Schedules

SCHEDULE - A

(See Clauses 2.1 and 8.1)

SITE OF THE PROJECT

1. The Site

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

1.2 The dates of handing over the Right of Way (RoW) to the Contractor are specified in 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 (i) of this Agreement.

1.4 The alignment plans of the Project Highway are specified in Annex-III. 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 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.

Annex - I

(Schedule-A)

Site

1. The Site

The Site of the Project Highway comprises the section of National Highway -39 (New NH-2) from Senapati (Ex. Km264+313 of NH-39) to Daili (Ex. Km276+578 of NH-39) in the state of Manipur. The contract package of the project comprises the rehabilitation and upgradation of existing two lanes to 4 lane divided carriageway configuration. The land, carriageway and structures comprising the Site are described below:

2. Land

The Site of the Project Highway comprises the land (existing right of way (ROW)) as described below:

S. No	Existing Chainage (Km)		Existing ROW (m)	Remarks
	From	To		
1	264+313	276+578	12	

3. Carriageway

The present carriageway of the Project Highway is generally Two Lane carriageway. The type of the existing pavement is flexible and road width details of are as below:

Ex. Chainage (Km)		Length (m)	Terrain		Carriageway	
From	To		LHS	RHS	Type	Width (m)
264+313	266+000	1687	Valley	Hilly	BT	7.5
266+000	266+600	600	Valley	Hilly	BT	6.5
266+600	267+800	1200	Rolling	Rolling	BT	6.7
267+800	269+800	2000	Valley	Hilly	BT	7
269+800	270+000	200	Valley	Hilly	BT	7.2
270+000	270+600	600	Rolling	Rolling	BT	7.2
270+600	271+800	1200	Valley	Hilly	BT	7/7.2
271+800	274+000	2200	Hilly	Valley	BT	7
274+000	274+600	600	Hilly	Valley	BT	6.3/6.8
274+600	274+800	200	Hilly	Valley	BT	7
274+800	276+400	1600	Valley	Hilly	BT	7

Ex. Chainage (Km)		Length (m)	Terrain		Carriageway	
From	To		LHS	RHS	Type	Width (m)
276+400	276+578	178	Valley	Hilly	BT	6.3/6.8
Total Length (km)		**12.265**				

4. Major Bridges

The Site includes the following Major Bridges:

S No.	Ex. Chainage	Ex. Span arrangement (No. x Span)	Total Outer Width (m)	Type of Structure		
				Superstructure	Substructure	Foundation
NIL						

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	Remarks
		Found-ation	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	Super structure		
NIL					

7. Minor bridges

The Site includes the following minor bridges:

S. No.	Ex. Chainage (Km)	Ex. Span arrangement (No. x Span)	Total Outer Width of Deck (m)	Type of Structure		
				Superstructure	Substructure	Foundation
1	272+283	1 x 6.5	8.5	RRM Arch+RCC Slab	RCC+CRM wall type Abutment	Open

S. No.	Ex. Chainage (Km)	Ex. Span arrangement (No. x Span)	Total Outer Width of Deck (m)	Type of Structure		
				Superstructure	Substructure	Foundation
2	274+643	1 x 25.6	8.3	PSC I Beam with RCC Deck	RCC wall type Abutment	Open
3	275+780	1 x 9.0	11.0	Solid Slab	RCC wall type Abutment	Open

8. Railway level crossings

The Site includes the following railway level crossings:

S. No.	Location/ Existing Chainage (KM)	Remarks
NIL		

9. Underpasses (Vehicular, Non Vehicular)

The Site includes the following underpasses:

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

10. Culverts

10.1 Pipe Culverts:

The Site has the following existing pipe culverts:

S. No.	Ex. Chainages (Km)	Type of Culvert	No. of Pipe	Pipe Dia (m)	Carriageway Width (m)	Remarks
1	265+090	Pipe	1	1	7.2	
2	266+330	Pipe	1	0.9	7.2	
3	267+369	Pipe	1	1.2	7.2	
4	267+1005	Pipe	1	0.96	6.8	
5	268+050	Pipe	1	1	6.7	
6	268+134	Pipe	1	1	7	
7	268+201	Pipe	1	1	7	
8	268+260	Pipe	1	1	6.4	
9	268+324	Pipe	1	1	7	
10	268+475	Pipe	1	1	6.7	

S. No.	Ex. Chainages (Km)	Type of Culvert	No. of Pipe	Pipe Dia (m)	Carriageway Width (m)	Remarks
11	268+558	Pipe	1	1	7	Blocked-L
12	268+708	Pipe	1	1	7	
13	268+800	Pipe	1	1	7	
14	269+052	Pipe	1	1	7	
15	269+160	Pipe	1	1	7	
16	269+216	Pipe	1	1	6.7	
17	269+324	Pipe	1	1	6.7	
18	269+430	Pipe	1	1	7	
19	269+513	Pipe	1	1	7	
20	269+865	Pipe	1	1	7	
21	270+070	Pipe	1	1	7	
22	270+954	Pipe	1	1	7.4	
23	271+080	Pipe	1	1	7.4	
24	271+319	Pipe	1	0.9	7.2	
25	271+660	Pipe	1	0.9	6.8	
26	271+850	Pipe	1	Block	7.2	
27	272+574	Pipe	1	1.2	7.2	
28	272+660	Pipe	1	0.9	7.5	
29	273+306	Pipe	1	1	7.1	
30	273+1081	Pipe	1	1	6.8	
31	274+195	Pipe	1	1	6.8	
32	274+821	Pipe	1	1		
33	275+446	Pipe	1	1	7.2	
34	275+853	Pipe	1	1	7.2	
35	275+1025	Pipe	1	1	7.2	
36	276+050	Pipe	1	1	7.2	
37	276+149	Pipe	1	1	7	
38	276+343	Pipe	1	1	7.2	
39	276+427	Pipe	1	1	7	
40	276+452	Pipe	1	1	7.2	Blocked-L
41	276+532	Pipe	1	1	7.2	Blocked-L

10.2 Slab Culverts

The Site has the following existing slab culverts:

S. No.	Ex. Chainages (Km)	Type of Culvert	Thickness of Slab (m)	Span Arrangement	Clear Span (m)	Carriageway Width (m)	Remarks
1	264+473	Slab	0.2	1	1	7.5	
2	264+530	Slab	0.2	1	1.2	7.5	
3	264+651	Slab	0.2	1	1.2	7.5	

S. No.	Ex. Chainages (Km)	Type of Culvert	Thickness of Slab (m)	Span Arrangement	Clear Span (m)	Carriageway Width (m)	Remarks
4	264+701	Slab	0.2	1	1	7.2	
5	264+828	Slab	0.2	1	1	7.2	
6	264+862	Slab	0.5	1	3	9.5	
7	264+883	Slab	0.3	1	2.7	7.3	
8	265+256	Slab	0.5	1	2.5	9.4	
9	265+349	Slab	0.4	1	5.2	7	
10	265+417	Slab	0.3	1	1	7.2	
11	265+827	Slab	0.5	1	3	11.3	
12	265+886	Slab	0.3	1	1	7.2	
13	266+199	Slab	0.3	1	1	7.2	
14	266+299	Slab	0.3	1	1	7.2	Blocked-L
15	266+351	Slab	0.5	1	3.8	8	
16	266+419	Slab	0.4	1	1.8	7.2	
17	266+486	Slab	0.5	1	2.5	8.5	
18	266+535	Slab	0.5	1	5.8	7.2	
19	266+646	Slab	0.3	1	1	7.2	
20	266+823	Slab	0.3	1	1.5	7.2	
21	267+075	Slab	0.4	1	1.6	7.2	
22	267+299	Slab	0.2	1	1.4	7.2	
23	267+468	Slab	0.3	1	1.6	7	
24	267+581	Slab	0.2	1	1.6	7	
25	267+731	Slab	0.4	1	2.1	7	
26	267+910	Slab	0.4	1	3	7	
27	268+416	Slab	0.5	1	2.7		
28	269+591	Slab	0.45	1	1.6	7	
29	269+946	Slab	0.2	1	1	-	
30	270+185	Slab	0.2	1	1	7	
31	270+256	Slab	0.15	1	1	7	
32	270+413	Slab	0.3	1	1.6	7	
33	270+502	Slab	0.25	1	2	7	
34	271+223	Slab	0.3	1	1.6	7.2	
35	272+283	slab	0.5	1	5.7	10	
36	272+730	Slab	0.3	1	2.1	7.2	
37	272+976	Slab	0.3	1	1.8	7.2	
38	273+457	Slab	0.3	1	3	7.2	
39	273+558	Slab	0.5	1	2.7	9	
40	273+698	Slab	0.5	1	2.7	9	
41	273+833	Slab	0.3	1	2	7.2	
42	273+1045	Slab	0.5	1	2.7	9	
43	273+1112	Slab	0.3	1	2	7	
44	274+108	Slab	0.2	1	1	7.2	
45	274+385	Slab	0.4	1	2.7	9	

S. No.	Ex. Chainages (Km)	Type of Culvert	Thickness of Slab (m)	Span Arrangement	Clear Span (m)	Carriageway Width (m)	Remarks
46	275+713	Slab	0.5	1	6	7.2	
47	275+980	Slab	0.3	1	2	7.5	
48	275+1103	Slab	0.3	1	2	7.2	
49	276+212	Slab	0.2	1	1.2	7.2	
50	276+560	Slab	0.2	1	1.2	7	

10.3Other Culverts

Nil

11. Bus bays & Bus Shelters

The details of bus stops on the site are as follows:

S.No	Ex. Chainage (Km)	Ex. Bus Stop	Side	Remarks
1	268+450	Bus Stop	LHS	Henjbung
2	271+156	Bus Stop	RHS	TumyonKhullen

12. Truck Lay byes

The details of truck lay byes are as follows:

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

13. Road side drains

S. No.	Existing Chainage(Km)		Type	
	From	To	Masonry/cc (Pukka)	Earthen (Kutcha)
Nil				

14. Major junctions

The details of Major junctions are as follows:

SN	Ex. Chainage (Km)	At Grade/ Grade Separated	Details of Cross Road		Starts From
			Direction (LHS/RHS)	Road Type (NH/SH/MDR)	

1	274+120	At Grade	RHS	SH	Kangpokpi

15. Minor junctions

The details of the minor junctions are as follows:

S.No	Existing Chainage (Km)	Type of Junction	Side	Width of Cross Road	Village/Town Name
1	266+975	T	LHS	3.2	Henjbung
2	268+775	T	RHS	6.7	Henjbung
3	269+050	+	BOTH	2.5/ 1.7	Henjbung
4	269+200	T	LHS	2	Henjbung
5	269+800	T	LHS	2.8	Henjbung
6	270+075	T	LHS	3.4	Henjbung
7	270+325	T	LHS	5.4	Henjbung
8	270+575	T	LHS	3.1	Henjbung
9	270+650	+	BOTH	4.2/ 3.3	Henjbung
10	270+900	T	LHS	3.2	Henjbung

16. Bypasses

The details of the bypasses are as follows:

S. No.	Name of bypass (town)	Chainage (km)	Length	Carriageway	
		From ----to	(in Km)	Width (m)	Type
NIL					

17. Other structures

- Nil –

18. Referencing

The relationship between the "Existing Chainage" as per field survey and "Design Chainage" is given below:

S.No.	Existing Chainage (Km)	Design Chainage (Km)	Remarks
1	264+313	262+175	Start of Package-4a
2	265+000	262+864	
3	266+000	263+848	

S.No.	Existing Chainage (Km)	Design Chainage (Km)	Remarks
4	267+000	264+881	
5	268+000	265+878	
6	269+000	266+795	
7	270+000	267+785	
8	271+000	268+776	
9	272+000	269+874	
10	273+000	270+830	
11	274+000	271+931	
12	276+578	274+610	End of Package-4a

Annex - II

(Schedule-A)

Dates for providing Right of Way of Construction Zone

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

S.No	Ex Chainage (m)		Design Chainage(m)		Length (m)	PROW width (m)	Date of Providing ROW*
	From	To	From	To			
1	264+313	264+435	262+175	262+300	125.0	12 - 52.5	90% land will be available at the time of appointed date and balance 10% land after 150 (one hundred and fifty) days from Appointed date.
2	264+435	264+535	262+300	262+400	100.0	52.5	
3	264+535	264+677	262+400	262+540	140.0	62.5	
4	264+677	264+778	262+540	262+640	100.0	57.5	
5	264+778	264+830	262+640	262+690	50.0	59.0	
6	264+830	264+881	262+690	262+740	50.0	46.5	
7	264+881	265+026	262+740	262+890	150.0	45.0	
8	265+026	265+086	262+890	262+950	60.0	54.0	
9	265+086	265+186	262+950	263+050	100.0	52.5	
10	265+186	265+237	263+050	263+100	50.0	45.0	
11	265+237	265+390	263+100	263+250	150.0	46.5	
12	265+390	265+441	263+250	263+300	50.0	45.0	
13	265+441	265+481	263+300	263+340	40.0	49.0	
14	265+481	265+542	263+340	263+400	60.0	54.0	
15	265+542	265+593	263+400	263+450	50.0	64.0	
16	265+593	265+746	263+450	263+600	150.0	62.5	
17	265+746	265+896	263+600	263+750	150.0	57.5	
18	265+896	265+946	263+750	263+800	50.0	52.5	
19	265+946	266+086	263+800	263+940	140.0	45.0	
20	266+086	266+196	263+940	264+050	110.0	46.5	
21	266+196	266356.0	264+050	264210.0	160.0	45.0	
22	266+356	266+546	264+210	264+400	190.0	46.5	
23	266+546	266+996	264+400	264+850	450.0	45.0	
24	266+996	267+168	264+850	265+050	200.0	46.5	
25	267+168	267+368	265+050	265+250	200.0	45.0	
26	267+368	267+418	265+250	265+300	50.0	56.5	
27	267+418	267+468	265+300	265+350	50.0	61.5	
28	267+468	267+518	265+350	265+400	50.0	56.5	
29	267+518	267+769	265+400	265+650	250.0	49.0	
30	267+769	268+018	265+650	265+900	250.0	46.5	
31	268+018	268+119	265+900	266+000	100.0	45.0	
32	268+119	268+427	266+000	266+300	300.0	46.5	
33	268+427	268+579	266+300	266+450	150.0	45.0	
34	268+579	268+729	266+450	266+600	150.0	47.5	
35	268+729	269+001	266+600	266+800	200.0	45.0	

S.No	Ex Chainage (m)		Design Chainage(m)		Length (m)	PROW width (m)	Date of Providing ROW*
	From	To	From	To			
36	269+001	269+305	266+800	267+100	300.0	46.5	
37	269+305	269+608	267+100	267+400	300.0	45.0	
38	269+608	269+758	267+400	267+550	150.0	47.5	
39	269+758	270+014	267+550	267+800	250.0	45.0	
40	270+014	270+268	267+800	268+050	250.0	46.5	
41	270+268	270+518	268+050	268+300	250.0	45.0	
42	270+518	270+618	268+300	268+400	100.0	47.5	
43	270+618	270+820	268+400	268+600	200.0	45.0	
44	270+820	270+976	268+600	268+750	150.0	46.5	
45	270+976	271+126	268+750	268+890	140.0	45.0	
46	271+126	271+244	268+890	269+000	110.0	47.0	
47	271+244	271+344	269+000	269+100	100.0	45.0	
48	271+344	271+384	269+100	269+140	40.0	57.5	
49	271+384	271+495	269+140	269+250	110.0	64.0	
50	271+495	271+663	269+250	269+400	150.0	53.5	
51	271+663	271+874	269+400	269+600	200.0	59.0	
52	271+874	271+1061	269+600	269+790	190.0	56.5	
53	271+1061	272+023	269+790	269+890	100.0	64.5	
54	272+023	272+034	269+890	269+900	10.0	57.5	
55	272+034	272+078	269+900	269+940	40.0	60.0	
56	272+078	272+323	269+940	270+030	90.0	47.5	
57	272+323	272+353	270+030	270+050	20.0	63.0	
58	272+353	272+565	270+050	270+240	190.0	60.5	
59	272+565	272+630	270+240	270+300	60.0	63.5	
60	272+630	272+669	270+300	270+340	40.0	70.5	
61	272+669	272+727	270+340	270+400	60.0	64.5	
62	272+727	272+825	270+400	270+500	100.0	52.5	
63	272+825	272+921	270+500	270+600	100.0	55.0	
64	272+921	272+1028	270+600	270+700	100.0	50.0	
65	272+1028	273+023	270+700	270+850	150.0	55.0	
66	273+023	273+238	270+850	271+050	200.0	51.0	
67	273+238	273+899	271+050	271+700	650.0	47.5	
68	273+899	273+951	271+700	271+750	50.0	52.0	
69	273+951	273+994	271+750	271+790	40.0	58.0	
70	273+994	273+1058	271+790	271+850	60.0	59.5	
71	273+1058	274+061	271+850	272+000	150.0	62.5	
72	274+061	274+202	272+000	272+140	140.0	69.5	
73	274+202	274+371	272+140	272+300	160.0	66.5	
74	274+371	274+411	272+300	272+340	40.0	55.0	
75	274+411	274+571	272+340	272+500	160.0	52.0	
76	274+571	274+644	272+500	272+550	50.0	60.0	
77	274+644		272+550	272+700	150.0	82.0	

S.No	Ex Chainage (m)		Design Chainage(m)		Length (m)	PROW width (m)	Date of Providing ROW*
	From	To	From	To			
78			272+700	272+740	40.0	67.5	
79			272+740	272+850	110.0	52.5	
80			272+850	272+950	100.0	55.0	
81			272+950	273+000	50.0	58.0	
82			273+000	273+050	50.0	55.5	
83			273+050	273+450	400.0	47.5	
84			273+450	273+500	50.0	50.0	
85			273+500	273+550	50.0	47.5	
86			273+550	273+600	50.0	55.5	
87			273+600	273+650	50.0	62.5	
88			273+650	273+700	50.0	65.0	
89			273+700	273+890	190.0	68.0	
90			273+890	273+950	60.0	52.5	
91		276+561	273+950	274+600	650.0	47.0	
92	276+561	276+578	274+600	274+610	10.0	75.6	

- The dates specified herein, shall in no case be beyond 150 (one hundred and fifty) days after the Appointed Date.

Annex - III

(Schedule-A)

Alignment Plans

The existing alignment of the Package-4A i.e. Senapati to Daili section of Project Highway shall be modified as per the Alignment plan.

Package 4a: (Senapati to Daili)

The proposed Alignment Plan and Profile of the Project Highway is available on e-Portal. Finished road level indicated in the alignment plan shall be followed by the contractor as minimum FRL.

Annex - IV

(Schedule-A)

Environment Clearances

As per GoI, MoEF notification No. 21-270/2008-IA, III dated 22nd August 2013, proposed project involves expansion of 12.435 km existing National Highway (less than 100 Km). As a result Environmental clearances will not be required from MoEF.

However, forest clearance is required for Tree cutting.

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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 Augmentation as Four lane divided carriageway

Rehabilitation and Upgradation shall include Four lane divided carriageway of 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 Four-Laning

1.1. Widening of the Existing Highway

The Project Highway shall follow the existing alignment unless otherwise specified by the Authority or shown in the alignment plan specified in Annex III of Schedule-A. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for plain/rolling terrain to the extent land is available.

1.2. Width of Carriageway

1.2.1 Four laning with paved shoulder from Senapati (Km262+175) to Daili (Km 274+610) including Kongpokpi bypass (from Km272+535 to Km274+610) shall be undertaken. The width of paved carriageway shall be 2x9m wide in accordance with the Typical Cross Section (TCS) drawings presented in ***Appendix B1- Typical Cross Sections or Manual referred to in the Schedule-D*** (herein after called the "Manual") unless otherwise specified in this Schedule-B and Schedule-D.

The total roadway width of project highway shall be 18 m wide.

Provided that in the built-up areas the width of the carriageway shall be as specified in the following table:

S. No.	Built-up stretch (Township)	Design Chainage (Km)		Roadway (m)	Paved Width (m)	(Typical cross section) (Ref. to Schedule B Appendix B-1)
		From	To			
1	NIL					

1.2.2 Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to paragraph 1.2.1 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 (IRC:SP:84-2014).

2.2. Design speed

The design Speed for the project highway adopted for plain/rolling terrain is 100km/hr. However due to certain site constraints, the minimum design speed adopted for plain/rolling terrain is 80km/hr. at locations mentioned in Schedule - D.

2.3. Improvement of the existing road geometrics

The alignment of existing road has been improved at many locations along the route either by eliminating sharp curves and/or increasing the radii of horizontal curves. Also, at few locations the existing steep gradients have been improved through cutting/filling so as to conform the requirement of IRC:SP:84-2014 and achieving ruling gradient for plain/rolling terrain. So the reconstruction of road shall follow the improved alignment as enclosed in the bid document.

Sl. No.	Design Chainage (Km)		Type of deficiency	Remarks
	From Km	To Km		
As per Alignment Plan (Annex-III, Schedule A)				

2.3.1 Details of proposed Realignments:

S. No	Design Chainage(Km)		Side	Design Length (Km)	Remarks
	From	To			
As per Alignment Plan (Annex-III, Schedule A)					

2.3.2 Details of Proposed Bypasses:

S. No	Design Chainage(Km)		Side	Design Length (km)	Remarks
	From	To			
1	272+535	274+610	LHS	2.075	Kangpokpi Bypass

2.4. Right of Way

Details of the Right-of-Way (ROW) are given in Annex II of Schedule-A.

2.5. Type of shoulders

(a) In built-up sections, footpaths/fully paved shoulders shall be provided in the following stretch:

S. No.	Design Chainage (Km)		Fully paved shoulders/ footpaths	(Typical cross section) (Ref. to Schedule B Appendix B-1)
	From	To		
1	NIL			

(b) In open country, paved shoulders of 1.5 m width shall be provided with same pavement layers of carriageway and balance 2.0m wide earthen shoulder shall be covered with 150mm thick compacted layer of granular/hard material. The granular sub-base (GSB) layer to be extended till side slope.

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

2.6. Lateral and vertical clearances at Underpasses

2.6.1 Lateral and vertical clearances at underpasses and provisions of guard rails/ crash barriers shall be as per the paragraph 2.10 of the Manual.

2.6.2 Lateral Clearance: The width of the openings at underpasses shall be as follows:

S. No.	Design Chainage(Km)	Span/opening (m)	Remarks
1.	273+940	1 x 10.5 x 3.5	Light Vehicular Underpass

2.7. Lateral and vertical clearances at overpasses

2.7.1 Lateral and vertical clearances at overpasses and provision of guard rails/crash barriers shall be as per the paragraph 2.11 of the Manual.

2.7.2 Lateral Clearance: The size of the openings at overpasses shall be as follows:

S. No.	Location (Chainage) (from km to km)	Span/opening (m)	Remarks
NIL			

2.8. Service roads / Slip roads

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

S. No.	Design Chainage	RHS / LHS/ or Both sides	Length (km)
NIL			

2.9. Grade separated structures:

2.9.1 Grade separated structures shall be provided as per the paragraph 2.13 of the Manual. The requisite particulars are given below:

S. No.	Location of Structure	Deck Width (m)	Number and length of spans	Approach gradient
NIL				

2.10. Cattle and Pedestrian under pass / over pass

Cattle and Pedestrian underpass/ overpass shall be constructed as follows:

S.No.	Location	Type of crossing
NIL		

2.11. Typical Cross Section of the Project Highway

Typical Cross Sections (TCS) have been developed as TCS-1, TCS-2 and TCS-4 to TCS-8showing configuration along with a schedule of their applicability is presented in Appendix B-1 to this Schedule-B.

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 tables below.

