SCHEDULE – B

(See Clause 2.1)

DEVELOPMENT OF THE PROJECT HIGHWAY

1 Development of the Project Highway

Development of the Project Highway shall include design and construction of the Project Highway as described in this Schedule-B and in Schedule-C. The project Highway is a new alignment which is to be developed to 2 lane with paved shoulder (NH standard)

2 Rehabilitation and augmentation

Rehabilitation and augmentation shall include [Two-Laning and strengthening] ofthe Project Highway as described inAnnex-I of this Schedule-B and in Schedule-C.

3 Specifications and Standards

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

Annex I

(Schedule-B)

Description of Two Laning

[Note: Description of the Project Highway shall be given by the Authority in detail together with explanatory drawings (where necessary) to explain the Authority's requirements precisely in order to avoid subsequent changes in the Scope of the Project. The particulars that must be specified in this Schedule-B are listed below as per the requirements of the Manual of Standards and Specifications for Two Laning of Highways (IRC: SP: 73-2015), referred to as the Manual. If any standards, specifications or details are not given in the Manual, the minimum design/construction requirements shall be specified in this Schedule. In addition to these particulars, all other essential project specific details, as required, should be provided in order to define the Scope of the Project clearly and precisely.]

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 hereinunder 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 patrols, 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 Authority Engineer).

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. Construction of the 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 hereinunder. 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.

2.2 Width of Carriageway

2.2.1 Two-Laningwithpaved shoulders shall be undertaken. The paved carriageway shall be [7(seven) m] wide in accordance with the typical cross sections drawings otherwise as per the two lane Manual.[IRC:SP:73:2015]. In addition, Paved shoulders as per manual is to be provided.

2.2.2 Except as otherwise provided in this Agreement, the width of the paved

carriagewayand 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 Section 2 of the Manual.

3.2 Design speed

The design speed shall be as per IRC:SP:73:2015, however, in exceptional cases the minimum design speed of [30 km per hr for hilly and mountainous terrain] is to be followed.

3.3 Improvement of the existing road geometries

3.4 Right of Way

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

3.5 Type of Shoulders

(a) In open country, paved shoulders of 1.5m in width shall be provided on Hill side and 1.5 m Paved shoulder +2.0m earthen shoulder shall be provided on valley side.

(b) In built up areas and approached to grade separated structures/ bridges.

	Width	Type	Total
Hill Side	0.25 m +1.5 m (Raised)	Paved	1.75 m
Valley Side	0.25 m +1.5 m (Raised)	Paved	1.75 m

(c) Design and specifications of shallconform to the requirements specified in the Manual.

3.6 Lateral and vertical clearances at underpasses

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

3.6.2 *Lateral clearance*: The width of the opening at the underpasses shall be as follows:

Sl No.	Location [Chainage (km)]		Span/Opening (m)	Remarks
	From	To		
Nil				

3.7 Lateral and vertical clearances at overpasses

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

3.7.2 *Lateral clearance*: The width of the opening at the overpasses shall be as follows:

Sl No.	Location [Chainage (km)]		Span/Opening (m)	Remarks
	From	To		
Nil				

3.8 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]

Sl No.	Location of Service Road (km)		Right Hand Side (RHS) / Left Hand Side (LHS) / Both Sides	Length (km) of Service Road
	From	To		
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]

Sl No.	Location of Structure	Length (m)	Number and Length of Spans (m)	Approach Gradient	Remarks, if any
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].

SlNo.	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: [Refer to paragraph 2.14.3 of the Manual and specify the requirements of cattle and pedestrian underpass/overpass.

Sl No.	Location	Type of Crossing
Nil		

3.11 Typical cross-sections of the Project Highway

Typical cross-sections to be followed as per IRC: SP-73-2015 and in addition the proposed cross section for various situations are given in the TCS III,IV,V(A) ,VI,VII & VIII. These illustrate the widening proposals for the project highway. The Project Highway (length 74.863 km) shall be 2-lane carriageway with paved shoulder.

Note: The Earthen shoulders mentioned in the TCS & drawings are to be read as Paved Shoulders

The cross section schedule shall be as follows:

Sl.NO.	DESIGN CHAINAGE		LENGTH	TYPE	Remarks / Location
	FROM	TO	(km)	TCS	
1	0.000	74.863	74.863	Type III,IV,V,VI,VII,VIII	Type of Cross Section shall be provided as per the profile & site condition

Note: The extent of cross section type is indicative and shall be reviewed in consultation with the Authority Engineer at the time of construction as per the site condition.

The alternative cross section of the Project Highway at the cross drainage structures shall follow the typical cross section in consultation with the Authority Engineer at the time of construction. The utility services, including optical fiber cables, shall be provided in the utility corridor earmarked for this purpose on the side where it is convenient to the NHIDCL or the fiber cable shall be relocated by the respective owner at a safe place as indicated by NHIDCL in such a way that it causes least hindrances to the execution of project. In urban sections the utility connection, the utility services shall be carried through the nearest cross drainage structure/cattle crossing below its deck slab and above HFL. In absence of such a structure in the vicinity of the purposed location, it shall pass through separate underground ducts. Location and design of the cross utility ducts shall be finalized at the detailed design stage in consonance with the Authority Engineer and NHIDCL.

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. However, the final finished road levels (FRL) will be finalized as per site conditions in consultation with NHIDCL.

4. INTERSECTIONS AND GRADE SEPARATORS

All intersections shall be as per Section3 of the Manual.
[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].

There areno intersections with cross roads having bituminous surfacing. The cross roads fall into the category VRs. The Construction Contractor has to construct the following:

i) Typical junction treatments as specified in Final Project Report shall be applied. Design types of intersections are as given below:

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

(a) At-grade Intersections

Major Intersections

Sl No.	Location of Intersection	Intersection Towards	Existing Configurations				Type of Intersection	Figure No.	Other Features
			Location	Type	Width (m)	Surface			
Requirement as per the manual									

Details of junction improvements shall be as per IRC SP: 73-2015.

Minor Intersections:

Sl No.	Location of Intersection	Type of Intersection
1	0.000	As per the 2 Lane Manuali.eIRC SP: 73-2015.
2	27.363	As per the 2 Lane Manuali.eIRC SP: 73-2015.
3	53.363	As per the 2 Lane Manual i.e IRC SP: 73-2015.
4	74.863	As per the 2 Lane Manual i.e IRC SP: 73-2015.

(b) **Grade Separated Intersections with/without Ramps**

Sl No.	Location (km)	Salient Features	Minimum Length of Viaduct to be Provided (m)	Road to be Carried Over/Under the Structures
Nil				

5. 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 Specificationsand Standards given in section 4 of the Manual and the specified cross sectionaldetails. 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. PAVEMENT DESIGN

6.1 Pavement design shall be carried out in accordance with section 5 of the Manual.The detailed pavement design including overlay and pavement characteristics requirements of the Project Highway shall be done in accordance with Schedule D. Flexible pavement shall be considered for the project road. Flexible pavement design shall be carried out in accordance with the section 5 of the Manual. (IRC: SP 73:2015)

6.2 Type of pavement

Flexible pavement shall be adopted for Project Highway in accordance with the IRC:37:2012 clause 2.2 . IRC:37:2012 identifies five types of flexible pavements. The estimated cost of civil works is based on flexible pavements consisting of Granular base, sub-base, DBM and BC. Since the successful bidders under the EPC mode can use any type of flexible pavements mentioned in clause 2.2 of IRC :37:2012, they may carry out their own diligence to arrive at project cost before submitting bids.

6.3 Design requirements

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

6.3.1 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.

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 20 million standardaxles as follows.

SL No	Design Chainage (km)		Length (km)	15Year MSA*
	From	To		
1	0.000	74.863	74.80	20

*As per 5.4.1 of IRC:SP:73-2015

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 26 months
(ii)	Traffic on Design Lane	Minimum 20msa 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 preferably polymer modified bitumen 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 20 million standard axles corresponding subgrade CBR.

6.3.8 Rigid Pavement

No rigid pavement has been considered for the Project Highway.

