

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: 73-2015. 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			
48/300	48/386	36	Steep gradient	
52/581	52/700	119	Steep gradient	
54/740	54/810	70	Hair pin bend	
55/050	55/130	80	Hair pin bend	Realignment required
55/650	55/690	40	Steep gradient	
55/740	55/820	80	Hair pin bend	Realignment required
55/500	55/570	70	Hair pin bend	Realignment required

56/153	56/260	107	Steep gradient	
56/614	56/679	65	Steep gradient	
56/844	56/890	46	Steep gradient	
56/952	57/050	98	Steep gradient	
57/128	57/204	76	Steep gradient	
57/538	57/600	62	Steep gradient	
57/623	57/732	109	Steep gradient	
57/990	58/010	20	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		
55/050	55/130	80	10
55/740	55/820	80	10
55/500	55/570	70	10
57/100	57/500	400	20

2.5 Type of Shoulders

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

SI No	Chainage from	Chainage to	Type of Shoulders	Width of Shoulders
1	52900	54750	Paved Shoulder with CC	1.5 m
2	48000	52900	Paved Shoulder with CC	1.25 m
3	54750	58000		
4	58000	60585	Paved Shoulder with CC	1.5 m

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 of Two Lane stretch and intermediate lane shall be developed as provided in 'Manual of Specifications & Standard for Two Laning of Highways through BOT Basis' (IRC: SP: 73-2015) and IRC SP 48-1998 referred in Schedule D. 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.

In built up areas in plain terrain, two laning 7 m carriageway shall be provided. Section with land constraint and hill section is proposed with intermediate carriageway.

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	53/844	Left	3.88	
2	54/335	Left	3.68	
3	54/423	Right		3.27
4	55/550	Right		3.31
5	58/100	Left	3.3	
6	58/500	Right		2.16
7	60/400	Left	6.15	

(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	48/000	60/585	12585	Flexible

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

For rehabilitation and up-gradation of Wokha-Merapani Road from (48/000 km) To Merapani (60/585 km) in the State of Nagaland and Assam

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 is 3 million 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 'Manual of Specifications & Standard for Two Laning of Highways through Public Private Partnership' (IRC: SP: 73-2015) and 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.

SI No	Chainage from	Chainage to	Width of drain
1	48000	52900	0.6 m along with breast wall
2	54750	58000	
3	52900	54750	1.0 m on both side
4	58550	58650	
5	60150	60585	

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 Section 7 of the IRC: SP: 73-2015 & IRC: SP: 48: 1998 and shall conform to the cross-sectional features and other details specified in typical cross-section.

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

For rehabilitation and up-gradation of Wokha-Merapani Road from (48/000 km)To Merapani (60/585 km) in the State of Nagaland and Assam

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	49.070	HP	1 X 1.2	12.5
2	49.160	HP	1 X 1.2	12.5
3	49.280	HP	1 X 1.2	12.5
4	50.000	HP	1 X 1.2	12.5
5	50.060	HP	1 X 1.2	12.5
6	50.120	HP	1 X 1.2	12.5
7	51.170	HP	1 X 1.2	12.5
8	52.105	HP	1 X 1.2	12.5
9	55.750	HP	1 X 1.2	12.5
10	58.980	HP	1 X 1.2	12.5
11	59.060	HP	1 X 1.2	12.5
12	59.425	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	49.200	HP	1 X 0.9	12.5
2	49.610	HP	1 X 0.9	12.5
3	49.630	HP	1 X 0.9	12.5
4	49.980	HP	1 X 0.9	12.5
5	50.490	HP	1 X 1.0	12.5
6	50.590	HP	1 X 1.0	12.5
7	50.990	HP	1 X 1.0	12.5
8	51.333	SLAB	1X 4.9	12.5
9	52.240	HP	1 X 1.0	12.5
10	52.560	HP	1 X 1.0	12.5

