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. The risk pertaining to the adequacy of the executed works in accordance with the Manual & Contract Agreement shall be assumed solely by the Contractor. **Prior to submitting the bid, the Contractor is permitted to conduct the Non Destructive Test (NDT) on the structural elements. Any expenses to be incurred for rectification measures in the executed works, if deemed necessary, shall be assumed to be integrated into the bid by the Contractor.**

1. Site

The Site of the Two-Lane Project Highway comprises the section of NH-244 commencing from Km 0.00 to Km 12.850 of Chenani-Sudhmahadev-Goha stretch of NH-244 i.e., Construction of Uni-directional Sudhmahadev – Dranga Twin Tube Tunnels and its approach roads on Chenani - Sudhmahadev - Goha 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:

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:

Sr. No.	Ex Chainage (km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-structure	Super- structure		
Nil						

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

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

S. No.	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:

S.	Chainage	Type of Structure		Width

No.	(km)	Foundation	Sub- structure	Super- structure	No. of Spans with span length (m)	(m)
Nil						

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:

S. No.	Chainage (km)	Type of Culvert	Span /Opening with span length (m)	Width (m)
Nil				

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 (Kutcha)
Nil				

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
Nil								

(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
Nil			

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)
Nl			

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.	From (Km)	To (Km)	Length (m)	Width (m)	Date of providing Right of Way*
1	2		3	4	5
(i) Full Right of Way (width)	0.000	0.050	50	112	90% shall be available on appointed date.
	0.050	5.499	5449	60	
	5.499	5.532	33	108	
	5.532	5.600	68	60	
	5.600	5.945	345	72	
	5.945	6.100	155	60	
	6.100	6.200	100	80	
	6.200	6.400	200	85	
	6.400	6.465	65	65	
	6.465	6.600	135	60	
	6.600	6.700	100	72	
	6.700	6.800	100	111	
	6.800	9.368	2568	60	
	9.368	9.400	32	91	
	9.400	9.875	475	70	
	9.875	10.000	125	50	
	10.000	11.460	1460	24	
	11.460	11.555	95	30	
	11.555	11.833	278	24	
	11.833	11.950	117	29	
	11.950	12.470	520	24	
	12.470	12.500	30	31	
	12.500	12.850	350	24	

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

Annex - III

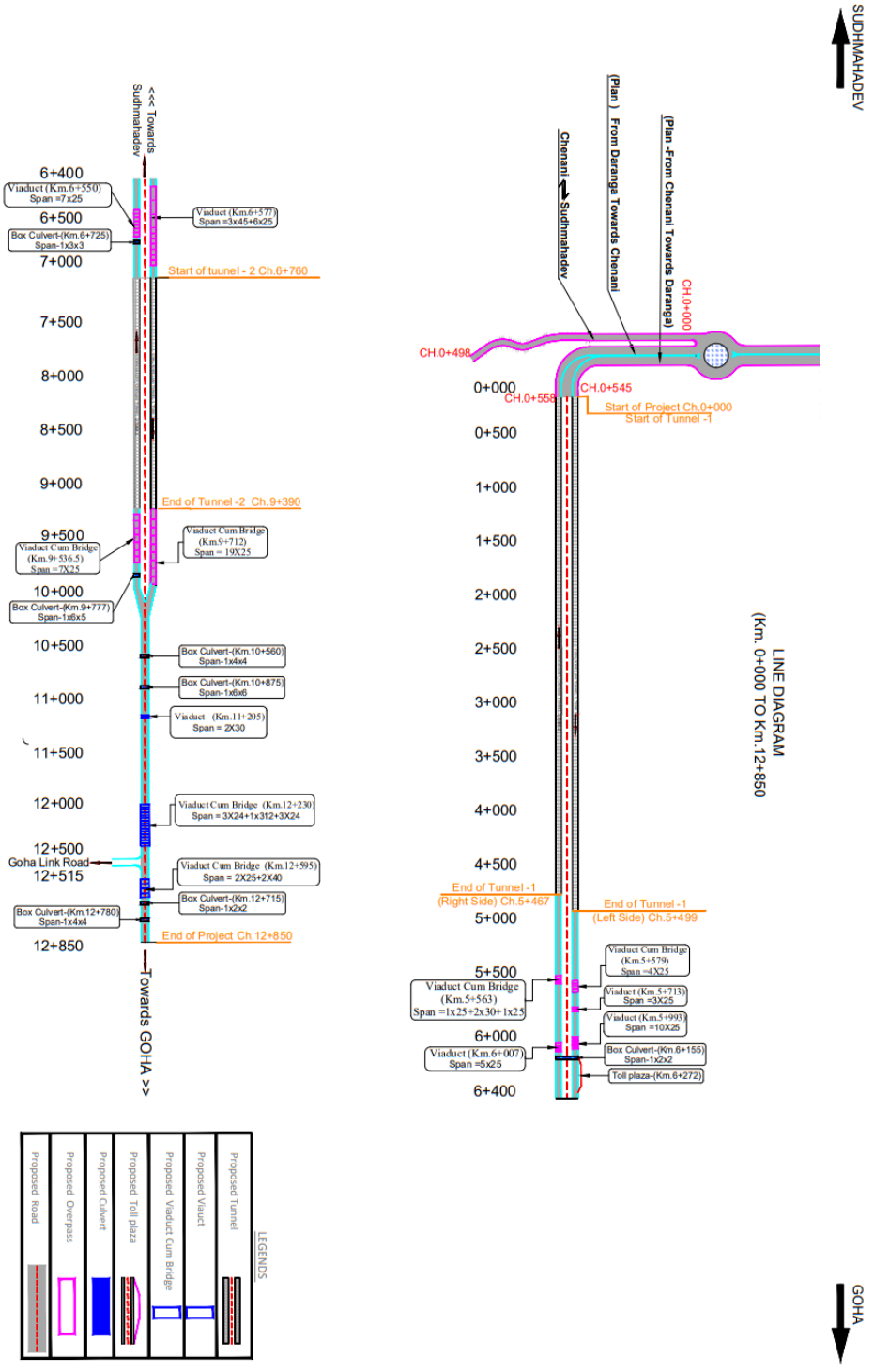
(Schedule-A)

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.


SUDHMAHADEV
<<< Towards Sudhmahadev
6+400
Viaduct (Km.6+550) Span =7x25
6+500
Box Culvert-(Km.6+725) Span-1x3x3
7+000
Viaduct (Km.6+577) Span =3x45+6x25
Start of tuunel - 2 Ch.6+760
7+500
8+000
8+500
9+000
End of Tunnel -2 Ch.9+390
9+500
Viaduct Cum Bridge (Km.9+536.5) Span =7X25
Viaduct Cum Bridge (Km.9+712) Span = 19X25
10+000
Box Culvert-(Km.9+777) Span-1x6x5
10+500
Box Culvert-(Km.10+560) Span-1x4x4
Box Culvert-(Km.10+875) Span-1x6x6
11+000
Viaduct (Km.11+205) Span = 2X30
11+500
12+000
Viaduct Cum Bridge (Km.12+230) Span = 3X24+1x312+3X24
12+500
Goha Link Road
12+515
Viaduct Cum Bridge (Km.12+595) Span = 2X25+2X40
Box Culvert-(Km.12+715) Span-1x2x2
Box Culvert-(Km.12+780) Span-1x4x4
12+850
End of Project Ch.12+850
Towards GOHA >>
(Plan) From Daranga Towards Chenani
(Plan -From Chenani Towards Daranga)
Chenani Sudhmahadev
CH.0+000
CH.0+498
CH.0+545
CH.0+559
0+000
Start of Project Ch.0+000
Start of Tunnel -1
0+500
1+000
1+500
2+000
2+500
3+000
3+500
4+000
4+500
End of Tunnel -1 (Right Side) Ch.5+467
End of Tunnel -1 (Left Side) Ch.5+499
5+000
5+500
Viaduct Cum Bridge (Km.5+579) Span =4X25
Viaduct Cum Bridge (Km.5+563) Span =1x25+2x30+ 1x25
Viaduct (Km.5+715) Span =3X25
Viaduct (Km.5+993) Span =10X25
6+000
Viaduct (Km.6+007) Span =5X25
Box Culvert-(Km.6+155) Span-1x2x2
Toll plaza-(Km.6+272)
6+400
LINE DIAGRAM (Km. 0+000 TO Km.12+850
GOHA
Proposed Road
Proposed Overpass
Proposed Culvert
Proposed Toll plaza
Proposed Viaduct Cum Bridge
Proposed Viaduct
Proposed Tunnel
LEGENDS

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& Attachment-D1.

.

Annex – I

(Schedule-B)

Description of the Project

"Construction of Uni-directional Sudhmahadev — Dranga Twin Tube Tunnel and its approach roads (From D.Ch. 0.00 to D Ch. 12.85) on Chenani - Sudhmahadev - Goha road (design length 12.850km including Uni-directional Tunnel 1- 5.449/5.417km (Tube-1/Tube-2) and Tunnel 2- 2.64/2.63km (Tube-1/Tube-2)) on NH-244 in the Union Territory of Jammu & Kashmir on EPC mode. Details of the proposed project section are as given below:

Tunnels (Uni-directional)

Description	Tunnel-1	Tunnel-2
Length of Tube-1 (Left)	**5.449 km**	**2.640 km**
Length of Tube-2 (Right)	**5.417 km**	**2.630 km**
Western Portal		
Elevation	1719 m	1585 m
Location	E533668.1783 N3654830.2225 (Tube-1) E533690.925 N3654810.663 (Tube-2)	E538249.583 N3659496.679 (Tube-1) E538249.319 N3659466.663 (Tube-2)
Approach road to portal	Uni- directional 2-lane approach road of 50 m length	2-lane approach road of 1270 m length including bridge and viaducts which connects tunnel-1 (tube-1) to tunnel-2 (tube-1) 2-lane approach road of 1280m length including bridge and viaducts which connects tunnel-1 (tube-2) to tunnel-2 (tube-2)
Eastern Portal		
Elevation	1635 m	1500 m
Location	E537166.903 N3658978.978 (Tube-1) E537161.243 N3658935.473 (Tube-2)	E540886.951 N3659373.775 (Tube-1) E540875.325 N3659344.284 (Tube-2)
Approach road to portal	2-lane approach road of 1270 m (For Tube-1) length including bridge and viaducts which connects to tunnel-2 (tube-1) 2-lane approach road of 1280m (For Tube-2) length including bridge and viaducts which connects to tunnel-2 (tube-2)	Two lane approach road of 540m length (For Tube-1) including bridge and viaducts Two lane approach road of 610m length (For Tube-2) including bridge and viaducts 2-lane approach road from km 9.950 to km 12.850 shall be of 2900m length including bridges & viaducts.
Junction:	Junction shall be developed at km16.250 on existing Chenani-Sudhmahadev Road including reconstruction of the main carriageway. The junction containing 3nos. of roads along with a rotary has been proposed at km 0.000 on Western portal of Sudhmahadev Tunnel, to nullify the conflict and for uninterrupted traffic movement between the Junction of proposed Tunnel and existing Chenani-Sudhmahadev Road. Road-1(From Chenani towards Dranga [Using Tube-1 of Tunnel-1]) 1 — 0.545 km Road-2 (From Dranga towards Chenani [using Tube-2 of Tunnel-1]) –	

	0.558 km Road-3 (Chenani-Sudhmahadev) Existing Road — 0.498 km Rotary shall be developed at the junction with existing road.

1. Development of the project section

(i) The Project Highway shall follow the new alignment unless otherwise specified by the Authority and shown in the alignment plans specified in Annex-III of Schedule-A.

(ii) Width of the proposed tunnel and its approach road carriageway shall be as follow.

