
14	105.180	106.400	1.220

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

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

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	87.700	106.730	19.030	45	Except at proposed Rest area & proposed new lane ROB

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. 2.15 & clause No. 2.6 IRC: SP:84-2014)

2.5.5 In open country, paved shoulders of 1.5m width shall be provided. (Clause No. 2.6 IRC: SP:84-2019)

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. (Clause No. 5.11 IRC: SP:84-2019)

2.6 Lateral and Vertical Clearance at Underpasses

2.6.1 In case of VUP/ LVUP/ SVUP, the proposed structure, the finish 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. **(Clause No. 2.10 IRC: SP:84-2019)**

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.**(Clause No. 2.11 IRC: SP:84-2019)**

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/Connecting 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 (kms)	Remarks
	From	To	LHS	RHS			
1	87.700	89.500	1.800	1.800	7.50	3.600	-
2	89.500	90.100	0.600	-	7.50	0.600	
3	90.100	93.100	3.000	3.000	7.50	6.000	
4	93.950	94.050	-	0.100	7.50	0.100	
5	94.050	96.200	2.150	2.150	7.50	4.300	
6	96.200	96.480	0.280	0.280	7.50	0.560	
Length			**7.930**	**7.230**			
Total length			**15.160**				

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 slip 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	Remarks
	From	To	LHS	RHS			
1	96.480	97.600	1.120	1.120	7.50	2.240	-
2	99.400	101.150	1.750	1.750	7.50	3.500	-
Subtotal on each side (km)			2.870	2.870			
Total Length (km)			5.740				

2.8.5 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:

I. 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**.

II. 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 (Clause No. 3.4 IRC SP: 84-2019)

Grade separated structures shall be constructed as per paragraph 2.13 of the Manual. Proposed levels at structure locations as shown in plan & profile 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 superstructure 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	97.000	11.00	11.00	Open to Sky	1 x 20.0	5.50	-	-
2	100.290	11.00	11.00	Open to Sky	1 x 20.0	5.50	-	-

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	Remarks
1	98.587	11.50	11.50	Open to Sky	1 x 12.0	4.00	-	-

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	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 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 are the optimum and should not be further reduced. 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 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 change of scope.
- Any additional LVUP/VUP not provided for in Schedule B but required during the execution of work will be dealt under the provisions of Article 16.
- Expansion joints shall be minimized by deck continuity/diaphragm 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. 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 (Km)	TCS	Remarks
	From	To			
1	87.700	88.650	0.950	V C	
2	88.650	89.100	0.450	V	
3	89.100	89.700	0.600	V C	
4	89.700	90.100	0.400	V B	
5	90.100	91.050	0.950	V C	
6	91.050	91.180	0.130	V	
7	91.180	91.900	0.720	V C	
8	91.900	92.400	0.500	V A	
9	92.400	92.800	0.400	V B	
10	92.800	93.100	0.300	V C	
11	93.100	93.950	0.850	IV	
12	93.950	94.050	0.100	V A	
13	94.050	94.730	0.680	V	
14	94.730	95.660	0.930	V C	
15	95.660	95.900	0.240	V A	
16	95.900	96.200	0.300	V B	
17	96.200	96.480	0.280	V A	
18	96.480	97.600	1.120	VI	
19	97.600	98.180	0.580	III	
20	98.180	99.080	0.900	I	
21	99.080	99.400	0.320	III	
22	99.400	101.150	1.750	VI	
23	101.150	101.350	0.200	III	
24	101.350	101.750	0.400	I	
25	101.750	101.940	0.190	IV	
26	101.940	103.370	1.430	I	
27	103.370	103.520	0.150	IV	
28	103.520	104.930	1.410	I	
29	104.930	105.180	0.250	IV	
30	105.180	106.400	1.220	I	
31	106.400	106.730	0.330	III	

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

At Structure locations, TCS of Structure mentioned will be applicable.

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. **(clause No. 7.1 (iv) IRC:SP:84-2019)**
4) **Toe wall (0.6m ht) to be provided where ROW is restricted and 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 mention clearly the changes from the cross section shown in the manual).

7) Carriageway width tapering shall be provided 1 in 50 as per manual
   a. **(Clause no 2.5.4. IRC: SP:84-2019)**
   b. 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.
   c. **(Clause No. 2.9.5 IRC: SP:84-2019/ IRC: SP:87-2019)**
8) Provide detailing of placement and specification of Railing, Fencing and electric poles, etc. **(Clause No. 2.17 IRC: SP:84-2019/ IRC: SP:87-2019)**

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	Carriageway width of crossroad	Length of crossroad to be developed
Nil							

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

(b) Minor Junctions:

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriageway width of crossroad	Length of crossroad to be developed		Remarks
			LHS	RHS				LHS	RHS	
1	89.930#	T	Baithakhal Basti	-	No	VR		15.0	-	Connected to Service Road
2	90.300#	T		Ankhappi Cherra	No	VR		-	15.0	
3	90.600#	Y	-	Dhengarbond	No	VR		-	15.0	
4	92.257#	T	Achairghat	-	No	VR		15.0	-	

5	92.880#	T	-	Dhengar bond	No	VR		-	15.0	
6	94.570	T	Solgoi	-	No	VR		15.0	-	
7	106.443	T	-	Kachari gaon	No	VR		-	15.0	

- Above mentioned crossroads are connected to Slip roads/service roads at underpass locations and others to MCW.

Sr. No	Design Chainage (km)	Span Arrangement (m)	Leads		Median Opening	Category of Cross Road	Carriageway width of crossroad	Length of crossroad to be developed		Remarks
			LHS	RHS				LHS	RHS	
1	89.127*	T	-	Mud road	No	VR	5.0	-	15.0	
2	91.448	T	-	Mud road	No	VR	4.0	-	15.0	
3	91.913*	T	Mud road	-	No	VR	5.0	15.0	-	
4	92.021	T	Mud road	-	No	VR	4.0	15.0	-	
5	92.100	T	-	Mud road	No	VR	4.0	-	15.0	
6	92.700*	T	-	Mud road	No	VR	4.0	-	15.0	
7	93.700*	T	Mud road	-	No	VR	4.0	15.0	-	
8	96.000	T	-	Mud road	No	VR	4.0	-	15.0	
9	96.217	T	-	Mud road	No	VR	4.0	-	15.0	
10	98.120*	T	Mud road	-	No	VR	4.0	15.0	-	
11	101.235*	T	Mud road	-	No	VR	8.0	15.0	-	
12	101.382*	T	Mud road	-	No	VR	5.0	15.0	-	

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

Note:

I. Type of Junction to be improved as per manual. (clause No. 3.2.5 IRC: SP:84-2019)

II. 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 carriageway, are to be improved at the level of main carriageway for the length of 30 metre and then to be merged with the cross road at the gradient not more than 1:50. (Clause No. 3.2.2 IRC: SP:84-2019)

III. For minor / major layout for left-in / left out arrangement with physical islands with hazard 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/ IRC: SP:87-2019)

IV. For U-turn, Self-Regulated U-Turn facility shall be created. (Fig 3.6 IRC: SP:84-2019/ IRC: SP:87-2019)

3.2 At-Grade Intersections below Grade Separators/Interchanges:

(clause No. 3.4.7 of IRC: SP:84-2019/ clause No. 3.2.4 of IRC: SP:87-2019)

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		U-Turn provision in Viaduct Spans	Category of Cross Road	Carriageway width of crossroad	Length of crossroad to be developed	
			LHS	RHS				LHS	RHS
1	97.000	+	Lowairpoa	-	Yes	NH-8	9.0	50.0	-
2	98.587	+	Lowairpoa	Hatikhira	Yes	MDR	5.0	50.0	50.0
3	100.290	+	Lowairpoa	Bazarghat	Yes	NH-8	10.0	50.0	50.0

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)

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% and maximum effective CBR of 10%. Stage construction shall not be permitted.

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 70 MSA.

5.2.3 The pavement for service road/slip roads shall be designed for projected traffic 20MSA 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, entry/ exit locations, acceleration/ deceleration lane, right turning lanes (Flexible) with CTB/CTSB

Pavement Composition	**Minimum Crust Thickness (mm)**
Subgrade	500
CTSB	200
CTB	100
AIL	100
DBM	65
BC	40

5.3.2 Main carriageway, paved shoulder, median side paved strip, entry/ exit locations, acceleration/ deceleration lane, right turning lanes (Rigid) For Toll Plaza location. Flexible)

Pavement Composition	**Minimum Crust Thickness (mm)**
Subgrade	500
GSB	150
DLC	150
PQC	300

5.3.3 Crossroads/Service roads/Slip Roads

Pavement Composition	**Minimum Crust Thickness (mm)**
Subgrade	500
GSB	200
WMM	250
DBM	80
BC	40

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

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

S. No	**Design chainage**		**Pavement Composition**	**Remarks**
	From	**To**		
1	87.700	88.650	Same as 5.3.1	Both sides of MCW
2	88.650	89.100		Both sides of MCW
3	89.100	89.700		Both sides of MCW
4	89.700	90.100		On RHS of MCW
5	90.100	91.050		Both sides of MCW
6	91.050	91.180		Both sides of MCW
7	91.180	91.900		Both sides of MCW
8	91.900	92.400		On LHS of MCW
9	92.400	92.800		On RHS of MCW
10	92.800	93.100		Both sides of MCW
11	93.100	93.950		On LHS of MCW
12	93.950	94.730		Both sides of MCW
13	94.730	95.660		Both sides of MCW
14	95.660	95.900		On LHS of MCW
15	95.900	96.200		On RHS of MCW
16	96.200	96.480		On LHS of MCW
17	97.600	98.180		On LHS of MCW
18	99.080	99.400		On LHS of MCW
19	99.400	101.150		Both sides of MCW

20	101.150	101.350		On LHS of MCW
21	101.750	101.940		On RHS of MCW
22	103.370	103.520		On RHS of MCW
23	104.930	105.180		On RHS of MCW
24	106.400	106.730		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 (km)		Width of Drain (m)	Total (kms)	Remarks
	From	To	LHS	RHS			
1	87.700	89.500	1.800	1.800	1.5	3.600	-
2	89.500	90.100	0.600	-	1.5	0.600	
3	90.100	93.100	3.000	3.000	1.5	6.000	
4	93.950	94.050	-	0.100	1.5	0.100	
5	94.050	96.200	2.150	2.150	1.5	4.300	
6	96.200	96.480	0.280	0.280	1.5	0.560	
7	96.480	97.600	1.120	1.120	1.5	2.240	
8	99.400	101.150	1.750	1.750	1.5	3.500	
Length			**10.700**	**10.200**			
Total length			**21.900**				

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 Median Drain (Clause No. 6.3 IRC SP 84-2019)

Lined drain shall be provided in the center of the median at super elevation locations and at stretch with depressed median. Design with drainage of storm water from one carriageway to another is not allowed. The Concessionaire shall design the median drain based on site/design requirement mentioned in Schedule D with approval from the Independent Engineer. All drains shall be connected to the nearest culvert/ outfall.

