

SCHEDULE – B
*(See Clause 2.1)***DEVELOPMENT OF THE PROJECT HIGHWAY****1 Development of the Project Highway**

Development of the Project Highway shall include design and construction of the 2 Lane with Paved Shoulder Project Highway as described in this Schedule-B and in Schedule-C.

2 Rehabilitation and augmentation

Rehabilitation and augmentation shall include [Two-Laning and strengthening] 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

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 of reliability, 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 Independent Consultant) before C.O.D.;
- 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. WIDENING OF THE EXISTING HIGHWAY

- 2.1** 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.

2.2 Width of Carriageway

- 2.2.1** Two-Laning with paved shoulders shall be undertaken. The paved carriageway shall be [7(seven) m] wide in accordance with the typical cross sections drawings in the Manual.
- 2.2.2** Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to paragraph 2.1 above.

3. GEOMETRIC DESIGN AND GENERAL FEATURES

3.1 General

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

3.2 Design speed

The design speed shall be the minimum design speed of [30 km per hr for hilly and mountainous terrain].

3.3 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: SP-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 / 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 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 proper road signs and safety measures shall be provided:

Improvement due to Realignments: (PKG-III)

S.NO.	DESIGN CHAINAGE		EXISTING CHAINAGE		LENGTH
	FROM	TO	FROM	TO	(m)
1	44000	44080	50050	50180	80
2	44100	44180	50190	50300	80
3	44200	44230	50330	50360	30
4	44340	44420	50485	50610	80
5	44540	44580	50725	50760	40
6	44640	44720	50830	50950	80
7	44790	44960	51010	51270	170
8	45070	45310	51370	51850	240
9	45430	45510	51970	52130	80
10	45590	45620	52200	52225	30
11	45730	45800	52375	52440	70
12	45830	45920	52490	52675	90

S.NO.	DESIGN CHAINAGE		EXISTING CHAINAGE		LENGTH (m)
	FROM	TO	FROM	TO	
13	46000	46110	52745	52850	110
14	46190	46230	52930	52975	40
15	46360	46560	53100	53305	200
16	46580	46900	53350	53890	320
17	46960	47780	53950	55150	820
18	47880	48000	55330	55460	120
19	48500	48850	56160	56550	350
20	48880	48950	56580	56640	70
21	49230	49250	56930	57000	20
22	49370	49390	57110	57150	20
23	49420	49650	57200	57550	230
24	49690	49980	57595	57900	290
25	50000	50230	57920	58330	230
26	50270	50290	58350	58370	20
27	50310	50340	58400	58480	30
28	50460	50580	58590	58700	120
29	50630	50670	58800	58820	40
30	50960	51080	59150	59250	120
31	51180	51270	59350	59450	90
32	51390	51460	59630	59700	70
33	51630	52310	59900	60650	680
34	52360	52675	60705	61060	315
35	52685	52840	61070	61250	155
36	52870	52950	61270	61400	80
37	53020	53070	61510	61600	50
38	53346	53500	61910	62070	154
39	53700	55250	62270	64350	1550
40	55400	57200	64505	66790	1800
Total					9164

Improvement due to Sharp Curves: Package-III

SL. No	Design Chainage(m)		Remarks
	From	To	
1	44+051.935	44+073.767	Radius <300
2	44+193.046	44+233.364	Radius <300
3	44+237.643	44+290.896	Radius <300
4	44+337.680	44+359.738	Radius <300
5	44+416.098	44+418.401	Radius <300
6	44+494.462	44+496.453	Radius <300

SL. No	Design Chainage(m)		Remarks
7	44+627.873	44+700.472	Radius <300
8	44+865.704	44+922.997	Radius <300
9	45+054.176	45+061.945	Radius <300
10	45+116.610	45+388.887	Radius <300
11	45+600.351	45+744.950	Radius <300
12	45+803.918	45+820.887	Radius <300
13	45+945.545	45+957.870	Radius <300
14	46+038.854	46+261.710	Radius <300
15	46+333.750	46+365.868	Radius <300
16	46+439.359	46+512.559	Radius <300
17	46+583.952	46+620.103	Radius <300
18	46+762.252	46+845.550	Radius <300
19	46+992.731	47+034.304	Radius <300
20	47+195.257	47+216.697	Radius <300
21	47+319.166	47+362.793	Radius <300
22	47+440.372	47+481.175	Radius <300
23	47+588.173	47+602.319	Radius <300
24	47+707.991	47+860.556	Radius <300
25	47+969.991	48+043.245	Radius <300
26	48+152.301	48+190.465	Radius <300
27	48+292.963	48+330.984	Radius <300
28	48+404.716	48+426.534	Radius <300
29	48+493.047	48+499.370	Radius <300
30	48+526.436	48+543.285	Radius <300
31	48+561.674	48+599.478	Radius <300
32	48+646.294	48+655.202	Radius <300
33	48+715.774	48+731.167	Radius <300
34	48+746.820	48+767.151	Radius <300
35	48+798.746	48+800.771	Radius <300
36	48+845.362	48+858.560	Radius <300
37	48+920.674	48+982.233	Radius <300
38	49+058.405	49+214.279	Radius <300
39	49+264.489	49+297.811	Radius <300
40	49+479.784	49+508.122	Radius <300
41	49+611.920	49+613.019	Radius <300
42	49+655.070	49+686.670	Radius <300
43	49+726.742	49+730.563	Radius <300
44	49+802.164	49+854.846	Radius <300
45	49+896.313	49+916.713	Radius <300
46	49+951.298	49+970.980	Radius <300
47	50+012.938	50+018.722	Radius <300
48	50+090.384	50+107.606	Radius <300
49	50+167.691	50+257.177	Radius <300

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 44+000 to km 59+363 [Existing km 50.050 to km 70.000] in the State of Arunachal Pradesh under SARDP-NE

