Schedules

SCHEDULE – A

(See Clause 8.1)

SITE OF THE PROJECT

1 **The Site**

1.1 Site of the Two-Laning of existing Singtam - Gyalshing Road on EPC basis from design Km 16+00 (Existing Km 15+300) to Km 32+50 (Existing Km 32+675) within South & West District of Sikkim under SARDP-NE-Phase-A Project Highway shall include the land, buildings, structures and road works as described in Annex-I of this Schedule-A.

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

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

1.4 The alignment plans of the Project Highway are specified in Annex-III. In the case of sections where no modification in the existing alignment of the Project Highway is contemplated, the alignment plan has not been provided. Alignment plans have only been given for sections where the existing alignment is proposed to be upgraded. The proposed profile of the Project Highway shall be followed by the contractor with minimum FRL as indicated in the alignment plan.

1.5 The status of the environment clearances obtained or awaited is given in Annex IV of Schedule A.

1.6 Additional land required for Toll Plazas, Traffic Aid Posts, Medical Aid Posts and vehicle rescue posts or for construction of works specified in the Change of Scope Order issued under Clause 13.2 of this Agreement shall be acquired. Upon acquisition, such land shall form part of the Site and vest in the Executing Agency.


Damthang
Mangbru
Bak
rku
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Annex - I
(Schedule - A)

1.0 The Site

The Project Corridor takes off from Km 62.80 on existing NH 10 at Singtam in East Sikkim and runs towards South Western direction passing through a number of towns like Singtam –Tarku - Rabongla- Legship- Gyalshing within South & West District. **This project section road (Package-I) starts from Km 16+000 (near Dentam) to Km 32+50 (near Rabangal)**.

The topography falls under the plain terrain of IRC classification and traverse generally through rural area with semi-urban areas in some places.

Majority of the land use along the project road is for agriculture in rural areas and commercial, residential, educational institutions, petrol stations and religious centers etc in built-up sections.

Traffic on this stretch of project road is of mixed type mostly with small passenger's vehicles and two wheelers. The number of commercial vehicles & passenger vehicles are very much less.

2.0 Referencing System

Kilometer stones are existing in some of the locations of the project highway. It is called the "Existing Chainage". During topographical survey with Total Station, observations made are referred to "Design Chainage". The relationship between the "Existing Chainage" and the "Design Chainage" as per field surveys of the location of existing Km stones using the total station for the "Project Highway" is given below:

Design Chainage corresponding to Existing Chainage

Sr.No.	Existing Chainage (Km)	Design Chainage (Km)	Remarks
1	15+300	16+00	Existing Road
2	16+320	17+000	Existing Road
3	17+345	18+000	Existing Road
4	18+360	19+000	Existing Road
5	19+520	20+000	Existing Road
6	20+600	21+000	Existing Road
7	21+620	22+000	Existing Road
8	22+630	23+000	Existing Road
9	23+680	24+000	Existing Road
10	24+750	25+000	Existing Road
11	25+820	26+000	Existing Road
12	26+880	27+000	Existing Road
13	28+000	28+000	Existing Road
14	29+105	29+000	Existing Road
15	30+140	30+000	Existing Road

Sr.No.	Existing Chainage (Km)	Design Chainage (Km)	Remarks
16	31+160	31+000	Existing Road
17	32+150	32+000	Existing Road
18	32+675	32+500	Existing Road

3.0 Land

The Site of the Project Highway comprises the land described below:

Sl. No.	Existing Chainage (km)		Design Chainage (km)		Length in m (Design)	Existing/ Available ROW (m)	Remarks
	From	To	From	To			
1	15+300	32+675	16+00	32+500	16500	16.5	No ROW available in realignment stretches of total 3.11km as given in para 3.3 of Annexure-1 Schedule B

4.0 Carriageway

The present carriageway of the Project Highway is substandard single lane configuration. The type of the existing pavement is flexible.

Sl. No.	Existing Chainage (km)		Design Chainage (km)		Length in m (Design)	Lane Width (m)	Remarks
	From	To	From	To			
1	15+300	32+675	16+00	32+50	16500	3.5 to 4.0	Lane width of existing road

5.0 Major Bridges

The Site includes the following Major Bridges:

Sl. No.	Chainage (km)	Type of Structures			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Superstructure		
NIL						

6.0 Railway Over Bridges (ROB)/ Railway under Bridges (RUB)

The Site includes the following Railway Over Bridges:

Sl. No.	Chainage (km)	Type of Structures			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Superstructure		
NIL						

7.0 Grade separators

The Site includes the following Grade separators:

Sl. No.	Chainage (km)	Type of Structures			No. of Spans with span length (m)	Width (m)
		Foundation	Sub-Structure	Superstructure		
NIL						

8.0 Minor Bridges

The site includes the following Minor Bridges:

S. No	Name of Bridge	Type	Existing Chainage (km)	Width (m)	Span Arrangement (m)	Type of Structure		
						Foundation	Sub-structure	Super-structure
1	Ringpl Chu	Minor	19.295	4.25	1x26.5	Open	RCC Abutment	Steel Truss
2	Ranka Khola	Minor	24.563	4.25	1x26.5	Open	RCC Abutment	Steel Truss

9.0 Railway level crossings – NIL

The Site includes the following railway level crossings:

Sl. No.	Road Segment	Existing Chainage (km)	Remarks
Nil			

10.0 (Under passes (Vehicular / Non Vehicular)

The Site includes the following underpasses:

Sl. No.	Road Segment	Existing Chainage (km)	Type of Structure	No. of Spans with Span Length (m)	Width (m)
Nil					

11.0 Culverts

The site includes the following Culverts:

Sl. No.	Location (m.)	Length (m)	Type of Structures (Pipe, Slab, Box, Arch)	Span Arrangement and Total Ventway [No.x Length(m)]	Carriageway Width (m)	Width of Culvert (m)
1	15952	4.7	SLAB	1x.6	4.1	5.1
2	16181	1.5	SLAB	1x.6	4.6	5.1
3	16210	1.9	SLAB	1x.6	5.1	5.4
4	16471		SLAB	1x.6		
5	17056	1.5	SLAB	1x.6	5.7	6.0

Sl. No.	Location (m.)	Length (m)	Type of Structures (Pipe, Slab, Box, Arch)	Span Arrangement and Total Ventway [No.x Length(m)]	Carriageway Width (m)	Width of Culvert (m)
6	17092	1.5	SLAB	1x.6	5.6	6.4
7	17383	1.5	SLAB	1x.6	5.6	6.6
8	19579	3.7	SLAB	1 X 2.8	6.7	7.4
9	19691	1.5	SLAB	1x.6	5.2	5.5
10	19925	1.6	SLAB	1x.6	4.9	5.0
11	20036	3.7	SLAB	3 X 3	6.7	7.5
12	20832	1.5	SLAB	1x.6	7.5	8.5
13	21894	1.9	SLAB	1x.6	4.2	4.8
14	22700	1.5	SLAB	1x.6	4.2	5.5
15	22930	1.5	SLAB	1x.6	3.8	4.5
16	23038	1.8	SLAB	1x.6	4.5	5.0
17	23218	1.8	SLAB	1 X 1.3	6.5	7.0
18	23700		PIPE	1 X 0.6	4.2	4.5
19	23886	1.5	SLAB	1x.6	4.0	5.5
20	25312		PIPE	1 X 0.6	5.0	5.2
21	26245	2.2	SLAB	1 X 1.4	5.1	6.4
22	26289	1.8	SLAB	1 X 1	4.3	5.5
23	26569		PIPE	1 X 0.6	5.0	5.3
24	27513	2.3	SLAB	1 X 1.1	6.1	7.5
25	27780	3.7	SLAB	1 X 3	6.6	7.5
26	27944		PIPE	1 X 0.6		6.0
27	28537		PIPE	1 X 0.6	5.1	6.2
28	28714	1.5	SLAB	1 X 0.5	5.3	6.5
29	28842	3.7	SLAB	1 X 2.8	6.5	7.5
30	28971		PIPE	1 X 0.6	4.9	5.1
31	29136	1.8	SLAB	1 X 0.6	4.4	4.9
32	30451		PIPE	1 X 0.6	4.5	4.8
33	30667		PIPE	1 X 0.6	5.0	5.4
34	30866	2.4	SLAB	1 X 1.2	6.4	6.7
35	31388		PIPE	1 X 0.6	4.2	5.0
36	31913		PIPE	1 X 0.6	5.0	5.8
37	32215	6.9	SLAB	1 X 5.5	5.3	6.0
38	32259	1.9	SLAB	1 X 0.7	5.8	6.2
39	32382	1.8	SLAB	1 X 0.7	5.8	6.2
40	32480	7.1	SLAB	1 X 6	5.7	7.5
41	32529	1.8	SLAB	1X 0.7	6.6	6.1
42	32857	1.8	SLAB	1X 0.7	5.7	5.1
43	33416		PIPE	1 X 0.6	4.8	5.1
44	34983		PIPE	1 X 0.6	4.1	6.2
45	34877	2	SLAB	1X 1.2	6.4	7.1
46	34661	2	SLAB	1 X 1.2	5.1	6

Sl. No.	Location (m.)	Length (m)	Type of Structures (Pipe, Slab, Box, Arch)	Span Arrangement and Total Ventway [No.x Length(m)]	Carriageway Width (m)	Width of Culvert (m)
47	34503		PIPE	1 X 0.6	4.4	5.9
48	36345		PIPE	1 X 1	4.7	5.7
49	36424	2.6	SLAB	2 X 2	5.3	7.3
50	36558	1.9	SLAB	1 X 1.1	4.7	5.9
51	36882	1.9	SLAB	1 X 1.3	4.8	5.7

12.0 Bus bays - Nil

13.0 Truck Lay byes - Nil

14.0 Roadside drains- Earthen drain on Hill side

15.0 Major Junctions

The details of major junctions are as follows:

Sl. No.	Location		At Grade	Separated	Category of Cross Roads			
	Existing Ch.	Design Ch.			NH	SH	MDR	Others
1	22+920	**3+780**	At-Grade				√	

16.0 Minor Junctions

The details of minor junctions are as follows:

S. No	Existing Chainage (Km)	Type	Type of junction	Place
1	21+800	At-Grade	Y	Mangley Village Road
2	22+325	At-Grade	Y	Nambrick Village Road

17.0 Bypasses

The details of bypasses are as follows:

S. No.	Name of Bypass (Town)	Road Segment	Existing Chainage		Length (km)	Carriageway	
			From (km)	To (km)		Width m)	Type
Nil							

18.0 Total number of structures on the Site

Total number of structures on the Site is noted below:

a)	Total No. of Major Bridges	-	Nil
b)	Total No. of Railway Over/Under Bridges	-	Nil
c)	Total No. of Minor Bridges	-	2
d)	Total No. of Pipe Culverts	-	14
e)	Total No. of Slab Culverts	-	37
f)	Total No. of Box Culverts	-	Nil
g)	Total No. of Flyovers	-	Nil
h)	Level Crossings	-	Nil
i)	Pedestrian Underpass-	-	Nil

19.0 **Built Up Locations**

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

Existing Chainage			Length in m	Village Name	District
Sr.No.	From	To			
1	15200	15800	600	Dentam	South
2	17120	18650	1530	Simkharka	South
3	19850	20160	310	Dodung	South
4	20700	20900	200	Bensimkharka	South
5	21450	21810	360	Ben Tthalabari	South
6	22420	22830	410	Ben Thaka	South
7	24950	25650	700	Cheerakh	South
8	26340	28700	2360	Rankey	South
9	29400	30650	1250	Ningaon	South
10	30950	31400	450	BhsiFatak	South

Annex - II
(Schedule - A)

Dates for providing Right of Way

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

S. No	From	To	Length	Total ROW Width (m)	Date of Providing ROW*
1	16+0	17+0	1000	24	Appointed Date
2	17+0	18+0	1000	24	Appointed Date
3	18+0	19+0	1000	24	Appointed Date
4	19+0	20+0	1000	24	Appointed Date
5	20+0	21+0	1000	24	Appointed Date
6	21+0	22+0	1000	24	Appointed Date
7	22+0	23+0	1000	24	Appointed Date
8	23+0	24+0	1000	24	Appointed Date
9	24+0	25+0	1000	24	Appointed Date
10	25+0	26+0	1000	24	Appointed Date
11	26+0	27+0	1000	24	Appointed Date
12	27+0	28+0	1000	24	Appointed Date
13	28+0	29+0	1000	24	Appointed Date
14	29+0	30+0	1000	24	Appointed Date
15	30+0	31+0	1000	24	Appointed Date
16	31+0	32+0	1000	24	Appointed Date
17	32+0	32+50	500	24	Appointed Date

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

Annex - III
(Schedule - A)

Alignment Plans

The existing alignment plan of the Project Highway is enclosed in digital form.

Annex - IV
(Schedule-A)

Environment Clearances

The project Highway does not require Environment Clearance as per MoEF corrigendum dated 22.08.2013.

In addition, the Stage-I Clearance is applied online dated 05.08.2016 which is likely to be received shortly. The Money will be deposited with MoEF for final approval on receipt of Stage-I clearance. Temporary working provision will be ensured before appointed date. All conditions imposed by MoEF while issuing the Approval in Principle(AIP) and final forest clearance(FC) to be adhered during construction stage and after construction stage are to be complied with.

The muck dumping sites in forest area stand identified and freezed by Forest department to be abided by agency during dumping of muck as stated in Schedule 'F'

SCHEDULE - B
(See Clause 2.1)

DEVELOPMENT OF THE PROJECT HIGHWAY

1 Development of the Project Highway

Development of the Project Highway shall include design and construction of the 2Lane with Paved shoulder Project Highway as described in this Schedule-B and in Schedule-C.

2 Rehabilitation and augmentation

Rehabilitation and augmentation shall include Two Laning with Paved Shoulder and strengthening of the Project Highway as described in Annex-I of this Schedule-B and in Schedule-C.

3 Specifications and Standards

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

- As per Government of Sikkim Gazette Notification, **Blasting** is not allowed for road formation widening work. In case of any special situation, controlled blasting can be resorted with the prior permission of the concerned District Administration after taking all necessary safety measures.
- Recovery of the Hard Rock. At least 50% quantity of the hard rock obtained from the road widening works is to be used for the Road Works. The cost effect of the same will be recovered in the running bill of the work as per the Government of Sikkim Notified Rates

Annex – I
(Schedule – B)

Project is construction/ improvement of the existing single lane road to two lane with paved shoulder in accordance with IRC-SP: 73:2015, IRC-SP: 48:1998 and other relevant codes including standard good practice of the road construction.

