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

NAME OF WORK:
Four Laning of Karimganj - Sutarkandi section of NH-37 from Design Ch 0+020 on NH 8 near Karimganj to Design Ch. 14+380 (Sutarkandi, India-Bangladesh Border) in the state of Assam

(Package-VII)

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

Schedules
(A, B, C & D)

January 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 Spur to Silchar-Churaibari corridor of NH 8 under NHIDCL. Project section commences from Design chainage Km. 0.020 on NH-8 near Karimganj and ends at design chainage Km. 14.380 near Sutarkandi of Karimganj district in the state of Assam. The land, carriageway and structures comprising the site are described below.

	Design Chainage (Km)	Easting#	Northing#
Start of Package	0.020	435987.071	2746705.396
End of Package	14.380	423929.123	2751076.438

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

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

2 Land

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

Sl.No	Design Chainage (Km)		Right of way (m)	Remarks
	From	To		
1	0.020	14.380	20	ROW is based on data collected from O/o EE, PWD, Karimganj

3 Carriageway

The details of existing carriageway are as given under:

Sl. No	Design Chainage (Km)		Length (km)	Carriageway (m)	Location
	From	To			
1	12.430	14.380	1.95	7.0m	End of Proposed Fakirabazar bypass to Sutarkandi

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	
Nil					

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

Minor Junctions

The details of minor junctions are as follows:

Sl.No	Design Chainage (Km)	Type of Intersection	Leads	
			LHS	RHS
1	13.557	Y	-	Jarapata

5 Service Roads / Slip roads

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

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

6 Bypasses

The details of the bypasses are as follows.

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

7 Major Bridges

The site includes the following major bridges.

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

8 Minor Bridges

The site includes the following minor bridges.

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span Length in meter)	Super Structure	Deck Width (m)
1	14.195	1 x 11.0	Slab type	

9 Causeways

The site includes the following causeways.

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

10 Road Over Bridge (ROB)

The site includes the following ROBs.

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

11 Road Under Bridge (RUB)

The site includes the following RUBs.

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

12 Grade Separators

The Site includes the following Grade Separators

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

13 Flyover

The Site includes the following Flyovers.

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

14 Vehicular Underpasses

The Site includes the following vehicular underpasses.

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

15 Vehicular Overpasses

The Site includes the following vehicular overpasses.

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

16 Cattle/Pedestrian Underpasses

The Site includes the following Cattle/Pedestrian underpasses.

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

17 Culverts

The Site has the following culverts.

17.1 Pipe Culverts

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

17.2 Slab Culverts

Sl. No	Design Chainage (Km)	Span Arrangement (No. x Span in m)	Width(m)
1	12.663	1 x 2.0	
2	13.065	1 x 2.0	
3	13.380	1 x 2.0	
4	13.740	1 x 2.0	

17.3 Box Culverts

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

18 Railway Level Crossing

The Site includes the following Level Crossings:

Sl. No	Railway Chainage (Km)	Location
Nil		

19 Total number of structures

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

Sl.No	Type of Structure	Nos
a	Major bridges	0
b	Minor Bridges	1
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	0
m	Slab Culverts	4
n	Box Culverts	0

20 Bus Bays & Truck Lay byes

The details of bus bays are as follows:

(a) No of Bus bays

Sl.No	Existing Chainage (Km)	Side	Remarks
Nil			

(b) No. of Bus Shelters

Sl.No	Design Chainage (Km)	Side	Remarks
			-

(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:

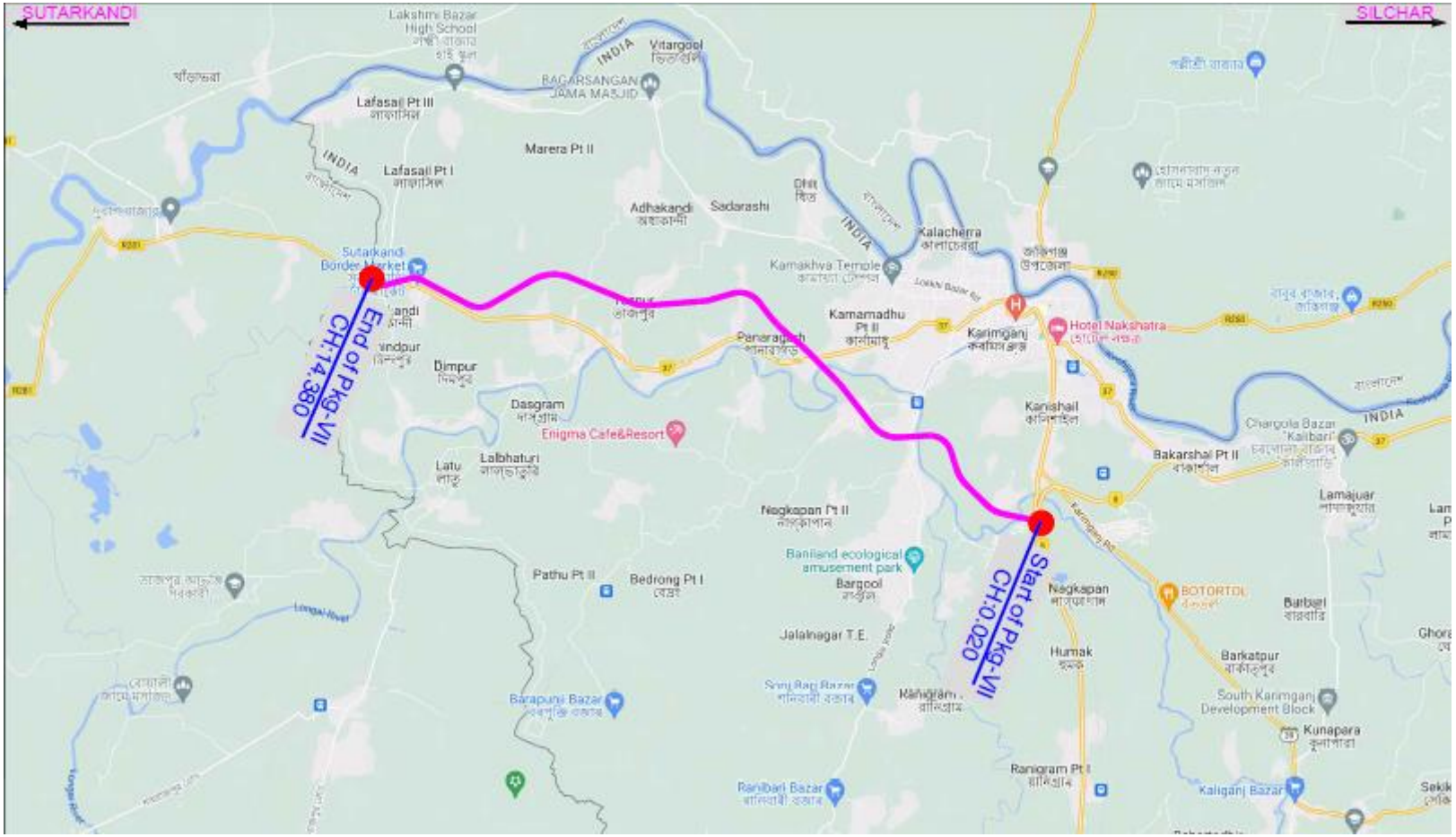
Lined Drain exists along the project stretch at the following locations.

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

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-7

Annex III
Schedule - A

The co-ordinates of Centreline are given below: -

Centre Line Co-ordinates at every 500m Interval

S. No.	Design Chainage (m.)	Easting	Northing
1	20	435987.071	2746705.396
2	500	435516.629	2746800.707
3	1000	435057.722	2746978.807
4	1500	434701.338	2747329.485
5	2000	434454.692	2747755.486
6	2500	434226.534	2748187.325
7	3000	433740.881	2748242.260
8	3500	433244.328	2748252.139
9	4000	432866.385	2748564.418
10	4500	432557.780	2748957.817
11	5000	432232.906	2749337.161
12	5500	431879.979	2749691.341
13	6000	431511.970	2750029.274
14	6500	431148.455	2750371.381
15	7000	430828.999	2750754.731
16	7500	430354.299	2750808.737
17	8000	429870.144	2750688.286
18	8500	429371.585	2750650.356
19	9000	428872.975	2750613.181
20	9500	428396.754	2750748.269
21	10000	427934.569	2750939.019
22	10500	427471.995	2751128.787
23	11000	426980.380	2751145.578
24	11500	426536.951	2750917.545
25	12000	426103.907	2750667.600
26	12500	425631.948	2750639.008

S. No.	Design Chainage (m.)	Easting	Northing
27	13000	425189.437	2750871.782
28	13500	424744.718	2751099.728
29	14000	424258.900	2751010.853
30	14380	423910.60	2751087.78

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 no forest section. Forest clearance is not required in this package.

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

Annex V
Schedule - A
Utilities

The Site includes the following Utilities.

i) Electrical Utilities

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

S.no	Chainage		Electrical poles (Nos)			Crossings			Transformer		Remarks
	From Km.	To Km.	33KV	11KV	LT	33KV	11KV	LT	No	Capacity	
1	0.020	1.000		6	4		3	2			
2	1.000	2.000					2	2			
3	2.000	3.000					2	2			
4	3.000	4.000					2	5			
5	4.000	5.000					3	5	2		
6	5.000	6.000					2	3			
7	6.000	7.000									
8	7.000	8.000						3			
9	8.000	9.000						2			
10	9.000	10.000					2	1			
11	10.000	11.000						2			
12	11.000	12.000		3	5		3	3	1		
13	12.000	13.000	3	17		2	1	5	3		
14	13.000	14.000		35	6		3	5	3		
15	14.000	14.380									

(ii) Extra High Tension lines (EHT Lines)

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

ii) Public Health utilities (Water/Sewage Pipelines)

S No	Chainage		Length (in Km)				Crossings			
			Water Supply line		Sewage line		Water Sup-ply line		Sewage line	
	From Km.	To Km.	With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity
1	1.000	2.000					1			

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
2	2.000	3.000					1			
3	3.000	4.000					3			
4	4.000	5.000					2			
5	5.000	6.000	0.225 (LHS) & 0.225 (RHS)				1			
6	7.000	8.000					1			
7	9.000	10.000	0.100 (RHS)				1			
8	10.000	11.000					2			
9	11.000	12.000	0.200 (LHS)				1			
10	12.000	13.000					1			
11	12.000	14.380	1.950 (LHS) & 1.950 (RHS)							

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

iii) Any other lines –

Note: - Length/location/specification mentioned above is tentative and liable to change. The bidders are advised to assess the existing utilities at site. Variation in length/location and specifications shall not constitute Change of Scope

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	0.020	14.380	14.360	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 Laning of Karimganj - Sutarkandi section of NH-37 from Design Ch 0+020 on NH 8 near Karimganj to Design Ch. 14+380 (Sutarkandi, India-Bangladesh Border) in Karimganj district 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

Four Laning of Karimganj - Sutarkandi section of NH-37 from Design Ch 0+020 on NH 8 near Karimganj to Design Ch. 14+380 (Sutarkandi, India-Bangladesh Border) in Karimganj district the state of Assam (Package-VII).

