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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 2 – Details of Rates (DoR)

Prepared by:		Date:	
Checked by:		Date:	
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Item No.	Description of Item	Unit	Rate per Unit	Transport	Rate at Site
Material Rates as per international tunnel construction practice					
Mat-001	Explosive including detonator and accessories for d&b	cum	408,66	45,01	453,67
Mat-002	Gasoline for wheel loader	hour	1.362,20	18,00	1.380,20
Mat-003	Gasoline for dumper	hour	2.615,08	27,01	2.642,09
Mat-004	Gasoline for transporter	hour	1.362,20	13,50	1.375,70
Mat-005	Miscellaneous material for tunnel excavation per cum excavation	cum	70,00	at site	70,00
Mat-006	Shotcrete C25/30 (mixing on site)	cum	4.818,64	at site	4.818,64
	Batching plant included in time dependent costs shotcrete cost calculated: [Equation = (a+b+c+d+e)/75]			-	-
	Output capacity = 75m ³ /h			-	-
a	Electricity = 110kW*1h = 110kWh*6,81INR/kWh		825,00	-	-
b	Skilled working man = 6*1h*2465,64INR/h		14.793,87	-	-
c	Aggregates = 67,5 m ³ *1135,75		76.663,13	-	-
d	Water = 0,18 m ³ /m ³ *75m ³ *68,11INR/m ³		919,49	-	-
e	CEMII/42.5R = 350 kg/m ³ *75m ³ *10,217INR/kg		268.196,25	-	-
Mat-007	No fines concrete (mixing on site)	cum	4.699,59	at site	4.699,59
Mat-008	Concrete C12/15 (mixing on site)	cum	4.103,19	at site	4.103,19
	Batching plant included in time dependent costs concrete cost calculated: [Equation = (a+b+c+d+e)/75]			-	-
	Output capacity = 75m ³ /h			-	-
a	Electricity = 110kW*1h = 110kWh*6,81INR/kWh		825,00	-	-
b	Skilled working man = 6*1h*2465,64INR/h		14.793,87	-	-
c	Aggregates = 67,5 m ³ *1135,75		76.663,13	-	-
d	Water = 0,18 m ³ /m ³ *75m ³ *68,11INR/m ³		919,49	-	-
e	CEMII/32.5R = 300 kg/m ³ *75m ³ *9,535INR/kg		214.537,50	-	-
Mat-009	Concrete C25/30 (mixing on site)	cum	4.818,64	at site	4.818,64
	Batching plant included in time dependent costs concrete cost calculated: [Equation = (a+b+c+d+e)/75]			-	-
	Output capacity = 75m ³ /h			-	-
a	Electricity = 110kW*1h = 110kWh*6,81INR/kWh		825,00	-	-
b	Skilled working man = 6*1h*2465,64INR/h		14.793,87	-	-
c	Aggregates = 67,5 m ³ *1135,75		76.663,13	-	-
d	Water = 0,18 m ³ /m ³ *75m ³ *68,11INR/m ³		919,49	-	-
e	CEMII/42.5R = 350 kg/m ³ *75m ³ *10,217INR/kg		268.196,25	-	-
Mat-010	Concrete C30/37 (mixing on site) for cement concrete pavement [Equation = (a+b+c+d+e)/75]	cum	5.263,74	at site	5.263,74
	Batching plant included in time dependent costs			-	-
	Output capacity = 75m ³ /h			-	-

a	Electricity = 110kW*1h = 110kWh*6,81INR/kWh		825,00	-	-
b	Skilled working man = 4*1h*2465,64INR/h		9.862,58	-	-
c	Aggregates = 67,5 m³*1135,75		76.663,13	-	-
d	Water = 0,18 m³/m³*75m³*68,11INR/m³		919,49	-	-
e	CEMII/42.5R = 400 kg/m³*75m³*10,217INR/kg		306.510,00	-	-
Mat-011	Electricity	kWh	7,50	at site	7,50
Mat-012	Gasoline	litre	78,00	0,90	78,90
Mat-013	Frictional bolt (Swellex or equivalent 200 kN)	meter	871,81	2,06	873,87
Mat-014	Anchor plate for frictional bolt and wear parts	pcs	323,52	1,80	325,32
Mat-015	Wire mesh (CQS60 or equivalent 3,11 kg/sqm)	kg	70,00	5,79	75,79
Mat-016	Lattice girder	tonne	185.000,00	2.158,23	187.158,23
Mat-017	Lattice girder connections and footing	pcs	68,11	at site	68,11
Mat-018	Grouted bolt	meter	221,36	0,44	221,80
Mat-019	Anchor plate for grouted bolt and wear parts	pcs	323,52	1,80	325,32
Mat-020	Self-drilling bolt	meter	681,10	0,44	681,54
Mat-021	Anchor plate for self-drilling bolt and wear parts	meter	306,50	1,80	308,30
Mat-022	Injection material	tonne	7.492,10	375,09	7.867,19
Mat-023	Explosive including detonator and accessories for excavation with tunnel excavator	cum	68,11	0,90	69,01
Mat-024	Gasoline for tunnel excavator	hour	1.294,09	17,10	1.311,19
Mat-025	Umbrella pipe	meter	442,72	9,18	451,90
Mat-026	Additional material formwork	cum	72,00	at site	72,00
Mat-027	Reinforcement grade S550	tonne	52.000,00	257,21	52.257,21
Mat-028	PVC or PP drainage pipe Ø150mm	meter	1.243,01	15,91	1.258,92
Mat-029	PVC or PP drainage pipe Ø250mm	meter	2.288,50	44,19	2.332,69
Mat-030	PVC or PP drainage pipe Ø400mm	meter	3.776,70	113,13	3.889,82
Mat-031	Drainage Material	cum	1.021,65	at site	1.021,65
Mat-032	PVC or PP pipe Ø150mm	meter	1.467,77	15,91	1.483,68
Mat-033	PVC or PP pipe Ø250mm	meter	2.346,39	44,19	2.390,58
Mat-034	PVC or PP pipe Ø400mm	meter	6.409,15	113,13	6.522,28
Mat-035	Pre-cast concrete slot channel	meter	5.632,70	225,06	5.857,75
Mat-036	Pre-cast concrete slot channel cover of steel	meter	5.435,18	20,26	5.455,43
Mat-037	Protective felt	sqm	119,19	3,60	122,79
Mat-038	Water proofing membrane	sqm	357,58	5,40	362,98
Mat-039	Water stop	meter	497,20	9,00	506,21
Mat-040	Cleaning and inspection chamber DN600 PP or PE-HD for DN150	pcs	11.129,17	180,04	11.309,22
Mat-041	Cleaning and inspection chamber DN600 PP or PE-HD for DN250	pcs	17.027,50	180,04	17.207,54
Mat-042	Cleaning and inspection chamber DN600 PP or PE-HD for DN400	pcs	19.411,35	180,04	19.591,39
Mat-043	Telescope chamber for inspection chamber	pcs	6.129,90	-	6.129,90
Mat-044	Sealing ring	pcs	2.179,52	at site	2.179,52

Mat-045	Inspection chamber iron cover class B	pcs	12.327,91	38,17	12.366,08
Mat-046	Inspection chamber iron cover class D	pcs	19.888,12	38,17	19.926,29
Mat-047	Dimpled sheets	sqm	323,52	9,00	332,52
Mat-048	Yielding elements	pcs	32.425,00	180,04	32.605,04
Mat-049	Injection material for tunnel crown injection	cum	68,11	at site	68,11
Mat-050	Gasoline for concrete pump	hour	856,82	9,00	865,83
Mat-051	Granular sub-base material	cum	1.191,93	at site	1.191,93
Mat-052	Gasoline for vibratory soil compactor	hour	856,82	9,00	865,83
Mat-053	Gasoline for grader	hour	856,82	9,00	865,83
Mat-054	Gasoline for paver	hour	1.713,65	18,00	1.731,65
Mat-055	Dowel rods and tie bars for concrete pavement	tonne	57.893,50	6,30	57.899,80
Mat-056	Mastic asphalt	cum	4.427,15	900,22	5.327,37
Mat-057	PE pipe SDR 26 Ø200 mm	meter	1.747,02	28,28	1.775,30
Mat-058	CEMII/42.5R	kg	8,00	0,75	8,75
Mat-059	CEMII/32.5R	kg	7,50	0,75	8,25
Mat-060	Formwork carriage	pcs	27.925.100,00	48.247,61	27.973.347,61
Mat-061	PVC ventilation duct Ø1800 mm	meter	1.907,08	114,33	2.021,41
Mat-062	Miscellaneous material for PVC ventilation duct	meter	129,41	at site	129,41
Mat-063	Electronic cable for temporary lighting	meter	1.362,20	at site	1.362,20
Mat-064	Halogen lamp 1500 w	pcs	6.078,82	28,81	6.107,62
Mat-065	Lamps	pcs	2.503,04	at site	2.503,04
Mat-066	Stones >1.5 m	cum	350,00	1.125,28	1.475,28
Mat-067	Stone Boulder of size of 240 mm at Crusher Plant	cum	470,00	at site	470,00
Mat-068	Pre-stressed anchors	meter	3.405,50	36,01	3.441,51
Mat-069	Anchor plate for pre-stressed anchors	pcs	647,05	3,60	650,65
Mat-070	3D monitoring targets	pcs	275,00	0,90	275,90
Mat-071	Borehole extensometer	each	12.500,00	79,49	12.579,49
Mat-072	Load cells	each	31.480,00	4,50	31.484,50
Mat-073	Strain gauges	each	4.230,00	0,90	4.230,90
Mat-074	Pressure cells	each	31.590,00	4,50	31.594,50
Mat-075	Temperature gauges	each	1.860,00	0,90	1.860,90
Mat-076	Strip drain 200 mm x 25 mm	meter	140,00	4,50	144,50
Mat-077	Strip drain 200 mm x 40 mm	meter	190,00	7,20	197,20
Mat-078	Steel fibre reinforcement	tonne	129.409,00	450,11	129.859,11
Mat-079	Aggregates	cum	366,00	802,70	1.168,70
Mat-080	GFP self-drilling bolts	meter	817,32	0,44	817,76
Mat-081	Anchor plate for self-drilling bolt and wear parts	meter	306,50	1,80	308,30
Mat-082	Fire main DN 150	meter	122,60	15,91	138,50
Mat-083	Fire hydrant	pcs	146.436,50	112,53	146.549,03

Item No.	Description of Item	Unit	Rate	Trans. Cost	Rate incl. Transport
Transportation from Srinagar to site					
a	Mean volume of transporter	cum	25,00		
b	Mean length of transportation route Srinagar to site installation	km	94,00		
c	Loading & unloading time	min	30,00		
d	Average driving speed	km/hour	40,00		
MAT	Material				
Mat-004.	Gasoline for transporter [Equation = $2*(c/60+b/d)$]	hour	5,70	1.362,20	7.764,54
LAB	Labour				
Lab-021	Mazdoor [Equation = $2*(c/60+b/d)$]	hour	5,70	125,00	712,50
MAC	Machinery				
Mac-059	Truck dumper [Equation = $2*(c/60+b/d)$]	hour	5,70	1.232,51	7.025,29
TR-SR	Transportation costs from Srinagar to site per cum [Equation = $\text{sum}(\text{MAT}+\text{LAB}+\text{MAC})/a$]				620,09
Transportation from Jammu to site					
a	Mean volume of transporter	cum	25,00		
b	Mean length of transportation route Jammu to site installation	km	390,00		
c	Loading & unloading time	min	30,00		
d	Average driving speed	km/hour	40,00		
MAT	Material				
Mat-004.	Gasoline for transporter [Equation = $2*(c/60+b/d)$]	hour	20,50	1.362,20	27.925,10
LAB	Labour				
Lab-021	Mazdoor [Equation = $2*(c/60+b/d)$]	hour	20,50	125,00	2.562,50
MAC	Machinery				
Mac-059	Truck dumper [Equation = $2*(c/60+b/d)$]	hour	20,50	1.232,51	25.266,40
TR-JA	Transportation costs from Jammu to site per cum [Equation = $\text{sum}(\text{MAT}+\text{LAB}+\text{MAC})/a$]				2.230,16
Transportation from Leh to site					
a	Mean volume of transporter	cum	25,00		
b	Mean length of transportation route Leh to site installation	km	300,00		
c	Loading & unloading time	min	30,00		
d	Average driving speed	km/hour	40,00		
MAT	Material				
Mat-004.	Gasoline for transporter [Equation = $2*(c/60+b/d)$]	hour	16,00	1.362,20	21.795,20
LAB	Labour				
Lab-021	Mazdoor [Equation = $2*(c/60+b/d)$]	hour	16,00	125,00	2.000,00
MAC	Machinery				
Mac-059	Truck dumper [Equation = $2*(c/60+b/d)$]	hour	16,00	1.232,51	19.720,12
TR-LE	Transportation costs from Leh to site per cum [Equation = $\text{sum}(\text{MAT}+\text{LAB}+\text{MAC})/a$]				1.740,61

Transportation of Aggregates					
a	Mean volume of transporter	cum	10,00		
b	Mean length of transportation route aggregates	km	29,27		
c	Loading & unloading time	min	30,00		
d	Average driving speed	km/hour	30,00		
MAT	Material				
Mat-004.	Gasoline for transporter [Equation = $2*(c/60+b/d)$]	hour	2,95	1.362,20	4.020,43
LAB	Labour				
Lab-021	Mazdoor [Equation = $2*(c/60+b/d)$]	hour	2,95	125,00	368,93
MAC	Machinery				
Mac-059	Truck dumper [Equation = $2*(c/60+b/d)$]	hour	2,95	1.232,51	3.637,65
TR-AG	Transportation costs of Aggragates [Equation = $\text{sum}(\text{MAT}+\text{LAB}+\text{MAC})/a$]				802,70
Mat-001	Explosive including detonator and accessories for d&b[Equation = $(\text{TR-SR}^3/4+\text{TR-LE}^1/4)*a$]	cum	408,66	45,01	453,67
a	Explosives per cum excavation	cum	0,05		
Mat-002	Gasoline for wheel loader [Equation = $a/1000*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	hour	1.362,20	18,00	1.380,20
a	Consumption per hour	litre	20,00		
Mat-003	Gasoline for dumper [Equation = $a/1000*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	hour	2.615,08	27,01	2.642,09
a	Consumption per hour	litre	30,00		
Mat-004	Gasoline for transporter [Equation = $a/1000*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	hour	1.362,20	13,50	1.375,70
a	Consumption per hour	litre	15,00		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation	cum	70,00	at site	70,00
Mat-006	Shotcrete C25/30 (mixing on site)	cum	4.818,64	at site	4.818,64
Mat-007	No fines concrete (mixing on site)	cum	4.699,59	at site	4.699,59
Mat-008	Concrete C12/15 (mixing on site)	cum	4.103,19	at site	4.103,19
Mat-009	Concrete C25/30 (mixing on site)	cum	4.818,64	at site	4.818,64
Mat-010	Concrete C30/37 (mixing on site) for cement concrete pavement [Equation = $(a+b+c+d+e)/75$]	cum	5.263,74	at site	5.263,74
Mat-011	Electricity	kWh	7,50	at site	7,50
Mat-012	Gasoline [Equation = $1/1000*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	litre	78,00	0,90	78,90
Mat-013	Frictional bolt (Swellex or equivalent 200 kN) [Equation = $a*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	meter	871,81	2,06	873,87
a	Volume of bolt per meter	cum/meter	2,29E-03		
Mat-014	Anchor plate for frictional bolt and wear parts [Equation = $a*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	pcs	323,52	1,80	325,32
a	Volume of anchor plate	cum/pcs	2,00E-03		
Mat-015	Wire mesh (CQS60 or equivalent 3,11 kg/sqm)	kg	70,00	5,79	75,79
a	Volume of wire mesh per sqm	cum/sqm	0,02		
Mat-016	Lattice girder [Equation = $1000/b*a*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	tonne	185.000,00	2.158,23	187.158,23
a	Volume of lattice girder per meter	cum/meter	0,04		
b	Mean weight of lattice girder per meter	kg/meter	15,60		
Mat-017	Lattice girder connections and footing	pcs	68,11	at site	68,11
Mat-018	Grouted bolt [Equation = $a*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	meter	221,36	0,44	221,80
a	Volume of bolt per meter	cum/meter	4,90E-04		
Mat-019	Anchor plate for grouted bolt and wear parts [Equation = $a*(\text{TR-SR}^3/4+\text{TR-LE}^1/4)$]	pcs	323,52	1,80	325,32

a	Volume of anchor plate	cum/pcs	2,00E-03		
Mat-020	Self-drilling bolt [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	681,10	0,44	681,54
a	Volume of bolt per meter	cum/meter	4,90E-04		
Mat-021	Anchor plate for self-drilling bolt and wear parts	meter	306,50	1,80	308,30
a	Volume of anchor plate	cum/pcs	2,00E-03		
Mat-022	Injection material [Equation = $1/a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	tonne	7.492,10	375,09	7.867,19
a	Mean unit weighth of injection material	tonne/cum	2,40		
Mat-023	Explosive including detonator and accessories for excavation with tunnel excavator [Equation = $(TR-SR^{3/4} + TR-LE^{1/4}) \cdot a$]	cum	68,11	0,90	69,01
a	Explosives per cum excavation	cum	1,00E-03		
Mat-024	Gasoline for tunnel excavator [Equation = $a/1000 \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	hour	1.294,09	17,10	1.311,19
a	Consumption per hour	litre	19,00		
Mat-025	Umbrella pipe [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	442,72	9,18	451,90
a	Volume of pipe umbrella per meter	cum/meter	0,01		
Mat-026	Additional material formwork	cum	72,00	at site	72,00
Mat-027	Reinforcement grade S550 [Equation = $1/a \cdot b \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	tonne	52.000,00	257,21	52.257,21
a	Unit weight of reinforcement	tonne/cum	7,00		
b	Loosening due to stocking	%/100	2,00		
Mat-028	PVC or PP drainage pipe Ø150mm [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	1.243,01	15,91	1.258,92
a	Volume of drainage pipe	cum/meter	1,77E-02		
Mat-029	PVC or PP drainage pipe Ø250mm [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	2.288,50	44,19	2.332,69
a	Volume of drainage pipe	cum/meter	4,91E-02		
Mat-030	PVC or PP drainage pipe Ø400mm [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	3.776,70	113,13	3.889,82
a	Volume of drainage pipe	cum/meter	1,26E-01		
Mat-031	Drainage Material	cum	1.021,65	at site	1.021,65
Mat-032	PVC or PP pipe Ø150mm [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	1.467,77	15,91	1.483,68
a	Volume of drainage pipe	cum/meter	1,77E-02		0,02
Mat-033	PVC or PP pipe Ø250mm [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	2.346,39	44,19	2.390,58
a	Volume of drainage pipe	cum/meter	4,91E-02		
Mat-034	PVC or PP pipe Ø400mm [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	6.409,15	113,13	6.522,28
a	Volume of drainage pipe	cum/meter	1,26E-01		
Mat-035	Pre-cast concrete slot channel [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	5.632,70	225,06	5.857,75
a	Volume of slot channel	cum/meter	0,25		
Mat-036	Pre-cast concrete slot channel cover of steel [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	5.435,18	20,26	5.455,43
a	Volume of channel cover	cum/meter	2,25E-02		
Mat-037	Protective felt [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	sqm	119,19	3,60	122,79
a	Volume per sqm	cum/sqm	4,00E-03		
Mat-038	Water proofing membrane [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	sqm	357,58	5,40	362,98
a	Volume per sqm	cum/sqm	6,00E-03		
Mat-039	Water stop [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	497,20	9,00	506,21
a	Volume per meter	cum/meter	0,01		

