

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)

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 with paved shoulder 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-I)

Sl.NO.	DESIGN CHAINAGE		EXISTING CHAINAGE		LENGTH (m)
	FROM	TO	FROM	TO	
1	20200	20600	20280	21018	400
2	20600	20610	21018	21050	10
3	20610	20690	21050	21100	80
4	20690	20700	21100	21145	10
5	20700	21000	21145	21510	300
6	21130	21140	21650	21660	10

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Sl.NO.	DESIGN CHAINAGE		EXISTING CHAINAGE		LENGTH (m)
	FROM	TO	FROM	TO	
7	21240	21270	21760	21790	30
8	21270	21840	21790	22460	570
9	21840	21850	22460	22480	10
10	21850	21940	22480	22570	90
11	21940	21990	22570	22630	50
12	21990	22000	22630	22640	10
13	22200	22220	22870	22890	20
14	22220	22230	22890	22900	10
15	22230	22300	22900	23000	70
16	22300	22310	23000	23010	10
17	22310	22700	23010	23460	390
18	22850	23000	23610	23805	150
19	23500	24000	24350	25700	500
20	24500	24700	26300	26510	200
21	24700	24710	26510	26520	10
22	24710	25010	26520	26860	300
23	25010	25090	26860	26950	80
24	25090	25500	26950	27550	410
25	25800	27400	27860	29990	1600
26	27600	27630	30195	30225	30
27	27630	27650	30225	30250	20
28	27650	28310	30250	31080	660
29	28310	28350	31080	31140	40
30	28350	28400	31140	31180	50
31	28680	28720	31465	31510	40
32	28720	28920	31510	31710	200
33	28920	28970	31710	31760	50
34	29600	29790	32410	32680	190
35	29790	29820	32680	32722	30
36	29820	30200	32722	33160	380
37	30400	30600	33360	33595	200
38	30800	31300	33803	34335	500
39	31480	31600	34515	34700	120
Total					7830

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Improvement due to Sharp Curves: Package-I

SL. No	Design Chainage(m)		Remarks
	From	To	
1	20+037.178	20+039.551	Radius <300
2	20+153.705	20+345.832	Radius <300
3	20+387.690	20+410.476	Radius <300
4	20+489.719	20+496.692	Radius <300
5	20+580.281	20+603.590	Radius <300
6	20+674.181	20+699.387	Radius <300
7	20+749.700	20+777.486	Radius <300
8	20+862.006	20+873.883	Radius <300
9	20+951.339	21+005.538	Radius <300
10	21+058.354	21+069.160	Radius <300
11	21+127.102	21+137.124	Radius <300
12	21+237.646	21+297.938	Radius <300
13	21+329.603	21+362.927	Radius <300
14	21+407.353	21+411.748	Radius <300
15	21+477.824	21+484.813	Radius <300
16	21+567.689	21+568.270	Radius <300
17	21+635.130	21+652.487	Radius <300
18	21+707.601	21+721.387	Radius <300
19	21+784.831	21+792.985	Radius <300
20	21+839.263	21+940.007	Radius <300
21	21+975.562	22+029.790	Radius <300
22	22+081.441	22+167.257	Radius <300
23	22+220.623	22+346.658	Radius <300
24	22+415.321	22+529.770	Radius <300
25	22+601.252	22+664.284	Radius <300
26	22+782.299	22+813.795	Radius <300
27	22+847.609	23+004.167	Radius <300
28	23+062.815	23+066.225	Radius <300
29	23+128.022	23+136.587	Radius <300
30	23+193.117	23+204.112	Radius <300
31	23+265.252	23+295.250	Radius <300
32	23+369.816	23+435.932	Radius <300
33	23+612.688	23+626.652	Radius <300
34	23+868.983	23+897.139	Radius <300
35	23+938.236	23+964.908	Radius <300
36	24+038.816	24+161.250	Radius <300