6.4 Reconstruction / Realignment / Bypass of sections

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

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

Sl No.	Section (km)		Remarks
	From	To	
1	Nil		

7. ROADSIDE DRAINAGE

Drainage system including surface and subsurface drains for the Project Highwayshall 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 Drainage Measures

Following measures shall be adopted:

i) Open side Trapezoidal drains at the hill side for widening at hill sides.

ii) Open side Trapezoidal drains at both sides in realignment stretches by hill cut.

Open side trapezoidal 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. RCC 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.

Trapezoidal section for the drain/ditch has been proposed as it is more economical and efficient as compared to rectangular cross section V-Shaped. These road side drains have been designed of adequate capacity to carry 100% surface runoff of the drainage area of highway ROW and the adjoining land. The side slopes have been kept as 1H:1V in case of unlined drain/ditches.

Lined drain to be provided in complete length on hill side, at junctions and on both sides on embankment portions/proposed built up areas. Minimum length of the drains to beconstructed is **99500 Rm.**

7.2 Slope Protection Measures

Breast Wall and Retaining Wall

Following measures shall be adopted:

Slope protection along hill slope side shall be with breast wallswith PCC minimum M15 grade concrete.However, at the zones prone to sliding breast walls will be of sausage type (by stone-mesh gabions).Retaining wall has been considered at valley

sides. The height of breast wallsis varying from 1.5 m to 3m as per site requirement and to be finalized by consultation with Authority Engineers. The breast wall of height 3m has been considered if the height of hill cut is more than 9m and in this circumstances 3m berm with catch water drain is required to beprovided. The maximum cut slope at hill side is 550 (0.7H to 1V).

Embankment less than 3m in height shall be turfed as per MoRTH Specifications.

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. DESIGN OF STRUCTURES

8.1 General

The Project road from Roingto Hunli, includes provision of 3Nos major bridges (span>=60m), and 7Nos minor bridges (span<60m) and 447 NosSlab/box culverts. All culverts and other structures shall be designed and constructed in accordancewith section 7 of the Manual and shall conform to the cross-sectional features and other details specified therein. New bridges and culverts shall be constructed wide enough to accommodate the adjacent road cross section as given in this Schedule-B.

The details of culverts shall be provided by the EPC Contractor and locations are given in Clause 8.2 of Schedule-B.

All the cross-drainage structures and other structures shall be designed in accordance with the design standards set out in **Schedule–D.**

The following guidelines shall be followed:

i) All the cross drainage structures for the new carriageway shall be designed in such 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 Slab/box culverts of minimum span2.0 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 Authority Engineer/NHIDCL and if required additional culverts shall be provided.

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

8.2 Culverts

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

8.2.2 New Culverts to be provided at following locations. In addition, if required provisions for additional culverts to be constructed as per the manual.

Sl No	Culvert Location (m)	Type (Proposed)	Span (in mts)		Sl No	Culvert Location (m)	Type (Proposed)	Span (in mts)
1	200	Box/Slab	2		225	37103	Box/Slab	2
2	330	Box/Slab	2		226	37253	Box/Slab	4
3	410	Box/Slab	2		227	37313	Box/Slab	2
4	500	Box/Slab	2		228	37563	Box/Slab	2
5	750	Box/Slab	2		229	37913	Box/Slab	2
6	880	Box/Slab	2		230	38033	Box/Slab	2
7	960	Box/Slab	6		231	38213	Box/Slab	2
8	1300	Box/Slab	2		232	38423	Box/Slab	2
9	1480	Box/Slab	2		233	38593	Box/Slab	2
10	1660	Box/Slab	2		234	38883	Box/Slab	2
11	1700	Box/Slab	2		235	38963	Box/Slab	2
12	1780	Box/Slab	2		236	39083	Box/Slab	2
13	1850	Box/Slab	3		237	39263	Box/Slab	2
14	2270	Box/Slab	2		238	39733	Box/Slab	2

15	2360	Box/Slab	6		239	40043	Box/Slab	2
16	2500	Box/Slab	2		240	40113	Box/Slab	2
17	2600	Box/Slab	2		241	40263	Box/Slab	2
18	2785	Box/Slab	4		242	40828	Box/Slab	2
19	2880	Box/Slab	2		243	40963	Box/Slab	2
20	3160	Box/Slab	2		244	41083	Box/Slab	2
21	3270	Box/Slab	2		245	41213	Box/Slab	2
22	3410	Box/Slab	4		246	41443	Box/Slab	2
23	3550	Box/Slab	2		247	41613	Box/Slab	3
24	3650	Box/Slab	2		248	41718	Box/Slab	2
25	3800	Box/Slab	3		249	41853	Box/Slab	2
26	3940	Box/Slab	2		250	42223	Box/Slab	6
27	4100	Box/Slab	2		251	42313	Box/Slab	2
28	4340	Box/Slab	2		252	42473	Box/Slab	2
29	4420	Box/Slab	2		253	42703	Box/Slab	2
30	4590	Box/Slab	2		254	42813	Box/Slab	2
31	4670	Box/Slab	2		255	43023	Box/Slab	2
32	4740	Box/Slab	2		256	43113	Box/Slab	2
33	4770	Box/Slab	2		257	43233	Box/Slab	2
34	5020	Box/Slab	2		258	43343	Box/Slab	6
35	5150	Box/Slab	2		259	43463	Box/Slab	2
36	5360	Box/Slab	3		260	43663	Box/Slab	2
37	5460	Box/Slab	2		261	43763	Box/Slab	2
38	5520	Box/Slab	2		262	43983	Box/Slab	2
39	5670	Box/Slab	2		263	44063	Box/Slab	2
40	5750	Box/Slab	2		264	44183	Box/Slab	3
41	5850	Box/Slab	2		265	44243	Box/Slab	2
42	6070	Box/Slab	2		266	44683	Box/Slab	2
43	6320	Box/Slab	3		267	44963	Box/Slab	2
44	6620	Box/Slab	2		268	45113	Box/Slab	2
45	6740	Box/Slab	2		269	45163	Box/Slab	2
46	7010	Box/Slab	2		270	45263	Box/Slab	2
47	7120	Box/Slab	2		271	45463	Box/Slab	2
48	7230	Box/Slab	4		272	45743	Box/Slab	2
49	7430	Box/Slab	2		273	45913	Box/Slab	2
50	7725	Box/Slab	2		274	46163	Box/Slab	2
51	7995	Box/Slab	4		275	46298	Box/Slab	2
52	8075	Box/Slab	2		276	46513	Box/Slab	2
53	8285	Box/Slab	2		277	46588	Box/Slab	2

54	8445	Box/Slab	2		278	46763	Box/Slab	2
55	8525	Box/Slab	2		279	46963	Box/Slab	2
56	8615	Box/Slab	2		280	47113	Box/Slab	2
57	8675	Box/Slab	2		281	48063	Box/Slab	2
58	8825	Box/Slab	2		282	48163	Box/Slab	2
59	8975	Box/Slab	2		283	48313	Box/Slab	2
60	9135	Box/Slab	2		284	48493	Box/Slab	2
61	9375	Box/Slab	2		285	48623	Box/Slab	2
62	9560	Box/Slab	3		286	48803	Box/Slab	2
63	9655	Box/Slab	2		287	48893	Box/Slab	2
64	9775	Box/Slab	2		288	48993	Box/Slab	2
65	9975	Box/Slab	2		289	49163	Box/Slab	2
66	10075	Box/Slab	2		290	49333	Box/Slab	2
67	10225	Box/Slab	2		291	49433	Box/Slab	2
68	10325	Box/Slab	2		292	49563	Box/Slab	3
69	10580	Box/Slab	2		293	49943	Box/Slab	2
70	10835	Box/Slab	2		294	50013	Box/Slab	2
71	10995	Box/Slab	3		295	50283	Box/Slab	2
72	11075	Box/Slab	2		296	50548	Box/Slab	2
73	11135	Box/Slab	2		297	50613	Box/Slab	2
74	11375	Box/Slab	2		298	50953	Box/Slab	4
75	11455	Box/Slab	2		299	51023	Box/Slab	2
76	11585	Box/Slab	2		300	51123	Box/Slab	2
77	11690	Box/Slab	3		301	51248	Box/Slab	2
78	11845	Box/Slab	2		302	51343	Box/Slab	2
79	12075	Box/Slab	2		303	51433	Box/Slab	2
80	12125	Box/Slab	2		304	51533	Box/Slab	2
81	12370	Box/Slab	2		305	51813	Box/Slab	4
82	12485	Box/Slab	2		306	51963	Box/Slab	2
83	12600	Box/Slab	2		307	52093	Box/Slab	4
84	12675	Box/Slab	2		308	52223	Box/Slab	4
85	12810	Box/Slab	2		309	52553	Box/Slab	3
86	13915	Box/Slab	2		310	52613	Box/Slab	2
87	14065	Box/Slab	2		311	52763	Box/Slab	2
88	14225	Box/Slab	2		312	52933	Box/Slab	2
89	14305	Box/Slab	4		313	53033	Box/Slab	3
90	14555	Box/Slab	2		314	53163	Box/Slab	2
91	14675	Box/Slab	2		315	53273	Box/Slab	2
92	14975	Box/Slab	2		316	53413	Box/Slab	2