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/Earthen shoulder shall be undertaken. The paved carriageway shall be 16.0 metre for four laning (including shyness & edge strip) in bypass locations. The earthen shoulder shall be 2.0 metres on either side. (Circular: NHAI/ Bharatmala/ EC/ DPR/ 2016/ 143430

1.1.2 At locations along existing road, it varies from 16.0m to 19.0m (including shyness/edge strip)

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

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

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

1.2 Width of Median

1.2.1 The width of median including kerb shyness shall be 1.6 metre for both new construction and widening locations.

1.2.2 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 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	13.495	13.606	Sub-standard horizontal curve	At border location normally speed is reduced. Hence, followed the existing road alignment.
2	14.146	14.168	Sub-standard horizontal curve	

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

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

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

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

S No	Design Chainage (Km)		Length (km)	Location
	From	To		
1	0.020	5.622	5.602	Karimganj bypass
2	5.622	12.730	7.108	Fakirabazar bypass

2.4 Right of Way

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

S.No	Stretches		Length (in Km)	ROW width (in m)	Remarks
	From (Km)	To (Km)			
1	0.020	12.900	12.880	45	Except at proposed new lane ROB
2	12.900	13.890	0.990	32	
3	13.890	14.380	0.490	26	

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

2.5 Type of shoulders

2.5.1 Paved shoulders and strip on median side shall be of same specification and pavement composition as of main carriageway.

2.5.2 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)

2.5.3 In Built-up sections, footpath shall be provided with width 1.5m/2.0m respectively. (Clause No. 2.15 & clause No. 2.6 IRC: SP:84-2014)

2.5.4 The earthen shoulder of 2.0m width on shoulder side shall be provided with top 150 mm on earthen shoulder with well graded naturals and morrum gravel crust stones or combination thereof, confirming to Clause 401 of MoRTH specification.

2.6 Lateral and Vertical Clearance at Underpasses

2.6.1 In case of VUP/ LVUP/ SVUP, the proposed structure, the 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.

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

2.7 Lateral and vertical clearances at Overpasses

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

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

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

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

2.8 Service roads/Slip roads/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 length (km)	Remarks
	From	To	LHS	RHS			
Nil							

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	
1	From Km. 12.900 to Km. 13.890	From Km. 12.900 to Km. 13.890	Truck parking adjacent to carriageway

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

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

Sr.No.	Design Chainage (Km)		Length (Km)		Paved Carriageway Width including shyness(m)	Total Length (kms)	Remarks
	From	To	LHS	RHS			
1	3.000	3.460	0.460	0.460	5.750	0.920	-
2	3.900	4.212	0.312	0.312	5.750	0.624	-
3	5.440	5.870	0.430	0.430	5.750	0.860	-
4	11.850	12.730	0.880	0.880	5.750	1.760	-
Total Length (kms)						4.164	

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:

- 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.**
- 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.

The sub-structure shall be continued in the median portion with RCC barrier wherever superstructure has not been proposed in median portion.

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 Small Vehicle Underpasses (SVUP)

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	3.728	9.5 SQ	9.5 SQ	Yes	1 x 7 .0	4.0	25^0	-

*- Crossroads under Underpasses are to be developed for 15.0m on either side and shall not constitute change of scope

2.9.3 Light Vehicle Underpass (LVUP)

Sr.No.	Design Chainage(Km)	LHS Roadway Width (m)	RHS Roadway Width (m)	Super Structure Provision in Median	Span Arrangement (m) (clear)	Minimum Vertical Clearance (m)	Skew Angle(to be specified)	Remarks
1	1.142	9.50 (SQ)	9.50 (SQ)	Yes	1 x 12.0	4.0	40^0	-
2	3.886	9.50 (SQ)	9.50 (SQ)	Yes	1 x 12.0	4.0	18^0	-
3	4.212	9.50 (SQ)	9.50 (SQ)	Yes	1 x 12.0	4.0	19^0	-
4	5.414	9.50 (SQ)	9.50 (SQ)	Yes	1 x 12.0	4.0	30^0	-
5	7.213	9.50	9.50	Yes	1 x 12.0	4.0	0	-
6	9.332	9.50 (SQ)	9.50 (SQ)	Yes	1 x 12.0	4.0	17^0	-
7	10.098	9.50 (SQ)	9.50 (SQ)	Yes	1 x 12.0	4.0	26^0	-
8	10.834	9.50 (SQ)	9.50 (SQ)	Yes	1 x 18.0	4.0	30^0	LVUP cum culvert
9	12.310	8.00	8.00	Yes	1 x 12.0	4.0	0	-

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

2.9.4 Vehicle Underpass (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(to be specified)	Remarks
1	2.999	8.0(SQ)	8.0(SQ)	Yes	1 x 20.0 (SQ)	5.5	22^0	-
2	5.622	8.0(SQ)	8.0(SQ)	Yes	1 x 20.0 (SQ)	5.5	35^0	-

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

2.9.5 Cattle and Pedestrian underpass

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

2.9.6 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

2.9.7 Details of Ramps, Crossroads and Connecting Roads at Interchanges

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

Note for 2.9:

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

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

2.10 Typical Cross Section (TCS) of the Project Highway

S. No.	Design Chainage (Km)		Length (m)	TCS	Remarks
	From	To			
1	0.020	3.000	2980	I	-
2	3.000	3.460	460	IV	-
3	3.460	3.900	440	I	-
4	3.900	4.212	312	IV	-
5	4.212	5.440	1228	I	-
6	5.440	5.870	430	IV	-
7	5.870	11.850	5980	I	-
8	11.850	12.730	880	IV	-
9	12.730	12.900	170	II	-
10	12.900	13.890	990	III	-
11	13.890	14.380	490	V	-

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

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

Note:

1) Any variations in the lengths specified in the above table shall not constitute a Change of Scope
2) Lengths mentioned in the above list for cross section types concerned to structures are inclusive of structure length.
3) Retaining wall/ RE wall shall be provided for full height on all structures.

4) Toe wall (0.6m ht) to be provided where ROW is restricted and at water bodies along the proposed highway on the sections specified in Schedule-B.

5) Chainages may be adjusted according to location of structures as per drawings.

6) For example (The design Consultant must clearly mention the changes from the cross section shown in the manual).

7) Carriageway width tapering shall be provided 1 in 50 as per manual.

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

Intermediate Sight Distance (Desirable Minimum Sight Distance) shall be followed for design of all vertical curves (Summit and Valley Curves) including structures as well as highways. **(Clause No. 2.9.5 IRC: SP:84-2019)**

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

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

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

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

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

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

(a) Major Junctions:

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriage way width of crossroad	Length of crossroad to be developed (m)	
			LHS	RHS				LHS	RHS
1	0.020	T	Karimganj	Churaibari	No	NH	18.0		
2	13.557	T	-	Jarpata	Yes	VR	7.50	-	50

Note: Our project starts at Design chainage Km. 0.020. (Co-ordinate 435987.071E, 2746705.396N. In the attached Junction drawing, the development of Cross road (LHS & RHS) comes under the scope of the concessionaire of Package-IV. Only development/improvement from the above given co-ordinate in the direction of road leading to Sutarkandi comes under the scope of Package-VII

(b) Minor Junctions:

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriage way width of crossroad	Length of crossroad to be developed (m)		Remarks
			LHS	RHS				LHS	RHS	

- Above mentioned crossroads are connected to MCW.

Note:

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

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

Sr. No	Design Chainage (Km)	Junction Type	Leads to		U-Turn provision in Viaduct Spans	Category of Cross Road	Carriageway width of cross-road	Length of crossroad to be developed (m)		Remarks
			LHS	RHS				LHS	RHS	
1	2.999	T	Nagkapan Pt I	Inathpur	Yes	MDR	3.5	50	50	-
2	4.212	T	Karnamadhu Pt I	Karnamadhu Pt I	Yes	VR	3.5	50	50	-
3	5.622	+	Fakirabazar	Karimganj	Yes	NH-37	7.0	50	50	-
4	12.310	+	Fakirabazar	Ulikandi	Yes	VR	7.0	50	50	-

Note:

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

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

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

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

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

4 Road Embankment and Cut Section

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

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

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

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

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

5 Pavement design

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

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

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

5.2.1 Design Period and Strategy Pavement shall be constructed for the entire length of Project Highway including paved shoulders. Flexible Pavement shall be designed for a minimum design period of 20 years and minimum subgrade CBR of 8% and maximum subgrade CBR of 10%. whereas Rigid pavement shall be designed for a minimum design period of 30 years. 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 65 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

5.3.1 Main carriageway, paved shoulder, median side paved strip, right turning lanes (Flexible) shall be designed for 65MSA.

5.3.2 Rigid pavement to be designed as per traffic count and axle spectrum

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

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

S. No	Design chainage (Km.)		Pavement Composition	Remarks
	From	To		
Nil				

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		
1	**12.730**	**12.900**	**BC-40, DBM -60mm**	**-**

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

6 Roadside Drainage

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

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

Sr. No.	Design Chainage (Km)		Length (m)		Width of Drain (m)	Total Length (m)
	From	To	LHS	RHS		
1	12.900	13.890	990	990	1.5	1980
2	13.890	14.380	490	490	2.0	980
	Sub Total on each side		1480	1480		
	Total					**2960**

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

6.2 Unlined Drains

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

6.3 Drainage arrangement between Main Carriageway and Service/Slip Roads

A suitable drainage arrangement for draining storm water of the main carriageway shall be provided. Drain of Storm water of main carriageway to service road is not permitted. (Clause No.

2.15 IRC: SP:84-2019)

6.4 Drainage where Embankment Height is more than 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)

6.5 Drainage for Structures

A suitable drainage arrangement for storm water from deck slab shall be provided. Falling of water on any surface of the structures, flow of underneath or remain standing or flowing over the road below the structure is not permitted in any circumstances.