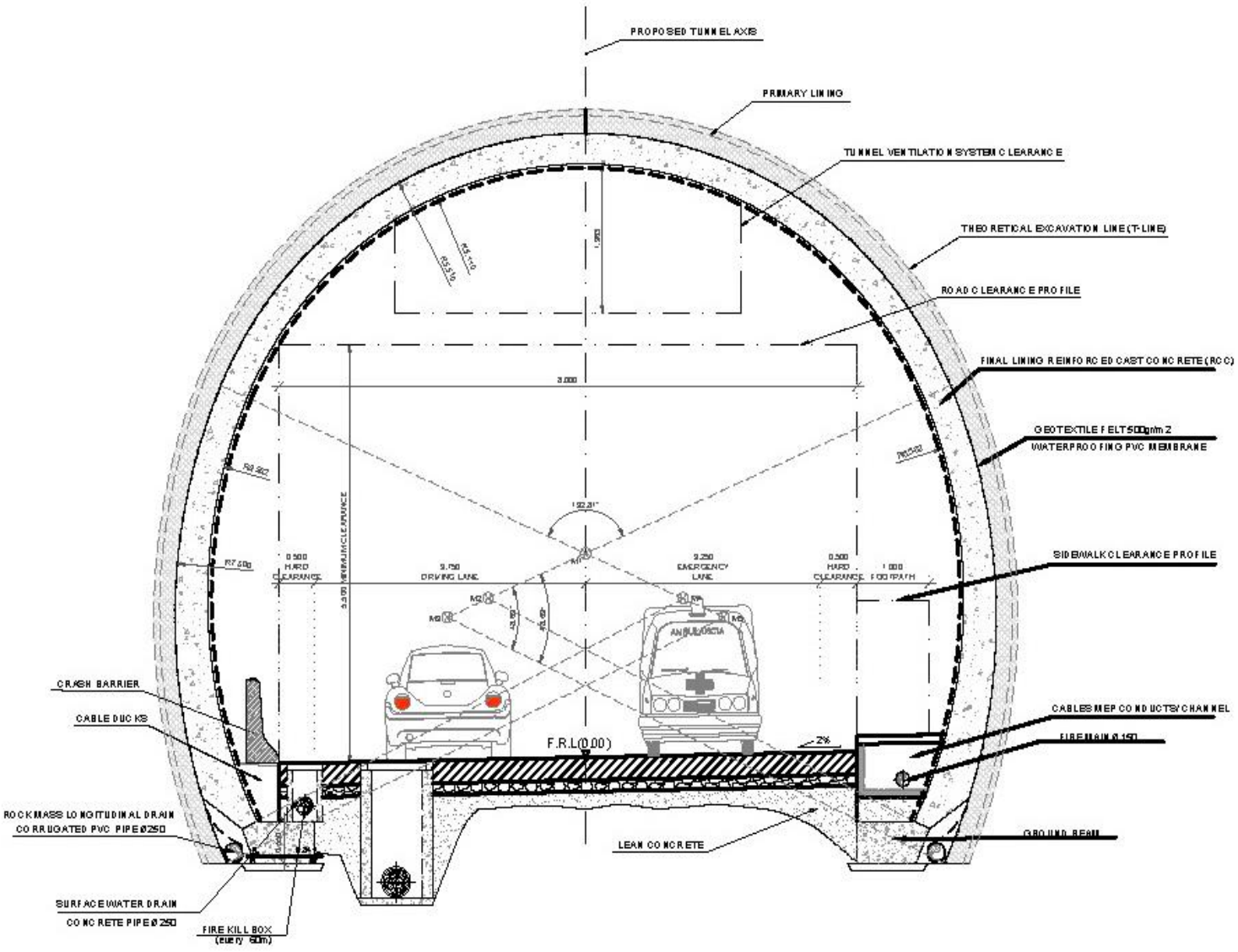
A. Tunnel Details

a) Cross Section Width and Height of proposed Tunnel

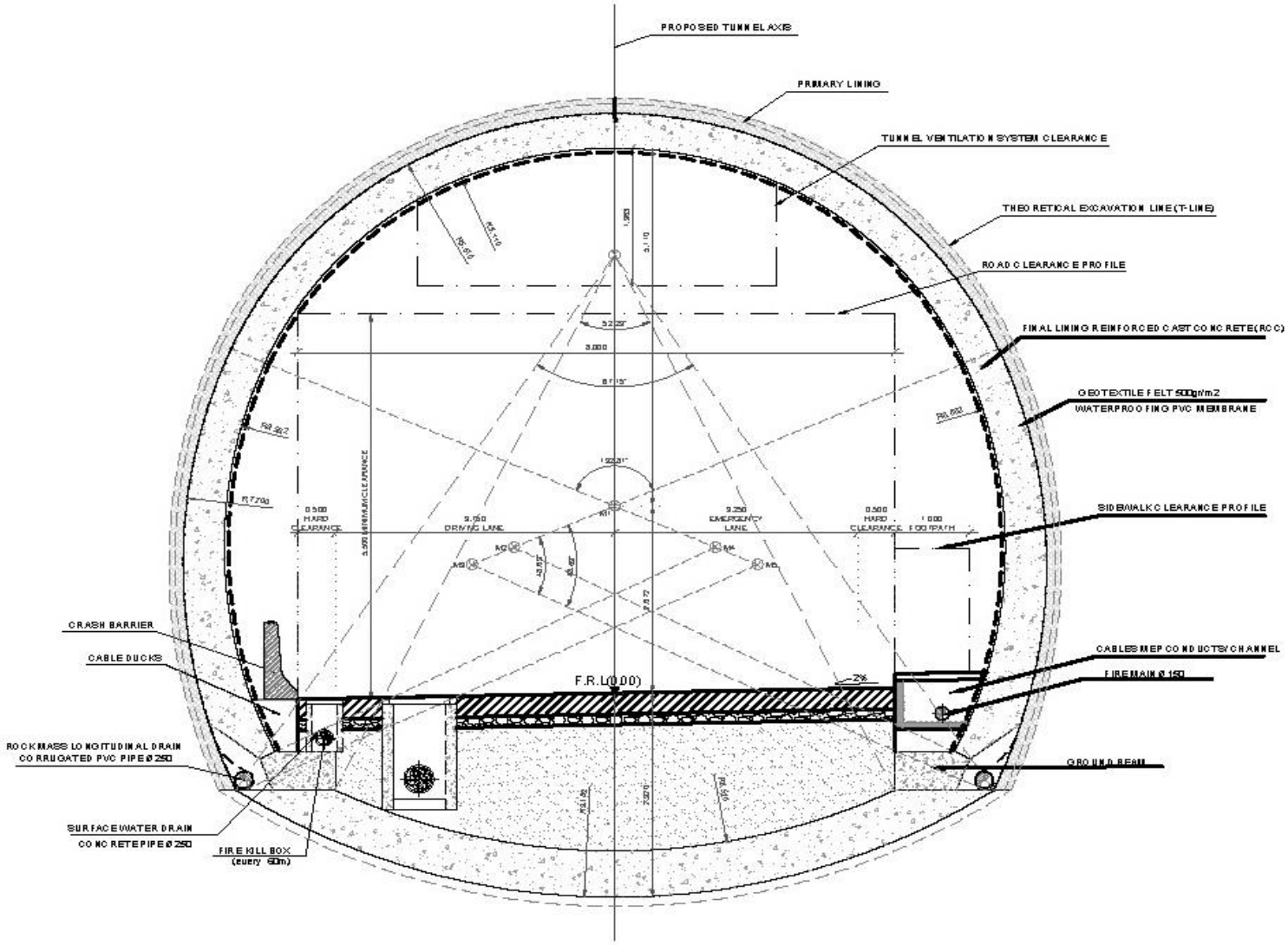
Summary of Road Cross Section inside the tunnel is given below:

Cross Section Element	Width in m
Crash barrier	0.57
Hard Clearance (either side)	2 x 0.50m
Traffic Lane	3.75m
Emergency Lane	3.25m
Raised Footpath	1.00m
Overall width	**9.57m**

Cross section of the tunnel is given below.



Tunnel-1 &Tunnel-2 (LHS)Uni-directional Tunnel Cross Section without invert



Tunnel-1 & Tunnel-2 (LHS) Uni-directional Tunnel Cross Section with invert

b) Pavement

The road pavement in the tunnel shall 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

c) Ventilation

A longitudinal ventilation system shall be provided for Sudhmahadev Tunnels 1 & 2. Ventilation system shall be provided as per the technical specifications and Guidelines for Road Tunnels IRC: SP:91-2019, NFPA 502 (2017), PIARC Technical Committee D5 – Road Tunnels: Vehicle Emissions and Air Demand for Ventilation (2019)

d) 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.

e) 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.

f) 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.

g) 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/NATAM) is Contractor's choice.

h) Muck Dump Disposal

Up to 15 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.

The tentative locations for dumping the muck that would be generated from the Sudhmahadev tunnel and approach road are given in below table.

Sl. No	Area name	Pocket	Approx. Area in Kanal (1 Kanal = 505.857 Sq.m)	Location	Coordinates
1	Sudhmahadev T1	M-1	40	Between Basht& Sudhmahadev	33° 2' 10" N 75° 19' 36" E
2	Sudhmahadev T1	M-2	30	Between Basht& Sudhmahadev	33° 2' 4" N 75° 19' 54" E
3	Sudhmahadev T 1	M-3	10	Between Basht& Sudhmahadev	33° 1' 58" N 75° 20'22" E
4	Sudhmahadev T 1	M-4	10	Between Basht& Sudhmahadev	33° 2' 10" N 75° 20' 41" E
5	Sudhmahadev T 1	M-5	10	Chullyar	33° 2' 23" N 75° 20' 57" E

6	Sudhmahadev T 1	M-6	30	Portal	33° 1' 51" N 75° 21' 35" E
7	Sudhmahadev T 1	M-7	10	Between Sudhmahadev & Kohsar Village	33° 0' 46" N 75° 22' 12" E
8	Sudhmahadev T 1	M-8	140	Kohsar Village	33° 0' 54" N 75° 02' 11" E
9	Thandapani T3 & T2	M-9	200	Thanda Pani	33° 04' 17" N 75° 23' 57" E
10	Thandapani T2	M-10	200	Thanda Pani	33° 4' 32" N 75° 24' 03" E
11	Kaiser Nallah T2	M-11	150	Kaiser Nallah	33° 4' 33" N 75° 26' 28" E
12	Sudhmahadev	M-12	215	Chenani Sudhmahadev	526193.27°E 3655102.22" N
13	Sudhmahadev	M-13	86	Chenani Sudhmahadev	527260.98°E 3654513.42" N
14	Sudhmahadev	M-14	200	Chenani Sudhmahadev	528372.68°E 3654391.23" N
15	Sudhmahadev	M-15	270	Chenani Sudhmahadev	528995.99°E 3653944.01" N
Total Kanal			**1601**		
Total Muck Identify Area			**809865.85 sq.m.**		

B. Width of Approach Road and existing Chenani-Sudhmahadev Road

(a) The paved carriageway shall be of 2-lane configuration for Sudhmahadev-Daranga section including existing Chenani-Sudhmahadev road, a rotary shall be constructed as per Annexure-III of Schedule-A. The approach roads connecting the rotary and the Tunnel shall be of 4 lane-configuration and tunnel section shall be of 9.57 m wide for (each tube) 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 sections shown.

2. 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 as per IRC: SP:73-2018. For mountainous/hilly terrain the minimum design speed shall be 40 km per hr.

(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 1.5 m width shall be provided on either side 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					

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) Overpass

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

Sl. No.	Location	Span arrangement (No. x L x H) 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.

Sr. No.	Detail	TCS	Length	
			(m)	Km
1	Approach of tunnel in mountainous terrain with left side fill with retaining/toe wall and right side cut (height of cut < 25m)	1	30.5	0.031
2	Approach of tunnel with both side cut (height of cut < 25m)	2	98	0.098
3	For approach of tunnel with both side cut (height of cut > 25m)	3	134	0.134
4	Approach of tunnel in mountainous terrain with left side fill with retaining/toe wall and right side cut (height of cut > 25m)	4	96.5	0.097
5	Approach of tunnel with left side viaduct and right side cut (height of cut > 25m)	5	239.5	0.240
6	Approach of tunnel with left side viaduct and right side cut (height of cut < 25m)	6	102.5	0.103
7	Approach of tunnel with both side fill with retaining/toe wall	7	20	0.020
8	Two lane carriageway with paved shoulder in mountainous terrain with both side cut (height of cut < 25m)	8	1809	1.809
9	Two lane carriageway with paved shoulder in mountainous terrain with both side fill with retaining/toe wall	9	445	0.445
11	Viaduct		1536	1.536
12	Tunnel		8089	8.089
13	Toll		250	0.250
	Total Design Length		12850.00	12.850

3. Intersections and Grade Separators

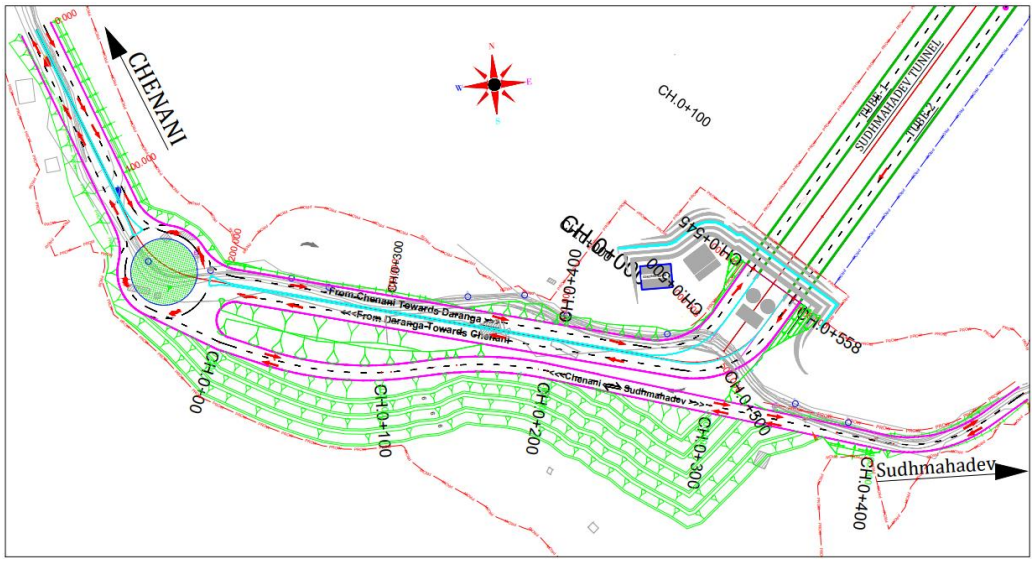
All intersections and grade separators shall be as per the provision of relevant Manual.

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.	Location of intersection	Type of intersection	Other features
1	12+500	Y	at Goha link road

Another Junction shall be developed at km 16.250 on existing Chenani-Sudhmahadev Road including reconstruction of the main carriageway. The junction containing 3nos. of roads along with a rotary has been proposed at km 0.000 on Western portal of Sudhmahadev Tunnel, to nullify the conflict and for uninterrupted traffic movement between the Junction of proposed Tunnel and existing Chenani-Sudhmahadev Road.



(ii) Grade separated intersection with ramps

Sl. No.	Location	Salient features	Minimum length of viaduct to be provided (m)	Road to be carried over/under the structures	Remarks
Nil					

4. 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			

5. Pavement Design

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

(ii) Type of pavement

Flexible pavement has been proposed at the main carriageway of highway. It shall be designed as per provision of IRC :37-2018.

Rigid Pavement has been proposed at the Toll Plaza portion of project Highway. It shall be designed as per provision of IRC: 58-2015.

(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.

6. Roadside Drainage

Drainage system including surface and subsurface drains for the Project Highway shall be provided as per the provision of relevant Manual. However, tentative locations are as follow:-

Roadside PCC Drain List					
Sr. No.	Design Chainage		Design Length (m)	Side	Roadside Drain Length (m)
	From	To			
1	00+020	00+030	10	Right	10
2	00+030	00+050	20	Both	40
3	05+499	05+508	9	Both	18
4	05+508	05+529	21	Right	21
5	05+618	05+629	11	Right	11
6	05+629	05+660	31	Both	62
7	05+660	05+676	15.5	Right	15.5
8	05+676	05+751	75	Right	75
9	05+751	05+765	14.5	Right	14.5
10	05+765	05+868	103	Both	206
11	05+868	05+945	76.5	Right	76.5
12	06+070	06+118	48.5	Right	48.5
13	06+118	06+155	37	Right	37
14	06+155	06+405	250	Both	500
15	06+405	06+435	29.5	Right	29.5
16	06+435	06+463	28.5	Right	28.5
17	06+638	06+720	81.5	Right	81.5
18	06+720	06+740	20.5	Right	20.5
19	06+740	06+760	20	Both	40
20	09+400	09+449	49	Both	98
21	09+950	09+980	30	Right	30
22	09+980	10+545	565	Both	1130
23	10+545	10+605	60	Right	60
24	10+605	10+825	220	Both	440
25	10+825	10+970	145	Right	145
26	10+970	11+175	205	Both	410
27	11+235	12+002	767	Both	1534
28	12+458	12+510	52	Both	104
29	12+510	12+530	20	Right	20
30	12+660	12+850	190	Right	190
	Total Roadside PCC Drainage Length				**5496 m**

Catch Drain List								
Sr. No.	Design Chainage		Design Length	TCS No	Side	Steps		Catch Drain Length (m)
	From	To				Left	Right	
1	00+000	00+020	20	TCS-7	-	0	0	0
2	00+020	00+030	10	TCS-1	One	0	2	20
3	00+030	00+050	20	TCS-2	Both	2	2	80
4	05+499	05+508	9	TCS-2	Both	2	2	36
5	05+508	05+529	21	TCS-6	One	0	2	42
6	05+618	05+629	11	TCS-5	One	0	2	22
7	05+629	05+660	31	TCS-3	Both	2	2	124
8	05+660	05+676	15.5	TCS-4	One	0	2	31

Catch Drain List								
Sr. No.	Design Chainage		Design Length	TCS No	Side	Steps		Catch Drain Length (m)
	From	To				Left	Right	
9	05+676	05+751	75	TCS-5	One	0	2	150
10	05+751	05+765	14.5	TCS-4	One	0	2	29
11	05+765	05+868	103	TCS-3	Both	2	2	412
12	05+868	05+945	76.5	TCS-5	One	0	2	153
13	06+070	06+118	48.5	TCS-5	One	0	2	97
14	06+118	06+155	37	TCS-4	One	0	2	74
15	06+405	06+435	29.5	TCS-4	One	0	2	59
16	06+435	06+463	28.5	TCS-5	One	0	2	57
17	06+638	06+720	81.5	TCS-6	One	0	2	163
18	06+720	06+740	20.5	TCS-1	One	0	2	41
19	06+740	06+760	20	TCS-2	Both	2	2	80
20	09+400	09+449	49	TCS-2	Both	2	2	196
21	09+950	09+980	30	TCS-9	One	0	2	60
22	09+980	10+545	565	TCS-8	Both	1	2	1695
23	10+545	10+605	60	TCS-9	One	0	2	120
24	10+605	10+825	220	TCS-8	Both	1	2	660
25	10+825	10+970	145	TCS-9	One	0	2	290
26	10+970	11+175	205	TCS-8	Both	1	2	615
27	11+235	12+002	767	TCS-8	Both	1	2	2301
28	12+458	12+510	52	TCS-8	Both	1	2	156
29	12+510	12+530	20	TCS-9	Both	0	2	40
30	12+660	12+850	190	TCS-9	One	0	2	380
	Total Catch Drain Length							**8183m**

7. Design of Structures

(i) General

(a) All bridges, Viaducts 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	5+579 (LHS), 5+563 (RHS)5+713,6+577 (LHS) and 6+550 (RHS)	Width of Carriageway – 9.0m including KS Crash Barrier – 0.5m (both sides) Total Width – 10m
2	5+993 (LHS), 6+007 (RHS), 9+712 (LHS), 9+536 (RHS), 11+205, 12+230 and 12+595	Width of Carriageway –7.5m including KS Width of footpath – 1.5m (both sides) Crash Barrier — 0.5m (both sides) RCC Railing – 0.5m (both sides) Total Width – 12.5m