93	15055	Box/Slab	2		317	53593	Box/Slab	2
94	15225	Box/Slab	3		318	53713	Box/Slab	2
95	15525	Box/Slab	2		319	53873	Box/Slab	4
96	15640	Box/Slab	2		320	54063	Box/Slab	2
97	15750	Box/Slab	2		321	54163	Box/Slab	2
98	15825	Box/Slab	2		322	54228	Box/Slab	2
99	15975	Box/Slab	2		323	54443	Box/Slab	2
100	16475	Box/Slab	2		324	54563	Box/Slab	2
101	16555	Box/Slab	2		325	54753	Box/Slab	2
102	16835	Box/Slab	2		326	54813	Box/Slab	2
103	17055	Box/Slab	6		327	55013	Box/Slab	2
104	17105	Box/Slab	2		328	55138	Box/Slab	2
105	17295	Box/Slab	2		329	55313	Box/Slab	2
106	17510	Box/Slab	2		330	55453	Box/Slab	2
107	17655	Box/Slab	2		331	55603	Box/Slab	2
108	17890	Box/Slab	3		332	55693	Box/Slab	2
109	18305	Box/Slab	2		333	55838	Box/Slab	2
110	18455	Box/Slab	2		334	55963	Box/Slab	2
111	18555	Box/Slab	2		335	56283	Box/Slab	2
112	19525	Box/Slab	2		336	56463	Box/Slab	2
113	19645	Box/Slab	2		337	56548	Box/Slab	2
114	19775	Box/Slab	2		338	56673	Box/Slab	2
115	19835	Box/Slab	2		339	56813	Box/Slab	2
116	19975	Box/Slab	2		340	57063	Box/Slab	2
117	20035	Box/Slab	2		341	57213	Box/Slab	2
118	20325	Box/Slab	2		342	57293	Box/Slab	2
119	20525	Box/Slab	2		343	57463	Box/Slab	2
120	20635	Box/Slab	2		344	57563	Box/Slab	2
121	20760	Box/Slab	3		345	57713	Box/Slab	2
122	20865	Box/Slab	2		346	57823	Box/Slab	2
123	20915	Box/Slab	2		347	58093	Box/Slab	2
124	21055	Box/Slab	2		348	58213	Box/Slab	2
125	21215	Box/Slab	2		349	58333	Box/Slab	2
126	21415	Box/Slab	2		350	58453	Box/Slab	6
127	21605	Box/Slab	6		351	58643	Box/Slab	2
128	21725	Box/Slab	2		352	58863	Box/Slab	2
129	21825	Box/Slab	2		353	58973	Box/Slab	2
130	21890	Box/Slab	4		354	59113	Box/Slab	2
131	22085	Box/Slab	2		355	59263	Box/Slab	2

132	22215	Box/Slab	2		356	59443	Box/Slab	2
133	22365	Box/Slab	2		357	59563	Box/Slab	2
134	22475	Box/Slab	2		358	59713	Box/Slab	2
135	22685	Box/Slab	2		359	59863	Box/Slab	2
136	22865	Box/Slab	2		360	59963	Box/Slab	2
137	22975	Box/Slab	2		361	60148	Box/Slab	2
138	23335	Box/Slab	2		362	60313	Box/Slab	2
139	23515	Box/Slab	2		363	60463	Box/Slab	2
140	23605	Box/Slab	2		364	60563	Box/Slab	2
141	23775	Box/Slab	2		365	60753	Box/Slab	2
142	23825	Box/Slab	2		366	60863	Box/Slab	4
143	24015	Box/Slab	2		367	61013	Box/Slab	2
144	24265	Box/Slab	2		368	61193	Box/Slab	2
145	24325	Box/Slab	2		369	61283	Box/Slab	2
146	24425	Box/Slab	2		370	61463	Box/Slab	2
147	24600	Box/Slab	2		371	61713	Box/Slab	2
148	24695	Box/Slab	2		372	61913	Box/Slab	2
149	24850	Box/Slab	2		373	62003	Box/Slab	2
150	25125	Box/Slab	2		374	62073	Box/Slab	2
151	25325	Box/Slab	2		375	62313	Box/Slab	2
152	25475	Box/Slab	2		376	62738	Box/Slab	2
153	25575	Box/Slab	2		377	62913	Box/Slab	2
154	25805	Box/Slab	2		378	63083	Box/Slab	2
155	25925	Box/Slab	2		379	63213	Box/Slab	2
156	26075	Box/Slab	2		380	63353	Box/Slab	4
157	26315	Box/Slab	2		381	63443	Box/Slab	2
158	26400	Box/Slab	2		382	63683	Box/Slab	2
159	26590	Box/Slab	2		383	63863	Box/Slab	2
160	26660	Box/Slab	2		384	63913	Box/Slab	2
161	26800	Box/Slab	2		385	64033	Box/Slab	2
162	26975	Box/Slab	2		386	64163	Box/Slab	2
163	27125	Box/Slab	2		387	64263	Box/Slab	2
164	27225	Box/Slab	2		388	64398	Box/Slab	2
165	27463	Box/Slab	2		389	64613	Box/Slab	2
166	27643	Box/Slab	2		390	64713	Box/Slab	4
167	27783	Box/Slab	2		391	64983	Box/Slab	2
168	27988	Box/Slab	2		392	65133	Box/Slab	2
169	28083	Box/Slab	2		393	65313	Box/Slab	2
170	28203	Box/Slab	2		394	65433	Box/Slab	2

171	28313	Box/Slab	2		395	65543	Box/Slab	2
172	28403	Box/Slab	2		396	65723	Box/Slab	2
173	28543	Box/Slab	2		397	65993	Box/Slab	2
174	28698	Box/Slab	2		398	66113	Box/Slab	2
175	28813	Box/Slab	2		399	66213	Box/Slab	2
176	28953	Box/Slab	2		400	66313	Box/Slab	2
177	29063	Box/Slab	2		401	66513	Box/Slab	2
178	29323	Box/Slab	2		402	66973	Box/Slab	2
179	29483	Box/Slab	3		403	67263	Box/Slab	2
180	29643	Box/Slab	2		404	67313	Box/Slab	2
181	29763	Box/Slab	2		405	67403	Box/Slab	2
182	29893	Box/Slab	2		406	67513	Box/Slab	2
183	30113	Box/Slab	2		407	67713	Box/Slab	2
184	30263	Box/Slab	2		408	67863	Box/Slab	2
185	30523	Box/Slab	2		409	68013	Box/Slab	2
186	30653	Box/Slab	2		410	68163	Box/Slab	2
187	31173	Box/Slab	2		411	68313	Box/Slab	2
188	31243	Box/Slab	2		412	68433	Box/Slab	6
189	31393	Box/Slab	2		413	68563	Box/Slab	2
190	31723	Box/Slab	2		414	68753	Box/Slab	2
191	31973	Box/Slab	2		415	68863	Box/Slab	2
192	32113	Box/Slab	2		416	68988	Box/Slab	2
193	32213	Box/Slab	2		417	69213	Box/Slab	2
194	32313	Box/Slab	2		418	69313	Box/Slab	4
195	32423	Box/Slab	2		419	69378	Box/Slab	2
196	32613	Box/Slab	2		420	69443	Box/Slab	2
197	32713	Box/Slab	2		421	69763	Box/Slab	2
198	32953	Box/Slab	2		422	69943	Box/Slab	2
199	33113	Box/Slab	2		423	70143	Box/Slab	2
200	33313	Box/Slab	2		424	70253	Box/Slab	2
201	33538	Box/Slab	3		425	70353	Box/Slab	2
202	33613	Box/Slab	2		426	70463	Box/Slab	2
203	33788	Box/Slab	4		427	70623	Box/Slab	2
204	33993	Box/Slab	2		428	70683	Box/Slab	2
205	34143	Box/Slab	2		429	70813	Box/Slab	2
206	34263	Box/Slab	2		430	71108	Box/Slab	4
207	34363	Box/Slab	2		431	71253	Box/Slab	2
208	34493	Box/Slab	2		432	71883	Box/Slab	2
209	34733	Box/Slab	4		433	72028	Box/Slab	2

