MINISTRY OF ROAD, TRANSPORT & HIGHWAYS
GOVERNMENT OF INDIA

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DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510
(SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING)
IN THE STATE OF SIKKIM

NHIDCL
BUILDING INFRASTRUCTURE - BUILDING THE NATION

DETAILED PROJECT REPORT

VOLUME – IV: DETAILED COST ESTIMATE

PACKAGE – III (From Km 32+500 to Km 33+600)

ESTIMATED COST: Rs.79.21Cr

JUN- 2020

CM engineering SOLUTION

CM ENGINEERING & SOLUTION

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NHIDCL SIKKIM

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DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

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INTRODUCTION

General

The cost estimate presented in this Section is based on the detailed proposals given in estimate. It is envisaged that the project would involve site clearance, construction of new formation in cutting, slope protection works, cross-drainage structures and bridges, pavement and road furniture etc. The detailed cost estimate presented in this report has been worked out using quantities of different items of works derived from the detailed design, drawing and unit rates.

Estimation of Quantities

In arriving at the quantities, the following items of civil works have been computed for the total length of the road :

* Earthwork Works
* Slope Protection Works
* Culverts and Bridges Works
* Tunnel Works
* Pavement Works
* Road appurtenances

Detailed estimate of quantities and costs are presented in "Volume – IV: Cost Estimate" of the report. Methodology followed for various items are based on Technical Specifications of Ministry of Road Transport and Highways (MoRTH) for material laying, its quality, measurements, etc. and it has been illustrated in brief in the subsequent paragraphs.

Earthwork: Earthwork quantities in cutting and small quantities of filling are calculated by highway design software Mx-Road for the entire length of the project road. The formation cutting consists of earth cutting to get a formation width of double lane standard. Through cutting has also been proposed in some locations especially in curves where the existing alignment has been followed to ease the curves while going round spurs. Embankment s has also been proposed at some stretches.

The classification of soil in cutting has been made in three categories :

Soil : includes ordinary soil, hard, soil mixed with boulder
Ordinary Rock not requiring blasting
Hard Rock requiring blasting.

Locations along the road alignment passing along the above given three were noted down during field surveys and total quantities of earthwork in cutting has been worked out accordingly.

Slope Protection Works: Quantities for retaining walls, breast walls, parapet walls, toe walls, etc. has been worked out based on the design proposals. Gabion walls have also been proposed at specified locations and quantities have been worked out.

Culverts & Tunnel: Quantities of culverts and bridges have been worked out for all the stretches of the road based on the structure proposed at each location of cross-stream or river. The proposal also includes quantity for construction of chutes to protect the adjoining areas from further erosion.

Pavement: The provision for pavement includes different layers of sub-base, base, and surfacing course as appropriate throughout the whole stretch of the road.

- Cement Treated Sub-base (CT): 200.00 mm thick sub-base layer of crushed stone aggregate has been proposed.

  Extra quantities for widening at curves, major and minor junction locations are calculated separately and final quantities are worked out.

- Cement Treated Base (CT): 150.00 mm thick base layer of Cement Treated Base is proposed for 7.0m width.

- Stress Absorbing Membrane (SAM) with crack width 6 mm to 9 mm in one layer.

- DBM of 50mm thick as surfacing course has been proposed.

- BC of 30mm thick as surfacing course has been proposed.

Junctions Improvement: This item includes quantities of kerbs, railings, median etc. at the location of junctions. Other items of road works have been included under the respective items of works. The cost for junctions includes the cost for at grade junctions, which need improvement along the highway.

Traffic Signs and Markings: Proper traffic signs were selected at required locations along the project corridor and special signs at tailgates were designed. It is reviewed considering the traffic and pedestrian safety and the number of traffic signs shall be minimum and modified if required. Centre line and edge markings required from safety point of view were considered in the quantity estimate.

Drainage and Protection works: Provision under this sub-head has been made for surface, subsurface roadside drains and open Transverse drains on the shoulder. This item covers for unlined, open lined and covered drains.

Project Facilities: provision under this sub head has been made for Truck lay-bye & Bus bays with Bus Shelters based on Manual of Standards & Specifications of two laning, IRC:SP:84-2009.

Miscellaneous Items: Lump sum amounts for cross utility ducts and Planting of trees by the road side (Avenue trees) has been provided and drainage chutes in cement concrete & stone pitching at outfalls/escapes for drainage in high embankment location.

Tunnel: Quantities of various items have been worked out based on details engineering and analysis of survey and geological data.

Other Charges: Other charges include Centages for the civil works are taken as follow:

- Contingency = 2.8%
- Construction Supervision Charge = 3.0%
- Maintenance for 10 Years = 3.75 %
- Escalation for 1.0 Years = 1 x 5.0% =5.0 %
- Agency (NHIDCL) Charge = 3.0 %

Unit Rates

The unit rates for arriving at cost of different components of works are based on Sikkim PWD Schedule of Rates 2018 (for National Highways). For those items of works which are not available in the SOR, separate Analysis of Rates have been carried out and incorporated in this DPR.The following considerations have been made with regard to the basic inputs of rate analysis:

- Material
- Labour
- Machineries

Material

The sources of material are as follows:

Bitumen	:	Siliguri, West Bengal
Emulsion	:	Siliguri, West Bengal
Steel	:	Siliguri, West Bengal
Cement	:	Siliguri, West Bengal
Borrow Soil	:	Borrow areas along the project
Aggregates	:	River bed Material /Quarry in Project Corridor
GSB	:	River bed Material in Project Corridor
Course Sand	:	River bed Material in Project Corridor
Fine Sand	:	River bed Material in Project Corridor

One Hot Mix Plant has been proposed to be erected at mid of the project road during construction. An Avg. lead of 15.0 km has been assumed form the HMP. The lead considerations for the different materials are as follows:

Bitumen	:	145.0 km to the Hot Mix Plant
Emulsion	:	145.0 km to the Hot Mix Plant
Steel	:	145.0 km from market to site
Cement	:	145.0 km from market to site
Borrow Soil	:	5 km from the site
Aggregates	:	55 km to the HMP
GSB	:	55 km to the HMP
Coarse Sand	:	55 km to the HMP
Fine Sand	:	55 km to HMP

Labour :*Labour rates for rate analysis have been based on Schedule of Rates (SOR) -2018 of Sikkim PWD*

Machineries: *The rates of machineries have been taken Schedule of Rates (SOR) -2018 of Sikkim PWD*

Project cost estimate is prepared based on SOR-2018, however WPI Financial Year 2018-19 to Financial Year 2019-20 (119.80 % to 121.86%) is included in the project cost to bring the current rate of project cost.

In proposed project cost is also included 12% of GST,

Construction Cost Items

For construction of project road, the cost items include various elements, which added together, will give the total cost. The elements of the cost considered for the project are under the following major heads :

* Site Clearance
* Earthwork

* Pavement Works
* Slope Protection Works
* Culverts/Tunnel Works
* Miscellaneous Works
* Provisional Sum

Based on the unit rate of various items as per rates adopted as mentioned earlier and quantities calculated, a detailed cost estimate has been prepared under the above mentioned major heads. During analysis of unit rates an overhead component of 20% has been considered to account for the establishment cost and cost of financing to the contractor. In addition, a contractor's profit of 10% has been included. In all cases, fully mechanised construction techniques have been assumed.

The total Project cost for civil construction works and other allied charges is **Rs 79.21 Cr.** which covers costs for formation work, Slope protection and cross drainage works, construction of bridges, and pavement works. Construction period of 24 months is proposed, considering the quantum of activities to be performed including mobilization period needed and four intervening rainy seasons in between.

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

ABSTRACT OF COST ESTIMATE

Sr.No.	Items of work	Total quantity	Unit	Amount (Rs)	Share
	CONSTRUCTION COST	1.10	Km		
1	Site Clearance			218,364.69	0.04%
2	Formation Works	35837.15	Cum	7,817,236.87	1.36%
3	Protection Works	600.00	Rm	22,439,219.00	3.90%
4	Cross Drainage Works	4.00	Nos	11,110,031.00	1.93%
5	Pavement Works	1.10	Km	19,924,659.75	3.46%
6	Km Stones & Road Signs		Nos	756,836.00	0.13%
7	Road Safety Measures		Rm	1,126,000.00	0.20%
8	Development of Junction		LS	49,254,493.00	8.56%
9	Development of Dumping Yard		LS	8,449,852.13	1.47%
10	Improvement of Existing Road	1300	Rm	5,813,565.00	1.01%
11	Tunnel Work	1	Nos	448,730,228.27	77.95%
A	**TOTAL OF (1 to 11)**		**Rs**	**575,640,485.71**	100.0%
B	**GST 12% of "A"**		**Rs.**	**69,076,858.29**	
C	**Civil cost Including GST (A+B)**		**Rs.**	**644,717,344.00**	
D	**Add Contigency 2.8% on "A"**		**Rs.**	**16,117,933.60**	
E	**Sub Total (C+D)**		**Rs.**	**660,835,277.60**	
F	Maintenance for 10 Yrs(0.25%x 5+0.5%x5=3.75% of A)		Rs.	21,586,518.21	
G	Escalation (5% of A) for 12 Months		Rs.	28,782,024.29	
H	Construction supervision Charge (3 % of A)		Rs.	17,269,214.57	
I	Agency NHIDCL) Charge (3 % of A)		Rs.	17,269,214.57	
	TOTAL PROJECT COST (E+F+G+H+I)		**Rs.**	**745,742,249.24**	
	Say		**Rs.**	**745,800,000.00**	
J	**PreConstruction Activity Cost**				
1	Forest Compensatory Afforestration		**Rs.**	**5,756,404.86**	
2	Utility Relocation & Shifting		**Rs.**	**11,512,809.71**	
3	Environment Impact Assessment		**Rs.**	**287,820.24**	
4	Land Acquisition & Resettlement		**Rs.**	**28,782,024.29**	
	TOTAL PRE CONSTRUCTION COST(1+2+3+4)		**Rs.**	**46,339,059.10**	
	TOTAL COST OF PROJECT (I+J)			**792,081,308.34**	
	Say		**Rs.**	**792,100,000.00**	
	Project Cost per Km		**Rs.**	**678,000,000.00**	
	Civil cost per km		**Rs.**	**523,309,532.46**	

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

ABSTRACT OF COST ESTIMATE FOR CIVIL WORK

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sr.No.	Items of work	Total quantity	Unit	Amount
A.	**SITE CLEARANCE**	**TOTAL 'A'**	**=**	**218,364.69**
1	Cutting of Trees	47.00	Nos	18,739.00
2	Clearing and Grubbing Road Land	1.70	Ha	43,970.50
3	Dismantling of Structures		L.S.	8,235.19
4	Dismantling of Flexible Pavements		L.S.	147,420.00
B.	**FORMATION WORK**	**TOTAL 'B'**	**=**	**7,817,236.87**
1	Ordinary soil	15216.60	Cum	2,294,663.28
2	Soft rock	17928.03	Cum	3,904,718.40
3	Hard rock	2692.52	Cum	1,270,330.94
4	Construction of Embankment	27.25	Cum	4,687.00
5	Preparation of Sub-Grade	619.75	Cum	205,137.25
6	Compacting of OGL supporting subgrade	1700.00	Cum	137,700.00
C.	**PROTECTION WORKS :**	**TOTAL 'C'**	**=**	**22,439,219.00**
1	Seeding and Mulching	560.00	Sqm	106,400.00
2	Vegetation Mat (Steep Slope)	560.00	Sqm	281,120.00
3	Retaining wall for 4.0 m Height	320.00	Rm	13,332,150.40
4	Retaining wall for 6.0 m Height	70.00	Rm	4,725,768.60
5	Breast Wall 2.00m high	105.00	Rm	1,442,910.00
6	Breast Wall 3.00m high	105.00	Rm	2,550,870.00
D.	**DRAINAGE WORKS :**	**TOTAL 'D'**	**=**	**11,110,031.00**
a	Concrete lined side drain	782.00	Rm	1,560,809
1	**Box Culvert**			
a	Type -1 - 2 x 2	3.00	No	4,282,690
b	Type -2 - 3 x 3	1.00	No	5,266,532
E.	**PAVEMENT WORKS**	**TOTAL 'E'**	**=**	**19,924,659.75**
1	CT Sub-base	1472.63	Cum	4,931,837.87
2	CT Base	1104.47	Cum	3,648,064.41
3	Penetration Coat	7363.20	Sqm	228,259.20
4	SAMI	7363.16	Sqm	692,137.04
5	Tack Coat	7363.20	Sqm	103,084.80
6	Dense Graded Bituminous Macadam	368.16	Cum	3,831,441.12
7	Bituminous Concrete	220.89	Cum	2,546,640.81
8	Carriage of materials			3,943,194.50
F.	**KM STONE & ROAD SIGN**	**TOTAL 'F'**	**=**	**756,836.00**
1	Traffic Sign	6.00	Nos	33,900.00
2	Pavement marking	330.00	Sqm	418,440.00
3	Direction and Place Identification signs upto 0.9 sqm size board.	2.00	Sqm	33,106.00
4	Boundary stone, km stone,5th km stone, & hectometre stones	40.00	Nos	19,902.00
5	Traffic blinker LED Delineator, stud, reflective payment marker, tree reflector	20.00	Nos	67,860.00
6	Road furniture	40.00	Nos	40,280.00
7	Land Slide Clearance		L.S.	143,348.00
G.	**ROAD SAFETY MEASURES**	**TOTAL 'G'**	**=**	**1,126,000.00**

Sr.No.	Items of work	Total quantity	Unit	Amount
	Steel Crash Barrier	250.00	Rm	1,126,000.00
H.	**JUNCTION DEVELOPMENT**	**TOTAL 'H'**	**=**	**49,254,493.00**
1	Development Major junction		L.S.	9,007,761.00
2	Development Minor junction		L.S.	40,246,732.00
I.	**DEVELOPMENT OF DUMPING YARD**	**TOTAL 'J'**	**=**	**8,449,852.13**
a	Spreading & Compaction of surplus material	19948.01	Cum	259,324.13
b	Gabion wall	300.00	Rm	4,453,200.00
c	Plum Toe wall	200.00	Rm	3,737,328.00
J.	**IMPROVEMENT OF EXISTING ROAD**	**TOTAL 'J'**		**5,813,565.00**
	Existing Road within Rabangla Town	1300.00	Rm	5,813,565.00
K.	**TUNNEL WORK**	**TOTAL 'K'**	=	**448,730,228.27**
a	Tunnel Portion	1	Nos	294,932,607.70
	Portal Portion	2	Nos	151,783,365.57
	Tunnel Lighting		L.S.	2,014,255.00
		GRAND TOTAL=	**Rs.**	**575,640,485.7**
			Say = Rs.	**575,650,000.0**

(Rupees fifty seven crore fifty six lakh fifty thousand) only

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE

COST ESTIMATE FOR SITE CLEARANCE

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sl/SOR	Description	Unit	Nos	L	B	H	Quantity	Rate	Amount
1/2.1	**Cutting of Trees, including Cutting of Trunks, Branches and Removal** (Cutting of trees, including cutting of trunks, branches and removal of stumps, roots, stacking of serviceable material with all lifts and up to a lead of 1000 mtrs and earth filling in the depression/pit.)								
	(A) Lead upto 1000m.								
	(i) Girth above 300mm to 600mm.	Nos		Qnty taken from detail of cutting down trees			26.00	266.00	6,916.00
	(ii) Girth above 600mm to 900mm.	Nos					16.00	404.00	6,464.00
	(iii) Girth above 900mm to 1800mm.	Nos					4.00	893.00	3,572.00
	(iv) Girth above 1800mm.	Nos					1.00	1787.00	1,787.00
2/2.3	**Clearing and Grubbing Road Land.** (Clearing and grubbing road land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned up to a lead of 1000 metres including removal and disposal of top organic soil not exceeding 150 mm in thickness.)								
(ii)	By Mechanical Means								
A	In area of light jungle	Ha		Qnty taken from clearing and grubbing of road land			1.70	25865.00	43,970.5
B	In area of thorny jungle	Ha					0.00	31574.00	0.0
3/2.4	**Dismantling of Structures** (Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead of 1000 metres)								
(i)	**Lime /Cement Concrete**								
II	**By Mechanical Means for items No. 202(b) & (c)**								
A	Cement Concrete Grade M-15 & M-20 (slab culvert slab)	Cum	2	6.5	1.3	0.2	3.38	425.00	1,436.50
(iii)	**Dismantling Stone Masonry**								
B	Rubble stone masonry in cement mortar. (Slab Culvert abutment wall)	Cum	2	6.5	1.2	1.5	23.4	188.00	4,399.20
1.4	**Cost of Haulage Excluding Loading and Unloading**								
(i)	Surfaced Road Upto 10 Km lead	T.km					42.848	56.00	2,399.49

Sl/SOR	Description	Unit	Nos	L	B	H	Quantity	Rate	Amount
4/2.5	**Dismantling of Flexible Pavements** (Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately)								
II	**By Mechanical Means**								
A	**Bituminous course**	Cum		800.00	3.75	0.15	450.00	238.00	107,100.00
1.4	**Cost of Haulage Excluding Loading and Unloading**								
(i)	Surfaced Road Upto 10 Km lead	T.km					720	56.00	40,320.00
								Total	**218,365**

(Rupees two lakh eighteen thousand three hundred sixty five) only

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

COST ESTIMATE FOR FORMATION CUTTING

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sl/SOR	Description	Unit	L	B	H	Quantity	Rate	Amount
1/3.32	**Excavation in Hilly Areas in Soil By Mechanical Means** (Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead .)		Quantity taken and calculated from abstract of Earth Work			**15216.60**		
	Case-I : Disposal of cut material with all lifts and lead upto 1000 metres.	Cum				15216.6	124.00	1,886,858.40
	(ii) Disposal of surplas earth from roadway and drain for additional haul involving beyond 1km and upto 10 km	Cum	50% of total Quantity of Case -I			7608.3	53.60	407,804.88
2/3.33	**Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting.** (Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material.)		Quantity taken and calculated from abstract of Earth Work			**17928.03**		
	Case-I : Disposal of cut material with all lifts and lead upto 1000 metres.	Cum				17928.0	191.00	3,424,248.00
	(ii) Disposal of surplas earth from roadway and drain for additional haul involving beyond 1km and upto 10 km	Cum	50% of total Quantity of Case -I			8964.0	53.60	480,470.40
3/3.08	**Excavation in Hard Rock (blasting prohibited)** (Excavation for roadway in hard rock (blasting prohibited) with rock breakers including breaking rock, loading in tippers and disposal within all lifts and lead upto 1000 metres, trimming bottom and side slopes in accordance with requirements of lines, grades and cross sections.)		Quantity taken and calculated from abstract of Earth Work			**2692.52**		
	Case-I : Disposal of cut material with all lifts and lead upto 1000 metres.	Cum				2692.52	445.00	1,198,171.40
	(ii) Disposal of surplas earth from roadway and drain for additional haul involving beyond 1km and upto 10 km		50% of total Quantity of Case -I			1346.26	53.60	72,159.54
4/3.17	**Construction of Embankment with Material Deposited from Roadway Cutting** (Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2)	Cum	Quantity taken from Abstract of Earth Work Table			27.25	172.00	4,687.00
5/3.18	**Construction of Subgrade and Earthen Shoulders** (Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2)	Cum	Quantity taken from Abstract of Earth Work Table			619.75	331.00	205,137.25

Sl/SOR	Description	Unit	L	B	H	Quantity	Rate	Amount
6/3.19	**Compacting original ground supporting subgrade** (Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction.)	Cum	340	10.00	0.50	1700.00	81.00	137700.00
		Sub Total of Earth work						**7,817,237**
7/A1	Construction of M20 grade lined surface drains specified lines, grades, levels and dimensions as per drawing or technical specification section 309 and 1700	Rm	782.00			782.00	1995.92	1560809.44
		Sub Total of side drain						**1,560,809**

Grand Total of Earth work & Side Drain **9,378,046**

(Rupees ninety three lakh seventy eight thousand forty six) only

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

DETAIL ESTIMATE FOR SLOPE PROTECTION WORKS

Sl/SOR	Description	Unit	L	B	H	Quantity	Rate	Amount
1/3.23	**Seeding and Mulching** (Preparation of seed bed on previously laid top soil, furnishing and placing of seeds, fertilizer, mulching material, applying bituminous emulsion at the rate of0.23 litres per sqm and laying and fixing jute netting, including watering for 3 months all as per clause 308)	Sqm	Location of Bio Protection work			560.00	Rs. 190.00	106,400.00
2/7.5	Vegetation Mat (Steep Slope) Supply and Installation of Non woven Coir Erosion Control Blanket for slope surface erosion protection including labours, tools and tackels complete as per the Technical specification mentioned in the tender document.	Sqm				560.00	Rs. 502.00	281,120.00
	Summary details of Slope protection work							
1	Retaining wall for 4.0 m Height	Rm	Location of Retaining wall			320.00	41,662.97	13,332,150.40
2	Retaining wall for 6.0 m Height	Rm				70.00	67,510.98	4,725,768.60
3	Breast Wall 2.00m high	Rm	Location of Breast wall			105.00	13,742.00	1,442,910.00
4	Breast Wall 3.00m high	Rm				105.00	24,294.00	2,550,870.00
				Total cost for slope protection works =				**22,439,219.00**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

DETAIL ESTIMATE FOR CROSS DRAINAGE WORKS

Sr.No	Description of Item	Unit	Rate per Unit	Qntty.	Cost	Total
	Box Culvert					
1	Type -1 - 2 x 2	No	Rs. 1,427,563.19	3	Rs. 4,282,689.57	
2	Type -2 - 3 x 3	No	Rs. 5,266,532.40	1	Rs. 5,266,532.40	**Rs. 9,549,221.97**
					Total cost for cross drainage works =	**Rs. 9,549,221.97**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

DETAIL ESTIMATE FOR PAVEMENT WORKS

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
1/4.6 (i)	**Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Sub base** (Providing, laying and spreading Material on a prepared sub grade, adding the designed quantity of cement to the spread Material, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of sub-base.)								
	Carriageway	Cum	800.00	8.80	0.200	1.00	1408.00		
	Extra widening of curve	Cum	323.16		0.200	1.00	64.63		
	Total	Cum					**1472.63**	**3349.00**	**4,931,837.87**
2/4.6 (ii)	**Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Base** (Providing, laying and spreading Material on a prepared sub grade, adding the designed quantity of cement to the spread Material, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of base.)								
	Carriageway	Cum	800.00	8.80	0.150	1.00	1056.00		
	Extra widening of curve	Cum	323.16		0.150	1.00	48.47		
	Total	Cum					**1104.47**	**3303.00**	**3,648,064.41**
3/4.11	**Penetration Coat Over Top Layer of Crushed Cement Concrete Base** (Spraying of bitumen over cleaned dry surface of crushed cement concrete base at the rate of 25 kg per 10 sqm by a bitumen pressure distributor, spreading of key aggregates at the rate of 0.13 cum per 10 sqm by a mechanical gritter and rolling the surface as per clause 506.3.8)								
	Carriageway	Sqm	800.00	8.800		1.00	7040.00		
	Extra widening of curve	Sqm	323.16			1.00	323.16		
	Total	**Sqm**					**7363.2**	**31.00**	**228,259.20**

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
4/5.21(ii)	**Stress Absorbing Membrane (SAM) with crack width 6 mm to 9 mm** (Providing and laying of a stress absorbing membrane over a cracked road surface, with crack width 6 to 9 mm after cleaning with a mechanical broom, using modified binder complying with clause 521, sprayed at the rate of 11 kg per 10 sqm and spreading 11.2 mm crushed stone aggregates @ 0.12 cum per 10 sqm, sweeping the surface for uniform spread of aggregates and surface finished to conform to clause 902.)								
	Carriageway	Cum	800.00	8.800		1.00	7040.00		
	Extra widening of curve	Cum	323.16			1.00	323.16		
	Total	**Cum**					**7363.16**	**94.00**	**692,137.04**
5/5.2	**Tack Coat** .(i) Providing and applying tack coat with Bitumen emulsion (RS-1) using emulsion distributor at the rate of 0.25 to 0.30 kg per sqm on the prepared Normal Bituminous Surface with primer and cleaned with Hydraulic broom as per Technical Specification Clause 503. (Normal Bituminous Surface)								
	Carriage way portion	Sqm	800.00	8.800		1.00	7040.00		
	Eextra widening of curve	Sqm	323.16			1.00	323.16		
	Total	**Sqm**					**7363.2**	**14.00**	**103,084.80**
6/5.6	**Dense Graded Bituminous Macadam** (Providing and laying dense bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.0 to 4.5% by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects.)								
	Case - II for Grading II (19 mm nominal size)	Cum	800.00	8.80	0.05	1.00	352.00		
	Eextra widening of curve	Cum	323.16		0.05	1.00	16.16		
	Total	Cum					368.16	**10407.00**	**3,831,441.12**

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
7/5.8	**Bituminous Concrete** (Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) Case-I Using Bitumen 60/70 grade (i)for Grading-I (13 mm nominal size)								
	Carriageway	Cum	800.00	8.800	0.03	1.00	211.20		
	Extra widening of curve	Cum	323.16		0.03	1.00	9.69		
	Total	**Cum**					**220.89**	**11529.00**	**2,546,640.81**
8/1.1	**Loading and unloading of Lime, Aggregates, Stone boulder,Brick Aggregates etc. by manual means**								
	i) Loading of aggregates	Cum	Qnty taken from Pavment Qnty Calculation				2835.9	105.0	**297,769.50**
	ii) Loading of sand	Cum					1507.5	105.0	**158,287.50**
9/1.9	**Loading and unloading of Bitumen drums by manual means including a lead upto 30m**								
	i) Bitumen drums by manual means including a lead upto 30m	ton	Qnty taken from Pavment Qnty Calculation				73.00	105.00	**7,665.00**
10/1.3	**Loading and unloading of Cement by manual means including a lead upto 30m**								
	i)Cement by manual means including a lead upto 30m	ton	Qnty taken from Pavment Qnty Calculation				206.00	215.00	**44,290.00**

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
11/1.4	**Haulage excluding Loading and Unloading**								
	Haulage of materials by tipper excluding cost of loading, unloading and stacking			**LEAD Km**			**Qnty Tonne**		
	For BC & SAMI								
	Case-I : Surfaced road								
	a) Sand			55.00			281.00	6.70	**103,548.50**
	b) Aggregates			55.00			1552.00	6.70	**571,912.00**
	c) Cement			145.00			0.00	6.70	**0.00**
	d) Bitumen			145.00			73.00	6.70	**70,919.50**
	Case-II : Unsurfaced Gravelled Road								
	a) Sand			5.00			281.00	8.40	**11,802.00**
	b) Aggregates			5.00			1552.00	8.40	**65,184.00**
	c) Cement			0.00			0.00	8.40	**0.00**
	d) Bitumen			0.00			73.00	8.40	**0.00**
	For CT Sub base & CT base								
	Case-I : Surfaced road								
	a) Sand			55.00			2493.00	6.70	**918,670.50**
	b) Aggregates			55.00			3382.00	6.70	**1,246,267.00**
	c) Cement			145.00			206.00	6.70	**200,129.00**
	d) Bitumen			145.00			0.0	6.70	**0.00**
	Case-II : Unsurfaced Gravelled Road								
	a) Sand			5.00			2493.00	8.40	**104,706.00**
	b) Aggregates			5.00			3382.00	8.40	**142,044.00**
	c) Cement			0.00			206.00	8.40	**0.00**
	d) Bitumen			0.00			0.0	8.40	**0.00**
									19,924,659.75
								Say	**19,924,660.00**