Mat-040	Cleaning and inspection chamber DN600 PP or PE-HD for DN150 [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	pcs	11.129,17	180,04	11.309,22
a	Volume per cleaning chamber	cum/pcs	0,20		
Mat-041	Cleaning and inspection chamber DN600 PP or PE-HD for DN250 [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	pcs	17.027,50	180,04	17.207,54
a	Volume per cleaning chamber	cum/pcs	0,20		
Mat-042	Cleaning and inspection chamber DN600 PP or PE-HD for DN400 [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	pcs	19.411,35	180,04	19.591,39
a	Volume per cleaning chamber	cum/pcs	0,20		
Mat-043	Telescope chamber for inspection chamber [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	pcs	6.129,90		6.129,90
a	Volume per cleaning chamber	cum/pcs	0,20		
Mat-044	Sealing ring	pcs	2.179,52	at site	2.179,52
#	included in cleaning chamber				
Mat-045	Inspection chamber iron cover class B [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	pcs	12.327,91	38,17	12.366,08
a	Volume of chamber cover	cum/pcs	4,24E-02		
Mat-046	Inspection chamber iron cover class D [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	pcs	19.888,12	38,17	19.926,29
a	Volume of chamber cover	cum/pcs	4,24E-02		
Mat-047	Dimpled sheets [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	sqm	323,52	9,00	332,52
a	Volume of dimpled sheets per sqm	cum/sqm	0,01		
Mat-048	Yielding elements [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	pcs	32.425,00	180,04	32.605,04
a	Volume of one yielding element	cum/pcs	0,20		
Mat-049	Injection material for tunnel crown injection [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	cum	68,11	at site	68,11
Mat-050	Gasoline for concrete pump [Equation = $a/1000 \cdot (TR-SR^3/4 + TR-LE^1/4)$]	hour	856,82	9,00	865,83
a	Consumption per hour	litre/hour	10,00		
Mat-051	Granular sub-base material	cum	1.191,93	at site	1.191,93
Mat-052	Gasoline for vibratory soil compactor [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	hour	856,82	9,00	865,83
a	Consumption per hour	litre/hour	10,00		
Mat-053	Gasoline for grader [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	hour	856,82	9,00	865,83
a	Consumption per hour	litre/hour	10,00		
Mat-054	Gasoline for paver [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	hour	1.713,65	18,00	1.731,65
a	Consumption per hour	litre/hour	20,00		
Mat-055	Dowel rods and tie bars for concrete pavement [Equation = $1/a \cdot b \cdot (TR-SR^3/4 + TR-LE^1/4)$]	tonne	57.893,50	6,30	57.899,80
a	Unit weight of reinforcement	tonne/cum	7,00		
b	Loosening due to stocking	%/100	3,00		
Mat-056	Mastic asphalt	cum	4.427,15	900,22	5.327,37
Mat-057	PE pipe SDR 26 Ø200 mm [Equation = $a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	meter	1.747,02	28,28	1.775,30
a	Volume of pipe per meter	cum/meter	3,14E-02		
Mat-058	CEMII/42.5R [Equation = $1/a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	kg	8,00	0,75	8,75
a	Bulk density	kg/cum	1.200,00		
Mat-059	CEMII/32.5R [Equation = $1/a \cdot (TR-SR^3/4 + TR-LE^1/4)$]	kg	7,50	0,75	8,25
a	Bulk density	kg/cum	1.200,00		
Mat-060	Formwork carriage [Equation = $a \cdot b$]	pcs	27.925.100,00	48.247,61	27.973.347,61

a	Trucks required per forwork carriage	pcs	4,00		
b	Transportation costs from Srinagar to site per truck [Equation = $(TR-SR*3/4+TR-LE*1/4)$ *mean volume of transporter]	INR/pcs	12.061,90		
Mat-061	PVC ventilation duct Ø1800 mm [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	meter	1.907,08	114,33	2.021,41
a	Volume of pipe per meter	cum/meter	0,13		
Mat-062	Miscellaneous material for PVC ventilation duct	meter	129,41	at site	129,41
#	Transport included in PVC ventilation pipe transport				
Mat-063	Electronic cable for temporary lighting	meter	1.362,20	at site	1.362,20
Mat-064	Halogen lamp 1500 w [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	pcs	6.078,82	28,81	6.107,62
a	Transport volume of halogen lamp	cum	3,20E-02		
Mat-065	Lamps	pcs	2.503,04	at site	2.503,04
#	Transportation included in halogen lamps				
Mat-066	Stones >1.5 m	cum	350,00	1.125,28	1.475,28
a	Transport volume of stones per cum (including loosening factor)	cum	1,25		
Mat-067	Stone Boulder of size of 240 mm at Cruser Plant	cum	470,00	at site	470,00
Mat-068	Pre-stressed anchors [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	meter	3.405,50	36,01	3.441,51
a	Transportation volume of pre-stressed anchors per meter	cum/meter	0,04		
Mat-069	Anchor plate for pre-stressed anchors [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	meter	647,05	3,60	650,65
a	Volume of anchor plate	cum/pcs	4,00E-03		
Mat-070	3D monitoring targets [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	pcs	275,00	0,90	275,90
a	Volume of monitoring target	cum/pcs	1,00E-03		
Mat-071	Borehole extensometer [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	each	12.500,00	79,49	12.579,49
a	Volume of extensiometer	cum/pcs	8,83E-02		
Mat-072	Load cells [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	each	31.480,00	4,50	31.484,50
a	Volume of load cell	cum/pcs	5,00E-03		
Mat-073	Strain gauges [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	each	4.230,00	0,90	4.230,90
a	Volume of strain gauges	cum/pcs	1,00E-03		
Mat-074	Pressure cells [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	each	31.590,00	4,50	31.594,50
a	Volume of pressure cells	cum/pcs	5,00E-03		
Mat-075	Temperature gauges [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	each	1.860,00	0,90	1.860,90
a	Volume of temperature gauges	cum/pcs	1,00E-03		
Mat-076	Strip drain 200 mm x 25 mm [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	each	140,00	4,50	144,50
a	Volume of strip drain per meter	cum/meter	5,00E-03		
Mat-077	Strip drain 200 mm x 40 mm [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	each	190,00	7,20	197,20
a	Volume of strip drain per meter	cum/meter	8,00E-03		
Mat-078	Steel fibre reinforcement [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	tonne	129.409,00	450,11	129.859,11
a	Volumer per transport tonne	cum/tonne	0,50		
Mat-079	Aggregates [Equation = $a*TR-AG$]	cum	366,00	802,70	1.168,70
a	Volume of transport	cum	1,00		
Mat-080	GFP self-drilling bolts [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	meter	817,32	0,44	817,76
a	Volume of bolt per meter	cum/meter	4,90E-04		
Mat-081	Anchor plate for self-drilling bolt and wear parts [Equation = $a*(TR-SR*3/4+TR-LE*1/4)$]	meter	306,50	1,80	308,30

a	Volume of bolt per meter	cum/meter	2,00E-03		
Mat-082	Fire main DN 150 [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	meter	122,60	15,91	138,50
a	Volume of fire main per meter	cum/meter	1,77E-02		
Mat-083	Fire hydrant [Equation = $a \cdot (TR-SR^{3/4} + TR-LE^{1/4})$]	pcs	146.436,50	112,53	146.549,03
a	Volume per piece	cum/pcs	0,13		

Item No.	Description of Item	Rate [INR/h]
Labour Rates as per international tunnel construction practice		
Lab-001	Project Manager Expert	4.286,37
Lab-002	Section Leader	3.716,16
Lab-003	Foreman specialist	3.429,09
Lab-004	Skilled NATM Working Man Underground	2.465,64
Lab-005	Skilled monitoring underground	3.214,78
Lab-006	Skilled unproductive experts	2.588,18
Lab-007	Skilled unproductive personell	2.465,64
Lab-008	Skilled productive personell	2.465,64
Labour Rates as per SoR Jammu Kashmir		
Lab-009	Blacksmith (IInd class)	104,17
Lab-010	Blacksmith (Ist class)/ Welder/ Plumber/ Electrician	125,00
Lab-011	Blaster (Stone cutter)	125,00
Lab-012	Carpenter I Class	125,00
Lab-013	Chiseller (Head Mazdoor)	125,00
Lab-014	Driller (Jumper)	125,00
Lab-015	Diver	177,08
Lab-016	Fitter	177,08
Lab-017	Mali	125,00
Lab-018	Mason (IInd class)	125,00
Lab-019	Mason (Ist class) & Skilled	177,08
Lab-020	Mate	125,00
Lab-021	Mazdoor	125,00
Lab-022	Mazdoor/Dresser (Semi Skilled)	104,17
Lab-023	Mazdoor/Dresser/Sinker (Skilled)	104,17
Lab-024	Medical Officer	291,67
Lab-025	Operator(grouting)	177,08
Lab-026	Painter I class	177,08
Lab-027	Para medical personnel	177,08

Item No.	Description of Item	Unit [INR]	Rate
	Machinery Rates as per international tunnel construction practice		
Mac-001	Drilling machine with 2 drilling booms and basket	6.089,81	hour
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent)	1.674,56	hour
Mac-003	Tunnel muck transporter (dumper or equivalent)	1.554,85	hour
Mac-004	Spraying manipulator	1.673,56	hour
Mac-005	Working platform	330,59	hour
Mac-006	Tunnel excavator	3.262,22	hour
Mac-007	Concrete Pump	777,88	hour
Mac-008	Truck mounted crane 18 tonnes	447.482,70	month
Mac-009	Truck mounted crane 25 tonnes	502.651,80	month
Mac-010	Compressor 24 kW	36.983,73	month
Mac-011	Transformer 630 kVA	49.938,25	month
Mac-012	Compact concrete mixing plant including aggregate storage	790.545,96	month
Mac-013	Power unit 100 kVA	49.938,25	month
Mac-014	Ventilation fan 1800 mm 250 kW	118.951,66	month
Mac-015	Frequency converter 250 kW	51.972,70	month
Mac-016	Silencer for ventilation fan 1800 mm	12.427,76	month
Mac-017	Concrete vibrator	19.051,73	month
Mac-018	Voltage transformer 4.0 kVA	5.196,79	month
Mac-019	Van	54.862,61	month
Mac-020	Core drilling machine 4.4 kW	67.565,12	month
Mac-021	Compressor 66 kW (9 cum)	76.092,49	month
Mac-022	Welding machine including generator, transformer and equipment	53.840,55	month
Mac-023	Foreman container	18.376,08	month
Mac-024	Workmanship container	18.893,71	month
Mac-025	Sanitary facility container	34.681,61	month
Mac-026	Container for monitoring facilities and workmanship	18.376,08	month
Mac-027	Project manager container	18.376,08	month
Mac-028	Storage container	13.976,17	month
Mac-029	Maintenance container	11.769,41	month
Mac-030	Van for workmanship	93.446,92	month
Mac-031	Loader crane	428.548,12	month
Mac-032	Tank truck	296.796,14	month
Mac-033	Tractor 110 kW	171.160,43	month
Mac-034	Portion neutralisation system	98.994,48	month
Mac-035	Transformer station	141.478,09	month
Mac-036	Transfer station	183.079,68	month

Mac-037	Compressor 85 kW (11 cum)	104.303,65	month
Mac-038	Water pump for Swellex construction	39.347,15	month
Mac-039	Ventilation fan 1400 mm 90 kW	70.627,55	month
Mac-040	Silencer for ventilation fan 1400 mm	7.616,74	month
Mac-041	Breaker 20 kg 2 kW	15.034,60	month
Mac-042	Air surge tank	8.192,95	month
Mac-043	Miscellaneous electronic devices	49.970,60	month
Mac-044	Pump	16.258,54	month
Mac-045	Hydraulic breaker 800 kg	169.491,74	month
Mac-046	Small excavator	168.923,70	month
Mac-047	Small paver 1.0 - 2.0m	404.948,01	month
Mac-048	Paver 8.0 m	1.082.029,52	month
Mac-049	Joint cutting equipment	62.422,82	month
Mac-050	Bolt setting equipment	74.699,64	month
Mac-051	Grader	752.274,95	month
Mac-052	Vibratory soil compactor	464.918,86	month
Mac-053	Container 12.2 m ² for accomodation of workmanship	10.182,45	month
Mac-054	Crusher	457.188,38	month
Mac-055	Gantry Crane 20m width, 30t	148.956,57	month
Mac-056	Bucket for gantry crane with hydraulic lock, 6 m ³	43.590,40	month
Mac-057	Elevator for workmanship 15 persons	203.853,23	month
Mac-058	Truck mixer	469.005,46	month
Mac-059	Truck dumper	295.801,73	month
Mac-060	Raise boring machine	1.183.411,25	month

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery 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						
a	Estimated length of upward drifts	4.500,00	meter				
MAT	Material						
Mat-057	PE pipe SDR 26 Ø200 mm	4.500,00	meter	1.775,30	7.988.862,79		
Mat-011	Electricity [Equation = b*c*d*24]	2.998.800,00	kWh	7,50	22.491.000,00		
b	Power of pumps	42,00	kW				
c	Number of pumps	5,00	pcs				
d	Estimated pumping time of all downward drives	595,00	day				
LAB	Labour						
#	Labour is included in tunnel excavation						
MAC	Machinery						
#	Machinery is included in time dependent costs						
Sum	Overall costs of care of water				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						
a	Construction Length	12,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						
Mat-032	PVC or PP pipe Ø150mm [Equation = a]	12,50	meter	1.467,77	18.347,13		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	0,75	hour	2.465,64		1.849,23	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,50	hour	177,08		88,54	
e	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*f]	0,75	hour	125,00		93,75	
f	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,25	hour	125,00		31,25	
g	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				18.347,13	2.062,78	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				1.467,77	165,02	-
A20102	250 mm internal diameter PVC pipe						
a	Construction Length	12,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						
Mat-033	PVC or PP pipe Ø250mm [Equation = 2*a]	12,50	meter	2.346,39	29.329,87		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	1,00	hour	2.465,64		2.465,64	
d	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,75	hour	177,08		132,81	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	1,00	hour	125,00		125,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	1,25	hour	125,00		156,25	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				29.329,87	2.879,71	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				2.346,39	230,38	-
A20103	400 mm internal diameter PVC pipe						-
a	Construction Length	12,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						
Mat-034	PVC or PP pipe Ø400mm [Equation = a]	12,50	meter	6.409,15	80.114,39		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	1,00	hour	2.465,64		2.465,64	
d	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,75	hour	177,08		132,81	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	1,00	hour	125,00		125,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	1,25	hour	125,00		156,25	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				80.114,39	2.879,71	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				6.409,15	230,38	-
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						
a	Block length	12,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						
Mat-028	PVC or PP drainage pipe Ø150mm [Equation = a]	12,50	meter	1.243,01	15.537,59		
Mat-031	Drainage Material	1,00	cum	1.021,65	1.021,65		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	0,75	hour	2.465,64		1.849,23	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,50	hour	177,08		88,54	
e	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*f]	0,75	hour	125,00		93,75	
f	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,25	hour	125,00		31,25	
g	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				16.559,24	2.062,78	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				1.324,74	165,02	-
A20202	250 mm internal diameter PVC pipe						-
a	Block length	12,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						
Mat-029	PVC or PP drainage pipe Ø250mm [Equation = a]	12,50	meter	1.243,01	15.537,59		
Mat-031	Drainage Material	1,00	cum	1.021,65	1.021,65		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	0,75	hour	2.465,64		1.849,23	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,50	hour	177,08		88,54	
e	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*f]	0,75	hour	125,00		93,75	
f	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,25	hour	125,00		31,25	
g	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				16.559,24	2.062,78	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				1.324,74	165,02	-
A203	Manufacture, supply, and placing of pre-cast concrete slot channel elements as per approved drawings for carriageway drainage						
a	Block length	12,50	meter				
b	Estimated construction time	0,50	hour				
MAT	Material						
Mat-035	Pre-cast concrete slot channel	12,50	meter	5.632,70	70.408,71		
Mat-036	Pre-cast concrete slot channel cover of steel	12,50	meter	5.435,18	67.939,73		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	1,50	hour	2.465,64		3.698,47	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	1,00	hour	177,08		177,08	
e	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*f]	1,50	hour	125,00		187,50	
f	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,50	hour	125,00		62,50	
g	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of pre-cast slot channel per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				138.348,44	4.125,55	-
Sum	Installation cost of pre-cast slot channel per meter [Equation = subsum/a]				11.067,88	330,04	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	0,26	day				
c	Tunnel perimeter from main tunnel cross section	29,21	meter				
MAT	Material						
Mat-047	Dimpled sheets [Equation = a*c*(1+d)]	383,42	sqm	323,52	124.045,16		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	6,30	hour	2.465,64		15.533,56	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	4,20	hour	177,08		743,75	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	6,30	hour	125,00		787,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	2,10	hour	125,00		262,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of dimpled sheet per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				124.045,16	17.327,31	-
Sum	Installation cost of dimpled sheet per sqm [Equation = subsum/(a*c)]				339,70	47,45	-

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
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.						
a	Block length	12,50	meter				
b	Estimated construction time	0,44	day				
c	Tunnel perimeter from main tunnel cross section	29,21	meter				
MAT	Material						
Mat-037	Protective felt [Equation = a*c*(1+d)]	383,42	sqm	119,19	45.700,85		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	10,50	hour	2.465,64		25.889,27	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	7,00	hour	177,08		1.239,58	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	10,50	hour	125,00		1.312,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	3,50	hour	125,00		437,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of protective felt per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				45.700,85	28.878,85	-
Sum	Installation cost of protective felt per sqm [Equation = subsum/(a*c)]				125,15	79,08	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	1,31	day				
c	Tunnel perimeter from main tunnel cross section	29,21	meter				
MAT	Material						
Mat-038	Water proofing membrane [Equation = a*c*(1+d)]	383,42	sqm	357,58	137.102,55		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	31,50	hour	2.465,64		77.667,81	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	21,00	hour	177,08		3.718,75	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	31,50	hour	125,00		3.937,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	10,50	hour	125,00		1.312,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of water proofing per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				137.102,55	86.636,56	-
Sum	Installation cost of water proofing per sqm [Equation = subsum/(a*c)]				375,46	237,25	-
A207	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)						
a	Block length	12,50	meter				
b	Estimated construction time	0,50	hour				
MAT	Material						
Mat-039	Water stop [Equation = a*2*(1+c)]	26,25	meter	497,20	13.051,58		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
c	Cut offs	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*d]	-	hour	3.429,09		-	
d	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*e]	1,50	hour	2.465,64		3.698,47	
e	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*f]	1,00	hour	177,08		177,08	
f	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*g]	1,50	hour	125,00		187,50	
g	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*h]	4,00	hour	125,00		500,00	
h	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of PVC water stop [Equation = sum(MAT); sum(LAB); sum(MAC)]				13.051,58	4.563,05	-
Sum	Installation cost of PVC water stop per meter [Equation = subsum/(a*2)]				522,06	182,52	-
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						
a	Estimated construction time	0,50	hour				
MAT	Material						
Mat-040	Cleaning and inspection chamber DN600 PP or PE-HD for DN150	1,00	pcs	11.129,17	11.129,17		
Mat-043	Telescope chamber for inspection chamber	1,00	pcs	6.129,90	6.129,90		
Mat-044	Sealing ring	1,00	pcs	2.179,52	2.179,52		
Mat-046	Inspection chamber iron cover class D	1,00	pcs	19.888,12	19.888,12		
LAB	Labour						
Lab-003	Foreman specialist [Equation = a*b]	-	hour	3.429,09		-	
b	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = a*c]	1,50	hour	2.465,64		3.698,47	
c	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = a*d]	1,00	hour	177,08		177,08	
d	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = a*e]	1,50	hour	125,00		187,50	
e	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = a*f]	4,00	hour	125,00		500,00	
f	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Sum	Installation cost of protective felt per sqm [Equation = sum(MAT); sum(LAB); sum(MAC)]				39.326,71	4.563,05	-
A20802	Cleaning and Inspection chamber for DN250						
a	Estimated construction time	0,50	hour				
MAT	Material						
Mat-041	Cleaning and inspection chamber DN600 PP or PE-HD for DN250	1,00	pcs	17.027,50	17.027,50		
Mat-043	Telescope chamber for inspection chamber	1,00	pcs	6.129,90	6.129,90		
Mat-044	Sealing ring	1,00	pcs	2.179,52	2.179,52		
Mat-046	Inspection chamber iron cover class D	1,00	pcs	19.888,12	19.888,12		
LAB	Labour						
Lab-003	Foreman specialist [Equation = a*b]	-	hour	3.429,09		-	
b	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = a*c]	1,50	hour	2.465,64		3.698,47	
c	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = a*d]	1,00	hour	177,08		177,08	
d	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = a*e]	1,50	hour	125,00		187,50	
e	Number of Mate	3,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-021	Mazdoor [Equation = a*f]	4,00	hour	125,00		500,00	
f	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Sum	Installation cost of protective felt per sqm [Equation = sum(MAT); sum(LAB); sum(MAC)]				45.225,04	4.563,05	-
A20803	Cleaning and Inspection chamber for DN400						
a	Estimated construction time	0,50	hour				
MAT	Material						
Mat-042	Cleaning and inspection chamber DN600 PP or PE-HD for DN400	1,00	pcs	19.411,35	19.411,35		
Mat-043	Telescope chamber for inspection chamber	1,00	pcs	6.129,90	6.129,90		
Mat-044	Sealing ring	1,00	pcs	2.179,52	2.179,52		
Mat-046	Inspection chamber iron cover class D	1,00	pcs	19.888,12	19.888,12		
LAB	Labour						
Lab-003	Foreman specialist [Equation = a*b]	-	hour	3.429,09		-	
b	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = a*c]	1,50	hour	2.465,64		3.698,47	
c	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = a*d]	1,00	hour	177,08		177,08	
d	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = a*e]	1,50	hour	125,00		187,50	
e	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = a*f]	4,00	hour	125,00		500,00	
f	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Sum	Installation cost of protective felt per sqm [Equation = sum(MAT); sum(LAB); sum(MAC)]				47.608,89	4.563,05	-
A209	Fire main						
a	Construction Length	6,00	meter				
b	Estimated construction time	1,00	hour				
MAT	Material						
Mat-082	Fire main DN 150	6,00	meter	138,50	831,03		
LAB	Labour						
Lab-004	Skilled NATM Working Man Underground [Equation = b*c]	2,00	hour	2.465,64		4.931,29	
b	Number of Skilled NATM Working Man Underground	2,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation costs per construction length [Equation = sum(MAT); sum(LAB); sum(MAC)]			2.604,15	831,03	4.931,29	
Sum	Installation costs per meter [Equation = subsum/a]				138,50	821,88	-
A210	Fire hydrant						
a	Estimated construction time	2,00	hour				
MAT	Material						
Mat-083	Fire hydrant	1,00	pcs	146.549,03	146.549,03		
LAB	Labour						
Lab-004	Skilled NATM Working Man Underground [Equation = b*c]	4,00	hour	2.465,64		9.862,58	
b	Number of Skilled NATM Working Man Underground	2,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Sum	Installation costs per hydrant [Equation = sum(MAT); sum(LAB); sum(MAC)]				146.549,03	9.862,58	-
SCHEDULE - B UNDERGROUND EXCAVATION							
SCHEDULE - B1 Excavation							