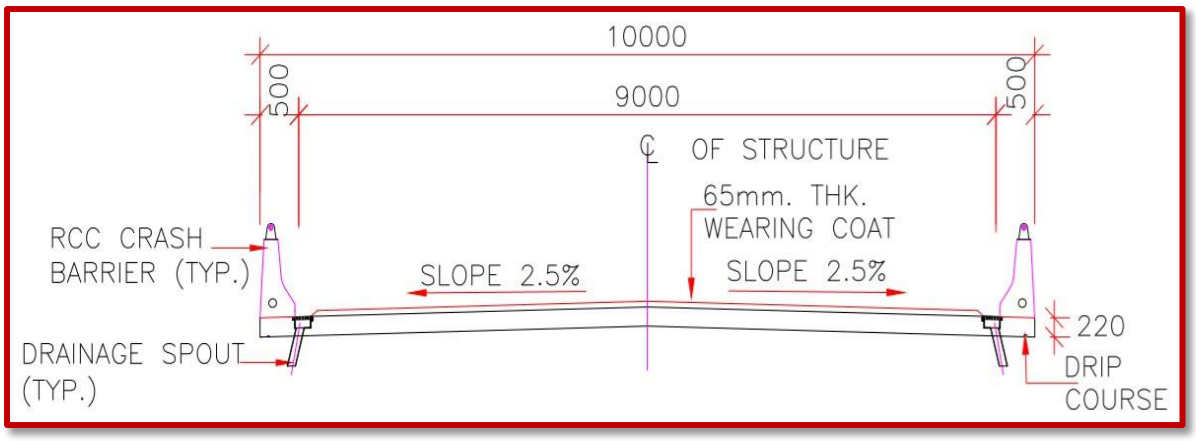


Figure for 7 (i) (b) 1

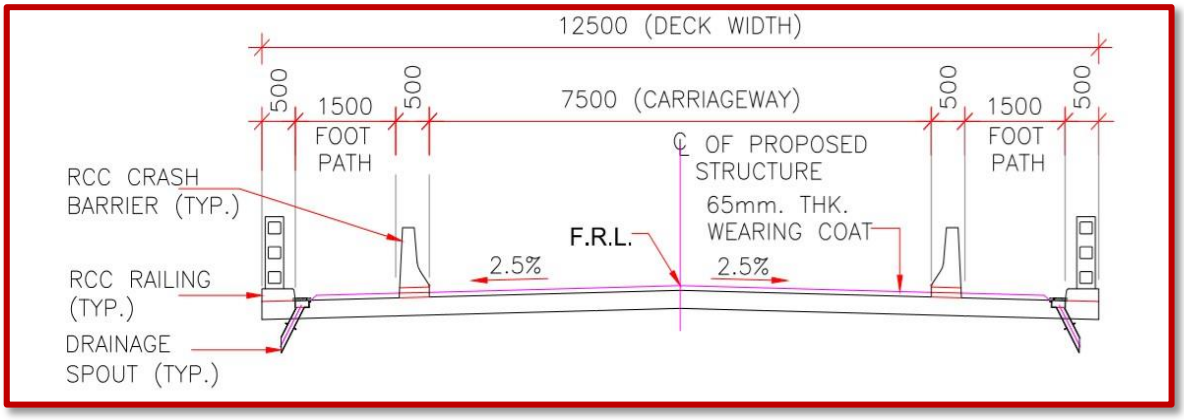


Figure for 7 (i) (b) 2

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

Sl. No.	Location at km	Remarks
1	5+993	Footpath-Both Sides
	6+007	Footpath-Both Sides
2	9+712	Footpath-Both Sides
	9+536	Footpath-Both Sides
3	12+230	Footpath-Both Sides
4	12+595	Footpath-Both Sides
5	11+205	Footpath-Both Sides

(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	5+579	Electricity cables, OFC cables etc.	LHS
	5+563	Electricity cables, OFC cables etc.	RHS
2	5+713	Electricity cables, OFC cables etc.	LHS
3	5+993	Electricity cables, OFC cables etc.	LHS
	6+007	Electricity cables, OFC cables etc.	RHS
4	6+577	Electricity cables, OFC cables etc.	LHS
	6+550	Electricity cables, OFC cables etc.	RHS
5	9+712	Electricity cables, OFC cables etc.	LHS
	9+536	Electricity cables, OFC cables etc.	RHS
6	11+205	Electricity cables, OFC cables etc.	2-lane
7	12+230	Electricity cables, OFC cables etc.	2-lane
8	12+595	Electricity cables, OFC cables etc.	2-lane

(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:

Sl. No.	Culvert location	Span/Opening (m)	Remarks, if any*
Nil			

(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:

Sl. No.	Culvert location* in km	Span/Opening (m) Lx Ht.	Remarks
1	6+155	2x2	LHS
		2x2	RHS
2	6+725	3x3	RHS
3	9+777	6x5	2-lane
4	10+560	4x4	2-lane
5	10+875	6x5	2-lane
6	12+715	2x2	2-lane
7	12+780	4x4	2-lane

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

(e) 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.

Sr. No.	Type of Structure	Design Chainage	Total Length (m)	Remarks
1	Viaduct cum Bridge	5+579	100	2 Lane bridge on LHS
		5+563	110	2 Lane bridge on RHS
2	Viaduct	05+713	75	2 Lane bridge on LHS only
3	Viaduct	5+993	250	2 Lane bridge on LHS
		06+007	125	2 Lane bridge on RHS
4	Viaduct	6+577	285	2 Lane bridge on LHS
		6+550	175	2 Lane bridge on RHS
5	Viaduct cum Bridge	9+712	475	2 Lane bridge on LHS
		9+536	175	2 Lane bridge on RHS
6	Viaduct	11+205	60	2 Lane bridge
7	Viaduct cum Bridge	12+230	456	2 Lane bridge
8	Viaduct cum Bridge	12+595	130	2 Lane bridge

(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/At-grade separated structures

The grade separated/at-grade 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 Bridges and Structures:

Sl. No.	Description	Location in km	Remarks
1	Viaduct cum Bridge	5+579	LHS
		5+563	RHS
2	Viaduct	5+713	LHS
3	Viaduct	5+993	LHS
		6+007	RHS
4	Viaduct	6+577	LHS
		6+550	RHS
5	Viaduct	11+205	2-lane
6	Viaduct cum Bridge	9+712	LHS
		9+536	RHS
7	Viaduct cum Bridge	12+230	2-lane
8	Viaduct cum Bridge	12+595	2-lane

8. 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)	0+50 to 5+499	1974	ESC 1	8 m
		0	ESC 2	
		2413	ESC 3	
		477	ESC 4	
		585	ESC 5	
Tunnel-1 (Tube-2)	0+50 to 5+467	1958	ESC 1	8 m
		0	ESC 2	
		2413	ESC 3	
		461	ESC 4	
		585	ESC 5	
Tunnel-2 (Tube-1)	6+760 to 9+400	560	ESC 1	8 m
		442	ESC 2	
		1367	ESC 3	
		157	ESC 4	
		114	ESC 5	
Tunnel-2 (Tube-2)	6+760 to 9+390	560	ESC 1	8 m
		442	ESC 2	
		1357	ESC 3	
		157	ESC 4	
		114	ESC 5	

Note:-ESC-1, ESC-2, ESC-3, ESC-4 and ESC-5 classified as under:-

Rock Class	Classification	Recommended Rock Support	Excavation
Good to very good	ESC-1 & ESC-2	Tunnel is self-standing with minimum support requirements of 160-120mm shotcrete and spot bolting 4m long. Final lining thickness of 400-660 mm.	Heading /Benching (3.25-2.75 m/ /6.5-5.5 m)
Rock Class	Classification	Recommended Rock Support	Excavation
Fair	ESC-3	Systematic Rock Bolt – 5.0 m with spacing – 2.0 m and steel fiber shotcrete – 260mm. Final lining thickness of 400-660 mm	Heading/ Benching (2.0m/4.0m)
Poor to very poor	ESC-4 & ESC-5	Systematic Rock Bolt – 9.0m-15.0m with spacing – 0.8-1.5 m with steel fiber Shotcrete of 300-350 mm thickness. Steel Rib- TH 29/TH36 or equivalent, @ 0.8m -1.25 c/c spacing. Pipe roofing poling 6.0m long @88.9 of dia. Final lining thickness of 500-760 mm	Heading/ Benching (0.8m-1.5m/1.5m-3.0m)

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

Tunnel No.	Location from to km	Remarks
Tunnel-1	0+50 to 5+499	Footpath width 1.0m
	0+50 to 5+467	Footpath width 1.0m
Tunnel-2	6+760 to 9+400	Footpath width 1.0m
	6+760 to 9+390	Footpath width 1.0m

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

(ii) 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 of each tube (m)	Remarks
1	LHS Carriageway	00+050	05+499	5449	9.00	New 2-lane Twin tube Tunnel
	RHS Carriageway	00+050	05+ 467	5417		
2	LHS Carriageway	06+760	09+400	2640	9.00	
	RHS Carriageway	06+760	09+390	2630		

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 shall 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 Sudhmahadev-Dranga Tunnel, although the speed limit shall be lower, considering –for security reasons- a real 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 suggested 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)***
Tunnel 1 - Tube 1	*96*	*89*
Tunnel 1 - Tube 2	*93*	*89*
Tunnel 2 - Tube 1	*106*	*89*
Tunnel 2 - Tube 2	*92*	*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 has been 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 will start 200 m before the portals and will finish in the portals.*
- *Threshold Zone: This zone will have a different length in each tunnel as it is shown in the following table:*

Tube	*Length (m)*
Tunnel 1 - Tube 1	*96*
Tunnel 1 - Tube 2	*93*
Tunnel 2 - Tube 1	*106*
Tunnel 2 - Tube 2	*92*

The threshold zone of each tube shall 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 shall 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 will serve as an intermediate jump between the last part of the transition zone and the interior zone that will 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 has been considered. Nevertheless, the CIE criterion has been 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 will depend on the stopping distance in the exit part.*

Ventilation system-

A longitudinal ventilation system has been proposed for Sudhmahadev Tunnels 1& Tunnel 2. The design of the ventilation system has been performed according to two different criteria:

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

Ventilation system shall be designed for the following conditions:

- ***50 MW fire (equivalent to HGV fire)***
- *Enough jet fans pairs would be installed to achieve a ventilation velocity over the critical velocity according to NFPA 502 (2020)*
- *An extra jet fan pair shall be installed for redundancy (failure or maintenance)*

Jet fans pairs would be installed to achieve a ventilation velocity over the critical velocity according to NFPA 502 (2020). The number of jet fan pairs provided below is tentative. The EPC Contractor shall carry out the detailed ventilation design and determine the required number and capacity of jet fan pairs based on ventilation calculations in accordance with NFPA 502 (2020), the design criteria stipulated in the Contract Agreement, and the applicable MoRTH/IRC Specifications.

TUNNEL	NUMBER OF JET FAN PAIRS
SUDHMAHADEV 1 – TUBE 1	13
SUDHMAHADEV 1 – TUBE 2	10
SUDHMAHADEV 2 – TUBE 1	10
SUDHMAHADEV 2 – TUBE 2	6

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 15ºC (adjustable).*

It has been 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 Sudhmahadev 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 west entrance of both tunnels, 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 tunnel, a water main buried pipe will 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 will connect the tunnel with the Fire Pumping Station. The underground main pipe will have a diameter of 8", 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 Stations will 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 will have a capacity of 120 m^3. 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 will 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:

Tunnel-1			
S. No.	**Design Chainage**	**Width of Cross Passage(m)**	**Length of Cross Passage(m)**
1	00+550	6.1 m	19m
2	01+050	6.1 m	19m
3	01+550	6.1 m	19m
4	02+050	6.1 m	19m
5	02+550	6.1 m	19m
6	03+050	6.1 m	19m
7	03+550	6.1 m	19m
8	04+050	6.1 m	19m
9	04+550	6.1 m	19m
10	05+050	6.1 m	19m

Tunnel-2			
S. No.	**Design Chainage**	**Width of Cross Passage(m)**	**Length of Cross Passage(m)**
1	07+093	6.1 m	19m
2	07+593	6.1 m	19m
3	08+093	6.1 m	19m

4	08+593	6.1 m	19m
5	09+093	6.1 m	19m

Note:-The proposed twin tube tunnel shall be connected by cross passage at an inclination of 90^0 at center to facilitate pedestrian/ traffic diversion in the event of any emergency at every 500 m spacing (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, 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 maximum Longitudinal gradient of the tunnel is about 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:

Tube-1 (Tunnel -1)								
Design Km		**Length (m)**	**Rock Type**	**Rock Characteristics as per site visit**	**RMR/Q**			**Rock Cover (m)**
From	**To**				**Values**	**Description**	**Rock mass Class**	
00+050	00+679	629	Limestone, Dolomitic Limestone, Shale, Sporadic Conglomerate	Slightly weathered	48-55/ 1.8-4.4	Fair	III	2-341

Tube-1 (Tunnel -1)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	Description	Rock mass Class	
00+679	00+805	126	Limestone, Dolomitic Limestone, Shale, Sporadic Conglomerate	Slightly weathered	23-35/ .05-0.2	Poor	IV	341-410
00+805	00+825	20	Limestone, Dolomitic Limestone, Shale, Sporadic Conglomerate	Slightly weathered	50-58/ 2.6-7	Fair	III	410-423
00+825	01+707	882	Phyllite, Slate, Limestone, Carbonaceou s Shale	Moderately weathered	50-58/ 2.6-7	Fair	III	423-831
01+707	03+044	1337	Phyllite, Slate, Limestone, Carbonaceou s Shale	Moderately weathered	63-76/ 15-119	Good	II	831-722
03+044	04+005	961	Phyllite, Slate, Limestone, Carbonaceou s Shale	Moderately weathered	45-55/ 1.1-4.4	Fair	III	722-455
04+005	04+117	112	Phyllite, Slate, Limestone, Carbonaceou s Shale, Quartzite, Phyllitic Quartzite, Limestone, Dolomite	Moderately weathered	25-34/ .05-0.2	Poor	IV	455-456
04+117	04+229	112	Dolomite, Dolomitic Limestone, Limestone, Quartzite	Slightly weathered	25-34/ .05-0.2	Poor	IV	456-432
04+229	04+494	265	Dolomite, Dolomitic Limestone, Limestone, Quartzite	Slightly weathered, crushed	25-34/ .05-0.2	Very Poor	V	432-366
04+494	04+774	280	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceou s Phyllite, Metavolcanics	Slightly weathered, crushed	10-18/ 0.007-0.02	Very Poor	V	366-259

Tube-1 (Tunnel -1)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	Description	Rock mass Class	
04+774	04+814	40	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceou s Phyllite, Metavolcanics	Slightly weathered	22-34/ .03-0.2	Poor	IV	259-245
04+814	05+364	550	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceou s Phyllite, Metavolcanics	Slightly weathered	45-55/ 1.1-4.4	Fair	III	245-45
05+364	05+499	135	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceou s Phyllite, Metavolcanics	Slightly weathered	25-35/ .05-0.2	Poor	IV	45-6

Tube-1 (Tunnel -2)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	From	To	
06+760	06+854	93.6	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	45-55/ 1.1-4.4	Fair	III	12-75
06+854	07+296	442.5	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	62-68/ 13-33	Good	II	75-221
07+296	07+396	100.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	45-55/ 1.1-4.4	Fair	III	221-212

Tube-1 (Tunnel -2)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	From	To	
07+396	07+612	216.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	25-32/ .05-.14	Poor	IV	212-332
07+612	07+894	282.1	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	48-55/ 1.8-4.4	Fair	III	332-635
07+894	08+454	560.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	62-72/ 13-63	Good	II	635-469
08+454	08+996	542.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	45-57/ 1.1-9.3	Fair	III	469-172
08+996	09+051	55.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	25-35/ .05-0.2	Poor	IV	172-157
09+051	09+400	348.8	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	42-50/ 0.7-2.6	Fair	III	157-8

Tube-2 (Tunnel-1)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	Description	Rock mass Class	
00+050	00+679	629	Limestone, Dolomitic Limestone, Shale, Sporadic Conglomerate	Slightly weathered	48-55/ 1.8-4.4	Fair	III	2-341
00+679	00+805	126	Limestone, Dolomitic Limestone, Shale, Sporadic Conglomerate	Slightly weathered	23-35/ .05-0.2	Poor	IV	341-410
00+805	00+825	20	Limestone, Dolomitic Limestone, Shale, Sporadic Conglomerate	Slightly weathered	50-58/ 2.6-7.0	Fair	III	410-423
00+825	01+707	882	Phyllite, Slate, Limestone, Carbonaceous Shale	Moderately weathered	50-58/ 2.6-7.0	Fair	III	423-831
01+707	03+044	1337	Phyllite, Slate, Limestone, Carbonaceous Shale	Moderately weathered	63-76/ 15-119	Good	II	831-722
03+044	04+005	961	Phyllite, Slate, Limestone, Carbonaceous Shale	Moderately weathered	45-55/ 1.1-4.4	Fair	III	722 455
04+005	04+117	112	Phyllite, Slate, Limestone, Carbonaceous Shale, Quartzite, Phyllitic Quartzite, Limestone, Dolomite	Moderately weathered	25-34/ .05-0.2	Poor	IV	455-456
04+117	04+229	112	Dolomite, Dolomitic Limestone, Limestone, Quartzite	Slightly weathered	25-34/ .05-0.2	Poor	IV	456-432
04+229	04+494	265	Dolomite, Dolomitic Limestone, Limestone, Quartzite	Slightly weathered, crushed	25-34/ .05-0.2	Very Poor	V	432-366

Tube-2 (Tunnel-1)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	Description	Rock mass Class	
04+494	04+774	280	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered, crushed	10-18/ 0.007-0.02	Very Poor	V	366-259
04+774	04+814	40	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	22-34/ .03-0.2	Poor	IV	259-245
04+814	05+364	550	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	45-55/ 1.1-4.4	Fair	III	245-45
05+364	05+467	103	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	25-35/ .05-0.2	Poor	IV	45-6

