SCHEDULE -B
(See Clause2.1)

Development of the Project Highway

1 Development of the Project Highway

Development of the Project Highway shall include design and construction of the Project Highway as described in this Schedule-B and in Schedule-C.

2 Rehabilitation and augmentation

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

Annex - I

(SCHEDULE-B)

DESCRIPTION OF TWO-LANING

1 WIDENING OF THE EXISTINGHIGHWAY

1.1 The Project Highway shall follow the proposed alignment as specified by the Authority and shown in the alignment plans specified in Annex III of Schedule-A. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for hilly terrain to the extent land is available.

1.2 WIDTH OFCARRIAGEWAY

1.2.1 Construction of Two-Lane pavement without paved shoulders shall be undertaken. The paved carriageway shall be 7 m wide with hard shoulders in accordance with the typical cross sections drawings.

1.2.2 Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to paragraph1.1above.

2 GEOMETRIC DESIGN AND GENERALFEATURES

2.1 General

Geometric design and general features of the Project Highway shall be in accordance with Section 2 of the Two Lane Manual (IRC : SP 73 -2018).

2.2 Design speed

The design speed shall be the minimum design speed of 30 km per hour and ruling design speed of 50 km / per hour for hilly terrain.

2.3 Improvement of the existing road geometrics

Improvement of the existing alignment geometrics shall be carried out as per section 2 of the Two Lane Manual (IRC : SP 73 -2018).

2.4 Right of Way

Details of Right of way are given in Annex-II of Schedule-A.

2.5 Rectification of earthwork including subgrade required in following chainages.

Chainage (Km)		Side	Length (Km)
From	To		
59+310	59+430	B/S	0.120
59+716	59+740	B/S	0.024
59+580	59+620	B/S	0.040
62+300	62+520	B/S	0.220
58+672		LHS	0.057
58+680		LHS	
58+700		LHS	
58+720		LHS	
58+725		LHS	
58+733		LHS	
58+740		LHS	
58+760		LHS	
58+775		LHS	
58+830		LHS	
58+860		LHS	
58+873		LHS	
58+883		LHS	
58+885		LHS	
58+900		LHS	
58+975		LHS	
58+987		LHS	
58+990		LHS	
58+995		LHS	
59+005		LHS	
59+010		LHS	
59+018		LHS	
59+020		LHS	
59+025		LHS	
59+185		LHS	
59+190		LHS	
59+200		LHS	
59+280		LHS	
59+290		LHS	
59+300		LHS	
61+190		LHS	
61+450		LHS	
61+660		LHS	
61+720		LHS	
61+760		LHS	
61+820		LHS	

61+830	LHS	
61+840	LHS	
61+970	LHS	
61+980	LHS	
62+050	LHS	
62+100	LHS	
62+145	LHS	
62+150	LHS	
62+170	LHS	
62+175	LHS	
62+180	LHS	
62+190	LHS	
62+239	LHS	
62+570	LHS	
62+590	LHS	
62+600	LHS	
62+620	LHS	
62+670	LHS	
62+775	LHS	
62+790	LHS	
Total=		0.461

2.5 Type ofshoulder

The shoulder shall be hard granular shoulder on both sides of the carriageway as per typical Cross Sections provided in para 2.11 of this Schedule B.

2.6 Lateral and vertical clearances at underpasses

2.6.1 Lateral and vertical clearances at underpasses and provision of guardrails / crash barriers shall be as per paragraph 2.11 of the Two Lane Manual (IRC : SP 73-2018).

2.6.2 Lateral clearance: The width of the opening at the Vehicle Underpasses shall be asfollows.

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

2.7 Lateral and vertical clearances at overpasses

2.7.1 Lateral and vertical clearances at overpasses shall be as per paragraph 2.12 of the Two Lane Manual (IRC : SP 73-2018).