210	34943	Box/Slab	2		434	72163	Box/Slab	2
211	35113	Box/Slab	2		435	72323	Box/Slab	2
212	35213	Box/Slab	2		436	72493	Box/Slab	2
213	35303	Box/Slab	2		437	72858	Box/Slab	2
214	35513	Box/Slab	2		438	72963	Box/Slab	2
215	35673	Box/Slab	2		439	73088	Box/Slab	2
216	35783	Box/Slab	2		440	73203	Box/Slab	2
217	35893	Box/Slab	2		441	73613	Box/Slab	2
218	35993	Box/Slab	2		442	73653	Box/Slab	2
219	36123	Box/Slab	2		443	73973	Box/Slab	2
220	36223	Box/Slab	2		444	74483	Box/Slab	2
221	36463	Box/Slab	2		445	74663	Box/Slab	2
222	36613	Box/Slab	2		446	74703	Box/Slab	2
223	36763	Box/Slab	4		447	74853	Box/Slab	4
224	36838	Box/Slab	2					

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

8.3 Bridges

8.3.1 The existing bridges to be reconstructed/widened

(i) The existing bridges at the following locations shall be reconstructed as new structures(Minor Bridge)

Sl No.	Existing Chainage	Design Chainage	Proposed Span(m)	Proposed Width(m)	Remarks
Nil					

Sl No	Bridge Location (km)	Salient Details of Existing Bridge					Adequacy or Otherwise of the Existing Waterway, Vertical Clearance etc.	Remarks
		Span Arrangement (m)	Carriageway Width (m)	Total Width (m)	Type of Superstructure	Type of Foundation		
Nil								

8.3.2 The following structures shall be provided with footpaths:

Sl No.	Location (km)	Remarks
Nil		

8.3.3 New Minor Bridges

New minor bridges at the following locations on the project highways shall be constructed as per Manual.

S. No.	Location, DesignChainage (km)	Span length (m) and numbers	Total length (m)	Remarks
1	16.233	2x10	20	
2	18.983	1x30	30	
3	30.970	2x30	60	AiriNala
4	40.572	1x40	40	Litti
5	47.706	3x10	30	Ayyu
6	56.053	2x30	60	Bi Nala
7	66.500	1x40	40	IthunNala

8.3.4 New Major Bridges

New major bridges at the following locations on the project highways shall be constructed as per Manual

S. No.	Location, DesignChainage (km)	Span length (m) and numbers	Total length (m)	Remarks
1.	13.228	6x40	240	Asupani
2.	71.543	1x15.5+1X150+1X15.5	181	Special High Level Bridge at River Eha
3.	74.178	1x15.5+1X130+1X15.5	161	Special High Level Bridge at River Ithun

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

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

Sl No.	Location (km)	Remarks
Nil		

8.3.6 Repairs/replacements of railings/parapets of the existing bridges shall be undertaken as follows:
[Refer to paragraph 7.18 (v) of the Manual and provide details]

Sl No.	Location (km)	Remarks
Nil		

8.3.7 Drainage system for bridge decks

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

8.3.8 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]

8.4 Rail-road Bridges

8.4.1 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]

8.4.2 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 (km)	Length of Bridge (m)
Nil		

8.4.3 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 Level Crossing (km)	Number and Length of Span (m)
Nil		

8.5 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.

8.6 Underpasses/Overpasses

There is no Underpass/Overpass proposed on the Project Highway.

8.7 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 of Bridge (km)	Nature and Extent of Repairs/Strengthening to be Carried out
Nil		

B. ROB / RUB

Sl No.	Location of Bridge (km)	Nature and Extent of Repairs/Strengthening to be Carried out
Nil		

C. Overpasses / Underpasses and Other Structures

Sl No.	Location of Bridge (km)	Nature and Extent of Repairs/Strengthening to be Carried out
Nil		

9. TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS

9.1 General

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

Specificationsof the reflective sheeting [Refer to paragraph 9.3 of the Manual andspecify]

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 Authority Engineer 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 Zebracrossings at parking areas.

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

9.2 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.

9.3 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

Traffic Signages, Road Marking and other appurtenances	Unit	Minimum Quantity
Octagonal stop sign 900mm size.	Nos	48
Octagonal stop sign 600mm size.	Nos	2
Triangular sign 900 side.	Nos	878
Circular sign 900 dia.	Nos	12
Circular sign 600 dia.	Nos	60
Facility information signs 800mm x 600mm	Nos	18
Facility information signs 600mm x 450mm	Nos	42
Place identification 600mm x800mm	Nos	12
Place identification 1500mm x2400mm	Nos	12
Overhead signboard	Nos	6
Directional arrow	Nos	3
200 m stone	Nos	299
Km stone	Nos	74
5^{th} Km Stone	Nos	14
Triangular Object Marker 300mm side with four red reflector	Nos	31
Rectangular hazard marker 600mm x 300mm	Nos	20
Roadway Indicators 1000mm high made with 80mm dia	Nos	1471
Route Marker sign boards size 600mmx450mm	Nos	300

Traffic Signages, Road Marking and other appurtenances	Unit	Minimum Quantity
R. C. boundary stone/ pillars	Nos	2994
Unidirectional reflective pavement marker(road studs) at every 25 m	Nos	352
25 mm thick M20 grade cement concrete precast chequered tiles	Sqm	300
Painting of kerbs& concrete crash barrier with two coats of road marking paint	Sqm	46
Lane/centreline / edge marking / transverse and any other marking.	Sqm	23764

10. ROADSIDE FURNITURE

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

10.1.2 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. The minimum number of overhead signs shall be 06.

11. COMPULSORY AFFORESTATION

[Refer to paragraph 12.1 of the Manual and specify the number of trees which arerequired to be planted by the Contractor as compensatory afforestation.]
Minimum2000 nos. trees are required to be planted.

12. HAZARDOUS LOCATIONS

Metal Beam crash barrier length of minimum 36011 m (single runner, heavy duty and W-shape) shall be provided at the locations of bridge approaches and high embankments (3.0m and more), 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.

