**NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT CORPORATION LIMITED**

**(Ministry of Road Transport & Highways)**

**Government of India**

## NAME OF WORK:

**Four Laning of Badarpur – Churaibari section of NH-8 from Design chainage 62.800 (Start of proposed Nilambazar/Cheragi Bypass) to Km. 87.700 (Chandkhira) in the state of Assam (Package-V)**

**INTERNATIONAL COMPETITIVE BIDDING (ICB)**

**REQUEST FOR PROPOSAL (RFP)**

**Schedules**

**(A, B, C & D)**

**January 2024**

**3rd Floor, PTI Building, 4-Parliament Street, New Delhi – 110 001**

# Schedules

# Schedule - A

(See Clause 10.1)

**SITE OF THE PROJECT**

## 1. THE SITE

1.1 The site of Four Lane Project Highway shall include land, buildings, structures & road works as described in **Annex-I** of this **Schedule – A.**

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

1.3 An inventory of the Site including 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 Concessionaire, and such inventory shall form part of the memorandum referred to in clause 10.3.1 of the Agreement.

1.4 Additional land required for toll plaza, Traffic Aid post, medical aid post and vehicle rescue post or for construction of works specified in the Change of Scope Order issued under clause 16.2.3 of this Agreement shall be acquired in accordance with the provisions of Clause 10.3.6 of this Agreement. Upon acquisition, such land shall form part of the Site and vest in Authority.

1.5 The status of the clearances (Forest) obtained or awaited is given in Annex IV.

**Annex - I**
**Schedule – A**

**Site for Project**

1 Site

Site of the proposed Project Highway is a section of Silchar-Churaibari corridor under NHIDCL. Project section commences from Design chainage Km. 62.800 of NH-8, near start point of Nilambazar/Cheragi bazar bypasss of Karimganj district and ends at design chainage Km. 87.700 near Chandkhira village of Karimganj district in the state of Assam. The land, carriageway and structures comprising the site are described below.

| | Design Chainage (Km) | Easting# | Northing# |
|---|---|---|---|
| Start of Package | 62.800 | 436489.714 | 2739114.410 |
| End of Package | 87.700 | 430088.067 | 2716463.658 |

#-UTM co-ordinates based on WGS 84 datum and 46N zone

An index map showing the existing features of the Project Highway is given at Annex II of Schedule - A.The design Chainage co-ordinates (centre line) at every 500m distance are given at Annex III of Schedule A.

2 Land

The Site of the Project Highway is an existing 2 lane with paved shoulder, existing ROW is 20m.

| Sl.No | Design Chainage (Km) | | Right of way (m) | Remarks |
|---|---|---|---|---|
| | From | To | | |
| 1 | 62.800 | 76.760 | 20 | RoW is based on data collected from O/o EE, PWD, Karimganj |
| 2 | 76.760 | 84.960 | 45 | |
| 3 | 84.960 | 87.700 | 20 | |

3 Carriageway

The details of existing carriageway are as given under:

| Sl. No | Design Chainage (Km) | | Length(km) | Carriageway (m) | Location |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 62.800 | 63.100 | 0.300 | 7.0m | - |
| 2 | 77.300 | 86.400 | 9.100 | 7.0m | Existing Patharkandi bypass to Chandkhira |

4 At Grade Intersections

Major Junctions

The details of major junctions are as follows:

| Sl. No | Design Chainage (Km) | Type of Inter-section | Leads To | | Remarks |
|---|---|---|---|---|---|
| | | | Left | Right | |
| 1 | 78.116 | + | Duhalia | Jamirala | MDR |
| 2 | 84.111 | Y | - | Jamirala | NH-8 |
| 3 | 86.432 | Y | - | Chandkhira | NH-8 & NH-208A |

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

Minor Junctions

The details of minor junctions are as follows:

| Sl.No | Design Chainage (Km) | Type of Inter-section | Leads | |
|---|---|---|---|---|
| | | | LHS | RHS |
| 1 | 77.433 | + | Nayagram | Kanaibazar |
| 2 | 78.187 | + | Singhariah | Jamirala |
| 3 | 80.748 | + | Nalibari | Rajbari |
| 4 | 82.021 | + | Pailamuli | Patarkandi |
| 5 | 83.024 | + | Katabari | Nalibari |
| 6 | 86.192 | T | - | Parugaon |

5 Service Roads / Slip roads

The details of Service Roads and Slip Roads are as follows.

| Sl. No | Design Chainage (Km) | | Roadway Width (m) | Side | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| Nil | | | | | |

6 Bypasses

The details of the bypasses are as follows.

| Sl. No | Name of Bypass (Town) | Design Chainage (Km) | Length in (km) | Carriageway |
|---|---|---|---|---|

| | | From | To | | Width (m) | Type |
|---|---|---|---|---|---|---|
| 1 | Patharkandi | 77.300 | 84.100 | 6.800 | 7.00 | 2lane + PS |

7 Major Bridges

The site includes the following major bridges.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Super Structure | Deck Width (m) |
|---|---|---|---|---|
| 1 | 85.640 | 3 x 47.3 | PSC I Girder | 11.0 |

8 Minor Bridges

The site includes the following minor bridges.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Super Structure | Deck Width (m) |
|---|---|---|---|---|
| 1 | 79.312 | 3 x 5.0 | Box Type | 12.50 |
| 2 | 79.873 | 4 x 4.0 | Box Type | 12.0 |
| 3 | 80.166 | 5 x 3.0 | Box Type | 12.0 |
| 4 | 81.393 | 3 x 3.0 | Box Type | 12.0 |
| 5 | 81.865 | 2 x 3.0 | Box Type | 12.0 |
| 6 | 83.060 | 4 x 3.25 | Box Type | 12.0 |
| 7 | 84.365 | 2 x 6.0 | Box Type | 12.0 |

9 Causeways

The site includes the following causeways.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Type of Structure | Deck Width (m) |
|---|---|---|---|---|
| Nil | | | | |

10 Road Over Bridge (ROB)

The site includes the following ROBs.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Super Struc-ture | Deck Width (m) | Remarks |
|---|---|---|---|---|---|
| NIL | | | | | |

11 Road Under Bridge (RUB)

The site includes the following RUBs.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Super Structure | Deck Width (m) | Remarks |
|---|---|---|---|---|---|
| Nil | | | | | |

12 Grade Separators

The Site includes the following Grade Separators

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Type of Structure | Deck Width (m) | Remarks |
|---|---|---|---|---|---|
| Nil | | | | | |

13 Flyover

The Site includes the following Flyovers.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Type of Structure | Deck Width (m) | Remarks |
|---|---|---|---|---|---|
| Nil | | | | | |

14 Vehicular Underpasses

The Site includes the following vehicular underpasses.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Type of Structure | Deck Width (m) | Remarks |
|---|---|---|---|---|---|
| Nil | | | | | |

15 Vehicular Overpasses

The Site includes the following vehicular overpasses.

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span Length) | Type of Structure | Deck Width (m) | Remarks |
|---|---|---|---|---|---|
| Nil | | | | | |

16 Cattle/Pedestrian Underpasses

The Site includes the following Cattle/Pedestrian underpasses.

| Sl. No | Existing Chainage (Km) | Span Arrangement (No. x Span Length) | Type of Structure | Deck Width (m) | Remarks |
|---|---|---|---|---|---|
| - NIL - | | | | | |

17 Culverts

The Site has the following culverts.

17.1 **Pipe Culverts**

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Dia in m) | Width (m) |
|---|---|---|---|
| 1 | 77.523 | 1 x 1.20 | 14.0 |
| 2 | 79.193 | 3 x 1.20 | 16.0 |
| 3 | 79.646 | 2 x 1.20 | 16.0 |
| 4 | 80.293 | 3 x 1.20 | 16.0 |
| 5 | 80.693 | 3 x 1.20 | 16.0 |
| 6 | 81.137 | 3 x 1.20 | 16.0 |
| 7 | 81.657 | 2 x 1.20 | 16.0 |
| 8 | 82.177 | 2 x 1.20 | 14.0 |
| 9 | 82.565 | 2 x 1.20 | 14.0 |
| 10 | 83.262 | 2 x 1.20 | 16.0 |
| 11 | 86.008 | 2 x1 .20 | 16.0 |

***19.2*** **Slab Culverts**

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span in m) | Width(m) |
|---|---|---|---|
| Nil | | | |

**19.3 Box Culverts**

| Sl. No | Design Chainage (Km) | Span Arrangement (No. x Span in m) | Width(m) |
|---|---|---|---|
| 1 | 78.071 | 1 x 3.0 | 12.0 |
| 2 | 78.370 | 2 x 2.0 | 12.0 |
| 3 | 78.954 | 1 x 3.0 | 12.0 |
| 4 | 80.495 | 1 x 4.0 | 12.0 |
| 5 | 80.907 | 1 x 4.0 | 12.0 |
| 6 | 82.847 | 1 x 2.0 | 12.0 |
| 7 | 83.892 | 1 x 3.0 | 12.0 |
| 8 | 84.027 | 1 x 4.0 | 12.0 |
| 9 | 84.685 | 1 x 5.0 | 12.0 |
| 10 | 86.294 | 1 x 2.0 | 12.0 |

18 Railway Level Crossing

The Site includes the following Level Crossings:

| Sl. No | Railway Chainage (Km) | Location |
|---|---|---|
| Nil | | |

19 Total number of structures

The total number of existing structures on the Project Highway is noted below:

| Sl.No | Type of Structure | Nos |
|---|---|---|
| a | Major bridges | 1 |
| b | Minor Bridges | 7 |
| c | Causeways | 0 |
| d | ROBs | 0 |

| Sl.No | Type of Structure | Nos |
|---|---|---|
| e | RUBs | 0 |
| f | Railway Level Crossings | 0 |
| g | Grade separators | 0 |
| h | Flyovers | 0 |
| i | Vehicular Underpasses | 0 |
| j | Vehicular Overpasses | 0 |
| k | Cattle /Pedestrian Underpasses | 0 |
| l | Pipe Culverts | 11 |
| m | Slab Culverts | 0 |
| n | Box Culverts | 10 |

20 Bus Bays & Truck Lay byes

The details of bus bays are as follows:

**(a) No of Bus bays**

| Sl.No | Design Chainage (Km) | Side | Remarks |
|---|---|---|---|
| Nil | | | |

**(b) No. of Bus Shelters**

| Sl.No | Design Chainage (Km) | Side | Remarks |
|---|---|---|---|
| 1 | 85.100 | LHS | - |
| 2 | 85.300 | RHS | - |

**(c) Truck Lay byes**

| Sl.No | Design Chainage (Km) | Side | Remarks |
|---|---|---|---|
| Nil | | | |

21 Wayside Amenities

The details of wayside amenities are as follows:

| Sl. No | Design Chainage (Km) | Location | Side | Remarks |
|---|---|---|---|---|
| Nil | | | | |

22 Toll plaza

The details of Toll Plaza are as follows:

| Sl. No | Design Chainage (Km) | Location | Side | Remarks |
|---|---|---|---|---|
| Nil | | | | |

23 Design Chainage corresponding to Existing Chainage

There are no visible Kilometer stones in our existing stretch. So, chainages provided in the schedule correspond to Design chainages.

24 Additional Features

**a) Footpath:**

Footpath of 1.5m exists along the project stretch at the following locations.

| Sl. No | From (Km) | To (Km) | Side | Remarks |
|---|---|---|---|---|
| Nil | | | | |

**Lined Drain:**

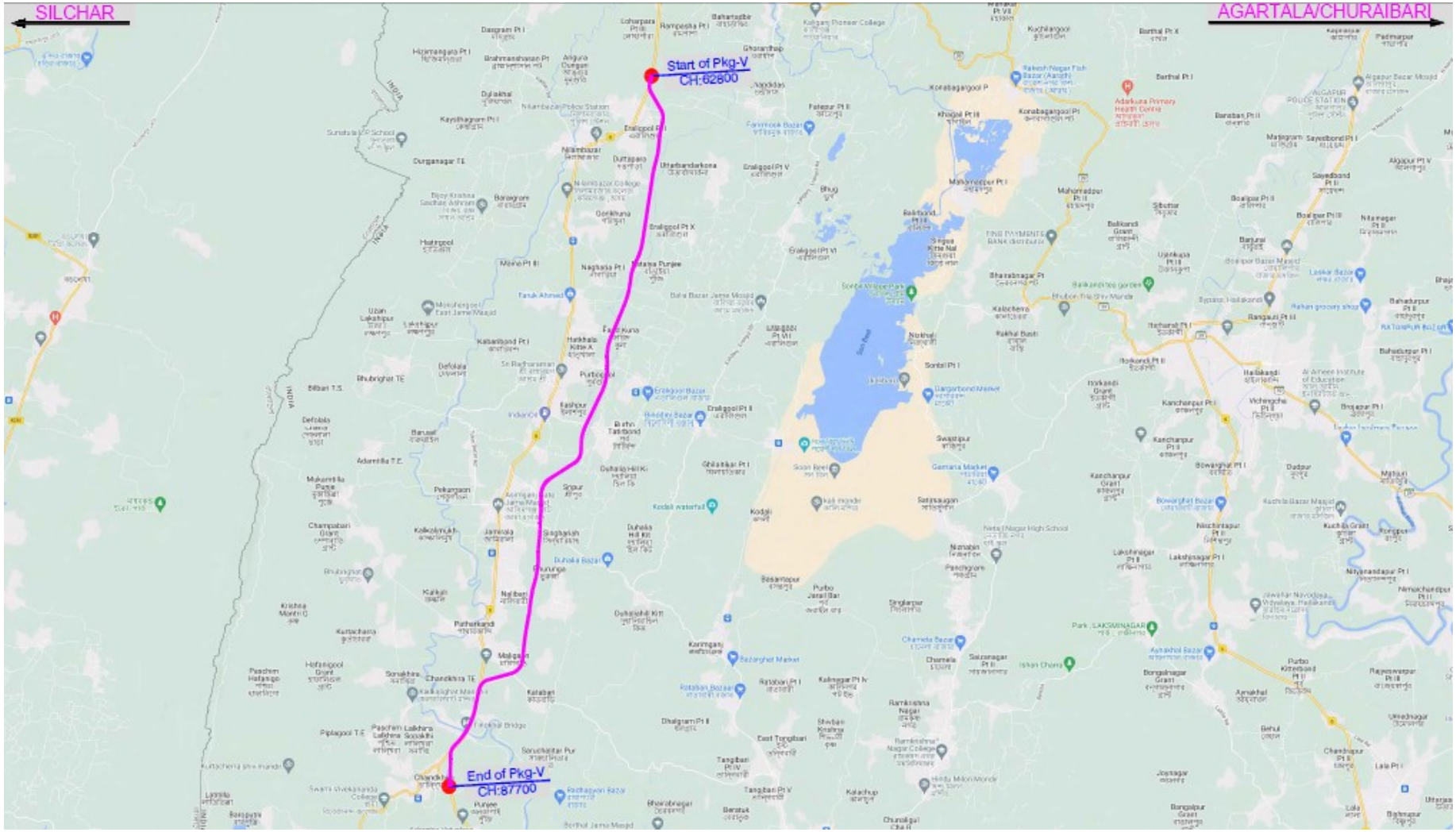
Lined Drain exists along the project stretch at the following locations.

| Sl. No | From (Km) | To (Km) | Side | Remarks |
|---|---|---|---|---|
| 1 | 63.100 | 63.111 | LHS | - |
| 2 | 87.645 | 87.700 | BS | - |

25. Details of Existing Utilities

The site includes utilities Details at Annex-V of Schedule-A.

# Annex II
## Schedule - A




**Index map of the Project Highway for Package-5**

## Annex III
## Schedule - A

The co-ordinates of Centreline are given below: -

### Centre Line Co-ordinates at every 500m Interval

| S. No. | Design Chainage (Km.) | Easting | Northing |
|---|---|---|---|
| 1 | 62.800 | 436486.599 | 2739102.495 |
| 2 | 63.000 | 436436.329 | 2738908.918 |
| 3 | 63.500 | 436559.535 | 2738441.932 |
| 4 | 64.000 | 436806.328 | 2738007.116 |
| 5 | 64.500 | 436810.764 | 2737520.027 |
| 6 | 65.000 | 436732.956 | 2737026.706 |
| 7 | 65.500 | 436661.867 | 2736532.252 |
| 8 | 66.000 | 436542.22 | 2736046.87 |
| 9 | 66.500 | 436465.625 | 2735552.78 |
| 10 | 67.000 | 436389.909 | 2735058.546 |
| 11 | 67.500 | 436314.193 | 2734564.312 |
| 12 | 68.000 | 436238.476 | 2734070.079 |
| 13 | 68.500 | 436143.496 | 2733579.725 |
| 14 | 69.000 | 435955.361 | 2733116.911 |
| 15 | 69.500 | 435824.167 | 2732637.512 |
| 16 | 70.000 | 435730.561 | 2732146.808 |
| 17 | 70.500 | 435561.31 | 2731676.779 |
| 18 | 71.000 | 435370.022 | 2731214.818 |
| 19 | 71.500 | 435179.085 | 2730752.713 |
| 20 | 72.000 | 435077.882 | 2730265.423 |
| 21 | 72.500 | 435079.327 | 2729765.48 |
| 22 | 73.000 | 434992.184 | 2729274.677 |
| 23 | 73.500 | 434791.987 | 2728817.027 |

| S. No. | Design Chainage (Km.) | Easting | Northing |
|---|---|---|---|
| 24 | 74.000 | 434576.180 | 2728365.997 |
| 25 | 74.500 | 434361.925 | 2727914.256 |
| 26 | 75.000 | 434257.040 | 2727428.230 |
| 27 | 75.500 | 434175.793 | 2726941.213 |
| 28 | 76.000 | 433784.710 | 2726637.077 |
| 29 | 76.500 | 433363.682 | 2726367.382 |
| 30 | 77.000 | 433025.011 | 2726012.861 |
| 31 | 77.500 | 432978.299 | 2725519.554 |
| 32 | 78.000 | 432951.885 | 2725020.796 |
| 33 | 78.500 | 432937.752 | 2724521.185 |
| 34 | 79.000 | 432889.663 | 2724023.54 |
| 35 | 79.500 | 432870.770 | 2723524.056 |
| 36 | 80.000 | 432781.284 | 2723032.717 |
| 37 | 80.500 | 432669.780 | 2722546.060 |
| 38 | 81.000 | 432602.998 | 2722050.631 |
| 39 | 81.500 | 432513.106 | 2721558.809 |
| 40 | 82.000 | 432442.926 | 2721063.802 |
| 41 | 82.500 | 432394.927 | 2720566.148 |
| 42 | 83.000 | 432151.868 | 2720152.199 |
| 43 | 83.500 | 431676.666 | 2720001.036 |
| 44 | 84.000 | 431199.708 | 2719854.223 |
| 45 | 84.500 | 430973.654 | 2719429.471 |
| 46 | 85.000 | 430870.305 | 2718940.269 |
| 47 | 85.500 | 430708.122 | 2718468.440 |
| 48 | 86.000 | 430443.797 | 2718045.288 |
| 49 | 86.500 | 430129.261 | 2717659.459 |
| 50 | 87.000 | 430093.023 | 2717163.492 |

| S. No. | Design Chainage (Km.) | Easting | Northing |
|---|---|---|---|
| 51 | 87.500 | 430086.330 | 2716663.537 |
| 52 | 87.700 | 430088.067 | 2716463.658 |

Northing and Easting UTM co-ordinates are based on WGS84 as datum and Zone 46N

# Annex IV
# Schedule - A

## Environment and Forest Clearances

**1. Forest Clearance: -** This package has no forest section. Forest clearance is not required in this package.

**2. Environmental Clearance: -** No Environmental Clearance is required for this project.

# Annex V
# Schedule – A
# Utilities

The Site includes the following Utilities.

i) Electrical Utilities

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

| S.no | Chainage | | Electrical poles (Nos) | | | Crossings | | | Transformer | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | From Km. | To Km. | 33KV | 11KV | LT | 33KV | 11KV | LT | No | Capacity | |
| 1 | 62.800 | 64.000 | | 55 | 10 | | 2 | 3 | | | |
| 2 | 65.000 | 66.000 | | | | | | 2 | | | |
| 3 | 67.000 | 68.000 | | | | | 1 | 1 | | | |
| 4 | 69.000 | 70.000 | | | | | 2 | 1 | | | |
| 5 | 73.000 | 74.000 | | | | | 1 | | | | |
| 6 | 74.000 | 75.000 | | | | | 1 | 2 | | | |
| 7 | 75.000 | 76.000 | | | | | 1 | | | | |
| 8 | 77.000 | 78.000 | | 25 | 26 | | 4 | 2 | 1 | | |
| 9 | 78.000 | 79.000 | | 8 | 20 | | 3 | 2 | 2 | | |
| 10 | 79.000 | 80.000 | | 22 | 12 | | 2 | | 2 | | |
| 11 | 80.000 | 81.000 | 18 | 26 | | | 1 | 1 | | | |
| 12 | 81.000 | 82.000 | 33 | 18 | | | 2 | 2 | 1 | | |
| 13 | 82.000 | 83.000 | 34 | 28 | 9 | 2 | | | | | |
| 14 | 83.000 | 84.000 | 38 | 12 | 9 | | 1 | | 1 | | |
| 15 | 84.000 | 85.000 | 4 | 55 | 5 | | 1 | | | | |
| 16 | 85.000 | 86.000 | 20 | 25 | | | 2 | 2 | 2 | | |
| 17 | 86.000 | 87.000 | | 34 | | | 1 | 2 | 2 | | |
| 18 | 87.000 | 88.000 | | 5 | 9 | | 2 | 2 | 1 | | |

(ii) Extra High Tension lines (EHT Lines)

| S.no | Chainage | | Length | | | | Crossings | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From Km. | To Km. | 400KV | 220KV | 110KV | 132KV | 800KV | 765KV | 400KV | 220 KV | 132KV | Remarks |
| 1 | 67.100 | 67.200 | | | | | | | | | 1 | |
| 2 | 75.900 | 76.000 | | | | | | | | | 1 | |
| 3 | 78.100 | 78.300 | | | | | | | | | 1 | |
| 4 | 82.000 | 82.200 | | | | 1 | | | | | | Adjacent to alignment |
| 5 | 82.600 | 82.700 | | | | 1 | | | | | | Adjacent to alignment |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 83.000 | 83.100 | | | | | | | | | 1 | |

There is a high mast pole and light at Km. 83.010

ii) Any other lines - Nil

# Annex VI
# Schedule – A
# ROW

A part of the proposed alignment is construction of a new bypass, and a part is widening of existing corridor. As per the details provided by O/o EE PWD, Karimganj, the existing ROW is 20m. 60m and 45m ROW has been proposed for the entire project corridor. LA activities are in progress. The status of 3(A) is 100% and 3D is yet to start.

**Dates for providing Right of Way of Construction Zone**

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

| SL No. | From (Km) | To (Km) | Length (Km) | Date of providing RoW |
|---|---|---|---|---|
| 1 | 62.800 | 87.700 | 24.900 | 80% RoW to be handed over on Appointed Date |

# SCHEDULE-B

*(See Clause 2.1)*

## DEVELOPMENT OF THE PROJECT HIGHWAY

### 1. Development of the Project

Development of the Project Highway shall include detailed design, including plan & profile within available proposed ROW and construction of the project highway as described in Schedule-B and Schedule-c. The alignment plans of the Project Highway are given in Annex-III of Schedule-A, which is minimum requirement and are for guidance only. The proposed plan and profile, locations of different structures/drains/service & slip road/RE walls, Chainages of different structures/drains/service & slip road/RE walls, length of different structures/drains/service & slip road/RE walls etc., of the Project highway as indicated in the Schedule-A, Schedule-B, Schedule-C and their Annexures, shall be treated as an approximate assessment and as minimum requirement. Based on site/design requirement, the Concessionaire shall finalise Detailed Project Report (DPR) including plan and profile of the project highway and submit the same to Authority and Independent Engineer for acceptance, before the start of the execution of Project.

