सत्यमेव जयते

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण

(सड़क परिवहन और राजमार्ग मंत्रालय, भारत सरकार)

National Highways Authority of India

(Ministry of Road Transport and Highways, Government of India)

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NHAI/Policy Guidelines/ Standard Documents/2023
Policy Circular No.11.54/ 2023 dated 30th October, 2023

{Decision taken on E-Office File No. NHAi/CGM(T)AP/ImprevementinDPR/2023 (Comp. No. 221026)}

Sub: Sample Schedule B & Schedule C for preparation of RFP for Four/ Six Laning of Highway works - reg.

It has been observed that DPR Consultants are not preparing the schedules correctly and providing ambiguous data and conditions in the Schedules B and C.

2. A Committee was constituted for preparing Schedule B & C with clear provisions. The Executive Committee in its 574th meeting held on 16.08.2023, approved the sample Schedules B & C. The sample Schedules B&C shall be used for all the future Projects.

3. The Projects which have been approved by SFC, shall, however be excluded.

4. This issues with the approval of Competent Authority.

30/10/23

Encl.: As stated above

(Sanjay Kumar Patel)
General Manager (Coord.)

To:

All Officers of NHAI HQ/ ROs/ PIUs/ CMUs/ Site Offices

Copy to:

1. Hindi Division for translation in Hindi.
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Annexure

Annexure – I

(Schedule – B)

Description of the Project

1. Development of the Project Highway

The Project Highway shall generally follow the horizontal alignment shown in the plan specified in Annexure- III of Schedule-A, unless otherwise specified by the Authority. Notwithstanding anything to the contrary contained in this Agreement or IRC:SP:84/87, 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.

1.1. Width of Carriageway

1.1.1. Four / Six-Laning with paved shoulders shall be undertaken. The paved carriageway shall be 18.2/25.2 metre for four/six laning (including paved shoulder and kerb shyness/edge strip). The earthen shoulder shall be 2 metre on either sides. (Circular: NHAI/ Bharatmala/ EC/ DPR/ 2016/ 143430) and Edge strip shall be minimum 0.6m as clause No. 2.5.3 IRC:SP:84-2019/ IRC:SP:87-2019.

1.1.2. In built-up sections/areas the width of paved carriageway shall be 20.2/27.2 metre for four/six laning (including paved shoulder and kerb 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 has to mention specifically such areas in Schedule-B). If required, suitable retaining structures shall be provided to accommodate the highway cross section within the available/ proposed ROW. The details of such sections are mentioned in Schedule-B. In case of any other section not included in Schedule-B, where retaining structures are to be provided, shall constitute a Change of Scope (the design

1.2. Width of Median

1.2.1. The width of median including kerb shyness shall be 7 metre for depressed median and 5 metre for flush median. In built up section the width of median shall be 2.5 metre.

1.2.2. In case of depressed median, a minimum of 0.6 metre width adjacent to carriageway in either direction shall be paved. In case of depressed / flushed median, the metal beam (thrie beam) crash barrier shall be provided on either side of the median. In case width of median is more than 9 metre, no crash barrier is required to be provided in the median side. (clause No. 2.5 IRC:SP:84-2019/ IRC:SP:87-2019 & Circular RW/NH-29023/02/2019-S&R(P&B)

1.2.3. A suitable paving (paver blocks, etc.) shall be proposed in case of flush median to prevent spreading of soil on carriageway (clause No. 6.3.2 IRC:SP:84-2019/ IRC:SP:87-2019)

1.2.4. A suitable anti-glare measures shall be proposed. (Clause No. 2.5.6 & 2.5.7 IRC: SP:84-2019/ IRC: SP:87-2019)

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/ IRC:SP:87-2019).

2.2. Design Speed: The project road shall be designed for 100 Kmph for plain and rolling terrain and 60 Kmph for mountainous and steep terrain. (clause No. 2.2 IRC:SP:84-2019/ IRC:SP:87-2019)

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.

Sr. No.	Stretch (Design Chainage) Km		Type of deficiency	Remarks
	From	To		

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

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

Sr. No.	Existing Chainage (Km)		Design Chainage (Km)		Length (Km)
	From	To	From	To	

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

Sr. No.	Name of bypass	Existing Chainage (Km)		Design Chainage (Km)		Length (Km)
		From	To	From	To	

2.4. Right of Way

Details of the Right of Way along Project Highways and Side Roads are given in Annexure-II of Schedule-A.

2.5. Type of shoulders

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

2.5.2 Paved shoulders and strip on median side shall be of same specification and pavement composition as of main carriageway (clause No. 5.10 IRC: SP:84-2019/ IRC: SP:87-2019)

2.5.3 The overlay on the main carriageway pavement and on the paved shoulders shall be uniform in thickness and composition. (Clause No. 5.10 IRC: SP:84-2019/ IRC: SP:87-2019)

2.5.4 In Built-up sections, footpaths/fully paved shoulder shall be provided with width 1.5m/2.5m respectively. (Clause No. 2.15 & clause No. 2.6 IRC: SP:84-2019/ IRC: SP:87-2019)

2.5.5 In open country, paved shoulders of 1.5m width shall be provided. (Clause No. 2.6 IRC: SP:84-2019/ IRC: SP:87-2019)

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

2.5.8 The earthen shoulder of 2.0m width on shoulder side shall be provided with top 150 mm on earthen shoulder with well graded naturals and morrum gravel crust stones or combination thereof, confirming to Clause 401 of MoRTH specification. (Clause No. 5.11 IRC: SP:84-2019/ IRC: SP:87-2019)

2.5.9 The earthen shoulder of 1.0m width on median 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 to fix MBCB and confirm placement requirement of MBCB. (Clause No. 9.7.2 (C) IRC: SP:84-2019/ IRC: SP:87-2019)

2.6. Lateral and Vertical Clearance at Underpasses

2.6.1. In case of VUP/ LVUP/ SVUP, the proposed structure, the finish road level in VUP/ LVUP/ SVUP shall be kept 150 mm above the ground level/service road/ cross road (whichever is higher) to ensure that these VUP/ LVUP/ SVUP don't become water accumulation points. (Clause No. 2.10 IRC: SP:84-2019/ IRC: SP:87-2019)

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

2.7. Lateral and vertical clearances at Overpasses

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

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

(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.

