Annex 1

(Schedule-B)

Project is construction, improvement of the existing single lane road to two lane with paved shoulder in accordance with IRC-SP: 73:2015, IRC-SP: 48:1998 and other relevant codes including standard good practice of the road construction. -

1. SCOPE OF THE PROJECT

1.1 GENERAL

The following sections of this schedule briefly highlight the scope of the work of the 'Project'. The descriptions of the requirements for the various elements of the Project Highway given herein under are the bare minimum requirements for the 'Project'.

In the planning, design and execution of the works and other works in connection with the repair, maintenance or improvement of the Project Highway and functions associated with the construction of the Project Highway and roadside facilities, the Construction Contractor shall take all such actions and do all such things (including, but not limiting to, organizing itself, adopting measures and standards, executing procedures, including inspection procedures and highway patrols, and engaging and managing agents and employees) as will;

a. enable the NHIDCL to provide an acceptably safe highway in respect of its condition (structural safety) and use (road safety);
b. enable the NHIDCL to fulfill its statutory and common law obligations;
c. enable the NHIDCL to provide a congestion free uninterrupted flow of traffic on the Project Highway;
d. enable the NHIDCL to provide a level of highway service to the public not inferior to that provided on the trunk road during construction or improvement works;
e. enable the police, local authorities, and others with statutory duties or functions in relation to the Project Highway or adjoining roads to fulfill those duties and functions;
f. minimize the occurrence and adverse effects of accidents and ensure that all

accidents and emergencies are responded to as quickly as possible;

g. minimize the risk of damage, destruction or disturbance to third party property;
h. ensure that members of the public are treated with all due courtesy and consideration;
i. provide a safe, clear and informative system of road signs;
j. comply with any specified programme requirements, including for the completion of the new road;
k. enable standards ofreliability, durability, accessibility, maintainability, quality control and assurance, and fitness for purpose appropriate to a highway of the character of the Project Highway to be achieved throughout the Contract Period;
l. ensure adequate off-street parking facilities for both passenger and goods vehicles;
m. provide adequate bus bays for stopping of buses and bus shelters for commuters to wait under protection;
n. achieve a high standard in the appearance and aesthetic quality of the Project Highway and achieve integration of the Project Highway with the character of the surrounding landscape through both sensitive design and sensitive management of all visible elements including those on the existing road;
o. Undertake proper safety audit through an appropriate consultant (i.e., apart from the Authority Engineer).
p. Carry out accident recording and reporting (to NHIDCL) by type on regular basis; and
q. Ensure adequate safety of the Project Workers on the work site.

2. GEOMETRIC DESIGN AND GENERAL FEATURES

2.1.1 General

Geometric design and general features of the Project Highway shall be in accordance with Section 2 of the Manual.

2.1.2 WIDENING OF THE EXISTING HIGHWAY

Notwithstanding the basic alignment plans enclosed with this document the Construction Contractor shall himself carryout and be responsible for engineering surveys, investigation and detailed engineering designs and prepare the working drawings for all the components relevant for the improvement and up-gradation of the Project Highway to fulfill the scope of the project as envisaged herein under.

These shall comply with design specifications and standards given in Schedule-D. The designs for different project facilities shall follow the locations and indicative designs given in Schedule-C and shall comply with design specifications and standards outlined in Schedule-D. All the designs and drawings shall be reviewed by the Authority Engineer prior to execution,

The Project Highway shall follow the existing alignment unless otherwise 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 [plain/rolling] terrain to the extent land is available.

2.1.3 Improvement of the existing road geometries

[Refer to paragraph 2.1 (v) of the Manual and provide details]

The hilly gradients shall be corrected in such a way so as to attain a limiting gradient of 6% in order to achieve longitudinal drainage. Also, vertical curves shall be improved/introduced so that' the vertical curves meet IRC: 5P-73 - 2015 standards.

The horizontal alignment of the Project Highway shall be improved as per the standards set out in **Schedule-D,**

The improvement shall be done in consultation with the independent consultant *I* Project Company ensuring that the proposed improvements are accommodated within the land width available as far as practical otherwise action to acquire more land shall be resorted to through NHIDCL.

In the following sections, where improvement of the existing road geometries 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 proper road signs and safety measures shall be provided:

Improvement due to Realignments: (PKG-VIII)

SL.NO	DESIGN CHAINAGE				LENGTH
	FROM	TO			(m)
1.	122+353	122+850			500
2.	122+866	123+600			734
3.	124+000	124+200			200
4.	125+300	125+500			200
5.	126+950	127+000			50
6.	127+900	128+180			280
7.	128+180	128+500			320
8.	130+950	131+350			400
9.	131+700	132+270			570
10.	132+270	132+550			280
11.	135+967	136+120			153
12.	136+748	137+000			252
13.	137+480	137+580			100

Probable location of Sharp Curves: Package-IV

Sl. No	Design Chainage (m)		Remarks
	From	To	
1.	122373.195	122387.986	Radius < 300
2.	122479.065	122516.706	Radius < 300
3.	122607.693	122632.68	Radius < 300
4.	122804.636	122834.587	Radius < 300
5.	122949.789	122962.15	Radius < 300
6.	123061.464	123101.462	Radius < 300
7.	123182.641	123247.983	Radius < 300
8.	123310.407	123345.053	Radius < 300
9.	123680.934	123723.009	Radius < 300
10.	123837.383	123886.162	Radius < 300
11.	124023.444	124057.684	Radius < 300
12.	124139.679	124338.459	Radius < 300
13.	124526.149	124567.869	Radius < 300
14.	124614.423	124660.268	Radius < 300
15.	124766.319	124794.529	Radius < 300

16.	124948.236	124988.569	Radius < 300
17.	125075.901	125125.594	Radius < 300
18.	125441.568	125463.391	Radius < 300
19.	125544.37	125556.908	Radius < 300
20.	125668.369	125678.911	Radius < 300
21.	125779.616	125827.358	Radius < 300
22.	125912.187	125953.209	Radius < 300
23.	126212.291	126239.593	Radius < 300
24.	126300.61	126327.302	Radius < 300
25.	126595.379	126656.207	Radius < 300
26.	126748.936	126779.069	Radius < 300
27.	126943.329	127011.484	Radius < 300
28.	127111.084	127186.868	Radius < 300
29.	127237.645	127367.732	Radius < 300
30.	127422.445	127504.26	Radius < 300
31.	127534.074	127605.236	Radius < 300
32.	127764.396	127784.981	Radius < 300
33.	128367.591	128373.081	Radius < 300
34.	128441.906	128464.693	Radius < 300
35.	128978.625	129019.122	Radius < 300
36.	129150.694	129183.305	Radius < 300
37.	129495.516	129574.451	Radius < 300
38.	129674.097	129696.394	Radius < 300
39.	129788.262	129827.965	Radius < 300
40.	129906.523	130043.892	Radius < 300
41.	130095.003	130154.049	Radius < 300
42.	130238.257	130272.384	Radius < 300
43.	130338.1	130345.397	Radius < 300
44.	131329.404	131378.035	Radius < 300
45.	131609.277	131626.458	Radius < 300
46.	131800.373	131903.916	Radius < 300
47.	132088.23	132227.971	Radius < 300
48.	132280.003	132369.211	Radius < 300
49.	132447.418	132504.331	Radius < 300
50.	132580.528	132588.85	Radius < 300
51.	132666.117	132695.51	Radius < 300
52.	132772.247	132788.219	Radius < 300
53.	132846	132856.951	Radius < 300
54.	133029.049	133035.236	Radius < 300
55.	133182.905	133192.66	Radius < 300
56.	133307.652	133329.008	Radius < 300
57.	133504.153	133509.855	Radius < 300