1. SCOPE OF THE PROJECT

1.1 GENERAL

The following sections of this schedule briefly highlight the scope of the work of the 'Project'. The descriptions of the requirements for the various elements of the Project Highway given herein under are the bare minimum requirements for the 'Project'.

In the planning, design and execution of the works and other works in connection with the repair, maintenance or improvement of the Project Highway and functions associated with the construction of the Project Highway and roadside facilities, the Construction Contractor shall take all such actions and do all such things (including, but not limiting to, organizing itself, adopting measures and standards, executing procedures, including inspection procedures and highway patrol's, and engaging and managing agents and employees) as will;

a. enable the NHIDCL to provide an acceptably safe highway in respect of its condition (structural safety) and use (road safety);

b. enable the NHIDCL to fulfill its statutory and common law obligations;

c. enable the NHIDCL to provide a congestion free uninterrupted flow of traffic on the Project Highway;

d. enable the NHIDCL to provide a level of highway service to the public not inferior to that provided on the trunk road during construction or improvement works;

e. enable the police, local authorities, and others with statutory duties or functions in relation to the Project Highway or adjoining roads to fulfill those duties and functions;

f. minimize the occurrence and adverse effects of accidents and ensure that all accidents and emergencies are responded to as quickly as possible;

g. minimize the risk of damage, destruction or disturbance to third party property;

h. ensure that members of the public are treated with all due courtesy and consideration;

i. provide a safe, clear and informative system of road signs;

j. comply with any specified programme requirements, including for the completion of the new road;

k. enable standards of reliability, durability, accessibility, maintainability, quality control and assurance, and fitness for purpose appropriate to a highway of the character of the Project Highway to be achieved throughout the Contract Period;

l. ensure adequate off-street parking facilities for both passenger and goods vehicles;

m. provide adequate bus bays for stopping of buses and bus shelters for commuters to wait under protection;

n. achieve a high standard in the appearance and aesthetic quality of the Project Highway and achieve integration of the Project Highway with the character of the surrounding landscape through both sensitive design and sensitive management of all visible elements including those on the existing road;

o. Undertake proper safety audit through an appropriate consultant (i.e. apart from the Independent Consultant) before C.O.D.;

p. Carry out accident recording and reporting (to NHIDCL) by type on regular basis; and

q. Ensure adequate safety of the Project Workers on the work site.

2 WIDENING OF THE EXISTING HIGHWAY

2.1 Notwithstanding the basic alignment plans enclosed with this document the Construction Contractor shall himself carryout and be responsible for engineering surveys, investigation and detailed engineering designs and prepare the working drawings for all the components relevant for the improvement and up-gradation of the Project Highway to fulfill the scope of the project as envisaged herein under. These shall comply with design specifications and standards given in Schedule–D. The designs for different project facilities shall follow the locations and indicative designs given in Schedule–C and shall comply with design specifications and standards outlined in Schedule–D. All the designs and drawings shall be reviewed by the Authority Engineer prior to execution Width of Carriageway

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

2.2 Width of Carriageway

2.2.1 The proposed 2-Lane Carriageway starts from Km 0+000 to Km 16+00 .The paved carriageway shall be 7.0m + 1.5m paved shoulder valley side +1.635m paved shoulder on hill side + 1.0 m Earthen shoulder /Parapet on Valley side +0.865 m road side on Hill side .

2.2.2 Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to paragraph 2.1 above.

3. GEOMETRIC DESIGN AND GENERAL FEATURES

3.1 General

Geometric design and general features of the Project Highway shall be in accordance with the relevant Sections of the Manuals for two laning

3.2 Design speed

The design speed shall be the minimum design speed of [30 km per hr for hilly and mountainous/steep terrain].

3.3 Improvement of the existing road geometrics

[Refer to paragraph 2.1 (v) of the Manual and provide details]

The hilly gradients shall be corrected in such a way so as to attain a limiting gradient of 6% in order to achieve longitudinal drainage. Also vertical curves shall be improved / introduced so that the vertical curves meet IRC: SP-73 - 2015 standards.

The horizontal alignment of the Project Highway shall be improved as per the standards set out in **Schedule–D.**

The improvement shall be done in consultation with the Independent consultant / Project Company ensuring that the proposed improvements are accommodated within the land width available as far as practical otherwise action to acquire more land shall be resorted to through NHIDCL.

In the following 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 proper road signs and safety measures shall be provided:

S. No.	From	To	Radius	Type of Deficiency	Remarks
1	19927.906	19946.48	20	Hair pin bend curve	Adopted Design Speed of 20 Kmph
2	19988.388	19997.74	20	Hair pin bend curve	Adopted Design Speed of 20 Kmph
3	24930.577	24936.42	20	Hair pin bend curve	Adopted Design Speed of 20 Kmph
4	24976.351	24988.08	20	Hair pin bend curve	Adopted Design Speed of 20 Kmph

The proposed horizontal and vertical alignment is available in digital format and this is for information and authority shall not be held responsible for any implications of the contract. EPC contractor shall carry out his own survey and investigations and due diligence both during bidding and during design and construction.

3.4 Right of Way

Details of Proposed ROW

As described in Annex-II of Schedule-A.

3.5 Type of shoulders

Paved shoulders of 1.5 m width on Valley side & 1.635 m width on Hillside shall be provided and balance 1.0m width on hill side Earthen shoulder.

3.6 Lateral and vertical clearances at Underpasses

Lateral and vertical clearances at underpasses and provision of guardrails/crash barriers shall be as per paragraph 2.11 of the Manual.

3.7 Lateral and vertical clearances at Overpasses

Lateral and vertical clearances at overpasses shall be as per paragraph 2.12 of the Manual.

3.8 Service roads - Nil

3.9 Grade separated structures

3.9.1 Grade separated structures shall be provided as per paragraph 2.14 of the Manual. The requisite particulars are given below:

[Refer to paragraphs 2.14.1 of the Manual and provide details]

S. No.	Design Chainage (Km)	Name of Intersecting Roads	Proposed Span Arrangement (m)	Remarks
Nil				

3.9.2 In the case of grade separated structures, the type of structure and the level of the Project Highway and the cross roads shall be as follows: [Refer to paragraphs 2.14.2 of the Manual and specify the type of vehicular under pass/ overpass structure and whether the cross road is to be carried at the existing level, raised or lowered].

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

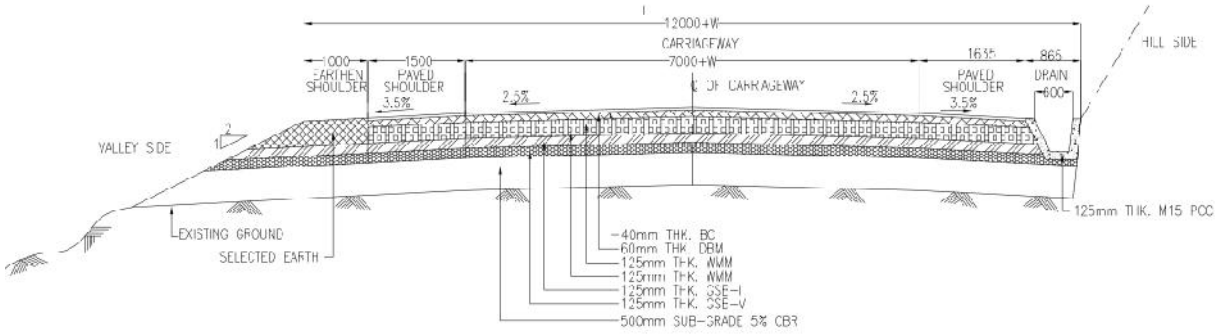
3.10 Cattle and pedestrian underpass /overpass

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

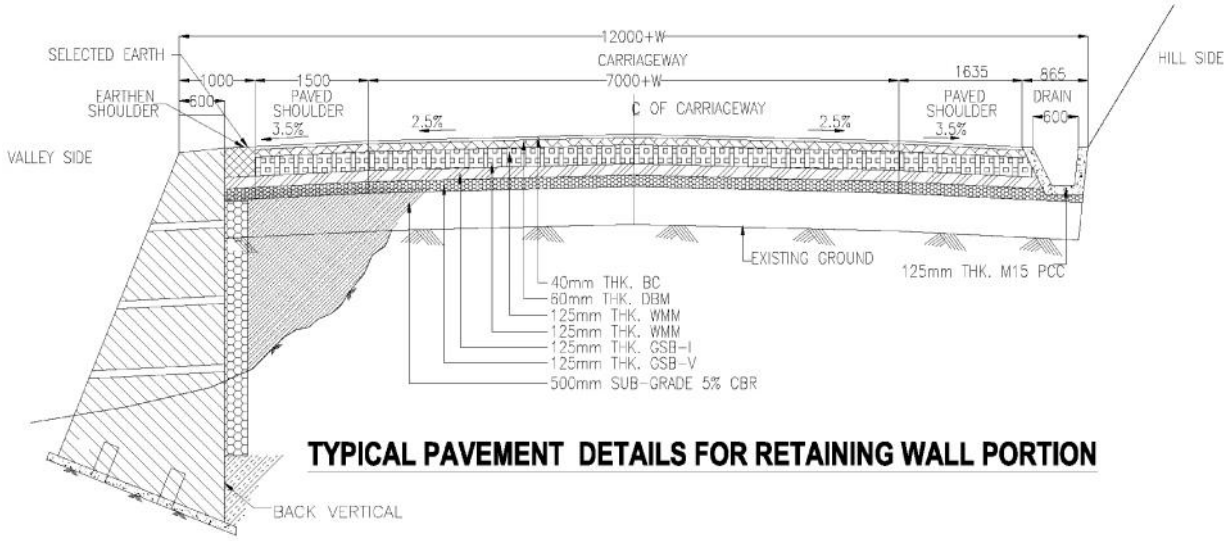
S. No.	Location	Type of crossing
Nil		

3.11 Typical cross-sections of the Project Highway

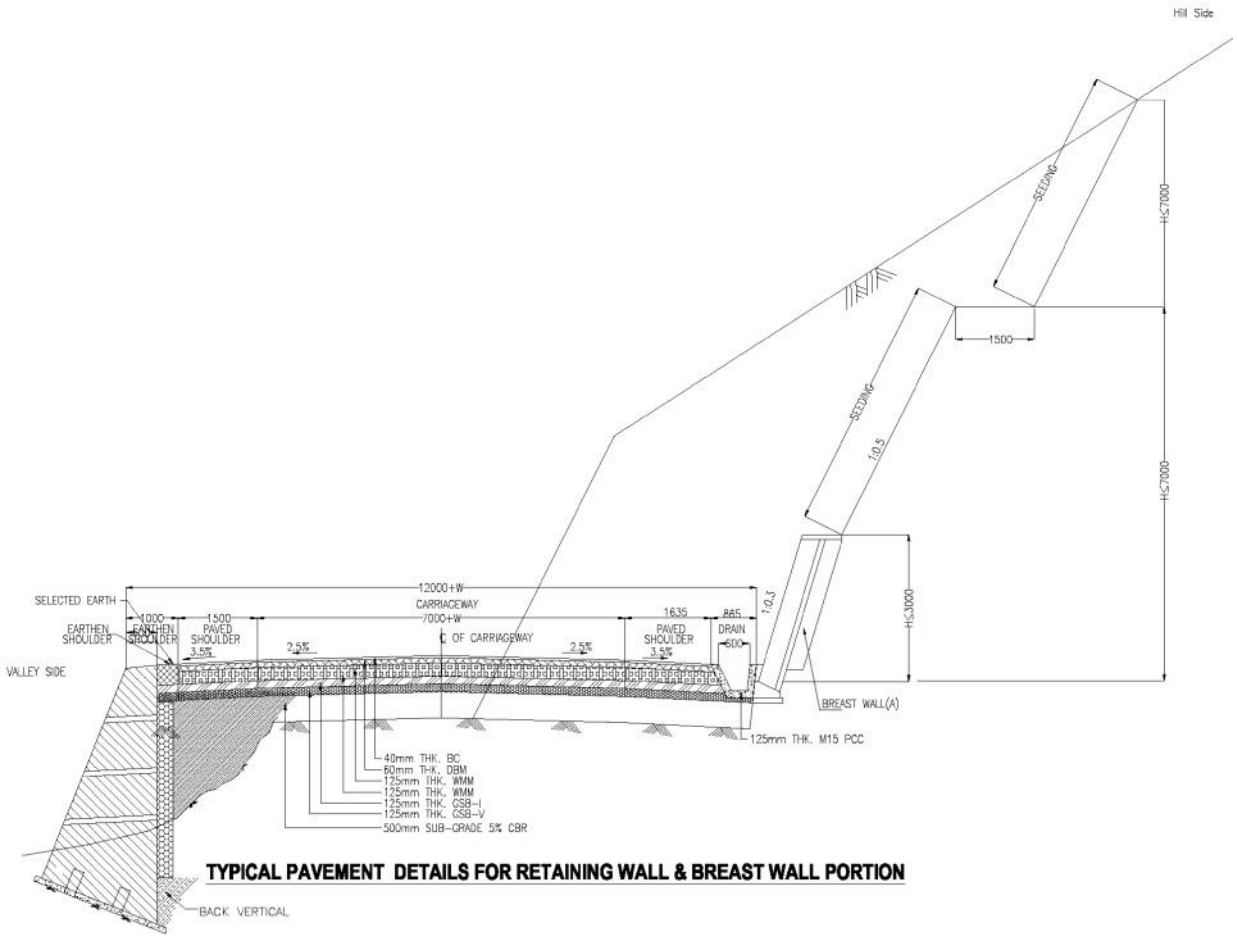
Approximate cross section type (tentative) suitable at various chainages of project highway is as shown below:



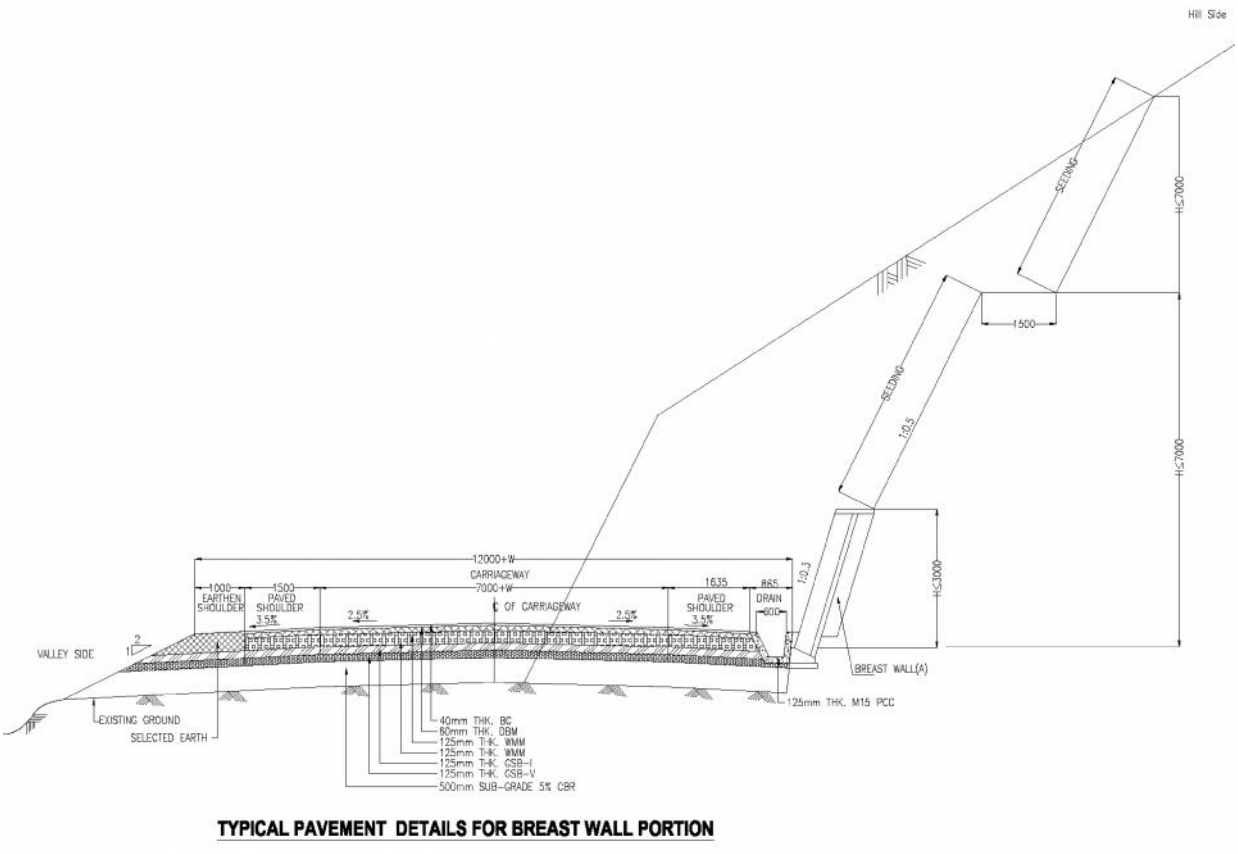
TCS 1- Typical Cross Section



TCS 2- Typical Cross Section



TCS 3- Typical Cross Section



TCS 4- Typical Cross Section

Sr. No.	Typical section	TCS No.	Remarks
1	Typical Cross section -1	TCS-1	General typical section of pavement
2	Typical Cross section -2	TCS-2	Ref clause No -8.1 & 8.2
3	Typical Cross section -3	TCS-3	Ref clause No -8.1 , 8.2 , 8.5 & 8.6
4	Typical Cross section -4	TCS-4	Ref clause No -8.5 & 8.6

3.12 Longitudinal Section

As a minimum, the Construction Contractor shall achieve the proposed finished road level as indicated in the plan and profile drawings for this purpose in FFSR. However, the final finished road levels (FRL) will be finalized as per site conditions in consultation with NHIDCL. The proposed profile of the Project Highway shall be followed by the contractor with minimum FRL as indicated in the alignment plan.

3.13 Built-Up Areas

Existing Chainage			Length in m	Village Name	District
Sr.No.	From	To			
1	15200	15800	600	Dentam	South
2	17120	18650	1530	Simkharka	South
3	19850	20160	310	Dodung	South
4	20700	20900	200	Bensimkharka	South
5	21450	21810	360	Ben Tthalabari	South
6	22420	22830	410	Ben Thaka	South
7	24950	25650	700	Cheerakh	South
8	26340	28700	2360	Rankey	South
9	29400	30650	1250	Ningaon	South
10	30950	31400	450	BhsiFatak	South

4 INTERSECTIONS AND GRADE SEPARATORS

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

[Refer to paragraphs 3.1.1, 3.1.2 and 3.3 of the Manual and specify the requirements. Explain where necessary with drawings/sketches/general arrangement].

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

(a) At-grade Major intersections

S. No	Existing Chainage (Km)	Design Chainage (Km)	Location	Proposed Structure	Remarks
Nil					

(b) Grade separated intersection with/without ramps

S. No.	Design Chainage (Km)	Road Leads To	Junction Type	Proposed Improvements
Nil				

(c) Major Intersections

Sr.No.	Design Chainage	Side	Remarks	Shape	Type
3	23310.00	LHS	Junction with Damthang Road	Y	Major

(d) Minor Intersections

Sr.No.	Design Chainage	Side	Remarks	Shape	Type
1	22175.00	RHS	Junction with Mangley Village Road	Y	Minor
2	22710.00	RHS	Junction with Nambrick Village Road	Y	Minor
3	32590.00	LHS	Army Camp Approach road	Y	Minor

5.0 ROAD EMBANKMENT AND CUT SECTION

5.1 Widening and improvement of the existing road embankment/cuttings and construction of new road embankment/ cuttings shall conform to the Specifications and Standards given in relevant sections of the Manuals and the specified cross sectional details. Deficiencies in the plan and profile of the existing road shall be corrected.

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

Sl No.	Section (km)		Length (km)	Extent of Raising*	Remarks
	From	To			
Nil					

* Difference between levels at proposed c/l and existing road/ground below proposed c/l

6.0 PAVEMENT DESIGN

6.1 Pavement design shall be carried out in accordance with relevant Sections of the Manuals.

6.2 Type of pavement

Flexible Pavement with Granular Sub-base (GSB) and Wet Mix Macadam (GSB) shall be designed as per IRC-37:2012.

6.3 Design requirements

6.3.1 Design Period and strategy

Flexible pavement shall be designed for a minimum design period of 15 years as per IRC-37:2012. Stage construction shall not be permitted.

6.3.2 Design Traffic

Notwithstanding anything to the contrary contained in this Agreement or the Manual, the Contractor shall design the pavement for design traffic of as given below:

From (Km)	To (Km)	Minimum Design Loading in terms of Million Standard Axles
16+00	32+50	10

6.3.3 Design Parameters

The flexible pavement for the main carriageway is a 2-lane carriageway having 1.5 m wide paved shoulder and 1.0 m wide earthen shoulder in some stretches. This shall be designed using the IRC 37: 2012 Method for the projected traffic levels and the following indicative design input parameters:

Indicative Design Parameters

(i)	Performance Period	15 years + Construction Period of 42 months
(ii)	Traffic on Design Lane	Minimum 10 msa as per IRC-SP-73. Design should take care of the maximum wheel load derived from the axle load survey on the design lane
(iii)	Design serviceability Loss	2.0
(iv)	Reliability	90%
(v)	Overall Standard Deviation	0.49
(vi)	Effective Roadblock Soil Resilient Modulus	Corresponding to 4-day soaked CBR value of 8.0% to 10.0%
(vii)	Layer Coefficients	As per the IRC 37 : 2012 procedures
(viii)	Drainage quality of Pavement	Good

6.3.4 The Project highway will be a light-trafficked section connecting the major arterial network of the country. The design exercise should therefore duly take into account the importance of the road, the performance level and the maintenance requirements during the performance period. The provision of Wet Mix Macadam (granular base)/cement-treated base/ sub-base (crushed stone only)/ subgrade layer(s) and the use of 60/70 Bitumen in bituminous base layers and polymer modified bitumen (PMB 40) in wearing course shall be considered while deciding about the composition of the pavement structure. The design should also accompany the Quality Assurance Plan (QAP) along with its implementation scheme for the construction of the pavement structure.

6.3.5 However, in case of a change in the pavement design at the detailed engineering stage, the same shall not be considered as a change in scope of work nor shall qualify for a variation order.

6.3.6 Paved shoulders of 1.5 m width shall have same thickness of the pavement as that of the

main carriageway with same composition as that of main carriageway for monolithic construction.

6.3.7 Contractor shall design the pavement for design traffic of 10 million standard axles (msa) corresponding subgrade CBR.

6.3.8 Rigid Pavement

No rigid pavement has been considered for the Project Highway.

6.4 Reconstruction of stretches

Total Project Road shall be considered as reconstruction from sub—grade level as per IRC-37-2012.

7 ROADSIDE DRAINAGE

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

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

7.1 Road side Drainage Measures

Following measures shall be adopted:

i) Open side V shape drains at the hill side for widening at hill sides and both sides in realignment stretches by hill cut.

Open side V shape cross section drain shall be provided on hill sides of the project highway in order to intercept surface water from the carriageway, shoulders and hill slopes. Trapezoidal Lined drains have slopes also been proposed in urban/semi urban/intersection stretches. The concrete drains shall be covered in reaches along commercial establishments and intersections. The drains outfall into the natural water courses i.e. either in culverts or bridges. Table below gives the location of lined drains.

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

Sr.No.	Chainage in m		Length	Type	Remarks
	From	To			
1	16000	17790	1790	Type-1	V shape Drain
2	17790	19285	1495	Type-2	Trapezoidal Drain
3	19285	20280	995	Type-1	V shape Drain
4	20280	20585	305	Type-2	Trapezoidal Drain
5	20585	21100	515	Type-1	V shape Drain

Sr.No.	Chainage in m		Length	Type	Remarks
	From	To			
6	21100	21195	95	Type-2	Trapezoidal Drain
7	21195	21840	645	Type-1	V shape Drain
8	21840	22230	390	Type-2	Trapezoidal Drain
9	22230	22795	565	Type-1	V shape Drain
10	22795	23195	400	Type-2	Trapezoidal Drain
11	23195	25190	1995	Type-1	V shape Drain
12	25190	25835	645	Type-2	Trapezoidal Drain
13	25835	26470	635	Type-1	V shape Drain
14	26470	28610	2140	Type-2	Trapezoidal Drain
15	28610	29295	685	Type-1	V shape Drain
16	29295	30500	1205	Type-2	Trapezoidal Drain
17	30500	30800	300	Type-1	V shape Drain
18	30800	31245	445	Type-2	Trapezoidal Drain
19	31245	32500	1255	Type-1	V shape Drain

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

7.2 Chutes

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

Sr.No.	Chainage	Clear Width of Chute	Length of Chute	Remarks
1	17384.00	1.85	20	Type-1
2	17630.00	1.85	20	Type-1
3	17881.00	1.85	20	Type-1
4	17910.00	3.2	20	Type-3
5	18087.00	1.85	20	Type-1
6	18525.00	2.70	20	Type-2
7	20197.00	1.85	20	Type-1
8	20623.00	2.70	20	Type-2

Sr.No.	Chainage	Clear Width of Chute	Length of Chute	Remarks
9	21081.00	1.85	20	Type-1
10	26130.00	3.2	20	Type-3
11	26280.00	1.85	20	Type-1
12	26385.00	1.85	20	Type-1
13	27025.00	2.70	20	Type-2
14	27555.00	1.85	20	Type-1
15	27798.00	1.85	20	Type-1
16	27947.00	2.70	20	Type-2
17	28005.00	1.85	20	Type-1
18	28163.00	1.85	20	Type-1
19	28465.00	3.2	20	Type-3
20	28624.00	1.85	20	Type-1
21	28746.00	1.85	20	Type-1
22	29031.00	3.2	20	Type-3
23	31253.00	1.85	20	Type-1
24	31303.00	1.85	20	Type-1
25	31405.00	3.2	20	Type-3
26	31696.00	1.85	20	Type-1
27	32311.00	1.85	20	Type-1

7.3 Drain on valley side at Box Cutting portion – 1400 m V shaped drain.

As per plan & Profile drawing

7.4 Catch water drain - 1800 m V shaped drain

Location will be finalized during construction stage as per site conditions in consultation with NHIDCL / AE

8 SLOPE PROTECTION MEASURES

8.1 Retaining wall

Slope protection along valley side shall be RRM retaining wall height from 3 m to 6 m

