

Schedule B

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.

2 Rehabilitation and augmentation

Rehabilitation and augmentation shall include widening and strengthening of the Project Highway as described in Annex-I of this Schedule-B and in Schedule-C.

3 Specifications and Standards

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

Annex – I
(Schedule-B)
Description of Widening and strengthening

1. Widening of the Existing Highway

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

1.2 Width of carriageway

- 1.2.1 The carriageway shall be of Two lane (7 m) / Intermediate lane (5.5 m) wide as per IRC: SP: 73-2015 for plain terrain and IRC SP 48:1998 for hilly stretches.
- 1.2.2 Except as otherwise provided in this Agreement, the width of the paved carriageway shall conform to paragraph 1.2.1.

1.2.3 Design Chainage Corresponding to Existing Chainage

Kilometer stones were not found in entire length of the project highway. Therefore there is no marking of existing chainage. During topography survey with Total Station, observations could not be made to these km stones and after finalization of alignment by improving the existing geometry the chainage has been referred to “Design Chainage”. Therefore, only design chainage is available for reference.

2. Geometric Design and General Features**2.1 General**

Geometric design and general features of the Project Highway shall be in accordance with Section-2 of the Manual.

2.2 Design Speed

The design speed of the road shall not be less than as mentioned in IRC SP 48:1998 clause 6& IRC SP 73-29=015. Necessary improvements shall be made to achieve the design speed required.

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

Design Chainage in km		Length in m	Type of Deficiency	Remarks
From	To			
26/510	26/600	90	Steep gradient	
27/926	27/965	39	Steep gradient	
31/400	31/480	80	Hair pin bend	
34/300	34/380	80	Hair pin bend	
37/200	37/300	100	Hair pin bend and steep gradient	
37/480	37/560	80	Hair pin bend	

38/000	38/080	80	Hair pin bend	
39/100	39/215	115	Steep gradient	
42/090	42/160	70	Steep gradient	
45/110	45/257	147	Steep gradient	
47/150	47/180	30	Steep gradient	

2.4 Right of Way

No land acquisition shall be taken up for the construction of work for the normal widening stretches. Hence the ROW shall be same as existing ROW for those stretches. Land acquisition shall be sought for the following stretches

Design Chainage in km		Length in m	Width
From	To		
Nil			

2.5 Type of Shoulders

The type of shoulders provided for the project road shall be as follows:

Sl No	Chainage from	Chainage to	Type of Shoulders	Width of Shoulders
1	32100	32400	Paved shoulder with CC	1.5 m
2	39800	40150		
3	40750	40850		
4	41200	41350		
5	26000	32100	Paved shoulder with CC	1.25 m
6	32400	39800		
7	40150	40750		
8	40850	41200		
9	41350	48000		

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 the paragraph 2.10 of the Manual.

2.6.2 Lateral clearance: The width/size of the opening at the underpasses shall be as follows:

S. No.	Existing Chainage	Design Chainage	Span (No. x length x ht.) in m	Minimum Length of RE wall	Remarks
NIL					

2.7 Lateral and vertical clearance at overpasses

2.7.1 Lateral and vertical clearances at over passes shall be as per paragraph 2.11 of the Manual- **No overpass**

2.7.2 Lateral clearance: The size of the opening at the overpasses shall be as follows:

S. No.	Location (chainage) From km to km	Number and length of spans	Remarks
Nil			

2.8 Service roads/ Slip Road

Service roads, as per clause 2.12 of the manual, shall be constructed at the locations and for the lengths indicated below:

S. No.	Existing Chainage		Design Chainage		Length (m)	Width (m)	Side
	From	To	From	To			
Nil							

2.9 Grade separated structures

2.9.1 Grade separated structures shall be provided as per paragraph 2.13 of the Manual. The requisite particulars are given below:

S. No.	Location of Structure	Design Chainage	Length (m)	Number and length of spans	Approach gradient	Remarks
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:

S. No.	Location of Structure	Design Chainage	Length (m)	Number and length of spans	Approach gradient	Remarks
NIL						

2.10 Cattle and Pedestrian UnderPass / Over Pass

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

S. No.	Existing Chainage	Design Chainage	Proposed span arrangement	width in m	Minimum length of RE wall
NIL					

2.11 Typical cross-sections of the Project Highway

Different type of cross sections for different segments with intermediate lanes shall be developed. The widening of the road due to land constraint and to avoid land acquisition, concentric widening has been done at open and built up sections. However in hill sections widening has been proposed on the hill side to avoid construction of costly protection structures.

