KARNATAKA ROAD DEVELOPMENT CORPORATION LIMITED
(Public works Department)
(A Government of Karnataka Enterprise)

SCHEDULES

For

CONSTRUCTION OF ELEVATED CORRIDORS WITHIN BANGALORE METROPOLITAN REGION

Package-3 (NSP-3): Construction of 4 lane elevated North-South Corridor from Shanti Nagar Bus Station to Silk Board Junction via BTS road, Bannerghatta road Junction, BOSCH, NDRI, and NIANP premises, Adugodi and Hosur road within Bangalore Metropolitan region in the State of Karnataka on EPC Mode

March -2019

Karnataka Road Development Corporation Limited
(a Government of Karnataka Enterprise)
"Samparka Soudha" Survey No.8, (B.E.P Premises), Dr. Rajkumar Road, Rajaji Nagar +1Block, Bengaluru-560 010. Tel: 080-22024000 Fax: 080-22024000.
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SCHEDULE - A

(See Clauses 2.1 and 8.1)

SITE OF THE PROJECT

1 **The Site**

1.1 Site of the "Construction of 4 lane elevated North South Corridor from Shanti Nagar Bus Station to Silk Board Junction from Ch. 8+925 to Ch.14+600 via BTS road, Bannerghatta road Junction, BOSCH, NDRI, and NIANP premises, Adugodi and Hosur road and St johns signal to Sony signal flyover of length 1.25 Km" as shown in the Key Map shall include Land, Building, Structures and Road Works as described in Annex-I of this Schedule-A.

1.2 The dates of handing over the Right of Way to the Contractor are specified in Annex-II of this Schedule-A.

1.3 An inventory of the Site including the land, buildings, structures, road works, trees and any other immovable property on, or attached to, the Site shall be prepared jointly by the Authority Representative and the Contractor, and such inventory shall form part of the memorandum referred to in Clause 8.2.1 of this Agreement.

1.4 The alignment plans of the Project Highway are specified in Annex-III and shall be followed as given in Annex-III. Minimum Vertical Clearance (as specified in Schedule-B) from existing road top to Soffit of Girder shall be followed in the design of vertical profile of the Elevated Corridor. The Contractor, however, improve/upgrade the existing Road Profile/Elevated Highway as indicated in Annexure-III based on site/design requirement.

1.5 The status of the environment clearances obtained is given in Annex IV.

Annex-I

(Schedule-A)

Site for Two/Four/Six Laning

1.1. **Site**

The Site of the (Two-Lane, Three-lane, Four-Lane and Six- Lane) Project Highway commencing from Shanti Nagar Bus Station to Silk Board Junction from Ch. 8+925 to Ch.14+600 via BTS road, Bannerghatta road Junction, BOSCH, NDRI, and NIANP premises, Adugodi and Hosur road and St johns signal to Sony signal flyover of length 1.25 Km.

The land, carriageway and structures comprising the Site are described below

1.2 Description of the Project Highway

The Project Highway is traversing through dense built up area of Bengaluru city having various widths all along. An index map & existing features of the Project Highway is given at **Appendix A-I.**

1.2.1 Referencing System

Proposed chainage as per plan shall be followed the alignment plan is Annexure-III of this schedule.

1.3 Latitudes & Longitudes

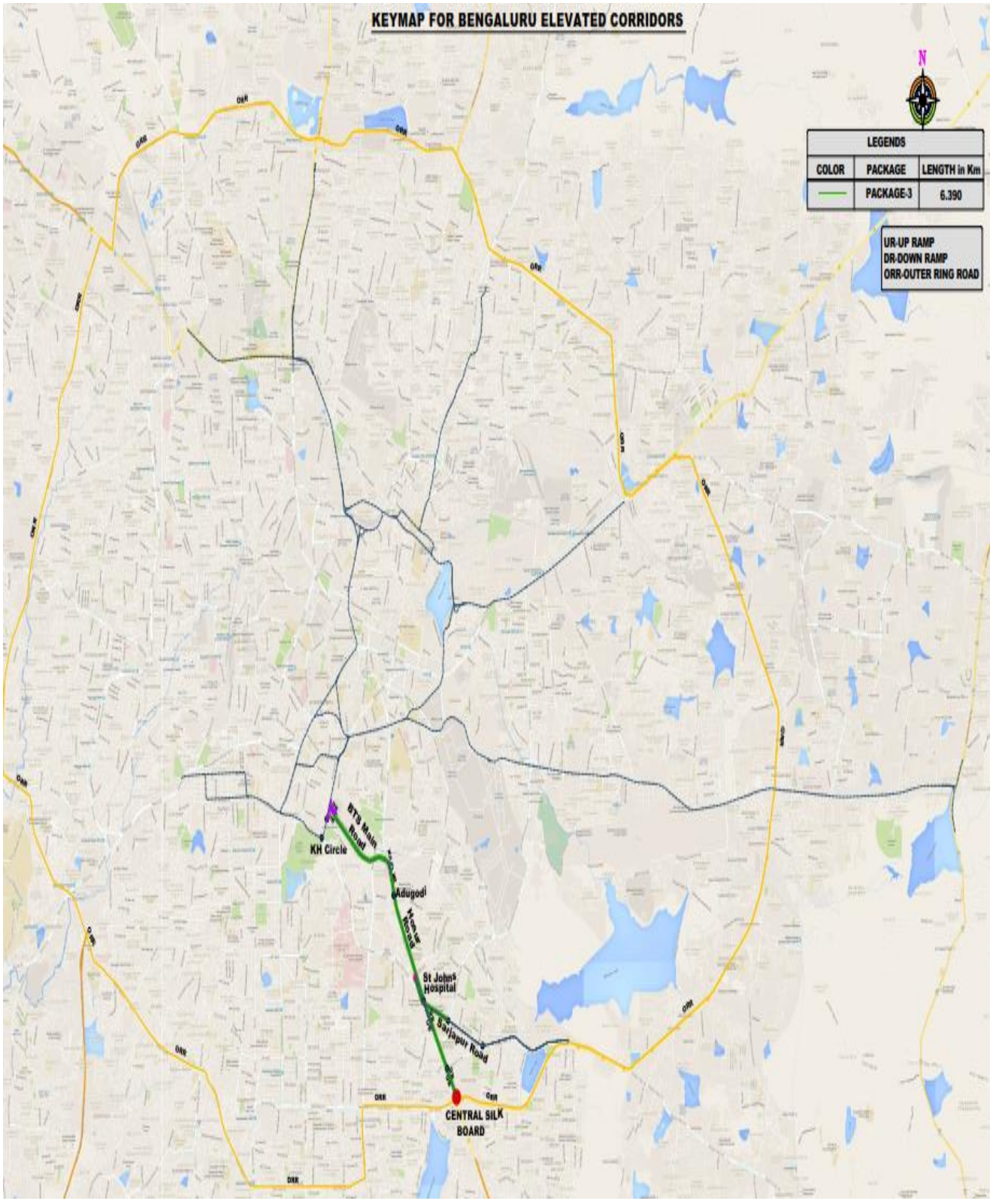
From	To
Shanthi Nagar Bus stop- 12°57'27.74"N, 77°35'34.25"E	Silk Board- 12°55'9.27"N, 77°37'17.24"E

1.4 Terrain

The terrain along the project stretch is predominantly plain terrain.

Appendix A-I

1.0 Index map of Project Highway



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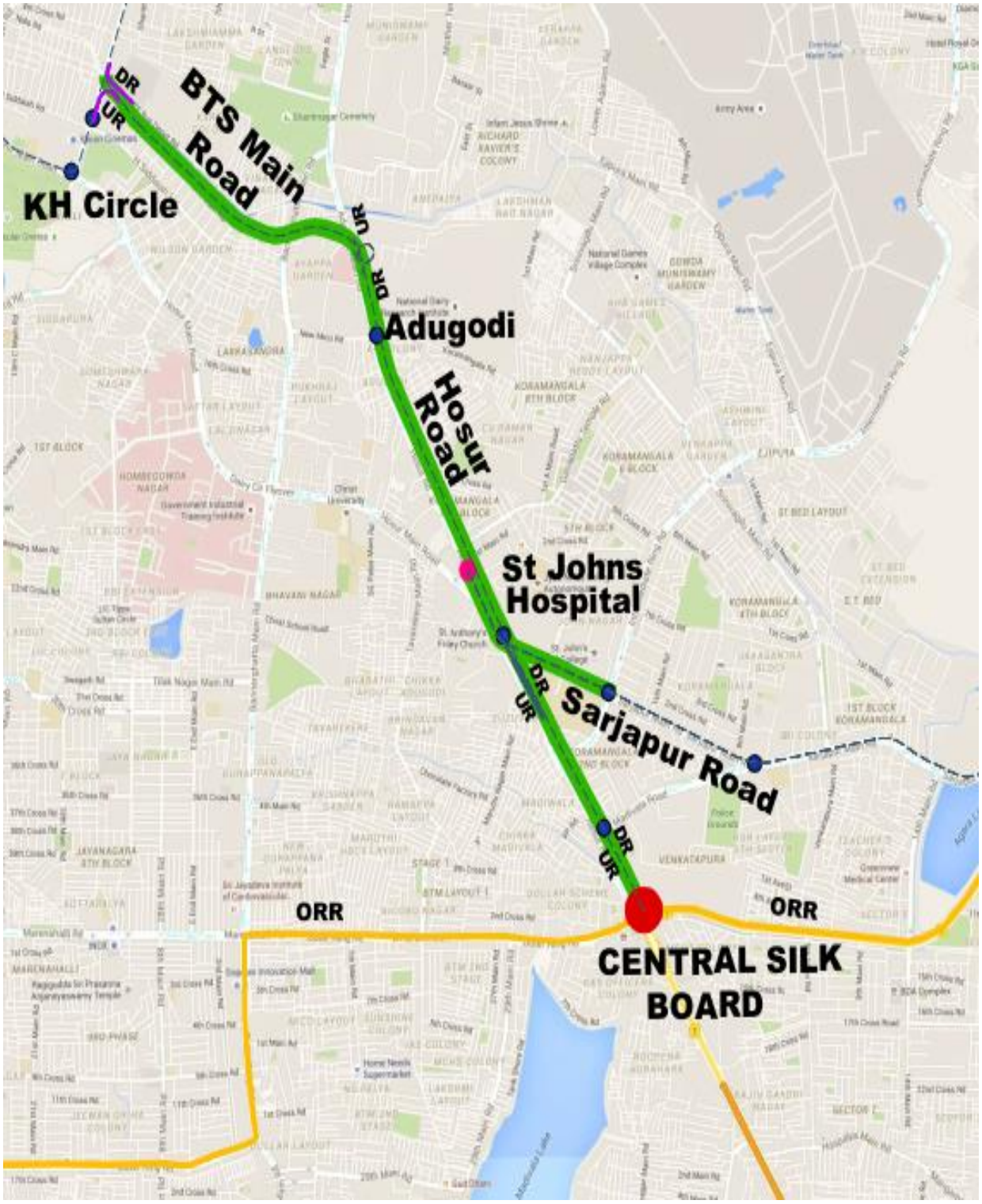

DR
UR
BTS Main Road
KH Circle
DR
UR
Adugodi
Hosur Road
St Johns Hospital
DR
UR
Sarjapur Road
DR
UR
ORR
ORR
CENTRAL SILK BOARD

2. Land

The site of the project highway comprises the land (total of land already in possession) as described below;

Sl. No	Chainage (Km)		EROW (m)
	From	To	
1.	8+925	9+100	30
2.	9+100	9+500	20
3.	9+500	9+600	15.6
4.	9+600	9+700	15
5.	9+700	9+800	15.5
6.	9+800	9+900	15
7.	9+900	10+000	15
8.	10+000	10+100	14.7
9.	11+100	11+200	31
10.	11+200	11+300	29
11.	11+300	11+400	25
12.	11+400	11+540	27 to 24.5
13.	11+540	11+600	21 to 19
14.	11+600	11+700	19 to 32
15.	11+700	11+885	30
16.	11+885	12+400	32
17.	12+400	12+500	30
18.	12+500	12+600	34.5
19.	12+600	12+700	41.7
20.	12+700	12+800	42

Sl. No	Chainage (Km)		EROW (m)
	From	To	
21.	12+800	12+885	41
22.	12+885	13+000	41
23.	13+000	13+100	38 to 29
24.	13+100	13+200	29 to 32
25.	13+200	13+270	32 to 85
26.	13+270	13+300	85 to 46
27.	13+300	13+400	45 to 35
28.	13+400	13+500	34
29.	13+500	13+600	34
30.	13+600	13+700	35
31.	13+700	13+800	28 to 32
32.	13+800	13+900	40 to 38
33.	13+900	14+000	38 to 28
34.	14+000	14+100	28 to 21.5
35.	14+100	14+200	19.2
36.	14+200	14+300	20 to 25.5
37.	14+300	14+400	27 to 34
38.	14+400	14+500	37
39.	14+500	14+600	37 to 50

Note: EROW – Existing Right of way

3. Carriageway

The existing carriageway of the Project Highway is heterogenous type carriageway and width of carriageway varies throughout the alignment as given in below table. The type of the existing pavement is flexible.

Sl. No.	Chainage (Km)		Main Carriageway Width (m)			Service road (m)	
	From	To	LHS	Median	RHS	LHS	RHS
Shanthi Nagar Bus stop to Silk Board							
1.	8+925	9+170					
2.	9+170	9+200	11	1.8	12	-	-
3.	9+200	9+300	11	8	12	-	-
4.	9+300	9+340	15	8	8.3	-	-
5.	9+340	9+400	9.3			-	-
6.	9+400	9+500	9.3			-	-
7.	9+500	9+600	9.3			-	-
8.	9+600	9+700	9.4			-	-
9.	9+700	9+800	9.2			-	-
10.	9+800	9+900	9			-	-

Sl. No.	Chainage (Km)		Main Carriageway Width (m)			Service road (m)	
	From	To	LHS	Median	RHS	LHS	RHS
	9+900	10+000	9			-	-
11.	10+000	10+100	7.5			-	-
12.	10+100	10+200	6.5			-	-
13.	10+200	10+300	6.5			-	-
14.	10+300	10+400	6.5			-	-
15.	10+400	10+500	7.5 to 8.5			-	-
16.	10+500	10+600	Realign, Bosch Factory (NA)				
17.	10+600	10+700					
18.	10+700	10+800					
19.	10+800	10+900					
20.	10+900	11+000					
21.	11+000	11+100					
22.	11+100	11+200	11.5	2	10.8	-	-
23.	11+200	11+270	12.5	1.5	7	-	-
24.	11+270	11+300	14.5	0.7	7.5	-	-
25.	11+300	11+400	11.5	0.7	8.5	-	-
26.	11+400	11+440	9.2	0.7	9.2	-	-
27.	11+440	11+460	Junction			-	-
28.	11+460	11+500	7.5	0.5	7	-	-
29.	11+500	11+600	7.8	0.5	6.2	-	-
30.	11+600	11+700	7	0.5	7.2		
31.	11+700	11+735	7.5	1	8	-	-
32.	11+735	11+800	11	1	8.2	-	-
33.	11+800	11+900	12.5	1	8.3	-	-
34.	11+900	12+000	13.2	1	8	-	-
35.	12+000	12+100	12.3	1	8.7	-	-
36.	12+100	12+200	14	1	12	-	-
37.	12+200	12+300	11	1	12	-	-
38.	12+300	12+400	11	1	12	-	-
39.	12+400	12+500	12.5	1	12.5	-	-
40.	12+500	12+600	15	0.5	12	-	-
41.	12+600	12+650	17	1	13.5	-	-
42.	12+650	12+700	18.5	1	14	5.5	-
43.	12+700	12+800	18.8	1	14.8	6	-
44.	12+800	12+900	7	1	13	5.7	-
45.	12+900	13+000	Junction			-	-
46.	13+000	13+100	18.5	0.5	14	-	-
47.	13+100	13+200	14.5	0.5	10	-	-
48.	13+200	13+300	Junction			-	-
49.	13+300	13+400	11	-	19	-	-
50.	13+400	13+500	8.2	0.5	18.8	-	-
51.	13+500	13+600	8.2	0.5	18.5	-	-
52.	13+600	13+700	12.3	0.5	18.5	-	-
53.	13+700	13+740	10.8	0.5	15	-	-

Sl. No.	Chainage (Km)		Main Carriageway Width (m)			Service road (m)	
	From	To	LHS	Median	RHS	LHS	RHS
54.	13+740	13+800	7.5	0.5	7.5	5	5
55.	13+800	13+900	7.5	0.5	7.5	5	5
56.	13+900	14+000	7.5	0.5	7.5	4	4
57.	14+000	14+030	10	0.4	12.5	-	-
58.	14+030	14+100	7.5	0.4	10	-	-
59.	14+100	14+200	6.5	0.4	10	-	-
60.	14+200	14+300	8	0.4	12	-	-
61.	14+300	14+320	8.5	0.4	12	-	-
62.	14+320	14+360	Junction				
63.	14+360	14+400	14	1.2	12.5	-	-
64.	14+400	14+600	15	1.2	16.5	-	-

4. **Major Bridges:** The Major Bridges in the site:

Sl. No.	Chainage (Km)	Type of Structure			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-structure	Superstructure		
Nil						

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

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

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

6. **Grade separators:** The Grade separators in the site:

Sl. No.	Chainage (km)		Type of Structure	No. of Spans	Span Length (m)	Width (m)
	LHS	RHS	Superstructure			
Nil						

7. **Minor bridges:** The Site includes the following minor bridges:

Sl.No	Existing Chainage (Km)	Type of structure			No. of Spans x length (m) (Clear span)	Overall Width (m)
		Type of Foundation	Sub Structure	Super Structure		
Nil						

8. **Railway level crossings:**

The Site includes the following railway level crossings**:**

Sl.No	Chainage (Km)	Railway Chainage	Level Crossing No.	Remarks
Nil				

9. **Underpasses (Vehicular, Pedestrian & Cattle Crossing)**

The Site includes the following underpasses:

Sl. No.	Chainage (Km)	Type of Structure	No. of Spans	Span length (m)	Width (m)
Shanthi Nagar Bus stop to Silk Board					
1	13+900	BOX	2	7	14

10. **Culverts**

The site includes the following Culverts.

Sl.No.	Chainage (Km)	Type Culvert	Spans/Opening x span length/Pipe dia. (m)	Overall Width (m)
Nil				

11. **Bus Bays /Shelter:** The details of bus bays on the Site are:

The bus bays and bus shelters are exists at the following locations on the Project Highway.

Sl.No.	Chainage (km)	Length (m)	Left Hand Side	Right Hand Side
Shanthi Nagar Bus stop to Silk Board				
1	11+380	7.5	Adugodi Bus stop	Adugodi Bus stop
2	12+000	30	Adugodi Bus stop	-
3	12+080	8	-	Adugodi police quarters
4	12+580	19	Forum Bus stop	-
5	12+810	31.6	-	Forum Bus stop

Sl.No.	Chainage (km)	Length (m)	Left Hand Side	Right Hand Side
6	13+310	44	-	St. Johns Bus stop
7	13+830	8	-	Madiwala Ayyappa temple Stop
8	14+470	25	-	Madiwala Bus stop

12. **Truck Lay byes:**

The details of truck lay byes are:

Sl. 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:

Sl. No.	Chainage (Km)		Length (Km)	Side of Drain	Type of Drain
	From	To			
1	9+100	10+200	1.10	LHS	Lined
2	11+000	13+700	2.70	Both sides	Lined

14. Major junctions

The details of major junctions are:

Sl. No.	Chainage (Km)	At Grade	Separated	Category of Cross Road			
				NH	SH	MDR	Others
1	9+100	Yes	-	-	-	-	'+' KH Road crosses BTS Main road
2	10+600	Yes	-	-	-	-	'+ 'BTS Main road crosses Bannerghatta road
3	10+900	Yes	-	-	-	-	'+ 'Cross road
4	11+000	Yes	-	-	-	-	Merges to Hosur main road
5	11+430	Yes	-	-	-	-	'+ 'LHS - Adugodi main road, RHS-New Mico road
6	12+330	Yes	-	-	-	-	LHS-Someshwara temple road
7	12+650	Yes	-	-	-	-	LHS-Ganapathy temple road
8	12+880 to 13+000	Yes	-	-	-	-	LHS-Jyotinivas road, RHS-Hosur main road

Sl. No.	Chainage (Km)	At Grade	Separated	Category of Cross Road			
				NH	SH	MDR	Others
9	13+230	Yes	-	-	-	-	LHS-Sarjapur main road RHS- St. Johns road
10	13+490	Yes	-	-	-	-	RHS-Maruti main road
11	13+900	Yes	Underpass	-	-	-	LHS-100 feet road
12	14+320	Yes	-	-	-	-	LHS- Madiwala road

15. Minor junctions

The details of the minor junctions are:

Sl. No.	Chainage (Km)	Type of junction	Name of Place
1	9+450	T	LHS-Road to BTS Bus depot
2	9+460	T	RHS-1ST Cross road
3	9+550	T	RHS-2nd Cross road
4	9+640	T	RHS-3rd Cross road
5	9+710	T	RHS-4th Cross road
6	9+770	T	RHS-5th Cross road
7	9+840	+	LHS-Cross road, RHS-6th Cross road
8	9+900	T	RHS-7th Cross road
9	9+980	T	RHS-8th Cross road
10	10+030	+	RHS-9th Cross road, LHS- Cross road
11	10+110	T	RHS-Mariswamappa road
12	10+170	T	RHS -11th Cross road
13	10+250	T	RHS-12th Cross road
14	10+310	T	RHS-16th Cross road
15	10+410	T	RHS-16th Cross road
16	10+470	T	RHS- Cross road
17	10+900	x	Cross road
18	11+200	+	Cross road
19	11+550	T	LHS- towards Basvanna Temple
20	11+630	T	RHS- 1st Cross road
21	11+690	T	RHS- 2nd Cross road
22	11+750	T	RHS- 3rd Cross road

Sl. No.	Chainage (Km)	Type of junction	Name of Place
23	11+780	T	RHS- 4th Cross road
24	11+810	T	RHS- 5th Cross road
25	11+900	T	RHS- 11th Cross road
26	12+710	T	LHS – 1st main road
27	12+830	T	LHS – 4th B CROSS road
28	13+580	T	RHS-1st main road
29	13+700	T	LHS-cross road, RHS-cross road,
30	13+990	T	LHS-3rd cross road, RHS-cross road,
31	14+050	T	LHS-4th cross road
32	14+150	T	LHS- Vinayaka Temple road, RHS-2nd cross road
33	14+190	T	RHS-VP road

16. Bypasses:

Sl. No.	Name of bypass (town)	Chainage (km)	Length (Km)
Nil			

17. Details of any other structures:

Sl. No	Chainage (Km)	Type of Structure	Width (m)	Remarks
1	12+500	Skywalk	4	Forum mall bus stop
2	12+900	Sky walk	4.5	At Madiwala Check post

18. Submergence Locations

The data of flooding over existing road is shown in Table below.

