EXECUTIVE SUMMARY

1. BACKGROUND

The roads of the north -eastern States are pathetic condition due to the soil type and majorly due its climatic conditions.India's north eastern region, where the road ministry has made ambitious plans to improve road infrastructure, including an accelerated road development program.DoNER with NHIDCL has undertaken measures to improve the transport system in North Eastern States and out of them, Wokha – Merapani–Golaghat road is also considered for up gradation. This road has an approximate length of 26 km starting from Wokha Junction (0/000) to (26/000) in the State of Nagaland. The road has 1 major junctions namely the Wokha Junction.

The task of widening and strengthening of the road was entrusted to NHIDCL, New Delhi for which M/s SM Consultants have been engaged by NHIDCL for preparation of detailed project report for rehabilitation and up-gradation of the existing intermediate lane road to two lane configuration.

1.1 The Inception report for this road was submitted in the month of July 2016. A presentation was made to the NHIDCL and DoNER in Delhi explaining the present road condition and road improvement programme. The meeting was held on 11.08.2016 at 12:15 hrs under the chairmanship of Secretary (DoNER) in presence of MD, NHIDCL, and the project consultant for Orphan roads M/s S M Consultant Pvt Ltd. The presentation highlighted the physical status of the road, improvement requirement, alternate proposals on the lane width, crust, pavement type, realignment etc. which would require finalization for preparation of DPR. The scale of damage to the road was highlighted. This road falls in heavy rainfallarea. The traffic is 3 MSA and the soaked CBR was found to be averaging at 5%.

The drainage system along the road stretch is very poor which is near to non-existence of the structure. The absence of proper drainage system is a prime cause of landslides and poor road conditions.

Following decisions were made in the meeting which eventually formed the design basis for preparation of Detailed Project Report.

i. The total stretch of road is proposed to be constructed using the conventional flexible pavement procedure.
ii. Intermediate Lane Carriageway (5.5m) as per IRC guidelines with conventional bituminous pavement as per IRC 37 with GSB, WMM, DBM and BC has been provided.
iii. The open area has to be developed with 1.25 m wide paved shoulder on both sides with 5.5m carriageway and lined drain. The hill road consist of 5.5 m carriageway with 1.25m paved shoulders with breast wall on hill side and guard walls on valley side.
iv. The portion existing along the nallah, has beenproposed to have 7 m carriageway with 1.5 m paved shoulders with drain on both the side as thenallah does not cut the road and is at a

distance away from the stream in some stretches. But at stretches where the nallah is just adjacent to the road embankment and has caused damage to the road formationhas been provided with 7m carriageway and 1.5 m paved shoulder with drain on side and retaining wall at the stream side. And 5.5 m carriageway with 1.5m paved shoulder with drain in built-up area.

v. All the culverts having diameter less than 900mm has to be reconstructed with 1200mm dia NP 4 HP culverts.

vi. All the culverts having length of 10m and diameter 900mm and above has been retained if they are found to have hydraulic sufficiency and structurally adequate.

vii. All new culverts has been constructed with 12m deck/formation width.

viii. Widening to pipe culverts has been done with multiple of one pipe length of 2.5m.

ix. The horizontal geometry has been restricted to available ROW. In case of places where this design speed cannot be achieved, speed limit signs has been introduced.

x. All the three bridges has been retained.

Managing Director, NHIDCL instructed to go ahead with preparation of the DPR in line with the decisions taken in the meeting. He instructed to the Consultant to incorporate clause for five years (5 years)maintainance period including defect liability period in the bid document which will eventually be part of the contract. He advised the Consultant to submit separate DPR for Wokha-Merapani road.

2 PROPOSED IMPROVEMENT

2.1 ROW: The road has no pillars or land boundary marked on ground. However from local enquiry and physical verification it was noted that the ROW varies as follows. The development of the road shall be limited within the ROW available and no land acquisition or resettlement shall be resorted to.