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SL. No	Design Chainage(m)		Remarks
37	24+208.678	24+238.090	Radius <300
38	24+278.487	24+324.320	Radius <300
39	24+359.951	24+370.865	Radius <300
40	24+404.127	24+442.302	Radius <300
41	24+498.723	24+525.205	Radius <300
42	24+555.022	24+586.084	Radius <300
43	24+625.088	24+676.364	Radius <300
44	24+743.282	24+794.535	Radius <300
45	24+849.799	24+907.234	Radius <300
46	24+943.171	25+003.987	Radius <300
47	25+081.050	25+104.357	Radius <300
48	25+168.576	25+199.118	Radius <300
49	25+268.470	25+302.142	Radius <300
50	25+411.445	25+413.390	Radius <300
51	25+418.730	25+532.977	Radius <300
52	25+551.587	25+619.777	Radius <300
53	25+671.986	25+674.072	Radius <300
54	25+708.090	25+731.980	Radius <300
55	25+769.977	25+785.543	Radius <300
56	25+838.783	25+868.565	Radius <300
57	25+969.350	26+002.287	Radius <300
58	26+168.356	26+226.720	Radius <300
59	26+323.066	26+452.944	Radius <300
60	26+517.834	26+598.464	Radius <300
61	26+652.669	26+667.366	Radius <300
62	26+807.270	26+823.408	Radius <300
63	26+864.487	26+873.390	Radius <300
64	26+929.084	26+958.418	Radius <300
65	27+008.227	27+085.206	Radius <300
66	27+225.676	27+321.497	Radius <300
67	27+398.276	27+474.209	Radius <300
68	27+543.830	27+609.959	Radius <300
69	27+738.410	27+779.837	Radius <300
70	27+872.194	27+962.301	Radius <300
71	28+028.627	28+101.333	Radius <300
72	28+168.776	28+243.494	Radius <300
73	28+301.330	28+441.364	Radius <300
74	28+574.879	28+632.942	Radius <300
75	28+916.087	29+015.159	Radius <300
76	29+203.305	29+246.137	Radius <300

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SL. No	Design Chainage(m)		Remarks
77	29+338.059	29+353.274	Radius <300
78	29+391.178	29+412.805	Radius <300
79	29+497.165	29+560.291	Radius <300
80	29+595.135	29+636.953	Radius <300
81	29+683.569	29+742.079	Radius <300
82	29+811.740	29+826.511	Radius <300
83	29+920.284	29+933.738	Radius <300
84	30+089.767	30+165.539	Radius <300
85	30+226.267	30+249.166	Radius <300
86	30+424.078	30+501.819	Radius <300
87	30+627.179	30+636.334	Radius <300
88	30+714.272	30+885.959	Radius <300
89	30+997.379	31+053.375	Radius <300
90	31+090.993	31+122.228	Radius <300
91	31+243.133	31+277.632	Radius <300
92	31+338.900	31+378.578	Radius <300
93	31+449.817	31+478.655	Radius <300
94	31+542.058	31+583.658	Radius <300
95	31+630.258	31+655.280	Radius <300
96	31+711.209	31+800.862	Radius <300
97	31+862.256	31+899.152	Radius <300
98	31+960.919	31+994.335	Radius <300

3.4 Proposed Right of Way

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

Sl. No	Design Chainage		Length	Width (m)
	From	To		
1.	20.000	32.050	12.050	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

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[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]

SI 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 12.050 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)	TYPE TCS	Remarks / Location
	FROM	TO			
1	20000	20010	10	1	Reconstruction and widening with Retaining wall
2	20010	20200	190	2	Reconstruction and widening
3	20200	20600	400	3	Realignment
4	20600	20610	10	1	Realignment with Retaining wall
5	20610	20690	80	3	Realignment
6	20690	20700	10	1	Realignment with Retaining wall
7	20700	21000	300	3	Realignment
8	21000	21130	130	1	Reconstruction and widening
9	21130	21140	10	1	Realignment with Retaining wall
10	21140	21240	100	2	Reconstruction and widening
11	21240	21270	30	1	Realignment with Retaining wall
12	21270	21840	570	3	Realignment
13	21840	21850	10	1	Realignment with Retaining wall
14	21850	21940	90	3	Realignment
15	21940	21990	50	1	Realignment with Retaining wall
16	21990	22000	10	3	Realignment
17	22000	22200	200	1	Reconstruction and widening
18	22200	22220	20	3	Realignment
19	22220	22230	10	1	Realignment with Retaining wall

