

SCHEDULES

Schedule-A

(See Clauses 2.1 and 8.1)

Site of the Project

1. The Site

- (i) Site of the [Two-Lane] Project Highway shall include the land, buildings, structures and road works as described in **Annex-I** of this Schedule-A.
- (ii) The dates of handing over the Right of Way to the Contractor are specified in **Annex-II** of this Schedule-A.
- (iii) 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.
- (iv) The alignment plans of the Project Highway are specified in Annex-III. In the case of sections where no modification in the existing alignment of the Project Highway is contemplated, the alignment plan has not been provided. Alignment plans have only been given for sections where the existing alignment is proposed to be upgraded. The proposed profile of the Project Highways shall be followed by the contractor with minimum FRL as indicated in the alignment plan. The Contractor, however, improve/upgrade the Road Profile as indicated in Annex-III based on site/design requirement.
- (v) The status of the environment clearances obtained or awaited is given in Annex-IV.

Annexure – I

(Schedule-A)

Site

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

1. Site

The Site of the Two-Lane Project Highway comprises the section of NH-244 commencing from Ex. Ch. 140+870 to Ex. Ch. 235+070 on Kishtwar – Vailoo - Khanabal stretch on NH-244 i.e., Construction of Uni-Directional Singhpora - Vailoo Twin Tube Tunnel (Under Sinthan pass) and its approach roads on Kishtwar – Vailoo - Khanabal section of NH-244 in the Union Territory of Jammu and Kashmir on EPC mode. The land, carriageway and structures comprising the Site are described below.

2. Land

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

possessed) as described below:				
Sr. No.	Chainage (km)		Right of Way (m)	Remarks
	From	To		
Nil				

3. Carriageway

The present carriageway of the Project Highway is Two Lane.

4. Major Bridges

The Site includes the following Major Bridges:

Sl. No.	Ex Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-structure	Super- structure		
1	0+975	Open	RCC	Steel Truss	1x65.00	

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.	Chainage (km)	Type of Structure		No. of Spans with span length (m)	Width (m)	ROB/ RUB
		Foundation	Superstructure			
Nil						

6. Grade separators

The Site includes the following grade separators:

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

7. Minor bridges

The Site includes the following minor bridges:

Sl. No.	Ex Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub- structure	Super- structure		
1	3+944	Open	Stone Masonry	Steel Truss	1x46.00	

2	7+260	Open	Stone Masonry	Steel Truss	1x26.00	
---	-------	------	---------------	-------------	---------	--

8. Railway level crossings

The Site includes the following railway level crossings:

S. No.	Location (km)	Remarks
Nil		

9. Underpasses (vehicular, non-vehicular)

The Site includes the following underpasses:

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

10. Culverts

The Site has the following culverts:

Sl. No.	Design Chainage in Km	Existing Chainages	Type of Culvert	Span /Opening with span length (m)	Width (m)
1	-	00+709	Slab Culvert		
2	-	01+470	Pipe Culvert	1.00	
3	112+097	02+253	Pipe Culvert	1.00	
4	112+237	02+395	Slab Culvert	Blocked	
5	112+640	02+831	Pipe Culvert	1.00	
6	113+137	03+345	Pipe Culvert	1.00	
7	114+070	04+333	Slab Culvert	1.55	
8	115+780	05+794	Pipe Culvert	1.00	
9	116+070	06+094	Pipe Culvert	1.00	
10	116+375	06+445	Pipe Culvert	1.00	
11	116+435	06+797	Pipe Culvert	1.00	
12	116+895	06+858	Pipe Culvert	1.00	
13	117+240	07+359	Pipe Culvert	1.00	
14	117+370	07+694	Pipe Culvert	1.00	
15	117+515	07+823	Pipe Culvert	1.00	
16	117+835	07+978	Pipe Culvert	1.00	
17	118+104	08+296	Pipe Culvert	1.00	
18	118+441	08+540	Pipe Culvert	1.00	
19	118+615	08+885	Pipe Culvert	1.00	
20	121+350	11+934	Pipe Culvert	1.00	
21	121+510	12+111	Pipe Culvert	1.00	
22	122+840	13+400	Pipe Culvert	1.00	
23	123+189	13+749	Pipe Culvert	1.00	
24	123+217	13+773	Pipe Culvert	1.00	
25	123+843	14+413	Pipe Culvert	1.00	
26	124+092	14+695	Pipe Culvert	1.00	
27	124+380	14+965	Pipe Culvert	1.00	
28	124+860	15+436	Slab Culvert	1.00	
29	125+196	15+780	Slab Culvert	2.30	
30	125+410	16+009	Slab Culvert	3.25	
31	126+012	16+600	Slab Culvert	1.75	

32	126+395	16+983	Slab Culvert	2.85	
33	126+720	17+318	Slab Culvert	1.50	

11. Bus bays

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

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

12. Truck Lay byes

The details of truck lay byes are as follows:

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

13. Road side drains

The details of the roadside drains are as follows:

S. No.	Location		Type	
	From km	to km	Masonry/cc (Pucca)	Earthen (Kutch)
1	115+442	115+687	Pucca	
2	115+897	116+142	Pucca	
3	116+872	117+067	Pucca	
4	127+181	127+280	Pucca	

14. Major junctions

The details of major junctions are as follows:

S. No.	Location		At grade	Separated	Category of Cross Road			
	From km	to km			NH	SH	MDR	Others
1	Realignment at km 111+067		T		NH			

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

15. Minor junctions

The details of the minor junctions are as follows:

S. No.	Location	Type	Remarks
1	112+702	T	To Sinthan top
2	115+679	Y	To Village
3	146+510	Y	To Vailoo Village

16. Bypasses

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

S. No.	Name of bypass (town)	Chainage (km) From km to km	Length (in Km)
Nil			

17. Other structures : Nil

18. Details of Existing Utilities: The details of existing utilities are given in Sheet-I.

Sheet-I

(Annexure-I of Schedule-A)

(i) ELECTRICAL UTILITIES

The site includes the following electrical utilities: -

(a) Extra High-Tension Lines (EHT lines)

Sr. No	Chainage		Length along NH (in Km)				ROW Crossings (in km)			
	From km	To km	400KV	220KV	110KV	66KV	400KV	220KV	110KV	66KV
Nil										

(b) High Tension/Low Tension Lines (HT/LT lines)

Sr. No	Chainage (in Km)	Length (in Km)				Crossings (no's)				Transformer	
		33KV	22KV	11KV	LT	33KV	22KV	11KV	LT	No	Capacity
Nil											

(c) Public Health Utilities (Water/Sewage Pipelines)

(a) The site includes the following public health utilities: -

Sr · No	Chainage(km)		Type	Length (in Km)				Crossings					Remarks
	From	To		Water Supply line		Sewage line		With pumping		Sewage line			
				With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity	With Pumping	With Gravity		
Nil													

(ii) Any Other Line: N/A

Annex – II

(As per Clause 8.3 (i))

(Schedule-A)

Dates for providing Right of Way of Construction Zone

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

Sl. No	Design Chainage Km		Length (km)	Width (m)	Date of providing ROW*	
	From	To				
(A) Part Right of Way (part width)						
Stretch. 1	111.485	113.662	2.177	4.5	On Appointed Date	
Stretch. 2	113.813	114.100	0.287	7.8		
Stretch. 3	114.476	115.620	1.144	5.5		
Stretch. 4	115.940	116.165	0.225	5		
Stretch. 5	116.230	116.650	0.420	6		
Stretch. 6	117.600	118.045	0.445	6		
Stretch. 7	118.500	120.900	2.400	5.5		
Stretch. 8	121.290	122.252	0.962	6		
Stretch. 9	123.555	124.373	0.818	5		
Stretch. 10	125.478	125.630	0.152	7		
Stretch. 11	138.800	138.980	0.180	5.5		
Stretch. 12	143.211	143.457	0.246	5.5		
Stretch. 13	144.000	144.390	0.390	6		
Stretch. 14	145.160	147.175	2.015	8		
(B) Balance Right of Way (Balance width)						
Stretch. 1	111.485	113.662	2.177	20.5	Within 90 days after the appointed Date	
Stretch. 2	113.813	114.100	0.287	17.2		
Stretch. 3	114.476	115.620	1.144	19.5		
Stretch. 4	115.940	116.165	0.225	29.5		
Stretch. 5	116.230	116.650	0.420	20		
Stretch. 6	117.600	118.045	0.445	17		
Stretch. 7	118.500	120.900	2.400	19.5		
Stretch. 8	121.290	122.252	0.962	15		
Stretch. 9	123.555	124.373	0.818	19.5		
Stretch. 10	125.478	125.630	0.152	20		
Stretch. 11	138.800	138.980	0.180	19.5		
Stretch. 12	143.211	143.457	0.246	24.5		
Stretch. 13	144.000	144.390	0.390	17		
Stretch. 14	145.160	147.175	2.015	18		
			11.861			
(C) New Alignment full PROW						
Stretch. 1	111.067	111.485	0.418	20 to 60 m	Within 90 days after the appointed date	
Stretch. 2	113.662	113.813	0.151			
Stretch. 3	114.100	114.476	0.376			
Stretch. 4	115.620	115.940	0.320			
Stretch. 5	116.165	116.230	0.065			
Stretch. 6	116.650	117.600	0.950			
Stretch. 7	118.045	118.500	0.455			
Stretch. 8	120.900	121.290	0.390			
Stretch. 9	122.252	123.555	1.303			
Stretch. 10	124.373	125.478	1.105	60 to 150 m		
Stretch. 11	125.630	128.100	2.470			
Stretch. 12	128.100	138.500	10.400			
Stretch. 13	138.500	138.800	0.300			20 to 60 m
Stretch. 14	138.980	140.334	1.354			

Sl. No	Design Chainage Km		Length (km)	Width (m)	Date of providing ROW*
	From	To			
Stretch. 15	140.334	143.211	2.877		
Stretch. 16	143.457	144.000	0.543		
Stretch. 17	144.390	145.160	0.770		
Stretch. 18	147.175	149.678	2.503		

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

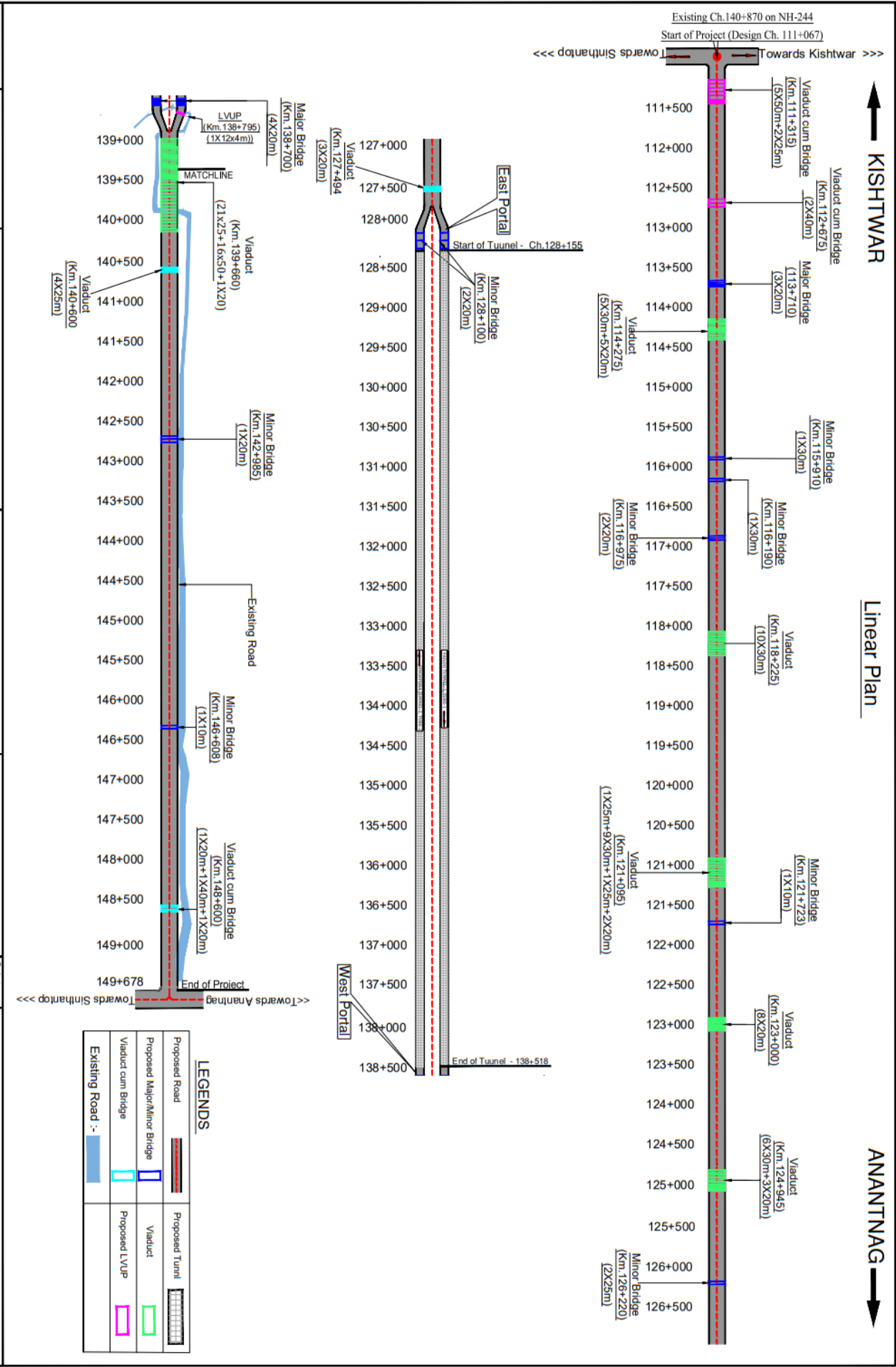
Annex - III

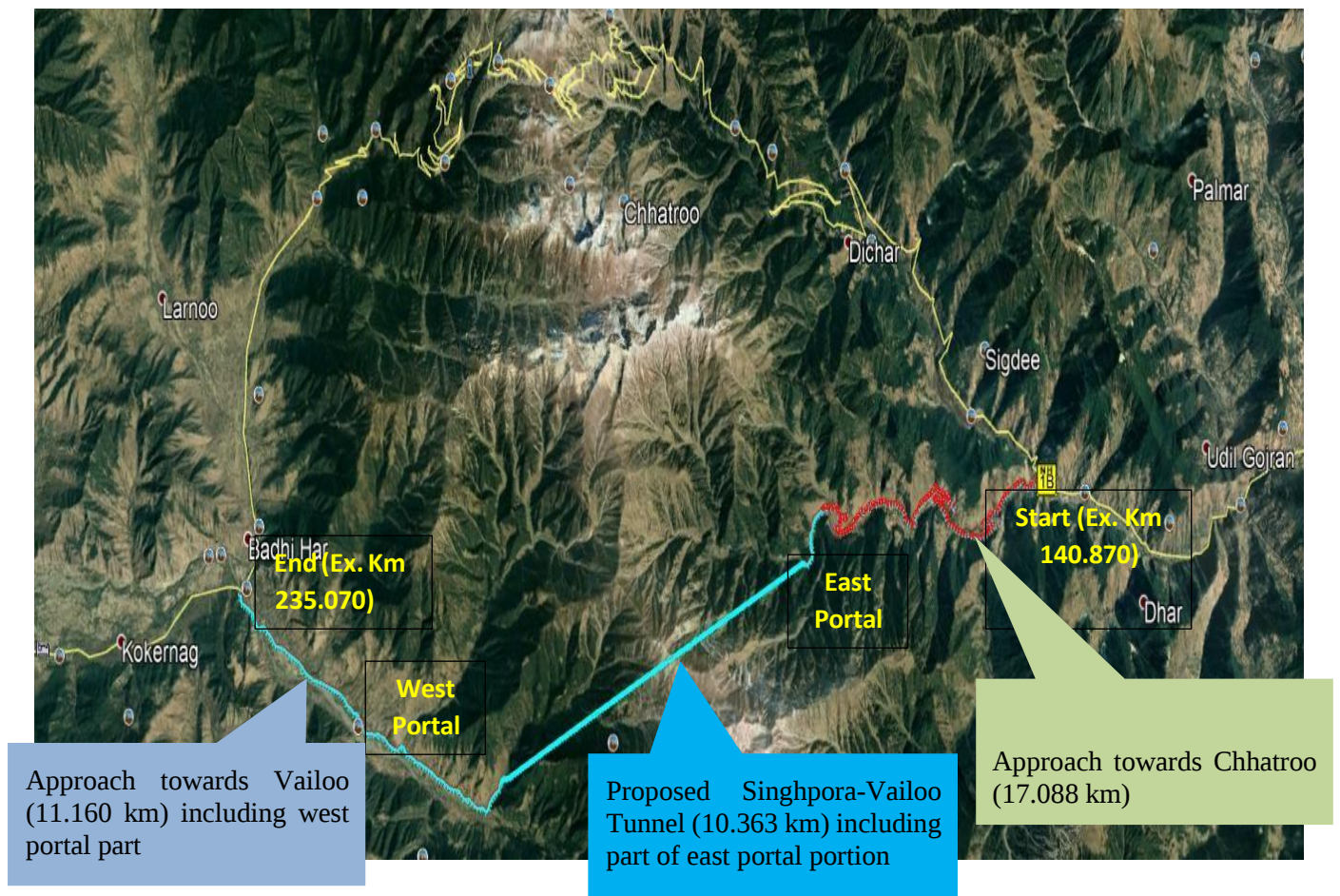
(Schedule-A)

Alignment Plans

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

- (i) The alignment of the Project Highway is enclosed in alignment plan. Finished road level indicated in the alignment plan shall be followed by the contractor as minimum FRL. In any case, the finished road level of the project highway shall not be less than those indicated in the alignment plan. The contractor shall, however, improve/upgrade the Road profile as indicated in Annex-III based on site/design requirement.
- (ii) Traffic Signage plan of the Project Highway showing numbers & location of traffic signs is enclosed. The contractor shall, however, improve/upgrade upon the traffic signage plan as indicated in Annex-III based on site/design requirement as per the relevant specifications/IRC Codes/Manual.





Annex – IV

(Schedule-A)

Environment Clearances

As per EIA notification 2006 and its amendment S.O.2559 (E) Dt 22nd August 2013, S.O 996(E) Dt 10th April 2015, S.O 382(E) Dt 3rd February 2015 Environmental Clearance Exempted from the purview of the Environmental Impact Assessment.

[To be published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section(ii)]

MINISTRY OF ENVIRONMENT AND FORESTS NOTIFICATION

New Delhi, the 22nd August, 2013

S.O. 2559 (E).- Whereas by notification of the Government of India in the Ministry of Environment and Forests vide number S.O.1533(E), dated the 14th September, 2006 issued under sub-section (1) and clause (v) of sub-section (2) of section (3) of the Environment (Protection) Act, 1986 read with clause (d) of sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government directed that on and from the date of its publication, the required construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to the said notification entailing the capacity addition with change in process or technology and or product mix shall be undertaken in any part of India only after prior environmental clearance from the Central Government or as the case may be, by the State level Environment Impact Assessment Authority, duly constituted by the Central Government under sub-section (3) of section 3 of the said Act, in accordance with the procedure specified therein;

And whereas the Government of India in the Ministry of Environment and Forests had constituted a High Level Committee under the Chairmanship of Member (Environment and Forests and Science and Technology), Planning Commission, vide OM No.21-270/2008-IA.III dated the 11th December, 2012 to review the provisions of Environmental Impact Assessment Notification, 2006 relating to granting Environmental Clearances for Roads, Buildings and Special Economic Zone projects and provisions under the OM dated the 7th February, 2012 issued by the Ministry of Environment and Forests regarding guidelines for High Rise Buildings;

And whereas one of the terms of reference (ToR) of the Committee was to review the requirement of Environmental Clearance for highway expansion projects upto the right of way of 60 meters and length of 200 kms under Environmental Impact Assessment notification;

And whereas the Committee has submitted its report to the Ministry and on this ToR, the Committee has recommended exempting highway expansion projects from the requirement of scoping and that Environmental Impact Assessment or Environment Management Plan for highway expansion projects may be prepared on the basis of model ToRs to be posted on Ministry's website and in respect of requirement of environmental clearance, **the Committee has recommended that expansion of National Highway projects up to 100 kms involving additional right of way or land acquisition upto 40 mts on existing alignments and 60 mts on re-alignments or by-passes may be exempted from the preview of the notification;**

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

Nil

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 the Project

Construction of Uni-directional Singhpora - Vailoo Tunnel (Under Sinthanpass) of length 10.331km/10.363km (Tube-1/Tube-2) and its approach road from Km 111+067 (at Chhatroo km 140.870 on NH-244) to 149+678 (at vailoo Junction with NH -244 i.e., existing km 235.070) of total length 38.611 km in Union Territory of Jammu & Kashmiron EPC mode. Details of proposed project section are as given below.

Tunnel (Uni-directional)

Length of Tube-1 (Left) 10.331 km

Length of Tube-2 (Right) 10.363 km

Eastern Portal

Elevation 2243 m

Location Km 128.155

Western Portal

Elevation 2404 m

Location Km 138.518

Approaches:

East portal: Approach Road starts at Chhatroo [Junction with NH -244 at existing km 140.870 (NH-1 B)] in Kishtwar District and Ends at start of Eastern portal of Singhpora- Vailoo Tunnel. The east portal is located near Singhpora (Kishtwar District) which is 17.088 Km from Chhatroo.

West Portal: The west Portal is located at Gadole and the end point of the approach road is located at Vailoo [Junction with NH-244 at existing km 235.070 (NH-1 B)] which is 11.160 Km long including portal. So, the length of approach road on west portal side is 11.160 Km and lies in the Anantnag District.

1. Development of the project section

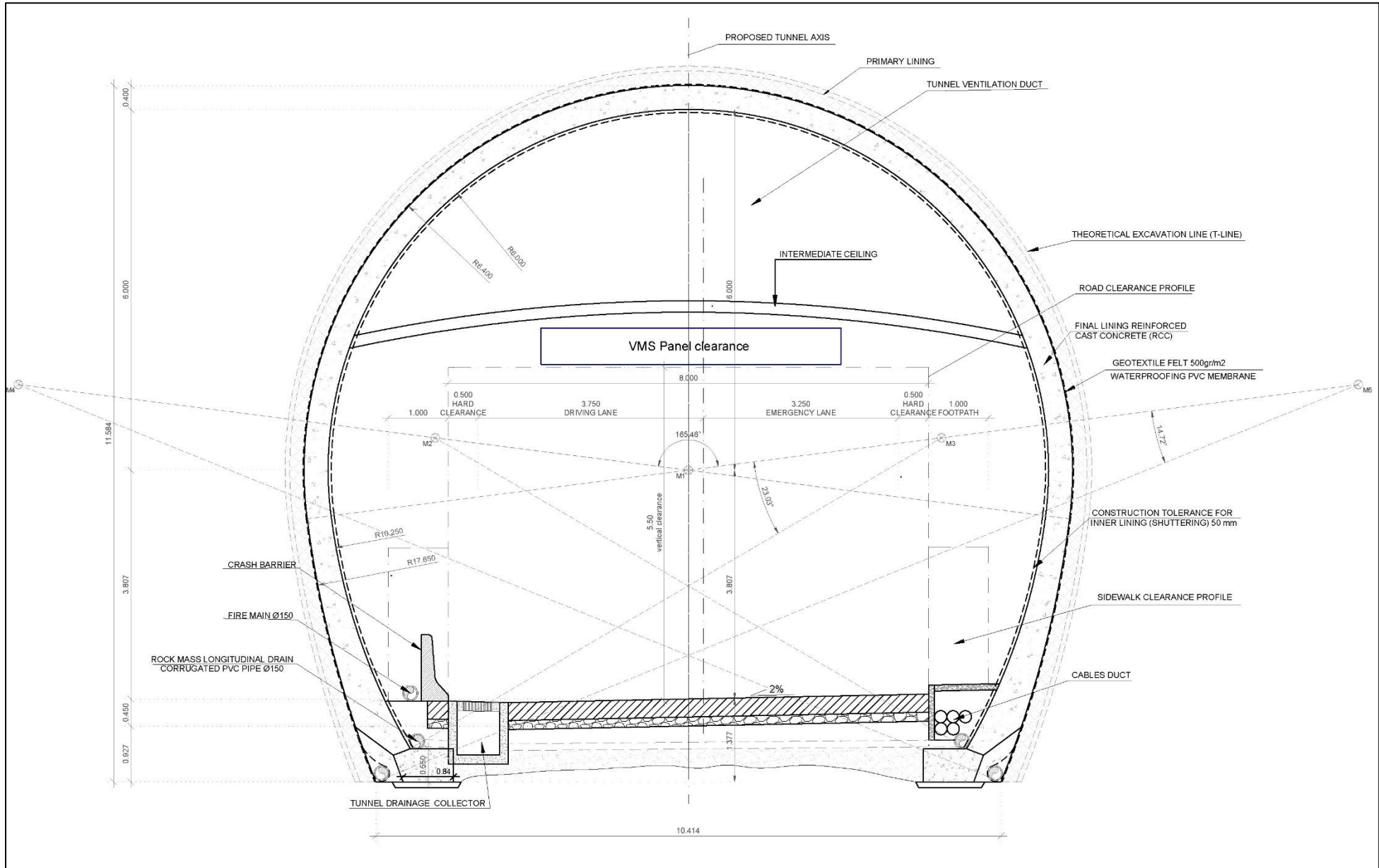
- (i) The Project Highway shall follow the existing village roads & new alignment unless otherwise specified by the Authority and shown in the alignment plans as specified in Annex-III of Schedule-A.
- (ii) Width of the proposed tunnel and its approach roads/carriageway.

1.1 Cross Section Width and Height of proposed Tunnels

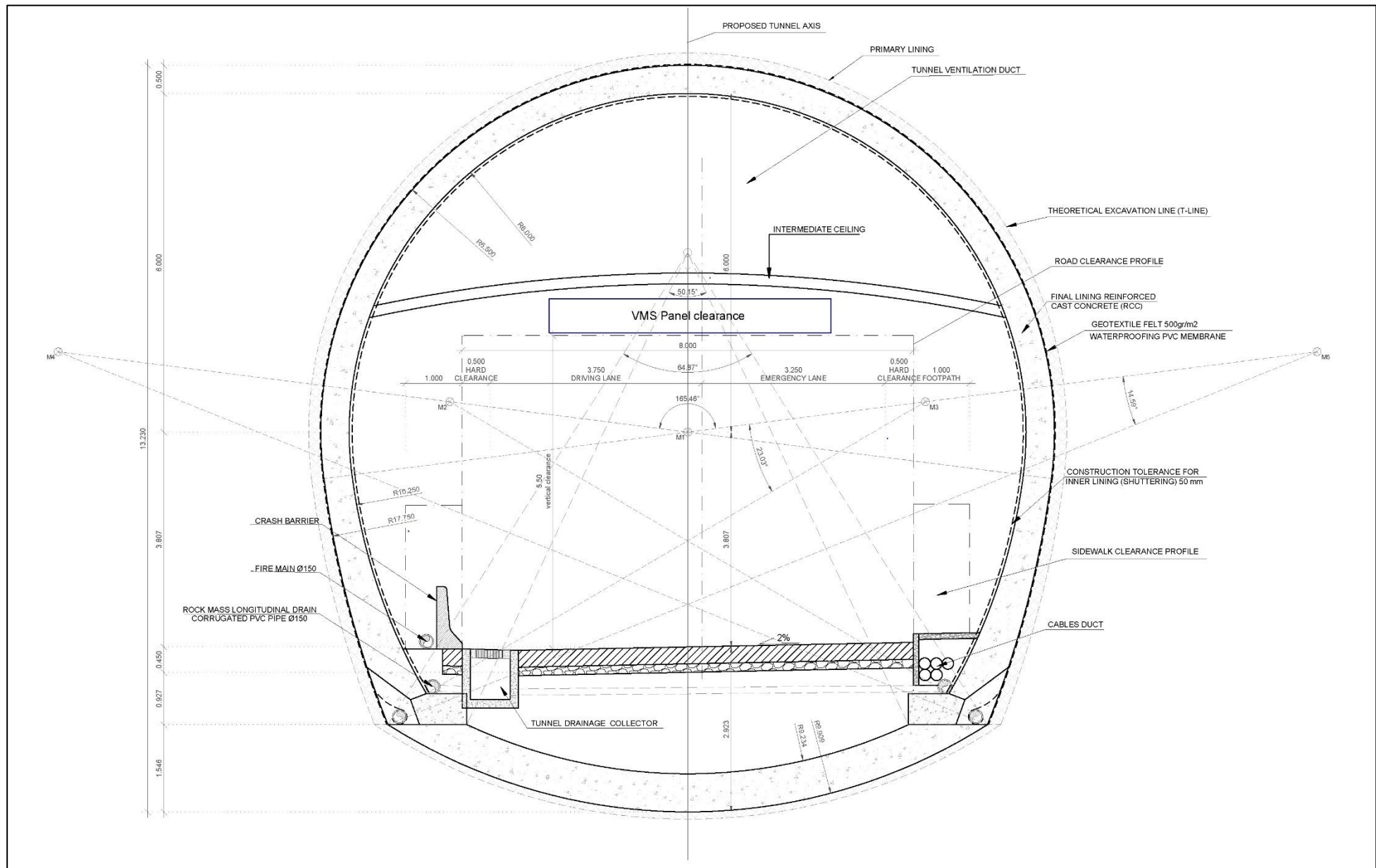
Summary of Road Cross Section inside the tunnel is given below,

Cross Section Element	Width in m
Crash barrier and services	1.00m
Hard Clearance (either side)	2 x 0.50m
Traffic Lane	3.75m
Emergency Lane/ Traffic Lane	3.25m
Raised Footpath	1.00m
Overall width	10.00m

Cross section of the tunnel is given below.



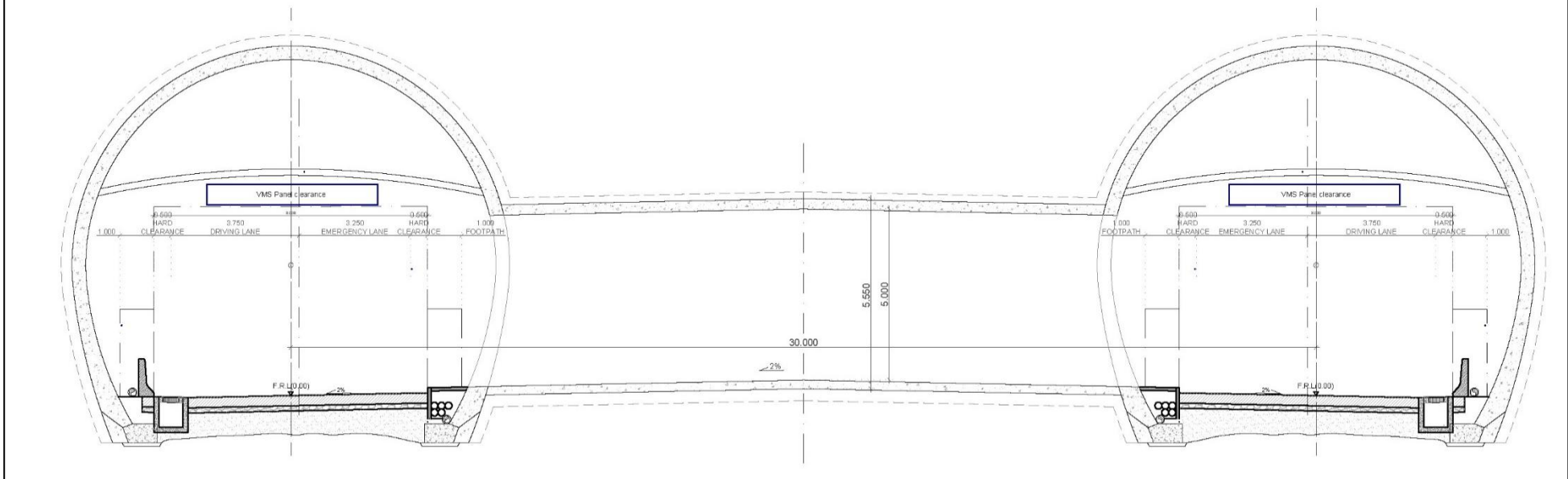
Uni-directional Tunnel Cross Section without invert (Tube-1)



Uni-directional Tunnel Cross Section with invert (Tube-1)

CROSS SECTION OF TWIN TUBES BY CROSS PASSAGE AXIS

Scale 1:100



Cross-section for cross-passage

1.2 Pavement

The road pavement in the tunnel consists of following layers,

- Pavement quality concrete
- Dry lean cement concrete subbase layer
- GSB

Note:- EPC Contractor shall design for the crust thickness in accordance to design criteria in the Contract Agreement and MoRT&H/ IRC Specification

1.3 Ventilation

A semi-transversal ventilation system shall be provided for Singhpura-Vailoo Tunnel. Ventilation system shall be provided as per the technical specifications and Guidelines for Road Tunnels IRC: SP:91-2019, NFPA 502 (2020), PIARC Technical Committee D5 – Road Tunnels: Vehicle Emissions and Air Demand for Ventilation (2019).

1.4 Final Interior Finish

The main traffic tunnel shall have a final interior finish of a fire-resistant material of suitable surface characteristics as per Contractor's detailed design subject to approval by Authority Engineer.

1.5 Lighting and E&M Facilities

As per Contractor's detailed design subject to approval by the Authority Engineer. Normal Lighting & Emergency Lighting in the Road tunnel shall be designed according to the Technical Specifications and CIE 88:2004 standard "Guide for the Lighting of Road Tunnels and Underpasses" for two- way traffic including Cable & cable laying, Main Electrical panel & Sub Panels, earthing of complete offered system, galvanized supporting structure and all other necessary accessories, etc. as per the design requirement. Also, the Guidelines for Road Tunnels IRC: SP:91-2019 will be considered. The luminous intensity at the entry and exit zones shall be adapted to the actual outside lighting level according to external conditions (day/night, regulation through measurement of luminous density).

Tunnel safety facilities such as CCTV- cameras, traffic lights, variable message signs, traffic loop detectors, emergency communications, alarm push buttons, fire detection systems etc. shall be provided as per Contractors detailed design/IRC:SP:2019.

1.6 Drainage and Waterproofing Concept

The tunnel shall be designed as a dry and drained tunnel as per contractor's detailed design. A waterproofing membrane shall be provided as per the drawing of cross section of tunnel. The water is drained along the bottom of the side walls with perforated drainage pipes.

1.7 Construction Concept

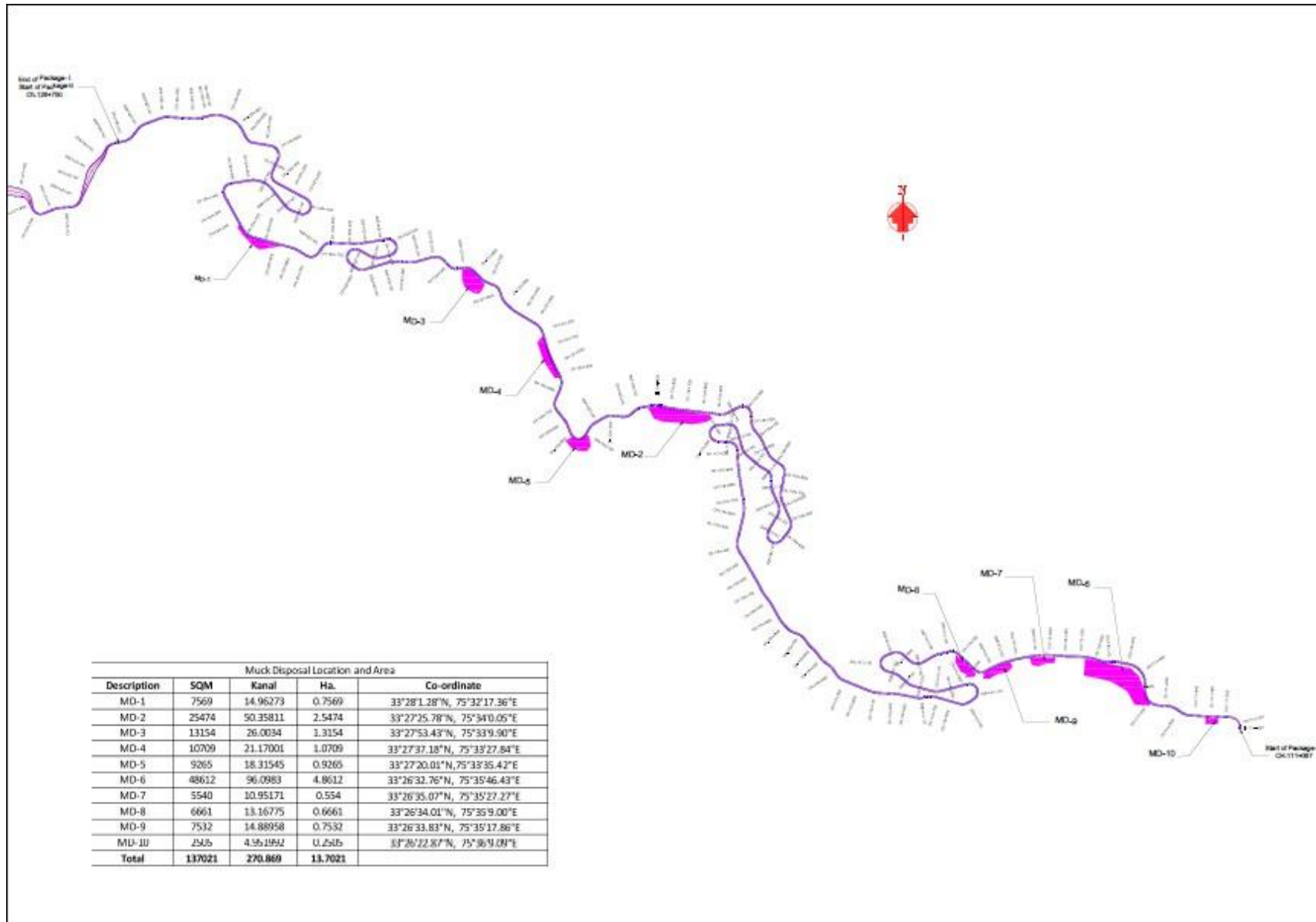
The construction method of the tunnel shall be internationally accepted method as proposed in the technical proposal maintaining the clear profile with prior approval of NHIDCL in consultation with the Authority Engineer. However, the method of construction (TBM/Drill & Blast Method/NATM) is Contractor's choice.