SL. No	Design Chainage(m)		Remarks
50	50+355.729	50+408.361	Radius <300
51	50+475.076	50+503.111	Radius <300
52	50+588.928	50+730.554	Radius <300
53	50+844.870	50+861.598	Radius <300
54	50+933.471	50+960.881	Radius <300
55	51+055.293	51+178.211	Radius <300
56	51+236.079	51+240.196	Radius <300
57	51+318.890	51+353.597	Radius <300
58	51+426.875	51+449.333	Radius <300
59	51+581.921	51+608.274	Radius <300
60	51+659.131	51+700.996	Radius <300
61	51+776.737	51+798.148	Radius <300
62	51+855.048	51+892.041	Radius <300
63	51+962.566	51+972.589	Radius <300
64	52+070.918	52+073.296	Radius <300
65	52+155.528	52+158.609	Radius <300
66	52+286.155	52+292.783	Radius <300
67	52+336.215	52+351.699	Radius <300
68	52+383.617	52+419.043	Radius <300
69	52+477.663	52+483.116	Radius <300
70	52+558.930	52+582.359	Radius <300
71	52+646.647	52+662.344	Radius <300
72	52+732.641	52+743.225	Radius <300
73	52+807.137	52+850.579	Radius <300
74	52+889.610	52+968.638	Radius <300
75	53+089.239	53+101.634	Radius <300
76	53+283.432	53+396.166	Radius <300
77	53+480.514	53+512.802	Radius <300
78	53+625.359	53+641.155	Radius <300
79	53+748.282	53+868.088	Radius <300
80	54+042.876	54+049.363	Radius <300
81	54+294.758	54+325.996	Radius <300
82	54+404.778	54+449.960	Radius <300
83	54+481.691	54+498.586	Radius <300
84	54+584.061	54+628.058	Radius <300
85	54+718.454	54+780.872	Radius <300
86	54+874.078	54+885.037	Radius <300
87	54+929.833	54+949.569	Radius <300
88	54+993.152	55+041.864	Radius <300
89	55+075.223	55+152.896	Radius <300
90	55+242.454	55+301.515	Radius <300
91	55+479.230	55+497.833	Radius <300
92	55+566.486	55+598.650	Radius <300

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 44+000 to km 59+363 [Existing km 50.050 to km 70.000] in the State of Arunachal Pradesh under SARDP-NE

SL. No	Design Chainage(m)		Remarks
93	55+634.142	55+696.470	Radius <300
94	55+759.982	55+789.503	Radius <300
95	55+856.269	55+874.914	Radius <300
96	55+932.126	55+952.228	Radius <300
97	55+995.608	55+997.804	Radius <300
98	56+078.264	56+140.683	Radius <300
99	56+218.857	56+297.862	Radius <300
100	56+352.298	56+376.159	Radius <300
101	56+415.813	56+424.054	Radius <300
102	56+444.811	56+463.932	Radius <300
103	56+545.377	56+634.775	Radius <300
104	56+673.682	56+699.451	Radius <300
105	56+783.481	56+802.961	Radius <300
106	56+872.316	56+975.984	Radius <300
107	57+020.747	57+060.431	Radius <300
108	57+094.302	57+100.808	Radius <300
109	57+142.369	57+180.522	Radius <300
110	57+185.657	57+212.974	Radius <300
111	57+269.589	57+303.459	Radius <300
112	57+366.656	57+399.879	Radius <300
113	57+454.981	57+469.703	Radius <300
114	57+504.635	57+545.318	Radius <300
115	57+557.241	57+600.308	Radius <300
116	57+704.158	57+719.562	Radius <300
117	57+856.278	57+884.964	Radius <300
118	57+981.144	58+070.569	Radius <300
119	58+130.081	58+148.896	Radius <300
120	58+210.963	58+221.769	Radius <300
121	58+279.262	58+305.610	Radius <300
122	58+365.362	58+416.154	Radius <300
123	58+428.851	58+450.568	Radius <300
124	58+595.493	58+621.347	Radius <300
125	58+670.013	59+330	Radius <300

3.4 Proposed Right of Way

[Refer to paragraph 2.3 of the Manual]. Details of the Right of Way are given in are tabulated below.

Sl. No	Design Chainage		Length	Width (m)
	From	To		
1.	44.000	59.363	15.363	18m – 35m

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

3.5 Type of Shoulders

[Refer to paragraph 2.6.1 of the Manual and specify]

- (a) In built-up sections, 1.5m paved shoulders with footpath have been considered as TCS-4.
- (b) In open country, paved shoulders of 1.5m in width shall be provided and 1.0m earthen shoulder shall be covered with 150mm thick compacted layer of granular material.
- (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.

3.6 Lateral and vertical clearances at underpasses

3.6.1 Lateral and vertical clearances at underpasses and provision of guardrails/crash barriers shall be as per paragraph 2.11 of the Manual.

3.6.2 *Lateral clearance:* The width of the opening at the underpasses shall be as follows:

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

3.7 Lateral and vertical clearances at overpasses

3.7.1 Lateral and vertical clearances at overpasses shall be as per paragraph 2.12 of the Manual.

3.7.2 *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				

3.8 Service roads

Service roads shall be constructed at the locations and for the lengths 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				

3.9 Grade Separated Structures

3.9.1 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					

3.9.2 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 pass/ overpass structure and whether the cross road is to be carried at the existing level, raised or lowered].

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

3.10 Cattle and pedestrian underpass / overpass

Cattle and pedestrian underpass/overpass 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		

3.11 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-4. These illustrate the widening proposals for the project highway. The Project Highway (length 15.363km) 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:

S.NO.	DESIGN CHAINAGE		LENGTH (m)	TYPE TCS	Remarks / Location
	FROM	TO			
1	44000	44080	80	3	Realignment
2	44080	44100	20	2	Reconstruction and widening
3	44100	44180	80	3	Realignment
4	44180	44200	20	2	Reconstruction and widening
5	44200	44230	30	3	Realignment
6	44230	44340	110	2	Reconstruction and widening
7	44340	44420	80	3	Realignment
8	44420	44540	120	2	Reconstruction and widening
9	44540	44580	40	3	Realignment
10	44580	44640	60	2	Reconstruction and widening
11	44640	44720	80	3	Realignment
12	44720	44790	70	1	Reconstruction and widening with Retaining wall
13	44790	44960	170	3	Realignment
14	44960	45070	110	2	Reconstruction and widening
15	45070	45310	240	3	Realignment
16	45310	45430	120	2	Reconstruction and widening
17	45430	45510	80	3	Realignment
18	45510	45590	80	2	Reconstruction and widening
19	45590	45620	30	3	Realignment
20	45620	45730	110	2	Reconstruction and widening
21	45730	45800	70	3	Realignment
22	45800	45830	30	2	Reconstruction and widening
23	45830	45920	90	3	Realignment
24	45920	46000	80	2	Reconstruction and widening
25	46000	46110	110	3	Realignment
26	46110	46190	80	2	Reconstruction and widening
27	46190	46230	40	3	Realignment
28	46230	46360	130	2	Reconstruction and widening