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
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						
a	Area of top heading excavation in cross section	56,16	sqm				
b	Round length top heading	3,50	meter				
c	Cycle time top heading Support Category A	12,00	hour				
d	Estimated excavation time per cycle	10,36	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	196,56	cum	453,67	89.173,60		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/l*h/(i*1000)]	4,40	hour	2.615,08	11.507,77		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	314,50	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	196,56	cum	70,00	13.759,20		
Mat-011	Electricity [Equation = m*a*b]	1.965,60	kWh	7,50		14.742,00	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	10,36	hour	3.429,09		35.515,73	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	62,14	hour	2.465,64		153.222,68	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	31,07	hour	177,08		5.502,25	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	41,43	hour	125,00		5.178,59	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	51,79	hour	125,00		6.473,23	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	11,17	hour	6.089,81			68.012,95
s	Excavation time including hold-back time [Equation = d+c*0,07]	11,17	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 3,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				115.121,67	220.634,48	162.740,44
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				585,68	1.122,48	827,94
B1010102	Bench						
a	Area of bench excavation in cross section	60,04	sqm				
b	Round length bench	7,00	meter				
c	Cycle time bench Support Category A	12,00	hour				
d	Estimated excavation time per cycle	10,36	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	420,28	cum	453,67	190.668,91		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	9,34	hour	2.615,08	24.424,97		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	672,45	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	420,28	cum	70,00	29.419,60		
Mat-011	Electricity [Equation = m*a*b]	4.202,80	kWh	7,50		31.521,00	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	10,36	hour	3.429,09		35.515,73	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	62,14	hour	2.465,64		153.222,68	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	31,07	hour	177,08		5.502,25	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	41,43	hour	125,00		5.178,59	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	51,79	hour	125,00		6.473,23	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	11,17	hour	6.089,81			68.012,95
s	Excavation time including hold-back time [Equation = d+c*0,07]	11,17	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 7 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				245.875,69	237.413,48	162.740,44
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				585,03	564,89	387,22
B10102	Excavation in Support Category B; top heading, bench, invert						
B1010201	Top heading						
a	Area of top heading excavation in cross section	56,95	sqm				
b	Round length top heading	2,50	meter				
c	Cycle time top heading Support Category B	12,00	hour				
d	Estimated excavation time per cycle	8,86	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	142,38	cum	453,67	64.591,43		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	3,33	hour	2.615,08	8.695,91		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	227,80	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	142,38	cum	70,00	9.966,25		
Mat-011	Electricity [Equation = m*a*b]	1.423,75	kWh	7,50		10.678,13	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	8,86	hour	3.429,09		30.385,82	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	53,17	hour	2.465,64		131.091,11	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	26,58	hour	177,08		4.707,50	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	35,44	hour	125,00		4.430,59	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	44,31	hour	125,00		5.538,24	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	10,50	hour	6.089,81			63.958,82
s	Excavation time including hold-back time [Equation = d+c*0,14]	10,50	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				83.934,69	186.831,38	158.686,31
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				589,53	1.312,25	1.114,57
B1010202	Bench						
a	Area of bench excavation in cross section	60,57	sqm				
b	Round length bench	5,00	meter				
c	Cycle time bench Support Category B	12,00	hour				
d	Estimated excavation time per cycle	8,86	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	302,85	cum	453,67	137.394,31		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	7,01	hour	2.615,08	18.331,10		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	484,56	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	302,85	cum	70,00	21.199,50		
Mat-011	Electricity [Equation = m*a*b]	3.028,50	kWh	7,50		22.713,75	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	8,86	hour	3.429,09		30.385,82	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	53,17	hour	2.465,64		131.091,11	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	26,58	hour	177,08		4.707,50	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	35,44	hour	125,00		4.430,59	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	44,31	hour	125,00		5.538,24	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	10,50	hour	6.089,81			63.958,82
s	Excavation time including hold-back time [Equation = d+c*0,14]	10,50	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				178.287,10	198.867,01	158.686,31
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				588,70	656,65	523,98
B10103	Excavation in Support Category C; top heading, bench, invert						
B1010301	Top heading						
a	Area of top heading excavation in cross section	57,90	sqm				
b	Round length top heading	1,75	meter				
c	Cycle time top heading Support Category C	12,00	hour				
d	Estimated excavation time per cycle	4,83	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	101,33	cum	453,67	45.968,23		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/l*(i*1000)]	2,51	hour	2.615,08	6.565,67		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	162,12	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	101,33	cum	70,00	7.092,75		
Mat-011	Electricity [Equation = m*a*b]	1.013,25	kWh	7,50		7.599,38	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	4,83	hour	3.429,09		16.574,73	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	29,00	hour	2.465,64		71.507,02	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	14,50	hour	177,08		2.567,83	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	19,33	hour	125,00		2.416,78	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	24,17	hour	125,00		3.020,97	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,71	hour	6.089,81			40.890,16
s	Excavation time including hold-back time [Equation = d+c*0,16]	6,71	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,75 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				60.307,75	103.686,70	135.617,66
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				595,19	1.023,31	1.338,44
B1010302	Bench						
a	Area of bench excavation in cross section	61,10	sqm				
b	Round length bench	3,50	meter				
c	Cycle time bench Support Category C	12,00	hour				
d	Estimated excavation time per cycle	4,83	hour				
MAT	Material						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	213,85	cum	453,67	97.017,58		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/l*h/(i*1000)]	5,24	hour	2.615,08	13.712,55		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	342,16	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	213,85	cum	70,00	14.969,50		
Mat-011	Electricity [Equation = m*a*b]	2.138,50	kWh	7,50		16.038,75	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	4,83	hour	3.429,09		16.574,73	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	29,00	hour	2.465,64		71.507,02	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	14,50	hour	177,08		2.567,83	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	19,33	hour	125,00		2.416,78	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	24,17	hour	125,00		3.020,97	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,71	hour	6.089,81			40.890,16
s	Excavation time including hold-back time [Equation = d+c*0,16]	6,71	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 3,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				127.061,83	112.126,08	135.617,66
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				594,16	524,32	634,17
B10104	Excavation in Support Category D; top heading, bench, invert						
B1010401	Top heading						
a	Area of top heading excavation in cross section	61,00	sqm				
b	Round length top heading	1,50	meter				
c	Cycle time top heading Support Category D	12,00	hour				
d	Estimated excavation time per cycle	4,26	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	91,50	cum	453,67	41.510,91		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/l*h/(i*1000)]	2,32	hour	2.615,08	6.055,82		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	146,40	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	91,50	cum	70,00	6.405,00		
Mat-011	Electricity [Equation = m*a*b]	915,00	kWh	7,50		6.862,50	
m	Estimated electricity per cum excavation	10,00	kWh/cum				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	4,26	hour	3.429,09		14.600,18	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	25,55	hour	2.465,64		62.988,41	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	12,77	hour	177,08		2.261,92	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	17,03	hour	125,00		2.128,87	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	21,29	hour	125,00		2.661,09	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,13	hour	6.089,81			37.313,71
s	Excavation time including hold-back time [Equation = d+c*0,16]	6,13	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				54.652,83	91.502,97	132.041,20
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				597,30	1.000,03	1.443,07
B1010402	Bench & Invert						
a	Area of bench & invert excavation in cross section	80,64	sqm				
b	Round length bench & invert	3,00	meter				
c	Cycle time bench & invert Support Category D	12,00	hour				
d	Estimated excavation time per cycle	4,26	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	241,92	cum	453,67	109.752,13		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/l*(i*1000)]	5,80	hour	2.615,08	15.169,21		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*i]	387,07	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	241,92	cum	70,00	16.934,40		
Mat-011	Electricity [Equation = m*a*b]	2.419,20	kWh	7,50		18.144,00	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	4,26	hour	3.429,09		14.600,18	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	25,55	hour	2.465,64		62.988,41	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	12,77	hour	177,08		2.261,92	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	17,03	hour	125,00		2.128,87	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	21,29	hour	125,00		2.661,09	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,13	hour	6.089,81			37.313,71
s	Excavation time including hold-back time [Equation = d+c*0,16]	6,13	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 3 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				143.217,94	102.784,47	132.041,20
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				592,01	424,87	545,81
B10105	Excavation in Support Category E; top heading, bench, invert						
B1010501	Top heading						
a	Area of top heading excavation in cross section	91,38	sqm				
b	Round length top heading	1,25	meter				
c	Cycle time top heading Support Category E	12,00	hour				
d	Estimated excavation time per cycle	3,48	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	114,23	cum	453,67	51.820,59		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	2,77	hour	2.615,08	7.235,10		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	182,76	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	114,23	cum	70,00	7.995,75		
Mat-011	Electricity [Equation = m*a*b]	1.142,25	kWh	7,50		8.566,88	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	3,48	hour	3.429,09		11.929,31	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	20,87	hour	2.465,64		51.465,68	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	10,44	hour	177,08		1.848,14	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	13,92	hour	125,00		1.739,43	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	17,39	hour	125,00		2.174,28	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	5,37	hour	6.089,81			32.697,50
s	Excavation time including hold-back time [Equation = d+c*0,16]	5,37	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,25 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				67.732,54	77.723,72	127.425,00
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				592,97	680,44	1.115,56
B1010502	Bench & Invert						
a	Area of bench & invert excavation in cross section	52,26	sqm				
b	Round length bench & invert	2,50	meter				
c	Cycle time bench & invert Support Category E	12,00	hour				
d	Estimated excavation time per cycle	3,48	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	130,65	cum	453,67	59.272,14		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = $\text{Mat-002} + k/l \cdot h / (i \cdot 1000)$]	3,59	hour	2.615,08	9.395,00		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e / (f \cdot 2) + g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a \cdot b \cdot j$]	209,04	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a \cdot b$]	130,65	cum	70,00	9.145,50		
Mat-011	Electricity [Equation = $m \cdot a \cdot b$]	1.306,50	kWh	7,50		9.798,75	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d \cdot n$]	3,48	hour	3.429,09		11.929,31	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d \cdot o$]	20,87	hour	2.465,64		51.465,68	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d \cdot p$]	10,44	hour	177,08		1.848,14	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $d \cdot q$]	13,92	hour	125,00		1.739,43	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $d \cdot r$]	17,39	hour	125,00		2.174,28	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	5,37	hour	6.089,81			32.697,50
s	Excavation time including hold-back time [Equation = $d + c \cdot 0,16$]	5,37	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = $t \cdot u$]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = $v \cdot w$]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				79.174,83	78.955,60	127.425,00
Sum	Excavation cost per cum [Equation = $\text{subsum} / (a \cdot b)$]				606,01	604,33	975,32
B10106	Excavation in Support Category F; top heading, bench, invert						
B1010601	Top heading						
a	Area of top heading excavation in cross section	93,12	sqm				
b	Round length top heading	1,25	meter				
c	Cycle time top heading Support Category F	12,00	hour				
d	Estimated excavation time per cycle	3,41	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = $a \cdot b$]	116,40	cum	453,67	52.807,32		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = $\text{Mat-002} + k/l \cdot h / (i \cdot 1000)$]	2,81	hour	2.615,08	7.347,97		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e / (f \cdot 2) + g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a \cdot b \cdot j$]	186,24	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a \cdot b$]	116,40	cum	70,00	8.148,00		
Mat-011	Electricity [Equation = $m \cdot a \cdot b$]	1.164,00	kWh	7,50		8.730,00	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-003	Foreman specialist [Equation = d*n]	3,41	hour	3.429,09		11.678,04	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	20,43	hour	2.465,64		50.381,62	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	10,22	hour	177,08		1.809,21	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	13,62	hour	125,00		1.702,79	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	17,03	hour	125,00		2.128,48	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	5,78	hour	6.089,81			35.213,39
s	Excavation time including hold-back time [Equation = d+c*0,2]	5,78	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,25 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				68.984,39	76.430,14	129.940,88
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				592,65	656,62	1.116,33
B1010602	Bench & Invert						
a	Area of bench & invert excavation in cross section	52,66	sqm				
b	Round length bench & invert	2,50	meter				
c	Cycle time bench & invert Support Category F	12,00	hour				
d	Estimated excavation time per cycle	3,41	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	131,65	cum	453,67	59.725,81		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*h/(i*1000))]	3,61	hour	2.615,08	9.446,89		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	210,64	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	131,65	cum	70,00	9.215,50		
Mat-011	Electricity [Equation = m*a*b]	1.316,50	kWh	7,50		9.873,75	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	3,41	hour	3.429,09		11.678,04	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	20,43	hour	2.465,64		50.381,62	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	10,22	hour	177,08		1.809,21	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	13,62	hour	125,00		1.702,79	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	17,03	hour	125,00		2.128,48	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	5,78	hour	6.089,81			35.213,39
s	Excavation time including hold-back time [Equation = d+c*0,2]	5,78	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				79.750,40	77.573,89	129.940,88
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				605,78	589,24	987,02
B10107	Excavation in Support Category G; top heading, bench, invert						
B1010701	Top heading						
a	Area of top heading excavation in cross section	93,12	sqm				
b	Round length top heading	1,25	meter				
c	Cycle time top heading Support Category G	12,00	hour				
d	Estimated excavation time per cycle	3,37	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	116,40	cum	453,67	52.807,32		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/l*h/(i*1000)]	2,81	hour	2.615,08	7.347,97		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	186,24	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	116,40	cum	70,00	8.148,00		
Mat-011	Electricity [Equation = m*a*b]	1.164,00	kWh	7,50		8.730,00	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	3,37	hour	3.429,09		11.551,77	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	20,21	hour	2.465,64		49.836,88	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	10,11	hour	177,08		1.789,65	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	13,48	hour	125,00		1.684,38	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	16,84	hour	125,00		2.105,47	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,08	hour	6.089,81			37.027,47
s	Excavation time including hold-back time [Equation = d+c*0,23]	6,08	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,25 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				68.984,39	75.698,15	131.754,96
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				592,65	650,33	1.131,92
B1010702	Bench & Invert						
a	Area of bench & invert excavation in cross section	52,66	sqm				
b	Round length bench & invert	2,50	meter				
c	Cycle time bench & invert Support Category G	12,00	hour				
d	Estimated excavation time per cycle	3,37	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	131,65	cum	453,67	59.725,81		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-003	Gasoline for dumper [Equation = $\text{Mat-002} + k/l \cdot h / (i \cdot 1000)$]	3,61	hour	2.615,08	9.446,89		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e / (f \cdot 2) + g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a \cdot b \cdot j$]	210,64	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a \cdot b$]	131,65	cum	70,00	9.215,50		
Mat-011	Electricity [Equation = $m \cdot a \cdot b$]	1.316,50	kWh	7,50		9.873,75	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d \cdot n$]	3,37	hour	3.429,09		11.551,77	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d \cdot o$]	20,21	hour	2.465,64		49.836,88	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d \cdot p$]	10,11	hour	177,08		1.789,65	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $d \cdot q$]	13,48	hour	125,00		1.684,38	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $d \cdot r$]	16,84	hour	125,00		2.105,47	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,08	hour	6.089,81			37.027,47
s	Excavation time including hold-back time [Equation = $d + c \cdot 0,23$]	6,08	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = $t \cdot u$]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = $v \cdot w$]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = $\text{sum}(\text{MAT}) + \text{sum}(\text{LAB}) + \text{sum}(\text{MAC})$]				79.750,40	76.841,90	131.754,96
Sum	Excavation cost per cum [Equation = $\text{subsum} / (a \cdot b)$]				605,78	583,68	1.000,80
B10108	Excavation in Support Category H; top heading, bench, invert						
B1010801	Top heading						
a	Area of top heading excavation in cross section	99,32	sqm				
b	Round length top heading	1,00	meter				
c	Cycle time top heading Support Category H	12,00	hour				
d	Estimated excavation time per cycle	4,61	hour				
MAT	Material						
Mat-023	Explosive including detonator and accessories for excavation with tunnel excavator [Equation = $a \cdot b$]	99,32	cum	69,01	6.854,10		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = $\text{Mat-002} + k/l \cdot h / (i \cdot 1000)$]	2,47	hour	2.615,08	6.461,63		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e / (f \cdot 2) + g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a \cdot b \cdot j$]	158,91	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a \cdot b$]	99,32	cum	70,00	6.952,40		
Mat-011	Electricity [Equation = $m \cdot a \cdot b$]	198,64	kWh	7,50		1.489,80	
m	Estimated electricity per cum excavation	2,00	kWh/cum				
Mat-024	Gasoline for tunnel excavator [Equation = d]	4,61	hour	1.294,09	5.966,22		
LAB	Labour						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-003	Foreman specialist [Equation = d*n]	4,61	hour	3.429,09		15.809,35	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	27,66	hour	2.465,64		68.205,01	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	13,83	hour	177,08		2.449,25	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	18,44	hour	125,00		2.305,18	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	23,05	hour	125,00		2.881,47	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	12,00	hour	6.089,81			73.077,72
s	Excavation time including hold-back time [Equation = c]	12,00	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Mac-006	Tunnel excavator [Equation = x*y]	12,00	hour	3.262,22			39.146,60
x	Number of tunnel excavator	1,00	pcs				
y	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				26.915,44	93.140,06	206.951,81
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				271,00	937,78	2.083,69
B1010802	Bench & Invert						
a	Area of bench & invert excavation in cross section	55,18	sgm				
b	Round length bench & invert	2,00	meter				
c	Cycle time bench & invert Support Category G	12,00	hour				
d	Estimated excavation time per cycle	4,61	hour				
MAT	Material						
Mat-023	Explosive including detonator and accessories for excavation with tunnel excavator [Equation = a*b]	110,36	cum	69,01	7.615,97		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	2,69	hour	2.615,08	7.034,53		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	176,58	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	110,36	cum	70,00	7.725,20		
Mat-011	Electricity [Equation = m*a*b]	220,72	kWh	7,50		1.655,40	
m	Estimated electricity per cum excavation	2,00	kWh/cum				
Mat-024	Gasoline for tunnel excavator [Equation = d]	4,61	hour	1.294,09	5.966,22		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	4,61	hour	3.429,09		15.809,35	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	27,66	hour	2.465,64		68.205,01	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	13,83	hour	177,08		2.449,25	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	18,44	hour	125,00		2.305,18	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	23,05	hour	125,00		2.881,47	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	12,00	hour	6.089,81			73.077,72
s	Excavation time including hold-back time [Equation = c]	12,00	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Mac-006	Tunnel excavator [Equation = x*y]	12,00	hour	3.262,22			39.146,60
x	Number of tunnel excavator	1,00	pcs				
y	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				29.294,01	94.243,44	209.035,50
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				265,44	853,96	1.894,12
B102	Mucking of geological overbreak accepted by Employer's Representative as per Technical Specifications						
a	Volume of excavation material	9,38	cum				
MAT	Material						
Mat-002	Gasoline for wheel loader	0,15	hour	1.362,20	204,33		
Mat-003	Gasoline for dumper [Equation = Mat-002+a/h*g/(e*1000)]	0,34	hour	2.615,08	878,77		
b	Mined tunnel length	14.083,00	meter				
c	Number of excavation faces	4,00	pcs				
d	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
e	Average transport length [Equation = b/(c*2)+d]	1.860,38	meter				
f	Average driving speed	10,00	km/hour				
g	Loosening factor of material	1,60	-				
h	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a]	9,38	cum	70,00	656,25		
Mat-011	Electricity [Equation = i*a]	93,75	kWh	7,50		703,13	
i	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = u*j]	0,15	hour	3.429,09		514,36	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = u*k]	0,90	hour	2.465,64		2.219,08	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = u*l]	0,45	hour	177,08		79,69	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = u*m]	0,60	hour	125,00		75,00	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = u*n]	0,75	hour	125,00		93,75	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = o]	0,15	hour	6.089,81			913,47
o	Hold back time [Equation = u]	0,15	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = p*g]	0,15	hour	1.674,56			251,18
p	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
q	Loading time	0,15	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = r*s]	0,60	hour	1.554,85			932,91
r	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
s	Loading time	0,15	hour				
Subsum	Mucking cost per 9,375 cum [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.739,35	3.685,01	2.097,57
Sum	Mucking cost of geological overbreak per cum [Equation = subsum/a]				185,53	393,07	223,74
B103	Additional underground excavation as directed by Employer's Representative without rock mass classification.						
a	Mean rate of excavation rates of all Support Categories [Equation = (B1010101 + B1010201 + B1010301 + B1010401 + B1010501 + B1010601 + B1010701 + B1010801)/8]				552,12	922,90	1.271,44
B104	Additional payment for extra transportation of excavation material to the muck deposit area as per approved drawings & Technical Specifications.						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
a	Volume of muck transporter	7,00	cum				
b	Mean length of additional transportation	15,00	km				
c	Loading & unloading time	7,50	min				
d	Average driving speed	30,00	km/hour				
MAT	Material						
Mat-003	Gasoline for dumper [Equation = $2*(c/60+b/d)$]	1,25	hour	2.642,09	3.302,61		
LAB	Labour						
Lab-007	Skilled unproductive personell [Equation = $2*(c/60+b/d)$]	1,25	hour	2.465,64		3.082,06	
MAC	Machinery						
Mac-059	Truck dumper [Equation = $2*(c/60+b/d)$]	1,25	hour	1.232,51			1.540,63
Subsum	Costs for extra transportation of material per load and 15 km [Equation = sum(MAT); sum(LAB); sum(MAC)]				3.302,61	3.082,06	1.540,63
Sum	Costs for extra transportation of material per cum and km [Equation = subsum/(a*b)]				31,45	29,35	14,67
B105	Re-profiling of tunnel due to deformations						
a	Time for reprofiling	0,50	hour				
b	Length of reprofiling section	4,00	meter				
c	Mean excavation perimeter top heading	19,12	meter				
d	Estimated excavation material [Equation = $c*0,5$]	9,56	cum				
Mat-002	Gasoline for wheel loader	0,15	hour	1.362,20	204,33		
Mat-003	Gasoline for dumper [Equation = $Mat-002+d/k*(i*1000)$]	0,34	hour	2.615,08	888,29		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $b/(c*2)+d$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Loading capacity dumper	15,00	cum				
Mat-011	Electricity [Equation = $i*d*j$]	30,59	kWh	7,50		229,41	
l	Estimated electricity per cum excavation	2,00	kWh/cum				
Lab-003	Foreman specialist [Equation = $a*mj$]	0,50	hour	3.429,09		1.714,55	
m	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $a*n$]	3,00	hour	2.465,64		7.396,93	
n	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $a*o$]	1,50	hour	177,08		265,63	
o	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $a*p$]	2,00	hour	125,00		250,00	
p	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $a*q$]	2,50	hour	125,00		312,50	
q	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = a]	0,50	hour	6.089,81			3.044,90
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = $a*r$]	0,50	hour	1.674,56			837,28
r	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = $a*s$]	2,00	hour	1.554,85			3.109,70
s	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
Subsum	Re-profiling cost per 4 meter tunnel lenght [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.092,62	10.169,01	6.991,88
Sum	Re-profiling cost per tunnel meter [Equation = subsum/b]				273,16	2.542,25	1.747,97
B106	Temporary suspension of D&B excavation						
a	Overall time dependent costs [Equation = sum(S&T-B101+S&T-B102+S&T-B103)]				-	2.296.162.461,60	-
b	Estimated construction time	84,00	month				
c	Number of excavation faces	6,00	pcs				
Sum	Cost for temporary suspension of works per day and excavation face [Equation = $a/(c*b*30)$]				-	151.862,60	-
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						
a	Drilling length [Equation = $(3+8)/2$]	5,50	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	1,25	m/min				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,11	hour				
MAT	Material						
Mat-011	Electricity [Equation = g*h*f]	13,94	kWh	7,50	104,54		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,11	hour	3.429,09		365,77	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	0,64	hour	2.465,64		1.578,01	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	0,32	hour	177,08		56,67	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	0,43	hour	125,00		53,33	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	0,53	hour	125,00		66,67	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,11	hour	6.089,81			649,58
Sum	Installation cost of drainage drillings per drilling [Equation = sum(MAT; LAB; MAC)]				104,54	2.120,45	649,58
B202	Drilling of exploratory drilling without core recovery, diameter 50 mm, length up to 20 m						
a	Drilling length [Equation = (8+20)/2]	14,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	1,25	m/min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,22	hour				
MAT	Material						
Mat-011	Electricity [Equation = g*h*f]	28,75	kWh	7,50	215,62		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,22	hour	3.429,09		754,40	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	1,32	hour	2.465,64		3.254,65	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	0,66	hour	177,08		116,88	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	0,88	hour	125,00		110,00	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	1,10	hour	125,00		137,50	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,22	hour	6.089,81			1.339,76
Sum	Drillings for exploratory drillings without core recovery per drilling [Equation = sum(MAT; LAB; MAC)]				215,62	4.373,43	1.339,76
B203	Drilling of exploratory drilling with core recovery, diameter 76 mm						
B20301	Drilling 0-10 m						
a	Drilling length [Equation = (0+10)/2]	5,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	0,50	m/min				
e	Setting up	30,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,67	hour				
MAT	Material						
Mat-011	Electricity [Equation = g*h*f]	87,12	kWh	7,50	653,40		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,67	hour	3.429,09		2.286,06	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*i]	4,00	hour	2.465,64		9.862,58	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	2,00	hour	177,08		354,17	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	2,67	hour	125,00		333,33	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	3,33	hour	125,00		416,67	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,67	hour	6.089,81			4.059,87
Sum	Drillings for exploratory drillings with core recovery per drilling [Equation = sum(MAT; LAB; MAC)]				653,40	13.252,81	4.059,87
B20302	Drilling 10-20 m						
a	Drilling length [Equation = (10+20)/2]	15,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	0,50	m/min				
e	Setting up	30,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	1,00	hour				
MAT	Material						
Mat-011	Electricity [Equation = g*h*f]	130,68	kWh	7,50	980,10		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	1,00	hour	3.429,09		3.429,09	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	6,00	hour	2.465,64		14.793,87	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	3,00	hour	177,08		531,25	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	4,00	hour	125,00		500,00	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	5,00	hour	125,00		625,00	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	1,00	hour	6.089,81			6.089,81
Sum	Drillings for exploratory drillings with core recovery per drilling [Equation = sum(MAT; LAB; MAC)]				980,10	19.879,21	6.089,81
B20303	Drilling 20-30 m						
a	Drilling length [Equation = (20+30)/2]	25,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	0,50	m/min				
e	Setting up	30,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	1,33	hour				
MAT	Material						
Mat-011	Electricity [Equation = g*h*f]	174,24	kWh	7,50	1.306,80		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	1,33	hour	3.429,09		4.572,13	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	8,00	hour	2.465,64		19.725,16	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	4,00	hour	177,08		708,33	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	5,33	hour	125,00		666,67	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	6,67	hour	125,00		833,33	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	1,33	hour	6.089,81			8.119,75
Sum	Drillings for exploratory drillings with core recovery per drilling [Equation = sum(MAT; LAB; MAC)]				1.306,80	26.505,62	8.119,75
B204	Strata grouting as defined by the approved drawings the Technical Specifications or directed by the Employer's Representative						
a	Grouting volume	1,00	cum				
b	Grouting capacity	10,00	cum/hour				
c	Setting up	15,00	min				
MAT	Material						
Mat-008	Concrete C12/15 (mixing on site)	1,00	cum	4.103,19	4.103,19		
LAB	Labour						
Lab-004	Skilled NATM Working Man Underground [Equation = a*b/d+c/60]	1,05	hour	2.465,64		2.588,93	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Sum	Strata grouting costs per cum [Equation = ssum(MAT; LAB; MAC)]				4.103,19	2.588,93	-
SCHEDULE - C PRIMARY SUPPORT MEASURES							
SCHEDULE - C1 Bolts & Anchors							
C101	Supply, drilling and installation of frictional rockbolts (Sweller 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						
a	Frictional bolt length	4,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,40	m/min				
d	Drill hole cleaning and installation of bolt	6,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,17	hour				
MAT	Material						
Mat-013	Frictional bolt (Sweller or equivalent 200 kN) [Equation = a]	4,00	meter	873,87	3.495,48		
Mat-014	Anchor plate for frictional bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	21,57	kWh	7,50	161,79		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,17	hour	3.429,09		566,07	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	0,99	hour	2.465,64		2.442,16	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	0,50	hour	177,08		87,70	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	0,66	hour	125,00		82,54	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	0,83	hour	125,00		103,17	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,17	hour	6.089,81			1.005,30
Sum	Installation costs of frictional bolt l = 4 meter				3.982,60	3.281,65	1.005,30
C10102	Length 6 m						
a	Frictional bolt length	6,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,40	m/min				
d	Drill hole cleaning and installation of bolt	6,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,18	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAT	Material						
Mat-013	Frictional bolt (Swellex or equivalent 200 kN) [Equation = a]	6,00	meter	873,87	5.243,22		
Mat-014	Anchor plate for frictional bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	23,65	kWh	7,50	177,35		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,18	hour	3.429,09		620,50	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	1,09	hour	2.465,64		2.676,99	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	0,54	hour	177,08		96,13	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	0,72	hour	125,00		90,48	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	0,90	hour	125,00		113,10	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,18	hour	6.089,81			1.101,97
Sum	Installation costs of frictional bolt l = 6 meter				5.745,89	3.597,19	1.101,97
C102	Supply, drilling, installation and grouting of grouted rockbolts (SN type) of the specified length, $F_y \geq 200$ 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						
a	Bolt length	6,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,50	m/min				
d	Drill hole cleaning and installation of bolt	10,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,24	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	6,00	meter	221,80	1.330,79		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	31,94	kWh	7,50	239,58		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,06	tonne	7.492,10	449,53		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	0,24	hour	3.429,09		838,22	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	1,47	hour	2.465,64		3.616,28	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	0,73	hour	177,08		129,86	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	0,98	hour	125,00		122,22	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	1,22	hour	125,00		152,78	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,24	hour	6.089,81			1.488,62
Sum	Installation costs of SN bolt l = 6 meter				2.345,22	4.859,36	1.488,62
C10202	Length 9 m						
a	Bolt length	9,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,50	m/min				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
d	Drill hole cleaning and installation of bolt	10,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = $(a/(b*c)+d+e)/60$]	0,27	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	9,00	meter	221,80	1.996,19		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = $g*h*f$]	34,85	kWh	7,50	261,36		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = $a*i/1000$]	0,09	tonne	7.492,10	674,29		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $f*j$]	0,27	hour	3.429,09		914,43	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $f*k$]	1,60	hour	2.465,64		3.945,03	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $f*l$]	0,80	hour	177,08		141,67	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $f*m$]	1,07	hour	125,00		133,33	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $f*n$]	1,33	hour	125,00		166,67	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,27	hour	6.089,81			1.623,95
Sum	Installation costs of SN bolt l = 9 meter				3.257,16	5.301,12	1.623,95
C103	Supply, drilling, installation and grouting of self-drilling bolts of the specified length, F_{yz} 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						
a	Bolt length	9,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,70	m/min				
d	Drill hole cleaning and installation of bolt	10,00	min				
e	Setting up	2,50	min				
f	Estimated installation time [Equation = $(a/(b*c)+d+e)/60$]	0,27	hour				
MAT	Material						
Mat-020	Self-drilling bolt [Equation = a]	9,00	meter	681,54	6.133,87		
Mat-021	Anchor plate for self-drilling bolt and wear parts	1,00	pcs	308,30	308,30		
Mat-011	Electricity [Equation = $g*h*f$]	34,91	kWh	7,50	261,84		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $f*i$]	0,27	hour	3.429,09		916,11	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $f*j$]	1,60	hour	2.465,64		3.952,28	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $f*k$]	0,80	hour	177,08		141,93	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $f*l$]	1,07	hour	125,00		133,58	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $f*m$]	1,34	hour	125,00		166,97	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,27	hour	6.089,81			1.626,93
Sum	Installation costs of self-drilling bolt l = 9 meter				6.704,01	5.310,87	1.626,93

