# SCHEDULE - B (See Clause 2.1)

# DEVELOPMENT OF THE PROJECT HIGHWAY

## 1 Development of the Project Highway

Development of the Project Highway shall include:

- <u>S-1</u> Design and construction of the Project Highway for proposed widening at the 250 m stretch length at km 54 as per the alignment plan mentioned in Annex-I of Schedule-A and as described in this Schedule-B and in Schedule-C.
- <u>S-2</u> Design and construction of the Project Highway for proposed widening at the 210 m stretch length at km 63 as per the alignment plan mentioned in Annex-I of Schedule-A and as described in this Schedule-B and in Schedule-C.
- <u>S-3</u> Design and construction of the Project Highway for landslide protection at 360 m stretch length at km 71 as per the alignment plan mentioned in Annex-I of Schedule-A and as described in this Schedule-B and in Schedule-C.
- <u>S-4</u> Design and construction of the Project Highway for landslide protection at 350 m stretch length at km 72 as per the alignment plan mentioned in Annex-I of Schedule-A and as described in this Schedule-B and in Schedule-C.

## 2 Widening and Rehabilitation / Restoration

Widening and Rehabilitation shall include proposed widening of the narrow zone at km 54 and Km 63 including toe protection from erosion and scouring of river with proper drainage works and road works of specified width of the Project Highway on designated locations as described in Annex-I of this Schedule-B and in Schedule-C.

Rehabilitation/ Restoration shall include proposed landslide protection works including necessary drainage works on the designated locations 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 strict conformity with the Specifications and Standards specified in Annex-I of Schedule-D.

# Annex - I (Schedule - B)

#### A. DESCRIPTION OF PROPOSED WIDENING WORKS

#### 1 WIDENING OF THE EXISTING HIGHWAY

The Project Highway shall follow the existing alignment unless otherwise specified by the Authority. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for hilly terrain to the extent land is available.

#### 2 GEOMETRIC DESIGN AND GENERAL FEATURES

#### 2.1 General

Geometric design and general features of the Project Highway shall be in accordance with the alignment plan mentioned in Annex-I of Schedule-A.

## 2.2 Design speed

The design speed shall be as per alignment plan.

## 2.3 Improvement of the existing road geometrics

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 available right of way and proper road signs and safety measures shall be provided.

#### 2.4 Right of Way

[Refer to paragraph 2.3 of the Manual]. Details of the Right of Way are given in Annex II of Schedule-A.

## 2.5 Type of Shoulders

In the following sections, paved shoulders of 1.5 m width shall be provided.

Sl. No.	Stretch From km to km	Remarks
1	54.255 to 54.505	
2	63.575 to 63.785	

## 2.6 Lateral and vertical clearances at underpasses

- 2.6.1 Lateral and vertical clearances at underpasses and provision of guardrails/crash barriers shall be as per paragraph 2.11 of the Manual.
- 2.6.2 Lateral clearance: The width of the opening at the underpasses shall be as follows:

	Sl. No.	Location	Span/opening (m)	Remarks
_				

(chainage) (from km to km)					
NIL					

# 2.7 Lateral and vertical clearances at overpasses

- 2.7.1 Lateral and vertical clearances at overpasses shall be as per paragraph 2.12 of the Manual.
- 2.7.2 Lateral clearance: The width of the opening at the overpasses shall be as follows:

Sl. No. Location (chainage) (from km to km)		Span/opening (m)	Remarks			
NIL						

#### 2.8 Service roads

Service roads shall be constructed at the locations and for the lengths indicated below: [Refer to paragraph 2.13 of the Manual and provide details]

SI No.	Location of service road (from km to km)	Right hand side (RHS)/Left hand side (LHS)/ or Both sides	Length (km) of service road				
	NIL						

# 2.9 Grade separated structures

2.9.1 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]

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

2.9.2 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	structure				Remarks, if any
		Length (m)	Existing Level	Raised Level	Lowered Level	
				NIL		

## 2.10 Cattle and pedestrian underpass /overpass

Cattle and pedestrian underpass/ overpass shall be constructed as follows: [Refer to paragraphs 2.14.3 of the Manual and specify the requirements of cattle and pedestrian underpass/ overpass]

Sl. No.	Location	Type of crossing
	NIL	

## 2.11 Typical Cross-sections of the Project Highway

The typical cross sections should be developed as per Drawing Number NHIDCL/KM 54, KM 63, KM 71 & KM 72/01 (02 sheets) as included in Annexure - A of this schedule.

#### 3 INTERSECTIONS AND GRADE SEPARATORS

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

[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 intersections

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

# (b) Grade separated intersection with/without ramps

Sl. No.	Location	Salient features	Minimum of viaduct provided	_	Road carried over/un	to der	be the
					structur	es	

NIL

# 4 ROAD EMBANKMENT FOR PROPOSED WIDENING

4.1 The proposed widening of the 250m stretch length of road at KM54 narrow zones shall comprise of following minimum components:

	lowing minimum	components:	
Stretch	Maximum Height of Valley Slope to be widened (m)	Top width of Finished Road (m)	Brief Scope of work
S-1  Km 54 (Stretch 1: Length 130m)	18.50	13	<ul> <li>Traffic Signages and Temporary barricading</li> <li>Excavation and Surface Preparation</li> <li>Soil Nailing on the existing valley slope considering the following:</li> <li>Nail: Fully threaded solid bar of 670/800 grade steel having yield strength of 670 MPa and UTS of 800 MPa hot dip galvanized (conforming to IS 4759:1996) to minimum thickness of 70 micron.</li> <li>Length of Nail: Minimum 8m</li> <li>Drill diameter: Minimum 75mm in soil and 50mm in rock</li> <li>Diameter of Nail: Minimum 22mm</li> <li>Maximum Horizontal Spacing of Nail: 1.50m c/c</li> <li>Maximum Vertical Spacing of Nail: 1.30m c/c</li> <li>Mechanically Stabilized Earth Structure to connect with these soil nails:</li> <li>Fascia: Prefabricated and hot deep galvanized mild steel bar steel mesh having minimum bar diameter of 8mm and minimum galvanization thickness of 86 microns.</li> <li>Soil reinforcing element: Geosynthetic Strips with lateral grooves on both side</li> <li>Maximum Vertical spacing of soil reinforcement: 0.6m</li> <li>Connection between fascia and soil reinforcement: Mechanical</li> <li>Connection between soil reinforcement and soil nail: Mechanical</li> <li>Selected Backfill Soil</li> <li>Granular fill soil such as river bed material of minimum angle of internal friction of minimum 30 degrees</li> </ul>

			compacted in layers to the requisite height  Broken boulder of 400mm thickness to be provided in between the fascia and selected backfill soil with a non-woven geotextile separator in between to avoid migration of backfill soil  Sub-Surface Drainage  Chimney Drain of 600mm thickness behind the built up portion of reinforced slope for draining out the entrapped seepage water from the backside of existing slope with Non-woven geotextile on both side  Toe Protection  It is necessary to protect the toe erosion of the structure by Articulating Block Concrete Form Liner known as Revetment. Average thickness shall be 200mm, grade M25.  Pavement Work  Pavement work shall be done for the entire stretch length of 250m as per IRC guidelines with metallic crash barriers,
Stretch	Maximum	Top width	road marking, signages, etc.
Sircicii	Height of Valley Slope to be widened (m)	of Finished Road (m)	Brief Scope of work
S-1  Km 54 (Stretch 2: Length 130m)	20	13	<ul> <li>Traffic Signages and Temporary barricading</li> <li>Excavation and Surface Preparation</li> <li>Soil Nailing on the existing valley slope considering the following:         <ul> <li>Nail: Fully threaded solid bar of 670/800 grade steel having yield strength of 670 MPa and UTS of 800 MPa hot dip galvanized (conforming to IS 4759:1996) to minimum thickness of 70 micron.</li> <li>Length of Nail: Minimum 8m</li> <li>Drill diameter: Minimum 75mm in soil and 50mm in rock</li> <li>Diameter of Nail: Minimum 22mm</li> <li>Maximum Horizontal Spacing of Nail: 1.50m c/c</li> <li>Maximum Vertical Spacing of Nail:</li> </ul> </li> </ul>

1.30m c/c
Mechanically Stabilized Earth Structure to connect with these soil nails:
Fascia : Prefabricated and hot deep  and analyzed mild steel ber steel mech
galvanized mild steel bar steel mesh having minimum bar diameter of 8mm
and minimum galvanization thickness of
86 microns.
Soil reinforcing element : Geosynthetic  Chains with lateral grasses on both aids
Strips with lateral grooves on both side  • Maximum vertical spacing of soil
reinforcement: 0.6m
<ul> <li>Connection between fascia and soil reinforcement: Mechanical</li> </ul>
Connection between soil reinforcement and soil nail: Mechanical
➤ Selected Backfill Soil
Granular fill soil such as river bed
material of minimum angle of internal
friction of minimum 30 degrees
compacted in layers to the requisite height
➤ Broken boulder of 400mm thickness to be
provided in between the fascia and
selected backfill soil with a non-woven
geotextile separator in between to avoid
migration of backfill soil
<ul><li>Sub-Surface Drainage</li><li>Chimney Drain of 600mm thickness</li></ul>
behind the built up portion of
reinforced slope for draining out the
entrapped seepage water from the
backside of existing slope with Non-
woven geotextile on both side
> Toe Protection
It is necessary to protect the toe erosion of the structure by Articulating Block
Concrete Form Liner known as Revetment
<ul><li>Pavement Work</li></ul>
Pavement work shall be done for the
entire stretch length of 250m as per IRC
guidelines with metallic crash barriers,
road marking, signages, etc.

The proposed restoration scheme is presented in Drawing number NHIDCL/KM54/01 (02 sheets) in Annexure - A of Schedule B.