1.8 Muck Dump Disposal

Up to 10on Kishtwar side &4 on Anantnag side muck dumping sites have been identified for the purpose of muck dumping. However, suitability of these muck dumping sites and finding of additional muck dumping sites, if any, for muck dumping volume is the sole responsibility of the Contractor.

Prior to any disposal of muck dumping material at muck dumping sites, necessary permission shall be obtained from the local authorities (Civil administration/Forest/Wildlife) as per applicable law for which the local NHIDCL office will provide necessary assistance. For estimation of capacity of the individual pockets, the Contractors are required to carry out

reconnaissance in coordination with local NHIDCL authorities. Muck disposal and management shall be carried out in accordance with the Environmental Laws of State/Central Govt.



2. Construction of Approaches

• Widening of the existing road

- i. The Project Highway shall follow the existing alignment unless otherwise specified by the Authority and shown in the alignment plans specified in Annex-III of Schedule-A. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for hilly/mountainous terrain to the extent land is available.
- ii. Width of Carriageway
 - (a) Two-Laning with paved shoulders shall be undertaken. The paved carriageway shall be 10m for road section in accordance with the typical cross section's drawings.
 - (b) Except as otherwise provided in this agreement, the width of the paved carriageway and cross-sectional features shall conform to cross section shown.

3. Geometric Design and General Features

(i) General

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

(ii) Design speed

The design speed shall be the minimum design speed of 40 km per hr. for mountainous/hilly terrain as per IRC SP 48:1998 and IRC SP: 73:2018.

(iii) Improvement of the existing road geometrics

In the following sections, where improvement of the existing road geometrics to the prescribed standards is not possible since the existing road is being abandoned and new alignment is being proposed.

Sl. No.	Stretch (from km to km)	Type of deficiency	Remarks
Nil			

(iv) Right of Way

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

(v) Type of shoulders

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

Sl. No.	Stretch (from km to km)	Fully paved shoulders/ footpaths	Reference to cross section
Nil			

- (b) In open country/hilly areas, paved shoulders of 1.5m width either side shall be provided and balance 1.0m width earthen shoulder at valley side only shall be covered with 150 mm thick compacted layer of granular material.

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

(vi) Lateral and vertical clearances at underpasses

- (a) Lateral and vertical clearances at underpasses and provision of guardrails/crash barriers shall be as per the provision of relevant Manual.

- (b) Lateral clearance: The width of the opening at the underpasses shall be as follows:

Sl. No.	Location (Chainage)	Span/ opening (m)	Vertical Clearance (m)	Remarks
---------	---------------------	----------------------	---------------------------	---------

	Nil
--	-----

(vii) Lateral and vertical clearances at overpasses

(a) Lateral and vertical clearances at overpasses shall be as per the provision of relevant Manual.

(b) Lateral clearance: The width of the opening at the overpasses shall be as follows:

Sl. No.	Location (Chainage) (from km to km)	Span/ opening (m)	Remarks
Nil			

(viii) Service roads

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

Sl. No.	Location of service road (from km to km)	Right hand side (RHS)/Left hand side (LHS)/ or Both sides	Length (km) of service road
Nil			

(ix) Grade separated structures

(a) Grade separated structures shall be provided as per provision of the relevant Manual.
The requisite is given below:

Sl. No.	Location of structure	Length (m)	Number and length of spans (m)	Approach gradient	Remarks, if any
Nil					

(b) In the case of grade separated structures, the type of structure and the level of the Project Highway and the crossroads shall be as follows:

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

(x) Cattle and pedestrian underpass /overpass

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

Sl. No.	Location at km	Span Arrangement (No. x Length) in m	Type of crossing
Nil			

(xi) Typical cross-sections of the Project Highway

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

Summary of TCS				
Sr. No.	Detail	TCS	Length	
			(m)	Kms
1	One Side Cut & One Side Fill With Protection On Either Side As Applicable (Reconstruction)	TCS-1	6612.43	6.61
2	One Side Cut(Cut Height<2m) & One Side Fill (Embankment Height<2m) Without Protection Work(Reconstruction)	TCS-1A	750.00	0.75
3	One Side Cut & One Side Fill With Protection On Either Side As Applicable (New Construction)	TCS-1B	1528.03	1.53
4	One Side Cut(Cut Height<2m) & One Side Fill(Embankment Height<2m) Without Protection Work(Reconstruction)	TCS-1C	750.00	0.75
5	One Side Cut (Ht.>15m) & One Side Fill With Protection On Either Side As Applicable (Reconstruction)	TCS-1D	980.00	0.98
6	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2	1961.00	1.96
7	Both Side Fill With Normal Embankment (Height.<2m)Without Protection Work(New Work(Reconstruction)	TCS-2A	990.00	0.99
8	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2B	1110.00	1.11

Summary of TCS				
Sr. No.	Detail	TCS	Length	
			(m)	Kms
9	Both Side Fill With Normal Embankment (Height.<2m)Without Protection Work(New Work(Reconstruction)	TCS-2C	1710.00	1.71
10	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3	2140.00	2.14
11	Both Side Cut Without Protection Work (Cut Height<2m) (Reconstruction)	TCS-3A	250.00	0.25
12	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3B	2960.00	2.96
13	Both Side Cut Without Protection Work (Cut Height<2m) (Reconstruction)	TCS-3C	380.00	0.38
14	Both Side Cut (Ht.>15m) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D	690.00	0.69
15	Both Side Cut (Ht.>15m) With Protection On Either Side As Applicable (New Construction)	TCS-3E	1130.00	1.13
16	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable (Reconstruction)	TCS-4	250.00	0.25
17	Both Side Fill For Tunnel Approach With Protection (As Applicable) (New Construction)	TCS-5	81.00	0.08
18	Both Side Cut For Tunnel Approach With Protection On Either Side As Applicable (New Construction)	TCS-6	75.00	0.08
19	Both Side Fill For Tunnel Approach With Protection (As Applicable) (New Construction)	TCS-7	110.00	0.11
20	Tunnel	As per indicative drawing	10363.00	10.36
21	Tunnel Portal	As per indicative drawing	146.00	0.15
22	Major Bridge	As per indicative drawing	1670.00	1.67
23	Viaduct cum Bridge	As per indicative drawing	80.00	0.08
24	Viaduct	As per indicative drawing	1665.00	1.67
25	Minor Bridge	As per indicative drawing	230.00	0.23
TOTAL DESIGN LENGTH			38611.46	

4. Intersections and Grade Separators

All intersections and grade separators shall be as per the provision of relevant Manual.

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

(i) At-grade intersections

SL. No.	Design Chainage in km	Type	Junction	Cross Road Direction to Village
1	111+130	T	Major	To Kishtwar
2	111+490	T	Minor	To Sinthan top
3	114+350	Y	Minor	To Village
4	127+615	T	Minor	To Village
5	141+005	X	Minor	To Gadol Village/To Trazi Village
6	142+345	X	Minor	To Gadol Village/To Village
7	142+560	T	Minor	To Gadol Village
8	142+915	Y	Minor	To Tuspura Village
9	143+015	Y	Minor	To Khatanpur Village
10	143+355	T	Minor	To Tuspura Village

SL. No.	Design Chainage in km	Type	Junction	Cross Road Direction to Village
11	143+755	T	Minor	To LoharSanzi Village
12	144+140	X	Minor	To LoharSanzi Village/To Khatanpur Village
13	144+530	X	Minor	To LoharSanzi Village
14	145+910	T	Minor	To Cherward Village
15	145+985	T	Minor	To Cherward Village
16	146+510	Y	Minor	To Vailoo

(ii) 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

5. Road Embankment and Cut Section

(i) 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.

(ii) Raising of the existing road

The existing road shall be raised in the following sections:

Sl. No.	Section (from km to km)	Length	Extent of raising [Top of finished road level]
			Nil

6. Pavement Design

(i) Pavement design shall be carried out in accordance with the provision of relevant Manual.

(ii) Type of pavement

Flexible pavement is proposed at the main carriageway of highway in accordance with IRC :37-2018.

(iii) Design requirements

(a) Design Period and strategy

Flexible pavement for new pavement shall be designed for a period of 20 years and Rigid pavement shall be designed for a minimum design period of 30 years. Stage construction shall not be permitted.

(b) Design Traffic

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

Note:- EPC Contractor is free to adopt either Flexible or Rigid Pavement at the main carriageway of highway in accordance to design criteria in the Contract Agreement and MoRT&H/ IRC Specification.

(iv) Reconstruction of stretches

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

Sl. No.	Section (from km to km)	Remarks
		Nil

7. Roadside Drainage

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

- Location of PCC Roadside drain

Roadside PCC Drainage List				
Design Chainage		Design Length (m)	Side	Roadside Drain Length (m)
From	To			
111+067	111+150	83	RIGHT	83.43
111+500	111+540	40	RIGHT	40
111+540	111+660	120	RIGHT	120
111+660	111+700	40	BOTH	80
111+700	111+730	30	RIGHT	30
111+730	111+770	40	BOTH	80
111+770	111+800	30	RIGHT	30
111+850	112+010	160	RIGHT	160
112+010	112+050	40	BOTH	80
112+050	112+080	30	RIGHT	30
112+080	112+110	30	RIGHT	30
112+110	112+130	20	RIGHT	20
112+130	112+330	200	RIGHT	200
112+330	112+400	70	RIGHT	70
112+400	112+490	90	RIGHT	90
112+490	112+510	20	RIGHT	20
112+510	112+530	20	RIGHT	20
112+530	112+560	30	RIGHT	30
112+560	112+600	40	RIGHT	40
112+600	112+635	35	RIGHT	35
112+715	112+740	25	RIGHT	25
112+740	112+870	130	RIGHT	130
112+870	112+900	30	RIGHT	30
112+900	112+930	30	RIGHT	30
112+930	112+960	30	RIGHT	30
112+960	113+000	40	RIGHT	40
113+060	113+110	50	BOTH	100
113+110	113+190	80	RIGHT	80
113+190	113+240	50	RIGHT	50
113+240	113+280	40	BOTH	80
113+280	113+310	30	BOTH	60
113+310	113+340	30	RIGHT	30
113+340	113+370	30	BOTH	60
113+370	113+390	20	RIGHT	20
113+390	113+450	60	RIGHT	60
113+450	113+470	20	RIGHT	20
113+470	113+510	40	RIGHT	40
113+510	113+540	30	RIGHT	30
113+540	113+560	20	RIGHT	20
113+560	113+620	60	RIGHT	60
113+620	113+640	20	RIGHT	20
113+640	113+680	40	RIGHT	40
113+740	113+890	150	RIGHT	150
113+890	114+040	150	RIGHT	150
114+410	114+810	400	RIGHT	400
114+810	114+860	50	BOTH	100

Roadside PCC Drainage List				
Design Chainage		Design Length (m)	Side	Roadside Drain Length (m)
From	To			
114+860	115+070	210	RIGHT	210
115+070	115+130	60	RIGHT	60
115+130	115+570	440	RIGHT	440
115+570	115+630	60	RIGHT	60
115+780	115+860	80	RIGHT	80
115+950	116+070	120	RIGHT	120
116+070	116+120	50	RIGHT	50
116+120	116+175	55	BOTH	110
116+205	116+280	75	BOTH	150
116+280	116+450	170	BOTH	340
116+450	116+630	180	BOTH	360
116+630	116+880	250	RIGHT	250
116+880	116+920	40	RIGHT	40
116+920	116+955	35	RIGHT	35
117+030	117+080	50	BOTH	100
117+080	117+130	50	BOTH	100
117+130	117+220	90	RIGHT	90
117+220	117+270	50	BOTH	100
117+270	117+500	230	RIGHT	230
117+500	117+530	30	BOTH	60
117+530	118+075	545	RIGHT	545
118+400	118+430	30	BOTH	60
118+430	118+490	60	BOTH	120
118+490	118+520	30	BOTH	60
118+520	118+660	140	RIGHT	140
118+660	118+690	30	BOTH	60
118+690	118+730	40	BOTH	80
118+730	118+790	60	RIGHT	60
118+790	118+840	50	BOTH	100
118+840	119+040	200	RIGHT	200
119+040	119+150	110	BOTH	220
119+150	119+230	80	BOTH	160
119+230	119+290	60	BOTH	120
119+340	119+450	110	BOTH	220
119+450	119+570	120	RIGHT	120
119+570	119+630	60	BOTH	120
119+630	119+640	10	RIGHT	10
119+640	119+690	50	RIGHT	50
119+690	120+090	400	RIGHT	400
120+090	120+120	30	RIGHT	30
120+120	120+170	50	RIGHT	50
120+170	120+310	140	BOTH	280
120+310	120+400	90	RIGHT	90
120+420	120+470	50	RIGHT	50
120+470	120+530	60	RIGHT	60
120+600	120+770	170	RIGHT	170

Roadside PCC Drainage List				
Design Chainage		Design Length (m)	Side	Roadside Drain Length (m)
From	To			
120+770	120+810	40	RIGHT	40
120+810	120+915	105	RIGHT	105
121+370	121+560	190	RIGHT	190
121+560	121+710	150	BOTH	300
121+740	122+030	290	BOTH	580
122+030	122+130	100	BOTH	200
122+130	122+160	30	BOTH	60
122+160	122+270	110	RIGHT	110
122+270	122+310	40	BOTH	80
122+310	122+670	360	BOTH	720
122+670	122+780	110	BOTH	220
122+780	122+840	60	BOTH	120
123+090	123+110	20	BOTH	40
123+110	123+230	120	BOTH	240
123+230	123+310	80	RIGHT	80
123+410	123+490	80	RIGHT	80
123+490	123+530	40	RIGHT	40
123+810	123+840	30	RIGHT	30
123+840	123+910	70	RIGHT	70
123+910	124+060	150	BOTH	300
124+060	124+120	60	RIGHT	60
124+180	124+290	110	RIGHT	110
124+350	124+770	420	BOTH	840
124+770	124+825	55	RIGHT	55
125+100	125+150	50	BOTH	100
125+150	125+350	200	BOTH	400
125+350	125+380	30	BOTH	60
125+380	125+460	80	RIGHT	80
125+460	125+500	40	RIGHT	40
125+820	126+030	210	BOTH	420
126+030	126+090	60	BOTH	120
126+090	126+195	105	BOTH	210
126+245	126+270	25	BOTH	50
126+420	126+610	190	RIGHT	190
126+610	126+770	160	RIGHT	160
126+770	126+910	140	RIGHT	140
126+910	126+950	40	BOTH	80
126+950	127+040	90	RIGHT	90
127+110	127+150	40	BOTH	80
127+150	127+240	90	BOTH	180
127+240	127+280	40	RIGHT	40
127+280	127+330	50	BOTH	100
127+330	127+400	70	BOTH	140
127+400	127+440	40	BOTH	80
127+440	127+464	24	RIGHT	24
127+540	127+570	30	RIGHT	30

Roadside PCC Drainage List				
Design Chainage		Design Length (m)	Side	Roadside Drain Length (m)
From	To			
127+570	127+610	40	BOTH	80
127+610	127+680	70	BOTH	140
127+680	127+710	30	RIGHT	30
127+710	127+750	40	BOTH	80
127+750	127+900	150	RIGHT	150
127+900	127+930	30	BOTH	60
127+930	127+970	40	BOTH	80
127+970	128+040	70	BOTH	140
128+040	128+070	30	RIGHT	30
138+518	138+640	122	Both	244
138+740	138+775	35	RIGHT	35
138+865	138+930	65	Both	130
140+360	140+550	190	Both	380
140+650	140+780	130	RIGHT	130
140+780	140+960	180	Both	360
140+960	141+000	40	Both	80
141+000	141+120	120	Both	240
141+240	141+290	50	RIGHT	50
141+290	141+460	170	Both	340
141+460	141+490	30	RIGHT	30
141+490	141+590	100	RIGHT	100
141+650	141+710	60	RIGHT	60
141+710	142+010	300	Both	600
142+100	142+170	70	RIGHT	70
142+170	142+220	50	RIGHT	50
142+410	142+490	80	Both	160
142+490	142+580	90	RIGHT	90
142+730	142+770	40	RIGHT	40
142+770	142+960	190	Both	380
142+960	142+975	15	RIGHT	15
142+995	143+190	195	Both	390
143+320	143+500	180	RIGHT	180
143+530	143+570	40	RIGHT	40
143+570	143+750	180	Both	360
143+750	143+810	60	RIGHT	60
143+810	143+960	150	Both	300
144+050	144+100	50	RIGHT	50
144+560	144+610	50	Both	100
144+730	144+780	50	Both	100
144+780	144+870	90	Both	180
144+870	144+930	60	Both	120
145+020	145+070	50	Both	100
145+330	145+450	120	RIGHT	120
145+450	145+490	40	RIGHT	40
145+490	145+540	50	Both	100
145+540	145+580	40	RIGHT	40

Roadside PCC Drainage List				
Design Chainage		Design Length (m)	Side	Roadside Drain Length (m)
From	To			
145+660	145+720	60	Both	120
146+290	146+520	230	RIGHT	230
146+520	146+570	50	Both	100
146+570	146+603	33	RIGHT	33
146+613	146+680	67	RIGHT	67
146+680	146+750	70	RIGHT	70
146+750	146+890	140	Both	280
146+890	147+200	310	RIGHT	310
147+200	147+270	70	RIGHT	70
147+370	147+490	120	RIGHT	120
148+700	148+870	170	RIGHT	170
148+870	148+920	50	RIGHT	50
148+920	148+960	40	RIGHT	40
148+960	149+010	50	RIGHT	50
149+010	149+080	70	RIGHT	70
149+110	149+678	568	RIGHT	568.034
Total Roadside PCC Drainage Length				26189.5

- **Location of PCC Catch Drain**

Design Chainage		Design Length (m)	Side	PCC Catch Drain Length (m)
From	To			
111+067	111+150	83	RIGHT	83
111+500	111+540	40	RIGHT	40
111+540	111+660	120	RIGHT	240
111+660	111+700	40	BOTH	160
111+700	111+730	30	RIGHT	60
111+730	111+770	40	BOTH	160
111+770	111+800	30	RIGHT	30
111+850	112+010	160	RIGHT	160
112+010	112+050	40	BOTH	160
112+050	112+080	30	RIGHT	60
112+080	112+110	30	RIGHT	30
112+110	112+130	20	RIGHT	40
112+130	112+330	200	RIGHT	200
112+330	112+400	70	RIGHT	140
112+400	112+490	90	RIGHT	90
112+490	112+510	20	RIGHT	40
112+510	112+530	20	RIGHT	20
112+530	112+560	30	RIGHT	60
112+560	112+600	40	RIGHT	40
112+600	112+635	35	RIGHT	35
112+715	112+740	25	RIGHT	25
112+740	112+870	130	RIGHT	260
112+870	112+900	30	RIGHT	30
112+900	112+930	30	RIGHT	60
112+930	112+960	30	RIGHT	30

Design Chainage		Design Length	Side	PCC Catch Drain Length (m)
From	To	(m)		
112+960	113+000	40	RIGHT	40
113+060	113+110	50	BOTH	200
113+110	113+190	80	RIGHT	80
113+190	113+240	50	RIGHT	100
113+240	113+280	40	BOTH	160
113+280	113+310	30	BOTH	60
113+310	113+340	30	RIGHT	60
113+340	113+370	30	BOTH	60
113+370	113+390	20	RIGHT	20
113+390	113+450	60	RIGHT	60
113+450	113+470	20	RIGHT	0
113+470	113+510	40	RIGHT	40
113+510	113+540	30	RIGHT	30
113+540	113+560	20	RIGHT	40
113+560	113+620	60	RIGHT	60
113+620	113+640	20	RIGHT	40
113+640	113+680	40	RIGHT	40
113+740	113+890	150	RIGHT	150
114+410	114+810	400	RIGHT	400
114+810	114+860	50	BOTH	100
114+860	115+070	210	RIGHT	210
115+070	115+130	60	RIGHT	120
115+130	115+570	440	RIGHT	440
115+780	115+860	80	RIGHT	80
115+950	116+070	120	RIGHT	120
116+070	116+120	50	RIGHT	100
116+120	116+175	55	BOTH	110
116+205	116+280	75	BOTH	150
116+280	116+450	170	BOTH	680
116+450	116+630	180	BOTH	360
116+630	116+880	250	RIGHT	250
116+880	116+920	40	RIGHT	80
116+920	116+955	35	RIGHT	35
117+030	117+080	50	BOTH	100
117+220	117+270	50	BOTH	100
117+270	117+500	230	BOTH	920
117+500	117+530	30	BOTH	60
117+530	118+075	545	RIGHT	545
118+400	118+430	30	BOTH	60
118+430	118+490	60	BOTH	240
118+490	118+520	30	BOTH	60
118+520	118+660	140	RIGHT	140
118+660	118+690	30	BOTH	120
118+690	118+730	40	BOTH	80
118+730	118+790	60	RIGHT	60
118+790	118+840	50	BOTH	100
118+840	119+040	200	RIGHT	200

Design Chainage		Design Length	Side	PCC Catch Drain Length (m)
From	To	(m)		
119+040	119+150	110	BOTH	220
119+150	119+230	80	BOTH	320
119+230	119+290	60	BOTH	120
119+340	119+450	110	BOTH	220
119+450	119+570	120	RIGHT	120
119+570	119+630	60	BOTH	240
119+630	119+640	10	RIGHT	10
119+640	119+690	50	RIGHT	50
119+690	120+090	400	RIGHT	400
120+090	120+120	30	RIGHT	60
120+120	120+170	50	RIGHT	50
120+170	120+310	140	BOTH	560
120+310	120+400	90	RIGHT	90
120+420	120+470	50	RIGHT	50
120+470	120+530	60	RIGHT	60
120+600	120+770	170	RIGHT	170
120+770	120+810	40	RIGHT	80
120+810	120+915	105	RIGHT	105
121+370	121+560	190	RIGHT	190
121+560	121+710	150	BOTH	300
121+740	122+030	290	BOTH	580
122+130	122+160	30	BOTH	60
122+160	122+270	110	RIGHT	110
122+310	122+670	360	BOTH	720
122+670	122+780	110	BOTH	440
122+780	122+840	60	BOTH	120
123+090	123+110	20	BOTH	40
123+110	123+230	120	BOTH	480
123+230	123+310	80	RIGHT	80
123+410	123+490	80	RIGHT	80
123+840	123+910	70	RIGHT	70
123+910	124+060	150	BOTH	300
124+060	124+120	60	RIGHT	60
124+180	124+290	110	RIGHT	110
124+350	124+770	420	BOTH	840
124+770	124+825	55	RIGHT	55
125+100	125+150	50	BOTH	100
125+150	125+350	200	BOTH	800
125+350	125+380	30	BOTH	60
125+380	125+460	80	RIGHT	80
125+460	125+500	40	RIGHT	40
125+820	126+030	210	BOTH	420
126+030	126+090	60	BOTH	240
126+090	126+195	105	BOTH	210
126+245	126+270	25	BOTH	50
126+420	126+610	190	RIGHT	190
126+610	126+770	160	RIGHT	320

Design Chainage		Design Length	Side	PCC Catch Drain Length (m)
From	To	(m)		
126+770	126+910	140	RIGHT	140
126+910	126+950	40	BOTH	160
126+950	127+040	90	RIGHT	90
127+110	127+150	40	BOTH	80
127+150	127+240	90	BOTH	360
127+240	127+280	40	RIGHT	40
127+280	127+330	50	BOTH	100
127+330	127+400	70	BOTH	280
127+400	127+440	40	BOTH	80
127+440	127+464	24	RIGHT	24
127+540	127+570	30	RIGHT	30
127+570	127+610	40	BOTH	80
127+610	127+680	70	BOTH	280
127+680	127+710	30	RIGHT	30
127+710	127+750	40	BOTH	160
127+750	127+900	150	RIGHT	150
127+900	127+930	30	BOTH	60
127+930	127+970	40	BOTH	160
127+970	128+040	70	BOTH	140
128+040	128+070	30	RIGHT	30
138+518	138+640	122	BOTH	244
138+740	138+775	35	RIGHT	35
138+865	138+930	65	BOTH	130
140+360	140+550	190	BOTH	380
140+650	140+780	130	RIGHT	130
140+780	140+960	180	BOTH	360
141+000	141+120	120	BOTH	240
141+240	141+290	50	RIGHT	50
141+290	141+460	170	BOTH	340
141+490	141+590	100	RIGHT	100
141+650	141+710	60	RIGHT	60
141+710	142+010	300	BOTH	600
142+170	142+220	50	RIGHT	50
142+730	142+770	40	RIGHT	40
142+770	142+960	190	BOTH	380
142+960	142+975	15	RIGHT	15
142+995	143+190	195	BOTH	390
143+320	143+500	180	RIGHT	180
143+530	143+570	40	RIGHT	40
143+570	143+750	180	BOTH	360
143+750	143+810	60	RIGHT	60
143+810	143+960	150	BOTH	300
144+780	144+870	90	BOTH	180
145+330	145+450	120	RIGHT	120
145+540	145+580	40	RIGHT	40
146+290	146+520	230	RIGHT	230
146+520	146+570	50	BOTH	100

Design Chainage		Design Length	Side	PCC Catch Drain Length (m)
From	To	(m)		
146+570	146+603	33	RIGHT	33
146+613	146+680	67	RIGHT	67
146+750	146+890	140	BOTH	280
148+870	148+920	50	RIGHT	50
148+960	149+010	50	RIGHT	50
149+110	149+678	568.034	RIGHT	568
Total Roadside PCC Catch Drain Length				28259

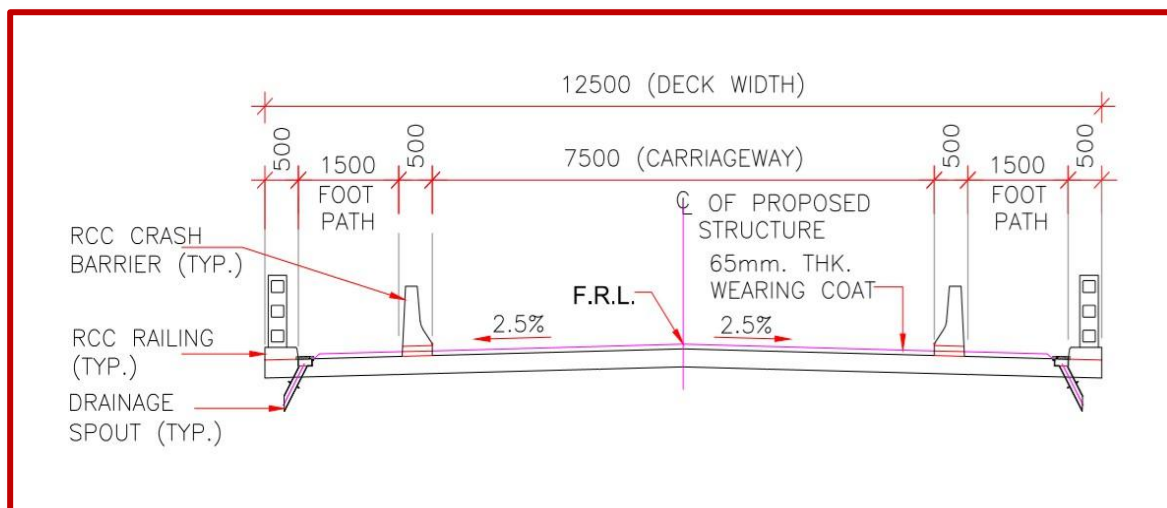
8. Design of Structures

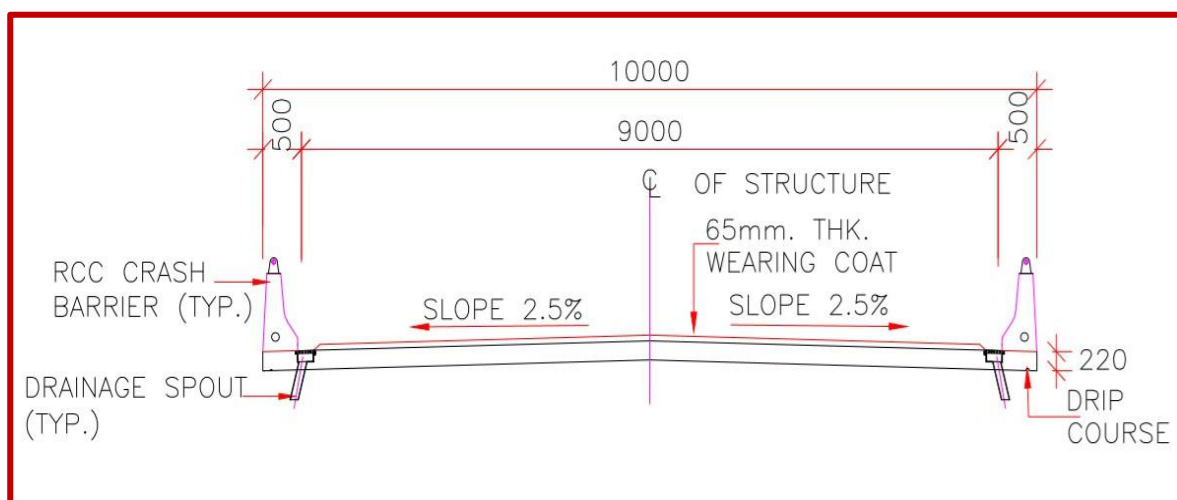
(i) General

(a) All bridges, culverts and structures shall be designed and constructed in accordance with the provision of relevant Manual and shall conform to the cross- sectional features and other details specified therein.

(b) Width of the carriageway of new bridges and structures shall be as follows:

Sl. No.	Structure/ Bridge at km	Width of carriageway and cross-sectional features*
1	111+315, 112+675, 113+710, 114+275, 115+910, 116+190, 116+975, 118+225, 121+095, 121+723, 123+000, 124+945, 126+220, 127+494, 138+795, 139+660, 140+600, 142+985, 146+608 and 148+600	Width of Carriageway – 7.5 m including KS Foot Path – 1.5 m (both sides) Crash Barrier – 0.5m (both sides) RCC Railing – 0.5 m (both sides) Total Width – 12.5m
2	128+100 and 138+700	Width of Carriageway –9.0m including KS Crash Barrier – 0.5m (both sides) Total Width – 10.0m





(c) The following structures shall be provided with footpaths:

Sl. No.	Location at km	Remarks
Nil		

(d) All bridges shall be high-level bridges.

Refer to the provision of relevant Manual and state if there is any exception

(e) 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
1	111+315	Electricity cables, OFC cables etc.	Remarks
2	112+675	Electricity cables, OFC cables etc.	2 Lane bridge
3	113+710	Electricity cables, OFC cables etc.	2 Lane bridge
4	114+275	Electricity cables, OFC cables etc.	2 Lane bridge
5	115+910	Electricity cables, OFC cables etc.	2 Lane bridge
6	116+190	Electricity cables, OFC cables etc.	2 Lane bridge
7	116+975	Electricity cables, OFC cables etc.	2 Lane bridge
8	118+225	Electricity cables, OFC cables etc.	2 Lane bridge
9	121+095	Electricity cables, OFC cables etc.	2 Lane bridge
10	121+723	Electricity cables, OFC cables etc.	2 Lane bridge
11	123+000	Electricity cables, OFC cables etc.	2 Lane bridge
12	124+945	Electricity cables, OFC cables etc.	2 Lane bridge
13	126+220	Electricity cables, OFC cables etc.	2 Lane bridge
14	127+494	Electricity cables, OFC cables etc.	2 Lane Bridge
15	128+100	Electricity cables, OFC cables etc.	2 Lane Bridge
16	138+700	Electricity cables, OFC cables etc.	2 Lane bridge on both LHS and RHS
17	138+795	Electricity cables, OFC cables etc.	2 Lane bridge on both LHS and RHS
18	139+660	Electricity cables, OFC cables etc.	LHS
19	140+600	Electricity cables, OFC cables etc.	2 Lane bridge
20	142+985	Electricity cables, OFC cables etc.	2 Lane Bridge
21	146+608	Electricity cables, OFC cables etc.	2 Lane bridge
22	148+600	Electricity cables, OFC cables etc.	2 Lane bridge

(f) Cross-section of the new culverts and bridges at deck level for the Project Highway shall conform to the typical cross-sections given in the provision of relevant Manual.

(ii) Culverts

(a) Overall width of all culverts shall be equal to the roadway width of the approaches.

(b) Reconstruction of existing culverts:

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

Sr. No.	Proposed Chainage	Span	Structure type	Remark
1	112+096	2X2	Box culvert	Re-const.
2	112+237	2X2	Box culvert	Re-const.
3	113+137	2X2	Box culvert	Re-const.
4	114+080	3X3	Box culvert	Re-const.
5	116+498	3X3	Box culvert	Re-const.
6	116+558	1X2X2	Box culvert	Re-const.
7	117+020	1X3X3	Box culvert	Re-const.
8	117+665	1X3X3	Box culvert	Re-const.
9	117+810	1X3X3	Box culvert	Re-const.
10	118+520	1X3X3	Box culvert	Re-const.
11	118+855	1X2X2	Box culvert	Re-const.
12	119+030	1X2X4	Box culvert	Re-const.
13	121+885	1X2X2	Box culvert	Re-const.
14	124+197	1X2X2	Box culvert	Re-const.
15	127+255	1X6X6	Box culvert	Re-const.
16	127+598	1X3X3	Box culvert	Re-const.
17	127+836	1X3X3	Box culvert	Re-const.
18	144+046	1X2X2	Box culvert	Re-const.
19	144+126	1X2X2	Box culvert	Re-const.
20	144+225	1X2X2	Box culvert	Re-const.
21	145+172	1X3X3	Box culvert	Re-const.
22	145+200	1X3X3	Box culvert	Re-const.
23	145+498	1X3X2	Box culvert	Re-const.
24	145+589	1X2X2	Box culvert	Re-const.
25	145+691	1X3X2	Box culvert	Re-const.
26	146+053	1X3X3	Box culvert	Re-const.
27	146+199	1X2X2	Box culvert	Re-const.
28	146+257	1X3X3	Box culvert	Re-const.
29	146+376	1X3X3	Box culvert	Re-const.
30	146+641	1X2X2	Box culvert	Re-const.
31	147+018	1X2X2	Box culvert	Re-const.

(c) 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 the provision of relevant Manual. Repairs and strengthening of existing structures where required shall be carried out.

Sl. No.	Culvert location	Type, span, height and width of existing culvert (m)	Repairs to be carried out [specify]
Nil			

(d) Additional new culverts shall be constructed as per given in the table below:

Sr. No.	Proposed Chainage	Span	Structure type	Remark
1	111+102	2X2	Box culvert	New-const.
2	111+820	3X3	Box culvert	New-const.
3	111+985	3X3	Box culvert	New-const.
4	112+485	3X3	Box culvert	New-const.
5	112+590	3X3	Box culvert	New-const.
6	113+530	3X3	Box culvert	New-const.
7	114+700	3X3	Box culvert	New-const.
8	115+035	2X2	Box culvert	New-const.
9	115+635	3X3	Box culvert	New-const.
10	115+730	3X3	Box culvert	New-const.

Sr. No.	Proposed Chainage	Span	Structure type	Remark
11	117+545	3X3	Box culvert	New-const.
12	119+320	3X3	Box culvert	New-const.
13	119+652	3X3	Box culvert	New-const.
14	120+060	3X3	Box culvert	New-const.
15	120+142	3X3	Box culvert	New-const.
16	120+342	2X4	Box culvert	New-const.
17	122+270	2X2	Box culvert	New-const.
18	123+580	3X3	Box culvert	New-const.
19	123+730	2X2	Box culvert	New-const.
20	124+095	3X3	Box culvert	New-const.
21	125+445	3X3	Box culvert	New-const.
22	125+615	3X3	Box culvert	New-const.
23	125+958	2X2	Box culvert	New-const.
24	126+154	2X2	Box culvert	New-const.
25	126+840	2X2	Box culvert	New-const.
26	126+975	3X3	Box culvert	New-const.
27	127+685	2X2	Box culvert	New-const.
28	140+686	2X2	Box culvert	New-const.
29	140+980	2X2	Box culvert	New-const.
30	141+148	3X3	Box culvert	New-const.
31	141+228	3X3	Box culvert	New-const.
32	141+418	2X2	Box culvert	New-const.
33	141+633	2X4	Box culvert	New-const.
34	142+055	2X2	Box culvert	New-const.
35	142+183	2X2	Box culvert	New-const.
36	142+339	2X2	Box culvert	New-const.
37	142+543	2X2	Box culvert	New-const.
38	142+629	2X2	Box culvert	New-const.
39	142+704	3X3	Box culvert	New-const.
40	142+927	2X2	Box culvert	New-const.
41	143+212	3X3	Box culvert	New-const.
42	143+320	2X2	Box culvert	New-const.
43	143+504	3X3	Box culvert	New-const.
44	143+849	2X2	Box culvert	New-const.
45	143+974	2X2	Box culvert	New-const.
46	144+263	2X2	Box culvert	New-const.
47	144+414	2X2	Box culvert	New-const.
48	144+533	2X2	Box culvert	New-const.
49	144+608	2X2	Box culvert	New-const.
50	144+729	2X2	Box culvert	New-const.
51	144+974	2X2	Box culvert	New-const.
52	145+302	2X2	Box culvert	New-const.
53	145+418	2X2	Box culvert	New-const.
54	145+643	2X2	Box culvert	New-const.
55	145+777	2X2	Box culvert	New-const.
56	145+852	2X2	Box culvert	New-const.
57	146+718	2X2	Box culvert	New-const.
58	147+126	2X2	Box culvert	New-const.
59	147+247	2X2	Box culvert	New-const.
60	147+311	2X2	Box culvert	New-const.
61	147+437	2X2	Box culvert	New-const.
62	147+522	2X2	Box culvert	New-const.
63	147+591	2X2	Box culvert	New-const.
64	147+937	2X2	Box culvert	New-const.
65	147+976	2X2	Box culvert	New-const.

