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**SCHEDULES**

**For**

**Construction of Uni-Directional twin tunnels including approach roads across Fotu La Pass on  
NH-01 (Leh-Kargil Highway) in the Union Territory of Ladakh**

**ON**

**ENGINEERING, PROCUREMENT & CONSTRUCTION (EPC) MODE**

**JUNE 2026**

**MINISTRY OF ROAD TRANSPORT AND HIGHWAY  
(MoRTH)**

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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. 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.

**Annex-I****(Schedule-A)****1 Site**

The site of the Two Lane with Paved Shoulder Project comprises the section of Construction of Highway tunnel across Fotu La Pass (1.95 Km approx.) along with its approaches on Zojila - Leh - Kargil Road to NHDL Specification Two lane with Paved shoulder including unidirectional twin Tunnels in the union territory of Ladakh on Engineering, Procurement & Construction (EPC) Basis Contract.

The land, carriageway and structures comprising the site are described below. An index map of the project highway is given in Appendix-A-I.

**2 Land**

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

S.No.	Description	State/UT	Chainage	Length (in Mtr.)	Width (in Mtr.)	Remarks
1	East Approach	UT of Ladakh	0+000 to 0+200	Variable Max Length:255m Min Length: 190m Avg. Length: 223m	24	Acquisition under Progress
2	East Portal	UT of Ladakh	0+200 to 0+400	Variable Max Length:175m Min Length: 185m Avg. Length: 180m	150	Acquisition under Progress
3	Muck Dumping Site-1 (East)	UT of Ladakh	At Chainage 291.8 of NH-01	495	Variable Max Length:220m Min Length: 30m Avg. Length: 125m	Acquisition under Progress
4	Site Camp-1 (East)	UT of Ladakh	At Chainage 287.6 of NH-01	345	Variable Max Length:235m Min Length: 200m Avg. Length: 218m	Acquisition under Progress
5	West Approach	UT of Ladakh	2+400 to 2+652	Variable Max Length:135m Min Length: 140m Avg. Length: 138m	65	Acquisition under Progress

S.No.	Description	State/UT	Chainage	Length (in Mtr.)	Width (in Mtr.)	Remarks
6	West Portal	UT of Ladakh	2+280 to 2+652	250	180	Acquisition under Progress
7	Muck Dumping Site-2 (West)	UT of Ladakh	At Chainage 287.6 of NH-01	165	60	Acquisition under Progress
8	Muck Dumping Site-3 (West)	UT of Ladakh	2+100 to 2+300	215	60	Acquisition under Progress
9	Muck Dumping Site-4 (West)	UT of Ladakh	1+900 to 2+200	290	Variable Max Length:95m Min Length: 55m Avg. Length: 75m	Acquisition under Progress
10	Muck Dumping Site- 5 (West)	UT of Ladakh	2+250 to 2+400	Variable Max Length:180m Min Length: 175m Avg. Length: 178m	Variable Max Length:60m Min Length: 55m Avg. Length: 57.5m	Acquisition under Progress
11	Site Camp-2 (West)	UT of Ladakh	2+100 to 2+300	240	50	Acquisition under Progress

### 3 Carriageway

The proposed alignment is new alignment.

S. No.	Chainage (km)		Carriageway width (m)	Remarks
	From	To		
	NIL			

### 4 Major Bridges

The Site includes the following Major Bridges:

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

The details of the roadside drains are as follows:

S. No.	Location		Type	
	From km	to km	Masonry/cc(Pucca)	Earthen (Kutch)
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)
1	Fotu La Top	Existing chainage 290 to 301.1 on NH 1 Chainage on proposed tunnel alignment 0+000 to 2+652	2.652 Km of tunnel is bye passing 11.1 Km of existing NH-01.

### 17 Other Structures

The details of the other structures to be bypassed are as follows:

S. No.	Chainage (km)	Type of Structure	length (m)
NIL			

## Appendix A-I

## (Schedule-A)

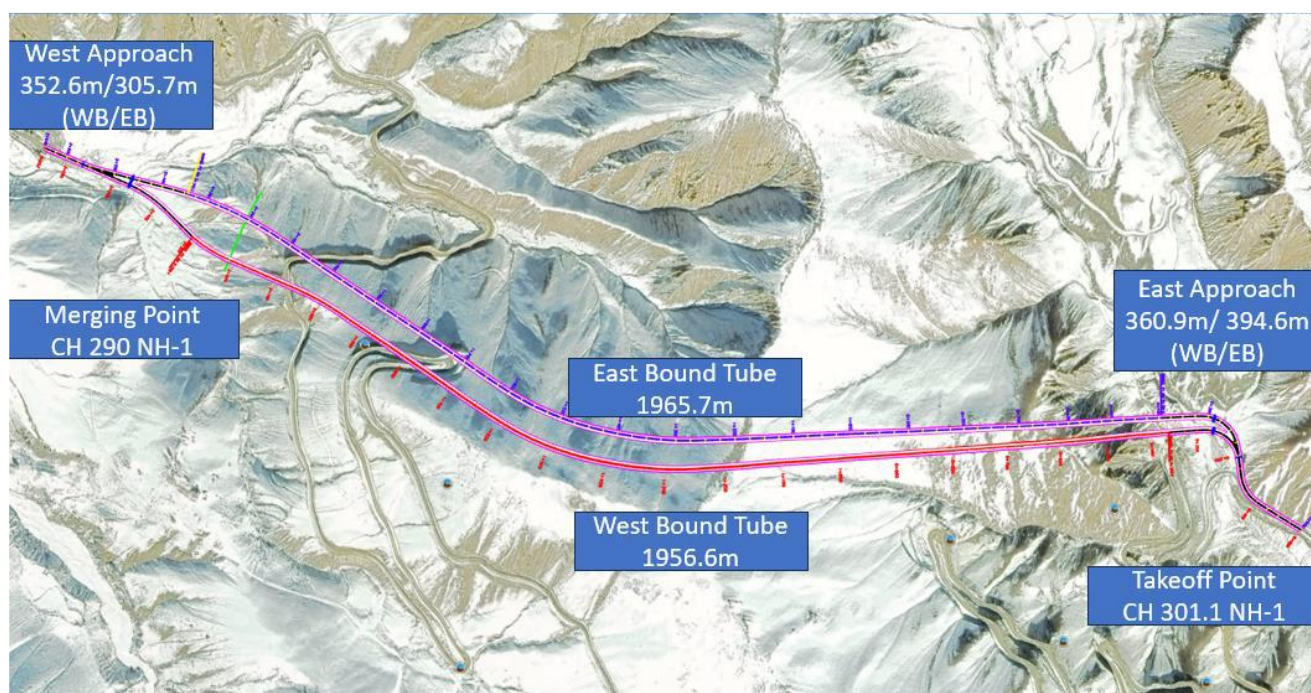
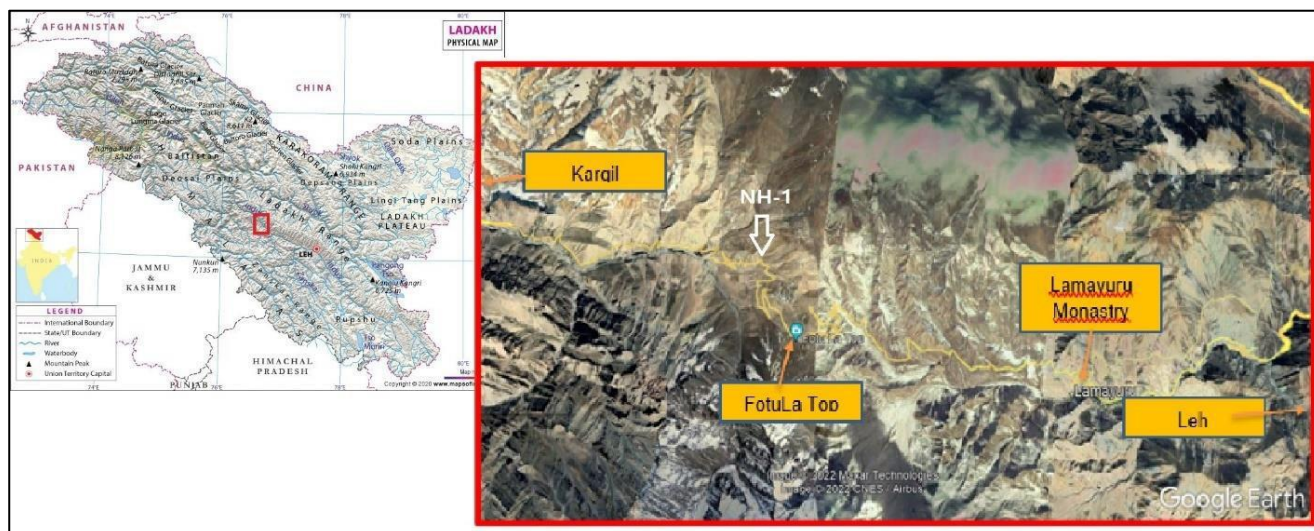


Figure 1: Index Map of the Project Area

Annex-I  
(Schedule-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:

S.No.	Description	Chainage	Length (in Mtr.)	Width (in Mtr.)	Date of providing Right of Way*
1	East Approach	0+000 to 0+200	Variable Max Length:255m Min Length: 190m Avg. Length: 223m	24	Working permission will be provided on Appointed date
2	East Portal	0+200 to 0+400	Variable Max Length:175m Min Length: 185m Avg. Length: 180m	150	Working permission will be provided on Appointed date
3	Muck Dumping Site-1 (East)	At Chainage 291.8 of NH-01	495	Variable Max Length:220m Min Length: 30m Avg. Length: 125m	Working permission will be provided on Appointed date
4	Site Camp-1 (East)	At Chainage 287.6 of NH-01	Variable max length: 120m min length: 20m Avg Length: 70m	Variable Max Length:235m Min Length: 200m Avg. Length: 218m	Working permission will be provided on Appointed date
5	West Approach	2+400 to 2+652	Variable Max Length:135m Min Length: 140m	65	Working permission will be provided on Appointed date

S.No.	Description	Chainage	Length (in Mtr.)	Width (in Mtr.)	Date of providing Right of Way*
			Avg. Length: 138m		
6	West Portal	2+280 to 2+652	250	180	Working permission will be provided on Appointed date
7	Muck Dumping Site-2 (West)	At Chainage 287.6 of NH-01	165	60	Working permission will be provided on Appointed date
8	Muck Dumping Site-3 (West)	2+100 to 2+300	215	60	Working permission will be provided on Appointed date
9	Muck Dumping Site-4 (West)	1+900 to 2+200	290	Variable Max Length:95m Min Length: 55m Avg. Length: 75m	Working permission will be provided on Appointed date
10	Muck Dumping Site- 5 (West)	2+250 to 2+400	Variable Max Length:180m Min Length: 175m Avg. Length: 178m	Variable Max Length:60m Min Length: 55m Avg. Length: 57.5m	Working permission will be provided on Appointed date
11	Site Camp-2 (West)	2+100 to 2+300	Variable Max Length: 230m Min Length: 170m Avg Length:185	50	Working permission will be provided on Appointed date
12	Site Camp-3 (West)	2+500 to 2+600	120	30	Working permission will be provided on Appointed date

\*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 new alignment of the Project Highway shall be prepared 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 and location of traffic sign is enclosed. The contractor shall, however, improve/upgrade upon the traffic plan as indicated in Annex-III based on the site/design requirement as per relevant specifications/IRC Code/manual.
- (iii) Following Drawings are enclosed in the digital form in CD marked as Annex-III
  - Alignment Plan and Longitudinal Profile
  - GAD of Structures
  - Traffic Signage Plan

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**Annex-IV****(Schedule-A)****Environment Clearances**

As per S. No 7 F under “List of Projects requiring Prior Environmental Clearance” of EIA Notification 2006 and its amendments; all New National Highway Projects need to get Environmental Clearance (EC) from MoEFCC.

The Tunnel and its approach road does not falls in forest area. Therefore Forest clearance is not required.

The site does not form a part of any National Park, Wildlife Sanctuary, Reserve, Tiger Reserve, Elephant corridor etc. Hence no approval from Wildlife department needs to be taken for the proposed project.

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



**[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 22<sup>nd</sup> 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 14<sup>th</sup> 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 11<sup>th</sup> 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 7<sup>th</sup> 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 Clauses 2.1)*

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## **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]**

Rehabilitation and augmentation shall include 2-Laning of the Project Highway as described in Annex-I of this Schedule-B and in Schedule-C.

### **3 Specifications and Standards**

The Project Highway shall be designed and constructed in conformity with the Specifications and Standards specified in Annex-I of Schedule-D.

## Annex-I

## (Schedule-B)

## Description of the national highway double lane (NHDL)

The proposed project seeks to introduce a tunnel across the Fotu La Pass, thereby improving the connection of the existing Leh-Srinagar Highway (NH-1). The road among others, intend to achieve all weather connectivity, increased mobility and reduce travel time between Leh and Kargil (the only two districts of Ladakh), and further to Srinagar, by further shortening the road length across this highest pass on the route. The terrain is mountainous in the entire region and existing stretch of the road crosses Fotula ridge between Ch 290 Km and Ch 301.1 Km [approx. existing chainages] (from Srinagar) has issues related to high altitude where the road crossed the top of the ridge through Fotula Pass at 4108m (circa) has issues related to high altitude like snow accumulation is around 5-10ft in winters, formation of icing on road leading to high risk of skidding during winters, frequent snow clearing, regular maintenance of highway and obstruction in mobility of traffic.

Construction of uni-directional tunnel across Fotu La pass total length including tunnel is 2.652km (West Bound)/ and 2.648km (East Bound). With a break up of 360.9m/ 394.6m of approach road on East end, tunnel length of 1956.5m/ 1965.7m (including NATM and cut & cover) and 352.6m/305.7m approach road on West end. The cut and cover stretch is 6m on western side and 12m on eastern side.

### 1 Development of the Project Section

- (i) Development of the Project Highway shall include design and construction of the Project Highway as described in this Schedule-B and in Schedule-C. The Project Highway shall follow the alignment plans as specified in **Annex-III of Schedule-A**, unless otherwise specified by the Authority. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for hilly terrain to the extent of land available.
- (ii) Width of Carriageway
- a) Two-Laning with paved shoulders shall be undertaken. The paved carriageway shall be provided as indicated below and referred to in **Appendix B-I** of this Schedule-B and Annex-I of Schedule-D.

For Tunnels the width of the carriageway shall be as per typical cross sections given in **Appendix B-I** of Schedule B.

TCS Schedule West Bound LHS						
S No.	Chainage		Length	TCS Type	TCS Description	Remarks
	From	To				
1.	0+000	0+070	70	TCS 1	TCS of Two Lane Carriageway approach in Normal Section	Ap- proaches to East Portal
2.	0+070	0+185	115	TCS 2	TCS of Two Lane Carriageway approach in Hill Section	
3.	0+185	0+215	30	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	
4.	0+215	0+248	33	TCS 3	TCS of Two Lane Carriageway approach in Hill Section with varies car-riageway	
5.	0+248	0+256	8	TCS 6	Two Lane for embankment Height upto 3m (merging Location)	
6.	0+256	0+361	104.9	TCS 5	TCS of both side hill for Four Lane Carriage way with median varies (New Construction)	
7.	0+361	2+299	1938.5	NATM Tunnel		

TCS Schedule West Bound LHS						
S No.	Chainage		Length	TCS Type	TCS Description	Remarks
	From	To				
8.	2+299	2+461	161.6	TCS 5	TCS of both side hill for Four Lane Carriage way with median varies (New Construction)	Ap-proaches to West Portal
9.	2+461	2+475	14	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	
10.	2+475	2+543	68	TCS 3	TCS of Two Lane Carriageway approach in Hill Section with varies carriageway	
11.	2+543	2+580	37	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	
12.	2+580	2+652	72	TCS 2	TCS of Two Lane Carriageway approach in Hill Section	
Total Length (m)			2652			

TCS Schedule East Bound RHS						
S No.	Chainage		Length	TCS Type	TCS Description	Re- marks
	From	To				
1.	0+000	0+071	71	TCS 1	TCS of Two Lane Carriageway ap- proach in Normal Section	Ap- proache s to East Portal
2.	0+071	0+185	114	TCS 2	TCS of Two Lane Carriageway ap- proach in Hill Section	
3.	0+185	0+211	26	TCS 4	TCS of Two Lane Carriageway ap- proach in Normal Section with varies carriageway	
4.	0+211	0+250	39	TCS 3	TCS of Two Lane Carriageway ap- proach in Hill Section with varies car- riageway	
5.	0+250	0+395	144.6	TCS 5	TCS of both side hill for Four Lane Car- riage way with median varies (New Construction)	
6.	0+395	2+342	1947.7	NATM Tunnel		
7.	2+342	2+460	117.7	TCS 5	TCS of both side hill for Four Lane Car- riage way with median varies (New Construction)	Ap- proache s to West Portal
8.	2+460	2+540	80	TCS 3	TCS of Two Lane Carriageway ap- proach in Hill Section with varies car- riageway	
9.	2+540	2+580	40	TCS 4	TCS of Two Lane Carriageway ap- proach in Normal Section with varies carriageway	
10.	2+580	2+648	68	TCS 2	TCS of Two Lane Carriageway ap- proach in Hill Section	
Total Length (m)			2648			

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

Sl. No.	Built-up stretch (Township)	Location (km to km)	Width (m)	Typical cross section (Ref. to Manual)
	Nil			

- b) Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to paragraph 1.1 above.
- c) The entire cross-sectional elements shall be accommodated in the available/proposed ROW. If required, suitable retaining structures shall be provided to accommodate the highway cross section within the available/ proposed ROW and the same 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 of the EPC Contract Agreement.

## 2 Geometric Design and General Features

### i. General

Geometric design and general features of the Project shall be in accordance with Section 2 of the Manual. (IRC: SP-48-1998, IRC: SP-73-2018 and IRC SP-91-2019).

### ii. Design speed

The contractor shall adopt ruling design speed for designing the project highway in conformity with the provisions of the manual & as specified in the Plan and Profile drawings of Annexure-III of Schedule-A and in Annex-I of Schedule D. Minimum design speed shall be adopted only where the site conditions are restrictive due to topographical restrictions.

The design speed shall be the minimum design speed of 40 km per hr for approach roads and 60 Kmph for tunnels, for mountainous/hilly terrain as per IRC: SP-48-1998 & IRC: SP-73-2018.

### iii. Improvement of the existing road geometrics

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

S. 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:

West Bound LHS					
S No.	Chainage		Length		TCS Type
	From	To			
1.	0+000	0+070	70	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 1
2.	0+070	0+185	115	1000mm of Paved shoulder, both the side of the carriage way	TCS 2
3.	0+185	0+215	30	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 4

West Bound LHS					
S No.	Chainage		Length		TCS Type
	From	To			
4.	0+215	0+248	33	1000mm of Paved shoulder, both the side of the carriage way	TCS 3
5.	0+248	0+256	8	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 6
6.	0+256	0+361	104.9	1000mm of Paved shoulder, both the side of the carriage way	TCS 5
7.	0+361	2+299	1938.5	NATM Tunnel, 750mm of walk way has been provided	
8.	2+299	2+461	161.6	1000mm of Paved shoulder, both the side of the carriage way	TCS 5
9.	2+461	2+475	14	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 4
10.	2+475	2+543	68	1000mm of Paved shoulder, both the side of the carriage way	TCS 3
11.	2+543	2+580	37	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 4
12.	2+580	2+652	72	1000mm of Paved shoulder, both the side of the carriage way	TCS 2
Total Length (m)			2652		

West Bound LHS					
S No.	Chainage		Length		TCS Type
	From	To			
1.	0+000	0+071	71	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 1
2.	0+071	0+185	114	1000mm of Paved shoulder, both the side of the carriage way	TCS 2
3.	0+185	0+211	26	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 4
4.	0+211	0+250	39	1000mm of Paved shoulder, both the side of the carriage way	TCS 3
5.	0+250	0+395	144.6	1000mm of Paved shoulder, both the side of the carriage way	TCS 5
6.	0+395	2+342	1947.7	NATM Tunnel, 750mm of walk way has been provided	
7.	2+342	2+460	117.7	1000mm of Paved shoulder, both the side of the carriage way	TCS 5
8.	2+460	2+540	80	1000mm of Paved shoulder, both the side of the carriage way	TCS 3
9.	2+540	2+580	40	1000 mm of paved shoulder and 500mm of Earthen shoulder, both the side of the carriage way	TCS 4
10.	2+580	2+648	68	1000mm of Paved shoulder, both the side of the carriage way	TCS 2

West Bound LHS				
S No.	Chainage		Length	TCS Type
	From	To		
Total Length (m)			2648	

- (b) 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 paragraph 2.10 of the Manual.
- (b) Lateral clearance: The width of the opening at the underpasses shall be as follows:

S. 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 paragraph 2.11 of the Manual.
- (b) Lateral clearance: The width of the opening at the overpasses shall be as follows:

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

**viii. Approach roads**

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

S. No.	Location of approach road (from km to km)	Right hand side (RHS)/Left hand side (LHS)/ or Both sides	Length (m) road
1	0+000 to 0+394.6	Both sides	394.6
2	2+299.4 to 2+652	Both sides	352.6

**ix. Grade separated structures**

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

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

**x. Cattle and pedestrian underpass /overpass**

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

S. No.	Location	Type of crossing
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Nil
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**xi. Typical cross-sections of the Project Highway**

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

TCS Schedule West Bound LHS						
S No.	Chainage		Length	TCS Type	TCS Description	Remarks
	From	To				
1.	0+000	0+070	70	TCS 1	TCS of Two Lane Carriageway approach in Normal Section	Approaches to East Portal
2.	0+070	0+185	115	TCS 2	TCS of Two Lane Carriageway approach in Hill Section	
3.	0+185	0+215	30	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	
4.	0+215	0+248	33	TCS 3	TCS of Two Lane Carriageway approach in Hill Section with varies carriageway	
5.	0+248	0+256	8	TCS 6	Two Lane for embankment Height upto 3m (merging Location)	
6.	0+256	0+361	104.9	TCS 5	TCS of both side hill for Four Lane Carriage way with median varies (New Construction)	
7.	0+361	2+299	1938.5	NATM Tunnel		
8.	2+299	2+461	161.6	TCS 5	TCS of both side hill for Four Lane Carriage way with median varies (New Construction)	Approaches to West Portal
9.	2+461	2+475	14	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	
10.	2+475	2+543	68	TCS 3	TCS of Two Lane Carriageway approach in Hill Section with varies carriageway	
11.	2+543	2+580	37	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	
12.	2+580	2+652	72	TCS 2	TCS of Two Lane Carriageway approach in Hill Section	
Total Length (m)			2652			

TCS Schedule East Bound RHS						
S No.	Chainage		Length	TCS Type	TCS Description	Remarks
	From	To				
1.	0+000	0+071	71	TCS 1	TCS of Two Lane Carriageway approach in Normal Section	Approaches to East Portal
2.	0+071	0+185	114	TCS 2	TCS of Two Lane Carriageway approach in Hill Section	
3.	0+185	0+211	26	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	



TCS Schedule East Bound RHS						
S No.	Chainage		Length	TCS Type	TCS Description	Remarks
	From	To				
4.	0+211	0+250	39	TCS 3	TCS of Two Lane Carriageway approach in Hill Section with varies carriageway	
5.	0+250	0+395	144.6	TCS 5	TCS of both side hill for Four Lane Carriage way with median varies (New Construction)	
6.	0+395	2+342	1947.7	NATM Tunnel		
7.	2+342	2+460	117.7	TCS 5	TCS of both side hill for Four Lane Carriage way with median varies (New Construction)	Ap- proaches to West Portal
8.	2+460	2+540	80	TCS 3	TCS of Two Lane Carriageway approach in Hill Section with varies carriageway	
9.	2+540	2+580	40	TCS 4	TCS of Two Lane Carriageway approach in Normal Section with varies carriageway	
10.	2+580	2+648	68	TCS 2	TCS of Two Lane Carriageway approach in Hill Section	
Total Length (m)			2648			

**Note:** The cross-section schedule given in above table is indicative and stretches may increase or decrease depending upon profile designed by contractor however, this shall not be treated as change of scope.