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

Sno	From Chainage (m)	To Chainage (m)	Distance (m)		Sno	From Chainage (m)	To Chainage (m)	Distance (m)
1	31	82	51		**238**	35229	35298	69
2	85	115	30		**239**	35341	35385	44
3	133	163	30		**240**	35593	35721	128
4	176	257	80		**241**	35795	35870	75
5	299	368	69		**242**	35917	35978	61
6	456	543	86		**243**	36056	36109	53
7	594	677	84		**244**	36202	36290	88
8	744	803	58		**245**	36418	36594	176
9	807	870	63		**246**	36719	36875	156
10	915	980	65		**247**	36974	37066	92
11	1162	1241	79		**248**	37174	37268	94
12	1273	1344	71		**249**	37403	37487	84
13	1468	1498	30		**250**	37595	37751	156
14	1600	1660	60		**251**	37873	38067	194
15	1680	1741	61		**252**	38277	38403	126
16	2083	2113	30		**253**	38487	38567	80
17	2130	2160	30		**254**	38628	38670	42
18	2206	2275	69		**255**	38816	38833	17
19	2310	2413	102		**256**	39093	39173	80
20	2425	2489	63		**257**	39281	39347	66
21	2525	2617	92		**258**	39422	39447	25
22	2618	2686	67		**259**	39513	39552	39
23	2722	2842	119		**260**	39620	39638	18
24	2859	2936	77		**261**	39743	39809	66
25	3025	3104	79		**262**	39945	40010	65
26	3198	3259	60		**263**	40047	40167	120
27	3285	3371	86		**264**	40326	40401	75
28	3503	3586	83		**265**	40485	40548	63
29	3599	3717	118		**266**	40610	40647	37
30	3751	3890	139		**267**	40739	40794	55

31	4077	4178	102		**268**	40862	40873	11
32	4211	4297	86		**269**	40920	40938	18
33	4306	4379	72		**270**	40991	41026	35
34	4385	4489	104		**271**	41067	41087	20
35	4625	4721	96		**272**	41129	41174	45
36	4753	4820	67		**273**	41197	41210	13
37	4821	4882	61		**274**	41313	41369	56
38	4927	5023	96		**275**	41391	41426	35
39	5030	5110	80		**276**	41519	41526	7
40	5124	5185	61		**277**	41591	41629	38
41	5214	5454	239		**278**	41781	41825	44
42	5338	5583	245		**279**	41843	41923	80
43	5520	5771	251		**280**	41959	41985	26
44	5763	6002	239		**281**	42089	42159	70
45	6090	6308	217		**282**	42194	42248	54
46	6399	6614	214		**283**	42294	42314	20
47	6639	6853	215		**284**	42409	42432	23
48	7810	7892	82		**285**	42537	42547	10
49	7936	8040	104		**286**	42602	42616	14
50	8263	8358	95		**287**	42666	42734	68
51	8475	8560	85		**288**	42815	42838	23
52	8621	8695	74		**289**	42887	42982	95
53	8768	8851	82		**290**	43025	43116	91
54	8901	8984	83		**291**	43261	43288	27
55	9172	9239	67		**292**	43301	43378	77
56	9262	9373	111		**293**	43400	43429	29
57	9489	9724	235		**294**	43516	43544	28
58	9787	9916	129		**295**	43600	43621	21
59	10015	10114	99		**296**	43704	43733	29
60	10135	10231	96		**297**	43833	43877	44
61	10271	10342	70		**298**	43995	44041	46
62	10433	10511	78		**299**	44136	44202	66
63	10522	10610	88		**300**	44356	44382	26
64	10685	10781	95		**301**	44474	44492	18
65	10935	11032	97		**302**	44589	44614	25
66	11055	11121	66		**303**	44715	44743	28

67	11185	11258	73		**304**	44873	44891	18
68	11266	11320	54		**305**	44981	44992	11
69	11322	11377	55		**306**	45035	45059	24
70	11387	11443	56		**307**	45261	45290	29
71	11468	11549	81		**308**	45511	45539	28
72	11638	11727	89		**309**	45646	45667	21
73	11805	11835	30		**310**	45727	45738	11
74	11871	11937	66		**311**	45911	45959	48
75	11992	12067	75		**312**	46089	46113	24
76	12073	12153	80		**313**	46282	46317	35
77	12175	12263	88		**314**	46392	46410	18
78	12312	12403	91		**315**	46503	46531	28
79	12457	12534	78		**316**	46563	46598	35
80	12543	12633	90		**317**	46685	46703	18
81	12652	12727	75		**318**	46802	46835	33
82	12841	12922	81		**319**	46955	46976	21
83	13010	13072	62		**320**	47103	47119	16
84	13354	13522	169		**321**	47272	47305	33
85	13547	13641	95		**322**	47575	47629	54
86	13784	13850	66		**323**	47775	47843	68
87	13987	14116	129		**324**	48043	48080	37
88	14155	14225	70		**325**	48227	48268	41
89	14259	14310	51		**326**	48468	48504	36
90	14320	14385	65		**327**	48655	48715	60
91	14419	14459	40		**328**	48758	48782	24
92	14562	14628	67		**329**	48810	48825	15
93	14847	14883	36		**330**	48906	48929	23
94	14926	14986	60		**331**	48980	49007	27
95	15071	15137	66		**332**	49019	49041	22
96	15168	15226	58		**333**	49050	49075	25
97	15235	15337	103		**334**	49099	49124	25
98	15453	15545	91		**335**	49191	49226	35
99	15603	15693	90		**336**	49261	49323	62
100	15833	15923	89		**337**	49329	49351	22
101	15977	16062	85		**338**	49361	49421	60
102	16146	16181	36		**339**	49444	49492	48

103	16274	16330	57		**340**	49638	49819	181
104	16386	16464	78		**341**	49894	49947	53
105	16485	16619	134		**342**	50037	50071	34
106	16671	16743	73		**343**	50153	50173	20
107	16793	16875	81		**344**	50190	50211	21
108	16961	17008	46		**345**	50264	50301	37
109	17098	17151	52		**346**	50341	50376	35
110	17209	17264	54		**347**	50386	50426	40
111	17323	17432	109		**348**	50483	50494	11
112	17464	17520	56		**349**	50541	50570	29
113	17544	17592	47		**350**	50597	50628	31
114	17606	17663	58		**351**	50736	50769	33
115	17719	17799	80		**352**	50898	50949	51
116	17819	17935	116		**353**	51079	51098	19
117	17947	18027	80		**354**	51173	51199	26
118	18137	18207	70		**355**	51240	51255	15
119	18245	18273	28		**356**	51307	51343	36
120	18373	18403	30		**357**	51378	51423	45
121	18414	18502	88		**358**	51437	51509	72
122	18616	18740	124		**359**	51679	51714	35
123	18921	18967	46		**360**	51747	51771	24
124	19018	19060	42		**361**	51824	51840	16
125	19105	19187	81		**362**	51906	51943	37
126	19252	19348	96		**363**	52010	52021	11
127	19486	19610	124		**364**	52055	52114	59
128	19631	19711	81		**365**	52121	52177	56
129	19764	19811	48		**366**	52203	52252	49
130	19941	20040	99		**367**	52349	52397	48
131	20164	20243	79		**368**	52416	52483	67
132	20310	20392	82		**369**	52496	52524	28
133	20531	20631	100		**370**	52591	52625	34
134	20673	20818	145		**371**	52659	52712	53
135	20864	20957	94		**372**	52721	52745	24
136	20997	21082	85		**373**	52814	52826	12
137	21179	21277	97		**374**	52881	52891	10
138	21397	21493	95		**375**	53004	53021	17

139	21532	21678	145		**376**	53042	53086	44
140	21706	21781	76		**377**	53155	53164	9
141	21879	22015	136		**378**	53276	53302	26
142	22107	22187	81		**379**	53409	53529	120
143	22212	22286	74		**380**	53553	53653	100
144	22404	22458	54		**381**	53874	54024	150
145	22523	22597	75		**382**	54182	54262	80
146	22647	22722	75		**383**	54353	54433	80
147	22756	22825	69		**384**	54573	54713	140
148	22899	23045	146		**385**	54813	54903	90
149	23227	23315	88		**386**	54953	55093	140
150	23323	23391	68		**387**	55126	55226	100
151	23484	23571	87		**388**	55298	55438	140
152	23746	23825	79		**389**	55525	55645	120
153	23864	23922	58		**390**	55774	55894	120
154	23966	24047	81		**391**	55945	56025	80
155	24093	24167	75		**392**	56082	56182	100
156	24223	24297	75		**393**	56235	56355	120
157	24425	24498	73		**394**	56461	56541	80
158	24528	24589	61		**395**	56698	56898	200
159	24642	24700	58		**396**	57082	57182	100
160	24768	24954	186		**397**	57198	57278	80
161	25072	25160	88		**398**	57286	57406	120
162	25225	25313	87		**399**	57447	57517	70
163	25487	25619	132		**400**	57648	57788	140
164	25786	25907	121		**401**	57859	57934	75
165	26022	26119	97		**402**	58086	58166	80
166	26264	26342	79		**403**	58344	58464	120
167	26344	26442	98		**404**	58489	58569	80
168	26473	26553	81		**405**	58647	58887	240
169	26609	26698	88		**406**	58923	59023	100
170	26745	26857	112		**407**	59229	59309	80
171	26895	26979	84		**408**	59695	59795	100
172	27007	27079	72		**409**	59942	60092	150
173	27095	27267	173		**410**	60142	60262	120
174	27499	27532	33		**411**	60406	60506	100

