National Highways & Infrastructure Development Corporation Limited

Ministry of Road Transport & Highways,
(Govt. of India)

SCHEDULES

For

"Construction of Twin Tube Uni-directional Aizawl Bypass Tunnel of 2.5 km and its approaches of 2.1 km from km 10.600 to km 15.200 (Package-2) on Sairang - Phaibawk section of NH-6 in the State of Mizoram on EPC Mode.)"

2023

National Highways & Infrastructure Development Corporation Ltd
3rd floor, PTI Building, 4-Parliament Street,
New Delhi – 110001

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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**.

(v) The status of the environment clearances obtained or awaited is given in **Annex-IV**.

Annex -I

(Schedule-A)

Annex –I: Site

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

1. Site

The Site of the Two-Lane Project Highway comprises the section of [National Highway -06] of from Km 10+600 to Km 15+200 of Aizawl Bypass on realignment of NH-06 in the State of Mizoram. The land, carriageway and structures comprising the Site are described below.

Sr.No.	Package No	Design		Remarks
		From	To	
1	P-2	10+600 X = 471299.257 Y = 2628357.847	15+200 X = 475336.897 Y = 2627064.082	Green field Alignment on Northeast of Aizawl City

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:

Sl. No.	Design Chainage (km)		Length in m (Design)	Existing/ Available ROW (m)	Remarks
	From	To			
1	10+600	15+200	4.600	-	Green field Alignment on Northeast of Aizawl City

3. Carriageway

New Green field Alignment on Northeast of Aizawl City. There is no existing carriageway.

4. Major Bridges

The Site includes the following Major Bridges:

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

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

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

Sr. 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:

Sr. 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	Superstructure		
Nil						

8. Railway level crossings

The Site includes the following railway level crossings

Sr. 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:

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

11. Bus bays

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

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

12. Truck Lay byes

The details of truck lay byes are as follows:

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

13. Road side drains

The details of the roadside drains are as follows:

S. No.	Location		Type	
	From km	To km	Masonry/cc (Pucca)	Earthen (Kutcha)
Nil				

14. Major junctions

The details of major junctions are as follows:

Sr. No.	Location (Km)	At grade	Separated	Category of Cross Road			
				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:

Sl. No.	Existing Chainage(Km)	Type	Type of junction	Place
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)
Nil			

17. Built Up Locations

The following are the Built-up locations on the Project Road.

Sr.	Name of Village	Name of	Existing Chainage	Block	District

No.		Road	From	To		
Nil						

Details of Existing utilities

The existing utilities are as below:

17.1 Electrical utilities

The site includes the following electrical utilities: -

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

SL.	Chainage		Length (in Km)				Crossings			
	From	To	400KV	220KV	110KV	66KV	400KV	220KV	110KV	66KV
Nil										

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

SL.	Chainage		No of poles affected			Transformers	
	From	To	33KV	11KV	LT	No	Capacity
Nil							

17.2 Public Health utilities (Water/Sewage Pipelines)

(a) The site includes the following Public Health utilities: -

S. No	Chainage		Length (in Km)
	From	To	Water Supply line
Nil			

(b) Bore well/Hand Pump within RoW – **Nil**

(c) Water Tank within RoW - **Nil**

17.3 Any Other Lines: **No**

18. Other structures]

[Provide details of other structures, if any.]

Total number of structures on the Site is noted below:

a) Total No. of Major Bridges - Nil

b) Total No. of Railway Over/Under Bridges - Nil

c) Total No. of Minor Bridges - Nil

d) Total No. of Pipe Culverts - Nil

e) Total No. of Slab Culverts - Nil

f) Total No. of Box Culverts - Nil

g)	Total No. of Flyovers	-	Nil
h)	Level Crossings	-	Nil
i)	Pedestrian Underpass	-	Nil

Annex - II

(As per Clause 8.3 (i))

(Schedule-A)

Annex – II: Dates for providing Right of Way of Construction Zone

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

Sl. No	From km to km	Length (km)	Width (m)	Date of providing Right of Way*
(1)	**(2)**	**(3)**	**(4)**	**(5)**
(i) Full Right of Way (full width) (a) Stretch (b) Stretch (c) Stretch	Km 10+600 to Km 15+200	4.60	24m to 98.0m	90% on Appointed Date
(ii) Part Right of Way (part width) (a) Stretch (b) Stretch (c) Stretch				
(iii) Balance Right of Way (width) (a) Stretch (b) Stretch (c) Stretch				

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

Annex - III

(Schedule-A)

Annex – III: **Alignment Plans**

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

(i) The alignment of the Project Highway is enclosed in alignment plan. Finished road level indicated in the alignment plan shall be followed by the contractor as minimum FRL. In any case, the finished road level of the project highway shall not be less than those indicated in the alignment plan. The contractor shall, however, improve/upgrade the Road profile as indicated in Annex-III based on site/design requirement.

(ii) Traffic Signage plan of the Project Highway showing numbers & location of traffic signs is enclosed. The contractor shall, however, improve/upgrade upon the traffic signage plan as indicated in Annex-III based on site/design requirement as per the relevant specifications/IRC Codes/Manual.

Annex - IV

(Schedule-A)

Annex – IV: Environment Clearances

The following environment clearances have been obtained: [***]

The following environment clearances are awaited: [***]

The project Highway does not require Environment Clearance as per MoRTH corrigendum dated 22.08. 2013.The muck dumping sites in forest area stand identified and freezed by Forest department to be abided by agency during dumping of muck as stated in Schedule 'F'

Schedule - B

(See Clause 2.1)

Development of the Project Highway

1. Development of the Project Highway

Development of the Project Highway shall include design and construction of the Project Highway as described in this Schedule-B and in Schedule-C.

2. [Rehabilitation and augmentation]

Rehabilitation and augmentation shall include Two/Four-Laning Paved shoulder and Strengthening 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.

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Annex -I

(Schedule –B)

Annex -I: Description of Two/Four –Laning

Coordinates of Start and End of Project Stretch

Location		UTM Co-ordinate	
Description	**Design Chainage**	**Easting (m)**	**Northing (m)**
Start of Project Road	10+600	471299.257	2628357.847
End of Project Road	15+200	475336.897	2627064.082

1. Widening of the Existing Highway

(i) The Project Highway shall follow the existing alignment unless otherwise specified by the Authority and shown in the alignment plans specified in Annex-III of Schedule-A. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for [Mountainous/ Steep] terrain to the extent land is available.

(ii) Width of Carriageway

(a) Four-Lane Divided highway with Paved shoulders shall be undertaken. The paved carriageway shall be [7 (seven) m] wide in accordance with the typical cross sections drawings in the Manual.

Provided that in the built-up areas [refer to paragraphs 2.1 (ii) of the Manual and provide necessary details]: the width of the carriageway shall be as specified in the following table:

Sl. No.	**Built-up stretch (Township)**	**Location in m**		**Width (m)**	**Typical cross section (Ref. to Manual)**
		From	**To**		
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(ii) (a) above.

2. Geometric Design and General Features

(i) General

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

(ii) Design speed

The design speed shall be the minimum design speed of 40 km per hr for Hilly terrain.

(iii) Improvement of the existing road geometrics

Not Applicable due to Green Field Alignment.

(iv) Right of Way

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

(v) Type of shoulders

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

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

(b) In open country, [Paved shoulders of 1.5 m width shall be provided with same configuration as main carriageway and hard shoulder 1.0m on valley side covered with 150 mm thick compacted layer of granular material].

(c) Design and specifications of paved shoulders and granular material shall conform to the requirements specified in paragraphs 5.10 of the 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 2.11 of the Manual.

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

Sl. No	Location (Chainage) (from km to km)	Span/ opening (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:

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

(viii) Service roads

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

Sl. No.	Location of service	Right hand side	Length (km) of

	road (from km to km)	(RHS)/Left hand side (LHS)/ or Both sides	service road
Nil			

(ix) Grade separated structures.

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

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

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

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

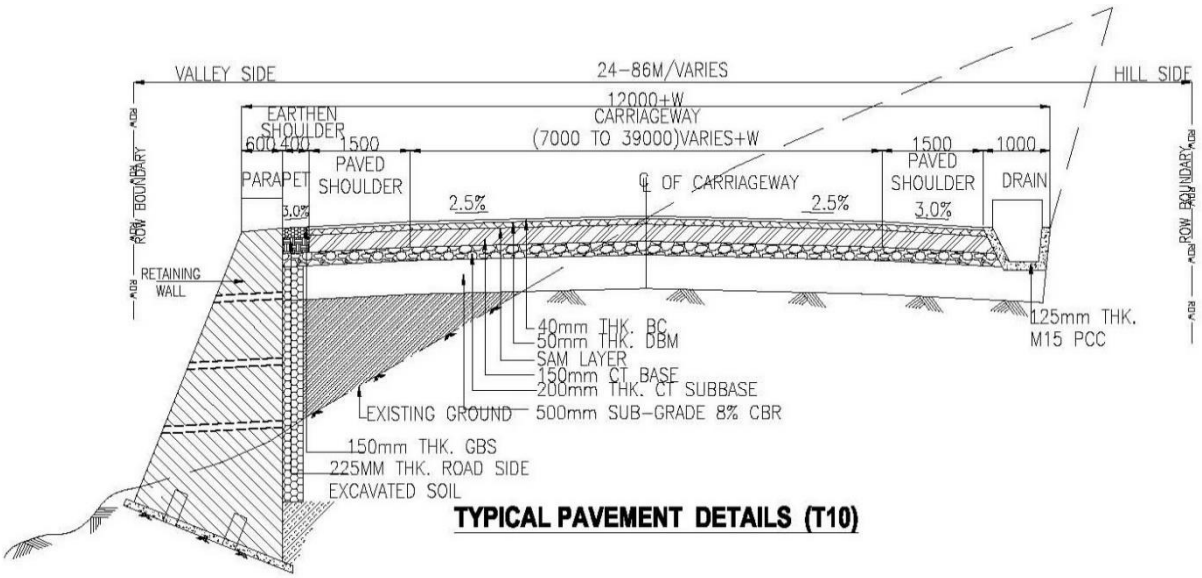
(x) Cattle and pedestrian underpass /overpass

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

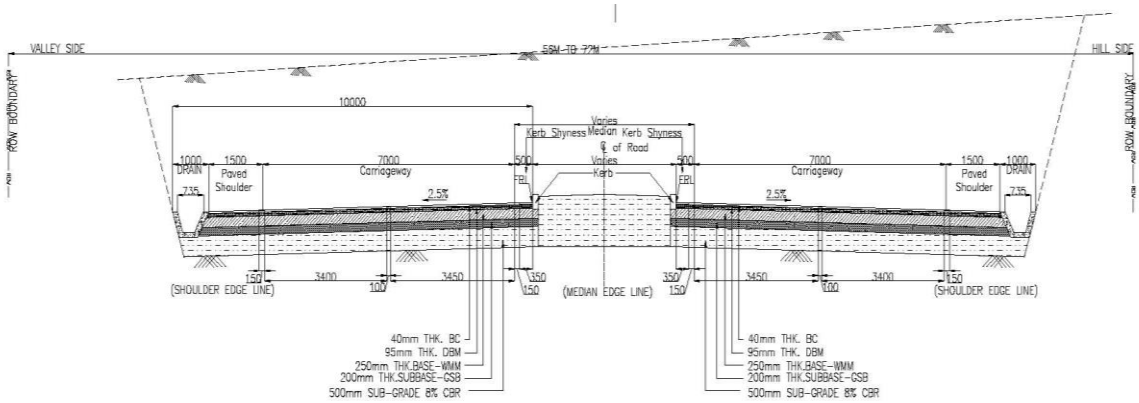
Sl. No.	Location	Type of crossing
Nil		

(xi) Typical cross-sections of the Project Highway

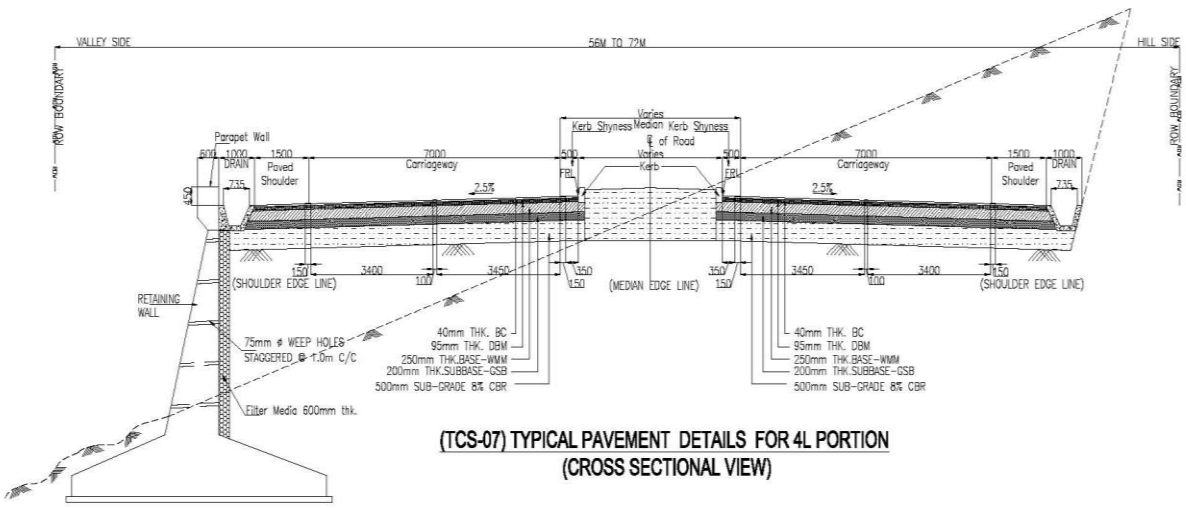
Sr.No	Description	Chainage	Typical Section
1	2Lane	From CH:10+600 to CH: 10+900	Type-10 & Ref Location R/W &B/W
2	Transition Zone	From CH:10+900 to CH: 11+050	Type-10 & Ref Location R/W &B/W
3	4 Lane Carriageway	From CH:11+050 to CH 11+600	Type-6-7-8-9 & Ref Location R/W &B/W
4	Tunnel Twin Tube Unidirectional 2Lane carriageway	From CH:11+600 to Ch:14+100	Ref Tunnel section
5	4 Lane Carriageway	From CH:14+100 to CH 14+650	Type-6-7-8-9 & Ref Location R/W &B/W
6	Transition Zone	From CH:14+650 to CH: 14+800	Type-10 & Ref Location R/W &B/W
7	2Lane	From CH:14+800 to CH:15+200	Type-10 & Ref Location R/W &B/W