Based on accepted DPR including Plan & profile prepared by the Concessionaire, the detailed work program prepared with Network Method (PERT/CPM) shall be prepared along with commensurate deployment of all resources and got approved from Engineer before start of civil work. Any required changes in scope of work given in Schedule B and Schedule C, including any variation in standard, shall be finalized by both the parties before start of actual civil work.

Requirement specifically mentioned in Schedule B and Schedule C shall prevail over general requirements given in Manual mentioned in Schedule-D.

### 2. Project Highway (4 lane)

Construction shall include Four Lane with Paved shoulders configuration from Start of proposed Nilambazar/Cheragi Bypass (Design Chainage Km.62+800) to Chandkhira (Design chainage Km 87+700) in the state of Assam as described in Annex-I of Schedule-B and in Schedule-C.

### 3. Specifications & Standards

The Project Highway shall be designed and constructed by the Agency/Concessionaire in conformity with the Specifications and Standards set forth in **Annex-I** of **Schedule-D**

Annex – I
(Schedule – B)

## Description of the Project

Development of 4 lane Highway, from End of proposed Nilambazar/Cheragi Bypass (62.800) to Chandkhira (Km 87.700) on HAM Mode under in the State of Assam (Package-5).

**1. Development of the Project Highway**

The Project Highway shall generally follow the horizontal alignment shown in the plan specified in Annex-III of Schedule-A, unless otherwise specified by the Authority. Notwithstanding anything to the contrary contained in this Agreement or IRC:SP:84, the proposed plan & profile, locations of different structures/drains/service & slip road/RE walls, chainages of different structures/drains/service & slip road/RE walls, length of different structures/drains/service & slip road/RE walls etc. of the project highway as indicated in the Schedule A, Schedule B, Schedule C and their Annexures shall be treated as an minimum requirement. Based on site/design requirement, the Concessionaire shall finalise their Detailed designs (Development stage) including plan & profile of the project highway and submit the same to Authority & its Engineer for consent/ approval and safety audit by safety auditor, before the start of the execution of project. The designs so approved shall not be in contradiction with the scope of project. For avoidance of doubt, the provisions mentioned in Schedule B & C cannot be changed, only design of the components is to be submitted for consent/approval.
Any changes in the finally accepted DPR in respect of the proposed provision in Schedule B and Schedule C shall not constitute a change of scope, save and except any variations arising out of a change of scope expressly undertaken in accordance with the provision of Article 16.

1.1 Width of Carriageway

1.1.1 Four Laning with paved shoulders shall be undertaken. The paved carriageway shall be 18.2 metre for four laning (including paved shoulder and kerb shyness/edge strip). The earthen shoulder shall be 2.0 metres on either side. (Circular: NHAI/ Bharatmala/ EC/ DPR/ 2016/ 143430) and Edge strip shall be minimum 0.6m as clause No. 2.5.3 IRC: SP:84-2019 in case of depressed median.

1.1.2 In built-up sections/areas the width of paved carriageway shall be 19.89m for four laning (including paved shoulder and Kerb shyness)

1.1.3 Except as otherwise provided in this Agreement, the width shall be adjusted to fit into appropriate plans and cross sections developed in accordance with TCS enclosed.

1.1.4 The entire cross-sectional elements shall be accommodated in the available/proposed ROW. If required, suitable retaining structures shall be provided to accommodate the highway cross section within the available/ proposed ROW. The details of such sections are mentioned in Schedule-B. In case of any other section not included in Schedule-B, where retaining structures are to be provided, shall constitute a Change of Scope.

1.1.5 The Project Highway shall follow the existing alignment unless otherwise specified by the Authority and shown in the alignment plan& Profile specified in Annex-III of Schedule-A. The Concessionaire shall, however, improve/upgrade the Road profile as indicated in Annex-III of Schedule A based on site/design requirement. However, in any case, the bottom of sub-grade shall be 1m above HFL/Water Table level. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for [plain/rolling] terrain to the extent land is available.

1.2 Width of Median

1.2.1 The width of median including kerb shyness shall be 5 metre for flush median. In built up section the width of median shall be 2.5 metre.

1.2.2 In case of depressed median, a minimum of 0.6 metre width adjacent to carriageway in either direction shall be paved. In case of depressed/flushed median, the metal beam (thrie beam) crash barrier shall be provided on either side of the median. In case width of median is more than 9 metre, no crash barrier is required to be provided in the median side. (clause No. 2.5 IRC:SP:84-2019 & Circular RW/NH-29023/02/2019-S&R(P&B)

1.2.3 A suitable paving (paver blocks, etc.) shall be proposed in case of flush median to prevent spreading of soil on carriageway (clause No. 6.3.2 IRC:SP:84-2019)

1.2.4 Suitable anti-glare measures shall be proposed. (Clause No. 2.5.6 IRC: SP:84 2019)

1.3 Project Facilities

Project Facilities shall be constructed in conformity with Annex-I of Schedule-C.

1.4 Specifications and Standards

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

Specifications for Building works: All buildings shall be constructed in conformity with the Specifications and Standards specified in CPWD manuals /norms.

Specifications for Electrical works: All electrical works shall be constructed in conformity with the Specifications and Standards specified by Telangana State Electricity/Transco owning department.

## 2. Geometric Design and General Features

2.1 General: Geometric design and general features of the Project Highway shall be in accordance with Section 2 of the manual. Intermediate Sight distance (Desirable Minimum Sight Distance) shall be followed for design of all vertical curves including structures as well as highways. (clause No. 2.9.5 IRC: SP:84-2019).

2.2 Design Speed: The project road shall be designed for 100 Kmph for plain and rolling terrain and 60 Kmph for mountainous and steep terrain. (clause No. 2.2 IRC: SP:84-2019)

2.3 Improvement of the existing road geometrics

2.3.1 The existing road geometrics shall be improved as per the codal provisions. In the sections, where improvement of the existing road geometrics to the prescribed standards is not possible, the existing road geometrics shall be improved to the extent possible within the given right of way and appropriate road signs, pavement markings and safety measures shall be provided.

| S. No | Stretch (Design Chainage Km) | | Type of Deficiency | Remarks |
|---|---|---|---|---|
| | From | To | | |
| 1 | 89.496 | 85.566 | Substandard curve | |

2.3.2 The entire cross-sectional elements shall be accommodated in the available/proposed ROW. If required, suitable full height retaining structures shall be provided to accommodate the highway cross section within the available/ proposed ROW. The details of such sections are mentioned in Schedule-B. In case of any other section not included in Schedule-B, where retaining structures are to be provided, shall constitute a Change of Scope

2.3.3 Realignments: The existing road shall be improved to the standards as specified in the manual at the following locations.

| S. No | Design Chainage (Km) | | Length (km) | Location |
|---|---|---|---|---|
| | From | To | | |
| 1 | 83.900 | 84.300 | 0.400 | Patharkandi |
| 2 | 85.100 | 85.550 | 0.450 | Baithakhal T.E |
| 3 | 86.350 | 87.700 | 1.350 | Chandkhira |

2.3.4 Bypasses: The existing road shall be bypassed to the standards as specified in the manual at the following locations.

| S. No | Design Chainage (Km) | | Length (km) | Location |
|---|---|---|---|---|
| | From | To | | |
| 1 | 62.800 | 77.260 | 14.460 | Nilambazar |

2.4 Right of Way

Details of the Right of Way along Project Highways are given in Annexure-VI of Schedule-A.

| S.No | Stretches | | Length (in Km) | ROW width (in m) | Remarks |
|---|---|---|---|---|---|
| | From (Km) | To (Km) | | | |
| 1 | 62.800 | 63.150 | 0.350 | 45 | Except at proposed Rest area & Proposed new lane RUB |
| 2 | 63.150 | 77.300 | 14.150 | 60 | |

| | | | | | |
|---|---|---|---|---|---|
| 3 | 77.300 | 87.700 | 10.400 | 45 | |

2.5 Type of shoulders

2.5.1 The Design Specification of paved shoulders shall conform to the requirements specified in paragraph 5.10 of the manual.

2.5.2 Paved shoulders and strip on median side shall be of same specification and pavement composition as of main carriageway (clause No. 5.10 IRC: SP:84-2019)

2.5.3 The overlay on the main carriageway pavement and on the paved shoulders shall be uniform in thickness and composition (Clause No. 5.10 IRC SP:84-2019)

2.5.4 In Built-up sections, footpaths/fully paved shoulder shall be provided with width 1.5m/2.0m respectively. (Clause No. 2.15 & clause No. 2.6 IRC: SP:84-2014)

2.5.5 In open country, paved shoulders of 1.5m width shall be provided. (Clause No. 2.6 IRC: SP:84-2019)

2.5.6 The Design Specification of paved shoulders shall conform to the requirements specified in paragraph 5.11 of the manual.

2.5.7 The earthen shoulder of 2.0m width on shoulder side shall be provided with top 150 mm on earthen shoulder with well graded naturals and morrum gravel crust stones or combination thereof, confirming to Clause 401 of MoRTH specification. (Clause No. 5.11 IRC: SP:84-2019)

2.5.8 The earthen shoulder of 1.0m width on median side shall be provided with top 150mm on earthen shoulder with well graded naturals and morrum gravel crust stones or combination thereof, confirming to clause 401 of MoRTH specification to fix MBCB and confirm placement requirement of MBC. (Clause no. 9.7.2 (C) IRC: SP: 84-2019)

2.6 Lateral and Vertical Clearance at Underpasses

2.6.1 In case of VUP/ LVUP/ SVUP, the proposed structure, the finish road level in VUP/ LVUP/ SVUP shall be kept 150 mm above the ground level/service road/ crossroad (whichever is higher) to ensure that these VUP/ LVUP/ SVUP don't become water accumulation points. (Clause No. 2.10 IRC: SP:84-2019)

2.6.2 The vertical and horizontal clearance at the underpasses shall be as per Clause 2.10.2 of the manual.

2.7 Lateral and vertical clearances at Overpasses

2.7.1 Lateral and vertical clearances for overpasses shall be as per paragraph 2.11 of the Manual.(Clause No. 2.11 IRC: SP:84-2019)

2.7.2 Lateral clearance: The width of the opening at the Overpasses shall be as follows:

| Sr. No. | Location Chainage (Km) | Span/opening (m) | Remarks |
|---|---|---|---|
| NIL | | | |

**(MCW** – main carriageway**, LHS** – Left Hand Side and **RHS** – Right Hand Side**)**

2.8 Service roads/Slip roads/Connecting Roads:

2.8.1 Service Road: The height of embankment of service road shall confirm to clause 4.2.1 of IRC SP: 84-2019

2.8.2 The service roads shall be constructed at the locations and for the lengths indicated below:

| Sr.No. | Design Chainage (Km) | | Length (Km) | | Paved Carriageway Width including shyness(m) | Total (km) | Remarks |
|---|---|---|---|---|---|---|---|
| | From | To | LHS | RHS | | | |
| 1 | 77.100 | 77.580 | 0.480 | 0.480 | 7.5 | 0.960 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | 78.700 | 81.550 | 2.850 | 2.850 | 7.5 | 5.700 | - |
| 3 | 87.600 | 87.700 | 0.100 | 0.100 | 7.5 | 0.200 | |

2.8.3 Parking bays

The parking bays shall be provided along service road (clause no 2.12.2.1 IRC SP:84-2019)

| Sr.No. | Design Chainage of Parking Bay | | Remarks |
|---|---|---|---|
| | LHS Service Road | RHS Service Road | |
| - NIL - | | | |

2.8.4 Slip Road: The height of embankment of slop road shall confirm to clause 4.2.1 (clause No. 4.2.1 IRC SP: 84-2019)

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

| Sr.No. | Design Chainage (Km) | | Length (Km) | | Paved Carriageway Width including shyness(m) | Total (Km) | Remarks |
|---|---|---|---|---|---|---|---|
| | From | To | LHS | RHS | | | |
| 1 | 62.800 | 63.180 | 0.380 | 0.380 | 7.500 | 0.760 | - |
| 2 | 68.180 | 69.800 | 1.620 | 1.620 | 7.250 | 3.240 | - |
| 3 | 73.760 | 74.750 | 0.990 | 0.990 | 7.250 | 1.980 | - |
| 4 | 77.580 | 78.700 | 1.120 | 1.120 | 7.500 | 2.240 | - |
| 5 | 83.600 | 84.730 | 1.130 | 1.130 | 7.250 | 2.260 | - |
| 6 | 86.030 | 86.920 | 0.890 | 0.890 | 7.250 | 1.780 | - |

2.8.5 Separator Between Main Carriageway and Service/Slip Road (clause No. 2.15.1 IRC:SP:84-2019)

A separator between main carriageway and service/slip road shall be provided to prevent the pedestrians, local vehicles and animals entering the highway.

Note:

(i) Above length of the service/slip roads is minimum specified. The actual length of the service/slip/connecting roads shall be determined by the Concessionaire in accordance with the approved plan & profile and design approved from the Independent Engineer. **Any increase/decrease up to 5 percent length from the length specified in this Clause of Schedule-B shall not constitute a Change of Scope. Any additional length shall be dealt in Change of Scope.**

(ii) The Acceleration, deceleration lane, right turning storage lane, entry/exit lanes shall be constructed in addition to length given in above table and shall be deemed to be part of the scope and no Change of Scope shall be considered for the same. **(Clause No. 2.12.2 IRC: SP:84-2019)**

2.9 Grade Separated Structures (Clause No. 3.4 IRC SP: 84-2019)

Grade separated structures shall be constructed as per paragraph 2.13 of the Manual. Proposed levels at structure locations as shown in plan & profile specified in Annexure-III of schedule-A are minimum requirement and only for guidance and any increase in levels shall not constitute any change of scope. Entry/Exit arrangement from main carriageway shall be 50m before/after the start/end of approach road to grade separator i.e. start/end of valley curve (clause No. 2.12.2.2 IRC:SP:84-2019).RCC barrier shall start from start of valley curve and end after grade separator at end of valley curve. (clause No. 2.12.2.2 IRC:SP:84-2019).

The sub-structure shall be continued in the median portion with RCC barrier wherever superstructure has not been proposed in median portion. (Clause 7.1 (vii) IRC: SP:84-2019).

50m long MBCB Safety barriers on structure approaches shall be provided on all four faces of each structure. MBCB provided towards median side of each structures shall be joined on ends in semi-circular shape. (Clause No. 4.3.5 and 4.9, IRC 119)

2.5m/1.5m/0.75m wide footpaths shall be provided at grade intersection below structures for each direction of pedestrian movement (refer fig 3.1 to 3.6 IRC: SP:84-2019).

Suitable longitudinal drain connectivity shall be provided for existing crossroads at proposed underpass locations. Drain should be designed for vehicle loading.

The requisite particulars are given below:

### 2.9.1 Vehicle Overpass (VOP)

| Sr.No. | Design Chainage (Km) | LHS Roadway Width (m) | RHS Roadway Width (m) | Super Structure Provision in Median | Span Arrangement (m) | Minimum Vertical Clearance (m) | Skew Angle (to be specified) | Remarks |
|---|---|---|---|---|---|---|---|---|
| Nil | | | | | | | | |

### 2.9.2 Vehicle Underpasses (VUP)

| Sr.No. | Design Chainage(Km) | LHS Roadway Width (m) | RHS Roadway Width (m | Super Structure Provision in Median | Span Arrangement (m) (clear) | Minimum Vertical Clearance (m) | Skew Angle | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | 63.147 | 11.00 | 11.00 | Open to Sky | 1 x 20.0 | 5.50 | - | |
| 2 | 69.016 | 11.00 | 11.00 | Open to Sky | 1 x 20.0 | 5.50 | $18^0$ | |
| 3 | 74.247 | 11.00 | 11.00 | Open to Sky | 1 x 20.0 | 5.50 | - | |
| 4 | 78.116 | 11.00 | 11.00 | Open to Sky | 1 x 30.0 | 5.50 | - | |
| 5 | 84.111 | 11.00 | 11.00 | Open to Sky | 1 x 30.0 | 5.50 | - | |
| 6 | 86.432 | 11.00 | 11.00 | Open to Sky | 1 x 20.0 | 5.50 | - | |

### 2.9.3 Light Vehicle Underpass (LVUP)

| Sr.No. | Design Chainage(Km) | LHS Roadway Width (m) | RHS Roadway Width (m | Super Structure Provision in Median | Span Arrangement (m) (clear) | Minimum Vertical Clearance (m) | Skew Angle | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | 63.824 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | $28^0$ | |
| 2 | 65.090 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | - | |
| 3 | 66.215 | 11.00 | 11.00 | Open to Sky | 1 x 20.0 | 4.00 | - | LVUP Cum Culvert |
| 4 | 67.540 | 11.00 | 11.00 | Open to Sky | 1 x 20.0 | 4.00 | - | LVUP cum Bridge |
| 5 | 69.596 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | - | |
| 6 | 70.118 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | - | |

| Sr.No. | Design Chainage(Km) | LHS Roadway Width (m) | RHS Roadway Width (m | Super Structure Provision in Median | Span Arrangement (m) (clear) | Minimum Vertical Clearance (m) | Skew Angle | Remarks |
|---|---|---|---|---|---|---|---|---|
| 7 | 71.252 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | $17^0$ | |
| 8 | 75.336 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | - | |
| 9 | 82.021 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | - | |
| 10 | 83.024 | 11.00 | 11.00 | Open to Sky | 1 x 12.0 | 4.00 | - | |

2.9.4 Cattle and Pedestrian underpass

| Sr.No. | Design Chainage(Km) | LHS Roadway Width (m) | RHS Roadway Width (m | Super Structure Provision in Median | Span Arrangement (m) | Minimum Vertical Clearance (m) | Skew Angle | Remarks |
|---|---|---|---|---|---|---|---|---|
| NIL | | | | | | | | |

2.9.5 Interchanges (IC) (Clause No. 3.4 IRC SP 84-2019)

| Sr.No. | Design Chainage(Km) | Name of structure | Span Arrangement (m) | Typical cross section | Remarks |
|---|---|---|---|---|---|
| NIL | | | | | |

Note: Layout, Geometric design and TCS of interchange shall be included by DPR consultant in Annexure to schedule B

2.9.6 Details of Ramps, Crossroads and Connecting Roads at Interchanges

| Sr. No. | Carriageway Widths including Kerb Shyness | Length (m) | Description of Ramps, Crossroads and Connecting Roads | Remarks |
|---|---|---|---|---|
| - NIL - | | | | |

## ***Note for 2.9:***

- For grade separated structures(interchange and underpass), span arrangement mentioned above is tentative and may be changed based on design of structure, latest construction techniques and aesthetics. The span length mentioned in the table are the optimum and should not be further reduced. The actual lengths as required for structure by detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Any increase in the lengths specified in this Schedule 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 16.

- Lateral and vertical clearances for overpasses and provision of guardrails/crash barriers shall be as per paragraph 2.11 of the Manual.
- All structures shall be designed and constructed in accordance with Section 7 of the Manual and shall conform all the cross-sectional features and details specified in Appendices of this Schedule.
- Finished Road levels at structure locations as shown in plan & profile of Appendix of the schedule are only for guidance. Any changes in levels shall not constitute change of scope.
- IRC Special vehicle loading is to be considered in Design of structures as per the code guidelines. Congestion factor to be considered as per recommendation of IRC 6-2017
- Wherever liquefaction is observed, ground improvement measures shall be done to compact to improve the penetration resistance and satisfy as per clause 8.4.4 (v) of IRC114.
- Any structures falling within acceleration / deceleration lane /merging and demerging shall be constructed to meet the crown section of highway required width of road. These changes shall not be treated as change of scope.
- Any additional LVUP/VUP not provided for in Schedule B but required during the execution of work will be dealt under the provisions of Article 16.
- Expansion joints shall be minimized by deck continuity/diaphragm continuity continuous superstructure over multiple spans. Deck length between two expansion joints shall not be less than 120m except where structure length falls short of it. Expansion joints shall be Finger joint type in compliance with IRC:SP:69-2011, Table 5.4.1 criteria for adoption of different types of expansion joints. Concessionaire shall ensure quality control as per good industry practice and shall ensure presence of manufacturer of expansion joints at the time of installation for quality control supervision.
- The approach length of the crossroad for overpass shall be developed as per site requirement in consultation with IE/NHIDCL.
- Deck width shown in above table shall be the width perpendicular to the alignment of the roads.

2.10 Typical Cross Section (TCS) of the Project Highway

| S. No. | Design Chainage (Km) | | Length (Km) | TCS | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 62.800 | 63.180 | 0.380 | VI | |
| 2 | 63.180 | 68.180 | 5.000 | I | |
| 3 | 68.180 | 69.800 | 1.620 | II | |
| 4 | 69.800 | 73.760 | 3.960 | I | |
| 5 | 73.760 | 74.750 | 0.990 | II | |
| 6 | 74.750 | 77.100 | 2.350 | I | |
| 7 | 77.100 | 77.580 | 0.480 | VA | |

| | | | | | |
|---|---|---|---|---|---|
| 8 | 77.580 | 78.700 | 1.120 | VI | |
| 9 | 78.700 | 80.100 | 1.400 | VA | |
| 10 | 80.100 | 80.900 | 0.800 | VB | |
| 11 | 80.900 | 81.550 | 0.650 | VA | |
| 12 | 81.550 | 83.600 | 2.050 | I | |
| 13 | 83.600 | 84.730 | 1.130 | II | |
| 14 | 84.730 | 85.070 | 0.340 | III | |
| 15 | 85.070 | 85.550 | 0.480 | I | |
| 16 | 85.550 | 85.830 | 0.280 | IV | |
| 17 | 85.830 | 86.030 | 0.200 | I | |
| 18 | 86.030 | 86.920 | 0.890 | II | |
| 19 | 86.920 | 87.600 | 0.680 | I | |
| 20 | 87.600 | 87.700 | 0.100 | VC | |

*-TCS drawings are attached in Annexure – II of Schedule - B.

At Structure locations, TCS of Structures mentioned in Annexure-II of Schedule B will be applicable.

Note:

1. Any variations in the lengths specified in the above table shall not constitute a Change of Scope
2. Lengths mentioned in the above list for cross section types concerned to structures are inclusive of structure length.
3. Retaining wall/ RE wall shall be provided for full height on all structures. **(clause No. 7.1 (iv) IRC:SP:84-2019)**
4. Toe wall (0.6m ht) to be provided where ROW is restricted and water bodies along the proposed highway on the sections specified in Schedule-B.
5. Chainages may be adjusted according to location of structures as per drawings.
6. Carriageway width tapering shall be provided 1 in 50 as per manual

   **(Clause no 2.5.4. IRC: SP:84-2019)**

   Intermediate Sight Distance (Desirable Minimum Sight Distance) shall be followed for design of all vertical curves (Summit and Valley Curves) including structures as well as highways.

   **(Clause No. 2.9.5 IRC: SP:84-2019)**
7. Provide detailing of placement and specification of Railing, Fencing and electric poles, etc. **(Clause No. 2.17 IRC: SP:84-2019)**

   Details of TCS are attached in Annexure – II of Schedule - B.

**3. Intersections and Grade Separated Intersections (Section 3, IRC SP 84 -2019)**

All at-grade intersections and grade separated intersections shall be as per Section 3 of the manual. Existing at-grade intersections shall be improved to the prescribed standards.

The service road pavement composition shall be continued on crossroads of the intersections for the length specified for at-grade and grade separated intersections.