2.7.2 Lateral clearance: The width of the opening at the overpasses shall be asfollows:

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

2.8 Service Roads

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

Sl. No.	Existing Location of Service road (from km to km)	Proposed Location of Service road (from km to km)	Right hand side (RHS)/Left hand side (LHS)/ or Both sides	Length (km) of Service road
NIL				

2.9 Grade separated structures

2.9.1 Grade separated structures shall be provided as per paragraph 2.14 of the Two Lane Manual (IRC: SP 73 -2015). The requisite particulars are given below and GADs are annexed at Annexure"D":

Sl. No.	Existing Chainage of the structure	Design Chainage of structure	Length (m)	Number and length of spans (m)	Approach gradient	Remarks, if any
NiL						

2.10 Cattle and Pedestrian Underpass/Overpass

Cattle and pedestrian underpass/ overpass shall be constructed as follows: [Refer to paragraphs 2.14.3 of the Two Lane Manual (IRC: SP 73 -2015) and specify the requirements of cattle and pedestrian underpass/ overpass]

Sl. No.	Location	Span/opening (m)	Type of crossing
NiL			

2.11 Typical cross-sections of the Project Highway

Typical Cross-Sections of the Project Highway are tabulated below –

Sl. No.	Design Chainage (Km)		Length (in m, after structure length deduction)	TCS Type	Widening Details	Shoulder
	From	To				
1	51.825	63.131	10.846	TCS I	New Two lane in Open areas	1.5 m Hard Shoulder on hill side and 1.9 m on Valley side

3 INTERSECTIONS AND GRADESEPARATORS

All intersections and grade separators shall be as per Section 3 of the Two Lane Manual (IRC: SP 73 - 2015).

Existing intersections which are deficient shall be improved to the prescribed standards.

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

(a) At-gradeintersections

Sl. No.	Existing Chainage (Km)	Design Chainage (m)	Type of Junction	Side	Remarks
1	0.00	51825	T	RHS	Start of Bypass
2	6.400	58455	Y	LHS	
3	10.900	62925	Y	LHS	
4	11.112	63131	T	LHS	End of Bypass

(b) Grade separated intersection with/*without* ramps

Sl. No.	Location	Salient Features	Minimum length of Viaduct to be Provided	Road to be carried over / under the structures
NIL				

4 ROAD EMBANKMENT AND CUTSECTION

4.1 Widening of the existing alignment and construction of new road embankment/ cuttings shall conform to the Specifications and Standards given in section 4 of the Two Lane Manual (IRC: SP 73 -2015) and the specified cross sectional details. Deficiencies in the plan and profile of the existing road shall be corrected.

4.2 The proposed road including raising shall be constructed as per FRL mentioned in Plan & Profile as attached in annex 3 of schedule A.

5 PAVEMENTDESIGN

5.1 Pavement design shall be carried out in accordance with Section 5 of the Two Lane Manual (IRC: SP 73-2015).

5.2 Type of pavement

Flexible pavement shall be adopted for Project Highway in accordance with Clause 2.2 of IRC:37-2012 identifies four type of flexible pavements. The estimated cost of civil works is based on flexible pavements consisting of Granular base, Sub base, DBM and BC. Since, the successful bidders under EPC mode can use any type of four flexible pavements mentioned Clause 2.2 of IRC:37-2012, they may carry out their own diligence to arrive at project cost before submitting bids.

5.3 Design requirements

5.3.1 Design Period and Strategy

The pavement shall be designed for a minimum design period of 15 years. Stage construction shall not be permitted.

5.3.2 Design Traffic

Notwithstanding anything to the contrary contained in this Agreement or the Two Lane Manual (IRC : SP 73 -2015), the Contractor shall design the pavement for entire Project Highway for design traffic of not less than 20 million standards axles (msa).

5.4 Reconstruction / Realignment / Bypass of stretches

5.4.1 The following stretches of the existing road shall be realigned. These shall be designed as new pavement.

Sl. No.	Existing Chainage (m)		Design Chainage (m)		Design Length (m)	Remarks
	From	To	From	To		
1	0	11112	51825	63131	11306	Complete alignment is proposed as Bypass

5.4.2 The existing alignment shall be constructed as per FRL mentioned in Plan & Profile (Annex III of Schedule A).

6 ROADSIDEDRAINAGE

Drainage system including surface and subsurface drains for the Project Highway shall be provided as per Section 6 of the Two Lane Manual (IRC : SP 73 -2015). How above, Line drains shall be provided in the following stretches –

Sl. No.	Design Chainage (Km)		Length (in m, after structure length deduction)	TCS Type	Drain Type
	From	To			
1	51.825	63.131	10846	TCS I	Rectangular drain on HillSide

7 DESIGN OFSTRUCTURES

7.1 General

7.1.1 All bridges, culverts and structures shall be designed and constructed in accordance with section 7 of the Two Lane Manual (IRC : SP 73 -2015) and shall conform to the cross- sectional features and other details specified therein.