6.6 Drainage for Underpass and Subways Structures

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

6.7 Drainage arrangement of Retaining Structures

Vertical Drop-down drainage pipes with suitable cleaning provision shall be provided at suitable interval. Drainage fixtures and drop down 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 configurations. As such, superstructures of all bridges, culverts and other structures shall be designed for edge movement of the vehicle considering stitching of new superstructure in future during widening to additional lanes. IRC Special vehicle loading is to be considered in the design of all bridges, culverts and structures.

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

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

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

7.1.2 The overall width of the structures shall be 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	MJB @ 0.526	-	1.5	1.5	-

Sr. No.	Location at km	Skew Angle	Footpath Width (m)		Remarks
			Left	Right	
2	MIB @ 0.742	57^0	1.5	1.5	-
3	MIB @ 1.768	-	1.5	1.5	-
4	MJB @ 2.880	-	1.5	1.5	-
5	ROB @ 4.624	-	1.5	1.5	-
6	MJB @ 5.322	-	1.5	1.5	-
7	MIB @ 6.313	18^0	1.5	1.5	-
8	MIB @ 7.306	-	1.5	1.5	-
9	MIB @ 9.003	-	1.5	1.5	-
10	MIB @ 9.293	30^0	1.5	1.5	-
11	MIB @ 11.363	60^0	1.5	1.5	MIB cum SVUP
12	MIB @ 14.195	-	2.0	2.0	-

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 compacting the soil to increase the penetration resistance to satisfy the clause 8.4.4 (v) of IRC114.

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

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

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

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

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

7.2 Culverts

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

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

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

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

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

7.2.2 New/ Reconstruction of existing RCC pipe culverts:

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

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

*- Box - Box Culvert

7.2.3 Widening of existing RCC pipe culverts

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

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

*-HPC – Hume Pipe culvert

7.2.4 Reconstruction of New Culverts/Structures:

Sr. No	Design Chainage	Culvert Type	Skew Angle	Span/ Opening (m)	New/ Reconstruction	Culvert Crossing Type (Balancing/Stream, etc)	Remarks
1	12.663	BC	-	1 x 2.0	Reconstruction	-	
2	13.065	BC	-	1 x 2.0	Reconstruction	-	
3	13.380	BC	-	1 x 2.0	Reconstruction	-	
4	13.740	BC	-	1 x 2.0	Reconstruction	-	

7.2.5 Construction of Box culverts

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

Sr No	Design Chainage (Km)	Proposed Span Arrangement (m)	Skew Angle	Road/Culvert Crossing type	Remarks
1	0.043	1 x 3.0	-	-	-
2	0.207	1 x 3.0	-	-	-
3	0.341	1 x 3.0	-	-	-
4	1.254	1 x 2.0	-	-	-
5	1.652	1 x 2.0	-	-	-
6	1.973	1 x 2.0	-	-	-
7	2.143	1 x 2.0	-	-	-
8	2.440	1 x 2.0	-	-	-
9	3.418	1 x 2.0	-	-	-
10	3.646	1 x 2.0	-	-	-
11	3.925	1 x 2.0	-	-	-
12	4.018	1 x 5.0	-	-	-
13	4.340	1 x 3.0	-	-	-
14	4.847	1 x 2.0	-	-	-

Sr No	Design Chainage (Km)	Proposed Span Arrangement (m)	Skew Angle	Road/Culvert Crossing type	Remarks
15	5.126	1 x 2.0	-	-	-
16	5.920	1 x 2.0	-	-	-
17	6.190	1 x 2.0	-	-	-
18	6.642	1 x 3.0	-	-	-
19	7.668	1 x 2.0	-	-	-
20	7.832	1 x 2.0	-	-	-
21	8.188	1 x 2.0	-	-	-
22	8.576	1 x 2.0	-	-	-
23	9.543	1 x 2.0	-	-	-
24	9.779	1 x 2.0	-	-	-
25	10.529	1 x 2.0	-	-	-
26	11.073	1 x 2.0	-	-	-
27	11.921	1 x 2.0	-	-	-
28	12.223	1 x 2.0	-	-	-

7.2.6 Widening of existing box culverts.

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

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

7.2.7 Culverts on Crossroads:

Sr. No	Design Chainage (km)	Span Arrangement (m)	Type (Box/Pipe)	Length of Culvert	Remarks	Junction type
NIL						

*In bypass/realignment locations, structures in existing crossroads shall be shifted to suitable location.

Culverts/Structures, if necessary are to build on crossroads. This shall not constitute a change of scope. The design should be for vehicle loading.

7.2.8 Construction of Box Underpasses

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

Sr No	Design Chainage (Km)	Proposed Span Arrangement (m)	Skew Angle	Road/Culvert Crossing type	Remarks
1	2.340	1 x 4.0	-	-	-
2	4.534	1 x 4.0	-	-	-

3	7.906	1 x 4.0	-	-	-
4	8.296	1 x 4.0	-	-	-

7.2.9 Utility ducts in bypasses

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

7.2.10 Details of Additional New Culverts:

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

7.3 Bridges

7.3.1 Existing bridges to be re-constructed/widened:

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

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

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

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

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

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
1	14.195	12.0	Stream	11.5 + M +11.5	-	V	-	Reconstruction - BHS

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

Sr. No	Design Chainage	Total Proposed	Type of Crossing	Total Proposed width (m)	Typical Cross Sec-	Skew Angle	Remarks

	(Km)	length (m)		MCW	SR	tion		
Nil								

7.3.2 Additional New Bridges

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

Major Bridges:

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section	Skew Angle	Remarks
				MCW	SR			
1	0.526	3 x 35.0	Puamara River	10.5 + M + 10.5	-	I	-	
2	2.880	3 x 37.5	Longai River	10.5 + M + 10.5	-	I	-	
3	5.322	3x 37.5	Longai River	10.5 + M + 10.5	-	I	-	

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	0.742	1 x 20.0 (clear)	Gas Pipeline	10.5 (SQ)+ M + 10.5 (SQ)	-	I	60^0	
2	1.768	1x15.0	Stream	10.5 + M + 10.5	-	I		
3	6.313	1 x15.0	Stream	10.5 + M + 10.5	-	I	18^0	
4	7.306	1 x6.0	-	10.0 + M +10.0	-	I		
5	9.003	1 x6.0	-	10.0 + M +10.0	-	I		
6	9.293	1 x6.0	-	10.0 + M +10.0 (SQ)	-	I	30^0	
7	11.363	2 x10.0 (clear)	-	10.5 + M +10.5 (SQ)	-	I	60^0	

*- MIB – Minor Bridge, UP- Underpass,

Indraprastha Gas Limited (IGL) has proposed a gas pipeline at Km. 0.762 and acquired land. Pipeline has not been laid yet. After discussions with IGL authorities, an MIB is proposed spanning 20m to avoid falling in their RoU.

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

Sr.No	Design Chainage		Length (m)	Remarks
	From	To		
1	14.189	14.201	24	MIB

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

Sr. No.	Location at km	Rehabilitation Proposals	Remarks
Nil			

7.3.4 Structures in marine environment:

The specific locations are to be mentioned by DPR Consultant.

Sr. No.	Location at km	Span	Remarks
Nil			

Note for Appendix Clause 7.3:

- Width is excluding Median (M) gap and the gap between Main Carriageway (MCW) & Service/Slip Road (SR).
- Location and span are indicative. Exact location may be decided in consultation with Authority/IE and the same shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
- Span arrangement mentioned above is tentative and may be changed based on design of structure, latest construction techniques and aesthetics of structures. The span lengths mentioned are optimum required span and should not be reduced. The actual lengths as required on the basis of detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Any increase in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
- In Case of bridges proposed for widening/repair as per details above, the same shall be re-constructed if the design shows that these are unsafe for design loads. No change of scope shall be considered in such cases.
- Expansion joints shall be minimized by deck continuity/ continuous superstructure over multiple spans. Deck length between two expansion joints shall not be less than 120m except where structure length falls short of it. Expansion joints shall be Finger joint type in compliance with IRC: SP:69-2011, Table 5.4.1 criteria for adoption of different types of expansion joints. Concessionaire shall ensure quality control as per good industry practice and shall ensure presence of manufacturer of expansion joints at the time of installation for quality control supervision.

7.4 Railroad Bridges (ROB/RUB)

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

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

Sr. No.	Design Chainage (Km)	Proposed Span Arrangement (m) (clear)	Type of superstructure (i.e. Bow string, simply supported composite structure etc.	Name of crossing	Total Width m)	Skew Angle	Remarks
1	4.624	1 x 20 m+ 2x 37.280m + 1 x 20m	RCC Girder + Steel Composite Girder	Railway track	2 x 12.30	-	New-BHS

Note:

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

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

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

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

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

7.4.3 Road under bridges (road under railway line) shall be provided at the following level crossings, as per GAD drawings attached:

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

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

7.5 Grade Separated Structures

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

7.6 FOB/ Skywalks

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

Sr. No.	Location at km	FoB Type	Remarks
Nil			

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

Sr. No.	Name of the Structure	Total Numbers	Remarks
1	Major Bridge	3	-
2	Minor Bridge	8	-
3	ROB	1	-
4	VUP (Single Span)	2	-
5	VUP (Multi Span)	0	-
7	SVUP	1	
6	LVUP	9	-
7	FOB	0	-
8	Box underpasses	4	-
9	Box Culverts	32+20	20 – Newly added structures

Sr. No.	Name of the Structure	Total Numbers	Remarks
10	Pipe Culverts	0+20	20 – Newly added structures

8 Traffic Control Devices and Road Safety Works

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

8.2 Traffic Signs:

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

8.3 Pavement Marking:

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

8.4 Safety Barrier:

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

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

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

The details of the location are as below:

S.No.	Item	LHS		RHS		Total Length (m)	Remarks
		(From in Km.)	(To in Km.)	(From in Km.)	(To in Km.)		
1	W-beam Single faced metal crash barrier	0.030	0.480	0.030	0.480	867	Excluding structure locations & approaches to underpasses, W beam crash barrier to be proposed for a length of 17655
		0.580	0.740	0.580	0.740	307	
		0.760	2.830	0.760	2.830	4090	
		3.470	3.720	3.470	3.720	448	
		3.750	3.870	3.750	3.870	240	
		4.240	4.570	4.240	4.570	601	
		4.690	5.270	4.690	5.270	1169	
		5.880	6.750	5.880	6.750	1560	
		6.910	7.190	6.910	7.190	568	
		7.240	7.670	7.240	7.670	774	
		7.770	8.530	7.770	8.530	1450	
		8.640	10.430	8.640	10.430	3428	
		10.540	11.650	10.540	11.650	2100	
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	New Jersey	From (Km)		To (Km)		Length	

	crash barrier					(m)	
		0.020		3.000		13302	New Jersey crash barrier is placed at the centre of MCW. Excluding structure locations & approaches to under-passes. Here chainages are provided continuous.
		3.460		3.950			
		4.212		5.440			
		5.870		11.850			
		12.730		12.900			
		12.900		13.890			
		3.000		3.460			
		3.950		4.212			
		5.440		5.870			
		11.850		12.730			
		13.890		14.380			
6	Friction slab crash Barrier	3.06	3.4	3.06	3.4	2804	Excluding structure locations & approaches to under-passes
		4.04	4.19	4.04	4.19		
		5.48	5.57	5.48	5.57		
		5.68	5.82	5.68	5.82		
		11.96	12.63	11.96	12.63		
7	Concrete Double-faced barriers	Nil					
8	Pedestrian guardrails	12.900	14.380	12.900	14.380	2980	Structures to be excluded
9	End Treatment for Steel Barriers						

Providing and laying of 93813 sqm Geocell with turfing for slope stabilization and furnishing and laying of the 136895 Sqm live sods of perennial turf forming grass on embankment slope

Lengths provided here are tentative and concessionaire should finalize length of barrier in consultation with IE/NHIDCL

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	150	460	310	LHS	3.25	Toe Wall	-	Average height is mentioned
2	590	1370	780	LHS	2.50		-	
3	1570	1970	400	LHS	2.00		-	
4	2190	2830	640	LHS	2.50		-	
5	2950	3000	50	LHS	5.00		-	
6	3260	4070	810	LHS	3.00		-	
7	4300	4570	270	LHS	6.00		-	
8	4670	5270	600	LHS	5.50		-	
9	5370	5600	230	LHS	6.00		-	
10	7020	7460	440	LHS	1.00		-	
11	7850	8390	540	LHS	1.50		-	
12	9050	9550	500	LHS	2.00		-	
13	9810	10340	530	LHS	2.00		-	
14	10650	11500	850	LHS	2.25		-	
15	150	460	310	RHS	3.50		-	
16	590	1370	780	RHS	2.00		-	
17	1570	1970	400	RHS	1.50		-	
18	2190	2830	640	RHS	3.25		-	
19	2950	3000	50	RHS	5.00		-	
20	3340	4130	790	RHS	3.00		-	
21	4210	4570	360	RHS	3.00		-	
22	4670	5270	600	RHS	6.00		-	
23	5370	5600	230	RHS	7.00			
24	6950	7470	520	RHS	2.00			
25	7900	8200	300	RHS	1.00			
26	9100	9550	450	RHS	2.00			
27	9810	10340	530	RHS	2.00			
28	10600	11500	900	RHS	2.75			
Total Length=			**13810**					

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.

Note I: -

(a) The type/spacing/size/specifications of poles/towers/line/cables to be used in shifting work are as per the guidelines of utility owning department and it is to be agreed solely between the Concessionaire and the Utility owning department. No change of scope shall be admissible and no

cost shall be paid for using different type/spacing/size/specifications in shifted work in comparison to those in the existing work or for making any overhead crossings to underground as per requirement of utility owning department and/or construction of project highway. The Concessionaire shall carry out joint inspection with utility owning department and get the estimates from utility owning department. The assistance of the Authority is limited to giving forwarding letter on the proposal of Concessionaire to utility owning department whenever asked by the Concessionaire. The decision/approval of utility owning department shall be binding on the Concessionaire.

(b) The supervision charges at the rates/charges applicable of the utility owning department shall be paid directly by the Authority to the Utility owning department as and when Concessionaire furnishes demand of Utility Owning Department along with a copy of estimated cost given by the latter.

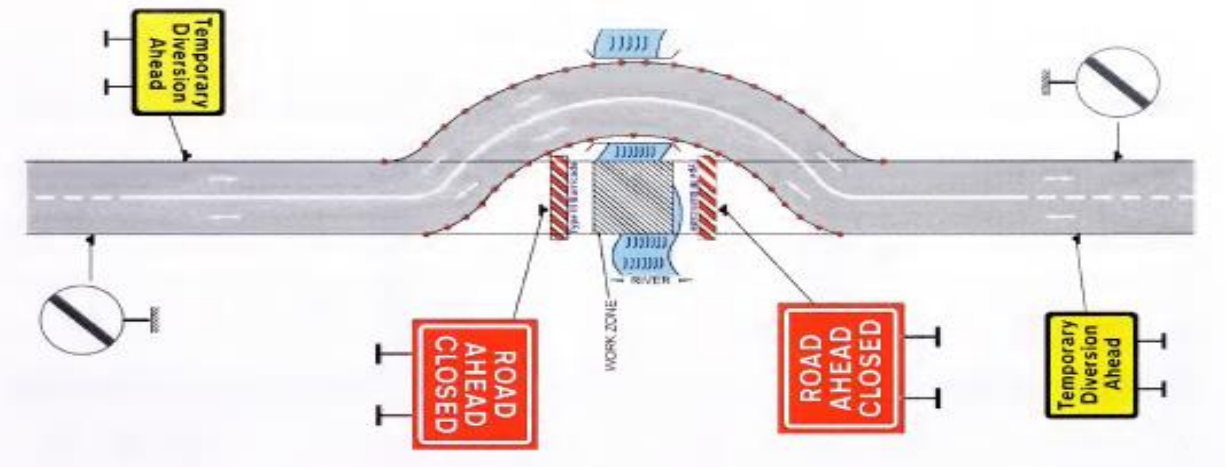
(c) The dismantled material/scrap of existing Utility to be shifted/dismantled shall belong to the Concessionaire who would be free to dispose-off the dismantled material as deemed fit by them unless the Concessionaire is required to deposit the dismantled material to Utility owning department as per the norms and practice and, in that case the amount of credit for dismantled material may be availed by the concessionaire as per the estimate agreed between them.

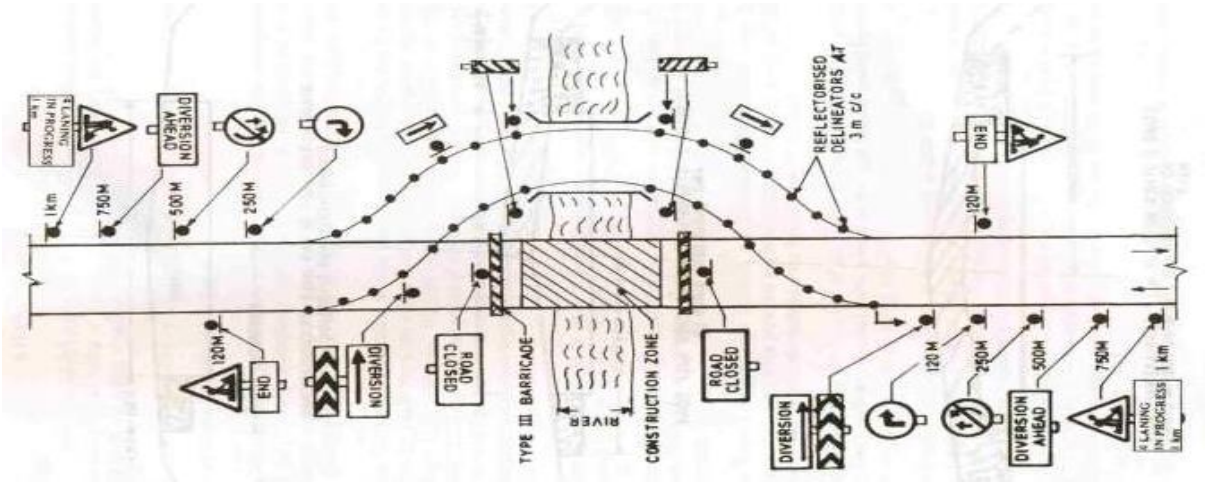
(d) The utilities shall be handed over after shifting work is completed to Utility Owning Department to their entire satisfaction. The maintenance liability shall rest with the Utility Owning Department after handing over process is complete as far as utility shifting works are concerned.