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

3.1 At-grade intersections:(clause no. 3.2 IRC SP 84-2019)

(a) Major Junctions:

| Sr. No. | Design Chainage (Km) | Junction Type | Leads to | Median Opening | Category of Cross Road | Carriageway width of crossroad | Length of crossroad to be developed |
|---|---|---|---|---|---|---|---|
| Nil | | | | | | | |

(b) Minor Junctions:

| Sr. No. | Design Chainage (Km) | Junction Type | Leads to | | Median Opening | Category of Cross Road | Carriageway width of crossroad | Length of crossroad to be developed | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | LHS | RHS | | | | LHS | RHS | |
| 1 | 77.433# | + | Nayagram | Kanaibazar | No | VR | 4.0 | 50.0 | 50.0 | Connected to Slip/Service Road |
| 2 | 78.187# | + | Singhariah | Jamirala | No | VR | 4.0 | 50.0 | 50.0 | |
| 3 | 80.748# | + | Nalibari | Rajbari | No | VR | 4.0 | 50.0 | 50.0 | |
| 4 | 86.192# | T | - | Parugaon | No | VR | 7.0 | - | 50.0 | |

# - Above mentioned crossroads are connected to Slip roads/service roads at underpass locations

Note:

I. Type of Junction to be improved as per manual. (clause No. 3.2.5 IRC:SP:84-2019)

II. The Concessionaire shall take up 'Detailed Engineering study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in section-3 of the manual. Auxiliary lanes including storage, acceleration and deceleration lane along with physical islands to be provided. The cross road at the junctions which are having a level difference from the main carriageway, are to be improved at the level of main carriageway for the length of 30 metre and then to be merged with the cross road at the gradient not more than 1:50. (Clause No. 3.2.2 IRC: SP:84-2019)

III. For minor / major layout for left-in / left out arrangement with physical islands with hazard marking. Where there is space constraint to provide physical islands, the effect of junction kept wide opened can be avoided by ghost island with marking. (Fig 3.7, IRC:SP:84-2019/ IRC:SP:87-2019)

IV. For U-turn, Self-Regulated U-Turn facility shall be created. (Fig 3.6 IRC:SP:84-2019/ IRC:SP:87-2019)

3.2 At-Grade Intersections below Grade Separators/Interchanges:

**(clause No. 3.4.7 of IRC: SP:84-2019)**

| Sr. No. | Design Chainage (Km) | Junction Type | Leads to | | U-Turn provision in Viaduct Spans | Category of Cross Road | Carriageway width of crossroad | Length of crossroad to be developed | |
|---|---|---|---|---|---|---|---|---|---|
| | | | LHS | RHS | | | | LHS | RHS |
| 1 | 63.147 | T | - | Nilambazar | Yes | NH | 10.00 | - | 15.0 |
| 2 | 63.824 | + | Rampasha | Farampasha | Yes | VR | 4.00 | 50.0 | 50.0 |
| 3 | 65.090 | + | Eraligooly | Nagharia | Yes | MDR | 5.50 | 50.0 | 50.0 |
| 4 | 66.215 | + | Ut- | Ilaspur | Yes | VR | 4.00 | 50.0 | 50.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | tarbandar kona | | | | | | |
| 5 | 67.540 | + | Eraligool | Gorikhuna | Yes | MDR | 5.50 | 50.0 | 50.0 |
| 6 | 69.016 | + | Bataiya Punjee | Nagharia Pt I | Yes | MDR | 5.50 | 50.0 | 50.0 |
| 7 | 69.596 | + | Singaria | Chayabari | Yes | MDR | 7.00 | 50.0 | 50.0 |
| 8 | 70.118 | + | Nankar | Eral IV | Yes | VR | 4.00 | 50.0 | 50.0 |
| 9 | 71.252 | + | Farid kuna | Bager San-gan | Yes | VR | 4.00 | 50.0 | 50.0 |
| 10 | 72.284 | + | SaijaNa-gar | Purbogool | Yes | VR | 5.00 | 50.0 | 50.0 |
| 11 | 74.247 | + | Purbo Tatirbond | Haitorkha | Yes | MDR | 5.00 | 50.0 | 50.0 |
| 12 | 75.336 | + | Duhalia | Moina | Yes | VR | 4.00 | 50.0 | 50.0 |
| 13 | 78.116 | + | Duhalia | Jamirala | Yes | MDR | 7.00 | 50.0 | 50.0 |
| 14 | 82.021 | + | Pailamuli | Patarkandi | Yes | VR | 3.00 | 50.0 | 50.0 |
| 15 | 83.024 | + | Katabari | Nalibari | Yes | MDR | 10.00 | 50.0 | 50.0 |
| 16 | 84.111 | + | - | Jamirala | Yes | NH-8 | 10.00 | - | 50.0 |
| 17 | 86.432 | + | - | Chandkhira | Yes | NH-8 | 10.00 | - | 50.0 |

Note:

(i) The Concessionaire shall take up 'Detailed Engineering study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in section-3 of manual.

(ii) Junction improvement under grade separators shall be carried out as per manual with proper entry/exit to crossroads and slip/service roads, etc. Auxiliary lanes including storage, acceleration and deceleration lane along with physical islands to be provided.

(iii) Location of grade-separated structures are indicative. Exact location should be decided in consultation with Independent Engineer

(iv) Intersection Layout, Entry/Exit, Right Turning Lane, U-Turns, Geometric Design and Typical Cross Sections of Interchange shall be included by DPR consultant in Annexure to schedule-B.

(v) Only Entry or Exit shall be designed at any location (provision of entry/exit by ghost island not permitted). (Clause No. 2.13.1 IRC: SP:84-2019)

**4. Road Embankment and Cut Section**

Construction of road embankment/cuttings shall conform to the Specifications and Standards given in section 4 of the manual. Notwithstanding anything to the contrary contained in this Agreement or Manual, the proposed profile of the project highway as indicated in the Annex-III of Schedule B shall be treated as minimum requirement.

Based on site/design requirement, the Concessionaire shall design the alignment plans and profiles of the project highway based on site/design requirement mentioned in Schedule B with approval from the Independent Engineer/Authority Engineer within the available Right of Way. However, it is clari-

fied that bottom of subgrade level shall be at-least 1500 mm above HFL/Existing ground level whichever is higher for a greenfield/ bypass stretch.

The side slopes shall not be steeper than 2H:1V. In case, there is a ROW constraint than, suitable soil retaining structures shall be provided.**(Clause No. 4.2 IRC: SP:84-2019)**

For stability of slope upto 3 metre height the turfing can be adapted. For the slope from 3-6 metre suitable, geocell, geo-grid, geo-green etc. can be provided with suitable drainage chutes as per IRC 56. For the slope more than 6 metre height, a complete slope stability analysis as per IRC:75 shall be done and the slopes shall be compulsory protected with stone pitching within stone masonry grid structure of 4x4 metre and suitable drains/chutes etc. shall be provided for effective drainage of the water.

Use of Pond Ash and Design of Pond Ash embankment shall be specified (Clause No. 4.2.4 & 4.4.4.i (d) IRC: SP:84-2019)

**5. Pavement design**

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

5.2 Type of Pavement and Design requirement (Clause No. 5.4 IRC: SP:84-2019/ IRC: SP:87-2019)

The pavement shall be flexible/rigid type for entire length of project highway except for toll plaza locations where rigid pavement shall be provided.

5.2.1 Design Period and Strategy Pavement shall be constructed for the entire length of Project Highway including paved shoulders. Flexible Pavement shall be designed for a minimum design period of 20 years and minimum subgrade CBR of 8% and maximum subgrade CBR of 10%. whereas Rigid pavement shall be designed for a minimum design period of 30 years. Stage construction shall not be permitted.

5.2.2 Recommended Pavement Design Notwithstanding anything to the contrary contained in this Agreement or the manual, the Concessionaire shall design the pavement of main carriageway for design traffic of 70 MSA.

5.2.3 The pavement for service road/slip roads shall be designed for projected traffic 20msa subject to minimum as follows. **(Clause No. 5.5.4 IRC: SP:84-2019)**

(i) Service Roads in Built up areas for minimum 20 MSA

(ii) Slip Roads for minimum 20 MSA

(iii) Service Roads in Rural Area for minimum 10 MSA

5.3 In order to meet the intended functional requirement of respective pavement layers on main carriageway, the minimum thickness of respective pavement layers for main carriageway and connecting crossroads/ service roads/ slip roads/ entry/exit locations, acceleration/ deceleration lane, right turning lanes shall, however, in no case be less than as given below:

5.3.1 Main carriageway, paved shoulder, median side paved strip, entry/ exit locations, acceleration/ deceleration lane, right turning lanes (Flexible) with CTB/CTSB

| Pavement Composition | Minimum Crust Thickness (mm) |
|---|---|
| Subgrade | 500 |
| CTSB | 200 |
| CTB | 100 |
| AIL | 100 |
| DBM | 65 |
| BC | 40 |

5.3.2 Main carriageway, paved shoulder, median side paved strip, entry/ exit locations, acceleration/ deceleration lane, right turning lanes (Rigid) For Toll Plaza location. Flexible)

| Pavement Composition | Minimum Crust Thickness (mm) |
|---|---|
| Subgrade | 500 |
| GSB | 150 |

| | |
|---|---|
| DLC | 100 |
| PQC | 300 |

5.3.3 Crossroads/Service roads/Slip Roads

| Pavement Composition | Minimum Crust Thickness (mm) |
|---|---|
| Subgrade | 500 |
| GSB | 200 |
| WMM | 250 |
| DBM | 70 |
| BC | 40 |

5.4 Reconstruction of Stretches with New pavement (Clause No 5.9.4 IRC SP 84-2019)

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

| S. No | Design chainage | | Pavement Composition | Remarks |
|---|---|---|---|---|
| | From | To | | |
| 1 | 62.800 | 63.180 | Same as 5.3.1 | BHS |
| 2 | 77.100 | 77.580 | | RHS |
| 3 | 77.580 | 78.700 | | BHS |
| 4 | 78.700 | 80.100 | | RHS |
| 5 | 80.100 | 80.900 | | LHS |
| 6 | 80.900 | 81.550 | | RHS |
| 7 | 84.730 | 85.070 | | RHS |
| 8 | 85.550 | 85.830 | | LHS |
| 9 | 87.600 | 87.700 | | BHS |

5.5 Bituminous Mix for Overlay

The following stretches of the existing road shall be provided bituminous overlay as follows:

| Sr. No. | Design Chainage | | Overlay Pavement Composition | Remarks |
|---|---|---|---|---|
| | From | To | | |
| Nil | | | | |

**(Clause No. 5.9.8 IRC: SP:84-2019)**

**6. Roadside Drainage**

6.1 Drainage system including surface and subsurface drains for the Project Highway including crossroads shall be provided as per section 6 of the manual. RCC Drain cum footpaths shall conform to the cross- sectional features and other details as given in Annexures to Schedule-B and shall be provided as under:

Details of RCC Drain Cum Footpath (Clause No 2.13 & 6.2.6 IRC SP 84-2019)

| Sr.No. | Design Chainage (Km) | | Length (m) | | Width of Drain (m) | Total Length (m) |
|---|---|---|---|---|---|---|
| | From | To | LHS | RHS | | |
| 1 | 62.800 | 63.180 | 380 | 380 | 1.5 | 760 |
| 2 | 77.100 | 77.580 | 480 | 480 | 1.5 | 960 |
| 3 | 77.580 | 78.700 | 1120 | 1120 | 1.5 | 2240 |
| 4 | 78.700 | 80.100 | 1400 | 1400 | 1.5 | 2800 |
| 5 | 80.100 | 80.900 | 800 | 800 | 1.5 | 1600 |
| 6 | 80.900 | 81.550 | 650 | 650 | 1.5 | 1300 |
| 7 | 87.600 | 87.700 | 100 | 100 | 1.5 | 200 |
| | **Sub Total on each side** | | **4930** | **4930** | | |
| | **Total** | | | | | 9840 |

6.2 Unlined Drains

Unlined Drains other than above mentioned locations shall be provided in the entire project length which gets terminated at all crossroad locations. In case the definite outfall is not available, a rainwater harvesting system shall be provided at the deepest location for dispersal of water.

6.3 Median Drain (Clause No. 6.3 IRC SP 84-2019)

Lined drain shall be provided in the center of the median at super elevation locations and depressed median. Design with drainage of storm water from one carriageway to another is not allowed. The Concessionaire shall design the median drain based on site/design requirement mentioned in Schedule D with approval from the Independent Engineer. All drains shall be connected to the nearest culvert/ outfall. (Clause No. 6.3 IRC: SP:84-2019)

6.4 Drainage arrangement between Main Carriageway and Service/Slip Roads (Clause No. 2.15 IRC SP 84-2019)

A suitable drainage arrangement for draining storm water of the main carriageway shall be provided. Drain of Storm water of main carriageway to service road is not permitted. (Clause No. 2.15 IRC: SP:84-2019)

6.5 Drainage where Embankment Height is more than 3m.

Chute drain shall be provided at suitable intervals on embankment slopes. The drainage arrangement shall include kerb, cement concrete drainage channel at the edge roadway, Cement Concrete Chutes, CC bedding, energy dissipation basin, etc. Mountable Kerb shall be provided beyond the post of MBCB to channelize storm water into chute. (Clause No. 6.8.2.4 of IRC: SP:84-2019)

6.6 Drainage for Structures

A suitable drainage arrangement for the flow of storm water from deck slab shall be provided. Falling of water on any surface of the structures, flow on underneath or remain standing or flowing over the road below the structure is not permitted in any circumstances. Clause No. 6.8 IRC: SP:84-2019)

6.7 Drainage for Underpass and Subways Structures

A suitable drainage arrangement for draining storm water from the Underpass and Subways shall be provided. (Clause No. 6.8.3 IRC: SP:84-2019)

6.8 Drainage arrangement of Retaining Structures

Vertical Drop-down drainage pipes with suitable cleaning provision shall be provided at suitable interval. Drainage fixtures and dropdown pipes shall be of rigid, corrosion resistant material not less than 100m. The Storm water drainage from main carriageway to service road is not permitted. (No Clause in IRC: SP:84-2019

**7. Design of Structures**

7.1 General

Project Highway in the improvement plan is proposed to be constructed to four lane configuration. As such, superstructures of all bridge, culverts and structures shall be designed for edge movement of the vehicle considering stitching of new superstructure in future during widening to additional lanes. IRC Special vehicle loading is to be considered in the design of all bridges, culverts and structures.

All structures except wherever expansion joints have been provided, the pavement layers CTSB, CTB, AIL, DBM & BC shall be continued over the structures so as to ensure smooth riding quality in project highway. These structures shall be designed considering the dead load of pavement layers .

All major structures shall be designed preferably with continuous structure to reduce the number of expansion joints on the MJB/ ROBs/ flyover/ Interchange etc.

7.1.1 Bridges, culverts and structures shall be designed for IRC class Special Vehicle (SV) loading as per recommendation of IRC: 6 and constructed in accordance with section-7 of the manual. All structures shall conform to the cross-sectional features and other details specified therein.

**7.1.2** The overall width of the structures shall be as given in Para 7.3.2 of Annex-I of Schedule-B. (Clause No. 7.3 IRC: SP:84-2019)

**7.1.3** The Safety Barrier and Footpath on Bridges and RoB shall continue on approaches. The footpath shall be provided with paved surface & railing till the embankment height is more than 3m. (Clause No. 7.17 IRC: SP:84-2019)

Details of Structures with footpaths

| Sr. No. | Location at km | Skew Angle | Footpath Width (m) | | Remarks |
|---|---|---|---|---|---|
| | | | Left | Right | |
| 1 | ROB at 63.391 | - | 1.5 | 1.5 | |
| 2 | MIB at 69.545 | - | 1.5 | 1.5 | |
| 3 | ROB at 73.001 | - | 1.5 | 1.5 | |
| 4 | MIB at 77.075 | - | 1.5 | 1.5 | |
| 5 | MIB at 79.312 | - | 1.5 | 1.5 | Box MIB |
| 6 | MIB at 79.873 | - | 1.5 | 1.5 | Box MIB |
| 7 | MIB at 80.166 | - | 1.5 | 1.5 | Box MIB |
| 8 | MIB at 81.393 | - | 1.5 | 1.5 | Box MIB |
| 9 | MIB at 84.365 | - | 1.5 | 1.5 | Box MIB |
| 10 | MJB at 85.640 | - | 1.5 | 1.5 | |

**(Clause No. 7.2 ii IRC: SP:84-2019)**

7.1.4 Bridges in the improvement proposal needs to be of high level bridge.

7.1.5 All structures shall be designed to carry utility services on the outer side of RCC barrier/Railing as per site requirement.

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 2.10 of the Schedule-B.

7.1.7 In bypass/realignment locations if the structures allowed in existing crossroads is be replaced to new locations. No change of scope shall be allowed.

7.1.8 If any new structures is provided at canal cum bund roads along the project highway in consultation with concerned irrigation department/IE/NHIDCL. No change of scope shall be applicable.

7.1.9 Wherever liquefaction is observed, ground improvement shall be done by replacing suitable material and compact the soil to increase the penetration resistance to satisfy the clause 8.4.4 (v) of IRC114.

7.1.10 Proposed levels at structure locations as shown in plan & profile specified in Appendix B-II of schedule B are only for guidance and any changes in levels shall not constitute change of scope.

7.1.11 The structures falling within acceleration / deceleration lane /taper shall be constructed to the required width at the location. These changes shall not be treated as a change of scope.

7.1.12 An effective drainage system for bridge decks shall be provided as specified in the Manual.

7.1.13 Repairs and rehabilitation of all existing bridges shall include but not limited to general cleaning of bridge and area around bridge, restoration of slopes and protective works, removal and relaying of existing wearing coat, repair and replacement of drainage spouts, construction of new crash barriers in place of old railing, providing of new expansion joints and bearings in place of old ones wherever required and repair and rehabilitation of damaged concrete, if any, and providing floor protection with rigid and flexible apron and embankment slope protection if any etc. to the complete satisfaction and as per directions of Independent Engineer/Authority. All the repairs and rehabilitation works shall be carried out as per standards and manuals.

7.1.14 The structures proposed to be retained, the FRL of those structures shall be maintained as per existing structure,widening/New shall be done as per the designed Finished Road level.

7.2 Culverts

**(Clause No. 7.3 i IRC: SP:84-2019)**

7.2.1 Overall width of all culverts shall be equal to the roadway width of the approaches.

The overall width of culverts shall be including width of main carriageway and slip/service roads/Entry ramps/Exit Ramps/ Acceleration/Deceleration lanes, etc. All culverts shall also be continued in median and in gap between main carriageway and service road. The locations, vents and type of Culverts are tentative and Changes in the locations, vents and type of Culverts, if any shall be finalized as per site conditions in consultation with Authority / IE, which shall not constitute COS.

Changes in the location of culverts, if any shall be finalized as per site conditions in consultation with Authority / IE which shall not be considered as Change of Scope.

For Box underpasses over crossroads/cart tracks, minimum vent height specified above shall be measured from FRL of crossroad.

Invert level of proposed Box type structure at cart track/Cross drainage locations shall be finalized as per site conditions. Floor protection works shall be as specified in the relevant IRC Codes and Specifications.

7.2.2 New/ Reconstruction of existing RCC pipe culverts:

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

| Sr. No | Design Chainage | Culvert Type | Skew Angle | Span/ Opening (m) | New/ Reconstruction | Culvert Crossing Type (Balancing/Stream, etc) | Remarks |
|---|---|---|---|---|---|---|---|
| **Nil** | | | | | | | |

7.2.3 Widening of existing RCC pipe culverts

All existing culverts which are to be retained shall be widened to the proposed roadway width of the Project Highway as per the typical cross section given in section 7 of the Manual. Repairs and strengthening of existing structures where required shall be carried out.

**(Clause No. 7.3 iii IRC: SP:84-2019/ IRC: SP:87-2019)**

| Sr. No | Design Chainage | Culvert Type | Skew Angle | Span/ Opening (m) | Repairs / Rehabilitation proposals | Culvert Crossing Type (Balancing/ Stream, etc) | Remarks |
|---|---|---|---|---|---|---|---|
| **1** | 77.523 | HPC | - | 1 x 1.20 | **Yes** | Drain | - |
| **2** | 79.193 | HPC | - | 3 x 1.2 | | Drain | - |
| **3** | 79.646 | HPC | - | 2 x 1.20 | | Drain | - |
| **4** | 80.293 | HPC | - | 3 x 1.20 | | Drain | - |
| **5** | 80.693 | HPC | - | 3 x 1.2 | | Drain | - |
| **6** | 81.137 | HPC | - | 2 x 1.20 | | Drain | - |
| **7** | 81.657 | HPC | - | 2 x 1.20 | | Drain | - |
| **8** | 82.177 | HPC | - | 2 x 1.20 | | Drain | - |
| **9** | 82.565 | HPC | - | 2 x 1.20 | | Drain | - |
| **10** | 83.262 | HPC | - | 2 x 1.20 | | Drain | - |
| **11** | 86.008 | HPC | - | 2 x 1.20 | | Drain | - |

7.2.4 Construction of Box Culverts

New culverts (given in table below) shall be constructed for width equal to the proposed roadway width of the Project Highway & as per typical cross-section given in schedule B. The details are given as under:

| Sl. No. | Design chainage (Km) | Span Arrangement (m) | Skew Angle | Crossing Type | Remarks |
|---|---|---|---|---|---|
| 1 | 63.125 | 1 x 2.0 | - | - | BC |
| 2 | 63.588 | 1 x 2.0 | - | Drain | BC |
| 3 | 63.695 | 1 x 2.0 | - | - | BC |
| 4 | 64.056 | 1 x 2.0 | - | - | BC |
| 5 | 64.160 | 1 x 2.0 | - | - | BC |
| 6 | 64.833 | 1 x 2.0 | - | - | BC |
| 7 | 65.175 | 1 x 2.0 | - | - | BC |
| 8 | 65.890 | 1 x 2.0 | - | - | BC |
| 9 | 66.400 | 1 x 2.0 | - | - | BC |

| Sl. No. | Design chainage (Km) | Span Arrangement (m) | Skew Angle | Crossing Type | Remarks |
|---|---|---|---|---|---|
| 10 | 66.680 | 1 x 5.0 | $52^0$ | Stream | BC |
| 11 | 66.840 | 1 x 2.0 | - | - | BC |
| 12 | 67.160 | 1 x 2.0 | - | - | BC |
| 14 | 67.838 | 1 x 5.0 | - | Stream | BC |
| 15 | 68.195 | 1 x 2.0 | - | - | BC |
| 16 | 68.395 | 1 x 8.0 | - | Stream | BC |
| 17 | 68.670 | 1 x 2.0 | - | - | BC |
| 18 | 68.820 | 1 x 2.0 | - | - | BC |
| 19 | 69.270 | 1 x 2.0 | - | - | BC |
| 20 | 69.846 | 1 x 2.0 | - | - | BC |
| 21 | 70.375 | 1 x 2.0 | - | - | BC |
| 22 | 70.990 | 1 x 2.0 | - | - | BC |
| 23 | 71.102 | 1 x 2.0 | - | - | BC |
| 24 | 71.530 | 1 x 2.0 | - | - | BC |
| 25 | 71.818 | 1 x 2.0 | - | - | BC |
| 26 | 72.082 | 1 x 2.0 | $16^0$ | Stream | BC |
| 27 | 72.562 | 1 x 2.0 | - | - | BC |
| 29 | 72.812 | 1 x 2.0 | - | - | BC |
| 30 | 73.222 | 1 x 2.0 | - | - | BC |
| 31 | 73.520 | 1 x 3.0 | - | Stream | BC |
| 32 | 73.840 | 1 x 2.0 | - | - | BC |
| 33 | 74.012 | 1 x 2.0 | $26^0$ | Stream | BC |
| 34 | 74.530 | 1 x 2.0 | - | - | BC |
| 35 | 74.784 | 1 x 2.0 | - | - | BC |
| 36 | 75.058 | 1 x 2.0 | - | Stream | BC |
| 37 | 75.539 | 1 x 2.0 | - | - | BC |
| 38 | 75.910 | 1 x 2.0 | - | - | BC |
| 39 | 76.320 | 1 x 2.0 | - | - | BC |

| Sl. No. | Design chainage (Km) | Span Arrangement (m) | Skew Angle | Crossing Type | Remarks |
|---|---|---|---|---|---|
| 40 | 76.531 | 1 x 4.0 | - | Stream | BC |
| 41 | 76.870 | 1 x 2.0 | - | - | BC |
| 42 | 86.513 | 1 x 2.0 | - | Stream | BC |
| 43 | 86.730 | 1 x 2.0 | - | - | BC |
| 44 | 87.155 | 1 x 2.0 | - | - | BC |
| 45 | 87.469 | 1 x 2.0 | - | - | BC |