Notes

Total length of Road	=	1100.00	m
Total length of Tunnel	=	300.00	m

Details of Extra Widening of Curve							
Curve No	**Chainage**	**Radius**	**Length of circular curve**	**Length of transition curve**	**Extra Widening**	**Circular curve portion area in sqm**	**Transition curve portion area in sqm**
1.0	32561.722	60	24.20	15.000	1.20	29.040	18.000
2.0	32611.428	-60	13.23	15.000	1.20	15.876	18.000
3.0	32673.274	75	9.38	15.000	0.90	8.442	13.500
4.0	32746.421	-150	3.53	15.000	0.60	2.118	9.000
5.0	32818.368	125	15.83	15.000	0.60	9.498	9.000
6.0	32874.593	-60	10.72	15.000	1.20	12.864	18.000
7.0	32913.582	125	5.00	15.000	0.60	3.000	9.000
8.0	32991.847	-300	58.05	0.000	0.60	34.830	0.000
9.0	33069.874	150	11.01	15.000	0.60	6.606	9.000
10.0	33132.837	-60	47.92	15.000	1.20	57.504	18.000
11.0	33552.139	65	9.31	15.000	0.90	8.379	13.500
				Total		**188.157**	**135.000**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

QUANTITY CALCULATION FOR PAVEMENT MATERIALS UNDER CARRIAGE ITEM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Ref Item no	Description	Requirement for	Cement	Bitumen	Aggregate	Crushed Sand	Total requirement from estimate	Individual requirement for whole length of road			
								Cement	Bitumen	Aggregate	Sand
			ton	ton	m^3	m^3		ton	ton	m^3	m^3
1	2	3	4	5	6	7	8	9	10	11	12
1/4.1	GSB	225 m^3			201.00	86.400	0.00 m^3	0		0.00	0.00
2/4.6	CT Sub Base	300 m^3	24.00		288.00	96.00	1472.63 m^3	117.8104		1413.72	471.24
3/4.6	CT Base	300 m^3	24.00		144.00	240.00	1104.47 m^3	88.3576		530.15	883.58
			Total requirement for the whole length of the road =					**206.17**	**0.00**	**1943.87**	**1354.82**
							Ton/Unit quantity	1	1	1.74	1.84
							Total weight	**206.00**	**0.00**	**3382.00**	**2493.00**
								ton	**ton**	**ton**	**ton**
4/4.11	Penetration Coat	7500 m^2		0.250	97.50		7363.20 m^2		0.25	95.72	0.00
5/5.21	SAMI	10500.00 m^2		11.55	105.00		7363.16 m^2		8.10	73.63	0.00
6/5.2	Tack coat	3500 m^2	1.050				7363.20 m^2		2.21		
7/5.6	DBM	195.00 m^3		19.13	281.50	5.750	368.16 m^3		36.12	531.47	10.86
8/5.8	Bituminous Concrete	191.00 m^3		22.50	165.300	122.620	220.89 m^3		26.02	191.17	141.81
							Total requirement for the whole length of the road =		**72.70**	**891.99**	**152.67**
							Ton/Unit quantity		1	1.74	1.84
							Total weight		**73.00**	**1552.00**	**281.00**
									ton	**ton**	**ton**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

DETAIL ESTIMATE FOR KM STONE & ROAD SIGN

SrNo	SOR No.	Description	Unit	No	L	B	H	Quantity	Rate (Rs)	Amount (Rs)
1	**8.4**	Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing								
	(ii)	60 cm equilateral triangle	each					2	4529.00	9058.00
	(iii)	60 cm circular	each					2	6301.00	12602.00
	(v)	60 cm x 45 cm rectangular	each					2	6120.00	12240.00
2	**8.5**	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign asper IRC:67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	Sqm					2	16553.00	33106.00
4	**8.13**	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.)	Sqm					330.00	1268.00	418440.00
5	**8.14**	Kilo Metre Stone (Reinforced cement concrete M15grade kilometre stone of standard design as per IRC:8-1980, fixing in position including painting and printing etc)								
	(i)	5th kilometre stone (precast)	each					0	4564.00	0.00
	(ii)	Ordinary Kilometer stone (Precast)	each					1	2762.00	2762.00
	(iii)	Hectometer stone (Precast)	each					5	760.00	3800.00

SrNo	SOR No.	Description	Unit	No	L	B	H	Quantity	Rate (Rs)	Amount (Rs)
6	**8.15**	**Road Delineators** (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.)	each					20	3393.00	67860.00
7	**8.16**	**Boundary pillar** (Reinforced cement concrete M15 grade boundary pillars of standard design as per IRC:25-1967, fixed in position including finishing and lettering but excluding painting)	each					20	667.00	13340.00
8	**8.35**	**Street Furniture** (Road Markers/Road Stud with Lense Reflector (Providing and fixing of road stud 100x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973)	each					40	1007.00	40280.00
9	10.12	Land Slide Clearance in soil (Clearance of landslides in soil and ordinary rock by a bull-dozer D 80 A-12, 180 HP and disposal of the same on the valley side)	Cum					3583.7	40.00	143348.00
10	M	**Bus Bay**								
		Earth workExcavation	Cum	0	198.00	5.20	5.00	0.00	124.00	0.00
		Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Sub base	Cum	0	198.00	5.00	0.20	0.00	3349.00	0.00
		Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Base	Cum	0	198.00	5.00	0.30	0.00	3303.00	0.00
		Penetration Coat Over Top Layer of Crushed Cement Concrete Base	Sqm	0	198.00	5.00		0.00	31.00	0.00
		Bituminous Concrete	Cum	0	198.00	5.00	0.10	0.00	11529.00	0.00
		Raised footpath of 2.0m with M15 grade concrete	Cum	0	15.00	2.00	0.30	0.00	6824.00	0.00

SrNo	SOR No.	Description	Unit	No	L	B	H	Quantity	Rate (Rs)	Amount (Rs)
11	M	**View Point**								
		Earth workExcavation	Cum	0	25.00	7.20	10.00	0.00	124.00	0.00
		Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Sub base	Cum	0	25.00	7.00	0.20	0.00	3349.00	0.00
		Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Base	Cum	0	25.00	7.00	0.30	0.00	3303.00	0.00
		Penetration Coat Over Top Layer of Crushed Cement Concrete Base	Sqm	0	25.00	7.00		0.00	31.00	0.00
		Bituminous Concrete	Cum	0	25.00	7.00	0.10	0.00	11529.00	0.00
		Raised footpath of 2.0m with M15 grade concrete	Cum	0	50.00	2.00	0.30	0.00	6824.00	0.00
12	M	**Roadside Amenities** Construction roadside Amenities including excavtion of foundation, laying of M15 PCC ,brick masonry (1:3) ,plastering of wall 12mm thk (1:3) ,stone Masonry (1:4) ,Centering and shuttering including strutting,propping etd. And removal of form, fifting of watersupply ,door ,window& electrical fitting complete as per Drawing & CPWD Specification								
		PUBLIC TOILET	No.	0				0.00	184,799	0.00
		BUS SHED	No.	0				0.00	70,468	0.00
		BAZAR SHED	No.	0				0.00	315,223	0.00
								TOTAL		**756836.0**

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

DETAIL ESTIMATE FOR ROAD SAFETY MEASURES

Item No.	Ref to SOR No.	Description	Unit	Nos	Quantity	Rate (Rs)	Amount (Rs)
1	**8.23-A**	Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810)	metre	1	250	4504.00	1126000.0
					TOTAL		**1126000**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

DETAIL ESTIMATE FOR MAJOR JUNCTION

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
1/3.32	Excavation in Hilly Areas in Soil By Mechanical Means (Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead .) Case-I : Disposal of cut material with all lifts and lead upto 1000 metres.	Cum	150.00	10.00	1.00	2.00	3000.00	124.00	372,000.00
2/3.19	**Compacting original ground supporting subgrade** (Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction.)	Cum	150.00	10.00	0.500	2.00	1500.00	81.00	121,500.00
3/3.17	**Construction of Embankment with Material Deposited from Roadway Cutting** (Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2)	Cum	150.00	10.00	0.500	2.00	1500.00	172.00	258,000.00
4/3.18	**Construction of Subgrade and Earthen Shoulders** (Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2)	Cum	150.00	10.00	0.500	2.00	1500.00	331.00	496,500.00
5/4.6 (i)	**Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Sub base** (Providing, laying and spreading Material on a prepared sub grade, adding the designed quantity of cement to the spread Material, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of sub-base.)	Cum	150.00	10.00	0.150	2.00	450.00	3349.00	1,507,050.00
6/4.6(ii)	**Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Base** (Providing, laying and spreading Material on a prepared sub grade, adding the designed quantity of cement to the spread Material, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of base.)	Cum	150.00	10.00	0.250	2.00	750.00	3303.00	2,477,250.00

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Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
7/4.11	**Penetration Coat Over Top Layer of Crushed Cement Concrete Base** (Spraying of bitumen over cleaned dry surface of crushed cement concrete base at the rate of 25 kg per 10 sqm by a bitumen pressure distributor, spreading of key aggregates at the rate of 0.13 cum per 10 sqm by a mechanical gritter and rolling the surface as per clause 506.3.8)	Sqm	150.00	10.000		2.00	3000.00	31.00	93,000.00
8/5.21(ii)	**Stress Absorbing Membrane (SAM) with crack width 6 mm to 9 mm** (Providing and laying of a stress absorbing membrane over a cracked road surface, with crack width 6 to 9 mm after cleaning with a mechanical broom, using modified binder complying with clause 521, sprayed at the rate of 11 kg per 10 sqm and spreading 11.2 mm crushed stone aggregates @ 0.12 cum per 10 sqm, sweeping the surface for uniform spread of aggregates and surface finished to conform to clause 902.)	Sqm	150.00	10.000		2.00	3000.00	94.00	282,000.00
9/5.8	**Bituminous Concrete** (Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) Case-I Using Bitumen 60/70 grade (i)for Grading-I (13 mm nominal size)	Cum	150.00	10.000	0.05	2.00	150.00	11529.00	1,729,350.00
10/1.1	**Loading and unloading of Lime, Aggregates, Stone boulder,Brick Aggregates etc. by manual means**		Qnty taken from Pavment Qnty Calculation						
	i) Loading of aggregates	Cum					990.8	105.0	104,034.00
	ii) Loading of sand	Cum					840.3	105.0	88,231.50
11/1.9	**Loading and unloading of Bitumen drums by manual means including a lead upto 30m** i)Unloading of Bitumen drums by manual means including a lead upto 30m	ton	Qnty taken from Pavment Qnty Calculation				21.00	105.00	2,205.00
12/1.3	**Loading and unloading of Cement by manual means including a lead upto 30m** i)Cement by manual means including a lead upto 30m	ton	Qnty taken from Pavment Qnty Calculation				96.00	215.00	20,640.00

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Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
9/1.4	**Haulage excluding Loading and Unloading**								
	Haulage of materials by tipper excluding cost of loading, unloading and stacking			**LEAD Km**			**Qnty Tonne**		
	For BC & SAMI								
	Case-I : Surfaced road								
	a) Sand			55.00			177.00	6.70	**65,224.50**
	b) Aggregates			55.00			346.00	6.70	**127,501.00**
	c) Cement			145.00			0.00	6.70	**0.00**
	d) Bitumen			145.00			21.00	6.70	**20,401.50**
	Case-II : Unsurfaced Gravelled Road								
	a) Sand			5.00			177.00	8.40	**7,434.00**
	b) Aggregates			5.00			346.00	8.40	**14,532.00**
	c) Cement			0.00			0.00	8.40	**0.00**
	d) Bitumen			0.00			21.00	8.40	**0.00**
	For CT Sub base & CT base								
	Case-I : Surfaced road								
	a) Sand			55.00			1369.00	6.70	**504,476.50**
	b) Aggregates			55.00			1378.0	6.70	**507,793.00**
	c) Cement			145.00			96.0	6.70	**93,264.00**
	d) Bitumen			145.00			0.0	6.70	**0.00**
	Case-II : Unsurfaced Gravelled Road								
	a) Sand			5.00			1369.0	8.40	**57,498.00**
	b) Aggregates			5.00			1378.0	8.40	**57,876.00**
	c) Cement			0.00			96.0	8.40	**0.00**
	d) Bitumen			0.00			0.0	8.40	**0.00**
									9,007,761.00
								Say	**9,007,761.00**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

QUANTITY CALCULATION FOR PAVEMENT MATERIALS UNDER CARRIAGE ITEM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Ref Item no	Description	Requirement for	Cement	Bitumen	Aggregate	Crushed Sand	Total requirement from estimate	Individual requirement for whole length of road			
								Cement	Bitumen	Aggregate	Sand
			ton	ton	m^3	m^3		ton	ton	m^3	m^3
1	2	3	4	5	6	7	8	9	10	11	12
1/4.6	CT Sub Base	300 m^3	24.00		288.00	96.00	450.00 m^3	36		432.00	144.00
2/4.6	CT Base	300 m^3	24.00		144.00	240.00	750.00 m^3	60		360.00	600.00
			Total requirement for the whole length of the road =					**96.00**	**0.00**	**792.00**	**744.00**
							Ton/Unit quantity	1	1	1.74	1.84
							Total weight	**96.00**	**0.00**	**1378.00**	**1369.00**
								ton	**ton**	**ton**	**ton**
3/4.11	Penetration Coat	7500 m^2		0.250	97.50		3000.00 m^2		0.10	39.00	0.00
4/5.21	SAMI	10500.00 m^2		11.55	105.00		3000.00 m^2		3.30	30.00	0.00
5/5.8	Bituminous Concre	191.00 m^3		22.50	165.300	122.620	150.00 m^3		17.67	129.82	96.30
							Total requirement for the whole length of the road =		**21.07**	**198.82**	**96.30**
							Ton/Unit quantity		1	1.74	1.84
							Total weight		**21.00**	**346.00**	**177.00**
									ton	**ton**	**ton**

DETAIL ESTIMATE FOR MINOR JUNCTION & DEVELOPMENT OF LINK ROAD

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
1/3.32	Excavation in Hilly Areas in Soil By Mechanical Means (Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead .) Case-I : Disposal of cut material with all lifts and lead upto 1000 metres.	Cum	150.00	6.00	1.00	22.00	19800.00	124.00	2,455,200.00
2/3.19	**Compacting original ground supporting subgrade** (Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction.)	Cum	150.00	6.00	0.500	22.00	9900.00	81.00	801,900.00
3/3.17	**Construction of Embankment with Material Deposited from Roadway Cutting** (Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2)	Cum	150.00	6.00	0.500	22.00	9900.00	172.00	1,702,800.00
4/3.18	**Construction of Subgrade and Earthen Shoulders** (Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2)	Cum	150.00	6.00	0.500	22.00	9900.00	331.00	3,276,900.00
5/4.6 (i)	**Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Sub base** (Providing, laying and spreading Material on a prepared sub grade, adding the designed quantity of cement to the spread Material, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of sub-base.)	Cum	150.00	3.75	0.150	22.00	1856.25	3349.00	6,216,581.25
6/4.6(ii)	**Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4in Base** (Providing, laying and spreading Material on a prepared sub grade, adding the designed quantity of cement to the spread Material, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of base.)	Cum	150.00	3.75	0.250	22.00	3093.75	3303.00	10,218,656.25

Mi Jun

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
7/4.11	**Penetration Coat Over Top Layer of Crushed Cement Concrete Base** (Spraying of bitumen over cleaned dry surface of crushed cement concrete base at the rate of 25 kg per 10 sqm by a bitumen pressure distributor, spreading of key aggregates at the rate of 0.13 cum per 10 sqm by a mechanical gritter and rolling the surface as per clause 506.3.8)	Sqm	150.00	3.75		22.00	12375.00	31.00	383,625.00
8/5.21(ii)	**Stress Absorbing Membrane (SAM) with crack width 6 mm to 9 mm** (Providing and laying of a stress absorbing membrane over a cracked road surface, with crack width 6 to 9 mm after cleaning with a mechanical broom, using modified binder complying with clause 521, sprayed at the rate of 11 kg per 10 sqm and spreading 11.2 mm crushed stone aggregates @ 0.12 cum per 10 sqm, sweeping the surface for uniform spread of aggregates and surface finished to conform to clause 902.)	Sqm	150.00	3.750		22.00	12375.00	94.00	1,163,250.00
9/5.8	**Bituminous Concrete** (Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) Case-I Using Bitumen 60/70 grade (i)for Grading-I (13 mm nominal size)	Cum	150.00	3.750	0.05	22.00	618.75	11529.00	7,133,568.75
10/1.1	**Loading and unloading of Lime, Aggregates, Stone boulder,Brick Aggregates etc. by manual means**		Qnty taken from Pavment Qnty Calculation						
	i) Loading of aggregates	Cum					4087.1	105.0	429,145.50
	ii) Loading of sand	Cum					3466.2	105.0	363,951.00
11/1.9	**Loading and unloading of Bitumen drums by manual means including a lead upto 30m**								
	i)Unloading of Bitumen drums by manual means including a lead upto 30m	ton	Qnty taken from Pavment Qnty Calculation				87.00	105.00	9,135.00
12/1.3	**Loading and unloading of Cement by manual means including a lead upto 30m**								
	i)Cement by manual means including a lead upto 30m	ton	Qnty taken from Pavment Qnty Calculation				396.00	215.00	85,140.00

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
9/1.4	**Haulage excluding Loading and Unloading**								
	Haulage of materials by tipper excluding cost of loading, unloading and stacking			**LEAD Km**			**Qnty Tonne**		
	For BC & SAMI								
	Case-I : Surfaced road								
	a) Sand			55.00			731.00	6.70	**269,373.50**
	b) Aggregates			55.00			1427.00	6.70	**525,849.50**
	c) Cement			145.00			0.00	6.70	**0.00**
	d) Bitumen			145.00			87.00	6.70	**84,520.50**
	Case-II : Unsurfaced Gravelled Road								
	a) Sand			5.00			731.00	8.40	**30,702.00**
	b) Aggregates			5.00			1427.00	8.40	**59,934.00**
	c) Cement			0.00			0.00	8.40	**0.00**
	d) Bitumen			0.00			87.00	8.40	**0.00**
	For CT Sub base & CT base								
	Case-I : Surfaced road								
	a) Sand			55.00			5647.00	6.70	**2,080,919.50**
	b) Aggregates			55.00			5685.0	6.70	**2,094,922.50**
	c) Cement			145.00			396.0	6.70	**384,714.00**
	d) Bitumen			145.00			0.0	6.70	**0.00**
	Case-II : Unsurfaced Gravelled Road								
	a) Sand			5.00			5647.0	8.40	**237,174.00**
	b) Aggregates			5.00			5685.0	8.40	**238,770.00**
	c) Cement			0.00			396.0	8.40	**0.00**
	d) Bitumen			0.00			0.0	8.40	**0.00**
									40,246,732.25
								Say	**40,246,732.00**

Mi Jun

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

QUANTITY CALCULATION FOR PAVEMENT MATERIALS UNDER CARRIAGE ITEM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Ref Item no	Description	Requirement for	Cement	Bitumen	Aggregate	Crushed Sand	Total requirement from estimate	Individual requirement for whole length of road			
								Cement	Bitumen	Aggregate	Sand
			ton	ton	m^3	m^3		ton	ton	m^3	m^3
1	2	3	4	5	6	7	8	9	10	11	12
1/4.6	CT Sub Base	300 m^3	24.00		288.00	96.00	1856.25 m^3	148.5		1782.00	594.00
2/4.6	CT Base	300 m^3	24.00		144.00	240.00	3093.75 m^3	247.5		1485.00	2475.00
			Total requirement for the whole length of the road =					**396.00**	**0.00**	**3267.00**	**3069.00**
							Ton/Unit quantity	1	1	1.74	1.84
							Total weight	**396.00**	**0.00**	**5685.00**	**5647.00**
								ton	**ton**	**ton**	**ton**
3/4.11	Penetration Coat	7500 m^2		0.250	97.50		12375.00 m^2		0.41	160.88	0.00
4/5.21	SAMI	10500.00 m^2		11.55	105.00		12375.00 m^2		13.61	123.75	0.00
5/5.8	Bituminous Concre	191.00 m^3		22.50	165.300	122.620	618.75 m^3		72.89	535.49	397.23
							Total requirement for the whole length of the road =		**86.91**	**820.12**	**397.23**
							Ton/Unit quantity		1	1.74	1.84
							Total weight		**87.00**	**1427.00**	**731.00**
									ton	**ton**	**ton**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

COST ESTIMATE FOR DEVELOPMENT OF DUMPING YARD

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sl/SOR	Description	Unit	L	B	H	Quantity	Rate	Amount
1/A7	Spreading & Compaction of Roadway cutting and excavation from drain and foundation of other structures surplus material in layers not exceeding 300mm thickness at selected displosal location by Dozer at least four passes including construction of approach road to dumping site.	Cum	Quantity taken and calculated from abstract of Earth Work			19948.01	13.00	259,324.13
2	Construction of Gabion toe wall for 2.0 m wall	Rm	150	Ref Gabion wall location		150.00	9884.10	1,482,615.00
3	Construction of Gabion toe wall for 3.0 m wall	Rm	150			150.00	19803.90	2,970,585.00
4	Construction of Plum toe wall for 2.0 wall	Rm	100	Ref Toe wall location		100.00	13510.51	1,351,051.00
5	Construction of Plum toe wall for 3.0 wall	Rm	100			100.00	23862.77	2,386,277.00

Grand Total of Earth work & Side Drain 8,449,852

(Rupees eighty four lakh forty nine thousand eight hundred fifty two) only

DETAIL ESTIMATE FOR IMPROVEMENT OF EXISTING ROAD PAVEMENT WORKS

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
1/5.2	**Tack Coat** .(i) Providing and applying tack coat with Bitumen emulsion (RS-1) using emulsion distributor at the rate of 0.25 to 0.30 kg per sqm on the prepared Normal Bituminous Surface with primer and cleaned with Hydraulic broom as per Technical Specification Clause 503. (Normal Bituminous Surface)								
	Carriage way portion	Sqm	1300.00	4.250		2.00	11050.00		
	Eextra widening of curve	Sqm				5%	552.50		
	Total	**Sqm**					**11602.5**	**14.00**	**162,435.00**
2/5.6	**Dense Graded Bituminous Macadam** (Providing and laying dense bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.0 to 4.5% by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects.)								
	Case - II for Grading II (19 mm nominal size)	Cum	1300.00	4.25	0.05	1.00	276.25		
	Eextra widening of curve	Cum				5%	13.81		
	Total	Cum					290.06	**10407.00**	**3,018,654.42**
3/5.8	**Bituminous Concrete** (Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects)								
	Case-I Using Bitumen 60/70 grade (i)for Grading-I (13 mm nominal size)								

Sl/SOR	Description	Unit	L	B	H	No	Qnty	Rate	Amount
	Carriageway	Cum	1300.00	4.250	0.03	1.00	165.75		
	Extra widening of curve	Cum				5%	8.29		
	Total	**Cum**					**174.04**	**11529.00**	**2,006,507.16**
4/1.1	**Loading and unloading of Lime, Aggregates, Stone boulder,Brick Aggregates etc. by manual means**								
	i) Loading of aggregates	Cum	Qnty taken from Pavment Qnty Calculation				569.4	105.0	**59,787.00**
	ii) Loading of sand	Cum					120.3	105.0	**12,631.50**
5/1.9	**Loading and unloading of Bitumen drums by manual means including a lead upto 30m**								
	i) Bitumen drums by manual means including a lead upto 30m	ton	Qnty taken from Pavment Qnty Calculation				52.44	105.00	**5,506.20**
6/1.4	**Haulage excluding Loading and Unloading**								
	Haulage of materials by tipper excluding cost of loading, unloading and stacking			**LEAD Km**			**Qnty Tonne**		
	For BC & SAMI								
	Case-I : Surfaced road								
	a) Sand			55.00			221.00	6.70	**81,438.50**
	b) Aggregates			55.00			991.00	6.70	**365,183.50**
	c) Cement			145.00			0.00	6.70	**0.00**
	d) Bitumen			145.00			52.00	6.70	**50,518.00**
	Case-II : Unsurfaced Gravelled Road								
	a) Sand			5.00			221.00	8.40	**9,282.00**
	b) Aggregates			5.00			991.00	8.40	**41,622.00**
	c) Cement			0.00			0.00	8.40	**0.00**
	d) Bitumen			0.00			52.00	8.40	**0.00**
									5,813,565.28
								Say	**5,813,565.00**

Notes

Total length of Road	=	1300.00	m
Total length of Tunnel	=	0.00	m

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

QUANTITY CALCULATION FOR PAVEMENT MATERIALS UNDER CARRIAGE ITEM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Ref Item no	Description	Requirement for	Cement	Bitumen	Aggregate	Crushed Sand	Total requirement from estimate	Individual requirement for whole length of road			
								Cement	Bitumen	Aggregate	Sand
			ton	ton	m^3	m^3		ton	ton	m^3	m^3
1	2	3	4	5	6	7	8	9	10	11	12
1/5.2	Tack coat	3500 m^2	1.050				11602.50 m^2		3.48		
2/5.6	DBM	195.00 m^3		19.13	281.50	5.750	290.06 m^3		28.46	418.73	8.55
3/5.8	Bituminous Concrete	191.00 m^3		22.50	165.300	122.620	174.04 m^3		20.50	150.62	111.73
Total requirement for the whole length of the road =									**52.44**	**569.35**	**120.28**
							Ton/Unit quantity		1	1.74	1.84
							Total weight		**52.00**	**991.00**	**221.00**
									ton	**ton**	**ton**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)
Length of road : 1.10 Km

CLEARING AND GRUBBING OF ROAD LAND

Sr No	Location in Kms		Length in m	Average width (m)	Area (Sqm)	Remarks
	From	To				
1	32500.00	33000.00	500.00	20.00	10000.00	Existing Road
2	33000.00	33600.00	350.00	20.00	7000.00	Existing Road
	Total		**850**		**17000**	
SUMMARY						
A	In area of light jungle		=	**17000.00**	**Sqm**	
B	In area of thorny jungle		=	**0.00**	**Sqm**	

CLEAR

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)
Length of road : 1.10 Km

DETAILS OF CUTTING DOWN TREES

S.N	Chainage		No of Trees With Grith				Remarks
	From	To	30-60 Cm	60-90 Cm	90-180Cm	More than 180 Cm	
1.0	32.50	33.00	12	7	1		Existing Road
2.0	33.00	33.60	14	9	3	1	Existing Road
	Total		**26**	**16**	**4**	**1**	

Tree

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

ABSTRACT OF EARTHWORK QUANTITY

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Sr.No.	Chainage		Volume of Cutting in Cum	Classification of Soil in %			Volume of cutting			Volume of filling in Cum	Volume of embankment in Cum	Volume of Subgrade in Cum
	To	From		Ordinary soil	Ordinary rock	Hard rock	Ordinary soil	Ordinary rock	Hard rock			
1.0	32500.0	33000.0	18013.150	35.0	55.0	10.0	6304.603	9907.233	1801.315	646.950	27.250	619.700
2.0	33000.0	33600.0	17824.000	50.0	45.0	5.0	8912.000	8020.800	891.200	0.050	0.000	0.050
		Total	**35837.15**				**15216.60**	**17928.03**	**2692.52**	**647.00**	**27.25**	**619.75**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Length of drain

Sr.No.	Chainage in m		Length in m	Type	Remarks
	From	To			
1	32500	33000	500	Type-1	Trapezoidal PCC drain
2	33000	33600	600	Type-1	Trapezoidal PCC drain
		Total	**1100.00**		

Summary		**Length of drain in m**
Length of drain on Hill side	=	1100.0
Length of drain on Valley side at Box Cutting port	=	0.0
Length of Tunnel	=	300.0
Catch water drain	=	0.0
Culvert catchpit opening	=	18.0
Net length of line drain	=	**782**

Type-1 **782** **Type-2** **0**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

LOCATION OF RETAINING WALL

Sr.No.	Chainage		Length in m	Height in m	Remarks	Type
	From	To				
1	32500	32600	100	4	RHS	Plum Concrete
2	32780	33000	220	4	RHS	Plum Concrete
3	33530	33600	70	6	RHS	RCC Relief Shelves
			390			

SUMMARY

Total length of Retaining wall for 4.0 m Height	=	320	m
Total length of Retaining wall for 6.0 m Height	=	70	m

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

LOCATION OF BREAST WALL

Sr.No.	Chainage		Length in m	Height in m	Side
	From	To			
1	32530	32565	35.00	3.00	LHS
2	32653	32668	15.00	2.00	LHS
3	33100	33170	70.00	3.00	LHS
4	33470	33490	20.00	2.00	LHS
5	33470	33490	20.00	2.00	RHS
6	33550	33600	50.00	2.00	LHS
			210.00		

SUMMARY

Total length of Breast wall for 2.0 m Height	=	105.00 m
Total length of Breast wall for 3.0 m Height	=	105.00 m

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

LOCATION OF GABION WALL

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
13	Displosal Portion		150	3	Disposal Yard
14	Displosal Portion		150	2	Disposal Yard
			300.000		

SUMMARY

Road work

Total length of Gabion wall for 2.0 m Height	=	.00 m
Total length of Gabion wall for 3.0 m Height	=	.00 m

Dumping work

Total length of Gabion wall for 2.0 m Height	=	150.00 m
Total length of Gabion wall for 3.0 m Height	=	150.00 m

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

LOCATION OF TOE WALL

Sr.No.	Chainage		Length in m	Height in m	Remarks
	From	To			
25	Displosal Portion		100	3.00	
26	Displosal Portion		100	2.00	
			200.000		

SUMMARY

Road work

Total length of Toe wall for 2.0 m Height = .00 m

Total length of Toe wall for 3.0 m Height = .00 m

Dumping work

Total length of Toe wall for 2.0 m Height = 100.00 m

Total length of Toe wall for 3.0 m Height = 100.00 m

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

LOCATION OF BIO PROTECTION WORK

Sr.No.	Design		Length in m	Width in m	Area in Sqm	Soil/Rock Condition
	To	From				
1	32530	32565	35.00	7.00	245.00	Soil mixed boulder
2	32653	32668	15.00	7.00	105.00	Soil mixed boulder
3	33100	33170	70.00	7.00	490.00	Soil mixed boulder
4	33170	33190	20.00	7.00	140.00	Soil mixed boulder
5	33450	33470	20.00	7.00	140.00	Soil mixed boulder
		Total			**1120**	

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

LIST OF PROPOSED CULVERTS

Sr. No.	Chainage (m)	Curve /Straight	Type	Span X Depth	Remarks
1	32670	75	BOX-TYPE-1	2 X 2	Reconstruction
2	32911	126	BOX-TYPE-1	2 X 2	Proposed
3	33080	217	BOX-TYPE-1	2 X 2	Proposed
4	33500	Straight	BOX-TYPE-2	3 X 3	Reconstruction

Summary

Total number of culvert **4**

	Description	Nos			Nos
	Box Culvert	**4**	**SPAN in m**	**DEPTH in m**	
	Type -1		**2**	**2**	**3**
	Type -2		**3**	**3**	**1**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

COST ESTIMATE PER METER OF RETAINING WALL TYPE-III.