58.	133628.324	133672.755	Radius < 300
59.	133749.588	133852.157	Radius < 300
60.	133939.973	133995.542	Radius < 300
61.	134081.699	134119.374	Radius < 300
62.	134272.674	134300.751	Radius < 300
63.	134837.168	134862.338	Radius < 300
64.	134937.8	134995.481	Radius < 300
65.	135065.641	135072.659	Radius < 300
66.	135123.911	135151.647	Radius < 300
67.	135204.801	135267.307	Radius < 300
68.	135338.925	135355.111	Radius < 300
69.	135408.239	135417.998	Radius < 300
70.	135465.264	135488.452	Radius < 300
71.	135545.67	135665.532	Radius < 300
72.	135666.72	135700.758	Radius < 300
73.	135781.362	135796.429	Radius < 300
74.	135972.11	136000.371	Radius < 300
75.	136094.983	136167.774	Radius < 300
76.	136271.612	136348.362	Radius < 300
77.	136403.113	136430.837	Radius < 300
78.	136545.881	136616.315	Radius < 300
79.	136723.868	136800.264	Radius < 300
80.	136855.851	136889.359	Radius < 300
81.	136972.506	137045.901	Radius < 300
82.	137128.878	137144.006	Radius < 300
83.	137221.571	137326.636	Radius < 300
84.	137403.61	137470.595	Radius < 300
85.	137526.566	137607.317	Radius < 300
86.	137640.591	137717.355	Radius < 300
87.	137787.059	137817.849	Radius < 300
88.	137874.542	137897.978	Radius < 300
89.	138060.973	138086.787	Radius < 300
90.	138212.684	138221.34	Radius < 300
91.	138261.445	138268.141	Radius < 300
92.	138293.487	138323.199	Radius < 300
93.	138364.338	138369.807	Radius < 300

2.2 Design speed

The design speed shall be as per IRC 73 : 2015 however in exceptional cases the minimum design speed of (30 km per hrfor hilly and mountainous terrain).

2.3 Proposed Right of Way

(Refer to paragraph 2.3 of the Manual). Details of the proposed Right of Way are tabulated below.

SI.No.	Design Chainage		Length	Width (m)
	From	To	KM	
1.	122.353	138.389	16.036	18m – 35m

2.3.1 The Scheduled date on which the Authority shall provide ROW to the contractor is given in Annexure-II of Schedule A

2.4 Type of Shoulders

[Refer to paragraph 2.6.1 of the Manual and specify]

a) In built-up sections, 1.5m wide Solid footpath has been considered as TCS-1 for normal camber and TCS-4.
b) In open country, paved shoulders of 1.5m in width shall be provided and 1.0m earthen shoulder shall be co*v*ered with 200mm thick compacted layer of granular material as TCS-2 for normal camber, as TCS-4 for super elevation, as TCS-5 for pick up Bus stop & passenger shelter and as TCS-6 for Gabion wall and super elevation,
c) Design and specifications of paved shoulders and granular material shall conform to the requirements specified in paragraphs 5.9.9 and 5.9.10 of the Manual.

2.5 Width of Carriageway/Roadway width

2.5.1 Two-Laning with paved shoulders shall be undertaken. The paved carriageway shall be [7(seven) m) wide and paved shoulder in accordance with the typical cross sections drawings in the Manual.

2.5.2 Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to Para 2.7 of the manual.

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 Manual.

2.6.2 *Lateral clearanc*e: The width of the opening at the underpasses shall be as follows:

Sl.No	Location[Chainage(km)]		Span/Opening(m)	Remarks
	From	To		
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 Manual.

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

Sl.No	Location[Chainage(km)]		Span/Opening(m)	Remarks
	From	To		
Nil				

2.8 Service roads

Service roads shall be constructed at the locations and for the length indicated below: [Refer to paragraph 2.13 of the manual and provide details]

Sl.No	Location of Service Road(km)		Right Hand Side(RHS) / Left Hand Side (LHS) / Both Sides	Length (km) of Service Road
	From	To		
Nil				

2.9 Grade Separated Structures

2.9.1 Grade separated structures shall be provided as per paragraph 2.14 of the Manual. The requisite particulars are given below:

[Refer to paragraphs 2.14.1 of the Manual and provide details]

SI.No	Location of Structure	Length(m)	Number and Length of Spans(m)	Approach Gradient	Remarks, if any
Nil					

2.9.2 In the case of grade separated structures, the type of structure and the level of the Project Highway and the cross roads shall be as follows: (Refer to paragraphs 2.14.2 of the Manual and specify the type of vehicular under pas*s/* overpass structure and whether the cross road is to be carried at the existing level, raised or lowered).

Sl.No	Location	Type of Structure /Length (m)	Cross Road at			Remarks, if any
			Existing Level	Raised Level	Lowered Level	
Nil						

2.9.3 Cattle and pedestrian underpass / Overpass

Cattle and pedestrian underpa*ss/ov*erpass shall be constructed as follows: (Refer to paragraph 2.14.3 of the Manual and specify the requirements of cattle and pedestrian underpass/overpass.

SI.No	Location	Type of Crossing
Nil		

2.10 Typical cross-sections of the Project Highway

Typical cross-sections to be followed as per IRC: SP-73-2015 and in addition the proposed cross section for various situations are given in Fig. B-1 to B-6. These illustrate the widening proposals for the project highway. The Project Highway (length 14.990 km) shall be 2-lane carriageway with 1.5m wide paved and 1.0m wide earthen shoulders facility.

Following typical cross sections shall be provided for the Project Highway:

TCS – 1 : Typical cross section of 2 – lane carriageway with retaining wall
TCS – 2: Typical cross section of 2 – lane carriageway without retaining wall
TCS – 3 : Typical cross section of 2 – lane carriageway at realignment stretches in

hill cutting

TCS – 4 : Typical cross section of 2 – lane carriageway at built up areas

The cross-section schedule shall be as follows:

SL.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE	Remarks / Location
	FROM	TO			
1.	122353	122503	150	2	Reconstruction & widening
2.	122503	122513	10	3	Realignment
3.	122513	122553	40	1	Realignment with Retaining wall
4.	122553	122653	100	1	Realignment with Retaining wall
5.	122653	122703	50	3	Realignment
6.	122703	122743	40	2	Reconstruction & widening
7.	122743	122753	10	1	Reconstruction & widening with retaining wall
8.	122753	122763	10	1	Realignment with Retaining wall
9.	122763	122853	90	3	Realignment
10.	122853	122883	30	1	Reconstruction and widening with retaining wall
11.	122883	122903	20	2	Reconstruction and widening
12.	122903	123053	150	3	Realignment
13.	123053	123063	10	3	Realignment
14.	123063	123263	200	3	Realignment
15.	123263	123293	30	1	Realignment with Retaining wall
16.	123293	123343	50	3	Realignment
17.	123343	123353	10	1	Realignment with Retaining wall
18.	123353	123393	40	1	Realignment with Retaining wall
19.	123393	123513	120	3	Realignment
20.	123513	123563	50	1	Realignment with Retaining wall
21.	123563	123853	290	3	Realignment
22.	123853	123973	120	1	Realignment with Retaining wall
23.	123973	124803	830	3	Realignment
24.	124803	124863	60	3	Realignment
25.	124863	124903	40	3	Realignment
26.	124903	124993	90	2	Reconstruction & widening
27.	124993	125013	20	1	Reconstruction & widening with retaining wall
28.	125013	125143	130	2	Reconstruction & widening
29.	125143	125153	10	1	Reconstruction & widening with retaining wall
30.	125153	125313	160	1	Realignment with Retaining wall
31.	125313	125363	50	3	Realignment
32.	125363	125443	80	1	Realignment with Retaining wall
33.	125443	125453	10	3	Realignment
34.	125453	125513	60	2	Reconstruction & widening
35.	125513	125553	40	1	Reconstruction & widening with retaining wall