*-BC Box Culvert

**(Clause No. 7.3 i IRC: SP:84-2019)**

7.2.5 Widening of existing box culverts (BC)

All existing culverts which are to be retained shall be widened to the proposed roadway width of the Project Highway as per the typical cross section given in Schedule-B. Repairs and strengthening of existing structures where required shall be carried out. **(Clause No. 7.3 iii IRC: SP:84-2019)**

| Sr. No | Design Chainage | Culvert Type | Skew Angle | Span/ Opening (m) | Repairs / Rehabilitation proposals | Culvert Crossing Type (Balancing/ Stream, etc) | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 78.954 | BC | - | 1 x 3.0 | Yes | Drain | |
| 2 | 80.495 | BC | - | 1 x 4.0 | | Stream | |
| 3 | 80.907 | BC | - | 1 x 4.0 | | Stream | |
| 4 | 84.685 | BC | - | 1 x 5.0 | | Stream | |

*BC- Box Culvert

7.2.6 Reconstruction of existing Box culverts

Culverts shall be reconstructed for width equal to the proposed roadway width of the Project Highway & as per typical cross-section given in schedule B. Repairs and strengthening of existing structures where required shall be carried out.

| Sr. No | Design Chainage | Culvert Type | Skew Angle | Span/ Opening (m) | Repairs / Rehabilitation proposals | Culvert Crossing Type (Balancing/ Stream, etc) | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 78.071 | BC | - | 1 x 3.0 | Yes | Drain | |
| 2 | 78.370 | BC | - | 2 x 2.0 | | Drain | |
| 3 | 82.847 | BC | - | 1 x 2.0 | | Stream | |
| 4 | 83.892 | BC | - | 1 x 3.0 | | Stream | |
| 5 | 84.027 | BC | - | 1 x 4.0 | | Stream | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 86.294 | BC | - | 1 x 2.0 | | Drain | |

BC- Box Culvert

7.2.7 Culverts on Crossroads:

| Sr. No | Design Chainage (km) | Span Arrange-ment (m) | Type (Box/Pipe) | Length of Culvert | Remark |
|---|---|---|---|---|---|
| 1 | 77.117 | 1 x 2.0 | Box | 5.0 | - |
| 2 | 86.195 | 1 x 2.0 | Box | 4.0 | - |
| 3 | 89.127 | 1 x 2.0 | Box | 5.0 | - |

7.2.8 Utility ducts in bypasses

Greenfield as well as Brownfield projects which are being upgraded. NP-4 RCC Pipe dia 600 mm shall be provided across the Project Highway @ 0.50 km c/c and along with inspection chamber were directed for crossing of utilities anywhere requirements. **(Clause No. 2.16 IRC: SP:84-2019)**

7.2.9 Construction of Box underpasses

New underpasses (given in table below) shall be constructed for width equal to the proposed roadway width of the Project Highway & as per typical cross-section given in schedule B. The details are given as under:

| Sl. No. | Design chainage (Km) | Span Arrangement (m) | Skew Angle | Crossing Type | Remarks |
|---|---|---|---|---|---|
| 1 | 65.526 | 1 x 4.0 | - | Road Connecting Fields and ALAM KHANI III | Box underpass |
| 2 | 67.002 | 1 x 4.0 | - | Road Connecting Ut-tarbandarkona and laspur | Box underpass |
| 3 | 72.120 | 1 x 4.0 | - | Road Connecting brick kiln | Box underpass |
| 4 | 75.720 | 1 x 4.0 | - | Road Connecting BT Road and CHAYA BARI I | Box underpass |

7.2.10 Details of Additional New Culverts:

Additional box culverts with 4m x3m clear opening shall be provided as per site requirement for field channels/cart track as decided by the IE/NHIDCL restricting to a maximum of 20 no.s

Additional pipe culverts restricting to a maximum of 20 no's with size 1 row of 1.2m dia shall be provided as per site requirement for field channels/across cross roads as decided by the IE/NHIDCL.

7.3 Bridges

7.3.1 Existing bridges to be re-constructed/widened:

(i) Existing Major bridges proposed for reconstructed as new structures: (Details to be given by DPR Consultant) (Clause No. 7.3 iv(a) IRC: SP:84-2019)

| Sr. No | Design Chainage (Km) | Total Pro-posed length (m) | Type of Crossing | Total Proposed width (m) | | Typical Cross Section of Manual | Skew An-gle |
|---|---|---|---|---|---|---|---|
| | | | | MCW | SR | | |

| Sr. No | Design Chainage (Km) | Total Proposed length (m) | Type of Crossing | Total Proposed width (m) | | Typical Cross Section of Manual | Skew Angle |
|---|---|---|---|---|---|---|---|
| | | | | MCW | SR | | |
| NIL | | | | | | | |

**(ii)** Existing Major narrow bridges proposed to be retained and widened: (Details to be given by DPR Consultant) (Clause No. 7.3 iv IRC: SP:84-2019)

| Sr. No | Design Chainage (Km) | Total Proposed length (m) | Type of Crossing | Total Proposed width (m) | | Typical Cross Section | Skew Angle |
|---|---|---|---|---|---|---|---|
| | | | | MCW | SR | | |
| 1 | 85.640 | 3 x 47.3 | River | 12.50 | - | VII | |

**(iii)** Existing Minor bridges proposed for reconstructed as new structures: (Details to be given by DPR Consultant) (Clause No. 7.3 iv(a) IRC: SP:84-2019)

| Sr. No | Design Chainage (Km) | Total Proposed length (m) | Type of Crossing | Total Proposed width (m) | | Typical Cross Section | Skew Angle |
|---|---|---|---|---|---|---|---|
| | | | | MCW | SR | | |
| 1 | 81.865 | 2 x 3.0 | | 11.50 | - | VIII | - |
| 2 | 83.060 | 4 x 3.25 | Stream | 11.50 | - | VIII | - |
| 3 | 84.365 | 1 x 12.0 | Stream | 11.00 | 9.25 | X | - |

**(iv)** Existing Minor narrow bridges proposed to be retained and widened: (Details to be given by DPR Consultant) (Clause No. 7.3 iv IRC: SP:84-2019)

| Sr. No | Design Chainage (Km) | Total Proposed length (m) | Type of Crossing | Total Proposed width (m) | | Typical Cross Section of Manual | Skew Angle | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | MCW | SR | | | |
| 1 | 79.312 | 3 x 5.0 | Stream | 11.00 | 10.80 | IX | - | |
| 2 | 79.873 | 4 x 4.0 | Stream | 11.00 | 10.80 | IX | - | |
| 3 | 80.166 | 5 x 3.0 | Stream | 11.00 | 10.80 | IX | - | |
| 4 | 81.393 | 3 x 3.0 | Stream | 11.00 | 10.80 | IX | - | |

7.3.2 Additional New Bridges

New bridges at the following locations on the Project Highway shall be constructed. GADs for the new bridges are attached in the drawings folder. **(Clause No. 7.3 ii IRC: SP:84-2019/ IRC: SP:87-2019)**

**Major Bridges:**

| Sr. No | Design Chainage (Km) | Total Proposed | Type of Crossing | Total Proposed width (m) | Typical Cross Section of | Skew Angle |
|---|---|---|---|---|---|---|

| | | length (m) | | MCW | SR | Manual | |
|---|---|---|---|---|---|---|---|
| Nil | | | | | | | |

**Minor Bridges:**

| Sr. No | Design Chainage (Km) | Total Proposed length (m) | Type of Crossing | Total Proposed width (m) | | Typical Cross Section | Skew Angle | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | MCW | SR | | | |
| 1 | 64.560 | 1 x 15 | Stream | 11.50 | | VIII | - | MIB cum UP |
| 2 | 65.342 | 1 x 20.0 | Stream | 11.50 | | VIII | - | MIB |
| 3 | 67.983 | 1 x 20.0 | Gas Pipe Line | 11.50 | | VIII | $18^0$ | MIB - Gas Pipe Line |
| 4 | 69.545 | 2 x 15 | Kakra Canal | 11.00 | 9.25 | X | - | MIB |
| 5 | 70.149 | 1 x 20.0 | Kakra Canal | 11.50 | | VIII | - | MIB |
| 6 | 70.775 | 1 x 24.0 | Kakra Canal | 11.50 | | VIII | $30^0$ | MIB |
| 7 | 72.284 | 2 x 20.0 | Kakra Canal & Road connecting Saija Nagar and Purbogool | 11.50 | | VIII | $27^0$ | MIB cum VUP |
| 8 | 73.624 | 1 x 20.0 | Kakra Canal | 11.50 | | VIII | $30^0$ | MIB |
| 9 | 76.082 | 2 x 25 | Stream | 11.50 | | VIII | $47^0$ | MIB |
| 10 | 77.075 | 1 x 20.0 | Stream | 11.50 | | VIII | - | MIB |
| 11 | 85.320 | 1 x 20.0 | Gas Pipe Line | 11.50 | | VIII | $28^0$ | MIB - Gas Pipe Line |

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

| Sr.No | Design Chainage | | Length (km) | Remarks |
|---|---|---|---|---|
| | From | To | | |
| 1 | 79.305 | 79.320 | 0.030 | - |
| 2 | 79.865 | 79.881 | 0.032 | - |
| 3 | 80.159 | 80.174 | 0.030 | - |

| Sr.No | Design Chainage | | Length (km) | Remarks |
|---|---|---|---|---|
| | From | To | | |
| 4 | 81.389 | 81.398 | 0.018 | - |

**(Clause No. 7.17 iv IRC: SP:84-2019/ IRC: SP:87-2019)**

7.3.4 The existing bridges/ RoB/ Grade Separators/ RUB retained on the project highway shall be upgraded and rehabilitation measures/proposals shall be specified as follows:

| Sr. No. | Location at km | Rehabilitation Proposals | Remarks |
|---|---|---|---|
| Nil | | | |

**(Clause No. 7.3 iv(b) IRC: SP:84-2019/ IRC: SP:87-2019)**

7.3.5 Structures in marine environment:

The specific locations are to be mentioned by DPR Consultant.

| Sr. No. | Location at km | Span | Remarks |
|---|---|---|---|
| Nil | | | |

**Note for Appendix Clause 7.3:**

- Width is excluding Median (M) gap and the gap between Main Carriageway (MCW) & Service/Slip Road (SR).
- Location and span are indicative. Exact location may be decided in consultation with Authority/IE and the same shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
- Span arrangement mentioned above is tentative and may be changed based on design of structure, latest construction techniques and aesthetics of structures. The span lengths mentioned are optimum required span and should not be reduced. The actual lengths as required on the basis of detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Any increase in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
- In Case of bridges proposed for widening/repair as per details above, the same shall be reconstructed if the design shows that these are unsafe for design loads. No change of scope shall be considered in such cases.
- Expansion joints shall be minimized by deck continuity/ continuous superstructure over multiple spans. Deck length between two expansion joints shall not be less than 120m except where structure length falls short of it. Expansion joints shall be Finger joint type in compliance with IRC: SP:69-2011, Table 5.4.1 criteria for adoption of different types of expansion joints. Concessionaire shall ensure quality control as per good industry practice and shall ensure presence of manufacturer of expansion joints at the time of installation for quality control supervision.

7.4 Railroad Bridges (ROB/RUB)

**(Clause No. 7.18 IRC: SP:84-2019/ IRC: SP:87-2019)**

7.4.1 Design, construction & 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:

| Sr. No. | Design Chainage (Km) | Proposed Span Arrangement (m) | Type of super-structure (i.e. Bow string, simply supported composite structure etc. | Name of crossing | Total Width m) | Skew Angle | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 63.391 | 1 x 25.0m +1 x 37.280m + 1 x 25.0m | RCC T Girder + Steel Composite Girder | Railway line | 12.3 | - | |
| 2 | 73.001 | 1 x 25.0m +1 x 37.280m + 1 x 25.0m | RCC T Girder + Steel Composite Girder | Railway line | 12.3 | - | |

Note:

(i) ROB shall be designed, constructed, and maintained as per the requirements of Railway authorities. The construction plan shall be prepared in consultation with the concerned railway authority.

(ii) The ROB shall be constructed and maintained by the concessionaire under supervision of the Railways.

(iii) All charges payable to the Railways like D&G, Capitalized maintenance, signaling, cabling, OHE modification, earthing etc. except P&E charges shall be borne by the Concessionaire.

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

| Sr. No. | Design Chainage | Proposed Span Arrangement (m) | Name of crossing | Total Width (m) | Skew Angle | Remarks |
|---|---|---|---|---|---|---|
| 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 2.9,2.10 and 3 of Annexure-I of Schedule-B. **(Clause No. 7.19 IRC: SP:84-2019)**

7.6 FoB/ Skywalks

FoB/Skywalks shall be provided in builup areas/ near schools. DPR Consultant to provide detailed drawings of FoB in schedule B (Clause No. 10 IRC: 103 and Clause No. 9.8.5 IRC: SP:84-2019)

| Sr. No. | Location at km | FoB Type | Remarks |
|---|---|---|---|
| Nil | | | |

7.7 A summary of Culverts, Bridges and Structures shall be presented as follows:

| Sr. No. | Name of the Structure | Total Numbers | Remarks |
|---|---|---|---|
| 1 | Major Bridge | 1 | - |

| Sr. No. | Name of the Structure | Total Numbers | Remarks |
|---|---|---|---|
| 2 | Minor Bridge | 18 | - |
| 3 | ROB | 2 | - |
| 4 | VUP (Single Span) | 6 | - |
| 5 | VUP (Multi Span) | 0 | - |
| 6 | LVUP | 10 | - |
| 7. | Box | 4 | - |
| 8. | FoB | 0 | - |
| 9 | Box Culverts | 53 | - |
| 10 | Pipe Culverts | 11 | - |

**8. 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 IRC:SP: 84/87

8.2 Traffic Signs:

Traffic signs shall be provided as per IRC 67 as mentioned in Schedule-C.

8.3 Pavement Marking:

Pavement markings shall be completed as per IRC 35 as mentioned in Schedule-C.

8.4 Safety Barrier:

The safety barriers shall be provided in accordance with Section-9 of the Clause 9.7 of the manual. The Safety Barrier length proposed are excluding the safety barrier already proposed on Culverts, Grade Separated Structures, Interchange, Bridges, RoB and RUB as applicable cross sections respectively.

End Treatment of Steel barriers/Rope Barrier shall be specified i.e. MELT or P-4 confirming to EN 1317-4, TT, MBCB barrier to Concrete Barrier (Clause No. 9.7.2 (b) IRC: SP:84-2019)

End Treatment to Concrete barrier shall be done as specified in Clause No. 9.7.3 (b) IRC: SP:84-2019.

The details of the location are as below:

| S.No. | Item | LHS | | RHS | | Total Length (m) | Remarks |
|---|---|---|---|---|---|---|---|
| | | (From) | (To) | (From) | (To) | | |
| 1 | W-beam Single faced metal crash barrier | 77.100 | 77.58 | 77.100 | 77.580 | 32626 | Excluding structure locations & approaches to underpasses |
| | | 78.700 | 81.55 | 78.700 | 81.550 | | |
| | | 87.600 | 96.48 | 87.600 | 96.480 | | |
| 2 | Thrie-beam Single faced metal crash barrier | 63.180 | 68.180 | 63.180 | 68.180 | 39404 | Excluding structure locations & approaches to underpasses |
| | | 68.180 | 69.800 | 68.180 | 69.800 | | |
| | | 69.800 | 73.760 | 69.800 | 73.760 | | |

| S.No. | Item | LHS | | RHS | | Total Length (m) | Remarks |
|---|---|---|---|---|---|---|---|
| | | (From) | (To) | (From) | (To) | | |
| | | 73.760 | 74.750 | 73.760 | 74.750 | | |
| | | 74.750 | 77.100 | 74.750 | 77.100 | | |
| | | 81.550 | 83.600 | 81.550 | 83.600 | | |
| | | 83.600 | 84.730 | 83.600 | 84.730 | | |
| | | 84.730 | 85.070 | 84.730 | 85.070 | | |
| | | 85.070 | 85.550 | 85.070 | 85.550 | | |
| | | 85.550 | 85.830 | 85.550 | 85.830 | | |
| | | 85.830 | 86.030 | 85.830 | 86.030 | | |
| | | 86.030 | 86.920 | 86.030 | 86.920 | | |
| | | 86.920 | 87.600 | 86.920 | 87.600 | | |
| 3 | wire rope safety barrier | Nil | | | | | |
| 4 | W-beam Double faced metal crash barrier | Nil | | | | | |
| 5 | Thrie-beam Double faced metal crash barrier | Nil | | | | | |
| 6 | Concrete Single faced barriers | | | | | | |
| 7 | Concrete Double faced barriers | 62800 | 63180 | 62800 | 63180 | 4315 | Excluding structure locations & approaches to under-passes |
| | | 77100 | 77580 | 77100 | 77580 | | |
| | | 77580 | 78700 | 77580 | 78700 | | |
| | | 78700 | 80100 | 78700 | 80100 | | |
| | | 80100 | 80900 | 80100 | 80900 | | |
| | | 80900 | 81550 | 80900 | 81550 | | |
| | | 87600 | 89700 | 87600 | 89700 | | |

| S.No. | Item | LHS | | RHS | | Total Length (m) | Remarks |
|---|---|---|---|---|---|---|---|
| | | (From) | (To) | (From) | (To) | | |
| 8 | Pedestrian guardrails | | | | | | |
| 9 | End Treat-ment for Steel Barri-ers | | | | | | |

**9. Roadside Furniture**

9.1 It shall be provided as per the details mentioned in Schedule-C.

**10. Hazardous Locations**

10.1 The safety barriers shall be provided at the following hazardous location such as ponds, well, electric sub-station, Electric tower, spilt carriageway, etc.

| Sr. No. | Location Stretch | | Type of Safety Barrier | LHS/ RHS |
|---|---|---|---|---|
| | From (Km) | To (Km) | | |
| **Nil** | | | | |

**11. Special Requirement:**

Retaining Structure and protection works shall be provided at locations as indicated below

| Sr. No. | Design Chainage (Km) | | Length (m) | Side | Height (m) | Retaining Structure/Toe Wall | Type of Safety Barrier | Remarks |
|---|---|---|---|---|---|---|---|---|
| | From | To | | | | | | |
| **1** | **76.910** | 77.080 | 170 | LHS | 3.0 | **Retaining Structure/Toe Wall** | - | |
| **2** | **76.910** | 76.950 | 40 | RHS | 2.0 | | | |
| | **76.980** | 77.070 | 90 | RHS | 2.0 | | | |
| **Total Length=** | | | **300** | | | | | |

**12. Open Well within RoW**

The Open well shall be identified and appropriate treatment shall be provided.

| Sr. No. | Design Chainage | Well Dimension | Well Depth | Filling Material for Well | Slab on Top of Well Yes/No | Remarks |
|---|---|---|---|---|---|---|
| NIL | | | | | | |

**13. Shifting of Utilities**

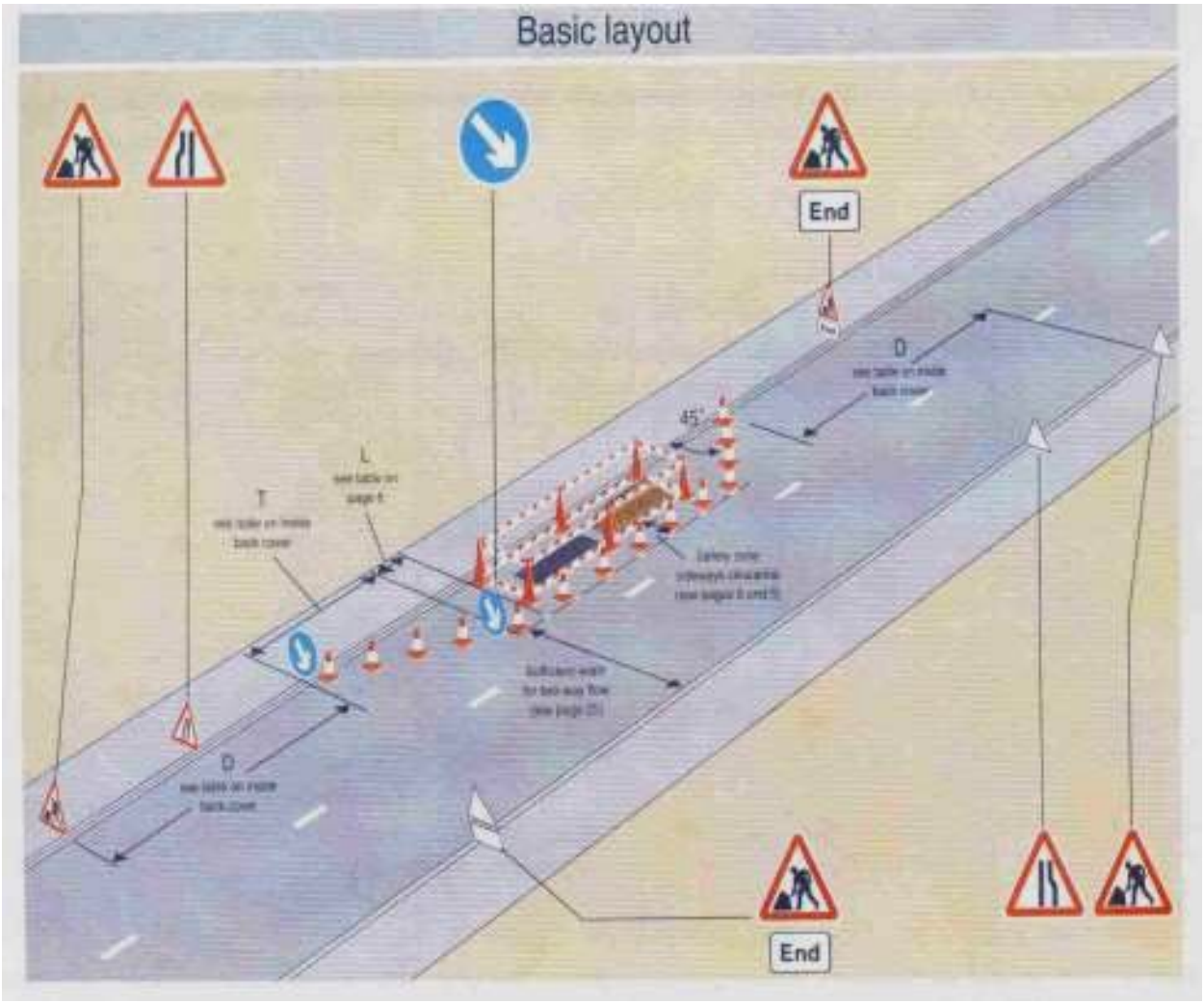
The Concessionaire shall undertake the work of shifting of any utility (including electric lines, water pipes, gas pipelines and telephone cables) to an appropriate location or alignment, in accordance with the provisions of Concession Agreement.

