Schedules

Contents

SCHEDULE - A

(See Clauses 2.1 and 8.1)

The Site

1. The Site

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

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

1.3 An inventory of the Site including the land, buildings, structures, road works, trees and any other immovable property on, or attached to, the Site shall be prepared jointly by the Authority Representative and the Contractor, and such inventory shall form part of the memorandum referred to in Clause 8.2.1 of this Agreement.

1.4 The alignment plans of the Project Highway are specified in Annex-III. In the case of sections where no modification in the existing alignment of the Project Highway is contemplated, the alignment plan has not been provided. Alignment plans have only been given for sections where the existing alignment is proposed to be upgraded. The proposed profile of the Project Highways shall be followed by the contractor with minimum FRL as indicated in the alignment plan. The contractor, however, has to improve/upgrade the Road Profile as indicated in Annexure-III based on site/design requirement.

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

Annexure - I

(Schedule-A)

Site

Note: Through suitable drawings and description in words, the land, buildings, structures and road works comprising the Site are specified briefly but precisely in this Annex-I. All the chainages/location referred to in Annex-I to Schedule A existing chainages.

1. Site

The Site of the Single Lane (3.50 m Carriageway) Project Highway comprises the section of National Highway – 51 commencing from km 85.000 to 95.000 & km 101.000 to km 145.000 i.e. from Tura to Dalu in the state of Meghalaya. The land, carriageway and structures comprising the Site are described below.

2. Land

The Site of the Project Highway comprises the land (sum total of land already in possession and land to be possessed) as described below:

S. No.	Chainage (km)		ROW (m)	Remarks
	From	To		
1	85+000	87+000	10	
2	87+000	88+000	15	
3	88+000	90+000	30	
4	90+000	94+000	15	
5	94+000	95+000	10	
6	101+000	107+000	30	
7	107+000	127+000	20	
8	127+000	140+000	30	
9	140+000	145+000	15	

3. Carriageway

The present carriageway of the Project Highway is single lane. The average pavement width in the entire stretch of project road is 3 to 4 m. The type of the existing pavement is flexible.

4. Major Bridges

The Site includes the following Major Bridges:

S. No.	Existing Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Super-Structure		

1	87+100	Open	Wall Type	RCC Girder	3x22	10.0

5. Road over-bridges (ROB)/ Road under-bridges (RUB):

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

S.No.	Existing Chainage (km)	Type of Structure		No. of Spans with span length (m)	Width (m)	ROB/ RUB
		Foundation	Super Structure			
NIL						

6. Grade separators

The Site includes the following grade separators:

S. No	Existing Chainage (km)	Type of Structure		No. of Spans with span length (m)	Width (m)
		Foundation	Superstructure		
NIL					

7. Minor Bridges

The Site includes the following minor bridges

S. No.	Existing Chainage (km)	Type of Structure			No. of Spans with span length (c/c of exp gap)	Total Width (m)
		Foundation	Sub-Structure	Super-Structure		
1	91+400	Open	Wall Type	RCC Girder	1x12.75	8.5
2	92+400	Open	Wall Type	RCC Slab	1x8.74	11
3	94+100	Open	Wall Type	RCC Girder	1x32.5	11
4	94+200	Open	Wall Type	RCC Girder	1x17	11
5	104+600	Open	Wall Type	RCC Slab	1x10.37	8.5
6	108+400	Open	Wall Type	RCC Girder	1x24.75	8.5
7	139+300	Open	Wall Type	RCC Girder	1x25.32	8.5
8	140+300	Open	Wall Type	RCC Girder	2x9+1x17.5	8.5
9	143+100	Open	Wall Type	RCC Slab	1x6	4.9
10	143+200	Open	Wall Type	RCC Slab	3x9.74	8.5
11	144+100	Open	Wall Type	RCC Slab	1x7.7	8.5

8. Railway level crossings

The Site includes the following level crossings:

S. No.	Location (km)	Remarks
NIL		

9. Underpasses (Vehicular, Non Vehicular)

The Site includes the following underpasses:

S. No.	Chainage (km)	Type of Structure	No. of Spans with span length (m)	Width (m)
NIL				

10. Culverts

The Site has the following culverts:

S. No.	Existing Chainage	Type of Culvert	Span /Opening with span length (m)	Existing Width of Culvert	Remarks
1	85+955	NP - 2 HPC	1 x 1.00 Φ	7.50	
2	86+764	NP - 2 Pipe	1 x 1.00 Φ	10.00	
3	87+077	NP - 3 Pipe	1 x 1.00 Φ	10.00	
4	87+469	RCC Slab	3.00 x 1.50	5.70	
5	87+839	NP - 2 Pipe	1 x 1.00 Φ	7.50	
6	88+028	RCC Slab(3.6 m) + NP-2 Pipe(2.5 m)	1.00 x 1.30	6.10	
7	88+099	RCC Slab	1.00 x 1.00	5.00	
8	88+137	RCC Slab	1.00 x 1.00	5.00	
9	88+231	NP - 3 Pipe	1 x 1.00 Φ	10.00	
10	88+311	NP - 2 Pipe	1 x 1.00 Φ	10.00	
11	88+737	RCC Slab	2 m x 1 m	10.90	
12	88+793	RCC Slab	2.10 x 2.00	6.30	
13	88+860	RCC Slab	2.50 x 2.50	8	
14	89+510	Dry Stone Slab (RCC Slab)	0.7 x 1.00	9.30	
15	90+012	NP - 3 HPC	1 x 1.00 Φ	10.00	
16	90+044	RCC Slab	0.70 x 0.70	5.40	
17	90+255	NP - 2 Pipe	1 x 0.90 Φ	10.00	
18	90+506	NP - 3 Pipe	1 x 1.00 Φ	8.75	
19	90+715	Dry Stone Slab	0.60 x 0.70	7.00	
20	90+886	Dry Stone Slab (RCC Slab)	0.95 x 1.20	8.50	
21	91+082	NP - 3 Pipe (2 Rows)	2 x 1.00 Φ	10.00	
22	91+284	NP - 3 Pipe	1 x 1.00 Φ	10.00	
23	91+652	RCC Slab & S.M. Face Wall	1.00 x 2.50	7.00	
24	92+465	NP - 3 Pipe (2 Rows)	2 x 1.00 Φ	10.00	

S. No.	Existing Chainage	Type of Culvert	Span /Opening with span length (m)	Existing Width of Culvert	Remarks
25	92+925	RCC Slab & S.M. Face Wall	0.60 x 0.60	7.80	
26	93+258	NP - 3 Pipe	1 x 1.00 Φ	10.00	
27	93+629	NP - 2 Pipe	1 x 0.90 Φ	8.75	
28	93+748	NP - 2 Pipe	1 x 0.90 Φ	10.00	
29	93+748	NP - 2 Pipe	1 x 0.90 Φ	10.00	
30	94+070	NP - 3 Pipe	1 x 1.00 Φ	10.00	
31	94+145	Dry Stone Slab	0.60 x 1.00	7.40	
32	94+386	NP - 3 Pipe	1 x 1.00 Φ	6.25	
33	94+520	RCC slab over dry wall	0.90 x 1.00	14.70	
34	101+127	NP - 2 Pipe (2 ROWS)	2 x 0.90 Φ	10.00	
35	101+250	Dry Stone Slab	0.70 x 0.70	5.85	
36	101+376	RCC Slab Over Stone	0.90 x 1.00	8.70	
37	101+529	NP - 2 Pipe	1 x 0.90 Φ	8.35	
38	101+666	NP - 2 Pipe	1 x 0.90 Φ	8.30	
39	102+150	Dry Stone Slab	0.60 x 0.60	6.50	
40	102+250	NP - 2 Pipe	1 x 1.00 Φ	11.25	
41	102+415	RCC Slab (1 ROW) +	2 x 1.00 Φ,	10.00	
42	102+521	RCC Slab	0.60 x 2.50	7.25	
43	102+678	RCC Slab	0.60 x 2.00	6.45	
44	102+773	Dry Stone Slab	0.60 x 0.65	6.20	
45	103+090	Dry Stone Slab	0.70 x 0.80	10.50	
46	103+150	RCC Slab	1.40 x 2.50	9.80	
47	103+310	NP - 2 Pipe	1 x 0.60 Φ	7.50	
48	103+395	Dry Stone Slab	0.75 x 0.70	9.20	
49	103+503	NP - 3 Pipe	1 x 1.00 Φ	10.00	
50	103+590	NP - 3 Pipe	1 x 1.00 Φ	11.25	
51	103+620	Dry Stone Slab	0.60 x 1.20	8.50	
52	103+660	Dry Stone Slab	0.75 x 1.00	7.40	
53	103+836	Dry Stone Slab	0.75 x 0.75	6.90	
54	103+900	Dry Stone Slab	0.75 x 0.75	8.50	
55	104+050	NP - 3 Pipe (2 ROWS)	2 x 1.00 Φ	11.25	
56	104+184	Box Type	0.80 x 1.80	7.50	
57	104+276	Box Type	0.70 x 1.60	6.70	
58	104+314	NP - 3 Pipe	1 x 1.00 Φ	5.00	
59	104+347	RCC Slab over stone masonry	0.60 x 0.60	6.25	
60	104+425	Box Type	0.65 x 1.80	6.00	
61	105+700	NP - 3 Pipe	1 x 1.00 Φ	11.25	
62	104+838	Dry Stone Slab	0.60 x 1.70	7.70	
63	105+153	RCC Slab	0.80 x 0.90	6.50	
64	105+576	RCC Slab	0.70 x 0.60	6.30	
65	105+806	RCC Slab	0.40 x 1.70	6.80	
66	105+972	RCC Slab	0.65 x 1.70	6.50	
67	106+016	Dry Stone Slab	0.80 x 0.75	8.50	

S. No.	Existing Chainage	Type of Culvert	Span /Opening with span length (m)	Existing Width of Culvert	Remarks
68	106+167	Dry Stone Slab	0.60 x 0.80	5.00	
69	107+300	Dry Stone Slab	0.60 x 0.80	7.00	
70	106+383	NP - 2 Pipe	1 x 0.60 Φ	7.00	
71	106+498	RCC Slab	1.50 x 1.60	6.40	
72	106+650	Dry Stone Slab	1.80 x 0.70	6.30	
73	106+750	RCC Slab	1.20 x 0.60	6.20	
74	107+014	RCC Slab	1.30 x 0.70	5.70	
75	107+250	NP - 3 Pipe	2 x 1.00 Φ	10.00	
76	107+362	NP - 3 Pipe (Ext. RCC Slab	1 x 1.00 Φ	7.50	
77	108+002	NP - 3 Pipe	1 x 1.00 Φ	10.00	
78	108+165	NP - 3 Pipe	1 x 1.00 Φ	10.00	
79	108+241	NP - 3 Pipe	1 x 1.00 Φ	10.00	
80	108+381	Dry Stone Slab	0.50 x 0.60	6.40	
81	108+481	Dry Stone Slab	0.60 x 0.70	6.80	
82	108+529	Half NP - 2 Pipe, Half Dry	1 x 0.60 Φ,	6.00	
83	108+700	NP - 3 Pipe(2 Rows)	2 x 1.00 Φ	10.00	
84	108+855	NP - 3 Pipe(2 Rows)	2 x 1.00 Φ	10.00	
85	109+010	RCC Slab	0.90 x 1.40	4.80	
86	109+272	NP - 3 Pipe	1 x 1.00 Φ	10.00	
87	109+553	Dry Stone Slab	1.20 x 0.50	4.80	
88	110+310	RCC Slab over SM Wall	0.40 x 0.80	6.10	
89	111+660	NP - 3 Pipe	1 x 1.00 Φ	11.25	
90	113+059	NP - 3 Pipe	1 x 1.00 Φ	10.00	
91	113+505	NP - 3 Pipe	1 x 1.00 Φ	11.25	
92	113+515	NP - 3 Pipe	1 x 1.00 Φ	11.25	
93	114+050	NP - 3 Pipe	1 x 1.00 Φ	11.25	
94	114+121	NP - 3 Pipe	1 x 1.00 Φ	10.00	
95	114+270	NP - 3 Pipe	1 x 1.00 Φ	10.00	
96	114+405	NP - 3 Pipe	1 x 1.00 Φ	10.00	
97	114+660	NP - 3 Pipe	1 x 1.00 Φ	10.00	
98	114+725	NP - 3 Pipe	1 x 1.00 Φ	11.25	
99	114+781	NP - 3 Pipe	1 x 1.00 Φ	11.25	
100	114+859	NP - 3 Pipe	1 x 1.00 Φ	10.00	
101	115+094	NP - 3 Pipe	1 x 1.00 Φ	11.25	
102	115+154	NP - 3 Pipe	2 x 1.00 Φ	11.25	
103	115+367	NP - 3 Pipe	1 x 1.00 Φ	10.00	
104	115+493	NP - 3 Pipe	1 x 1.00 Φ	10.00	
105	116+225	NP - 3 Pipe	1 x 1.00 Φ	11.25	
106	116+302	NP - 3 Pipe	1 x 1.00 Φ	11.25	
107	116+408	NP - 3 Pipe	1 x 1.00 Φ	10.00	
108	116+443	NP - 3 Pipe	1 x 1.00 Φ	10.00	
109	116+584	NP - 3 Pipe	1 x 1.00 Φ	11.25	
110	116+701	NP - 3 Pipe	1 x 1.00 Φ	10.00	

S. No.	Existing Chainage	Type of Culvert	Span /Opening with span length (m)	Existing Width of Culvert	Remarks
111	116+741	NP - 3 Pipe	1 x 1.00 Φ	10.00	
112	117+238	NP - 3 Pipe	2 x 1.00 Φ	10.00	
113	117+435	NP - 3 Pipe	1 x 1.00 Φ	11.25	
114	117+582	NP - 3 Pipe	2 x 1.00 Φ	11.25	
115	117+645	NP - 3 Pipe	2 x 1.00 Φ	10.00	
116	117+771	NP - 3 Pipe	2 x 1.00 Φ	10.00	
117	117+868	NP - 3 Pipe	2 x 1.00 Φ	10.00	
118	117+970	NP - 3 Pipe	1 x 1.00 Φ	10.00	
119	118+068	NP - 3 Pipe	1 x 1.00 Φ	10.00	
120	118+130	NP - 3 Pipe	1 x 1.00 Φ	10.00	
121	118+232	NP - 3 Pipe	1 x 1.00 Φ	11.25	
122	118+264	NP - 3 Pipe	1 x 1.00 Φ	10.00	
123	118+309	NP - 3 Pipe	1 x 1.00 Φ	10.00	
124	118+329	NP - 3 Pipe	1 x 1.00 Φ	10.00	
125	118+392	NP - 3 Pipe	2 x 1.00 Φ	10.00	
126	118+492	NP - 3 Pipe	1 x 1.00 Φ	11.25	
127	118+515	NP - 3 Pipe	1 x 1.00 Φ	11.25	
128	118+572	NP - 3 Pipe	1 x 1.00 Φ	11.25	
129	118+629	NP - 3 Pipe	1 x 1.00 Φ	11.25	
130	118+739	NP - 3 Pipe	1 x 1.00 Φ	11.25	
131	118+836	NP - 3 Pipe	2 x 1.00 Φ	10.00	
132	119+289	NP - 3 Pipe	1 x 1.00 Φ	11.25	
133	119+358	NP - 3 Pipe	1 x 1.00 Φ	11.25	
134	119+473	NP - 3 Pipe	1 x 1.00 Φ	10.00	
135	119+710	NP - 3 Pipe	1 x 1.00 Φ	11.25	
136	119+852	NP - 3 Pipe	1 x 1.00 Φ	11.25	
137	120+511	NP - 3 Pipe	1 x 1.00 Φ	10.00	
138	120+663	NP - 3 Pipe	1 x 1.00 Φ	11.25	
139	120+810	NP - 3 Pipe	1 x 1.00 Φ	10.00	
140	121+831	RCC Slab over SM wall	0.90 x 1.80	5.30	
141	121+930	NP - 3 Pipe	1 x 1.00 Φ	10.00	
142	122+080	NP - 3 Pipe	1 x 1.00 Φ	10.00	
143	122+270	NP - 3 Pipe	1 x 1.00 Φ	11.25	
144	122+419	NP - 3 Pipe	1 x 1.00 Φ	10.00	
145	123+343	NP - 3 Pipe	1 x 1.00 Φ	10.00	
146	123+425	NP - 3 Pipe	1 x 1.00 Φ	10.00	
147	123+471	RCC Slab over SM wall	1.00 x 1.00	7.30	
148	123+705	NP - 3 Pipe	1 x 1.00 Φ	10.00	
149	123+769	Stone Slabe over dry wall	0.80 x 1.00	7.70	
150	124+058	NP - 3 Pipe	1 x 1.00 Φ	10.00	
151	124+159	NP - 2 Pipe	1 x 1.00 Φ	10.00	
152	124+517	NP - 3 Pipe	1 x 1.00 Φ	11.25	
153	124+322	RCC Slab over SM wall	1.00 x 1.00	10.00	

S. No.	Existing Chainage	Type of Culvert	Span /Opening with span length (m)	Existing Width of Culvert	Remarks
154	124+557	NP - 3 Pipe	1 x 1.00 Φ	10.00	
155	124+652	NP - 3 Pipe	1 x 1.00 Φ	10.00	
156	124+678	NP - 3 Pipe	1 x 1.00 Φ	11.25	
157	124+761	NP - 3 Pipe	1 x 1.00 Φ	10.00	
158	124+901	NP - 3 Pipe	1 x 1.00 Φ	10.00	
159	125+024	NP - 3 Pipe	1 x 1.00 Φ	10.00	
160	125+121	NP - 3 Pipe	1 x 1.00 Φ	10.00	
161	125+182	NP - 3 Pipe	2 x 1.00 Φ	10.00	
162	125+215	NP - 3 Pipe	2 x 1.00 Φ	10.00	
163	125+307	NP - 3 Pipe	1 x 1.00 Φ	10.00	
164	125+390	NP - 3 Pipe	1 x 1.00 Φ	10.00	
165	125+458	NP - 3 Pipe	1 x 1.00 Φ	10.00	
166	125+563	NP - 3 Pipe	1 x 1.00 Φ	10.00	
167	125+860	NP - 3 Pipe	1 x 1.00 Φ	10.00	
168	126+099	NP - 3 Pipe	1 x 1.00 Φ	10.00	
169	126+161	NP - 3 Pipe	1 x 1.00 Φ	10.00	
170	126+222	NP - 3 Pipe	1 x 1.00 Φ	10.00	
171	126+305	NP - 3 Pipe	1 x 1.00 Φ	10.00	
172	126+371	NP - 3 Pipe	1 x 1.00 Φ	10.00	
173	126+462	NP - 3 Pipe	1 x 1.00 Φ	11.25	
174	126+506	NP - 3 Pipe	1 x 1.00 Φ	10.00	
175	126+582	NP - 3 Pipe	1 x 1.00 Φ	10.00	
176	126+669	NP - 3 Pipe	1 x 1.00 Φ	10.00	
177	126+733	NP - 3 Pipe	1 x 1.00 Φ	11.25	
178	126+837	NP - 3 Pipe	1 x 1.00 Φ	10.00	
179	127+129	NP - 3 Pipe	1 x 1.00 Φ	10.00	
180	127+315	NP - 3 Pipe	1 x 1.00 Φ	10.00	
181	127+514	NP - 3 Pipe	1 x 1.00 Φ	10.00	
182	127+802	NP - 3 Pipe	1 x 1.00 Φ	10.00	
183	127+921	NP - 3 Pipe	1 x 1.00 Φ	10.00	
184	128+068	NP - 3 Pipe	1 x 1.00 Φ	10.00	
185	128+109	NP - 3 Pipe	1 x 1.00 Φ	10.00	
186	128+310	NP - 3 Pipe	2 x 1.00 Φ	11.25	
187	128+463	NP - 3 Pipe	1 x 1.00 Φ	10.00	
188	128+595	NP - 3 Pipe	1 x 1.00 Φ	10.00	
189	128+711	NP - 3 Pipe	1 x 1.00 Φ	10.00	
190	128+802	NP - 3 Pipe	1 x 1.00 Φ	10.00	
191	128+950	NP - 3 Pipe	1 x 1.00 Φ	10.00	
192	129+112	NP - 3 Pipe	1 x 1.00 Φ	10.00	
193	129+217	NP - 3 Pipe	1 x 1.00 Φ	10.00	
194	129+506	NP - 3 Pipe	1 x 1.00 Φ	11.25	
195	129+718	NP - 3 Pipe	1 x 1.00 Φ	11.25	
196	129+884	NP - 3 Pipe	1 x 1.00 Φ	10.00	

S. No.	Existing Chainage	Type of Culvert	Span /Opening with span length (m)	Existing Width of Culvert	Remarks
197	129+944	NP - 3 Pipe	1 x 1.00 Φ	10.00	
198	130+303	NP - 3 Pipe	1 x 1.00 Φ	10.00	
199	130+427	NP - 3 Pipe	1 x 1.00 Φ	10.00	
200	130+617	RCC Slab	1.20 x 1.00	6.20	
201	131+610	RCC Slab over SM wall	0.6 x 1.00	7.00	
202	131+899	NP - 3 Pipe	1 x 1.00 Φ	11.25	
203	132+273	RCC Slab over SM wall	0.60 x 1.00	7.80	
204	132+922	RCC Slab over SM wall	0.90 x 0.90	5.70	
205	133+254	NP - 3 Pipe	1 x 1.00 Φ	10.00	
206	133+450	RCC Slab over dry stone	1.00 x 1.00	7.20	
207	133+690	RCC Slab over dry stone	1.00 x 1.00	7.60	
208	135+235	RCC Slab	1.00 x 1.00	6.00	
209	137+064	Stone Slab over dry wall	0.45 x 1.00	5.00	
210	137+493	NP - 2 Pipe	1 x 0.90 Φ	10.00	
211	137+696	RCC Slab	1.9 x 1.00	8.00	
212	137+742	NP - 2 Pipe	0.60 m Φ	7.50	
213	138+174	RCC Slab	1.00 x 1.00	6.60	
214	138+498	NP - 2 Pipe	1 x 1.00 Φ	11.25	
215	138+782	RCC Slab	0.60 x 0.60	6.15	
216	139+010	RCC Slab	0.40 x 0.80	5.40	
217	140+200	NP - 2 Pipe	1 x 1.00 Φ	10.00	
218	139+643	RCC Slab	0.90 x 0.90	6.20	
219	139+820	NP - 2 Pipe	1 x 0.60 Φ	6.25	
220	139+898	Stone Slab over dry wall	0.60 x 0.80	9.30	
221	140+414	NP - 2 Pipe	1 x 0.60 Φ	7.50	
222	140+781	RCC Slab	1.20 x 1.60	8.50	
223	141+044	NP - 3 Pipe	2 x 1.00 Φ	10.00	
224	141+119	NP - 3 Pipe	1 x 1.00 Φ	11.25	
225	141+587	RCC Slab	2.50 x 2.50	12.20	
226	141+886	RCC Slab	2.50 x 1.50	12.20	
227	144+200	NP - 3 Pipe	2 x 1.00 Φ	12.00	

11. Bus bays/Bus Shelters

The details of bus shelters on the Site are as follows:

S. No.	Chainage (km)	Length (m)	Left Hand Side	Right Hand Side
NIL				

12. Truck Lay byes

The details of truck lay byes are as follows:

S. No.	Chainage (km)	Length (m)	Left Hand Side	Right Hand Side
NIL				

13. Road side drains

The details of the roadside drains are as follows:

S. No.	Location		Type	
	From km	To km	Masonry/cc (Pucca)	Earthen (Kutcha)
1	85+000	95+000	-	Yes
2	101+000	145+000	-	Yes

14. Major junctions

The details of major junctions are as follows:

S. No	Chainage (km)	At Grade	Side	Type	Remarks
	Existing Chainage				
1	92+925	At Grade	RHS	Y	EDAN BARI
2	109+306	At Grade	RHS	Y	TO TURA BY-PASS

(NH: National Highway, SH: State Highway, MDR: Major District Road.)

15. Minor junctions

The details of the minor junctions (all at grade) are as follows:

S. No.	Location of Intersection	Type of Intersection	Other features	
			LHS	RHS
1	85+357	T	Police HQ Ggoeragre	
2	85+838	T		To Babadam
3	86+033	T	To Champarea	
4	86+863	Y		To Ganol
5	88+136	Y		To Nehu Campus
6	88+360	Y	B.T. Road	
7	89+680	Y		Rongan Hiran
8	92+184	T		Bosco Mount
9	92+710	T		Don Bosco Sec.School
10	92+790	Y	DAP.of Agriculture Rongkhon	
11	94+620	Y		Edan Bari
12	94+862	T		Tura Public School
13	101+360	T	To ganrak	
14	104+286	Y		To Sangsanggri,Tura

S. No.	Location of Intersection	Type of Intersection	Other features	
			LHS	RHS
15	104+611	Y	To Rongpinggre E.G.S.I.P.	
16	104+631	Y	BT Road	
17	107+948	T		To Rongongri
18	109+912	T		To The Rubber Board
19	110+392	T		To Tura By-pass
20	111+905	T	ToJjenggitc	
21	112+677	Y	To Bolchugri	
22	113+367	Y		To Purakashya
23	114+010	Y		To Chikwatgri
24	114+548	Y	To Rongrang Gri	
25	116+127	Y		BT road
26	120+624	Y		To Rongdilbanggre
27	120+687	Y	To Chokpot	
28	124+201	T		To Wakkalnangri
29	126+059	T		To Wakkalnangri
30	128+255	Y	To Among Para	
31	129+767	Y	To Deku bazar	
32	134+379	Y		To Moropgre
33	135+082	T		To Morigre
34	135+247	Y		To Rengsipara
35	140+023	T	To Rendapara	
36	140+643	Y		To Rendapara
37	141+844	T	To Bagamara	
38	142+861	T	To Baghmara	
39	143+491	Y		To Magupara
40	144+124	Y		To Purakhasia
41	144+344	Y	BT road	
42	144+582	Y		To Purakhasia
43	144+582	T	To Koinabhui Road	

16. Bypasses

The details of the existing road sections proposed to be bypassed are as follows:

S. No	Name of bypass (Town)	Chainage (Km)		Length (Km)
		From	To	
NIL				

17. Other Structures : NIL

18. Design Chainages corresponding to Existing references

SI No	Existing Chainage (Km)	Proposed Chainage (Km)
1	85+000	85+000
2	86+000	85+977
3	87+000	86+747
4	88+000	87+749
5	89+000	88+687
6	90+000	89+683
7	91+000	90+646
8	92+000	91+646
9	93+000	92+375
10	94+000	93+350
11	95+000	94+228
12	101+000	101+000
13	102+000	101+921
14	103+000	102+719
15	104+000	103+634
16	105+000	104+634
17	106+000	105+616
18	107+000	106+565
19	108+000	107+489
20	109+000	108+449
21	110+000	109+428
22	111+000	110+431
23	112+000	111+395
24	113+000	112+378
25	114+000	113+300
26	115+000	114+165
27	116+000	115+123
28	117+000	116+124
29	118+000	117+083
30	119+000	118+069
31	120+000	119+077
32	121+000	119+968
33	122+000	120+866
34	123+000	121+857
35	124+000	122+842
36	125+000	123+877
37	126+000	124+821

SI No	Existing Chainage (Km)	Proposed Chainage (Km)
38	127+000	125+680
39	128+000	126+602
40	129+000	127+568
41	130+000	128+550
42	131+000	129+506
43	132+000	130+506
44	133+000	131+506
45	134+000	132+461
46	135+000	133+453
47	136+000	134+512
48	137+000	135+509
49	138+000	136+459
50	139+000	137+350
51	140+000	138+329
52	141+000	139+346
53	142+000	140+343
54	143+000	141+299
55	144+000	142+326
56	145+000	143+268

Annex - II

(Schedule-A)

Dates for providing Right of Way

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

(I). Full Right of Way (full width)

Stretch	S. No.	Existing Km		Length (m)	Existing ROW (m)	Proposed ROW (m)	Date of Providing ROW*
		Start	End				
Full Right of Way for Proposed 2-Lane with paved shoulder Section	1	87+000	88+000	1+000	15	15	Minimum 90% on Appointed date and remaining within 90 days of appointed Date
	2	88+000	89+300	1+300	30	15	
	3	89+300	89+430	0+130	30	12	
	4	89+430	90+000	0+570	30	15	
	5	90+000	92+100	2+100	15	15	
	6	92+100	92+250	0+150	15	12	
	7	92+250	93+950	1+700	15	15	
	8	93+950	94+100	0+150	15	12	
	9	101+000	104+200	3+200	30	15	
	10	104+200	104+400	0+200	30	12	
	11	104+400	107+550	3+150	30	12	
	12	107+550	111+250	3+700	20	15	
	13	111+250	111+400	0+150	20	12	
	14	111+400	115+200	3+800	20	15	
	15	115+200	115+400	0+200	20	12	
	16	115+400	126+850	11+450	20	15	
	17	126+850	126+950	0+100	20	12	
	18	126+950	127+000	0+050	20	15	
	19	127+000	132+800	5+800	30	15	
	20	132+800	132+950	0+150	30	12	
	21	132+950	133+600	0+650	30	15	
	22	133+600	133+800	0+200	30	12	
	23	133+800	140+000	6+200	30	15	
	24	140+000	140+500	0+500	15	15	
	25	140+500	140+700	0+200	15	12	
	26	140+700	141+200	0+500	15	15	
	27	141+200	141+750	0+550	15	12	
	28	141+750	142+450	0+700	15	15	
	29	142+450	143+400	0+950	15	12	
	30	143+400	145+000	1+600	15	15	
	Total Length			**51100**			

(II). Part Right of Way (part width)

Stretch	S. No.	Existing Km		Length (m)	Partly ROW (m)	Proposed ROW (m)	Date of Providing ROW*
		Start	End				
Part Right of Way for Proposed 2-Lane with paved shoulder Section	1	85+000	85+750	0+750	10	15	At the time of Appointed Date
	2	85+750	85+850	0+100	10	12	
	3	85+850	85+940	0+090	10	15	
	4	85+940	86+060	0+120	10	12	
	5	86+060	86+570	0+510	10	12	
	6	86+570	86+660	0+090	10	12	
	7	86+660	87+000	0+340	10	15	
	8	94+100	95+000	0+900	10	15	
	Total Length			**2900**			

(III). Balance Right of Way (width)

Stretch	S. No.	Existing Km		Length (m)	Balance ROW (m)	Proposed ROW (m)	Date of Providing ROW*
		Start	End				
Balance Right of Way for Proposed 2-Lane Section	1	85+000	85+750	0+750	5	15	At the time of Appointed Date
	2	85+750	85+850	0+100	2	12	
	3	85+850	85+940	0+090	5	15	
	4	85+940	86+060	0+120	2	12	
	5	86+060	86+570	0+510	2	12	
	6	86+570	86+660	0+090	2	12	
	7	86+660	87+000	0+340	5	15	
	8	94+100	95+000	0+900	5	15	
	Total Length			**2900**			

Annex-III

(Schedule-A)

Alignment Plans

The existing alignment of the Project Highway shall be modified in the following sections as per the alignment plan indicated below:

The alignment plan of the Project Highway is available on CPP Portal i.e. https://eprocure.gov.in/cppp/ and NHIDCL website i.e. https://nhidcl.com/ .

Annex - IV

(Schedule-A)

Environment Clearances

The project highway does not require environment clearance as per MoEF circular dated 22.08.2013.

The muck dumping sites in forest area stand identified and freezed by forest department to be abided by agency during dumping of muck as stated in Schedule F.

Annex-V

Index Map of Project Highways

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 Project Highway as described in this Schedule-B and in Schedule-C.

2. Rehabilitation and Upgradation

Widening and Upgradation shall include Two-Laning with Paved shoulder 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 with Paved Shoulder

1. WIDENING OF THE EXISTING HIGHWAY

1.1 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/mountainous/steep terrain to the extent land is available.

1.2 WIDTH OF CARRIAGEWAY

1.2.1 The project highway shall be designed as per Manual.

The Project Highway passes through the following built up areas (however, four laning is not required):

Sr. No.	Built up areas	Design Chainage (km)		Length (m)	Width (m)	TCS*
		From	To			
1	Babadam	85+000	85+125	125	12.00	Type-10
		85+125	85+150	25	12.00	Type-1
		85+150	85+350	200	12.00	Type-10
		85+350	85+400	50	12.00	Type-1
2	Rongan Hiran	90+700	90+775	75	12.00	Type-7
		90+775	90+850	75	12.00	Type-4
		90+850	90+925	75	12.00	Type-8
		90+925	91+025	100	12.00	Type-4
		91+025	91+175	150	12.00	Type-7
		91+175	91+375	200	12.00	Type-8
		91+375	91+400	25	12.00	Type-1
3	Rongkon	92+050	92+075	25	12.00	Type-8
		92+075	92+100	25	12.00	Type-7
		92+100	92+125	25	12.00	Type-4
		92+125	92+150	25	12.00	Type-1
		92+150	92+225	75	12.00	Type-4
		92+225	92+250	25	12.00	Type-7
		92+250	92+275	25	12.00	Type-4
		92+275	92+350	75	12.00	Type-1
4	Tura	93+900	93+950	50	12.00	Type-8
		93+950	94+100	150	12.00	Type-4
		94+100	94+175	75	12.00	Type-7
		94+175	94+200	25	12.00	Type-4
5	Dadaun Giri	104+200	104+300	100	12.00	Type-1

Sr. No.	Built up areas	Design Chainage (km)		Length (m)	Width (m)	TCS*
		From	To			
6	Rubber	107+400	107+500	100	12.00	Type-1
7	Fodder Seed	108+700	108+800	100	12.00	Type-1
8	Purakashya	111+200	111+350	150	12.00	Type-1
9	Chitoktak	115+180	115+320	140	12.00	Type-1
10	Moropgre	125+500	125+750	250	12.00	Type-1
11	Rendapara	133+550	133+650	100	12.00	Type-1
12	Dalu	142+400	142+950	550	12.00	Type-1

The TCS given are indicative only.