S.NO.	DESIGN CHAINAGE		LENGTH	TYPE	Remarks / Location
29	46360	46560	200	3	Realignment
30	46560	46580	20	2	Reconstruction and widening
31	46580	46900	320	3	Realignment
32	46900	46960	60	2	Reconstruction and widening
33	46960	47780	820	3	Realignment
34	47780	47810	30	2	Reconstruction and widening
35	47810	47830	20	1	Reconstruction and widening with Retaining wall
36	47830	47880	50	1	Reconstruction and widening with Retaining wall
37	47880	48000	120	3	Realignment
38	48000	48450	450	2	Reconstruction and widening
39	48450	48490	40	2	Reconstruction and widening with Retaining wall
40	48490	48500	10	2	Reconstruction and widening
41	48500	48850	350	3	Realignment
42	48850	48880	30	2	Reconstruction and widening
43	48880	48950	70	3	Realignment
44	48950	49000	50	2	Reconstruction and widening
45	49000	49200	200	1	Reconstruction and widening with Retaining wall
46	49200	49230	30	1	Reconstruction and widening with Retaining wall
47	49230	49250	20	3	Realignment
48	49250	49370	120	2	Reconstruction and widening
49	49370	49390	20	3	Realignment
50	49390	49420	30	2	Reconstruction and widening
51	49420	49650	230	3	Realignment
52	49650	49690	40	1	Reconstruction and widening with Retaining wall
53	49690	49980	290	3	Realignment
54	49980	50000	20	1	Reconstruction and widening with Retaining wall
55	50000	50230	230	3	Realignment
56	50230	50270	40	2	Reconstruction and widening
57	50270	50290	20	3	Realignment
58	50290	50310	20	2	Reconstruction and widening
59	50310	50340	30	3	Realignment

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 44+000 to km 59+363 [Existing km 50.050 to km 70.000] in the State of Arunachal Pradesh under SARDP-NE

S.NO.	DESIGN CHAINAGE		LENGTH	TYPE	Remarks / Location
60	50340	50460	120	2	Reconstruction and widening
61	50460	50580	120	3	Realignment
62	50580	50630	50	1	Reconstruction and widening with Retaining wall
63	50630	50670	40	3	Realignment
64	50670	50960	290	2	Reconstruction and widening
65	50960	51080	120	3	Realignment
66	51080	51180	100	2	Reconstruction and widening
67	51180	51270	90	3	Realignment
68	51270	51390	120	2	Reconstruction and widening
69	51390	51460	70	3	Realignment
70	51460	51630	170	1	Reconstruction and widening with Retaining wall
71	51630	52310	680	3	Realignment
72	52310	52360	50	1	Reconstruction and widening with Retaining wall
73	52360	52675	315	3	Realignment
74	52675	52685	10	2	Reconstruction and widening
75	52685	52840	155	3	Realignment
76	52840	52870	30	2	Reconstruction and widening
77	52870	52950	80	3	Realignment
78	52950	53020	70	2	Reconstruction and widening
79	53020	53070	50	3	Realignment
80	53070	53346	276	2	Reconstruction and widening
81	53346	53500	154	3	Realignment
82	53500	53700	200	2	Reconstruction and widening
83	53700	55250	1550	3	Realignment
84	55250	55400	150	2	Reconstruction and widening
85	55400	57200	1800	3	Realignment
86	57200	59363	2163	4	Built up area
Total			15363		

Note: The extent of cross section type is indicative and shall be reviewed in consultation with the Independent Consultant 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 Independent Consultant at the time of construction. The utility services, including optical fiber cables, shall be provided in the utility corridor earmarked for this purpose on the side where it is convenient to the NHIDCL or the fiber cable shall be relocated by the respective owner at a safe place as indicated by NHIDCL in such a way that it causes least hindrances to the execution of project. In urban sections the utility connection, the utility services shall be carried through the nearest cross drainage structure/cattle crossing below its deck slab and above HFL. In absence of such a structure in the vicinity of the purposed location, it shall pass through separate underground ducts. Location and design of the cross utility ducts shall be finalized at the detailed design stage in consonance with the Independent Consultant and NHIDCL.

3.12 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 .

3.13 Built-Up Areas

The alignment passes through Built up areas as tabulated below.

Sl.no	Location/Design Chainage(km)	Name of Village/town etc
1	New Palin	58+200

4. INTERSECTIONS AND GRADE SEPARATORS

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:

- i) Typical junction treatments as specified in Final Project Report shall be applied. Design types of intersections are as given below:

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

- (a) At-grade Intersections

Major Intersections

SI No.	Location of Intersection	Intersection Towards	Existing Configurations				Type of Intersection	Figure No.	Other Features
			Location	Type	Width (m)	Surface			
Nil									

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

Minor Intersections

SI No.	Location of Intersection	Type of Intersection	Side
1	44+300	3-Legged	Left side
2	49+360	3-Legged	Left side
3	52+040	3-Legged	Left side
4	56+810	3-Legged	Left side
5	57+200	3-Legged	Right side
6	57+765	3-Legged	Right side
7	58+080	3-Legged	Right side
8	58+135	3-Legged	Right side
9	58+460	3-Legged	Right side

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

(b) Grade Separated Intersections with/without Ramps

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

5. ROAD EMBANKMENT AND CUT SECTION

5.1 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.

5.2 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:

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 44+000 to km 59+363 [Existing km 50.050 to km 70.000] in the State of Arunachal Pradesh under SARDP-NE

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

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

6. PAVEMENT DESIGN

6.1 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).

6.2 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: 37-2012, they may carry out their own diligence to arrive at project cost before submitting bids.

6.3 Design requirements

[Refer to paragraph 5.4, 5.9 and 5.1'0 of the Manual and specify design requirements and strategy]

6.3.1 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 15years. Stage construction shall not be permitted.

6.3.2 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 (msa) as follows.

PACKAGE	Design Chainage (km)		Length (km)	15 Year MSA*
	From	To		
III	44+000	59+363	15.363	20

*As per 5.4.1 of IRC:SP: 73-2015

6.3.3 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. Design should take care of the maximum wheel load derived from the axle load survey on the design lane
(iii)	Design serviceability Loss	2.0
(iv)	Reliability	90%
(v)	Overall Standard Deviation	0.49
(vi)	Effective Roadblock Soil Resilient Modulus	Corresponding to 4-day soaked CBR value of 8.0% to 10.0%
(vii)	Layer Coefficients	As per the IRC 37 : 2012 procedures
(viii)	Drainage quality of Pavement	Good

6.3.4 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 polymer modified bitumen (PMB 40) 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.

6.3.5 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.

6.3.6 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.

6.3.7 Contractor shall design the pavement for design traffic of 20 million standard axles with corresponding subgrade CBR.

6.3.8 Rigid Pavement

No rigid pavement has been considered for the Project Highway.