11	52.890	HP	1 X 1.0	12.5
12	53.050	HP	1 X 1.0	12.5
13	53.240	HP	1 X 1.0	12.5
14	54.150	HP	1 X 0.9	12.5
15	54.610	HP	1 X 0.9	12.5
16	54.660	HP	1 X 0.9	12.5
17	54.780	HP	1 X 0.9	12.5
18	54.910	HP	1 X 0.9	12.5
19	55.520	HP	1 X 0.9	12.5
20	56.040	HP	1 X 0.9	12.5
21	56.260	HP	1 X 0.9	12.5
22	56.360	HP	1 X 0.9	12.5
23	56.460	HP	1 X 0.9	12.5
24	57.120	HP	1 X 0.9	12.5
25	57.320	HP	1 X 0.9	12.5
26	57.830	HP	1 X 0.9	12.5
27	57.880	HP	1 X 1.0	12.5
28	58.220	HP	1 X 0.9	12.5
29	58.390	HP	1 X 0.9	12.5
30	58.800	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	48.140	HP	1 X 1.2
2	48.780	HP	1 X 1.2
3	48.940	HP	1 X 1.2
4	49.450	HP	1 X 1.2
5	49.700	HP	1 X 1.2
6	50.700	HP	1 X 1.2
7	52.800	HP	1 X 1.2
8	56.910	HP	1 X 1.2
9	57.660	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	52.640	HP	Crash barrier	Replacement of parapet wall with concrete crash	
			Floor Apron		