Sr. No.	Proposed Chainage	Span	Structure type	Remark
66	148+166	2X2	Box culvert	New-const.
67	148+312	2X2	Box culvert	New-const.
68	148+890	3X3	Box culvert	New-const.
69	149+108	6X3	Box culvert	New-const.
70	149+273	3X3	Box culvert	New-const.
71	149+437	3X3	Box culvert	New-const.
72	149+530	3X3	Box culvert	New-const.
73	149+583	2X2	Box culvert	New-const.

Note: The chainages are indicative and culverts to be provided as per the site requirement with the approval of the Authority's Engineer

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

S. No.	Location at km	Type of repair required
Nil		

- (f) Floor protection works shall be as specified in the relevant IRC Codes and Specifications.

(iii) **Bridges**

- (a) Existing bridges to be re- constructed/widened.

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

Sl. No.	Bridge location (km)	Salient details of existing bridge	Adequacy or otherwise of the existing waterway, vertical clearance, etc.*	Remarks
Nil				

*Attach GAD

- (ii) The following narrow bridges shall be widened:

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

@ Attach cross-section

- (b) Additional new bridges

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

Type of Structure	Design Chainage in km	Total Length (M)
Viaduct cum Bridge	111+315	300
Viaduct cum Bridge	112+675	80
Major Bridge	113+710	60
Viaduct	114+275	250
Minor bridge	115+910	30
Minor bridge	116+190	30
Minor bridge	116+975	40
Viaduct	118+225	300
Viaduct	121+095	360
Minor bridge	121+723	10
Viaduct	123+000	160
Viaduct	124+945	240
Minor Bridge	126+220	50

Type of Structure	Design Chainage in km	Total Length (M)
Viaduct (new)	127+494	60
Minor Bridge	128+100	40
Major bridge	138+700	80
Viaduct	139+660	1345
Viaduct	140+600	100
Minor bridge	142+985	20
Minor bridge	146+608	10
Viaduct cum Bridge	148+600	80

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

Sl. No.	Location at km	Remarks
Nil		

(d) Repairs/replacements of railing/parapets of the existing bridges shall be undertaken as follows:

Sl. No.	Location at km	Remarks
Nil		

(e) Drainage system for bridge decks

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

(f) Structures in marine environment

Refer to the provision of relevant Manual and specify the necessary measures/treatments for protecting structures in marine environment, where applicable.

(iv) Rail-road bridges

(a) Design, construction and detailing of ROB/RUB shall be as specified in the provision of relevant Manual.

(b) Road over-bridges

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

Sl. No.	Location of Level crossing (Chainage km)	Length of bridge (m)
Nil		

(c) Road under-bridges

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

Sl. No.	Location of Level crossing (Chainage km)	Number and length of span (m)
Nil		

(v) Grade separated structures

The grade separated structures shall be provided at the locations and of the type and length specified in paragraphs 2 (ix) and 3 of this Annex-I.

(vi) 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
Nil		

(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		

(vii) List of Major Bridges and Structures

The following is the list of the Major/Minor Bridges and Structures:

Sl. No.	Description	Location at km	Remarks
1	Viaduct cum Bridge	111+315	2 Lane bridge
2	Viaduct cum Bridge	112+675	2 Lane bridge
3	Major Bridge	113+710	2 Lane bridge
4	Viaduct	114+275	2 Lane bridge
5	Minor bridge	115+910	2 Lane bridge
6	Minor bridge	116+190	2 Lane bridge
7	Minor bridge	116+975	2 Lane bridge
8	Viaduct	118+225	2 Lane bridge
9	Viaduct	121+095	2 Lane bridge
10	Minor bridge	121+723	2 Lane bridge
11	Viaduct	123+000	2 Lane bridge
12	Viaduct	124+945	2 Lane bridge
13	Minor Bridge	126+220	2 Lane Bridge
14	Viaduct (new)	127+494	2 Lane Bridge
15	Minor Bridge	128+100	2 Lane bridge on both LHS and RHS
16	Major bridge	138+700	2 Lane bridge on both LHS and RHS
17	Viaduct	139+660	2 Lane bridge
18	Viaduct	140+600	2 Lane Bridge
19	Minor bridge	142+985	2 Lane bridge
20	Minor bridge	146+608	2 Lane bridge
21	Viaduct cum Bridge	148+600	2 Lane bridge

9. Design of Tunnel

(i) General

(a) Tunnel shall be designed and constructed in accordance with the provision of relevant Indian/International standards and shall conform to the cross- sectional features and other details specified therein.

(b) Width of the carriageway of tunnel shall be as follows:

Tunnel No.	Tunnel Chainage from to in km	Rock Classes wise length		Width of carriageway
		Length (in m)	Class	
Tunnel-1 (Tube-1)	Km 128+155 to Km 138+486	1602	ESC 1	9 m
		378	ESC 3b	
		463	ESC 4v	
		100	ESC 5	
		4165	ESC 10	
		3623	ESC 11	
Tunnel-1 (Tube-2)	Km 128+155 to Km 138+518	1602	ESC 1	9 m
		378	ESC 3	
		495	ESC 4	
		100	ESC 5	

Tunnel No.	Tunnel Chainage from to in km	Rock Classes wise length		Width of carriageway
		Length (in m)	Class	
		4165	ESC 10	
		3623	ESC 11	

Note: - ESC-1, ESC-3, ESC-4, ESC-5, ESC-10 & ESC-11 classified as under: -

Rock Class	Classification	Recommended Rock Support	Excavation
Good to very good	ESC-1, ESC 10& ESC-11	Tunnel is self-standing with minimum support requirements of 180 (ESC-10)-150mm shotcrete and spot bolting 5m-6m long. Final lining thickness of 400-660 mm.	Heading /Benching (3.5-3.0m/6.0m)
Fair	ESC-3	Systematic Rock Bolt – 6.0 m with spacing – 2.0 m and steel fiber shotcrete – 200mm. Final lining thickness of 400-660 mm	Heading/ Benching (2.5m/5.0m)
Poor to very poor	ESC-4 & ESC-5	Systematic Rock Bolt – 8.0m-12.0m with spacing – 0.8-1.25 m with steel fiber Shotcrete of 320-380 mm thickness. Steel Rib- TH 29/TH36 or equivalent, @ 0.8m -1.25 c/c spacing. Pipe roofing-forepoling 6.0m long @88.9 of dia. Final lining thickness of 500-760 mm	Heading/ Benching (0.8m-1.8m/1.6m-3.5m)

(c) The following tunnel shall be provided with footpaths:

Sl. No.	Location at km	Remarks
1	Tunnel –Km 128+155 to km 138+486/ Km 138+518 (Tube 1/ Tube 2)	Tube 1 & Tube 2

(d) Cross-section of the tunnel in the Project Highway shall conform to the typical cross-sections provided in schedule.

(iv) Tunnels

a. Rehabilitation of existing Tunnels

S. No.	Location	Start Chainage (km)	End Chainage (km.)	Length (m)	Proposed Rehabilitation
Nil					

b. Proposed Tunnels on the Project Road Section

S. No.	Location	Start Design Chainage (Ch.)	End Design Chainage (Ch.)	Length of Tunnel (m)	Carriageway width including Footpath & Walkway (m)	Remarks
1	LHS Carriageway	128+155	138+486	10331	2x9.00	New 2-lane Twin tube Tunnel
	RHS Carriageway	128+155	138+518	10363		

Note: i. The tunnel mentioned at s.no.1 shall be uni-directional twin tube (2X2-lane) configuration, tunnel as per the chainages mentioned in the above table.

Lighting system-

The lighting system shall be calculated regarding the Guide for Lighting Road Tunnels and Underpasses CIE 88/2004. Also, the Guidelines for Road Tunnels IRC: SP:91-2019 will be taken into account.

The time that a motorist needs to get adapted to the tunnel lighting environment is generally considered as about 4 seconds. In the case of the Vailoo tunnel, although the speed limit will be lower, considering –for

security reasons- a speed of 80 kmph, the length travelled in 4 seconds would be about 89 m. Nevertheless, considering the CIE 88/2004, the distance that is used as a reference to divide the zones is the stopping distance, which is different in each tube, since it depends on the slope among other factors.

It has been decided to follow the CIE 88/2004 as it is the most recognized standard worldwide in relation to tunnel lighting design, and regarding the security aspect, it shows just slightly more restrictive values than the IRC for the tunnel entrance area.

Tube	CIE 88/2004	IRC: SP:91-2019
	Stopping Distance in the entrances (m)	Zones Length (m)
Tube 1	98	89
Tube 2	98	89

It must be taken into account that, although the speed limit in the tunnel is 50 kmph, for the tunnel lighting design, a higher speed shall be used (80 kmph) in order to minimize the risk in the case of some vehicles exceeding the speed limit. This decision can be considered safe, as the layout of the road is favorable.

The characteristics of each one of the zones are described below:

- Access Road Sections: The access sections of the different tubes shall start 200 m before the portals and will finish in the portals.
- Threshold Zone: This zone shall have a different length in each tunnel as it is shown in the following table:

Tube	Length (m)
Tube 1	98
Tube 2	98

The threshold zone of each tube should be divided into two different parts, so that there are two jumps between the luminance of the access zone and the luminance of the transition zone.

- Transition Zone: This zone is similar in the two tubes that are being studied. Each zone will be divided into four parts. In this way, the luminance will vary from 45 cd/m² to 8 cd/m² progressively.
- Interior zone: The interior zone of each tube shall be composed by two parts. The first one shall serve as an intermediate jump between the last part of the transition zone and the interior zone that shall cover most of the tube.

In this zone, the IRC recommends using a luminance between 15 and 20 cd/sq.m. However, as the IRC indicates values for the luminance in the interior zone that are significantly higher than the usual designs and that overcome what the main international recommendations indicate, in order to obtain a better energy efficiency, the criterion established by the CIE for the interior zone should be considered. Nevertheless, the CIE criterion should be slightly upgraded considering a higher-class road. The considered luminance for the interior zone is 3 cd/m²

- Exit zone: According to the CIE 88/2004, it is important to have a zone in the tunnel that allows the adaptation of the driver to the exterior light. In this manner, the exit zone length of each tube shall depend on the stopping distance in the exit part.

Ventilation system-

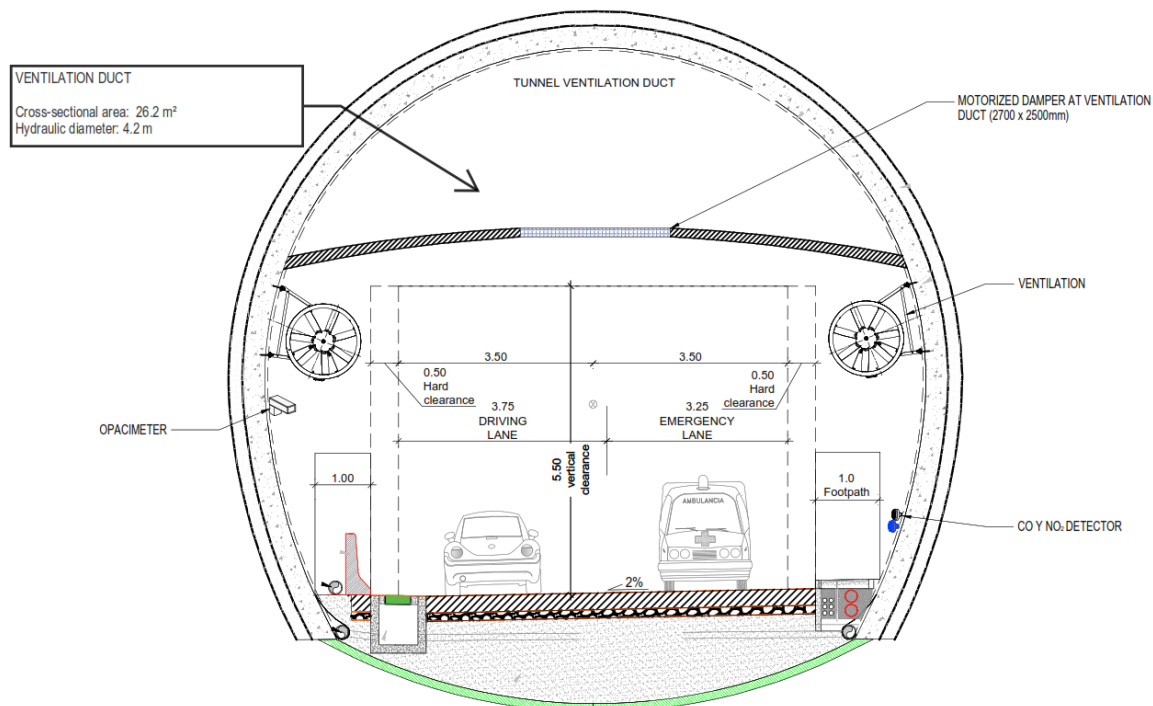
A semi-transverse ventilation system shall be proposed for Vailoo Tunnel.

The design of the ventilation system shall be performed according to two different criteria:

- Pollutants concentration below threshold limits for sanitary ventilation
- Critical velocity (V_c) achieved for emergency ventilation

Ventilation system has been designed for the following conditions:

- 50 MW fire (equivalent to HGV fire)
- Each ventilation station at the tunnel portals shall have three reversible axial fans for each tube, able to supply fresh air and extract polluted air or smoke, depending on the needs. All axial fans shall be fire-rated 2h at 400°C and will have shut-off motorized dampers.
- The configuration of each set of fans, will be 2+1, meaning two of them operating at 100% flow rate shall provide the design flow rate, while a third shall remain on standby to cover the event of a failure or maintenance of one of the fans. The system shall automatically balance the operating hours and the number of starts for each fan.
- The fans shall be powered by variable frequency drives, which shall allow the operating speed of each fan to be adjusted continuously based on demand.
- Silencers shall be installed on both sides of the fan sections to minimize noise, both inside and outside the tunnel, to improve PA system audibility in case of emergency (interior-tunnel side) and to minimize environmental impacts (exterior side).
- The connection between the ventilation duct and the main tunnels shall be done through motorized dampers distributed along the tunnels, to allow selective supply or exhaust in every tunnel section, depending on the needs in every moment. This system shall also help to control longitudinal flows along the tunnel that could be not desirable in case of fire
- The air duct shall be located at the top of the section, where smoke shall tend to accumulate in the event of a fire. The motorized dampers shall be arranged horizontally. The estimated configuration can be seen in the following figure:.



The installation of a series of jet fans shall be required to withstand external atmospheric conditions.

An optimal number of 12 pairs of jet-fans in each tube has been determined, considering the use of 11 of them and an additional pair that would be considered in a state of maintenance or unavailable.

The characteristics of the fans proposed are including in the following tables:

AXIAL FAN				
Inner diameter (mm)	Motor nominal power (kW)	Flow (m³/s)	Pressure (Pa)	Resistance
2600	400	135	2000	400°C / 2 hours

JET FANS STAINLESS STEEL BLADES AND HUB - 50 Hz REVERSIBLE 100%						
Inner diameter (mm)	Shaft power (kW)	Motor nominal power (kW)	Thrust (N)	Flow (m³/s)	Air speed (m/s)	Resistance
1200	54.5	55	1791	42.2	37.3	400°C / 2 hours

Smoke Detection & Firefighting system-

A linear fire detection system shall be installed in both tunnels, being able to detect a fire source, its magnitude and evolution. The alarm signal can occur for one of the following reasons:

- *Exceeding a pre-set temperature.*
- *Fast increase in temperature.*
- *Exceeding the average tunnel temperature by 15°C (adjustable).*

It shall be planned to install a conventional fire detection system by means of thermal and thermovelocimetric detectors. In addition, fire buttons and alarms shall be added in order to increase security in case of fire.

Moreover, in the technical rooms located inside the tunnels, there shall be an automatic fire-fighting system by inert gas. This system shall be designed on account the risk that could cause to the circulation a fire in an interior technical room.

A Fixed Water-Based Fire-Fighting System shall be installed in Vailoo main tunnels, in order to allow the control of an eventual fire of a power release up to 50 MW.

The designed system shall be fed from two fire water plants located at both sides of the tunnel, with their corresponding pumping groups. Due to the high difference in height between both tunnel exits, the pressures in the system demand two pumping stations for this FFFS, while only one is necessary for the hydrants' system.

All along the tunnels, a water main buried pipe shall connect the pumping station with any of the deluge zones.

A high pressure PVC pipe shall be installed under the right sidewalk in the driving direction of the road, with transverse connections between both tunnel tubes, providing a "ring" configuration with several bypasses. This pipe shall connect the tunnel with the Fire Pumping Station. The underground main pipe shall have a

diameter of 8" in the increasing slope and a diameter of 6" in the decreasing slope, whereas the diameter of the derivation to the fire hydrants shall be 4" and the derivations to the hose connections shall be 2 ½". All the piping shall be made of high pressure PVC but the pipes and manifolds of the Fire Pumping Station which shall be of black steel.

There shall be fire hydrants of 4" diameter installed every 250 meters. Each hydrant shall be equipped with 2 connection types, one of 2 x 2 ½" and the second of 4".

There shall be hose connections of 2 ½" every 83.33 meters between fire hydrants.

The Fire Pumping Station shall supply the water to the hydrants in order to be able to provide water for 1 hour with a flow of 946 l/min in 2 hydrants simultaneously. For fulfilling this requirement, the reservoir shall have a capacity of 120 m³. This tank shall be divided into two symmetric volumes in order to enable maintenance operations and availability of 50 % of the capacity in any circumstance. The firefighting system shall be complemented by hand – operated fire extinguishers installed in a cabinet every 83,33 meters in the right side along the tunnel, in combination with the hose connections, hydrants or emergency station, depending on the position.

Each egress passageway shall have an emergency station composed by two fire extinguishers. All the fire extinguishers shall be type ABC dry powder extinguisher of 13 lb (6 kg).

The control units shall be distributed in the different technical rooms, inside and outside the tunnels, and they shall be able to control the condition of the tunnel.

The fire hydrants shall be installed at the entrance of the tunnels and every 250 meters in the right side along the tunnel, where the emergency lane and the cross - passages are located. Furthermore, the hand – operated fire extinguishers shall be mounted every 83.33 meters and the hose connections shall be fixed every 83, 33 meters between hydrants.

The tunnel cross section shall be as per TCS enclosed in Schedule B.

c. Details of Cross Passages for Tunnels as below:

S. No.	Design Chainage	Width of Cross Passage(m)	Length of Cross Passage(m)
1	128+500	6.1 m	18.5 m
2	129+000	6.1 m	18.5 m
3	129+500	6.1 m	18.5 m
4	130+000	6.1 m	18.5 m
5	130+500	6.1 m	18.5 m
6	131+000	6.1 m	18.5 m
7	131+500	6.1 m	18.5 m
8	132+000	6.1 m	18.5 m
9	132+500	6.1 m	18.5 m
10	133+000	6.1 m	18.5 m
11	133+500	6.1 m	18.5 m

S. No.	Design Chainage	Width of Cross Passage(m)	Length of Cross Passage(m)
12	134+000	6.1 m	18.5 m
13	134+500	6.1 m	18.5 m
14	135+000	6.1 m	18.5 m
15	135+500	6.1 m	18.5 m
16	136+000	6.1 m	18.5 m
17	136+500	6.1 m	18.5 m
18	137+000	6.1 m	18.5 m
19	137+500	6.1 m	18.5 m
20	138+000	6.1 m	18.5 m

The proposed twin tube tunnel shall be connected by cross passage at an inclination of 90° at center to facilitate pedestrian/ traffic diversion in the event of any emergency at every 500 m spacing (tentative Chainages are given in table above). The cross-section for cross- passage shall be as enclosed in Schedule-B. Other tunnel ancillary works including drainage, water proofing, ventilation, tunnel illumination including electrical sub-station on both sides' portals, furnishing, signage's, emergency facilities, etc. shall be provided as specified in IRC: SP:84- 2019, IRC: SP:91-2019 and specification as per **Schedule-D**. The Longitudinal gradient of the tunnel is less than 3%. Apart from the geological challenges the topography of the stretch is bound with steep mountains with limited access to the faces for excavation this limitation leads to opening the excavation faces only at proposed portals of the tunnels with negligible options of creating adits in long tunnels. Given the limitation in number of faces the most critical activities remain the portal creation and stabilization for starting and achieving significant progress in tunnel drive. For every face of the excavation for portal and tunnel the set of critical machinery involving the hydraulic boomer, shotcrete machine, grouting machine, excavation mucking and dumping machinery shall be maintained dedicated for each face of excavation. The excavation & support installation for portal face and underground excavation opening within stipulated cycle can only be achieved if the excavation, mucking and dumping, support installation, shotcrete, grouting and tunnel formwork set for final lining, Plant, machinery and manpower resources are provided dedicatedly for each face of each tunnel tube. It should be noted that the minimum drifting scheme has to be adopted as per the specifications and drawings but shall be revised (by EPC contractor) based upon the geological findings of the ground and if required the stages shall be increased to achieve the desired excavation stability and hence the provisioning of resources shall be accounted for any such requirements.

d. The details of the distribution of rock- mass conditions on the Basis of Geological strength index are as below:

Vailoo Tunnel- Tube-1								
RD (m)		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Cover
From	To				Values	Description	Rock mass Class	
128+155	128+765	610	Quartzite, Shales, Siltstone, Slate & Conglomerate	Slightly weathered	46-54/1.3-5.3	Fair	III	10-194
128+765	129+003	238	Diamictite, Arenite with Phyllite & Ash Beds	Moderately to Highly weathered	15-35/0.02-0.2	Poor Very Poor	IV-V	194-215
129+003	129+883	880	Diamictite, Arenite with Phyllite & Ash Beds	Slightly weathered	48-57/1.8-6.0	Fair	III	215-505
129+883	129+974	91	Diamictite, Arenite with Phyllite & Ash Beds	Moderately to Highly weathered	15-35/0.02-0.2	Poor Very Poor	IV-V	497-529
129+974	130+898	924	Andesitic & Basaltic Lava Flows	Slightly weathered	48-58/1.8-6.9	Fair	III	529-895
130+898	131+723	825	Andesitic & Basaltic Lava Flows	Fresh	62-68/12.9-33.1	Good	II	686-1023
131+723	132+467	744	Andesitic & Basaltic Lava Flows	Slightly weathered	50-56/2.6-5.1	Fair	III	1023-1347
132+467	132+517	50	Andesitic & Basaltic Lava Flows	Moderately to Highly weathered	15-35/0.014-0.22	Poor	IV-V	1118-1140
132+517	134+871	2354	Andesitic & Basaltic Lava Flows	Fresh	64-72/17.6-62.7	Good	II	1506-725
134+871	135+390	519	Andesitic & Basaltic Lava Flows	Slightly weathered	52-58/2.8-6.9	Fair	III	725-595
135+390	135+410	20	Andesitic & Basaltic Lava Flows	Moderately to Highly	15-35/0.014-0.22	Poor to Very Poor	IV-V	655-651

Vailoo Tunnel- Tube-1									
RD (m)		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q				Cover
From	To				Values	Description	Rock mass Class		
				weathered					
135+410	135+669	259	Andesitic & Basaltic Lava Flows	Fresh to Slightly weathered	62-68/12.9-33.1	Good	II	595-463	
135+669	136+619	950	Andesitic & Basaltic Lava Flows	Slightly weathered to Fresh	52-58/2.8-6.9	Fair	III	463-355	
136+619	136+669	50	Calcareous shales & Crystalline Limestone	Moderately to Highly weathered	15-35/0.014-0.22	Poor to Very Poor	IV-V	355-347	
136+669	137+846	1177	Calcareous shales & Crystalline Limestone	Moderately to Highly weathered	42-48/0.7-1.8	Fair	III	347-238	
137+846	137+896	50	Calcareous shales & Crystalline Limestone	Moderately to Highly weathered	15-35/0.014-0.22	Poor to Very Poor	IV-V	238-210	
137+896	137+988	92	Andesitic & Basaltic Lava Flows	Fresh to Slightly weathered	50-55/2.6-4.4	Fair	III	210-172	
137+988	138+429	441	Andesitic & Basaltic Lava Flows	Fresh to Slightly weathered	61-66/11-24.2	Good	II	172-39	
138+429	138+486	57	Andesitic & Basaltic Lava Flows	Slightly to Moderately weathered	50-55/2.6-4.4	Fair	III	39-25	

Vailoo Tunnel- Tube-2									
RD (m)		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q				Cover
From	To				Values	Description	Rock mass Class		
128+155	128+765	610	Quartzite, Shales, Siltstone, Slate & Conglomerate	Slightly weathered	46-54/1.3-5.3	Fair	III	10-194	
128+765	129+003	238	Diamictite, Arenite with Phyllite & Ash Beds	Moderately to Highly weathered	15-35/0.02-0.2	Poor Very Poor	IV-V	194-215	
129+003	129+883	880	Diamictite, Arenite with Phyllite & Ash Beds	Slightly weathered	48-57/1.8-6.0	Fair	III	215-505	
129+883	129+974	91	Diamictite, Arenite with Phyllite & Ash Beds	Moderately to Highly weathered	15-35/0.02-0.2	Poor Very Poor	IV-V	497-529	
129+974	130+898	924	Andesitic & Basaltic Lava Flows	Slightly weathered	48-58/1.8-6.9	Fair	III	529-895	
130+898	131+723	825	Andesitic & Basaltic Lava Flows	Fresh	62-68/12.9-33.1	Good	II	686-1023	
131+723	132+467	744	Andesitic & Basaltic Lava Flows	Slightly weathered	50-56/2.6-5.1	Fair	III	1023-1347	
132+467	132+517	50	Andesitic & Basaltic Lava Flows	Moderately to Highly weathered	15-35/0.014-0.22	Poor	IV-V	1118-1140	
132+517	134+871	2354	Andesitic & Basaltic Lava Flows	Fresh	64-72/17.6-62.7	Good	II	1506-725	
134+871	135+390	519	Andesitic & Basaltic Lava Flows	Slightly weathered	52-58/2.8-6.9	Fair	III	725-595	
135+390	135+410	20	Andesitic & Basaltic Lava Flows	Moderately to Highly	15-35/0.014-0.22	Poor to Very Poor	IV-V	655-651	

Vailoo Tunnel- Tube-2									
RD (m)		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q				Cover
From	To				Values	Description	Rock mass Class		
135+410	135+669	259	Andesitic & Basaltic Lava Flows	Fresh to Slightly weathered	62-68/12.9-33.1	Good	II	595-463	
135+669	136+619	950	Andesitic & Basaltic Lava Flows	Slightly weathered to Fresh	52-58/2.8-6.9	Fair	III	463-355	
136+619	136+669	50	Calcareous shales & Crystalline Limestone	Moderately to Highly weathered	15-35/0.014-0.22	Poor to Very Poor	IV-V	355-347	
136+669	137+846	1177	Calcareous shales & Crystalline Limestone	Moderately to Highly weathered	42-48/0.7-1.8	Fair	III	347-238	
137+846	137+896	50	Calcareous shales & Crystalline Limestone	Moderately to Highly weathered	15-35/0.014-0.22	Poor to Very Poor	IV-V	238-210	
137+896	137+988	92	Andesitic & Basaltic Lava Flows	Fresh to Slightly weathered	50-55/2.6-4.4	Fair	III	210-172	
137+988	138+429	441	Andesitic & Basaltic Lava Flows	Fresh to Slightly weathered	61-66/11-24.2	Good	II	172-39	
138+429	138+518	89	Andesitic & Basaltic Lava Flows	Slightly to Moderately weathered	50-55/2.6-4.4	Fair	III	39-25	

e. Based on the surface Geological Mapping and Geotechnical investigation of tunnel, the support measures recommended are as follows:

Rock Class	Classification	Recommended Rock Support	Excavation
Good to very good	ESC-1, ESC 10& ESC-11	Tunnel is self-standing with minimum support requirements of 180 (ESC-10)-150mm shotcrete and spot bolting 5m-6m long. Final lining thickness of 400-660 mm.	Heading /Benching (3.5-3.0m/6.0m)
Fair	ESC-3	Systematic Rock Bolt – 6.0 m with spacing – 2.0 m and steel fiber shotcrete – 200mm. Final lining thickness of 400-660 mm	Heading/ Benching (2.5m/5.0m)
Poor to very poor	ESC-4 & ESC-5	Systematic Rock Bolt – 8.0m-12.0m with spacing – 0.8-1.25 m with steel fiber Shotcrete of 320-380 mm thickness. Steel Rib- TH 29/TH36 or equivalent, @ 0.8m -1.25 c/c spacing. Pipe roofing-forepoling 6.0m long @88.9 of dia. Final lining thickness of 500-760 mm	Heading/ Benching (0.8m-1.8m/1.6m-3.5m)

Notes:

- Above details of the tunnel has been prepared as per the field survey of the geologist and the report submitted by the geologist based on the Geotechnical and Geophysical studies.*
- ESC1, ESC3, ESC4, ESC5, ESC10 & ESC11 are the tunnel support categories applicable to different types of rock classes mentioned in the table.*
- Above details for the tunnel support system has been prepared as per the Geological/Geotechnical data collected from the field. This shall form Geotechnical Baseline Report (GBR) and any variation in tunnel support system due to deviation from the GBR shall be treated as change of scope under the provision of the **Article 13** of the EPC Contract agreement subject to following conditions: -*
 - Any positive variation upto the 5% of the cost of the Tunnel due to change in length in particular rock classification shall not be treated as Change of Scope (COS). (Ex: Awarded cost x Weightage defined in Schedule H for Tunnel cost x 5%)*
 - Beyond positive 5% of the cost of the Tunnel may be treated as Change of Scope in only such case where variation in length interchanges from one rock class to other rock class beyond the classification specified in para 9 above of Schedule-B. In addition, Contractor is required to submit the Change of Scope Proposal +/- due to interchange in length of rock classification after consuming of length of respective classification as specified in Schedule B.*
- Provisions for Probe holes: Where the geological data collected so warrants advance probe holes by percussion or core drilling, as required, shall be drilled ahead of the tunnel faces to locate any gas, flowing mass of rock, auriferous strata, geological disturbances, etc. 2 probe holes of 15-20m long and 1 probe hole of 35-40m long shall be drilled at the tunnel face during each advancement.*
- The tunnel details, including but not limited to the alignment, excavation profile, support system, lining, cross passages, ventilation system, fire & life safety provisions, electrical and mechanical systems, drainage, lighting, and other associated components presented in this DPR are indicative and tentative in nature. The EPC Contractor shall undertake the detailed engineering and finalize all design parameters, dimensions, quantities, layouts, and specifications in accordance with the design criteria stipulated in the*

Contract Agreement, applicable MoRTH/IRC Specifications, and other relevant national and international codes, standards, and best engineering practices.

10. Real Time Wireless Tunnel Monitoring System

Contractor shall provide the real time wireless tunnel monitoring system as per the detail & Specifications given below

Summary of the specifications of tunnel monitoring instruments

1. Strain Meter integrated to Vibrating Wire Wireless Nodes (VWWSN)	
Parameters	Specifications
Range	3000 μ strain
Sensitivity	1 μ strain
Active gauge length	150 mm
Temperature operating range	-20°C +80°C
2. Tri-axial Tilt Meter Wireless for tunnel portal with wireless DAQ integration	
Parameters	Specifications
Resolution	0.0001° (Degree)
Repeatability	$\pm 0.0005^\circ$ (Degree)
Range	$\pm 90^\circ$ (Degree)
Maximum Reporting Frequency	30-40 seconds
Communication Type	IEEE 802.4 Mesh Networking Protocols
Frequency Band	2400 MHz - 2485 MHz
Battery Type and Life	Integrated up-to 10 years or more
Temperature Sensor	Integrated
Ingress Protection	IP68
Battery Type and Life	Integrated up-to 10 years or more
Cable & Accessories if Any	Equipment's/sensors to be supplied with mounting kits and onsite installation.
Manuals	Full documentation and maintenance manual in English
3. Optical Displacement Sensor integrated with Tri-axial Tilt Sensor Wireless for NATM with wireless DAQ integration	
Parameters	Specifications
Optical Sensor Specifications	3000 μ ε.
Resolution	0.2 mm or better
Repeatability	± 0.20 mm or better
Range	40 meters (natural surface) 80 meters (white target) 120 meters (reflecting target)
Laser Type	Class 2, 655nm (visible red)
Tilt Sensor Specification	

Resolution	0.0001° (Degree)
Repeatability	±0.0005° (Degree)
Range	±90° (Degree)
Maximum Reporting Frequency	30-40 seconds or higher
4. Strain Meter integrated to Vibrating Wire Wireless Nodes (VWWSN)	
Parameters	Specifications
Range	3000 μ strain
Sensitivity	1 μ strain
Active gauge length	150 mm
Temperature operating range	-20°C +80°C
5. Tri-axial Tilt Meter Wireless for tunnel portal with wireless DAQ integration	
Parameters	Specifications
Resolution	0.0001° (Degree)
Repeatability	±0.0005° (Degree)
Range	±90° (Degree)
Maximum Reporting Frequency	30-40 seconds
Communication Type	IEEE 802.4 Mesh Networking Protocols
Frequency Band	2400 MHz - 2485 MHz
Battery Type and Life	Integrated up-to 10 years or more
Temperature Sensor	Integrated
Ingress Protection	IP68
Battery Type and Life	Integrated up-to 10 years or more
Cable & Accessories if Any	Equipment's/sensors to be supplied with mountingkits and onsite installation.
Manuals	Full documentation and maintenance manual in English
6. Optical Displacement Sensor integrated with Tri-axial Tilt Sensor Wireless for NATM with wireless DAQ integration	
Parameters	Specifications
Optical Sensor Specifications	3000με.
Resolution	0.2 mm or better
Repeatability	±0.20 mm or better
Range	40 meters (natural surface) 80 meters (white target) 120 meters (reflecting target)
Laser Type	Class 2, 655nm (visible red)
Tilt Sensor Specification	
Resolution	0.0001° (Degree)
Repeatability	±0.0005° (Degree)

Range	±90° (Degree)
Maximum Reporting Frequency	30-40 seconds or higher
7. Strain Meter integrated to Vibrating Wire Wireless Nodes (VWWSN)	
Parameters	Specifications
Range	3000 μ strain
Sensitivity	1 μ strain
Active gauge length	150 mm
Temperature operating range	-20°C +80°C
8. Tri-axial Tilt Meter Wireless for tunnel portal with wireless DAQ integration	
Parameters	Specifications
Resolution	0.0001° (Degree)
Repeatability	±0.0005° (Degree)
Range	±90° (Degree)
Maximum Reporting Frequency	30-40 seconds
Communication Type	IEEE 802.4 Mesh Networking Protocols
Frequency Band	2400 MHz - 2485 MHz
Battery Type and Life	Integrated up-to 10 years or more
Temperature Sensor	Integrated
Ingress Protection	IP68
Battery Type and Life	Integrated up-to 10 years or more
Cable & Accessories if Any	Equipment's/sensors to be supplied with mounting kits and onsite installation.
Manuals	Full documentation and maintenance manual in English
9. Optical Displacement Sensor integrated with Tri-axial Tilt Sensor Wireless for NATM with wireless DAQ integration	
Parameters	Specifications
Optical Sensor Specifications	3000με.
Resolution	0.2 mm or better
Repeatability	±0.20 mm or better
Range	40 meters (natural surface) 80 meters (white target) 120 meters (reflecting target)
Laser Type	Class 2, 655nm (visible red)
Tilt Sensor Specification	
Resolution	0.0001° (Degree)
Repeatability	±0.0005° (Degree)
Range	±90° (Degree)
Maximum Reporting Frequency	30-40 seconds or higher

10. Strain Meter integrated to Vibrating Wire Wireless Nodes (VWWSN)	
Parameters	Specifications
Range	3000 μ strain
Sensitivity	1 μ strain
Active gauge length	150 mm
Temperature operating range	-20°C +80°C
11. Tri-axial Tilt Meter Wireless for tunnel portal with wireless DAQ integration	
Parameters	Specifications
Resolution	0.0001° (Degree)
Repeatability	$\pm 0.0005^\circ$ (Degree)
Range	$\pm 90^\circ$ (Degree)
Maximum Reporting Frequency	30-40 seconds
Communication Type	IEEE 802.4 Mesh Networking Protocols
Frequency Band	2400 MHz - 2485 MHz
Battery Type and Life	Integrated up-to 10 years or more
Temperature Sensor	Integrated
Ingress Protection	IP68
Battery Type and Life	Integrated up-to 10 years or more
Cable & Accessories if Any	Equipment's/sensors to be supplied with mounting kits and onsite installation.
Manuals	Full documentation and maintenance manual in English
12. Optical Displacement Sensor integrated with Tri-axial Tilt Sensor Wireless for NATM with wireless DAQ integration	
Parameters	Specifications
Optical Sensor Specifications	3000 $\mu\epsilon$.
Resolution	0.2 mm or better
Repeatability	± 0.20 mm or better
Range	40 meters (natural surface) 80 meters (white target) 120 meters (reflecting target)
Laser Type	Class 2, 655nm (visible red)
Tilt Sensor Specification	
Resolution	0.0001° (Degree)
Repeatability	$\pm 0.0005^\circ$ (Degree)
Range	$\pm 90^\circ$ (Degree)
Maximum Reporting Frequency	30-40 seconds or higher
13. Strain Meter integrated to Vibrating Wire Wireless Nodes (VWWSN)	
Parameters	Specifications