175	27563	27621	58		**412**	60671	60741	70
176	27661	27685	24		**413**	60759	60879	120
177	27759	27789	30		**414**	61036	61116	80
178	27829	27894	65		**415**	61338	61488	150
179	27921	28019	98		**416**	61541	61661	120
180	28084	28122	38		**417**	61691	61771	80
181	28180	28208	28		**418**	61861	62001	140
182	28258	28294	36		**419**	62116	62216	100
183	28348	28382	34		**420**	62353	62453	100
184	28421	28471	50		**421**	62514	62664	150
185	28529	28559	30		**422**	62754	62854	100
186	28615	28648	33		**423**	62951	63071	120
187	28711	28740	29		**424**	63233	63333	100
188	28806	28915	109		**425**	63387	63507	120
189	29084	29161	77		**426**	63537	63657	120
190	29214	29249	35		**427**	63687	63757	70
191	29298	29326	28		**428**	63833	63913	80
192	29379	29396	17		**429**	63948	64108	160
193	29472	29520	48		**430**	64117	64197	80
194	29611	29653	42		**431**	64240	64440	200
195	29747	29798	51		**432**	64571	64671	100
196	29925	29994	69		**433**	64840	64930	90
197	30096	30169	73		**434**	65016	65116	100
198	30207	30302	95		**435**	65365	65565	200
199	30344	30426	82		**436**	65682	65762	80
200	30499	30560	61		**437**	65829	66049	220
201	30635	30669	34		**438**	66135	66335	200
202	30739	30767	28		**439**	66413	66493	80
203	30858	30914	56		**440**	66565	66665	100
204	31018	31052	34		**441**	66757	66897	140
205	31163	31194	31		**442**	66938	67038	100
206	31231	31259	28		**443**	67140	67210	70
207	31307	31333	26		**444**	67346	67456	110
208	31409	31439	30		**445**	67497	67577	80
209	31474	31534	60		**446**	67659	67779	120
210	31586	31631	45		**447**	67912	68032	120

211	31695	31810	115		**448**	68239	68379	140
212	31878	31906	28		**449**	68441	68521	80
213	31959	31983	24		**450**	68640	68780	140
214	32045	32063	18		**451**	68833	68903	70
215	32109	32134	25		**452**	68976	69076	100
216	32202	32266	64		**453**	69176	69296	120
217	32307	32333	26		**454**	69323	69503	180
218	32376	32389	13		**455**	69661	69766	105
219	32426	32461	35		**456**	69779	69899	120
220	32508	32602	94		**457**	69961	70081	120
221	32705	32771	66		**458**	70107	70287	180
222	32945	33021	76		**459**	70371	70471	100
223	33126	33163	37		**460**	70572	70732	160
224	33215	33242	27		**461**	70838	70938	100
225	33363	33399	36		**462**	71075	71215	140
226	33433	33508	75		**463**	71288	71408	120
227	33529	33587	58		**464**	71658	71758	100
228	33635	33698	63		**465**	71975	72075	100
229	33775	33826	51		**466**	72408	72658	250
230	33918	33939	21		**467**	72784	72884	100
231	33992	34013	21		**468**	73104	73304	200
232	34070	34110	40		**469**	73489	73629	140
233	34155	34179	24		**470**	73778	73898	120
234	34222	34288	66		**471**	73996	74076	80
235	34404	34459	55		**472**	74291	74371	80
236	34758	34912	154		**473**	74391	74491	100
237	35042	35140	98		**474**	74574	74724	150

The safety barriers, protective works shall also be provided at the hazardous location/lengths. The minimum quantity of protection work is presented in the following table:

13. ROAD LAND BOUNDARY

As per the Clause 12.2 of Manual (IRC: SP: 73:2015).

Road land (ROW) boundary shall be demarcated by putting RCC boundary pillars of size 60cm x 15cm x 15 cm embedded in concrete (as per IRC:25) along the Project Highway at 200 m interval on both

sides. All the components used in delineating road land boundary shall be aesthetically pleasing, sturdy and vandal proof. The road land boundary shall be demarcated in consultation with NHIDCL.

14. SPECIAL REQUIREMENT FOR HILL ROADS

14.1 All special features shall be provided as per Manual.

14.2 The side slope shall be protected by using suitable slope protection measures all along the highway on Hill side and Valley side. The details of the minimum protection work as tabulated below

		Height										
Sr. No	**Protection Work**	**Upto 4 m**	**5 m**	**6 m**	**7 m**	**8 m**	**9 m**	**10 m**	**11 m**	**12 m**	**Standard**	**Total (in m)**
1	RR Masonry				243	187	261	176	94	317		1278
2	Gabion Wall		532	1198	1074	15904	0	0	0	0		18708
3	Toe Wall		0	0	0	0	0	0	0	0	442	442
4	Retaining Wall	8791	1437	1052	336	0	0	0	0	0		11616
5	Breast wall		0	0	0	0	0	0	0	0	17599	17599

14.3 The chainage wise details of Protection works are given in Annexure II.

14.4 Contractor shall identify areas and provide the suitable protection measures to stabilize the entire landslide area along with the design for the review of the Authority Engineer. No change of scope shall be considered for t be dealt properly and adequate safety /Protection measures with proper design shall be provided.

14.5 Slide Mitigation: All hill slope having tendency for future slide needs to be arrested by special slope protection measures and plantation shall be carried out to arrest barren slope

15. CHANGE OF SCOPE

The length of Structures and bridges specified hereinabove shall be treated as an

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

16. 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.

17. ENVIRONMENT

The Project Highway during design, engineering, construction, operation and maintenance shall conform to the environmental rules and regulations in force. The Construction Contractor shall be responsible for the same. However this does not absolve the Construction Contractor from performance according to the laws on environment.

18. 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 Contractorcan follow the same as it is with the review of Authority Engineer. The Construction Contractorcan also follow the alternate Design/Drawings with the prior approval of NHIDCL. However the Construction Contractorshall 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 Contractoris 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 Highwaysbut 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 Authority Engineer 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 Contractorand incorporated accordingly.

(e) Alternative design for structures i.e. bridges, culverts, and retaining walls etc. can be adopted by the Construction Contractorin accordance with Design Requirements subject to review of the same by Consultant. 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 beminimum, 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: 73:2015 or other latest codes as applicable to the National Highways. These should be adhered to and minimum requirements should be maintained for the Project Highway. The Construction Contractormay 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 20 years

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.