36.	125553	125593	40	1	Realignment with Retaining wall
37.	125593	125853	260	3	Realignment
38.	125853	126003	150	2	Reconstruction & widening
39.	126003	126703	700	3	Realignment
40.	126703	126753	50	2	Reconstruction & widening
41.	126753	126853	100	3	Realignment
42.	126853	126903	50	1	Realignment with Retaining wall
43.	126903	127563	660	3	Realignment
44.	127563	127573	10	1	Realignment with Retaining wall
45.	127573	127753	180	3	Realignment
46.	127753	128003	250	2	Reconstruction & widening
47.	128003	128053	50	3	Realignment
48.	128053	128123	70	3	Realignment
49.	128123	128223	100	1	Realignment with Retaining wall
50.	128223	128453	230	3	Realignment
51.	128453	128673	220	2	Reconstruction & widening
52.	128673	128783	110	1	Reconstruction & widening with retaining wall
53.	128783	128853	70	2	Reconstruction & widening
54.	128853	128903	50	3	Realignment
55.	128903	129013	110	3	Realignment
56.	129013	129073	60	3	Realignment
57.	129073	129193	120	3	Realignment
58.	129193	129253	60	3	Realignment
59.	129253	129353	100	2	Reconstruction & widening
60.	129353	129373	20	3	Realignment
61.	129373	129473	100	1	Realignment with Retaining wall
62.	129473	129573	100	3	Realignment
63.	129573	129603	30	1	Realignment with Retaining wall
64.	129603	129693	90	3	Realignment
65.	129693	129713	20	1	Realignment with Retaining wall
66.	129713	129903	190	3	Realignment
67.	129903	129963	60	1	Realignment with Retaining wall
68.	129963	130023	60	3	Realignment
69.	130023	130063	40	3	Realignment
70.	130063	130553	490	3	Realignment
71.	130553	130603	50	2	Reconstruction & widening
72.	130603	130803	200	3	Realignment
73.	130803	130813	10	1	Realignment with Retaining wall
74.	130813	131253	440	3	Realignment
75.	131253	131283	30	2	Reconstruction & widening
76.	131283	131353	70	1	Reconstruction & widening with retaining wall
77.	131353	131443	90	3	Realignment
78.	131443	131523	80	3	Realignment
79.	131523	131583	60	3	Realignment
80.	131583	131603	20	3	Realignment
81.	131603	131723	120	3	Realignment
82.	131723	131763	40	1	Realignment with Retaining wall
83.	131763	132753	990	3	Realignment
84.	132753	132793	40	1	Realignment with Retaining wall

85.	132793	132903	110	3	Realignment
86.	132903	132923	20	1	Realignment with Retaining wall
87.	132923	133183	260	3	Realignment
88.	133183	133213	30	1	Realignment with Retaining wall
89.	133213	133293	80	3	Realignment
90.	133293	133353	60	1	Realignment with Retaining wall
91.	133353	133453	100	3	Realignment
92.	133453	133533	80	1	Realignment with Retaining wall
93.	133533	133603	70	3	Realignment
94.	133603	133623	20	1	Realignment with Retaining wall
95.	133623	133663	40	3	Realignment
96.	133663	133703	40	1	Realignment with Retaining wall
97.	133703	133783	80	3	Realignment
98.	133783	133803	20	3	Realignment
99.	133803	134073	270	3	Realignment
100.	134073	134123	50	3	Realignment
101.	134123	134153	30	3	Realignment
102.	134153	134163	10	1	Realignment with Retaining wall
103.	134163	134343	180	3	Realignment
104.	134343	134363	20	1	Realignment with Retaining wall
105.	134363	134433	70	3	Realignment
106.	134433	134453	20	1	Realignment with Retaining wall
107.	134453	134653	200	3	Realignment
108.	134653	134733	80	2	Reconstruction & widening
109.	134733	134753	20	1	Reconstruction & widening with retaining wall
110.	134753	134763	10	1	Realignment with Retaining wall
111.	134763	134823	60	3	Realignment
112.	134823	134843	20	1	Realignment with Retaining wall
113.	134843	135103	260	3	Realignment
114.	135103	135203	100	2	Reconstruction & widening
115.	135203	135653	450	3	Realignment
116.	135653	135753	100	2	Reconstruction & widening
117.	135753	135973	220	3	Realignment
118.	135973	135993	20	1	Realignment with Retaining wall
119.	135993	136153	160	3	Realignment
120.	136153	136163	10	1	Realignment with Retaining wall
121.	136163	136453	290	3	Realignment
122.	136453	136463	10	1	Realignment with Retaining wall
123.	136463	136573	110	3	Realignment
124.	136573	136613	40	1	Realignment with Retaining wall
125.	136613	136653	40	3	Realignment
126.	136653	136693	40	1	Realignment with Retaining wall
127.	136693	136893	200	3	Realignment
128.	136893	136923	30	1	Realignment with Retaining wall
129.	136923	137023	100	3	Realignment
130.	137023	137043	20	1	Realignment with Retaining wall
131.	137043	137676	633	3	Realignment
132.	137676	138389	713	4	Built up

Note: The extent of cross section type is indicative and shall be reviewed in consultation with the Authority Engineer at the time of construction as per the site condition.

The alternative cross section of the Project Highway at the cross-drainage structures shall follow the typical cross section in consultation with the Authority Engineer at the time of construction.

2.11 Longitudinal Section

As a minimum, the Construction Contractor shall achieve the proposed finished road level as indicated in the plan and profile drawings for this purpose in FFSR. However, the final finished road levels (FRL) will be finalized as per site conditions in consultation with NHIDCL.

2.12 Built-Up Areas

The alignment passes through Built up areas as tabulated below.

Sl.No	Location/Design Chainage	Name of Village / Town etc
1.	138+350	Koloriang

3 INTERSECTIONS AND GRADE SEPARATORS

3.1 Introduction

All intersections shall be as per Section3 of the Manual. Existing intersections which are deficient shall be improved to the prescribed standards.

(Refer to paragraphs 3.1.1, 3.1.2 and 3.3 of the Manual and specify the requirements. Explain where necessary with drawings/sketches/general arrangement),

There are no intersections with cross roads having bituminous surfacing. The cross roads fall into the category VRs. The Construction Contractor has to construct the following:

1) Typical junction treatments as specified in Final Project Report shall be applied. Design types of intersections are as given belo*w:*

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

3.2 At-grade Intersections

(a) Major Intersections

SI.No	Location of Intersection	Intersection Towards	Existing Configurations				Type of Intersection
			Location	Type	Width (m)	Surface	
1.	138+389	Three sides	**Koloriang**	**SH-17**	**3.5/4**	**BT**	4-Legged

Details of junction improvements shall be as per IRC SP: 73-2015.

(b) Minor Intersections

SI.No	Location of Intersection	Type of Intersection	Side
1.	126+393	3-Legged	Right side
2.	126+933	3-Legged	Left side
3.	128+453	3-Legged	Right side
4.	132+763	3-Legged	Left side
5.	134+633	3-Legged	Right side
6.	135+063	3-Legged	Right side
7.	137+983	3-Legged	Right side
8.	138+113	3-Legged	Right side
9.	138+203	3-Legged	Right side
10.	138+313	3-Legged	Right side

Details of junction improvements shall be as per IRC SP: 73-2015.

3.3 Grade Separated Intersections with*/w*ithout Ramps

SI.No	Location	Salient Features	Minimum Length of Viaduct to be Provided (m)	Road to be Carried Over / Under the Structures
Nil				

4 ROAD EMBANKMENT AND CUT SECTION

4.1 Widening and improvement of the existing road embankment/cuttings and construction of new road embankment/ cuttings shall conform to the Specifications and Standards given in section 4 of the Manual and the specified cross sectional details. Deficiencies in the plan and profile of the existing road shall be corrected.

4.2 Raising of the existing road (Refer to paragraph 4.2.2 of the Manual and specify sections to be raised).

The existing road shall be raised in the following sections:

SI.No	Section (Km)		Length (Km)	Extent of Raising*	Remarks
	From	To			
Nil					

* Difference between levels at proposed c/land existing road/ground below proposed c/l

5 PAVEMENT DESIGN

5.1 General

Pavement design shall be carried out in accordance with section 5 of the Manual. The detailed pavement design including overlay and pavement characteristics requirements of the Project Highway shall be done in accordance with Schedule D. Flexible pavement shall be considered for the project road. Flexible 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 IRC: 37-2012. Clause 2.2 of IRC:37-2012 identifies five type of flexible pavements. The estimated cost of civil works is based on flexible pavements consisting of Granular base, Sub base, DBM and Be. Since, the successful bidders under EPC mode can use any type of five flexible pavements mentioned Clause 2.2 of IRC: *3*7-2012, they may carry out their own diligence to arrive at project cost before submitting bids.