Sl. No.	Chainage (Km)		Overtopping above the existing road (m)
	From	To	
Nil			

19. Service road/Slip road locations

Sl. No.	Chainage (Km)		Remarks
	From	To	
1	12+650	12+700	LHS
2	12+700	12+800	LHS
3	12+800	12+900	LHS
4	13+740	13+800	Both Sides
5	13+800	13+900	Both Sides
6	13+900	14+000	Both Sides

Appendix A-II.

As the proposed alignment is part of City roads, the Chainage shall be refereed as shown in the alignment plan vide Annexure-III of this Schedule.

Annex – II

(Schedule-A)

Dates for providing Right of Way

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

Sl.	Design Chainage (Km)		Length (m)	Proposed RoW	Date of providing Row
Shanthi nagar bus stand to Silk board flyover					
Full Right of way					
1	8+925	9+005	80	20.5	on available date
2	11+100	13+000	1900	24.5	
3	13+200	13+320	120	35	
4	13+800	14+350	550	20.5	
Loop connecting St Johns signal towards Agara					
5	0+450	1+250	800	25	
	Total length (m)		**3450**		
Partial Right of way					
6	9+005	9+450	445	10	on available date
7	9+450	10+500	1050	15.5	
8	10+500	10+950	450	0	
9	10+950	11+100	150	30	
10	13+000	13+200	200	26.5	
11	13+320	13+800	480	35	
12	14+350	14+600	250	30	
	Total length (m)		**3025**		
Additional right of way					
13	9+005	9+450	445	130	180 days from the appointed date
14	9+450	10+500	1050	5	
15	10+500	10+950	450	20.5	
16	10+950	11+100	150	80	
17	13+000	13+200	200	8.5	
18	13+320	13+800	480	20	
19	14+350	14+600	250	6	
	Total length (m)		**3025**		

Notes: The 80% of the required land is available and rest of the land i.e. 20% shall in no case be beyond 180 (one hundred and eighty) days after the Appointed Date.

Annex- III

(Schedule-A)

Drawings

The existing alignment of the Project Highway shall be modified as per the enclosed alignment plan. Except the sections shown in Annex-II other locations alignments (including all type of improvements proposed in schedules/TCS) shall be within the existing ROW. Finished road level indicated in the alignment plan are indicative and the Elevated Highway profile in any case shall not be less than based on the minimum Vertical clearance (from existing road top to soffit of the girder) as specified in Schedule-B. Structural general alignment drawing are provided for guidelines purpose only. The contractor shall, however, improve/upgrade the Road profile as indicated in Annexure-III based on site/ design requirement. The effort shall be made to keep at-grade existing carriageway width same as present.

Annex - IV

(Schedule-A)

Environment Clearances

Environment clearance is required for the project as per EIA notification 2006 and subsequent amendments.

Accordingly Environmental clearance has been obtained (vide No. SEIAA/135/CON/2018 dated 02-03-2019)

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 Elevated Corridor including improvement of at-grade road as described in this Schedule-B and in Schedule-C according to the standard and specification mentioned in Schedule-D.

2 Description of Project Highway

Construction of 4 lane elevated North South Corridor from Shanti Nagar Bus Station to Silk Board Junction from Ch. 8+925 to Ch.14+600 via BTS road, Bannerghatta road Junction, BOSCH, NDRI, and NIANP premises, Adugodi and Hosur road and St johns signal to Sony signal flyover of length 1.25 Km within Bangalore Metropolitan region in the State of Karnataka on EPC Mode.

As described in Annex-I of this Schedule-B and in Schedule-C.

3 Specifications and Standards

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

Annex - I

(Schedule-B)

Description of the Project Highway

1 WIDENING OF THE EXISTING HIGHWAY

Construction of 4 lane elevated North South Corridor from Shanti Nagar Bus Station to Silk Board Junction from Ch. 8+925 to Ch.14+600 via BTS road, Bannerghatta road Junction, BOSCH, NDRI, and NIANP premises, Adugodi and Hosur road and St johns signal to Sony signal flyover of length 1.25 Km within Bangalore Metropolitan region in the State of Karnataka on EPC Mode

1.1 The Project Highway shall comprise of construction of 4-lane Elevated corridor including At-Grade/Underneath road. The proposed drawings of the Project Highway enclosed in Annex III of Schedule A are indicative & reference only.

Sl. No	Design Chainage (Km)		Length (m)		New Construction of Elevated Highway/ Upgradation of At Grade /Underneath Road*	Remarks
	From	To	At -Grade Road	Elevated corridor		
Shanthi nagar bus stand to Silk board flyover						
1.	8+925	9+005	80	80	5 lane with Paved shoulder Elevated Corridor at 1st level and Upgradation of Existing road	Shanthi nagar Bus stand
Shanthi nagar Interchange						
2.	9+005	9+100	95	95	2 lane with Paved shoulder Elevated Corridor and Upgradation of Existing road	Shanthi nagar bus stand to KH road towards Lalbagh
3.	9+100	9+392	292	292	2 lane with Paved shoulder Elevated Corridor and Upgradation of Existing road	Shanthi nagar bus stand to BTS road

Sl. No	Design Chainage (Km)		Length (m)		New Construction of Elevated Highway/ Upgradation of At Grade /Underneath Road*	Remarks
	From	To	At -Grade Road	Elevated corridor		
4.	Starts at Ch.9+005	Ends at Ch.9+392	-	380	2 lane with Paved shoulder Elevated Corridor and Upgradation of Existing road	Loop connecting KH road to BTS road
5.	Down ramp starts at Ch.9+005		-	As per site requirement including upto 5m height viaduct	5.5m Intermediate lane	Connecting KH road to Shanthi nagar bus stand
6.	Up ramp starts at Shanthi nagar bus stand		-	As per site requirement including upto 5m height viaduct	5.5m Intermediate lane	Up ramp Connecting Shanthi nagar bus stand to KH road
7.	Down ramp starts at Ch.9+300		-	As per site requirement including upto 5m height viaduct	5.5m Intermediate lane	Down ramp Connecting BTS road to Shanthi nagar bus stand
8.	Up ramp from Shanthi nagar bus stand ends at Ch.9+500		-	As per site requirement including upto 5m	5.5m Intermediate lane	Up ramp Connecting Shanthi nagar bus stand to BTS road

Sl. No	Design Chainage (Km)		Length (m)		New Construction of Elevated Highway/ Upgradation of At Grade /Underneath Road*	Remarks
	From	To	At -Grade Road	Elevated corridor		
				height viaduct		
9.	9+392	9+500	108	108	4 lane with Paved shoulder Elevated Corridor at 1st level and Up ramp from Shanthi nagar bus stand to BTS road Upgradation of Existing road	Shanthi nagar Bus stand to BTS road
10.	9+500	12+838	3738	3738	4 lane with Paved shoulder Elevated Corridor at 1st level and Upgradation of Existing road	Shanthi nagar Bus stand to Hosur road at Madiwala
11.	12+838	13+180	342	342	4 lane with Paved shoulder Elevated Corridor at 1st level and connecting link to Agara on RHS, and Upgradation of Existing road	Hosur road at Madiwala to St.Johns Signal
12.	13+180	13+800	620	620	2 lane +2 lane Paved shoulder Elevated Corridor on LHS & RHS at 1st level separated by up and Down ramp and Upgradation of Existing road	St.Johns Signal to Madiwala Underpass
13.	13+800	14+420	620	620	4 lane with Paved shoulder Elevated Corridor at 1st level and Upgradation of	Madiwala Underpass to Madiwala

Sl. No	Design Chainage (Km)		Length (m)		New Construction of Elevated Highway/ Upgradation of At Grade /Underneath Road*	Remarks
	From	To	At -Grade Road	Elevated corridor		
					Existing road	Police station
14.	14+420	14+600	180	180	4 lane with Paved shoulder Elevated Corridor integration with existing Silk board flyover and Upgradation of Existing road	Madiwala Police station to Silk board Flyover
NDRI Interchange						
15.	Down ramp on LHS towards Adugodi starts at Ch.10+965		-	As per site requirement including upto 5m height viaduct	Intermediate lane (+1 level to At-grade)	Down ramp to Adugodi near NDRI campus near Bosch factory
16.	Up ramp from Adugodi to silk board ends at Ch.11+100		-	As per site requirement including upto 5m height viaduct	Intermediate lane (At-grade to +1 level)	Up ramp from Adugodi near NDRI campus to Silk board
Ramp at St johns Signal to Madiwala underpass						
17.	Up ramp/down from St.johns signal to madiwala Underpass starts at Ch.13+320		-	As per site requirement including upto 5m height	Up ramp on LHS & Down ramp on RHS Intermediate lane)	Up ramp & Down ramp from St johns signal to Madiwala underpass

Sl. No	Design Chainage (Km)		Length (m)		New Construction of Elevated Highway/ Upgradation of At Grade /Underneath Road*	Remarks
	From	To	At -Grade Road	Elevated corridor		
				viaduct		start
Loop connecting St Johns signal towards Agara						
18.	Starts at Ch.12+980 on RHS	0+410 towards Agara on RHS	-	220	2 lane with Paved shoulder Elevated Corridor at +2 level and Upgradation of Existing road	St johns signal
19.	Starts at Ch.0+380 on LHS	0+410 towards Agara on LHS	-	30	2 lane with Paved shoulder Elevated Corridor at +1 level and Upgradation of Existing road	St johns signal
20.	0+410 towards Agara	1+240 towards Agara	840	840	4 lane with Paved shoulder Elevated Corridor at +2 level to +1 level and Upgradation of Existing road	St johns signal to st. johns hospital

Note: Refer Alignment Plan, structural GADs and cross sections in Annexure-III of Schedule-A

1.2 WIDTH OF CARRIAGEWAY

1.2.1 The Project Highway shall be Two-Lane/Four-lane Elevated carriageway with or without paved shoulder. Improvement to At-Grade road shall be undertaken as shown in the plan and profile and Typical Cross-sections enclosed. However it shall be within the available RoW in consultation with Authority/Authority Engineer. The paved carriageway shall be provided as indicated below:

Elevated carriageway:

Sl.No.	Location (Km)		Total Width including Carriageway, Paved Shoulder and Shyness
	From	To	Elevated

			LHS (m)	RHS (m)
1.	8+925	9+005	18.5	-
Shanthi nagar Interchange				
2.	9+005	9+100	9.0	-
3.	9+100	9+392	9.0	-
4.	Starts at Ch.9+005	Ends at Ch.9+392	9.0	-
5.	Down ramp starts at Ch.9+005		5.5	
6.	Up ramp starts at Shanthi nagar bus stand		5.5	
7.	Down ramp starts at Ch.9+300		5.5	
8.	Up ramp from Shanthi nagar bus stand ends at Ch.9+500		5.5	
9.	9+392	14+600	9.5	9.5
NDRI Interchange				
10.	Down ramp on LHS towards Adugodi starts at Ch.10+965		5.5	
11.	Up ramp from Adugodi to silk board ends at Ch.11+100		5.5	
Ramp at St johns Signal to Madiwala underpass)				
12.	13+320	13+665	8	8
Loop connecting St Johns signal towards Agara				
13.	Starts at Ch.12+980 on RHS	0+410 towards Agara on RHS	-	9.5
14.	Starts at Ch.0+380 on LHS	0+410 towards Agara on LHS	9.5	-
15.	0+410 towards Agara	1+240 towards Agara	9.5	9.5

At-grade carriageway:

Sl.No	Design Chainage (Km)		Length (m)		Main CW		Service/Slip Road		Drain
	From	To	At -Grade Road	Elevated	LHS	RHS	LHS	RHS	
1.	8+925	9+005	80	80	6.5 - 11	6.5 - 11	-	-	Both side
2.	9+005	9+450	445	445	6.5 - 11	6.5 - 11	-	-	Both side
3.	9+450	10+500	1050	1050	6.5-9.5	6.5-9.5	-	-	Both side
4.	10+500	10+950	450	450	-	-	-	-	-
5.	10+950	11+100	150	150	-	-	-	-	-
6.	11+100	13+000	1900	1900	9.0 - 11.0	9.0 - 11.0	-	-	Both side
7.	13+000	13+200	200	200	9.0 - 11.0	9.0 - 11.0	-	-	Both side
8.	13+200	13+320	120	120	6.5 - 9.5	6.5 - 9.5	-	-	Both side
9.	13+320	13+800	480	480	-	-	6.5-8.0	6.5-8.0	Both side
10.	13+800	14+350	550	550	6.5 - 9.5	6.5 - 9.5	-	-	Both side
11.	14+350	14+600	250	250	-	-	6.5	6.5	Both side
12.	0+450	1+250	800	800	6.5 - 11.0	6.5 - 11.0	-	-	Both side

The widths mentioned in above table are minimum, However actual width as per site to be considered in consultation with Authority/Authority Engineer. The change/increase in width/length of improvement shall not be considered as change of scope.

1.2.2 Except as otherwise provided in this agreement the Total width including carriageway, Paved Shoulder, Shyness and cross sectional features shall conform to paragraph 1.2.1 above.

2 GEOMETRIC DESIGN AND GENERAL FEATURES

2.1 General

The project highway is situated in highly urbanized and constrained area. The horizontal alignment of Elevated corridor shall not be changed, if inevitable, it shall have consent and approval in writing from Authority and shall not constitute change of scope and shall be done in accordance with Section 2 of the Manual.

Plan and profile have been designed keeping in view the considerations such as design speed appropriate for the terrain and Site constraints. The profile designed shall be carried out keeping the vertical clearance from At-Grade road to soffit of girder not less than 8.5m. However, the Contractor shall improve upon the plan and profile to

the extent possible within the Site (Proposed ROW) with prior approval of Authority's Engineer/Authority.

2.2 Design Speed

As far as possible the design speed shall be 80/65 kmph and minimum speed shall be 50/ 40 kmph for elevated corridor. However, ramps and loops shall be for 30 kmph.

However the minimum radius of curvature for Elevated corridor shall be 60/100 m and for Loops and Ramps shall be 40/60 m.

2.3 Improvement of the existing road geometrics:

The improvement shall be to the extent possible within the given right of way and proper road signs and safety measures shall be provided after accommodating Substructure of Elevated Highway. The Cross section of At Grade road shall be maintained provided in clause No. 2.1.1.

2.4 Right of Way

Details of proposed Right of Way are given in Annexure II of Schedule A.

2.5. Provision of Footpaths / Utility corridor

(a) Provision of Footpath cum Utility corridor shall be as shown in Plan & profile and TCS enclosed and however it shall be within available Row in consultation with Authority/Authority Engineer.

2.6. Lateral and vertical clearances of Elevated Highway

2.6.1 Lateral clearances at underpasses shall be as per paragraph 2.10 of the Manual.

2.6.2 Vertical clearance from At-Grade road to soffit of girder shall not be less than 8.5m. Any local change in vertical clearance will be decided in consultation with Authority / Authority Engineer.

2.7 Lateral and vertical clearance at Underpasses/overpass

Sl. No	Location (Chainage) (KM)	Span/Opening (m)	Remarks
Nil			

2.8 Service roads

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

Sl.No	Proposed Chainage		Design Length (Km)	Remarks
	From (Km)	To (Km)		
Shall be improved as per existing available locations to the full width in consultation with Authority/Authority Engineer				

2.9 Elevated highway (Grade separated structures)

Elevated Highway (Grade Separated Structures) shall be provided as per the details given in 7.5.

Sl.No	Chainage		Length(m)	Carriageway Width		Paved Shoulder		Shyness		Remarks
	From	To		LHS	RHS	LHS	RHS	LHS	RHS	
Shanthi nagar bus stand to Silk board flyover										
1.	8+925	9+005	80	17.50		-		0.5	0.5	5-Lane (+1 level)
Shanthi nagar Interchange										
2.	9+005	9+100	95	7.0	-	1.5	-	0.5	0.5	2-lane with paved shoulder (+1) Shanthi nagar bus stand to KH road towards Lalbagh
3.	9+100	9+392	292	7.0	-	1.5	-	0.5	0.5	2-lane with paved shoulder (+1) Shanthi nagar bus stand to BTS road
4.	Starts at Ch.9+005	Ends at Ch.9+392	380	7.0	-	1.5	-	0.5	0.5	2-lane with paved shoulder (+1) Loop connecting KH road to BTS road
5.	Down ramp starts at Ch.9+005		As per site requirement including upto 5m height viaduct	5.5		-	-	-	-	Connecting KH road to Shanthi nagar bus stand
6.	Up ramp starts at Shanthi nagar bus stand		As per site requirement including upto 5m	5.5		-	-	-	-	Up ramp Connecting Shanthi nagar bus stand to KH road

Sl.No	Chainage		Length(m)	Carriageway Width		Paved Shoulder		Shyness		Remarks
	From	To		LHS	RHS	LHS	RHS	LHS	RHS	
			height viaduct							
7.	Down ramp starts at Ch.9+300		As per site requirement including upto 5m height viaduct	5.5		-	-	-	-	Down ramp Connecting BTS road to Shanthi nagar bus stand
8.	Up ramp from Shanthi nagar bus stand ends at Ch.9+500		As per site requirement including upto 5m height viaduct	5.5		-	-	-	-	Up ramp Connecting Shanthi nagar bus stand to BTS road
9.	9+392	14+600	5208	7.0	7.0	1.5	1.5	0.5	0.5	4-lane with paved shoulder
NDRI Interchange										
10.	Down ramp on LHS towards Adugodi starts at Ch.10+965		As per site requirement including upto 5m height viaduct	5.5		-	-	-		Down ramp to Adugodi near NDRI campus near Bosch factory
11.	Up ramp from Adugodi to silk board ends at Ch.11+100		As per site requirement including upto 5m height viaduct	5.5		-	-	-		Up ramp from Adugodi near NDRI campus to Silk board
Ramp at St johns Signal to Madiwala underpass										

Sl.No	Chainage		Length(m)	Carriageway Width		Paved Shoulder		Shyness		Remarks
	From	To		LHS	RHS	LHS	RHS	LHS	RHS	
12.	Up ramp/down from St. Johns signal to madiwala Underpass starts at Ch.13+320		As per site requirement including upto 5m height viaduct	7	7	-	-	0.5	0.5	Up ramp & Down ramp from St johns signal to Madiwala underpass start
Loop connecting St Johns signal towards Agara										
13.	Starts at Ch.12+980 on RHS	0+410 towards Agara on RHS	220	-	7.0	-	1.5	0.5	0.5	St johns signal
14.	Starts at Ch.0+380 on LHS	0+410 towards Agara on LHS	30	7.0	-	1.5	-	0.5	0.5	St johns signal
15.	0+410 towards Agara	1+240 towards Agara	840	7.0	7.0	1.5	1.5	2x0.5	2x0.5	St johns signal to st. johns hospital