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
1	17885.00	17895.00	10	3	RHS
2	17895.00	17905.00	10	3	RHS
3	19745.00	19755.00	10	3	RHS
4	19755.00	19765.00	10	3	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
5	19765.00	19775.00	10	4	RHS
6	19775.00	19785.00	10	3	RHS
7	19785.00	19795.00	10	4	RHS
8	19795.00	19805.00	10	4	RHS
9	19805.00	19815.00	10	5	RHS
10	19815.00	19825.00	10	6	RHS
11	19825.00	19835.00	10	6	RHS
12	19835.00	19845.00	10	5	RHS
13	19845.00	19855.00	10	5	RHS
14	19855.00	19865.00	10	6	RHS
15	19875.00	19885.00	10	3	LHS
16	19885.00	19895.00	10	3	LHS
17	19895.00	19905.00	10	3	LHS
18	19895.00	19905.00	10	6	RHS
19	19905.00	19915.00	10	3	LHS
20	19905.00	19915.00	10	6	RHS
21	19915.00	19925.00	10	6	RHS
22	19925.00	19935.00	10	6	RHS
23	19995.00	20005.00	10	3	RHS
24	20505.00	20515.00	10	3	RHS
25	20515.00	20525.00	10	3	RHS
26	20615.00	20625.00	10	3	RHS
27	20625.00	20635.00	10	3	RHS
28	20935.00	20945.00	10	4	RHS
29	20945.00	20955.00	10	3	RHS
30	21645.00	21655.00	10	3	RHS
31	21655.00	21665.00	10	3	RHS
32	21665.00	21675.00	10	3	RHS
33	21675.00	21685.00	10	3	RHS
34	21705.00	21715.00	10	3	RHS
35	22675.00	22685.00	10	3	RHS
36	23155.00	23165.00	10	3	RHS
37	23165.00	23175.00	10	4	RHS
38	23215.00	23225.00	10	3	RHS
39	23225.00	23235.00	10	3	RHS
40	25125.00	25135.00	10	5	RHS
41	25135.00	25145.00	10	5	RHS
42	25185.00	25195.00	10	4	RHS
43	25195.00	25205.00	10	4	RHS
44	25255.00	25265.00	10	3	RHS
45	25265.00	25275.00	10	4	RHS
46	25355.00	25365.00	10	3	RHS
47	25365.00	25375.00	10	3	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
48	26025.00	26035.00	10	3	RHS
49	26115.00	26125.00	10	5	RHS
50	26135.00	26145.00	10	5	RHS
51	26365.00	26375.00	10	4	RHS
52	26375.00	26385.00	10	4	RHS
53	27515.00	27525.00	10	3	RHS
54	27545.00	27555.00	10	5	RHS
55	27555.00	27565.00	10	3	RHS
56	27755.00	27765.00	10	3	RHS
57	27765.00	27775.00	10	6	RHS
58	27785.00	27795.00	10	4	LHS
59	27795.00	27805.00	10	5	LHS
60	27805.00	27815.00	10	3	LHS
61	27815.00	27825.00	10	3	LHS
62	27815.00	27825.00	10	4	RHS
63	27825.00	27835.00	10	4	RHS
64	27835.00	27845.00	10	4	RHS
65	27845.00	27855.00	10	5	RHS
66	27855.00	27865.00	10	5	RHS
67	27865.00	27875.00	10	5	RHS
68	27875.00	27885.00	10	5	RHS
69	27895.00	27905.00	10	4	RHS
70	27905.00	27915.00	10	3	RHS
71	27935.00	27945.00	10	3	LHS
72	27975.00	27985.00	10	3	LHS
73	27995.00	28005.00	10	5	LHS
74	28005.00	28015.00	10	5	LHS
75	28025.00	28035.00	10	4	RHS
76	28035.00	28045.00	10	4	RHS
77	28045.00	28055.00	10	4	RHS
78	28055.00	28065.00	10	4	RHS
79	28065.00	28075.00	10	4	RHS
80	28075.00	28085.00	10	3	RHS
81	28085.00	28095.00	10	3	RHS
82	28095.00	28105.00	10	5	RHS
83	28105.00	28115.00	10	4	RHS
84	28115.00	28125.00	10	3	RHS
85	28125.00	28135.00	10	3	RHS
86	28135.00	28145.00	10	3	RHS
87	28145.00	28155.00	10	4	RHS
88	28155.00	28165.00	10	3	LHS
89	28165.00	28175.00	10	3	LHS
90	28725.00	28735.00	10	3	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
91	28745.00	28755.00	10	4	RHS
92	29375.00	29385.00	10	4	RHS
93	29395.00	29405.00	10	3	RHS
94	29425.00	29435.00	10	3	RHS
95	29435.00	29445.00	10	3	RHS
96	29765.00	29775.00	10	3	RHS
97	29775.00	29785.00	10	3	RHS
98	29885.00	29895.00	10	3	RHS
99	30055.00	30065.00	10	3	RHS
100	30285.00	30295.00	10	3	RHS
101	30295.00	30305.00	10	3	RHS
102	30305.00	30315.00	10	3	RHS
103	30315.00	30325.00	10	3	RHS
104	30355.00	30365.00	10	3	RHS
105	30365.00	30375.00	10	3	RHS
106	30385.00	30395.00	10	3	RHS
107	30395.00	30405.00	10	3	RHS
108	32045.00	32055.00	10	3	RHS
109	32325.00	32335.00	10	3	RHS
110	32505.00	32515.00	10	3	RHS
111	32515.00	32525.00	10	3	RHS

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

8.2 Details of Reinforced Earth Wall locations: (Specification detailed Schedule D)

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
1	16245.00	16255.00	10	12	RHS
2	17975.00	17985.00	10	12	RHS
3	19865.00	19875.00	10	8	RHS
4	19875.00	19885.00	10	12	RHS
5	19885.00	19895.00	10	12	RHS
6	20505.00	20515.00	10	10	LHS
7	26125.00	26135.00	10	8	RHS
8	27775.00	27785.00	10	6	RHS
9	27785.00	27795.00	10	10	RHS
10	27795.00	27805.00	10	10	RHS
11	27805.00	27815.00	10	6	RHS
12	27885.00	27895.00	10	6	RHS
13	27925.00	27935.00	10	6	RHS
14	27935.00	27945.00	10	6	RHS
15	27945.00	27955.00	10	6	LHS
16	27945.00	27955.00	10	10	RHS
17	27955.00	27965.00	10	12	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
18	27965.00	27975.00	10	10	RHS
19	27975.00	27985.00	10	10	RHS
20	27985.00	27995.00	10	10	RHS
21	27995.00	28005.00	10	8	RHS
22	28005.00	28015.00	10	10	RHS
23	28015.00	28025.00	10	8	RHS
24	28155.00	28165.00	10	8	RHS
25	28165.00	28175.00	10	6	RHS
26	28455.00	28465.00	10	8	RHS
27	28465.00	28475.00	10	8	RHS
28	28735.00	28745.00	10	6	RHS
29	31625.00	31635.00	10	10	RHS
30	32315.00	32325.00	10	10	RHS

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

8.3 Toe wall

The requirement of the Toe walls is generated only when the road has been in use and problems of the slope line have been identified. These are proposed at locations having hill with steep slope & height of filling are more and retaining wall height more than 6.0 m along with valley side toe protection.

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
1	16245.00	16255.00	10	3	RHS
2	16245.00	16255.00	10	2	RHS
3	17395.00	17405.00	10	2	RHS
4	17405.00	17415.00	10	2	RHS
5	17415.00	17425.00	10	3	RHS
6	17425.00	17435.00	10	2	RHS
7	17435.00	17445.00	10	2	RHS
8	17695.00	17705.00	10	2	LHS
9	17795.00	17805.00	10	2	RHS
10	17805.00	17815.00	10	2	RHS
11	17875.00	17885.00	10	2	RHS
12	17905.00	17915.00	10	3	RHS
13	17965.00	17975.00	10	2	RHS
14	17975.00	17985.00	10	3	RHS
15	17975.00	17985.00	10	2	RHS
16	18005.00	18015.00	10	2	RHS
17	18085.00	18095.00	10	3	RHS
18	18985.00	18995.00	10	2	RHS
19	19265.00	19275.00	10	2	RHS
20	19395.00	19405.00	10	2	RHS
21	19455.00	19465.00	10	3	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
22	19725.00	19735.00	10	2	RHS
23	19735.00	19745.00	10	2	RHS
24	19875.00	19885.00	10	3	RHS
25	19885.00	19895.00	10	3	RHS
26	19885.00	19895.00	10	2	RHS
27	19925.00	19935.00	10	2	LHS
28	19995.00	20005.00	10	3	LHS
29	20005.00	20015.00	10	3	RHS
30	20495.00	20505.00	10	3	RHS
31	20575.00	20585.00	10	2	RHS
32	20975.00	20985.00	10	2	RHS
33	21145.00	21155.00	10	2	RHS
34	21255.00	21265.00	10	2	RHS
35	21625.00	21635.00	10	2	RHS
36	21635.00	21645.00	10	2	RHS
37	21685.00	21695.00	10	3	RHS
38	21695.00	21705.00	10	2	RHS
39	21715.00	21725.00	10	2	RHS
40	21725.00	21735.00	10	3	RHS
41	21745.00	21755.00	10	2	RHS
42	21755.00	21765.00	10	2	RHS
43	21785.00	21795.00	10	2	RHS
44	21795.00	21805.00	10	2	RHS
45	21835.00	21845.00	10	2	RHS
46	21895.00	21905.00	10	2	RHS
47	22425.00	22435.00	10	2	RHS
48	22575.00	22585.00	10	3	RHS
49	22655.00	22665.00	10	2	RHS
50	22665.00	22675.00	10	2	RHS
51	22775.00	22785.00	10	3	RHS
52	22785.00	22795.00	10	2	RHS
53	22795.00	22805.00	10	2	RHS
54	22805.00	22815.00	10	3	RHS
55	22885.00	22895.00	10	2	RHS
56	22945.00	22955.00	10	3	RHS
57	22955.00	22965.00	10	2	RHS
58	22965.00	22975.00	10	2	RHS
59	22975.00	22985.00	10	3	RHS
60	22985.00	22995.00	10	2	RHS
61	23145.00	23155.00	10	2	RHS
62	23175.00	23185.00	10	2	RHS
63	23185.00	23195.00	10	2	RHS
64	23195.00	23205.00	10	2	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
65	23205.00	23215.00	10	2	RHS
66	23235.00	23245.00	10	3	RHS
67	23255.00	23265.00	10	3	RHS
68	23265.00	23275.00	10	2	RHS
69	23275.00	23285.00	10	2	RHS
70	23285.00	23295.00	10	2	RHS
71	23295.00	23305.00	10	2	RHS
72	23305.00	23315.00	10	2	RHS
73	23315.00	23325.00	10	2	RHS
74	23325.00	23335.00	10	2	RHS
75	23345.00	23355.00	10	2	RHS
76	23355.00	23365.00	10	3	RHS
77	23365.00	23375.00	10	2	RHS
78	23515.00	23525.00	10	2	RHS
79	24925.00	24935.00	10	3	RHS
80	25005.00	25015.00	10	3	RHS
81	25015.00	25025.00	10	2	RHS
82	25025.00	25035.00	10	2	RHS
83	25055.00	25065.00	10	2	RHS
84	25065.00	25075.00	10	2	RHS
85	25075.00	25085.00	10	2	RHS
86	25145.00	25155.00	10	3	RHS
87	25175.00	25185.00	10	3	RHS
88	25205.00	25215.00	10	3	RHS
89	25215.00	25225.00	10	2	RHS
90	25225.00	25235.00	10	2	RHS
91	25235.00	25245.00	10	3	RHS
92	25245.00	25255.00	10	2	RHS
93	25345.00	25355.00	10	3	RHS
94	25375.00	25385.00	10	2	RHS
95	25385.00	25395.00	10	3	RHS
96	25395.00	25405.00	10	3	RHS
97	25405.00	25415.00	10	2	RHS
98	25465.00	25475.00	10	2	RHS
99	26085.00	26095.00	10	2	RHS
100	26095.00	26105.00	10	2	RHS
101	26105.00	26115.00	10	2	RHS
102	26145.00	26155.00	10	3	RHS
103	26155.00	26165.00	10	2	RHS
104	26355.00	26365.00	10	2	RHS
105	26385.00	26395.00	10	2	RHS
106	27505.00	27515.00	10	3	RHS
107	27525.00	27535.00	10	2	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
108	27915.00	27925.00	10	2	RHS
109	27955.00	27965.00	10	3	RHS
110	27955.00	27965.00	10	2	RHS
111	27985.00	27995.00	10	2	LHS
112	28015.00	28025.00	10	2	LHS
113	28185.00	28195.00	10	2	RHS
114	28255.00	28265.00	10	2	RHS
115	28265.00	28275.00	10	3	RHS
116	28275.00	28285.00	10	3	RHS
117	28285.00	28295.00	10	3	RHS
118	28295.00	28305.00	10	3	RHS
119	28305.00	28315.00	10	2	RHS
120	28445.00	28455.00	10	2	RHS
121	28475.00	28485.00	10	3	RHS
122	28625.00	28635.00	10	3	RHS
123	28635.00	28645.00	10	2	RHS
124	29055.00	29065.00	10	3	RHS
125	29185.00	29195.00	10	3	RHS
126	29195.00	29205.00	10	3	RHS
127	29225.00	29235.00	10	2	RHS
128	29385.00	29395.00	10	2	RHS
129	29415.00	29425.00	10	2	RHS
130	29445.00	29455.00	10	3	RHS
131	29475.00	29485.00	10	2	RHS
132	29485.00	29495.00	10	2	RHS
133	29495.00	29505.00	10	3	RHS
134	29505.00	29515.00	10	2	RHS
135	29515.00	29525.00	10	2	RHS
136	29705.00	29715.00	10	2	RHS
137	29785.00	29795.00	10	2	RHS
138	29795.00	29805.00	10	2	RHS
139	29805.00	29815.00	10	2	RHS
140	29815.00	29825.00	10	3	RHS
141	29895.00	29905.00	10	3	RHS
142	29945.00	29955.00	10	3	RHS
143	29955.00	29965.00	10	3	RHS
144	29965.00	29975.00	10	2	RHS
145	29975.00	29985.00	10	2	RHS
146	29985.00	29995.00	10	3	RHS
147	30005.00	30015.00	10	2	RHS
148	30015.00	30025.00	10	3	RHS
149	30025.00	30035.00	10	2	RHS
150	30035.00	30045.00	10	2	RHS

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
151	30045.00	30055.00	10	3	RHS
152	30065.00	30075.00	10	2	RHS
153	30075.00	30085.00	10	2	RHS
154	30085.00	30095.00	10	2	RHS
155	30135.00	30145.00	10	2	RHS
156	30145.00	30155.00	10	2	RHS
157	30155.00	30165.00	10	2	RHS
158	30165.00	30175.00	10	2	RHS
159	30175.00	30185.00	10	2	RHS
160	30185.00	30195.00	10	2	RHS
161	30195.00	30205.00	10	2	RHS
162	30205.00	30215.00	10	2	RHS
163	30225.00	30235.00	10	2	RHS
164	30235.00	30245.00	10	2	RHS
165	30245.00	30255.00	10	2	RHS
166	30255.00	30265.00	10	3	RHS
167	30275.00	30285.00	10	2	RHS
168	30325.00	30335.00	10	2	RHS
169	30335.00	30345.00	10	2	RHS
170	30345.00	30355.00	10	3	RHS
171	30375.00	30385.00	10	3	RHS
172	30405.00	30415.00	10	3	RHS
173	30425.00	30435.00	10	2	RHS
174	30465.00	30475.00	10	2	RHS
175	31445.00	31455.00	10	2	RHS
176	31695.00	31705.00	10	2	RHS
177	32485.00	32495.00	10	3	RHS
178	32495.00	32505.00	10	3	RHS
179	32615.00	32625.00	10	3	RHS
180	32785.00	32795.00	10	3	RHS
181	32825.00	32835.00	10	2	RHS
182	32835.00	32845.00	10	2	RHS
183	32845.00	32855.00	10	3	RHS
184	32855.00	32865.00	10	2	RHS
185	32885.00	32895.00	10	2	RHS
			1850.000		

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

8.4 Gabion Wall:

The requirement of the Gabion wall is generated only where the road is aligned along a saddle portion, Near bus stand & river bank or a nallah (stream) slope failure and erosion of toe has also to be prevented and valley side slope made stable These are proposed at locations having hill with steep slope, having soil matrix Soil Mixed with Boulders and sharp

curve portion. It is also proposed where the road side excavated spoils dumping area and embankment toe.

Sr.No.	CHAINAGE		LENGTH in m	HEIGHT in m	REMARKS
	FROM	TO			
1	20645	20980	335	3	Disposal Yard on RHS
2	22215	22325	110	3	Sinking Portion
3	32210	32660	450	2	Disposal Yard on RHS
			895.000		

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

8.5 Breast Wall:

The requirement of the breast walls is generated only when the road has been in use and problems of the slope line have been identified. These are proposed at locations having hill with steep slope, having soil matrix Soil Mixed with Boulders and sharp curve portion. It is also proposed where the rain water spills all around causing mud flow.