(a) At-grade intersections

Major Junctions: -

S. No	Existing Chainage (Km)	Design Chainage (Km)	Type of Junction	Side	Remarks
1	274+602	272+536	Y	LHS	Start of Kangpokpi bypass
2	276+217	274+622	T	RHS	End of Kangpokpi bypass

Minor Junctions: -

S. No	Existing Chainage (Km)	Design Chainage (Km)	Type of Junction	Side	Proposed Width	Village/Town Name
1	267+362	265+243	Y	LHS	3.5	Henjbung
2	269+203	266+997	T	RHS	5.5	Henjbung
3	269+471	267+262	T	RHS	3.5	Thangal
4	269+504	267+294	T	LHS	3.5	Thangal
5	269+635	267+425	T	LHS	3.5	Thangal
6	270+209	267+995	Y	LHS	3.5	Tumuyon khullen
7	270+512	268+298	Y	LHS	3.5	Tumuyon khullen
8	270+775	268+559	Y	LHS	3.5	Tumuyon khullen
9	271+000	268+776	Y	LHS	3.5	Tumuyon khullen
10	271+121	268+870	Y	LHS	3.5	Tumuyon khullen
11	271+328	269+084	T	LHS	3.5	Tumuyon khullen

For the proper drainage, additional Pipe Culvert (NP4 class) shall be provided on cross roads as per site condition.

(b) Grade separated intersection with/without ramps

Sl. No.	Location	Salient features	Minimum length of viaduct to be provided	Road to be carried over/under the structures
NIL				

4. Road Embankment and Cut Section

4.1 The reconstruction of the existing road 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 profile of the existing road at the following locations shall be raised:

S. No.	Chainage		Length	Extent of raising
	From	To		
As per Alignment Plan & Profile (Annex-III, Schedule A)				

5. Pavement Design

5.1. Pavement design

Pavement design shall be carried out in accordance with Section 5 of the Manual and IRC:37-2018.

5.2. Type of pavement

Flexible pavement should be provided on entire project length.

5.3. Design requirements

Pavement design shall be as per section 5 of the Manual and IRC: 37: 2018.

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 ***30*** Million Standard Axles (MSA).

5.4. Reconstruction stretches

The entire length of the Project road requires 'reconstruction' following the Alignment Plan (Annex III-Schedule A). The entire road shall be designed as new flexible pavement.

6. Roadside Drainage

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

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 follows:

S. No.	Bridge (Km)	Carriageway width and Cross section Features
As per GAD		

7.1.3 The following structures shall be provided with footpaths:

S. No.	Bridge (Km)	Carriageway width and Cross section Features
As per GAD		

7.1.4 All bridges shall be high-level bridges.

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

Sl. No.	Bridge at km	Utility service to be carried	Remarks
To be finalized as per the site condition, during the execution, in consultation with the Authority Engineer.			

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 for Project Highway.

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:

(i) **Reconstruction of Pipe Culvert to Pipe Culvert**

The following pipe culverts are proposed for reconstruction to pipe culverts:

S. No.	Location		Proposed Span (m)	Type	Remarks
	Existing	Proposed			
NIL					

(ii) **Reconstruction of Pipe/Slab Culvert to Box Culvert**

The following pipe/slab culverts are proposed for reconstruction to box culverts:

S. No.	Location		Type	Proposed Span (m)	Remarks
	Existing	Proposed			
1	264+862	262+725	Box Culvert	1X3X3m	
2	266+199	264+046	Box Culvert	1X2X2m	
3	266+646	264+493	Box Culvert	1X2X2m	
4	266+822	264+669	Box Culvert	1X2X2m	
5	267+298	265+179	Box Culvert	1X2X2m	

S. No.	Location		Type	Proposed Span (m)	Remarks
	Existing	Proposed			
6	268+558	266+426	Box Culvert	1X2X2m	
7	268+708	266+575	Box Culvert	1X2X2m	
8	268+800	266+668	Box Culvert	1X2X2m	
9	269+052	266+848	Box Culvert	1X2X2m	
10	270+185	267+971	Box Culvert	1X3X3m	
11	270+413	268+199	Box Culvert	1X3X3m	
12	270+502	268+288	Box Culvert	1X3X3m	
13	273+306	271+116	Box Culvert	1X2X2m	
14	273+457	271+268	Box Culvert	1X2X2m	
15	273+833	271+642	Box Culvert	1X2X2m	
16	274+062	272+000	Box Culvert	1X2X2m	

7.2.3 Widening of Existing Culverts:

All existing culverts which are not to be reconstructed shall be widened to the roadway width of the Project Highway as per the typical cross section given in Appendix B-1 to this Schedule-B. Repairs and strengthening of existing structures where required shall be carried out.

(a) Retaining / widening of Pipe Culverts

S. No.	Ex. Chainage (Km)	Design Chainage (Km)	Type	Size (Nos x dia in m)	Remark
1	265+090	262+954	Pipe Culvert	1X1m	Widened Both side
2	268+050	265+929	Pipe Culvert	1X1m	Widened Both side
3	268+201	266+077	Pipe Culvert	1X1m	Widened Both side
4	268+475	266+342	Pipe Culvert	1X1m	Widened Left side
5	269+430	267+223	Pipe Culvert	1X1m	Widened Both side
6	269+513	267+303	Pipe Culvert	1X1m	Widened Both side
7	269+865	267+655	Pipe Culvert	1X1m	Widened Both side
8	270+070	267+857	Pipe Culvert	1X1m	Widened Left side

(b) Retaining / widening of Slab Culverts

S.No.	Ex. Chainage (Km)	Design Chainage (Km)	Type	Span	Remark

1	265+350	263+116	Slab Culvert	1x2.5 m	Widened Both side
2	265+425	263+210	Slab Culvert	1X5.2m	Widened Both side
3	266+325	264+198	Slab Culvert	1X3.8m	Widened Both side
4	266+475	264+333	Slab Culvert	1X2.5m	Widened Both side
5	266+525	264+382	Slab Culvert	1X5.8m	Widened Both side
6	267+090	264+956	Slab Culvert	1X1.6m	Widened Both side
7	267+475	265+348	Slab Culvert	1X1.6m	Widened Both side
8	267+755	265+462	Slab Culvert	1X1.6m	Widened Both side
9	267+850	265+612	Slab Culvert	1X2.1m	Widened Both side
10	269+615	267+381	Slab Culvert	1X1.6m	Widened Both side
11	274+910	272+313	Slab Culvert	1X2.7m	Widened Left side

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

S.No.	Design Chainage (Km)	Type	Size (No x span)	Cushion (m)
1	263+840	Box Culvert	1X2X2m	
2	265+785	Box Culvert	1X2X2m	
3	266+205	Box Culvert	1X3x3m	
4	267+030	Box Culvert	1X2X2m	
5	267+500	Box Culvert	1X3X3m	3.0
6	268+700	Box Culvert	1X3X3m	3.0
7	268+979	Box Culvert	1X2X2m	
8	270+230	Box Culvert	1X2X2m	
9	270+500	Box Culvert	1X2X2m	
10	270+660	Box Culvert	1X3X3m	
11	271+480	Box Culvert	1X2X2m	
12	272+500	Box Culvert	1X2X2m	
13	273+275	Box Culvert	1X3X2m	
14	274+470	Box Culvert	1X3X3m	3.0

One additional culvert shall also be provided at each 'T' or 'Y' shape junction and two additional pipe culvers at each cross roads as per site condition for drainage requirement.

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

Sl. No.	Location	Type	Size	Type of repair

	Existing	**Proposed**			**required**
Necessary repair and rehabilitation / strengthening works are to be carried out for all widening and retained culverts as per site condition and as directed by Authority's Engineer.					

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

(a) The existing bridges at the following locations shall be re-constructed as new Structures:

a) Major Bridges:

S.No.	Location		Type of Existing structure	Span Arrangement		Deck width
	Existing	Proposed		Existing	Proposed	
NIL						

b) Minor Bridges:

S. No.	Location		Type of Existing structure	Span Arrangement		Deck width
	Existing	Proposed		Existing	Proposed	
NIL						

(ii)The following bridges shall be retained / widened:

a) Major Bridges:

S. No	Chainage (km)		Span Arrangement (m)	Outer Width (m)	Super Struc. Type	Remarks
	Design	Existing				
NIL						

b) Minor Bridges:

S. No	Chainage (km)		Span Arrangement (m)	Outer Width (m)	Super Structure Type	Remarks
	Design	Existing				
Nil						

Note: Necessary repair and rehabilitation/ strengthening works are to be carried out for all widening and retained bridges as per site condition and as directed by the Authority's Engineer

7.3.2 Additional New bridges:

New bridges at the following locations on the Project Highway shall be constructed. The GADs of new bridges are attached in Volume II: Drawings folder.

S. No.	Design Chainage	Type of Structure	Proposed Span	Remarks
1	269+990	MNBR	1 x 40	New 4Lane bridge
2	273+080	MNBR	2 x 5.0 (Clear Span) x 2.5	New 4 Lane bridge
3	273+551	MNBR	2 x 5.0 (Clear Span) x 2.5	New 4 Lane bridge
4	274+160	MNBR	1 x 30.0	New 4 Lane bridge

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

S. No.	Location at km	Remarks
NIL		

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

S. No.	Location		Type of Existing structure	Span Arrangement	Remarks
	Existing	Proposed			
As per Note given under clause 7.3.1					

7.3.5 Drainage system for bridge decks

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

Sl. No.	Location at km	Remarks
NIL		

7.4. Rail-road bridges- NIL

7.4.1 Design, construction and detailing of ROB/RUB shall be as specified in section 7 of the Manual.

7.4.2 *Road over-bridges- NIL*

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

S. No.	Chainage	Proposed Span	Type of Superstructure	Deck Width	Remarks
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:

S.No.	Location of Level crossing	Proposed Span arrangement
NIL		

7.5. Grade separated structures

S. No.	Design Chainage	Type of Structure	Proposed Span (m)	Deck width (M)
NIL				

7.6. Repairs and strengthening of bridges and structures

The existing bridges and structures to be repaired/strengthened, and the nature and extent of repairs /strengthening required are given below:

A. Bridges

Sl. No.	Location of bridge (km)	Nature and extent of repairs/strengthening to be carried out
Repair of wearing course and partially damaged railing most of existing bridge location. Vegetation growth needs to be removed from existing structure.		

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		

7.7. W- Beam Metal Crash Barrier

The W beam crash Barriers are proposed where the embankment height is more than 3m height. The locations are as below:

Sl. No.	Design Chainage (Km)		TCS Type	Length (m)
	From	To		
Left Hand Side (LHS)				
1	262+175	262+300	Merging with Ex 2 lane road	125
2	262+680	262+780	TCS - 5	100
3	263+130	263+140	TCS - 1	10
4	263+140	263+220	TCS - 8	80
5	263+220	263+240	TCS - 1	20
6	263+310	263+440	TCS - 4	130
7	264+200	264+340	TCS - 1	140
8	264+380	264+410	TCS - 1	30
9	264+780	264+920	TCS - 1	140

Sl. No.	Design Chainage (Km)		TCS Type	Length (m)
	From	To		
10	264+920	265+000	TCS - 8	80
11	265+000	265+040	TCS - 1	40
12	265+420	265+560	TCS - 8	140
13	265+560	265+640	TCS - 7	80
14	265+640	265+670	TCS - 1	30
15	265+790	265+820	TCS - 1	30
16	265+820	265+900	TCS - 8	80
17	265+900	265+910	TCS - 6	10
18	266+030	266+040	TCS - 6	10
19	266+040	266+140	TCS - 5	100
20	266+140	266+160	TCS - 6	20
21	266+160	266+270	TCS - 8	110
22	266+270	266+280	TCS - 1	10
23	266+820	266+910	TCS - 8	90
24	266+940	266+970	TCS - 5	30
25	266+970	267+090	TCS - 8	120
26	267+090	267+110	TCS - 1	20
27	267+460	267+470	TCS - 1	10
28	267+470	267+550	TCS - 8	80
29	267+550	267+570	TCS - 6	20
30	267+610	267+670	TCS - 1	60
31	267+820	267+910	TCS - 8	90
32	267+910	267+960	TCS - 6	50
33	267+960	268+010	TCS - 5	50
34	268+010	268+040	TCS - 8	30
35	268+170	268+290	TCS - 1	120
36	268+630	268+730	TCS - 6	100
37	268+730	268+740	TCS - 1	10
38	270+180	270+240	TCS - 6	60
39	270+490	270+510	TCS - 6	20
40	270+510	270+630	TCS - 5	120
41	270+630	270+690	TCS - 8	60
42	270+690	270+990	TCS - 5	300
43	271+040	271+090	TCS - 5	50
44	271+090	271+180	TCS - 8	90
45	271+180	271+800	TCS - 5	620
46	272+330	272+490	TCS - 4	160
47	273+490	273+546	TCS - 5	56
48	273+960	274+147	TCS - 7	187
Right Hand Side (RHS)				
1	265+460	265+560	TCS - 8	100
2	265+560	265+640	TCS - 7	80

Sl. No.	Design Chainage (Km)		TCS Type	Length (m)
	From	To		
3	265+640	265+660	TCS - 1	20
4	267+480	267+530	TCS - 8	50
5	268+300	268+310	TCS - 1	10
6	268+310	268+350	TCS - 6	40
7	268+350	268+400	TCS - 5	50
8	268+400	268+430	TCS - 1	30
9	270+005	270+030	TCS - 6	25
10	273+949	274+147	TCS - 7	198
11	274+177	274+270	TCS - 8	93
12	274+270	274+610	TCS - 7	340

The W beam crash Barriers are proposed in both sides, where the radius of the curve upto 450m as given below:

S No	CHAINAGE		Length	Remark (Curve Radius)
	Start	End		
Inner edge				
1	262+598	262+933	335	-360
2	262+987	263+474	487	360
3	263+660	263+998	338	-360
4	265+847	266+152	304	360
5	267+084	267+407	323	360
6	269+132	269+516	384	-360
7	269+518	269+845	327	360
8	269+863	270+274	411	-360
9	270+300	270+675	375	360
10	270+690	270+970	280	-360
11	271+066	271+353	287	360
12	271+550	271+833	284	-400
13	271+889	272+088	199	400
14	272+091	272+395	305	-400
15	273+840	274+265	425	360

LEFT Side Outer Edge				RIGHT Side Outer Edge			
S No	CHAINAGE		Length	S No	CHAINAGE		Length
	Start	End			Start	End	
1	262+987	263+130	143	**1**	262+598	262+933	335
2	263+240	263+310	70	**2**	263+660	263+998	338
3	263+440	263+474	34	**3**	269+132	269+516	384
4	265+910	266+030	120	**4**	269+863	270+274	411
5	267+110	267+407	297	**5**	270+690	270+970	280
6	269+518	269+845	327	**6**	271+550	271+833	284
7	270+300	270+490	190	**7**	272+091	272+395	305
8	271+889	272+088	199				
9	273+840	273+960	120				
10	274+147	274+265	118				

7.8. Protection Work

The Stone Masonry Breast wall have been proposed on hill side section along the roadway edge where cutting is required or cutting is more than available ROW.

Retaining walls are proposed to restrict the earth along the filling section where normal side slope crosses the available ROW. The PCC toe walls are adopted upto the height of 2m from GL and RCC retaining wall where the required height of wall at site is more than 2m.

The project section where the hill cut heights of side slope is more than 25m, Surficial protection and Erosion Control measures have been considered and details of Typical measures for soil and Rocky surface are presented in Appendix B-1 of this Schedule B.

Breast wall and Retaining wall shall be provided in accordance with section 13 of the Manual.

1. Breast wall

The Stone masonry Breast Wall shall be provided at the following locations**:**

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
1	262+300	262+310	6		1.5		10
2	262+310	262+320	6		3		10
3	262+320	262+330	6		3		10
4	262+330	262+340	6		3		10
5	262+340	262+350	6	3	3	10	10
6	262+350	262+360	6	3	3	10	10
7	262+360	262+370	6	3	3	10	10
8	262+370	262+380	6	3	3	10	10
9	262+380	262+390	6	3	3	10	10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
10	262+390	262+400	6	3	3	10	10
11	262+400	262+410	6	3	3	10	10
12	262+440	262+450	6	1.5		10	
13	262+450	262+460	6	1.5		10	
14	262+460	262+470	6	1.5		10	
15	262+470	262+480	6	1.5		10	
16	262+480	262+490	6	1.5		10	
17	262+490	262+500	6	3		10	
18	262+500	262+510	6	3		10	
19	262+510	262+520	6	3		10	
20	262+520	262+530	6	3		10	
21	262+530	262+540	6	3		10	
22	262+540	262+550	6	1.5		10	
23	262+550	262+560	6	1.5		10	
24	262+560	262+570	6	1.5		10	
25	262+570	262+580	6	1.5		10	
26	262+580	262+590	6	1.5		10	
27	262+590	262+600	6	1.5		10	
28	262+600	262+610	6	1.5		10	
29	262+660	262+670	6		3		10
30	262+670	262+680	6		3		10
31	262+680	262+690	5		3		10
32	262+690	262+700	5		3		10
33	262+700	262+710	5		3		10
34	262+850	262+860	6		1.5		10
35	262+860	262+870	6		1.5		10
36	262+870	262+880	6		1.5		10
37	262+880	262+890	6		1.5		10
38	262+890	262+900	6		1.5		10
39	262+900	262+910	6		1.5		10
40	262+910	262+920	6		3		10
41	262+920	262+930	6		3		10
42	262+930	262+940	6		3		10
43	262+940	262+950	6		3		10
44	262+950	262+960	6		3		10
45	262+960	262+970	6		3		10
46	262+970	262+980	6		3		10
47	262+980	262+990	6		3		10
48	262+990	263+000	6		3		10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
49	263+000	263+010	6		3		10
50	263+010	263+020	6		3		10
51	263+020	263+030	6		3		10
52	263+030	263+040	6		3		10
53	263+040	263+050	6		3		10
54	263+050	263+060	6		3		10
55	263+060	263+070	6		1.5		10
56	263+070	263+080	6		1.5		10
57	263+080	263+090	6		1.5		10
58	263+090	263+100	6		1.5		10
59	263+260	263+270	6		1.5		10
60	263+270	263+280	6		1.5		10
61	263+280	263+290	6		3		10
62	263+290	263+300	6		3		10
63	263+300	263+310	6		3		10
64	263+310	263+320	4		3		10
65	263+320	263+330	4		3		10
66	263+330	263+340	4		3		10
67	263+340	263+350	4		3		10
68	263+350	263+360	4		3		10
69	263+360	263+370	4		3		10
70	263+370	263+380	4		3		10
71	263+380	263+390	4		3		10
72	263+390	263+400	4		3		10
73	263+400	263+410	4		3		10
74	263+410	263+420	4		3		10
75	263+480	263+490	6	1.5		10	
76	263+490	263+500	6	1.5		10	
77	263+500	263+510	6	1.5		10	
78	263+510	263+520	6	3		10	
79	263+520	263+530	6	3		10	
80	263+530	263+540	6	3		10	
81	263+540	263+550	6	3		10	
82	263+550	263+560	6	3		10	
83	263+560	263+570	6	3		10	
84	263+570	263+580	6	3		10	
85	263+580	263+590	6	3		10	
86	263+590	263+600	6	3		10	
87	263+600	263+610	6	1.5		10	
88	263+610	263+620	6	1.5		10	