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								





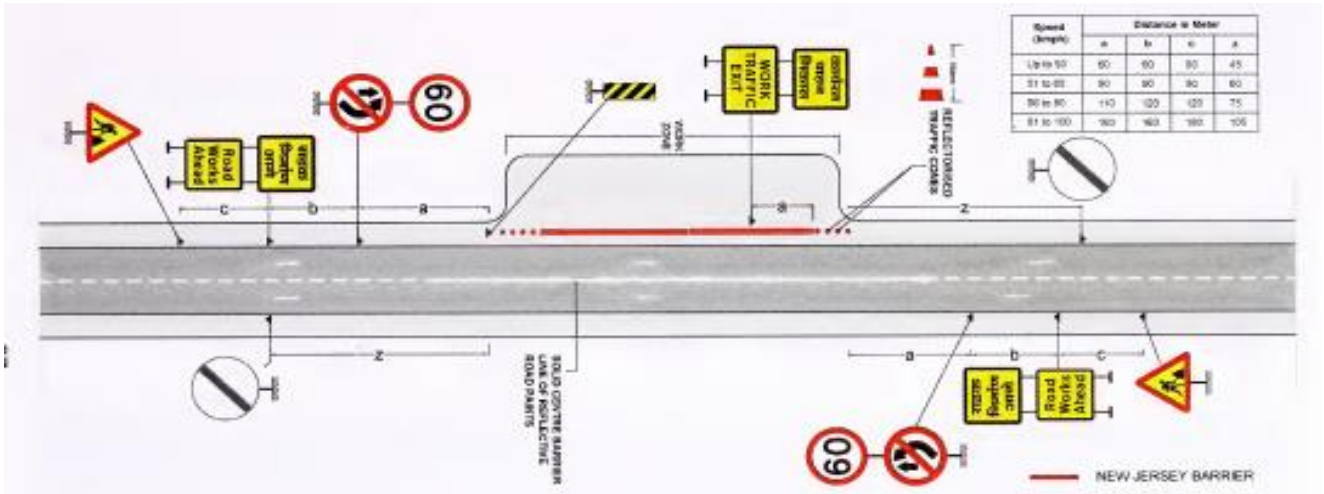
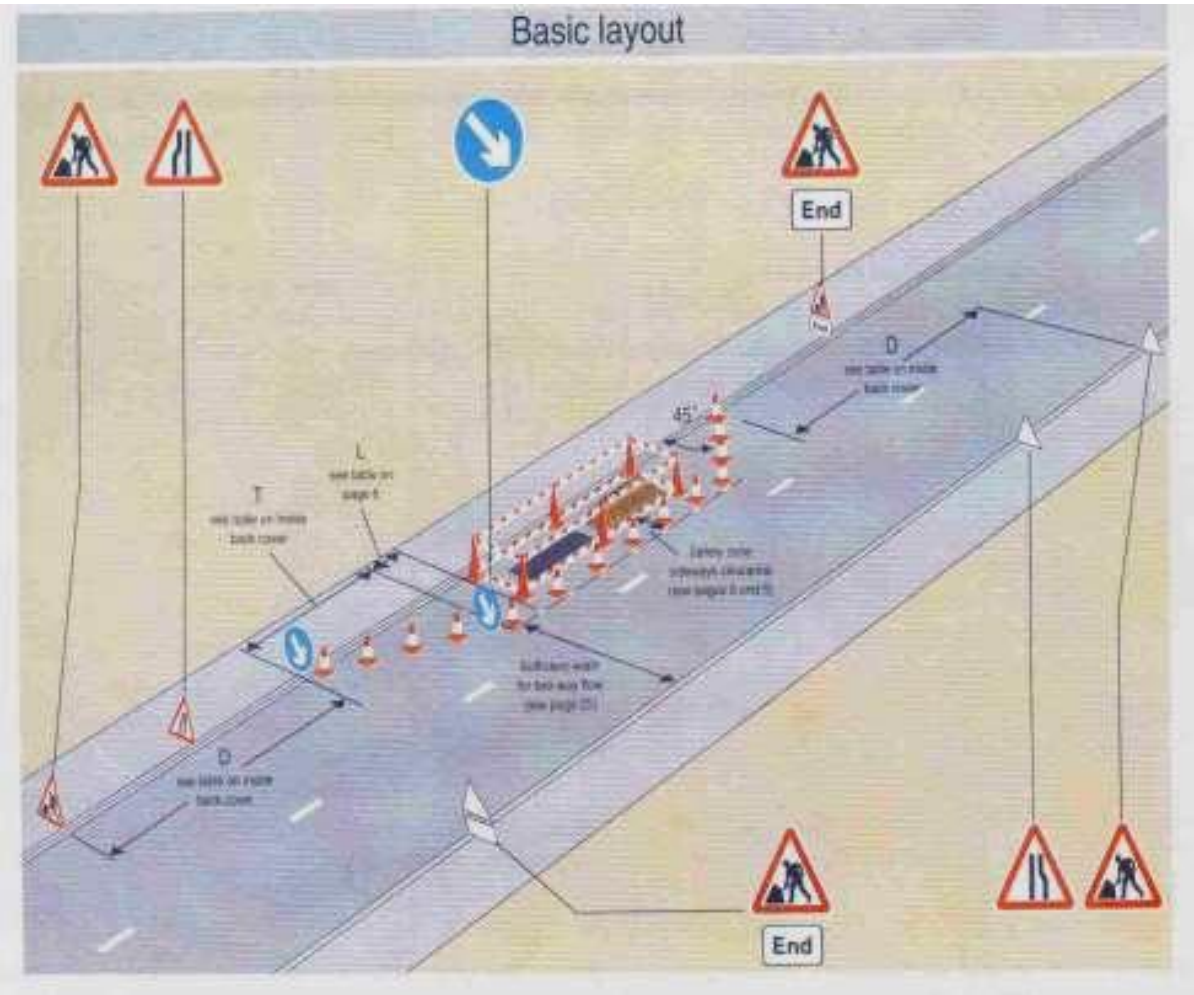


Fig. 10.1 Two Lane to Four Lane (Eccentric Widening)

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.



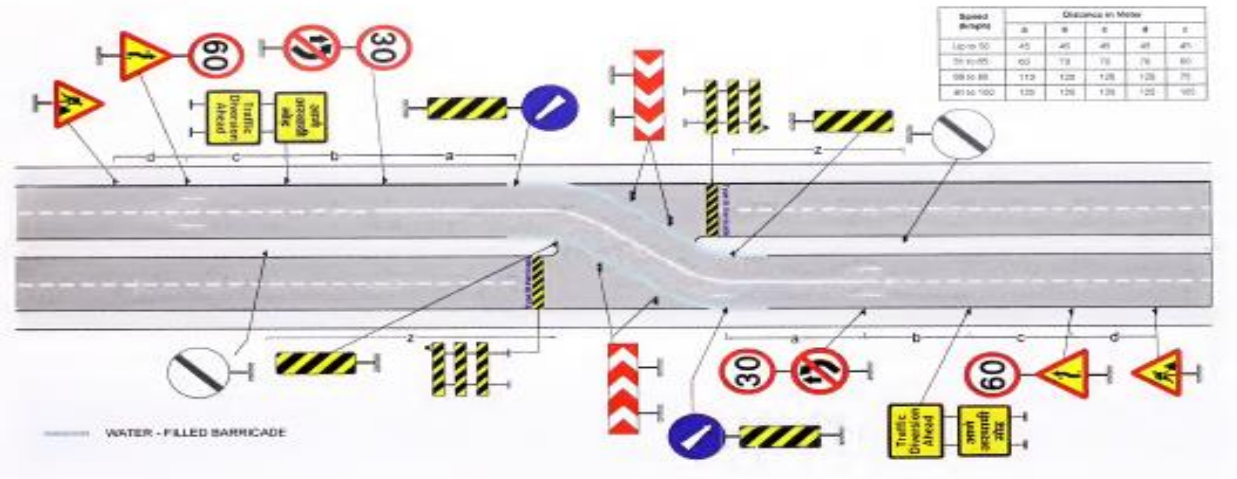
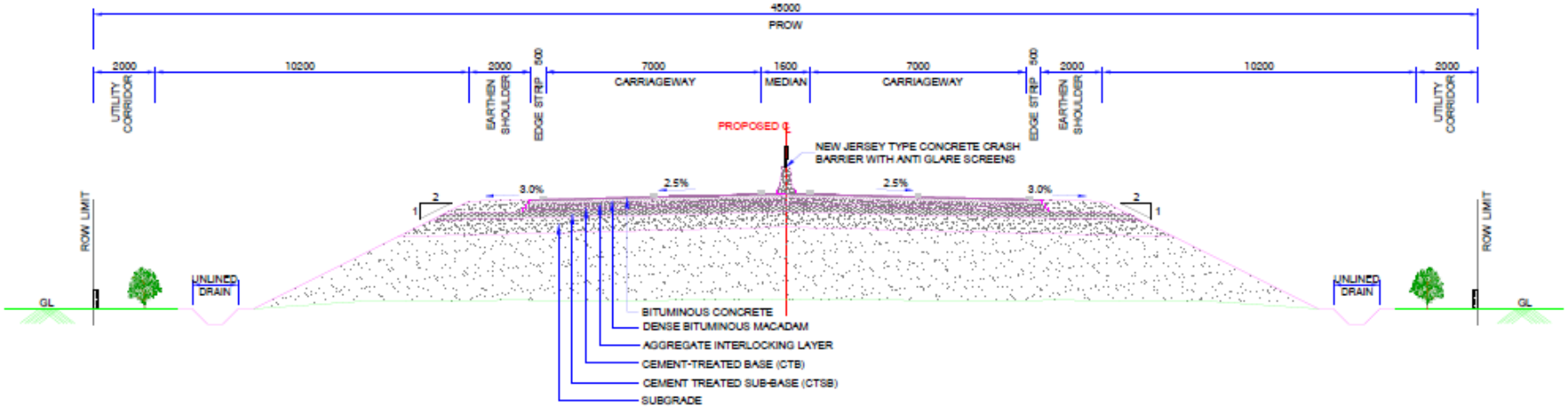


Fig. 10.2 Two Lane to Four Lane (Shifting of Traffic from One Carriageway to Other)

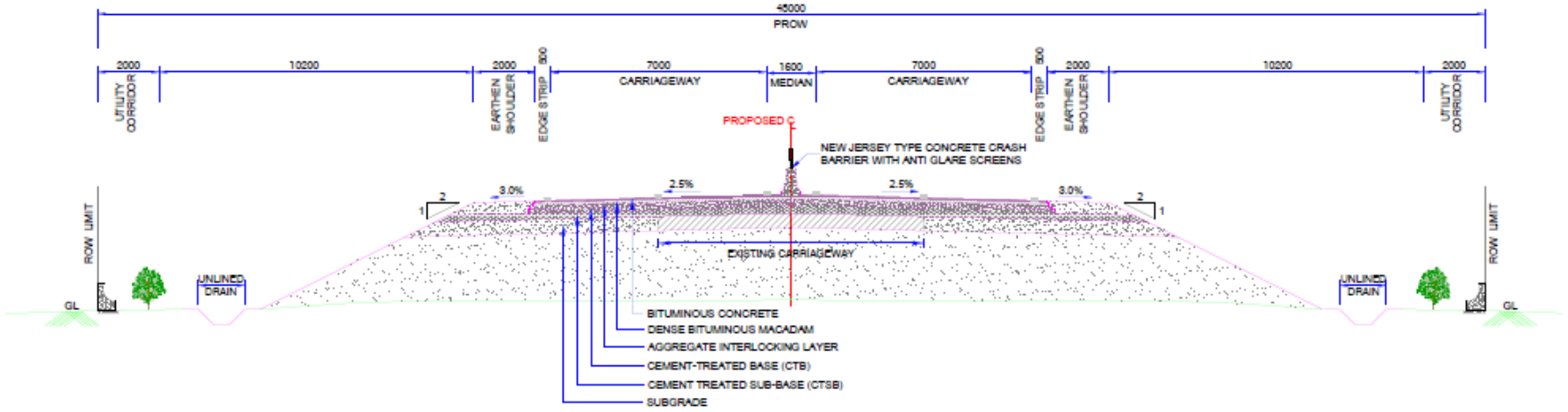
APPLICATION :

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.