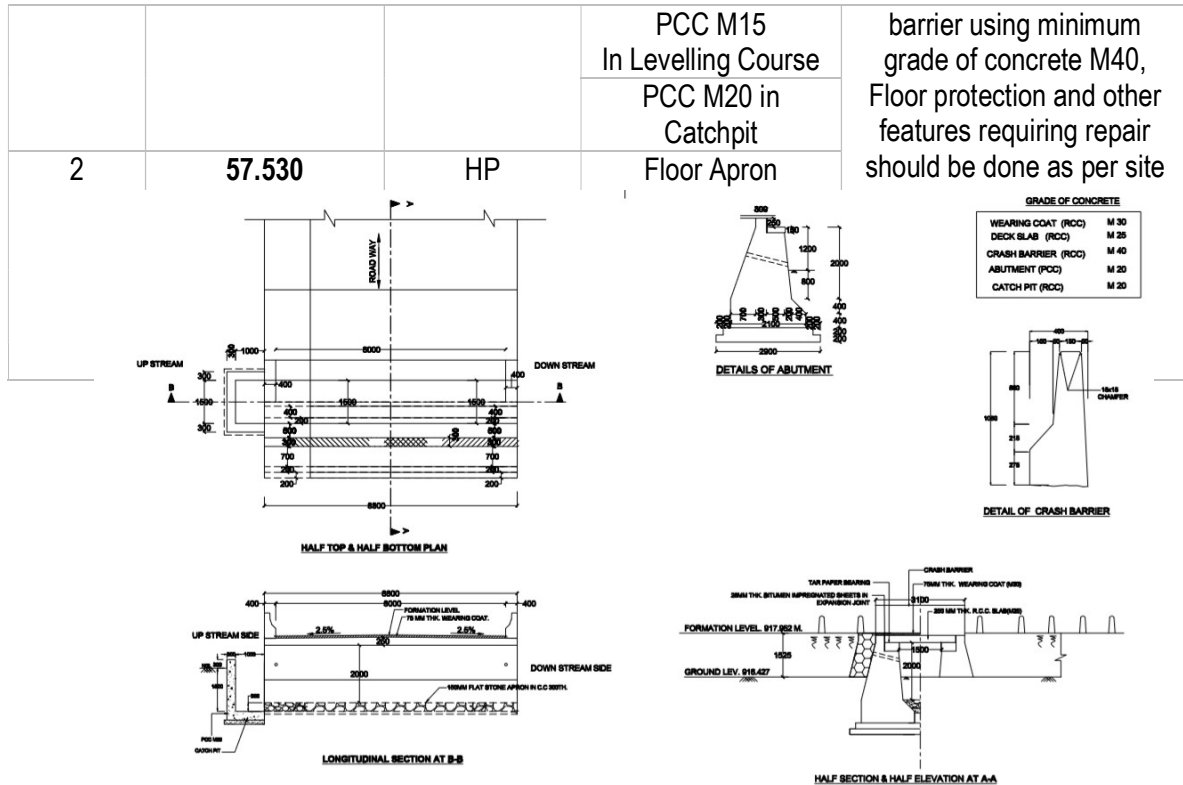


FIG: Repair of Slab Culvert

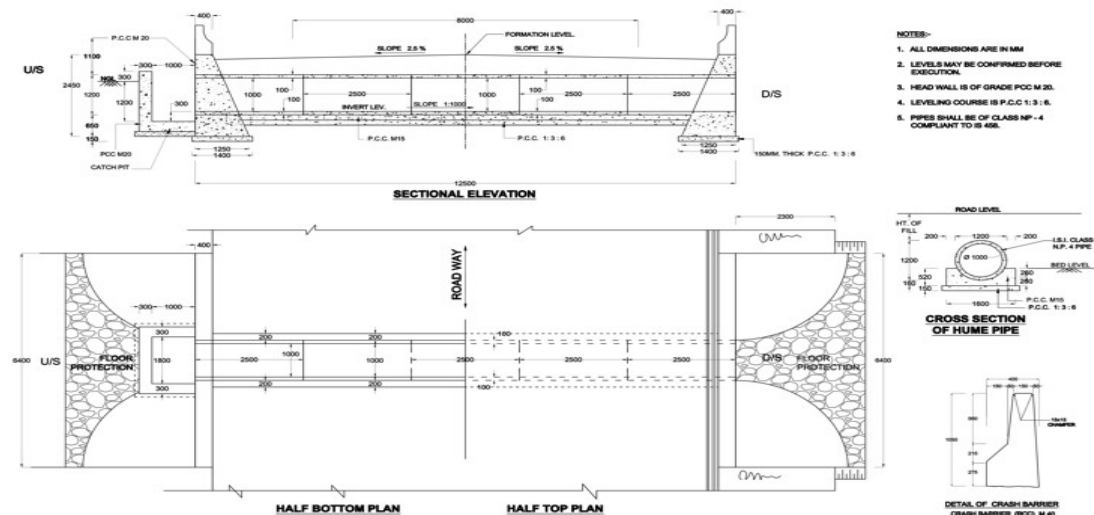


FIG: Repair of HP Culvert

7.3 Bridges

For rehabilitation and up-gradation of Wokha-Merapani Road from (48/000 km) To Merapani (60/585 km) in the State of Nagaland and Assam

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
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

For rehabilitation and up-gradation of Wokha-Merapani Road from (48/000 km)To Merapani (60/585 km) in the State of Nagaland and Assam

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.	Location of structure (km)	Nature and extent of repairs/strengthening to be carried out
NIL		

7.7 List of Major Bridges and Structures

For rehabilitation and up-gradation of Wokha-Merapani Road from (48/000 km)To Merapani (60/585 km) in the State of Nagaland and Assam

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 Manual.

- 9.1 Overhead traffic signs: location and size location and size shall be finalized in consultation with A.E

S. No.	Design Chainage (km)	Remarks
1	60/585	Merapani

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: 1998 Hill Road Manual and IRC:SP:73-2015.

S. No.	Chainage	Curve Radius	Nos.	Width
1	48/000-60/585	101-300	8	0.6
2		61-100	16	0.9
3		41-60	51	1.2
4		0-40	104	1.5

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

1. Guard wall

Sl no	Chainage from - to		Height	Side
7	48000	52900	0.6	Valley side
8	54750	58000		

2. Breast Wall

Sl no	Chainage (km)	Length (m)	Location and Height	Side
1	48/200-49/100	900	To be finalized in	Hilly side

			consultation with A.E.	
2	49/300-49/500	200		Hilly side
3	50/600-51/000	400		Hilly side
4	56/600-58/000	1400		Hilly side