Table: RoW in Project Highway

Sl No	Chainage (Km)		Existing ROW (m)	Land use
	From	To		
1	0	150	22	Built-up Area
2	12000	14100	17	
3	22400	23600	20	
4	150	12000	10-15	Open Area
5	14100	22400	22	
6	23600	26000	23	Hill Area

2.2. RoadCross section: This road passes through hilly area for about 58 km and rest in plain area. The road shall be widened to have 5.5m carriageway width in built up area with paved shoulders of 1.5 m on both sides with lined drain.

Open area will have 5.5m carriageway width equivalent to intermediate lane carriageway with paved shoulder of 1.25m on both the sides with lined drain on hill side and guard wall of 0.6 m in valley side..

TABLE:LIST OF CROSS-SECTIONS

The existing carriageway and shoulder details are as tabulated below.

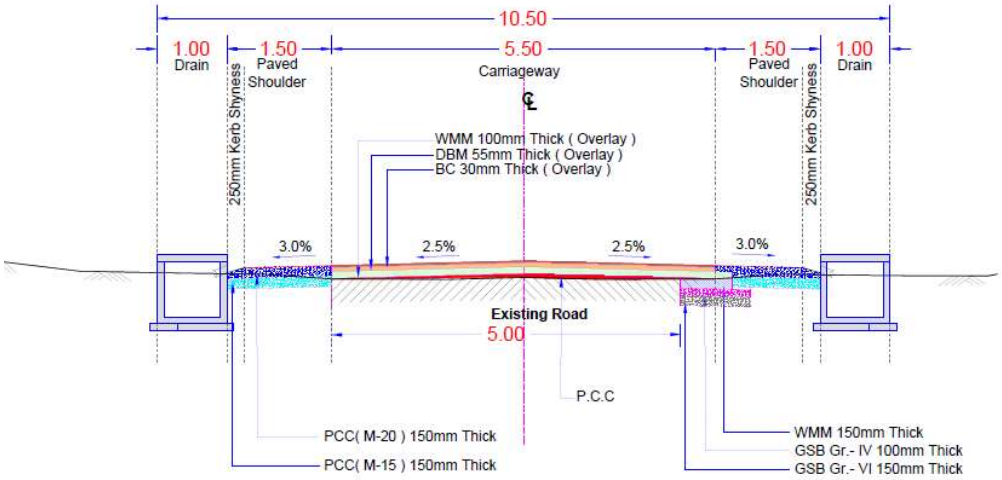
Sl No	Chainage from	Chainage to	TYPES OF CROSS SECTIONS
1	0	150	5.5 M CARRIAGEWAY WITH 1.5 M PAVED SHOULDERS WITH 1 M COVERED DRAIN ON TYPE 1
2	12000	14100	
3	22400	23600	
4	150	12000	5.5 M CARRIAGEWAY WITH 1.25 M CCPAVED SHOULDERS ON EITHER SIDE AND 0.6 M GUARD WALL ON VALLEY SIDE WITH PROVISION OF LONGITUDINAL DRAIN ON HILL SIDE TYPE 2
5	14100	21800	
6	22300	22400	
7	23600	26000	
8	21800	22300	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

TABLE:SHOULDER DETAILS

Design Chainage (km)		Carriageway Width	Earthen Shoulders	
From	To		Left	Right
0/000	26/000	5	1	1