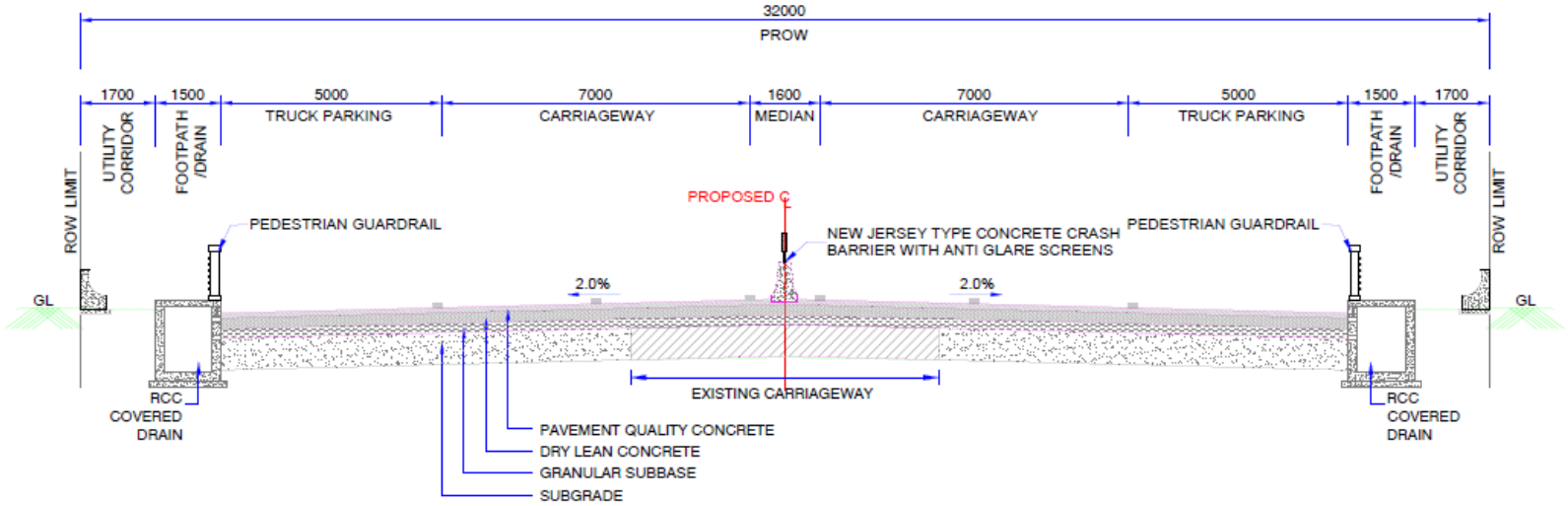
Annex-II
(Schedule B)
Typical Cross Section



TCS-I: 4 LANE DIVIDED CARRIAGEWAY (NEW CONSTRUCTION)

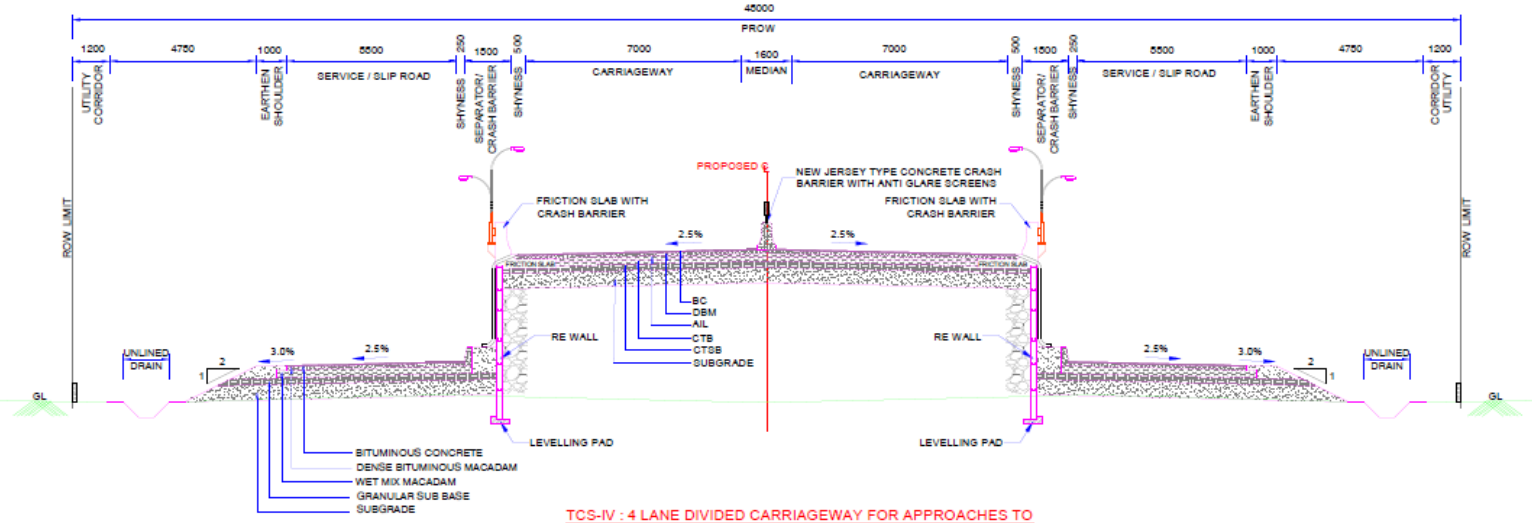


TCS-II: 4 LANE DIVIDED CARRIAGEWAY (CONCENTRIC WIDENING)

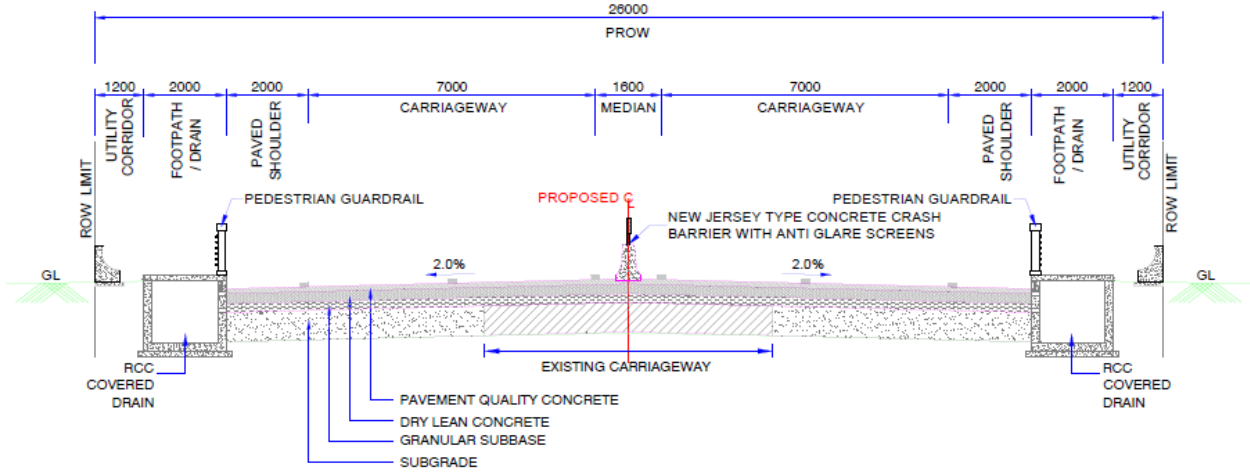


TCS-III: 4 LANE DIVIDED CARRIAGEWAY WITH TRUCK PARKING (CONCENTRIC WIDENING)

(AS PER IRC SP-63 2004)



TCS-IV : 4 LANE DIVIDED CARRIAGEWAY FOR APPROACHES TO LVUP / VUP WITH SLIP ROADS ON BOTH SIDES (NEW CONSTRUCTION)



TCS-V: 4 LANE DIVIDED CARRIAGEWAY (CONCENTRIC WIDENING)

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 highway, Exit: from Highway)	Minimum number of Toll Lanes	
	Existing Chainages	Design Chainages		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**	24	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**	114	
3	**5th Kilometer Stone**	6	

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)	Either left or right
b	At major trauma centre, roads leading to religious places or any other important location	-
3.	Double/Butterfly Cantilever	-

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

S.No.	Road Signs	Number	Remarks
I	**Mandatory/Regulatory**		
1	Stop signs	7	
2	Give Way Signs	-	
3	Prohibitory signs	-	
4	No Parking signs	-	
5	No Stopping signs	-	
6	Speed Limit signs (Circular)	-	
7	Speed Limit signs (Vehicle Type)	-	
8	Vehicle Control signs	-	
9	Restriction Ends sign	-	
10	Compulsory Direction Control and other signs	-	
II	**Cautionary/Warning**		
1	Left/Right Curve	24	
2	Left / Right Curve with side road	-	
2	Right/Left Hairpin Bend	-	
3	Right/Left Reverse Bend	-	
4	Series of Bends	-	
5	270 Degree Loop	-	

S.No.	Road Signs	Number	Remarks
6	Side Road	4	
7	Y-intersection	-	
8	Cross Road	-	
9	Roundabout	-	
10	Traffic Signals	-	
11	T-lntersection	5	
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	14	
25	Pedestrian crossing with backing board	-	
26	School Ahead	7	
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	7	
36	Rumble Strip		
37	Rough Road	-	
38	Dangerous Ditch	-	
39	Slippery Road	-	
40	Slippery Road because of Ice	-	
41	Opening or Swing Bridge	-	
42	Overhead Cable	-	
43	Playground Ahead	-	
44	Quay Side or Riverbank	-	

S.No.	Road Signs	Number	Remarks
45	Sudden Side Winds	-	
46	Tunnel Ahead Warning	-	
47	Falling Rocks	-	
48	Cattle Crossing	-	
49	Wild Animals likely to be on Road Ahead	-	
50	Queues Likely Ahead	-	
51	Low flying Aircraft	-	
52	Unguarded Railway Crossing	-	
53	Guarded Railway Crossing	-	
54	Crash prone area ahead	-	
55	U- Turn	-	
III	**Chevron Signs**		
1	Single Chevron	149	
2	Double Chevron	-	
3	Triple Chevron	-	
IV	**Object Hazard Marker Sign**	-	
1	Left /Right side Object Hazard Marker	130	
2	Two-way Object Hazard Marker	-	
V	**Informatory/Guide**		
1	Direction and Place Identification signs	-	
2	Stack Type Advance Direction Sign (Shoulder Mounted)	8	
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	10	
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 Ahead of a Flyover in Urban/City Roads	-	
15	Gantry Mounted advance Direction Sign	-	

S.No.	Road Signs	Number	Remarks
	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	-	
4	First Aid Post	-	
5	Toilet	-	
6	Filling Station(Fuel Pump)	-	
7	Hospital	-	
9	U-Turn Ahead	-	
10	Pedestrian Subway	-	
11	Police Station	-	
12	Picnic Site	-	
13	Repair Facility	-	
14	Railway Station/Metro Station/Monorail Station	-	
15	Industrial Area	-	
16	Cycle Rickshaw Stand	-	
17	Taxi Stand	-	
18	Auto Rickshaw Stand	-	
19	Home Zone	-	
20	Camp Site	-	