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
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 rockbolts (SN type) with a length of 6 m, Fy≥ 200 KN						
a	Bolt length	6,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,80	m/min				
d	Drill hole cleaning and installation of bolt	2,50	min				
e	Setting up	1,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,10	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	6,00	meter	221,80	1.330,79		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	12,46	kWh	7,50	93,47		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,10	hour	3.429,09		327,03	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	0,57	hour	2.465,64		1.410,90	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	0,29	hour	177,08		50,67	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	0,38	hour	125,00		47,69	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	0,48	hour	125,00		59,61	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,10	hour	6.089,81			580,79
Subsum	Installation costs of spiles l = 6 meter [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.749,59	1.895,89	580,79
Sum	Installation costs of spiles per meter [Equation = subsum/a]				291,60	315,98	96,80
C10402	Steel Pipe umbrella with a diameter of 114 mm, wall thickness of 6.5 mm and a length of 14 m						
a	Pipe length	14,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	0,50	m/min				
d	Drill hole cleaning and installation of pipe	30,00	min				
e	Setting up	10,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,98	hour				
MAT	Material						
Mat-025	Umbrella pipe [Equation = a]	14,00	meter	451,90	6.326,56		
Mat-011	Electricity [Equation = g*h*f]	127,78	kWh	7,50	958,32		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,98	hour	3.429,09		3.352,89	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	5,87	hour	2.465,64		14.465,12	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	2,93	hour	177,08		519,44	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	3,91	hour	125,00		488,89	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	4,89	hour	125,00		611,11	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,98	hour	6.089,81			5.954,48
Subsum	Installation costs of pipe umbrella l = 14 meter [Equation = sum(MAT); sum(LAB); sum(MAC)]				7.284,88	19.437,45	5.954,48

