

00	2013-03-31	Preliminary Tunnel Design Phase II			
Rev.	Date	Status	Prepared	Checked	Approved

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CLIENT:



The Chief Employer's
Representative
Project BEACON
Border Roads Organization
C/O 56 APO

PROJECT:

Consultancy Services for Detailed Feasibility Study and Framing up of
Phasewise proposal (DPR) for construction of two tunnels at Z-Morh and at
Zojila for all weather connectivity from Srinagar to Leh in Jammu & Kashmir
State

ZOJILA TUNNEL

TITLE:

Phase II: Detailed Project Report - Preliminary Tunnel Design
Volume VII: Cost Estimation
Addendum 3 – Bill of Quantity (BoQ)

Prepared by:		Date:	
Checked by:		Date:	
Approved by:		Date:	

Contract No.:	CE (P) BCN/05/2009-10	File:	8482B-II-ZOT-rep-07-12-00-A3
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Description of item	Amount (Rs.)	
TOTAL OF BILL 1 - CIVIL ENGINEERING MAIN TUNNEL	INR	15.316.101.149,34
TOTAL OF BILL 2 - CIVIL ENGINEERING EGRESS TUNNEL	INR	8.499.278.123,06
TOTAL OF BILL 3 - CIVIL ENGINEERING VENTILATION SHAFT & VENTILATION CAVERN	INR	1.653.090.463,42
TOTAL OF BILL 4 - CIVIL ENGINEERING PORTAL WEST	INR	322.946.707,83
TOTAL OF BILL 5 - CIVIL ENGINEERING PORTAL EAST	INR	376.409.666,69
TOTAL OF BILL 6 - SITE FACILITY AND TIME-DEPENDNENT COSTS	INR	11.383.620.091,77
TOTAL OF BILL 7 - ELECTRO & MECHANICAL EQUIPMENT	INR	5.220.186.741,70
TOTAL OF BILL 8 - VENTILATION SYSTEM	INR	2.616.590.724,30
CONSTRUCTION COSTS	INR	45.388.223.668,12

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
BILL 1 - CIVIL ENGINEERING MAIN TUNNEL							
SCHEDULE -A DEWATERING ARRANGEMENT							
SCHEDULE - A1 Temporary Dewatering Arrangement Tunnel							
A101	Care of water in max 3.0% drift for downward drives	1,00	lumpsum	30.479.862,79			30.479.862,79
TOTAL OF SCHEDULE - A1 Temporary Dewatering Arrangement Tunnel							30.479.862,79
SCHEDULE - A2 Permanent Dewatering Arrangement Tunnel							
A201	Providing and laying of PVC pipe of following diameters as main collector pipe, connection pipes, cleaning access pipes etc., as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
A20101	150 mm internal diameter PVC pipe	423,00	meter	1.467,77	165,02		690.671,24
A20102	250 mm internal diameter PVC pipe	1.528,44	meter	2.346,39	230,38		3.938.432,37
A20103	400 mm internal diameter PVC pipe	14.083,00	meter	6.409,15	230,38		93.504.467,10
A202	Providing and laying of perforated PVC pipe of following diameters as drainage pipes, as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
A20201	150 mm internal diameter PVC pipe	14.083,00	meter	1.324,74	165,02		20.980.311,61
A20202	250 mm internal diameter PVC pipe	28.166,00	meter	1.324,74	165,02		41.960.623,21
A203	Manufacture, supply, and placing of pre-cast concrete slot channel elements as per approved drawings for carriageway drainage	28.166,00	meter	11.067,88	330,04		321.033.788,16
A204	Providing and installing of dimpled sheets in the tunnel between primary and permanent lining as per approved drawings & Technical Specifications or as directed by Employer's Representative.	41.140,66	sqm	339,70	47,45		15.927.588,56
A205	Providing, laying and fixing of Protective Felt (geotextile) with a minimum weight of 500 g/m ² for protection of the waterproofing membrane & drainage on the finished outer lining surface, including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	413.689,86	sqm	125,15	79,08		84.490.814,16
A206	Providing, placing, welding of 2 mm thick PVC or ECB Water Proofing Membrane including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	413.689,86	sqm	375,46	237,25		253.472.442,49
A207	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)	28.166,00	meter	522,06	182,52		19.845.346,14
A208	Manufacture, supply, and placing of inspection and cleaning chambers of PP or PE-HD including bell mouth, manhole cover, the cost of all materials, labour, equipment, etc. required for the completion of job as per approved detailed drawings & Technical Specifications or as directed by Employer's Representative.						
A20801	Cleaning and Inspection chamber for DN150	141,00	pcs	39.326,71	4.563,05		6.188.456,82
A20802	Cleaning and Inspection chamber for DN250	282,00	pcs	45.225,04	4.563,05		14.040.241,58
A20803	Cleaning and Inspection chamber for DN400	141,00	pcs	47.608,89	4.563,05		7.356.243,64
A209	Fire main	14.200,00	meter	138,50	821,88		13.637.489,46
A210	Hydrant including accessories	132,00	pcs	146.549,03	9.862,58		20.646.332,20
TOTAL OF SCHEDULE - A2 Permanent Dewatering Arrangement Tunnel							917.713.248,74
TOTAL OF SCHEDULE -A DEWATERING ARRANGEMENT							948.193.111,53
SCHEDULE - B UNDERGROUND EXCAVATION							
SCHEDULE - B1 Excavation							
B101	Underground excavation for tunnel in Support Category dominating the Face Area. Including all type of niches and lay-by including drilling, blasting, or other means of excavation, including widening of top heading footings, provision of surface drainage, construction ventilation, lighting arrangement during construction, temporary backfilling for traffic in tunnel, removal of the same and disposal of excavated material to muck disposal area with all lifts as per approved drawings & Technical Specifications. The quantities of excavation are determined to the design lines of excavation as per Technical Specifications. Overexcavation to the overexcavation line defined by the Technical Specifications is compensated with the unit rates.						
B10101	Excavation in Support Category A; top heading, bench, invert						
B1010101	Top heading	154.664,64	cum	585,68	1.122,48	827,94	392.245.608,46
B1010102	Bench	165.350,16	cum	585,03	564,89	387,22	254.166.507,36
B10102	Excavation in Support Category B; top heading, bench, invert						
B1010201	Top heading	118.752,48	cum	589,53	1.312,25	1.114,57	358.198.666,93
B1010202	Bench	166.809,78	cum	588,70	656,65	523,98	295.140.903,12
B10103	Excavation in Support Category C; top heading, bench, invert						
B1010301	Top heading	88.831,38	cum	595,19	1.023,31	1.338,44	262.669.205,30
B1010302	Bench	124.829,74	cum	594,16	524,32	634,17	218.783.647,20
B10104	Excavation in Support Category D; top heading, bench, invert						

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
B1010401	Top heading	164.818,16	cum	597,30	1.000,03	1.443,07	501.113.831,24
B1010402	Bench & Invert	217.884,20	cum	592,01	424,87	545,81	340.483.331,81
B10105	Excavation in Support Category E; top heading, bench, invert						
B1010501	Top heading	181.941,20	cum	592,97	680,44	1.115,56	434.653.911,71
B1010502	Bench & Invert	104.051,73	cum	606,01	604,33	975,32	227.420.865,41
B10106	Excavation in Support Category F; top heading, bench, invert						
B1010601	Top heading	112.478,10	cum	592,65	656,62	1.116,33	266.077.784,80
B1010602	Bench & Invert	63.607,14	cum	605,78	589,24	987,02	138.793.131,00
B10107	Excavation in Support Category G; top heading, bench, invert						
B1010701	Top heading	51.690,91	cum	592,65	650,33	1.131,92	122.760.366,44
B1010702	Bench & Invert	29.231,57	cum	605,78	583,68	1.000,80	64.024.625,44
B10108	Excavation in Support Category H; top heading, bench, invert						
B1010801	Top heading	7.457,12	cum	271,00	937,78	2.083,69	24.552.283,21
B1010802	Bench & Invert	4.193,68	cum	265,44	853,96	1.894,12	12.637.772,24
B102	Mucking of geological overbreak accepted by Employer's Representative as per Technical Specifications	8.500,00	cum	185,53	393,07	223,74	6.819.872,63
B103	Additional underground excavation as directed by Employer's Representative without rock mass classification.	1.250,00	cum	552,12	922,90	1.271,44	3.433.082,46
B104	Additional payment for extra transportation of excavation material to the muck deposit area as per approved drawings & Technical Specifications.	16.194.003,96	cum*km	31,45	29,35	14,67	1.222.308.433,44
B105	Re-profiling of tunnel due to deformations	4.850,00	cum	273,16	2.542,25	1.747,97	22.132.391,57
B106	Temporary suspension of D&B excavation	151,20	wd		151.862,60		22.961.624,62
TOTAL OF SCHEDULE - B1 Excavation							5.191.377.846,39
SCHEDULE - B2 Drilling and Grouting							
B201	Drilling of drainage drilling in the tunnel perimeter and face, diameter 50 mm, length 3 m to 8 m	19.250,00	meter	104,54	2.120,45	649,58	55.335.534,41
B202	Drilling of exploratory drilling without core recovery, diameter 50 mm, length up to 20 m	30,00	pcs	215,62	4.373,43	1.339,76	177.864,22
B203	Drilling of exploratory drilling with core recovery, diameter 76 mm						
B20301	Drilling 0-10 m	25,00	pcs	653,40	13.252,81	4.059,87	449.152,07
B20302	Drilling 10-20 m	25,00	pcs	980,10	19.879,21	6.089,81	673.728,10
B20303	Drilling 20-30 m	25,00	pcs	1.306,80	26.505,62	8.119,75	898.304,13
B204	Strata grouting as defined by the approved drawings the Technical Specifications or directed by the Employer's Representative	2.600,00	cum	4.103,19	2.588,93		17.399.495,25
TOTAL OF SCHEDULE - B2 Drilling and Grouting							74.934.078,17
TOTAL OF SCHEDULE - B UNDERGROUND EXCAVATION							5.266.311.924,56
SCHEDULE - C PRIMARY SUPPORT MEASURES							
SCHEDULE - C1 Bolts & Anchors							
C101	Supply, drilling and installation of frictional rock bolts (Swellex or similar) of the specified length, Fy≥ 150 KN (tunnel support) as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
C10101	Length 4 m	13.881,00	pcs	3.982,60	3.281,65	1.005,30	114.789.557,65
C10102	Length 6 m	4.958,00	pcs	5.745,89	3.597,19	1.101,97	51.786.548,71
C102	Supply, drilling, installation and grouting of grouted rock bolts (SN type) of the specified length, Fy≥ 200 KN (tunnel perimeter & face) as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
C10201	Length 6 m	26.267,00	pcs	2.345,22	4.859,36	1.488,62	228.344.395,30
C10202	Length 9 m	61.510,00	pcs	3.257,16	5.301,12	1.623,95	626.309.119,24
C103	Supply, drilling, installation and grouting of self-drilling bolts of the specified length, Fy≥ 200 KN (tunnel perimeter & face) as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
C10301	Length 9 m	1.520,00	pcs	6.704,01	5.310,87	1.626,93	20.735.549,41
C104	Supply, drilling, installation and grouting of forepoling as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
C10401	Grouted rock bolts (SN type) with a length of 6 m, Fy≥ 200 KN	1.505.105,00	meter	291,60	315,98	96,80	1.060.161.477,43
C10402	Steel Pipe umbrella with a diameter of 114 mm, wall thickness of 6.5 mm and a length of 14 m	5.725,00	meter	520,35	1.388,39	425,32	13.362.483,82
TOTAL OF SCHEDULE - C1 Bolts & Anchors							2.115.489.131,57
SCHEDULE - C2 Shotcrete, Lattice Girder, Lining Stress Controllers & Wire Mesh							