4.2 The proposed restoration scheme as presented in this schedule is the minimum requirement. However, the contractor shall check, validate and if require improve/augment the detailed

design based on his surveys and investigations of minimum scope as given below before commencement of work.

- GEOPHYSICAL INVESTIGATION to know the natural formation and its weak plane / zones in valley slope in addition to the GEOTECHNICAL INVESTIGATION by conducting geophysical study and geotechnical investigation of minimum 6 numbers of boreholes of minimum depth around 30m or termination depth at 1.5m inside hard rock whichever is less by positioning the boreholes all along the valley slope namely at top, intermediate of valley slope
- TOPOGRAPHICAL SURVEY for the Stretch to be rehabilitated including the Detailed Contour Survey and Cross-Section Survey covering the total area in valley sides
- MAPPING of any kind of crack, fault etc. generated in the entire affected area and its influence zone (beyond the affected zone).

Any associated risk with respect to cost and time due to modification / changes in the design shall be assessed and incorporated in the bid.

4.3 The proposed widening of the 210m stretch length of road at KM 63 narrow zones shall comprises of following minimum components:

Stretch	Height of Valley Slope to be widened (m)	Top width of Finished Road (m)	Brief scope of work
<u>S-2</u> Km 63	20	12	<ul> <li>Traffic Signages and Temporary barricading</li> <li>Excavation and Surface Preparation</li> <li>Soil Nailing on the existing valley slope including in the existing toe wall considering the following:</li> <li>Nail: Fully threaded solid bar of 670/800 grade steel having yield strength of 670 MPa and UTS of 800 MPa hot dip galvanized (conforming to IS 4759:1996) to minimum thickness of 70 micron.</li> <li>Length of Nail: 8 m minimum</li> <li>Diameter of Nail: 22 mm minimum</li> <li>Maximum Horizontal Spacing of Nail: 1.50m c/c</li> <li>Maximum Vertical Spacing of Nail: 1.30m c/c</li> <li>Mechanically Stabilized Earth Structure to connect with these soil nails:</li> <li>Fascia: Prefabricated and hot deep galvanized mild steel bar steel mesh having minimum bar diameter of 8mm and minimum galvanization thickness of 86 microns.</li> <li>Soil reinforcing element: Geosynthetic Strips with lateral grooves on both side</li> </ul>

Maximum Vertical spacing of soil reinforcement: 0.6mMinimum length of soil reinforcement: 3m Connection between fascia and soil reinforcement: Mechanical Connection between soil reinforcement and soil nail: Mechanical Selected Backfill Soil Granular fill soil of minimum angle of internal friction of 30 degrees compacted in layers to the requisite height ➤ Broken boulder of 400mm thickness to be provided in between the fascia and selected backfill soil with a non-woven geotextile separator in between to avoid migration of backfill soil Sub-Surface Drainage Chimney Drain of 600mm thickness behind the built up portion of reinforced slope for draining out the entrapped seepage water from the backside of existing slope > Toe Protection It is necessary to protect the toe erosion of the structure by Articulating Block Concrete Form Liner known as Revetment Pavement Work Pavement work shall be done for the entire stretch length of 300m as per IRC guidelines with crash barriers, road marking, signages, etc.

The proposed restoration scheme is presented in Drawing number NHIDCL/KM63/01 (02 sheets) in Annexure - A of Schedule B.

- 4.4 The proposed restoration scheme as presented in this schedule is the minimum requirement. However, the contractor shall check, validate and if require improve/augment the detailed design based on his surveys and investigations of minimum scope as given below before commencement of work.
  - GEOPHYSICAL INVESTIGATION to know the natural formation and its weak plane / zones in valley slope in addition to the GEOTECHNICAL INVESTIGATION by conducting adequate numbers of boreholes of minimum depth around 30m or termination depth at 1.5m inside hard rock whichever is less by positioning the boreholes all along the valley slope namely at top, intermediate of valley slope
  - TOPOGRAPHICAL SURVEY for the Stretch to be rehabilitated including the Detailed Contour Survey and Cross-Section Survey covering the total area in valley sides
  - MAPPING of any kind of crack, fault etc. generated in the entire affected area and its influence zone (beyond the affected zone).

Any associated risk with respect to cost and time due to modification / changes in the design shall be assessed and incorporated in the bid.

4.5 The proposed landslide protection works of the 360m stretch length at KM71 shall comprises of following minimum components:

Stretch	Average Height of Hill Slope to be widened (m)	Top width of Finished Road (m)	Brief Scope of work
<u>S-3</u> Km 71	25	12	<ul> <li>Traffic Signages and Temporary barricading</li> <li>Excavation and Surface Preparation</li> <li>Fixing High strength steel wire mesh</li> <li>Strength of Wire: 1770 MPa as per EN 10204 - 2.2</li> <li>Tensile resistance of wire: 12.5 kN</li> <li>Wire diameter: 3mm</li> <li>Ends: Knotted</li> <li>Mesh Width: 65mm</li> <li>Tensile strength of mesh: Zm≥ 150 kN/m</li> <li>Bearing resistance against puncturing: D<sub>R</sub> ≥ 180 kN</li> <li>Bearing resistance against shearing-off: P<sub>R</sub> ≥ 90 kN</li> <li>Bearing resistance against slope parallel tensile stress: Z<sub>R</sub> ≥ 30 kN</li> <li>Soil Nailing on the existing hill slope considering the following:</li> <li>Nail: Fully threaded solid bar of 670/800 grade steel having yield strength of 670 MPa and UTS of 800 MPa hot dip galvanized (conforming to IS 4759:1996) to minimum thickness of 70 micron.</li> <li>Length of Nail: Minimum 8m</li> <li>Diameter of Nail: Minimum 22mm</li> <li>Maximum Horizontal Spacing of Nail: 2.0m c/c</li> <li>Maximum Vertical Spacing of Nail: 1.50m c/c</li> <li>Drainage Arrangement</li> </ul>

The proposed restoration scheme is presented in Drawing number NHIDCL/KM71/01 (02 sheets) in Annexure - A of Schedule B.

- 4.6 The proposed restoration scheme as presented in this schedule is the minimum requirement. However, the contractor shall check, validate and if require improve/augment the detailed design based on his surveys and investigations of minimum scope as given below before commencement of work.
  - GEOPHYSICAL INVESTIGATION to know the natural formation and its weak plane / zones in valley slope in addition to the GEOTECHNICAL INVESTIGATION by conducting

adequate numbers of boreholes of minimum depth around 30m by positioning the boreholes all along the hill slope namely at top, intermediate and bottom of hill slope.

- TOPOGRAPHICAL SURVEY for the Stretch to be rehabilitated including the Detailed Contour Survey and Cross-Section Survey covering the total area in valley sides.
- MAPPING of any kind of crack, fault etc. generated in the entire affected area and its influence zone (beyond the affected zone).

Any associated risk with respect to cost and time due to modification / changes in the design shall be assessed and incorporated in the bid.

4.7 The proposed landslide protection works of the 350m stretch length at KM72 shall comprises of following minimum components:

Stretch Average Height of Height of Hill Slope to be widened widened (m) (m) Traffic Signages and Temporary barricading	1			
S-4 20 12 Traffic Signages and Temporary barricading	Stretch	Height of Hill Slope to be widened	width of Finishe d Road	Brief Scope of work
<ul> <li>Excavation and Surface Preparation</li> <li>Fixing High strength steel wire mesh as per EN 10204 - 2.2</li> <li>Strength of Wire: 1770 MPa</li> <li>Tensile resistance of wire: 12.5 kN</li> <li>Wire diameter: 3mm</li> <li>Ends: Knotted</li> <li>Mesh Width: 65mm</li> <li>Tensile strength of mesh: Zm≥ 150 kN/m</li> <li>Bearing resistance against puncturing: D<sub>R</sub> ≥ 180 kN</li> <li>Bearing resistance against shearing-off: P<sub>R</sub> ≥ 90 kN</li> <li>Bearing resistance against slope parallel tensile stress: Z<sub>R</sub> ≥ 30 kN</li> <li>Soil Nailing on the existing hill slope considering the following:</li> <li>Nail: Fully threaded solid bar of 670/800 grade steel having yield strength of 670 MPa and UTS of 800</li> </ul>	<u>S-4</u> Km 72	20	12	<ul> <li>Fixing High strength steel wire mesh as per EN 10204 - 2.2</li> <li>Strength of Wire: 1770 MPa</li> <li>Tensile resistance of wire: 12.5 kN</li> <li>Wire diameter: 3mm</li> <li>Ends: Knotted</li> <li>Mesh Width: 65mm</li> <li>Tensile strength of mesh: Zm≥ 150 kN/m</li> <li>Bearing resistance against puncturing: D<sub>R</sub> ≥ 180 kN</li> <li>Bearing resistance against shearing-off: P<sub>R</sub> ≥ 90 kN</li> <li>Bearing resistance against slope parallel tensile stress: Z<sub>R</sub> ≥ 30 kN</li> <li>Soil Nailing on the existing hill slope considering the following:</li> <li>Nail: Fully threaded solid bar of 670/800 grade steel having yield strength of 670 MPa and UTS of 800 MPa hot dip galvanized (conforming to IS 4759:1996) to minimum thickness of 70 micron.</li> <li>Length of Nail: 8m minimum</li> <li>Diameter of Nail: 22mm minimum</li> <li>Maximum Horizontal Spacing of Nail: 2.0m c/c</li> </ul>

The proposed restoration scheme is presented in Drawing number NHIDCL/KM72/01 (02 sheets) in Annexure - A of Schedule B.