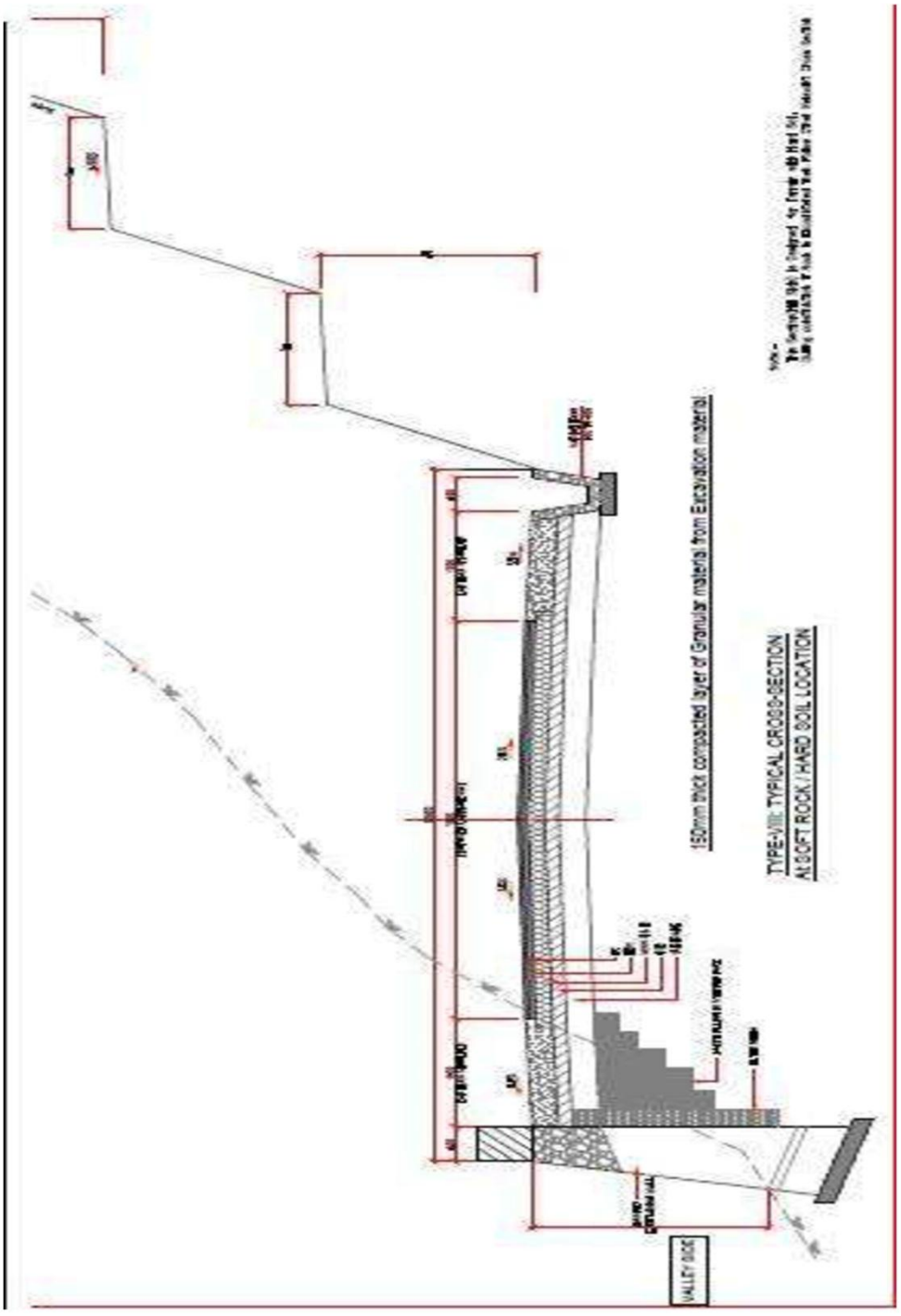
(l) Reinforced Earth/RCC Retaining Wall type shall be liberally provided through areas for high fill/embankment with aesthetically pleasing appearance. These shall be of varying height constructed of several sections, located mainly between main line and where land constraint exists. Design life of reinforcing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

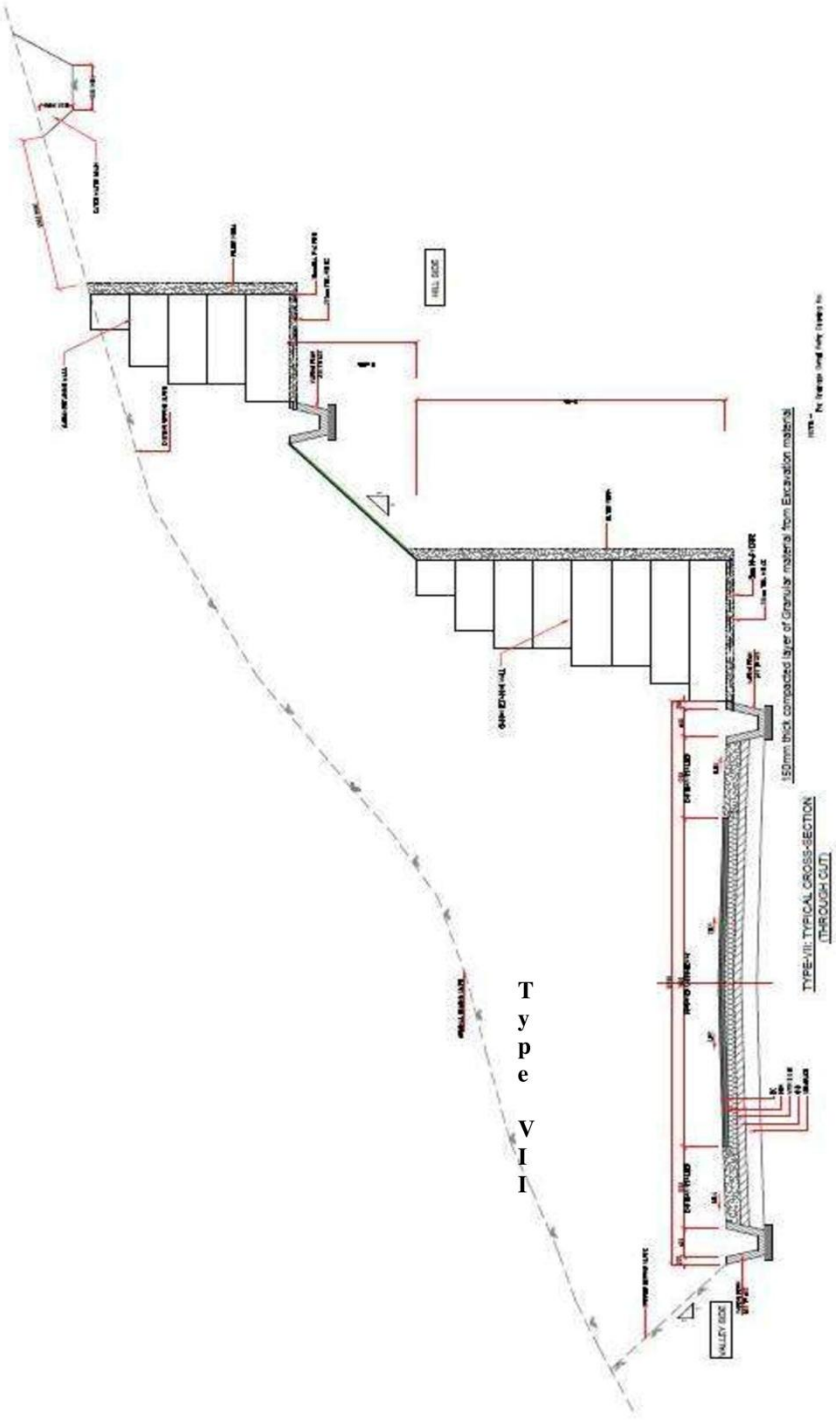
(m) Riprap protection to be provided at the valley side.

(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.

Following Typical Cross Sections are indicated in the Table below.

S. No.	Proposed Chainage		Design Length in KM	C/S-Type	Remark
	From	To			
1	0	74.863	74.863	Type III, IV,V, VI, VII, VIII	Type of Cross Section shall be provided as per the profile & side Condition.