Tube-2 (Tunnel-2)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	Description	Rock mass Class	
06+760	06+854	93.6	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	45-55/ 1.1-4.4	Fair	III	12-75
06+854	07+296	442.5	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	62-68/ 13-33	Good	II	75-221

Tube-2 (Tunnel-2)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	Description	Rock mass Class	
07+296	07+396	100.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	45-55/ 1.1-4.4	Fair	III	221-212
07+396	07+612	216.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	25-32/ .05-.14	Poor	IV	212-332
07+612	07+894	282.1	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Slightly weathered	48-55/ 1.8-4.4	Fair	III	332-635
07+894	08+454	560.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	62-72/ 13-63	Good	II	635-469
08+454	08+996	542.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	45-57/ 1.1-9.3	Fair	III	469-172
08+996	09+051	55.0	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanic s	Moderately weathered	25-35/ .05-0.2	Poor	IV	172-157

Tube-2 (Tunnel-2)								
Design Km		Length (m)	Rock Type	Rock Characteristics as per site visit	RMR/Q			Rock Cover (m)
From	To				Values	Description	Rock mass Class	
09+051	09+390	338.8	Quartzite, Phyllitic Quartzite, Limestone, Carbonaceous Phyllite, Metavolcanics	Moderately weathered	42-50/ 0.7-2.6	Fair	III	157-8

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-2	Tunnel is self-standing with minimum support requirements of 160-120 mm shotcrete and spot bolting 4m long. Final lining thickness of 400-660 mm.	Heading /Benching (3.25-2.75 m/ /6.5-5.5 m)
Fair	ESC-3	Systematic Rock Bolt – 5.0 m with spacing – 2.0 m and steel fiber shotcrete – 260 mm. Final lining thickness of 400-660 mm	Heading/ Benching (2.0m/4.0m)
Poor to very poor	ESC-4 & ESC-5	Systematic Rock Bolt – 9.0m-15.0m with spacing – 0.8-1.5 m with steel fiber Shotcrete of 300-350 mm thickness. Steel Rib- TH 29/TH36 or equivalent, @ 0.8m -1.25 c/cspacing. Pipe roofing poling 6.0m long @88.9 of dia. Final lining thickness of 500-760 mm	Heading/ Benching (0.8m-1.5m/1.5m-3.0m)

Notes:

1 *Above details of the tunnel has been prepared as per the geotechnical investigation, field survey of the geologist and the report submitted by the geologist based on the geotechnical and geophysical reports.*

2 *ESC1, ESC2, ESC3, ESC4 & ESC5 are the tunnel support categories applicable to different types of rock classes mentioned in the table.*

3 *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 Baseline GBR shall be treated as change of scope under the provision of the* ***Article 13*** *of the EPC Contract agreement subject to following conditions: -*

i) Any positive variation up to 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%)*

ii) 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 8 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.

4 *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.*

5 *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.*

9. Real Time Wireless Tunnel Monitoring System

Concessionaire 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^{o}C +80^{o}C
2. 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
3. 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
4. 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
5. 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
6. 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 inthe database and implicates the presented results are always up-to-datein 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-relfex 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	

10. 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 specifications and manual.

11. Roadside Furniture

(i) Roadside furniture shall be provided in accordance with the provision of relevant Manual.

(ii) Overhead cantilever traffic signs are provided in 3 Nos.

12. 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.

13. Hazardous Locations

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

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

14. Special Requirement for Hill Roads

In accordance with section 13 of the manual (from IRC: SP: 73-2018), IRC: SP 48: 2023 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.**

1 Retaining Wall

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.

RCC retaining Wall (Above ht. 3 m upto 12 m)

Design Ch. in km on LHS		
From	To	Length in m
0000	0010	10
5640	5650	10
5750	5760	10
5860	5870	10
6120	6180	60
6420	6430	10
6720	6730	10
9520	9550	30
9750	9950	200
9990	10090	100
10130	10360	230
10440	10720	280
10800	10920	120
12000	12010	10
12530	12540	10
12680	12690	10
12740	12850	110
Total Length in m		**1220**

Design Ch. in km on RHS		
From	To	Length in m
0000	0010	10
5510	5520	10
5620	5630	10
6640	6650	10
9530	9540	10
10840	10860	20
12460	12470	10
12780	12800	20
Total Length in m		**100**

RRM Retaining Wall (Below ht. 3 m)

LEFT SIDE	
Design Chainage km	

RIGHT SIDE	
Design Chainage km	

From	To	Length in m
0010	0030	20
5666	5676	10
6730	6740	10
9950	9990	40
10080	10110	30
10120	10130	10
10370	10380	10
10430	10440	10
10720	10750	30
10780	10800	20
10920	11030	110
11050	11070	20
12460	12470	10
12510	12530	20
12670	12680	10
12710	12740	30
TOTAL LENGTH		**390**

From	To	Length in m
0010	0020	10
5500	5510	10
6607	6620	13
10220	10340	120
10470	10490	20
10830	10840	10
10860	10880	20
12670	12680	10
12690	12700	10
12770	12780	10
12800	12840	40
TOTAL LENGTH		**273**

2 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

Design Chainage		Design Length (m)	Side	*Length where Rock Bolts to be provided in m
From	To			
00+020	00+030	10	Right	10
00+030	00+050	20	BOTH	40
05+499	05+508	9	BOTH	18
05+508	05+529	21	Right	21
05+618	05+635	17	Right	17
05+635	05+660	25	BOTH	50
05+660	05+676	16	Right	16
05+676	05+751	75	Right	75
05+751	05+765	14	Right	14
05+765	05+868	103	BOTH	206
05+868	05+945	77	Right	77
06+070	06+118	48	Right	48
06+118	06+155	37	Right	37
06+405	06+435	30	Right	30
06+435	06+463	28	Right	28
06+638	06+720	82	Right	82
06+720	06+740	20	Right	20
06+740	06+760	20	BOTH	40
09+400	09+449	49	BOTH	98
09+950	09+980	30	Right	30
09+980	10+545	565	BOTH	1130
10+545	10+605	60	Right	60
10+605	10+825	220	BOTH	440

Design Chainage		Design Length (m)	Side	*Length where Rock Bolts to be provided in m
From	To			
10+825	10+970	145	Right	145
10+970	11+175	205	BOTH	410
11+235	11+334	99	BOTH	198
11+346	12+002	656	BOTH	1312
12+458	12+510	52	BOTH	104
12+510	12+530	20	Right	20
12+660	12+850	190	Right	190
Total Length				4966

***Note-**

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

2.Project Length requiring rock bolt on the cut hill surface slopes of varying heights as per site requirement.

3.The Rock bolts to be provided as per design requirement at site.

15. Change of Scope

The length of Structures, bridges and **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.

16. Indicative Chainages with applicable typical Cross section

Design Chainage		Design Length	TCS Type	TCS No	Lane
From	To				
00+000	00+020	20	Approach Of Tunnel With Both Side Fill With Retaining/Toe Wall	TCS-7	both side fill
00+020	00+030	10	Approach Of Tunnel In Mountainous Terrain With Left Side Fill With Retaining/Toe Wall And Right Side Cut (Height Of Cut < 25m)	TCS-1	left side fill right cut
00+030	00+050	20	Approach Of Tunnel With Both Side Cut ((Height Of Cut < 25m)	TCS-2	both side cut
00+050	05+499	5449	Tunnel	TUNNEL	tunnel
05+499	05+508	9	Approach Of Tunnel With Both Side Cut ((Height Of Cut < 25m)	TCS-2	both side cut
05+508	05+529	21	Approach Of Tunnel With Left Side Viaduct And Right Side Cut (Height Of Cut < 25m)	TCS-6	viaduct left
05+529	05+618	89	Viaduct	VIADUCT	viaduct both
05+618	05+629	11	Approach Of Tunnel With Left Side Viaduct And Right Side Cut (Height Of Cut > 25m)	TCS-5	viaduct left
05+629	05+660	31	For Approach Of Tunnel With Both Side Cut (Height Of Cut > 25m)	TCS-3	both side cut
05+660	05+676	15.5	Approach Of Tunnel In Mountainous Terrain With Left Side Fill With Retaining/Toe Wall And Right Side Cut (Height Of Cut > 25m)	TCS-4	left side fill right cut

Design Chainage		Design Length	TCS Type	TCS No	Lane
From	To				
05+676	05+751	75	Approach Of Tunnel With Left Side Viaduct And Right Side Cut (Height Of Cut > 25m)	TCS-5	viaduct left
05+751	05+765	14.5	Approach Of Tunnel In Mountainous Terrain With Left Side Fill With Retaining/Toe Wall And Right Side Cut (Height Of Cut > 25m)	TCS-4	left side fill right cut
05+765	05+868	103	For Approach Of Tunnel With Both Side Cut (Height Of Cut > 25m)	TCS-3	both side cut
05+868	05+945	76.5	Approach Of Tunnel With Left Side Viaduct And Right Side Cut (Height Of Cut > 25m)	TCS-5	viaduct left
05+945	06+070	125	Viaduct	VIADUCT	viaduct both
06+070	06+118	48.5	Approach Of Tunnel With Left Side Viaduct And Right Side Cut (Height Of Cut > 25m)	TCS-5	viaduct left
06+118	06+155	37	Approach Of Tunnel In Mountainous Terrain With Left Side Fill With Retaining/Toe Wall And Right Side Cut (Height Of Cut > 25m)	TCS-4	left side fill right cut
06+155	06+405	250	For Approach Of Tunnel With Both Side Cut (Height Of Cut > 25m)	TOLL	toll
06+405	06+435	29.5	Approach Of Tunnel In Mountainous Terrain With Left Side Fill With Retaining/Toe Wall And Right Side Cut (Height Of Cut > 25m)	TCS-4	left side fill right cut
06+435	06+463	28.5	Approach Of Tunnel With Left Side Viaduct And Right Side Cut (Height Of Cut > 25m)	TCS-5	viaduct left right cut
06+463	06+638	175	Viaduct	VIADUCT	viaduct both
06+638	06+720	81.5	Approach Of Tunnel With Left Side Viaduct And Right Side Cut (Height Of Cut < 25m)	TCS-6	viaduct left right cut
06+720	06+740	20.5	Approach Of Tunnel In Mountainous Terrain With Left Side Fill With Retaining/Toe Wall And Right Side Cut (Height Of Cut < 25m)	TCS-1	left side fill right cut
06+740	06+760	20	Approach Of Tunnel With Both Side Cut ((Height Of Cut < 25m)	TCS-2	approach both side cut
06+760	09+400	2640	**Tunnel**	**TUNNEL**	tunnel
09+400	09+449	49	Approach Of Tunnel With Both Side Cut ((Height Of Cut < 25m)	TCS-2	approach both side cut
09+449	09+475	26	Approach Of Tunnel With Right Side Viaduct	VIADUCT	viaduct right
09+475	09+624	149	Viaduct	VIADUCT	viaduct both
09+624	09+950	326	Approach Of Tunnel With Left Side Viaduct	VIADUCT	viaduct left
09+950	09+980	30	Two Lane Carriageway With Paved Shoulder With Left Side Retaining/Toe .Wall & Right Side Cut. (Height Of Cut < 25m)	TCS-9	left side fill right cut
09+980	10+545	565	Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With Both Side Cut (Height Of Cut < 25m)	TCS-8	2 -lane both side cut
10+545	10+605	60	Two Lane Carriageway With Paved Shoulder With Left Side Retaining/Toe .Wall & Right Side Cut. (Height Of Cut < 25m)	TCS-9	left side fill right cut

Design Chainage		Design Length	TCS Type	TCS No	Lane
From	To				
10+605	10+825	220	Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With Both Side Cut (Height Of Cut < 25m)	TCS-8	2 -lane both side cut
10+825	10+970	145	Two Lane Carriageway With Paved Shoulder With Left Side Retaining/Toe .Wall & Right Side Cut. (Height Of Cut < 25m)	TCS-9	left side fill right cut
10+970	11+175	205	Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With Both Side Cut (Height Of Cut < 25m)	TCS-8	2 -lane both side cut
11+175	11+235	60	Viaduct	VIADUCT	viaduct
11+235	12+002	767	Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With Both Side Cut (Height Of Cut < 25m)	TCS-8	2 -lane both side cut
12+002	12+458	456	Viaduct	VIADUCT	2lane viaduct
12+458	12+510	52	Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With Both Side Cut (Height Of Cut < 25m)	TCS-8	2 -lane both side cut
12+510	12+530	20	Two Lane Carriageway With Paved Shoulder With Left Side Retaining/Toe .Wall & Right Side Cut. (Height Of Cut < 25m)	TCS-9	left side fill right cut
12+530	12+660	130	Viaduct	VIADUCT	2lane viaduct
12+660	12+850	190	Two Lane Carriageway With Paved Shoulder With Left Side Retaining/Toe .Wall & Right Side Cut. (Height Of Cut < 25m)	TCS-9	left side fill right cut
Total Length (in m)		12850			

Note: Utility duct shall be laid with 300mm dia. HDPE pipe all along the project length as per applicable TCS 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. The shifting of utilities and felling of trees shall be carried out by the Contractor. The cost of the same shall be borne by the Authority The details of utilities are as follows:

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

Sl. No.	Type of Utility	Unit		Remark
A	**Electrical Utilities** i.e., Sub-Transmission Division and JPDCL			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.
1	Electrical poles & Conductor	Nos.	208 nos. &18 km	
2	Electrical cables	Meters	4860	
3	Crossings i.e., Overhead & U/g	No.	8	
3	Transformers	Nos.	4	

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	**Meters**		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.**
	15mm to 50 mm Dia Pipe under Doda, Division		3800	

(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.

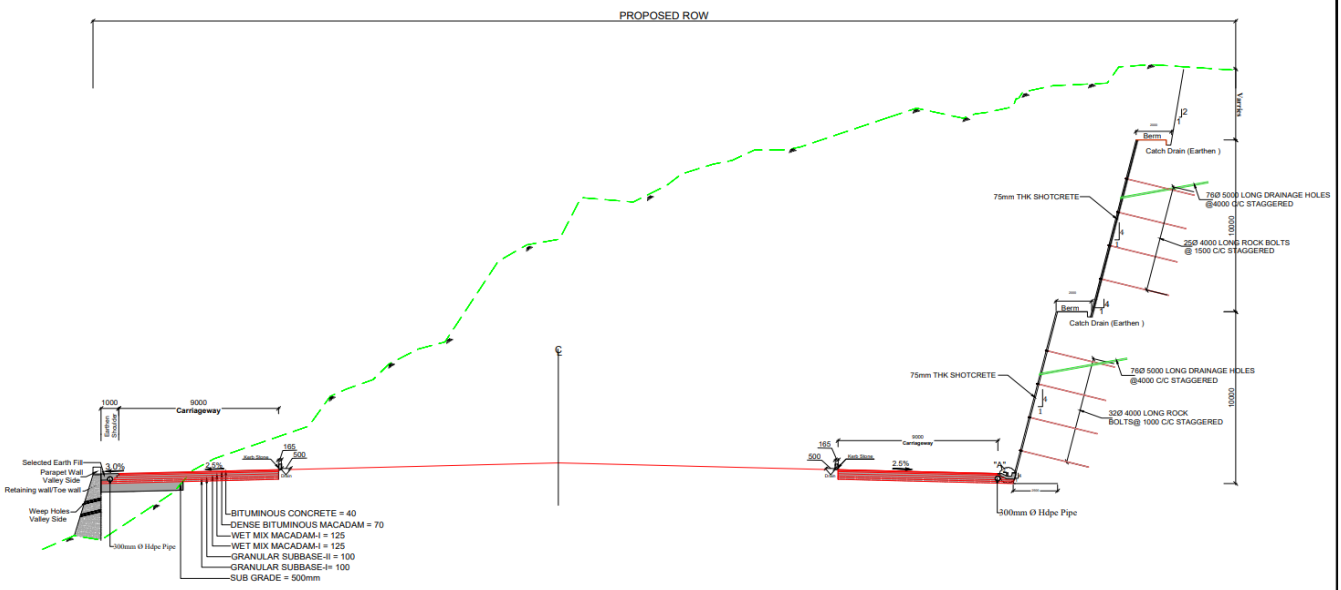
(d) The utilities shall be handed over after shifting work is completed to Utility Owning Department up to their entire satisfaction. The maintenance liability shall rest with the Utility Owning Department after handing over process is complete as far as utility shifting works are concerned.

2. Power Supply for Tunnel and Tunnel Portals

For power supply to the tunnel and tunnel portals it is required to power supply line of 33KV and create Sub-stations 33/11 KV as per the requirement. TheSub-stations shall be created at no. of suitable locations to cater the load of 3.08 MW and 2.14 MW for Tunnel-I and Tunnel-II respectively.