6.4 Drainage arrangement between Main Carriageway and Service/Slip Roads (Clause No. 2.15 IRC SP 84-2019)

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)

6.5 Drainage where Embankment Height is more than 3m.

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)

6.6 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.

6.7 Drainage for Underpass and Subways Structures

A suitable drainage arrangement for draining storm water from the Underpass and Subways shall be provided.

6.8 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 the 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 configuration. 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 CTSB, CTB, AIL, DBM & BC 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 as given in Para 7.3.2 of Annex-I of Schedule-B.

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.

Details of Structures with footpaths

Sr. No.	Location at km	Skew Angle	Footpath Width (m)		Remarks
			Left	Right	
1	MIB at 87.779	20^0	1.5	1.5	MIB
2	MIB at 89.535	-	1.5	1.5	Box MIB
3	MIB at 89.560	21^0	1.5	1.5	MIB - Gas Pipeline
4	MIB at 90.535	-	1.5	1.5	Box MIB
5	MIB at 92.706	-	1.5	1.5	MIB
6	MIB at 95.587	-	1.5	1.5	MIB
7	MIB at 97.092	-	1.5	1.5	Box MIB
8	MIB at 97.448	-	1.5	1.5	Box MIB

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 is 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 compact 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

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							

*BC-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 Chain-age	Cul-vert Type*	Skew Angle	Span/ Opening (m)	Repairs / Rehabilitation pro-posals	Culvert Crossing Type (Balancing/ Stream, etc)	Remarks
1	93.508	HPC	-	1 x 0.9	Yes	Drain	-
2	97.261	HPC	-	2 x 1.20		Drain	-
3	97.371	HPC	-	2 x 1.20		Drain	-
4	97.934	HPC	-	2 x 1.20		Drain	-
5	98.043	HPC	-	3 x 1.20		Drain	-
6	98.889	HPC	-	3 x 1.20		Stream	-
7	98.939	HPC	-	2 x 1.20		-	-
8	99.369	HPC	-	2 x 1.20		Drain	-
9	99.595	HPC	-	2 x 1.20		Drain	-
10	99.965	HPC	-	2 x 1.20		Drain	-

*-HPC – Hume Pipe Culvert

7.2.4 Construction of Box Culverts:

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

Sl. No.	Design chainage (Km)	Span Arrangement (m)	Skew Angle	Culvert Crossing Type	Remarks
1	90.315	1 x 2.0	-	-	New Construction
2	91.657	1 x 2.0	-	-	New Construction
3	92.854	1 x 3.0	-	Drain	New Construction
4	101.530	1 x 2.0	-	Drain	New Construction
5	102.962	1 x 2.0	-	Drain	New Construction
6	103.655	1 x 3.0	-	Stream	New Construction
7	103.911	1 x 2.0	-	Stream	New Construction

7.2.5 Reconstruction of Box Culverts:

Culverts (given in table below) shall be reconstructed 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:

Sl. No.	Design chainage (Km)	Span Arrange-ment (m)	Skew An-gle	Culvert Crossing Type	Remarks
1	88.604	1 x 2.0	-	Drain	
2	89.041	1 x 2.0	-	Drain	
3	89.839	1 x 3.0	-	Drain	
4	90.739	1 x 5.0	-	Stream	
5	90.962	1 x 2.0	-	Drain	
6	91.341	1 x 4.0	-	Drain	
7	92.039	1 x 2.0	-	Drain	
8	93.110	1 x 2.0	-	Drain	
9	94.337	1 x 2.0	-	Drain	
10	94.806	1 x 2.0	-	Stream	
11	96.422	1 x 2.0	-	Stream	
12	96.684	1 x 4.0	-	Drain	
13	96.944	1 x 4.0	-	Stream	
14	98.368	1 x 2.0	-	Stream	
15	98.437	1 x 2.0	-	Drain	
16	99.511	1 x 2.0	-	Drain	
17	99.688	1 x 3.0	-	-	
18	99.891	1 x 3.0	-	Stream	
19	100.469	1 x 2.0	-	Stream	
20	100.659	1 x 2.0	-	Stream	
21	100.856	1 x 3.0	-	Drain	
22	101.185	1 x 2.0	-	Drain	
23	101.375	1 x 2.0	-	Drain	
24	104.737	1 x 2.0	-	Drain	
25	104.933	1 x 2.0	-	Drain	
26	105.081	1 x 3.0	-	Drain	

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
1	93.346	BC		1 x 2.0	Yes	Drain	-
2	94.917	BC	19^0	1 x 2.0		Drain	-
3	99.438	BC		1 x 2.0		Drain	-
4	101.054	BC		1 x 4.0		Stream	-
5	101.875	BC		1 x 2.0		Drain	-

*BC – Box Culvert

7.2.7 Culverts on Crossroads:

Sr. No	Design Chainage (km)	Span Arrange-ment (m)	Type (Box/Pipe)	Length of Culvert	Remark
1	89.127	1 x 1.2	Pipe	5.0	RHS
2	91.448	1 x 1.2	Pipe	5.0	RHS
3	91.913	1 x 1.2	Pipe	5.0	LHS
4	92.021	1 x 1.2	Pipe	5.0	LHS
5	92.100	1 x 1.2	Pipe	5.0	RHS
6	92.700	1 x 1.2	Pipe	5.0	RHS
7	93.700	1 x 1.2	Pipe	5.0	LHS
8	96.000	1 x 1.2	Pipe	5.0	RHS
9	96.217	1 x 1.2	Pipe	5.0	RHS
10	98.120	1 x 1.2	Pipe	5.0	LHS
11	101.235	1 x 1.2	Pipe	10.0	LHS
12	101.382	1 x 1.2	Pipe	5.0	LHS

*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 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. **(Clause No. 2.16 IRC: SP:84-2019)**

7.2.9 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 no's with size 1 row of 1.2m dia shall be provided as per site requirement for field channels/across cross roads 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: (Details to be given by DPR Consultant) (Clause No. 7.3 iv(a) IRC: SP:84-2019)

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 narrow bridges proposed to be retained and widened: (Details to be given by DPR Consultant) (Clause No. 7.3 iv IRC: SP:84-2019)

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

Existing Minor bridges proposed for reconstructed as new structures: (Details to be given by DPR Consultant) (Clause No. 7.3 iv(a) IRC: SP:84-2019)

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	87.779	1 x 25.0	Stream	11.000+M+ 11.000	2 x10.800	IX	20^0	BHS
2	92.706	1 x 20.0	Stream	11.000+M+ 11.000	2 x10.800	IX	-	BHS
3	95.587	1 x 20.0	Stream	11.000+M+ 11.000	2 x10.800	IX	-	BHS
4	97.092	1 x 6.0	Stream	11.000+M+ 11.000	2 x10.800	IX		BHS
5	98.260	1 x 6.0	Stream	11.500+M+ 11.500	-	VIII		BHS
6	98.501	1 x 6.0	Stream	11.500+M+ 11.500	-	VIII	-	BHS
7	98.625	1 x 6.0	Stream	11.500+M+ 11.500	-	VIII	-	BHS
8	102.102	1 x 6.0	Stream	11.500+M+ 11.500	-	VIII	-	BHS
9	102.500	1 x 6.0	Drain	11.500+M+ 11.500	-	VIII		BHS
10	103.430	3 x 6.0	Stream	11.500+M+ 11.500	-	VIII	-	BHS
11	103.777	1 x 6.0	Stream	11.500+M+ 11.500	-	VIII	-	BHS
12	104.436	2 x 3.0	Stream	11.500+M+ 11.500	-	VIII	-	BHS
13	105.684	1 x 16.0	Stream	11.500+M+ 11.500	-	VIII	-	BHS

*M - Median

Existing Minor bridges proposed to be retained and widened: (Details to be given by DPR Consultant) (Clause No. 7.3 iv IRC: SP:84-2019)

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section of Manual	Skew Angle	Remarks
				MCW	SR			
1	90.535	2 x 6.0	Stream	11.000	2 x 9.500	V C	-	LHS- Retained, RHS- New
2	97.448	1 x 6.0	Stream	11.000	2 x 9.500	VI	-	LHS- Retained, RHS- New
3	97.664	1 x 6.0	Stream	11.500	-	VIII		LHS- Retained, RHS- New
4	97.774	1 x 6.0	Stream	11.500	-	VIII		LHS- Retained, RHS- New
5	99.041	1 x 6.0	Stream	11.500	-	VIII		LHS- Retained, RHS- New
6	99.242	1 x 6.0	Stream	11.500	-	VIII		LHS- Retained, RHS- New
7	106.511	1 x 25.0	Stream, Located at Border	11.500	-	VIII	-	LHS- Retained, RHS- 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. **(Clause No. 7.3 ii IRC: SP:84-2019/ IRC: SP:87-2019)**

Major Bridges:

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

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	89.535	1 x 10.0	Stream	11.000+M+ 11.000	2 x10.800	IX	-	Box MIB, New-BHS
2	89.560	1 x 20.0	Gas pipe line	11.000+M+ 11.000	2 x10.800	IX	21^0	MIB for Gas pipeline (clear opening 20m), New-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			
3	103.109	1 x 6.0	Stream	11.500+M+ 11.500	-	VIII		Box MIB, New-BHS
4	105.370	1 x 6.0	Stream	11.500+M+ 11.500	-	VIII		Box MIB, New-BHS
5	106.290	1 x 20.0	Gas pipeline	11.500+M+ 11.500	-	VIII	0^0	MIB for Gas pipeline (clear opening 20m), New-BHS

*M - Median

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

Sr.No	Design Chainage		Length (m)	Remarks
	From (Km.)	To (Km.)		
1	90.529	90.541	24	BHS
2	97.089	97.095	12	BHS
3	97.445	97.451	12	BHS
4	97.661	97.667	12	BHS
5	97.771	97.777	12	BHS
6	98.257	98.263	12	BHS
7	98.498	98.504	12	BHS
8	90.529	90.541	12	BHS
9	97.089	97.095	12	BHS
10	97.445	97.451	12	BHS
11	97.661	97.667	50	BHS

(Clause No. 7.17 iv IRC: SP:84-2019/ IRC: SP:87-2019)

7.3.4 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			

(Clause No. 7.3 iv(b) IRC: SP:84-2019/ IRC: SP:87-2019)

7.3.5 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)

(Clause No. 7.18 IRC: SP:84-2019/ IRC: SP:87-2019)

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)	Type of superstructure (i.e. Bow string, simply supported composite structure etc.	Name of crossing	Total Width m)	Skew Angle	Remarks
Nil							

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, signaling, cabling, OHE modification, earthing etc. except P&E charges shall be borne by the Concessionaire.

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

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. **(Clause No. 7.19 IRC: SP:84-2019)**

7.6 FOB/ Skywalks

FoB/Skywalks shall be provided in builup areas/ near schools. DPR Consultant to provide detailed drawings of FoB in schedule B (Clause No. 10 IRC: 103 and Clause No. 9.8.5 IRC: SP:84-2019)

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	0	-
2	Minor Bridge	25	-
3	ROB	0	-
4	VUP (Single Span)	2	-
5	VUP (Multi Span)	0	-
6	LVUP	1	-
7.	Box	0	-
8.	FOB	0	-
9	Box Culverts	38+20	20-Newly added structures
10	Pipe Culverts	10+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: 84/87

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 (Km)		RHS (Km)		Total Length (m)	Remarks
		(From)	(To)	(From)	(To)		
1	W-beam Single faced metal crash barrier	87700	93100	-	-	5400	Excluding structure locations & approaches to underpasses. In addition to these, additional 70.5m "W" beam crash barrier is required in between these chainages.
		-	-	87700	89500	1800	
		-	-	90100	93100	3000	
		-	-	93950	97600	3650	
		94050	97600	-	-	3550	
		98250	98900	98250	98900	1073	
		102450	102820	102450	102820	484	
		102860	103350	102860	103350	798	
		103380	103480	103380	103480	124	
		103530	104160	103530	104160	904	
		104290	104450	104290	104450	298	
		104510	104570	104510	104570	70	
		104610	104890	104610	104890	370	
		105290	105500	105290	105500	227	
		105540	105950	105540	105950	534	
		105980	106010	105980	106010	60	
		106120	106280	106120	106280	320	
		106380	106500	106380	106500	98.5	
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	Crash barriers with Friction slab	96480	97490	96480	97490	4,666	Excluding structure locations & approaches to underpasses
		99540	101060	99540	101060		

7	New Jersey barrier	87700 99400	96400 101150	87700 99400	97600 101150	3230	Structure locations & approaches to underpasses to be excluded from chainges mentioned to arrive at total length
8	Pedestrian guardrails	87700 99400	97600 101150	87700 99400	97600 101150	23,300	Excluding structure locations & approaches to underpasses
9	**End Treatment for Steel Barriers**	-	-	-	-	-	-

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 (m)	Retaining Structure/ Toe Wall	Type of Safety Barrier	Remarks
	From	To						
1	98.320	98.870	550	LHS	3.50	**Toe Wall**	-	Heights mentioned are Average heights
2	102.550	102.640	90	LHS	2.00		-	
3	103.580	103.640	60	LHS	2.00		-	
4	105.290	105.350	60	LHS	2.50		-	
5	105.710	105.820	110	LHS	2.50		-	
6	98.250	98.870	620	RHS	3.50		-	
7	102.500	102.580	80	RHS	2.00		-	
8	103.090	103.330	240	RHS	4.50		-	
9	103.530	103.800	270	RHS	4.50		-	
10	104.720	104.910	190	RHS	2.00		-	
11	105.380	105.500	120	RHS	2.00		-	
12	105.540	105.700	160	RHS	2.00		-	
13	105.830	105.900	70	RHS	2.00		-	
Total Length=			**2560**					

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						

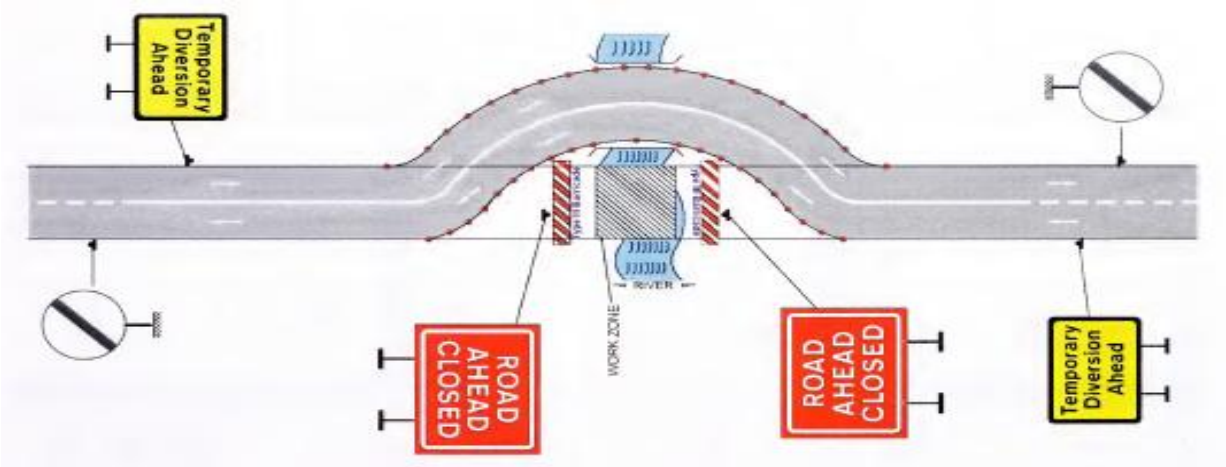
13 Shifting of Utilities

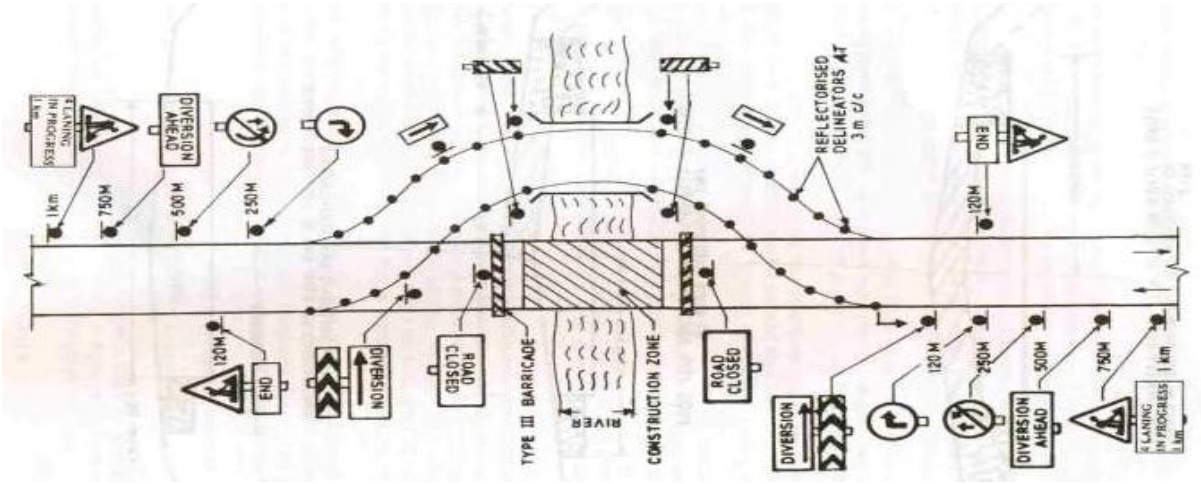
The Concessionaire shall undertake the work of shifting of any utility (including electric lines, water pipes, gas pipelines and telephone cables) to an appropriate location or alignment, in accordance with the provisions of Concession Agreement.

