BUILDING INFRASTRUCTURE - BUILDING THE NATION

राष्ट्रीय राजमार्ग एवं अवसंरचना विकास निगम लिमिटेड

NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD.

FINAL DETAILED PROJECT REPORT
SUDHMAHADEV - DRANGA TUNNEL

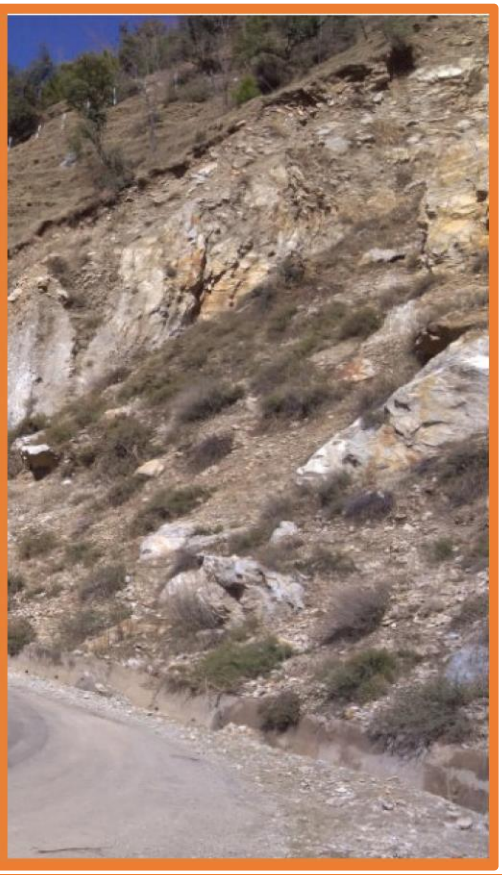
CONSULTANCY SERVICES FOR PREPERATION OF DETAILED PROJECT REPORT AND PROVIDING PRE-CONSTRUCTION ACTIVITIES IN RESPECT OF THE FOLLOWING STRETCH ON NH-244 (OLD NH-1B) IN THE STATE OF JAMMU AND KASHMIR.

(1) SUDHMAHADEV- DRANGA TUNNEL OF APPROX. LENGTH 4.5 KM AND ITS APPROACH ROAD ON CHENANI - SUDHMAHADEV- GOHA ROAD PORTION.

(2) VAILOO TUNNEL OF APPROX. LENGTH 10.0 KM UNDER SINTHAN PASS AND ITS APPROACH ROAD ON GOHA-KHELLANI- KHANABAL ROAD PORTION.

(3) ROAD PORTION FROM 82.675 TO 82.925 AT KM 83 ON BATOTE-KISHTWAR ROAD SECTION OF NH-244.

(4) EXTENDED ROAD SECTION FROM GOHA TO KHELLANI OF 30 KM LENGTH



PACKAGE-1 – KM 0+000 TO KM 6+405
VOLUME - VII – COST ESTIMATE

FEBRUARY 2020

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IN ASSOCIATION WITH

Rodic

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GENERAL ABSTRACT OF COST

	General Abstract of Cost					
Sr No	Detail	Unit	No	Length	Rate	Cost
1	**Road Work**					
	Site Clearance					**422030.69**
(a)	Typical Cross Section Type- 1	Km	1	0.010	34,368,044	343680.44
(b)	Typical Cross Section Type- 2	Km	1	0.029	34,125,056	989626.62
(c)	Typical Cross Section Type- 3	Km	1	0.128	34,125,056	4368007.14
(d)	Typical Cross Section Type- 4	Km	1	0.067	34,597,481	2318031.19
(e)	Typical Cross Section Type- 5	Km	1	0.217	17,082,193	3706835.85
(f)	Typical Cross Section Type- 6	Km	1	0.027	17,068,558	460851.07
(g)	Typical Cross Section Type- 7	Km	1	0.020	35,210,020	704200.40
(h)	Cutting & Filling					478665286.79
(i)	Extra Widening					1124454.72
2	**Culvert**					
(i)	Construction of Culvert					**3452903.78**
	Total Road Works Cost					**496555908.67**
3	**Bridges Cum Via Duct**					
(i)	Construction of VUP,Bridges & Viaduct					673367964.99
	Total Bridge Works					**673367964.99**
4	**Tunnel**					
(i)	Construction of Tunnel					14973600000.00
	Total Tunnel Works					**14973600000.00**
5	**Toll Plaza**					
(i)	Construction of Toll Plaza					83962285.46
	Total Toll Plaza Works					**83962285.46**
6	**Other Works**					
(i)	Protection Works including Drain					293910524.63
(ii)	Traffic Signs					9652890.97
(iii)	**Junction**					
a)	Major Junction					397622999.09
(iv)	Miscellaneous					869029.92
	Total Other Works					**702055444.61**
	Grand Total					**16929541603.73**
	Cost Per Km					**264.32**

SITE CLEARANCE

SITE CLEARANCE & DISMANTALING									
SR. NO.	**ITEM DESCRIPTION**	**UNIT**	**No.**	**Length**	**Width**	**Height**	**QTY**	**RATE**	**AMOUNT**
1.01	Cutting of trees, including cutting of trunks, branches and removal of stumps, roots, stacking of serviceable material with all leads and lifts and earth filling in the depression/pit and as per relevant clauses of Section-200.								
(i)	Girth from 300 mm to 600 mm	No.	201				201.00	164.00	32964.00
(ii)	Girth from 600 mm to 900 mm	No.	213				213.00	271.00	57723.00
(iii)	Girth from 900 mm to 1800 mm	No.	139				139.00	560.00	77840.00
(iv)	Girth above 1800 mm	No.	87				87.00	1,089.00	94743.00
1.01	Clearing and grubbing road land by mechanical means in area of light jungle 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.								
	TCS-1	Ha.	1	10.00	47		0.05		
	TCS-2	Ha.	1	29.00	53		0.15		
	TCS-3	Ha.	1	128.00	53		0.67		
	TCS-4	Ha.	1	67.00	42		0.28		
	TCS-5	Ha.	1	217.00	26		0.57		
	TCS-6	Ha.	1	27.00	26		0.07		
	TCS-7	Ha.	1	20.00	52		0.10		
	TOTAL						**1.90**	**83,750.00**	158760.69
TOTAL									**422030.69**

TYPICAL CROSS SECTION

APPROACH OF TUNNEL IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL AND RIGHT SIDE CUT (HEIGHT OF CUT < 25m)

Typical Cross Section Type- 1

Total length of TCS Type 1 in Km				0.010					
Item No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Qty**	**Rate (Rs)**	**Amount (Rs)**
1	Subgrade From excavated earth	Cum	1	10	4.645	0.500	23.23	148.00	3437.30
2	Earthen Shoulder	Cum	1	10	1.000	0.360	3.60	148.00	532.80
3	GSB (Bottom Layer)	Cum	1	10	20.012	0.100	20.01	1746.00	34940.95
4	GSB (Upper layer)	Cum	1	10	20.012	0.100	20.01	1746.00	34940.95
5	WMM (Bottom layer)	Cum	1	10	18.912	0.125	23.64	2158.00	51015.12
6	WMM (Upper layer)	Cum	1	10	18.237	0.125	22.80	2158.00	49194.31
7	Prime Coat	Sqm	1	10	18.237	-	182.37	11.00	2006.07
8	Tack Coat	Sqm	2	10	18.237	-	364.74	6.00	2188.44
9	DBM	Cum	1	10	18.050	0.070	12.64	7997.00	101042.10
10	BC	Cum	1	10	18.000	0.040	7.20	8942.00	64382.40
Total Cost =									**343680.44**
Cost per Km									**34368043.65**
Per Km Cost of TCS Type- 1 in Cr. =									**3.44**

APPROACH OF TUNNEL WITH BOTH SIDE CUT (HEIGHT OF CUT < 25m)

Typical Cross Section Type- 2

Total length of TCS Type 2 in Km				0.029					
Item No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Qty**	**Rate (Rs)**	**Amount (Rs)**
1	GSB (Bottom Layer)	Cum	1	29	19.79	0.100	57.39	1746.00	100204.69
2	GSB (Upper layer)	Cum	1	29	19.82	0.100	57.46	1746.00	100331.27
3	WMM (Bottom layer)	Cum	1	29	19.37	0.125	70.20	2158.00	151487.55
4	WMM (Upper layer)	Cum	1	29	18.50	0.125	67.06	2158.00	144720.88
5	Prime Coat	Sqm	1	29	18.500	-	536.50	11.00	5901.50
6	Tack Coat	Sqm	2	29	18.500	-	1073.00	6.00	6438.00
7	DBM	Cum	1	29	18.10	0.070	36.74	7997.00	293833.77
8	BC	Cum	1	29	18.00	0.040	20.88	8942.00	186708.96
Total Cost =									**989626.62**
Cost per Km									**34125055.75**
Per Km Cost of TCS Type- 2 in Cr. =									**3.41**

FOR APPROACH OF TUNNEL WITH BOTH SIDE CUT (HEIGHT OF CUT > 25m)

Typical Cross Section Type- 3

Total length of TCS Type 3 in Km				0.128					
Item No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Qty**	**Rate (Rs)**	**Amount (Rs)**
1	GSB (Bottom Layer)	Cum	1	128	19.79	0.100	253.31	1746.00	442282.75
2	GSB (Upper layer)	Cum	1	128	19.82	0.100	253.63	1746.00	442841.47
3	WMM (Bottom layer)	Cum	1	128	19.37	0.125	309.84	2158.00	668634.72
4	WMM (Upper layer)	Cum	1	128	18.50	0.125	296.00	2158.00	638768.00
5	Prime Coat	Sqm	1	128	18.50	-	2368.00	11.00	26048.00
6	Tack Coat	Sqm	2	128	18.50	-	4736.00	6.00	28416.00
7	DBM	Cum	1	128	18.10	0.070	162.18	7997.00	1296921.47
8	BC	Cum	1	128	18.00	0.040	92.16	8942.00	824094.72
Total Cost =									**4368007.14**
Cost per Km									**34125055.75**
Per Km Cost of TCS Type-3 in Cr. =									**3.41**

APPROACH OF TUNNEL IN MOUNTAINOUS TERRAIN WITH LEFT SIDE FILL WITH RETAINING/TOE WALL AND RIGHT SIDE CUT (HEIGHT OF CUT > 25m)

Typical Cross Section Type- 4

Total length of TCS Type 4 in Km: 0.067

Item No.	Description	Unit	No.	Length (m)	Width (m)	Depth (m)	Qty	Rate (Rs)	Amount (Rs)
1	Subgrade From excavated earth	Cum	1	67	4.645	0.500	155.61	148.00	23029.91
2	Earthen Shoulder	Cum	1	67	1.000	0.235	15.75	148.00	2330.26
3	GSB (Bottom Layer)	Cum	1	67	19.965	0.100	133.77	1746.00	233554.56
4	GSB (Upper layer)	Cum	1	67	19.925	0.100	133.50	1746.00	233086.64
5	WMM (Bottom layer)	Cum	1	67	19.800	0.125	165.83	2158.00	357850.35
6	WMM (Upper layer)	Cum	1	67	18.250	0.125	152.84	2158.00	329836.81
7	Prime Coat	Sqm	1	67	18.250	-	1222.75	11.00	13450.25
8	Tack Coat	Sqm	2	67	18.250	-	2445.50	6.00	14673.00
9	DBM	Cum	1	67	18.100	0.070	84.89	7997.00	678857.33
10	BC	Cum	1	67	18.000	0.040	48.24	8942.00	431362.08
								Total Cost =	**2318031.19**
								Cost per Km	**34597480.50**
								Per Km Cost of TCS Type- 4 in Cr. =	**3.46**

APPROACH OF TUNNEL WITH LEFT SIDE VIADUCT AND RIGHT SIDE CUT (HEIGHT OF CUT > 25m)

Typical Cross Section Type- 5

Total length of TCS Type 5 in Km: 0.217

Item No.	Description	Unit	No.	Length (m)	Width (m)	Depth (m)	Qty	Rate (Rs)	Amount (Rs)
1	GSB (Bottom Layer)	Cum	1	217	9.915	0.100	215.16	1746.00	375661.50
2	GSB (Upper layer)	Cum	1	217	9.925	0.100	215.37	1746.00	376040.39
3	WMM (Bottom layer)	Cum	1	217	9.700	0.125	263.11	2158.00	567796.78
4	WMM (Upper layer)	Cum	1	217	9.250	0.125	250.91	2158.00	541455.69
5	Prime Coat	Sqm	1	217	9.250	-	2007.25	11.00	22079.75
6	Tack Coat	Sqm	2	217	9.250	-	4014.50	6.00	24087.00
7	DBM	Cum	1	217	9.065	0.070	137.70	7997.00	1101165.71
8	BC	Cum	1	217	9.000	0.040	78.12	8942.00	698549.04
Total Cost =									**3706835.85**
Cost per Km									**17082192.85**
Per Km Cost of TCS Type- 5 in Cr. =									**1.71**

APPROACH OF TUNNEL WITH LEFT SIDE VIADUCT AND RIGHT SIDE CUT (HEIGHT OF CUT < 25m)

Typical Cross Section Type- 6

Total length of TCS Type 6 in Km: 0.027

Item No.	Description	Unit	No.	Length (m)	Width (m)	Depth (m)	Qty	Rate (Rs)	Amount (Rs)
1	GSB (Bottom Layer)	Cum	1	27	9.900	0.100	26.73	1746.00	46670.58
2	GSB (Upper layer)	Cum	1	27	9.910	0.100	26.76	1746.00	46717.72
3	WMM (Bottom layer)	Cum	1	27	9.700	0.125	32.74	2158.00	70647.53
4	WMM (Upper layer)	Cum	1	27	9.250	0.125	31.22	2158.00	67370.06
5	Prime Coat	Sqm	1	27	9.250	-	249.75	11.00	2747.25
6	Tack Coat	Sqm	2	27	9.250	-	499.50	6.00	2997.00
7	DBM	Cum	1	27	9.050	0.070	17.10	7997.00	136784.69
8	BC	Cum	1	27	9.000	0.040	9.72	8942.00	86916.24
Total Cost =									**460851.07**
Cost per Km									**17068558.00**
Per Km Cost of TCS Type- 6 in Cr. =									**1.71**

APPROACH OF TUNNEL WITH BOTH SIDE FILL WITH RETAINING/TOE WALL

Typical Cross Section Type- 7

Total length of TCS Type 7 in Km: 0.020

Item No.	Description	Unit	No.	Length (m)	Width (m)	Depth (m)	Qty	Rate (Rs)	Amount (Rs)
1	Subgrade From excavated earth	Cum	1	**20**	20.000	0.500	200.00	148.00	29600.00
2	Earthen Shoulder	Cum	1	**20**	2.000	0.360	14.40	148.00	2131.20
3	GSB (Bottom Layer)	Cum	1	20	20.000	0.100	40.00	1746.00	69840.00
4	GSB (Upper layer)	Cum	1	20	20.000	0.100	40.00	1746.00	69840.00
5	WMM (Bottom layer)	Cum	1	20	18.000	0.125	45.00	2158.00	97110.00
6	WMM (Upper layer)	Cum	1	20	18.000	0.125	45.00	2158.00	97110.00
7	Prime Coat	Sqm	1	20	18.000	-	360.00	11.00	3960.00
8	Tack Coat	Sqm	2	20	18.000	-	720.00	6.00	4320.00
9	DBM	Cum	1	20	18.000	0.070	25.20	7997.00	201524.40
10	BC	Cum	1	20	18.000	0.040	14.40	8942.00	128764.80
Total Cost =									**704200.40**
Cost per Km									**35210020.00**
Per Km Cost of TCS Type- 7 in Cr. =									**3.52**

CUT AND FILL

COST OF CUT & FILL					
Item No.	**Description**	**Unit**	**Estimated Quantity**	**Unit Rate in Rs.** In Figures	**Amount in Rs.** In Figures
1 (A)	Excavation for roadwork in soil with hydraulic excavator of 0.9 cum bucket capacity including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location within all lifts and lead upto 1000m (including royality @ Rs. 15.00 per cum but excluding watering, rolling & compaction)	cum	350434.38	611.00	214115405.87
1 (B)	E/W in Excavation in rock - not required blasting	cum	210260.63	708.00	148864524.41
1 (C)	E/W in Excavation in hard rock required blasting	cum	140173.75	808.00	113260391.45
2	Construction of embankment with approved materials deposited at site from Roadway cutting and excavation from drain and foundation of the structures, graded and compacted to meet requirement of Table 300-2, complete as per Technical Specifications Clause 305.	cum	16384.90	148.00	2424965.05
TOTAL COST OF CUT & FILL					**478665286.79**

EXTRA WIDENING

Extra Widening

Total length of 0.6 m widening in KM				0.951					
Item No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Qty**	**Rate (Rs)**	**Amount (Rs)**
1	E/W in Embankment	Cum	1	950.75	0.60	0.500	285.23	148.00	42213.33
2	Subgrade	Cum	1	950.75	0.60	0.500	285.23	148.00	42213.33
3	GSB (Bottom Layer)	Cum	1	950.75	0.60	0.100	57.05	1746.00	99600.64
4	GSB (Upper layer)	Cum	1	950.75	0.60	0.100	57.05	1746.00	99600.64
5	WMM	Cum	1	950.75	0.60	0.250	142.61	2158.00	307757.99
6	Prime Coat	Sqm	1	950.75	0.60	-	570.45	11.00	6274.95
7	Tack Coat	Sqm	1	950.75	0.60	-	570.45	6.00	3422.70
8	DBM	Cum	1	950.75	0.60	0.070	39.93	7997.00	319332.43
9	BC	Cum	1	950.75	0.60	0.040	22.82	8942.00	204038.70
								Cost 0.6 m widening =	**1124454.72**
Total Cost of Extra Widening =									**1124454.72**

CULVERT

Number of Culverts **1** **2m X 2m**

Sl. No.	Ref. to MoRTH Spec.	Item Description	Unit	Nos	Length (m)	Width (m)	Depth/ Height (m)	AREA (Sqm.)	Quantity	Total Quantity
		FOUNDATION								
1	304	**Excavation for Structures**								
		Earthwork in excavation for structures as per drawing and technical specifications Clause 305.1 including setting out, construction of shoring and bracing, removal of stumps and other deleterious material and disposal upto a lead of 50 m, dressing of sides and bottom and backfilling in trenches with excavated suitable material.								
	I.	Ordinary Soil								
		i) Upto 3m depth								
		Box bridge	Cum	1	2.80	8.500	1.00		23.80	
		Return Wall	Cum	4	3.70	3.140	1.15		53.44	
		Retaining wall	Cum	4	3.375	0.300	0.00		0.00	
		Curtain wall								
		D/S Side	Cum	1	9.800	1.850	2.95		53.48	
		U/S Side	Cum	0	9.800	1.500	2.45		0.00	
		Rigid Apron								
		D/S Side	Cum	1	9.800	3.000	0.75		22.05	
		U/S Side	Cum	0	9.800	3.000	0.75		0.00	
		Flexible Apron								
		D/S Side	Cum	1	9.800	6.000	1.05		61.74	
		U/S Side	Cum	0	9.800	3.000	1.05		0.00	
		Sub-Total =	Cum						**214.5**	214.5163
2	**1500, 1700 & 2100**	Providing and laying of PCC M15 levelling course below bottom Slab & Retaning wall & Curtain wall.								
		Below Bottom Slab	Cum	1	2.80	12.20	0.150		5.12	
		Below Independent Retaining Wall	Cum	0	3.23	0.30	0.150		0.00	
		Below Curtain Wall								
		D/S Side	Cum	1	9.80	1.85	0.150		2.72	
		U/S Side	Cum	0	9.80	1.50	0.150		0.00	
		Below Rigid Apron								
		D/S Side	Cum	1	9.80	3.00	0.150		4.41	
		U/S Side	Cum	0	9.80	3.00	0.150		0.00	
		Return Wall	Cum	4	3.70	3.14	0.150		6.97	
		Sub-Total =	Cum						**19.22**	19.2243
		SUBSTRUCTURE								
3	**1500, 1700 & 2200**	R.C.C. grade M 20 in Sub Structure complete as per Dwg & Tech Specification.								
		Up to 5m Height.								
		Bottom Slab	Cum	1	2.60	12.00	0.380		11.86	
		Side Wall	Cum	2	12.00	0.300	2.00		14.40	
		Middle Wall	Cum	0	12.00	0.300	2.00		0.00	
		Foundation of Retaining Wall								
		1 st. Rectangular portion.	Cum	4	3.23	0.000	0.400		0.00	
		2 nd. Rectangular portion.	Cum	4	3.23	0.000	0.500		0.00	
		1 st. Triangular portion	Cum	4	3.23	0.000	0.500		0.00	
		2 st. Triangular portion	Cum	4	3.23	0.000	0.500		0.00	
		Retaining Wall Stem	Cum	4	3.23	0.000	1.600		0.00	
		Haunch at Bottom Slab	Cum	2	12.00	0.150	0.150		0.27	
		Haunch at Top Slab	Cum	2	12.00	0.150	0.150		0.27	
		Shear key								
		Rectangular portion.	Cum	2	2.60	0.300	0.820		1.28	
		Triangular portion	Cum	2	2.60	0.820	0.820		1.75	
		Return Foundation	Cum	4	3.50	2.940	0.700		14.41	
		Return Wall	Cum	4	3.50	0.495	2.200		7.62	
		Sub-Total =	Cum						**51.85**	51.85244
		Above 5m Height.								
		Box Side Wall	Cum	2	12.00	0.300	0.000		0.00	
		Box middle Wall	Cum	0	12.00	0.30	0.000		0.00	
		Retaining wall Stem	Cum	4	3.23	0.000	0.000		0.00	
		Haunch at Top Slab	Cum	2	12.00	0.150	0.150		0.00	
		Sub-Total =	Cum						**0.00**	
4	**1600 & 2200**	Supplying, fitting and placing TMT bar reinforcement (Fe-500) in substructrue complete as per drawings and technical specification Clauses 1002, 1005, 1010 & 1202								
	(i)	For Box Structure @ 90 Kg per cum of Concrete	t		51.85				4.667	
	(ii)	For Retaining Wall @ 90 Kg per cum of Concrete	t		0.00				0.000	
		Sub-Total =	cum						**4.67**	4.6667196
5	**2706 & 2200**	**Providing weepholes** in brick masonry/stone masonry, plain/reinforced concrete abutment, wing wall, return wall with 100 mm dia AC pipe extending through the full width of the structures with slope of 1(V):20(H) towards drawing face complete as per drawing and technical specification Clauses 614, 709, 1204.3.7								
		No of weep holes in Abutment	Nos	2					46	
		No of weep holes in Retaining Wall	Nos	0					0	
		Sub-Total =	Nos						**46**	46