- 4.8 The proposed restoration scheme as presented in this schedule is the minimum requirement. However, the contractor shall check, validate and if require improve/augment the detailed design based on his surveys and investigations of minimum scope as given below before commencement of work.
  - GEOPHYSICAL INVESTIGATION to know the natural formation and its weak plane / zones in valley slope in addition to the GEOTECHNICAL INVESTIGATION by conducting adequate numbers of boreholes of depth around 30m or termination depth at 1.5m inside hard rock whichever is less by positioning the boreholes all along the valley slope namely at top, intermediate of valley slope
  - TOPOGRAPHICAL SURVEY for the Stretch to be rehabilitated including the Detailed Contour Survey and Cross-Section Survey covering the total area in valley sides.
  - MAPPING of any kind of crack, fault etc. generated in the entire affected area and its influence zone (beyond the affected zone).

Any associated risk with respect to cost and time due to modification / changes in the design shall be assessed and incorporated in the bid.

#### 5 PAVEMENT DESIGN

5.1 Pavement layers shall be constructed in accordance with the thickness provided below table/Drawing.

## 5.2 Type of pavement

The project highway is flexible pavement and the layer thicknesses are tabulated below as minimum required provisions:

S.No.	Description	Pavement Thickness
	_	(in mm)
1	Bituminous Concrete	40
2	Dense Bituminous Macadam	75
3	WMM	200
4	Granular Sub Base	200

# 5.3 Design requirements

[Refer to paragraph 5.4, 5.9 and 5.10 of the Manual and specify design requirements and strategy]

## 5.3.1 *Design Period and strategy*

Flexible pavement for new pavement or for widening and strengthening of the existing pavement shall be designed for a minimum design period of 15 years. Stage construction shall

not be permitted.

## 5.3.2 Design Traffic

Notwithstanding anything to the contrary contained in this Agreement or the Manual, the Contractor shall design the pavement for a design traffic of 25 million standard axles.

#### 5.4 Reconstruction of stretches

[Refer to paragraph 5.9.7 of the Manual and specify the stretches, if any, to be reconstructed.]

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

Sl. No.	Stretch From km to km	Remarks
1	54.255 to 54.505	
2	63.575 to 63.785	

#### 6 ROADSIDE DRAINAGE

Drainage system including surface and subsurface drains shall be provided as per proposed restoration scheme presented in Drawing number NHIDCL/KM54 & KM 63/01 (02 sheets) in Annexure - A of Schedule B.

## 7 DESIGN OF STRUCTURES

#### 7.1 General

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

[Refer to paragraph 7.1 (ii) of the Manual and specify the width of carriageway of new bridges and structures of more than 60 metre length, if the carriageway width is different from 7.5 metres in the table below.]

Sl No.	Bridge at km	Width of carriageway and cross-
		sectional features <sup>@</sup>

<sup>&</sup>lt;sup>®</sup> Attach typical cross-section, if necessary.

	NIL	
	NII	

7.1.3 The following structures shall be provided with footpaths:

[Refer to paragraph 7.1 (iii) of the Manual and provide details of new Structures with footpath.]

Sl. No.	Location at km	Remarks
	NIL	

7.1.4 All bridges shall be high-level bridges.

[Refer to paragraph 7.1 (iv) of the Manual and state if there is any exception]

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

[Refer to paragraph 7.1 (viii) of the Manual and provide details]

	Sl. No.	Bridge at km	Utility service carried	e to	be	Remarks
7.1.6			NIL			

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

## 7.2 Culverts

- 7.2.1 Overall width of all culverts shall be equal to the roadway width of the approaches.
- 7.2.2 Reconstruction of existing culverts:

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

[Refer to paragraph 7.3 (i) of the Manual and provide details]

Sl. No.	Culvert location	Span/Opening (m)	Remarks, if any*

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

7.2.3 Widening of existing culverts

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

Sl. No.	Culvert location		Repairs to be carried out [specify]		
NIL					

7.2.4 Additional new culverts shall be constructed as per particulars given in the table below:

Sl No.	Culvert location	Span/Opening (m)
	NI	L

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

[Refer to paragraph 7.23 of the Manual and provide details]

Sl. No.	Location at km	Type of repair required
		NIL

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

# 7.3 Bridges

- 7.3.1 Existing bridges to be re-constructed/widened
  - [(i) The existing bridges at the following locations shall be re-constructed as new Structures:]

[Refer to paragraph 7.3.2 of the Manual and provide details]

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

\*Attach GAD

(ii) The following narrow bridges shall be widened:

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

- @ Attach cross-section
- 7.3.2 Additional new bridges

[Specify additional new bridges if required, and attach GAD]

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

Sl. No.	Location (km)	Total length (m)	Remarks, if any
		NIL	

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

[Refer to paragraph 7.18 (iv) the Manual and provide details:]

Sl. No.	Location at km	Remarks	
		NIL	

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

[Refer to paragraph 7.18 (v) the Manual and provide details]

Sl. No.	Location at km	Remarks
	N	IL .

7.3.5 Drainage system for bridge decks

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

#### 7.3.6 Structures in marine environment

[Refer to paragraph 7.22 of the Manual and specify the necessary measures / treatments for protecting structures in marine environment, where applicable]

# 7.4. Rail-road bridges

7.4.1 Design, construction and detailing of ROB/RUB shall be as specified in section 7 of the Manual. [Refer to paragraph 7.19 of the Manual and specify modification, if any]

## 7.4.2 Road over-bridges

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

Sl. No.	Location of Level crossing (chainage km)	Length of bridge (m)
	NIL	

## 7.4.3 Road under-bridges

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

Sl. No.	Location of crossing (chainage km)	Level	Number and length of span (m)
		NIL	

## 7.5 Grade separated structures

[Refer to paragraph 7.20 of the Manual]

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

# 7.6 Repairs and strengthening of bridges and structures

[Refer to paragraph 7.23 of the Manual and provide details]

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

#### A. Bridges

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

#### B. ROB/RUB

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

# C. Overpasses/Underpasses and other structures

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

# 7.7 List of Major Bridges and Structures

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

Sl. No.	Location	Location		
NIL				

#### 8 TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS

- 8.1 Traffic control devices and road safety works shall be provided in accordance with Section 9 of the Manual.
- 8.2 Specifications of the reflective sheeting. [Refer to paragraph 9.3 of the Manual and specify]

# 9 ROADSIDE FURNITURE

9.1 Roadside furniture shall be provided in accordance with the provisions of Section 11 of the Manual. The W- Beam metal Crash barrier shall be provided in the following stretches.

Sl. No.	Stretch From km to km	Remarks
1	54.255 to 54.505	

2
---

## 9.2 Overhead traffic signs: location and size

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

#### 10 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.]

#### 11 HAZARDOUS LOCATIONS

The safety barriers shall also be provided at the following hazardous locations:

Sl. No.	Location stretch from (km) to (km)	LHS/RHS		
NIL				

## 12 SPECIAL REQUIREMENT FOR HILL ROADS

In accordance with section 13 of the manual (from IRC SP 73: 2015), IRC: SP 48:1998 and Recommended Practices for the Treatment of Embankment and Roadside slopes for Erosion control(First Revision) IRC: 56:2011 and relevant IRC codes.

Land slide protection works as para 4.1, 4.3, 4.5 & 4.7 above shall be provided.

However, the Contractor shall be responsible for accurate assessment of the actual requirement as per site situation & prepare designs for slope protection & stabilization as per the specifications & standards stipulated in schedule 'D' and submit the same to AE for review through the proof consultant and implement it accordingly thereafter.

Any increase in quantity over and above the tentative quantity as mentioned in above tables or through change in specifications will not be considered for payment as change of scope. Therefore Contractor shall make through investigation of the site and assess the requirement of slope protection and slide prone zones and other safety features on his own before submission of bid.

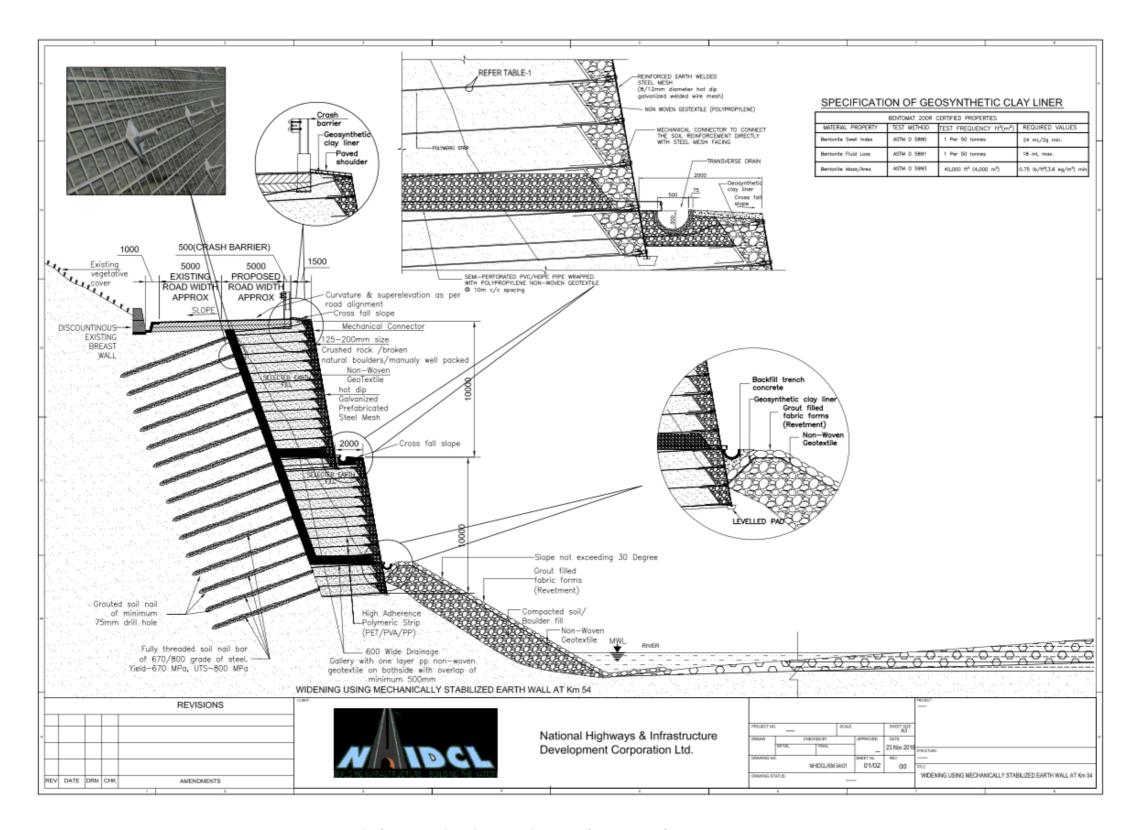
#### 13 CHANGE OF SCOPE

The length of Structures, bridges and slope protection works whatsoever in terms of retaining wall, breast wall and gabion wall or under special requirement of hill slope specified herein above shall be treated as an approximate assessment. The actual lengths as required on the basis of detailed investigations shall be determined by the Contractor in accordance with the specification and standards. Any variations in the lengths and specifications given in the schedule—B shall not constitute a change of Scope.