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Installation costs of pipe umbrella per meter [Equation = subsum/a]				520,35	1.388,39	425,32
SCHEDULE - C2 Shotcrete, Lattice Girder, Lining Stress Controllers & Wire Mesh							
C201	Shotcreting of primary lining (tunnel, niches, caverns) with designed mix cement concrete SpC20/25(56)/11/12/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						
a	Lining thickness	0,05	meter				
b	Additional thickness due to tolerance of excavation geometry	0,02	meter				
c	Lining perimeter	18,72	meter				
d	Round length	3,50	meter				
e	Estimated shotcreting time	0,81	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	5,50	cum	4.818,64	26.520,23		
Mat-011	Electricity [Equation = g*e*h]	73,00	kWh	7,50	547,52		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,81	hour	3.429,09		2.781,50	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	4,87	hour	2.465,64		12.000,00	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,43	hour	177,08		430,92	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,24	hour	125,00		405,57	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,06	hour	125,00		506,97	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 3,5 meter round length [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				27.067,76	16.124,96	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				413,12	246,11	306,51
C20102	100 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,10	meter				
b	Additional thickness due to tolerance of excavation geometry	0,02	meter				
c	Lining perimeter	18,78	meter				
d	Round length	2,50	meter				
e	Estimated shotcreting time	1,10	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	6,76	cum	4.818,64	32.577,84		
Mat-011	Electricity [Equation = g*e*h]	98,93	kWh	7,50	742,00		
g	Power of Tank truck	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,10	hour	3.429,09		3.769,45	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	6,60	hour	2.465,64		16.262,24	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	3,30	hour	177,08		583,98	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	4,40	hour	125,00		549,63	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	5,50	hour	125,00		687,03	
m	Number of Mazdoor	5,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 2,5 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				33.319,83	21.852,34	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				709,69	465,44	427,75
C20103	150 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,15	meter				
b	Additional thickness due to tolerance of excavation geometry	0,06	meter				
c	Lining perimeter	18,86	meter				
d	Round length	1,75	meter				
e	Estimated shotcreting time	0,77	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	8,32	cum	4.818,64	40.077,85		
Mat-011	Electricity [Equation = g*e*h]	69,74	kWh	7,50	523,04		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,77	hour	3.429,09		2.657,12	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	4,65	hour	2.465,64		11.463,42	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,32	hour	177,08		411,65	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,10	hour	125,00		387,44	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	3,87	hour	125,00		484,30	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 1,75 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				40.600,89	15.403,93	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.230,14	466,72	608,47
C20104	200 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,20	meter				
b	Additional thickness due to tolerance of excavation geometry	0,08	meter				
c	Lining perimeter	19,28	meter				
d	Round length	1,50	meter				
e	Estimated shotcreting time	0,82	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	9,72	cum	4.818,64	46.823,27		
Mat-011	Electricity [Equation = g*e*h]	73,79	kWh	7,50	553,40		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,82	hour	3.429,09		2.811,33	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	4,92	hour	2.465,64		12.128,69	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,46	hour	177,08		435,54	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,28	hour	125,00		409,92	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,10	hour	125,00		512,40	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 1,5 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				47.376,66	16.297,89	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.638,20	563,55	694,42
C20105	250 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,25	meter				
b	Additional thickness due to tolerance of excavation geometry	0,10	meter				
c	Lining perimeter	33,82	meter				
d	Round length	1,25	meter				
e	Estimated shotcreting time	1,05	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	17,76	cum	4.818,64	85.557,30		
Mat-011	Electricity [Equation = g*e*h]	94,29	kWh	7,50	707,21		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,05	hour	3.429,09		3.592,71	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	6,29	hour	2.465,64		15.499,75	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	3,14	hour	177,08		556,60	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	4,19	hour	125,00		523,86	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	5,24	hour	125,00		654,82	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 1,25 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				86.264,51	20.827,74	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				2.040,56	492,67	475,05
C20106	300 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,30	meter				
b	Additional thickness due to tolerance of excavation geometry	0,12	meter				
c	Lining perimeter	34,02	meter				
d	Round length	1,25	meter				
e	Estimated shotcreting time	1,19	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	21,43	cum	4.818,64	103.275,91		
Mat-011	Electricity [Equation = g*e*h]	107,34	kWh	7,50	805,03		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,19	hour	3.429,09		4.089,69	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	7,16	hour	2.465,64		17.643,81	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	3,58	hour	177,08		633,59	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	4,77	hour	125,00		596,32	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	5,96	hour	125,00		745,40	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 1,25 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				104.080,94	23.708,81	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				2.447,52	557,53	472,26
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						
a	Lining thickness	0,20	meter				
b	Additional thickness due to tolerance of excavation geometry	0,08	meter				
c	Lining perimeter	19,28	meter				
d	Round length	3,00	meter				
e	Estimated shotcreting time	0,82	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	19,43	cum	4.818,64	93.646,54		
Mat-011	Electricity [Equation = g*e*h]	73,79	kWh	7,50	553,40		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,82	hour	3.429,09		2.811,33	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	4,92	hour	2.465,64		12.128,69	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,46	hour	177,08		435,54	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,28	hour	125,00		409,92	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,10	hour	125,00		512,40	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 3 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				94.199,93	16.297,89	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.628,63	281,78	347,21
C20202	250 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,25	meter				
b	Additional thickness due to tolerance of excavation geometry	0,10	meter				
c	Lining perimeter	33,82	meter				
d	Round length	2,50	meter				
e	Estimated shotcreting time	1,05	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	35,51	cum	4.818,64	171.114,60		
Mat-011	Electricity [Equation = g*e*h]	94,29	kWh	7,50	707,21		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,05	hour	3.429,09		3.592,71	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	6,29	hour	2.465,64		15.499,75	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	3,14	hour	177,08		556,60	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	4,19	hour	125,00		523,86	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	5,24	hour	125,00		654,82	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 2,5 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				171.821,80	20.827,74	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				2.032,19	246,34	237,52
C20203	300 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,30	meter				
b	Additional thickness due to tolerance of excavation geometry	0,12	meter				
c	Lining perimeter	34,02	meter				
d	Round length	2,50	meter				
e	Estimated shotcreting time	1,19	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	42,87	cum	4.818,64	206.551,81		
Mat-011	Electricity [Equation = g*e*h]	107,34	kWh	7,50	805,03		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,19	hour	3.429,09		4.089,69	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	7,16	hour	2.465,64		17.643,81	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	3,58	hour	177,08		633,59	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	4,77	hour	125,00		596,32	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	5,96	hour	125,00		745,40	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 2,5 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				207.356,85	23.708,81	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				2.438,06	278,76	236,13
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						
a	Mean estimated lining thickness of face sealing	0,15	meter				
b	Mean face area of top heading excavation Support Category H	67,70	sqm				
c	Shotcreting capacity at face	0,15	cum/min				
d	Estimated shotcreting time [Equation =a*b*(1+e)/(c*60)]	1,35	hours				
e	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	12,19	cum	4.818,64	58.719,90		
Mat-011	Electricity [Equation = g*e*h]	121,86	kWh	7,50	913,95		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,35	hour	3.429,09		4.642,99	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	8,12	hour	2.465,64		20.030,90	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	4,06	hour	177,08		719,31	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	5,42	hour	125,00		677,00	
l	Number of Mate	4,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-021	Mazdoor [Equation = e*m]	6,77	hour	125,00		846,25	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	1,35	hour	1.673,56			2.266,00
n	Shotcrete time including hold back time	1,35	hour				
Subsum	Shotcreting costs per face sealing in Support Category H round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				59.633,85	26.916,46	2.266,00
Sum	Shotcreting cost per cum [Equation = Subsum/(a*b)]				5.872,36	2.650,56	223,14
C204	Steel fibre reinforcement if required						
a	Steel fibre reinforcement grade per cum shotcrete	25,00	kg/cum				
MAT	Material						
Mat-078	Steel fibre reinforcement [Equation = a/1000]	0,03	tonne	129.859,11	3.246,48		
LAB	Labour						
#	General shotcreting labour is included in shotcrete						
b	Additional shotcreting costs due to handling of fibre shotcrete	1,00	cum	340,55		340,55	
MAC	Machinery						
#	General shotcreting machinery is included in shotcrete						
c	Additional shotcreting costs due to handling of fibre shotcrete	1,00	cum	868,40			868,40
Sum	Reinforcement cost per cum shotcrete [Equation = sum(MAT; LAB; MAC)]				3.246,48	340,55	868,40
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						
a	Mean advance rate of all Support Categories with respect of distribution	2,05	meter				
b	Estimated installation time of one layer wire mesh	0,25	hour				
c	Mean perimeter with respect to support category of installed wire mesh	19,29	meter				
MAT	Material						
Mat-015	Wire mesh (CQS60 or equivalent 3,11 kg/sqm) [Equation = a*c*(1+d)]	153,959	kg	70,00	10.777,12		
d	Offcuts	0,250	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*e]	0,25	hour	3.429,09		857,27	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f]	1,50	hour	2.465,64		3.698,47	
f	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g]	0,75	hour	177,08		132,81	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*h]	1,00	hour	125,00		125,00	
h	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*i]	1,25	hour	125,00		156,25	
i	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = j]	4,000	hour	330,59			1.322,36
j	Installation time including holdbacktime of Working platform	4,000	hour				
Subsum	Average installation cost of wire mesh per round [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				10.777,12	4.969,80	1.322,36
Sum	Installation cost of wire mesh per tonne [Equation = subsum/(c*a*3,11kg/sqm)*1000]				87.500,00	40.350,11	10.736,28
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 footings						
a	Intersections of lattice girder	5,00	pcs				
b	Mean linear weight of lattice girder	13,20	kg/meter				
c	Mean perimeter of installed lattice girder	19,46	meter				
d	Mean installation time	0,25	hour				
MAT	Material						
Mat-016	Lattice girder [Equation = b*c/1000]	0,257	tonne	185.000,00	47.529,46		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-017	Lattice girder connections and footing [Equation = a-1]	4,000	pcs	68,11	272,44		
Mat-011	Electricity [Equation = e*b*c/1000]	141,304	kWh	7,50	1.059,78		
e	Estimated power consumption per tonne	550,000	kWh/tonne				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	0,25	hour	3.429,09		857,27	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	1,50	hour	2.465,64		3.698,47	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	0,75	hour	177,08		132,81	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	1,00	hour	125,00		125,00	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	1,25	hour	125,00		156,25	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = k]	4,000	hour	330,59			1.322,36
k	Installation time including holdbacktime of Working platform	4,000	hour				
Subsum	Installation cost of lattice girder per advance [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				48.861,68	4.969,80	1.322,36
Sum	Installation cost of lattice girder per tonne [Equation = subsum/(b*c/1000)]				190.185,42	19.344,08	5.147,04
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.						
a	Mean advance rate of Support Categories with yielding elements	1,25	meter				
b	Mean installation time	0,17	hour				
MAT	Material						
Mat-048	Yielding elements [Equation = a*2]	2,500	pcs	32.425,00	81.062,50		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	0,25	hour	3.429,09		857,27	
c	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	1,50	hour	2.465,64		3.698,47	
d	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,75	hour	177,08		132,81	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	1,00	hour	125,00		125,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	1,25	hour	125,00		156,25	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = h]	4,000	hour	330,59			1.322,36
h	Installation time including holdbacktime of Working platform	4,000	hour				
Subsum	Installation cost of yielding element per advance [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				81.062,50	4.969,80	1.322,36
Sum	Installation cost of yielding element per meter [Equation = subsum/(2*a)]				32.425,00	1.987,92	528,94
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						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	0,87	sqm				
c	Estimated construction time of foundation per formblock	1,25	hour				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+d)]	11,13	cum	4.818,64	53.635,04		
d	Concrete loss	0,02	%/100				
Mat-011	Electricity	15,63	kWh	7,50	117,19		
e	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump	1,25	hour	865,83	1.082,28		
Mat-026	Additional material formwork [Equation = a*b]	10,91	cum	72,00	785,70		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f*8]	1,25	hour	3.429,09		4.286,37	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	8,75	hour	2.465,64		21.574,39	
g	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	3,75	hour	177,08		664,06	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i*8]	3,75	hour	125,00		468,75	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j*8]	5,00	hour	125,00		625,00	
j	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Costs for machinery included in tunnel vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				55.620,21	27.618,57	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.096,93	2.530,91	-
D10102	Inner lining of tunnel - invert						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	9,50	sqm				
c	Estimated construction time of foundation per formblock	10,00	hour				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+d)]	121,13	cum	4.818,64	583.657,33		
d	Concrete loss	0,02	%/100				
Mat-011	Electricity	125,00	kWh	7,50	937,50		
e	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump	10,00	hour	865,83	8.658,26		
Mat-026	Additional material formwork [Equation = a*b]	118,75	cum	72,00	8.550,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f*8]	10,00	hour	3.429,09		34.290,95	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	70,00	hour	2.465,64		172.595,14	
g	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	30,00	hour	177,08		5.312,50	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i*8]	30,00	hour	125,00		3.750,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j*8]	40,00	hour	125,00		5.000,00	
j	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Costs for machinery included in tunnel vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				601.803,09	220.948,59	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.067,82	1.860,62	-
D10103	Inner lining of tunnel & niches - vault with radial formwork						
D1010301	with thickness of 30 cm						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	9,07	sqm				
c	Thickness of concrete lining	0,30	meter				
d	Estimated construction time per formwork block	1,75	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	115,64	cum	4.818,64	557.239,16		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	21,88	kWh	7,50	164,06		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = d*8]	14,00	hour	865,83	12.121,56		
Mat-049	Injection material for tunnel crown injection [Equation = a*b]	113,38	cum	68,11	7.721,97		
Mat-026	Additional material formwork [Equation = a*b]	113,38	cum	72,00	8.163,00		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-003	Foreman specialist [Equation = d*g*8]	14,00	hour	3.429,09		48.007,33	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*h*8]	98,00	hour	2.465,64		241.633,20	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*i*8]	42,00	hour	177,08		7.437,50	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*j*8]	42,00	hour	125,00		5.250,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*k*8]	56,00	hour	125,00		7.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = l*m]	84,00	hour	777,88			65.342,32
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = d*24]	42,00	hour				
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				585.409,76	309.328,03	65.342,32
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.163,48	2.728,36	576,34
D1010302	with thickness of 40 cm						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	11,77	sqm				
c	Thickness of concrete lining	0,30	meter				
d	Estimated construction time per formwork block	1,75	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	150,07	cum	4.818,64	723.120,72		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	21,88	kWh	7,50	164,06		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = d*8]	14,00	hour	865,83	12.121,56		
Mat-049	Injection material for tunnel crown injection [Equation = a*b]	147,13	cum	68,11	10.020,68		
Mat-026	Additional material formwork [Equation = a*b]	147,13	cum	72,00	10.593,00		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = d*g*8]	14,00	hour	3.429,09		48.007,33	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*h*8]	98,00	hour	2.465,64		241.633,20	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*i*8]	42,00	hour	177,08		7.437,50	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*j*8]	42,00	hour	125,00		5.250,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*k*8]	56,00	hour	125,00		7.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = l*m]	84,00	hour	777,88			65.342,32
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = d*24]	42,00	hour				
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				756.020,03	309.328,03	65.342,32
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.138,62	2.102,48	444,13
D10104	Inner lining tunnel ceiling and ventilation wall						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	3,77	sqm				
c	Thickness of concrete lining	0,25	meter				
d	Estimated construction time per formwork block	1,75	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	48,03	cum	4.818,64	231.435,49		
e	Concrete loss	0,02	%/100				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-011	Electricity	21,88	kWh	7,50	164,06		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = d*8]	14,00	hour	865,83	12.121,56		
Mat-026	Additional material formwork [Equation = a*b]	47,09	cum	72,00	3.390,30		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = d*g*8]	14,00	hour	3.429,09		48.007,33	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*h*8]	56,00	hour	2.465,64		138.076,12	
h	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*i*8]	42,00	hour	177,08		7.437,50	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*j*8]	42,00	hour	125,00		5.250,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*k*8]	56,00	hour	125,00		7.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = l*m]	84,00	hour	777,88			65.342,32
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = d*24]	42,00	hour				
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				247.111,42	205.770,94	65.342,32
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.247,92	4.369,97	1.387,68
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						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	2,36	sqm				
c	Estimated construction time per formwork block	1,50	hours				
MAT	Material						
Mat-008	Concrete C12/15 (mixing on site) [Equation = a*b*(1+d)]	30,09	cum	4.103,19	123.464,88		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	4,50	hour	2.465,64		11.095,40	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	3,00	hour	177,08		531,25	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = c*h]	4,50	hour	125,00		562,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	1,50	hour	125,00		187,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in concrete cost vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				123.464,88	12.376,65	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				4.185,25	419,55	-
D10202	Binding concrete in tunnel						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	0,42	sqm				
c	Estimated construction time per formwork block	0,50	hours				
MAT	Material						
Mat-008	Concrete C12/15 (mixing on site) [Equation = a*b*(1+d)]	5,36	cum	4.103,19	21.972,56		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	-	hour	3.429,09		-	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	1,50	hour	2.465,64		3.698,47	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	1,00	hour	177,08		177,08	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = c*h]	1,50	hour	125,00		187,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	0,50	hour	125,00		62,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in concrete cost vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				21.972,56	4.125,55	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				4.185,25	785,82	-
D103	No-fines porous concrete in tunnel						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	0,26	sqm				
c	Estimated construction time per formwork block	0,50	hours				
MAT	Material						
Mat-007	No fines concrete (mixing on site) [Equation = a*b*(1+d)]	3,37	cum	4.699,59	15.818,82		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	1,50	hour	2.465,64		3.698,47	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	1,00	hour	177,08		177,08	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = c*h]	1,50	hour	125,00		187,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	0,50	hour	125,00		62,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in concrete cost vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				15.818,82	4.125,55	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				4.793,58	1.250,17	-
D104	Reinforcement for inner lining						
D10401	Reinforcement for inner lining - foundation						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	0,87	sqm				
c	Estimated construction time of foundation per formblock	1,25	hour				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = a*b*d*(1+e)]	1,15	tonne	52.000,00	59.582,25		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = a*b]	10,91	cum	72,00	785,70		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	5,00	hour	2.465,64		12.328,22	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	2,50	hour	177,08		442,71	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	3,75	hour	125,00		468,75	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	3,75	hour	125,00		468,75	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				60.367,95	13.708,43	-

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Reinforcement cost per tonne [Equation = $\text{subsum}/(b*a)$]				52.685,71	11.963,94	-
D10402	Reinforcement for inner lining - invert						
a	Length of formwork block	12,50	meter				
b	Area of invert cross section	9,50	sqm				
c	Estimated construction time of foundation per formblock	8,00	hour				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = $a*b*d*(1+e)$]	12,47	tonne	52.000,00	648.375,00		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = $a*b$]	118,75	cum	72,00	8.550,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*f$]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*g$]	32,00	hour	2.465,64		78.900,64	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*h$]	16,00	hour	177,08		2.833,33	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $d*i$]	24,00	hour	125,00		3.000,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*j$]	24,00	hour	125,00		3.000,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				656.925,00	87.733,97	-
Sum	Reinforcement cost per tonne [Equation = $\text{subsum}/(b*a)$]				52.685,71	7.036,31	-
D10403	Reinforcement for inner lining - vault						
a	Length of formwork block	12,50	meter				
b	Area of vault cross section	9,07	sqm				
c	Estimated construction time of foundation per formblock	1,75	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = $a*b*d*(1+e)$]	11,90	tonne	52.000,00	619.027,50		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = $a*b$]	113,38	cum	72,00	8.163,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*f*8$]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*g*8$]	56,00	hour	2.465,64		138.076,12	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*h*8$]	28,00	hour	177,08		4.958,33	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $d*i*8$]	42,00	hour	125,00		5.250,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*j*8$]	42,00	hour	125,00		5.250,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				627.190,50	153.534,45	-
Sum	Reinforcement cost per tonne [Equation = $\text{subsum}/(b*a)$]				52.685,71	12.897,31	-
D10404	Reinforcement for inner lining tunnel ceiling and ventilation wall						
a	Length of formwork block	12,50	meter				
b	Area of vault cross section	3,77	sqm				
c	Estimated construction time of foundation per formblock	1,75	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = $a*b*d*(1+e)$]	4,94	tonne	52.000,00	257.097,75		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = $a*b$]	47,09	cum	72,00	3.390,30		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*f*8$]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	56,00	hour	2.465,64		138.076,12	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	28,00	hour	177,08		4.958,33	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i*8]	42,00	hour	125,00		5.250,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j*8]	42,00	hour	125,00		5.250,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				260.488,05	153.534,45	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				52.685,71	31.053,52	-
D105	Concrete tests						
a	Estimated costs of concrete tests including all labour and machinery	1,00	lump sum	116.024.959,31			116.024.959,31
Sum	Costs for concrete tests						116.024.959,31
SCHEDULE - E INSTRUMENTATION AND MONITORING							
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.						
MAT	Material						
Mat-070	3D monitoring targets	1,00	pcs	275,90	275,90		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for 3D monitoring targets each [Equation = sum(MAT; LAB; MAC)]				275,90	-	-
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.						
MAT	Material						
Mat-071	Borehole extensometer	1,00	pcs	12.579,49	12.579,49		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for borehole extensometer each [Equation = sum(MAT; LAB; MAC)]				12.579,49	-	-
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.						
MAT	Material						
Mat-072	Load cells	1,00	pcs	31.484,50	31.484,50		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for load cells each [Equation = sum(MAT; LAB; MAC)]				31.484,50	-	-
E104	Supply, install, read and maintain of strain gauges for shotcrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
MAT	Material						
Mat-073	Strain gauges	1,00	pcs	4.230,90	4.230,90		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for strain gauges each [Equation = sum(MAT; LAB; MAC)]				4.230,90	-	-
E105	Supply, install, read and maintain of strain gauges for concrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
MAT	Material						
Mat-073	Strain gauges	1,00	pcs	4.230,90	4.230,90		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for strain gauges each [Equation = sum(MAT; LAB; MAC)]				4.230,90	-	-
E106	Supply, install, read and maintain of radial pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
MAT	Material						
Mat-074	Pressure cells	1,00	pcs	31.594,50	31.594,50		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for radial pressure cells each [Equation = sum(MAT; LAB; MAC)]				31.594,50	-	-
E107	Supply, install, read and maintain of tangential pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
MAT	Material						
Mat-074	Pressure cells	1,00	pcs	31.594,50	31.594,50		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for tangential pressure cells each [Equation = sum(MAT; LAB; MAC)]				31.594,50	-	-
E108	Supply, install, read and maintain of temperature gauges as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
MAT	Material						
Mat-075	Temperature gauges	1,00	pcs	1.860,90	1.860,90		
LAB	Labour						
#	Labour for installation is included in excavation costs						
#	Labour for Monitoring is included in time-dependent costs						
MAC	Machinery						
#	Machinery for installation is included in excavation costs						
#	Machinery for monitoring is included in time-dependent costs						
Sum	Costs for temperature gauges each [Equation = sum(MAT; LAB; MAC)]				1.860,90	-	-
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.						
a	Block length	12,50	meter				
b	Width of pavement	8,50	meter				
c	Thickness of layer	0,30	meter				
d	Estimated construction time per block length	2,00	hour				
MAT	Material						
Mat-051	Granular sub-base material [Equation = a*b*c]	31,88	cum	1.191,93	37.992,61		
Mat-052	Gasoline for vibratory soil compactor	2,00	hour	865,83	1.731,65		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-053	Gasoline for grader	2,00	hour	865,83	1.731,65		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*f]	6,00	hour	2.465,64		14.793,87	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*g]	4,00	hour	177,08		708,33	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*h]	4,00	hour	125,00		500,00	
h	Number of Mate	2,00	pcs				
Lab-021	Mazdoor [Equation = d*i]	6,00	hour	125,00		750,00	
i	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Supplying Machinery is included in time-dependent costs						
Mac-052	Vibratory soil compactor	0,25	day	15.497,30			3.874,32
Mac-051	Grader	0,25	day	25.075,83			6.268,96
Subsum	Construction cost of sub base layer per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				41.455,91	16.752,20	10.143,28
Sum	Construction cost of sub base per cum [Equation = subsum/(a*b)]				1.300,58	525,56	318,22
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.						
a	Block length	12,50	meter				
b	Width of pavement	8,50	meter				
c	Thickness of layer	0,05	meter				
d	Estimated construction time per block length	2,00	hour				
MAT	Material						
Mat-008	Concrete C12/15 (mixing on site) [Equation = a*b*c]	5,31	cum	4.103,19	21.798,18		
Mat-050	Gasoline for concrete pump	0,25	hour	865,83	216,46		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*f]	6,00	hour	2.465,64		14.793,87	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*g]	4,00	hour	177,08		708,33	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*h]	4,00	hour	125,00		500,00	
h	Number of Mate	2,00	pcs				
Lab-021	Mazdoor [Equation = d*i]	6,00	hour	125,00		750,00	
i	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Supplying Machinery is included in time-dependent costs						
Mac-007	Concrete Pump	0,25	day	18.669,23			4.667,31
Subsum	Construction cost of dry lean cement concrete base layer per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				22.014,63	16.752,20	4.667,31
Sum	Construction cost of dry lean cement concrete base layer per sqm [Equation = subsum/(a*b)]				207,20	157,67	43,93
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.						
a	Block length	12,50	meter				
b	Width of pavement	8,50	meter				
c	Thickness of layer	0,22	meter				
d	Estimated construction time per block length	4,00	hour				
MAT	Material						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-010	Concrete C30/37 (mixing on site) for cement concrete pavement [Equation = (a+b+c+d+e)/75] [Equation = a*b*c]	23,38	cum	5.263,74	123.039,83		
Mat-050	Gasoline for concrete pump	8,00	hour	865,83	6.926,61		
Mat-055	Dowel rods and tie bars for concrete pavement	0,23	tonne	57.893,50	13.532,61		
e	Required dowels and tie rods for concrete pavement	0,01	tonne/cum				
Mat-054	Gasoline for paver	4,00	hour	1.731,65	6.926,61		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	4,00	hour	3.429,09		13.716,38	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	24,00	hour	2.465,64		59.175,48	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	8,00	hour	177,08		1.416,67	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	8,00	hour	125,00		1.000,00	
i	Number of Mate	2,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	12,00	hour	125,00		1.500,00	
j	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Supplying Machinery is included in time-dependent costs						
Mac-007	Concrete Pump[Equation = k*d/8]	1,00	day	18.669,23			18.669,23
k	Number of concrete pumps per concrete section	2,00	pcs				
Mac-048	Paver 8.0 m	0,50	day	36.067,65			18.033,83
Mac-049	Joint cutting equipment	0,50	day	2.080,76			1.040,38
Mac-050	Bolt setting equipment	0,50	day	2.489,99			1.244,99
Subsum	Construction cost of concrete pavement per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				150.425,65	76.808,52	38.988,43
Sum	Construction cost of concrete pavement per sqm [Equation = subsum/(a*b)]				1.415,77	722,90	366,95
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.						
a	Block length	12,50	meter				
b	Width of pavement	1,00	meter				
c	Thickness of layer pre-cast footpath element	0,15	meter				
d	Estimated construction time per block length	4,00	hour				
e	Thickness of mastic asphalt layer	0,02	meter				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*c*2]	3,75	cum	4.818,64	18.069,89		
Mat-027	Reinforcement grade S550	0,19	tonne	52.257,21	9.798,23		
e	Estimated reinforcement grade	0,05	tonne/cum				
Mat-056	Mastic asphalt [Equation = a*b*e*2]	0,50	cum	5.327,37	2.663,69		
Mat-054	Gasoline for paver	4,00	hour	1.731,65	6.926,61		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	16,00	hour	2.465,64		39.450,32	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	8,00	hour	177,08		1.416,67	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	8,00	hour	125,00		1.000,00	
i	Number of Mate	2,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	12,00	hour	125,00		1.500,00	
j	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Mucking Machinery is included in time-dependent costs						
Mac-047	Small paver 1.0 - 2.0m	0,50	day	5.649,72			2.824,86
Subsum	Construction cost of sub base layer per block length				37.458,41	43.366,99	2.824,86
Sum	Construction cost of sub base per sqm				1.498,34	1.734,68	112,99
BILL 2 - CIVIL ENGINEERING EGRESS TUNNEL							