Sl. No.	Ref. to MoRTH Spec.	Item Description	Unit	Nos	Length (m)	Width (m)	Depth/ Height (m)	AREA (Sqm.)	Quantity	Total Quantity
6	2200	**Providing and laying filter media** with granular crushed aggregates as per specification to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and providing over the entire surface behind abutment, wing wall, return wall to the full height, compacted to firm condition complete as per drawing and technical specification Clause 1204.3.8								
	(i)	Behind Abutment	cum	2	12.00	0.60	1.90		27.360	
	(ii)	Behind Return Wall	cum	4	3.50	0.60	2.20		18.480	
	(iii)	Behind Retaining Wall	cum	1	3.50	0.60	0.00		0.000	
		Sub-Total =	cum						**45.84**	45.84
7	2200 II)	**Backfilling** behind abutment, wing wall and retaining wall complete as per drawings & technical specification Clause 1204.3.8 **With Sandy Material**								
	(i)	Below Culvert	cum	0	15.4	2.60	4.32		**0.0**	
	(ii)	Behind Abutment & Independent Retaining Wall	cum	2	10.8	2.90	1.90		**119.0**	
		Sub-Total =	cum						**119.02**	119.016
		SUPERSTRUCTURE								
8	1500 &1600 1700	Providing and laying reinforced cement concrete in superstructure complete as per drawing and technical specifications Clauses 800, 1205.4 and 1205.5. **RCC M-20**								
	(i)	Top Slab (Upto 5m height)	cum	1	2.600	12.00	0.425		**13.26**	13.26
	(II)	Top Slab (Above 5m height)	cum	1	0.000	0.00	0.000		**0.00**	
9	1600	Supplying, fitting and placing HYSD bar reinforcement (Fe 500) in superstructrue complete as per drawings and technical specification Clauses 1002, 1010 & 1202								
		For Top Slab @ 90Kg per cum of Concrete	t		13.260				1.19	1.1934
11	2703, 1500, 1600 & 1700	**Construction of R.C.C. railing** of M 30 grade in cast-in-situ with 20 mm nominal size aggregate, true to line and grade, tolerance of vertical railing post not to exceed 1 in 500, centre-to-centre spacing between vertical posts not to exceed 2000 mm as per drawing and technical specifications Clauses 800, 900 and 1208.3	m	2	9.6	-	-		19.200	19.2
14	2705	**Drainage Spouts** complete as per drawing and technical specifications Clause 1209	No	1					1	1
		PROTECTION WORK								
17	1500, 1700 & 2100	P.C.C. grade M-15 in Curtain Wall complete as per Dwg & Tech Specification.								
		For Curtain wall								
		Curtain Wall (D/S)	Cum	1	15.60			1.468	22.89	
		Curtain Wall (U/S)	Cum	0	15.60			1.898	0.00	
		Sub-Total =	cum						**22.89**	22.893
18	2505	Providing and laying flooring laid over cement concrete bedding complete as per drawing and technical specification Clause 1303. **Rubble Stone laid in Cement Mortar 1:3**								
		D/S	Cum	1	9.60	3.000	0.30		8.64	
		U/S	Cum	0	9.60	3.000	0.30		0.00	
		Sub-Total =	cum						**8.64**	8.64
19	2503	Providing and laying boulder apron for bed protection with stone boulders of minimum size and weight as per Table 1300.1, no fragment weighing less than 25 kg laid dry complete as per drawing and technical specifications Clause 1301.								
		D/S	Cum	1	9.60	6.00	0.75		43.20	
		U/S	Cum	0	9.60	3.00	0.75		0.00	
		Sub-Total =	cum						**43.20**	43.2
20		Providing P.C.C M-15 Gabion Wall as per drawing and technical specifications								
	(i)	Levelling Course	cum	0	9.51	2.60	0.10		0.000	0
	(ii)	PCC M-15	cum	0	Area =	3.22	2.60		0.000	0
	(iii)	Retaining Wall M-20	cum	0	Area =	9.36313	2.60		0.000	0
21		Providing P.C.C M-15 Catch pit as per drawing and								
	(i)	Levelling Course	cum	1	2.60	1.80	0.10		0.260	0.26
	(ii)	PCC M-15	cum	1	Area =	1.76	1.50		2.640	2.64

Number of Culverts **1** **2m X 2m 5m fill (Below)**

Sl. No.	Ref. to MoRTH Spec.	Item Description	Unit	Nos	Length (m)	Width (m)	Depth/ Height (m)	AREA (Sqm.)	Quantity	Total Quantity
		FOUNDATION								
1	304	**Excavation for Structures**								
		Earthwork in excavation for structures as per drawing and technical specifications Clause 305.1 including setting out, construction of shoring and bracing, removal of stumps and other deleterious material and disposal upto a lead of 50 m, dressing of sides and bottom and backfilling in trenches with excavated suitable material.								
	I.	Ordinary Soil								
		i) Upto 3m depth								
		Box bridge	Cum	1	2.80	13.000	3.10		112.84	
		Return Wall	Cum	4	3.70	3.140	1.15		53.44	
		Sub-Total =	Cum						**166.3**	166.2828
2	1500, 1700 & 2100	Providing and laying of PCC M15 levelling course below bottom Slab & Retaning wall & Curtain wall.								
		Below Bottom Slab	Cum	1	2.80	12.20	0.150		5.12	
		Return Wall	Cum	4	3.70	3.14	0.150		6.97	
		Sub-Total =	Cum						**12.09**	12.0948
		SUBSTRUCTURE								
3	1500, 1700 & 2200	R.C.C. grade M 20 in Sub Structure complete as per Dwg & Tech Specification.								
		Up to 5m Height.								
		Bottom Slab	Cum	1	2.60	12.00	0.380		11.86	
		Side Wall	Cum	2	12.00	0.300	2.00		14.40	
		Middle Wall	Cum	0	12.00	0.300	2.00		0.00	
		Foundation of Retaining Wall								
		1 st. Rectangular portion.	Cum	4	3.23	0.000	0.400		0.00	
		2 nd. Rectangular portion.	Cum	4	3.23	0.000	0.500		0.00	
		1 st. Triangular portion	Cum	4	3.23	0.000	0.500		0.00	
		2 st. Triangular portion	Cum	4	3.23	0.000	0.500		0.00	
		Retaining Wall Stem	Cum	4	3.23	0.000	1.600		0.00	
		Haunch at Bottom Slab	Cum	2	12.00	0.150	0.150		0.27	
		Haunch at Top Slab	Cum	2	12.00	0.150	0.150		0.27	
		Shear key								
		Rectangular portion.	Cum	2	2.60	0.300	0.820		1.28	
		Triangular portion	Cum	2	2.60	0.820	0.820		1.75	
		Return Foundation	Cum	4	3.50	2.940	0.700		14.41	
		Return Wall	Cum	4	3.50	0.495	2.200		7.62	
		Sub-Total =	Cum						**51.85**	51.85244
		Above 5m Height.								
		Box Side Wall	Cum	2	12.00	0.300	0.000		0.00	
		Box middle Wall	Cum	0	12.00	0.30	0.000		0.00	
		Retaining wall Stem	Cum	4	3.23	0.000	0.000		0.00	
		Haunch at Top Slab	Cum	2	12.00	0.150	0.150		0.00	
		Sub-Total =	Cum						**0.00**	
4	1600 & 2200	Supplying, fitting and placing TMT bar reinforcement (Fe-500) in substructrue complete as per drawings and technical specification Clauses 1002, 1005, 1010 & 1202								
	(i)	For Box Structure @ 90 Kg per cum of Concrete	t		51.85				4.667	
	(ii)	For Retaining Wall @ 90 Kg per cum of Concrete	t		15.59				1.403	
		Sub-Total =	cum						**6.07**	6.0694034
5	2706 & 2200	**Providing weepholes** in brick masonry/stone masonry, plain/reinforced concrete abutment, wing wall, return wall with 100 mm dia AC pipe extending through the full width of the structures with slope of 1(V):20(H) towards drawing face complete as per drawing and technical specification Clauses 614, 709, 1204.3.7								

Sl. No.	Ref. to MoRTH Spec.	Item Description	Unit	Nos	Length (m)	Width (m)	Depth/ Height (m)	AREA (Sqm.)	Quantity	Total Quantity
		No of weep holes in Abutment	Nos	2					46	
		No of weep holes in Retaining Wall	Nos	1					5	
		Sub-Total =	Nos						**51**	51
6	**2200**	**Providing and laying filter media** with granular crushed aggregates as per specification to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and providing over the entire surface behind abutment, wing wall, return wall to the full height, compacted to firm condition complete as per drawing and technical specification Clause 1204.3.8								
	(i)	Behind Abutment	cum	2	12.00	0.60	1.90		27.360	
	(ii)	Behind Return Wall	cum	4	3.50	0.60	2.20		18.480	
	(iii)	Behind Retaining Wall	cum	1	3.50	0.60	3.38		7.091	
		Sub-Total =	cum						**52.93**	52.931
7	**2200**	**Backfilling** behind abutment, wing wall and retaining wall complete as per drawings & technical specification Clause 1204.3.8								
	II)	**With Sandy Material**								
	(i)	Below Culvert	cum	1	15.4	2.60	3.04		**121.7**	
	(ii)	Behind Abutment & Independent Retaining Wall	cum	2	10.8	2.90	1.90		**119.0**	
		Sub-Total =	cum						**240.67**	240.67087
		SUPERSTRUCTURE								
8	**1500 &1600 1700**	Providing and laying reinforced cement concrete in superstructure complete as per drawing and technical specifications Clauses 800, 1205.4 and 1205.5. **RCC M-20**								
	(i)	Top Slab (Upto 5m height)	cum	1	2.600	12.00	0.425		**13.26**	13.26
	(II)	Top Slab (Above 5m height)	cum	1	0.000	0.00	0.000		**0.00**	
9	**1600**	Supplying, fitting and placing HYSD bar reinforcement (Fe 500) in superstructrue complete as per drawings and technical specification Clauses 1002, 1010 & 1202								
		For Top Slab @ 90Kg per cum of Concrete	t		13.260				1.19	1.1934
11	**2703, 1500, 1600 & 1700**	**Construction of R.C.C. railing** of M 30 grade in cast-in-situ with 20 mm nominal size aggregate, true to line and grade, tolerance of vertical railing post not to exceed 1 in 500, centre-to-centre spacing between vertical posts not to exceed 2000 mm as per drawing and technical specifications Clauses 800, 900 and 1208.3	m	2	9.6	-	-		19.200	19.2
14	**2705**	**Drainage Spouts** complete as per drawing and technical specifications Clause 1209	No	1					1	1
		PROTECTION WORK								
20		Providing P.C.C M-15 Gabion Wall as per drawing and technical specifications								
	(i)	Levelling Course	cum	1	7.58	2.60	0.10		1.971	1.97145
	(ii)	PCC M-15	cum	1	Area =	3.22	2.60		8.372	8.372
	(iii)	Drop curtain wall	cum	1	0.2	0.2	3.00		0.120	0.12
	(iv)	Retaining Wall M-20	cum	1	Area =	5.99438	2.60		15.585	15.585375
21		Providing P.C.C M-15 Catch pit as per drawing and								
	(i)	Levelling Course	cum	1	2.60	1.80	0.10		0.468	0.468
	(ii)	PCC M-15	cum	1	Area =	1.76	1.50		2.640	2.64

COST ESTIMATE

Item No.	Description	Unit	Total Quantity	Unit Rate in Rs.	Amount in Rs.	Referrence
				In Figures	In Figures	
6.1	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.					
A	In all types of soil including marshy soils.	cum	380.80	111	42,268.70	CHAPTER-CULVERT, SR. NO.-12.1(I) B (ii)
6.2	Providing and laying Plain/Reinforced Cement Concrete in Open Foundation complete as per Drawing and Technical Specifications.					
A	PCC Grade M15	cum	41.78	5540.00	231,475.33	CHAPTER-CULVERT, SR. NO.-12.8 A
6.3	Providing and laying Reinforced Cement Concrete in substructure, wall, slab etc. complete as per Drawing and Technical Specifications.					
A	Upto 5m Height	cum	119.29	6280.00	749,142.80	CHAPTER-CULVERT, SR. NO.-13.5 E (p)
A	Upto 5m -10m Height	cum				
6.4	Providing and laying Plain/Reinforced Cement Concrete in Superstructure complete as per Drawing and Technical Specifications.					
A	Upto 5m Height	cum	26.52	6786.00	179,964.72	CHAPTER-CULVERT, SR. NO.-14.1A Case II (p)
B	Upto 5m - 10m Height	cum				
6.5	Providing and laying Supplying, Fitting and Placing un-coated HYSD bar Reinforcement in Foundation complete as per Drawing and Technical Specifications. Grade Fe 415.					
	Substructure	MT	10.74	68369.00	734,017.99	CHAPTER-CULVERT, SR. NO.-13.6
	Superstructure	MT	2.39	70039.00	167,169.09	CHAPTER-CULVERT, SR. NO.-14.2
6.6	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	98.77	2071.00	204,554.74	CHAPTER-CULVERT, SR. NO.13.10
6.7	Providing and laying boulder apron for bed protection with stone boulders of minimum size and weight as per Table 1300.1, no fragment weighing less than 25 kg laid dry complete as per drawing and technical specifications Clause 1301.	cum	43.20	1893.00	81,777.60	CHAPTER-CULVERT, SR. NO.-15.4
6.8	Providing Back filling behind abutment, wing wall and return wall complete as per drawing and Technical Specification	cum	359.69	2119.00	762,176.47	CHAPTER-CULVERT, SR. NO.-13.9
6.9	Construction of R.C.C. railing of M 30 grade in cast-in-situ with 20 mm nominal size aggregate, true to line and grade, tolerance of vertical railing post not to exceed 1 in 500, centre-to-centre spacing between vertical posts not to exceed 2000 mm as per drawing and technical specifications Clauses 800, 900 and 1208.3	R - Mtr	38.40	1857.00	71,308.80	CHAPTER-CULVERT, SR. NO.-14.7
6.10	Providing and laying flooring laid over cement concrete bedding complete as per drawing and technical specification Clause 1303. Rubble Stone laid in Cement Mortar 1:3	cum	8.64	6038.00	52,168.32	CHAPTER-CULVERT, SR. NO.-15.8
6.11	Drainage Spouts complete as per drawing and technical specifications Clause 1209	Nos.	2.00	2910.00	5,820.00	CHAPTER-CULVERT, SR. NO.-14.9
6.12	Providing weepholes in brick masonry/stone masonry, plain/reinforced concrete abutment, wing wall, return wall with 100 mm dia AC pipe extending through the full width of the structures with slope of 1(V):20(H) towards drawing face complete as per drawing and technical specification Clauses 614, 709, 1204.3.7	Nos.	97.00	456.00	44,232.00	CHAPTER-CULVERT, SR. NO.-13.8
6.13	P.C.C. grade M-15 in Curtain Wall complete as per Dwg & Tech Specification.	cum	22.89	5540.00	126,827.22	CHAPTER-CULVERT, SR. NO.-15.10
	TOTAL COST OF CULVERT				**3,452,903.78**	**0.35 Cr**

BRIDGE CUM VIADUCT

SL No	VOP	VUP
Ch	16+000	16+250
Skew Angle	0	62
No of Cells	1	1
Length of single cell	12	12
Total span	13.200	29.821
Ts	0.6	1
Bs	0.7	1
Wall	0.6	1
FRL	6.4	6.8
GL	0	0
Founding lvl	-1	-1.3
Recons/Retain	Recons	Recons
Existing width	0	0
Proposed Width of box	30	9
Proposed Width of Carriageway	27	8
Width of raised kerb	3	3
Thickness of kerb	0.3	0.3
Kerb one side / both side	0	0
Total length of median/retaining wall	5.0	5.0
Ht of median/retaining wall	7.400	8.100
Foundation width of median/retaining wall	5.180	5.670
c/s area of median/retaining wall (sqm)	2.593	3.034
Length of approach slab	3.500	3.500
Thickness of approach slab	0.300	0.300
Thk of Filter media (m) =	0.6	0.6
PCC thickness (m)	0.1	0.1
Excavation (1)	515	475
Backfilling (2)	948	341
PCC below foundation (3)	43	31
M20 PCC in curtain wall (8a)	0	0
M30 RCC in Box (8c)	734	771
R/F in Box (7)	88	92
M30 RCC in median/retaining wall (9i)	13	15
R/F in median/retaining wall (10)	1	1
Wearing coat (15)	545	295
Filler type expansion joint (17i)	60	38
Drainage spouts @ 5.0m c/c (18)	7	14
Crash Barrier (19)	81	147
Pipe rail over Crash Barrier (20)	81	147
RCC Railing	0	0
M30 RCC in Approach slab (24)	63	19
PCC below Approach slab (25)	32	9
Filter media (26)	0	0
Weep holes (27)	0	0
Bridge no marking (28)	2	2
Confirmatory bore holes (29)	15	15

Vehicular Underpass

Item No.	Description	Unit	Quantity	Rate	Cost (in rupees)
5.01	Earthwork in excavation of foundations for structures in all kinds of soils including all leads and lifts complete as per drawings and Technical Specifications Clause 304 a) Depth up to 3.0 m i) all types of soils	cum	990	123	121766
5.02	Back filling behind abutments, wing walls and return walls with selected imported granular material of approved quality, including all leads and lifts, complete as per drawings and Technical Specifications Clause 305 and Clause 710.1.4 of IRC:78	cum	1289	1942	2503997
5.03	Plain Cement Concrete / Reinforced Cement Concrete in foundation below levelling course excluding reinforcement complete as per drawings and Technical Specifications a) M-15 grade	cum	74	6155	453698
5.04	Plain Cement Concrete/ Reinforced Cement Concrete in substructure excluding reinforcement complete as per drawings and Technical Specifications Sections 1500, 1700 and 2200. c) M-30 grade	cum	1533	8809	13505883
5.05	Supplying, fixing and placing TMT/HYSD bar reinforcement complete as per drawings and Technical Specification Section 1600 b) For Sub structure	t	183	75737	13870386
5.06	Providing 65 mm thick wearing course consisting of 40 mm thick asphaltic concrete covered by 25 mm thick mastic asphalt on top complete as per Technical Specification Section 2700	sqm	840	1752	1471352
5.07	Providing and fixing drainage spouts as per drawings and Technical Specifications Clause 2705	no	21	3233	68566
5.08	Supplying and fixing of expansion joints complete as per drawings and Technical Specifications Section 2600. c) 20 mm wide filler type joints	m	98	235	23110
5.09	Reinforced Cement Concrete Crash Barrier including reinforcement and MS pipe complete as per drawings and Technical Specifications Sections 1500, 1600, 1700, 2200 and Clause 809 a) M-40 grade	m	228	5270	1201957
5.10	Plain Cement Concrete in leveling course under the approach slabs complete as per drawings and Technical Specifications Section 1700, 2100 & 2700. M-15 grade	cum	41	5919	242378
5.11	Reinforced Cement Concrete in approach slabs including reinforcement and form work complete as per drawings and Technical Specifications Sections 1500, 1600, 1700 and 2100 and Clause 2704. M-30 grade	cum	82	10943	896232
	Total Cost (in Rupees)				**34359325**