Annexure-A (Schedule B)



Existing Cross-Section of first 130m stretch length at KM54 narrow zone



Detail of proposed widening scheme at first 130m of narrow zone at KM54

GROUT FILLED FABRIC FORM . ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METER UNLESS OTHERWISE STATED SOIL REINFORCEMENT (TABLE-1) DETAILED DESIGN SHALL BE DONE BY CONDUCTING DETAILED SOIL INVESTIGATION AS REQUIRED FOR DESIGN, WHICH SHALL INCLUDE GEOPHYSICAL STUDY AND INNIMUM SIX BORE HOLE INVESTIGATION PER SITE, THREE ON HILL SIDE, AND THREE ON INTERMEDIATE LEVEL. HIGH ADHERENCE (HIL) POLYMERIC STRP THE ANALYSIS SHALL BE DONE CONSIDERING SEISMIC ZONE- W. THE HA POLYMERIC STRIP REINFORCEMENT SHALL BE AS SHOWN IN TABLE NO.1 AND THE GROUTED SOL NAL SHALL BE AS SHOWN IN TABLE NO.3. THE PRELIMINARY ANALYSIS SHALL BE DONE CONSIDERING DESIGN BOND STRENGTH OF 60Kpa BETWEEN THE GROUT AND SOIL. 251 300 THE PULL OUT BOND STRENGTH SHALL BE RE VERIFIED AS SITE BY CONDUCTING IN SITU PULLOUT TEST THE MECHANICALLY STABLIZED REINFORCIED EARTH WALL DESIGN ANALYSIS SHALL BE DONE AS PER AFNOR RE-PR4-270 JULY 2009 AS CITED IN ANNEXURE A1-1.1 IN SECTION 3180 OF MORTH-5th REVISION OR FHWA. THE OVERALL STABLITY ANALYSIS SHALL BE DONE FOR WORKING STRESS ANALYSIS CONSIDERING A FACTOR OF SAFETY OF 1.3 FOR STATIC 8.1.1 FOR SESSING. 329 ALL DRAINAGE GALLERY SHALL BE AS PER CLASS-II GRADATION OF MORTH 5TH REV. SPECIFICATION (TABLE NO.-300.3, PAGE-87) 670/900 28 413 493 GROUT FILLED FABRIC FORM REVETMENT: THE TOE PROTECTION/BED PROTECTION SHALL BE DONE USING GROUT FILLED MATTRESS AS PER DETAILED SPECIFICATION SHOWN IN TABLE NO.-12 (grade (TABLE -2) PROPERTIES OF GROUT FILLED FABRIC FORM THE SEMI PERFORATED PVC PIPE HAS BEEN PROVIDED AS A DRAINAGE OUTLET AT THE TOE OF EACH TIER WALL AS SHOWN IN CROSS SECTION. DETAIL AS SHOWN IN SECTION X-X. 474 566 PHYSICAL PROPERTIES THE FACING FOR THE MECHANICALLY STABILIZED REINFORCED EARTH WALL (ON BOTH SIDES-EXPOSED FACE & SLOPED SURFACE) SHALL BE USING HOT DIP GALVANIZED WELDED STEEL MESH OF MINIMUM Brim DIA BAR@HOTmin ob EXCEPT THE HORIZONTAL BARS WHERE THE PRIMARY REINFORCEMENT IS CONNECTED SHALL BE OF MINIMUM 12mm. DIA BAR Mass Per Unit Area (double-lover AS D 5261 g/m² 500 AS D 5199 Mm , THE SOIL REINFORCEMENT USED FOR MECHANICALLY STABILIZED REINFORCED EARTH WALL SHALL BE CONNECTED MECHANICALLY WITH THE FACING DIRECTLY USING POSITIVE CONNECTION, NO OVERLAP CONNECTION SHALL BE USED DUE TO HIGH SEISMIC ZONE AS PER AGLAST PAPACRAPH OF ANNEXURE-IP PAGEZ379 BS-0006:2019. THE DETAILS FOR THE SOIL REINFORCEMENT (HIGH ADHERENCE POLYMERIC STRAP) IS SHOWN IN TABLE NO-01. MILWSHE Wide-Width Strip Tensile Strength AS D 4595 THE SOLL REINFORCEMENT USED FOR MECHANICALLY STABILIZED REINFORCED EARTH WALL SHALL BE CONNECTED MECHANICALLY WITH THE GROUTED NAIL AND MESH DIRECTLY USING POSITIVE CONNECTION. Machine Direction 01 8 හි @100 c/c Cross Machine Direction kNim . ALL THE STEEL COMPONENTS SHALL BE NOT DIP GALVANIZED WITH A MINIMUM GALVANIZATION OF 70  $\mu$  (500gm/Sqm) EXPECT THE WELDED GRID MESH WHICH SHALL BE MINIMUM OF 86  $\mu$  (610gm/Sqm) Elongation at Break Machine Direction FULLY THREADED GALVANIZED HIGH TENSILE IN-SITU SOIL REINFORCEMENT SHOULD HAVE A MINIMUM YIELD STRENGTH OF 670 MPA AND ULTIMATE TENSILE STRENGTH OF 600 MPA. AS PER TABLE NO.3. Grab Tensile Strength AS D 4632 . DETAILS OF TOE PROTECTION USING GROUTED. FILLED MATTRESS FOR EROSION PROTECTION OF WATER FRONT STRUCTURE AND SLOPE EROSION PROTECTION IS GIVEN IN TABLE NO.2. Machine Direction Elongation at Break AS D 4632 EROSION CONTROL- COIR NON-WOVEN GEOTEXTILE. Machine Direction . THE FACE WHERE ONLY SLOPE PROTECTION HAS BEEN PROPOSED (HLL SIDE) SHALL BE COVERED WITH EROSION CONTROL COR NON-WOVEN GEOTEXTILE AS PER TECHNICAL SPECIFICATION. Frapezoidal Tear Strength AS D 4533 FACING . STONE AGGREGATES OF SIZE 125-200 ym SHALL BE USED BEHIND THE FACING OF MECHANICALLY STABILIZED REINFORCED EARTH WALL AS SHONE IN DETAIL-Y. BROKEN NATURAL BOULDERS SHALL BE PLACED JUST BEHIND THE STEEL MESH FACING. N 600 CBR Puncture Strength Mullen Burst Strength AS D 3786 (Mod.) kg/cm<sup>-r</sup> 40 5.No. Testing Parameters Acceptable Limits Code Applicable for Testing HYDRAULIC PROPERTIES Full Threaded Nail Bar AS D 4751 mm 0.30-0.80 Apparent Opening Size (ADS) Flow Rate AS D 4491 | l/min/m² | 1200-1625 EN 30204 or IS 1608 TYPICAL ELEVATION DETAIL OF REINFORCED EARTH STEEL MESH 85.729 PERFORATIONS #6 Approx 12 STAGGERED HOLES PER RUNNING METER/PER ROW 3)12Ø @ 8 Ø 12Nos. Approx 12 STAGGERED HOLES PER RUNNING METER/PER ROW TOP PLAN AT SEMI PERFORATED PIPE SECTION X-X SECTION Y-Y REVISIONS