Range	3000 μ strain
Sensitivity	1 μ strain
Active gauge length	150 mm
Temperature operating range	-20°C +80°C
14. Tri-axial Tilt Meter Wireless for tunnel portal with wireless DAQ integration	
Parameters	Specifications
Resolution	0.0001° (Degree)
Repeatability	$\pm 0.0005^\circ$ (Degree)
Range	$\pm 90^\circ$ (Degree)
Maximum Reporting Frequency	30-40 seconds
Communication Type	IEEE 802.4 Mesh Networking Protocols
Frequency Band	2400 MHz - 2485 MHz
Battery Type and Life	Integrated up-to 10 years or more
Temperature Sensor	Integrated
Ingress Protection	IP68
Battery Type and Life	Integrated up-to 10 years or more
Cable & Accessories if Any	Equipment's/sensors to be supplied with mounting kits and onsite installation.
Manuals	Full documentation and maintenance manual in English
15. Optical Displacement Sensor integrated with Tri-axial Tilt Sensor Wireless for NATM with wireless DAQ integration	
Parameters	Specifications
Optical Sensor Specifications	3000 $\mu\epsilon$.
Resolution	0.2 mm or better
Repeatability	± 0.20 mm or better
Range	40 meters (natural surface) 80 meters (white target) 120 meters (reflecting target)
Laser Type	Class 2, 655nm (visible red)
Tilt Sensor Specification	
Resolution	0.0001° (Degree)
Repeatability	$\pm 0.0005^\circ$ (Degree)
Range	$\pm 90^\circ$ (Degree)
Maximum Reporting Frequency	30-40 seconds or higher
16. Optical Targets Bi-Reflex	
Parameters	Specifications
No. of Targets	5

Spacing	75 m (Class C), 50 (Class D) & 35 m (Class E) (or as per the drawings or as directed by Engineer in-charge)
Maximum Measuring Distance	≥ 140m
Overall Accuracy	± 1mm
17. Multipoint Extensometers integrated to Vibrating Wire Wireless Nodes (VWWSN)	
Parameters	Specifications
No. Of Points	3 Points Extensometers
Length	10 m (with anchors at 2 m, 5 m and 10 m)
Measuring rod material	fiberglass or invar or inox
Anchor rod material	zinc-plated steel
Diameter of head with rods	≥ 98 mm
Displacement transducer range	50 mm
Displacement transducer accuracy	< 0.5% FS
Displacement transducer resolution	0.01 mm
Temperature operating range	-20°C + 80°C
18. Pressure Cells integrated to Vibrating Wire Wireless Nodes (VWWSN)	
Parameters	Specifications
Minimum dimension	150 mm x 150 mm
Range	1, 10, 30 MPa
Accuracy	0.5% FS
Over range limit	150%
Temperature operating range	-20°C +80°C
Battery Type	10 years at 1-hour reporting interval
Nominal Voltage	3-4 V
Nominal Capacity Power	17000mAh – 19000 mAh (milliampere hour)
Cable & Accessories if Any	Equipment's to be supplied with mounting kit and onsite installation.
Manuals	Full documentation and maintenance manual in English
7. Data Acquisition (DAQ) and Communication	
Parameters	Specifications
Type	Wireless Gateway for data acquisition from all Vibrating Wire Sensors integrated with Vibrating Wire Wireless Nodes, Tilt meters, ODS and other sensors.
Memory	Onboard backup memory for data logging for loss of network.
Battery	Internal Battery with 15 days backup with charging from AC and DC.
Cellular Radio	With LTE Support and internal SIM Slot

Communication	All communication should be based on intelligent mode with each Tilt, VWWSN, Optical displacement sensor communicating with each other and hopping to gateway.
Data Transfer	The data transfer to Web DAS should occur through Wireless Monitoring Gateway powered by AC and DC power supply.
8. Data logging & Readout Solutions for all Vibrating Wire Sensors using VWWSN	
Vibrating Wire Wireless Sensor Node (VWWSN) for logging to DAQ for WirelessMonitoring	
Sensors Supported	Shall supported for Vibrating Wire Sensors: (i) Piezometers (ii) Strain Gauges (iii) Crack meter, Joint meter (iv) Load Cells, Pressure Cells (v) Extensometers (vi) Uplift Pressure Etc.
Ports	4 VW (Vibrating Wire) and 1 Thermistor Channel and incase of multiple sensors nearby can support multi-channel connectors
Technology	Vibrating Wire Sensor Node brings a wide variety of vibrating wire sensors into the system. It should be a highly integrated system capable of exciting and sampling vibrating wire sensors and reporting its measurements through wireless communications network to a Gateway without data logger.
Protection	IP68
Battery Type	Internal Integrated with 3.6V 19000mAh with 10 hours of life at 1-hour reporting
Frequency Band	2400 – 2485 MHz with mesh networking protocols IEEE 802.15.4 compliant
Maximum Transmit Power	6.5 dBm
Maximum Antenna Gain	2.2dBi
Range	1.6 dBi with Range of Up to 300m
Operating Temperature Range	-40 to 85 Deg C
VW interface connector Specifications for Sensor Node	
Frequency Resolution for VW	0.001 Hz
Frequency Repeatability for	±0.02 Hz
Frequency Range	200-6000Hz
Stimulus Type	Swept Sine Wave, 6V peak to peak
Thermistor Type	3kΩ NTC
Temperature Resolution	0.05°

Temperature Accuracy	±0.1°C
Temperature Range	-40°C to +85°C
9. Monitoring Software	
Parameters	Specifications
Nature of Provided Solution	Real-time Data Acquisition Solution Monitoring Solution and Monitoring from Web Based Wireless Geotechnical, & other interconnected Sensor and Equipment's including Web Based Customization for Data & Application Access for Monitoring and Visualization including featured for Analysis, Alarming & Alerting, Plotting and Reporting. The software shall require to be multitasking and online data management and presentation tool shall import data from automated systems, allow manual data entry, allow changes to its configuration, present plots and reports all at the same time, from different locations and for multiple users with timestamps.
Software Modules Expectations	
Features	The software solution should be modular and shall be capable of acquiring data from wireless DAQ.
	Screening & filtering the data for data inconsistencies and outliers through relevant modules.
	Processing that data and storing the data in an Azure database. The software shall must have a distinctive feature to store 'raw' data in the database and implicates the presented results are always up-to-date in the raw data is instantly visible.
	Graphic view/representation to display to view customisable site images / site maps for display of overlaid sensor data.
	Storage of sampled data and images, with easy data export in CSV format
Software Platform	Shall fully supported to Windows based Operating Platform
Alert and Alarms	Configurable multiple trigger levels and SMS and Email alerts
	Secure user access for login over web interface front end.
	Administrator control over levels of user access
	Geo-referenced Map views with data overlay
	Thematic display of displacement
	Aggregate node calculations allow for derivation of a single value from multiple sensor values and site/ node specific parameters
	Displacements relative to radial and tangential axes displayed in report and directly on Base free plugin satellite image of site
	Custom modules for creating dashboard charts for different sensors and measurements.
	Color Coded Scatter Plots
	Detailed Analysis Tools

Alarming Functionality	The software shall send automated Alerts and Alarms to define sets of conditions including tolerances for displacement at any point via SMS and email to specified stakeholders based on user defined thresholds. The software shall send the reports automatically to multiple people or groups of people and at different schedules to different groups with acknowledgement.
	Boolean Capabilities in Alarm Definition
	The software shall have function to generate an email/alarm in case of 'no data received' from the instruments for a period of defined time.
	Minimum of 3 Levels of Alarm Level
	SMS, Email and Batch File Alarm Support
	User Definable Alarm Recipients
	Alarm Response Monitoring and Escalation Capabilities
Protection & Access Control	The Password shall be protected for access with 3 levels of privileges (incl. password lost option).
Device Compatibilities	The software shall support PDA or mobile device functionality and integration.
View and Analytic Platform Module for Optical Bi-Reflex Targets	A special module shall be provided for storing the Bi-reflex target data in an online cloud data based platform. The platform shall enable the import of total station data which will automatically plot the data on a base image and relevant to tunnel direction. The software shall provide online user access and view platform which will help plot each sectional information as sectors and depict the variation of the captured data in longitudinal, transverse and height axis. All the BRT data shall be provided to all stake holders through this online platform with desktop software version for generating the data to be pushed to cloud platform. The data acquired will be fixed after each acquisition and reported online,
10. Data Reporting	

11. Traffic Control Devices and Road Safety Works

- (i) Traffic control devices and road safety works shall be provided in accordance with the provision of relevant Manual.
- (ii) Specifications of the reflective sheeting shall be as per IRC specifications and manual.

12. Roadside Furniture

Roadside furniture shall be provided in accordance with the provision of relevant Manual and minimum shall be given as given above table. However, additional Traffic control devices and road safety work devices if required on the site shall be install as per IRC manual for safety point view.

13. Compulsory Afforestation

The Contractor shall refer the provision of relevant Manual and specify the number of trees which are required to be planted as compensatory afforestation.

14. Hazardous Locations

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

Sl. No.	Location stretches from (km) to (km)	LHS/RHS
---------	--------------------------------------	---------

15. Special Requirement for Hill Roads

In accordance with section 13 of the manual (from IRC: SP: 73-2018), IRC: SP: 48: 2023, IRC: 52: 2019 and Recommended practices for Treatment of Embankment and Roadside slopes for erosion control (First Revision), IRC: 56: 2011 and relevant IRC codes.

The side slope shall be protected by using suitable slope protection measures all along the highway on Hill side and valley side. The retaining wall/Toe wall, gabion wall and Soil nailing or Rock Bolting and bio engineering measures shall be constructed as per requirement of site condition in accordance with manual requirement. However, minimum length of protection works shall be construction as per details given below and the typical section of protection work are given in typical TCS. **Any increase in length/height from the minimum length/height defined in the Schedule-B for the protection work shall not be considered as Change of Scope.**

16. Retaining Wall/ Gabion Wall/ Breast Wall

Retaining Walls: Retaining walls shall be provided to arrest damage cause to the valley side and the road, by under cutting by stream or other water course as per site requirement.

a) RRM Retaining wall/ Gabion Wall: -

- b) Retaining wall to be provided where height is varying from 1 m to 4m and Gabion wall to be provided where height is varying more than 4 m up to 10 m.

• RRM Retaining wall

Left hand Side			
Chainage		Length(m)	Min. Height (m)
From	To		
111+590	111+620	30	2.00
111+860	111+890	30	3.50
111+950	111+970	20	3.50
112+080	112+120	40	3.50
112+160	112+240	80	3.50
112+290	112+330	40	1.50
112+380	112+410	30	3.50
112+470	112+510	40	3.50
112+900	112+920	20	3.50
112+950	112+960	10	3.50
113+140	113+180	40	4.00
114+040	114+110	70	3.00
115+710	115+750	40	3.00
115+870	115+890	20	3.50
117+000	117+020	20	2.50
118+560	118+620	60	2.50
118+760	118+770	10	2.50
118+840	118+920	80	2.00
119+020	119+030	10	3.50
119+650	119+690	40	2.50
119+760	119+800	40	2.50
119+870	119+890	20	2.50
119+960	120+030	70	2.00
120+340	120+380	40	2.50
120+460	120+470	10	1.50
120+630	120+650	20	3.50
121+280	121+320	40	2.50

Left hand Side			
Chainage		Length(m)	Min. Height (m)
From	To		
121+380	121+530	150	2.50
122+230	122+260	30	2.00
122+870	122+880	10	2.00
123+260	123+480	220	2.00
123+530	123+550	20	2.50
123+860	123+890	30	3.50
124+170	124+310	140	2.00
125+420	125+430	10	2.50
125+780	125+810	30	2.00
126+270	126+290	20	3.00
126+720	126+730	10	2.50
127+090	127+100	10	2.50
127+880	127+890	10	2.50
128+040	128+060	20	3.50
138+750	138+770	20	2.50
138+920	138+930	10	3.00
140+350	140+360	10	3.00
140+510	140+520	10	3.00
140+710	140+750	40	3.50
141+220	141+260	40	2.50
141+480	141+510	30	1.50
141+530	141+590	60	2.00
141+650	141+660	10	2.00
142+030	142+200	170	2.50
142+370	142+410	40	3.00
142+530	142+600	70	2.00
142+670	142+750	80	3.00
143+260	143+330	70	3.00
143+440	143+450	10	1.50
143+480	143+560	80	2.50
143+760	143+800	40	2.50
143+970	143+990	20	1.50
145+280	145+310	30	2.00
145+330	145+400	70	2.00
145+420	145+430	10	2.00
145+540	145+600	60	2.00
145+950	145+980	30	1.50
146+220	146+360	140	3.00
146+410	146+480	70	3.00
146+620	146+630	10	1.50
148+520	148+550	30	1.50
Total Length		2940	

Right Hand Side			
Chainage		Length/(m)	Min. Height (m)
From	To		
115+010	115+080	70	3.50
115+140	115+170	30	2.00
115+400	115+560	160	2.00
115+790	115+840	50	2.50

Right Hand Side			
Chainage		Length/(m)	Min. Height (m)
From	To		
115+990	116+080	90	2.50
116+650	116+770	120	2.00
116+810	116+850	40	2.50
116+930	116+950	20	4.00
117+580	117+630	50	2.50
117+860	117+880	20	3.50
117+910	118+000	90	2.50
119+310	119+320	10	2.00
120+400	120+410	10	2.00
121+710	121+730	20	2.50
122+840	122+890	50	2.00
123+630	123+650	20	2.00
123+690	123+770	80	2.00
125+080	125+090	10	1.50
125+590	125+600	10	2.00
125+650	125+690	40	4.00
125+710	125+720	10	4.00
125+740	125+780	40	2.50
126+310	126+340	30	2.00
127+470	127+480	10	2.00
127+500	127+510	10	2.00
138+650	138+660	10	2.50
138+950	138+970	20	2.50
140+340	140+350	10	3.00
140+650	140+670	20	3.00
141+150	141+180	30	2.00
141+600	141+630	30	3.00
142+050	142+070	20	1.50
142+230	142+260	30	3.50
142+340	142+390	50	2.50
142+600	142+650	50	2.00
143+200	143+220	20	2.00
143+980	144+000	20	1.50
148+540	148+560	20	2.00
148+870	148+910	40	2.50
149+110	149+130	20	2.00
149+250	149+260	10	3.00
149+280	149+320	40	3.00
149+360	149+370	10	1.50
149+420	149+430	10	3.00
149+460	149+470	10	2.00
149+500	149+520	20	3.00
149+540	149+580	40	2.50
149+650	149+660	10	2.00
Total Length		1630	

- Gabion wall

Left Hand Side			
Chainage		Length (m)	Min. Height(m)
From	To		
111+150	111+160	10	5.00

Left Hand Side			
Chainage		Length (m)	Min. Height(m)
From	To		
111+520	111+530	10	5.00
111+790	111+850	60	6.00
111+980	112+000	20	6.00
112+580	112+590	10	5.00
112+750	112+860	110	6.00
112+990	113+050	60	6.00
113+300	113+320	20	7.00
113+390	113+440	50	5.00
113+520	113+550	30	5.00
113+610	113+630	20	6.00
113+660	113+680	20	6.00
113+740	113+770	30	6.00
113+840	113+880	40	6.00
114+120	114+150	30	7.00
115+640	115+650	10	5.00
118+380	118+390	10	5.00
118+520	118+550	30	8.00
118+630	118+650	20	5.00
119+300	119+330	30	7.00
119+470	119+550	80	5.00
120+040	120+080	40	5.00
120+130	120+160	30	6.00
120+390	120+430	40	7.00
120+480	120+620	140	8.00
120+660	120+770	110	6.00
120+820	120+910	90	6.00
121+330	121+370	40	5.00
121+720	121+730	10	5.00
122+170	122+220	50	7.00
122+890	122+920	30	6.00
123+560	123+800	240	7.00
124+060	124+160	100	5.00
125+440	125+770	330	5.00
126+300	126+600	300	5.00
126+740	126+880	140	5.00
126+960	127+080	120	6.00
127+250	127+260	10	7.00
127+450	127+550	100	7.00
127+680	127+690	10	7.00
127+760	127+870	110	7.00
128+070	128+080	10	7.00
138+730	138+740	10	9.00
138+940	138+990	50	6.00
140+530	140+550	20	7.00
140+650	140+700	50	6.00
141+120	141+210	90	6.00
141+600	141+640	40	5.00
142+210	142+360	150	6.00
142+610	142+660	50	5.00
143+190	143+250	60	5.00
146+370	146+380	10	5.00
148+560	148+570	10	7.00

Left Hand Side			
Chainage		Length (m)	Min. Height(m)
From	To		
148+650	148+670	20	7.00
Total Length		3310	

Right hand Side			
Chainage		Length (m)	Min. Height (m)
From	To		
114+450	114+610	160	5.00
114+670	114+710	40	5.00
114+770	114+790	20	5.00
115+630	115+780	150	6.00
115+850	115+890	40	7.00
115+930	115+980	50	6.00
116+780	116+800	20	5.00
117+530	117+570	40	5.00
117+660	117+680	20	5.00
117+780	117+810	30	5.00
118+060	118+070	10	6.00
118+380	118+390	10	5.00
122+900	122+920	20	7.00
123+560	123+620	60	5.00
124+800	124+820	20	7.00
125+610	125+640	30	5.00
138+980	138+990	10	5.00
140+540	140+550	10	5.00
142+270	142+330	60	5.00
148+650	148+690	40	8.00
149+440	149+450	10	5.00
Total Length		850	

a) RRM Breast wall: -

RRM Breast wall to be provided with height varying from 1 m to 3m and additional height varying up to 10m

Left Hand side			
From	To	Length(m)	Min. Height (m)
114+440	114+450	10	3
114+520	114+780	260	3
114+820	115+020	200	3
115+060	115+190	130	3
115+220	115+370	150	3
115+510	115+610	100	1
115+820	115+850	30	3
115+950	116+170	220	3
116+220	116+640	420	3
116+840	116+950	110	3
117+220	117+650	430	3
117+680	117+790	110	3
117+830	118+050	220	3

Left Hand side			
From	To	Length(m)	Min. Height (m)
118+410	118+480	70	3
119+410	119+440	30	3
119+570	119+600	30	1
121+740	121+800	60	3
121+910	121+940	30	3
121+980	122+020	40	1
122+340	122+440	100	3
122+530	122+820	290	3
123+100	123+200	100	3
124+400	124+810	410	3
125+100	125+370	270	3
125+840	126+210	370	3
126+920	126+930	10	1
127+140	127+150	10	1
127+190	127+230	40	1
127+280	127+420	140	3
127+590	127+610	20	1
127+630	127+640	10	1
127+720	127+730	10	3
127+910	128+020	110	3
128+120	128+150	30	3
138+520	138+630	110	3
140+390	140+480	90	3
140+780	140+950	170	3
141+030	141+090	60	1
141+310	141+390	80	3
141+820	141+880	60	1
142+780	142+950	170	3
143+000	143+170	170	3
143+580	143+720	140	3
143+820	143+830	10	3
143+860	143+910	50	3
144+790	144+870	80	3
148+760	148+870	110	1
148+960	149+000	40	3
149+150	149+510	360	3
149+550	149+650	100	3
Total Length		6370	

Right Hand Side			
From	To	Length(m)	Min. Height (in m)
111+070	111+140	70	3
111+500	111+790	290	3
111+850	111+960	110	3
112+010	112+620	610	3
112+750	112+990	240	3
113+050	113+390	340	3
113+450	113+520	70	3

Right Hand Side			
From	To	Length(m)	Min. Height (in m)
113+540	113+650	110	3
113+770	113+850	80	3
116+220	116+490	270	1
117+030	117+070	40	3
117+220	117+520	300	3
118+410	118+500	90	3
118+550	118+840	290	3
118+870	119+280	410	3
119+350	119+470	120	3
119+550	119+640	90	3
119+690	119+860	170	3
119+890	120+020	130	3
120+040	120+120	80	3
120+160	120+330	170	3
120+350	120+390	40	3
120+420	120+470	50	3
120+600	120+670	70	3
120+730	120+840	110	3
120+880	120+910	30	3
121+420	121+700	280	3
121+740	122+020	280	3
122+130	122+160	30	3
122+310	122+830	520	3
123+090	123+300	210	3
123+410	123+520	110	1
123+840	124+060	220	3
124+200	124+210	10	3
124+350	124+740	390	3
125+110	125+490	380	3
125+820	125+950	130	3
125+980	126+210	230	3
126+230	126+260	30	3
126+420	126+770	350	3
126+870	127+020	150	3
127+110	127+240	130	3
127+270	127+440	170	3
127+550	127+810	260	3
127+840	128+070	230	3
128+130	128+150	20	3
138+490	138+620	130	3
138+740	138+920	180	3
140+380	140+500	120	3
140+760	141+120	360	3
141+270	141+460	190	3
141+690	142+000	310	3
142+740	142+950	210	3
143+000	143+180	180	3
143+320	143+480	160	3
143+540	143+760	220	3

Right Hand Side			
From	To	Length(m)	Min. Height (in m)
143+810	143+840	30	3
143+860	143+950	90	3
144+760	144+870	110	3
145+380	145+420	40	3
145+510	145+530	20	1
146+170	146+180	10	1
146+290	146+580	290	3
146+650	146+670	20	3
146+750	146+890	140	3
147+120	147+130	10	1
Total Length		11330	

Right			
From	To	Breast Wall Length (m)	Min. Height (m)
111+540	111+660	120	10
111+700	111+730	30	10
112+050	112+080	30	10
112+110	112+130	20	10
112+330	112+400	70	10
112+490	112+510	20	10
112+530	112+560	30	10
112+740	112+870	130	10
112+900	112+930	30	10
113+190	113+240	50	10
113+310	113+340	30	10
113+540	113+560	20	10
113+620	113+640	20	10
115+070	115+130	60	10
116+070	116+120	50	10
116+880	116+920	40	10
120+090	120+120	30	10
120+770	120+810	40	10
126+610	126+770	160	10
Total Length		980 m	

Both Side			
From	To	Breast Wall Length (m)	Min. Height (m)
111+660	111+700	80	10
111+730	111+770	80	10
112+010	112+050	80	10
113+060	113+110	100	10

Both Side			
From	To	Breast Wall Length (m)	Min. Height (m)
113+240	113+280	80	10
116+280	116+450	340	10
117+270	117+500	460	10
118+430	118+490	120	10
118+660	118+690	60	10
119+150	119+230	160	10
119+570	119+630	120	10
120+170	120+310	280	10
122+670	122+780	220	10
123+110	123+230	240	10
125+150	125+350	400	10
126+030	126+090	120	10
126+910	126+950	80	10
127+150	127+240	180	10
127+330	127+400	140	10
127+610	127+680	140	10
127+710	127+750	80	10
127+930	127+970	80	10
Total Length		3640 m	

17. Slope Protection

As the project involves cutting of existing hill slopes, it is imperative that slopes are stabilized for ensuring longevity of the slope and the road. Slope stability, erosion control and landslide correction shall be accomplished in accordance with IRC: SP: 48-1998. Reference may be drawn from IRC: 56- 2011.

Rock Bolting with bioengineering

Design Chainage in Km		Side	Length (m)
From	To		
112+560	112+600	RHS	40.00
112+930	112+960	RHS	30.00
113+370	113+390	RHS	20.00
113+450	113+470	RHS	20.00
113+510	113+540	RHS	30.00
119+640	119+690	RHS	50.00
120+470	120+530	RHS	60.00
Total Length in m			250

Grass Turfing

Design Chainage in km		Length (m)	TCS No
From	To		
113+890	114+040	150	TCS-1A
115+570	115+630	60	TCS-1A
117+130	117+220	90	TCS-1C
123+490	123+530	40	TCS-1A

Design Chainage in km		Length (m)	TCS No
From	To		
123+810	123+840	30	TCS-1A
124+320	124+350	30	TCS-2C
141+460	141+490	30	TCS-1C
142+010	142+040	30	TCS-2C
142+100	142+170	70	TCS-1C
142+490	142+580	90	TCS-1C
143+960	144+010	50	TCS-2C
144+010	144+050	40	TCS-2A
144+050	144+100	50	TCS-1A
144+100	144+410	310	TCS-2A
144+410	144+560	150	TCS-2C
144+610	144+730	120	TCS-2C
144+930	145+020	90	TCS-2C
145+070	145+150	80	TCS-2C
145+150	145+280	130	TCS-2A
145+450	145+490	40	TCS-1A
145+720	146+230	510	TCS-2A
146+680	146+750	70	TCS-1A
146+890	147+200	310	TCS-1A
147+200	147+270	70	TCS-1C
147+270	147+370	100	TCS-2C
147+370	147+490	120	TCS-1C
147+490	148+520	1030	TCS-2C
148+700	148+870	170	TCS-1C
148+920	148+960	40	TCS-1C
149+010	149+080	70	TCS-1C
149+080	149+110	30	TCS-2C
Total Length		4200	

***Note-**

1.Locations/ length indicated above are tentative and minimum, any additional length required at site shall not attract any COS.

18. Change of Scope

The length of Structures and bridges & Tunnels 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.

19. Indicative Chainages with applicable typical Cross section

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
1	111+067	111+150	83.43	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
2	111+150	111+165	15.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
3	111+165	111+465	300.00	Major Bridge	MAJOR BRIDGE
4	111+465	111+500	35.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
5	111+500	111+540	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
6	111+540	111+660	120.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
7	111+660	111+700	40.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
8	111+700	111+730	30.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
9	111+730	111+770	40.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
10	111+770	111+800	30.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
11	111+800	111+850	50.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
12	111+850	112+010	160.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
13	112+010	112+050	40.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
14	112+050	112+080	30.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
15	112+080	112+110	30.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
16	112+110	112+130	20.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
17	112+130	112+330	200.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
18	112+330	112+400	70.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
19	112+400	112+490	90.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
20	112+490	112+510	20.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
21	112+510	112+530	20.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
22	112+530	112+560	30.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
23	112+560	112+600	40.00	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable(Reconstruction)	TCS-4
24	112+600	112+635	35.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
25	112+635	112+715	80.00	Major Bridge	MAJOR BRIDGE
26	112+715	112+740	25.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
27	112+740	112+870	130.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
28	112+870	112+900	30.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
29	112+900	112+930	30.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
30	112+930	112+960	30.00	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable(Reconstruction)	TCS-4
31	112+960	113+000	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
32	113+000	113+060	60.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
33	113+060	113+110	50.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
34	113+110	113+190	80.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
35	113+190	113+240	50.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
36	113+240	113+280	40.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
37	113+280	113+310	30.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
38	113+310	113+340	30.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
39	113+340	113+370	30.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
40	113+370	113+390	20.00	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable(Reconstruction)	TCS-4
41	113+390	113+450	60.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
42	113+450	113+470	20.00	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable(Reconstruction)	TCS-4
43	113+470	113+510	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
44	113+510	113+540	30.00	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable(Reconstruction)	TCS-4
45	113+540	113+560	20.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
46	113+560	113+620	60.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
47	113+620	113+640	20.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
48	113+640	113+680	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
49	113+680	113+740	60.00	Major Bridge	MAJOR BRIDGE
50	113+740	113+890	150.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
51	113+890	114+040	150.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
52	114+040	114+150	110.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
53	114+150	114+400	250.00	Major Bridge	MAJOR BRIDGE
54	114+400	114+410	10.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
55	114+410	114+810	400.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
56	114+810	114+860	50.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
57	114+860	115+070	210.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
58	115+070	115+130	60.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
59	115+130	115+570	440.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
60	115+570	115+630	60.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
61	115+630	115+780	150.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
62	115+780	115+860	80.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
63	115+860	115+895	35.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
64	115+895	115+925	30.00	Minor Bridge	MINOR BRIDGE
65	115+925	115+950	25.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
66	115+950	116+070	120.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
67	116+070	116+120	50.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
68	116+120	116+175	55.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
69	116+175	116+205	30.00	Minor Bridge	MINOR BRIDGE
70	116+205	116+280	75.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
71	116+280	116+450	170.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
72	116+450	116+630	180.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
73	116+630	116+880	250.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
74	116+880	116+920	40.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
75	116+920	116+955	35.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
76	116+955	116+995	40.00	Minor Bridge	MINOR BRIDGE
77	116+995	117+030	35.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
78	117+030	117+080	50.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
79	117+080	117+130	50.00	Both Side Cut Without Protection Work (Cut Height<2M)(New Construction)	TCS-3C
80	117+130	117+220	90.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
81	117+220	117+270	50.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
82	117+270	117+500	230.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
83	117+500	117+530	30.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
84	117+530	118+075	545.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
85	118+075	118+375	300.00	Major Bridge	MAJOR BRIDGE
86	118+375	118+400	25.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
87	118+400	118+430	30.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
88	118+430	118+490	60.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
89	118+490	118+520	30.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
90	118+520	118+660	140.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
91	118+660	118+690	30.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
92	118+690	118+730	40.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
93	118+730	118+790	60.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
94	118+790	118+840	50.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
95	118+840	119+040	200.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
96	119+040	119+150	110.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
97	119+150	119+230	80.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
98	119+230	119+290	60.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
99	119+290	119+340	50.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
100	119+340	119+450	110.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
101	119+450	119+570	120.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
102	119+570	119+630	60.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
103	119+630	119+640	10.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
104	119+640	119+690	50.00	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable(Reconstruction)	TCS-4
105	119+690	120+090	400.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
106	120+090	120+120	30.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
107	120+120	120+170	50.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
108	120+170	120+310	140.00	Both Side Cut (Ht.>15M) With Protection On Either Side As Applicable (Reconstruction)	TCS-3D
109	120+310	120+400	90.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
110	120+400	120+420	20.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
111	120+420	120+470	50.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
112	120+470	120+530	60.00	One Side Cut With Rock Bolting & One Side Fill With Protection As Applicable(Reconstruction)	TCS-4
113	120+530	120+600	70.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
114	120+600	120+770	170.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
115	120+770	120+810	40.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
116	120+810	120+915	105.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
117	120+915	121+275	360.00	Major Bridge	MAJOR BRIDGE
118	121+275	121+370	95.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
119	121+370	121+560	190.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
120	121+560	121+710	150.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
121	121+710	121+718	8.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
122	121+718	121+728	10.00	Minor Bridge	MINOR BRIDGE
123	121+728	121+740	12.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
124	121+740	122+030	290.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
125	122+030	122+130	100.00	Both Side Cut Without Protection Work (Cut Height<2M)(Reconstruction)	TCS-3A
126	122+130	122+160	30.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
127	122+160	122+270	110.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
128	122+270	122+310	40.00	Both Side Cut Without Protection Work (Cut Height<2M)(Reconstruction)	TCS-3A
129	122+310	122+670	360.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
130	122+670	122+780	110.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
131	122+780	122+840	60.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
132	122+840	122+920	80.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
133	122+920	123+080	160.00	Viaduct	VIADUCT
134	123+080	123+090	10.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
135	123+090	123+110	20.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
136	123+110	123+230	120.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
137	123+230	123+310	80.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
138	123+310	123+410	100.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
139	123+410	123+490	80.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
140	123+490	123+530	40.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
141	123+530	123+810	280.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
142	123+810	123+840	30.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
143	123+840	123+910	70.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
144	123+910	124+060	150.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
145	124+060	124+120	60.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
146	124+120	124+180	60.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
147	124+180	124+290	110.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
148	124+290	124+320	30.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
149	124+320	124+350	30.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
150	124+350	124+770	420.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
151	124+770	124+825	55.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
152	124+825	125+065	240.00	Major Bridge	MAJOR BRIDGE
153	125+065	125+100	35.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
154	125+100	125+150	50.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
155	125+150	125+350	200.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
156	125+350	125+380	30.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
157	125+380	125+460	80.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
158	125+460	125+500	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
159	125+500	125+820	320.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
160	125+820	126+030	210.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-3
161	126+030	126+090	60.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
162	126+090	126+195	105.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3
163	126+195	126+245	50.00	Minor Bridge	MINOR BRIDGE
164	126+245	126+270	25.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3
165	126+270	126+420	150.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-2
166	126+420	126+610	190.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
167	126+610	126+770	160.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1D
168	126+770	126+910	140.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
169	126+910	126+950	40.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
170	126+950	127+040	90.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
171	127+040	127+110	70.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-2
172	127+110	127+150	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3
173	127+150	127+240	90.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
174	127+240	127+280	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
175	127+280	127+330	50.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3
176	127+330	127+400	70.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
177	127+400	127+440	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3
178	127+440	127+464	24.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
179	127+464	127+524	60.00	Viaduct	VIADUCT
180	127+524	127+540	16.00	One Side Cut (Ht.>15M) & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-2
181	127+540	127+570	30.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
182	127+570	127+610	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3
183	127+610	127+680	70.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
184	127+680	127+710	30.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
185	127+710	127+750	40.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
186	127+750	127+900	150.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
187	127+900	127+930	30.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3
188	127+930	127+970	40.00	Both Side Cut (Ht.>15M)With Protection On Either Side As Applicable (New Construction)	TCS-3E
189	127+970	128+040	70.00	Both Side Fill For Tunnel Approach With Protection (As Applicable)(New Construction)	TCS-5
190	128+040	128+080	40.00	Both Side Cut For Tunnel Approach With Protection On Either Side As Applicable (New Construction)	TCS-6
191	128+080	128+120	40.00	Minor Bridge	MINOR BRIDGE
192	128+120	128+155	35.00	Tunnel Portal	TUNNEL Portal
193	128+155	138+518	10363.00	Tunnel	TUNNEL
194	138+518	138+629	111.00	Tunnel Portal	TUNNEL Portal

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
195	138+629	138+640	11.00	Both Side Fill For Tunnel Approach With Protection (As Applicable)(New Construction)	TCS-5
196	138+640	138+660	20.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-7
197	138+660	138+740	80.00	Major Bridge	MAJOR BRIDGE
198	138+740	138+775	35.00	Both Side Cut For Tunnel Approach With Protection On Either Side As Applicable (New Construction)	TCS-6
199	138+775	138+865	90.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-7
200	138+865	138+930	65.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-3B
201	138+930	138+988	57.50	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
202	138+988	140+333	1345.00	Viaduct	VIADUCT
203	140+333	140+360	27.50	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
204	140+360	140+550	190.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
205	140+550	140+650	100.00	Viaduct	VIADUCT
206	140+650	140+780	130.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
207	140+780	140+960	180.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
208	140+960	141+000	40.00	Both Side Cut Without Protection Work (Cut Height<2M)(New Construction)	TCS-3C
209	141+000	141+120	120.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
210	141+120	141+240	120.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
211	141+240	141+290	50.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
212	141+290	141+460	170.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
213	141+460	141+490	30.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
214	141+490	141+590	100.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
215	141+590	141+650	60.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
216	141+650	141+710	60.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
217	141+710	142+010	300.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
218	142+010	142+040	30.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
219	142+040	142+100	60.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
220	142+100	142+170	70.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
221	142+170	142+220	50.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
222	142+220	142+410	190.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
223	142+410	142+490	80.00	Both Side Cut Without Protection Work (Cut Height<2M)(New Construction)	TCS-3C
224	142+490	142+580	90.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
225	142+580	142+730	150.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
226	142+730	142+770	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
227	142+770	142+960	190.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
228	142+960	142+975	15.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
229	142+975	142+995	20.00	Minor Bridge	MINOR BRIDGE
230	142+995	143+190	195.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
231	143+190	143+320	130.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
232	143+320	143+500	180.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
233	143+500	143+530	30.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
234	143+530	143+570	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
235	143+570	143+750	180.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
236	143+750	143+810	60.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
237	143+810	143+960	150.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
238	143+960	144+010	50.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
239	144+010	144+050	40.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(Reconstruction)	TCS-2A
240	144+050	144+100	50.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
241	144+100	144+410	310.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(Reconstruction)	TCS-2A
242	144+410	144+560	150.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
243	144+560	144+610	50.00	Both Side Cut Without Protection Work (Cut Height<2M)(New Construction)	TCS-3C
244	144+610	144+730	120.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
245	144+730	144+780	50.00	Both Side Cut Without Protection Work (Cut Height<2M)(New Construction)	TCS-3C
246	144+780	144+870	90.00	Both Side Cut With Protection On Either Side As Applicable (New Construction)	TCS-3B
247	144+870	144+930	60.00	Both Side Cut Without Protection Work (Cut Height<2M)(New Construction)	TCS-3C
248	144+930	145+020	90.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
249	145+020	145+070	50.00	Both Side Cut Without Protection Work (Cut Height<2M)(New Construction)	TCS-3C
250	145+070	145+150	80.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
251	145+150	145+280	130.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(Reconstruction)	TCS-2A
252	145+280	145+330	50.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
253	145+330	145+450	120.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
254	145+450	145+490	40.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
255	145+490	145+540	50.00	Both Side Cut Without Protection Work (Cut Height<2M)(Reconstruction)	TCS-3A
256	145+540	145+580	40.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
257	145+580	145+660	80.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
258	145+660	145+720	60.00	Both Side Cut Without Protection Work (Cut Height<2M)(Reconstruction)	TCS-3A
259	145+720	146+230	510.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(Reconstruction)	TCS-2A
260	146+230	146+290	60.00	Both Side Fill With Protection (As Applicable)(Reconstruction)	TCS-2
261	146+290	146+520	230.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
262	146+520	146+570	50.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
263	146+570	146+603	33.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
264	146+603	146+613	10.00	Minor Bridge	MINOR BRIDGE
265	146+613	146+680	67.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(Reconstruction)	TCS-1
266	146+680	146+750	70.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
267	146+750	146+890	140.00	Both Side Cut With Protection On Either Side As Applicable (Reconstruction)	TCS-3
268	146+890	147+200	310.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(Reconstruction)	TCS-1A
269	147+200	147+270	70.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
270	147+270	147+370	100.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
271	147+370	147+490	120.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C

Sr. no.	Design Chainage		Design Length	TCS Detail	TCS Type
	From	To			
272	147+490	148+520	1030.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
273	148+520	148+560	40.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
274	148+560	148+640	80.00	Viaduct Cum Bridge	VIADUCT CUM BRIDGE
275	148+640	148+700	60.00	Both Side Fill With Protection (As Applicable)(New Construction)	TCS-2B
276	148+700	148+870	170.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
277	148+870	148+920	50.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
278	148+920	148+960	40.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
279	148+960	149+010	50.00	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
280	149+010	149+080	70.00	One Side Cut(Cut Height<2M) & One Side Fill(Embankment Height<2M) Without Protection Work(New Construction)	TCS-1C
281	149+080	149+110	30.00	Both Side Fill With Normal Embankment (Height.<2M)Without Protection Work(New Construction)	TCS-2C
282	149+110	149+678	568.03	One Side Cut & One Side Fill With Protection On Either Side As Applicable(New Construction)	TCS-1B
TOTAL DESIGN LENGTH			38611.46		

Note: Utility duct shall be laid with 300mm dia. HDPE pipe all along the project length as per applicable TCS given below and cross sectional in accordance with IS: 4984/14333 or any other relevant code with inspection chambers at acceptable interval as approved by Authority Engineer/ Employer.