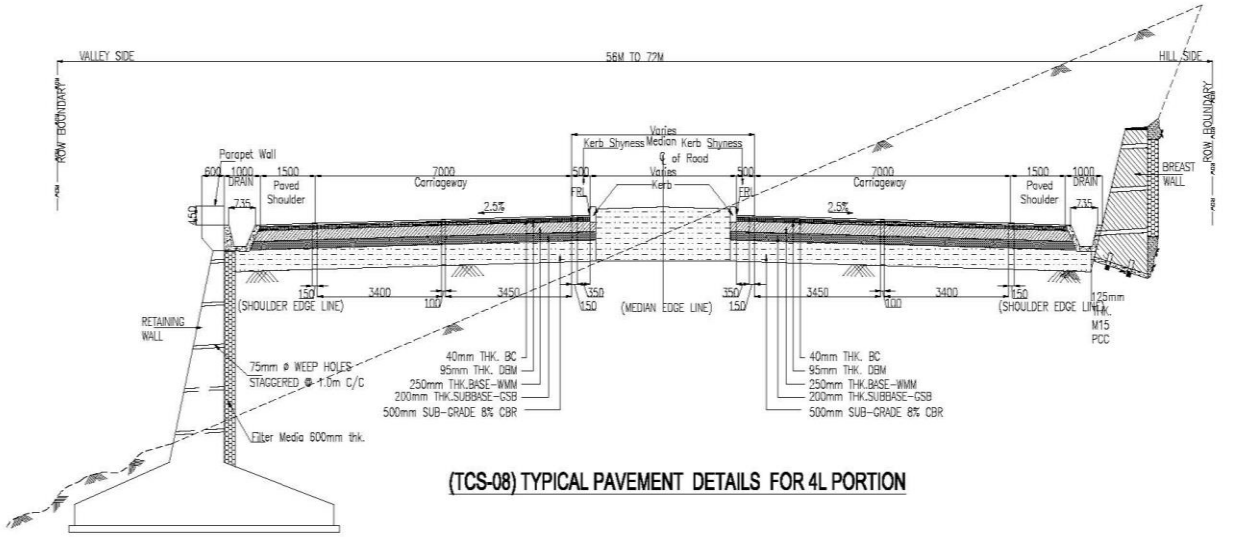
TYPICAL PAVEMENT DETAILS (T10)



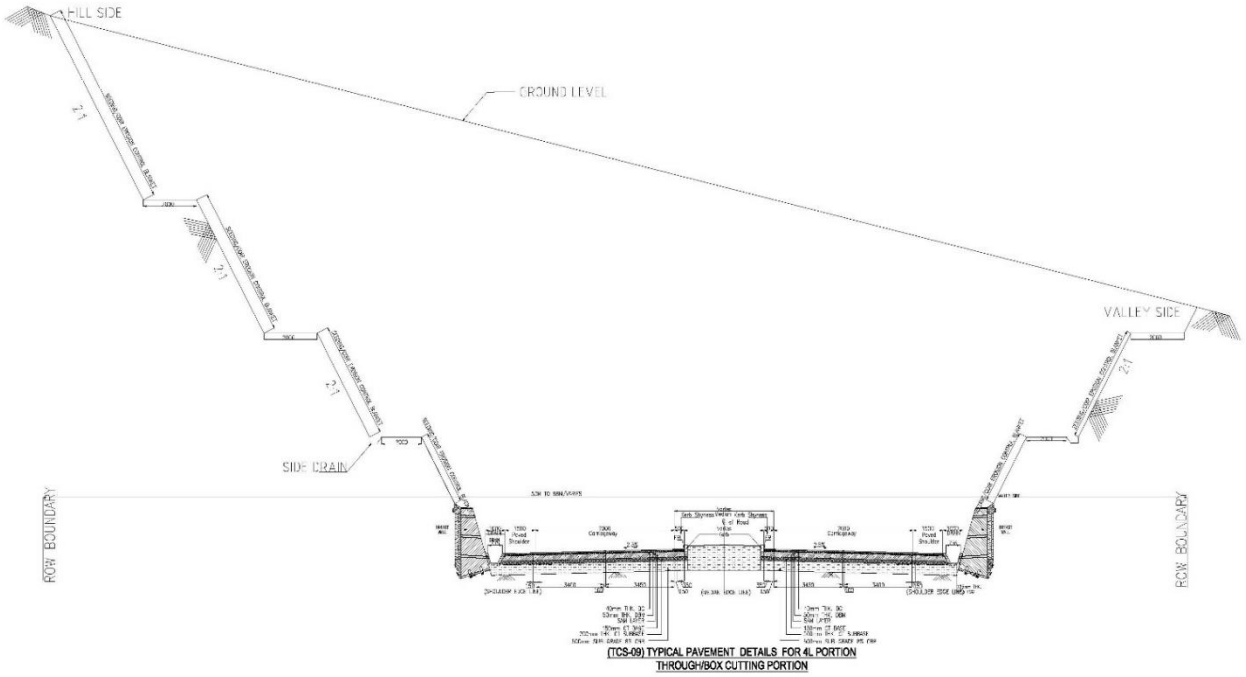
(TCS-06) TYPICAL PAVEMENT DETAILS FOR 4L PORTION



(TCS-07) TYPICAL PAVEMENT DETAILS FOR 4L PORTION
(CROSS SECTIONAL VIEW)



(TCS-08) TYPICAL PAVEMENT DETAILS FOR 4L PORTION



(TCS-09) TYPICAL PAVEMENT DETAILS FOR 4L PORTION THROUGH/BOX CUTTING PORTION

3. Intersections and Grade Separators

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

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

(i) At-grade intersections

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

(ii) Grade separated intersection with/without ramps

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

4. Road Embankment and Cut Section

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

(ii) Raising of the existing road

The existing road shall be raised in the following sections:

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

5. Pavement Design

For Road portion

(i) Pavement design shall be carried out in accordance with Section 5 of the Manual. CBR8% and 20 MSA.

(ii) Type of pavement

Flexible Pavement

(iii) Design requirements

Notwithstanding anything to the contrary contained in this agreement, the contractor shall design the pavement of main carriageway for design traffic of 20 MSA with a minimum design period of 20 years. CBR taken for the road is 8%.

a. Design Period and strategy

As per clause 5.4.1 (i), 5.9 & 5.10 of IRC: SP: 73- 2018 & IRC: SP:84-2019

Flexible pavement for new pavement or for widening and strengthening of the existing pavement shall be designed for a minimum design period of 20 years. Stage construction shall not be permitted

b. Design Traffic

As per clause 5.4.1 (i), 5.9 & 5.10 of IRC: SP: 73- 2018

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

For Tunnel Portion

Type of pavement: Rigid Pavement as Per IRC: 58:2015

(iv) Reconstruction of stretches

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

Sr.No.	Stretch in Km		Remarks
	From	To	
NIl			

6. Roadside Drainage

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

The improvements in the drainage and the slope erosion shall be made as per the following norms:

Open side trapezoidal lined cross section drain shall be provided on hill sides of the project highway in order to intercept surface water from the carriageway, shoulders and hill slopes. The drains outfall into the natural water courses i.e. either in culverts or bridges. Table below gives the location of lined drains.

These are guidelines for minimum provisions. However, contractor has to design as per requirement of road in accordance with manual.

Sr. No.	Chainage in m		Length in m	Remarks
	From	To		
1	10+600	15+200	2360	Trapezoidal line drain
2	Box cutting portion		1410.0	Trapezoidal line drain
3	Catch water drain		1050.0	Trapezoidal Drain

Note: (The above locations shall be reviewed in consultation with the AE at the time of construction as per the site condition).

6.1 Chutes Drain

Surface run off on a hill slope flows down in the form of natural gulleys / chutes. The water entrapped in the catch water drains is also brought down by connecting them with existing natural gulleys. It is therefore desired to provide lined chutes to lead the discharge to the catch pit of culvert or to a natural drainage channel.

Sr.No.	Clear Width of Chute	Length of Chute	Remarks
1	1.85	550	Type-1
2	2.70	250	Type-2
3	4.00	250	Type-3

Note: (The above locations shall be reviewed in consultation with the Authority

Engineer at the time of construction as per the site condition).

7. Design of Structures

(i) General

(a) All bridges, culverts and structures shall be designed and constructed in accordance with Section 7 of the Manual and shall conform to the cross-sectional features and other details specified therein.

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

Sr.No.	Bridge at Km	Width of carriageway and cross-sectional features*
1	11+530	2x10.15 m to total width 96.428 (SK)
2	14+325	2x10.15 m to total width 46.90

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

Sr.No.	Location at Km	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:

Sr.No.	Bridge at Km	Utility services to be carried	Remarks
1	11+530	OFC and Electric cable	
2	14+325	OFC and Electric cable	

(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 section 7 of the Manual.

(ii) Culverts

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

(b) Reconstruction of existing culverts:

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

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

(c) Widening of existing culverts:

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

Sl. No	Culvert location	Type, span, height and width of existing culvert	Repairs to be carried out
Nil			

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

Sr. No.	Culvert location in m	Span / Opening (m)	Width (m)	Remarks, if any*
1	11020	1 X 3	39.50	RCC BOX
2	11065	1 X 2	46.30	RCC BOX
3	11170	1 X 2	46.90	RCC BOX
4	11275	1 X 4	46.90	RCC BOX
5	11530	1 X 3	21.10	RCC BOX
6	14825	1 X 2	12.00	RCC BOX
7	15050	1 X 2	12.60	RCC BOX
8	15100	1 X 2	12.60	RCC BOX

Note: (The above locations and size shall be reviewed in consultation with the AE at the time of construction as per the site condition).

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

Sl.No.	Location at Km	Type of repair required
Nil		

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

(iii) Bridges

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

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

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

*Attach GAD

(ii) The following narrow bridges shall be widened:

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

				widening @
Nil				

@ Attach cross-section

(b) Additional new bridges

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

Sr. No.	Location (Km)	River Name	Proposed bridge on Aizawl Bypass		
			Span Arrangement	Carria geway	Total width
1	11+530	Durtlang Lui	1X 8	2x10.15	96.428 (SK)
2	14+325	Muthi Lui	1 X 10	2x10.15	46.90

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

Sl. No.	Location at Km	Remarks, if any
Nil		

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

Sl. No.	Location at Km	Remarks, if any
Nil		

(e) Drainage system for bridge decks

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

(f) Structures in marine environment

[Refer to paragraph 7.21 of the Manual and specify the necessary measures / treatments for protecting structures in marine environment, where applicable]

(iv) Rail-road bridges

(a) Design, construction and detailing of ROB/RUB shall be as specified in section 7 of the Manual. -Nil

(b) Road over-bridges

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

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

(c) Road under-bridges

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

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

(v) Grade separated structures

The grade separated structures shall be provided at the locations and of the type and length specified in paragraphs 2.9 and 3 of this Annex-I.

(vi) Repairs and strengthening of bridges and structures

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

(a) Bridges

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

(b) ROB/RUB

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

(c) Overpasses/Underpasses and other structures

(d)

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

(vii) List of Major Structures

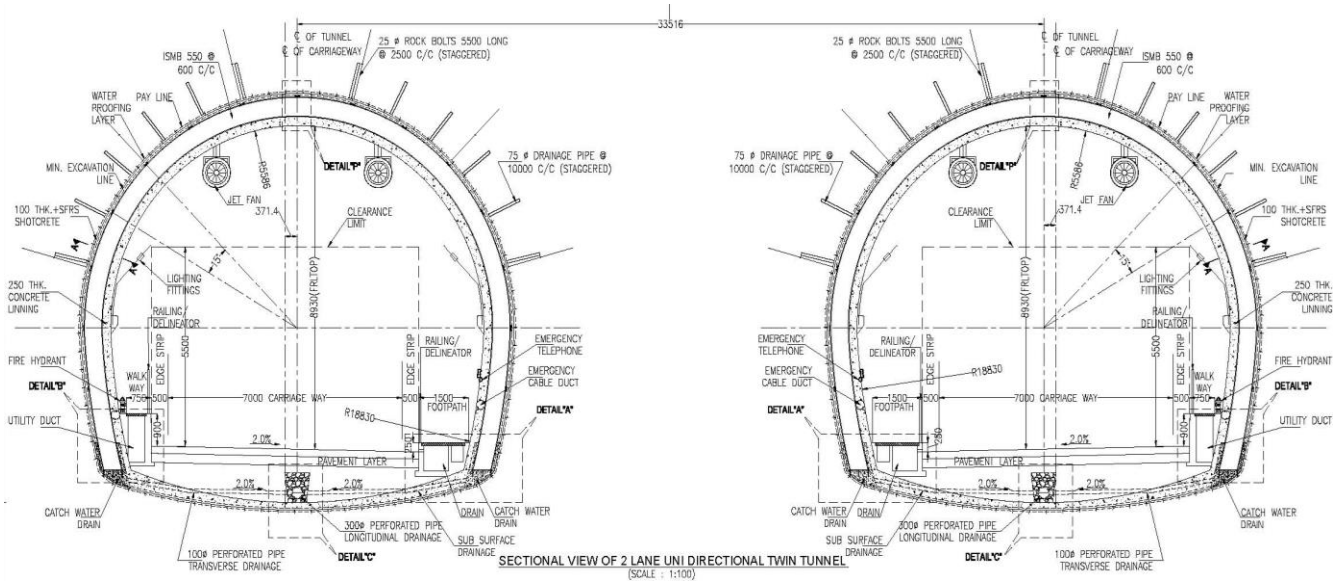
Construction of twin tube 2 Lane Tunnel as per specification configuration of IRC: SP-91-2019 and relevant IRC standards and MoRT&H guidelines.