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
SCHEDULE - G DEWATERING ARRANGEMENT							
SCHEDULE - G1 Temporary Dewatering Arrangement Tunnel							
G101	Care of water in max 3.0% downwards drives						
a	Costs for Item A101				30.479.862,79		
Sum	Temporary dewatering cost				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						
a	Block length	12,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						
Mat-029	PVC or PP drainage pipe Ø250mm [Equation = a]	12,50	meter	1.243,01	15.537,59		
Mat-031	Drainage Material	1,00	cum	1.021,65	1.021,65		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	0,75	hour	2.465,64		1.849,23	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,50	hour	177,08		88,54	
e	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*f]	0,75	hour	125,00		93,75	
f	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,25	hour	125,00		31,25	
g	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				16.559,24	2.062,78	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				1.324,74	165,02	-
G20102	400 mm internal diameter PVC pipe						-
a	Construction Length	12,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						
Mat-030	PVC or PP drainage pipe Ø400mm [Equation = a]	12,50	meter	3.776,70	47.208,74		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	1,00	hour	2.465,64		2.465,64	
d	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,75	hour	177,08		132,81	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	1,00	hour	125,00		125,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	1,25	hour	125,00		156,25	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				47.208,74	2.879,71	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				3.776,70	230,38	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	0,26	day				
c	Tunnel perimeter from egress tunnel cross section	17,34	meter				
MAT	Material						
Mat-047	Dimpled sheets [Equation = a*c*(1+d)]	227,60	sqm	323,52	73.633,78		
d	Cut offs	0,05	%/100				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = $b \cdot e \cdot 8$]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $b \cdot f \cdot 8$]	6,30	hour	2.465,64		15.533,56	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $b \cdot g \cdot 8$]	4,20	hour	177,08		743,75	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $b \cdot h \cdot 8$]	6,30	hour	125,00		787,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $b \cdot i \cdot 8$]	2,10	hour	125,00		262,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of dimpled sheet per block length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				73.633,78	17.327,31	-
Sum	Installation cost of dimpled sheet per sqm [Equation = $\text{subsum}/a \cdot c$]				339,70	79,94	-
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						
a	Construction length	10,00	meter				
b	Estimated construction time	0,50	hour				
MAT	Material						
Mat-076	Strip drain 200 mm x 25 mm [Equation = $a \cdot (1+d)$]	10,50	sqm	140,00	1.470,00		
c	Cut offs	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $b \cdot d$]	-	hour	3.429,09		-	
d	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $b \cdot e$]	1,50	hour	2.465,64		3.698,47	
e	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $b \cdot f$]	1,00	hour	177,08		177,08	
f	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $b \cdot g$]	1,50	hour	125,00		187,50	
g	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $b \cdot h$]	0,50	hour	125,00		62,50	
h	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of dimpled sheet per block length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				1.470,00	4.125,55	-
Sum	Installation cost of strip drain per meter [Equation = subsum/a]				147,00	412,56	-
G20302	Strip drain 200 mm x 40 mm						
a	Construction length	10,00	meter				
b	Estimated construction time	0,50	hour				
MAT	Material						
Mat-077	Strip drain 200 mm x 40 mm [Equation = $a \cdot (1+d)$]	10,50	sqm	190,00	1.995,00		
c	Cut offs	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $b \cdot d$]	-	hour	3.429,09		-	
d	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $b \cdot e$]	1,50	hour	2.465,64		3.698,47	
e	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $b \cdot f$]	1,00	hour	177,08		177,08	
f	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $b \cdot g$]	1,50	hour	125,00		187,50	
g	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $b \cdot h$]	0,50	hour	125,00		62,50	
h	Number of Mazdoor	1,00	pcs				
MAC	Machinery						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of dimpled sheet per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.995,00	4.125,55	-
Sum	Installation cost of strip drain per meter [Equation = subsum/a]				199,50	412,56	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	0,44	day				
c	Tunnel perimeter from main tunnel cross section	17,34	meter				
MAT	Material						
Mat-037	Protective felt [Equation = a*c*(1+d)]	227,60	sqm	119,19	27.128,23		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	10,50	hour	2.465,64		25.889,27	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	7,00	hour	177,08		1.239,58	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	10,50	hour	125,00		1.312,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	3,50	hour	125,00		437,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of protective felt per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				27.128,23	28.878,85	-
Sum	Installation cost of protective felt per sqm [Equation = subsum/(a*c)]				125,15	133,23	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	1,31	day				
c	Tunnel perimeter from main tunnel cross section	17,34	meter				
MAT	Material						
Mat-038	Water proofing membrane [Equation = a*c*(1+d)]	227,60	sqm	357,58	81.384,70		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	31,50	hour	2.465,64		77.667,81	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	21,00	hour	177,08		3.718,75	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	31,50	hour	125,00		3.937,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	10,50	hour	125,00		1.312,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of water proofing per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				81.384,70	86.636,56	-
Sum	Installation cost of water proofing per sqm [Equation = subsum/(a*c)]				375,46	399,69	-
G206	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)						
a	Block length	12,50	meter				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
b	Estimated construction time	0,50	hour				
MAT	Material						
Mat-039	Water stop [Equation = $a*2*(1+c)$]	26,25	meter	357,58	9.386,41		
c	Cut offs	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $b*d$]	-	hour	3.429,09		-	
d	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $b*e$]	1,50	hour	2.465,64		3.698,47	
e	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $b*f$]	1,00	hour	177,08		177,08	
f	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $b*g$]	1,50	hour	125,00		187,50	
g	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $b*h$]	4,00	hour	125,00		500,00	
h	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of water stop per block length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				9.386,41	4.563,05	-
Sum	Installation cost of water stop per meter [Equation = $\text{subsum}/(a*2)$]				375,46	182,52	-
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						
a	Estimated construction time	0,50	hour				
MAT	Material						
Mat-041	Cleaning and inspection chamber DN600 PP or PE-HD for DN250	1,00	pcs	17.027,50	17.027,50		
Mat-043	Telescope chamber for inspection chamber	1,00	pcs	6.129,90	6.129,90		
Mat-044	Sealing ring	1,00	pcs	2.179,52	2.179,52		
Mat-046	Inspection chamber iron cover class D	1,00	pcs	19.888,12	19.888,12		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $a*b$]	-	hour	3.429,09		-	
b	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $a*c$]	1,50	hour	2.465,64		3.698,47	
c	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $a*d$]	1,00	hour	177,08		177,08	
d	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $a*e$]	1,50	hour	125,00		187,50	
e	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $a*f$]	4,00	hour	125,00		500,00	
f	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Sum	Installation cost of protective felt per sqm [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				45.225,04	4.563,05	-
G20702	Cleaning and Inspection chamber for DN400						
a	Estimated construction time	0,50	hour				
MAT	Material						
Mat-042	Cleaning and inspection chamber DN600 PP or PE-HD for DN400	1,00	pcs	19.411,35	19.411,35		
Mat-043	Telescope chamber for inspection chamber	1,00	pcs	6.129,90	6.129,90		
Mat-044	Sealing ring	1,00	pcs	2.179,52	2.179,52		
Mat-046	Inspection chamber iron cover class D	1,00	pcs	19.888,12	19.888,12		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $a*b$]	-	hour	3.429,09		-	
b	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $a*c$]	1,50	hour	2.465,64		3.698,47	
c	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $a*d$]	1,00	hour	177,08		177,08	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
d	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = a*e]	1,50	hour	125,00		187,50	
e	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = a*f]	4,00	hour	125,00		500,00	
f	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Sum	Installation cost of protective felt per sqm [Equation = sum(MAT); sum(LAB); sum(MAC)]				47.608,89	4.563,05	-
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						
a	Area of top heading excavation in cross section	35,08	sqm				
b	Round length top heading	3,50	meter				
c	Cycle time top heading Support Category A	12,00	hour				
d	Estimated excavation time per cycle	10,00	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	122,78	cum	453,67	55.701,74		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/l*(i*1000)]	2,94	hour	2.615,08	7.679,05		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*i]	196,45	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	122,78	cum	70,00	8.594,60		
Mat-011	Electricity [Equation = m*a*b]	1.227,80	kWh	7,50		9.208,50	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	10,00	hour	3.429,09		34.274,29	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	59,97	hour	2.465,64		147.866,84	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	29,99	hour	177,08		5.309,92	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	39,98	hour	125,00		4.997,57	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	49,98	hour	125,00		6.246,96	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	10,97	hour	6.089,81			66.821,17
s	Excavation time including hold-back time [Equation = d+c*0,08]	10,97	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 3,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				72.656,50	207.904,09	161.548,67
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				591,76	1.693,31	1.315,76
H10102	Excavation in Support Category B; top heading, bench, invert						
H1010201	Top heading						
a	Area of top heading excavation in cross section	35,82	sqm				
b	Round length top heading	2,50	meter				
c	Cycle time top heading Support Category B	12,00	hour				
d	Estimated excavation time per cycle	8,65	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	89,56	cum	453,67	40.629,20		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	2,28	hour	2.615,08	5.954,96		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	143,29	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	89,56	cum	70,00	6.268,96		
Mat-011	Electricity [Equation = m*a*b]	895,57	kWh	7,50		6.716,74	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	8,65	hour	3.429,09		29.669,45	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	51,91	hour	2.465,64		128.000,54	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	25,96	hour	177,08		4.596,52	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	34,61	hour	125,00		4.326,13	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	43,26	hour	125,00		5.407,67	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	9,94	hour	6.089,81			60.559,15
s	Excavation time including hold-back time [Equation = d*c*0,11]	9,94	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				53.534,22	178.717,04	155.286,64
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				597,77	1.995,58	1.733,95
H10103	Excavation in Support Category C; top heading, bench, invert						
H1010301	Top heading						
a	Area of top heading excavation in cross section	36,63	sqm				
b	Round length top heading	1,75	meter				
c	Cycle time top heading Support Category C	12,00	hour				
d	Estimated excavation time per cycle	5,11	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	64,10	cum	453,67	29.079,71		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-003	Gasoline for dumper [Equation = $\text{Mat-002} + k/l \cdot h / (i \cdot 1000)$]	1,77	hour	2.615,08	4.633,86		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e / (f \cdot 2) + g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a \cdot b \cdot j$]	102,56	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a \cdot b$]	64,10	cum	70,00	4.486,91		
Mat-011	Electricity [Equation = $m \cdot a \cdot b$]	640,99	kWh	7,50		4.807,40	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d \cdot n$]	5,11	hour	3.429,09		17.508,27	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d \cdot o$]	30,63	hour	2.465,64		75.534,55	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d \cdot p$]	15,32	hour	177,08		2.712,46	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $d \cdot q$]	20,42	hour	125,00		2.552,90	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $d \cdot r$]	25,53	hour	125,00		3.191,13	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	7,63	hour	6.089,81			46.458,67
s	Excavation time including hold-back time [Equation = $d + c \cdot 0,21$]	7,63	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = $t \cdot u$]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = $v \cdot w$]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,75 m [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				38.881,57	106.306,70	141.186,16
Sum	Excavation cost per cum [Equation = $\text{subsum} / (a \cdot b)$]				606,59	1.658,49	2.202,64
H10104	Excavation in Support Category D; top heading, bench, invert						
H1010401	Top heading						
a	Area of top heading excavation in cross section	39,05	sqm				
b	Round length top heading	1,25	meter				
c	Cycle time top heading Support Category D	12,00	hour				
d	Estimated excavation time per cycle	3,72	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = $a \cdot b$]	48,82	cum	453,67	22.147,09		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = $\text{Mat-002} + k/l \cdot h / (i \cdot 1000)$]	1,47	hour	2.615,08	3.840,86		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e / (f \cdot 2) + g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a \cdot b \cdot j$]	78,11	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a \cdot b$]	48,82	cum	70,00	3.417,23		
Mat-011	Electricity [Equation = $m \cdot a \cdot b$]	488,18	kWh	7,50		3.661,31	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d \cdot n$]	3,72	hour	3.429,09		12.754,93	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	22,32	hour	2.465,64		55.027,59	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	11,16	hour	177,08		1.976,05	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	14,88	hour	125,00		1.859,81	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	18,60	hour	125,00		2.324,76	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	5,84	hour	6.089,81			35.583,34
s	Excavation time including hold-back time [Equation = d+c*0,18]	5,84	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,25 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				30.086,28	77.604,46	130.310,83
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				616,30	1.589,69	2.669,35
H1010402	Invert						
a	Area of invert excavation in cross section	12,36	sqm				
b	Round length invert	2,50	meter				
c	Cycle time invert Support Category D	12,00	hour				
d	Estimated excavation time per cycle	3,72	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	30,90	cum	453,67	14.020,48		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	1,11	hour	2.615,08	2.911,29		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	49,45	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	30,90	cum	70,00	2.163,32		
Mat-011	Electricity [Equation = m*a*b]	309,05	kWh	7,50		2.317,84	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	3,72	hour	3.429,09		12.754,93	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	22,32	hour	2.465,64		55.027,59	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	11,16	hour	177,08		1.976,05	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	14,88	hour	125,00		1.859,81	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	18,60	hour	125,00		2.324,76	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	0,66	hour	6.089,81			4.008,37
s	Excavation time including hold-back time [Equation = d+c*0,18]	0,66	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	3,72	hour	1.674,56			6.228,73
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	3,72	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				19.776,19	76.260,99	84.869,88
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				639,91	2.467,63	2.746,20
H10105	Excavation in Support Category E; top heading, bench, invert						
H1010501	Top heading						
a	Area of top heading excavation in cross section	39,83	sqm				
b	Round length top heading	1,25	meter				
c	Cycle time top heading Support Category E	12,00	hour				
d	Estimated excavation time per cycle	3,49	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	49,79	cum	453,67	22.589,42		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	1,49	hour	2.615,08	3.891,46		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	79,67	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	49,79	cum	70,00	3.485,48		
Mat-011	Electricity [Equation = m*a*b]	497,93	kWh	7,50		3.734,44	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	3,49	hour	3.429,09		11.981,65	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	20,96	hour	2.465,64		51.691,46	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	10,48	hour	177,08		1.856,25	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	13,98	hour	125,00		1.747,06	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	17,47	hour	125,00		2.183,82	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,15	hour	6.089,81			37.464,89
s	Excavation time including hold-back time [Equation = d+c*0,22]	6,15	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,25 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				30.647,46	73.194,67	132.192,39
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				615,50	1.469,99	2.654,87
H1010502	Invert						
a	Area of invert excavation in cross section	12,86	sqm				
b	Round length invert	2,50	meter				
c	Cycle time invert Support Category E	12,00	hour				
d	Estimated excavation time per cycle	3,49	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	32,15	cum	453,67	14.583,94		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	1,64	hour	2.615,08	4.283,28		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e/(f*2)+g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a*b*i$]	51,43	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a*b$]	32,15	cum	70,00	2.250,26		
Mat-011	Electricity [Equation = $m*a*b$]	321,47	kWh	7,50		2.410,99	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*n$]	3,49	hour	3.429,09		11.981,65	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*o$]	20,96	hour	2.465,64		51.691,46	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*p$]	10,48	hour	177,08		1.856,25	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $d*q$]	13,98	hour	125,00		1.747,06	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $d*r$]	17,47	hour	125,00		2.183,82	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	6,15	hour	6.089,81			37.464,89
s	Excavation time including hold-back time [Equation = $d+c*0,22$]	6,15	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = $t*u$]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = $v*w$]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				22.479,68	71.871,22	132.192,39
Sum	Excavation cost per cum [Equation = $\text{subsum}/(a*b)$]				699,29	2.235,74	4.112,19
H10106	Excavation in Support Category F; top heading, bench, invert						
H1010601	Top heading						
a	Area of top heading excavation in cross section	47,36	sqm				
b	Round length top heading	1,25	meter				
c	Cycle time top heading Support Category F	12,00	hour				
d	Estimated excavation time per cycle	3,88	hour				
MAT	Material						
Mat-023	Explosive including detonator and accessories for excavation with tunnel excavator [Equation = $a*b$]	59,20	cum	69,01	4.085,51		
Mat-002	Gasoline for wheel loader	0,50	hour	1.362,20	681,10		
Mat-003	Gasoline for dumper [Equation = $\text{Mat-002}+k/(i*1000)$]	1,67	hour	2.615,08	4.379,73		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = $e/(f*2)+g$]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = $a*b*i$]	94,72	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = $a*b$]	59,20	cum	70,00	4.144,11		
Mat-011	Electricity [Equation = $m*a*b$]	592,02	kWh	7,50		4.440,11	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
Mat-024	Gasoline for tunnel excavator [Equation = d]	3,88	hour	1.294,09	5.020,18		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*n$]	3,88	hour	3.429,09		13.302,54	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	23,28	hour	2.465,64		57.390,09	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	11,64	hour	177,08		2.060,89	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	15,52	hour	125,00		1.939,66	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	19,40	hour	125,00		2.424,57	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	12,00	hour	6.089,81			73.077,72
s	Excavation time including hold-back time [Equation = c]	12,00	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Mac-006	Tunnel excavator [Equation = x*y]	12,00	hour	3.262,22			39.146,60
x	Number of tunnel excavator	1,00	pcs				
y	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 1,25 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				18.310,62	81.557,86	206.951,81
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				309,29	1.377,63	3.495,72
H1010602	Invert						
a	Area of invert excavation in cross section	13,60	sqm				
b	Round length invert	2,50	meter				
c	Cycle time invert Support Category F	12,00	hour				
d	Estimated excavation time per cycle	3,88	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	34,00	cum	453,67	15.426,63		
Mat-002	Gasoline for wheel loader	1,00	hour	1.362,20	1.362,20		
Mat-003	Gasoline for dumper [Equation = Mat-002+k/(i*1000)]	1,67	hour	2.615,08	4.379,68		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = e/(f*2)+g]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Excavation material [Equation = a*b*j]	54,41	cum				
l	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	34,00	cum	70,00	2.380,28		
Mat-011	Electricity [Equation = m*a*b]	340,04	kWh	7,50		2.550,30	
m	Estimated electricity per cum excavation	10,00	kWh/cum				
Mat-024	Gasoline for tunnel excavator [Equation = d]	3,88	hour	1.294,09	5.020,18		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	3,88	hour	3.429,09		13.302,54	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	23,28	hour	2.465,64		57.390,09	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	11,64	hour	177,08		2.060,89	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	15,52	hour	125,00		1.939,66	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	19,40	hour	125,00		2.424,57	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	12,00	hour	6.089,81			73.077,72