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20	22230	22300	70	3	Realignment
21	22300	22310	10	1	Realignment with Retaining wall
22	22310	22700	390	3	Realignment
23	22700	22850	150	1	Reconstruction and widening
24	22850	23000	150	3	Realignment
25	23000	23500	500	1	Reconstruction and widening
26	23500	24000	500	3	Realignment
27	24000	24500	500	1	Reconstruction and widening
28	24500	24700	200	3	Realignment
29	24700	24710	10	1	Realignment with Retaining wall
30	24710	25010	300	1	Realignment
31	25010	25090	80	1	Realignment with Retaining wall
32	25090	25500	410	3	Realignment
33	25500	25800	300	1	Reconstruction and widening
34	25800	27400	1600	3	Realignment
35	27400	27520	120	1	Reconstruction and widening
36	27520	27590	70	1	Reconstruction and widening with Retaining wall
37	27590	27600	10	1	Reconstruction and widening
38	27600	27630	30	3	Realignment
39	27630	27650	20	1	Realignment with Retaining wall
40	27650	28310	660	3	Realignment
41	28310	28350	40	1	Realignment with Retaining wall
42	28350	28400	50	3	Realignment
43	28400	28680	280	1	Reconstruction and widening

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44	28680	28720	40	1	Realignment with Retaining wall
45	28720	28920	200	3	Realignment
46	28920	28970	50	1	Realignment with Retaining wall
47	28970	29260	290	1	Reconstruction and widening
48	29260	29280	20	1	Reconstruction and widening with Retaining wall
49	29280	29340	60	1	Reconstruction and widening
50	29340	29400	60	1	Reconstruction and widening with Retaining wall
51	29400	29600	200	1	Reconstruction and widening
52	29600	29790	190	3	Realignment
53	29790	29820	30	1	Realignment with Retaining wall
54	29820	30200	380	3	Realignment
55	30200	30400	200	1	Reconstruction and widening
56	30400	30600	200	3	Realignment
57	30600	30800	200	1	Reconstruction and widening
58	30800	31300	500	3	Realignment
59	31300	31480	180	1	Reconstruction and widening
60	31480	31600	120	3	Realignment
61	31600	32050	450	1	Reconstruction and widening
Total			12050		

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.

The alignment passes through built up areas as tabulated below:			
Sno	Location/Chainage		Name of Village/town etc
	From (Km)	To (Km)	
Nil			

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:

- 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:

- 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			

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	20+320	3-Legged	Left side
2	20+460	3-Legged	Left side
3	22+780	3-Legged	Right side
4	22+940	3-Legged	Left side
5	23+010	3-Legged	Left side
6	23+440	3-Legged	Left side
7	23+500	3-Legged	Right side
8	27+800	3-Legged	Right side
9	27+820	3-Legged	Left side
10	28+000	3-Legged	Left side
11	28+360	3-Legged	Left side
12	28+420	3-Legged	Right side
13	28+740	3-Legged	Right side
14	29+060	3-Legged	Left side
15	29+380	3-Legged	Right side
16	29+450	3-Legged	Left side
17	29+670	3-Legged	Left side
18	29+980	3-Legged	Left side
19	30+140	3-Legged	Right side
20	30+960	3-Legged	Left side
21	31+120	3-Legged	Right side
22	31+400	3-Legged	Left side
23	31+500	3-Legged	Left side
24	31+570	3-Legged	Left side
25	31+580	3-Legged	Right side
26	31+740	3-Legged	Left 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:

Sl 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 5.10 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 15 years. 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 as follows.

PACKAGE	Design Chainage (km)		Length (km)	15Year MSA*
	From	To		
I	20+000	32+050	12.050	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 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)	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 (msa) 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.