150mm thick compacted layer of Granular material from Excavation material
TYPE-VIII: TYPICAL CROSS-SECTION
AT SOFT ROCK / HARD SOIL LOCATION
VALLEY SIDE


HILL SIDE
150mm thick compacted layer of Granular material from Excavation material
TYPE-VII: TYPICAL CROSS-SECTION
THROUGH CUT
VALLEY SIDE

Type VII

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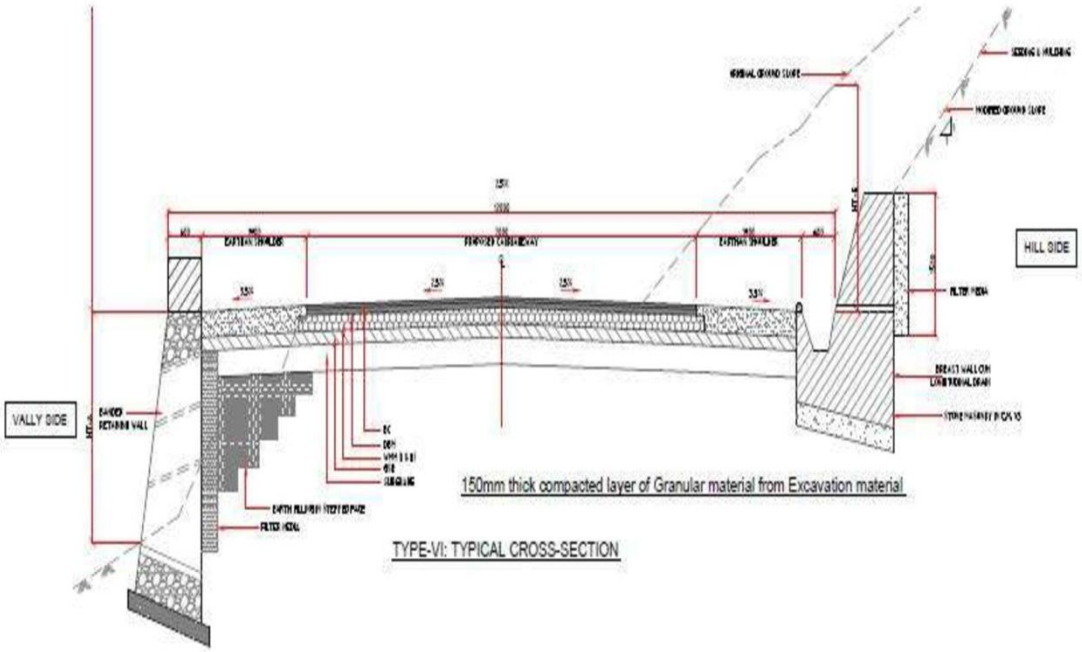
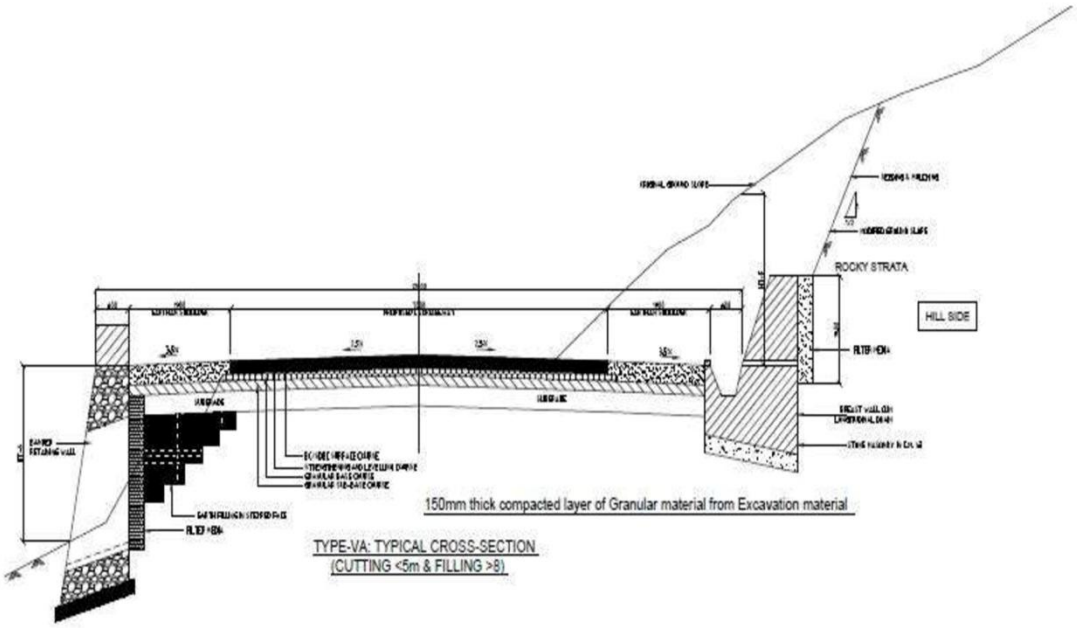
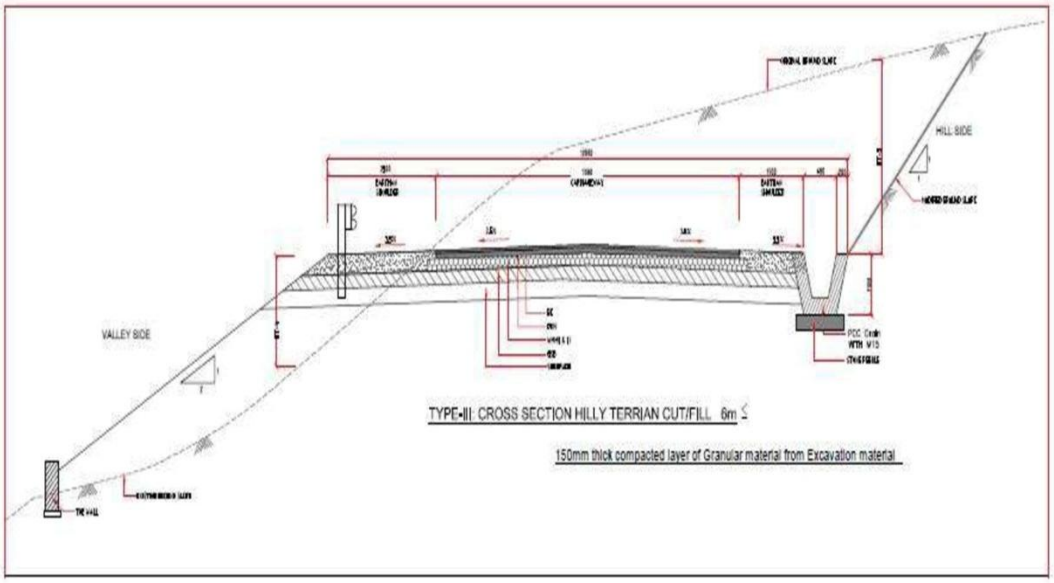


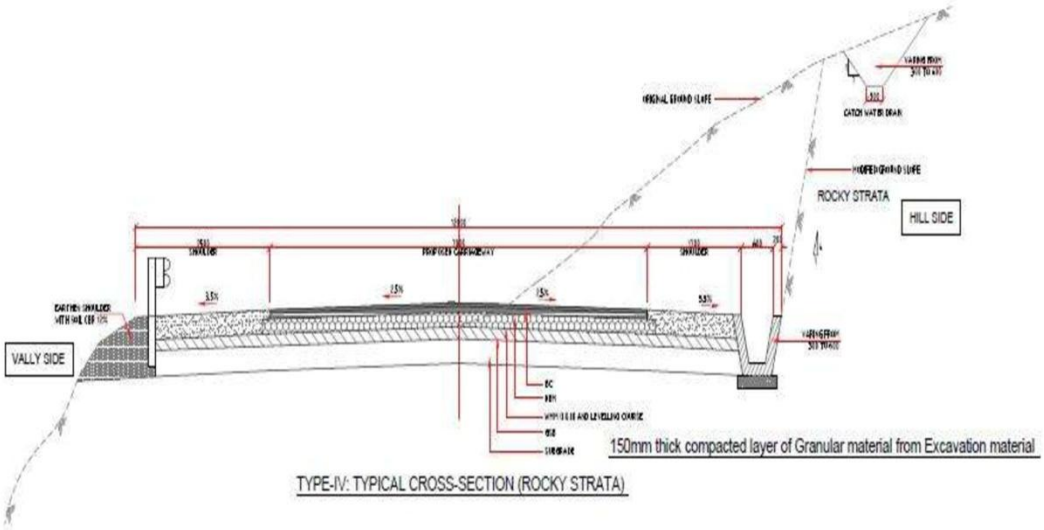
TYPE-VI: TYPICAL CROSS-SECTION



TYPE-VA: TYPICAL CROSS-SECTION
(CUTTING <5m & FILLING >8)

Drawings


HILL SIDE
VALLEY SIDE
TYPE-III: CROSS SECTION HILLY TERRIAN CUT/FILL 6m ≤
150mm thick compacted layer of Granular material from Excavation material


ROCKY STRATA
HILL SIDE
VALLY SIDE
150mm thick compacted layer of Granular material from Excavation material
TYPE-IV: TYPICAL CROSS-SECTION (ROCKY STRATA)