1.2.2 Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to paragraph 1.1 above.

2. GEOMETRIC DESIGN AND GENERAL FEATURES

2.1 General

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

2.2 Design Speed

The design speed given in following table shall be adopted for various terrains

Nature of Terrain	Cross Slope of the Ground	Design Speed (km/hr)	
		Ruling	Minimum
Mountainous and Steep	More than 25 percent	60	40

2.3 Improvement of the existing road geometry

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:

Deficient Curves:-

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
1	85+010	85+080	Speed Restriction	Due to site constraint
2	85+081	85+142		
3	85+149	85+198		
4	85+231	85+352		
5	85+353	85+445		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
6	85+455	85+673		
7	85+709	85+812		
8	85+822	85+916	Speed Restriction	Due to site constraint
9	85+962	86+042		
10	86+096	86+211		
11	86+382	86+474		
12	86+504	86+579		
13	86+649	86+703		
14	86+730	86+788		
15	86+905	86+969		
16	87+017	87+077		
17	87+118	87+217		
18	87+539	87+592		
19	87+736	87+795		
20	87+822	87+881		
21	87+973	88+030		
22	88+153	88+219		
23	88+253	88+306		
24	88+324	88+417		
25	88+419	88+605		
26	88+613	88+669		
27	88+670	88+714		
28	88+714	88+783		
29	88+788	88+827		
30	88+860	88+901		
31	88+903	88+945		
32	88+950	89+048		
33	89+075	89+156		
34	89+160	89+232		
35	89+233	89+303		
36	89+368	89+447		
37	89+469	89+520		
38	89+530	89+626		
39	89+640	89+763		
40	89+770	89+816		
41	89+834	89+872		
42	89+881	89+982		
43	89+983	90+071		
44	90+083	90+150		
45	90+183	90+240		
46	90+266	90+364		
47	90+364	90+411		
48	90+412	90+485		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
49	90+516	90+628		
50	90+748	90+853		
51	90+855	90+987	Speed Restriction	Due to site constraint
52	91+055	91+125		
53	91+161	91+217		
54	91+310	91+383		
55	91+405	91+453		
56	91+481	91+526		
57	91+531	91+575		
58	91+585	91+633		
59	91+710	91+750		
60	91+756	91+814		
61	91+816	91+883		
62	91+883	91+933		
63	91+937	91+977		
64	91+983	92+059		
65	92+082	92+132		
66	92+152	92+212		
67	92+227	92+270		
68	92+273	92+356		
69	92+468	92+512		
70	92+548	92+613		
71	92+689	92+736		
72	92+738	92+791		
73	92+800	92+837		
74	92+863	92+928		
75	92+931	93+001		
76	93+054	93+105		
77	93+109	93+161		
78	93+163	93+221		
79	93+224	93+288		
80	93+336	93+409		
81	93+513	93+564		
82	93+586	93+646		
83	93+647	93+696		
84	93+698	93+748		
85	93+783	93+833		
86	93+834	93+908		
87	93+933	94+053		
88	94+115	94+169		
89	101+001	101+094		
90	101+113	101+172		
91	101+173	101+235		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
92	101+261	101+302		
93	101+320	101+426		
94	101+478	101+579	Speed Restriction	Due to site constraint
95	101+589	101+698		
96	101+726	101+797		
97	101+802	101+843		
98	101+866	101+957		
99	101+959	102+020		
100	102+084	102+158		
101	102+205	102+241		
102	102+246	102+316		
103	102+318	102+411		
104	102+411	102+476		
105	102+493	102+571		
106	102+580	102+616		
107	102+640	102+700		
108	102+773	102+829		
109	102+832	102+867		
110	102+868	102+911		
111	102+915	103+002		
112	103+006	103+047		
113	103+075	103+123		
114	103+139	103+214		
115	103+291	103+340		
116	103+356	103+445		
117	103+460	103+571		
118	103+589	103+627		
119	103+727	103+810		
120	103+886	103+973		
121	104+019	104+082		
122	104+147	104+203		
123	104+249	104+284		
124	104+355	104+406		
125	104+421	104+463		
126	104+475	104+534		
127	104+555	104+621		
128	104+627	104+676		
129	104+708	104+754		
130	104+762	104+829		
131	104+862	104+908		
132	104+975	105+022		
133	105+069	105+106		
134	105+149	105+194		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
135	105+202	105+252		
136	105+252	105+290		
137	105+299	105+375	Speed Restriction	Due to site constraint
138	105+388	105+458		
139	105+465	105+556		
140	105+584	105+677		
141	105+679	105+750		
142	105+755	105+805		
143	105+830	105+882		
144	105+885	105+939		
145	105+947	106+006		
146	106+010	106+073		
147	106+081	106+116		
148	106+130	106+182		
149	106+220	106+286		
150	106+329	106+393		
151	106+466	106+513		
152	106+552	106+631		
153	106+648	106+768		
154	106+806	106+870		
155	106+905	106+961		
156	107+050	107+137		
157	107+169	107+210		
158	107+219	107+278		
159	107+386	107+457		
160	107+534	107+648		
161	107+678	107+733		
162	107+758	107+810		
163	107+849	107+898		
164	107+915	107+961		
165	107+977	108+052		
166	108+087	108+140		
167	108+160	108+219		
168	108+226	108+297		
169	108+309	108+391		
170	108+399	108+450		
171	108+452	108+500		
172	108+533	108+608		
173	108+613	108+665		
174	108+730	108+848		
175	108+928	109+021		
176	109+059	109+146		
177	109+150	109+192		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
178	109+225	109+290		
179	109+302	109+359		
180	109+362	109+406	Speed Restriction	Due to site constraint
181	109+415	109+484		
182	109+496	109+531		
183	109+604	109+694		
184	109+760	109+861		
185	109+939	110+039		
186	110+049	110+118		
187	110+122	110+197		
188	110+252	110+302		
189	110+336	110+371		
190	110+388	110+438		
191	110+477	110+591		
192	110+596	110+644		
193	110+658	110+747		
194	110+767	110+822		
195	110+827	110+892		
196	110+945	111+031		
197	111+034	111+112		
198	111+133	111+178		
199	111+212	111+256		
200	111+257	111+346		
201	111+480	111+530		
202	111+552	111+618		
203	111+654	111+742		
204	111+745	111+817		
205	111+836	111+919		
206	111+924	111+984		
207	112+007	112+119		
208	112+120	112+176		
209	112+220	112+326		
210	112+376	112+463		
211	112+504	112+644		
212	112+725	112+758		
213	112+777	112+824		
214	112+851	112+929		
215	112+932	113+013		
216	113+096	113+194		
217	113+223	113+263		
218	113+281	113+381		
219	113+530	113+608		
220	113+814	113+924		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
221	113+961	114+056		
222	114+239	114+339		
223	114+473	114+521	Speed Restriction	Due to site constraint
224	114+555	114+604		
225	114+644	114+698		
226	114+718	114+794		
227	114+937	115+002		
228	115+126	115+169		
229	115+197	115+246		
230	115+276	115+329		
231	115+362	115+442		
232	115+569	115+610		
233	115+647	115+771		
234	115+890	115+937		
235	115+958	116+069		
236	116+103	116+195		
237	116+196	116+265		
238	116+265	116+366		
239	116+405	116+487		
240	116+498	116+580		
241	116+581	116+652		
242	116+652	116+716		
243	116+735	116+784		
244	116+784	116+837		
245	116+847	116+895		
246	116+900	116+946		
247	116+950	116+995		
248	117+007	117+066		
249	117+100	117+202		
250	117+236	117+300		
251	117+318	117+372		
252	117+411	117+458		
253	117+458	117+509		
254	117+509	117+545		
255	117+561	117+621		
256	117+657	117+704		
257	117+710	117+826		
258	117+842	117+924		
259	118+006	118+053		
260	118+077	118+125		
261	118+143	118+212		
262	118+220	118+277		
263	118+285	118+337		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
264	118+351	118+414		
265	118+416	118+451		
266	118+484	118+526	Speed Restriction	
267	118+537	118+604		
268	118+609	118+693		
269	118+706	118+752		
270	118+759	118+813		
271	118+837	118+901		
272	118+903	118+962		
273	119+019	119+073		
274	119+183	119+249		
275	119+265	119+329		
276	119+373	119+409		
277	119+463	119+549		
278	119+717	119+836		
279	119+890	120+047		
280	120+136	120+217		
281	120+236	120+280		
282	120+299	120+362		
283	120+365	120+427		
284	120+431	120+489		
285	120+506	120+557		Due to site constraint
286	120+557	120+623		
287	120+626	120+689		
288	120+693	120+762		
289	120+813	120+919		
290	120+989	121+160		
291	121+212	121+296		
292	121+309	121+382		
293	121+433	121+501		
294	121+556	121+614		
295	121+626	121+676		
296	121+676	121+741		
297	121+846	121+934		
298	121+967	122+009		
299	122+029	122+068		
300	122+073	122+135		
301	122+142	122+182		
302	122+185	122+231		
303	122+241	122+326		
304	122+368	122+444		
305	122+502	122+606		
306	122+637	122+705		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
307	122+724	122+775		
308	122+826	122+931		
309	122+964	123+106	Speed Restriction	Due to site constraint
310	123+113	123+177		
311	123+181	123+272		
312	123+360	123+448		
313	123+463	123+537		
314	123+574	123+614		
315	123+634	123+682		
316	123+716	123+800		
317	123+848	123+977		
318	124+026	124+124		
319	124+150	124+191		
320	124+193	124+237		
321	124+238	124+289		
322	124+348	124+414		
323	124+433	124+515		
324	124+533	124+596		
325	124+601	124+651		
326	124+681	124+746		
327	124+850	124+930		
328	124+939	125+029		
329	125+054	125+123		
330	125+150	125+226		
331	125+266	125+329		
332	125+351	125+428		
333	125+456	125+519		
334	125+544	125+601		
335	125+682	125+748		
336	125+761	125+811		
337	125+864	125+913		
338	125+973	126+013		
339	126+031	126+104		
340	126+122	126+245		
341	126+290	126+366		
342	126+417	126+473		
343	126+521	126+597		
344	126+679	126+729		
345	126+729	126+826		
346	126+848	126+910		
347	126+959	127+040		
348	127+062	127+115		
349	127+115	127+219		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
350	127+303	127+402		
351	127+434	127+516		
352	127+573	127+628	Speed Restriction	Due to site constraint
353	127+739	127+779		
354	127+964	128+010		
355	128+019	128+120		
356	128+281	128+361		
357	128+368	128+429		
358	128+433	128+539		
359	128+543	128+636		
360	128+637	128+697		
361	128+706	128+784		
362	128+786	128+844		
363	128+860	128+915		
364	128+921	128+969		
365	128+984	129+062		
366	129+097	129+185		
367	129+199	129+265		
368	129+308	129+356		
369	129+381	129+445		
370	129+448	129+517		
371	129+518	129+574		
372	129+577	129+657		
373	129+691	129+743		
374	129+930	129+976		
375	129+984	130+052		
376	130+058	130+118		
377	130+125	130+187		
378	130+195	130+278		
379	130+335	130+402		
380	130+407	130+503		
381	130+509	130+566		
382	130+595	130+646		
383	130+668	130+805		
384	130+810	130+866		
385	130+871	130+953		
386	130+956	131+061		
387	131+064	131+124		
388	131+125	131+177		
389	131+180	131+244		
390	131+361	131+427		
391	131+731	131+798		
392	131+802	131+855		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
393	131+872	131+924		
394	132+192	132+278		
395	132+342	132+429	Speed Restriction	Due to site constraint
396	132+443	132+486		
397	132+514	132+587		
398	132+629	132+694		
399	132+708	132+760		
400	132+762	132+884		
401	132+893	132+988		
402	133+001	133+074		
403	133+141	133+185		
404	133+190	133+242		
405	133+242	133+291		
406	133+295	133+396		
407	133+397	133+440		
408	133+497	133+562		
409	133+563	133+632		
410	133+699	133+797		
411	133+799	133+857		
412	133+857	133+925		
413	133+928	133+972		
414	133+981	134+062		
415	134+090	134+164		
416	134+167	134+276		
417	134+396	134+450		
418	134+660	134+720		
419	134+723	134+785		
420	134+840	134+918		
421	134+926	134+976		
422	135+063	135+099		
423	135+102	135+174		
424	135+194	135+237		
425	135+305	135+371		
426	135+378	135+434		
427	135+449	135+509		
428	135+515	135+567		
429	135+579	135+629		
430	135+656	135+719		
431	135+739	135+786		
432	135+790	135+931		
433	135+955	135+999		
434	136+001	136+082		
435	136+087	136+131		

S. No	Stretch (km)		Type of Deficiency	Remarks
	From	To		
436	136+155	136+229		
437	136+231	136+278		
438	136+293	136+345	Speed Restriction	Due to site constraint
439	136+348	136+459		
440	136+460	136+532		
441	136+546	136+604		
442	136+629	136+699		
443	136+727	136+776		
444	136+777	136+822		
445	136+824	136+882		
446	136+894	136+945		
447	137+040	137+141		
448	137+156	137+284		
449	137+295	137+345		
450	137+460	137+514		
451	137+542	137+611		
452	137+755	137+818		
453	137+858	137+916		
454	137+937	137+991		
455	138+005	138+045		
456	138+070	138+136		
457	138+140	138+189		
458	138+192	138+255		
459	138+286	138+400		
460	138+405	138+482		
461	138+499	138+548		
462	138+557	138+628		
463	138+725	138+806		
464	138+838	138+905		
465	138+917	138+976		
466	138+988	139+044		
467	139+045	139+090		
468	139+245	139+312		
469	139+645	139+738		
470	140+016	140+105		
471	141+425	141+541		

The proposed horizontal and vertical alignment is available in digital format and this is for information and the Authority shall not be held responsible for any implications of the contract. EPC contractor shall carry out his own survey and investigations and due diligence both during bidding and during design and construction.

2.4 Right of Way

The Site of the Project Highway comprises the land as described in Annexure-II of Schedule-A.

2.5 Type of Shoulders

(a) In built-up sections, footpaths/ paved shoulders shall be provided in the stretches mentioned at clause 1.2.1 above.

(b) In open country, paved shoulders shall be provided in accordance with the typical cross sections drawings in the Manual.

(c) Design and specifications of paved shoulders and granular material shall conform to the requirements specified in paragraphs 5.10 and 5.11 of the Manual.

2.6 Lateral and vertical clearances at underpasses

No underpass is proposed in the Project Highway.

2.7 Lateral and vertical clearances at overpasses

No overpass is proposed in the Project Highway.

2.8 Service roads

No service road is proposed in the Project Highway.

2.9 Grade separated structures

No grade separated structure is proposed in the Project Highway.

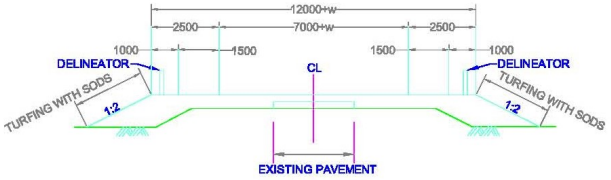
2.10 Cattle and pedestrian under pass / over pass

No cattle and pedestrian underpass is proposed in the Project Highway.

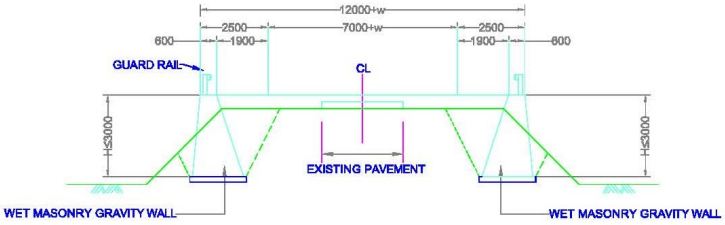
2.11 Typical cross-sections of the Project Highway

Indicative typical cross sections along with different types of cross-sections required to be developed in different segments of the project highway are indicated in the Manual and is as follow:-

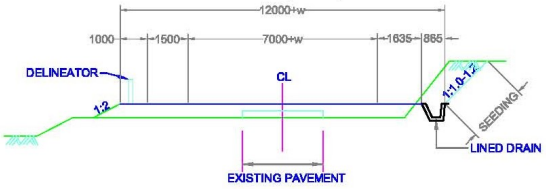
PLAIN AND ROLLING TERRAIN SECTION
FORMATION IN EMBANKMENT
TYPICAL-1



TYPICAL-2

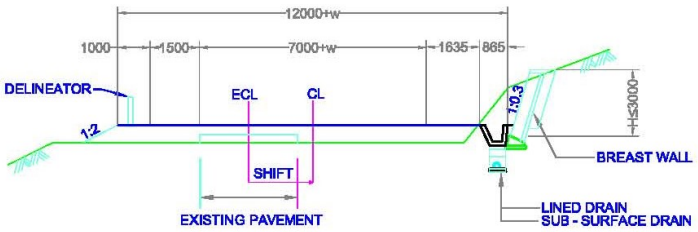


FORMATION IN CUTTING AND EMBANKMENT
TYPICAL-3

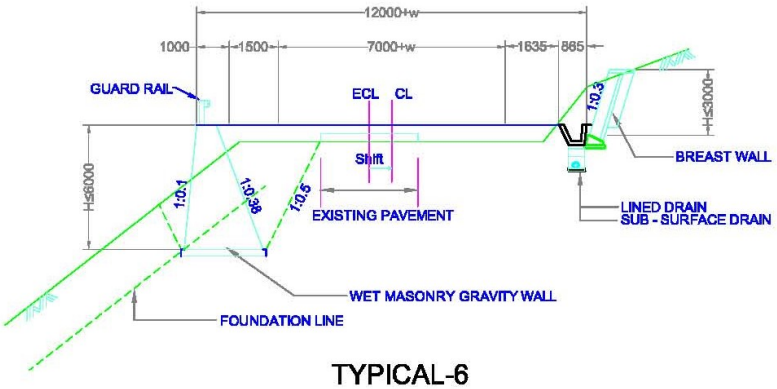


MOUNTAINOUS AND STEEP TERRAIN SECTION

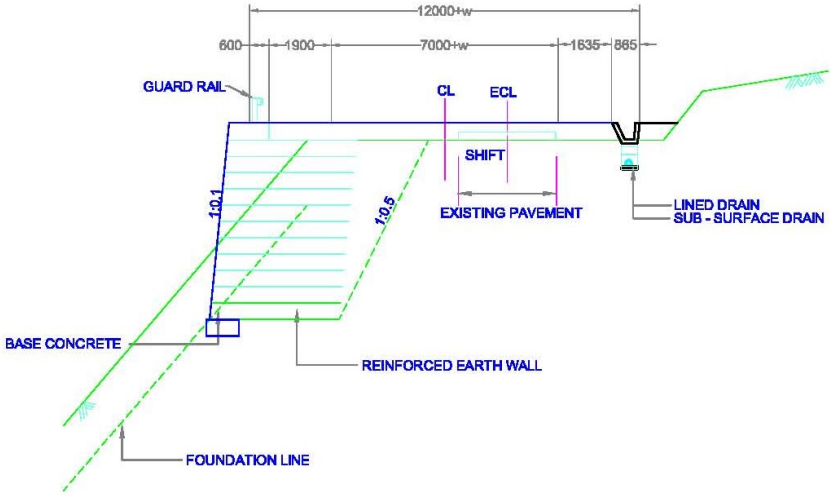
TYPICAL-4



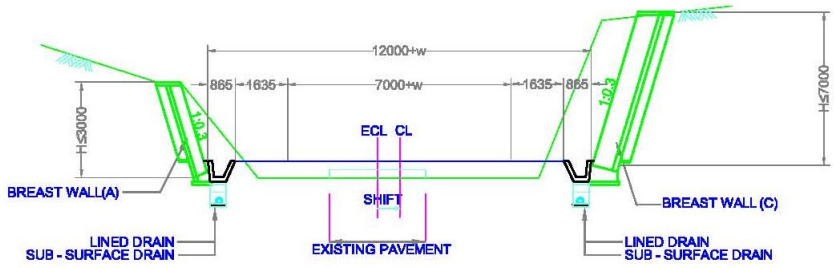
TYPICAL-5



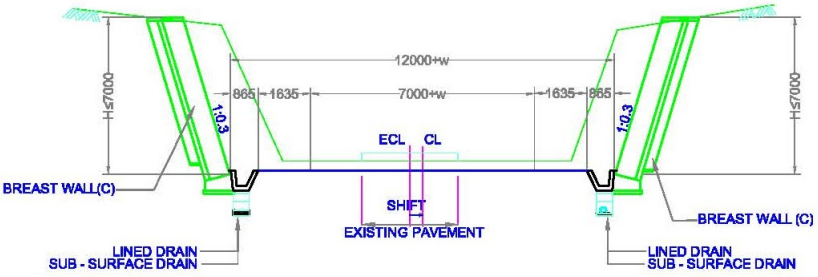
TYPICAL-6



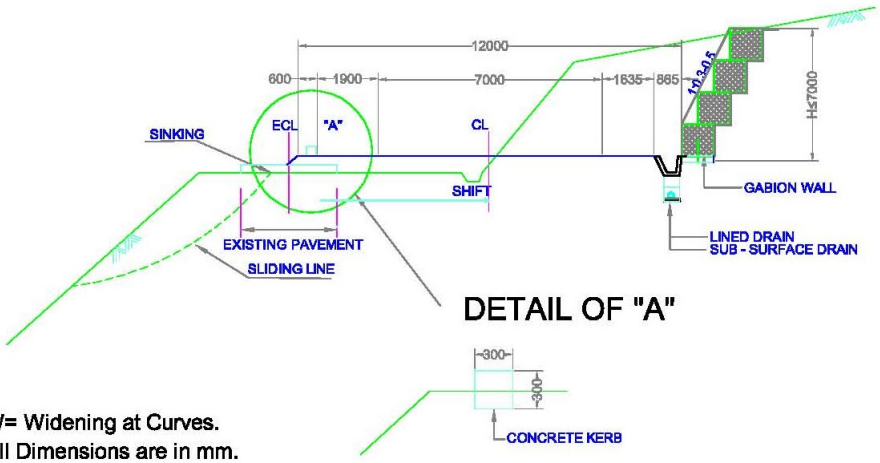
TYPICAL-7
(APPLICATION TO COMMON SOIL)



TYPICAL-8
(APPLICATION TO COMMON SOIL)

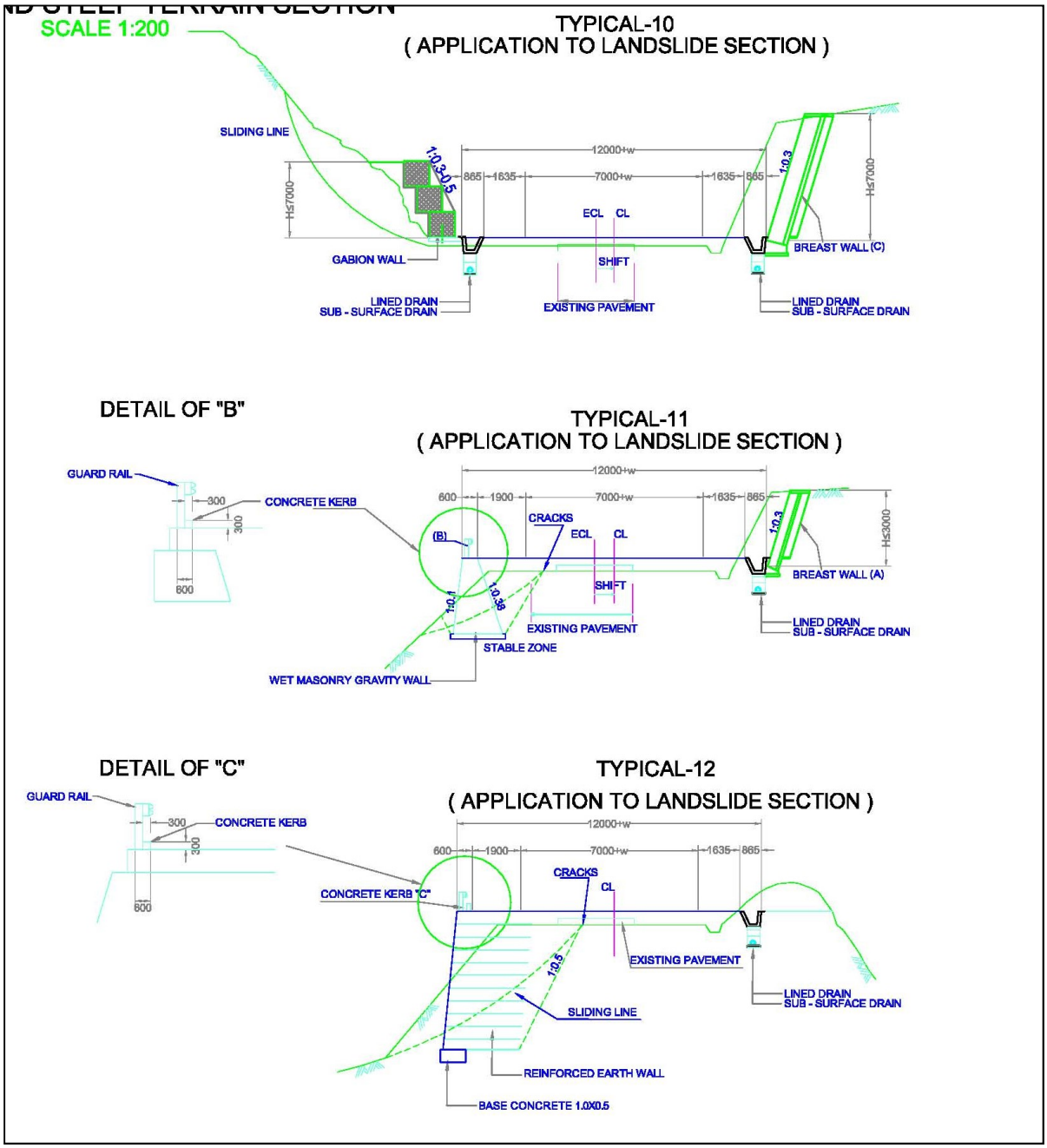


TYPICAL-9
(APPLICATION TO LANDSLIDE SECTION)



DETAIL OF "A"

1: W= Widening at Curves.
2: All Dimensions are in mm.


SCALE 1:200
TYPICAL-10
(APPLICATION TO LANDSLIDE SECTION)
SLIDING LINE
12000+w
865
1635
7000+w
1635
865
1:0.3
1:0.5
H≤7000
ECL
CL
SHIFT
BREAST WALL (C)
GABION WALL
LINED DRAIN
SUB - SURFACE DRAIN
EXISTING PAVEMENT
DETAIL OF "B"
TYPICAL-11
(APPLICATION TO LANDSLIDE SECTION)
GUARD RAIL
300
CONCRETE KERB
600
1900
CRACKS
(B)
1:0.38
1:0.1
STABLE ZONE
WET MASONRY GRAVITY WALL
H≤3000
BREAST WALL (A)
DETAIL OF "C"
TYPICAL-12
(APPLICATION TO LANDSLIDE SECTION)
CONCRETE KERB "C"
REINFORCED EARTH WALL
BASE CONCRETE 1.0X0.5

S.No	Location (Design Chainage)		Length	Width (m)	Typical cross section*	Widening side
	From(Km)	To(Km)				
1	85+000	85+050	50	12	Type-10	Concentric
2	85+050	85+125	75	12	Type-10	Left
3	85+125	85+150	25	12	Type-1	Left
4	85+150	85+180	30	12	Type-10	Left
5	85+180	85+260	80	12	Type-10	Right
6	85+260	85+310	50	12	Type-10	Concentric
7	85+310	85+350	40	12	Type-10	Left
8	85+350	85+400	50	12	Type-1	Left
9	85+400	85+475	75	12	Type-10	Left
10	85+475	85+500	25	12	Type-4	Left
11	85+500	85+525	25	12	Type-7	Concentric
12	85+525	85+570	45	12	Type-10	Concentric
13	85+570	85+600	30	12	Type-10	Right
14	85+600	85+650	50	12	Type-7	Right
15	85+650	85+670	20	12	Type-7	Right
16	85+670	85+775	105	12	Type-7	Concentric
17	85+775	85+875	100	12	Type-1	Concentric
18	85+875	85+950	75	12	Type-4	Concentric
19	85+950	85+975	25	12	Type-10	Concentric
20	85+975	86+050	75	12	Type-4	Concentric
21	86+050	86+075	25	12	Type-10	Concentric
22	86+075	86+125	50	12	Type-3	Concentric
23	86+125	86+175	50	12	Type-1	Concentric
24	86+175	86+225	50	12	Type-4	Concentric
25	86+225	86+275	50	12	Type-7	Concentric
26	86+275	86+375	100	12	Type-2	Concentric
27	86+375	86+430	55	12	Type-1	Concentric
28	86+430	86+475	45	12	Type-1	Right
29	86+475	86+530	55	12	Type-4	Right
30	86+530	86+575	45	12	Type-4	Concentric
31	86+575	86+600	25	12	Type-1	Concentric
32	86+600	86+775	175	12	Type-4	Concentric
33	86+775	86+800	25	12	Type-7	Concentric
34	86+800	86+825	25	12	Type-4	Concentric
35	86+825	86+875	50	12	Type-1	Concentric
36	86+875	86+900	25	12	Type-7	Concentric
37	86+900	87+025	125	12	Type-4	Concentric
38	87+025	87+050	25	12	Type-1	Concentric
39	87+050	87+150	100	12	Type-4	Right
40	87+150	87+175	25	12	Type-4	Concentric
41	87+175	87+200	25	12	Type-1	Concentric

S.No	Location (Design Chainage)		Length	Width (m)	Typical cross section*	Widening side
	From(Km)	To(Km)				
42	87+200	87+225	25	12	Type-4	Concentric
43	87+225	87+320	95	12	Type-7	Concentric
44	87+320	87+370	50	12	Type-7	Right
45	87+370	87+475	105	12	Type-4	Concentric
46	87+475	87+525	50	12	Type-7	Concentric
47	87+525	87+550	25	12	Type-4	Concentric
48	87+550	87+600	50	12	Type-1	Concentric
49	87+600	87+650	50	12	Type-7	Concentric
50	87+650	87+675	25	12	Type-1	Concentric
51	87+675	87+800	125	12	Type-4	Concentric
52	87+800	87+825	25	12	Type-7	Concentric
53	87+825	87+850	25	12	Type-1	Concentric
54	87+850	87+890	40	12	Type-4	Concentric
55	87+890	87+950	60	12	Type-7	Right
56	87+950	87+975	25	12	Type-7	Right
57	87+975	88+000	25	12	Type-4	Right
58	88+000	88+010	10	12	Type-1	Right
59	88+010	88+075	65	12	Type-1	Concentric
60	88+075	88+250	175	12	Type-8	Concentric
61	88+250	88+275	25	12	Type-4	Concentric
62	88+275	88+325	50	12	Type-1	Concentric
63	88+325	88+350	25	12	Type-4	Concentric
64	88+350	88+375	25	12	Type-1	Concentric
65	88+375	88+450	75	12	Type-4	Concentric
66	88+450	88+475	25	12	Type-1	Concentric
67	88+475	88+525	50	12	Type-4	Concentric
68	88+525	88+540	15	12	Type-1	Concentric
69	88+540	88+550	10	12	Type-1	Right
70	88+550	88+630	80	12	Type-4	Right
71	88+630	88+650	20	12	Type-4	Concentric
72	88+650	88+675	25	12	Type-1	Concentric
73	88+675	88+925	250	12	Type-4	Concentric
74	88+925	88+975	50	12	Type-1	Concentric
75	88+975	89+000	25	12	Type-4	Concentric
76	89+000	89+025	25	12	Type-8	Concentric
77	89+025	89+050	25	12	Type-4	Concentric
78	89+050	89+200	150	12	Type-8	Concentric
79	89+200	89+225	25	12	Type-1	Concentric
80	89+225	89+400	175	12	Type-8	Concentric
81	89+400	89+475	75	12	Type-8	Left
82	89+475	89+550	75	12	Type-4	Concentric
83	89+550	89+575	25	12	Type-1	Concentric
84	89+575	89+650	75	12	Type-4	Left
85	89+650	89+675	25	12	Type-7	Left

S.No	Location (Design Chainage)		Length	Width (m)	Typical cross section*	Widening side
	From(Km)	To(Km)				
86	89+675	89+700	25	12	Type-8	Left
87	89+700	89+725	25	12	Type-1	Left
88	89+725	89+800	75	12	Type-4	Left
89	89+800	89+825	25	12	Type-7	Left
90	89+825	89+850	25	12	Type-4	Right
91	89+850	89+875	25	12	Type-1	Right
92	89+875	89+900	25	12	Type-7	Right
93	89+900	89+925	25	12	Type-4	Right
94	89+925	89+940	15	12	Type-1	Right
95	89+940	89+950	10	12	Type-1	Left
96	89+950	90+050	100	12	Type-4	Left
97	90+050	90+100	50	12	Type-1	Left
98	90+100	90+125	25	12	Type-4	Left
99	90+125	90+150	25	12	Type-1	Left
100	90+150	90+190	40	12	Type-4	Left
101	90+190	90+350	160	12	Type-4	Concentric
102	90+350	90+430	80	12	Type-4	Left
103	90+430	90+550	120	12	Type-7	Concentric
104	90+550	90+575	25	12	Type-4	Concentric
105	90+575	90+675	100	12	Type-8	Concentric
106	90+675	90+700	25	12	Type-1	Concentric
107	90+700	90+775	75	12	Type-7	Concentric
108	90+775	90+850	75	12	Type-4	Concentric
109	90+850	90+925	75	12	Type-8	Concentric
110	90+925	91+025	100	12	Type-4	Concentric
111	91+025	91+175	150	12	Type-7	Concentric
112	91+175	91+375	200	12	Type-8	Concentric
113	91+375	91+400	25	12	Type-1	Concentric
114	91+400	91+525	125	12	Type-8	Concentric
115	91+525	91+540	15	12	Type-4	Concentric
116	91+540	91+650	110	12	Type-8	Left
117	91+650	91+725	75	12	Type-4	Concentric
118	91+725	91+800	75	12	Type-1	Concentric
119	91+800	91+825	25	12	Type-4	Concentric
120	91+825	91+875	50	12	Type-1	Concentric
121	91+875	92+050	175	12	Type-4	Concentric
122	92+050	92+075	25	12	Type-8	Concentric
123	92+075	92+100	25	12	Type-7	Concentric
124	92+100	92+125	25	12	Type-4	Concentric
125	92+125	92+150	25	12	Type-1	Concentric
126	92+150	92+225	75	12	Type-4	Concentric
127	92+225	92+250	25	12	Type-7	Concentric
128	92+250	92+275	25	12	Type-4	Concentric
129	92+275	92+350	75	12	Type-1	Concentric