6.4 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.

SI No.	Section (km)		Remarks
	From	To	
1	44+000	59+363	Poor condition of existing pavement

7. 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:

7.1 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

SL.NO.	Package	DESIGN CHAINAGE		LENGTH	SIDE	Remarks / Location
		FROM	TO	(m)		
1	PKG-3	44000	44080	160	Both	Realignment
2	PKG-3	44080	44100	20	One	Reconstruction and widening
3	PKG-3	44100	44180	160	Both	Realignment

4	PKG-3	44180	44200	20	One	Reconstruction and widening
5	PKG-3	44200	44230	60	Both	Realignment
6	PKG-3	44230	44340	110	One	Reconstruction and widening
7	PKG-3	44340	44420	160	Both	Realignment
8	PKG-3	44420	44540	120	One	Reconstruction and widening
9	PKG-3	44540	44580	80	Both	Realignment
10	PKG-3	44580	44640	60	One	Reconstruction and widening
11	PKG-3	44640	44720	160	Both	Realignment
12	PKG-3	44720	44790	70	One	Reconstruction and widening with Retaining wall
13	PKG-3	44790	44960	340	Both	Realignment
14	PKG-3	44960	45070	110	One	Reconstruction and widening
15	PKG-3	45070	45310	480	Both	Realignment
16	PKG-3	45310	45430	120	One	Reconstruction and widening
17	PKG-3	45430	45510	160	Both	Realignment
18	PKG-3	45510	45590	80	One	Reconstruction and widening
19	PKG-3	45590	45620	60	Both	Realignment
20	PKG-3	45620	45730	110	One	Reconstruction and widening
21	PKG-3	45730	45800	140	Both	Realignment
22	PKG-3	45800	45830	30	One	Reconstruction and widening
23	PKG-3	45830	45920	180	Both	Realignment
24	PKG-3	45920	46000	80	One	Reconstruction and widening
25	PKG-3	46000	46110	220	Both	Realignment
26	PKG-3	46110	46190	80	One	Reconstruction and widening
27	PKG-3	46190	46230	80	Both	Realignment
28	PKG-3	46230	46360	130	One	Reconstruction and widening
29	PKG-3	46360	46560	400	Both	Realignment
30	PKG-3	46560	46580	20	One	Reconstruction and widening
31	PKG-3	46580	46900	640	Both	Realignment
32	PKG-3	46900	46960	60	One	Reconstruction and widening
33	PKG-3	46960	47780	1640	Both	Realignment

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 44+000 to km 59+363 [Existing km 50.050 to km 70.000] in the State of Arunachal Pradesh under SARDP-NE

34	PKG-3	47780	47810	30	One	Reconstruction and widening
35	PKG-3	47810	47830	20	One	Reconstruction and widening with Retaining wall
36	PKG-3	47830	47880	50	One	Reconstruction and widening with Retaining wall
37	PKG-3	47880	48000	240	Both	Realignment
38	PKG-3	48000	48450	450	One	Reconstruction and widening
39	PKG-3	48450	48490	40	One	Reconstruction and widening with Retaining wall
40	PKG-3	48490	48500	10	One	Reconstruction and widening
41	PKG-3	48500	48850	700	Both	Realignment
42	PKG-3	48850	48880	30	One	Reconstruction and widening
43	PKG-3	48880	48950	140	Both	Realignment
44	PKG-3	48950	49000	50	One	Reconstruction and widening
45	PKG-3	49000	49200	200	One	Reconstruction and widening with Retaining wall
46	PKG-3	49200	49230	30	One	Reconstruction and widening with Retaining wall
47	PKG-3	49230	49250	40	Both	Realignment
48	PKG-3	49250	49370	120	One	Reconstruction and widening
49	PKG-3	49370	49390	40	Both	Realignment
50	PKG-3	49390	49420	30	One	Reconstruction and widening
51	PKG-3	49420	49650	460	Both	Realignment
52	PKG-3	49650	49690	40	One	Reconstruction and widening with Retaining wall
53	PKG-3	49690	49980	580	Both	Realignment
54	PKG-3	49980	50000	20	One	Reconstruction and widening with Retaining wall
55	PKG-3	50000	50230	460	Both	Realignment
56	PKG-3	50230	50270	40	One	Reconstruction and widening
57	PKG-3	50270	50290	40	Both	Realignment
58	PKG-3	50290	50310	20	One	Reconstruction and widening

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 44+000 to km 59+363 [Existing km 50.050 to km 70.000] in the State of Arunachal Pradesh under SARDP-NE

59	PKG-3	50310	50340	60	Both	Realignment
60	PKG-3	50340	50460	120	One	Reconstruction and widening
61	PKG-3	50460	50580	240	Both	Realignment
62	PKG-3	50580	50630	50	One	Reconstruction and widening with Retaining wall
63	PKG-3	50630	50670	80	Both	Realignment
64	PKG-3	50670	50960	290	One	Reconstruction and widening
65	PKG-3	50960	51080	240	Both	Realignment
66	PKG-3	51080	51180	100	One	Reconstruction and widening
67	PKG-3	51180	51270	180	Both	Realignment
68	PKG-3	51270	51390	120	One	Reconstruction and widening
69	PKG-3	51390	51460	140	Both	Realignment
70	PKG-3	51460	51630	170	One	Reconstruction and widening with Retaining wall
71	PKG-3	51630	52310	1360	Both	Realignment
72	PKG-3	52310	52360	50	One	Reconstruction and widening with Retaining wall
73	PKG-3	52360	52675	630	Both	Realignment
74	PKG-3	52675	52685	10	One	Reconstruction and widening
75	PKG-3	52685	52840	310	Both	Realignment
76	PKG-3	52840	52870	30	One	Reconstruction and widening
77	PKG-3	52870	52950	160	Both	Realignment
78	PKG-3	52950	53020	70	One	Reconstruction and widening
79	PKG-3	53020	53070	100	Both	Realignment
80	PKG-3	53070	53346	276	One	Reconstruction and widening
81	PKG-3	53346	53500	308	Both	Realignment
82	PKG-3	53500	53700	200	One	Reconstruction and widening
83	PKG-3	53700	55250	3100	Both	Realignment
84	PKG-3	55250	55400	150	One	Reconstruction and widening
85	PKG-3	55400	57200	3600	Both	Realignment
86	PKG-3	57200	59363	4326	Both	Built up area
Total				26690		

Note: (The above locations shall be reviewed in consultation with the Independent Consultant 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 IRC and accordingly they may carry out their own diligence to arrive at project cost before submitting the bid.