5.3 Design requirements

(Refer to paragraph 5.4, 5.9 and 5.10 of the Manual and specify design requirements and strategy)

5.3.1 Design Period and strategy

Flexible pavement for new pavement or for widening and strengthening of the existing pavement shall be designed for a minimum design period of 15 years, Stage construction shall not be permitted.

5.4 Design Traffic

Notwithstanding anything to the contrary contained in this Agreement or the Manual, the Contractor shall design the pavement for design traffic of 20 million standard axles as follows.

PACKAGE	Design Chainage (Km)		Length (Km)	15 Year MSA*
	From	To		
III	122+353	138+389	16.036	20

5.5 Design Parameters

The flexible pavement for the main carriageway is a 2-lane carriageway having 1.5 m wide paved shoulder and 1.0 m wide earthen shoulder in some stretches. This shall be designed using the IRC 37: 2012 Method for the projected traffic levels and the following indicative design input parameters:

Indicative Design Parameters

I.	Performance Period	15 years + Construction Period of 24 months
II.	Traffic on Design Lane	Minimum 20msa as per IRC-SP-73. Design should take care of the maximum wheel load derived from the axle load survey on the design lane
III.	Reliability	90%
IV.	Effective Roadblock Soil Resilient Modulus	corresponding to 4-day soaked CBR value of 8.0% Modulus to 10.0%
V.	Layer Coefficients	As per the IRC 37: 2012 procedures
VI.	Drainage quality of Pavement	Good

5.5.1 The Project highway will be a light-trafficked section connecting the major arterial network of the country. The design exercise should therefore duly. take into account the importance of the road, the performance level and the maintenance requirements during the performance period. The provision of Wet Mix Macadam (granular base)/cement-treated

base/ sub-base (crushed stone only)/ subgrade layer(s) and the use of 60/70 Bitumen in bituminous base layers and preferably polymer modified bitumen in wearing course shall be considered while deciding about the composition of the pavement structure. The design should also accompany the Quality Assurance Plan (QAP) along with its implementation scheme for the construction of the pavement structure.

5.5.2 However, in case of a change in the pavement design at the detailed engineering stage, the same shall not be considered as a change in scope of work nor shall qualify for a variation order.

5.5.3 Paved shoulders of.1.5 m width shall have same thickness of the pavement as that of the main carriageway with same composition as that of main carriageway for monolithic construction,

5.5.4 Contractor shall design the pavement for design traffic of 20 million standard axles (msa) corresponding subgrade CBR

5.5.5: Rigid Pavement

No rigid pavement has been considered for the Project Highway.

5.6 Reconstruction / Realignment / Bypass of sections

[Refer to paragraph 5.9.7 of the Manual and specify the sections, if any, to be reconstructed.)

The following sections of the existing road shall be reconstructed. These shall be designed as new pavement.

Sl.No	Section (Km)		Remarks
	From	To	
1.	122+353	138+389	Poor condition of exiting pavement

6 ROADSIDE DRAINAGE

Drainage system including surface and subsurface drains for the Project Highway shall be provided as per section 6 of the Manual.

The improvements in the drainage and the slope erosion shall be made as per the following

norms:

6.1 Drainage Measures

Following measures shall be adopted:

i. Open side Trapezoidal drains at the hill side for widening at hill sides.

ii. Open side Trapezoidal drains at both sides in realignment stretches by hill cut.

Open side trapezoidal cross section drain shall be provided on hill sides of the project highway in order to intercept surface water from the carriageway, shoulders and hill slopes. RCC Lined drains have slopes also been proposed in urban/semi urban/intersection stretches. The concrete drains shall be covered in reaches along commercial establishments and intersections. The drains outfall into the natural water courses i.e. either in culverts or bridges. Table below gives the location of lined drains.

These are guidelines for minimum provisions. However, contractor has to design as per requirement of road in accordance with manual.

Details of Lined Drains

	Design Chainage (m)				
SI.No	**From**	**To**	**Length (m)**	**Side**	**Remarks**
1.	122353	122503	150	One	Widening
2.	122503	122513	20	Both	Realignment
3.	122513	122553	40	One	Realignment
4.	122553	122653	100	One	Realignment
5.	122653	122703	100	Both	Realignment

6.	122703	122743	40	One	Widening
7.	122743	122753	10	One	Widening
8.	122753	122763	10	One	Realignment
9.	122763	122853	180	Both	Realignment
10.	122853	122883	30	One	Widening
11.	122883	122903	20	One	Widening
12.	122903	123053	300	Both	Realignment
13.	123053	123063	20	Both	Realignment
14.	123063	123263	400	Both	Realignment
15.	123263	123293	30	One	Realignment
16.	123293	123343	100	Both	Realignment
17.	123343	123353	10	One	Realignment
18.	123353	123393	40	One	Realignment
19.	123393	123513	240	Both	Realignment
20.	123513	123563	50	One	Realignment
21.	123563	123853	580	Both	Realignment
22.	123853	123973	120	One	Realignment
23.	123973	124803	1660	Both	Realignment

24.	124803	124863	120	Both	Realignment
25.	124863	124903	80	Both	Realignment
26.	124903	124993	90	One	Widening
27.	124993	125013	20	One	Widening
28.	125013	125143	130	One	Widening
29.	125143	125153	10	One	Widening
30.	125153	125313	160	One	Realignment
31.	125313	125363	100	Both	Realignment
32.	125363	125443	80	One	Realignment
33.	125443	125453	20	Both	Realignment
34.	125453	125513	60	One	Widening
35.	125513	125553	40	One	Widening
36.	125553	125593	40	One	Realignment
37.	125593	125853	520	Both	Realignment
38.	125853	126003	150	One	Widening
39.	126003	126703	1400	Both	Realignment
40.	126703	126753	50	One	Widening
41.	126753	126853	200	Both	Realignment

42.	126853	126903	50	One	Realignment
43.	126903	127563	1320	Both	Realignment
44.	127563	127573	10	One	Realignment
45.	127573	127753	360	Both	Realignment
46.	127753	128003	250	One	Widening
47.	128003	128053	100	Both	Realignment
48.	128053	128123	140	Both	Realignment
49.	128123	128223	100	One	Realignment
50.	128223	128453	460	Both	Realignment
51.	128453	128673	220	One	Widening
52.	128673	128783	110	One	Widening
53.	128783	128853	70	One	Widening
54.	128853	128903	100	Both	Realignment
55.	128903	129013	220	Both	Realignment
56.	129013	129073	120	Both	Realignment
57.	129073	129193	240	Both	Realignment
58.	129193	129253	120	Both	Realignment
59.	129253	129353	100	One	Widening

60.	129353	129373	40	Both	Realignment
61.	129373	129473	100	One	Realignment
62.	129473	129573	200	Both	Realignment
63	129573	129603	30	One	Realignment
64	129603	129680	154	Both	Realignment
65	129680	129693	13	One	Realignment
66	129713	129785	72	One	Realignment
67	129785	129903	236	Both	Realignment
68	129903	129963	60	One	Realignment
69	129963	130023	120	Both	Realignment
70	130023	130063	80	Both	Realignment
71	130063	130553	980	Both	Realignment
72	130553	130603	50	One	Widening
73	130603	130803	400	Both	Realignment
74	130803	130813	10	One	Realignment
75	130813	131253	880	Both	Realignment
76	131253	131283	30	One	Widening
77	131283	131353	70	One	Widening

78	131353	131443	180	Both	Realignment
79	131443	131523	160	Both	Realignment
80	131523	131583	120	Both	Realignment
81	131583	131603	40	Both	Realignment
82	131603	131723	240	Both	Realignment
83	131723	131763	40	One	Realignment
84	131763	132753	1980	Both	Realignment
85	132753	132793	40	One	Realignment
86	132793	132903	220	Both	Realignment
87	132903	132923	20	One	Realignment
88	132923	133183	520	Both	Realignment
89	133183	133213	30	One	Realignment
90	133213	133293	160	Both	Realignment
91	133293	133353	60	One	Realignment
92	133353	133453	200	Both	Realignment
93	133453	133533	80	One	Realignment
94	133533	133560	54	Both	Realignment
95	133560	133603	43	One	Realignment