The EPC Contractor shall, at its own cost and responsibility, design, construct, improve (where required), operate, maintain, and subsequently restore, if necessary, all temporary and permanent access roads required for execution of the Project, including but not limited to access roads leading to the tunnel portals, open spandrel bridges, construction sites, borrow areas, quarries, disposal areas, camps, batching plants, and any other locations necessary for completion of the Project Highway.

No additional payment or compensation whatsoever shall be admissible from the Authority for the construction, maintenance, operation, or restoration of such access roads, and all associated costs shall be deemed to be included in the Contract Price

Schedule B-1

1. Utility Shifting:- The details of utilities are as follows:

(i) Electrical utilities i.e., High Tension and Low-Tension Lines

Sl. No.	Type of Utility	Unit	Quantity	Remark
A	Electrical Utilities i.e., Sub-Transmission Division and JPDCL			The details are given in utility shifting plan. The actual as required based on the basis of detailed investigations shall be determined by the Contractor in accordance with the Specifications and Standards. Any variations in the specified in this Schedule B shall not constitute a Change of Scope.
1	Electrical poles & Conductor	Nos.	61	
2	Electrical cables	Meters	1800	
3	Crossings i.e., Overhead & U/g	No.	41	
3	Transformers	Nos.	1	

TC - Triple circuit, DC - Double circuit, SC - Single circuit

(ii) Public Health utilities (Water/Sewage Pipelines)

Sl. No.	Type of Utility	Unit	Length in m	Remark
1	PHE Jal Shakti to 100mm Dia Pipe under Kishtwar, Division	Meters	1500	The actual 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 specified in this Schedule B shall not constitute a Change of Scope.

(iii) Any Other Line

- (a) The type/spacing/size/specifications of poles/towers/lines/cables to be used in shifting work are as per the guidelines of utility owning department and it is solely between the Contractor and the utility owning department. No change of scope shall be eligible, or no cost shall be paid for using different type/spacing /size/specifications in shifted work in comparison to those in the existing or for making any overhead crossings to underground as per requirement of utility owning department/construction of project highway. The Contractor shall carry out joint inspection with utility owning department and get the estimates sanctioned from utility owning department. The assistance of the Authority is limited to giving forwarding letter on the proposal of Contractor to utility owning department whenever asked by the Contractor. The decision/approval of utility owning department shall be binding on the Contractor. No CoS or no cost shall, be eligible on any account.
- (b) The supervision charges at the rates/charges applicable between implementing agencies of MoRTH and utility owning department shall be paid directly by the Authority to the Utility Owning Entity as and when Contractor furnishing a demand of Utility Owning Department along with a copy of sanctioned estimate.
- (c) The credit of dismantled materials has been accounted for in the estimated cost. The dismantled material /scrap of existing Utility to be shifted/dismantled shall belong to the Contractor/Concessionaire who would be free to dispose-off the dismantled material as deemed fit by them. If the Contractor is forced to deposit the dismantled material to utility owning department, then the amount of credit for dismantled material indicated in the sanctioned estimates of utility owning department will be reimbursed to the Contractor after submitting the duly authenticated receipt of the dismantled material from utility owning

department to the Authority.

- (d) The utilities shall be handed over after shifting work is completed to Utility Owning Department up to their entire satisfaction. The maintenance liability shall rest with the Utility Owning Department after handing over process is complete as far as utility shifting works are concerned.

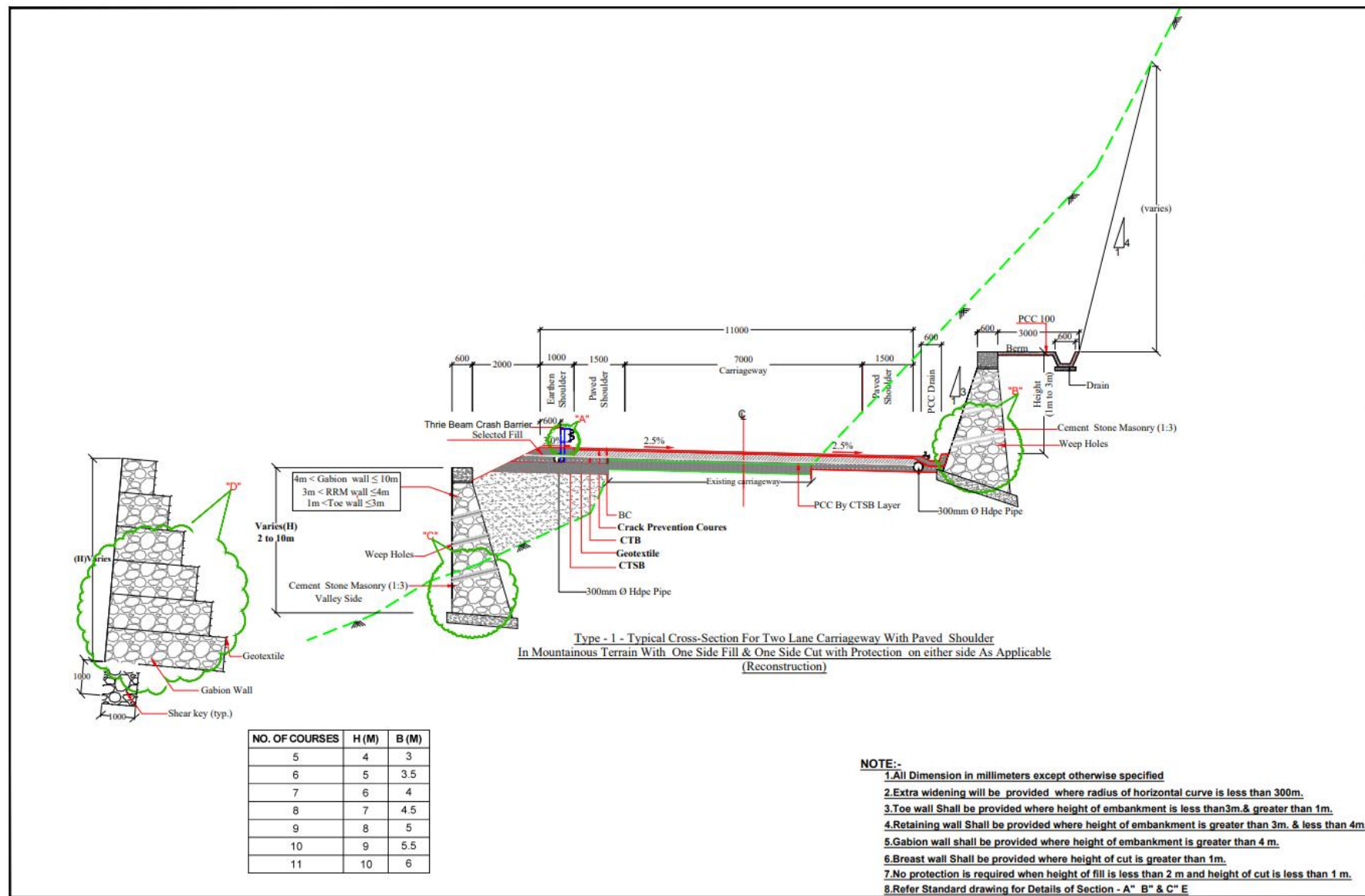
No change of scope shall be paid for any over-ground utilities. However, for any underground utilities not mentioned in Schedule B shall form change of scope, which shall be worked out as per the estimation of the concerned utility owning dept. and shall be payable to the contractor accordingly.

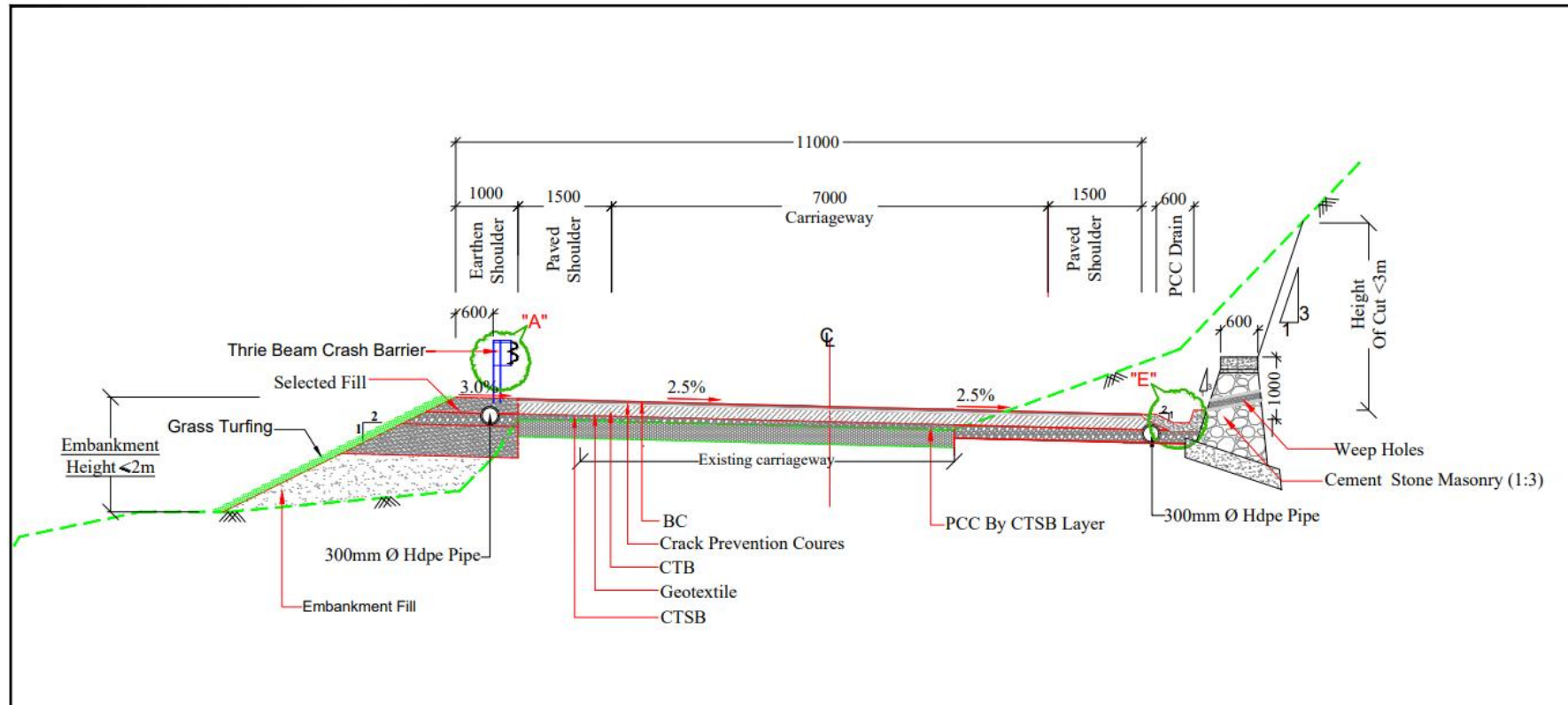
2. Power Supply for Tunnel and Tunnel Portals

For power supply to the tunnel and tunnel portals it is required to lay power line and create Receiving Station. The Receiving Stations shall be created at no. of locations to cater the load of 6.624 MW and for Vailoo Tunnel.

S.No	Description
East Portal	
1	12 Km long 33KV new Dadpeth line from 132/33 KV Katersamna grid to Bindraban tap
2	Bus-out arrangement at Dadpeth along with extension of control room building at Dadpeth station.
3	Creation of 10 MVA receiving station along with 35 Km long 33KV line from Dadpeth station.
West Portal	
1	Construction of 1x10MVA, 33/11KV Sub Stn. At Vailoo Tunnel
2	Construction of 27 Km long 33 KV line on 11m ST Poles with 100 sqm. ACSR
3	8 number of Gantry Structures at road crossings

The length of line will depend on the location of Receiving Station and may vary. The land for all the Receiving stations for the purpose of supplying power to the tunnel and tunnel portals shall be provided by the NHIDCL/competent authority.





Type - 1A - Typical Cross-Section For Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With One Side Fill & One Side Cut With Protection (Reconstruction)

NOTE:-

1. All Dimension in millimeters except otherwise specified

2. Extra widening will be provided where radius of horizontal curve is less than 300m.

3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.

4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.

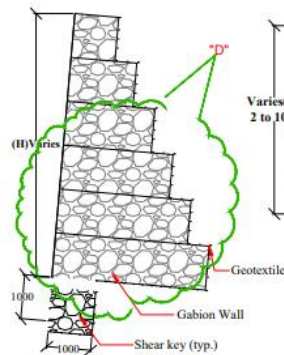
5. Gabion wall shall be provided where height of embankment is greater than 4 m.

6. Breast wall Shall be provided where height of cut is greater than 1m.

7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.

8. Refer Standard drawing for Details of Section - A" B" & C" E

NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6



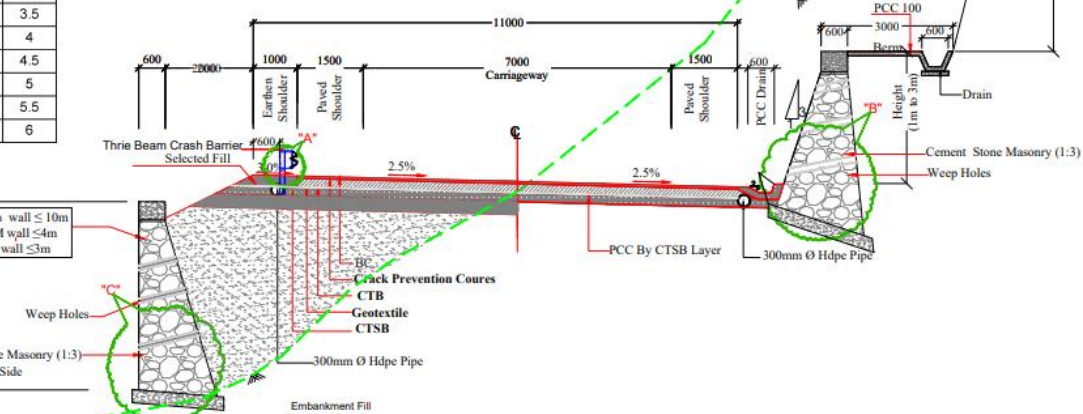
4m < Gabion wall ≤ 10m
3m < RRM wall ≤ 4m
1m < Toe wall ≤ 3m

Varies (H)
2 to 10m

Cement Stone Masonry (1:3)
Valley Side

Geotextile

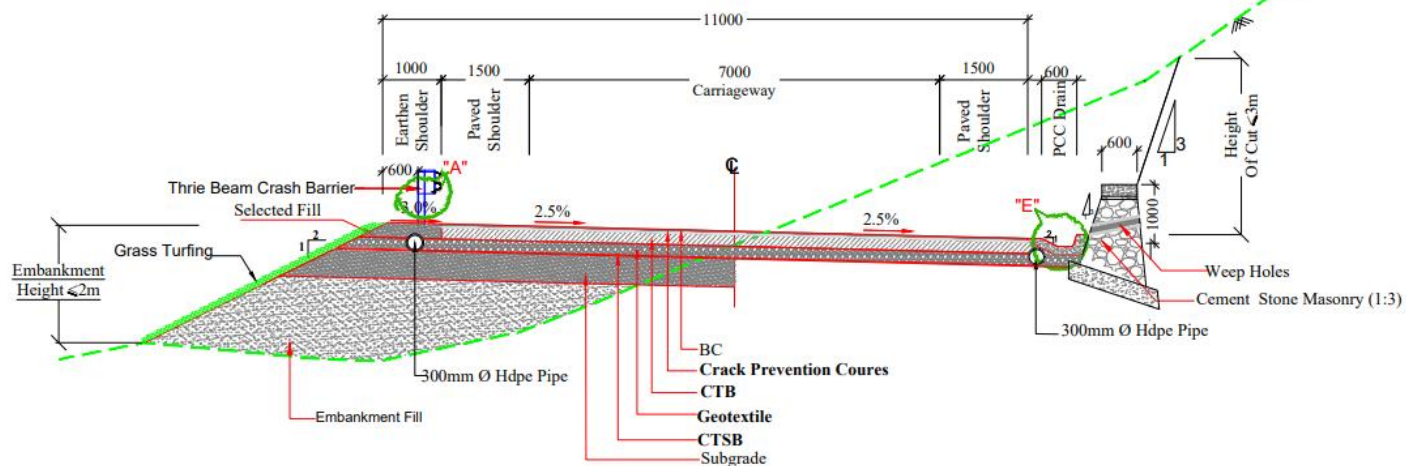
Shear key (typ.)



**Type - 1B - Typical Cross-Section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With One Side Fill & One Side Cut with Protection On Either Side As Applicable
(New Construction)**

NOTE:-

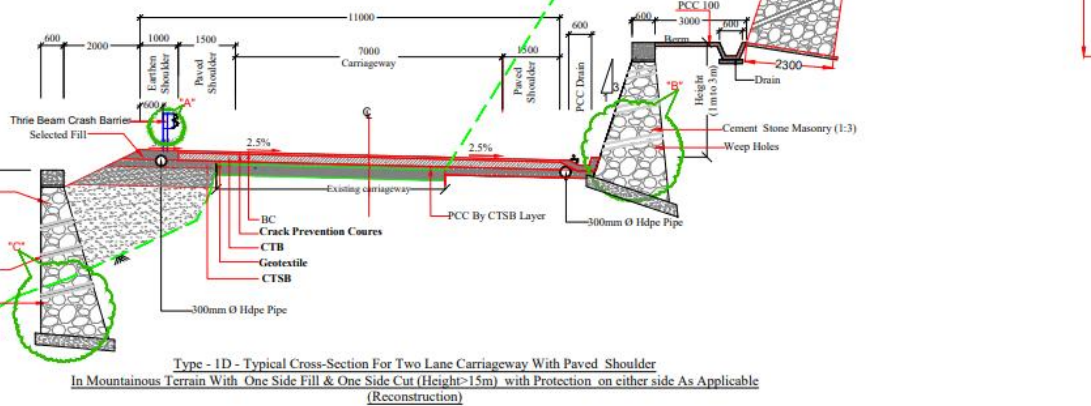
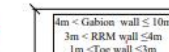
1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" C" E



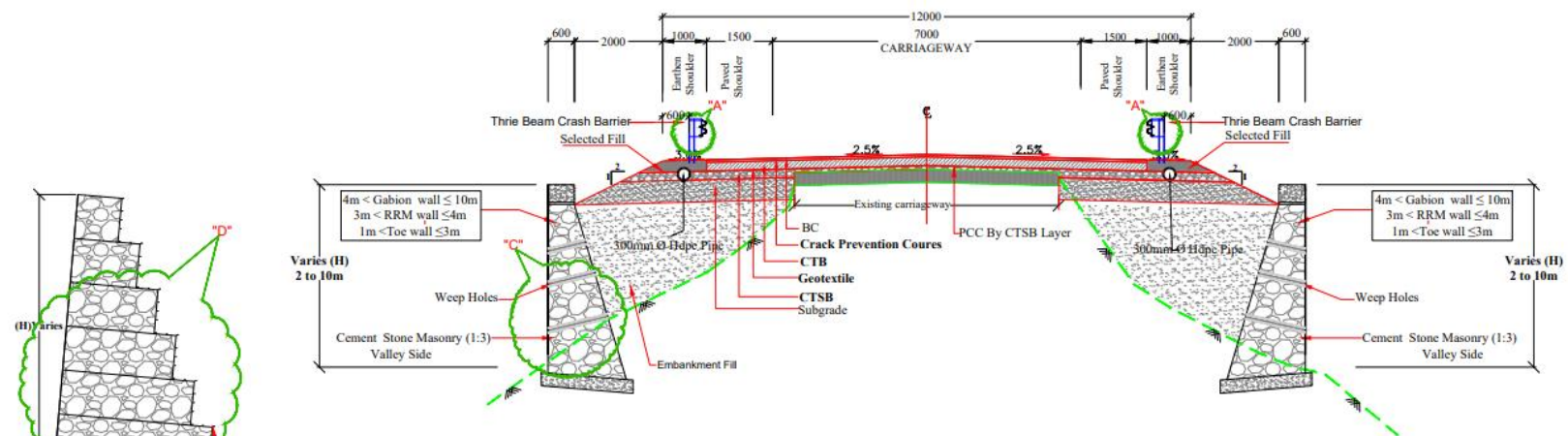
**Type - 1C - Typical Cross-Section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With One Side Fill & One Side Cut With Protection
(New Construction)**

NOTE:-

1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E

[illegible]

1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



Type - 2 - Typical Cross-Section for Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Fill With Protection on Either Side As Applicable
(Reconstruction)

NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6

NOTE:-

1. All Dimension in millimeters except otherwise specified

2. Extra widening will be provided where radius of horizontal curve is less than 300m.

3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.

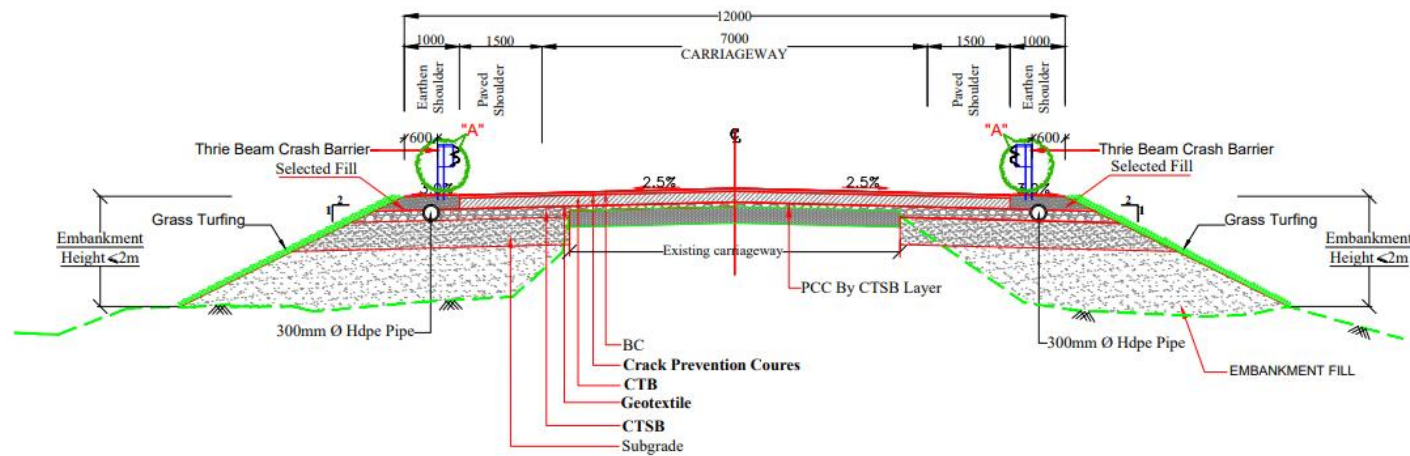
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.

5. Gabion wall shall be provided where height of embankment is greater than 4 m.

6. Breast wall Shall be provided where height of cut is greater than 1m.

7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.

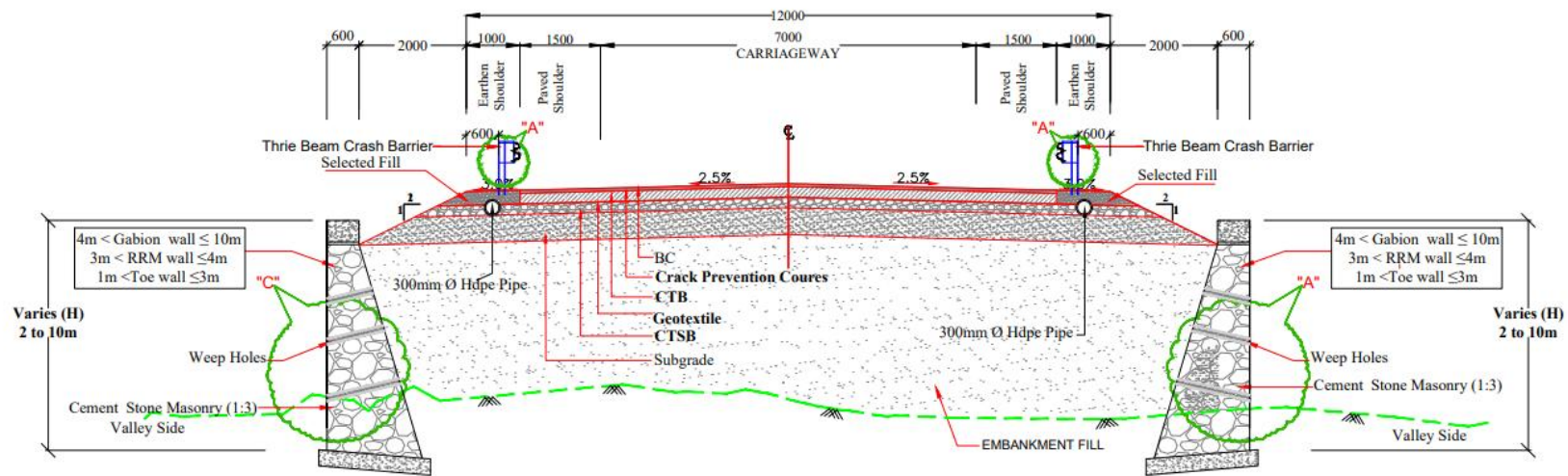
8. Refer Standard drawing for Details of Section - A" B" & C" E



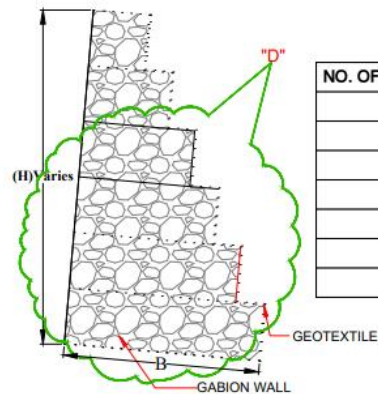
Type - 2A - Typical Cross-Section for Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Fill With Embankment Height <2m
(Reconstruction)

NOTE:-

1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m, & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



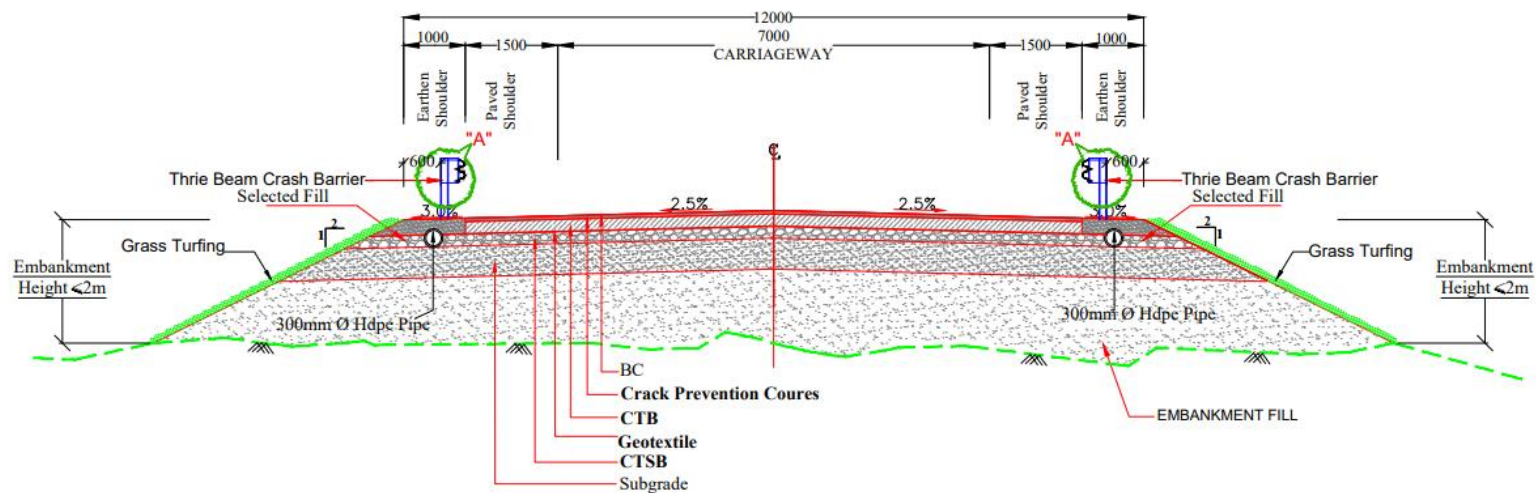
**Type - 2B - Typical Cross-section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Fill With Protection As Applicable
(New Construction)**



NO. OF COURSES	H (M)	B (M)
5	4	3
6	5	3.5
7	6	4
8	7	4.5
9	8	5
10	9	5.5
11	10	6

NOTE:-

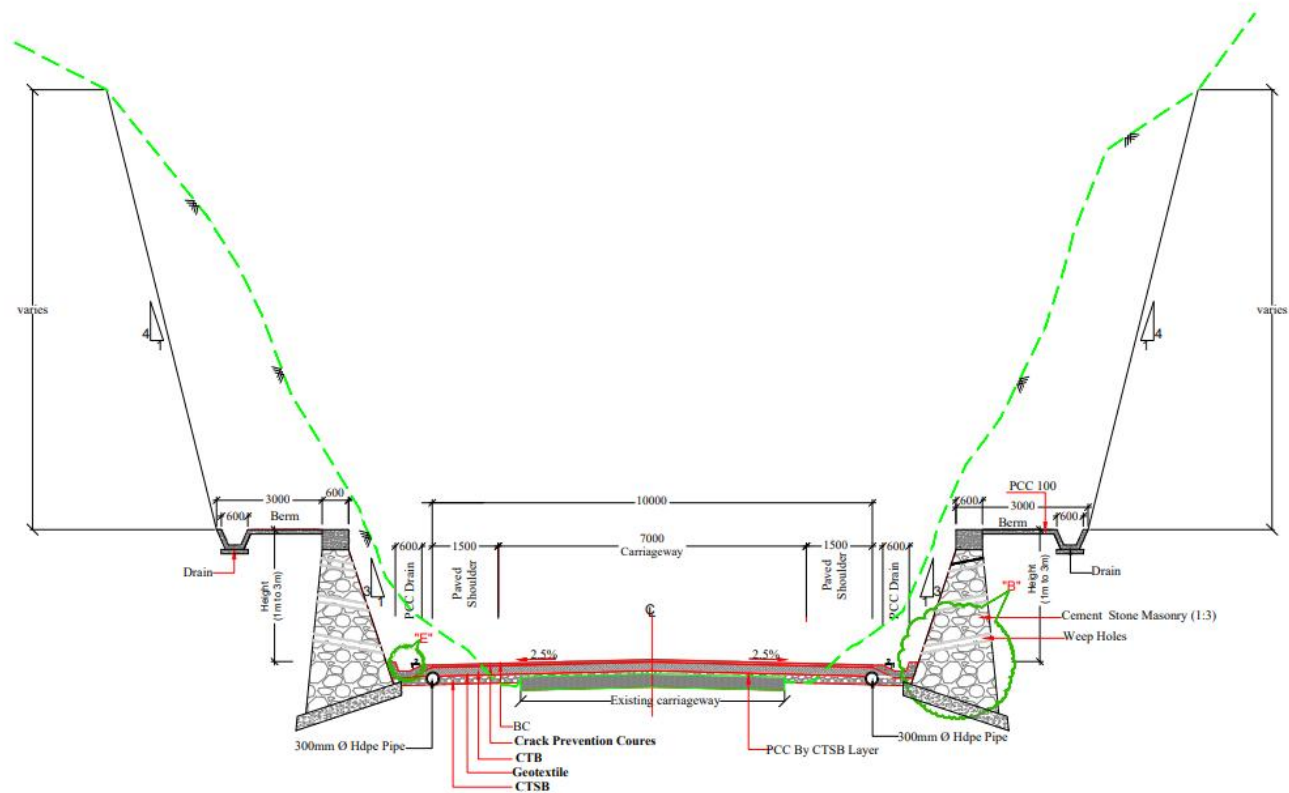
1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



**Type - 2C- Typical Cross-section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Fill With Embankment Height $\leq 2\text{m}$
(New Construction)**

NOTE:-

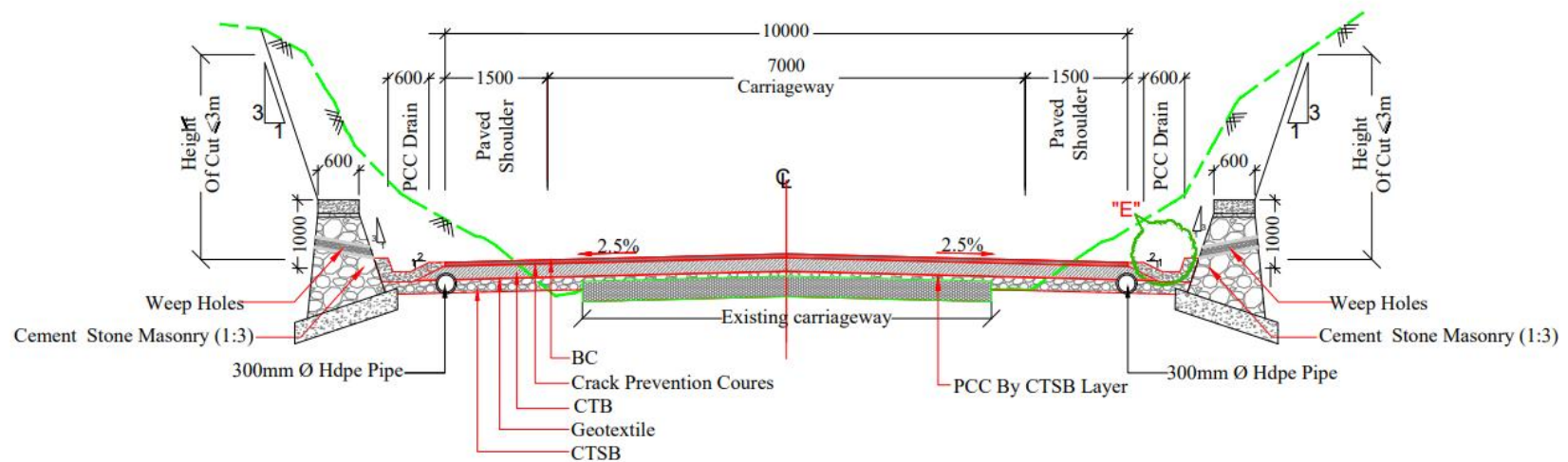
1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



Type - 3- Typical Cross-Section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Cut With Protection on Either Side as Applicable
(Reconstruction)