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
s	Excavation time including hold-back time [Equation = c]	12,00	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	12,00	hour	1.674,56			20.094,71
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	12,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	48,00	hour	1.554,85			74.632,78
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	12,00	hour				
Mac-006	Tunnel excavator [Equation = x*y]	12,00	hour	3.262,22			39.146,60
x	Number of tunnel excavator	1,00	pcs				
y	Excavation time including hold-back time	12,00	hour				
Subsum	Excavation cost per 2,5 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				28.568,97	79.668,04	206.951,81
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				840,17	2.342,90	6.086,10
H102	Underground excavation for cross passages for pedestrian use without rock mass classification						
Sum	Mean rate of excavation rates of all Support Categories for Egress Tunnel [Equation = (H1010101 + H1010201 + H1010301 + H1010401 + H1010402 + H1010501 + H1010502 + H1010601 + H1010602)/9]				551,66	1.683,10	2.701,68
H103	Mucking of geological overbreak accepted by Employer's Representative as per Technical Specifications						
a	Volume of excavation material	9,38	cum				
MAT	Material						
Mat-002	Gasoline for wheel loader	0,15	hour	1.362,20	204,33		
Mat-003	Gasoline for dumper [Equation = Mat-002+a/h*g/(e*1000)]	0,34	hour	2.615,08	878,77		
b	Mined tunnel length	14.083,00	meter				
c	Number of excavation faces	4,00	pcs				
d	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
e	Average transport length [Equation = b/(c*2)+d]	1.860,38	meter				
f	Average driving speed	10,00	km/hour				
g	Loosening factor of material	1,60	-				
h	Loading capacity dumper	15,00	cum				
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a]	9,38	cum	70,00	656,25		
Mat-011	Electricity [Equation = i*a]	93,75	kWh	7,50		703,13	
i	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = u*i]	0,15	hour	3.429,09		514,36	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = u*k]	0,90	hour	2.465,64		2.219,08	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = u*l]	0,45	hour	177,08		79,69	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = u*m]	0,60	hour	125,00		75,00	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = u*n]	0,75	hour	125,00		93,75	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = o]	0,15	hour	6.089,81			913,47
o	Hold back time [Equation = u]	0,15	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = p*q]	0,15	hour	1.674,56			251,18
p	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
q	Loading time	0,15	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = r*s]	0,60	hour	1.554,85			932,91
r	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
s	Loading time	0,15	hour				
Subsum	Mucking costs per 9,375 cum [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.739,35	3.685,01	2.097,57
Sum	Mucking of geological overbreak cost per cum [Equation = subsum/a]				185,53	393,07	223,74
H104	Additional underground excavation as directed by Employer's Representative without rock mass classification.						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Mean rate of excavation rates of all Support Categories for Egress Tunnel [Equation = (H1010101 + H1010201 + H1010301 + H1010401 + H1010402 + H1010501 + H1010502 + H1010601 + H1010602)/9]				551,66	1.683,10	2.701,68
H105	Additional payment for extra transportation of excavation material to the muck deposit area as per approved drawings & Technical Specifications.						
a	Volume of muck transporter	7,00	cum				
b	Mean length of additional transportation	15,00	km				
c	Loading & unloading time	7,50	min				
d	Average driving speed	30,00	km/hour				
MAT	Material						
Mat-003	Gasoline for dumper [Equation = 2*(c/60+b/d)]	1,25	hour	2.642,09	3.302,61		
LAB	Labour						
Lab-007	Skilled unproductive personell [Equation = 2*(c/60+b/d)]	1,25	hour	2.465,64		3.082,06	
MAC	Machinery						
Mac-059	Truck dumper [Equation = 2*(c/60+b/d)]	1,25	hour	1.232,51			1.540,63
Subsum	Costs for extra transportation of material per load and 15 km [Equation = sum(MAT); sum(LAB); sum(MAC)]				3.302,61	3.082,06	1.540,63
Sum	Costs for extra transportation of material per cum and km [Equation = subsum/(a*b)]				31,45	29,35	14,67
H106	Re-profiling of tunnel due to deformations						
a	Time for reprofiling	0,50	hour				
b	Length of reprofiling section	4,00	meter				
c	Mean excavation perimeter top heading	15,90	meter				
d	Estimated excavation material [Equation = c*0,5]	7,95	cum				
Mat-002	Gasoline for wheel loader	0,15	hour	1.362,20	204,33		
Mat-003	Gasoline for dumper [Equation = Mat-002+d/(k*(i*1000))]	0,31	hour	2.615,08	804,90		
e	Mined tunnel length	14.083,00	meter				
f	Number of excavation faces	4,00	pcs				
g	Estimated distance between mined tunnel portal and temporary repository	100,00	meter				
h	Average transport length [Equation = b/(c*2)+d]	1.860,38	meter				
i	Average driving speed	10,00	km/hour				
j	Loosening factor of material	1,60	-				
k	Loading capacity dumper	15,00	cum				
Mat-011	Electricity [Equation = i*d*j]	25,45	kWh	7,50		190,84	
l	Estimated electricity per cum excavation	2,00	kWh/cum				
Lab-003	Foreman specialist [Equation = a*m]	0,50	hour	3.429,09		1.714,55	
m	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = a*n]	3,00	hour	2.465,64		7.396,93	
n	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = a*o]	1,50	hour	177,08		265,63	
o	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = a*p]	2,00	hour	125,00		250,00	
p	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = a*q]	2,50	hour	125,00		312,50	
q	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = a]	0,50	hour	6.089,81			3.044,90
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = a*r]	0,50	hour	1.674,56			837,28
r	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = a*s]	2,00	hour	1.554,85			3.109,70
s	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
Subsum	Re-profiling cost per 4 meter tunnel lenght [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.009,23	10.130,45	6.991,88
Sum	Re-profiling cost per tunnel meter [Equation = subsum/b]				252,31	2.532,61	1.747,97
H107	Temporary suspension of D&B excavation						
Sum	Cost for temporary suspension of works per day and excavation face [Equation = costs for item B106]				-	151.862,60	-
SCHEDULE - H2 Drilling and Grouting							

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
H201	Drilling of drainage drilling in the tunnel perimeter and face, diameter 50 mm, length 3 m to 8 m						
Sum	Installation cost of drainage drillings each [Equation = cost for item B201]				104,54	2.120,45	649,58
H202	Drilling of exploratory drilling without core recovery, diameter 50 mm, length up to 20 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B202]				215,62	4.373,43	1.339,76
H203	Drilling of exploratory drilling with core recovery, diameter 76 mm						
H20301	Drilling 0-10 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B20301]				653,40	13.252,81	4.059,87
H20302	Drilling 10-20 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B20302]				980,10	19.879,21	6.089,81
H20303	Drilling 20-30 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B20303]				1.306,80	26.505,62	8.119,75
H204	Strata grouting as defined by the approved drawings the Technical Specifications or directed by the Employer's Representative						
Sum	Costs of strata grouting per cum [Equation = cost for item B204]				4.103,19	2.588,93	-
SCHEDULE - I PRIMARY & FINAL SUPPORT MEASURES							
SCHEDULE - I1 Bolts & Anchors							
I101	Supply, drilling and installation of frictional rockbolts (Swelllex 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						
a	Frictional bolt length	3,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,40	m/min				
d	Drill hole cleaning and installation of bolt	6,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,16	hour				
MAT	Material						
Mat-013	Frictional bolt (Swelllex or equivalent 200 kN) [Equation = a]	3,00	meter	873,87	2.621,61		
Mat-014	Anchor plate for frictional bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	20,54	kWh	7,50	154,02		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,16	hour	3.429,09		538,86	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	0,94	hour	2.465,64		2.324,75	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	0,47	hour	177,08		83,48	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	0,63	hour	125,00		78,57	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	0,79	hour	125,00		98,21	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,16	hour	6.089,81			956,97
Sum	Installation costs of frictional bolt I = 3 meter				3.100,95	3.123,88	956,97
I10102	Length 4 m						
a	Frictional bolt length	4,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,40	m/min				
d	Drill hole cleaning and installation of bolt	6,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,17	hour				
MAT	Material						
Mat-013	Frictional bolt (Swelllex or equivalent 200 kN) [Equation = a]	4,00	meter	873,87	3.495,48		
Mat-014	Anchor plate for frictional bolt and wear parts	1,00	pcs	325,32	325,32		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-011	Electricity [Equation = $g \cdot h \cdot f$]	21,57	kWh	7,50	161,79		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $f \cdot i$]	0,17	hour	3.429,09		566,07	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $f \cdot j$]	0,99	hour	2.465,64		2.442,16	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $f \cdot k$]	0,50	hour	177,08		87,70	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $f \cdot l$]	0,66	hour	125,00		82,54	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $f \cdot m$]	0,83	hour	125,00		103,17	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,17	hour	6.089,81			1.005,30
Sum	Installation costs of frictional bolt l = 4 meter				3.982,60	3.281,65	1.005,30
I102	Supply, drilling, installation and grouting of grouted rockbolts (SN type) of the specified length, $F_y \geq 200$ 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						
a	SN bolt length	4,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,50	m/min				
d	Drill hole cleaning and installation of bolt	10,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = $(a/(b \cdot c) + d + e)/60$]	0,23	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	4,00	meter	221,80	887,19		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = $g \cdot h \cdot f$]	30,01	kWh	7,50	225,06		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = $a \cdot i/1000$]	0,04	tonne	7.492,10	299,68		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $f \cdot i$]	0,23	hour	3.429,09		787,42	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $f \cdot j$]	1,38	hour	2.465,64		3.397,11	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $f \cdot l$]	0,69	hour	177,08		121,99	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $f \cdot m$]	0,92	hour	125,00		114,81	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = $f \cdot n$]	1,15	hour	125,00		143,52	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,23	hour	6.089,81			1.398,40
Sum	Installation costs of SN bolt l = 4 meter				1.737,26	4.564,86	1.398,40
I10202	Length 6 m						
a	SN bolt length	6,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,50	m/min				
d	Drill hole cleaning and installation of bolt	10,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = $(a/(b \cdot c) + d + e)/60$]	0,24	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	6,00	meter	221,80	1.330,79		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	31,94	kWh	7,50	239,58		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,06	tonne	7.492,10	449,53		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	0,24	hour	3.429,09		838,22	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	1,47	hour	2.465,64		3.616,28	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	0,73	hour	177,08		129,86	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	0,98	hour	125,00		122,22	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	1,22	hour	125,00		152,78	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,24	hour	6.089,81			1.488,62
Sum	Installation costs of SN bolt l = 6 meter				2.345,22	4.859,36	1.488,62
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 rockbolts (SN type) with a length of 4 m, Fy ≥ 200 KN						
a	Grouted bolt length	4,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	1,80	m/min				
d	Drill hole cleaning and installation of bolt	2,50	min				
e	Setting up	1,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,08	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	4,00	meter	221,80	887,19		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	10,85	kWh	7,50	81,37		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,08	hour	3.429,09		284,70	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	0,50	hour	2.465,64		1.228,26	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	0,25	hour	177,08		44,11	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	0,33	hour	125,00		41,51	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	0,42	hour	125,00		51,89	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,08	hour	6.089,81			505,60
Subsum	Installation costs of spiles l = 4 meter				1.293,89	1.650,47	505,60
Sum	Installation costs of spiles per meter [Equation = subsum/a]				323,47	412,62	126,40
I10402	Steel Pipe umbrella with a diameter of 114 mm, wall thickness of 6.5 mm and a length of 12 m						
a	Pipe length	12,00	meter				
b	Effective drilling rod numbers anchorage	1,50	pcs				
c	Drilling capacity	0,50	m/min				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
d	Drill hole cleaning and installation of pipe	30,00	min				
e	Setting up	10,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,93	hour				
MAT	Material						
Mat-025	Umbrella pipe [Equation = a]	12,00	meter	451,90	5.422,77		
Mat-011	Electricity [Equation = g*h*f]	121,97	kWh	7,50	914,76		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,93	hour	3.429,09		3.200,49	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	5,60	hour	2.465,64		13.807,61	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	2,80	hour	177,08		495,83	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	3,73	hour	125,00		466,67	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	4,67	hour	125,00		583,33	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,93	hour	6.089,81			5.683,82
Subsum	Installation costs of pipe umbrella l = 12 meter [Equation = sum(MAT); sum(LAB); sum(MAC)]				6.337,53	18.553,93	5.683,82
Sum	Installation costs of pipe umbrella per meter [Equation = subsum/a]				528,13	1.546,16	473,65
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/I2/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						
a	Lining thickness	0,05	meter				
b	Additional thickness due to tolerance of excavation geometry	0,02	meter				
c	Lining perimeter	15,34	meter				
d	Round length	3,50	meter				
e	Estimated shotcreting time	0,98	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	4,51	cum	4.818,64	21.730,16		
Mat-011	Electricity [Equation = g*e*h]	87,97	kWh	7,50	659,80		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,98	hour	3.429,09		3.351,86	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	5,86	hour	2.465,64		14.460,68	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,93	hour	177,08		519,29	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,91	hour	125,00		488,74	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,89	hour	125,00		610,92	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 3,5 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				22.389,95	19.431,49	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				417,06	361,95	374,08
I20102	100 mm thick shotcrete lining in tunnel						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
a	Lining thickness	0,10	meter				
b	Additional thickness due to tolerance of excavation geometry	0,04	meter				
c	Lining perimeter	15,42	meter				
d	Round length	2,50	meter				
e	Estimated shotcreting time	1,29	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	6,48	cum	4.818,64	31.202,15		
Mat-011	Electricity [Equation = g*e*h]	116,29	kWh	7,50	872,15		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,29	hour	3.429,09		4.430,64	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	7,75	hour	2.465,64		19.114,76	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	3,88	hour	177,08		686,41	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	5,17	hour	125,00		646,04	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	6,46	hour	125,00		807,55	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 2,5 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				32.074,30	25.685,39	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				832,16	666,40	521,04
I20103	150 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,15	meter				
b	Additional thickness due to tolerance of excavation geometry	0,06	meter				
c	Lining perimeter	15,50	meter				
d	Round length	1,75	meter				
e	Estimated shotcreting time	0,96	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	6,83	cum	4.818,64	32.929,29		
Mat-011	Electricity [Equation = g*e*h]	86,49	kWh	7,50	648,71		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,96	hour	3.429,09		3.295,51	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	5,77	hour	2.465,64		14.217,58	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,88	hour	177,08		510,56	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,84	hour	125,00		480,52	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,81	hour	125,00		600,65	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 1,75 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				33.577,99	19.104,82	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.238,22	704,51	740,57
I20104	200 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,20	meter				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
b	Additional thickness due to tolerance of excavation geometry	0,08	meter				
c	Lining perimeter	15,89	meter				
d	Round length	1,25	meter				
e	Estimated shotcreting time	0,80	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	6,67	cum	4.818,64	32.153,76		
Mat-011	Electricity [Equation = g*e*h]	72,11	kWh	7,50	540,84		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,80	hour	3.429,09		2.747,54	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	4,81	hour	2.465,64		11.853,51	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,40	hour	177,08		425,66	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,20	hour	125,00		400,62	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,01	hour	125,00		500,78	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 1,25 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				32.694,60	15.928,12	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.646,30	802,04	1.011,24
I20105	250 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,25	meter				
b	Additional thickness due to tolerance of excavation geometry	0,10	meter				
c	Lining perimeter	15,97	meter				
d	Round length	1,25	meter				
e	Estimated shotcreting time	0,87	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	8,38	cum	4.818,64	40.390,53		
Mat-011	Electricity [Equation = g*e*h]	78,41	kWh	7,50	588,06		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,87	hour	3.429,09		2.987,40	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	5,23	hour	2.465,64		12.888,32	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,61	hour	177,08		462,82	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,48	hour	125,00		435,60	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,36	hour	125,00		544,50	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	12,00	hour	1.673,56			20.082,72
n	Shotcrete time including hold back time	12,00	hour				
Subsum	Shotcreting costs per 1,25 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				40.978,59	17.318,64	20.082,72
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				2.053,29	867,78	1.006,27

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
I202	Shotcreting of primary invert lining with designed mix cement concrete SpC20/25(56)/II/I2/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						
a	Lining thickness	0,20	meter				
b	Additional thickness due to tolerance of excavation geometry	0,08	meter				
c	Lining perimeter	9,18	meter				
d	Round length	1,25	meter				
e	Estimated shotcreting time	0,80	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	3,86	cum	4.818,64	18.577,92		
Mat-011	Electricity [Equation = g*e*h]	72,11	kWh	7,50	540,84		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,80	hour	3.429,09		2.747,54	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	4,81	hour	2.465,64		11.853,51	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,40	hour	177,08		425,66	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,20	hour	125,00		400,62	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,01	hour	125,00		500,78	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Machinery included in Item I201 shotcreting of primary tunnel lining						
Subsum	Shotcreting costs per 1,25 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				19.118,77	15.928,12	-
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.666,20	1.388,13	-
I20202	250 mm thick shotcrete lining in tunnel						
a	Lining thickness	0,25	meter				
b	Additional thickness due to tolerance of excavation geometry	0,10	meter				
c	Lining perimeter	13,80	meter				
d	Round length	1,25	meter				
e	Estimated shotcreting time	0,87	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	7,25	cum	4.818,64	34.911,02		
Mat-011	Electricity [Equation = g*e*h]	78,41	kWh	7,50	588,06		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,87	hour	3.429,09		2.987,40	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	5,23	hour	2.465,64		12.888,32	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	2,61	hour	177,08		462,82	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	3,48	hour	125,00		435,60	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	4,36	hour	125,00		544,50	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Machinery included in Item I201 shotcreting of primary tunnel lining						
Subsum	Shotcreting costs per 1,25 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				35.499,08	17.318,64	-