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
C201	Shotcreting of primary lining (tunnel, niches, caverns) with designed mix cement concrete SpC20/25(56)/II/J2/XC1/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative in charge including all materials, labour, equipment, etc. required for complete job. The reinforcement is compensated separately.						
C20101	50 mm thick shotcrete lining in tunnel	80.361,72	sqm	413,12	246,11	306,51	77.608.710,94
C20102	100 mm thick shotcrete lining in tunnel	80.471,88	sqm	709,69	465,44	427,75	128.986.203,39
C20103	150 mm thick shotcrete lining in tunnel	59.861,07	sqm	1.230,14	466,72	608,47	137.999.753,41
C20104	200 mm thick shotcrete lining in tunnel	77.059,24	sqm	1.638,20	563,55	694,42	223.176.758,70
C20105	250 mm thick shotcrete lining in tunnel	56.903,91	sqm	2.040,56	492,67	475,05	171.182.799,24
C20106	300 mm thick shotcrete lining in tunnel	52.739,92	sqm	2.447,52	557,53	472,26	183.392.893,23
C202	Shotcreting of primary invert lining with designed mix cement concrete SpC20/25(56)/II/J2/XC1/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative in charge including all materials, labour, equipment, etc. required for complete job. The reinforcement is compensated separately.						
C20201	200 mm thick shotcrete lining in tunnel	65.900,83	sqm	1.628,63	281,78	347,21	148.778.799,19
C20202	250 mm thick shotcrete lining in tunnel	54.333,86	sqm	2.032,19	246,34	237,52	136.706.868,50
C20203	300 mm thick shotcrete lining in tunnel	25.564,15	sqm	2.438,06	278,76	236,13	75.489.647,35
C203	Shotcreting with designed mix cement concrete SpC20/25(56)/II/J2/XC1/GK8 of face sealing and widening of top heading footing in tunnel, as defined in the Technical Specifications including all labour, materials, cost of pins, hooks, lead, lift, handling, wastage complete with contractor's own equipment for complete job	11.742,00	cum	5.872,36	2.650,56	223,14	102.696.317,00
C204	Steel fibre reinforcement if required	56,25	tonne	3.246,48	340,55	868,40	250.632,23
C205	Supply and placing of 150 x 150 x 6 mm welded wire fabric of Fe 500 as reinforcement in primary lining as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include all labour, materials, cost of pins, hooks, lead, lift, handling, wastage complete with contractor's own equipment for complete job	2.690,77	tonne	87.500,00	40.350,11	10.736,28	372.903.465,17
C206	Supply, fabrication and erection of lattice girders and all accessories including all lead, lift, wastage, storing, drilling holes, fixing in phases etc. and installation of accessories for joining the lattice girder segments as per approved workshop drawings of contractor & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, welding, etc. for the complete job including additional cost for enlargement of top heading footing.	2.232,82	tonne	190.185,42	19.344,08	5.147,04	479.334.517,76
C207	Providing and fixing yielding elements (Lining Stress Controllers - LSC or equivalent) as per approved drawings and Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	4.640,00	pcs	32.425,00	1.987,92	528,94	162.130.247,48
TOTAL OF SCHEDULE - C2 Shotcrete, Lattice Girder, Lining Stress Controllers & Wire Mesh							2.400.637.613,59
TOTAL OF SCHEDULE - C PRIMARY SUPPORT MEASURES							4.516.126.745,15
SCHEDULE - D CONCRETE WORK							
D101	Design Mix Cement Concrete C25/30 including machine mixed, machine batched, machine vibrated, form work, etc. as per Technical Specifications & drawings or as directed by Employer's Representative. The reinforcement is compensated separately.						
D10101	Inner lining of tunnel - foundation	13.184,12	cum	5.096,93	2.530,91		100.566.298,36
D10102	Inner lining of tunnel - invert	62.060,15	cum	5.067,82	1.860,62		429.979.743,81
D10103	Inner lining of tunnel & niches - vault with radial formwork						
D1010301	with thickness of 30 cm	68.487,93	cum	5.163,48	2.728,36	576,34	579.968.263,18
D1010302	with thickness of 40 cm	76.907,30	sqm	5.138,62	2.102,48	444,13	591.050.743,90
D10104	Inner lining tunnel ceiling and ventilation wall	53.050,66	cum	5.247,92	4.369,97	1.387,68	583.852.655,52
D102	Design Mix Cement Concrete C12/15 including mechanically mixed machine mixed, machine batched, machine vibrated, form work, etc. as per Technical Specifications & drawings or as directed by Employer's Representative						
D10201	Fill concrete in tunnel - invert	82.955,72	cum	4.185,25	419,55		381.994.318,26
D10202	binding concrete in tunnel	3.156,33	cum	4.185,25	785,82		15.690.358,64
D103	No-fines porous concrete in tunnel	4.723,37	cum	4.793,58	1.250,17		28.546.843,81
D104	Reinforcement for inner lining						
D10401	Reinforcement for inner lining - foundation	988,81	tonne	52.685,71	11.963,94		63.926.140,63
D10402	Reinforcement for inner lining - invert	4.654,51	tonne	52.685,71	7.036,31		277.976.835,39
D10403	Reinforcement for inner lining - vault	6.089,42	tonne	52.685,71	12.897,31		399.362.578,16
D10404	Reinforcement for inner lining tunnel ceiling and ventilation wall	3.978,80	tonne	52.685,71	31.053,52		333.181.648,61
D105	Concrete tests	1,00	lump sum			116.024.959,31	116.024.959,31
TOTAL OF SCHEDULE - D CONCRETE WORK							3.902.121.387,57
SCHEDULE - E INSTRUMENTATION AND MONITORING							

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
E101	Supply, install, read and maintain of 3D monitoring targets (reflectors) in top heading bench and invert as per approved drawings & Technical Specifications or as directed by Employer's Representative.	9.238,00	pcs	275,90			2.548.766,26
E102	Supply, drill, install, grout, read and maintain of borehole extensometer (four point) in the tunnel perimeter as per approved drawings & Technical Specifications or as directed by Employer's Representative.	1.130,00	pcs	12.579,49			14.214.823,36
E103	Supply, install, read and maintain of load cells for rock bolts as per approved drawings & Technical Specifications or as directed by Employer's Representative.	628,00	pcs	31.484,50			19.772.266,70
E104	Supply, install, read and maintain of strain gauges for shotcrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.	318,00	pcs	4.230,90			1.345.426,27
E105	Supply, install, read and maintain of strain gauges for concrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.	318,00	pcs	4.230,90			1.345.426,27
E106	Supply, install, read and maintain of radial pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.	1.570,00	pcs	31.594,50			49.603.366,75
E107	Supply, install, read and maintain of tangential pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.	1.570,00	pcs	31.594,50			49.603.366,75
E108	Supply, install, read and maintain of temperature gauges as per approved drawings & Technical Specifications or as directed by Employer's Representative.	282,00	pcs	1.860,90			524.773,86
TOTAL OF SCHEDULE - E INSTRUMENTATION AND MONITORING							138.958.216,23
SCHEDULE - F PAVEMENT							
F101	Supply, preparation of material, placing, compacting of granular sub-base with a minimum thickness of 30 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	40.708,65	cum	1.300,58	525,56	318,22	87.293.902,50
F102	Supply, mixing, placing, compacting of dry lean cement concrete base layer with a minimum thickness of 5 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	124.502,50	sqm	207,20	157,67	43,93	50.895.621,02
F103	Supply, mixing, placing, compacting of cement concrete pavement with a minimum thickness of 22 cm including construction of contraction joints, expansion joints, longitudinal joints, joint sealing compound, reinforcement, dowel rods and tie bars complete as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	124.502,50	sqm	1.415,77	722,90	366,95	311.956.517,35
F104	Manufacture, supply, and placing of pre-cast footpath elements in tunnel as per approved drawings, including application of 2 cm mastic asphalt surface. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	28.166,00	meter	1.498,34	1.734,68	112,99	94.243.723,43
TOTAL OF SCHEDULE - F PAVEMENT							544.389.764,30
TOTAL OF BILL 1 - CIVIL ENGINEERING MAIN TUNNEL							15.316.101.149,34
BILL 2 - CIVIL ENGINEERING EGRESS TUNNEL							
SCHEDULE - G DEWATERING ARRANGEMENT							
SCHEDULE - G1 Temporary Dewatering Arrangement Tunnel							
G101	Care of water in max 3.0% downwards drives	1,00	lump sum	30.479.862,79			30.479.862,79
TOTAL OF SCHEDULE - G1 Temporary Dewatering Arrangement Tunnel							30.479.862,79
SCHEDULE - G2 Permanent Dewatering Arrangement Tunnel							
G201	Providing and laying of perforated PVC pipe of following diameters as drainage pipes, as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
G20101	250 mm internal diameter PVC pipe	22.583,68	meter	1.324,74	165,02		33.644.302,98
G202	Providing and installing of dimpled sheets in the tunnel between primary and permanent lining as per approved drawings & Technical Specifications or as directed by Employer's Representative.	12.185,50	sqm	339,70	79,94		5.113.468,54
G203	Providing and installing of strip drains in the tunnel as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
G20301	Strip drain 200 mm x 25 mm	1.480,00	meter	147,00	412,56		828.141,51
G20302	Strip drain 200 mm x 40 mm	980,00	meter	199,50	412,56		599.813,97
G204	Providing, laying and fixing of Protective Felt (geotextile) with a minimum weight of 500 g/m ² for protection of the waterproofing membrane & drainage on the finished outer lining surface, including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	195.811,44	sqm	125,15	133,23		50.593.854,18
G205	Providing, placing, welding of 2 mm thick PVC or ECB Water Proofing Membrane including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	195.811,44	sqm	375,46	399,69		151.781.562,55
G206	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)	22.583,68	meter	375,46	182,52		12.601.207,71