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
89	263+620	263+630	6	1.5		10	
90	263+630	263+640	6	1.5		10	
91	263+730	263+740	6		3		10
92	263+740	263+750	6		3		10
93	263+750	263+760	6		3		10
94	263+760	263+770	6		3		10
95	263+770	263+780	6		3		10
96	263+780	263+790	6		3		10
97	263+790	263+800	6		3		10
98	263+800	263+810	6		1.5		10
99	263+880	263+890	6		1.5		10
100	263+890	263+900	6	1.5	3	10	10
101	263+900	263+910	6	1.5	3	10	10
102	263+910	263+920	6	1.5	1.5	10	10
103	263+920	263+930	6		1.5		10
104	263+930	263+940	6		1.5		10
105	263+940	263+950	6		3		10
106	263+950	263+960	6		1.5		10
107	263+960	263+970	6		1.5		10
108	263+970	263+980	6		1.5		10
109	263+980	263+990	6		1.5		10
110	263+990	264+000	6		1.5		10
111	264+000	264+010	6		1.5		10
112	264+010	264+020	6		3		10
113	264+020	264+030	6		3		10
114	264+030	264+040	6		3		10
115	264+040	264+050	6		3		10
116	264+050	264+060	6		1.5		10
117	264+060	264+070	6		1.5		10
118	264+070	264+080	6		3		10
119	264+080	264+090	6		3		10
120	264+090	264+100	6		3		10
121	264+100	264+110	6		3		10
122	264+110	264+120	6		3		10
123	264+120	264+130	6		1.5		10
124	265+890	265+900	8		1.5		10
125	265+900	265+910	6		1.5		10
126	265+910	265+920	6		1.5		10
127	265+920	265+930	6		1.5		10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
128	265+930	265+940	6		1.5		10
129	265+940	265+950	6		3		10
130	265+950	265+960	6		3		10
131	265+960	265+970	6		3		10
132	265+970	265+980	6		3		10
133	265+980	265+990	6		3		10
134	265+990	266+000	6		3		10
135	266+000	266+010	6		3		10
136	266+010	266+020	6		3		10
137	266+020	266+030	6		3		10
138	266+030	266+040	6		1.5		10
139	266+040	266+050	5		1.5		10
140	266+050	266+060	5		1.5		10
141	266+060	266+070	5		1.5		10
142	266+070	266+080	5		1.5		10
143	266+080	266+090	5		1.5		10
144	266+090	266+100	5		1.5		10
145	266+100	266+110	5		1.5		10
146	266+110	266+120	5		1.5		10
147	266+120	266+130	5		3		10
148	266+130	266+140	5		3		10
149	266+140	266+150	6		3		10
150	266+150	266+160	6		3		10
151	266+160	266+170	8		1.5		10
152	266+350	266+360	6		1.5		10
153	266+360	266+370	6		3		10
154	266+370	266+380	6		3		10
155	266+380	266+390	6		3		10
156	266+390	266+400	6		1.5		10
157	266+440	266+450	6		1.5		10
158	266+450	266+460	6		1.5		10
159	266+460	266+470	6	0	3		10
160	266+470	266+480	6	0	3		10
161	266+480	266+490	6	0	3		10
162	266+490	266+500	6	0	3		10
163	266+500	266+510	6	0	3		10
164	266+510	266+520	6	0	3		10
165	266+520	266+530	6	0	3		10
166	266+530	266+540	6	0	3		10
167	266+540	266+550	6	0	3		10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
168	266+550	266+560	6	0	3		10
169	266+560	266+570	6	0	3		10
170	266+570	266+580	6	0	3		10
171	266+580	266+590	6	0	3		10
172	266+590	266+600	6	0	3		10
173	266+600	266+610	6	0	3		10
174	266+610	266+620	6	0	1.5		10
175	266+620	266+630	6	0	1.5		10
176	266+630	266+640	6	0	1.5		10
177	266+640	266+650	6		1.5		10
178	266+650	266+660	6				
179	266+670	266+680	6		1.5		10
180	266+680	266+690	6		1.5		10
181	266+690	266+700	6		1.5		10
182	266+700	266+710	6		3		10
183	266+710	266+720	6		3		10
184	266+720	266+730	6		3		10
185	266+730	266+740	6		3		10
186	266+740	266+750	6		3		10
187	266+750	266+760	6		3		10
188	266+760	266+770	6		3		10
189	266+770	266+780	6		3		10
190	266+780	266+790	6		3		10
191	266+790	266+800	6		3		10
192	266+800	266+810	6		1.5		10
193	266+810	266+820	6		1.5		10
194	266+820	266+830	8		1.5		10
195	266+930	266+940	6		1.5		10
196	266+940	266+950	5		1.5		10
197	266+950	266+960	5		1.5		10
198	266+960	266+970	5		1.5		10
199	267+170	267+180	6	0	1.5		10
200	267+180	267+190	6	0	3		10
201	267+190	267+200	6	1.5	3	10	10
202	267+200	267+210	6		3		10
203	267+210	267+220	6		3		10
204	267+220	267+230	6		3		10
205	267+230	267+240	6		3		10
206	267+240	267+250	6		3		10
207	267+250	267+260	6		3		10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
208	267+260	267+270	6		1.5		10
209	267+270	267+280	6		3		10
210	267+280	267+290	6		3		10
211	267+290	267+300	6		1.5		10
212	267+300	267+310	6		3		10
213	267+310	267+320	6		3		10
214	267+320	267+330	6		1.5		10
215	267+330	267+340	6	0	3		10
216	267+340	267+350	6	0	1.5		10
217	267+350	267+360	6	0	1.5		10
218	267+360	267+370	6	0	1.5		10
219	267+370	267+380	6		1.5		10
220	267+380	267+390	6	0	1.5		10
221	267+390	267+400	6	1.5	1.5	10	10
222	267+400	267+410	6	1.5	1.5	10	10
223	267+410	267+420	6	0	1.5		10
224	267+560	267+570	6		1.5		10
225	267+570	267+580	6		1.5		10
226	267+580	267+590	6		0		
227	267+590	267+600	6		1.5		10
228	267+600	267+610	6		1.5		10
229	267+700	267+710	6		1.5		10
230	267+710	267+720	6		3		10
231	267+720	267+730	6		3		10
232	267+730	267+740	6		3		10
233	267+740	267+750	6		3		10
234	267+750	267+760	6		3		10
235	267+760	267+770	6		3		10
236	267+770	267+780	6	0	3		10
237	267+780	267+790	6	0	3		10
238	267+790	267+800	6		3		10
239	267+800	267+810	6		3		10
240	267+810	267+820	6		1.5		10
241	267+820	267+830	8		1.5		10
242	267+830	267+840	8		1.5		10
243	267+910	267+920	6		1.5		10
244	267+920	267+930	6		1.5		10
245	267+930	267+940	6		1.5		10
246	267+940	267+950	6		1.5		10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
247	267+950	267+960	6		1.5		10
248	267+960	267+970	5		1.5		10
249	267+970	267+980	5		1.5		10
250	267+980	267+990	5		1.5		10
251	267+990	268+000	5		1.5		10
252	268+000	268+010	5		1.5		10
253	268+310	268+320	6	1.5		10	
254	268+320	268+330	6	1.5		10	
255	268+330	268+340	6	3		10	
256	268+340	268+350	6	3		10	
257	268+350	268+360	5	3		10	
258	268+360	268+370	5	1.5		10	
259	268+370	268+380	5	1.5		10	
260	268+380	268+390	5	1.5		10	
261	268+390	268+400	5	1.5		10	
262	268+510	268+520	6		1.5		10
263	268+520	268+530	6		1.5		10
264	268+530	268+540	6	0	1.5		10
265	268+540	268+550	6	0	3		10
266	268+550	268+560	6	0	3		10
267	268+560	268+570	6	0	1.5		10
268	268+570	268+580	6	0	1.5		10
269	268+580	268+590	6	0	3		10
270	268+590	268+600	6	0	3		10
271	268+600	268+610	6		1.5		10
272	268+610	268+620	6	0	1.5		10
273	268+620	268+630	6		1.5		10
274	268+770	268+780	6		1.5		10
275	268+780	268+790	6		1.5		10
276	268+790	268+800	6		1.5		10
277	268+800	268+810	6		1.5		10
278	268+810	268+820	6		1.5		10
279	268+820	268+830	6	0	3		10
280	268+830	268+840	6	1.5	3	10	10
281	268+840	268+850	6	1.5	1.5	10	10
282	268+850	268+860	6	1.5	1.5	10	10
283	268+860	268+870	6	1.5	3	10	10
284	268+870	268+880	6	1.5	3	10	10
285	268+880	268+890	6	1.5	3	10	10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
286	268+890	268+900	6	1.5	3	10	10
287	268+900	268+910	6	1.5	3	10	10
288	268+910	268+920	6	0	3		10
289	268+920	268+930	6	1.5	3	10	10
290	268+930	268+940	6	1.5	1.5	10	10
291	269+010	269+020	2	1.5	1.5	10	10
292	269+020	269+030	2	1.5	1.5	10	10
293	269+030	269+040	2	3	1.5	10	10
294	269+040	269+050	2	3	3	10	10
295	269+050	269+060	2	3	3	10	10
296	269+060	269+070	2	3	3	10	10
297	269+070	269+080	2	3	3	10	10
298	269+080	269+090	2	3	3	10	10
299	269+090	269+100	2	3	3	10	10
300	269+100	269+110	2	3	3	10	10
301	269+110	269+120	2	3	3	10	10
302	269+120	269+130	2	3	3	10	10
303	269+130	269+140	2	3	3	10	10
304	269+140	269+150	2	3	3	10	10
305	269+150	269+160	2	3	3	10	10
306	269+160	269+170	2	3	3	10	10
307	269+170	269+180	2	3	3	10	10
308	269+180	269+190	2	3	3	10	10
309	269+190	269+200	2	3	3	10	10
310	269+200	269+210	2	3	3	10	10
311	269+210	269+220	2	3	3	10	10
312	269+220	269+230	2	3	3	10	10
313	269+230	269+240	2	3	3	10	10
314	269+240	269+250	2	3	3	10	10
315	269+250	269+260	2	3	3	10	10
316	269+260	269+270	2	3	3	10	10
317	269+270	269+280	2	3	3	10	10
318	269+280	269+290	2	3	3	10	10
319	269+290	269+300	2	3	3	10	10
320	269+300	269+310	2	3	3	10	10
321	269+310	269+320	2	3	3	10	10
322	269+320	269+330	2	3	3	10	10
323	269+330	269+340	2	3	3	10	10
324	269+340	269+350	2	3	3	10	10
325	269+350	269+360	2	3	3	10	10
326	269+360	269+370	2	3	3	10	10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
327	269+370	269+380	2	3	3	10	10
328	269+380	269+390	2	3	3	10	10
329	269+390	269+400	2	3	3	10	10
330	269+400	269+410	2	3	3	10	10
331	269+410	269+420	2	3	3	10	10
332	269+420	269+430	2		3		10
333	269+430	269+440	2		3		10
334	269+440	269+450	2		3		10
335	269+450	269+460	2		3		10
336	269+460	269+470	2		3		10
337	269+470	269+480	2		3		10
338	269+480	269+490	2		3		10
339	269+490	269+500	2		3		10
340	269+500	269+510	2		3		10
341	269+510	269+520	2		3		10
342	269+520	269+530	2		3		10
343	269+530	269+540	2		3		10
344	269+540	269+550	2		3		10
345	269+550	269+560	2		3		10
346	269+560	269+570	2		3		10
347	269+570	269+580	2		3		10
348	269+580	269+590	2		3		10
349	269+590	269+600	2		3		10
350	269+600	269+610	2		3		10
351	269+610	269+620	2		3		10
352	269+620	269+630	2		3		10
353	269+630	269+640	2		3		10
354	269+640	269+650	2		3		10
355	269+650	269+660	2		3		10
356	269+660	269+670	2		3		10
357	269+670	269+680	2	3	3	10	10
358	269+680	269+690	2	3	3	10	10
359	269+690	269+700	2	3	3	10	10
360	269+700	269+710	2	3	3	10	10
361	269+710	269+720	2	3	3	10	10
362	269+720	269+730	2	3	3	10	10
363	269+730	269+740	2	3	3	10	10
364	269+740	269+750	2	3	1.5	10	10
365	269+750	269+760	2	3	1.5	10	10
366	269+760	269+770	2	3	1.5	10	10
367	269+770	269+780	2	3	1.5	10	10
368	269+780	269+790	2	3	1.5	10	10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
369	269+790	269+800	2		1.5		10
370	269+800	269+810	2		1.5		10
371	269+810	269+820	2		3		10
372	269+820	269+830	2		3		10
373	269+830	269+840	2		3		10
374	269+840	269+850	2		3		10
375	269+850	269+860	2		3		10
376	269+860	269+870	2		3		10
377	269+870	269+880	2		3		10
378	269+880	269+890	2		3		10
379	269+890	269+900	2		3		10
380	269+900	269+910	2		3		10
381	269+910	269+920	2		3		10
382	269+920	269+930	2	3	3	10	10
383	269+930	269+940	2	3	3	10	10
384	269+940	269+950	2	3	3	10	10
385	269+950	269+960	2	1.5	1.5	10	10
386	269+960	269+965	2	1.5	1.5	5	5
387	270+020	270+030	6	1.5		10	
388	270+030	270+040	6	3		10	
389	270+040	270+050	6	3	1.5	10	10
390	270+050	270+060	2		3		10
391	270+060	270+070	2		3		10
392	270+070	270+080	2		3		10
393	270+080	270+090	2		3		10
394	270+090	270+100	2		3		10
395	270+100	270+110	2		3		10
396	270+110	270+120	2		3		10
397	270+120	270+130	2		3		10
398	270+130	270+140	2		3		10
399	270+140	270+150	6		1.5		10
400	270+150	270+160	6		1.5		10
401	270+260	270+270	6				
402	270+270	270+280	6		1.5		10
403	270+280	270+290	6		1.5		10
404	270+290	270+300	6		1.5		10
405	270+300	270+310	6		3		10
406	270+310	270+320	6		3		10
407	270+320	270+330	6		3		10
408	270+330	270+340	6		3		10
409	270+340	270+350	6		3		10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
410	270+350	270+360	6		1.5		10
411	270+360	270+370	6		1.5		10
412	270+370	270+380	6		1.5		10
413	270+380	270+390	6		1.5		10
414	270+390	270+400	6		1.5		10
415	270+400	270+410	6	3		10	
416	270+410	270+420	6	3		10	
417	270+420	270+430	6	3		10	
418	270+430	270+440	6	3		10	
419	270+440	270+450	6	3		10	
420	270+450	270+460	6	3		10	
421	270+460	270+470	6	3		10	
422	270+470	270+480	6	3		10	
423	270+480	270+490	6	3		10	
424	270+490	270+500	6	3		10	
425	270+500	270+510	6	3		10	
426	270+510	270+520	5	3		10	
427	270+520	270+530	5	3		10	
428	270+530	270+540	5	3		10	
429	270+540	270+550	5	3		10	
430	270+550	270+560	5	3		10	
431	270+560	270+570	5	3		10	
432	270+570	270+580	5	3		10	
433	270+580	270+590	5	3		10	
434	270+590	270+600	5	3		10	
435	270+600	270+610	5	3		10	
436	270+610	270+620	5	3		10	
437	270+620	270+630	5	1.5		10	
438	270+700	270+710	5	1.5		10	
439	270+710	270+720	5	3		10	
440	270+720	270+730	5	3		10	
441	270+730	270+740	5	3		10	
442	270+740	270+750	5	3		10	
443	270+750	270+760	5	3		10	
444	270+760	270+770	5	3		10	
445	270+770	270+780	5	3		10	
446	270+780	270+790	5	3		10	
447	270+790	270+800	5	3		10	
448	270+800	270+810	5	3		10	
449	270+810	270+820	5	3		10	
450	270+820	270+830	5	3		10	

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
451	270+830	270+840	5	3		10	
452	270+840	270+850	5	3		10	
453	270+850	270+860	5	3		10	
454	270+860	270+870	5	3		10	
455	270+870	270+880	5	3		10	
456	270+880	270+890	5	3		10	
457	270+890	270+900	5	3		10	
458	270+900	270+910	5	3		10	
459	270+910	270+920	5	3		10	
460	270+920	270+930	5	3		10	
461	270+930	270+940	5	3		10	
462	270+940	270+950	5	3		10	
463	270+950	270+960	5	3		10	
464	270+960	270+970	5	3		10	
465	270+970	270+980	5	3		10	
466	270+980	270+990	5	3		10	
467	270+990	271+000	6	3		10	
468	271+000	271+010	6	3	1.5	10	10
469	271+010	271+020	6	3	1.5	10	10
470	271+020	271+030	6	3	1.5	10	10
471	271+030	271+040	6	3		10	
472	271+040	271+050	5	3		10	
473	271+050	271+060	5	3		10	
474	271+060	271+070	5	1.5		10	
475	271+070	271+080	5	1.5		10	
476	271+080	271+090	5	1.5		10	
477	271+180	271+190	5	1.5		10	
478	271+190	271+200	5	1.5		10	
479	271+200	271+210	5	1.5		10	
480	271+210	271+220	5	1.5		10	
481	271+220	271+230	5	1.5		10	
482	271+230	271+240	5	3		10	
483	271+240	271+250	5	3		10	
484	271+250	271+260	5	1.5		10	
485	271+260	271+270	5	1.5		10	
486	271+270	271+280	5	1.5		10	
487	271+280	271+290	5	1.5		10	
488	271+290	271+300	5	1.5		10	
489	271+300	271+310	5	1.5		10	
490	271+310	271+320	5	1.5		10	
491	271+320	271+330	5	1.5		10	

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
492	271+330	271+340	5	1.5		10	
493	271+340	271+350	5	1.5		10	
494	271+350	271+360	5	1.5		10	
495	271+360	271+370	5	3		10	
496	271+370	271+380	5	3		10	
497	271+380	271+390	5	3		10	
498	271+390	271+400	5	3		10	
499	271+400	271+410	5	3		10	
500	271+410	271+420	5	3		10	
501	271+420	271+430	5	3		10	
502	271+430	271+440	5	3		10	
503	271+440	271+450	5	1.5		10	
504	271+450	271+460	5	1.5		10	
505	271+460	271+470	5				
506	271+490	271+500	5	1.5		10	
507	271+500	271+510	5	1.5		10	
508	271+510	271+520	5	3		10	
509	271+520	271+530	5	3		10	
510	271+530	271+540	5	3		10	
511	271+540	271+550	5	3		10	
512	271+550	271+560	5	3		10	
513	271+560	271+570	5	3		10	
514	271+570	271+580	5	3		10	
515	271+580	271+590	5	3		10	
516	271+590	271+600	5	3		10	
517	271+600	271+610	5	3		10	
518	271+610	271+620	5	3		10	
519	271+620	271+630	5	3		10	
520	271+630	271+640	5	3		10	
521	271+640	271+650	5	3		10	
522	271+650	271+660	5	3		10	
523	271+660	271+670	5	3		10	
524	271+670	271+680	5	3		10	
525	271+680	271+690	5	3		10	
526	271+690	271+700	5	3		10	
527	271+700	271+710	5	3		10	
528	271+710	271+720	5	3		10	
529	271+720	271+730	5	3		10	
530	271+730	271+740	5	3		10	
531	271+740	271+750	5	3		10	
532	271+750	271+760	5	3		10	
533	271+760	271+770	5	3		10	

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
534	271+770	271+780	5	3		10	
535	271+780	271+790	5	3		10	
536	271+790	271+800	5				
537	271+800	271+810	6		1.5		10
538	271+810	271+820	6		1.5		10
539	271+820	271+830	6		3		10
540	271+830	271+840	6		3		10
541	271+840	271+850	6		3		10
542	271+850	271+860	6		3		10
543	271+860	271+870	6		3		10
544	271+870	271+880	6		3		10
545	271+880	271+890	6		3		10
546	271+890	271+900	6		3		10
547	271+900	271+910	6		3		10
548	271+910	271+920	6		1.5		10
549	271+920	271+930	6		1.5		10
550	271+930	271+940	6		1.5		10
551	272+180	272+190	6		1.5		10
552	272+190	272+200	6		1.5		10
553	272+200	272+210	6		1.5		10
554	272+210	272+220	6		1.5		10
555	272+310	272+320	6	3		10	
556	272+320	272+330	4	3		10	
557	272+330	272+340	4	3		10	
558	272+340	272+350	4	3		10	
559	272+350	272+360	4	3		10	
560	272+360	272+370	4	3		10	
561	272+370	272+380	4	3		10	
562	272+380	272+390	4	3		10	
563	272+390	272+400	4	3		10	
564	272+400	272+410	4	3		10	
565	272+410	272+420	4	3		10	
566	272+420	272+430	4	3		10	
567	272+430	272+440	4	3		10	
568	272+440	272+450	4	3		10	
569	272+450	272+460	4	3		10	
570	272+460	272+470	4	3		10	
571	272+470	272+480	4	3		10	
572	272+480	272+490	4	3		10	
573	272+490	272+500	6	3		10	

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
574	272+500	272+510	6	3		10	
575	272+510	272+520	6	3		10	
576	272+520	272+530	6	3		10	
577	272+530	272+540	6	3		10	
578	272+540	272+550	6	3		10	
579	272+550	272+560	2		1.5		10
580	272+560	272+570	2		3		10
581	272+570	272+580	2		3		10
582	272+580	272+590	2		3		10
583	272+590	272+600	2		3		10
584	272+600	272+610	2		3		10
585	272+610	272+620	2		3		10
586	272+620	272+630	2		3		10
587	272+630	272+640	2		3		10
588	272+640	272+650	2		3		10
589	272+650	272+660	2		3		10
590	272+660	272+670	2		3		10
591	272+670	272+680	2		3		10
592	272+680	272+690	2		3		10
593	272+690	272+700	2		3		10
594	272+700	272+710	2		3		10
595	272+710	272+720	2		3		10
596	272+720	272+730	2		1.5		10
597	272+730	272+740	6		1.5		10
598	272+740	272+750	6		1.5		10
599	272+750	272+760	6	3	1.5	10	10
600	272+760	272+770	6	3	1.5	10	10
601	272+770	272+780	6	3		10	
602	272+780	272+790	6	3	1.5	10	10
603	272+790	272+800	6	3	1.5	10	10
604	272+800	272+810	6	3	1.5	10	10
605	272+810	272+820	6	3	1.5	10	10
606	272+820	272+830	2	3	1.5	10	10
607	272+830	272+840	2	3	1.5	10	10
608	272+840	272+850	2	3	1.5	10	10
609	272+850	272+860	2	3	3	10	10
610	272+860	272+870	2	3	3	10	10
611	272+870	272+880	2	3	3	10	10
612	272+880	272+890	2	3	3	10	10
613	272+890	272+900	2	3	3	10	10
614	272+900	272+910	2	3	3	10	10
615	272+910	272+920	2	3	3	10	10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
616	272+920	272+930	2	3	3	10	10
617	272+930	272+940	2	3	3	10	10
618	272+940	272+950	2	3	3	10	10
619	272+950	272+960	2	3	3	10	10
620	272+960	272+970	2	3	3	10	10
621	272+970	272+980	2	3	3	10	10
622	272+980	272+990	2	3	3	10	10
623	272+990	273+000	2	3	3	10	10
624	273+000	273+010	2	3	3	10	10
625	273+010	273+020	2	3	3	10	10
626	273+020	273+030	2	3	3	10	10
627	273+030	273+040	2	3	3	10	10
628	273+040	273+050	2	3	3	10	10
629	273+050	273+060	2	3	3	10	10
630	273+060	273+070	2	3	3	10	10
631	273+070	273+080	6	3	1.5	10	10
632	273+080	273+090	6	3	1.5	10	10
633	273+090	273+100	6	3	1.5	10	10
634	273+100	273+110	6	3	1.5	10	10
635	273+110	273+120	6	3	1.5	10	10
636	273+120	273+130	6	3		10	
637	273+130	273+140	6	3		10	
638	273+140	273+150	5	3		10	
639	273+150	273+160	5	3		10	
640	273+160	273+170	5	3		10	
641	273+170	273+180	6	3		10	
642	273+180	273+190	6	3	1.5	10	10
643	273+190	273+200	6	3	1.5	10	10
644	273+200	273+210	6	3	0	10	
645	273+210	273+220	6	3	0	10	
646	273+220	273+230	6	3	0	10	
647	273+230	273+240	6	3	0	10	
648	273+240	273+250	6	3	0	10	
649	273+250	273+260	6	3	1.5	10	10
650	273+260	273+270	6	3	1.5	10	10
651	273+270	273+280	6	3	1.5	10	10
652	273+280	273+290	6	3	1.5	10	10
653	273+290	273+300	6	3	1.5	10	10
654	273+300	273+310	6	3	3	10	10
655	273+310	273+320	6	3	3	10	10
656	273+320	273+330	6	3	1.5	10	10
657	273+330	273+340	6	3	1.5	10	10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
658	273+340	273+350	2	3	3	10	10
659	273+350	273+360	2	3	3	10	10
660	273+360	273+370	2	3	3	10	10
661	273+370	273+380	2	3	3	10	10
662	273+380	273+390	2	3	3	10	10
663	273+390	273+400	2	3	3	10	10
664	273+400	273+410	6	3	1.5	10	10
665	273+410	273+420	6	3	1.5	10	10
666	273+420	273+430	6	3	1.5	10	10
667	273+430	273+440	6	3	1.5	10	10
668	273+440	273+450	6	3	1.5	10	10
669	273+450	273+460	6	3	1.5	10	10
670	273+460	273+470	6	3		10	
671	273+470	273+480	6	3		10	
672	273+480	273+490	6	3		10	
673	273+490	273+500	5	3		10	
674	273+500	273+510	5	3		10	
675	273+510	273+520	5	3		10	
676	273+520	273+530	5	3		10	
677	273+530	273+540	5	3		10	
678	273+540	273+550	5	3		10	
679	273+550	273+560	2	3		10	
680	273+560	273+570	2	3	1.5	10	10
681	273+570	273+580	2	3	1.5	10	10
682	273+580	273+590	2	3	3	10	10
683	273+590	273+600	2	3	3	10	10
684	273+600	273+610	2		3		10
685	273+610	273+620	2		3		10
686	273+620	273+630	2		3		10
687	273+630	273+640	2		3		10
688	273+640	273+650	2		3		10
689	273+650	273+660	2		3		10
690	273+660	273+670	2		3		10
691	273+670	273+680	2		3		10
692	273+680	273+690	2		3		10
693	273+690	273+700	2		3		10
694	273+700	273+710	2		3		10
695	273+710	273+720	2		3		10
696	273+720	273+730	2		3		10
697	273+730	273+740	2		3		10
698	273+740	273+750	2		3		10
699	273+750	273+760	2		3		10

S No	Design Chainage (Km)		TCS	Breast Wall Height above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
700	273+760	273+770	2		3		10
701	273+770	273+780	2		3		10
702	273+780	273+790	2		3		10
703	273+790	273+800	2		3		10
704	273+800	273+810	2		3		10
705	273+810	273+820	2		3		10
706	273+820	273+830	2		3		10
707	273+830	273+840	2		3		10
708	273+840	273+850	2		3		10
709	273+850	273+860	2		3		10
710	273+860	273+870	2		3		10
711	273+870	273+880	2		3		10
712	273+880	273+890	2		3		10
713	273+890	273+900	2	3	3	10	10
714	273+900	273+910	2	3	1.5	10	10
715	273+910	273+920	2	3	1.5	10	10
716	273+920	273+930	2	3		10	

2. Toe/Retaining wall:

Retaining walls shall be designed considering appropriate height as per site condition. The PCC walls have been adopted upto the height of 2m from the ground level and RCC retaining walls for height more than 2m. The proposal shall be got approved from the Authority Engineer. The minimum length and height details of Toe Wall are as below:

The details of Toe Wall are as below:

S. No	*Design Chainage (in m)*		*TCS Type*	*Toe wall height above GL (m)*		*Length (m)*	
	From	*To*		*LHS*	*RHS*	*LHS*	*RHS*
1	262680	262690	5	0.476		10	
2	262690	262700	5	1.431		10	
3	262740	262750	8	1.299		10	
4	262750	262760	8	0.521		10	
5	263140	263150	8	0.395		10	
6	263150	263160	8	0.54		10	
7	263160	263170	8	1.964		10	
8	263190	263200	8	1.98		10	
9	263200	263210	8	1.189		10	
10	263210	263220	8	0.326		10	