S.No	Location (Design Chainage)		Length	Width (m)	Typical cross section*	Widening side
	From(Km)	To(Km)				
130	92+350	92+425	75	12	Type-4	Concentric
131	92+425	92+660	235	12	Type-1	Concentric
132	92+660	92+790	130	12	Type-1	Left
133	92+790	92+860	70	12	Type-4	Right
134	92+860	92+925	65	12	Type-4	Left
135	92+925	93+075	150	12	Type-8	Left
136	93+075	93+100	25	12	Type-4	Left
137	93+100	93+125	25	12	Type-8	Left
138	93+125	93+150	25	12	Type-4	Left
139	93+150	93+175	25	12	Type-7	Left
140	93+175	93+200	25	12	Type-1	Left
141	93+200	93+320	120	12	Type-4	Left
142	93+320	93+425	105	12	Type-4	Concentric
143	93+425	93+450	25	12	Type-1	Concentric
144	93+450	93+500	50	12	Type-4	Concentric
145	93+500	93+525	25	12	Type-7	Concentric
146	93+525	93+650	125	12	Type-4	Concentric
147	93+650	93+700	50	12	Type-1	Concentric
148	93+700	93+750	50	12	Type-4	Concentric
149	93+750	93+775	25	12	Type-1	Concentric
150	93+775	93+850	75	12	Type-4	Concentric
151	93+850	93+875	25	12	Type-7	Concentric
152	93+875	93+900	25	12	Type-4	Concentric
153	93+900	93+950	50	12	Type-8	Concentric
154	93+950	94+100	150	12	Type-4	Concentric
155	94+100	94+175	75	12	Type-7	Concentric
156	94+175	94+200	25	12	Type-4	Concentric
157	94+200	94+225	25	12	Type-1	Concentric
158	94+225	94+250	25	12	Type-4	Concentric
159	94+250	94+268	18	12	Type-1	Concentric
160	101+000	101+070	70	12	Type-1	Left
161	101+070	101+130	60	12	Type-1	Right
162	101+130	101+180	50	12	Type-1	Concentric
163	101+180	101+350	170	12	Type-1	Left
164	101+350	101+410	60	12	Type-1	Right
165	101+410	101+490	80	12	Type-1	Left
166	101+490	101+560	70	12	Type-1	Concentric
167	101+560	101+650	90	12	Type-1	Right
168	101+650	101+700	50	12	Type-1	Left
169	101+700	101+830	130	12	Type-1	Right
170	101+830	101+880	50	12	Type-1	Concentric
171	101+880	101+950	70	12	Type-1	Left
172	101+950	102+080	130	12	Type-1	Right
173	102+080	103+150	1070	12	Type-1	Left

S.No	Location (Design Chainage)		Length	Width (m)	Typical cross section*	Widening side
	From(Km)	To(Km)				
174	103+150	103+280	130	12	Type-1	Concentric
175	103+280	103+460	180	12	Type-1	Left
176	103+460	104+330	870	12	Type-1	Concentric
177	104+330	104+390	60	12	Type-1	Right
178	104+390	104+460	70	12	Type-1	Concentric
179	104+460	104+620	160	12	Type-1	Right
180	104+620	104+840	220	12	Type-1	Concentric
181	104+840	104+920	80	12	Type-1	Right
182	104+920	105+500	580	12	Type-1	Concentric
183	105+500	105+730	230	12	Type-1	Right
184	105+730	105+910	180	12	Type-1	Left
185	105+910	105+960	50	12	Type-1	Concentric
186	105+960	106+280	320	12	Type-1	Right
187	106+280	106+820	540	12	Type-1	Concentric
188	106+820	106+990	170	12	Type-1	Right
189	106+990	108+100	1110	12	Type-1	Concentric
190	108+100	108+280	180	12	Type-1	Left
191	108+280	108+770	490	12	Type-1	Concentric
192	108+770	108+840	70	12	Type-1	Left
193	108+840	109+050	210	12	Type-1	Concentric
194	109+050	109+200	150	12	Type-1	Left
195	109+200	112+740	3540	12	Type-1	Concentric
196	112+740	112+890	150	12	Type-1	Left
197	112+890	113+110	220	12	Type-1	Concentric
198	113+110	113+170	60	12	Type-1	Right
199	113+170	116+000	2830	12	Type-1	Concentric
200	116+000	116+110	110	12	Type-1	Right
201	116+110	116+200	90	12	Type-1	Left
202	116+200	116+320	120	12	Type-1	Concentric
203	116+320	117+030	710	12	Type-1	Right
204	117+030	117+890	860	12	Type-1	Concentric
205	117+890	118+160	270	12	Type-1	Right
206	118+160	120+430	2270	12	Type-1	Concentric
207	120+430	120+700	270	12	Type-1	Right
208	120+700	120+980	280	12	Type-1	Concentric
209	120+980	121+250	270	12	Type-1	Right
210	121+250	122+670	1420	12	Type-1	Concentric
211	122+670	123+260	590	12	Type-1	Right
212	123+260	124+010	750	12	Type-1	Concentric
213	124+010	124+540	530	12	Type-1	Right
214	124+540	125+070	530	12	Type-1	Left
215	125+070	125+210	140	12	Type-1	Right
216	125+210	125+290	80	12	Type-1	Concentric
217	125+290	125+570	280	12	Type-1	Left

S.No	Location (Design Chainage)		Length	Width (m)	Typical cross section*	Widening side
	From(Km)	To(Km)				
218	125+570	125+690	120	12	Type-1	Concentric
219	125+690	125+980	290	12	Type-1	Left
220	125+980	126+450	470	12	Type-1	Concentric
221	126+450	126+600	150	12	Type-1	Left
222	126+600	126+660	60	12	Type-1	Concentric
223	126+660	126+720	60	12	Type-1	Right
224	126+720	127+320	600	12	Type-1	Concentric
225	127+320	127+480	160	12	Type-1	Left
226	127+480	127+760	280	12	Type-1	Concentric
227	127+760	127+900	140	12	Type-1	Right
228	127+900	128+000	100	12	Type-1	Concentric
229	128+000	128+110	110	12	Type-1	Left
230	128+110	128+400	290	12	Type-1	Concentric
231	128+400	129+300	900	12	Type-1	Right
232	129+300	129+380	80	12	Type-1	Concentric
233	129+380	129+600	220	12	Type-1	Left
234	129+600	129+690	90	12	Type-1	Concentric
235	129+690	130+900	1210	12	Type-1	Right
236	130+900	131+140	240	12	Type-1	Concentric
237	131+140	131+210	70	12	Type-1	Right
238	131+210	131+340	130	12	Type-1	Concentric
239	131+340	131+400	60	12	Type-1	Right
240	131+400	131+550	150	12	Type-1	Concentric
241	131+550	131+660	110	12	Type-1	Right
242	131+660	131+800	140	12	Type-1	Concentric
243	131+800	131+870	70	12	Type-1	Right
244	131+870	131+990	120	12	Type-1	Concentric
245	131+990	132+130	140	12	Type-1	Right
246	132+130	132+450	320	12	Type-1	Concentric
247	132+450	134+080	1630	12	Type-1	Right
248	134+080	134+130	50	12	Type-1	Left
249	134+130	134+260	130	12	Type-1	Concentric
250	134+260	134+550	290	12	Type-1	Left
251	134+550	134+660	110	12	Type-1	Right
252	134+660	134+840	180	12	Type-1	Left
253	134+840	134+950	110	12	Type-1	Right
254	134+950	135+220	270	12	Type-1	Concentric
255	135+220	135+330	110	12	Type-1	Left
256	135+330	135+410	80	12	Type-1	Right
257	135+410	135+770	360	12	Type-1	Concentric
258	135+770	136+310	540	12	Type-1	Right
259	136+310	136+460	150	12	Type-1	Concentric
260	136+460	136+540	80	12	Type-1	Right
261	136+540	136+620	80	12	Type-1	Concentric

S.No	Location (Design Chainage)		Length	Width (m)	Typical cross section*	Widening side
	From(Km)	To(Km)				
262	136+620	136+860	240	12	Type-1	Right
263	136+860	137+010	150	12	Type-1	Concentric
264	137+010	137+130	120	12	Type-1	Right
265	137+130	137+250	120	12	Type-1	Concentric
266	137+250	137+480	230	12	Type-1	Right
267	137+480	137+640	160	12	Type-1	Concentric
268	137+640	137+780	140	12	Type-1	Left
269	137+780	138+070	290	12	Type-1	Concentric
270	138+070	138+690	620	12	Type-1	Left
271	138+690	138+820	130	12	Type-1	Right
272	138+820	139+420	600	12	Type-1	Left
273	139+420	143+268	3848	12	Type-1	Concentric

***The TCS given are indicative only.**

3. INTERSECTIONS AND GRADE SEPARATORS

All intersections and grade separators shall be as per section 3 of the Manual. Existing intersections which are deficient shall be improved to the prescribed standards.

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

a) At-grade intersections (Major Junctions)

S. No	Chainage (km)		At Grade	Type	Side	Remarks
	Existing Chainage	Design Chainage				
1	92+925	92+300	At Grade	Y	RHS	EDAN BARI
2	109+306	108+755	At Grade	Y	RHS	TO TURA BY-PASS

b) At-grade intersections (Minor Junctions)

Sr No	Location (km)		Type of Junction		
	Existing Chainage	Design Chainage	T-Junction	Y-Junction	Cross Road
1	85+357	85+357	T		
2	85+838	85+815	T		
3	86+033	86+010	T		
4	86+863	86+610		Y	
5	88+136	87+885		Y	
6	88+360	88+047		Y	
7	89+680	89+363		Y	
8	92+184	91+830	T		

Sr No	Location (km)		Type of Junction		
	Existing Chainage	Design Chainage	T-Junction	Y-Junction	Cross Road
9	92+710	92+085	T		
10	92+790	92+165		Y	
11	94+620	93+970		Y	
12	94+862	94+090	T		
13	101+360	101+360	T		
14	104+286	103+920		Y	
15	104+611	104+243		Y	
16	104+631	104+265		Y	
17	107+948	107+437	T		
18	109+912	109+340	T		
19	110+392	109+820	T		
20	111+905	111+300	T		
21	112+677	112+055		Y	
22	113+367	112+745		Y	
23	114+010	113+310		Y	
24	114+548	113+848		Y	
25	116+127	115+250		Y	
26	120+624	119+592		Y	
27	120+687	119+655		Y	
28	124+201	123+078	T		
29	126+059	124+880	T		
30	128+255	126+857		Y	
31	129+767	128+317		Y	
32	134+379	132+840		Y	
33	135+082	133+535	Y		
34	135+247	133+700		T	
35	140+023	138+352	T		
36	140+643	138+972		Y	
37	141+844	140+187	T		
38	142+861	140+160	T		
39	143+491	141+790		Y	
40	144+124	142+450		Y	
41	144+344	142+670		Y	
42	144+582	142+908		Y	
43	144+582	142+908	T		

c) Grade separated intersection without ramps

S. No.	Location	Salient features	Minimum length of viaduct to be	Road to be carried over/under the

			provided	structures
NIL				

4. ROAD EMBANKMENT AND CUT SECTION

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

4.2 Raising of the existing road
The existing road shall be raised at the required locations to meet the requisite specifications.

5. PAVEMENT DESIGN

5.1 Pavement design shall be carried out in accordance with Section 5 of the Manual.

5.2 Type of pavement
The contractor is to adopt flexible pavement for the project highway as per manual and technical specifications.

5.3 Design Requirements
Pavement design shall be as per section 5 of the Manual and technical specifications.

5.3.1 **Design Period and strategy**

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

5.3.2 **Design Traffic**

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

5.4 Reconstruction of stretches

Reconstruction of stretches for matching the proposed plan & profile or meeting the technical specifications and standards shall be taken up as per actual requirements.
The following sections of the existing road shall be reconstruction. These shall be designed as new pavement.

S.No	Stretch		Length	Remarks
	From	To		
1	85+050	85+150	100	Reconstruction
2	85+375	85+425	50	
3	85+850	85+900	50	
4	86+000	86+050	50	

S.No	Stretch		Length	Remarks
	From	To		
5	86+950	87+025	75	Reconstruction
6	87+300	87+350	50	
7	87+825	87+875	50	
8	88+075	88+200	125	
9	88+300	88+375	75	
10	88+650	88+700	50	
11	88+975	89+250	275	
12	89+300	89+550	250	
13	89+725	89+975	250	
14	90+575	90+650	75	
15	90+775	90+850	75	
16	91+400	91+700	300	
17	92+150	92+200	50	
18	92+750	93+550	800	
19	93+950	94+250	300	
20	101+225	101+275	50	
21	101+750	101+825	75	
22	107+125	107+275	150	
23	109+850	109+925	75	
24	111+250	111+300	50	
25	112+350	112+425	75	
26	114+050	114+150	100	
27	114+425	114+500	75	
28	114+575	114+650	75	
29	114+700	114+800	100	
30	115+575	115+625	50	
31	115+775	115+825	50	
32	116+050	116+350	300	
33	116+600	116+650	50	
34	116+900	116+975	75	
35	117+225	117+300	75	
36	117+425	117+700	275	
37	118+150	118+275	125	
38	119+725	119+850	125	
39	120+600	120+725	125	
40	120+850	120+950	100	
41	121+050	121+100	50	
42	121+200	121+275	75	
43	121+325	121+425	100	
44	122+225	122+275	50	
45	122+375	122+425	50	
46	122+550	122+600	50	
47	123+450	123+500	50	

S.No	Stretch		Length	Remarks
	From	To		
48	123+625	123+675	50	Reconstruction
49	123+825	123+975	150	
50	124+050	124+150	100	
51	124+250	124+375	125	
52	124+500	124+550	50	
53	125+025	125+125	100	
54	126+500	126+575	75	
55	126+800	126+875	75	
56	127+000	127+050	50	
57	127+350	127+400	50	
58	127+700	127+850	150	
59	128+450	128+500	50	
60	128+975	129+050	75	
61	129+350	129+550	200	
62	129+700	129+850	150	
63	130+450	130+525	75	
64	130+675	130+850	175	
65	130+975	131+025	50	
66	131+150	131+200	50	
67	131+225	131+300	75	
68	131+425	131+525	100	
69	131+650	131+825	175	
70	131+975	132+050	75	
71	132+075	132+150	75	
72	133+000	133+050	50	
73	133+325	133+375	50	
74	134+400	134+450	50	
75	134+825	134+950	125	
76	135+275	135+350	75	
77	135+450	135+575	125	
78	135+800	135+850	50	
79	136+500	136+700	200	
	Total Length (in meter)		**8675**	

6. ROADSIDE DRAINAGE

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

7. DESIGN OF STRUCTURES

7.1 General

7.1.1 All bridges, culverts and 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.

7.1.2 Width of the carriageway of new bridges and structures shall be as per the manual and technical specifications.

7.1.3 The structures shall be provided with footpaths, if required as per the provisions of the manual and technical specifications.

7.1.4 All bridges shall be high-level bridges.

7.1.5 The structures shall be designed to carry utility services as per the requirement of site.

7.1.6 Cross-section of the new culverts and bridges at deck level for the Project Highway shall conform to the typical cross-sections given in section 7 of the Manual.

7.2 Culverts

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

7.2.2 ***Reconstruction of existing culverts***:

The existing culverts at the following locations shall be re-constructed as new culverts. These are guidelines for minimum provisions; however, the Contractor has to design as per requirement of road in accordance with manual.

(a) Pipe Culverts :-

Sl. No	Proposed Chainage	Span opening (m)	Proposed Type of structures	Prop. Width	Improvement Proposal
1	86+820	1 x 1200 mm	Pipe Culvert	12.0	Reconstruction
2	87+205	1 x 1200 mm	Pipe Culvert	12.0	
3	87+575	1 x 1200 mm	Pipe Culvert	12.0	
4	87+850	1 x 1200 mm	Pipe Culvert	12.0	
5	87+980	1 x 1200 mm	Pipe Culvert	12.0	
6	88+470	1 x 1200 mm	Pipe Culvert	12.0	
7	88+530	1 x 1200 mm	Pipe Culvert	12.0	
8	88+640	1 x 1200 mm	Pipe Culvert	12.0	
9	89+695	1 x 1200 mm	Pipe Culvert	12.0	
10	89+730	1 x 1200 mm	Pipe Culvert	12.0	
11	90+185	1 x 1200 mm	Pipe Culvert	12.0	
12	90+560	1 x 1200 mm	Pipe Culvert	12.0	
13	90+730	1 x 1200 mm	Pipe Culvert	12.0	
14	90+930	1 x 1200 mm	Pipe Culvert	12.0	
15	92+100	1 x 1200 mm	Pipe Culvert	12.0	

Sl. No	Proposed Chainage	Span opening (m)	Proposed Type of structures	Prop. Width	Improvement Proposal
16	92+220	1 x 1200 mm	Pipe Culvert	12.0	Reconstruction
17	92+420	1 x 1200 mm	Pipe Culvert	12.0	
18	92+600	1 x 1200 mm	Pipe Culvert	12.0	
19	92+935	1 x 1200 mm	Pipe Culvert	12.0	
20	93+150	1 x 1200 mm	Pipe Culvert	12.0	
21	93+620	1 x 1200 mm	Pipe Culvert	12.0	
22	93+855	1 x 1200 mm	Pipe Culvert	12.0	
23	93+910	1 x 1200 mm	Pipe Culvert	12.0	
24	101+267	1 x 1200 mm	Pipe Culvert	12.0	
25	101+779	1 x 1200 mm	Pipe Culvert	12.0	
26	102+077	1 x 1200 mm	Pipe Culvert	12.0	
27	102+267	1 x 1200 mm	Pipe Culvert	12.0	
28	102+349	1 x 1200 mm	Pipe Culvert	12.0	
29	102+817	1 x 1200 mm	Pipe Culvert	12.0	
30	102+877	1 x 1200 mm	Pipe Culvert	12.0	
31	103+409	1 x 1200 mm	Pipe Culvert	12.0	
32	103+616	1 x 1200 mm	Pipe Culvert	12.0	
33	103+677	1 x 1200 mm	Pipe Culvert	12.0	
34	103+810	1 x 1200 mm	Pipe Culvert	12.0	
35	103+910	1 x 1200 mm	Pipe Culvert	12.0	
36	103+947	1 x 1200 mm	Pipe Culvert	12.0	
37	103+980	1 x 1200 mm	Pipe Culvert	12.0	
38	104+470	1 x 1200 mm	Pipe Culvert	12.0	
39	104+584	1 x 1200 mm	Pipe Culvert	12.0	
40	105+607	1 x 1200 mm	Pipe Culvert	12.0	
41	105+867	1 x 1200 mm	Pipe Culvert	12.0	
42	105+976	1 x 1200 mm	Pipe Culvert	12.0	
43	106+092	1 x 1200 mm	Pipe Culvert	12.0	
44	106+243	1 x 1200 mm	Pipe Culvert	12.0	
45	106+581	1 x 1200 mm	Pipe Culvert	12.0	
46	106+823	1 x 1200 mm	Pipe Culvert	12.0	
47	106+915	1 x 1200 mm	Pipe Culvert	12.0	
48	107+493	1 x 1200 mm	Pipe Culvert	12.0	
49	107+652	1 x 1200 mm	Pipe Culvert	12.0	
50	107+727	1 x 1200 mm	Pipe Culvert	12.0	
51	108+015	1 x 1200 mm	Pipe Culvert	12.0	
52	108+188	1 x 1200 mm	Pipe Culvert	12.0	
53	108+460	1 x 1200 mm	Pipe Culvert	12.0	
54	108+720	1 x 1200 mm	Pipe Culvert	12.0	
55	109+785	1 x 1200 mm	Pipe Culvert	12.0	
56	110+087	1 x 1200 mm	Pipe Culvert	12.0	
57	111+085	1 x 1200 mm	Pipe Culvert	12.0	
58	112+440	1 x 1200 mm	Pipe Culvert	12.0	
59	112+540	1 x 1200 mm	Pipe Culvert	12.0	
60	112+880	1 x 1200 mm	Pipe Culvert	12.0	

Sl. No	Proposed Chainage	Span opening (m)	Proposed Type of structures	Prop. Width	Improvement Proposal
61	113+225	1 x 1200 mm	Pipe Culvert	12.0	Reconstruction
62	113+345	1 x 1200 mm	Pipe Culvert	12.0	
63	113+422	1 x 1200 mm	Pipe Culvert	12.0	
64	113+510	1 x 1200 mm	Pipe Culvert	12.0	
65	113+705	1 x 1200 mm	Pipe Culvert	12.0	
66	113+950	1 x 1200 mm	Pipe Culvert	12.0	
67	114+022	1 x 1200 mm	Pipe Culvert	12.0	
68	114+080	1 x 1200 mm	Pipe Culvert	12.0	
69	114+142	1 x 1200 mm	Pipe Culvert	12.0	
70	114+260	1 x 1200 mm	Pipe Culvert	12.0	
71	114+317	1 x 1200 mm	Pipe Culvert	12.0	
72	114+530	1 x 1200 mm	Pipe Culvert	12.0	
73	114+655	1 x 1200 mm	Pipe Culvert	12.0	
74	115+165	1 x 1200 mm	Pipe Culvert	12.0	
75	115+340	1 x 1200 mm	Pipe Culvert	12.0	
76	115+425	1 x 1200 mm	Pipe Culvert	12.0	
77	115+530	1 x 1200 mm	Pipe Culvert	12.0	
78	115+562	1 x 1200 mm	Pipe Culvert	12.0	
79	115+700	1 x 1200 mm	Pipe Culvert	12.0	
80	115+820	1 x 1200 mm	Pipe Culvert	12.0	
81	115+860	1 x 1200 mm	Pipe Culvert	12.0	
82	116+350	1 x 1200 mm	Pipe Culvert	12.0	
83	116+545	1 x 1200 mm	Pipe Culvert	12.0	
84	116+690	1 x 1200 mm	Pipe Culvert	12.0	
85	116+755	1 x 1200 mm	Pipe Culvert	12.0	
86	116+880	1 x 1200 mm	Pipe Culvert	12.0	
87	116+975	1 x 1200 mm	Pipe Culvert	12.0	
88	117+075	1 x 1200 mm	Pipe Culvert	12.0	
89	117+140	1 x 1200 mm	Pipe Culvert	12.0	
90	117+210	1 x 1200 mm	Pipe Culvert	12.0	
91	117+310	1 x 1200 mm	Pipe Culvert	12.0	
92	117+345	1 x 1200 mm	Pipe Culvert	12.0	
93	117+385	1 x 1200 mm	Pipe Culvert	12.0	
94	117+410	1 x 1200 mm	Pipe Culvert	12.0	
95	117+470	1 x 1200 mm	Pipe Culvert	12.0	
96	117+570	1 x 1200 mm	Pipe Culvert	12.0	
97	117+595	1 x 1200 mm	Pipe Culvert	12.0	
98	117+650	1 x 1200 mm	Pipe Culvert	12.0	
99	117+710	1 x 1200 mm	Pipe Culvert	12.0	
100	117+820	1 x 1200 mm	Pipe Culvert	12.0	
101	117+915	1 x 1200 mm	Pipe Culvert	12.0	
102	118+345	1 x 1200 mm	Pipe Culvert	12.0	
103	118+410	1 x 1200 mm	Pipe Culvert	12.0	
104	118+525	1 x 1200 mm	Pipe Culvert	12.0	
105	118+760	1 x 1200 mm	Pipe Culvert	12.0	

Sl. No	Proposed Chainage	Span opening (m)	Proposed Type of structures	Prop. Width	Improvement Proposal
106	118+900	1 x 1200 mm	Pipe Culvert	12.0	Reconstruction
107	119+590	1 x 1200 mm	Pipe Culvert	12.0	
108	119+740	1 x 1200 mm	Pipe Culvert	12.0	
109	119+850	1 x 1200 mm	Pipe Culvert	12.0	
110	119+885	1 x 1200 mm	Pipe Culvert	12.0	
111	120+530	1 x 1200 mm	Pipe Culvert	12.0	
112	120+770	1 x 1200 mm	Pipe Culvert	12.0	
113	120+870	1 x 1200 mm	Pipe Culvert	12.0	
114	121+005	1 x 1200 mm	Pipe Culvert	12.0	
115	121+205	1 x 1200 mm	Pipe Culvert	12.0	
116	121+305	1 x 1200 mm	Pipe Culvert	12.0	
117	122+200	1 x 1200 mm	Pipe Culvert	12.0	
118	122+285	1 x 1200 mm	Pipe Culvert	12.0	
119	122+330	1 x 1200 mm	Pipe Culvert	12.0	
120	122+560	1 x 1200 mm	Pipe Culvert	12.0	
121	122+625	1 x 1200 mm	Pipe Culvert	12.0	
122	122+900	1 x 1200 mm	Pipe Culvert	12.0	
123	123+010	1 x 1200 mm	Pipe Culvert	12.0	
124	123+070	1 x 1200 mm	Pipe Culvert	12.0	
125	123+175	1 x 1200 mm	Pipe Culvert	12.0	
126	123+400	1 x 1200 mm	Pipe Culvert	12.0	
127	123+495	1 x 1200 mm	Pipe Culvert	12.0	
128	123+520	1 x 1200 mm	Pipe Culvert	12.0	
129	123+600	1 x 1200 mm	Pipe Culvert	12.0	
130	123+740	1 x 1200 mm	Pipe Culvert	12.0	
131	123+900	1 x 1200 mm	Pipe Culvert	12.0	
132	123+995	1 x 1200 mm	Pipe Culvert	12.0	
133	124+060	1 x 1200 mm	Pipe Culvert	12.0	
134	124+090	1 x 1200 mm	Pipe Culvert	12.0	
135	124+185	1 x 1200 mm	Pipe Culvert	12.0	
136	124+270	1 x 1200 mm	Pipe Culvert	12.0	
137	124+330	1 x 1200 mm	Pipe Culvert	12.0	
138	124+440	1 x 1200 mm	Pipe Culvert	12.0	
139	124+685	1 x 1200 mm	Pipe Culvert	12.0	
140	124+760	1 x 1200 mm	Pipe Culvert	12.0	
141	124+925	1 x 1200 mm	Pipe Culvert	12.0	
142	124+990	1 x 1200 mm	Pipe Culvert	12.0	
143	125+050	1 x 1200 mm	Pipe Culvert	12.0	
144	125+130	1 x 1200 mm	Pipe Culvert	12.0	
145	125+200	1 x 1200 mm	Pipe Culvert	12.0	
146	125+288	1 x 1200 mm	Pipe Culvert	12.0	
147	125+335	1 x 1200 mm	Pipe Culvert	12.0	
148	125+405	1 x 1200 mm	Pipe Culvert	12.0	
149	125+495	1 x 1200 mm	Pipe Culvert	12.0	
150	125+560	1 x 1200 mm	Pipe Culvert	12.0	

Sl. No	Proposed Chainage	Span opening (m)	Proposed Type of structures	Prop. Width	Improvement Proposal
151	125+665	1 x 1200 mm	Pipe Culvert	12.0	Reconstruction
152	125+805	1 x 1200 mm	Pipe Culvert	12.0	
153	125+990	1 x 1200 mm	Pipe Culvert	12.0	
154	126+190	1 x 1200 mm	Pipe Culvert	12.0	
155	126+475	1 x 1200 mm	Pipe Culvert	12.0	
156	126+600	1 x 1200 mm	Pipe Culvert	12.0	
157	126+670	1 x 1200 mm	Pipe Culvert	12.0	
158	126+710	1 x 1200 mm	Pipe Culvert	12.0	
159	126+900	1 x 1200 mm	Pipe Culvert	12.0	
160	127+060	1 x 1200 mm	Pipe Culvert	12.0	
161	127+190	1 x 1200 mm	Pipe Culvert	12.0	
162	127+305	1 x 1200 mm	Pipe Culvert	12.0	
163	127+545	1 x 1200 mm	Pipe Culvert	12.0	
164	127+680	1 x 1200 mm	Pipe Culvert	12.0	
165	127+790	1 x 1200 mm	Pipe Culvert	12.0	
166	128+080	1 x 1200 mm	Pipe Culvert	12.0	
167	128+290	1 x 1200 mm	Pipe Culvert	12.0	
168	128+460	1 x 1200 mm	Pipe Culvert	12.0	
169	128+545	1 x 1200 mm	Pipe Culvert	12.0	
170	128+840	1 x 1200 mm	Pipe Culvert	12.0	
171	128+960	1 x 1200 mm	Pipe Culvert	12.0	
172	129+140	1 x 1200 mm	Pipe Culvert	12.0	
173	130+405	1 x 1200 mm	Pipe Culvert	12.0	
174	131+705	1 x 1200 mm	Pipe Culvert	12.0	
175	131+822	1 x 1200 mm	Pipe Culvert	12.0	
176	133+680	1 x 1200 mm	Pipe Culvert	12.0	
177	134+760	1 x 1200 mm	Pipe Culvert	12.0	
178	135+572	1 x 1200 mm	Pipe Culvert	12.0	
179	135+990	1 x 1200 mm	Pipe Culvert	12.0	
180	136+182	1 x 1200 mm	Pipe Culvert	12.0	
181	136+230	1 x 1200 mm	Pipe Culvert	12.0	
182	136+632	1 x 1200 mm	Pipe Culvert	12.0	
183	136+835	1 x 1200 mm	Pipe Culvert	12.0	
184	137+555	1 x 1200 mm	Pipe Culvert	12.0	
185	138+022	1 x 1200 mm	Pipe Culvert	12.0	
186	138+305	1 x 1200 mm	Pipe Culvert	12.0	
187	138+485	1 x 1200 mm	Pipe Culvert	12.0	
188	138+740	1 x 1200 mm	Pipe Culvert	12.0	
189	138+915	1 x 1200 mm	Pipe Culvert	12.0	
190	138+965	1 x 1200 mm	Pipe Culvert	12.0	
191	139+062	1 x 1200 mm	Pipe Culvert	12.0	
192	139+465	1 x 1200 mm	Pipe Culvert	12.0	
193	139+715	1 x 1200 mm	Pipe Culvert	12.0	
194	140+230	1 x 1200 mm	Pipe Culvert	12.0	
195	142+160	1 x 1200 mm	Pipe Culvert	12.0	

(b) Box Culverts :-

Sl. No	Proposed Chainage (km)	Span opening (m)	Proposed Type of structures	Prop. Width	Improvement Proposal
1	86+570	4x4	RCC BOX	12.0	Reconstruction
2	87+885	2x2	RCC BOX	12.0	
3	90+395	4x4	RCC BOX	12.0	
4	93+080	2x2	RCC BOX	12.0	
5	93+490	3x3	RCC BOX	12.0	
6	138+168	4x4	RCC BOX	12.0	
7	139+930	4x4	RCC BOX	12.0	

7.2.3 ***Widening of Existing Culverts***

All existing culverts, which are not to be reconstructed, shall be widened up to the roadway width of the Project Highway & as per the typical cross section given in section 7 of the Manual. Repairs and strengthening of existing structures where required shall be carried out.