7.2 Slope Protection Measures

7.2.1 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) or specialized treatment as per good engineering practices. 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° (0.7H to 1V). Slide prone zones is from Km 48+300 to Km 48+900 and Km 49+400 to Km 49+800.

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

7.2.3 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.

7.3 Rip Rap Protection:

The riprap protection or similar work to be provided at valley side shoulder over the granular sub base layer in the following locations as special safety feature on valley side on curves.

Sl. No	Chainage		Length(m)
	From (km)	To(km)	
1	44080	44100	20
2	44180	44200	20
3	44230	44340	110
4	44420	44540	120

Sl. No	Chainage		Length(m)
	From (km)	To(km)	
5	44580	44640	60
6	44720	44790	70
7	44960	45070	110
8	45310	45430	120
9	45510	45590	80
10	45620	45730	110
11	45800	45830	30
12	45920	46000	80
13	46110	46190	80
14	46230	46360	130
15	46560	46580	20
16	46900	46960	60
17	47780	47810	30
18	47810	47830	20
19	47830	47880	50
20	48000	48450	450
21	48450	48490	40
22	48490	48500	10
23	48850	48880	30
24	48950	49120	170
25	49120	49200	80
26	49200	49230	30
27	49250	49370	120
28	49390	49420	30
29	49650	49690	40
30	49980	50000	20
31	50230	50270	40
32	50290	50310	20
33	50340	50460	120
34	50580	50630	50
35	50670	50960	290
36	51080	51180	100
37	51270	51390	120
38	51460	51630	170
39	52310	52360	50
40	52675	52685	10
41	52840	52870	30
42	52950	53020	70
43	53070	53346	276
44	53500	53700	200
45	55250	55400	150

8. DESIGN OF STRUCTURES

8.1 General

The Project road from Dam to New Palin, includes provision of no major bridges (span \geq 60m), 4 no minor bridge (span $<$ 60m) and 93 box 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 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 from local authorities/interviews with locals/irrigation authorities.
- iv) For drainage purpose the new/to be reconstructed box culverts of minimum span 2.0 m 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.

8.2 Culverts

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

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

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Proposed Span
1	50+160	44+080	RCC Box/ Slab	2.0
2	50+360	44+230	RCC Box/ Slab	2.0
3	50+500	44+370	RCC Box/ Slab	2.0
4	50+830	44+640	RCC Box/ Slab	2.0
5	52+710	45+980	RCC Box/ Slab	2.0
6	53+475	46+690	RCC Box/ Slab	2.0
7	53+870	46+890	RCC Box/ Slab	2.0
8	54+020	47+030	RCC Box/ Slab	2.0
9	54+050	47+070	RCC Box/ Slab	2.0
10	55+700	48+150	RCC Box/ Slab	2.0
11	56+270	48+230	RCC Box/ Slab	2.0
12	57+260	49+490	RCC Box/ Slab	2.0
13	57+750	49+860	RCC Box/ Slab	2.0
14	58+625	50+500	RCC Box/ Slab	2.0
15	58+750	50+600	RCC Box/ Slab	2.0
16	59+640	51+400	RCC Box/ Slab	2.0
17	59+825	51+570	RCC Box/ Slab	2.0
18	60+350	52+110	RCC Box/ Slab	2.0
19	62+650	54+050	RCC Box/ Slab	2.0
20	62+745	54+150	RCC Box/ Slab	2.0
21	62+810	54+210	RCC Box/ Slab	2.0
22	64+990	55+710	RCC Box/ Slab	2.0
23	65+810	56+390	RCC Box/ Slab	2.0
24	65+950	56+490	RCC Box/ Slab	2.0
25	66+150	56+640	RCC Box/ Slab	2.0
26	66+400	56+850	RCC Box/ Slab	2.0
27	66+480	56+930	RCC Box/ Slab	2.0
28	67+480	57+760	RCC Box/ Slab	3.0
29	67+660	57+920	RCC Box/ Slab	2.0
30	68+440	58+600	RCC Box/ Slab	2.0
31	68+870	59+000	RCC Box/ Slab	2.0

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

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

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Span
1	50+290	44+160	RCC Box/ Slab	2.0
2	51+450	45+130	RCC Box/ Slab	2.0
3	51+500	45+170	RCC Box/ Slab	2.0
4	51+860	45+330	RCC Box/ Slab	2.0
5	52+255	45+640	RCC Box/ Slab	2.0
6	52+475	45+810	RCC Box/ Slab	2.0
7	53+550	46+800	RCC Box/ Slab	2.0
8	53+920	46+930	RCC Box/ Slab	2.0
9	54+620	47+410	RCC Box/ Slab	2.0
10	55+550	47+740	RCC Box/ Slab	2.0
11	55+610	48+080	RCC Box/ Slab	2.0
12	56+570	48+890	RCC Box/ Slab	2.0
13	56+895	49+190	RCC Box/ Slab	2.0
14	57+030	49+280	RCC Box/ Slab	2.0
15	57+160	49+400	RCC Box/ Slab	2.0
16	57+320	49+530	RCC Box/ Slab	2.0
17	57+450	49+570	RCC Box/ Slab	2.0
18	57+900	49+980	RCC Box/ Slab	2.0
19	58+320	50+250	RCC Box/ Slab	2.0
20	58+325	50+310	RCC Box/ Slab	2.0
21	58+500	50+360	RCC Box/ Slab	2.0
22	59+000	50+850	RCC Box/ Slab	2.0
23	59+150	50+980	RCC Box/ Slab	2.0
24	59+270	51+090	RCC Box/ Slab	2.0
25	59+494	51+280	RCC Box/ Slab	2.0
26	59+550	51+330	RCC Box/ Slab	2.0
27	60+160	51+910	RCC Box/ Slab	2.0
28	60+600	52+280	RCC Box/ Slab	2.0
29	61+080	52+680	RCC Box/ Slab	2.0
30	61+190	52+790	RCC Box/ Slab	2.0
31	61+330	52+910	RCC Box/ Slab	6.0
32	61+510	52+980	RCC Box/ Slab	2.0
33	61+700	53+140	RCC Box/ Slab	2.0
34	61+810	53+270	RCC Box/ Slab	2.0
35	61+950	53+370	RCC Box/ Slab	2.0
36	62+280	53+700	RCC Box/ Slab	2.0
37	62+410	53+810	RCC Box/ Slab	2.0
38	62+510	53+920	RCC Box/ Slab	2.0

Two Lining of Joram – koloriang Road (NH-713) on EPC basis from design km 44+000 to km 59+363 [Existing km 50.050 to km 70.000] in the State of Arunachal Pradesh under SARDP-NE

