WIDENING AND RECONSTRUCTION OF EXISTING TWO LANE CARRIAGEWAY TO FOUR LANE WITH PAVED SHOULDER INCLUDING CONSTRUCTION OF ROB IN MAKHU TOWN FROM KM. 170+000 TO KM. 171+900 OF NH-54 IN THE STATE OF PUNJAB ON EPC MODE

Technical Schedules

Schedule A	:	Site of the Project
Schedule B	:	Development of the Project
Schedule C	:	Project Facilities
Schedule D	:	Specifications and Standards

May 2024

SCHEDULE - A

(See Clause 2.1 and 8.1)

SITE OF THE PROJECT

1 The Site

1.1 Site of the Project Highway shall include the land, buildings, structures and road works as described in **Annex-I** of this **Schedule-A**.

1.2 The dates of handing over the Right of Way to the Contractor are specified in **Annex-II** of this **Schedule-A**.

1.3 An inventory of the Site including the 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 Contractor, and such inventory shall form part of the memorandum referred to in Clause 8.2.1 of this Agreement.

1.4 The alignment plans of the Project Highway are given in **Annex-III** of **Schedule-A** which is minimum requirement and are for guidance only. The proposed plan & profile, locations of different structures / drains / service road / RE walls, chainages of different structures / drains / service road / RE walls, length of different structures / drains / service 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 as minimum requirement. Based on site / design requirement, the Contractor shall finalise Detailed Project Report (DPR) including plan & profile of the project highway and submit the same to Authority and its Engineer for acceptance, before the start of the execution of project.

1.5 The status of the environment clearances obtained or awaited is given in **Annex-IV** of this **Schedule-A**.

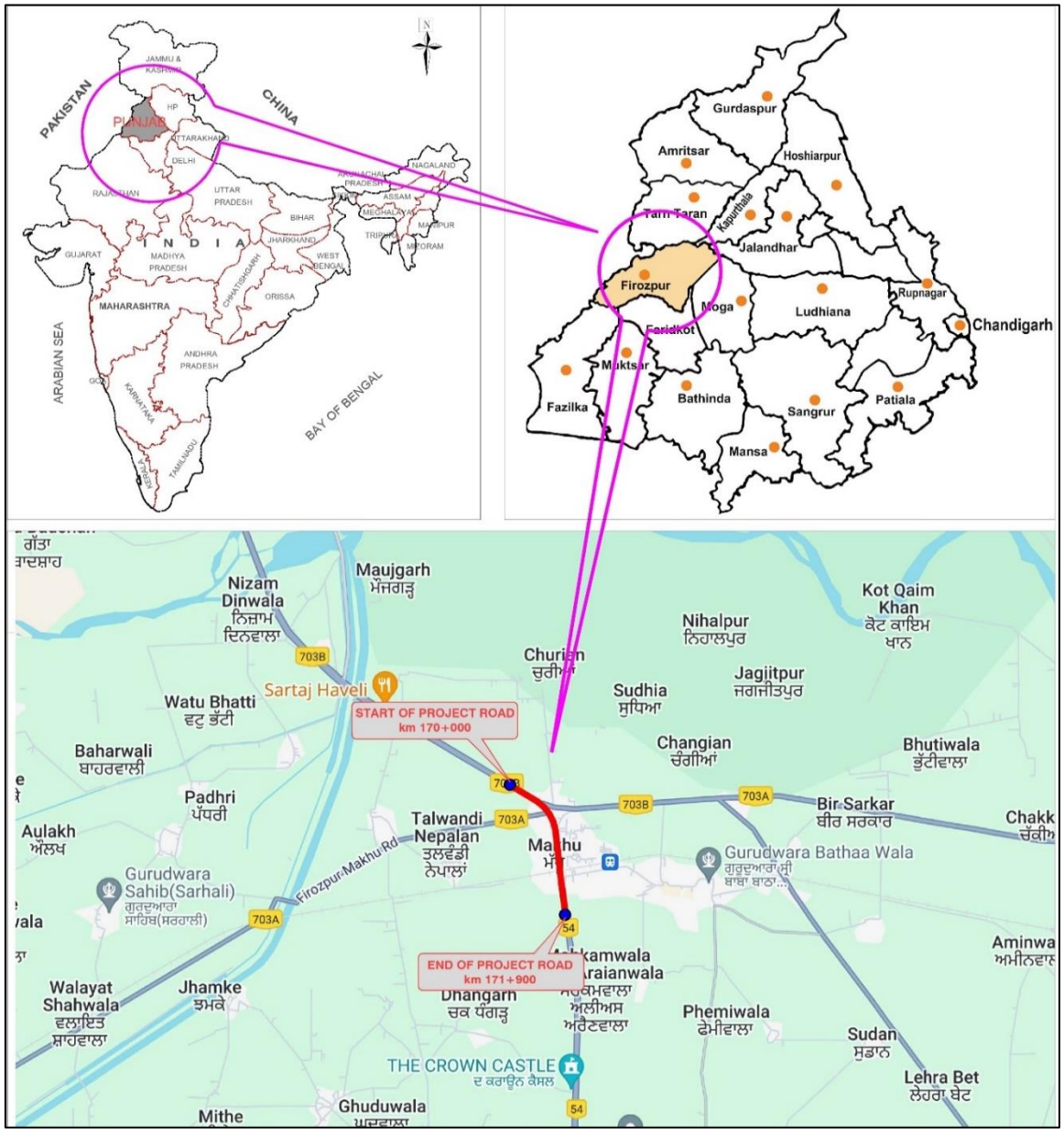
Annex-I
(Schedule-A)

Site of the Project

1 Site

The Site of the Project Highway comprises existing two lane with paved shoulder section of National Highway NH-54 commencing from existing km. 170+000 to km. 171+900 of NH-54 in the State of Punjab. The Site also includes construction of Service Road at villages of Ratol Rohi, Sekhwan, Kot-Karor Kalan, Kaler and Tehna and construction of built-up / RCC drains from km. 171+900 to km. 172+499, at villages of Ratol Rohi, Sekhwan, Kot-Karor Kalan, Kaler and Tehna. The land, carriageway and structures comprising the site are described below.

The Location Map of the project highway is presented below.



2 Terrain

The terrain along the project Highway is predominantly plain terrain.

3 Land

The Site of the Project Highway comprises the land described below:

Sr. No.	Existing Chainage (km)		Length (km)	Existing ROW (m)	Remarks
	From	To			
1	170+000	171+900	1.900	45 m	

4 Carriageway

The existing carriageway of the Project Highway is two lane with paved shoulder configuration with carriageway width ranging from 9.50 m to 10.0 m. The type of the existing pavement is flexible pavement.