7.1.2 Width of the carriageway of new bridges and structures shall be as per figure 7.2 and figure 7.3 of the Two Lane Manual (IRC: SP 73-2015).

7.1.3 The following structures shall be provided with footpaths:

NIL

7.1.4 All bridges shall be high-level bridges.

7.1.5 The following structures shall be designed to carry utility services specified in tablebelow:

Sl. No.	Bridge at Design km	Utility service to be carried	Remarks
1	51.825 (start of Hawai Bypass)	Water Pipe	Nil

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 7 of the Two Lane Manual (IRC : SP 73-2018).

7.2 Culverts

7.2.1 Overall width of all culverts shall be equal to the roadway width of the approaches.

7.2.2 Reconstruction of existing culverts:

Existing Culverts at the following locations shall be re-constructed as new culverts:

Sl. No.	Existing Chainage	Design Chainage	Type of Culvert	Width (m)
1	6+670	58+725	Slab/Box	3
2	6+930	59+000	Slab/Box	3
3	7+010	59+075	Slab/Box	3
4	7+180	59+225	Slab/Box	3
5	7+275	59+335	Slab/Box	3
6	7+350	59+410	Slab/Box	3
7	7+480	59+525	Slab/Box	3
8	7+600	59+640	Slab/Box	3
9	7+810	59+850	Slab/Box	3
10	8+305	60+335	Slab/Box	3
11	8+840	60+870	Slab/Box	3

Sl. No.	Existing Chainage	Design Chainage	Type of Culvert	Width (m)
12	8+955	60+985	Slab/Box	3
13	10+755	62+775	Slab/Box	3
14	10+850	62+865	Slab/Box	3
15	10+905	62+925	Slab/Box	3

7.2.3 Widening of existing culverts **-NIL**

7.2.4 Additional new culverts shall be constructed as per particulars given in the table below:

Sl. No.	Design Chainage	Type of Culvert	Width (m)
1	52135	Slab/Box	3
2	52435	Slab/Box	3
3	52570	Slab/Box	3
4	52760	Slab/Box	3
5	53015	Slab/Box	3
6	53170	Slab/Box	3
7	53320	Slab/Box	3
8	53515	Slab/Box	3
9	53775	Slab/Box	3
10	53995	Slab/Box	3
11	54095	Slab/Box	3
12	54255	Slab/Box	3
13	54575	Slab/Box	3
14	54705	Slab/Box	3
15	54800	Slab/Box	3
16	55090	Slab/Box	3
17	55220	Slab/Box	3

Sl. No.	Design Chainage	Type of Culvert	Width (m)
18	55445	Slab/Box	3
19	55575	Slab/Box	3
20	55705	Slab/Box	3
21	55800	Slab/Box	3
22	56035	Slab/Box	3
23	56145	Slab/Box	3
24	56365	Slab/Box	3
25	56530	Slab/Box	3
26	56640	Slab/Box	3
27	56750	Slab/Box	3
28	56865	Slab/Box	3
29	56980	Slab/Box	3
30	57145	Slab/Box	3
31	57285	Slab/Box	3
32	57440	Slab/Box	3
33	57610	Slab/Box	3
34	57750	Slab/Box	3
35	57910	Slab/Box	3
36	58335	Slab/Box	3
37	58620	Slab/Box	3
38	59335	Slab/Box	3
39	59530	Slab/Box	3
40	59850	Slab/Box	3
41	59990	Slab/Box	3
42	60335	Slab/Box	3
43	60440	Slab/Box	3

Sl. No.	Design Chainage	Type of Culvert	Width (m)
44	60870	Slab/Box	3
45	60990	Slab/Box	3
46	61170	Slab/Box	3
47	61365	Slab/Box	3
48	61485	Slab/Box	3
49	61640	Slab/Box	3
50	61750	Slab/Box	3
51	61850	Slab/Box	3
52	61970	Slab/Box	3
53	62160	Slab/Box	3
54	62440	Slab/Box	3
55	62865	Slab/Box	3

7.2.5 Repairs/replacements of railing/parapets, flooring and protection works of the existing culverts shall be undertaken as follows:

NIL

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

7.3 Minor Bridges

7.3.1 Existing bridges to be re-constructed/widened

(i) Theexistingbridgesatthefollowinglocationsshallbereconstructedasnewstructures **(Minor Bridges)–**

Sl. No.	Existing Chainage (Km)	Design Chainage (m)	Proposed Span in m	Proposed Width in m	Remark
NiL					

GAD is attached at Annex B of annex 1 of this Schedule.