39	63+125	54+410	RCC Box/ Slab	2.0
40	63+260	54+440	RCC Box/ Slab	2.0
41	63+280	54+570	RCC Box/ Slab	2.0
42	63+560	54+740	RCC Box/ Slab	2.0
43	63+650	54+820	RCC Box/ Slab	2.0
44	63+750	54+910	RCC Box/ Slab	2.0
45	63+820	54+970	RCC Box/ Slab	2.0
46	64+125	55+190	RCC Box/ Slab	2.0
47	64+355	55+270	RCC Box/ Slab	2.0
48	64+455	55+330	RCC Box/ Slab	2.0
49	64+560	55+460	RCC Box/ Slab	2.0
50	64+610	55+500	RCC Box/ Slab	2.0
51	64+740	55+600	RCC Box/ Slab	2.0
52	64+800	55+640	RCC Box/ Slab	2.0
53	65+300	55+900	RCC Box/ Slab	2.0
54	65+575	56+150	RCC Box/ Slab	2.0
55	65+740	56+320	RCC Box/ Slab	2.0
56	66+350	56+790	RCC Box/ Slab	2.0
57	66+790	57+200	RCC Box/ Slab	2.0
58	68+000	58+160	RCC Box/ Slab	2.0
59	68+680	58+820	RCC Box/ Slab	2.0
60	69+110	59+250	RCC Box/ Slab	2.0

8.2.4 Repairs/replacements 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]

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Proposed Span
1	57+600	49+690	RCC Box/ Slab	2.0
2	57+650	49+750	RCC Box/ Slab	3.0

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

8.3 Bridges

8.3.1 The existing bridges to be reconstructed/widened

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

Sl No.	Existing Chainage	Design Chainage	Proposed Span(m)	Proposed Width(m)	Remarks
1	56+350	48+657	1 x 7	16.0	Reconstruction
2	56+420	48+740	1 x 7	16.0	Reconstruction
3	62+150	53+574	1 x 16	16.0	Reconstruction
4	69+200	59+346	1 x 33	16.0	Reconstruction

Sl No	Bridge Location (km)	Salient Details of Existing Bridge					Adequacy or Otherwise of the Existing Waterway, Vertical Clearance etc.	Remarks
		Span Arrangement (m)	Carriageway Width (m)	Total Width (m)	Type of Superstructure	Type of Foundation		
1	56+350	1x7.0	6.1	6.6	RCC Slab	Open	Vertical Clearance~3.0m	Narrow Bridge
2	56+420	1x6.75	5.0	5.5	RCC Slab	Open	Vertical Clearance~3.2m	Narrow Bridge
3	62+150	1 X 15.5	3.5	5.0	DS type Bailey bridge	Open	Vertical Clearance~5.3m	Narrow Bridge
4	69+200	1 X 33.0	3.3	4.5	TS type bailey bridge	Open	Vertical Clearance~8.6m	Narrow Bridge

8.3.2 The following structures shall be provided with footpaths:

Sl No.	Location (km)	Remarks
1	48+657	Footpath on both sides
2	48+740	Footpath on both sides
3	53+574	Footpath on both sides
4	59+346	Footpath on both sides

8.3.3 Additional New Minor Bridges

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

Sl No.	Bridge at km	Utility Services to be Carried	Remarks
Nil			

8.3.4 Additional new bridges

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

No new bridges at the following locations on the Project Highway shall be constructed.

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

- 8.3.5** 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		

- 8.3.6** 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		

- 8.3.7** Drainage system for bridge decks

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

- 8.3.8** 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]

8.4 Rail-road Bridges

- 8.4.1** Design, construction and detailing of ROB/RUB shall be as specified in section 7 of the Manual. [Refer to paragraph 7.19 of the Manual and specify modification, if any]

8.4.2 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		

8.1.1 Road under-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 (km)	Number and Length of Span (m)
Nil		

8.5 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.

8.6 Underpasses/Overpasses

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

8.7 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

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

B. ROB / RUB

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

C. Overpasses / Underpasses and Other Structures

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

8.8 List of Major Bridges and Structures

The following is the list of Major Bridges

Sl No.	Location (km)
Nil	

9. TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS

9.1 General

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

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 amount 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 Independent Consultant 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 170 RM (minimum) shall be provided by EPC Contractor in bus bays and Islands.

9.2 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.

9.3 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 VIII and /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	1216.750
Centre line on curve portion	sqm	460.890
Edge Line at Paved Shoulder	sqm	6145.200
Add 15% for Misc. including Pedestrian X-ings etc	sqm	1173.426
Directional Arrows, letter marking etc.	Nos.	56
Advance Direction signs size 1800X1200 mm	Nos.	7
Village name boards size 600X900 mm	Nos.	60
Place Identification signs size 1200X900 mm	Nos.	5
90 cm Triangle	Nos.	9
90 cm Octagon	Nos.	9
60 cm circuler	Nos	75
Hazard plate 300X900 mm	Nos.	45
800 x 600 mm Size	Nos.	17
Boundary Stone	Nos.	155
5th km stone	Nos.	3
Km stone	Nos.	12
Enamel Paint	sqm	965
Delineator	Nos	1345
Rip Rap	Rm	4036
Convex Mirror	Nos	40
W Type metal Crash Barrier	Rm	2683

10. ROADSIDE FURNITURE

10.1.1 Roadside furniture shall be provided in accordance with the provisions of Section 11 of the Manual.

10.1.2 Overhead traffic signs: location and size

[Refer to paragraph 11.5 of the Manual and provide details]

The overhead signs shall be the reflectorised 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 installation 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 (1 No. of Gantry & 1 no. of Cantilever) as per this manual.

Sl No.	Location (km)	Size	Remarks
1	50+030	5.5m x 2.1m	Cantilever
2	59+363	12m x 2.1m	Overhead Gantry

11. 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 1155 nos. trees are required to be planted.

12. HAZARDOUS LOCATIONS

Metal Beam crash barrier length of minimum 10050m (single runner, heavy duty and W-shape) shall be provided at the locations 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 as per manual.