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								





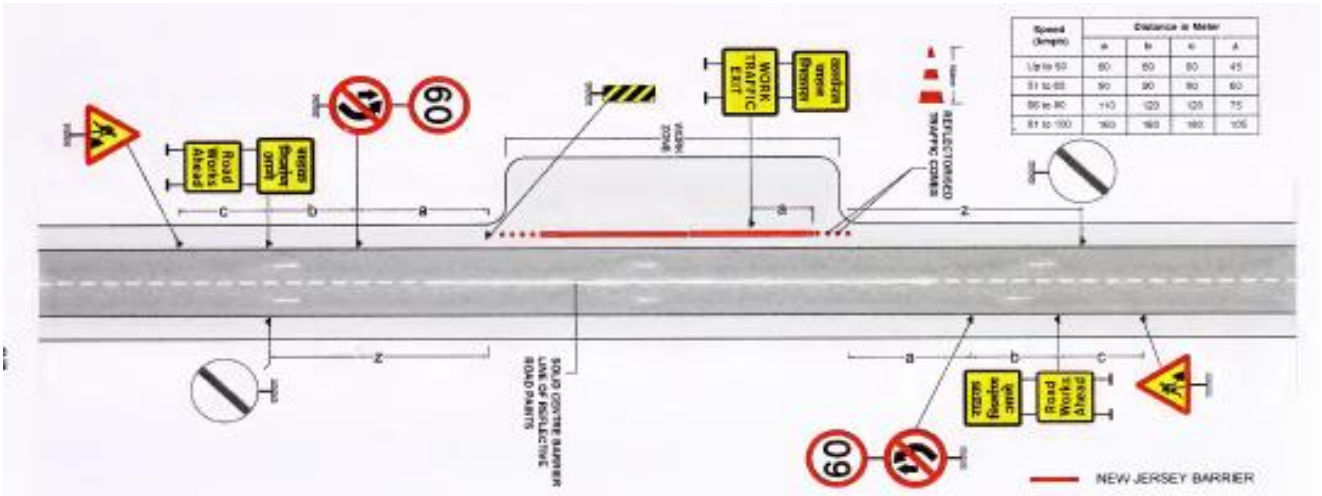
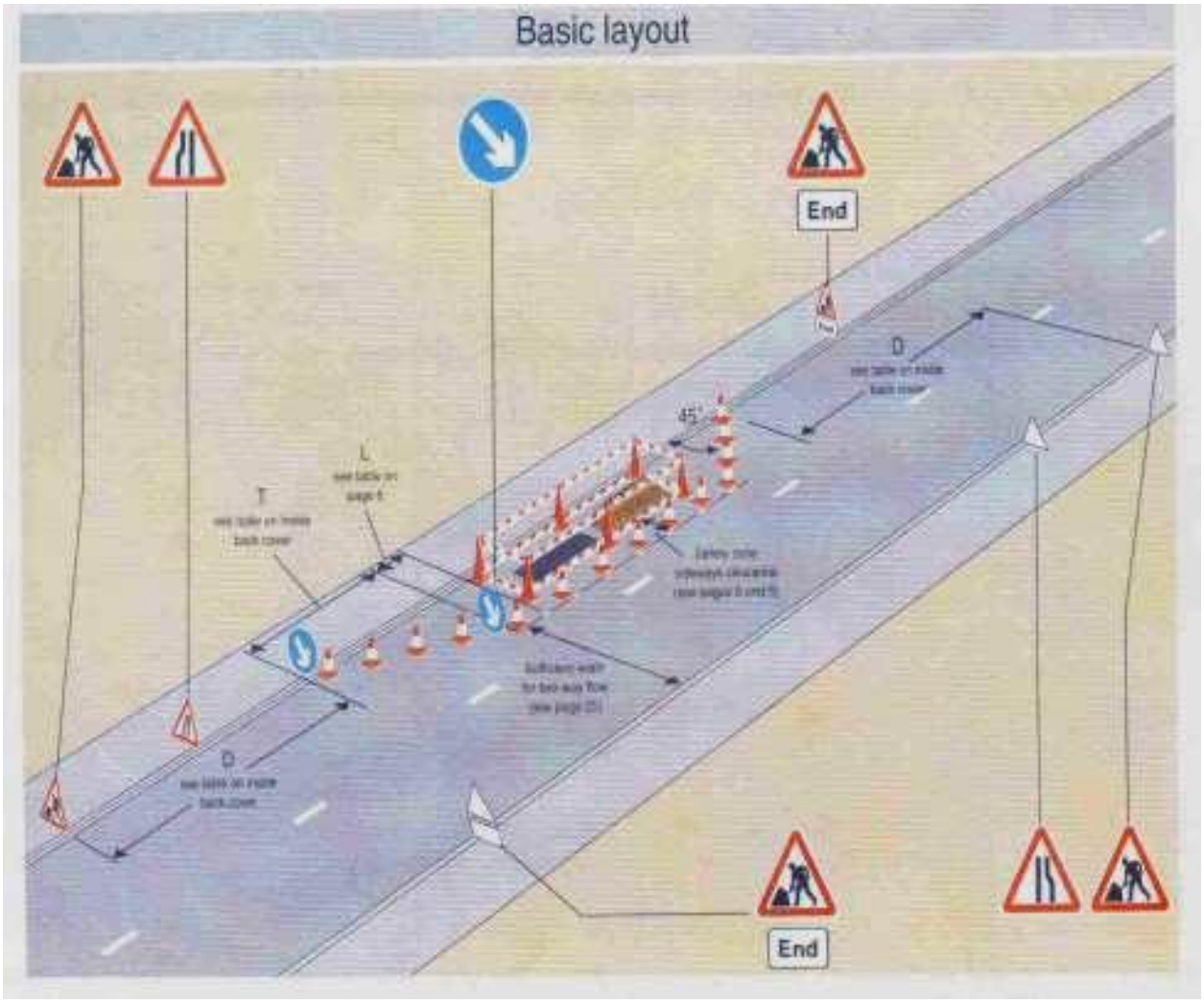


Fig. 10.1 Two Lane to Four Lane (Eccentric Widening)

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.



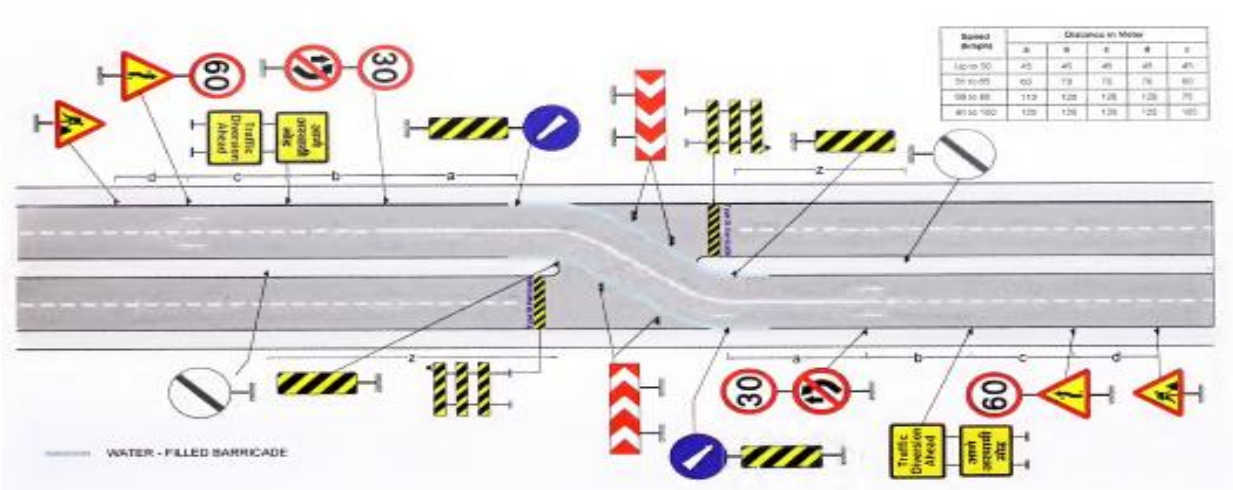
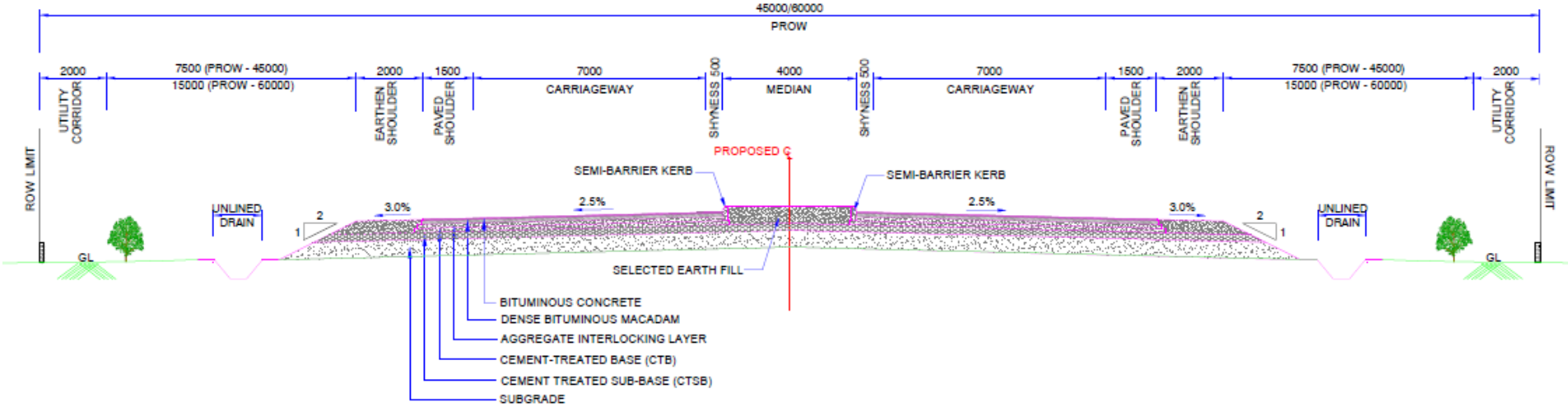


Fig. 10.2 Two Lane to Four Lane (Shifting of Traffic from One Carriageway to Other)

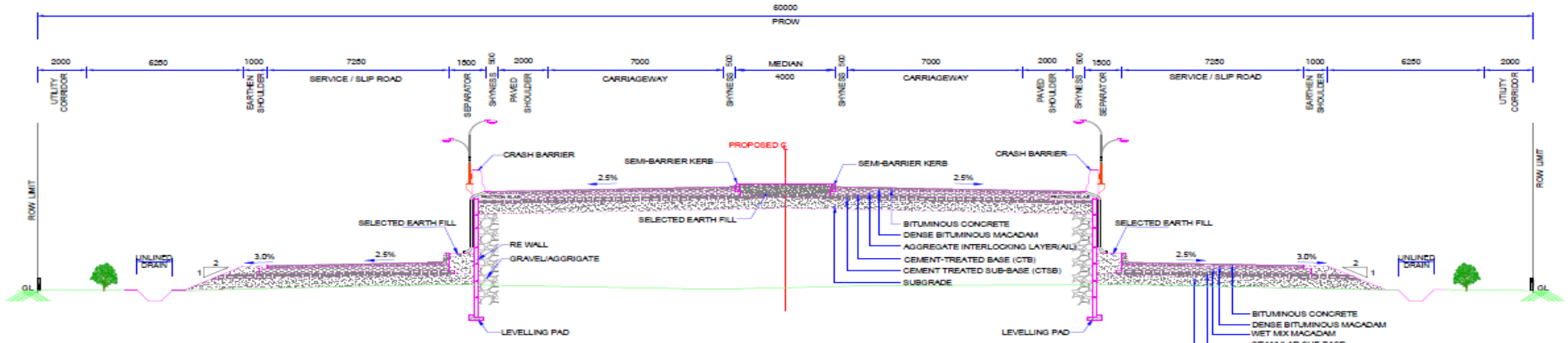
APPLICATION :

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.