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	Remarks
	From	To	LHS	RHS			

2.8.3. The Parking bays shall be provided along service road (clause No. 2.12.2.1 IRC:SP:84-2019/ IRC:SP:87-2019)

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

2.8.4. Slip Road: The height of embankment of slip road shall confirm to clause 4.2.1. (clause No. 4.2.1 IRC:SP:84-2019/ IRC:SP:87-2019)

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

Sr. No.	Design Chainage (Km)		Length (km)		Paved Carriageway Width including shyness (m)	Total	Remarks
	From	To	LHS	RHS			

2.8.5. Separator Between Main Carriageway and Service/Slip Road (clause No. 2.15.1 IRC:SP:84-2019/ IRC:SP:87-2019)

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

Note:

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

ii. The Acceleration, deceleration lane, right turning storage lane, entry/exit lanes shall be constructed in addition to length given in above table and shall be deemed to be part of the scope and no Change of Scope shall be considered for the same. (Clause No. 2.12.2 IRC: SP:84-2019/ IRC: SP:87-2019)

2.9. Grade Separated Structures (clause No. 3.4 IRC:SP:84-2019/ IRC:SP:87-2019): Grade separated structures shall be constructed as per paragraph 2.13 of the Manual. Proposed levels at structure locations as shown in plan & profile specified in Annexure-III of schedule A 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/ IRC:SP:87-2019). 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. (Clause 7.1 (vii) IRC: SP:84-2019/ IRC: SP:87-2019).

50m long MBCB Safety barriers on structure approaches shall be provided on all four faces of each structure. MBCB provided towards median side of each structures 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/ IRC: SP:87-2019).

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
1		15.1	15.1	No	1x40	5.5	0	
2		15.1	15.1	No	1x40	5.5	40°	
3		15.1	15.1	No	1x40	5.5	40°	
4		15.1	15.1	No	1x40	5.5	16°	

2.9.2. Vehicle Underpasses (VUP)

Sr. No.	Design Chainage (Km)	LHS Roadway Width (m)	RHS Roadway Width (m)	Super Structure Provision in Median	Span Arrangement (m)	Minimum Vertical Clearance (m)	Skew Angle (to be specified)	Remarks
1		15.1	15.1	No	1x 20+1x30+1x20	5.5	0	
2		15.1	15.1	No	1x 20+3x30+1x20	5.5	40°	
3		15.1	15.1	Yes	1x20	5.5	40°	
4		15.1	15.1	Yes	1x20	5.5	16°	

2.9.3. Light Vehicle Underpasses (LVUP)

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
1		15.1	15.1	No	1x12	4.0	0	
2		15.1	15.1	No	1x12	4.0	40°	
3		15.1	15.1	Yes	1x12	4.0	40°	
4		15.1	15.1	Yes	1x12	4.0	16°	

2.9.4. 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)	Minimum Vertical Clearance (m)	Skew Angle (to be specified)	Remarks
1		15.1	15.1	No	1x7	4.0	0	
2		15.1	15.1	No	1x7	4.0	40°	
3		15.1	15.1	Yes	1x7	4.0	40°	
4		15.1	15.1	Yes	1x7	4.0	16°	

2.9.5. Cattle and Pedestrian underpasses

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
1		15.1	15.1	No	1x7		0	
2		15.1	15.1	No	1x7		40°	
3		15.1	15.1	Yes	1x7		40°	
4		15.1	15.1	Yes	1x7		16°	

Cattle and pedestrian underpass shall be constructed as follows: (No Clause exists IRC: SP:84-2019/ IRC: SP:87-2019)

2.9.6. Interchanges (IC) (clause No. 3.4 IRC:SP:84-2019/ IRC:SP:87-2019)

Sr. No	Design Chainage (km)	Name of structure	Span Arrangement (m)	Total Width (m)	Typical Cross Section	Remarks

Note : Layout, Geometric Design and Typical Cross Sections of Interchange shall be included by DPR consultant in Annexure to schedule-B.

2.9.7. Details of Ramps, Cross Roads and Connecting Roads at Interchanges (IC)

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

Note : Layout, Geometric Design and Typical Cross Sections of Interchange shall be included by DPR consultant in Annexure to schedule-B.

2.10. Typical Cross Section (TCS) of the Project Highway (clause No. 2.17 IRC:SP:84-2019/ IRC:SP:87-2019)

The Project Highway shall be constructed to Four/Six lane configuration. Typical cross sections required to be developed in different sections of the Project Highway are given below.

S.No	Design Chainage (Km)		Length (Km)	TCS as per Manual	Remarks
	From	To			
1					
2					

The Design Consultant shall take full care in designing 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. (clause No. 7.1 (iv) IRC:SP:84-2019/ IRC:SP:87-2019)

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

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

6. For example (The design Consultant has to mentioned clearly 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.

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/ IRC: SP:87-2019)

8. Provide detailing of placement and specification of Railing, Fencing and electric poles, etc.

(Clause No. 2.17 IRC: SP:84-2019/ IRC: SP:87-2019)

3. **Intersections and Grade Separated Intersections** (Section 3, IRC:SP:84-2019/ IRC:SP:87-2019)

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 cross roads of the intersections for the length specified for at-grade and grade separated intersections.