Sr.No.	Chainage		Length in m	Height in m	Side	Remarks
	From	To				
1	16000	16050	50.00	2.00	LHS	
2	17205	17240	35.00	2.00	LHS	
3	18775	18880	105.00	2.00	LHS	
4	18995	19015	20.00	2.00	LHS	
5	19305	19345	40.00	3.00	LHS	
6	19450	19525	75.00	3.00	LHS	
7	19600	19680	80.00	2.00	LHS	
8	19730	19975	245.00	3.00	LHS	
9	20690	20730	40.00	2.00	LHS	
10	21105	21140	35.00	3.00	LHS	
11	21280	21330	50.00	2.00	LHS	
12	22155	22195	40.00	2.00	RHS	Junction with Mangley Village Road
13	22690	22730	40.00	2.00	RHS	Junction with Nambrick Village Road
14	23290	23330	40.00	2.00	LHS	Junction with Damthang Road
15	25585	25650	65.00	2.00	LHS	
16	32570	32610	40.00	3.00	LHS	Army Camp Approach road

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

8.6 Cut Slope wall :

Slope protection along hill side to protect the public properties and soil exposed face on hill side Height of wall varies from 3m to 5.0 m and shall be constructed with M 15 PCC .Length of wall – 7500 m

Location will be finalized during construction stage as per site conditions in consultation with NHIDCL / AE

8.7 Vetiver Plantation, Hydro Seeding and Hydro Mulching etc or similar works is to be done for slope protection and site mitigation measure upto a height of 12-15 m all along the slopes in each cutting locations except hard rock location which needs to be protected with appropriate applicable technologies, if required.

8.8 Turfing with Sods on hill side slope shall be as per MoRTH Specifications

9.0 DESIGN OF STRUCTURES

9.1 General

9.1.1 All bridges and structures shall be designed and constructed in accordance with section 7 of the Manual and shall conform to the cross sectional features and other details specified in MoRTH circular No: RW/NH/33044/2/88-S&R dated 24.03.2009 (for 2 lane structures as 12.9m without) and shall conform to the cross sectional features and other details specified in IRC:SP:84-2014 The culverts shall be designed and constructed in accordance with section 7 of the Manuals.

The following guidelines shall be followed:

i) All the cross drainage structures for the new carriageway shall be designed in such a way so that the outer most face of railing/parapet shall be in line with the out most edge of shoulder.

ii) The existing culverts shall be extended to match the new road cross sections.

iii) The adequacy of the vent size for all culverts/bridges shall be ascertained through detailed hydrological surveys and finalized in consultation with the IC/Project Company. The highest flood level/maximum supply level shall be properly assessed after collecting flood histories form local authorities/interviews with locals/irrigation authorities.

iv) For drainage purpose the new/to be reconstructed box culverts of minimum span 2.0 m shall be provided.

v) Suitable river training works, bank protection and embankment protection works ensuring safety of bridge structure and its approaches against damage by flood water / rain water shall be provided.

The cross drainage plan of the highway shall be finalized in consultation with IC/Project Company and if required additional culverts shall be provided.

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

9.1.2 All bridges shall be high-level bridges.

9.1.3 All bridges shall be designed to carry utility services

9.2 Culverts

9.2.1 Overall width of all culverts shall be equal to the roadway width of the approaches as per TCS at that particular location.

Proposed Culvert:

Sr. No.	Chainage (m)	Curve/ Straight	Radius	Type	Span X Depth	Remarks
1	16194	S	1000	BOX-TYPE-1	2 X 2	Proposed
2	16484	C	60	BOX-TYPE-2	3 X 3	Proposed
3	18900	S	272	BOX-TYPE-1	2 X 2	Proposed
4	19209	S	INFINITY	BOX-TYPE-1	2 X 2	Proposed
5	19718	S	-326	BOX-TYPE-1	2 X 2	Proposed
6	21447	S	-397	BOX-TYPE-3	4 X 4	Proposed
7	21739	C	-55	BOX-TYPE-1	2 X 2	Proposed
8	22147	C	-104	HPC-TYPE-2	1.2 X D NP4	Proposed
9	22927	S	INFINITY	BOX-TYPE-1	2 X 2	Proposed
10	23220	C	45	HPC-TYPE-2	1.2 X D NP4	Proposed
11	23327	C	58	BOX-TYPE-1	2 X 2	Proposed
12	23882	S	INFINITY	BOX-TYPE-2	3 X 3	Proposed
13	24521	S	30	HPC-TYPE-1	1.2 X D NP4	Proposed
14	25071	C	45	BOX-TYPE-1	2 X 2	Proposed
15	25315	S	1205	HPC-TYPE-1	1.2 X D NP4	Proposed
16	25577	C	31	HPC-TYPE-2	1.2 X D NP4	Proposed
17	25921	C	45	HPC-TYPE-2	1.2 X D NP4	Proposed
18	27180	S	1542	HPC-TYPE-1	1.2 X D NP4	Proposed
19	29386	C	112	BOX-TYPE-1	2 X 2	Proposed
20	29678	C	50	BOX-TYPE-1	2 X 2	Proposed
21	29882	S	-60	BOX-TYPE-1	2 X 2	Proposed
22	30162	S	INFINITY	BOX-TYPE-1	2 X 2	Proposed
23	31056	S	INFINITY	BOX-TYPE-1	2 X 2	Proposed
24	31696	S	65	BOX-TYPE-1	2 X 2	Proposed
25	32911	S	126	HPC-TYPE-1	1.2 X D NP4	Proposed

Reconstruction of culvert

Sr. No.	Chainage (m)	Curve/ Straight	Radius	Type	Span X Depth	Remarks
1	16733	C	144	BOX-TYPE-1	2 X 2	Re-construction
2	16785	S	INFINITY	HPC-TYPE-1	1.2 X D NP4	Re-construction
3	17014	S	65	HPC-TYPE-1	1.2 X D NP4	Re-construction
4	17044	S	INFINITY	HPC-TYPE-1	1.2 X D NP4	Re-construction
5	17277	S	30	HPC-TYPE-1	1.2 X D NP4	Re-construction
6	17384	C	80	BOX-TYPE-2	3 X 3	Re-construction
7	17630	C	60	BOX-TYPE-4	6 X 4	Re-construction
8	17881	C	66	BOX-TYPE-1	2 X 2	Re-construction
9	17910	C	64	BOX-TYPE-1	2 X 2	Re-construction
10	18087	C	70	BOX-TYPE-2	3 X 3	Re-construction
11	18189	S	45	HPC-TYPE-1	1.2 X D NP4	Re-construction
12	18525	S	30	BOX-TYPE-3	4 X 4	Re-construction
13	20197	S	36	BOX-TYPE-4	6 X 4	Re-construction
14	20288	C	-60	HPC-TYPE-2	1.2 X D NP4	Re-construction
15	20505	C	-45	HPC-TYPE-2	1.2 X D NP4	Re-construction
16	20623	S	45	BOX-TYPE-3	4 X 4	Re-construction
17	21081	S	INFINITY	BOX-TYPE-1	2 X 2	Re-construction
18	21391	C	40	HPC-TYPE-2	1.2 X D NP4	Re-construction
19	22434	C	70	HPC-TYPE-2	1.2 X D NP4	Re-construction
20	22581	S	76	HPC-TYPE-1	1.2 X D NP4	Re-construction
21	23364	S	526	HPC-TYPE-1	1.2 X D NP4	Re-construction
22	23423	S	INFINITY	HPC-TYPE-1	1.2 X D NP4	Re-construction
23	23553	C	216	HPC-TYPE-2	1.2 X D NP4	Re-construction
24	23721	C	60	HPC-TYPE-2	1.2 X D NP4	Re-construction
25	24131	S	2454	HPC-TYPE-1	1.2 X D NP4	Re-construction
26	24411	S	30	HPC-TYPE-1	1.2 X D NP4	Re-construction
27	24627	S	63	HPC-TYPE-1	1.2 X D NP4	Re-construction
28	24682	S	30	HPC-TYPE-1	1.2 X D NP4	Re-construction
29	26130	C	30	BOX-TYPE-3	4 X 4	Re-construction
30	26280	C	30	BOX-TYPE-2	3 X 3	Re-construction
31	26385	S	30	BOX-TYPE-2	3 X 3	Re-construction
32	26437	S	INFINITY	HPC-TYPE-1	1.2 X D NP4	Re-construction
33	26705	S	INFINITY	HPC-TYPE-1	1.2 X D NP4	Re-construction
34	26797	C	65	HPC-TYPE-2	1.2 X D NP4	Re-construction
35	27025	C	30	BOX-TYPE-3	4 X 4	Re-construction
36	27555	C	30	BOX-TYPE-2	3 X 3	Re-construction
37	27798	C	30	BOX-TYPE-3	4 X 4	Re-construction
38	27947	C	47	BOX-TYPE-1	2 X 2	Re-construction
39	28005	S	45	BOX-TYPE-2	3 X 3	Re-construction
40	28163	C	35	BOX-TYPE-3	4 X 4	Re-construction
41	28465	C	30	BOX-TYPE-2	3 X 3	Re-construction

Sr. No.	Chainage (m)	Curve/ Straight	Radius	Type	Span X Depth	Remarks
42	28624	C	59	BOX-TYPE-2	3 X 3	Re-construction
43	28746	C	30	BOX-TYPE-2	3 X 3	Re-construction
44	28871	C	30	HPC-TYPE-2	1.2 X D NP4	Re-construction
45	29031	S	217	BOX-TYPE-1	2 X 2	Re-construction
46	30298	S	INFINITY	HPC-TYPE-1	1.2 X D NP4	Re-construction
47	30518	S	211	HPC-TYPE-1	1.2 X D NP4	Re-construction
48	30714	S	340	HPC-TYPE-1	1.2 X D NP4	Re-construction
49	31253	S	INFINITY	BOX-TYPE-1	2 X 2	Re-construction
50	31303	C	45	BOX-TYPE-1	2 X 2	Re-construction
51	31405	S	65	BOX-TYPE-1	2 X 2	Re-construction
52	31488	S	309	BOX-TYPE-1	2 X 2	Re-construction
53	31668	S	503	HPC-TYPE-1	1.2 X D NP4	Re-construction
54	32046	C	60	HPC-TYPE-2	1.2 X D NP4	Re-construction
55	32091	S	INFINITY	HPC-TYPE-1	1.2 X D NP4	Re-construction
56	32212	C	93	HPC-TYPE-2	1.2 X D NP4	Re-construction
57	32311	S	INFINITY	BOX-TYPE-1	2 X 2	Re-construction
58	32669	S	75	HPC-TYPE-1	1.2 X D NP4	Re-construction

9.2.3 Widening of existing culverts - Nil

9.2.4 Repairs/replacements of railing/parapets, flooring and protection works of the existing culverts - Nil

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

9.3 Bridges (Major & Minor)

9.3.1 Existing bridges to be Re-constructed

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

S/N	Location in m	Super structure	Foundation	Remarks	Span Arrangement	Remarks
1	19565	PSC	Open	Nala	1x10+1X40+1X20	Existing bridge
2	19965	PSC	Open	Nala	1X2+1X35	
3	24970	PSC	Open	Nala	1X25+1X50+1X25	

Note: Extra widening shall be provided over structures falling on curves with radius less than 300m.

9.3.2 Additional *new bridges:- Nil*

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

S. No.	Location at Km	Remarks
Nil		

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

S. No.	Location at Km	Remarks
Nil		

9.3.5 Drainage system for bridge decks

An effective drainage system for bridge decks shall be provided as specified in paragraph 7.21 of the Manual

9.3.6 Structures in marine environment - Nil

9.4. Rail-road bridges - Nil

9.4.2 ***Road over-bridges- Nil***

9.4.3 Road under-bridges:-Nil

9.5 Grade separated structures- Nil

9.6 Vehicular Underpass - Nil

10 TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS

10.1 General

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

Specifications of the reflective sheeting [Refer to paragraph 9.3 of the Manual and specify]

Traffic signs and pavements markings shall include roadside signs, overhead signs, curve amounted signs and road marking along the Project Highway. The design and marking for the project Highway shall be as per design standards indicated in **Schedule–D** and the location for various treatments shall be finalized in consultation with the Independent Consultant and Project Company.

The road markings shall be applied to lane lines, road center lines, edge lines, continuity line, stop lines, give way lines, directional arrows, diagonal/chevron markings, and Zebra crossings at parking areas.

PCC kerbs (duly painted) approximately 460 RM (minimum) shall be provided by EPC Contractor in busbays and Islands.

10.2 Traffic Signs

(i) A complete range of permanent retro-reflective traffic signs as per the requirements defined in but not limited to the FPR, for the safe and efficient movement of traffic. These sign are to be of regulatory, warning and informatory types and placed on the roadside except at the start and end of the project road and start and end of two bypasses where overhead directional and lane designation signs shall be mounted on the steels portals.

(ii) Temporary traffic and construction signs are to be provided during construction and maintenance operations for traffic diversion and pedestrian safety.

10.3 Pavement Marking

I. Retro-reflective thermoplastic paint is proposed for use.
The road markings shall be applied to lane lines, road center lines, edge lines, continuity line, stop lines, give way lines, diagonal/chevron markings, Zebra crossings and at parking areas.

II. Delineators bollards and other safety devices shall be provided on entire project Highway and other locations as directed by NHIDCL.

III. All signs shall be the reflectorized type with high intensity retro-reflective sheeting conforming to ASTM D 4956-01, type VIII and /or type IX of micro prismatic type. All

sign boards of size more than 1.2 m and less than 0.9 m shall be provided at the locations finalized in consultation with NHIDCL.

IV. Cautionary sign boards (900mm Equilateral Triangle), stop sign (900mm Octagonal) mandatory sign boards(600mm dia), Village name boards (600X900mm), Hazard Plate (300X900mm), chevron signboard (600X750mm), Facility information sign (600X800mm), Advance direction sign (1800X1200mm), Place identification sign (1200X900mm) shall be provided by the Construction Contractor with suitable interval in consultation with NHIDCL.