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
G207	Manufacture, supply, and placing of inspection and cleaning chambers of PP or PE-HD including bell mouth, manhole cover, the cost of all materials, labour, equipment, etc. required for the completion of job as per approved detailed drawings & Technical Specifications or as directed by Employer's Representative.						
G20701	Cleaning and Inspection chamber for DN250	200,00	pcs	45.225,04	4.563,05		9.957.618,14
G20702	Cleaning and Inspection chamber for DN400	100,00	pcs	47.608,89	4.563,05		5.217.194,07
TOTAL OF SCHEDULE - G2 Permanent Dewatering Arrangement Tunnel							270.337.163,67
TOTAL OF SCHEDULE - G DEWATERING ARRANGEMENT							300.817.026,46
SCHEDULE - H UNDERGROUND EXCAVATION							
SCHEDULE - H1 Excavation							
H101	Underground excavation for tunnel in Support Category dominating the Face Area. Including all including drilling, blasting, or other means of excavation, including widening of top heading footings, provision of surface drainage, construction ventilation, lighting arrangement during construction, temporary backfilling for traffic in tunnel, removal of the same and disposal of excavated material to muck disposal area with all lifts as per approved drawings & Technical Specifications. The quantities of excavation are determined to the design lines of excavation as per Technical Specifications. Overexcavation to the overexcavation line defined by the Technical Specifications is compensated with the unit rates.						
H10101	Excavation in Support Category A; top heading, bench, invert						
H1010101	Top heading	105.005,98	cum	591,76	1.693,31	1.315,76	378.108.116,72
H10102	Excavation in Support Category B; top heading, bench, invert						
H1010201	Top heading	103.467,45	cum	597,77	1.995,58	1.733,95	447.734.771,54
H10103	Excavation in Support Category C; top heading, bench, invert						
H1010301	Top heading	82.708,50	cum	606,59	1.658,49	2.202,64	369.517.907,31
H10104	Excavation in Support Category D; top heading, bench, invert						
H1010401	Top heading	187.002,77	cum	616,30	1.589,69	2.669,35	911.700.756,19
H1010402	Invert	59.192,16	cum	639,91	2.467,63	2.746,20	346.495.818,32
H10105	Excavation in Support Category E; top heading, bench, invert						
H1010501	Top heading	70.082,07	cum	615,50	1.469,99	2.654,87	332.214.429,12
H1010502	Invert	22.622,82	cum	699,29	2.235,74	4.112,19	159.427.847,72
H10106	Excavation in Support Category F; top heading, bench, invert						
H1010601	Top heading	3.592,04	cum	309,29	1.377,63	3.495,72	18.616.259,65
H1010602	Invert	1.031,59	cum	840,17	2.342,90	6.086,10	9.562.009,49
H102	Underground excavation for cross passages for pedestrian use without rock mass classification	20.257,69	cum	551,66	1.683,10	2.701,68	100.000.659,32
H103	Mucking of geological overbreak accepted by Employer's Representative as per Technical Specifications	2.250,00	cum	185,53	393,07	223,74	1.805.260,40
H104	Additional underground excavation as directed by Employer's Representative without rock mass classification.	980,00	cum	551,66	1.683,10	2.701,68	4.837.702,14
H105	Additional payment for extra transportation of excavation material further than to the muck deposit area as per approved drawings & Technical Specifications.	5.950.362,88	cum*km	31,45	29,35	14,67	449.127.884,21
H106	Re-profiling of tunnel due to deformations	1.320,00	cum	252,31	2.532,61	1.747,97	5.983.415,98
H107	Temporary suspension of D&B excavation	201,60	wd		151.862,60		30.615.499,49
TOTAL OF SCHEDULE - H1 Excavation							3.565.748.337,60
SCHEDULE - H2 Drilling and Grouting							
H201	Drilling of drainage drilling in the tunnel perimeter and face, diameter 50 mm, length 3 m to 8 m	19.250,00	meter	104,54	2.120,45	649,58	55.335.534,41
H202	Drilling of exploratory drilling without core recovery, diameter 50 mm, length up to 20 m	225,00	meter	215,62	4.373,43	1.339,76	1.333.981,63
H203	Drilling of exploratory drilling with core recovery, diameter 76 mm						
H20301	Drilling 0-10 m	37,50	meter	653,40	13.252,81	4.059,87	673.728,10
H20302	Drilling 10-20 m	75,00	meter	980,10	19.879,21	6.089,81	2.021.184,29
H20303	Drilling 20-30 m	125,00	meter	1.306,80	26.505,62	8.119,75	4.491.520,65
H204	Strata grouting as defined by the approved drawings the Technical Specifications or directed by the Employer's Representative	890,00	cum	4.103,19	2.588,93		5.955.981,07
TOTAL OF SCHEDULE - H2 Drilling and Grouting							69.811.930,15
TOTAL OF SCHEDULE - H UNDERGROUND EXCAVATION							3.635.560.267,75
SCHEDULE - I PRIMARY SUPPORT MEASURES							
SCHEDULE - I1 Bolts & Anchors							
I101	Supply, drilling and installation of frictional rock bolts (Swellax or similar) of the specified length, Fy≥ 150 KN (tunnel support) as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
I10101	Length 3 m	6.776,00	pcs	3.100,95	3.123,88	956,97	48.663.834,83

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
I10102	Length 4 m	8.665,00	pcs	3.982,60	3.281,65	1.005,30	71.655.609,61
I102	Supply, drilling, installation and grouting of grouted rock bolts (SN type) of the specified length, Fy≥ 200 KN (tunnel perimeter & face) as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
I10201	Length 4 m	19.433,00	pcs	1.737,26	4.564,86	1.398,40	149.644.180,35
I10202	Length 6 m	37.744,00	pcs	2.345,22	4.859,36	1.488,62	328.116.300,16
I104	Supply, drilling, installation and grouting of forepoling as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
I10401	Grouted rock bolts (SN type) with a length of 4 m, Fy≥ 200 KN	544.588,00	meter	323,47	412,62	126,40	469.701.714,69
I10402	Steel Pipe umbrella with a diameter of 114 mm, wall thickness of 6.5 mm and a length of 12 m	2.394,00	meter	528,13	1.546,16	473,65	6.099.768,95
TOTAL OF SCHEDULE - I1 Bolts & Anchors							1.073.881.408,59
SCHEDULE - I2 Shotcrete, Lattice Girder, Lining Stress Controllers & Wire Mesh							
I201	Shotcreting of primary lining (tunnel, niches, caverns) with designed mix cement concrete SpC20/25(56)/II/J2/XC1/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative in charge including all materials, labour, equipment, etc. required for complete job. The reinforcement is compensated separately.						
I20101	50 mm thick shotcrete lining in tunnel	42.156,07	sqm	417,06	361,95	374,08	48.609.428,21
I20102	100 mm thick shotcrete lining in tunnel	42.372,09	sqm	832,16	666,40	521,04	85.574.623,18
I20103	150 mm thick shotcrete lining in tunnel	32.050,45	sqm	1.238,22	704,51	740,57	86.000.748,67
I20104	200 mm thick shotcrete lining in tunnel	74.406,60	sqm	1.646,30	802,04	1.011,24	257.415.226,66
I20105	250 mm thick shotcrete lining in tunnel	29.402,98	sqm	2.053,29	867,78	1.006,27	115.475.594,06
I202	Shotcreting of primary invert lining with designed mix cement concrete SpC20/25(56)/II/J2/XC1/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative in charge including all materials, labour, equipment, etc. required for complete job. The reinforcement is compensated separately.						
I20201	200 mm thick shotcrete lining in tunnel	42.990,94	sqm	1.666,20	1.388,13		131.308.416,36
I20202	250 mm thick shotcrete lining in tunnel	23.364,07	sqm	2.057,92	1.003,98		71.538.346,41
I203	Shotcreting of permanent lining with designed mix cement concrete SpC20/25(56)/II/J2/XC3/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative in charge including all materials, labour, equipment, etc. required for complete job. The reinforcement is compensated separately.						
I20301	100 mm thick shotcrete lining in tunnel	63.568,85	sqm	832,16	666,40	521,04	128.383.581,81
I204	Shotcreting with designed mix cement concrete SpC20/25(56)/II/J2/XC1/GK8 of face sealing, filling of cavities, unavoidable and geological overbreak approved by the Employer's Representative as defined in the Technical Specifications and widening of top heading footing in tunnel including all labour, materials, cost of pins, hooks, lead, lift, handling, wastage complete with contractor's own equipment for complete job .	32,50	cum	5.872,36	2.650,56	223,14	284.247,17
I205	Steel fibre reinforcement if required	116,75	tonne	3.246,48	340,55	868,40	520.157,92
I206	Supply and placing of 150 x 150 x 6 mm welded wire fabric of Fe 500 as reinforcement in primary lining as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include all labour, materials, cost of pins, hooks, lead, lift, handling, wastage complete with contractor's own equipment for complete job.	1.218,38	tonne	87.500,00	50.066,70	13.321,65	183.839.011,24
I207	Supply, fabrication and erection of lattice girders and all accessories including all lead, lift, wastage, storing, drilling holes, fixing in phases etc. and installation of accessories for joining the lattice girder segments as per approved workshop drawings of contractor & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, welding, etc. for the complete job including additional cost for enlargement of top heading footing.	1.013,62	tonne	189.967,64	30.742,51	8.179,91	232.008.024,40
I208	Providing and fixing yielding elements (Lining Stress Controllers - LSC or equivalent) as per approved drawings and Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	3.526,00	meter	32.425,00	1.325,28	528,94	120.868.541,03
TOTAL OF SCHEDULE - I2 Shotcrete, Lattice Girder, Lining Stress Controllers & Wire Mesh							1.461.825.947,12
TOTAL OF SCHEDULE - I PRIMARY SUPPORT MEASURES							2.535.707.355,72
SCHEDULE - J CONCRETE WORK							
J101	Design Mix Cement Concrete C25/30 including machine mixed, machine batched, machine vibrated, form work, etc. as per Technical Specifications & drawings or as directed by Employer's Representative. The reinforcement is compensated separately.						
J10101	Inner lining of tunnel - foundation	9.236,39	cum	5.098,59	2.569,17		70.822.399,80
J10102	Inner lining of tunnel - invert	26.321,74	cum	5.177,02	4.375,22		251.431.681,41