(a) Functional/Safety Requirements Based on Length of Tunnels

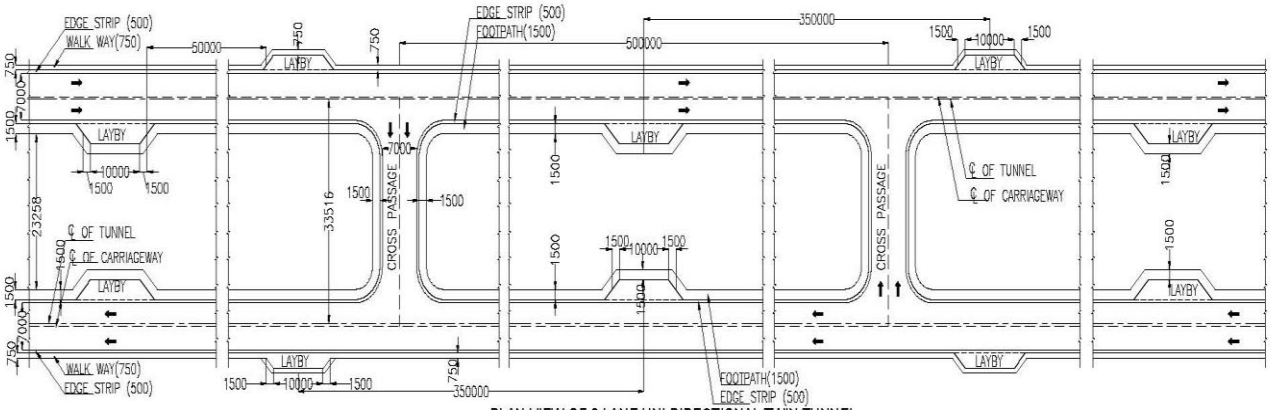
Classification of Tunnel	Double Tube Uni-Directional				
	CP	Vent	Light	Comm	Fire Safety
Long tunnel >1500 m	Yes	Yes	Yes	Yes	Yes

- Fire safety - Fire extinguisher at spacing of 100 m
- Communication - Telephone at spacing about 100 m
- Lighting - Tunnels Lighting as IRC:SP-91-2019
- Cross Passages - Cross passages provided at 500 m spacing

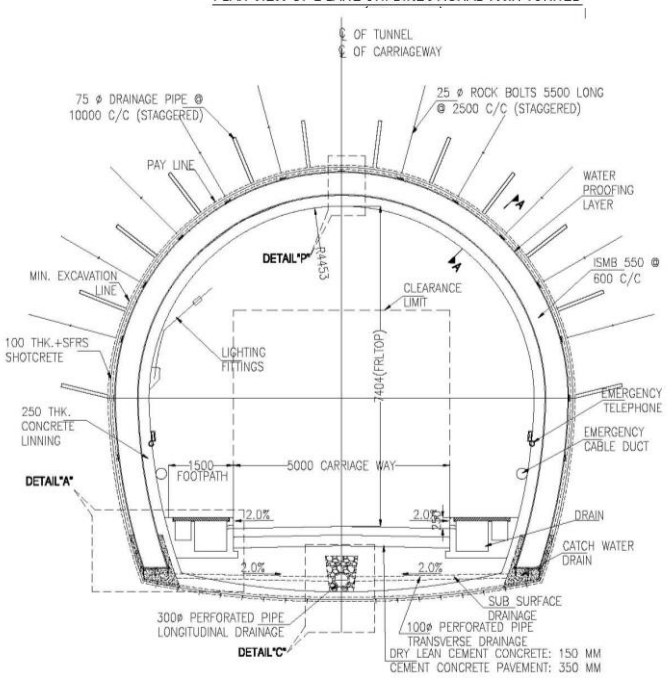
Sl.No	Chainage	Length	Carriageway	Remarks
1	CH: 11600 to CH: 14100	2500.00m	7.0 m (Walkway &utility 750+Edge strip 500+Carriageway 7000+Edge Strip 500+ Footpath cum drain & utility 1500) mm	Twin Tube Tunnel, having Inlet Portal 100.0 m and Outlet Portal 100.0 m Rigid Pavement composition within the Tunnel portion DLC – &utility 150 mm PQC – 350 mm
2	Cross Passage	4x22.7m	(Footpath cum drain & utility 1500+Edge strip 500+Carriageway 5000+Edge Strip 500+ Footpath cum drain & utility 1500) mm	Rigid Pavement composition within the Tunnel portion DLC – &utility 150 mm PQC – 350 mm



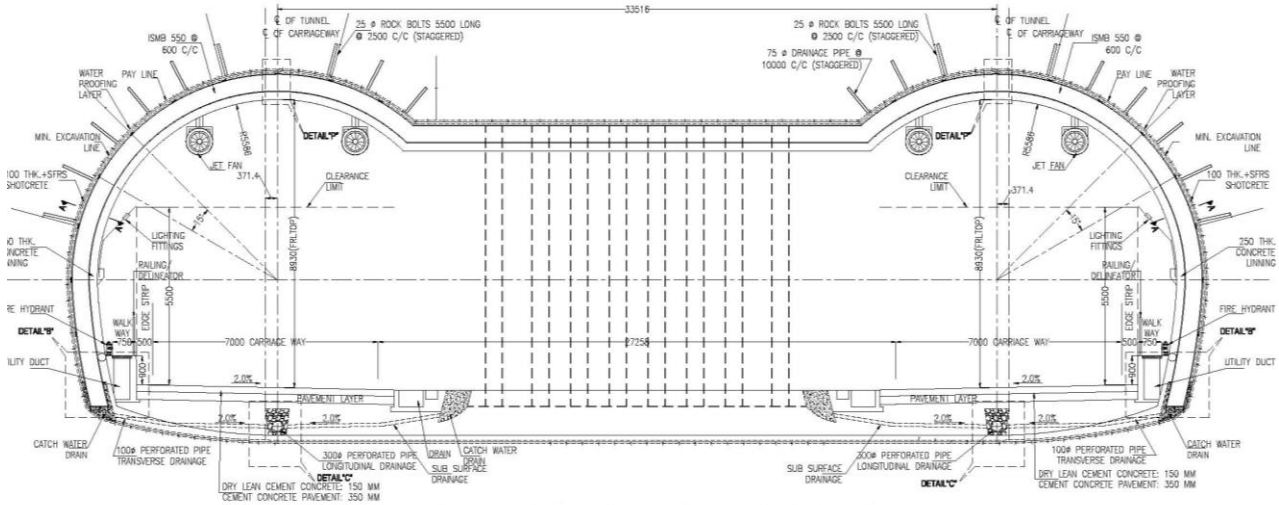
SECTIONAL VIEW OF 2 LANE UNI DIRECTIONAL TWIN TUNNEL
(SCALE : 1:100)



PLAN VIEW OF 2 LANE UNI DIRECTIONAL TWIN TUNNEL



SECTION OF CROSS PASSAGES TUNNEL
(SCALE : 1:100)



SECTIONAL VIEW OF 2 LANE UNI DIRECTIONAL TWIN TUNNEL CROSS PASSAGES
(SCALE : 1:100)

(b) Tunnel Ventilation System:

The ventilation system chosen is longitudinal ventilation with Jet Fans . 2x13 Nos Jet in tube. (1487 N Thrust). Fresh air demand can be provided to the tunnel without exceeding the maximum airspeed in tunnel (10 m/s according to RVS 09.02.31).

- Fire thermal power of 50 MW.
- The defining parameter here is the fire power, that depends on inflammable goods, fuels, vehicle fire etc. that will be transported through the tunnels.
- 70% light vehicles (35% petrol, 35% diesel), and 30 % heavy vehicles (trucks, busses,)
- Twin tube unidirectional tunnels having 2 lane for each direction.

The longitudinal (Jet) fans need to comply with fire rating (250°C - 2 hrs/400 °C - 2 hrs) in accordance with design of the tunnel

The concentration of CO inside the tunnel should not exceed 70 ppm for normal flowing traffic. This concentration may be permitted up to 100 ppm during traffic congestion. If the CO concentration reaches 200 ppm, tunnel operations should be immediately suspended.

It is recommended to permit a maximum average in-tunnel concentration of 1.0 ppm NO_2 along the length of the tunnel at any one time. For a short-time working exposure a limit of 5 ppm is recommended.

(c) Automatic Tunnel Fire Detection and Warning Systems

The key objective of the automatic tunnel fire detection and warning systems is to provide prompt, accurate, and reliable fire detection while preventing nuisance alarms. Prompt and accurate fire detection will result in timely activation of tunnel ventilation system in the predetermined mode of operation to maintain tenable environment for evacuees. The successful management of tunnel fires requires that fires are detected quickly and accurately while they are still at a controllable size (in the order of 1 - 5 MW [3-17 MBtu/hr]).

(d) Fire Fighting Systems

Fire Suppression Systems with the goal to reduce the fire HRR by sufficient application of water, e.g., Deluge system with adequate water storage inside/ outside tunnel.

i) **The standpipe system for firefighting** shall be a Class – I" automatic Wet" type system. It contain water at all times that is attached to a water supply capable of supplying the system demand at all times and that requires no action other than opening loose valve to provide water at loose connections. 150 mm main waterline shall be laid on one side of the walkway of tunnel wherein standpipe system shall be installed at an interval of 80 m. The required flow rate for the standpipe system shall be 1920 l/minute. It shall be connected to a reliable water supply storage tank which is capable of supplying the system demand for a minimum of 1 hour. Construction of 4 Nos of 10mx5mx3m size of RCC Water tank.

ii) **Passive fire protection systems:** Tunnel lining and interiors may be coated with fireproof coatings to keep the strength of structural elements and concrete lining within safe temperature ranges.

(e) Tunnel lighting system

The lighting requirements of a tunnel are totally different by day and by night. At night the problem is relatively simple and consists in providing luminance level on lit routes inside the tunnel at least equal to those outside the tunnel. The design of lighting during daytime is particularly critical because of human visual system. The driver outside the tunnel cannot simultaneously perceive details on the road under lighting levels existing in a highly illuminated exterior and a relatively dark interior. When the visual system can adapt to rapid reduction in ambient illumination such as that produced when passing from daylight into the darkness of a tunnel these adjustments are not instantaneous. The adaptation process takes a certain time, depending on the amplitude of the reduction, the greater the difference, the lighting level outside and that inside the tunnel.

It is practical to distinguish different zones in the tunnel in order to determine the longitudinal lighting level at daytime lighting i.e. the access zone, the threshold zone, the transition zone, the interior zone and the exit zone.

Access Zone: The part of the open road immediately outside (in front of) the tunnel portal, covering the distance over which an approaching driver must be able to see into the tunnel. The access zone begins at the stopping distance point ahead of the portal.

Threshold Zone: The first part of the tunnel, directly after entering the portal. The total length of the threshold zone must be at least equal to the stopping distance. Over the first half of the distance, the luminance level must be equal to Lth_1- 325cd/m^2. It is recommended that from half the stopping distance onwards the lighting level may gradually and linearly decrease to a value, at the end of the threshold zone, equal to 0.4 Lth_1 i.e. Lth_2 from 325cd/m^2 to 130cd/m^2. The gradual reduction over the last half of the threshold zone may be in steps.

Transition Zone: A zone of diminished light level downstream of the threshold zone to enable gradual adaptation to the interior tunnel lighting level. The length of this zone is based on the minimum time needed for a motorist's eye to adapt to the darker tunnel interior. The average luminance levels should decrease smoothly from 130cd/m^2 to 4cd/m^2 through the transition zone.

Interior Zone: The interior zone is the portion of the tunnel where the driver's vision has adapted to a low luminance. The interior of the tunnel should be illuminated to a level of 4cd/m^2.

Exit Zone: The exit zone should be illuminated in the same way as the access zone of the tunnel. The 150m length of road (access/exit zone) at both sides of the tunnel shall be illuminated with LED-type street lighting fixtures on poles.

Emergency lighting shall be provided. Luminaries with 2X28W T5 lamps with battery backup for 2 hours (minimum) shall be used for emergency lighting. These lights will normally remain in "off" condition and shall come into operation automatically during an emergency i.e. in case of failure of originally installed light fittings in the respective zones.

Safety in the event of a fire is of paramount importance in a tunnel. The catastrophe consequence of the tunnel fires not only resulted in loss of life, property but also

concerns of the lack of fire life safety protection in the road tunnels. Minimum fire protection requirements are based on tunnel length. Where tunnel length is 240 m and where the maximum distance from any point within the tunnel to an area of safety exceeds 120m, all safety measures are taken.

Road tunnels require a dependable power supply and a flexible power distribution system that will provide maximum reliability and power continuity for tunnel ventilation, lighting and water pumping etc. Minimum illumination level is to be maintained without interruption. During the daytime, when vehicle do not have their headlights on, a sudden loss of all tunnel illumination can cause driver confusion and result in an accident.

In order to provide reliability and continuity, diversity is needed in the power distribution system so that an alternate power source is available upon failure of the normal power source. The tunnel lighting can be provided from alternate source of emergency i.e. solar power voltalic calls.

For the two-service system, two services from separate and independent sources of the power are needed. The primary power source i.e. sub-station is existing near site. The power line can be drawn from sub-station to provide the necessary power required for the tunnels. The secondary source is anticipated to come from Alternate source of energy i.e. solar power voltalic cell.

The electric power shall be required of the order of 2.6 MW. The limitations of solar power system are the following:

- During continuous rainfall days or in cloudy weather conditions, the array cannot be charged. Under such situation main power supply from sub-station shall be restored.
- Shadow free area is necessary for installation of array.

(f) Tunnel Drainage

Drainage is needed inside the tunnels to remove water and other liquids introduced during firefighting, washing of tunnel interiors, flushing of pavements and water dripping from vehicle during rainy season. Water will drain from the roadway into drainage inlets along each side of the tunnel. Inlets will be connected to longitudinal drain provided in concrete below the walkway leading to the portal of the tunnel. Near the portal, covered trench culvert shall be constructed to pass the discharge. Closed spaced drain inlets are preferred as they help to prevent propagation of fire by burning fuel in case of serious accident.

(g) Emergency Communication:

Emergency telephones should be provided in the tunnels and connected to the emergency power supply. When such a telephone is used, the location of the caller should be identified both at the control Centre and personnel by a warning light visible to rescuing personnel. Telephones shall be provided at suitable places such as near the portals and at emergency exists. Communication system should give the traveling public the possibility of summoning help and receiving instructions and should ensure co-ordinate rescue. Systems should raise the alarm quickly and reliably when unusual operating conditions

or emergency situations arise.

(i) Supplying, installation, testing and commissioning of basic security system comprising of PTZ / fixed camera, cabling, digital recording , HD display system in the tunnel to include control room at the gate and intercom connection to each dwelling unit, and basic IP based CCTV system to be installed at the entry and exit points, parking areas, entry point of each dwelling unit and other common areas as required including CCTV control room, required under ground cabling, digital recording system and monitor/ monitors with minimum display of 5" x 8" per camera in the control room

(ii) Supplying, installation, testing and commissioning of LAN system comprising of core switches & L2 switches with 10 G, 10 giga SFP modules, WIFI access points, WIFI controller, network management software, racks, CAT 6A cable, patch panels, OFC etc.

(iii) Supplying, installation, testing and commissioning of IP based EPABX system comprising of core switches & L2 switches with 10 G, 10 giga SFP modules, industry standard appliance server, cloud-based, enterprise-grade UC solution, MID/ENTRY level IP/SIP phone with, dual 1 gig ports, racks, CAT 6A cable, patch panels, OFC etc.

(iv) Supplying, installation, testing and commissioning of driver face and automatic number plate recording system / recognition system including high resolution camera and software set for the driver face capture and automatic number plate recording.

(v) Baggage scanner big: computer based multi energy X-Ray baggage inspection system capable of passing through bags/parcels of dimension 940mm (W) x 640mm (H) with Belt Height- 750mm-850mm with 22'724" LCD Monitor, Input/ Output rollers with frames etc. as required.

(vi) Electromechanical boom barrier with all accessories upto 6 meter length.

(vii) SCADA systems & network devices and instruments for 3D monitoring

(h) Service building and utility Building for Tunnel operation & Maintenance

During operation and Maintenance period of Tunnel several utilities required to installation and continuous supervision of security official and Tunnel maintenance engineer and supervision staff need to stay 24x7 Hour. Therefore, either end of Tunnel 4 story building having floor area 2x37.2m x 15m is proposed with all necessary amenities as per CPWD Manual

(i) Water proofing

Water proofing (Umbrella System water proofing for tunnel geotextile/ drainage layer nailed at intervals onto tunnel wall using PVC-disk, 2pcs/sq.ya. membrane 3.0mm welded to PVC disk. Joints are welded by hot wedge machine or hot air. water barrier welded to the membrane as required including cost of all materials, machinery, labour, ventilation, lighting, drainage etc., complete.)

(j) Energy Supply 2 Nos of 2.6 MW Substation

Supplying, installation, testing and commissioning of 33 kV substation

comprising 33 kV HT panel, transformers 33kV/11 kV, 11 kV HT panel, inter connections, 11 kV HT underground cabling to the distribution substations on ring main system, substation earthing, substation safety equipment including civil work component.