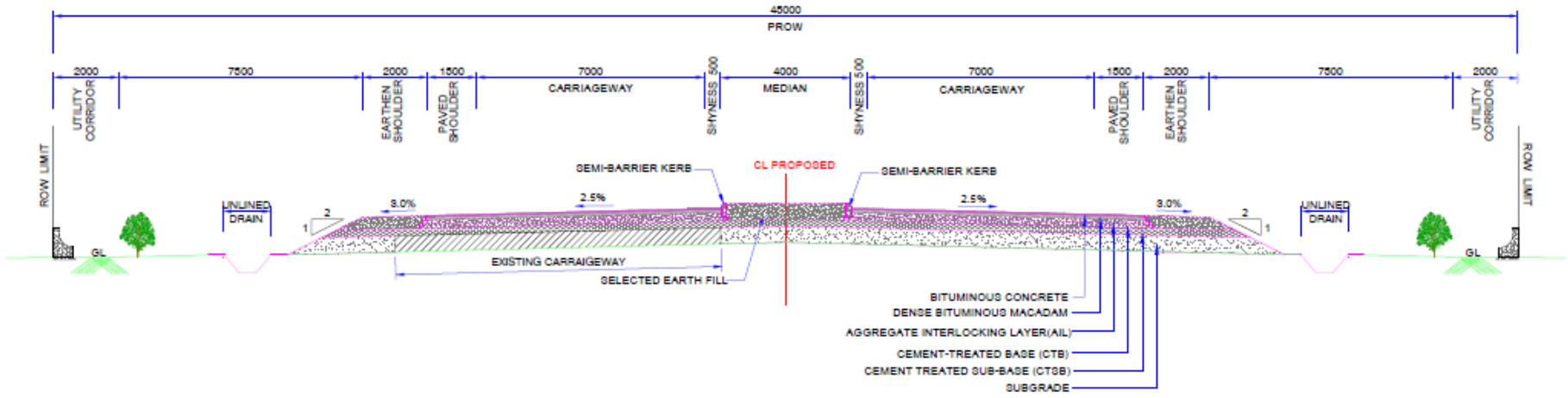
Annex-II
(Schedule B)
Typical Cross Section



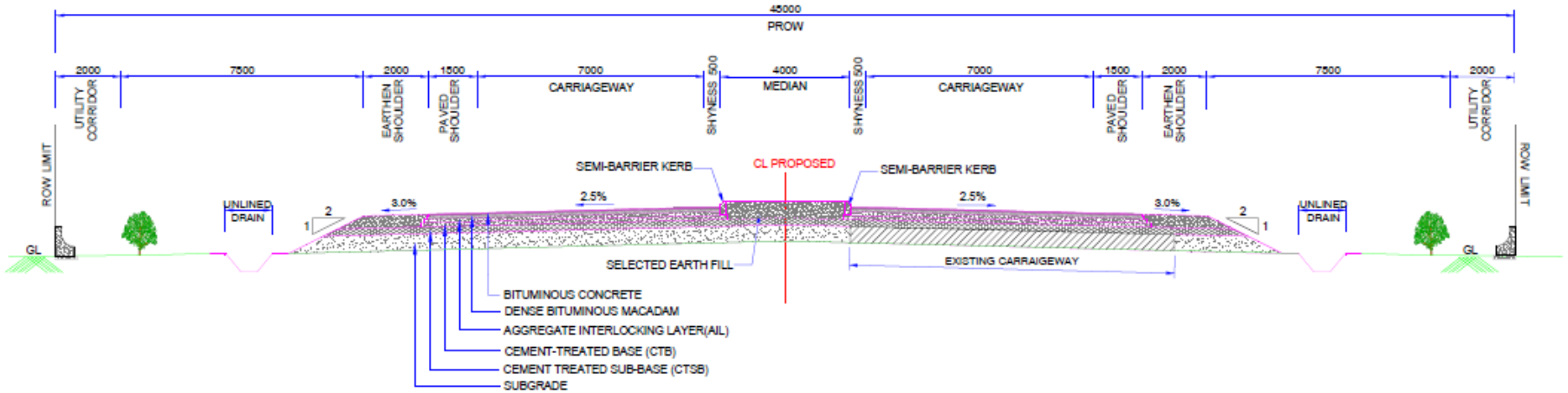
TCS-I: 4 LANE DIVIDED CARRIAGEWAY WITH FLUSH MEDIAN (BYPASS)



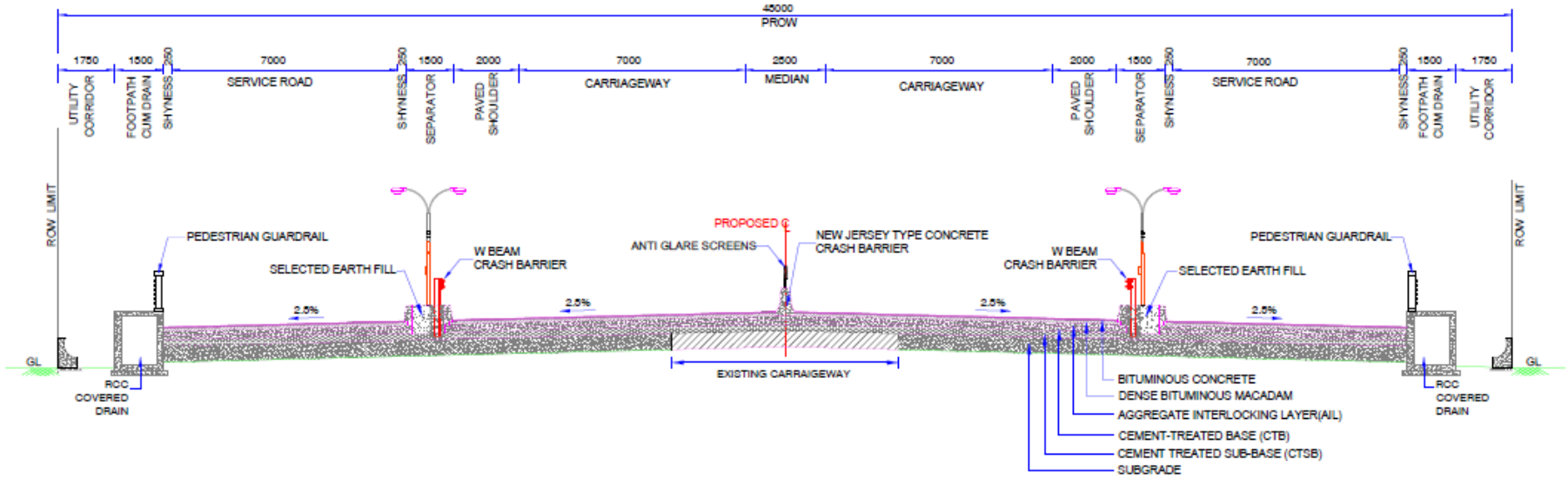
TCS-II : 4 LANE DIVIDED CARRIAGEWAY FOR APPROACHES TO VUP WITH SLIP ROADS ON BOTH SIDES (BYPASS)



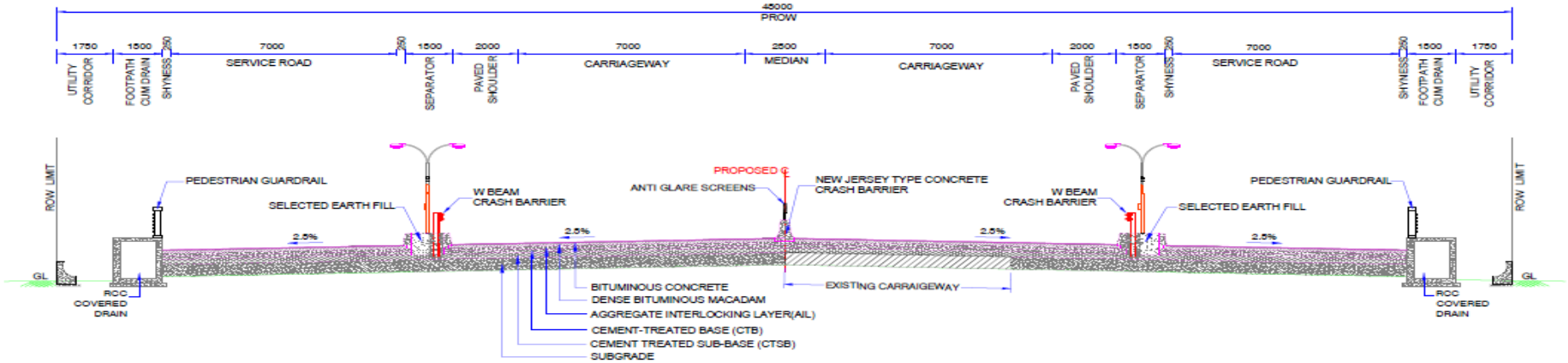
TCS-III: 4 LANE DIVIDED CARRIAGEWAY ECCENTRIC WIDENING (RHS)