The alternative cross section of the Project Highway at the cross drainage structures shall follow the typical cross section in consultation with the Authority Engineer at the time of construction.

### 3 Intersections and Grade Separators

All intersections and grade separators shall be as per section 3 of the 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

S. No.	Location of intersection	Type of intersection	Other features
Nil			

(ii) Grade separated intersection with/without ramps

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

### 4 Road Embankment and Cut Section

(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:

S. 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 IRC: SP 37-2018.

(ii) Type of pavement

Flexible Pavement– Flexible Pavement shall be constructed in entire length of Approach Road 714 m (in between km 0.000 to km 2.652 w.r.t. LHS) of project excluding Tunnels.

It shall be noted that the grade of bitumen to be used shall be VG-40 as it is a snow bound area and NH. Further, in order to meet the intended functional requirement of respective pavement layers as well as compaction of heavy bituminous layers on main carriageway, the minimum thickness of respective pavement layers for main carriageway shall, however, in no case be less than as given below

Layer	Thickness (mm)
BC	40
DBM	80
WMM	200
Granular Subbase (GSB)	200

(iii) Design requirements

(a) Design Period and strategy

Flexible pavement shall be constructed for new pavements road. Flexible pavement shall be designed for a minimum design period of 20 (Twenty) years and minimum CBR of subgrade should be 15%. 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 36 million standard axles. In case the MSA is more than specified above at the time of traffic survey done by Contractor at the time of design of project highway, then the higher traffic will be adopted for design.

## 6 Roadside Drainage

Drainage system including surface and subsurface drains for the Project shall be provided as per relevant Section of the latest revision of Manual (IRC:SP-48-1998) and as per TCS schedule provided as Appendix B-I to this schedule. Total 1138 Rm of lined drain shall be provided along the approach roads of Fotu La Tunnels as per TCS.

## 7 Design of Structures

(i) General

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

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

S. No.	Bridge at km	Width of carriageway and cross-sectional features*
--------	--------------	--

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

S. No.	Location at km	Span Arrangement No. x Length (m)	Remarks
Nil			

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

(e) The following structures shall be designed to carry utility services specified in table below:

S. No.	Bridge at km	Utility service to be carried	Remarks
Nil			

(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:

[Refer to the provision of relevant Manual and provide details]

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

\*[Specify modifications, if any, required in the road level, etc]

(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.

S. 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 particulars given in the table below:

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

1	0+197 (Combined)	RCC Box Culvert	1x2x2
2	0+269 (LHS)	RCC Box Culvert	1x2x2
3	0+269 (RHS)	RCC Box Culvert	1x2x2
4	2+469 (Combined)	RCC Box Culvert	1x2x2
5	2+569 (Combined)	RCC Box Culvert	1x2x2

Overall width of all culverts shall be equal to the roadway width. Barrel Length may change as per height of embankment and shall get approval from Authority and its Engineer; this will not be considered under change of scope.

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

[Refer to the provision of relevant Manual and provide details]

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

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

### (iii) Bridges

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

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

[Refer to the provision of relevant Manual and provide details]

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

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

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

- (b) Additional new bridges

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

S. No.	Location (km)	Span Arrangement	Total length (m)	Remarks, if any
Nil				

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

[Refer to the provision of relevant Manual and provide details:]

S. No.	Location at km	Remarks
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Nil
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(d) Repairs/replacements of railing/parapets of the existing bridges shall be undertaken as follows:

[Refer to the provision of relevant Manual and provide details]

S. 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

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

[Refer to the provision of relevant Manual and specify modification, if any]

(a) Road over-bridges

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

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

(b) Road under-bridges

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

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

(v) Grade separated structures

[Refer to the provision of relevant Manual]

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

(vi) Repairs and strengthening of bridges and structures

[Refer to the provision of relevant Manual and provide details]

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

(a) Bridges

S. No.	Location of bridge (km)	Nature and extent of repairs /strengthening to be carried out
Nil		

(b) ROB / RUB

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

## (c) Overpasses/Underpasses and other structures

S. 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:

S. No.	Location (km)	Span Arrangement	Total length (m)	Remarks, if any
NIL				

**8 Traffic Control Devices and Road Safety Works**

- (i) Traffic control devices and road safety works shall be provided in accordance with section 9 of the Manual.
- (ii) Specifications of the reflective sheeting shall be as per section 9 of the Manual.

**9 Roadside Furniture**

- (i) Roadside furniture shall be provided in accordance with the provision of section 9 of the Manual.
- (ii) Overhead traffic signs: Overhead traffic signs shall be evolved based on design of sign boards given in IRC 67. All Traffic Signs for Road Users would be provided as per Manual. However, the Contractor shall provide minimum numbers of Cautionary, Mandatory, Warning and Informatory Traffic Sign Boards.

**10 Compulsory Afforestation**

The contractor is to plant trees as compensatory forestation as per as per IRC SP 21 and guidelines of the forest department.

**11 Hazardous Locations**

The safety barriers like metal beam crash barriers shall also be provided at the following hazardous locations:

S. No.	Location stretch from (km) to (km)	LHS/RHS
Nil		

**12 Special Requirement for Hill Roads**

In accordance with section 13 of the manual (from IRC: SP: 73-2018), IRC: SP 48: 1998 and Recommended practices for Treatment of Embankment and Roadside slopes for erosion control (First Revision), IRC: 56-2011 and relevant IRC codes.

There are following protection works are provided at the following locations.

## (a) Breast Walls:

Retaining/Breast walls shall be provided at the valley side as per applicable Typical Cross-Section. The detailed chainages are as follows:

Structures to be built at LHS West Bound:

S. No.	Chainage (km)	Type of Structure	length (m)
1	0+070 to 0+185	Breast wall both side	230
2	0+215 to 0+248	Breast wall both side	66
3	0+256 to 0+390	Breast wall both side in both approach to tunnel	536
4	2+314 to 2+461	Breast wall both side in both approach to tunnel	588
5	2+475 to 2+543	Breast wall both side	136
6	2+580 to 2+652	Breast wall both side	144

(b) Gabion Walls:

Gabion walls shall be provided at the hill side as per applicable Typical Cross-Section. The gabions are to be provided at muck dumping locations as per the site requirement. The detailed chainages are as follows:

Design Chainage		Length (m)	side
From	To		
To be provided at muck dumping locations, wherever applicable			

(c) 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.

Slope protection shall be provided at the hill side as per applicable Typical Cross-Section. The detailed chainages are as follows:

Design Chainage		Length (m)	Side
From	To		
0+295	0+360	65	LHS
2+299	2+410	111	LHS
0+324	0+394	70	RHS
2+342	2+435	93	RHS

(d) Avalanche Protection:

In view of the identified avalanches falling on the project road, avalanche protection measures are required. The major avalanches where protection measures would be required are as follows:

S.No.	Description	Length	Chainage	Type of Net
Nil				

(e) Snow Clearance

During the winters season, the contractor is to make sure that the snow clearance mechanism is to be followed in order to optimise the resources within the least operation time. Snow clearance activities such as Snow Plowing/Removal with the use of machineries (snow plower, snow blower, snow grader etc.) shall be done by the contractor on daily basis for the full length of construction package. Cost of the snow clearance mechanism whether or electrical will be borne by the contractor.

### 13 Major Junction

The details of proposed major junctions are as follows:

S.No.	Location		At grade	Separated	Category of Cross Road			
	From km	to km			NH	SH	MDR	Others
1	0+000	0+040	At grade		NH-01			
2	2+620	2+648	At grade		NH-01			

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

### 14 Tunnels

(i) Existing Tunnels to be re- constructed/widened

S. No.	location (km)	Salient details of Tunnel	Proposed Rehabilitation	Remarks
Nil				

(ii) Proposed New Tunnels

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

S. No.	Location (km)	Portal Design Chainage		Length of Tunnel (m)	Remarks
		Start	End		
1	East Bound (EB)	0+394.6	2+342.3	1947.7 [Without Cut and Cover] 1965.7 [With Cut and Cover]	Total Width of 9.0m including 7.0m of driving + emergency lane (2x 3.5m), side strip of 0.5m, and 1.5m of both side walkway (2 x 0.75m) Traffic clearance of 5.5m.
2	West Bound (WB)	0+360.9	2+299.4	1938.5 [Without Cut and Cover] 1956.5 [With Cut and Cover]	

Note: 6 m of cut and cover has been provided at western side and 12 m of cut and cover has been provided at eastern side at each portal.

Above length of the Tunnel are indicative and minimum specified, the actual length of the Tunnel shall be determined by the Contractor keeping in view the Tunnel location and in accordance with the Manual requirements with approval from the Authority's Engineer. As per site requirement and directed by Authority Engineer will be considered under a Change of Scope. For Tunnel design and Specification refer Para 3 of Annexure 1 to schedule D.

(iii) The proposed twin tube tunnel shall be connected by cross passage in accordance with IRC SP: 91-2019 at every 500m spacing for emergency rescue. The cross-section for cross-passage shall be as enclosed in



Appendix B-I of Schedule-B. Other tunnel ancillary works not limited to drainage, water proofing, ventilation, fire-fighting system, tunnel illumination, emergency power supply, electrical sub-station, control centre, pump rooms, furnishing, signages, emergency facilities, etc. shall be provided as specified in IRC:SP:74-2019, IRC: SP:91-2019 and specification as per schedule-D. Details of Cross passage is mentioned below:

S. No.	Location EB (km)	Type	Length of Cross-Passage (m)	Remarks
1	0+906	Vehicular	27.29	For Vehicular CP – Total width of 6.4m including 3.5m driving lane, 2m walkway of both sides (2x 1m), 0.3m of kerb of both sides (2 x 0.15m) Traffic Clearance of 4.5m.
2	1+396	Vehicular	38.35	
3	1+850	Vehicular	38.64	

- (iv) 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 additional faces through e.g. adits. 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 the excavation of portal and tunnel the set of critical machinery involving the hydraulic boomer, shotcrete machine, grouting equipment, excavation mucking and dumping machinery shall be maintained dedicated for each face of excavation.
- (v) The geological formations in the project areas are identified as rocks belonging to Kuling-Lialng roup of Permian Jurassic age (Schuppean zone). Mainly phyllite rock is reported all along the tunnel length. Hence, along the proposed tunnel alignment, a range of rock mass types with varying mechanical properties having potential to exhibit varying behavioural patterns during excavation activities is anticipated.
- (vi) Four broad division of the rock mass types have been interpreted according to the combination of rock types (indicative) and their structure. The interpreted Ground/ Rock mass types and their mechanical evaluations are tabulated below.

Ground Type	Lithology	Structure
GT1	Reddish brown coloured to dark greyish coloured phyllitic limestone, limestonic phyllite	Bedded and closely but tightly jointed.
GT2	Light brownish to greyish coloured, moderately jointed, moderately to closely foliated, moderately strong phyllite/quartzitic phyllite	Stratified alternations with subordinate thinner bands of phyllites, often warped.
GT3	Highly folded, highly fractured, closely foliated, fine grained, light brownish grey coloured, quartzitic phyllite with quartzitic bands	Stratified in alternations with subordinate thinner bands of Phyllitic Quartzites/Quartzitic Phyllites/Phyllites, occasionally folded, visibly foliated.
GT4	Slope debris at portal area consisting of mainly heterogeneous matrix (sand, silt & clay) with angular to sub angular, boulder, cobble, pebble size fragments of	Inhomogeneous mixture of boulders in sandy soil matrix, Colluvium/ Talus material.

	Quartzite, Phyllite, Quartzitic-Phyllite and Slate	
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The mechanical attributes of each ground type is expected to vary based on the range of intact properties, joint condition/ characteristics. Based on this bandwidth the ground type may further be divided in high (H) and Low (L) of mechanical properties to decide the behavior and support type. A range for the anticipated lengths of the tunnel set to negotiate different Ground Types is suggested below assuming for variations in actual geological settings and structure. This range is expressed as percentages (indicating the optimistic and pessimistic assessment of their distribution) and average lengths.

Ground Type	GT1H	GT1L	GT2H	GT2L	GT3H	GT3L	GT4
Distribution %	15.4%	10.5%	27.8%	21.1%	9.5 %	7.7 %	8.0 %
Avg. Length (m)	300	204.1	540	410	185	149.4	154.6

The extraneous factors like excavation of the tunnel (shape and size), ground stresses, ground water conditions influence the behaviour of individual ground types. The guidelines for geotechnical design with conventional excavation published by Austrian Society of Geomechanics identifies a set of ground behaviour types. Linking the above ground types with that will lead to following matrix of ground behaviour.

		Overburden depth			
		0-50	50-100	100-250	250-500
Ground Types	GT1	BT-1,2	BT- 1,2,3	BT-3,4	BT-3,4
	GT2	BT-3,7,8	BT-3,4	BT-4	BT-4
	GT3	BT-4,8	BT-4,8	BT-4	BT-4
	GT4	BT-7,8,11			

- (vii) Based on the geological and geotechnical assessment, primary support for the main tunnels is proposed in the DPR. The tunnel support system can be divided in 2 parts. The primary support is installed sequentially along with tunnel excavation while secondary support is applied at later stage after ceasing of tunnel deformation.

Primary support based on the DPR is shown as under

Support Class	Avg. Round Length (m)	Sprayed Concrete		Rock Bolt Details			Additional Support Measures
		Thickness (mm)	Type	Capacity (kN)	Length (m)	Spacing (m)	
SCI	3	50	SFRS	200kN Swellex	4	If required	
SCII	2.5	100	SFRS	200kN SN	4	2.5X2.5	
SCIII	2	150	SFRS	200kN SN	4	2.0X1.5	
SCIV	1.5	200	SFRS	350kN SN/SDA	6	1.5X1.5	Forpoles (If required) 3m long @400mm c/c 90 degree in crown, LG 95/20/25
SCV	1	250	SFRS with 1 layer of wire mesh	350 kN SN/SDA	9	1.0X1.3	Forpoles 4m long @300mm c/c 90 degree in crown (alternate round), Face bolts 6 numbers with 9m length and 3m overlap (GFRP, 350kN strength), LG 95/20/25
SCVI	0.8	300	SFRS with 1 layer of wire mesh	350 kN SDA	9(Crown)/12(Side-wall)	0.8X1.3	Pipe roof 12m long with 4m overlap 76mm dia @300mm c/c spacing 120 degree in crown Temporary invert of 250mm thickness along with elephant foot, Face bolts 9 numbers with 9m length and 3m overlap (GFRP, 350kN strength), LG 130/25/32, 2 rows of LSC at 120 degree (if required)

Combining the DPR assessment of ground condition, behaviour types and support system following anticipated distribution of support class is derived.

Excavation and Support Classes	ESC I	ESC II	ESC III	ESC IV	ESC V	ESC VI
Distribution %	0 . 5 1 5 %	4 . 6 3 2 %	2 0 . 7 9 7 %	9 . 5 2 1 %	1 1 . 8 3 7 %	5 2 . 6 9 9 %
Avg. Length (m)	10	90	404.1	185	230	1024

- (viii) Portal Support Details: Pattern rock bolting of 6.0 m length SDR 32mm dia of 350 KN Yield capacity length with spacing of 2mx2m from top of cutting to 8.0m above toe of cutting. Pattern rock bolting of 4 lines of 9.0 m length SDR 32mm dia of 350 KN Yield capacity length with spacing of 2mx2m from 6.0m

above toe of cutting to toe of cutting. 100mm shotcrete with 1 layer of wire mesh. Drainage pipe of 6m long with spacing pf 4x4m (76mm dia perforated pipe wrapped around with geotextile).

(ix) Final Lining Details: The grade of concrete SFRC Concrete Grade M45

Thickness:

a) Sections without invert - Overt : 350mm, Sidewall :350 to 700mm

b) Sections with invert - Overt 400mm, Sidewall 400 to 700 mm.

For GT-03 and GT-04, additional steel reinforcement need to be provided.

(x) Above details for the tunnel support system has been prepared as per the Geological/ geotechnical studies at DPR stage. This shall form Geotechnical Baseline Report (GBR) and any variation in tunnel support system due to deviation from the Geotechnical Baseline report shall be considered as change of scope under the provision of the Article 13 of the EPC Contract agreement.

(xi) Rigid Pavement for the tunnel:

<b>Pavement Quality Concrete (PQC)</b>	
Concrete Slab, thickness (M40)	250mm
Dry Lean concrete, thickness	150 mm
Granular Sub-base, thickness	200 mm
<b>Dowel Bar (Mild Steel)</b>	
Contraction joints @c/c	4500mm
Diameter/ length/ spacing	32mm/ 500mm/ 160mm
<b>Tie Bar (deformed)</b>	
Longitudinal joint @c/c	3500 mm
Diameter/ length/ spacing	12mm/ 640mm/ 720mm

(xii) Ventilation Concept and Design: The ventilation system shall be designed for normal, congestion and emergency (fire case) operational scenarios. The ventilation during normal and congestion operations shall ensure that the levels of pollutants are below the allowable limits published by PIARC 2019R02EN.

The emergency ventilation system (case of a fire) shall provide a means for controlling smoke during an incident. In all cases, the desired goal shall be to push the smoke away from stuck motorists behind the incident, therefore providing time for self-rescue of motorists who can exit the incident area of the tunnel and to facilitate firefighting / emergency service operations. The system shall be designed to comply with NFPA 502 and IRC: SP 91-2019 in case of a fire. Based on design in this situation the ventilation system needs to produce a velocity greater than critical velocity based on NFPA 502 criteria to prevent back layering upstream of the fire.

Both the tunnel tubes will be equipped with a longitudinal ventilation system and shall be provided with an array of reversible type jet fans of adequate capacity (installed in pairs) at a suitable interval determined during detailed engineering analysis.

Based on numerous simulations an optimized ventilation design was prepared. Handling a 50 MW fire at the worst-case fire location in the eastbound direction 28 jet fans and in the westbound direction 34 jet fans are necessary. Each tube will be provided with 2 redundant banks. Each tube will be equipped with 3 air velocity measurement systems/sensors. Emergency cases shall be handled by designated mode of

operations and controlled by integrated SCADA system. The ventilation system is designed for normal, congestion and emergency (fire case) operational scenarios. The ventilation during normal and congestion operations shall ensure that the levels of pollutants are below the allowable limits published by PIARC 2019R02EN.

The emergency ventilation system (case of a fire) shall provide a means for controlling smoke during an incident. In all cases, the desired goal shall be to push the smoke away from stuck motorists behind the incident, therefore providing time for self-rescue of motorists who can exit the incident area of the tunnel and to facilitate firefighting / emergency service operations. The system shall be designed to comply with NFPA 502 and IRC: SP 91-2019 in case of a fire. Based on design in this situation the ventilation system needs to produce a velocity greater than critical velocity based on NFPA 502 criteria to prevent back layering upstream of the fire.