Height of Retaining wall H	=	04.00 m	**Parapets**				
Inclined Base Width B1 = 0.4H+0.6	=	02.20 m	No of parapets	=	5.00		
Depth of tranch D=0.1H+0.3	=	0.70 m	Top width of parapet wall	=	0.45 m		
Length of wall L	=	10.00 m	Length of parapet	=	01.00 m		
Top width of retaining wall	=	0.60 m	Bottom width of parapet wall	=	0.60 m		
Horizontal base width B	=	02.13 m	Height of parapet wall	=	0.60 m		
Depth of Slope H1	=	0.53 m	Depth of back filling	=	02.97 m		

Sl. No	Sor. No	Description of item	No.	Length	Width	Height	Unit	Quantity	Rate (Rs. P)	Amount (Rs. P)
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.) I. Ordinary soil								
		A Manual Means (i). upto 3m depth	1	10.30	2.50	2.35	Cum	60.513	357.00	21,603.14
2	12.8-A	Plain/Reinforced cement concrete in open foundation complete as per drawing and technical specifications, placed in foundation and compacted by vibration including curing for 14 days.. I. PCC grade M15								
		Nominal mix 1 : 2 : 4 (hand mixing)	1	10.30	2.50	0.15	Cum	3.863	6,824.00	26,361.11
3	A3	Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete.								
		Trapezodial Wall :	1	10.00	1.37	4.00	Cum	54.800		
		Triangular portion :	1	10.00	1.065	0.53	Cum	5.645		
		Parapet :	5	1.00	0.53	0.60	Cum	1.590		
		Total :					Cum	60.445	4,934.00	298,235.63
4	13.9	Back filling behind abutment, wing wall and return wall complete as per drawing and Technical specification (a) Granular material	1	10.00	0.30	2.97	Cum	8.910	1,251.00	11,146.41

Construction cost = 357,346.29

Sl. No	Sor. No	Description of item	No.	Length	Width	Height	Unit	Quantity	Rate (Rs. P)	Amount (Rs. P)
		Carriage of Materials								
5	1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
		For M15 grade concrete								
		a) Sand		0.450	3.863		Cum	1.738	105.000	182.490
		b) Aggregates		0.90	3.863		Cum	3.477	105.000	365.085
		c) Cement		0.280	3.863		Ton	1.082	215.000	232.630
		For Plum concrete								
		a) Sand		0.45	60.445		Cum	27.200	105.000	2,856.000
		b) Aggregates		0.36	60.445		Cum	21.760	105.000	2,284.800
		c) Cement		0.28	60.445		Ton	16.925	215.000	3,638.875
		d) Masonry stone		0.54	60.445		Cum	32.640	105.000	3,427.200
6	1.6	Haulage of materials by tipper excluding cost of loading, unloading and stacking	**Lead**			**Unit Weight**				
		Case-I : Surfaced road								
		a) Sand		55.00 Kms		1.84	T/Km	53.25	6.70	19622.63
		b) Aggregates		55.00 Kms		1.74	T/km	43.91	6.70	16180.84
		c) Cement		145.00 Kms			T/km	18.01	6.70	17496.72
		d) Masonry stone		5.00 Kms		1.74	T/km	56.79	6.70	1902.47
		Case-II : Unsurfaced Gravelled Road								
		a) Sand		5.00 Kms			T/Km	53.25	8.40	2236.50
		b) Aggregates		5.00 Kms			T/Km	43.91	8.40	1844.22
		c) Cement		0.00 Kms			T/Km	18.01	8.40	0.00
		d) Masonry stone		0.00 Kms			T/Km	56.79	8.40	0.00
								Carriage cost =		**59283.38**

Cost for 10.00m = Rs. 416,629.67

Cost per meter = Rs. 41,662.97

Say = Rs. 41,663.00

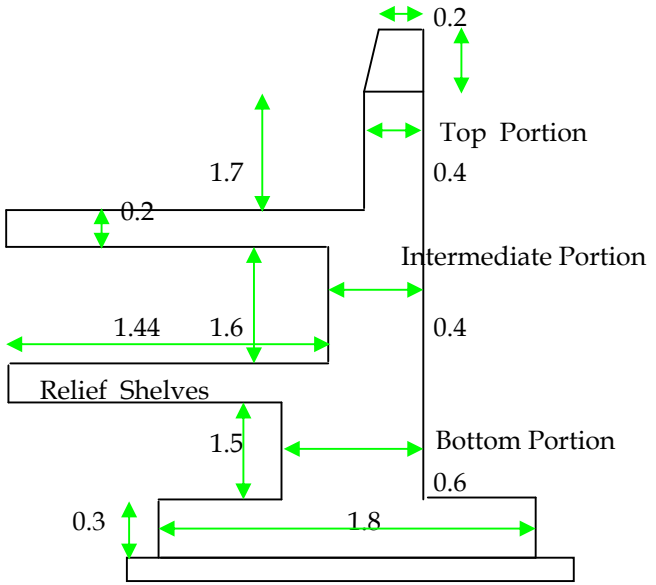
DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

COST ESTIMATE FOR CANTILEVER RETAINING WALL WITH RELIEF SHELVES (TYPE-II)

Length of footing	=	1.80 m
Height of footing	=	0.30 m
Botton stem thickness	=	0.60 m
Height of bottom stem	=	1.50 m
Length of Relief Shelves	=	1.84 m
Thickness of Relief Shelves	=	0.20 m
Nos of Relief Sheves	=	3.00 Nos
Intermediate stem thickness	=	0.40 m
Height of Intermediate stem	=	1.60 m
Nos of Intermediate stem	=	2.00 Nos
Top stem thickness	=	0.40 m
Height of Top stem	=	1.70 m
Thickness of Backfilling (Granular Material)	=	0.30 m
Height of wall	**=**	**7.00 m**
Length of wall	=	10.00 m



Item No.	Items of Work	Unit	Nos	Length	Width	Height	Quantity	Unit Rate (Rs.)	Amount (Rs.)
1/3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.)								
	I - Ordinary Soil (Manual means) upto 3m depth	cum.	1	10.00	2.60	0.55	14.30	357.00	5105.10
	II - Ordinary rock (not requiring blasting) (Manual means) upto 3m depth	cum.	1	10.00	2.10	0.45	9.45	447.00	4224.15
2/12.8-A	Plain/Reinforced cement concrete in open foundation complete as per drawing and technical specifications (PCC Grade M15)	cum	1	10.00	2.10	0.15	3.15	6824.00	21495.60

Item No.	Items of Work	Unit	Nos	Length	Width	Height	Quantity	Unit Rate (Rs.)	Amount (Rs.)
3/12.8 -A	Plain/Reinforced cement concrete in substructure complete as per drawing and technical specifications (for Parapet walls) (PCC Grade M15)	cum	5	1.00	0.25	0.45	0.56	6824.00	3821.44
4/12.8 -C	Provide M20 plain cement concrete levelling course in catch pit complete as per Drawings and Technical Specification Clause 1500,1700 & 2100.								
	Footing	cum	1	10.00	1.80	0.30	5.40		
	Botton stem	cum	1	10.00	0.60	1.50	9.00		
	Relief Sheves	cum	3	10.00	1.84	0.20	11.04		
	Intermediate stem	cum	2	10.00	0.40	1.60	12.80		
	Top stem	cum	1	10.00	0.30	1.70	5.10		
	Total	cum					43.34	7782.00	337271.88
5/12.40	Supplying, fitting and placing HYSD bar reinforcement in sub-structure complete as per drawing and technical specifications	MT	1				2.38	84490.00	201086.20
6/13.9	Backfilling behind the abutment, wing wall and return walls complete as per drawing and Technical specification(Granular Material)	cum	4	10.00	0.30	1.50	18.00	1251.00	22518.00
								Construction cost =	**595522.37**
	Carriage of Materials								
7/1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
	For M15 grade concrete								
	a) Sand	Cum	0.450	3.710			1.670	105.000	175.350
	b) Aggregates	Cum	0.900	3.710			3.339	105.000	350.595
	c) Cement	Ton	0.280	3.710			1.039	215.000	223.385
	For M20 grade concrete								
	a) Sand	Cum	0.450	43.340			19.503	105.000	2047.815
	b) Aggregates	Cum	0.900	43.340			39.006	105.000	4095.630
	c) Cement	Ton	0.344	43.340			14.909	215.000	3205.435
	d) Steel	Ton	1.050	2.380			2.499	215.000	537.285
	Back filling material	Cum	1.200	18.000			21.600	105.000	2268.000

Item No.	Items of Work	Unit	Nos	Length	Width	Height	Quantity	Unit Rate (Rs.)	Amount (Rs.)
8/1.6	Cost of Haulage Excluding Loading and Unloading		Lead		Unit Weight				
(i)	Surfaced Road								
	a) Cement	T/Km	145.00	Kms			15.948	6.70	15493.482
	b) Steel	T/Km	145.00	Kms			2.499	6.70	2427.779
	c) Stone Aggregates	T/Km	55.00	Kms	1.74		111.264	6.70	41000.784
	d) Sand	T/Km	55.00	Kms	1.84		38.958	6.70	14356.023
(ii)	Case-II : Unsurfaced Gravelled Road								
	a) Cement	T/Km	0.00	Kms			15.948	8.40	0.00
	b) Steel	T/Km	0.00	Kms			2.499	8.40	0.00
	c) Stone Aggregates	T/Km	5.00	Kms			111.264	8.40	4673.09
	d) Sand	T/Km	5.00	Kms			38.958	8.40	1636.24
								Carriage cost =	**79587.40**
								Cost for 10.00m =	***675109.77***
								Cost per meter =	***67510.98***
								Say =	***67511.00***

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

COST ESTIMATE PER METER OF BREAST WALL TYPE-I.

Height of Breast wall H	=	02.00 m	Top width of retaining wall	=	0.60 m
Inclined Base Width B1 = 0.4H+0.3	=	01.10 m	Horizontal base width B	=	01.04 m
Depth of tranch D=0.1H+0.3	=	0.50 m	Depth of Slope H1	=	0.35 m
Length of wall L	=	10.00 m	Depth of back filling	=	01.35 m

Sl. No	Sor. No	Description of item	No.	Length	Width	Height	Unit	Quantity	Rate (Rs. P)	Amount (Rs. P)
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.) I. Ordinary soil A Manual Means (i). upto 3m depth	1	10.30	1.40	1.25	Cum	18.025	357.00	6,434.93
2	12.8-A	Plain/Reinforced cement concrete in open foundation complete as per drawing and technical specifications, placed in foundation and compacted by vibration including curing for 14 days.. I. PCC grade M15 Nominal mix 1 : 2 : 4 (hand mixing)	1	10.30	1.40	0.15	Cum	2.163	6,824.00	14,760.31
3	A3	Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete.								
		Trapezodial Wall :	1	10.00	0.82	2.00	Cum	16.400		
		Triangular portion :	1	10.00	0.520	0.35	Cum	1.820		
		Total :					Cum	18.220	4,934.00	89,897.48
4	13.9	Back filling behind abutment, wing wall and return wall complete as per drawing and Technical specification (a) Granular material	1	10.00	0.30	1.35	Cum	4.050	1,251.00	5,066.55
								Construction cost =		**116,159.27**

Sl. No	Sor. No	Description of item	No.	Length	Width	Height	Unit	Quantity	Rate (Rs. P)	Amount (Rs. P)
		Carriage of Materials								
5	1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
		For M15 grade concrete								
		a) Sand		0.450	2.163		Cum	0.973	105.000	102.165
		b) Aggregates		0.90	2.163		Cum	1.947	105.000	204.435
	1.3	c) Cement		0.280	2.163		Ton	0.606	215.000	130.290
		For Plum concrete								
		a) Sand		0.45	18.220		Cum	8.199	105.000	860.895
		b) Aggregates		0.36	18.220		Cum	6.559	105.000	688.695
	1.3	c) Cement		0.28	18.220		Ton	5.102	215.000	1,096.930
		d) Masonry stone		0.54	18.220		Cum	9.839	105.000	1,033.095
6	1.6	Haulage of materials by tipper excluding cost of loading, unloading and stacking		**Lead**		**Unit Weight**				
		Case-I : Surfaced road		Lead						
		a) Sand		55.00 Kms		1.84	T/Km	16.88	6.70	6220.28
		b) Aggregates		55.00 Kms		1.74	T/Km	14.80	6.70	5453.80
		c) Cement		145.00 Kms			T/Km	5.71	6.70	5547.27
		d) Masonry stone		5.00 Kms		1.74	T/Km	17.12	6.70	573.52
		Case-II : Unsurfaced Gravelled Road								
		a) Sand		5.00 Kms			T/Km	16.88	8.40	708.96
		b) Aggregates		5.00 Kms			T/Km	14.80	8.40	621.60
		c) Cement		0.00 Kms			T/Km	5.71	8.40	0.00
		d) Masonry stone		0.00 Kms			T/Km	17.12	8.40	0.00
									Carriage cost =	**21255.46**
									Cost for 10.00m =	**Rs. 137,415**
									Cost per meter =	**Rs. 13,742**
									Say =	**Rs. 13,742**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

COST ESTIMATE PER METER OF BREAST WALL TYPE-II.

Height of Breast wall H	=	03.00 m	Top width of retaining wall	=	0.60 m
Inclined Base Width B1 = 0.4H+0.3	=	01.50 m	Horizontal base width B	=	01.42 m
Depth of tranch D=0.1H+0.3	=	0.60 m	Depth of Slope H1	=	0.47 m
Length of wall L	=	10.00 m	Depth of back filling	=	02.23 m

Sl. No	Sor. No	Description of item	No.	Length	Width	Height	Unit	Quantity	Rate (Rs. P)	Amount (Rs. P)
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.) I. Ordinary soil A Manual Means (i). upto 3m depth	1	10.30	1.80	1.80	Cum	33.372	357.00	11,913.80
2	12.8-A	Plain/Reinforced cement concrete in open foundation complete as per drawing and technical specifications, placed in foundation and compacted by vibration including curing for 14 days.. I. PCC grade M15 Nominal mix 1 : 2 : 4 (hand mixing)	1	10.30	1.80	0.15	Cum	2.781	6,824.00	18,977.54
3	A3	Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete.								
		Trapezodial Wall :	1	10.00	1.01	3.00	Cum	30.300		
		Triangular portion :	1	10.00	0.710	0.47	Cum	3.337		
		Total :					Cum	33.637	4,934.00	165,964.96
4	13.9	Back filling behind abutment, wing wall and return wall complete as per drawing and Technical specification (a) Granular material	1	10.00	0.30	2.23	Cum	6.690	1,251.00	8,369.19
								Construction cost =		**205,225.49**

Sl. No	Sor. No	Description of item	No.	Length	Width	Height	Unit	Quantity	Rate (Rs. P)	Amount (Rs. P)
		Carriage of Materials								
5	1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
		For M15 grade concrete								
		a) Sand		0.450	2.781		Cum	1.251	105.000	131.355
		b) Aggregates		0.90	2.781		Cum	2.503	105.000	262.815
		c) Cement		0.280	2.781		Ton	0.779	215.000	167.485
		For Plum concrete								
		a) Sand		0.45	33.637		Cum	15.137	105.000	1,589.385
		b) Aggregates		0.36	33.637		Cum	12.109	105.000	1,271.445
		c) Cement		0.28	33.637		Ton	9.418	215.000	2,024.870
		d) Masonry stone		0.54	33.637		Cum	18.164	105.000	1,907.220
6	1.6	Haulage of materials by tipper excluding cost of loading, unloading and stacking	**Lead**			**Unit Weight**				
		Case-I : Surfaced road		Lead						
		a) Sand		55.00 Kms		1.84	T/Km	30.15	6.70	11110.28
		b) Aggregates		55.00 Kms		1.74	T/Km	25.42	6.70	9367.27
		c) Cement		145.00 Kms			T/Km	10.20	6.70	9909.30
		d) Masonry stone		5.00 Kms		1.74	T/Km	31.61	6.70	1058.94
		Case-II : Unsurfaced Gravelled Road								
		a) Sand		5.00 Kms			T/Km	30.15	8.40	1266.30
		b) Aggregates		5.00 Kms			T/Km	25.42	8.40	1067.64
		c) Cement		0.00 Kms			T/Km	10.20	8.40	0.00
		d) Masonry stone		0.00 Kms			T/Km	31.61	8.40	0.00
									Carriage cost =	**37711.82**
									Cost for 10.00m =	**Rs. 242,937**
									Cost per meter =	**Rs. 24,294**
									Say =	**Rs. 24,294**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

COST ESTIMATE PER METER OF GABION WALL TYPE-I.

Height of Retaining wall H	=	2.0 m	Depth of tranch D	=	.30 m
Base Width B	=	2.0 m	Length of wall L	=	10.0 m
Top Width T	=	1.0 m	Depth of Gabion box	=	1.0 m

Sr.No	Ref to SOR No.	Description	Unit	Nos	Length	Width	Depth	Quantity	Rate in Rs	Amount in Rs
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.) I. Ordinary soil								
		A Manual Means (i). upto 3m depth	Cum	1	10	2	0.65	13.0	357.00	4641
2	15.12	**Gabian Structure for Retaining Earth** (Providing and construction of a gabain structure for retaining earth with segments of wire crates of size 7 m x 3 m x 0.6 m each divided into 1.5 m compartments by cross netting, made from 4 mm galvanised steel wire @ 32 kg per 10sqm having minimum tensile strength of 300 Mpa conforming to IS:280 and galvanizing coating conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be tied with 4 mm galvanised steel wire								
		Bottom layer	Cum	1	10	2.0 m	1.0 m	20.0		
		Top layer	Cum	1	10	1.0 m	1.0 m	10.0		
		Total quantity	Cum					**30.00**	3035.00	91050.00
3		***Carriage of Materials***								
	1.1	Loading and unloading of stone boulder	Cum					30.00	105.00	3150.00
	1.6	Cost of Haulage Excluding Loading and Unloading								
	(ii)	Case-II : Unsurfaced Gravelled Road								
		b) Stone boulder	ton. km	0			1.74	52.20	8.40	0.00

Total cost for 10Rm 0f Gabion Wall 2.00m high = 98841

Therefore,Rate per Rm = 9884.1

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

COST ESTIMATE PER METER OF GABION WALL TYPE-II.

Height of Retaining wall H	=	3.00 m	Depth of tranch D	=	.30 m
Base Width B	=	3.00 m	Length of wall L	=	10.0 m
Top Width T	=	1.0 m	Depth of Gabion box	=	1.0 m

Sr. No	Ref to SOR No.	Description	Unit	Nos	Length	Width	Depth	Quantity	Rate in Rs	Amount in Rs
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.) I. Ordinary soil								
		A Manual Means (i). upto 3m depth	Cum	1.00	10.00	3.00	0.9	27.00	357.00	9639.00
2	15.12	Gabian Structure for Retaining Earth (Providing and construction of a gabain structure for retaining earth with segments of wire crates of size 7 m x 3 m x 0.6 m each divided into 1.5 m compartments by cross netting, made from 4 mm galvanised steel wire @ 32 kg per 10sqm having minimum tensile strength of 300 Mpa conforming to IS:280 and galvanizing coating conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be tied with 4 mm galvanised steel wire								
		Bottom layer	Cum	1.00	10.00	3.00	1.00	30.00		
		Middle layer	Cum	1.00	10.00	2.00	1.00	20.00		
		Top layer	Cum	1.00	10.00	1.00	1.00	10.00		
		Total quantity =	Cum					60.00	3035.00	182100.00
3		***Carriage of Materials***								
	1.1	Loading and unloading of stone boulder	Cum					60.00	105.00	6300.00
	1.4	Cost of Haulage Excluding Loading and Unloading								
	(iii)	Case-II : Unsurfaced Gravelled Road								
		b) Stone boulder	ton. km	0.00			1.74	104.40	8.40	0.00
								Total cost for 10Rm 0f Gabion Wall 3.0m high =		**198039.00**
								Therefore,Rate per Rm =		**19803.90**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

COST ESTIMATE PER METER OF TOE WALL TYPE -I

Height of Toe wall H	2.0 m	Top width of Toe wall	=	0.60 m
Inclined Base Width B1 = 0.4H+0.3	1.1 m	Horizontal base width B	=	1.07 m
Depth of tranch D=0.1H+0.3	0.5 m	Depth of tranch H1	=	0.27 m
Length of wall L	10.0 m	Depth of back filling	=	1.00 m

Sr.No	Ref to SOR No.	Description	Unit	Nos	Length	Width	Depth	Quantity	Rate in Rs	Amount in Rs
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.) I. Ordinary soil A Manual Means (i). upto 3m depth	Cum	1	10.00	1.40	0.75	10.5	357.00	3748.50
2	12.8 **A**	Plain/Reinforced cement concrete in open foundation as per drawing and technical specifications . **PCC Grade M15**	Cum	1	10.00	1.40	0.15	2.10	6,824.00	14330.40
3	A3	Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete. Trapezoidal Portion : Triangular portion : Total :	Cum Cum Cum	1 1	10.00 10.00	0.84 0.54	2.000 0.270	16.800 1.458 18.258	4,934.00	90084.97
4	13.09 **A**	Backfilling behind the abutment, wing wall and return walls complete as per drawing and Technical specification **Granular Material**	Cum	1	10.00	0.30	1.00	3.000	1,251.00	3753.00

Construction cost = 111916.87

Sr.No	Ref to SOR No.	Description	Unit	Nos	Length	Width	Depth	Quantity	Rate in Rs	Amount in Rs
		Carriage of Materials								
5	1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
		For M15 grade concrete								
		a) Sand		0.450	2.100		Cum	0.945	105.000	99.225
		b) Aggregates		0.90	2.100		Cum	1.890	105.000	198.450
		c) Cement		0.280	2.100		Ton	0.588	215.000	126.420
		For Plum concrete								
		a) Sand		0.45	18.258		Cum	8.216	105.000	862.680
		b) Aggregates		0.36	18.258		Cum	6.573	105.000	690.165
		c) Cement		0.28	18.258		Ton	5.112	215.000	1,099.080
		d) Masonry stone		0.54	18.258		Cum	9.859	105.000	1,035.195
6	1.6	Cost of Haulage Excluding Loading and Unloading	**Lead**			**Unit Weight**				
	(i)	Surfaced Road								
		a) Sand		55.00 Kms		1.84	T/Km	16.856	6.70	6211.44
		b) Aggregates		55.00 Kms		1.74	T/Km	14.726	6.70	5426.53
		c) Cement		145.0 Kms			T/Km	5.700	6.70	5537.55
		d) Masonry stone		5.00 Kms		1.74	T/Km	17.155	6.70	574.69
	(ii)	Case-II : Unsurfaced Gravelled Road								
		a) Sand		5.00 Kms			T/Km	16.86	8.40	708.12
		b) Aggregates		5.00 Kms			T/Km	14.73	8.40	618.66
		c) Cement		0.00 Kms			T/Km	5.70	8.40	0.00
		d) Masonry stone		0.00 Kms			T/Km	17.16	8.40	0.00
									Carriage cost =	**23188.21**
									Cost for 10.00m =	**135105.08**
									Cost per meter =	**13510.51**
									Say =	**13511.00**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

COST ESTIMATE PER METER OF TOE WALL TYPE -II

Height of Toe wall H	3.0 m	Top width of Toe wall	=	0.60 m
Inclined Base Width B1 = 0.4H+0.3	1.5 m	Horizontal base width B	=	1.46 m
Depth of tranch D=0.1H+0.3	0.6 m	Depth of tranch H1	=	0.36 m
Length of wall L	10.0 m	Depth of back filling	=	1.90 m