Sl. No	Culvert Location	Span opening (m)	Remarks
NIL			

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

(a) Pipe Culverts:-

S. No.	Culvert Location (Proposed Chainage)	Proposed Type of structure	Span/ opening (m)	Width of New culverts	Proposal	Remarks (Type of Culvert)
1	85+190	Pipe	1 x 1200 mm	12.0	New	New Culvert
2	85+390	Pipe	1 x 1200 mm	12.0		
3	85+590	Pipe	1 x 1200 mm	12.0		
4	85+795	Pipe	1 x 1200 mm	12.0		
5	85+990	Pipe	1 x 1200 mm	12.0		
6	86+200	Pipe	1 x 1200 mm	12.0		
7	86+725	Pipe	1 x 1200 mm	12.0		
8	87+000	Pipe	1 x 1200 mm	12.0		
9	87+300	Pipe	1 x 1200 mm	12.0		
10	88+200	Pipe	1 x 1200 mm	12.0		
11	89+100	Pipe	1 x 1200 mm	12.0		
12	89+305	Pipe	1 x 1200 mm	12.0		
13	89+505	Pipe	1 x 1200 mm	12.0		
14	89+915	Pipe	1 x 1200 mm	12.0		
15	91+620	Pipe	1 x 1200 mm	12.0		
16	91+720	Pipe	1 x 1200 mm	12.0		
17	91+970	Pipe	1 x 1200 mm	12.0		
18	92+790	Pipe	1 x 1200 mm	12.0		
19	93+325	Pipe	1 x 1200 mm	12.0		
20	94+060	Pipe	1 x 1200 mm	12.0		
21	101+492	Pipe	1 x 1200 mm	12.0		

S. No.	Culvert Location (Proposed Chainage)	Proposed Type of structure	Span/ opening (m)	Width of New culverts	Proposal	Remarks (Type of Culvert)
22	101+647	Pipe	1 x 1200 mm	12.0	New	New Culvert
23	102+539	Pipe	1 x 1200 mm	12.0		
24	102+719	Pipe	1 x 1200 mm	12.0		
25	103+067	Pipe	1 x 1200 mm	12.0		
26	104+230	Pipe	1 x 1200 mm	12.0		
27	104+834	Pipe	1 x 1200 mm	12.0		
28	105+084	Pipe	1 x 1200 mm	12.0		
29	105+334	Pipe	1 x 1200 mm	12.0		
30	106+443	Pipe	1 x 1200 mm	12.0		
31	107+165	Pipe	1 x 1200 mm	12.0		
32	108+995	Pipe	1 x 1200 mm	12.0		
33	109+245	Pipe	1 x 1200 mm	12.0		
34	109+445	Pipe	1 x 1200 mm	12.0		
35	109+645	Pipe	1 x 1200 mm	12.0		
36	109+985	Pipe	1 x 1200 mm	12.0		
37	110+160	Pipe	1 x 1200 mm	12.0		
38	110+260	Pipe	1 x 1200 mm	12.0		
39	110+387	Pipe	1 x 1200 mm	12.0		
40	110+687	Pipe	1 x 1200 mm	12.0		
41	110+987	Pipe	1 x 1200 mm	12.0		
42	111+287	Pipe	1 x 1200 mm	12.0		
43	112+665	Pipe	1 x 1200 mm	12.0		
44	113+005	Pipe	1 x 1200 mm	12.0		
45	114+955	Pipe	1 x 1200 mm	12.0		
46	116+160	Pipe	1 x 1200 mm	12.0		
47	118+155	Pipe	1 x 1200 mm	12.0		
48	119+150	Pipe	1 x 1200 mm	12.0		
49	119+350	Pipe	1 x 1200 mm	12.0		
50	120+060	Pipe	1 x 1200 mm	12.0		
51	120+270	Pipe	1 x 1200 mm	12.0		
52	121+530	Pipe	1 x 1200 mm	12.0		
53	121+730	Pipe	1 x 1200 mm	12.0		
54	121+930	Pipe	1 x 1200 mm	12.0		
55	129+440	Pipe	1 x 1200 mm	12.0		
56	129+740	Pipe	1 x 1200 mm	12.0		
57	130+040	Pipe	1 x 1200 mm	12.0		
58	130+250	Pipe	1 x 1200 mm	12.0		
59	130+655	Pipe	1 x 1200 mm	12.0		
60	130+855	Pipe	1 x 1200 mm	12.0		
61	131+055	Pipe	1 x 1200 mm	12.0		
62	131+255	Pipe	1 x 1200 mm	12.0		
63	131+455	Pipe	1 x 1200 mm	12.0		
64	132+047	Pipe	1 x 1200 mm	12.0		
65	132+247	Pipe	1 x 1200 mm	12.0		

S. No.	Culvert Location (Proposed Chainage)	Proposed Type of structure	Span/ opening (m)	Width of New culverts	Proposal	Remarks (Type of Culvert)
66	132+447	Pipe	1 x 1200 mm	12.0	New	New Culvert
67	132+647	Pipe	1 x 1200 mm	12.0		
68	132+847	Pipe	1 x 1200 mm	12.0		
69	133+047	Pipe	1 x 1200 mm	12.0		
70	133+247	Pipe	1 x 1200 mm	12.0		
71	133+437	Pipe	1 x 1200 mm	12.0		
72	133+830	Pipe	1 x 1200 mm	12.0		
73	134+030	Pipe	1 x 1200 mm	12.0		
74	134+230	Pipe	1 x 1200 mm	12.0		
75	134+430	Pipe	1 x 1200 mm	12.0		
76	134+960	Pipe	1 x 1200 mm	12.0		
77	135+160	Pipe	1 x 1200 mm	12.0		
78	135+360	Pipe	1 x 1200 mm	12.0		
79	135+747	Pipe	1 x 1200 mm	12.0		
80	136+455	Pipe	1 x 1200 mm	12.0		
81	137+155	Pipe	1 x 1200 mm	12.0		
82	137+355	Pipe	1 x 1200 mm	12.0		
83	140+430	Pipe	1 x 1200 mm	12.0		
84	140+930	Pipe	1 x 1200 mm	12.0		
85	141+330	Pipe	1 x 1200 mm	12.0		
86	141+680	Pipe	1 x 1200 mm	12.0		
87	141+997	Pipe	1 x 1200 mm	12.0		
88	142+297	Pipe	1 x 1200 mm	12.0		
89	142+452	Pipe	1 x 1200 mm	12.0		
90	142+697	Pipe	1 x 1200 mm	12.0		
91	142+897	Pipe	1 x 1200 mm	12.0		
92	143+197	Pipe	1 x 1200 mm	12.0		

(b) Box Culverts:-

S. No.	Culvert Location (Proposed Chainage)	Proposed Type of structure	Span/ opening (m)	Width of New culverts	Proposal	Remarks (Type of Culvert)
1	88+850	RCC BOX	2x2	12.0	New	New Culvert
2	91+020	RCC BOX	2x2	12.0		
3	91+120	RCC BOX	2x2	12.0		
4	139237	RCC BOX	2x2	12.0		
5	141+580	RCC BOX	4x4	12.0		

7.2.5 Repairs/replacements of railing/parapets, flooring and protection works of the existing culverts shall be undertaken as required as per standards and specifications.

S. No.	Location at km	Remarks
NIL		

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

7.3 Bridges

7.3.1 Existing bridges to be re-constructed/widened:

(i) The Existing bridges at the following locations shall be reconstructed:

Sl. No.	Bridge location(km)	Salient details of existing bridge	Type	Span Arrangement	Remarks
1	140+690	1 x 6.0	RCC Slab	1 x 6.0	Reconstructed

(ii) The following narrow bridges shall be widened:

Sl. No.	Location (km)	Existing width (m)	Extent of widening (m)	Cross-section at deck level for widening @
NIL				

7.3.2 *Additional new bridges*

New bridges at the following locations on the project highway shall be constructed. GADs for the new bridges are attached in the drawings folder.

Sl. No.	Location (km)	Total length (m)	Remarks, if any
NIL			

7.3.3 The super structure of existing bridges shall be reconstructed at the following locations:

S. No.	Location at km	Remarks
1	90+075	Reconstruction of super structure (Minor Bridge)
2	91+385	
3	103+259	
4	137+840	
5	141+009	
6	141+945	

7.3.4 Repairs/replacements of railing/parapets/Rehabilitation of the existing Minor bridges shall be undertaken as follows

S. No.	Location at km	Remarks
1	92+445	Minor Bridge
2	92+532	Minor Bridge
3	107+353	Minor Bridge
4	137+005	Minor Bridge
5	142+855	Minor Bridge

7.3.5 *Drainage system for bridge deck*

An effective drainage system for bridge decks shall be provided as specified in paragraph 7.20 of the Manual

7.3.6 *Structures in marine environment*
The Project Alignment does not lie in Marine Alignment.

7.4 Rail-road bridges

7.4.1 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].

Sl. No.	Location of Level crossing (chainage km)	Length of bridge (m)
NIL		

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

Sl. No.	Location of Level crossing (chainage km)	Length of bridge (m)
NIL		

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

Sl. No.	Location of Level crossing (chainage km)	Number and length of span (m)
NIL		

7.5 Grade separated structures

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.

NIL.

7.6 Repairs and strengthening of bridges and structures

Repairs/replacements of railing/parapets/Rehabilitation of the existing bridges shall be undertaken as follows:

A. Major Bridges

Sl. No.	Location of bridge Existing Chainage (km)	Nature and extent of repairs /strengthening to be carried out
1	86+305	Repairs/replacements of railing/parapets/Rehabilitation

B. ROB / RUB

Sl. No.	Location of ROB/RUB (km)	Nature and extent of repairs /strengthening to be carried out
NIL		

C. Overpasses/Underpasses and other structures

Sl. No.	Location of Structure (km)	Nature and extent of repairs /strengthening to be carried out
NIL		

Note: - *1. The location and vent size of all the culverts proposed for irrigation purposes shall be decided in consultation with Authority's Engineer.*

2. Width of culvert shall be reconciled as per cross section at that location

3. Cross road culvert to be provided at the location of Major Junction/ Minor Junctions or utility purposes etc. shall be decided with independent Engineer shall not be treated as change of scope.

8. TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORK.

8.1 Traffic control devices and road safety works including traffic signs, overhead signs, pavement marking, safety barriers etc. shall be provided in accordance with Section 9 of the Manual.

8.2 Specifications of the reflective sheeting shall be as per Section 9 of the Manual

9. ROAD SIDE FURNITURE

9.1 Road side furniture including Road Boundary Stone, Pedestrian Guard Rail, Pedestrian Crossings, Delineators, MS Railing etc. shall be provided in accordance with the provisions of the Manual and Scheduled D.

9.2 Overhead traffic signs: location and size

Full width overhead signs 2 nos. (Start and end of Project road) and at other locations shall be provided as per requirement of site in consultation with the Authority's Engineer.

10. COMPULSORY AFFORESTATION

The number of trees which are required to be planted by the Agency as compensatory afforestation should be as per Forest Conservation Act, thrice the number of trees to be cut.

11. HAZARDOUS LOCATIONS

Provide W-beam crash barrier along the project highway at the locations as suggested in the Manual. The safety barriers shall also be provided at all hazardous locations in consultation with the Authority's Engineer. Hazardous locations are as follows;-

S.No	Design Chainage		Length (m)	Remarks
	From	To		
1	115+180	115+210	30	Sinking Zone
2	118+694	118+760	66	Sinking Zone
3	119+575	119+615	40	Land Slide
4	121+150	121+260	110	Sinking Zone
5	121+735	121+780	45	Sinking Zone
6	123+005	123+060	55	Sinking Zone
7	123+000	123+050	50	Land Slide
	Total Length (m)		**396**	

12. SPECIAL REQUIREMENTS FOR HILL ROAD

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

13. 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.

SCHEDULE - C

(See Clause 2.1)

PROJECT FACILITIES

1. Project Facilities

The Contractor shall construct the Project Facilities in accordance with the provisions of this Agreement. Such Project Facilities shall include:

(a) roadside furniture;

(b) pedestrian facilities;

(c) tree plantation;

(d) truck lay-byes;

(e) bus-bays and bus shelters;

(f)) rest areas; and

(g) others

(i) View Point

(ii) Highway Lighting

2. Description of Project Facilities

Each of the Project Facilities is described below:

(a) Roadside Furniture/Traffic control devices/Road safety devices

Road side furniture/Traffic control devices/Road safety devices shall be provided in accordance with the Manual of Specifications and Standards as referred in schedule "D" including the provisions mentioned in Schedule "B".

(b) Pedestrian Facilities

Pedestrian Facilities shall be provided in accordance with the Manual of Specifications and Standards as referred in schedule "D".

(c) Landscaping and Tree Plantation

Landscaping of the highway shall be done in accordance with the Manual of Specifications and Standards as referred in schedule "D".

(d) Truck Lay-byes

No truck Lay-bye has been proposed. However, if any Truck Lay-bye(s) are required as per the requirement of site, then Contractor shall provide the same as per suitability of location and site requirement in consultation with the Authority's Engineer/ Authority.

(e) Bus-Bays and Bus Shelters

The Contractor shall provide minimum 18 nos. of Bus Bays with Bus Shelter on both side along the project highway. Tentative locations for Bus Bays are indicated below, however, the same shall be finalized as per suitability of location and site requirement in consultation with the Authority's Engineer/ Authority.

S. No.	Design Chainage (km)	Location	Side
1	91+150	Rongkhon	Both Side
2	101+355	Dadaungiri	
3	102+530	Dadaungiri	
4	102+915	Dadaungiri	
5	104+225	Rubber	
6	107+035	Rubber	
7	109+180	Purakashya	
8	109+700	Purakashya	
9	110+625	Purakashya	
10	113+680	Chokpot,	
11	115+100	Chokpot,	
12	118+710	Moropgre,	
13	126+700	Rengsipara	
14	127+000	Rengsipara	
15	133+450	Rendapara,	
16	136+850	Rendapara,	
17	137+560	Rendapara,	
18	141+320	Purakhasia	

(f) Others:

(i) View Point

The Contractor shall construct the View Points along the project highway. Tentative locations for View Points shall be finalized as per suitability of location and site requirement in consultation with the Authority's Engineer/ Authority:

(ii) Highway Lighting

High Mast Lighting shall be provided as per Schedule D at all requisite areas including built-up areas except for Minor Junctions where Solar lighting may be provided.

(iii) Spoil Banks

Spoil bank shall be proposed in accordance with the Clause 3.1 of Schedule-D (Specification and Standard for the Construction).

The actual number, each location and volume of spoil banks shall be determined by the Contractor with approval of Authority's Engineer/Authority.

Any variation in number, each location and volume of spoil banks in this Schedule-B shall not constitute a Change of Scope.

Note: Estimated capacity of each spoil bank shall be confirmed by the Contractor based on his final design drawings and the Plan for Earthworks submitted for review and approval by the Authority's Engineer. Other Facilities.

(iv) Other Facilities

(a) Supply of project record in digital format in two copies (one for the Engineer and the other for the Employer) including video recording updated on monthly basis throughout the construction period.

(b) As per the direction of Engineer-in-charge.

1. Facilities for the Authority and the Authority's Engineer

The facilities to be provided for the Authority and the Authority's Engineer, comprehending the Site Offices and Accommodation shall be as follows:

Table 1: Facilities for the Authority and the Authority's Engineer to be provided by the Contractors

Section	**Package**	**Offices** *(Note 1)*	**Accommodation** *(Note 2)*	
			Staff	**Period** (months)
Phase-I NH51	Tura-Dalu	Core Office Type 1 Location: Tura Period: 60 months	- Team Leader: .....1 - International Experts: .....1 - National Experts.....6 - Sub-Professional Staff.....11 - Office Supporting Staff.....10 - Authority (Central Team).....1	T/L: ..... 36 Int. Experts ..... 36 General ..... 36 R/E 1: ..... 48 Safeguard Expert: .... 42 Q/Surveyor 1: ..... 48 CAD Engineer 1 ..... 42 Field Eng.1, 2 & 3: . 54

Section	Package	Offices *(Note 1)*	Accommodation *(Note 2)*	
			Staff	**Period** (months)
				Surveyor 1: ..... 42 Supporting Staff: 54

Note (1): *Site Office*: The layout shall be prepared by the Contractor and submitted for review and approval by the Authority's Engineer. The locations shown in this table are tentative and shall be confirmed by the Authority's Engineer.

Note (2): *Accommodation*: Depending upon the Authority's Engineer acceptance, rental of existing buildings will be allowed depending the proximity of the works to the nearby cities or towns, and comfortability.

3.1 Site Office for the Authority and the Authority's Engineer

3.1.1 Construction of Site Offices

The basic layout of each site office shall be prepared by the Contractor and submitted to the Authority's Engineer for review and respective acceptance.

The building shall comply with India's applicable specifications for architectural and structural works for buildings.

a. Basic Layout

The layout shall be prepared in accordance with the number of staff shown in Table-1 to accommodate properly the following (note: the plan area shown below are the minimum requirement to be considered):

(1) Core Office – Office Type 1: (to be located nearby Tura)

- Minimum Area: 450 sqm
  - One office room for Team Leader (private arrangement) .....25 sqm
  - One office room for the Authority's representative (private arrangement) .....25 sqm
  - One office room for International Experts .....45 sqm
  - One office room for National Experts .....30 sqm
  - One office room for Sub-Professional Staff .....80 sqm
  - One Meeting/Conference Room .....40 sqm
  - One reception/administration office room.....56 sqm
  - One office room for working tables .....50 sqm
  - A kitchen (Pantry) plan area well equipped with sink, draining board, cupboards, shelving, etc. .....20 sqm
  - Male (3) and Female (1) toilets with shower and wash-hand basin facilities for the sole use of the Authority's representative, International Experts,

National Experts, and administration staff (office manager and secretaries) ..... 4 units

- Male (2) toilets for Sub-Professional and Supporting staff ..... 2 units
- Corridor for connecting all rooms (approx..60 sqm) .....2m width
- Parking for the vehicles used by the Authority's Engineer and visitor's vehicles..... 12 veh.

b. Basic Requirements

The Contractor shall, not later than 7 days after the starting date, submit full details of the Design Drawings to the Authority's Engineer, including floor plans, elevations, construction principles and materials, before commencing the erection of the facilities.

The Contractor shall be responsible for raising the ground (if necessary), grading and drainage in the vicinity of the building(s), with suitable access and walkways. The Contractor shall construct a covered hard-standing parking area, for the exclusive use of the Authority's Engineer and his visitors and respective access road to the parking area. The access road shall be paved and hard enough in order to be transited even during heavy rains. Outside lighting shall be installed around the buildings and the parking area, and appropriate signs shall be erected to indicate the purpose of the facilities.

All facilities shall conform to current fabrication standards for the required types. The facilities described above shall represent the minimum requirements. The Contractor shall provide all additional incidentals and necessary items, so that the facilities will be completely adequate and satisfactory in every respect for their intended use. Painting both the exterior and the interior shall be as agreed with the Authority's Engineer.

The building shall be complete with all services connected with clean water supply by water bowser (including elevated water tank and the tower for capacity of 3,000 liters for Office Type 1), electricity and sewerage. Each room shall be provided with at least four electrical outlet sockets. All power shall be 220V-240V, 50Hz except where otherwise agreed by the Authority's Engineer. All rooms shall be illuminated by fluorescent lighting. Each toilet shall be provided with a flushing toilet and warm water hand washing and shower facilities and extractor fans.

Telephone services (minimum 3 telephone lines and 6 extension lines completed with equipment for the office), including international direct dialing shall be provided. In addition, extra lines shall be provided for facsimile and internet connections. Each office shall be equipped with a telephone connected to the main reception telephone.

Offices and meeting rooms shall be air-conditioned. The air-conditioning may be either individual units or a central ducted system and shall be

adequate to maintain temperature of not more than 24°C (dry bulb) at a relative humidity of 50% during the hottest season of the year. The noise level of the air-conditioning while working should be sufficiently low to allow normal voice level discussions to take place.

Office rooms shall be capable of providing at all times environmental conditions suitable for the operation of specified electronic office equipment.

The building shall be weather proof, fire protected, heat-insulated and secured. Windows shall give adequate light and ventilation and be protected with metal mosquito-proof gauze and have security bars and Venetian, or other approved sun blinds. Ceiling height above the floor level shall be at least 2.75 m. All internal walls shall be sound insulated. Floors shall be PVC tile covered. In toilets and other washing areas the floors shall have drains to assist cleaning.

3.1.2 Maintaining and Servicing of the Offices

The construction of the new office building for the Authority's Engineer shall be completed within 60 days since the date of commencement of the Contract and shall be equipped and maintained by the Contractor to the satisfaction of the Authority's Engineer until 3 months after the issue of a Completion Certificate for the Works or such earlier time as instructed by the Authority's Engineer whereupon the furniture shall be removed and any internal partition walls modified as required by the Authority's Engineer.

The Contractor shall provide all laborers, materials and equipment for maintaining and cleaning offices, furniture and fittings. The Contractor shall replace and/or restore, as directed, any facilities or parts thereof that become damaged, worn out, lost or stolen. The Contractor shall provide an adequate stock of all expendable and consumable items including refreshments, clean water supply and drinking water, paper towels, toilet rolls, soaps, washing up liquid, brooms/mops and shall ensure proper and continuing functioning of all components and parts of the facilities during the contract period.

The Offices shall be provided with waste disposal material and these shall be emptied and disposed of daily by the Contractor.

3.1.3 Equipment and Expenses for Running-Off the Offices

The Contractor shall provide the following furniture and equipment to be used by the Authority's Engineer at Site.

Furniture and Equipment for Site Offices (each office)

Item	Unit	Quantity	Remarks
Refrigerator (deodorizer and no-frost system)	unit	1	Office Type 1: 300liters' minimum capacity
Water Dispenser (19 liters capacity including bottles and 6 spares bottles/gallon)	set	2	Office Type 1
Electric Kitchen Stove	unit	1	Size and model shall be discussed

Item	Unit	Quantity	Remarks
Electric Kettle	unit	1	
Diesel Generator Set	unit	1	Office Type 1: 125 KVA

3.2 Accommodation for the Authority and the Authority's Engineer Staff

3.2.1 Temporary Accommodation (initial period)

(1) General

Immediately after the date for Commencement of Works, during the first 3 months or until the permanent installations are prepared and approved, the Contractor shall provide rented houses as per the accommodation for all staff of the Authority's Engineer.

The accommodation shall be equipped with security grilles and mosquito netting, and shall be fully furnished and equipped with new items by the Contractor to the satisfaction of the Authority's Engineer, including curtains, linen, blankets, glassware, cutlery, crockery and kitchen utensils.

Each house shall be wired to permit the use of standby generators as well as mains for the supply of electricity. The generators shall be fitted with automatic starting switchgear if so directed by the Engineer. Covered, hard standing areas for positioning generators and storing fuel shall be provided.

Each house designated for the Engineer's International Experts and National Experts shall be provided with one telephone line and internet connection. Telephone installation shall be made by the Contractor but the cost of calls shall be paid by the Authority's Engineer staff.

Each house shall be provided with a TV (including cable and satellite connection). The installation shall be made by the Contractor but the cost of calls shall be paid by the Authority's Engineer staff.

Each house shall be provided with hot and cold water in the kitchen and the bathrooms.

The Contractor shall provide watchmen for security purposes to the approval of the Authority's Engineer.

The accommodation shall be available and ready for occupation within the number of days approved by the Authority's Engineer after the Commencement Date.

In the event that the Contractor fails to provide the required accommodation within the time specified or subsequently agreed by the Authority's Engineer, the Contractor shall provide, at no cost to the Employer, suitable hotel accommodation until such time as the accommodation is ready for occupation.

When a house is no longer required by the Authority's Engineer, all furniture, fittings and equipment provided by the Contractor for that house shall become the property of the Contractor.

(2) Housing Types

- ✧ House for the Authority near to Core Office (Central Team: 1 per 1 person)

  One detached house, internal floor area approximately 80sqm, comprising 1 x sitting room, 1 x dining room, 2 x bedrooms with attached bathrooms, 1 x kitchen, 1 x office, 1 x veranda. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a garage for one vehicle and fully equipped quarters for two servants shall be provided.

- ✧ Team Leader (Authority's Engineer)

  One detached house, internal floor area approximately 100sqm, comprising 1 x sitting room, 1 x dining room, 2 x bedrooms with attached bathrooms, 1 x kitchen, 1 x office, 1xmaid's room, 1 x veranda. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a garage for two vehicles and fully equipped quarters for two servants shall be provided.

- ✧ International Experts (1 per 3 experts)

  One detached house, internal floor area approximately 120sqm, comprising 1 x sitting room, 1 x dining room, 1 x bedroom with attached bathrooms, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a fully equipped quarter for one servant shall be provided.

- ✧ National Experts (1 per 3 experts)

  One detached house, internal floor area approximately 80sqm, comprising 1 x sitting room, 1 x dining room, 1 x bedroom with attached bathrooms, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a fully equipped quarter for one servants shall be provided.

- ✧ Sub-Professional Staff and Office Supporting Staff (1 per 3 persons)

  One detached house, internal floor area approximately 60sqm, comprising 1 x sitting room, 1 x dining room, 3 x bedroom, 1 x bathroom, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a fully equipped quarter for one servants shall be provided.

- ✧ Secretary or Ladies Staff (1 per 3 persons)

  One detached house, internal floor area approximately 60sqm, comprising 1 x sitting room, 1 x dining room, 3 x bedroom, 1 x bathroom, 1 x kitchen. Split type air-conditioners to the sitting room, dining room and bedrooms. Moreover, a fully equipped quarter for one servants shall be provided.

(3) Maintenance

The Contractor shall be responsible for supplying all utilities, including electricity (whether by mains or generator), water, timber for open fires, drainage and telephone services, and shall meet the cost of these services, except the cost of telephone calls.

The Contractor shall maintain the accommodation, and all furniture, fittings and equipment, whether supplied by him or not, in good repair and to the satisfaction of the Authority's Engineer as long as such accommodation is occupied by the staff of the Authority's Engineer for the purposes of the Contract.

3.2.2 Construction of Houses for Accommodation (after lasted the initial period)

The procedures and standards for construction approved for the construction of the Site Offices will be applied for the construction of houses for accommodation of the staff of the Authority's Engineer.

The layout and design of the houses shall maintain equivalency with the houses approved for the Initial Period.

The location and house type shall be submitted for review and approval to Authority's Engineer.

The Initial Period will be defined and proposed by the Contractor based on the approved Construction Programme but not later than 3 months or the period accepted by the Authority's Engineer.

SCHEDULE – D

(See Clause 2.1)

SPECIFICATIONS AND STANDARDS

1. Construction

The Contractor shall comply with the Specifications and Standards set forth in Annex-I of this Schedule-D for construction of the Project Highway.

2. Design Standards

The Project Highway including Project Facilities shall conform to design requirements set out in the following documents:

Manual of Specifications and Standards for Two- Laning of Highways **(IRC: SP: 73-2015)**, referred to herein as the Manual.

Annex - I

(Schedule-D)

Specifications and Standards for Construction

2. Specification and Standards

All Materials, works and construction operations shall conform to the Manual of Specifications and Standards for Two-Lanning of Highways (IRC: SP: 73-2015), referred to as the Manual, and MORTH Specifications for Road and Bridge Works. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Engineer in charge.

3. Deviations from the Specifications and Standards

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

3.2. Notwithstanding anything to the contrary contained in Paragraph 1 above, the following Specifications and Standards shall apply to the Project Highway, and for purposes of this Agreement, the aforesaid Specifications and Standards shall be deemed to be amended to the extent set forth below:

a. In case of usage of soil stabilization technology, soil stabilizer shall be accredited by IRC.

b. Design Speed as per Clause 2.2 of Manual, 60 kmph (Ruling speed) & 40 kmph (Minimum speed) for Mountainous and Steep terrain. Following stretches where design speed other than ruling speed is to be adopted:-

S. No	Stretch (km)		Remarks
	From	To	
1	85+010	85+080	Due to site constraint
2	85+081	85+142	
3	85+149	85+198	
4	85+231	85+352	
5	85+353	85+445	
6	85+455	85+673	
7	85+709	85+812	
8	85+822	85+916	
9	85+962	86+042	
10	86+096	86+211	
11	86+382	86+474	
12	86+504	86+579	
13	86+649	86+703	
14	86+730	86+788	
15	86+905	86+969	
16	87+017	87+077	Due to site constraint

S. No	Stretch (km)		Remarks
	From	To	
17	87+118	87+217	
18	87+539	87+592	
19	87+736	87+795	
20	87+822	87+881	
21	87+973	88+030	
22	88+153	88+219	
23	88+253	88+306	
24	88+324	88+417	
25	88+419	88+605	
26	88+613	88+669	
27	88+670	88+714	
28	88+714	88+783	
29	88+788	88+827	
30	88+860	88+901	
31	88+903	88+945	
32	88+950	89+048	
33	89+075	89+156	
34	89+160	89+232	
35	89+233	89+303	
36	89+368	89+447	
37	89+469	89+520	
38	89+530	89+626	
39	89+640	89+763	
40	89+770	89+816	
41	89+834	89+872	
42	89+881	89+982	
43	89+983	90+071	
44	90+083	90+150	
45	90+183	90+240	
46	90+266	90+364	
47	90+364	90+411	
48	90+412	90+485	
49	90+516	90+628	
50	90+748	90+853	
51	90+855	90+987	
52	91+055	91+125	
53	91+161	91+217	
54	91+310	91+383	
55	91+405	91+453	
56	91+481	91+526	
57	91+531	91+575	
58	91+585	91+633	Due to site constraint
59	91+710	91+750	
60	91+756	91+814	
61	91+816	91+883	

S. No	Stretch (km)		Remarks
	From	To	
62	91+883	91+933	
63	91+937	91+977	
64	91+983	92+059	
65	92+082	92+132	
66	92+152	92+212	
67	92+227	92+270	
68	92+273	92+356	
69	92+468	92+512	
70	92+548	92+613	
71	92+689	92+736	
72	92+738	92+791	
73	92+800	92+837	
74	92+863	92+928	
75	92+931	93+001	
76	93+054	93+105	
77	93+109	93+161	
78	93+163	93+221	
79	93+224	93+288	
80	93+336	93+409	
81	93+513	93+564	
82	93+586	93+646	
83	93+647	93+696	
84	93+698	93+748	
85	93+783	93+833	
86	93+834	93+908	
87	93+933	94+053	
88	94+115	94+169	
89	101+001	101+094	
90	101+113	101+172	
91	101+173	101+235	
92	101+261	101+302	
93	101+320	101+426	
94	101+478	101+579	
95	101+589	101+698	
96	101+726	101+797	
97	101+802	101+843	
98	101+866	101+957	
99	101+959	102+020	
100	102+084	102+158	Due to site constraint
101	102+205	102+241	
102	102+246	102+316	
103	102+318	102+411	
104	102+411	102+476	
105	102+493	102+571	
106	102+580	102+616	

S. No	Stretch (km)		Remarks
	From	To	
107	102+640	102+700	
108	102+773	102+829	
109	102+832	102+867	
110	102+868	102+911	
111	102+915	103+002	
112	103+006	103+047	
113	103+075	103+123	
114	103+139	103+214	
115	103+291	103+340	
116	103+356	103+445	
117	103+460	103+571	
118	103+589	103+627	
119	103+727	103+810	
120	103+886	103+973	
121	104+019	104+082	
122	104+147	104+203	
123	104+249	104+284	
124	104+355	104+406	
125	104+421	104+463	
126	104+475	104+534	
127	104+555	104+621	
128	104+627	104+676	
129	104+708	104+754	
130	104+762	104+829	
131	104+862	104+908	
132	104+975	105+022	
133	105+069	105+106	
134	105+149	105+194	
135	105+202	105+252	
136	105+252	105+290	
137	105+299	105+375	
138	105+388	105+458	
139	105+465	105+556	
140	105+584	105+677	
141	105+679	105+750	
142	105+755	105+805	Due to site constraint
143	105+830	105+882	
144	105+885	105+939	
145	105+947	106+006	
146	106+010	106+073	
147	106+081	106+116	
148	106+130	106+182	
149	106+220	106+286	
150	106+329	106+393	
151	106+466	106+513	

S. No	Stretch (km)		Remarks
	From	To	
152	106+552	106+631	
153	106+648	106+768	
154	106+806	106+870	
155	106+905	106+961	
156	107+050	107+137	
157	107+169	107+210	
158	107+219	107+278	
159	107+386	107+457	
160	107+534	107+648	
161	107+678	107+733	
162	107+758	107+810	
163	107+849	107+898	
164	107+915	107+961	
165	107+977	108+052	
166	108+087	108+140	
167	108+160	108+219	
168	108+226	108+297	
169	108+309	108+391	
170	108+399	108+450	
171	108+452	108+500	
172	108+533	108+608	
173	108+613	108+665	
174	108+730	108+848	
175	108+928	109+021	
176	109+059	109+146	
177	109+150	109+192	
178	109+225	109+290	
179	109+302	109+359	
180	109+362	109+406	
181	109+415	109+484	
182	109+496	109+531	
183	109+604	109+694	
184	109+760	109+861	
185	109+939	110+039	
186	110+049	110+118	
187	110+122	110+197	
188	110+252	110+302	
189	110+336	110+371	
190	110+388	110+438	
191	110+477	110+591	
192	110+596	110+644	
193	110+658	110+747	
194	110+767	110+822	
195	110+827	110+892	
196	110+945	111+031	

S. No	Stretch (km)		Remarks
	From	To	
197	111+034	111+112	
198	111+133	111+178	
199	111+212	111+256	
200	111+257	111+346	
201	111+480	111+530	
202	111+552	111+618	
203	111+654	111+742	
204	111+745	111+817	
205	111+836	111+919	
206	111+924	111+984	
207	112+007	112+119	
208	112+120	112+176	
209	112+220	112+326	
210	112+376	112+463	
211	112+504	112+644	
212	112+725	112+758	
213	112+777	112+824	
214	112+851	112+929	
215	112+932	113+013	
216	113+096	113+194	
217	113+223	113+263	
218	113+281	113+381	
219	113+530	113+608	
220	113+814	113+924	
221	113+961	114+056	
222	114+239	114+339	
223	114+473	114+521	
224	114+555	114+604	
225	114+644	114+698	
226	114+718	114+794	Due to site constraint
227	114+937	115+002	
228	115+126	115+169	
229	115+197	115+246	
230	115+276	115+329	
231	115+362	115+442	
232	115+569	115+610	
233	115+647	115+771	
234	115+890	115+937	
235	115+958	116+069	
236	116+103	116+195	
237	116+196	116+265	
238	116+265	116+366	
239	116+405	116+487	
240	116+498	116+580	
241	116+581	116+652	

S. No	Stretch (km)		Remarks
	From	To	
242	116+652	116+716	
243	116+735	116+784	
244	116+784	116+837	
245	116+847	116+895	
246	116+900	116+946	
247	116+950	116+995	
248	117+007	117+066	
249	117+100	117+202	
250	117+236	117+300	
251	117+318	117+372	
252	117+411	117+458	
253	117+458	117+509	
254	117+509	117+545	
255	117+561	117+621	
256	117+657	117+704	
257	117+710	117+826	
258	117+842	117+924	
259	118+006	118+053	
260	118+077	118+125	
261	118+143	118+212	
262	118+220	118+277	
263	118+285	118+337	
264	118+351	118+414	
265	118+416	118+451	
266	118+484	118+526	
267	118+537	118+604	
268	118+609	118+693	Due to site constraint
269	118+706	118+752	
270	118+759	118+813	
271	118+837	118+901	
272	118+903	118+962	
273	119+019	119+073	
274	119+183	119+249	
275	119+265	119+329	
276	119+373	119+409	
277	119+463	119+549	
278	119+717	119+836	
279	119+890	120+047	
280	120+136	120+217	
281	120+236	120+280	
282	120+299	120+362	
283	120+365	120+427	
284	120+431	120+489	
285	120+506	120+557	
286	120+557	120+623	