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

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

(a) Major Junctions:

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriageway width of cross road	Length of cross road to be developed	
			Left	Right				LHS	RHS
1	00+485	T	-	-	Yes	Start of Bypass	7.5m	500m	-
2.	5+000	X			Yes	MDR	7.5m	500m	500m

Note : Layout, Geometric Design and Typical Cross Sections of Major Junction shall be included by DPR consultant in Annexure to schedule-B.

(b) Minor Intersections:

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriageway width of cross road	Length of cross road to be developed	
			Left	Right				LHS	RHS
1	00+485	T	-	-	No	VR	3.5m	200m	-
2.	5+000	X			Yes	MDR	3.5m	200m	200m

Note : Typical Layout, Geometric Design and Typical Cross Sections of Major Junction shall be included by DPR consultant in Annexure to schedule-B.

Note: *The DPR Consultant has to furnish the exhaustive list of major / minor junctions (including village roads)

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

2. 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 cross road at the junctions which are having a level difference from the main carriageway, are to be improved at the level of main carriageway for the length of 30 metre and then to be merged with the cross road at the gradient not more than 1:50. (Clause No. 3.2.2 IRC: SP:84-2019/ IRC: SP:87-2019)

3. For minor / major layout for left-in / left out arrangement with physical islands with hazard marking. Where there is space constraint to provide physical islands, the effect of junction kept wide opened can be avoided by ghost island with marking. **(Fig 3.7, IRC:SP:84-2019/ IRC:SP:87-2019)**

4. For U-turn, Self-Regulated U-Turn facility shall be created. **(Fig 3.6 IRC:SP:84-2019/ IRC:SP:87-2019)** as per fig 3.6 of manual (IRC SP 84).

3.2. At-Grade Intersections below Grade Separators/ Interchanges: These shall be provided as given at para----- of this Annexure-I of the Schedule B. **(clause No. 3.4.7 of IRC:SP:84-2019/ clause No. 3.2.4 of IRC:SP:87-2019)**

Sr. No.	Design Chainage (Km)	Junction Type	Leads to		U-Turn provision in Viaduct Spans	Category of Cross Road	Carriageway width of cross road	Length of cross road to be developed
			Left	Right				

								LHS	RHS
1	00+485	T	-	-	No	Start of Bypass	7.5m	500m	-
2.	5+000	X			Yes	MDR	7.5m	500m	500m

Note:

1.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.

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

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

4.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.

5. 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/ IRC: SP:87-2019)**

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 A 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 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/ IRC: SP:87-2019)**

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/ IRC: SP:87-2019)

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.

(The design consultant will carry out life cycle cost analysis for flexible and as well as rigid pavement. The cost-effective solution shall be proposed for the project.)

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 sub grade 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 ___ MSA.

5.2.3 The pavement for service road/slip roads shall be designed for projected traffic ____ subject to minimum as follows: **(Clause No. 5.5.4 IRC: SP:84-2019/ IRC: SP:87-2019)**

i. **Service Roads in Builtup areas for minimum 20** MSA
ii. Slip Roads for minimum 20 MSA
iii. Service Roads in Rural Area for minimum 10 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 cross roads/ service roads/ slip roads/ entry/exit locations, acceleration/ deceleration lane, right turning lanes shall, however, in no case be less than as given below:

5.3.1 Main carriageway, paved shoulder, median side paved strip, entry/exit locations, acceleration/ deceleration lane, right turning lanes (Flexible) with GSB/WMM

Pavement Composition	Minimum Crust Thickness (mm)

Subgrade	500
GSB	200
WMM	250
DBM	
BC	

5.3.2 Main carriageway, paved shoulder, median side paved strip, entry/exit locations, acceleration/ deceleration lane, right turning lanes (Flexible) with CTB/CTSB

Pavement Composition	Minimum Crust Thickness (mm)
Subgrade	
CTB	
CTSB	
DBM	
BC	

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

Pavement Composition	Minimum Crust Thickness (mm)
Subgrade	500
GSB	150
DLC	150
PQC	280

5.3.4 crossroads/ service roads/ slip roads

Pavement Composition	Minimum Crust Thickness (mm)
Subgrade	
GSB	
WMM	
DBM	
BC	

Note: The design Consultant shall mention the crust thickness based on the design traffic assessed during traffic survey and CBR.

5.4 Reconstruction of Stretches with New pavement (Clause No. 5.9.4 IRC: SP:84-2019/ IRC: SP:87-2019)

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

Sr. No.	Design Chainage		Pavement Composition	Remarks
	From	To		

			Same as 5.3.1/5.3.2/ 5.3.3	

5.5 Bituminous Mix for Overlay (Clause No. 5.9.8 IRC: SP:84-2019/ IRC: SP:87-2019)

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

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

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/ IRC: SP:87-2019)

Sr. No.	Design Chainage (Km)		Length (m)		Width of Drain (m)	Total Length (m)
	From	To	LHS	RHS		
1	0+000	1+200			2	
2	4+100	4+900			2	
3	6+200	7+040			2	
4	7+440	8+060			2	
	Sub Total on each side					
	Total					

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

6.3.Median Drain (Clause No. 6.3 IRC: SP:84-2019/ IRC: SP:87-2019)

Lined drain shall be provided in the center of the median at super elevation locations and depressed median. Draining of strom water from one carriageway to other carriageway is not permitted. the Concessionaire shall design the median drain based on site/design requirement mentioned in Schedule D with approval from the Independent Engineer and shall be connected with the nearest culvert/outfall.