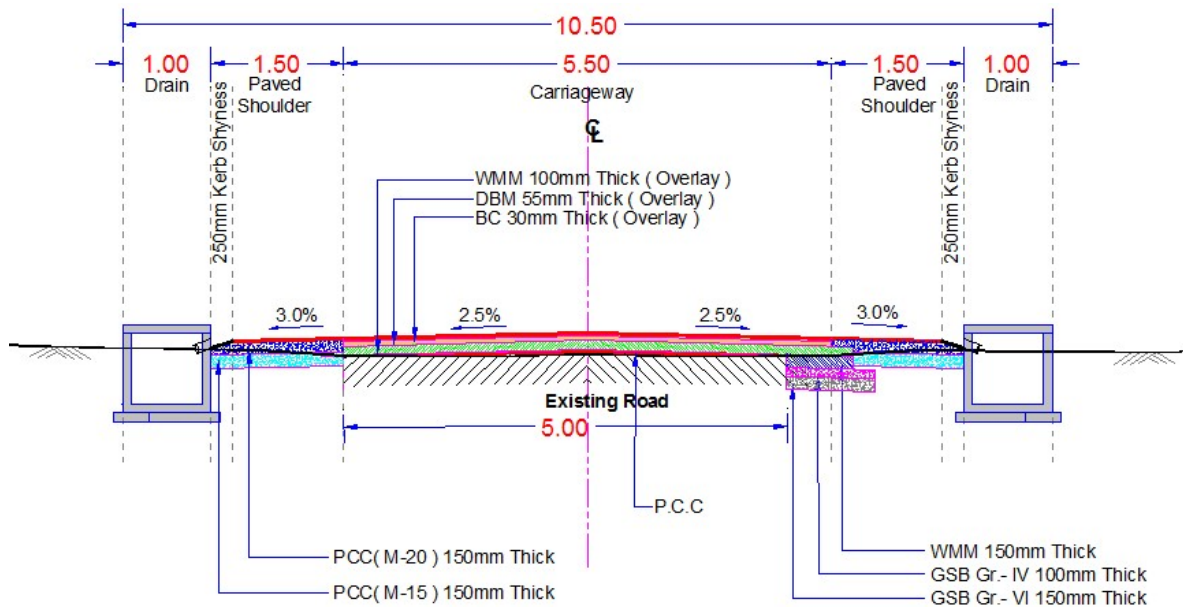
3. Retaining Wall

Sl no	Chainage from to to		Height	Side
1	58000	58550	3m	Hill Side
2	58650	60150		

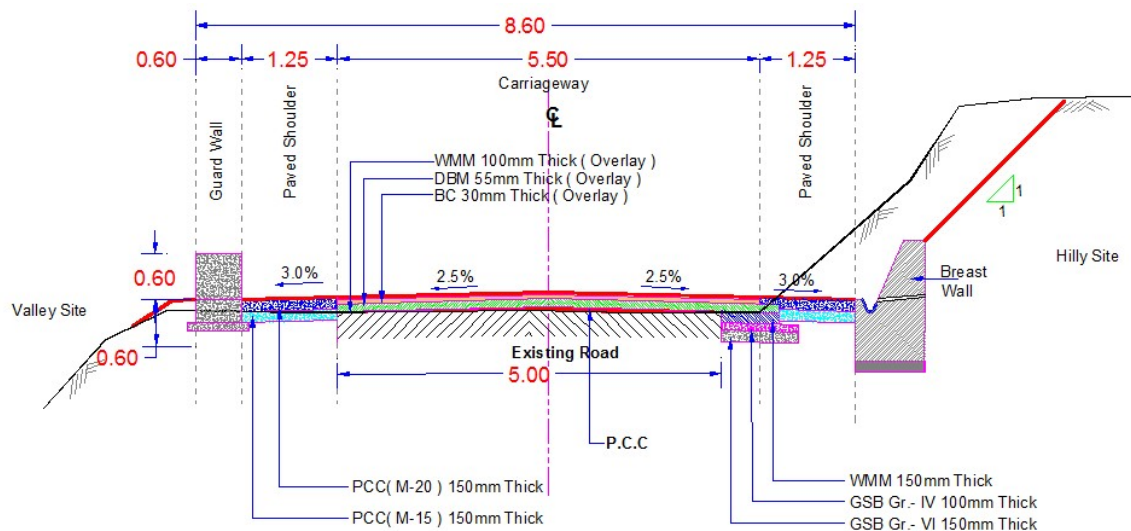
13. Change of Scope

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.