Solid ramp Locations				
Sl.No	**Chainage**		**Length (m)**	**Remarks**
	From	**To**		
Shanthi nagar Interchange				
1.	Down ramp starts at Ch.9+005		As per site requirement including upto 5m height viaduct	Connecting KH road to Shanthi nagar bus stand
2.	Up ramp starts at Shanthi nagar bus stand		As per site requirement including upto 5m height viaduct	Up ramp Connecting Shanthi nagar bus stand to KH road
3.	Down ramp starts at Ch.9+300		As per site requirement including upto 5m height viaduct	Down ramp Connecting BTS road to Shanthi nagar bus stand
4.	Up ramp from Shanthi nagar bus stand ends at Ch.9+500		As per site requirement including upto 5m height viaduct	Up ramp Connecting Shanthi nagar bus stand to BTS road
NDRI Interchange				
5.	Down ramp on LHS towards Adugodi starts at Ch.10+965		As per site requirement including upto 5m height viaduct	Down ramp to Adugodi near NDRI campus near Bosch factory
6.	Up ramp from Adugodi to silk board ends at Ch.11+100		As per site requirement including upto 5m height viaduct	Up ramp from Adugodi near NDRI campus to Silk board
Ramp at St johns Signal to Madiwala underpass				

Solid ramp Locations				
Sl.No	**Chainage**		**Length (m)**	**Remarks**
	From	**To**		
7.	Up ramp/down from St. Johns signal to madiwala Underpass starts at Ch.13+320		As per site requirement including upto 5m height viaduct	Up ramp & Down ramp from St johns signal to Madiwala underpass start
8.	14+450	14+600	150	Madiwala police station to silk board flyover

2.9.2 The Deck Width, Vertical Clearance and Type of Super Structure.

Refer Clause.7.5 & Clause 14 of schedule-B

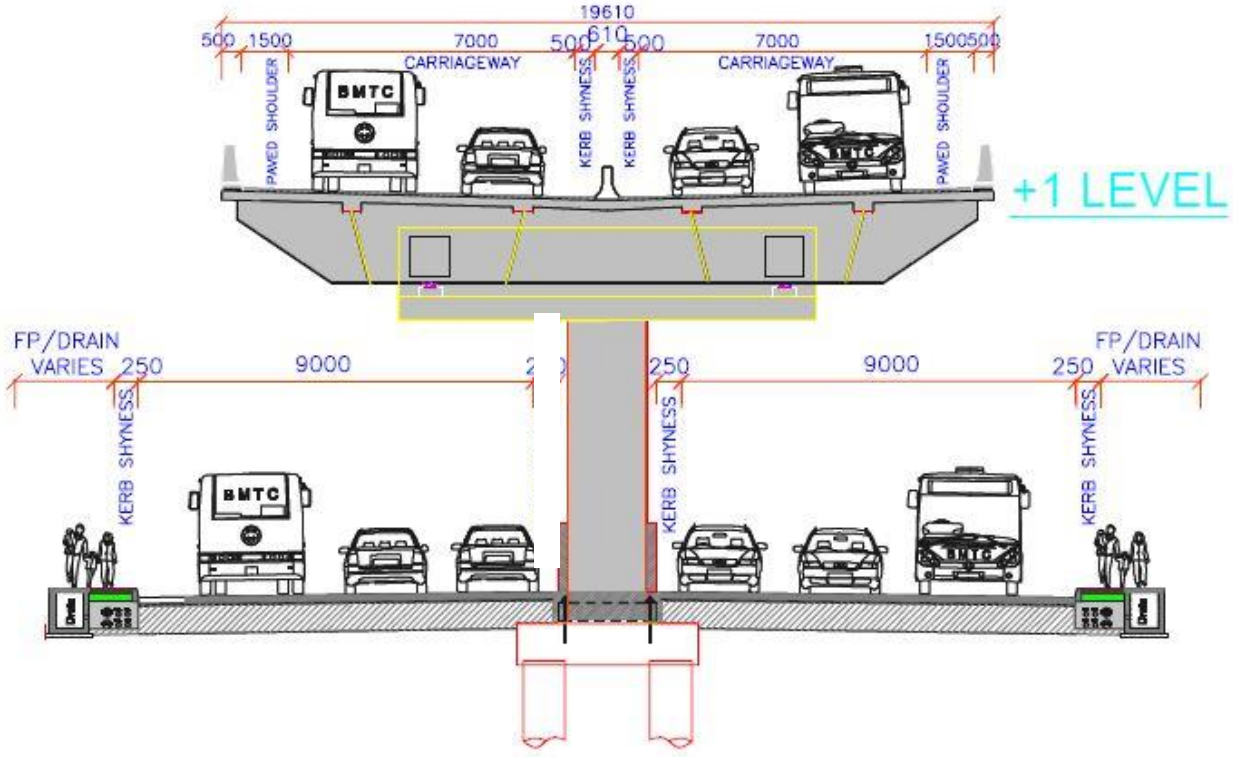
2.10 Cattle and pedestrian underpass /overpass:

Cattle and pedestrian underpass/ overpass shall be constructed: [Refer to paragraphs 2.13 of the Manual and specify the requirements of cattle and pedestrian underpass/ overpass:

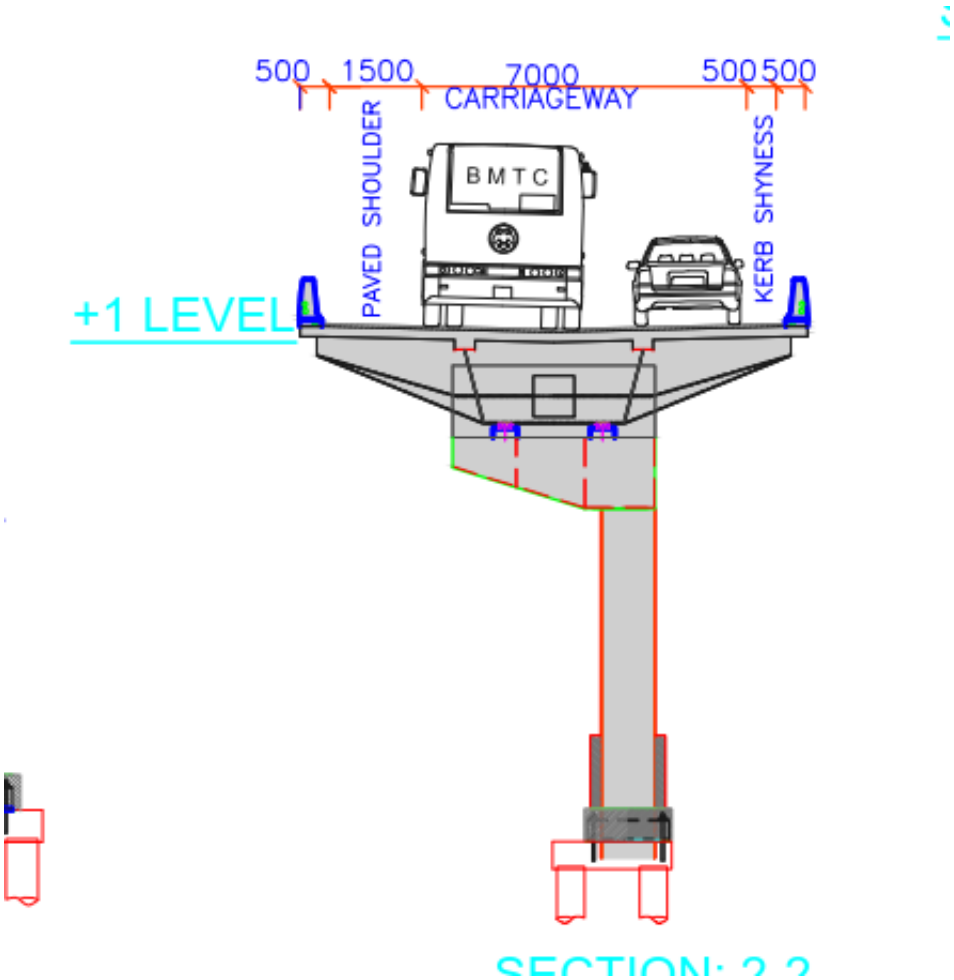
S. No.	Chainage (km)	Type of Structure	No. of Spans with span length (m)	Width (m)
Nil				

2.11 Typical Cross-sections of the Project Highway:

Typical cross section drawings showing configuration are as below.



ELEVATED 4 LANE WITH PAVED SHOULDER CROSS SECTION



ELEVATED 2 LANE WITH PAVED SHOULDER CROSS SECTION

3 INTERSECTIONS AND GRADE SEPARATORS

All intersections shall be improved to the possible extent as per Ministry standard drawing and 2/4/6 Lane Manual of standards and specifications within the available RoW. The location, type and features of the at-grade intersections are given in the tables below. Properly designed intersections shall be provided at the locations and types and features given in the tables below:

(a) At-grade intersections

Major Intersections

Sl.No.	Chainage,Km	At grade	Grade Separated	Location
SECTION-1 (Shanthi nagar bus stand to Silk board flyover)				
1	9+100	Yes	-	KH road (Double road)
2	10+600	Yes	-	Bannerghatta road
3	11+000	Yes	-	Hosur main road
4	11+430	Yes	-	Mico road signal
5	12+650	Yes	-	Koramangala
6	12+950	Yes	-	Forum signal (Hosur road)
7	13+230	Yes	-	St.Johns signal
8	13+490	Yes	-	BTM layout
9	13+900	-	Underpass	Madiwala Ayyappa temple
10	14+320	Yes	-	Madiwala police station signal

Minor junctions

Sl. No.	Chainage (Km)	Type of junction	Name of Place
SECTION-1 (Shanthi nagar bus stand to Silk board flyover)			
1	9+450	T (LHS)	BTS Bus depot
2	9+460	T (RHS)	1ST Cross road
3	9+550	T (RHS)	2nd Cross road
4	9+640	T (RHS)	3rd Cross road
5	9+710	T (RHS)	4th Cross road
6	9+770	T (RHS)	5th Cross road
7	9+840	+ (Both)	LHS-BTS bus depot road, RHS-6th Cross road
8	9+900	T (RHS)	7th Cross road
9	9+980	T (RHS)	8th Cross road
10	10+030	+ (Both)	9th Cross road
11	10+110	T (RHS)	Mariswamappa road
12	10+170	T (RHS)	11th Cross road
13	10+250	T (RHS)	12th Cross road
14	10+310	T (RHS)	16th Cross road
15	10+410	T (RHS)	16th Cross road
16	10+470	T (RHS)	Cross road
17	11+550	T (LHS)	Basvanna Temple
18	11+630	T (RHS)	1st Cross road
19	11+690	T (RHS)	2nd Cross road
20	11+750	T (RHS)	3rd Cross road
21	11+780	T (RHS)	4th Cross road

Sl. No.	Chainage (Km)	Type of junction	Name of Place
22	11+900	T (LHS)	11th Cross road
23	12+710	T (LHS)	1ST main road
24	12+830	T (LHS)	4th B CROSS road
25	13+580	T (RHS)	1st main road
26	13+700	+ (Both)	cross road
27	13+990	+ (Both)	cross road
28	14+050	T (LHS)	4th cross road
29	14+150	+ (Both)	LHS- Vinayaka Temple road, RHS-2nd cross road
30	14+190	T (RHS)	VP road

All At Grade arterial roads intersection with project highway shall be improved by the contractor as per the instructions of Authority Engineer / Authority.

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4 ROAD EMBANKMENTS AND CUT SECTION

4.1.1 Widening and improvement of the existing road embankment/cut and construction of new road embankment/ cut shall conform to the plan and TCS enclosed. The vertical clearance shall be 8.5m from the finished level of improved existing road.

4.1.2 Raising of the existing road [Refer to paragraph 4.2.2 of the Manual and specify sections to be raised]: The existing road shall be raised in the following sections:

Sl.No	Existing Chainage		Design Chainage		Remarks
	From	To	From	To	
Nil					

5 PAVEMENT DESIGN (Refer drawing for typical details)

5.1 Pavement design shall be carried out in accordance with Section 5 of the Manual.

5.2 Type of Pavement

The new pavement for entry/exit solid ramps shall be flexible type as per IRC 37 2018.

The Pavement for improvement of At-Grade all roads shall be with White Topping as per IRC: SP:76-2015.

The wearing course on elevated corridor and entry/exit viaduct ramps shall be of Type-3 stone matrix Asphalt thick laid in single layer as per MoRTH specification.

5.3 Design requirements

5.3.1 Design Period and strategy

Flexible pavement shall be designed with minimum subgrade CBR of 8%. Stage construction shall not be permitted.

All the exist/entry ramps pavement composition shall be as below

S. No.	Description of item	Minimum pavement Composition of Flexible Pavement (mm)
1	Bituminous Concrete (BC)	40
2	Dense Bituminous Concrete (DBM)	100
3	Wet Mix Macadam (WMM)	250
4	Granular Subbase (GSB)	200
5	Subgrade	500

White topping shall be proposed for improvement of At-Grade all roads with minimum pavement composition as - White topping (PQC-M40)-170mm, BM-75mm, and widening of existing road portion wherever necessary within existing ROW shall be with -White topping (PQC-M40)-170mm, BM-75mm, WMM-250mm, GSB-200, Subgrade-500mm (CBR 8%).

5.4 Reconstruction of stretches:

Refer to paragraph 5.9.5 of the Manual and specify the stretches, if any, to be reconstructed. The stretches where ground level improvements are proposed shall be reconstructed. These shall be designed & constructed as new pavement with White Topping.

6 ROADSIDE DRAINAGE & FOOTPATH:

6.1 ROADSIDE DRAINAGE:

RCC drains for surface and subsurface drainage for the Project Highway shall be provided as per Section 6 of the Manual. Lined Drains shall be provided for minimum linear project length in built-up areas and service/slip road locations as per manual requirements, which are connected to the existing CD works on project highway and corresponding to the typical cross-sections referred to in Clause 2.11 of this Schedule B and detailed as below:

Actual length and size of the lined drains shall be determined by the Contractor in accordance with the Manual requirements with approval from the Authority's Engineer. Any increase in the length specified in this Clause of 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. RCC drain cover slab form part of the carriage way and therefore it shall designed to take the load due to movement of traffic wherever necessary.

6.2 ROADSIDE FOOTPATH

Footpaths shall be constructed as shown in the typical cross section and the width of footpath shall be minimum 1.8m wherever possible in consultation with Authority/Authority Engineer and can be extended more based on site conditions & available RoW. The footpath shall be constructed with GSB/WMM and paver blocks of rectangular shape satisfying as relevant IRC code. Parking, kerbs to support vehicles acceleration, wheel chair movement should be part of design & construction.

7. DESIGN OF STRUCTURES

7.1 General

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

7.1.2 The width of Elevated carriageway of Proposed structures shall have the minimum requirement as follows:

Sl. No.	No. of Lanes	CB (m)	SH (m)	CW (m)	SH (m)	CB (m)	PS (m)	Median (m)	SH (m)	CW (m)	SH (m)	CB (m)	PS (m)	Total Deck Width
1.	Two Lane	0.5	0.5	7.0	0.5	0.5		-	-	-	-	-		9.0
2.	Three Lane	0.5	0.5	10.5	0.5	0.5	-	-	-	-	-	-		12.5
3.	Four Lane	0.5	0.5	7.0	0.5	-	-	0.61	0.5	7.0	0.5	0.5		17.61
4.	Four Lane with paved	0.5	0.5	7	0.5	-	1.5	0.61	0.5	7	0.5	0.5	1.5	19.61

Sl. No.	No. of Lanes	CB (m)	SH (m)	CW (m)	SH (m)	CB (m)	PS (m)	Median (m)	SH (m)	CW (m)	SH (m)	CB (m)	PS (m)	Total Deck Width
	shoulder													
5	Five lane	0.5	0.5	17.5	0.5	0.5	-	-	-	-	-	-	-	19.50
5.	Six Lane	0.5	0.5	10.5	0.5	-	-	0.61	0.5	10.5	0.5	0.5		24.61

CB; Crash barrier, SH; Kerb Shyness, CW; Carriageway

7.1.3 The structures shall be provided with footpaths:

S. No.	Design Chainage	Remarks
Nil		

7.1.4 All bridges shall be high-level bridges: **Nil**

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

7.1.6 Cross-section of the new culverts and bridges at deck level for the Project Highway shall conform to the typical cross-sections given in Section 7 of the Manual.

7.2 Culverts

7.2.1 Overall width of all culverts shall be equal to the roadway width of the approaches as given in Section 7.3.1 of the Manual: **Nil**

7.2.2 Reconstruction of existing culverts:

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

Sl. No.	Location, Design chainage km	TCS Type	Width of culvert	Proposed Span	Type of Culvert
Nil					

7.2.3 **Widening of existing culverts**:

Sl. No.	Location, Design chainage km	TCS Type	Length of culvert	Proposed Span	Type of Culvert
As per Site requirement and in consultation with Authority / Authority Engineer and shall not constituent to Change of Scope.					

7.2.4 Additional new culverts shall be constructed as per particulars given:

Sl. No.	Location, Design chainage km	TCS Type	Length of culvert	Proposed Span	Type of Culvert
Nil					

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

Sl.No.	Location, Design chainage km	TCS Type	Length of culvert	Proposed Span	Type of Culvert
As per Site requirement and in consultation with Authority / Authority Engineer and shall not constituent to Change of Scope.					

7.2.6 Floor protection works shall be as specified in the relevant IRC Codes and Specifications.

*All existing culverts which are not to be reconstructed shall be retained / widened to the roadway width of the Project Highway at that particular location. Repairs and strengthening of existing / widening structures where required shall be carried out. The general repairs and rehabilitation works of culverts shall include but not limited to general cleaning of culvert and area around culvert, restoration of slopes and protective works, repair and replacement of drainage spouts where required, construction/repair of damaged parapets / railing and repair and rehabilitation of damaged concrete/masonry of any component etc. to the complete satisfaction of Authority's Engineer. All repair and rehabilitation works shall be carried out as per the Manual and Specifications. The same shall not constituent to change of scope or variations under any clause of this agreement.

7.3 Bridges

7.3.1 Existing bridges to be re-constructed/widened*:*

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

Major Bridge (Reconstruction):

Sl. No	Design Chainage km	Existing Chainage	Span Arrangement (m)	Total width (m)
Nil				

Minor Bridge (Reconstruction):

Sl. No	Design Chainage km	Existing Chainage Km	Span Arrangement of Proposed Bridge	Total width (m)
Nil				

The existing bridges at the locations shall be re-constructed as new Structures

7.3.2 Additional new bridges

New bridges at the following locations on the Project Highway shall be constructed.

Major Bridges:

SI No.	Design Chainage (In Km)	Existing Chainage	Location	Span Arrangement (m)	Total width (m)
Nil					

Minor Bridges:

SI No.	Design Chainage (In Km)	Existing Chainage	Location	Span Arrangement (m)	Total width (m)
Nil					

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

Replacement of railing of existing bridges shall be replaced by crash barriers as per paragraph 7.6 of Annex-I of Schedule B.

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

Sl. No.	Location of Bridges (Km)	Nature of extent of repairs/ strengthening to be carried out
1	All Existing Bridges	Not limited to Cleaning, painting, replacement of railing with crash barrier, replacement of expansion joint & wearing coat, epoxy application, floor protection work and

Sl. No.	Location of Bridges (Km)	Nature of extent of repairs/ strengthening to be carried out
		any other repairs required as per site condition.

7.3.5 Drainage system for bridge decks

The drainage system of the project will be designed to effectively collect runoff at the elevated carriageway and convey that collected runoff to the existing drainage mainline of the At-grade roads without aggravating the present flooding situation as specified in paragraph 7.20 of the Manual

7.3.6 Structures in marine environment - Nil

7.4 Rail-road bridges

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

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

S. No.	Design Chainage	Proposed Span Arrangement (m)	Name of crossing	Width (m)
Nil				

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

S. No.	Design Chainage	Proposed Span Arrangement (m)	Name of crossing	Width (m)
Nil				

7.5 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.