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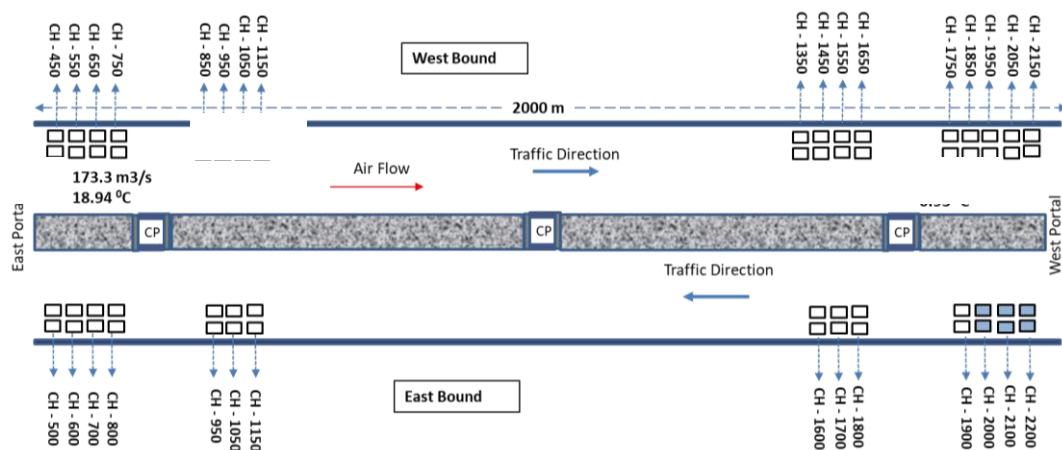
Under normal tunnel operation, the ventilation system is designed to maintain air quality by keeping pollutant concentrations below permissible limits: CO (100 ppm, 5 min average), NO<sub>2</sub> (1 ppm, 15 min average), and visibility defined by an extinction coefficient of 0.007 m<sup>-1</sup>. Sensors for CO, NO<sub>2</sub>, and visibility are installed at regular intervals along the tunnel to continuously monitor pollutant levels.

The system operates based on a PID controller. When the concentration of any pollutant reaches 80% of its threshold, the ventilation fans are activated automatically based on the inputs of pollutant sensors. The fans remain in operation until pollutant levels fall below the activation threshold, ensuring effective pollutant control and safe tunnel conditions.

The parameters for each level must be optimized during the first few months.

In case of maintenance works in the tunnel CO should not exceed 30 ppm and TR should not be higher than 0.003 m<sup>-1</sup>. Tunnel operator will turn on the ventilation system manually before starting service work and maintenance in the tunnel.

In total 62 jet fans are installed. The tentative locations of jet fans installations attached in the Figure below. The specifications of the jet fans to be installed is also mentioned in the table attached below.



**Figure: Ventilation design, disposition of jet fans and air velocity measurement**

Table for Jet fan data

Jet fan data	
Net thrust	2,241 N by 1.2 kg/m <sup>3</sup> (in both directions)
Outlet velocity	about 31 m/s
Inlet diameter	1,400 mm
Outer diameter	1,650 mm
Temperature resistance (F250/120)	250°C / 120 min.
Motor power	55 kW
Voltage for motor	415 V
Installation factor	0.7
Motor efficiency	>91%
Power factor cos j	>82%

(xiii) Tunnel Electrical and Firefighting System

(a) Power distribution

The total power for both tunnels under emergency and normal scenario is approximately 2.51 MW and 0.51 MW respectively. In order to have the required power available, a grid sub station is to be constructed on western portal drawing power from main grid and stepping it down to 11kV for distribution to substations at portal. One working + 1 standby 66/11kV ONAN Transformers of 4 MVA shall be installed on west portal.

Based on the placement of jet fans and to minimize the voltage drop within 5% 11/433 V substations are planned at both portals. The general power supply of the 433/ 230 volt – level to different equipment is drawn from the main power supply (portal substation) to the E&M Niches as applicable and then further to the ultimate equipment.

(b) DG Set

The DG sets are to be kept outside the tunnel at west portal substation to prevent unsafe condition inside the tunnels due to fuel handling and exhaust fumes. The 11 kV DG set shall be complete with cooling system, fuel system, lubricating system, air intake system, exhaust system, governing system, standby system, engine protection safety system with microprocessor-based power control command generator set monitoring, metering, protection, and control system to meet demands of engine driven generator sets. Operating temperature range of the DG sets shall take into account the cold climate.

Based on the analysis the total 3 number of 1500 kVA DG sets are required at west portal. In normal scenario one DG set shall be used and in case of emergency all three shall be used.

(c) UPS System

Uninterrupted Power Supply system shall be connected to the following systems:

- Emergency lighting
- Traffic control

- Exit signs
- Communication
- Ventilation Sensors
- Fire detection
- Security
- Closed-circuit television or video.

The rated capacity of the UPS is recommended to be one & half hour for Emergency lighting and half hour for Critical Loads.

Power Supplies will be provided. The UPS will be fed from the main power supply (433 / 250 V, 50 Hz) and shall supply the connected equipment via rectifier, battery and inverter.

(d) Tunnel Lighting

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 CIE 88:2004 standard "Guide for the Lighting of Road Tunnels and Underpasses" 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 shall be considered. The light intensity of 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).

The tunnel lighting will be fully controlled automatically by the SCADA system according to measurements of the light sensors situated outside and inside the tunnel. A manual control of the entire lighting system will remain possible at any time.

(e) CCTV System

The cameras will be mounted on a height of approximately 5 m on the side of the emergency lane. Every access door to the cross passage will be monitored by a separate camera, which will be installed on the opposite tunnel wall. Also cameras will be installed in the cross-passage.

The tunnel video camera network will be completed with pole mounted video cameras located outside of the tunnel. These cameras will monitor the traffic on the tunnel access road and tunnel access ramps. They will be equipped with pan/ tilt and zoom devices.

All the video pictures from the video cameras will be transmitted in real time to the Tunnel Control Centre and continuously recorded on HDD digital recording system.

The video pictures will be transmitted from the video camera to electrical substations via single optical fibre and then to the control centre via the main tunnel optical fibre network. The main tunnel optical fibre network is designed as a ring for redundancy.

The CCTV network will be connected to the Control Centre, by which the pictures can be seen and cameras can be controlled.

(f) Emergency Call Network

An emergency call telephone will be installed in each emergency niche. A dedicated workstation (Emergency Roadside Telephone Workstation) will be located in the Tunnel Control Centre to allow the operator full control of the system. The architecture of the communication network of the emergency roadside telephones will consist in an optical fibre loop controlled from an emergency roadside telephone network interface located in the tunnel technical room. All of the emergency roadside telephone in the east tube will be connected to one branch and all of the emergency roadside telephones in the westbound tube will be connected to the other branch.

For redundancy an emergency roadside telephone network interface shall be located at the east portal and another at the west portal.

(g) Traffic Management System

Closing equipment (automatic barriers, traffic lights, variable speed limit signs, and variable message signs) in front of all portals will be required to prevent cars/lorries entering the tunnel in case of an emergency situation (e.g. fire inside the tunnel). The CCTV-cameras (pan/tilt/zoom) will give the operator at the CC an overview of the situation in front of the closing equipment.

A signalization with traffic lights and variable message signs ("STOP!", "FIRE!") inside the tunnel tubes will be situated in front of each vehicular cross passage (as seen in driving direction) for both directions.

Inside the tunnel tubes additional variable speed limit signs and illuminated traffic signs for each direction shall be mounted at the same location – so the illuminated traffic signs are visible independently from the driving direction.

(h) SCADA System and Data Processing and Transmission

The data processing and data transmission will be realized by using a fiber optic cable ring (over both tunnel tubes) where the local PLCs (at Portal Substation, Cross passage substation, etc.) will be connected to the fibre optic cable ring by using optical link modules. The use of a ring structure gives additional security, due to the fact that in case of a failure or cable break on one side of the ring, the data transmission will be done over the other side of the ring. The control of the tunnel will be designed in such a way, that the tunnel will operate fully automatic with the possibility of manual intervention if needed. In the control centres (main CC resp. sub CC) the supervision and manual control of the tunnel's electrical and safety installation can be managed (automatic/remote/local mode, supervision interface, SCADA-workstations, etc.).

The complete architecture of the data processing and data transmission as well as the SCADA system is designed to be redundant - so the power supply units, the data transmission rings (two rings are designed), etc. are designed in such a way, that the breakdown of a PLC, tunnel ring, etc. does not result in a breakdown of a part of the system resp. the complete system.

(i) Control Centre (main CC and back-up CC)

The main Control Centre will be situated at east portal. The back-up Control Centre will be situated at the west portal. The control centre will include the control rooms for tunnels traffic operation all the necessary technical rooms, the operation and maintenance buildings and the administrative facilities. The Tunnel Control Centre is an essential part of the tunnel safety system. It controls the traffic flow in the tunnel and co-ordinates the initial interventions in the event of an incident or emergency in the tunnel. The necessary rescue equipment and vehicles must be located in the immediate vicinity of the tunnel portals. The tunnel control centre will be associated with the following functions:

- Monitoring the traffic conditions in the tunnel and its accesses
- Monitoring the emergency call systems
- Receiving any alarms and alerts associated with the tunnel equipment systems
- Receiving and displaying the images transmitted from the CCTV cameras
- Supervising the operation of the tunnel ventilation, traffic control and lighting systems and other safety equipment

The equipment of the Control Centres include the supervisor workstation, two traffic controller workstations, CCTV monitors, emergency call control equipment, tunnel radio control equipment, PA control equipment, etc.

\*Note: To ensure the integrity and resilience of the SCADA and CCTV system for the Tunnel, strict safeguards shall be implemented across hardware, physical, and cyber domain, as brought below:



- I. **Hardware Usage.** It is required to be ensured that all hardware used in the SCADA (ITCS) and CCTV system are not of Chinese origin.
- II. **Physical Security.** The system including various peripherals/components needs to be physically secured to mitigate any tampering of the equipment.
- III. **Cyber Security.** Cyber Security of the control system is of utmost importance to prevent malicious/cyber-attacks leading to failures or hostile take overs. Strict access control, installation of firewalls and cyber hardening of the system as part of real-time intrusions detection systems and back up control modes needs to be incorporated in the system. The system should be isolated and insulated from other networks to prevent potential attack.

(xiv) Fire Fighting Systems

(a) Fire Detection System

A linear fire detection system (optical cable) shall be installed along the tunnel for both tubes. In case of a fire alarm the operator in the control centre knows the exact area of the detected fire. The linear fire detection system consists of a linear fire cable in the tunnel. The indicated fire alarms will be transmitted to the Control Centre. The alarm to the fire department can be transferred manually by the operator (after checking the alarm). When an alarm occurs the operator has 30 seconds (this time is variably and can be changed) to check the alarm. After his time the alarm will be forwarded to the fire department.

(b) Fire Hydrant System

The Fire Hydrant System shall be provided for the water supply of the tunnel. The basic requirement is as per NFPA, National Building Codes of India (NBC) 2016 (Part 4): Fire and Life Safety, Indian Standards, Indian Road Congress and Local Fire Authority Norms.

A wet pipe fire hydrants system with hose reels shall be provided in the tunnel. As the temperature in the area is very cold and goes in minus (below 0°Celsius) hence the piping will be insulated and there will be 500mtrs from each portal there will be Self-regulating heating cable for frost protection in the fire water pipes. The heat tracing cable will keep the water in liquid state.

The Fire Hydrant System with a hydrant valve at a spacing of every 150 m in both the east and west bound tunnels. The main purpose of the Fire Hydrant System is to fight fire manually by trained firefighting personnel / emergency action team of the tunnel. The double headed hydrant valves are fed by a 200 mm header pipeline which is fed by gravity through tanks placed at west. There will be hose reel at every 50 meters as per IRC 90. There will be firefighting pump rooms and water storage at both the portals. West portal firefighting pumphouse will feed the of the tunnel. The firefighting pipes system shall be fed from an insulated R.C.C reservoirs of 260 KL (130X2 Tanks) capacity.

(xv) 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.

(xvi) 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 BRO in consultation with the Authority Engineer. However, the method of construction is Contractor's choice. However, Tunnel will be constructed from both the tunnel portals.

(xvii) Muck Dump Disposal

Muck dump disposal sites are available in the project area on both sides of tunnel. Total five muck dumping sites have been proposed for disposing muck, one at eastern side and four at western side. Prior to any disposal of muck dump material, necessary permission shall be obtained from the local authorities (Civil administration/Forest/Wildlife) as per law for which the local BRO office will provide necessary assistance. For estimation of capacity of the individual pockets the Contractors are required to carry out

reconnaissance in coordination with BRO authorities. Muck disposal and management shall be carried out in accordance with the Environmental Laws of State/Central Govt. The muck shall be disposed as per the muck dumping plan approved by the Client/Authority. Contractor may use the good tunnel muck for filling or other construction purposes subject to confirmation of its suitability for the project highway. The statutory compliances like royalty for the use of the muck shall be arranged by the contractor at no extra cost. The contractor shall abide by all UT/central laws for using and disposing the muck.

The possible locations for muck dumping approach road are given in below table:

S No.	State/UT	Description	Chainage	ROW Width (in meter)		Area (Sq.m.)	Area (Hect.)
				Left	Right		
1	UT of Ladakh	Muck Dumping-1 (East)	Ch 291.84 at NH 01	Varies		51590	5.159
2	UT of Ladakh	Muck Dumping-2 (West)	Ch 298.13 at NH 01	Varies		9900	0.99
3	UT of Ladakh	Muck Dumping-3 (West)	Ch 2+200 of West bound Tube	Varies		12900	1.29
4	UT of Ladakh	Muck Dumping-4 (West)	Ch 2+200 of East Bound Tube	Varies		19590	1.959
5	UT of Ladakh	Muck Dumping-5 (West)	Ch 2+400 of East Bound Tube	Varies		9200	0.92
			Total Area			103180	10.3180

(xviii) Service/Operation Buildings

Service/ control room building with provision of substation – 11kV & 66kV, DG room, pump room etc. are to be constructed on both/either portals of Fotu La tunnel as per project requirement and specifications given in Schedule -D. Floor area for the buildings is considered as 2025m<sup>2</sup> and a tentative layout is shown in the portal drawings. The exact layout and area shall be as per contractor's detailed design.

(xix) Site Installation

For tunnel construction site installations are required on both the portals, near NH-01 with in the vicinity of 2.5 Km from portals. Accordingly, the space for the site camps had been identified and shall be acquired. The contractor shall construct the site camps for his staff and machinery at his own cost.

After completion of construction work the contractor will free 70% of camp area and buildings and hand over to BRO in as it is condition. After completion of Defect liability period the remaining 30% camp area and building shall be handed over to BRO in as it is condition. BRO may instruct the contractor to demolish some facilities not having future utilization and contractor has to do this without any cost to BRO.

### 15 High Altitude and Severe Climatic Conditions – Fotula Pass

The stretch of road crossing the Fotula Ridge between Ch. 290.000 km and Ch. 301.100 km tentative (from Srinagar) passes through high-altitude terrain, where the alignment crosses Fotula Pass at an elevation of approximately 4,108 m above mean sea level. This stretch is subject to severe climatic and operational conditions, including but not limited to heavy snowfall of about 5–10 ft during winter months, formation of ice on the carriageway leading to high risk of skidding, frequent snow clearance operations, regular maintenance requirements, and obstruction to traffic mobility. The accessibility to Fotu La project site remains disrupted both from Srinagar side (NH-1) and Manali side (NH-3) during winters for 2-3 months.

The Contractor shall be deemed to have inspected the site and to have fully acquainted himself with the prevailing high-altitude and severe climatic conditions of the area. The Contractor shall make his own assessment of the risks, constraints, and difficulties associated with execution of works in such conditions. In view of the likelihood of road closure during winter months, the Contractor shall ensure availability of a minimum inventory of construction materials sufficient for a continuous period of three (3) months. Such inventory shall be maintained at site or at approved locations so that construction activities can be continued using available stocks during periods of restricted access or road closure.

The Contractor shall note that sub-zero temperatures may prevail for a period of about 2–3 months in a year, which may result in freezing of water and difficulty in handling construction materials, machinery, and manpower. Accordingly, the Contractor shall make adequate arrangements at his own cost for insulation of equipment for round-the-clock working, covered and insulated sheds for storage of materials, preparation of concrete and shotcrete mixes, insulated water pipelines along with plumbing arrangements, and insulated shelters for labour.

The Contractor shall take all necessary measures to mitigate the effects of high-altitude and severe climatic conditions and shall factor all associated risks, costs, delays, and constraints into the quoted Contract Price. No claim for extension of time, additional cost, compensation, or damages on account of snowfall, low temperature, road closure, snow clearance, freezing conditions, or any other consequences arising from high-altitude and severe climatic conditions shall be entertained by the Employer.

## 16 Change of Scope

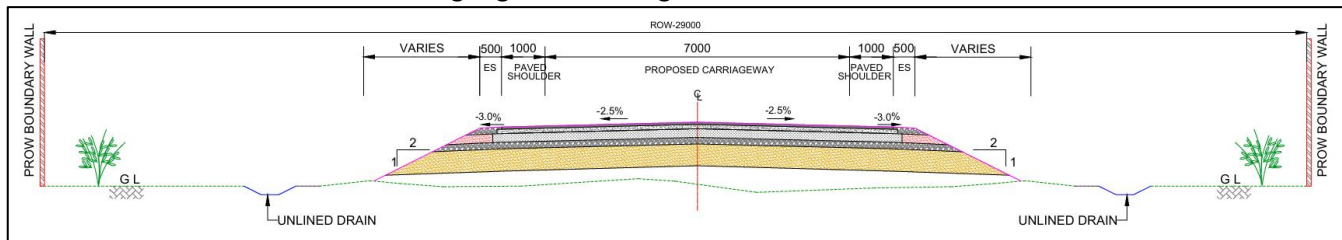
The length of tunnels, Structures, bridges, culverts and miscellaneous structure under special requirement for hill road specified hereinabove shall be treated as an approximate assessment. The actual lengths as required on the basis of detailed investigations shall be determined by the Contractor in 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 of EPC contract agreement.

## Appendix B-I

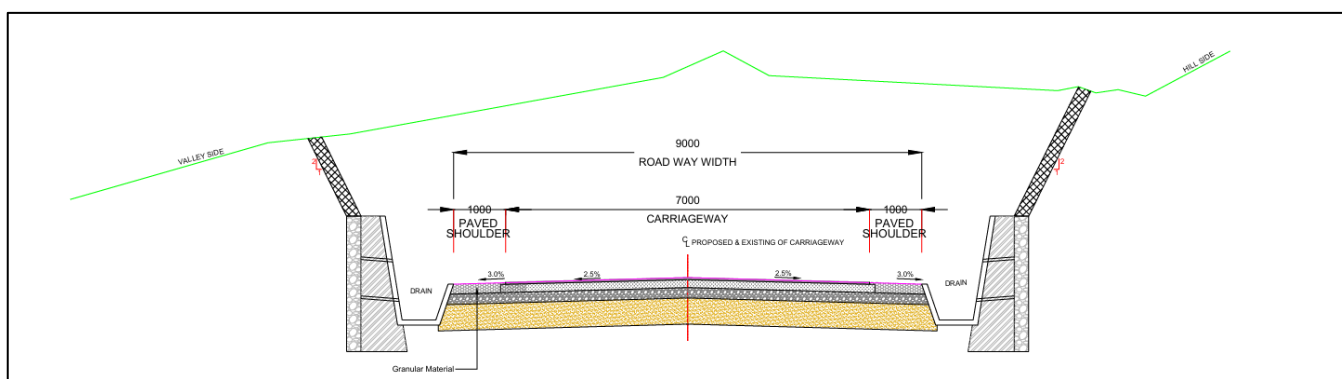
## Drawings and documents

## 1. Applicable typical cross-section (TCS) of highway approach road

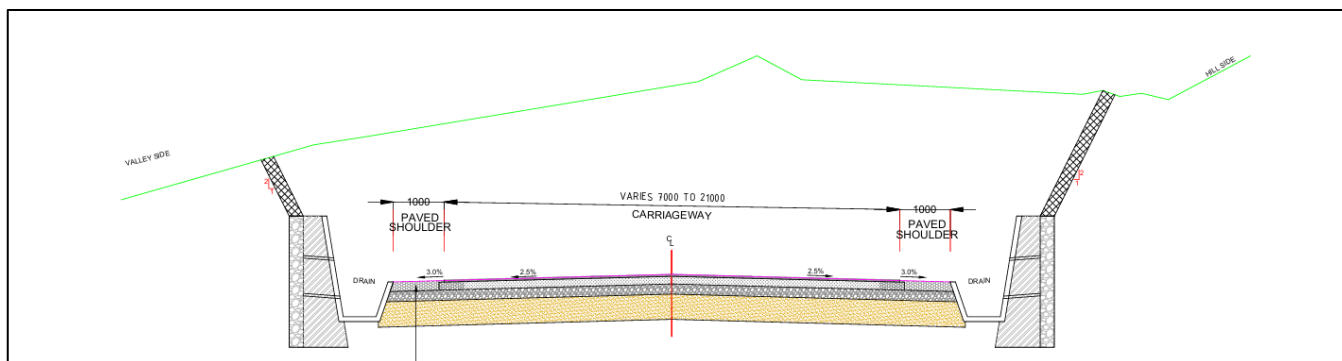
The detailed cross section drawing is given in the figures below:



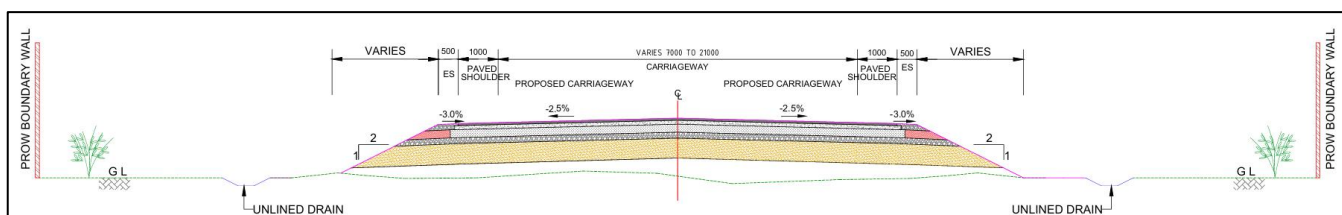
TCS-1 TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY APPROACH IN NORMAL SECTION