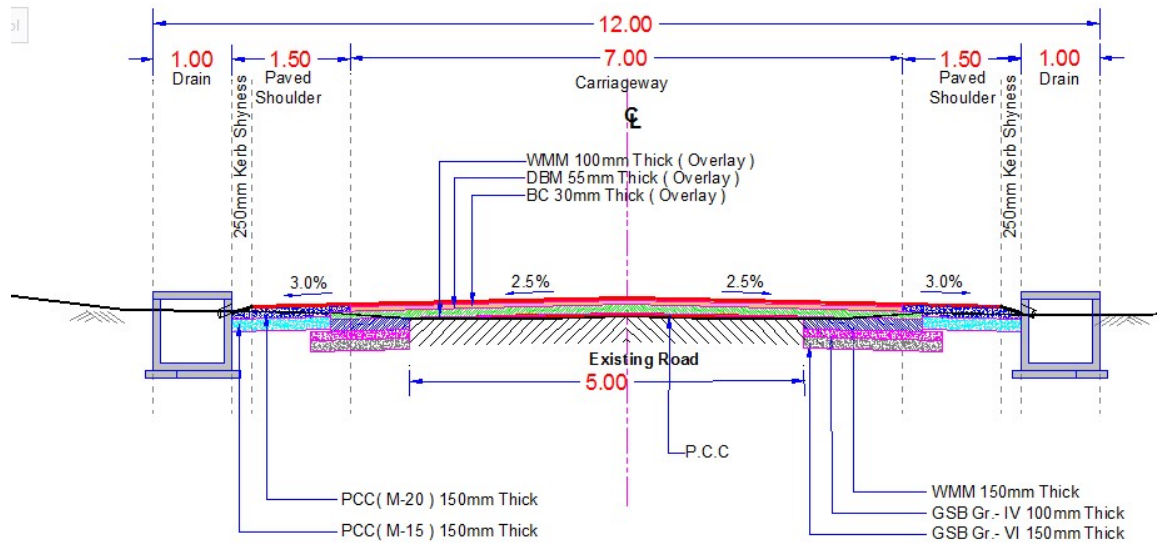
1. Typical Cross Section



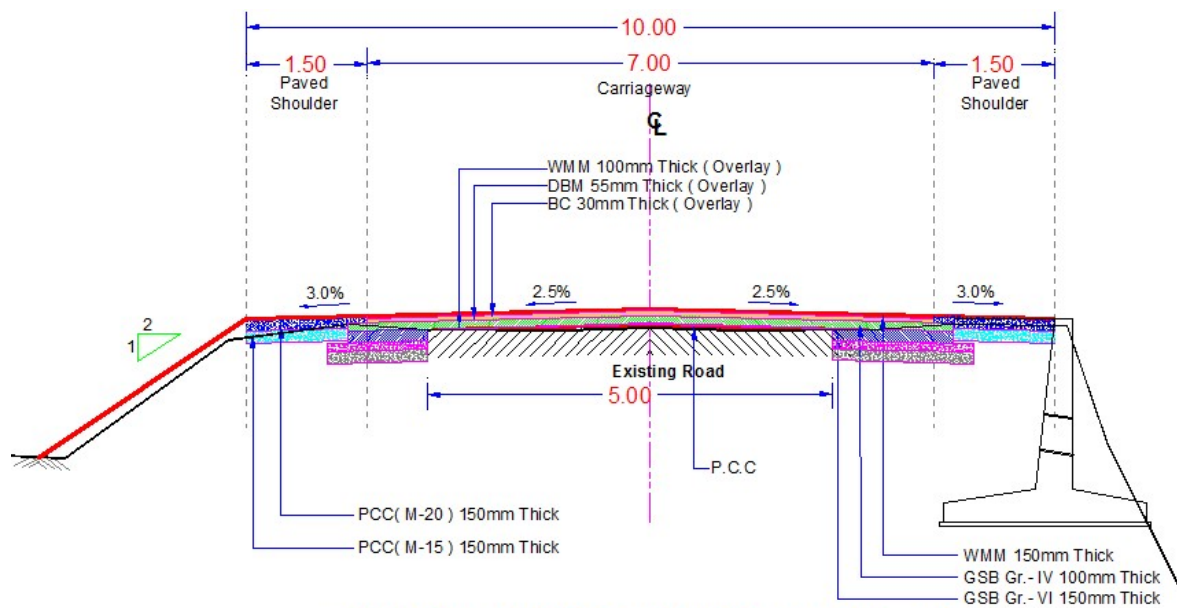
TYPICAL CROSS SECTION (TYPE - 1)