S. No	Stretch (km)		Remarks
	From	To	
287	120+626	120+689	
288	120+693	120+762	
289	120+813	120+919	
290	120+989	121+160	
291	121+212	121+296	
292	121+309	121+382	
293	121+433	121+501	
294	121+556	121+614	
295	121+626	121+676	
296	121+676	121+741	
297	121+846	121+934	
298	121+967	122+009	
299	122+029	122+068	
300	122+073	122+135	
301	122+142	122+182	
302	122+185	122+231	
303	122+241	122+326	
304	122+368	122+444	
305	122+502	122+606	
306	122+637	122+705	
307	122+724	122+775	
308	122+826	122+931	
309	122+964	123+106	
310	123+113	123+177	Due to site constraint
311	123+181	123+272	
312	123+360	123+448	
313	123+463	123+537	
314	123+574	123+614	
315	123+634	123+682	
316	123+716	123+800	
317	123+848	123+977	
318	124+026	124+124	
319	124+150	124+191	
320	124+193	124+237	
321	124+238	124+289	
322	124+348	124+414	
323	124+433	124+515	
324	124+533	124+596	
325	124+601	124+651	
326	124+681	124+746	
327	124+850	124+930	
328	124+939	125+029	
329	125+054	125+123	
330	125+150	125+226	
331	125+266	125+329	

S. No	Stretch (km)		Remarks
	From	To	
332	125+351	125+428	
333	125+456	125+519	
334	125+544	125+601	
335	125+682	125+748	
336	125+761	125+811	
337	125+864	125+913	
338	125+973	126+013	
339	126+031	126+104	
340	126+122	126+245	
341	126+290	126+366	
342	126+417	126+473	
343	126+521	126+597	
344	126+679	126+729	
345	126+729	126+826	
346	126+848	126+910	
347	126+959	127+040	
348	127+062	127+115	
349	127+115	127+219	
350	127+303	127+402	
351	127+434	127+516	
352	127+573	127+628	Due to site constraint
353	127+739	127+779	
354	127+964	128+010	
355	128+019	128+120	
356	128+281	128+361	
357	128+368	128+429	
358	128+433	128+539	
359	128+543	128+636	
360	128+637	128+697	
361	128+706	128+784	
362	128+786	128+844	
363	128+860	128+915	
364	128+921	128+969	
365	128+984	129+062	
366	129+097	129+185	
367	129+199	129+265	
368	129+308	129+356	
369	129+381	129+445	
370	129+448	129+517	
371	129+518	129+574	
372	129+577	129+657	
373	129+691	129+743	
374	129+930	129+976	
375	129+984	130+052	
376	130+058	130+118	

S. No	Stretch (km)		Remarks
	From	To	
377	130+125	130+187	
378	130+195	130+278	
379	130+335	130+402	
380	130+407	130+503	
381	130+509	130+566	
382	130+595	130+646	
383	130+668	130+805	
384	130+810	130+866	
385	130+871	130+953	
386	130+956	131+061	
387	131+064	131+124	
388	131+125	131+177	
389	131+180	131+244	
390	131+361	131+427	
391	131+731	131+798	
392	131+802	131+855	
393	131+872	131+924	
394	132+192	132+278	Due to site constraint
395	132+342	132+429	
396	132+443	132+486	
397	132+514	132+587	
398	132+629	132+694	
399	132+708	132+760	
400	132+762	132+884	
401	132+893	132+988	
402	133+001	133+074	
403	133+141	133+185	
404	133+190	133+242	
405	133+242	133+291	
406	133+295	133+396	
407	133+397	133+440	
408	133+497	133+562	
409	133+563	133+632	
410	133+699	133+797	
411	133+799	133+857	
412	133+857	133+925	
413	133+928	133+972	
414	133+981	134+062	
415	134+090	134+164	
416	134+167	134+276	
417	134+396	134+450	
418	134+660	134+720	
419	134+723	134+785	
420	134+840	134+918	
421	134+926	134+976	

S. No	Stretch (km)		Remarks
	From	To	
422	135+063	135+099	
423	135+102	135+174	
424	135+194	135+237	
425	135+305	135+371	
426	135+378	135+434	
427	135+449	135+509	
428	135+515	135+567	
429	135+579	135+629	
430	135+656	135+719	
431	135+739	135+786	
432	135+790	135+931	
433	135+955	135+999	
434	136+001	136+082	
435	136+087	136+131	
436	136+155	136+229	Due to site constraint
437	136+231	136+278	
438	136+293	136+345	
439	136+348	136+459	
440	136+460	136+532	
441	136+546	136+604	
442	136+629	136+699	
443	136+727	136+776	
444	136+777	136+822	
445	136+824	136+882	
446	136+894	136+945	
447	137+040	137+141	
448	137+156	137+284	
449	137+295	137+345	
450	137+460	137+514	
451	137+542	137+611	
452	137+755	137+818	
453	137+858	137+916	
454	137+937	137+991	
455	138+005	138+045	
456	138+070	138+136	
457	138+140	138+189	
458	138+192	138+255	
459	138+286	138+400	
460	138+405	138+482	
461	138+499	138+548	
462	138+557	138+628	
463	138+725	138+806	
464	138+838	138+905	
465	138+917	138+976	
466	138+988	139+044	

S. No	Stretch (km)		Remarks
	From	To	
467	139+045	139+090	
468	139+245	139+312	
469	139+645	139+738	
470	140+016	140+105	
471	141+425	141+541	

3.3. Notwithstanding anything to the contrary contained in Paragraph 1 above, the following Specifications and Standards shall apply to the Project Highway, and for purposes of this Agreement, the aforesaid Specifications and Standards shall be deemed to be amended to the extent set forth below:

c. In case of usage of soil stabilization technology, soil stabilizer shall be accredited by IRC.

d. Carriageway shall be 7.0m with 1.5m hard shoulder wherever ROW is available. IRC: SP: 73-2015 shall be followed to the extent as required for execution of work in consonance with plan & profile and TCS.

S. No.	Clause Referred in Manual	Provisions as per Manual	Modified Provision
1	7.3 (iv)	If the width of additional widening is less than 0.5 m on either side, the widening of the structure may be dispensed with and traffic shall be guided with the help of crash barriers in a transition of 1 in 30 on either side approaches	The existing bridge proposed to be repaired and rehabilitated as specified and to be retained without widening.
2	12.6.3 (ii)	For hilly areas, where there is a general constraint on space, the layout indicated in fig 12.3 may be adopted for Bus bay	The width & length has been designed as available in field.
3	12.5.2	A typical lay out is given in **Fig. 12.1**.	The width & length has been designed as available in field.

S. No.	Clause Referred in Manual	Provisions as per Manual	Modified Provision
4		View Point	The width & length shall be designed as available in field.
5		Rock Anchor Work	As the site needs this type of Typical arrangement, necessary typical drawing has been given in drawing volume to be executed by Manufacturer / expert designer as per their design standard needed as per site condition
6		Design Standard	As per Clause 3 given below

3. Particular Specifications

3.1 Earthworks: Re-Usable and Unsuitable Materials

In addition, and without detriment to the requirements specified in Section 4 of the Manual and Section 301 of the MORTH Specifications for Road and Bridge Works related to the re-use and unsuitable material, the following requirements shall be included:

a. Previous to perform the earthworks for road construction (minimum 28 days before commencement of earthworks), the Contractor shall submit for review and approval by the Authority's Engineer, a "Plan for Earthworks" detailed by sections showing the cutting and embankment with respective hauling distances, quantities and location of the re-usable material and respective spoil-banks for wasting of unsuitable material, not re-usable material or exceeding material (from the balance between cutting excavation and fill embankment works), and respective time schedule. The Plan for Earthworks shall be updated and reviewed periodically every 3 months or when required by the Authority's Engineer.

b. When unsuitable material below sub-grade level in cut or below embankment foundation level is planned to be removed, the soil left in place after the removal of the unsuitable material shall be compacted to a depth of 20 cm and a density of 90 percent of the maximum dry density determined according to the relevant specifications.

c. The material to be disposed of as Unsuitable Material shall not be wasted until it is duly approved or directed by the Authority's Engineer.

d. Unsuitable Material shall be removed and disposed of in waste areas provided by the Contractor in such a manner as to present a neat appearance and not to obstruct drainages to any highway nor to cause injury to highway works or property. If it becomes necessary for the

Contractor to locate or relocate any waste areas, the Contractor shall obtain previously the approval from the Authority's Engineer to commence the operation for spreading any waste.

e. The Contractor is responsible to perform and follow all the required procedures to obtain respective authorizations for the usage of the areas where it is intended to waste the unsuitable material or to open quarries for borrow material.

f. The relevant and applicable provisions "Environmental Control and Protection" shall be adhered to the Plan for Earthworks for the hauling and disposal of unsuitable materials.

g. Spoil Banks:

The following requirements shall be satisfied for the proper implementation of Spoil-Banks:

- ✧ The Contractor shall submit, at least 15 days before commencing the works for any Spoil-Bank, for review and approval by the Authority's Engineer a detailed plan for implementation of the Spoil-Banks that are being considered in his "Plan for Earthworks" showing the location, capacity, time schedule and method statement for construction
- ✧ The Spoil-Banks shall be constructed applying the same technical specifications used for road embankment construction regarding preparation of the ground, leveling, thickness and compaction of each layer.
- ✧ The drainage to be implemented in the Spoil-Banks shall be constructed following the applicable standards for road drainage and in accordance with the drawings prepared by the Contractor in accordance with the Article 10: "Design and Construction of the Project Highway" of the Contract Agreement, and reviewed & approved by the Authority's Engineer.
- ✧ The Spoil-Banks shall be design in accordance with the requirements shown in **Table-1** and the typical arrangement shown in **Figure-1**.

Table-1: Requirements for Design and Construction Spoil Banks

Design Conditions:		
Item	**Description**	**Criteria**
- Topography	Depression or hilly	Prevention against disasters due to landslide and collapse
- Ground Inclination	Less than 22°	ditto
- Embankment' Size	Embankment height shall be 30m or less	ditto
- Land's Use	Land is not urbanized	Environmental protection
- Environment	Not considered as environmental nature	ditto

	reservation. Residential areas (if any) shall not located at downstream of spoil bank.	

Design Requirements:

Item	Remarks
- Installation of open drain or canal	Drain is treated from upstream
- Installation of surface drainage system	Slope feet and berms
- Installation of underground drainage	Swamps and Valley
- Installation of internal-horizontal drainage of embankment	Reduction of water filtration in the embankment and prevention against superficial collapse
- Implementation of the works for Slope Protection	Turfing or Seeding
- Construction of retaining wall in the lower edge	Prevention against collapse
- Installation of check dam structure on the upstream inlets	Concrete Wall
- Implementation of the works for scouring prevention along downstream outlet	Gabion Mat

Special Provisions on the Specifications:

Item	Description	Special Provision
- Drainage	Works for channels drainages	50 years return period
	Gutters	25 years return period Minimum 40cm x 40cm
	Horizontal drainage sheet (50cm width, 2m interval)	Every 5m height; L=20m
- French Drain	Large Drain Basin	Perforated pipes of 300mm minimum diameter shall be applied
	Small Drain Basin	Perforated pipes of 100mm minimum diameter shall be applied
- Slope Protection	Sodding	As the standards
- Retaining Wall	Retaining wall by Gabion or Gravity Type	As the standards
- Embankment	Compaction and layer thickness	Compaction of embankment equal or higher than 90% shall be secured. Layer thickness same than road embankment.

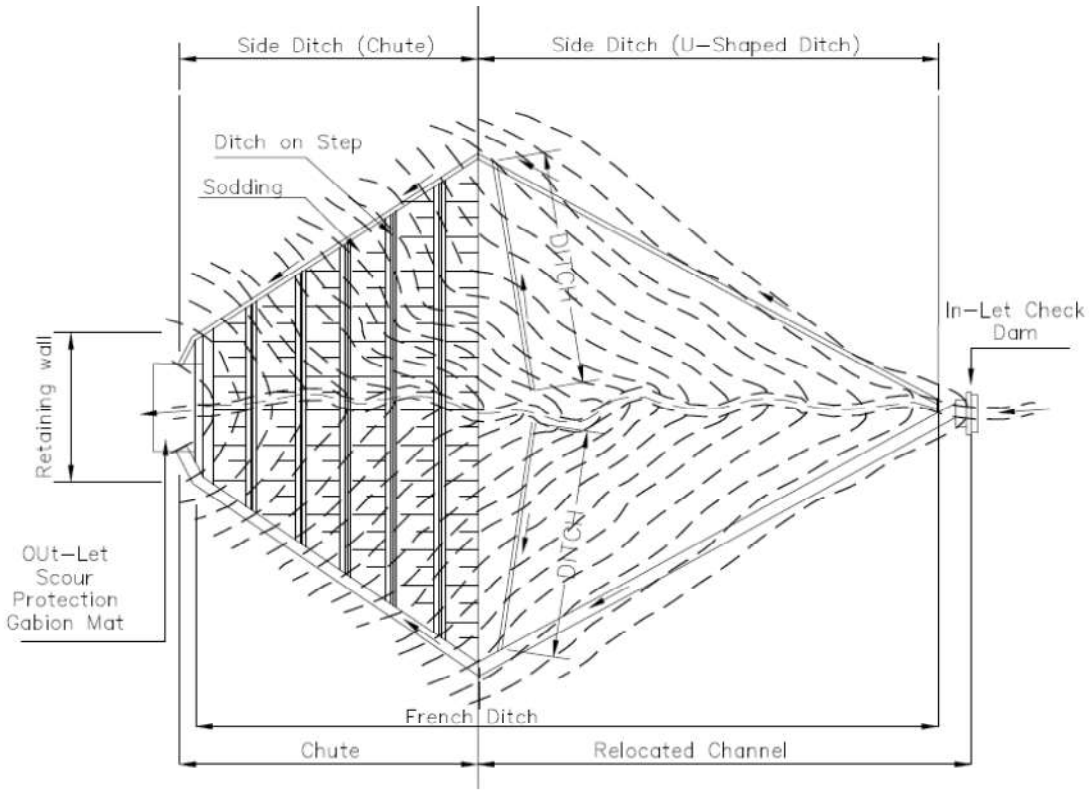


Figure-1(a): Typical Arrangement for Spoil Banks: Plan

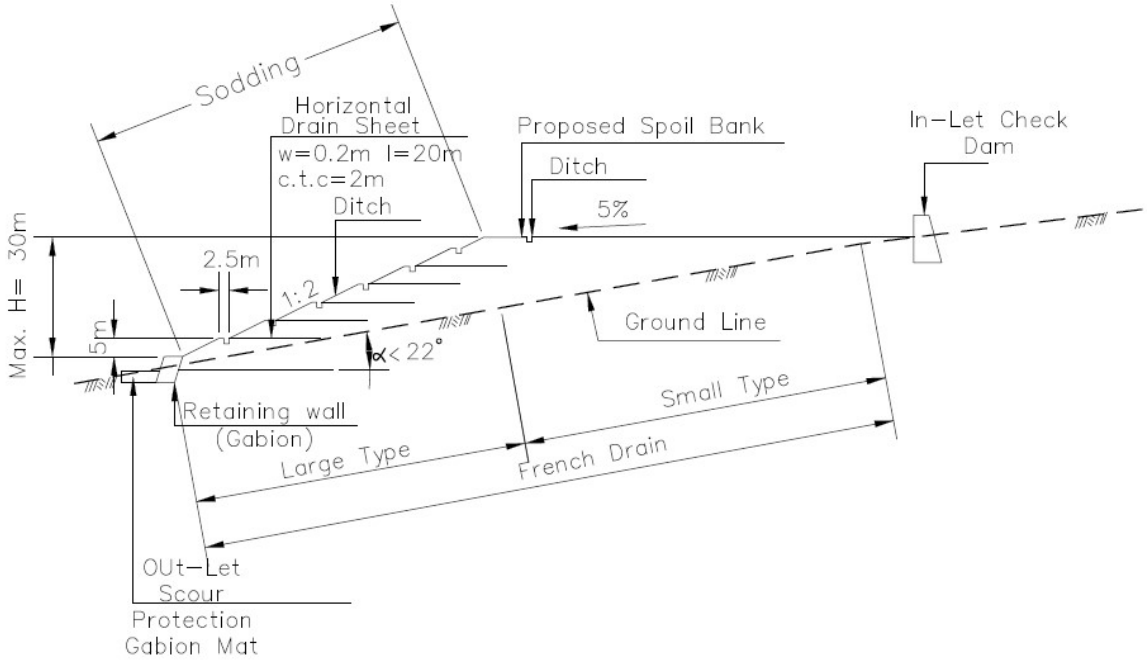


Figure-1(b): Typical Arrangement for Spoil Banks: Profile

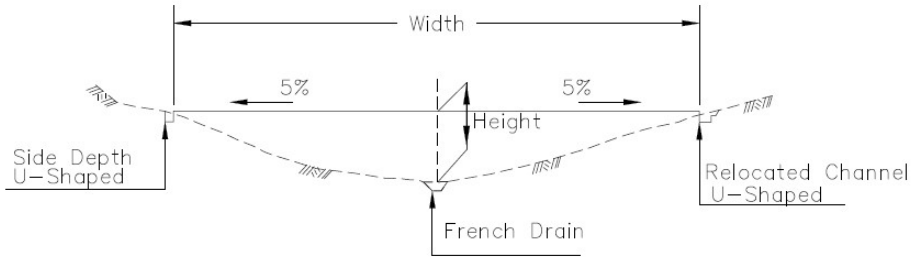


Figure-1(c): Typical Arrangement for Spoil Banks: Cross Section of French Drain

h. Supplementary Works in Case of Disasters by Landslides

The works to be performed in the event of disasters due to landslides, slope failure or soil/rock collapses, etc. occurred during the construction period shall be treated by the Contractor under the following conditions and requirements:

- The material from the disaster area which is disrupting the traffic or operation of the Project road shall be removed and treated as unsuitable material, and shall be disposed in a Spoil Bank in accordance with these specifications.
- The slopes remaining after the effect of the disaster shall be re-arranged and the affected drainages shall be reestablished.
- The quantities and costs for these works will be deemed to be covered in the quoted price and no separate or additional payments will be made under this account.

3.2 Design and Construction Specification for Slope Prevention Works

Slope protection of NH54 shall be designed in accordance with requirements and design conditions described in these Specifications and the requirements specified by IRC: SP 102-2014: "Guidelines for Design and Construction of Reinforced Soil Walls" as applicable. The preliminary design drawings are to be used as per reference.

3.2.1 Sub-Surface Drainage

a. General

In conducting groundwater drainage works, it is important to investigate groundwater conditions, surrounding facilities, etc. beforehand in consideration of its purpose.

b. Planning

The sub-surface drainage shall be able to drain promptly the groundwater that is affecting the landslide activity, taking it to in/outside of the landslide.

The following items shall be considered for preparation of the planning for sub-drainage drainage:

i) Implementation of boreholes of a diameter of 66mm or more to drain shallow groundwater.

ii) The free groundwater shall be drained during the time of rain.

iii) The planned height for groundwater drawdown shall be about 3 m at the landslide layer thickness of about 20 m.

iv) Evaluation of the effect shall be made taking into account the water level before construction, the water level after construction, and the amount of discharge water.

c. Investigation

The groundwater investigation shall be conducted during the rainy season and the dry season and grasp the groundwater level affecting the landslide activity.

The investigation on the groundwater level shall be conducted by using boring holes carried out on the landslide that will be treated.

d. Save Record

Changes in the groundwater level shall be recorded and kept by the responsible person in order to contribute to the evaluation and engineering judgment of the effect of the design / countermeasure work.

e. Material

The following material and respective method for application shall be used:

i) *Groundwater Drainage*: Strainer-processed drainage pipes shall be inserted.

ii) *Drainage Pipe*: PVC pipe (VP-50 [outer diameter 60 mm, inner diameter 51 mm]) shall be used.

iii) *Strainer*: The strainer or slotted type shall be processed for the total length. The diameter of strainer is 2 to 5 mm.

iv) *Protection of Strainer*: Strainers shall be wrapped or covered with a polyethylene sheet for protection to prevent from clogging and disruption.

f. Design and Construction

The design and construction of sub-surface drainage shall apply the following basic procedure or method:

i) Placement in-site of the drainage pipes

ii) Radial or parallel arrangement of the drainage pipes without affecting to other facilities located nearby or around the area

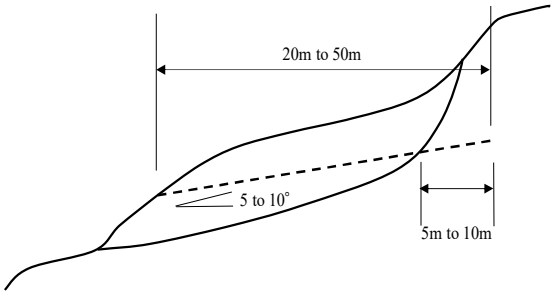
iii) Confirmation of the angle for installation of the drainage pipes. Drainage pipes shall be installed upwardly 5° to 10°.

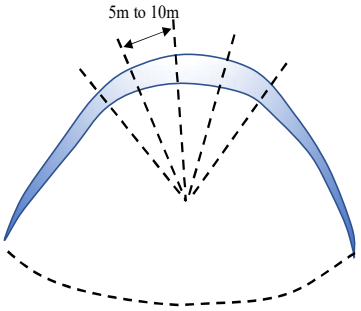
iv) Confirmation of the length of drainage pipes:

- All pipes shall be about 20m to 50m long
- The pipes shall be inserted into the sliding surface in 5m to 10m and shall be installed with a spacing of 5m to 10m

vi) Protection of drilling mouth

- The drilling mouth shall be set on a stable ground.
- To install gabions or concrete walls so that the discharged water does not wash out sediment around the drain outlet.





g. Maintenance

The works for maintenance of the drainage system shall take into account the following main items:

i) Inspection of drainage operative efficiency

The main objective of the groundwater drainage system is to drain promptly all the groundwater at the time of heavy rain.

In order to secure the drainage in good and efficient operative efficiency conditions, periodically inspection is necessary to observe the quantity of drained water immediately after heavy rain to confirm the landslide activity and drainage function.

The period for periodically inspection shall be about 3 to 5 years.

ii) Inspection of drainage pipe

After 10 years or more, the drainage pipe might be clogged at the drilling mouth by the effect of ferric oxide. Therefore, it is necessary to perform regularly inspection of the facilities that have been over operating 10 years or longer period.

Based on the results of the inspection, after confirmation of the existence or absence of clogging, the works for cleaning and washing shall be applied as necessary.

h. Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- IRC: Special Report: State of the Art: Landslide Correction Techniques. Sub-Clause 7.8

- IRC: SP 48 -1998: Hill Road Manual. Sub-Clause 11.6.3

3.2.2 Rockfall Prevention Fence and Rockfall Prevention Retaining Wall

a. Rockfall Prevention Fence

✧ General

Rockfall prevention fence is a countermeasure installed besides the road to prevent against the rocks falling from the slopes.

For the design of rockfall prevention fence, it is necessary to assume the external forces that will be applied on the structure. The assumed falling-rock weight, falling speed, direction of action on the protection fence, action position, etc. are different depending on the topography, geology, weathering condition of the slope, and vegetation on each site. Therefore, in designing a rockfall prevention, it is necessary to estimate the value that seems to be the most appropriate on the basis of the investigation at the site and experience of falling rocks in the past.

✧ Design Concept

Rockfall prevention fences are effective as countermeasures against falling rocks of relatively small scale, and the type and size shall be determined according to the situation of the slope. Rockfall prevention fences have the following types:

i) *Wire Rope and Wire Mesh Type*: Using H steel as a support, wire rope and wire mesh are attached to it.

ii) *H Steel Type*: H steel is used as a support, horizontal steel of H steel and expanded metal are attached, and usually old tires are applied as cushioning material.

iii) *High Energy Absorption Type*: A mechanism that easily absorbs energy by elastic-plastic deformation of members such as net (wire mesh), wire rope or strut is incorporated.

✧ Load

The load is the falling-rock load. The falling-rock for design is assumed as a rock with a maximum diameter of 50 cm, a falling height of 10 m or less (within the site range), and with an unit volume weight 26 kN/m3.

✧ Allowable maximum displacement amount and possible absorbed energy

Allowable maximum displacement amount and possible absorbed energy shall be calculated.

b. Rockfall Prevention Retaining Wall

✧ General

Rockfall Prevention Retaining Wall is usually built as gravity type concrete retaining wall. The basic idea is to convert the kinetic energy of the falling rock into deformation energy of the supporting ground and to stop the falling-rock by absorbing it.

For the design, it is necessary to consider the stability of the *Rockfall Prevention Retaining Wall* and reinforcement of the cross section of the structure, taking into consideration the topography and geology as well as the expected falling rock weight, falling height.

✧ Stability of Retaining Wall during Rockfall Collision

Stability of retaining wall during rockfall collision shall be considered.

✧ At Ordinary Times, At Deposition, During Earthquake

Stability of retaining wall at ordinary times, at deposition, during earthquake shall be considered.

c. Applicable Design Standard

The following are IRC Specifications, Standards and Design codes majorly applied for the design;

- IRC: Special Report State of the Art: Landslide Correction Techniques. Sub-Clause 7.3.6 and Sub-Clause 7.9
- IRC: SP 48 -1998: Hill Road Manual. Sub-Clause 8.2.1
- IRC: 78-2014 Standard Specifications and Code of Practice for Road Bridges Section VII Foundation and Substructure (Revised Edition). Sub-Clause 710.7
- IRC: 24-2010 Standard Specifications and Code of Practice for Road Bridges Section V Steel Road Bridge (Third Revision). Clause 502.

The following specifications of JIS (Japanese Industrial Standards) or equivalent shall be applied for the materials:

- JIS G 3101: H steel
- JIS G 3525: Wire rope
- JIS G 3552: Wire net

3.2.3 Anchor Works

a. Design

✧ General

i) In designing an anchor, consideration should be given to safety, workability and economic efficiency so as to conform to the purpose, and to have no harmful influence on surrounding structures, buried objects and so on.

ii) In designing an anchor, in principle, a basic test shall be conducted. If it cannot be carried out before design, it shall be carried out immediately after the start of construction to confirm the validity of the design.

✧ Investigation

i) General investigation: (investigation other than geotechnical investigation)

- literature investigation
- investigation of adjacent structures and their influence
- investigation of buried objects of underground
- surrounding investigation
- investigation of construction conditions.

ii) Geotechnical investigation:

- Investigation on corrosion
- Investigation for design anchor force
- Investigation for finding the installation position of anchor bodies
- Investigation for finding the extreme pull-out force of anchor
- Investigation for design of reaction force body
- Investigation on workability
- Investigation of groundwater

iii) Basic investigation test:

- Pull out test (test to set limiting friction resistance and ultimate bearing resistance of the ground)
- Long term test (Test to presume of decrease tendency of residual tensile force of anchor planned for important structures)

iv) Save record:

- Materials related to the investigation of anchor shall be kept by the responsible person.

✧ Material

i) General:

- Materials shall comply with the IRC's prescribed standards, international standards, Japanese Industrial Standards or equivalent approved by the Authority's Engineer.
- When materials used for anchors are being assembled, materials that do not affect adversely to other materials shall be used.

ii) Grout:

- Cement-based grout: Cement shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH.
- When grouts other than cement-based grout are used, those having required quality and performance shall be used.

iii) Tendon

- Materials of tendon shall conform the requirements of Section 1009 of the Specifications for Road and Bridge Works of MORTH. Also, it shall obtain approval from the Authority's Engineer.
- When steel material is used as a tensile material constituting tendon, it is necessary to use one conforming to the standards and standards of public institutions (JIS G 3536-2008, JIS G 3109-2008, JIS G 3137-2008).
- When continuous fiber reinforcement material is used as a tensile material constituting tendon, it is necessary to use one conforming to the standards of JSCE-E 131-1999 (Japan Society of Civil Engineering).

iv) Fixture

- The fixture shall have a structure and strength that does not break or impair the performance of the anchor before the tensile material is broken.
- The fixing tool shall have a structure adapted to the structure and purpose of use.

v) Other materials

- Head Cap: The head cap shall protect the anchor head and shall have a leak prevention function and strength and durability of the anticorrosive material.
- Bearing Pressure Plate: The bearing pressure plate shall have a shape and strength suitable for the fixture and the structure.

- Sheath: The sheath shall have undamaged abrasion resistance and strength, durability and water tightness against harmful substances when assembling, transporting, inserting and grouting of the tendon.
- Others: The other materials shall be of a shape and material that does not interfere with the function of the anchor, depending on the type of anchor and purpose of use.

✧ Corrosion protection

i) General:

Considering the corrosive environment around the structure, the service period and the importance of the structure, the anchor shall be ensured corrosion prevention so that the function of the anchor is maintained during its use period.

ii) Anticorrosive materials:

The following, or others proposed by the Contractor and approved by the Authority's Engineer, are the applicable anticorrosive materials:

- Filler: Greases, petrolatums, synthetic resins are often used.
- Covering material (sheath): Synthetic resin (polyethylene, polypropylene, etc.), stainless steel, steel materials and so on.
- Coating material: Galvanizing, anti-rust plating, epoxy material and so on.

iii) Anticorrosion method

- The anticorrosive structure of the anchor body shall not interfere with the structure of the anchor body which transmits the tensile force to the ground.
- Corrosion protection of the tension part should be a structure that combines the sheath and other anticorrosive material and shall be able to follow the change of the tension.
- The anti-corrosion structure of the anchor head shall not interfere maintenance and management such as lift-off test or re-tension.
- Since the risk of corrosion is particularly high at the boundary between the tension part and the anchor body or between the tension part and the anchor head part, corrosion protection shall be performed in a reliable manner.

✧ Design

i) Anchor arrangement

- *Anchor arrangement plan*: Anchor placement shall be planned taking into consideration the overall stability including the surrounding ground of the structure fixed by the anchor, the influence on the adjacent structure, the geology and so on.
- *Tilt angle of anchor*: The tilt angle of anchor shall be determined to ensure that a given anchor can be constructed. But, angles between -5° and + 5° may effect on the anchor strength by residual slime or grout breathing, so this range should be avoided.
- *Anchor body installation interval*: The installation interval of the anchor bodies shall be determined in consideration of the interaction of the anchors. Generally, an interval of 1.5 m or more shall be secured.

ii) Anchor length

- *Anchor Free Length*: In principle, the minimum length of the anchor free length shall be 4 m, and the anchor free length shall be determined in consideration of the thickness of the earth covering, the stability of the entire structure system and so on.
- *Tendon Free Length*: Tendon's free length shall be determined to allow for deformation and to ensure the required tension.
- *Anchor length*: In principle, the length of the anchor is 3 m or more and 10 m or less, and it shall be determined in consideration of the drawing force of the ground and grout, and the binding force of grout and tendon.

iii) Anchor body

The anchor body shall have a required strength and durability during tension or service period and have a structure that can reliably transmit the anchor force to the ground. The compressive strength of grout such as cement paste and mortar used for anchor bodies shall be 24N/mm^2 or more in consideration of durability against deterioration of grout during service period.

iv) Anchor head

- The anchor head, that is, the fixing tool and the pressure bearing plate is a part provided for reliably transmitting the anchor force to the structure or the ground. It shall have a required strength against the anchor force and be a structure that does not cause harmful deformation.

- The anchoring force decreases with time due to creep of the ground and relaxation of the tensile material. Therefore, when it can be predicted that re-tension is required, the tensile material constituting the tendon shall use a tensile margin which has sufficient length or a fixing tool which can be re-strained.

v) Anchor force

- The design anchor force (Td: the tensile force used for the design): Td shall not exceed the allowable anchor force (Ta).
- The allowable anchor force (Ta) shall be examined for the following three items, and the smallest value shall be adopted:

  ◆ Tendon allowable tensile stress (Tas)

  The tendon allowable tensile force (Tas) shall be set to a smaller value among the Tendon's ultimate tensile force (Tus: the tensile force obtained from the maximum test force prescribed by JIS such as steel used for tendon) and the tendon's yield tensile force (Tys: the tensile force obtained from the test force against 0.2% permanent elongation prescribed by JIS such as steel used for tendon) multiplied by the reduction rate.

  ◆ Allowable binding force of Tendon (Tab)

  Tendon's allowable binding force (Tab: the value obtained by dividing the ultimate binding force of Tendon by the safety factor) shall be a value considering the stress transmission method from tendon to grout material and design standard strength of grout material.

  ◆ Allowable pull-out force of anchor (Tag)

  The allowable pull-out force (Tag) of the anchor shall be a value obtained by dividing the ultimate pull-out force (Tug: the value at which the resistance due to adhesion, friction or bearing occurring between the ground and the anchor body becomes the ultimate limit state) of the anchor by the safety factor.

vi) Tension force at fixing time

The tension force at fixing time shall be determined depending on the purpose of use, considering the stability of the entire structure including the ground.

- *Initial tensile force*: Maximum tensile force when tensioning and fixing the anchor head.

- *Tension force at fixing time*: Tensile force acting on tendon after fixing time is completed.
- *Residual tensile force*: It is the tensile force that ultimately acts on tendon due to ground creep, relaxation of tensile material, and other external forces.

vii) Basic investigation test

- *Pull-out test*: The pull-out test is carried out to confirm the ultimate pull-out force of the anchor and its behavior, and to determine various constants parameters used for anchor's design. For the anchor used in the pull-out test, the specifications of the anchor shall be specified so that the ultimate pull-out force can be confirmed.

  From the test results, it is possible to calculate the ultimate skin friction resistance (τa) or the ultimate bearing resistance (qu) of the anchor body.

  - Test Anchor

  The test anchor shall be carried out in the same way as the anchor to be used. The planned maximum load shall be planned so that ultimate destruction occurs between the ground and the anchor body and can be pulled out.

  - Loading Method

  The loading method shall be carried out in a multi-cycle system in which the relationship between load and elastic displacement amount and plastic displacement amount can be obtained. The number of cycles is decided by the responsible technician's judgment.

- *Long term test*: Long term tests are performed to confirm the long-term behavior of the anchor and to determine the constants used for designing the anchor. The test anchor used for the long-term test shall be carried out with an anchor constructed under the same use conditions as the actually-used anchor
- *Test load*: The maximum load for test shall be as follows:
  - PC steel material: yield tensile load × 0.9 or less
  - Continuous fiber reinforcement material: ultimate tensile load × 0.75 or less

b. Construction

✧ General

In anchor construction, ground conditions, environmental conditions, construction contents and on-site construction conditions shall be grasped to ensure safety, disaster prevention

and the surrounding environment conservation. In addition, construction plans shall be formulated to satisfy the design specifications and obtain appropriate quality. Construction shall be carried out by specialized workers under the guidance of responsible technicians who have sufficient knowledge and experience regarding anchors.