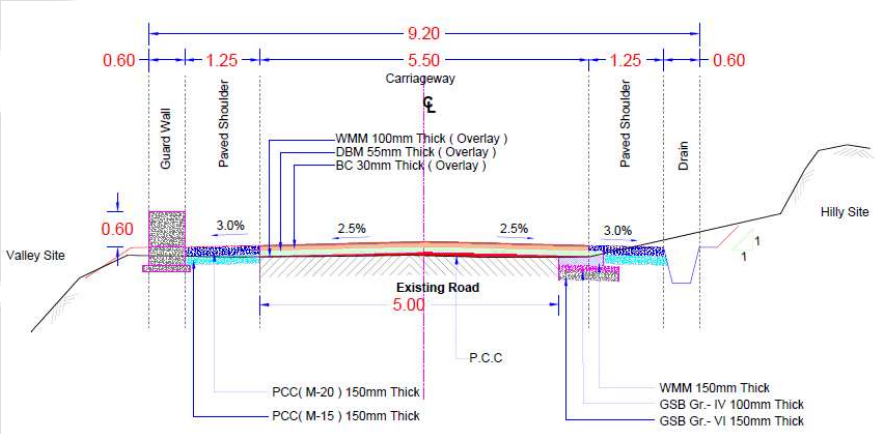
The road widening and improvement proposal has been divided into 6 sections and widening& realignment of the road has been taken up as per IRC SP 73:2015 and IRC SP 48 1998.

Section 1: Built-up Area with flexible pavement: The road stretch passes through built-up areas requiring proper drainage facility along the stretch as the condition of the road is poor due to the improper drainage of the storm water. The stretches enumerated above have been planned for widening with 5.5 m carriageway and 1.5 m paved shoulders and provision of providing drain cum footpath on both sides.



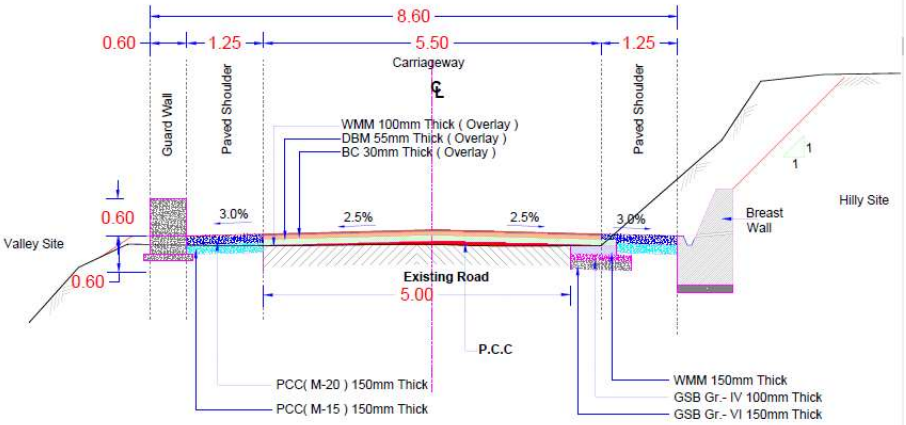
TYPICAL CROSS SECTION (TYPE - 1)

Section 2: Open area with flexible pavement with paved shoulder: The present condition of the road is nearly damaged at some locations. The stretch is valley on one side and small stretch of hill locks with less height are seen here. The section is provided withbituminous overlay of BC, DBM and WMM 100mm layer and lined drain on the hill side of the road.



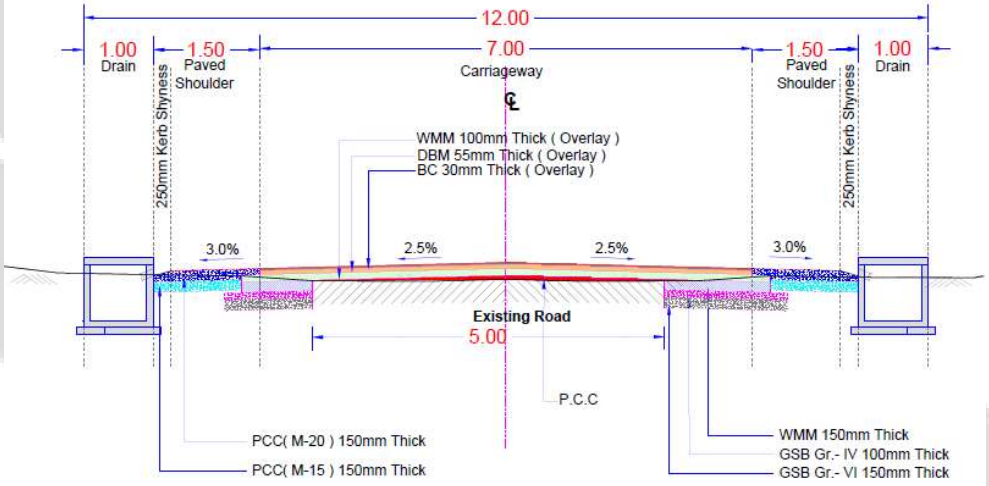
TYPICAL CROSS SECTION (TYPE - 2)