Sl No.	Section (km)		Remarks
	From	To	
1	20+000	32+050	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	Design Chainage(m)		Length(m)	Side	Remarks
	From	To			
1	20000	20010	10	One	Widening
2	20010	20200	190	One	Widening
3	20200	20600	800	Both	Realignment
4	20600	20610	10	One	Widening
5	20610	20690	160	Both	Realignment
6	20690	20700	10	One	Widening
7	20700	21000	600	Both	Realignment
8	21000	21130	130	One	Widening
9	21130	21140	10	One	Widening
10	21140	21240	100	One	Widening
11	21240	21270	30	One	Widening
12	21270	21840	1140	Both	Realignment
13	21840	21850	10	One	Widening
14	21850	21940	180	Both	Realignment
15	21940	21990	50	One	Widening
16	21990	22000	20	Both	Realignment
17	22000	22200	200	One	Widening

18	22200	22220	40	Both	Realignment
19	22220	22230	10	One	Widening
20	22230	22300	140	Both	Realignment
21	22300	22310	10	One	Widening
22	22310	22700	780	Both	Realignment
23	22700	22850	150	One	Widening
24	22850	23000	300	Both	Realignment
25	23000	23500	500	One	Widening
26	23500	24000	1000	Both	Realignment
27	24000	24500	500	One	Widening
28	24500	24700	400	Both	Realignment
29	24700	24710	10	One	Widening
30	24710	25010	600	One	Realignment
31	25010	25090	80	One	Widening
32	25090	25500	820	Both	Realignment
33	25500	25800	300	One	Widening
34	25800	27400	3200	Both	Realignment
35	27400	27520	120	One	Widening
36	27520	27590	70	One	Widening
37	27590	27600	10	One	Widening
38	27600	27630	60	Both	Realignment
39	27630	27650	20	One	Widening
40	27650	28310	1320	Both	Realignment
41	28310	28350	40	One	Widening
42	28350	28400	100	Both	Realignment
43	28400	28680	280	One	Widening
44	28680	28720	40	One	Widening
45	28720	28920	400	Both	Realignment
46	28920	28970	50	One	Widening
47	28970	29260	290	One	Widening
48	29260	29280	20	One	Widening
49	29280	29340	60	One	Widening
50	29340	29400	60	One	Widening
51	29400	29600	200	One	Widening
52	29600	29790	380	Both	Realignment
53	29790	29820	30	One	Widening
54	29820	30200	760	Both	Realignment
55	30200	30400	200	One	Widening
56	30400	30600	400	Both	Realignment

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57	30600	30800	200	One	Widening
58	30800	31300	1000	Both	Realignment
59	31300	31480	180	One	Widening
60	31480	31600	480	Both	Realignment
61	31600	32050	450	One	Widening
Total Length			19710		

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 are Km 24+900 to Km 25+100 & Km 28+800 to Km 29+100.

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:

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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
	From(km)	To(km)	
1	20000	20010	10
2	20010	20200	190
3	20600	20610	10
4	20690	20700	10
5	21000	21130	130
6	21130	21140	10
7	21140	21240	100
8	21240	21270	30
9	21840	21850	10
10	21940	21990	50
11	22000	22200	200
12	22220	22230	10
13	22300	22310	10
14	22700	22850	150
15	23000	23500	500
16	24000	24500	500
17	24700	24710	10
18	25010	25090	80
19	25500	25800	300
20	27400	27520	120
21	27520	27590	70
22	27590	27600	10
23	27630	27650	20
24	28310	28350	40
25	28400	28680	280
26	28680	28720	40
27	28920	28970	50
28	28970	29260	290
29	29260	29280	20
30	29280	29340	60
31	29340	29400	60
32	29400	29600	200
33	29790	29820	30
34	30200	30400	200

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Sl. No.	Chainage		Length
	From(km)	To(km)	
35	30600	30800	200
36	31300	31480	180
37	31600	32050	450