CH.	MJB 05+585	MJB 05+563	MJB 05+713	MJB 05+993	MJB 06+007	MNB - 16+465(Portal	
	LHS	RHS	LHS	LHS	RHS		
	(New 2L)	(New 2L)	(New 2L)	(New 2L)	(New 2L)	(New 2L)	
	(4x25.00m)	(2x25.00m + 2x30.00m)	(3x25.00m)	(10x25.00m)	(5x25.00m)	(1x40.00m)	
Skew Angle	0	0	0	0	0	0	
1.0 Excavation :							
Abutment A1							
Bed level	0	0	0	0	0	0	
Founding level	-5.000	-5.000	-4.000	-5.000	-5.000	-4.000	
Thk of levelling course	0.100	0.100	0.100	0.100	0.100	0.100	
Excavation Depth	5.100	5.100	4.100	5.100	5.100	4.100	
Excavation Length	13.40	13.50	15.00	13.00	13.00	15.00	
Excavation Width	12.000	12.000	12.000	14.500	14.500	11.000	
Earth work (cum)	820.1	826.2	738.0	961.4	961.4	676.5	
Abutment A2							
Bed level	0	0	0	0	0	0	
Founding level	-7.000	-5.000	-7.000	-5.000	-5.000	-4.000	
Thk of levelling course	0.100	0.100	0.100	0.100	0.100	0.100	
Excavation Depth	7.100	5.100	7.100	5.100	5.100	4.100	
Excavation Length	13.40	13.50	15.00	13.00	13.00	15.00	
Excavation Width	12.000	12.000	12.000	14.500	14.500	11.000	
Earth work (cum)	1141.7	826.2	1278.0	961.4	961.4	676.5	
Pier (Open)							
No of pier	3	3	2	9	4	0	
Average Bed level	0	0	0	0	0	0	
Founding level	-5.000	-5.000	-5.000	-5.222	-5.250	-5.300	
Thk of levelling course	0.100	0.100	0.100	0.100	0.100	0.100	
Excavation Depth	5.100	5.100	5.100	5.322	5.350	5.400	
Excavation Length	16	14	15.5	16.7	15.5	2.0	
Excavation Width	12.000	12.000	12.000	14.000	14.000	2.000	
Earth work (cum)	2937.6	2570.4	1897.2	11176.7	4643.8	0.0	
Pier (Pile)							
No of pier	0	0	0	0	0	0	
Average Bed level	0	0	0	0	0	0	
Founding level	-5.000	-5.000	-5.000	-5.000	-5.000	-4.000	
Thk of levelling course	7.100	5.100	7.100	5.100	5.100	4.100	
Excavation Depth	12.100	10.100	12.100	10.100	10.100	8.100	
Excavation Length	2	2	2	2	2	2	
Excavation Width	17.000	2.000	17.000	19.400	17.000	2.000	
Earth work (cum)	0.0	0.0	0.0	0.0	0.0	0.0	
Retaining/Median Wall							
No of retaining wall	0	2	0	4	0	4	
Length of each wall	13	7	13	11	13	0	
No of median wall	0	0	0	0	0	0	
Length of each wall	1.5	1.5	1.5	1.5	1.5	1.5	
Excavation Depth	2.000	2.000	2.000	2.000	2.000	2.000	
Excavation Width	7.74	8.65	9.525	7.845	8.265	11.8	
Earth work (cum)	0.0	254.3	0.0	724.9	0.0	0.0	
Total excavation (cum)	**4899.4**	**4477.1**	**3913.2**	**13824.2**	**6566.5**	**1353.0**	**MJB**
Excavation in soil (cum)	**2940**	**2788**	**2348**	**8584**	**3940**	**812**	**23035**
Excavation in rock (cum)	**1960**	**1689**	**1565**	**5240**	**2627**	**541**	**14704**
Annular Backfilling (cum)	**1265**	**993**	**1008**	**3328**	**1594**	**307**	**9110**
2.0 Backfilling :							
Length behind abutment	19.45	13.5	20.6	17	19	7.5	
Height	10.325	11.625	11.875	10.475	11.075	15	
Width	9.000	9.000	9.000	11.500	11.500	8.000	
Backfilling behind abutments	3614.8	2824.9	4403.3	4095.7	4839.8	1800.0	
Backfilling for piers	0	0	0	0	0	0	
Total backfilling (cum)	**3615**	**2825**	**4403**	**4096**	**4840**	**1800**	**25178**
3.0 Levelling Course :							
Thk of levelling course	0.100	0.100	0.100	0.100	0.100	0.100	
Abutment A1							
Foundation Length	11.40	11.50	13.00	11.00	11.00	13.00	
Foundation Width	10.000	10.000	10.000	12.500	12.500	9.000	

Volume (cum)	11.8	11.9	13.5	14.2	14.2	12.1	
Abutment A2							
Foundation Length	11.40	11.50	13.00	11.00	11.00	13.00	
Foundation Width	10.000	10.000	10.000	12.500	12.500	9.000	
Volume (cum)	11.8	11.9	13.5	14.2	14.2	12.1	
Piers							
Foundation Length	12	12	12	11.25	12	0	
Foundation Width	10.000	10.000	10.000	12.000	12.000	0.000	
Volume (cum)	37.3	37.3	24.9	125.7	59.5	0.0	
Piers							
Foundation Length	0	0	0	0	0	0	
Foundation Width	0.000	0.000	0.000	0.000	0.000	0.000	
Volume (cum)	0.0	0.0	0.0	0.0	0.0	0.0	
Retaining walls							
Foundation Length	13	7	13	11	13	0	
Foundation Width	5.74	6.65	7.525	5.845	6.265	9.8	
Volume (cum)	0.0	9.6	0.0	26.6	0.0	0.0	
Total levelling course (cum)	**61**	**71**	**52**	**181**	**88**	**24**	**525**

4.0 Abutment & Pier Open Foundation & Retaining Wall :

Abutment						
Formation Level =	6.2	7.5	8.8	6.4	7.0	12.0
Ht of abutment =	12.200	12.500	14.250	11.350	11.950	16.000
Width of abutment =	10.000	10.000	10.000	12.500	12.500	9.000
Ht of dirt wall =	2.410	2.410	2.410	2.441	2.441	3.071
Thickness of dirt wall =	0.3	0.3	0.3	0.3	0.3	0.3
Width of cap at top =	1.85	2.045	1.95	2.045	1.85	2.8
Width of cap at bottom =	1	1	1	1	1	1
Uniform thk of cap =	0.5	0.5	0.5	0.5	0.5	0.4
Varying thk of cap =	0.5	0.5	0.5	0.5	0.5	0.4
Thk of stem at top =	1	1	0.9	1	1	1
Thk of stem at bottom =	1	1	0.9	1	1	1.5
Ht of abutment stem =	7.540	7.840	9.590	6.659	7.259	10.629
Min footing thk at edge =	0.5	0.5	0.5	0.5	0.5	0.5
Footing thk at junction =	1.3	1.3	1.3	1.3	1.3	1.5
Width of heel =	6.45	6.5	7.6	6	6	7.5
Width of toe =	3.95	4	4.5	4	4	4
Base width =	11.40	11.50	13.00	11.00	11.00	13.00
No. of counterfort wall	0	0	2	0	0	0
Base Length of counterfort wall	0	0	9.2	0	0	0
Height of counterfort wall	0	0	11.29	0	0	0
Thickness of counterfort wall	0	0	0.6	0	0	0
Thk of end return wall at top =	0.5	0.5	0.5	0.5	0.5	0.5
Thk of end return wall at bottom =	1.0	1.0	1.0	1.0	1.0	1.0
Length of cantilever bracket =	2.3	0	4	0	0	0
Depth of bracket at edge =	0.5	0.5	0.5	0.5	0.5	0.5
Depth of bracket at junction =	2.033	0.500	3.167	0.500	0.500	0.500
Thk of bracket =	0.3	0.3	0.3	0.3	0.3	0.3
Width of Seismic Arrester=	1	1	1	1	1	1
Depth of Seismic Arrester=	0.5	0.5	0.5	0.5	0.5	0.5
Height of Seismic Arrester=	0.8	0.8	0.8	0.8	0.8	0.8
No of Seismic Arrester=	2	2	2	2	2	2
Width of Seismic Arrester=	1	1	1	1	1	1
Depth of Seismic Arrester=	0.5	0.5	0.5	0.5	0.5	0.5
Height of Seismic Arrester=	0.8	0.8	0.8	0.8	0.8	0.8
No of Seismic Arrester=	0	0	0	0	0	0
No of Bearing Pedestal =	3	3	3	3	3	3
Volume of each pedestal =	0.192	0.192	0.192	0.192	0.192	0.192
	0.576	0.576	0.576	0.576	0.576	0.576
Length of footing at top above pile fdn.	0	0	0	0	0	0
Length of footing at bottom above pile fdn.	0	0	0	0	0	0
Width of footing above pile fdn.	0	0	0	0	0	0
Height of footing above pile fdn.	0	0	0	0	0	0
Qty of footing (cum) =	103.5	104.4	117.1	125.0	125.0	123.8
Qty of substructure (cum) =	211.7	218.2	331.2	210.3	221.4	320.5
R/F in footing (t) =	15.53	15.66	17.57	18.75	18.75	18.56
R/F in substructure (t) =	33.87	34.91	53.00	33.65	35.43	51.29
Dia of pile=	0	0	0	0	0	0
Cross sectional area of pile =						
Length of pile=	0	0	0	0	0	0
No. of Pile=	0	0	0	0	0	0
Total Length of pile (m) =	0	0	0	0	0	0

Volume of conc. Qty in pile (cum)=	0	0	0	0	0	0	
R/F Qty (t) =	0	0	0	0	0	0	0
Length of retaining wall =	0	14	0	44	0	0	
Concrete Qty per meter (cum) =	8.30	10.66	13.21	8.56	9.63	21.07	
Concrete Qty (cum) =	0.0	149.3	0.0	376.5	0.0	0.0	
R/F Qty (t) =	0.00	14.93	0.00	37.65	0.00	0.00	
Conc Qty in abut foundns and retaining walls (cum) =	207.0	358.0	234.3	626.5	250.0	247.5	
R/F Qty in abut foundns and retaining walls (t) =	31.1	46.2	35.1	75.1	37.5	37.1	
Piers							
Foundation Length (bottom)	12	12	12	11.25	12	0	
Foundation Width (bottom)	10.000	10.000	10.000	12.000	12.000	0.000	
Foundation Length (top)	3.0	3.0	2.7	3.0	3.0	0.0	
Foundation Width (top)	10.000	10.000	10.000	12.000	12.000	0.000	
Uniform thickness of footing	0.75	0.75	0.75	0.75	0.75	1	
Varying thickness of footing	1.25	1.25	1.25	1.25	1.25	1.4	
Additional Thickness of beam	0	0	0	0	0	0	
Concrete Qty (cum) =	183.75	551.25	181.88	832.50	441.00	0.00	
R/F Qty (t) =	25.73	77.18	25.46	116.55	61.74	0.00	
Foundation Length (bottom)	15	0	15	17.4	15	0	
Foundation Width (bottom)	10.000	0.000	10.000	12.000	12.000	0.000	
Foundation Length (top)	3.0	0.0	2.7	3.0	3.0	0.0	
Foundation Width (top)	10.000	0.000	10.000	12.000	12.000	0.000	
Uniform thickness of footing	0.75	0.75	0.75	1.5	1	1	
Varying thickness of footing	1.25	1.25	1.25	2.5	2	1.8	
Additional Thickness of beam	0	0	0	0	0	0	
Concrete Qty (cum) =	450.00	0.00	223.13	3096.00	792.00	0.00	
R/F Qty (t) =	63.00	0.00	31.24	433.44	110.88	0.00	
Total concrete qty in open foundations & retaining walls (cum)	**840.8**	**909.3**	**639.3**	**4555.0**	**1483.0**	**247.5**	**9170**
Total R/F qty in open foundations & retaining walls (t)	**119.8**	**123.4**	**91.8**	**625.1**	**210.1**	**37.1**	**1282**
5.0 Substructure							
Conc Qty in abutments (cum) =	423.4	436.4	662.5	420.7	442.8	641.1	
R/F Qty in abutments (t) =	67.7	69.8	106.0	67.3	70.9	102.6	
Formation Level for piers=	23.83	17.57	18.60	26.17	20.95	0.00	
C/S area of pier (sqm) =	2.64	2.64	2.64	3.93	2.64	3.93	
Ht of pier wall =	22.823	16.357	17.590	25.348	20.159	-1.771	
Thk of pier cap at junction	1.6	1.6	1.6	1.6	1.6	1.6	
Thk of pier cap at edge =	0.8	0.8	0.8	0.8	0.8	0.8	
Length of pier cap at top =	3.400	3.400	3.250	3.400	3.400	3.300	
Length of pier cap at bottom =	3.400	3.400	3.250	3.400	3.400	3.300	
Width of pier cap at top =	8.000	8.000	8.000	10.200	10.200	10.500	
Width of pier cap at bottom =	2.700	2.700	2.700	2.700	2.700	3.200	
No of Bearing Pedestal =	6	6	6	8	8	8	
Volume of each pedestal =	0.192	0.192	0.192	0.192	0.192	0.192	
Total concrete in pedestal	3.456	3.456	2.304	13.824	6.144	0.000	
Conc Qty in piers (cum) =	287.7	236.5	161.0	1293.6	389.6	0.0	
R/F Qty in piers (t) =	46.0	37.8	25.8	207.0	62.3	0.0	
Total conc qty in substructures (cum)	**711.1**	**672.9**	**823.5**	**1714.3**	**832.4**	**641.1**	**6677**
Total R/F qty in substructures (t)	**113.8**	**107.7**	**131.8**	**274.3**	**133.2**	**102.6**	**1068**
	233.6	231.1	223.6	899.4	343.3	139.7	
6.0 Superstructure							
No of RCC superstructures =	*0*	*0*	*0*	*0*	*0*	*0*	
Conc Qty per superstructure (cum) =	*144*	*144*	*144*	*144*	*144*	*144*	
Conc Qty in superstructures (cum) =	**0**	**0**	**0**	**0**	**0**	**0**	**0**
R/F Qty in superstructures (t) =	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0**
No of PSC superstructures =	*4*	*4*	*3*	*10*	*5*	*5*	
Prestressed Conc Qty per superstructure (cum) =	*66*	*75*	*66*	*66*	*66*	*0*	
Prestressed Conc Qty in superstructures (cum) =	**264.1**	**301.4**	**198.1**	**660.2**	**330.1**	**0.0**	**1754**
Deck Slab Conc.Qty per Span (cum) =	*62*	*68*	*62*	*62*	*62*	*0*	
Deck Slab Conc.Qty in Superstructures (cum) =	**248.0**	**271.4**	**186.0**	**620.1**	**310.1**	**0.0**	1635.6
R/F Qty in superstructures (t) =	**92**	**103**	**69**	**230**	**115**	**0**	610.1
Strand Qty in superstructures (t) =	**11.9**	**13.6**	**8.9**	**29.7**	**14.9**	**0.0**	78.9
Total Conc Qty in superstructures (cum) =	**248.0**	**271.4**	**186.0**	**620.1**	**310.1**	**211.7**	**2271**

Total R/F Qty in superstructures (t) =	**92.2**	**103.1**	**69.1**	**230.5**	**115.2**	**25.4**	**686**
Total Strand Qty in superstructures (t) =	**11.9**	**13.6**	**8.9**	**29.7**	**14.9**	**0.0**	**79**
No of Steel Composite Spans =	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*1.0*	
Structural Steel quantity per span (t) =	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*125.0*	
Total Structural Steel (t) =	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**125.0**	**375**
Concrete Quantity in Deck Slab (cum)=	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**211.7**	**635**
R/F Qty in Deck Slab (t) =	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**25.4**	**76**
	92.2	103.1	69.1	230.5	115.2	25.4	
7.0 Miscellaneous							
Total length of bridge =	100	110	75	250	125	40	
Total width of bridge =	10	10	10	12.5	12.5	9	
Length of approach slab =	3.5	3.5	3.5	3.5	3.5	3.5	
Thk of approach slab =	0.3	0.3	0.3	0.3	0.3	0.3	
Thk of PCC below approach slab =	0.15	0.15	0.15	0.15	0.15	0.15	
Carriageway width =	9	9	9	10.5	10.5	10.5	
Elastomer bearing :							
Length of bearing (cm) =	0	0	0	0	0	0	
Width of bearing (cm) =	0	0	0	0	0	0	
Thickness of bearing (cm) =	0	0	0	0	0	0	
No of bearing =	0	0	0	0	0	0	
No of Free bearing per span =	0	0	0	0	0	0	
No of Guided bearing per span =	0	0	0	0	0	0	
No of Fixed bearing per span =	0	0	0	0	0	0	
No of Metallic Guided bearing per span =	0	0	0	0	0	0	
No of Pin bearing per span =	0	0	0	0	0	0	
No of spans with Spherical brg =	4	4	3	10	5	1	
No of Spherical brg =	6	6	6	8	8	6	
Spacing of drainage spouts =	5	5	5	5	5	5	
Spouts one(1) or both(2) sides =	2	2	2	2	2	2	
Width of kerb =	0	0	0	0	0	0	
Thk of kerb =	0	0	0	0	0	0	
Kerbs one(1) or both(2) sides =	2	2	2	2	2	2	
Thk of Filter media (m) =	0.6	0.6	0.6	0.6	0.6	0.6	
No of Service Pipes in each Kerb =	1	1	1	1	1	1	
Wearing Coat (sqm) =	**963**	**1053**	**738**	**2699**	**1386**	**494**	**8319**
Tar paper bearing (sqm) =	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Elastomer bearing (cucm) =	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total No of Free bearings =	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total No of Guided bearings =	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total No of Fixed bearings =	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total No of Metallic Guided bearings =	**0**	**0**	**0**	**0**	**0**	**0**	**0**
No of Spherical brg =	**24**	**24**	**18**	**80**	**40**	**6**	**204**
Expansion Joint (m) =	**50.0**	**50.0**	**40.0**	**137.5**	**75.0**	**18.0**	**407**
Drainage spouts (nos) =	**40.0**	**44.0**	**30.0**	**100.0**	**50.0**	**16.0**	**312**
Crash Barrier (m) =	**214.0**	**234.0**	**164.0**	**514.0**	**264.0**	**94.0**	**1672**
Railing (m) =	**0.0**	**0.0**	**0.0**	**514.0**	**264.0**	**94.0**	**1060**
RCC in Kerb (cum) =	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0**
Length of service pipes (m) =	**214.0**	**234.0**	**164.0**	**514.0**	**264.0**	**94.0**	**1672**
Approach slab (cum) =	**18.9**	**18.9**	**18.9**	**24.2**	**24.2**	**16.8**	**155**
PCC below approach slab (cum) =	**9.5**	**9.5**	**9.5**	**12.1**	**12.1**	**8.4**	**78**
Filter media (cum) =	**375.0**	**346.5**	**553.4**	**365.8**	**433.7**	**367.2**	**3176**
Weep holes (nos) =	**625**	**578**	**922**	**610**	**723**	**612**	**5293**
Stone Pitching (cum) =	**98**	**143**	**195**	**103**	**123**	**367**	**1763**
Filtermedia underneath pitching (cum) =	**49**	**72**	**98**	**51**	**62**	**184**	**882**