Section 3: Open section with flexible pavement: This stretch of area is prone to landslides as the continuous stretches of hill locks are seen in these areas. The height of hill locks increase along the road stretch. The carriageway provided is widened to 5.5 m with 1.25 m paved shoulder. The valley side along the road is protected with 0.6 m guard wall and the hill is retained by breast wall where the hill locks are adjacent to the road.The overlay provided in this stretch consists of BC, DBM and WMM 100 mm layer.



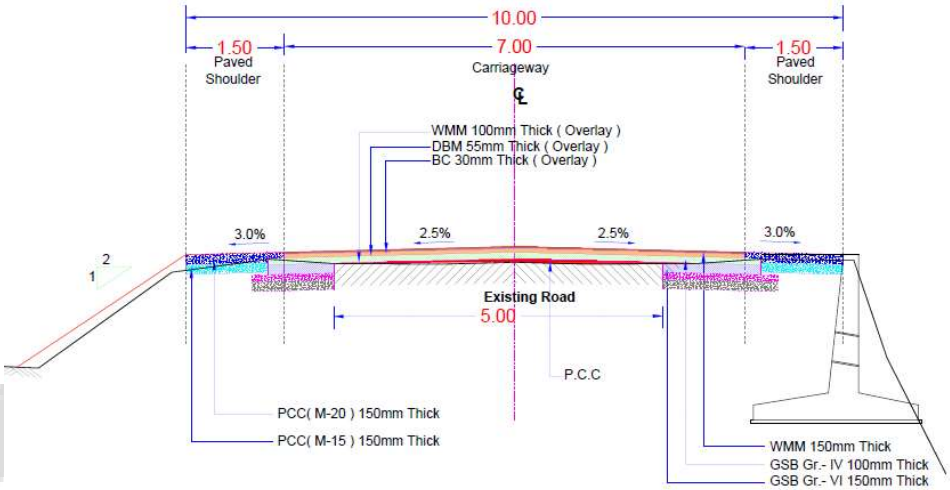
TYPICAL CROSS SECTION (TYPE - 3)

Section 4:Open section with flexible pavement: The road along the stretch passes near to the nallah. As the area is near the nallah, the area is under the influence of water logging. Drains of 1 m are provided along the road to avoid the effects of the water logging and avoid the damage to the pavement. Development of this stretch has been done with widening of carriageway to7 m wide and 1.5 m paved shoulder on both sides. The overlay provided in this stretch is BC, DBM and WMM (100 mm).