8. DESIGN OF STRUCTURES

8.1 General

The Project road from New Pania to Deed, includes provision of no major bridges (span \geq 60m), no minor bridges (span $<$ 60m) and 63 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 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 (m)
1	20+294	20+220	RCC Box/ Slab	2.0
2	21+005	20+580	RCC Box/ Slab	2.0
3	21+125	20+690	RCC Box/ Slab	2.0
4	21+296	20+800	RCC Box/ Slab	2.0
5	22+300	21+710	RCC Box/ Slab	2.0
6	22+470	21+840	RCC Box/ Slab	2.0
7	22+700	22+050	RCC Box/ Slab	2.0
8	23+150	22+400	RCC Box/ Slab	2.0
9	23+200	22+460	RCC Box/ Slab	2.0
10	24+180	23+350	RCC Box/ Slab	2.0
11	24+345	23+490	RCC Box/ Slab	2.0
12	25+850	24+120	RCC Box/ Slab	2.0
13	26+025	24+300	RCC Box/ Slab	2.0
14	26+310	24+500	RCC Box/ Slab	2.0
15	26+380	24+580	RCC Box/ Slab	2.0
16	26+625	24+680	RCC Box/ Slab	2.0
17	26+900	25+050	RCC Box/ Slab	2.0

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18	27+200	25+230	RCC Box/ Slab	2.5
19	27+600	25+550	RCC Box/ Slab	2.0
20	27+650	25+600	RCC Box/ Slab	2.0
21	27+740	25+680	RCC Box/ Slab	2.0
22	27+850	25+800	RCC Box/ Slab	2.0
23	28+550	26+250	RCC Box/ Slab	2.0
24	28+610	26+310	RCC Box/ Slab	2.0
25	29+355	26+900	RCC Box/ Slab	2.0
26	29+560	27+030	RCC Box/ Slab	2.0
27	29+740	27+210	RCC Box/ Slab	2.0
28	30+070	27+470	RCC Box/ Slab	2.0
29	30+880	28+100	RCC Box/ Slab	2.0
30	31+200	28+400	RCC Box/ Slab	2.0
31	33+830	30+820	RCC Box/ Slab	2.0
32	34+140	31+140	RCC Box/ Slab	2.0
33	34+900	31+790	RCC Box/ Slab	2.0
34	35+010	31+900	RCC Box/ Slab	2.0
35	35+150	32+020	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 (m)
1	20+595	20+400	RCC Box/ Slab	2.0
2	20+848	20+470	RCC Box/ Slab	2.0
3	21+025	20+600	RCC Box/ Slab	2.0
4	22+050	21+480	RCC Box/ Slab	2.0
5	22+100	21+530	RCC Box/ Slab	2.0
6	22+450	21+810	RCC Box/ Slab	2.0
7	22+800	22+140	RCC Box/ Slab	2.0
8	22+950	22+250	RCC Box/ Slab	2.0
9	23+020	22+320	RCC Box/ Slab	2.0
10	24+565	23+650	RCC Box/ Slab	2.0
11	25+350	23+870	RCC Box/ Slab	2.0
12	25+590	23+930	RCC Box/ Slab	2.0
13	25+800	24+060	RCC Box/ Slab	2.0
14	26+980	25+100	RCC Box/ Slab	2.0
15	27+430	25+447	RCC Box/ Slab	2.0

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Sl. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Span (m)
16	28+080	25+870	RCC Box/ Slab	2.0
17	28+300	26+030	RCC Box/ Slab	3.0
18	28+380	26+090	RCC Box/ Slab	2.0
19	28+480	26+170	RCC Box/ Slab	2.0
20	28+910	26+580	RCC Box/ Slab	2.0
21	28+950	26+600	RCC Box/ Slab	2.0
22	28+990	26+630	RCC Box/ Slab	2.0
23	29+120	26+720	RCC Box/ Slab	2.0
24	30+420	27+790	RCC Box/ Slab	2.5
25	33+910	30+900	RCC Box/ Slab	2.0
26	33+970	30+980	RCC Box/ Slab	2.0
27	34+620	31+540	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	22+560	21+920	RCC Box/ Slab	2.0

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
Nil					

Sl	Bridge	Salient Details of Existing Bridge	Adequacy or	E s L
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No	Location (km)	Span Arrangement (m)	Carriageway Width (m)	Total Width (m)	Type of Superstructure	Type of Foundation	Otherwise of the Existing Waterway, Vertical Clearance etc.	
Nil								