Bridge Cost Estimate

Item No.	Description	Unit	Quantity	Rate	Cost in Rs	Cost in Cr	SOR Referrence
7.01	Earthwork in excavation of foundations for structures						
	in all kinds of soils including all leads and lifts complete as						
	per drawings and Technical Specifications Clause 304						
	b) Depth up to 3.0 m to 6.0 m						
	i) all types of soils	cum	23035	141	3247980.68	0.32	12.1 I.B.(ii)
	iii) Soft/ordinary rock	cum	14704	158	2323246.33	0.23	12.1 II.B.(ii)
7.02	Back filling behind abutments, wing walls and return walls						
	with selected imported granular material of approved						
	quality, including all leads and lifts, complete as per						
	drawings and Technical Specifications Clause 305 and						
	Clause 710.1.4 of IRC:78	cum	25178	1942	48896467.37	4.89	13.9 A
7.03	Providing and laying filter media behind abutments, wing						
	walls & return walls with well packed material to the						
	specified thickness with smaller size towards the soil and						
	bigger size towards the wall complete with all leads and						
	lifts as per drawings and Technical Specifications Clauses						
	305 and Clause 710.1.4 of IRC:78	cum	3176	2301	7307667.67	0.73	13.10
7.04	Plain Cement Concrete / Reinforced Cement Concrete in						
	foundation/ leveling course/annular filling upto rock						
	level excluding reinforcement complete as per drawings						
	and Technical Specifications Sections1500, 1700 and 2100						
	a) M-15 grade	cum	9635	6155	59304549.31	5.93	12.8 A
6.10	Providing bored cast-in-situ RCC vertical piles excluding						
	reinforcement complete as per drawing and Technical						
	Specifications Sections 1100 and 1700						
	a) 1200 mm dia piles						
	(M-35 grade concrete)	m	0	16454	0.00	0.00	
7.05	Plain/Reinforced cement concrete in open foundation						
	complete as per drawing and technical specifications						
	c) RCC Grade M35	cum	9170	7273	66691851.03	6.67	12.8 H Case II
7.06	Plain Cement Concrete/ Reinforced Cement Concrete in						
	substructure excluding reinforcement complete as per						
	drawings and Technical Specifications Sections						
	1500, 1700 and 2200.						
	d) M-35 grade	cum	6677	8080	53953829.24	5.40	13.5 H (r) Case II
7.07	Reinforced/Prestressed Cement Concrete in superstructure						
	excluding reinforcement complete as per drawings						
	and Technical Specifications Sections 1500, 1700 and 2300						
	b) RCC I-beam and slab						
	ii) M-35 grade	cum	2271	9397	21338169.86	2.13	14.1 D Case (II) (ii)
	c) PSC I Beam and Slab						
	ii) M-45 grade	cum	1754	10217	17918275.75	1.79	14.1 F (ii) r
7.08	Supplying, fixing and placing TMT/HYSD bar						
	reinforcement complete as per drawings and Technical						
	Specification Section 1600						
	a) For Foundation	t	1282	75737	97069353.42	9.71	12.40
	b) For Sub structure	t	1068	75965	81160448.28	8.12	13.6

Bridge Cost Estimate

Item No.	Description	Unit	Quantity	Rate	Cost in Rs	Cost in Cr	SOR Referrence
	c) For Superstructure/Friction Slab/Facia Panels	t	686	77821	53408965.38	5.34	14.2
	d) Strands in superstructures	t	79	148607.00	11728017.44	1.17	14.3
	e) Structural Steel	t	375	120000.00	45000000.00	4.50	
7.09	Providing 65 mm thick wearing course consisting						
	of 40 mm thick asphaltic concrete covered by						
	25 mm thick mastic asphalt on top complete as						
	per Technical Specification Section 2700	sqm	8319	1752	14572225.92	1.46	14.4 & 14.5
7.10	Providing and fixing drainage spouts as per drawings						
	and Technical Specifications Clause 2705	no	312	3233	1008696.00	0.10	14.9
7.11	Supplying and fixing of Spherical bearings complete						
	as per drawings and IRC:83(Part III) - 2002						
	Capacity 2000 kN	no	204	137000	27948000.00	2.79	13.16
7.12	Supplying and fixing of expansion joints complete as per						
	drawings and Technical Specifications Section 2600.						
	b) 50 mm wide strip seal joints	m	407	10458	4251177.00	0.43	14.22
7.13	Reinforced Cement Concrete Railing in M-30 grade						
	including reinforcement complete as per drawings and						
	Technical Specifications Sections 1500, 1600, 1700,						
	2200 and Clause 2703	m	1060	2123	2250380.00	0.23	14.7
7.14	Reinforced Cement Concrete Crash Barrier						
	including reinforcement and MS pipe complete as per						
	drawings and Technical Specifications Sections 1500,						
	1600, 1700, 2200 and Clause 809						
	b) M-40 grade	m	1672	5270	8811139.04	0.88	14.15
7.15	Plain Cement Concrete in leveling course under the						
	approach slabs complete as per drawings and						
	Technical Specifications Section 1700, 2100 & 2700.						
	M-15 grade	cum	78	5919	459896.98	0.05	14.10
7.16	Reinforced Cement Concrete in approach slabs						
	including reinforcement and form work complete as per						
	drawings and Technical Specifications Sections 1500,						
	1600, 1700 and 2100 and Clause 2704.						
	M-30 grade	cum	155	10943	1700542.20	0.17	14.11
7.17	Providing and laying filter material underneath stone						
	boulder pitching on slopes complete as per drawings and						
	Technical Specifications Section 2500	cum	882	2576	2271167.36	0.23	15.5
7.18	Providing and laying stone boulder pitching on slopes						
	with cement mortar filled joints 1:3 complete as per						
	drawings and Technical Specifications Section 2500	cum	1763	2103	3708280.24	0.37	15.4 A
7.19	Providing weep holes in abutments, wing walls, retaining						
	walls, return walls etc. complete as per drawings and						
	Technical Specifications Clause 2706	no	5293	506	2678313.66	0.27	13.8
	Total Cost				**639008640.15**	**63.90**	

TUNNEL

Sudhmahadev - Tunnel					
Abstract of Quantity/Cost for Tunnel -1					
Sl.	Description	Unit	Quantity	Rate Rs.	Amount (in Cr.)
1.0	**Portal Development**				
1.1	Surface Excavation				
	Soil/Soft Rock	m^3	38024	858	3.26
	Hard Rock	m^3	123406	981	12.11
1.2	Rock Bolts (25mm Dia)	m	36246	1289	4.67
1.3	Rockbolts (32mm dia)	m	11020	1470	1.62
1.4	Shotcrete with Wiremesh	m^3	1401	13433	1.88
1.5	Drilling for drainage holes	m^3	13649	675	0.92
1.6	Concrete	m^3	2584	9567	2.47
1.7	Reinforment	MT	207	85883	1.78
1.8	Control Room/Technical/Other Buildings				4.11
					32.82
2.0	**Tunnel Excavation including overbreak**				
	Class I to III	m^3	848903	3550	301.36
	Class IV	m^3	84097	4771	40.12
	Class V	m^3	122329	5994	73.32
3.0	Steel Supports	MT	3476	97629	33.94
4.0	Pipe Roofing (89mm dia)	m	73320	13525	99.17
5.0	Rockbolts (25mm dia)	m	532021	1289	68.58
6.0	SFRS	m^3	83330	17424	145.19
7.0	Drilling for drainage holes	Rm	15496	675	1.05
8.0	Drilling for grouting holes	Rm	29252	380	1.11
9.0	Grouting including material				
	Contact Grouting	MT	2197	30370	6.67
	Consolidation Grouting	MT	2922	22120	6.46
10.0	M-35 Concrete Lining	m^3	175636	9567	168.03
11.0	Reinforcement	MT	4705	85883	40.41
12.0	**Pavement**				
	Pavement Quality Concrete (PQC)	m^3	25068	8208	20.58
	Dry lean Concrete (DLC) (M15)	m^3	12534	4228	5.30
	Granular Sub base	m^3	49195	2107	10.37
	Bed Concrete, M15	m^3	8356	6822	5.70
	Subtotal				**1060.17**
13.0	Site Facility (8% of Civil cost +4% of MEP cost)	@		-	94.15
14.0	Dewatering	@		-	38.96
15.0	Unforseen Geological Surprises	@	5.0%		38.85
16.0	Investigations & Design	@	2.5%	-	26.50
17.0	Instrumentation	@	0.50%	-	5.30
	Total				**1263.94**
18.0	MEP Cost			-	233.42
	Total Cost				**1497.36**

Sudhmahadev Tunnel

Abstract of Quantity/Cost for Tunnel -1

Input Parameters	Tube-1	Tube-2
Length of tunnel-1	5449	5417
No. of Tunnels	2	
Total length of road tunnel	10866 m	

	Desription	Unit	Class I	Class II	Class III		Class IV	Class V		Total
					Class III-A	Class III-B		Class V-A	Class V-B	
	Length	m			8022			1484		
			28.82%	5.49%	14.91%	34.79%	6.80%	2.76%	6.44%	100.00%
		m	3131	596	1620	3780	739	300	699	**10866**
	Concrete lining	m	0.400	0.400	0.400	0.400	0.500	0.500	0.500	
	Shotcrete	m	0.150	0.150	0.270	0.270	0.320	0.350	0.350	
			10.53	10.53	10.77	10.77	11.08	11.14	11.14	
1	**Under ground excavation**									
	Excavation area	m^2	88.50	88.37	91.57	91.65	112.30	118.02	118.02	
			90.34							
a)	*Excavation Quantity*	m^3	277134	52707	148349	346434	83001	35369	82528	**1025523**
	I to III	m^3	10.67							**824625**
	IV	m^3								**83001**
	V	m^3								**117898**
	Excavation Qt. incuding Overbreak									
	I to III	m^3								**824625**
	IV	m^3								**83001**
	V	m^3								**117898**
2	**Shotcrete**									
	Shotcrete Area		3.72	3.71	6.74	6.74	16.379	18.19	18.19	
a)	*Shotcrete Quantity*	m^3	11633.51	2212.69	10918.83	25477.27	12105.82	5450.10	12716.91	**80515**
3	**Rock bolt/Anchors**									
	25 dia rock bolt length	m	4	4	5	5	9	12	12	
	Rock bolt spacing along peripheri	m	3	2.50	2.00	2.00	1.50	1.25	1.25	
	Rock bolt spacing along tunnel length	m	3.25	2.75	2.00	2.00	1.25	1.25	1.25	

	Input Parameters		Tube-1	Tube-2						
	Length of tunnel-1		5449	5417						
	No. of Tunnels		2							
	Total length of road tunnel		10866	m						
	Desription	**Unit**	**Class I**	**Class II**	**Class III**		**Class IV**	**Class V**		**Total**
					Class III-A	**Class III-B**		**Class V-A**	**Class V-B**	
	Unit wt. of steel rib ISHB 300	m	25	25	25.38	25.39	25.53	26.08	26.08	
	No. of bolts per section	nos	9	10	13	13	18	21	21	
	Length of tunnel	m	3131	596	1620	3780	739	300	699	
	No. of sections	nos	965	218	812	1892	593	241	561	
	No. of bolts	nos	8685.00	2180.00	10556.00	24596.00	10674.00	5061.00	11781.00	
	Total length of bolts/ anchors in tunnel	m	34740.00	8720.00	52780.00	122980.00	96066.00	60732.00	141372.00	**517390**
4	**Steel rib**									
	Unit wt. of steel rib	kg/m			29		29	36	36	
	Length of tunnel				1620		739	300	699	
	Spacing of steel rib	m			1.0		0.90	0.90	1.10	
	Perimeter of steel rib	m			25.04		37.11	38.05	38.05	
	No. of sections for steel rib	nos			1622		823	334	637	
	Length of steel rib	m			40615		30542	12709	24238	
	Wt. of steel rib	MT			1178		886	458	873	**3394**
5	**Pipe Roofing**									
	Dia of Pipe	mm					89	89	89	
	Length of Pipe	m					6.00	6.00	6.00	
	No. of pipes along periphery	Nos					27	27	27	
	No. of tunnel sections for pipe roofing	Nos					185	75	175	
	Total No. of pipes	Nos					4995	2025	4725	
	Total Length of Pipe	m					29970	12150	28350	**70470**
6	**Concrete**									
b)	*Concrete Lining*									
	Concrete Area	m	13.325	13.333	13.505	13.579	24.04	28.37	28.37	
	Quantity	m^3	41727	7952	21878	51329	17768	8503	19841	**168998**
	Total Concrete									**168998**

	Input Parameters		Tube-1	Tube-2						
	Length of tunnel-1		5449	5417						
	No. of Tunnels		2							
	Total length of road tunnel		10866	m						
	Desription	**Unit**	**Class I**	**Class II**	**Class III**		**Class IV**	**Class V**		**Total**
					Class III-A	**Class III-B**		**Class V-A**	**Class V-B**	
7	**Contact grouting (45mm dia)**									
	Depth of hole into rock		0.30	0.30	0.30	0.30	0.30	0.30	0.30	
	Depth of grouting hole	m	0.85	0.85	0.97	0.97	1.12	1.15	1.15	
	Length of tunnel		3131	596	1620	3780	739	300	699	
	Spacing of sections	m	3	3	3	3	3	3	3	
	No. of grouting holes per section	no	4	4	4	4	4	4	4	
	Length of grouting holes	m	3553	680	2103	4897	1111	465	1081	**13889**
	Cement Qt	MT								**2083**
8	**Consolidtion grouting (45mm dia)**									
	Depth of grouting hole	m					6	6	6	
	Spacing of sections	m					3	3	3	
	No. of grouting holes per section	no					4	4	4	
	Length of grouting holes	m					5952	2424	5640	**14016**
	Cement Qt.	MT								**2803**
9	**Drainage holes (45mm dia)**									
	Depth of drainage hole	m	4	4	4	4	4	4	4	
	Spacing of sections	m	6	6	6	6	6	6	6	
	No. of drainage holes per section	no	2	2	2	2	2	2	2	
	Length of drainage holes	m	4184	808	2176	5056	1000	408	944	**14576**
10	**Water proffing Membrane**									
	Length	m	25.5	25.40	25.88	25.89	26.13	26.08	26.08	
	Qt.	m^2	79853	15149	41926	97864	19313	7816	18237	**280158**
11	**Reinforcement**									
	Concrete Qt. considered as RCC						46112	m^3		
	Steel Qt. (@ 100kg/m^3)						4611	MT		

Input Parameters			Tube-1	Tube-2						
Length of tunnel-1			5449	5417						
No. of Tunnels			2							
Total length of road tunnel			10866	m						
	Desription	**Unit**	**Class I**	**Class II**	**Class III**		**Class IV**	**Class V**		**Total**
					Class III-A	**Class III-B**		**Class V-A**	**Class V-B**	
12	**Pavement**									
	Pavement Quantity Concrete (PQC)					2.22 Sqm				24123 Cum
	Dry lean Concrete (DLC)(M15)					1.11 Sqm				12061 Cum
	Granular Sub base					3.33 Sqm				47777 Cum
	(With invert section)					10.0 Sqm				
	Bed Concrete					0.74 Sqm				8041 Cum

Sudhmahadev Tunnel

Abstract of Quantity/Cost for Tunnel -1

Input Parameters

Total length of Cross Passage 630 m

	Desription		Class I	Class II	Class III		Class IV	Class V		Total
					Class III-a	Class III-b		Class V-a	Class V- b	
	Length				53.13%			12.50%		
			21.88%	9.38%	15.94%	37.19%	3.13%	3.75%	8.75%	100%
		m	137.81	59.06	100.41	234.28	19.69	23.63	55.13	**630**
	Overbreak		10%	10%	10%	10%	10%	10%	10%	
1	**Under ground excavation**									
	Excavation area	m^2	40.23	40.30	42.27	42.27	50.61	50.61	51.38	
a)	*Excavation Quantity*	m^3	5544	2380	4244	9903	996	1196	2832	**27096**
	I to III	m^3								**22072**
	IV									**996**
	V	m^3								**4028**
b)	*Overbreak*	m^3	554	238	424	990	100	120	283	**2710**
	Excavation Qt. incuding Overbreak									
	I to III	m^3								**24279**
	IV									**1096**
	V	m^3								**4431**
2	**Shotcrete**									
	Shotcrete Area		2.49	2.49	4.52	4.52	7.82	7.82	8.58	
a)	*Shotcrete Quantity*	m^3	343.15	147.07	453.84	1058.95	153.96	184.75	472.97	**2815**
3	**Rock bolt/Anchors**									
	25 dia rock bolt length	m	3	3	3	3	5	9	9	
	Rock bolt spacing along Periphery	m	2.25	2.00	1.75	1.75	1.75	1.50	1.50	
	Rock bolt spacing along tunnel length		3.25	2.75	2.00	2.00	1.25	1.00	1.20	
	Perimeter of rock bolt	m	16.8	16.80	17.16	17.16	18.50	18.50	18.60	
	No. of bolts per section	nos	8	9	10	10	11	13	13	
	Length of tunnel	m	137.81	59.06	100.41	234.28	19.69	23.63	55.13	

Input Parameters

Total length of Cross Passage 630 m

	Desription		Class I	Class II	Class III		Class IV	Class V		Total
					Class III-a	Class III-b		Class V-a	Class V- b	
	No. of sections	nos	44	23	52	119	17	25	47	
		nos	352.00	207.00	8.18	1190.00	187.00	325.00	611.00	
	Total length of bolts/ anchors in tunnel	m	1056.00	621.00	24.53	3570.00	935.00	2925.00	5499.00	**14631**
4	**Steel rib**									
	Unit wt. of steel rib	kg/m			21		21	29	21	
	Length of tunnel				100		20	24	55	
	Spacing of steel rib	m			1		0.90	0.90	1.10	
	Perimeter of steel rib	m			17.16		18.50	18.50	18.60	
	No. of sections for steel rib	nos			102		23.00	28.00	52.00	
	Length of steel rib	m			1750		425.50	518.00	967.20	
	Wt. of steel rib	MT			37		8.94	15.02	20.31	**82**
5	**Pipe Roofing**									
	Dia of Pipe	mm					88.9	88.9	88.9	
	Length of Pipe	m					6.00	6.00	6.00	
	No. of pipes along periphery	Nos					19	19	19	
	No. of tunnel sections for pipe roofing	Nos					5	6	14	
	Total No. of pipes	Nos					95	114	266	
	Total Length of Pipe	m					570	684	1596	**2850**
6	**Concrete**									
a)	Geological approved overbreak for lining	m^3	554.42	238.02	424.42	990.31	99.64	119.57	283.23	**2710**
b)	*Concrete Lining*									
	Concrete Area	m	5.64	5.64	5.64	5.64	9.45	9.45	9.45	
	Quantity	m^3	777.26	333.11	566.29	1321.35	186.05	223.26	520.93	**3928**
	Total Concrete									**6638**
7	**Contact grouting (45mm dia)**									
	Depth of hole into rock		0.30	0.30	0.30	0.30	0.30	0.30	0.30	
	Depth of grouting hole	m	0.75	0.75	0.87	0.87	1.00	1.03	1.03	
	Length of tunnel		138	59	100	234	20	24	55	
	Spacing of sections	m	3	3	3	3	3	3	3	
	No. of grouting holes per section	no	4	4	4	4	4	4	4	
	Length of grouting holes	m	141	63	121.8	278.4	31.84	36.9	82	**755**
	Cement Qt	MT								**113**

Input Parameters

Total length of Cross Passage 630 m

	Desription		Class I	Class II	Class III		Class IV	Class V		Total
					Class III-a	Class III-b		Class V-a	Class V- b	
8	**Consolidtion grouting (45mm dia)**									
	Depth of grouting hole	m					4	4	4	
	Spacing of sections	m					3	3	3	
	No. of grouting holes per section	no					4	4	4	
	Length of grouting holes	m					128	144	320	**592**
	Cement Qt.	MT								**118**
9	**Drainage holes (45mm dia)**									
	Depth of drainage hole	m	4	4	4	4	4	4	4	
	Spacing of sections	m	6	6	6	6	6	6	6	
	No. of drainage holes per section	no	2	2	2	2	2	2	2	
	Length of drainage holes	m	192	88	144	328	40	40	88	**920**
10	**Water proffing Membrane**									
	Perimeter	m	16.87	16.87	16.87	16.87	17.19	17.19	17.19	
	Qt	m^2	2324.90	996.38	1693.85	3952.32	338.43	406.11	947.60	**10660**
11	**Reinforcement**									
	Concrete Qt. considered as RCC					930 m^3				
	Steel Qt. (@ 100kg/m^3)					94 MT				
12	**Pavement**									
	Pavement Quantity Concrete (PQC)					1.50 Sqm				945 Cum
	Dry lean Concrete (DLC)					0.75 Sqm				473 Cum
	Granular Sub base					2.25 Sqm				1418 Cum
	Bed Concrete					0.50 Sqm				315 Cum