Power Distribution

Supplying, installation, testing and commissioning of 33 kV/0.433 kV or 11 kV/0.433 kV substation equipment comprising HT panel, dry lypc/Oil type transformers, HT cable, bus trunking from transformer to LT panel, LT panels, automatic power factor correction panel, active harmonic fdters, TVSS (transient voltage suppression system), SPD (surge protection system), essential panel, earthing, required inter-connections, substation safety equipment including LT cabling from substation to the buildings fed by the substation including civil work component.

Emergency Power Supply

Supplying, installation, testing and commissioning of DG sets, AMF panel, bus ducting/ cables from DG sets to essential panel, DG set enclosure room sound insulation/ ventilation/smoke exhaust as required, earthing of DG set system, control cabling, fuel tank/piping, DG set exhaust piping/ exhaust chimney as per CPCB norms, civil works connected with DG sets including foundation as required.

Providing and supply of 11 kV Line from Luangmual Sub-station to Aizawl Bypass inlet substation (7Km length) and Zuangtui Sub-station to Aizawl Bypass Tunnel outlet substation (2Km length) including civil works foundation as required

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.

(iii) Illuminated signages

9. **Roadside Furniture**

(i) Roadside furniture shall be provided in accordance with the provisions of Section-9 of the Manual.

(ii) Overhead traffic signs: location and size

10. **Compulsory Afforestation - Nil**

11. Hazardous Locations

The safety barriers shall also be provided at the following hazardous locations as per Clause 7.18 of the Manual (IRC: SP: 73-2018).W-Beam metal crash barriers shall however be provided for a minimum length at all hazardous locations. All hazardous locations shall be finalized in consultation with the Authority Engineer.

Sl.No.	Location stretch from (Km) to (Km)	Length in m
1	Type - A, "W" : Metal Beam Crash Barrier	1500.0

12. Special Requirement for Hill Roads

As the project involves cutting of the hill slopes, it's imperative that slopes are stabilized for ensuring longevity of the slopes 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.

Spreading & Compaction of Roadway cutting and excavation from drain and foundation of other structures surplus material in layers not exceeding 300mm thickness at selected disposal location by Dozer at least four passes including construction of approach road to dumping site.

The minimum quantity of protection works may be taken as below:

Sl.No.	Description	Unit	Quantity
1	Vetiver grass	Sqm	20000.0
2	Seeding and Mulching	Sqm	13440.00
3	Non-woven Coir Erosion Control Blanket	Sqm	13440.00
4	Turfing with Sods	Sqm	10000.00
5	Vegetated bamboo crib wall	Rm	5000.00
6*	Shotcreting with welded wire mesh	Cum	525.00
7*	25 mm diameter 3-meter-long steel rock bolts	Nos	585.00
8	Retaining wall for 3.0 m Height	Rm	80.00
9	Retaining wall for 4.0 m Height	Rm	00.00
10	Retaining wall for 5.0 m Height	Rm	80.00
11	Retaining wall for 6.0 m Height	Rm	70.00
12	Gabion RE Wall	Sqm	6700.00
13	Breast Wall 2.00m high	Rm	850.00
14	Breast Wall 3.00m high	Rm	910.00
15	Gabion Wall 2.00 m high	Rm	700.00
16	Gabion Wall 3.00 m high	Rm	600.00
17	Toe Wall 2.00 m high	Rm	220.00
18	Toe Wall 3.00 m high	Rm	240.00

*Note: Shotcreting with welded wire mesh & 25 mm diameter 3-meter-long steel rock bolts Outside of Tunnel portal

Retaining wall Location

Sr.No.	Chainage		Length in m	Height in m	Remarks	Type
	From	To				
1	10600	10630	30	5	RHS	Plum Concrete
2	10950	11000	50	3	RHS	Plum Concrete
3	11000	11070	70	6	RHS	Plum Concrete
4	11070	11100	30	3	RHS	Plum Concrete
5	11260	11310	50	5	RHS	Plum Concrete
6	14780	14880	100	12	RHS	Gabion RE Wall
7	14910	15160	250	22	RHS	Gabion RE Wall

Note: The wall length is indicative and shall be estimated by the EPC contractor.

Breast wall Location

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
1	10630	11040	410	3	RHS
2	11100	11250	150	2	RHS
3	11290	11520	230	3	RHS
4	11520	11600	80	3	RHS
5	11500	11600	100	2	LHS
6	14100	14290	190	3	RHS
7	14100	14290	190	2	LHS
8	14350	14760	410	2	RHS

Note: The wall length is indicative and shall be estimated by the EPC contractor.

(i) Bio Engineering:

Vetiver Plantation, Hydro Seeding and Hydro Mulching etc or similar works is to be done for slope protection and site mitigation measure upto a height of 8-15 m all along the slopes in each cutting locations except hard rock location which needs to be protected with appropriate applicable technologies, if required. As per Engineering Guidelines on Landslide Mitigation Measures for Indian Roads IRC: SP-106-2015, Clause 8.3.8.1, Table 8.7

(ii) Disposal of cut material

Disposal of cut material at designed disposal area. Spreading & Compaction of Roadway cutting and excavation from drain and foundation of other structures surplus material in layers not exceeding 300mm thickness at selected disposals location by Dozer at least four passes including construction of approach road to dumping site and construction of Bamboo crib wall and construction of Gabion Toe wall

13. Change of Scope

The length of Structures, Tunnels and bridges specified hereinabove shall be treated as an approximate assessment. The actual lengths as required on the basis of detailed investigations shall be determined by the Contractor in accordance with the Specifications and Standards. Any variations in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 13.

14. Utility Shifting

Shifting of obstructing existing utilities indicated in Schedule A to an appropriate location in accordance with the standards and specification of concerned Utility Owning Department is part of the scope of work of the Contractor/Concessionaire. The bidders may visit the site and assess the quantum of shifting of utilities for the projects before submission of their bid. The specification of concerned Utility Owning Department shall be applicable and followed.

Note-I:

a) The type/spacing/size/specifications of poles/towers/lines/cables to be used in shifting work shall be as per the guidelines of utility owning department and it is to be agreed solely between the contractor/Concessionaire and the utility owning department. No change of scope shall be admissible and no cost shall be paid for using different type/spacing/size/specifications in shifted work in comparison to those in the existing work or for making any overhead crossing to underground as per requirement of utility owning department and/or construction of project highway. The contractor/ concessionaire shall carry out joint inspection with utility owning department and get the estimates from the utility owning department. The assistance of the Authority is limited to giving forwarding letter on the proposal of contractor/concessionaire to utility owning department whenever asked by the contractor/concessionaire. The decision/ approval of utility owning department shall be on the contractor/concessionaire.

b) The supervision charges at the rates/charges applicable of the utility owning department shall be paid directly by the Authority to the utility Owning department as and when contractor/concessionaire furnishes demand of utility Owning Department along with a copy of estimated cost given by later.

c) The dismantled material/scrap of existing Utility to be shifted/Dismantled shall belong to the contractor/concessionaire who would be free to dispose-off the dismantled material as deemed fit by them unless the contractor/concessionaire is required to deposit the dismantled material may be availed by the contractor/concessionaire as per estimate agreed between them.

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

14.1. Details of proposed Utilities

Utilities Relocation Plan and its Schedule initially prepared by DPR consultant followed by joint verification with P&E and PHE department in presence of NHIDCL officers dully certified details as shown below:

14.2. Electrical Utilities

The site includes the following electrical utilities: -

a) Extra High-Tension Lines (EHT Lines)

Sl. No.	Chainage		Length (in Km)				Crossings			
	From	To	400KV	220KV	110KV	66KV	400KV	220KV	110KV	66KV
	NIL									

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

Sl.No.	Chainage		No of poles affected			Transformers	
	From	To	33KV	11KV	LT	No	Capacity
Nil							

14.3. Public Health utilities (Water/Sewage Pipelines)

(a) The site includes the following Public Health utilities: -

S. No.	Chainage		Length (in Km)
	From	To	Water Supply line
Nil			

(b) Bore well / Hand Pump within ROW – **NIL**

(c) Water Tank - **NIL**

14.4. Any Other line: NIL

15. Utility Duct: NIL

Note: Variation upto 10% in quantities of Utilities to be shifted will not constitute Change of Scope.

Schedule - C

(See Clause 2.1)

Project Facilities

1. Project Facilities

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

(a) toll plaza[s];

(b) roadside furniture;

(c) pedestrian facilities;

(d) tree plantation;

(e) truck lay-byes;

(f) bus-bays and bus shelters;

(g) rest areas; and

(h) others to be specified

2. Description of Project Facilities

Each of the Project Facilities is described below:

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

Note: Provide adequate details of each Project Facility to ensure their design and completion in accordance with the project-specific requirements and the provisions of the Manual.

(a) Toll Plaza

Toll plaza shall be designed as per the guidelines of manual and it is provided at following locations:

S. No.	Toll Plaza Location (Design Chainage in Km)
Nil	

(b) Roadside Furniture

The roadside furniture shall be provided in accordance with section 9.0 of the Manual of the standards and Specifications.

(c) Pedestrian Facilities

The pedestrian crossing facilities shall be provided in accordance with clause 9.8 /12.2 of the 2 lane / 4 lane manual of Standards and Specifications and Typical Cross section details provided in Appendix BI.

(d) Landscaping and Tree Plantation

The landscaping and tree plantation shall be provided. The locations for these provisions shall be finalized in consultation with Independent Engineer.

(e) Truck Lay-byes

Truck lay byes shall be provided at the following locations.

Sr. No.	Proposed Chainage (km)
1	Nil

(f) Bus Bays & Bus Shelter:

Bus Bays shall be provided at locations given below:

S. No	Proposed Chainage (km)	S. No	Proposed Chainage (km)
1	CH: 10+975	3	CH:14+450
2	CH: 11+085	4	CH:14+550

Note: * refer IRC SP-73:2018

(g) Rest Areas, Nil.

(h) Others

1. **Highway Lighting**

   Lighting shall be provided at the following locations (Minimum 40 Lux to be maintained):

   (i) Lighting shall be provided at approach to bridges, Built up areas, Toll plaza, Bus stops, truck Lay-bys, Minor junction and Major Junction and as per manual recommended in Schedule D.

   (ii) High Mast Lighting shall be provided at all Major Junctions, Toll plaza locations,

2. **Highway Patrol**

   Not applicable

3. **Ambulances**

   Not applicable

4. **Cranes**

   Not applicable

5. **Advance Traffic Management System (ATMS)**

Typical Drawing of Advance Traffic Management System (ATMS) is given and location of the same shall be as per IRC: 67: 2001 and IRC: SP: 84-2014. Provisions of other facilities, if required may be made in similar manner.

Schedule - D

(See Clause 2.1)

Specifications and Standards

1. Construction

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

2. Design Standards

All Materials, works and construction operations shall conform to the Manual of Specifications and Standards for Two-Laning of Highways (IRC: SP: 73-2018) referred to as the Manual, and MORTH Specifications for Road and Bridge Works 5th Revision 2013. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

The Hill Road Manual IRC SP 48 -1998 and IRC:52-2019 should be referred.

Guidelines for Road Tunnels (First Revision) IRC: SP:91 - 2019

TECHNICAL SPECIFICATIONS FOR TUNNEL WORK: VOLUME – V SHOULD BE REFERRED.

THE NATIONAL GREEN TRIBUNAL PRINCIPAL BENCH, NEW DELHI on 01th Nov, 2018

Following recommendations and suggestions have been made for dumping muck & dumping yard:-

a. Before dumping muck at the dumping yard first of all retaining/ gabion walls of specified capacity and suitable design should be constructed.

b. All the dumping sites should be properly designed with retaining wall/gabion structures and should be maintained regularly in order to check the spillage of the muck down the slope and into the rivers and other places.

c. Wherever boulders are rolling down along with much, gabion structures/ retaining wall should have sufficient foundation and bottom width should be 4-5 m. Length of one gabion structure should not be more than 6-8 m. Wherever more length of gabion structure is required one gabion structure should be bound with another

d. If any new dumping sites are identified in future, then the retaining /gabion structures should be constructed at suitable vertical interval of 5-6 m so that entire disposed muck may not exert pressure only at one wall/ toe wall rather the load of muck should be distributed on different walls.

e. Angle of repose of muck should be maintained between 30 to 450. Long slopes should be intercepted to several short ones with the help of 1.5 to 2.0 m

wide berms / terraces/ benches in between in order to maintain less than critical velocity for runoff water and simultaneously mass erosion with be controlled.

f. The capacity/ volume of muck disposal site should be more than volume of muck to be disposed.

g. Proper sign boards indicating the name, number, location, dumping capacity, etc. should be installed at all the dumping sites.

h. Dumping sites which are full of their capacity they should be rehabilitated with local grass or shrubs. Jute geo textile (JGT) may also be used for establishment of vegetation at vulnerable sites.

i. Gabion walls should be constructed above HFL of River. If slope is very high to construct a gabion wall, then a RCC/stone masonry retaining wall should be given at bank of River after proper design including foundation. Height of this wall should be well above the HFL of River.

j. All construction sites should follow and comply with the provisions of the Construction and Demolition Waste Management Rules, 2016".

Annex -I

(Schedule-D)

Annex –I: 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 [Guidelines for Alignment survey and Geometric design of Hill roads – IRC: 52-2019 and Hill Road manual IRC: SP 48 -1998 and IRC SP 73-2018], referred to as the Manual, and MORTH Specifications for Road and Bridge Works. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2. Deviations from the Specifications and Standards

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

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

Clause Referred in Manual	Item	Provision as per Manual	Modified Provision	Remarks
2.2.1	Minimum design speed in hilly terrain.	40 kmph	Where the horizontal curve radius is not meeting the criteria as per clause 2.9.4 and table 2.5 of IRC: SP: 73-2018.	Speed is restricted for Curve having radius less 50m.

(iii) [Note 1: Deviations from the aforesaid Specifications and Standards shall be listed out here. Such deviations shall be specified only if they are considered essential in view of project-specific requirements.]

Schedule - E

(See Clauses 2.1 and 14.2)

Maintenance Requirements

1. Maintenance Requirements

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

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

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

[Specify all the relevant documents]

2. Repair/rectification of Defects and deficiencies

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

3. Other Defects and deficiencies

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

4. Extension of time limit

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

5. Emergency repairs/restoration

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

6. Daily inspection by the Contractor

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

7. Pre-monsoon inspection / Post-monsoon inspection

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and drainage system before [1st June] every year in accordance with the guidelines contained in IRC: SP35. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Authority's Engineer before the [10th June] every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Authority's Engineer a compliance report. Post monsoon inspection shall be done by the [30th September] and the inspection report together with details of any damages observed and proposed action to remedy the same shall be sent to the Authority's Engineer.

8. Repairs on account of natural calamities

All damages occurring to the Project Highway on account of a Force Majeure Event or wilful default or neglect of the Authority shall be undertaken by the Authority at its own cost. The Authority may instruct the Contractor to undertake the repairs at the rates agreed between the Parties.