S. No	Design Chainage (in m)		TCS Type	Toe wall height above GL (m)		Length (m)	
	From	To		LHS	RHS	LHS	RHS
11	263430	263440	4	1.852		10	
12	*264930*	*264940*	*8*	*0.465*		*10*	
13	*264940*	*264950*	*8*	*0.751*		*10*	
14	*264950*	*264960*	*8*	*0.938*		*10*	
15	*264960*	*264970*	*8*	*1.061*		*10*	
16	*264970*	*264980*	*8*	*0.725*		*10*	
17	*264980*	*264990*	*8*	*0.27*		*10*	
18	*264990*	*265000*	*8*	*0.328*		*10*	
19	*265000*	*265010*	*8*	*0.262*		*10*	
20	265420	265430	8	0.377		10	
21	265430	265440	8	0.348		10	
22	265440	265450	8	1.549		10	
23	*265490*	*265500*	*8*	*0.536*		*10*	
24	*265500*	*265510*	*8*	*0.979*		*10*	
25	*265510*	*265520*	*8*	*1.56*		*10*	
26	*265520*	*265530*	*8*	*1.428*		*10*	
27	*265530*	*265540*	*8*	*1.077*		*10*	
28	*265540*	*265550*	*8*	*1.415*		*10*	
29	*265550*	*265560*	*8*	*1.161*		*10*	
30	*265560*	*265570*	*7*	1.507	*0.163*	10	*10*
31	*265570*	*265580*	*7*		*0.39*		*10*
32	*265580*	*265590*	*7*		*0.526*		*10*
33	*265590*	*265600*	*7*	1.751	*0.574*	10	*10*
34	*265600*	*265610*	*7*	*1.364*	*0.469*	*10*	*10*
35	*265610*	*265620*	*7*	*0.923*	*0.37*	*10*	*10*
36	*265620*	*265630*	*7*	*0.626*	*0.596*	*10*	*10*
37	*265630*	*265640*	*7*	*0.129*	*0.587*	*10*	*10*
38	*265640*	*265650*	*7*		*0.221*		*10*
39	*265820*	*265830*	*8*	*0.305*		*10*	
40	*265830*	*265840*	*8*	*0.64*		*10*	
41	*265840*	*265850*	*8*	*0.99*		*10*	
42	*265850*	*265860*	*8*	*1.34*		*10*	
43	*265860*	*265870*	*8*	*1.529*		*10*	
44	*265870*	*265880*	*8*	*1.471*		*10*	
45	*265880*	*265890*	*8*	*1.183*		*10*	
46	*265890*	*265900*	*8*	*1.185*		*10*	
47	266040	266050	5	0.99		10	

S. No	Design Chainage (in m)		TCS Type	Toe wall height above GL (m)		Length (m)	
	From	To		LHS	RHS	LHS	RHS
48	266050	266060	5	1.497		10	
49	*266090*	*266100*	*5*	*1.5*		*10*	
50	*266100*	*266110*	*5*	*1.299*		*10*	
51	*266110*	*266120*	*5*	*0.559*		*10*	
52	*266120*	*266130*	*5*	*0.5*		*10*	
53	*266130*	*266140*	*5*	*0.451*		*10*	
54	266160	266170	8	1.518		10	
55	*266820*	*266830*	*8*	*0.245*		*10*	
56	*266830*	*266840*	*8*	*1.036*		*10*	
57	*266840*	*266850*	*8*	*1.825*		*10*	
58	*266850*	*266860*	*8*	*1.258*		*10*	
59	*266860*	*266870*	*8*	*1.272*		*10*	
60	*266870*	*266880*	*8*	*1.377*		*10*	
61	266900	266910	8	1.857		10	
62	*266940*	*266950*	*5*	*1.327*		*10*	
63	*266950*	*266960*	*5*	*1.327*		*10*	
64	*266960*	*266970*	*5*	*1.402*		*10*	
65	*266970*	*266980*	*8*	*1.594*		*10*	
66	*266980*	*266990*	*8*	*1.611*		*10*	
67	*266990*	*267000*	*8*	*1.41*		*10*	
68	*267000*	*267010*	*8*	*1.139*		*10*	
69	*267010*	*267020*	*8*	*1.021*		*10*	
70	*267020*	*267030*	*8*	*1.038*		*10*	
71	*267030*	*267040*	*8*	*1.039*		*10*	
72	*267040*	*267050*	*8*	*0.976*		*10*	
73	*267050*	*267060*	*8*	*0.457*		*10*	
74	*267060*	*267070*	*8*	*0.441*		*10*	
75	*267070*	*267080*	*8*	*0.423*		*10*	
76	*267080*	*267090*	*8*	*0.404*		*10*	
77	267470	267480	8	0.36		10	
78	267480	267490	8	1.522		10	
79	267530	267540	8	0.901		10	
80	267540	267550	8	0.289		10	
81	*267830*	*267840*	*8*	*0.309*		*10*	
82	*267840*	*267850*	*8*	*0.57*		*10*	

S. No	Design Chainage (in m)		TCS Type	Toe wall height above GL (m)		Length (m)	
	From	To		LHS	RHS	LHS	RHS
83	267850	267860	8	0.819		10	
84	267860	267870	8	0.953		10	
85	267870	267880	8	1.104		10	
86	267880	267890	8	0.923		10	
87	267890	267900	8	1.189		10	
88	267900	267910	8	1.026		10	
89	267960	267970	5	0.251		10	
90	267970	267980	5	0.714		10	
91	267980	267990	5	0.82		10	
92	267990	268000	5	0.065		10	
93	268010	268020	8	0.142		10	
94	268020	268030	8	1.273		10	
95	268030	268040	8	0.315		10	
96	268350	268360	5		0.85		10
97	268360	268370	5		1.124		10
98	268370	268380	5		1.325		10
99	268380	268390	5		1.278		10
100	268390	268400	5		0.342		10
101	268630	268640	8	0.328		10	
102	268640	268650	8	0.434		10	
103	268650	268660	8	0.903		10	
104	268660	268670	8	1.34		10	
105	268670	268680	8	1.718		10	
106	268720	268730	8	1.366		10	
107	270510	270520	5		0.759		10
108	270520	270530	5		0.849		10
109	270530	270540	5		0.825		10
110	270540	270550	5		0.973		10
111	270550	270560	5		1.066		10
112	270560	270570	5		0.943		10
113	270570	270580	5		0.756		10
114	270580	270590	5		0.534		10
115	270590	270600	5		0.631		10
116	270600	270610	5		0.813		10
117	270610	270620	5		0.966		10
118	270620	270630	5		1.025		10
119	270630	270640	8		1.922		10
120	270710	270720	5		1.441		10

S. No	Design Chainage (in m)		TCS Type	Toe wall height above GL (m)		Length (m)	
	From	To		LHS	RHS	LHS	RHS
121	270720	270730	5		0.07		10
122	270730	270740	5		0.199		10
123	271040	271050	5		0.232		10
124	271720	271730	5		1.771		10
125	271730	271740	5		1.812		10
126	*271750*	*271760*	*5*		*1.185*		*10*
127	*271760*	*271770*	*5*		*0.861*		*10*
128	*271770*	*271780*	*5*		*1.598*		*10*
129	*271780*	*271790*	*5*		*1.281*		*10*
130	*271790*	*271800*	*5*		*0.822*		*10*
131	*273140*	*273150*	*5*		*0.216*		*10*
132	*273150*	*273160*	*5*		*0.768*		*10*
133	*273160*	*273170*	*5*		*0.389*		*10*
134	273540	273550	5		1.936		10
135	273960	273970	7	0.827	1.038	10	10
136	273970	273980	7	2.218	1.385		10
137	273980	273990	7	3.31	1.525		10
138	273990	274000	7	2.934	1.574		10
139	274000	274010	7	2.571	1.671		10
140	274010	274020	7	3.11	1.708		10
141	274020	274030	7	3.772	1.723		10
142	274030	274040	7	3.878	1.737		10
143	274040	274050	7	3.842	1.651		10
144	274050	274060	7	3.755	1.572		10
145	274060	274070	7	3.672	1.551		10
146	274070	274080	7	3.608	1.552		10
147	274080	274090	7	3.58	1.542		10
148	274090	274100	7	3.561	1.547		10
149	274100	274110	7	3.455	1.571		10
150	274110	274120	7	3.529	1.576		10
151	274120	274130	7	4.055	1.506		10
152	274130	274140	7	3.918	1.547		10
153	274140	274147	7	3.594	1.826		7
154	274177	274180	7	2.586	0.755		3
155	274180	274190	8	1.733		10	
156	274190	274200	8	1.682		10	

S. No	Design Chainage (in m)		TCS Type	Toe wall height above GL (m)		Length (m)	
	From	To		LHS	RHS	LHS	RHS
157	274200	274210	8	1.613		10	
158	274210	274220	8	1.517		10	
159	274220	274230	8	1.576		10	
160	274230	274240	8	1.652		10	
161	274240	274250	8	1.672		10	
162	274250	274260	8	1.551		10	
163	274260	274270	8	1.502		10	
164	274270	274280	7	1.612	0.073	10	10
165	274280	274290	7	1.722	0.281	10	10
166	274290	274300	7	1.824	0.274	10	10
167	274300	274310	7	1.82	0.307	10	10
168	274310	274320	7	1.773	0.478	10	10
169	274320	274330	7	1.739	0.658	10	10
170	274330	274340	7	1.69	0.823	10	10
171	274340	274350	7	1.646	0.988	10	10
172	274350	274360	7	1.612	1.018	10	10
173	274360	274370	7	1.575	1.005	10	10
174	274370	274380	7	1.585	0.991	10	10
175	274380	274390	7	1.463	1.102	10	10
176	274390	274400	7	1.356	1.182	10	10
177	274400	274410	7	1.246	1.223	10	10
178	274410	274420	7	1.123	1.449	10	10
179	274420	274430	7	1.005	1.6	10	10
180	274430	274440	7	0.954	1.657	10	10
181	274440	274450	7	0.983	1.799	10	10
182	274450	274460	7	1.135	1.938	10	10
183	274460	274470	7	1.289		10	
184	274470	274480	7	1.476		10	
185	274480	274490	7	2.121	1.914		10
186	274490	274500	7	1.728	1.78	10	10
187	274500	274510	7	1.687	1.741	10	10
188	274510	274520	7	1.651	1.607	10	10
189	274520	274530	7	1.622	1.289	10	10
190	274530	274540	7	1.507	0.967	10	10
191	274540	274550	7	1.33	0.762	10	10
192	274550	274560	7	1.15	0.751	10	10
193	274560	274570	7	0.973	0.606	10	10
194	274570	274580	7	0.859	0.556	10	10
195	274580	274590	7	0.789	0.419	10	10
196	274590	274600	7	0.775	0.866	10	10
197	274600	274610	7	0.814	0.756	10	10

The details of Retaining Walls are as below:

S No	Design Chainage (Km)		TCS Type	Retaining Wall (m) above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
1	262+700	262+710	5	2.239		10	
2	262+710	262+720	5	2.743		10	
3	262+720	262+730	8	3.276		10	
4	262+730	262+740	8	3.525		10	
5	263+170	263+180	8	3.309		10	
6	263+180	263+190	8	3.1		10	
7	263+310	263+320	4	2.224		10	
8	263+320	263+330	4	4.826		10	
9	263+330	263+340	4	5.585		10	
10	263+340	263+350	4	5.868		10	
11	263+350	263+360	4	5.98		10	
12	263+360	263+370	4	5.968		10	
13	263+370	263+380	4	5.055		10	
14	263+380	263+390	4	4.325		10	
15	263+390	263+400	4	4.04		10	
16	263+400	263+410	4	2.56		10	
17	263+410	263+420	4	2.245		10	
18	263+420	263+430	4	2.298		10	
19	265+450	265+460	8	2.264		10	
20	265+460	265+470	8	2.44		10	
21	265+470	265+480	8	2.574		10	
22	265+480	265+490	8	2.537		10	
23	265+570	265+580	7	2.143		10	
24	265+580	265+590	7	2.124		10	
25	266+060	266+070	5	2.06		10	
26	266+070	266+080	5	2.76		10	
27	266+080	266+090	5	2.155		10	
28	266+170	266+180	8	2.224		10	
29	266+180	266+190	8	2.357		10	
30	266+190	266+200	8	2.371		10	
31	266+200	266+210	8	2.403		10	
32	266+210	266+220	8	2.654		10	
33	266+220	266+230	8	2.668		10	
34	266+230	266+240	8	2.765		10	
35	266+240	266+250	8	2.498		10	
36	266+250	266+260	8	2.217		10	

S No	Design Chainage (Km)		TCS Type	Retaining Wall (m) above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
37	266+260	266+270	8	2.249		10	
38	266+880	266+890	8	2.094		10	
39	266+890	266+900	8	2.571		10	
40	267+490	267+500	8	2.708		10	
41	267+500	267+510	8	2.881		10	
42	267+510	267+520	8	2.804		10	
43	267+520	267+530	8	2.362		10	
44	268+680	268+690	8	5.215		10	
45	268+690	268+700	8	4.789		10	
46	268+700	268+710	8	4.416		10	
47	268+710	268+720	8	3.215		10	
48	270+640	270+650	8		4.203		10
49	270+650	270+660	8		4.481		10
50	270+660	270+670	8		3.698		10
51	270+670	270+680	8		2.195		10
52	270+680	270+690	8		2.321		10
53	270+690	270+700	5		2.824		10
54	270+700	270+710	5		2.709		10
55	270+740	270+750	5		2.341		10
56	270+750	270+760	5		2.996		10
57	270+760	270+770	5		3.651		10
58	270+770	270+780	5		3.887		10
59	270+780	270+790	5		4.041		10
60	270+790	270+800	5		4.308		10
61	270+800	270+810	5		4.775		10
62	270+810	270+820	5		4.708		10
63	270+820	270+830	5		4.773		10
64	270+830	270+840	5		5.038		10
65	270+840	270+850	5		5.5		10
66	270+850	270+860	5		5.964		10
67	270+860	270+870	5		5.876		10
68	270+870	270+880	5		6.074		10
69	270+880	270+890	5		6.088		10
70	270+890	270+900	5		6.248		10
71	270+900	270+910	5		6.308		10
72	270+910	270+920	5		5.946		10
73	270+920	270+930	5		5.715		10

S No	Design Chainage (Km)		TCS Type	Retaining Wall (m) above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
74	270+930	270+940	5		5.853		10
75	270+940	270+950	5		6.432		10
76	270+950	270+960	5		6.195		10
77	270+960	270+970	5		5.388		10
78	270+970	270+980	5		4.897		10
79	270+980	270+990	5		4.609		10
80	271+050	271+060	5		2.983		10
81	271+060	271+070	5		4.801		10
82	271+070	271+080	5		6.608		10
83	271+080	271+090	5		6.874		10
84	271+090	271+100	8		8.356		10
85	271+100	271+110	8		7.977		10
86	271+110	271+120	8		8.895		10
87	271+120	271+130	8		9.394		10
88	271+130	271+140	8		8.614		10
89	271+140	271+150	8		7.405		10
90	271+150	271+160	8		6.995		10
91	271+160	271+170	8		6.843		10
92	271+170	271+180	8		6.779		10
93	271+180	271+190	5		6.817		10
94	271+190	271+200	5		6.835		10
95	271+200	271+210	5		6.658		10
96	271+210	271+220	5		6.603		10
97	271+220	271+230	5		6.71		10
98	271+230	271+240	5		6.904		10
99	271+240	271+250	5		6.859		10
100	271+250	271+260	5		6.745		10
101	271+260	271+270	5		6.742		10
102	271+270	271+280	5		7.302		10
103	271+280	271+290	5		7.612		10
104	271+290	271+300	5		7.255		10
105	271+300	271+310	5		7.435		10
106	271+310	271+320	5		7.531		10
107	271+320	271+330	5		7.657		10
108	271+330	271+340	5		7.818		10
109	271+340	271+350	5		8.004		10
110	271+350	271+360	5		8.446		10
111	271+360	271+370	5		9.043		10
112	271+370	271+380	5		9.277		10
113	271+380	271+390	5		8.683		10

S No	Design Chainage (Km)		TCS Type	Retaining Wall (m) above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
114	271+390	271+400	5		8.025		10
115	271+400	271+410	5		7.822		10
116	271+410	271+420	5		7.817		10
117	271+420	271+430	5		7.883		10
118	271+430	271+440	5		7.902		10
119	271+440	271+450	5		7.893		10
120	271+450	271+460	5		8.071		10
121	271+460	271+470	5		8.16		10
122	271+470	271+480	5		8.257		10
123	271+480	271+490	5		8.135		10
124	271+490	271+500	5		7.689		10
125	271+500	271+510	5		7.342		10
126	271+510	271+520	5		7.046		10
127	271+520	271+530	5		6.741		10
128	271+530	271+540	5		6.56		10
129	271+540	271+550	5		6.413		10
130	271+550	271+560	5		6.171		10
131	271+560	271+570	5		6.008		10
132	271+570	271+580	5		5.776		10
133	271+580	271+590	5		5.534		10
134	271+590	271+600	5		5.318		10
135	271+600	271+610	5		5.086		10
136	271+610	271+620	5		4.986		10
137	271+620	271+630	5		4.787		10
138	271+630	271+640	5		4.907		10
139	271+640	271+650	5		4.473		10
140	271+650	271+660	5		4.568		10
141	271+660	271+670	5		3.969		10
142	271+670	271+680	5		3.354		10
143	271+680	271+690	5		3.74		10
144	271+690	271+700	5		3.48		10
145	271+700	271+710	5		2.975		10
146	271+710	271+720	5		3.197		10
147	271+740	271+750	5		2.387		10
148	273+490	273+500	5		3.56		10
149	273+500	273+510	5		3.719		10
150	273+510	273+520	5		3.389		10
151	273+520	273+530	5		3.052		10
152	273+530	273+540	5		3.294		10
153	273+970	273+980	7	2.218		10	

S No	Design Chainage (Km)		TCS Type	Retaining Wall (m) above GL		Length (m)	
	From	To		LHS	RHS	LHS	RHS
154	273+980	273+990	7	3.31		10	
155	273+990	274+000	7	2.934		10	
156	274+000	274+010	7	2.571		10	
157	274+010	274+020	7	3.11		10	
158	274+020	274+030	7	3.772		10	
159	274+030	274+040	7	3.878		10	
160	274+040	274+050	7	3.842		10	
161	274+050	274+060	7	3.755		10	
162	274+060	274+070	7	3.672		10	
163	274+070	274+080	7	3.608		10	
164	274+080	274+090	7	3.58		10	
165	274+090	274+100	7	3.561		10	
166	274+100	274+110	7	3.455		10	
167	274+110	274+120	7	3.529		10	
168	274+120	274+130	7	4.055		10	
169	274+130	274+140	7	3.918		10	
170	274+140	274+147	7	3.594		7	
171	274+177	274+180	7	2.586		3	
172	274+460	274+470	7		2.013		10
173	274+470	274+480	7		2.053		10
174	274+480	274+490	7	2.121		10	

Note: The above mentioned retaining wall locations are tentative and total length given is minimum. Additional length if required shall be provided as per site conditions. Also, Toe/Retaining walls at toe to be provided to accommodate the cross section within the available RoW whenever required.

3. Stone Pitching

The Stone pitching has been adopted to protect the erosion of embankment side slope where the river stream are very close and may damage the side slope. The minimum locations on the project highway are as below:

S. No.	Design Chainage (Km)		Length (m)	Avg. height (m	Side
	From	To			
1	263+310	263+440	130	4.00	LHS
2	272+320	272+490	170	4.00	RHS

4. Surficial Protection and Erosion Control Measures (Cut Height of Side Slope >25m)

The Hill side surficial protection and erosion control measures is proposed at locations where the cut height of side slope is more than 25m.

The minimum details of locations with length and average height are as below and may be finalized in consultation with the Authority Engineer.

S No	Design Chainage (Km)		Length (m)	Average Height (m)
	From	To		
LHS				
1	269+420	269+670	250	21.952
2	269+790	269+920	130	27.025
3	270+050	270+400	350	28.234
4	271+790	272+300	510	29.838
5	272+550	272+750	200	31.462
6	273+600	273+890	290	30.234
RHS				
1	262+410	262+660	250	25.061
2	263+420	263+730	310	23.808

Hill side Typical Surficial Protection and Erosion Control Measures for cut height of side slope more than 25m are presented in Appendix-1 of this Schedule B and described below:

(a) Hill side Toe Gabion wall for Isolated Soil Strata - Mechanically woven Zn+10%Al with PVC coated steel wire mesh gabion toe wall with minimum height of wall 3.0 m shall be constructed for the locations wherever soil strata is encountered after cutting at the toe of hill side slope. Gabion toe wall shall be constructed along with non-woven geotextile behind the gabion for filtration & separation and road edge drain.

(b) Surficial Protection for Rocky Strata -Continuously threaded anchors shall be installed wherever rocky strata are encountered on the slope. Surficial protection with secured drapery system shall be done for full length and height of cut slope surface developed by cutting the rock with slope angle of 80 degree with horizontal after excavation, wherever rocky strata is encountered. Surface protection for rocky strata shall be done by high resistance double twisted hexagonal Zn+5%Al coated wire mesh with top, bottom and surface continuously threaded anchors. Top, bottom and surface anchors shall have minimum length and minimum diameter as 3.0 m and 25 mm respectively. Top and bottom anchors shall be provided at a maximum spacing of 1.5 m and 3.0 m c/c in longitudinal direction respectively. Surface anchors shall be provided with

maximum spacing of 3 m c/c in longitudinal and vertical directions for total area. All rock anchors shall be fully grouted. Minimum yield strength of anchorages shall be 500 MPa.

(c) Erosion Control Measures for Soil Surface - Self drilling anchors shall be installed wherever collapsible strata is encountered on the slope. Erosion control measures shall be adopted for cut slope wherever soil strata is encountered at the surface and slope angle shall be limited to 45 degrees or flatter with horizontal after the excavation upto proposed right of way. Three dimensional reinforced synthetic geomat shall be used for erosion control measures along with hydraulically applied erosion control measures. Self Drilling Anchors shall be used for supporting geomat along with u-pins. Minimum length and outer diameter of self drilling anchors shall be 1 m and 32 mm respectively. Self drilling anchors shall be provided with maximum spacing of 3 m c/c in longitudinal and vertical directions.

(d) Drainage Measures for Cut Slopes - Drainage measures for internal seepage in the cut slope shall be adopted by installing PVC pipes inside the slope. PVC pipes for internal seepage shall be half perforated and lined with geotextile. PVC pipes shall be installed for minimum 4 m length at spacing of 4 m c/c in longitudinal direction in minimum 4 layers at the bottom of the cut slope. Top drain shall also be constructed at the toe wherever soil strata is encountered after rocky strata. In addition to the above mentioned drainage measures, suitable surface drainage measures shall be adopted as per the site condition.

8. Traffic Control Devices and Road Safety Works

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

8.1. Traffic signs, Pavement marking and Safety barriers

a) **Traffic Signs:**

Traffic signs include roadside signs, overhead signs and curb mounted signs along the entire Project Highway as per section 9 of Manual.

b) **Pavement marking:**

Pavement markings shall cover road marking for the entire Project Highway as per section 9 of Manual

c) **Safety Barrier:**

Provide W-beam crash barrier, and parapet walls along the project highway as suggested in the section 9 of Manual.

8.2. Specifications of the Reflective Sheeting

The prismatic Reflective sheeting shall be provided in accordance with the para 9.2.3 of the Manual.

9. Roadside Furniture

a. Roadside furniture shall be provided in accordance with the provisions of Section 9and 12 of the Manual and as given in Schedule-C.

b. Overhead traffic signs: location and size

Overhead traffic signs are provided as per site requirement according to paragraph 9.2.5 of the Manual and as given in Schedule-C.
Major Road Junctions

a) Delineators: Delineators for the entire Project Highway

10. Compulsory Afforestation

NIL

11. Hazardous Locations

The hazardous locations those require safety barriers are the locations such as Road Side obstacles, Sharp Curves, Bridge approaches and any other locations identified in consultation with Authority Engineer during the execution of project highway.