3.0 Intersections and grade separators

All intersections and grade separators shall be as per Section 3 of the IRC: SP: 73-2015. Existing intersections which are deficient shall be improved to the prescribed standards.

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

(a) At-grade intersections

i) Major Junction

Sl No	Design Chainage (km)	Category of Road	Type of Junction	Remarks
NIL				

ii) Minor Intersection

Sl No	Design Chainage (km)	Side (Left/Right)	Carriageway Width in m	
			Left	Right
1	32/232	Left	4.75	
2	32/254	Right		3.3
3	40/738	Left	3.16	
4	41/061	Right		4.35
5	41/100	Right		1.88
6	41/147	Left	3.71	

(b) Grade separated intersection with/without ramps

S. No.	Location	Salient features	Minimum length of viaduct to be provided	Read to be carried over / under the structures
NIL				

4. Road embankment and cut section

4.1 Widening and improvement of the existing road embankment/cuttings and construction of new road embankment / cuttings shall conform to the standards and specifications given in Section 4 of the IRC: SP: 73-2015 and the specified cross sectional details. Deficiencies in the plan and profile of the existing road shall be corrected.

4.2 Raising of existing road.

The existing road shall be raised as per drawings enclosed.

S. No.	Design chainage from	Design chainage to	Average height
NIL			

5. Pavement design

5.1 Pavement design shall be carried out in accordance with Section 5 of the IRC: SP: 73-2015. Contractor has to provide additional performance bank guarantee of 5% of the contract price valid up to a period 5 years from completion of construction of highway in case the Contractor intends to use any alternative material, innovative technology/method, whether patented or otherwise, that is not specifically covered in the Indian or International Standards.

5.2 Type of pavement

The road has stretches of flexible pavement. The details of flexible pavement is provided in table as under. The flexible has been strengthened and widened with flexible pavement. The development shall be with cross sections provided.

Sl No	Design Chainage from (km)	Design Chainage to (km)	Length in m	Type of pavement
1	26/000	48/000	22000	Flexible

5.3 Design requirements**5.3.1 Design Period and Strategy**

Pavement for new pavement and for widening and strengthening of the existing pavement shall be designed as per relevant paragraphs of Section 5 of the IRC: SP: 73-2015 pertaining to flexible pavement and rigid pavement, 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 design traffic of 10million standard axles (msa) for a design period of 15 years.

5.4 Reconstruction of stretches

Construction/ Reconstruction of the Project Highway shall be as per 'Hill Road Manual' IRC SP 48-1998 referred in Schedule D.

6. Roadside drainage

Drainage system including surface and subsurface drains for the Project Highway shall be provided as per section 6 of the IRC: SP: 73-2015. Covered Drains and lined drain shall be provided in the Built-up sections on both sides of the road. In the hill sections catch water drains have been provided on the hill side.

Drains shall be provided at the following chainages:

SI No	Chainage from	Chainage to	Width of drain
1	32100	32400	1.0 m on both side
2	39800	40150	
3	40750	40850	
4	41200	41350	
5	26000	32100	0.6 m on along with Breast Wall
6	32400	39800	
7	40150	40750	
8	40850	41200	
9	41350	48000	

The drains shall terminate on the existing drains.

7. Design of structures

7.1 General

7.1.1 All bridges, culverts and structures shall be designed and constructed in accordance with Chapter 8 of the IRC: SP: 48-1988 and IRC SP 73 2015 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:

All new structures shall have minimum carriageway as per typical cross-section.

7.1.3 The following structures shall be provided with footpaths

S. No.	Bridge at km	Structures	Remarks
Nil			

7.1.4 Development of causeways: The existing causeways at the following locations shall be developed as vented causeways

S. No.	Chainage	Proposed span	Remarks
Nil			

7.1.5 Utility services to be carried over the structures

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

S. No.	Bridge at km	Utility service to be carried	Remarks
Nil			

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

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:

S. No.	Design Chainage	Proposed Type of Structure	Proposed Span (m)	Over all Width in m
1	28.430	HP	1 X 1.2	12.5
2	29.155	HP	1 X 1.2	12.5
3	33.620	HP	1 X 1.2	12.5
4	34.880	HP	1 X 1.2	12.5
5	40.400	HP	1 X 1.2	12.5
6	40.970	HP	1 X 1.2	12.5
7	41.900	HP	1 X 1.2	12.5
8	43.730	HP	1 X 1.2	12.5
9	47.040	HP	1 X 1.2	12.5
10	47.730	HP	1 X 1.2	12.5

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 IRC: SP: 73-2015. Repairs and strengthening of existing structures where required shall be carried out.