96	133623	133645	22	One	Realignment
97	133645	133663	36	Both	Realignment
98	133663	133703	40	One	Realignment
99	133703	133783	160	Both	Realignment
100	133783	133803	40	Both	Realignment
101	133803	134025	444	Both	Realignment
102	134025	134060	35	one	Realignment
103	134060	134073	26	Both	Realignment
104	134073	134123	100	Both	Realignment
105	134123	134153	60	Both	Realignment
106	134153	134163	10	One	Realignment
107	134163	134343	360	Both	Realignment
108	134343	134363	20	One	Realignment
109	134363	134433	140	Both	Realignment
110	134433	134453	20	One	Realignment
111	134453	134653	400	Both	Realignment
112	134653	134733	80	One	Widening
113	134733	134753	20	One	Widening

114	134753	134763	10	One	Realignment
115	134763	134785	44	Both	Realignment
116	134785	134805	20	One	Realignment
117	134805	134823	36	Both	Realignment
118	134823	134843	20	One	Realignment
119	134843	134880	74	Both	Realignment
120	134880	134900	20	One	Realignment
121	134900	135103	406	Both	Realignment
122	135103	135203	100	One	Widening
123	135203	135545	684	Both	Realignment
124	135545	135570	25	One	Widening
125	135570	135653	166	Both	Realignment
126	135653	135740	87	One	Widening
127	135753	135810	57	One	Widening
128	135810	135973	326	Both	Realignment
129	135973	135993	20	One	Realignment
130	135993	136153	320	Both	Realignment
131	136153	136163	10	One	Realignment

132	136163	136453	580	Both	Realignment
133	136453	136463	10	One	Realignment
134.	136463	136573	220	Both	Realignment
135	136573	136613	40	One	Realignment
136	136613	136653	80	Both	Realignment
137	136653	136693	40	One	Realignment
138	136693	136893	400	Both	Realignment
139	136893	136923	30	One	Realignment
140	136923	137000	154	Both	Realignment
141	137000	137020	20	One	Realignment
142	137020	137023	6	Both	Realignment
143	137023	137030	7	One	Realignment
144	137043	137050	7	One	Realignment
145	137050	137060	20	Both	Realignment
146	137060	137250	190	One	Realignment
147	137250	137330	160	Both	Realignment
148	137330	137370	40	One	Realignment
149	137370	137676	612	Both	Realignment

150	137676	138389	1426	Both	Built up
Total=			27802Mtrs		

Note: (The above locations shall be reviewed in consultation with the Authority Engineer at the time of construction as per the site condition).

Trapezoidal section for the drain/ditch has been proposed as it is more economical and efficient as compared to rectangular cross section V-Shaped. These road side drains have been designed of adequate capacity to carry 100% surface runoff of the drainage area of highway ROW and the adjoining land. The side slopes have been kept as 1H:1V in case of unlined drain/ditches. However, successful bidder may adopt any type of PCC drain as per RC and accordingly they may carry out their own diligence to arrive at project cost before submitting the bid. Also the catch water drain for the project stretch is 1634 Rm.

7 DESIGN OF STRUCTURES

7.1 General

The Project road includes provision of no major bridges (span>=60m), **6 nos minor bridge** (span<60m) and **98 RCC box/Slab culverts**. All culverts and other structures shall be designed and constructed in accordance with section 7 of the Manual and shall conform to the cross-sectional features and other details specified therein. New bridges and culverts shall be constructed wide enough to accommodate the adjacent road cross section as given in this Schedule-B. The details of existing culverts are given in **Schedule-A.**

The details of culverts shall be provided by the EPC Contractor and locations are given in Clause 8.2 of Schedule-B.

All the cross-drainage structures and other structures shall be designed in accordance with the design standards set out in Schedule-D.

The following guidelines shall be followed:

I) All the cross-drainage structures for the new carriageway shall be designed in such a way so that the outer most face of railing/parapet shall be in line with the out most edge of shoulder.

ii) The existing culverts shall be extended to match the new road cross sections.

iii) The adequacy of the vent size for all culverts/bridges shall be ascertained through detailed hydrological surveys and finalized in consultation with the IC/Project Company. The highest flood level/maximum supply level shall be properly assessed after collecting flood histories form local authorities/interviews with locals/irrigation authorities.

iv) For drainage purpose the new/tobe reconstructed box culverts of minimum span 2.0m shall be provided.

v) Suitable river training works, bank protection and embankment protection works ensuring safety of bridge structure and its approaches against damage by flood water / rain water shall be provided.

The cross-drainage plan of the highway shall be finalized in consultation with IC/Project Company and if required additional culverts shall be provided.

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 Manual.

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

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

[Refer to paragraph 7.3 (i) of the Manual and provide details).

SI.No	Existing Chainage (Km)	Design Chainage (Km)	Proposal	Proposed span (m)
1.	138+760	123+053	RCC Slab/Box	2.0

2.	138+800	123+083	RCC Slab/Box	2.0
3.	141+135	125+233	RCC Slab/Box	2.0
4.	143+455	127+353	RCC Slab/Box	2.0
5.	151+410	134+073	RCC Slab/Box	3.0
6.	151+580	134+278	RCC Slab/Box	3.0

* Specify modifications, if any, required in the road level etc.

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

SI.No	Existing Chainage (Km)	Design Chainage (Km)	Proposal	Span (m)
1.	138+900	123+163	RCC Slab/Box	2.0
2.	139+125	123+333	RCC Slab/Box	2.0
3.	139+310	123+523	RCC Slab/Box	2.0
4.	139+490	123+673	RCC Slab/Box	2.0
5.	141+300	125+393	RCC Slab/Box	3.0
6.	142+795	126+758	RCC Slab/Box	2.0
7.	143+020	126+993	RCC Slab/Box	2.0
8.	143+120	127+093	RCC Slab/Box	2.0
9.	143+820	127+583	RCC Slab/Box	2.0
10.	144+010	127+763	RCC Slab/Box	2.0
11.	144+150	127+903	RCC Slab/Box	2.0
12.	144+315	128+063	RCC Slab/Box	2.0
13.	147+590	131+003	RCC Slab/Box	2.0
14.	147+820	131+333	RCC Slab/Box	2.0
15.	148+155	131+763	RCC Slab/Box	3.5
16.	148+730	132+053	RCC Slab/Box	2.0
17.	149+175	132+143	RCC Slab/Box	4.0
18.	149+240	132+153	RCC Slab/Box	6.0
19.	149+290	132+203	RCC Slab/Box	2.5
20.	149+405	132+293	RCC Slab/Box	3.0
21.	149+500	132+338	RCC Slab/Box	3.0
22.	149+575	132+413	RCC Slab/Box	2.0
23.	149+960	132+783	RCC Slab/Box	3.0
24.	150+180	132+983	RCC Slab/Box	3.0
25.	150+585	133+323	RCC Slab/Box	2.5
26.	152+890	135+413	RCC Slab/Box	3.0
27.	153+310	135+863	RCC Slab/Box	4.0
28.	153+450	135+993	RCC Slab/Box	4.0

29.	154+085	136+393	RCC Slab/Box	4.0
30.	154+205	136+463	RCC Slab/Box	4.0
31.	154+400	136+613	RCC Slab/Box	2.5
32.	154+575	136+773	RCC Slab/Box	2.5
33.	154+760	136+943	RCC Slab/Box	4.0
34.	156+400	138+263	RCC Slab/Box	2.0

7.2.4 Repairs/*r*eplacements of railing/parapets, flooring and protection, works of the existing culverts shall be undertaken as follows:
(Refer to paragraph 7.23 of the Manual and provide details)

SI.No	Existing Chainage (Km)	Design Chainage (Km)	Proposal	Proposed Span
1.	140+970	125+073	RCC Slab/Box	3.0
2.	155+850	137+638	RCC Slab/Box	2.1
3.	156+180	137+883	RCC Slab/Box	5.9