Sl.No	Design Chainage		Length	Proposed Span Arrangement* (m)	Deck width (m)	Type of Superstructure	Type of Substructure
	From	To					
Shanthi nagar bus stand to Silk board flyover							
1.	8+925	9+005	80		19.5	TUB Type (BOX Girder)	Composite Pier
Shanthi nagar Interchange							
2.	9+005	9+100	95		10	TUB Type (BOX Girder)	Composite Pier
3.	9+100	9+392	292		10	TUB Type (BOX Girder)	Composite Pier
4.	Starts at Ch.9+005	Ends at Ch.9+392	380		10	TUB Type (BOX Girder)	Composite Pier
5.	Down ramp starts at Ch.9+005		As per site requirement including upto 5m height viaduct		6.5	TUB Type (BOX Girder)	Composite Pier
6.	Up ramp starts at Shanthi nagar bus stand		As per site requirement including upto 5m height viaduct		6.5	TUB Type (BOX Girder)	Composite Pier
7.	Down ramp starts at Ch.9+300		As per site requirement including upto 5m height viaduct		6.5	TUB Type (BOX Girder)	Composite Pier
8.	Up ramp from Shanthi nagar bus stand ends at Ch.9+500		As per site requirement including upto 5m height viaduct		6.5	TUB Type (BOX Girder)	Composite Pier
9.	9+392	13+180	3788		19.61	TUB Type	Composite

Sl.No	Design Chainage		Length	Proposed Span Arrangement* (m)	Deck width (m)	Type of Superstructure	Type of Substructure
	From	To					
						(BOX Girder)	Pier
10.	13+180	13+800	620		10.5x2	TUB Type (BOX Girder)	Composite Pier
11.	13+800	14+450	650		19.61	TUB Type (BOX Girder)	Composite Pier
NDRI Interchange							
12.	Down ramp on LHS towards Adugodi starts at Ch.10+965		As per site requirement including upto 5m height viaduct		6.5	TUB Type (BOX Girder)	Composite Pier
13.	Up ramp from Adugodi to silk board ends at Ch.11+100		As per site requirement including upto 5m height viaduct		6.5	TUB Type (BOX Girder)	Composite Pier
Ramp at St johns Signal to Madiwala underpass							
14.	Up ramp/down from St.johns signal to madiwala Underpass starts at Ch.13+320		As per site requirement including upto 5m height viaduct		9.0x2	TUB Type (BOX Girder)	Up ramp & Down ramp from St johns signal to Madiwala underpass start
Loop connecting St Johns signal towards Agara							
15.	Starts at Ch.12+980 on RHS	0+410 towards Agara on RHS	220		10.5	TUB Type (BOX Girder)	Composite Pier
16.	Starts at Ch.0+380 on LHS	0+410 towards Agara on LHS	30		10.5	TUB Type (BOX Girder)	Composite Pier
17.	0+410 towards Agara	1+240 towards Agara	840		10.5x2	TUB Type (BOX Girder)	Composite Pier

* **Notes:**

1) Minimum individual span for main line structure will be 40m and 20m for

Ramps/Loops unless otherwise there is any obligatory requirement.

2) Elevated/ grade separated section of Main Carriageway shall be designed as continuous structure with modules of minimum length of 160m for Main Carriageway and 80m for Ramps. Accordingly, the minimum spacing between successive expansion joints shall be 160 m in case of main carriageway and 80m in Ramps. All the spans shown are from center to center of pier.

7.6 Repairs and strengthening of Bridge / Structures

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

A – Bridges

Sl. No.	Location of Bridges (Km)	Nature of extent of repairs/ strengthening to be carried out
1	All Existing Bridges	Not limited to Cleaning, painting, replacement of railing with crash barrier, replacement of expansion joint & wearing coat, epoxy application, floor protection works and any other repairs required as per site condition.

B – ROB / RUB

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

C – Overpasses/Underpasses and other structures

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

7.7 List of Major Bridges and Structures

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

Sl. No.	Name of the Structure	Design Chainage
1	ROB	Nil

Sl. No.	Name of the Structure	Design Chainage
2	Major Bridge	Nil
3	Elevated Highway	As Described in the Section 2 of this schedule.
4	VUP	Nil
5	VOP	Nil

8.0 Traffic control devices and road safety works

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

(a) Traffic Signs:

Traffic road signs include roadside signs, overhead signs and kerb mounted signs along the entire Project Highway as specified in IRC: 67. Some of them are mentioned below.

- Speed restriction signs on elevated highway and services roads at ground level shall be provided in stretches where geometric standards are restricted as specified under Sch-D.
- **Median and crash barrier**

  Median and crash barrier shall be provided as shown in table below.

S. No.	Design Chainage (m)		Type of Barrier
	From	To	
1	Elevated, Ramps		New jersey Barrier shall be provided at the Median and outer edges
2	At-Grade Ground Level Improvements		Crash Barrier shall be provided at Pier circumference and at median

- Delineators in curves shall be provided as shown in fig. 9.1 of Manual on elevated highway.

(b) Road Marking:

Road markings shall cover road marking for the entire Project Highway as specified in IRC: 35.

(c) Retro-reflective sheeting:
Retro-reflective sheet shall be pasted on road side crash and on median crash barriers.

(d) Reflective sheeting shall be provided in accordance with section 9.2.3 of the Manual.

9.0 Roadside furniture

9.1 Roadside furniture like Road Boundary Stones, Railings, Traffic Impact Attenuators, Delineators shall be provided in accordance with the provisions of Section 9 and Section 12 of IRC: SP:84-2014.

a) Pedestrian Guard Rail: Provide pedestrian guard rail at each bus stop location, built-up sections and intersections

b) Pedestrian Crossings: Provide pedestrian crossings facilities on service roads, built-up sections and intersections.

c) Overhead Traffic Signs shall be provided in consultation with AUTHORITY ENGINEER/KRDCL.

Full width overhead Signs : 8 No's in 4 lane/6lane.

Cantilever gantries : 20 No's

(Location to be finalised in consultation with Authority Engineer)

d) Delineators: Delineators for the entire project highway at the locations as suggested in Schedule-D

10 COMPULSORY AFFORESTATION:

Landscaping and tree plantation shall be provided as per manual keeping in view IRC: SP:21-2009 & as given at Schedule C.

11 Hazardous Locations

As specified in para 8.0

12 Retaining walls & Protection Works

Retaining walls and protection works shall be provided at locations Wherever necessary and any change in no and length or height shall not constituent to change of scope and variation under any clause of this agreement.

13 Change of Scope

The length/span/width (at merging and diverging locations) of Structures and bridges specified hereinabove shall be treated as an approximate assessment. The proposed span arrangement of above structures may be changed based on innovative design of structure, latest construction techniques and aesthetics of structures and the actual lengths of Structures and bridges 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 length/span/width (at merging and diverging locations) 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 SPECIAL REQUIRMENTS OF THE PROJECT

Structural requirement:

1) Minimum individual span for main line structure will be 40m and 20m for Ramps/Loops unless otherwise there is any obligatory requirement.
2) Elevated/ grade separated section of Main Carriageway shall be designed as continuous structure with modules of minimum length of 160m for Main Carriageway and 80m for Ramps. Accordingly, the minimum spacing between successive expansion joints shall be 160 m in case of main carriageway and 80m in Ramps. All the spans shown in drawings are from center to center of pier.
3) Superstructure shall be BOX type steel girders and Substructure shall be concrete filled composite steel piers (CFST). Foundations shall be RCC Open/Pile as per Geotechnical investigation Requirement.
4) All the ramps shall be constructed with RE wall upto 5m height from EGL and thereafter with viaduct spans.

Traffic Management: Project highway alignment is traversing through highly congested and heavy traffic density areas of Bengaluru City; it is utmost important to have proper and location specific Traffic Management Plan (TMP) for **safe and smooth** movement of traffic during construction.

Contractor shall prepare the location specific detailed Traffic Management Plan (including but not limited to diversions, all times legible direction signs, advanced information signs and barricading) etc. well ahead of actual construction and same shall be submitted for its approval by the concerned Authority/Board. All necessary traffic diversions are included in the scope of work. Contractor shall start the construction work after getting the approval from the concerned Authority/Board. Contractor is sole responsible for the **safe and smooth** movement of the traffic. Contractor shall ensure that at no point of time vehicle movement is stopped due to the hindrance caused by the Construction of the Project highway. Contractor shall be proactive in consulting all the concerned departments and taking their guidance for safe and smooth movement of the traffic. Contractor shall ensure that at construction site Ambulance, Tow away vehicle, and other emergency situation tackling vehicles available at 24x7 in operations condition. The number of such vehicles is depending upon the site requirement and shall be finalized in consultation with the concerned Authority/Board. The Contractor make sure that provisions in the IRC SP-55 be implemented on site. Barricading shall be of Type IV as per clause 5.2.5 and proper lighting / blinkers shall be provided to guide the traffic movement.

Contractor shall make sure that it's domain representatives shall be present whenever there is a meetings of Authority / Board without fail for discussing safe and smooth movement of traffic. Contractor shall also deploy at least 30nos. of personnel for every 8hours shift, i.e. at least 90 persons per day, who will be responsible to manage the traffic during

construction period including any extension in the period thereof. All the persons responsible for traffic management shall be "Home Guard" or equivalent and shall have experience in traffic management for at least 2nos. of road or similar projects in metropolitan areas.. In case the deployment is less than the specified and the Authority/ Authority Engineer finds any lapse in traffic management leading to undesirable heavy traffic congestion or deadlock, Contractor shall take immediate measure to resolve the same at the full satisfaction of the Authority. Non-compliance of the same shall lead to penalty at the rate of Rs. 500,000 (Rupees Five Lakhs only) per day.

The cost incurred for Traffic management including for devices, signs and personnel shall be deemed included in the project cost no extra payment shall be made.

Approvals from the statutory bodies: Contractor shall be proactive in getting the approvals from the respective utility departments for shifting / protecting or any other requirement well in advance so that there is no hindrance to the constriction activity. Whenever Project corridor alignment is traversing through or by adjacently any State Govt. agency property (Waterbodies, Metrorail, Railways, Parks etc.) they shall obtain necessary guidelines/approvals form the concerned Authorities to avoid any hindrance during the construction.

Dust Mitigation measures during Construction & Demolition (C&D) activities and safe disposal/reuse/recycling of waste generated:

a. Prepare an action plan for the reduction, reuse & recycling of waste with clear targets and timelines for the achievement of targets.

b. Prepare Environmental management plan during construction including of dust mitigation measures.

c. Roads leading to or at construction sites must be paved and blacktopped (i.e. metallic roads)

d. No loose soil or sand or construction and demolition waste (C&D) or any other construction material that causes dust shall be left uncovered.

e. Wind-breaker of appropriate height i.e. 1/3 of building height and maximum upto 10 meters shall be provided.

f. Water sprinkling system shall be put in place.

g. Dust mitigation measures adopted should be displayed prominently at the construction site for easy public viewing.

h. Grinding and cutting of construction materials in open area shall be prohibited.

i. Construction materials and waste should be stored only within earmarked area and road side storage of construction materials and waste shall be permitted.

j. No uncovered vehicles carrying construction materials and waste shall be permitted.

k. Construction and Demolition (C&D) waste processing and disposal site shall be identified and required dust mitigation measures be notified at the site

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;
b. Roadside Furniture;
c. Pedestrian Facilities;
d. Landscaping and Tree Plantation;
e. Truck Lay-Byes;
f. Bus-Bays and Bus Shelters;
g. Rest Areas; and
h. Street Lighting
i. (ECB and VMS
j. (Utility crossing ducts
k. Telecom system
l. Mobile patrol units
m. Traffic Aid posts
n. ATMS
o. Medical aid post and Ambulance
p. Vehicle rescue posts and Crane
q. Architectural features to piers of elevated corridor
r. CCTV
s. Land scape and protection works
t. Blinkers at medians
u. High mast lighting
v. Safety measures
w. Painting on exterior surface of structural steel:
x. Anti-Glare Screen
y. Overhead Driver Feedback System
z. Noise barriers

2 Description of Project Facilities

Each of the Project Facilities is described below:

(a) Toll Plaza[s];

Toll Plaza shall be provided as below:

ID	Existing Chainage (km)		Design Chainage (m)		Length (m)	Remarks
	Start	End	Start	End		(Location)

Nil

(b) Roadside Furniture;

Road side Furniture shall include the provision of the following:

i. Traffic Sign
Traffic Sign includes the Road Side Signs, Overhead signs and Kerb mounted signs along the entire Project Highway in accordance with section 9 of IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010.

ii. Pavement Marking
Pavement Marking shall cover the road marking for the entire Project Highway in accordance with section 9 of IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010.

Crash barrier and kerbs shall also be painted for night visibility also.

iii. Delineators
Delineators shall be provided along the entire Project Highway in accordance with section 9 of IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010.

iv. Road Studs
Road Studs shall be provided along the entire Project Highway at the Edge, lanes and at center of each carriageway in accordance with section 9 of IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010. However all the curve portion shall be provided with solar studs both at edge and center of the carriageway in two ways.

v. Traffic Impact Attenuators
Traffic Impact Attenuators shall be provided along the entire Project Highway in accordance with section 9 of IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010.

vi. Safety Barrier
Concrete crash barrier of New Jersey type shall be provided on Elevated highway at median. Retro-reflective sheet shall be pasted on road side and on median crash barriers in both ways all along the project road.

(c) Pedestrian Facilities
Pedestrian Facilities include the provision of:

i. Pedestrian Guard Rail - Provide it in accordance with IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010.
ii. Pedestrian Crossing - Provide it in accordance with IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010.

iii. The additional pedestrian facilities in the form of guard rails, footpath, lighting etc. shall be provided wherever required in accordance with Section 12.2 of the Manual of Specifications and Standards

(d) Landscaping and tree plantation;

In addition to compensatory afforestation specified in Clause 10 of Schedule B, tree plantation and landscaping shall be done as per IRC: SP:21: 2009 and Section 11 of the Manual on the project highway. Landscaping and tree plantation of the highway shall be provided on the project highway, but not limited to the following:

- Median [as per Clause 11.2.4 of the Manual] and Ornamental railing on both sides of median shall be provided. Railing height shall be 750mm. The drawings of the same shall be got approved from AE/KRDCL.
- Grade Separated intersections at ground level where land is available.
- At grade islands of intersection locations
- Toll Plaza Area
- Wayside Amenities
- Road side
- Top of 4-Tank bunds
- Any other locations as per requirements of Clause 11.3 of the Manual.

Tree Transplantation: at least 20% of the trees being impacted shall be transplanted to suitable locations as directed by authority or Forest Department, Govt. of Karnataka.

Compensatory plantation: The compensatory plantation shall be done at the rate of 10 trees to each tree cut or as per State Govt. policy

Median Plantation: 2 rows of median plantation shall be planted all along the at-grade (Ground level Improvements) of project road in both ways. On Elevated corridor at median location flower pots shall be provided at an interval of 50m throughout the length and as directed by Authority/Authority Engineer.

Vertical Gardens: Vertical gardens shall be provided all along the project road at ground level all around pier faces upto height of 2m.

(e) Truck Lay-Byes:

Truck Lay-Byes shall be provided at following locations:

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	Side	Location
Nil				

(f) Bus-Bays and Bus shelters:

Bus-Shelter shall be provided at following locations [to be rechecked with the plan & profile]:

Sl. No.	Existing Chainage (Km)	Design Chainage (Km)	Side	Location
Nil				

(g) Rest Areas and wayside amenities:

Development of site for wayside amenities and rest area shall be at the following locations as per manual requirements:

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Side	Location
Nil				

(h) Street Lighting

- Minimum level of illumination at all locations/ sections of carriageways shall be 40 lux. It shall be provided as specified in clause 12.3 of manual on Elevated Highway and At grade level carriageways. Lighting shall also be provided on soffit of the Elevated structure and as directed by the Authority/Authority Engineer and same shall not constitute Change of scope.

- The minimum illumination level of 40 lux shall be provided on both sides of footpath.

(i) Emergency Call boxes and Variable Message Signs (ECBs &VMS)

Emergency call boxes and Variable Message Signs shall be provided as per Manual. 20 locations (To display various information related to road and traffic)

(j) Utility Crossings ducts

Utility ducts 2x300mm dia concrete Hume Pipe shall be provided across the Project Highway at every 250m interval and along with inspection chamber for crossing of underground utilities in Built-up areas as per manual requirements. Location for such utility crossing shall be finalized in consultation with utility owners/ Authority Engineer/PWD /State Government.

(k) Telecom System

Telecommunication system shall be developed by providing necessary Network so that immediate actions can be taken in case of emergency accordance with Section 12.11 of the Manual of Specifications and Standards.

(l) Mobile patrol units

Highway Patrol units in one numbers shall be provided

(m) Traffic Aid posts

Traffic aid post in one numbers shall be provided

(n) ATMS

ATMS shall be provided as per Manual

(o) Medical aid post and Ambulance

Medical aid post and Ambulance in one numbers shall be provided

(p) Vehicle rescue posts and Crane

Vehicle rescue post and Tow-away crane of suitable capacity as suggested by Authority / Authority in one numbers shall be provided

(q) Architectural features to piers of Elevated corridor

(r) CCTV Cameras

CCTV cameras shall be fitted at every 500m covering both sides of the elevated corridor which are of high resolution with necessary cable/electrical infrastructure needed.

(s) Land scape and protection works

(t) Blinkers at median openings:

Solar blinkers shall be provided at all median openings on both directions at at-grade and at split carriageways in elevated or as suggested by Authority / Authority Engineer.

(u) High mast lighting:

High mast lighting of 5 numbers shall be provided at locations

Note: - In case of any discrepancy in numbers or location of any of the project facilities mentioned in this Annex-I, the Authority Engineer shall finalize the number/location of these facilities as per site requirement. Any increase in the

number/location of these facilities specified in the relevant Clause of this Schedule-C 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.

(v) Safety measures:

In addition to the safety measures as specified in the Manual of Specifications and Standards, speed calming measures at every 500m interval on main carriageway, merging/diverging locations and at every entry/ exit ramps rumble strips made of thermoplastic material of thickness 5mm minimum with appropriate signs to warn the users are to be provided on Elevated corridor. Suitable standard signs and flashing beacons etc. shall be provided wherever required in consultation and approval of the Authority/Authority Engineer.

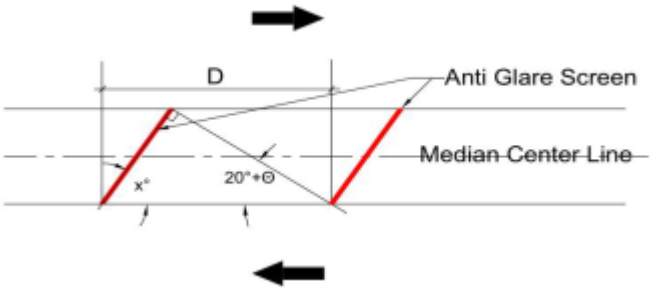
(w) Painting on exterior surface of structural steel:

Contractor shall do the surface painting on exterior surface of structural steel for severe atmospheric exposure conditions in consultation with Authority/Authority Engineer.

(x) Anti-Glare Screen

Anti-glare screen shall be provided in the median as shown in the TCS both for elevated section and Ramp portion of the Main Carriageway for enhancing road safety. Specifications of anti-glare screen shall be as per the following:

- Top of the Screen shall be at least 1.8m above the finished road level
- Shall be able to block light at angles from 0° to 20°
- Shall be installed inclined to the median
- Spacing (D) and the angle of inclination (x) shall be decided on the basis of the curvature of the road following the equation and fig. given below:



- Cut-off angle = 20°+Ĭ, as defined by National Cooperative Highway Research Program (NCHRP): 66, 1979
- x = angle of inclination w.r.t. median centre line
- Spacing of anti-glare screen (D) in meters = B x [cot (x) + cot(20°+Ĭ)],where

Ĭ = degree of curvature of road in degree = 1746 / R, where R = radius of median center line in metres

B = width of the anti-glare screen in metres

- Shall be double sided along with retro-reflective marking along edges of both sides of the screen
- Shall be water resistant, resistant against corrosion and UV radiation and can stand against most arduous traffic conditions
- Shall be acceptable at temperature between -10°C and +60°C
- The system structure shall be capable to withstand wind speed of 150 km/h
- Shall have no sharp edges and corners on which people can get hurt
- Easy to install
- Shall not discolor
- Aesthetically pleasing with green body to make the drive comfortable

(y) Overhead Driver Feedback System

Overhead Driver Feedback System along with along with minimum 2 closed circuits automatic number plate recognition (ANPR) cameras shall be installed on main carriageway at an interval of every 2 Km in each direction. Specifications shall be as per following:

DFS (Driver feedback System) is a full size sign with extra-large 15" digits for improved visibility as vehicles approach from a distance. DFS sign should displays driver speeds and can be programmed to flash when the chosen speed is exceeded. In addition to the user friendly software, vandal resistance, and low power consumption and should have universal mounting bracket, making it a robust for safer streets. It should have all the power option AC/DC/Solar.