The minimum quantity of Traffic signages and pavement marking are tabulated here

Sr.No.	Traffic Signages, Road Marking and other appurtenances	unit	Quantity
1	90 cm equilateral triangle	each	12
2	60 cm equilateral triangle	each	30
3	60 cm circular	each	33
4	80 mm x 60 mm rectangular	each	22
5	60 cm x 45 cm rectangular	each	28
6	60 cm x 60 cm square	each	30
7	Direction and Place Identification signs upto 0.9 sqm size board.	Sqm	7.5
8	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass	Sqm	4125
9	5th kilometre stone (precast)	each	
10	Ordinary Kilometer stone (Precast)	each	3
11	Hectometer stone (Precast)	each	13
12	Road Delineators	each	65
13	Boundary pillar	each	15
14	Street Furniture	each	180

11 ROADSIDE FURNITURE

11.1 Roadside furniture shall be provided in accordance with the provisions of Section 11 of the Manual.

11.2 *Overhead traffic signs: location and size*

[Refer to paragraph 11.5 of the Manual and provide details]

The overhead signs shall be the reflectorized type with high intensity retro-reflective sheeting conforming to ASTM D 4956-01, type VIII and /or type IX of micro prismatic type. The retro reflected sheets of Engineering Grade and high intensity grade (ordinary) shall not be used. The height, lateral clearance, location and instillation shall be as per relevant clauses of MoRTH specifications. Overhead sign shall be installed ahead of major intersections and urban areas as per detailed design requirements.

Sl No.	Location (km)	Size	Remarks
NIL			

12 COMPULSORY AFFORESTATION

[Refer to paragraph 12.1 of the Manual and specify the number of trees which are required to be planted by the Contractor as compensatory afforestation.]

Minimum 2740 nos. trees are required to be planted.

13 HAZARDOUS LOCATIONS

Metal Beam crash barrier length of minimum 3500 m (single runner, heavy duty and W-shape) shall be provided at the locations of bridge approaches, sheep valley side and at sharp curves on both sides. Heavy duty metal beam crash barriers shall be provided on this project by the Construction Contractor at the locations finalized in consultation with NHIDCL. Typical details of metal crash barrier are given in as per manual.

14 SPECIAL REQUIREMENTS FOR HILL ROADS

1. Spreading & Compaction of Roadway cutting and excavation from drain and foundation of other structures surplus material in layers not exceeding 300mm thickness at selected disposal location by Dozer at least four passes including construction of approach road to dumping site.
2. Land Slide Clearance in soil: Clearance of landslides in soil , ordinary rock and rock disposal of the same on the valley side/selected disposal side.

Sr.No.	Landslide Location		Disaster Type	Soil/Rock Condition	Landslide Size	
	Start	End			Length	Width
1	22215	22325	Sinking Portion	Bed Rock	110	60

Mitigation measure adopted in above location			
Sr.No.	Descrption	Unit	Quantity
1	Seeding and Mulching (Soil Cut Slope)	sqm	40000.00
2	Vegetation Mat (Steep Slope)	sqm	1600.00
3	Crib Work (F300)	sqm	800.00
4	Crib Work (F500)	sqm	1910.00

5	Groundwater Drainage Work	metre	5424.00
6	Anchor Work	Rm	1472.00
7	Rock-bolt Work	Rm	700.00
8	Turfing with Sods	sqm	25000

14.1 Dismantling of Structures

Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead of 1000 metres

Nos of culvert & other cross drainage structure - 55No.

Nos of retaining wall, breast wall & other protection structure - 482 Nos

14.2 Dismantling of Flexible Pavements

Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately

Length of existing pavement - 15.00 Km

14.3 Removal of landslide

Clearance of landslides in soil and ordinary rock and disposal of the same on the valley side.

14.4 Disposal of cut material

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

15 CHANGE OF SCOPE

The change in span configuration or overall length of either Major Bridge or Minor Bridge shall not constitute change of scope. The actual lengths of bridge as required shall be determined by the Contractor on the basis of detailed investigations and Hydraulic requirements of irrigation authorities if required and in accordance with the Specifications and Standards.

16 BYPASSES: Nil

17 REALIGNMENTS: Nil

18 PRE-CONSTRUCTION ACTIVITIES

18.1 Land Acquisition (L.A.)

Existing Road is single lane road. Proposed ROW is varying from 18m to 30 m to accommodate 2-lane configuration as given in clause 3.4 above.

The land is to be acquired by NHIDCL and all related costs shall be borne by NHIDCL.

18.2 Utility Shifting and Removal of Trees

All the utilities are to be got shifted by NHIDCL and the related cost shall be borne by NHIDCL. The permission regarding cutting of trees is to be given by NHIDCL. The cost towards utility shifting, environmental and forest clearances, railway clearances etc. shall be borne by NHIDCL as per the demand note of the concerned government/semi government departments/agencies.

18.3 Clearance to be obtained

NHIDCL shall provide all necessary clearances from all the concerned authorities required for implementing the project at his own cost.

18.4 Encroachment Removal

Encroachments shall be removed by NHIDCL at his own cost and the State Government will provide administrative support to maintain law and order.

18.5 Compensatory Afforestation:

Refer Clause 12 of this Schedule-B.

18.6 LANDSCAPING

The finished road facility shall exhibit adequate landscaping of aesthetically pleasing view. All the borrow areas shall be properly dressed maintaining drain ability outward from the road facility. The side slopes shall be turfed**.**

Planting along the highway shall follow a variety of schemes depending upon location requirement as per the IRC and MoRTH guidelines. On island, planting of dust and gaseous substance absorbing shrubs such as aneurism oleander album is recommended. To ensure survival from herbivorous animals, shrubs/plants containing latex shall only be planted. Trees shall be provided with tree guards.

The treatment of highway embankment slopes shall be with vegetative turfing, hydro seeding and hydro mulching as per IRC: 56-2011, depending on the soil types involved. Pitching works along with filter material on slopes shall be as per MoRTH specifications.

19 Fixed Parameters for Design

(i) The Construction Contractor shall consider the following fixed parameters for design

(a) In general Drawings are provided for reference. The Construction Contractor can follow the same as it is with the review of IC. The Construction Contractor can also follow the alternate Design/Drawings with the prior approval of NHIDCL. However the Construction Contractor shall be responsible for all

design and Drawings and not be absolved from their liabilities even if they follow the DPR Drawings without any change.

(b) The scope of work shall be as specified in **Schedule–B** together with the provision of Project facilities as given in **Schedule–C** and in conformity with the specifications & standards set forth in **Schedule–D**.

(c) The finished top level of the road (Formation level) as shown in the P&P (Plan & Profile) drawing shall not be reduced/lowered unless there are some apparent errors / deficiencies in the DPR and the Construction Contractor is able to demonstrate sound and durable design by lowering the formation levels with proper geometry as recommended in IRC: SP:73-2015 or other codes as applicable to the National Highways but no portion of Road should be allowed under submergence.

(d) The numbers and sizes of the culverts as well as waterway as provided in the FFSR shall not be reduced in any case, however the locations can be suitably modified in consultation & approval of the IC if required. Any additional requirement of culverts as per site conditions or increase in size due to hydrologic requirement should be assessed by the Construction Contractor and incorporated accordingly.

(e) Alternative design for structures i.e. bridges, culverts, and retaining walls etc. can be adopted by the Construction Contractor in accordance with Design Requirements subject to review of the same by Authority Engineer. However, the span length (total clear span/water way) as shown in the drawings shall be considered as minimum requirement and cannot be reduced.

(f) The length and/or the nos. of various project facilities like Drain, Bus bays, etc. as mentioned in Schedule B and Schedule C shall be minimum, however the locations can be suitably modified in consultation with the Authority Engineer.

(g) The Geometric Design Standards for the Project/Project Facilities shall be as per IRC: 73 or other codes as applicable to the National Highways. These should be adhered to and minimum requirements should be maintained for the Project Highway. The Construction Contractor may adopt better standards for enhancing the requirements of safety and mobility.

(h) Pavement Design

i) The typical cross sections shall be followed as far as possible. Alternate cross sections shall be accepted subjected to approval from the Authority Engineer without altering the pavement widths and subject to the restriction of ROW widths. Pavement of the main carriageway has been designed for a period of 15 years + 24 months of construction period.

ii) The composition of Pavement Layers of the paved shoulders shall not be lower than the adjacent flexible pavement of the mainline project highway.

(i) All the slopes having embankment height more than 1.0m shall be protected by vegetation mulching. Filter material shall be provided below the pitching where ever embankment is exposed to water bodies.

(j) W- Beam crash barrier shall be provided on sections of the road
i) sharp curves having radius less than 300m

(k) All pipe culverts shall be replaced by box culverts.

(l) Reinforced Earth/RCC Retaining Wall type shall be liberally provided through areas for high fill/embankment with aesthetically pleasing appearance. These shall be of varying height constructed of several sections, located mainly between main line and where land constraint exists. Design life of reinforcing elements for earth retaining structures shall be 100 years minimum.

(m) RRM retaining wall & Reinforce anchored earth wall protection to be provided at the valley side on curve as special safety features.

(n) All road signs shall be with retro-reflective sheet of high intensity grade conforming to ASTM D-4957-01/ (type VIII and type IX) and as per clause 801 of MoRTH specifications. The retro reflective sheet with engineering grade shall not be used and instead micro-prismatic shall be used.

SCHEDULE – C

(See Clause 2.1)

PROJECT FACILITIES

1 Project Facilities

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

(a) Toll plazas;

(b) Roadside furniture;

(c) Street lighting;

(d) Pedestrian facilities;

(e) Landscaping and tree plantation;

(f) Truck lay-byes;

(g) Bus-bays and bus shelters;

(h) Traffic aid posts;

(i) Medical aid posts;

(j) Vehicle rescue posts; and

(k) Others

Annex - I
(Schedule-C)

PROJECT FACILITIES

1 Project Facilities

The EPC Contractor shall construct the Project Facilities described in this Annex-I to form part of the Two-Lane Project Highway. The Project Facilities shall include:

(a) Toll plazas;

(b) Roadside furniture;

(c) Pedestrian facilities;

(d) Landscaping and tree plantation;

(e) Truck lay-byes;

(f) Bus-bays and bus shelters;

(g) Highway Patrol Unit;

(h) Emergency Medical Services;

(i) Crane Services; and

(j) Others

2 Description of Project Facilities

Each of the Project Facilities is briefly described below:

(a) Toll Plazas

Toll Plaza shall be provided at following one location in accordance with Section 10 of Manual. The pavement shall be concrete pavement, the requirements and equipment's shall be provided in accordance with Clause 10.4.9 of Manual of Standards and Specifications. The Toll Plaza complex shall be provided at the Toll Plazas or at any other location along the highway in accordance with Clause 10.4.20 of the Manual of Standards and Specifications.

Design Chainage	Toll Lanes
Nil	

Note: The location may be suitably modified as per the site condition and as decided by Authority / Authority Engineer.

(b) Road side Furniture

Road side furniture shall be provided in accordance with Section 9.0 of the Manual of Standards and Specifications.

(c) Pedestrian Facilities

Pedestrian crossing Facilities shall be provided in accordance with Clause 9.8 / 12.2 of the 2 Lane / 4 Lane Manual of Standards and Specifications and Typical Cross Section Details provided in Appendix BI.

(d) Landscaping and Tree Plantation

Highway landscaping and tree plantation shall be provided in accordance with Section 11 of the Manual of Standards and Specifications.

(e) Truck Lay-byes

Nil

(f) Bus-bays and Bus Shelter

Bus-bays and shelters shall be provided in accordance with Clause 12.6 of the 2 Lane Manual of Standards and Specifications at following locations.

S. No	Design Chainage (km)	Village	Side
1	32+500	Rabangla	Valley side

Note: * refer IRC SP-73:2015

(g) Highway Patrol Unit - Nil

Highway Patrol unit shall be provided at the Toll Plazas in accordance with Clause 12.11 of the 2 Lane Manual of Standards and Specifications with the provisions of the Contract.

(h) Emergency Medical Services

Emergency medical Services shall be provided at the Toll Plazas in accordance with Clause 12.12 of the 2 Lane Manual of Standards and Specifications with the provisions of the Contract.

(i) Crane Services -Nil

(j) Others

Highway Lighting

Lighting shall be provided at the following locations:

(i) Lighting shall be provided at Bus stops as per Schedule D

(ii) High Mast Lighting shall be provided at all Major Junctions

Removal of land slide

Dismantling of existing structure

SCHEDULE – D

(See Clause 2.1)

SPECIFICATIONS AND STANDARDS

1 Construction

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

2 Design Standards

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

Manual of Standards and Specifications for Two Laning of Highways (IRC: SP: 73-2015)

Annex - I
(Schedule-D)

SPECIFICATIONS AND STANDARDS FOR CONSTRUCTION

1 Specifications and Standards

All Materials, works and construction operations shall conform to the Manual of Specifications and Standards for Two-Laning of Highways (IRC: SP: 73-2015) referred to as the Manual, and MORTH Specifications for Road and Bridge Works 5th Revision 2013. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2 CRITERIA FOR REINFORCED EARTH STRUCTURE

Reinforced Earth Structure shall be used as a retaining structure for proposed widening of the Hill and/or Valley Side for those locations wherever requisite design width is sufficiently available to lay the soil reinforcing element of the Reinforced Earth Structure with minimal excavation and disturbance to the existing slope and the traffic running on top of it.

Reinforced Earth Structure shall consist of the following key elements and as per the typical drawing enclosed in Schedule A:

- **Fascia** : The fascia element shall be of prefabricated and hot deep galvanized mild steel bar steel mesh having minimum bar diameter of 8mm and minimum galvanization thickness of 86 microns in accordance with BS 729: 1971 (1994). The facing detailing shall include one or two layers of special compressible panel to adapt the internal settlement of fill. The details of compressible panel shall be submitted along with bid.
- **Soil Reinforcing Element:** High Adherence Geosynthetic Straps with trapezoidal groove on both side to generate high friction and having LLDPE coating for better durability shall be allowed as soil reinforcing element. Any other type of reinforcement like PVC/Latex/ Bitumen coated geogrid or HDPE geogrids, or mesh or sheet type shall not be allowed to use.
  Specific Properties of the Core Polyester fibre of the Geosynthetic Straps

Specific properties	*Unit*	Typical value	Test Method
Molecular weight	*g/mol*	28000	
Elongation at break	%	< 15	DIN 53834
Resistance to hydrolysis	%	< 25	CEN ENV 124 47

Reinforcement Specification

HA Geosynthetic Straps9 and HA Geosynthetic Straps5		
Grade kN	**Characteristic initial strength (kN)**	**Guaranteed minimum width (mm)**
25	25	49
37.5	37.5	49
50	50	49
65	65	49
75	75	89
90	90	89
100	100	89

- **Connection between fascia and soil reinforcing element :**Only mechanicalconnection system shall be used which shall be manufactured using carbon steel meeting the long term design strength criteria. After fabrication the connector is hot-dip galvanized to BS 729:1971 requirements or IS 4759:1996, except that the weight of average zinc coating shall not be less than 600 gm/m².