NOTE:-

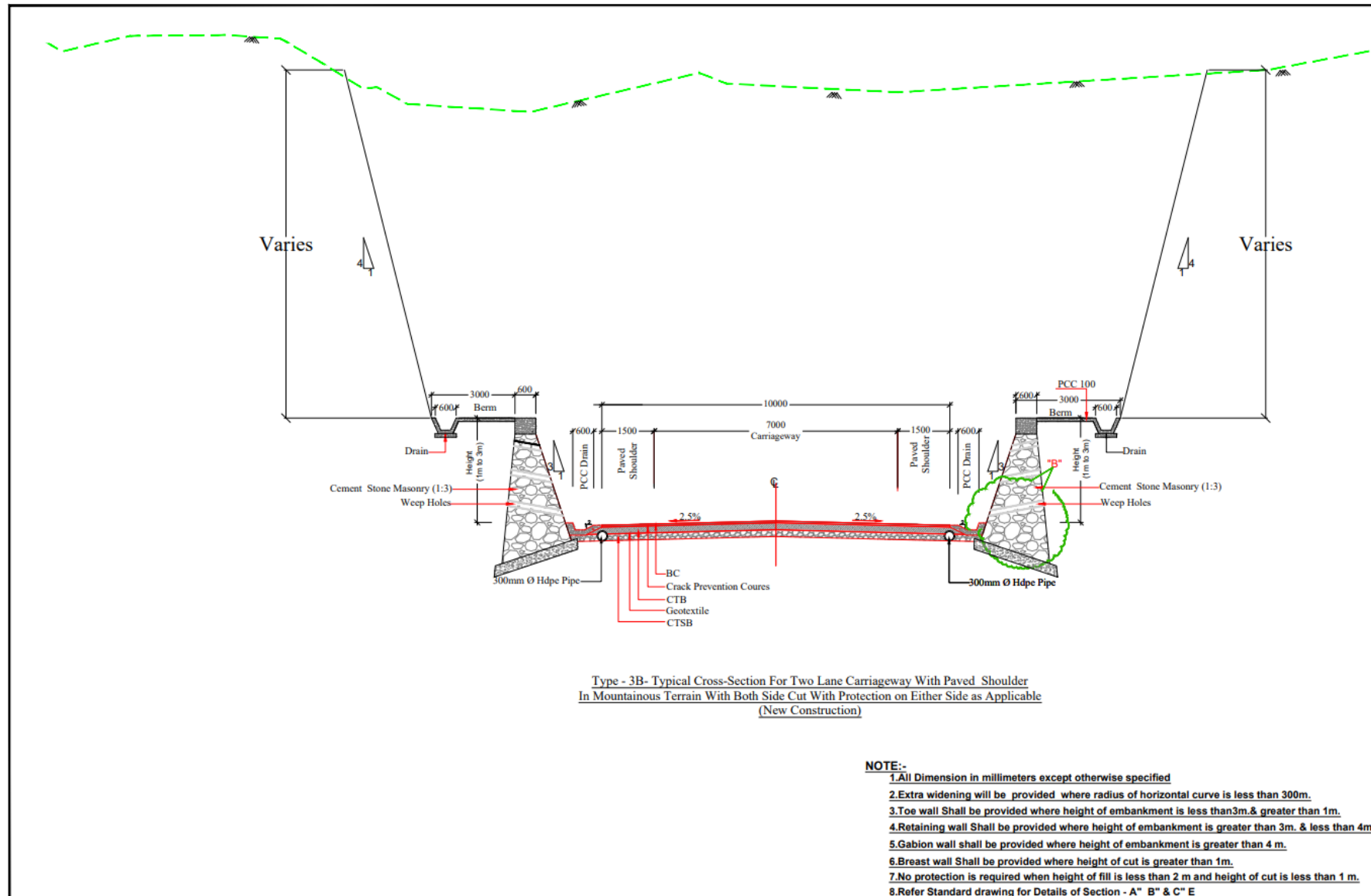
1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E

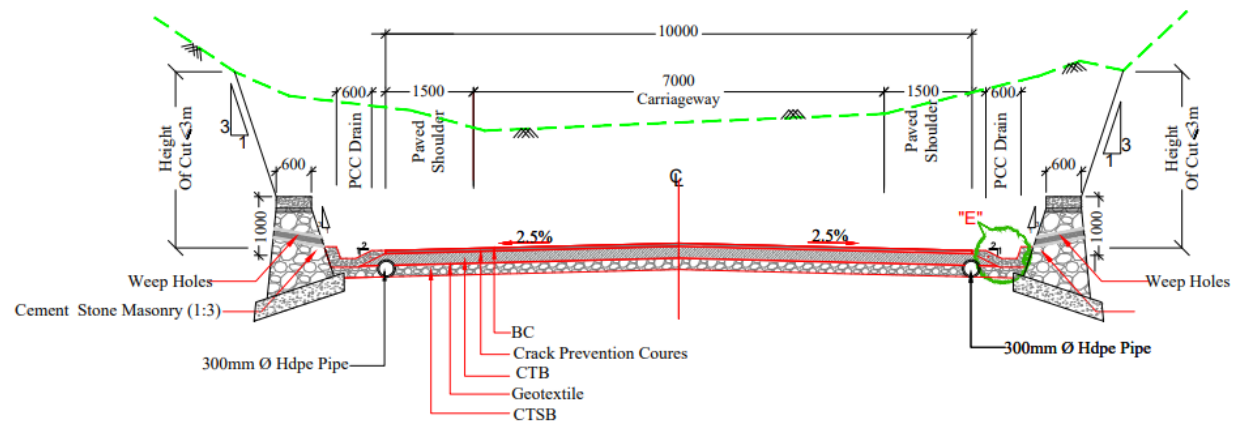


Type - 3A- Typical Cross-Section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Cut With Protection As Applicable
(Reconstruction)

NOTE:-

1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E

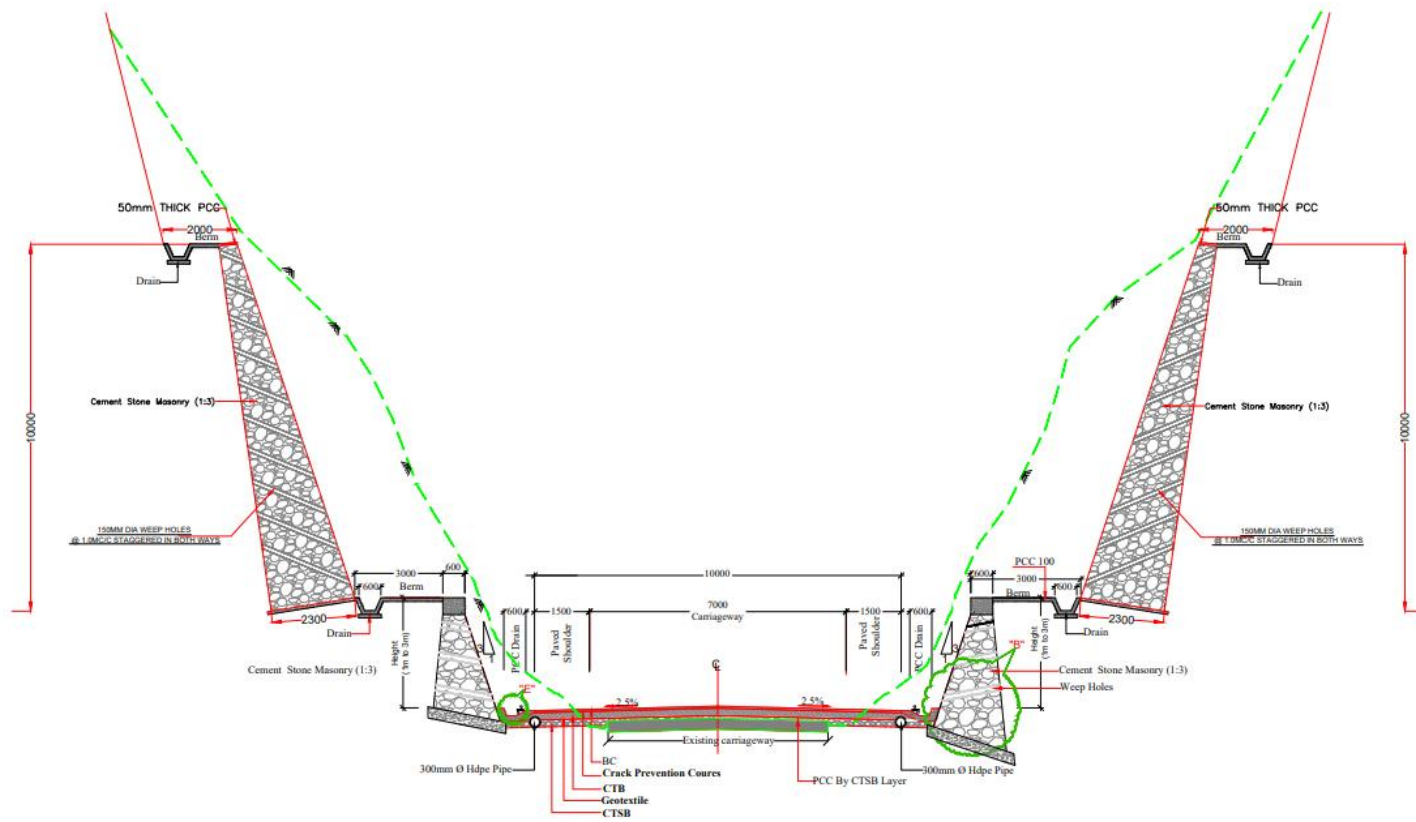




Type - 3C- Typical Cross-Section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Cut With Protection As Applicable
(New Construction)

NOTE:-

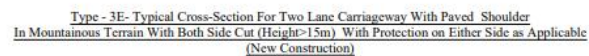
1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



Type - 3D- Typical Cross-Section For Two Lane Carriageway With Paved Shoulder
In Mountainous Terrain With Both Side Cut (Height > 15m) With Protection on Either Side as Applicable
(Reconstruction)

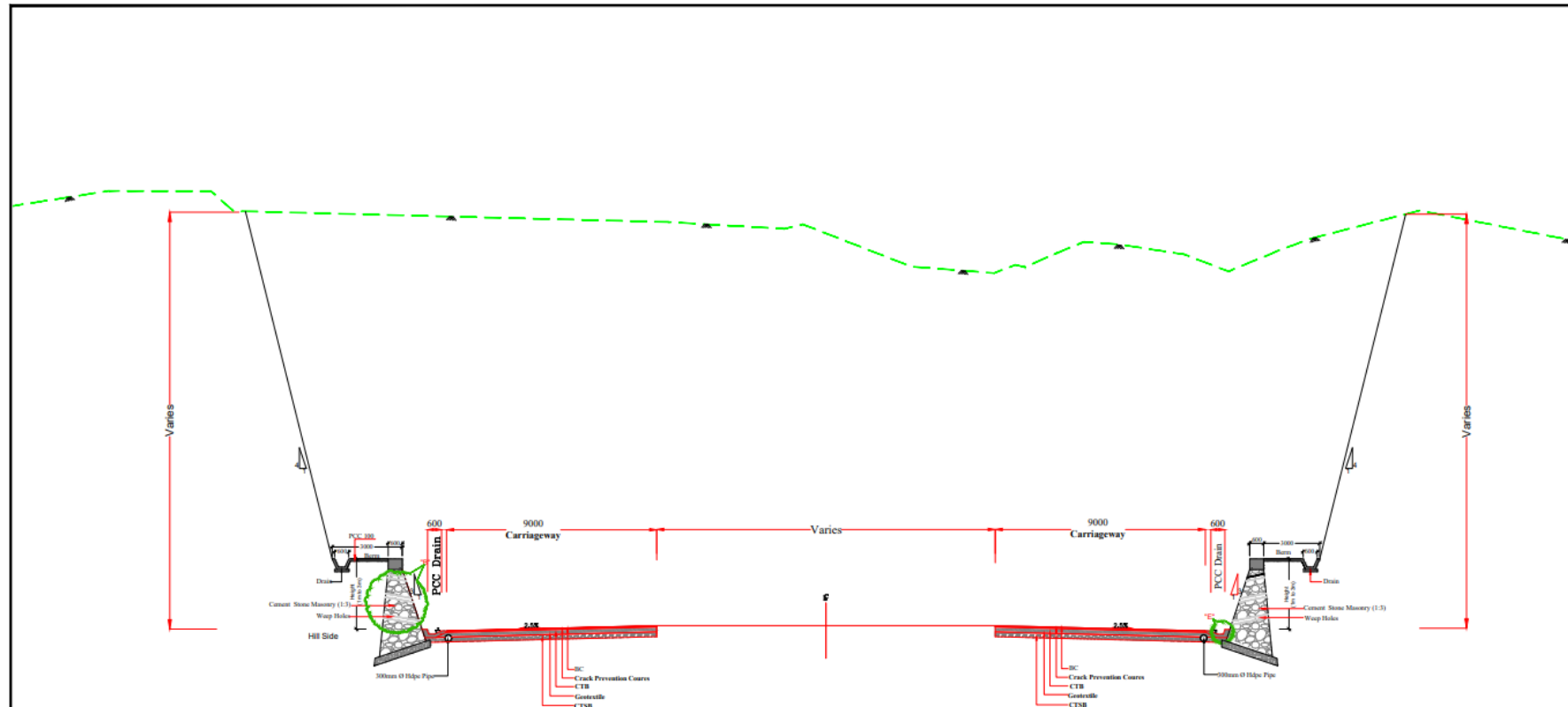
NOTE:-

1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



1.All Dimension in millimeters except otherwise specified

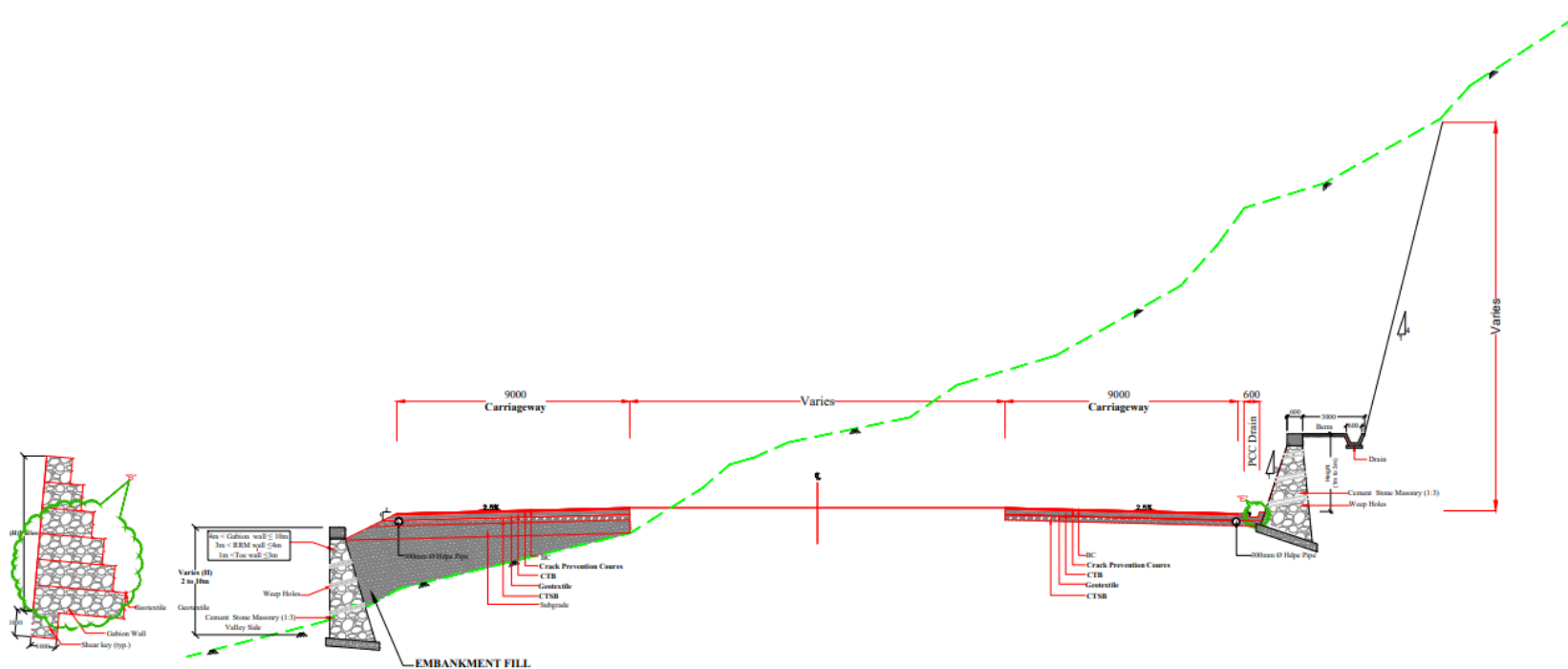
- 18



Type - 05 - Typical Cross Section For Tunnel Approach With Both Side Cut With Protection On Either Side As Applicable (New Construction)

NOTE:-

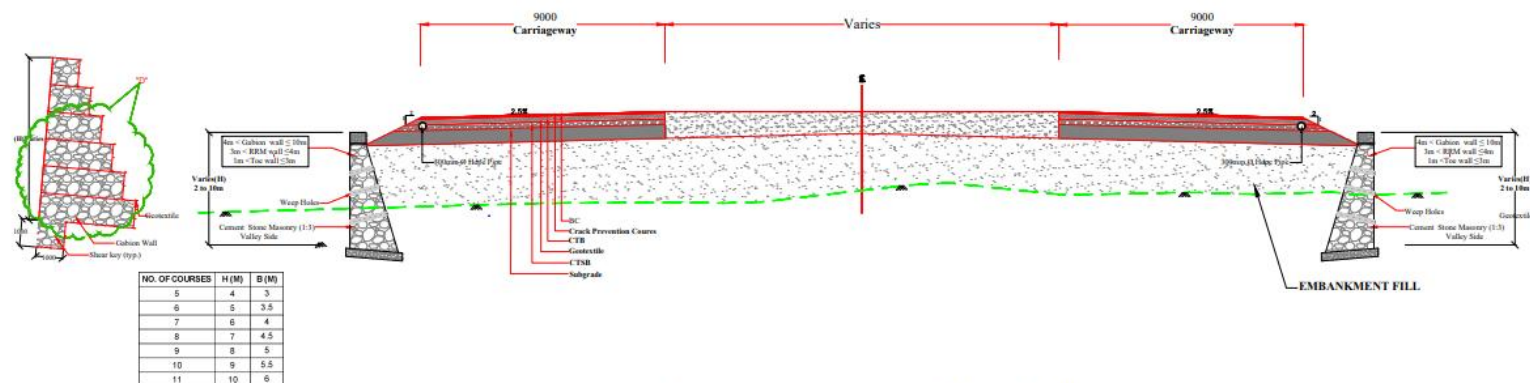
1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



Type -06- Typical Cross Section For Tunnel Approach With One Side Cut & One Side Fill With Protection
On Either Side As Applicable (new Construction)

NOTE:-

1. All Dimension in millimeters except otherwise specified
2. Extra widening will be provided where radius of horizontal curve is less than 300m.
3. Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
4. Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
5. Gabion wall shall be provided where height of embankment is greater than 4 m.
6. Breast wall Shall be provided where height of cut is greater than 1m.
7. No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
8. Refer Standard drawing for Details of Section - A" B" & C" E



Type - 07-Typical Cross-section For Tunnel Approach With Both Side Fill With Protection As Applicable (New Construction)

NOTE:-

- 1.All Dimension in millimeters except otherwise specified
- 2.Extra widening will be provided where radius of horizontal curve is less than 300m.
- 3.Toe wall Shall be provided where height of embankment is less than 3m. & greater than 1m.
- 4.Retaining wall Shall be provided where height of embankment is greater than 3m. & less than 4m.
- 5.Gabion wall shall be provided where height of embankment is greater than 4 m.
- 6.Breast wall Shall be provided where height of cut is greater than 1m.
- 7.No protection is required when height of fill is less than 2 m and height of cut is less than 1 m.
- 8.Refer Standard drawing for Details of Section - A" B" & C" E

Schedule – C

(See Clause 2.1)

Project Facilities

1. Project Facilities

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

- (a) toll plaza[s];
- (b) roadside furniture;
- (c) pedestrian facilities;
- (d) tree plantation;
- (e) truck lay-byes;
- (f) bus-bays and bus shelters;
- (g) Facility for Authority and the Authority Engineer;
- (h) Helicopter services;
- (i) Training Facility & Capacity Building Infrastructure;
- (j) International Study Visit / Knowledge Sharing Programme;
- (k) others to be specified

2. Description of Project Facilities

Each of the Project Facilities is described below:

a) Toll plaza

Sl. No.	Project Facility	Location	Design Requirements	Other essential details
Nil				

b) Roadside Furniture

Traffic signs, kilometer stone (5th km, km and hectometer), Road marking, Road Delineator, Crash barrier, Road studs etc. shall be provided as per section 11 of manual.

c) Pedestrian Facilities

Street lighting/High mast shall be provided at the location interchange i.e., Major junction, Major Bridge, inside & outside of Tunnel location as per manual.

d) Tree Plantation

Tree plantation shall be done within the available land within the ROW @ one row of 333 plants on each side of the project highway. The number and type of species shall be fixed in consultation with Authority Engineer/Authority for the entire project Highway conforming to provisions and guidelines of IRC: SP:21-2009 and IRC: SP:73-2018.

e) Truck lay-bye

Locations for proposed truck lay-byes is as follows:

S. No.	Design Chainage	Side
Nil		

f) Bus-Bays and bus shelters

Bus bays & Bus Shelters have been proposed in the project road location may be fixed with the consultation with Authority Engineer and local authority. Tentative location is as given below:-

Sl. No.	Design Chainage in km	Side
1	114+500	Both
2	115+430	Both

Sl. No.	Design Chainage in km	Side
3	117+860	Both
4	118+760	Both
5	121+670	Both
6	123+760	Both
7	124+600	Both
8	125+975	Both
9	140+465	Both
10	142+015	Both
11	144+010	Both
12	145+910	Both
13	146+510	Both
14	147+810	Both
15	149+010	Both

g) Facilities for the Authority and the Authority Engineer

Facilities for the Authority and Authority's Engineer are to be provided within 06 months of appointed date as per Annexure-I of Schedule-C.

h) Helicopter Services

Contractor shall provide helicopter (Twin Engines) services from Jammu airport to project site and return for half day (Four Hours) twice a month on the request of the Authority. Additional or less usage of Helicopter service can be adjusted in subsequent months. The Contractor shall provide the Helicopter service within one month from the appointed date and shall be provided and maintained until issue of the Taking Over Certificate for the complete work.

i) Training Facility & Capacity Building Infrastructure

Training Facility & Capacity Building Infrastructure for the Authority and Authority's Engineer are to be provided as per Annexure-II of Schedule-C.

j) International Study Visit / Knowledge Sharing Programme

The Contractor shall organize and facilitate an International Study Visit and Knowledge Sharing Programme for officers and personnel nominated by the Authority to enable exposure to international best practices in the planning, design, construction, operation, maintenance, asset management, safety, and environmental sustainability of highway and tunnel infrastructure projects. The programme shall include technical visits to relevant infrastructure facilities, interactions with international experts and agencies, workshops, seminars, and knowledge exchange sessions covering advanced construction technologies, project management practices, intelligent transportation systems, tunnel safety systems, operation and maintenance methodologies, and other innovative engineering solutions applicable to the Project. The Contractor shall make all necessary arrangements, including international and domestic travel, visas, accommodation, local transportation, technical coordination, interpreters (where required), training materials, and logistical support. The number of participants, destination country/countries, duration of the programme, itinerary, and technical agenda shall be finalized in consultation with and subject to the approval of the Authority. Upon completion of the programme, the Contractor shall submit a comprehensive report documenting the technical learnings, recommendations, and applicability of the international practices to the Project. All costs associated with the programme shall be deemed to be included in the Contract Price, and no separate payment shall be made on this account.

k) Other Facilities

As per the direction of Engineer-in-charge.

Annexure-I
(SCHEDULE- C)

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

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

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

Offices	Accommodation for Authority Staff	Accommodation for Authority Engineer Staff
Core Office and Work Site offices	ED/GM: 2	Team Leader (T/L): 1
	Dy. General Manager (DGM).....2	Other Key Experts 7
	Manager /Site Engineer.....6	Sub-Professional Staff 7
	Office Supporting Staff.....9	Office Supporting Staff 9
	Visiting Officials.....5	Visiting Experts.....3

Note (1): Site Office: The layout shall be prepared by the Contractor and submitted for review and approval by the Authority's Engineer/ Authority. The locations shall be confirmed by the Authority's Engineer/ Authority.

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

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

1.1.1 Construction of Site Offices

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

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

a. Basic Layout

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

(1) Core Office – Office Type 1:

Minimum Area: 400 sqm for Authority, 150 sqm Authority Engineer and 150 sqm common area. The tentative area requirements are given below:

- (i) One office room for Team Leader.....25 sqm
- (ii) Two office room for the ED/GM, NHIDCL. 25 sqm each
- (iii) Office room for DGM, NHIDCL.....20 sqm each
- (iv) Office room for Other Key Experts of AE..... 15 sqm
- (v) One office room for Manager/Site Engineer of Authority 50 sqm
- (vi) One office room for Sub-Professional Staff of AE..... 50 sqm
- (vii) One Meeting/Conference Room (Common)..... 40 sqm

- (viii) One reception/administration office room (Common).... 50 sqm
- (ix) One office room for working tables..... 20 sqm
- (x) 2 kitchen (Pantry) plan area well equipped with sink, draining board, cupboards, shelving, etc. 10 sqm each
- (xi) Male (3) and Female (1) toilets with shower and wash-hand basin facilities for the sole use of the Authority's representative, International Experts, National Experts, and administration staff (office manager and secretaries) 4 units
- (xii) Male (2) toilets for Sub-Professional and Supporting staff 2 units
- (xiii) Corridor for connecting all rooms (approx..60 sqm) 2m width
- (xiv) Parking for the vehicles used by the Authority and Authority's Engineer and visitor's vehicles 12 veh.

(2) Site Office – Office Type 2: (to be provided at all work sites i.e., both portals, three shaft locations and plant area)

b. Basic Requirements

- (i) The Contractor shall, not later than 15 days after the starting date, submit full details of the Design Drawings to the Authority's Engineer, including floor plans, elevations, construction principles and materials, before commencing the erection of the facilities.
- (ii) The Contractor shall be responsible for raising the ground (if necessary), grading and drainage in the vicinity of the building(s), with suitable access and walkways. The Contractor shall construct a covered hard-standing parking area, for the exclusive use of the Authority's Engineer and his visitors and respective access road to the parking area. The access road shall be paved and hard enough in order to be transited even during heavy rains. Outside lighting shall be installed around the buildings and the parking area, and appropriate signs shall be erected to indicate the purpose of the facilities.
- (iii) All facilities shall conform to current fabrication standards for the required types. The facilities described above shall represent the minimum requirements. The Contractor shall provide all additional incidentals and necessary items, so that the facilities will be completely adequate and satisfactory in every respect for their intended use. Painting both the exterior and the interior shall be as agreed with the Authority's Engineer.
- (iv) The building shall be complete with all services connected with clean water supply by water bowser (including elevated water tank and the tower for capacity of 3,000 liters for Office Type 1), electricity and sewerage. Each room shall be provided with at least four electrical outlet sockets. All power shall be 220V-240V, 50Hz except where otherwise agreed by the Authority's Engineer. All rooms shall be illuminated by fluorescent lighting. Each toilet shall be provided with a flushing toilet and warm water hand washing and shower facilities and extractor fans.
- (v) Telephone services (minimum 3 telephone lines and 6 extension lines completed with equipment for the office), including international direct dialing shall be provided. In addition, extra lines shall be provided for facsimile and internet connections. Each office shall be equipped with a telephone connected to the main reception telephone.
- (vi) Offices and meeting rooms shall be air-conditioned. The air-conditioning may be either individual units or a central ducted system and shall be adequate to maintain temperature of neither be more than 24°C (dry bulb) nor less than 15°C. The noise level of the air-conditioning while working should be sufficiently low to allow normal voice level discussions to take place.
- (vii) Office rooms shall be capable of providing at all times environmental conditions suitable for the operation of specified electronic office equipment.
- (viii) The building shall be weatherproof, fire protected, heat-insulated and secured. Windows shall give adequate light and ventilation and be protected with metal mosquito-proof gauze and have security bars and Venetian, or other approved sun blinds. Ceiling height above the floor level shall be at least 2.75 m. All internal walls shall be sound insulated. Floors shall be PVC tile covered. In

toilets and other washing areas the floors shall have drains to assist cleaning.

1.1.2 Maintaining and Servicing of the Offices

- (i) The construction of the new office building for the Authority's Engineer shall be completed within 60 days since the date of commencement of the Contract and shall be equipped and maintained by the Contractor to the satisfaction of the Authority's Engineer until 3 months after the issue of a Completion Certificate for the Works or such earlier time as instructed by the Authority's Engineer whereupon the furniture shall be removed and any internal partition walls modified as required by the Authority's Engineer.
- (ii) The Contractor shall provide all laborers, materials and equipment for maintaining and cleaning offices, furniture and fittings. The Contractor shall replace and/or restore, as directed, any facilities or parts thereof that become damaged, worn out, lost or stolen. The Contractor shall provide an adequate stock of all expendable and consumable items including refreshments, clean water supply and drinking water, paper towels, toilet rolls, soaps, washing up liquid, brooms/mops and shall ensure proper and continuing functioning of all components and parts of the facilities during the contract period.
- (iii) The Offices shall be provided with waste disposal material, and these shall be emptied and disposed of daily by the Contractor.

1.1.3 Equipment and Expenses for Running-Off the Offices

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

Table: Furniture and Equipment for Site Offices (each office)

Item	Unit	Quantity for Core office	Quantity for each of work site office	Remarks
Refrigerator deodorizer and no-frost system)	unit	2	1	Office Type 1: 300liters' minimum capacity
Deep Freezer	Unit	1	-	
Water Dispenser (19 liters capacity including bottles and 6 spares bottles/gallon)	set	4	2	Office Type 1
Electric Kitchen Stove	unit	2	1	Size and model shall be discussed
Electric Kettle	unit	2	1	
Diesel Generator Set	unit	1	-	Office Type 1: 125 KVA

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

1.2.1 Accommodation

- (1) General
 - (i) Immediately after the date for Commencement of Works, during the first 3 months or until the permanent installations are prepared and approved, the Contractor shall provide rented houses as per the accommodation for all staff of the Authority's Engineer.
 - (ii) The accommodation shall be equipped with security grilles and mosquito netting, and shall be fully furnished and equipped with new items by the Contractor to the satisfaction of the Authority's Engineer, including curtains, linen, blankets, glassware, cutlery, crockery and kitchen utensils.
 - (iii) Each house shall be wired to permit the use of standby generators as well as mains for the supply of electricity. The generators shall be fitted with automatic starting switchgear if so directed by

the Engineer. Covered, hard standing areas for positioning generators and storing fuel shall be provided.

- (iv) Each house designated for the Engineer's International Experts and National Experts shall be provided with one telephone line and internet connection. Telephone installation shall be made by the Contractor but the cost of calls shall be paid by the Authority's Engineer staff.
- (v) Each house shall be provided with a TV (including cable and satellite connection). The installation shall be made by the Contractor, but the cost of calls shall be paid by the Authority's Engineer staff.
- (vi) Each house shall be provided with hot and cold water in the kitchen and the bathrooms.
- (vii) The Contractor shall provide watchmen for security purposes to the approval of the Authority's Engineer.
- (viii) The accommodation shall be available and ready for occupation within the number of days approved by the Authority's Engineer after the Commencement Date.
- (ix) In the event that the Contractor fails to provide the required accommodation within the time specified or subsequently agreed by the Authority's Engineer, the Contractor shall provide, at no cost to the Employer, suitable hotel accommodation until such time as the accommodation is ready for occupation.
- (x) When a house is no longer required by the Authority's Engineer, all furniture, fittings and equipment provided by the Contractor for that house shall become the property of the Contractor.

(2) Housing Types

(A). House for the Authority near to Core Office (ED/ GM, NHIDCL)

Two residential accommodation, internal floor area approximately 100sqm comprising 1 x sitting room, 1 x dining room, 1 x bedroom with attached bathrooms, 1 additional bathroom, 1 x kitchen, 1 x office, 1 x veranda. Temperature control arrangements to the sitting room, dining room and bedrooms.

(B). Accommodation for the Authority near to Core Office (Other Staff: 1 per 1 person)

Bachelor's accommodation having internal floor area approximately 40 sqm (03 nos.) and other of 25 sqm with attached bathrooms.

(C). Team Leader (Authority's Engineer)

One residential accommodation, internal floor area approximately 100sqm comprising 1 x sitting room, 1 x dining room, 1 x bedroom with attached bathrooms, 1 additional bathroom, 1 x kitchen, 1 x office, 1 x veranda. Temperature control arrangements to the sitting room, dining room and bedrooms.

(D). Other Key Experts and Sub-Professional /Supporting Staff

Bachelor's accommodation having internal floor area approximately 25 sqm with attached bathrooms.

Note: (1) All the residential accommodation must have temperature control facility so that temperature is neither more than 24°C nor less than 15°C.

(3) Maintenance

- (i) The Contractor shall be responsible for supplying all utilities, including electricity (whether by mains or generator), water, timber for open fires, drainage and telephone services, and shall meet the cost of these services, except the cost of telephone calls.
- (ii) The Contractor shall maintain the accommodation, and all furniture, fittings and equipment, whether supplied by him or not, in good repair and to the satisfaction of the Authority's Engineer as long as such accommodation is occupied by the staff of the Authority & Authority's Engineer for the purposes of the Contract.

**Annexure-II
(SCHEDULE-C)**

TRAINING FACILITY & CAPACITY BUILDING INFRASTRUCTURE

1. GENERAL

1.1 This Annexure-II to Schedule-C forms an integral part of the Contract Agreement ("Agreement").

1.2 The Contractor shall design, construct, establish, operate and maintain the Project Facilities described herein in accordance with the Agreement, Applicable Laws, Applicable Permits and Good Industry Practice.

1.3 Without prejudice to the generality of the foregoing, the Contractor shall establish and operate a dedicated Training and Capacity Building Facility in accordance with this Annexure.

2. TRAINING FACILITY – ESTABLISHMENT OBLIGATION

2.1 Objective

The Training Facility shall serve as a structured skill development and upskilling centre for highway construction personnel engaged in the Project, particularly for tunnels in Himalayan region and North-Eastern terrain conditions.

2.2 Location

The Training Facility shall be established at West portal of the Project or at such other location as may be approved in writing by the Authority.

2.3 Minimum Infrastructure Requirements

(a) Built-Up Area: Minimum 5000 sqm; G+1 RCC structure. The Architectural Drawing shall be approved by Authority.

(b) Academic Infrastructure: Two Smart Classrooms; One Conference Room; Audio-visual systems; Internet-enabled systems; Digital knowledge repository.

(c) Residential Infrastructure: Accommodation for minimum 30 Technician trainees and 18 Officer trainees; Twin-sharing rooms; Separate trainer accommodation; Mess and sanitation facilities.

(d) Utilities: Power backup; Water supply; Fire & safety compliance; Basic security systems including CCTV.

3. TIMELINE FOR COMPLETION

3.1 The Training Facility shall be completed prior to Construction Milestone-I and in any event within **640 (Six Hundred and Forty) days** from the Appointed Date.

3.2 Completion of the Training Facility shall be a pre-condition for certification of Construction Milestone-I.

4. TRAINING PROGRAMME REQUIREMENTS

4.1 Scope of Training

The Contractor shall conduct structured training covering the following trades:

- (a) Planning of tunnels
- (b) Rock & soil behaviour in fault zones and drainage
- (c) Excavation and NATM
- (d) Emergency response
- (e) Ventilation
- (f) Ecology, environment and safety

Minimum **10% of the workforce** deployed on the Project shall undergo structured training.

4.2 Duration of Courses

- (a) 1-week Awareness Programmes
- (b) 2-week Intermediate Programmes
- (c) 4-week Advanced Technical Programmes
- (d) 12-week Certification Programmes

5. KNOWLEDGE PARTNER

5.1 The Authority may appoint a Knowledge Partner for curriculum design, training of trainers, assessment and certification.

6. ROLE OF AUTHORITY ENGINEER

6.1 The Authority Engineer shall deploy:

- (a) One (1) Training Coordinator (Full-Time)
- (b) Two (2) Assistant Training Coordinators (Full-Time)

6.2 The Training Coordinator shall oversee operations of the Training Facility, prepare case studies, monitor training quality and submit Monthly Reports to the Authority.

6.3 The Authority Engineer shall approve the design of the training facility building and supervise its Construction.

7. ROLE OF CONTRACTOR

7.1 This Annexure-II is applicable in entirety for Contractor for Project stretch

7.2 Other than above, the Contractor for the project shall be responsible for providing access to the project site and facilitating trainees on its respective project packages.

7.3 Contractor for Project shall be responsible for having their manpower trained at the training facility covered in this Annexure, to an extent of 10% of its manpower for duration minimum 2 months.

7.5 Training Coordinator – Each of the Contractor shall appoint at its own cost one adequately qualified and experienced training coordinator and the same shall be intimated to the Authority Engineer and the Authority.

8. FINANCIAL PROVISIONS

8.1 The capital cost of the Training Facility shall be paid separately for an estimate as per latest J&K. It is to clarify that the determination of cost of change of scope (if any), the same SOR rate shall be applicable for items of works without any updation to Base date. The Tender

premium / discount shall be applied over the cost estimate for the purpose of cost payable to the Contractor.

8.2 The Authority shall reimburse Rs. [*****] per trainee per batch and Rs. [****] per month towards operational support during the Construction Period to Contractor.

8.3 The Training Facility shall constitute a Project Asset, and ownership shall vest with the Authority.

9. OPERATION DURING O&M PERIOD

9.1 During the O&M Period, the Facility shall continue as a knowledge and training hub.

10. REPORTING REQUIREMENTS

The Contractor shall submit:

- (a) Monthly Training Progress Reports
- (b) Attendance and Certification Records
- (c) Skill Assessment Sheets
- (d) Safety Compliance Integration Reports
- (e) Photographic Documentation

11. NON-COMPLIANCE

Failure to comply with this Annexure-II to Schedule-C shall constitute a Material Breach and may result in withholding of Milestone Payments, deduction in Annuity Payments, or invocation of Performance Security in accordance with the Agreement.

Schedule - D

(See Clause 2.1)

Specifications and Standards

1. Construction

The Contractor shall comply with the Specifications and Standards set forth in Annex- I & Attachment D1 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 2-Laning of Highways IRC: SP: 73: 2018, referred to herein as the Manual for the road work.