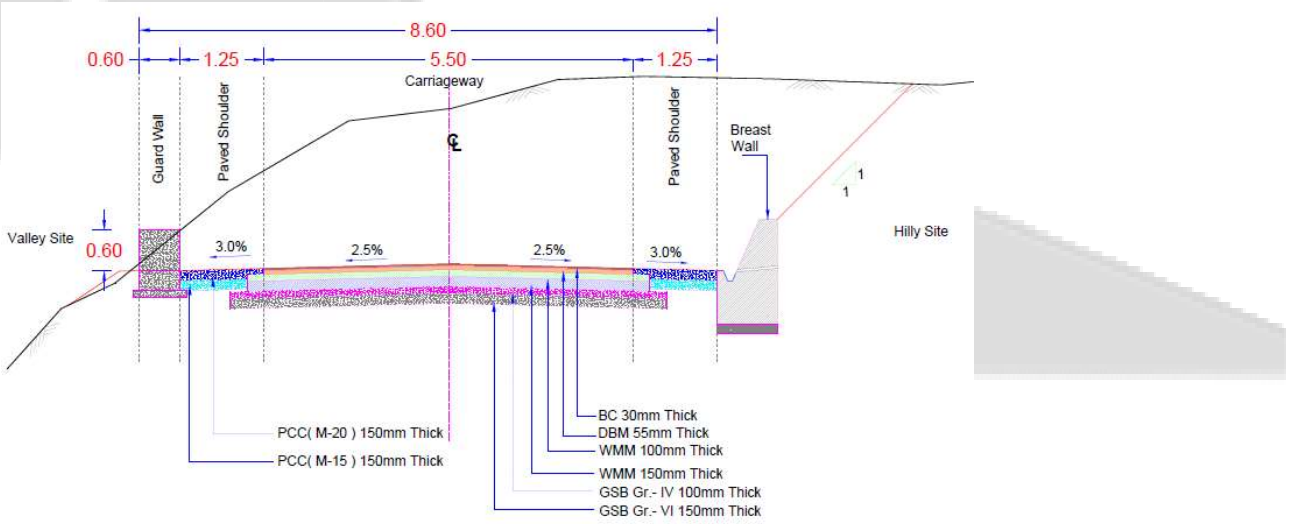
TYPICAL CROSS SECTION (TYPE - 4)

Section 5: Open area with flexible pavement: The present condition of the road is very poor as the subgrade of the road is totally affected by the flow of the nallah adjacent to it. The edge is totally damaged. The carriageway of the stretch has been proposed to be widened to 7 m with paved shoulder of 1.5 m on both sides. Drain is provided on one side and to the other side retaining wall is provided to minimise the effect of the water current of the nallah which is the reason for constant degradation of the road crust.



TYPICAL CROSS SECTION (TYPE - 5)

Section 6: Realignment Section with flexible pavement (New Alignment): The road in this this stretch is almost non-existent due to landslide. This stretch requires a new alignment for the road to develop. The road is proposed to be constructed by cutting the hill and providing a carriageway of 5.5 m with paved shoulders of 1.5 m and 0.6 m guard wall at the valley side and to retain the hill slope, breast wall is provided.



TYPICAL CROSS SECTION (TYPE - 6)

2.3Longitudinal Drain: RCC drains and lined drains are proposed to be provided near the urban areas and locations with stretches of living is found. The proposed cross-section has also provisions for proper drainage along the whole stretch by providing other drainage facility in the structures.

2.4 Road Crust: The existing bituminous road has been developed with flexible pavement. As the present condition of flexible road is poor, the development have been made with,100 mm WMM, DBM 55 mm and BC 30 mm as overlay and widening with 250 mm GSB with different gradation having provision for both filter and drainage layer, WMM 250 MM, DBM 50 MM and BC 40MM.

2.5Junction development: There is 1 major junctions and 5 minor junctions which requires improvement.

TABLE: LIST OF MAJORJUNCTION

Sl No	Design Chainage (Km)	Category of Road	Type of Junction	Remarks
1	0/000 (Road-1)	NH	T Junction	Wokha Junction

TABLE: LIST OF MINOR INTERSECTIONS

Sl No	Design Chainage (Km)	Side (Left/Right)	Carriageway Width in m	
			Left	Right
1	0/129	Right		3.3
2	11/912	Right		3.8
3	12/930	Right		2.7
4	23/253	Right		3.1
5	23/470	Right		4.16

3 STRUCTURES

The existing road alignment has 110 no of structures along the road. 101 are HP culverts, 8number of slab culverts and 1 major bridge have been noticed along the project corridor.