And newly constructed culverts

Sl. No.	Design Chainage (km)	Type of Culvert	Span/Dia (m)	Width (m)	Remarks
1	122+900	BOX Culvert	3.00	12.00	Protection work is remaining
2	123+323	BOX Culvert	2.0	12.00	Protection work is remaining
3	123+934	BOX Culvert	2.0	12.00	Protection work is remaining
4	124+057	BOX Culvert	3.0	12.00	Protection work is remaining
5	125+039	BOX Culvert	2.0	12.00	Protection work is remaining
6	125+732	BOX Culvert	2.0	12.00	Protection work is remaining
7	125+786	BOX Culvert	2.0	12.00	Protection work is remaining
8	125+884	BOX Culvert	2.0	12.00	Protection work is remaining
9	126+017	BOX Culvert	2.0	12.00	Protection work is remaining
10	126+180	BOX Culvert	2.0	12.00	Protection work is

					remaining
11	126+330	BOX Culvert	2.0	12.00	Protection work is remaining
12	126+383	BOX Culvert	3.0	12.00	Protection work is remaining
13	126+477	BOX Culvert	2.0	12.00	Protection work is remaining
14	126+667	BOX Culvert	4.0	12.00	Protection work is remaining
15	128+631	BOX Culvert	3.0	12.00	Protection work is remaining
16	128+780	BOX Culvert	3.0	12.00	Protection work is remaining
17	129+200	BOX Culvert	2.0	12.00	Protection work is remaining
18	129+563	BOX Culvert	2.0	12.00	Protection work is remaining
19	129+830	BOX Culvert	2.0	12.00	Protection work is remaining
20	129+900	BOX Culvert	3.0	12.00	Protection work is remaining
21	130+150	BOX Culvert	3.0	12.00	Protection work is remaining
22	130+457	BOX Culvert	6.0	12.00	Protection work is remaining
23	130+600	BOX Culvert	2.0	12.00	Protection work is remaining
24	130+865	BOX Culvert	3.0	12.00	Protection work is remaining
25	132+642	BOX Culvert	3.0	12.00	Protection work is remaining
26	133+180	BOX Culvert		12.00	Protection work is remaining
27	133+237	BOX Culvert	2.0	12.00	Protection work is remaining
28	133+304	BOX Culvert		12.00	Protection work is remaining
29	133+381	BOX Culvert	2.0	12.00	Protection work is remaining
30	133+430	BOX Culvert		12.00	Protection work is

					remaining
31	133+469	BOX Culvert	2.0	12.00	Protection work is remaining
32	133+558	BOX Culvert	2.0	12.00	Protection work is remaining
33	133+592	BOX Culvert	2.0	12.00	Protection work is remaining
34	134+016	BOX Culvert		12.00	Protection work is remaining
35	134+197	BOX Culvert	2.0	12.00	Protection work is remaining
36	134+390	BOX Culvert		12.00	Protection work is remaining
37	134+494	BOX Culvert	2.0	12.00	Protection work is remaining
38	134+560	BOX Culvert	2.0	12.00	Protection work is remaining
39	134+618	BOX Culvert	4.0	12.00	Protection work is remaining
40	134+735	BOX Culvert		12.00	Protection work is remaining
41	134+794	BOX Culvert		12.00	Protection work is remaining
42	134+838	BOX Culvert	2.0	12.00	Protection work is remaining
43	134+940	BOX Culvert		12.00	Protection work is remaining
44	134+977	BOX Culvert		12.00	Protection work is remaining
45	135+537	BOX Culvert	2.0	12.00	Protection work is remaining
46	135+804	BOX Culvert	2.0	12.00	Protection work is remaining
47	136+137	BOX Culvert		12.00	Protection work is remaining
48	136+242	BOX Culvert	2.0	12.00	Protection work is remaining
49	136+364	BOX Culvert	3.0	12.00	Protection work is remaining
50	136+526	BOX Culvert	3.0	12.00	Protection work is

					remaining
51	137+058	BOX Culvert		12.00	Protection work is remaining
52	137+207	BOX Culvert	2.0	12.00	Protection work is remaining
53	137+407	BOX Culvert		12.00	Protection work is remaining
54	137+789	BOX Culvert		12.00	Protection work is remaining
55	137+900	BOX Culvert	2.0	12.00	Protection work is remaining

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

7.3 Bridges

7.3.1 The existing bridges to be reconstructed/widened

The existing bridges at the following locations shall be reconstructed as new structures (Minor Bridge)

SI.No.	Existing Chainage	Design Chainage	Proposed Span (m)	Proposed Width (m)	Remarks
1.	140+450	124+583	1 x 34	16.0	Reconstruction
2.	143+400	127+050	1 x 10	16.0	Protection works, railing and Approach slab work are balance
3.	144+640	128+423	1 x 52	16.0	Reconstruction
4.	147+100	130+383	1 x 7	16.0	Reconstruction
5.	152+640	135+253	1 x 25	16.0	Only A1 foundation is constructed

SI.No	Bridge	Salient Details of Existing Bridge	Adequacy or Otherwise of the Existing	

	Location (km)	Span Arrangement (m)	Carriageway Width (m)	Total Width (m)	Type of Superstructure	Type of Foundation	Waterway, Vertical Clearance etc.	Remarks
1.	140+450	1 x 34.0	3.5	5.5	DS type Bailey Bridge	Open	Vertical Clearance~8.5m	Narrow Bridge
2.	143+400	1 x 10.0	5.5	6	RCC Slab	Open	Vertical Clearance~4.0m	Narrow Bridge
3.	144+640	1 x 52.0	3.5	5.5	TS type Bailey Bridge	Open	Vertical Clearance~17.0m	Narrow Bridge
4.	147+100	1 x 6.5	5.3	5.8	RCC Slab	Open	Vertical Clearance~6.0m	Narrow Bridge
5.	152+640	1 x 25.0	3.5	5.5	DS type Bailey Bridge	Open	Vertical Clearance~8.5m	Narrow Bridge

7.3.2 The following structures shall be provided with footpaths:

SI.No	Design Ch. (Km)	Remarks
1.	124+583	Footpath on both sides
2.	127+283	Footpath on both sides
3.	128+423	Footpath on both sides
4.	130+383	Footpath on both sides
5.	135+183	Footpath on both sides
6.	137+568	Footpath on both sides

7.3.3 Additional New Minor Bridges

New minor bridges at the following locations on the project highways shall be constructed

SI.No	Bridge at KM	Span Arrangement (m)	Carriageway Width (m)	Total Width (m)	Type of Superstructure	Type of Foundation
1.	137+568	1 x 30.0m	11.0m	16.0m	PSC Girder	Open

7.3.4 Additional new bridges

(Specify additional new bridges if required, and attach GAD]

One new bridges at the following locations on the Project Highway shall be constructed.

SI.No	Location (Km)	Total Length (m)	Remarks
Nil			

7.3.5 The railings of existing bridges shall be replaced by crash barriers at the following locations:
[Refer to paragraph 7.18 (iv) of the Manual and provide details]

SI.No	Location (Km)	Remarks
Nil		

7.3.6 Repairs/replacements of railings/parapets of the existing bridges shall be undertaken as follows:
[Refer to paragraph 7.18 (V) of the Manual and provide details)

SI.No	Location (Km)	Remarks
Nil		

7.3.7 Drainage system for bridge decks

An effective drainage system for bridge decks shall be provided as specified in paragraph 7.21 of the Manual

7.3.8 Structures in marine environment

(Refer to paragraph 7.22 of the Manual and specify the necessary measures / treatments for protecting structures in marine environment, where applicable)

7.4 Rail-road Bridges

7.4.1 Design, construction and detailing of ROB/RUB shall be as specified in section 7of the Manual. (Refer to paragraph 7.19 of the Manual and specify modification, if any)

7.4.2 Road over-bridges

Road over-bridges (road over rail) shall be provided at the following level crossings, as

per GAD drawings attached:

SI.No	Location of Level Crossing (km)	Length of Bridge (m)
Nil		

7.4.3 Road under-bridges

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

SI.No	Location of Level Crossing (km)	Number and Length of Span (m)
Nil		

7.5 Grade Separated Structures

(Refer to paragraph 7.20 of the Manual]

The grade separated structures shall be provided at the locations and of the type and length specified in paragraphs 2.9 and 3 of this Annex-I

7.6 Underpasses/Overpasses

There is no Underpass/Overpass proposed on the Project Highway.