Annex -I

(Schedule-E)

Annex –I Repair/rectification of Defects and deficiencies

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

Table -1: Maintenance Criteria for Pavements:

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/ Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specifications
		Desirable	Acceptable					
Flexible Pavement (Pavement of MCW, Service Road, approaches of Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Potholes	Nil	< 0.1 % of area and subject to limit of 10 mm in depth	Daily	Length Measurement Unit like Scale, Tape, odometer etc.	IRC 82: 2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003 (http://www.tfhrc.com/pavement/lttp/reports/03031/)	24-48 hours	MORT&H Specification 3004.2
	Cracking	Nil	< 5 % subject to limit of 0.5 sqm for any 50 m length	Daily			7-15 days	MORT&H Specification 3004.3
	Rutting	Nil	< 5 mm	Daily	Straight Edge		15 -30 days	MORT&H Specification 3004.2
	Corrugations and Shoving	Nil	< 0.1 % of area	Daily	Length Measurement Unit like Scale, Tape, odometer etc.		2-7 days	IRC:82-2015
	Bleeding	Nil	< 1 % of area	Daily			3-7 days	MORT&H Specification 3004.4
	Ravelling/ Stripping	Nil	< 1 % of area	Daily			7-15 days	IRC:82-2015 read with IRC SP 81
	Edge Deformation/ Breaking	Nil	< 1 m for any 100 m section and width < 0.1 m at any location, restricted to 30 cm from the edge	Daily			7- 15 days	IRC:82-2015
	Roughness BI	2000 mm/km	2400 mm/km	Bi-Annually	Class I Profilometer SCRIM (Sideway-force Coefficient Routine Investigation Machine or equivalent)	Class I Profilometer : ASTM E950 (98) :2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling Reference ASTM E1656 -94: 2000- Standard Guide for Classification of Automatic Pavement Condition Survey	180 days	IRC:82-2015
	Skid Number	60SN	50SN	Bi-Annually			180 days	BS: 7941-1: 2006
	Pavement Condition Index	3	2.1	Bi-Annually			180 days	IRC:82-2015
	Other Pavement Distresses			Bi-Annually			2-7 days	IRC:82-2015

<table>
<tr><th rowspan="2">Asset Type</th><th rowspan="2">Performance Parameter</th><th colspan="2">Level of Service (LOS)</th><th rowspan="2">Frequency of Inspection</th><th rowspan="2">Tools/ Equipment</th><th rowspan="2">Standards and References for Inspection and Data Analysis</th><th rowspan="2">Time limit for Rectification/Repair</th><th rowspan="2">Maintenance Specifications</th></tr>
<tr><th>Desirable</th><th>Acceptable</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Equipment</td><td></td><td></td></tr>
<tr><td></td><td>Deflection/ Remaining Life</td><td></td><td></td><td>Annually</td><td>Falling Weight Deflectometer</td><td>IRC 115: 2014</td><td>180 days</td><td>IRC:115-2014</td></tr>
<tr><td>Rigid Pavement (Pavement of MCW, Service Road, Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)</td><td>Roughness BI</td><td>2200mm/ km</td><td>2400mm/km</td><td>Bi-Annually</td><td>Class I Profilometer</td><td>ASTM E950 (98) :2004 and ASTM E1656 -94: 2000</td><td>180 days</td><td>IRC:SP:83-2008</td></tr>
<tr><td></td><td>Skid</td><td colspan="2">Skid Resistance no. at different speed of vehicles
<table><tr><th>Minimum SN</th><th>Traffic Speed (Km/h)</th></tr><tr><td>36</td><td>50</td></tr><tr><td>33</td><td>65</td></tr><tr><td>32</td><td>80</td></tr><tr><td>31</td><td>95</td></tr><tr><td>31</td><td>110</td></tr></table></td><td>Bi-Annually</td><td>SCRIM (Sideway-force Coefficient Routine Investigation Machine or equivalent)</td><td>IRC:SP:83-2008</td><td>180 days</td><td>IRC:SP:83-2008</td></tr>
<tr><td rowspan="5">Embankment / Slope</td><td>Edge drop at shoulders</td><td>Nil</td><td>40mm</td><td>Daily</td><td rowspan="3">Length Measurement Unit like Scale, Tape, odometer etc.</td><td rowspan="5">IRC</td><td>7-15 days</td><td>MORT&H Specification 408.4</td></tr>
<tr><td>Slope of camber/cross fall</td><td>Nil</td><td><2% variation in prescribed slope of camber /cross fall</td><td>Daily</td><td>7-15 days</td><td>MORT&H Specification 408.4</td></tr>
<tr><td>Embankment Slopes</td><td>Nil</td><td><15 % variation in prescribe side slope</td><td>Daily</td><td>7-15 days</td><td>MORT&H Specification 408.4</td></tr>
<tr><td>Embankment Protection</td><td>Nil</td><td>Nil</td><td>Daily</td><td>NA</td><td>7-15 days</td><td>MORT&H Specification</td></tr>
<tr><td>Rain Cuts/ Gullies in slope</td><td>Nil</td><td>Nil</td><td>Daily Specially During Rainy Season</td><td>NA</td><td>7-15 days</td><td>MORT&H Specification</td></tr>
</table>

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

Table -2: **Maintenance Criteria for Rigid Pavements:**

Sr. No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
CRACKING						
1	**Single Discrete Cracks Not intersecting with any joint**	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	Not applicable
			1	w < 0.2 mm. hair cracks		
			2	w = 0.2 - 0.5 mm, discernible from slow-moving car	Seal without delay	Seal, and stitch if L > lm. Within 7days
			3	w = 0.5 - 1.5 mm, discernible from fast-moving car		
			4	w = 1.5 - 3.0 mm	Seal, and stitch if L > l m. Within 7 days	Staple or Dowel Bar Retrofit, FDR for affected portion. Within 15days
			5	w > 3 mm.		
2	**Single Transverse (or Diagonal) Crack intersecting with one or more joints**	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks	Route and seal with epoxy. Within 7 days	Staple or Dowel Bar Retrofit. Within 15days
			2	w = 0.2 - 0.5 mm, discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Route, seal and stitch, if L > 1 m. Within 7 days	
			4	w = 3.0 - 6.0 mm	Dowel Bar Retrofit. Within 15 days	Full Depth Repair Dismantle and reconstruct affected. Portion with norms and specifications - See Para 5.5 & 9.2 Within 15days
			5	w > 6 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, as it may be full depth	
3	**Single Longitudinal Crack intersecting with one or more joints**	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.5 mm, discernable from slow moving vehicle	Seal with epoxy, if L > 1 m. Within 7 days	Staple or dowel bar retrofit. Within 15days
			2	w = 0.5 - 3.0 mm, discernible from fast vehicle	Route seal and stitch, if L > l m. Within 15 days	-
			3	w = 3.0 - 6.0 mm	Staple, if L > 1 m. Within 15 days	Partial Depth Repair with stapling. Within 15 days
			4	w = 6.0 - 12.0 mm, usually associated with spalling	Not Applicable, as it may be full depth	
			5	w > 12 mm, usually associated with spalling, and/or slab rocking under traffic		Full Depth Repair Dismantle and reconstruct affected portion

Sr. No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
						as per norms and specifications - See Para 5.6.4 Within 15 days
4	**Multiple Cracks intersecting with one or more joints**	**w = width of crack**	0	Nil, not discernible	No Action	-
			1	w < 0.2 mm, hair cracks	Seal, and stitch if L > l m. Within 15 days	
			2	w = 0.2 - 0.5 mm. discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Full depth repair within 15 days	Dismantle, Reinstate subbase, Reconstruct whole slab as per specifications within 30 days
			4	w = 3.0 - 6.0 mm panel broken into 2 or 3 pieces		
			5	w > 6 mm and/or panel broken into more than 4 pieces		
5	**Corner Break**	w = width of crack L = length of crack	0	Nil, not discernible	No Action	-
			1	w < 0.5 mm; only 1 corner broken	Seal with low viscosity epoxy to secure broken parts Within 7 days	Seal with epoxy seal with epoxy Within 7days
			2	w < 1.5 mm; L < 0.6 m, only one corner broken		
			3	w < 1.5 mm; L < 0.6 m, two corners broken	Partial Depth (Refer Figure 8.3 of IRC:SP: 83-2008) Within 15 days	Full depth repair
			4	w > 1.5 mm; L > 0.6 m or three corners broken		
			5	three or four corners broken		Reinstate sub-base, and reconstruct the slab as per norms and specifications within 30days
6	**Punchout (Applicable to Continuous Reinforced Concrete Pavement (CRCP) only)**	w = width of crack L = length (m/m2)	0	Nil, not discernible		No Action
			1	w < 0.5 mm; L < 3 m/m²	Not Applicable, as it may be full depth	Seal with low viscosity epoxy to secure broken parts. Within 15days
			2	either w > 0.5 mm or L < 3 m/m²		
			3	w > 1.5 mm and L < 3 m/m²		
			4	w > 3 mm, L < 3 m/m² and deformation		Full depth repair - Cut out and replace damaged area taking care not to damage reinforcement. Within 30days
			5	w > 3 mm, L > 3 m/m² and deformation		
Surface Defects						
7	Ravelling or Honeycomb type surface	r = area damaged surface/total surface	0	Nil, not discernible	**Short Term**	**Long Term**
					No action.	Not Applicable

Sr. No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
		of slab (%) h = maximum depth of damage	1	r < 2 %	Local repair of areas damaged and liable to be damaged. Within 15 days	
			2	r = 2 - 10 %		
			3	r = 10-25%	Bonded Inlay, 2 or 3 slabs if affecting. Within 30 days	
			4	r = 25 - 50 %		
			5	r > 50% and h > 25 mm	Reconstruct slabs, 4 or more slabs if affecting. Within 30 days	
8	**Scaling**	r = damaged surface/total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	**Short Term**	**Long Term**
					No action.	Not Applicable
			1	r < **2** %	Local repair of areas damaged and liable to be damaged. Within 7days	
			2	r = 2 - 10 %		
			3	r = 10 - 20%	Bonded Inlay within 15 days	
			4	r = 20 - 30 %		
			5	r > 30 % and h > 25 mm	Reconstruct slab within 30 days	
9	**Polished Surface/Glazing**	t = texture depth, sand patch test	0		No action.	Not Applicable
			1	t > 1 mm		
			2 '	t = 1 - 0.6 mm	Monitor rate of deterioration	
			3	t = 0.6 - 0.3 mm		
			4	t = 0.3 - 0.1 mm		
			5	t < 0.1 mm	Diamond Grinding if affecting 50% or more slabs in a continuous stretch of minimum 5 km. Within 30 days	
10	**Popout (Small Hole), Pothole Refer Para 8.4**	n = number/m² d = diameter h = maximum depth	0	d < 50 mm; h < 25 mm; n < 1 per 5 m²	No action.	Not Applicable
			1	d = 50 - 100 mm; h < 50 mm; n < 1 per 5 m²	Partial depth repair 65 mm deep.	
			2	d = 50 - 100 mm; h > 50 mm; n < 1 per 5 m²		

Sr. No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
					Within 15 days	
			3	d = 100 - 300 mm; h < 100 mm n < 1 per 5 m²	Partial depth repair 110mm i.e.10 mm more than the depth of the hole. Within 30 days	
			4	d = 100 - 300 mm; h > 100 mm; n < 1 per 5 m²		
			5	d > 300 mm; h > 100 mm: n > 1 per 5 m²	Full depth repair. Within 30 days	
Joint Defects						
11	**Joint Seal Defects**	loss or damage L = Length as % total joint length	0	Difficult to discern.	**Short Term**	**Long Term**
					No action.	Not Applicable
			1	Discernible, L< 25% but of little immediate consequence with regard to ingress of water or trapping incompressible material.	Clean joint, inspect later.	
			3	Notable. L > 25% insufficient protection against ingress of water and trapping incompressible material.	Clean and reapply sealant in selected locations. Within 7 days	
			5	Severe; w > 3 mm negligible protection against ingress of water and trapping incompressible material.	Clean, widen and reseal the joint. Within 7 days	
12	**Spalling of Joints**	w = width on either side of the joint L = length of spalled portion (as % joint length)	0	Nil, not discernible	No action.	Not Applicable
			1	w < 10 mm	Apply low viscosity epoxy resin/ mortar in cracked portion. Within 7 days	
			2	w = 10 - 20 mm, L < 25%		
			3	w = 20 - 40 mm, L > 25%	Partial Depth Repair. Within 15 days	
			4	w = 40 - 80 mm, L > 25%	30 - 50 mm deep, h = w + 20% of w, within 30 days	
			5	w > 80 mm, and L > 25%	50 - 100 mm deep repair. H = w + 20% of w. Within 30 days	
13	**Faulting (or Stepping) in Cracks or Joints**	f = difference of level	0	not discernible, < 1 mm	No action.	No action.
			1	f < 3 mm		

Sr. No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			2	f = 3 - 6 mm	Determine cause and observe, take action for diamond grinding	Replace the slab as appropriate. Within 30days
			3	f = 6 - 12 mm	Diamond Grinding	
			4	f= 12 - 18 mm	Raise sunken slab.	Replace the slab as appropriate. Within 30days
			5	f> 18 mm	Strengthen subgrade and sub-base by grouting and raising sunken slab	
14	**Blowup or Buckling**	h = vertical displacement from normal profile			**Short Term**	**Long Term**
			0	Nil, not discernible	No Action	
			1	h < 6 mm		
			2	h = 6 - 12 mm	Install Signs to Warn Traffic within 7 days	
			3	h = 12 - 25 mm		
			4	h > 25 mm	Full Depth Repair. Within 30 days	
			5	shattered slabs, ie 4 or more pieces	Replace broken slabs. Within 30 days	
15	**Depression**	h = negative vertical displacement from normal profile L =length	0	Not discernible, h < 5 mm	No action.	Not Applicable
			1	h = 5 - 15 mm		
			2	h = 15-30 mm, Nos <20% joints	Install Signs to Warn Traffic within 7 days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Strengthen sub-grade. Reinstate pavement at normal level if L < 20 m. Within 30 days	
			5	h > 100 mm		
16	**Heave**	h = positive vertical displacement from normal profile. L = length	0	Not discernible. h < 5 mm	**Short Term**	**Long Term**
					No action.	scrabble
			1	h = 5 - 15 mm	Follow up.	
			2	h = 15 - 30 mm, Nos <20% joints	Install Signs to Warn Traffic within 7 days	
			3	h = 30 - 50 mm		
			4	h > 50 mm or > 20% joints	Stabilise subgrade. Reinstate	