The improvement proposals finalized for the stretch are:

TABLE: LIST OFADDITIONAL STRUCTURES PROPOSED FOR THE PROJECT STRETCH

S. No.	Design Chainage (km)	Proposed Type of Culvert	Span Arrangement No. x Length / No. x Dia (m)
1	0.900	HP	1 X 1.2
2	1.270	HP	1 X 1.2
3	1.400	HP	1 X 1.2
4	1.640	HP	1 X 1.2
5	1.825	HP	1 X 1.2
6	2.200	HP	1 X 1.2
7	2.850	HP	1 X 1.2
8	3.080	HP	1 X 1.2
9	4.000	HP	1 X 1.2
10	4.070	HP	1 X 1.2

11	4.450	HP	1 X 1.2
12	5.540	HP	1 X 1.2
13	5.770	HP	1 X 1.2
14	6.850	HP	1 X 1.2
15	7.200	HP	1 X 1.2
16	7.800	HP	1 X 1.2
17	8.045	HP	1 X 1.2
18	8.235	HP	1 X 1.2
19	8.900	HP	1 X 1.2
20	9.150	HP	1 X 1.2
21	9.890	HP	1 X 1.2
22	11.130	HP	1 X 1.2
23	11.380	HP	1 X 1.2
24	13.050	HP	1 X 1.2
25	13.260	HP	1 X 1.2
26	15.480	HP	1 X 1.2
27	16.480	HP	1 X 1.2
28	16.860	HP	1 X 1.2
29	17.560	HP	1 X 1.2
30	18.020	HP	1 X 1.2
31	18.700	HP	1 X 1.2
32	19.020	HP	1 X 1.2
33	19.860	HP	1 X 1.2
34	20.260	HP	1 X 1.2
35	20.350	HP	1 X 1.2
36	20.990	HP	1 X 1.2

Some of the existing structures need to be widened and reconstructed as the conditions of the structures is very poor. These structures are listed as below.

TABLE: LIST OF STRUCTURES PROPOSED FOR RECONSTRUCTION

S. No.	Design Chainage	Proposed Type of Structure	Proposed Span (m)	Over all Width in m
1	0.850	HP	**1 X 1.2**	**12.5**
2	2.945	HP	**1 X 1.2**	**12.5**
3	10.900	HP	**1 X 1.2**	**12.5**
4	16.060	HP	**1 X 1.2**	**12.5**
5	16.120	HP	**1 X 1.2**	**12.5**
6	22.550	HP	**1 X 1.2**	**12.5**
7	22.600	HP	**1 X 1.2**	**12.5**
8	**22.710**	HP	**1 X 1.2**	**12.5**
9	22.780	HP	**1 X 1.2**	**12.5**
10	22.820	HP	**1 X 1.2**	**12.5**
11	22.920	HP	**1 X 1.2**	**12.5**
12	23.680	HP	**1 X 1.2**	**12.5**
13	23.800	HP	**1 X 1.2**	**12.5**
14	23.990	HP	**1 X 1.2**	**12.5**
15	24.150	HP	**1 X 1.2**	**12.5**
16	24.240	HP	**1 X 1.2**	**12.5**