(a) The safety barriers shall be provided on both side of curves with radius upto 450m as per clause 9.7.1 of Manual at the following hazardous location on:

S No	CHAINAGE		Length	Remark (Curve Radius)
	Start	End		
For Inner Side				
1	262+598	262+933	335	-360
2	262+987	263+474	487	360
3	263+660	263+998	338	-360
4	265+847	266+152	304	360
5	267+084	267+407	323	360
6	269+132	269+516	384	-360
7	269+518	269+845	327	360
8	269+863	270+274	411	-360
9	270+300	270+675	375	360

10	270+690	270+970	280	-360
11	271+066	271+353	287	360
12	271+550	271+833	284	-400
13	271+889	272+088	199	400
14	272+091	272+395	305	-400
15	273+840	274+265	425	360

Left Side Outer Edge				Right Side Outer Edge			
S No	**CHAINAGE**		**Length**	**S No**	**CHAINAGE**		**Length**
	Start	**End**			**Start**	**End**	
1	262+987	263+130	143	1	262+598	262+933	335
2	263+240	263+310	70	2	263+660	263+998	338
3	263+440	263+474	34	3	269+132	269+516	384
4	265+910	266+030	120	4	269+863	270+274	411
5	267+110	267+407	297	5	270+690	270+970	280
6	269+518	269+845	327	6	271+550	271+833	284
7	270+300	270+490	190	7	272+091	272+395	305
8	271+889	272+088	199				
9	273+840	273+960	120				
10	274+147	274+265	118				

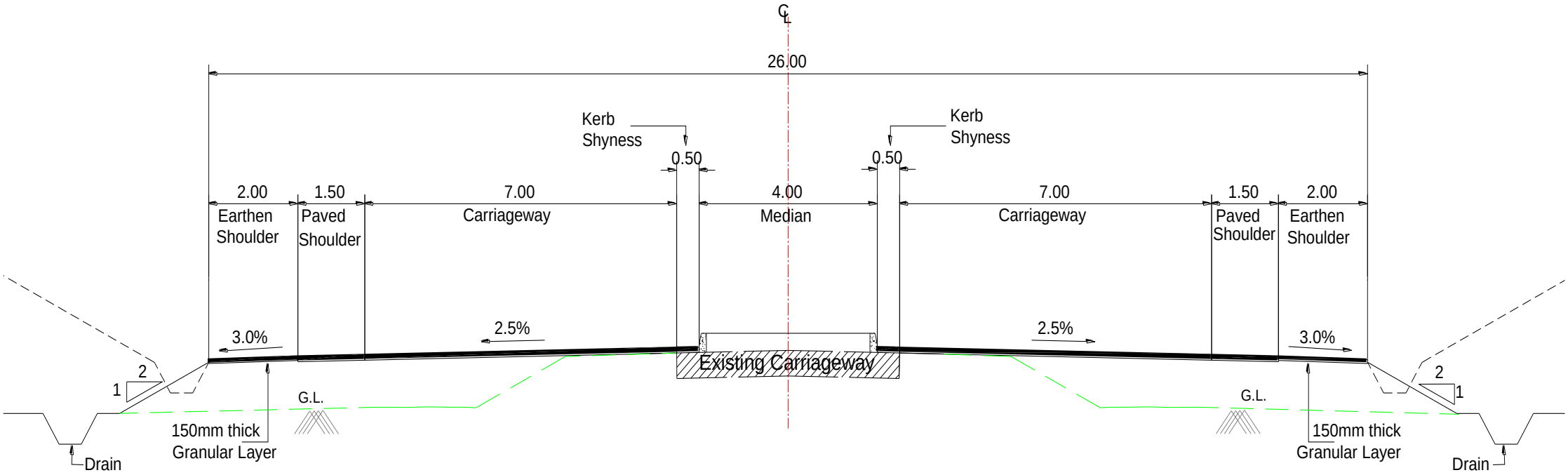
12. Special Requirement for Hill Roads

In accordance with the Section 13 of the Manual and recommended practices for treatment of Embankment and road side slope erosion control.

13. Change of Scope

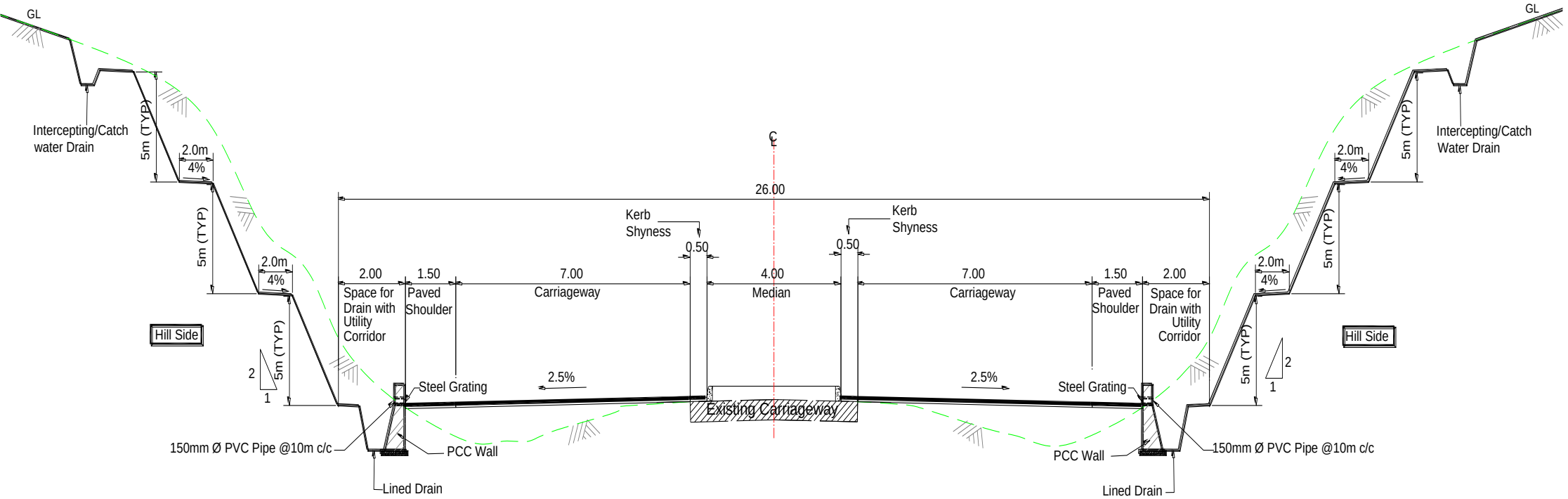
The length of Structures and bridges specified hereinabove shall be treated as an approximate assessment. The actual lengths as required on the basis of detailed investigations shall be determined by the Contractor in accordance with the Specifications and Standards. Any variations in the lengths specified 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 .

Appendix B1 - Typical Cross Sections

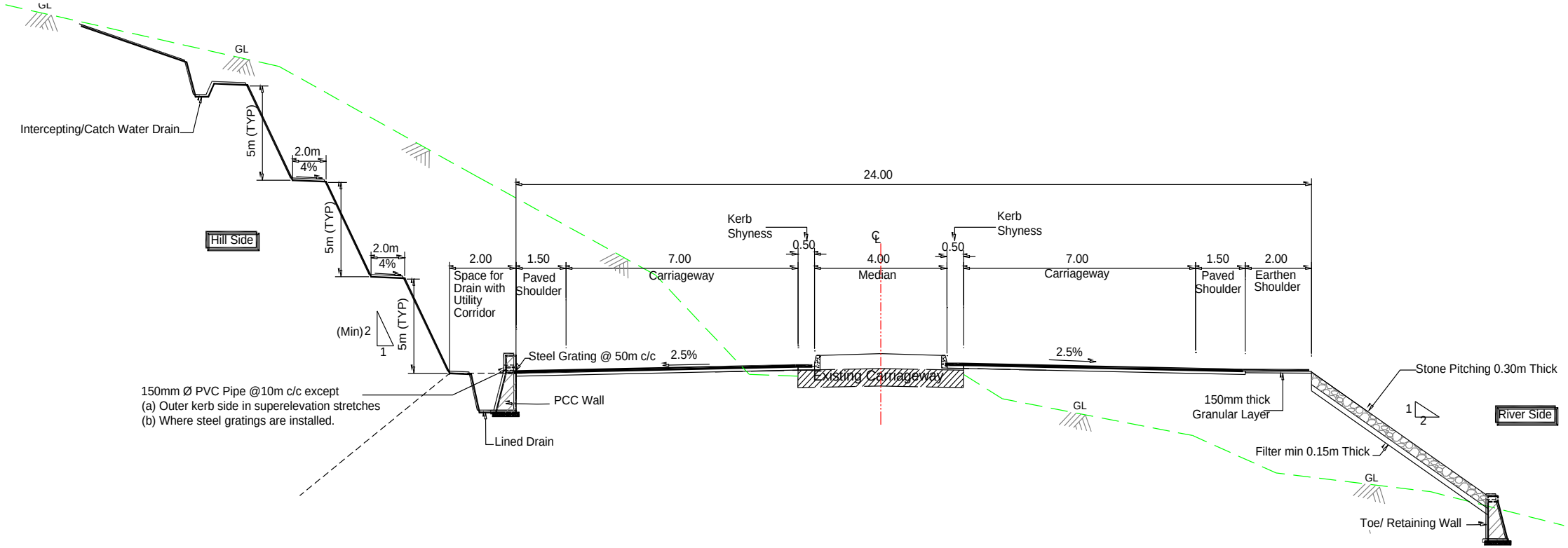


TCS-1 : 4-Lane Divided Carriageway With Raised Media

(Normal Fill/Cut Section– Rural Section)

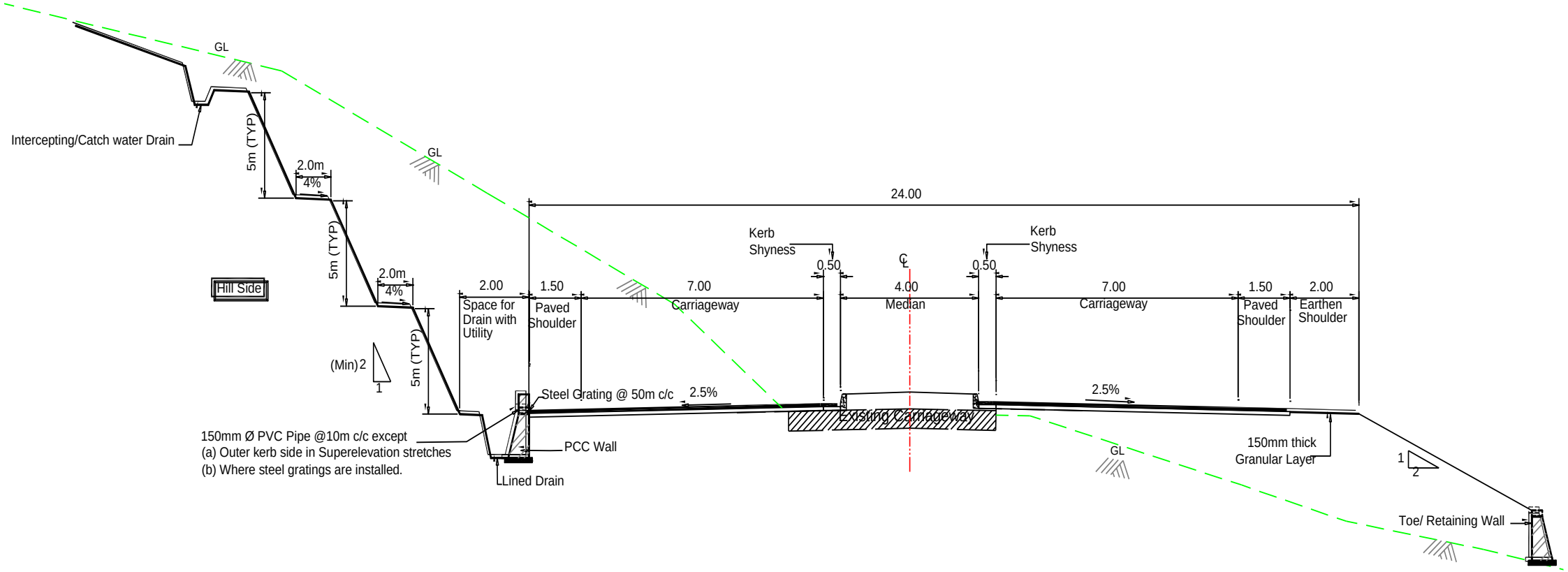


TCS-2 : 4-Lane Divided Carriageway with Both-side Hill Cutting



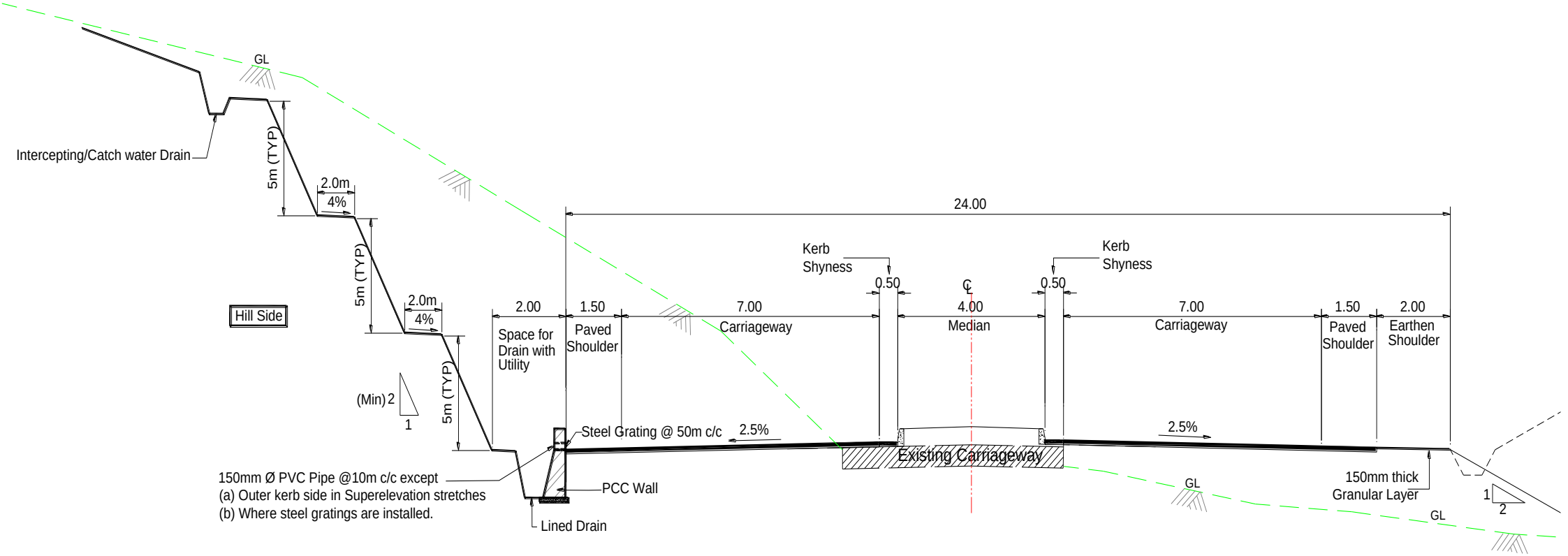
TCS-4 : 4-Lane Divided Carriageway

(Hill Side Cutting / Fill and River Side Stone Pitching with Toe/Retaining Wall)

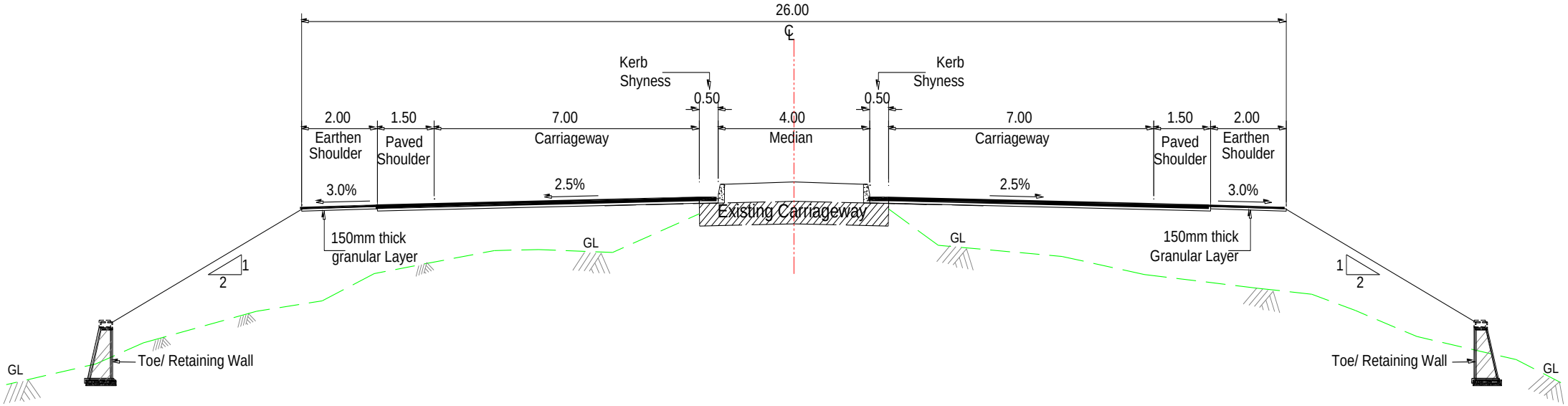


TCS-5 : 4-Lane Divided Carriageway

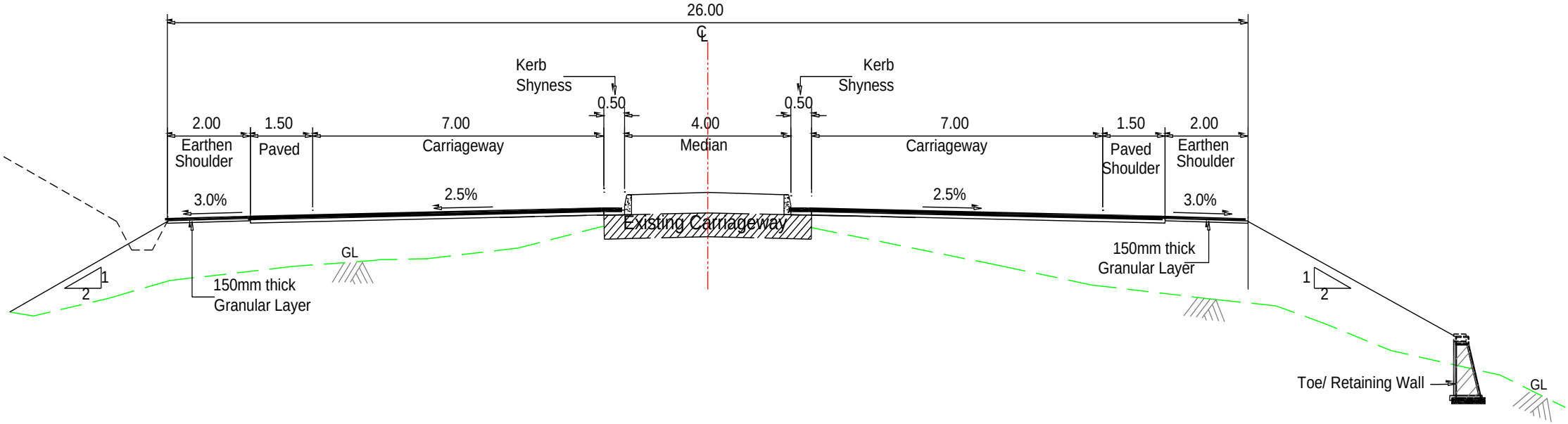
(One Side Hill Cutting and Other Side Toe/Retaining Wall)



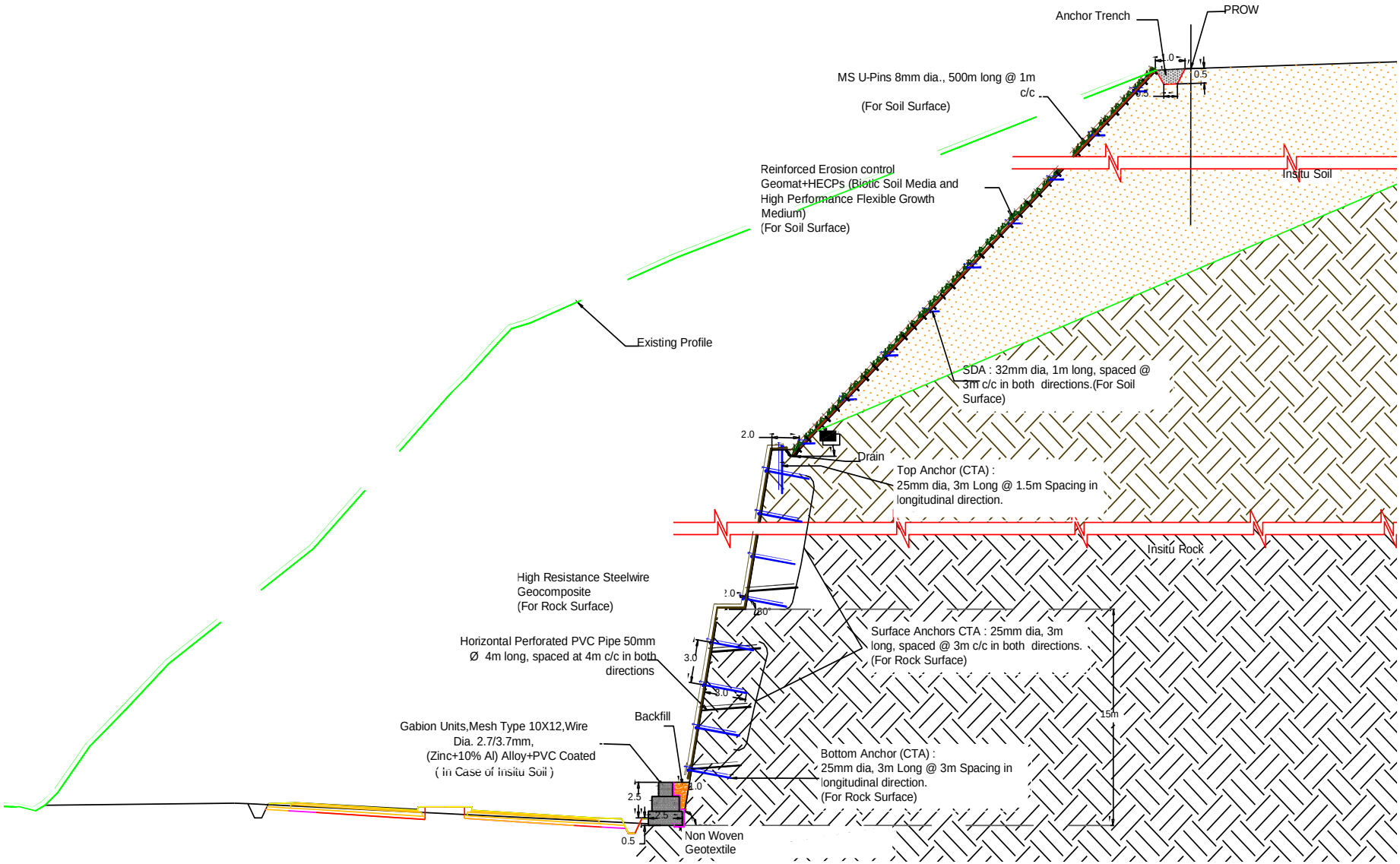
TCS-6 : 4-Lane Divided Carriageway
(One Side Hill Cutting and Other Side normal Cut/Fill Section)



TCS-7 : 4-Lane Divided Carriageway with Bothside Toe/Retaining Walls



TCS-8 : 4-Lane Divided Carriageway
(One Side Retaining Wall and Other Side normal Cut/Fill Section)



Typical Surficial Protection and Erosion Control Measures (Cut Height of Side Slope > 25m)

Applicable Stretches of Typical Cross-section

S No	DESIGN CHAINAGE (Km)		Length (m)	TCS Type
	From	To		
1	262+175	262+300	125	Merging with Ex 2 lane road
2	262+300	262+680	380	6
3	262+680	262+720	40	5
4	262+720	262+760	40	8
5	262+760	262+830	70	1
6	262+830	263+120	290	6
7	263+120	263+140	20	1
8	263+140	263+220	80	8
9	263+220	263+260	40	1
10	263+260	263+310	50	6
11	263+310	263+440	130	4
12	263+440	263+810	370	6
13	263+810	263+880	70	1
14	263+880	264+130	250	6
15	264+130	264+920	790	1
16	264+920	265+000	80	8
17	265+000	265+420	420	1
18	265+420	265+560	140	8
19	265+560	265+640	80	7
20	265+640	265+820	180	1
21	265+820	265+900	80	8
22	265+900	266+040	140	6
23	266+040	266+140	100	5
24	266+140	266+160	20	6
25	266+160	266+270	110	8
26	266+270	266+350	80	1
27	266+350	266+820	470	6
28	266+820	266+910	90	8
29	266+910	266+940	30	6
30	266+940	266+970	30	5
31	266+970	267+090	120	8
32	267+090	267+170	80	1
33	267+170	267+420	250	6
34	267+420	267+470	50	1
35	267+470	267+550	80	8
36	267+550	267+610	60	6
37	267+610	267+700	90	1
38	267+700	267+820	120	6
39	267+820	267+910	90	8
40	267+910	267+960	50	6
41	267+960	268+010	50	5
42	268+010	268+040	30	8
43	268+040	268+310	270	1
44	268+310	268+350	40	6
45	268+350	268+400	50	5
46	268+400	268+510	110	1

S No	DESIGN CHAINAGE (Km)		Length (m)	TCS Type
	From	To		
47	268+510	268+630	120	6
48	268+630	268+730	100	8
49	268+730	268+770	40	1
50	268+770	268+940	170	6
51	268+940	269+010	70	1
52	269+010	269+965	955	2
53	269+965	270+005	40	BRG
54	270+005	270+050	45	6
55	270+050	270+140	90	2
56	270+140	270+510	370	6
57	270+510	270+630	120	5
58	270+630	270+690	60	8
59	270+690	270+990	300	5
60	270+990	271+040	50	6
61	271+040	271+090	50	5
62	271+090	271+180	90	8
63	271+180	271+800	620	5
64	271+800	272+320	520	6
65	272+320	272+490	170	4
66	272+490	272+550	60	6
67	272+550	272+730	180	2
68	272+730	272+820	90	6
69	272+820	273+072	252	2
70	273+072	273+082	10	BRG
71	273+082	273+140	58	6
72	273+140	273+170	30	5
73	273+170	273+340	170	6
74	273+340	273+400	60	2
75	273+400	273+490	90	6
76	273+490	273+546	56	5
77	273+546	273+556	10	BRG
78	273+556	273+930	374	2
79	273+930	273+939	8.75	1
80	273+939	273+949	10.5	PUP
81	273+949	274+147	197.75	7
82	274+147	274+177	30	BRG
83	274+177	274+270	93	8
84	274+270	274+610	340	7

Total Length (m) of each TCS:		
TCS-1	2388.75	4 Lane Divided Carriageway with 4m Raised Median- Normal Cut/Fill section in Rural Section
TCS-2	1911	4 Lane Divided Carriageway with 4m Raised Median- Both side Hill Cutting with PCC Toe wall cum lined drain
TCS-4	300	4 Lane Divided Carriageway with 4m Raised Median- Hill side Cutting/Normal Filling and River side Stone Pitching on Embankment with Toe/Retaining wall
TCS-5	1446	4 Lane Divided Carriageway with 4m Raised Median- One side Hill Cutting with PCC Toe wall cum lined drain and other side Toe/ Retaining wall
TCS-6	4263	4 Lane Divided Carriageway with 4m Raised Median- One side Hill Cutting with PCC Toe wall cum lined drain and other side Normal Cut/Fill
TCS-7	617.75	4 Lane Divided Carriageway with 4m Raised Median- Both side Toe/Retaining walls
TCS-8	1283	4 Lane Divided Carriageway with 4m Raised Median- One side Normal Cut/Fill and other side Toe/Retaining wall
Bridges	90	Bridge Section as per GAD
PUP	10.5	
Taper	125	Ex. Two lane road merging with 4 Lane Divided Carriageway

(Schedule B-1)

The shifting of utilities and felling of trees shall be carried out by the Contractor. The cost of the same shall be borne by the Authority.