- **Fill material:** Backfill material shall be reasonably free from organic or other deleterious materials conforming to MORT&H "Specification for Road and Bridge Works", Latest Revision, Section 3100 and IRC:SP:102-2014 shall conform to the following mechanical and physio-chemical requirements:

Mechanical Requirements	
Sieve size	*Percent Passing*
80 mm (gravel)	*100%*
4.75mm (coarse sand)	*More than 75%*
75 micron (silt)	*Less than 15%*

The backfill material shall be chemically inert having pH, chloride and sulphate content within the prescribed codal provision.

- **Drainage** : Drainage gallery of minimum 600mm wide having 20mm down aggregates as per MoRT&H's specification as filter media which should be wrapped with non-woven geotextile as per the Typical Drawings mentioned in Schedule A.

A. CRITERIA FOR REINFORCED SOIL WALL WITH ANCHOR/BAR SYSTEM

Reinforced Soil Wall with Anchor/Bar System shall be used as a retaining structure for proposed widening of the Hill and/or Valley Side for those locations wherever requisite design width is not available to lay the soil reinforcing element of the Reinforced Earth Structure.

This includes reinforce and strengthen the unstable valley slopes while doing the excavation in a top-down manner by incorporating inclusions into the excavated slope surface based on the detail soil investigation and slope stability analysis.

Reinforced Soil Wall with Anchor/Bar System shall consist of reinforced slope directly attached with stabilized slope mass. The Reinforced Soil Wall with Anchor/Barsystem shall consists of same specification as described above and in addition the following key elements and as per the typical drawing enclosed in Schedule A:

- **Soil Nails** : Soil Nail shall be fully threaded solid hot laminated geotechnical bars which are hot – dip galvanized conforming to IS 4759:1996 requirements, except that the average zinc coating weight on the outer surface is not less than 500gm/m² and having the physio-mechanical properties as per the below table:

Nominal diameter (mm)	Grade (MPa/MPa)	Weight (kg/m)	Cross section (mm²)	Nominal X (mm)	Nominal Y (mm)	Yield load (kN)	Ultimate load (kN)	Elongation mini Agt (%)	Elongation mini A10d (%)
18	St 670/800 (classe 97)	1,96	250	17,3	20,0	168	200	5	7
22		2,94	375	21,5	23,8	251	300	5	7
25		3,85	491	24,2	27,3	329	393	5	7
28		4,83	616	27,0	30,6	413	493	5	7
30		5,55	707	29,2	33,0	474	566	5	7
35		7,55	962	34,2	38,3	645	770	5	7
43		11,4	1452	42,3	46,8	973	1162	5	7
57,5		20,38	2597	55,9	61,5	1740	2078	5	7
63,5		24,86	3167	62,1	67,8	2122	2534	5	7

- **Ground Anchors :**Depending on the soil strata, height of the structure and slope stability design, the excavated slope surface needs to be strengthened by Permanent Ground Anchors.

Permanent Ground Anchor Properties

I) Grade and Properties of Tendon Materials
a) HTS wire in accordance with : PrEN-10138-3-2005/ ASTM-A416-06
b) Diameter of HTS wire – 15.7 mm
c) Nominal C/S Area – 150mm²
d) Ultimate Breaking Load – 279 KN
e) Specified 0.1% Proof Load – 246 KN
f) Maximum Relaxation – 2.5%
g) Ultimate Tensile Strength – 1860 N/mm²

II) Detail of Triple Layer Corrosion Protection

Layer 01 : Epoxy coating for the entire length of tendon
Layer 02 : Grease for free length, cement grout for fixed length prior to stressing
Layer 03 : HDPE pipe for free length, Corrugated HDPE duct for fixed length

III) Grout, Cement, Additive details:

a) Grout properties in accordance with BSEN-445-1997 and BSEN-447-1997. Grade of cement – OPC 43 grade.
b) Additive
c) Water cement ratio of 0.36 to 0.40
d) Compressive strength is 20 MPa after 3 days, 30 MPa after 7 days and 35 MPa after 28 days.

- **Connection between soil reinforcing element and stabilized slope mass:** The reinforced slope mass shall be connected with stabilized existing soil mass in such a way that the total long term design force is effectively transferred to the stabilized soil mass. This is possible by either directly connecting the soil reinforcement with soil nail or anchor head or through another welded wire mesh or in combination of both. All steel components shall be hot-dip galvanized to BS 729:1971 requirements or IS 4759:1996, except that the average zinc coat weight is not less than 600 gm/m^2.

B. CRITERIA FOR REVETMENT

- **Articulating Block Concrete Form Liner** : Wherever there are chances of toe erosion due to river flowing near or adjacent to the base of Reinforced Slope Structure or Reinforced Earth Composite System. In those locations, it is necessary to protect the toe erosion of the structure by Articulating Block Concrete Form Liner known as Revetment.

PROPERTY REQUIREMENTS – ARTICULATING BLOCK (US) FABRIC			
	Test Method	**Units**	**Values**
PHYSICAL PROPERTIES [1, 2]			
Composition of Yarns			Polyester
Mass Per Unit Area (double-layer)	ASTM D 5261	g/m^2	500
Thickness	ASTM D 5199	Mm	0.40
Mill Width		M	2.13
MECHANICAL PROPERTIES [1, 2]			
Wide-Width Strip Tensile Strength	ASTM D 4595		
Machine Direction		kN/m	50
Cross Machine Direction		kN/m	60
Elongation at Break	ASTM D 4595		
Machine Direction		%	8
Cross Machine Direction		%	8
Grab Tensile Strength	ASTM D 4632		
Machine Direction		N	1395
Cross Machine Direction		N	1365
Elongation at Break	ASTM D 4632		
Machine Direction		%	25
Cross Machine Direction		%	20
Trapezoidal Tear Strength	ASTM D 4533		
Machine Direction		N	460
Cross machine Direction		N	600
CBR Puncture Strength	ASTM D 6241	N	5450
Mullen Burst Strength	ASTM D 3786 (Mod.)	kg/cm^2	40
HYDRAULIC PROPERTIES [1, 3]			
Apparent Opening Size (AOS)	ASTM D 4751	mm	0.30-0.80
Permittivity	ASTM D 4491	sec^{-1}	0.40-0.55
Flow Rate	ASTM D 4491	l/min/m^2	1200-1625

Submittals for Revetment

i). The Contractor shall submit to the Engineer-in-charge the fabric form manufacturer's full scale flume hydraulic testing and calculations in support of the proposed fabric formed concrete lining system.

ii). The Contractor shall submit to the Engineer-in-charge the fabric form manufacturer's certificates of compliance for the fabric forms and geotextile filter fabric. The Contractor shall also furnish the manufacturer's specifications, literature, shop and layout drawings for the concrete lining panels, and any recommendations, if applicable, that are specifically related to the project.

iii). The Contractor shall submit to the Engineer-in-charge the ready-mix manufacturer's certificate of compliance for the fine aggregate concrete, with the inclusion of mix proportions, flow cone rate and concrete compression test results.

iv). The contractor shall submit at least one completed project reference in India using Tech Revetment technology.

v). The contractor shall submit documentary proof of manufacturing in India. The material shall be manufactured in India.

vi). The contractor shall appoint a specialized system provider for TechRevetment technology and such system provider must be existing in India for minimum 20 years. Documentary evidence such as certificate of incorporation shall be produced.

C. ELIGIBILITY CRITERIA

Eligibility Criteria of specialized agency for Reinforced Earth Wall and Reinforced Soil Wall with Anchor/BarSystem:

The Reinforced Earth Wall,Reinforced Soil Wall with Anchor/BarSystem and TechRevetment are a specialized system for a which only those single specialized agency is eligible who are having ISO 9001:2008 registration for "The structural design, engineering, procurement, supervision and installation and Project Management of Mechanically Stabilized Earth and Precast Concrete structures for civil engineering application". Fully authenticated details of registration certificate shall be provided prior to commencement of work.

In addition to this, the specialized agency shall also meet the following eligibility criteria:

1. ELIGIBILITY AND APPROVAL CRITERIA FOR SPECIALIZED SYSTEM PROVIDERS | AGENCIES

Since the work of Reinforced Earth Wall, Reinforced Soil Wall with Anchor/Bar System and Tech Revetment Systemare specialized in nature, the contractor shall source the design, drawing, technology, requisite materials, expertise and other services required for Reinforced Earth Wall, Reinforced Soil Wall with Anchor/Bar System and Tech Revetment System works from one single specialized system provider meeting the eligibility criteria as under. The scope of this work should be considered as a single item and contractor shall get the work done by one specialized agency only including design, supply and requisite technical services. Any proposal consisting design, supply and services to be done by separate agencies will not be accepted. The technology provider must meet all the following criteria to be eligible for this work;

i. The system provider | agency should be a firm established under Indian Company's Act and must be existing in India for minimum 20 years.

ii. The system provider | agency must have completed;

- At least (1) one project involving Soil Nail in India involving design, supply and/or installation works.
- At least (1) one project involving Reinforced earth composite structure involving design, supply and/or installation works.

- Minimum 50,000sqm of Reinforced Earth Wall and single project of minimum 50000 sqm.
- At least (1) one project involving Tech Revetment involving design, supply and/or installation works.

Case studies and Completion certificates to substantiate the above shall be submitted to the client.

iii. Qualified bidder(s) must enter into pre bid agreement with only prequalified system suppliers | technology providers as per the system | technology pre-qualification eligibility criterion and specifications detailed in the technical specifications for Reinforced Earth Wall, Reinforced Soil Wall with Anchor/Bar System and Tech Revetment works prior to tender date. Original duplicate copy of such pre-bid | pre-tender agreement executed on stamp paper, shall be submitted along with the bid document, with supporting specifications, references, qualifications and literature from system suppliers | technology providers. No change or revision in name of proposed system supplier | technology provider shall be allowed post tender. The bidder shall be liable to be rejected should the bidder not able to submit such pre-bid agreement.

- **Soil Nails** :

Soil Nail shall be fully threaded solid hot laminated geotechnical bars which are hot – dip galvanized conforming to IS 4759:1996 / relevant BS code requirements.

- **Ground Anchors :**

Depending on the soil strata, height of the structure and slope stability design, the excavated slope surface needs to be strengthened by Permanent Ground Anchors as per MORTH / BS code specifications.

- Special Report 23, State of the Art: Design, Construction of Rockfall Mitigation System, Published by IRC Highway Research Board, 2014 and European Technical Approval Guidelines (ETAG)-27.
- Specification for Monitoring Instruments shall be in accordance with IS 14395 and IRC 75.
- **Rock Bolting** As per IS code 13517 (1992), IS 14448 (1997) , IS 11309 (1985) & IS 4000 (1992)

3 Deviations from the Specifications and Standards

3.1 The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively. Other deviations to the manual are given below.

Sl. No.	Clause No.	Description	Deviation
1	Clause 2.2	Design Speed: Ruling or minimum Design speed shall be followed	Design speed shall be adopted as mentioned in the Plan & Profile drawings given **in Schedule B and clause 2.2**
2	Clause 2.6	Type and width of Shoulders	Type and Width of shoulders shall be as per the **Typical cross sections given in Schedule B.**
3	Clause 2.9.3	Super-elevation Shall be limited to 7 Percent	Super-elevation shall be limited to 10% **(five Percent).**
4	Clause 2.9.4	Radius of Horizontal Curves	Radius of Horizontal curves shall be as per the alignment plan shown in Plan & Profile drawings given in **Schedule B.**
5	Clause 2.9.5	Sight Distance: On two-lane roads, normally intermediate sight distance should be available throughout.	Stopping sight distance shall be provided as a minimum, where ever possible intermediate and over taking sight distance shall be provided.
6	Clause 5.1 & 5.1.1	Provision of Flexible pavement	The type of Pavement shall be as per **Clause 5.2 of Schedule B.**
7	Clause 5.9	Widening and strengthening	The project road is recommended for widening, strengthening & reconstruction based on the schemes based on the designed profiles and as per the **TCS given in Schedule B.**
12	Fig 7.2, 7.3 & 7.4 of 2 Lane and Fig 7.2 & 7.4A & 7.4B of 4 Lane Manual	Deck Width of bridges	Deck width of Structures and bridges shall be **as per clause 7.0 of Schedule B.**

3.2 Notwithstanding anything to the contrary contained in Paragraph 1 above, the MORTH Specifications for Road and Bridge Works 5th Revision 2013 shall be amended to the extent given in Appendix D-1 to this Schedule D.

SCHEDULE - H

(See Clauses10.1.4 and 19.3)

CONTRACT PRICE WEIGHTAGES

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

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

S.No	Item	Weightage in percentage to the contract price		Stage for Payment	Percentage Weightage	Percentage Weightage vis a vis Overall Project
1	**Road works including culverts, minor bridges, underpasses, overpasses, approaches to ROB/RUB/ Major Bridges/ Structures (but excluding service roads)**	54.9%	A	**Widening and strengthening of existing road**	**85.90%**	
			1	Earthwork up to top of the sub-grade	35.62%	19.55%
			2	Granular work (subbase, base, shoulders)	26.04%	14.29%
			3	Bituminous work	24.23%	13.30%
			4	Widening and repair of culverts	0.00%	0.00%
			5	Widening and repair of minor bridges	0.00%	0.00%
			B	**B- New 2-lane realignment/bypass**	**0.00%**	
			1	Earthwork up to top of the sub-grade	0.00%	0.00%
			2	Granular work (subbase, base, shoulders)	0.00%	0.00%
			3	Bituminous work	0.00%	0.00%
			4	CC Pavement	0.00%	0.00%
			C	**C- New culverts, minor bridges, underpasses,overpasses on existing road, realignments, bypasses:**	**14.10%**	
			1	**Culverts**	**14.10%**	
			a	Pipe culvert	3.17%	1.74%
			b	RCC Box Culvert	10.93%	6.00%
			2	Minor bridges	0.00%	0.00%
			3	Cattle/Pedestrian underpasses	0.00%	0.00%
			4	Pedestrain overpasses	0.00%	0.00%
			5	**Grade separated structure**	**0.00%**	
				(a) Underpasses	0.00%	0.00%
				(b) Overpasses	0.00%	0.00%
2	**Major Bridge works and ROB/RUB**	9.2%	A	**A-Widening and repairs of Major Bridges**	0.00%	
			1	Foundation	0.00%	0.00%
			2	Sub-structure	0.00%	0.00%
			3	Super -structure (including crash barriers etc. complete)	0.00%	0.00%