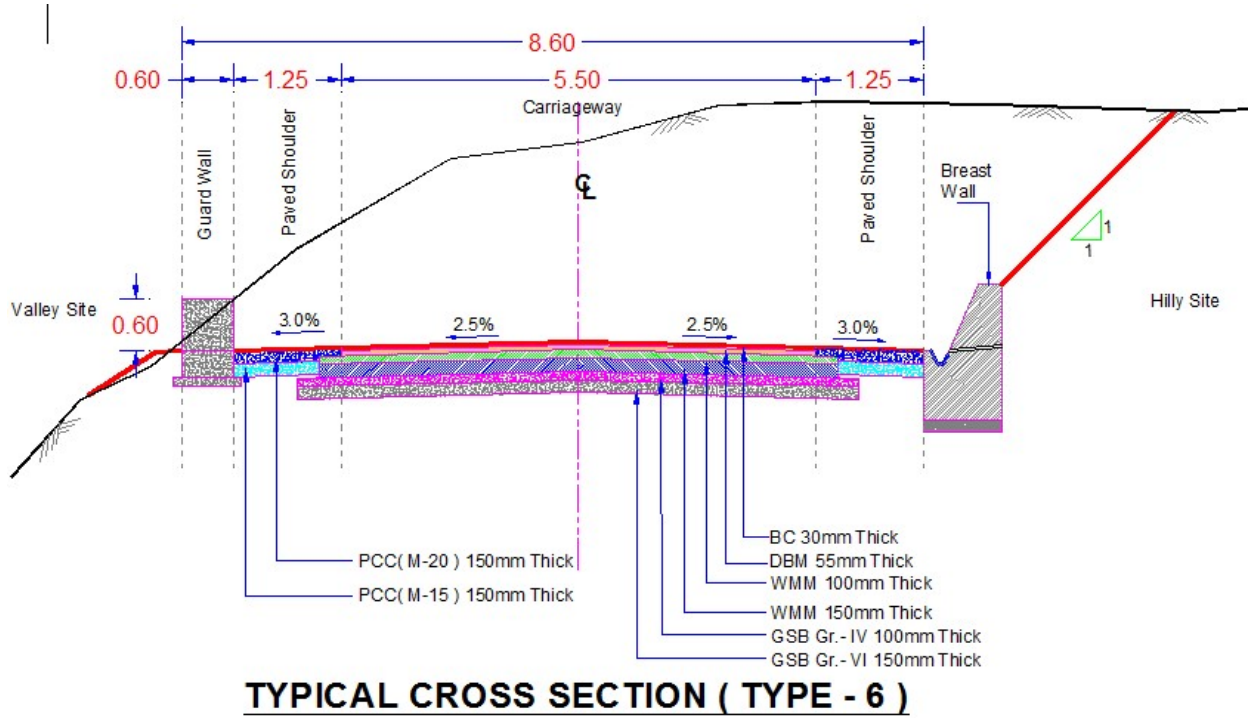
TYPICAL CROSS SECTION (TYPE - 3)



TYPICAL CROSS SECTION (TYPE - 4)



TYPICAL CROSS SECTION (TYPE - 5)



Applicable Stretches of Typical Cross-Sections

Appendix B1

Sl No	Chainage from	Chainage to	TYPES OF CROSS SECTIONS
1	52900	54750	5.5 M CARRIAGEWAY WITH 1.5 M PAVED SHOULDERS WITH 1 M COVERED DRAIN ON TYPE 1
2	48000	52900	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
3	54750	57100	
4	57500	58000	
5	58550	58650	7 M CARRIAGEWAY WITH 1.5 M PAVED SHOULDERS AND 1 M COVERED DRAIN ON BOTH SIDE TYPE 4
6	60150	60585	
7	58000	58550	7M CARRIAGEWAY WITH 1.5M PAVED SHOULDER WITH RETAINING WALL ON CANAL SIDE TYPE 5
8	58650	60150	
9	57100	57500	5.5 M CARRIAGEWAY WITH 1.25 M PAVED SHOULDERS AND BREAST WALL ON HILL SIDE AND 0.6M GUARD WALL ON VALLEY SIDE TYPE 6