Sr.No	Ref to SOR No.	Description	Unit	Nos	Length	Width	Depth	Quantity	Rate in Rs	Amount in Rs
1	3.11	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.) I. Ordinary soil A Manual Means (i). upto 3m depth	Cum	1	10.00	1.80	1.05	18.9	357.00	6747.30
2	12.8 **A**	Plain/Reinforced cement concrete in open foundation as per drawing and technical specifications . **PCC Grade M15**	Cum	1	10.00	1.80	0.15	2.70	6,824.00	18424.80
3	A3	Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete.								
		Trapezoidal Portion :	Cum	1	10.00	1.03	3.000	30.900		
		Triangular portion :	Cum	1	10.00	0.73	0.360	2.628		
		Total :	Cum					33.528	4,934.00	165427.15
4	13.09	Backfilling behind the abutment, wing wall and return walls complete as per drawing and Technical specification								
	A	**Granular Material**	Cum	1	10.00	0.30	1.90	5.700	1,251.00	7130.70

Construction cost = 197729.95

Sr.No	Ref to SOR No.	Description	Unit	Nos	Length	Width	Depth	Quantity	Rate in Rs	Amount in Rs
		Carriage of Materials								
5	1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
		For M15 grade concrete								
		a) Sand		0.450	2.700		Cum	1.215	105.000	127.575
		b) Aggregates		0.90	2.700		Cum	2.430	105.000	255.150
		c) Cement		0.280	2.700		Ton	0.756	215.000	162.540
		For Plum concrete								
		a) Sand		0.45	33.528		Cum	15.088	105.000	1,584.240
		b) Aggregates		0.36	33.528		Cum	12.070	105.000	1,267.350
		c) Cement		0.28	33.528		Ton	9.388	215.000	2,018.420
		d) Masonry stone		0.54	33.528		Cum	18.105	105.000	1,901.025
6	1.6	Cost of Haulage Excluding Loading and Unloading	**Lead**			**Unit Weight**				
	(i)	Surfaced Road								
		a) Sand		55.00 Kms		1.84	T/Km	29.998	6.70	11054.26
		b) Aggregates		55.00 Kms		1.74	T/Km	25.230	6.70	9297.26
		c) Cement		145.0 Kms			T/Km	10.144	6.70	9854.90
		d) Masonry stone		5.00 Kms		1.74	T/Km	31.503	6.70	1055.35
	(ii)	Case-II : Unsurfaced Gravelled Road								
		a) Sand		5.00 Kms			T/Km	30.00	8.40	1260.00
		b) Aggregates		5.00 Kms			T/Km	25.23	8.40	1059.66
		c) Cement		0.00 Kms			T/Km	10.14	8.40	0.00
		d) Masonry stone		0.00 Kms			T/Km	31.50	8.40	0.00
									Carriage cost =	**40897.73**
									Cost for 10.00m =	**238627.68**
									Cost per meter =	**23862.77**
									Say =	**23863.00**

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

COST ESTIMATE FOR RCC BOX CULVERT TYPE-I

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Catch pit size Width X Length	1.80 m	x	2.60 m				
Catch pit wall thickness	0.30 m		Top width of wall		=		0.600 m
Height of Upstream wall	4.23 m	Bottom Width	=	2.292 m	Length	=	4.600 m
Height of Downstream wall	5.63 m	Bottom Width	=	2.852 m	Length	=	8.600 m
Width of U/S head wall at box bottom level	=	2.09 m	Width of D/S head wall at box bottom			=	2.592 m
Width of U/S head wall at box top level	=	0.98 m	Width of D/S head wall at box top leve			=	1.480 m
Length of wing wall U/S	=	1.00 m	Length of wing wall D/S			=	1.000 m
Span	**=**	**2.00 m**	Wall thinkness " f "			=	0.300 m
Depth	**=**	**2.00 m**	Bottom slab offset " c "			=	0.500 m
Barrel length	**=**	**11.50 m**	Bottom slab thickness " e "			=	0.380 m
Top slab thickness " d "	=	0.40 m	PCC thickness			=	0.150 m

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work.)								
		Up stream head wall	Cum	1	4.75	2.44	4.38	50.764		
		Down stream head wall	Cum	1	8.75	3.00	2.97	77.963		
		Culvert beding	Cum	1	6.82	3.90	3.68	97.881		
		Catch pit	Cum	1	2.75	1.88	3.64	18.819		
		Apron	Cum	1	4.50	3.20	0.30	4.320		
		Total	Cum					249.747		
	I	Ordinary Soil A.Manual means (i) upto 3m depth	Cum	70%				174.823	357.00	62411.81
	II	Ordinary rock (not requiring blasting) A.Manual means (i) upto 3m depth	Cum	30%				74.924	447.00	33491.03
2	12.8-A	Provide M15 plain cement concrete levelling course below box bedding ,wingwalls, catch pits, cross drains etc. complete as per Drawings and Technical Specification Clause 1500,1700 & 2100.								
		Up stream head wall footing	Cum	1	4.75	2.44	0.15	1.739		
		Down stream head wall footing	Cum	1	8.75	3	0.15	3.938		
		Box Bedding	Cum	1	6.82	3.9	0.15	3.990		
		Catch pit	Cum	1	2.75	2.03	0.15	0.837		
		Total	Cum					10.504	6824.00	71679.30

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
3	12.8-B	Provide M20 plain cement concrete levelling course in catch pit complete as per Drawings and Technical Specification Clause 1500,1700 & 2100.	Cum	1	2.600	1.800	0.075	0.35	7782.00	2723.70
4	12.8-E	Plain/Reinforced cement concrete M25 in sub-structure complete as per drawing and technical specifications								
		base slab	Cum	1	11.50	3.6	0.380	15.732		
		side wall	Cum	2	11.50	0.3	2.00	13.800		
		top slab	Cum	1	11.50	2.6	0.400	11.960		
		Hunch	Cum	4	11.50	0.15	0.15	0.518		
		Wing wall	Cum	4	1.00	0.3	2.40	1.440		
		Total	Cum					43.450	8499.00	369281.55
5	12.40	Supplying, fitting and placing HYSD bar reinforcement in sub-structure complete as per drawing and technical specifications								
		80 kg/Cum	MT	1.00				3.48	84490.00	294025.20
6	A	Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete.								
		Up stream head wall	Cum	1	4.60	1.45	4.23	14.107		
		Down stream head wall	Cum	1	8.60	1.73	5.63	41.882		
		Deduction of box portion in U/S H/W	Cum	-1	4.60	1.54	2.78	-9.847		
		Deduction of box portion in D/S H/W	Cum	-1	4.60	2.04	2.78	-13.044		
		Parapet Wall	Cum	3	2.00	0.60	0.45	0.810		
		Catch pit Long wall	Cum	2	2.90	0.30	3.49	3.036		
		Catch pit short wall	Cum	1	1.80	0.30	3.49	1.885		
		Apron Side Wall	Cum	2	4.50	0.40	0.45	1.620		
		Apron Flooring	Cum	1	4.50	3.20	0.30	4.320		
		Apron toe Wall	Cum	1	3.20	0.50	0.50	0.800		
		Total	Cum					45.569	4934.00	224837.45
7	13.3	Plastering with cement mortar (1:3) in sub-structure as per Technical specifications								
		12mm thick plaster in CM 1:3 Long wall	Sqm	2	2.60		3.49	18.148		
		12mm thick plaster in CM 1:3 short wall	Sqm	1	1.80		3.49	6.282		
		Total	Sqm					24.430	166.20	4060.27

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
8	13.10	**Providing and laying of Filter media** with granular materials/stone crushed aggregates satisfying the requirements laid down in clause 2504.2.2. of MoRTH specifications to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and provided over the entire surface behind abutment, wing wall and return wall to the full height compacted to a firm condition complete as per drawing and technical specification.	Cum	2	10.90	0.6	2.4	31.392	1291.00	40527.07
9	13.09	Back filling behind abutment, wing wall and return wall complete as per drawing and Technical specification A -- Granular material	Cum	1	9.16	4.6	2.89	121.773	1251.00	152338.02
									Construction cost =	**1,255,375.40**
		Carriage of Materials								
5	1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
		For M15 grade concrete								
		a) Sand		0.450	10.504		Cum	4.727	105.00	496.335
		b) Aggregates		0.90	10.504		Cum	9.454	105.00	992.670
		c) Cement		0.280	10.504		Ton	2.941	215.00	632.315
		For M20 grade concrete								
		a) Sand		0.450	0.350		Cum	0.158	105.00	16.590
		b) Aggregates		0.90	0.350		Cum	0.315	105.00	33.075
		c) Cement		0.344	0.350		Ton	0.120	215.00	25.800
		For M25 grade concrete								
		a) Sand		0.450	43.450		Cum	19.553	105.00	2,053.065
		b) Aggregates		0.90	43.450		Cum	39.105	105.00	4,106.025
		c) Cement		0.403	43.450		Ton	17.510	215.00	3,764.650
		d) Steel		1.050	3.480		Ton	3.654	215.00	785.610
		For Plum concrete								
		a) Sand		0.45	45.569		Cum	20.506	105.00	2,153.130
		b) Aggregates		0.36	45.569		Cum	16.405	105.00	1,722.525
		c) Cement		0.28	45.569		Ton	12.759	215.00	2,743.185
		d) Masonry stone		0.54	45.569		Cum	24.607	105.00	2,583.735
		Back filling material		1.2	31.392		Cum	37.670	105.00	3,955.350
		Plastering with c.m. (1:3) for catch pit								
		a) Sand		0.015	24.430		Cum	0.366	105.00	38.430
		b) Cement		0.007	24.430		Ton	0.171	215.00	36.765

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
	1.4	Cost of Haulage Excluding Loading and Unloading		Lead		Unit Weight				
	(i)	Surfaced Road								
		a) Cement		145.00	Kms		T/Km	33.501	6.70	32546.22
		b) Steel		145.00	Kms		T/Km	3.654	6.70	3549.86
		c) Masonry stone		5.00	Kms	1.74	T/Km	65.546	6.70	2195.79
		d Stone Aggregates		55.00	Kms	1.74	T/Km	179.131	6.70	66009.77
		e) Sand		55.00	Kms	1.84	T/Km	83.370	6.70	30721.85
	(ii)	Case-II : Unsurfaced Gravelled Road								
		a) Cement		0.00	Kms		T/Km	33.501	8.40	0.00
		b) Steel		0.00	Kms		T/Km	3.654	8.40	0.00
		c) Masonry stone		0.00	Kms		T/Km	65.546	8.40	0.00
		d Stone Aggregates		5.00	Kms		T/Km	179.131	8.40	7523.50
		e) Sand		5.00	Kms		T/Km	83.370	8.40	3501.54

Carriage cost = 172187.79

Cost for Box culvert = 1427563.19

DETAILED PROJECT REPORT FOR WIDENING TO 2-LANE OF NH 510 (SINGTAM-TARKU-RABONGLA-LEGSHIP-GYALSHING) IN THE STATE OF SIKKIM

COST ESTIMATE FOR RCC BOX CULVERT TYPE-II

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Catch pit size Width X Length	1.80 m	x	3.60 m					
Catch pit wall thickness	0.30 m		Top width of wall			=	0.600 m	
Height of Upstream wall	5.27 m	Bottom Width	=	2.708 m	Length	=	5.840 m	
Height of Downstream wall	6.67 m	Bottom Width	=	3.268 m	Length	=	9.840 m	
Width of U/S head wall at box bottom level	=	2.5 m	Width of D/S head wall at box bottom			=	3.008 m	
Width of U/S head wall at box top level	=	1.0 m	Width of D/S head wall at box top leve			=	1.480 m	
Length of wing wall U/S	=	1.00 m	Length of wing wall D/S			=	1.000 m	
Span	**=**	**3.00 m**	Wall thinkness " f "			=	0.420 m	
Depth	**=**	**3.00 m**	Bottom slab offset " c "			=	0.900 m	
Barrel length	**=**	**30.00 m**	Bottom slab thickness " e "			=	0.420 m	
Top slab thickness " d "	=	0.40 m	PCC thickness			=	0.150 m	

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
1	3.13	**Excavation for Structures** (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work.)								
		Up stream head wall	Cum	1	5.99	2.86	5.42	92.852		
		Down stream head wall	Cum	1	9.99	3.42	3.49	119.239		
		Culvert beding	Cum	1	24.49	5.94	4.46	648.799		
		Catch pit	Cum	1	3.75	1.88	4.68	32.994		
		Apron	Cum	1	4.50	4.20	0.30	5.670		
		Total	Cum					899.554		
	I	Ordinary Soil A.Manual means (i) upto 3m depth	Cum	70%				629.688	357.00	224798.62
	II	Ordinary rock (not requiring blasting) A.Manual means (i) upto 3m depth	Cum	30%				269.866	447.00	120630.10
2	12.8-A	Provide M15 plain cement concrete levelling course below box bedding ,wingwalls, catch pits, cross drains etc. complete as per Drawings and Technical Specification Clause 1500,1700 & 2100.								
		Up stream head wall footing	Cum	1	5.99	2.86	0.15	2.570		
		Down stream head wall footing	Cum	1	9.99	3.42	0.15	5.125		
		Box Bedding	Cum	1	24.49	5.94	0.15	21.821		
		Catch pit	Cum	1	3.75	2.03	0.15	1.142		
		Total	Cum					30.658	6824.00	209210.19

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
3	12.8-B	Provide M20 plain cement concrete levelling course in catch pit complete as per Drawings and Technical Specification Clause 1500,1700 & 2100.	Cum	1	3.600	1.800	0.075	0.49	7782.00	3813.18
4	12.8-E	Plain/Reinforced cement concrete M25 in sub-structure complete as per drawing and technical specifications								
		base slab	Cum	1	30.00	5.64	0.420	71.064		
		side wall	Cum	2	30.00	0.42	3.00	75.600		
		top slab	Cum	1	30.00	3.84	0.400	46.080		
		Hunch	Cum	4	30.00	0.15	0.15	1.350		
		Wing wall	Cum	4	1.00	0.3	3.40	2.040		
		Total	Cum					196.134	8499.00	1666942.87
5	12.40	Supplying, fitting and placing HYSD bar reinforcement in sub-structure complete as per drawing and technical specifications								
		80 kg/Cum	MT	1.00				15.69	84490.00	1325648.10
6	A	Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete.								
		Up stream head wall	Cum	1	5.84	1.65	5.27	25.391		
		Down stream head wall	Cum	1	9.84	1.93	6.67	63.336		
		Deduction of box portion in U/S H/W	Cum	-1	5.84	1.75	3.82	-19.520		
		Deduction of box portion in D/S H/W	Cum	-1	5.84	2.24	3.82	-24.986		
		Parapet Wall	Cum	4	2.00	0.60	0.45	1.080		
		Catch pit Long wall	Cum	2	3.90	0.30	4.53	5.300		
		Catch pit short wall	Cum	1	1.80	0.30	4.53	2.446		
		Apron Side Wall	Cum	2	4.50	0.40	0.45	1.620		
		Apron Flooring	Cum	1	4.50	4.20	0.30	5.670		
		Apron toe Wall	Cum	1	4.20	0.50	0.50	1.050		
		Total	Cum					61.387	4934.00	302883.46
7	13.3	Plastering with cement mortar (1:3) in sub-structure as per Technical specifications								
		12mm thick plaster in CM 1:3 Long wall	Sqm	2	3.60		4.53	32.616		
		12mm thick plaster in CM 1:3 short wall	Sqm	1	1.80		4.53	8.154		
		Total	Sqm					40.770	166.20	6775.97

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
8	13.10	**Providing and laying of Filter media** with granular materials/stone crushed aggregates satisfying the requirements laid down in clause 2504.2.2. of MoRTH specifications to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and provided over the entire surface behind abutment, wing wall and return wall to the full height compacted to a firm condition complete as per drawing and technical specification.	Cum	2	29.40	0.6	3.4	119.952	1291.00	154858.03
9	13.09	Back filling behind abutment, wing wall and return wall complete as per drawing and Technical specification A -- Granular material	Cum	1	27.245	5.84	3.41	542.568	1251.00	678752.57
									Construction cost =	**4,694,313.09**
		Carriage of Materials								
5	1.1	Loading and unloading by manual means	**Unit of reqd**		**Total quantity**					
		For M15 grade concrete								
		a) Sand		0.450	30.658		Cum	13.796	105.00	1,448.580
		b) Aggregates		0.90	30.658		Cum	27.592	105.00	2,897.160
		c) Cement		0.280	30.658		Ton	8.584	215.00	1,845.560
		For M20 grade concrete								
		a) Sand		0.450	0.490		Cum	0.221	105.00	23.205
		b) Aggregates		0.90	0.490		Cum	0.441	105.00	46.305
		c) Cement		0.344	0.490		Ton	0.169	215.00	36.335
		For M25 grade concrete								
		a) Sand		0.450	196.134		Cum	88.260	105.00	9,267.300
		b) Aggregates		0.90	196.134		Cum	176.521	105.00	18,534.705
		c) Cement		0.403	196.134		Ton	79.042	215.00	16,994.030
		d) Steel		1.050	15.690		Ton	16.475	215.00	3,542.125
		For Plum concrete								
		a) Sand		0.45	61.387		Cum	27.624	105.00	2,900.520
		b) Aggregates		0.36	61.387		Cum	22.099	105.00	2,320.395
		c) Cement		0.28	61.387		Ton	17.188	215.00	3,695.420
		d) Masonry stone		0.54	61.387		Cum	33.149	105.00	3,480.645
		Back filling material		1.2	119.952		Cum	143.942	105.00	15,113.910
		Plastering with c.m. (1:3) for catch pit								
		a) Sand		0.015	40.770		Cum	0.612	105.00	64.260
		b) Cement		0.007	40.770		Ton	0.285	215.00	61.275

Sl. No.	Ref to SOR	Description	A/U	nos.	Length	Width	Depth	Quantity	Rate	Amount
	1.6	Cost of Haulage Excluding Loading and Unloading		Lead		Unit Weight				
	(i)	Surfaced Road								
		a) Cement		145.00	Kms		T/Km	105.268	6.70	102267.862
		b) Steel		145.00	Kms		T/Km	16.475	6.70	16005.463
		c) Masonry stone		5.00	Kms	1.74	T/Km	250.459	6.70	8390.377
		d Stone Aggregates		55.00	Kms	1.74	T/Km	644.835	6.70	237621.698
		e) Sand		55.00	Kms	1.84	T/Km	240.144	6.70	88493.064
	(ii)	Case-II : Unsurfaced Gravelled Road								
		a) Cement		0.00	Kms		T/Km	105.268	8.40	0.000
		b) Steel		0.00	Kms		T/Km	16.475	8.40	0.000
		c) Masonry stone		0.00	Kms		T/Km	250.459	8.40	0.000
		d Stone Aggregates		5.00	Kms		T/Km	644.835	8.40	27083.070
		e) Sand		5.00	Kms		T/Km	240.144	8.40	10086.048

Carriage cost = 572219.31

Cost for Box culvert = 5266532.40

ANALYSIS-1

Sr. No	Description	Unit	Quantity	Rate Rs	Cost Rs
A1	**Type -1 Side Drain**				
	Plain/Reinforced Cement Concrete in Open Foundation complete as per Drawing and Ref. to MoRTH Technical Specifications 1500, 1700 & 2100				
	PCC Grade M20 *Unit : cum* *Taking output = 15 cum*				
	a) Material				
	Cement	tonne	5.16	9584.21	49454.52
	Coarse sand	cum	6.75	538.20	3632.85
	40 mm Aggregate	cum	5.40	1399	7555
	20 mm Aggregate	cum	5.40	1506.95	8137.53
	10 mm Aggregate	cum	2.70	1372.95	3706.97
	b) Labour				
	Mate	day	0.86	457.65	393.58
	Mason	day	1.50	457.65	686.48
	Mazdoor	day	20.00	355.95	7119.00
	c) Machinery				
	Concrete mixer (cap. 0.40/0.28 cum)	hour	6.00	140.35	842.10
	Generator 33 KVA	hour	6.00	467.82	2806.92
	d) Formwork @ 4 per cent on cost of concrete i.e. cost of material, labour and machinery				3373.40
	e) Overhead charges @ 25 % on (a+b+c+d)				21927.1
	f) Contractor's profit @ 10 % on (a+b+c+d+e)				10963.5
	Cost for 15 cum = a+b+c+d+e+f				120599.0
	Rate per cum = (a+b+c+d+e+f)/15				8039.9
				say	**8040.00**
	Cross sectional area of lined drain	sqm			**0.216**
	Rate per running meter	RM			**1736.6**

Description	Unit	Co-efficient	Total quantity	Unit weight	Carriage	Quantity	Rate in Rs	Amount in Rs
Loading and unloading of stone boulder/stone aggregates/sand								
Stone aggregates	**Cum**	0.90	0.22			0.20	105.00	21.00
Sand	**Cum**	0.45	0.22			0.10	105.00	10.50
Cement	**MT**	0.34	0.22			0.08	215.00	17.20
Cost of Haulage Excluding Loading and Unloading								
Surfaced Road								
Cement	**ton. km**				145.00	0.08	6.70	77.72
Stone aggregates	**ton. km**				55.00	0.20	6.70	73.70
Sand	**ton. km**				55.00	0.10	6.70	36.85
Case-II : Unsurfaced Gravelled Road								
a) Cement	**ton. km**				0.00	0.08	8.40	0.00
b) Stone Aggregates	**ton. km**			1.74	5.00	0.20	8.40	14.62
b) Sand	**ton. km**			1.84	5.00	0.10	8.40	7.73

Cost of Carriage of material **259.32**

Grand Total cost per metre length of line drain carriage cost **1995.920**

Rate Analysis for Plum Concrete (1:2:4)

Sr No	Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
A2	**Providing & laying Plum concrete in 1:2:4 c.c. (1cement, 2coarse sand, 4clean hard graded stone chips of 20 mm down nominal gauge) with 50% clean hard stone of sizes not exceeding 15cm including shuttering, compacting and curing complete.**					
	Unit = cum					
	Taking output = 15 cum					
	a) Material					
	Cement	tonn	3.45	9584.21	33065.52	M-081
	Coarse sand	cum	3.53	538.20	1899.85	M-005
	Hard selected stone	cum	7.50	559.35	4195.13	M-001
	20 mm Aggregate	cum	5.29	1506.95	7971.77	M-053
	10 mm Aggregate	cum	1.76	1372.95	2416.39	M-051
	b) Labour					
	Mate	day	0.86	457.65	393.58	L-12
	Mason	day	1.50	457.65	686.48	L-11
	Mazdoor	day	15.00	355.95	5339.25	L-13
	c) Machinery					
	Concrete mixer (cap. 0.40/0.28 cum)	hour	6.00	140.35	842.10	P&M-009
	Generator 33 KVA	hour	6.00	467.82	2806.92	P&M-079
	d) Formwork @ 4 per cent on cost of concrete i.e. cost of material, labour and machinery				2384.68	
	e) Overhead charges @ 10 % on (a+b+c+d)				5270.14	
	f) Contractor's profit @ 10 % on (a+b+c+d+e)				6727.18	
	Cost for 15 cum = a+b+c+d+e+f				73998.99	
	Rate per cum = (a+b+c+d+e+f)/15				4933.27	
				say	***4934.00***	

ANALYSIS- 03

A3	Spreading & Compaction of Roadway cutting and excavation from drain and foundation of other structures surplus material at selected displosal location by Dozer at least four passes.				
	Unit = cum				
	Taking output = 100 cum				
	a) Labour				
	Mate	day	0.020	457.65	9.15
	Mazdoor	day	0.500	355.95	177.98
	b) Machinery				
	Dozer D-50 for spreading & compaction@ 300 cum per hour	hour	0.330	2689.97	887.69
	c) Overhead charges @ 10 % on (a+b)				107.48
	d) Contractor's profit @ 10 % on (a+b+c)				118.23
	Rate for 100 cum = a+b+c+d				1300.53
	Rate per cum = (a+b+c+d)/100				13.01
				say	***13.00***

A5- Analysis of Rate for Non woven Coir Blanket

Sr.No	Description	Unit	Quantity	Rate in Rs.	Amount in Rs.
	Supply and Installation of Non woven Coir Erosion Control Blanket for slope surface erosion protection including labours, tools and tackels complete as per the Technical specification mentioned in the tender document.				
	Unit = Square metre				
	Taking output = 1.0 Square metres				
	a) Labour				
	Mate	day	0.083	457.65	37.98
	Mazdoor	day	0.500	355.95	177.98
	b) Machinery				
	Water tanker 6 KL capacity including watering for 3 months	hour	0.050	350.87	17.54
	Tractor-trolley	hour	0.050	415.19	20.76
	c) Material				
	Supply of non-woven coir erosion control blanket as per Technical Specification	Sqm	1.000	45.00	45.00
	Non-woven coir erosion control blanket 15% extra for trenching and overlapping on the effective slope face area	Sqm	1.000	7.00	7.00
	GI "U" Hook - 1 No. per Sqmtr of effective slope face area having size of 12"x3"x12" with 3.5mm-3.8mm diameter	Sqm	1.000	27.00	27.00
	Native Grass Seeds of approx. 1Kg per 9Sqm of effective slope face area	Sqm	1.000	38.00	38.00
	Sourcing of top soil (including transportation if it is available in close proximity, the cost may vary if the distance is more)	Sqm	1.000	30.00	30.00
	Cow dung manure	Sqm	1.000	7.00	7.00
	Live Sticks	Sqm	1.000	7.00	7.00
	d) Overhead charges @ 10 % on (a+b+c)				41.53
	e) Contractor's profit @ 10 % on (a+b+c+d)				45.68
	Cost for 1 sqm = a+b+c+d+e				502.47
	Rate per sqm = (a+b+c+d+e)				502.47
				say	***502.00***

Name of Road :NH-510 within Sikkim (KM 32+500 TO KM- 33+600)

Length of road : 1.10 Km

Earth Work Quantity Calculation

Sr. No.	Chainage in m	Area Cut (m2)	Area Fill (m2)	Volume Cut (m3)	Volume Fill (m3)	Embankment filling (m3)	Subgrade filling (m3)
1	32500	34.16	3.74	0.00	0.00	0.00	0.00
2	32510	21.95	5.26	280.55	45.00	0.00	45.00
3	32520	17.49	6.03	197.20	56.45	3.95	52.50
4	32530	24.24	0.68	208.65	33.55	0.00	33.55
5	32540	29.69	0.00	269.65	3.40	0.00	3.40
6	32550	29.63	1.18	296.60	5.90	0.00	5.90
7	32560	13.48	0.79	215.55	9.85	0.00	9.85
8	32570	21.93	0.00	177.05	3.95	0.00	3.95
9	32580	22.15	0.00	220.40	0.00	0.00	0.00
10	32590	21.56	0.00	218.55	0.00	0.00	0.00
11	32600	43.82	0.00	326.90	0.00	0.00	0.00
12	32610	38.35	0.11	410.85	0.55	0.00	0.55
13	32620	24.45	2.23	314.00	11.70	0.00	11.70
14	32630	30.85	0.63	276.50	14.30	0.00	14.30
15	32640	25.98	0.48	284.15	5.55	0.00	5.55
16	32650	36.90	0.07	314.40	2.75	0.00	2.75
17	32660	24.84	0.00	308.70	0.35	0.00	0.35
18	32670	23.40	0.00	241.20	0.00	0.00	0.00
19	32680	46.54	0.00	349.70	0.00	0.00	0.00
20	32690	73.96	0.00	602.50	0.00	0.00	0.00
21	32700	93.91	0.00	839.35	0.00	0.00	0.00
22	32710	102.33	0.00	981.20	0.00	0.00	0.00
23	32720	105.74	0.00	1040.35	0.00	0.00	0.00
24	32730	71.35	0.00	885.45	0.00	0.00	0.00
25	32740	56.54	0.00	639.45	0.00	0.00	0.00
26	32750	33.05	0.00	447.95	0.00	0.00	0.00
27	32760	8.40	12.39	207.25	61.95	9.45	52.50
28	32770	28.32	0.00	183.60	61.95	9.45	52.50
29	32780	32.42	0.00	303.70	0.00	0.00	0.00
30	32790	19.40	3.46	259.10	17.30	0.00	17.30
31	32800	29.68	4.61	245.40	40.35	0.00	40.35
32	32810	37.88	0.00	337.80	23.05	0.00	23.05
33	32820	28.89	1.65	333.85	8.25	0.00	8.25
34	32830	25.12	4.00	270.05	28.25	0.00	28.25
35	32840	18.08	2.93	216.00	34.65	0.00	34.65
36	32850	15.70	2.91	168.90	29.20	0.00	29.20
37	32860	30.24	1.12	229.70	20.15	0.00	20.15
38	32870	24.59	10.26	274.15	56.90	4.40	52.50
39	32880	34.63	0.00	296.10	51.30	0.00	51.30
40	32890	34.99	1.10	348.10	5.50	0.00	5.50
41	32900	38.80	0.00	368.95	5.50	0.00	5.50
42	32910	40.50	0.00	396.50	0.00	0.00	0.00
43	32920	44.44	0.04	424.70	0.20	0.00	0.20
44	32930	51.15	0.00	477.95	0.20	0.00	0.20
45	32940	53.39	0.00	522.70	0.00	0.00	0.00
46	32950	36.54	0.00	449.65	0.00	0.00	0.00
47	32960	32.63	0.00	345.85	0.00	0.00	0.00
48	32970	29.14	0.89	308.85	4.45	0.00	4.45
49	32980	37.93	0.00	335.35	4.45	0.00	4.45