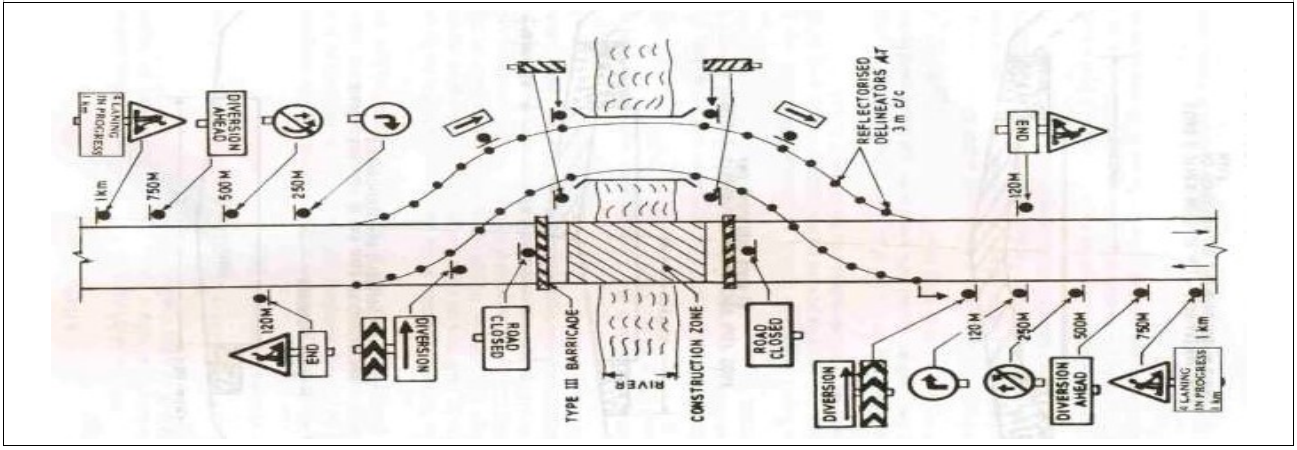
**14. Work Zone Traffic Management Plans**

The traffic diversion plans shall be prepared as per IRC SP 55 for smooth flow of traffic and safety. A diversion plan shall be proposed for construction of Culvert, Grade Separated Structures, Bridges,

RoB/RUB, etc. and traffic management plan for widening/ reconstruction of carriageway. **(Clause No. 7.19 IRC: SP:84-2019)**

| Sr. No. | Design Chainage (Km) | | Construction Activity | Diversion | Traffic Management Plan | Barricading Type - III/IV/CC Barrier with lighting along barrier | Deployment of Flagman in Habitation/Schools/Hospital, etc. | Remarks |
|---|---|---|---|---|---|---|---|---|
| | From | To | | | | | | |
| **Traffic Diversion for the works executing in existing road shall be followed as per drawings given below** | | | | | | | | |



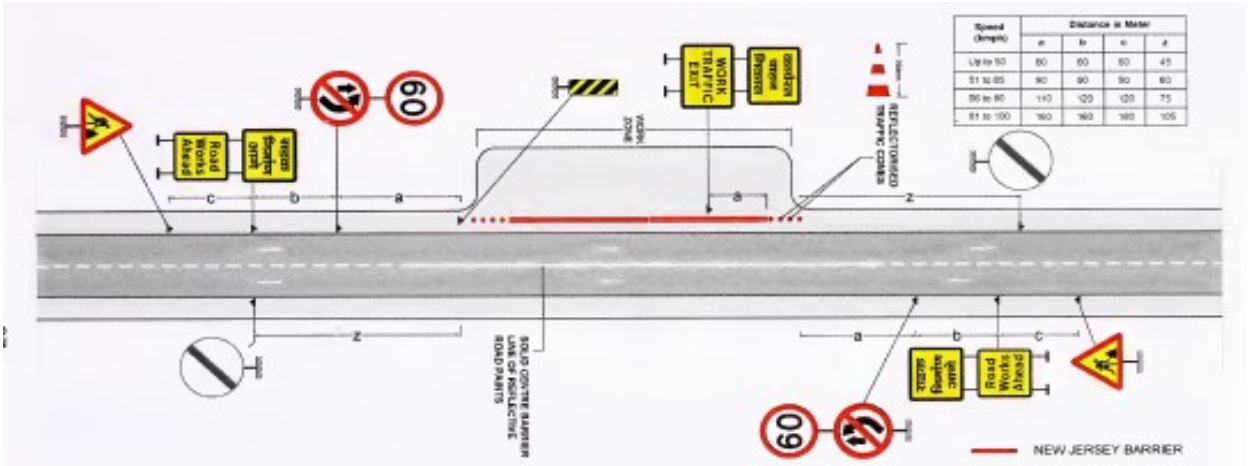
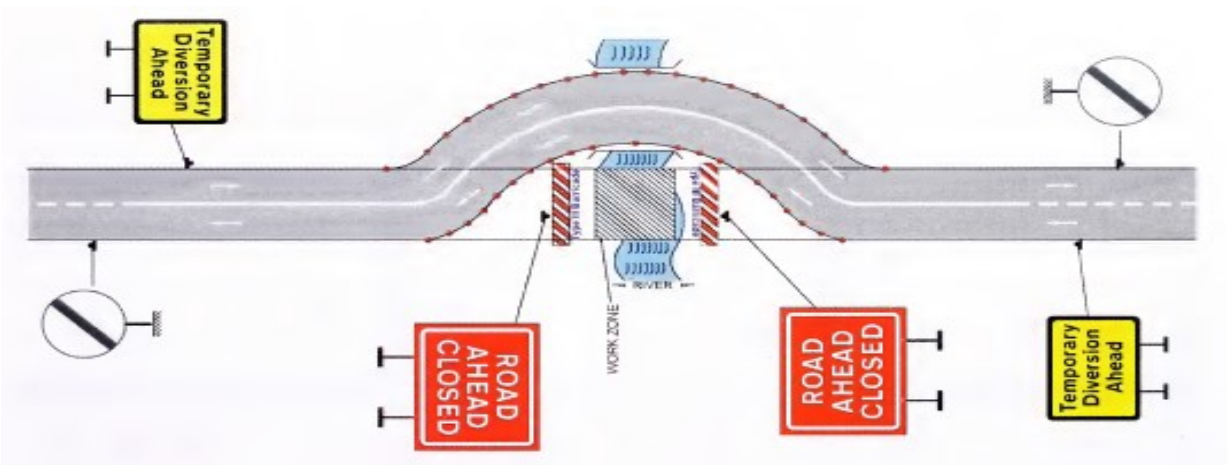


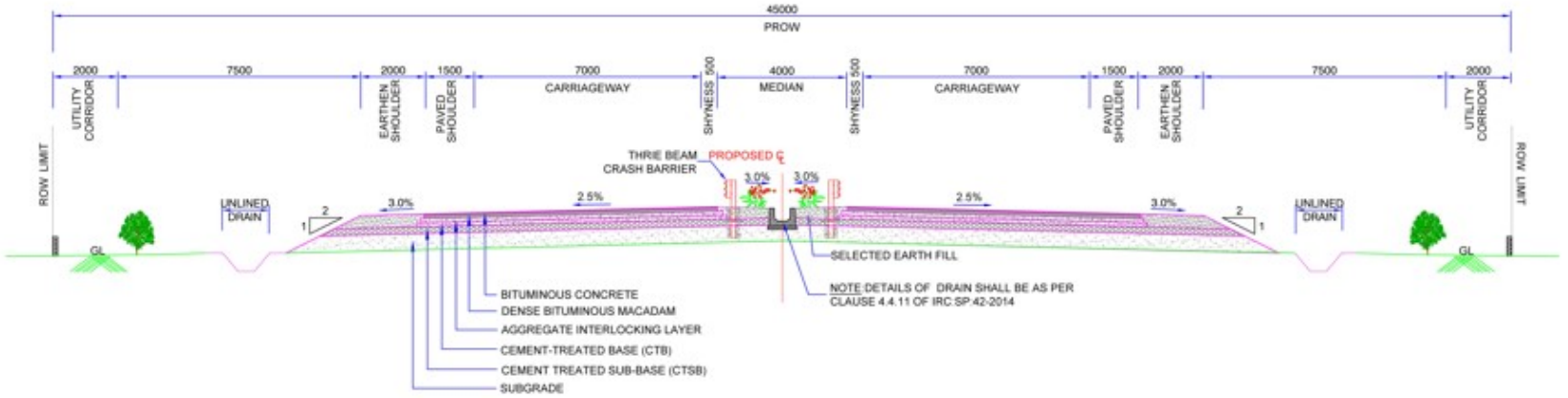

Fig. 10.1 Two Lane to Four Lane (Eccentric Widening)

**APPLICATION :**

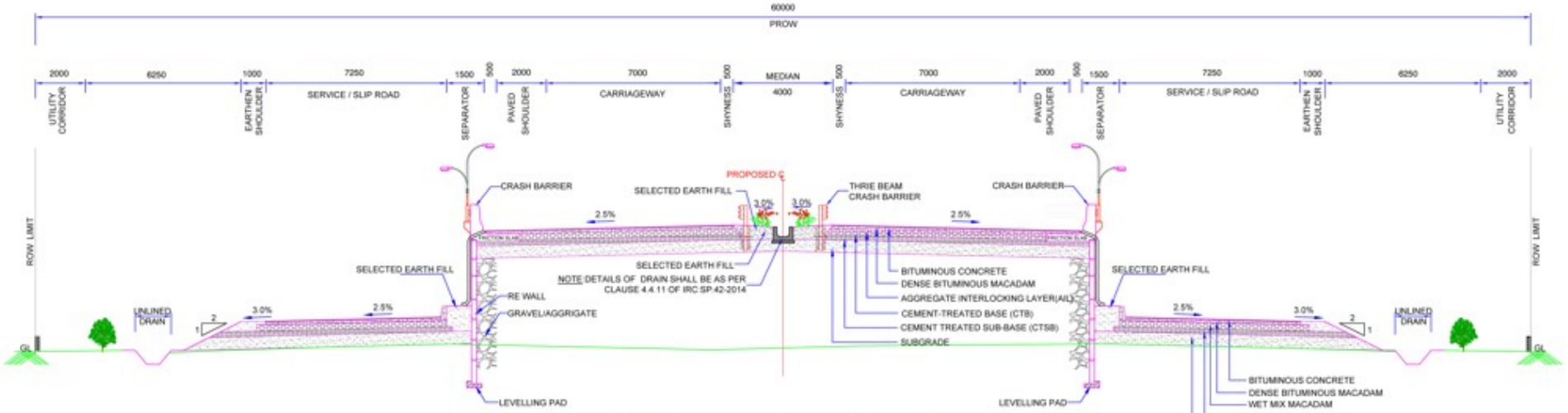
The layout shown is applicable when a two lane highway is upgraded to 4-lane, with eccentric widening. In the first stage, the new carriageway would be constructed on the sides. While the new carriageway is being constructed, the traffic will continue to ply through the existing road. Layout of signs and barriers would be as shown.



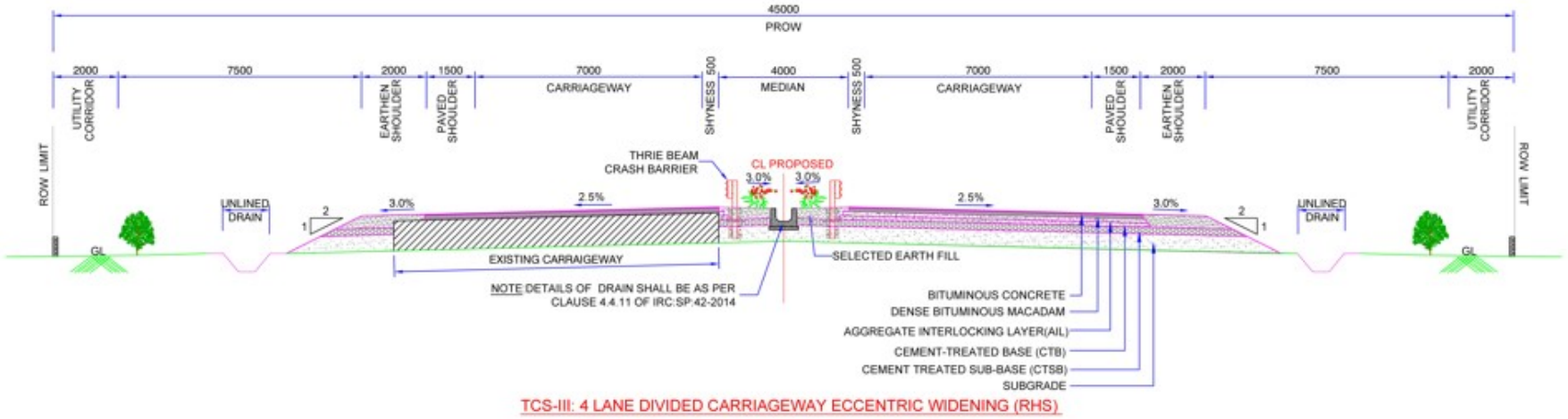
Annexure II (Schedule B)
Typical Cross sections



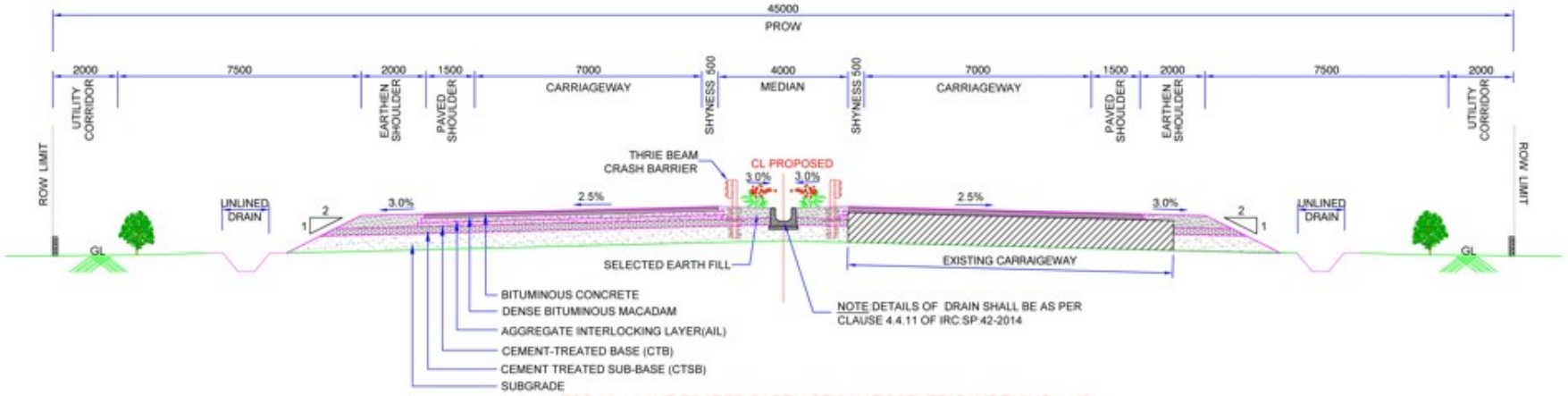

TCS-I: 4 LANE DIVIDED CARRIAGEWAY WITH FLUSH MEDIAN (BYPASS)



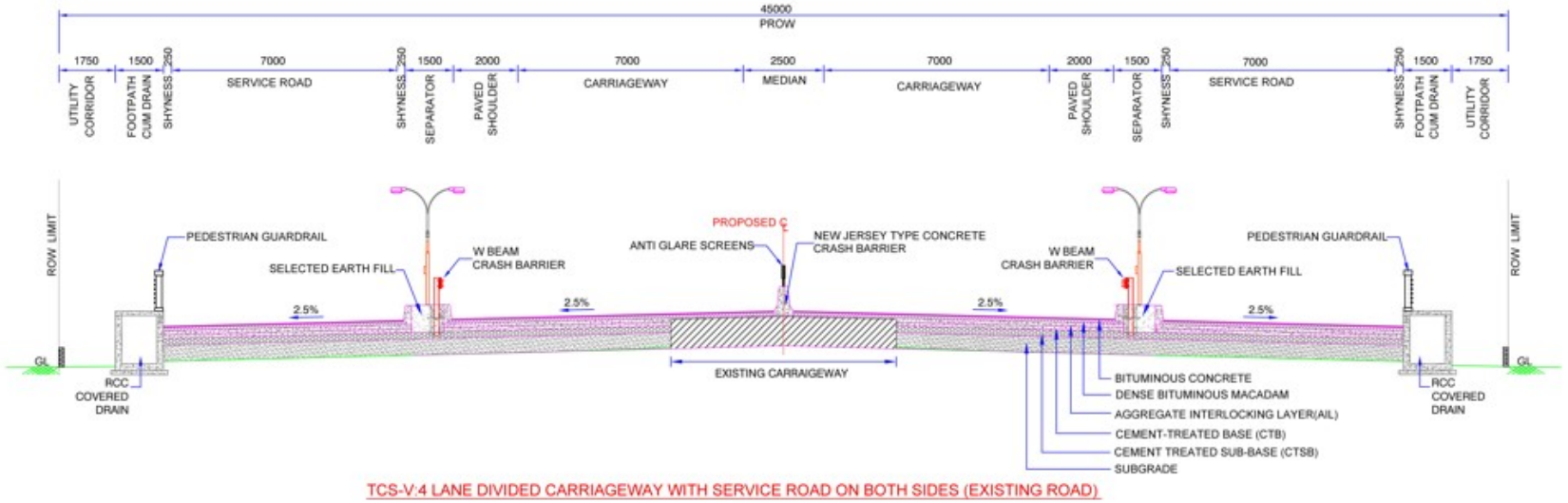

TCS-II : 4 LANE DIVIDED CARRIAGEWAY FOR APPROACHES TO VUP WITH SLIP ROADS ON BOTH SIDES (BYPASS)



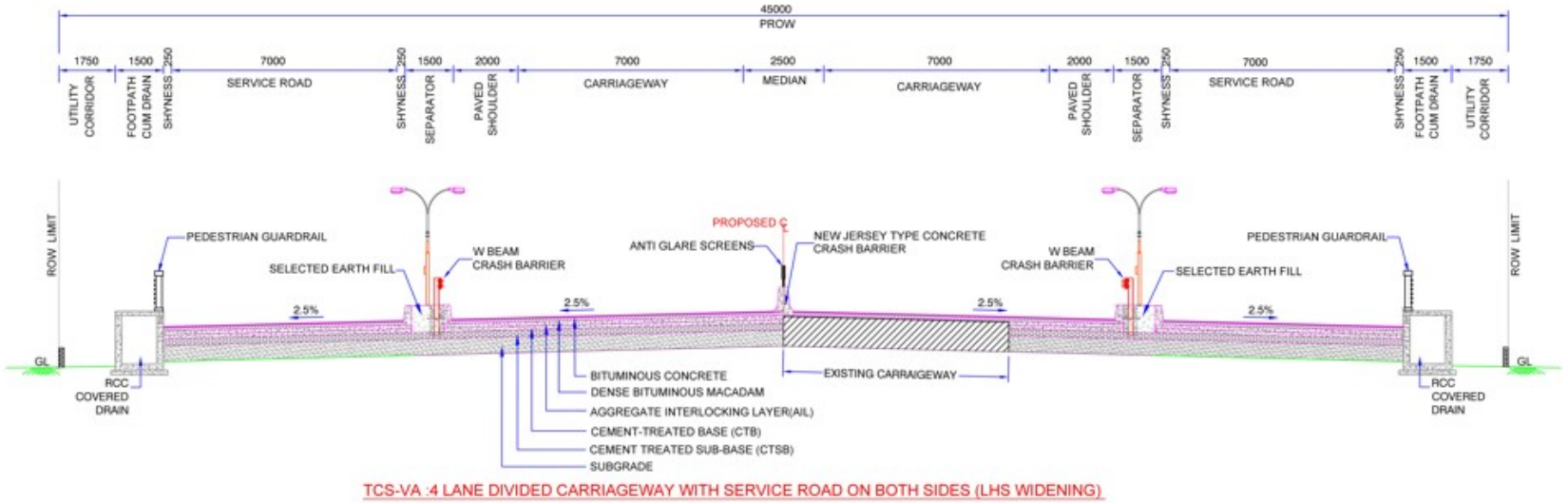

TCS-III: 4 LANE DIVIDED CARRIAGEWAY ECCENTRIC WIDENING (RHS)



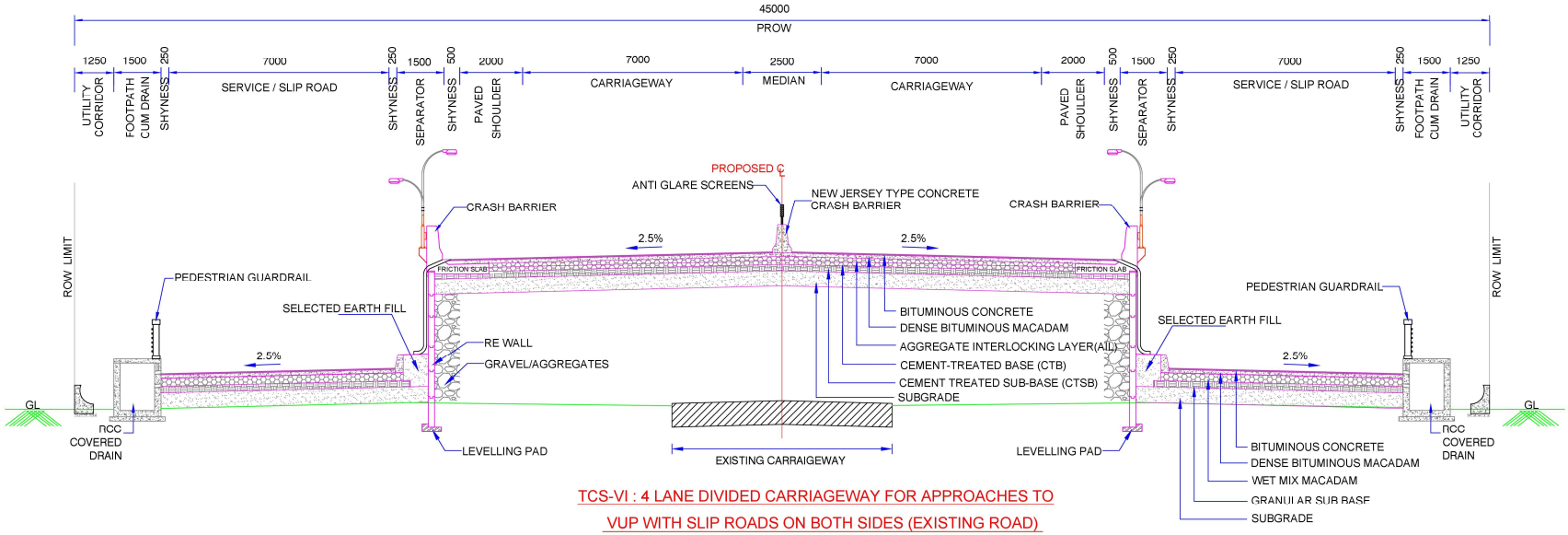

TCS-IV: 4 LANE DIVIDED CARRIAGEWAY ECCENTRIC WIDENING (LHS)



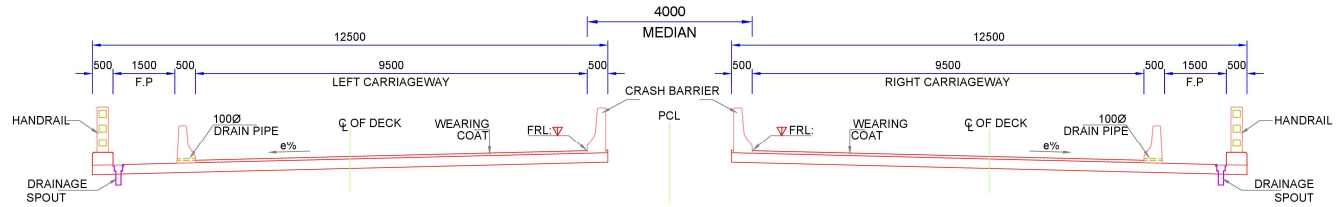

TCS-V:4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (EXISTING ROAD)



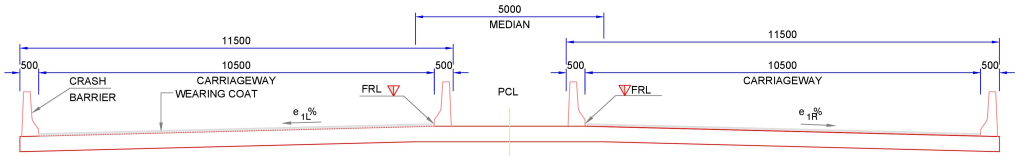

TCS-VA :4 LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD ON BOTH SIDES (LHS WIDENING)



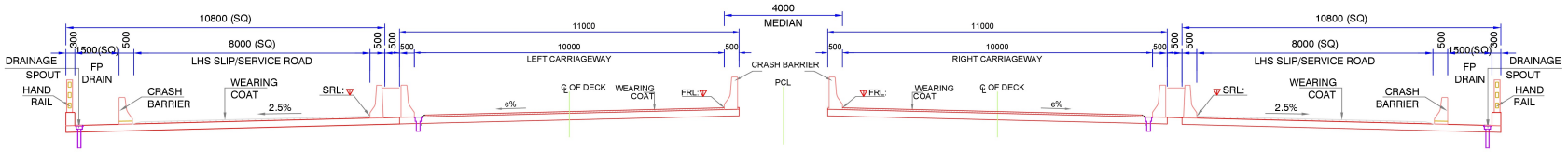

TCS-VI : 4 LANE DIVIDED CARRIAGEWAY FOR APPROACHES TO VUP WITH SLIP ROADS ON BOTH SIDES (EXISTING ROAD)



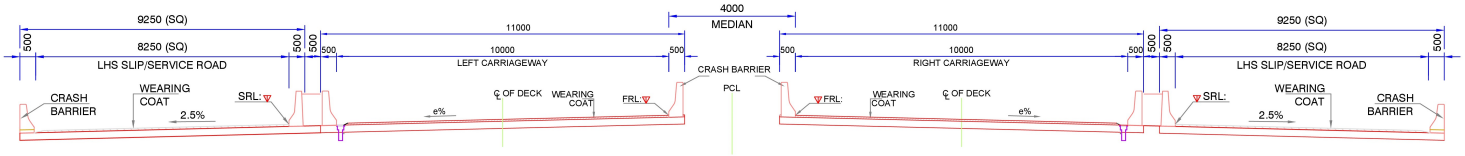

TCS:VII CROSS SECTION OF BRIDGE / ROB AT DECK LEVEL - WITH FOOTPATH FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)




TCS:VIII CROSS SECTION OF STRUCTURE AT DECK LEVEL - WITHOUT FOOTPATH
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)




TCS:IX CROSS SECTION OF STRUCTURE AT DECK LEVEL - WITH FOOTPATH FOR
SLIP/SERVICEROAD
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)




TCS:X CROSS SECTION OF STRUCTURE AT DECK LEVEL - WITHOUT FOOTPATH FOR
SLIP/SERVICE ROAD
FOR 4 - LANE DIVIDED HIGHWAY (4-LANE BRIDGE)

**Annexure-iii Schedule C Project Facilities**

**Annexure-III SCHEDULE –C**

*(See Clause 2.1)*

**PROJECT FACILITIES**

**1 Project Facilities**

The Concessionaire shall construct the project facilities in accordance with the provisions of this agreement. Such Project facilities shall include:

- **a)** Toll Plaza
- **b)** Roadside furniture
    - i. Kilometer and Hectometre Stones
    - ii. Traffic Signs
    - iii. Overhead Signs
    - iv. Road Marking
    - v. Road Delineators
    - vi. Reflective Pavement Markers & Solar Studs
    - vii. Traffic Impact Attenuators
    - viii. Boundary wall and Fencing
- **c)** Operation and Maintenance centres
- **d)** Way side Amenities / Service Areas
- **e)** Truck lay-byes.
- **f)** Bus Bay and Bus shelter
- **g)** Pedestrian Facilities
- **h)** Highway Lighting
- **i)** Rainwater Harvesting
- **j)** Environmental Management Plan
- **k)** Land Scaping and Tree Plantation
- **l)** Advanced Traffic Management System (ATMS)
- **m)** Highway Patrol Units
- **n)** Emergency medical services
- **o)** Crane Service

1.1 Project Facilities to be completed on or before project completion date have been described in Annexure-I of this Schedule-C.