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

S.No.	Road Signs	Number	Remarks
1	State Highway Route Marker Sign	-	
2	National Highway Route Marker Sign	6	
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	7693		
10	No Overtaking Lines			
11	Warning Lines			
12	Border or Edge Lines	28720		
13	Longitudinal Markings for Undivided Roads	9574		
14	Longitudinal Markings for divided Roads			
15	Longitudinal Markings for Ramps/Slip Roads/One Way Streets			
16	Stop Line	35.900		
17	Give Way Lines			
18	Diagonal Markings			
19	Chevron Markings			
20	Continuity Line			
21	Word Messages			
22	Lane Change			
23	Merging/Diverging Markings			
24	Hatch Markings			
25	Raised Profile Edge Lines			
26	Lane Reduction / Narrowing Situations and Transitions (lane Balancing)			
27	Directional Arrows		24	
28	Mandatory Turn Arrows			

S.No	Item	Unit		Remarks
29	Guidance Arrows			
30	Deflection Arrows			
31	Bifurcation Arrows			
32	Arrows on Side Road Approaches			
33	Arrows on Main Road Approaches			
34	Word Messages			
35	Yellow Box Markings			
36	Ghost Island			
37	Marking for Speed Breakers			
38	Pedestrian Crossing	217		
39	Markings when highway passes through settlement fig 9.4 of IRC SP 84/87			
40	Transverse Bar Markings			
41	Busbay Marking			
42	Truck Lay-by Markings			
43	Toll Plaza Marking	273.5		
44	School Zone Markings			
45	Object Markings within Carriageway			
46	Objects Markings Adjacent to Carriageway			
47	i. Subway Piers, Abutments, Culverts Head Walls, Concrete Barrier			
48	ii. Electrical Poles			
49	iii. Guard Rails			
50	iv. Trees			
51	v. Kerbs			
52	Directional Markings as per Annexure: A 6			
53	Facility Markings as per Annexure A.7 of IRC 35			

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

2.4 Road Delineators

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

S.No.	Item	Number/ Length (m)	Remarks
1	Roadway Indicators	96 no.	
2	Median Marker on Median/RCC Barrier **(Clause 4 of IRC 79 2019)**		Anti-glare screens are used on Medians
3	Object Markers		-
4	Flexible Object Markers **(Clause 6 of IRC 79 2019)** i. On Metal Beam Barrier ii. On Toll Booth/Toll Island iii. On Entry/Exit of Tunnel iv. On Exit from Main carriageway	ii) 8	

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

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

2.5 Reflective Pavement Markers & Solar Studs

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

S.No.	Item	Number	Location	Remarks
A. For 4 Lane Projects				
1	White Colour one coloured face Road Studs		Traffic lane line & center of carriageway	Bi-directional Carriageway
2	Red Colour one coloured face Road Studs	798	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	798	Median side edge line, zebra crossing	
4	Green Colour one coloured face Road Studs	0	Lay byes, left hand side of the carriageway in case of multilane divided carriageways, crossable continuous line like in acceleration/deceleration lanes involving lane changing	
B- For 2 Lane PS Projects				
5	White Colour Two coloured face Road Studs	NA	Traffic lane line & center of carriageway	Uni-directional Carriageway
6	Red Colour Two coloured face Road Studs	NA	Left hand edge of the carriageway, entry to truck lay bye / bus bay, start of service road, chevron/diagonal markings on gorge	
7	Green Colour Two coloured face Road Studs	NA	Lay byes, left hand side of the carriageway in case of multilane divided carriageways, crossable continuous line like in acceleration/ deceleration lanes involving lane changing	

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

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

2.6.1 Provide Impact Attenuators in Gore Areas

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

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

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

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

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

2.7 Boundary wall and Fencing

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

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

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

3 Operation and Maintenance centers

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

4 Way side Amenities / Service Areas/Rest Area

S.No	Item	Design Chainage (Km)	Side	Remarks
Nil				

- 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.
- Lighting needs to be in place for way side amenities / service areas/rest area.
- These tasks need completed and handed 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)
-

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, intersec-

tions 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	13.914	13.914	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 Chainage (Km)		Pedestrian Shelter Length (m)	Remark
	Left	Right		
Nil				

6.3 Bus Bay Pavement

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

Pavement Composition (Flexible/Rigid/ Paver Blocks)
Rigid

7 Pedestrian Facilities

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

The details are as mentioned below:

S.No.	Pedestrian facilities	Chainage		Side	Remarks
		From	To		
1	Pedestrian guardrails shall be 150 mm from Carriageway/Paved Shoulder i. Hazardous Locations on Straight Stretches ii. At Junctions/Intersections iii. Schools iv. Bus Stop/Railway Stations v. Overpass, Subway vi. Central Reserve	12.900	14.380	BS	-
2	Footpath paving including fixing of Tactile pavers	-	-	-	-

S.No.	Pedestrian facilities	Chainage		Side	Remarks
3	Pedestrian Crossing i. With Zebra Marking ii. With Tabletop Crossing iii. At Intersections iv. At Schools	i)2			At bus shelter locations with Zebra markings

8 Highway Lighting

The street light poles shall be 1 piece, continuous-tapered, octagonal poles and shall be manufactured from one length of steel sheet, formed in continuous tapered tube, with one continuous arc-welded vertical seam. The minimum wall thickness for lighting poles shall not be less than 4 mm. The Bottom Diameter shall be minimum 175 mm. The Top Diameter shall be minimum 75 mm. The door on window of pole shall be antitheft. All electrical cable should be concealed. All electrical lighting fixers shall be LED. The fixtures shall be concealed except on poles. Lighting poles shall be fixed on outer side of steel/concrete barrier. The lighting shall be providing at the following locations: (Clause No. 12.5 IRC: SP:84-2019)

S.No.	Lighting facilities	Chainage		Side	Lighting Source: Electricity Board/ Generator/ Solar
		From	To		
1	**Toll Plaza area:** The lighting in and around toll plaza, toll booths, office building, on the approach road, etc. shall be as per Section 12 of the Manual. In addition to at least two high mast light shall be provided on either side of toll plaza	Nil			
2	**Rest Areas:** The entire Rest areas shall be provided with lighting with average illumination to 40 Lux	Nil			
3	**Truck Parking:** The entire area of truck parking and 50m length of the project highway on its either side shall be illuminated at night to provide an average illumination of 40Lux. Suitable designed electric poles having aesthetic appeal and energy saving bulbs (LED) may be used to provide required illumination. Alternatively, photo voltaic lamps may be used	12.900	13.890-	BHS	Electricity Board
4	**Bus Bay & bus shelter locations**: The entire bus bay & bus shelter area shall be provided with Lighting (Average illumination of 40Lux.).	13.865	13.965	BHS	Electricity Board

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 were flaring of the main carriageway takes place shall be provided with lighting. Also, on all legs of at grade interchange/ crossings the lighting shall be provided 50m beyond the point of Centre on all legs. The minimum illumination shall be 40 Lux., at the extreme edge of the Highway.	2.950	3.050	BHS	Electricity Board
		4.212	4.262	BHS	
		5.364	5.464	BHS	
		12.260	12.360	BHS	
6	**Built-up sections** on the project highway both in the median of main carriageway and on the service roads on both sides				
7	**On Median Openings provide 1 no. high mast lighting of 25m height**	-	-	-	-
8	**On Major Bridges and its approaches higher than 3m**	0.470	0.580	BHS	
		2.833	2.953	BHS	
		5.262	5.382	BHS	

9 Rainwater Harvesting

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

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

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

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

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

12 Advanced Traffic Management System (ATMS)

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

The ATMS components to be deployed shall inter alia include:

12.1 General

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

12.1.1 Video Surveillance System / Traffic Monitoring Camera System (TMCS)
12.1.2 Video Incident Detection System (VIDS)
12.1.3 Vehicle Actuated Speed Display System (VASDS)
12.1.4 Fixed and Portable Variable Message Sign (VMS) System
12.1.5 Communication Network with OFC Backbone
12.1.6 Common ATMS Command & Control Center for Km. 0.020 to 14.380
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, II, III & V For TCS IV, 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 so as to monitor the traffic at the following junctions:

Sl No	Location (Km)	LHS/ RHS/ BHS	Remarks
1	3.000	BHS	-
2	4.212	BHS	-
3	5.622	BHS	-
4	12.310	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	0.020	2 No. (one of LHS & RHS)	To be provided
2	14.380	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	7.000	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	0.020	2 No. (one of LHS & RHS)	To be provided
2	14.380	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 7.000. The ATMS Contractor shall set up and operate the ATMS Command And Control Center as per the Standards and Specification. The ATMS Contractor shall undertake any additional civil works, interior works, MEP works, for setting up the Command Center, including all additional related electrical, lighting, electrical connection, DG set, power backup, HVAC works, access control, building CCTV, PTZ cameras outside building, fire-fighting system, alarm, fire extinguishers, raised floor, housekeeping, building cleaning, maintenance, recurring charges including electricity bills, telephone bills, DG fuel, servicing, security.

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

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

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

a. The Contractor shall perform all the necessary application procedures to the Power Company required for the power to be supplied to the Traffic Management Centre, Sub-Centre

and the field equipment in their own name. All the expenses charged by Power Companies regarding such applications and execution of work shall be borne by the Contractor as part of the scope of this contract. Any damage to the highway during such execution of work shall have to be repaired by the ATMS Contractor to the pre-existing condition without any cost implications to NHIDCL.