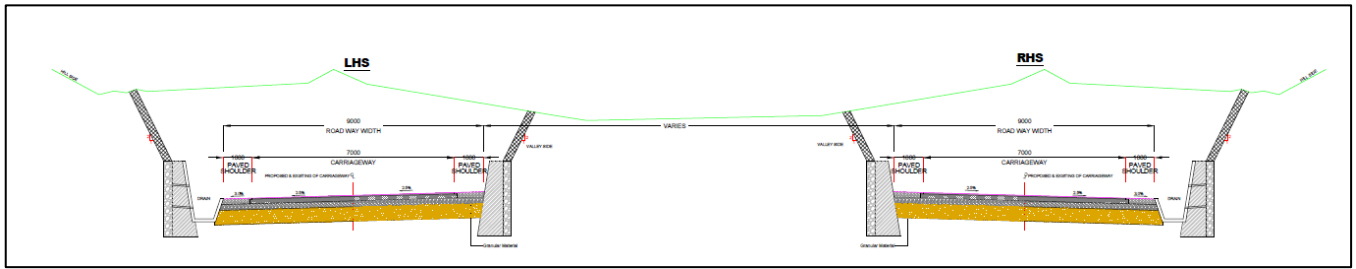
TCS-2 TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY APPROACH IN HILL SECTION



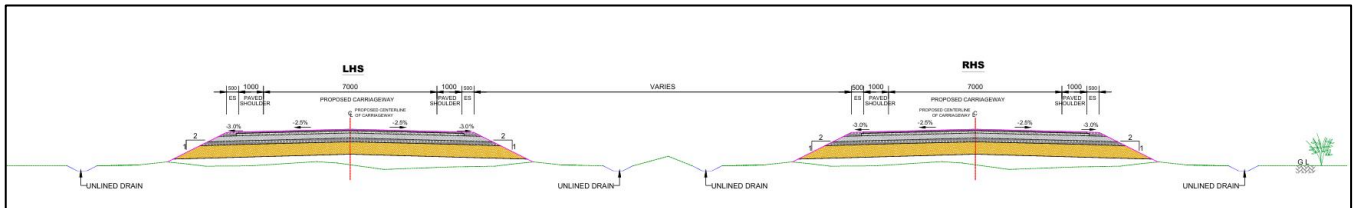
TCS-3 TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY APPROACH IN HILL SECTION WITH VARIES CARRIAGEWAY



TCS-4 TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY APPROACH IN NORMAL SECTION WITH VARIES CARRIAGEWAY

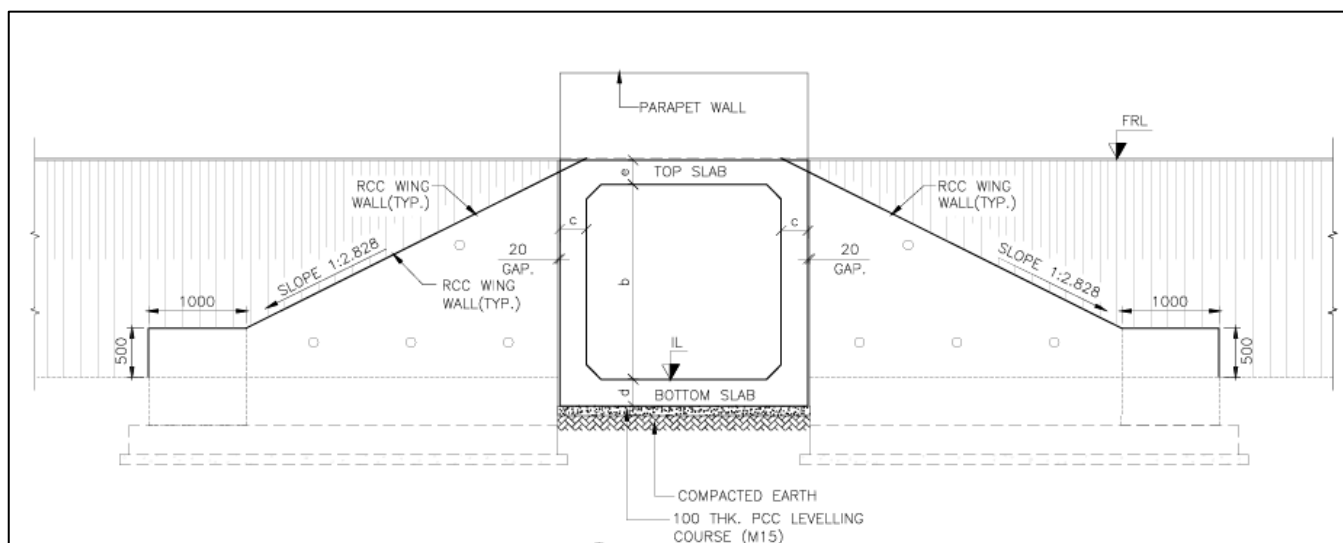


TCS -5 TYPICAL CROSS SECTION OF BOTH SIDE HILL FOR FOUR LANE CARRIGEWAY WITH MEDAIN VARIES (NEW CONSTRUCTION )



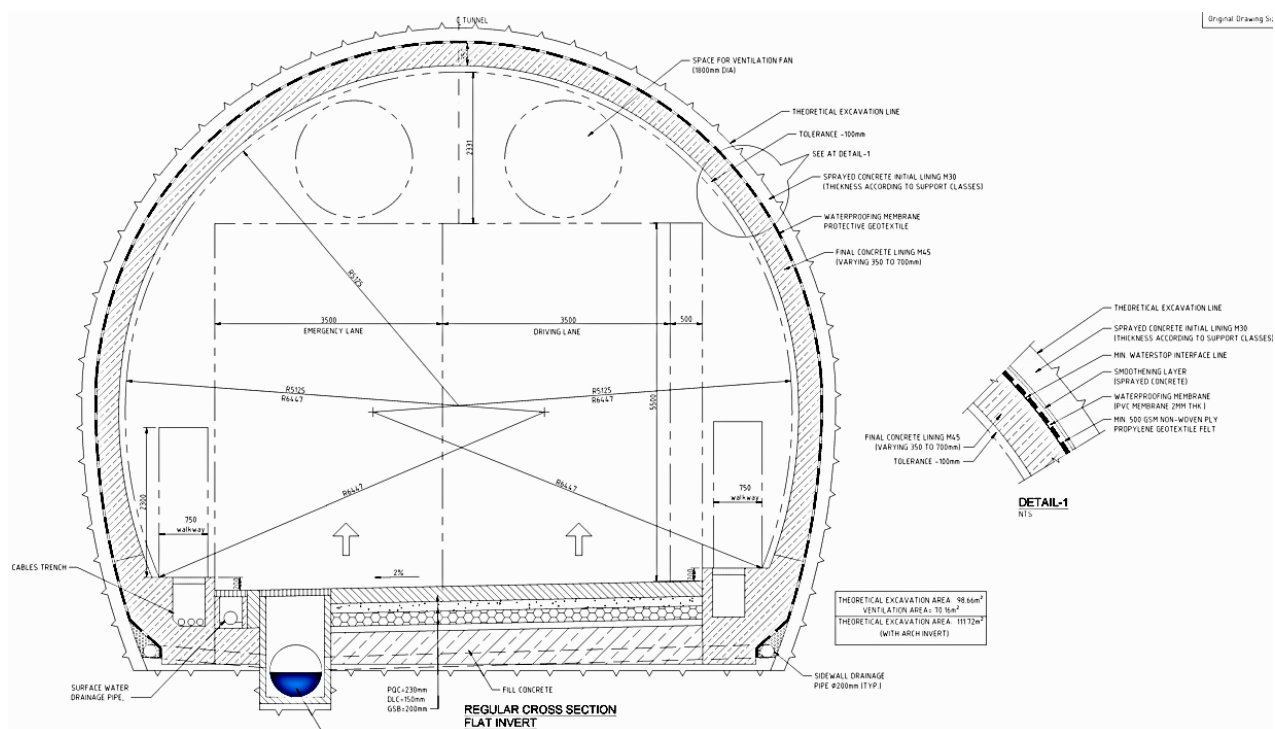
TCS -6 TYPICAL CROSS SECTION OF BOTH SIDE NORMAL SECTION FOR FOUR LANE CARRIGEWAY WITH MEDAIN VARIES (NEW CONSTRUCTION )

## 2. Applicable typical cross-section of Culverts



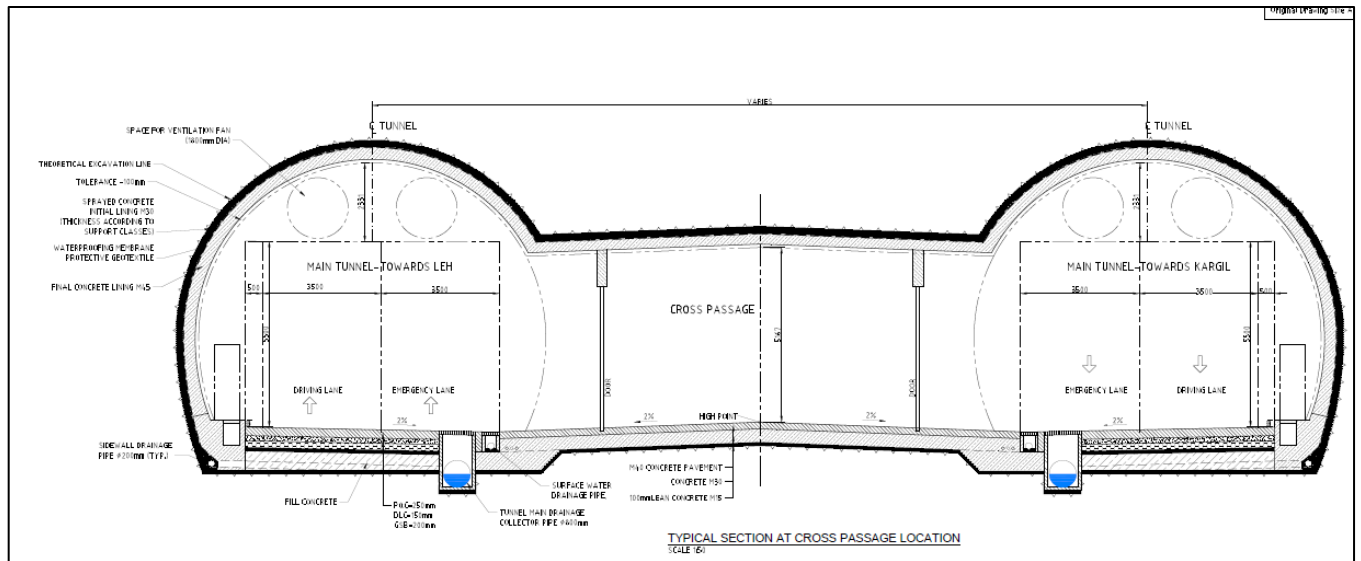
**Applicable typical cross-section of 2 x 2m Box Culvert**

### 3. TCS 06 – Tunnel Regular Cross section (Flat invert and arched invert)

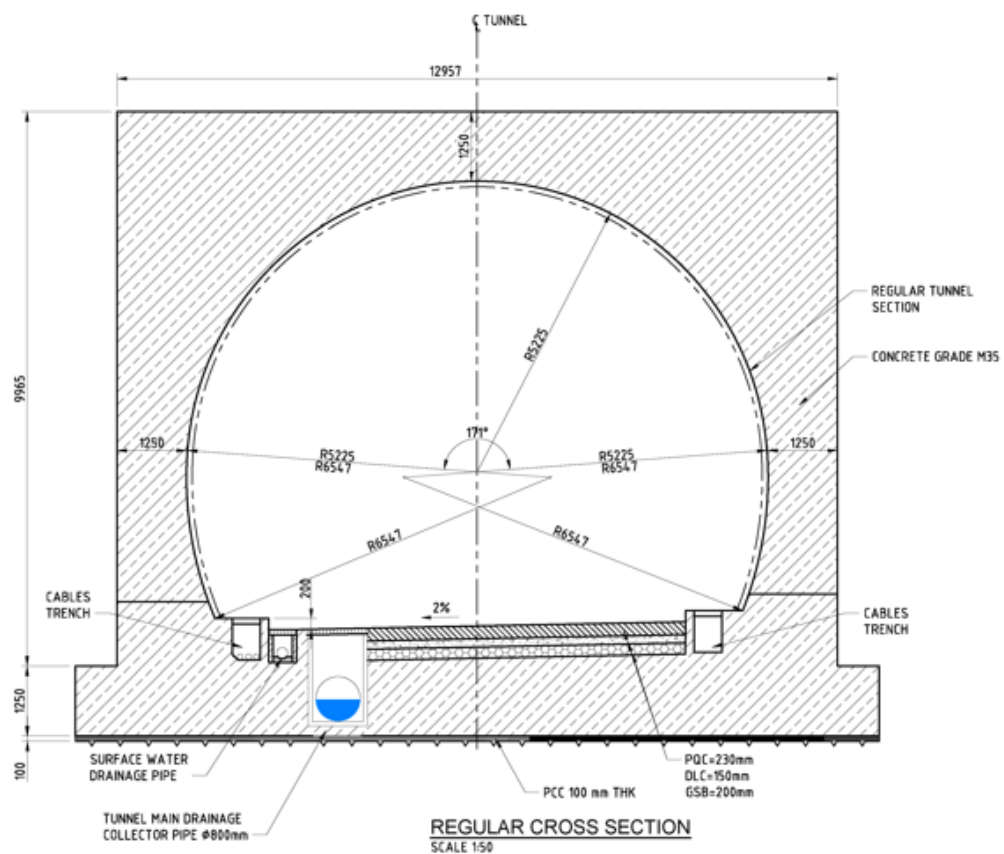




### 5. Typical tunnel system section along the Cross-passage



### 6. Typical Cross section of Cut & Cover at tunnel portal





**SCHEDULE – B-1**

The shifting of utilities and felling of trees shall be carried out by the contractor. The cost of the same shall be borne by the Authority. The details of utilities are as follows:

<b>S. No.</b>	<b>Type of Utility</b>	<b>Unit</b>	<b>Quantity</b>	<b>Location/stretch (LHS/RHS)</b>
<b>A</b>	<b>Electrical Utilities</b>			
A1	Electrical poles	Nos.	Nil	
A2	Electrical cables	Meters	Nil	
A3	Transformers	Nos.	Nil	
<b>B</b>	OFC	No.	Nil	
<b>C</b>	Felling of Trees	Nos.	Nil	

## SCHEDULE – C

*(See Clauses 2.1)*

### Project Facilities

#### 1 Project Facilities

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

- (a) Roadside furniture;
- (b) Street and tunnel lighting;
- (c) Pedestrian facilities;
- (d) Landscaping and tree plantation;
- (e) truck lay-byes;
- (f) Rest areas;
- (g) Traffic aid post;
- (h) Medical aid posts;
- (i) Vehicle rescue posts;
- (j) Telecom system
- (k) Highway traffic management system
- (l) Operation and Maintenance Centre
- (m) Security Building
- (n) Parking near portals
- (o) Others to be specified

#### 2 Description of Project Facilities

Each of the Project Facilities is described below:

##### **a) 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 9 of manual.

##### **b) Street and tunnel lighting**

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

##### **c) Pedestrian Facilities**

Pedestrian Facilities shall be provided in accordance with the Manual of Specifications and Standards.

##### **d) Landscaping and Tree Plantation**

Landscaping and free plantation shall be provided in accordance with the Manual of specifications and Standards.

##### **e) Rest areas**

Rest areas shall be provided in the vicinity of the east and west portals. They shall include toilets and drinking water facilities.

**f) Truck Bays**

NIL

**g) Traffic Aid Posts**

Traffic Aid Posts shall be provided outside the east and west portals to facilitate smooth flow of traffic.

**h) Medical Aid Posts**

Medical aid posts shall be provided at the Service Buildings.

**i) Vehicle rescue posts**

Vehicle rescue posts shall be provided at the service building areas in accordance with Specifications and Standards.

**j) Telecom system**

Telecom posts (at Western and Eastern portal locations) shall be provided for convenience of the users of the Project.

**k) Highway traffic management system**

Advanced Highway Traffic Management System (ATMS) shall be provided as per specifications and standards specified in Schedule D.

**l) Facilities for the Authority and Authority's Engineer**

Prefabricated Office complex in the given land shall be constructed by the contractor in accordance to relevant MORTH/ CPWD guidelines for buildings

**m) Operation and Maintenance Centre**

Portal stations shall be required to be provided a

t both end at the portal locations for accommodating the electrical, firefighting system including water storage tank having adequate capacity and ventilation equipment's, etc. Keeping in view the space and functional requirements for above installation, conceptual layout has to be proposed by the contractor for the portal stations. However, the portal station shall not be more than 200m distance from the portal.

The space requirement in the utility buildings for accommodating various equipment will be estimated based on the technology and sizes of the equipment. However, the space requirements may have to be reviewed at the time of execution based upon the details. The minimum built up area of service building shall be 1750 m<sup>2</sup>.

**n) Other Facilities**

Tunnels shall be categorized into collapse-risk zones based on the potential for structural failure, even after primary support systems are installed. In high-risk zones, a Np-4 escape pipe of minimum 0.9-meter-diameter shall be placed in the invert area and extended into lower-risk zones to provide emergency access. The pipe shall be positioned near the tunnel sidewalls to minimize loads in case of collapse.

High-risk zones typically move with the tunnel face, while areas where displacement has stabilized are considered safe. At least one mobile rescue container (capacity: 12 workers) shall be positioned 150-300 meters behind the tunnel face, with a fixed container (capacity: 24 workers) inside the tunnel, in consultation with Engineer-in-charge. These containers must provide at least 24 hours of survival capability.

The Ministry of Road Transport & Highways, through Circular No. NH-12037/170/2025/TUNNEL dated 05.12.2025, has issued *Guidelines for the Prevention and Mitigation of Road Tunnel Collapses*. These guidelines provide a comprehensive framework of preventive and mitigation measures to be applied at every

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critical stage of tunnel development. The recommendations outlined in the guidelines must be strictly implemented during both the construction and operation phases of the tunnel. Furthermore, they shall be incorporated into the safety manual to be prepared by the EPC Contractor in accordance with IRC:SP:91-2019.

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**SCHEDULE – D**

*(See Clauses 2.1)*

**Specification 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 Standards and Specifications for Two-Laning of Highways (IRC: SP:73-2018); referred to herein as the Manual and all the other latest IRC Codes, Specifications and Circulars issued by Ministry of Road Transport & Highways (MoRTH).

## 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: 48-1998) and Guidelines for Road Tunnel (IRC SP:91-2019) referred to as the Manual, and MORTH Specifications for Road and Bridge Works. As regards, the work of utility shifting, the relevant specification, relevant rules, regulations and acts of Utility Owning Department, Agencies shall be applicable. 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, and for purposes of this Agreement, the aforesaid Specifications and Standards shall be deemed to be amended to the extent set forth below:

**Deviations from the Manual**

S. No.	Item	Clause No. of 2 lane Manual	Description of Deviation
1	Typical cross section	2.17	The width of carriage way and paved shoulders shall be followed as given in Typical cross sections, Schedule B and GAD attached in drawing volume.
2	Overall Width of structure	7.3	Overall Width of structures/Grade Separators/ROB/flyover/Viaduct for Elevated corridor and Slip Road including approaches shall be as given in Typical cross sections, Schedule B and GAD attached in drawing volume.
3	Median	2.5	The width of Median shall be followed as given in Typical cross sections, Schedule B and GAD attached in drawing volume.
4	Shoulders	2.6	The width of Shoulder shall be followed as given in Typical cross sections, Schedule B and GAD attached in drawing volume.
5	Separators, Footpath, and drains	2.15	The width of Separators and Footpath cum Drains shall be followed as given in Typical cross sections, Schedule B and GAD attached in drawing volume.
6	Right of way	2.3	The Right of way shall be followed as given in Typical cross sections, Schedule B.

- Contractor to ensure implementation of MoRT&H Circulars mentioned below wherever applicable. These instructions given below-mentioned Circulars shall prevail over the Manual /IRC Guidelines in case of ambiguity in interpretation of provisions given therein:

Sr. No.	Policy Circular no.	Dated	Subject
1.	Efile No. RW/NH-33044/27/2024/S&R(P&B) (Computer No. 243038)	23rd September 2024	Policy Guidelines on use of Inert Material in construction of National Highways.
2.	Efile No. RW/NH-34066/09/2017/S&R(B) (Computer No. 185417)	12th February 2021	Reinforcing Steel Bars (Clause 1000.9.3.1 of Ministry's Specifications for Road and Bridge Works)
3.	Efile No. RW/NH-34066/09/2017/S&R(B) (Computer No. 185417)	22nd 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.
4.	EFile No. RW/NH-34049/01/2020-S&R (P&B)pt. (Computer No. 207229)	20th September 2024	Use of New / Alternative Material and Technology in Construction and Maintenance of National Highways project and adaption of value Engineering Practices therein.
5.	Efile No. RW/NH-35083/02/2024-S&R (Computer No. 238879)	26th November 2024	Use of Waste Plastic in Bituminous Concrete Wearing Course Mix in National Highways Construction & Maintenance Works
6.	Efile No. RW/NH-33044/2212020-S&R (P&B) (Computer No.186381)	4th June, 2024	Width of Shoulder (Paved & Earthen) for National Highways.
7.	Efile No. RW/NH-35072/05/2018-S&R (P&B) (Computer No.165688)	19th April, 2024	Recommended Bitumen Type & Grade for Different Climate & Traffic Loading for National Highway and Expressway Works in India.
8.	Efile No. RW/NH-35072/05/2018-S&R (P&B) (E165688)	23rd August, 2023	Use of Bitumen: Demand- Supply, Type & Grade, Specifications, Source of Procurement and Quality in Construction of National highway projects.
9.	Efile No. RW/NH-36098/25/2022-S&R P&B)I pt.	16th 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)	15th March, 2023	Reuse of materials reclaimed from existing pavement layers.
11.	Efile No. RW/NH-36098/17/2022/S&R(B)	2nd January, 2023	Provisions of crash barriers in existing bridges.
12.	Efile No. RW/NH-33049/01/2020-S&R (B)	22nd February, 2022	Use of Ultra High Performance Fiber Reinforced Concrete (UHPFRC) in Design & Construction of Structures/Bridges of National Highways.