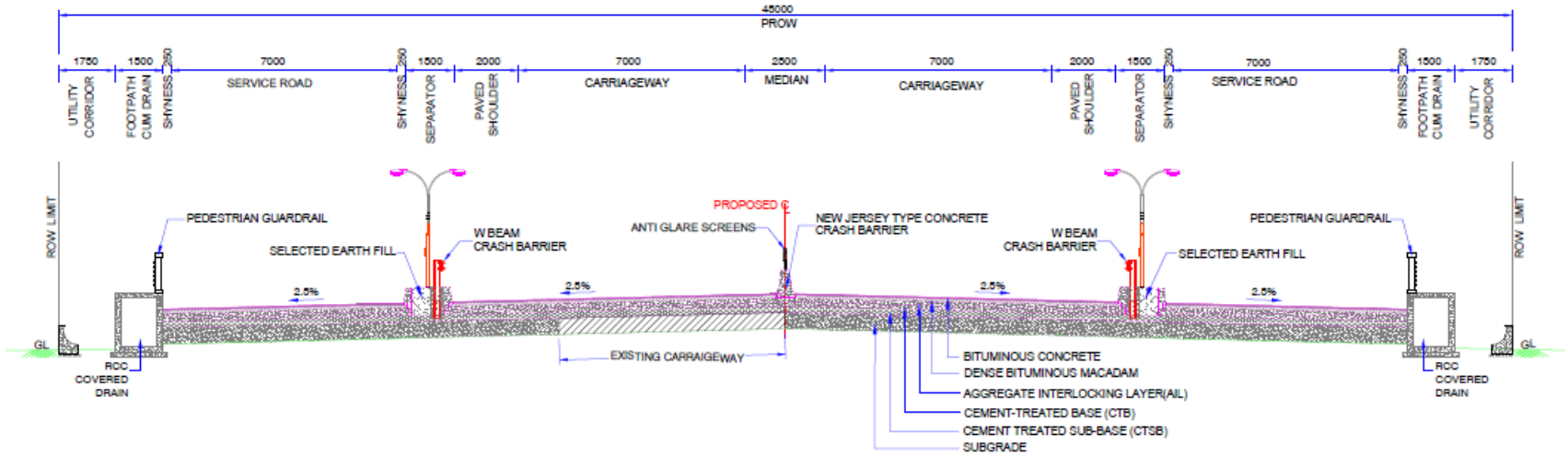
TCS-IV: 4 LANE DIVIDED CARRIAGEWAY ECCENTRIC WIDENING (LHS)



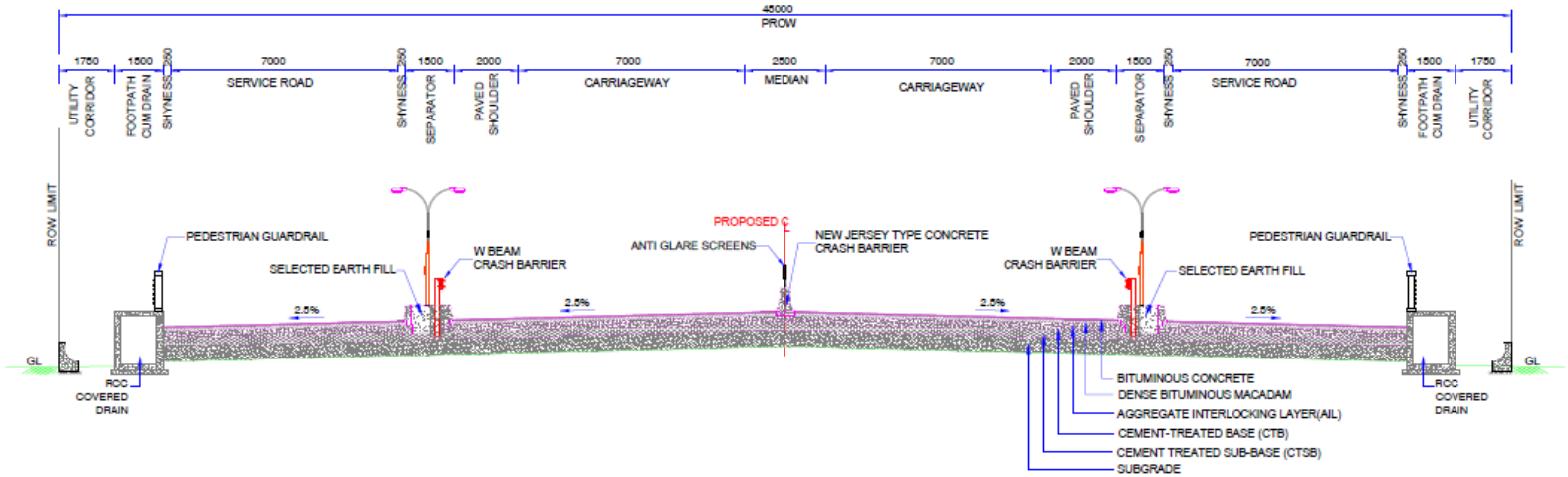
TCS-V:4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (EXISTING ROAD)



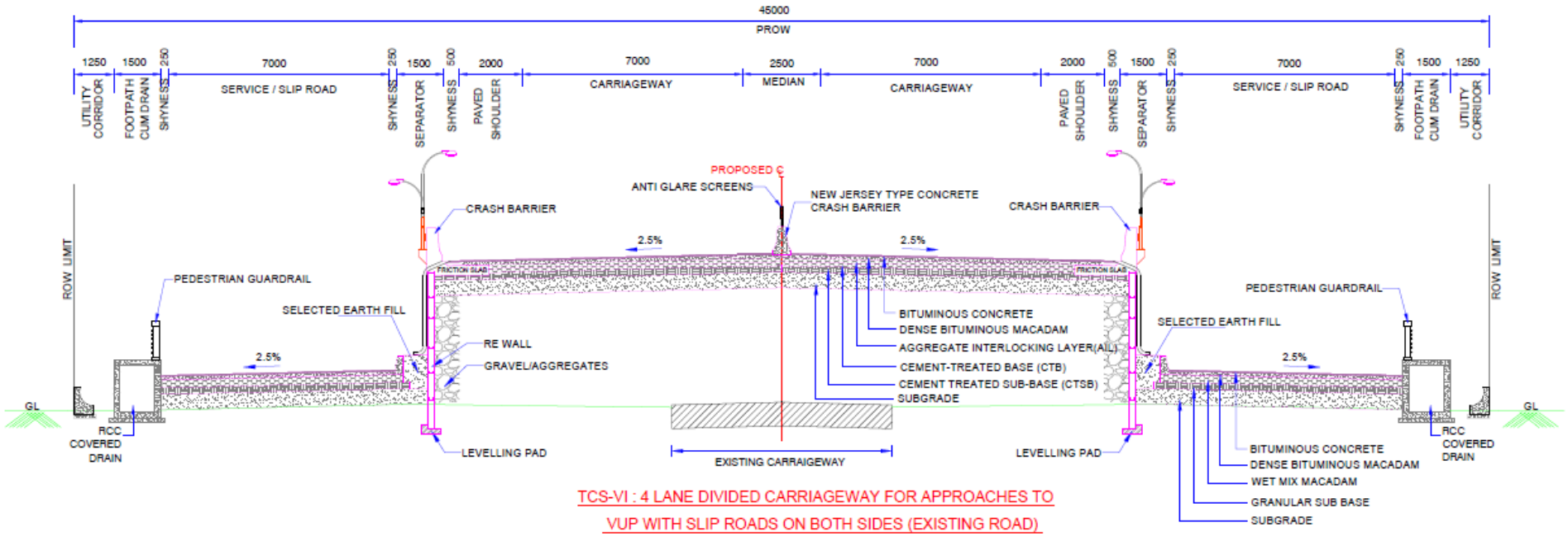
TCS-VA :4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (LHS WIDENING)



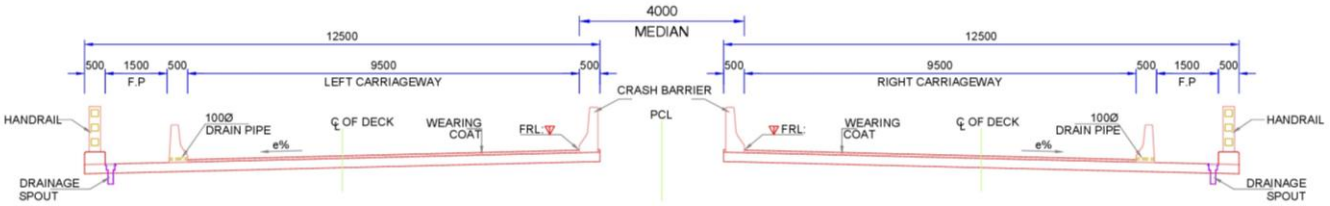
TCS-V B :4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (RHS WIDENING)



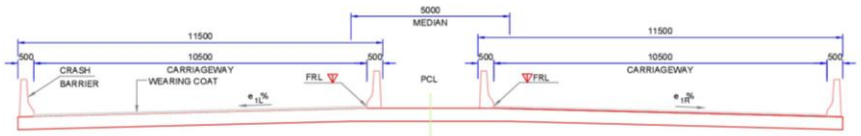
TCS-VC:4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (RE CONSTRUCTION)



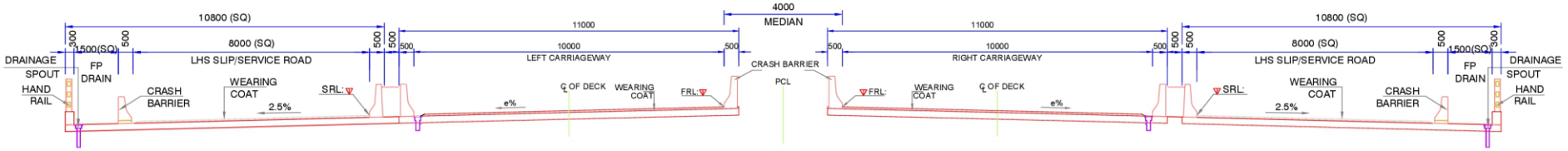
TCS-VI : 4 LANE DIVIDED CARRIAGEWAY FOR APPROACHES TO VUP WITH SLIP ROADS ON BOTH SIDES (EXISTING ROAD)



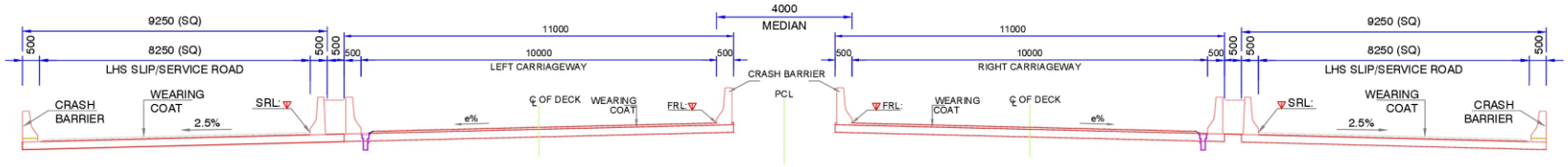
TCS:VII CROSS SECTION OF BRIDGE / ROB AT DECK LEVEL - WITH FOOTPATH
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)



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)

Annexure-iii Schedule C Project Facilities

Annexure-III 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 Chainages	Design Chain-ages		Entry	Exit
Nil					

The Sub Items of toll Plaza are as follows.