Sr. No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
			5	h > 100 mm	pavement at normal level if length < 20 m. Within 30 days	
17	**Bump**	h = vertical displacement from normal profile	0	h < 4 mm	No action	
			1	h = 4 - 7 mm	Grind, in case of new construction within 7 days	Construction Limit for New Construction.
			3	h = 7 - 15 mm	Grind, in case of ongoing Maintenance within 15 days	Replace in case of new construction. Within 30days
			5	h > 15 mm	Full Depth Repair. Within 30 days	Full Depth Repair. Within 30days
18	**Lane to Shoulder Dropoff**	f = difference of level	0	Nil, not discernible < 3mm	**Short Term**	**Long Term**
					No action.	
			1	f = 3 - 10 mm	Spot repair of shoulder within 7 days	
			2	f = 10 - 25 mm		
			3	f = 25 - 50 mm	Fill up shoulder within 7 days	
			4	f = 50 - 75 mm		For any 100 m stretch Reconstruct shoulder, if affecting 25% or more of stretch. Within 30days
			5	f > 75 mm		
Drainage						
19	**Pumping**	quantity of fines and water expelled through open joints and cracks Nos	0	not discernible	No Action	
			1 to 2	slight/ occasional Nos < 10%	Repair cracks and joints Without delay.	Inspect and repair sub-drainage at distressed sections and upstream.
			3 to 4	appreciable/ Frequent 10 - 25%	Lift or jack slab within 30 days.	
		Nos/100 m stretch	5	abundant, crack development > 25%	Repair distressed pavement sections. Strengthen subgrade and subbase. Replace slab. Within 30 days	

Sr. No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
20	**Ponding**	Ponding on slabs due to blockage of drains	0-2	No discernible problem	No action.	
			3 to 4	Blockages observed in drains, but water flowing	Clean drains etc within 7 days, Follow up	Action required to stop water damaging foundation within 30 days.
			5	Ponding, accumulation of water observed	-do-	

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

<table>
<tr><th>Asset Type</th><th>Performance Parameter</th><th>Level of Service (LOS)</th><th>Frequency of Measurement</th><th>Testing Method</th><th>Recommended Remedial measures</th><th>Time limit for Rectification</th><th>Specifications and Standards</th></tr>
<tr><td>Highway</td><td>Availability of Safe Sight Distance</td><td>As per IRC SP: 84-2014, a minimum of safe stopping sight distance shall be available throughout.
<table><tr><th>Design Speed, kmph</th><th>Desirable Minimum Sight Distance (m)</th><th>Safe Stopping Sight Distance (m)</th></tr><tr><td>100</td><td>360</td><td>180</td></tr><tr><td>80</td><td>260</td><td>130</td></tr></table></td><td>Monthly</td><td>Manual Measurements with Odometer along with video/ image backup</td><td colspan="2">Removal of obstruction within 24 hours, in case of sight line affected by temporary objects such as trees, temporary encroachments.
In case of permanent structure or design deficiency:
Removal of obstruction/improvement of deficiency at the earliest
Speed Restriction boards and suitable traffic calming measures such as transverse bar marking, blinkers, etc. shall be applied during the period of rectification.</td><td>IRC:SP 84-2014</td></tr>
<tr><td rowspan="3">Pavement Marking</td><td>Wear</td><td colspan="2"><70% of marking remaining</td><td>Bi-Annually</td><td>Visual Assessment as per Annexure-F of IRC:35-2015</td><td>Re - painting</td><td>Cat-1 Defect – within 24 hours
Cat-2 Defect - within 2 months</td><td>IRC:35-2015</td></tr>
<tr><td>Day time Visibility</td><td colspan="2">During expected life Service Time
Cement Road - 130mcd/m²/lux
Bituminous Road - 100mcd/m²/lux</td><td>Monthly</td><td>As per Annexure-D of IRC:35-2015</td><td>Re - painting</td><td>Cat-1 Defect – within 24 hours
Cat-2 Defect – within 2 months</td><td>IRC:35-2015</td></tr>
<tr><td>Night Time Visibility</td><td colspan="2"><u>Initial and Minimum Performance for Dry Retro reflectivity during night time:</u>
<table><tr><td>Design Speed</td><td colspan="2">(RL) Retro Reflectivity (mcd/m²/lux)</td></tr><tr><td></td><td>Initial (7 days)</td><td>Minimum Threshold level (TL) & warranty period required up to 2 years</td></tr><tr><td>Up to 65</td><td>200</td><td>80</td></tr><tr><td>65 - 100</td><td>250</td><td>120</td></tr></table></td><td>Bi-Annually</td><td>As per Annexure-E of IRC:35-2015</td><td>Re - painting</td><td>Cat-1 Defect – within 24 hours
Cat-2 Defect – within 2 months</td><td>IRC:35-2015</td></tr>
</table>

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
		Above 100 | 350 | 150 Initial and Minimum Performance for Night Visibility under wet condition (Retro reflectivity): Initial 7 days Retro reflectivity: 100 mcd/m²/lux Minimum Threshold Level: 50 mcd/m²/lux					
	Skid Resistance	Initial and Minimum performance for Skid Resistance: Initial (7days): 55BPN Min. Threshold: 44BPN *Note: shall be considered under urban/city traffic condition encompassing the locations like pedestrian crossings, bus bay, bus stop, cycle track intersection delineation, transverse bar markings etc	Bi-Annually	As per Annexure-G of IRC:35-2015		Within 24 hours	IRC:35-2015
Road Signs	Shape and Position	Shape and Position as per IRC:67-2012. Signboard should be clearly visible for the design speed of the section.	Daily	Visual with video/image backup	Improvement of shape, in case if shape is damaged. Relocation as per requirement	48 hours in case of Mandatory Signs, Cautionary and Informatory Signs (Single and Dual post signs) 15 Days in case of Gantry/Cantilever Sign boards	IRC:67-2012
	Retro reflectivity	As per specifications in IRC:67-2012	Bi-Annually	Testing of each signboard using Retro Reflectivity Measuring Device. In accordance with ASTM D 4956-09.	Change of signboard	48 hours in case of Mandatory Signs, Cautionary and Informatory Signs (Single and Dual post signs)	RC:67-2012

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
						1 Month in case of Gantry/Cantilever Sign boards	
Kerb	Kerb Height	As per IRC 86:1983 depending upon type of Kerb	Bi-Annually	Use of distance measuring tape	Raising Kerb Height	Within 1 Month	RC 86:1983
	Kerb Painting	Functionality: Functioning of Kerb painting as intended	Daily	Visual with video/image backup	Kerb Repainting	Within 7-days	RC 35:2015
Other Road Furniture	Reflective Pavement Markers (Road Studs)	Numbers and Functionality as per specifications in IRC:SP:84-2014 and IRC:35-2015, unless specified in Schedule-B.	Daily	Counting	New Installation	Within 2 months	IRC:SP:84-2014, IRC:35-2015
	Pedestrian Guardrail	Functionality: Functioning of guardrail as intended	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC:SP:84-2014
	Traffic Safety Barriers	Functionality: Functioning of Safety Barriers as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014, IRC:119-2015
	End Treatment of Traffic Safety Barriers	Functionality: Functioning of End Treatment as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014, IRC:119-2015
	Attenuators	Functionality: Functioning of Attenuators as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP-2014, IRC:119-2015
	Guard Posts and Delineators	Functionality: Functioning of Guard Posts and Delineators as intended	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC: 79 - 1981
	Overhead Sign Structure	Overhead sign structure shall be structurally adequate	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC:67-2012
	Traffic Blinkers	Functionality: Functioning of Traffic Blinkers as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
Highway Lighting System	Highway Lights	Illumination: Minimum 40 Lux illumination on the road surface	Daily	The illumination level shall be measured with luxmeter	Improvement in Lighting System	24 hours	IRC:SP:84-2014
		No major failure in the lighting system	Daily	-	Rectification of failure	24 hours	IRC:SP:84-2014
		No minor failure in the lighting system	Monthly	-	Rectification of failure	8 hours	IRC:SP:84-2014
	Toll Plaza Canopy Lights	Minimum 40 Lux illumination on the road surface	Daily	The illumination level shall be measured with luxmeter	Improvement in Lighting System	24 hours	IRC:SP:84-2014
		No major/minor failure in the lighting system	Daily	-	Rectification of failure	8 hours	IRC:SP:84-2014
Trees and Plantation including median plantation	Obstruction in a minimum head-room of 5.5 m above carriageway or obstruction in visibility of road signs	No obstruction due to trees	Monthly	Visual with video/image backup	Removal of trees	Immediate	IRC:SP:84-2014
	Deterioration in health of trees and bushes	Health of plantation shall be as per requirement of specifications & instructions issued by Authority from time to time	Daily	Visual with video/image backup	Timely watering and treatment. Or Replacement of Trees and Bushes.	Within 90 days	IRC:SP:84-2014
	Vegetation affecting sight line and road	Sight line shall be free from obstruction by vegetation	Daily	Visual with video/image backup	Removal of Trees	Immediate	IRC:SP 84-2014

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
	structures						
Rest Areas	Cleaning of toilets	-	Daily	-	-	Every 4 hours	
	Defects in electrical, water and sanitary installations	-	Daily	-	Rectification	24 hours	
Other Project Facilities and Approach roads	Damage or deterioration in Approach Roads, pedestrian facilities, truck lay-bys, bus-bays, bus- shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts and other works		Daily	-	Rectification	15 days	IRC:SP 84-2014
Pipe/box/ slab culverts	Free waterway/ unobstructed flow section	85% of culvert normal flow area to available.	2 times in a year (before and after rainy season)	Inspection by Bridge Engineer as per IRC SP: 35-1990 and recording of depth of silting and area of vegetation.	Cleaning silt up soils and debris in culvert barrel after rainy season, removal of bushes and vegetation, U/s of barrel, under barrel and D/s of barrel before rainy season.	15 days before onset of monsoon and within 30 days after end of rainy season.	IRC 5-2015, IRC SP:40-1993 and IRC SP:13-2004
	Leak-proof expansion joints if any	No leakage through expansion joints	Bi-Annually	Physical inspection of expansion joints as per IRC SP: 35-1990 if any, for leakage strains on walls at joints.	Fixing with sealant suitably	30 days or before onset of rains whichever comes earlier	IRC SP:40-1993 and IRC SP:69-2011
	Structurally sound	Spalling of concrete not more than 0.25 sqm Delamination of concrete not more than 0.25 sq.m.	Bi-Annually	Detailed inspection of all components of culvert as per IRC SP:35-1990	Repairs to spalling, cracking, delamination, rusting shall be followed as per IRC:	15 days	IRC SP 40-1993 and MORTH Specifications clause 2800

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
		Cracks wider than 0.3 mm not more than 1m aggregate length		and recording the defects	SP: 40-1993.		
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3 sqm, damage to solid apron (concrete apron) not more than 1 sqm	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and pitching	30 days after defect observation or 2 weeks before onset of rainy season whichever is earlier.	IRC: SP 40-1993 and IRC:SP:13-2004.
Bridges including ROBs Flyover etc. as applicable	Riding quality or user comfort	No pothole in wearing coat on bridge deck	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC or wearing coat	15 days	MORT&H Specification 2811
Bridge - Super Structure	Bumps	No bump at expansion joint	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC on either side of expansion joints, profile correction course on approach slab in case of settlement to approach embankment	15 days	MORT&H Specification 3004.2 & 2811.
	User safety (condition of crash barrier and guard rail)	No damaged or missing stretch of crash barrier or pedestrian hand railing	Daily	Visual inspection and detailed condition survey as per IRC SP: 35-1990.	Repairs and replacement of safety barriers as the case may be	3days	IRC: 5-1998, IRC SP: 84-2014 and IRC SP: 40-1993.
	Rusted reinforcement	Not more than 0.25 sqm	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with anti-corrosive coating before carrying out the	15 days	IRC SP: 40-1993 and MORTH Specification 1600.
	Spalling of concrete	Not more than 0.50 sqm					

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
	Delamination	Not more than 0.50 sq.m			repairs to affected concrete portion with epoxy mortar / concrete.		
	Cracks wider than 0.30 mm	Not more than 1m total length	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Grouting with epoxy mortar, investigating causes for cracks development and carry out necessary rehabilitation.	48 Hours	IRC SP: 40-1993 and MORTH Specification 2800.
	Rainwater seepage through deck slab	Leakage – nil	Quarterly	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Grouting of deck slab at leakage areas, waterproofing, repairs to drainage spouts	1 months	MORTH specifications 2600 & 2700.
	Deflection due to permanent loads and live loads	Within design limits.	Once in every 10 years for spans more than 40 m	Load test method	Carry out major rehabilitation works on bridge to retain original design loads capacity	6 months	IRC SP: 51-1999.
	Vibrations in bridge deck due to moving trucks	Frequency of vibrations shall not be more than 5 Hz	Once in every 5 years for spans more than 30m and every 10 years for spans between 15 to 30 m	Laser displacement sensors or laser vibro-meters	Strengthening of super structure	4 months	AASHTO LRFD specifications
	Leakage in Expansion joints	No damage to elastomeric sealant compound in strip seal expansion joint, no leakage of rain water through expansion joint in case of buried and asphalt plug and	Bi-Annually	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge	Replace of seal in expansion joint	15 days	MORTH specifications 2600 and IRC SP: 40-1993.

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
		copper strip joint.		Inspection Unit			
	Debris and dust in strip seal expansion joint	No dust or debris in expansion joint gap.	Monthly	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Cleaning of expansion joint gaps thoroughly	3 days	MORTH specifications 2600 and IRC SP: 40-1993.
	Drainage spouts	No down take pipe missing/broken below soffit of the deck slab. No silt, debris, clogging of drainage spout collection chamber.	Monthly	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Cleaning of drainage spouts thoroughly. Replacement of missing/broken down take pipes with a minimum pipe extension of 500mm below soffit of slab. Providing sealant around the drainage spout if any leakages observed.	3 days	MORTH specification 2700.
Bridge-substructure	Cracks/spalling of concrete/rusted steel	No cracks, spalling of concrete and rusted steel	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with anti-corrosive coating before carrying out repairs to substructure by grouting/guniting	30 days	IRC SP: 40-1993 and MORTH specification 2800.

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
					and micro concreting depending on type of defect noticed		
	Bearings	Delamination of bearing reinforcement not more than 5%, cracking or tearing of rubber not more than 2 locations per side, no rupture of reinforcement or rubber	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	In case of failure of even one bearing on any pier/abutment, all the bearings on that pier/abutment shall be replaced, in order to get uniform load transfer on to bearings.	3 months	MORTH specification 2810 and IRC SP: 40-199.
Bridge Foundations	Scouring around foundations	Scouring shall not be lower than maximum scour level for the bridge	Bi-Annually	Condition survey and visual inspection as per IRC SP:35-1990 using Mobile Bridge Inspection Unit. In case of doubt, use Underwater camera for inspection of deep wells in major Rivers.	Suitable protection works around pier/abutment	1 month	IRC SP: 40-1993, IRC 83-2014, MORTH specification 2500
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3 sq.m, damage to solid apron (concrete apron) not more than 1 sq.m	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and pitching.	30 days after defect observation or 2 weeks before onset of rainy season whichever is earlier.	IRC: SP 40-1993 and IRC:SP:13-2004.

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specifications and Standards
Note: Any Structure during the entire contract period which is found that does not complies with all requirements of this Table will be prepared, rehabilitated or even reconstructed under the scope of the contractor.							

Table 4: Maintenance Criteria for Structures and Culverts:

Table 5: Maintenance Criteria for Hill Roads

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

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

Table 6: Maintenance Criteria for Highway Tunnel

Nature of Defect or deficiency		**Time limit for repair/ rectification**
	Tunnel	
(a)	**Tunnel Power Supply System(Mains)**	
(i)	Any major failure of the system	24 hours
(ii)	Faults and minor failures	8 hours
(b)	**Tunnel Traffic Control System**	
(i)	Any major failure of the system	24 hours
(ii)	Faults and minor failures	8 hours
(c)	**Tunnel Fire Safety System**	
(i)	Any major Failure of the system	8 hours

Note: For all tables 1 to 6 above, latest BIS & IRC standards (even those not indicated herewith) along with MoRTH specifications shall be binding for all maintenance activities.