5 Total number of Structures

The total nos. of structures are shown in table below:

Type	Major Bridges	Minor Bridges	Culverts		ROB / RUB	Total
			Slab Culvert	HP Culvert		
Existing Structure	-	01	-	01	-	**02**

6 Major Bridges

The Site includes the following Major Bridges:

Sr. No.	Structure No.	Existing Chainage (km)	Type of structure			No. of Spans with Span Length (m)	Outer Width (m)
			Foundation	Sub-structure	Super-structure		
Nil							

7 Road Over-Bridges (ROB) / Road Under-Bridges (RUB)

The Site includes the following ROB (road over railway line) / RUB (road under railway line):

Sr. No.	Existing Chainage (km)	Type of Structure		No. of Spans with Span Length (m)	Width (m)	ROB / RUB
		Foundation	Super-structure			
Nil						

8 Grade Separators

The Site includes the following grade separators:

Sr. No.	Existing Chainage (km)	Type of Structure		No. of Spans with Span Length (m)	Width (m)
		Foundation	Super-structure		
Nil					

9 Minor Bridges

The Site includes the following minor bridges:

Sr. No.	Existing Chainage (km)	Type of Structure			Span Arrangement (m)	Length (m)
		Super-structure	Sub-structure	Foundation		
1	171+572	RCC solid slab	Brick masonry wall type pier	Open	2 x 3.4	6.8

10 Railway Level Crossings

The Site includes the following railway level crossings:

Sr. No.	Design Chainage (km)	Remarks
1	171+387	Level crossing No. S-86 / T2 at railway km. 76/5

11 Underpasses (Vehicular, Non-vehicular)

The Site includes the following Underpasses:

Sr. No.	Existing Chainage (km)	Type of Structure	No. of Spans with Span Length (m)	Width (m)
Nil				

12 Overpasses (Vehicular, Non-vehicular)

The Site includes the following Overpasses:

Sr. No.	Existing Chainage (km)	Type of Structure	No. of Spans with Span Length (m)	Width (m)
Nil				

13 Culverts

The Site includes the following culverts:

Sr. No.	Existing Chainage (km)	Type of Culvert	No. of Span x Clear Span (m)	Remarks
1	170+522	Hume Pipe Culvert	1 x 0.9 dia	

14 Bus Bays / Passenger Shelters

The Site includes the following passenger shelters:

Sr. No.	Existing Chainage (km)	Left Hand Side	Right Hand Side	Remarks
Nil				

15 Truck Lay Byes

The Site includes the following truck lay byes:

Sr. No.	Existing Chainage (km)	Length (m)	Left Hand Side	Right Hand Side
Nil				

16 Roadside Drains

The Site includes the following built-up / RCC drains:

Sr. No.	Existing Chainage (km)		Length (m)	Side	Remarks
	From	To			
1	170+200	170+310	110	RHS	
2	170+860	170+925	65	RHS	
3	170+925	170+950	25	RHS	
4	171+100	171+200	100	RHS	
5	171+220	171+270	50	RHS	
6	171+485	171+555	70	RHS	
7	171+635	171+685	50	RHS	
8	171+635	171+715	80	LHS	

17 Major Junctions

The Site includes the following major junctions:

Sr. No.	Existing Chainage (km)	At grade / Separated	Type of Junction	Leading to
1	170+400	At-grade	Y-type	Chakkian
2	170+600	At-grade	T-type	Mallan Wala
3	170+850	At-grade	Y-type	Chakkian

18 Minor Junctions

The Site includes the following minor junctions:

Sr. No.	Existing Chainage (km)	Type of Junction	Leading to
1	170+985	3-legged	Mandi
2	171+005	3-legged	Village Road
3	171+200	4-legged	Mandi / Village Road
4	171+330	3-legged	Village Road
5	171+405	3-legged	Village Road
6	171+470	3-legged	Village Road
7	171+535	4-legged	Village Road, Basti Vishas Singh
8	171+610	3-legged	Village Road
9	171+625	3-legged	Village Road

19 Bypass

The Site includes the following bypass:

Sr. No.	Name of bypass (town)	Existing Chainage (km)	Length (km)	Carriageway	
				Width (m)	Type
Nil					

20 Stretches passing through / abutting reserved forest area

The details of the stretches passing through / abutting reserved forest area are as follows:

Sr. No.	Name of the Forest Area	Existing Chainage		Side (Left / Right / Both)	Length (km)
		From	To		
Nil					

21 Stretches passing through / abutting wildlife area

The details of the stretches passing through / abutting wildlife area are as follows:

Sr. No.	Name of the Wildlife area	Existing Chainage (km)		Side (Left / Right / Both)	Length (km)
		From	To		
Nil					

22 Stretches passing through / abutting CRZ area

The details of the stretches passing through / abutting CRZ area are as follows:

Sr. No.	Name of the CRZ	Existing Chainage (km)		Length (km)	Type of CRZ I / II / III
		From	To		
Nil					

23 Environmentally sensitive area

The details of the stretches passing through environmentally sensitive areas such as mangroves, mud floors, bird sanctuaries etc. are as follows:

Sr. No.	Environmentally Sensitive Areas	Existing Chainage (km)		Length (km)	Remarks
		From	To		
Nil					

24 Existing Utilities

The site includes the existing utilities as described in Sheet-1 **(Annexure-1 to Schedule A).**

Sheet-1 (Annexure-I to Schedule A)

Detail of Existing Utilities

(i) Electrical Utilities

The site includes the following electrical utilities:

(a) Extra High Tension Lines (EHT Lines)*

Sr. No.	Chainage (km)		Length (km)				Crossings			
	From	To	400 KV	220 KV	110 KV	66 KV	400 KV	220 KV	110 KV	66 KV
1	170+000	171+900	-	-	-	-	-	-	-	-

(b) High Tension / Low Tension Lines (HT / LT Lines)*

Sr. No.	Chainage (km)		Length (km) [BHS]			Crossings			Transformer	
	From	To	33 KV	11 KV	LT	33 KV	11 KV	LT	No.	Capacity
1	170+000	171+900	-	2.200	-	-	12	-	7	-

(ii) Public Health Utilities (Water / Sewage Pipe Lines)*

The site includes the following Public Health Utilities:

Sr. No.	Chainage		Length (km) [BHS]				Crossings			
			Water Supply Line		Sewage Line		Water Supply Line		Sewage Line	
	From	To	With Pumping	With Gravity Flow	With Pumping	With Gravity Flow	With Pumping	With Gravity Flow	With Pumping	With Gravity Flow
1	170+000	171+000	-	0.800	-	0.700	-	2	-	1

(iii) Any Other Line

(* This is illustrative and may change as per feature of existing utilities)

Annex-II
(Schedule-A)

Dates for providing Right of Way

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

Sr. No.	Existing Chainage (km)		Design Chainage (km)		Length (km)	Width (m)	Date of providing ROW
	From	To	From	To			
(i) Full Right of Way (full width)	170+000	171+900	170+000	171+900	1.900	45	On Appointed Date
(ii) Part Right of Way (Part width)	-	-	-	-	-	-	On Appointed Date
(iii) Balance Right of Way	-	-	-	-	-	-	90th Day from Appointed Date

Note: There is no provision for parallel working strip of 3 m wide on either side of road.