S.No	Description
1	Creation of 1x6.3MVA receiving station along with 9 Km long 33KV line at Thanda pani
2	Creation of 1x6.3MVA receiving station along with 9 Km long 33KV line at Bari Marmat
3	Creation of 1x6.3MVA receiving station along with 5Km long 33KV line at Sudhmahadev Bachal

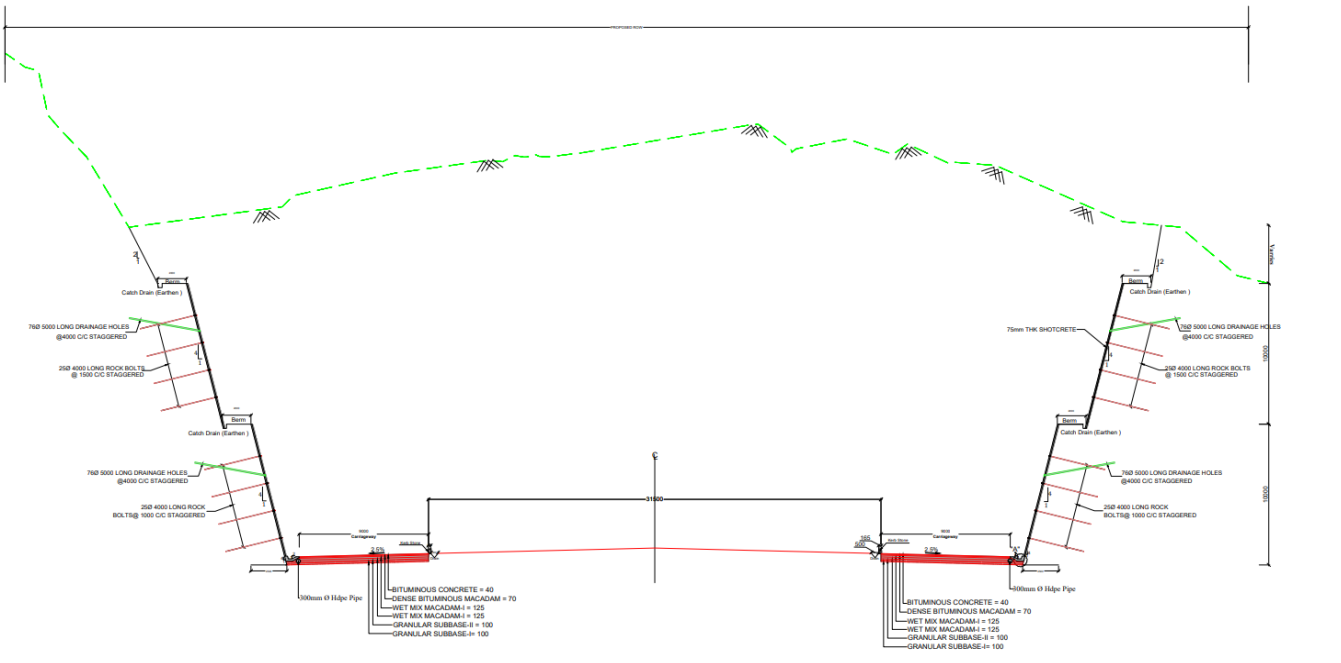
The length of supply line of 33 KV will depend on the locations of Sub-Station and may vary on ground at the time of execution. The land for all the Sub-Stations for the purpose of supplying power to the tunnel and tunnel portals shall be provided by the NHIDCL/competent authority.



TYPE - 1 TYPICAL CROSS-SECTION FOR APPROACH OF TUNNEL IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL AND RIGHT SIDE CUT (HEIGHT OF CUT < 25m)

NOTE:-

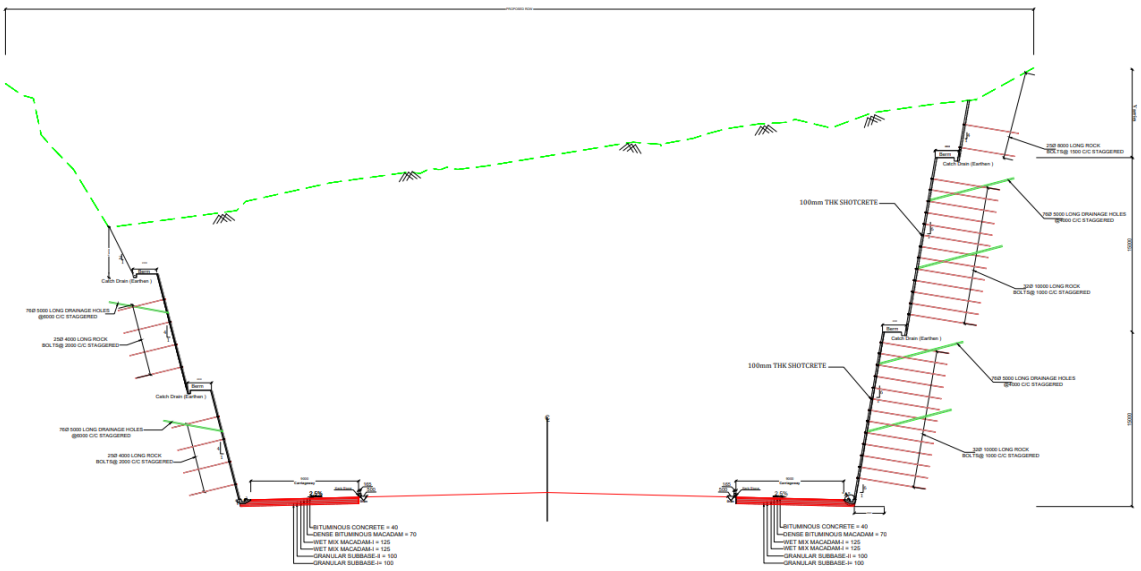
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.



TYPE - 2 TYPICAL CROSS-SECTION FOR APPROACH OF TUNNEL WITH BOTH SIDE CUT ((HEIGHT OF CUT < 25m)

NOTE:-

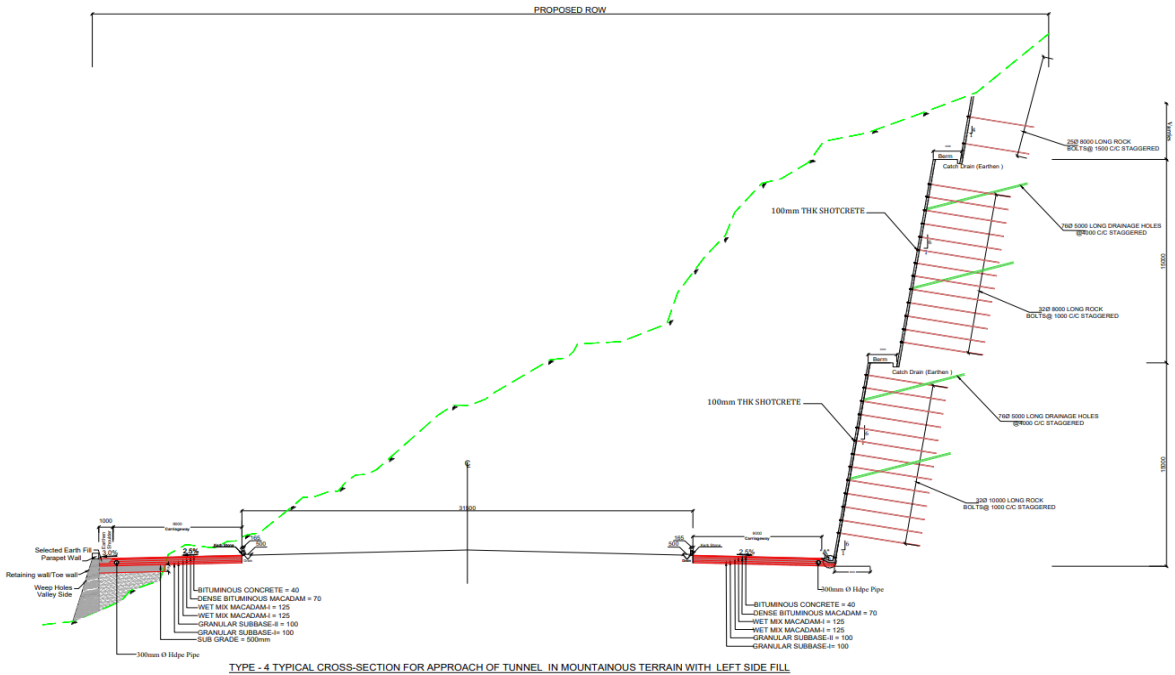
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.



TYPE - 3 TYPICAL CROSS-SECTION FOR APPROACH OF TUNNEL WITH BOTH SIDE CUT ((HEIGHT OF CUT > 25m)

NOTE:-

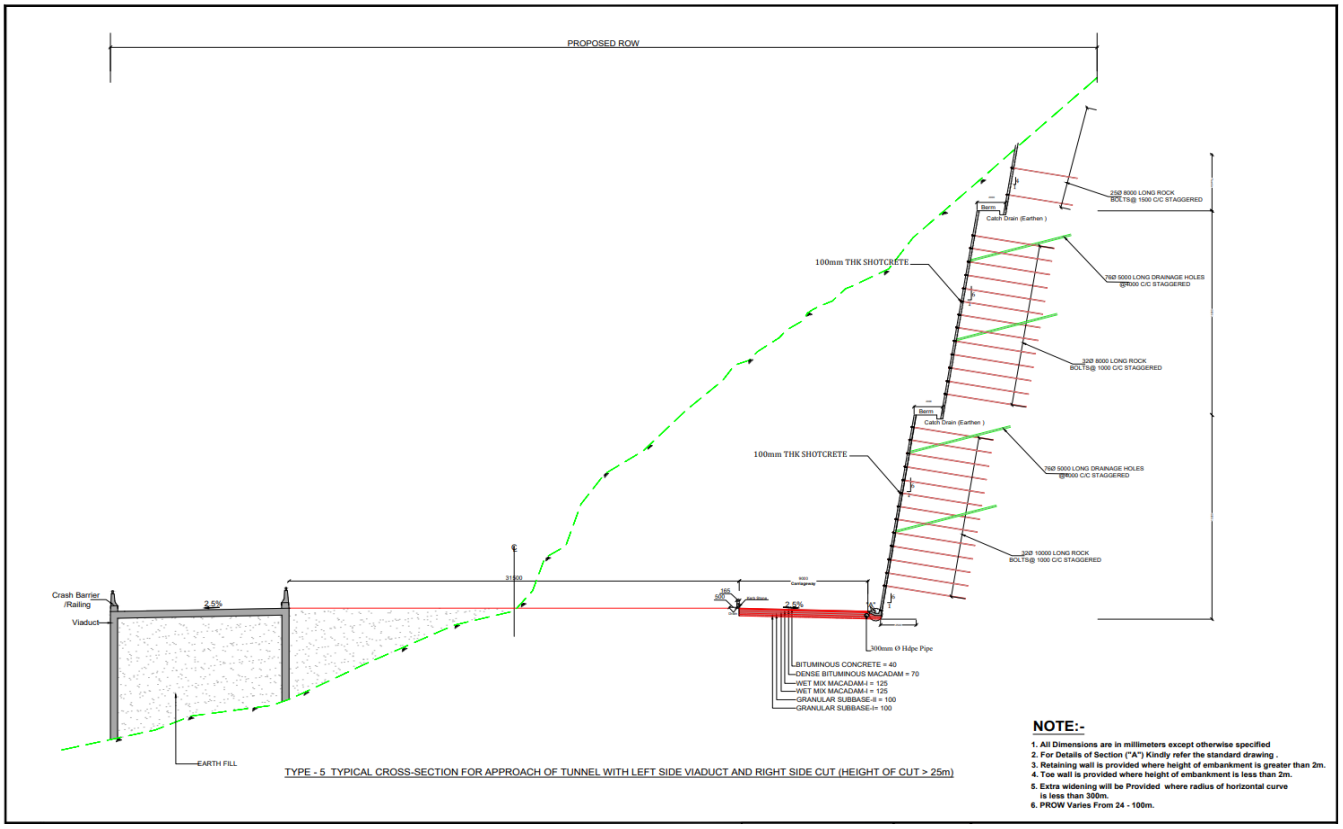
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.



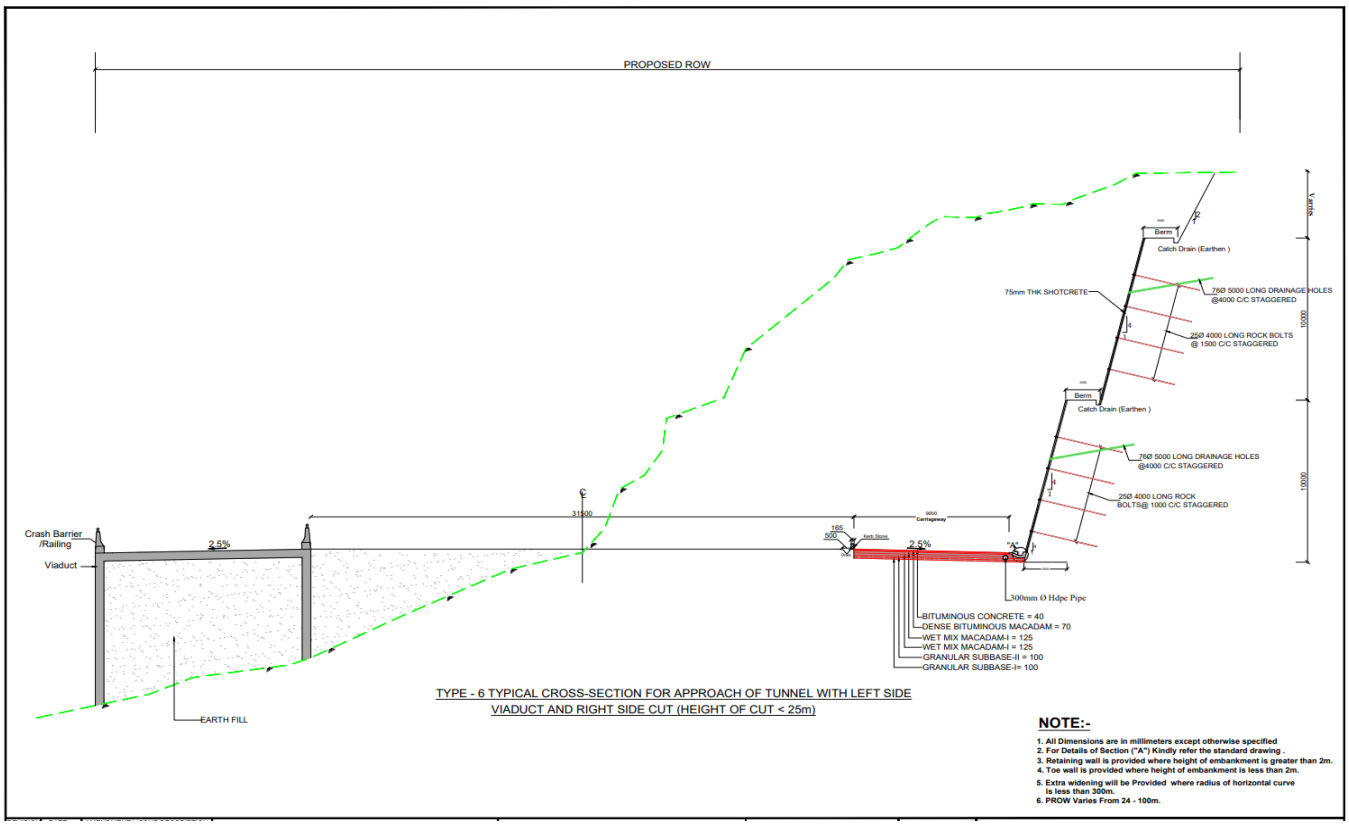
TYPE - 4 TYPICAL CROSS-SECTION FOR APPROACH OF TUNNEL IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL AND RIGHT SIDE CUT (HEIGHT OF CUT > 25m)

NOTE:-

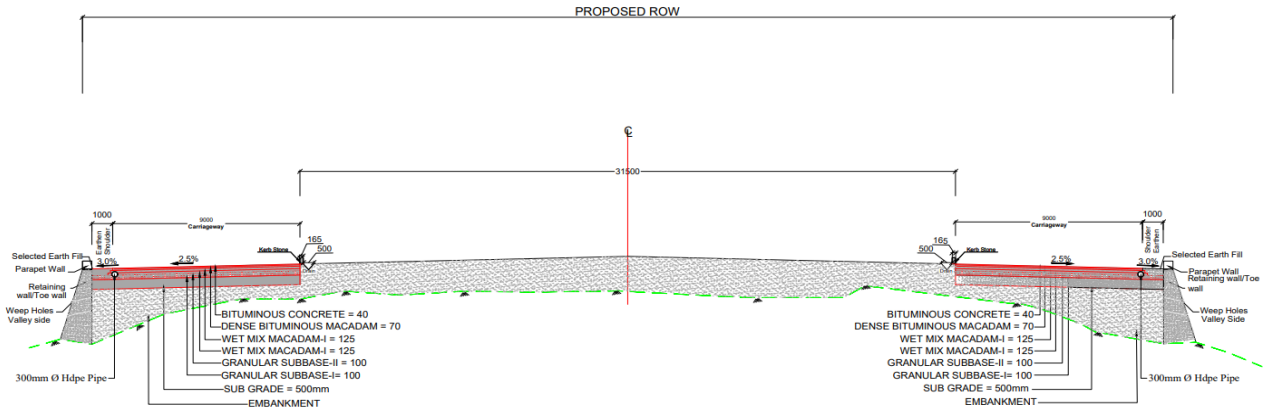
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.