Sr. No.	Chainage in m	Area Cut (m2)	Area Fill (m2)	Volume Cut (m3)	Volume Fill (m3)	Embankment filling (m3)	Subgrade filling (m3)
50	32990	34.49	0.01	362.10	0.05	0.00	0.05
51	33000	33.80	0.00	341.45	0.05	0.00	0.05
52	33010	29.51	0.00	316.55	0.00	0.00	0.00
53	33020	34.40	0.00	319.55	0.00	0.00	0.00
54	33030	36.22	0.00	353.10	0.00	0.00	0.00
55	33040	56.21	0.00	462.15	0.00	0.00	0.00
56	33050	57.06	0.00	566.35	0.00	0.00	0.00
57	33060	53.53	0.00	552.95	0.00	0.00	0.00
58	33070	51.58	0.00	525.55	0.00	0.00	0.00
59	33080	52.59	0.00	520.85	0.00	0.00	0.00
60	33090	54.64	0.00	536.15	0.00	0.00	0.00
61	33100	47.45	0.00	510.45	0.00	0.00	0.00
62	33110	60.54	0.00	539.95	0.00	0.00	0.00
63	33120	52.43	0.00	564.85	0.00	0.00	0.00
64	33130	98.72	0.00	755.75	0.00	0.00	0.00
65	33140	158.13	0.00	1284.25	0.00	0.00	0.00
66	33150	231.49	0.00	1948.10	0.00	0.00	0.00
67	33160	261.97	0.00	2467.30	0.00	0.00	0.00
68	33170	343.05	0.00	Tunnel	0.00	0.00	0.00
69	33180	455.06	0.00	Tunnel	0.00	0.00	0.00
70	33190	601.09	0.00	Tunnel	0.00	0.00	0.00
71	33200	775.27	0.00	Tunnel	0.00	0.00	0.00
72	33210	973.55	0.00	Tunnel	0.00	0.00	0.00
73	33220	1207.04	0.00	Tunnel	0.00	0.00	0.00
74	33230	1478.49	0.00	Tunnel	0.00	0.00	0.00
75	33240	1623.19	0.00	Tunnel	0.00	0.00	0.00
76	33250	1611.29	0.00	Tunnel	0.00	0.00	0.00
77	33260	1607.17	0.00	Tunnel	0.00	0.00	0.00
78	33270	1596.47	0.00	Tunnel	0.00	0.00	0.00
79	33280	1559.98	0.00	Tunnel	0.00	0.00	0.00
80	33290	1480.79	0.00	Tunnel	0.00	0.00	0.00
81	33300	1374.58	0.00	Tunnel	0.00	0.00	0.00
82	33310	1298.74	0.00	Tunnel	0.00	0.00	0.00
83	33320	1295.88	0.00	Tunnel	0.00	0.00	0.00
84	33330	1222.91	0.00	Tunnel	0.00	0.00	0.00
85	33340	1176.94	0.00	Tunnel	0.00	0.00	0.00
86	33350	1158.43	0.00	Tunnel	0.00	0.00	0.00
87	33360	1146.41	0.00	Tunnel	0.00	0.00	0.00
88	33370	1107.59	0.00	Tunnel	0.00	0.00	0.00
89	33380	1106.63	0.00	Tunnel	0.00	0.00	0.00
90	33390	1084.82	0.00	Tunnel	0.00	0.00	0.00
91	33400	1041.84	0.00	Tunnel	0.00	0.00	0.00
92	33410	916.22	0.00	Tunnel	0.00	0.00	0.00
93	33420	760.12	0.00	Tunnel	0.00	0.00	0.00
94	33430	623.09	0.00	Tunnel	0.00	0.00	0.00
95	33440	516.82	0.00	Tunnel	0.00	0.00	0.00
96	33450	429.87	0.00	Tunnel	0.00	0.00	0.00
97	33460	329.67	0.00	Tunnel	0.00	0.00	0.00
98	33470	228.63	0.00	Tunnel	0.00	0.00	0.00
99	33480	160.27	0.00	1944.50	0.00	0.00	0.00
100	33490	56.60	0.00	1084.35	0.00	0.00	0.00
101	33500	25.14	0.00	408.70	0.00	0.00	0.00
102	33510	33.14	0.00	291.40	0.00	0.00	0.00
103	33520	27.21	0.00	301.75	0.00	0.00	0.00
104	33530	21.70	0.00	244.55	0.00	0.00	0.00
105	33540	14.00	0.00	178.50	0.00	0.00	0.00

Sr. No.	Chainage in m	Area Cut (m2)	Area Fill (m2)	Volume Cut (m3)	Volume Fill (m3)	Embankment filling (m3)	Subgrade filling (m3)
106	33550	8.31	0.00	111.55	0.00	0.00	0.00
107	33560	15.18	0.00	117.45	0.00	0.00	0.00
108	33570	12.81	0.00	139.95	0.00	0.00	0.00
109	33580	12.82	0.00	128.15	0.00	0.00	0.00
110	33590	15.19	0.00	140.05	0.00	0.00	0.00
111	33600	18.37	0.00	167.80	0.00	0.00	0.00
			Total =	**35837.2**	**647.0**	**27.3**	**619.8**
			Grand Total =	**35837.2**	**647.0**	**27.3**	**619.8**

ESTIMATE FOR TUNNEL

Road Tunnel - I (300 m Length including Portals)

A. Road Tunnel (Length -200 m)

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
1	**Underground excavation**								
	Excavation for tunnel including excavation for supports in all types of soil / rock strata requiring supports including cost of all materials, machinery, labour, scaling excavated surface,ventilation, lighting, drainage, removing and hauling excavated muckoutside tunnel upto specified dump area and all other ancillaryoperations etc., complete with initial lead upto 1 km and all lifts.								
a.	Average Rock	Cum	1	80.00	112.33 Sqm		8986.00		
b.	Poor Rock	Cum	1	60.00	118.83 Sqm		7129.56		
c.	Very Poor Rock	Cum	1	60.00	121.62 Sqm		7296.96		
	Total	Cum		200.00			23412.52	2967.70	69,481,335.60
2	**Provision for over break in underground excavation**								
	Overbreakof for tunnel after the payline due to natural causes such as geological faults etc., including breaking any large rockfragments by blasting if necessary and disposing off the same inspecified dump area or as directed including cost of all materials, machinery, labour, ventilation, drainage, lighting and all other ancillaryoperations etc., complete with initial lead upto 1 km and all lifts.	Cum	1	20% of Sr. No-01			4682.50	2967.70	13,896,267.12
3	**Backfill concrete (M-15)**								
	roviding and laying insitu vibrated M-15 (28 days cube compressive strength not less than 15 N / sq mm) grade cement concrete using 40 mm down size approved, clean, hard, graded aggregate crushed from tunnel excavated muck for filling and levelling over cuts in bed due to geological faults etc., including cost of all materials, labour, machinery, cleaning bed, batching, mixing, conveying and laying,levelling, compacting, finishing, curing, ventilation, lighting, drainageetc., complete with lead upto 1 km and all lifts.	Cum	1	200.00	27.60	0.25	1380.00	7146.00	9,861,480.00

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
4	**Shotcreting**								
	Providing specified thick shortcrete to sides and arch of tunnel as per the mixed proporation of 10 mm size aggregate ,cement admixture determinded by contractor & approved by Engineer in Charge including cost of all materials, labour, machinery, ventilation, lighting,drainage and all other ancillaryoperations & excluding steel fibre etc., complete with lead upto 1 km and all lifts.								
a.	Average Rock 70 mm thick + SFRS	Cum	1	80.00	41.12	0.075	246.74		
b.	Poor Rock 100 mm thick	Cum	1	60.00	42.34	0.10	254.06		
c.	Very Poor Rock 100 mm thick + SFRS	Cum	1	60.00	42.86	0.10	257.15		
	Total	Cum		200.00			757.95	12874.00	9,757,848.30
5	**Steel fibre reinforcement in shotcrete**								
	Providing **steel fiber in shotcrete** to sides and arch of tunnel including cost of all materials, labour,machinery, ventilation, lighting, drainage and all other ancillaryoperations & excluding steel fibre etc., complete with lead upto 1 km and all lifts.	MT					50.39	73200.00	3,688,445.52
6	**Concrete lining work M-20**								
	Providing and laying insitu vibrated M-20 (28 days cube compressive strength not less than 20 N/Sqmm) grade cement concrete using40 mm and down size approved clean, hard, graded aggregate crushedfrom tunnel excavated muck for sides and arch lining including cost of all materials, machinery, labour, formwork, batching, mixing, conveyingupto placing point in agitator car, placing in position, levelling, vibrating,finishing, curing, ventilation, lighting, drainage and all other ancillaryoperations etc., complete with lead upto 1 km and all lifts.	Cum	1	200.00	27.60	0.25	1380.00	8414.00	11,611,320.00
7	**Supply and erection of steel supports**								
	Providing, fabricating and fixing in position permanent structural steel supports as per details including cost of all materials, machinery, labour, cutting ,bending, welding, grinding, ventilation, lighting, drainage and all other ancillary operations etc., complete with initial lead upto 1 km and all lifts.								
a.	Average Rock ISMB 250 @ 600 mm	MT	133	26.23	37 Wt/RM		130.47		
b.	Poor Rock ISMB 450 @ 600 mm	MT	100	26.55	72 Wt/RM		192.21		
c.	Very Poor Rock ISMB 550 @ 600 mm	MT	100	26.78	104 Wt/RM		277.71		
	Total	MT					600.4	120056.00	72,080,007.25

Tu Est

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
8	**Wooden block**								
	Providing and fixing hard variety cut jungle wood for blocking locations in tunnel wherever required including cost of all materials, machinery, labour, fixing in position, ventilation, lighting,drainage etc., complete with all leads and lifts.	Cum	1666.7	0.15	0.15	0.20	7.50	9500.00	71,250.00
9	**Precast RCC Lagginge M 20 grade**								
	Providing, fabricating and placing in position precast RCC Lagging including 60kg steel/ cum including casting , levelling, vibrating,finishing, curing,cleaning, straightening, cutting, bending,hooking, lapping / welding joints wherever required, tying with 16mm dia lifting hook, including cost of all materials, labour,machinery, ventilation, lighting, drainage etc., complete with lead upto 1 km and all lifts.	Cum	333	26.52	0.60	0.075	397.81	21209.00	8,437,152.29
10	**Rock bolting**								
	Providing and fixing 25 mm diameter steel rock bolts with mechanical/ wedge type anchorage including drilling 35 mm dia holes, providing150 mm long 20 mm thick steel tapered wedge, 10 mm thick 150 x150 mm plate washer and nuts, tightening bolt by torque wrench, cost of all materials, machinery, labour, ventilation, lighting, drainage and all other ancillary operations etc., complete with lead upto 1 km and alllifts.								
a.	Average Rock – 25 mm dia. 3.5 m long @ 1.7 m c/c (Staggered)	Rm	635.2	3.50			2223.36		
b.	Poor Rock – 25 mm dia. 4.5 m long @ 2.0 m c/c (Staggered)	Rm	416.2	4.50			1872.72		
c.	Very Poor Rock – 25 mm dia. 5.5 m long @ 2.5 m c/c (Staggered)	Rm	481.0	5.50			2645.50		
	Total	Rm					6741.58	4112.00	27,721,396.31
11	**Drilling in hard rock for contact grout holes**								
	Drilling 35 mm diameter grout holes in concrete / rock by percussion drilling using jack hammer or stooper drills as directed to specified depth for contact grouting including cost of all materials,machinery, labour, cleaning holes, ventilation, lighting, drainage and allother ancillary operations etc., complete.	Rm	590	3.00			1770.00	1593.00	2,819,610.00
12	**Pressure grouting with cement (contact grouting)**								
	Grouting cement slurry in grout holes under specified pressure for contact grouting including cost of all materials, labour,machinery, redrilling wherever necessary, ventilation, lighting, drainageand other ancillary operations etc., complete with lead upto 1 km andall lifts.	MT					3.54	20322.17	71,940.48

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
13	**Drilling in hard rock for consolidation grout holes**								
	Drilling 35 mm diameter grout holes in concrete / rock by percussion drilling using jack hammer or stooper drills as directed to specified depth for consolidation grouting including cost of all materials,machinery, labour, cleaning holes, ventilation, lighting, drainage and all other ancillary operations etc., complete.	Rm	590	5.00			2950.00	4200.00	12,390,000.00
14	**Pressure grouting with cement (consolidation)**								
	Grouting cement slurry in grout holes under specified pressure for consolidation grouting including cost of all materials, labour,machinery, redrilling wherever necessary, ventilation, lighting, drainageand other ancillary operations etc., complete with lead upto 1 km andall lifts.	MT					5.90	20322.17	119,900.79
15	**Water proofing**								
	Umbrella System water proofing for tunnel geotextile/ drainage layer nailed at intervals onto tunnel wall using PVC-disk, 2pcs/sq.ya. membrane 3.0mm welded to PVC-disk. Joints welded by hot wedge machine or hot air. water barrier welded to membrane as required including cost of all materials, machinery,labour, ventilation, lighting, drainage etc., complete.	Sqm	1	200.00	27.60		5520	4200.00	23,184,000.00
16	**Bed lining**								
	Providing and laying insitu vibrated M-15 (28 days cube compressive strength not less than 15 N / sqmm) grade cement concrete using 25 mm and down size approved clean, hard, graded aggregate crushedfrom tunnel excavated muck for bed lining including cost of all materials, machinery, labour, formwork, batching, mixing, conveyingupto placing point in agitator car, placing in position, levelling, vibrating,finishing, curing, ventilation, lighting, drainage and all other ancillaryoperations etc., complete with lead upto 1 km and all lifts.	Cum	1	200.00	13.5	0.1	270	7146.00	1,929,420.00
17	**Perforated concrete**	Cum	2	200.00	0.15	0.6	36	8414.00	302,904.00
18	**100 mm dia Perforated drain pipe**	Rm	134	2.0			268	568.00	152,224.00
19	**Sub total 'A'**								267,576,501.66
20	**Dewatering @ 3%**								8,027,295.05
								Sub Total 'A'	**275,603,796.71**

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
B. Portals (Inlet length -40 m & outlet length -60 m)									
1	**Site clearance**								
	Clearing and grubbing road land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned up to a lead of 50 metres including removal and disposal of top organic soil not exceeding 150 mm in thickness.(By Mechanical Means-In area of thorny jungle)								
	Inlet Portal	Ha	1	27.46	25.00	13.65	0.03		
	Outlet Portal	Ha	1	26.00	25.00	5.80	0.01		
	Total	Ha					0.05	25865.00	1,257.69
2	**Open excavation in rock**								
	Excavation in Hard Rock (controlled blasting) with disposal upto 1000 metres (Excavation for roadway in hard rock with controlled blasting by drilling, blasting and breaking, trimming of bottom and side slopes in accordance with requirements of lines, grades and cross sections, loading and disposal of cut road with in all lifts and leads upto 1000 metres)								
	Inlet Portal	Cum	1	6.449	25.00	6.83	1100.36		
	Outlet Portal	Cum	1	2.453	25.00	2.90	177.84		
	Total	Cum					1278.20	519.00	663,387.42
3	**Rock bolting**								
	Providing and fixing 25 mm diameter steel rock bolts with mechanical/ wedge type anchorage including drilling 35 mm dia holes, providing150 mm long 20 mm thick steel tapered wedge, 10 mm thick 150 x150 mm plate washer and nuts, tightening bolt by torque wrench, cost of all materials, machinery, labour, ventilation, lighting, drainage and all other ancillary operations etc., complete with lead upto 1 km and all lifts.								
	Inlet Portal	Rm	86	4.5			387.00		
	Outlet Portal	Rm	37	4.5			166.50		
	Total	Rm					553.50	4112.00	2,275,992.00

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
4	**Shotcrete work chainlink wire mesh**								
	Providing specified thick shortcrete to sides and arch of tunnel as per the mixed proporation of 10 mm size aggregate ,cement admixture determinded by contractor & approved by Engineer in Charge including cost of all materials, labour, machinery, ventilation, lighting,drainage and all other ancillaryoperations & excluding steel fibre etc., complete with lead upto 1 km and all lifts.								
	Inlet Portal	Cum	1	13.65	25.0	0.075	25.59		
	Outlet Portal	Cum	1	5.80	25.0	0.075	10.88		
	Total	Cum					36.47	12874.00	469,498.69
5	**Steel fibre reinforcement in shotcrete**								
	Providing **steel fiber in shotcrete** to sides and arch of tunnel including cost of all materials, labour,machinery, ventilation, lighting, drainage and all other ancillaryoperations & excluding steel fibre etc., complete with lead upto 1 km and all lifts.	MT					3.65	73200.00	266,951.25
6	**Underground excavation**								
	Excavation for tunnel including excavation forsupports in all types of soil / rock strata requiring supports including cost of all materials, machinery, labour, scaling excavated surface,ventilation, lighting, drainage, removing and hauling excavated muckoutside tunnel upto specified dump area and all other ancillaryoperations etc., complete with initial lead upto 1 km and all lifts.								
	Inlet Portal								
a.	Average Rock	Cum	1	16.00	112.33		1797.20		
b.	Poor Rock	Cum	1	24.00	118.83		2851.82		
	Outlet Portal								
a.	Average Rock	Cum	1	30.00	158.11		4743.30		
b.	Poor Rock	Cum	1	30.00	120.95		3628.50		
	Total	Cum					13020.82	2967.70	38,641,899.38

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
7	**Provision for over break in underground excavation**								
	Excavation for tunnel due to natural causes such as geological faults etc., out of tunnel including breaking any large rockfragments by blasting if necessary and disposing off the same inspecified dump area or as directed including cost of all materials,machinery, labour, ventilation, drainage, lighting and all other ancillaryoperations etc., complete with initial lead upto 1 km and all lifts.	Cum		20% of Sr. No-06			2604.16	2967.70	7,728,379.88
8	**Backfill concrete (M-15)**								
	Providing and laying insitu vibrated M-15 (28 days cube compressive strength not less than 15 N / sq mm) grade cement concrete using 40 mm down size approved, clean, hard, graded aggregate crushed from tunnel excavated muck for filling and levelling over cuts in bed due to geological faults etc., including cost of all materials, labour, machinery, cleaning bed, batching, mixing, conveying and laying,levelling, compacting, finishing, curing, ventilation, lighting, drainageetc., complete with lead upto 1 km and all lifts.	Cum	1	15% of Sr. No-06			1953.12	7146.00	13,957,021.25
9	**Shotcreting**								
	Providing specified thick shortcrete to sides and arch of tunnel as per the mixed proporation of 10 mm size aggregate ,cement admixture determinded by contractor & approved by Engineer in Charge including cost of all materials, labour, machinery, ventilation, lighting,drainage and all other ancillaryoperations & excluding steel fibre etc., complete with lead upto 1 km and all lifts.								
	Inlet Portal								
a.	Average Rock	Cum	1	16.00	41.12	0.05	32.90		
b.	Poor Rock	Cum	1	24.00	42.34	0.05	50.81		
	Outlet Portal								
a.	Average Rock	Cum	1	30.00	42.70	0.05	64.05		
b.	Poor Rock	Cum	1	30.00	42.34	0.05	63.52		
	Total	Cum					211.28	12874.00	2,719,982.67

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
10	**RCC lining work M-25**								
	Providing and laying insitu vibrated M-25 (28 days cube compressive strength not less than 25 N/Sqmm) grade cement concrete using 25 mm and down size approved clean, hard, graded aggregate crushedfrom tunnel excavated muck for sides and arch lining including cost of all materials, machinery, labour, formwork, batching, mixing, conveyingupto placing point in agitator car, placing in position, levelling, vibrating,finishing, curing, ventilation, lighting, drainage and all other ancillaryoperations etc., complete with lead upto 1 km and all lifts.								
	Inlet Portal								
a.	Average Rock	Cum	1	16.00	26.016	0.50	208.13		
b.	Poor Rock	Cum	1	24.00	26.330	0.70	442.34		
	Outlet Portal								
a.	Average Rock	Cum	1	30.00	26.330	0.70	552.93		
b.	Poor Rock	Cum	1	30.00	43.900	1.20	1580.40		
	Total	Cum					2783.80	10359.00	28,837,404.92
11	**Reinforcement steel**								
	Providing, fabricating and placing in position reinforcement steel for tunnel RCC works including cleaning, straightening, cutting, bending, hooking, lapping / welding joints wherever required, tying with 1.25 mm diameter soft annealed steel wire, including cost of all materials, labour, machinery, ventilation, lighting, drainage etc., complete with lead upto 1 km and all lifts.	MT					361.89	84490.00	30,576,446.03
12	**Bed lining**								
	Providing and laying insitu vibrated M-15 (28 days cube compressive strength not less than 15 N / sqmm) grade cement concrete using 25 mm and down size approved clean, hard, graded aggregate crushedfrom tunnel excavated muck for bed lining including cost of all materials, machinery, labour, formwork, batching, mixing, conveyingupto placing point in agitator car, placing in position, levelling, vibrating,finishing, curing, ventilation, lighting, drainage and all other ancillaryoperations etc., complete with lead upto 1 km and all lifts.	Cum	1	100.00	13.5	0.1	135	7146.00	964,710.00

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
13	**Water proofing**								
	Umbrella System water proofing for tunnel geotextile/ drainage layer nailed at intervals onto tunnel wall using PVC-disk, 2pcs/sq.ya. membrane 3.0mm welded to PVC-disk. Joints welded by hot wedge machine or hot air. water barrier welded to membrane as required including cost of all materials, machinery,labour, ventilation, lighting, drainage etc., complete.	Sqm	1	100.00	27.371		2737.10	4200.00	11,495,820.00
14	**Sub Total 'B'**								138,598,751.17
15	**Dewatering @ 3%**								4,157,962.54
								Sub Total 'B'	**142,756,713.71**
C. Pavement & Side Drain Work									
1	**RCC Drain & Cable trench**								
	Providing and laying insitu vibrated M-25 (28 days cube compressive strength not less than 25 N / sqmm) grade cement concrete using 25 mm and down size approved clean, hard, graded aggregate crushedfrom tunnel excavated muck for bed lining including cost of all materials, machinery, labour, formwork, batching, mixing, conveyingupto placing point in agitator car, placing in position, levelling, vibrating,finishing, curing, ventilation, lighting, drainage and all other ancillaryoperations etc., complete with lead upto 1 km and all lifts.								
	Outer wall	Cum	2	300	0.150	0.700	63.00		
	Mid wall	Cum	2	300	0.075	0.625	28.13		
	End wall	Cum	2	300	0.075	0.625	28.13		
	Total	Cum					119.25	10359.00	1,235,310.75
2	**75 mm thick RCC Precast slab for Drain & Cable trench**								
	Providing, fabricating and placing in position M- 25 precast RCC slab including 60kg steel/ cum including casting , levelling, vibrating,finishing, curing,cleaning, straightening, cutting, bending,hooking, lapping / welding joints wherever required, tying with 16mm dia lifting hook, including cost of all materials, labour,machinery, ventilation, lighting, drainage etc., complete with lead upto 1 km and all lifts.	Cum	2	300	2.045	0.075	92.025	10359.00	953,286.98

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
3	**Reinforcement steel**								
	Providing, fabricating and placing in position reinforcement steel for tunnel RCC works including cleaning, straightening, cutting, bending, hooking, lapping / welding joints wherever required, tying with 1.25 mm diameter soft annealed steel wire, including cost of all materials, labour, machinery, ventilation, lighting, drainage etc., complete with lead upto 1 km and all lifts.	MT					12.677	84490.00	1,071,037.49
4	**Dry Lean Cement Concrete Sub- base**								
	Construction of dry lean cement concrete Sub- base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.	Cum	1	300	10.5	0.15	472.5	4054.00	1,915,515.00
5	**Cement Concrete Pavement**								
	Construction of un-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base with 43 grade cement @ 400 kg per cum, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing	Cum	1	300	10.5	0.35	1102.5	9456.00	10,425,240.00
								Sub Total 'D'	**15,600,390.21**
	Grand Total – Sub Total A + Sub Total B +Sub Total C+ Sub Total C=275603796.71+142756713.71+15600390.21								**433,960,900.6**

Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
D.Carriage of Materials									
Sr.No.	**Description**	**Unit**	**Unit of reqd**	**Total quantity**	**Unit weight**	**Carriage distance**	**Quantity**	**Rate in Rs**	**Amount in Rs**
1.0	**Loading and unloading of stone boulder/stone aggregates/sand**								
a	**Loading and unloading of stone aggregates**								
	M15 grade concrete	**Cum**	0.89	3738.12			3326.93	105.00	349327.65
	M20 grade concrete	**Cum**	0.90	1777.81			1600.03	105.00	168003.05
	M25 grade concrete	**Cum**	0.90	2995.08			2695.57	105.00	283034.78
	DLC	**Cum**	0.90	472.50			425.25	105.00	44651.25
	PQC	**Cum**	0.90	1102.50			992.25	105.00	104186.25
b	**Loading and unloading of sand**								
	M15 grade concrete	**Cum**	0.445	3738.12			1663.47	105.00	174663.83
	M20 grade concrete	**Cum**	0.450	1777.81			800.01	105.00	84001.52
	M25 grade concrete	**Cum**	0.450	2995.08			1347.78	105.00	141517.39
	DLC	**Cum**	0.450	472.50			212.63	105.00	22325.63
	PQC	**Cum**	0.500	1102.50			551.25	105.00	57881.25
	Shotcrete	**Cum**	1.050	1005.70			1055.98	105.00	110877.98
c	**Loading and unloading of cement & Steel by manual means and stacking**								
	M15 grade concrete	**MT**	0.320	3738.12			1196.20	155.00	185410.93
	M20 grade concrete	**MT**	0.340	1777.81			604.46	155.00	93690.59
	M25 grade concrete	**MT**	0.400	2995.08			1198.03	155.00	185694.77
	DLC	**MT**	0.150	472.50			70.88	155.00	10985.63
	PQC	**MT**	0.400	1102.50			441.00	155.00	68355.00
	Shotcrete	**MT**	0.510	1005.70			512.90	155.00	79500.26
	Grouting	**MT**	1.050	9.44			9.91	155.00	1536.36
	Steel	**MT**	1.050	1069.21			1122.67	155.00	174013.33
2.0	**Cost of Haulage Excluding Loading and Unloading**								
	Surfaced Road								
	a) Cement	**T.km**				145.00	4033.38	6.70	3918426.42
	b) Stone Aggregates	**T.km**				55.00	9040.03	6.70	3331250.43
	c) Sand	**T.km**				55.00	5631.12	6.70	2075067.68