Annex - III
(Schedule-A)

Alignment Plans

The alignment plan of the Project Highway is enclosed which is minimum requirement and is for guidance only. The proposed plan & profile, locations of different structures / drains / service road / RE walls, chainages of different structures / drains / service road / RE walls, length of different structures / drains / service 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 Contractor shall finalise Detailed Project Report (DPR) including plan & profile of the project highway and submit the same to Authority and its Engineer for acceptance, before the start of the execution of project.

The Contractor shall match the horizontal and vertical geometry of existing road at start and end of the project highway.

Annex - IV
(Schedule-A)

Environment Clearances

Environmental Clearance is not required as per MoEFCC Notification 23rd March 2020.

SCHEDULE - B

(See Clause 2.1)

Development of the Project Highway

1. **Development of the Project Highway**

Development of the Project Highway shall include detailed design, including plan & profile within available ROW and construction of the Project Highway as described in Schedule-B and Schedule-C. The alignment plans of the Project Highway are given in Annex-III of Schedule A which is minimum requirement and are for guidance only. The proposed plan & profile, locations of different structures / drains / slip road / retaining walls, chainages of different structures / drains / slip road / retaining walls, length of different structures / drains / slip road / retaining 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 Contractor shall finalise Detailed Project Report (DPR) including plan & profile of the project highway and submit the same to Authority and its Engineer for acceptance, before the start of the execution of project.

2. **Rehabilitation and Augmentation**

Rehabilitation, upgradation and augmentation shall include Four Laning of the Project Highway as described in Annex-I of this Schedule-B and Schedule-C.

3. **Specifications and Standards**

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

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:84-2019, the proposed plan & profile, locations of different structures / drains / service road / RE walls, chainages of different structures / drains / service road / RE walls, length of different structures / drains / service 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 Contractor 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 Laning with paved shoulders shall be undertaken. The paved carriageway shall be 18.0 m for four laning (including paved shoulder and kerb shyness / edge strip). The earthen shoulder shall be 2 m on either sides. (Circular: NHAI/Bharatmala/EC/DPR/2016/ 143430 dated 30.10.2019).

1.1.2. In built-up sections / areas the width of paved carriageway shall be 19.0 m for four 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. 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.

1.2. **Width of Median**

1.2.1. The width of median including kerb shyness shall be 5.0 m for raised median. In built up section the width of median shall be 4.0 m.

1.2.2. A suitable shrub shall be proposed in median portion. (clause No. 2.5.6 of IRC:SP:84-2019).

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 summit curves including structures as well as highways. (clause No. 2.9.5 of IRC:SP:84-2019).

2.2. Design Speed

The project highway passes through plain & rolling terrain, the project road shall be designed for 100 kmph. (clause No. 2.2 of 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.

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

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:

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

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

2.4. Right of Way

Details of the Right of Way along Project Highway 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 of IRC:SP:84-2019).

2.5.3. In Built-up sections, footpaths / fully paved shoulder shall be provided with width 1.5 m. (Clause No. 2.15 of IRC:SP:84-2019).

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

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

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

2.6. **Lateral and Vertical Clearance at Underpasses**

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

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

2.7. **Lateral and vertical clearances at Overpasses**

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

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 the manual.

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

Sr. No.	Design Chainage (km)		Length (m)		Paved Carriageway Width including paver block (m)	Total (m)	Remarks
	From	To	LHS	RHS			
1	170+300	171+340	1040	1040	6.5	2080	
2	171+422	171+900	478	478	6.5	956	

Sr. No.	Design Chainage (km)		Length (m)		Paved Carriageway Width (m)	Total (m)	Remarks
	From	To	LHS	RHS			
1	193+310	193+480	-	170	7.0	170	
2	196+004	196+090	86	-	5.5	86	
3	196+163	196+200	37	-	5.5	37	
4	196+277	196+340	63	-	5.5	63	
5	205+300	205+320	20	-	5.5	20	
6	205+455	205+790	335	-	5.5	335	
7	205+855	206+055	200	-	5.5	200	
8	220+745	220+800	-	55	7.0	55	
9	224+953	225+100	147	-	5.5	147	
10	225+000	225+050	-	50	5.5	50	

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

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

2.8.4. **Slip Road:** The height of embankment of slip road shall confirm to clause 4.2.1 of manual.

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			
Nil							

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

A separator between main carriageway and service 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 Contractor in accordance with the approved plan & profile and design approved from the Authority 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 of IRC:SP:84-2019)

2.9. **Grade Separated Structures** (clause No. 3.4 of 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 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 50 m before / after the start / end of approach road to grade separator i.e. start / end of valley curve (clause No. 2.12.2.2 of 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. (Clause 7.1 (vii) of IRC:SP:84-2019).

50 m 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 of IRC:119)

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

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	Remarks
Nil								

2.9.2. Vehicle Underpasses (VUP)

Sr. No.	Design Chainage (km)	LHS Roadway Width (m)	RHS Roadway Width (m)	Super Structure Provision in Median	Span Arrangement (m)	Minimum Vertical Clearance (m)	Skew Angle	Remarks
The details are as included along with ROB under 7.4.2 of Schedule-B.								

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	Remarks
Nil								

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	Remarks
Nil								

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	Remarks
Nil								

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

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

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

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
Nil				

2.9.8. Elevated Portion

Sr. No.	Design Chainage (km)	LHS Roadway Width (m)	RHS Roadway Width (m)	Super Structure Provision in Median	Span Arrangement (m)	Minimum Vertical Clearance (m)	Skew Angle	Remarks
The details are as included along with ROB under 7.4.2 of Schedule-B.								