6.4.Drainage arrangement between Main Carriageway and Service/Slip Roads (Clause No. 2.15 IRC: SP:84-2019/ IRC: SP:87-2019)

A suitable drainage arrangement for draining storm water of main carriageway shall be provided. Storm water of main carriageway to service road is not permitted.

6.5. Drainage where Embankment Height is more than 3m (Clause No. 6.4 IRC: SP:84-2019/ IRC: SP:87-2019)

Drainage chutes shall be provided at suitable interval 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/ IRC: SP:87-2019)**

6.6.Drainage for Structures (Clause No. 6.8 IRC: SP:84-2019/ IRC: SP:87-2019)

A suitable drainage arrangement for draining storm water from deck slab shall be provided. Water shall not fall on any surface of the structures, or remain standing or flowing over the road below structure.

6.7.Drainage for Underpass and Subways Structures (Clause No. 6.8.3 IRC: SP:84-2019/ IRC: SP:87-2019)

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

6.8.Drainage arrangement of Retaining Structures (No Clause in IRC: SP:84-2019/ IRC: SP:87-2019)

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

7. Design of Structures

7.1.General

Project Highway is proposed to be constructed to Four/ Six-lane configuration with provision for widening to six/eight-lane configuration in future. As such, superstructure of all bridges, culverts and structures is to be designed for edge movement of the vehicle considering stitching of new superstructure in future due to widening for additional lane. **Special vehicle loading is to be considered in design of all bridges, culverts and structures.**

All structures except wherever expansion joints have been provided, The pavement layers WMM,DBM & BC shall be continued over the structures for smooth riding quality of the project highway. These structures shall be designed considering the dead load of pavement (WMM, DBM,BC, etc) layers .

All major structures will be designed preferably as continuous slab to reduce the number of expansion joints on the MJB/ ROBs/ flyover/ Interchange etc.

7.1.1. All bridges, culverts and structures shall be designed for IRC class Special Vehicle (SV) loading as per IRC: 6 and constructed in accordance with section-7 of the manual and 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 of Annex-I of Schedule-B. **(Clause No. 7.3 IRC: SP:84-2019/ IRC: SP:87-2019)**

7.1.3.The Safety Barrier and Footpath on Bridges and RoB shall continue on approaches. The footpath shall be provided with paved surface & railing till the embankment height is more than 3m. (Clause No. 7.17 IRC: SP:84-2019/ IRC: SP:87-2019)

Details of Structures with footpaths **(Clause No. 7.2 ii IRC: SP:84-2019/ IRC: SP:87-2019)**

Sr. No.	Location at km	Skew Angle	Footpath Width (m)		Remarks
			Left	Right	
1	ROB@ 1+944				
2	MIB @ 2+857				
3	MJB@ 26+494				

7.1.4. All bridges shall be high level bridges.

7.1.5. All structures shall be designed to carry utility services on 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 ------- of the Schedule-B.

7.2. Culverts (Clause No. 7.3 i IRC: SP:84-2019/ IRC: SP:87-2019)

7.2.1. Overall width of all culverts 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.

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
		Pipe					

7.2.3. Widening of existing RCC pipe culverts (Clause No. 7.3 iii IRC: SP:84-2019/ IRC: SP:87-2019)

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
		pipe			Replacement /Provision of Railing, floor protection, railing, parapet etc. per relevant IRC codes and specifications.		

7.2.4. Construction of Box Culverts:

7.2.5. 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:

Box Culverts (Clause No. 7.3 i IRC: SP:84-2019/ IRC: SP:87-2019)

Sr. No	Design Chainage (km)	Span Arrangement (m)	Skew Angle	Culvert Crossing Type	Remarks
1	01+400	1x2x1.5		Balancing	
2	05+588	1x2x1.5		Stream	
3	03+937	1x5x2		Canal	
4	06+450	1x2x1.5		Drain	

7.2.6. Widening of existing box culverts

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

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

Sr. No	Design Chainage	Culvert Type	Skew Angle	Span/ Opening (m)	Repairs /Rehabilitation proposals	Culvert Crossing Type (Balancing/Stream, etc)	Remarks
		Box			Replacement /Provision of Railing, floor protection, railing, parapet etc. per relevant IRC codes and specifications.		

7.2.7. Culverts on Crossroads:

Sr. No	Design Chainage (km)	Span Arrangement (m)	Type (Box/Pipe)	Length of Culvert	Remark
1	8+930	1x1.2			
2	8+930	1x1.2			
3	8+946	1x1.2			
4	8+946	1x1.2			

7.2.8. Utility ducts in bypasses (Greenfield as well as Brownfield which is being upgraded) in form of NP-4 RCC Pipe dia 600 mm shall be provided across the Project Highway @ 0.50 km c/c and along with inspection chamber where directed for crossing of utilities anywhere as per manual (Clause 2.16) requirements. **(Clause No. 2.16 IRC: SP:84-2019/ IRC: SP:87-2019)**

Location for utility Ducts

Sr. No	Design Chainage (km)		Remark
	From	To	
1	8+930	9 + 500	
2			
3			
4			

7.3. Bridges

7.3.1. Existing bridges to be re-constructed/widened:

1. Existing bridges proposed for reconstructed as new structures: **(Details to be given by DPR Consultant) (Clause No. 7.3 iv(a) IRC: SP:84-2019/ IRC: SP:87-2019)**
2. Existing narrow bridges proposed to be retained and widened: **(Details to be given by DPR Consultant) (Clause No. 7.3 iv IRC: SP:84-2019/ IRC: SP:87-2019)**

7.3.2. Additional New Bridges: New bridges at the following locations on the Project Highway shall be constructed. GADs for the new bridges are attached in the drawings folder. **(Clause No. 7.3 ii IRC: SP:84-2019/ IRC: SP:87-2019)**