S. No.	Design Chainage	Proposed Type of Structure	Proposed Span (m)	Over all Width in m
1	26.620	HP	1 X 0.9	12.5
2	26.710	HP	1 X 1.0	12.5
3	26.880	HP	1 X 0.9	12.5
4	27.050	HP	1 X 1.0	12.5
5	27.110	HP	1 X 1.0	12.5
6	27.230	HP	1 X 0.9	12.5
7	27.550	SLAB	1 X 3.3	12.5
8	27.840	HP	1 X 0.9	12.5
9	27.890	HP	1 X 0.9	12.5
10	28.930	HP	1 X 0.9	12.5
11	29.390	HP	1 X 0.9	12.5
12	29.460	HP	1 X 0.9	12.5
13	30.140	HP	1 X 1.0	12.5
14	30.190	HP	1 X 0.9	12.5
15	30.400	HP	1 X 1.0	12.5
16	30.870	HP	1 X 1.0	12.5
17	30.950	HP	1 X 0.9	12.5
18	31.140	HP	1 X 0.9	12.5
19	31.700	HP	1 X 0.9	12.5
20	31.800	HP	1 X 0.9	12.5
21	32.590	HP	1 X 1.0	12.5
22	32.710	HP	1 X 0.9	12.5
23	32.860	HP	1 X 1.0	12.5
24	32.910	HP	1 X 1.0	12.5

25	33.090	HP	1 X 0.9	12.5
26	33.250	HP	1 X 1.0	12.5
27	33.400	HP	1 X 1.0	12.5
28	33.715	HP	1 X 0.9	12.5
29	33.770	HP	1 X 0.9	12.5
30	33.870	HP	1 X 0.9	12.5
31	33.955	HP	1 X 0.9	12.5
32	34.080	HP	1 X 0.9	12.5
33	34.110	HP	1 X 1.0	12.5
34	34.290	HP	1 X 0.9	12.5
35	34.470	HP	1 X 0.9	12.5
36	34.620	HP	1 X 1.0	12.5
37	34.700	HP	1 X 0.9	12.5
38	34.750	HP	1 X 0.9	12.5
39	34.940	HP	1 X 0.9	12.5
40	34.960	HP	1 X 0.9	12.5
41	35.380	HP	1 X 1.0	12.5
42	35.890	HP	1 X 1.0	12.5
43	36.310	HP	1 X 0.9	12.5
44	36.400	HP	1 X 0.9	12.5
45	36.710	HP	1 X 0.9	12.5
46	36.900	HP	1 X 0.9	12.5
47	36.980	HP	1 X 0.9	12.5
48	37.480	SLAB	1 X 3.0	12.5
49	37.740	HP	1 X 1.0	12.5
50	37.975	SLAB	1 X 5.8	12.5
51	38.220	HP	1 X 0.9	12.5
52	38.320	HP	1 X 0.9	12.5
53	38.470	HP	1 X 0.9	12.5
54	38.690	HP	1 X 0.9	12.5
55	39.000	HP	1 X 1.0	12.5
56	39.500	HP	1 X 0.9	12.5
57	39.600	HP	1 X 0.9	12.5
58	39.980	HP	1 X 0.9	12.5
59	40.130	HP	1 X 0.9	12.5
60	40.230	HP	1 X 0.9	12.5
61	40.820	HP	1 X 0.9	12.5

62	41.250	HP	1 X 1.0	12.5
63	41.290	HP	1 X 0.9	12.5
64	41.480	HP	1 X 1.0	12.5
65	41.700	HP	1 X 0.9	12.5
66	42.030	HP	1 X 0.9	12.5
67	43.015	HP	1 X 0.9	12.5
68	43.130	HP	1 X 0.9	12.5
69	43.520	HP	1 X 0.9	12.5
70	43.660	HP	1 X 0.9	12.5
71	43.760	HP	1 X 0.9	12.5
72	43.850	HP	1 X 0.9	12.5
73	43.900	HP	1 X 0.9	12.5
74	45.880	HP	1 X 0.9	12.5