13.	Efile No. RW/NH-33044/33/2025-S&R (P&B) Computer No. 254799	03rd November, 2025	Guidelines on design Criteria and Pavement type for service road and slip roads in NH projects
14.	Efile No. RW/NH-34049/01/2020-S&R (B) Computer No. 182692	24th June, 2025	Mandatory use of precast concrete components in NHs projects
15.	Efile No. RT-25035/07/2023–RS(Part) (221534)	24th December, 2024	Guidelines for provisions on Expressways and National Highways
16.	NHAI Policy Circular No. 17.5.82	24.05.2021	Amendment in the provisions of Toll Plaza consequent upon implementation of Electronic Toll Collection- Layout and design of Toll Plaza

#### **ATTACHMENT-D-1: TECHNICAL SPECIFICATIONS FOR ROAD TUNNELS - CIVIL WORKS**

- i. Annexure (i) to Attachment-D-1: “Guideline for Inner Shell Concrete”, Austrian Society for Concrete-and Construction Technology, 2006, Austria.
- ii. Annexure (ii) to Attachment-D-1: “Guideline for Sprayed Concrete”, Austrian Society for Concrete-and Construction Technology, 2013, Austria.

#### **ATTACHMENT-D-2: TECHNICAL SPECIFICATIONS FOR ROAD TUNNELS – E&M WORKS**

- i. Annexure (i) to Attachment-D-2: Technical Specification Ventilation Equipment

#### **ATTACHMENT-D-3: TECHNICAL SPECIFICATIONS FOR ROAD & BRIDGES**



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**ATTACHMENT-D-1: TECHNICAL SPECIFICATIONS FOR ROAD TUNNELS****- CIVIL WORKS**

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**ATTACHMENT-D-2: TECHNICAL SPECIFICATIONS FOR ROAD TUNNELS – E&M WORKS**

## ATTACHMENT-D-3: TECHNICAL SPECIFICATIONS FOR ROAD & BRIDGES

### 1.1 Site Information General

#### 1.1.4 Seismic Zone

### 3 GENERAL REQUIREMENTS

#### 3.1 Part-I: General Technical Specifications

#### 3.2 Part-II: Supplementary Technical Specifications

#### 3.3 PART-III Specifications for Miscellaneous Works

### CLAUSE 102 DEFINITIONS

### CLAUSE 106 CONSTRUCTION EQUIPMENT

### CLAUSE 108 SITE INFORMATION

### CLAUSE 109 SETTING OUT

### CLAUSE 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT

#### Sub-Clause 111.1 General

#### Sub-Clause 111.2 Borrow Pits for Embankment Construction

#### Sub-Clause 111.3 Quarry Operations

#### Sub-Clause 111.5 Pollution from Hot-Mix Plant and Batching Plants

#### Sub-Clause 111.8.2 Air Quality

#### Sub-Clause 111.8.3 Water Sources and Water Quality Sub-

#### Clause 111.20 Control and Disposal of Wastes

#### Sub-Clause 111.14 Equipment and Vehicles used for the Works

#### Sub-Clause 111.15 Noise Control

#### Sub-Clause 111.16 Vibration Control Sub-Clause 111.17 Measurement

### CLAUSE 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION

#### Sub-Clause 112.6 Measurement for Payment and Rates

### CLAUSE 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK

### CLAUSE 115 METHODOLOGY AND SEQUENCE OF WORK

#### Sub-Clause 115.1 Submission of Method Statement

#### Sub-Clause 115.2 Approval of Proprietary Product/Process/System

### CLAUSE 120 FIELD LABORATORY

#### Sub-Clause 120.3 Ownership

#### Sub-Clause 120.4 Maintenance

#### Sub-Clause 120.5 Rate

### SECTION 200 Site Clearance

### CLAUSE 201 CLEARING AND GRUBBING

### CLAUSE 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/ PAVEMENTS

### SECTION 300 Earthwork, Erosion Control and Drainage

### CLAUSE 301 EXCAVATION FOR ROADWAY AND DRAINS

### CLAUSE 304 EXCAVATION FOR STRUCTURES

### CLAUSE 305 EMBANKMENT CONSTRUCTION

#### Sub-Clause 305.2.2.2 Borrow Materials

#### Sub-Clause 305.2.2.4 Compaction Requirements Sub-

#### Clause 305.3 Construction Operations

#### Sub-Clause 305.8 Measurement for Payment

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CLAUSE 306 SOIL EROSION AND SEDIMENTATION CONTROL

SECTION 400 Sub-Bases, Bases (Non-Bituminous) and Shoulders

CLAUSE 401 GRANULAR SUB -BASE

Sub-Clause 401.2.2 Physical Requirements

CLAUSE 406 WET MIX MACADAM SUB -BASE/BASE

Sub-Clause 406.4 Opening to Traffic

SECTION 500 Base and Surface Courses (Bituminous)

Sub-Clause 501.2 Materials Sub clause 501.2.1 Binder

Binder of VG-30 grade shall be used or if available viscosity grade of bitumen shall be used in accordance with IS: 73

CLAUSE 505 DENSE BITUMINOUS MACADAM CLAUSE 507 BITUMINOUS CONCRETE

SECTION 800 Traffic Signs, Markings and Other Road Appurtenances

CLAUSE 803 ROAD MARKINGS

CLAUSE 806 ROAD DELINATORS

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## SCOPE OF WORKS

### Road Works

Site clearance; setting-out and layout; widening of existing carriageway and strengthening including camber corrections; construction of new road/ parallel service road; bituminous pavements remodelling/construction of junctions, intersections, bus bays, lay bays; supplying and placing of drainage channels, flumes, guard posts, guard rails and other related items; construction/extension of cross drainage works, bridges, approaches and other related works; road markings, road signs and kilometer/ hectometre stones; protective works for roads/ bridges; all aspects of quality assurance of various components of works; rectification of the defects in the completed works during the Defect Liability Period; submission of "As built" drawings and any other related documents; and other items of work as may be required to be carried out for completing the works in accordance with the drawings and provisions of the Contractor insure safety.

### Other Items

Execution of any other items of work for the construction and completion of the Works in accordance with the provisions of the Contract including all incidental items as well as preparation and submittal of reports, plans as may be required.

During the period of the Contract the right of way and all existing roads shall be kept open for traffic and maintained in a safe and usable condition. Residents along and adjacent to the works are always to be provided with safe and convenient access to their properties. Traffic control and traffic diversions shall be used as necessary to protect the works and maintenance will be carried out as directed by the Engineer and provided in the Contract.

Any other items as required to fulfil all contractual obligations as per the Bid Documents.

## PART II

## SUPPLEMENTARY TECHNICAL SPECIFICATION

## AMENDMENTS/MODIFICATIONS/ADDITIONS TO EXISTING CLAUSES OF GENERAL TECHNICAL SPECIFICATIONS

## SECTION 100 General

## CLAUSE 102

**DEFINITIONS**

The following abbreviations shall be added in this Clause: "MORT&H" :  
 Ministry of Road Transport & Highways  
 (Previously known as 'MOST', Ministry of Surface Transport)  
 "NHAI": National Highways Authority of India

## CLAUSE 106

**CONSTRUCTION EQUIPMENT**

Add the following sub para (g) and (h) after sub para (f)

- Adequate standby equipment including spare parts shall be available.
- All measuring devices and gauges shall be in good working condition. Measuring devices that can affect product quality shall be calibrated prior to use and at prescribed intervals against certified equipment. Calibration procedures shall be established, maintained and documented and corrective actions taken when results are unsatisfactory. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

## CLAUSE 108

**SITE INFORMATION****Sub-Clause 108.4**

This clause shall be as follows:

"Identification of quarry sites and borrow areas shall be the responsibility of the Contractor. Materials procured from quarry sites and borrow areas identified by Contractor and to be used in Works must comply with the requirements of quality as stipulated in the Technical Specification for particular items of work."

## CLAUSE 109

**SETTING OUT****Sub-Clause 109.8**

Delete the 2<sup>nd</sup> and 3<sup>rd</sup> sentences in Clause 109.8 and substitute the following:  
 "Setting out of the road alignment and measurement of angles shall be done by using Total Station."

## CLAUSE 111

**PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT****Sub-Clause 111.1****General**

Delete the text of Clause 111.1 in its entirety and substitute the following:

"The Contractor shall take all necessary measures and precautions and otherwise ensure that the execution of the Works and all associated operations on site

or off-site are carried out in conformity with statutory and regulatory requirements including those prescribed elsewhere in this document.

The Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising for the execution of the Works. This shall wherever possible be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated. All vehicles deployed for material haulage shall be spillageproof.

Haul roads shall be inspected at least once daily to clear any accidental spillage. In the event of any spoil, debris, wastes or any deleterious substance from the Site being deposited on any adjacent land, the Contractor shall immediately remove all such material at no cost to the Contract and restore the affected area to its original state to the satisfaction of the Engineer."

#### Sub-Clause 111.2

#### **Borrow Pits for Embankment Construction**

Delete the text of Clause 111.2 and substitute the following:

"Prior approval shall be sought from the concerned State Authorities, and the Contractor shall comply with all local environmental regulations. For all borrow areas, the actual extent of area/zones to be excavated shall be demarcated with the signboards and the operational areas shall be access controlled.

In the case of borrow from tank beds, a regrade/improvement of the inlet channels (at least up to 100m stretch) shall be undertaken in consultation with the concerned state government departments (the Minor Irrigation department of the State PWD) and local bodies. The Contractor shall ensure that excavation of tank beds is uniform over the entire area and that the finished profile of the bed is smooth.

In the case of borrow from the dry highlands, all borrow areas shall be reinstated by the formation gentle side slopes, re-vegetated and connected to the nearest drainage channel to avoid the formation of pools during/after the rainy seasons.

Plant and machinery used in the borrow areas shall conform to State noise emission regulations. All operation areas shall be water sprinkled to contain dust levels to the National Ambient Air Quality Standards."

#### Sub-Clause 111.3

#### **Quarry Operations**

Delete the text of Clause 111.3 and substitute the following:

"Aggregates shall be sourced only from quarry sites that comply with the local/state environmental and other applicable regulations. Occupational safety procedures/practices for the work force in all quarries shall be in accordance with applicable laws. Quarry and crushing units shall have adequate dust suppression measures, such as sprinklers, in work areas and along all approach roads to the quarry sites. These shall preferably be located on the upwind side."

#### Sub-Clause 111.5

#### **Pollution from Hot-Mix Plant and Batching Plants**

Delete the 1<sup>st</sup> sentence of Clause 111.5 and substitute the following:

“Bituminous hot mix plant and concrete batching plants shall be located at least one(1)km away from the sensitive receptors(schools, hospitals, etc.)and atleast 500m from urban settlements, unless otherwise required by the statutory requirements.”

Sub-Clause 111.8.1 **Environmental Protection:**

Add the following sentences in the first paragraph of Sub Clause 111.8.1:

Water tankers with suitable sprinkling system shall be deployed along the haulage roads and in the work sites. Water shall be sprinkled regularly all along the routes to suppress airborne dusts from truck/dumper movements particularly on unpaved roads. Actual frequency will be agreed with the Engineer to suit site conditions.”

Sub-Clause 111.8.2 **Air Quality**

The Contractor shall device and implement methods of working to minimize dust, gaseous and other air-borne emissions and carry out the Works in such a manner as to minimize adverse impacts on the air quality. Construction camps shall have facilities for LPG fuel. The use of firewood shall not be permitted.

The Contractor shall utilize effective water sprays during delivery, manufacture, processing and handling of materials when dust is likely to be created, and to dampen stored materials during dry and windy weather. Stockpiles of friable materials shall be covered with clean tarpaulins, with applications of sprayed water during dry and windy weather. Stockpiles of materials or debris shall be dampened prior to their movement, except where this is contrary to the Specification.

Any vehicle with an open load-carrying area used for transporting potentially dust-producing material shall have properly fitting side and tail boards. Materials having the potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulins in good condition. The tarpaulin shall be properly secured and extend at least 300mm over the edges of the side of the side and tailboards.

The Contractor shall monitor air-quality once weekly in all operational areas under the project and take the necessary steps to comply with the specified requirements. Air quality parameters will include SPM, RPM, SO<sub>2</sub>, NO<sub>x</sub>, HC and CO. operational areas include work sites, haulage roads, hot mix plants, quarries, crushing plants, stockpiles, borrow sites and spoil disposal sites.

Sub-Clause 111.8.3 **Water Sources and Water Quality**

The Contractor shall provide independent sources of water supply, such as bore wells, for use in the Works and for associated storage, workshop and work force compounds. Prior approval shall be obtained from the relevant State Authorities and all installations shall follow local regulations. Bore wells installed and used for the project shall be left in good operating condition for the use of NHAI and local



communities. The Contractor shall prevent any interference with the supply to or abstraction from and prevent any pollution of water resources (including underground percolating water) as a result of the execution of the Works.

Areas where water is regularly or repetitively used for dust suppression purposes shall be laid to fall to specially constructed settlement tanks to permit sedimentation of particulate matter. After settlement, the water may be re-used for dust suppression and rinsing. The Contractor shall protect all watercourses, waterways, ditches, canals, drains, lakes and the likes from pollution as a result of the execution of the Works.

All water and other liquid waste products arising on the Site shall be collected and disposed of at a location on or off the Site and in a manner that shall not cause either nuisance or pollution.

The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to, the Site are kept safe and free from any debris and any materials arising from the Works. The Contractor shall not discharge or deposit any matter arising from the execution of the Works into any water except with the permission of the Engineer and the regulatory authority concerned.

Work force camps shall have septic tank and soak away pits. Operational areas like POL storage areas/hot mix plant areas shall comply with local/state environmental regulations and safety procedures. Storage and handling areas shall be impervious and surrounded by an impervious lined drain to catch any accidental spills. Storm water shall be stored in lined holding tanks with oil, grease-tapping facility prior to disposal in to nearby watercourses. The trappings and sludge of holding tanks shall be disposed off in accordance with the procedures approved by the local regulatory authority.

#### Sub-Clause 111.20

#### **Control and Disposal of Wastes**

The Contractor shall control the disposal of all forms of waste generated by the construction operations and in all associated activities. No uncontrolled deposition or dumping shall be permitted. Wastes to be so controlled shall include, but shall not be limited to, all forms of fuels and engine oils, all types of bitumen, cement, and surplus aggregates, gravels, bituminous mixtures etc. The Contractor shall make specific provision for the proper disposal of these and any other waste products, conforming to local regulations and acceptable to the Engineer.

Spilling of oil and bituminous products during construction and transport shall be avoided to reduce the chances of contamination of surface as well as ground water.

Degraded materials shall be disposed of in a manner as approved by the Engineer and wastewater shall be disposed into septic tanks and soak pits etc. The Contractor shall make arrangements to clean-up spoil as soon as the work finishes in a stretch. If such sites are located outside the ROW, restoration of the site to a level acceptable to the land owner(s) will be carried out within a time period agreed between landowner(s) and the Contractor. Separators shall be used to separate

POL materials from wastewater prior to discharging to the watercourses or as approved by the Engineer in conformance with directives and guidelines.

Disposal of solid waste materials shall be outlined in a plan for which environmental clearances shall be obtained from State environmental regulatory authorities. Potential locations for solid waste disposal are the natural depressions and borrow areas. The areas used for dumping of uncontaminated debris shall be covered with 300mm soil and shall be planted. Contaminated debris shall be dumped in depressions whose bed must be impervious e.g., stone quarry sites or depressions made impervious with 450mm thick impervious floor apron as per MORT&H Technical Specifications. Each successive 1.0m layers shall be covered with 500mm thick soil layer, and the area will be covered with 300mm thick layer and planted.

After Clause 111.12 add the following new Clauses 111.13 to 111.17 Sub-Clause 111.13

#### **Haulage Roads**

Existing roads used for hauling shall be strengthened and/ or widened by the Contractor in accordance with the requirements for normal and construction traffic.

Where such roads are not existing, the Contractor shall construct project specific single lane paved roads in settlement areas and gravel roads in open areas conforming to the Ministry of Road Transport and Highways (MORT&H) specifications.

The alignment of the haulage roads shall be fixed to avoid agricultural land to the extent possible. In unavoidable circumstances, suitable compensation shall be paid to the people whose land will be temporarily acquired for the duration of the operations. The compensation shall cover for loss of income for the duration of temporary acquisition and land restoration. Prior to the construction of the haul roads, topsoil shall be stripped and stockpiled for re- use.

Material dumping sites shall be access controlled to prevent the unauthorized entry of the people, grazing cattle and stray animals.

Haulage roads shall be reinstated upon completion of hauling for the use of local communities."

Sub-Clause 111.14 **Equipment and Vehicles used for the Works**

Equipments and vehicles deployed for the construction activities shall not be older than 5 years. Equipments used for road and bridge works shall be based on new technology and shall generate noise and pollutants not exceeding the limits specified by the relevant State Authorities. Vehicles and machineries used for road and bridge works are to be regularly maintained to conform to the National Air Quality Standards. Blasting, if any, will be carried out using small charges.

Sub-Clause 111.15 **Noise Control**

The Contractor shall consider noise as an environmental constrain in the planning and execution of the Works.

The Contractor shall take all necessary measures so that the operation of all mechanical equipment and construction processes on and off the site shall not cause any unnecessary or excessive noise, taking in to account applicable environmental requirements. The Contractor shall use all necessary measures and shall maintains all plant and silencing equipment in good conditions so as to minimize the noise emission during construction works.

Any member of the work force likely to be exposed to beyond their threshold noise levels shall be provided with protective equipment, such as earplugs, and shall be rotated every four hours.

Construction operations shall be limited to daytime hours only, particularly in the settlement areas.

Sub-Clause 111.16 **Vibration Control**

The Contractor shall take measures during construction activities to control the movement of the work force and construction machinery/equipment, and to avoid/ minimize activities, which produce vibrations.

Sub-Clause 111.17 **Measurement**

Monitoring of Air/Water/Noise and Soil quality shall be paid as per numbers of samples tested. For Compliance of all other provisions made in this Clause 111, it shall be deemed to be incidental to the work and no separate measurement shall be made. The Contractor shall be deemed to have made allowance for such compliance with these provisions in the preparations of his prices for items of work included in the Bills of Quantities and full compensation for such compliance shall be deemed to be covered by them."

CLAUSE 112 **ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION**

Sub-Clause 112.4 **Traffic Safety and Control**

Last line of Para 5 shall be read as under:

"The signs shall be of approved design and of reflector type." Add the following paragraph at the end of the clause:

"Before commencement of any construction, the Contractor shall prepare and submit details of the arrangements for passing traffic during construction, design of barricades, signs, markings, lights, flags etc. conforming and satisfying the requirements of the "Guidelines on Safety in Road Construction Zones" of IRC: SP 55-2001 and get the same approved by the Engineer.

Sub-Clause 112.6 **Measurement for Payment and Rates**

- a) The provision of treated shoulder including construction of temporary cross drainage structures, if required, as described in Clause 112.2 including their

maintenance, dismantling and clearing debris, where necessary, shall be considered as incidental to the works and shall be Contractor's responsibility.

- b) The Construction of temporary diversion including temporary cross drainage structures as described in subclause 112.3, shall be measured in linear meter and the unit contract rate shall be inclusive of full compensation for construction (including supply of material, labor, tools, etc.), maintenance as per sub clause 112.5, final dismantling, and disposal.
- c) All Traffic safety and control devices during construction as per sub clause 112.4 including providing, erecting and maintaining barrier, signs, markings, flags, lights and providing flag men etc. is included in item rate.

#### CLAUSE 114

#### SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK

##### Sub-Clause 114.2

Item (ii) of Clause 114.2 shall read as follows:

A detailed resource-based construction programme including resources planning using computerized critical path network method/PERT in a form, which facilitates control of the progress of the works and consequences of any changes in terms of time. The programme shall also include detailed network, activities for the submission and approval of materials, procurement of critical materials and equipment, fabrication of special products/ equipment and their installation and testing and for all activities of the Contractor that are likely to affect the progress of work etc. including updating all such activities on the basis of decisions taken at the periodic site review meetings or as directed by the Engineer. The Contractor shall submit data via electronic media to the Engineer in a form readily compatible with Engineer's planning system.

The first issue of the detailed construction programme including the detailed description of the system and the procedures shall be submitted to the Engineer for acceptance not later than 28 days after the date of receipt of the letter of acceptance.

The contractor shall submit to the Engineer for approval & consent, the updated & revised programme at every three months interval or as such as directed by the Engineer. The updated & revised programme shall be submitted showing the actual progress achieved (physical & financial) and the effects of the progress achieved on the timing of the remaining work including any change to the sequence of the activities

#### CLAUSE 115

#### METHODOLOGY AND SEQUENCE OF WORK

The Clause shall be substituted as follows:

##### Sub-Clause 115.1

##### Submission of Method Statement

The Contractor shall submit methods statement within 28 days after the date of letter of acceptance. The methods statement shall be submitted in two parts.