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

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

Sr. No.	Design Chainage (km)		Length (m)	TCS Type	Cross Section Description
	From	To			
1	170+000	170+300	300	TCS-01	Reconstruction of existing carriageway - Open Country (Concentric Widening)
2	170+300	170+890	590	TCS-02	Reconstruction of existing carriageway - Built up area (Concentric Widening)
3	170+890	171+320	430	TCS-03	Four Lane ROB Approach with 4.0 m median
4	171+320	171+340	20	TCS-04(b)	Four Lane ROB Viaduct (Non-Railway portion)
5	171+340	171+422	82	TCS-04(a)	Four Lane ROB Viaduct (Railway portion)
6	171+422	171+556	134	TCS-04(b)	Four Lane ROB Viaduct (Non-Railway portion)
7	171+556	171+900	344	TCS-03	Four Lane ROB Approach with 4.0 m median

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. RE wall shall be provided for full height on all structures. (clause No. 7.1 (iv) of IRC:SP:84-2019)

4. Toe wall (0.6 m height) 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. 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 summit curves including structures as well as highways. (clause No. 2.9.5 of IRC:SP:84-2019).

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

8. The provision of merging and de-merging arrangement as per Manual after km. 171+900 is in the scope of Contractor**.**

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

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

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

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

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

(a) Major Junctions

Sr. No.	Design Chainage (km)	Junction Type	Leads to		Median Opening	Category of Cross Road	Carriageway width of cross road	Length of cross road to be developed	
			Left	Right				LHS	RHS
1	170+515	T	Chakkian	-	Yes	NH-703B	7.0 m	250 m	-
2	170+600	T	-	Mallanwala	Yes	NH-703A	7.0 m	-	250 m
3	170+785	T	Chakkian	-	Yes	NH-703B	7.0 m	250 m	-

(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	170+985	T	-	-	No	VR	5.5 m	-	50 m
2	171+005	T	-	-	No	VR	5.5 m	50 m	
3	171+200	X	-	-	No	VR	5.5 m	50 m	50 m
4	171+610	T	-	-	No	VR	5.5 m	-	50 m
5	171+625	T	-	-	No	VR	5.5 m	50 m	-

Note:

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

2. The Contractor 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 m and then to be merged with the cross road at the gradient not more than 1:50. (Clause No. 3.2.2 of IRC:SP:84-2019)

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 of IRC:SP:84-2019)

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

3.2. **At-Grade Intersections below Grade Separators / Interchanges:** These shall be provided as given at para 2.9 of this Annexure-I of the Schedule B. (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 cross road to be developed	
			Left	Right				LHS	RHS
1	171+330	T	-	-	Yes	VR	7.0 m	50 m	-
2	171+405	T	-	-	No	VR	3.5 m	50 m	-
3	171+470	T	-	-	No	VR	7.0 m	50 m	-
4	171+535	X	-	-	Yes	VR	5.5 m	50 m	50 m

Note:

1. The Contractor 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 Authority Engineer

4. Only Entry or Exit shall be designed at any location (provision of entry / exit by ghost island not permitted). (Clause No. 2.13.1 of 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 A shall be treated as a minimum requirement.

Based on site / design requirement, the Contractor shall design the alignment plans and profiles of the project highway based on site / design requirement mentioned in Schedule-B with approval from the 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 then, suitable soil retaining structures shall be provided (Clause No. 4.2 IRC:SP:84-2019)

For stability of slope upto 3 m height the turfing can be adopted. For the slope from 3-6 m suitable, geocell, geo-grid, geo-green etc. can be provided with suitable drainage chutes as per IRC:56. For the slope more than 6 m 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 4 x 4 m and suitable drains / chutes etc. shall be provided for effective drainage of the water.

5. **Pavement designs**

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 of IRC:SP:84-2019)**

The pavement shall be flexible type for entire length of project highway including service road.

5.2.1. Design Period and Strategy: The Flexible 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%. 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 Contractor shall design the pavement of main carriageway for minimum design traffic of 85 MSA.

5.2.3. The pavement for service roads shall be designed for projected traffic of minimum of 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	125
BC	40

5.3.2. **Crossroads / Service Roads / Slip Roads**

Pavement Composition	Minimum Crust Thickness (mm)
Subgrade	500
GSB	200
WMM	250
DBM	50
BC	40

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

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

Sr. No.	Design Chainage (km)		Pavement Composition	Remarks
	From	To		
1	170+000	170+890	Same as 5.3.1	

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

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

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

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 of IRC:SP:84-2019)

i. New Construction:

Sr. No.	Design Chainage (Km)		Length (m)		Width of Drain (m)	Total Length (m)
	From	To	LHS	RHS		
1	170+200	170+310	110	-	1.5	
2	170+310	170+860	550	550	1.5	
3	170+860	170+925	65	-	1.5	
4	170+925	170+950	25	-	1.5	
5	170+950	171+100	150	150	1.5	
6	171+100	171+200	100	-	1.5	
7	171+200	171+220	20	20	1.5	
8	171+220	171+270	50	-	1.5	
9	171+270	171+485	215	215	1.5	
10	171+485	171+555	70	-	1.5	
11	171+555	171+635	80	80	1.5	
12	171+685	171+715	-	30	1.5	
13	171+715	171+900	185	185	1.5	
	Sub Total on each side		**1620**	**1230**		
	Total		**2850**			

In addition to the above chainages, new RCC drain shall be constructed at the following locations in consultation with Authority Engineer at Site.

Sr. No.	Design Chainage (Km)		Length (m)		Width of Drain (m)	Total Length (m)
	From	To	LHS	RHS		
1	171+900	172+499	-	599	1.5	
2	Village Ratol Rohi		100		1.5	
3	Village Sekhwan		295		1.5	
4	Village Kot-Karor Kalan		390		1.5	
5	Village Tehna		120		1.5	
	Total		**1504**			

ii. Re-construction:

Sr. No.	Design Chainage (Km)		Length (m)		Width of Drain (m)	Total Length (m)
	From	To	LHS	RHS		
1	170+860	170+925	-	65	1.5	
2	171+485	171+555	-	70	1.5	
	Sub Total on each side		**-**	**135**		
	Total		**135**			

iii. Retention:

Sr. No.	Design Chainage (Km)		Length (m)		Width of Drain (m)	Total Length (m)
	From	To	LHS	RHS		
1	170+200	170+310	-	110	1.5	
2	170+925	170+950	-	25	1.5	
3	171+100	171+200	-	100	1.5	
4	171+220	171+270	-	50	1.5	
5	171+635	171+685	-	50	1.5	
6	171+635	171+715	80	-	1.5	
	Sub Total on each side		**80**	**335**		
	Total		**415**			

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 of IRC:SP:84-2019)

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

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

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 3 m** (Clause No. 6.4 of IRC:SP:84-2019)

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)

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

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 of IRC:SP:84-2019)

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)

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 100 mm 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 lane configuration. Special vehicle loading is to be considered in design of all bridges, culverts and structures.