A. Flexible Pavement

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

Nature of Defect or deficiency		Time limit for repair/ rectification
(g)	**[Toll Plaza]**	
(h)	**Other Project Facilities and Approach roads**	
(i)	Damage in approach roads, pedestrian facilities, truck lay- byes, bus-bays, bus-shelters, cattle crossings, [Traffic Aid Posts, Medical Aid Posts] and service roads	15 (fifteen) days
(ii)	Damaged vehicles or debris on the road	4 (four) hours
(iii)	Malfunctioning of the mobile crane	4 (four) hours
Bridges		
(a)	**Superstructure**	
(i)	Any damage, cracks, spalling/ scaling Temporary measures	within 48 (forty eight) hours
	Permanent measures	within15 (fifteen) days or as specified by the Authority's Engineer
(b)	**Foundations**	
(i)	Scouring and/or cavitation	15 (fifteen) days
(c)	**Piers, abutments, return walls and wing walls**	
(i)	Cracks and damages including settlement and tilting, spalling, scaling	30 (thirty) days
(d)	**Bearings (metallic) of bridges**	
(i)	Deformation, damages, tilting or shifting of bearings	15 (fifteen) days Greasing of metallic bearings once in a year
(e)	**Joints**	
(i)	Malfunctioning of joints	15 (fifteen) days
(f)	**Other items**	
(i)	Deforming of pads in elastomeric bearings	7 (seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	3 (three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	3 (three) days (immediately within 24 hours if posing danger to safety)
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	7 (seven) days
(v)	Damage to wearing coat	15 (fifteen) days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	30 (thirty) days
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	15 (fifteen) days
(g)	**Hill Roads**	
(i)	Damage to retaining wall/breast wall	7 (seven) days

Nature of Defect or deficiency		Time limit for repair/ rectification
(ii)	Landslides requiring clearance	12 (twelve) hours
(iii)	Snow requiring clearance	24 (twenty four) hours

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

Schedule - F

(See Clause 4.1 (vii)(a))

Applicable Permits

1. Applicable Permits

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

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

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

(c) Licence for use of explosives;

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

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

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

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

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

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

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

Schedule - G

(See Clauses 7.1 and 19.2)

Annex-I : Form of E-Bank Guarantee

(See Clause 7.1)

[Performance Security /Additional Performance Security]

To

_____[name of Authority]

_____ [address of Authority]

WHEREAS_____[name and address of Contractor] (hereafter called the "Contractor") has undertaken, in pursuance of Letter of Acceptance (LOA) No. _Dated__ for construction of [name of the Project] (hereinafter called the "Contract")

AND WHEREAS the Contract requires the Contractor to furnish an {Performance Security/ Additional Performance Security} for due and faithful performance of its obligations, under and in accordance with the Contract, during the {Construction Period/ Defects Liability Period and Maintenance Period} in a sum of Rs….. cr. (Rupees ……..….. crore) (the "**Guarantee Amount**"[1]).

AND WHEREAS 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 Contract, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the 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.

[1] Guarantee Amount for Performance Security and Additional Performance Security shall be calculated as per Contract.

2. A letter from the Authority, under the hand of an officer not below the rank of [General Manager of National Highways & Infrastructure Development Corporation Limited], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Contract shall be conclusive, final and binding on the 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 Contract 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 Contract or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Contract or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Contract and/or the securities available to the Authority, and the 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 Contract or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Contract.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made

by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

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

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

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

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

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

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

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

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

DLP.

S.No.	Particulars	Details
1	Name of Beneficiary	National Highways & Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Canara Bank (erstwhile Syndicate Bank) transport Bhawan, 1st Parliament Street, New Delhi-110001

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

SIGNED, SEALED AND DELIVERED
For and on behalf of the Bank by:
(Signature)
(Name)
(Designation)
(Code Number)
(Address)

NOTES:

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

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

Annex - II

(Schedule - G)

(See Clause 19.2)

Annex – II: Form for E- Bank Guarantee for Advance Payment

To

_____ [name of Authority]

_____ [address of Authority]

WHEREAS:

(A) [name and address of contractor] (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "**Agreement**") with the [name and address of the authority], (hereinafter called the "**Authority**") for the construction of the ***** section of [National Highway No. **] on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement

(B) In accordance with Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest bearing @Bank Rate + 3% advance payment (herein after called "**Advance Payment**") equal to 10% (ten per cent) of the Contract Price; and that the Advance Payment shall be made in two installments subject to the Contractor furnishing an irrevocable and unconditional 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**")[2].

(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

2 The Guarantee Amount should be equivalent to 110% of the value of the applicable instalment

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 ****[3] Unless a demand or

3 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).

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.

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

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

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

S.No.	Particulars	Details
1	Name of Beneficiary	National Highways & Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Canara Bank (erstwhile Syndicate Bank) transport Bhawan, 1st Parliament Street, New Delhi-110001

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

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:
(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

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

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

Schedule - H

(See Clauses10.1 (iv) and 19.3)

Contract Price Weightages

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

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

Item	Weightage in percentage to the contract Price	Stage for Payment		Percentage Weightage
1	2	3		4
Road works including culverts, widening and repair of culverts.	6.25%	**B.1**	**Reconstruction/ New 2-Lane realignment/ bypass (Flexible pavement)**	**91.04%**
		1	Earthwork up to top of the sub-grade	69.28%
		2	Sub-base Course	5.92%
		3	Non bituminous Base course	4.48%
		4	Bituminous Base course	6.40%
		5	Wearing Coat	4.96%
		D	**Re- Construction and New culverts on existing road, realignments, bypassed:**	**8.96%**
Minor Bridges/ underpasses/ Overpasses	2.25%	**A2**	**New Minor bridges (length<6 and >60 m.)**	**100.00%**
		1	**Foundation:** On completion of the foundation work including foundations for wing and return walls, abutments, piers.	34.49%
		2	**Sub-structure:** On completion of abutments, piers upto the abutment/ pier cap including wing/ return/ retaining wall upto top	43.05%
		3	**Super-structure:** On completion of the super-structure in all respects including Girder, Deck slab, bearings	22.46%
Tunnel and structures	2.49%	**A**	**Portals (Inlet & outlet)**	**100.00%**
		1	Temporary Dewatering Arrangement	0.93%

		2	Open Excavation and Earthwork	11.43%
			Protection work on face of Portal	7.84%
		3	Underground Excavation & over break in underground excavation for portal in Support Category dominating the Face Area	18.67%
		4	Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh including Drilling and Grouting)	4.22%
		5	Water proofing & Permanent Dewatering Arrangement	12.33%
		6	Concrete Back filling & bed lining work	1.56%
		7	Final RCC Linning and Niche for Parking and Cabinet	43.02%
		B	**Main Tunnel**	**100.00%**
		1	Temporary Dewatering Arrangement	0.97%
		2	Underground Excavation & over break in underground excavation for portal in Support Category dominating the Face Area	15.98%
		3	Water proofing & Permanent Dewatering Arrangement	10.09%
	70.09%	4	Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh including Drilling and Grouting)	9.49%
		5	Concrete Back filling & bed lining work	8.94%
		6	Fabricating and fixing in position permanent structural steel supports	36.51%
		7	Precast RCC Laggingе M 20 grade	3.67%
		8	Final RCC Linning and Niche for Parking and Cabinet	14.35%
		C	**Cross Passage**	**100.00%**
		1	Temporary Dewatering Arrangement	0.98%
	1.03%	2	Underground Excavation & over break in underground excavation for portal in Support Category dominating the Face Area	16.15%
		3	Water proofing & Permanent Dewatering Arrangement	11.62%

		4	Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh including Drilling and Grouting)	8.72%
		5	Concrete Back filling & bed lining work	7.33%
		6	Fabricating and fixing in position permanent structural steel supports	33.68%
		7	Precast RCC Laggingе M 20 grade	4.29%
		8	Final RCC Linning and Niche for Parking and Cabinet	17.23%
		D	**Other Items**	**100.00%**
		1	Pavement Work	
		a	Dry Lean Cement Concrete	2.66%
		b	Cement Concrete Pavement	14.13%
		2	RCC Drain & Cable trench and Side Walk	9.81%
		3	**Energy Supply & Power Distribution**	4.71%
		4	**Emergency Power Supply**	0.97%
		5	Roof top solar photo voltaic power generation system including space frame	1.44%
		6	**Tunnel lighting** (Supplying, installation, testing and commissioning of lighting automation including occupancy sensors)	2.40%
		7	CCTV system	1.30%
	15.50%	8	LAN system	2.17%
		9	EPABX system	2.17%
		10	Driver face and automatic number plate recording system / recognition system	0.52%
		11	Baggage scanner big	0.51%
		12	Electromechanical boom barrier with all accessories upto 6 meter length.	0.04%
		13	Illuminated signages	0.17%
		14	Service and utility Building and niche installation	17.10%
		15	Ventilation system and air flow measurement	22.03%
		16	SCADA systems & network devices and instruments for 3D monitoring	0.27%
		17	Fire hydrant , Fire water tank & effluents equipment	17.63%

Other works	2.39%	(i)	Toll plaza	0.00%
		(ii)	Road side drains	2.41%
		(iii)	Road signs markings, km stones, safety devices,…	
		a	Traffic Sign	0.58%
		b	Pavement marking	2.53%
		c	Direction and Place Identification signs upto 0.9 sqm size board.	0.32%
		d	Boundary stone, km stone,5th km stone, & hectometre stones	0.03%
		e	Traffic blinker LED Delineator, stud, reflective payment marker, tree reflector	0.48%
		f	Road furniture	0.14%
		g	Steel Crash Barrier	4.45%
		h	Cast in Situ Cement Concrete M 20 Kerb	1.07%
		i	Catch Water Drain	0.13%
		j	Chute Drain	6.72%
		k	Site Clearance	0.73%
		(iv)	Project Facilities	
		(a)	Truck lay-byes	0.00%
		(b)	Wayside Amenities	1.05%
		(c)	Busbays	2.26%
		(v)	Roadside plantation	
		a	Road side plantation & medium Plantation.	0.00%
		b	Plantation (Vetiver, Hydro seeding& Turfine etc.) for slope protection on exposed hill slopes as slide mitigation measure.	2.64%
		(vi)	Repair of protection works other than approaches to the bridges, elevated section/ flyovers/grade separators and ROBs.	0.00%
		(vii)	Safety and traffic management during construction	0.00%
		(viii)	**Protection works**	
		a	Breast wall	17.53%
		b	Retaining wall	6.18%
		c	Gabion wall	10.81%

		d	Toe wall	4.71%
		e	Gabion RE Wall	22.03%
		f	Seeding and Mulching (Soil Cut Slope)	1.80%
		g	Erosion Control Blanket	4.24%
		h	Vegetated bamboo crib wall	2.20%
		i	Shotcreting with welded wiremesh	4.12%
		j	25 mm dia. 3 m long steel rock bolts	0.83%

Procedure of estimating the value of work done.

(i) Road works

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

Table 1.3.1

	Stage of Payment	Percentage-weightage	Payment Procedure
B.1	**Reconstruction /New 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 stage in full length or 5(five) km length, whichever is less.
1	Earthwork up top of the sub-grade	68.480%	
2	Sub-Base Course	5.920%	
3	Non Bituminous Base Course	4.480%	
4	Bituminous Base Course	6.400%	
5	Wearing Coat	4.960%	
6	Widening and repair of culverts		
D	**Re- Construction and New culverts on existing road, realignments, bypasses,:** Culverts (length,6m)	8.96%	Cost of each culvert shall be determined on pro rata basis with respect to the total number of culverts. Payment shall be made on the completion of atleast five culvert.

@ For calculation of payment stage for main carriageway the project length shall be converted into equivalent 2 lane length. For example, if the total length of 4 lane main carriageway is 100 km, then the equivalent length for calculation of payment stage will be 2 x 100 km. Now, if the total length of bituminous work to be done is 100 km, the cost per km of bituminous work shall be determined as follows:

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

Where

P = Contract Price

L = Total equivalent 2-Lane length in km as defined above

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

(ii) Minor Bridges and Underpasses/Overpasses

Procedure for estimating the value of Minor bridge and

Underpasses/Overpasses shall be as stated in table 1.3.2:

Table 1.3.2

	Stage of Payment	Percentage-weightage	Payment Procedure
	1	2	3
A.2	**New minor bridges**		
(i)	**Foundation:** On completion of the foundation work including foundations for wing and return walls, abutments, piers.	**34.49%**	**Foundation:** Cost of each minor bridge shall be determined on pro- rata basis with respect to the total linear length (m) of the minor bridges. Payment against foundation shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of foundation of each bridge. In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
(ii)	**Sub-structure:** On completion of abutments, piers upto the abutment/ pier cap including wing/ return/ retaining wall upto top	**43.05%**	**Sub-structure:** Cost of each minor bridge shall be determined on pro- rata basis with respect to the total linear length (m) of the minor bridges. Payment against sub- structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of each bridge.
(iii)	**Super-structure:** On completion of the super-structure in all respects including wearing coat, bearings, expansion joints, had rails, crash barriers, road signs & markimh, tests om comletion etc. complete in all respect.	**22.46%**	**Super-structure:** Payment shall be made on pro-rata basis on completion of a stage i.e. completion of super structure of atleast one span in all respects as specified in the column of "Stage of Payment" in this sub- clause. In case of structures where pre-cast girders have been proposed by the Contractor, 50% of the stage payment shall be due and payable on casting of girders for each span and balance 50% of the stage payment shall be made on completion of stage specified as above

(iii) Tunnel Work and Structures

Procedure for estimating the value of Tunnel work and Structures Work shall be as stated in table 1.3.3:

Table 1.3.3

Sr.No.	Stage of Payment	Percentage weightage	Payment Procedure
1	2	3	4
A	**Portals (Inlet & outlet)**	**100.00%**	
1	Temporary Dewatering Arrangement	0.93%	Unit of measurement is linear length.
2	Open Excavation and Earthwork	11.43%	
	Protection work on face of Portal	7.84%	