(ii) The following bridges shall bewidened:

NIL

7.3.2 Additional New **MinorBridges**

New minor bridges at the following locations on the Project Highway shall be constructed

Sl. No.	Existing Chainage (Km)	Design Chainage (m)	Proposed Span in mt	Proposed Width in mt	Proposed / Remark
NiL					

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

Sl. No.	Location at km	Remarks
Nil		

7.3.4 Repairs/replacement of railing/parapets of the existing bridges shall be undertaken asfollows:

Sl. No.	Location at km	Remarks
Nil		

7.3.5 Drainage system for bridge decks

An effective drainage system for bridge decks shall be provided as specified in the Two Lane Manual (IRC : SP 73 -2018)

7.3.6 Structures in marine environment

NIL

7.4. Rail-road bridges

7.4.1 Design, construction and detailing of ROB/RUB shall be as specified in section 7 of the Two Lane Manual (IRC : SP 73-2018).

NIL

7.4.2 Roadover-bridges

Road over-bridges (road over rail) shall be provided at the following level crossings, as per GAD drawings attached at Annexure – "C" to this schedule :

Sl. No.	Existing Location of Level crossing / Railway Track (Chainage km)	Proposed Location of Level crossing / Railway Track (Chainage km)	Length of bridge (m)
NiL			

7.4.3 Roadunder-bridges

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

Sl. No.	Location of Level Crossing (Chainage km)	Number and length of span (m)
NIL		

7.5 Grade separated structures

NiL

7.6 Repairs and strengthening of bridges and structures

A. Bridges

The existing bridges and structures to be repaired/strengthened are given below:

NiL

B. ROB /RUB

Nil

C. Overpasses/Underpasses and other structures

Nil

7.7 List of Major Bridges andStructures

7.7.1 The following is the list of the **Major Bridges** and Structures:

(i) Theexistingbridgesatthefollowinglocationsshallbeconstructedasnewstructures **(Major Bridges) -**

Sl. No.	Existing Chainage (Km)	Design Chainage (m)	Proposed Span in m	Proposed Width in m	Proposed/Remark
NiL					

7.7.2 Additional **New Major Bridges**

New major bridges at the following locations on the Project Highway shall be constructed as per 2 Laning ManualSection 7 of the Two Lane Manual (IRC: SP 73 -2018)

Sl. No.	Design Chainage (m)	Proposed Span in m	Proposed Width in m	Proposed/Remark
1	51825	230	As per IRC :SP 73-2018	Steel/RCC /Bow String Girder / Suspended Superstructure with well/pile/rock bolt foundation

8 TRAFFIC CONTROL DEVICES AND ROAD SAFETYWORKS

8.1 Traffic control devices and road safety works shall be provided in accordance with Section 9 of the Two Lane Manual (IRC: SP 73 -2018). (Polymer rumble strips (min. 1700 RM) on hazardous locations specially on shoulders of valley side curves).

8.2 Specifications of the reflecting sheeting: As per the Clause 9.3 of the Two Lane Manual (IRC : SP 73 -2018) of Specification and Standards.

The Tentative quantity of Traffic signages and pavement marking are as tabulated below –