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

Sl No.	Location		Length (m)	Remarks
	From	To		
1	44+051.935	44+073.767	21.83	Radius<300m
2	44+416.098	44+418.401	02.30	Radius<300m
3	44+494.462	44+496.453	01.99	Radius<300m

Sl No.	Location		Length (m)	Remarks
	From	To		
4	44+627.873	44+700.472	72.60	Radius<300m
5	44+865.704	44+922.997	57.29	Radius<300m
6	45+054.176	45+061.945	07.77	Radius<300m
7	45+116.610	45+388.887	272.28	Radius<300m
8	45+600.351	45+744.950	144.60	Radius<300m
9	45+803.918	45+820.887	16.97	Radius<300m
10	45+945.545	45+957.870	12.33	Radius<300m
11	46+038.854	46+261.710	222.86	Radius<300m
12	46+333.750	46+365.868	32.12	Radius<300m
13	46+439.359	46+512.559	73.20	Radius<300m
14	46+583.952	46+620.103	36.15	Radius<300m
15	46+762.252	46+845.550	83.30	Radius<300m
16	46+992.731	47+034.304	41.57	Radius<300m
17	47+195.257	47+216.697	21.44	Radius<300m
18	47+319.166	47+362.793	43.63	Radius<300m
19	47+440.372	47+481.175	40.80	Radius<300m
20	47+588.173	47+602.319	14.15	Radius<300m
21	47+707.991	47+860.556	152.56	Radius<300m
22	47+969.991	48+043.245	73.25	Radius<300m
23	48+152.301	48+190.465	38.16	Radius<300m
24	48+292.963	48+330.984	38.02	Radius<300m
25	48+404.716	48+426.534	21.82	Radius<300m
26	48+493.047	48+499.370	06.32	Radius<300m
27	48+646.294	48+655.202	08.91	Radius<300m
28	48+845.362	48+858.560	13.20	Radius<300m
29	48+920.674	48+982.233	61.56	Radius<300m
30	49+058.405	49+214.279	155.87	Radius<300m
31	49+264.489	49+297.811	33.32	Radius<300m
32	49+479.784	49+508.122	28.34	Radius<300m
33	49+611.920	49+613.019	01.10	Radius<300m
34	49+726.742	49+730.563	03.82	Radius<300m
35	49+951.298	49+970.980	19.68	Radius<300m
36	50+012.938	50+018.722	05.78	Radius<300m
37	50+090.384	50+107.606	17.22	Radius<300m
38	50+167.691	50+257.177	89.49	Radius<300m
39	50+355.729	50+408.361	52.63	Radius<300m
40	50+475.076	50+503.111	28.03	Radius<300m
41	50+588.928	50+730.554	141.63	Radius<300m
42	50+844.870	50+861.598	16.73	Radius<300m
43	50+933.471	50+960.881	27.41	Radius<300m
44	51+055.293	51+178.211	122.92	Radius<300m

Sl No.	Location		Length (m)	Remarks
	From	To		
45	51+236.079	51+240.196	04.12	Radius<300m
46	51+318.890	51+353.597	34.71	Radius<300m
47	51+426.875	51+449.333	22.46	Radius<300m
48	51+581.921	51+608.274	26.35	Radius<300m
49	51+659.131	51+700.996	41.86	Radius<300m
50	51+776.737	51+798.148	21.41	Radius<300m
51	51+855.048	51+892.041	36.99	Radius<300m
52	51+962.566	51+972.589	10.02	Radius<300m
53	52+070.918	52+073.296	02.38	Radius<300m
54	52+155.528	52+158.609	03.08	Radius<300m
55	52+286.155	52+292.783	06.63	Radius<300m
56	52+336.215	52+351.699	15.48	Radius<300m
57	52+383.617	52+419.043	35.43	Radius<300m
58	52+477.663	52+483.116	05.45	Radius<300m
59	52+558.930	52+582.359	23.43	Radius<300m
60	52+646.647	52+662.344	15.70	Radius<300m
61	52+732.641	52+743.225	10.58	Radius<300m
62	52+807.137	52+850.579	43.44	Radius<300m
63	53+089.239	53+101.634	12.39	Radius<300m
64	53+283.432	53+396.166	112.73	Radius<300m
65	53+480.514	53+512.802	32.29	Radius<300m
66	53+625.359	53+641.155	15.80	Radius<300m
67	53+748.282	53+868.088	119.81	Radius<300m
68	54+042.876	54+049.363	06.49	Radius<300m
69	54+294.758	54+325.996	31.24	Radius<300m
70	54+404.778	54+449.960	45.18	Radius<300m
71	54+481.691	54+498.586	16.90	Radius<300m
72	54+584.061	54+628.058	44.00	Radius<300m
73	54+718.454	54+780.872	62.42	Radius<300m
74	54+874.078	54+885.037	10.96	Radius<300m
75	54+929.833	54+949.569	19.74	Radius<300m
76	54+993.152	55+041.864	48.71	Radius<300m
77	55+075.223	55+152.896	77.67	Radius<300m
78	55+242.454	55+301.515	59.06	Radius<300m
79	55+479.230	55+497.833	18.60	Radius<300m
80	55+566.486	55+598.650	32.16	Radius<300m
81	55+634.142	55+696.470	62.33	Radius<300m
82	55+759.982	55+789.503	29.52	Radius<300m
83	55+995.608	55+997.804	02.20	Radius<300m
84	56+078.264	56+140.683	62.42	Radius<300m
85	56+218.857	56+297.862	79.00	Radius<300m

Sl No.	Location		Length (m)	Remarks
	From	To		
86	56+545.377	56+634.775	89.40	Radius<300m
87	56+872.316	56+975.984	103.67	Radius<300m
88	57+366.656	57+399.879	33.22	Radius<300m
89	57+856.278	57+884.964	28.69	Radius<300m
90	57+981.144	58+070.569	89.43	Radius<300m
91	58+130.081	58+148.896	18.82	Radius<300m
92	58+210.963	58+221.769	10.81	Radius<300m
93	58+279.262	58+305.610	26.35	Radius<300m
94	58+595.493	58+621.347	25.85	Radius<300m
95	54+584.061	54+628.058	44.00	Radius<300m
96	54+718.454	54+780.872	62.42	Radius<300m
97	54+874.078	54+885.037	10.96	Radius<300m
98	54+929.833	54+949.569	19.74	Radius<300m
99	54+993.152	55+041.864	48.71	Radius<300m
100	55+075.223	55+152.896	77.67	Radius<300m
101	55+242.454	55+301.515	59.06	Radius<300m
102	55+479.230	55+497.833	18.60	Radius<300m
103	55+566.486	55+598.650	32.16	Radius<300m
104	55+634.142	55+696.470	62.33	Radius<300m
105	55+759.982	55+789.503	29.52	Radius<300m
106	55+995.608	55+997.804	02.20	Radius<300m
107	56+078.264	56+140.683	62.42	Radius<300m
108	56+218.857	56+297.862	79.00	Radius<300m
109	56+545.377	56+634.775	89.40	Radius<300m
110	56+872.316	56+975.984	103.67	Radius<300m
111	57+366.656	57+399.879	33.22	Radius<300m
112	57+856.278	57+884.964	28.69	Radius<300m
113	57+981.144	58+070.569	89.43	Radius<300m
114	58+130.081	58+148.896	18.82	Radius<300m
115	58+210.963	58+221.769	10.81	Radius<300m
116	58+279.262	58+305.610	26.35	Radius<300m
117	58+595.493	58+621.347	25.85	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:

Type of Protection Work with Minimum Quantity		
Protection Work	Unit	Quantity
1.Parapet	Rm	3336
2.Breast wall by PCC		

a)1.5 m height	Rm	1420
b) 2.0m height	Rm	3740
c) 3.0m height	Rm	3316
3. Breast wall sausage type by gabion/ specialized treatment for slide protection	Rm	500
4.Retaining Wall		
a) 2m Height	Rm	490
b)3m Height	Rm	70
c)4m Height	Rm	10

13. ROAD LAND BOUNDARY

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.

14. SPECIAL REQUIREMENT FOR HILL ROADS

[Refer to paragraphs 14.5 and 14.8 of the Manual and provide details where relevant and required.]

15. 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 Article 13.

16. PRE-CONSTRUCTION ACTIVITIES**16.1 Land Acquisition (L.A.)**

Existing Road is single lane road. Proposed ROW is varying from 18 m to 35m to accommodate 2-lane configuration as given in clause 3.4 above.

The land is to be acquired by NHIDCL and all related costs shall be borne by NHIDCL.

16.2 Utility Shifting and Removal of Trees

All the utilities are to be got shifted by NHIDCL and the related cost shall be borne by NHIDCL. The permission regarding cutting of trees is to be given by NHIDCL. The cost towards utility shifting, environmental and forest clearances, railway clearances etc. shall be borne by NHIDCL as per the demand note of the concerned government/semi government departments/agencies.

16.3 Clearance to be obtained

NHIDCL shall provide all necessary clearances from all the concerned authorities required for implementing the project at his own cost.

16.4 Encroachment Removal

Encroachments shall be removed by NHIDCL at his own cost and the State Government will provide administrative support to maintain law and order.

16.5 Compensatory Afforestation:

Refer Clause 11 of this Schedule-B.

17. LANDSCAPING

The finished road facility shall exhibit adequate landscaping of aesthetically pleasing view. All the borrow areas shall be properly dressed maintaining drain ability outward from the road facility. The side slopes shall be turfed.

Planting along the highway shall follow a variety of schemes depending upon location requirement as per the IRC and MoRTH guidelines. On island, planting of dust and gaseous substance absorbing shrubs such as aneurism oleander album is recommended. To ensure survival from herbivorous animals, shrubs/plants containing latex shall only be planted. Trees shall be provided with tree guards.

The treatment of highway embankment slopes shall be with vegetative turfing, hydro seeding and hydro mulching as per IRC: 56-2011, depending on the soil types involved. Pitching works along with filter material on slopes shall be as per MoRTH specifications.

18. Fixed Parameters for Design

- (i) The Construction Contractor shall consider the following fixed parameters for design
 - (a) In general Drawings are provided for reference. The Construction Contractor can follow the same as it is with the review of IC. The Construction Contractor can also follow the alternate Design/Drawings with the prior approval of

- NHIDCL. However the Construction Contractor shall be responsible for all design and Drawings and not be absolved from their liabilities even if they follow the DPR Drawings without any change.
- (b) The scope of work shall be as specified in **Schedule–B** together with the provision of Project facilities as given in **Schedule–C** and in conformity with the specifications & standards set forth in **Schedule–D**.
 - (c) The finished top level of the road (Formation level) as shown in the P&P (Plan & Profile) drawing shall not be reduced/lowered unless there are some apparent errors / deficiencies in the FFSR and the Construction Contractor is able to demonstrate sound and durable design by lowering the formation levels with proper geometry as recommended in IRC: SP:73-2015 or other codes as applicable to the National Highways but no portion of Road should be allowed under submergence.
 - (d) The numbers and sizes of the culverts as well as waterway as provided in the FFSR shall not be reduced in any case, however the locations can be suitably modified in consultation & approval of the IC if required. Any additional requirement of culverts as per site conditions or increase in size due to hydrologic requirement should be assessed by the Construction Contractor and incorporated accordingly.
 - (e) Alternative design for structures i.e. bridges, culverts, and retaining walls etc. can be adopted by the Construction Contractor in accordance with Design Requirements subject to review of the same by Authority Engineer. However, the span length (total clear span/water way) as shown in the drawings shall be considered as minimum requirement and cannot be reduced.
 - (f) The length and/or the nos. of various project facilities like Drain, Bus bays, etc. as mentioned in Schedule B and Schedule C shall be minimum, however the locations can be suitably modified in consultation with the Authority Engineer.
 - (g) The Geometric Design Standards for the Project/Project Facilities shall be as per IRC: 73 or other codes as applicable to the National Highways. These should be adhered to and minimum requirements should be maintained for the Project Highway. The Construction Contractor may adopt better standards for enhancing the requirements of safety and mobility.
 - (h) *Pavement Design*
 - i) The typical cross sections shall be followed as far as possible. Alternate cross sections shall be accepted subjected to approval from the Authority Engineer without altering the pavement widths and subject to the restriction of ROW widths. Pavement of the main carriageway has been designed for a period of 15 years + 24 months of construction period.

- ii) The composition of Pavement Layers of the paved shoulders shall not be lower than the adjacent flexible pavement of the mainline project highway.
- (i) All the slopes having embankment height more than 1.0m shall be protected by vegetation mulching. Filter material shall be provided below the pitching where ever embankment is exposed to water bodies.
- (j) W- Beam crash barrier shall be provided on sections of the road
 - i) sharp curves having radius less than 300m
- (k) All culverts shall be replaced by box culverts.
- (l) Reinforced Earth/RCC Retaining Wall type shall be liberally provided through areas for high fill/embankment with aesthetically pleasing appearance. These shall be of varying height constructed of several sections, located mainly between main line and where land constraint exists. Design life of reinforcing elements for earth retaining structures shall be 100 years minimum.
- (m) Riprap protection to be provided at the valley side on curves as special safety features.
- (n) All road signs shall be with retro-reflective sheet of high intensity grade conforming to ASTM D-4957-01/ (type VIII and type IX) and as per clause 801 of MoRTH specifications. The retro reflective sheet with engineering grade shall not be used and instead micro-prismatic shall be used.