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Sl. No.	Description	Units	Nos	Length	Width	Depth	Qty.	Rate in Rs.	Amount in Rs.
	d) Steel	**T.km**				145.00	1122.67	6.70	1090670.68
	Unsurface road								
	a) Cement	**T.km**				0.00	4033.38	-	0.00
	b) Stone Aggregates	**T.km**			1.74	5.00	4926.96	-	0.00
	c) Sand	**T.km**			1.84	5.00	2463.48	-	0.00
	d) Steel	**T.km**				0.00	1122.67	-	0.00
	Grand Total cost for carriage of material								**12,755,072.65**
	Grand Total cost for Tunnel								**446,715,973.27**

446,716,000.0

(Rupees forty four crore sixty seven lakh sixteen thousand) only

DETAIL ESTIMATE FOR 5KW OFF GRID SOLAR PLANT

Sr No.	Description	Unit	Quantity	Rate (Rs)	Amount (Rs)
1	**Supply of 5 kW off Grid Solar Power Plant** ((Solar PV Panel (300w Solar Panel 24v DC) (Mono/Poly)),Solar Battery (Gel Tubular) ,inverter (Charge Controller with Dusk to Dawn Function)	No	1	570,000.0	570000.00
2	Install, test and commission of 5KW solar light system single or multi-core copper cables including all necessary cleats, supports, brackets, glands, cable terminals, ducts, pipes, boxes, etc. includes excavations works and fillings ,all necessary accessories, required in order to light it with lamps and electronic starter with in the tunnel, complete as per sloar specification specifications. **(50 % of s/n-1)**	No	1	285,000.0	285000.00
3	Construction of conrol room ,battery room including excavtion of foundation, laying of M15 PCC ,brick masonry (1:3) ,plastering of wall 12mm thk (1:3) ,stone Masonry (1:4) ,Centering and shuttering including strutting,propping etd. And removal of form, fifting of watersupply ,door ,window& electrical fitting complete as per Drawing & CPWD Specification	Sqm	47	24,665.0	1159255.0
			TOTAL		**2014255.0**
				Say	**2000000.0**

Chapter – 03
BASIC RATE

Sr.No.	Description	Unit	Rates
1	Foreman	Monthly	45000.00
2	Operator-1	Monthly	30000.00
3	Operator-2	Monthly	25000.00
4	Mechanic	Monthly	25000.00
5	Electrician	Monthly	25000.00
6	Supervisor	Monthly	25000.00
7	Driver	Monthly	15000.00
8	Helper	Monthly	15000.00
9	Watchman	Monthly	15000.00
10	Cableman	Monthly	15000.00
11	Beldar	Monthly	20000.00
12	Diesel	Per Litre	65.00
13	Electricity	Per KWH	4.50
14	Explosive inspector	Monthly	30000.00
15	Explosive Chargeman	Monthly	2500.00
16	Drilling Rod	Rm	2400.00
17	Cold twisted bars (HYSD Fe 500 Bars)	MT	57432.18
18	Gelatine	Kg	110.00
19	Electric Detonators @ 1 detonator for 1/2 gelatin stick of 125 gms each	Each	276.00
20	Drilling steel	Rm	289.00
21	GI pipe 4" Dia	Rm	740.00
22	Cement (53 grade) (Ex-Singtam)	MT	9584.21
23	Sand	Cum	538.20
24	Coarse aggregate	Cum	1506.95
25	Admixtures (SP)	Kg	110.00

Chapter – 04

UNIT RATE

Sr.No.	Description	Unit	Rates
1	Shotcrete	Cum	12874.00
2	Rock bolt (25 mm)	Rm	4112.00
3	Rock excavation (heading)	Cum	3255.00
4	Rock excavation (benching)	Cum	2410.00
5	Tunnel excavation	Cum	2967.70
6	Grouting	MT	20322.17
7	Drilling grout holes upto 5 m depth	Rm	1593.00
8	Fabrication and erection of steel supports	MT	120056.00
9	Drainage hole 100 m dia.	Rm	5722.00
10	Concrete m15 (pumped concrete)	Cum	7146.00
11	Concrete m20 (pumped concrete)	Cum	8414.00
12	Concrete m 25 (pumped concrete)	Cum	10359.00
13	Precast RC Lagginge	Cum	21209.00

Chapter – 05

HOURLY USE RATE OF MACHINERY /EQUIPMENT

Sr.No.	Description of Equipment / Machinery	Capcacity	Hourly use Rate in Rs.
1	Three boom drill jumboo	3-boom	12476.14
2	Hydraulic Rock bolt drill	1-boom	11113.17
3	Jack hammer	120 cfm	986.29
4	Jack hammer	200 cfm	1129.40
5	Pneumatic Crawler Drill	48 - 75 mm	1892.56
6	Pneumatic Crawler Drill	76 - 110 mm	2448.08
7	Electrical air Compressor	1000 cfm, 180 KWH	2806.35
8	Electrical air Compressor	1500 cfm, 240 KWH	3219.86
9	Ventilation blower	50 HP	705.32
10	Excavator backhoe	2.8 cum	6667.87
11	Shovel	4.5 cum	8390.13
12	Front End loader	2.0 cum	3072.64
13	Front End loader	3.0 cum	4081.83
14	Crawler tractor dozer	180 HP	5697.94
15	Rear end dumper	18 t	3469.59
16	Pumpcrete machine	38 cum/ hr	4362.45
17	Shotcrete machine	6 cum/hr	3398.22
18	Batching & mixing plant	30 Cum	4783.21
19	Batching & mixing plant	60 Cum	6532.73
20	Two boom drill jumboo	2 -boom	10562.37
21	Transit mixer	4.5 cum	2687.57
22	Grouting Machine	5 cum/hr	1507.17
23	Road Header	35 Cum/hr	10327.51

Chapter – 06

ANALYSIS OF RATES

1 SHOTCRETE

Sr. No.	Activity	Equipment proposed	Capacity	Fixed time (mm)	Travelling speed (km/h)	
					Hauling (Loaded)	Return (Empty)
1	Preparation of Shotcrete mix	Batching & mixing	30 cum			
2	Transportation of shotcrete to site	Dumper	18 T	2.5	12	16
3	Placement of shotcrete	Shotcrete machine	6 cum/hr	3.0		

Operating effeciency and Job & mangement factors

Operating eficiency (for average classification) (min per hour)	50	Min/hr
Job & management factor (for excellent Job & management condition)	0.84	

Computation of unit rate of activity

Sr. No.	Description	Cmputation / Reference	Quantity/ Cost	Unit
1	**Cost of preparation of shotcrete mix per cum**			

1.1 Material charges

Sr. No.	Item	Quantity	% wastage	Quantity (with wastage)	Unit	Unit rate of item	Cost	Unit
1	Cement	425	5.0%	446.25	Kg	9.58	4276.95	Rs./Cum
2	Sand	0.85		0.85	cum	538.20	457.47	Rs./Cum
3	Coarse aggregate	0.28		0.28	cum	1506.95	421.95	Rs./Cum
4	Admixtures (SP)			4.00	Kg	110.00	440.00	Rs./Cum
5	Water						50.00	Rs./Cum
	Total cost of concrete material per cum						5646.37	Rs./Cum

1.2 Batching & mixing charges :

Batching & mixing plant of 30 cum capacity		30.00	Cum/hr
Ideal production rate			
Job & management factor		0.84	
Actual production rate		25.20	Cum/hr
Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment	4783.21	Rs./hr.
Rate of Batching & mixing plannt of 30 cum	Hourly use rates/Actual production rate	189.81	Rs./Cum
Abstract of cost for preparation of concrete mix per cum	**Sr.no : 1.1 +1.2**	**5836.18**	**Rs./Cum**

2 Cost of transportion of shotcrete to site of placement per cum

Rear dumper 18T capacity			
Capacity of dumper		6.87	Cum
Average lead	Assumed	3	
Dumper cycle time			
Loading time		16.36	min
Spotting turning & unloading time		2.5	min
Loaded haul @ 16 Km/hr	(Average lead x 60)/ Loaded speed	**15**	min
Empty haul @24 Km /hr	(Average lead x 60)/ Loaded speed	**11.25**	min
Total cycle time		**45.11**	**min**
Operation efficiency		50	Min/hr
Number of trips	Operating effeciency / Total cycle time	1.11	Times
Quantity carried by dumper	No. of trips x volume per trip	7.61	Cum

	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment	3469.59	Rs./hr.
	Cost per cum	**Hourly use rates/Actual production rate**	**455.64**	**Rs./Cum**
3	**Cost of placement of shotcrete at site per cum**			
3.1	**Machinery charges**			
	Ideal production rate		6	cum/hr
	Overall efficiency		75%	
	Actual production rate		4.500	cum/hr
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment	3398.219	Rs./hr.
	Cost per cum	Hourly use rates/Actual production rate	755.160	Rs./Cum
3.2	Light ,workshop charges,water charges and etc	100 % of machinery charges	755.160	Rs./Cum
	Total cost placement of shotcrete at site per cum	**Sr.no : 3.1 +3.2**	**1510.320**	**Rs./Cum**
4	**Abstract of shorcrete**	**Sr.no. 1+2+3**	**7802.14**	**Rs./Cum**
5	25% rebound	25 % of total sr.no. 4	1950.54	Rs./Cum
6	Prime cost	Sr.no : 4 + 5	9752.68	Rs./Cum
7	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 6	1950.54	Rs./Cum
8	Contractors profit @ 10% on (6+7)		1170.32	Rs./Cum
		Rate per cum	12873.53	Rs./Cum
		Rate per cum (Say)	**12874.00**	**Rs./Cum**

2 ROCK BOLT (25 mm)

Sr. No.	Description	Cmputation / Reference	Quantity/ Cost	Unit
1	**Drilling & Bolting**			
	One boom drill jumboo			
	Ideal production rate		50	Rm/hr
	Overall efficiency		70%	
	Actual production rate		35	Rm/hr
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment	11113.17	Rs./hr.
	Rate of drilling	Hourly use rates/Actual production rate	317.52	Rs./Rm
	Cost of drill rod per metre drilling		2400.00	Rs./Rm
	Light ,ventilation & workshop charges LS		35.00	Rs./Rm
	Total of drilling and Bolting		**2752.52**	**Rs./Rm**
2	**Supply and making the Bolts**			
(i)	Rock bolts 25 mm dia ,3.86 Kg per Rm	57.43218	221.69	Rs./Rm
(ii)	Wastage in cutting 2.5 % of (i) above		5.54	Rs./Rm
(iii)	Cutting & making tip,L.S.		15	Rs.
(iv)	Threading , L.S.		15	Rs.
(v)	Cost of nut and plate,L.S.		25	Rs.
	Total of supply and making of Bolts		**282.23**	**Rs./Rm**
3	**Instation**			
(i)	Grouting rock bolt,L.S.		15	Rs.
(ii)	Miscellaneous work,L.S.		15	Rs.
(iii)	Resin Capsule		50	Rs.
	Total Installation		**80.00**	**Rs./Rm**
4	**Prime cost**	**Sr.no. 1+2+3**	**3114.75**	**Rs./Rm**
5	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 4	622.95	**Rs./Rm**
6	Contractors profit @ 10% on (4+5)		373.77	**Rs./Rm**
		Rate per Rm	4111.47	**Rs./Rm**
		Rate per Rm (Say)	**4112.00**	**Rs./Rm**

3 ROCK EXCAVATION (HEADING)

The finished dia and excavated dia of tunnel are 10.3 & 11.65 m respectively.It is ensisaged to excavate the tunnel in two stages.Two third of excavation is proposed in heading & remaing in benching .This cost analysis is for heading excavation in very good /good/fair rock.

	Rock Type	**Very good /good/fair rock.**			**Heading**			
	Finished Dia in m	Excavated Dia in m		Area of the Tunnel in heading in sqm	Total excavated volume/unit length in cum			
	10.30	11.65		75.01	75.01			
1	**A. Progress of work**							
	Assumptions							
	Progess per cycle in m	Excn . Qty.per cycle in cum		Progresss per day in m	Excn. Qty.per day in cum			
	3	225.3		4	300.4			
	Depth of hole to be drilled			3.3 m				
	Pattern of drill hole (area)			0.64 Sqm				
	Spacing of holes on the perimeter C/C			0.8 m				
	No. of holes to be drilled = c.s.a of tunnel/area of drill hole							
	No. of holes	Perimeter holes	Cut Holes	Total No. of holes	Depth of Drilling (m)			
	117.20	30.65	3	150.85	497.805			
	B. Cycle of Operation							
	Placing of jumbo			0.50 hr.				
	Drilling			6.00 hr.				
	Loading/Blasting/defuming			1.50 hr.				
	Removal of jumbo			0.50 hr.				
	Shotcreting (primary)			1.00 hr.				
	Scaling			1.00 hr.				
	Shotcreting (secandary)			1.00 hr.				
	Mucking			4.50 hr.				
	Forepoling & supporting			2.00 hr.				
	Total Cycle time			**18.00 hr.**				
2	**Labour Charges / day**							
	Type-1 : Regular							
	Category			No.	M/day	Amount		
	Foreman			1.5	1500	2250.00		
	Operator-1			0	1000	0.00		
	Explosive inspector			1	1000	1000.00		
	Electrician			1.5	833	1250.00		
	Explosive Chargeman			0	83	0.00		
	Total wages of regular crew					**4500.00**		
	Type-2 : Casual							
	Helper to electrician			1.5	667	1000.00		
	Beldar			12	500	6000.00		
	Total wages of casual crew					**7000.00**		
	Total Direct labour charges in Rs.					11500.00		
	Add for indirect charges							
	(@ 80% of direct charges for regular workers & 55 % of direct crew charges for casual workers)					9925		
	Total labour charges per day in Rs.					21425.00		
	Rates per cum					**95.10**		
3	**Material Charges**							
i	**Drilling & Blasting**							
	Cost of Drilling steel in Rs.					289.00		

	Total cost of drill steel in Rs. = Cost of drill steel x Depth of drilling					143865.65
	Cost of drill steel /cum in Rs.= Total cost of drill steel /Qty. of excvn.per cycle					638.55
ii	**Explosive**					
a	Gelatine reqd. per cum (Kg)		Rate of Gelatine per Kg			Cost per cum in Rs.
	1.25		110			137.50
b	Nos. of detonators & fuse coils at one hole per face		Cost /each in Rs.	Qty. of excavation per cycle in cum		Rate per cum
	151		276	225.03		185.202
c	Other at 50% of ii(a)					68.75
	(Consumable petty stores such as blasting batteries , galvanometers & blasting wires etc.					
	Total explosive charges in Rs.					391.45
	Total drilling and Blasting charges in Rs.					1030.00
iii	**Provision of pipelines for air & water for wet drilling**					20.00
iv	**Miscellaneous Supplies**					15.00
	(Safety hats,gumboots,rain-coats, wire ropes ,manila ropes,U-clamps,GI					
	Total material charges per cum in Rs.					**1065.00**
4	**Machinery Charges**					
	Equipment	Nos.	Use per cycle	Total /cycle	Hourly use rate	Amount
	Drill jumbo 2 boom	1	6	6	10562.37	63374.229
	Loader, 2 cum	1	4.5	4.5	3072.64	13826.862
	Dumper ,18 ton	4	4.5	18	3469.59	62452.659
	Dozer 180 HP	1	2.25	2.25	5697.94	12820.361
					Total Machinery charges in Rs.	152474.111
	Rates per cum in Rs.					**676.760**
5	**Ventilation Blowers**					
	Hourly use rate of 5 nos Ventilation blower				3526.62	
	No. of working hours of blowers per cycle				18.00	
	Total Cost of blower				63479.17	
	Rate per cum in Rs.					**282.09**
6	**Shop charges (LS)**					
	Machine Shop	Structural Shop	Steel Metal Shop	Air & Water pipe shop	Carpentry shop	**Total**
	40	30	20	15	20	**125.00**
7	**Electrical Material Charges LS in Rs.**					**30.00**
8	**Compressed Air Chargers LS in Rs.**					**20.00**
9	**Water Charges LS in Rs.**					**10.00**
10	**Total Charges (2+3+4+5+6+7+8+9) in Rs.**					**2303.95**
11	**Maintenance of haul roads in Rs.**			**5% of total sr.no 10**		**115.20**
12	**Electricity charges in Rs.**			**2% of total sr.no 10**		**46.08**
13	Prime cost in Rs			**Sr.no. 10+11+12**		**2465.23**
14	Overhead charges & contractor's profit @ 20% of prime cost			**20 % of total sr.no. 13**		**493.05**
15	Contractors profit @ 10% on (13+14)					295.83
					Rate per cum	**3254.10**
					Rate per cum (Say)	**3255.00**

4 ROCK EXCAVATION (BENCHING)

The finished dia and excavated dia of tunnel are 10.3 & 11.65 m respectively.It is ensisaged to excavate the tunnel in two stages.Two third of excavation is proposed in heading & remaing in benching .This cost analysis is for heading excavation in very good /good/fair rock.

	Rock Type	**Very good /good/fair rock.**			**Benching**		
	Finished Dia in m	Excavated Dia in m		Area of the Tunnel in Benching in sqm	Total excavated volume cs area of bench x length of bench in cum		
	10.3	11.65		37.5	225.03		
1	**A. Progress of work**						
	Chord length of bench	9.786 m					
	Area under blast for 6 m pull	58.716 sqm					
	Assumptions						
	Progess per cycle in m	Excn . Qty.per cycle in cum		Progresss per day in m	Excn. Qty.per day in cum		
	6	225.03		8.78	329.31		
	Depth of hole to be drilled			3.30 m			
	Pattern of drill hole (area)			0.64 Sqm			
	Spacing of holes on the perimeter C/C			0.80 m			
	No. of holes to be drilled = c.s.a of tunnel/area of drill hole			91.74 Nos			
	Total drilling required			302.75 m			
	Drilling times with 2 nos of crawler drill			8.41 hr.			
	B. Cycle of Operation						
	Drilling			8.41 hr.			
	Loading/Blasting/defuming			1.00 hr.			
	Shotcreting (primary)			0.50 hr.			
	Shotcreting (secandary)			0.50 hr.			
	Mucking			4.50 hr.			
	Rock bolting & steel ribs			1.50 hr.			
	Total Cycle time			**16.41 hr.**			
2	**Labour Charges / day**						
	Type-1 : Regular						
	Category			No.	M/day	Amount	
	Foreman			1.5	1500	2250.00	
	Operator-1			0	1000	0.00	
	Explosive inspector			1	1000	1000.00	
	Electrician			1.5	833	1250.00	
	Explosive Chargeman			0	83	0.00	
	Total wages of regular crew					**4500.00**	
	Type-2 : Casual						
	Helper to electrician			1.5	667	1000.00	
	Beldar			12	500	6000.00	
	Total wages of casual crew					**7000.00**	
	Total Direct labour charges in Rs.					11500.00	
	Add for indirect charges						
	(@ 80% of direct charges for regular workers & 55 % of direct crew charges for casual workers)					9925	
	Total labour charges per day in Rs.					21425.00	
	Rates per cum					**95.21**	
3	**Material Charges**						
i	**Drilling & Blasting**						
	Cost of Drilling steel in Rs.					289.0	
	Total cost of drill steel in Rs. = Cost of drill steel x Depth of drilling					87496.01	
	Cost of drill steel /cum in Rs.= Total cost of drill steel /Qty. of excvn.per cycle					388.82	

ii	**Explosive**						
a	Gelatine reqd. per cum (Kg)		Rate of Gelatine per Kg				Cost per cum in Rs.
	1		110.00				110.00
b	Nos. of detonators & fuse coils at one		Cost /each in Rs.		Qty. of excavation		Rate per cum
	91.74		276.00		225.03		112.52
c	Other at 50% of ii(a)						55.00
	(Consumable petty stores such as blasting batteries , galvanometers & blasting wires etc.						
	Total explosive charges in Rs.						277.52
	Total drilling and Blasting charges in Rs.						666.34
iii	**Provision of pipelines for air & water for wet drilling**						10
iv	**Miscellaneous Supplies**						10
	(Safety hats,gumboots,rain-coats, wire ropes ,manila ropes,U-clamps,GI						
	Total material charges per cum in Rs.						**686.34**
4	**Machinery Charges**						
	Equipment	Nos.	Use per cycle	Total /cycle	Hourly use rate		Amount
	Crawler drill	2	8.4	16.8	1892.56		31794.941
	Loader,2 cum	1	4.5	4.5	3072.64		13826.862
	Dumper,18T	4	4.5	18	3469.59		62452.659
	Dozer 180 HP	1	2.25	2.25	5697.94		12820.361
					Total Machinery charges in Rs.		120894.823
	Rates per cum in Rs.						**537.239**
5	**Ventilation Blowers**						
	Hourly use rate of 5 nos Ventilation blower				3526.62		
	No. of working hours of blowers per cycle				16.40		
	Total Cost of blower				57836.58		
	Rate per cum in Rs.						**257.02**
6	**Shop charges (LS)**						
	Machine Shop	Structural Shop	Steel Metal Shop	Air & Water pipe shop	Carpentry shop		**Total**
	30	20	20	10	10		**90.00**
7	**Electrical Material Charges LS in Rs.**						**20.00**
8	**Compressed Air Chargers LS in Rs.**						**10.00**
9	**Water Charges LS in Rs.**						**10.00**
10	**Total Charges (2+3+4+5+6+7+8+9) in Rs.**						**1705.80**
11	**Maintenance of haul roads in Rs.**		**5% of total sr.no 10**				**85.29**
12	**Electricity charges in Rs.**		**2% of total sr.no 10**				**34.12**
13	Prime cost in Rs		**Sr.no. 10+11+12**				**1825.21**
14	Overhead charges & contractor's profit @ 20% of prime cost		**20 % of total sr.no. 13**				**365.04**
15	Contractors profit @ 10% on (13+14)						219.03
						Rate per cum	**2409.28**
						Rate per cum (Say)	**2410.00**

Rock excavation in Heading	**Rs.**	**3255.00**
Rock excavation in Benching	**Rs.**	**2410.00**
66 % in heading	**Rs.**	**2148.30**
34% in benching	**Rs.**	**819.40**
So rate per cum tunnel excavation	**Rs.**	**2967.70**

5 GROUTING

Sr. No.	Description	Cmputation / Reference	Quantity/ Cost	Unit
1	**Material Charges**	**Unit Quantity Rate Rs**		
	Cement	Bags 1.05 479.2105	503.171025	Bags
	Sand	Cum 0.071 538.20	38.2122	Cum
	Total		**541.38**	**Rs.**
2	**Washing the hole**			
	Cost of equipment (L.S.)		10.00	Rs.
	Cost of labour (L.S.)		10.00	Rs.
	Total		**20.00**	**Rs.**
3	**Grouting**			
	Grouting machine charges considering 8 bags / hr	Refer analysis of Hourly use rates of machines/ equipment	1507.17	Rs.
	Grouting charges per bag		188.40	Rs.
	Labour Charges (LS)		10.00	Rs.
	Total		**198.40**	**Rs.**
4	**Other misc. item such as G.I.pipe fitting & pressure testing etc (L.S.)**		**10**	**Rs.**
5	**Prime cost**	Sr.no. 1+2+3+4	**769.78**	**Rs.**
6	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 5	153.96	**Rs.**
7	Contractors profit @ 10% on (5+6)		92.37	**Rs.**
		Cost of grouting per bag of 50 Kg	1016.11	**Rs.**
		Rate per MT (Say)	**20322.17**	**Rs.**

6	DRILLING GROUT HOLES UPTO 5 M DEPTH			
Sr. No.	**Description**	**Cmputation / Reference**	**Quantity/ Cost**	**Unit**
1	**Equipment Charges**			
	Jack hammer	Refer analysis of Hourly use rates of machines/ equipment	986.29	Rs.
	Rate per Rm of drill	Average rate of drilling 35 mm dia holes for 4m /hr	1232.86	Rs.
2	**Material Charges**			
	Cost of drill rod per metre of drilling equals use rate of drill steel with jack hammer		2400.00	Rs.
3	**Labour,lighting & scaffolding etc at 60 % of 2 above**		1440.00	Rs.
4	**Ventilation and workshop charges at 40 % of 2 above**		960.00	Rs.
5	**Prime cost**	Sr.no. 1+2+3+4	**6032.86**	**Rs.**
6	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 5	1206.57	**Rs.**
7	Contractors profit @ 10% on (5+6)		723.94	**Rs.**
	Cost of drilling grouting holes per 5 Rm		7963.37	**Rs.**
	Rate per Rm (Say)		**1593.00**	**Rs.**

7	FABRICATION AND ERECTION OF STEEL SUPPORTS					
Sr. No.	Description	Cmputation / Reference			Quantity/ Cost	Unit
1	**Material Charges**	**Unit**	**Quantity**	**Rate Rs**		
	Structural steel	MT	1.025	57432.18	58867.9845	Rs.
2	**Fabrication Charges**					
a	Marking rolled section	2.5 % of sr.no.-1			1471.70	Rs.
b	Cutting of rolled section	3.0 % of sr.no.-1			1766.04	Rs.
c	Bending of rolled section	6.0 % of sr.no.-1			3532.08	Rs.
d	Welding					
i	Cost of electrodes including 20 % wastage	8.0 % of sr.no.-1			4709.44	Rs.
ii	Labour & electric charges	10.0 % of sr.no.-1			5886.80	Rs.
iii	Handling of material during	5.0 % of sr.no.-1			2943.40	Rs.
iv	Temporary fixture	8.0 % of sr.no.-1			4709.44	Rs.
	Total of fabrication				**25018.89**	**Rs.**
3	**Erection Charges**					
	Transportion of material out of w/shop, handling ,final matching & field welding ,etc	12.0 % of sr.no.-1			7064.16	Rs.
4	**Prime cost**	**Sr.no. 1+2+3**			**90951.04**	**Rs.**
5	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 4			18190.21	**Rs.**
6	Contractors profit @ 10% on (4+5)				10914.12	**Rs.**
	Cost of fabrication & erection of steel support per MT				**120055.37**	**Rs.**
	Rate per MT (Say)				**120056.00**	**Rs.**

8	DRAINAGE HOLE			
Sr. No.	**Description**	**Cmputation / Reference**	**Quantity/ Cost**	**Unit**
1	**Equipment Charges**			
	Jack hammer	Refer analysis of Hourly use rates of machines/ equipment	986.29	Rs.
	Rate per Rm of drill	Average rate of drilling100 mm dia holes for 6m depth /hr	164.38	Rs.
2	**Material Charges**			
i	Cost of drill rod per metre of drilling	Rate of drill steel with jack hammer	2400.00	Rs.
ii	Cost of shifting of wagon drill	5.0 % of sr.no.- 2 - i	960.00	Rs.
iii	Cost of GI pipe 4" Dia/m		740.00	Rs.
iv	Pressure relief valve charges / m LS		25.00	Rs.
v	Misc .stores /m LS		25.00	Rs.
	Total		**4150.00**	**Rs.**
3	**Installation charges**			
	Placing of pipe in position / m LS		20.00	Rs.
4	**Prime cost**	Sr.no. 1+2+3	**4334.38**	**Rs.**
5	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 4	866.88	**Rs.**
6	Contractors profit @ 10% on (4+5)		520.13	**Rs.**
		Cost of drainage hole per Rm	5721.38	**Rs.**
		Rate per Rm (Say)	**5722.00**	**Rs.**

9 CONCRETE M15 (PUMPED CONCRETE)

Sr.No.	Activity	Equipment proposed	Capacity	Fixed time (mm)	Travelling speed (km/h)	
					Hauling (Loaded)	Return (Empty)
1	Preparation of concrete mix	Batching & mixing	60 cum			
2	Transportation of concrete to site of placement (average lead of 2.65 Km)	Transit Mixer	4.5 cum	3	12	16
3	Placement of concrete	pumpcrete machine	38 cum/hr	3		
4	Vibration ,curing & finishing of concrete	Lump sum				

Operating effeciency and Job & mangement factors

Operating eficiency (for average classification) (min per hour)	50	Min/hr
Job & management factor (for excellent Job & management condition)	0.84	

Computation of unit rate of activity

Sr. No.	Description	Cmputation / Reference	Quantity/ Cost	Unit
1	**Cost of preparation of concrete mix per cum**			

1.1 Material charges

Sr. No.	Item	Quantity	% wastage	Quantity (with wastage)	Unit	Unit rate of item	Cost	Unit
1	Cement	300	5.0%	315	Kg	9.58	3019.03	Rs./Cum
2	Sand	0.45		0.45	cum	538.2	242.19	Rs./Cum
3	Coarse aggregate	0.9		0.9	cum	1506.95	1356.26	Rs./Cum
4	Admixtures (SP)	Lump sum					20.00	Rs./Cum
5	Water	Lump sum					10.00	Rs./Cum
	Total cost of concrete material per cum						**4647.47**	**Rs./Cum**
1.2	**Batching & mixing charges :**							
	Batching & mixing plant of 60 cum							
	Ideal production rate						60	Cum/hr
	Job & management factor						0.84	
	Actual production rate						50.4	Cum/hr
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment					6532.73	Rs./hr.
	Rate of Batching & mixing plant of 60 cum	Hourly use rates/Actual production rate					129.62	Rs./Cum
	Abstract of cost for preparation of concrete mix per cum	**Sr.no : 1.1 +1.2**					**4777.09**	**Rs./Cum**
2	**Cost of transportion of concrete to site of placement per cum**							
	Transite mixer of 4.5 cum capacity							
	Capacity of transite						4.5	Cum
	Average lead	Assumed					2	Km
	Transite mixer cycle time							
	Loading time						4.02	min
	Spotting turning & unloading time						3	min
	Loaded haul @ 16 Km/hr	(Average lead x 60)/ Loaded speed					**7.5**	min
	Empty haul @24 Km /hr	(Average lead x 60)/ Loaded speed					**5**	min
	Total cycle time						**19.52**	**min**
	Operation efficiency						50	Min/hr
	Number of trips	Operating effeciency / Total cycle time					2.56	Times
	Quantity carried by transite mixer	No. of trips x volume per trip					11.53	Cum
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment					2687.57	Rs./hr.