Sr. No	Design Chainage (Km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Typical Cross Section of Manual	Skew Angle
				MCW	SR		
1	02+857	8	Stream	2x16	-	Fig 7.2A	
2	03+510	8	Stream	2x16	-	Fig 7.2A	38°
3	04+569	61	Stream	2x14.5	2x10.8	Fig 7.3A	
4	06+920	10	Stream	2x14.5	2x10.8	Fig 7.3A	
5	10+082	15	Stream	2x16	-	Fig 7.2A	13°

7.3.3. The railings of existing bridges shall be replaced by crash barriers at the following locations: the specific locations are to be mentioned by DPR Consultant. **(Clause No. 7.17 iv IRC: SP:84-2019/ IRC: SP:87-2019)**

Sr.No	Design Chainage		Length (km)	Remarks
	From	To		
1				
2				
3				
4				

7.3.4. The existing bridges/ RoB/ Grade Separators/ RUB retained on the project highway shall be upgraded and rehabilitation measures/proposals shall be specified as follows: **(Clause No. 7.3 iv(b) IRC: SP:84-2019/ IRC: SP:87-2019)**

Sr. No.	Location at km	Rehabilitation Proposals	Remarks
1		Replacement /Provision of Bearings, Expansion Joints, Wearing coat, footpath, Lighting, floor protection, etc. per relevant IRC codes and specifications.	
2			
3			

7.3.5. Structures in marine environment: - the specific locations are to be mentioned by DPR Consultant.

7.4. Railroad Bridges (ROB/RUB) (Clause No. 7.18 IRC: SP:84-2019/ IRC: SP:87-2019)

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

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

Sr. No.	Design Chainage (Km)	Proposed Span Arrangement (m)	Type of super-structure (i.e Bow string, simply supported composite structure etc.	Name of crossing	Total Width m)	Skew Angle	Remarks
1	1.944				2x15.3	10°	
2	27.226				2x15.3		

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.

3. 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.
4. The ROB shall be constructed and maintained by the concessionaire under supervision of the Railways.
5. All charges payable to the Railways like D&G, Capitalized maintenance, signaling, cabling, OHE modification, earthing etc. except P&E charges shall be borne by the Concessionaire.

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

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

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

7.5 Grade Separated Structures (Clause No. 7.19 IRC: SP:84-2019/ IRC: SP:87-2019)

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 (Clause No. 10 IRC: 103 and Clause No. 9.8.5 IRC: SP:84-2019/ IRC: SP:87-2019)

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
1			
2			
3			

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	10	-
3	ROB	2	-
4	VUP (Single Span)	6	-
5	VUP (Multi Span)	2	
6	LVUP	11	-
7.	SVUP	5	
8.	FoB	2	
9	Box Culverts	42	-
10	Pipe Culverts	44	-

8. Traffic Control Devices and Road Safety Works

8.1. Traffic control devices and road safety works shall be provided in accordance with Section 9 of the IRC:SP: 84/87

8.2. Traffic Signs:

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

8.3.Pavement Marking:

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

8.4.Safety Barrier:

The safety barriers shall be provided in accordance with Section-9 of the Clause 9.7 of the manual.

The Safety Barrier length proposed are excluding the safety barrier already proposed on Culverts, Grade Separated Structures, Interchange, Bridges, RoB and RUB as applicable cross sections respectively.

End Treatment of Steel barriers/Rope Barrier shall be specified i.e. **MELT or P-4 confirming to EN 1317-4**, TT, MBCB barrier to Concrete Barrier **(Clause No. 9.7.2 (b) IRC: SP:84-2019/ IRC: SP:87-2019)**

End Treatment to Concrete barrier shall be done as specified in **Clause No. 9.7.3 (b) IRC: SP:84-2019/ IRC: SP:87-2019.**

The details of the location are as below:

S.No.	Item	LHS		RHS		Total Length (m)	Remarks
		(From)	(To)	(From)	(To)		
1	W-beam Single faced metal crash barrier						
2	Thrie-beam Single faced metal crash barrier						
3	wire rope safety barrier						
4	W-beam Double faced metal crash barrier						
5	Thrie-beam Double faced metal crash barrier						
6	Concrete Single faced barriers						
7	Concrete Double faced barriers						
8	Pedestrian guardrails						
9	End Treatment for Steel Barriers						

The specific locations are to be mentioned by DPR Consultant.

9. Roadside Furniture

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

10. Hazardous Locations

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 and as provided in TCS schedule in cl. 2.11 of schedule-B.

Sr. No.	Design Chainage (Km)		Length (m)	Side	Height (m)	Retaining Structure/ Toe Wall	Type of Safety Barrier	Remarks
	From	To						

DPR Consultant to provide the details of retaining walls and toe wall etc.

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
1				Sand		
2						
3						

13. Shifting of Utilities

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

14. **Work Zone Traffic Management Plans (Clause No. 7.19 IRC: SP:84-2019/ IRC: SP:87-2019)** Annexure-ii Schedule B- Typical Cross Sections

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.

Sr. No.	Design Chainage (Km)		Construction Activity	Diversion	Traffic Management Plan	Barricading Type – III/IV/CC Barrier with lighting	Deployment of Flagman in Habitation/ Schools/	Remarks
	From	To						

						along barrier	Hospital, etc.	
			Widening of Pavement					
			VUP					
			Bridge Widening					

Annexure – II *(Schedule – B)* Typical Cross Sections

Annexure-iii Schedule C Project Facilities

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) Road side 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

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/ IRC: SP:87-2019)** 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
1	-	-		n	n

The Sub Items of toll Plaza are as follows

S.No.	Item	Number	Remarks
1	No. of toll lane		As per design to be fixed by DPR Consultant
2	toll Booth complex		As per design to be fixed by DPR Consultant
3	weigh bridges	2	1 each on either side of Toll Plaza
4	electrical systems		Sufficient for all equipment placed on Toll Plaza and for future expansion
5	Highway Nest with toilet facility	2	1 in Each Direction after crossing the Toll Booth
6	Internet facility	2	Internet facility with 2 different telecom operator

Note:

1.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.