7.7 Repairs and strengthening of bridges and structures

(Refer to paragraph 7.23 of the Manual and provide details] The existing bridges and structures to be repaired/strengthened, and the nature and extent of repairs/strengthening required are given below:

A. Bridges

SI.No	Location of Bridge (km)	Nature and Extent of Repairs/Strengthening to be carried out
Nil		

B. ROB / RUB

SI.No	Location of Bridge (km)	Nature and Extent of Repairs/Strengthening to be carried out
Nil		

C. Overpasses / Underpasses and Other Structures

SI.No	Location of Bridge (km)	Nature and Extent of Repairs/Strengthening to be carried out
Nil		

7.8 List of Major Bridges and Structures

The following is the list of Major Bridges

SI.No	Location (Km)
Nil	

8 TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS

8.1 General

Traffic control devices and road safety works shall be provided in accordance with Section 9 of theManual.

Specifications of the reflective sheeting (Refer to paragraph 9.3 of the Manual and specify)

Traffic signs and pavements markings shall include roadside signs, overhead signs, curve amounted signs and road marking along the Project Highway. The design and marking for the project Highway shall be as per design standards indicated in **Schedule-D** and the location for various treatments shall be finalized in consultation with the Authority Engineer and Project Company.

The road markings shall be applied to lane lines, road center lines, edge lines, continuity line, stop lines, give way lines, directional arrows, diagonal/chevron markings, and Zebra crossings at parking areas.

PCC Kerbs (duly painted) approximately 460 RM (minimum) shall be provided by EPC Contractor in busbays and Islands.

8.2 Road/Traffic Signs

i) A complete range of permanent retro-reflective traffic signs as per the requirements defined in but not limited to the FPR, for the safe and efficient movement of traffic. These sign are to be of regulatory, warning and informatory types and placed on the roadside except at the start and end of the project road and start and end of two bypasses where overhead directional and lane designation signs shall be mounted on the steels portals.

ii) Temporary traffic and construction signs are to be provided during construction and maintenance operations for traffic diversion and pedestrian safety.

8.3 Pavement Marking

I. Retro-reflective thermoplastic paint is proposed for use. The road markings shall be applied to lane lines, road center lines, edge lines, continuity line, stop lines, give way lines, diagonal/chevron markings, Zebra crossings and at parking areas.
II. Delineators bollards and other safety devices shall be provided on entire project Highway and other locations as directed by NHIDCL.
III. All signs shall be the reflectorized type with high intensity retro-reflective sheeting conforming to ASTM D 4956-01, type Villand/or type IX of micro prismatic type. All sign boards of size more than 1.2 m and less than 0.9 m shall be provided at the locations finalized in consultation with NHIDCL.
IV. Cautionary sign boards (900mm Equilateral Triangle), stop sign (900mm Octagonal) mandatory sign boards (600mm dia), Village name boards (600X900mm), Hazard Plate (300X900mm), chevron signboard (600x750mm), Facility information sign (600x800mm), Advance direction sign (1800X1200mm), Place identification sign (1200x900mm) shall be provided by the Construction Contractor with suitable interval in consultation with NHIDCL.

The **minimum quantity** of Traffic signages and pavement marking are tabulated here

Traffic Signages, Road Marking and other appurtenances	Unit	Quantity

Centre line on straight portion	Sqm	1270
Centre Line on curve portion	Sqm	481
Edge line at paved Shoulder	Sqm	6415
Add 15% for Misc. including pedestrian X-ingsetc	Sqm	1225
Directional Arrows, letter marking etc.	Nos.	146
Advance Direction signs sixe 1800 x 1200 mm	Nos.	17
Village name boards size 600 x 900 mm	Nos.	152
Place identification signs size 1200 x 900	Nos.	11
90 cm Triangle	Nos.	23
90 cm Octagon	Nos.	21
Hazard plate 300 x 900 mm	Nos.	113
800 x 600 mm Size	Nos.	45
60 cm Circular	Nos.	75
Boundary Stone (Clause 13 herein under)	Nos.	163
5^{th} Km Stone – new	Nos.	3
Ordinary Km stone	Nos.	15
Hectometer Stone	Nos.	62
Delineator	Nos.	1214
Rip Rap	Rm	3640
Convex Mirror	Nos.	60
W Type metal Crash barrier	Rm	4311

9 ROADSIDE FURNITURE

9.1.1 Roadside furniture shall be provided in accordance with the provisions of Section 11 of theManual IRC: SP:73-2007.

9.1.2 Overhead traffic signs: location and size
(Refer to paragraph 11.5 of the Manual and provide details]

The overhead signs shall be the reflectorized type with high intensity retro-reflective sheeting conforming to ASTM D 4956-01, type VIII and /or type IX of micro prismatic type. The retro reflected sheets of Engineering Grade and high intensity grade (ordinary) shall not be used. The height, lateral clearance, location and instillation shall be as per relevant clauses of MORTH specifications. Overhead sign shall be installed ahead of major intersections and urban areas as per detailed design requirements. The minimum number of overhead signs shall be (02 No. of gantry)

as per this manual.

SI.No	Location (Km)	Size	Remarks
1	122+353	12.0m x 2.1m	Overhead Gantry
2.	138+389	12.0m x 2.1m	Overhead Gantry

10 COMPULSORY AFFORESTATION

[Refer to paragraph 12.1 of the Manual and specify the number of trees which are required to be planted by the Contractor as compensatory afforestation.) Minimum 1160nos, trees are required to be planted.

11 HAZARDOUS LOCATIONS

iv) Metal Beam crash barrier length of minimum 10050m (single runner, heavy duty and W shape) shall be provided at the focations of bridge approaches and high embankments (3.0m and more), at sharp curves on both sides. Heavy duty metal beam crash barriers shall be provided on this project by the Construction Contractor at the locations finalized in consultation with NHIDCL. Typical details of metal crash barrier are given in as per manual.

The safety barriers shall also be provided at the following hazardous locations:

SI.No	Location		Length (m)	Remarks
	From	To		
1.	122373.195	122387.986	14.79	Radius<300m
2.	122479.065	122516.706	37.64	Radius<300m
3.	122607.693	122632.68	24.99	Radius<300m
4.	122804.636	122834.587	29.95	Radius<300m
5.	122949.789	122962.15	12.36	Radius<300m
6.	123061.464	123101.462	40.00	Radius<300m
7.	123182.641	123247.983	65.34	Radius<300m
8.	123310.407	123345.053	34.65	Radius<300m
9.	123562.046	123572.875	10.83	Radius<300m
10.	123680.934	123723.009	42.07	Radius<300m
11.	123837.383	123886.162	48.78	Radius<300m
12.	124012.123	124038.426	26.30	Radius<300m
13.	124170.276	124220.796	50.52	Radius<300m
14.	124306.995	124320.054	13.06	Radius<300m

15.	124528.767	124574.612	45.85	Radius<300m
16.	124680.663	124708.873	28.21	Radius<300m
17.	124862.579	124902.913	40.33	Radius<300m
18.	124990.245	125039.938	49.69	Radius<300m
19.	125355.912	125377.734	21.82	Radius<300m
20.	125458.713	125471.252	12.54	Radius<300m
21.	125582.713	125593.254	10.54	Radius<300m
22.	125693.959	125741.702	47.74	Radius<300m
23.	125826.531	125867.553	41.02	Radius<300m
24.	126126.635	126153.936	27.30	Radius<300m
25.	126214.954	126241.646	26.69	Radius<300m
26.	126509.723	126570.551	60.83	Radius<300m
27.	126663.279	126693.412	30.13	Radius<300m
28.	126857.672	126925.828	68.16	Radius<300m
29.	127025.427	127101.212	75.79	Radius<300m
30.	127151.988	127282.075	130.09	Radius<300m
31.	127336.788	127418.603	81.82	Radius<300m
32.	127448.417	127519.579	71.16	Radius<300m
33.	127678.739	127699.325	20.59	Radius<300m
34.	127791.312	127880.97	89.66	Radius<300m
35.	128550.338	128771.557	221.22	Radius<300m
36.	128892.968	128933.466	40.50	Radius<300m
37.	129065.038	129097.648	32.61	Radius<300m
38.	129409.859	129488.794	78.93	Radius<300m
39.	129588.44	129610.738	22.30	Radius<300m
40.	129702.606	129742.309	39.70	Radius<300m
41.	129820.866	129958.235	137.37	Radius<300m
42.	130009.347	130068.392	59.04	Radius<300m
43.	130152.6	130186.728	34.13	Radius<300m
44.	130252.444	130259.74	07.30	Radius<300m
45.	131243.748	131292.379	48.63	Radius<300m
46.	131523.621	131540.801	17.18	Radius<300m
47.	131714.716	131818.259	103.54	Radius<300m
48.	132002.573	132142.314	139.74	Radius<300m
49.	132194.346	132283.554	89.21	Radius<300m
50.	132361.761	132418.674	56.91	Radius<300m
51.	132494.872	132503.194	08.32	Radius<300m
52.	132580.461	132609.853	29.39	Radius<300m
53.	132686.591	132702.562	15.97	Radius<300m
54.	132760.344	132771.295	10.95	Radius<300m
55.	132943.392	132949.579	06.19	Radius<300m