Annex – I

SCHEDULE - C

PROJECT FACILITIES

1. Project Facilities

The Contractor shall construct the Project Facilities described in this Annex-I to form part of the Two Lane with Paved Shoulders Project Highway. Such Project Facilities shall include:

(a) Toll Plaza
(b) Roadside furniture;
(c) Pedestrian facilities
(d) Tree plantation;
(e) Truck lay-byes;
(f) Bus-bays and bus shelters;
(g) Median Opening
(h) Utility duct
(i) Others to be specified

1. Operational and maintenance base camp
2. Utilities

2. Description of Project Facilities

Each of the Project Facilities is described below:

a) Roadside furniture

The roadside furniture shall include the provision of the;

i. Traffic Signs

Traffic signs include roadside signs, overhead signs and curb mounted signs along the entire Project Highway as per manual recommended in Schedule D. locations of the sign boards shall be finalized with the consultation of Authority Engineer.

ii. Pavement Markings

Pavement markings shall cover road marking for the entire Project Highway as per the manual recommended in Schedule D. locations of the sign boards shall be finalized with the consultation of Authority Engineer.

iii. LED Traffic Blinkers

For all **Pedestrian** cross walks along the alignment, at all Major Junction locations and at Curve locations where curve radius not confirming to minimum radius as per design standards and any other locations specified in relevant manual recommended in Schedule D.

iv.Crash barrier

Provide W-beam Steel crash barrier along the Project Highway at the locations as suggested in the manual recommended in Schedule D.

No W-Beam Steel crash barrier is required where already masonry/ concrete parapet wall is provisioned.

v.Delineators

Delineators for the entire project highway at the locations as recommend in relevant IRC Manual (mentioned in Schedule D) or as directed by Authority's Engineer shall be provided.

vi.Boundary stones

For the entire project highway as recommend in relevant IRC Manual (mentioned in Schedule D) shall be provided.

vii. Hectometer/Kilometer stones

For the entire project highway as recommend in relevant IRC Manual (mentioned in Schedule D) shall be provided

b) Pedestrian Facilities

i. Pedestrian Guard Rail: Provide pedestrian guard rail at each bus stop location, shall be provided.

ii. Additional Pedestrian facilities shall be provided at vulnerable locations as per specifications and standards specified in Schedule D.

c) Landscaping and Tree Plantation

Landscaping: At major intersections, interchange etc.

Landscaping within ROW of the project highway shall be done as per specifications and standards specified in Schedule D.

d) Truck Lay-Byes:

Two 100m length and 7m width Truck lay byes with both side taper of 70m length as per Figure 12.1 of IRC:SP:84-2014 have been proposed are given below.

S No	Design Chainage	Side	Existing/Proposed	Village Name
1	262+980	Both Side	Proposed	Taphoukuki

e) Bus Bays/Bus Shelters

Bus Bays (15m length and 3.5m width) with ghost island (width=1.5m) and taper of 100m length on both side as per Figure 12.2 of IRC:SP:84-2014 are proposed at following locations. The design of bus shelters should be aesthetically pleased with surrounding. However, locations shall be decided with Authority & Authority's Engineer at site. The minimum number of bus bays/ shelters is given below.

S No	Design Chainage (Km)	Side	Existing/Proposed	Village Name
1	264+050	Both Side	Proposed	Henjbung
2	265+320	Both Side	Proposed	Thangal
3	267+400	Both Side	Proposed	Thangal
4	268+710	RHS	Proposed	TumyonKhullen
5	268+900	LHS	Proposed	TumyonKhullen
6	272+625	Both Side	Proposed	Kongkopi

f) Median Opening

The median opening of 20m length are proposed at following locations with both side storage lanes of 3.5m for 55m length (minimum) where the proposed median width is 4m:

S. No.	Design Chainage (Km)	Name of Place
1	262+210	Senapati Bypass End Junction
2	263+150	Near Truck Laybyes
3	265+450	
4	267+050	Thangal
5	268+700	Tumnyon
6	270+800	
7	272+520	Kangpokpi bypass Start Junction

g) Utility Duct

A 600mm diameter NP-4 Pipe with inspection box/chamber as per clause 2.16 of IRC:SP:84-2014 are proposed.

h) Others: NIL

1. Operational and maintenance base camp- NIL

2. Utilities- NIL

3. Rainwater Harvesting- NIL

SCHEDULE – D

(Refer 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 Four Laning of Highways through Public Private Partnership (IRC: SP: 84-2014), referred to herein as the Manual.

Annex - I

(Schedule-D)

Specifications and Standards for Construction of Project Highway

1. Specifications and Standards

All Materials, works and construction operations shall conform to the Manual of Specifications and Standards for Four Laning of Highways through Public Private Partnership (IRC: SP: 84-2014), referred to as the Manual and MoRT&H Specifications for Road and Bridge Work (Fifth Revision 2013). Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2. Deviations from the Specifications and Standards

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

2.2 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 Manual shall be deemed to be amended to the extent set forth below:

S. No	Clause No	Description	Deviation to Clause
1	**2.5.1**	Median width in Open country with isolated built up area	The median width of 2.5 including Kerb Shyness of 0.5m on either side has been adopted in TCS-9, TCS-10 and TCS-13.

Schedule -E

(See Clauses 2.1 and 14.2)

Maintenance Requirements

1. Maintenance Requirements

(i) The Contractor shall, at all times maintain the Project Highway in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits.

(ii) The Contractor shall repair or rectify any Defect or deficiency set forth in Paragraph2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfilment 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.

(iii) All Materials, works and construction operations shall conform to the MORTH Specifications for Road and Bridge Works, and the relevant IRC publications. Where the specifications for a work are not given, Good Industry Practice shall be adopted.

[Specify all the relevant documents]

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, specifythe permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limitshall be repaired or rectified by the Contractor within the time limit specified bythe 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: SP35. 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 a Force Majeure Event or wilful default or neglect of the Authority shall be undertaken by the Authority at its own cost. The Authority may instruct the Contractor to undertake the repairs at the rates agreed between the Parties .

Annex –I

(Schedule-E)

Repair/rectification of Defects anddeficiencies

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

Table -1: Maintenance Criteria forPavements:

AssetType	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	Acceptable					
Flexible Pavement (Pavement of MCW, Service Road, approache	Potholes	Nil	< 0.1% of area and subjectto limit of 10 mmin depth	Daily	Length Measurement Unitlike Scale,Tape, odometer etc.	IRC 82: 2015 and DistressIdentification Manual for Long TermPavement Performance Program, FHWA 2003(http://www.tfhrc.com/pavement/lttp/reports/03031/)	24-48hours	MORT&H Specification 3004.2

AssetTypes	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	Acceptable					
ofGrade structure, approachesof connecting roads,slip roads,lay byes etc. as applicable)	Cracking	Nil	< 5% subjectto limitof 0.5sqm forany 50 m length	Daily			7-15 days	MORT&H Specification3004.3
	Rutting	Nil	< 5mm	Daily	Straight Edge		15 -30days	MORT&H Specification3004.2
	Corrugations and Shoving	Nil	< 0.1% ofarea	Daily	Length Measurement Unitlike		2-7days	IRC:82-2015

AssetType	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	Acceptable					
	Bleeding	Nil	< 1 %of area	Daily	Scale,Tape, odometer etc.		3-7days	MORT&H Specification3004.4
	Ravelling / Stripping	Nil	< 1 %of area	Daily			7-15 days	IRC:82-2015read with IRCSP 81
	Edge Deformation/ Breaking	Nil	< 1 mfor any100 msection and width < 0.1 mat any location,restricte	Daily			7- 15days	IRC:82-2015

AssetType	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	**Acceptable**					
			d to30 cmfrom theedge					
	Roughness BI	2000 mm/km	2400 mm/km	Bi-Annually	Class I Profilometer SCRIM (Sideway-force Coefficient Routine Investigation Machineor equivalent)	Class I Profilometer : ASTM E950 (98) :2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling Reference ASTM E1656 -94: 2000- Standard Guide for Classification of Automatic Pavement Condition Survey Equipment	180days	IRC:82-2015
	Skid Number	60SN	50SN	Bi-Annually			180days	BS:7941-1: 2006
	Pavement Condition Index	3	2.1	Bi-Annually			180days	IRC:82-2015

AssetType	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	**Acceptable**					
	Other PavementDistresses			Bi-Annually			2-7days	IRC:82-2015
	Deflection/RemainingLife			Annually	Falling Weight Deflectometer	IRC 115: 2014	180days	IRC:115-2014
Rigid Pavement (PavementofMCW, ServiceRoad,Grade structure,	Roughness BI	2200mm/km	2400mm/km	Bi-Annually	Class I Profilometer	ASTM E950 (98) :2004 and ASTM E1656-94:2000	180days	IRC:SP:83-2008
	Skid	Skid Resistance no. at different speed of vehicles		Bi-Annually	SCRIM (Sideway-force	IRC:SP:83-2008	180days	IRC:SP:83-2008

AssetType	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	Acceptable					
approaches of connecting roads, slip roads,lay byes etc. as applicable)		Minimum SN	Traffic Speed(Km/h)		Coefficient Routine Investigation Machineor equivalent)			
		36	50					
		33	65					
		32	80					
		31	95					
		31	110					

AssetType	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	Acceptable					
Embankment/ Slope	Edgedrop at shoulders	Nil	40mm	Daily	Length Measurement Unitlike Scale,Tape, odometer	IRC	7-15 days	MORT&H Specification408.4
	Slopeof camber/crossfall	Nil	<2% variation in prescribedslope of camber/cross fall	Daily			7-15 days	MORT&H Specification408.4
	EmbankmentSlopes	Nil	<15% variation in prescribe	Daily			7-15 days	MORT&H Specification408.4

AssetType	Performance Parameter	Level ofService (LOS)		Frequency of Inspection	Tools/Equipment	Standards and Referencesfor Inspection and DataAnalysis	Time limitfor Rectification/ Repair	Maintenance Specifications
		Desirable	**Acceptable**					
			side slope					
	Embankment Protection	Nil	Nil	Daily	NA		7-15 days	MORT&H Specification
	RainCuts/ Gulliesin slope	Nil	Nil	Daily Specially During Rainy Season	NA		7-15 days	MORT&H Specification

In addition to the above performance criterion, the contractor shall strictly maintain the rigid pavements as per requirements in the followingtable

Table -2: **Maintenance Criteria for RigidPavements:**

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	**For the case d > D/2**
CRACKING						
1	**Single Discrete Cracks Not intersecting withany joint**	w = width ofcrack L = length ofcrack d = depth of crack D = depth ofslab	0	Nil, notdiscernible	NoAction	Not applicable
			1	w < 0.2 mm. hair cracks		
			2	w = 0.2 - 0.5 mm, discerniblefrom slow-movingcar	Seal withoutdelay	Seal, and stitch if L> lm.
			3	w = 0.5 - 1.5 mm, discerniblefrom fast-movingcar		Within7days

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
			4	w = 1.5 - 3.0mm	Seal, and stitch if L > l m. Within 7days	Staple or DowelBar Retrofit, FDRfor affectedportion. Within 15days
			5	w > 3mm.		
2	**Single Transverse (or Diagonal)Crack intersecting withone or morejoints**	w = width ofcrack L = length ofcrack d = depth of crack D = depth ofslab	0	Nil, notdiscernible	NoAction	
			1	w < 0.2 mm, hair cracks	Route and seal with epoxy. Within 7days	Staple or DowelBar Retrofit. Within 15days
			2	w = 0.2 - 0.5 mm, discerniblefrom slowvehicle		
			3	w = 0.5 - 3.0 mm, discerniblefrom fastvehicle	Route, seal and stitch,if L > 1m. Within 7days	

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
			4	w = 3.0 - 6.0mm	Dowel BarRetrofit. Within 15days	Full DepthRepair Dismantle and reconstructaffected. Portion withnorms and specifications-See Para 5.5 &9.2 Within 15days
			5	w > 6 mm, usually associatedwith spalling, and/or slab rockingunder traffic	Not Applicable, as it may befull depth	
3	**SingleLongitudinal Crackintersecting with one ormore joints**	w = width ofcrack L = length ofcrack d = depth ofcrack D = depth ofslab	0	Nil, notdiscernible	NoAction	
			1	w < 0.5 mm, discernable fromslow movingvehicle	Seal with epoxy, if L >1 m. Within 7days	Staple or dowelbar retrofit. Within 15days

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
			2	w = 0.5 - 3.0 mm, discerniblefrom fastvehicle	Route seal and stitch, ifL > lm. Within 15days	-
			3	w = 3.0 - 6.0mm	Staple, if L > 1m. Within 15days	Partial DepthRepair withstapling. Within 15days
			4	w = 6.0 - 12.0 mm, usually associated with spalling	Not Applicable, as it may befull depth	
			5	w > 12 mm, usually associatedwith spalling, and/or slab rockingunder traffic		Full DepthRepair Dismantle and reconstructaffected portion as pernorms and specifications -

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
						See Para5.6.4 Within 15days
4	**Multiple Cracks intersecting withone or morejoints**	**w = width ofcrack**	0	Nil, notdiscernible	NoAction	-
			1	w < 0.2 mm, hair cracks	Seal, and stitch if L > l m. Within 15days	
			2	w = 0.2 - 0.5 mm. discerniblefrom slowvehicle		
			3	w = 0.5 - 3.0 mm, discerniblefrom fastvehicle	Full depth repairwithin 15days	Dismantle,Reinstate subbase, Reconstructwhole slab as per specificationswithin 30days
			4	w = 3.0 - 6.0 mm panel brokeninto 2 or 3 pieces		
			5	w > 6 mm and/or panel broken		

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
				into more than 4 pieces		
5	**CornerBreak**	w = width of crack L = length ofcrack	0	Nil, notdiscernible	NoAction	-
			1	w < 0.5 mm; only 1 cornerbroken	Seal with lowviscosity epoxyto secure broken parts Within 7days	Seal with epoxyseal withepoxy Within 7days
			2	w < 1.5 mm; L < 0.6 m, onlyone cornerbroken		
			3	w < 1.5 mm; L < 0.6 m, twocorners broken	Partial Depth (ReferFigure 8.3of IRC:SP:83-2008) Within 15days	Full depth repair
			4	w > 1.5 mm; L > 0.6 m orthree cornersbroken		
			5	ree or four cornersbroken		Reinstate sub-base, and reconstruct the

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	**For the case d > D/2**
						slab as pernorms andspecifications within30days
6	**Punchout (Applicable to ContinuousReinforced Concrete Pavement (CRCP) only)**	w = width ofcrack L = length(m/m2)	0	Nil, notdiscernible		NoAction
			1	w < 0.5 mm; L < 3m/m^2	Not Applicable, as itmay be fulldepth	Seal withlow viscosity epoxyto secure broken parts. Within 15days
			2	either w > 0.5 mm or L < 3m/m^2		
			3	w > 1.5 mm and L < 3 m/m^2		
			4	w > 3 mm, L < 3 m/m^{2}and deformation		Full depth repair-Cut out andreplace damaged areataking care not todamage reinforcement. Within 30days
			5	w>3mm,L>3m/m^{2}and deformation		

<table>
<tr><th rowspan="2">S.No.</th><th rowspan="2">Type ofDistress</th><th rowspan="2">Measured Parameter</th><th rowspan="2">Degreeof Severity</th><th rowspan="2">AssessmentRating</th><th colspan="2">RepairAction</th></tr>
<tr><th>For the case d < D/2</th><th>For the case d > D/2</th></tr>
<tr><td colspan="7">Surface Defects</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Ravelling or Honeycomb type surface</td><td rowspan="5">r = areadamaged surface/totalsurface of slab (%) h = maximumdepth ofdamage</td><td rowspan="2">0</td><td rowspan="2">Nil, notdiscernible</td><td>ShortTerm</td><td>LongTerm</td></tr>
<tr><td>Noaction.</td><td rowspan="4">NotApplicable</td></tr>
<tr><td>1</td><td>r < 2%</td><td rowspan="2">Local repair of areas damaged and liable to be damaged.
Within 15days</td></tr>
<tr><td>2</td><td>r = 2 - 10%</td></tr>
<tr><td>3</td><td>r =10-25%</td><td rowspan="2">Bonded Inlay, 2 or 3 slabs if affecting.</td></tr>
<tr><td>4</td><td>r = 25 - 50%</td></tr>
</table>

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	**For the case d > D/2**
					Within 30days	
			5	r > 50% and h > 25mm	Reconstruct slabs, 4or more slabs if affecting. Within 30days	
8	**Scaling**	r = damagedsurface/totalsurface of slab (%) h = maximumdepth ofdamage	0	Nil, notdiscernible	**ShortTerm**	**LongTerm**
					Noaction.	NotApplicable
			1	r <**2 %**	Local repair of areas damaged and liable to be damaged. Within 7days	
			2	r = 2 - 10%		

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
			3	r = 10 - 20%	Bonded Inlay within15 days	
			4	r = 20 - 30%		
			5	r > 30 % and h > 25mm	Reconstruct slabwithin 30days	
9	**Polished Surface/Glazing**	t = texturedepth, sand patchtest	0		Noaction.	NotApplicable
			1	t > 1mm		
			2'	t = 1 - 0.6mm	Monitor rate of deterioration	
			3	t = 0.6 - 0.3mm		
			4	t = 0.3 - 0.1mm		

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
			5	t < 0.1 mm	Diamond Grinding if affecting 50% or more slabs in a continuous stretch of minimum 5km. Within 30days	
10	**Popout (SmallHole), Pothole ReferPara 8.4**	n = number/m^2d = diameter h = maximumdepth	0	d < 50 mm; h < 25 mm; n < 1 per5 m^2	Noaction.	NotApplicable
			1	d = 50 - 100 mm; h < 50 mm; n <1 per 5 m^2	Partial depth repair65 mmdeep. Within 15days	
			2	d = 50 - 100 mm; h > 50 mm; n <1 per 5 m^2		

S.No.	Type ofDistress	Measured Parameter	Degreeof Severity	AssessmentRating	RepairAction	
					For the case d < D/2	For the case d > D/2
			3	d = 100 - 300 mm; h < 100 mm n < 1 per 5m^2	Partial depth repair110mm i.e.10 mm more than the depth of the hole. Within 30days	
			4	d = 100 - 300 mm; h > 100 mm; n< 1 per 5m^2		
			5	d > 300 mm; h > 100 mm: n > 1per 5 m^2	Full depthrepair. Within 30days	

JointDefects						
11	**Joint SealDefects**	loss or damage L = Length as %total joint length	0	Difficult todiscern.	**ShortTerm**	**LongTerm**
					Noaction.	NotApplicable
			1	Discernible, L< 25% but of littleimmediate consequence withregard to ingress of wateror trappingincompressible material.	Clean joint, inspectlater.	
			3	Notable.L>25% insufficientprotection against ingress ofwater and trapping incompressiblematerial.	Clean and reapply sealantin selected locations. Within 7days	
			5	Severe; w > 3mm negligible protection against ingress ofwater	Clean, widen and reseal thejoint. Within 7days	

				and trapping incompressiblematerial.		
12	**Spalling ofJoints**	w = width oneither side of the joint L= lengthofspalled portion (as %joint length)	0	Nil, notdiscernible	Noaction.	NotApplicable
			1	w < 10mm	Apply low viscosity epoxyresin/ mortar in crackedportion.	
			2	w = 10 - 20 mm, L <25%	Within 7days	
			3	w = 20 - 40 mm, L >25%	Partial Depth Repair. Within 15days	
			4	w = 40 - 80 mm, L >25%	30 - 50 mm deep, h = w + 20%of w, within 30days	
			5	w > 80 mm, and L > 25%	50 - 100 mm deeprepair. H = w + 20% ofw. Within 30days	
13	**Faulting (or Stepping)**	f = difference oflevel	0	not discernible, < 1 mm	Noaction.	Noaction.

	in Cracks or Joints		1	f < 3mm		
			2	f = 3 - 6mm	Determine cause and observe,take action for diamondgrinding	Replace the slabas appropriate. Within 30days
			3	f = 6 - 12mm	DiamondGrinding	
			4	f= 12 - 18 mm	Raise sunkenslab.	Replace the slabas appropriate. Within 30days
			5	f> 18mm	Strengthen subgrade andsub-base by groutingand raising sunkenslab	
14	**Blowup or Buckling**	h = vertical displacementfrom normalprofile	0	Nil, notdiscernible	**ShortTerm**	**LongTerm**
			1	h < 6mm	NoAction	
			2	h = 6 - 12mm	Install Signs to WarnTraffic	