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 of IRC:SP:84-2019)

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

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

Sr. No.	Location at km	Skew Angle	Footpath Width (m)		Remarks
			Left	Right	
1	ROB @ 171+387	3^0	1.5 m	1.5 m	

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 Section 2.10 of the Schedule-B.

7.2. **Culverts** (Clause No. 7.3 i of IRC:SP:84-2019)

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 (km)	Culvert Type	Skew Angle	Span / Opening (m)	New / Reconstruction	Culvert Crossing Type (Balancing / Stream, etc)	Remarks
Nil							

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

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 (km)	Culvert Type	Skew Angle	Span / Opening (m)	New / Reconstruction	Culvert Crossing Type (Balancing / Stream, etc)	Remarks
Nil							

7.2.4. **Construction of Box Culverts**

7.2.5. **New / Reconstruction of existing 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	170+522	1 x 2 x 2	-	Balancing	

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 of IRC:SP:84-2019)

Sr. No.	Design Chainage (km)	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 (m)	Remark
Nil					

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

7.3. **Bridges**

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

1. Existing bridges proposed for reconstructed as new structures: 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 iv(a) of IRC:SP:84-2019)

Sr. No.	Design Chainage (km)	Total Proposed length (m)	Type of Crossing	Total Proposed width (m)		Skew Angle
				MCW	SR	
1	171+575	11.0	Stream	1 x 23	2 x 8.8	-

2. Existing narrow bridges proposed to be retained and widened: (Clause No. 7.3 iv of IRC:SP:84-2019)

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

7.3.2. **Additional New Bridges:** New bridges at the following locations on the Project Highway shall be constructed. (Clause No. 7.3 ii of IRC:SP:84-2019)

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

7.3.3. The railings of existing bridges shall be replaced by crash barriers at the following locations: (Clause No. 7.17 iv of IRC:SP:84-2019)

Sr. No.	Design Chainage (km)		Length (km)	Remarks
	From	To		
Nil				

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) of IRC:SP:84-2019)

Sr. No.	Location at km	Rehabilitation Proposals	Remarks
Nil			

7.3.5. **Structures in marine environment:** Nil

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

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	171+387	1 x 19.24 (VUP) + (1 x 25.25 + 1 x 37.28 + 1 x 19.24) [ROB] + 7 x 19.24 (Elevated portion)	Simply supported steel composite girder (Railway portion) & PSC girder (Non-Railway portion)	Makhu Town	2 x 12.30	3°	Approved GAD is placed in Drawing Volume

Note:

1. If the length / width of the span / type of super-structure is changed due to any reason the COS shall be considered.
2. 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.
3. The ROB shall be constructed and maintained by the Contractor under supervision of the Railways.
4. 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 Contractor.

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						

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

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 of IRC:103 and Clause No. 9.8.5 of IRC:SP:84-2019)

FoB / Skywalks shall be provided in build-up areas / near schools.

Sr. No.	Location at km	FoB Type	Remarks
Nil			

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

Sr. No.	Name of the Structure	Total Numbers	Remarks
1	Major Bridge	-	
2	Minor Bridge	1	
3	VUP + ROB + Elevated portion	1	
4	VUP (Single Span)	-	
5	VUP (Multi Span)	-	
6	LVUP	-	

Sr. No.	Name of the Structure	Total Numbers	Remarks
7.	SVUP	-	
8.	FoB	-	
9	Box Culverts	-	
10	Pipe Culverts	1	

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:84-2019.

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 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) of IRC:SP:84-2019)

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

The details of the location are as below:

Sr. 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	170+300	170+890	170+300	17+890	1180	
		170+890	171+320	170+890	171+320	860	
		171+320	171+556	171+320	171+556	944	
		171+556	171+900	171+556	171+900	688	
7	Concrete Double faced barriers	-	-	-	-	-	
8	Pedestrian guardrails	171+340	171+422	171+340	171+422	164	
9	End Treatment for Steel Barriers	-	-	-	-	-	As required

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)		
Nil				

11. **Special Requirement**

Retaining Structure and protection works shall be provided at locations as indicated below and as provided in TCS schedule in cl. 2.10 of schedule-B.

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

12. **Open Well within RoW**

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

Sr. No.	Design Chainage (km)	Well Dimension	Well Depth	Filling Material for Well	Slab on Top of Well (Yes / No)	Remarks
Nil						

13. **Shifting of Utilities**

The Contractor 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 Contract Agreement.

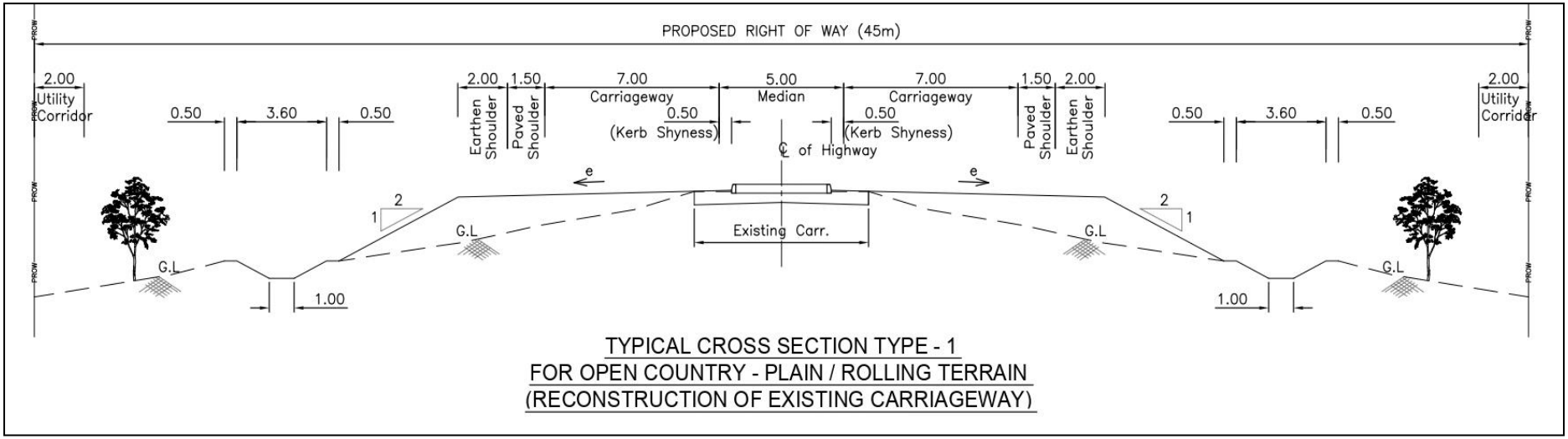
The details of the existing utilities to be shifted are mentioned in Annexure-I to Schedule-A. A copy of Utility Shifting Plan is enclosed for reference.