	Cost per cum	**Hourly use rates/Actual production rate**	**233.16**	**Rs./Cum**
3	**Cost of placement of concrete at site per cum**			
3.1	**Machinery charges**			
	Ideal production rate		38.00	cum/hr
	Overall efficiency		75%	
	Actual production rate		28.5	cum/hr
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment	4362.45	Rs./hr.
	Cost per cum	Hourly use rates/Actual production rate	153.07	Rs./Cum
3.2	Vibrating charges per cum	Lump sum	10.00	Rs./Cum
3.3	Cleaning,slurry,curing & finishing per cum	Lump sum	15.00	Rs./Cum
3.4	Catwalks & other aids for concreting per cum	Lump sum	10.00	Rs./Cum
3.5	Other charges e.g.electric energy,compressed air workshop & track charges per cum	Lump sum	20.00	Rs./Cum
3.6	Misc supplies such as hose pipe gum boots & small tools etc. per cum	Lump sum	20.00	Rs./Cum
	Total cost placement of shotcrete at site per cum	**Sr.no : 3.1 +3.2+3.3+3.4+3.5+3.6**	**228.07**	**Rs./Cum**
4	**Shuttering**	Lump sum	**175.00**	**Rs./Cum**
5	Prime cost	**Sr.no. 1+2+3+4**	**5413.32**	**Rs./Cum**
6	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 5	1082.66	Rs./Cum
7	Contractors profit @ 10% on (5+6)		649.60	Rs./Cum
		Rate per cum	7145.58	Rs./Cum
		Rate per cum (Say)	**7146.00**	**Rs./Cum**

10	CONCRETE M20 (PUMPED CONCRETE)					
Sr. No.	Activity	Equipment proposed	Capacity	Fixed time (mm)	Travelling speed (km/h)	
					Hauling (Loaded)	Return (Empty)
1	Preparation of concrete mix	Batching & mixing	60 cum			
2	Transportation of concrete to site of placement (average lead of 2.65 Km)	Transit Mixer	4.5 cum	3	12	16
3	Placement of concrete	pumpcrete machine	38 cum/hr	2.5		
4	Vibration ,curing & finishing of concrete	Lump sum				

Operating effeciency and Job & mangement factors

Operating eficiency (for average classification) (min per hour)	50	Min/hr
Job & management factor (for excellent Job & management condition)	0.84	

Computation of unit rate of activity

Sr. No.	Description	Cmputation / Reference	Quantity/ Cost	Unit
1	**Cost of preparation of concrete mix per cum**			

1.1 Material charges

Sr. No.	Item	Quantity	% wastage	Quantity (with wastage)	Unit	Unit rate of item	Cost	Unit
1	Cement	400	5.0%	420	Kg	9.58421	4025.37	Rs./Cum
2	Sand	0.43		0.43	cum	538.2	231.43	Rs./Cum
3	Coarse aggregate	0.86		0.86	cum	1506.95	1295.98	Rs./Cum
4	Admixtures (SP)	Lump sum					25.00	Rs./Cum
5	Water	Lump sum					10.00	Rs./Cum
	Total cost of concrete material per cum						**5587.77**	**Rs./Cum**
1.2	**Batching & mixing charges :**							
	Batching & mixing plant of 60 cum							
	Ideal production rate						60	Cum/hr
	Job & management factor						0.84	
	Actual production rate						50.4	Cum/hr
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment					6532.73	Rs./hr.
	Rate of Batching & mixing plant of 60 cum	Hourly use rates/Actual production rate					129.62	Rs./Cum
	Abstract of cost for preparation of concrete mix per cum	**Sr.no : 1.1 +1.2**					**5717.39**	**Rs./Cum**
2	**Cost of transportion of concrete to site of placement per cum**							
	Transite mixer of 4.5 cum capacity							
	Capacity of transite						4.5	Cum
	Average lead	Assumed					2	Km
	Transite mixer cycle time							
	Loading time						4.02	min
	Spotting turning & unloading time						3	min
	Loaded haul @ 16 Km/hr	(Average lead x 60)/ Loaded speed					**7.5**	min
	Empty haul @24 Km /hr	(Average lead x 60)/ Loaded speed					**5**	min
	Total cycle time						**19.52**	**min**
	Operation efficiency						50	Min/hr
	Number of trips	Operating effeciency / Total cycle time					2.56	Times
	Quantity carried by transite mixer	No. of trips x volume per trip					11.53	Cum
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment					2687.57	Rs./hr.
	Cost per cum	**Hourly use rates/Actual production rate**					**233.16**	**Rs./Cum**

3	**Cost of placement of concrete at site per cum**			
3.1	**Machinery charges**			
	Ideal production rate		38.00	cum/hr
	Overall efficiency		75%	
	Actual production rate		28.5	cum/hr
	Hourly use rate	Refer analysis of Hourly use rates of	4362.45	Rs./hr.
	Cost per cum	Hourly use rates/Actual production rate	153.07	Rs./Cum
3.2	Vibrating charges per cum	Lump sum	15.00	Rs./Cum
3.3	Cleaning,slurry,curing & finishing	Lump sum	20.00	Rs./Cum
3.4	Catwalks & other aids for concreting	Lump sum	10.00	Rs./Cum
3.5	Other charges e.g.electric	Lump sum	25.00	Rs./Cum
3.6	Misc supplies such as hose pipe gum	Lump sum	25.00	Rs./Cum
	Total cost placement of shotcrete at site per cum	**Sr.no : 3.1 +3.2+3.3+3.4+3.5+3.6**	**248.07**	**Rs./Cum**
4	**Shuttering**	Lump sum	**175.00**	**Rs./Cum**
5	Prime cost	**Sr.no. 1+2+3+4**	**6373.62**	**Rs./Cum**
6	Overhead charges & contractor's profit @ 20% of prime cost	20 % of total sr.no. 5	1274.72	Rs./Cum
7	Contractors profit @ 10% on (5+6)		764.83	Rs./Cum
		Rate per cum	8413.18	Rs./Cum
		Rate per cum (Say)	**8414.00**	**Rs./Cum**

11 CONCRETE M25 (PUMPED CONCRETE)

Sr. No.	Activity	Equipment proposed	Capacity	Fixed time (mm)	Travelling speed (km/h)	
					Hauling (Loaded)	Return (Empty)
1	Preparation of concrete mix	Batching & mixing	60 cum			
2	Transportation of concrete to site of placement (average lead of 2.65 Km)	Transit Mixer	4.5 cum	3	12	16
3	Placement of concrete	pumpcrete machine	38 cum/hr	2.5		
4	Vibration ,curing & finishing of concrete	Lump sum				

Operating effeciency and Job & mangement factors

Operating eficiency (for average classification) (min per hour)	50	Min/hr
Job & management factor (for excellent Job & management condition)	0.84	

Computation of unit rate of activity

Sr. No.	Description	Cmputation / Reference	Quantity/ Cost	Unit
1	**Cost of preparation of concrete mix per cum**			

1.1 Material charges

Sr. No.	Item	Quantity	% wastage	Quantity (with wastage)	Unit	Unit rate of item	Cost	Unit
1	Cement	550	5.0%	577.5	Kg	9.58	5534.88	Rs./Cum
2	Sand	0.42		0.42	cum	538.2	226.04	Rs./Cum
3	Coarse aggregate	0.84		0.84	cum	1506.95	1265.84	Rs./Cum
4	Admixtures (SP)	Lump sum					25.00	Rs./Cum
5	Water	Lump sum					10.00	Rs./Cum
	Total cost of concrete material per cum						**7061.76**	**Rs./Cum**
1.2	**Batching & mixing charges :**							
	Batching & mixing plant of 60 cum							
	Ideal production rate						60	Cum/hr
	Job & management factor						0.84	
	Actual production rate						50.4	Cum/hr
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment					6532.73	Rs./hr.
	Rate of Batching & mixing plant of 60	Hourly use rates/Actual production rate					129.62	Rs./Cum
	Abstract of cost for preparation of concrete mix per cum	**Sr.no : 1.1 +1.2**					**7191.38**	**Rs./Cum**
2	**Cost of transportion of concrete to site of placement per cum**							
	Transite mixer of 4.5 cum capacity							
	Capacity of transite						4.5	Cum
	Average lead	Assumed					2	Km
	Transite mixer cycle time							
	Loading time						4.02	min
	Spotting turning & unloading time						3	min
	Loaded haul @ 16 Km/hr	(Average lead x 60)/ Loaded speed					**7.5**	min
	Empty haul @24 Km /hr	(Average lead x 60)/ Loaded speed					**5**	min
	Total cycle time						**19.52**	**min**
	Operation efficiency						50	Min/hr
	Number of trips	Operating effeciency / Total cycle time					2.56	Times
	Quantity carried by transite mixer	No. of trips x volume per trip					11.53	Cum
	Hourly use rate	Refer analysis of Hourly use rates of					2687.57	Rs./hr.
	Cost per cum	**Hourly use rates/Actual production rate**					**233.16**	**Rs./Cum**

3	**Cost of placement of concrete at site per cum**			
3.1	**Machinery charges**			
	Ideal production rate		38.00	cum/hr
	Overall efficiency		75%	
	Actual production rate		28.5	cum/hr
	Hourly use rate	Refer analysis of Hourly use rates of machines/ equipment	4362.45	Rs./hr.
	Cost per cum	Hourly use rates/Actual production rate	153.07	Rs./Cum
3.2	Vibrating charges per cum	Lump sum	15.00	Rs./Cum
3.3	Cleaning,slurry,curing & finishing	Lump sum	20.00	Rs./Cum
3.4	Catwalks & other aids for concreting	Lump sum	10.00	Rs./Cum
3.5	Other charges e.g.electric	Lump sum	25.00	Rs./Cum
3.6	Misc supplies such as hose pipe gum	Lump sum	25.00	Rs./Cum
	Total cost placement of shotcrete at site per cum	**Sr.no : 3.1 +3.2+3.3+3.4+3.5+3.6**	**248.07**	**Rs./Cum**
4	**Shuttering**	Lump sum	**175.00**	**Rs./Cum**
5	Prime cost	**Sr.no. 1+2+3+4**	**7847.61**	**Rs./Cum**
6	Overhead charges & contractor's	20 % of total sr.no. 5	1569.52	Rs./Cum
7	Contractors profit @ 10% on (5+6)		941.71	Rs./Cum
		Rate per cum	10358.85	Rs./Cum
		Rate per cum (Say)	**10359.00**	**Rs./Cum**

12 PRECAST RC LAGGINGE

Sr. No.	Item	Quantity	Unit rate of item	Cost	Unit
	Precast RC Lagginge (Per Cum)				
1	Cost of concrete M20	1.00	8414.00	8414.00	**Rs./Cum**
2	Reinforcement @ 60 Kg/Cum	60.00	57.43218	3445.93	**Rs./MT**
3	Cost of labour for placement , moulds & curing ,transport etc @ 50 % cost of concrete			4207.00	
4	Prime cost	**Sr.no. 1+2+3**		**16066.93**	**Rs./Cum**
5	Overhead charges & contractor's	20 % of total sr.no. 4		3213.39	Rs./Cum
6	Contractors profit @ 10% on (4+5)			1928.03	Rs./Cum
		Rate per cum		21208.35	Rs./Cum
		Rate per cum (Say)		**21209.00**	**Rs./Cum**

13 EXCAVATION OF TUNNEL WITH ROAD HEADER

The finished dia and excavated dia of tunnel are 10.3 & 11.65 m respectively.It is ensisaged to excavate the tunnel in

	Rock Type	**Very good /good/fair rock.**		**Heading**			
	Finished Dia in m	Excavated Dia in m	Area of the Tunnel in	Total excavated volume/unit length			
	10.30	11.65	75.01	75.01			
1	**A. Progress of work**						
	Assumptions						
	Progess per cycle in m	Excn. Qty.per cycle in cum	Progresss per day in m	Excn. Qty.per day in cum			
	2	150.02	2	150.02			
	B. Cycle of Operation						
	Placing of Road header		0.50 hr.				
	Cutting		7.00 hr.				
	Removal of Road header		0.50 hr.				
	Shotcreting (primary)		1.00 hr.				
	Scaling		1.00 hr.				
	Shotcreting (secandary)		1.00 hr.				
	Mucking		3.00 hr.				
	Forepoling & supporting		2.00 hr.				

	Total Cycle time				**16.00 hr.**		
2	**Labour Charges / day**						
	Type-1 : Regular						
	Category				No.	M/day	Amount
	Foreman				2	1500	3000.00
	Operator-1				2	1000	2000.00
	Electrician				2	833	1666.67
	Total wages of regular crew						**6666.67**
	Type-2 : Casual						
	Helper to electrician				2	667	1333.33
	Beldar				8	500	4000.00
	Total wages of casual crew						**5333.33**
	Total Direct labour charges in Rs.						12000.00
	Add for indirect charges						
	(@ 80% of direct charges for regular workers & 55 % of direct crew charges for casual workers)						11933.33333
	Total labour charges per day in Rs.						23933.33
	Rates per cum						**159.53**
iii	**Provision of pipelines for air & dewater**						20.00
iv	**Miscellaneous Supplies**						15.00
	(Safety hats,gumboots,rain-coats, wire ropes ,manila ropes,U-clamps,GI						
	Total material charges per cum in Rs.						**35.00**
4	**Machinery Charges**						
	Equipment	Nos.	Use per cycle	Total /cycle	Hourly use rate		Amount
	Road Header	1	7.0	7	10327.51		72292.544
	Loader, 2 cum	2	6	12	3072.64		36871.632
	Dumper ,18 ton	4	4	16	3469.59		55513.475
	Dozer 180 HP	1	2.25	2.25	5697.94		12820.361
						Total Machinery charges in Rs.	177498.012
	Rates per cum in Rs.						**1183.162**
5	**Ventilation Blowers**						
	Hourly use rate of 5 nos Ventilation blower				3526.62		
	No. of working hours of blowers per cycle				16.00		
	Total Cost of blower				56425.93		
	Rate per cum in Rs.						**376.12**
6	**Shop charges (LS)**						
	Machine Shop	Structural Shop	Steel Metal Shop	Air & Water pipe shop	Carpentry shop		**Total**
	40	30	20	15	20		**125.00**
7	**Electrical Material Charges LS in Rs.**						**50.00**
8	**Compressed Air Chargers LS in Rs.**						**40.00**
9	**Water Charges LS in Rs.**						**20.00**
10	**Total Charges (2+3+4+5+6+7+8+9) in Rs.**						**1988.82**
11	**Maintenance of haul roads in Rs.**			**5% of total sr.no 10**			**99.44**
12	**Electricity charges in Rs.**			**2% of total sr.no 10**			**39.78**
13	Prime cost in Rs			**Sr.no. 10+11+12**			**2128.04**
14	Overhead charges @ 20% of prime cost			**20 % of total sr.no. 13**			**425.61**
15	Contractors profit @ 10% on (13+14)						255.36
						Rate per cum	**2809.01**
						Rate per cum (Say)	**2810.00**

Chapter – 07

ANALYSIS OF RATE OF MACHINERY /EQUIPMENT

1 THREE BOOM DRILL JUMBO

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.58,808,398.00
B.	Depreciation value @ 15% of A		=	Rs.8,821,259.70
C.	Depreciation, = A-B =	Rs.(58808398-8821259.7)	=	Rs.49,987,138.30
D.	Economic life of machine (In hours)		=	15000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.49987138.3 / 15000	=	Rs.3,332.48
G.	Storage charge per hour @ 1% of F	=0.01 x 3332.48	=	Rs.33.32
	Total ownership charge = F +G	**Rs.(3332.48 + 33.32)**	**=**	**Rs.3,365.80**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of parts etc. @ 150% of C/D spread over economic life

ie. 1.50 xC/D = 1.5 x 3332.475886 Rs.4,998.71

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-1	6.000	30000.00	180000.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
Total monthly wages of regular crew			**215625.00**
Casual			
Helper	12.000	15000.00	180000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
Total monthly wages of regular crew			**191250.00**
Total direct crew charges/month			406875.00
Total indirect crew charges/month (@ 80% of direct charges for regular workers & 55 % of direct crew charges for casual workers)			277687.50
Total crew charges/month			684562.50
Total crew charges/year			8214750.00
Hours crew charges			2738.25

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	90	
Type factor C1	0.25	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	4.95	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**321.75**
Electrically powerd		
B.H.P of Engine	135	
Type factor C1	0.8	
Duty factor C2	1	
Hourly fuel comsumption = 0.746xFHPxC1xC2(In KWH)	80.57	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**362.56**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**189.20**
Hourly P.O.L & Energy charges (in Rs.)		**873.51**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.) 499.87

	Total hourly operational cost (in Rs.) = 4998.71+2738.25+873.52+499.88			9110.34
	Hourly use rate of the equipment (in Rs.) = 3365.796+9110.342			**12476.14**

2 HYDRAULIC ROCK BOLT DRILL

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.51,456,903.00
B.	Depreciation value @ 15% of A		=	Rs.7,718,535.45
C.	Depreciation, = A-B =	Rs.(51456903-7718535.45)	=	Rs.43,738,367.55
D.	Economic life of machine (In hours)		=	15000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.43738367.55 / 15000	=	Rs.2,915.89
G.	Storage charge per hour @ 1% of F	=0.01 x 2915.9	=	Rs.29.16
	Total ownership charge = F +G	**Rs.(2915.9 + 29.16)**	**=**	**Rs.2,945.05**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of		
ie. 1.50 xC/D =	**1.5 x 2915.89117**	**Rs.4,373.84**

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-1	6.000	30000.00	180000.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
Total monthly wages of regular crew			**215625.00**
Casual			
Helper	12.000	15000.00	180000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
Total monthly wages of regular crew			**191250.00**
Total direct crew charges/month			406875.00
Total indirect crew charges/month			277687.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			684562.50
Total crew charges/year			8214750.00
Hours crew charges			2738.25

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	90	
Type factor C1	0.25	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	4.95	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**321.75**
Electrically powerd		
B.H.P of Engine	62	
Type factor C1	0.8	
Duty factor C2	1	
Hourly fuel comsumption = 0.746xFHPxC1xC2(In KWH)	37.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**166.51**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**130.39**
Hourly P.O.L & Energy charges (in Rs.)		**618.65**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	437.38
Total hourly operational cost (in Rs.) = 4373.84+2738.25+618.65+437.39	8168.12
Hourly use rate of the equipment (in Rs.) = 2945.052+8168.121	**11113.17**

3 JACK HAMMER ,120 cfm

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	
B.	Depreciation value @ 15% of A		=	Rs.36.15
C.	Depreciation, = A-B =	Rs.(241-36.15)	=	Rs.204.85
D.	Economic life of machine (In hours)		=	10000.00
E.	Annual Scheduled Production hours			2200.00
F.	Depreciation per hour = C/D =	Rs.204.85 / 10000	=	Rs.0.02
G.	Storage charge per hour @ 1% of F	=0.01 x 0.03	=	Rs.0.00
	Total ownership charge = F +G	**Rs.(0.03 + 0)**	**=**	**Rs.0.02**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 0.020485 Rs.0.03

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.000	45000.00	0.00
Operator-2	2.000	25000.00	50000.00
Mechanic	0.250	25000.00	6250.00
Electrician	0.000	25000.00	0.00
Supervisor	0.400	25000.00	10000.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**66250.00**
Casual			
Helper	1.000	15000.00	15000.00
Watchman	0.250	15000.00	3750.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**18750.00**
Total direct crew charges/month			85000.00
Total indirect crew charges/month			63312.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			148312.50
Total crew charges/year			1779750.00
Hours crew charges			808.98

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.746xFHPxC1xC2(In KWH)	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	118.17	
Cost of compressed air (120 cfm)		**141.80**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**35.45**
Hourly P.O.L & Energy charges (in Rs.)		**177.26**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	0.00
Total hourly operational cost (in Rs.) = 0.03+808.98+177.26+0.01	986.27
Hourly use rate of the equipment (in Rs.) = 0.021+986.266	**986.29**

4 JACK HAMMER ,200 cfm

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.110,576.00
B.	Depreciation value @ 15% of A		=	Rs.16,586.40
C.	Depreciation, = A-B =	Rs.(110576-16586.4)	=	Rs.93,989.60
D.	Economic life of machine (In hours)		=	10000.00
E.	Annual Scheduled Production hours			2200.00
F.	Depreciation per hour = C/D =	Rs.93989.6 / 10000	=	Rs.9.40
G.	Storage charge per hour @ 1% of F	=0.01 x 9.4	=	Rs.0.09
	Total ownership charge = F +G	**Rs.(9.4 + 0.09)**	**=**	**Rs.9.49**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 9.39896 Rs.14.10

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.000	45000.00	0.00
Operator-2	2.000	25000.00	50000.00
Mechanic	0.250	25000.00	6250.00
Electrician	0.000	25000.00	0.00
Supervisor	0.400	25000.00	10000.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**66250.00**
Casual			
Helper	1.000	15000.00	15000.00
Watchman	0.250	15000.00	3750.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**18750.00**
Total direct crew charges/month			85000.00
Total indirect crew charges/month			63312.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			148312.50
Total crew charges/year			1779750.00
Hours crew charges			808.98

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.746xFHPxC1xC2(In KWH)	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	118.17	
Cost of compressed air (200 cfm)		**236.34**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**59.09**
Hourly P.O.L & Energy charges (in Rs.)		**295.43**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	1.41
Total hourly operational cost (in Rs.) = 14.1+808.98+295.43+1.41	1119.91
Hourly use rate of the equipment (in Rs.) = 9.489+1119.913	**1129.40**

5 PNEUMATIC CRAWLER DRILL (48 - 75mm)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.1,836,983.00
B.	Depreciation value @ 15% of A		=	Rs.275,547.45
C.	Depreciation, = A-B =	Rs.(1836983-275547.45)	=	Rs.1,561,435.55
D.	Economic life of machine (In hours)		=	8000.00
E.	Annual Scheduled Production hours			2200.00
F.	Depreciation per hour = C/D =	Rs.1561435.55 / 8000	=	Rs.195.18
G.	Storage charge per hour @ 1% of F	=0.01 x 195.18	=	Rs.1.95
	Total ownership charge = F +G	**Rs.(195.18 + 1.95)**	**=**	**Rs.197.13**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 195.1794437 Rs.292.77

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.250	45000.00	11250.00
Operator-1	2.000	30000.00	60000.00
Mechanic	0.250	25000.00	6250.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**77500.00**
Casual			
Helper	2.000	15000.00	30000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**37500.00**
Total direct crew charges/month			115000.00
Total indirect crew charges/month			82625.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			197625.00
Total crew charges/year			2371500.00
Hours crew charges			1077.95

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.746xFHPxC1xC2(In KWH)	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	118.17	
Cost of compressed air (200 cfm)		**236.34**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**59.09**
Hourly P.O.L & Energy charges (in Rs.)		**295.43**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	29.28
Total hourly operational cost (in Rs.) = 292.77+1077.96+295.43+29.28	1695.43
Hourly use rate of the equipment (in Rs.) = 197.13+1695.427	**1892.56**

6 PNEUMATIC CRAWLER DRILL (76 - 100mm)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.2,757,257.00
B.	Depreciation value @ 15% of A		=	Rs.413,588.55
C.	Depreciation, = A-B =	Rs.(2757257-413588.55)	=	Rs.2,343,668.45
D.	Economic life of machine (In hours)		=	8000.00
E.	Annual Scheduled Production hours			2200.00
F.	Depreciation per hour = C/D =	Rs.2343668.45 / 8000	=	Rs.292.96
G.	Storage charge per hour @ 1% of F	=0.01 x 292.96	=	Rs.2.93
	Total ownership charge = F +G	**Rs.(292.96 + 2.93)**	**=**	**Rs.295.89**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 292.9585562 Rs.439.44

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.250	45000.00	11250.00
Operator-1	2.000	30000.00	60000.00
Mechanic	0.250	25000.00	6250.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**77500.00**
Casual			
Helper	2.000	15000.00	30000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**37500.00**
Total direct crew charges/month			115000.00
Total indirect crew charges/month			82625.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			197625.00
Total crew charges/year			2371500.00
Hours crew charges			1077.95