**Annexure – II**

*(Schedule-C)*

**PROJECT FACILITIES**

1. Project Facilities

The Concessionaire shall construct the Project Facilities described in this Annexure-I to form part of the Project Highway. The Project Facilities shall include:

- **a)** Toll Plaza
- **b)** Roadside furniture
  - i. Kilometer and Hectometer Stones
  - ii. Traffic Signs
  - iii. Overhead Signs
  - iv. Road Marking
  - v. Road Delineators
  - vi. Reflective Pavement Markers & Solar Studs
  - vii. Traffic Impact Attenuators
  - viii. Boundary wall and Fencing
- **c)** Operation and Maintenance centers
- **d)** Way side Amenities / Service Areas
- **e)** Truck lay-byes
- **f)** Bus Bay and Bus shelter
- **g)** Pedestrian Facilities
- **h)** Highway Lighting
- **i)** Rainwater Harvesting
- **j)** Environmental Management Plan
- **k)** Land Scaping and Tree Plantation
- **l)** Advanced Traffic Management System (ATMS)
- **m)** Highway Patrol Units
- **n)** Emergency medical services
- **o)** Crane Service

**Description of Project Facilities**

Each of the Project Facilities is briefly described below:

**1 Toll Plaza**

Tolling system shall be provided in entire length of the project and the same is integrated with the adjoining packages. The Toll Plazas shall be provided as per NHAI circular No. 17.5.82 dated 24/5/2021 and Schedule D. Minimum Lane requirement in the opening year are as follows.

Toll Plaza shall be provided confirming to **(Clause No. 10.2 IRC: SP:84-2019)** at the following locations:

| S.No | Location of Toll Plaza (Km) | | Direction (Entry: to high-way, Exit: from Highway) | Minimum number of Toll Lanes | |
|---|---|---|---|---|---|
| | Design Chainages | | | Entry | Exit |
| 1 | 84.855 | | On MCW | 2+2 | 2+2 |

The Sub Items of toll Plaza are as follows.

| S.No. | Item | Number | Remarks |
|---|---|---|---|
| 1 | No. of toll lane | 4 +4 | |
| 2 | toll Booth complex | 2 | One on RHS and One on LHS |
| 3 | weigh bridges | 2 | |
| 4 | electrical systems | | Sufficient for all equipment placed on Toll Plaza |
| 5 | Highway Nest with toilet facility | 0 | |
| 6 | Internet facility | 0 Locations | Internet facility with 2 different telecom Opera-tor |

Note:

**(i)** The Toll Plaza shall be constructed as per Manual (Schedule D) considering the modification as per NHAI Circular NHAI/Policy Guidelines/Management of Toll Plaza/2021 Policy Circular No. 17.5.82 dated 24th May, 2021. However, layout as mentioned in Schedule-C shall be followed.

**(ii)** Based on the toll lanes as given above, toll Booth complex, weigh bridges, electrical systems, and all other facilities required/ mentioned in manual shall be provided as per specification mentioned in Schedule D

**(iii)** No. of toll lane specified above are to be provided. The Concessionaire shall design and provide toll lane as per Manual (Schedule D) & NHAI Circular NHAI/Policy Guidelines/Management of Toll Plaza/2021 Policy Circular No.17.5.82 dated 24th May, 2021 subject to as specified above.

**(iv)** All Toll Lanes to be equipped with Hybrid ETC equipment's as per NHAI/Policy Guide-lines/Management of Toll Plaza/2021 Policy Circular No. 17.5.82 dated 24th May, 2021. DPR consultant to specify details of equipment's with their numbers. **(Clause No. 10.5 IRC: SP:84-2019)**

**(v)** A separate Highway Nest with toilet facility for road users shall be provided near toll plaza lo-cation along with parking facility. One toilet block on each direction shall be provided. These toilet facilities shall follow CPWD specifications for sanitary ware items and fittings such as WC, wash basin, Wash basin-Under counter, Urinal flat back, PVC Cistern, IWC Orissa Pan, Flush Value –CP, Wash Basin pillar cock-CP, Bib Cock—CP, Health Faucet, W/c Bib cock, Wash Basin angle cock. One WC shall be provided for specially challenged persons.

**(vi)** Point of Sale (POS) with card swapping machines shall be provided.

**(vii)** Provide Lane markings and Traffic Signs as per IRC: SP: 84-2019, IRC 35 and IRC 67 **(Clause No. 10.8 & 10.9 of IRC: SP:84-2019)**

**(viii)** Solar panels shall be erected over the either on FOB or over Toll plaza / Admin building to generate the green energy. Same shall be utilized for toll plaza lighting and other energy requirement within toll plaza area along with conventional lighting.

**(ix)** Medium speed Weigh in Motion (MSWIM) devices shall be provided in all toll lanes at Toll plaza Location. In addition to MSWIM, Static weigh Bridge (SWBs) shall be provided on each direction as per manual. **(Clause No. 10.6, IRC: SP:84-2019)**

**(x)** Provide Impact Attenuators on Toll Plaza islands in the direction of traffic. Impact attenuators shall be self-restoring confirm to section 10.6 of IRC SP 99 i.e. Manual of Specifications and Standards for Expressways. **(Clause No9.6, IRC: SP:84-2019)**

**(xi)** Provide Staircase on either side of the FoB at Median Island location by widening the island appropriately.

## 2 Roadside furniture

2.1 Kilometer and Hectometer Stones

(CLAUSE NO. 12.3 IRC: SP:84-2019/ IRC: SP:87-2019)

| S.No. | Item | Number | Remarks |
|---|---|---|---|
| 1 | **Kilometer Marker/ Stones** | 40 | The KM/ Hectometer stones/ marker can be Concrete/ Stones and shall be placed on both outer side of the earthen shoulder.<br>In case KM/ Hectometer marker are to be fixed on separator between Main Carriageway & Service Road then these should be fixed as reflective signs.<br>In case of Access Control Highway/ Expressway, KM/ Hectometer marker should be fixed as reflective signs.<br>Km/ Hectometer stones are required to provide on main carriageway and Service Road, both if continuous service road is provided throughout project length (Service Road length is more than 1 Km). |
| 2 | **Hectometer Marker/ Stones** | 200 | |

2.2 Traffic Signs

Traffic Signs include roadside signs, overhead signs and kerb mounted signs etc. shall be provided along the entire Project Highway and on all Side, Roads joining the main carriageway/service road. A QR code shall be marked on back of each sign as per IRC 67.

**(Clause No. 9.2 IRC: SP:84-2019)**

All signs shall be of Micro Prismatic Grade Sheeting Corresponding to Class C sheeting as per ASTM D 4956 Type VIII, IX and XI. **(Clause No. 9.2.3 IRC: SP:84-2019)**

All shoulder mounted signs shall be supported on GI Pipes. Overhead Signs shall be placed on a structurally sound gantry or cantilever structure made of GI pipes. **(Clause No. 9.2.4 IRC: SP:84-2019)**

The siting of signs shall confirm to Table 4.1 and Fig 4.1 of IRC 67. (Clause No. 4.7 IRC: SP:84-2019/ IRC: SP:87-2019). The two successive signs shall be placed at a minimum distance of 0.6 x V metre (V is design speed in Kmph). **(Clause No. 4.8 IRC 67 2022).**

The overhead gantry signs shall be placed as given below: (**Clause No. 16.3.2 of IRC 67 2022)**

| S.No. | Item | Carriageway (Left, Right, Both) |
|---|---|---|
| 1 | Overhead Gantry signs | |
| a | Start of Project | Both (2) |
| b | End of project | Both (2) |
| c | Toll plaza location on both side | - |
| 2 | Overhead Cantilever Gantry signs | - |
| a | At all major locations of crossroads i.e NH, SH, MDR (start of grade separated structure/at grade interchange) | - |
| b | At major trauma centre, roads leading to religious places or any other important location | - |
| 3. | Double/Butterfly Cantilever | On Gore Area of Exit Locations of Access Controlled Highway/ Expressway. |

The detailed minimum number of signages indicating places, direction, distances, and other features shall be marked on the alignment plan and submitted, which are as mentioned below.

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| I | **Mandatory/Regulatory** | | |
| 1 | Stop signs | | |
| 2 | Give Way Signs | 12 | |
| 3 | Prohibitory signs | - | |
| 4 | No Parking signs | - | |
| 5 | No Stopping signs | 20 | |
| 6 | Speed Limit signs (Circular) | | |
| 7 | Speed Limit signs (Vehicle Type) | | |
| 8 | Vehicle Control signs | 36 | |
| 9 | Restriction Ends sign | | |

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| 10 | Compulsory Direction Control and other signs | 36 | |
| **II** | **Cautionary/Warning** | | |
| 1 | Left/Right Curve | 36 | |
| 2 | Left / Right Curve with side road | - | |
| 2 | Right/Left Hairpin Bend | - | |
| 3 | Right/Left Reverse Bend | - | |
| 4 | Series of Bends | - | |
| 5 | 270 Degree Loop | - | |
| 6 | Side Road | - | |
| 7 | Y-intersection | - | |
| 8 | Cross Road | 64 | |
| 9 | Roundabout | - | |
| 10 | Traffic Signals | - | |
| 11 | T-lntersection | - | |
| 12 | Major Road Ahead | - | |
| 13 | Staggered Inter-section | - | |
| 14 | Merging Traffic Ahead | 32 | |
| 15 | Narrow Road Ahead | - | |
| 16 | Road Widens | - | |
| 17 | Narrow Bridge Ahead | - | |
| 18 | Steep Ascent/Descent | - | |
| 20 | Reduced Carriageway | - | |
| 21 | Start /End of Dual Carriageway | - | |
| 23 | Gap in Median | - | |

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| 24 | Pedestrian Crossing | 7 | |
| 25 | Pedestrian crossing with backing board | - | |
| 26 | School Ahead | - | |
| 27 | Built Up Area | - | |
| 28 | Two Way Operation (on main carriage way /service road | - | |
| 29 | Two Way Traffic on Cross Road Ahead | - | |
| 30 | Danger Warning Sign | - | |
| 31 | Deaf or Blind Persons Likely on Road Ahead | - | |
| 32 | Cycle Crossing | - | |
| 33 | Cycle Route Ahead (Warning for Cycles on road ahead) | - | |
| 34 | Dangerous Dip | - | |
| 35 | Speed Breaker | - | |
| 36 | Rumble Strip | 64 | |
| 37 | Rough Road | - | |
| 38 | Dangerous Ditch | - | |
| 39 | Slippery Road | - | |
| 40 | Slippery Road because of Ice | - | |
| 41 | Opening or Swing Bridge | - | |
| 42 | Overhead Cable | - | |
| 43 | Play Ground Ahead | - | |
| 44 | Quay Side or River Bank | - | |
| 45 | Sudden Side Winds | - | |
| 46 | Tunnel Ahead Warning | - | |
| 47 | Falling Rocks | - | |

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| 48 | Cattle Crossing | - | |
| 49 | Wild Animals likely to be on Road Ahead | - | |
| 50 | Queues Likely Ahead | - | |
| 51 | Low flying Air Craft | - | |
| 52 | Unguarded Railway Crossing | - | |
| 53 | Guarded Railway Crossing | - | |
| 54 | Crash prone area ahead | - | |
| 55 | U- Turn | - | |
| III | **Chevron Signs** | | |
| 1 | Single Chevron | 213 | |
| 2 | Double Chevron | | |
| 3 | Triple Chevron | | |
| **IV** | **Object Hazard Marker Sign** | | |
| 1 | Left /Right side Object Hazard Marker | 102 | |
| 2 | Two way Object Hazard Marker | - | |
| **V** | **Informatory/Guide** | | |
| 1 | Direction and Place Identification signs | 36 | |
| 2 | Stack Type Advance Direction Sign (Shoulder Mounted) | - | |
| 3 | Stack Type Advance Direction Sign with cautionary / regulatory signs (Shoulder Mounted) | - | |
| 4 | Map Type Advance Direction Sign (Shoulder Mounted) | - | |
| 5 | Map Type Advance Direction Sign for roundabout (Shoulder Mounted) | - | |
| 6 | Flag Type Direction Sign | - | |
| 7 | Reassurance Sign | - | |

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| 8 | Place Identification Sign | 12 | |
| 9 | Truck Lay -By | - | |
| 10 | Toll Booth Ahead | - | |
| 11 | Weigh Bridge Ahead | - | |
| 12 | Shoulder Mounted Sign in Advance of a Grade Separated Junction/ Interchange | - | |
| 13 | Expressway Sign | - | |
| 14 | Gantry Mounted advance Direction Sign Ahead of a Flyover in Urban/City Roads | - | |
| 15 | Gantry Mounted advance Direction Sign Ahead of a Grade Separated Junction | - | |
| 16 | Gantry Mounted advance Direction Sign Ahead of a At Grade Intersection | - | |
| 17 | Gantry Mounted Advance Direction Sign for Interchange | - | |
| 18 | Cantilever Gantry Mounted Advance Direction Sign for Interchange | - | |
| 19 | Lane Dedicated Gantry Sign | - | |
| 20 | Definition/Supplementary Plates | - | |
| 21 | Tourism Related Sign | - | |
| 22 | Tourist Destination Direction Information Signs Without Photograph | - | |
| 23 | Tourist Destination Direction Information Signs With Photograph | - | |
| 24 | Finger Destination direction Information Sign for Pedestrians | - | |
| 25 | Tourist Map Information Sign | - | |
| 26 | Boundary Sign at Entrance to a City/Place | - | |
| 27 | Boundary Sign at Entrance to a Tourist Destination | - | |

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| **VI** | **Facility Information signs** | | |
| 1 | Eating Place | - | |
| 2 | Light Refreshment | - | |
| 3 | Resting Place | - | |
| 4 | First Aid Post | - | |
| 5 | Toilet | - | |
| 6 | Filling Station(Fuel Pump) | - | |
| 7 | Hospital | 6 | |
| 9 | U-Turn Ahead | 22 | |
| 10 | Pedestrian Subway | - | |
| 11 | Police Station | - | |
| 12 | Picnic Site | - | |
| 13 | Repair Facility | - | |
| 14 | Railway Station/Metro Station/Monorail Station | 4 | |
| 15 | Industrial Area | - | |
| 16 | Cycle Rickshaw Stand | - | |
| 17 | Taxi Stand | - | |
| 18 | Auto Rickshaw Stand | - | |
| 19 | Home Zone | - | |
| 20 | Camp Site | - | |
| 21 | Airport | - | |
| 22 | Golf Course | - | |
| 23 | National Heritage | - | |
| 24 | No Through Road | - | |

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| 25 | No Through Side Road | - | |
| 26 | Toll Road Ahead | - | |
| 27 | Guide Sign on Toll Lane Portal | - | |
| 28 | Country Border | - | |
| 29 | Entry Ramp for Expressway | - | |
| 30 | Exit Ramp for Expressway | - | |
| 31 | Expressway Symbol | - | |
| 32 | End of Expressway | - | |
| 33 | Bus Stop | 8 | |
| 34 | Bus Lane | - | |
| 35 | Contra Flow Bus Lane | - | |
| 36 | Cycle Lane | - | |
| 37 | Contra Flow Cycle Lane | - | |
| 38 | Holiday Chalets | - | |
| 39 | Emergency Exit | - | |
| **VII** | **Other Useful Information Signs** | | |
| 1 | Signs For Persons With Disabilities | - | |
| 2 | International symbol of Accessibility | - | |
| 3 | Parking Information | - | |
| 4 | Parking Areas | - | |
| 5 | Ramped Entrance to Subway/Over Bridge | - | |
| 6 | Telephone Facilities | - | |
| 7 | Toilet Facilities | - | |
| 8 | Way Finding | - | |

| S.No. | Road Signs | Number | Remarks |
|---|---|---|---|
| 9 | Parking Signs | - | |
| 10 | Auto Rickshaw Parking | - | |
| 11 | Cycle Parking | - | |
| 12 | Cycle Rickshaw Parking | - | |
| 13 | Scooter and Motorcycle Parking | - | |
| 14 | Taxi Parking | - | |
| 15 | Park and Ride | - | |
| 16 | Parking Restrictions Signs for Traffic Management | - | |
| 17 | Flood Gauge Sign | - | |
| **VIII** | **Route Maker Signs** | | |
| 1 | State Highway Route Marker Sign | - | |
| 2 | National Highway Route Marker Sign | 24 | |
| 3 | Asian Highway Route Marker Sign | - | |
| 4 | Expressway Route Marker Sign | - | |

Note: **The locations of the placement of signages shall be finalized in consultation with Independent Engineer/ NHIDCL, as per site requirement.**

2.3 Road Marking

Road Markings shall be Hot applied thermoplastic materials with reflectorized beads to achieve visibility confirming to clause 2.7.2 of IRC 35. **(Clause No. 2.2 IRC: 35)**

The cold applied plastics pavement markings shall be used for School Zone Markings, Audible Raised Profile Edge Lines and Block Markings (BM 01/02/03). **(Clause No. 2.4 of IRC: 35)**

| S.No. | Item | Unit | | Remarks |
|---|---|---|---|---|
| | | Length (m) | Number | |
| 1 | Longitudinal Marking | | | |
| 2 | Transverse Marking | | | |
| 3 | Hazard Marking | | | |

| S.No. | Item | Unit | | Remarks |
|---|---|---|---|---|
| 4 | Block Marking | | | |
| 5 | Arrow Marking | | | |
| 6 | Directional Marking | | | |
| 7 | Facility Marking | | | |
| 8 | Center Line | | | |
| 9 | Traffic Lane Lines | 12691 | | |
| 10 | No Overtaking Lines | | | |
| 11 | Warning Lines | | | |
| 12 | Border or Edge Lines | 24990 | | |
| 13 | Longitudinal Markings for Undivided Roads | | | |
| 14 | Longitudinal Markings for divided Roads | 12209 | | |
| 15 | Longitudinal Markings for Ramps/Slip Roads/One Way Streets | 31844 | | |
| 16 | Stop Line | | | |
| 17 | Give Way Lines | | | |
| 18 | Diagonal Markings | | | |
| 19 | Chevron Markings | | | |
| 20 | Continuity Line | | | |
| 21 | Word Messages | | | |
| 22 | Lane Change | | | |
| 23 | Merging/Diverging Markings | | | |
| 24 | Hatch Markings | | | |
| 25 | Raised Profile Edge Lines | | | |
| 26 | Lane Reduction / Narrowing Situations and Transitions (lane Balancing) | | | |
| 27 | Directional Arrows | | | |

| S.No. | Item | Unit | | Remarks |
|---|---|---|---|---|
| 28 | Mandatory Turn Arrows | | | |
| 29 | Guidance Arrows | | | |
| 30 | Deflection Arrows | | | |
| 31 | Bifurcation Arrows | | | |
| 32 | Arrows on Side Road Approaches | | | |
| 33 | Arrows on Main Road Approaches | | | |
| 34 | Word Messages | | | |
| 35 | Yellow Box Markings | | | |
| 36 | Ghost Island | | | |
| 37 | Marking for Speed Breakers | | | |
| 38 | Pedestrian Crossing | 28 | 4 | |
| 39 | Markings when highway passes through settlement fig 9.4 of IRC SP 84/87 | | | |
| 40 | Transverse Bar Markings | | | |
| 41 | Busbay Marking | | | |
| 42 | Truck Lay-by Markings | | | |
| 43 | Toll Plaza Marking | | | |
| 44 | School Zone Markings | | | |
| 45 | Object Markings within Carriageway | | | |
| 46 | Objects Markings Adjacent to Carriageway | | | |
| 47 | i. Subway Piers, Abutments, Culverts Head Walls, Concrete Barrier | | | |
| 48 | ii. Electrical Poles | | | |
| 49 | iii. Guard Rails | | | |
| 50 | iv. Trees | | | |
| 51 | v. Kerbs | | | |

| S.No. | Item | Unit | | Remarks |
|---|---|---|---|---|
| 52 | Directional Markings as per Annexure: A 6 | | | |
| 53 | Facility Markings as per Annexure A.7 of IRC 35 | | | |

Note: **The locations of the placement of signages shall be finalized in consultation with Independent Engineer/ NHIDCL, as per site requirement.**

2.4 Road Delineators

(Clause No. 9.4 IRC: SP:84-2019/ IRC: SP:87-2019)

| S.No. | Item | Number/ Length (m) | Remarks |
|---|---|---|---|
| 1 | Roadway Indicators | 76 | |
| 2 | Median Marker on Median/RCC Barrier **(Clause 4 of IRC 79 2019)** | | |
| 3 | Object Markers | 12 | |
| 4 | Flexible Object Markers **(Clause 6 of IRC 79 2019)**<br>On Metal Beam Barrier<br>On Toll Booth/Toll Island<br>On Entry/Exit of Tunnel<br>On Exit from Main carriageway | ii)12 | |
| 5. | Solar Blinkers on Median Opening, on exit from main carriageway and traffic islands of grade separated intersections | | |

Note: The locations of the marking shall be finalized in consultation with Independent Engineer/NHIDCL, as per site requirement.