			3	h = 12 - 25 mm	within 7days	
			4	h > 25mm	Full DepthRepair. Within 30days	
			5	shattered slabs, ie 4or more pieces	Replace broken slabs. Within 30days	
15	**Depression**	h = negativevertical displacementfrom normal profile L =length	0	Not discernible, h < 5mm	Noaction.	NotApplicable
			1	h = 5 - 15mm		
			2	h = 15-30 mm, Nos<20% joints	Install Signs to WarnTraffic within 7days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or >20% joints	Strengthensubgrade. Reinstate pavement at normallevel	

			5	h > 100mm	if L < 20m. Within 30days	
16	**Heave**	h = positivevertical displacementfrom normalprofile. L = length	0	Not discernible. h <5 mm	**ShortTerm**	**LongTerm**
					Noaction.	scrabble
			1	h = 5 - 15mm	Followup.	
			2	h = 15 - 30 mm, Nos <20%joints	Install Signs toWarn Traffic within 7days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or >20% joints	Stabilise subgrade. Reinstate pavement at normal level if length < 20 m. Within 30days	
			5	h > 100mm		
17	**Bump**	h = vertical	0	h < 4mm	Noaction	

		displacement from normalprofile	1	h = 4 - 7mm	Grind, in case of new construction within 7days	ConstructionLimit for New Construction.
			3	h = 7 - 15mm	Grind, in case of ongoingMaintenance within 15days	Replace in caseof newconstruction. Within 30days
			5	h > 15mm	Full DepthRepair. Within 30days	Full DepthRepair. Within 30days
18	**Lane to Shoulder Drop-off**	f = differenceof level	0	Nil, not discernible <3mm	**ShortTerm** Noaction.	**LongTerm**
			1	f = 3 - 10mm	Spot repair ofshoulder within 7 days	
			2	f = 10 - 25 mm		
			3	f = 25 - 50 mm	Fill upshoulder	

			4	f = 50 - 75 mm	within 7days	For any 100m stretchReconstruct shoulder, if affecting 25%or more ofstretch. Within 30days
			5	f > 75mm		
Drainage						
19	**Pumping**	quantity offines and waterexpelled through open joints andcracks Nos	0	not discernible	NoAction	
			1 to2	slight/ occasional Nos< 10%	Repair cracks and jointsWithout delay.	Inspect andrepair sub-drainageat distressedsections andupstream.
			3 to4	appreciable/ Frequent 10 -25%	Lift or jack slab within 30 days.	
		Nos/100 m stretch	5	abundant, crack development > 25%	Repair distressedpavement sections. Strengthensubgrade and subbase. Replaceslab. Within 30days	

20	**Ponding**	Ponding onslabs due to blockage of drains	0-2	No discernible problem	Noaction.	
			3 to4	Blockages observedin drains,butwater flowing	Clean drains etc. within 7days, Followup	Action requiredto stop waterdamaging foundation within30 days.
			5	Ponding,accumulation of waterobserved	-do-	

Table -3: Maintenance Criteria for Safety Related Items and Other FurnitureItems:

<table>
<tr><th>Asset Type</th><th>Performance Parameter</th><th>Level of Service(LOS)</th><th>Frequencyof Measurement</th><th>TestingMethod</th><th>Recommended Remedial measures</th><th>Time limitfor Rectification</th><th>Specifications and Standards</th></tr>
<tr><td>Highway</td><td>Availability of SafeSight Distance</td><td>As per IRC SP :84-2014, aminimum of safe stopping sight distanceshall be availablethroughout.
<table><tr><th>Design Speed, kmph</th><th>Desirable MinimumSight Distance(m)</th><th>Safe Stopping Sight Distance (m)</th></tr><tr><td>100</td><td>360</td><td>180</td></tr><tr><td>80</td><td>260</td><td>130</td></tr></table></td><td>Monthly</td><td>ManualMeasurements with Odometeralong with video/image backup</td><td colspan="2">Removal of obstruction within24 hours, in case of sight lineaffected by temporary objects such astrees, temporaryencroachments.

In case of permanent structureor designdeficiency:
Removal of obstruction/improvement of deficiency at the earliest
Speed Restrictionboards and suitable trafficcalming measures such as transversebar marking, blinkers, etc. shallbe applied during the periodof rectification.</td><td>IRC:SP84-2014</td></tr>
<tr><td>Pavement Marking</td><td>Wear</td><td><70% of markingremaining</td><td>Bi-Annually</td><td>VisualAssessmentas per Annexure-F ofIRC:35-2015</td><td>Re - painting</td><td>Cat-1Defect– within 24 hours
Cat-2 Defect - within 2months</td><td>IRC:35-2015</td></tr>
</table>

<table>
<tr><th>Asset Type</th><th>Performance Parameter</th><th>Level of Service(LOS)</th><th>Frequencyof Measurement</th><th>TestingMethod</th><th>Recommended Remedial measures</th><th>Time limitfor Rectification</th><th>Specifications and Standards</th></tr>
<tr><td></td><td>Day time Visibility</td><td>During expected life ServiceTime
Cement Road-130mcd/m²/lux
Bituminous Road -100mcd/m²/lux</td><td>Monthly</td><td>As per Annexure-Dof IRC:35-2015</td><td>Re - painting</td><td>Cat-1 Defect–within 24 hours
Cat-2 Defect–within 2months</td><td>IRC:35-2015</td></tr>
<tr><td></td><td>Night Time Visibility</td><td>Initial and MinimumPerformancefor Dry Retro reflectivityduringnight time:
<table><tr><td>Design Speed</td><td colspan="2">(RL) Retro Reflectivity(mcd/m²/lux)</td></tr><tr><td></td><td>Initial (7days)</td><td>Minimum Thresholdlevel (TL) &warranty periodrequired up to 2years</td></tr><tr><td>Up to65</td><td>200</td><td>80</td></tr><tr><td>65 -100</td><td>250</td><td>120</td></tr><tr><td>Above 100</td><td>350</td><td>150</td></tr></table>Initial and Minimum PerformanceforNight Visibility under wetcondition(Retroreflectivity):</td><td>Bi-Annually</td><td>As per Annexure-E of IRC:35-2015</td><td>Re - painting</td><td>Cat-1 Defect–within 24 hours
Cat-2 Defect–within 2months</td><td>IRC:35-2015</td></tr>
</table>

Asset Type	Performance Parameter	Level of Service(LOS)	Frequencyof Measurement	TestingMethod	Recommended Remedial measures	Time limitfor Rectification	Specifications and Standards
		Initial 7 days Retro reflectivity:100 mcd/m^2/lux Minimum Threshold Level:50 mcd/m^2/lux					
	Skid Resistance	Initial and Minimumperformance for SkidResistance: Initial (7days):55BPN Min. Threshold: 44BPN *Note: shall be considered under urban/city trafficcondition encompassing the locationslike pedestrian crossings, bus bay,bus stop, cycle trackintersection delineation, transverse barmarkings etc	Bi-Annually	As per Annexure-Gof IRC:35-2015		Within 24hours	IRC:35-2015
Road Signs	Shape and Position	Shape and Position as perIRC:67-2012. Signboard should be clearly visiblefor the design speed of thesection.	Daily	Visual with video/image backup	Improvement of shape, in caseif shape is damaged. Relocation as perrequirement	48 hours incase of Mandatory Signs,Cautionary and Informatory Signs (Singleand Dual post signs) 15 Days in case of Gantry/Cantilever Signboards	IRC:67-2012
	Retro reflectivity	As per specifications inIRC:67-2012	Bi-Annually	Testing of each	hange of ignboard	48 hours incase of Mandatory	RC:67-2012

Asset Type	Performance Parameter	Level of Service(LOS)	Frequencyof Measurement	TestingMethod	Recommended Remedial measures	Time limitfor Rectification	Specifications and Standards
				signboardusing Retro ReflectivityMeasuringDevice. In accordance with ASTMD 4956-09.		Signs, Cautionary and InformatorySigns (Singleand Dual post signs) 1 Month incase of Gantry/Cantilever Signboards	
Kerb	KerbHeight	As per IRC 86:1983 dependingupon type ofKerb	Bi-Annually	Use ofdistance measuringtape	Raising Kerb Height	Within 1 Month	RC 86:1983
	KerbPainting	Functionality: Functioning ofKerb painting asintended	Daily	Visualwith video/image backup	KerbRepainting	Within7-days	RC 35:2015
OtherRoad Furniture	ReflectivePavementMarkers(Road Studs)	Numbers and Functionality asper specifications in IRC:SP:84-2014and IRC:35-2015, unless specifiedin Schedule-B.	Daily	Counting	NewInstallation	Within 2months	IRC:SP:84-2014,IRC:35-2015
	Pedestrian Guardrail	Functionality: Functioning of guardrail asintended	Daily	Visual with video/image backup	Rectification	Within 15days	IRC:SP:84-2014
	Traffic Safety Barriers	Functionality: Functioning ofSafety Barriers asintended	Daily	Visual with video/image backup	Rectification	Within 7days	IRC:SP:84-2014, IRC:119-2015
	End Treatment of	Functionality: Functioning of End Treatment asintended	Daily	Visual with video/image	Rectification	Within 7days	IRC:SP:84-2014,

Asset Type	Performance Parameter	Level of Service(LOS)	Frequencyof Measurement	TestingMethod	Recommended Remedial measures	Time limitfor Rectification	Specifications and Standards
	Traffic Safety Barriers			backup			IRC:119-2015
	Attenuators	Functionality: Functioning of Attenuators asintended	Daily	Visual with video/imageb ackup	Rectification	Within 7days	IRC:SP-2014,IRC:119- 2015
	Guard Posts and Delineators	Functionality: Functioning ofGuard Posts and Delineators as intended	Daily	Visual with video/image backup	Rectificatio n	Within 15days	IRC: 79 - 1981
	OverheadSign Structure	Overhead signstructure shall be structurallyadequate	Daily	Visual with video/image backup	Rectification	Within 15days	IRC:67-2012
	TrafficB linkers	Functionality: Functioning ofTraffic Blinkers asintended	Daily	Visual with video/image backup	Rectification	Within 7days	IRC:SP:84-2014
Highway Lighting System	Highway Lights	Illumination: Minimum 40 Lux illumination onthe road surface	Daily	Theillumination level shallbe measuredwith luxmeter	Improvement in Lighting System	24hours	IRC:SP:84-2014
		Nomajor failure in the lighting system	Daily	-	Rectification of failure	24hours	IRC:SP:84-2014
		Nominor failure in the lighting system	Monthly	-	Rectification of failure	8hours	IRC:SP:84-2014
	Toll Plaza Canopy Lights	Minimum 40 Lux illumination onthe road surface	Daily	The illuminationlev el shallbe measuredwith luxmeter	Improvementin LightingSystem	24hours	IRC:SP:84-2014
		No major/minor failure in thelighting system	Daily	-	Rectification of failure	8hours	IRC:SP:84-2014

Asset Type	Performance Parameter	Level of Service(LOS)	Frequencyof Measurement	TestingMethod	Recommended Remedial measures	Time limitfor Rectification	Specifications and Standards
Treesand Plantation including medianplantation	Obstruction in aminimum head-room of 5.5 mabove carriagewayor obstruction in visibilityof road signs	No obstruction due totrees	Monthly	Visual with video/image backup	Removal oftrees	Immediate	IRC:SP:84-2014
	Deterioration in healthof treesand bushes	Health of plantation shall be asper requirement of specifications& instructions issued by Authorityfrom time to time	Daily	Visual with video/image backup	Timelywatering andtreatment. OrReplacement of Treesand Bushes.	Within 90days	IRC:SP:84-2014
	Vegetationaffectingsight line androad structures	Sight line shall be free from obstruction byvegetation	Daily	Visual with video/image backup	Removal ofTrees	Immediate	IRC:SP 84 - 2014
Rest Areas	Cleaning of toilets	-	Daily	-	-	Every 4hours	
	Defects in electrical,water and sanitaryinstallations	-	Daily	-	Rectification	24hours	

Asset Type	Performance Parameter	Level of Service(LOS)	Frequencyof Measurement	TestingMethod	Recommended Remedial measures	Time limitfor Rectification	Specifications and Standards
OtherProject Facilities and Approachroads	Damage or deterioration in ApproachRoads, pedestrian facilities, truck lay-bys, bus-bays,bus-shelters, cattle crossings, Traffic Aid Posts,Medical Aid Posts and otherworks		Daily	-	Rectification	15days	IRC:SP 84 - 2014

AssetType	PerformanceParameter	Level ofService (LOS)	FrequencyofMeasurement	TestingMethod	RecommendedRemedial measures	Timelimit for Rectification	SpecificationsandStandards
Pipe/box/slab culverts	Free waterway/ unobstructed flow section	85% ofculvert normal flowarea to available.	2 times ina year(before andafter rainyseason)	Inspection byBridge Engineer as perIRC SP: 35-1990 and recording of depthof silting and areaof vegetation.	Cleaning silt up soilsand debris in culvert barrel after rainy season,removal of bushes andvegetation, U/s of barrel, underbarrel and D/s of barrelbefore rainyseason.	15 days beforeonset ofmonsoon andwithin 30 daysafter end ofrainy season.	IRC5-2015, IRC SP:40-1993 and IRC SP:13-2004
	Leak-proof expansionjoints if any	No leakage throughexpansionjoints	Bi-Annually	Physicalinspection of expansionjoints as per IRC SP:35-1990 if any,for leakage strainson walls at joints.	Fixing with sealant suitably	30 days or beforeonset of rains whicheverc omesearlier	IRCSP:40-1993 andIRC SP:69-2011
	Structurallysound	Spalling of concrete not more than0.25 sqm	Bi-Annually	Detailedinspection of all componentsof culvert as perIRC SP:35-1990 and recording the defects	Repairs tospalling, cracking,delamination, rusting shall befollowed as perIRC:SP:40-1993.	15days	IRC SP 40-1993 and MORTH Specifications clause 2800
		Delaminationof concrete notmore than 0.25 sq.m.					
		Crackswider than 0.3 mmnot more than1m aggregatelength					

	Protection works in good condition	Damaged ofrough stone apronor bankrevetment not more than 3 sqm, damageto solid apron (concreteapron) not more than 1	2 times ina year(before andafter rainy season)	Condition surveyas per IRCSP:35-1990	Repairs to damaged aprons andpitching	30 days afterdefect observation or 2weeks beforeonset of rainy seasonwhic hever isearlier.	IRC: SP 40-1993 and IRC:SP:13-2004.
Bridgesincludin gROBs Flyover etc.as applicable	Ridingquali ty or user comfort	No potholein wearing coaton bridgedeck	Daily	Visual inspectionas per IRCSP:35-1990	Repairs to BC orwearing coat	15days	MORT&H Specification 2811
Bridge -Super Structure	Bumps	No bump at expansionjoint	Daily	Visual inspection as per IRCSP:35-1990	Repairs to BC oneither side of expansionjoints, profile correctioncourse on approach slab incase of settlement toapproach embankment	15days	MORT&H Specification 3004.2 & 2811.
	User safety(con ditionof crash barrier and guard rail)	No damagedor missingstretch of crashbarrier orpedestrian handrailing	Daily	Visualinspection and detailed condition surveyas per IRC SP:35- 1990.	Repairs andreplacement of safety barriers asthe case maybe	3days	IRC: 5-1998, IRC SP: 84-2014 and IRC SP: 40-1993.

	Rustedreinforcem ent	Not more than 0.25sq.m	Bi-Annually	Detailedcondition survey as per IRC SP: 35-1990using Mobile Bridge InspectionUnit	All the corroded reinforcement shallneed to be thoroughlycleaned from rusting andapplied with anti-corrosive coating before carrying out the repairs toaffected concrete portionwith epoxy mortar /concrete.	15days	IRC SP:40-1993 and MORTH Specification1600.
	Spallingof concrete	Not more than 0.50sq.m					
	Delaminatio n	Not more than0.50 sq.m					
	Crackswid er than 0.30mm	Not morethan 1m totallength	Bi-Annually	Detailedcondition survey as per IRC SP: 35-1990using Mobile Bridge InspectionUnit	Groutingwithepoxy mortar, investigating causes for cracks development and carry out necessary rehabilitation.	48 Hours	IRC SP: 40-1993 and MORTH Specification 2800.
	Rainwater seepageth roughdec kslab	Leakage - nil	Quarterly	Detailedcondition survey as per IRC SP: 35-1990using Mobile Bridge InspectionUnit	Grouting of deck slabat leakage areas, waterproofing, repairsto drainagespouts	1months	MORTH specifications 2600 & 2700.
	Deflectiond ue to permanent loads and	Within design limits.	Once in every 10 years for spans more	Load testmethod	Carry out majorrehabilitation workson bridge to retainoriginal design loads capacity	6months	IRC SP: 51-1999.

	liveloads		than 40m				
	Vibrations in bridge deck dueto movingtrucks	Frequency of vibrationsshall not be morethan 5Hz	Once in every 5years for spans more than 30m and every 10 years for spans between 15 to 30m	Laserdisplacement sensors orlaser vibro-meters	Strengthening of super structure	4months	AASHTO LRFD specifications
	Leakagein Expansionjoints	No damage to elastomeric sealant compound in strip seal expansionjoint, no leakage ofrain waterthrough expansion jointin case of buriedand asphalt plugand copper stripjoint.	Bi-Annually	Detailedcondition survey as perIRC SP:35-1990using Mobile Bridge InspectionUnit	Replace of seal in expansionjoint	15days	MORTH specifications 2600 and IRC SP:40-1993.
	Debrisand dust in strip seal	No dust or debrisexpa in nsion joint	Monthly	Detailedcondition survey as perIRC SP:35-1990 using	Cleaning of expansion joint gapsthoroughly	3days	MORTH specifications 2600 and

	expansion joint	gap.		Mobile Bridge InspectionUnit			IRC SP: 40-1993.
	Drainage spouts	No down take pipe missing/broken below soffitof the deck slab.No silt, debris,clogging of drainage spout collectionchamb	Monthly	Detailedcondition survey as perIRC SP: 35-1990 using Mobile Bridge InspectionUnit	Cleaningofdrainage spouts thoroughly. Replacement of missing/brokendown takepipeswitha minimum pipeextension of 500mm below soffitof slab. Providingsealant around the drainagespout if any leakagesobserved.	3days	MORTH specification 2700.
Bridge-substructure	Cracks/spalling of concrete/ rustedsteel	No cracks, spalling of concrete and rusted steel	Bi-Annually	Detailedcondition survey as perIRC SP: 35-1990using Mobile Bridge InspectionUnit	All the corrodedreinforcement shallneed to be thoroughlycleaned from rusting andapplied with anti-corrosive coating beforecarrying out repairs to substructure by grouting/gunitingand micro concreting depending on typeof	30days	IRC SP: 40-1993 and MORTH specification 2800.

	Bearings	Delamination of bearingreinforcement not more than 5%, crackingor tearing ofrubber not more than2 locations per side, norupture ofreinforcement orrubber	Bi-Annually	Detailedcondition survey as perIRC SP: 35-1990using Mobile Bridge InspectionUnit	In case of failure ofeven one bearing onany pier/abutment, allthe bearings on that pier/abutment shallbe replaced, in order togetuniform load transferon tobearings.	3months	MORTH specification 2810 and IRC SP: 40-199.
BridgeFoundations	Scouring aroundfoundations	Scouringshall not belower thanmaximum scour levelfor thebridge	Bi-Annually	Conditionsurvey and visual inspection asper IRC SP:35-1990 using Mobile BridgeInspection Unit. In case ofdoubt, useUnderwater camera for inspection ofdeep wells inmajor	Suitable protection works aroundpier/abutment	1month	IRC SP: 40-1993, IRC 83-2014,MORTH specification2500
	Protection works in good condition	Damagedof roughstone apron or bank revetmentnot more than 3	2 times in a year (beforeand afterrainy season)	Condition survey as per IRCSP:35-1990	Repairs to damaged aprons andpitching.	30 days after defectobservatio n or 2	IRC: SP 40-1993 and IRC:SP:13-2004.

		sq.m, damageto solid apron(concreteapron) not more than 1 sq.m				weeksbefore onset of rainy seasonwhicheverisearlier.	
Note: AnyStructureduringtheentirecontractperiodwhichisfoundthatdoesnotcomplieswithallrequirementsofthisTablewillbeprepared, rehabilitated or even reconstructed under the scope of thecontractor.							

Table 4: Maintenance Criteria for Structures andCulverts:

Table 5: Maintenance Criteria for HillRoads

In addition to above, for hill roads the following provisions for maintenance is also todone.

HillRoads		
(i)	Damage to Retaining wall/ Breastwall	7 (Seven)days
(ii)	Landslides requiringclearance	12 (Twelve)hours
(iii)	Snow requiringclearance	24 (Twenty Four) hours

<u>Note:</u>Foralltables1to5above,latestBIS&IRCstandards(eventhosenotindicated herewith) along with MoRTH specifications shall be binding for allmaintenance activities.

A. FlexiblePavement

Nature of Defect or deficiency		Time limit forrepair/ rectification
(b)	**Granular earth shoulders, side slopes, drains andculverts**	
(i)	Variation by more than 1 % in the prescribedslope of camber/cross fall (shall not be less thanthe camber on the maincarriageway)	7 (seven)days
(ii)	Edge drop at shoulders exceeding 40mm	7 (seven)days
(iii)	Variation by more than 15% in the prescribedside (embankment)slopes	30 (thirty) days
(iv)	Rain cuts/gullies inslope	7 (seven)days
(v)	Damage to or silting of culverts and sidedrains	7 (seven)days
(vi)	Desilting of drains in urban/semi- urbanareas	24 (twenty four)hours
(vii)	Railing, parapets, crashbarriers	7 (seven) days(Restore immediately if causingsafety hazard)
(c)	**Road side furniture including road sign and pavementmarking**	
(i)	Damage to shape or position, poor visibility orloss of retro-reflectivity	48 (forty eight)hours
(ii)	Painting of km stone, railing, parapets,crash barriers	As and when required/Once everyyear
(iii)	Damaged/missing signs road requiring replacement	7 (seven)days
(iv)	Damage to road markups	7 (seven)days
(d)	**Roadlighting**	
(i)	Any major failure of thesystem	24 (twenty four)hours
(ii)	Faults and minorfailures	8 (eight) hours
(e)	**Trees andplantation**	

Nature of Defect or deficiency		Time limit forrepair/ rectification
(i)	Obstruction in a minimum head- room of 5m above carriageway or obstruction in visibilityof road signs	24 (twenty four)hours
(ii)	Removal of fallen trees fromcarriageway	4 (four)hours
(iii)	Deterioration in health of trees andbushes	Timely watering andtreatment
(iv)	Trees and bushes requiringreplacement	30 (thirty) days
(v)	Removal of vegetation affecting sight line androad structures	15 (fifteen)days
(f) Restarea		
(i)	Cleaning oftoilets	Every 4 (four)hours
(ii)	Defects in electrical, water and sanitaryinstallations	24 (twenty four)hours
(g) [Toll Plaza]		
(h)	**Other Project Facilities and Approachroads**	
(i)	Damage in approach roads, pedestrianfacilities, truck lay- byes, bus-bays, bus-shelters,cattle crossings, [Traffic Aid Posts, Medical Aid Posts]and serviceroads	15 (fifteen)days
(ii)	Damaged vehicles or debris on the road	4 (four)hours
(iii)	Malfunctioning of the mobilecrane	4 (four)hours
Bridges		
(a) Superstructure		
(i)	Any damage, cracks, spalling/scaling Temporarymeasures Permanentmeasures	within 48 (forty eight)hours within 15 (fifteen) days oras specified by theAuthority's Engineer
(b) Foundations		

Nature of Defect or deficiency		Time limit forrepair/ rectification
(i)	Scouring and/or cavitation	15 (fifteen)days
(c)	**Piers, abutments, return walls and wing walls**	
(i)	Cracks and damages including settlementand tilting, spalling,scaling	30 (thirty) days
(d)	**Bearings (metallic) of bridges**	
(i)	Deformation, damages, tilting or shifting of bearings	15 (fifteen) daysGreasing of metallic bearings oncein ayear
(e)	**Joints**	
(i)	Malfunctioning ofjoints	15 (fifteen)days
(f)	**Otheritems**	
(i)	Deforming of pads in elastomericbearings	7 (seven)days
(ii)	Gathering of dirt in bearings and joints; orclogging of spouts, weep holes andvent-holes	3 (three)days
(iii)	Damage or deterioration in kerbs,parapets, handrails and crashbarriers	3 (three) days(immediately within 24 hours ifposing danger tosafety)
(iv)	Rain-cuts or erosion of banks of the side slopesof approaches	7 (seven)days
(v)	Damage to wearingcoat	15 (fifteen)days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guidebunds	30 (thirty) days
(vii)	Growth of vegetation affecting the structureor obstructing thewaterway	15 (fifteen)days
(g)	**Hill Roads**	
(i)	Damage to retaining wall/breastwall	7 (seven)days
(ii)	Landslides requiringclearance	12 (twelve)hours

Nature of Defect or deficiency		Time limit forrepair/ rectification
(iii)	Snow requiringclearance	24 (twenty four)hours

Schedule -F

(See Clause 4.1(vii)(a))

Applicable Permits

1. Applicable Permits

(i) 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 Panchayats and Pollution Control Board for installation of crushers;

(c) Licence for use of explosives;

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

(e) LicencefrominspectoroffactoriesorothercompetentAuthorityforsetting 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 or clearances required under Applicable Laws.