7.2.4 Additional new culverts shall be constructed, as per IRC SP 73-2015, particulars given below:

S. No.	Design Chainage (km)	Proposed Type of Culvert	Span Arrangement No. x Length / No. x Dia (m)
1	26.200	HP	1 X 1.2
2	26.340	HP	1 X 1.2
3	27.950	HP	1 X 1.2
4	28.230	HP	1 X 1.2
5	28.650	HP	1 X 1.2
6	29.800	HP	1 X 1.2
7	30.700	HP	1 X 1.2
8	31.270	HP	1 X 1.2
9	31.460	HP	1 X 1.2
10	31.580	HP	1 X 1.2
11	31.950	HP	1 X 1.2
12	33.350	HP	1 X 1.2
13	35.680	HP	1 X 1.2
14	36.040	HP	1 X 1.2
15	36.560	HP	1 X 1.2
16	37.250	HP	1 X 1.2
17	39.090	HP	1 X 1.2
18	42.320	HP	1 X 1.2
19	42.590	HP	1 X 1.2
20	44.510	HP	1 X 1.2
21	44.650	HP	1 X 1.2
22	45.170	HP	1 X 1.2
23	45.440	HP	1 X 1.2
24	45.990	HP	1 X 1.2
25	46.700	HP	1 X 1.2
26	46.820	HP	1 X 1.2
27	47.200	HP	1 X 1.2

28	47.800	HP	1 X 1.2
----	--------	----	---------

7.2.5 Repairs/ replacements of railing /parapets, flooring and protection works

Sl. No.	Design Chainage	Type of Structures	Repair work	Length (m)	Width (m)
1	32.800	HP	Crash barrier	Replacement of parapet wall with concrete crash barrier using minimum grade of concrete M40, Floor protection and other features requiring repair should be done as per site requirement and in consultation with A.E.	
			PCC M15 in Levelling Course		
			PCC M20 in Catchpit		
			Floor Apron		
2	33.180	HP	Crash barrier		
			PCC M15 in Levelling Course		
			PCC M20 in Catchpit		
			Floor Apron		
3	36.760	HP	Crash barrier		
			PCC M15 in Levelling Course		
			PCC M20 in Catchpit		
			Floor Apron		
4	38.910	HP	Crash barrier		
			PCC M15 in Levelling Course		
			PCC M20 in Catchpit		
			Floor Apron		
5	45.620	HP	Crash barrier		
			PCC M15 in Levelling Course		
			PCC M20 in Catchpit		
			Floor Apron		