14. **Work Zone Traffic Management Plans** (Clause No. 9.9 of IRC:SP:84-2019) Annexure-ii Schedule B- Typical Cross Sections

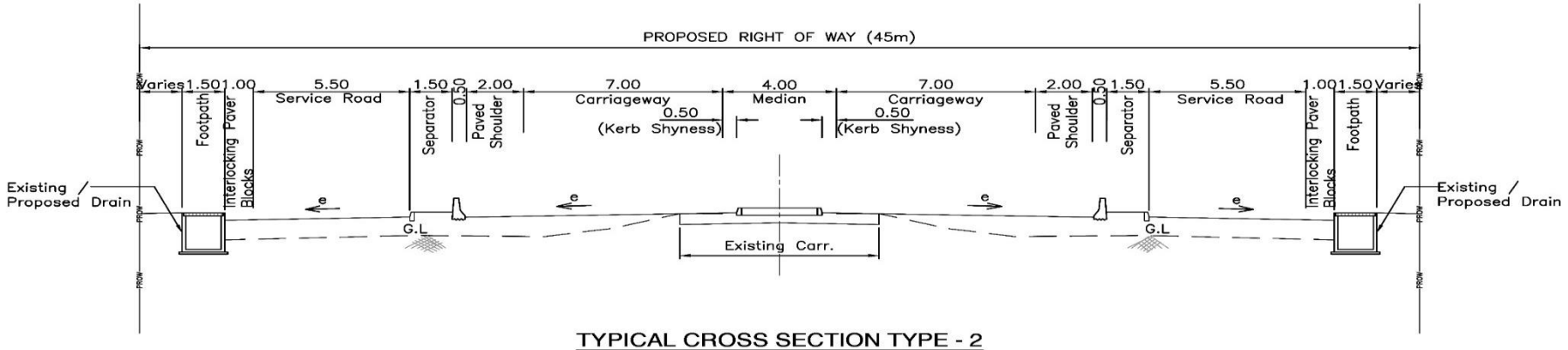
The traffic diversion plans shall be prepared as per IRC:SP:55 for smooth flow of traffic and safety. A diversion plan shall be proposed for construction of Culvert, Grade Separated Structures, Bridges, RoB / RUB, etc. and traffic management plan for widening / reconstruction of carriageway.