The General part of the methods statement shall describe the Contractor's proposals regarding preliminary works, common facilities, and items that require

consideration at the early stage of the Contract. The General part shall be furnished along with the first issue of the construction programme (refer clause 114.2) and shall include information on:

- a) Sources of materials like coarse aggregate and fine aggregate, quantity and quality of materials available in different sources;
- b) Sources of manufactured materials like cement, steel, bitumen reinforcement, pre stressing strands and bearings. Wherever possible the Contractor shall identify at least two sources for each of the items; he shall also submit test certificates of recently manufactured materials for the consideration of the Engineer.
- c) Locations of site facilities like batching plant, hot mix plant, aggregate processing plant, crushing plant etc.
- d) Details of facilities/approaches for transportation of men, equipment and materials for construction of pavements, foundations and substructure in riverbed, and plan for free traffic flow and safe drainage.
- e) Information on procedures to be adopted by the Contractor for prevention and mitigation of negative environmental impact due to construction activities.
- f) Any other information required by the Engineer subsequent to the scrutiny of method statement

The General part of the Q.A. Programme shall accompany the methods statement under sub-clause 105.3.

The Special part of the methods statement shall be submitted to the Engineer by the Contractor for each important item of work like construction of embankments and sub grade, pavements, pile/well foundations, concreting, pre stressing, repair and rehabilitation of existing structures, concrete superstructure, dismantling of structures and pavement and for any other item as directed by the Engineer.

These statements shall give information on

- i) Details of personnel both for execution and quality control of the work.
- ii) Equipment deployment with details of number of units, capacity, standby arrangements
- iii) Sequence of construction, details of temporary or enabling works like, diversions, cofferdams, formwork including specialized formwork for superstructure, details of borrow areas, method of construction of embankment and sub grade, pavements, piles, wells, concreting procedures, details of proprietary process and products (e.g. details of pre stressing systems, proprietary piling systems, bearings, expansion joints etc.) and details of equipment to be deployed. Wherever necessary, technical literature, design calculations and drawings shall be included in the methods statement.
- iv) Testing and acceptance procedures including documentation.

- v) Special part of the Q.A. Programme referred in clause 105.3 for the particular item of work shall be submitted along with the methods statement for the concerned activity.
- vi) Engineer shall examine and approve the methods statement or direct the Contractor to resubmit the statement with required modifications. The modified statement shall be submitted within 14 days of receipt of Engineer's comments.

The sole responsibility for the safety and adequacy of the methods adopted by the Contractor shall rest on the Contractor irrespective of any approval given by the Engineer.

#### Sub-Clause 115.2

#### **Approval of Proprietary Product/Process/System**

Only proprietary products proven by International usage in comparable projects shall be permitted to be used. Fully authenticated details of licensing and collaboration arrangement shall be submitted by the manufacturer, where relevant.

Within 90 days of award of work the Contractor shall submit the following information for all proprietary products for approval by the Engineer.

- i) Name of manufacturer and name of product/ process/system.

Complete details of the manufacturer of the product/ process/ system shall be furnished. Details of projects where similar product/process/system has been successfully used shall be furnished. Authenticated copies of license/collaboration agreement shall be furnished.

- ii) General features of the product/product process/system.

Detailed write up with methods statements shall be furnished for each product/ process/ system. This shall include complete working drawings & installation drawings, technical specifications covering fabrication, materials, system of corrosion protection etc.

- i) Details of product development and development testing.
- ii) Acceptance test and criteria.

Manufacturer shall submit a quality assurance system document. Details of acceptance test and criteria of acceptance shall be furnished in this document.

- i) Installation Procedure.
- ii) Maintenance procedure and schedule.
- iii) Warranty proposal.

The Engineer may instruct any additional tests for the purpose of accepting the product. The charges of these additional tests shall be borne by the Employer only in case the product satisfies the specifications.

#### CLAUSE 120

#### **FIELD LABORATORY**

##### Sub-Clause 120.2

##### Description

Replace the words “indicated in the drawings” in the first sentence of second paragraph of this Clause with the words “per provisions indicated in this Clause and at a location approved by the Engineer.”

Replace “electric supply etc.” to the second sentence of first paragraph by “including uninterrupted power supply etc.”

Delete the first sentence of second paragraph “The floor space in the drawing” and substitute the following:

“The floor space required for the field laboratory shall be not less than 200 sq.m.

“The fourth sentence of second paragraphs “The furnishing In Table100-2”shall read as under.

“A good semi furnished office accommodation shall be provided to the Material Engineers of the Supervision Team as per the direction of the Engineer.”

Add the following at the end of this Clause:

“There shall also be provided a concrete paved area, for storing samples adjacent to the laboratory, of about 100 sq.m and another 75 sq.m shall be suitably roofed with open sides giving protection against sun and rain.

Within 14 (fourteen) days of the commencement date, the Contractor shall prepare and submit a layout plan and details of the laboratory building and make/supplier of the equipment to the Engineer for his approval.

The field laboratory to be provided under the Contract shall be handed over to the Engineer in finished and fully equipped condition not later than 2 months after the receipt of Notice to Commence Work, and the field laboratory with all equipment/instrument shall be to the entire satisfaction of the Engineer. During the 2- month-period starting from the Notice to Commence work, the laboratory tests shall be performed in another laboratory proposed by the Contractor and approved by the Engineer.

#### **Laboratory Equipment General**

The items of laboratory equipment shall be provided in the field laboratory depending upon the items to be executed as per Table mentioned below instead of Table 100-2 shown in MORTH:

The following items of laboratory equipment shall be provided in the field laboratory:

The equipment and instruments shall be new and shall be quality certified by Bureau of Indian Standards (BIS).

Sr. No.	Sub No.	Item, Specifications	Nos. required
<b>A: General</b>			

(i)	<b>Balance</b>		
	(a)	7 kg to 10 kg capacity semi -self indicating Electronic Type –Accuracy 1 gm	2
	(b)	500 gm capacity semi-self-indicating Electronic Type – Accuracy 0.01 gm	2
	(c)	Chemical balance 100gm capacity - Accuracy 0.0001gm	1
	(d)	Pan balance 5 kg capacity - Accuracy 0.5 gm	2
	(e)	Platform Scale – 300 kg capacity	1
	(f)	Triple Beam balance-25kg capacity Accuracy 1gm	2
(ii)	<b>Ovens – Electrically operated, thermostatically controlled</b>		
	(a)	From 100°C to 220°C – Sensitivity	2
(iii)	<b>Sieves, as per IS 460-1962</b>		
	(a)	IS Sieves 450 mm internal dia. of sieve sets as per BIS of required sieve sizes complete with lid and pan	2 set
	(b)	IS sieve 200 mm internal dia. (brass frame and steel or brass wire cloth mesh) consisting of sieve sets of required sieve sizes complete with lid and pan	2 set
(iv)	Sieve shaker capable of taking 200 mm and 450 mm dia. Sieves electrically operated with time switch assembly (As per BIS)		1
(v)	200 tones compression testing machine		1
(vi)	Stop watches 1/5 sec. Accuracy		2
(vii)	Glassware comprising of Beakers, Pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) glass rods and funnels, glass thermometers range 0°C to 100°C and metallic thermometers range 300°C		1 Dozen each
(viii)	Hot plates 200 mm dia (1500 watt)		6
(ix)	<b>Enamel trays</b>		
	(a)	600 mm x 450 mm x 50 mm	10
	(b)	450 mm x 300 mm x 40 mm	10
	(c)	300 mm x 250 mm x 40 mm	6
	(d)	Circular plates of 250 mm dia.	6
(x)	Water Testing Kit		1
(xi)	First Aid Box		1
(xii)	Spatula Set of 100 and 200 long		3
(xiii)	Digging Tools (pixels, shovel, fork etc.)		As reqd.
(xiv)	Miscellaneous tools (sledge hammer, lump hammer, wooden pegs etc.)		As reqd.
(xv)	Maximum and Minimum Thermometer		2 Set
(xvi)	Rain Gauge		1 Set
(xvii)	Timer 0-60 minutes with alarm & 1/5 sec accuracy.		3 Sets

<b>B: For Soils and Aggregates</b>		
(i)	Water still, 3 litre/hr with fittings and accessories	1
(ii)	Liquid limit device with Casagrande and ASTM grooving tools as per IS: 2720	1
(iii)	Sampling pipettes fitted with pressure and suction inlets, 10 mlCapacity	2 set



(iv)	Compaction apparatus (Proctor) as per IS: 2720 (Part 8) complete with collar, base plate and hammer	1 set
(v)	Modified AASHTO compaction apparatus as per IS. 2720 (Part 7) 1980 or Heavy Compaction Apparatus as per IS complete with collar, base plate and hammer	1 set
(vi)	Sand pouring cylinder with conical funnel and tap and complete as per IS 2720 (Part 28) 1980 including modified equipment	4
(vii)	Sampling tins with lids 100 mm dia x 75 mm ht ½ kg capacity and miscellaneous items like moisture, tins with lid (50 grams) etc.	12
(viii)	Lab CBR testing equipment for conducting CBR testing, load frame with 5 Ton capacity, electrically operated with speed control as per IS: 2720 (Part 16), and consisting of following:	1 set
	(a) CBR moulds 150-mm dia – 175-mm ht complete with collar, base plate etc.	24
	(b) Tripod stands for holding dial gauge holder	24
	(c) CBR plunger with settlement dial gauge holder	1
	(d) Surcharge weight 147-mm dia 2.5 kg weight with central hole	48
	(e) Spacer disc 148-mm dia, 47.7-mm ht. With handle	3
	(f) Perforated plate (Brass)	24
	(g) Soaking tank for accommodating 24 CBR moulds	
	(h) Proving rings of 1000kg, 2500kg and 5000kg capacity	1 each
	(i) Dial gauges, 25 mm travel- 0.01 mm/division	10
	(j) <b>Aluminium Tis</b>	
	50x30m	36 nos
	55x35m	36 nos
	70x45m	36 nos
	70x50m	36 nos
	80x50m	36 nos
(ix)	Standard Penetration test equipment	1
(x)	Nuclear Moisture Density Meter or equivalent	2
(xi)	Speedy moisture meter complete with chemicals	2
(xii)	Unconfined compression test apparatus	1 set
(xiii)	Aggregate Impact Test Apparatus	1
(xiv)	Aggregate Impact Test Apparatus as per IS 2386 (Part 4) 1963	1
(xv)	Los Angeles abrasion Test Apparatus as per IS 2386 (Part 4) 1963	1
(xvi)	Riffle Box of Slot size of 50mm as per ASTM C-136	1

### C: For Bitumen and Bituminous Mixes

(i)	Constant temperature bath for accommodating bitumen	2
	Test specimen electrically operated and thermostatically controlled, 50-liter capacity temp. range ambient 80o C	
(ii)	Penetrometer automatic type, adjustable weight arrangement and needles as per IS. 1203 – 1978	2
(iii)	Solvent extraction or centrifuge type apparatus complete (AASHTO, T-164) with extraction thimbles with stocks of solvent and filter paper	1
(iv)	Laboratory mixer including required accessories about .02 cum capacity electrically operated fitted with heating jacket	1

(v)	Marshall compaction apparatus automatically operated as per ASTM 1559-62 T and complete with electrically operated loading unit, compaction pedestal heating head assembly, dial micrometre and bracket for flow measurement, load transfer bar, specimen mould 100 mm dia. (4 in) with base plate, collars, specimen extractor, compaction hammer 4.53 kg (10 lb.) x457 mm (18 in) fall	1 set
(vi)	Distant Reading Digital Thermometer for Measuring Temperatures in Asphaltic Mixes	As required
(vii)	Riffle Box	1
(viii)	Automatic Asphalt Content Gauge [Nuclear are equivalent]	1
(ix)	Thin film Oven test apparatus to the requirement of AASHTO T 179, including accessories	1
(x)	Ring Ball Apparatus as per IS 1205- 1978	1
(xi)	Asphalt Institute Vacuum Viscometer as per IS 1206(part II) – 1978	1
(xii)	BS U- Tube Modified Reverse Floro Viscometer IS 1206(Part III) – 1978	1
(xiii)	Apparatus for Determination of Ductility Test as per IS 1208 – 1978	1
(xiv)	Pen Sky – Martars closed Tester for testing flashandfire point as per IS 1209 – 1978.	1
(xv)	Apparatus for Float Test – IS – 1210 – 1978	1
(xvi)	Apparatus for Determination of water content (Deanand Shark Method) IS – 1211 – 1978	1
(xvii)	Apparatus for Determination of Loss on Heading IS– 1212-1978.	1
(xviii)	Apparatus of Determination of specified Gravity IS- 1202-1978	1
(xix)	Core cutting machine with 100mm dia. Diamond cutting Edge	1
(xx)	Apparatus for Elastic Recovery test for Modified Bitumen	1
(xxi)	Apparatus for Storage Stability test for Modified Bitumen	1
(xxii)	Apparatus for Separation test for modified bitumen	1

D: For Cement, Cement Concrete and Materials			
(i)	Water still		1
(ii)	Vicat needle apparatus for setting time with plungers, as per IS. 269-1967		1
(iii)	Moulds		
	(a)	150 mm x 300 mm ht cylinder with capping component	As required
	(b)	150mmx150 mm x150mm cubical for compressive strength	As required
	(c)	150mmx100 mm x600mm beam for flexural strength	As required
(iv)	Concrete permeability apparatus		1
(v)	High frequency mortar cube vibrator for cement testing		1
(vi)	Concrete mixer power driven, 1 cu ft. capacity		1

(vii)	Variable frequency and amplitude vibrating table size 1 metre x 1 metre, as per the relevant British Standard		1
(viii)	Flakiness & Elongation test apparatus		2 each
(ix)	Aggregate impact test apparatus as per IS 2386 (Part 4) 1963		2
(x)	Los Angeles abrasion apparatus as per IS. 2386 (Part 4) 1963		1
(xi)	Flow table as per IS 712-1973		1
(xii)	(a)	Equipment for slump test	2
	(b)	Compaction factor test equipment	1
(xiii)	Equipment for determination of specific gravity for fine and coarse aggregate as per IS 2386 (Part 3) 1963		2
(xiv)	Flexural attachment to compression testing machine		1
(xv)	Core cutting machine with 150 mm dia. Diamond cutting edge		1
(xvi)	Needle vibrator		1
(xvii)	Vibrating hammer as per BS specification		1
(xviii)	Air entrainment meter ASTM C - 231		1
(xix)	0.5 Cft, 1 Cft cylinder for checking bulk density of aggregate with tamping rod		1
(xx)	Soundness testing apparatus for cement		1
(xxi)	Flexural Beam testing machine with accessories		1
(xxii)	Chemicals solutions and consumable		As reqd.
(xxiii)	Chloride Testing kit for chemical analysis of chloride content.		1
(xxiv)	ION Exchange kit for rapid determination of sulphate content.		1

#### E: For Control of Profile and Surface Evenness

(i)	Digital Level complete with all accessories		2 sets
(ii)	Distomat or equivalent		2 Nos.
(iii)	Theodolite – Electronically operated with computerized output attachment		2 sets
(iv)	Total Station with all accessories		2 sets
(v)	Towed Fifth Wheel Bump Indicator		1 set
(vi)	3meter straight edge and measuring wedge		2 sets
	Camber templates 2 lane		
(vii)	String line Arrangement with paver and sensor powers		1
	(a)	Crown type cross-section	2 sets
	(b)	Straight run cross-section	2 sets
(viii)	Steel tape		
	(a)	5 m long	as reqd
	(b)	10 m long	as reqd
	(c)	20 m long	as reqd

	(d)	30 m long	as reqd
	(e)	50 m long	As reqd
	(e)	50 m long	As reqd
(ix)	Precision Staff		3 Sets

**Note:** The laboratory set-up must be complete including a set of reference standards, adequately staffed and operational to the satisfaction of the Engineer not later than 2 months from the date of receipt of Notice to commence the works.

Sub-Clause 120.3      **Ownership**

This Clause shall read as under:

“Land for the laboratory shall be provided by the Contractor.”

Sub-Clause 120.4      **Maintenance**

This Clause shall read as under:

“The Contractor shall arrange to maintain the field laboratory including sample store yards in a satisfactory manner until the issue of Taking over Certificate for the whole work. Maintenance includes all activities described in Clause 120.4 and maintenance of equipment and running of the same including chemicals and consumables.”

Sub-Clause 120.5      **Rate**

The construction, supply, installation, maintenance, and operation including all consumables like chemicals & reagents etc., and all other expenses involved in connection thereto for the field laboratory shall be incidental to the work, and shall not be paid for separately.

SECTION 200      Site Clearance

CLAUSE 201      **CLEARING AND GRUBBING**

Sub-Clause 201.1      Scope

Replace with following Para:

This work shall consist of cutting, excavating, removing, and disposing of all materials such as trees of girth up to 300 mm, bushes, shrubs, stumps, roots, grass weeds, rubbish etc. and top soil up to 150 mm, which in the opinion of Engineer is unsuitable for incorporation in the work including draining out stagnant water if any from the area of road land, drain, cross drainage structure and other area as specified in the drawing or instructed by Engineer. It shall include necessary excavation by harrow discs or any other suitable equipment, backfilling of the pits by suitable soil, resulting from uprooting of trees & stumps and making the surface in proper grade by suitable equipment and compacted by power roller to required compaction as per Clause 305.3.4. The work also includes handling, salvaging and disposal of cleared material. Clearing and grubbing shall be performed less than one month in advance of earthwork operation and in accordance with requirement of the specifications.

CLAUSE 202      **DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/ PAVEMENTS**

Sub-Clause 202.5      Disposal of Materials

The first paragraph of the sub clause shall read as below:

All materials obtained of dismantling/milling shall be the property of the Contractor for which he shall quote a rate for rebate in BOQ Bill No. 1, and the Contractor shall be free to use this material in work, or he may sell/dispose the material to as desired / deemed fit by him.

The existing pavement crust shall be reused as indicated below:

Contractor shall be free to use dismantled / milled material, as is where basis is, or by suitably modifying the material, or by crushing the material, or by breaking the material, and screening the same, provided it meets the specifications and is approved by the Engineer.

## SECTION 300 **Earthwork, Erosion Control and Drainage**

### CLAUSE 301 **EXCAVATION FOR ROADWAY AND DRAINS**

#### Sub-Clause 301.1 Scope

Add the following as second paragraph under this clause:

“The work shall also include excavation for channel training at culverts/bridges, excavation of existing shoulders and medians for purposes of widening the pavement and excavation of existing embankment for reconstruction to specification.”

### CLAUSE 304 **EXCAVATION FOR STRUCTURES**

#### Sub-Clause 304.3.2 Excavation

At the end of 1<sup>st</sup> paragraph of Clause 304.3.2 inserts the following additional sentences:

“The Contractor shall ensure the stability and structural integrity of adjacent existing foundations and structures and if necessary shall, at his own expense, install temporary or permanent sheet piles, coffer dams, shoring or similar as support or protection to the satisfaction of the Engineer.”

### CLAUSE 305 **EMBANKMENT CONSTRUCTION**

#### Sub-Clause 305.2 Material and General Requirements Sub-Clause 305.2.1

##### Physical Requirements:

##### Sub-Clause 305.2.1.2 Add the following after second paragraph:

“Soils having medium and high swelling potential shall be defined based on Liquid Limit, Plastic Limit, Shrinkage Limit, Gradation, Free swelling Index, Field dry Density and Field Moisture Content and types of Clay minerals present in the soil and as directed by the Engineer. The location and the extent of these soils with medium to high swelling potential should be defined as directed by the Engineer.”

##### Sub-Clause 305.2.2.2 Borrow Materials

Para 1 of this Clause shall read as under:

” No borrow area shall be made available by the Employer for this work. The arrangement for the source of supply of the material for embankment and sub- grade as well as compliance to the different environmental

requirements in respect of excavation and borrow areas as stipulated, from time to time, by the Ministry of Environmental and Forest, Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor.”

#### Sub-Clause 305.2.2.4 Compaction Requirements

In Clause 305.2.2.4 delete Table 300-2 and substitute the following:

**Table 300-2: Compaction Requirements of Embankment and Subgrade**

Sr. No.	Type of Work/Material	Relative Compaction as %age of maximum laboratory dry density as per IS 2720 (Part 8)
1	Subgrade and earthen shoulders	Not less than 97%
2	Embankment	Not less than 95%
3	Expansive clays	Not allowed
4	Design CBR of Subgrade & Shoulder has been taken 8. The borrow earth used for sub grade material must satisfied the requirement of the design CBR of 8 %	

Para 2 of this Clause given below Table 300-2 shall read as under:

The contractor shall at least 21 working days before commencement of construction of embankment and the sub grade; submit the following to the Engineer for approval:

- (i) The values of maximum dry density and optimum moisture content obtained in accordance with IS: 2720 (Part 8) for each fill material proposed to be used in the construction of embankment and sub grade.
- (ii) The graphs of Density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
- (iii) The dry density-moisture content-CBR relationships, heavy comp active efforts conforming to the IS 2770 (part 8) for each of the fill material proposed to be used in the subgrade.

The above information shall form the basis for compaction only upon its approval by the Engineer.”

#### Sub-Clause 305.3 **Construction Operations**

##### Sub-Clause 305.3.4 Compacting Ground Supporting Embankment/Subgrade

Para 1 of this clause shall be read as

“Where necessary the original ground shall be levelled, scarified, mixed with water and then compacted by rolling to facilitate placement of first layer of embankment so as to achieve minimum dry density as given in Table 300-2.

#### Sub-Clause 305.8 **Measurement for Payment**

Substitute Clause 305.8.1 shall be read as

"Earth embankment/sub-grade construction shall be measured separately by taking cross sections at intervals after clearing and grubbing and if necessary compaction of original ground before the embankment work starts and after its completion and computing the volumes of earthwork in cubic metres by the method of average and areas."