Guidelines for road Tunnel IRC: SP:91- 2019, referred to herein as the Manual for the tunnel work.

Annex – I
(Schedule-D)

Specifications and Standards for Construction

1. Specifications and Standards

All Materials works and construction operations shall conform to the Manual of Specifications and Standards for Two-Laning of Highways IRC:SP:73-2018, Hill Road Manual (IRC:SP: 48-2023) and Guidelines for Road Tunnel(IRC SP:91: 2019) referred to as the Manual, and MORTH Specifications for Road and Bridge Works. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2. Deviations from the Specifications and Standards

- (i) The terms “Concessionaire”, “Independent Engineer” and “Concession Agreement” used in the Manual shall be deemed to be substituted by the terms “Contractor”, “Authority's Engineer” and “Agreement” respectively.
- (ii) Notwithstanding anything to the contrary contained in Paragraph 1 above, the following Specifications and Standards shall apply to the Project Highway, and for purposes of this Agreement, the aforesaid Specifications and Standards shall be deemed to be amended to the extent set forth below:
- (iii) [Note 1: Deviations from the aforesaid Specifications and Standards shall be listed out here. Such deviations shall be specified only if they are considered essential in view of project-specific requirements.]

Sl. No.	Item	Provisions	Deviation
1	Width of Structure	For open country/rolling terrain total width of the structure should be 18 m as per Clause 7.3(ii) of IRC: SP:73-2018(Fig.- 7.6). No width of structure /bridges for mountainous/hilly terrain.	Provided total width of structure/Viaduct cum bridge/Viaduct/bridges –10m (paved carriageway width 9m) and 12.5m (paved carriageway width 11.5 m).
3	Raised footpath /inspection path	Annexure-B (Page no 104) Para 2e in IRC: SP:91-2019 (1.5m with railing)	Provided 1m raised footpath without railing.

3. Following MoRT&H circulars are also to be followed :-

S. No.	Policy Circular No.	Dated	Subject
1	Efile No. RW/NH. 33044/55/2021-S&R (P&B)pt. /Hill Slope Monitoring (Computer No.219394)	28 November 2024	Expert Committee Report on Cost Effective Long-term Remedial Measures for Landslide Prone Areas In Hilly Regions.
2	Efile No. RW/NH 33044/27/2024/S&R(PG B) (Computer No. 243038)	23 September 2024	Policy Guidelines on use of Inert Material in construction of National Highways.

S. No.	Policy Circular No.	Dated	Subject
3	Efile No. RW/NH-34066/09/2017/S&R(B) (Computer No. 185417)	12 February 2021	Reinforcing Steel Bars (Clause 1000.9.3.1 of Ministry's Specifications for Road and Bridge Works).
4	Efile No. RW/NH-34066/09/2017/S&R(B) (Computer No. 185417)	22 January 2021	Use of Stainless Steel Reinforcing Steel Bars in Bridges on National Highways and other centrally sponsored projects to be constructed in marine Environment Susceptible to Severe Corrosion.
5	EFile No. RW/NH: 34049/01/2020-S&R (PEB)pt No.-207229) (Computer No.207229)	20 September 2024	Use of New/ Alternative Material and Technology in Construction and Maintenance of National Highways Projects and adoption of Value Engineering Practices therein.
6	Efile No. RW/NH-35083/02/2024-S&R (Computer No. 238879)	26 TH Nov.2024	Use of Waste Plastic in Bituminous Concrete Wearing Course Mix In National Highways Construction & Maintenance Works.
7	EFile No. RW/NH: 35072/05/2018-S&R (P&B) No. 165688) (Computer	19 April, 2024	Recommended Bitumen Type & Grade for Different Climate it Traffic Loading for National Highway and Expressway Works in India.
8	EFile No. RW/NH- 23 35072/05/2018-SER (P&B) (E165688)	23 rd August, 2023	Use of Bitumen: Demand-Supply. Type & Grade, Specifications, Source of Procurement and Quality in Construction Highways Projects. of National
9	EFile No. RW/NH-36098/25/2022-5GR (P&B)/pt.	16 March, 2023	Safety in Road Construction Zones In National Highway Projects effective and adequate measures to be taken.
10	EFile No: RW/NH-33044/10/2021-S&R(P&B)(171909)	15 March, 2023	Reuse of materials reclaimed from existing pavement layers
11	Efile No. RW/NH-36098/17/2022/S&R(B)	2 January, 2023	Provisions of crash barriers in existing bridges.
12	EFile No.RW/NH: 33049/01/2020-S&R (B) Pt.	22 February, 2022	Use of Ultra High Performance Fiber Reinforced Concrete (UHPFRC) in Design & Construction of Structures/Bridges of National Highways.
13	Efile No. 33044/04/2022-S&R(P&B)	15 February, 2022	Use of dynamite on hills/mountains for the construction of roads.

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 Paragraph 2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfillment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 14.6 of this Agreement, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.
- (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, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Authority's Engineer.

4. Extension of time limit

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

5. Emergency repairs/restoration

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

6. Daily inspection by the Contractor

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

7. Pre-monsoon inspection / Post-monsoon inspection

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and drainage system before [1st June] every year in accordance with the guidelines contained in IRC: 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

(a) 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 and deficiencies

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

Table -1: Maintenance Criteria for Pavements:

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specifications
		Desirable	Acceptable					
Flexible Pavement (Pavement of MCW, Service Road, Approaches of Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Potholes	Nil	< 0.1 % of area and subject to limit of 10 mm in depth	Daily	Length Measurement Unit Tape, like Scale, odometer etc.	IRC 82: 2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003 (http://www.tfhr.com/pavement/ltp/reports/03031/)	24-48 hours	MORT&H Specification 3004.2
	Cracking	Nil	< 5 % subject to limit of 0.5 sqm anyfor 50 m length	Daily			7-15 days	MORT&H Specification 3004.3
	Rutting	Nil	< 5 mm	Daily	Straight Edge		15 -30 days	MORT&H Specification 3004.2
	Corrugations and Shoving	Nil	< 0.1 % of area	Daily	Length Measurement Unit like		2-7 days	IRC:82- 2015
	Bleeding	Nil	< 1 % of area	Daily			3-7 days	MORT&H Specification 3004.4
	Raveling /Stripping	Nil	< 1 % of area	Daily	Scale, Tape odometer etc.		7-15 days	IRC:82- 2015 read with IRC SP 81

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specifications
		Desirable	Acceptable					
	Edge Deformation/ Breaking	Nil	< 1 m for any 100 m section and width < 0.1 m at any location, restricted to 30 cm from the edge	Daily			7- 15 days	IRC:82- 2015
	Roughness BI	2000 mm/km	2400 mm/km	Bi- Annually	Class I Profilometer SCRM (Sideway- force Coefficient Routine Investigation Machine equivalent)	Class I Profilometer : ASTM E950 (98) :2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer	180 days	IRC:82- 2015
	Skid Number	60SN	50SN	Bi- Annually		Established Inertial Profiling Reference	180 days	BS: 7941-1: 2006
	Pavement Condition Index	3	2.1	Bi- Annually		ASTM E1656 -94: 2000- Standard Guide for Classification of Automatic Pavement Condition Survey Equipment	180 days	IRC:82- 2015
	Other Pavement Distresses			Bi- Annually			2-7 days	IRC:82- 2015
	Deflection/ Remaining Life			Annual ly	Falling Weight Deflectometer	IRC 115: 2014	180 days	IRC:115- 2014
Rigid Pavement	Roughness BI	2200m m/km	2400mm /km	Bi- Annually	Class I Profilometer	ASTM E950 (98) :2004 and ASTM E1656 94: 2000	180 days	IRC:SP:83- 2008

EPC AGREEMENT & TECHNICAL SCHEDULE

(Pavement of MCW, Service Road, Grade structure, approaches of connecting road, slip roads, lay byes etc. as applicable)	Skid	Skid Resistance no. at different speed of vehicles	Bi- Annually	SCRIM (Sideway- force	IRC:SP:83-2008	180 days	IRC:SP:83-2008
		Minimum SN 36 33 32 31 31	Traffic Speed (Km/h) 50 65 80 95 110		Coefficient Routine Investigation Machine or equivalent)		
Embankment/ Slope	Edge drop at shoulders	Nil	40m	Daily	Length Measurement Unit like Scale, Tape, odometer etc.	IRC	MORT&H Specification 408.4
	Slope of camber/cross fall	Nil	<2% variation in prescribed slope of camber /cross fall	Daily			MORT&H Specification 408.4
	Embankment Slopes	Nil	<15 % variation in prescribe side slope	Daily			MORT&H Specification 408.4
	Embankment Protection	Nil	Nil	Daily	NA		MORT&H Specification

EPC AGREEMENT & TECHNICAL SCHEDULE

	Rain Cuts/ Gullies in 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 following table

Table -2: Maintenance Criteria for Rigid Pavements:

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
CRACKING						
1	Single Discrete Cracks Not intersecting with any joint	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	Not applicable
			1	w < 0.2 mm. hair cracks		
			2	w = 0.2 - 0.5 mm, discernible from slow-moving car	Seal without delay	Seal, and stitch if L > 1m. Within 7days
			3	w = 0.5 - 1.5 mm, discernible from fast-moving car		
			4	w = 1.5 - 3.0 mm	Seal, and stitch if L > 1 m. Within 7 days	Staple or Dowel Bar Retrofit, FDR for affected portion. Within 15days
			5	w > 3 mm.		
2	Single Transverse (or Diagonal) Crack intersecting with one or more joints	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks	Route and seal with epoxy. Within 7 days	Staple or Dowel Bar Retrofit. Within 15days
			2	w = 0.2 - 0.5 mm, discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Route, seal and stitch, if L > 1 m.	

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
					Within 7 days	
			4	$w = 3.0 - 6.0 \text{ mm}$	Dowel Bar Retrofit. Within 15 days	Full Depth Repair Dismantle and reconstruct affected.
			5	$w > 6 \text{ mm}$, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, as it may be full depth	Portion with norms and specifications - See Para 5.5 & 9.2 Within 15days
3	Single Longitudinal Crack intersecting with one or more joints	$w = \text{width of crack}$ $L = \text{length of crack}$ $d = \text{depth of crack}$ $D = \text{depth of slab}$	0	Nil, not discernible	No Action	
			1	$w < 0.5 \text{ mm}$, discernible from slow moving vehicle	Seal with epoxy, if $L > 1 \text{ m}$. Within 7 days	Staple or dowel bar retrofit. Within 15days
			2	$w = 0.5 - 3.0 \text{ mm}$, discernible from fast vehicle	Route seal and stitch, if $L > 1 \text{ m}$. Within 15 days	-
			3	$w = 3.0 - 6.0 \text{ mm}$	Staple, if $L > 1 \text{ m}$. Within 15 days	Partial Depth Repair with stapling. Within 15 days
			4	$w = 6.0 - 12.0 \text{ mm}$, usually associated with spalling		

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			5	w > 12 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, as it may be full depth	Full Depth Repair Dismantle and reconstruct affected portion as per norms And specifications - See Para 5.6.4 Within 15 days
4	Multiple Cracks intersecting with one or more joints	w = width of crack	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks	Seal, and stitch if L > 1	
			2	w = 0.2 - 0.5 mm. discernible from slow vehicle	m. Within 15 days	
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Full depth repair within 15 days	Dismantle, Reinstall subbase, Reconstruct whole slab as per specifications within 30 days
			4	w = 3.0 - 6.0 mm panel broken into 2 or 3 pieces		
			5	w > 6 mm and/or panel broken into more than 4 pieces		
5	Corner Break	w = width of crack L = length of crack	0	Nil, not discernible	No Action	-
			1	w < 0.5 mm; only 1 corner broken	Seal with low viscosity epoxy to secure broken parts	Seal with epoxy seal with epoxy Within 7 days
			2	w < 1.5 mm; L < 0.6 m, only one corner broken	Within 7 days	
			3	w < 1.5 mm; L < 0.6 m, two corners broken	Partial Depth (Refer Figure	Full depth repair

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			4	$w > 1.5$ mm; $L > 0.6$ m or three corners broken	8.3 of IRC:SP: 83-2008) Within 15 days	Reinstate sub-base, and reconstruct the slab as per norms and specifications within 30days
			5	three or four corners broken		
6	Punch out (Continuous Concrete Pavement only)	Applicable to Reinforced Concrete (CRCP) w = width of crack L = length (m/m ²)	0	Nil, not discernible		No Action
			1	$w < 0.5$ mm; $L < 3$ m/m ²	Applicable, as it may be full depth	Seal with low viscosity epoxy to secure broken parts. Within 15days
			2	either $w > 0.5$ mm or $L < 3$ m/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 and replace damaged area taking care not to damage reinforcement. Within 30days
			5	$w > 3$ mm, $L > 3$ m/m ² and deformation		
7	Raveling Honeycomb surface	r = area damaged surface/total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term	Long Term
					No action.	Not Applicable
			1	$r < 2$ %	Local repair of areas damaged and liable to be damaged.	

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			2	$r = 2 - 10 \%$	Within 15 days	
			3	$r = 10-25\%$	Bonded Inlay, 2 or 3 slabs if affecting.	
			4	$r = 25 - 50 \%$	Within 30 days	
			5	$r > 50\%$ and $h > 25 \text{ mm}$	Reconstruct slabs, 4 or more slabs if affecting.	
					Within 30 days	
8	Scaling	r = damaged surface/total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term	Long Term
			1	$r < 2 \%$	No action.	
			2	$r = 2 - 10 \%$	Local repair of areas damaged and liable to be damaged.	
					Within 7days	Not Applicable
			3	$r = 10 - 20\%$	Bonded Inlay within 15 days	
			4	$r = 20 - 30 \%$		
			5	$r > 30 \%$ and $h > 25 \text{ mm}$	Reconstruct slab within 30 days	
9	Polished Surface/Glazing	t = texture depth, sand patch test	0		No action.	Not Applicable
			1	$t > 1 \text{ mm}$		
			2	$t = 1 - 0.6 \text{ mm}$	Monitor rate of deterioration	
			3	$t = 0.6 - 0.3 \text{ mm}$		
			4	$t = 0.3 - 0.1 \text{ mm}$		

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			5	$t < 0.1 \text{ mm}$	Diamond Grinding 50% or more slabs in a continuous stretch of minimum 5 km. Within 30 days	
10	Popout (Small Hole), Pothole Refer Para 8.4	$n = \text{number/m}^2$	0	$d < 50 \text{ mm}; h < 25 \text{ mm}; n < 1 \text{ per } 5 \text{ m}^2$	No action.	
			1	$d = 50 - 100 \text{ mm}; h < 50 \text{ mm}; n < 1 \text{ per } 5 \text{ m}^2$	Partial depth repair mm deep. Within 30 days	Not Applicable
			2	$d = 50 - 100 \text{ mm}; h > 50 \text{ mm}; n < 1 \text{ per } 5 \text{ m}^2$		
			3	$d = 100 - 300 \text{ mm}; h < 100 \text{ mm}; n < 1 \text{ per } 5 \text{ m}^2$		
			4	$d = 100 - 300 \text{ mm}; h > 100 \text{ mm}; n < 1 \text{ per } 5 \text{ m}^2$		
			5	$d > 300 \text{ mm}; h > 100 \text{ mm}; n > 1 \text{ per } 5 \text{ m}^2$		
Joint Defects						
11	Joint Seal Defects	loss or damage L = Length as % total joint length	0	Difficult to discern.	Short Term	Long Term
					No action.	Not Applicable

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			1	Discernible, $L < 25\%$ but of little immediate consequence with regard to ingress of water or trapping incompressible material.	Clean joint, inspect later.	
			3	Notable. $L > 25\%$ insufficient protection against ingress of water and trapping incompressible material.	Clean and reapply sealant in selected locations. Within 7 days	
			5	Severe; $w > 3$ mm negligible protection against ingress of water and trapping incompressible material.	Clean, widen and reseal the joint. Within 7 days	
			0	Nil, not discernible	No action.	
			1	$w < 10$ mm	Apply low viscosity epoxy resin/ mortar in cracked portion. Within 7 days	Not Applicable
			2	$w = 10 - 20$ mm, $L < 25\%$		
			3	$w = 20 - 40$ mm, $L > 25\%$	Partial Depth Repair. Within 15 days	
			4	$w = 40 - 80$ mm, $L > 25\%$	30 - 50 mm deep, $h = w + 20\%$ of w , within 30 days	
			5	$w > 80$ mm, and $L > 25\%$	50 - 100 mm deep repair. $H = w + 20\%$ of w . Within 30 days	

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
13	Faulting (or Stepping) in Cracks or Joints	f = difference of level	0	not discernible, < 1 mm	No action.	No action.
			1	f < 3 mm		
			2	f = 3 - 6 mm	Determine cause and observe, take action for diamond grinding	Replace slab as the appropriate. Within 30days
			3	f = 6 - 12 mm	Diamond Grinding	
			4	f = 12 - 18 mm	Raise sunken slab.	Replace slab as the appropriate. Within 30days
			5	f > 18 mm	Strengthen subgrade and sub-base by grouting and raising sunken slab	
14	Blowup or Buckling	h = vertical displacement from normal profile	0	Nil, not discernible	Short Term	Long Term
					No Action	
			1	h < 6 mm		
			2	h = 6 - 12 mm	Install Signs to Warn Traffic	
			3	h = 12 - 25 mm	within 7 days	
			4	h > 25 mm	Full Depth Repair. Within 30 days	
			5	shattered slabs, ie 4 or more pieces	Replace broken slabs. Within 30 days	

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
15	Depression	h = negative vertical displacement from normal profile L = length	0	Not discernible, $h < 5\text{ mm}$	No action.	Not Applicable
			1	$h = 5 - 15\text{ mm}$		
			2	$h = 15\text{-}30\text{ mm}$, Nos $<20\%$ joints	Install Signs to Warn Traffic within 7 days	
			3	$h = 30 - 50\text{ mm}$		
			4	$h > 50\text{ mm}$ or $> 20\%$ joints	Strengthen subgrade. Reinstate pavement at normal level	
			5	$h > 100\text{ mm}$	if $L < 20\text{ m}$. Within 30 days	
16	Heave	h = positive vertical displacement from normal profile. L = length	0	Not discernible. $h < 5\text{ mm}$	Short Term	Long Term
					No action.	scrabble
			1	$h = 5 - 15\text{ mm}$	Follow up.	
			2	$h = 15 - 30\text{ mm}$, Nos $<20\%$ joints	Install Signs to Warn Traffic within 7 days	
			3	$h = 30 - 50\text{ mm}$		
			4	$h > 50\text{ mm}$ or $> 20\%$ joints	Stabilise subgrade. Reinstate pavement at normal level if length $< 20\text{ m}$. Within 30 days	
			5	$h > 100\text{ mm}$		
17	Bump	h = vertical displacement from normal profile	0	$h < 4\text{ mm}$	No action	
			1	$h = 4 - 7\text{ mm}$	Grind, in case of new construction within 7 days	Construction Limit for New Construction.

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			3	$h = 7 - 15 \text{ mm}$	Grind, in case of ongoing Maintenance within 15 days	Replace in case of new construction. Within 30days
			5	$h > 15 \text{ mm}$	Full Depth Repair. Within 30 days	Full Depth Repair. Within 30days
18	Lane to Shoulder Dropoff	f = difference of level	0	Nil, not discernible $< 3\text{mm}$	Short Term No action.	Long Term
			1	$f = 3 - 10 \text{ mm}$	Spot repair of shoulder within 7 days	
			2	$f = 10 - 25 \text{ mm}$		
			3	$f = 25 - 50 \text{ mm}$	Fill up shoulder within 7 dayss	For any 100 m stretch Reconstruct shoulder, if affecting 25% or more of stretch. Within 30days
			4	$f = 50 - 75 \text{ mm}$		
			5	$f > 75 \text{ mm}$		
			Drainage			
19	Pumping	quantity of fines and water expelled through open joints and cracks Nos Nos/100 m stretch	0	not discernible	No Action	
			1 to 2	slight/ occasional Nos $< 10\%$	Repair cracks and joints Without delay.	Inspect and repair subdrainage at distressed sections and upstream.
			3 to 4	appreciable/ Frequent 10 25%	Lift or jack slab within 30 days.	

EPC AGREEMENT & TECHNICAL SCHEDULE

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			5	abundant, crack development > 25%	Repair distressed pavement sections. Strengthen subgrade and subbase. Replace slab.	
					Within 30 days	
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem	No action.	
			3 to 4	Blockages observed in drains, but water flowing	Clean drains etc within 7 days, Follow up	Action required to stop water damaging foundation within 30 days.
			5	Ponding, accumulation of water observed	-do-	

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

Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
Highway	Availability of Safe Sight Distance	As per IRC SP :84-2014, a minimum of safe stopping sight distance shall be available throughout.			Monthly	Manual Measurements with Odometer along with video/ image backup	Removal of obstruction within 24 hours, in case of sight line affected by temporary objects such as trees, temporary encroachments. In case of permanent structure or design deficiency: Removal of obstruction/improvement of deficiency at the earliest Speed Restriction boards and suitable traffic calming measures such as transverse bar marking, blinkers, etc. shall be applied during the period of rectification.		IRC:SP 84-2014
		Design Speed, kmph	Desirable Minimum Sight Distance (m)	Safe Stopping Sight Distance (m)					
		100	360	180					
		80	260	130					
Pavement Marking	Wear	<70% of marking remaining			Bi- Annually	Visual Assessment as per Annexure-F of IRC:35-2015	Re - painting	Cat-1 Defect within 24 hours Cat-2 Defect within 2 months-	IRC:35-2015
	Day time Visibility	During expected life Service Time Cement Road - 130mcd/m2/lux Bituminous Road - 100mcd/m2/lux			Monthly	As per Annexure-D of IRC:35-2015	Re - painting	Cat-1 Defect within 24 hours Cat-2 Defect - within 2 months	IRC:35- 2015
	Night Time Visibility	Initial and Minimum Performance for Dry Retro reflectivity during			Bi-Annually	As per	Re - painting	Cat-1 Defect within 24 hours Cat-2 Defect -	IRC:35-2015

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)			Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
		night time:				Annexure-E		within 2 months	
		Design Speed	(RL) Retro Reflectivity (mcd/m2/lux)			f IRC:35-2015			
			Initial (7 days)	Minimum Threshold level (TL) & warranty period required up to 2 years					
		Up to 65	200	80					
		65 - 100	250	120					
		Above 100	350	150					
		Initial and Minimum Performance for Night Visibility under wet condition (<u>Retro reflectivity</u>):							
		Initial 7 days Retro reflectivity: 100 mcd/m2/lux Minimum Threshold Level: 50 mcd/m2/lux							

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	Skid Resistance	Initial and Minimum performance for Skid Resistance: Initial (7days): 55BPN Min. Threshold: 44BPN *Note: shall be considered under urban/city traffic condition encompassing the	Bi-Annually	As per Annexure-G of IRC:35-2015		Within 24 hours	IRC:35-2015
		locations like pedestrian crossings, bus bay, bus stop, cycle track intersection delineation, transverse bar markings etc					
Road Signs	Shape Position and	Shape and Position as per IRC:67- 2012. Signboard should be clearly visible for the design speed of the section.	Daily	Visual with video/image backup	Improvement is of shape, in case if shape Damaged.	48 hours in case of Mandatory Signs, Cautionary and Informatory Signs (Single and Dual	IRC:67-2012

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	Retro reflectivity	As per specifications in IRC:672012	Bi-Annually	Testing of each Signboard using Retro Reflectivity Measuring Device. In accordance with ASTM D 4956-09.	Relocation as requirement per range of signboard of	post signs) 15 Days in case of Gantry/Cantilever Sign boards 48 hours in case of Mandatory Signs, Cautionary and Informatory Signs (Single and Dual post signs) 1 Month in case of Gantry/Cantilever Sign boards	RC:67-2012
Kerb	Kerb Height	As per IRC 86:1983 depending upon type of Kerb	Bi-Annually	Use of distance measuring tape	Raising Kerb Height	Within 1 Month	RC 86:1983
	Kerb Painting	Functionality: Functioning of Kerb painting as intended	Daily	Visual with video/image backup	Kerb Repaint	Within 7-days	RC 35:2015
Other Road Furniture	Reflective Markers (Road Studs)	Numbers and Functionality as per specifications in IRC:SP:84-2014 and IRC: 35-2015, unless specified in Schedule-B.				Within 2 months	IRC:SP:84-
			Daily	Counting	New Installation		2014, IRC:35-2015
			Daily			Within 15 days	

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	Pedestrian Guardrail	Functionality: Functioning of guardrail as intended		Visual with video/image backup	Rectification		IRC:SP:84-2014
	Traffic Safety Barriers	Functionality: Functioning of Safety Barriers as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014, IRC:119-2015
	End Treatment of	Functionality: Functioning of	Daily	Visual with video/image	Rectification	Within 7 days	IRC:SP:84-2014,
	Traffic Safety Barriers			backup			IRC:119-2015
	Attenuators	Functionality: Functioning	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP-2014, IRC:119-2015
	Guard Posts and Delineators	Functionality: Functioning of Guard Posts and Delineators as intended	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC: 79 - 1981
	Overhead Sign Structure	Overhead sign structure shall be structurally adequate	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC:67-2012
	Traffic Blinkers	Functionality: Functioning of Traffic Blinkers as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
Highway Lighting System	Highway Lights	Illumination: Minimum 40 Lux illumination on the road surface	Daily	The illumination level shall be measured with	Improvement in Lighting System	24 hours	IRC:SP:84-2014

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
				luxmeter			
		No major failure in the lighting system	Daily	-	Rectification of failure	24 hours	IRC:SP:84-2014
		No minor failure in the lighting system	Monthly	-	Rectification of failure	8 hours	IRC:SP:84-2014
	Toll Plaza Canopy Lights	Minimum 40 Lux illumination on the road surface	Daily	The illumination level shall be measured with luxmeter	Improvement in Lighting System	24 hours	IRC:SP:84-2014
		No major/minor failure in the lighting system	Daily	-	Rectification of failure	8 hours	IRC:SP:84-2014
Trees and Plantation	Obstruction in a minimum head-room of 5.5 m above carriageway or obstruction in visibility of road signs	No obstruction due to trees	Monthly	Visual with video/image backup	Removal of trees	Immediate	IRC:SP:84-2014

EPC AGREEMENT & TECHNICAL SCHEDULE

including median plantation	Deterioration in health of trees and bushes	Health of plantation shall be as per requirement of specifications & instructions issued by Authority from time to time	Daily	Visual with video/image backup	Timely watering and treatment. Or Replacement of Trees and Bushes.	Within 90 days	IRC:SP:84-2014
	Vegetation affecting sight line and road structures	Sight line shall be free	Daily	Visual with video/image backup	Removal of Trees	Immediate	IRC:SP 842014
Rest Areas	Cleaning of toilets	-	Daily	-	-	Every 4 hours	
	Defects in			-	Rectification	24 hours	
	electrical, water and sanitary installations	-	Daily				
Other Project Facilities and Approach roads	Damage or deterioration in Approach Roads, pedestrian facilities, truck lay-bys, bus-bays, bus-shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts and other works		Daily	-	Rectification	15 days	IRC:SP 84-2014

EPC AGREEMENT & TECHNICAL SCHEDULE

Pipe/box/slab culverts	Free waterway/unobstructed flow section	85% of culvert normal flow area to available.	2 times in a year (before and after rainy season)	Inspection by Bridge Engineer as per IRC SP: 35-1990 and recording of depth of silting and area of vegetation.	Cleaning silt up soils and debris in culvert barrel after rainy season, removal of bushes and vegetation, U/s of barrel, under barrel and D/s of barrel before rainy season.	15 days before onset of monsoon and within 30 days after end of rainy season.	IRC 5-2015, IRC SP:40 - 1993 and IRC 2004 SP:13-
	Leak-proof expansion joints if any	No leakage through expansion joints	Bi-Annually	Physical inspection of expansion joints as per IRC SP: 35- 1990 if any, for leakage strains on walls at joints.	Fixing with sealant suitably	30 days or before onset of rains whichever comes earlier	IRC SP:40- 1993 and IRC SP:69-2011
		Spalling of					
	Structurally sound	concrete not more than 0.25 sqm	Bi-Annually	Detailed inspection of all components of culvert as per IRC SP:35-1990 and recording	Repairs to spalling, cracking, delamination, rusting shall be followed as per IRC:SP:40-1993.	15 days	IRC SP 40- 1993 and MORTH Specification s clause 2800
		Delamination of concrete not more than 0.25 sq.m.					
		Cracks wider than 0.3 mm not more than 1m aggregate length					

EPC AGREEMENT & TECHNICAL SCHEDULE

	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3 sqm, damage to solid apron (concrete apron) not more than 1 sqm	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and pitching	30 days after defect observation or 2 weeks before onset of rainy season whichever is earlier.	IRC: SP 40-1993 and IRC:SP:132004.
Bridges including ROB's Flyover etc. as applicable	Riding quality or user comfort	No pothole in wearing coat on bridge deck	Daily	Visual inspection as per IRC SP:351990	Repairs to BC or wearing coat	15 days	MORT&H Specification 2811
Bridge - Super Structure	Bumps	No bump at expansion joint	Daily	Visual inspection as per IRC SP:351990	Repairs to BC on either side of expansion joints, profile correction course on approach slab in case of settlement to approach embankment	15 days	MORT&H Specification 3004.2 & 2811.
	User safety						
	(condition of crash barrier and guard rail)	No damaged or missing stretch of crash barrier or pedestrian hand railing	Daily	Visual inspection and detailed condition survey as per IRC SP: 35-1990.	Repairs and replacement of safety barriers as the case may be	3days	IRC: 5-1998, IRC SP: 84-2014 and IRC SP: 40-1993.

EPC AGREEMENT & TECHNICAL SCHEDULE

	Rusted reinforcement Spalling of concrete Delamination	Not more than 0.25 sq.m Not more than 0.50 sq.m Not more than 0.50 sq.m	Bi- Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with anti-corrosive coating before carrying out the repairs to affected concrete portion with epoxy mortar / concrete.	15 days	IRC SP: 40-1993 and MORTH Specification 1600.
	Cracks wider than 0.30 mm	Not more than 1m total length	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Grouting with epoxy mortar, investigation causes for cracks development and carry out necessary rehabilitation.	48 Hours	IRC SP: 40-1993 and MORTH Specification 2800.
				Detailed			
	Rainwater seepage through deck slab	Leakage - nil	Quarterly	condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection	Grouting of deck slab at leakage areas, waterproofing, repairs to drainage spouts	1 months	MORTH specifications 2600 & 2700.

EPC AGREEMENT & TECHNICAL SCHEDULE

				Unit			
	Deflection due to permanent loads and live loads	Within design limits.	Once in every 10 years for spans more than 40 m	Load test method	Carry out major rehabilitation works on bridge to retain original design loads capacity	6 months	IRC SP: 51-1999.
	Vibrations in bridge deck due to moving trucks	Frequency of vibrations shall not be more than 5 Hz	Once in every 5 years for spans more than 30m and every 10 years for spans between 15 to 30 m	Laser displacement sensors or laser vibro-meters	Strengthening structure of super	4 months	AASHTO LRFD specifications
	Leakage in Expansion joints	No damage to elastomeric sealant compound in strip seal expansion joint, no leakage of rain water through expansion joint in case of buried and asphalt plug and copper strip joint.	Bi-Annually	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Replace of expansion joint seal in	15 days	MORTH specifications 2600 and IRC SP: 40-1993.

EPC AGREEMENT & TECHNICAL SCHEDULE

	Debris and dust in strip or joint seal expansion joint	No dust debris expansion joint	Monthly	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Cleaning of expansion joint gaps thoroughly	3 days	MORTH specification s 2600 and IRC SP: 40-1993.
	Drainage spouts	No down take pipe missing/broken below soffit of the deck slab. No silt, debris, clogging of drainage spout collection chamber.	Monthly	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Cleaning of drainage spouts thoroughly. Replacement of missing/broken down take pipes with a minimum pipe extension of 500mm below soffit of slab. Providing sealant around the drainage spout if any leakages observed.	3 days	MORTH specification 2700.
Bridge-substructure	Cracks/spalling of concrete/rusted steel	No cracks, spalling of concrete and rusted steel	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with defect noticed	30 days	IRC SP: 40-1993 and MORTH specification 2800.

EPC AGREEMENT & TECHNICAL SCHEDULE

[illegible]

Table 1: Maintenance Criteria for Structures and Culverts:

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
Pipe/box/slab culverts	Free waterway/unobstructed flow section	85% of culvert normal flow area to available.	2 times in a year (before and after rainy season)	Inspection by Bridge Engineer as per IRC SP: 35-1990 and recording of depth of silting and area of vegetation.	Cleaning silt up soils and debris in culvert barrel after rainy season, removal of bushes and vegetation, U/s of barrel, under barrel and D/s of barrel before rainy season.	15 days before onset of monsoon and within 30 days after end of rainy season.	IRC 5-2015, IRC SP:40-2019 and IRC SP:13-2004
	Leak-proof expansion joints if any	No leakage through expansion joints	Bi-Annually	Physical inspection of expansion joints as per IRC SP: 35-1990 if any, for leakage strains on walls at joints.	Fixing with sealant suitably	30 days or before onset of rains whichever comes earlier	IRC SP:40-2019 and IRC SP:69-2011
	Structurally sound	Spalling of concrete not more than 0.25 sqm	Bi-Annually	Detailed inspection of all components of culvert as per IRC SP:35-1990 and recording the defects	Repairs to spalling, cracking, delamination, rusting shall be followed as per IRC: SP:40-2019.	15 days	IRC SP 40-2019 and MORTH Specifications clause 2800
		Delamination of concrete not more than 0.25 Sqm.					
		Cracks wider than 0.3 mm not more than 1m aggregate length					
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3 sqm, damage to solid apron (concrete apron) not more than 1 sqm	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and pitching	30 days after defect observation or 2 weeks before onset of rainy season whichever is earlier.	IRC: SP 40-2019 and IRC: SP:13-2004.

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
Bridges including ROB's Flyove etc. as applicable	Riding quality or user comfort	No pothole in wearing coat on bridge deck	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC or wearing coat	15 days	MORT&H Specification 2811
Bridge - Super Structure	Bumps	No bump at expansion joint	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC on either side of expansion joints, profile correction course on approach slab in case of settlement to approach embankment	15 days	MORT&H Specification 3004.2 & 2811.
	User safety (condition of crash barrier and guard rail)	No damaged or missing stretch of crash barrier or pedestrian hand railing	Daily	Visual inspection and detailed condition survey as per IRC SP: 35-1990.	Repairs and replacement of safety barriers as the case may be	3days	IRC: 5-2015, IRC SP: 73-2018 and IRC SP: 40-2019.
	Rusted reinforcement	Not more than 0.25 sq.m	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with anti-corrosive coating before carrying out the repairs to affected concrete portion with epoxy mortar / concrete.	15 days	IRC SP: 40-2019 and MORTH Specification 1600.
	Spalling of concrete	Not more than 0.50 sq.m					
	Delamination	Not more than 0.50 sq.m					
	Cracks wider than 0.30 mm	Not more than 1m total length	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Grouting with epoxy mortar, investigating causes for cracks development and carry out necessary rehabilitation.	48 Hours	IRC SP: 40-2019 and MORTH Specification 2800.

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
	Rainwater seepage through deck slab	Leakage - nil	Quarterly	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Grouting of deck slab at leakage areas, waterproofing, repairs to drainage spouts	1 months	MORTH specifications 2600 & 2700.
	Deflection due to permanent loads and live loads	Within design limits.	Once in every 10 years for spans more than 40 m	Load test method	Carry out major rehabilitation works on bridge to retain original design loads capacity	6 months	IRC SP: 51-2015.
	Vibrations in bridge deck due to moving trucks	Frequency of vibrations shall not be more than 5 Hz	Once in every 5 years for spans more than 30m and every 10 years for spans between 15 to 30 m	Laser displacement sensors or laser vibro-meters	Strengthening of super structure	4 months	AASHTO LRFD specifications
	Leakage in Expansion joints	No damage to elastomeric sealant compound in strip seal expansion joint, no leakage of rain water through expansion joint in case of buried and asphalt plug and copper strip joint.	Bi-Annually	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Replace of seal in expansion joint	15 days	MORTH specifications 2600 and IRC SP: 40-2019.

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
	Debris and dust in strip seal expansion joint	No dust or debris in expansion joint gap.	Monthly	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Cleaning of expansion joint gaps thoroughly	3 days	MORTH specifications 2600 and IRC SP: 40-2019.
	Drainage spouts	No down take pipe missing/broken below soffit of the deck slab. No silt, debris, clogging of drainage spout collection chamber.	Monthly	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Cleaning of drainage spouts thoroughly. Replacement of missing/broken down take pipes with a minimum pipe extension of 500mm below soffit of slab. Providing sealant around the drainage spout if any leakages observed.	3 days	MORTH specification 2700.
Bridge-substructure	Cracks/spalling of concrete/ rusted steel	No cracks, spalling of concrete and rusted steel	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with anti-corrosive coating before carrying out repairs to substructure by grouting/guniting and micro concreting depending on type of defect noticed	30 days	IRC SP: 40-2019 and MORTH specification 2800.
	Bearings	Delamination of bearing reinforcement not more than 5%, cracking or tearing of rubber not more than 2 locations	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	In case of failure of even one bearing on any pier/abutment, all the bearings on that pier/abutment shall be replaced, in order to get	3 months	MORTH specification 2810, IRC 83 and IRC SP: 40-2019.