TYPE - 5 TYPICAL CROSS-SECTION FOR APPROACH OF TUNNEL WITH LEFT SIDE VIADUCT AND RIGHT SIDE CUT (HEIGHT OF CUT > 25m)



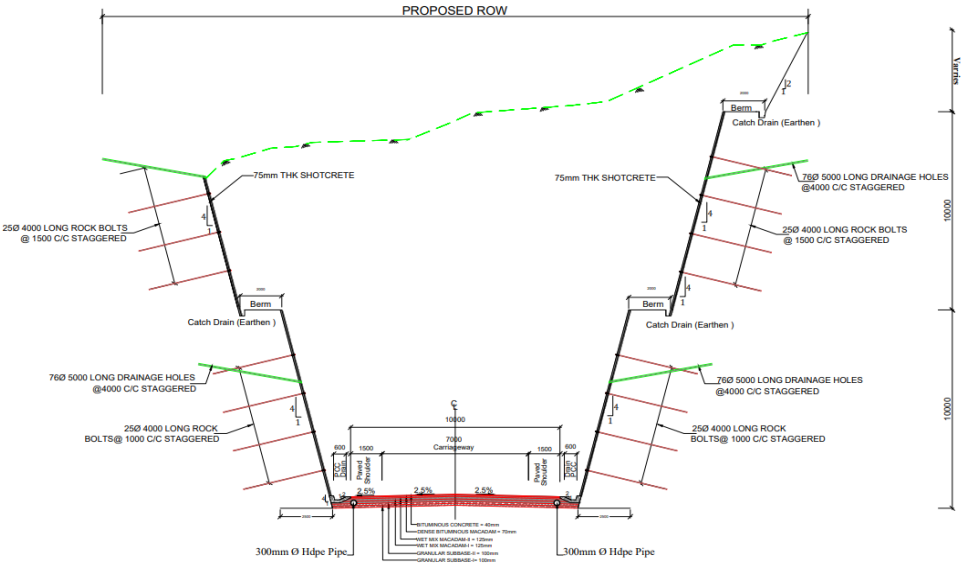
TYPE - 6 TYPICAL CROSS-SECTION FOR APPROACH OF TUNNEL WITH LEFT SIDE VIADUCT AND RIGHT SIDE CUT (HEIGHT OF CUT < 25m)



TYPE - 7 TYPICAL CROSS-SECTION FOR APPROACH OF TUNNEL WITH BOTH SIDE FILL WITH RETAINING/TOE WALL

NOTE:-

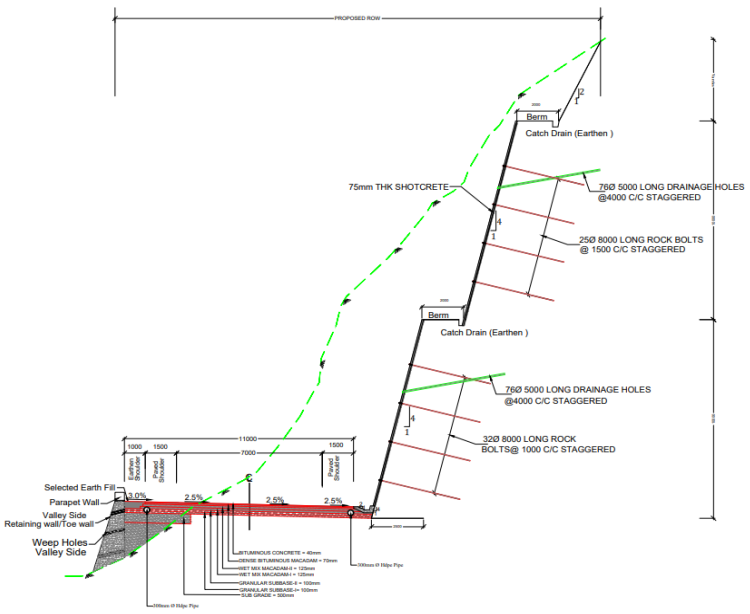
1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.



TYPE-8 TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN MOUNTAINOUS TERRAIN WITH BOTH SIDE CUT (HEIGHT OF CUT < 25m)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.



TYPE-9 TYPICAL CROSS-SECTION FOR TWO LANE CARRIAGEWAY WITH PAVED SHOULDER WITH LEFT SIDE RETAINING/TOE .WALL & RIGHT SIDE CUT. (HEIGHT OF CUT < 25m)

NOTE:-

1. All Dimensions are in millimeters except otherwise specified
2. For Details of Section ("A") Kindly refer the standard drawing .
3. Retaining wall is provided where height of embankment is greater than 2m.
4. Toe wall is provided where height of embankment is less than 2m.
5. Extra widening will be Provided where radius of horizontal curve is less than 300m.
6. PROW Varies From 24 - 100m.

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;

(h) Helicopter services;

(i) Training Facility & Capacity Building Infrastructure

(j) International Study Visit / Knowledge Sharing Programme

(k) Overhead Gantry signs; and

(l) 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
1	Toll Plaza	6+280	8- lane	4 lane for each direction

Note: The provisions of Toll plaza shall be as per applicable guidelines..

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 10 of manual.

c) Pedestrian Facilities

Street lighting shall be provided at the location interchange i.e., Major junction, Major Bridge, Toll Plaza including High must lighting additional to the inside & outside of Tunnel location as per section 12 of the manual.

d) Tree plantation

Tree planation shall be done with in 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 Shelter shall be provided at following locations:-

S. No.	Design Chainage	Side
Nil		

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.

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 Dy. General Manager (DGM) 2 Manager /Site Engineer… 6 Office Supporting Staff 9 Visiting Officials 5	Team Leader (T/L): 1 Other Key Experts 7 Sub-Professional Staff 7 Office Supporting Staff 9 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 weather proof, fire protected, heat-insulated and secured. Windows shall give adequate light and ventilation and be protected with metal mosquito-proof gauze and have security bars and Venetian, or other approved sun blinds. Ceiling height above the floor level shall be at least 2.75 m. All internal walls shall be sound insulated. Floors shall be PVC tile covered. In toilets and other washing areas the floors shall have drains to assist cleaning.

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

Item	Unit	Quantity for Core office	Quantity for each of work site office	Remarks
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.

Schedule - D

(See Clause 2.1)

Specifications and Standards

1. Construction

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

2. Design Standards

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

Manual of Specifications and Standards for Two Laning of Highways (IRC: SP: 73: 2018 referred to herein as the Manual for the road work and 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 (carriageway width 9 m) and 12.5m (carriageway width 7.5 m).
2	Raised footpath /inspection path	Annexure-B (Page no 104) Para 2e in IRC: SP:91-2019 (1.5 m with railing)	Provided 1m raised footpath without railing.

v. 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.
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).

S. No.	Policy Circular No.	Dated	Subject
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)	26TH 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)	23rd 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 like Scale, Tape, odometer etc.	IRC 82: 2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003 (http://www.tfhrc.com/pavement/lttp/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	Scale, Tape odometer etc.		3-7 days	MORT&H Specification 3004.4
	Raveling /Stripping	Nil	< 1 % of area	Daily			7-15 days	IRC:82-2015 read with IRC SP 81

Asset Type	**Performance Parameter**	**Level of Service (LOS)**		**Frequency ofInspection**	**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 SCRIM (Sideway- force Coefficient Routine Investigation Machine or equivalent)	Class I Profilometer : ASTM E950 (98) :2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling Reference ASTM E1656 -94: 2000- Standard Guide for Classification of Automatic Pavement Condition Survey Equipment	180 days	IRC:82- 2015
	Skid Number	60SN	50SN	Bi- Annually			180 days	BS: 7941-1: 2006
	Pavement Condition Index	3	2.1	Bi- Annually			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	2200mm/km	2400mm/km	Bi- Annually	Class I Profilometer	ASTM E950 (98) :2004 and ASTM E1656 94: 2000	180 days	IRC:SP:83- 2008

(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	7-15 days	MORT&H Specification 408.4
	Slope of camber/c ross fall	Nil	<2% variation in prescribed slope of camber /cross fall	Daily			7-15 days	MORT&H Specification 408.4
	Embankment Slopes	Nil	<15 % variation in prescribe side slope	Daily			7-15 days	MORT&H Specification 408.4
	Embankment Protection	Nil	Nil	Daily	NA		7-15 days	MORT&H Specification

	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 > lm. 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 > l 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.	

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 mm	Dowel Bar Retrofit. Within 15 days	Full Depth Repair Dismantle and reconstruct affected. Portion with norms and specifications - See Para 5.5 & 9.2 Within 15days
			5	w > 6 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, as it may be full depth	
3	**Single Longitudinal 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 < 0.5 mm, discernable from slow moving vehicle	Seal with epoxy, if L > 1 m. Within 7 days	Staple or dowel bar retrofit. Within 15days
			2	w = 0.5 - 3.0 mm, discernible	Route seal and stitch, if	
				from fast vehicle	L > l m. Within 15 days	-
			3	w = 3.0 - 6.0 mm	Staple, if L > 1 m. Within 15 days	Partial Depth Repair with stapling. Within 15 days
			4	w = 6.0 - 12.0 mm, usually associated with spalling		

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 > l m. Within 15 days	
			2	w = 0.2 - 0.5 mm. discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Full depth repair within 15 days	Dismantle, Reinstate 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 7days
			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

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 (Applicable to Continuous Reinforced Concrete Paveme nt (CRCP) only)**	w = width of crack L = length (m/m2)	0	Nil, not discernible		No Action
			1	w < 0.5 mm; L < 3 m/m2	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/m2		
			3	w > 1.5 mm and L < 3 m/m2		
			4	w > 3 mm, L < 3 m/m2 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/m2 and deformation		
7	Raveling Honeycomb o surface r type	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.	

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. Within 30 days	
			4	r = 25 - 50 %		
			5	r > 50% and h > 25 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**
					No action.	
			1	r < **2 %**	Local repair of areas damaged and liable to be damaged. Within 7days	Not Applicable
			2	r = 2 - 10 %		
			3	r = 10 - 20%	Bonded Inlay within 15 days	
			4	r = 20 - 30 %		
			5	r > 30 % and h > 25 mm	Reconstruct slab within 30 days	
9	**Polished Surface/Glazing**	t = texture depth, sand patch test	0		No action.	Not Applicable
			1	t > 1 mm		
			2	t = 1 - 0.6 mm	Monitor rate of deterioration	
			3	t = 0.6 - 0.3 mm		
			4	t = 0.3 - 0.1 mm		

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 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 = number/m2 d	0	d < 50 mm; h < 25 mm; n < 1 per 5 m2	No action.	
			1	d = 50 - 100 mm; h < 50 mm; n < 1 per 5 m2	Partial depth re mm deep. Wit days	Not Applicable
			2	d = 50 - 100 mm; h > 50 mm; n < 1 per 5 m2		
			3	d = 100 - 300 mm; h < 100 mm n < 1 per 5 m2		
			4	d = 100 - 300 mm; h > 100 mm; n < 1 per 5 m2		
			5	d > 300 mm; h > 100 mm: n > 1 per 5 m2		
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

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	

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.
			3	f = 6 - 12 mm	Diamond Grinding	Within 30days
			4	f= 12 - 18 mm	Raise sunken slab.	Replace slab as the appropriate.
			5	f> 18 mm	Strengthen subgrade and sub-base by grouting and raising sunken slab	Within 30days
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	

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 mm	No action.	Not Applicable
			1	h = 5 - 15 mm		
			2	h = 15-30 mm, Nos <20% joints	Install Signs to Warn Traffic within 7 days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Strengthen subgrade. Reinstate pavement at normal level	
			5	h > 100 mm	if L < 20 m. Within 30 days	
16	**Heave**	h = positive vertical displacement from normal profile. L = length	0	Not discernible. h < 5 mm	**Short Term**	**Long Term**
					No action.	scrabble
			1	h = 5 - 15 mm	Follow up.	
			2	h = 15 - 30 mm, Nos <20% joints	Install Signs to Warn Traffic within 7 days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Stabilise subgrade. Reinstate pavement at normal level if length < 20 m. Within 30 days	
			5	h > 100 mm		
17	**Bump**	h = vertical displacement from normal profile	0	h < 4 mm	No action	
			1	h = 4 - 7 mm	Grind, in case of new construction within 7 days	Construction Limit for New Construction.

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 mm	Grind, in case of ongoing Maintenance within 15 days	Replace in case of new construction. Within 30days
			5	h > 15 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 < 3mm	**Short Term**	**Long Term**
					No action.	
			1	f = 3 - 10 mm	Spot repair of shoulder within 7 days	
			2	f = 10 - 25 mm		
			3	f = 25 - 50 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 mm		
			5	f > 75 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.	

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:

<table>
<tr><th>Asset Type</th><th>Performance Parameter</th><th>Level of Service (LOS)</th><th>Frequency of Measurement</th><th>Testing Method</th><th>Recommended Remedial measures</th><th>Time limit for Rectification</th><th>Specifications and Standards</th></tr>
<tr><td>Highway</td><td>Availability of Safe Sight Distance</td><td>As per IRC SP :84-2014, a minimum of safe stopping sight distance shall be available throughout.
<table><tr><th>Design Speed, kmph</th><th>Desirable Minimum Sight Distance (m)</th><th>Safe Stopping Sight Distance (m)</th></tr><tr><td>100</td><td>360</td><td>180</td></tr><tr><td>80</td><td>260</td><td>130</td></tr></table></td><td>Monthly</td><td>Manual Measurements with Odometer along with video/ image backup</td><td colspan="2">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.</td><td>IRC:SP 84-2014</td></tr>
<tr><td>Pavement Marking</td><td>Wear</td><td><70% of marking remaining</td><td>Bi- Annually</td><td>Visual Assessment as per Annexure-F of IRC:35-2015</td><td>Re - painting</td><td>Cat-1 Defect – within 24 hours
Cat-2 Defect within 2 months-</td><td>IRC:35-2015</td></tr>
<tr><td></td><td>Day time Visibility</td><td>During expected life Service Time Cement Road - 130mcd/m2/lux
Bituminous Road - 100mcd/m2/lux</td><td>Monthly</td><td>As per Annexure-D of IRC:35-2015</td><td>Re - painting</td><td>Cat-1 Defect – within 24 hours
Cat-2 Defect – within 2 months</td><td>IRC:35- 2015</td></tr>
<tr><td></td><td>Night Time Visibility</td><td>Initial and Minimum Performance for Dry Retro reflectivity during</td><td>Bi-Annually</td><td>As per</td><td>Re - painting</td><td>Cat-1 Defect – within 24 hours
Cat-2 Defect –</td><td>IRC:35-2015</td></tr>
</table>

<table>
<tr><th>Asset Type</th><th>Performance Parameter</th><th colspan="3">Level of Service (LOS)</th><th>Frequency of Measurement</th><th>Testing Method</th><th>Recommended Remedial measures</th><th>Time limit for Rectification</th><th>Specifications and Standards</th></tr>
<tr><td></td><td></td><td colspan="3">night time:</td><td></td><td>Annexure-E of IRC:35-2015</td><td></td><td>within 2 months</td><td></td></tr>
<tr><td></td><td></td><td>Design Speed</td><td colspan="2">(RL) Retro Reflectivity (mcd/m2/lux)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="7"></td><td rowspan="7"></td><td></td><td>Initial (7 days)</td><td>Minimum Threshold level (TL) & warranty period required up to 2 years</td><td rowspan="7"></td><td rowspan="7"></td><td rowspan="7"></td><td rowspan="7"></td><td rowspan="7"></td></tr>
<tr><td>Up 65to</td><td>200</td><td>80</td></tr>
<tr><td>65 - 100</td><td>250</td><td>120</td></tr>
<tr><td>Above 100</td><td>350</td><td>150</td></tr>
<tr><td colspan="3">Initial and Minimum Performance for Night Visibility under wet condition (Retro reflectivity):</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td></td><td></td><td colspan="3">Initial 7 days Retro reflectivity: 100 mcd/m2/lux
Minimum Threshold Level: 50 mcd/m2/lux</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Asset Type	**Performance Parameter**	**Level of Service (LOS)**	**Frequency of Measurement**	**Testing Method**	**Recommended Remedial measures**	**Time limit for Rectification**	**Specifications 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

Asset Type	**Performance Parameter**	**Level of Service (LOS)**	**Frequency of Measurement**	**Testing Method**	**Recommended Remedial measures**	**Time limit for Rectification**	**Specifications 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 per requirement pe r hange ignboard 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/Cantilev er 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 Repainti	Within 7-days	RC 35:2015
Other Road Furniture	Reflective Pavement Markers (Road Studs)	Numbers and Functionality as per specifications in IRC:SP:84 2014 and IRC: 35-2015, unless specified in Schedule-B.	Daily	Counting	New Installation		IRC:SP:84-2014, IRC:35-2015
			Daily			Within 15 days	

Asset Type	**Performance Parameter**	**Level of Service (LOS)**	**Frequency of Measurement**	**Testing Method**	**Recommended Remedial measures**	**Time limit for Rectification**	**Specifications 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 Traffic Safety Barriers	Functionality: Functioning of	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014, 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	Rectificatio n	Within 15 days	IRC: 79 -1981
	Overhead Sign Structure	Overhead sign structure shall be structurally adequate	Daily	Visual wit h 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

Asset Type	**Performance Parameter**	**Level of Service (LOS)**	**Frequency of Measurement**	**Testing Method**	**Recommended Remedial measures**	**Time limit for Rectification**	**Specifications 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**	**Specifications 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
and Trees 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 wit h video/ima ge backup	Removal of trees	Immediate	IRC:SP:84-2014

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 84201 4
Rest Areas	Cleaning of toilets	-	Daily	-	-	Every 4 hours	
	Defects in electrical, water and sanitary installations	-	Daily	-	Rectification	24 hours	
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

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 concrete not more than 0.25 sqm					
	Structurally sound	Delamination of concrete not more than 0.25 sq.m.	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
		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 40-1993 and IRC:SP:132004.
Bridges including ROBs 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.