SUDHMAHADEV TUNNEL (Pkg.-1) - MEP SYSTEMS - COST ESTIMATION FOR DPR DESIGN				Input	$1.0	=	INR 70
Code	**Chapter / Subchapter / Element**	**Quantity**	**Unit**	**Unitary Cost $ (USD)**	**Total Cost $ (USD)**	**Subchapter Total $ (USD)**	**Chapter Total $ (USD)**
1	**VENTILATION SYSTEM**						**$2,515,780**
1.1	**Tunnel Ventilation System (electrical supply valued apart)**					**$2,082,640**	
1.1.1	Jet Fan 1200 mm inlet diameter, unidirectional, 37kW motor, with silencers at inlet and outlet, anti-vibration mountings. Able to operate at 400 ºC during 2 hours. Including anchoring structure and set of	52	un	$28,000.00	$1,456,000		
	Sudhmahadev 1 - T1	28					
	Sudhmahadev 1 - T2	24					
1.1.2	Fans' local cabinet (manual cutting switch, sensors' control) for two (2) jet-fan´s	26	un	$2,300.00	$59,800		
	Sudhmahadev 1 - T1	14					
	Sudhmahadev 1 - T2	12					
1.1.3	Pressurization system for emergency exit door, including fan, ducts, dampers, pressure control system and control panel.	42	un	$12,500.00	$525,000		
	Sudhmahadev 1	42					
1.1.4	Ventilation system local control panel	3	un	$3,780.00	$11,340		
	Sudhmahadev 1	3					
1.1.5	Ventilation system Testing and Commissioning, including test certificate, per tunnel	1	un	$30,500.00	$30,500		
	Sudhmahadev 1	1					
1.2	**Environmental Monitoring System (EMS)**					**$433,140**	
1.2.1	NOx concentration monitoring system by electrochemical sensor 0...100 ppm, Resol. +0.5 ppm (it measures NO + NO2)	30	un	$700.00	$21,000		
	Sudhmahadev 1 - T1	15					
	Sudhmahadev 1 - T2	15					
1.2.2	Visibility (opacimeter) monitoring system, K value by scattered light measurement principle. Range 0...15 km^{-1}, Resol. +0.001 km^{-1}	30	un	$8,000.00	$240,000		
	Sudhmahadev 1 - T1	15					
	Sudhmahadev 1 - T2	15					
1.2.3	CO concentration monitoring system by electrochemical sensor. Range 0...300 ppm, Resol. +0.5 ppm	30	un	$700.00	$21,000		
	Sudhmahadev 1 - T1	15					
	Sudhmahadev 1 - T2	15					
1.2.4	Flow velocity and direction measuring device, (anemometer), by ultrasonic and contact-free technology, for large measuring distances. Anchoring elements included.	16	un	$9,000.00	$144,000		
	Sudhmahadev 1 - T1	8					
	Sudhmahadev 1 - T2	8					
1.2.5	Flow velocity and direction measuring device, (anemometer) for outdoor use. Anchoring elements included.	2	un	$1,300.00	$2,600		
	Sudhmahadev 1	2					
1.2.6	Outdoor ambience temperature sensor, anchoring elements included	2	un	$350.00	$700		
	Sudhmahadev 1	2					
1.2.7	Differential pressure sensors	2	un	$380.00	$760		
	Sudhmahadev 1	2					
1.2.8	Gas sensor	4	un	$350.00	$1,400		
	Technical rooms	4					
1.2.9	Hydrogen sensor	4	un	$350.00	$1,400		
	Technical rooms	4					
1.2.10	Temperature sensor	4	un	$70.00	$280		
	Technical rooms	4					
2	**FIREFIGHTING SYSTEM**						**$9,888,220**
2.1	**Firefighting Standpipe system (hydrants)**					**$925,700**	
2.1.1	840m^3 water cylindrical tank (Diameter: 10.5 m / Height: 10.0 m). Galvanized steel. (UNE-23500)	2	un	$42,700.00	$85,400		
	Sudhmahadev 1	2					
2.1.2	Firefighting pump for 114 m3/h and 114 wmc An electric pump of 110 kW A diesel pump of 110 kW A booster pump of 4,0 kW	1	un	$63,000.00	$63,000		
	Sudhmahadev 1	1					
2.1.4	Fire Hydrant, 4" + 2 x 2 1/2" riser, pressure regulator, ball valve and closing caps	44	un	$700.00	$30,800		
	Sudhmahadev 1	44					
2.1.5	Fire Hydrant, 4" double exterior hydrant, complete.	4	un	$590.00	$2,360		
2.1.6	Hose connection, 2 1/2", pressure regulator, ball valve and closing caps	84	un	$450.00	$37,800		
	Sudhmahadev 1	84					
2.1.7	Assembly of a 8" Ø main valve installation at crossing passages including all supports	48	un	$1,100.00	$52,800		
2.1.8	Assembly of a 8" Ø pressure reducer installation in the crossing tunnels in the passages including supports.	3	un	$7,500.00	$22,500		
2.1.9	Assembly of a main 6" drainage valve system including supports	4	un	$820.00	$3,280		
2.1.10	8" Ø high-pressure PVC pipe for a maximum working pressure of 25 atm. + compressed concrete, including accesories	11,196	m	$55.00	$615,780		
	Sudhmahadev 1	11,196					
2.1.11	4" Ø cast iron pipe with colloidal [interior] coating and Class II black polyethylene exterior sheathing + compressed concrete, including accesories	52	m	$85.00	$4,420		
	Sudhmahadev 1	52					
2.1.12	21/2" Ø cast iron pipe with colloidal [interior] coating and Class II black polyethylene exterior sheathing + compressed concrete, including accesories	126	m	$60.00	$7,560		
	Sudhmahadev 1	126					
2.2	**Fire extinguishing stations**					**$195,650**	

SUDHMAHADEV TUNNEL (Pkg.-1) - MEP SYSTEMS - COST ESTIMATION FOR DPR DESIGN							
				Input	$1.0	=	INR 70
2.2.1	Main fire extinguishing station FH/M, containing: a) A 6" standpipe with four 3" hose bibs each compatible with all parts and shall include a protective cover (as for example Pomas or approved equivalent) and pressure breaker device. b) A 100 m long rack and reel hose with a pulley on the sides of the device in order to facilitate quick deployment, a pressure booster pump and a high pressure nozzle. c) Three 2" diameter x 15 m long flexible hoses. d) Jet spray nozzle. e) Water protected emergency outlet box. f) Two 6 kg dry powder fire extinguishers. g) Firefighters' telephone. h) Permanently lit illuminated sign for marking the alcove visible from the adjacent sidewalks at right angles to them. i) Emergency lighting within the alcove.	21	un	$7,750.00	$162,750		
	Sudhmahadev 1	21					
2.2.2	Fire extinguishing station (portable fire extinguishers with steel enclosure)	70	un	$470.00	$32,900		
	Sudhmahadev 1	70					
2.3	**Fixed Fire Fighting System**					**$8,766,870**	
2.3.1	Packaged Fire Pump System, compliant with NFPA-20, with 3x160kW electrical pumps (2 on duty + 1 on standby), flow rate 1568 gpm each, head 121 psi (8.35 bar), including jockey pump, pressure tank, test headers, flow loops, city bypass loops and control board. Frame mounted. UL listed components. For redundant power supply.	1	un	$202,000.00	$202,000		
	Sudhmahadev 1	1					
2.3.3	FFFS system Main Control Panel, with connection to FDAS, for zone valves activation. Included PLC system with communication module and connections to the corresponding switch(es) for the SCADA monitoring	1	un	$65,000	$65,000		
	Sudhmahadev 1	1					
2.3.4	Automatic Water Control Valve Cabinet including DN150 DV-5A Electric actuation Pressure reducing Remote resetting PN 53060511A5	360	un	$16,000.00	$5,760,000		
	Sudhmahadev 1	360					
2.3.5	Spray nozzle, open type, 25,2 (K-240) K-factor, protected against contamination and clogging, designed to cover an area of 16 ft x 24 ft. Including T connection pipe.	4,320	un	$160.00	$691,200		
	Sudhmahadev 1	4,320					
2.3.6	10" Ø high-pressure PVC pipe for a maximum working pressure of 25 atm. + compressed concrete, including accesories	4,700	m	$80.00	$376,000		
	Sudhmahadev 1	4,700					
2.3.7	8" Ø high-pressure PVC pipe for a maximum working pressure of 25 atm. + compressed concrete, including accesories	6,860	m	$55.00	$377,300		
	Sudhmahadev 1	6,860					
2.3.8	6" Galvanized steel pipe, incl. st.st. fixings, flexible couplings, etc.	12,654	m	$95.00	$1,202,130		
	Sudhmahadev 1	12,654					
2.3.9	2" Galvanized steel pipe, incl. st.st. fixings, flexible couplings, etc.	972	m	$45.00	$43,740		
	Sudhmahadev 1	972					
2.3.10	Assembly of a 8" Ø main valve installation including all supports	45	un	$1,100.00	$49,500		
	Sudhmahadev 1	45					
3	**FIRE DETECTION AND ALARM SYSTEM (FDAS)**						**$331,175**
3.1	**Tunnel fire detection system**					**$322,075**	
3.1.1	Optical heat detector cable, consisting of two covered fiber optic cables, including all the necessary support and connection elements	11,325	m	$11.00	$124,575		
	Sudhmahadev 1	11,325					
3.1.3	Fire detection control unit, 2-meter space resolution, 2-meter precision, 2 independent channels, outputs: RS-485, RS-232 and IP, including the programming	4	un	$45,000.00	$180,000		
3.1.4	Smoke control system (mechanical)	7	un	$2,500.00	$17,500		
	Sudhmahadev 1	7					
3.2	**Fire Alarm system**					**$9,100**	
3.2.1	Alarm buttons, including copper connection cable to the detection control unit	130	un	$70.00	$9,100		
	Sudhmahadev 1	130					
4	**ELECTRICAL POWER SYSTEMS**						**$12,390,495**
4.1	**Conduits and Cable Trays (Tunnel and tecnical rooms)**					**$5,131,103**	
4.1.3	50mm PE conduit, flush-mounted inside concrete, for equipment connection from buried trenches to equipment location.	5,500	m	$30.00	$165,000		
4.1.4	100mm PE conduit, flush-mounted inside concrete, for equipment connection from buried trenches to equipment location.	5,696	m	$50.00	$284,800		
4.1.5	2" sleeve for feed equipment, including accesories.	5,500	m	$5.00	$27,500		
4.1.6	4" sleeve for feed equipment, including accesories.	5,500	m	$9.00	$49,500		
4.1.7	Galvanized steel perforated cable tray 600 mm wide, with cover plate, including all the fixings and the support elements	11,000	m	$100.00	$1,100,000		
4.1.8	Galvanized steel perforated cable tray 400 mm wide, with cover plate, including all the fixings and the support elements	11,000	m	$80.00	$880,000		
4.1.9	Galvanized steel perforated cable tray 200 mm wide, with cover plate, including all the fixings and the support elements	1,085	m	$50.00	$54,250		
4.1.10	Bare copper cable for electrical earth bonding of cable trays	23,085	m	$6.50	$150,053		

SUDHMAHADEV TUNNEL (Pkg.-1) - MEP SYSTEMS - COST ESTIMATION FOR DPR DESIGN							
				Input	$1.0	=	INR 70
4.1.11	Communications conduits trench 0,8x1 m consisting of the following ducts: - 10 conduits PVC Ø 50 mm - 14 conduits PVC Ø 63 mm - 3 conduits PVC 4" Including excavation of trench, sand layer, manholes every 30 m, covers, accesories.	11,000	m	$120.00	$1,320,000		
4.1.12	Electrical conduits trench 0,8x1 m consisting of the following ducts: - 4 conduits PVC 3" - 6 conduits PVC 4" - 3 conduits PVC 6" - 2 conduits PVC 8" Including excavation of trench, sand layer, concrete plate between HV and LV, manholes every 30 m, covers, accesories.	11,000	m	$100.00	$1,100,000		
4.2	**Power Supply**					**$3,238,113**	
4.2.1	HV switchgear (electrical power supply, measurement and transformers protection switchgear), busbar current: 600A, interrupting current: 400A, isolated SF6 gas, circuit breakers, including control, HV and LV measurement elements, according to single line diagram	1	set	$140,000.00	$140,000		
4.2.2	HV cabinet switchboard for 2000 kVA (working and backup)	1	set	$77,400.00	$77,400		
4.2.3	Electrical dry/oil transformer 2000 kVA. Including HV and LV connections, and temperature sensors.	2	un	$57,600.00	$115,200		
4.2.4	2000 kVA main low-voltage panel busbar including capacitor array	1	un	$297,000.00	$297,000		
4.2.5	HV cabinet switchboard for 1600 kVA (working and backup)	2	set	$64,500.00	$129,000		
4.2.6	Electrical dry/oil transformer 1600 kVA. Including HV and LV connections, and temperature sensors.	4	un	$48,000.00	$192,000		
4.2.7	1600 kVA main low-voltage panel busbar including capacitor array	2	un	$247,500.00	$495,000		
4.2.8	Secondary low voltage panels	29	un	$3,200.00	$92,800		
4.2.9	22 kV synchronization panel	3	un	$24,000.00	$72,000		
4.2.10	22 kV main distribution board	1	un	$45,000.00	$45,000		
4.2.11	22 kV RMU panel	1	un	$45,000.00	$45,000		
4.2.12	Emergency field operations room electrical board including essential field and UPS	3	un	$15,500.00	$46,500		
4.2.13	1000 VA UPS unit for backup of high-voltage control	3	un	$1,800.00	$5,400		
4.2.14	HV safety equipment cabinet	5	un	$1,450.00	$7,250		
4.2.15	30 kV rubber carpet	70	sq. M	$157.68	$11,038		
4.2.16	Complete grounding installation in the HV room including transformer room	3	un	$3,800.00	$11,400		
4.2.17	Framed protective link fence in HV rooms	35	sq. M	$35.00	$1,225		
4.2.18	Supply of a set of HV terminations for the IEC	3	un	$40,000.00	$120,000		
4.2.19	400 A tunnel lighting electrical panel	10	un	$35,000.00	$350,000		
4.2.20	PLC electrical panel in the passages and buildings (communication, ventilation and lighting)	24	un	$1,600.00	$38,400		
4.2.21	80 kVA UPS system with bank of batteries for 10 minute backup	3	un	$28,000.00	$84,000		
4.2.22	Emergency Diesel generator 1850 kVA, with stack for the exhaustion of gas, including control panels and connection elements, transport, placement and installation, exhaust piping, fuel piping and air intake.	2	un	$197,500.00	$395,000		
4.2.22	Emergency Diesel generator 1250 kVA, with stack for the exhaustion of gas, including control panels and connection elements, transport, placement and installation, exhaust piping, fuel piping and air intake.	1	un	$133,500.00	$133,500		
4.2.23	1000 L daily fuel tank + floats, including connection elements	3	un	$3,500.00	$10,500		
4.2.24	Underground Double-walled 10,000 L tank, including HDPE membranes, panelsultrasonic height gage, blast resistant fuel pump, intake opening, piping, water gauge and diesel fuel fill for the tank. Installed on stable ground or on stable foundations and surrounded by washed sand	2	un	$55,000.00	$110,000		
4.2.25	Surface mounted Double-walled 10,000 L tank, including HDPE membranes, panelsultrasonic height gage, blast resistant fuel pump, intake opening, piping, water gauge and diesel fuel fill for the tank. Installed on concrete bench	1	un	$35,000.00	$35,000		
4.2.26	Fan soft starter, for 37 kW electrical power	52	un	$3,000.00	$156,000		
4.2.27	Electrical supply control system, dedicated, with rack and display in every HV room, integrated in the SCADA.	3	un	$7,500.00	$22,500		
4.3	**Cabling**					**$4,021,280**	
4.3.1	Buried HV transmission line, performed with 4x1x150 NA2XSY HV cable in 60x100 trench (estimation, specific location of HV connection to company's network unknown)	1,000	m	$150.00	$150,000		
	Sudhmahadev 1	1,000					
4.3.2	Copper cable 4x1x240 mm² HV cable LSZH (90ºC)	5,600	m	$100.00	$560,000		
	Sudhmahadev 1	5,600					
4.3.3	Copper cable LSZH-XLPE (90ºC) - 90 min fire resistant - multipolar - several sections	91,980	m	$36.00	$3,311,280		
5	**LIGHTING AND SIGNAGE SYSTEMS**						**$2,367,516**
5.1	**Tunnel Lighting System**					**$1,445,900**	
5.1.1	LED road luminaire, for linear distribution, 95 W , IP66 enclosure, capable of being pressure hosed, independent IP66 enclosure for driver, including regulation controller through power supply line and specially constructed connection cable with IP66 connector	1,592	un	$520.00	$827,840		
	Sudhmahadev 1 - T1	796					
	Sudhmahadev 1 - T2	796					

SUDHMAHADEV TUNNEL (Pkg.-1) - MEP SYSTEMS - COST ESTIMATION FOR DPR DESIGN							
				Input	$1.0	=	INR 70
5.1.2	High-power LED lighting projector, 374 W, IP66 enclosure, capable of being pressure hosed, independent IP66 enclosure for driver, including regulation controller through power supply line and specially constructed connection cable with IP66 connector.	148	un	$1,350.00	$199,800		
	Sudhmahadev 1 - T1	75					
	Sudhmahadev 1 - T2	73					
	High-power LED lighting projector, 253 W, IP66 enclosure, capable of being pressure hosed, independent IP66 enclosure for driver, including regulation controller through power supply line and specially constructed connection cable with IP66 connector.	127	un	$1,050.00	$133,350		
	Sudhmahadev 1 - T1	64					
	Sudhmahadev 1 - T2	63					
	High-power LED lighting projector, 61 W, IP66 enclosure, capable of being pressure hosed, independent IP66 enclosure for driver, including regulation controller through power supply line and specially constructed connection cable with IP66 connector.	22	un	$430.00	$9,460		
	Sudhmahadev 1 - T1	11					
	Sudhmahadev 1 - T2	11					
5.1.3	Anchoring structure for pending luminaire/projector, to be fixed to the ceiling structure	1,889	un	$30.00	$56,670		
5.1.6	Luminance photometer, near entrance portals, pole-mounted, including pole and connection to the lighting control unit	2	un	$10,500.00	$21,000		
5.1.7	Lighting control system, including individual regulation unit for LED luminaire through power supply cable, recognized control protocols	4	un	$40,000.00	$160,000		
5.1.8	Junction boxes, for connection to LED luminaires (linear and projectors), IP67 protection grade, for shunting of the three phases, neutral and ground without main line interruption, tray mounted	1,889	un	$20.00	$37,780		
5.2	**Galleries Lighting System**					**$128,520**	
5.2.1	Supply and installation of remote control equipment for zonal control of lighting luminaires.	21	un	$2,200.00	$46,200		
5.2.2	Supply and installation of LED 2x28W waterproof luminaire with electronic ignition control. IP65	294	un	$120.00	$35,280		
5.2.3	Supply and installation of thermoplastic Junction Box, IP66, halogen-free (VO) and fire resistant (M1), equipped with a 316 stainless steel plate. The supply circuit will be for unipolar or multiconductor type CR1-C1 cable for Section from 4 to 35 mm^2	294	un	$160.00	$47,040		
5.3	**Technical rooms Lighting System**					**$13,200**	
5.3.1	Supply and installation of LED 2x28W waterproof luminaire with electronic ignition control. IP65	110	un	$120.00	$13,200		
5.4	**Street Lighting System**					**$123,700**	
5.4.1	B-30 reinforced concrete base for a light pole up to 6 m in height having dimensions of 0.9 x 0.9 x 1.50 m or a 1.0 m Ø and 1.8 m deep pile including 4 x 50 mm galvanized steel bar connected by welding to the foundation bolts for foundation grounding including all conduit in the base and 110 mm Ø annular pipe sleeves, including soil excavations, rock cutting, breaking into or drilling in any type of soil for the pit, preparation of a wood form, installation of foundation bolts, casting of concrete, reinforcing steel, fill, compaction and disposal of surplus soil.	20	un	$160.00	$3,200		
5.4.2	B-30 reinforced concrete base for a light pole up to 12 m in height having dimensions of 0.9 x 0.9 x 1.75 m or a 1.0 m Ø and 1.8 m deep pile including 4 x 50 mm galvanized steel bar connected by welding to the foundation bolts for foundation grounding including all conduit in the base and 110 mm Ø annular pipe sleeves, including soil excavations, rock cutting, breaking into or drilling in any type of soil for the pit, preparation of a wood form, installation of foundation bolts, casting of concrete, reinforcing steel, fill, compaction and disposal of surplus soil.	42	un	$300.00	$12,600		
5.4.4	Supply to the site of a 6 m high (height including arm) conical hot-dipped zinc [galvanized] steel pole in round cross-section, designed for bearing single or double arms with a horizontal length of up to 3.5 m	20	un	$420.00	$8,400		
5.4.5	Supply to the site of a 12 m high (height including arm) conical hot-dipped zinc [galvanized] steel pole in round cross-section, designed for bearing single or double arms with a horizontal length of up to 1.5 m	42	un	$780.00	$32,760		
5.4.6	Luminaire 210 W LED, 34.000 lm	42	un	$1,120.00	$47,040		
5.4.7	Luminaire 70 W LED, 8.500 lm	20	un	$535.00	$10,700		
5.4.17	Lighting switchboard for connections of up to 3 x 160 A, comprised of sealed reinforced polyester cabinets including electrical panel composed of CI boxes and all equipment and required accessories installed in these cabinets in accordance with the drawings, including balancing of loads for the 3 phases.	2	un	$4,500.00	$9,000		
5.5	**Emergency Signage System**					**$656,196**	
5.5.1	LED evacuation luminaire, 12W (marking lighting), waterproof, fixed on the Tunnel wall, including all the support and fixing elements, powered from UPS centralized system	2,160	un	$105.00	$226,800		
	Sudhmahadev 1 - T1	1,080					
	Sudhmahadev 1 - T2	1,080					
5.5.2	Fire-rated enclosure for connection of 2 evacuation luminaires	1,080	un	$120.00	$129,600		
5.5.3	Green leds to enlight escape exit	84	m	$300.00	$25,200		