S.No.	Item	Number	Remarks
1	No. of toll lane	0	-
2	toll Booth complex	0	-
3	weigh bridges	0	-
4	electrical systems	0	-
5	Highway Nest with toilet facility	0	-
6	Internet facility	0	-

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	30	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	152	
3	5th Kilometer stone	8	

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	-
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)	-
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		
2	Give Way Signs		
3	Prohibitory signs		
4	No Parking signs		
5	No Stopping signs		
6	Speed Limit signs (Circular)	5	
7	Speed Limit signs (Vehicle Type)		
8	Vehicle Control signs	36	
9	Restriction Ends sign		
10	Compulsory Direction Control and other signs		
II	**Cautionary/Warning**		
1	Left/Right Curve	8	
2	Left / Right Curve with side road		
2	Right/Left Hairpin Bend		
3	Right/Left Reverse Bend		

S.No.	Road Signs	Number	Remarks
4	Series of Bends	10	
5	270 Degree Loop		
6	Side Road		
7	Y-intersection		
8	Cross Road		
9	Roundabout		
10	Traffic Signals		
11	T-lntersection		
12	Major Road Ahead		
13	Staggered Inter-section		
14	Merging Traffic Ahead		
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	5	
25	Pedestrian crossing with backing board	-	
26	School Ahead	5	
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	5	
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	-	

S.No.	Road Signs	Number	Remarks
43	Play Ground Ahead	-	
44	Quay Side or River Bank	-	
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 Air Craft	-	
52	Unguarded Railway Crossing	-	
53	Guarded Railway Crossing	-	
54	Crash prone area ahead	-	
55	U- Turn	-	
III	**Chevron Signs**		
1	Single Chevron	304	
2	Double Chevron	-	
3	Triple Chevron	-	
IV	**Object Hazard Marker Sign**		
1	Left /Right side Object Hazard Marker	180	
2	Two way Object Hazard Marker	-	
V	**Informatory/Guide**		
1	Direction and Place Identification signs	8	
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	-	
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	-	

S.No.	Road Signs	Number	Remarks
	Ahead of a Flyover in Urban/City Roads		
15	Gantry Mounted advance Direction Sign Ahead of a Grade Separated Junction	-	
16	Gantry Mounted advance Direction Sign Ahead of a At Grade Intersection	-	
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	0	
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	-	

S.No.	Road Signs	Number	Remarks
20	Camp Site	-	
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	15	
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	-	

S.No.	Road Signs	Number	Remarks
VIII	**Route Maker Signs**		
1	State Highway Route Marker Sign	-	
2	National Highway Route Marker Sign	-	
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	11458		
10	No Overtaking Lines			
11	Warning Lines			
12	Border or Edge Lines	18850		
13	Longitudinal Markings for Undivided Roads			
14	Longitudinal Markings for divided Roads	7392		
15	Longitudinal Markings for Ramps/Slip Roads/One Way Streets	47094		
16	Stop Line			
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)			

S.No.	Item	Unit		Remarks
		Length (m)	Number	
27	Directional Arrows			
28	Mandatory Turn Arrows			
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	189		
39	Markings when highway passes through settlement 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			
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/NHAI, as per site requirement.

2.4 Road Delineators

(Clause No. 9.4 IRC: SP:84-2019/ IRC: SP:87-2019)

S.No.	Item	Number/ Length (m)	Remarks
1	Roadway Indicators	32 no.	
2	Median Marker on Median/RCC Barrier **(Clause 4 of IRC 79 2019)**	269	Anti-glare screens are used on Median
3	Object Markers		
4	Flexible Object Markers **(Clause 6 of IRC 79 2019)** i. On Metal Beam Barrier	4	

S.No.	Item	Number/ Length (m)	Remarks
	ii. On Toll Booth/Toll Island iii. On Entry/Exit of Tunnel iv. On Exit from Main carriageway		
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/NHAI, 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	Uni-directional carriageway
2	Red Colour one coloured face Road Studs	1189	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	1189	Median side edge line, zebra crossing	
4	Green Colour one coloured face Road Studs		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,	

S.No.	Item	Number	Location	Remarks
			crossable continuous line like in acceleration/ deceleration lanes involving lane changing	
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 Way side Amenities / Service Areas/Rest Area

S.No	Item	Design Chainage (Km)	Side	Remarks
1	Rest Area	91+625	RHS	

- The Site needs to levelled/ graded for the whole of Way side Amenities area and boundary wall of the height of 3.0 m shall be constructed along the periphery of the area.
- Ramps to be constructed at entry and exit of way side amenities / service areas/rest area
- Lightings needs to be in place for way side amenities / service areas/rest area
- These tasks needs completed and handed over back to the authority at the end of 1st Milestone.

5 Truck lay-byes:

5.1 The truck lay-bye shall be provided at below 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	106.410	106.470	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	87+740	87+710	15.0	
2	90+110	90+190	15.0	
3	94+540	94+620	15.0	
4	96+970	97+030	15.0	
5	100+230	100+350	15.0	

6.3 Bus Bay Pavement

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

Pavement Composition (Flexible/Rigid/ Paver Blocks)
N.A

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	87.700	97.600	BHS	-
2	i. Hazardous Locations on Straight Stretches ii. At Junctions/Intersections iii. Schools iv. Bus Stop/Railway Stations v. Overpass, Subway vi. Central Reserve	99.400	101.150	BHS	
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	6 on LHS and 6 No. On RHS	-	-	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)

.	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				
2	**Rest Areas:** The entire Rest areas shall be provided with lighting with average illumination to 40 Lux	91.400	91.800	RHS	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 illumi-	-	-	-	-

.	Lighting facilities	Chainage		Side	Lighting Source: Electricity Board/ Generator/ Solar
		From	To		
	nated 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.).	87.680	87.780	LHS	Electricity Board
		90.150	90.250	LHS	
		94.600	94.700	LHS	
		97.000	97.100	LHS	
		100.280	100.380	LHS	
		106.430	106.530	LHS	
		87.650	87.750	RHS	
		90.070	90.170	RHS	
		94.500	94.600	RHS	
		96.890	96.990	RHS	
		100.180	100.280	RHS	
		106.380	106.480	RHS	
5	**Grade separated structures, interchanges, flyovers, underpasses (vehicular/ pedestrian) and Vehicle overpasses:** 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 where 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	86.030	86.920	BS	Electricity Board
		96.480	97.600	BS	
		99.400	101.150	BS	Electricity Board
6	**Built-up sections** on the project highway both in the median of main carriageway				

.	Lighting facilities	Chainage		Side	Lighting Source: Electricity Board/ Generator/ Solar
		From	To		
	and on the service roads on both sides				
7	On Median Openings provide 1 nos. high mast lighting of 25m height				
8	On Major Bridges and its approaches higher than 3m	85.500	85.800	BS	Electricity Board

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 rain water 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.	Rain water 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 project length	Both Side	As per Fig.10.6 of IRC SP 42

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

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. 87.700 to Km.106.730
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

12.2 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	97.000	BHS	-
2	98.587	BHS	-
3	100.290	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	87.700	2 No. (one of LHS & RHS)	To be provided
2	106.730	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	97.000	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	87.700	2 No. (one of LHS & RHS)	To be provided
2	106.730	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. 97.500. 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 NHAI.

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 NHAI 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.**