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.746xFHPxC1xC2(In KWH)	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	118.17	
Cost of compressed air (400 cfm)		**472.68**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**118.17**
Hourly P.O.L & Energy charges (in Rs.)		**590.85**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	43.94
Total hourly operational cost (in Rs.) = 439.44+1077.96+590.85+43.95	2152.19
Hourly use rate of the equipment (in Rs.) = 295.889+2152.189	**2448.08**

7 ELECTRICAL AIR COMPRESSOR 1000 cfm 180 KWH

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.1,653,284.00
B.	Depreciation value @ 15% of A		=	Rs.247,992.60
C.	Depreciation, = A-B =	Rs.(1653284-247992.6)	=	Rs.1,405,291.40
D.	Economic life of machine (In hours)		=	20000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.1405291.4 / 20000	=	Rs.70.26
G.	Storage charge per hour @ 1% of F	=0.01 x 70.27	=	Rs.0.70
	Total ownership charge = F +G	**Rs.(70.27 + 0.7)**	**=**	**Rs.70.96**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 70.26457 Rs.105.40

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-1	3.000	30000.00	90000.00
Mechanic	0.990	25000.00	24750.00
Electrician	1.500	25000.00	37500.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**169125.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**56250.00**
Total direct crew charges/month			225375.00
Total indirect crew charges/month			166237.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			391612.50
Total crew charges/year			4699350.00
Hours crew charges			1566.45

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	180.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**810.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**243.00**
Hourly P.O.L & Energy charges (in Rs.)		**1053.00**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	10.54
Total hourly operational cost (in Rs.) = 105.4+1566.45+1053+10.54	2735.39
Hourly use rate of the equipment (in Rs.) = 70.965+2735.39	**2806.35**

8 ELECTRICAL AIR COMPRESSOR 1500 cfm 240 KWH

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.2,206,163.00
B.	Depreciation value @ 15% of A		=	Rs.330,924.45
C.	Depreciation, = A-B =	Rs.(2206163-330924.45)	=	Rs.1,875,238.55
D.	Economic life of machine (In hours)		=	20000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.1875238.55 / 20000	=	Rs.93.76
G.	Storage charge per hour @ 1% of F	=0.01 x 93.77	=	Rs.0.94
	Total ownership charge = F +G	**Rs.(93.77 + 0.94)**	**=**	**Rs.94.70**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 93.7619275 Rs.140.64

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-1	3.000	30000.00	90000.00
Mechanic	0.990	25000.00	24750.00
Electrician	1.500	25000.00	37500.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**169125.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**56250.00**
Total direct crew charges/month			225375.00
Total indirect crew charges/month			166237.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			391612.50
Total crew charges/year			4699350.00
Hours crew charges			1566.45

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	240.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**1080.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**324.00**
Hourly P.O.L & Energy charges (in Rs.)		**1404.00**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	14.06
Total hourly operational cost (in Rs.) = 140.64+1566.45+1404+14.07	3125.15
Hourly use rate of the equipment (in Rs.) = 94.702+3125.154	**3219.86**

9 DIESEL COMPRESSOR 500 cfm

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.1,148,560.00
B.	Depreciation value @ 15% of A		=	Rs.172,284.00
C.	Depreciation, = A-B =	Rs.(1148560-172284)	=	Rs.976,276.00
D.	Economic life of machine (In hours)		=	12000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.976276 / 12000	=	Rs.81.36
G.	Storage charge per hour @ 1% of F	=0.01 x 81.36	=	Rs.0.81
	Total ownership charge = F +G	**Rs.(81.36 + 0.81)**	**=**	**Rs.82.17**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 81.35633333 Rs.122.03

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-1	3.000	30000.00	90000.00
Mechanic	0.990	25000.00	24750.00
Electrician	1.500	25000.00	37500.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**169125.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**56250.00**
Total direct crew charges/month			225375.00
Total indirect crew charges/month			166237.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			391612.50
Total crew charges/year			4699350.00
Hours crew charges			1566.45

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	148	
Type factor C1	1	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	32.56	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**2116.40**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**529.10**
Hourly P.O.L & Energy charges (in Rs.)		**2645.50**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	12.20
Total hourly operational cost (in Rs.) = 122.03+1566.45+2645.5+12.21	4346.18
Hourly use rate of the equipment (in Rs.) = 82.167+4346.183	**4428.35**

10 VENTILATION BLOWER,50 HP

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.686,639.00
B.	Depreciation value @ 15% of A		=	Rs.102,995.85
C.	Depreciation, = A-B =	Rs.(686639-102995.85)	=	Rs.583,643.15
D.	Economic life of machine (In hours)		=	20000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.583643.15 / 20000	=	Rs.29.18
G.	Storage charge per hour @ 1% of F	=0.01 x 29.19	=	Rs.0.29
	Total ownership charge = F +G	**Rs.(29.19 + 0.29)**	**=**	**Rs.29.47**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 29.1821575 Rs.43.77

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.000	45000.00	0.00
Operator-2	0.750	25000.00	18750.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
Total monthly wages of regular crew			**37500.00**
Casual			
Helper	1.500	15000.00	22500.00
Watchman	0.000	15000.00	0.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
Total monthly wages of regular crew			**22500.00**
Total direct crew charges/month			60000.00
Total indirect crew charges/month			42375.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			102375.00
Total crew charges/year			1228500.00
Hours crew charges			409.50

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	50	
Type factor C1	1	
Duty factor C2	1	
Hourly fuel comsumption	37.30	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**167.85**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**50.36**
Hourly P.O.L & Energy charges (in Rs.)		**218.21**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	4.38
Total hourly operational cost (in Rs.) = 43.77+409.5+218.21+4.38	675.85
Hourly use rate of the equipment (in Rs.) = 29.473+675.852	**705.32**

11 EXCAVATOR BACKHOE

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.20,215,722.00
B.	Depreciation value @ 15% of A		=	Rs.3,032,358.30
C.	Depreciation, = A-B =	Rs.(20215722-3032358.3)	=	Rs.17,183,363.70
D.	Economic life of machine (In hours)		=	17500.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.17183363.7 / 17500	=	Rs.981.91
G.	Storage charge per hour @ 1% of F	=0.01 x 981.91	=	Rs.9.82
	Total ownership charge = F +G	**Rs.(981.91 + 9.82)**	**=**	**Rs.991.73**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 981.9064971 Rs.1,472.86

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.750	45000.00	33750.00
Operator-1	3.000	30000.00	90000.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**142500.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**56250.00**
Total direct crew charges/month			198750.00
Total indirect crew charges/month			144937.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			343687.50
Total crew charges/year			4124250.00
Hours crew charges			1374.75

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	300	
Type factor C1	0.5	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	33	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**2145.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**536.25**
Hourly P.O.L & Energy charges (in Rs.)		**2681.25**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	147.29
Total hourly operational cost (in Rs.) = 1472.86+1374.75+2681.25+147.29	5676.15
Hourly use rate of the equipment (in Rs.) = 991.727+5676.146	**6667.87**

12 SHOVEL , 4.5 CUM

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.33,079,947.00
B.	Depreciation value @ 15% of A		=	Rs.4,961,992.05
C.	Depreciation, = A-B =	Rs.(33079947-4961992.05)	=	Rs.28,117,954.95
D.	Economic life of machine (In hours)		=	40000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.28117954.95 / 40000	=	Rs.702.95
G.	Storage charge per hour @ 1% of F	=0.01 x 702.95	=	Rs.7.03
	Total ownership charge = F +G	**Rs.(702.95 + 7.03)**	**=**	**Rs.709.98**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 702.9488737 Rs.1,054.42

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.750	45000.00	33750.00
Operator-1	3.000	30000.00	90000.00
Mechanic	1.500	25000.00	37500.00
Electrician	0.000	25000.00	0.00
Supervisor	3.000	25000.00	75000.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**236250.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of casual crew		**56250.00**
Total direct crew charges/month			292500.00
Total indirect crew charges/month			219937.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			512437.50
Total crew charges/year			6149250.00
Hours crew charges			2049.75

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	410	
Type factor C1	0.61	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	55.022	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**3576.43**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**894.11**
Hourly P.O.L & Energy charges (in Rs.)		**4470.54**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	105.44
Total hourly operational cost (in Rs.) = 1054.42+2049.75+4470.54+105.45	7680.15
Hourly use rate of the equipment (in Rs.) = 709.979+7680.15	**8390.13**

13 FRONT END LOADER 2.0 CUM

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.5,512,730.00
B.	Depreciation value @ 15% of A		=	Rs.826,909.50
C.	Depreciation, = A-B =	Rs.(5512730-826909.5)	=	Rs.4,685,820.50
D.	Economic life of machine (In hours)		=	15000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.4685820.5 / 15000	=	Rs.312.39
G.	Storage charge per hour @ 1% of F	=0.01 x 312.39	=	Rs.3.12
	Total ownership charge = F +G	**Rs.(312.39 + 3.12)**	**=**	**Rs.315.51**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 312.3880333 Rs.468.58

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-2	3.000	25000.00	75000.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**110625.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**52500.00**
Total direct crew charges/month			163125.00
Total indirect crew charges/month			117375.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			280500.00
Total crew charges/year			3366000.00
Hours crew charges			1122.00

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	108	
Type factor C1	0.58	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	13.78	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**895.75**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**223.94**
Hourly P.O.L & Energy charges (in Rs.)		**1119.69**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	46.86
Total hourly operational cost (in Rs.) = 468.58+1122+1119.69+46.86	2757.13
Hourly use rate of the equipment (in Rs.) = 315.509+2757.128	**3072.64**

14 FRONT END LOADER 3.0 CUM

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.5,880,127.00
B.	Depreciation value @ 15% of A		=	Rs.882,019.05
C.	Depreciation, = A-B =	Rs.(5880127-882019.05)	=	Rs.4,998,107.95
D.	Economic life of machine (In hours)		=	15000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.4998107.95 / 15000	=	Rs.333.21
G.	Storage charge per hour @ 1% of F	=0.01 x 333.21	=	Rs.3.33
	Total ownership charge = F +G	**Rs.(333.21 + 3.33)**	**=**	**Rs.336.54**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 333.2071966 Rs.499.81

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-2	3.000	25000.00	75000.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**110625.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**52500.00**
Total direct crew charges/month			163125.00
Total indirect crew charges/month			117375.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			280500.00
Total crew charges/year			3366000.00
Hours crew charges			1122.00

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	200	
Type factor C1	0.58	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	25.52	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**1658.80**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**414.70**
Hourly P.O.L & Energy charges (in Rs.)		**2073.50**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	49.98
Total hourly operational cost (in Rs.) = 499.81+1122+2073.5+49.99	3745.29
Hourly use rate of the equipment (in Rs.) = 336.538+3745.291	**4081.83**

15 CRAWLER TRACTOR DOZER 180 HP

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.15,437,785.00
B.	Depreciation value @ 15% of A		=	Rs.2,315,667.75
C.	Depreciation, = A-B =	Rs.(15437785-2315667.75)	=	Rs.13,122,117.25
D.	Economic life of machine (In hours)		=	12000.00
E.	Annual Scheduled Production hours			2200.00
F.	Depreciation per hour = C/D =	Rs.13122117.25 / 12000	=	Rs.1,093.51
G.	Storage charge per hour @ 1% of F	=0.01 x 1093.51	=	Rs.10.94
	Total ownership charge = F +G	**Rs.(1093.51 + 10.94)**	**=**	**Rs.1,104.45**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 1093.509770 Rs.1,640.26

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.500	45000.00	22500.00
Operator-2	0.000	25000.00	0.00
Mechanic	0.500	25000.00	12500.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	2.000	15000.00	30000.00
	Total monthly wages of regular crew		**65000.00**
Casual			
Helper	2.000	15000.00	30000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**37500.00**
Total direct crew charges/month			102500.00
Total indirect crew charges/month			72625.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			175125.00
Total crew charges/year			2101500.00
Hours crew charges			955.23

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	180	
Type factor C1	0.57	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	22.57	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**1467.18**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**366.80**
Hourly P.O.L & Energy charges (in Rs.)		**1833.98**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	164.03
Total hourly operational cost (in Rs.) = 1640.26+955.23+1833.98+164.03	4593.49
Hourly use rate of the equipment (in Rs.) = 1104.45+4593.489	**5697.94**

16 REAR END DUMPER 18t

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.6,433,005.00
B.	Depreciation value @ 15% of A		=	Rs.964,950.75
C.	Depreciation, = A-B =	Rs.(6433005-964950.75)	=	Rs.5,468,054.25
D.	Economic life of machine (In hours)		=	12000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.5468054.25 / 12000	=	Rs.455.67
G.	Storage charge per hour @ 1% of F	=0.01 x 455.68	=	Rs.4.56
	Total ownership charge = F +G	**Rs.(455.68 + 4.56)**	**=**	**Rs.460.23**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 455.6711875 Rs.683.51

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-1	3.000	30000.00	90000.00
Mechanic	0.500	25000.00	12500.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
Total monthly wages of regular crew			**119375.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
Total monthly wages of regular crew			**52500.00**
Total direct crew charges/month			171875.00
Total indirect crew charges/month			124375.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			296250.00
Total crew charges/year			3555000.00
Hours crew charges			1185.00

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	200	
Type factor C1	0.3	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	13.20	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**858.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**214.50**
Hourly P.O.L & Energy charges (in Rs.)		**1072.50**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	68.35
Total hourly operational cost (in Rs.) = 683.51+1185+1072.5+68.36	3009.36
Hourly use rate of the equipment (in Rs.) = 460.232+3009.361	**3469.59**

17 PUMPCRETE MACHINE (38 cum/hr)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.7,351,496.00
B.	Depreciation value @ 15% of A		=	Rs.1,102,724.40
C.	Depreciation, = A-B =	Rs.(7351496-1102724.4)	=	Rs.6,248,771.60
D.	Economic life of machine (In hours)		=	8000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.6248771.6 / 8000	=	Rs.781.10
G.	Storage charge per hour @ 1% of F	=0.01 x 781.1	=	Rs.7.81
	Total ownership charge = F +G	**Rs.(781.1 + 7.81)**	**=**	**Rs.788.91**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 781.09645 Rs.1,171.64

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-1	3.000	30000.00	90000.00
Mechanic	0.500	25000.00	12500.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
Total monthly wages of regular crew			**119375.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
Total monthly wages of regular crew			**52500.00**
Total direct crew charges/month			171875.00
Total indirect crew charges/month			124375.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			296250.00
Total crew charges/year			3555000.00
Hours crew charges			1185.00

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	90	
Type factor C1	0.58	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	11.48	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**746.46**
Electrically powerd		
B.H.P of Engine	67	
Type factor C1	0.57	
Duty factor C2	1	
Hourly fuel comsumption	28.49	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**128.20**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (400 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**225.08**
Hourly P.O.L & Energy charges (in Rs.)		**1099.74**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	117.16
Total hourly operational cost (in Rs.) = 1171.64+1185+1099.74+117.17	3573.54
Hourly use rate of the equipment (in Rs.) = 788.907+3573.544	**4362.45**

18 SHOTCRETE MACHINE (6 cum/hr)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.5,145,334.00
B.	Depreciation value @ 15% of A		=	Rs.771,800.10
C.	Depreciation, = A-B =	Rs.(5145334-771800.1)	=	Rs.4,373,533.90
D.	Economic life of machine (In hours)		=	6000.00
E.	Annual Scheduled Production hours			2200.00
F.	Depreciation per hour = C/D =	Rs.4373533.9 / 6000	=	Rs.728.92
G.	Storage charge per hour @ 1% of F	=0.01 x 728.93	=	Rs.7.29
	Total ownership charge = F +G	**Rs.(728.93 + 7.29)**	**=**	**Rs.736.21**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 728.9223166 Rs.1,093.38

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.250	45000.00	11250.00
Operator-2	2.000	25000.00	50000.00
Mechanic	1.000	25000.00	25000.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**86250.00**
Casual			
Helper	2.000	15000.00	30000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**37500.00**
Total direct crew charges/month			123750.00
Total indirect crew charges/month			89625.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			213375.00
Total crew charges/year			2560500.00
Hours crew charges			1163.86

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0.00	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	118.17	
Cost of compressed air (250 cfm)		**295.43**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**0.00**
Hourly P.O.L & Energy charges (in Rs.)		**295.43**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	109.34
Total hourly operational cost (in Rs.) = 1093.38+1163.87+295.43+109.34	2662.01
Hourly use rate of the equipment (in Rs.) = 736.213+2662.007	**3398.22**

19 BATCHING & MIXING PLANT (30 cum)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.11,027,244.00
B.	Depreciation value @ 15% of A		=	Rs.1,654,086.60
C.	Depreciation, = A-B =	Rs.(11027244-1654086.6)	=	Rs.9,373,157.40
D.	Economic life of machine (In hours)		=	30000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.9373157.4 / 30000	=	Rs.312.44
G.	Storage charge per hour @ 1% of F	=0.01 x 312.44	=	Rs.3.12
	Total ownership charge = F +G	**Rs.(312.44 + 3.12)**	**=**	**Rs.315.56**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 312.43858 Rs.468.66

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	1.500	45000.00	67500.00
Operator-2	6.000	25000.00	150000.00
Mechanic	1.500	25000.00	37500.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**255000.00**
Casual			
Helper	0.000	15000.00	0.00
Watchman	3.000	15000.00	45000.00
Cableman	0.000	15000.00	0.00
Beldar	12.000	20000.00	240000.00
	Total monthly wages of regular crew		**285000.00**
Total direct crew charges/month			540000.00
Total indirect crew charges/month			360750.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			900750.00
Total crew charges/year			10809000.00
Hours crew charges			3603.00

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0.00	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	80	
Type factor C1	1	
Duty factor C2	1	
Hourly fuel comsumption	59.68	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**268.56**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (250 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**80.57**
Hourly P.O.L & Energy charges (in Rs.)		**349.13**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	46.87
Total hourly operational cost (in Rs.) = 468.66+3603+349.13+46.87	4467.65
Hourly use rate of the equipment (in Rs.) = 315.559+4467.654	**4783.21**

20 BATCHING & MIXING PLANT (60 cum)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.22,052,704.00
B.	Depreciation value @ 15% of A		=	Rs.3,307,905.60
C.	Depreciation, = A-B =	Rs.(22052704-3307905.6)	=	Rs.18,744,798.40
D.	Economic life of machine (In hours)		=	30000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.18744798.4 / 30000	=	Rs.624.83
G.	Storage charge per hour @ 1% of F	=0.01 x 624.83	=	Rs.6.25
	Total ownership charge = F +G	**Rs.(624.83 + 6.25)**	**=**	**Rs.631.08**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 624.8266133 Rs.937.24

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	1.500	45000.00	67500.00
Operator-2	6.000	25000.00	150000.00
Mechanic	1.500	25000.00	37500.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**255000.00**
Casual			
Helper	0.000	15000.00	0.00
Watchman	3.000	15000.00	45000.00
Cableman	0.000	15000.00	0.00
Beldar	18.000	20000.00	360000.00
	Total monthly wages of regular crew		**405000.00**
Total direct crew charges/month			660000.00
Total indirect crew charges/month			426750.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			1086750.00
Total crew charges/year			13041000.00
Hours crew charges			4347.00

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0.00	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	120	
Type factor C1	1	
Duty factor C2	1	
Hourly fuel comsumption	89.52	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**402.84**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (250 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**120.85**
Hourly P.O.L & Energy charges (in Rs.)		**523.69**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	93.72
Total hourly operational cost (in Rs.) = 937.24+4347+523.7+93.73	5901.66
Hourly use rate of the equipment (in Rs.) = 631.077+5901.656	**6532.73**

21 TWO BOOM DRILL JUMBOO

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.47,781,155.00
B.	Depreciation value @ 15% of A		=	Rs.7,167,173.25
C.	Depreciation, = A-B =	Rs.(47781155-7167173.25)	=	Rs.40,613,981.75
D.	Economic life of machine (In hours)		=	15000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.40613981.75 / 15000	=	Rs.2,707.60
G.	Storage charge per hour @ 1% of F	=0.01 x 2707.6	=	Rs.27.08
	Total ownership charge = F +G	**Rs.(2707.6 + 27.08)**	**=**	**Rs.2,734.68**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 2707.598783 Rs.4,061.40

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.750	45000.00	33750.00
Operator-2	6.000	25000.00	150000.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
Total monthly wages of regular crew			**202500.00**
Casual			
Helper	12.000	15000.00	180000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
Total monthly wages of regular crew			**191250.00**
Total direct crew charges/month			393750.00
Total indirect crew charges/month			267187.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			660937.50
Total crew charges/year			7931250.00
Hours crew charges			2643.75

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	90	
Type factor C1	0.25	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	4.95	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**321.75**
Electrically powerd		
B.H.P of Engine	90	
Type factor C1	0.8	
Duty factor C2	1	
Hourly fuel comsumption	53.71	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**241.70**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (250 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**152.95**
Hourly P.O.L & Energy charges (in Rs.)		**716.40**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	406.14
Total hourly operational cost (in Rs.) = 4061.4+2643.75+716.41+406.14	7827.69
Hourly use rate of the equipment (in Rs.) = 2734.679+7827.693	**10562.37**

22 TRANSIT MIXER (4.5 cum)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.5,512,730.00
B.	Depreciation value @ 15% of A		=	Rs.826,909.50
C.	Depreciation, = A-B =	Rs.(5512730-826909.5)	=	Rs.4,685,820.50
D.	Economic life of machine (In hours)		=	15000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.4685820.5 / 15000	=	Rs.312.39
G.	Storage charge per hour @ 1% of F	=0.01 x 312.39	=	Rs.3.12
	Total ownership charge = F +G	**Rs.(312.39 + 3.12)**	**=**	**Rs.315.51**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 312.3880333 Rs.468.58

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.750	45000.00	33750.00
Operator-2	3.000	25000.00	75000.00
Mechanic	0.750	25000.00	18750.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
Total monthly wages of regular crew			**127500.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.750	15000.00	11250.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
Total monthly wages of regular crew			**56250.00**
Total direct crew charges/month			183750.00
Total indirect crew charges/month			132937.50
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			316687.50
Total crew charges/year			3800250.00
Hours crew charges			1266.75

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	110	
Type factor C1	0.3	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	7.26	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**471.90**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	0	
Cost of compressed air (250 cfm)		**0.00**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**117.98**
Hourly P.O.L & Energy charges (in Rs.)		**589.88**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	46.86
Total hourly operational cost (in Rs.) = 468.58+1266.75+589.88+46.86	2372.06
Hourly use rate of the equipment (in Rs.) = 315.509+2372.063	**2687.57**

23 GROUTING MACHINE (5 cum/hr)

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.1,285,888.00
B.	Depreciation value @ 15% of A		=	Rs.192,883.20
C.	Depreciation, = A-B =	Rs.(1285888-192883.2)	=	Rs.1,093,004.80
D.	Economic life of machine (In hours)		=	15000.00
E.	Annual Scheduled Production hours			3000.00
F.	Depreciation per hour = C/D =	Rs.1093004.8 / 15000	=	Rs.72.87
G.	Storage charge per hour @ 1% of F	=0.01 x 72.87	=	Rs.0.73
	Total ownership charge = F +G	**Rs.(72.87 + 0.73)**	**=**	**Rs.73.60**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 72.86698666 Rs.109.30

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	0.375	45000.00	16875.00
Operator-2	3.000	25000.00	75000.00
Mechanic	0.500	25000.00	12500.00
Electrician	0.000	25000.00	0.00
Supervisor	0.000	25000.00	0.00
Driver	0.000	15000.00	0.00
	Total monthly wages of regular crew		**104375.00**
Casual			
Helper	3.000	15000.00	45000.00
Watchman	0.500	15000.00	7500.00
Cableman	0.000	15000.00	0.00
Beldar	0.000	20000.00	0.00
	Total monthly wages of regular crew		**52500.00**
Total direct crew charges/month			156875.00
Total indirect crew charges/month			112375.00
(@ 80% of direct charges for regular workers & 55 % of			
Total crew charges/month			269250.00
Total crew charges/year			3231000.00
Hours crew charges			1077.00

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	0.00	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**0.00**
Electrically powerd		
B.H.P of Engine	0	
Type factor C1	0	
Duty factor C2	0	
Hourly fuel comsumption	0.00	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**0.00**
Compressed air		
Rate of compressed air per 100 cfm	118.17	
Cost of compressed air (200 cfm)		**236.34**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**0.00**
Hourly P.O.L & Energy charges (in Rs.)		**236.34**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	10.93
Total hourly operational cost (in Rs.) = 109.3+1077+236.34+10.93	1433.57
Hourly use rate of the equipment (in Rs.) = 73.597+1433.57	**1507.17**

24 ROAD HEADER

1.0 OWNERSHIP CHARGES :

A.	Capital cost including all taxes, transportation, custom duty etc.		=	Rs.23,000,000.00
B.	Depreciation value @ 15% of A		=	Rs.3,450,000.00
C.	Depreciation, = A-B =	Rs.(23000000-3450000)	=	Rs.19,550,000.00
D.	Economic life of machine (In hours)		=	12000.00
E.	Annual Scheduled Production hours			2500.00
F.	Depreciation per hour = C/D =	Rs.19550000 / 12000	=	Rs.1,629.17
G.	Storage charge per hour @ 1% of F	=0.01 x 1629.17	=	Rs.16.29
	Total ownership charge = F +G	**Rs.(1629.17 + 16.29)**	**=**	**Rs.1,645.46**

2.0 OPERATIONAL CHARGES :

Replacing charge per hour including maintenance and replacement of
ie. 1.50 xC/D = 1.5 x 1629.17 Rs.2,443.76

3.0 RUNNING CHARGES :

(i) Operations & Maintenance crew charges

Category	Duration	Basic Wages	Amount in Rs.
Regular			
Foreman	1.000	45000.00	45000.00
Operator-1	6.000	30000.00	180000.00
Mechanic	1.000	25000.00	25000.00
Electrician	1.000	25000.00	25000.00
Supervisor	1.000	25000.00	25000.00
Driver	2.000	15000.00	30000.00
	Total monthly wages of regular crew		**330000.00**
Casual			
Helper	12.000	15000.00	180000.00
Watchman	1.000	15000.00	15000.00
Cableman	2.000	15000.00	30000.00
Beldar	4.000	20000.00	80000.00
	Total monthly wages of regular crew		**305000.00**
Total direct crew charges/month			635000.00
Total indirect crew charges/month			431750.00
(@ 80% of direct charges for regular workers & 55 % of direct crew charges for casual workers)			
Total crew charges/month			1066750.00
Total crew charges/year			12801000.00
Hours crew charges			5120.40

(ii) P.O.L&Energy charges

Diesel Engine powerd		
F.H.P of Engine	90	
Type factor C1	0.25	
Duty factor C2	1	
Hourly fuel comsumption = 0.22xFHPxC1xC2(litres)	4.95	
Rates of Diesel(in Rs./Litre)	65.00	
Cost of Diesel (in Rs.)		**321.75**
Electrically powerd		
B.H.P of Engine	135	
Type factor C1	0.8	
Duty factor C2	1	
Hourly fuel comsumption = 0.746xFHPxC1xC2(In KWH)	80.57	
Rates of electricity (in Rs./KWH)	4.50	
Cost of electricity (in Rs.)		**362.56**
Lubricants:		
(@ 25% of fuel charges & 30 % of electricity charges (in Rs.)		**189.20**
Hourly P.O.L & Energy charges (in Rs.)		**873.51**

(iii) Miscellaneous charges:

(@ 10 % of hourly repair charges (in Rs.)	244.38
Total hourly operational cost (in Rs.) = 2443.76+5120.4+873.52+244.38	8682.05
Hourly use rate of the equipment (in Rs.) = 1645.46+8682.047	**10327.51**