	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 Br idge 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 Specificatio n 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 Br idge Inspection Unit	Grouting with epoxy mortar, investiga ting 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 B ridge Inspection	Grouting of deck slab at leakage a reas, waterproofing, repairs to drainage spouts	1 months	MORTH specifications 2600 & 2700.

				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 B ridge Inspection Unit	Replace of expansion joint seal in	15 days	MORTH specifications 2600 and IRC SP: 40-1993.

	Debris and dust in strip seal expansion joint	No dust debris expansion or in 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 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.

		Delamination of bearing reinforcement not more	Bi-Annually	Detailed condition survey	In case of failure of even one bearing on	3 months	MORTH specificatio n
	Bearings	than 5%, cracking or tearing of rubber not more than 2 locations per side, no rupture of reinforcement or rubber		as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	any pier/abutment, all the bearings on that pier/abutment shall be replaced, in order to get uniform load transfer on to bearings.		2810 and IRC SP: 40-199.
Bridge Foundations	Scouring around foundatio ns	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 Rivers.	Suitable protection works around pier/abutment	1 month	IRC SP: 40-1993, IRC 83-2014, MORTH specificatio n 2500
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3	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	IRC: SP 40-1993 and IRC:SP:13-2004.
		sq.m, damage to solid apron (concrete apron) not more than 1 sq.m				weeks before onset of rainy season whichever is earlier.	
Note: Any Structure during the entire contract period which is found that does not complies with all requirements of this Table will be prepared, rehabilitated or even reconstructed under the scope of the contractor.							

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.

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 ROBs 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.

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.

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.

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

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 saf
(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 herby 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 shalt 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, shalt 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.

[$]Insert 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)

[$]Insert 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 Clauses10.1 (iv) and 19.3

Contract Price Weightages

1.1 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.	1.54%	**B.1- Reconstruction/ New 2-lane realignment/ bypass (Flexible pavement)**	
		(1) Earthwork upto top of the embankment	68.49%
		(2) Sub-Grade	0.05%
		(3) Sub-Base Course	4.94%
		(4) Non-Bituminous Base Course	6.25%
		(5) Bituminous Base Course	7.08%
		(6) Wearing Coat	4.29%
		(7) Widening and repair of Culverts	0.00%
		Re-Construction and New culverts on existing road, realignments, bypasses:	
		Culverts (length < 6 m)	8.90%
Minor Bridges/ Under passes/ Overpasses	0.000%	**A.2- New Minor bridges (length >6 and <60 m.)**	
		1) Foundation +Sub-Structure: On completion of the foundation work including foundations for wing and return walls, abutments, piers upto the abutment/pier cap.	0.00%
		2) 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.	0.00%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		3) Approaches: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use.	0.00%
		4) Guide Bunds and River Training Works: On completion of Guide Bunds and river Training Works complete in all respects	
		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 barriers, road signs & markings tests on completion etc. complete in all respect.	0.00%
		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	**12.483%**	**A.2- New Major Bridges cum Viaduct**	
		1) Foundation	0.00%
		(i) Pile Foundation	0.54%
		(ii) Open Foundation	20.24%
		2) Sub-structure	19.07%
		3) Super-structure (including bearings)	41.23%
		4) Wearing Coat including expansion joints	1.37%
		5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.80%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		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)	0.07%
		C.2-New Elevated Section/Flyovers/ Grade Separators	
		1) Foundation	
		(i) Pile Foundation	0.00%
		(ii) Open Foundation	7.09%
		2) Sub-structure	4.70%
		3) Super-structure (including bearings)	4.03%
		4) Wearing Coat including expansion joints	0.27%
		5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.45%
		6) Wing walls/return walls	0.00%
		7) Approaches (including Retaining walls, stone pitching and protection works)	0.12%
		<u>Tunnel main</u>	
Tunnel	**60.814%**	A-Investigation & Design	1.73%
		A1- Temporary Dewatering Arrangement	0.40%
		A2- Underground Excavation for tunnel in Support Category dominating the Face Area including Drilling and Grouting	
		ESC-1	9.28%
		ESC-2	1.26%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		ESC-3	9.12%
		ESC-4	2.98%
		ESC-5	4.36%
		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,)	3.50%
		A4- Primary Support Measures	
		SFRS/Shotcrete With Wiremesh	
		ESC-1	3.91%
		ESC-2	0.65%
		ESC-3	5.78%
		ESC-4	1.01%
		ESC-5	1.10%
		Rock Bolts/SteelRib/Spile bars/Piperoofing	
		ESC-1	5.44%
		ESC-2	0.49%
		ESC-3	7.41%
		ESC-4	1.38%
		ESC-5	1.59%
		Lining Stress controller a set of 3 cylinders	
		ESC-1	0.00%
		ESC-2	0.00%
		ESC-3	0.00%
		ESC-4	0.00%
		ESC-5	13.75%
		A5- Lining/Bed Concrete Works	17.01%
		A6-Instrumentation and Monitoring	0.45%
		A7-Pavement	2.94%
		Drain, footpath, Crash barrier with Railing and cable duct etc	3.20%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		Drilling & grouting holes	1.25%
		Portals	
	1.715%	A1- Temporary Dewatering Arrangement	
		A2- Open Excavation and Earthwork (Loose excavation, rock excavation, rip rap layer on embankment, Gabion etc.)	41.64%
		A3- Primary support measures	
		SFRS/Shotcrete with Wiremesh	8.61%
		Rock Bolts/Forepoling/Piperoofing	24.77%
		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,)	3.63%
		A5-Concrete Works at portal	21.34%
		A6- Pavement	0.00%
		A7-Construction of buildings	0.00%
		Electro, Mechanical Equipment work and power supply	
	18.233%	1. Electro and Mechanical equipment	87.37%
		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.	6.13%
		Ventilation System	6.50%
Other Works	5.110%	1) Toll Plaza	6.75%
		2) Roadside drains	0.63%
		3) Road signs, markings, km stones safety devices,...	0.90%
		4) Project Facilities	
		a) Bus bye	0.00%

Item no.	Weightage in percentage to the Contract Price	Description	Percentage Weightage
		b) Truck lay-byes	0.00%
		c) Site clearance	0.14%
		i) Junctions	13.03%
		ii) High Mast Lighting	0.03%
		iii) Cement concrete Kerb	0.03%
		5) Roadside plantation	
		6) Muck Disposal & Management	
		i) Disposal of excavated materials	17.35%
		ii) Protection work at muck disposal via Gabion wall, RR wall, etc.	12.81%
		7) Protection works other than approaches to the bridges, elevated sections/ flyovers/grade separators and ROBs/RUBs. (Retaining/Toe wall)	34.37%
		8) Slope Protection (Hill Side)	13.95%
Utility Estimate	0.108%	Electrical JPDCL	26.92%
		Jal Shakti	73.08%

*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 than10 (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%	
(7) Widening and repair of Culverts	0.00%	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.
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.

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

1.3.2 Minor Bridges and Underpasses/Overpasses.

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

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	**0.54%**	**(i) Pile Foundation:** (a) Piling – Payment of 70% shall be made on completion of piling upto bottom of pile cap for each pile on prorate 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.
(ii) Open Foundation	**20.24%**	**(ii) Open Foundation:** Payment shall be made on completion of a stage i.e. on completion of atleast one foundation.
(2) Sub-structure	19.07%	**(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)	41.23%	**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.	1.37%	**(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.	0.80%	**(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.)	0.07%	**((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:
(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 prorate 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	7.09%	(iii) Open Foundation: Payment shall be made on completion of a stage i.e. on completion of atleast one foundation.
(2) Sub-structure	4.70%	(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)	4.03%	(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.	0.27%	(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.	0.45%	(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.
(7) Approaches (including Retaining walls, stone pitching and protection works)	0.12%	(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 (A)

Stage of Payment	Percentage - weightage	Payment Procedure
A- Investigation & Design	1.73%	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	0.40%	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-1	9.28%	
ESC-2	1.26%	
ESC-3	9.12%	
ESC-4	2.98%	
ESC-5	4.36%	
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.)	3.50%	
A4- Primary Support Measures		
SFRS/Shotcrete with Wire mesh		
ESC-1	3.91%	
ESC-2	0.65%	
ESC-3	5.78%	
ESC-4	1.01%	
ESC-5	1.10%	
Rock Bolts/Steel Rib/Spile Bars/Piperoofing		
ESC-1	5.44%	
ESC-2	0.49%	
ESC-3	7.41%	
ESC-4	1.38%	
ESC-5	1.59%	
Lining Stress controller a set of 3 cylinders		
ESC-1	0.00%	
ESC-2	0.00%	
ESC-3	0.00%	
ESC-4	0.00%	
ESC-5	13.75%	
A5- Lining/Bed Concrete Works	17.04%	
A6- Instrumentation and Monitoring	0.45%	
A7- Pavement	2.94%	

Stage of Payment	Percentage - weightage	Payment Procedure
Drain footpath, Crash Barrier with Railing and Cable	3.20%	
Drilling & Grouting holes	1.25%	
Portal		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.
A1- Temporary Dewatering Arrangement	0.00%	
A2- Open Excavation and Earthwork (Loose excavation, rock excavation, rip rap layer on embankment, Gabion etc.)	41.64%	
A3- Primary support measures		
SFRS/Shotcrete with Wiremesh	8.61%	
Rock Bolts/Forepoling/Piperoofing	24.77%	
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.)	3.63%	
A5- Concrete Works at portal	21.34%	
A6- Pavement	0.00%	
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	87.37%	
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	6.13%	
3. Ventilation System	6.50%	On delivery, installation and commissioning of E&M equipment in the ratio of 20:20:60.

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	6.75%	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	0.63%	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	0.90%	
(4) Project Facilities		
a) Bus bays	0.00%	Payment shall be made on pro rata basis for completed facilities.
b) Truck lay-byes	0.00%	
c) Site Clearance	0.14%	
(i) Junction	13.03%	Payment shall be made on pro rata basis for completed facilities.
(ii) High Mast Lighting	0.03%	Payment shall be made on pro rata basis for completion of work.
(iii) Cement concrete kerb	0.03%	Payment shall be made on pro rata basis for

		completion of work.
(5) Muck Disposal & Management		
(i) Disposal of excavated materials	17.35%	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.	12.81%	
(6) Protection work other than approaches to the bridges, elevated sections/flyovers/grade separators and ROBs/RUBs (Retaining/Toe Wall)	34.37%	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.
(7) Slope Protection (Hill side)	13.95%	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.

1.3.6 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	26.92%	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.
(ii) Jal Shakti	73.08%	

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 DRAWINGS Excavation and Support

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

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, filter material, chute drain and energy dissipation basin-std

Details of double head metal beam crash barrier

Details for 200 meter 1 km & km post

Detail for boundary stone & guard post

Drain retaining wall & kerb

Gabion wall

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 510 (Five Hundred and Ten) 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 **875th** (Eight Hundred and Seventy-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 **1240th** (Twelve Hundred Fourty) day 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 **1460th** (Fourteen Hundred and Sixty) 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 of …….20…..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Authority's Engineer by:

(Signature)

(Name)

(Designation)

(Address)

Schedule - M

(See Clauses 14.6, 15.2 and 19.7)

Payment Reduction for Non-Compliance

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

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

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

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

2. Percentage reductions in lump sum payments on monthly basis (i)

The following percentages shall govern the payment reduction:

S. No.	Item/Defect/Deficiency	Percentage
(a)	**Carriageway/Pavement**	
(i)	Potholes, cracks, other surface defects	15%
(ii)	Repairs of Edges, Rutting	5%
(b)	**Road, Embankment, Cuttings, Shoulders**	
(i)	Edge drop, inadequate cross fall, undulations, settlement, potholes, ponding, obstructions	10%
(ii)	Deficient slopes, raincuts, disturbed pitching, vegetation growth, pruning of trees	5%
(c)	**Bridges and Culverts**	
(i)	Desilting, cleaning. vegetation growth, damaged pitching, flooring, parapets, wearing course, footpaths, any damage to foundations	20%
(ii)	Any Defects in superstructures, bearings and sub-structures	10%
(iii)	Painting, repairs/replacement kerbs, railings, parapets, guideposts/crash barriers	5%
(d)	**Tunnel**	
(i)	Tunnel lighting (Street lighting and Telecom ATMS)	
	➢ Any major/ minor faults and failure of the system	15%
(ii)	Tunnel Ventilation system	
	➢ Any major/ minor faults and failure of the system	10%
(iii)	Tunnel Traffic Control system	
	➢ Any major/ minor faults and failure of the system	10%
(iv)	Tunnel Power Supply system	
	➢ Any major/ minor faults and failure of the system	10%
(v)	Tunnel CCTV monitoring system	
	➢ Any major/ minor faults and failure of the system	10%

(vi)	Tunnel Fire Safety system	
	➢ Any major/ minor faults and failure of the system	12.5%
(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:

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

Where,

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

M1= Monthly lump-sum payment in accordance para 1.2 above of this Schedule

M2= Monthly lump-sum payment in accordance para 1.2 above of this Schedule

L1= Non-complying length L = Total length of the road,

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

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

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

Schedule - N

(See Clause 18.1 (i))

Selection of Authority's Engineer

1. Selection of Authority's Engineer

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

(ii) In the event of termination of the Technical Consultants appointed in accordance with the provisions of Paragraph 1.1, the Authority shall appoint another firm of Technical Consultants forthwith and may engage a government-owned entity in accordance with the provisions of Paragraph 3 of this Schedule-N.

2. Terms of Reference

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

3. Appointment of Government entity as Authority's Engineer

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

Annex – I

(Schedule - N)

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 - O

(See Clauses 19.4 (i), 19.6 (i), and 19.8 (i))

Forms of Payment Statements

1. Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

(a) the estimated amount for the Works executed in accordance with Clause 19.3 (i) subsequent to the last claim;

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

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

(d) amounts reflecting adjustment in price, if any, for (c) above in accordance with the provisions of Clause 13.2 (iii) (a);

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

(f) Deductions:

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

ii. Any amount towards deduction of taxes; and

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

(g) Net claim: (e) – (f) (iii);

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

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

ii. For Change of Scope Orders, and

iii. Taxes deducted

2. Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

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

(b) the deductions for maintenance work not done;

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

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

(e) amount towards deduction of taxes

3. Contractor's claim for Damages

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

Schedule - P

(See Clause 20.1)

Insurance

1. Insurance during Construction Period

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

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

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

(ii) The insurance under sub para (a) and (b) of paragraph 1(i) above shall cover the Authority and the Contractor against all loss or damage from any cause arising under paragraph 1.1 other than risks which are not insurable at commercial terms.