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Volume III- Schedule - B

23.Nov.201

WIDENING USING MECHANICALLY STABILIZED EARTH WALL AT Km 5

Detail of proposed widening scheme at first 130m of narrow zone at KM54

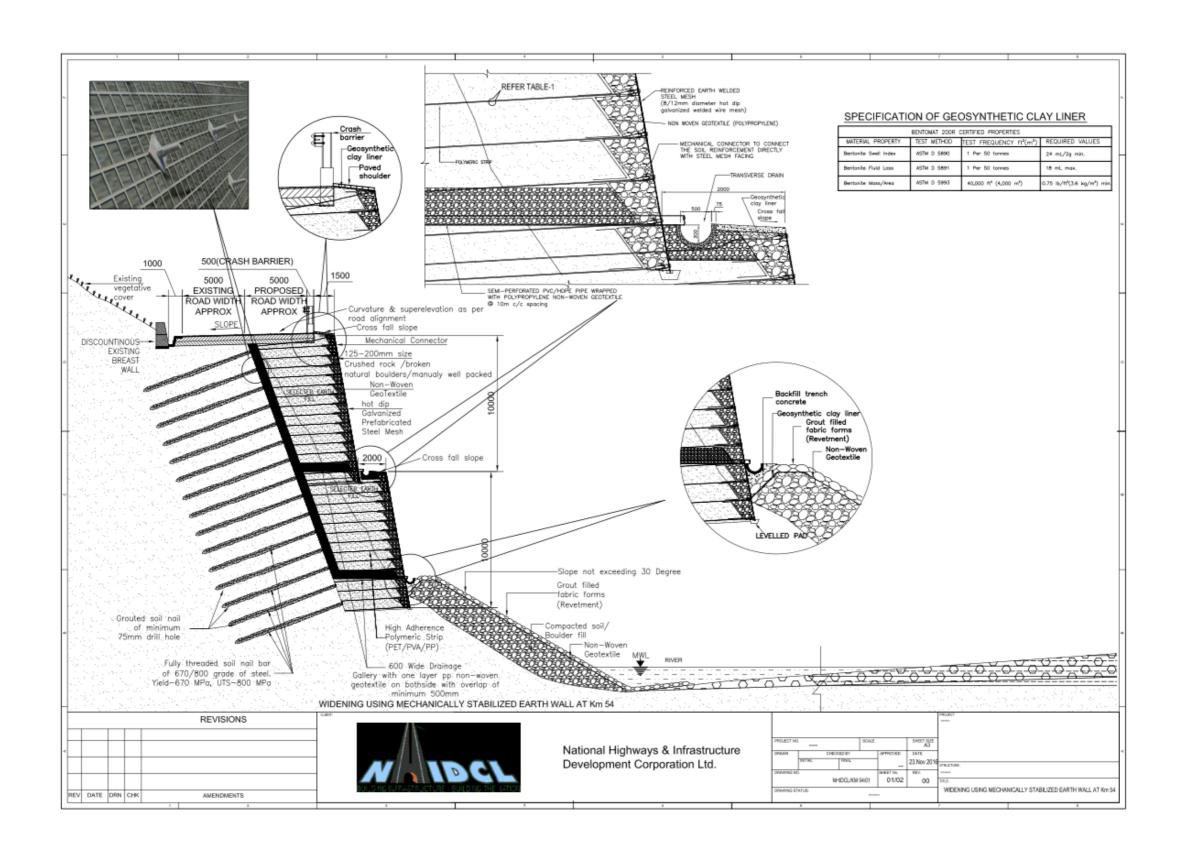
National Highways & Infrastructure

Development Corporation Ltd.

REV DATE DRN CHK



Existing Cross-Section of balance 130m stretch length at KM54 narrow zone



Detail of proposed widening scheme at balance 130m of narrow zone at KM54

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METER UNLESS OTHERWISE STATED. SOIL REINFORCEMENT (TABLE-1) HIGH ADHERENCE (HII) POLYMERIC STRIP THE HA POLYMERIC STRIP REINFORCEMENT SHALL BE AS SHOWN IN TABLE NO.1 AND THE GROUTED SOL NALL SHALL BE AS SHOWN IN TABLE NO.3. THE PRELIMINARY ANALYSIS SHALL BE DONE CONSIDERING DESIGN BOND STRENGTH OF 60K
 <sub>M</sub> BETWEEN THE GROUT AND SOIL 375 251 300 (grade 97) 6. THE PULL OUT BOND STRENGTH SHALL BE RE VERIFIED AS SITE BY CONDUCTING IN SITU PULLOUT TEST THE MECHANICALLY STABLIZED REINFORCED EARTH WALL DESIGN ANALYSIS SHALL BE DONE AS PER AFNOR NF.P94-270 JULY 2009 AS CITED IN ANNEXURE A1-1.1 IN SECTION 3100 OF MORTH-5th REVISION OR FHWA. THE OVERALL STABLITY ANALYSIS SHALL BE DONE FOR WORKING STRESS ANALYSIS CONSIDERING A FACTOR OF SAFETY OF 1.3 FOR STATIC & 1.1 FOR SEISMC. 491 329 393 ALL DRAINAGE GALLERY SHALL BE AS PER CLASS-II GRADATION OF MORTH 5TH REV. SPECIFICATION (TABLE NO.-300.3, PAGE-87) 413 GROUT FILLED FABRIC FORM REVETMENT: THE TOE PROTECTION/BED PROTECTION SHALL BE DONE USING GROUT FILLED MATTRESS AS PER DETAILED SPECIFICATION SHOWN IN TABLE NO. 02 (TABLE -2) PROPERTIES OF GROUT FILLED FABRIC FORM . THE SEMI PERFORATED PVC PIPE HAS BEEN PROVIDED AS A DRAINAGE OUTLET AT THE TOE OF EACH TIER WALL AS SHOWN IN CROSS SECTION, DETAIL AS SHOWN IN SECTION X-X. Test Method Units Values 474 (grade 97) Composition of Yarns Mass Per Unit Area (double-layer) THE FACING FOR THE MECHANICALLY STABILIZED REINFORCED EARTH WALL ( ON BOTH SIDES-EXPOSED FACE & SLOPED SURFACE) SHALL BE USING HOT DP GALVANIZED WELDED STEEL MESH OF MINIMUM firm DIA BARGINORMS ON EXCEPT THE HORIZONTAL BARS WHERE THE PRIMARY REINFORCEMENT IS CONNECTED SHALL BE OF MINIMUM Târms. DA BAR AS D 5199 THE SOIL REINFORCEMENT USED FOR MECHANICALLY STABILIZED REINFORCED EARTH WALL SHALL BE CONNECTED MECHANICALLY WITH THE FACING DIRECTLY USING POSITIVE CONNECTION NO OVERLAP CONNECTION SHALL BE USED DUE TO HIGH SEISNIC ZONE AS PER JALLST PARAGRAPH OF AMERICANE LONG AND THE DETAILS FOR THE SOIL REINFORCEMENT (HIGH ADHERENCE POLYMERIC STRAP) IS SHOWN IN TABLE NO.01. M 2.13 MECHANICAL PROPERTIES Wide-Width Strip Tensile Strength . THE BOIL REINFORCEMENT USED FOR MECHANICALLY STABILIZED REINFORCED EARTH, WALL SHALL BE CONNECTED, MECHANICALLY WITH THE GROUTED NAIL AND MESH DIRECTLY USING POSITIVE CONNECTION. 01 8 Ø @100 c/c Machine Direction Cross Machine Direction ALL THE STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED WITH A MINIMUM GALVANIZATION OF 70 µ(\$00gm/Sqm) EXPECT THE WELDED GRID MESH WHICH SHALL BE MINIMUM OF 86 µ (\$10gm/Sqm) Elongation at Break AS D 4595 Machine Direction . FULLY THREADED GALVANIZED HIGH TENSILE IN-SITU SOIL REINFORCEMENT SHOULD HAVE A MINIMUM YIELD STRENGTH OF 670 MPA AND ULTIMATE TENSILE STRENGTH OF 800 MPA, AS PER TABLE NO-3. AS D 4632 . DETAILS OF TOE PROTECTION USING GROUTED. FILLED MATTRESS FOR EROSION PROTECTION OF WATER FRONT STRUCTURE AND SLOPE BROSION PROTECTION IS GIVEN IN TABLE NO.2. Cross Machine Direction N 1396 AS D 4632 EROSION CONTROL- COIR NON-WOVEN GEOTEXTILE. THE FACE WHERE ONLY SLOPE PROTECTION HAS BEEN PROPOSED (HLL SIDE) SHALL BE COVERED WITH EROSION CONTROL COR NON-MOVEN GEOTEXTILE AS PER TECHNICAL SPECIFICATION. Cross Machine Direction % 20 FACING Machine Direction Cross Machine Direction CBR Puncture Strength Mullen Burst Strength AS D 3786 (Mod.) kg/cm<sup>-r</sup> 40 AS D 4751 mm 0.30-0.90 Permittivity AS D 4491 sec 1 0.40-0.55 AS D 4491 | l/min/m<sup>2</sup> 1200-1625 670 Mpa (Minimum) EN 30204 or IS 1608 Yolki Strongth 3120 3000 Bongation 7% TYPICAL ELEVATION DETAIL OF REINFORCED EARTH STEEL MESH PERFORATIONS #6 Approx 12 STAGGERED HOLES PER RUNNING METER/PER ROW ③12ø @ 8 Ø 12Nos. Approx 12 STAGGERED HOLES PER RUNNING METER/PER ROW #150 SEMI PERFORATED TYPE-B PVC PIPE CONFORMING TO IS 13592-1992 (MIN 4 mm THICKIN WRAPPED WITH GEOTEXTILE (min. 119 gam TOP PLAN AT SEMI PERFORATED PIPE SECTION X-X SECTION Y-Y REVISIONS

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Volume III- Schedule - B

23 Nov 2019

WIDENING USING MECHANICALLY STABILIZED EARTH WALL AT Km 54

02/02

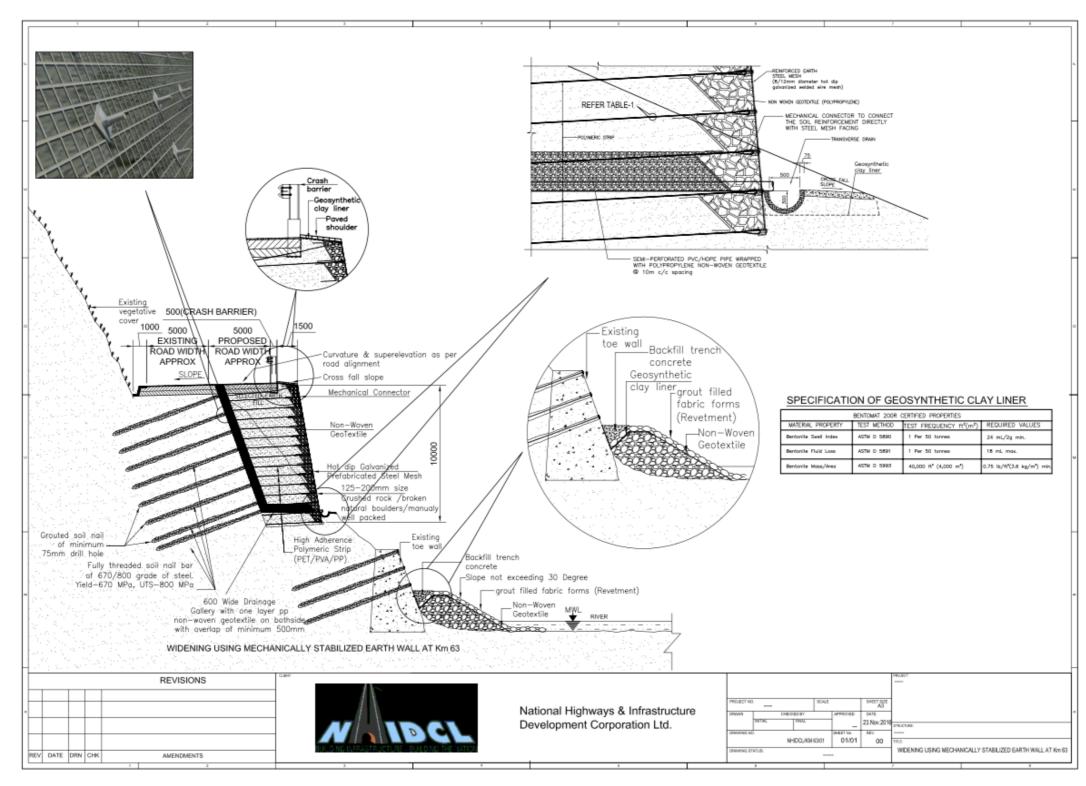
NHIDCL/KM 54/01

Detail of proposed widening scheme at balance 130m of narrow zone at KM54

National Highways & Infrastructure

Development Corporation Ltd.