Traffic Signages, Road Marking and other appurtenances			
1	Road Marking: - Lane, Centre Line, Pedestrian crossing		
	Centre line on straight portion	Sqm	448
	Centre line on curve portion	Sqm	170
	Edge Line at Paved Shoulder	Sqm	2261
	Add 15% for Misc. including Pedestrian X-ingsetc	Sqm	432
	Total	Sqm	3311
2	Directional Arrows, letter marking etc.	Nos.	60
3	Advance Direction signs size 1800X1200 mm	Nos.	25
4	Village name boards size 600X900mm	Sqm	8.1
5	Place Identification signs size 1200X900 mm	Sqm	2.88
6	90 cm Triangle	Nos.	30
7	90 cm Octagon	Nos.	30
8	Hazard plate 300X900 mm	Sqm	103.95
9	800 x 600 mm Size	Nos.	35
10	60 Cm circular	Nos.	35
11	Supply and fixing of Micro Prismatic type Retro-Reflective sign plate which is to be fixed on Overhead/ Cantilever structures with the help of G.I. nut bolts	Sqm	51.36
12	Over Head Sign Truss	MT	5.5
13	Boundary Stone (taken 10% of Qty)	Nos.	As per IRC SP :73 2018
14	5th Km Stone -New	Nos.	
15	Ordinary Km Stone	Nos.	
16	Hectometer Stone	Nos.	
17	Delineator	Nos.	250
18	Bollards	Nos.	As per IRC SP :73 2018
19	RCC Guard Post	Nos.	
20	Enamel Paint	Sqm	

9 ROADSIDEFURNITURE

9.1 Roadside furniture shall be provided in accordance with the provisions of Section 9 of the Two Lane Manual (IRC : SP 73-2018).

9.2 The Overhead traffic signs: location and size

Full width overhead sign:1no.

Cantilever overhead signs :2nos. (Locations to be finalized in consultation with Authority's Engineer.)

10 COMPULSORY AFFORESTATION

The number of trees which are required to be planted by the contractor as compulsory afforestation shall be as per Forest Conservation Act and as per the Two Lane Manual (IRC : SP 73 -2018).

In addition Hydro seeding/plantation or similar on hill slopes as slope protection works for minimum 64500Sqm)

11 HAZARDOUSLOCATIONS

The safety barriers, Protective works shall also be provided at the following hazardous locations / lengths:

Sl. No.	Type of Protection works	Minimum Length (m)	Height (range in m)	Remarks
1	Parapet Wall on Valley side	3252		As per manual and codes
2	W-Beam Crash Barrier	2814		
3	Breast Wall	3525	2 – 6 m	
4	RCC Retaining Wall	3797	2 - 4 m	
5	Gabion Wall	1085	2 - 4 m	

12 SPECIAL REQUIREMENTS FOR HILLROADS

All special features shall be provided as per Two Lane Manual (IRC : SP 73 -2018).
The side slope shall be protected by using suitable slope protection measures all along the highway on Hill side and Valley side. The details of the protection work are listed in "Annex B" and the typical sections for the protection works are given in "Annex A".

No any major land slide location is identified along the Project alignment, however Contractor shall identify other areas if found after excavation and provide the suitable protection measures to stabilize all the landslide zones. A report on the land slide zones shall be furnished along with the design for the review of the Authority Engineer. No change of scope shall be considered for the additional protection measures, if any.

13 Utilities

Provision of accommodating utilities shall be made both over as well as underground wherever required.

14 Change of Scope

The length of Structures and bridges specified hereinabove shall be treated as an approximate assessment. The actual lengths as required on the basis of detailed investigations shall be determined by the Contractor in accordance with the Specifications and Standards. Any variations in the lengths specified in this Schedule B shall not constitute a Change of Scope, save and except any variations in the length arising out of a change of scope expressly undertaken in accordance with the provisions of Article13.

15.0 Slope Protection Measures

15.1.1 Breast Wall and Retaining Wall

Following measures shall be adopted:

Slope protection along hill slope side shall be with breast walls with PCC minimum M15 grade concrete. However, at the zones prone to sliding breast walls will be of sausage type (by stone-mesh gabions). Retaining wall has been considered at valley sides. The height of breast walls is varying from 1.5 m to 3m as per site requirement and to be finalized by consultation with Authority Engineers. The breast wall of height 3m has been considered if the height of hill cut is more than 9m and in this circumstances 3m berm with catch water drain is required to be provided. The maximum cut slope at hill side is 55^0 (0.7H to 1V).

15.1.2 Embankment less than 3m in height shall be turfed as per MoRTH Specifications.

15.1.3 Vetiver Plantation, Hydro Seeding and Hydro Mulching etc or similar works is to be done for slope protection and site mitigation measure upto a height of 12-15 m all along the slopes in each cutting locations except hard rock location which needs to be protected with appropriate applicable technologies, if required.

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