2. Insurance for Contractor's Defects Liability

The Contractor shall effect and maintain insurance cover of not less than 15% of the Contract Price for the Works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for any loss or damage for which the Contractor is liable and which arises from a cause occurring prior to the issue of the Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

3. Insurance against injury to persons and damage to property

(i) The Contractor shall insure against its liability for any loss, damage, death or bodily injury, or damage to any property (except things insured under Paragraphs 1 and 2 of this Schedule or to any person (except persons insured under Clause 20.9), which may arise out of the Contractor's performance of this Agreement. This insurance shall be for a limit per occurrence of not less than the amount stated below with no limit on the number of occurrences.

The insurance cover shall be not less than: Rs. 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)

SCHEDULE – S

Procedure for Dispute Resolution Board

The parties to the Contract Agreement mutually agree as follows:

1. The Board shall comprise of three Members having experience in the field of construction or have been involved in the Works related to construction and with the interpretation of contractual documents. One Member shall be selected by each of the Authority and the Contractor from the list maintained by NHIDCL hosted on its website website (https://nhidcl.com/). In the event the parties fail to select the member within 28 days of the date of the signing of Contract agreement, in that eventuality, upon the request of either or both parties such Member shall be selected by SAROD within 14 days. The third Member shall be selected by the other two members from the same list. If the two Members selected by or on behalf of the parties fail to select the third Member within 14 days after the later of their selections, then upon the request of either or both parties such third Member shall be selected by SAROD within 14 days. The third Member shall serve as DG (Road & Development) of the Board.

2. The Board shall be constituted when each of the three Board Members has signed a Board Member's declaration of Acceptance as required by the DRB's rules and procedures (which, along with the declaration of acceptance form, are attached as Annexure herewith).

3. In the event of death, disability, or resignation of any Member, such Member shall be replaced in the same manner as the Member being replaced was selected. If for any other reason, a Member fails or is unable to serve, the Managing Director, NHIDCL (or failing the action of the Managing Director then either of the other Members) shall inform the Parties and such non-serving Member shall be replaced in the same manner as the Member being replaced was selected. Any replacement made by the parties shall be completed within 28 days after the event giving rise to the vacancy on the Board, failing which the replacement shall be made by SAROD in the same manner as described above. Replacement shall be considered complete when the new Member signs the Board Member's Declaration of Acceptance. Throughout any replacement process, the Members not being replaced shall continue to serve and the Board shall continue to function and its activities shall have the same force and effect as if the vacancy had not occurred, provided, however that the Board shall not conduct a hearing nor issue a decision until the replacement is completed.

4. If either the Authority or the Contractor is dissatisfied with any decision of the Board, and/or if the Board fails to issue its decision within 56 days after receipt of all the pleadings (along with the supporting documents) of the parties by the DG (Road & Development) of the Board or any extension mutually agreed upon by the Authority and the Contractor, in such a case, either the Authority or the Contractor may, within 28 days after his receipt of the decision, or within 28 days after the expiry of the said period, as the case may be, give notice to the other party, with a copy for information to the Authority's Engineer, of his intention to refer the matter to the Conciliation Committee of Independent Experts (CCIE) of the Authority for Conciliation/amicable settlement.

5. It is mandatory to refer all the disputes to DRB before issuance of completion certificate and satisfactory completion of punch list items. No dispute shall be entertained after completion of aforementioned date.

6. If the Board has issued a decision to the Authority and the Contractor within the said 56 days or any extension mutually agreed upon by the Authority and the Contractor and no notice of intention to commence Conciliation by the Conciliation Committee of Independent Experts (CCIE) of the Authority for Conciliation/amicable settlement as to such dispute has been given by either the Authority or the Contractor within 28 days after the parties received such decision from the Board, the decision shall become final and binding upon the Authority and Contractor.

7. Whether or not it has become final and binding upon the Authority and the Contractor, a decision shall be admissible as evidence in any subsequent dispute resolution procedure, including any arbitration or litigation having any relation to the dispute to which the decision relates.

8. All decision of DRB which have become final and binding or till they have been reversed in subsequent conciliation/Arbitration process shall be implemented by the parties forthwith. Such implementation shall also include any relevant action of the Authority's Engineer.

9. If during the Contract Period, the Authority and the Contractor are of the opinion that the Disputes Resolution Board is not performing its functions properly, the Authority and the Contractor may together disband the Disputes Resolution Board and reconstitute it. In that case, a new board shall be selected in accordance with the provisions applying to the selection of the original Board as specified above, except that words "within 28 days after the signing of this Contract agreement" shall be replaced by the words "within 28 days after the date on which the notice disbanding the original Board became effective".
10. The Authority and the Contractor shall jointly signed a notice specifying that the Board shall stand disbanded with effect from the date specified in the notice. The notice shall be posted by the email to each member of the Board. A Member shall be deemed to have received the email even if he refuses to have received the same.
11. All other terms and conditions of the original Contract Agreement shall remain unaltered/unaffected and the parties shall remain bound by terms and conditions as contained therein.

Annexure to Schedule [S]

Disputes Resolution Board's Rules and Procedures

1. Except for providing the services required hereunder, the Board Members shall not give any advice to either party or to the Authority's Engineer concerning conduct of the Works. The Board Members:

   a. Shall have no financial interest in any party to the Contract, or the Authority's Engineer, or a financial interest in the contract, except for payment for services on the Board.

   b. Shall have had no previous employment by, or financial ties to, any party to the Contract Agreement, or the Authority's Engineer, except for fee based consulting services/advisers on other projects, and/or be Retired Government Officers (not connected in whole or part with the project), all of which must be disclosed in writing to both parties prior to appointment to the Board.

   c. Shall have disclosed in writing to both parties prior to appointment to the Board any and all recent or close professional or personal relationships with any director, officer, or employee of any party to the Contract, or the Authority's Engineer, and any and all prior involvement in the project to which the Contract relates:

   d. Shall not, while Board member, be employed whether as a consultant or adviser or otherwise by either party to the Contract, or the Authority's Engineer, except as a Board Member, without the prior consent of the parties and the other Board Members;

   e. Shall not, while a Board Member, engage in discussion or make any agreement with any party to the Contract, or with the Authority's Engineer, regarding employment whether as a consultant or otherwise whether after the Contract is completed or after service as a Board Member is completed.

   f. Shall remain and be impartial and independent of the parties and shall disclose in writing to the Authority, the Contractor and one another any fact or circumstance which might be such as to cause either the Authority or the Contractor to question the continued existence of the impartiality and independence required of Board Members, and

   g. Shall be fluent in the language of the Contract.

2. Except for its participation in the Board's activities as provided in the Contract Agreement and in this Agreement none of the Authority, the Contractor, and or the Authority's Engineer shall solicit advice or consultation from the Board or the Board Members on matters dealing with the conduct of the Works.

3. The Contractor shall:

a. Furnish to each Board member one copy of all documents which the Board may request including Contract Agreement, progress reports and other documents pertinent to the performance of the Contract Agreement.

b. In cooperation with the Authority, coordinate the site visits of the Board, including conference facilities, and secretarial and copying service.

4. The Board shall begin its activities following the signing of a Board Member's Declaration of Acceptance by all three Board Members, and it shall terminate these activities as set forth below:

a. The Board shall terminate its regular activities when either (i) issuance of completion certificate and completion of punch list items or (ii) the parties have terminated the contract and when, in either case, the Board has communicated to the parties and the Authority's Engineer its decision on all disputes previously referred to it.

b. Once the Board has terminated its regular activities as provided by the previous paragraph, the Board shall remain available to process any dispute referred to it by either party. In case of such a referral, Board Members shall receive payments as provided in paragraphs 7(a) (ii), (iii) and (iv).

5. Board Members shall not assign or subcontract any of their work under these Rules and Procedures.

6. The Board Members are Independent and not employees or agents of either the Authority or the Contractor.

7. Payments to the Board Members for their services shall be governed by the following provisions.

a. Each Board Member will receive payments as follows:

i. A retainer fee per calendar month as specified in the schedule of fee made part of this Schedule and its revision from time to time. This retainer fee shall be considered as payment in full for:

A. Being available, on 7 days' notice, for all hearings, Site Visits, and other meetings of the Board.

B. Being conversant with all project developments and maintaining relevant files.

C. All offices and overhead expenses such as secretarial services, photocopying and office supplies (but not include telephone calls, faxes and telexes) incurred in connection with the duties as a Board Member.

ii. A daily fee as specified in the schedule of fee in respect of fee for site visit & meeting, fee for meeting/ hearing not at site and extra charges for days max. of 02 days for travel on each occasion) other than hearing / meeting days.

iii. Expenses, in addition to the above, all reasonable and necessary travel expenses (including economy class air fare, subsistence, and other direct travel expenses). Receipts for all expenses in excess of Rs. 2000/- (Rupees Two Thousand only) shall be provided.

iv. Reimbursement of any taxes that may be levied on payments made to the Board Member pursuant to this paragraph 7.

b. The retainer fee and other fees shall remain fixed for the period of each Board Member's term until revised by NHIDCL.

c. Phasing out of monthly retainer fee. Beginning with the next month after the completion certificate (or, if there are more than one, the one issued last) has been issued, the Board members shall receive only one-third of the monthly retainer fee till next one year. Beginning with the next month after the Board has terminated its regular activities pursuant to paragraph 4(a) above, the Board members shall no longer receive any monthly retainer fee.

d. Payments to the Board Members shall be shared equally by the Authority and the Contractor. The concerned Project Implementation Unit (PIU) of Authority shall pay members' invoices within 30 calendar days after receipt of such invoices and shall invoice the Contractor for one-

half of the amounts of such invoices. The Contractor shall pay such invoices within 30 days' time period after receipt of such invoices.

8. Board Site Visits:

a. The Board shall visit the Site and meet the representatives of the Authority, the Contractor and the Authority's Engineer at regular intervals, at times of critical construction events, at the written request of either party, and in any case not less than 6 times in any period or 12 months. The timing of Site visits shall be as agreed among the Authority, the Contractor and the Board, but failing agreement shall be fixed by the Board.

b. Site visits shall include an informal discussion of the status of the construction of the Works. Site visits shall be attended by personnel from the Authority, the Contractor and the Authority's Engineer.

c. At the conclusion of each Site visit, the Board shall prepare a report covering its activities during the visit and shall send copies to the parties and to the Authority's Engineer.

9. Procedure for Dispute Referral to the Board

a. lf either party objects to any action or inaction of the other party or the Authority's Engineer, the objecting party may file a written Notice of Dispute to the other party with a copy to the Authority's Engineer stating that it is given pursuant to the Agreement and state clearly and in details the basis of the dispute.

b. The party receiving the Notice of Dispute will consider it and respond to it in writing within 14 days after receipt.

c. This response shall be final and conclusive on the subject, unless a written appeal to the response is filed with the responding party within 10 days after receiving the response and call upon Authority's Engineer to mediate and assist the parties in arriving an amicable settlement thereof. Both parties are encouraged to pursue the matter further to attempt to settle the dispute.

d. If the Authority's Engineer receiving the Notice of Dispute fails to provide a written response within 14 days after receipt of such Notice or failing mediation by Authority's Engineer, either party may require such dispute to be referred to the Board, either party may refer the dispute to the Board by written Request to the Board. The Request for decision shall state clearly and in full detail the specific issues of the dispute (s) to be considered by Board and shall be addressed to the DG (Road & Development) of the Board, with copies to the other Board Members, the other party, and the Authority Engineer, and it shall state that it is made pursuant to this Agreement.

e. When a dispute is referred to the Board, and the Board is satisfied that the dispute requires the Board's assistance, the Board decide when to conduct a hearing on the dispute. The Board may request that written documentation and arguments from both parties be submitted to each Board Member before the hearing begins. The parties shall submit insofar as possible agreed statements of the relevant facts.

f. During the hearing, the Contractor, the Authority, and the Authority's Engineer shall each have ample opportunity to be heard and to offer evidence. The Board's decision for resolution of the dispute will be given in writing to the Authority, the Contractor and the Authority's Engineer as soon as possible, and in any event not more than 56 days or any mutually extended period between the Authority and the Contractor. The time period of 56 days of issuance of DRB

decision will reckon/start from the day of first hearing that begins after submission of complete pleadings (including supporting documents, if any) by the parties.

10. Conduct of Hearings:

a. Normally hearings will be conducted at the Site, but any location that would be more convenient and still provide all required facilities and access to necessary documentation may be utilized by the Board. Private session of the Board may be held at any cost-effective location convenient to the Board. Video recordings of all hearings shall invariably be made.

b. The Authority, the Authority's Engineer and the Contractor shall be given opportunity to have representatives at all hearings. Parties should restrain to bring any Advocate/Law Firm during DRB hearings.

c. During the hearings, no Board Member shall express any opinion concerning the merit of the respective arguments of the parties.

d. After the hearings are concluded, the Board shall meet privately to formulate its decision. The private meeting (s) of the Board shall not exceed 3 sittings. All Board deliberations shall be conducted in private, with all Members' individual views kept strictly confidential. The Board's decisions, together with an explanation of its reasoning shall be submitted in writing to both parties and to the Authority's Engineer. The decision shall be based on the pertinent contract provisions, applicable laws and regulations and the facts and circumstances involved in the dispute.

e. The Board shall make every effort to reach a unanimous decision. If this proves impossible the majority shall decide and the dissenting Member may prepare a written minority report together with an explanation of its reasoning for submission to both parties and to the Authority's Engineer

11. In all procedural matters, including the furnishing of written documents and arguments relating to disputes, site visits and conduct of hearings, the Board shall have full and the final authority. If a unanimous decision on any such matter proves impossible, the majority shall prevail.

12. After having been selected and where necessary approved each Board Member shall sign two copies of the following declaration and make one copy available each to the Authority and to the Contractor.

BOARD MEMBER'S DECLARATION OF ACCEPTANCE

WHEREAS

a. A Contract Agreement (the Contract) for the_____ project [fill in the name of project] has been signed on _____ [fill in date] between_____ [name of Authority] and _____name of Contractor] (the Contractor).;

b. The provisions of Agreement and Dispute Resolution Board's rules and procedure provided for establishment and operation of Dispute Resolution Board (DRB).

c. The undersigned has been selected to serve as a Board Member on said Board;

NOW THEREFORE, the undersigned Board Member hereby declares as follows

1. I accept the selection as a Board Member and agree to serve on the Board and to be bound by the provisions of Contract Agreement and rules and procedure provided for establishment and operation of Dispute Resolution Board DRB).

2. With respect to paragraph 1 of Dispute Resolution Board's Rules and Procedure. said Annex A, I declare

    a. that I have no financial interest of the kind referred to in subparagraph (a):

    b. that I have had no previous employment nor financial ties of the kind referred to in subparagraph (b); and

    c. that I have made to both parties any disclosures that may be required by sub- paragraphs (b) and (c).

3. I declare that I have _____no. of Arbitrations (list enclosed) and _____ no. of DRBs (list enclosed) in progress and that I will give sufficient time for the current assignment.

BOARD MEMBER

_____

_____ [insert name of Board Member)
Date: _____

Schedule of expenses and fees payable to the Member(s) of Dispute Resolution Board (DRB)

The fee and other expenses payable to the Members of DRB shall be as under

S. No.	Particular	Amount Payable
1	Retainer-ship fee, secretarial assistance and incidental charges (telephone, fax, postage etc)	Rs. 50,000/- per month for one package and maximum of Rs. 75,000/- per month for 2 or more packages
2(i)	Fee for site visit or meetings at site	Rs. 25,000/- per day
(ii)	Fee for meetings/hearings not at site	Rs. 10,000/- per day
3	Traveling expenses	Economy class by air, AC first class by train and AC taxi by road
4	Lodging & Boarding	Rs. 15,000/- per day (Metro Cities): or Rs. 10,000/- per day (in other cities); or Rs. 5,000/- per day (own arrangement)
5	Extra charges for days other than hearing/meeting days (travel days maximum of 2 days on each occasion)	Rs. 5,000/-
6	Local conveyance	Rs. 2,000/-

Notes:

i. Lodging, boarding and travelling expenses will be allowed only for those members who are residing 100 kms away from the place of meeting.

ii. Delhi, Mumbai, Chennai, Kolkata, Bangalore and Hyderabad shall be considered as Metro Cites.

ii. The above schedule of fee and expenses shall be applicable on or after the date of issue of this circular.

iv. The expenses are to be shared equally by the parties i.e. Authority and Contractor.

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