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

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

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

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

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

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

12.1.9 Maintenance Vehicle

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

13 Highway Patrol Units

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

14 Emergency medical services

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

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

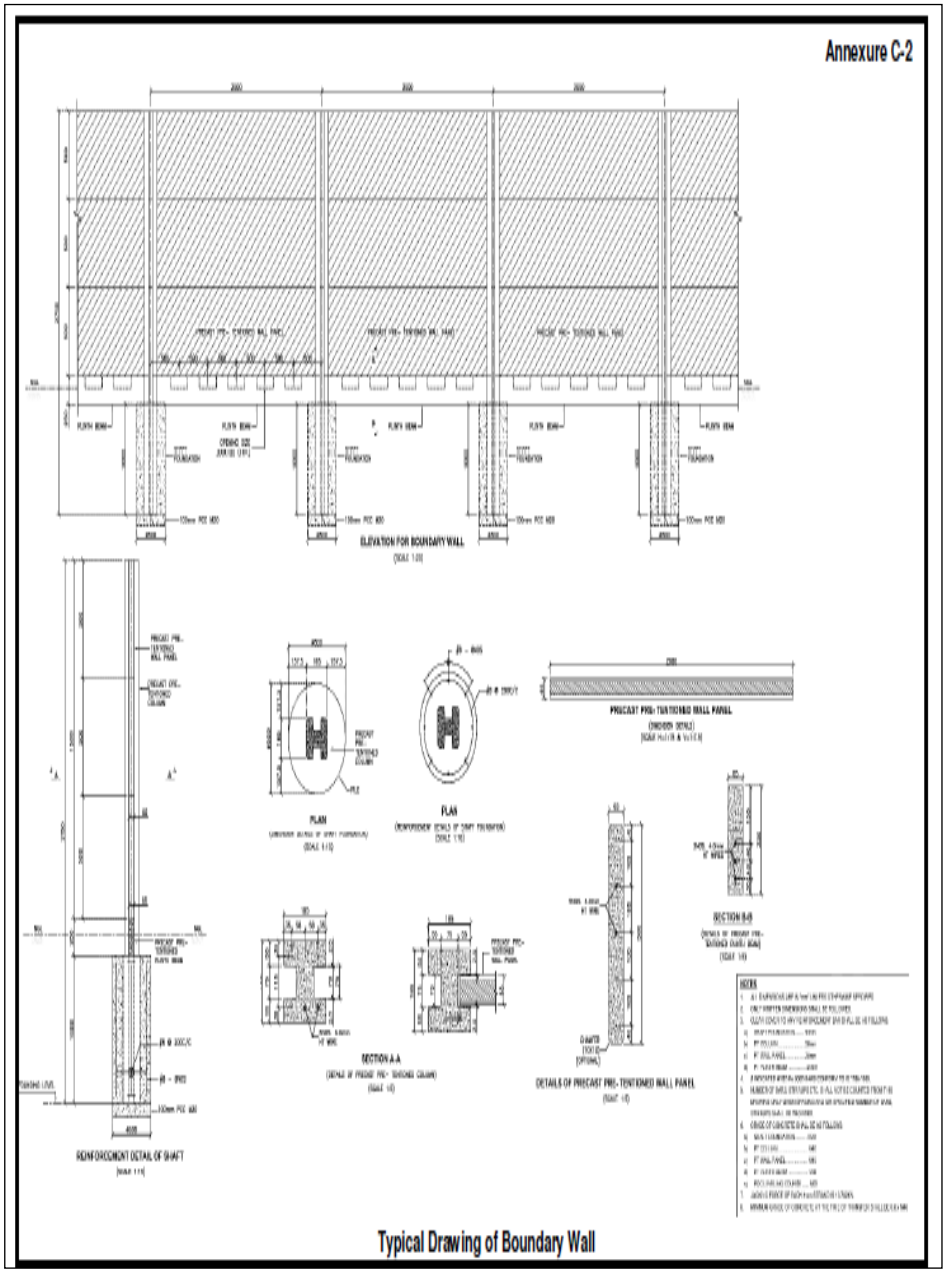
15 Crane Service:

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

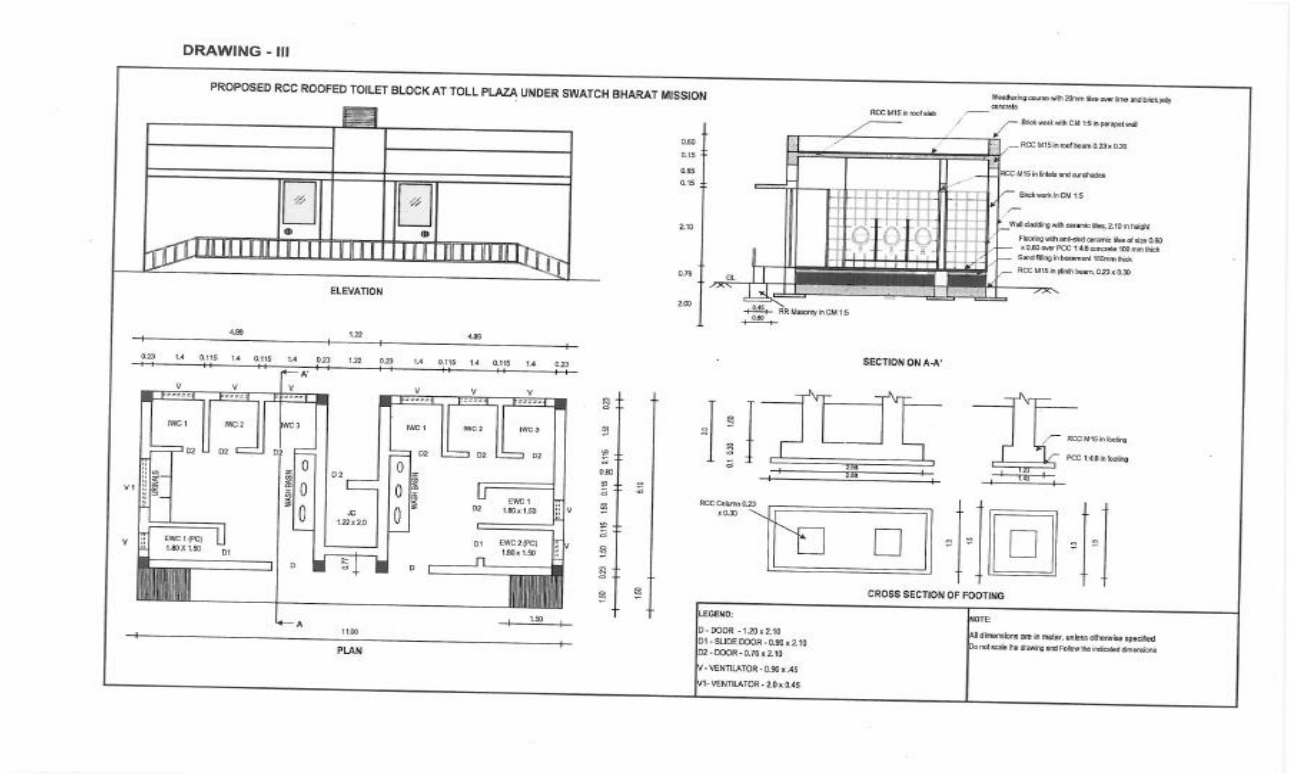
Annexure A of Schedule C

(Schedule-C)

Standard Drawing for Boundary Wall



Annexure-II
Schedule C Standard Drawing for Toilet



SCHEDULE- D

(See Clause2.1)

D. SPECIFICATIONS AND STANDARDS

1 Construction

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

2 Design Standards

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

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

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

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

Manual of specifications and standards to apply.

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

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

Sl. No.	Item	Manual Clause reference	Provision as per Manual / Circular / Minutes	Modified Provision
1	Typical cross section	Clause 2.17 of IRC SP: 84-2019	Typical cross section	Typical Cross section shall be followed as per Clause 2.10 of Schedule B and drawings as per Annex-II of schedule B
2	Median	Clause 2.5 of IRC SP:84-2019	Raised OR depressed median	Median provided as per TCS drawings in Annex-II of schedule B shall be adopted
3	Width Shoulder	Clause 2.6 of IRC SP:84-2019	a. Paved Shoulders 2.0m b. Earthen Shoulder 2.0m	a. Paved and Earthen shoulders width shall be adopted as per drawings provided in annex-II of schedule B
4	Side Slopes	Clause 4.2.3.2	Not steeper than 2H : 1V	Side slopes shall be 2H : 1V with Geocell and turfing
6	Structures	Clause 7.3 of IRC SP:84-2019	Deck width of bridges	Deck width of structures to be adopted as per clause 7.2 & 7.3 of Schedule B and drawings provided
7	Underpasses	Clause 2.13 of IRC SP:84-2019	Width of underpasses	Width of structures to be adopted as per clause 2.9 of Schedule B and drawings provided

Sl. No.	Item	Manual Clause reference	Provision as per Manual / Circular / Minutes	Modified Provision
8	Design Speed	Clause 2.2 of IRC SP 84-2019	Design Speed – 100Kmph	At 2 locations (Table 2.3.1), Design speed is restricted due to presence of border check post and Land Port Authority of India
9	Boundary Wall	Clause 12.2 of IRC SP:84-2019	Road Wall Boundary	Boundary Wall shall be provided as per Schedule-C
10	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.
11	Traffic Signs	Clause 9.2 of IRC SP:84-2019	Road Signs	In addition to Manual, Schedule-C shall be followed.
12	Longitudinal Drain	IRC SP:84-2019	Drainage	As per clause 4.14 of Schedule-B
13	Expansion Joints	Clause 7.13 of IRC SP:84-2019	Expansion Joints	In addition to Manual, Schedule-B shall be followed.
14	Utility Corridor	Clause 2.16 of IRC SP: 84-2019	Built-up locations	Entire Stretch
15	Landscaping and Tree Plantation	Section 11 of IRC SP: 84-2019	Landscaping and Tree Plantation	NHAI Policy circular No. 7.4.9 dated 15th March 2023, Avenue plantation is delinked from EPC/HAM/BOT toll projects. The aforesaid manual shall be applicable except for the provision/scope of avenue plantations. However, specifications for plantations shall be followed as per IRC: SP-21, i.e., Guidelines on Landscaping and Tree Plantation.

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

Specifications and standards for development of buildings

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

b. **Code for Structural design and details:**

CODE OF PRACTICE FOR LOADS AND COMBINATIONS	
IS 875 Part I	Dead Loads - Unit weights of building Materials and stored materials.
IS 875 Part II	Imposed loads.

CODE OF PRACTICE FOR LOADS AND COMBINATIONS	
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

1. All relevant BIS Code of India for Civil, Electrical, Water Supply, Sanitary, HVAC and Solar Panels.

2. Energy Conservation Code - 2007.

3. Roads / Driveway / Parking: IRC 37-1984 / MORTH specifications.

4. Indian Electricity Rules / State Electricity Rules.

5. ASHRAE Standards.

6. All local bylaws.

7. Hand Book of Water Supply and Drainage, BIS, SP-35.

8. CPWD - Specifications published by Director General (Works) CPWD, New Delhi including subsequent amendments, upto date correction slips, revisions.

    - CPWD Specifications 2009 (Volume I & II)
    - CPWD General Specifications for Electrical Works Part IV Sub Station - 2013

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

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

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

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