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6 COST ESTIMATE

6.1 Introduction and Assumption

Cost estimation is important for the detailed study as it provides vital input to the economic and financial evaluation of the project. The cost estimates have been prepared for the Project Highway considering the recommended alignment. The estimate has been prepared for widening of the existing carriageway with to 2 lanes with paved shoulder configurations including construction of:

- Structures (culverts and minor bridges)
- Cross drainage structures,
- Chute drains,
- Junctions
- Road signs and markings,

6.1.1 Quantification

The main items that have been covered in cost estimation are as following:

S. No	Description of work	Items of work
1	Site clearance	<ul style="list-style-type: none"> ▪ Clearing & grubbing
2	Earth work	<ul style="list-style-type: none"> ▪ Earth work excavation for ordinary soil/ soft rock/ hard rock ▪ Construction of embankment with useful material obtained from roadway excavation. ▪ Construction of sub-grade and shoulder with selected soil. ▪ Excavation and disposal of unsuitable materials
3	Non-Bituminous base & sub-base courses	<ul style="list-style-type: none"> ▪ Granular sub base ▪ Wet mix macadam
4	Bituminous course	<ul style="list-style-type: none"> ▪ Prime coat ▪ Tack coat ▪ Dense Bituminous macadam ▪ Bituminous concrete
5	CD – Structures	<ul style="list-style-type: none"> ▪ New /Reconstruction of Culverts
6	Bridges, Grade Separators, Underpasses and ROB's	<ul style="list-style-type: none"> ▪ New /Reconstruction construction of Bridges
7	Drainage & protection works	<ul style="list-style-type: none"> ▪ Gabion Wall ▪ Chute Line drain ▪ Gabion wall
8	Junctions	<ul style="list-style-type: none"> ▪ Sub-Grade ▪ Granular Sub-base ▪ Wet Mix Macadam ▪ Prime Coat ▪ Tack Coat ▪ Dense Bituminous Macadam
9	Traffic signs marking and other appurtenance	<ul style="list-style-type: none"> ▪ PCC for Kerb ▪ Lane, Centre line, Edge etc. ▪ 5th km, Ordinary km and Hectometer Stones ▪ Metal beam crash barrier and Guard post

S. No	Description of work	Items of work
		<ul style="list-style-type: none"> W-Metal Beam Crash Barrier Pedestrian Guard Rails
10	Miscellaneous	<ul style="list-style-type: none"> Chequered tiles High Mast lights Bus Shelter
11	Maintenance of Road	<ul style="list-style-type: none"> Repairs of POT Holes and Patches Tack Coat Renewal Coat

The quantities for various items of work have been computed as detailed below:

- The quantities for sub grade, sub base, base and bituminous/rigid courses have been computed as per TCS.
- The quantities for earthwork (earthwork excavation and embankment construction) have been computed as per corresponding TCS with certain assumptions
- The quantities for structures like bridges, ROB, culverts, VUP, CUP, etc., have been calculated based on the preliminary GAD's and design calculations.
- The quantities for drainage & protection works and other items have been computed based on the proposed details and drawings.

6.2 Adoption of unit rates

6.2.1 Construction Items

The unit rates for each construction items have been arrived by using the “**Nagaland Schedule of Rates (SOR): 2016-17 and escalated from WPI**” in this report. The detailed analysis has been carried out as per **Standard Data Book of Ministry of Road Transport & Highways (MORT&H)** for deriving unit rates of items of Road and Bridge works.

The input rates of Cement have been taken from market. Input for Emulsion has been taken from IOCL, Inputs for steel has been taken from SAIL, the rates of plant, machinery, labour and other materials like metal, sand Earth etc. have been taken from Nagaland SOR 2016-17. The basic rates for each construction items have been analysed on the basis of Schedule of Rates, the prices of construction materials collected from various sources and on the anticipated distance between source and the site of work. For items where rates are not available in SOR, the rates have been adopted as per previous experience of the consultant or on the present market rates.

The basis and sources of various components being considered in Rate Analysis and Quantification are provided in the following table:

Table 6-1: Rate Analysis: Basis and Source

1.	Rate Analysis	MORT&H	MORT&H Standard Data Book
Material			
	Aggregate Quarry		Nagaland SOR 2016-17
	Sand		Nagaland SOR 2016-17

	Earth		Nagaland SOR 2016-17
	Bitumen	Haldia Refinery	IOCL
	Cement	Nagoan	Nagoan
	Steel	Guwahati	SAIL
	Emulsion	Haldia Refinery	IOCL
	Labour	Nagaland SOR 2016-17	Nagaland SOR 2016-17