TABLE: LIST OF STRUCTURES PROPOSED FOR WIDENING

S. No.	Design Chainage	Proposed Type of Structure	Proposed Span (m)	Over all Width in m
1	0.280	HP	1 X1.0	5
2	0.590	HP	1 X 0.9	2.5
3	1.085	HP	1 X0.9	5
4	1.220	HP	1 X1.0	5
5	1.770	HP	1 X 1.0	5
6	2.150	HP	1 X0.9	5
7	2.310	HP	1 X 0.9	5
8	2.770	HP	1 X 0.9	5
9	3.310	HP	1 X 0.9	5
10	3.900	HP	1 X 0.9	5
11	4.550	HP	1 X 0.9	5
12	5.100	HP	1 X 1	5
13	5.840	HP	1 X0.9	5
14	5.920	HP	1 X0.9	5
15	5.965	HP	1 X1.0	5
16	6.000	HP	1 X1.0	5
17	6.760	HP	1 X1.0	5
18	8.570	HP	1 X 0.9	5
19	10.050	HP	1 X0.9	5
20	10.380	SLAB	1 X 1.50	5
21	10.560	HP	1 X0.9	5
22	10.620	HP	1 X0.9	5
23	10.830	SLAB	1 x 2.5	5
24	10.990	HP	1 X 0.9	2.5
25	11.180	HP	1 X 0.9	5
26	11.230	HP	1 X 0.9	5
27	11.510	HP	1 X 0.9	5
28	11.820	HP	1 X 0.9	5
29	13.210	HP	1 X 0.9	5
30	13.460	HP	1 X 0.9	5
31	13.630	HP	1 X 0.9	5
32	14.020	HP	1 X 0.9	5
33	14.400	HP	1 X0.9	5

34	14.470	HP	1 X0.9	5
35	14.640	HP	1 X0.9	5
36	14.840	HP	1 X0.9	5
37	15.880	HP	1 X 0.9	5
38	16.015	SLAB	1 X 3.5	5
39	16.395	HP	1 X 0.9	5
40	17.400	HP	1 X 0.9	5
41	17.480	HP	1 X 0.9	5
42	17.500	HP	1 X 0.9	5
43	18.290	HP	1 X 0.9	5
44	19.290	HP	1 X 0.9	5
45	19.390	HP	1 X 0.9	5
46	19.500	HP	1 X 0.9	5
47	20.510	HP	1 X 0.9	5
48	20.580	HP	1 X 0.9	5
49	20.665	HP	1 X 0.9	5
50	20.860	HP	1 X 0.9	5
51	21.090	HP	1 X 0.9	5
52	21.105	HP	1 X 0.9	5
53	21.150	HP	1 X 0.9	5
54	21.240	HP	1 X 0.9	5
55	21.600	HP	1 X 0.9	5
56	21.750	HP	1 X 0.9	5
57	21.940	HP	1 X 0.9	5
58	22.110	HP	1 X 0.9	5
59	22.180	HP	1 X 0.9	5
60	22.270	HP	1 X 0.9	5
61	22.320	HP	1 X 0.9	5
62	22.400	HP	1 X 0.9	5
63	22.485	HP	1 X 0.9	5
64	24.100	HP	1 X 0.9	5
65	24.350	HP	1 X 0.9	5
66	24.500	HP	1 X 0.9	5
67	24.750	SLAB	1 X 2.0	5
68	24.790	HP	1 X 0.9	5

69	24.880	HP	1 X 0.9	5
70	25.010	HP	1 X 0.9	5
71	25.050	HP	1 X 0.9	5
72	25.210	HP	1 X 0.9	5
73	25.380	HP	1 X 0.9	5
74	25.560	HP	1 X 0.9	5
75	25.625	HP	1 X 0.9	5
76	25.650	HP	1 X 0.9	5
77	25.925	SLAB	1 X 1.6	5

Some of the structures are in good condition but require some repairing work to improve their performance and protection level. These are as listed below:

TABLE: STUCTURES REQUIRING REPAIRS/ REPLACEMENTS OF RAILING /PARAPETS, FLOORING AND PROTECTION WORKS

Sl. No.	Design Chainage	Type of Structures	Repair work	Length (m)	Width (m)
1	13.900	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 Leveling Course		
			PCC M20 in Catch pit		
			Floor Apron		
2	14.180	HP	Crash barrier		
			PCC M15 Leveling Course		
			PCC M20 in Catch pit		
			Floor Apron		
3	15.540	SLAB	Crash barrier		
			Floor Apron		
4	19.650	HP	Crash barrier		
			PCC M15 Leveling Course		
			PCC M20 in Catch pit		
			Floor Apron		
5	21.480	HP	Crash barrier		
			PCC M15 Leveling Course		
			PCC M20 in Catch pit		
			Floor Apron		
6	21.800	HP	Crash barrier		
			PCC M15 Leveling Course		
			PCC M20 in Catch pit		
			Floor Apron		