(ii) Applicable Permits, as required, relating to environmental protection and conservation shall have been procured by the Authority in accordance with the provisions of this Agreement.

Schedule – G

(See Clauses 7.1 and 19.2)

Annex-I

(See Clause 7.1)

Annex-I : Form of Bank Guarantee
[Performance Security/Additional Performance Security]

To,
Managing Director, NHIDCL,
National Highways & Infrastructure Development Corporation Ltd.

(A) _____[name and address of contractor] (hereinafter called the "**Contractor**") and [name and address of the authority], (hereinafter called the **"Authority"**) have entered into an agreement (hereinafter called the "**Agreement**") for the **"Name of Work"** (the "**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/ Defects Liability Period and Maintenance Period} (as defined in the Agreement) in a sum of 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**") 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 the {Construction Period/ Defects Liability Period and Maintenance 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 General Manager in the National Highways & Infrastructure Development Corporation Ltd. , 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 differences 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 on ****[$]. Unless a demand or claim under this Guarantee is made in writing before expiry of the Guarantee, the Bank shall be discharged from its liabilities hereunder.

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.

[$] Insert date being 2 (two) years from the date of issuance of this Guarantee (in accordance with Clause 7.2 of the Agreement).

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 authorised 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 paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operatable at our…….. Branch at New Delhi (Complete Address of bank branch is mandatory), 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 there under claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

13. The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of NHIDCL, details of which is as under:

Sl. No	Particulars	Details
1	Name of the Beneficiary	lational Highways and Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	yndicate Bank, Transport Bhawan, 1st Parliament street, New Delhi-110001

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 19.2)

Annex-II : Form for Guarantee for Advance Payment

To,
Managing Director, NHIDCL,
National Highways & Infrastructure Development Corporation Ltd.
WHEREAS:

(A) [name and address of contractor] (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "**Agreement**") with the [name and address of the authority], (hereinafter called the "**Authority**") for the "**Name of Work"** (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement

(B) In accordance with Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest bearing *@Bank Rate + 3%* advance payment (herein after 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 irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid instalment 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.

A letter from the Authority, under the hand of an officer not below the rank of General Manager in the National Highways & Infrastructure Development Corporation Ltd., that the Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the instalment of the Advance Payment under and in

[$] The Guarantee Amount should be equivalent to 110% of the value of the applicable instalment.

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 differences 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. The Guarantee shall cease to be in force and effect on ****.[$] Unless a demand or claim under this Guarantee is made in writing on or before the aforesaid date, the Bank shall be discharged from its liabilities hereunder.

8. 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

[$] Insert a date being 90 (ninety) days after the end of one year from the date of payment of the Advance payment to the Contractor (in accordance with Clause 19.2 of the Agreement).

the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

9. 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 authorised 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.

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

11. This guarantee shall also be operatable at our…….. Branch at New Delhi (Complete Address of bank branch is mandatory), 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 there under claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

12. The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of NHIDCL, details of which is as under:

Sl. No	Particulars	Details
1	Name of the Beneficiary	National Highways and Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Syndicate Bank, Transport Bhawan, 1st Parliament street, New Delhi-110001

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.

SCHEDULE - H

(See Clauses10.1(iv) and 19.3)

Contract Price Weightages

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

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 of for Payment	Percentage Weightage
1	**2**	**3**	**4**
Road works including New Culverts, Widening and Repair of Culverts	56.98%	**A-Widening and Strengthening of Existing Road**	
		(1) Earthwork up to top of the sub-grade	
		(2) Sub Base Course	
		(3) Non Bituminous Base Course	
		(4) Bituminous Base Course	
		(5) Bituminous Concrete	
		(6) Widening and repair of culverts	4.58%
		B.1- Reconstruction/ New 4 Lane/Realignment/ Bypass (Flexible Pavement)	
		(1) Earthwork up to top of the sub-grade	38.02%
		(2) Sub Base Course (Granular work sub-base, shoulders)	11.20%
		(3) Non Bituminous Base Course (WMM)	13.12%
		(4) Bituminous Base Course (DBM)	14.60%
		(5) Wearing Coat (Bituminous Concrete)	6.85%
		C.1- Reconstruction/ New Service road (Flexible pavement)	
		(1) Earthwork up to top of the sub-grade	
		(2) Sub Base Course (Granular work sub-base, shoulders)	
		(3) Non Bituminous Base Course (WMM)	
		(4) Bituminous Base Course (DBM)	
		(5) Wearing Coat (Bituminous Concrete)	
		D-Reconstruction and New Culverts on existing road, realignment and Bypasses,	
		(1) Culverts(length <6m)	12.17%

Item	Weightage in Percentage to the Contract Price	Stage of for Payment	Percentage Weightage
1	**2**	**3**	**4**
Minor Bridges / Underpasses/ Overpasses	4.84%	**A.1- Widening and Repair of Minor bridges (length>6m and <60m)**	
		Minor Bridges	
		A.2-New Minor bridges (length>6m and <60m)	
		1. Foundation + Sub-Structure: On completion of foundation work including foundations for wing and return walls, abutments, piers up to the abutment/pier cap	38.34%
		2. Super-structure: On completion of super structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs and markings, tests on completion etc., complete in all respects	42.55%
		3. Approaches: On completion of approaches including Retaining walls, stone pitching, protection works, filter media. etc., complete in all respects & fit for use.	3.17%
		4. Guide Bunds and river Training Works: On completion of Guide Bund and River Training Works complete in all respects	
		B.2-New Underpass	
		1. Foundation + Sub-Structure: On completion of foundation work including foundations for wing and return walls, abutments, piers up to the abutment/pier cap	10.02%

Item	Weightage in Percentage to the Contract Price	Stage of for Payment	Percentage Weightage
1	2	3	4
		2. Super-structure: On completion of super structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs and markings, tests on completion etc., complete in all respects Wearing Coat (a) in case of Overpass- wearing coat including expansion joints complete in all respects as specified and (b) in case of underpass-rigid pavement including drainage facility complete in all respects as specified	5.86%
		3. Approaches: On completion of approaches including Retaining walls/Reinforced Earth walls,, stone pitching, protection works, etc., complete in all respects & fit for use.	0.06%
Major Bridge (length>60m) works and ROB/UB/Elevated sections/ Flyovers including viaducts, if any		**A.1- Widening and Repair of Major Bridges**	
		1. Foundation	
		2. Sub-structure	
		3. Super-structure (including bearings)	
		4. Wearing Coat including expansion joints	
		5. Miscellaneous Items like hand rails, crash barriers, road marking etc.)	
		6. Wing walls/Return walls	
		7. Guide Bunds, River Training works etc.	
		8. Approaches (Including Retaining walls, stone pitching and protection works)	
		A.2- New Major Bridges	
		1. Foundation	
		2. Sub-structure	
		3. Super-structure (including bearings)	

Item	Weightage in Percentage to the Contract Price	Stage of for Payment	Percentage Weightage
1	**2**	**3**	**4**
		4. Wearing Coat including expansion joints	
		5. Miscellaneous Items like hand rails, crash barriers, road marking etc.)	
		6. Wing walls/Return walls	
		7. Guide Bunds, River Training works etc.	
		8. Approaches (Including Retaining walls, stone pitching and protection works)	
Other Works	38.18%	(i) . Road Side Drain	8.73%
		(ii).Road signs, markings, km stones, safety devices… a) W beam crash barrier b) Utility Duct c) Misc	 5.16% 4.11%
		(iii).Project Facilities a) Bus Shelter b) Truck lay byes	 4.01% 0.78%
		(iv) Road side Plantation	
		(v) Protection works other than approaches to the bridges, elevated section/flyover/grade separator and ROBs/ RUBs	0.26%

Item	Weightage in Percentage to the Contract Price	Stage of for Payment	Percentage Weightage
1	2	3	4
		(vi) Protection works a) Retaining wall b) Breast wall c) Toe wall d) Surficial protection and Erosion Control Measures (Cut Height of Side slope >25m)	 14.4% 25.72% 3.79 % 33.04%
		(vii) Safety and Traffic Management during Construction	-

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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		
(6) Widening and repair of culverts	4.58%	Cost of each culvert shall be determined on pro rata basis with respect to the total number of culverts. Payment shall be made on the completion of at least 1 (One) Culvert.
B.1- Reconstruction/ New 4 Lane/Realignment/ Bypass (Flexible Pavement)		
(1) Earthwork up to top of the sub-grade	38.02%	Unit of measurement is linear length.
(2) Sub Base Course	11.20%	

Stage of Payment	Percentage Weightage	Payment Procedure
(3) Non Bituminous Base Course (WMM)	13.12%	Payment of each stage shall be made on pro rata basis on completion of a stage in full length or 5 (five) km length, whichever is less.
(4) Bituminous Base Course (DBM)	14.60%	
(5) Wearing Coat (Bituminous Concrete)	6.85%	
D -Reconstruction and New Culverts on existing road, realignment and Bypasses, Culvert (length<6m)	12.17%	Cost of each culvert shall be determined on pro rata basis with respect to the total number of culverts. Payment shall be made on the completion of atleast 1(One) Culvert.

@. 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 out 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 length calculated here is only for payment purposes and will not affect and referred in other clauses of the Contract Agreement.

1.3.2 **Minor Bridge and Underpasses/Overpasses**

Procedure for estimating the value of Minor Bridge and Underpass/overpasses shall be as stated in Table 1.3.2:

Table 1.3.2

Stage of Payment	Percentage Weightage	Payment Procedure
A.1- Widening and repairs of Minor Bridges (length >6m and <60m)	-	Cost of each Minor Bridge shall be determined on pro rata basis with respect to the total linear length of the Minor Bridge. Payment shall be made on the

Stage of Payment	Percentage Weightage	Payment Procedure
		completion of widening and repair work of Minor Bridge.
A.2- New Minor Bridges		
1. Foundation +Sub-Structure: On completion of foundation work including foundations for wing and return walls, abutments, piers up to the abutment/pier cap	38.34%	**1. Foundation +Sub-Structure:** Cost of each Minor Bridge shall be determined on pro rata basis with respect to the total linear length (m) of the Minor Bridges. Payment against foundation+ substructure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of foundation + substructure of each bridge subject to completion of at least two foundations along with sub structure upto abutment/pier cap level of each bridge.
2. Super-structure: On completion of super structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs and markings, tests on completion etc., complete in all respects	42.55%	**2. Super-structure:** Payment shall be made on pro-rata basis on completion of a stage i.e. completion of super structure of at least one span in all respect as specified in the column of "Stage of Payment" in this sub-clause.
3. Approaches: On completion of approaches including Retaining walls, stone pitching, protection works, filter media. etc., complete in all respects & fit for use.	3.17%	**3. Approaches** : Payment shall be made on pro-rata basis on completion of a stage i.e. completion of approaches in all respect as specified in the column of "Stage of Payment" in this sub-clause.
4. Guide Bunds and River Training Works: On completion of Guide Bunds and River Training Works complete in all respects		**4. Guide Bunds and River Training Works:** Payment shall be made on pro-rata basis on completion of a stage i.e. completion of Guide Bunds and River training works in all

Stage of Payment	Percentage Weightage	Payment Procedure
		respects as specified.
B.2- New Underpass/Overpasses		
1. Foundation +Sub-Structure: On completion of foundation work including foundations for wing and return walls, abutments, piers up to the abutment/pier cap	10.02%	**1. Foundation +Sub-Structure:** Cost of each Underpass shall be determined on pro rata basis with respect to the total linear length (m) of the Underpass. Payment against foundation+ substructure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of foundation + substructure of each Underpass subject to completion of at least two foundations along with sub-structure upto abutment/pier cap level of each Underpass.
1. **Super-structure:** On completion of super structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs and markings, tests on completion etc., complete in all respects Wearing Coat (a) in case of Overpass- wearing coat including expansion joints complete in all respects as specified and (b) in case of underpass-rigid pavement including drainage facility complete in all respects as specified.	5.86%	**2. Super-structure:** Payment shall be made on pro-rata basis on completion of a stage i.e. completion of super structure of at least one span in all respect as specified in the column of "Stage of Payment" in this sub-clause.
3. Approaches: On completion of approaches including Retaining walls/Reinforced Earth walls, stone pitching, protection works,. etc., complete in all respects & fit	0.06%	**3. Approaches** : Payment shall be made on pro-rata basis on completion of a stage i.e. completion of approaches in all respect as specified.

Stage of Payment	Percentage Weightage	Payment Procedure
for use.		

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.2- New Major Bridges		
1. Foundation:		**1. Foundation:** Cost of each Major Bridge shall be determined on pro rata basis with respect to the total linear length (m) of the Major Bridges. Payment against foundation shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of foundation of Major bridge subject to completion of at least two foundations of the Major Bridge. In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
2. Sub-Structure		**2. Sub-Structure:** Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of the major bridge subject to completion of at least two sub-structures of abutments/piers upto abutment/pier cap level of the

Stage of Payment	Percentage Weightage	Payment Procedure
		major bridge.
3.Super-structure (including bearings)		**3. Super-structure:** Payment shall be made on pro-rata basis on completion of a stage i.e. completion of super structure including bearing of at least one span in all respect as specified.
4.Wearing coat including expansion joints		**4. Wearing Coat:** Payment shall be made on completion of wearing coat including expansion joints complete in all respect as specified.
5.Miscellaneous Items like hand rails, crash barriers, road marking etc.		**5. Miscellaneous:** Payment shall be made on completion of all miscellaneous works like hand rails, crash barrier, road marking etc. complete in all respect as specified.
6.Wing walls/ Return walls		**6. Wing walls/ Return walls:** Payment shall be made on completion of all wing walls/return walls complete in all respect as specified.
7.Guide bunds, River Training works etc.		**7. Guide bunds, River Training works:** Payment shall be made on completion of all Guide bunds/ River Training works etc. complete in all respect as specified
8.Approaches (including Retaining walls, stone pitching and protection works)		**8. Approaches:** Payment shall be made on completion of both approaches including stone pitching, protection works etc. complete in all respect as specified

1.3.4 Other works.

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
(ii) Road side drains	8.73%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 5 (five) percent of the total length.
(iii)Road signs, markings, km stones, safety devices… d) W beam crash barrier e) Utility Duct f) Misc.	 5.16% 4.11%	
(iv) Project facilities		
a) Bus Shelter	4.01%	Payment shall be made on pro rata basis for completed facilities.
b) Truck lay-byes	0.78%	
(v) Roadside plantation		Unit of measurement is linear length.
(vii) Protection works other than approaches to the bridges, elevated section/flyover/grade separator and ROBs/ RUBs	0.26%	Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 5 (five) percent of the total length.
(viii) Protection works (Retaining wall Breast wall Toe wall	 14.4 % 25.72 % 3.79 %	

Stage of Payment	Percentage Weightage	Payment Procedure
Surficial protection and Erosion Control Measures (Cut Height of Side slope >25m)	33.04%	
(ix) Safety and traffic management during construction	--	Payment shall be made on pro rata basis every six months.

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(iv))

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

a) Working Drawings of all the components/elements of the project Highway as determined by Authority Engineer/ Authority, and

b) As-built drawings for the Project Highway components/elements as determined by Authority Engineer/ Authority. As-built drawings shall be duly certified by Authority Engineer.

a) A broad list of the drawings of the various components/elements of the project Highway and project facilities required to be submitted by the Contractor is given below:

a) Horizontal and Vertical Alignment (Plan & Profile) with:

- Details of Reference Pillars,
- Horizontal Intersection Point
- Vertical Intersection Point
- Elements of Curves, Details of Structures, etc.

b) Detailed Designed Cross Sections with Pavement layers at 20 m interval

c) Detailed Drawings of individual Cross Drainage Structures

d) Detailed drawing of Individual Minor & Major Bridges

e) Detailed Drawing of Breast wall, PPC wall, Retaining walls and Slope Protection work

f) Detailed Drawing of Drainage including lined drain and other drains.

g) Drawings of Major and Minor junctions,

h) Detailed Drawing of Light Vehicular Underpass

i) Drawings of a Truck lay bye and Bus bay with furniture and drainage system

j) Drawings of road furniture items including traffic signage, markings, safety barriers, etc.

k) Drawings of traffic diversion plans and traffic control measures

l) Drawings of landscaping and horticulture

m) Drawings of pedestrian crossings

n) General arrangement of Base camp and Administrative Block

Schedule - J

(See Clause 10.3 (ii))

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 ofeach Project Milestone, the Contractor shall notify the Authority of such compliance along with necessary particulars thereof.

2. *Project Milestone-I*

(i) Project Milestone-I shall occur on the date falling on the **[35% of the Scheduled Construction Period]** day from the Appointed Date (the "**Project Milestone- I**").

(i) 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*

(i) Project Milestone-II shall occur on the date falling on the **[60% of the Scheduled Construction Period]** day from the Appointed Date (the "**Project Milestone- II**").

(ii) 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 35% (thirty five per cent) of the Contract Price **and should have started construction of all bridges**

4. *Project Milestone-III*

(i) Project Milestone-III shall occur on the date falling on the **[85% of the Scheduled Construction Period]** day from the Appointed Date (the "**Project Milestone- III**").

(ii) 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 70% (seventy per cent) of the Contract Price and **should have** started construction of all project facilities.

5. *Scheduled Completion Date*

(i) The Scheduled Completion Date shall occur on the [Scheduled Construction Period] day from the Appointed Date.

(ii) 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 (ii))

Tests on Completion

1. ***Schedule for Tests***

(i) 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.

(ii) 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***

(i) 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 [***].

(ii) Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a Network Survey Vehicle (NSV) fitted with latest equipments and the maximum permissible roughness for purposes of this Test shall be [2,000 (two thousand)] mm for each kilometre.

(iii) 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 Nondestructive 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) metres or more shall also be subjected to load testing.

(iv) 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, except tests as specified in clause 5,but shall include measuring the reflectivity of road markings and road signs; and measuring the illumination level (lux) of lighting using requisite testing equipment.

(v) 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.

(vi) 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.

5. The Authority Engineer will carry out tests with following equipment at his own cost in the presence of contractor's representative.

Sr. No.	Key metrics of Asset	Equipment to be used	Frequency of condition survey
1	Surface defects of pavement	Network Survey Vehicle (NSV)	At least twice a year (As per survey months defined for the state basis rainy season)
2	Roughness of pavement	Network Survey Vehicle (NSV)	At least twice a year (As per survey months defined for the state basis rainy season)
3	Strength of pavement	Falling Weight Deflectometer (FWD)	At least once a year
4	Bridges	Mobile Bridge Inspection Unit (MBU)	At least twice a year (As per survey months defined for the state basis rainy season)
5	Road signs	Retro-reflectometer	At least twice a year (As per survey months defined for the state basis rainy season)

The first testing with the help of NSV shall be conducted at the time of issue of Completion Certificate.

Schedule -L

(See Clause12.2)

Completion Certificate

1 I, …….. (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated ……(the "**Agreement**"), for **"…….Name of Work……"**on Engineering, Procurement and Construction(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 safely and reliably placed in service of the Users there of.

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….. , Scheduled Completed Date for which was the …… day of ……20…..

SIGNED, SEALED AND DELIVERED

For and on behalf of the 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***

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

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

(iii) 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 on monthly basis***

(i) 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 cross fall, 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%

S. No.	Item/Defect/Deficiency	Percentage
(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%

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

$$R = {}^{P}/_{100} \times (M1 \; or \; M2) \times {}^{L1}/_{L}$$

Where,

P= Percentage of particular item/Defect/deficiency for deduction
M1= Monthly lump-sum payment in accordance para 1.2 above of this Schedule
M2= Monthly lump-sum payment in accordance para 1.2 above of this Schedule
L1= Non-complying length L = Total length of the road,
R= Reduction (the amount to be deducted for non-compliance 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 non-compliance.

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(i))

Selection of Authority's Engineer

1. Selection of Authority's Engineer

(i) 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.

(ii) In the event of termination of the Technical Consultants appointed in accordance with the provisions of Paragraph 1.1, 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)

Annex-I : Terms of Reference for Authority's Engineer

1. Scope

(i) 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 [name and address of the Authority] (the "**Authority**") and ..... (the "**Contractor**")# for [Two-Laning] of the **** section (km ** to km **) of National Highway No. ** in the State of *** on Engineering, Procurement, Construction (EPC) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

- In case the bid of Authority's Engineer is invited simultaneously with the bid of EPC project, then the status of bidding of EPC project only to be indicated

(ii) The TOR shall apply to construction and maintenance of the Project Highway.

2. Definitions and interpretation

(i) 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.

(ii) 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.

(iii) The rules of interpretation stated in Article 1 of the Agreement shall apply, mutatis mutandis, to this TOR.

3. General

(i) 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.

(ii) 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) issuance of Completion Certificate or

(e) any other matter which is not specified in (a), (b), (c) or (d) above and which creates a financial liability on either Party.

(iii) 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.

(iv) 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.

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

(vi) 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

(i) During the Construction Period, the Authority's Engineer shall review and approve 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 (vi). The Authority's Engineer shall complete such review and approval 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.

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

(iii) The Authority's Engineer shall review and approve 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.

(iv) The Authority's Engineer shall complete the review and approve 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.

(v) 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.

(vi) 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.

(vii) 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.

(viii) 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.

(ix) 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 (ix), 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.

(x) The Authority's Engineer shall test check at least 50 (fifty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.

(xi) The timing of tests referred to in Paragraph 4 (ix), 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.

(xii) 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.

(xiii) 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.

(xiv) 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.

(xv) 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 12.2.

(xvi) 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.

(xvii) 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.

(xviii) 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, as the case may be. For carrying out its functions under this Paragraph 4 (xviii) 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

(i) 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.

(ii) 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.

(iii) 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.

(iv) 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.

(v) 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

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

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

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

7. Payments

(i) 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 (iv) (d).

(ii) 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.

(iii) 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.

(iv) 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

(i) 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.

(ii) 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.

(iii) 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.

(iv) 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.

(v) 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 (i), 19.6 (i), and 19.8 (i))

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 (i) 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 (iii) (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***

(i) The Contractor shall effect and maintain at its own cost, from the Appointed Date till the date of issue of the 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.

(ii) The insurance under sub para (a) and (b) of paragraph 1(i) above shall cover the Authority and the Contractor against all loss or damage from any 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 of not less than 15% of the Contract Price 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 which arises from a cause occurring prior to the issue of the 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***

(i) The Contractor shall insure against its liability for any loss, damage, death or bodily injury, or damage to any property (except things insured under Paragraphs 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. 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 not less than: Rs. [*****]

(ii) 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 an 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 Maintenance Period

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 [2,200 (two thousand and two hundred only)] mm for each kilometre.

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 shall be as per the requirement of maintenance mentioned in Schedule-E.

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 [construction of the ****section (km ** to km **) of
****] (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 and designation of Authority's Representative)
(Address)