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
J10103	Inner lining of tunnel & niches - vault with radial formwork						
J1010301	with thickness of 25 cm	48.480,41	cum	5.270,66	5.426,81	1.146,36	574.193.247,31
J1010302	with thickness of 35 cm	40.075,79	cum	5.214,93	4.023,78	849,98	404.312.383,40
J102	Design Mix Cement Concrete C12/15 including mechanically mixed machine mixed, machine batched, machine vibrated, form work, etc. as per Technical Specifications & drawings or as directed by Employer's Representative						
J10201	Fill concrete in tunnel - invert	26.150,51	cum	4.185,25	611,19		125.429.442,86
J10202	Binding concrete in tunnel	696,25	cum	4.185,25	1.650,22		4.062.954,83
J103	No-fines porous concrete in tunnel	2.990,19	cum	4.793,58	1.269,40		18.129.461,59
J104	Reinforcement for inner lining						
J10401	Reinforcement for inner lining - foundation	692,73	tonne	52.685,71	2.585,28		38.287.833,68
J10402	Reinforcement for inner lining - invert	1.974,13	tonne	52.685,71	16.545,77		136.671.996,05
J10403	Reinforcement for inner lining - vault	3.005,68	tonne	52.685,71	19.020,92		215.527.512,82
J105	Concrete tests						
#	All costs for concrete testing are included in Item D105						
TOTAL OF SCHEDULE - J CONCRETE WORK							1.838.868.913,75
SCHEDULE - K INSTRUMENTATION AND MONITORING							
K101	Supply, install, read and maintain of 3D monitoring targets (reflectors) in top heading bench and invert as per approved drawings & Technical Specifications or as directed by Employer's Representative.	4.643,00	pcs	275,90			1.281.004,74
K102	Supply, drill, install, grout, read and maintain of borehole extensometer (four point) in the tunnel perimeter as per approved drawings & Technical Specifications or as directed by Employer's Representative.	960,00	pcs	12.579,49			12.076.310,11
K103	Supply, install, read and maintain of load cells for rock bolts as per approved drawings & Technical Specifications or as directed by Employer's Representative.	542,00	pcs	31.484,50			17.064.599,60
K104	Supply, install, read and maintain of strain gauges for shotcrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.	271,00	pcs	4.230,90			1.146.573,96
K105	Supply, install, read and maintain of strain gauges for concrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.	271,00	pcs	4.230,90			1.146.573,96
K106	Supply, install, read and maintain of radial pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.	1.084,00	pcs	31.594,50			34.248.439,21
K107	Supply, install, read and maintain of tangential pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.	1.084,00	pcs	31.594,50			34.248.439,21
TOTAL OF SCHEDULE - K INSTRUMENTATION AND MONITORING							101.211.940,79
SCHEDULE - L PAVEMENT							
L101	Supply, preparation of material, placing, compacting of granular sub-base with a minimum thickness of 25 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	23.048,56	cum	1.300,58	525,56	318,22	49.424.354,51
L102	Supply, mixing, placing, compacting of dry lean cement concrete base layer with a minimum thickness of 5 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	92.194,24	sqm	207,20	157,67	43,93	37.688.264,09
L103	Supply, mixing, placing, compacting of cement concrete pavement with a minimum thickness of 15 cm including construction of contraction joints, expansion joints, longitudinal joints, joint sealing compound, reinforcement, dowel rods and tie bars complete as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	92.194,24	sqm	963,36	722,90	366,95	189.294.821,34
TOTAL OF SCHEDULE - L PAVEMENT							87.112.618,60
TOTAL OF BILL 2 - CIVIL ENGINEERING EGRESS TUNNEL							8.499.278.123,06
BILL 3 - CIVIL ENGINEERING VENTILATION SHAFT & VENTILATION CAVERN							
SCHEDULE - M DEWATERING ARRANGEMENT							
SCHEDULE - M1 Temporary Dewatering Arrangement							
M101	Care of water in shaft drifts d&b construction	1,00	lump sum	69.646.397,65			69.646.397,65
TOTAL OF SCHEDULE - M1 Temporary Dewatering Arrangement							69.646.397,65
SCHEDULE - M2 Permanent Dewatering Arrangement							
M201	Providing and laying of perforated PVC pipe of following diameters as drainage pipes, as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
M20101	250 mm internal diameter PVC pipe	1.162,00	meter	1.324,74	495,07		2.114.614,09
M202	Providing and installing of dimpled sheets in the tunnel between primary lining and foundation as per approved drawings & Technical Specifications or as directed by Employer's Representative.	4.251,04	sqm	339,70	39,40		1.611.554,92

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
M203	Providing, laying and fixing of Protective Felt (geotextile) with a minimum weight of 500 g/m ² for protection of the waterproofing membrane & drainage on the finished outer lining surface, including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	42.510,35	sqm	125,15	65,66		8.111.663,46
M204	Providing, placing, welding of 2 mm thick PVC or ECB Water Proofing Membrane including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	42.510,35	sqm	522,06	182,52		29.952.162,59
M205	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)	210,00	meter	522,06	182,52		147.962,89
M206	Manufacture, supply, and placing of inspection and cleaning chambers of PP or PE-HD including bell mouth, manhole cover, the cost of all materials, labour, equipment, etc. required for the completion of job as per approved detailed drawings & Technical Specifications or as directed by Employer's Representative.						
M20601	Cleaning and Inspection chamber for DN250	9,00	pcs	45.225,04	4.563,05		448.092,82
TOTAL OF SCHEDULE - M2 Permanent Dewatering Arrangement							42.386.050,76
TOTAL OF SCHEDULE - M DEWATERING ARRANGEMENT							112.032.448,41
SCHEDULE - N UNDERGROUND EXCAVATION							
SCHEDULE - N1 Excavation							
N101	Underground excavation for tunnel in Support Category dominating the Face Area. Including drilling, blasting, or other means of excavation, provision of surface drainage, construction ventilation, lighting arrangement during construction, temporary backfilling for traffic in tunnel, removal of the same and disposal of excavated material to muck disposal area with all lifts as per approved drawings & Technical Specifications. The quantities of excavation are determined to the design lines of excavation as per Technical Specifications. Overexcavation to the overexcavation line defined by the Technical Specifications is compensated with the unit rates.						
N10101	Support Category 01	33.341,06	cum	535,25	2.541,83	1.026,64	136.822.468,38
N10102	Support Category 02	35.412,90	cum	539,02	2.478,70	1.067,83	144.681.306,97
N10103	Support Category 03	27.350,64	cum	540,97	2.533,44	1.178,33	116.315.042,24
N10104	Support Category 04	13.681,38	cum	543,56	2.457,02	1.216,29	57.692.528,40
N10105	Support Category 05	3.412,83	cum	546,84	2.542,44	1.341,96	15.123.081,04
N10106	Excavation in bored pile section	30,00	meter	238,56	2.368,76	376,41	89.511,62
N102	Underground excavation for ventilation cavern without rock mass classification as per approved drawings & Technical Specifications or as directed by Employer's Representative without rock mass classification.	34.302,45	cum	552,12	922,90	1.271,44	94.210.511,47
N103	Raise boring	5.881,06	cum	58,71	449,97	436,49	5.558.621,27
TOTAL OF SCHEDULE - N1 Excavation							570.493.071,39
SCHEDULE - N2 Drilling and Grouting							
N201	Drilling of drainage drilling in the shaft perimeter, diameter 50 mm, length 3 m to 8 m	1.556,50	meter	104,54	2.120,45	649,58	4.474.273,21
N202	Drilling of exploratory drilling without core recovery, diameter 50 mm, length up to 20 m	6,00	pcs	215,62	4.373,43	1.339,76	35.572,84
N203	Drilling of exploratory drilling with core recovery, diameter 76 mm						
N20301	Drilling 0-10 m	2,00	pcs	653,40	13.252,81	4.059,87	35.932,17
N20302	Drilling 10-20 m	2,00	pcs	980,10	19.879,21	6.089,81	53.898,25
N20303	Drilling 20-30 m	2,00	pcs	1.306,80	26.505,62	8.119,75	71.864,33
N204	Strata grouting as defined by the approved drawings the Technical Specifications or directed by the Employer's Representative	275,00	cum	4.103,19	2.588,93		1.840.331,23
TOTAL OF SCHEDULE - N2 Drilling and Grouting							6.511.872,03
TOTAL OF SCHEDULE - N UNDERGROUND EXCAVATION							577.004.943,42
SCHEDULE - O PRIMARY SUPPORT MEASURES							
SCHEDULE - O1 Bolts & Anchors							
O101	Supply, drilling and installation of frictional rock bolts (Swellex or similar) of the specified length, Fy≥ 150 KN (tunnel support) as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
O10101	Length 4 m	4.558,00	pcs	4.150,73	6.691,94	2.050,01	58.764.860,76
O10102	Length 6 m	3.267,00	pcs	5.916,42	7.056,03	2.161,55	49.442.772,36
O10103	Length 9 m	814,00	pcs	8.564,96	7.602,16	2.328,85	15.055.717,43
O102	Supply, drilling, installation and grouting of grouted rock bolts (SN type) of the specified length, Fy≥ 200 KN (tunnel perimeter & face) as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
O10201	Length 6 m	1.666,25	pcs	2.441,76	6.817,55	2.088,49	18.908.285,24