Sr.No.	Stage of Payment	Percentage weightage	Payment Procedure
1	2	3	4
3	Underground Excavation & over break in underground excavation for portal in Support Category dominating the Face Area	18.67%	Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
4	Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh including Drilling and Grouting)	4.22%	
5	Water proofing & Permanent Dewatering Arrangement	12.33%	
6	Concrete Back filling & bed lining work	1.56%	
7	Final RCC Linning and Niche for Parking and Cabinet	43.02%	
B	**Main Tunnel**	**100.00%**	
1	Temporary Dewatering Arrangement	0.97%	Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
2	Underground Excavation & over break in underground excavation for portal in Support Category dominating the Face Area	15.98%	
3	Water proofing & Permanent Dewatering Arrangement	10.09%	
4	Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh including Drilling and Grouting)	9.49%	
5	Concrete Back filling & bed lining work	8.94%	
6	Fabricating and fixing in position permanent structural steel supports	36.51%	
7	Precast RCC Lagginge M 20 grade	3.67%	
8	Final RCC Linning and Niche for Parking and Cabinet	14.35%	
C	**Cross Passage**	**100.00%**	
1	Temporary Dewatering Arrangement	0.98%	Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
2	Underground Excavation & over break in underground excavation for portal in Support Category dominating the Face Area	16.15%	
3	Water proofing & Permanent Dewatering Arrangement	11.62%	
4	Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh including Drilling and Grouting)	8.72%	
5	Concrete Back filling & bed lining work	7.33%	
6	Fabricating and fixing in position permanent structural steel supports	33.68%	
7	Precast RCC Lagginge M 20 grade	4.29%	
8	Final RCC Linning and Niche for Parking and Cabinet	17.23%	
D	**Other Items**	**100.00%**	
1	Pavement Work		
a	Dry Lean Cement Concrete	2.66%	Unit of measurement is linear length. Payment shall be made on pro rata
b	Cement Concrete Pavement	14.13%	
2	RCC Drain & Cable trench and Side Walk	9.81%	
3	**Energy Supply & Power Distirbution**	4.71%	
4	**Emergency Power Supply**	0.97%	

Sr.No.	Stage of Payment	Percentage weightage	Payment Procedure
1	2	3	4
5	Providing and supply of 11 kV Line for from Luangmual Sub-station to Aizawl Bypass inlet substation (7Km length) & Zuangtui Sub-station to Aizawl Bypass Tunnel outlet substation (2Km length	1.44%	basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
6	**Tunnel lighting** (Supplying, installation, testing and commissioning of lighting automation including occupancy sensors)	2.40%	
7	Supplying, installation, testing and commissioning of basic security system comprising of PTZ / fixed camera, cabling, digital recording , HD display system in the tunnel to include control room at the gate and intercom connection to each dwelling unit, and basic IP based CCTV system to be installed at the entry and exit points, parking areas, entry point of each dwelling unit and other common areas as required including CCTV control room, required under ground cabling, digital recording system and monitor/ monitors with minimum display of 5" x 8" per camera in the control room:	1.30%	
8	Supplying, installation, testing and commissioning of LAN system comprising of core switches & L2 switches with 10 G, 10 giga SFP modules, WIFI access points, WIFI controller, network management software, racks, CAT 6A cable, patch panels, OFC etc.	2.17%	
9	Supplying, installation, testing and commissioning of IP based EPABX system comprising of core switches & L2 switches with 10 G, 10 giga SFP modules, industry standard appliance server, cloud-based, enterprise-grade UC solution, MID/ENTRY level IP/SIP phone with, dual 1 gig ports, racks, CAT 6A cable, patch panels, OFC etc.	2.17%	
10	Supplying, installation, testing and commissioning of driver face and automatic number plate recording system / recognition system including high resolution camera and software set for the driver face capture and automatic number plate recording	0.52%	
11	Baggage scanner big: computer based multi energy X-Ray baggage inspection system capable of passing through bags/parcels of dimension 940mm (W) x 640mm (H) with Belt Height- 750mm-850mm with 22'724" LCD Monitor, Input/ Output rollers with frames etc. as required.	0.51%	
12	Electromechanical boom barrier with all accessories upto 6 meter length.	0.04%	
13	Illuminated signages	0.17%	
14	Service and utility Building and niche installation	17.10%	

Sr.No.	Stage of Payment	Percentage weightage	Payment Procedure
1	2	3	4
15	Ventilation system and air flow measurement	22.03%	
16	SCADA systems & network devices and instruments for 3D monitoring	0.27%	
17	Fire hydrant , Fire water tank & effluents equipment	17.63%	

Note:

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

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

(iv) Other Works.

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

	Stage of Payment	weightage	Payment Procedure
(i)	Toll plaza	0.00%	Unit of measurement is each completed toll plaza. Payment of each toll plaza shall be made on peo rata basis with respect to the total of all toll plazas.
(ii)	Road side drains	2.41%	Unit of measurement is linear in k.m Payment shall be made on pro rata basis on completion of a stage in a length on not less than 10% (ten per sent) of the total length.
(iii)	Road signs markings, km stones, safety devices,…		
a	Traffic Sign	0.58%	Unit of measurement is linear in k.m Payment shall be made on pro rata basis on completion of a stage in a length on not less than 10% (ten per sent) of the total length.
b	Pavement marking	2.53%	
c	Direction and Place Identification signs upto 0.9 sqm size board.	0.32%	
d	Boundary stone, km stone,5th km stone, & hectometre stones	0.03%	
e	Traffic blinker LED Delineator, stud, reflective payment marker, tree reflector	0.48%	
f	Road furniture	0.14%	
g	Steel Crash Barrier	4.45%	

	Stage of Payment	weightage	Payment Procedure
h	Cast in Situ Cement Concrete M 20 Kerb	1.07%	
i	Catch Water Drain	0.13%	
j	Chute Drain	6.72%	
k	Site Clearance	0.73%	
(iv)	Project Facilitities		
(a)	Truck Lay-Byes	0.00%	Payment shall be made on pro rata basis for completed facilities.
(b)	Wayside Amenities excluding Slip Roads & but including all internal roads (Service areas including Truck Lay-Byes)	1.05%	
(c)	Busbays	2.26%	
(v)	Roadside plantation		
a	Road side plantation & medium Plantation.		Unit of measurement is linear length payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length.
b	Plantation (Vetiver, Hydro seeding& Turfine etc.) for slope protection on exposed hill slopes as slide mitigation measure.	2.64%	
(vi)	Repair of protection works other than approaches to the bridges, elevated section/ flyovers/grade separators and ROBs.		Unit of measurement is linear length payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length.
(vii)	Safety and traffic management during construction		Payment shall be made on prorata basis every six months.
(viii)	**Protection works**		
a	Breast wall	17.53%	Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
b	Retaining wall	6.18%	
c	Gabion wall	10.81%	
d	Toe wall	4.71%	
e	Gabion RE Wall	22.03%	
f	Seeding and Mulching (Soil Cut Slope)	1.80%	
g	Erosion Control Blanket	4.24%	
h	Vegetated bamboo crib wall	2.20%	
i	Shotcreting with welded wiremesh	4.12%	
j	25 mm dia. 3 m long steel rock bolts	0.83%	

1.3.5 Electrical utilities and Public Health Utilities (Water pipelines and sewage lines)

Procedure for estimating the value of other works done shall be as

stated in table 1.3.5:

Table 1.3.5

Stage of	Weightage	Payment Procedure
NA		

2. Procedure for payment for Maintenance

(a) The cost for maintenance shall be as stated in Clause 14.1 (v).

Payment for Maintenance shall be made in accordance with the provisions of Article 14 and Article 19

Schedule -I

(See Clause 10.2 (iv))

Drawings

1. Drawings

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

2. Additional Drawings

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

Annex -I

(Schedule -I)

Annex –I: List of Drawings

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

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) Drawings of Major intersections, Grade Separated Structures, Viaduct.

e) Drawing of bus-bay and bus shelters.

f) Drawing of road furniture including traffic signage, marking, safety barriers etc.

g) Drawing of traffic diversion plan.

h) General arrangement showing area of base camp and administrative block.

i) Any other Drawing as per instruction of Authority's Engineer.

Schedule - J

(See Clause 10.3 (ii))

Project Completion Schedule

1. Project Completion Schedule

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

2. Project Milestone-I

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

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

3. Project Milestone-II

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

(ii) Prior to the occurrence of Project Milestone-II, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 35% (thirty five per cent) of the Contract Price **and should have started construction of all bridges**

4. Project Milestone-III

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

(ii) Prior to the occurrence of Project Milestone-III, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 70% (seventy per cent) of the Contract Price and **should have** started construction of all **project facilities**.

5. Scheduled Completion Date

(i) The Scheduled Completion Date shall occur on the **1096th day** from the Appointed Date.

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

6. Extension of time

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

Schedule - K

(See Clause 12.1 (ii))

Tests on Completion

1. Schedule for Tests

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

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

2. Tests

(i) Visual and physical test: The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include [***].

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

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

(iv) Other tests: The Authority's Engineer may require the Contractor to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the Project Highway with Specifications and Standards, except tests as specified in clause 5,but shall include measuring the reflectivity of road markings and road signs; and measuring the illumination level (lux) of lighting using requisite testing equipment.

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

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

3. Agency for conducting Tests

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

4. Completion Certificate

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

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

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

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

Schedule - L

(See Clause 12.2)

Completion Certificate

1. I,…….. (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated (the **"Agreement"),** for [construction of the ****section (km ** to km **) of National Highway No. ***] (the **"Project Highway")** on Engineering, Procurement and Construction (EPC) basis through……. (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement, and I am satisfied that the Project Highway can be safely and reliably placed in service of the Users thereof.

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

SIGNED, SEALED AND DELIVERED

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

(Signature)

(Name)

(Designation) (Address)

Schedule - M

(See Clauses 14.6, 15.2 and 19.7)

Payment Reduction for Non-Compliance

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

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

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

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

2. Percentage reductions in lump sum payments on monthly basis

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

S. No.	Item/Defect/Deficiency	Percentage
(a)	**Carriageway/Pavement**	
(i)	Potholes, cracks, other surface defects	15%
(ii)	Repairs of Edges, Rutting	5%
(b)	**Road, Embankment, Cuttings, Shoulders**	
(i)	Edge drop, inadequate cross fall, undulations, settlement, potholes, ponding, obstructions	10%
(ii)	Deficient slopes, raincuts, disturbed pitching, vegetation growth, pruning of trees	5%
(c)	**Bridges and Culverts**	
(i)	Desilting, cleaning. vegetation growth, damaged pitching, flooring, parapets, wearing course, footpaths, any damage to foundations	20%
(ii)	Any Defects in superstructures, bearings and sub-structures	10%
(iii)	Painting, repairs/replacement kerbs, railings, parapets, guideposts/crash barriers	5%
(d)	**Roadside Drains**	
(i)	Cleaning and repair of drains	5%
(e)	**Road Furniture**	
(i)	Cleaning, painting, replacement of road signs, delineators, road markings, 200 m/km/5th km stones	5%
(f)	**Miscellaneous Items**	
(i)	Removal of dead animals, broken down/accidented vehicles, fallen trees, road blockades or malfunctioning of mobile crane	10%
(ii)	Any other Defects in accordance with paragraph 1.	5%

S. No.	Item/Defect/Deficiency	Percentage
(g)	**Defects in Other Project Facilities**	5%

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

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

Where,

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

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

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

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

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

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

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

Schedule - N

(See Clause 18.1 (i))

Selection of Authority's Engineer

1. Selection of Authority's Engineer

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

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

2. Terms of Reference

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

3. Appointment of Government entity as Authority's Engineer

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

Annex -I

(Schedule - N)

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

1. Scope

(i) These Terms of Reference (the **"TOR")** for the Authority's Engineer are being specified pursuant to the EPC Agreement dated (the **"Agreement),** which has been entered into between the [name and address of the Authority] (the **"Authority")** and…… (the **"Contractor")#** for [Two-Laning] of the **** section (km ** to km **) of National Highway No. ** in the State of *** on Engineering, Procurement, Construction (EPC) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

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

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

2. Definitions and interpretation

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

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

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

3. General

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

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

(a) any Time Extension;

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

(c) the Termination Payment; or

(d) issuance of Completion Certificate or

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

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

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

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

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

4. Construction Period

(i) During the Construction Period, the Authority's Engineer shall review and approve the Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1 (vi). The Authority's Engineer shall complete such review and approval and send its observations to the Authority and the Contractor within 15 (fifteen) days of receipt of such Drawings; provided, however that in case of a Major Bridge or Structure, the aforesaid period of 15 (fifteen) days may be extended upto 30 (thirty) days. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.

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

(iii) The Authority's Engineer shall review and approve the Quality Assurance Plan submitted

by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty one) days stating the modifications, if any, required thereto.

(iv) The Authority's Engineer shall complete the review and approve of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

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

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

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

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

(ix) For determining that the Works conform to Specifications and Standards, the Authority's Engineer shall require the Contractor to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4 (ix), the tests specified in the IRC Special Publication-11 (Handbook of Quality Control for Construction of Roads and Runways) and the Specifications for Road and Bridge Works issued by MORTH (the "Quality Control Manuals") or any modification/substitution thereof shall be deemed to be tests conforming to Good Industry Practice for quality assurance.

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

(xi) The timing of tests referred to in Paragraph 4 (ix), and the criteria for acceptance/ rejection of their results shall be determined by the Authority's Engineer in accordance with the Quality Control Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the

Contractor for its own quality assurance in accordance with Good Industry Practice.

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

(xiii) The Authority's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project Highway, whether because of an accident, unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.

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

(xv) The Authority's Engineer shall obtain from the Contractor a copy of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.2.

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

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

(xviii) The Authority's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate, as the case may be. For carrying out its functions under this Paragraph 4 (xviii) and all matters incidental thereto, the Authority's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

5. Maintenance Period

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

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

(iii) The Authority's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project Highway is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Contractor in this behalf.

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

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

6. Determination of costs and time

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

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

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

7. Payments

(i) The Authority's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the Authority's Engineer in accordance with the provisions of Clause 10.2 (iv) (d).

(ii) Authority's Engineer shall -

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

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

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

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

8. Other duties and functions

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

9. Miscellaneous

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

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

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

(iv) The Authority's Engineer, if called upon by the Authority or the Contractor

or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.

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

Schedule - O

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

Forms of Payment Statements

1. Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

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

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

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

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

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

(f) Deductions:

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

ii. Any amount towards deduction of taxes; and

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

(g) Net claim: (e) - (f) (iii);

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

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

v. For Change of Scope Orders, and

vi. Taxes deducted

2. Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

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

(b) the deductions for maintenance work not done;

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

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

(e) amount towards deduction of taxes

3. Contractor's claim for Damages

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

Authority.

Schedule - P

(See Clause 20.1)

Insurance

1. Insurance during Construction Period

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

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

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

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

2. Insurance for Contractor's Defects Liability

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

3. Insurance against injury to persons and damage to property

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

The insurance cover shall be not less than: Rs. [*****]

(ii) The insurance shall be extended to cover liability for all loss and damage to the

Authority's property arising out of the Contractor's performance of this Agreement excluding:

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

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

4. Insurance to be in joint names

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

Schedule-Q

(See Clause 14.10)

Tests on Completion of Maintenance Period

1. Riding Quality test:

Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [2,200 (two thousand and two hundred only)] mm for each kilometre.

2. Visual and physical test:

The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include measurement of cracking, rutting, stripping and potholes and shall be as per the requirement of maintenance mentioned in Schedule-E.

Schedule-R

(See Clause 14.10)

Taking Over Certificate

I,…….. (Name and designation of the Authority's Representative) under and in accordance with the Agreement dated……. (the **"Agreement**"), for [construction of the****section (km ** to km **) of ****] (the "**Project Highway**") on Engineering, Procurement and Construction (EPC) basis

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

SIGNED, SEALED AND DELIVERED

(Signature)

(Name and designation of Authority's Representative)

(Address)

*******END OF THE DOCUMENT*******