56.	133097.248	133107.003	09.76	Radius<300m
57.	133221.995	133243.351	21.36	Radius<300m
58.	133418.496	133424.198	05.70	Radius<300m
59.	133542.667	133587.098	44.43	Radius<300m
60.	133663.931	133766.5	102.57	Radius<300m
61.	133854.317	133909.886	55.57	Radius<300m
62.	133996.043	134033.717	37.67	Radius<300m
63.	134187.017	134215.094	28.08	Radius<300m
64.	134385.296	134434.529	49.23	Radius<300m
65.	134751.511	134776.681	25.17	Radius<300m
66.	134852.143	134909.825	57.68	Radius<300m
67.	134979.984	134987.003	07.02	Radius<300m
68.	135038.255	135065.991	27.74	Radius<300m
69.	135119.145	135181.65	62.51	Radius<300m
70.	135253.268	135269.455	16.19	Radius<300m
71.	135322.582	135332.342	09.76	Radius<300m
72.	135379.608	135402.796	23.19	Radius<300m
73.	135460.013	135579.876	119.86	Radius<300m
74.	135581.063	135615.101	34.04	Radius<300m
75.	135695.705	135710.772	15.07	Radius<300m
76.	135886.453	135914.714	28.26	Radius<300m
77.	136009.326	136082.117	72.79	Radius<300m
78.	136185.955	136262.706	76.75	Radius<300m
79.	136317.457	136345.18	27.72	Radius<300m
80.	136460.225	136530.658	70.43	Radius<300m
81.	136638.211	136714.607	76.40	Radius<300m
82.	136770.194	136803.703	33.51	Radius<300m
83.	136886.85	136960.245	73.39	Radius<300m
84.	137043.221	137058.349	15.13	Radius<300m
85.	137135.914	137240.98	105.07	Radius<300m
86.	137317.953	137384.938	66.98	Radius<300m
87.	137440.909	137521.66	80.75	Radius<300m
88.	137554.935	137631.699	76.76	Radius<300m
89.	137701.403	137732.192	30.79	Radius<300m
90.	137788.886	137812.322	23.44	Radius<300m
91.	137975.316	138001.131	25.82	Radius<300m
92.	138127.027	138135.684	08.66	Radius<300m
93.	138207.831	138237.543	29.71	Radius<300m
94.	138278.682	138284.151	05.47	Radius<300m

The safety barriers, protective works shall also be provided at the hazardous location/lengths.

The minimum quantity of protection work is presented in the following table:

12. SPECIAL REQUIREMENT FOR HILL ROADS

In accordance with section 13 of the manual (from IRC: SP:73-2015), IRC: SP-1998 and Recommended practices for Treatment of Embankment and Roadside slopes for Erosion control (First Revision), IRC:56-2011 and relevant IRC codes,

12.1 Slope Protection As the project involves cutting of existing hill slopes, it is imperative that

slopes are stabilized for ensuring longevity of the slope and the road, Slope stability, erosion control and landslide correction shall be accomplished in accordance with IRC : SP: 48-1998. Reference may be drawn from IRC:56-2011.

(i) The minimum quantity of protection work may be taken as below:

Type of Protection Work		
Protection Work	**Unit**	**Quantity**
1. Parapet Wall	Rm	5640
2. Breast wall with PCC	Rm	9050
3. Breast wall sausage type by gabion Specialized treatment for slide protection as specified above	Rm	2000
4. Retaining Wall with PCC	Rm	1750
5. Catch water drain	Rm	7000
6. Vetiver Plantation, Hydro Seeding and Hydro Mulching etc. including nets if required or similar works are to be done for slope protection and site mitigation measure upto a height of 12-15 m all along the road on barren slopes except hard rock location which needs to be protected with appropriate applicable technologies, if required.		

(ii) Location of existing Slide prone zones

SI.No	Design Chainage		Length(m)	Remarks
	From (m)	To (m)		
1.	127+453	128+153	700	
2.	131+553	132+053	500	
3.	134+853	135+153	300	
4.	135+203	135+703	500	

Note- *The Contractor shall be responsible for accurate assessment of the actual requirement as per site situation & prepare designs for slope protection &stabilization as per the specifications &standards stipulated in schedule 'D' and submit the same to the AE for review through the proof consultant and implement it accordingly thereafter.*

Any increase in quantity over and above the tentative qty. ***as mentioned in above table or through change in specifications will not be considered as change of scope.*** *Therefore contractor shall make thorough investigation at site and assess the requirement of slope protection and slide prone zone and other safety features at his own before submission of bid.*

12.2 Rip rap Protection:

The minimum quantity of riprap protection or similar work to be provided at valley side shoulder in the following locations as special safety feature on valley side on curves.

SI.No	Chainage		Length
	From (km)	To (km)	
1.	122353	122503	150
2.	122513	122553	40
3.	122553	122653	100
4.	122703	122743	40
5.	122743	122753	10
6.	122753	122763	10
7.	122853	122883	30
8.	122883	122903	20
9.	123263	123293	30
10.	123343	123353	10
11.	123353	123393	40
12.	123513	123563	50
13.	123853	123973	120
14.	124903	124993	90
15.	124993	125013	20
16.	125013	125143	130
17.	125143	125153	10
18.	125153	125313	160
19.	125363	125443	80
20.	125453	125513	60
21.	125513	125553	40

22.	125553	125593	40
23.	125853	126003	150
24.	126703	126753	50
25.	126853	126903	50
26.	127563	127573	10
27.	127753	128003	250
28.	128123	128223	100
29.	128453	128673	220
30.	128673	128783	110
31.	128783	128853	70
32.	129253	129353	100
33.	129373	129473	100
34.	129573	129603	30
35.	129693	129713	20
36.	129903	129963	60
37.	130553	130603	50
38.	130803	130813	10
39.	131253	131283	30
40.	131283	131353	70
41.	131723	131763	40
42.	132753	132793	40
43.	132903	132923	20
44.	133183	133213	30
45.	133293	133353	60
46.	133453	133533	80
47.	133603	133623	20
48.	133663	133703	40
49.	134153	134163	10
50.	134343	134363	20
51.	134433	134453	20
52.	134653	134733	80
53.	134733	134753	20
54.	134753	134763	10
55.	134823	134843	20
56.	135103	135203	100
57.	135653	135753	100
58.	135973	135993	20
59.	136153	136163	10
60.	136453	136463	10
61.	136573	136613	40
62.	136653	136693	40
63.	136893	136923	30

64.	137023	137043	20

12.3 ROAD LAND BOUNDARY (Clause 12.2 IRC SP: 73 : 2015)

Road land (ROW) boundary shall be demarcated by putting RCC boundary pillars of size 60cm x 15cm x 15 cm embedded in concrete (as per IRC:25) along the Project Highway at 200 m interval on both sides. All the components used in delineating road land boundary shall be aesthetically pleasing, sturdy and vandal proof. The road land boundary shall be demarcated in consultation with NHIDCL.

12.4 Disposal of Debris: - As per Manual

13 CHANGE OF SCOPE

The length of Structures, bridges and slope protection works whatsoever in terms of retaining wall, breast wall, gabion wall or under special requirement of hill slope 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 and specifications in this Schedule-B shall not constitute a Change of Scope.