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
		per side, no rupture of reinforcement or rubber			uniform load transfer on to bearings.		
Bridge Foundation	Scouring around foundations	Scouring shall not be lower than maximum scour level for the bridge	Bi-Annually	Condition survey and visual inspection as per IRC SP:35-1990 using Mobile Bridge Inspection Unit. In case of doubt, use Underwater camera for inspection of deep wells in major Rivers.	Suitable protection works around pier/abutment	1 month	IRC SP: 40-2019, MORTH specification 2500
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3 sq.m, damage to solid apron (concrete apron) not more than 1 sq.m	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and pitching.	30 days after defect observation or 2 weeks before onset of rainy season whichever is earlier.	IRC: SP 40-2019 and IRC: SP:13-2022.
Slope Protection (Landslide & Sinking)	Movement & deformation in landslide & sinking zones	Movement & deformation beyond permissible limit should be made good to the design standard	14 Days	Once in month/ as when noticed	Standard method as approved by the Authority QA/QC plan of the contractor	30 days after defect observation or 2 weeks before onset of rainy season whichever is earlier	Refer the Schedule B and Schedule D
	Any material or defect development in workmanship	The material and workmanship specification should be in accordance with	14 Days	Once in month/ as when noticed	Standard method as approved by the Authority QA/QC plan of the contractor	30 days after defect observation or 2 weeks before onset of rainy	Refer the Schedule B and Schedule D

EPC AGREEMENT & TECHNICAL SCHEDULE

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
	used in protection work	Schedule B and Schedule D				season whichever is earlier.	

Table 5: Maintenance Criteria for Hill Roads

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

Hill Roads		
(i)	Damage to Retaining wall/ Breast wall	7 (Seven) days
(ii)	Landslides requiring clearance	12 (Twelve) hours
(iii)	Snow requiring clearance	24 (Twenty-Four) hours

Note: For all tables 1 to 5 above, latest BIS & IRC standards (even those not indicated herewith) along with MoRT&H specifications shall be binding for all maintenance activities.

A. Flexible Pavement

Nature of Defect or deficiency		Time limit for repair/ rectification
(b) Granular earth shoulders, side slopes, drains and culverts		
(i)	Variation by more than 1 % in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway)	7 (seven) days
(ii)	Edge drop at shoulders exceeding 40 mm	7 (seven) days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 (thirty) days
(iv)	Rain cuts/gullies in slope	7 (seven) days
(v)	Damage to or silting of culverts and side drains	7 (seven) days
(vi)	Desilting of drains in urban/semi- urban areas	24 (twenty-four) hours
(vii)	Railing, parapets, crash barriers	7 (seven) days (Restore immediately if causing safety hazard)
(c) Road side furniture including road sign and pavement marking		
(i)	Damage to shape or position, poor visibility or loss of retroreflectivity	48 (forty-eight) hours
(ii)	Painting of km stone, railing, parapets, crash barriers	As and when required/ Once every year
(iii)	Damaged/missing signs road requiring replacement	7 (seven) days
(iv)	Damage to road mark ups	7 (seven) days
(d) Road lighting		
(i)	Any major failure of the system	24 (twenty-four) hours
(ii)	Faults and minor failures	8 (eight) hours
(e) Trees and plantation		
(i)	Obstruction in a minimum head- room of 5 m above carriageway or obstruction in visibility of road signs	24 (twenty-four) hours
(ii)	Removal of fallen trees from carriageway	4 (four) hours
(iii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iv)	Trees and bushes requiring replacement	30 (thirty) days
(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
(f) Rest area		
(i)	Cleaning of toilets	Every 4 (four) hours

(ii)	Defects in electrical, water and sanitary installations	24 (twenty-four) hours
(g) [Toll Plaza]		
(h) Other Project Facilities and Approach roads		
(i)	Damage in approach roads, pedestrian facilities, truck lay- byes, bus-bays, bus-shelters, cattle crossings, [Traffic Aid Posts, Medical Aid Posts] and service roads	15 (fifteen) days
(ii)	Damaged vehicles or debris on the road	4 (four) hours
(iii)	Malfunctioning of the mobile crane	4 (four) hours
Bridges		
(a) Superstructure		
(i)	Any damage, cracks, spalling/ scaling Temporary measures Permanent measures	within 48 (forty-eight) hours within 15 (fifteen) days or as specified by the Authority's Engineer
(b) Foundations		
(i)	Scouring and/or cavitation	15 (fifteen) days
(c) Piers, abutments, return walls and wing walls		
(i)	Cracks and damages including settlement and tilting, spalling, scaling	30 (thirty) days
(d) Bearings (metallic) of bridges		
(i)	Deformation, damages, tilting or shifting of bearings	15 (fifteen) days Greasing of metallic bearings once in a year
(e) Joints		
(i)	Malfunctioning of joints	15 (fifteen) days
(f) Other items		
(i)	Deforming of pads in elastomeric bearings	7 (seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	3 (three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	3 (three) days with(immediately posing danger to sal
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	7 (seven) days
(v)	Damage to wearing coat	15 (fifteen) days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	30 (thirty) days
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	15 (fifteen) days
(g) Hill Roads		

(i)	Damage to retaining wall/breast wall	7 (seven) days
(ii)	Landslides requiring clearance	12 (twelve) hours
(iii)	Snow requiring clearance	24 (twenty-four) hours

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

Schedule - F

(See Clause 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) Licence from inspector of factories or other competent Authority for setting up batching plant;
 - (f) Clearance of Pollution Control Board for setting up batching plant;
 - (g) Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;
 - (h) Permission of Village Panchayats and State Government for borrow earth; and
- (i) Any other permits 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)

Form of Bank Guarantee

[Performance Security/Additional Performance Security]

To,

The Managing Director,

National Highways & Infrastructure Development Corporation Ltd.,

1st floor, Tower-A, World Trade Centre, Nauroji Nagar,

New Delhi - 110029

WHEREAS:

- (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 construction of the ***** section of [National Highway No. **] on Engineering, Procurement and Construction (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.
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.

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.

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

(See Clauses 2.21)

Format of Insurance Surety Bond
[Performance Security/Additional Performance Security]

To

The Managing Director,
National Highway & Highway Development Corporation Ltd.
1st Floor, Tower-A, World Trade Centre, Nauroji Nagar
New Delhi- 110029

WHEREAS _____ [name and address of Contractor]
(hereafter called the "Contractor") has undertaken, in pursuance of Letter of Acceptance (LOA) No. _____ Dated _____ for construction of "----" (hereinafter called the "Contract").

AND WHEREAS the Contract requires the Contractor to furnish an [Performance Security/Additional Performance Security] for due and faithful performance of its obligations, under and in accordance with the Contract, during the [Construction Period/ Defects Liability Period and Maintenance Period] in a sum of Rs cr. (Rupees crore) (the "Surety Bond amount").

AND WHEREAS we, through our branch at (the "Surety Insurer") have agreed to furnish this Surety Bond by way of Performance security.

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

1. The Surety Insurer 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 Contract, 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 Surety Bond 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 Contract shall be conclusive, final and binding on the Surety Insurer. The Surety Insurer 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 Contract and its decision that the Contractor is in default shall be final and binding on the Surety Insurer, 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 Surety Bond, the Authority shall be entitled to act as if the Surety Insurer were the principal debtor and any/Change in the constitution of the Contractor and/or the Surety Insurer, 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 Surety insurer under this Surety Bond

4. It shall not be necessary, and the Surety Insurer hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Surety Insurer its demand under this Surety Bond.
5. The Authority shall have the liberty, without affecting in any manner the liability of the Surety Insurer under this Surety Bond, to vary at any time, the terms and conditions of the Contract 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 Contract 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 Contract and/or the securities available to the Authority, and the Surety Insurer 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 Surety Insurer from its liability and obligation under this Surety Bond and the Surety Insurer hereby waives all of its rights under any such law
6. This Surety Bond is in addition to and not in substitution of any other Surety Bond or security now or which may hereafter be held by the Authority in respect of or relating to the Contract or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Contract.
7. Notwithstanding anything contained hereinbefore, the liability of the Surety Insurer under this Surety Bond is restricted to the Surety Bond Amount and this Surety Bond 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 Surety Insurer under this Surety Bond all rights of the Authority under this Surety Bond shall be forfeited and the Surety Insurer shall be relieved from its liabilities hereunder
8. The Surety Bond shall cease to be in force and effect on ****\$. Unless³ a demand or claim under this Surety Bond is made in writing before expiry of the Surety Bond, the Surety Insurer shall be discharged from its liabilities hereunder.
9. The Surety Insurer undertakes not to revoke this Surety Bond 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 Surety Bond and the undersigned has full powers to do so on behalf of the Surety Insurer.
10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Surety Insurer at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post 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 Surety Bond 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 Contract.
12. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

³Insert date atleast 2 (two) years from the date of issuance of this Surety Bond (in accordance with Clause 2.21 of the RFP). The Contractors can submit the BG for periods of two years at one time and keep on renewing the same till the DLP is over if they have problems in getting the BG in one go for the entire DLP.

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)

^sInsert date atleast 2 (two) years from the date of issuance of this Surety Bond (in accordance with Clause 2.21 of the RFP). The Contractors can submit the BG for periods of two years at one time and keep on renewing the same till the DLP is over if they have problems in getting the BG in one go for the entire DLP.

Annex – II

(Schedule - G)

(See Clause 19.2)

Form for Insurance Surety Bond for Advance Payment

To,

The Managing Director,

National Highways & Infrastructure Development Corporation Ltd.,

1st floor, Tower-A, World Trade Centre, Nauroji Nagar,

New Delhi - 110029

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 construction of the ***** section of [National Highway No. **] on Engineering, Procurement and Construction (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 Insurance Surety Bond 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 Insurance Surety Bond (hereinafter called the “**Guarantee**”) for the Guarantee Amount.

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

- (1) The Insurance company 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 accordance with the Agreement shall be conclusive, final and binding on the Insurance company.

The Insurance company 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 Insurance company, 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 Insurance Surety Bond, the Authority shall be entitled to act as if the Insurance company were the principal debtor and any change in the constitution of the Contractor and/or the Insurance company, 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 Insurance company under this Guarantee.
3. It shall not be necessary, and the Insurance company hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Insurance company its demand under this Guarantee.
4. The Authority shall have the liberty, without affecting in any manner the liability of the Insurance company 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 Insurance company 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 Insurance company from its liability and obligation under this Guarantee and the Insurance company hereby waives all of its rights under any such law.
5. This Insurance Surety Bond 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 Insurance company 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 Insurance company under this Guarantee all rights of the Authority under this Insurance Surety Bond shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
7. The Insurance Surety Bond 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 Insurance company shall be discharged from its liabilities hereunder.
8. The Insurance company 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 Insurance company.
9. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Insurance company 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 Insurance Surety Bond 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.

\$ 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)

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

SIGNED, SEALED AND DELIVERED

For and on behalf of the Insurance company by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

- (i) The Insurance Surety Bond should contain the name, designation and code number of the officer(s) signing the Insurance Surety Bond.
- (ii) The address, telephone number and other details of the head office of the Insurance company as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Schedule - H

See Clauses 10.1 (iv) and 19.3

Contract Price Weightages1.1 The Contract Price for this Agreement is **Rs. ***** Crores**

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

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
Road works including culverts, widening and repair of culverts.	3.92%	B.1- Reconstruction/ New 2-lane realignment/ bypass (Flexible pavement)	
		(1) Earthwork upto top of the embankment	26.19%
		(2) Sub-Grade	0.55%
		(3) Sub-Base Course	19.31%
		(4) Non-Bituminous Base Course	16.33%
		(5) Bituminous Base Course	2.20%
		(6) Wearing Coat	13.72%
		(7) Reconstruction of existing Road	0.77%
		Re-Construction and New culverts on existing road, realignments, bypasses:	
		Culverts (length < 6 m)	20.93%
Minor Bridges/ Under passes/ Overpasses	0.86%	A.2- New Minor bridges (length >6 and <60 m.)	
		1) Foundation: On completion of the foundation work Abutment & Piers.	26.04%
		2) Sub-Structure: On completion of Abutment & Piers with Abutment/Pier cap	45.86%
		3) Super-structure: On completion of the super-structure in all respects including wearing coat, bearings, expansion joints, handrails, crash barriers, road signs & markings tests on completion etc. complete in all respect.	26.86%
		4) Approaches: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use.	1.23%
		5) Guide Bunds and River Training Works: On completion of Guide Bunds and river Training Works complete in all respects	0.00%
		B.2- Underpasses/overpasses	
		1) Foundation +Sub-Structure: On completion of the foundation work including foundations for wing and return walls, abutments, piers upto the abutment/pier cap.	0.00%
		2) Super-structure: On completion of the super-structure in all respects including wearing coat, bearings, expansion joints, handrails, crash	0.00%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		barriers, road signs & markings tests on completion etc. complete in all respect.	
		3) Approaches: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use.	0.00%
Major Bridge (length >60 m) works and ROB/ RUB/ elevated sections/flyovers including viaducts, if any	10.69%	A.2- New Major Bridges cum Viaduct	
		1) Foundation	0.00%
		(i) Pile Foundation	0.00%
		(ii) Open Foundation	1.57%
		2) Sub-structure	1.71%
		3) Super-structure (including bearings)	1.48%
		4) Wearing Coat including expansion joints	0.08%
		5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.08%
		6) Wing walls/return walls	0.00%
		7) Guide Bunds, River Training works etc.	0.00%
		8) Approaches (including Retaining walls, stone pitching and protection works)	0.02%
		C.2-New Elevated Section/Flyovers/ Grade Separators	
		1) Foundation	
		(i) Pile Foundation	0.00%
		(ii) Open Foundation	23.12%
		2) Sub-structure	22.66%
		3) Super-structure (including bearings)	47.04%
		4) Wearing Coat including expansion joints	0.99%
		5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	1.12%
		6) Wing walls/return walls	0.00%
		7) Approaches (including Retaining walls, stone pitching and protection works)	0.13%
		<u>Tunnel main</u>	
Tunnel	55.25%	A-Investigation & Design	1.77%
		A1- Temporary Dewatering Arrangement	0.25%
		A2- Underground Excavation for tunnel in Support Category dominating the Face Area including Drilling and Grouting	
		ESC-10	15.24%
		ESC-11	13.33%
		ESC-1	5.71%
		ESC-3	1.52%
		ESC-4	1.90%
		ESC-5	0.19%
		ESC-5V	0.19%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		A3- Permanent Dewatering Arrangement, (PVC pipes, perforated PVC pipes, precast concrete slots channel elements, dimpled sheets between permanent lines of C&C tunnel length and backfill material, water-proofing membrane etc,)	4.12%
		A4- Primary Support Measures	
		SFRS/Shotcrete With Wiremesh	
		ESC-10	4.98%
		ESC-11	4.35%
		ESC-1	1.87%
		ESC-3	0.50%
		ESC-4	0.62%
		ESC-5	0.062%
		ESC-5V	0.062%
		Rock Bolts/SteelRib/Spile bars/Piperoofing	
		ESC-10	3.10%
		ESC-11	2.71%
		ESC-1	1.16%
		ESC-3	0.31%
		ESC-4	0.39%
		ESC-5	0.04%
		ESC-5V	0.04%
		Lining Stress controller a set of 3 cylinders	
		ESC-10	0.00%
		ESC-11	0.00%
		ESC-1	0.00%
		ESC-3	0.00%
		ESC-4	9.53%
		ESC-5	1.05%
		ESC-5V	1.05%
		A5- Lining/Bed Concrete Works	14.78%
		A6-Instrumentation and Monitoring	0.39%
		A7-Pavement	3.99%
		Drain, footpath, Crash barrier with Railing and cable duct etc	3.95%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		Drilling & grouting holes	0.86%
		<u>Portals</u>	
	2.11%	A1- Temporary Dewatering Arrangement	
		A2- Open Excavation and Earthwork (Loose excavation, rock excavation, rip rap layer on embankment, Gabion etc.)	70.12%
		A3- Primary support measures	
		SFRS/Shotcrete with Wiremesh	4.61%
		Rock Bolts/Forepoling/Piperoofing	14.56%
		A4- Permanent Dewatering (PVC pipes, perforated PVC pipes, precast concrete slots channel elements, dimpled sheets between permanent lines of C&C tunnel length and backfill material, water-proofing membrane etc.)	1.82%
		A5-Concrete Works at portal	7.12%
		A6- Pavement	1.77%
		A7-Construction of buildings	0.00%
		<u>Electro, Mechanical Equipment work and power supply</u>	
	18.93%	1. Electro and Mechanical equipment	74.26%
		2. Construction of 4 nos. of 1x 10 MVA, 33/11 kv substation, 33 kva line from nearest source i/c pole, gantry, conductor and applicable supervision charges of utility owing department.	3.45%
		Ventilation System	22.28%
Other Works	7.62%	1) Toll Plaza	0.00%
		2) Roadside drains	6.05%
		3) Road signs, markings, km stones safety devices	7.21%
		4) Project Facilities	
		a) Bus bye	0.19%
		b) Truck lay-byes	0.00%
		c) Site clearance	0.65%
		i) Junctions	2.06%
		ii) High Mast Lighting	0.00%
		iii) Utility duct	2.70%
		5) Roadside plantation	0.34%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		6) Muck Disposal & Management	
		i) Disposal of excavated materials	7.70%
		ii) Protection work at muck disposal via Gabion wall, RR wall, etc.	9.97%
		7) Protection works other than approaches to the bridges, elevated sections/ flyovers/grade separators and ROB/RUBs. (Retaining/Toe wall)	0.00%
		8) Slope Protection (Hill Side) Bio-Engineering	0.76%
		(i) Retaining Wall	13.02%
		(ii) Breast Wall	39.93%
		(iii) Gabion Wall	8.96%
		9) Safety and traffic management during construction	0.45%
Utility Estimate	0.60%	Electrical JPDCL	100.00%

*Note- In case of CTB and AIL layer, this stage may be modified suitably to permit separate weightages for each of these layers.

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
B.1 - Reconstruction/New alignment/bypass (Flexible pavement)		Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length or 500m whichever is less.
(1) Earthwork up to top of the embankment	68.48%	
(2) Sub-Grade	0.05%	
(3) Sub-Base Course	4.94%	
(4) Non Bituminous Course*	6.25%	
(5) Bituminous Course	7.08%	
(6) Wearing Coat	4.290%	Cost of completed culverts shall be determined pro rata basis with respect to the total no. of culverts. The payment shall be made on the completion of atleast one culvert. 75% of the cost will be payable on completion of box/abutment and slab/pipe and headwall. Remaining 25% will become payable on completion of protection work including return/wing walls and any other work associated with culverts.
(7) Widening and repair of Culverts	0.00%	

D - Re-Construction and New culverts on existing road, realignments, bypasses:		
(1) Culverts (length < 6m)	8.90%	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 one culvert. 75% of the cost will be payable on completion of box/abutments and slab/ pipe and head wall. Remaining 25% will become payable on completion of protection works including return/wing walls and any other work associated with culverts.

*Note- In case of CTB and AIL layer, this stage may be modified suitably to permit separate weightages for each of these layers.

@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.

1.3.2 Minor Bridges and Underpasses/Overpasses.

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

Stage of Payment	Weightage	Payment Procedure
1	2	3
A.2- New minor bridges		
(i) Foundation: On completion of the foundation work of abutment and piers.	26.04%	Cost of each minor bridge shall be determined on pro rata basis with respect to the total linear length (m) of the minor bridges. (i) Foundation: Payment against foundation shall be made on pro rata basis on completion of a stage completion of atleast two foundations of each bridge. In case where load testing is specified for foundation, the trigger of first payment shall include load testing also.
(ii) Sub-structure:	45.86%	(ii) Sub-structure: Payment shall be made on pro-rata basis on completion of stage i.e. completion of atleast one sub-structure upto abutment/pier cap level of each bridge.
iii) Super-structure: On completion of the super-structure upto deck slab including bearings.	26.86%	(iii) 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 upto deck slab including bearing as specified in the column of "Stage of Payment" in the sub-clause. If pre-casts girders/segments are used, interim

		payments shall be made at 75% of the cost of that element, as derived from MoRTH Data Book, applicable SOR of the State PWD on Base Date with tender discount/premium applied thereon.
(iv) Miscellaneous Works:	[**]	(iv) Miscellaneous Works : Payment shall be made on pro-rata basis on completion of a stage i.e. completion of wearing coat, expansion joint, crash barriers, railing protection works and any other remaining work associated to bridge including tests on bridge for each bridge.
(v) Approaches: On completion of approached including wing wall/return wall, Retaining walls/Reinforced Earth walls, stone pitching, protection works complete in all respect and fit for use .	1.23%	(v) Approaches: Payment shall be made on pro-rata basis on completion of a stage i.e. completion of approached including wing wall/return wall, retaining walls, Reinforced Earth walls, stone pitching, protection works complete in all respect for each bridge.

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	Weightage	Payment Procedure
1	2	3
A.2- New Major Bridges cum Viaduct		
(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. (1) Foundation: Payment against foundation shall be made on pro rata basis on completion of a stage i.e. completion of atleast one foundation of each of the major bridge as specified hereunder.
(i) Well Foundation (a) On completion of Cutting Edge+ Well Curb (b) Wellsteining : On completion of wellsteining upto bottom of well cap. (c) On completion of bottom plug + top plug (if provisioned as per design) + well cap	0.00%	(i) Well Foundation (a) Cutting Edge + well Curb: Payment of 10% shall be made on completion of a stage i.e. completion of cutting edge + well curb. (b) Well steining : Payment of 65% shall be made on completion of well cap. The payment stage shall be further sub-divided on pro-data basis i.e. (i) on completion upto 10 m and (ii) on completion of each subsequent 5 m or part thereof. (c) Bottom plug + top plug (if provisioned as per design)+ well cap: Payment of 25% shall be made on completion of a stage i.e. completion of bottom plug, back fill, top plug and well cap.
(i) Pile Foundation: (a) Piling – On completion of pile upto bottom of pile cap (b) Pile Cap : On completion of pile cap	0.00%	(i) Pile Foundation: (a) Piling – Payment of 70% shall be made on completion of piling upto bottom of pile cap for each pile on prorata basis. (b) Pile Cap : payment of 30% on pro-rata basis shall be made on completion of pile cap.

Stage of Payment	Weightage	Payment Procedure
1	2	3
		In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
(ii) Open Foundation	1.57%	(ii) Open Foundation: Payment shall be made on completion of a stage i.e. on completion of atleast one foundation.
(2) Sub-structure	1.71%	(2) Sub-structure- Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. completion of as stage i.e. completion of atleast one sub-structure of abutments/pier upto abutment/pier cap level of each of the major bridge.
(3) Super-structure (including bearings)	1.48%	3) Super-structure: Payment shall be made on pro-rata basis on completion of a stage i.e., completion of super-structure upto deck slab including bearings of at least one span as specified herein under: If pre-cast girders/segments are used, interim payments shall be made at 75% of the cost of that element, as derived from MoRTH Data Book, applicable SOR of State PWD on Base Date with tender discount/premium applied thereon. (For cable stayed bridge and suspension cable bridge, detailed payment stage may be included on case to case basis)
(4) Wearing Coat including expansion joints.	0.08%	(4) Wearing Coat: Payments shall be made on completion of wearing coat including expansion joints complete in all respects as specified for each major bridge.
(5) Miscellaneous Items like handrails, crash barriers, road markings etc.	0.08%	(5) Miscellaneous: Payments shall be made on completion of all miscellaneous works like handrails, crash barriers, road marking etc. complete in all respects as specified for each major bridge.
(6) Wing walls/return walls	0.000%	(6) Wing walls/return walls: Payments shall be made on completion of all wing walls/return walls complete in all respects as specified for each major bridge.
(7) Guide bunds, River Training works etc.	0.00%	7) Guide bunds, River Training works: Payments shall be made on completion of all Guide bunds, River Training works etc. complete in all respects as specified for each major bridge.
(8) Approaches (including Retaining walls, stone pitching and protection works for floor, embankment slope etc.)	0.02%	(8) Approaches : Payments shall be made on completion of both approaches including Retaining walls, stone pitching and protection works, etc. complete in all respects as specified for each major bridge
C.2 New Elevated Section/Flyover/Grade Separators		
(1) Foundation		Cost of each structure shall be determined on pro rata basis with respect to the total linear length (m) of the structures. (1) Foundation: Payment against foundation shall be made on pro rata basis on completion of a stage i.e. completion of atleast one foundation of each of the structure as specified here in under:

Stage of Payment	Weightage	Payment Procedure
1	2	3
(i) Well Foundation (a) On completion of Cutting Edge+ Well Curb (b) Wellsteining : On completion of wellsteining upto bottom of well cap. (c) On completion of bottom plug + top plug (if provisioned as per design) + well cap	0.00%	(i) Well Foundation (a) Cutting Edge + well Curb: Payment of 10% shall be made on completion of a stage i.e. completion of cutting edge + well curb. (b) Well steining : Payment of 65% shall be made on completion of well cap. The payment stage shall be further sub-divided on pro-data basis i.e. (i) on completion upto 10 m and (ii) on completion of each subsequent 5 m or part thereof. (c) Bottom plug + top plug (if provisioned as per design)+ well cap: Payment of 25% shall be made on completion of a stage i.e. completion of bottom plug, back fill, top plug and well cap.
(ii) Pile Foundation: (a) Piling – On completion of pile upto bottom of pile cap (b) Pile Cap : On completion of pile cap	0.00%	(ii) Pile Foundation: (a) Piling – Payment of 70% shall be made on completion of piling upto bottom of pile cap for each pile on prorata basis. (b) Pile Cap : Payment of 30% on pro-rata basis shall be made on completion of pile cap. In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
(iii) Open Foundation	23.12%	(iii) Open Foundation: Payment shall be made on completion of a stage i.e. on completion of atleast one foundation.
(2) Sub-structure	22.66%	(2) Sub-structure- Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. completion of as stage i.e. completion of atleast one sub-structure of abutments/pier upto abutment/pier cap level of each of the structure.
(3) Super-structure (including bearings)	47.04%	(3) Super-structure: Payment shall be made on pro-rata basis on completion of a stage i.e., completion of super-structure upto deck slab including bearings of at least one span as specified herein under: If pre-cast girders/segments are used, interim payments shall be made at 75% of the cost of that element, as derived from MoRTH Data Book, applicable SOR of State PWD on Base Date with tender discount/premium applied thereon.
(4) Wearing Coat including expansion joints in case of RUB, rigid pavement under RUB including drainage facility as specified.	0.99%	(4) Wearing Coat: Payments shall be made on completion of (a) in case of ROB- wearing coat including expansion joints complete in all respects as specified for each of ROB and (b) in case of RUB- rigid pavement under RUB including drainage facility complete in all respects as specified for each of the structure.
(5) Miscellaneous Items like handrails, crash barriers, road markings etc.	1.12%	(5) Miscellaneous: Payments shall be made on completion of all miscellaneous works like handrails, crash barriers, road marking etc. complete in all respects as specified for each structure.
(6) Wing walls/return walls	0.000%	(6) Wing walls/return walls: Payments shall be made on completion of all wing walls/return walls complete in all respects as specified for each of the structure.

Stage of Payment	Weightage	Payment Procedure
1	2	3
(7) Approaches (including Retaining walls, stone pitching and protection works)	0.13%	(7) Approaches : Payments shall be made on completion of both approaches including Retaining walls, stone pitching and protection works, etc. complete in all respects as specified here in under : If reinforced soil wall is used with facia panel/blocks, interim payment shall be made @75% of the Cost of that element as derived from MoRTH data Book. Applicable SOR of State PWD on Base Date with tender discount/premium applied thereon.

1.3.4 Tunnel

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

Table 1.3.4

Stage of Payment	Percentage - weightage	Payment Procedure
A- Investigation & Design	1.77%	Unit of measurement in submission of Detailed Design and Investigation report complete payment shall be made on the completion and approval of the same.
A1- Temporary Dewatering Arrangement	0.25%	Unit of measurement is linear length-meter. Payment of each stage shall be made on pro rata basis of completion of a stage in a continuous length of 50 meter of induvial tube.
A2- Underground Excavation for tunnel in Support Category dominating the Face Area including Drilling and Grouting		
ESC-10	15.24%	
ESC-11	13.33%	
ESC-1	5.71%	
ESC-3	1.52%	
ESC-4	1.90%	
ESC-5	0.19%	
ESC-5V	0.19%	
A3- Permanent Dewatering Arrangement, (PVC pipes, perforated PVC pipes, precast concrete slots channel elements, dimpled sheets between permanent lines of C&C tunnel length and backfill material, water-proofing membrane etc.)	4.12%	
A4- Primary Support Measures		
SFRS/Shotcrete with Wire mesh		
ESC-10	4.98%	
ESC-11	4.35%	
ESC-1	1.87%	
ESC-3	0.50%	
ESC-4	0.62%	
ESC-5	0.06%	
ESC-5V	0.06%	
Rock Bolts/Steel Rib/Spile Bars/Piperoofing		
ESC-10	3.10%	
ESC-11	2.71%	
ESC-1	1.61%	

Stage of Payment	Percentage - weightage	Payment Procedure
ESC-3	0.31%	
ESC-4	0.39%	
ESC-5	0.04%	
ESC-5V	0.04%	
Lining Stress controller a set of 3 cylinders		
ESC-10	0.00%	
ESC-11	0.00%	
ESC-1	0.00%	
ESC-3	0.00%	
ESC-4	9.53%	
ESC-5	1.05%	
ESC-5V	1.05%	
A5- Lining/Bed Concrete Works	14.78%	
A6- Instrumentation and Monitoring	0.39%	
A7- Pavement	3.99%	
Drain footpath, Crash Barrier with Railing and Cable	3.95%	Unit of measurement is linear length-meter. Payment of each stage shall be made on pro rata basis of completion of a stage in a continuous length of 50 meter of individual tube.
Drilling & Grouting holes	0.85%	
Portal		
A1- Temporary Dewatering Arrangement	0.00%	
A2- Open Excavation and Earthwork (Loose excavation, rock excavation, rip rap layer on embankment, Gabion etc.)	70.12%	
A3- Primary support measures		
SFRS/Shotcrete with Wiremesh	4.61%	
Rock Bolts/Forepoling/Piperooting	14.56%	
A4- Permanent Dewatering (PVC pipes, perforate PVC pipes, precast concrete slots and channel elements, dimpled sheets between permanent lines of C&C tunnel length and backfill material, water-proofing membrane etc.)	1.82%	
A5- Concrete Works at portal	7.12%	
A6- Pavement	1.77%	
A7- Construction of building	0.00%	
Electro and Mechanical Equipment work and power supply		On delivery, installation and commissioning of E&M equipment in the ratio of 20:40:40 and on installation of power supply to each tunnel portal
1. Electro and Mechanical equipment	74.26%	
2. Construction of 4 nos. of 1x 10 MVA, 33/11 Kv substation, 33 kva line from nearest source i/c pole, gantry, conductor and applicable charges of utility owning department	3.45%	On delivery, installation and commissioning of E&M equipment in the ratio of 20:20:60.
3. Ventilation System	22.85%	

1.3.5 Other works.

Procedure for estimating the value of other works done shall be as stated in table 1.3.5.

Table 1.3.5

Stage of Payment	Weightage	Payment Procedure
(1) Toll plaza	0.00%	Unit of measurement is each completed toll plaza. Payment of each toll plaza shall be made on pro rata basis with respect to the total of all toll plazas.

(2) Road-side drains	6.05%	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 10 % (ten per cent) of the total length.
(3) Road signs, markings, km stones, safety devices	7.21%	
(4) Project Facilities		
a) Bus bays	0.19%	Payment shall be made on pro rata basis for completed facilities.
b) Truck lay-byes	0.00%	
c) Site Clearance	0.65%	
(i) Junction	2.06%	Payment shall be made on pro rata basis for completed facilities.
(ii) High Mast Lighting	0.00%	Payment shall be made on pro rata basis for completion of work.
(iii) Utility duct	2.70%	Payment shall be made on pro rata basis for completion of work.
(5) Road Side Plantation	0.34%	Payment shall be made on pro rata basis for completion of work.
(6) Muck Disposal & Management		
(i) Disposal of excavated materials	7.70%	Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length.
(ii) Protection work at muck disposal via Gabion wall, RR wall, etc.	9.97%	
(7) Protection work other than approaches to the bridges, elevated sections/flyovers/grade separators and ROB/RUBs (Retaining/Toe Wall)	0.00%	Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length.
(8) Slope Protection (Hill side) Bio-Engineering	0.76%	Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length.
Retaining Wall	13.02%	
Breast Wall	39.93%	
Gabion Wall	8.96%	
(9) Safety and traffic management during construction	0.45%	Every quarter after duly certified the work by the AE as per Contractual requirement at site.

1.1.1 Utility Shifting Estimate

Procedure for estimating the value of Utility Shifting works done shall be as stated in table 1.3.6

Table 1.3.6

Stage of Payment	Weightage	Payment Procedure
(i) Electrical JPDCL	100.00%	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 10 % (ten per cent) of the total length.

2. Procedure for payment for Maintenance

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

2.2 Payment for Maintenance shall be made in quarterly instalments 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**

1. The Project drawings, as defined in Clause 1.1, Definitions, Article 1, Definitions and Interpretation, Part-I: Preliminary, of the Contract Agreement shall consist:
 - (a) Working Drawings of all the components/elements of the Project as determined by Authority Engineer/Authority, and
 - (b) As-built drawings for the Project components/elements as determined by AE/Authority. As-built drawings shall be duly certified by Authority Engineer.
2. A minimum list of the drawings of the various components/elements of the Project and project facilities required to be submitted by the Contractor is given below:

A. GENERAL LAYOUT PLAN
Tunnel Layout Plan and L-Section
Tunnel Cross Section
B. TUNNEL GEOLOGICAL DRAWINGS
Geological Layout Plan
Geological L-Section
Geological Cross Section
C. TUNNEL CIVIL & MEP DRAWINGS
Excavation and Support Drawings
Portal Development Drawings
Instrumentation Details
Detailed Drawing of Concrete Outline and Reinforcement
Drawings of clearance profile and installations without invert slab
Drawings of clearance profile and installations with invert slab
Detailed Drawings of Tunnel lighting.
Drawings of Tunnel system and installations
Tunnel MEP Drawings
D. BRIDGE
General Arrangement Drawing
Detailed Drawings of Structures/Bridges
E. ROAD (PLAN & PROFILE)
Plan & Profile
Cross Sections
Drawings of horizontal alignment, vertical profile and cross sections
Drawings of cross drainage works
Drawings of traffic diversion plans and traffic control measures
Drawings of road drainage measures
Drawings of typical details slope protection measures
Drawings of landscaping and horticulture
Drawings of street lighting
F. STANDARD DRAWINGS
Detail of Mandatory Regulatory Signs

Detail of Mandatory Regulatory Signs & Compulsory Direction Control and Other Signs
Detail of Informatroy Signs
Detail of Cautionary Signs-TS
Detail of cautionary warning signs
Detail of cautionary warning signs
Details of route marking (chevron marking)
Details of road marking
Details of directional signs
Details Toe drain
Details of pitching, filtermaterial, chute drain and energy dissipation basin-std
Details of double head metal beam crash barrier
Details for 200meter 1 km & km post
Detail for boundary stone & guard post
Drain retaining wall & kerb
Gabion wall
D. Utility shifting Plan.

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 of each 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 **640th (Six Hundred and Forty)** day from the Appointed Date (the “**Project Milestone- I**”).
- (ii) 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 **1095th(One Thousand and Ninety- Five)** 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 **1552nd(One Thousand Five Hundred and Fifty-Two)** 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 **1825th (One Thousand Eight Hundred and Twenty-Five)** 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 equipment 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 Non-destructive Testing Techniques, at two spots in every span, to be chosen at random by the Authority's Engineer. Bridges with a span of 15 (fifteen) 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 Vehicle Survey (NSV)	At least twice a year (As per survey months defined for the state basis rainy season)
2	Roughness of pavement	Network Vehicle Survey (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 Clause 12.2)

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 [construction of the ****section (km ** to km **) of National Highway No. ***] (the "**Project Highway**") 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 thereof.
- 2 It is certified that, in terms of the aforesaid Agreement, all works forming part of Project Highway have been completed, and the Project Highway is hereby declared fit for entry into operation on this the day of 20... , Scheduled Completed Date for which was the day of20.....

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%
(e)	Roadside Drains	
(i)	Cleaning and repair of drains	5%
(f)	Road Furniture	
(i)	Cleaning, painting, replacement of road signs, delineators, road markings, 200 m/km/5th km stones	5%
(g)	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%
(h)	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:

$$R = \frac{P}{100} \times (M1 \text{ or } M2) \times \frac{L1}{L}$$

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)

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 geotechnical 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 management. For purpose of this paragraph 4(ix), the tests specified in the MoRTH Specifications for Road and Bridge works and respective

Indian Roads Congress Standards/ Guidelines/ Manuals, together with any other Indian/ International Standards mentioned therein including any modifications/ substitutions thereof shall be deemed to be tests confirming to Good Industry Practice for quality management.

- (x) The Authority's Engineer shall witness all the quality control tests carried out by the Contractor at its site laboratory/ main laboratory/ field/ plants. These include tests for all materials, mixes, products etc. Authority's Engineer shall also witness all tests of finished products like bearing in the manufacturer's laboratory as mandated in respective standards. Authority's Engineer will also conduct review of quality control documents in respect of factory manufactured materials/ finished products, etc. as per IRC:SP:112.
- (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 MoRTH specifications for Road & Bridge works and respective Indian Roads Congress Standards/ Guidelines/ Manuals together with any other Indian/ International standards referred thereto. 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 - 0

(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. 1,00,00,000/- (One Crore only)

- (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)

******* End of the Document *******