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				Input	$1.0	=	INR 70
	Sudhmahadev 1 - T1	42					
	Sudhmahadev 1 - T2	42					
5.5.4	Illuminated sign with pictogram sized 15 cm with distance to the exits with emergency batteries for a minimum of 90 minutes.	216	un	$480.00	$103,680		
	Sudhmahadev 1 - T1	108					
	Sudhmahadev 1 - T2	108					
5.5.5	Reflective sign with pictogram sized 15 cm with distance to the exits.	648	un	$90.00	$58,320		
	Sudhmahadev 1 - T1	324					
	Sudhmahadev 1 - T2	324					
5.5.6	Illuminated SOS sign including telephone, individual extinguisher and hydrant inscription and the word SOS with emergency batteries for a minimum of 90 minutes.	64	un	$480.00	$30,720		
	Sudhmahadev 1 - T1	32					
	Sudhmahadev 1 - T2	32					
5.5.7	Illuminated sign including individual extinguisher and hydrant inscription with emergency batteries for a minimum of 90 minutes.	64	un	$460.00	$29,440		
	Sudhmahadev 1 - T1	32					
	Sudhmahadev 1 - T2	32					
5.5.8	Illuminated sign including hydrant inscription with emergency batteries for a minimum of 90 minutes.	1	un	$440.00	$440		
	Sudhmahadev 1 - T1	1					
	Sudhmahadev 1 - T2	0					
5.5.9	Reflective sign of 1.5 m x 1.5 m with pictogram for emergency exit at both sides of the Cross Passages entrance.	84	un	$619.00	$51,996		
	Sudhmahadev 1 - T1	42					
	Sudhmahadev 1 - T2	42					
6	**CCTV CAMERA SYSTEM**						**$677,700**
6.1	**CCTV Camera Systems**					**$677,700**	
6.1.1	Ethernet Color CCTV Pan, Tilt, Zoom (X30 optical X16 digital) Camera with wipe and wash facilities, with Integrated Automatic Incident Detection AID. Including licenses, Structural framing, count detectors, etc (according to drawings). High Efficiency Video Coding H.265 and video resolution of 4k	4	un	$12,500.00	$50,000		
	Sudhmahadev 1 - T1	1					
	Sudhmahadev 1 - T2	1					
	Outdoor technical rooms buildings	2					
6.1.2	Security cameras in emergency exit corridors including accesories, Structural framing, etc	21	un	$2,300.00	$48,300		
	Sudhmahadev 1	21					
6.1.3	Ethernet CCTV Pan, Tilt, Zoom (X30 optical X16 digital) Camera. High Efficiency Video Coding H.265 and video resolution of 4k	134	un	$4,200.00	$562,800		
	Sudhmahadev 1 - T1	67					
	Sudhmahadev 1 - T2	67					
6.1.4	Pole and foundation for Outdoor Camera	4	un	$3,000.00	$12,000		
6.1.5	Security cameras in the distribution ares inside the biulding where technical rooms are located, structural framing, etc	2	un	$2,300.00	$4,600		
7	**INTELLIGENT TRANSPORTATION SYSTEMS (ITS)**						**$2,427,479**
7.1	**Vehicle Detection**					**$49,980**	
7.1.1	Traffic data collection equipment	5	un	$4,200.00	$21,000		
7.1.3	Inductive loop detectors	24	un	$360.00	$8,640		
	Sudhmahadev 1 - T1	12					
	Sudhmahadev 1 - T2	12					
7.1.4	3-aspect traffic light	4	un	$710.00	$2,840		
	Sudhmahadev 1 - T1	2					
	Sudhmahadev 1 - T2	2					
7.1.5	Height limiter (covering any lane of the road section)	1	un	$17,500.00	$17,500		
7.2	**Emergency Road Side Phones**					**$213,500**	
7.2.1	Emergency SOS Station, with emergency phone for communication with Control Center, firefighters phone, 2 extinguishers (6 kg each), door opening detector, illumination, fire alarm manual pull station	4	un	$1,750.00	$7,000		
7.2.2	Emergency SOS Station, with emergency phone for communication with Control Center, firefighters phone, 2 extinguishers (6 kg each), door opening detector, illumination, fire alarm manual pull station	70	un	$2,950.00	$206,500		
	Sudhmahadev 1 - T1	35					
	Sudhmahadev 1 - T2	35					
7.3	**Radio Communications**					**$1,058,479**	
7.3.1	Main rack communications	3	un	$45,000.00	$135,000		
7.3.2	Signal amplifier	3	un	$36,000.00	$108,000		
7.3.4	Connection to Emergency Services System (first responders)	4	un	$1,000.00	$4,000		
7.3.5	Radio license (6 channels and a control channel for each tunnel)	2	un	$25,000.00	$50,000		
7.3.7	Emergency Services Systema Repeater and Antenna	2	un	$120,000.00	$240,000		
7.3.9	Voice break in feature	2	un	$2,775.00	$5,550		
7.3.10	Radiant cable	10,960	m	$39.03	$427,769		
	Sudhmahadev 1	10,960					
7.3.11	Coaxial cable	20	m	$28.00	$560		
	Sudhmahadev 1	20					
7.3.12	32 strands single mode F.O cable	10,950	m	$8.00	$87,600		
	Sudhmahadev 1	10,950					
7.4	**Voice Alarm / Public Address System (VA/PA)**					**$179,100**	
7.4.1	Local speaker box	360	un	$180.00	$64,800		
	Sudhmahadev 1 - T1	180					
	Sudhmahadev 1 - T2	180					
7.4.2	Fiber optic ethernet connection	4	un	$1,200.00	$4,800		

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				Input	$1.0	=	INR 70
7.4.3	Emergency voice evacuation coverage	21	un	$3,500.00	$73,500		
7.4.4	Amplifier	45	un	$800.00	$36,000		
7.5	**Variable Signing**					**$806,420**	
7.5.1	Internal Lane-use sign (LCS lane control sign), including installation, accesories and structural equipment	28	un	$6,465.00	$181,020		
	Sudhmahadev 1 - T1	14					
	Sudhmahadev 1 - T2	14					
7.5.2	Entrance Lane-use sign (LCS lane control sign), including installation, accesories and structural equipment (Red Cross / Green Arrow / Crossover Yellow Arrow / Entry prohibited)	2	un	$9,600.00	$19,200		
	Sudhmahadev 1 - T1	1					
	Sudhmahadev 1 - T2	1					
7.5.3	Speed Limit Variable Sign (SLVS), including installation, accesories and structural equipment	30	un	$7,500.00	$225,000		
	Sudhmahadev 1 - T1	15					
	Sudhmahadev 1 - T2	15					
7.5.5	Internal dynamic message sign (VMS variable message sign) S1 (pictogram Area 64x64 + 45 cm 22 character height), including installation, accesories and structural equipment for 3 roads	14	un	$20,000.00	$280,000		
	Sudhmahadev 1 - T1	7					
	Sudhmahadev 1 - T2	7					
7.5.6	Dynamic message sign (VMS variable message sign) S2 (pictogram Area 64x64 + 40 cm 22 character height), including installation, accesories and structural equipment for 2 roads	2	un	$43,000.00	$86,000		
7.5.7	Traffic Lights Amber-Amber	28	un	$450.00	$12,600		
	Sudhmahadev 1 - T1	14					
	Sudhmahadev 1 - T2	14					
7.5.7	Traffic Lights 3-coloured	4	un	$650.00	$2,600		
	Sudhmahadev 1 - T1	2					
	Sudhmahadev 1 - T2	2					
7.6	**Automatic Incident Detection (AID) System**					**$120,000**	
7.6.1	AID server and software	1	un	$120,000.00	$120,000		
8	**TUNNEL DRAINAGE MECHANICAL SYSTEM (EXCLUDED)**						**$0**
8.1	**Tunnel Drainage mechanical system**					**$0**	
8.1.1	Drainage Pumping group (to be confirmed by Drainage team)	0	un	$0.00	$0		
8.1.2	Drainage Valves (to be confirmed by Drainage team)	0	set	$0.00	$0		
8.1.3	Drainage Tank level sensors (to be confirmed by Drainage team)	0	set	$0.00	$0		
8.1.4	Control and monitoring equipment (to be confirmed by Drainage team)	0	un	$0.00	$0		
9	**MONITORING AND CONTROL SYSTEM**						**$814,422**
9.1	**Communications network control equipment**					**$281,160**	
9.1.1	PLC Cabinets (exterior RCC cabitet + interior LCR cabinet 42 U)	21	un	$1,200.00	$0		
9.1.2	Ethernet Switch for distributed cabinets	21	un	$600.00	$0		
9.1.3	Remote Terminal Unit (RTU), redundant	4	un	$14,000.00	$56,000		
9.1.4	Redundant server in Control Center	1	un	$34,000.00	$34,000		
9.1.5	Communication Ethernet switch	72	un	$2,280.00	$164,160		
9.1.6	24- port Patch Panel	5	un	$3,000.00	$15,000		
9.1.7	Drainage Processor	3	un	$4,000.00	$12,000		
9.2	**Communications cables for MEP Systems**					**$533,262**	
9.2.1	Copper communications cable 2x1,5 mm2 LSZH (90ºC) - 90min fire resistant	11,000	m	$3.61	$39,688		
9.2.2	Copper communications cable 7x1,5 mm2 LSZH (90ºC) - 90min fire resistant	11,000	m	$10.82	$119,064		
9.2.3	Copper communications cable 3x2,5 mm2 LSZH (90ºC) - 90min fire resistant	11,000	m	$10.66	$117,260		
9.2.4	16 Strand Fiber Optic Cable, Furnish and Install	11,000	m	$11.85	$130,350		
9.2.5	12 Strand Fiber Optic Cable, Furnish and Install	11,000	m	$7.50	$82,500		
9.2.6	2 Strand Fiber Optic Cable, Furnish and Install	11,000	m	$3.20	$35,200		
9.2.7	Fiber Optic Splice Closure	4	un	$2,300.00	$9,200		
10	**OPERATOR INTERFACE SYSTEM**						**$1,014,900**
10.1	**Control Center Equipment and software**					**$1,014,900**	
10.1.1	Facility Management System (FMS system, controllers and wiring) including controller programs	1	un	$250,000.00	$250,000		
10.1.2	Motorway Management System (MMS system)	1	un	$250,000.00	$250,000		
10.1.3	Traffic Management Server, to be configured in on duty/standby mode	1	un	$25,000.00	$25,000		
10.1.4	HMI (Human-Machine Interface) workstation, including 24" Dual Screen PLC operator station with HMI software with suitable furniture and chair	1	un	$5,500.00	$5,500		
10.1.5	Data Historian	1	un	$48,000.00	$48,000		
10.1.6	Communications panel with emergency telephone, Emergency Roadside Telephone, Tunnel Staff radio, and Voice alert/ Public address with redundant Ethernet communications	1	un	$2,200.00	$2,200		
10.1.7	46" Color Video Displays for Tunnel and Highway Surveillance displays with wall mounting hardware	12	un	$4,800.00	$57,600		
10.1.8	VMS system (video management software)	1	un	$50,000.00	$50,000		
10.1.9	CCTV keyboard controls	1	un	$1,200.00	$1,200		
10.1.10	Redundant CCTV recording servers and software with 30 days of storage for each camera	1	un	$45,000.00	$45,000		
10.1.11	Camera Control software	1	un	$25,000.00	$25,000		
10.1.12	IP Server	1	un	$6,000.00	$6,000		
10.1.13	IP Telephone	10	un	$150.00	$1,500		
10.1.14	Printer	3	un	$2,500.00	$7,500		
10.1.15	Gateways (router with firewalls) to interface to external networks	2	un	$1,200.00	$2,400		
10.1.16	I/O and Ethernet Switch cabinet	1	un	$15,000.00	$15,000		
10.1.17	Ethernet Switch	8	un	$12,000.00	$96,000		

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				Input	$1.0	=	INR 70
10.1.18	PLC I/O including 20% spare	10	un	$2,200.00	$22,000		
10.1.19	PLC Engineering Work Station with password protected software	10	un	$3,500.00	$35,000		
10.1.20	Programming for Tunnel logic and interfaces	1	un	$70,000.00	$70,000		
11	**TECHNICAL ROOMS' EQUIPMENT**						**$459,201**
11.1	**Mechanical equipment**					**$221,500**	
11.1.1	100,000 BTU VRF condenser including ducts	5	un	$20,000.00	$100,000		
11.1.2	100,000 BTU evaporator unit including ducts	5	un	$11,000.00	$55,000		
1.1.13	Split DX AC for internal tech rooms	5	un	$1,800.00	$9,000		
	Sudhmahadev 1	5					
11.1.3	Hydrogen extraction fan including ducts and gas piping	5	un	$8,500.00	$42,500		
11.1.4	Motorized fire damper	5	sq. m	$2,500.00	$12,500		
11.1.5	Supply and return air grilles	5	sq. m	$500.00	$2,500		
11.2	**Electrical equipment**					**$80,900**	
11.2.1	Grounding network for the technical rooms in a passage, including grounding electrodes, bare copper cable, isolated copper cable and connection elements	5	un	$5,000.00	$25,000		
11.2.2	Power outlet / switch, including power supply connections	10	un	$40.00	$400		
11.2.3	Intruder alert system	15	un	$2,200.00	$33,000		
11.2.4	Access control system	5	un	$4,500.00	$22,500		
11.3	**Fire protection systems**					**$156,801**	
11.3.1	Automatic gas-based fire extinguishing system, for electrical rooms	2	un	$60,000.00	$120,000		
11.3.2	Local fire panel	9	un	$1,500.00	$13,500		
11.3.3	Optical-thermal smoke detector, including communication cable and protection conduit	90	un	$110.00	$9,900		
11.3.4	Alarm button	90	un	$70.00	$6,300		
11.3.5	Optical-acoustic alarm, including copper connection cable to the detection control unit	90	un	$65.00	$5,850		
11.3.6	4,50 kg CO_2 fire extinguisher, diffuser hose with open/close command	9	un	$84.00	$756		
11.3.7	4,50 kg dry powder fire extinguisher (ABC)	9	un	$55.00	$495		
12	**AUXILIARY CIVIL WORKS**						**$428,728**
12.1	**Tunnel cross-passage doors**					**$198,800**	
12.1.1	Vehicle passage door	14	un	$8,600.00	$120,400		
	Sudhmahadev 1 - T1	7					
	Sudhmahadev 1 - T2	7					
12.1.2	Pedestrian evacuation door	28	un	$2,800.00	$78,400		
	Sudhmahadev 1 - T1	14					
	Sudhmahadev 1 - T2	14					
12.2	**Outdoor cable conduits and trenches**					**$155,928**	
12.2.1	Electrical & Communications conduits outdoor trench 1x1,4 m consisting of the following ducts: - 3 conduits PVC Ø 50 mm - 2 conduits PVC Ø 63 mm - 2 conduits PVC 3" - 4 conduits PVC 4" - 2 conduits PVC 6" - 1 conduits PVC 8" Including excavation of trench, sand layer, concrete plate between HV, LV and communications ducts, independent manholes every 50 m for electricity and every 200m for communications, covers, accesories.	644	m	$242.12	$155,928		
12.3	**Technical rooms**					**$74,000**	
12.3.2	Indoor technical rooms construction (in existing passageway)	185	m2	$400.00	$74,000		
	Sudhmahadev 1	185					
13	**SIGNALLING**						**$30,000**
13.1	**Signalling**					**$30,000**	
13.1.1	Traffic barrier, electro-mechanically actuated	4	un	$7,500.00	$30,000		
	Sudhmahadev 1 - T1	2					
	Sudhmahadev 1 - T2	2					
TOTAL COSTS					**$33,345,616**	**$33,345,616**	**$33,345,616**
					INR 2,334,193,139	**INR 2,334,193,139**	**INR 2,334,193,139**
					INR 233.42	**INR 233.42**	**INR 233.42**

	Building Cost							
Abstra	**Description**	**Area**	**Nos**	**No. of Floors**	**Total Area**	**Area in Sqft**	**Rate/Sqft**	**Cost (in Cr.)**
1	Technical Room	207	2	1	414	4454	2000	0.89
2	Control Room	260	1	3	780	8392	2000	1.68
3	Fire Room	115			115	1237	2000	0.25
4	Other Buildings	300	1	2	600	6455	2000	1.29
	Total Cost							**4.11**

Cost of Dewatering

ity/Cost for Tunnel -1

A	**Temporary Dewatering Cost during Construction**			
A1	**Tunnel**			
1	Water flow		0.25	litre/sec/m
2	Length of tunnel for dewatering -			m,
		T1	767	m,
3	Average Discharge from the tunnel	T1	1520	gallon/min
4	Head for water pump	T1	11.51	m
5	Head considering losses (@ 40%)			
		T1	16.11	m
			53	ft
6	Capacity of pump required	T1	20	HP
7	Let's considred pumps of capacity	3	25	HP
8	Electricty consumed per Hr.		18.65	KW
9	Construction Time (when dewatering is required)		6.39	months
			4602	hrs
10	Total Electricity consumed		85827	KWh
		lets say	100000	KWh
11	Unit Rate of Electricity		30	Rs. per KWh
12	Total Cost of Electricity		**0.30**	Cr
A2	**Portal Area (Lump Sump)**		**0.50**	Cr
B	**Permanent Dewatering Cost**			
B1	**Tunnel**			
1	Water proofing Membrane Quantity		290818	m^2
	Unit Rate		890	$Rs./m^2$
	Cost		**25.88**	Cr.
2	Perforated PVC Pipe 250mm Dia, Length		10866	m
	Nos		2	nos
	Total Length of Pipes		21732	m
	Unit rate of Pipe		1883	Rs./m
	Cost of Pipe		**4.09**	Cr.
3	PVC Pipe 250mm Dia, Length		10866	m
	Nos		1	nos
	Total Length of Pipes		10866	m
	Unit rate of Pipe		1819	Rs./m
	Cost of Pipe		**1.98**	Cr.
4	PVC Pipe 400mm Dia, Length		10866	m
	Nos		1	nos
	Total Length of Pipes		10866	m
	Unit rate of Pipe		4807	Rs./m
	Cost of Pipe		**5.22**	Cr.