✧ Construction plan

i) When constructing an anchor, a construction plan document that defines the construction method, construction management method, and management standard at each construction stage shall be prepared in order to construct an anchor that satisfies the design specifications.

The standard items described in the construction plan document are as follows:

- construction purpose
- construction outline
- plan/design condition
- process
- construction management organization table
- equipment used
- material used
- temporary plan
- work procedure, construction procedure
- construction management, quality control plan
- safety management plan
- technical document, brochure, etc.
- others

ii) The construction plan should take into consideration safety and environmental conservation at the site and its surroundings, and maintenance and management of the anchor.

✧ Construction and construction management

i) Construction and construction management of anchors shall be implemented based on the construction plan.

ii) In the construction of anchors, if a situation different from the conditions assumed at the time of planning occurs, it is necessary to promptly investigate the cause and take appropriate measures as necessary.

✧ Material storage

i) The materials to be used (fixtures, tendons, other materials for processing) shall be kept so as not to impair their functions. The storage location should be level so as not to touch the ground. In addition, it is necessary to take into consideration not to adversely affect the quality due to adhesion of rain water, moisture, salt, mud and the like.

ii) At the time of storage of materials, safety data sheets such as material chemical substances (injection material, rust preventive material, waterproof material, etc.,) should be clearly showed so that the workers can view them at any time as necessary.

✧ Drilling

i) Drilling of the anchor shall satisfy the control value specified in the construction plan concerning the position, hole diameter, length, direction, etc. indicated in the design documents. In drilling, the following points shall be considered:

- The drilling method shall be able to prevent the collapse of the hole wall and be adopted a method that can reliably perform tendon insertion and grout injection. For this reason, it is necessary to select an appropriate method with casing drilling as a standard.
- The control value of drilling precision shall be determined in consideration of the importance of the structure, purpose of use, anchor specification, etc. so that the anchor will not adversely affect other existing structures. Also, it is necessary to set so that the anchors to be constructed do not interfere with each other.
- It is necessary to estimate the position and layer thickness of the installation ground of the anchor body based on the color / state of the slime discharged during drilling and the drilling speed, etc., and to confirm the validity as the installation ground.

ii) If there is concern about the influence on the surrounding ground due to the drilling of the anchor, it shall be prevented by an appropriate method.

iii) In the case where the groundwater level is higher than the drilling mouth, or in the case of artesian water, spouting of considerable water or sediment is assumed from the drilling mouth during the anchor construction, and the state that adversely affects the quality of grout of the anchor body is presumed. If such a situation is assumed, appropriate measures shall be taken to prevent this condition until the anchor body is completed.

iv) Cleaning in the drilling hole shall be carried out by a method using fresh water or air depending on ground conditions and construction

conditions. Drilling of soft rocks with slaking properties such as mudstone and tuff shall be taken care as drilling surfaces tend to become muddy and there is a possibility that prescribed skin friction resistance cannot be obtained.

v) In the case of the ground such as gravel, talus or rocks with many cracks, there is a concern that grout of the anchor body may flow out into the ground. In this case, it is necessary to conduct pre-injection with grout.

✧ Assembling and processing Tendon

i) Tendon shall be assembled so as not to impair its function based on design specifications. Since assembly and processing are carried out using parts such as a sheath and a centralizer, each component shall be handled carefully.

ii) Tendon shall ensure the covering of the predetermined grout and assemble to be located it in the center of the hole.

iii) Cutting of tendon is not a method of applying heat such as gas cutting, but it shall be done using a disk cutter and so on so as not to impair its characteristics.

✧ Tendon handling

Tendon shall be handled carefully so as not to scratch, bend sharply, or destroy anticorrosive material. The tendon of the anchor body to which the grout adheres shall be handled carefully so as not to adhere to the oil or soil that impairs the function.

✧ Insertion and retaining of Tendon

Insertion of the tendon shall be performed precisely in a predetermined position so as not to cause harmful damage or deformation and hold the tendon so as not to move until the grout hardens.

✧ Injection

The injection is performed by replacement injection, pressurized injection and filling injection.

i) Substitution Injection:

Replacement injection shall start from the lowest part of the anchor hole in order to smooth drainage and exhaust air in the hole. The work shall be carried out continuously without interruption until the grout having the same properties (the same degree of concentration) as the injected grout is discharged from the drilling mouth.

ii) Pressurized injection:

Methods of pressurized injection include casing pressurization and packer pressurization. The injection shall be carried out by using an

appropriate method according to the ground conditions around the anchor body.

iii) Filling Injection:

This purpose is to increase the anticorrosion function of the free length part by filling the gap between the outside of the anchor free long sheath and the ground with grout, and to control the looseness and weathering of the ground around the hole wall.

✧ Curing

The anchor shall be cured so as not to adhere foreign matter or not to receive deformation and vibration such as impairing function during the period from the end of the grout injection to the tension of the tendon and from the fixing to the head treatment.

✧ Tension and fixings

i) After the grout reaches the predetermined strength, the predetermined test load and displacement characteristics shall be confirmed by the aptitude test / confirmation test, and the initial tensioning force shall be introduced to obtain the required residual tensile force.

ii) The anchor head fixing work shall be carried out so as to obtain a predetermined fixing tension force. The allowable error of the installation angle at the anchor head shall be ± 5 ° or less.

iii) The initial tensile force shall be determined taking into consideration the set amount (the length by which the tension material is drawn in fixing the anchor).

iv) The tensioning device shall be calibrated.

✧ Head treatment

i) On the back of the anchor head, head treatment shall be carried out in the manner shown in the design documents before tensioning / fixing in order to prevent corrosion at the boundary between the anchor head part and the free length part of the anchor.

ii) The head treatment of the anchor shall be carried out quickly after tension and fixing for the purpose of corrosion prevention and protecting of the anchor head. Specifically, the anchor head shall be covered with a cap, and the cap shall be filled with an anticorrosive material such as rust preventive oil.

✧ Record

At the stage of anchor maintenance management, necessary data shall be recorded and saved.

✧ Acceptance inspection

i) Aptitude test

The aptitude test is carried out in order to check whether the design and construction of the anchor are appropriate from the load-displacement amount characteristic by loading up to a predetermined load in multiple cycles with an anchor to be actually used.

The test shall be selected from a part of the anchors actually used and shall be 5% of the construction quantity and 3 or more in consideration of the ground on which the anchor body is installed, the specifications of the anchor, the setting method.

ii) Confirmation test

The confirmation test is carried out to load the anchor actually used up to a predetermined load in one cycle and to confirm that the anchor is safe against the designed anchor force. The anchor used for the confirmation test shall be carried out against all anchor except for the anchor used for the aptitude test.

✧ Maintenance and management

i) General

- The anchor shall be conducted inspections and investigations, etc. systematically, to maintain the original function. Inspections are basically based on periodic inspections, but if abnormal weather such as heavy rain or earthquakes occurred, they shall be checked promptly as necessary.
- As a result of inspection, if it is judged necessary, soundness investigation should be carried out, and appropriate measures shall be taken against anchors considered to be problematic in soundness.

ii) Inspection of anchor

- *Inspection item*: It shall be decided in consideration of the site situation.
- *Duration and Frequency of Inspection*: The inspection shall be continued, and its frequency shall be determined in consideration of the anchor's purpose, application, circumstances, etc.
- *Records*: It is necessary to record the inspection result and evaluate it. Based on that, it is necessary to judge whether further detailed soundness investigation is necessary or not.

iii) Soundness investigation of anchor

- *Investigation method*: As for investigation of soundness of anchor, preliminary investigation shall be carried out and gather materials necessary for planning soundness investigation. Based on that, it is necessary to select an

appropriate method considering the condition of the target anchor and the site conditions, etc. The soundness investigation plan shall be planned in detail in consideration of safety and environmental conservation at the site and its surroundings, regarding the implemental method of investigations and tests and the construction management method. The investigation and test items of the soundness investigation are as follows. a) visual inspection in head detail investigation, b) exposure investigation in head detail investigation, c) lift-off test, d) head back investigation, e) monitoring

- *Evaluation of investigation results*: The necessity and method of countermeasures shall be considered by evaluation of soundness from the investigation results.

iv) Measures

The countermeasures shall be planned after clarifying the purpose of durability improvement measures, repair / reinforcement, renewal, etc.

v) Record

Maintenance records related to inspection / soundness investigation / countermeasures shall be preserved during the service period of the anchor.

c. Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- IRC: Special Report: State of the Art: Landslide Correction Techniques. Sub-Clause 7.3
- Ministry of Road Transport & Highways: Specifications for Road and Bridge Works (Fifth Revision) 2013; Section 1700: Structural Concrete.

Followings are design and construction standard of Japanese Geotechnical Society and Anchor materials of JIS (Japanese Industrial Standards). The materials shall be JIS or equivalent.

- Ground anchor design and construction standard: JGS 4101-2012 (Japan Society of Civil Engineering).
- Concrete standard specifications: Civil Engineering Society

3.2.4 Rock Bolt Works

a. Design

✧ General

It is a feature to stabilize the slope by the reinforcement effect of the ground by reinforcing material.

✧ Material

Materials shall comply with the IRC's prescribed standards, international standards, Japanese Industrial Standards, and/or equivalent, and with the approval of the Authority's Engineer.

i) Reinforcing material

- Reinforcing material shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH.
- The reinforcing material shall have a predetermined tensile strength, flexural rigidity and durability.
- The reinforcing material shall be a fully threaded hollow bar steel (self-piercing rod: JIS G 4051 or equivalent: permissible load of 129 kN, yield load of 196 kN) or full screw steel (SD 490-D 22: JIS G 3112 or equivalent: permissible load of 96.8 kN, Yield load 190 kN) shall be used.
- In order to ensure durability, the reinforcing material shall be subjected to surface treatment (hot dip galvanizing treatment, etc.).

ii) Bearing pressure plate

- The bearing pressure plate shall have a predetermined strength (JIS G 3101 or equivalent).
- In order to ensure durability, the bearing pressure plate shall be subjected to surface treatment (hot dip galvanizing treatment, etc.).

iii) Injection material

- The injection material shall ensure pulling resistance force, and shall be superior adhesion, fast strength.
- For cement used for injection material, ordinary Portland cement (JIS R 5210 or equivalent) or blast furnace cement (JIS R 5211 or equivalent) shall be used.

✧ Design

The design of the lock bolt shall be designed so that stability is ensured by sufficient consideration of ground conditions, groundwater condition, surrounding structures etc.

i) Fixing length

The fixing length of the reinforcing material shall be set so as to satisfy the required deterring force against the assumed surface collapse.

ii) Installation angle of reinforcing material

The installation angle of the reinforcing material shall be perpendicular to the sliding surface. However, on a natural slope, it shall be perpendicular to the average slope gradient.

iii) Length of reinforcing material

The length of the reinforcing material shall be equal to or more than "assumed collapse layer thickness + fixing length + surplus length".

b. Construction

✧ General

i) In rock bolt construction, ground conditions, environmental conditions, construction contents and construction conditions shall be grasped to ensure safety, disaster prevention and the surrounding environment conservation.

ii) Construction plans shall be formulated to satisfy the design specifications and obtain appropriate quality.

iii) Construction shall be carried out by specialized workers under the guidance of responsible technicians who have sufficient knowledge and experience regarding rock bolt.

✧ Construction plan

i) When constructing the lock bolt, a construction plan shall be prepared to satisfy the design specifications. The standard items described in the construction plan document are as follows.

- construction purpose,
- construction outline
- plan / design condition
- process
- construction management
- quality control plan
- safety management plan
- technical document, brochure

ii) The construction plan should take into consideration safety and environmental conservation at the site and its surroundings, and maintenance and management.

✧ Construction and construction management

i) Construction and construction management of rock bolt shall be implemented based on the construction plan.

ii) In the construction of rock bolt, if a situation different from the conditions assumed at the time of planning occurs, it is necessary to

promptly investigate the cause and take appropriate measures as necessary.

✧ Drilling

Drilling methods include self-drilling, rotary drilling and leg hammer drilling. Drilling shall select an appropriate excavator in consideration of geological and topographical conditions. Drilling shall be carried out based on the design drawing and guided by the Authority's Engineer.

✧ Insertion of reinforcing material

Immediately after the excavation is completed, the lock bolt shall be easily inserted into the borehole to the specified depth. Materials "oil, mud, rust" that reduce the adhesion between lock bolt and grout shall be cleaned before insertion. When using a casing, a spacer shall be attached so that the reinforcing material is arranged in the center of the hole so that mud etc. does not adhere.

✧ Injection

i) Before grout injection, air shall be sent to wash the inside of the hole.

ii) Injection is carried out from the bottom of the hole and shall be injected until the cement milk is discharged from the hole mouth.

iii) The water cement ratio is 40% to 50%.

✧ Curing

After the grout injection is completed, the lock bolt shall be cured so as not to receive deformation or vibration that may impair the function.

✧ Acceptance inspection (Confirmation test)

i) In order to confirm whether or not the fixing power of the reinforcing material satisfies the design value, an acceptance inspection (confirmation test) shall be carried out.

ii) The number of tests shall be 3 or more and 3% or more of the total number.

iii) The maximum test load shall be the design load, but it shall not exceed 80% of the allowable stress degree.

iv) The load cycle shall be a single cycle.

✧ Head treatment

i) A bearing pressure plate shall be installed on the reinforcing material head.

ii) The head of the reinforcing material shall be tightened with a nut.

iii) After tensioning, a cap filled with anticorrosive oil shall be installed.

✧ Record

The necessary data for maintenance and management shall be recorded and preserved.

c. Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- Ministry of Road Transport & Highways: Specifications for Road and Bridge Works (Fifth Revision) 2013

3.2.5. Crib Works

a. Design

✧ General

The crib works is a construction method aimed at stabilizing the slope by creating a continuous lattice frame against cutting surfaces and natural slopes. In the grating crib works for stabilizing the slope, there are a shotcrete grating crib works and a cast -in -place grating crib works.

✧ Material

i) General

Materials shall comply with the IRC's prescribed standards, international standards, Japanese Industrial Standards, and equivalent, and with the approval of the Authority's Engineer.

ii) Cement

- Cement-based grout: Cement shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS R 5210, or equivalent.
- When cement other than ordinary Portland cement is used, it must be confirmed that required performance can be obtained beforehand.

iii) Aggregate

- Aggregate shall be clean, rigid, durable and suitable particle size, and free of dirt, mud, organic impurities, chloride, etc.
- Aggregate shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS A 5005, or equivalent.
- The sand used as fine aggregate shall have a dry density of 2.5 g/cm3 or more and a water absorption of 3.5% or less.

- The fine aggregate shall be chemically and physically stable.
- Hazardous aggregate showing alkali silica reaction shall not be used.

iv) Admixture

- The admixture shall be of quality assured.
- AE agent, water reducing agent and AE water reducing agent used as admixture shall be one conforming the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS A 6204, or equivalent.

v) Reinforcing Streel

- Reinforcing steel shall conform the requirements of Section 1000 of the Specifications for Road and Bridge Works of MORTH or JIS G 3112, or equivalent.
- Reinforcing bars to be used shall use the ones shown in the design drawing.

vi) Wire Mesh and Formwork

- For wire mesh used for shotcrete grating crib works, rhombus wire mesh conforming to JIS G 3552 or welded wire mesh conforming to JIS G 3551 or equivalent shall be standard.
- The material of the formwork for shotcrete shall be selected by checking the quality and carefully examining the construction conditions, spraying conditions, spraying materials, construction method, etc.

✧ Design

i) General

Based on natural conditions and field survey, the design of grating crib works shall be designed taking into consideration its type, function and scope.

ii) Load

- The load acting on the framework is its own weight (framework material and filling material), the assumed load of collapsed soil, ground reaction force.
- The design load shall be the value obtained by multiplying the working load by the load coefficient.

iii) Inspection

Inspection of the grating crib works shall be conducted according to a prescribed procedure (Reference: Designing and Construction

Guidelines for Grating Crib Works: Revised Edition 3rd Edition; 2013 National Specific Slope Protection Association).

b. Construction

✧ General

i) The construction of the shotcrete grating crib works shall be carried out in accordance with the construction plan in consideration of strength, durability, slope condition, environment etc. sufficiently, further considering the safety of the construction, construction environment, etc.

ii) Construction management shall be performed by a technician with sufficient knowledge concerning construction of the shotcrete crib works.

iii) Construction shall be carried out by specialized workers under the guidance of responsible engineers with sufficient knowledge and experience.

✧ Construction plan

i) When constructing the grating crib work, a construction plan shall be prepared to satisfy the design specifications. The standard items described in the construction plan document are as follows:

- construction purpose
- construction outline
- plan / design condition
- process
- construction management
- quality control plan
- safety management plan
- technical document, brochure

ii) The construction plan should take into consideration safety and environmental conservation at the site and its surroundings, and maintenance and management.

✧ Construction and construction management

i) Construction and construction management of rock bolt shall be implemented based on the construction plan.

ii) In the construction of rock bolt, if a situation different from the conditions assumed at the time of planning occurs, it is necessary to promptly investigate the cause and take appropriate measures as necessary.

✧ Assembling the formwork

i) Those that are likely to affect the quality of spraying mortar such as floating stones on the slope and the root system of vegetation shall be removed.

ii) The formwork shall be assembled so as to satisfy a predetermined standard.

✧ People who handles nozzle

Since the quality of the shotcrete mortar is affected by the skill of the person who handles the nozzle, the skill of that person shall be confirmed in advance.

✧ Spraying and surface treatment

i) At the time of spraying, the rebounding mortar shall be removed and cleaned.

ii) Surface treatment of the grating crib works shall be finished smoothly.

iii) After spraying, the interior of the frame shall be cleaned.

✧ Record

The necessary data for maintenance and management shall be recorded and preserved.

c. Applicable Design Standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design;

- Ministry of Road Transport & Highways: Specifications for Road and Bridge works (Fifth Revision) 2013

3.2.6. Non-Frame Works

a. Design

✧ General

i) The non-frame works is a construction method to stabilize the slope without cutting trees.

ii) This method is characterized by stabilizing the slope due to the reinforcement effect of the reinforcing material "lock bolt", the bearing pressure effect of the surface ground by the bearing pressure plate, and the group effect by head connection.

iii) Because the construction material is lightweight and easy to handle, it is excellent for steep slope construction.

✧ Material

i) General

Conform to the chapter on lock bolt.

ii) Reinforcing material

Conform to the chapter on lock bolt.

iii) Bearing pressure plate

Conform to the chapter on lock bolt.

iv) Head coupling material

- The head connecting material shall have sufficient strength to withstand the tensile force.
- Head connecting material consists of wire rope (JIS G 3525 or equivalent), turn buckle (JIS G 3445, JIS G 3101 or equivalent) etc.
- In order to ensure durability, the head connecting material shall be subjected to surface treatment (alloy plating, hot dip galvanizing treatment, etc.).

v) Injection material

Conform r to the chapter on lock bolt.

✧ Design

i) General

The design of the Non-frame works shall be designed so that stability is ensured by sufficient consideration of ground conditions, groundwater condition, surrounding structures etc.

ii) Arrangement of reinforcement

The arrangement of the reinforcing materials shall be arranged so as to draw an equilateral triangle such that the length of one side is 2 m in principle.

iii) Fixing length

Conform to the chapter on lock bolt.

iv) Installation angle of reinforcing material

Conform to the chapter on lock bolt.

v) Length of reinforcing material

Conform to the chapter on lock bolt.

vi) Bearing pressure plate and Head connecting material

Bearing pressure plates shall be arranged in an equilateral triangle shape and connected by a connecting material.

b. Construction

✧ General

Conform to the chapter on lock bolt.

- ✧ Construction plan

  Conform to the chapter on lock bolt.

- ✧ Construction and construction management

  Conform to the chapter on lock bolt.

- ✧ Positioning

i) The arrangement of the reinforcing materials shall be arranged so as to draw an equilateral triangle such that the length of one side is 2 m in principle.

ii) When the bearing pressure plate cannot be placed, it shall be positioned so that the length of one side is 3 m and the total of the three sides does not exceed 7 m.

- ✧ Scaffolding

i) The scaffold area shall be about 2 m × 2 m in the case of self-drilling.

ii) When the casing is used, the scaffold area should be suitable for the weight of the drilling machine.

- ✧ Drilling

  Conform to the chapter on lock bolt.

- ✧ Insertion of reinforcing material
  Conform to the chapter on lock bolt.
- ✧ Injection
  Conform to the chapter on lock bolt.
- ✧ Curing
  After the grout injection is completed, the lock bolt shall be cured so as not to receive deformation or vibration that may impair the function.
- ✧ Acceptance inspection (Confirmation test)
  Conform to the chapter on lock bolt.
- ✧ Head treatment
  Conform to the chapter on lock bolt.
- ✧ Head connecting material
  Head connecting material shall be properly attached to the bearing pressure plate and tensioned (the slack of the wire is less than 2cm).
- ✧ Record
  Conform to the chapter on lock bolt.

c. Applicable Design standard

Followings are IRC Specifications, Standards and Design codes majorly applied for the design:

- Ministry of Road Transport & Highways: Specifications for Road and Bridge works (Fifth Revision) 2013.

3.2.7. Reinforced Earth Wall

a. General

Reinforced earth wall shall be designed and constructed based on followings guidelines and specifications;

- IRC: SP:102-2014, Guidelines for Design and Construction of Reinforced Soil Wall
- MORTH Specifications for Road and Bridge works (Fifth Revision), 2013
- Japanese design or construction standards for reinforced earth walls or equivalent international standards as necessary

b. Elements of Reinforced Earth Wall

✧ Facing Elements

Facing elements shall be designed in accordance with IRC: SP:102-2014 and MORTH Specifications, 2013.

✧ Reinforcement Material

Reinforcement material shall be in accordance with IRC: SP:102-2014 and MORTH Specifications, 2013.

i) Drainage

In order to drain out the water remaining at back of reinforced earth wall, the filter material such as filter geofabric shall be provided properly as shown in the Drawings.

ii) Foundation

In order to avoid the stability failure of the structure, foundation of reinforced earth wall shall be embedded more than 0.5m into rock ground as shown in Drawings.

For reinforced earth wall installed at steep slope terrain, the foundation may be composed as multistage of base concrete as shown in the Drawing. In addition, rock anchors may be required to provide adequate structural stability in some case as shown in Drawing.

When such advanced foundation was applied, the design, material, construction methodology and etc. shall be proposed by the Contractor and require the approval by the Authority's Engineer.

iii) Others

For reinforced earth wall installed at steep slope terrain, it may be difficult to provide enough width of the wall at back side and length of reinforcement materials adequate without huge excavation of slope terrain. In such case, advanced structural details shall be considered in

order to reduce the wall width. One of the method to is "Reinforced soil wall by fixing reinforced material with anchor bar" as shown in the Drawings.

When such advanced method was applied, the design of each members, material, connection details, construction methodology and etc. shall be proposed by the Contractor and require the approval by the Authority's Engineer.

c. Design Principles

Basically, reinforced earth wall shall be designed in accordance with IRC:SP: 102-2014 and MORTH Specifications,2013. For the foundation and wall with advanced method applied, the design shall be proposed by the Contractor and require the approval by the Authority's Engineer.

d. Construction and Quality Control Tests

Basically, reinforced earth wall shall be constructed in accordance with IRC: SP:102-2014 and MORTH Specifications,2013. For the foundation and wall with advanced method applied, construction methodology and quality control tests shall be proposed by the Contractor and require the approval by the Authority's Engineer.

1. Table for Clause 3

Geometric design criteria of the Project Highway shall be in accordance with the Table below.

	Design Elements		Type/Value	Remarks
1	Highway Classification		National Highway	
2	Terrain Classification		Steep	
3	Design Speed (km/h)			
		Ruling (km/h)	40	
		Minimum (km/h)	30	
4	Cross-Sectional Elements	Basic Lane Width (m)	3.5	
		Number of Lanes	2	
		Formation Width (m)	12.0	
		Carriageway Width (m)	2 x 3.5	
		Outer Shoulder Paved Width (m)	2 x 1.5	
		Outer Shoulder Earthen Width (m)	2 x 1.0	
		Crossfall of Roadway (%)	2.5	
		Slope of Earthworks		
		Fill	V : H = 1:1.75	
		Cut (soil)	V : H = 1:1.2	Varies
		Cut (rock)	V : H = 1:0.2-0.5	Varies
5	Sight ist.	Stopping Sight Distance, SSD (m)	30 (45)	Figures in () corresponds to speed of 40km/h
		Intermediate Sight Distance, ISD (m)	60 (90)	
		Overtaking Sight Distance, OSD (m)	(165)	
6	Horizontal Alignment	Horizontal Curve		
		Absolute Minimum Radius of Horizontal Curve (m)	30	
		Ruling Minimum Radius of Horizontal Curve (m)	50	
		Widening of Carriageway on Horizontal Curves		
		Widening for Absolute Minimum Radius (20m-40m)	1.5	
		Widening for Ruling Minimum Radius (41m-60m)	1.2	
		Widening for Radius (61m-100m)	0.9	
		Widening for Radius (101m-300m)	0.6	
		Superelevation (Se)		
		Maximum Se for Absolute Minimum Radius (%)	7.0	
		Superelevation Runoff Rate	1/60	
		Transition Curve		
		Minimum Length for Absolute Minimum Radius (m)	30	
		Minimum Length for Ruling Minimum Radius (m)	20	
7	Vertical Alignment	Vertical Gradient		
		Ruling Gradient (%)	6.0	
		Critical length of continuous Ruling Gradient (m)	2000	120m rise in 2km for
		Limiting Gradient (%)	7.0	
		Exceptional Gradient (%)	8.0	
		Critical Length for Exceptional Gradient (m)	100	
		Minimum Gradient for Drainage (%)	0.5	Cut sections with lined
		Vertical Curve		
		Minimum Length of Vertical Curve (m)	15	
		Minimum Radius of Summit (Crest) Curve (m)		
		Absolute Minimum Radius (m)	205	From SSD
		Minimum Radius (m)	375	From ISD
		Desirable Minimum Radius (m)	1500	From OSD
		Minimum Radius of Valley (Sag) Curve (m)		
		Absolute Minimum Radius (m)	355	

2. Environment Management Plan

4.1 Overview

Descriptions of environment management measures during different stages of the project are provided in this chapter.

2.1.1. Pre-construction Stage

Required management measures during the pre-construction stage include the clearance of the ROW, plantation of trees, the measures for protecting/replacing community resources such as electric poles, public urinals and water points that are likely to be impacted. Their enhancement shall also be completed before construction work starts so that the community can start using these when the construction activity begins.

2.1.2. Construction Stage

This will be most crucial and active stage for the Environmental Management Plan (EMP). In addition to the monitoring of the construction activity itself to ensure that the environment is not damaged beyond permissible limits, the enhancement of cultural and community properties, mitigation and enhancement measures for water bodies through proper treatment of spoil soils will be undertaken as the construction progresses. To facilitate implementation of the enhancement and mitigation measures suggested, working drawings of the same have been provided in the Appendices. In addition, the provision of proper risk management with respect to construction activities such as accidental spillage is critical at this stage to avoid damage to flora and fauna, agricultural land and other sensitive resources. Typical locations of concerns include the locations of hot-mix plants (spillage of fuel, bitumen etc.) and labor camp sites.

2.1.3. Operation Stage

The operation stage will essentially entail monitoring activity along the project area. In addition to checking the efficacy of the protection/ mitigation/ enhancement measures implemented, this will help verify or refuse the predictions made as a part of the impact assessment. Thus, it will complete a very important feedback loop for the project.

2.2. Environment Management Plan for Mitigation of Negative Impacts

The detailed measures adopted and/or to be adopted during different stages of the project to mitigate negative impacts and enhance positive aspects are shown in Table. The responsibility for implementation and supervision of EMPs are vested with three agencies, namely Contractors, Branch Office (BO), and Authority's Engineer (AE). The Contractors herein mean the agency hired for execution of the construction works for the respective contract packages. BO would be implementation agency. The Figure below indicates implementation structure of the EMP.

In the given flow diagram "BO Aizwal" shall be read as "BO Shillong"

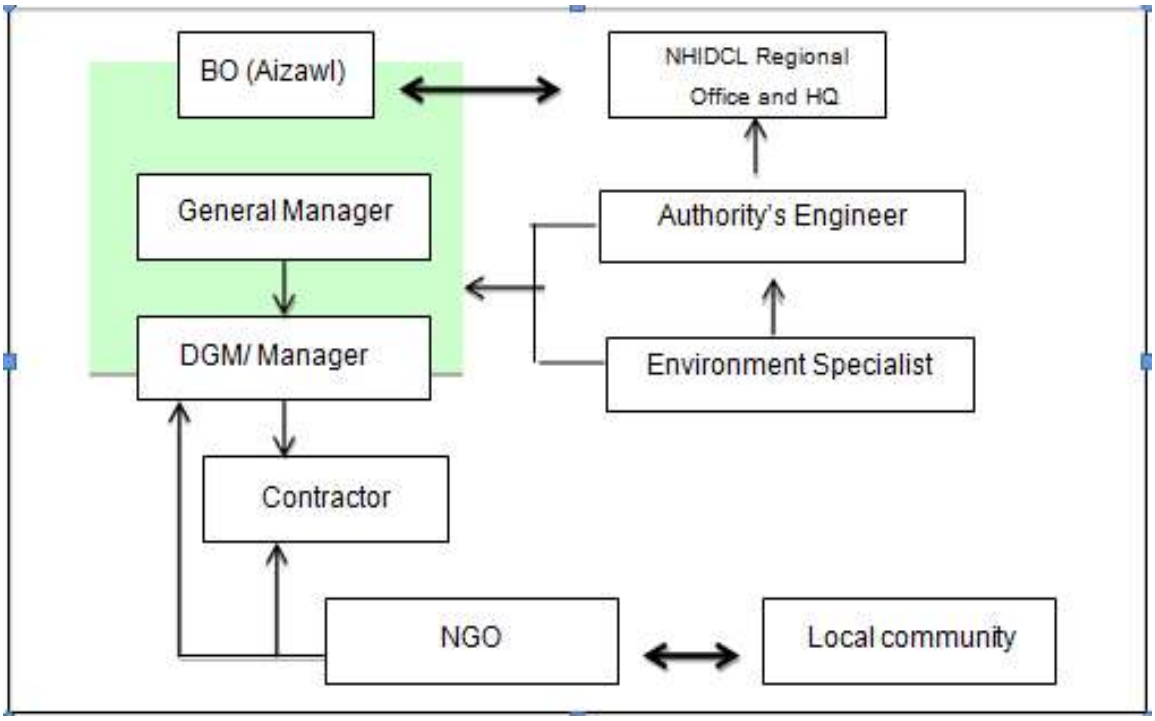


Fig: Institutional Arrangement for EMP Implementation

It has been proposed that General Manager (Projects) based in Shillong will be in charge for the implementation of EIA and EMP for this project. General Manager will be assisted by Deputy General Manager/Manager by Authority's Engineer (and Environment Specialist) and contractor.

The Authority's Manager are expected to have in-house capacity to advise on and supervise the implementation of the EMP including suggesting enhancement design options and modifications, as necessary. For this purpose, the Authority's Engineer will employ a full-time environmental specialist.

The NGO will be one of the stakeholders in the entire project cycle with primary responsibility of facilitating the implementation of RAP and help NHIDCL/State Government in mitigating the adverse impacts of the project. Meanwhile, they can play a role in successful implementation of EMP, for example by supporting afforestation activity and awareness-raising campaign for traffic safety/risk of HIV/AIDS among others. Compensatory plantation and maintenance and protection of vegetation will be required as part of environmental mitigation and enhancement works. Likewise, spoil soils shall be used, where possible, to create community assets such as playground as per request of the community. In these types of works, the project may engage NGO to liaise with local community for effective implementation of the project.

Table 4.1 Environmental Management Plan for Pre-Construction Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
P1	Relocation of Project Affected Persons (PAP)	• All requirements of the RAP as applicable shall be complete before start of construction stage. The activities broadly include acquisition of land and structures, relocation of utilities, payment of compensation and provision assistance	All areas	Before construction begins	Government of Meghalaya, District Revenue authorities, Village Councils, NGO	BO, AE
P2	Removal of vegetation	• Minimize the scale of vegetation clearing by factoring vegetation/forest cover in the final design of the road alignment process • Removal of trees to be carried out after forest clearance is obtained • Reforestation/replantation of trees at a term as instructed by the Forest Dept. or by the Forest Dept. • Activity shall be supervised to avoid poaching of animals	All areas	Before construction begins (Reforestration/replan tation may extend to during/after construction)	BO,Contractor, Forest Dept.	BO, AE, Forest Dept.