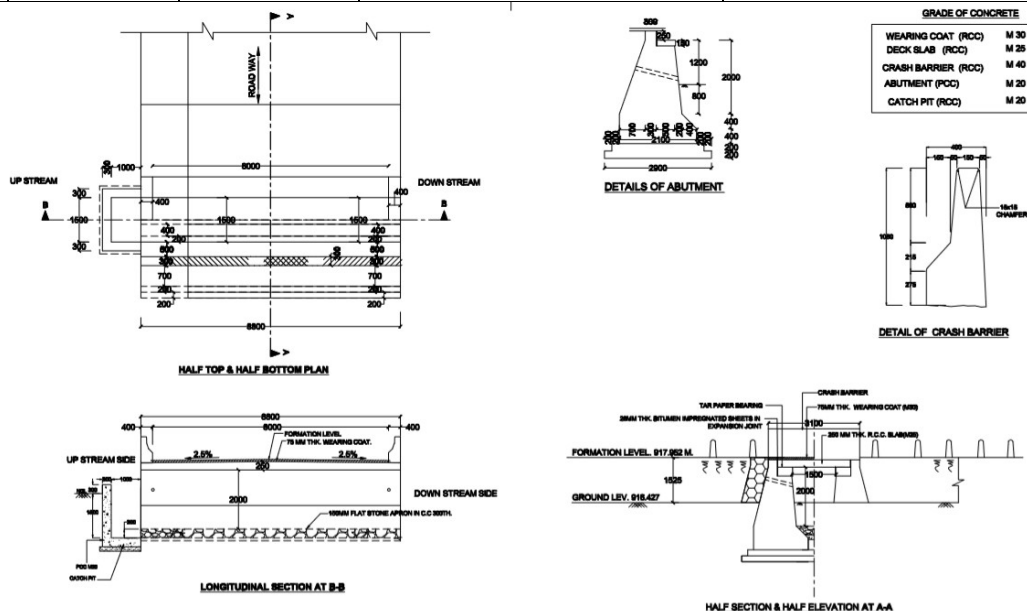


FIG: Repair of Slab Culvert

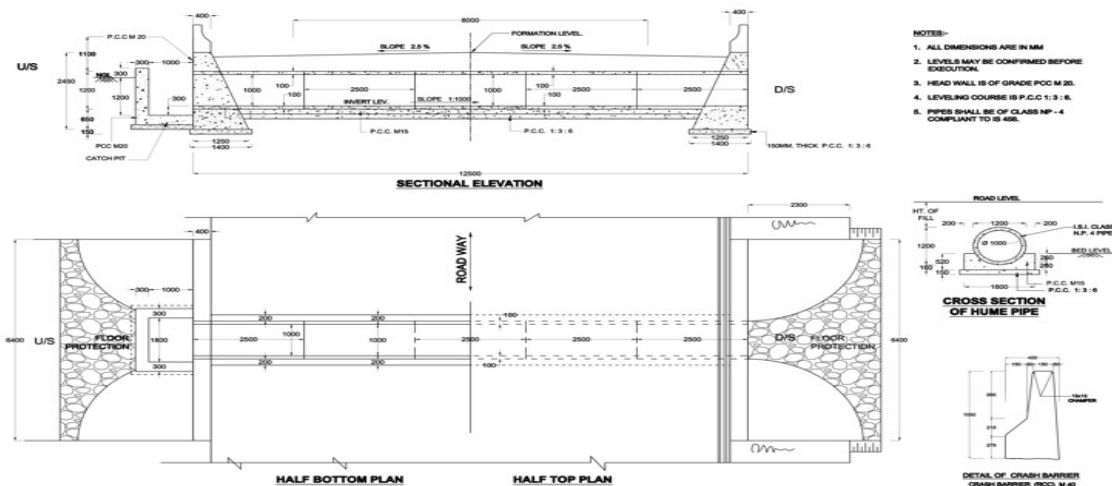


FIG: Repair of HP Culvert

7.3 Bridges

7.3.1 Existing bridges to be re-constructed/widened /Repairs

- i) The existing bridges at the following locations shall be reconstructed
- a) Major Bridges: NIL
- b) Minor Bridges: NIL
- ii) The following narrow bridges shall be widened/Repairs and Strengthened:
- a) **Major Bridges:**

S. No.	Chainage (km)	Width (m)	Span Arrangement	Type of structure			Details of Widening
				Foundation	Sub structure	Super structure	
NIL							

Note: Widening of major Bridges is not applicable due to PSC Girder & SLAB type super structures. However repairs & strengthening of the bridge shall be carried out.

b) **Minor Bridges:**

S. No.	Chainage (km)	Existing width (m)	Span Arrangement	Type of structure			Details of widening
				Foundation	Sub structure	Super structure	
Nil							

Note: repair /strengthening work also to be carried out along with widening.

7.3.2 Additional new bridges

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

a) **Major Bridge:**

S. No.	Name of Bridge	Existing Chainage	Design Chainage	Proposed span arrangement (No. x l)	Remarks
Nil					

b) **Minor Bridge:**

S. No.	Name of Bridge	Existing Chainage	Design Chainage	Proposed span arrangement (No. x l)	Remarks
--------	----------------	-------------------	-----------------	-------------------------------------	---------

For rehabilitation and up-gradation of Wokha-Merapani Road from (26/000 km) To(48/000 km) in the State of Nagaland

Nil

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

S. No.	Location at km	Remarks
Nil		

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

S. No.	Location at km	Remarks
Nil		

7.3.5 Drainage system for bridge decks

Nil

7.3.6 Structures in marine environment: Nil**7.4 Rail-road bridges****7.4.1 Design, construction and detailing of ROB/RUB shall be as specified in section 7 of the IRC: SP: 73-2015.****7.4.2 Road over bridges (road over rail) shall be provided at the following crossings, as per GAD drawings attached:**