6.2.2 Materials Source and Lead

For items where these rates are not available, the rates were adopted as per previous experience of the consultants / Market rates. For rate analysis of bituminous items, the rates of all grade of bitumen recommended in the project are considered from department schedule of Rate. The basic material rates have been adopted as per **Nagaland Schedule of Rates (SOR): 2016-17 and escalated from WPI.**

The lead distance for some of the major material source is shown in the following table:

Table 6-2: Bitumen Rate

Bitumen: Source and Rate	
Haldia Refinery	1582 km from site
Grade VG 40 Basic Rate (INR) per MT	Rs. 32760
Carriage Cost including Loading and Unloading	Rs. 7047
VAT@4.75%	Rs. 1556
Total (INR) per MT	Rs. 41363

Table 6-3: Cement Rates

Rate of Cement	
Nagoan	Lead: 350 km
Cement Grade: OPC 43	
Basic Rate (INR/MT)	Rs. 4840
Carriage Cost including Loading and Unloading	Rs. 1688
VAT@13.25%	Rs. 641
Total (INR) per MT	Rs. 7169

Table 6-4: Steel Rates

Rate of STEEL as per SAIL Guwahati	
SAIL	Lead: 460 km
Rate inclusive of GST (INR/MT)	Rs. 50749
Carriage Cost including Loading and Unloading	Rs. 2166
Total (INR) per MT	Rs. 52915
Per Kg Cost of steel (INR)	Rs. 52.915

6.3 Bill of Quantity (BOQ)

Bill of Quantity (BOQ) has been prepared and is being submitted in a separate volume.

6.4 Costing of Safety Devices

Adequate numbers of road signs and pavement markings (as per IRC Guidelines: IRC 35/ IRC 67/ IRC SP 48) have been considered as safety measures while estimating cost for road safety to give information to the road users to avoid accident and aid in convenience on the project road. Details of major road safety devices adopted for the project are as under:

- Pavement markings
- Road signage
- 5th km, Ordinary km and Hectometre Stones
- Metal beam crash barrier and Guard post
- Gantry/Overhead Cantilever sign Board
- Bus shelter

6.5 Cost of Environmental Mitigation Plan

Environmental costs include the cost of cutting of trees (compensatory afforestation), rehabilitation of water source such as hand pumps, wells, bore wells and ponds, noise protection measures near sensitive locations, air, water and noise quality monitoring at different stages and the cost of environmental enhancement along the project road.

6.6 Project Cost Abstract

The detailed cost estimate is given in a separate volume. The summary of project cost has been worked and shown in the following table:

Table 6-5 : Abstract of Cost Estimate (Construction Package – II)

Sr. No.	Particulars	Amount (INR)
1	Site clearance and Dismantling	36,42,925
2	Earth Work	28,41,17,000
3	Granular Sub Base Courses and Base Courses (Non- Bituminous)	39,84,11,667
4	Bituminous Pavement Courses	20,97,28,397
5	Culverts	12,98,78,979
6	Bridges	
	a) Minor Bridges	0
	b) Major Bridges	0
	c) FO, ROB	0
	d) VUP/PUP	0
	c) Repair and Rehabilitation of bridges and culverts	16,84,688
7	Drainage & Protective Works	95,92,51,245
8	Junctions	1,28,53,094
9	Traffic signs, Road markings and other road appurtenances	11,26,31,674
10	Miscellaneous Works including truck lay bye and bus lay bye	2,56,41,620
11	Maintenance of Existing roads during Construction	1,38,27,946

Sr. No.	Particulars	Amount (INR)
A	Civil Cost	2,15,16,69,236
B1	Contingency Charges 2.8% @ Civil Cost	6,02,46,739
B2	Add GST 6.0 % @ Civil Cost	12,91,00,154
C	Sub Total (A+B1+B2)	2,34,10,16,128
D	Supervision Charges 3% @ Civil Cost	7,02,30,484
E	Agency Charges @ 3% on C	7,02,30,484
F	Sub Total (C+D+E)	2,48,14,77,096
G	Maintenance Cost @ 2.5% on Civil Cost for 5 Years (1st & 2nd year 0.25%, 3rd & 4th year 0.5%, & 5th year 1%)	5,37,91,731
H	Escalation @ 5% per annum for 2 years on A	21,51,66,924
K	Total Project Cost (G+H)	2,75,04,35,751
	Cost Per Km in Crores (On Civil Cost)	10.64
	Cost Per Km in Crores (On TPC)	12.50
	Utility Shifting @0.5%	1,07,58,346
	Land Acquisition, Resettlement and Rehabilitation Cost	61,12,09,426
	Environmental Cost	1,24,74,229
	Total Capital Cost	3,38,48,77,752