**CLAUSE 306****SOIL EROSION AND SEDIMENTATION CONTROL**

## Sub-Clause 306.4

Measurements for Payment

Substitute Clause 306.4 as follows:

"All temporary sedimentation and pollution control works shall be deemed as incidental to the earthwork and other items of work and as such no separate payment shall be made for the same."

**SECTION 400 Sub-Bases, Bases (Non-Bituminous) and Shoulders****CLAUSE 401****GRANULAR SUB BASE**

## Sub-Clause 401.1

Scope

Add the following at the end of this Clause:

"A site trial shall be performed in accordance with Clause 901.16."

## Sub-Clause 401.2.2

Physical Requirements

Add at the end of this clause as under:

The Contractor shall, at least 21 working days before the commencement of the construction of the sub-base course, submit to the Engineer, the results for approval of the laboratory testing on the physical properties defined above. The construction of the sub-base course shall be taken up only upon the Engineer's approval of the material.

Grading-I of table 400-1 shall be adopted at site.

**CLAUSE 406****WET MIX MACADAM SUB BASE/BASE**

## Sub-Clause 406.4

Opening to Traffic

The Clause shall be read as follows:

No vehicular traffic of any kind shall be allowed on the finished wet mix macadam surface.

**SECTION 500****Base and Surface Courses (Bituminous)**

## Sub-Clause 501.2

Materials

## Sub clause 501.2.1

Binder

Binder of VG-30 grade shall be used or if available viscosity grade of bitumen shall be used in accordance with IS: 73

- Sub-Clause 501.2.2 Delete "Crushed gravel or other hard material" from first Line of Para 1."  
Para 3 is deleted.
- CLAUSE 505 **DENSE BITUMINOUS MACADAM**
- Sub-Clause 505.2.1 Bitumen  
Binder of VG-30 grade shall be used or if available viscosity grade of bitumen shall be used in accordance with IS: 73.
- CLAUSE 507 **BITUMINOUS CONCRETE**
- Sub-Clause 507.2.1 Bitumen  
Binder of CRMB-60 grade shall be used.
- SECTION 800 Traffic Signs, Markings and Other Road Appurtenances
- CLAUSE 803 **ROAD MARKINGS**
- Sub-Clause 803.2 Materials  
This clause shall read as under:  
"Road markings shall be hot applied thermoplastic compound and the materials shall meet the requirements as specified in Clause 803.4.  
The road markings shall be laid in one layer with appropriate road marking machine approved by the Engineer. Before the road-marking machine is used on the permanent works, the satisfactory working of the machine shall be demonstrated on a suitable site, which is not part of the permanent works. The rate of application shall be checked and adjusted as necessary before application on a large scale is commenced, and the reafterdaily."
- CLAUSE 806 **ROAD DELINATORS**
- Sub-Clause 806.2 This clause shall read as follows:
- a) Triangular Object Marker shall be 300mm side with four red reflectors, made out of 2mm thick aluminium sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type as per clause 801. The background/border/symbols shall be made by screen- printing of desired colour as per sign details. The sign plate shall be fixed with 6mm dia. aluminium rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 40mmx40mmx5mm. The sign shall be fixed with nut-bolts & welding on MS pipe 50mm dia (NB-MW) and 500mmhigh.
  - b) Rectangular hazard marker 600mm x 300mm made out of 2mm thick aluminium sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type. The background/ border/ symbols shall be made by screen-printing of desired colour as per sign details. The sign plate shall be fixed with 6mm dia aluminium rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 40mmx40mmx5mm. The sign shall be fixed to 80mm dia (NB-MW) MS pipe.



- c) Roadway Indicators shall be 1000mm high made with 100 mm dia. NB medium weight MS pipe. One reflector of high intensity grade retro reflective sheeting with encapsulated lens shall be provided on top of the reflector. The white & red reflector shall be provided alternatively of 40mm width, so that total width of reflector shall be 120mm. A wire mesh cover of 150mm height shall be provided on top.
- d) All components of signs & supports shall be thoroughly de scaled, cleaned, primed and painted with two coats of epoxy paint. The sign backside shall be with grey colour and post shall be white colour/ alternate white & black bands. The post below ground shall be painted with three coats of red lead.

Clause 2100

#### **Open Foundation**

Sub-Clause 2104.1

#### **Preparation of Foundation**

Please add the following as a last para-Considering the soil SBC as per Geotechnical report, 1 m of depth below the founding level of bridges shall be removed and replaced with granular sand. The cost of the excavation and sand shall be made from respective items.

## SCHEDULE – E

*(See Clauses 2.1 and 14.2)*

### **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, Austrian Guidelines/ ITA guidelines/ Good Industry Practice shall be adopted.

### **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 Periodic inspection/ Post-monsoon inspection**

The Contractor shall carry out a detailed pre-monsoon inspection of all tunnels, 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.

The contractor shall carry out a detailed pre-winter inspection to assess the readiness of resources for winter maintenance operations along the highway. This may include the proposed plant and equipment that will be employed to keep the highway operable during the entire winter season with blockage as minimum as practically possible. The inspection report and maintenance plan for winter operation shall be submitted to Authority's Engineer before 30th September. Repairs on account of natural calamities

All damages occurring to the Project Highway on account of a Force Majeure Event or 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.

## **8 Repairs on account of natural calamities**

All damages occurring to the Project Highway on account of a Force Majeure Event or 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 tables below.

**Table 1: Maintenance Criteria for Mountainous Tunnels (Civil):**

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification
<b>Tunnel- Lining and side walls</b>	Peeling off (honeycomb, scaling, spalling, cracking)	Peeling off of concrete not more than 0.25sqm	Annually / Daily	De-tailed inspection	Repairs to peeling off (honeycomb, scaling, spalling, cracking)	24 hours
	Water leakage	No water dripping down to road surface	Daily	Daily inspection	Installation of leak prevention trough	15 days
	Steel corrosion	Not more than 0.25sqm	Annually	De-tailed inspection of all components as per IRC/International guidelines	All the corroded reinforcement shall be thoroughly cleaned from rusting and applied with anti-corrosive coating before carrying out the repairs to affected concrete portion with	15 days

					epoxy mortar/ concrete	
	Insufficient effective lining thickness	Effective thickness needs to be secured	In case possibility of insufficient effective lining thickness is estimated by detailed inspection	Detailed investigation by electromagnetic wave and core boring of lining concrete	Detailed design shall be conducted in close coordination with the Authority to determine counter-measure works, such as inner reinforcement lining by concrete/continuous fiber sheet	1 year
	Corrosion of Steel Fibers in Steel Fiber Concrete	Not more than 0.25sqm	Annually	Detailed inspection of all components as per IRC/International guidelines	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
<b>Tunnel - Entrance</b>	Peeling off (honeycomb,	Peeling off of concrete	Daily/ Annually	Daily inspection/	Repairs to peeling off	24 hours

	scaling, crack- ing)	not more than 0.25sqm		De- tailed inspec- tion	(honey- comb, scal- ing, crack- ing)	
	Inclination, movement, settlement, joints, etc. caused by ex- ternal forces.	Deterio- ration does not affect struc- tural sound- ness	Annually	De- tailed inspec- tion	Detailed de- sign shall be conducted in close co- ordination with the Au- thority to determine counter- measure works	1 year
	Scour	Scour shall not be affect safety of tun- nel/road- way structure	Bi-Annu- ally	Basic inspec- tion and De- tailed inspec- tion	Suitable protection works around tun- nel entrance	1 month
<b>Tunnel - Leak pre- vention trough/Flak- ing preven- tion facility</b>	Corrosion of trough/ flak- ing prevention net	No corro- sion	Annually	De- tailed inspec- tion	Replace- ment of cor- roded parts with new trough/flak- ing preven- tion net, or all the cor- roded parts shall be thoroughly cleaned from rusting and applied with anti- corrosive coating	7 days
	Cracking, de- formation, de- fect, and wa- ter leakage of	No water dripping down to	Daily	Visual inspec- tion on board	Replace- ment of de- teriorated	24 hours

	trough/flaking prevention net	road surface		and distant visual inspection	trough/flaking prevention net with new parts	
	Corrosion of bolts and nuts (Mounting Bracket)	No corrosion	Annually	Detailed inspection	Replacement of corroded parts with new trough/flaking prevention net, or all the corroded parts shall be thoroughly cleaned from rusting and applied with anti-corrosive coating	24hours
	Falling out or loosening of bolts and nuts (Mounting Bracket)	All bolts and nuts installed properly	Annually	Detailed inspection	Installation of new bolts and nuts	24hours
	Floating, cracked, or flaked filling prevention sheet	Free from floating, crack, and flaking	Annually	Detailed inspection	Replacement of floating, cracked, or flaked filling prevention sheet with new sheet	3 months
	Cracks, corrosion, deformation, defects, or backlash of hand-rail	Free from cracks, corrosion, deformation, defects,	Annually /Daily	Detailed inspection	Replacement of deteriorated handrail with new handrail	1 month

		or back-lash				
	Deformation, failure, or defect of audit corridor observer corridor	Free from deformation, failure, or defect	Annually	Detailed inspection	Replacement of deteriorated parts of audit corridor observer with new parts	1 month
	Cracks, deformation, defects of ceiling board	Deterioration does not affect structural soundness	Annually	Detailed inspection	Replacement of deteriorated parts with new parts or monitoring	3 months
	Water leakage of ceiling board	No water dripping down to road surface	Daily	Daily inspection	Installation of leak prevention trough	15 days
	Cracks, corrosion, deformation, and defects of wire	Deterioration does not affect traffic safety	Annually /Daily	Detailed inspection/ Daily inspection	Replacement of deteriorated wire with new wire	1 month
	Cracks, corrosion, deformation, defects, backlash of main body attachment	Deterioration does not affect traffic safety	Annually /Daily	Detailed inspection/ Daily inspection	Replacement of deteriorated main body attachment with new attachment	1 month
	Fracture, crack, corrosion, deformation, defect, backlash	Deterioration does not affect	Annually /Daily	Detailed inspection/	Replacement of deteriorated mounting	1 month



	of mounting bracket	traffic safety		Daily inspection	bracket with new bracket	
	Fracture /looseness, fall-off/crack/corrosion of bolts and nuts, Anchors	All bolts and nuts installed properly	Annually	Detailed inspection	Installation of new bolts and nuts	24hours
<b>Tunnel - Drainage facilities</b>	Deformation and fracture of catchment and circular channel	Drainage function is secured	Daily/Annually	Daily inspection/ detailed inspection	Replacement of deteriorated catchment/circular channel with new catchment/circular channel	1 month
	Damage, corrosion, or deformation of the lid of catchment and circular channel	Drainage function is secured	Daily/Annually	Daily inspection/ detailed inspection	Replacement of deteriorated catchment/circular channel with new catchment/circular channel	1 month

**Table 2: Maintenance Criteria for Mountainous Tunnels (Mechanical, Electrical, and Plumbing):**

Facility / Equipment	Failure	Category of Failure*  * Please see the Table 3 below	Note
Power reception and distribution facilities	Power outage Power ground fault Power short circuit	1	
	Transformer short circuit at primary side Ancillary power transmission short circuit/ground fault Main transformer temperature rise Main circuit failure (short circuit/ground fault)	1 or 2	Depending on failure status
	Fault at branch circuit	1 or 2	Depending on failure status
	Ground at branch circuit	2	
Power generator	Serious failure Overspeed Low lubricant pressure Cooling water outage Start-up congestion Overvoltage/overcurrent Main miniature circuit breaker trip Emergency stop	1 or 2	Depending on failure status
	Minor malfunction Air pressure drop Fuel level drop Auxiliary machine malfunction Ground fault	2	
DC power supply and uninterruptible power supply facilities	Miniature circuit breaker Trip Fuse blown Battery voltage drop Equipment failure Battery temperature rise Output voltage abnormality Inverter failure CVCF failure	1 or 2	Depending on failure status
	Low liquid level	3	

Road lighting and sign lighting facilities	Lighting control panel failure Lighting control panel power outage	2 or 3	Depending on failure status
	Sign circuit short circuit/ground fault Lighting circuit short circuit/ground fault	2	
	Short circuit at Lighting/sign main circuit Dimmer transformer primary short circuit	1	
Tunnel lighting facilities	Lighting circuit short circuit, ground fault Luminance meter failure Control panel failure Earth leakage circuit breaker failure	2	
Tunnel emergency facilities	Disaster prevention receiving panel failure Fire hydrant circuit disconnected Fire pump failure Fire pump control panel failure Pump control panel (on-site) line abnormality Manual report (Push-button) circuit disconnected Automatic report (Fire detector) circuit failure Booster pump failure Main water tank shortage Water intake tank shortage Water intake pump failure Signal line to evacuation routes disconnected	1 or 2	Depending on failure status
	Water heater failure Heater at tunnel portal failure Heater control panel failure Heater control panel power outage Water heater control panel failure Water heater control panel power outage Oil tank oil level low Water heater auxiliary machine failure	2	
	Fire detector not working	3	

	Fire detector failure Discharge valve failure Circulation valve failure Intake valve failure Automatic water supply system pressure abnormality	2	
Tunnel ventilation facility	Control panel failure Ventilation control panel severe failure	1 or 2	Depending on failure status
	Jet fan short circuit, ground fault Booster fan short circuit, ground fault Supply fan start-up congestion Exhaust fan startup congestion Minor failure of ventilation control panel	2	
Electrostatic precipitator facilities	Control panel failure Cleaning auxiliary machine failure Wastewater treatment auxiliary machine failure Fan failure	2	
	Dust collector failure	3	
VMS (Variable message sign-board)	Information board congestion, breakdown, power outage, no response Monitoring control panel power outage Monitoring control panel failure Monitoring control panel communication error Communication control unit communication error IP conversion monitoring control panel communication error IP conversion communication control unit communication error	1 or 2	Depending on failure status
	Information congestion of tunnel information board Tunnel information board failure Monitoring control panel communication error Communication control unit failure	1	
Measuring facilities	Visibility meter failure Carbon monoxide concentration meter failure	2	

	Air flow velocity and direction meter failure Differential pressure meter failure		
CCTV facilities	Controlled unit failure Control unit failure Image processing failure	1	
In-tunnel broadcasting facilities	Control rack failure Transmission device communication error Power outage Amplifier rack failure	1 or 2	Depending on failure status
Information processing facilities	Various abnormalities and failures	1 or 2	Depending on failure status
Roadway drainage facilities	Major failure Minor failure Drainage pump short circuit Drainage pump ground fault Drainage pump failure	2	
	Water level abnormality (high water level)	1	
	Power outage	3	
Communication line facilities	Fuse blown Optical insulation Metal wire break Metal wire insulation Equipment abnormality	1 or 2	Depending on failure status
Loudspeaker facilities	Failures on center office side On-site failures	2	
Mobile radio facilities	Transmitter/receiver failure	2 or 3	In case of more than 2 channels failure, category of failure is "2"
Emergency telephone facilities	Broken wire Interference Poor insulation	1 or 2	Depending on failure status
	Power outage	3	
DC power supply facilities for communications	Failures of set of equipment Unit failure	1 or 2	Depending on failure status

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Air-conditioner facilities for communications	Package failure, stoppage Temperature abnormality Air conditioner (unit) stoppage Equipment failure Failures of set of equipment	2	
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**Table 3: Category of Failure**

Category of Failure	Definition	Basic Concept	Note
1	Failure(s) that seriously disrupts road operation, functionality of facilities, or third parties.	<ul style="list-style-type: none"> <li>The Contractor shall carry out restoration or temporary response immediately (within the same day).</li> <li>This category failure needs to arrange backup measures (i.e. support system) such as power vehicles, sign vehicles, water trucks, etc., special patrols and on-site monitoring is required due to the inability of facilities.</li> </ul>	<p>Examples:</p> <ul style="list-style-type: none"> <li>Electric shock accidents</li> <li>Electrical fire accidents</li> <li>Fatal and injured accidents caused by electrical facilities</li> <li>Inability to collect and provide information</li> <li>Line interruptions on main lines</li> <li>Other failures that have a social impact</li> </ul>
2	This is a failure that disrupts road operation or the functionality of the equipment.	<ul style="list-style-type: none"> <li>The Contractor shall carry out restoration or temporary restoration within the next working day.</li> </ul>	
3	The Contractor shall carry out restoration or temporary restoration within the next working day.	<ul style="list-style-type: none"> <li>The Contractor shall respond to the failure within three (3) working days.</li> </ul>	

Nature of Defect or deficiency		Time limit for repair/ rectification
<b>ROADS</b>		
<b>(a)</b>	<b>Carriageway and paved shoulders</b>	
(i)	Breach or blockade	Temporary restoration of traffic within 24 hours; permanent restoration within 15 (fifteen) days
(ii)	Roughness value exceeding 3000 mm in a stretch of 1 km (as measured by a calibrated bump integrator)	120 (one hundred and twenty) days
(iii)	Pot holes	48 hours
(iv)	Any cracks in road surface	15 (fifteen) days
(v)	Any depressions, rutting exceeding 10 mm in road surface	30 (thirty) days
(vi)	Bleeding/skidding	7 (seven ) days
(vii)	Any other defect/distress on the road	15 (fifteen) days
(viii)	Damage to pavement edges	15 (fifteen) days
(ix)	Removal of debris, dead animals	6 hours
<b>(b)</b>	<b>Granular earth shoulders, side slopes, drains and culverts</b>	
(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 hours
(vii)	Railing, parapets, crash barriers	7 (seven) days (Restore immediately if causing safety hazard)
<b>(c)</b>	<b>Road side furniture including road sign and pavement marking</b>	
(i)	Damage to shape or position, poor visibility or loss of retro-reflectivity	48 hours
(ii)	Painting of KM stone, railing, parapets, crash barriers	As and when required/Once every year
(iii)	Damaged/missing road signs requiring replacement	7 (seven) days
(iv)	Damage to road mark ups	7 (seven) days



<b>(d)</b>	<b>Road lighting</b>	
(i)	Any major failure of the system	24 hours
(ii)	Faults and minor failures	8 hours
(iii)	Any other defects/deficiency not covered above but pointed out by Authority's Engineer	3 (three) days
<b>(e)</b>	<b>Trees and plantation</b>	
(i)	Obstruction in a minimum head-room of 5 m above carriageway or obstruction in visibility of road signs	24 hours
(ii)	Removal of fallen trees from carriageway	4 hours
(iii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iv)	Trees and bushes requiring replacement	30 (thirty) days
(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
(vi)	Any other defects/deficiency not covered above but pointed out by Authority's Engineer	3 (three) days
<b>(f)</b>	<b>Rest area</b>	
(i)	Cleaning of toilets	Every 4 hours
(ii)	Defects in electrical, water and sanitary installation	24 hours
<b>(g)</b>	<b>Other Project Facilities and Approach roads</b>	
(i)	Damage in approach roads, pedestrian facilities, truck lay-buys, bus-bays, bus-shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts and service roads	15 (fifteen) days
(ii)	Damaged vehicles or debris on the road	4 (four) hours
(iii)	Malfunctioning of the mobile crane	4 (four) hours
<b>Bridges</b>		
<b>(a)</b>	<b>Superstructure</b>	
(i)	Any damage, cracks, spalling/ scaling Temporary measures Permanent measures	Within 48 hours Within 15 (fifteen) days or as specified by the Authority's Engineer
<b>(b)</b>	<b>Foundations</b>	
(i)	Scouring and/or cavitation	15 (fifteen) days
<b>(c)</b>	<b>Piers, abutments, return walls and wing walls</b>	

(i)	Cracks and damages including settlement and tilting, spalling, scaling	30 (thirty) days
<b>(d)</b>	<b>Bearings (metallic) of bridges</b>	
(i)	Deformation, damages, tilting or shifting of bearings Greasing of metallic bearings once in a year	15 (fifteen) days
<b>(e)</b>	<b>Joints</b>	
(i)	Malfunctioning of joints	15 (fifteen) days
<b>(f)</b>	<b>Other items</b>	
(i)	Deforming of pads in elastomeric bearings	7 (seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	3 (three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	3 three days (immediately within 24 hours if posing danger of safety)
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	15 (fifteen) 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
<b>(g)</b>	<b>Hill Roads</b>	
(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
<b>(h)</b>	<b>Tunnels</b>	
(i)	Damage to Riding Surface inside the tunnel will be governed by stipulations for Road	As stated in preceding sections
(ii)	Damage of Air monitoring sensors / Ventilation system	Temporary measures within 24 hrs and permanent measures within 15 days

**Schedule-F**

*(See Clause 3.1.7(a))*

**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. License for use of explosives;
  - d. Permission of the State Government for drawing water from river/reservoir;
  - e. License from inspector of factories or other competent Authority for setting up batching plant;
  - f. Clearance of Pollution Control Board for setting up batching plant;
  - g. Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;
  - h. Permission of Village Panchayats and State Government for borrow earth; and
  - i. Any other permits 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]**

**Director (EPC)**  
**HQ DGBR /EPC Cell**  
**Ring Road, Delhi Cantt New Delhi – 110010**

WHEREAS:

- (A) \_\_\_\_\_ [name and address of contractor] (hereinafter called the “**Contractor**”) and Chief Engineer, Vijayak, (hereinafter called the “**Authority**”) have entered into an agreement (hereinafter called the “**Agreement**”) for the construction of [Comments] section of 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 Authority of India], 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 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 Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.
7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

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

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

## Annex-II

## (Schedule-G)

(See Clause 19.2)

## Form for Guarantee for Advance Payment

Director (EPC)  
 HQ DGBR /EPC Cell  
 Ring Road, Delhi Cantt New Delhi – 110010

WHEREAS:

- (A) \_\_\_\_\_ [name and address of contractor] (hereinafter called the “**Contractor**”) has executed an agreement (hereinafter called the “**Agreement**”) with the Chief Engineer, Vijayak, (hereinafter called the “**Authority**”) for the construction of [Comments] section of 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 guarantee by a scheduled bank for an amount equivalent to 110% (one hundred and ten percent) of such installment to remain effective till the complete and full repayment of the installment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second} installment of the Advance Payment is Rs. ----- cr. (Rupees ----- crore) and the amount of this Guarantee is Rs. ----- cr. (Rupees ----- crore) (the “**Guarantee Amount**”)\$.
- (C) We, ..... through our branch at ..... (the “**Bank**”) have agreed to furnish this bank guarantee (*hereinafter called the “**Guarantee**”*) for the Guarantee Amount.