2.5 Reflective Pavement Markers & Solar Studs

The Prismatic Retro-Reflective type confirming to ASTM D-4280 Pavement Markers & Solar Power Studs on Highway shall be provided in accordance with Schedule - D.

(Clause No. 9.5 IRC: SP:84-2019/ IRC: SP:87-2019

| S.No. | Item | Number | Location | Remarks |
|---|---|---|---|---|
| **- For 4 Lane Projects** | | | | |
| 1 | White Colour one coloured face Road Studs | 1245 | Traffic lane line & center of carriageway | Uni-directional |

| S.No. | Item | Number | Location | Remarks |
|---|---|---|---|---|
| 2 | Red Colour one coloured face Road Studs | 138 | Left hand edge of the carriage-way, entry to truck lay bye / bus bay, start of service road, chev-ron/diagonal markings on gorge | carriageway |
| 3 | Yellow / Amber Colour one coloured face Road Studs | | Median side edge line, zebra crossing | |
| 4 | Green Colour one coloured face Road Studs | | Lay byes, left hand side of the carriageway in case of multi-lane divided carriageways, crossable continuous line like in accelera-tion/deceleration lanes involving lane<br>changing | |
| **B- For 2 Lane PS Projects** | | | | |
| 5 | White Colour Two coloured face Road Studs | NA | Traffic lane line & center of car-riageway | Bi-directional carriageway |
| 6 | Red Colour Two coloured face Road Studs | NA | Left hand edge of the carriage-way, entry to truck lay bye / bus bay, start of service road, chev-ron/diagonal markings on gorge | |
| 7 | Green Colour Two coloured face Road Studs | NA | Lay byes, left hand side of the carriageway in case of multi-lane divided carriageways, crossable continuous line like in accelera-tion/ deceleration lanes involving lane<br>changing | |
| 8. | Solar Studs on Major/Minor bridge, RoB, and all struc-tures (Inter-change/Flyover/VUP) and Builtup areas, In storage lane of median opening and Exit/Entry from main car-riageway | NA | | |

2.6 Traffic Impact Attenuators

(CLAUSE NO. 9.6 IRC: SP:84-2019)

2.6.1 Provide Impact Attenuators in Gore Areas

It shall be self-restoring confirming to section 10.6 of IRC SP 99 i.e. Manual of Specifications and Standards for Expressways at following locations

| S.No. | Item | Chainage / Number | Remarks |
|---|---|---|---|
| 1 | On flyover/grade separated structure at exit from main carriageway | - | |
| 2 | On Island of Toll Plaza | - | |
| 3 | Any other location which Safety Hazard | - | |

2.6.2 Providing End Terminals (Clause No. -----, IRC SP 99)

Provide End Terminals P-4 type confirming to EN 1317-4 to Parapet Walls of Culverts, Structures ends for the safety of approaching traffic etc.

| S.No. | Item | Chainage / Number | Remarks |
|---|---|---|---|
| 1 | Culvert Ends | | |
| 2 | Structures Ends | | |
| 3 | Any other location which Safety Hazard | | |

2.7 Boundary wall and Fencing

Boundary wall shall be provided along the entire length on either side (including transverse requirements at structure locations) as per the detail given below in accordance with IRC: SP:84. Road boundary walls shall be provided at the boundary on both sides of the right of way available under the control of the Authority, except at ingress and egress points. The boundary walls shall be of Precast panel fencing as per figure enclosed as Annexure A of Schedule C.

At all CD structure locations, the boundary wall shall be discontinued by turning and joining it with the wing/return wall to allow crossing through these structures during dry seasons.

In case of Precast panel fencing, provide cast in situ coping beam on top of fencing. provide detailed drawings as Annexure A **(Clause No. 12.2 IRC: SP:84-2019)**

**3 Operation and Maintenance centers**

**There shall be operation and maintenance center(s) as per Clause 12.15 of Schedule-D, either near the toll plaza location or at any other location along the Project Highway, as identified by the Concessionaire. The minimum land for O & M center shall be 2000 sq.m and shall be acquired by the Concessionaire at his own cost and risk. Dedicated operation and maintenance center shall be provided in accordance to Schedule D. (Clause No. 12.15 IRC: SP:84-2019)**

**4 Way side Amenities / Service Areas/Rest Area**

| S.No | Item | Design Chainage (Km) | Side | Remarks |
|---|---|---|---|---|
| Nil | | | | |

- The Site needs to levelled/ graded for the whole of Way side Amenities area and boundary wall of the height of 3.0 m shall be constructed along the periphery of the area.

- Ramps to be constructed at entry and exit of way side amenities / service areas/rest area
- Lightings needs to be in place for way side amenities / service areas/rest area
- These tasks needs completed and handed over back to the authority at the end of 1st Milestone.

**5 Truck lay-byes:**

5.1 The truck lay-bye shall be provided at below given location and as per the design mentioned in Schedule-D.

| Sr. No. | Design Chainage | Side | Remarks |
|---|---|---|---|
| NIL | | | |

5.2 Toilet block

Toilet block along with Janitor room on each Truck Lay bye shall be provided. The toilet block shall consist of atleast 1 block for bathing, atleast 2 fixtures each for urinals, WC and wash basin. There shall be 24-hour lighting facility in toilet block. These toilets facilities must be functional round the clock including proper maintenance. For arrangement of water, 1 no. of boring along with water pump shall be provided to keep the toilet clean. For upkeep and maintenance of Toilet, 3 Safai wale (1 in each 8 hour shift) shall be engaged and is in the scope throughout contract period.

5.3 Truck Lay Bye Pavement

| Pavement Composition (Flexible/Rigid/ Paver Blocks) |
|---|
| Flexible Pavement (Same as Main Carriageway) |

**6 Bus Bay and Bus shelter:**

Provision of Busbay and bus shelter on highways as per IRC 80 : 2022 including paving of layby, signs, markings, speed calming measures, drainage, lighting etc., in builtup areas, intersections of NH/SH/MDR and roads leading to large settlements is as follows: **(Clause No. 12.7 IRC: SP:84-2019)**

6.1 Bus Bays

Bus Bays with tapers shall be provided along with passenger's shelters shall be constructed at the following locations.

| Sr. No. | Design Chainage (Km) | | Entry Taper Length | Bus Bay Length | Exit Taper Length | Remark |
|---|---|---|---|---|---|---|
| | Left | Right | | | | |
| NIL | | | | | | |

6.2 Kerb Side Bus Stop with Pedestrian shelter

Kerb Side Bus Stop with Pedestrian shelter shall be provided at the following locations.

| Sr. No. | Design Chainage (Km) | | Pedestrian Shelter Length | Remark |
|---|---|---|---|---|
| | Left | Right | | |

| | | | | |
|---|---|---|---|---|
| 1 | 74.300 | 74.200 | 15.0 | |
| 2 | 78.080 | 78.160 | 15.0 | |
| 3 | 80.720 | 80.800 | 15.0 | |
| 4 | 84.080 | 84.060 | 15.0 | |
| 5 | **87.740** | **87.710** | **15.0** | |

6.3 Bus Bay Pavement

Provide pavement composition (Flexible/Rigid/ Paver Blocks) as follows:

| Pavement Composition (Flexible/Rigid/ Paver Blocks) |
|---|
| N.A |

## 7 Pedestrian Facilities

Pedestrian Facilities shall be provided in accordance with the Manual of Specifications and Standards as referred in Clause 9.8 of Schedule D and IRC 103 2022. This shall consist of footpath (sidewalks), pedestrian guard rails and pedestrian crossing. **(Clause No. 9.8 IRC: SP:84-2019/ IRC: SP:87-2019)**

The details are as mentioned below:

| S.No. | Pedestrian facilities | Design Chainage (Km) | | Side | Remarks |
|---|---|---|---|---|---|
| | | From | To | | |
| 1 | Pedestrian guardrails shall be 150 mm from Carriageway/Paved Shoulder | 62.800 | 63.180 | Both sides | - |
| | Hazardous Locations on Straight Stretches<br>At Junctions/Intersections<br>Schools<br>Bus Stop/Railway Stations<br>Overpass, Subway<br>Central Reserve | 77.100 | 87.700 | Both sides | |
| 2 | Footpath paving including fixing of Tactile pavers | - | - | - | - |
| 3 | Pedestrian Crossing<br>With Zebra Marking<br>With Tabletop Crossing<br>At Intersections<br>At Schools | i) 10 | - | - | At bus shelter locations with zebra markings |

## 8 Highway Lighting

The street light poles shall be 1 piece, continuous-tapered, octagonal poles and shall be manufactured from one length of steel sheet, formed in continuous tapered tube, with one continuous arc-welded vertical seam. The minimum wall thickness for lighting poles shall not be less than 4 mm.

The Bottom Diameter shall be minimum 175 mm. The Top Diameter shall be minimum 75 mm. The door on window of pole shall be antitheft. All electrical cable should be concealed. All electrical lighting fixers shall be LED. The fixtures shall be concealed except on poles. Lighting poles shall be fixed on outer side of steel/concrete barrier. The lighting shall be providing at the following locations: (Clause No. 12.5 IRC: SP:84-2019)

| S.No. | Lighting facilities | Chainage | | Side | Lighting Source: Electricity Board / Generator/ Solar |
|---|---|---|---|---|---|
| | | From | To | | |
| 1 | **Toll Plaza area:** The lighting in and around toll plaza, toll booths, office building, on the approach road, etc. shall be as per Section 12 of the Manual. In addition to at least two high mast light shall be provided on either side of toll plaza | 84.700 | 84.900 | Both sides | **Electricity Board** |
| 2 | **Rest Areas:** The entire Rest areas shall be provided with lighting with average illumination to 40 Lux | 87.200 | 87.400 | LHS | |
| | | 91.450 | 91.800 | RHS | |
| 3 | **Truck lay-bye:** The entire area of truck lay-byes and 50m length of the project highway on its either side shall be illuminated at night to provide an average illumination of 40Lux. Suitable designed electric poles having aesthetic appeal and energy saving bulbs (LED) may be used to provide required illumination. Alternatively, photo voltaic lamps may be used | | | | |
| 4 | **Bus Bay & bus shelter locations**: The entire bus bay & bus shelter area shall be provided with Lighting (Average illumination of 40Lux.). | 74.250 | 74.350 | LHS | |
| | | 78.030 | 78.130 | LHS | |
| | | 80.670 | 80.770 | LHS | |
| | | 84.030 | 84.130 | LHS | |
| | | 87.690 | 87.790 | **LHS** | |

| | | | | | |
|---|---|---|---|---|---|
| | | 74.150 | 74.250 | RHS | |
| | | 78.110 | 78.210 | RHS | |
| | | 80.750 | 80.850 | RHS | |
| | | 84.010 | 84.110 | RHS | |
| | | 87.660 | 87.760 | **RHS** | |
| 5 | **Grade separated structures, interchanges, flyovers, underpasses (vehicular/ pedestrian) and Vehicle overpasses:** Lighting requirement shall be as per section 12 of the manual. The top and underside of the grade separated structures including service road/ slip road, interchange area at the ground level up to 50m beyond the point from where flaring of the main carriageway takes place shall be provided with lighting. Also, on all legs of at grade interchange/ crossings the lighting shall be provided 50m beyond the point of Centre on all legs. The minimum illumination shall be 40 Lux., at the extreme edge of the Highway | 62.800 | 63.180 | Both Sides | |
| | | 68.180 | 69.800 | Both Sides | |
| | | 73.760 | 74.750 | Both Sides | |
| | | 77.100 | 77.580 | Both Sides | |
| | | 77.580 | 78.700 | Both Sides | |
| | | 78.700 | 80.100 | Both Sides | |
| | | 80.100 | 80.900 | Both Sides | |
| | | 80.900 | 81.550 | Both Sides | |
| | | 83.600 | 84.730 | Both Sides | |
| | | 86.030 | 86.920 | Both Sides | |
| | | 87.600 | 87.700 | Both Sides | |

| | | | | | |
|---|---|---|---|---|---|
| 6 | **Built-up sections** on the project highway both in the median of main carriageway and on the service roads on both sides | | | | |
| 7 | **On Median Openings provide 1 nos. high mast lighting of 25m height** | | | | |
| 8 | **On Major Bridges and its approaches higher than 3m** | 85.570 | 84.711 | Both Sides | |

**9 Rainwater Harvesting**

The provision of rainwater harvesting shall be provided at every 500m staggered in the entire project length and shall be executed as per requirement of IRC SP: 42-2014 and IRC SP: 50-2013. Additionally, wherever urban drains are provided, which do not have a definite outfall for discharge of water, at such location one pit for rain water harvesting shall be provided along the side drains at the lowest point/ where the water stagnates. The type and location of rain water harvesting is as follows:

| S.No. | Rain water Harvesting Type | Chainage | Side | Depth of Recharge Structure |
|---|---|---|---|---|
| 1 | Type 1 confirming to clause 10.7.2 of IRC SP 42 | | | |
| 2 | Type 2 confirming to clause 10.7.3 of IRC SP 42 | | | |
| 3 | Type 3 confirming to clause 10.7.4 of IRC SP 42 | | | |
| 4 | Type 4 confirming to clause 10.7.5 of IRC SP 42 | @500 m staggered in the entire project length | Both Side | As per Fig.10.6 of IRC SP 42 |

**10 Environmental Management Plan**

The Concessionaire shall implement the Environmental Management plan & action Plan for undertaking possible mitigation measures in accordance with environmental clearance accorded by Ministry of Environment and Forests and climate change. The conditions & directions stipulated by the MOEF shall be complied by the contractor/ concessionaire.

**11 Land Scaping and Tree Plantation**

The Concessionaire shall plant trees and shrubs of required numbers and types at the appropriate locations within Right of Way and in the land earmarked by the Authority for afforestation as per Schedule D at the following areas.

**12 Advanced Traffic Management System (ATMS)**

The Concessionaire is required to design, install, operate and maintain Advanced Traffic Management System (ATMS) as part of the project facilities. Advanced Traffic Management System shall be provided as per standards and specifications specified in the manual and as per NHAI circular dated 10.10.2023 and shall be maintained throughout the contract period. (NHAI Policy Circular No 11.53/2023)

The ATMS components to be deployed shall inter alia include:

12.1 General

The ATMS Project shall broadly include the following sub-systems to be provided as per the standards & specifications mentioned in NHAI Policy Circular No11.53/2023.

12.1.1 Video Surveillance System / Traffic Monitoring Camera System (TMCS)

12.1.2 Video Incident Detection System (VIDS)

12.1.3 Vehicle Actuated Speed Display System (VASDS)

12.1.4 Fixed and Portable Variable Message Sign (VMS) System

12.1.5 Communication Network with OFC Backbone

12.1.6 Common ATMS Command & Control Center - NA

12.1.7 Power Supply for Field Equipment as well as for ATMS Command & Control Center

12.1.8 Operation & Maintenance (O&M) of the entire ATMS Facility

12.1.9 Maintenance Vehicle

12.2 The requirements stated herein shall be construed as minimum requirement and meeting the respective requirements individually shall not relieve the Contractor from the responsibility. The entire system should function efficiently as an integrated solution during the entire O&M period.

12.1.1 Video Surveillance System / Traffic Monitoring Camera System (TMCS)

(i) The system monitors vehicular and other road related activity along the highway stretch through PTZ Camera mounted on Poles. Generally, the camera should be placed at a distance not greater than 1km so as to effectively monitor all the lanes of the entire stretch of Highway. In case certain stretches include regular curves, ramps etc not allowing central line of sight, then additional TMCS camera shall be put to ensure effective surveillance of the entire stretch. The TMCS cameras should also be placed on the following Junctions below the Grade Separated Structure.

*- As per TCS drawings attached in Annex-II of Schedule B, 1 TMCS/km will be provided in median in TCS-I, III & IV. For TCS II, V, VA, VB and VI 2 TMCS/km will be provided. These shall be placed on Electric poles on separators.

(ii) The TMCS should also be provided at the following Junctions so as to monitor the traffic at the following junctions:

| Sl No | Location (Km) | LHS/ RHS/ BHS | Remarks |
|---|---|---|---|
| 1 | 63.147 | BHS | |
| 2 | 63.824 | BHS | |
| 3 | 65.090 | BHS | |
| 4 | 66.215 | BHS | |
| 5 | 67.540 | BHS | |
| 6 | 69.016 | BHS | |
| 7 | 69.596 | BHS | |
| 8 | 70.118 | BHS | |
| 9 | 71.252 | BHS | |
| 10 | 72.284 | BHS | |
| 11 | 74.247 | BHS | |
| 12 | 75.336 | BHS | |

| | | | |
|---|---|---|---|
| 13 | 78.116 | BHS | |
| 14 | 82.021 | BHS | |
| 15 | 83.024 | BHS | |
| 16 | 84.111 | BHS | |
| 17 | 86.432 | BHS | |

12.1.2 Video Incident Detection System (VIDS)

The VIDS include Gantry Mounted ANPR Cameras, Overview Cameras and associated incident detection software system to effectively detect pre-defined actionable incidents which triggers enforcement and incident response system. The VIDS should also act as Automatic Traffic Counting and Classifying (ATCC) system. The VIDS should be provided at following locations:

| Sl No | Location (Km) | Remarks | Availability of Full Gantry** |
|---|---|---|---|
| 1 | 70.000 | 2 No. (one of LHS & RHS) | To be provided |
| 2 | 82.850 | 2 No. (one of LHS & RHS) | To be provided |

** [ VIDS system requires full Gantry on both LHS & RHS]

12.1.3 Vehicle Actuated Speed Display (VASD) System

The VASD system shall include gantry mounted Radar and Speed Display system for each lane to warn the road users of their speed. The system shall act as a Speed Calming Measure. VASD System should be provided at following locations along the Expressways:

| Sl No | Location (Km) | Remarks | Availability of Full Gantry** |
|---|---|---|---|
| **1** | **62.800** | 2 No. (one on LHS & one on RHS) | To be provided |

** [ VIDS system requires full Gantry on both LHS & RHS]

12.1.4 Variable Message Sign (VMS) System

The VMS shall provide road users advance information of road conditions ahead and shall be controlled from the local ATMS Control centre. The VMS shall be installed at following locations:

12.1.4.1 Fixed VMS

12.1.4.1.1 Gantry (M Type)

| Sl No | Location (Km) | Remarks | Availability of Full Gantry** |
|---|---|---|---|
| Already provided in preceding and succeeding packages. Those can be used | | | |

** [ VIDS system requires full Gantry on both LHS & RHS]

12.1.4.1.2 Cantilever (L Type)

| Sl No | Location (Km) | Remarks | Availability of Full Gantry** |
|---|---|---|---|
| | | | |

** [ VIDS system requires full Gantry on both LHS & RHS]

12.1.4.2 Portable VMS

Details of Trolley Mounted Portable VMS signs shall be finalised by the concessionaire in consultation with IE /NHIDCL

12.1.5 Communication Network with OFC Backbone

The entire Expressway stretch shall be provided with minimum 24 Core OFC Backbone as per the standards & specifications. The short haul connections like between field equipment to access points, access points to OFC backbone etc shall be done with minimum 12 Core cable. The OFC shall be laid strictly as per the Standards and Specification.

12.1.6 ATMS Command and Control Center

The ATMS Command and Control Centre structure is not proposed as these are provided in succeeding and preceding packages.

12.1.7 Power Supply for ATMS Command & Control Center and Field Equipment

The Contractor shall ensure 24x7 supply for the ATMS Command and Control Centre and Field Equipment with supply power from Electricity Department as primary source supported by UPS renewable power (solar etc) and DG Set of adequate capacity.

There shall be NO obligation of NHIDCL with regard to providing power/ electricity supply/connections for testing commission, operation & maintenance of any component of the ATMS. Further, the following points are to also be observed by the ATMS contractor:

a. The Contractor shall perform all the necessary application procedures to the Power Company required for the power to be supplied to the Traffic Management Centre, Sub-Centre and the field equipment in their own name. All the expenses charged by Power Companies regarding such applications and execution of work shall be borne by the Contractor as part of the scope of this contract. Any damage to the highway during such execution of work shall have to be repaired by the ATMS Contractor to the pre-existing condition without any cost implications to NHAI.

b. The Contractor shall make all necessary arrangements for the electricity needed for the execution of the Works and O&M period for the entire period of the Contract. In case electricity is not made available through electricity companies, alternate electricity arrangements such as through renewable energy/DG Set should be made by the Contractor. Under no circumstances NHAI shall grant an extension of time for achieving the milestones if the contractor is unable to make the electricity arrangement either for the execution of the work or for the O&M activities.

c. The fixed charges, installation charges, recurring charges, electricity bill, DG set fuel, maintenance etc. for each field equipment, TMC, Control Centre, Sub-centre, Contractor's site office, or any other facility being used by the Contractor under the scope of this Contract shall be in the scope of the Contractor only for the entire Contract period i.e., Design phase, procurement, installation, testing, trail-run, commissioning, operations, and maintenance period. The Authority shall not be responsible for any provision for power supply during implementation as well as operations and maintenance period.

12.1.8 Operation & Maintenance (O&M) of the entire ATMS Facility.

a. The O&M period after the successful completion of works shall include Operation & Maintenance of the entire ATMS Facility as per the Service Level Agreement (SLA) with Qualified Manpower mentioned in Standards & Specifications including supply of adequate spares, parts, consumables, and maintenance equipment required for the facility. The Contractor shall maintain the required spare parts to maintain required service levels.

b. The Contractor shall have sufficient infrastructure and capability to keep/store spares required for maintenances and will at all times during the contract period maintain sufficient inventory of spares and consumables for operating and maintaining the ATMS and to meet the Service Level requirements.

c. Before the start of O&M Period, the Contractor shall deploy the O&M Personal mentioned at Appendix-C of Standards & Specification with prior approval of the Authority.

12.1.9 Maintenance Vehicle

The ATMS Contractor shall keep adequate numbers of dedicated vehicles (minimum 1 vehicle per 50km) to attend the maintenance requirement during the Operation & Maintenance period.

**13 Highway Patrol Units**

Highway Patrol units shall be established and operate at toll plaza location as per Schedule-D Clause 12.10 (strictly as per details mentioned in Annexure-C), which shall continuously patrol the highway in a stretch not exceeding 50 km (if the stretch is more than 50 km additional 1 number of patrol vehicle per 50 km or less shall be provided). The vehicle shall be brand new with fuel, driver, and insurance all-inclusive for the entire contract period. Highway Patrol units shall be fitted with GPS and GSM based vehicle tracker system. Highway Patrol Vehicles shall be stationed on layby constructed on Project Highway @ every 20 km of each Toll Plaza. (Clause No. 12.10 IRC: SP:84-2019)

**14 Emergency medical services**

The Contractor shall, at its own cost, construct a medical aid post at each toll plaza with a minimum size of 5 x 5 sq.m with a toilet (to be used for the patients of minimum size of 3 x3 sq.m) and hand it over to the Authority, no later than 30 (thirty) days prior to PCOD/COD. The Medical Aid Post(s) shall be deemed to be part of the project and shall vest in the Authority. Medical Aid Post shall be set up at Administrative Block with round-the-clock services for victims of accidents on the Project Highway.