Annexure - II *(Schedule - B)*

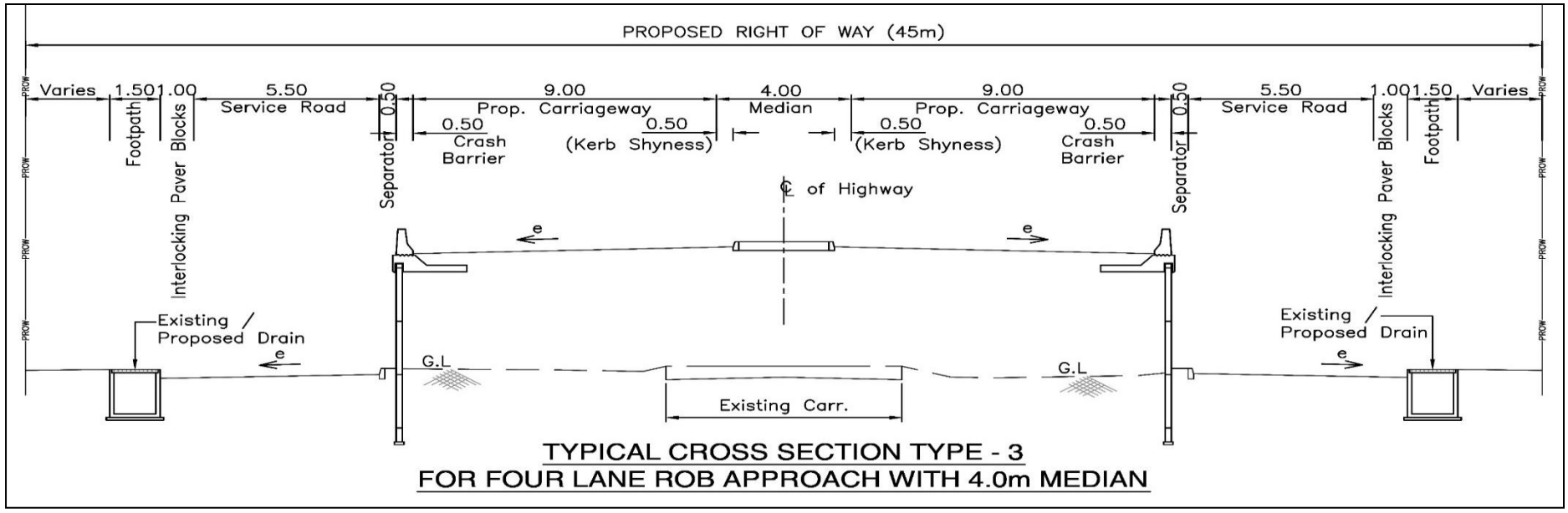
Typical Cross Sections



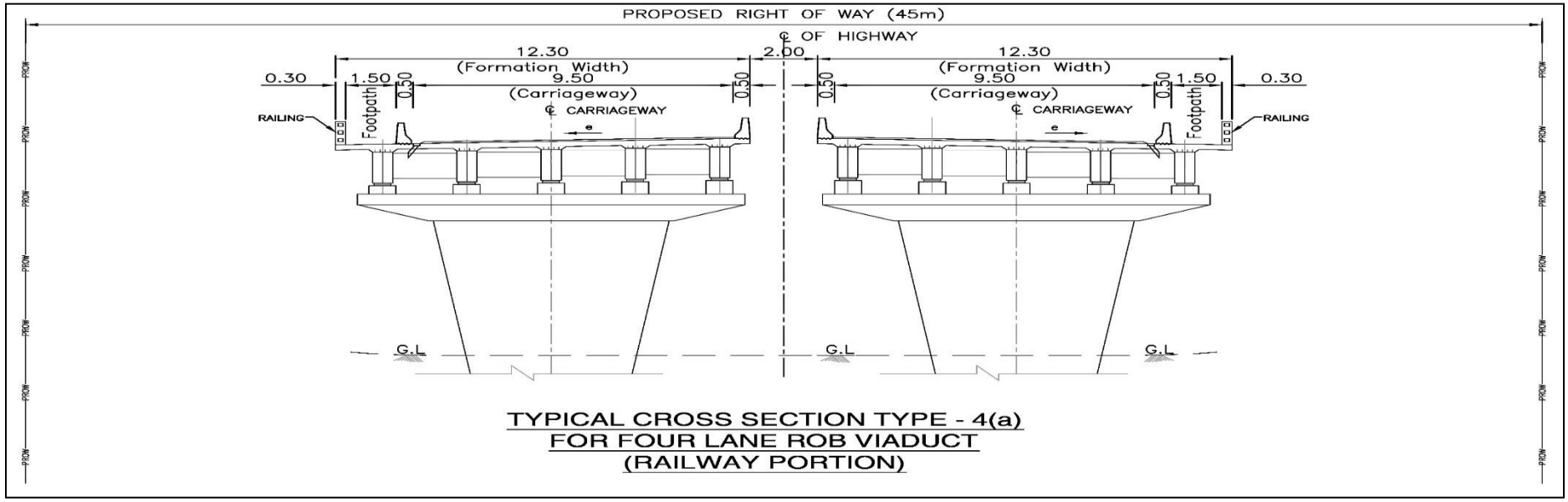
TYPICAL CROSS SECTION TYPE - 1
FOR OPEN COUNTRY - PLAIN / ROLLING TERRAIN
(RECONSTRUCTION OF EXISTING CARRIAGEWAY)



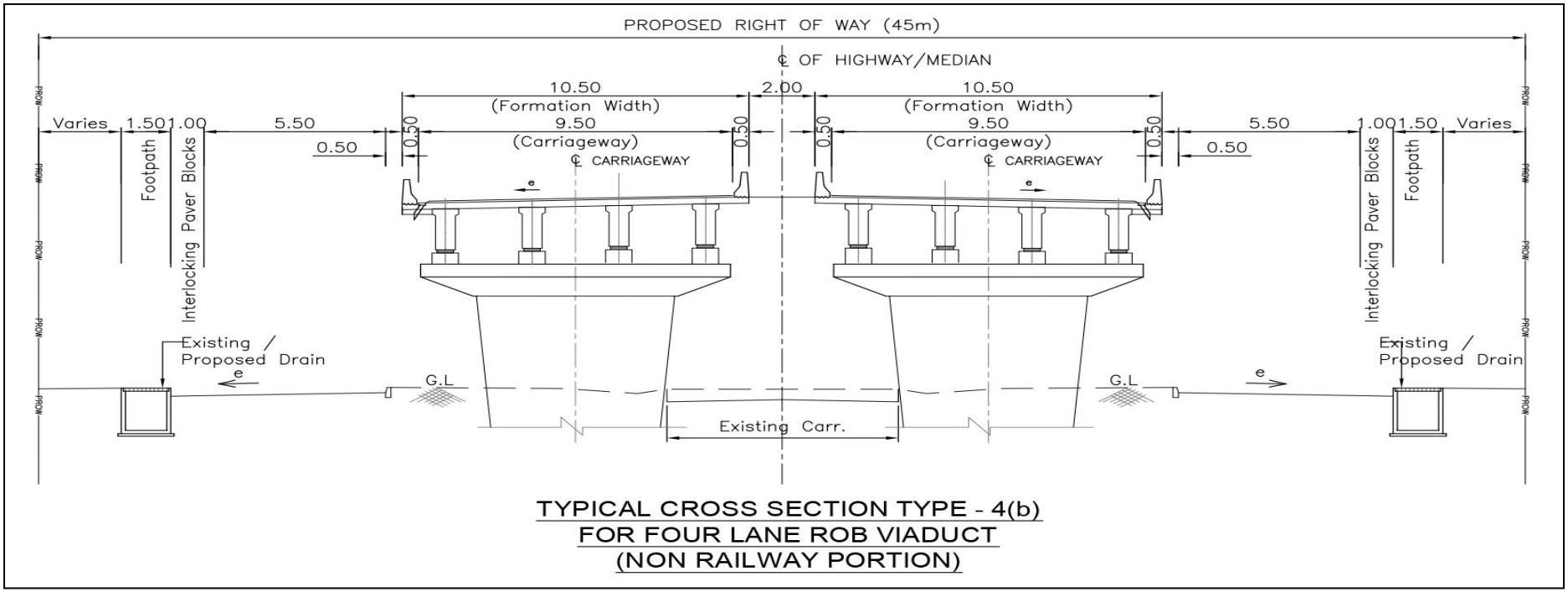
TYPICAL CROSS SECTION TYPE - 2
FOR BUILT-UP SECTION - PLAIN / ROLLING TERRAIN
(RECONSTRUCTION OF EXISTING CARRIAGEWAY)



TYPICAL CROSS SECTION TYPE - 3
FOR FOUR LANE ROB APPROACH WITH 4.0m MEDIAN



TYPICAL CROSS SECTION TYPE - 4(a)
FOR FOUR LANE ROB VIADUCT
(RAILWAY PORTION)



TYPICAL CROSS SECTION TYPE - 4(b)
FOR FOUR LANE ROB VIADUCT
(NON RAILWAY PORTION)

Annexure - III

(Schedule - B)

The Plan & Profile and General Arrangement Drawing (GAD) of structures of the Project highway are provided along with Bid Documents.