Specification:

- Digit: 15.0"(h) x 8.0"(w), 112 LEDs per digit
- Text:
    - o Full Size: Letters 6.0"(h) spell "YOUR SPEED" fixed message, 2 lines
    - o Compact Size: Letters 4.0" (h) spell "YOUR SPEED" fixed message, 1 line
- Unit alone: 21.5"(h) x 26.0"(w) x 3.0"(d)
- Unit with "YOUR SPEED" sign mounted:
    - o Full Size: 30.0"(h) x 24.0"(w) x 3.0"(d)
- Accessories
    - o 4 Cell Lithium Ion Battery: 4 lbs
    - o Universal Mounting Bracket System

f Sign Bracket: 2 lbs

f Pole Bracket: 5 lbs

Technical Specifications:

- Kilometers Per Hour (km/h)
- Aluminum protective cover:
- Yellow or white High-Intensity prismatic fluorescent reflective sheeting on the sign face with black colored text
- Conformal coating on all circuit boards

Power

- Power input:
- AC 100~240 VAC
- 12 VDC
- Built in ambient light sensing and automatic brightness control
- Wireless battery charge monitor

Power Options

- AC power input: 100~240 VAC
- DC power input: 12 VDC
- Solar power: 90 W solar panel

Radar:

- Internal Radar: Doppler
- Radar RF out: 5 mW maximum
- Radar f-center: 24.125 GHz center +/-25 MHz
- Pickup distance: Up to 1,200 feet (366 m)
- Beam angle: 24° (vertical) x 12° (horizontal)
- Beam polarization: Linear

Display:

- LEDs 245:
- Digits: 224 Amber, 23°, 5 mm, luminous Intensity (5680 – 8200 mcd/LED)
- Speed Violator Strobe: 21 White, 15°, 5 mm , luminous intensity (28,150 mcd/LED)
- Optical lenses: 245 lenses
- Ambient light sensor and automatic brightness adjustment
  Enclosure:
- Aluminum, flat black powder coated front for reduced glare and maximum contrast; light gray powder coated body to minimize heat absorption
- Weatherproof, , IP65 level compliant
- Non-sealed and ventilated
- Mounting Options
- Theft resistant

(z) Noise barriers

Noise barriers to be installed outer side of both sides of the Elevated structure and also along the both sides of the ramps. Noise barriers shall comprise of 8mm thick polycarbonate sheet, GI pipe structure, Aluminum Pressure pad profile, rubber gasket and other related accessories. The length of noise barriers shall be as per Environment Management Plan (EMP) report attached

Note: - In case of any discrepancy in numbers or location of any of the project facilities mentioned in this Annex-I, the Authority Engineer shall finalize the number/location of these facilities as per site requirement. Any increase in the number/location of these facilities specified in the relevant Clause of this Schedule-C 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.

Special requirements for Environmental aspects:

Appendix A-1 Environment management plan

SCHEDULE - D

(See Clause 2.1)

SPECIFICATIONS AND STANDARDS

1 Construction

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

2 Design Standards

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

Manual of Specifications and Standards (IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010), referred to herein as the Manual and all the other latest IRC codes, MoRTH specifications & circulars issued by MoRTH shall form part of the specifications and standards.

Annex - I
*(*Schedule-D*)*

Specifications and Standards for Construction

1 Specifications and Standards

All Materials, works and construction operations shall conform to the Manual of Specifications and Standards (IRC:SP:73-2018, IRC:SP:84-2014, IRC:SP:87-2013 and IRC:SP:90-2010), referred to as the Manual, and MoRTH Specifications for Road and Bridge Works (fifth Revision). Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2 Deviations from the Specifications and Standards

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

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

Sl. No.	Clause No.	Description	Deviation
1.	Clause 2.1	General: Provision of Two/Four/Six lane divided carriageway through built-up areas	Lane configuration and width of carriageway shall be provided as per the Typical cross sections given at Appendix B-2 of Schedule B.
2.	Clause 2.2	Design Speed: Ruling or minimum Design speed shall be followed	Design speed shall be adopted as mentioned in the Plan & Profile drawings given in Appendix B-1 of Schedule B.
3.	Clause 2.3	RoW	Right of Way is provided as per the Table provided in Schedule A
4.	Clause 2.5	Median	On At grade road, existing median is kept as it is or modified as specified in TCS. On Elevated corridor median width is as specified in TCS and Plan
5.	Clause 2.6	Type and width of Shoulders	Type and Width of shoulders shall be as per the Typical cross sections given at

Sl. No.	Clause No.	Description	Deviation
			Appendix B-2 of Schedule B.
6.	Clause 2.9.3	Super-elevation Shall be limited to 7 Percent	Super-elevation shall be limited to 4% (four Percent).
7.	Clause 2.9.4	Radius of Horizontal Curves	Radius of Horizontal curves shall be as per the alignment plan shown in Plan & Profile drawings given in Appendix B-1 of Schedule B.
8.	Clause 2.9.5	Sight Distance: On two-lane roads, normally intermediate sight distance should be available throughout.	Stopping sight distance shall be provided as a minimum, where ever possible intermediate and overtaking sight distance shall be provided.
9.	Clause2.10.2	Vertical Clearance for Vehicular Elevated corridor	The vertical clearance for Vehicular Elevated corridor shall be min. 8m and as per Clause7.6 of Schedule B.
10.	Clause 2.16	Utility Corridor	Location and size of Utility Corridor shall be as per TCS attached with Schedule B.
11.	Clause 2.17	Typical Cross sections	The proposed cross section has been given in schedule B which are to be followed.
12.	Clause 2.12.2.3 & 2.13.1	Entry and Exit Point	Entry and exit ramps shall be as per plan and profile drawings given in Appendix B-1 of Schedule B
13.	Clause 10.4.20	Traffic Aid Post, Medical Aid Post and Vehicle Rescue Post	Due to urban area, these facilities are available along the project stretch. Therefore not provided.
14.	Clause 3.3.2	Gradient	At grade existing road Gradient shall be retained as exists. Elevated corridor and ramps gradient shall be as shown in plan and profile drawings given in Appendix B-1 of Schedule B
15.	Clause 4.2	Road Embankment: Principles for height of embankment	The minimum FRL shall be followed as per the Plan & Profile drawings given in Appendix B-1 of Schedule B
16.	Clause 5.1 &5.1.1	Provision of Flexible or Rigid pavement	The type of Pavement shall be as per Clause 5.2 of Schedule B.
17.	Clause 5.9	Widening and strengthening	The project road is recommended for widening and strengthening based on the schemes based on the designed profiles and as per the TCS given in Appendix B-

Sl. No.	Clause No.	Description	Deviation
			2.
18.	Clause 6.3.2	Median Drainage: In super-elevated sections, combination of covered longitudinal and cross drains shall be provided	Median cuts shall be provided at the location of super-elevated sections to allow the water to flow from one side carriageway to other side.
19.	Fig 7.2A &7.4A & 7.4B	Deck Width of bridges	Deck width of Structures and bridges shall be as per clause 7.1.1of Schedule B
20.	& Fig 7.2A &7.4A & 7.4B	Shyness width	The shyness for the 2/3/4/6 laning road and Major Bridge / Elevated corridor is as given in the clasuse7.5 of Schedule B.2.2 Notwithstanding anything to the contrary contained in Paragraph 1 above, the MORTHS specifications for Road and Bridge Works 5th Revision 2013 shall be amended to the extent given in Appendix D-1 to this Schedule D.
21.	Clause 3.2, Fig. 3.1 to 3.7	At Grade intersections	All Junctions shall be developed as per MOST standard drawings, but within extent of ROW available.
22.	7.3 (ii), (fig 7.2A & 7.2B)	Width of Ramp	5.5 m carriage way has been Proposed for up & down ramp, due to restriction of land, except where standard 2-lane ramps are proposed

OTHER SPECIFICATIONS TO BE FOLLOWED FOR ELEVATED ROAD

1. Scope of Work:

These specifications shall be applied to the **fabrication, transportation storage, erection/construction and maintenance of steel structures, composite steel superstructure and steel/composite pier and pier cap etc.** The steel shall comply in all respects with the requirements of approved drawings and relevant codes and specifications and shall be procured from approved manufacturers only. The quality of the work and the materials shall comply with the requirement set forth in the succeeding sections. The contractor shall be fully responsible to ensure that the finished works are free from any defects, weakness, cracks etc.

These specifications shall be read in conjunction with all relevant latest Indian standards, MORTH Specifications (Rev. 5) and other relevant reference specifications described in the successive sections. In absence of Indian Standards, appropriate British Standards, Eurocode and other International standards will be referred.

The contractor will prepare Quality Assurance Plan (QAP) for fabrication of steel members of the elevated corridor and get the same approved from the Engineer before proceeding with the work. All steel members will be got fabricated by a firm who has full fledge fabrication workshop and should have valid certification and completed work of similar nature.

2. Shop Drawings

2.1. Contractor will prepare shop drawings based on the design drawings showing sizes of all structural members, typical connection details, procedures and diagrams showing the sequence of erection.

2.2. The Contractor shall further provide a drawing showing the accurate setting out to line and level of all the anchor bolts intended for the work in sufficient time for their inclusion in the work so as to maintain the construction program.

2.3. The Contractor will prepare all the necessary fabrication shop drawings and these shall be submitted to the Engineer in duplicate (both in soft copy and hard copy) and be approved by him before fabrication is commenced. All such drawings shall show the dimensions of all parts, method of construction, welding, details of splicing and bolting. A further set of all approved fabrication drawings 10 copies shall be supplied by the Contractor for use of the Engineer as required.

2.4. Approval by the Engineer of the submitted drawings or any other particulars shall not relieve the Contractor of full responsibility for any discrepancies, errors or omissions therein

3. Material:

All materials for the steel work shall pass tests and/or analysis prescribed in relevant IS/IRC Specifications or such other equivalent specifications. For all materials including rivets and bolts, the Contractor shall furnish copies of test certificates from the manufacturers including proof sheets, mill sheets etc. showing that the materials have been tested in accordance with the requirements of various specifications and standard provisions.

3.1. Structural Steel

All structural steel shall be of tested quality and conform to one of the following standards:

IS: 226-1975 Structural steel (Standard Quality)

IS: 2062-2011 Hot Rolled Medium and High Tensile Structural Steel

IS: 961-1975 High Tensile Structural Steel (Ordinary)

IS: 1161-2014 Steel Tubes for Structural Purposes-Specifications

IS: 4923-1997 Hollow Steel Sections for Structural Use-Specifications

The Contractor shall supply to the Engineer copies of the manufacturer certificate that the steel brought to the site for incorporation in the works is of a quality fully complying with the specification. Further, Contractor shall arrange for third party testing of the steel samples as per IS: 1608-2005 (Mechanical Testing of the Metal).

Structural steel used for temporary works should also meet the above requirements. Pitted/rusted steel shall not be used.

3.2. Welding Electrodes and Welding Wire:

Welding electrodes used for the works shall conform to IS: 814-2004 (Reaffirmed 2010). These shall be approved grade and be supplied by manufacturer approved by the Engineer-in-Charge. All electrodes shall be kept under dry conditions. Any electrode which has part of its flux coating broken away or is damaged shall be rejected.

Welding wires and flux used for SAW welding works shall conform to IS: 3613-1974 and IS: 7280-1974 and shall be supplied by manufacturer approved by the Engineer and shall be of approved grade. All welding wires shall be kept under dry conditions. Any electrode wire which is broken away or is damaged shall be rejected.

Welding wires used for CO_2 welding works shall conform to IS: 6419-1996 (R2004) and IS: 6560-1996 and shall be supplied by manufacturer approved by the Engineer and shall be of the grade approved by the Engineer. All welding wires shall be kept under dry conditions. Any electrode wire which has part of it broken away or is

damaged shall be rejected.

Welding rods used for manual arc welding works shall be of low hydrogen electrodes ESAB 7018 or approved equivalent. All welding rods shall be kept under dry conditions. Any rod which has part of it broken away or is damaged shall be rejected.

3.3. High Strength Friction Grip Bolts and Nuts:

All High Strength Friction Grip bolts and nuts of grade 8.8 only shall be procured from approved vendors. High Strength Friction Grip Bolts and nuts used for the works shall unless otherwise specified be galvanized bolts and nuts with double washers on both sides supplied by manufacturer approved by the Engineer and shall conform to IS:4000-1992.

All bolts and nuts shall be tightened using pneumatic torque wrenches to the specified torque levels as per relevant Indian or international standards.

3.4. Shear Studs:

Shear connectors in the form of studs will conform to IS: 11384-1985. Use automatic end welding of headed stud shear connectors in accordance with the manufacturer's printed instructions.

3.5. Holding down and Anchor bolts:

The holding down and anchor bolts should conform to the requirements as laid down in IS: 5624-1993 (Code of Practice for Foundation Bolts) or as directed by the Engineer.

3.6. For all other material required for the works, the approval of the Engineer shall be obtained by the Contractor prior to the procurement and use of the material in the works.

4. Storage of Materials and Components

4.1. General

All materials shall be stored in such a manner to prevent deterioration and to ensure the preservation of their quality and fitness for the work. If required by the Engineer, the materials shall be stored under cover the suitably painted for the protection against weather. Any material, which has deteriorated or has been damaged shall be removed from site and replaced by new one, as directed by the Engineer at no extra cost and time.

- Steel to be used in fabrication shall be stored in separate stacks clear of the ground, section wise and lengthwise.
- The storage area shall be kept clean and properly drained. Structural steel shall be stored and handled in such a manner that members are not subjected to excessive

stresses and damage. Girders and beams shall be placed in upright position. Long members shall be supported on closely spaced skids to avoid unacceptable deflection.

4.2. Storage Yard

The Contractor shall be required to establish to suitable yard, at an approved location at site for storing the fabricated steel structures and other materials which will be delivered to site. The yard shall have proper facilities such as drainage and Lighting including access for cranes, trailers and other heavy equipment.

The Contractor shall be responsible to finalize the site, prior to submission of his tender, to acquaint himself with the availability of land and the development necessary by way of filling, drainage, access roads, fences, sheds etc., All this shall be carried out by the Contractor at his own cost and will be approved by by the Engineer-in-Charge.

4.3. Covered Store

All structural steel items, field connection materials, paints etc. shall be stored on racks and platforms, off the ground in a properly covered building by the Contractor.

4.4. Fabrication and Metallizing Yard

Contractor shall set up a fabrication and metalizing yard exclusively for storing, cutting, fabricating, welding and metalizing works in close vicinity of project site.

Fabrication & Metallizing yard to be equipped with all necessary equipment, power supply required for cutting, welding and metalizing works.

All cutting, welding and metalizing works to be carried out in covered yards.

Contractor shall be responsible for setting up, maintaining and watch & ward of the yard and lastly dismantling and clearing off the yard after completion of the work.

All precautions will be taken to ensure Health, Safety and Environment requirement laid by statutory bodies.

No separate payment/claim will be admissible towards the cost of setting up and maintaining and clearing off the fabrication yard and same needs to absorb in rates quoted for structural steel works.

5. Furnishing of Information:

5.1 Preliminary design drawings shall be furnished to the contractor and all such drawings shall form part of these Specifications.

5.2 The Engineer reserves the right to make changes in the design drawings even after release for preparation of shop drawings to reflect addition, omission & modifications in data / details and requirements. Contractor shall consider such changes as part of

these specifications and the contract, and no claims shall be entertained on this account.

5.3 Design drawings, approved by the Engineer, will show as appropriate the salient dimensions, design loads, sizes of members, location of openings at various levels and other necessary information required for the preparation of fabrication drawings, designs and erection details.

5.4 It shall be clearly understood that the drawings of the Engineer are design drawings. The typical detail of connection, cuts, notches, bends etc. where shown in the design drawings are only for general guidance of the contractor. The contractor shall design and develop all such details based on the design forces and functional requirements.

5.5 In case of variations between design drawings and specifications, the decision of the Engineer shall be final. Should the contractor, find any discrepancy in the information furnished by the Engineer, same shall be immediately brought to the notice of Engineer for resolution. The contractor shall obtain clarifications on discrepancies from Engineer before proceeding with the work.

5.6 No detailed erection or shop drawings for temporary structures will be accepted for examination by the Engineer unless the same have first been completely checked by the contractor's qualified structural engineer (independent agency to be appointed by contractor) and are accompanied by an erection plan showing the location of all pieces detailed. The contractor shall check and ensure that detailing of connections is carefully planned to obtain ease in erection of structures, including field-welded connections and / or bolting.

5.7 No fabrication work shall be started by the contractor without prior approval of Engineer on the relevant drawings. Approval by the Engineer of any of the drawings shall not relieve the contractor of his responsibility to provide correct design of connections, workmanships, fit of parts, details, materials and errors or omissions of all work shown thereon. The approval of Engineer shall constitute approval of the size of members, dimensions and general arrangement, but shall not constitute approval of the connections between members and other details.

5.8 Drawings, for approval, shall be submitted by the contractor in an orderly manner commensurate with erection sequence and approved construction program.

5.9 The contractor shall furnish ten prints of all approved final drawings including soft copy in CD ROM for interface / field use and record purpose.

5.10 The drawings prepared by the Contractor, and all subsequent revisions thereof shall be at the cost of the Contractor, and no separate payments shall be made for the same. Revisions shall incorporate all modifications, field changes, substitutions etc. effected. The rates / prices quoted for fabrication work shall be deemed to include the cost of such drawing work.

5.11 All the drawings shall be prepared in metric units. The drawings should preferably be of A2 standard size, and the details shown therein shall be clear and legible. These drawings shall include but shall not be limited to the following:

6. Submittals from Contractor

6.1. Prior to the commencement of the work, the Contractor shall submit the following:

i. Prior to the technical submittals, the contractor shall submit the proposed overall schedule for documentation such as calculations, erection drawings, shop / working drawings for all temporary structures etc. It is highlighted that structural steel member dimensions indicated in tender drawings are tentative only, and may be modified during final design stage.

ii. A detailed list of all constructional Plant & Equipment, such as cranes, derricks, winches, welding sets, erection tools etc. their make, model, present condition and location, available to the contractor and the ones he will employ on the job to maintain the progress of work in accordance with the contract.

iii. The total number of experienced personnel of each category, like fillers, welders, riggers etc., which he intends to deploy on the work.

6.2. The contractor shall submit a detailed erection program for completion of the work in time and in accordance with contract. This will show, in a Performa approved by the Engineer, the target program, with details of erection proposed to be carried out in each week, details of major equipment required and an assessment of required strength of various categories of workers.

6.3. The contractor shall submit complete design calculations for any alternatives sections (for permanent structure) proposed by him, for approval of the Engineer. Use of any alternative section shall be subjected to approval of the Engineer. However, no escalation in unit rates of work shall be allowed for such cases.

6.4. The contractor shall submit for approval a full description of his proposed erection method including sequence of erection, use of temporary supports, connection details and erection camber diagram and design calculations covering various stages of erection process.

7. Structural Steel Fabrication:

The fabrication of the built-up steel member and its accessories shall be carried out by the contractor in his factory premises or in a well-established fabrication workshop to be set up by the contractor near/at the construction site or any other location approved by the Engineer.

The workshop staff shall have requisite experience, proven skill and experience in the technique of fabricating large components. Accuracy of fabrication shall be realized through controlled high precision jigs, fixtures and templates, which shall be inspected

and passed by Engineer / any other inspection agency as nominated by Engineer. The fabrication shall be preceded by Quality Plans to be submitted by the Contractor and every activity shall be documented in detail. The Quality Plans shall clearly indicate how individual processes such as cutting of raw steel, marking, drilling, assembly, welding, painting, handling etc. shall be monitored for quality. The quality parameters for monitoring shall be identified along with monitoring frequency and quality records to be maintained. The officials responsible for monitoring these identified quality parameters shall also be specified in these quality plans. The Contractor shall get these quality plans approved from Engineer before start of fabrication work.

All structural steel welding works i.e. substructure works (viz. pier and pier cap, portal frames etc.), superstructure works (viz. longitudinal girders, diaphragm girders etc.) needs be necessarily made using Submerged arc welding (SAW) method either fully automatic or semi-automatic in accordance with the stipulations from IS:4353-1995 (Submerged arc welding of Mild Steel and Low Alloy Steels).

If pre fabrication of any steel element is not feasible due to transportation constraints, then such elements could be pre-fabricated on site using Gas metal arc welding (GMAW) usually called CO_2 welding method at particular site, subject to prior approval of Engineer-in-Charge. All such CO_2 welding shall confirm to requirements of IS:10178-1995 (Reaffirmed 2006)

Metal arc welding, manual welding shall not be allowed, except otherwise for relatively small weld lengths, where SAW and CO_2 welding are practically not feasible subject to prior approval of Engineer-In-Charge

Applicability of different welding methods for various structural members shall be as per the table hereunder

S.No.	Welding Method	Applicable for following Structural Members
1.	Submerged Arc Welding [SAW]	Pier, Pier cap, Portal Frames, Longitudinal girders, Diaphragm girders and all other structural works related super structure and sub structure.
2.	CO_2 Welding	For super structure works that are practically not feasible to be fabricated at yard and transport to site.
3.	Manual Arc Welding	For non-structural works such as hand rails on crash barrier, pedestrian hand rails, tack welding etc.

All structural steel fabrication, transportation and erection works specifically needs to comply with latest versions of IS: 1024-1999 (Code of Practice for Use of welding in

Bridges and Structures subject to Dynamic Loading).

The Contractor will provide all materials and equipment required to complete the works in every respect, whether such materials are required as part of the permanent structures or temporary work for fabrication or erection or maintenance including specifically structural steel plates, flats, bars, welding rods, rivets, bolts and nuts, paint, welding sets in the shop and at site, all workshop facilities including automatic SAW (Submerged arc welding) gantries with necessary accessories, CO_2 welding sets with all necessary accessories, derricks, cranes, pulley blocks, wire ropes, hemp or manila ropes, winches, erection cleats and temporary braces or supports and all other materials required to deliver the works complete in every respect.