7	23.190	SLAB	Crash barrier	
			Floor Apron	
8	23.400	SLAB	Crash barrier	
			Floor Apron	

The existing road has been provided with the following protection works on the road stretch.

Construction of guard wall, retaining wall and breast wall has to be provided at the below mentioned chainage.

TABLE: LIST OF PROTECTION WORKS

1. GUARD WALL

Sl no	Chainage from - to		Height	Side
1	0/150	12/000	0.6 m	On Valley Side
2	14/100	22/400		
3	23/600	26/000		

2. RETAINING WALL

Sl no	Chainage from to to		Height	Side

3. BREAST WALL

Sl no	Chainage from - to		Height	Side
1	21/800	22/300	To be finalized in consultation with A.E.	Hilly side

4 COST ESTIMATE

The project cost is worked out according to the improvement proposals enumerated in chapter 8. The summary of the cost is as provided below.

TABLE: SUMMARY OF COST ESTIMATES

GENERAL ABSTRACT			
Name of Work:-Consultancy Services for Preparation of Detailed Project Report for Four Different Roads in the North Eastern State (Wokha to Merapani)			
SL. NO	**TYPE OF WORK**	**AMOUNT**	**REMARKS**
1	**Road Work**	**372482387.35**	

2	C.D Works		
i)	Hume Pipe Culvert	26464445.99	
ii)	Repair of Culverts	13806493.93	
3	Miscellaneous Item		
i)	Drain	44975012.74	
ii)	Lined Drain	31132827.68	
iii)	Breast Wall	18940092.00	
iv)	Guard Wall	46240748.61	
vi)	Junctions	5392425.79	
vi)	Signs & Safety	5563177.03	
vii)	Overhead Signage	912900.32	
viii)	Project falities (Crash Barriers)	2213844.56	
	Sub Total	568124356.00	
	Add Price escalation for years 2014-15, 2015-16 & 2016-17 (5% per annum) i.e. 15%	85218653.40	
4	Total Civil Cost "A" (Rs.)	653343009.40	A
	Add Contingency @ 2.8% on"A"	18293604.26	B
5	Total Cost with contingency (EPC Cost = A+B)	671636613.66	C
	Add Agency Charges @ 3.0% on "C"	20149098.41	D
	Add Quality Control @ 0.5% on "C"	3358183.07	E
	Add Road Safety @ 0.5% on "C"	3358183.07	F
	Add Supervision @ 4.0% on "C"	26865464.55	G
	Add Escalation @ 10.0% on "A" (5% per year)		H
	Add Maintenance @ 5.0% on "A"		I J K L
	1st year (0.5%)	3266715.05	
	2nd year (0.5%)	3266715.05	
	3rd year(1.0%)	6533430.09	
	4th year (1.5%)	9800145.14	
	5th year (1.5%)	9800145.14	

	Sum(C+D+E+F+G+H+I)	**758034693.22**	
	Add for Preconstruction activities	**500000.00**	
	Add for Tree cutting & avenue Plantation	**1500000.00**	
	GRAND TOTAL (J+K+L)	**760034693.22**	
	SAY Rs.	**76.00**	
		CRORES	

5 CONSTRUCTION SCHEDULING

The time period of implementation for such a road is 6 months. Therefore, any delay in handing over of the site will delay the project implementation.

6 CONCLUSION

The technology adopted for improvement of this road is the conventional flexible pavement method. The methods of improvement aims the overall pavement development in the area and provide an easy communication within the area and also within the state.