S. No.	Design Chainage (km)	Span Arrangement / length of span in m	Remark
Nil			

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

S. No.	Location of level crossing	Number and length of span
NIL		

7.5 Grade Separated Structures

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

7.6 Repairs and Strengthening of Structures

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

A – Bridges**i) Major Bridges**

S. No.	Location of bridge (km)		Nature and extent of repairs/ strengthening to be carried out
	Existing Chainage	Design Chainage	
Nil			

ii) Minor Bridge:

S. No.	Existing Chainage (km)	Design Chainage (km)	Details of Repairing/Strengthening to be carried out
Nil			

B – ROB / RUB

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

C – Overpasses/Underpasses and other structures

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

7.7 List of Major Bridges and Structures

The following is the list of the Major Bridges and structures to be constructed

S. No.	Name of Bridge	Existing Chainage	Design Chainage	Proposed span arrangement (No. x l)	Remarks
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 IRC: SP: 73-2015.

8.2 Specifications of the reflecting sheeting: As per the Clause 9.2 of the IRC: SP: 73-2015.

9. Roadside Furniture

Roadside furniture shall be provided in accordance with the provisions of section 9 of the IRC: SP: 73-2015.

9.1 Overhead traffic signs: location and size

S. No.	Design Chainage (km)	Remarks
NIL		

10. Compulsory Afforestation

The contractor is to plant trees as compensatory forestation as per as per IRC SP 21 and guidelines of the forest department.

The contractor is to plant double of no of trees cut for the widening of road on both sides of road.

11. Hazardous Locations

The safety barriers like metal beam crash barriers shall also be provided at the following hazardous locations

S. No.	Location Stretch From (km) to (km)	LHS/RHS
NIL		

11.1 Extra Widening

Extra widening shall be provided at sharp curve with radius less than 300 m and the widening shall conform to the code IRC: SP:48: Hill Road Manual.

S. No.	Chainage	Curve Radius	Nos.	Width
1	26/000-48/000	101-300	14	0.6
2		61-100	30	0.9
3		41-60	100	1.2
4		0-40	247	1.5

12. Protection work: - Construction of Guard wall, Breast Wall shall be as provided

For rehabilitation and up-gradation of Wokha-Merapani Road from (26/000 km) To(48/000 km) in the State of Nagaland

1. Guard wall

Sl no	Chainage from - to		Height	Side
3	26/000	32/100	0.6 m	On Valley Side
4	32/400	39/800		
5	40/150	40/750		
6	40/850	41/200		
7	41/350	48/000		

2. Breast Wall

Sl no	Chainage (km)	Length (m)	Location and Height	Side
1	32/400-33/500	1100	To be finalized in consultation with A.E.	Hilly side
2	38/00-38/200	200		Hilly side
3	38/500-38/900	400		Hilly side
4	41/800-41/900	100		Hilly side
5	43/500-43/900	400		Hilly side

3. Retaining Wall

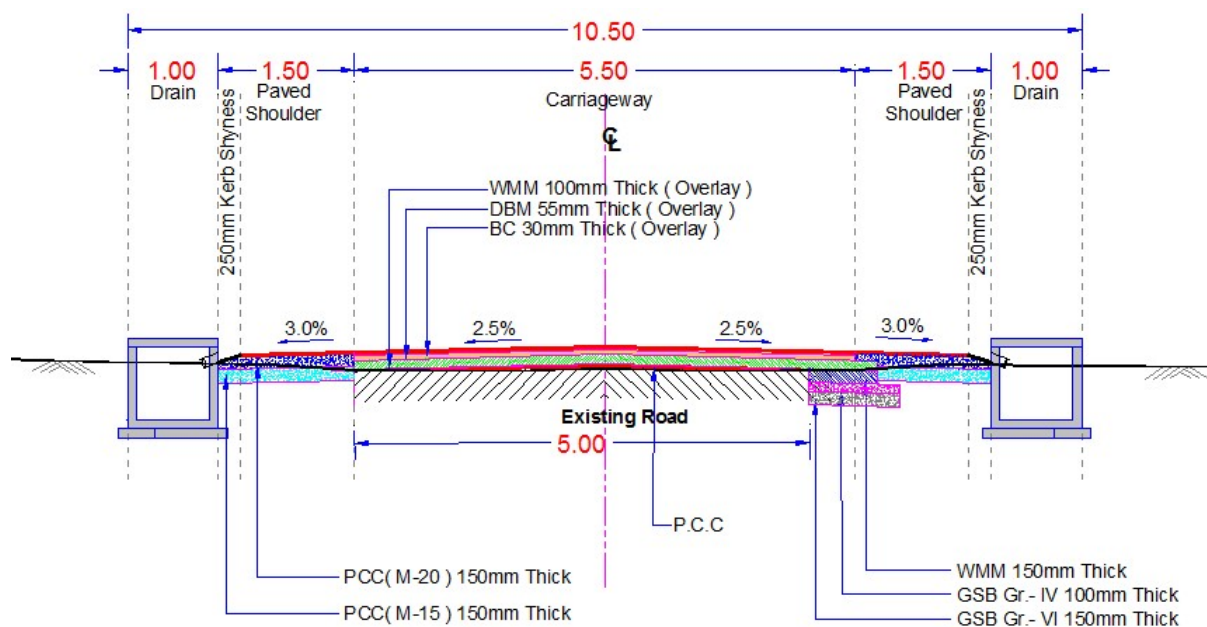
Sl no	Chainage from to to	Height	Side
NIL			