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
O10202	Length 8 m	484,00	pcs	3.051,96	7.157,37	2.192,59	6.002.527,39
TOTAL OF SCHEDULE - O1 Bolts & Anchors							148.174.163,18
SCHEDULE - O2 Shotcrete & Wire Mesh							
O201	Shotcreting of primary lining (shaft, caverns) with designed mix cement concrete SpC20/25(56)/II/J2/XC1/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative in charge including all materials, labour, equipment, etc. required for complete job. The reinforcement is compensated separately.						
O20101	50 mm thick shotcrete lining in shaft	14.202,76	sqm	420,26	456,28	736,99	22.916.519,79
O20102	100 mm thick shotcrete lining in shaft	10.812,60	sqm	832,91	688,58	825,90	25.381.391,37
O20103	150 mm thick shotcrete lining in shaft	8.255,80	sqm	1.246,20	939,72	940,24	25.808.973,01
O20104	200 mm thick shotcrete lining in shaft	4.083,08	sqm	1.656,96	1.116,00	1.092,73	15.783.899,24
O20105	300 mm thick shotcrete lining in shaft	995,95	sqm	2.481,50	1.558,13	1.301,27	5.319.277,71
O20106	100 mm thick shotcrete lining in cavern	3.834,60	sqm	709,69	465,44	427,75	6.146.376,79
O20107	200 mm thick shotcrete lining in cavern	5.262,60	sqm	1.638,20	563,55	694,42	15.241.390,40
O202	Supply and placing of 150 x 150 x 6 mm welded wire fabric of Fe 500 as reinforcement in primary lining as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include all labour, materials, cost of pins, hooks, lead, lift, handling, wastage complete with contractor's own equipment for complete job.						
O20201	Shaft Construction	160,74	tonne	87.500,00	33.803,66	35.977,65	25.281.465,47
O20202	Cavern Construction	44,66	tonne	87.500,00	40.350,11	10.736,28	6.189.126,65
O203	Supply, fabrication and erection of lattice girders and all accessories including all lead, lift, wastage, storing, drilling holes, fixing in phases etc. and installation of accessories for joining the lattice girder segments as per approved workshop drawings of contractor & Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, welding, etc. for the complete job including additional cost for enlargement of top heading footing.	60,41	tonne	189.587,72	8.440,85	8.983,70	12.505.452,85
TOTAL OF SCHEDULE - O2 Shotcrete & Wire Mesh							160.573.873,27
TOTAL OF SCHEDULE - O PRIMARY SUPPORT MEASURES							308.748.036,45
SCHEDULE - P CONCRETE WORK							
P101	Design Mix Cement Concrete C25/30 for inner lining of ventilation shaft and cavern including machine mixed, machine batched, machine vibrated, form work, etc. as per Technical Specifications & detailed drawings or as directed by Employer's Representative. The reinforcement is compensated separately.						
P10101	Ventilation shaft d&b	16.215,90	cum	5.113,93	1.480,70	312,78	112.009.934,64
P10102	Ventilation shaft raise boring	1.318,72	cum	5.232,29	4.460,79	942,30	14.025.083,77
P10103	Ventilation cavern - foundation	78,75	cum	5.114,95	2.945,98		634.798,54
P10104	Ventilation cavern - vault	1.777,65	cum	5.386,78	8.350,48	1.763,95	27.555.732,01
P10105	Ventilation cavern - ventilation ducts	1.183,35	cum	5.304,29	6.273,61	1.325,23	15.268.918,65
P10106	Bored piles	1.137,60	cum	5.446,63	3.729,09	393,87	
P102	Reinforcement for inner lining of ventilation tunnel & cavern						
P10201	Reinforcement for inner lining of ventilation shaft d&b	608,10	tonne	54.600,00	8.209,03		38.193.933,48
P10202	Reinforcement for inner lining of ventilation shaft raise boring	98,90	tonne	54.600,00	18.867,52		7.266.231,66
P10203	Reinforcement for inner lining of ventilation cavern - foundation	5.906,25	tonne	54.600,00	14.622,33		408.844.377,45
P10204	Reinforcement for inner lining of ventilation cavern - vault	133,32	tonne	54.600,00	20.723,74		10.042.444,03
P10205	Reinforcement for inner lining of ventilation cavern - ventilation ducts	88,75	tonne	54.600,00	31.138,94		7.609.438,33
P10206	Reinforcement for bored piles	42,66	tonne	54.600,00	648,73		
TOTAL OF SCHEDULE - P CONCRETE WORK							641.450.892,56
SCHEDULE - Q INSTRUMENTATION AND MONITORING							
Q101	Supply, install, read and maintain of 3D monitoring targets (reflectors) in top heading bench and invert as per approved drawings & Technical Specifications or as directed by Employer's Representative.	384,00	pcs	275,90			105.945,69
Q102	Supply, drill, install, grout, read and maintain of borehole extensometer (four point) in the tunnel perimeter as per approved drawings & Technical Specifications or as directed by Employer's Representative.	55,00	pcs	12.579,49			691.871,93
Q103	Supply, install, read and maintain of load cells for rock bolts as per approved drawings & Technical Specifications or as directed by Employer's Representative.	22,00	pcs	31.484,50			692.659,02
Q104	Supply, install, read and maintain of strain gauges for shotcrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.	11,00	pcs	4.230,90			46.539,90
Q105	Supply, install, read and maintain of strain gauges for concrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.	11,00	pcs	4.230,90			46.539,90
Q106	Supply, install, read and maintain of radial pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.	55,00	pcs	31.594,50			1.737.697,56

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
Q107	Supply, install, read and maintain of tangential pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.	55,00	pcs	31.594,50			1.737.697,56
Q108	Supply, install, read and maintain of temperature gauges as per approved drawings & Technical Specifications or as directed by Employer's Representative.	17,00	pcs	1.860,90			31.635,30
TOTAL OF SCHEDULE - Q INSTRUMENTATION AND MONITORING							5.090.586,88
SCHEDULE - R PAVEMENT							
R101	Supply, preparation of material, placing, compacting of granular sub-base with a minimum thickness of 30 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	756,00	cum	1.300,58	525,56	318,22	1.621.134,34
R102	Supply, mixing, placing, compacting of dry lean cement concrete base layer with a minimum thickness of 5 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	2.520,00	sqm	207,20	157,67	43,93	1.030.155,74
R103	Supply, mixing, placing, compacting of cement concrete pavement with a minimum thickness of 25 cm including construction of contraction joints, expansion joints, longitudinal joints, joint sealing compound, reinforcement, dowel rods and tie bars complete as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	2.520,00	sqm	1.499,13	614,47	311,91	6.112.265,63
TOTAL OF SCHEDULE - R PAVEMENT							8.763.555,71
TOTAL OF BILL 3 - CIVIL ENGINEERING VENTILATION SHAFT & VENTILATION CAVERN							1.653.090.463,42
BILL 4 - CIVIL ENGINEERING PORTAL WEST							
SCHEDULE -S DEWATERING ARRANGEMENT							
SCHEDULE - S1 Temporary Dewatering Arrangement							
S101	Care of water in temporary portal construction site	1,00	ls	29.198.155,99			29.198.155,99
TOTAL OF SCHEDULE - S1 Temporary Dewatering Arrangement							29.198.155,99
SCHEDULE - S2 Permanent Dewatering Arrangement Portal							
S201	Providing and laying of PVC pipe of following diameters as main collector pipe, connection pipes, cleaning access pipes etc., as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
S20101	250 mm internal diameter PVC pipe	115,50	meter	1.877,11	921,51		323.240,38
S20102	400 mm internal diameter PVC pipe	195,50	meter	5.127,32	921,51		1.182.545,71
S202	Providing and laying of perforated PVC pipe of following diameters as drainage pipes, as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
S20201	250 mm internal diameter PVC pipe	124,60	meter	1.830,80	921,51		342.936,98
S203	Manufacture, supply, and placing of pre-cast concrete slot channel elements as per approved drawings for carriageway drainage	94,00	meter	2.213,58	165,02		223.588,12
S204	Providing and installing of dimpled sheets between permanent lining of cut & cover tunnel and backfill material as per approved drawings & Technical Specifications or as directed by Employer's Representative.	1.147,40	sqm	339,70	183,65		600.489,43
S205	Providing, placing, welding of 2 mm thick PVC or ECB Water Proofing Membrane including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	1.147,40	sqm	375,46	550,95		1.062.956,32
TOTAL OF SCHEDULE - S2 Permanent Dewatering Arrangement Portal							3.735.756,93
TOTAL OF SCHEDULE - S DEWATERING ARRANGEMENT							32.933.912,93
SCHEDULE - T OPEN EXCAVATION & EARTHWORK							
T101	Earthwork in open excavation in all kinds of soils and rock, including rock requiring use of blasting, crow bars, etc. at portals and construction roads and to make berms, surface drains and the like, diversion of irrigation canal, nallah & the like and disposal of the excavated material to dumping site etc. as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate for this item includes all site clearance (cutting of trees, shrubs, roots, vegetation etc.), lift, ascent descent handling & lead to designated muck dump areas as per approved drawings & Technical Specifications, dressing of cuttings to final profile, demarcation and setting out.						
T10101	Loose excavation as per classification of excavation laid down in the Technical Technical Specifications	23.440,97	cum	212,45	200,65	201,24	14.400.666,89
T10102	Rock excavation as per classification of excavation laid down in the Technical Technical Specifications	1.233,74	cum	904,25	1.178,03	828,67	3.591.337,41
T102	Embankments and fillings in area of open excavation as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate for this item includes supply, preparation of material, filling and compaction in layers.	47.893,00	cum	267,98	419,85	251,14	44.969.721,80
T103	Rip-rap layer on embankments with a minimum thickness of 1.0 m for erosion protection as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate for this item includes supply, preparation of material, placing, labour, equipment for complete job.	5.449,00	sqm	875,72	390,56	94,28	7.413.661,89