2.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

3.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.

4.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/ IRC: SP:87-2019)**

5. 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.

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

7.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/ IRC: SP:87-2019)**

8.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.

9.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/ IRC: SP:87-2019)**

10.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/ IRC: SP:87-2019)**

11.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**	(2X No. of Kms)+2	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
2	**Hectometer Marker/ Stones**	(8X No. of Kms)	

			(Service Road length is more than 1 Km).

2.2. Traffic Signs (Clause No. 9.2 IRC: SP:84-2019/ IRC: SP:87-2019)

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.

All sign 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/ IRC: SP:87-2019)**

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/ IRC: SP:87-2019)**

On multi lane roads (6 lanes or above), signs shall be mounted overhead. **(Clause No. 4.6 of IRC: 67 2022)**

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	Both
a	Start of Project	
b	End of project	
c	Toll plaza location on both side	
2	Overhead Cantilever Gantry signs	Either left or Right
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 center, roads leading to religious places or any other important location	Both sides
3.	Double/Butterfly Cantilever	On Gore Area of Exit Locations of Access Controlled Highway/Expressway.

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 (DPR Consultant has to give the number required for each sign)	Remarks
I	**Mandatory/Regulatory**		
1	Stop signs		
2	Give Way Signs		
3	Prohibitory signs		
4	No Parking signs		
5	No Stopping signs		
6	Speed Limit signs (Circular)		
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		
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		
6	Side Road		
7	Y-intersection		
8	Cross Road		
9	Roundabout		
10	Traffic Signals		
11	T-Intersection		
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		
25	Pedestrian crossing with backing board		

S.No.	Road Signs	Number (DPR Consultant has to give the number required for each sign)	Remarks
26	School Ahead		
27	Built Up Area		
28	Two Way Operation (on main carriage way /service road		
29	Two Way Traffic on Cross Road Ahead		
30	Danger Warning Sign		
31	Deaf or Blind Persons Likely on Road Ahead		
32	Cycle Crossing		
33	Cycle Route Ahead (Warning for Cycles on road ahead)		
34	Dangerous Dip		
35	Speed Breaker		
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	Play Ground Ahead		
44	Quay Side or River Bank		
45	Sudden Side Winds		
46	Tunnel Ahead Warning		
47	Falling Rocks		
48	Cattle Crossing		
49	Wild Animals likely to be on Road Ahead		
50	Queues Likely Ahead		
51	Low flying Air Craft		
52	Unguarded Railway Crossing		
53	Guarded Railway Crossing		
54	Crash prone area ahead		
55	U- Turn		
III	**Chevron Signs**		
1	Single Chevron		
2	Double Chevron		
3	Triple Chevron		
IV	**Object Hazard Marker Sign**		

S.No.	Road Signs	Number (DPR Consultant has to give the number required for each sign)	Remarks
1	Left /Right side Object Hazard Marker		
2	Two way Object Hazard Marker		
V	**Informatory/Guide**		
1	Direction and Place Identification signs		
2	Stack Type Advance Direction Sign (Shoulder Mounted)		
3	Stack Type Advance Direction Sign with cautionary / regulatory signs (Shoulder Mounted)		
4	Map Type Advance Direction Sign (Shoulder Mounted)		
5	Map Type Advance Direction Sign for roundabout (Shoulder Mounted)		
6	Flag Type Direction Sign		
7	Reassurance Sign		
8	Place Identification Sign		
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		Instead of continuous sign board, Separate Signs shall be provided for each information
15	Gantry Mounted advance Direction Sign Ahead of a Grade Separated Junction		
16	Gantry Mounted advance Direction Sign Ahead of a At Grade Intersection		
17	Gantry Mounted Advance Direction Sign for Interchange		
18	Cantilever Gantry Mounted Advance Direction Sign for Interchange		
19	Lane Dedicated Gantry Sign		
20	Definition/Supplementary Plates		
21	Tourism Related Sign		
22	Tourist Destination Direction Information Signs Without Photograph		
23	Tourist Destination Direction Information Signs With Photograph		
24	Finger Destination direction Information Sign for Pedestrians		

S.No.	Road Signs	Number (DPR Consultant has to give the number required for each sign)	Remarks
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		
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		

S.No.	Road Signs	Number (DPR Consultant has to give the number required for each sign)	Remarks
33	Bus Stop		
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**		
1	State Highway Route Marker Sign		
2	National Highway Route Marker Sign		
3	Asian Highway Route Marker Sign		
4	Expressway Route Marker Sign		

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

2.3. Road Marking (Clause No. 9.2 IRC: SP:84-2019/ IRC: SP:87-2019)

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			
10	No Overtaking Lines			
11	Warning Lines			
12	Border or Edge Lines			
13	Longitudinal Markings for Undivided Roads			
14	Longitudinal Markings for divided Roads			
15	Longitudinal Markings for Ramps/Slip Roads/One Way Streets			
16	Stop Line			
17	Give Way Lines			
18	Diagonal Markings			
19	Chevron Markings			
20	Continuity Line			
21	Word Messages			
22	Lane Change			
23	Merging/Diverging Markings			
24	Hatch Markings			
25	Raised Profile Edge Lines			
26	Lane Reduction / Narrowing Situations and Transitions (lane Balancing)			
27	Directional Arrows			
28	Mandatory Turn Arrows			
29	Guidance Arrows			
30	Deflection Arrows			
31	Bifurcation Arrows			
32	Arrows on Side Road Approaches			