8. Workmanship:

8.1 For all the works, workmanship shall be of first class quality, throughout, in conformity with IS: 800-2007 and true to line, level and dimension as shown in the drawings or instructed by the Engineer.

8.2 All ends shall be cut true to planes. They must fit the abutting surfaces closely.

8.3 All stiffeners shall fit tightly at both ends.

8.4 As far as possible the steel plates shall be procured on "cut to size basis" from approved steel vendors in order to minimize the cutting wastages and for fast tracking the fabrication process. All metal plates cutting shall be done using plasma cutters fitted with CNC (computer numerical control) machine. Hand held manual plasma cutting is allowed subject to prior approval from Design consultant and Engineer-In-Charge for small extents where plasma steel plate cutting is not practically feasible. Hand held flame cutting shall not be permitted.

8.5 All work shall be welded in shops. The pieces shall be manipulated to ensure down hand welding for all shop joints as far as possible. All parts to be welded shall be arranged so as to fit properly on assembly. After assembly and before the general welding is to commence the parts are to be tack welded with small fillet or butt welds as the case may be. The tack welding must be strong enough to hold the parts together but small enough to be covered by the general welding. The welding procedure shall be so arranged that the distortion and shrinkage stresses are reduced to a minimum. Drilling of holes shall be done using automatic CNC drilling machines. Holes for bolts shall be drilled conforming to clause 10 of IS: 7215 (1974). Punching of holes will not be permitted. All drilling shall be free from burrs. No hole shall be made by gas cutting process. All parts assembled for bolting shall be in close contact over the whole surface and all bearing stiffeners shall bear tightly at top and bottom without being drawn or caulked. The component parts shall be so assembled that they are neither twisted nor otherwise damaged as specified cambers if any shall be provided. Drilling done during

assembling shall not distort the metal or enlarge holes. The butting surfaces at all joints shall be so cut and milled so as to butt in close contact throughout the finished joints.

8.6 All welding for the substructure and superstructure works shall be carried out by submerged arc welding (SAW) confirming to IS: 4353-1995 and shall be in accordance with Indian Standard IS:1024-1999 (Use of welding in bridges and structures subject to Dynamic Loading)-Code of Practice.

The Engineer may order periodic tests of the welder and/or of the welds produced by them at his discretion. All such tests shall be carried out by the Contractor at his cost.

8.7 Safety requirements should conform to IS: 7205-1974 and IS: 7273-1974 as applicable and should conform to safety, economy and rapidity.

8.8 All joints required in structure to facilitate transport or erection shall be shown on the drawings or as specified by the Engineer. Should the Contractor need to provide joints in locations other than those specified by the Engineer, he shall submit his proposals to obtain the prior sanction of the Engineer for such joints. The lengths of structural shall be the maximum normally available in the market, jointing of shorter length in order to make up lengths required shall not be permitted.

8.9 Each piece of steel work shall be marked distinctly before delivery, indicating the position and direction in which it is to be fixed. Three copies of a complete marking plan will be submitted to the Engineer before erection commences.

8.10 In the case of welded fabrication any distortion remaining in the member after welding operations, shall be rectified by at the expense of the Contractor to the approval of the Engineer.

8.11 All members of girders and diaphragm girders shall be profiled throughout their length, unless shown otherwise on the drawings, and shall be accurately set to the lines shown on the drawings. Sheared edges of gussets or other members to be straightened and dressed where necessary.

8.12 Templates and jigs used throughout the work shall be all steel. In cases where actual materials have been used as templates for drilling similar pieces, the Engineer shall decide whether they are fit to be used as parts of the finished structure.

9. Testing of Welds (Weld Quality Test):

The welding procedure shall be such as to avoid distortion and minimize residual shrinkage stresses. Properly designed jigs should be used for assembly. The welding techniques and sequences, quality, size of electrodes, voltage and current required shall be as prescribed by manufacturers of the material and welding equipment. All welds shall be subjected to testing in following order

- Initially 100% thorough visual inspection.

- Further liquid penetration test at suspected location (minimum 5% of weld length) as per IS: 3658-1999 - Code of practice for liquid penetrant flaw detection.
- Further necessary tests as per IS: 3600-2009 (Method of Testing Fusion Welded Joints and Weld Metal in Steel): based on the need and direction of Engineer in charge.

In addition to above following tests shall also be applicable

Butt welds: Radiographic testing of 5% of welds as per IS:1182-1983.

Fillet Welds: Ultrasonic testing of 1 in 20 positions decreased to 1 in 50 if failures are less than 1 in 10.

10. Protection of Steel Works (Conforming to IS: 8629-1977):

All fabricated structural steel components of elevated corridor such as pier, pier cap, portal frames, superstructure elements such as longitudinal girders, diaphragm girders needs to be protected from atmospheric corrosion by metallizing (as per technical specifications of Metalizing described separately), the steel surfaces soon after the completion of fabrication activity in the fabrication yard.

For other items of work (such as hand rail, pedestrian hand rail, etc.) for which, metalizing is not proposed needs to be painted

10.1 Painting work shall be carried out in accordance with IS: 8629-1977 (Parts 1 to 3). Painting shall be applied under the temperature requirement specified by the manufacturer.

10.2 The steel work, prior to delivery, shall be cleaned from scale, rust, dirt and grease etc., but means of chipping, scraping and wire brushing using skilled operators as described in the painting systems below. The cleaning shall proceed each day over the extent of surfaces which can be painted on that day. The paint shall be applied by brushing or spraying as per approval of the Engineer.

10.3 Site weld locations shall be left free from paint within 50mm of the weld position, and contact surfaces in connection using High Strength Friction Grip Bolts shall not be painted. Immediately after completion of erection all damaged paint shall be scraped off and made good to the approval of the Engineer.

10.4 All paints and primers shall be of best quality and in original sealed containers as packed by the paint manufacturer conforming to the relevant Indian Standards and shall be procured directly from the manufacturers. All paint to be used shall be stored under cover in such conditions as will preserve it from extreme of temperature and the paint shall be used and applied strictly in accordance with the manufacturer's instructions.

10.5 In addition, the following additional requirements shall be applied to the shop painting of contact and inaccessible surfaces:

- Surfaces to be painted shall be thoroughly cleaned from scale, rust, dirt, grease etc. by means of sand/grit/shot blasting or other equivalent means.
- Surfaces which are to be brought permanently into close contact or made inaccessible either in the shops or upon erection shall, after cleaning, be given two coats of Red Lead Priming Paint. The surfaces shall be brought into contact while the paint is still wet.
- Contact surfaces in connection using High Strength Friction Grip bolts shall not be painted or oiled and shall be free from dirt, loosed scale, burrs, pits and any other defects which would prevent the solid seating of the parts and would interfere with the development of friction between them.
- All enclosed surfaces of box members shall be completely sealed by oiling or by coating with approved bitumen paint and all such members and tubes shall have their ends closed by suitable plates welded in position.

10.6 Surfaces in contact during shop assembly shall not be painted. Surfaces which cannot be painted, but require protection, shall be given a rust inhibitive grease conforming to IS:958 -1975, or solvent deposited compound conforming to IS:1153-1975 or IS:1674-1960, or treated as specified in the drawings.

10.7 Surfaces to be in contact with concrete shall not be painted.

11. Inspection of Fabricated Members:

11.1. The contractor shall inform the Engineer of the progress in fabrication and as to when individual pieces are ready for inspection. All gauge templates necessary to satisfy the Engineer shall be supplied by the contractor. The Engineer may at his discretion check the results obtained at the contractor's works by independent tests and the cost of such tests shall be borne by the contractor.

11.2. Structural steel and components viz. bolts, nuts, washers, welding consumables, etc. should be tested for mechanical and chemical properties as per the requirement of the relevant IS or any other specified codes/standard.

11.3. During Inspection, the component/member shall not have any load or external restraint.

11.4. Contractor shall procure, maintain and make available all necessary testing apparatuses, Inspection kits to facilitate quick and accurate testing such as vernier caliper, screw gauge, DFT meter/ Elcometer, Metal Flaw Detectors (list is not exhaustive) and any other testing equipment required by Engineer.

12. Execution (Erection & Launching):

12.1. Contactor's Responsibilities:

(a) Preparation of complete erection sequence drawing with method statement based on the suggested erection scheme(s) as proposed by contractor, required for all the permanent and temporary structures including launching nose / gantry / truss.

(b) Submission of detailed particulars of the proposed method of erection of the steelwork together with complete calculations relating to strength and deflection to the Engineer for review.

(c) Providing details of all construction and transport equipment, tools, tackle and consumables, materials, labour and supervision required for the erection of the structural steelwork.

(d) The Contractor shall be responsible for safe and deformation free transportation of all structural members to site. Due care shall be exercised to ensure protective coating on structural steel the not damaged during the transportation loading and unloading. Nylon slings are must for handling and erection. Use of other types of ropes and steel cradles is banned. Soft wood cradle only needs to be used for during the transportation and stacking.

(e) All equipment used by the Contractor shall be sufficient for the purpose of erection of the steel work, in the time specified in the contract. Any lifting or erecting machinery shall be to the approval of the Engineer and shall be removed from the site if he considers such appliances dangerous or unsuitable for their functions. The approval of the Engineer shall not relieve the Contractor of the responsibilities for the loads to which the erection equipment shall be called upon to carry. Adequate arrangement shall be made to resist wind loads and lateral forces arising at the time of erection.

(f) The Contractor will be responsible for the stability of the structure during erection and shall arrange that sufficient tack bolts, braces or guy ropes are used to ensure that work will remain rigid until final bolting, riveting or welding is completed. The Contractor shall supply and fix, without extra charge, any temporary bracing which may be necessary.

(g) The Contractor shall observe all safety requirements for erection of structural steelwork as covered in IS: 7205-1974 (Safety code for Erection of Structural Steelwork)

12.2. Delivery, Storage & Handling

(a) Before the shop assembly is dismantled, all members and sections shall be appropriately marked with paint or grooved with their identifications numbers a detailed in shop drawings. The Contractor's representative shall be present during all the shop assemblies (wherever fabrication will be done). It's dismantling and marking operations.

(b) The Contractor shall deliver the fabricated structural steel materials to site, with all necessary field connection materials, in such sequence as will permit the most efficient

and economical performance of the erection work. As per scheduled program, the Engineer may, at his discretion prescribe or control the sequence of delivery of materials.

(c) Fabricated parts shall be handled and staked in such a way that no damage is caused to the components. Measures shall be taken to minimize damage to the protective treatment on the steelwork. All work shall be protected from damage in transit. Particular care shall be taken to stiffen free ends, prevent permanent distortion and adequately protect all machined surfaces. All bolts, nuts, washers, screws, small plates and articles shall be suitably packed and identified.

12.3. Plant & Equipment

All erection tools and plant and equipment proposed to be used shall be efficient dependable duly certified by independent third party and in good working condition, and the suitability and adequacy of such shall be determined by the Engineer. The Contractor shall, in his technical proposal submittal, specify the plant and equipment proposed by him for erection of structural steelwork at site

12.4. Storage

Materials to be stored shall be placed on skids above the ground and shall be kept clean and properly drained.

12.5. Method and Sequence of Erection

The method and sequence of erection shall have the prior approval of the Engineer. The contractor shall follow most economic method and sequence consistent with the drawings and Specifications and such information as may be furnished to him prior to the execution of the Contract. The erection of steelwork shall be planned so as to ensure safe-working conditions at all times. The Contractor shall be solely responsible for enhancing the safety of his construction activities at site.

12.6. Assembly and Erection of Steel Work

(a) During erection, the members and sections shall be accurately assembled as shown in the approved shop drawings and by following the match marks. The material shall be carefully handled so that no section will be bent, broken or otherwise damaged. Hammering which will damage or distort the members shall not be done. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled. Splices and field connections shall have 50% of the holes filled with bolts and balance 50% with cylindrical erection pins before bolting with high-strength bolts. Filling-up bolts shall be of the same nominal diameter as the high-strength bolts, whereas the cylindrical erection pins shall be 1 mm or larger in diameter.

(b) The correction of minor misfits involving harmless amounts of reaming, cutting and chipping will be considered a legitimate part of the erection. However, any error in the shop fabrication or deformation resulting from handling and transportation which prevents the proper assembling and fitting up of parts by the moderate use of drift pins or by a amount of reaming and slight chipping or cutting, shall be reported immediately to the Engineer and his approval of the method of correction obtained. The contractor shall be responsible for all misfits, errors and injuries and shall make the necessary corrections and replacements.

(c) The straightening of plates, angles, other shapes and built-up members, when permitted by the Engineer, shall be done by methods that will not produce fracture or other damages. Distorted member shall be straightened by mechanical means or, if approved by the Engineer, by the carefully planned and well supervised applications of a limited amount of localized heat. Each application will be subject to the approval of the Engineer.

(d) The responsibility in respect of temporary bracing and guys shall rest with the Contractor until the structural steel is located, kept in plumb, leveled, aligned and grouted with the tolerances permitted under the Specifications, and the permanent bracing / framing system has been installed.

(e) The temporary guys, braces, false work and cribbing shall not be the property of the Engineer / Employer and will be removed by the Contractor, with the approval of the Engineer, without any change, once the permanent framing system has been installed to the satisfaction of the Engineer and when the temporary bracing, guys etc. can be removed without any potential danger / damage to the erected structure.

12.7. Setting Out

(a) Positioning and leveling of all steelwork, keeping in plumb and placing of every part of the structure, with accuracy, shall be in accordance with the approved drawings and to the satisfaction of the Engineer. The Contractor shall check the positions and levels of the anchor bolts etc. The contractor shall check the positions and levels of the anchor bolts etc. before concreting and ensure that they are properly secured against disturbance during pouring operations. The Contractor shall remain responsible for correct positioning and shall set proper screed bars to maintain proper level. No extra payment shall be made on this account.

(b) No permanent field connections by bolting shall be carried out until proper alignment and guides for keeping in plumb have been attached.

12.8. Field Bolting:

(a) Bolts shall be inserted in such a way that they remain in position under gravity, even before fixing the nut. Bolted parts shall fit solidly together when assembled

and shall not be separated by gaskets or any other interposed compressible materials. When assembled all joint surfaces including those adjacent to the washers shall be free of scales. They shall be free of dirt, loose scales, burns and other defects that would prevent solid seating of the parts. Contact surfaces within the friction type joints shall be free of oil, paint, and lacquer or galvanizing.

(b) Holes for turned bolts to be inserted in the field shall reamed in the field drilling and remaining for turned bolts shall be done only after the parts to connected are assembled. Tolerances applicable in the fit of the bolts shall in accordance with relevant Indian Standard Specifications.

(c) All high tensile bolts shall be tightened to provide the required minimum Torque as per relevant Indian Standards / Specifications when all fasteners the joint are tight.

(d) The manufacture and use of high strength friction grip bolts shall comply with all the requirements of IS: 3757 (1985)

(e) Load indicating bolts or washers may be used, subject to the approval of Engineer.

- Requirements stipulated under bolting shall apply for field bolts. Field bolts, nuts and washers shall be supplied by the authorized fabricators of the structural member in excess of the nominal numbers required. Only HSFG bolts of class 8.8 shall be used.
- At the time of assembly the surfaces in contact shall be free of paint or any other applied finish, oil, dirt, loose rust, loose scale, burrs and other defects which would prevent solid seating of the parts or would interface with the development of friction between them.
- In any other surface condition, including a machined surface, is specified, it shall be the responsibility of the Contractor to work within the slip factor specified for the particular case.
- Each bolt and nut shall be assembled with washers of appropriate shape, quality and number in cases where plane parallel surfaces are involved. Such washers shall be placed under the bolt head or the nut, whichever is to be rotated during the tightening operation. The rotated nut or bolt head shall be tightened against a surface normal to the bolt axis, and the appropriate tapered washer shall be, used when the surfaces are not parallel. The angle between the bolts axis and the surface under the non-rotating component (i.e., the bolt head or the nut) shall be 90 + 3 degree. For angles outside these limits, a tapered washer shall be placed under the non-rotating component. Tapered washers shall be correctly positioned.

- No gasket or other flexible material shall be placed between the holes. The holes in parts to be joined shall be sufficiently well aligned to permit bolts to be freely placed in position. Driving of bolts is not permitted. The nuts shall be placed so that the identification marks are clearly visible after tightening. Nuts and bolts shall always be tightened in a staggered pattern and where there are more than four bolts in any one joint, they shall be tightened from the centre of the joint outwards.
- If, after final tightening, a nut or bolt gets slackened off for any reason, the bolt, nut and washer or washers shall be discarded and not used again.

12.9. Holes, Cutting and Fitting

(a) No cutting of sections, flanges, webs and clients, rivets, bolts, welds etc. shall be done unless specifically approved and / or instructed by the Engineer.

(b) The erector shall not cut, drill or otherwise after the work of other trades, or his own work to accommodate other trades, unless such work is clearly specified in the contract, or directed by the Engineer. Wherever such work is specified the Contractor shall obtain complete information as to size, location and number of alternations, prior to carrying out any work. The Contractor shall not be entitled for any payment on account of any such work.

12.10. Drifting:

(a) Correction of minor misfits will be considered as permissible. For this, light drifting may be used to draw holes together and drills shall be used to enlarge holes, as necessary to make connections. Reaming, that weakens the member or makes it impossible to fill the holes properly or to adjust accurately after remaining, shall not be allowed.

(b) Any error in shop work which prevents the proper assembling and filling of parts by moderate use of drift pins and reamers shall immediately be brought to the attention of the Engineer, and approval of the method of correction obtained. The use of gas cutting torches at the erection site is prohibited.

12.11. Grouting:

(a) The positions to be grouted shall be cleaned thoroughly with compresses air jet and wetter with water, and any accumulated water shall be removed. Grouting shall be carried out under expert supervision; takings care to avoid air locks. Edges shall be finished properly.

(b) Whatever method of grouting is employed, the operation shall not be carried out until the steelwork has been finally aligned and leveled. Immediately before grouting, the space under steel is thoroughly cleaned. Where packings are to be left in place, they shall be placed such that they are completely covered with grout.

(c) The grout to be used shall be Non-shrink grout Conbextra GP-2 M/S Fosroc or approved equivalent.

(d) All steel in foundations shall be solidly encased in Portland Cement Concrete of minimum characteristics strength at 28 days as specified in the drawings, subject to a minimum of 35 N/mm^2. A minimum cover of 100 mm shall be provided to all steelwork where surrounding concrete is in contact with soil.

12.12. Inserts and Embedment:

Various steel inserts and embedment's will be required under the contract to be fabricated, positioned and secured firmly into place inside the formwork prior to concrete being poured. There are also requirements of jointing, threading, bolting and welding insets and embedment's of different concrete and structural steel elements in order to establish structural continuity and connection. Great care shall be exercised by the contractor in executing all aspects of the work related to inserts and embedment's, including tolerances, so that the final assembly of the concrete elements can meet satisfactorily the continuity and contiguity requirements intended in the structure.

12.13. Metalizing after Erection

(a) The damaged surfaces of metalizing due to transportation, handling and erection, shall be metalized using portable metalizing equipment after the structure is erected, leveled, kept in plumb, aligned in its final position, and accepted by the Engineer. Touch up with Zinc rich/Aluminum rich painting as substitute for metalizing is not acceptable.

(b) Metalizing shall not be done in frost or foggy weather, or when humidity is such as to cause condensation on the surfaces to be metalized. Before, commencing metalizing of steel, all surfaces to be painted shall be dried and thoroughly cleaned from all loose scale and rust using power driven steel brushes.

(c) Surfaces which will be inaccessible after field assembly, shall receive the full-specified protective treatment of metalizing before assembly. Bolts and fabricated steel members, which are galvanized or otherwise treated, shall not be metalized.

(d) The contractor shall be responsible for any damage caused to other components of the structure including the substructure in particular, he shall take all necessary precautions to minimize concrete splash onto complete… steelwork or rust staining of concrete due to erected steel work and clean and / or repair all stains and other damages to completed work prior to tests on completion.

12.14. Final Cleaning Up:

Upon completion of erection, and before final acceptance of the work by the Engineer, the Contractor shall remove, free to cost, all false work, rubbish and all temporary works, resulting from or in connection with the performance of his work.

13. Rectification of Damaged Materials:

Any deficiency in shop work which prevents the proper assembly and lifting up of the parts by moderate use of drift pins or reaming or cutting shall be immediately reported to the Engineer and his approval of the method of rectification obtained in writing. Wrongly fabricated material whose erection in the field necessitates extra work shall be the responsibility of the contractor. The entire costs of such operation including the replacement of defective members, if required, shall be borne by the contractor

14. Holding down Steel Base and Anchor bolts:

14.1 The holding down and anchor bolts should conform to the requirements as laid down in IS: 5624-1993 (Code of Practice for Foundation Bolts) or as directed by the Engineer.

14.2 **Installation**: Individual bolt in groups of holding down bolts shall be positioned accurately within a tolerance of + 6mm. The bolts shall be set vertically to a tolerance of not more than 1 in 250.