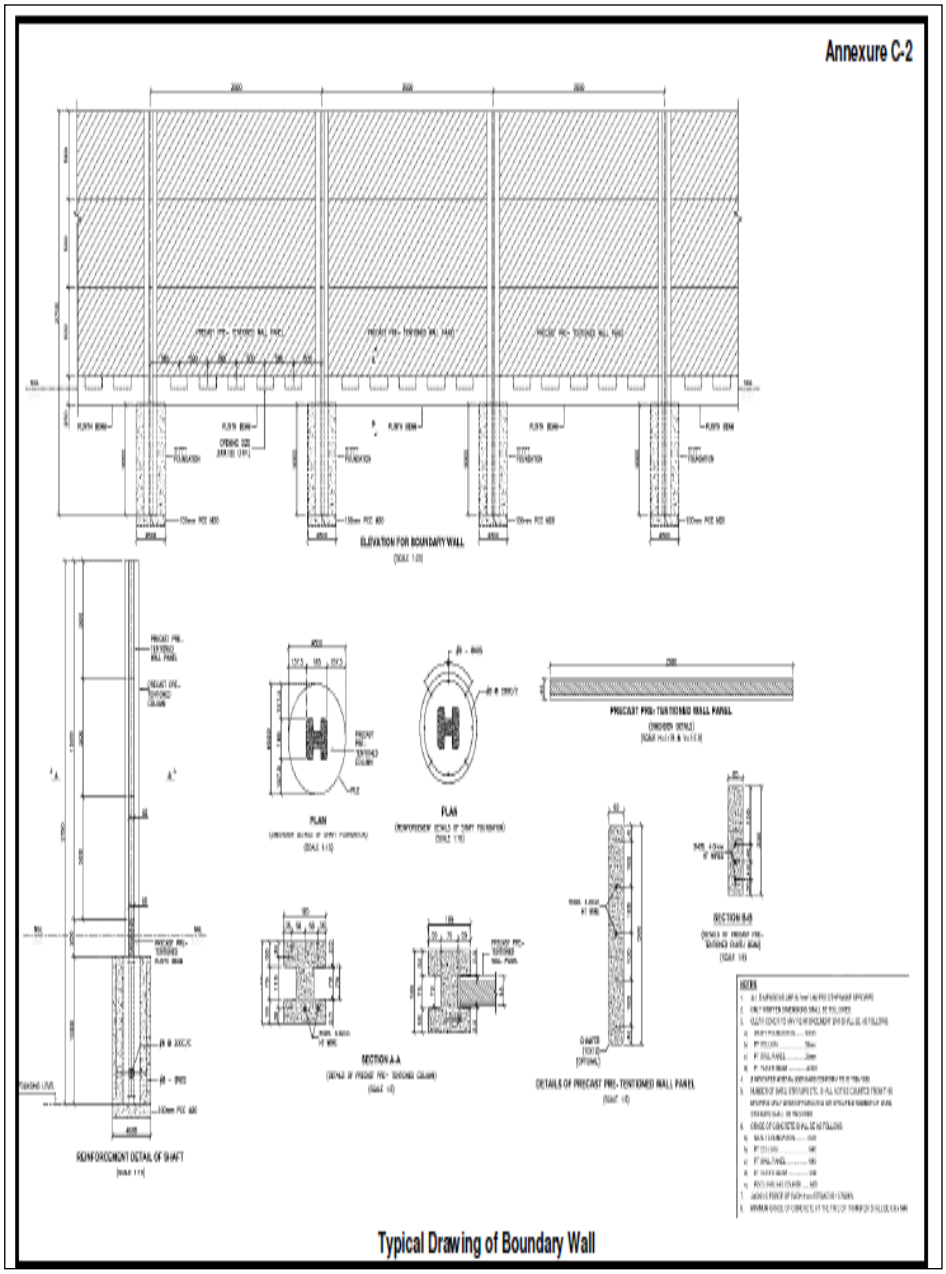
15 Crane Service:

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)

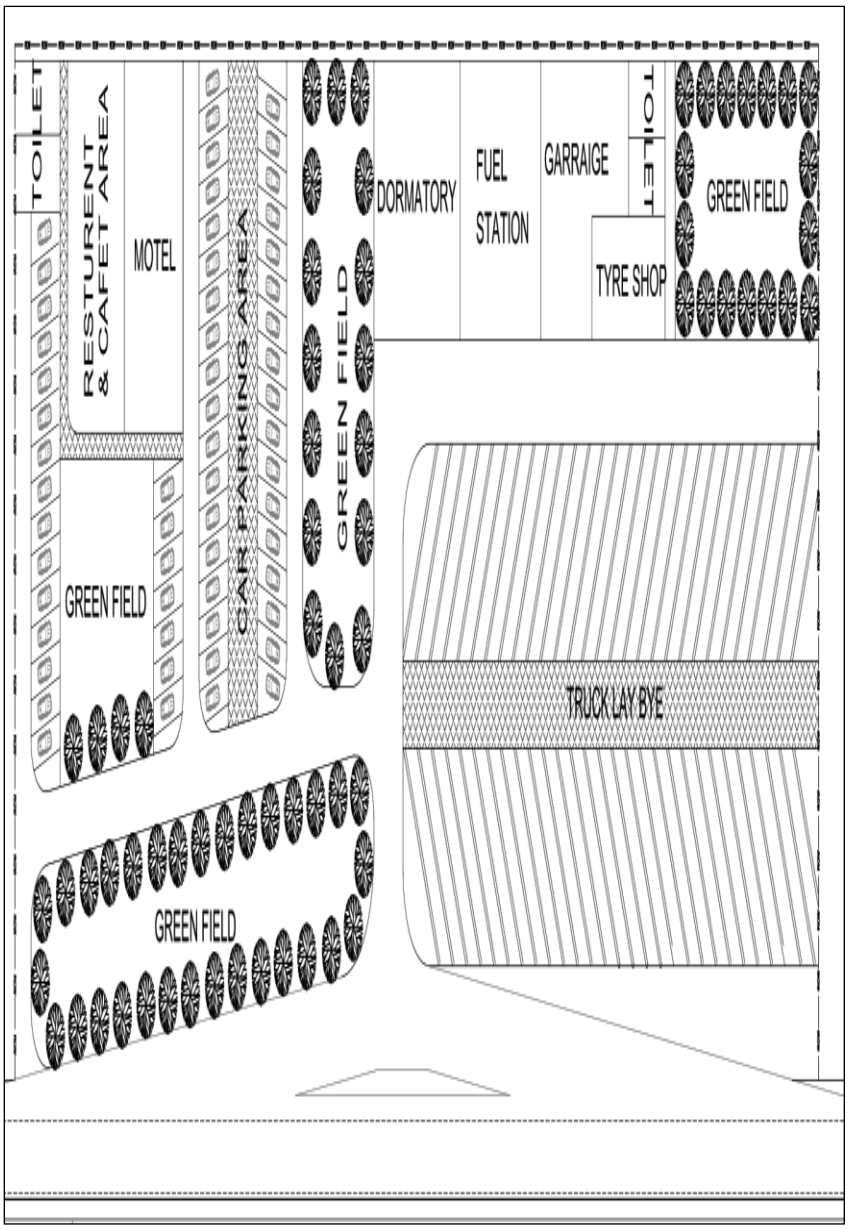
Standard Drawing for Boundary Wall



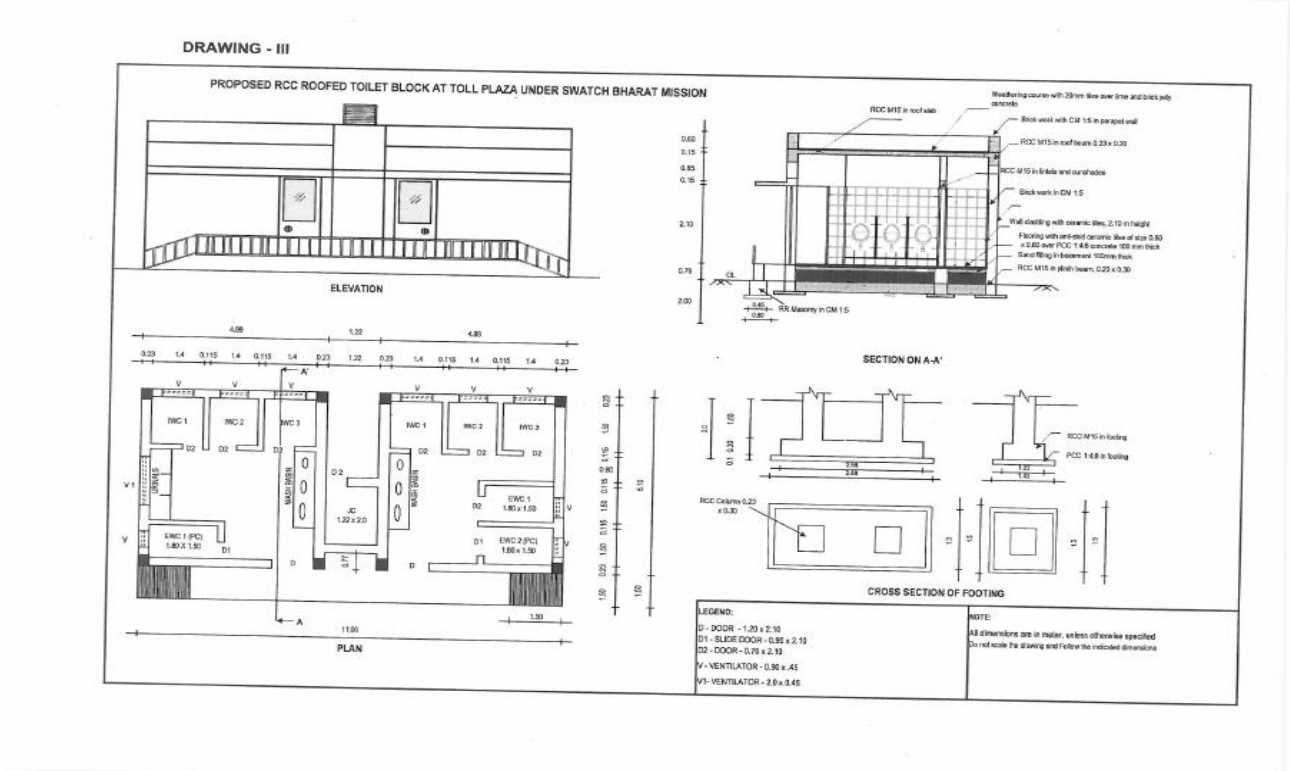
Annexure-I

(Schedule-C)

Typical Drawing of Wayside Amenities/Rest Area



Annexure-v
Schedule C Standard Drawing for Toilet



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	Flush 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)
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-	Deck width of bridges	Major bridges, ROBs and Minor bridges in urban areas will be hav-

Sl. No.	Item	Manual Clause reference	Provision as per Manual / Circular / Minutes	Modified Provision
		2019		ing footpath, Minor Bridges in Non 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)
8	Boundary Wall	Clause 12.2 of IRC SP:84-2019	Road Wall Boundary	Boundary Wall shall be provided as per Schedule-B 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

*- 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

1. **General: National Building Code of India – 2005**

2. **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.

CODE OF PRACTICE FOR LOADS AND COMBINATIONS	
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

3. All relevant BIS Code of India for Civil, Electrical, Water Supply, Sanitary, HVAC and Solar Panels.
4. Energy Conservation Code - 2007.
5. Roads / Driveway / Parking: IRC 37-1984 / MORTH specifications.
6. Indian Electricity Rules / State Electricity Rules.
7. ASHRAE Standards.
8. All local bylaws.
9. Hand Book of Water Supply and Drainage, BIS, SP-35.
10. CPWD - Specifications published by Director General (Works) CPWD, New Delhi including subsequent amendments, upto date correction slips, revisions.

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

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

- MES SSR Part I 2009,
- 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.