13. Change of Scope

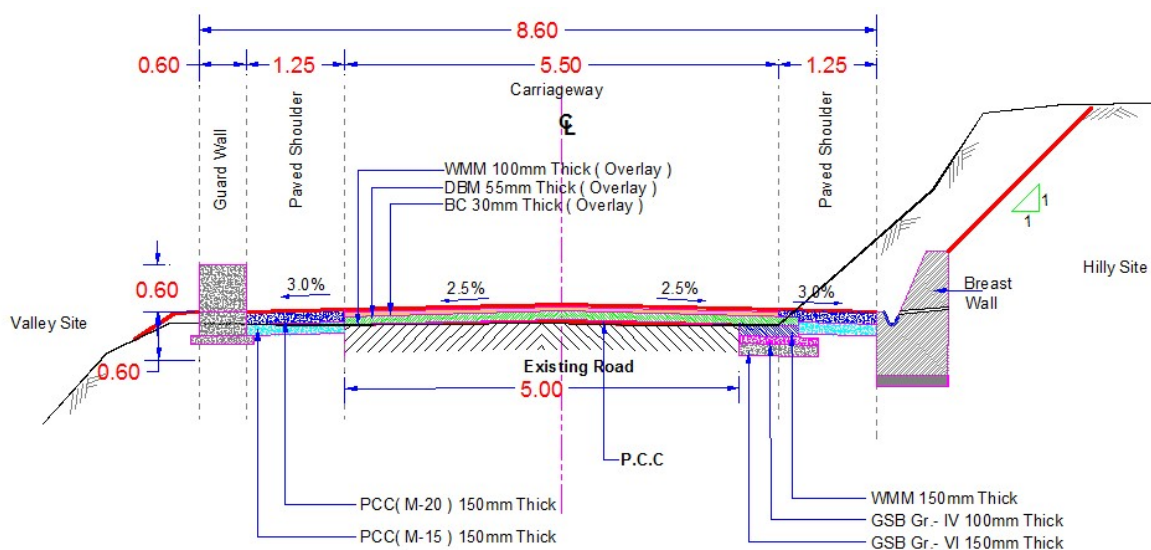
The length of Structures, bridges specified herein above shall be treated as an approximate assessment. The actual lengths and location as required on the basis of detailed investigations shall be determined by the Contractor in accordance with the Specifications and Standards. Any variations in the 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.

Appendix-B1

1. Typical Cross Section



TYPICAL CROSS SECTION (TYPE - 1)



TYPICAL CROSS SECTION (TYPE - 3)

Applicable Stretches of Typical Cross-Sections

Appendix B1

Sl No	Chainage from	Chainage to	TYPES OF CROSS SECTIONS
1	32100	32400	5.5 M CARRIAGEWAY WITH 1.5 M PAVED SHOULDERS WITH 1 M COVERED DRAIN ON TYPE 1
2	39800	40150	
3	40750	40850	
4	41200	41350	
5	26000	32100	5.5 M CARRIAGEWAY WITH 1.25 M CC PAVED SHOULDERS ON EITHER SIDE AND BREAST WALL ON HILL SIDE WITH 0.6M GUARD WALL ON VALLEY SIDE TYPE 3
6	32400	39800	
7	40150	40750	
8	40850	41200	
9	41350	48000	