14.3 During the casting of concrete the contractor shall ensure that space between the bolt and sleeves is kept clean after removal of shuttering. The contractor shall provide and fix timber plugs to maintain this space in a clean condition. The projecting threads of bolts shall be protected by approved wrapping materials.

14.4 Grouting of bolt tubes shall be carried out after the steelwork or equipment have been aligned, plumbed and levelled.

15. Grouting of Steel Bases:

15.1. Before grouting of pier bases, the contractor shall take the following action :

a. Inform the Engineer.
b. Clean all holes, openings, recesses and the top of foundations of all dirt, mud, water, oil or other extraneous matter.
c. A frame shall be placed in position around the base plate with a provision for placing or injecting grout.
d. The contractor shall provide screed bars or mild steel flats and fix them in mortar.
e. Holes shall be provided on the stanchion bases for escape of air.

15.2. Grouting of steel beams, steel pier, bases and bearings and encasement of steelwork will be carried out by the contractor after the steelwork has been finally aligned and levelled and approval of the Engineer obtained.

15.3. The bolt sleeves shall be grouted as a separate operation using neat cement grout of a creamy consistency, which shall be poured in so as to completely fill the holes. "Non-shrink" cements, additives of approved makes shall be used for all grouting operations.

15.4. The space between the top of the foundations and the underside of the base plate shall be completely filled with a "Non-shrink Group Conbextra GP2 of M/s Fosroc or approved equivalent" and finished flush with edge of the base plate, either :

a. Mixed as a stiff mortar well rammed into place from all sides.

b. Mixed as thickly as possible consistent with fluidity and poured under a suitable head and tamped until the space has been properly filled.

16. Tolerances:

16.1. All tolerances shall be in accordance with IS: 7215-1974 (Code of Practice for Tolerances for fabrication of steel structures) unless otherwise specified.

16.2. The maximum deviation for line and level shall be + 3.0mm for any part of the structure including for location of column centers.

16.3. The maximum deviation from plumb for columns shall be +3.0mm in 10.0m height subject to a maximum of +6.0mm in a total height of 30.0m.

16.4. The deviation at the center of the upper chord member from vertical plane running through the center of the bottom chord shall not be more than 1/1500 of span but in no case more than 10.0mm. The lateral displacement of top chord at center of span form vertical plane running through center of supports shall not be more than 1/250 of the depth of truss but in no case more than 20.0mm.

17. Additional Specifications for Erection:

Girder erection for longer and regular spans:

17.1. Preferably no road traffic blocking will be used. Multiple day / night short blocks of 1-1.5hours maximum are acceptable to ensure safety subject to approval of Engineer.

17.2. Erection scheme shown in Preliminary drawings is suggestive only. Contractor has to provide his own proposed Erection scheme and supporting calculations with the offer.

17.3. Contractor will furnish the design and details of all temporary works to be used at site for execution of permanent structure and get them approved from Engineer

17.4. Contractor will coordinate with Bangalore Traffic Police, other departments such as KPTCL, BSNL, BESCOM, BWSSB and Engineer before and during the erection. Contractor will be responsible to develop detailed traffic diversion scheme for at grade running traffic.

17.5. Tentative allowable bearing pressure for temporary supports foundation concrete blocks shall be assumed at 10 tonnes / sqm.

17.6. Any necessary precaution by proper and secure fixing shall be taken by the contractor to prevent the fall of any object onto the road below during the whole erection period.

17.7. A minimum 15 m clear width (4 lanes) shall be kept during the whole construction period. These lanes can be obtained as 4 or 2+2.

18. Testing and Acceptance Criteria:

Loading tests shall be carried out on erected structures, if required by the Engineer, to check adequacy of fabrication and/or erection as per relevant IRC Specification. Any structure or a part thereof found to be unsuitable for acceptance as a result of the test shall have to be dismantled and replaced with suitable member as per the Contract and no payment towards the cost of the dismantled portion and any connected work shall be made to the contractor. In course of dismantling, if any damage is done to any other parts of the structure or to any fixtures, the same shall be made good free of cost by the Contractor, to the satisfaction of the Engineer.

19. Method of Measurement:

The pricing must include for all rolling margins, extras for length and size, allowance for waste, complete fabrication, delivery and erection, and sealing the gap between base plate and foundation, and painting as specified in the item. Unless otherwise specified, the final coats of paints, however, will be measured and paid separately on the basis of tonnage fabricated and erected.

For the purpose of payment, the weight of the actual completed structures shall be calculated from the approved drawings for different items of work.

No allowances will be permitted for bolts, nuts, washers, studs, screws etc, galvanizing, welding or for rolling margins. One tonne for the purpose of payment shall mean ONE METRIC TONNE i.e. 1000 Kg.

The structural work which is temporary in nature and/or which is required for erection purpose shall not be measured.

20. Applicable Code of Practice:

The following specifications, standards and codes are included as part of this Specification. All Standards, specifications, codes of practice current on the date of signing of agreement and referred to herein shall be applicable.

IS:226 (1975)	Specifications for Structural steel (Standard Quality)
IS:800 (2007)	Code of Practice for General Construction in Steel.
IS:808 (1989)	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Section
IS:812 (1989)	Glossary of terms relating to welding and cutting of metals
IS:813 (1986)	Scheme of symbols for welding
IS:814 (2004)	Covered Electrodes for Manual Metal Arc Welding of Carbon & Carbon - Manganese Steel.
IS:816 (1969)	Code of Practice for Use of Metal Arc welding for General Construction in

	Mild Steel.
IS:817 (1966)	Code of Practice for Training and Testing of Metal Arc Welders.
IS:817-1 (1992)	Code of Practice for Training of Metal Arc Welders.
IS:818 (1968)	Code of Practice for Safety and Health requirements in electric and gas welding and cutting operations
IS:822 (1970)	Code of procedure for inspection of welds
IS:919 (1993)	ISO System of Limits & Fits (Part 1 & Part 2)
IS:1024: 1999	Use of welding in bridges and structures subject to dynamic loading - Code of Practice
IS:1148 (2009)	Hot Rolled Rivet Bars (up to 40 mm) for Structural Purposes.
IS:1179 (1967)	Equipment for eye and face protection during welding
IS:1182 (1983)	Recommended Practice for Radio Graphic Examination of Fusion Welded Butt joints in steel plates.
IS:1261 (1959)	Code of practice for seam welding in mild steel up to 8mm
IS: 1363 (2002)	Hexagon Head Bolts, Screws and Nuts of Product grade C. (Part 1,2&3)
IS:1364(2002/2003)	Hexagon Head Bolts, Screws and Nuts of Product grade A & B. (Part 1 to 6)
IS: 1367	Technical Supply Conditions for Threaded Steel Fasteners. (All parts)
IS: 1852 (1985)	Rolling & Cutting Tolerances for Hot-Rolled Steel Product
IS: 2016 (1967)	Plain Washers
IS: 2062 (1992)	Steel for General Structural Purposes.
IS: 2595 (1978)	Code of Practice for Radio Graphic Testing.
IS: 3600 (1985)	Methods of Testing Fusion Welding joints (Part 1 to Part 9)
IS: 3613 (1974)	Acceptance Tests for Wire Flux Combinations for Submerged Arc Welding
IS: 3658 (1981)	Code of practice for Liquid Penetrant Flow, Detection.
IS: 3757 (1985)	High Strength Structural Bolts
IS: 4000 (1992)	High Strength Bolts in Steel Structures Code of Practice.
IS: 4353 (1967)	Recommendations for Submerged Arc Welding of Mild Steel and Low Alloy Steel.
IS: 4943 (1968)	Assessment of Butt and Fillet Fusion Welds in Steel Sheet, Plate and Pipe.
IS: 5334 (1981)	Code of Practice for Magnetic Particle Flow Detection of Welds.
IS: 5369 (1975)	General requirements for Plain Washers and Lock Washers.
IS: 5372 (1975)	Taper Washers for Channels.
IS: 5374 (1975)	Taper Washers for I Beams
IS: 6623 (1985)	Specifications for High Strength Structural nuts.
IS: 6649 (1985)	Specifications for hardening and tempering washers for high strength structural nuts.
IS: 6755 (1980)	Double Coil Helical Spring Washers
IS:7205 (1974)	Safety code for erection of structural steelwork
IS:7215 (1974)	Tolerances for Fabrication of Steel Structure.

IS:7318 (1974) (Part I)	Approval Test for Welders when welding procedure approval is not required - fusion welding of steel.
IS:7969 (1975)	Safety code for handling and storage of building materials
IS: 8500 (1974)	Structural steel - Micro alloyed (Medium and high Strength Qualities)
IS: 8910 (1978)	General requirements of Supply of Weldable Structural Steel.
IS: 9595 (1980)	Recommendations for Metal Arc Welding of Carbon & Carbon - Manganese Steels.

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 bythe Authority's Engineer and conveyed to the Contractor and the Authority with reasons thereof.

5. Emergency repairs/restoration

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

eliminating or minimizing such danger.

6. Daily inspection by the Contractor

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

7. Pre-monsoon inspection / Post-monsoon inspection

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

8. Repairs on account of natural calamities

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

Annex – I

(Schedule-E)

Repair/rectification of Defects 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.

Nature of Defect or deficiency		Time limit for repair/ rectification
ROADS		
(a)	**Carriageway and paved shoulders**	
(i)	Breach or blockade	Temporary restoration of traffic within24 hours; permanent restoration within 15 (fifteen) days
(ii)	Roughness value exceeding 2,200 mm in ramps and approaches (as measured by a calibrated bump integrator)	120 (one hundred and twenty) days
(iii)	Pot holes in ramps and approaches	24 (twenty four) hours
(iv)	Any cracks in road surface	15 (fifteen) days
(v)	Any depressions, rutting exceeding 10 mm in road surface	30 (thirty) days
(vi)	Bleeding/skidding	7 (seven) days
(vii)	Any other defect/distress on the road	15 (fifteen) days
(viii)	Damage to concrete and pavement edges	15 (fifteen) days
(ix)	Removal of debris, dead animals	6 (six) hours
(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)	Rain cuts/gullies in slope	7 (seven) days
(iii)	Damage to or silting of culverts and side drains	7 (seven) days
(iv)	Desilting of drains in urban/semi- urban areas	24 (twenty four) hours
(v)	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

Nature of Defect or deficiency		**Time limit for repair/ rectification**
(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
Bridges		
(a)	**Superstructure**	
(i)	Any damage, cracks, spalling/ scaling Temporary measures Permanent measures	 within 48 (forty eight) hours within 15 (fifteen) days or as specified by the Authority's Engineer
(b)	**Foundations**	
(i)	Scouring and/or cavitation	15 (fifteen) days
(c)	**Piers, abutments, return walls and wing walls**	
(i)	Cracks and damages including settlement and tilting, spalling, scaling	30 (thirty) days

Nature of Defect or deficiency		Time limit for repair/ rectification
(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

[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) License for use of explosives;

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

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

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

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

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

(i) Permission from Pollution Control Board and Village Panchayat for establishment of Construction Camp and Labour Camps.

(j) Permission of Forest Dept./BBMP for cutting tress at Construction camps and Labour camps.

(k) Permission from Pollution Control Board for storage, handling and transportation of hazardous materials.

(l) Permission from Pollution Co troll Board for installation of Diesel generators

(m) Labour License from District Labour Commissioner.

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

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

Schedule – G

(See Clauses 7.1 and 19.2)

Annex-I

(See Clause 7.1)

Form of Bank Guarantee

[Performance Security/Additional Performance Security]

[Managing Director,

Karnataka Road Development Corporation Limited, Bangalore]
WHEREAS:

(A) [name and address of contractor] (hereinafter called the "**Contractor**") and [name and address of the authority], (hereinafter called the **"Authority"**) have entered into an agreement (hereinafter called the "**Agreement**") for the construction of the ***** section of Elevated Corridor on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement

(B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the {Construction Period/ Defects Liability Period and Maintenance Period} (as defined in the Agreement) in a sum of Rs….. cr. (Rupees…….…….. crore) (the "**Guarantee Amount**").

(C) We, ……. through our branch at …… (the "**Bank**") have agreed to furnish this bank guarantee (*hereinafter called the* **"Guarantee**") by way of Performance Security.

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during the {Construction Period/ Defects Liability Period } under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [Managing Director in the Karnataka Road 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 Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge

as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

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

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it

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

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

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

Signed and sealed this ……. day of ……., 20…… at
…….. SIGNED, SEALED AND DELIVERED

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

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

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

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

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

Annex – II

(Schedule - G)

(See Clause 19.2)

Form for Guarantee for Advance Payment

[Managing Director,

Karnataka Road Development Corporation Limited , Bangalore]
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 Elevated Corridor on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement

(B) In accordance with Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest bearing *@Bank Rate + 3%* advance payment (herein after called "**Advance Payment**") equal to 10% (ten per cent) of the Contract Price; and that the Advance Payment shall be made in two installments subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equivalent to 110% (one hundred and ten percent) of such installment to remain effective till the complete and full repayment of the installment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second} installment of the Advance Payment is Rs. ----- cr. (Rupees ------ crore) and the amount of this Guarantee is Rs. ------- cr. (Rupees ------ crore) (the **"Guarantee Amount")[$].**

(C) We, …… through our branch at …… (the "**Bank"**) have agreed to furnish this bank guarantee (*hereinafter called the* **"Guarantee"**) for the Guarantee Amount.

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid instalment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

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

Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

A letter from the Authority, under the hand of an officer not below the rank of [General Manager in the National Highways Authority of India], that the Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the instalment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

2. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

3. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

4. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

5. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.

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

the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

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

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

9. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly 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.

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

Signed and sealed this ……. day of ……., 20…… at
…….. SIGNED, SEALED AND DELIVERED

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

(Name)
(Designation)
(Code Number)
(Address)
NOTES:

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

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

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

Schedule - H

(See Clauses10.1 (iv) and 19.3)

Contract Price Weightages

1.1 The Contract Price for this Agreement is Rs._____

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

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
Road works including culverts, widening and repair of culverts.	2.36%	**A- Widening and strengthening of existing road**	
		(I) Earthwork up to top of the sub-grade	18.48%
		(2) Earthwork in shoulders/median	0.00%
		(3) Sub-Base Course	5.48%
		(4) Non Bituminous Base Course	2.75%
		(5) Bituminous Base	35.90%
		(6) Pavement Quality Control (PQC) Course	37.38%
		(7) Wearing Coat	0.00%
		(8) Widening and repair of Culverts	0.00%
		B.1- Reconstruction/ New 2-lane realignment /bypass (Flexible pavement)	
		1) Earthwork up to top of the sub-grade	0.00%
		2) Earthwork in shoulders/median	0.00%
		3) Sub Base Course	0.00%
		4) Non-Bituminous Base	0.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		(5) Bituminous Base Course	0.00%
		(6) Wearing Coat	0.00%
		B.2- Reconstruction/ New 2-Iane realignment/ bypass(Rigid Pavement)	
		(1) Earthwork up to top of the sub-grade	0.00%
		(2) Earthwork in Shoulders / median	0.00%
		(3) Sub Base Course	0.00%
		(4) Dry Lean Concrete (DLC) Course	0.00%
		(5) Pavement Quality Control (PQC) Course	0.00%
		C.l- Reconstruction/ New service road (Flexible pavement)	
		(1) Earthwork up to top of the sub-grade	0.00%
		(2)) Earthwork in Shoulders / median	0.00%
		(3) Sub Base Course	0.00%
		(4) Non-Bituminous Base Course	0.00%
		(5) Bituminous Base Course	0.00%
		(6) Wearing Coat	0.00%
		C.2- Reconstruction/ New Service road (Rigid Pavement)	
		(1) Earthwork up to top of the sub-grade	0.00%
		(2) Sub Base Course	0.00%
		(3) Dry Lean Concrete (DLC) Course	0.00%
		(4) Pavement Quality 0.00% Control (PQC) Course	0.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		D- Re-Construction and New culverts on existing road, realignments, bypasses:	
		Culverts (length < 6 m)	0.00%
Minor Bridges/ Underpasses/ Overpasses	0.00%	**A.1- Widening and Repair of Minor bridges (length > 6 m and< 60 m)**	
		Minor bridges	
		A.2- New Minor bridges (length >6 and <60 m.)	
		(1) **Foundation + Sub- Structure:** On completion of the foundation work including foundations for wing and return walls, abutments, piers upto the abutment/pier cap.	0.00%
		(2) Super-structure: On completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. complete in all respect.	0.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		(3) Approaches: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use.	0.00%
		(4) Guide Bonds and River Training Works: On completion of Guide Bunds and river Training Works complete in all respects	0.00%
		B.l- Widening and Repair of underpasses/ overpasses	
		Underpasses/ Overpasses	0.00%
		B.2- New underpasses/ overpasses	
		(1) Foundation + Sub- Structure: On completion of the foundation work including foundations for wing and return walls, abutments, piers upto the abutment/pier cap.	0.00%
		(2) Super-structure: On completion of the super- structure in all respects including wearing coat, bearings, expansion joints, hand rails, crash barriers, road signs & markings, tests on completion etc. completion in all respect.	0.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		Wearing Coat (a) in case of Overpass- wearing coat including expansion joints complete in all respects as specified and (b) in case of underpass- rigid pavement including drainage facility complete in all respects as specified as specified.	
		(3) Approaches: On completion of approaches including Retaining walls/ Reinforced Earth walls, stone pitching, protection works complete in all respect and fit for use.	0.00%
Major Bridge (length >60m.) works and ROB/ RUB/ elevated sections/ flyovers including viaducts, if any	89.38%	**A.I- Widening and repairs of Major Bridges**	
		(I) Foundation	
		(2) Sub-structure	0.00%
		(3) Super-structure (including bearings)	0.00%
		(4) Wearing Coat including expansion joints	0.00%
		(5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.00%
		(6) Wing walls/return walls	0.00%
		(7) Guide Bunds, River Training works etc.	0.00%
		(8) Approaches (including Retaining walls, stone pitching and protection works)	0.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		A.2- New Major Bridges	
		(I) Foundation	0.00%
		(2) Sub-structure	0.00%
		(3) Super-structure (including bearings)	0.00%
		(4) Wearing Coat including expansion joints	0.00%
		(5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.00%
		(6) Wing walls/return walls	0.00%
		(7) Guide Bunds, River Training works etc.	0.00%
		(8) Approaches (including Retaining walls, stone pitching and protection works)	0.00%
		B.1- Widening and repair of **(a) ROB** **(b) RUB**	
		(1) Foundation	0.00%
		(2) Sub-structure	0.00%
		(3) Super-structure (including bearings)	0.00%
		(4) Wearing Coat:(a) in case of ROB- wearing coat including expansion joints complete in all respects as specified and (b) in case of RUB - rigid pavement under RUB including drainage facility complete in all respects as specified as specified	0.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		(5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.00%
		(6) Wing walls/return walls	0.00%
		(7) Approaches (including Retaining walls, stone pitching and protection works)	0.00%
		B.2- NewROB/RUB (a) ROB (b) RUB	
		(1) Foundation	0.00%
		(2) Sub-structure	0.00%
		(3) Super-structure (including bearings)	0.00%
		(4) Wearing Coat: (a) in case of ROB- wearing coat including expansion joints complete in all respects as specified and (b) in case of RUB- rigid pavement under RUB including drainage facility complete in all respects as specified as specified.	0.00%
		(5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		(6) Wing walls/return walls	0.00%
		(7) Approaches (including Retaining walls/Reinforced Earth wall, stone pitching and protection works)	0.00%
		C.1- Widening and repair of Elevated Section/Flyovers/ Grade Separators	
		(1) Foundation	0.00%
		(2) Sub-structure	0.00%
		(3) Super-structure (including bearings)	0.00%
		(4) Wearing Coat including expansion joints	0.00%
		(5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.00%
		(6) Wing walls/return walls	0.00%
		(7) Approaches (including Retaining walls/Reinforced Earth wall, stone pitching and protection works)	0.00%
		C.2-New Elevated Section / Flyovers/Grade Separators	
		(1) Foundation	15.45%
		(2) Sub-structure	26.00%
		(3) Super-structure (including bearings)	57.40%
		(4) Wearing Coat including expansion joints	0.66
		(5) Miscellaneous Items like hand rails, crash barriers, road markings etc.)	0.49%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
		(6) Wing walls/return walls	0.00%
		(7) Retaining/Reinforced Earth walls	0.00%
		(8) Approaches (including Retaining walls/Reinforced Earth wall, stone pitching and protection works)	0.00%
Other works	8.26%	(i) Toll Plaza	0.00%
		(ii) Road side drains a. Lined Drain b. Unlined Drain	 29.36% 0.00%
		(iii) Road signs, safety devices, Road Furniture's etc.	11.62%
		(iv) Road markings and Studs	2.49%
		(v) Crash Barrier	0.00%
		(vi) Project facilities (a) Bus Bays (b) Wayside Amenities (c) others	 0.00% 0.00% 0.00%
		(vii) Retaining Wall	0.00%
		(viii) RE Wall	17.19%
		(ix) Street Lighting	17.34%
		(x) Utility Ducts	0.01%
		(xi) Boundary Wall	0.00%
		(xii) ATMS	0.00%
		(xiii) Rain Water Harvesting	0.00%
		(xiv) Road Side Plantation	7.08%
		(xv) Protection works other than approaches to bridges, elevated sections/ flyovers/ grade separators and ROBs / RUBs.	0.00%
		(xvi) Safety and Traffic management during construction	0.00%
		(xvii) Other, Environment Management Plan	4.50%
		(xviii) Junctions/intersection improvements	9.76%
		(xviii) Footpath and Separators	0.66%

1.3 Procedure of estimating the value of work done

1.3.1 Road works.

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

Table 1.3.1

Stage of Payment	Percentage - weightage	Payment Procedure
A-Widening and strengthening of existing road (1) Earthwork up to top of the sub-grade	0.00%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
(2) Earthwork in Shoulders/Median	0.00%	
(3) Sub-Base Course	0.00%	
(4) Non Bituminous Base Course	0.00%	
(5) Bituminous Base Course	0.00%	
(6) Wearing Coat	0.00%	
(7) Widening and repair of culverts	0.00%	Cost of completed culverts shall be determined pro rata basis with respect to the total no. of culverts. The payment shall be made on the completion of at least five culverts.
B.l- Reconstruction/New 2- lane realignment/bypass **(Flexible pavement)**		Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in full length or 5 (five) km. length, whichever is less.