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
T104	Supply and placing of 120 x 60 cm gabion cage with wire mesh 50 x 50 x 6 mm of Fe 500 as permanent slope protection as per drawings & Technical Specifications or as directed by Employer's Representative. The rate shall compensate all labour, materials (including wire mesh, fill material with boulder size minimum 240 mm), cost of pins, overlapping, hooks, bending, lift, handling, wastage complete with contractor's own equipment for complete job.	440,00	sqm	135,07	131,50		117.292,47
T105	Supply and placing of geotextile as filter membrane behind gabion cage	440,00	sqm	135,07	131,50		117.292,47
TOTAL OF SCHEDULE - T OPEN EXCAVATION & EARTHWORK							70.609.972,93
SCHEDULE - U PRIMARY SUPPORT MEASURES							
SCHEDULE - U1 Bolts & Anchors							
U101	Supply, drilling, installation and grouting of SN type rock bolts of the specified length, Fy≥200 KN as per approved drawings & Technical Specifications or as directed by the Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
U10101	Length 8 m	79,00	pcs	2.982,22	5.742,88	1.759,28	828.266,20
U102	Supply, drilling, installation, grouting and pre-stressing of pre-stressed anchors with double corrosion protection at slopes as per approved drawings and Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
U10201	Length 20 m	200,00	pcs	72.988,45	40.752,39	12.484,11	25.244.989,67
TOTAL OF SCHEDULE - U1 Bolts & Anchors							26.073.255,87
SCHEDULE - U2 Shotcrete & Wire Mesh							
U201	Shotcreting with designed mix cement concrete SpC20/25/II/J1/XF3/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative including all materials, labour, equipment, etc. required for complete job.						
U20101	Thickness of 50 mm	503,10	sqm	396,96	266,71	67,36	367.781,22
U20102	Thickness of 100 mm	479,30	sqm	793,91	533,43	134,72	700.765,40
U20103	Thickness of 200 mm	1.423,80	sqm	1.587,83	1.066,85	269,44	4.163.362,32
U202	Sprayed concrete SpC20/25/II/J1/XF3/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative for temporary surface drains	40,00	cum	5.670,81	3.810,18	962,30	417.731,46
U203	Sprayed concrete SpC20/25/II/J1/XF3/GK8 as per Technical Specifications & drawings or as directed by Employer's Representative for shotcrete beam with a height of 50 cm and a thickness of 50 cm including reinforcement.	108,93	cum	5.670,81	3.810,18	962,30	1.137.534,97
U204	Supply and placing of 150 x 150 x 6 mm welded wire fabric of Fe 500 as reinforcement in slopes as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate shall include all labour, materials, cost of pins, overlapping, hooks, lead, lift, handling, wastage complete with contractor's own equipment for complete job.	10,35	tonne	87.500,00	109.577,66		2.039.095,37
TOTAL OF SCHEDULE - U2 Shotcrete & Wire Mesh							8.826.270,73
TOTAL OF SCHEDULE - U PRIMARY SUPPORT MEASURES							34.899.526,60
SCHEDULE - V CONCRETE WORK							
V101	Design Mix Cement Concrete works including machine mixed, machine batched, machine vibrated, form work, etc. but excluding the cost of reinforcement as per Technical Specifications & drawings or as directed by Employer's Representative.						
V10101	Concrete C12/15 as binding concrete	22,24	cum	4.254,52	660,09	186,69	113.437,53
V10102	Concrete C25/30	1.936,40	cum	4.940,87	1.934,90	209,10	13.719.129,23
V102	Reinforcement steel	154,91	tonne	52.685,71	9.358,29		9.611.360,82
V103	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)	74,00	meter	522,06	182,52		52.139,30
TOTAL OF SCHEDULE - V CONCRETE WORK							23.496.066,89
SCHEDULE - W PAVEMENT							
W101	Supply, preparation of material, placing, compacting of granular sub-base with a minimum thickness of 30 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	1.341,51	cum	1.300,58	525,56	318,22	2.876.677,15
W102	Supply, mixing, placing, compacting of dry lean cement concrete base layer with a minimum thickness of 5 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	3.142,40	sqm	207,20	157,67	43,93	1.284.587,86
W103	Sloping concrete C12/15	47,18	cum	4.254,52	660,09	186,69	240.653,67
W104	Supply, mixing, placing, compacting of cement concrete pavement with a minimum thickness of 22 cm including construction of contraction joints, expansion joints, longitudinal joints, joint sealing compound, reinforcement, dowel rods and tie bars complete as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	3.142,40	sqm	1.415,77	722,90	366,95	7.873.674,51

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
W105	Manufacture, supply, and placing of pre-cast footpath elements in tunnel as per approved drawings, including application of 2 cm mastic asphalt surface. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	74,00	meter	1.498,34	1.734,68	112,99	247.604,76
W106	Supply, preparation of material, placing, compacting of granular base with a minimum thickness of 20 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	265,86	cum	1.300,58	525,56	318,22	570.098,91
W107	Supply, mixing, placing, compacting of bituminous pavement with a minimum thickness of 10 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	1.329,30	sqm	602,00	380,56	120,23	1.465.931,64
TOTAL OF SCHEDULE - W PAVEMENT							14.559.228,48
SCHEDULE - X BUILDINGS							
X101	Construction of buildings	5.424,00	sqm	8.100,00	10.800,00	8.100,00	146.448.000,00
TOTAL OF SCHEDULE - X BUILDINGS							146.448.000,00
TOTAL OF BILL 4 - CIVIL ENGINEERING PORTAL WEST							322.946.707,83
BILL 5 - CIVIL ENGINEERING PORTAL EAST							
SCHEDULE -Y DEWATERING ARRANGEMENT							
SCHEDULE - Y1 Temporary Dewatering Arrangement Portal							
Y101	Care of water in temporary portal construction site	1,00	ls	19.938.851,42			19.938.851,42
TOTAL OF SCHEDULE - Y1 Temporary Dewatering Arrangement Portal							19.938.851,42
SCHEDULE - Y2 Permanent Dewatering Arrangement Portal							
Y201	Providing and laying of PVC pipe of following diameters as main collector pipe, connection pipes, cleaning access pipes etc., as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Y20101	250 mm internal diameter PVC pipe	79,40	meter	1.877,11	921,51		222.210,27
Y20102	400 mm internal diameter PVC pipe	74,00	meter	5.127,32	921,51		447.613,21
Y202	Providing and laying of perforated PVC pipe of following diameters as drainage pipes, as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Y20201	250 mm internal diameter PVC pipe	334,00	meter	1.830,80	921,51		919.269,26
Y203	Manufacture, supply, and placing of pre-cast concrete slot channel elements as per approved drawings for carriageway drainage	80,00	meter	2.213,58	165,02		190.287,76
Y204	Providing and installing of dimpled sheets between permanent lining of cut & cover tunnel and backfill material as per approved drawings & Technical Specifications or as directed by Employer's Representative.	952,80	sqm	339,70	183,65		498.645,92
Y205	Providing, placing, welding of 2 mm thick PVC or ECB Water Proofing Membrane including the cost of all materials, labour, equipment, etc. required for the completion of job, as per Technical Specifications or as directed by the Employer's Representative.	952,80	sqm	375,46	550,95		882.678,04
TOTAL OF SCHEDULE - Y2 Permanent Dewatering Arrangement Portal							3.160.704,46
TOTAL OF SCHEDULE - Y DEWATERING ARRANGEMENT							23.099.555,88
SCHEDULE - Z OPEN EXCAVATION & EARTHWORK							
Z101	Earthwork in open excavation in all kinds of soils and rock, including rock requiring use of blasting, crow bars, etc. at portals and construction roads and to make berms, surface drains and the like, diversion of irrigation canal, nallah & the like and disposal of the excavated material to dumping site etc. as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate for this item includes all site clearance (cutting of trees, shrubs, roots, vegetation etc.), lift, ascent descent handling & lead to designated muck dump areas as per approved drawings & Technical Specifications, dressing of cuttings to final profile, demarcation and setting out.						
Z10101	Loose excavation as per classification of excavation laid down in the Technical Technical Specifications	2.778,54	cum	212,45	200,65	201,24	1.706.961,68
Z10102	Rock excavation as per classification of excavation laid down in the Technical Technical Specifications	21.499,99	cum	904,25	1.178,03	828,67	62.585.320,55
Z102	Embankments and fillings in area of open excavation as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate for this item includes supply, preparation of material, filling and compaction in layers.	97.597,00	cum	267,98	419,85	251,14	91.639.904,34
Z103	Rip-rap layer on embankments with a minimum thickness of 1.0 m for erosion protection as per approved drawings & Technical Specifications or as directed by Employer's Representative. The rate for this item includes supply, preparation of material, placing, labour, equipment for complete job.	9.100,00	sqm	875,72	390,56	94,28	12.381.046,65
Z104	Supply and placing of 120 x 60 cm gabion cage with wire mesh 50 x 50 x 6 mm of Fe 500 as permanent slope protection as per drawings & Technical Technical Specifications or as directed by Employer's Representative. The rate shall compensate all labour, materials (including wire mesh, fill material with boulder size minimum 240 mm), cost of pins, overlapping, hooks, bending, lift, handling, wastage complete with contractor's own equipment for complete job	1.003,00	sqm	508,64	473,40	85,71	1.070.955,89
Z105	Supply and placing of geotextile as filter membrane behind gabion cage	1.003,00	sqm	135,07	131,50		267.373,52