Existing Cross-Section of 210m stretch length at KM63 narrow zone



Typical Detail of proposed widening scheme at 210m of narrow zone at KM63

DETAILED DESIGN SHALL BE DONE BY CONDUCTING DETAILED SOIL INVESTIGATION AS REQUIRED FOR DESIGN, WHICH SHALL INCLUDE GEOPHYSICAL STUDY AND MINIMUM SIX BORE HOLE INVESTIGATION PER SITE, THREE ON HILL SIDE AND THREE ON INTERNEDIATE LEVEL. SOIL REINFORCEMENT (TABLE-1) HIGH ACHERENCE (HA) POLYMERIC STR THE ANALYSIS SHALL BE DONE CONSIDERING SEISMIC ZONE- ₩. . THE HA POLYMERIC STRIP REINFORCEMENT SHALL BE AS SHOWN IN TABLE NO.1 AND THE GROUTED SOIL NAIL SHALL BE AS SHOWN IN TABLE NO-3. . THE PRELIMINARY ANALYSIS SHALL BE DONE CONSIDERING DESIGN BOND STRENGTH OF 60Kpa BETWEEN THE GROUT AND SOIL. 251 THE PULL OUT BOND STRENGTH SHALL BE RE VERIFIED AS SITE BY CONDUCTING IN SITU PULLOUT TEST THE MECHANICALLY STABLIZED REINFORCED EARTH WALL DESIGN ANALYSIS SHALL BE DONE AS PER AFNOR NF P94-270 JULY 2009 AS CITED IN ANNEXURE A1-1.1 IN SECTION 3100 OF MORTH-6IN REVISION OR FHWA. THE OVERALL STABLITY ANALYSIS SHALL BE DONE FOR WORKING STRESS ANALYSIS CONSIDERING A FACTOR OF SAFETY OF 1.3 FOR STATIC 6.1.1 FOR SESSING. 329 ALL DRAINAGE GALLERY SHALL BE AS PER CLASS-II GRADATION OF MORTH 5TH REV. SPECIFICATION (TABLE NO.-300.3, PAGE-87) 616 413 493 . GROUT FILLED FABRIC FORM REVETIMENT : THE TOE PROTECTION/BED PROTECTION SHALL BE DONE USING GROUT FILLED MATTRESS AS PER DETAILED SPECIFICATION SHOWN IN TABLE NO.42 (TABLE -2) PROPERTIES OF GROUT FILLED FABRIC FORM THE SEMI PERFORATED PVC PIPE HAS BEEN PROVIDED AS A DRAINAGE OUTLET AT THE TOE OF EACH TIER WALL AS SHOWN IN CROSS SECTION. DETAIL AS SHOWN IN SECTION X-X. 474 PHYSICAL PROPERTIES 1. THE FACING FOR THE MECHANICALLY STABILIZED REINFORCED EARTH WALL (ON BOTH SIDES-EXPOSED FACE & SLOPED SURFACE) AS D 5261 SHALL BE USING HOT DIP GALVANIZED WELDED STEEL MESH OF MINIMUM 8mm DIA BARIQH00mm ob EXCEPT THE HORIZONTAL BARS WHERE THE PRIMARY REINFORCEMENT IS CONNECTED SHALL BE OF MINIMUM 12mm. DIA BAR AS D 5199 THE SOIL REINFORCEMENT USED FOR MECHANICALLY STABILIZED REINFORCED EARTH WALL SHALL BE CONNECTED MECHANICALL WITH THE FACING DIRECTLY USING POSITIVE CONNECTION. NO OVERLAP CONNECTION SHALL BE USED DUE TO HIGH SEISMIC ZONE AS PER "34 LAST PARAGRAPH OF ANNEXURE-F (PAGE237) B5-806:2010. THE DETAILS FOR THE SOIL REINFORCEMENT IS SHOWN IN TABLE NO.01. M 2.13 MECHANICAL PROPERTIES YΗ Naminal length 3000 THE SOIL REINFORCEMENT USED FOR MECHANICALLY STABILIZED REINFORCED EARTH WALL SHALL BE CONNECTED MECHANICALLY WITH THE GROUTED NAIL AND MESH DIRECTLY USING POSITIVE CONNECTION. Machine Direction Cross Machine Direc kNim 60 ALL THE STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED WITH A MINIMUM GALVANIZATION OF 70 μ(500gm/Sqm) EXPECT THE
WELDED GRD MESH WHICH SHALL BE MINIMUM OF 86 μ (610gm/sqm) ③12 Ø ③ 12 Ø ② 8 Ø 13Noc. Elongation at Break Machine Direction FULLY THREADED GALVANZED HIGH TENSILE IN-SITU SOIL REINFORCEMENT SHOULD HAVE A MINIMUM YIELD STRENGTH OF 670 MPA AND ULTIMATE TENSILE STRENGTH OF 800 MPA. AS PER TABLE NO-3. Grab Tensile Strength AS D 4632 . DETAILS OF TOE PROTECTION USING GROUTED FILLED MATTRESS FOR EROSION PROTECTION OF WATER FRONT STRUCTURE AND SLOPE EROSION PROTECTION IS GIVEN IN TRAILE IN O.2. Machine Direction Cross Machine Directio N 1396 EROSION CONTROL- COIR NON-WOVEN GEOTEXTILE. THE FACE WHERE ONLY SLOPE PROTECTION HAS BEEN PROPOSED (HILL SIDE) SHALL BE COVERED WITH EROSION CONTROL COR NON-WOVEN GEOTEXTILE AS PER TECHNICAL SPECIFICATION. Cross Machine Directio rapezoidal Tear Streng FACING Machine Direction STONE AGGREGATES OF SIZE 125-200ym SHALL BE USED BEHIND THE FACING OF MECHANICALLY STABILIZED REINFORCED EARTH
WALL AS SHONE IN DETAIL-Y, BROKEN NATURAL BOULDERS SHALL BE PLACED JUST BEHIND THE STEEL MESH FACING. Cross Machine Direction CBR Puncture Strength AS D 6241 N 5450 AS D 3786 (Mod.) kg/cm<sup>-1</sup> 40 HYDRAULIC PROPERTIES Apparent Opening Size (ADS) AS D 4751 mm 0.30-0.80 AS D 4491 | l/min/m<sup>2</sup> | 1200-1625 YΨ 3120 H 3000 TYPICAL ELEVATION DETAIL OF REINFORCED EARTH STEEL MESH Galvanization 500 gm/sem 85 729 PERFORATIONS Ø6 Approx 12 STAGGERED HOLES PER RUNNING METER/PER ROW ③12Ø @ 8 Ø 12Nos. Approx 12 STAGGERED HOLES PER RUNNING METER/PER ROW TOP PLAN AT SEMI PERFORATED PIPE SECTION X-X SECTION Y-Y

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Volume III- Schedule - B

23.Nov.201

WIDENING USING MECHANICALLY STABILIZED EARTH WALL AT KIN

NHIDGL/KM 6301 02/02 00

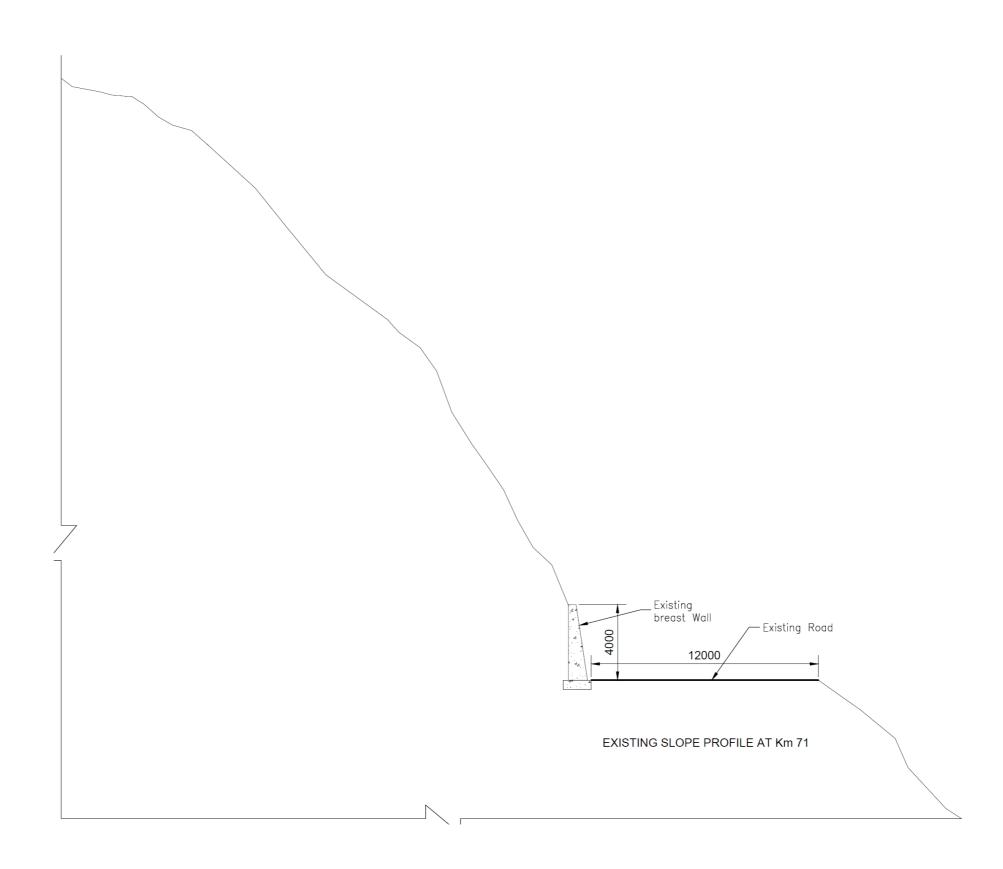
Typical Detail of proposed widening scheme at 210m of narrow zone at KM63