P3	Setting up construction camps	• Camps shall be located at least 500m away from the nearest built-up area. • Sewage system for a construction laborer's camp shall be designed, built and operated so that no pollution to ground or adjacent water bodies/ watercourses takes place. Garbage bins shall be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner, to the satisfaction of the relevant norms and the Engineer. • In relation to underground water resources, the contractor shall take all necessary precaution to prevent interference with such water resources. • All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 shall be adhered to.	All construction campsite identified by the contractor and approved by AE	During Establishment, Operation and Dismantling of Such Camps.	Contractor	BO, AE
P4	Setting up hot mix plants	• Hot mix plants and batching plants shall be located sufficiently away from habitation and agricultural operations. • Where possible such plants will be located at least 1000m away from the nearest habitation.	All hot-mix and batching plants	During Erection, Testing, Operation and Dismantling of Such Plants.	Contractor	BO, AE

P5	Finalizing sites for surplus soil dumping	• Location of dumping sites shall be finalized. The sites shall meet following conditions: i) dumping does not impact natural drainage courses; ii) no endangered/rare flora is impacted by such dumping	All areas identified as potential dumping sites	During mobilization	Contractor	BO, AE
P6	Identification of hazard-prone locations	• The contractor shall identify locations sensitive to landslides (in addition to the ones that area already identified) and shall duly report these to the Supervision Consultant (AE) and to BO.	All area	During mobilization	Contractor	BO, AE
P7	Identify and prepare relocation sites	• Location of relocation sites shall be identified in consultation with district/village authorities and PAPs. • Sites to be developed including provision of necessary utilities such as water and electricity.	Near villages with large-scale resettlement		BO	BO

Table 4.2 Environmental Management Plan for Construction Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
Soil						
C1	Soil Erosion in Borrow Pits	• The depth of borrow pits shall be restricted so that sides of the excavation shall have a slope not steeper than 1:4, from the edge of the final section of the bank. (if applicable)	On approved locations of borrow pits.	Construction Stage	Contractor and Authority's Engineer	BO
C2	Loss of top soil in Borrow pits	• Agricultural fields or productive land shall be avoided for borrowing earth. If unavoidable topsoil shall be preserved and used for tree plantation. (if applicable)	On approved locations of borrow pits.	Construction Stage	Contractor and Authority's Engineer	BO
C3	Compaction of Soil	• Construction equipment and vehicles shall be restricted to move only within designated area to avoid compaction of productive soil.	Throughout corridor.	Construction Stage	Contractor and Authority's Engineer	BO
C4	Soil erosion in embankments	• Pitching shall be done for slope stabilization as per the IRC guidelines (if applicable)	At the places of embankments	Construction Stage	Contractor and Authority's Engineer	BO
C5	Contamination of soil from fuel and lubricants	• Construction vehicles and equipment shall be operated and maintained in such a manner so that soil contamination due to its spillage shall be minimum. • Fuel storage shall only be done on wasteland and will be kept away from drainages channels and natural water bodies.	Near Labor camp And sites of installation of Construction machineries	Construction Stage	Contractor and Authority's Engineer	BO

C6	Contamination of land from construction waste and quarry materials	• Debris generated due to the dismantling of the existing pavement structure and the cutting of the hillside for the widening shall be suitably reused in the proposed construction, such as for fill materials for embankments. • Debris and other material obtained from existing embankment shall be dumped in approved landfill site already identified by concerned agency. All spoils shall be disposed off as desired and the site shall be fully cleaned before handing over. • Construction waste including non-bituminous and bituminous waste shall be dumped in approved landfill site identified by State Pollution Control Board (SPCB) or competent authority. All spoils shall be disposed off as desired and the site shall be fully cleaned before handing over.	Solid waste dump Site identified and approved by SPCB. or competent authority. Throughout the area	Construction Stage	Contractor and Authority's Engineer	BO
C7	Loss of top soil in land acquisition	• Topsoil shall be stripped, stored and shall be laid on ground for landscaping purpose. (if feasible)	Throughout the area	Construction Stage	Contractor and Authority's Engineer	BO
Water						

C8	Contamination of water by fuel/ oil spillage of vehicle	• Construction vehicles / equipment shall be operated and maintained in such a manner to avoid contamination of water bodies due to oil spillage. • Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies.	Near labor camp and sites of installation of Construction machineries.	Construction Stage	Contractor and Authority's Engineer	BO
C9	Contamination of stagnant water body by fecal matters from labor camp.	• Labor camp shall not be allowed near any of the water bodies. • The proper sanitation facilities shall be provided.	Preapproved locations away from the water bodies.	Construction Stage	Contractor and Authority's Engineer	BO

C10	Deposition of dust in open wells near construction site	• The mouth/opening of the well shall be covered with suitable material during any of the construction activity so as to prevent dust entering in the well.	All the wells along the project corridor.	Construction Stage	Contractor and Authority's Engineer	BO
C11	Using drinking water for construction purpose	• The contractor shall make arrangements for water required for construction in such a way that water availability and supply to nearby community is unaffected. • Wastage of water shall be kept minimum during construction.	At respective planned construction sites	Construction Stage	Contractor and Authority's Engineer	BO
C12	Hand pump close to road may get affected in widening	• All the Hand pumps shall be relocated to suitable alternate place.	At the respective locations	Construction Stage	Contractor and Authority's Engineer	BO
C13	Wells or water stoarge system may get affected in widening	• Alternate arrangements will be made for all the Wells or water storage system.	At the respective locations	Construction Stage	Contractor and Authority's Engineer	BO
C14	Altering flow of natural drains	• Drain shall be channelized with Slope protection - Gabion Structure.	At the respective locations	Construction Stage	Contractor and Authority's Engineer	BO
C15	Sanitation of waste disposal in construction camps	• The construction of camps will be done with sufficient buffer from habitation. • At construction sites and labor camps sufficient no of latrines will be provided. • The sewage generated from the camps will be properly disposed off so that it does not affect water bodies	Wherever labor camp is located	Construction Stage	Contractor and Authority's Engineer	BO

Air						
C16	Emission from construction vehicles and machinery.	• All vehicles, equipment and machinery shall be selected to meet recognized international and national standards for emissions and shall be maintained and operated in a manner that ensures relevant air, noise and discharge rules. • Only unleaded petrol and low sulphur diesel or sulphur free diesel shall be used as fuel for vehicles, equipment and machinery.	Wherever the hot mix plant and batching plant is setup.	Construction Stage	Contractor and Authority's Engineer	BO
C17	Air pollution from various plants affecting settlements	• The asphalt plants, crushers and batching plants shall not be sited at least 500 m in leeward direction from nearest human settlement	Locations near Settlement	Construction Stage	Contractor and Authority's Engineer	BO
C18	Air pollution may exceed the limits prescribed by Central Pollution Control Board.	• Regular monitoring or air quality parameters during the construction period as envisaged in the Environmental Monitoring Plan.	Locations given in Environmental Monitoring Plan.	Construction Stage	Contractor and Authority's Engineer	BO
C19	Vehicles will generate dust and suspended particles.	• The dust generated by vehicles on site shall be arrested using a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding.	Wherever the plants are setup and sensitive locations as suggested in monitoring plan.	Construction Stage	Contractor and Authority's Engineer	BO

Noise						
C20	Noise levels from vehicles. Asphalt plants and equipment	• The plants and equipment used for construction shall confirm to CPCB norms. • Vehicles and equipment used shall be fitted with silencer. • Any vehicle and machinery shall be kept in good working order and engines turned off when not in use. • All equipment and plants shall strictly be placed away from educational institutes and hospitals. • Regular monitoring of noise parameters (Leq) during the construction period as envisaged in the Environmental Monitoring Plan.	Wherever the plants are setup.	Construction Stage	Contractor and Authority's Engineer	BO
C21	Noise from blasting operations	• Blasting as per Indian Explosives act will be carried out. • People living near such blasting operation sites shall be informed before the operational hours. • Workers at blasting sites shall be provided with earplugs.	At the sites where the blasting is required and in quarry sites	Construction Stage	Contractor and Authority's Engineer	BO
C22	Noise barriers	• Construction of noise barriers in the form of walls at Sensitive locations upon consultation with stakeholders.	All along the corridor wherever the sensitive locations like schools, hospitals and other community places are located	Construction Stage	Contractor and Authority's Engineer	BO
Flora and Fauna						

C23	Tree cutting for widening.	• Three trees shall replace each tree cut for the purpose. • The Engineer shall approve such felling only when the NHIDCL receives a "clearance" for such felling from the MOEF, as applicable. • Trees felled shall be replaced as per the compensatory afforestation criteria in accordance with the Forests (Conservation) Act, 1980.	Throughou the project t area.	Construction stage	Contractor And Authority's Engineer Forest Dept.	BO
C24	Damage or Loss of Important Flora	• During construction, at any point of time, if a rare/ threatened/endangered flora species is found, it shall be conserved in a suitable manner in consultation with authorities. The Engineer shall approve detailed conservation processes, plans and designs as well as associated modification in the project design.	Throughou the project t area.	Construction Stage	Contractor and Authority's Engineer	BO
Health and Hygiene						

C25	Health hazard to workers due to bad water and sanitation	• At every workplace, good and sufficient portable water (as per IS 10500) supply shall be ensured to avoid water borne diseases and secure the health of the workers • Adequate drainage, sanitation and waste disposal shall be provided at workplaces. • Preventive medical care shall be provided to the worker.	Wherever labor camp is setup	Construction Stage	Contractor and Authority's Engineer	BO
C26	Health hazard to workers by various construction activity	• Personal protective equipment shall • be provided to worker as per the Factories Act.	Throughou the project t area.	Construction Stage	Contractor and Authority's Engineer	BO
C27	Health/ social hazard, sexual harassment to female workers	• Segregation of male and female areas in labor camp shall be executed.	Wherever labor camp is setup	Construction Stage	Contractor and Authority's Engineer	BO

C28	Hygiene at Construction Camps	• The Contractor during the progress of work will provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labor to standards and scales approved by the resident engineer. • These shall be provided within the precincts of every workplace, latrines and urinals in an accessible place, and the accommodation, separately for each for these, as per standards set by the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996. There shall be adequate supply of water, close to latrines and urinals. • All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place. Compliance with the relevant legislation must be strictly adhered to. Garbage bins must be provided in the camp and regularly emptied and the garbage disposed off in a lined landfill sites. Construction camps are to be sited away from vulnerable people and adequate health care is to be provided for the work force.	Wherever labor camp is setup	Construction Stage	Contractor and Authority's Engineer	BO

C29	Hygiene at Construction Camps	• On completion of the works, the whole of such temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the whole of the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.				
C29	Abandoned Quarry will accumulate water and act as a breading ground for disease vectors.	• Reclamation measure shall be adopted with garland of trees around the periphery. The quarry dust and waste shall be used for refilling. The remaining portion should be covered with trees.	All quarry locations.	Construction Stage	Contractor and Authority's Engineer	BO
Safety						
C30	Safety of vehicles plying on road while the construction activity is going on.	• Prior arrangement/traffic diversion for safe passage of vehicles shall be made with proper direction and signage at the construction site. • Detailed Traffic Control Plans shall be prepared and submitted to the Site Engineer/ Project Director for approval 5 days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, details of arrangements for	Throughou the project t area.	Construction stage	Contractor and Authority's Engineer	BO

		construction under traffic and details of traffic arrangement after cessation of work each day.				

C31	Risk from Operations	• The Contractor is required to comply with all the precautions as required for the safety of the workmen as far as those are applicable to this contract. • The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff. The contractor has to comply with all regulation regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.	All construction sites	Construction stage	Contractor and Authority's Engineer	BO

C32	Risk from Electrical Equipment	• Adequate precautions will be taken to prevent danger from electrical equipment. No material or any of the sites will be so stacked or placed as to cause danger or inconvenience to any person or the public. • All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provisions and to the satisfaction of the Engineer.	All construction Site	Construction stage	Contractor and Authority's Engineer	BO

C33	Risk at Hazardous Activity	• All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stone-breakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. • The use of any herbicide or other toxic chemical shall be strictly in accordance with the manufacturer's instructions. The Engineer shall be given at least 6 working day's notice of the proposed use of any herbicide or toxic chemical. A register of all herbicides and other toxic chemicals delivered to the site shall be kept and maintained up to date by the Contractor. The register shall include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product. This should comply with Hazardous Material Act.	All construction sites	Construction stage	Contractor and Authority's Engineer	BO

C34	Risk of Lead Pollution	• Nobody below the age of 18 years and no woman shall be employed on the work of painting with products containing lead in any form. No paint containing lead or lead products will be used except in the form of paste or readymade paint. • Facemasks will be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped	All construction sites	Construction stage	Contractor and Authority's Engineer	BO

C35	Risk caused by Force' Majure	• All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.	All construction Site	Construction stage	Contractor and Authority's Engineer	BO
C36	Risk from Explosives	• Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor shall not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor shall comply with the requirements of the following Sub-Clauses of this Clause besides the law of the land as applicable. • The Contractor shall at all times take every possible precaution and shall comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives and shall, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. • The Contractor shall at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whatsoever concerned or affected or likely to be concerned or affected by blasting operations.	Place of use of Explosives	Construction stage	Contractor and Authority's Engineer	BO

C37	Malarial risk	• The Contractor shall, at his own expense, conform to all anti-malarial instructions given to him by the Engineer, including filling up any borrow pits which may have been dug by him	All construction sites, particularly beyond Lunglei district	Construction stage	Contractor and Supervision Consultant	BO

C38	First Aid	• At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided.	At the construction site /labor camp	Construction stage	Contractor	BO
Disruption to Users						
C39	Loss of Access	• At all times, the Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property accesses connecting the project road. Work that affects the use of side roads and existing accesses shall not be undertaken without providing adequate provisions to the prior satisfaction of the Engineer. • The works shall not interfere unnecessarily or improperly with the convenience of public or the access to, use and occupation of public or private roads, railways and any other access footpaths to or of properties whether public or private.	Throughout the project area, particularly in built-up areas	During Construction.	Contractor	Authority's Engineer

C40	Traffic Jams and Congestion	• Detailed Traffic Control Plans shall be prepared and submitted to the Site Engineer/ Project Director for approval 5 days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day. • Temporary diversion (including scheme of temporary and acquisition) will be constructed with the approval of the designated Engineer. While approving temporary diversion construction, the Engineer will seek endorsement from the BO. • Special consideration shall be given in the preparation of the traffic control plan to the safety of pedestrians and workers at night. • The Contractor shall ensure that the running surface is always properly maintained, particularly during the monsoon so that no disruption to the traffic flow occurs. As far as possible idling of engines shall be avoided to curb pollution. • The temporary traffic detours shall	Throughout Corridor	During Construction.	Contractor	Authority's Engineer

		be kept free of dust by frequent application of water, if necessary.				

C41	Traffic Control and Safety	• The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades,including signs, markings, flags, lights and flagmen as may be required by the Authority's Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement. • All signs, barricades, pavement markings shall be as per the MORTH specification. Before taking up construction on any section of the highway, a traffic control plan shall be devised to the satisfaction of the Authority's Engineer as per EMP. Excavated pits shall be filled to avoid falling of animals/ human beings.	Throughout the project area	During Construction.	Contractor	Authority's Engineer
Environment Enhancement						
C42	Hand pumps enhancement/relocation for ground water recharging	• Hand pumps within Right of Way shall be enhanced/relocated.	At the respective locations along the corridor.	Construction Stage	Contractor and Authority's Engineer	BO
C43	Roadside landscape development	• Avenue plantation of foliage trees mixed with flowering trees, shrubs and aromatic plants shall be carried out where ever land is available between ditches and	Throughout the corridor	Construction Stage	Contractor and Authority's Engineer	BO

		Right of Way.				
C44	Providing better bus bays	• Bus shelters shall be provided at given locations	As per traffic plan	Construction Stage	Contractor and Authority's Engineer	BO
C45	Better sitting arrangements where small space is available	• Designed sitting arrangements shall be provided.	As per the design	Construction Stage	Contractor and Authority's Engineer	BO
C46	Landscaping of junctions	• All rotary junctions shall be landscaped suitably	As per landscape design at the respective locations	Construction Stage	Contractor and Authority's Engineer	BO
C47	Abandoned Quarry will accumulate water and act as a breeding ground for disease vectors.	• The abandoned quarry locations shall be planted suitably as the plan	Wherever quarries are located and abandoned	Construction Stage	Contractor and Authority's Engineer	BO
C48	Erosion of embankments, shoulders, side slopes, and pavement leading to deterioration and affecting stability and integrity of road	• Earth works specifications will include provision for stable slope construction, compacting and laying out turf including watering until ground cover is fully established • Proper construction of Breast wall and retaining wall at the locations identified by the design team to avoid soil erosion • The measures proposed for slope stabilization are: Discharge zones of drainage	At the respective locations throughout the project area.	Construction Stage	Contractor and Authority's Engineer	BO

		structures (culverts and minor bridges) provided with riprap • Construction in erosion and flood prone areas will not be in monsoon /season. • Side slopes will be kept flatter wherever possible, and in case of steeper slopes it will be supported by the retaining wall.				

Table 4.3 Environmental Management Plan for Operation Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
O1	Water quality degradation due to road-run-off	• Silt fencing, oil & grease traps, etc. shall be provided at sensitive water bodies to ensure that the water quality is not impaired due to contaminants from road run-off • Monitoring shall be carried out as specified in the monitoring plan	As specified in the monitoring plan	As per monitoring plan	BO, SPCB	BO
O2	Soil and water contamination from accidental spills	• Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals • Monitoring shall be carried out as specified in the Monitoring Plan	All area and as specified in the monitoring plan	Plan to be developed at state/district level by early operation stage	BO, SPCB, Local Government Bodies	BO
O3	Air quality degradation due to increases in traffic volume	• Monitoring shall be carried out as specified in the Monitoring plan • Share air quality data with SPBC and relevant agencies and discuss options for mitigate air quality degradation associated with greater traffic volume	As specified in the monitoring plan	As per monitoring plan	BO, SPCB	BO
Q4	Increases in noise and vibration due to greater traffic volume	• Monitoring shall be carried out as specified in the Monitoring plan	As specified in the monitoring plan	As per monitoring plan	BO, SPCB	BO

		• Install noise barrier (wall etc.) in sensitive areas, if necessary				
O5	Traffic safety	• Traffic control measures including speed limits to be enforced strictly. • Local government bodies and development authorities will be encouraged to control building development along the highway.	All area	Throughout operation stage	BO, Local Government Bodies	BO
O6	Accidents involving hazardous materials	• Compliance with the Hazardous Wastes (Management and Handling) Rules, 1989 including: ✓ For delivery of hazardous substances, permit license, driving license and guidance license will be required. ✓ These vehicles will only be harbored at designated parking lots. ✓ In case of spill of hazardous materials, the relevant departments will be notified at once to deal with it with the spill contingency plan.	All area	Manual/guideline to be prepared during early operation stage	BO	BO

O7	Roadside tree plantation, flora and fauna	• Trees planted along the corridor shall be maintained for a period of three years. Maintenance works include, watering of the saplings, replacement of the bamboo fence every year for 3 years and all necessary measures for survival of the sapling. • Monitoring of flora and fauna along the highway shall be carried out to assess conditions of ecosystem against the baseline	All area and as per the monitoring plan	Immediately from the planting of sapling, and as per monitoring plan	BO, NGO	BO

4.3 Environment Monitoring Plan

To ensure effective implementation of the EMP, it is essential that an effective monitoring plan be designed and carried out. The environmental monitoring plan provides such information on which management decision may be taken during construction and operational phases. It provides basis for evaluating the efficiency of mitigation and enhancement measures and suggest further actions that need to be taken to achieve the desired effect. The monitoring includes: i) Visual observations; ii) Selection of environmental parameters at specific locations; and iii) Sampling and regular testing of these parameters

Monitoring methodology covers the following key aspects: Components to be monitored; parameters for monitoring of the above components; monitoring frequency; monitoring standards; responsibilities for monitoring; direct responsibility, overall responsibility; and monitoring costs. Environmental monitoring of the parameters involved and the threshold limits specified are discussed below.

Ambient air quality

Ambient air quality parameters recommended for monitoring road transportation developments are PM10, PM 2.5, Carbon Monoxide (CO), Oxides of Nitrogen (NO_X), Sulphur Dioxide (SO_2) and Lead (Pb). These will be monitored at designated locations starting from the commencement of construction activity. Data should be generated at all identified locations in accordance to the National Ambient Air Quality Standards, 2009. The location, duration and the pollution parameters will be monitored and the responsible institutional arrangements are detailed out in the Monitoring Plan.

Water quality

The physical and chemical parameters recommended for analysis of water quality relevant to road development projects are pH, total solids, total dissolved solids, total suspended solids, oil and grease, COD, chloride, lead, zinc and cadmium. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan. The monitoring of the water quality is to be carried out at all identified locations in accordance to the Indian Standard Drinking Water Specification – IS 10500: 1991.

Noise

The measurements for monitoring noise levels would be carried out at all designated locations in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) in 1989. Noise should be recorded at an “A” weighted frequency using a “slow time response mode” of the measuring instrument. The location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan

The monitoring plan for the various performance indicators of the project in the construction and operation stages is summarized in the Table 8.4.

Table 4.4 Environmental Monitoring Plan

Sl. No	Item	Project Stage	Parameters	Guidance	Standards	Location	Frequency	Duration	Responsibility	
									Implementation	Supervision
M1	Air	Construction	SPM, RSMP, SO_2, NOx, CO, HC	• Dust sampler to be located 50m from the plan in the downwind direction. • Use method specified by CPCB for analysis	Air (P&CP) Rules, CPCB, 1994	Hot mix plant/ batching plant	Twice a year for three years	Continuous 24 hours	Contractor through approved monitoring agency	BO
M2		Construction	SPM, RSPM	• Dust sampler to be located 50m from the earthworks site downwind direction. Follow CPCD method for analysis	Air (P&CP) Rules, CPCB, 1994	Stretch of road where construction is underway	Twice a year for three years	Continuous 24 hours	Contractor through approved monitoring agency	BO
M3		Operation	SPM, RSMP, SO_2, NOx, CO, HC	• Use method specified by CPCB for analysis	Air (P&CP) Rules, CPCB, 1994	Sampling location specified in EIA report	Twice a year for one year	Continuous 24 hours	BO	BO
M4	Water	Construction	pH, BOD, COD, TDS, TSS, DO, Oil & Grease and Pb	• Sample collected from source and analyze as per Standard Methods for Examination of Water and Wastewater	Water quality standards by CPCB	Sampling locations specified in EIA report	Twice a year for three years		Contractor through approved monitoring agency	BO
M5		Operation	pH, BOD, COD, TDS, TSS, DO, Oil & Grease and Pb	• Grab sample collected • from source and analyze as per Standard Methods for Examination of Water • and Wastewater	Water quality standards by CPCB	Sampling locations specified in EIA report	Twice a year for one year		BO	BO

M6		Operation	Cleaning of drains and water bodies	• Choked drains, water bodies undergoing siltation and subject to debris disposal should be monitored under cleaning operations	To the satisfaction of the engineer (PWD)	All area	Post-monsoon		BO	BO

M7	Noise and vibration	Construction	Noise levels on dB (A) scale	• Free field at 1m from the equipment whose noise levels are being determined	Noise standards by CPCB	At equipment yard	Once every 3 Month (max) for three years, as required by the Authority's engineer	Reading to be taken at 15 seconds interval for 15 minutes every hour and then averaged	Contractor through approved monitoring agency	BO
M8		Operation	Noise levels on dB (A) scale	• Equivalent Noise levels using an integrated noise level meter kept at a distance of 15 m from edge of Pavement	Noise standards by CPCB	At maximum 15 sites inc. those listed in EIA report for noise monitoring locations	Twice a year for 1 years	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged.	BO	BO
M9	Soil erosion	Construction	Turbidity in Storm water; Silt load in ponds, water courses	• Visual observations during site visits	As specified by the Authority's engineer / Water quality standards	At locations of stream crossings and at locations of retaining wall and breast wall	Pre-monsoon and post-monsoon for three years		Contractor	BO
M10		Operation	Turbidity in Storm water; Silt load in ponds, water courses	• Visual observations during site visits	As specified by the Authority's engineer / Water quality standards	As directed by the engineer	Pre-monsoon and post-monsoon for one year		BO	BO

M11	Construction Camp	Construction	Monitoring of: 1.Storage Area; 2. Drainage Arrangement 3. Sanitation in Camps	• Visual Observations and as directed by the Authority's engineer	To the satisfaction of the Authority's engineer and Water quality standards	At storage area and construction workers' camp	Quarterly during construction stage		BO	BO
M12	Affores tation	Construction and operation	Plant survival	• The success of tree planting. Monitor the rate of survival after six months, one year and 18 months in relation to total numbers of trees planted		All area	Minimum three years after planting		NGO, BO	BO
M13	Flora and Fauna	Construction and Operation	Condition of ecosystem	• Comparison to pre-project flora and fauna	As specified in TOR	As specified in TOR	Twice a year for three years		BO	BO

*Any amendment/ Corrigendum/ revision of standards as per latest status shall

Schedule – E

(See Clause 2.1 and 14.2)

MAINTENANCE REQUIREMENTS

1. Maintenance Requirements

1.1. The Contractor shall, at all-time maintain the Project Highway in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits.

1.2 The Contractor shall repair or rectify any Defect or deficiency set forth in Paragraph 2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfillment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 14.6 of this Agreement, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.

1.3. All Materials, works and construction operations shall conform to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013)", including latest corrections slips, issued by the Ministry of Surface Transport & Highways, Government of India and published by the Indian Roads Congress.

Where the specifications for a work are not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2. Repair/rectification of Defects and deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in Annex-I of this Schedule-E within the time limit set forth therein.

3. Other Defects and deficiencies

In respect of any Defect or deficiency not specified in Annex-I of this Schedule-E, the Authority's Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Authority's Engineer.

4. Extension of time limit

Notwithstanding anything to the contrary specified in this Schedule-E, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Authority's Engineer and conveyed to the Contractor and the Authority with reasons thereof;

5. Emergency repairs/restoration

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Project Highway poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

6. Daily inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project Highway and maintain a record thereof in a register to be kept in such form and manner as the Authority's Engineer may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority and the Authority's Engineer at any time during office hours.

7. Pre-monsoon inspection / Post-monsoon inspection

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and drainage system before [1st June] every year in accordance with the guidelines contained in IRC: SP:35. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Authority's Engineer before the [10th June] every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Authority's Engineer a compliance report. Post monsoon inspection shall be done by the [30th September] and the inspection report together with details of any damages observed and proposed action to remedy the same shall be sent to the Authority's Engineer.

8. Repairs on account of natural calamities

All damages occurring to the Project Highway on account of torrential rains, floods, earthquake or other natural disasters shall be undertaken by the Contractor at its own cost and/or out of the proceeds of insurance.

Annex – I

(Schedule-E)

Repair/rectification of Defects and deficiencies

The Contractor shall repair and rectify the defects and deficiencies specified in this Annex-I of Schedule-E within the time limit set forth in the table below.

Nature of Defect or deficiency		Time limit for repair/ rectification
ROADS		
(a)	**Carriageway and paved shoulders**	
(i)	Breach or blockade	Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days
(ii)	Roughness value exceeding 2,200 mm in a stretch of 1 km (as measured by a calibrated bump integrator)	120 (one hundred and twenty) days
(iii)	Pot holes	24 hours
(iv)	Any cracks in road surface	15 (fifteen) days
(v)	Any depressions, rutting exceeding 10 mm in road surface	30 (Thirty) days
(vi)	Bleeding/Skidding	7 (seven) days
(vii)	Any other defect/distress on the road	15 (fifteen) days
(viii)	Damage to pavement edges	15 (fifteen) days
(ix)	Removal of debris, dead animals	6 hours
(b)	**Granular earth shoulders, side slopes, drains and culverts**	
(i)	Edge drop at shoulders exceeding 40 mm	7 (Seven) days
(ii)	Variation by more than 1% in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway)	7 (seven) days

(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 (thirty) days
(iv)	Rain cuts/gullies in slope	7 (Seven) days
(v)	Damage to or silting of culverts and side drains	7 (Seven) days
(vi)	Desilting of drains in urban/semi-urban areas	24 hours
(vii)	Railing, parapets, crash barriers	7 (Seven) days (Restore immediately if causing safety hazard)
(c)	**Road side furniture including road sign and pavement marking**	
(i)	Damage to shape or position, poor visibility or loss of retro-reflectivity	48 hours
(ii)	Painting of KM stone, railing, parapets, crash barriers	As and when required/Once every year
(iii)	Damaged/missing road signs required replacement	7 (Seven) days
(iv)	Damage to road mark ups	7 (Seven) days
(d)	**Road lighting**	
(i)	Any major failure of the system	24 hours
(ii)	Faults and minor failures	8 hours
(e)	**Trees and plantation**	
(i)	Obstruction in a minimum head-room of 5 m above carriageway or obstruction in visibility of road signs	24 hours
(ii)	Removal of fallen trees from carriageway	4 hours
(iii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iv)	Trees and bushes requiring replacement	30 (Thirty) days
(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
(f)	**Rest area**	

(i)	Cleaning of toilets	Every 4 hours
(ii)	Defects in electrical, water and sanitary installation	24 hours
(g)	**Toll Plaza**	
(h)	**Other Project Facilities, Rest Area and Approach roads**	
(i)	Damage in pedestrian facilities, truck lay-buys, bus-bays, bus-shelters, cattle, crossings, [Traffic Aid Posts, Medical Aid Posts] and service roads	15 (fifteen) days
(ii)	Damaged vehicles or debris on the road	4 (Four) hours
(iii)	Malfunctioning of the mobile cranes	4 (four) hours
Bridges		
(a)	**Superstructure**	
(i)	Any damage, cracks, spalling/scaling Temporary measures Permanent measures	 Within 48 hours Within 15 (fifteen) days or as specified by the Authority's Engineer
(b)	**Foundations**	
(i)	Scouring and/or cavitation	15 (fifteen) days
(c)	**Piers, abutments, return walls and wing walls**	
(i)	Cracks and damages including settlement and tilting, Spalling, scaling	30 (thirty) days
(d)	**Bearings (metallic) of bridges**	
(i)	Deformation	15 (fifteen) days Greasing of metallic bearings once in a year
(e)	**Joints**	

(i)	malfunctioning of joints	15 (fifteen) days
(f)	**Other items**	
(i)	Deforming of pads in elastomeric bearings	7 (seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	3 (three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	3 (three) days (immediately within 24 hours if posing danger of safety)
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	7 (seven) days
(v)	Damage to wearing coat	15 (fifteen) days
(vi)	Damage or deterioration in approach Slabs, pitching, apron, toes, floor or guide bunds	30 (thirty) days
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	15 (fifteen) days
(g)	**Hill Roads**	
(i)	Damage to retaining wall/breast wall	7 (seven) days
(ii)	Landslides requiring clearance	12 (twelve) hours
(iii)	Snow requiring clearance	24 (twenty four) hours

[**Note:** Where necessary, the Authority may modify the time limit for repair/rectification, or add to the nature of Defect or deficiency before issuing the bidding document, with the approval of the competent authority.]

Schedule-F

(See Clause 3.1.5(a))

APPLICABLE PERMITS

1. **Applicable Permits**

The Contractor shall obtain, as required under the Applicable Laws, the following Applicable Permits:

(a) Permission of the State Government for extraction of boulders from quarry;

(b) Permission of Village Panchayat and Pollution Control Board for installation of crushers;

(c) License for use of explosives;

(d) Permission of the State Government for drawing water from river/reservoir;

(e) License from inspector of factories or other competent Authority for setting up batching plant;

(f) Clearance of Pollution Control Board for setting up batching plant;

(g) Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;

(h) Permission of Village Panchayats and State Government for borrow earth; and

(i) Any other permits, clearances or approvals required under Applicable Laws.

1.2 Applicable permits, as required, relating to environmental protection and conservation shall have been produced by the Authority in accordance with the provisions of this Agreement

Schedule-G

(See Clause 7.1.1, 7.5.3 and 19.2)

FORM OF BANK GUARANTEE

Annex-I

(See Clause 7.1.1)

PERFORMANCE SECURITY

The Managing Director,
NHIDCL,
3rd Floor, PTI Building, 4, Parliament Street,
New Delhi-110001

WHEREAS:

(A) _____ [name and address of contractor] (hereinafter called "the Contractor") and [**NHIDCL**], (**"the Authority"**) have entered into an agreement (the **"Agreement"**) for "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya *on EPC basis***", subject to and in accordance with the provisions of the Agreement.

(B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period and Defects Liability Period (as defined in the Agreement) in a sum of Rs. …. Crore (Rupees …. Crore) (the "**Guarantee Amount**").

(C) We, ……..through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during Construction Period and Defects Liability Period under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the guarantee amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [Executive Director, NHIDCL], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other Authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfillment and/or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority

of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect upto 90 (ninety) days after the end of the Defects Liability Period as set forth in Clauses 17.1 of EPC agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in para 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operable at our…… Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension/ renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

13. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication no. 758, except that the supporting statement under Article 15 (a) is hereby excluded.

Signed and sealed this …….. day of ……. 20…….. at ……

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Annex-II

(Schedule-G)

(See Clause 7.5.3)

Form for Guarantee for Withdrawal of Retention Money

The Managing Director,
NHIDCL,
3rd Floor, PTI Building, 4, Parliament Street
New Delhi-110001

WHEREAS:

(A) [Name and address of contractor] (hereinafter called "**the Contractor**") has executed an agreement (hereinafter called the "Agreement") with the [NHIDCL], (hereinafter called "the Authority") for the "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya *on EPC basis***, subject to and in accordance with the provisions of the Agreement.

(B) In accordance with the Clause 7.5.3 of the Agreement, the Contractor may withdraw the retention money (hereinafter called "**Retention Money**") after furnishing to the Authority a bank guarantee for an amount equal to the proposed withdrawal.

(C) We, ……..through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the amount of Rs. ……Cr. (Rs……. in words) (the "**Guarantee Amount"**).

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [Executive Director, NHIDCL], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other Authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Retention Money and any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Retention Money.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The guarantee shall cease to be in force and effect 90 (ninety) days after the end of the Defects Liability Period specified in Clauses 17.1 of the Agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in para 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operable at our…… Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension/ renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

Signed and sealed this …….. day of ……. 20…….. at ……

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Annex-III

(Schedule-G)

(See Clause 19.2)

Form for Guarantee for Advance Payment

The Managing Director,
NHIDCL,
3rd Floor, PTI Building, 4, Parliament Street,
New Delhi-110001

WHEREAS:

(A) [name and address of contractor] (hereinafter called "**the Contractor**") has executed an agreement (hereinafter called the "Agreement") with the [**NHIDCL**], (hereinafter called "**the Authority**") for the "**widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya *on EPC basis)***", subject to and in accordance with the provisions of the Agreement.

(B) In accordance with the Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest bearing (@ Bank Rate) advance payment (hereinafter called "**Advance Payment**") equal to 10% (ten per cent) of the contract price; and that the Advance Payment shall be made in two installments subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equivalent to 110% (one hundred and ten percent) of such installment to remain effective till the complete and full repayment of the installment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second} installment of the Advance Payment is Rs. ------ cr. (Rupees ------ crore) and the amount of this Guarantee is Rs. ------- cr. (Rupees ------ crore) (the **"Guarantee Amount")**[$].