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid instalment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.  
 A letter from the Authority, under the hand of an officer not below the rank of [General Manager in the National Highways Authority of India], 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 Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

2. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.
3. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
4. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
5. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.
6. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.



7. The Guarantee shall cease to be in force and effect on \*\*\*\*\$. Unless a demand or claim under this Guarantee is made in writing on or before the aforesaid date, the Bank shall be discharged from its liabilities hereunder.
8. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
9. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.
10. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

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.

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\$ 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).

## Schedule – H

(See Clauses 10.1 (iv) and 19.3)

## Contract Price Weightages

1. The Contract Price for this Agreement is Rs. ....
2. Proportions of the Contract Price for different stages of Construction of the Project Highway shall be as specified below:

Item	Weightage in percentage to the Contract Price	Stage of Payment	Percentage Weightage
1	2	3	4
Road works including culverts, widening and repair of culverts and Site Clearance	1.05%	<b>B.1 - Reconstruction/New 2-lane realignment/bypass (Flexible pavement)</b>	
		1) Earthwork up to top of Sub-grade	60.63%
		2) Sub-Base Course	3.81%
		3) Non-Bituminous Base Course	3.37%
		4) Bituminous Base Course	20.93%
		5) Wearing Coat	0.81%
		<b>D - Re-Construction and New culverts on existing road, realignments, bypasses:</b>	
		(1) Culverts (length < 6m)	10.45%
Tunnel	1.61%	<b>A. Investigation &amp; Design</b>	
		A.1 Investigation	60%
		A2 Detailed Design	40%
	0.54%	<b>B. Portals</b>	
		B1- Temporary Dewatering Arrangement	0.28%
		B2- Open Excavation and Earthwork (Loose excavation, rock excavation, rip rap layer on embankment, Gabion etc.)	16.29%
		B3- Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh)	26.39%
		B4-Concrete Works at portal	9.04%
		B5-Construction of buildings	48.00%
	87.54%	<b>C. Tunnel</b>	
		C1- Temporary Dewatering Arrangement	0.13%
		C2- Underground Excavation for tunnel in Support Category dominating the Face Area including Drilling and Grouting	14.35%

Item	Weightage in percentage to the Contract Price	Stage of Payment	Percentage Weightage
1	2	3	4
		C3- Permanent Dewatering Arrangement, (PVC pipes, perforated PVC pipes, precast concrete slots channel elements, dimpled sheets between permanent lines of C&C tunnel length and backfill material, water- proofing membrane etc.)	4.13%
		C4- Primary Support Measures (Bolts & Anchors, Shotcrete & Wire Mesh)	64.87%
		C5-Concrete Works	13.15%
		C6-Instrumentation and Monitoring	0.67%
		C7-Pavement	2.23%
		C8-Grouting	0.47%
	7.87%	<b>D. E&amp;M and Ventilation</b>	100.00%
	0.90%	<b>E. Fire Fighting System</b>	100.00%
	0.01%	<b>F. Site Facility</b>	100.00%
Other Works	0.48%	(i) Roadside drains	2.96%
		(ii) Road signs, markings, km stones, safety devices, ...	2.93%
		(iii) Paver blocks, Utility Pipes, Bus Shelters	19.22%
		(iv) Protection works other than approaches to the bridges, elevated sections/ flyovers/grade separators and ROBs/RUBs.	
		a) Protection works	74.89%

### 1.1 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:

Stage of Payment	Percentage - Weightage	Payment Procedure
1	2	3
B.1 - Reconstruction/New 2-lane realignment/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 length 10% of
Site Clearance		
(1) Earthwork up to top of the sub-grade	60.63%	
(2) Sub-Base Course	3.81%	
(3) Non-Bituminous Course	3.37%	

Stage of Payment	Percentage - Weightage	Payment Procedure
1	2	3
(4) Bituminous Base Course	20.93%	total length.
(5) Wearing Coat	0.81%	
D - Re-Construction and New culverts on existing road, realignments, bypasses:		
(1) Culverts (length < 6m)	10.45%	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 each culvert.

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

Cost per km =  $P \times \text{weightage for road work} \times \text{weightage for bituminous work} \times (1/L)$  Where

P= Contract Price

L = Total length in km

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

### 1.3.3 Major Bridge works, ROB/RUB and Structures

**NIL**

### 1.3.4 Tunnel

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

Table 1.3.4

Stage of Payment	Weightage	Payment Procedure
1	2	3
A-Investigation and Design		Unit of measurement in submission of Detailed Design and Investigation report complete. Payment shall be made on the completion of a stage.
A1 Investigation	60.00%	
A2 Design	40.00%	
B-Portal		
B1- Temporary Dewatering Arrangement	0.28%	Unit of measurement is completion of portal in all respect. The payment shall be made on the completion of a stage in portals area.  Note- Payment against item B1 shall be made on completion of portal in all respect.

Stage of Payment	Weightage	Payment Procedure
1	2	3
B2- Open Excavation and Earthwork (Loose excavation, rock excavation, rip rap layer on embankment, Gabion etc.)	16.29%	
B3- Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh)	26.39%	
B4-Concrete Works at portal	9.04%	
B5-Construction of buildings	48.00%	
C. Tunnel		
C1- Temporary Dewatering Arrangement	0.13%	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.
C2- Underground Excavation for tunnel in Support Category dominating the Face Area including Drilling and Grouting	14.35%	
C3- Permanent Dewatering Arrangement,	4.13%	
C4- Primary Support Measures (Bolts & Anchors, Shotcrete & Wire Mesh)	64.87%	
C5-Concrete Works	13.15%	
C6-Instrumentation and Monitoring	0.67%	
C7-Pavement	2.23%	
C8-Grouting	0.47%	
D- E&M and Ventilation System	100.00%	On delivery, installation and commissioning of E&M equipment in the ratio of 20:40:40.
E. Fire Fighting System	100.00%	On delivery, installation and commissioning of E&M equipment in the ratio of 20:40:40.

Stage of Payment	Weightage	Payment Procedure
1	2	3
F- Site Facility Costs	100%	30% of the cost shall be paid after completing the portals excavation and support installation work and on the commencement of mined tunnel excavation. The 50% of Balance amount shall be paid on the basis of tunnel progress with respect to the excavation and supports installation on quarterly basis and 50% of the balance amount in quarterly instalments in each year over the remaining construction period.

### 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	Weight-	Payment Procedure
1	2	3
(i) Toll plaza	0.00%	Unit of measurement is each completed toll plaza. Payment of each toll plaza shall be made on pro rata basis with respect to the total of all toll plaza.
(ii) Road-side drains	2.96%	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.
(iii) Road signs, markings, km stones, safety devices, ...	2.93%	
(iv) Paver blocks, Utility Pipes, Bus Shelters	19.22%	Payment shall be made on pro rata basis for completed facilities.
a) Bus bays	0.00%	Payment shall be made on pro rata basis for completed facilities.
b) Truck lay-byes	0.00%	
c) Rest areas	0.00%	
d) others	0.00%	
(v) Junction	0.00%	
(vi) High mast lighting	0.00%	
(vii) Protection works other than approaches to the bridges, elevated sections/ flyovers/grade separators and ROBs/RUBs.		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.
a) Protection works	74.89%	
b) Avalanche Structures	0.00%	
(viii) Safety and traffic management during construction	0.00%	

- 
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****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.

**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)*

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.

**List of Drawings**

A minimum list of the drawings of the various components / elements of the Project and project facilities required to be submitted by the Contractors given below:

- a) Drawings of horizontal alignment, vertical profile and detailed cross sections.
- b) Drawings of all Major and Minor Bridges.
- c) Drawings of cross-drainage works.
- d) Drawing of road furniture including traffic signage, marking, safety barriers etc.
- e) Drawing as per instruction of Authority's Engineer.
- f) General arrangement showing area of base camp and administrative block.
- g) Tunnel General Layout – Plan and Longitudinal section
- h) Tunnel regular cross sections for various sections e.g. main tunnel, cross passage, C&C portal
- i) Tunnel Portal Design drawings.
- j) Tunnel Support Design drawings.
- k) Schematic of tunnel lighting and Power distribution systems.
- l) Fire Fighting System Layout with Specifications.
- m) Geological face log for each round of tunnel advance and as built Support Drawings (During construction).
- n) Drainage and waterproofing arrangements for Tunnels.
- o) Drawings for Ventilation arrangements with specifications.
- p) Detailed cross section of main Tunnel, escape tunnel and cross passages.
- q) Muck Disposal sites.
- r) Slope protection drawings and Avalanche protection structural drawings.
- s) Drawing of all outside structures at tunnel portals

## Schedule - J

(See Clause 10.3 (ii))

### Project Completion Schedule

#### 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.

#### Project Milestone-I

- (i) Project Milestone-I shall occur on the date falling on the **384 days** 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 completion schedule in reference to Schedule-H Items, Stages and Sub-stages payment statements for an amount not less than 10% (ten per cent) of the Contract Price.

#### Project Milestone-II

- (iii) Project Milestone-II shall occur on the date falling on the **657 days** from the Appointed Date (the "**Project Milestone- II**").
- (iv) 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 completion schedule in reference to Schedule-H Items, Stages and Sub-stages payment statements for an amount not less than 55% (Fifty five per cent) of the Contract Price.

#### Project Milestone-III

- (v) Project Milestone-III shall occur on the date falling on the **931 days** from the Appointed Date (the "**Project Milestone- III**").
- (vi) 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 completion schedule in reference to Schedule-H Items, Stages and Sub-stages payment statements for an amount not less than 90% (Ninety per cent) of the Contract Price and **should have completed all 90% of the civil work inside the tunnels and started the E&M and ventilation installations.**

#### Scheduled Completion Date

- (vii) The Scheduled Completion Date shall occur on the **1095 days** from the Appointed Date.

- (viii) On or before the Scheduled Completion Date, the Contractor shall have completed construction in accordance with this Agreement.

**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

##### 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 as per relevant IRC Code/ Manual.
- (ii) Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a Network Survey Vehicle (NSV) fitted with latest equipments and the maximum permissible roughness for purposes of this Test shall be [2,000 (two thousand)] mm for each kilometre.
- (iii) Tests for bridges: All major and minor bridges shall be subjected to the rebound hammer and ultrasonic pulse velocity tests, to be conducted in accordance with the procedure described in Special Report No. 17: 1996 of the IRC Highway Research Board on Nondestructive Testing Techniques, at two spots in every span, to be chosen at random by the Authority's Engineer. Bridges with a span of 15 (fifteen) metres or more shall also be subjected to load testing.
- (iv) Test for Tunnels: Authority engineer shall collect all the tunnel monitoring data and check to confirm all displacements have ceased within tolerance limit. Permanent lining shall be checked for any visible defect such as crack, spalling or seepage further rebound hammer and UPV tests to be conducted at doubtful parts of lining. Functioning of drainage system to be checked. Testing and commissioning of E&M and ventilation system Systems including integration testing and checking of all sensors and SCADA system. Communication and emergency response drills to be carried out to conclude the completion.
- (v) 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.

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

### **3. Agency for conducting Tests**

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

### **4. Completion Certificate**

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

Schedule - L

(See Clause 12.2)

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 [Comments] (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

##### 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.

##### Percentage reductions in lump sum payments on monthly basis

- (i) The following percentages shall govern the payment reduction:

S. No.	Item/Defect/Deficiency	Percentage
<b>(a)</b>	<b>Carriageway/Pavement</b>	
(i)	Potholes, cracks, other surface defects	15%
(ii)	Repairs of Edges, Rutting	5%
<b>(b)</b>	<b>Road, Embankment, Cuttings, Shoulders</b>	
(i)	Edge drop, inadequate cross fall, undulations, settlement, potholes, ponding, obstructions	10%
(ii)	Deficient slopes, raincuts, disturbed pitching, vegetation growth, pruning of trees	5%
<b>(c)</b>	<b>Bridges and Culverts</b>	
(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%
<b>(d)</b>	<b>Tunnels</b>	
(i)	Any defect in the permanent lining	10%
(ii)	Drainage issue inside tunnel, water ponding, pot holes or damage to lanes or walkway	10%
(iii)	Problem with fire fighting system, PA system, signage , air monitoring inside the tunnel or any other defect in E&M or ventilation facility	15%
(i)	Cleaning and repair of drains	5%
<b>(e)</b>	<b>Road Furniture</b>	
(i)	Cleaning, painting, replacement of road signs, delineators, road markings, 200 m/km/5 <sup>th</sup> km stones	5%
<b>(f)</b>	<b>Miscellaneous Items</b>	
(i)	Removal of dead animals, broken down/accident vehicles, fallen trees, road blockades or malfunctioning of mobile crane	10%
(ii)	Any other Defects in accordance with paragraph 1.	5%
<b>(g)</b>	<b>Defects in Other Project Facilities</b>	5%

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

$$R = P/100 \times M \times L_1/L$$

Where

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

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

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

R = Reduction (the amount to be deducted for 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****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.

**Terms of Reference**

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

**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 **Chief Engineer Project Yojak, Manali** (the “**Authority**”) and ..... (the “**Contractor**”)<sup>#</sup> for [Comments] Ladakh 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.
- (ii) The TOR shall apply to construction and maintenance of the Project Highway.

#### 2. Definitions and interpretation

- (i) The words and expressions beginning with or in capital letters and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Agreement.
- (ii) References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of this TOR.
- (iii) The rules of interpretation stated in Article 1 of the Agreement shall apply, mutatis mutandis, to this TOR.

#### 3. General

- (i) The Authority’s Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.
- (ii) The Authority’s Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement, but subject to obtaining prior written approval of the Authority before determining:
  - a. any Time Extension;
  - b. any additional cost to be paid by the Authority to the Contractor;
  - c. the Termination Payment; or
  - d. issuance of Completion Certificate or
  - e. any other matter which is not specified in (a), (b), (c) or (d) above and which creates a financial liability on either Party.
- (iii) The Authority’s Engineer shall submit regular periodic reports, at least once every month, to the

- Authority in respect of its duties and functions under this Agreement. Such reports shall be submitted by the Authority's Engineer within 10 (ten) days of the beginning of every month.
- (iv) The Authority's Engineer shall inform the Contractor of any delegation of its duties and responsibilities to its suitably qualified and experienced personnel; provided, however, that it shall not delegate the authority to refer any matter for the Authority's prior approval in accordance with the provisions of Clause 18.2.
  - (v) The Authority's Engineer shall aid and advise the Authority on any proposal for Change of Scope under Article 13.
  - (vi) In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the Authority's Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

#### **4. Construction Period**

- (i) During the Construction Period, the Authority's Engineer shall review and approve the Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1 (vi). The Authority's Engineer shall complete such review and approval and send its observations to the Authority and the Contractor within 15 (fifteen) days of receipt of such Drawings; provided, however that in case of a Tunnel/ Major Bridge or Structure, the aforesaid period of 15 (fifteen) days may be extended upto 30 (thirty) days. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.
- (ii) The Authority's Engineer shall review and approve any revised Drawings sent to it by the Contractor and furnish its comments within 10 (ten) days of receiving such Drawings.
- (iii) The Authority's Engineer shall review and approve the Quality Assurance Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty one) days stating the modifications, if any, required thereto.
- (iv) The Authority's Engineer shall complete the review and approve of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.
- (v) The Authority's Engineer shall grant written approval to the Contractor, where necessary, for interruption and diversion of the flow of traffic in the existing lane(s) of the Project Highway for purposes of maintenance during the Construction Period in accordance with the provisions of Clause 10.4.
- (vi) The Authority's Engineer shall review the monthly progress report furnished by the Contractor and send its comments thereon to the Authority and the Contractor within 7 (seven) days of receipt of such report.

- (vii) The Authority's Engineer shall inspect the Construction Works and the Project Highway and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. In particular, the Authority's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.
- (viii) The Authority's Engineer shall conduct the pre-construction review of manufacturer's test reports and standard samples of manufactured Materials, and such other Materials as the Authority's Engineer may require.
- (ix) For determining that the Works conform to Specifications and Standards, the Authority's Engineer shall require the Contractor to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4 (ix), the tests specified in the IRC Special Publication-11 (Handbook of Quality Control for Construction of Roads and Runways) and the Specifications for Road and Bridge Works issued by MORTH (the "Quality Control Manuals") or any modification/substitution thereof shall be deemed to be tests conforming to Good Industry Practice for quality assurance.
- (x) The Authority's Engineer shall test check at least 50 (fifty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.
- (xi) The timing of tests referred to in Paragraph 4 (ix), and the criteria for acceptance/ rejection of their results shall be determined by the Authority's Engineer in accordance with the Quality Control Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Contractor for its own quality assurance in accordance with Good Industry Practice.
- (xii) In the event that results of any tests conducted under Clause 11.10 establish any Defects or deficiencies in the Works, the Authority's Engineer shall require the Contractor to carry out remedial measures.
- (xiii) The Authority's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project Highway, whether because of an accident, unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.
- (xiv) In the event that the Contractor fails to achieve any of the Project Milestones, the Authority's Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the Authority's Engineer shall determine that completion of the Project Highway is not feasible within the time specified in the Agreement, it shall require the Contractor to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the Contractor, the Authority's Engineer shall review the same and send its comments to the Authority and the Contractor forthwith.
- (xv) The Authority's Engineer shall obtain from the Contractor a copy of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.2.
- (xvi) Authority's Engineer may recommend to the Authority suspension of the whole or part of the Works if the work threatens the safety of the Users and pedestrians. After the Contractor has

carried out remedial measure, the Authority's Engineer shall inspect such remedial measures forthwith and make a report to the Authority recommending whether or not the suspension hereunder may be revoked.

- (xvii) In the event that the Contractor carries out any remedial measures to secure the safety of suspended works and Users, and requires the Authority's Engineer to inspect such works, the Authority's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the Authority forthwith, recommending whether or not such suspension may be revoked by the Authority.
- (xviii) The Authority's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate, as the case may be. For carrying out its functions under this Paragraph 4 (xviii) and all matters incidental thereto, the Authority's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

### **5. Maintenance Period**

- (i) The Authority's Engineer shall aid and advise the Contractor in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with the Contractor.
- (ii) The Authority's Engineer shall undertake regular inspections, at least once every month, to evaluate compliance with the Maintenance Requirements and submit a Maintenance Inspection Report to the Authority and the Contractor.
- (iii) The Authority's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project Highway is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Contractor in this behalf.
- (iv) In respect of any defect or deficiency referred to in Paragraph 3 of Schedule- E, the Authority's Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissible limit.
- (v) The Authority's Engineer shall examine the request of the Contractor for closure of any lane(s) of the Project Highway for undertaking maintenance/repair thereof, and shall grant permission with such modifications, as it may deem necessary, within 5 (five) days of receiving a request from the Contractor. Upon expiry of the permitted period of closure, the Authority's Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the Contractor to the Authority under Clause 14.5.

### **6. Determination of costs and time**

- (i) The Authority's Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.
- (ii) The Authority's Engineer shall determine the period of Time Extension that is required to be determined by it under the Agreement.
- (iii) The Authority's Engineer shall consult each Party in every case of determination in accordance

with the provisions of Clause 18.5.

## 7. Payments

- (i) The Authority's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the Authority's Engineer in accordance with the provisions of Clause 10.2 (iv) (d).
- (ii) Authority's Engineer shall -
  - (a) within 10 (ten) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and
  - (b) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, deliver to the Authority and the Contractor an Interim Payment Certificate certifying the amount due and payable to the Contractor, after adjustments in accordance with the provisions of Clause 19.10.
- (iii) The Authority's Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, verify the Contractor's monthly statement and certify the amount to be paid to the Contractor in accordance with the provisions of the Agreement.
- (iv) The Authority's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance in accordance with the provisions of Clause 19.16.

## 8. Other duties and functions

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

## 9. Miscellaneous

- (i) A copy of all communications, comments, instructions, Drawings or Documents sent by the Authority's Engineer to the Contractor pursuant to this TOR, and a copy of all the test results with comments of the Authority's Engineer thereon, shall be furnished by the Authority's Engineer to the Authority forthwith.
- (ii) The Authority's Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.
- (iii) Within 90 (ninety) days of the Project Completion Date, the Authority's Engineer shall obtain a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the Authority, reflecting the Project Highway as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project Highway and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the Authority against receipt thereof.
- (iv) The Authority's Engineer, if called upon by the Authority or the Contractor or both, shall mediate

- and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.
- (v) The Authority's Engineer shall inform the Authority and the Contractor of any event of Contractor's Default within one week of its occurrence.



## Schedule - O

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

### Forms of Payment Statements

#### 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 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

#### 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

**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

#### 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 the value of the contract price.
- (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**

##### **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.

##### **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. Inspection of permanent lining inside the tunnels to be done visually in case of doubt the rebound hammer and UPV tests to be carried out. Site inspection test for functionality of all E&M and ventilation system for tunnels to be done.

**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 [Comments](the "**Project Highway**") on Engineering, Procurement and Construction (EPC) basis through ..... (Name of Contractor), hereby certify that the Tests on completion of Maintenance Period in accordance with Article 14 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement and I hereby certify that the Authority has taken over the Project highway from the Contractor on this day.....

SIGNED, SEALED AND DELIVERED

(Signature) (Name

and designation of Authority's Representative)

(Address)

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