National Highways & Infrastructure

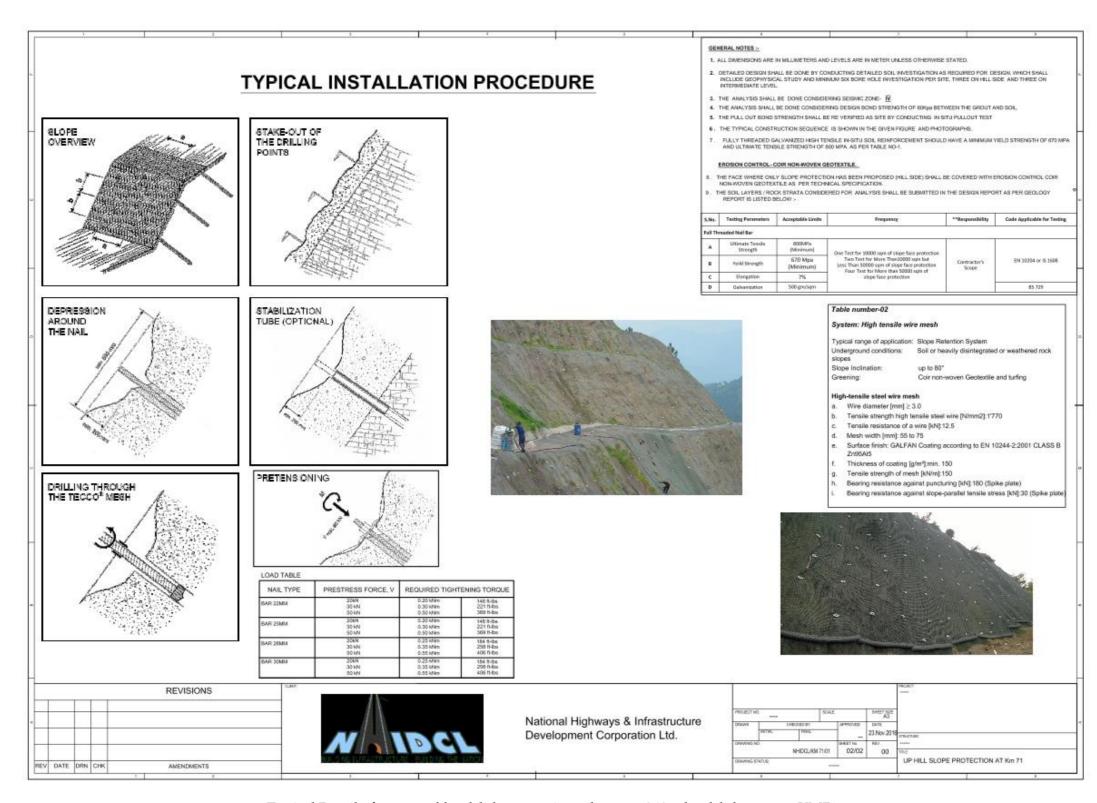
Development Corporation Ltd.

REVISIONS

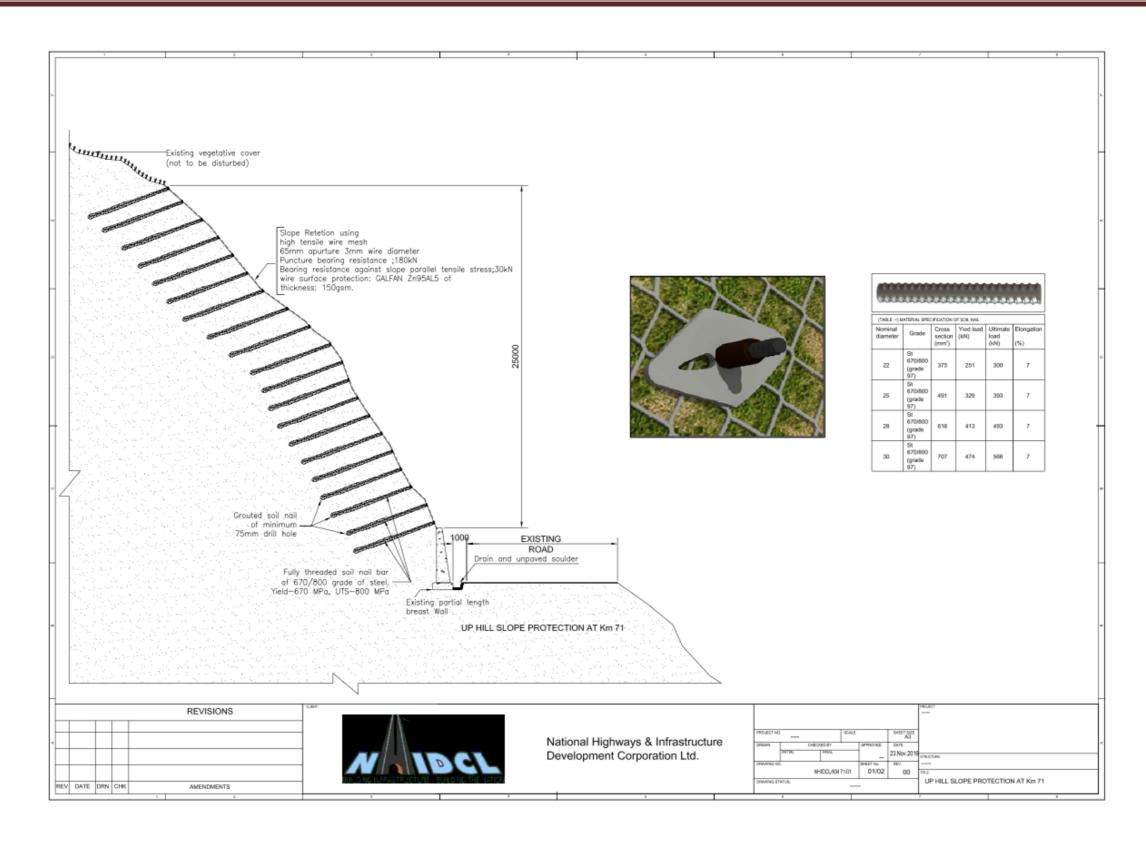
AMENDMENTS



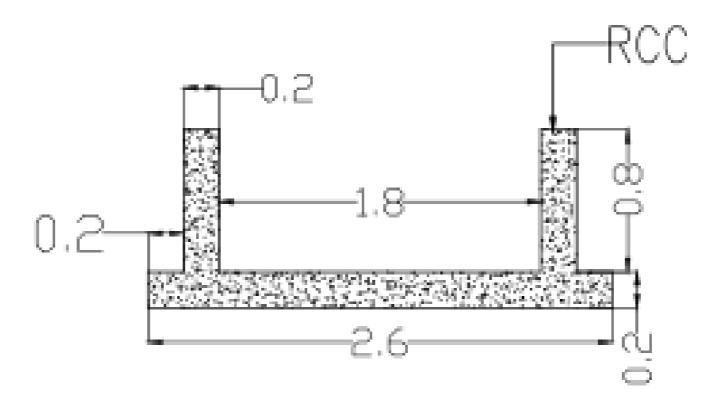
Existing Cross-Section of 360m stretch length at KM71 landslide zone