(C) We, ……..through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the Guarantee Amount.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevoc**ably, guarantee**s and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid installment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the guarantee amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [Executive Director, NHIDCL], that the Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the installment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other Authority or body, or by the discharge of the Contractor for any reason whatsoever

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other

matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The guarantee shall cease to be in force and effect 90 (ninety) days after the end of the one year from the date of payment of the installment of the Advance Payment, as set forth in Clause 19.2 of the Agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in Para 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operable at our…… Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension/ renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

13. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication no. 758, except that the supporting statement under Article 15 (a) is hereby excluded.

Signed and sealed this …….. day of ……. 20…….. at ……

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

$ The Guarantee Amount should be equivalent to 110% of the value of the applicable installment

Schedule-H

(See Clause 19.3)

Contract Price Weightages

1.1 The Contract Price for this Agreement is Rs.******

1.2 Proportions of the Contract Price for different stages of Construction of the Project Highway shall be as specified below :

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
1	2	3	4
Road works including culverts, widening and repair of culverts.	71.90%	**A-Widening and strengthening of existing road including Junction improvement**	
		(1) Earthwork up to top of the sub-grade	9.69%
		(2) Spoil Bank	4.26%
		(3) Sub-Base Course	18.56%
		(4) Non Bituminous Base Course	16.80%
		(5) Bituminous Base Course	28.22%
		(6) Wearing Coat	12.52%
		(7) Widening and repair of Culvert / Re-Construction and New culverts on existing road, realignments, bypasses:	
		Culverts (length <6m)	9.95%
Minor Bridges / Underpasses / Overpasses	1.18%	**A.1- New \ Reconstruction Minor bridges (length>6 and <60 m)**	
		(1) **Foundation + Sub- Structure:** On completion of the foundation work including foundations for wing and return walls, abutments, piers upto the abutment/pier cap	14.62%
		(2) **Super-structure**: On completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. complete in all respect.	3.95%
		(3) **Approaches**: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use.	3.42%
		A.2- Reconstruction\Rehabilitation of Super Structure of Minor bridges (length>6 and <60 m)	
		(1) **Super-structure**: On completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. complete in all respect.	78.01%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
1	2	3	4
Major Bridge (length > 60m.) works and ROB / RUB/ elevated sections/ flyovers including viaducts, if any	0.08%	**A.1- Widening and repairs of Major Bridges**	
		Repair/replacements of railing/parapets/Rehabilitation	100%
		A.2- New Major Bridges	0.00 %
Other works	26.84%	(i) Toll Plaza	0.00 %
		(ii) Road side drains	11.53%
		(iii) Road signs, markings, km stones, safety devices,…	16.675%
		(iv) Project facilities	
		(a) Bus Bays	6.58%
		(b) Truck lay-byes	0.00 %
		(c) Rest areas	0.00 %
		(d) Others	0.00 %
		(v) Road side plantation	0.00 %
		(vi) Protection works other than approaches to the bridges, Elevated sections / flyovers / grade separators and ROBs / RUBs.	
		(a) Seeding and Mulching	3.70%
		(b) Turfing with Sods	1.11%
		(c) Emergency Work	1.32%
		(d) Wet Masonry Retaining Wall (H=3m)	9.03%
		(e) Wet Masonry Retaining Wall (H=7m)	9.65%
		(f) Gravity Wall (H=1.5m)	5.44%
		(g) Gravity Wall (H=2m)	6.30%
		(h) Gravity Wall (H=3m)	10.07%
		(i) Gravity Wall (H=4m)	6.44%
		(j) Gravity Wall (H=5m)	2.77%
		(k) Gravity Wall (H=6m)	2.77%
		(l) Reinforced Earth Retaining Wall (H=7m)	1.39%
		(m) Reinforced Earth Retaining Wall (H=8m)	3.86%
		(n) Reinforced Earth Retaining Wall (H=10m)	0.79%
		(o) Gabion wall (1:0.3)	0.39%
		(p) Earth Removal	0.07%
		(vii) Safety and traffic management during construction.	0.005%
		(viii) Highway Patrolling and Traffic Aid Post with Gantry Support System	0.11%

1.3 Procedure of estimating the value of work done

1.3.1 Road works.

Procedure for estimating the value of road work done shall be as follows:

Table 1.3.1

Stage of Payment	Percentage weightage	Payment Procedure
A-Widening and strengthening of existing road including Junction improvement		Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
(1) Earthwork up to top of the sub-grade	9.69%	
(2) Spoil Bank	4.26%	
(2) Sub-Base Course	18.56%	
(3) Non Bituminous Base Course	16.80%	
(4) Bituminous Base Course	28.22%	
(5) Wearing Coat	12.52%	
(6) Re-Construction and New culverts on existing road, realignments, bypasses:		Cost of each culverts shall be determined pro rata basis with respect to the total no. of culverts. The payment shall be made on the completion of at least five culverts.
Culverts (length <6m)	9.95%	

@ For example, if the total length of bituminous work to be done is 100 km, the cost per km of bituminous work shall be determined as follows:

Cost per km= P x weightage for road work x weightage for bituminous work x (1/L)

Where P = Contract Price

L=Total length in km

Similarly, the rates per km for other stages shall be worked our accordingly.

Note: The length affected due to law and order problems or litigation during execution due to which the Contractor is unable to execute the work, may be deducted from the total project length for payment purposes. The total calculated here is only for payment purposes and will not affect and referred in other clauses of the Contract Agreement.

1.3.1 Minor Bridges and Underpasses / Overpasses.

Procedure for estimating the value of Minor bridge and underpasses / Overpasses shall be as stated in table 1.3.2:

Table 1.3.2

Stage of Payment	Percentage weightage	Payment Procedure
A.1- New \ Reconstruction Minor bridges (length>6 and <60 m)		Cost of each minor bridge shall be determined pro rata basis with respect to the total linear length of the minor bridges. The payment shall be made on the completion Widening and Repair of Minor bridges.
Minor Bridges	21.99%	

Stage of Payment	Percentage weightage	Payment Procedure
A.2- Reconstruction\Rehabilitation of Super Structure of Minor bridges (length>6 and <60 m)		
Minor Bridges	78.01%	Cost of each minor bridge shall be determined pro rata basis with respect to the total linear length of the minor bridges. The payment shall be made on the completion Widening and Repair of Minor bridges

1.3.3 **Major Bridge works, ROB/ RUB and Structures**.

Procedure for estimating the value of Major Bridge works, ROB/RUB and Structures shall be as stated in table 1.3.3:

Table 1.3.3

Stage of Payment	Percentage weightage	Payment Procedure
A.1- Widening and repairs of Major Bridges **A.2- New Major Bridges**	0.08 %	Cost of each minor bridge shall be determined pro rata basis with respect to the total linear length of the minor bridges. The payment shall be made on the completion Widening and Repair of Minor bridges.

Note : (1) In case of innovate Major Bridge projects like cable suspension/cable stayed/Extra Dozed and exceptionally long span bridges, the schedule may be modified as per site requirements before bidding with due approval of DG (RD) & SS, MoRT&H.

(2) The Schedule for exclusive tunnel may be prepared as per site requirements before bidding with due approval of DG (RD) & SS, MoRT&H.

1.3.4 Other work

Procedure for estimating the value of other works done shall be as stated in table 1.3.4

Table 1.3.4

Stage of Payment	Percentage weightage	Payment Procedure
(i) Toll Plaza	0.00 %	Unit of measurement is each completed toll plaza. Payment of each toll plaza shall be made on pro rate basis with respect to the total of all toll plazas.
(ii) Road side drains	11.53%	Unit of measurement is liner length in km. Payment shall be made on pro rate basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length.
(iii) Road signs, markings, km stones, safety devices,…	16.675%	
(iv) Project facilities		Payment shall be made on pro rate basis for completed facilities
(a) Bus Bays	6.58%	
(b) Truck lay-byes	0.00 %	

Stage of Payment	Percentage weightage	Payment Procedure
(c) Rest areas	0.00 %	
(d) Others	0.00 %	
(v) Road side plantation	0.00 %	Unit of measurement is liner length. Payment shall be made on pro rate basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length
(vi) Protection works other than approaches to the bridges, Elevated sections / flyovers / grade separators and ROBs / RUBs.		
(a) Seeding and Mulching	3.70%	
(b) Turfing with Sods	1.11%	
(c) Emergency Work	1.32%	
(d) Wet Masonry Retaining Wall (H=3m)	9.03%	
(e) Wet Masonry Retaining Wall (H=7m)	9.65%	
(f) Gravity Wall (H=1.5m)	5.44%	
(g) Gravity Wall (H=2m)	6.30%	
(h) Gravity Wall (H=3m)	10.07%	
(i) Gravity Wall (H=4m)	6.44%	
(j) Gravity Wall (H=5m)	2.77%	
(k) Gravity Wall (H=6m)	2.77%	
(l) Reinforced Earth Retaining Wall (H=7m)	1.39%	
(m) Reinforced Earth Retaining Wall (H=8m)	3.86%	
(n) Reinforced Earth Retaining Wall (H=10m)	0.79%	
(o) Gabion wall (1:0.3)	0.39%	
(p) Earth Removal	0.07%	
(vii) Safety and traffic management during construction.	0.005%	Payment shall be made on prorate basis every six months.
(viii) Highway Patrolling and Traffic Aid Post with Gantry Support System	0.11%	

2. Procedure for payment for Maintenance

2.1 The cost for maintenance shall be as stated in Clause 14.1.1

2.2 Payment for Maintenance shall be made in quarterly installments in accordance with the provisions of Clause 19.7.

Schedule-I

(See Clause 10.2)

DRAWINGS

1. Drawings

In compliance of the obligations set forth in Clause 10.2 of this Agreement, the Contractor shall furnish to the Authority's Engineer, free of cost, all Drawings listed in Annex-I of this Schedule-I.

2. Additional Drawings

If the Authority's Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in Annex-I, it may by notice require the Contractor to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Contractor shall promptly prepare and furnish such drawings to the Authority's Engineer, as if such drawings formed part of Annex-I of this Schedule-I.

Annex-I

(Schedule-I)

List of Drawings

Alignment Plan and longitudinal Section are enclosed in digital form in CD marked as Annex-I

[Note: The Authority shall describe in this Annex-I, all the Drawings that the Contractor is required to furnish under Clause 10.2.]

- Horizontal and Vertical Alignment (with plan & profile) with details of reference pillars. Horizontal Intersection Point, Vertical Intersection Points, elements of curves, and sight distances.
- Typical Cross-section with details of pavement structures.
- GAD drawings of individual Bridges/Structures

Schedule-J

(See Clause 10.3.2)

PROJECT COMPLETION SCHEDULE

1. Project Completion Schedule

During Construction period, the Contractor shall comply with the requirements set forth in this Schedule J for each of the Project Milestones and the **Scheduled Completion Date.** Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the Authority of such compliance along with necessary particulars thereof.

2. Project Milestone-I

2.1 2.1 Project Milestone-I shall occur on the date falling on the 210th (two hundred and tenth) day from the Appointed Date (the "Project Milestone-I").

2.2 Prior to the occurrence of Project Milestone-I, the Contractor shall have commenced construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 10% (ten per cent) of the Contract Price.

3. Project Milestone-II

3.1 Project Milestone-II shall occur on the date falling on the 450th (four hundred and fiftieth) day from the Appointed Date (the "Project Milestone-II").

3.2 Prior to the occurrence of Project Milestone-II, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 30% (thirty per cent) of the Contract Price.

4. Project Milestone-III

4.1 Project Milestone-III shall occur on the date falling on the 810th (Eight hundred and tenth) day from the Appointed Date (the "Project Milestone-III").

4.2 Prior to the occurrence of Project Milestone-III, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority

duly and validly prepared Stage Payment Statements for an amount not less than 60% (sixty per cent) of the Contract Price.

5 Schedule Completion Date

5.1 The Scheduled Completion Date shall occur on the 1095th (one thousand and ninety fifth) day from the Appointed Date.

5.2 On or before the Scheduled Completion Date, the Contractor shall have completed construction in accordance with this Agreement.

6 Extension of time

Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Completion Date, as the case may be, under and in accordance with the provisions of this Agreement, the Project Completion Schedule shall be deemed to have been amended accordingly.

Schedule-K

(See Clause 12.1.2)

Tests on Completion

1. Schedule for Tests

1.1 The Contractor shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Authority's Engineer and the Authority of its intent to subject the Project Highway to Tests, and no later than 10 (ten) days prior to the actual date of Tests, furnish to the Authority's Engineer and the Authority detailed inventory and particulars of all works and equipment forming part of Works.

1.2 The Contractor shall notify the Authority's Engineer of its readiness to subject the Project Highway to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Authority's Engineer shall, in consultation with the Contractor, determine the date and time for each Test and notify the same to the Authority who may designate its representative to witness the Tests. The Authority's Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 12 and this Schedule K.

2 Tests

2.1 Visual and physical test: The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include: all the tests specified in IRC code, manual and MORTH specifications for the road and Bridge works, 5th revision, 2013.

2.2 Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [2,000 (two thousand)] mm for each kilometer.

2.3 Tests for bridges: All major and minor bridges shall be subjected to the rebound hammer and ultrasonic pulse velocity tests, to be conducted in accordance with the procedure described in Special Report No. 17: 1996 of the IRC Highway Research Board on Non destructive Testing Techniques, at two spots in every span, to be chosen at random by the Authority's Engineer. Bridges with a span of 15 (fifteen) meters or more shall also be subjected to load testing.

2.4 Other tests: The Authority's Engineer may require the Contractor to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the Project Highway with Specifications and Standards.

2.5 Environmental audit: The Authority's Engineer shall carry out a check to determine conformity of the Project Highway with the environmental requirements set forth in Applicable Laws and Applicable Permits.

2.6 Safety Audit: The Authority's Engineer shall carry out or cause to be carried out, a safety audit to determine conformity of the Project Highway with the safety requirements and Good Industry Practice.

3 Agency for conducting Tests

All Tests set forth in this Schedule-K shall be conducted by the Authority's Engineer or such other agency or person as it may specify in consultation with the Authority.

4. Completion Certificate

Upon successful completion of Tests, the Authority's Engineer shall issue the Completion Certificate in accordance with the provisions of Article 12.

Schedule-L

(See Clause 12.2 and 12.4)

PROVISIONAL CERTIFICATE

1. I, …….. (Name of the Authority's Engineer), acting as Authority's Engineer, under and in accordance with the Agreement dated …….. (the "**Agreement**"), for construction of the "***widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis"*** through ……. (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been undertaken to determine compliance of the Project Highway with the provisions of the Agreement.

2. Construction Works that are incomplete on account of Time Extension have been specified in the Punch List appended hereto, and the Contractor has agreed and accepted that it shall complete all such works in the time and manner set forth in the Agreement. In addition, certain minor works are incomplete and these are not likely to cause material inconvenience to the users of the Project Highway or other their safety. The contractor has agreed and accepted that as a condition of this Provisional Certificate, it shall complete such minor works within 30 (thirty) days hereof. These minor works have also been specified in the aforesaid punch list.

3. In view of the foregoing, I am satisfied that that Project Highway can be safety and reliably placed in service of the users thereof, and in terms of the Agreement, the Project Highway is hereby provisionally declared fit for entry into operation on this the ……day of …….20 …..

ACCEPTED, SIGNED, SEALED AND DELIVERED

For and on behalf of

CONTRACTOR by Authority's Engineer by:

(Signature)

SIGNED, SEALED AND DELIVERED

For and on behalf of

(Signature)

COMPLETION CERTIFICATE

1. I, …….. (Name of the Authority's Engineer), acting as Authority's Engineer, under and in accordance with the Agreement dated …….. (the "**Agreement**"), for construction of the "***widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis"*** through ……. (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement, and I am satisfied that the Project Highway can be safety and reliably placed in service of the Users thereof.

2. It is certified that, in terms of the aforesaid Agreement, all works forming part of Project Highway have been completed, and the Project Highway is hereby declared fit for entry into operation on this the ……..day of ……..20 …..

SIGNED, SEALED AND DELIVERED

For and on behalf of

Authority's Engineer by:

(Signature)

(Name)

(Designation)

(Address)

Schedule-M

(See Clauses 14.6., 15.2 and 19.7)

PAYMENT REDUCTION FOR NON-COMPLIANCE

1. Payment reduction for non-compliance with the Maintenance Requirements

1.1 Monthly lump sum payments for maintenance shall be reduced in the case of non-compliance with the Maintenance Requirements set forth in Schedule-E.

1.2 Any deduction made on account of non-compliance with the maintenance Requirements shall not be paid even after compliance subsequently. The deduction shall continue to be made every month until compliance is done.

1.3 The Authority's Engineer shall calculate the amount of payment reduction on the basis of weightage in percentage assigned to non-conforming items as given in Paragraph 2.

2. Percentage reductions in lump sum payments

2.1 The following percentages shall govern the payment reduction:

S. No.	Item/Defect/Deficiency	Percentage
(a)	**Carriageway/Pavement**	
(i)	Potholes, cracks, other surface defects	15%
(ii)	Repairs of Edges, Rutting	5%
(b)	**Road, Embankment, Cuttings, Shoulders**	
(i)	Edge drop, inadequate crossfall, undulations, settlement, potholes, ponding, obstructions	10%
(ii)	Deficient slopes, raincuts, disturbed pitching, vegetation growth, pruning of trees	5%
(c)	**Bridges and Culverts**	
(i)	Desilting, cleaning. vegetation growth, damaged pitching, flooring, parapets, wearing course, footpaths, any damage to foundations	20%

(ii)	Any Defects in superstructures, bearings and sub-structures	10%
(iii)	Painting, repairs/replacement kerbs, railings, parapets, guideposts/crash barriers	5%
(d)	**Roadside Drains**	
(i)	Cleaning and repair of drains	5%
(e)	**Road Furniture**	
(i)	Cleaning, painting, replacement of road signs, delineators, road markings, 200 m/km/5th km stones	5%
(f)	**Miscellaneous Items**	
(i)	Removal of dead animals, broken down/accidented vehicles, fallen trees, road blockades or malfunctioning of mobile crane	10%
(ii)	Any other Defects in accordance with paragraph 1.	5%
(g)	**Defects in Other Project Facilities**	5%

2.2 The amount to be deducted from monthly lump-sum payment for non-compliance of particular item shall be calculated as under:

R=P/100 * M * L1/L

Where: P= Percentage of particular item//Defect/deficiency for deduction

M = Monthly lump-sum payment in accordance with the Bid

L1 = Non-complying length

L = Total length of the road,

R = Reduction (the amount to be deducted for noncompliance for a particular item/Defect/deficiency

The total amount of reduction shall be arrived at by summation of reductions for such items/Defects/deficiency or noncompliance.

For any Defect in a part of one kilometer, the non-conforming length shall be taken as one kilometer.

Schedule-N

(See Clause 18.1.1)

SELECTION OF AUTHORITY'S ENGINEER

1 Selection of Authority's Engineer

1.1 The provisions of the Model Request for Proposal for Selection of Technical Consultants, issued by the Ministry of Finance in May 2009, or any substitute thereof shall apply for selection of an experienced firm to discharge the functions and duties of an Authority's Engineer.

1.2 The Authority shall invite Expression of Interest from Consulting Engineering firms for bodies corporate to undertake and perform the duties and functions set for in Annexure-I of Schedule-N and thereupon shortlist qualified firms in accordance with pre-determined criteria.

1.3 The Authority shall invite the aforesaid firms in the panel of firms to submit their respective technical and financial offers, each in separate sealed cover. All the technical bids so received shall be opened at pursuant to the evaluation thereof, the Authority shall open the financial bids in respect of each shortlisted firm and the order of priority as among these firms shall be determined on the basis of a weighted evaluation where technical and financial score shall be assigned respective weights of 80:20.

1.4 In the event of termination of the Technical Consultants appointed in accordance with the provisions of above Paragraphs, the Authority shall appoint another firm of Technical Consultants forthwith and may engage a government-owned entity in accordance with the provisions of Paragraph 3 of this Schedule-N.

2 Terms of Reference

The Terms of Reference for the Authority's Engineer (the "**TOR**") shall substantially conform with Annex 1 to this Schedule N.

3 Appointment of Government entity as Authority's Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Authority may in its discretion appoint a government-owned entity as the Authority's Engineer; provided that such entity shall be a body corporate having as one of its primary functions the provision of consulting, advisory and supervisory services for engineering projects; provided further that a government-owned entity which is owned or controlled by the Authority shall not be eligible for appointment as Authority's Engineer.

Annex – I

(Schedule - N)

TERMS OF REFERENCE FOR AUTHORITY'S ENGINEER

1. Scope

1.1 These Terms of Reference (the "**TOR**") for the Authority's Engineer are being specified pursuant to the EPC Agreement dated..... (the "**Agreement**), which has been entered into between the Ministry of Road Transport and Highways (the "**Authority**") and ..... (the "**Contractor**") for "***widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis (Package 1-1)***" through Engineering, Procurement & Construction (EPC) Contract, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

1.2 The TOR shall apply to construction and maintenance of the Project Highway.

2. Definitions and interpretation

2.1 The words and expressions beginning with or in capital letters and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Agreement.

2.2 References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of this TOR.

2.3 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Agreement shall apply, *mutatis mutandis*, to this TOR.

3. General

3.1 The Authority's Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.

3.2 The Authority's Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement, but subject to obtaining prior written approval of the Authority before determining:

(a) Any Time extension;

(b) Any additional cost to be paid by the Authority to the Contractor;

(c) The Termination Payment; or

(d) Any other matter which is not specified in (a), (b) or (c) above and which creates an obligation or liability on either Party for a sum exceeding Rs. 5,000,000 (Rs. fifty Lakhs).

3.1 The Authority's Engineer shall submit regular periodic reports, at least once every month, to the Authority in respect of its duties and functions under this Agreement. Such reports shall be submitted by the Authority's Engineer within 10 (ten) days of the beginning of every month.

3.4 The Authority's Engineer shall inform the Contractor of any delegation of its duties and responsibilities to its suitably qualified and experienced personnel; provided, however, that it shall not delegate the authority to refer any matter for the Authority's prior approval in accordance with the provisions of Clause 18.2.

3.5 The Authority's Engineer shall aid and advise the Authority on any proposal for Change of Scope under Article 13.

3.6 In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the authority's Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

4 Construction Period

4.1 During the Construction Period, the Authority's Engineer shall review the Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1.6. The Authority's Engineer shall complete such review and send its observations to the Authority and the Contractor within 15 (fifteen) days of receipt of such Drawings; provided, however that in case of a Major Bridge or Structure, the aforesaid period of 15 (fifteen) days may be extended upto 30 (thirty) days. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.

4.2 The Authority's Engineer shall review any revised Drawings sent to it by the Contractor and furnish its comments within 10 (ten) days of receiving such Drawings.

4.3 The Authority's Engineer shall review the Quality Assurance Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty-one) days stating the modifications, if any, required thereto.

4.4 The Authority's Engineer shall complete the review of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its comments to

the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

4.5 The Authority's Engineer shall grant written approval to the Contractor, where necessary, for interruption and diversion of the flow of traffic in the existing lane(s) of the Project Highway for purposes of maintenance during the Construction Period in accordance with the provisions of Clause 10.4.

4.6 The Authority's Engineer shall review the monthly progress report furnished by the Contractor and send its comments thereon to the Authority and the Contractor within 7 (seven) days of receipt of such report.

4.7 The Authority's Engineer shall inspect the Construction Works and the Project Highway and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. In particular, the Authority's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.

4.8 The Authority's Engineer shall conduct the pre-construction review of manufacturer's test reports and standard samples of manufactured Materials, and such other Materials as the Authority's Engineer may require.

4.9 For determining that the Works conform to Specifications and Standards, the

Authority's Engineer shall require the Contractor to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4.9, the tests specified in the IRC Special Publication-11 (Handbook of Quality Control for Construction of Roads and Runways) and the Specifications for Road and Bridge Works issued by MORTH (the "Quality Control Manuals") or any modification/substitution thereof shall be deemed to be tests conforming to Good Industry Practice for quality assurance.

4.10 The Authority's Engineer shall test check at least 20 (twenty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.

4.11 The timing of tests referred to in Paragraph 4.9, and the criteria for acceptance/ rejection of their results shall be determined by the Authority's Engineer in accordance with the Quality Control Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Contractor for its own quality assurance in accordance with Good Industry Practice.

4.12 In the event that results of any tests conducted under Clause 11.10 establish any Defects or deficiencies in the Works, the Authority's Engineer shall require the Contractor to carry out remedial measures.

4.13 The Authority's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project Highway, whether because of an

accident, unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.

4.14 In the event that the Contractor fails to achieve any of the Project Milestones, the Authority's Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the Authority's Engineer shall determine that completion of the Project Highway is not feasible within the time specified in the Agreement, it shall require the Contractor to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the Contractor, the Authority's Engineer shall review the same and send its comments to the Authority and the Contractor forthwith.

4.15 The Authority's Engineer shall obtain from the Contractor a copy of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.4.

4.16 Authority's Engineer may recommend to the Authority suspension of the whole or part of the Works if the work threatens the safety of the Users and pedestrians. After the Contractor has carried out remedial measure, the Authority's Engineer shall inspect such remedial measures forthwith and make a report to the Authority recommending whether or not the suspension hereunder may be revoked.

4.17 In the event that the Contractor carries out any remedial measures to secure the safety of suspended works and Users, and requires the Authority's Engineer to inspect such works, the Authority's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the Authority forthwith, recommending whether or not such suspension may be revoked by the Authority.

4.18 The Authority's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate or Provisional Certificate, as the case may be. For carrying out its functions under this Paragraph 4.18 and all matters incidental thereto, the Authority's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

5. Maintenance Period

5.1 The Authority's Engineer shall aid and advise the Contractor in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with the Contractor.

5.2 The Authority's Engineer shall undertake regular inspections, at least once every month, to evaluate compliance with the Maintenance Requirements and submit a Maintenance Inspection Report to the Authority and the Contractor.

5.3 The Authority's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project Highway is in conformity with the Maintenance Requirements. It shall monitor and

review the results of such tests and the remedial measures, if any, taken by the Contractor in this behalf.

5.4 In respect of any defect or deficiency referred to in Paragraph 3 of Schedule- E, the Authority's Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissible limit.

5.5 The Authority's Engineer shall examine the request of the Contractor for closure of any lane(s) of the Project Highway for undertaking maintenance/repair thereof, and shall grant permission with such modifications, as it may deem necessary, within 5 (five) days of receiving a request from the Contractor. Upon expiry of the permitted period of closure, the Authority's Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the Contractor to the Authority under Clause 14.5.

6 Determination of costs and time

6.1 The Authority's Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.

6.2 The Authority's Engineer shall determine the period of Time Extension that is required to be determined by it under the Agreement.

6.3 The Authority's Engineer shall consult each Party in every case of determination in accordance with the provisions of Clause 18.5.

7. Payments

7.1 The Authority's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the Authority's Engineer in accordance with the provisions of Clause 10.2.4 (d).

7.2 Authority's Engineer shall -

(a) within 10 (ten) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and

(b) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, deliver to the Authority and the Contractor an Interim Payment Certificate certifying the amount due and payable to the Contractor, after adjustments in accordance with the provisions of Clause 19.10.

7.3 The Authority's Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, verify the Contractor's monthly statement and certify the amount to be paid to the Contractor in accordance with the provisions of the Agreement.

7.4 The Authority's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance in accordance with the provisions of Clause 19.16.

8. Other duties and functions

The Authority's Engineer shall perform all other duties and functions as specified in the Agreement.

9 Miscellaneous

9.1 A copy of all communications, comments, instructions, Drawings or Documents sent by the Authority's Engineer to the Contractor pursuant to this TOR, and a copy of all the test results with comments of the Authority's Engineer thereon, shall be furnished by the Authority's Engineer to the Authority forthwith.

9.2 The Authority's Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.

9.3 Within 90 (ninety) days of the Project Completion Date, the Authority's Engineer shall obtain a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the Authority, reflecting the Project Highway as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project Highway and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the Authority against receipt thereof.

9.4 The Authority's Engineer, if called upon by the Authority or the Contractor or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.

9.5 The Authority's Engineer shall inform the Authority and the Contractor of any event of Contractor's Default within one week of its occurrence.

SCHEDULE - O

(See Clauses 19.4.1, 19.6.1, and 19.8.1)

Forms of Payment Statements

1. Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

(a) The estimated amount for the Works executed in accordance with Clause 19.3.1 subsequent to the last claim;

(b) Amounts reflecting adjustments in price for the aforesaid claim;

(c) The estimated amount of each Change of Scope Order executed subsequent to the last claim;

(d) Amounts reflecting adjustment in price, if any, for (c) above in accordance with the provisions of Clause 13.2.3 (a);

(e) Total of (a), (b), (c) and (d) above;

(f) Deductions:

  (i) Any amount to be deducted in accordance with the provisions of the Agreement except taxes;

  (ii) Any amount towards deduction of taxes; and

  (iii) Total of (i) and (ii) above.

(g) Net claim: (e) – (f) (iii);

(h) The amounts received by the Contractor upto the last claim:

  (i) For the Works executed (excluding Change of Scope orders);

  (ii) For Change of Scope Orders, and

  (iii) Taxes deducted

2. Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

(a) the monthly payment admissible in accordance with the provisions of the agreement;

(b) the deductions for maintenance work not done;

(c) net payment for maintenance due, (a) minus (b);

(d) amounts reflecting adjustments in price under Clause 19.12; and

(e) amount towards deduction of taxes

3. Contractor's claim for Damages

Note: The Contractor shall submit its claims in a form acceptable to the Authority.

Schedule-P

(See Clause 20.1)

INSURANCE

1. Insurance during Construction Period

1.1. The Contractor shall effect and maintain at its own cost, from the Appointed Date till the date of issue of the last Completion Certificate, the following insurances for any loss or damage occurring on account of Non Political Event of Force Majeure, malicious act, accidental damage, explosion, fire and terrorism:

(a) insurance of Works, Plant and Materials and an additional sum of [15 (fifteen)] per cent of such replacement cost to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature; and

(b) Insurance for the Contractor's equipment and Documents brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

1.2 The insurance under paragraph 1.1 (a) and (b) above shall cover the authority and the Contractor against all loss or damage from whatsoever cause arising under paragraph 1.1 other than risks which are not insurable at commercial terms.

2. Insurance for Contractor's Defects Liability

The Contractor shall effect and maintain insurance cover for the works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for any loss or damage for which the Contractor is liable and arises from a cuase occurring prior to the issue of Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

3. Insurance against injury to persons and damage to property

3.1. The Contractor shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured

under Paragraph 1 and 2 of this Schedule or to any person (except persons insured under Clause 20.9), which may arise out of the Contractor's performance of this agreement and occurring before the issue of the Performance Certificate. This insurance shall be for a limit per occurrence of not less than the amount stated below with no limit on the number of occurrences.

The insurance cover shall be as per the applicable laws of government and procedure in vogue.

3.2 The insurance shall be extended to cover liability for all loss and damage to the Authority's property arising out of the Contractor's performance of this Agreement excluding:

(a) the Authority's right to have the construction works executed on, over, under, in or through any land, and to occupy this land for the Works; and

(b) Damage which is and unavoidable result of the Contractor's obligations to execute the Works.

4. Insurance to be in joint names

The insurance under paragraphs 1 to 3 above shall be in the joint names of the Contractor and the Authority.

SCHEDULE-Q

(See Clause 14.10)

Tests on Completion of Construction

1. Riding Quality test:

Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [2,500 (two thousand five hundred)] mm for each kilometer.

2. Visual and physical test:

The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include measurement of cracking, rutting, stripping and potholes and the permissible values are given below: • Area of cracking not more than 2 % area

• Area of rutting with rut depth more than 10 mm - not more than 1 …. % area

• Area of stripping: not more than 2 % area

• Area of potholes: Nil

• Edge drop – Shall not be more than 15 mm

SCHEDULE-R

(See Clause 14.10)

Taking Over Certificate

I, ……. (Name and designation of the Authority's representative) under and in accordance with the Agreement dated

…… (the "Agreement"), for ***widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis"*** (the "**Project Highway**") on Engineering, Procurement and Construction (EPC) basis through

……. (Name of Contractor), hereby certify that the Tests on completion of Maintenance Period in accordance with Article 14 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement and I hereby certify that the Authority has Taken over the Project Highway from the Contractor on this day .....

SIGNED, SEALED AND DELIVERED

(Signature)

(Name of Authority's Engineer)

(Address)

SCHEDULE-S

(See Clause 17.7.2)

Performance Certificate

I, ……. (Name and designation of the Authority's representative) under and in accordance with the Agreement dated …… (the "Agreement"), for [construction and maintenance of the ***widening and upgradation to 2 lane with paved shoulder configuration and geometric improvement from km 85.000 to km 95.000 & km 101.000 to km 145.000 on Tura - Dalu section of NH-51 in the state of Meghalaya on EPC basis (Package 1-1)*** (the "Project Highway") on Engineering, Procurement and Construction (EPC) basis through ……. (Name of Contractor), hereby certify that the Contractor has discharged all its obligations under the Agreement and in accordance with Article 17 of the Agreement I hereby issue Performance Certificate to the Contractor on this day.....

SIGNED, SEALED AND DELIVERED

(Signature)

(Name of Authority's Engineer)

(Address)

SCHEDULE-T

(See Clause 19.1.6)

Name of Currency	A Amount of Currency	B Rate of Exchange Prevailing on the Base Date (Local Currency per Unit of Foreign Currency)	C Local Currency Equivalent	D Percentage of Net Bid Price (NTP) (100 x C) / NTP
Local Currency				
Foreign Currency 1				
Foreign Currency 2				
Foreign Currency 3				
Net Bid Price				100.00

1. Change in scope would require agreement between parties on currency.
2. Regarding damages by the Authority, financing charges for a payment delays will be in corresponding currency amounts.
3. Delay damages will be recovered in currencies in proportion which in which contract price is payable.