8.3.2 The following structures shall be provided with footpaths:

SI No.	Location (km)	Remarks
Nil		

8.3.3 Additional New Minor Bridges

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

SI No.	Bridge at km	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:

SI 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

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		

8.8 List of Major Bridges and Structures

The following is the list of Major Bridges

SI 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 amounting 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 460 RM (minimum) shall be provided by EPC Contractor in busbays 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.
- i) Delineators bollards and other safety devices shall be provided on entire project Highway and other locations as directed by NHIDCL.
- ii) 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.
- iii) 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	954.360
Centre line on curve portion	sqm	361.500
Edge Line at Paved Shoulder	sqm	4820
Add 15% for Misc. including Pedestrian X-ings etc	sqm	920.379
Directional Arrows, letter marking etc.	Nos.	45
Advance Direction signs size 1800X1200 mm	Nos.	5
Village name boards size 600X900 mm	Nos.	46
Place Identification signs size 1200X900 mm	Nos.	3
90 cm Triangle	Nos.	7
90 cm Octagon	Nos.	9
Hazard plate 300X900 mm	Nos.	34
800 x 600 mm Size	Nos.	14
Boundary Stone	Nos.	120
5th km stone	Nos.	2
Km stone	Nos.	10
W Type metal Crash Barrier	Rm	4015
Riprap	Rm	4630
Convex Mirror	No	60
Delineator	No	190
Enamel Paint	sqm	1445

10. ROADSIDE FURNITURE

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 20+000 to km 32+050 [Existing km 20.000 to km 35.150] in the State of Arunachal Pradesh under SARDP-NE

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 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 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 03 (01 No. of gantry and 02 No. of Cantilever) as per this manual.

SI No.	Location (km)	Size	Remarks
1	20+000	12m x 2.1m	Overhead Gantry
2	23+630	5.5m x 2.1m	Cantilever
3	29+190	5.5m x 2.1m	Cantilever

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 850 nos. trees are required to be planted.

12. HAZARDOUS LOCATIONS

- iv) 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 are given in as per manual.

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

SI No.	Location	Length	Remarks
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	From	To	(m)	
1	20+037.178	20+039.551	02.37	Radius<300m
2	20+153.705	20+345.832	192.13	Radius<300m
3	20+387.690	20+410.476	22.79	Radius<300m
4	20+489.719	20+496.692	06.97	Radius<300m
5	20+580.281	20+603.590	23.31	Radius<300m
6	20+674.181	20+699.387	25.21	Radius<300m
7	20+749.700	20+777.486	27.79	Radius<300m
8	20+862.006	20+873.883	11.88	Radius<300m
9	20+951.339	21+005.538	54.20	Radius<300m
10	21+058.354	21+069.160	10.81	Radius<300m
11	21+127.102	21+137.124	10.02	Radius<300m
12	21+237.646	21+297.938	60.29	Radius<300m
13	21+329.603	21+362.927	33.32	Radius<300m
14	21+407.353	21+411.748	04.40	Radius<300m
15	21+477.824	21+484.813	06.99	Radius<300m
16	21+567.689	21+568.270	00.58	Radius<300m
17	21+707.601	21+721.387	13.79	Radius<300m
18	21+784.831	21+792.985	08.15	Radius<300m
19	21+839.263	21+940.007	100.74	Radius<300m
20	21+975.562	22+029.790	54.23	Radius<300m
21	22+081.441	22+167.257	85.82	Radius<300m
22	22+220.623	22+346.658	126.04	Radius<300m
23	22+415.321	22+529.770	114.45	Radius<300m
24	22+601.252	22+664.284	63.03	Radius<300m
25	22+782.299	22+813.795	31.50	Radius<300m
26	22+847.609	23+004.167	156.56	Radius<300m
27	23+062.815	23+066.225	03.41	Radius<300m
28	23+128.022	23+136.587	08.56	Radius<300m
29	23+193.117	23+204.112	11.00	Radius<300m
30	23+369.816	23+435.932	66.12	Radius<300m
31	23+612.688	23+626.652	13.96	Radius<300m
32	23+868.983	23+897.139	28.16	Radius<300m
33	23+938.236	23+964.908	26.67	Radius<300m
34	24+038.816	24+161.250	122.43	Radius<300m
35	24+359.951	24+370.865	10.91	Radius<300m
36	24+555.022	24+586.084	31.06	Radius<300m
37	25+081.050	25+104.357	23.31	Radius<300m
38	25+418.730	25+532.977	114.25	Radius<300m
39	25+671.986	25+674.072	02.09	Radius<300m
40	25+708.090	25+731.980	23.89	Radius<300m