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
TOTAL OF SCHEDULE - Z OPEN EXCAVATION & EARTHWORK							169.651.562,62
SCHEDULE - ZA PRIMARY SUPPORT MEASURES							
SCHEDULE - ZA1 Bolts & Anchors							
ZA101	Supply, drilling, installation and grouting of 16 mm dia. reinforcement bars as soil nails at slopes as per approved drawings and Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
ZA10101	Length 8 m	171,00	pcs	3.951,85	13.252,81	4.059,87	3.636.234,70
ZA102	Supply, drilling, installation, grouting and pre-stressing of pre-stressed anchors with double corrosion protection at slopes as per approved drawings and Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
ZA10201	Length 20 m	77,00	pcs	73.315,15	47.378,79	14.514,05	10.411.015,20
ZA103	Supply, drilling, installation, grouting and glass fibre plastic (GFP) self-drilling bolt at slopes as per approved drawings and Technical Specifications or as directed by Employer's Representative. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.						
ZA10301	Length 9 m	84,00	pcs	8.652,80	6.295,08	1.928,44	1.417.611,19
TOTAL OF SCHEDULE - ZA1 Bolts & Anchors							15.464.861,09
SCHEDULE - ZA2 Shotcrete & Wire Mesh							
ZA201	Shotcreting with designed mix cement concrete SpC20/25/II/J1/XF3/GK8 as per Technical Technical Specifications & drawings or as directed by Employer's Representative including all materials, labour, equipment, etc. required for complete job.						
ZA20101	Thickness of 50 mm	-	sqm	396,96	266,71	67,36	-
ZA20102	Thickness of 100 mm	847,20	sqm	793,91	533,43	134,72	1.238.657,31
ZA20103	Thickness of 200 mm	1.202,60	sqm	1.587,83	1.066,85	269,44	3.516.546,94
ZA202	Sprayed concrete SpC20/25/II/J1/XF3/GK8 as per Technical Technical Specifications & drawings or as directed by Employer's Representative for temporary surface drains	37,00	cum	5.670,81	3.810,18	962,30	386.401,60
ZA203	Supply and placing of 150 x 150 x 6 mm welded wire fabric of Fe 500 as reinforcement in slopes as per approved drawings & Technical Technical Specifications or as directed by Employer's Representative. The rate shall include all labour, materials, cost of pins, overlapping, hooks, lead, lift, handling, wastage complete with contractor's own equipment for complete job.	10,11	tonne	87.500,00	109.577,66		1.993.433,46
TOTAL OF SCHEDULE - ZA2 Shotcrete & Wire Mesh							7.135.039,30
TOTAL OF SCHEDULE - ZA PRIMARY SUPPORT MEASURES							22.599.900,39
SCHEDULE - ZB CONCRETE WORK							
ZB101	Design Mix Cement Concrete works including machine mixed, machine batched, machine vibrated, form work, etc. but excluding the cost of reinforcement as per Technical Specifications & drawings or as directed by Employer's Representative.						
ZB10101	Concrete C12/15	18,03	cum	4.254,52	660,09	186,69	91.976,38
ZB10102	Concrete C25/30	1.770,20	cum	4.940,87	1.934,90	209,10	12.541.624,95
ZB102	Reinforcement steel	141,62	tonne	52.685,71	9.358,29		8.786.423,74
ZB103	Water stop	60,00	meter	522,06	182,52		42.275,11
TOTAL OF SCHEDULE - ZB CONCRETE WORK							21.420.025,07
SCHEDULE - ZC PAVEMENT							
ZC101	Supply, preparation of material, placing, compacting of granular sub-base with a minimum thickness of 30 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	1.363,11	cum	1.300,58	525,56	318,22	2.922.995,27
ZC102	Supply, mixing, placing, compacting of dry lean cement concrete base layer with a minimum thickness of 5 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	2.719,10	sqm	207,20	157,67	43,93	1.111.546,22
ZC103	Sloping concrete C12/15	38,25	cum	4.254,52	660,09	186,69	195.124,60
ZC103	Supply, mixing, placing, compacting of cement concrete pavement with a minimum thickness of 22 cm including construction of contraction joints, expansion joints, longitudinal joints, joint sealing compound, reinforcement, dowel rods and tie bars complete as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	38,25	cum	4.254,52	660,09	186,69	195.124,60
ZC104	Manufacture, supply, and placing of pre-cast footpath elements in tunnel as per approved drawings, including application of 2 cm mastic asphalt surface. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	2.719,10	sqm	1.415,77	722,90	366,95	6.813.043,64

Item No.	Description of item	Quantity	Unit	Rate Material Rs	Rate Labour Rs	Rate Machinery Rs	Item Costs Rs
ZC105	Supply, preparation of material, placing, compacting of granular base with a minimum thickness of 20 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, etc. required for the complete job.	60,00	meter	1.498,34	1.734,68	112,99	200.760,61
ZC106	Supply, mixing, placing, compacting of bituminous pavement with a minimum thickness of 10 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	261,42	cum	1.300,58	525,56	318,22	560.577,96
ZC107	Supply, mixing, placing, compacting of bituminous pavement with a minimum thickness of 10 cm as per approved drawings & Technical Specifications. The rate shall include costs of all materials, labour, equipment, quality checks etc. required for the complete job.	1.307,10	cum	602,00	380,56	120,23	1.441.449,82
TOTAL OF SCHEDULE - ZC PAVEMENT							13.440.622,72
SCHEDULE - ZD BUILDINGS							
ZD101	Construction of buildings	4.674,00	sqm	8.100,00	10.800,00	8.100,00	126.198.000,00
TOTAL OF SCHEDULE - ZD BUILDINGS							126.198.000,00
TOTAL OF BILL 5 - CIVIL ENGINEERING PORTAL EAST							376.409.666,69
BILL 6 -SITE FACILITY & TIME-DEPENDENT COSTS							
SCHEDULE S&T-A - SITE FACILITY							
S&T-A101	Installation of site facility and clearance of site installation including all labour, machinery and transportation to the site location.	1,00	lump sum	44.271.500,00	149.842.000,00	187.302.500,00	381.416.000,00
S&T-A102	Formwork inner lining	11,00	pcs	27.973.347,61	2.159.154,14	783.877,80	340.080.174,98
S&T-A103	Formwork ventilation ceiling	8,00	pcs	9.231.204,71	712.520,87	258.679,67	81.619.241,99
S&T-A104	Temporary ventilation ducts	29.223,00	meter	2.150,82			62.853.334,89
S&T-A105	Temporary lighting	29.223,00	meter	1.630,38			47.644.686,06
S&T-A106	Site Facility Costs Machinery	1,00	lump sum			3.223.844.192,24	3.223.844.192,24
S&T-A107	Additional costs for site facility, machinery and material not included in time dependent costs and general site facility costs	1,00	lump sum	1.980.000.000,00	990.000.000,00	1.980.000.000,00	4.950.000.000,00
TOTAL OF SCHEDULE S&T-A - SITE FACILITY							9.087.457.630,17
SCHEDULE S&T-B - TIME DEPENDENT COSTS							
S&T-B101	Time dependent costs from commencement of construction to commencement of mined tunnel excavation	1,00	lump sum		164.011.604,40		164.011.604,40
S&T-B102	Time dependent costs commencement of tunnel excavation to end of concrete works	1,00	lump sum		1.722.121.846,20		1.722.121.846,20
S&T-B103	Time dependent costs end of concrete works to end of construction works	1,00	lump sum		410.029.011,00		410.029.011,00
TOTAL OF SCHEDULE S&T-B - TIME DEPENDENT COSTS							2.296.162.461,60
TOTAL OF BILL 6 - SITE FACILITY AND TIME-DEPENDNENT COSTS							11.383.620.091,77