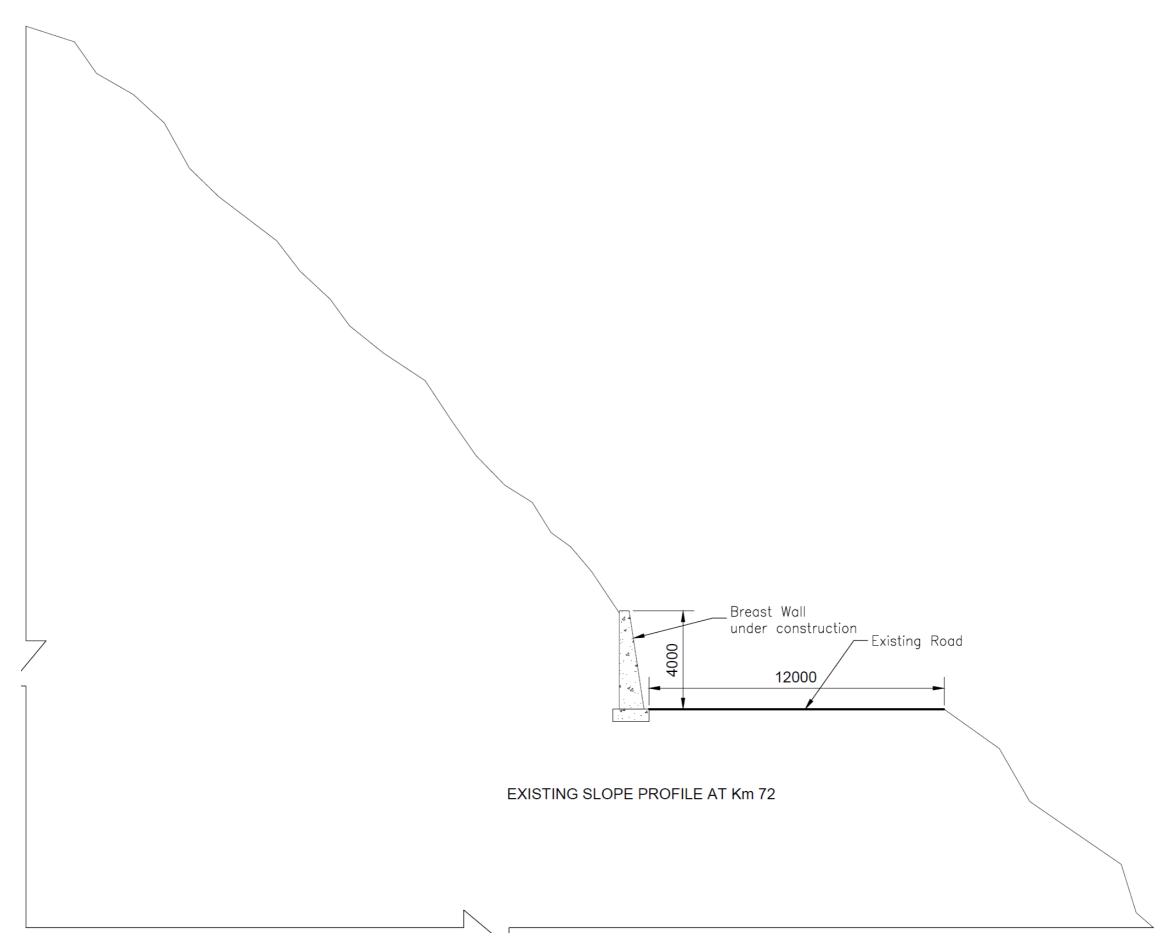
Typical Detail of proposed landslide protection scheme at 360m landslide zone at KM71



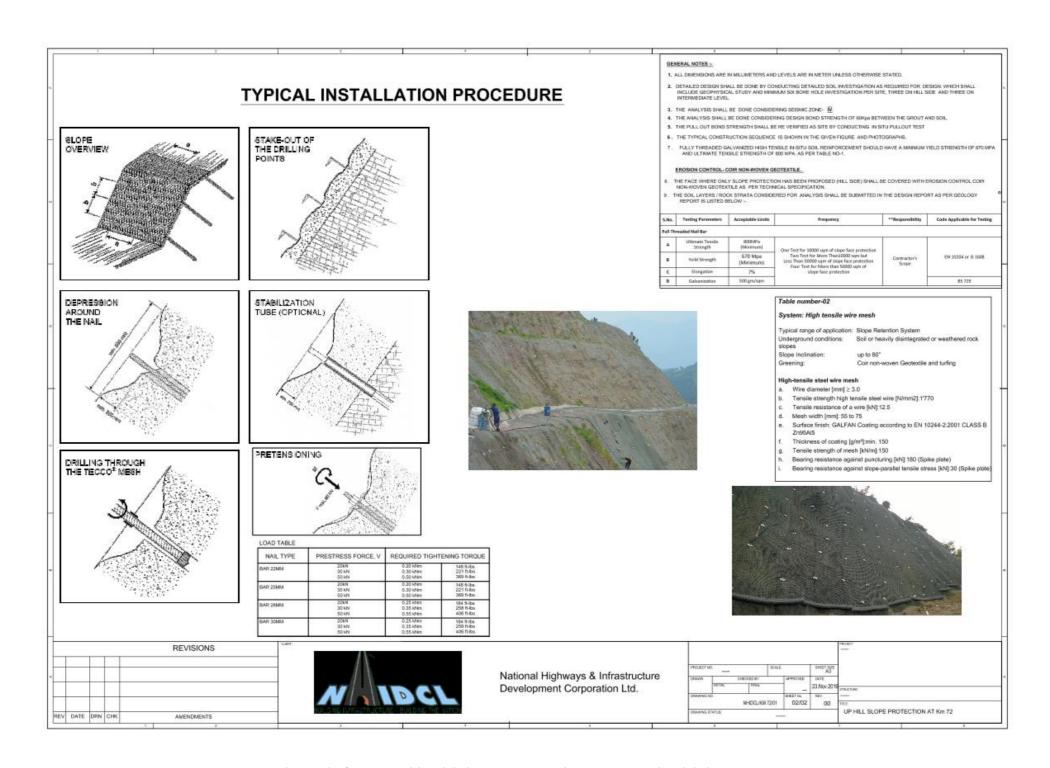
Typical Detail of proposed landslide protection scheme at 360m landslide zone at KM71



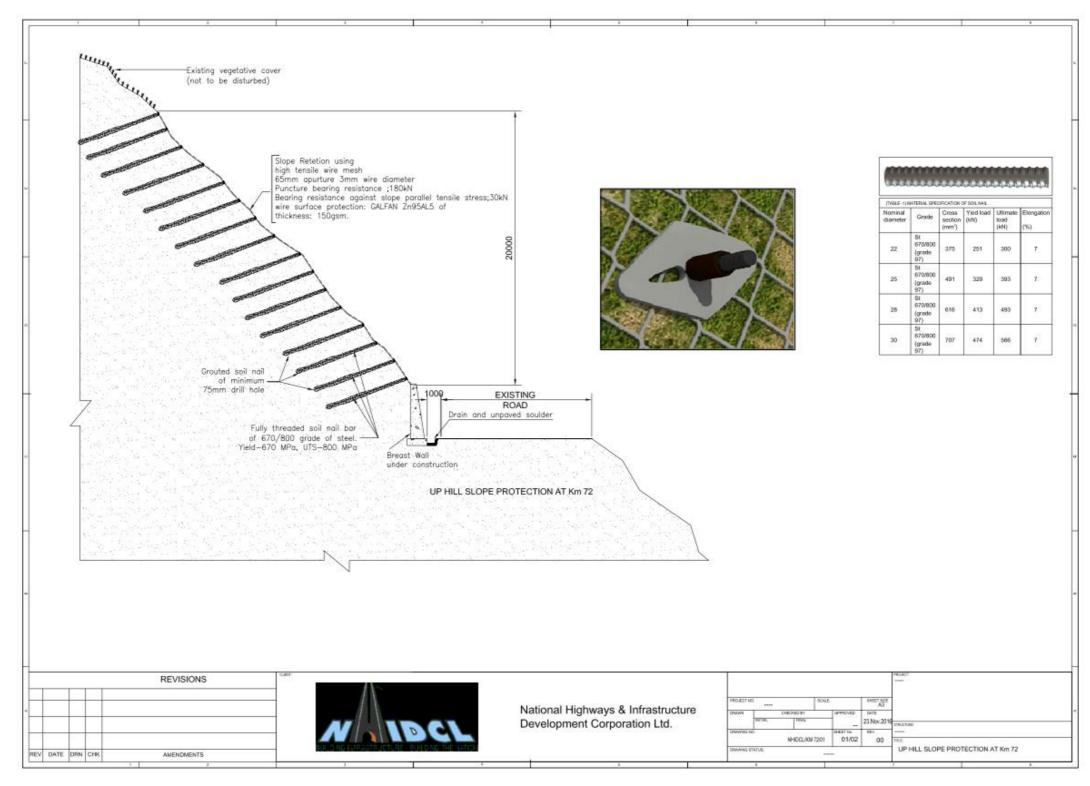
Typical cross section of the drain directed to the nearest culvert at KM71



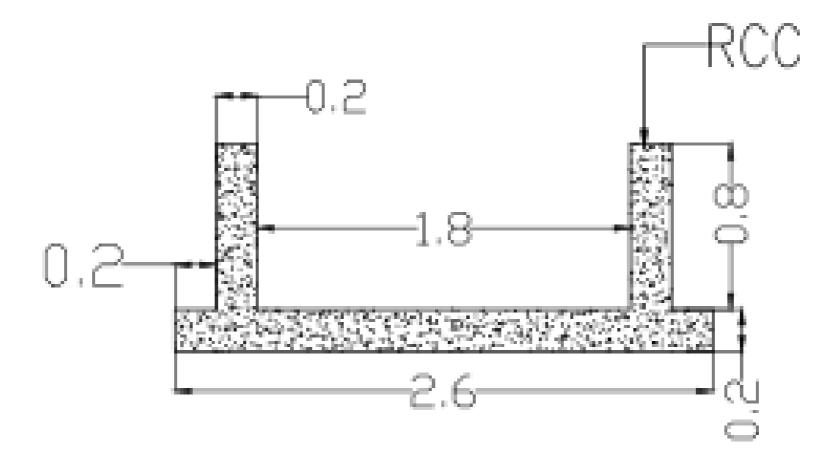
Existing Cross-Section of 350m stretch length at KM72 landslide zone



Typical Detail of proposed landslide protection scheme at 350m landslide zone at KM72



Typical Detail of proposed landslide protection scheme at 350m landslide zone at KM72



Typical cross section of the drain directed to the nearest culvert at KM72

# Annex - I (Schedule-D)

#### SPECIFICATIONS AND STANDARDS FOR CONSTRUCTION

## Para-1

# **Specification and Standards**

All Materials, works and construction operations shall conform to the Two lane Manual(IRC:SP:73-2015) of Specifications and Standards for Two-Laning (IRC:SP:73-2015) and MORTH Specifications for Road and Bridge Works(Fifth Revision) and IRC 56-2011Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

## Para-2

# 2.1

The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Two lane Manual(IRC:SP:73-2015) shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and Agreement" respectively.