5	Perforated PVC Pipe 150mm Dia, Length	630	m
	Nos	2	nos
	Total Length of Pipes	1260	m
	Unit rate of Pipe	774	Rs./m
	Cost of Pipe	**0.10**	Cr.
6	Perforated PVC Pipe 45mm Dia,	**15496**	
	Unit rate of Pipe	228	Rs./m
	Cost of Pipe	**0.35**	Cr.
B2	**Portal Area**		
	Perforated PVC Pipe 75mm Dia,	**13649**	
	Unit rate of Pipe	394	Rs./m
	Cost of Pipe	**0.54**	Cr.
	Total Dewatering Cost		
1	Temporary Dewatering Cost during Construction	0.80	Cr.
2	Water proofing Membrane	25.88	Cr.
3	PVC Pipe	12.28	Cr.
	Total Cost	**38.96**	**Cr.**

Summary of Portals			
tity/C	Description	Units	Qt.
1	Suraface Excavation		
	In overburden	m^3	38024
	In Rock	m^3	123406
2	Rock Bolts		
	25 mm dia	m	36246
	32 mm dia	m	11020
3	Shotcrete with wiremesh	m^3	1401
4	Drainage Holes	m	13649
5	Concrete	m^3	2584
6	Reinforcement	MT	207

Tunnel-1 - Western Portal

tity/C Surface Excavation

Sl.	Description of Sections	Distance between sections	Area	Av. Area	Qt. (m^3)
1	Section-Start		0		
2	Section-1	13.8	467.15	233.575	3223.335
3	Section-2	15	807.71	637.43	9561.45
4	Section-3	27.5	625.18	716.445	19702.238
5	Section-4 Back side	16	336.59	480.885	7694.16
6	Section-4		1089.1		
7	Section-5	11	574.58	831.84	9150.24
8	Tube-1 center	21	691.84	633.21	13297.41
9	Section-6	23	701.346	701.346	16130.958
10	Tube-2 center	17.54	996.068	996.068	17471.033
11	Section End	10		996.068	9960.68
					106192
			Overburden		**15929**
			Rock		**90263**

2 Shotcrete

Sl.	Description	Length	Inclined Ht.	Av. Ht	Surface Area	Thickness	Qt. (m^3)
1	Section Start		**0**				
2	Section-1	13.8	38.25	19.125	263.925	0.1	26.3925
3	Section-2	15	48.81	43.53	652.95	0.1	65.295
4	Section-3	27.5	57.94	53.375	1467.8125	0.1	146.781
5	Section-4	16	33.41	45.675	730.8	0.1	73.08
6	Section-5	11	42.47	37.94	417.34	0.1	41.734
7	Tube-1 center	21	53.73	48.1	1010.1	0.1	101.01
8	Section-6	23	45.01	45.01	1035.23	0.1	103.523
9	Tube-2 center	17.54	47.98	47.98	841.5692	0.1	84.1569
10	Tube -2 Right Side	20	25.89	36.935	738.7	0.1	73.87
11	End	25	0	12.945	323.625	0.1	32.3625
					7482		**748**

3 Rock Bolts

Sl.	Description	Length (m)	Inclined Ht. (m)	Av. Ht, (m)	Spacing, (m)	No. of Bolts	Length of Bolts, (m)	Total Length of Bolts
	Section Start		0	0				
			0	0				
	Section-1	13.8	25.89	12.945	1.5	90	6	540
			12.36	6.18	2	28	6	168
	Section-2	15	25.89	25.89	1.5	180	6	1080
			22.92	17.64	2	72	6	432
	Section-3	27.5	25.89	25.89	1.5	342	6	2052
			32.05	27.485	2	196	6	1176
	Section-4	16	25.89	25.89	1.5	198	6	1188
			7.52	19.785	2	80	6	480
	Section-5	11	25.89	25.89	1.5	144	6	864
			16.58	12.05	2	42	6	252
	Tube-1 center	21	28.66	27.275	1.5	266	6	1596
			25.07	20.825	2	121	6	726
	Section-6	23	25.38	25.38	1.5	272	6	1632
			19.63	19.63	2	120	6	720
	Tube-2 center	17.54	28.66	28.66	1.5	240	6	1440
			20.02	20.02	2	99	6	594
	Tube -2 Right Side	20	28.66	28.66	1.5	280	6	1680
			20.02	20.02	2	110	6	660
	End	25	0	10.01	2	78	6	468
							Total Length of Rock Bolts, 25 dia	**17748**

4 Drainage Holes

Spacing of holes	4	m c/c
Depth of Holes	5	m
No. of holes	13	(8x8 square area)
	0.20	Holes/m^2
Surface Area	7196	m^2
Total No. of Holes	1461.70	nos
Total Depth of Holes	**7309**	m

Tunnel-1 Eastern Portal

ity/ **Surface Excavation**

Sl.	Description of Sections	Distance	Area	Av. Area	Qt. (m^3)
	Tube-1				
1	Start		0.00		
2	Section4 Right	34	197.35	98.675	3354.95
3	Section-5		188.88		
4	Section-4 Right	26	197.35	193.116	5021.0
5	Section-1	19		694.76	12853
6	Section-6		116.46		
7	Section-4 Left	13	79.40	97.9275	1273
8	Section-4-left	28	79.40	39.7	1112
9	End		0.00		
	Tube-2				
10	Start		0		
11	Section-3-right	37	284.463	142.2315	5263
12	Section-7	25	307.653	296.058	7401
13	Section-1	38		418.564	15905
14	Section-8	12	104.828	133.2865	1599
15	Section-3-left	18	161.745	80.8725	1456
16	End		0		
					55238

Overburden **22095**
Rock **33143**

Shotcrete

Sl.	Description	Length	Inclined length	Surface Area	Thickness	Qt. (m^3)
	Tube -1					
1	From bottom to El.1650	19	18.54	352.26	0.1	35.226
		44.34	18.54	822.0636	0.1	82.2064
		25	9.27	231.75	0.1	23.175
				0		0
2	Up to El.1660	25.27	10.6	267.862	0.1	26.7862
		19.17	10.6	203.202	0.1	20.3202
		29	5.3	153.7	0.1	15.37
3	Up to El.1670	36	10.6	381.6	0.1	38.16
		12	5.3	63.6	0.1	6.36
4	Up to El.1680	22	10.6	233.2	0.1	23.32
		11	5.3	58.3	0.1	5.83
5	Up to Top	22	5.3	116.6	0.1	11.66
	Tube -2					
6	From bottom to El.1650	39	18.54	723.06	0.1	72.306
		30	18.54	556.2	0.1	55.62
		24	9.27	222.48	0.1	22.248
				0		0
7	Up to El.1660	54	10.6	572.4	0.1	57.24
		15	10.6	159	0.1	15.9
		19	5.3	100.7	0.1	10.07
8	Up to El.1670	53	10.6	561.8	0.1	56.18
		26	5.3	137.8	0.1	13.78
9	Up to El.1680	30	10.6	318	0.1	31.8
		37	5.3	196.1	0.1	19.61
10	Up to Top	18	5.3	95.4	0.1	9.54
				6527		**653**

Rock Bolts

Sl.	Description	Length	Inclined length	Spacing	No. of Bolts	Length of Bolts	Dia of Bolts	Total length of Bolts
1	From bottom to El.1650	19	18.54	1	361	10	32	3610
		44.34	18.54	1.5	390	8	25	3120
		25	9.27	1.5	119	6	25	714
2	Up to El.1660	25.27	10.6	1.5	136	8	25	1088
		19.17	10.6	1.5	104	6	25	624
		29	5.3	1.5	80	6	25	480
3	Up to El.1670	36	10.6	1.5	192	6	25	1152
		12	5.3	1.5	32	6	25	192
	Up to El.1680	22	10.6	1.5	120	6	25	720
		11	5.3	1.5	32	6	25	192
4	Top	22	5.3	1.5	60	6	25	360
	Tube -2							
5	From bottom to El.1650	39	18.54	1	741	10	32	7410
		30	18.54	1.5	260	8	25	2080
		24	9.27	1.5	112	6	25	672
6	Up to El.1660	54	10.6	1.5	288	8	25	2304
		15	10.6	1.5	80	6	25	480
		19	5.3	1.5	52	6	25	312
7	Up to El.1670	53	10.6	1.5	288	6	25	1728
		26	5.3	1.5	72	6	25	432
8	Up to El.1680	30	10.6	1.5	160	6	25	960
		37	5.3	1.5	100	6	25	600
9	Up to Top	18	5.3	1.5	48	6	25	288
				Total Length of Rock Bolts, 25 dia				**18498**
				Total Length of Rock Bolts, 32 dia				**11020**

Drainage Holes

Length of each hole	5	m,
Spacing of Holes	4	m, c/c
No. of holes	13	in area of 8x8
	0.20	holes/m^2
Surface area	6241	m^2
	1268	nos
Length of drainage holes	**6340**	m,

TOLL PLAZA

Quantities for Toll Plaza

Total number of toll plaza = 1

Item no.	Item Description	Unit	Nos. for one toll paza	Length	Width	Height	Qty	Total Nos. of toll plaza	Total Qty	Rate in Rs.	Amount (Rs.)
	Area										
	Tapper portion - Rigid pavement	sqm	1	100	41.50		**4150.00**				
	Straight portion - Rigid Paveme	sqm	1	150	41.50		**6225.00**				
1	Clearing and Grubbing	Hec					**1.04**	1	1.04	83750.00	87100.00
2	Subgrade	cum	1	10375		0.500	**5187.50**	1	5187.50	341.00	1768937.50
3	GSB	cum	1	10375		0.150	1556.25				
						subtotal	**1556.25**	1	1556.25	1746.00	2717212.50
4	DLC										
	Plaza area	cum	1	10375		0.150	1556.25				
	Deductions for toll booth island		(5)	7	1.90	0.150	-9.98				
						Subtotal	**1546.28**	1	1546.28	3496.00	5405794.88
5	PQC	cum									
		cum	1	10375		0.300	3112.50				
	Deductions for toll booth island		(5)	7	1.90	0.300	-19.95				
						Subtotal	**3092.55**	1	3092.55	6803.00	21038617.65
6	Shoulder portion										
	on straight reach		2	150	2.50	0.600	**450.00**				
	on tapering portion		4	50	2.50	0.600	**300.00**				
						Subtotal	**750.00**	1	750.00	148.00	111000.00
7	Median Fill										
	For Toll islands	cum	7	25	1.90	0.700	232.75				
	Footpath	cum	2	150	1.35	0.700	283.50				
						Subtotal	**516.25**	1	516.25	240.00	123900.00
8	60mm thick Paving Blocks										
	Platform	sqm	7	25	1.90		332.50				
	Deductions for Toll Booth	sqm	(7)	4	1.20		-33.60				
						Subtotal	**298.90**	1	298.90	564.30	168668.73
9	Kerb										
	For Toll islands	RM	7	53.8			376.60				
						Subtotal	**376.60**	1	376.60	589.00	221817.40
10	Painting on kerbs	Sqm	1	376.6	0.40		**150.64**	1	151.00	89.00	13439.00
11	Providing Toll platza building										
a	Administrative Building including traffic aid post and	Sqm	1	150	15.00		**2250.00**	1	2250.00	9500.00	21375000.00
b	Generator	Nr.	2				**2.00**	1	2.00	50000.00	100000.00
c	Single Toll booth	Nr.	6				**6.00**	1	6.00	50000.00	300000.00
d	Double Toll booth	Nr.	1				**1.00**	1	1.00	90000.00	90000.00
12	Electrically operated Barrier Gate										
a	For 3.2m	Nr.	6				**6.00**	1	6.00	120000.00	720000.00
b	For 4.5m	Nr.	2				**2.00**	1	2.00	150000.00	300000.00
13	Canopy for toll platza	Sqm	1	25	46.50		**1162.50**	1	1162.50	6000.00	6975000.00
14	Providing and erecting street light										
a	Single arm Street Light for fixing on approaches bothsides	Nr.	2				**2.00**	1	2.00	100000.00	200000.00
b	High Mast lighting	Nr.	2				**2.00**	1	2.00	2000000.00	4000000.00
c	Canopy lighting	Nr.									
	i) Halide lamps 150 watt	Nr.	7				**7.00**	1	7.00	15000.00	105000.00
	ii) Halogen lamps 1000 watt	Nr.	5				**5.00**	1	5.00	25000.00	125000.00
15	Sign Board / Sign										
	a) cantilever gantry signs-" Toll Road" as T1& " Toll Road End" as T8	Nr.	4				**4.00**	1	4.00	197186.00	788744.00
	b) cantilever gantry signs-for toll gate - 1.0km as T2	Nr.	2				**2.00**	1	2.00	202928.00	405856.00
	c) kerb sign for toll gate 500m and tol rates, T3	Nr.	2				**2.00**	1	2.00	155574.00	311148.00
	d) kerb sign for exempt vehicles, T4	Nr.	2				**2.00**	1	2.00	77186.00	154372.00
	e) kerb sign-pictorial dipiction of toll rates as T5	Nr.	2				**2.00**	1	2.00	401955.00	803910.00
	f) kerb sign- for exempt and over size vehicles lane direction as T6	Nr.	2				**2.00**	1	2.00	77186.00	154372.00

Quantities for Toll Plaza											
							Total number of toll plaza =	1			
Item no.	**Item Description**	**Unit**	**Nos. for one toll paza**	**Length**	**Width**	**Height**	**Qty**	**Total Nos. of toll plaza**	**Total Qty**	**Rate in Rs.**	**Amount (Rs.)**
	g) Sign near the tollbooth displaying tol rates, exempt vehicles and complaint telephone number and addresskerb sign - for Toll gate 200m as T7	Nr.	2				**2.00**	1	2.00	401955.00	803910.00
17	Barbed wire fencing on three sides of administrative block	Lm	1	180			**180.00**	1	180.00	372.00	66960.00
	Around three sides of administrative building. So the perimeter = Length + 2* breadth										
18	Electronic weigh bridge	No.	2				**2.00**	1	2.00	1000000.00	2000000.00
19	Elevated Safety Block (PCC 40)	Cum	7	2.5	1.28	sqm	**22.40**	1	22.40	7212.00	161548.80
20	Overhead lane control signal	Nr.	7				**7.00**	1	7.00	200000.00	1400000.00
21	CCTV Mast	Nr.	2				**2.00**	1	2.00	50000.00	100000.00
22	Installation of Semi Automatic Collection System	No.	7				7.00	1	7.00	150000.00	1050000.00
23	Road Marking	sqm									
	Edge of carriageway marking		2	250	0.15		75.00				
	Centre line (double marking)		2	200	0.10		40.00				
	Bar Marking		24	27.75	0.30		199.80				
	chevronmarking on either sides of traffic		14	3	0.90		37.80				
						Subtotal	**352.60**	1	353.00	609.00	214977.00
24	For cash collection under Ground Subway (4*2.5)	Sqm	1	60	4.00	2.500	**240.00**		240.00	40000.00	9600000.00

Total Cost for 1 toll plaza with 3x3 lane configuation	**83962285.46**

OTHER WORKS

RETAINING WALL QUANTITY FOR 4.0 M @ Ch. (KM 0000 - 0010) LHS

Length of retaining wall	=	10 m
Depth of retaining wall above ground level	=	4.0 m
Depth of retaining wall below ground level	=	2.0 m
Height of retaining wall	=	6 m
Width of retaining wall	=	4.2 m
Thickness of stem at top	=	0.3 m
Thickness of stem at bottom	=	0.6 m
Width of heel	=	2.1 m
Width of toe	=	1.5 m
Base width	=	4.2 m
Thickness at edge	=	0.3 m
Thickness at junction	=	0.6 m
Thickness of PCC below retaining wall	=	0.1 m
Overall Width of road/structure	=	2.7 m

Excavation:		
Excavation length	=	12 m
Excavation width	=	6.2 m
Excavation Depth	=	2.1 m
Earthwork	=	**156.24 m^3**

Backfilling:		
Length	=	10 m
Width	=	3.25 m
Height	=	5.55 m
Backfilling behind retaining wall	=	**180.375 m^3**

Levelling Course:		
Length	=	10.2 m
Width	=	4.4 m
Depth	=	0.1 m
Levelling Course below retaining wall	=	**4.488 m^3**

Concrete Quantity:		
Concrete Qty. in footing per metre	=	1.98 m^2
Concrete Qty. in Stem per metre	=	2.43 m^2
Total Concrete Qty. in retaining wall	=	**44.1 m^3**

Reinforcement Quantity:		
Total R/F Qty. in retaining wall	=	**3.528 t**

RETAINING WALL QUANTITY FOR 6.0 M Height @ CH. (KM 5640-5650) LHS

Length of retaining wall	=	10 m
Depth of retaining wall above ground level	=	6.0 m
Depth of retaining wall below ground level	=	2.0 m
Height of retaining wall	=	8 m
Width of retaining wall	=	5.6 m
Thickness of stem at top	=	0.4 m
Thickness of stem at bottom	=	0.8 m
Width of heel	=	2.8 m
Width of toe	=	2.0 m
Base width	=	5.6 m
Thickness at edge	=	0.4 m
Thickness at junction	=	0.8 m
Thickness of PCC below retaining wall	=	0.1 m
Overall Width of road/structure	=	3.6 m

Excavation:

Excavation length	=	12 m
Excavation width	=	7.6 m
Excavation Depth	=	2.1 m
Earthwork	=	**191.52 m^3**

Backfilling:

Length	=	10 m
Width	=	4 m
Height	=	7.4 m
Backfilling behind retaining wall	=	**296 m^3**

Levelling Course:

Length	=	10.2 m
Width	=	5.8 m
Depth	=	0.1 m
Levelling Course below retaining wall	=	**5.916 m^3**

Concrete Quantity:

Concrete Qty. in footing per metre	=	3.52 m^2
Concrete Qty. in Stem per metre	=	4.32 m^2
Total Concrete Qty. in retaining wall	=	**78.4 m^3**

Reinforcement Quantity:

Total R/F Qty. in retaining wall	=	**6.272 t**

RETAINING WALL QUANTITY FOR 17.0 M Height @ CH. (KM 5750-5760) LHS

Length of retaining wall	=	10	m
Depth of retaining wall above ground level	=	17.0	m
Depth of retaining wall below ground level	=	2.0	m
Height of retaining wall	=	19	m
Width of retaining wall	=	13.3	m
Thickness of stem at top	=	0.5	m
Thickness of stem at bottom	=	1.9	m
Width of heel	=	6.65	m
Width of toe	=	4.8	m
Base width	=	13.3	m
Thickness at edge	=	0.5	m
Thickness at junction	=	1.9	m
Thickness of PCC below retaining wall	=	0.1	m
Overall Width of road/structure	=	8.55	m

Excavation:			
Excavation length	=	12	m
Excavation width	=	15.3	m
Excavation Depth	=	2.1	m
Earthwork	=	**385.56**	**m^3**

Backfilling:			
Length	=	10	m
Width	=	8.35	m
Height	=	17.8	m
Backfilling behind retaining wall	=	**1486.3**	**m^3**

Levelling Course:			
Length	=	10.2	m
Width	=	13.5	m
Depth	=	0.1	m
Levelling Course below retaining wall	=	**13.77**	**m^3**

Concrete Quantity:			
Concrete Qty. in footing per metre	=	17.29	m^2
Concrete Qty. in Stem per metre	=	20.52	m^2
Total Concrete Qty. in retaining wall	=	**378.1**	**m^3**

Reinforcement Quantity:			
Total R/F Qty. in retaining wall	=	**41.591**	**t**

RETAINING WALL QUANTITY FOR 10.0 M Height@ CH. (KM 5860-5870) LHS

Length of retaining wall	=	10	m
Depth of retaining wall above ground level	=	10.0	m
Depth of retaining wall below ground level	=	2.0	m
Height of retaining wall	=	12	m
Width of retaining wall	=	8.4	m
Thickness of stem at top	=	0.3	m
Thickness of stem at bottom	=	1.2	m
Width of heel	=	4.2	m
Width of toe	=	3.0	m
Base width	=	8.4	m
Thickness at edge	=	0.3	m
Thickness at junction	=	1.2	m
Thickness of PCC below retaining wall	=	0.1	m
Overall Width of road/structure	=	5.4	m

Excavation:			
Excavation length	=	12	m
Excavation width	=	10.4	m
Excavation Depth	=	2.1	m
Earthwork	=	**262.08**	**m^3**

Backfilling:			
Length	=	10	m
Width	=	5.65	m
Height	=	11.25	m
Backfilling behind retaining wall	=	**635.625**	**m^3**

Levelling Course:			
Length	=	10.2	m
Width	=	8.6	m
Depth	=	0.1	m
Levelling Course below retaining wall	=	**8.772**	**m^3**

Concrete Quantity:			
Concrete Qty. in footing per metre	=	6.84	m^2
Concrete Qty. in Stem per metre	=	8.1	m^2
Total Concrete Qty. in retaining wall	=	**149.4**	**m^3**