S.No.	Item	Unit		Remarks
		Length (m)	Number	
33	Arrows on Main Road Approaches			
34	Word Messages			
35	Yellow Box Markings			
36	Ghost Island			
37	Marking for Speed Breakers			
38	Pedestrian Crossing			
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			
44	School Zone Markings			
45	Object Markings within Carriageway			
46	Objects Markings Adjacent to Carriageway			
47	i. Subway Piers, Abutments, Culverts Head Walls, Concrete Barrier			
48	ii. Electrical Poles			
49	iii. Guard Rails			
50	iv. Trees			
51	v. Kerbs			
52	Directional Markings as per Annexure: A 6			
53	Facility Markings as per Annexure A.7 of IRC 35			

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

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

S.No.	Item	Number/ Length (m)	Remarks
1	Roadway Indicators		
2	Median Marker on Median/RCC Barrier **(Clause 4 of IRC 79 2019)**		
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		

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/NHAI, as per site requirement.

2.5. Reflective Pavement Markers & Solar Studs (Clause No. 9.5 IRC: SP:84-2019/ IRC: SP:87-2019

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.

S.No.	Item	Number	Location	Remarks
A. – For 4/ 6 Lane Projects				
1	White Colour one coloured face Road Studs		Traffic lane line & center of carriageway	Uni-directional carriageway
2	Red Colour one coloured face Road Studs		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		Median side edge line, zebra crossing	
4	Green Colour one coloured face Road Studs		Lay byes, left hand side of the carriageway in case of multi-lane 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		Traffic lane line & center of carriageway	Bi-directional carriageway
6	Red Colour Two coloured face Road Studs		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		Lay byes, left hand side of the carriageway in case of multi-lane divided carriageways, crossable continuous line like in acceleration/ deceleration lanes involving lane changing	
8.	Solar Studs on Major/Minor bridge, RoB,			

S.No.	Item	Number	Location	Remarks
	and all structures (Interchange/Flyover/VUP) and Builtup areas, In storage lane of median opening and Exit/Entry from main carriageway			

2.6. Traffic Impact Attenuators (Clause No. 9.6 IRC: SP:84-2019/ IRC: SP:87-2019)

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 (Clause No. 12.2 IRC: SP:84-2019/ IRC: SP:87-2019)

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:84/87. 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 reinforced cement concrete as per figure enclosed as Annexure A.

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 Chainlink fencing, provide detailed drawings as Annexure A.

In case of Pre cast panel fencing, provide cast in situ coping beam on top of fencing. provide detailed drawings as Annexure A

3. Operation and Maintenance centers (Clause No. 12.15 IRC: SP:84-2019/ IRC: SP:87-2019)

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.

4. Way side Amenities / Service Areas/Rest Area (Clause No. 12.6 IRC: SP:84-2019/ IRC: SP:87-2019

S.No	Item	Existing Chainage (Km)	Side	Remarks
1	Way side Amenities-1			Tentative area=
2	Way side Amenities-2			Tentative area=

The Site needs to levelled/ graded for the whole of Way side Amenities area and boundary wall of the height of 1.5m shall be constructed along the periphery of the area.

5. Truck lay-byes: (Clause No. 12.6 IRC: SP:84-2019/ IRC: SP:87-2019

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
1			
2			

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

Pavement Composition (Flexible/Rigid/ Paver Blocks)

6. Bus Bay and Bus shelter: (Clause No. 12.7 IRC: SP:84-2019/ IRC: SP:87-2019)

Provision of Busbay and bus shelter on highways as per **IRC 80 : 2022** including paving of layby, signs, markings, speed calming measures, drainage, lighting etc., in builtup areas, intersections of NH/SH/MDR and roads leading to large settlements is as follows:

6.1. 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 Lenth	Exit Taper Length	Remark
	Left	Right				

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

Sr. No.	Design (Existing) Chainage (Km)		Pedestrian Shelter Length	Remark
	Left	Right		

6.3 Bus Bay Pavement: Provide pavement composition (Flexible/Rigid/ Paver Blocks) as follows:

Pavement Composition (Flexible/Rigid/ Paver Blocks)

7. Pedestrian Facilities (Clause No. 9.8 IRC: SP:84-2019/ IRC: SP:87-2019

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.

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				
2	Footpath paving including fixing of Tactile pavers				
3	Pedestrian Crossing i. With Zebra Marking ii. With Tabletop Crossing iii. At Intersections iv. At Schools				

8. Highway Lighting (Clause No. 12.5 IRC: SP:84-2019/ IRC: SP:87-2019)

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:

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				
2	**Rest Areas:** The entire Rest areas shall be provided with lighting with average illumination to 40 Lux				
3	**Truck lay-bye:** The entire area of truck lay-byes and 50m length of the				

S.No.	Lighting facilities	Chainage		Side	Lighting Source: Electricity Board/ Generator/ Solar
		From	To		
	project highway on its either side shall be illuminated at night to provide an average illumination of 40Lux. Suitable designed electric poles having aesthetic appeal and energy saving bulbs (LED) may be used to provide required illumination. Alternatively, photo voltaic lamps may be used				
4	**Bus Bay & bus shelter locations**: The entire bus bay & bus shelter area shall be provided with Lighting (Average illumination of 40Lux.).				
	Grade separated structures, interchanges, flyovers, underpasses (vehicular/ pedestrian) and Vehicle overpasses: Lighting requirement shall be as per section 12 of the manual. The top and underside of the grade separated structures including service road/ slip road, interchange area at the ground level up to 50m beyond the point from where flaring of the main carriageway takes place shall be provided with lighting. Also, on all legs of at grade interchange/ crossings the lighting shall be provided 50m beyond the point of Centre on all legs. The minimum illumination shall be 40 Lux., at the extreme edge of the Highway				
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 nos. high mast lighting of 25m height**				
8	**On Major Bridges and its approaches higher than 3m**				