One number Ambulance shall be provided in a stretch not exceeding 50 km (if the stretch is more than 50 km additional 1 number of ambulances per 50 km or less shall be provided). The Ambulance shall be brand new with fuel, driver, medical staff and insurance all-inclusive for the entire contract period. Ambulance fitted with GPS and GSM based vehicle tracker system shall be provided to be integrated with the Video Incident Detection System with ATMS, as per Schedule-D, Clause 12.11 (strictly as per details mentioned in Annexure-D), along with all necessary manpower (including paramedical staff), medicines, equipment's etc. and shall be maintained in an effective manner throughout the contract period starting from the appointed date. Ambulance shall be stationed on layby constructed on Project Highway @ every 20 km of each Toll Plaza **(Clause No. 12.11 IRC: SP:84-2019) & NHAI Circular NHAI/Incident Management/ 2021 Policy Circular No. 18.6/2021 dated 11th March 2021.**

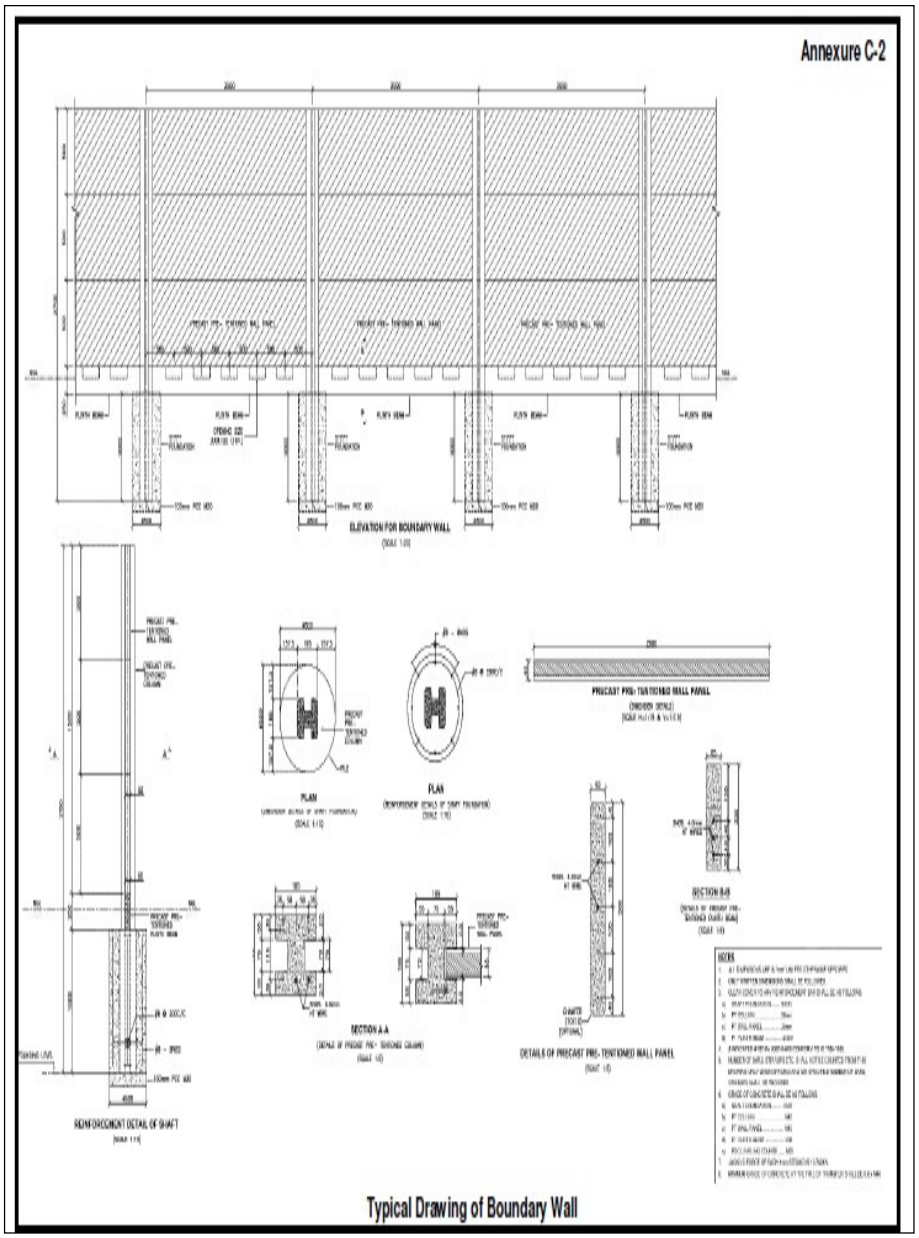
**15 Crane Service:**

Crane Service shall be provided on project highway, as specified in the manual Clause 12.12. One number crane shall be provided in a stretch not exceeding 50 km (if the stretch is more than 50 km additional 1 number of crane per 50 km or less shall be provided). Crane having capacity of minimum 20T shall be made available. The crane shall be brand new with fuel, driver, and insurance all-inclusive for the entire contract period. Cranes shall be stationed on layby constructed on Project Highway @ every 20 km of each Toll Plaza. **(Clause No. 12.12 IRC: SP:84-2019)**

# Annexure A of Schedule C

*(Schedule-C)*

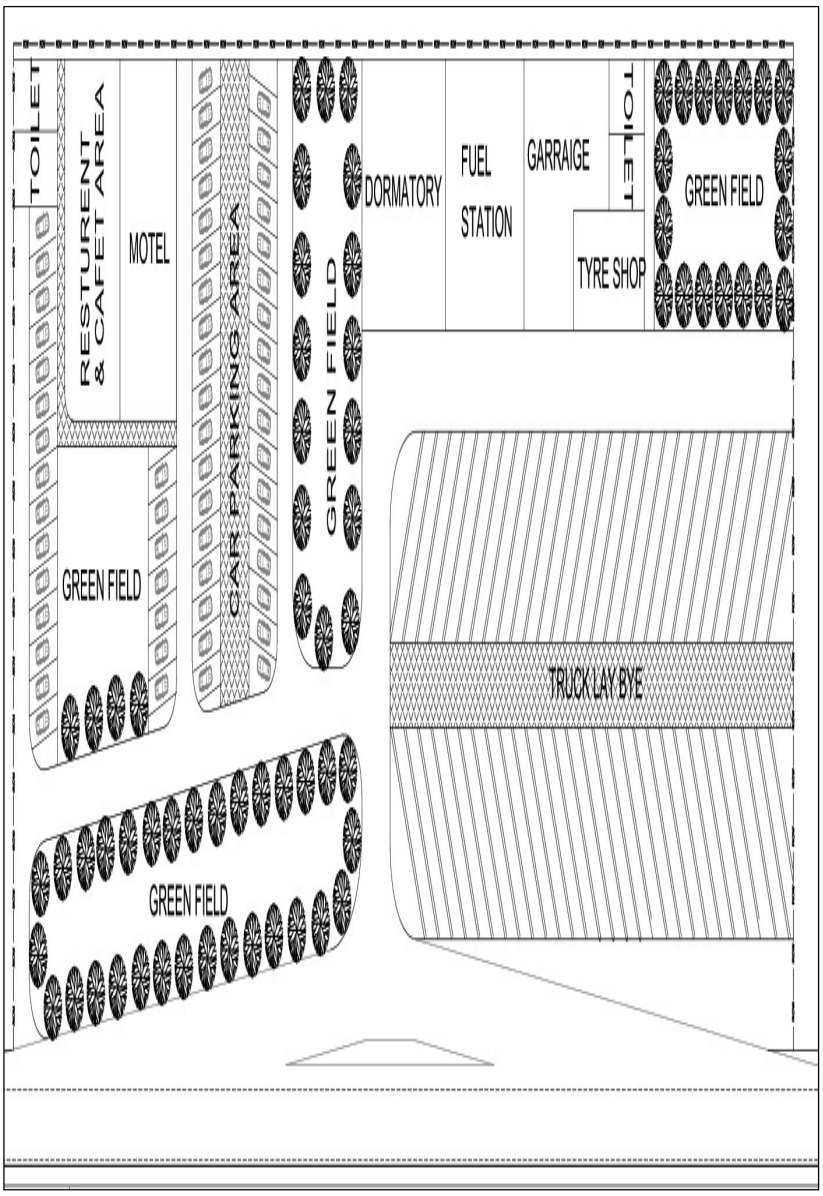
Standard Drawing for Boundary Wall



# Annexure-I

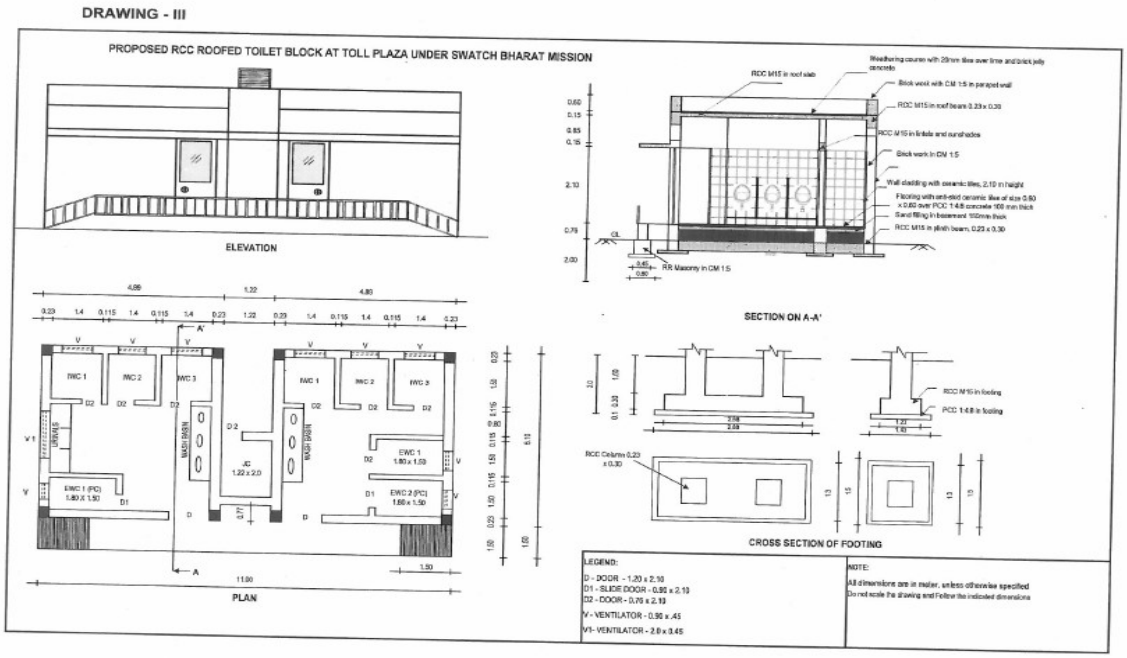
*(Schedule-C)*

**Typical Drawing of Wayside Amenities/Rest Area**

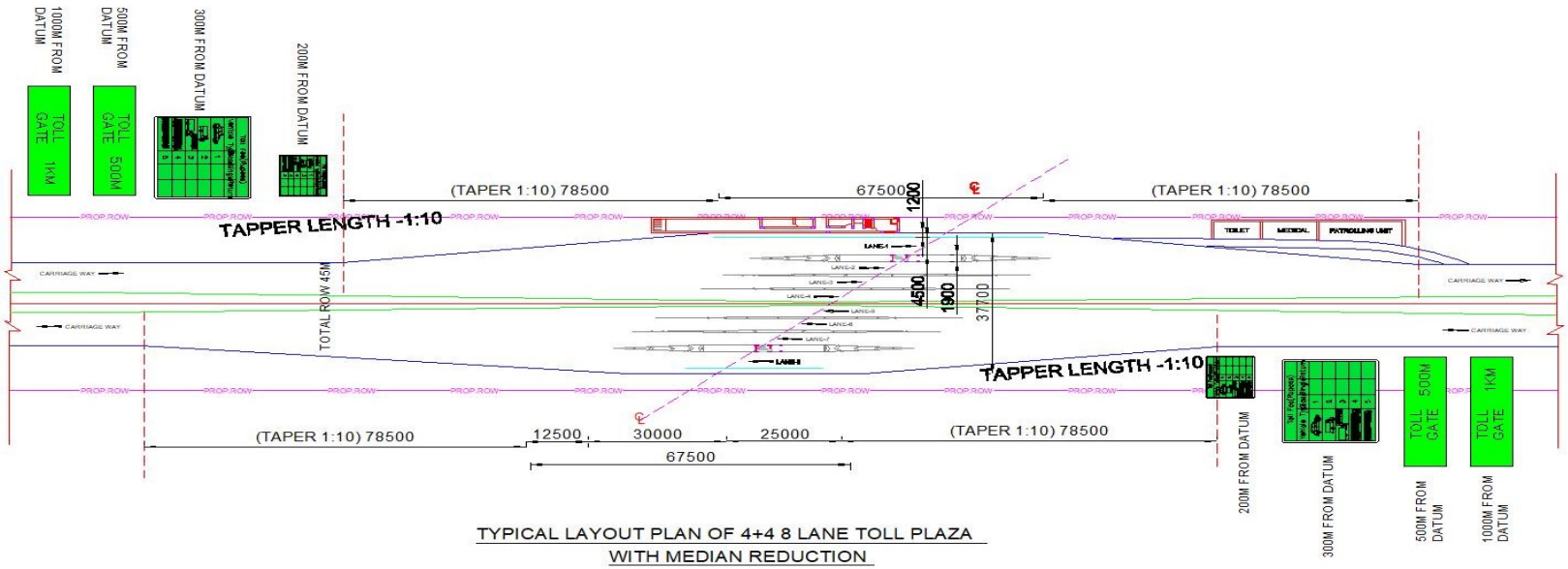



**Annexure-v**

## Schedule C Standard Drawing for Toilet



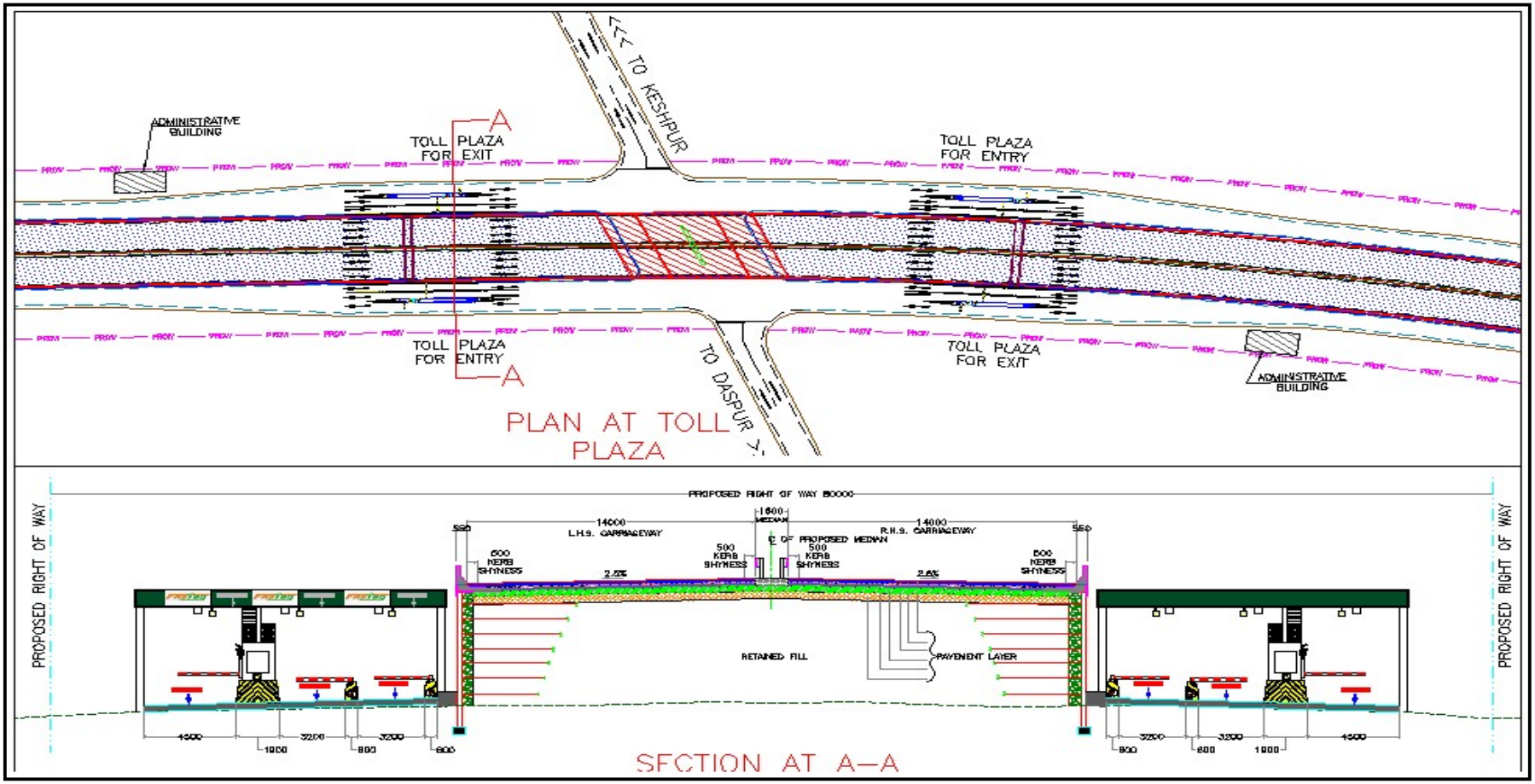
## Annexure-III




TYPICAL LAYOUT PLAN OF 4+4 8 LANE TOLL PLAZA
WITH MEDIAN REDUCTION

(Schedule-C)

## Typical Drawing for Toll Plaza




**Note:** Above mentioned typical drawing is for reference, Concessionaire shall finalize the detailed drawing as per manual consultation with Independent Engineer/ NHIDCL.

I

## SCHEDULE- D

***(SeeClause2.1)***

D. SPECIFICATIONS AND STANDARDS

1 Construction

The Concessionaires 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 & Standards for four laning of Highways IRC: SP: 84-2019, referred to herein as the manual.

As regards to work of utility shifting, the relevant specifications, relevant rules, regulation and acts of Utility owning Department / Agencies shall be applicable.

**Annex - I**

**(Schedule - D)**

**Specifications and Standards for Four-Laning**

**Manual of specifications and standards to apply**

Four- Laning of the Project shall conform to the Manual of Specifications and Standards for Four – Laning of Highways through Public Private Partnership published by the IRC (IRC: SP: 84-2019, Referred as 4-laning manual) with all amendments and additions till date. (Referred to as "Manuals" in this Schedule) and MORTH Specifications for Road & Bridge Works (5th revision). Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Independent Engineer.

**Deviations from the Manual**

Notwithstanding anything to the contrary contained in the aforesaid Manual, the following Specifications and Standards shall apply to the construction of the Project Highway, and for purposes of this agreement, the aforesaid manual shall be deemed to be amended to the extent set forth below:

| Sl. No. | Item | Manual Clause reference | Provision as per Manual / Circular / Minutes | Modified Provision |
|---|---|---|---|---|
| 1 | Typical cross section | Clause 2.17 of IRC SP: 84-2019 | Typical cross section | Typical Cross section<br>shall be followed as per Clause 4.1 of Schedule B |
| 2 | Median | Clause 2.5 of IRC SP:84-2019 | Raised OR depressed median | Flush Median shall be proposed as per Schedule-B |
| 3 | Width Shoulder | Clause 2.6 of IRC SP: 84-2019 | a. Paved Shoulders 2.5m | a. Paved edge strip of 0.5m |
| | | | b.Earthen Shoulder 1.5m | b. Earthen Shoulder shall be 4m wide as per specifications mentioned under para 4.9 of Schedule B |
| 4 | Side Slopes | Clause 4.2.3.2 | Not steeper than<br>2H : 1V | Side slopes shall be 1.5H : 1V with Geocell and turfing |
| 5 | Toll Plaza | 10.4 | Fig 10.1 -Typical layout for Toll plaza | All lanes must be ETC equipped with Hybrid ETC equipment as per NHAI circular No. 17.5.82 dated 24-05-2021. |
| 6 | Structures | Clause 7.3 of IRC SP: 84-2019 | Width of Structure | 15.0m deck width (without footpath) shall be provided |

| Sl. No. | Item | Manual Clause reference | Provision as per Manual / Circular / Minutes | Modified Provision |
|---|---|---|---|---|
| 7 | Boundary Wall | Clause 12.2 of IRC SP:84-2019 | Road Wall Boundary | Boundary Wall shall be provided as per Schedule-C |
| 8 | Lighting | Clause 12.5 of IRC SP:84-2019 | Street Lighting | In addition to Locations provided as per Manual, Lighting shall be provided also as per Schedule-C. |
| 9 | Traffic Signs | Clause 9.2 of IRC SP:84-2019 | Road Signs | In addition to Manual, Schedule-C shall be followed. |
| 10 | Longitudinal Drain | IRC SP:84-2019 | Drainage | As per clause 4.14 of Schedule-B |
| 11 | Expansion Joints | Clause 7.13 of IRC SP:84-2019 | Expansion Joints | In addition to Manual, Schedule-B shall be followed. |
| 12 | Utility Corridor | Clause 2.16 of IRC SP: 84-2019 | Built-up locations | Entire Stretch |

**Specifications for Avenue & Median Plantations:**

*- As per NHAI Policy circular No. 7.4.9 dated 15th March 2023, Avenue plantation is delinked from EPC/HAM/BOT toll projects.

**Specifications and standards for development of buildings**

1. **General: National Building Code of India - 2005**
2. **Code for Structural design and details:**

| | |
|---|---|
| **CODE OF PRACTICE FOR LOADS AND COMBINATIONS** | |
| IS 875 Part I | Dead Loads - Unit weights of building Materials and stored materials. |
| IS 875 Part II | Imposed loads. |
| IS 875 Part III | Wind Loads. |
| IS 875 Part V | Special Loads and Combinations. |
| **CODES OF DESIGN AND FABRICATION FOR PRE - ENGINEERED BUILDING** | |
| IS 800 : 2007 | General construction in steel |
| IS 808 : 1989 | Dimensions for hot Rolled steel sections. |

| **CODE OF PRACTICE FOR LOADS AND COMBINATIONS** | |
|---|---|
| IS 801 : 1975 | Code of Practice for use of Cold Formed light gauge steel structural members in general building |
| IS 811 | Code of Practice for use of Cold Formed light gauge structural steel sections |
| AISC : 2000 | Design Code |
| IBC : 2002 | Building Code |
| AISI : 2001 | Purlin Code |
| ANS : 2006 | Welding Code |
| SP - 38 (S&T): 1987 | Handbook of typified designs for structures with steel Roof trusses |
| IS 816 : 1969 | Code of Practice for use of metal arc welding for general construction in mild steel |
| IS 456 : 2000 | Plain and Reinforced Concrete Code of Practice. |
| IS 1893: 2002 | Criteria for Earthquake resistant design of structures |
| IS 6403: 1981 | Code of Practice for determination of bearing capacity of shallow foundations |
| IS 1786: 2008 | Specification for high strength deformed steel bars and wires for concrete reinforcement |
| IS 13920: 1983 | Code of practice for ductile detailing of reinforced concrete Structures subjected to seismic forces. |
| SP - 16 (Design Aids for Reinforced Concrete) :1978 | Design aids for reinforced concrete to IS 456. |
| SP - 34:1987 | Hand book on concrete reinforcement and detailing |

3. All relevant BIS Code of India for Civil, Electrical, Water Supply, Sanitary, HVAC and Solar Panels.
4. Energy Conservation Code - 2007.
5. Roads / Driveway / Parking: IRC 37-1984 / MORTH specifications.
6. Indian Electricity Rules / State Electricity Rules.
7. ASHRAE Standards.
8. All local bylaws.
9. Hand Book of Water Supply and Drainage, BIS, SP-35.
10. CPWD - Specifications published by Director General (Works) CPWD, New Delhi including subsequent amendments, upto date correction slips, revisions.
    - CPWD Specifications 2009 (Volume I & II)
    - CPWD General Specifications for Electrical Works Part IV Sub Station - 2013

- CPWD General Specifications for Electrical Works Part IV Sub Station - 2013.
- CPWD General Specifications for Electrical Works Part VII D.G. Sets - 2013.
- General Specifications for Heating, Ventilation & Air-Conditioning(HVAC) - 2004

11. Specifications published by Director General (Works), MES, E-in-C branch, Kashmere House New Delhi, including subsequent amendments, upto date correction slips, revisions
    a. MES SSR Part I 2009,
    b. TI's issued by E-in-C branch for specified purpose from time to time

    **Note:** Any reference to codes and standards shall be deemed to include all subsequent revisions, upto date corrections slips, updates, amendments etc.