Item No.	Description of item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
SCHEDULE - E&M ELECTRO & MECHANICAL EQUIPMENT					
E&M101	General costs: Site installation General costs of machinery, man, site Site clearance	1,00	lumpsum	374.100.986,00	374.100.986,00
E&M102	Power supply system: High voltage power supply Energy Distribution Safety power supply Grounding	1,00	lumpsum	694.946.763,00	694.946.763,00
E&M103	Ventilation measuring system: Air flow measuring Co and visibility measuring Dust particle measuring Cabling	1,00	lumpsum	195.098.370,60	195.098.370,60
E&M104	Traffic control: Traffic Lights Overheight Vehicle detection Traffic Logging Equipment Guidance System Variable Message Signs Cabling	1,00	lumpsum	404.358.172,40	404.358.172,40
E&M105	CCTV System: CCTV cameras Control units Cabling	1,00	lumpsum	483.448.866,60	483.448.866,60
E&M106	Emergency call system: Emergency Call Columns (open road units) Emergency Call Unit (tunnel units) Emergency Push Buttons Cabling	1,00	lumpsum	425.487.256,60	425.487.256,60
E&M107	Communication system: Tunnel radio system Internal telephone system Sound system Cabling	1,00	lumpsum	191.324.395,50	191.324.395,50
E&M108	Fire Safety Equipment: Fire Alarm System in Buildings Automatic Fire Detection System Main Tunnel Automatic Fire Detection System Egress Tunnel Fire Alarm Push Buttons Hydrant Niches Equipment Fire Extinguisher	1,00	lumpsum	303.652.769,70	303.652.769,70

Item No.	Description of item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
E&M109	Tunnel Lighting System: Entrance Lighting Interior Lighting Lay-Bys Lighting Egress Tunnel Lighting Street lighting Luminance Measurement Escape Direction Lamps Evacuation Route Lamps and Signs Cabling	1,00	lumpsum	613.744.658,80	613.744.658,80
E&M110	Integrated Tunnel Control System (SCADA)	1,00	lumpsum	481.561.538,50	481.561.538,50
E&M111	Doors and gates	1,00	lumpsum	455.996.450,00	455.996.450,00
E&M112	Building Installation and Equipment: Local control centre installation Local control centre ventilation Ventilation Building Installation Tunnel Niches Installation Cabling	1,00	lumpsum	134.680.714,00	134.680.714,00
E&M113	Testing and approvals, Engineering	1,00	lumpsum	171.194.485,00	171.194.485,00
E&M114	Documentation	1,00	lumpsum	65.828.315,00	65.828.315,00
E&M115	Miscellaneous	1,00	lumpsum	224.763.000,00	224.763.000,00
TOTAL OF SCHEDULE - E&M ELECTRO & MECHANICAL EQUIPMENT					INR 5.220.186.741,70

Item No.	Description of item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
SCHEDULE - VS VENTILATION SYSTEM					
	GENERAL NOTES: - To all Cost Estimate Items shall be applicable GENERAL WORK SPECIFICATIONS, which are a constitutional part of Work Execution Contract, the same as COST ESTIMATE WITH SPECIAL PROVISIONS Spare part items shall not be included in the list bellow.				
1.	Main exhaust air ventilator (E1), incl. accessories and structures Normal operation: 190 c.m.s-1, 1289 Pa, 350 kW*, 0.94 kg.m-3 Incident ventilation: 200 c.m.s-1, 2555 Pa, 730 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
2.	Main exhaust air ventilator (E2), incl. accessories and structures Normal operation: 190 c.m.s-1, 1768 Pa, 480 kW*, 0.94 kg.m-3 Incident ventilation: 200 c.m.s-1, 2975 Pa, 850 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
3.	Main exhaust air ventilator (E3), incl. accessories and structures Normal operation: 135 c.m.s-1, 985 Pa, 190 kW*, 0.94 kg.m-3 Incident ventilation: 185 c.m.s-1, 2308 Pa, 610 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
4.	Main exhaust air ventilator (E4), incl. accessories and structures Normal operation: 135 c.m.s-1, 778 Pa, 150 kW*, 0.94 kg.m-3 Incident ventilation: 185 c.m.s-1, 2195 Pa, 580 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
5.	Main exhaust air ventilator (E5), incl. accessories and structures Normal operation: 150 c.m.s-1, 980 Pa, 210 kW*, 0.94 kg.m-3 Incident ventilation: 190 c.m.s-1, 2321 Pa, 630 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
6.	Main exhaust air ventilator (E6), incl. accessories and structures Normal operation: 150 c.m.s-1, 1307 Pa, 280 kW*, 0.94 kg.m-3 Incident ventilation: 190 c.m.s-1, 2800 Pa, 760 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
7.	Main exhaust air ventilator (E7), incl. accessories and structures Normal operation: 132 c.m.s-1, 1008 Pa, 190 kW*, 0.94 kg.m-3 Incident ventilation: 185 c.m.s-1, 2649 Pa, 700 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
8.	Main exhaust air ventilator (E8), incl. accessories and structures Normal operation: 132 c.m.s-1, 583 Pa, 110 kW*, 0.94 kg.m-3 Incident ventilation: 185 c.m.s-1, 1854 Pa, 490 kW*, 0.94 kg.m-3 Ambient conditions and temperature of 400°C over 2 hours	pcs.	1	96.035.100,00	96.035.100,00
9.	Main fresh air ventilator (F1), incl. accessories and structures Normal operation: 190 c.m.s-1, 1289 Pa, 350 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00

Item No.	Description of item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
10.	Main fresh air ventilator (F2), incl. accessories and structures Normal operation: 190 c.m.s-1, 1768 Pa, 480 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00
11.	Main fresh air ventilator (F3), incl. accessories and structures Normal operation: 135 c.m.s-1, 985 Pa, 190 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00
12.	Main fresh air ventilator (F4), incl. accessories and structures Normal operation: 135 c.m.s-1, 778 Pa, 150 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00
13.	Main fresh air ventilator (F5), incl. accessories and structures Normal operation: 150 c.m.s-1, 980 Pa, 210 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00
14.	Main fresh air ventilator (F6), incl. accessories and structures Normal operation: 150 c.m.s-1, 1307 Pa, 280 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00
15.	Main fresh air ventilator (F7), incl. accessories and structures Normal operation: 132 c.m.s-1, 1008 Pa, 190 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00
16.	Main fresh air ventilator (F8), incl. accessories and structures Normal operation: 132 c.m.s-1, 583 Pa, 110 kW*, 0.94 kg.m-3 Ambient conditions	pcs.	1	58.574.600,00	58.574.600,00
17.	butterfly flap (stainless steel 1.4404)	pcs.	11	4.086.600,00	44.952.600,00
18.	vanes in the exhaust air ducts (stainless steel 1.4404)	pcs.	28	2.451.960,00	68.654.880,00
19.	vanes in the fresh air ducts (aluminium)	pcs.	23	2.179.520,00	50.128.960,00
20.	Fresh air regulator metal sheet (stainless steel 1.4404)	pcs.	1180	34.055,00	40.184.900,00
21.	Exhaust air damper - size 3.0 m x 4.0 m stainless steel 1.4404 Ambient conditions and temperature of 400°C over 2 hours	pcs.	140	2.860.620,00	400.486.800,00
22.	Jet fan (traffic room), incl. accessories and structures Nominal Thrust: 2660 N Outlet velocity: 37.6 m.s-1 Air density: 1.2 kg.m-3 Power consumption: 90 kW Ambient conditions and temperature of 400°C over 2 hours (Stainless steel 1.4404)	pcs.	22	11.578.700,00	254.731.400,00
23.	Rescue tunnel ventilator, incl. accessories and structures Incident ventilation: 25 c.m.s-1, 1200 Pa, 50 kW, 0.94 kg.m-3	pcs.	2	3.064.950,00	6.129.900,00
24.	Rescue tunnel flap, incl. accessories and structures (stainless steel 1.4404)	pcs.	2	408.660,00	817.320,00
25.	Crossway tunnel overpressure flap, incl. accessories and structures	pcs.	55	476.770,00	26.222.350,00
26.	Crossway tunnel fire flap, incl. accessories and structures	pcs.	55	612.990,00	33.714.450,00
27.	Crossway tunnel pressure difference measurement, incl. accessories and structures	pcs.	55	408.660,00	22.476.300,00

Item No.	Description of item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
28.	Jet fan (Crossway tunnel), incl. accessories and structures Nominal Thrust: 255 N Outlet velocity: 24.4 m.s-1 Air density: 1.2 kg.m-3 Power consumption: 6.5 kW	pcs.	55	1.566.530,00	86.159.150,00
29.	Velocity measurement system (+/-15m/s; accuracy +/-0,3m/s)	pcs.	24	1.021.650,00	24.519.600,00
30.	Probation and system testing, duration 10 days	lumpsum	1	10.216.500,00	10.216.500,00
31.	Implementation design documentation	lumpsum	1	20.433.000,00	20.433.000,00
32.	As-built documentation	lumpsum	1	4.767.700,00	4.767.700,00
33.	Metrological detection system	pcs.	2	2.588.180,00	5.176.360,00
34.	Doors in exhaust air and fresh air ducts (Stainless steel - 1.4404)	pcs.	30	1.294.090,00	38.822.700,00
35.	Doors in crossway tunnels and in the locks (Stainless steel - 1.4404)	pcs.	59	1.294.090,00	76.351.310,00
36.	Gate in locks	pcs.	4	5.448.800,00	21.795.200,00
37.	Crane facility (12 ton)	pcs.	5	10.897.600,00	54.488.000,00
38.	Overhead costs (3.5 per cent of construction costs)	lumpsum	1		88.483.744,30
TOTAL OF SCHEDULE - VS VENTILATION SYSTEM					INR 2.616.590.724,30

* min. aerodynamic efficiency at operating point = 0.7, It is proposed that only four types of drive motors (480 kW for F1 and F2; 280 kW for F3, F4, F5, F6, F7 and F8; 630 kW for E3, E4, E5 and E8 and 850 kW for E1, E2, E6 and E7) for the fresh and exhaust air axial fans are used in order to reduce the maintenance complexity. It is further proposed that the principal dimensions (diameter, length etc.) of the fresh and exhaust air axial fans are the same so that they are interchangeable.