Stage of Payment	Percentage - weightage	Payment Procedure
(1) Earthwork up to top of the sub-grade	0.00%	
(2) Sub Base Course	0.00%	
(3) Non-Bituminous Course	0.00%	
(4) Bituminous Base Course	0.00%	
(5) Wearing Coat	0.00%	
B.2- Reconstruction/New 2-lane realignment/bypass (Rigid pavement) (1) Earthwork up to top of the sub-grade	0.00%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in full length or 5 (five) km. length, whichever is less..
(2) Sub Base Course	0.00%	
(3) Dry Lean Concrete (DLC) Course	0.00%	
(4) Pavement Quality Control (PQC) Course	0.00%	
C.I- Reconstruction/ New service road (Flexible pavement) (1) Earthwork up to top of the sub-grade	0.00%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in full length or 5 (five) km. length, whichever is less.
(2) Earthwork in Shoulders/Median	0.00%	
(3) Sub Base Course	0.00%	
(4) Non-Bituminous Course	0.00%	
(5) Bituminous Base Course	0.00%	

Stage of Payment	Percentage - weightage	Payment Procedure
(6) Wearing Coat	0.00%	
C.2- Reconstruction/ New service road (Rigid pavement) (1) Earthwork up to top of the sub-grade	0.00%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in full length or 5(five) km. length, whichever is less..
(2) Sub Base Course	0.00%	
(3) Dry Lean Concrete (DLC) Course	0.00%	
(4) Pavement Quality Control (PQC) Course	0.00%	
D- Re-Construction and New culverts on existing road, realignments, bypasses: (I) Culverts (length< 6m)	0.00%	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 culverts.

For calculation of payment stage for main carriageway the project length shall be converted into equivalent 2-lane length 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.

Note: The length affected due to law and order problems or litigation during execution including the length not handed over to the contractor under clause 8.3 of this Contract Agreement due to which the Contractor Is unable to execute the work, may be deducted from the total project length for payment purposes. The total length calculated here is only for payment purposes and will not affect and referred in other clauses of the Contract Agreement.

1.3.2 Minor Bridges and Underpasses/Overpasses.

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

Table 1.3.2

Stage of Payment	Weightage	Payment Procedure
A.l-Widening and repair of minor bridges **(length> 6m and< 60m)**	0.00%	Cost of each minor bridge shall be determined on pro rata basis with respect to the total linear length of the minor bridges. Payment shall be made on the completion of widening & repair works of a minor bridge.
A.2- New minor bridges **(i) Foundation:** On completion of the foundation work including foundations for wing and return walls, abutments, piers	0.00%	**(i) 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 wall upto top.	0.00%	**(ii) 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 girder, deck slab, bearings	0.00%	**(iii) 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 precast 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

(iv) Approaches: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use.	0.00%	(iv) **Approaches:** Payment shall be made on pro-rata basis on completion of a stage i.e. completion of approaches in all respect as specified in the column of "Stage of Payment" in this sub-clause.
(iv) Guide Bonds and River Training Works: On completion of Guide Bunds and river Training Works complete in all respects	0.00%	(iv) **Guide Bonds and River Training Works:** Payment shall be made on pro- rata basis on completion of a stage i.e. completion of Guide Bunds and River training Works in all respects as specified.
(v) Other Ancillary Works: On completion of wearing coat, expansion joint, hand rails, crash barriers, road signs & markings complete in all respects	0.00%	(v) **Other Ancillary Works:** Payment shall be made on pro- rata basis on completion of a stage in all respects as specified
B.l-Widening and repair of underpasses/overpasses	0.00%	Cost of each Underpass / overpass shall be determined on pro- rata basis with respect to the total linear length of the underpasses / overpasses. Payment shall be made on the completion of widening & repair works of a underpass/ overpass.
B.2- New Underpasses/ Overpasses: **(i) Foundation:** On completion of the foundation work including foundations for wing and return walls, abutments, piers	0.00%	(i) **Foundation**: Cost of each Underpass / Overpass shall be determined on pro rata basis with respect to the total linear length (m) of the Underpasses / Overpasses. 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 Underpasses / Overpasses 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 wall upto top.	0.00%	**Sub- Structure**: Cost of each Underpass / Overpass shall be determined on pro rata basis with respect to the total linear length (m) of the Underpasses / Overpasses. 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 Underpasses / Overpasses
(iii) Super-structure: On completion of the super-structure in all respects including girder, deck slab, bearings	0.00%	**(iii) 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 precast 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
(iv) On completion of Retaining/ Reinforced earth walls complete in all respect and fit for use	0.00%	(iv) Payment shall be made on pro-rata basis on completion of 20% of total area
(v) Approaches and Other Ancillary works: On completion of approaches including Retaining walls/ Reinforced Earth walls, stone pitching, protection works complete in all respect and fit for use.	0.00%	(v) Approaches and other Ancillary works: Payment shall be made on pro-rata basis on completion of a in all respect as specified.

1.3.3 Major Bridge works, ROB/RUB and Structures.

Procedure for estimating the value of Major Bridge works, ROB/RUB and Structures shall be as stated in table 1.3.3:

Table 1.3.3

Stage of Payment	Weightage	Payment Procedure
A.l- Widening and repairs of Major Bridges		
(i) **Foundation:** On completion of the foundation work including foundations for wing and return walls, abutments, piers	0.00%	**(i) Foundation:** Cost of each Major Bridge shall be determined on pro rata basis with respect to the total linear length (m) of the Major Bridge. 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 the major 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	0.00%	**(ii) Sub-Structure:** Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of the major bridge
(iii) **Super-structure :** On completion of the super-structure in all respects including girder, deck slab, bearings	0.00% 0.00%	**(iii) 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 precast 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

(iv) Wearing Coat including expansion joints	0.00%	**(iv) Wearing Coat:** Payment shall be made on completion of wearing coat including expansion joints complete in all respects as specified.
(v) Miscellaneous Items like hand rails, crash barriers, road markings etc.	0.00%	(v) **Miscellaneous:** Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified.
(vi) Wing walls/return walls	0.00%	(vi) **Wing walls/return walls:** Payments shall be made on completion of all wing walls/return walls complete in all respects as specified.
(vii) Guide Bunds, River Training works etc.	0.00%	(vii) **Guide Bonds, River Training works:** Payments shall be made on completion of all guide bunds/river training works etc. complete in all respects as specified.
(viii) Approaches (including Retaining walls, stone pitching and protection works)	0.00%	**(viii) Approaches:** Payments shall be made on completion of both approaches including stone pitching, protection works, etc. complete in all respects as specified.

A.2- New Major Bridges (i) **Foundation:** On completion of the foundation work including foundations for wing and return walls, abutments, piers	0.00%	(i) **Foundation:** Cost of each Major Bridge shall be determined on pro rata basis with respect to the total linear length (m) of the Major Bridge. 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 the major 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	0.00%	(ii) **Sub-Structure:** Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of the major bridge.
(iii) **Super-structure :** On completion of the super-structure in all respects including girder, deck slab, bearings	0.00%	(iii) **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 precast 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
(iv) Wearing Coat including expansion joints	0.00%	**(iv) Wearing Coat:** Payment shall be made on completion of wearing coat including expansion joints complete in all respects as specified.

(v) Miscellaneous Items like hand rails, crash barriers, road markings etc.	0.00%	(v) **Miscellaneous:** Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified.
(vi) Wing walls/return walls	0.00%	(vi) **Wing walls/return walls:** Payments shall be made on completion of all wing walls/return walls complete in all respects as specified.
(vii) Guide Bunds, River Training works etc.	0.00%	(vii) **Guide Bonds, River Training works:** Payments shall be made on completion of all guide bunds/river training works etc. complete in all respects as specified.
(viii) Approaches (including Retaining walls, stone pitching and protection works)	0.00%	**(viii) Approaches:** Payment shall be made on pro- rata basis on completion of 10% of the scope of each stage.
B.l -Widening and repairs of **(a) ROB** **(b) RUB** (i) Foundation	0.00%	(i) **Foundation:** Cost of each ROB/RUB shall be determined on pro rata basis with respect to the total linear length (m) of the ROBs/RUBs. 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 the ROB/RUB In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.

(ii) Sub-structure	0.00%	**(ii) Sub-Structure:** Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of the ROB/RUB
(iii) Super-Structure (including bearings)	0.00%	(iii) **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 precast 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
(iv) Wearing Coat including expansion joints in case of ROB. In case of RUB, rigid pavement under RUB including drainage facility as specified.	0.00%	(iv) Wearing Coat: Payment shall be made on completion of (a) in case of ROB- wearing coat including expansion joints complete in all respects as specified and (b) in case of RUB- rigid pavement under RUB including drainage facility complete in all respects as specified as specified.

(v) Miscellaneous Items like hand rails, crash barriers, road markings etc.	0.00%	(v) Miscellaneous: Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified
(vi) Wing walls/return walls	0.00%	(vi) Wing walls/return walls: Payments shall be made on completion of all wing walls/return walls complete in all respects as specified.
(vii) On completion of Retaining / Reinforced earth walls complete in all respect and fit for use	0.00%	(vii) Retaining/Reinforced walls: Payments shall be made on pro-rata basis on completion of 20% of total areal
(viii) Approaches and other Ancillary works: On completion of wearing coat, expansion joints, hand rails, crash barriers, road signs & markings, stone pitching, protection works, tests on completion in all respect	0.00%	(viii) Approaches: Payments shall be made on completion of both approaches including stone pitching, protection works, etc. complete in all respects as specified.
B.2-New **(a) ROB** **(b) RUB** (i) Foundation	0.00%	(i) Foundation: Cost of each ROB/RUB shall be determined on pro rata basis with respect to the total linear length (m) of the ROBs/RUBs. 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 the ROB/RUB e where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.

(ii) Sub-structure	0.00%	**(ii) Sub-Structure:.** Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of the ROB/RUB
(iii) Super-structure (including bearings	0.00%	(iii) **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 case of structures where precast 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
(iv) Wearing Coat including expansion joints in case of ROB. In case of RUB, rigid pavement under RUB including drainage facility as specified.	0.00%	**(iv) Wearing Coat:** Payment shall be made on completion of (a) in case of ROB-waring coat including expansion joints complete in all respects as specified and (b) in case of RUB- rigid pavement under RUB including drainage facility complete in all respects as specified as specified.
(v) Miscellaneous Items like hand rails, crash barriers, road markings etc.	0.00%	(v) **Miscellaneous:** Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified.
(vi) Wing walls/return walls	0.00%	(vi) **Wing walls/return walls:** Payments shall be made on completion of all wing wall /return walls complete in all respects as specified

(vii) On completion of Retaining / Reinforced earth walls complete in all respect and fit for use	0.00%	. (vii) Retaining/Reinforced walls: Payments shall be made on pro-rata basis on completion of 20% of total areal
(viii) Approaches and other Ancillary works: On completion of wearing coat, expansion joints, hand rails, crash barriers, road signs & markings, stone pitching, protection works, tests on completion in all respect	0.00%	(viii) Approaches: Payments shall be made on completion of both approaches including stone pitching, protection works, etc. complete in all respects as specified
C.I- Widening and repairs of Elevated Section/Flyovers/ Grade Separators		
(i) Foundation	0.00%	(i) Foundation: Cost of each structure shall be determined on pro rata basis with respect to the total linear length (m) of the structures. 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 the structure In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
(ii) Sub-structure	0.00%	(ii) Sub-Structure: Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of the structure

(iii) Super-structure: On completion of the super-structure in all respects including Girder, Deck slab, bearings	0.00%	**(iii) 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 case of structures where precast 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 .
(iv) Wearing Coat including expansion joints	0.00%	**(iv) Wearing Coat:** Payment shall be made on completion of wearing coat including expansion joints complete in all respects as specified.
(v) Miscellaneous Items like hand rails, crash barriers, road markings etc.	0.00%	(v) **Miscellaneous:** Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified.
(vi) Wing walls/return walls	0.00%	(vi) **Wing walls/return walls:** Payments shall be made on completion of all wing walls/return walls complete in all respects as specified.
(vii) On completion of Retaining / Reinforced earth walls complete in all respect and fit for use	0.00%	(vii) Retaining/Reinforced walls: Payments shall be made on pro-rata basis on completion of 20% of total areal
(viii) Approaches and other Ancillary works: On completion of wearing coat, expansion joints, hand rails, crash barriers, road signs & markings, stone pitching, protection works, tests on completion in all respect	0.00%	(viii) Approaches: Payments shall be made on completion of both approaches including stone pitching, protection works, etc. complete in all respects as specified

C.2 New Elevated Section / Flyovers/ Grade Separators		
(i) Foundation	0.00%	(i) **Foundation:** Cost of each structure shall be determined on pro rata basis with respect *to* the total linear length (m) of the structure 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 the structure In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
(ii) Sub-structure	0.00%	(ii) **Sub-Structure:** Payment against Sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of sub-structure of the structure
(iii) Super-structure: On completion of the super-structure in all respects including Girder, Deck slab, bearings	0.00%	(iii) **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 case of structures where precast 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.

(iv) Wearing Coat including expansion joints	0.00%	(iv) **Wearing Coat:** Payment shall be made on completion of wearing coat including expansion joints completion in all respects as specified.
(v) Miscellaneous Items like hand rails, crash barriers, road markings	0.00%	(v) **Miscellaneous**: Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified.
(vi) Wing walls/return walls	0.00%	(vi) **Wing walls/return walls**: Payments shall be made on completion of all wing walls/return walls complete in all respects as specified.
(vii) On completion of Retaining / Reinforced earth walls complete in all respect and fit for use	0.00%	(vii) Retaining/Reinforced walls: Payments shall be made on pro-rata basis on completion of 20% of total areal
(viii) Approaches and other Ancillary works: On completion of wearing coat, expansion joints, hand rails, crash barriers, road signs & markings, stone pitching, protection works, tests on completion in all respect	0.00%	(viii) Approaches: Payments shall be made on completion of both approaches including stone pitching, protection works, etc. complete in all respects as specified

Note: (1) In case of innovate 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.

1.3.4 Other works.

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

Table 1.3.4

Stage 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 pro rata basis with respect to the total of all toll plazas.
(ii) Road side drains Lined Drain Unlined Drain	 0.00% 0.00%	Unit of measurement is linear length in km. Payment shall be made on pro-rata basis on completion of a stage in a length of not less than 10% (ten per cent) of the total length.
(iii) Road signs, safety Devices, Road Furnitures etc.	0.00%	
(iv) Road markings & Studs	0.00%	
(v) Crash Barrier	0.00%	
(vi) Project Facilities a) Bus bays b) Wayside Amenities excluding Slip Roads & but including all internal roads (Service areas including Truck Lay-Byes) c) Others	 0.00% 0.00% 0.00%	Payment shall be made on pro rata basis for completed facilities.
(vii) Rain water Harvesting	0.00%	
(viii) Retaining Wall	0.00%	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
(ix) RE Wall	0.00%	
(x) Street Lighting	0.00%	
(xi) Utility Ducts	0.00%	
(xii) ATMS	0.00%	
(xiii) Road side Plantation including Horticulture in Wayside Amenities	0.00%	
Stage Payment	**Weightage**	**Payment Procedure**
(xiv) Protection Works other than approaches to the bridges,	0.00%	Unit of measurement is linear length. Payment shall be made on pro rata basis on

Stage Payment	Weightage	Payment Procedure
elevated sections/ flyover/ grade separators and ROBs/ RUBs		completion of a stage in a length of not less than 10% (ten per cent) of the total length
(xv) Boundary wall	0.00%	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.
(xvi) Safety and traffic management during construction	0.00%	Payment shall be made on prorate basis every six months.
(xvii) Other miscellaneous works including Connecting road & Junction under Grade separator	0.00%	Payment should be made on pro rata basis on completion of each stage

2. Procedure for payment for Maintenance

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

(b) 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)

List of Drawings

The Drawings that the Contractor is required to furnish under Clause 10.2 for Elevated Corridor and At Grade highway are as follows:

1. Contractor shall prepare the detailed structure design and drawings of all structural components of the elevated structure for execution of the works.

2. Contractor shall prepare detailed highway drawings for improvement of At Grade existing road

3. Horizontal and vertical alignment with details of reference pillars, Horizontal intersection points, vertical intersection points, elements of curves and sight distances and superelevation details for both Elevated corridor and At Grade existing Highway.

4. GADs Structures shall be submitted

5. Typical cross section with details of pavement structural and embankments

6. Detailed drawings for Elevated Corridor

7. Detailed layout drawings for Intersections, loops & ramps.

8. Drawings for Road sign, marking, Bus stops, Parking areas

9. Detailed drawings for electrical works street lighting, CCTV, Overhead Driver Feedback System

10. Detailed layout of drawings for traffic circulation

11. Detailed layout drawings for Landscaping & Tree plantation.

12. Detailed Traffic management drawings for safety in construction zones.

13. Detailed drawings of road side furniture and safety of structures

14. Detailed drawings of Drainage including RCC covered drains

15. Detailed drawings of Launching and/or erection scheme/scaffolding details for Elevated corridor & ramps and loops shall be submitted

16. Cross section at 50m interval along the alignment with ROW, and all underground and above ground utilities

Note: Fabrication drawings and shop drawings should be submitted after designed drawings are approved.

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 Elevated Corridor 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 **shouldhave** started construction of all project facilities.

5. Scheduled Completion Date

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

(ii) On or before the Scheduled Completion Date, the Contractor shall have completed

construction in accordance with this Agreement.

6. Extension of time

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

Schedule - K

(See Clause 12.1 (ii))

Tests on Completion

1. Schedule for Tests

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

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

2. Tests

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

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

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

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

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

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

3. Agency for conducting Tests

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

4. Completion Certificate

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

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

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

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

Schedule - L *(See 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 Elevated Corridor (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%

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

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 the construction of Elevated Corridor (km ** to km **) within the Bangalore Metropolitan region in the State of Karnataka on Engineering, Procurement, Construction (EPC) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

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

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

2. Definitions and interpretation

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

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

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

3. General

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

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

(a) any Time Extension;

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

(c) the Termination Payment; or

(d) issuance of Completion Certificate or

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

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

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

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

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

4. Construction Period

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

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

(iii) The Authority's Engineer shall review and approve the Quality Assurance Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty one) days stating the modifications, if any, required thereto.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Maintenance Period

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

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

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

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

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

6. Determination of costs and time

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

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

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

7. Payments

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

(ii) Authority's Engineer shall -

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

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

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

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

8. Other duties and functions

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

9. Miscellaneous

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

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

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

(iv) The Authority's Engineer, if called upon by the Authority or the Contractor or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.

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

Schedule - O

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

Forms of Payment Statements

1. Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

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

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

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

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

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

(f) Deductions:

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

ii. Any amount towards deduction of taxes; and

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

(g) Net claim: (e) – (f) (iii);

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

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

ii. For Change of Scope Orders, and

iii. Taxes deducted

2. Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

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

(b) the deductions for maintenance work not done; (c)

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

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

(e) amount towards deduction of taxes

3. Contractor's claim for Damages

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

Schedule – P

(See Clause 20.1)

Insurance

1. Insurance during Construction Period

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

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

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

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

2. Insurance for Contractor's Defects Liability

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

3. Insurance against injury to persons and damage to property

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

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

(ii)The insurance shall be extended to cover liability for all loss and damage to the Authority's property arising out of the Contractor’s performance of this Agreement excluding:

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

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

4. Insurance to be in joint names

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

Schedule-Q

(See Clause 14.10)

Tests on Completion of Maintenance Period

1. Riding Quality test:

Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [2,000 (two thousand 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)