9. Rainwater Harvesting

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

S.No.	Rain water Harvesting Type	Chainage	Side	Depth of Recharge Structure
1	Type 1 confirming to clause 10.7.2 of IRC SP 42			
2	Type 2 confirming to clause 10.7.3 of IRC SP 42			
3	Type 3 confirming to clause 10.7.4 of IRC SP 42			
4	Type 4 confirming to clause 10.7.5 of IRC SP 42			

10. Environmental Management Plan (Attach MOEF Mitigation Report in Schedule D)

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 (Section 11 of IRC SP 84 2019/ IRC SP 87 2019)

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 Plantation	Location (Km)	Number of trees to be planted	Remarks
1	Shrubs	In median except Structures+ Frist row from side of drain	1 row of 333 plants for the median of 2-3 metre at every km. and 2 rows of 333 plants (staggered) for the median of 3 metre and more	Ornamental type plantation shall be provided
2	Land Scaping	O & M Centers, Vacant land parcels, lend within loops of flyovers, Toll Plaza building and surroundings Vacant space below the flyovers	Landscaping plans will be submitted by the Concessionaire/Contractor which shall include ornamental trees, decorative statues and landscaping	The number of Ornamental type plantation and other things shall be decided on the basis availability of land.
3	Plantations	Available open land within ROW	1 row of 333 plants on each side of project highway.	Minimum _____ nos. of trees of desired type in two rows per Km. @10 m c/c near edge of ROW on both side (As per Schedule D) preferably local varieties like mango, Neem, Sheesham,

Sl. No.	Types of Plantation	Location (Km)	Number of trees to be planted	Remarks
				Babul, Peepal etc. shall be planted

Drip irrigation system for median plantation by gravity/pressure sources with all necessary components / systems and emitting devices at plants shall be provided.

The Concessionaire shall maintain the trees and shrubs in good condition during concession period as per the concession agreement.

12. Advanced Traffic Management System (ATMS) (NHAI Policy Circular No--------)

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 .....and shall be maintained throughout the contract period.

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 No.....:

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. _____ to Km._____.

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.

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

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**

** [The Table should include a Column informing whether Full Gantry is available at that location or not. 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**

** [The Table should include a Column informing whether Full Gantry is available at that location or not. 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**

** [The Table should include a Column informing whether Full Gantry is available at that location or not. VMS M Type requires full Gantry]

12.1.4.1.2 Cantilever (L Type)

Sl No	Location (Km)	LHS/RHS/BHS	Remarks	Availability of Full Gantry**

** [The Table should include a Column informing whether Cantilever Gantry is available at that location or not. VMS L Type requires Cantilever Gantry]

12.1.4.2 Portable VMS

The Contractor shall provide ..... (Nos) Trolley Mounted Portable VMS

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 NHAI at Km..... 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, firefighting 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 NHAI with regard to providing power/ electricity supply/connections for testing commission, operation & maintenance of any component of the ATMS. Further, the following points are to also be observed by the ATMS contractor:

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

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

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

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

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

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

maintaining the ATMS and to meet the Service Level requirements.

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

12.1.9 Maintenance Vehicle

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

13. Highway Patrol Units (Clause No. 12.10 IRC: SP:84-2019/ IRC: SP:87-2019)

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.

14. Emergency medical services (Clause No. 12.11 IRC: SP:84-2019/ IRC: SP:87-2019)

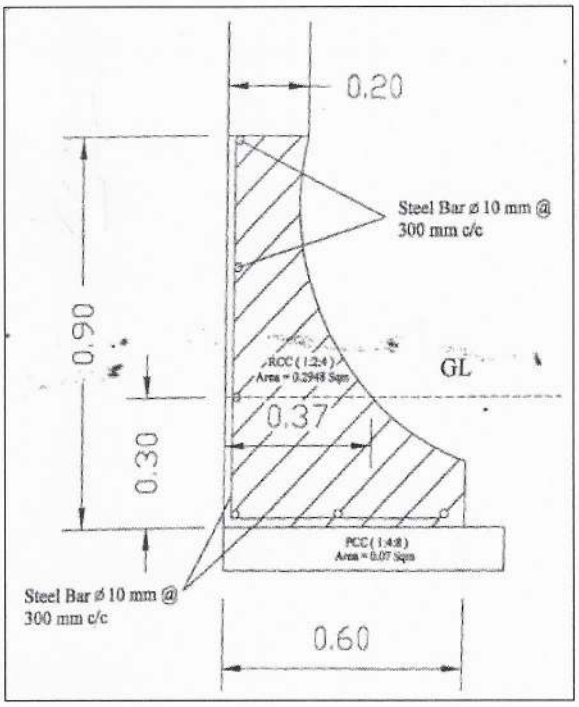
The Contractor shall, at its own cost, construct a medical aid post at each toll plaza with a minimum size of 5 x 5 sq.m with a toilet (to be used for the patients of minimum size of 3 x3 sq.m) and hand it over to the Authority, no later than 30 (thirty) days prior to PCOD/COD. The Medical Aid Post(s) 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

15. Crane Service: (Clause No. 12.12 IRC: SP:84-2019/ IRC: SP:87-2019)

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.

Annexure-iv Schedule C Standard Drawing for Toe Wall



Annexure-v Schedule C Standard Drawing for Toilet

DRAWING - III