Reinforcement Quantity:			
Total R/F Qty. in retaining wall	=	**14.94**	**t**

RETAINING WALL QUANTITY FOR 10.0 M Height @ CH. (KM 6120-6180) LHS

Length of retaining wall	=	60	m
Depth of retaining wall above ground level	=	10.0	m
Depth of retaining wall below ground level	=	2.0	m
Height of retaining wall	=	12	m
Width of retaining wall	=	8.4	m
Thickness of stem at top	=	0.5	m
Thickness of stem at bottom	=	1.2	m
Width of heel	=	4.2	m
Width of toe	=	3.0	m
Base width	=	8.4	m
Thickness at edge	=	0.5	m
Thickness at junction	=	1.2	m
Thickness of PCC below retaining wall	=	0.1	m
Overall Width of road/structure	=	5.4	m

Excavation:			
Excavation length	=	62	m
Excavation width	=	10.4	m
Excavation Depth	=	2.1	m
Earthwork	=	**1354.08**	**m^3**

Backfilling:			
Length	=	60	m
Width	=	5.55	m
Height	=	11.15	m
Backfilling behind retaining wall	=	**3712.95**	**m^3**

Levelling Course:			
Length	=	60.2	m
Width	=	8.6	m
Depth	=	0.1	m
Levelling Course below retaining wall	=	**51.772**	**m^3**

Concrete Quantity:			
Concrete Qty. in footing per metre	=	7.56	m^2
Concrete Qty. in Stem per metre	=	9.18	m^2
Total Concrete Qty. in retaining wall	=	**1004.4**	**m^3**

Reinforcement Quantity:			
Total R/F Qty. in retaining wall	=	**100.44**	**t**

RETAINING WALL QUANTITY FOR 10.0 M Height @ CH. (KM 0000 - 0010) LHS

Length of retaining wall	=	10	m
Depth of retaining wall above ground level	=	10.0	m
Depth of retaining wall below ground level	=	2.0	m
Height of retaining wall	=	12	m
Width of retaining wall	=	8.4	m
Thickness of stem at top	=	0.5	m
Thickness of stem at bottom	=	1.2	m
Width of heel	=	4.2	m
Width of toe	=	3.0	m
Base width	=	8.4	m
Thickness at edge	=	0.5	m
Thickness at junction	=	1.2	m
Thickness of PCC below retaining wall	=	0.1	m
Overall Width of road/structure	=	5.4	m

Excavation:

Excavation length	=	12	m
Excavation width	=	10.4	m
Excavation Depth	=	2.1	m
Earthwork	=	**262.08**	**m^3**

Backfilling:

Length	=	10	m
Width	=	5.55	m
Height	=	11.15	m
Backfilling behind retaining wall	=	**618.825**	**m^3**

Levelling Course:

Length	=	10.2	m
Width	=	8.6	m
Depth	=	0.1	m
Levelling Course below retaining wall	=	**8.772**	**m^3**

Concrete Quantity:

Concrete Qty. in footing per metre	=	7.56	m^2
Concrete Qty. in Stem per metre	=	9.18	m^2
Total Concrete Qty. in retaining wall	=	**167.4**	**m^3**

Reinforcement Quantity:

Total R/F Qty. in retaining wall	=	**16.74**	**t**

RETAINING WALL QUANTITY FOR 8.0 M Height @ CH. (KM 5510-5520) LHS

Length of retaining wall	=	10 m
Depth of retaining wall above ground level	=	8.0 m
Depth of retaining wall below ground level	=	2.0 m
Height of retaining wall	=	10 m
Width of retaining wall	=	7 m
Thickness of stem at top	=	0.3 m
Thickness of stem at bottom	=	1 m
Width of heel	=	3.5 m
Width of toe	=	2.5 m
Base width	=	7 m
Thickness at edge	=	0.3 m
Thickness at junction	=	1 m
Thickness of PCC below retaining wall	=	0.1 m
Overall Width of road/structure	=	4.5 m

Excavation:		
Excavation length	=	12 m
Excavation width	=	9 m
Excavation Depth	=	2.1 m
Earthwork	=	**226.8 m^3**

Backfilling:		
Length	=	10 m
Width	=	4.85 m
Height	=	9.35 m
Backfilling behind retaining wall	=	**453.475 m^3**

Levelling Course:		
Length	=	10.2 m
Width	=	7.2 m
Depth	=	0.1 m
Levelling Course below retaining wall	=	**7.344 m^3**

Concrete Quantity:		
Concrete Qty. in footing per metre	=	4.9 m^2
Concrete Qty. in Stem per metre	=	5.85 m^2
Total Concrete Qty. in retaining wall	=	**107.5 m^3**

Reinforcement Quantity:		
Total R/F Qty. in retaining wall	=	**9.675 t**

RETAINING WALL QUANTITY FOR 6.0 M Height @ CH. (KM 5510-5520) LHS

Length of retaining wall	=	10 m
Depth of retaining wall above ground level	=	6.0 m
Depth of retaining wall below ground level	=	2.0 m
Height of retaining wall	=	8 m
Width of retaining wall	=	5.6 m
Thickness of stem at top	=	0.3 m
Thickness of stem at bottom	=	0.8 m
Width of heel	=	2.8 m
Width of toe	=	2.0 m
Base width	=	5.6 m
Thickness at edge	=	0.3 m
Thickness at junction	=	0.8 m
Thickness of PCC below retaining wall	=	0.1 m
Overall Width of road/structure	=	3.6 m

Excavation:		
Excavation length	=	12 m
Excavation width	=	7.6 m
Excavation Depth	=	2.1 m
Earthwork	=	**191.52 m^3**

Backfilling:		
Length	=	10 m
Width	=	4.05 m
Height	=	7.45 m
Backfilling behind retaining wall	=	**301.725 m^3**

Levelling Course:		
Length	=	10.2 m
Width	=	5.8 m
Depth	=	0.1 m
Levelling Course below retaining wall	=	**5.916 m^3**

Concrete Quantity:		
Concrete Qty. in footing per metre	=	3.28 m^2
Concrete Qty. in Stem per metre	=	3.96 m^2
Total Concrete Qty. in retaining wall	=	**72.4 m^3**

Reinforcement Quantity:		
Total R/F Qty. in retaining wall	=	**6.154 t**

Retaining wall

Item No.	Description	Unit	Quantity	Rate	Cost in Rs	Cost in Cr	SOR Reference No.
8.01	Earthwork in excavation of foundations for structures in all kinds of soils including all leads and lifts complete as per drawings and Technical Specifications Clause 304						
	a) Depth up to 3.0 m						
	i) all types of soils	cum	3030	111	336317	0.034	BOQ Rate B90
	ii) Hard Rock	cum					
	iii) Soft/ordinary rock	cum					
8.02	Back filling behind abutments, wing walls and return walls with selected imported granular material of approved quality, including all leads and lifts, complete as per drawings and Technical Specifications Clause 305 and Clause 710.1.4 of IRC:78	cum	7685	2119	16285098	1.629	BOQ Rate B111
8.03	Plain Cement Concrete / Reinforced Cement Concrete in foundation/ leveling course/annular filling upto rock level excluding reinforcement complete as per drawings and Technical Specifications Sections1500, 1700 and 2100						
	a) M-15 grade	cum	107	5540	591395	0.059	BOQ Rate B102
8.04	Plain Cement Concrete/ Reinforced Cement Concrete in substructure excluding reinforcement complete as per drawings and Technical Specifications Sections 1500, 1700 and 2200.						
	d) M-30 grade	cum	2002	8809	17632975	1.763	13.5 G (q) Case II
8.05	Supplying, fixing and placing TMT/HYSD bar reinforcement complete as per drawings and Technical Specification Section 1600	t	199	68369.00	13628676	1.363	BOQ Rate B106
	Total Cost				**48474461**	**4.85**	

Drainage & Protection Works

Cost Of RRM Toe/Retaining Wall 2.5 m Height

	Length of Toe/Retaining Wall 2.5 m Height			40.00		
Sr. No.	**Description**	**Unit**	**X-sectional area (m^2)**	**Quantity**	**Rate**	**Cost**
i)	Excavation for Foundation	cum	2.45	98.00	111.00	10878.00
ii)	PCC M-15 (Levelling Course)	cum	0.75	30.00	5540.00	166200.00
iii)	RRM in substructure of Toe/Retaining Wall	cum	4.35	174.00	4325.00	752550.00
iv)	Filter Media	cum	1.30	52.00	2071.00	107692.00
v)	PCC Coping	cum	0.27	10.80	5540.00	59832.00
Cost Of RRM Toe/Retaining Wall 2.5 m Height						1097152.00

Drainage & Protection Works

Cost Of RRM Toe/Retaining Wall 3 m Height

	Length of Toe/Retaining Wall 3 m Height			20.00		
Sr. No.	**Description**	**Unit**	**X-sectional area (m^2)**	**Quantity**	**Rate**	**Cost**
i)	Excavation for Foundation	cum	3.50	70.00	111.00	7770.00
ii)	PCC M-15 (Levelling Course)	cum	0.90	18.00	5540.00	99720.00
iii)	RRM in substructure of Toe/Retaining Wall	cum	6.70	134.00	4325.00	579550.00
iv)	Filter Media	cum	1.60	32.00	2071.00	66272.00
v)	PCC Coping	cum	0.27	5.40	5540.00	29916.00
Cost Of RRM Toe/Retaining Wall 3 m Height						783228.00

Total Cost of RRM Toe/Retaining Wall	*1880380.00*

Cost Of Road side PCC Drain

	Length of Road side PCC Drain					*1426.00*		
Sr. No.	**Description**	**Unit**	**Breadth m**	**Height m**	**C/s Area m2**	**Quantity m3**	**Rate**	**Cost**
i)	i) Excavation for drain work	cum	1.00	0.35	0.35	499.10	708.00	353362.80
ii)	ii) PCC-M15	cum	Area=		0.18	257.16	5540.00	1424660.56
Total Cost of Road side PCC Drain								*1778023.36*

Cost Of Catch Drain

	Length of Catch Drain					*1270.00*		
Sr. No.	**Description**	**Unit**	**Breadth m**	**Height m**	**C/s Area m2**	**Quantity m3**	**Rate**	**Cost**
i)	i) Excavation for Catch Drain	cum	0.75	0.30	0.23	285.75	708.00	202311.00
Total Cost of Catch Drain								*202311.00*

Drainage & Protection Works

Rock Bolts

Sr. No.	Length	Height	Surface Area	Spacing	Dia of Bolt	Length of bolt	Nos.	Length of Bolts	Rate	Cost
1	256	10.31	2638.59	2.00	25.00	4.00	768.00	3072.00	1110.00	3409920.00
2	27	10.31	278.29	1.50	25.00	8.00	126.00	1008.00	1110.00	1118880.00
3	311	5.00	1555.00	1.50	25.00	8.00	832.00	6656.00	1110.00	7388160.00
4	27	10.31	278.29	1.00	32.00	4.00	297.00	1188.00	1270.00	1508760.00
5	824	15.21	12530.57	1.00	32.00	10.00	13184.00	131840.00	1270.00	167436800.00
			17280.738	Total Cost of Rock Bolts						180862520.00

Shotcrete

Sr. No.	Thickness of Shotcrete		Surface Area	Thick.	Quantity	Rate	Cost
1	75mm thick	42.98%	7426.53	0.08	556.99		
2	100mm thick	57.02%	9854.21	0.10	985.42		
					1542.41	10346.00	15957779.11
Total Cost of Shotcrete							15957779.11

Drainage Holes

Sr. No.	Spacing of holes m,C/C	Depth of Holes (M)	No. of holes (8x8 square area)	Surface Area	Total No. of Holes	Total Depth of Holes	Rate	Cost
1	4	5	13.00	17280.74	3510.15	17551.00	2550.00	44755050.00
Total Cost of Drainage Holes								44755050.00
Total Cost of Drainage & Protection Works								245436063.47

TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES

SR. NO.	ITEM DESCRIPTION	Unit	No	Length	Width	Height	Qty	Rate	Amount
1.01	Painting lines, dashes, arrows etc on roads in two coats on new work with ready mixed road marking paint conforming to IS:164 on bituminous surface, including cleaning the surface of all dirt, dust and other foreign matter, demarcation at site and traffic control	SQM					6878.69	609.00	4189122.21
1.02	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 aluminum sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm (height from crown level of the road and bottom of the sign board shall not be less than 1.5 m.) 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 including painting of vertical post as per specification.								
(a)	90 cm equilateral triangle	NO	2				2.00	5835.00	11670.00
(b)	60 cm x 50 cm rectangular	NO	143				143.00	22253.00	3182179.00
(c)	90 cm x 30 cm rectangular	NO	54				54.00	22253.00	1201662.00
(f)	60 cm circular	NO	7				7.00	5126.00	35882.00
(d)	60 cm x 45 cm rectangular	NO	18				18.00	4988.00	89784.00
1.03	Direction and Place Identification signs with size more than 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminum sheeting, 2 mm thick with area exceeding 0.9 sqm supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm (height from crown level of the road and bottom of the sign board shall not be less than 1.5 m.) , 2 Nos. firmly fixed to the ground by means of properly designed foundation with M 15 grade cement concrete45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing including painting of vertical post as per specification.								
(a)	1800mm x 1200mm	NO	11				11.00	22253.00	244783.00
1.04	Supply and fixing tubular gantry mounted Overhead/cantilever signs. All components of signs & supports, other than the reflective portion shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. The sign back side shall be with grey color and post shall be in black & white alternate bands. The post below ground shall be painted with three coats of red lead paint. The sign shall be made as per IRC-67-2001 and Technical Specifications Clause 801 & 802 or as directed by the Engineer.								
1	Erection of Over Head Gantry structure as per drawing including steel work in trusses, steel tubes cutting; fixing in position with welding and bolted complete in all respect.								
(a)	Gantry Mounted Advance Directon	T	2	Roadway width=5 m		Weight 1.50 Tonne	3.00	64248.00	192744.00
1.05	The sign boards made out of 2mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type. The background / border / symbols / legend / arrows shall be made by transparent overlay film of desired colour as per sign details except those in black which shall be of non reflective type. The sign plate shall be fixed with 6mm dia aluminium rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 70mmx70mmx8mm with additional bracing at every 600mm c/c, if any dimension is more than 1200mm.								
(a)	Over Head Gantry Mounted Sign	SQM	2	5.5	1.2		13.20	11499.00	151786.80
1.06	Reinforced cement concrete M15 grade kilometre stone of standard design as per IRC:8-1980, fixing in position including painting and printing etc								
(a)	5th kilometre stone (precast)	NO	1				1.00	4062.00	4062.00
(b)	Ordinary kilometer stone (precast)	NO	6				6.00	2481.00	14886.00
(c)	Hectometer stone (precast)	NO	26				26.00	685.00	17810.00

TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES									
SR. NO.	**ITEM DESCRIPTION**	**Unit**	**No**	**Length**	**Width**	**Height**	**Qty**	**Rate**	**Amount**
1.07	Providing and fixing road delineators complete as per technical specification Section 800.								
(a)	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 strips, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and conforming toIRC-79 and the drawings.	NO	56				55.69	1055.00	58754.03
1.08	Reinforced cement concrete M-15 grade boundary pillars of standard design as per IRC:25-1967, fixed in position including finishing and lettering but including painting) etc. complete.	NO	51				51.24	826.00	42324.24
1.09	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)	NO	258				258.32	834.00	215441.69
TOTAL cost of Traffic Signs									**9652890.97**

Major Junction Improvement						
Total Area of Junction (Sqm)				**37208**		
S. No.	**Item Description**	**Unit**	**Tk.(m)**	**Qty**	**Rate**	**Amt**
1	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	Ha		3.72	83750.00	311617.00
	Excavation for roadwork in soil with hydraulic excavator of 0.9 cum bucket capacity including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location within all lifts and lead upto 1000m	cum	288903		259.00	74825786.87
2	Construction of **embankment** with approved material obtained from roadway excavation satisfying the requirements of Techinical specification indicated in the drawings including all leads and lifts complete as per Technical Specifications Clause 305.	cum	806349		148.00	119339598.51
3	Construction of **subgrade** with approved material satisfying the requirements of minimum soaked CBR value as indicated in the drawings including all leads and lifts complete as per Technical Specifications Clause 305.	Cum	0.500	18604.00	148.00	2753392.00
4	Construction of **granular sub-base** by providing close graded Material, mixing by Mix in Place Method by rotavator at OMC, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density,G-I complete as per clause 401	Cum	0.200	7441.60	1746.00	12993033.60
5	Providing, laying, spreading and compacting graded stone aggregate to **wet mix macadam** specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver	Cum	0.250	9302.00	2158.00	20073716.00
6	Providing and applying **primer coat** with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.60 kg/sqm using mechanical means.	Sqm		37208.00	11.00	409288.00
7	Providing and applying **tack coat** with bitumen emulsion using emulsion pressure distributor at the rate of 0.25 kg per sqm on the prepared granular surface cleaned with mechanical broom.	Sqm		37208.00	6.00	223248.00
8	Providing and laying **dense graded 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 VG-30 grade of bitumen @ 4-4.25% by weight of total mixture	Cum	0.070	2604.56	7997.00	20828666.32
9	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 VG-30 Grade of bitumen @ 5.4-5.6% by weight of total mixture	Cum	0.040	1488.32	8942.00	13308557.44
Total Cost of Junction						**265066903.74**

Major Junction Improvement

RRM Retaining Wall of height = 4m

Description	Unit	L (m)	Area	Quantity	Rate	Amount (Rs.)
i) Excavation for Foundation	cum	50	Cross Sectional Area 4.49	224.50	111.00	24919.50
ii) PCC M-15 (Levelling Course)	cum	50	Cross Sectional Area 1.38	69.00	5540.00	382260.00
iii) RRM in substructure of wall	cum	50	Cross Sectional Area 9.18	459.00	4325.00	1985175.00
iv) PCC Coping	cum	50	Cross Sectional Area 0.27	13.50	5540.00	74790.00
v) Filter Media	cum	50	Cross Sectional Area 2.50	125.00	2071.00	258875.00
v) Weep holes	Nos.	50.00		50.00	456.00	22800.00
Total Cost of RRM RETAINING Wall of height = 4m						2748819.50

Cost Of RRM Breast Wall 10 m Height

Description	Unit	L (m)	X-sectional area (m^2)	Quantity	Rate	Cost
Excavation for Foundation	cum	1610	3.00	4830.00	111.00	536130.00
PCC M-15 (Levelling Course)	cum	1610	0.24	384.79	5540.00	2131736.60
RRM in substructure of BreastWall	cum	1610	15.51	24969.49	4325.00	107993044.25
PCC Coping	cum	1610	0.03	40.25	5540.00	222985.00
Cost Of RRM Breast Wall 10 m Height						110883895.85
Gabion wall cost						18923380.00
Total Cost of Junction						397622999.09

Sudhmahadev Daranga Tunnel Junction Gabion Wall from CH. Km 16+717 to CH. Km 16+997

Gabion Wall

Front batter	=	5	deg
Height	=	8	m
Depth Below Ground Leve	=	0.5	m
Slant Height	=	8.530	m
No. of steps	=	9	m
Base Width	=	5.5	m
C/S Area of Gabion Wall	=	27	sqm
Offset	=	0.5	m

Geotextile				**Rate**	**Cost**
Length	=	18.5	m		
C/S Area of Geotextile	**=**	**5180**	**sqm**	937.00	**4853660**

Excavation

Width	=	6.5	m
Depth	=	2	m
C/S Area of Excavation	=	13	sqm

Length of Wall	=	280	m

Volume of Gabion Wall	**=**	**7560**	**cum**	1785.00	**13494600**
Volume of Excavation	**=**	**3640**	**cum**	158.00	**575120**
TOTAL COST =					**18923380**
TOTAL COST IN CRORES =					**1.892338**

MISCELLANEOUS ITEMS									
SR. NO.	**ITEM DESCRIPTION**	**UNIT**	**No.**	**Length**	**Width**	**Height**	**Total QTY**	**RATE**	**AMT**
1.01	Provision of High mast Lighting at , major junctions, truck laybye as per specification or as per the instruction of the Authority.	NO	2				2	200000.00	400000.00
1.02	Construction of cement concrete kerb with channel with top and bottom width 115 and 165 mm respectively, 275 mm high in M 20 grade PCC on M10 grade foundation 150 mm thick, kerb channel 300 mm wide, 50 mm thick in PCCM20 grade, sloped towards the kerb, kerb stone with channel laid with kerb laying machine, foundation concrete laid manually, all complete as per clause 408	Rmt	752				752	589.00	442928.00
1.03	Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces	SQM	293				293	89.00	26101.92
TOTAL COST OF MISCELLENEAUS WORKS									**869029.92**