S.No	Item	Weightage in percentage to the contract price		Stage for Payment	Percentage Weightage	Percentage Weightage vis a vis Overall Project
			B	**B-Widening and repair of**	0.00%	
			(a)	ROB	0.00%	0.00%
			(b)	RUB	0.00%	0.00%
			C	**C- New Major Bridges**	**100.00%**	
			1	Foundation	21.20%	1.94%
			2	Sub-structure	26.25%	2.41%
			3	Super -structure (including crash barriers etc. complete)	52.55%	4.82%
				D-New rail-road bridges	0.00%	
				(a) ROB	0.00%	0.00%
				(b) RUB	0.00%	0.00%
3	**Structures (elevated sections, reinforced earth**	0.0%	1	Foundation	0.00%	0.00%
			2	Sub-structure	0.00%	0.00%
			3	Super -structure (including crash barriers etc. complete)	0.00%	0.00%
			4	Reinforced Earth	0.00%	0.00%
4	**Other works**	35.9%	(i)	Service roads/slip road	0.00%	0.00%
			(ii)	Toll Plaza	0.00%	0.00%
			(iii)	Road side drains	5.58%	2.01%
			(iv)	**Road signs , markings, km stones, safety device,**		
			a	Traffic Sign	0.18%	0.06%
			b	Pavement marking	0.98%	0.35%
			c	Crash barrier/"W" Metal Beam Crash Barrier	2.84%	1.02%
			d	Boundary stone, km stone,5th km stone, & hectometre stones	0.03%	0.01%
			e	Traffic blinker LED Delineator, stud, reflective payment marker, tree reflector	0.01%	0.00%
			f	Direction and Place Identification signs upto 0.9 sqm size board	0.02%	0.01%
			g	Median Kerbs	0.00%	0.00%
			h	Median filling shrub plantation & maintenance for 1 year	0.00%	0.00%
			i	Minor junction	1.29%	0.46%
			j	Major Junction	0.72%	0.26%
			k	Overhead signboard	0.00%	0.00%
			l	Painting on kerb	0.00%	0.00%
			m	Footpath &Separator	0.00%	0.00%
			n	Solar stud & solar blinking LED	0.00%	0.00%
			o	Traffic control devices and road safety works	0.00%	0.00%
			p	Traffic diversion, Safety and traffic management during	1.29%	0.46%

S.No	Item	Weightage in percentage to the contract price		Stage for Payment	Percentage Weightage	Percentage Weightage vis a vis Overall Project
				construction		
			q	Road furniture	0.22%	0.08%
			r	Dismantling of Structures	0.36%	0.13%
			s	Dismantling of Flexible Pavements	0.99%	0.36%
			t	Site Clearance	0.15%	0.05%
			u	Chute drain	0.82%	0.29%
			v	Land Slide Clearance	0.83%	0.30%
			(v)	**Project facilities**		
			a	Bus bays	0.00%	0.00%
			b	Truck lay - byes	0.00%	0.00%
			c	Rest areas	0.12%	0.04%
			d	Others	0.07%	0.03%
			(vi)	**Repairs to existing bridges/structures**		
			a	Providing wearing coat	0.00%	0.00%
			b	Replacement of bearing joints	0.00%	0.00%
			c	Providing crash barriers	0.00%	0.00%
			d	Other items	0.00%	0.00%
			(vii)	**Roadside plantation**		
			a	Road side plantation & medium Plantation.	0.00%	0.00%
			b	Plantation (Vetive & Turfine etc.) for slope protection on exposed hill slopes as slide mitigation measure.	0.27%	0.10%
			(viii)	**Protection works**		
			a	Breast wall	2.83%	1.02%
			b	Retaining wall	6.96%	2.50%
			c	Cut Slope Wall	13.88%	4.99%
			d	Gabion wall	2.10%	0.75%
			e	Toe wall	4.36%	1.57%
			f	Reinforce Anchored wall	27.31%	9.82%
			g	Hydro Seeding and Mulching (Soil Cut Slope)	1.40%	0.50%
			h	Vegetation Mat (Steep Slope)	0.26%	0.09%
			i	Crib Work (F300)	0.62%	0.22%
			j	Crib Work (F500)	2.53%	0.91%
			k	Groundwater Drainage Work	14.33%	5.15%
			l	Anchor Work	6.48%	2.33%
			m	Rock-bolt Work	0.18%	0.06%

S.No	Item	Weightage in percentage to the contract price		Stage for Payment	Percentage Weightage	Percentage Weightage vis a vis Overall Project
			n	Protection works of guide bund including construction of flexible aprons , boulder pitching and filter media on slopes	0.00%	0.00%
			(ix)	**safety and traffic management during construction**	0.00%	0.00%

* The above list is illustrative and may require modification as per the scope of the work.

1.3 Procedure of estimating the value of work done

1.3.1 Road works including approaches to minor bridges, Major Bridges and Structures (excluding service roads).

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

Table 1.3.1

Stage of Payment	Percentage -weightage	Payment Produre
A-Widening and strenthening		Unit of measurement is linear length . Payment of each stage shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.@
(1) Earthwork up to top of the sub-grade	35.62%	
(2) Granular work (sub-base, base, shoulders	26.04%	
(3) Bituminous work	24.23%	
(4) Widening and repair of culverts	0.00%	Cost of ten completed culverts shall be determined pro rata with respect to the total number be made on the completion of ten culverts
(5) Widening and repair of minor bridges	0.00%	Cost of each minor bridge shall be determined on pro rata basis with respect to the total linear length of the bridges. Payment shall be made on the completion of a minor bridge
B- New 2-lane realignment, bypass		
(1) Earthwork up to top of the sub-grade	0.00%	Unit of measurement is linear length . Payment of each stage shall be made on pro rata basis on completion of a stage in full length or 5(five) km length
(2) Granular work (sub-base, base, shoulders)	0.00%	
(3) Bituminous work	0.00%	
(4) CC Pavement	0.00%	
C-New culverts , minor bridges underpasses, overpasses on existing road , realignments , bypasses :		

Stage of Payment	Percentage -weightage	Payment Produre
(1) Culverts		Cost of each culverts shall be determined on pro rata basis with respect to the total number of culverts .Payment shall be made on the completion of five culverts
(a) Pipe Culvert	3.17%	
(b) RCC Box culvert	10.93%	
(2) Minor bridges	0.00%	Cost of each minor bridge shall be determined on pro rata basis with respect to the total linear length of the bridges. Payment shall be made on the completion of a minor bridge
(3) Cattle/Pedestrian underpasses	0.00%	Cost of each cattle /pedestrain underpass shall be determined on pro rata basis with respect to the total number of cattle / pedestrian underpasses. Payment shall be made on the completion of the number of cattle/pedestrian underpasses specified below: Total no. Stage for Payment: (i) 1 to 5 - on completion of all, (ii) 6 or more- on completion of five
(4) Pedestrian Over passes	0.00%	Same as for (3) above
(5)Grade separated structures	0.00%	
(a) Underpasses	0.00%	Same as for (3) above
(b) Overpasses	0.00%	Same as for (3) above

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

Cost per km = P x weight age for road work x weight age for bituminous work x (1/L) Where P= Contract Price

L = Total length in km

Similarly, the rates per km for stages (1), (2) and (4) above shall be worked out.

1.3.2 Major Bridge works and ROB/RUB.

Procedure for estimating the value of Major Bridge works and of ROB/RUB shall be as stated in table 1.3.2.

Table 1.3.2

Stage of Payment	Percentage - weightage	Payment Produre
A-Widening and repairs of Major Bridges		Cost of each Major Bridge (widening and repairs) shall be determined on pro rata basis with respect to the total linear length (m) of the Major Bridges (widening and repairs) Payment shall be made on completion of each stage of a Major Bridge as per the weightage given in this table.
Foundation: On compleetion of the foundation work including foundations for wing and return walls		
Sub- structure: On completion of abutments, piers up to the abutment/pier cap		
Super -structure : On completion of the super structure in all respects including hand rails/crash barriers,wing walls return walls, guide bunds,if any, tests on completion etc., bridge complete in all respects and fit for use.		
B-widening and repairs of		

Stage of Payment	Percentage - weightage	Payment Produre
(a) ROB		cost of each ROB/RUB (widening and repairs shall be determined on pro rata basis with respect to total linear(m) of the ROB/RUB (widening and repairs). Payment shall be made on completion of an ROB/RUB
(b) RUB		
C-New Major Bridges		
Ch 19565 Span Arrganement 1X10+1X40+1X20		
(1) Foundation: On completion of the foundation work including foundations for wing and return walls	21.96%	Cost of each Major Bridge shall be determined on pro rata basis with respect to the total linear length(m) 0f the Major Bridges. Payment shall be made on completion of each stage of a Major Bridge as per the weightage given in thus table
(2) Sub-structure : On completion of abutments, piers up to the abutment/pier cap	24.00%	
(3) Super-structure: On completion of the super structure in all respects including hand rails/crash barriers,wing walls, return walls , guide bunds, if any, tests on completion etc., complete in all respects and fit for use	54.04%	
Ch 19965 Span Arrganement 1X20+1X35		
(1) Foundation: On completion of the foundation work including foundations for wing and return walls	22.48%	Cost of each Major Bridge shall be determined on pro rata basis with respect to the total linear length(m) 0f the Major Bridges. Payment shall be made on completion of each stage of a Major Bridge as per the weightage given in thus table
(2) Sub-structure : On completion of abutments, piers up to the abutment/pier cap	28.28%	
(3) Super-structure: On completion of the super structure in all respects including hand rails/crash barriers,wing walls, return walls , guide bunds, if any, tests on completion etc., complete in all respects and fit for use	49.23%	
Ch 24970 Span Arrganement 1X25+1X50+1X25		
(1) Foundation: On completion of the foundation work including foundations for wing and return walls	19.15%	Cost of each Major Bridge shall be determined on pro rata basis with respect to the total linear length(m) 0f the Major Bridges. Payment shall be made on completion of each stage of a Major Bridge as per the weightage given in thus table
(2) Sub-structure : On completion of abutments, piers up to the abutment/pier cap	26.47%	
(3) Super-structure: On completion of the super structure in all respects including hand rails/crash barriers,wing walls, return walls , guide bunds, if any, tests on completion etc., complete in all respects and fit for use	54.38%	
D- New Rail-road bridges		Cost of each ROB/RUB shall be determined on pro rata basis with respect to the linear length (m) of the ROB/RUB. Payment shall be made on completion of an ROB/RUB
(a) ROB		
(b) RUB		

1.3.3 Structures

Procedure for estimating the value of structure work shall be as stated in 1.3.3.

Stage of Payment	Percentage -weightage	Payment Produre
(1) Foundation: On completion of the foundation works including foundations for wing and return walls	0.00%	Cost of each structure shall be determined on pro rata basis in respect to the total linear length(m) of all the structure.Payment shall be made on completion of each stage of astructure as per the weightage given in this table
(2) Sub -structure: On completion of abutments,piers up to the abutment/pier cap	0.00%	
(3) Super-structure:On completion of the Structure along with super structure,including hand rails/crash barriers,wing walls,return walls,tests on completion etc., elevated structure complete in all respects and fit for use.	0.00%	
(4) Rreinforced earth work	0.00%	Payment shall be made on pro rata basis on completion of 25 (twenty five) percent of total area.

1.3.4 Other works.

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

	Stage of Payment	Percentage - weightage	Payment Produre
	Other Engineering Works		
(i)	Service roads/slip road	0.00%	Unit of measurement is linear length in km. Cost per km shall be determined on pro rata basis with respect to the total length of the service roads/slip roads. Payment shall be made for completed service roads/slip roads in a length of not less than 20 (twenty) percent of the total length of service roads/slip roads.
(ii)	Toll Plaza	0.00%	Unit of measurement is each completed toll plaza. Payment of each toll plaza shall be made on pro rata basis with respect to the total of all toll plazas
(iii)	Road side drains	5.58%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten percent of total length.
(iv)	Road signs , markings, km stones, safety device,	0.00%	
a	Traffic Sign	0.18%	Payment shall be made for completed items.
b	Pavement marking	0.98%	
c	Crash barrier/"W" Metal Beam Crash Barrier	2.84%	
d	Boundary stone, km stone,5th km stone, & hectometre stones	0.03%	

	Stage of Payment	Percentage - weightage	Payment Produre
e	Traffic blinker LED Delineator, stud, reflective payment marker, tree reflector	0.01%	
f	Direction and Place Identification signs upto 0.9 sqm size board	0.02%	Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
g	Median Kerbs	0.00%	
h	Median filling shrub plantation & maintenance for 1 year	0.00%	
i	Minor junction	1.29%	Payment shall be made for completed items.
j	Major Junction	0.72%	Payment shall be made for completed items.
k	Overhead signboard	0.00%	Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
l	Painting on kerb	0.00%	
m	Footpath &Separator	0.00%	
n	Solar stud & solar blinking LED	0.00%	
o	Traffic control devices and road safety works	0.00%	
p	Traffic diversion, Safety and traffic management during construction	1.29%	
q	Road furniture	0.22%	
r	Dismantling of Structures	0.36%	
s	Dismantling of Flexible Pavements	0.99%	
t	Site Clearance	0.15%	
u	Chute drain	0.82%	
v	Land Slide Clearance	0.83%	
(v)	**Project facilities**		
a	Bus bays	0.00%	Payment shall be made for completed items.
b	Truck lay - byes	0.00%	
c	Rest areas	0.12%	
d	Others	0.07%	
(vi)	**Repairs to existing bridges/structures**		
a	Providing wearing coat	0.00%	Payment shall be made for completed items.
b	Replacement of bearing joints	0.00%	
c	Providing crash barriers	0.00%	
d	Other items	0.00%	
(vii)	**Roadside plantation**		
a	Road side plantation & medium Plantation.		Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
b	Plantation (Vetiver & Turfine etc.) for slope protection on exposed hill slopes as slide mitigation measure.	0.27%	
(viii)	**Protection works**		
a	Breast wall	2.83%	Unit of measurement is linear length. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 (ten) percent of the total length.
b	Retaining wall	6.96%	
c	Cut Slope Wall	13.88%	
d	Gabion wall	2.10%	
e	Toe wall	4.36%	
f	Reinforce Anchored wall	27.31%	

	Stage of Payment	Percentage - weightage	Payment Produre
g	Hydro seeding Seeding and Mulching (Soil Cut Slope)	1.40%	
h	Vegetation Mat (Steep Slope)	0.26%	
i	Crib Work (F300)	0.62%	
j	Crib Work (F500)	2.53%	
k	Groundwater Drainage Work	14.33%	
l	Anchor Work	6.48%	
m	Rock-bolt Work	0.18%	
n	Protection works of guide bund including construction of flexible aprons , boulder pitching and filter media on slopes		
(ix)	**safety and traffic management during construction**		Payment shall be made on pro rata basis every six months