Two Lining of Joram – koloriang Road (NH-713) on EPC basis from design km 20+000 to km 32+050 [Existing km 20.000 to km 35.150] in the State of Arunachal Pradesh under SARDP-NE

41	25+769.977	25+785.543	15.57	Radius<300m
42	25+838.783	25+868.565	29.78	Radius<300m
43	25+969.350	26+002.287	32.94	Radius<300m
44	26+168.356	26+226.720	58.36	Radius<300m
45	26+323.066	26+452.944	129.88	Radius<300m
46	26+517.834	26+598.464	80.63	Radius<300m
47	26+652.669	26+667.366	14.70	Radius<300m
48	26+807.270	26+823.408	16.14	Radius<300m
49	26+864.487	26+873.390	08.90	Radius<300m
50	26+929.084	26+958.418	29.33	Radius<300m
51	27+008.227	27+085.206	76.98	Radius<300m
52	27+225.676	27+321.497	95.82	Radius<300m
53	27+398.276	27+474.209	75.93	Radius<300m
54	27+543.830	27+609.959	66.13	Radius<300m
55	27+738.410	27+779.837	41.43	Radius<300m
56	27+872.194	27+962.301	90.11	Radius<300m
57	28+028.627	28+101.333	72.71	Radius<300m
58	28+168.776	28+243.494	74.72	Radius<300m
59	28+301.330	28+441.364	140.03	Radius<300m
60	28+574.879	28+632.942	58.06	Radius<300m
61	28+916.087	29+015.159	99.07	Radius<300m
62	29+203.305	29+246.137	42.83	Radius<300m
63	29+338.059	29+353.274	15.22	Radius<300m
64	29+391.178	29+412.805	21.63	Radius<300m
65	29+497.165	29+560.291	63.13	Radius<300m
66	29+595.135	29+636.953	41.82	Radius<300m
67	29+683.569	29+742.079	58.51	Radius<300m
68	29+811.740	29+826.511	14.77	Radius<300m
69	29+920.284	29+933.738	13.45	Radius<300m
70	30+089.767	30+165.539	75.77	Radius<300m
71	30+226.267	30+249.166	22.90	Radius<300m
72	30+424.078	30+501.819	77.74	Radius<300m
73	30+627.179	30+636.334	09.15	Radius<300m
74	30+714.272	30+885.959	171.69	Radius<300m
75	30+997.379	31+053.375	56.00	Radius<300m
76	31+090.993	31+122.228	31.24	Radius<300m
77	31+338.900	31+378.578	39.68	Radius<300m
78	31+449.817	31+478.655	28.84	Radius<300m
79	31+542.058	31+583.658	41.60	Radius<300m
80	31+630.258	31+655.280	25.02	Radius<300m
81	31+711.209	31+800.862	89.65	Radius<300m

Two Laning of Joram – koloriang Road (NH-713) on EPC basis from design km 20+000 to km 32+050 [Existing km 20.000 to km 35.150] in the State of Arunachal Pradesh under SARDP-NE

82	31+960.919	31+994.335	33.42	Radius<300m
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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		
Protection Work	Unit	Quantity
1. Parapet Wall	Rm	4060
2. Breast wall with PCC		
a) 1.5m height	Rm	1950
b) 2.0m height	Rm	4270
c) 3.0m height	Rm	3530
3. Breast wall sausage type by gabion/ Specialized treatment for slide protection	Rm	500
4. Retaining Wall with PCC		
a) 2m Height	Rm	240
b) 3m Height	Rm	120

Type of Protection Work		
Protection Work	Unit	Quantity
c)4m Height	Rm	210

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 18m 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 DPR 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 pipe 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 curve 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.