SCHEDULE - C

(See Clause 2.1)

PROJECT FACILITIES

1. Project Facilities

The Contractor 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 - I
(Schedule-C)

PROJECT FACILITIES

1. Project Facilities

The Contractor 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 of IRC:SP:84-2019 at the following locations:

Sr. 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					

2. Roadside furniture

2.1. **Kilometer and Hectometer Stones** (Clause No. 12.3 of IRC:SP:84-2019)

Sr. No.	Item	Number	Remarks
1	**Kilometer Marker / Stones**	(2 x 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 (Service Road length is more than 1 km).
2	**Hectometer Marker / Stones**	(8 x No. of kms)	

2.2. **Traffic Signs** (Clause No. 9.2 of IRC:SP:84-2019)

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 of 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 of IRC:SP:84-2019)

The siting of signs shall confirm to Table 4.1 and Fig 4.1 of IRC:67. 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 of IRC:67-2022)

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

Sr. No.	Item	Carriageway (Left, Right, Both)
1	Overhead Gantry signs	01 No. at km. 171+000 (towards Amritsar direction on RHS c/w)
2	Overhead Cantilever Gantry Signs	-
3	Double / Butterfly Cantilever	-

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

2.3. **Road Marking** (Clause No. 9.3 of IRC:SP:84-2019)

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 of 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)

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

2.4. **Road Delineators** (Clause No. 9.4 of IRC:SP:84-2019)

Sr. No.	Item	Number/ Length (m)	Remarks
1	Roadway Indicators	-	
2	Median Marker on Median / RCC Barrier (Clause 4 of IRC:79-2019)	km. 170+300 to km. 171+900	
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	-	
5.	Solar Blinkers on Median Opening, on exit from main carriageway and traffic islands of grade separated intersections	06 Nos. at median openings	

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

2.5. **Reflective Pavement Markers & Solar Studs** (Clause No. 9.5 of IRC:SP:84-2019)

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.

2.6. **Traffic Impact Attenuators** (Clause No. 9.6 of 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.

Sr. No.	Item	Chainage / Number	Remarks
1	On flyover / grade separated structure at exit from main carriageway	km. 170+300, km. 170+515, km. 170+600, km. 170+785, km. 171+900 / 5 Nos.	
2	On Island of Toll Plaza	-	
3	Any other location which Safety Hazard	-	

2.6.2. **Providing End Terminals**

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.

Sr. No.	Item	Chainage / Number	Remarks
1	Culvert Ends	-	
2	Structures Ends	ROB at km. 171+387 (median side on both ends)	
3	Any other location which Safety Hazard	-	

2.7. **Boundary wall and Fencing** (Clause No. 12.2 of IRC:SP:84-2019)

Deleted.

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

Deleted.

4. **Way side Amenities / Service Areas / Rest Area** (Clause No. 12.9 of IRC:SP:84-2019)

Deleted.

5. **Truck lay-byes:** (Clause No. 12.6 of IRC:SP:84-2019)

Deleted.

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

Deleted.

7. **Pedestrian Facilities** (Clause No. 9.8 of IRC:SP:84-2019)

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:

Sr. No.	Pedestrian facilities	Chainage (km)		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	170+515 170+600 170+785		03 locations	

Sr. No.	Pedestrian facilities	Chainage (km)		Side	Remarks
		From	To		
	iii.At Intersections iv.At Schools				

8. **Highway Lighting** (Clause No. 12.5 of IRC:SP:84-2019)

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:

Sr. 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 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	170+890	171+900	Both side	Electricity Board

Sr. No.	Lighting facilities	Chainage		Side	Lighting Source: Electricity Board / Generator / Solar
		From	To		
	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	170+300 171+400	171+320 171+900	Both side	Electricity Board
7	**On Median Openings provide 1 no. high mast lighting of 25m height**	170+515 170+600 170+785		-	Electricity Board
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 rainwater harvesting shall be provided along the side drains at the lowest point / where the water stagnates.

10. **Environmental Management Plan**

The Contractor 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.

11. **Land Scaping and Tree Plantation** (Section 11 of IRC:SP:84-2019)

The Contractor 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.

Sr. 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	Landscaping plans will be submitted by the Contractor which shall include ornamental trees, decorative statues and landscaping	The number of Ornamental type plantation and other things shall be decided on the

Sr. No.	Types of Plantation	Location (km)	Number of trees to be planted	Remarks
		Vacant space below the flyovers		basis availability of land.
3	Plantations	Available open land within ROW	1 row of 333 plants on each side of project highway.	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, 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 Contractor shall maintain the trees and shrubs in good condition during the concession period as per the concession agreement.

12. Advanced Traffic Management System (ATMS)

Deleted.

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

Deleted.

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

Deleted.

15. **Crane Service:** (Clause No. 12.12 of IRC:SP:84-2019)

Deleted.

SCHEDULE - D

(See Clause 2.1)

SPECIFICATIONS AND STANDARDS

1 Construction

The Contractor 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 and Standards for Four Laning of Highways (IRC:SP:84-2019), referred to herein as the Manual and relevant IRC codes and international codes applicable.

Latest MoRTH standards and specifications shall be applicable for specifications, methodology, standards, quality control etc., for various activities to be performed during engineering, development, and O&M of Project Highway.

Annex - I

(Schedule-D)

Specifications and Standards for Construction

1 Manual of Specifications and Standards to apply

All Materials, works and construction operations of the Project Highway shall confirm to the "Manual of Specifications and Standards for Four Laning of Highways" published as IRC:SP:84-2019 with all amendments and additions till date (Referred to as "Manuals" in this Schedule) and MORTH Specifications for Road and Bridge Works (5th revision). Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2 Deviations from the Specifications and Standards

2.1 The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively.

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

Sr. No.	Clause No.	Details of item	Description of Deviation
1	2.3	Right of Way	RoW shall be as specified in Annexure-II of Schedule-A.
3	2.5.1	Width of Median	Median shall be as given in Schedule-B (TCS).
4	2.6.1	Width of Shoulder	Width of the paved shoulder shall be 1.5 m for open country and 2.0 m for built-up locations.
5	2.9.5	Sight Distance	Stopping Sight Distance shall be adopted for the following locations: 1. km. 171+100 to km. 171+350 2. km. 171+420 to km. 171+670
6	2.9.6.2	Gradients	Limiting Gradient of 3.3% shall be adopted for the following locations: 1. km. 170+960 to km. 171+230 2. km. 171+540 to km. 171+820
7	2.10	Lateral Clearance	Lateral Clearance shall be as given in Schedule-B.
8	2.16	Utility Corridor	Utility corridor shall be provided as per availability of land at Site.
9	2.17	Typical Cross Section	Typical Cross Section shall be as given in Schedule-B.
10	3.2	At-Grade Intersections	Design of all At-Grade Intersections (Major and minor) shall be within RoW of Project Road and Intersecting Road. No additional land acquisition is proposed.
11	5.2	Type of pavement	The type of pavement shall be as specified in Schedule-B.
12	7.3	Height and Width of Structure	The overall deck configuration of all structures shall be as per Schedule-B (TCS).

Sr. No.	Clause No.	Details of item	Description of Deviation
13	12.2	Road Boundary Walls (RBW)	Road Boundary Stones shall be provided as specified in Schedule-C.