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				2.057,92	1.003,98	-
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						
Sum	Shotcreting cost per sqm [Equation = cost for item I20102]				832,16	666,40	521,04
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 .						
a	Mean estimated lining thickness of face sealing	0,10	meter				
b	Mean face area of top heading excavation Support Category F	47,36	sqm				
c	Shotcreting capacity at face	0,15	cum/min				
d	Estimated shotcreting time [Equation =a*b*(1+e)/(c*60)]	0,63	hours				
e	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	5,68	cum	4.818,64	27.385,97		
Mat-011	Electricity [Equation = g*e*h]	56,83	kWh	7,50	426,25		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	0,63	hour	3.429,09		2.165,41	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	3,79	hour	2.465,64		9.342,07	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	1,89	hour	177,08		335,48	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	2,53	hour	125,00		315,74	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	3,16	hour	125,00		394,68	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	0,63	hour	1.673,56			1.056,82
n	Shotcrete time including hold back time	0,63	hour				
Subsum	Shotcreting costs per face sealing in Support Category H round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				27.812,22	12.553,38	1.056,82
Sum	Shotcreting cost per cum [Equation = Subsum/(a*b)]				5.872,36	2.650,56	223,14
I205	Steel fibre reinforcement if required						
Sum	Steel fibre reinforcement costs per tonne [Equation = cost for item C204]				3.246,48	340,55	868,40
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.						
a	Mean advance rate of all Support Categories with respect of distribution	2,01	meter				
b	Estimated installation time of one layer wire mesh	0,25	hour				
c	Mean perimeter with respect to support category of installed wire mesh	15,90	meter				
MAT	Material						
Mat-015	Wire mesh (CQS60 or equivalent 3,11 kg/sqm) [Equation = a*c*(1+d)*3,11kg/sqm]	124,080	kg	70,00	8.685,57		
d	Offcuts	0,250	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*e]	0,25	hour	3.429,09		857,27	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f]	1,50	hour	2.465,64		3.698,47	
f	Number of Skilled NATM Working Man Underground	6,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-019	Mason (1st class) & Skilled [Equation = b*g]	0,75	hour	177,08		132,81	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*h]	1,00	hour	125,00		125,00	
h	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*i]	1,25	hour	125,00		156,25	
i	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = j]	4,000	hour	330,59			1.322,36
j	Installation time including holdbacktime of Working platform	4,000	hour				
Subsum	Average installation cost of wire mesh per round [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				8.685,57	4.969,80	1.322,36
Sum	Installation costs of wire mesh per tonne [Equation = subsum/(c*a*3,11kg/sqm)*1000]				87.500,00	50.066,70	13.321,65
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						
a	Intersections of lattice girder	3,00	pcs				
b	Mean linear weight of lattice girder	10,00	kg/meter				
c	Mean perimeter of installed lattice girder	16,17	meter				
d	Mean installation time	0,17	hour				
MAT	Material						
Mat-016	Lattice girder [Equation = b*c/1000]	0,162	tonne	185.000,00	29.906,92		
Mat-017	Lattice girder connections and footing [Equation = a-1]	2,000	pcs	68,11	136,22		
Mat-011	Electricity [Equation = e*b*c/1000]	88,912	kWh	7,50	666,84		
e	Estimated power consumption per tonne	550,000	kWh/tonne				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	0,25	hour	3.429,09		857,27	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	1,50	hour	2.465,64		3.698,47	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	0,75	hour	177,08		132,81	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	1,00	hour	125,00		125,00	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	1,25	hour	125,00		156,25	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = k]	4,000	hour	330,59			1.322,36
k	Installation time including holdbacktime of Working platform	4,000	hour				
Subsum	Installation cost of lattice girder per advance [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				30.709,98	4.969,80	1.322,36
Sum	Installation cost of lattice girder per tonne [Equation = subsum/(b*c/1000)]				189.967,64	30.742,51	8.179,91
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.						
a	Mean advance rate of Support Categories with yielding elements	1,25	meter				
b	Mean installation time	0,17	hour				
MAT	Material						
Mat-048	Yielding elements [Equation = a*2]	2,500	pcs	32.425,00	81.062,50		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	0,17	hour	3.429,09		571,52	
c	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	1,00	hour	2.465,64		2.465,64	
d	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,50	hour	177,08		88,54	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	0,67	hour	125,00		83,33	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,83	hour	125,00		104,17	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = h]	4,000	hour	330,59			1.322,36
h	Installation time including holdbacktime of Working platform	4,000	hour				
Subsum	Installation cost of yielding element per advance [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				81.062,50	3.313,20	1.322,36
Sum	Installation cost of yielding element per meter [Equation = subsum/(2*a)]				32.425,00	1.325,28	528,94
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						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	0,86	sqm				
c	Estimated construction time of foundation per formblock	1,25	hour				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+d)]	10,97	cum	4.818,64	52.836,35		
d	Concrete loss	0,02	%/100				
Mat-011	Electricity	15,63	kWh	7,50	117,19		
e	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump	1,25	hour	865,83	1.082,28		
Mat-026	Additional material formwork [Equation = a*b]	10,75	cum	72,00	774,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f*8]	1,25	hour	3.429,09		4.286,37	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	8,75	hour	2.465,64		21.574,39	
g	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	3,75	hour	177,08		664,06	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i*8]	3,75	hour	125,00		468,75	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*i*8]	5,00	hour	125,00		625,00	
j	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Costs for machinery included in tunnel vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				54.809,82	27.618,57	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.098,59	2.569,17	-
J10102	Inner lining of tunnel - invert						
a	Length of formwork block	12,50	meter				
b	Area of invert cross section	4,04	sqm				
c	Estimated construction time of foundation per formblock	10,00	hour				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+d)]	51,51	cum	4.818,64	248.207,96		
d	Concrete loss	0,02	%/100				
Mat-011	Electricity	125,00	kWh	7,50	937,50		
e	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump	10,00	hour	865,83	8.658,26		
Mat-026	Additional material formwork [Equation = a*b]	50,50	cum	72,00	3.636,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f*8]	10,00	hour	3.429,09		34.290,95	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	70,00	hour	2.465,64		172.595,14	
g	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	30,00	hour	177,08		5.312,50	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i*8]	30,00	hour	125,00		3.750,00	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j*8]	40,00	hour	125,00		5.000,00	
j	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Costs for machinery included in tunnel vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				261.439,72	220.948,59	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.177,02	4.375,22	-
J10103	Inner lining of tunnel & niches - vault with radial formwork						
J1010301	with thickness of 25 cm						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	4,56	sqm				
c	Thickness of concrete lining	0,25	meter				
d	Estimated construction time per formwork block	1,75	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	58,14	cum	4.818,64	280.155,52		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	21,88	kWh	7,50	164,06		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = d*8]	14,00	hour	865,83	12.121,56		
Mat-049	Injection material for tunnel crown injection [Equation = a*b]	57,00	cum	68,11	3.882,27		
Mat-026	Additional material formwork [Equation = a*b]	57,00	cum	72,00	4.104,00		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = d*g*8]	14,00	hour	3.429,09		48.007,33	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*h*8]	98,00	hour	2.465,64		241.633,20	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*i*8]	42,00	hour	177,08		7.437,50	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*j*8]	42,00	hour	125,00		5.250,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*k*8]	56,00	hour	125,00		7.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = l*m]	84,00	hour	777,88			65.342,32
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = d*24]	42,00	hour				
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				300.427,42	309.328,03	65.342,32
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.270,66	5.426,81	1.146,36
J1010302	with thickness of 35 cm						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	6,15	sqm				
c	Thickness of concrete lining	0,35	meter				
d	Estimated construction time per formwork block	1,75	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	78,41	cum	4.818,64	377.841,33		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	21,88	kWh	7,50	164,06		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = d*8]	14,00	hour	865,83	12.121,56		
Mat-049	Injection material for tunnel crown injection [Equation = a*b]	76,88	cum	68,11	5.235,96		
Mat-026	Additional material formwork [Equation = a*b]	76,88	cum	72,00	5.535,00		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = d*g*8]	14,00	hour	3.429,09		48.007,33	
g	Number of Foreman specialist	1,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-004	Skilled NATM Working Man Underground [Equation = d*h*8]	98,00	hour	2.465,64		241.633,20	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*i*8]	42,00	hour	177,08		7.437,50	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*j*8]	42,00	hour	125,00		5.250,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*k*8]	56,00	hour	125,00		7.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = l*m]	84,00	hour	777,88			65.342,32
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = d*24]	42,00	hour				
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				400.897,91	309.328,03	65.342,32
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.214,93	4.023,78	849,98
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						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	1,62	sqm				
c	Estimated construction time per formwork block	1,50	hours				
MAT	Material						
Mat-008	Concrete C12/15 (mixing on site) [Equation = a*b*(1+d)]	20,66	cum	4.103,19	84.751,31		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	4,50	hour	2.465,64		11.095,40	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	3,00	hour	177,08		531,25	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = c*h]	4,50	hour	125,00		562,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	1,50	hour	125,00		187,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in concrete cost vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				84.751,31	12.376,65	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				4.185,25	611,19	-
J10202	Binding concrete in tunnel						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	0,20	sqm				
c	Estimated construction time per formwork block	0,50	hours				
MAT	Material						
Mat-008	Concrete C12/15 (mixing on site) [Equation = a*b*(1+d)]	2,55	cum	4.103,19	10.463,13		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	1,50	hour	2.465,64		3.698,47	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	1,00	hour	177,08		177,08	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = c*h]	1,50	hour	125,00		187,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	0,50	hour	125,00		62,50	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in concrete cost vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				10.463,13	4.125,55	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				4.185,25	1.650,22	-
J103	No-fines porous concrete in tunnel						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	0,26	sqm				
c	Estimated construction time per formwork block	0,50	hours				
MAT	Material						
Mat-007	No fines concrete (mixing on site) [Equation = a*b*(1+d)]	3,32	cum	4.699,59	15.579,14		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	1,50	hour	2.465,64		3.698,47	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	1,00	hour	177,08		177,08	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = c*h]	1,50	hour	125,00		187,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	0,50	hour	125,00		62,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in concrete cost vault						
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				15.579,14	4.125,55	-
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				4.793,58	1.269,40	-
J104	Reinforcement for inner lining						
J10401	Reinforcement for inner lining - foundation						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	4,04	sqm				
c	Estimated construction time of foundation per formblock	1,25	hour				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = a*b*d*(1+e)]	5,30	tonne	52.000,00	275.730,00		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = a*b]	50,50	cum	72,00	3.636,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	5,00	hour	2.465,64		12.328,22	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	2,50	hour	177,08		442,71	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	3,75	hour	125,00		468,75	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	3,75	hour	125,00		468,75	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				279.366,00	13.708,43	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				52.685,71	2.585,28	-
J10402	Reinforcement for inner lining - invert						
a	Length of formwork block	12,50	meter				
b	Area of invert cross section	4,04	sqm				
c	Estimated construction time of foundation per formblock	8,00	hour				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = a*b*d*(1+e)]	5,30	tonne	52.000,00	275.730,00		
d	Estimated reinforcement grade	0,10	tonne/cum				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = a*b]	50,50	cum	72,00	3.636,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	32,00	hour	2.465,64		78.900,64	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	16,00	hour	177,08		2.833,33	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	24,00	hour	125,00		3.000,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	24,00	hour	125,00		3.000,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				279.366,00	87.733,97	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				52.685,71	16.545,77	-
J10403	Reinforcement for inner lining - vault						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	6,15	sqm				
c	Estimated construction time of foundation per formblock	1,75	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = a*b*d*(1+e)]	8,07	tonne	52.000,00	419.737,50		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = a*b]	76,88	cum	72,00	5.535,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f*8]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	56,00	hour	2.465,64		138.076,12	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	28,00	hour	177,08		4.958,33	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i*8]	42,00	hour	125,00		5.250,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j*8]	42,00	hour	125,00		5.250,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				425.272,50	153.534,45	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				52.685,71	19.020,92	-
J105	Concrete tests						
#	All costs for concrete testing are included in Item D105						
Sum	Costs for concrete tests						-
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.						
Sum	Costs of 3D monitoring targets each [Equation = cost for item E101]				275,90	-	-
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.						
Sum	Costs of borehole extensometers each [Equation = cost for item E102]				12.579,49	-	-
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.						
Sum	Costs of load cells each [Equation = cost for item E103]				31.484,50	-	-
K104	Supply, install, read and maintain of strain gauges for shotcrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of strain gauges each [Equation = cost for item E104]				4.230,90	-	-
K105	Supply, install, read and maintain of strain gauges for concrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of strain gauges each [Equation = cost for item E105]				4.230,90	-	-

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
K106	Supply, install, read and maintain of radial pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of radial pressure cells each [Equation = cost for item E106]				31.594,50	-	-
K107	Supply, install, read and maintain of tangential pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of tangential pressure cells each [Equation = cost for item E107]				31.594,50	-	-
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.						
a	Cost for item F101				1.300,58	525,56	318,22
b	Sub-base cost per sqm [Equation = a)]				1.300,58	525,56	318,22
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.						
a	Cost for item F102				207,20	157,67	43,93
b	Dry lean cement concrete cost per sqm [Equation = a)]				207,20	157,67	43,93
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.						
a	Block length	12,50	meter				
b	Width of pavement	8,50	meter				
c	Thickness of layer	0,15	meter				
d	Estimated construction time per block length	4,00	hour				
MAT	Material						
Mat-010	Concrete C30/37 (mixing on site) for cement concrete pavement [Equation = (a+b+c+d+e)/75] [Equation = a*b*c]	15,94	cum	5.263,74	83.890,79		
Mat-050	Gasoline for concrete pump	8,00	hour	865,83	6.926,61		
Mat-055	Dowel rods and tie bars for concrete pavement	0,08	tonne	57.893,50	4.613,39		
e	Required dowels and tie rods for concrete pavement	0,005	tonne/cum				
Mat-054	Gasoline for paver	4,00	hour	1.731,65	6.926,61		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	4,00	hour	3.429,09		13.716,38	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	24,00	hour	2.465,64		59.175,48	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	8,00	hour	177,08		1.416,67	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	8,00	hour	125,00		1.000,00	
i	Number of Mate	2,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	12,00	hour	125,00		1.500,00	
j	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Supplying Machinery is included in time-dependent costs						
Mac-007	Concrete Pump[Equation = k*d/8]	1,00	day	18.669,23			18.669,23
k	Number of concrete pumps per concrete section	2,00	pcs				
Mac-048	Paver 8.0 m	0,50	day	36.067,65			18.033,83
Mac-049	Joint cutting equipment	0,50	day	2.080,76			1.040,38
Mac-050	Bolt setting equipment	0,50	day	2.489,99			1.244,99
Subsum	Construction cost of concrete pavement per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				102.357,40	76.808,52	38.988,43
Sum	Construction cost of concrete pavement per sqm [Equation = subsum/(a*b)]				963,36	722,90	366,95
BILL 3 - CIVIL ENGINEERING VENTILATION SHAFT & VENTILATION CAVERN							
SCHEDULE - M DEWATERING ARRANGEMENT							
SCHEDULE - M1 Temporary Dewatering Arrangement							

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
M101	Care of water in shaft drifts d&b construction						
a	Estimated length of upward drifts	4.450,00	meter				
MAT	Material						
Mat-057	PE pipe SDR 26 Ø200 mm	4.450,00	meter	1.775,30	7.900.097,65		
Mat-011	Electricity [Equation = b*c*d*24]	8.232.840,00	kWh	7,50	61.746.300,00		
b	Power of pumps	42,00	kW				
c	Number of pumps	22,00	pcs				
d	Estimated pumping time of all downward drives	371,25	day				
LAB	Labour						
#	Labour is included in tunnel excavation						
MAC	Machinery						
#	Machinery is included in time dependent costs						
Sum	Overall costs of care of water				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						
a	Block length	12,50	meter				
b	Estimated construction time	0,75	hour				
MAT	Material						
Mat-029	PVC or PP drainage pipe Ø250mm [Equation = a]	12,50	meter	1.243,01	15.537,59		
Mat-031	Drainage Material	1,00	cum	1.021,65	1.021,65		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	2,25	hour	2.465,64		5.547,70	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	1,50	hour	177,08		265,63	
e	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*f]	2,25	hour	125,00		281,25	
f	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,75	hour	125,00		93,75	
g	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				16.559,24	6.188,33	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				1.324,74	495,07	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	0,30	day				
c	Shaft perimeter from main shaft cross section	40,21	meter				
MAT	Material						
Mat-047	Dimpled sheets [Equation = a*c*(1+d)]	527,76	sqm	323,52	170.741,02		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	7,20	hour	2.465,64		17.752,64	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	4,80	hour	177,08		850,00	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	7,20	hour	125,00		900,00	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	2,40	hour	125,00		300,00	
i	Number of Mazdoor	1,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of dimpled sheet per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				170.741,02	19.802,64	-
Sum	Installation cost of dimpled sheet per sqm [Equation = subsum/(a*c)]				339,70	39,40	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	0,50	day				
c	Shaft perimeter from main shaft cross section	40,21	meter				
MAT	Material						
Mat-037	Protective felt [Equation = a*c*(1+d)]	527,76	sqm	119,19	62.904,59		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	12,00	hour	2.465,64		29.587,74	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	8,00	hour	177,08		1.416,67	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	12,00	hour	125,00		1.500,00	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	4,00	hour	125,00		500,00	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of protective felt per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				62.904,59	33.004,41	-
Sum	Installation cost of protective felt per sqm [Equation = subsum/(a*c)]				125,15	65,66	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	1,50	day				
c	Tunnel perimeter from main tunnel cross section	29,21	meter				
MAT	Material						
Mat-038	Water proofing membrane [Equation = a*c*(1+d)]	383,42	sqm	357,58	137.102,55		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	36,00	hour	2.465,64		88.763,22	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	24,00	hour	177,08		4.250,00	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	36,00	hour	125,00		4.500,00	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	12,00	hour	125,00		1.500,00	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of water proofing per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				137.102,55	99.013,22	-
Sum	Installation cost of water proofing per sqm [Equation = subsum/(a*c)]				375,46	271,15	-
M205	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Cost for PVC water stop [Equation = cost for item A207]				522,06	182,52	-
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						
Sum	Cost for cleaning and inspection chamber [Equation = cost for item A20802]				45.225,04	4.563,05	-
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						
a	Area of shaft excavation in cross section	130,70	sqm				
b	Round length of shaft excavation	1,80	meter				
c	Cycle time of shaft excavation Support Category 01	32,00	hour				
d	Estimated excavation time per cycle	29,19	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	235,26	cum	453,67	106.729,04		
Mat-002	Gasoline for wheel loader	2,00	hour	1.362,20	2.724,40		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	235,26	cum	70,00	16.467,95		
Mat-011	Electricity [Equation = e*a*b]	2.352,56	kWh	7,50		17.644,23	
e	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	29,19	hour	3.429,09		100.106,19	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	175,16	hour	2.465,64		431.880,16	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	87,58	hour	177,08		15.508,88	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	116,77	hour	125,00		14.596,59	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	145,97	hour	125,00		18.245,74	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = k]	30,86	hour	6.089,81			187.937,98
k	Excavation time including hold-back time [Equation = d+c*0,15]	30,86	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = l*m]	32,00	hour	1.674,56			53.585,90
l	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
m	Excavation time including hold-back time	32,00	hour				
#	Band conveyor included in site facility						
Subsum	Excavation cost per 1,8 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				125.921,39	597.981,79	241.523,88
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				535,25	2.541,83	1.026,64
N10102	Support Category 02						
a	Area of shaft excavation in cross section	132,73	sqm				
b	Round length of shaft excavation	1,60	meter				
c	Cycle time of shaft excavation Support Category 02	32,00	hour				
d	Estimated excavation time per cycle	25,55	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	212,37	cum	453,67	96.346,69		
Mat-002	Gasoline for wheel loader	2,00	hour	1.362,20	2.724,40		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	212,37	cum	70,00	14.865,98		
Mat-011	Electricity [Equation = e*a*b]	2.123,71	kWh	7,50		15.927,84	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
e	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	25,55	hour	3.429,09		87.617,14	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	153,31	hour	2.465,64		377.999,64	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	76,65	hour	177,08		13.574,02	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	102,20	hour	125,00		12.775,55	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	127,76	hour	125,00		15.969,44	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
k	Drilling machine with 2 drilling booms and basket [Equation = k]	28,27	hour	6.089,81			172.163,69
l	Excavation time including hold-back time [Equation = d+c*0,15]	28,27	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = l*m]	32,00	hour	1.674,56			53.585,90
m	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
n	Excavation time including hold-back time	32,00	hour				
#	Band conveyor included in site facility						
Subsum	Excavation cost per 1,6 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				114.472,32	526.405,47	226.776,22
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				539,02	2.478,70	1.067,83
N10103	Support Category 03						
a	Area of shaft excavation in cross section	134,78	sqm				
b	Round length of shaft excavation	1,40	meter				
c	Cycle time of shaft excavation Support Category 03	32,00	hour				
d	Estimated excavation time per cycle	23,21	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	188,69	cum	453,67	85.605,39		
Mat-002	Gasoline for wheel loader	2,00	hour	1.362,20	2.724,40		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	188,69	cum	70,00	13.208,64		
Mat-011	Electricity [Equation = e*a*b]	1.886,95	kWh	7,50		14.152,11	
e	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	23,21	hour	3.429,09		79.592,83	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	139,27	hour	2.465,64		343.380,98	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	69,63	hour	177,08		12.330,86	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	92,84	hour	125,00		11.605,52	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	116,06	hour	125,00		14.506,90	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = k]	27,54	hour	6.089,81			167.690,12
k	Excavation time including hold-back time [Equation = d+c*0,15]	27,54	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = l*m]	32,00	hour	1.674,56			53.585,90
l	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
m	Excavation time including hold-back time	32,00	hour				
#	Band conveyor included in site facility						
Subsum	Excavation cost per 1,4 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				102.077,44	478.047,89	222.343,85
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				540,97	2.533,44	1.178,33
N10104	Support Category 04						
a	Area of shaft excavation in cross section	136,85	sqm				
b	Round length of shaft excavation	1,20	meter				
c	Cycle time of shaft excavation Support Category 04	32,00	hour				
d	Estimated excavation time per cycle	19,55	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	164,22	cum	453,67	74.500,79		
Mat-002	Gasoline for wheel loader	2,00	hour	1.362,20	2.724,40		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	164,22	cum	70,00	11.495,23		
Mat-011	Electricity [Equation = e*a*b]	1.642,18	kWh	7,50		12.316,32	
e	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	19,55	hour	3.429,09		67.038,41	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	117,30	hour	2.465,64		289.218,46	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	58,65	hour	177,08		10.385,88	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	78,20	hour	125,00		9.774,94	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	97,75	hour	125,00		12.218,68	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = k]	23,81	hour	6.089,81			144.971,73
k	Excavation time including hold-back time [Equation = d+c*0,15]	23,81	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = l*m]	32,00	hour	1.674,56			53.585,90
l	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
m	Excavation time including hold-back time	32,00	hour				
#	Band conveyor included in site facility						
Subsum	Excavation cost per 1,2 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				89.261,39	403.486,13	199.735,95
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				543,56	2.457,02	1.216,29
N10105	Support Category 05						
a	Area of shaft excavation in cross section	141,03	sqm				
b	Round length of shaft excavation	1,00	meter				
c	Cycle time of shaft excavation Support Category 05	32,00	hour				
d	Estimated excavation time per cycle	17,38	hour				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a*b]	141,03	cum	453,67	63.979,43		
Mat-002	Gasoline for wheel loader	2,00	hour	1.362,20	2.724,40		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	141,03	cum	70,00	9.871,82		
Mat-011	Electricity [Equation = e*a*b]	1.410,26	kWh	7,50		10.576,95	
e	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	17,38	hour	3.429,09		59.600,23	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	104,28	hour	2.465,64		257.128,52	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	52,14	hour	177,08		9.233,52	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	69,52	hour	125,00		8.690,37	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	86,90	hour	125,00		10.862,97	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = k]	22,08	hour	6.089,81			134.449,73
k	Excavation time including hold-back time [Equation = d+c*0,15]	22,08	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = l*m]	32,00	hour	1.674,56			53.585,90
l	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
m	Excavation time including hold-back time	32,00	hour				
#	Band conveyor included in site facility						
Subsum	Excavation cost per 1 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				77.119,20	358.549,58	189.251,92
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				546,84	2.542,44	1.341,96

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
N10106	Excavation in bored pile section						
a	Area of shaft excavation in cross section	130,00	sqm				
b	Round length of shaft excavation	1,00	meter				
c	Estimated excavation time per cycle	15,00	hour				
MAT	Material						
Mat-023	Explosive including detonator and accessories for excavation with tunnel excavator [Equation = a*b]	130,00	cum	69,01	8.971,33		
Mat-024	Gasoline for tunnel excavator	10,00	hour	1.294,09	12.940,90		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a*b]	130,00	cum	70,00	9.100,00		
Mat-011	Electricity [Equation = d*a*b]	1.300,00	kWh	7,50		9.750,00	
d	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	15,00	hour	3.429,09		51.436,42	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	90,00	hour	2.465,64		221.908,04	
f	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	45,00	hour	177,08		7.968,75	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = c*h]	60,00	hour	125,00		7.500,00	
h	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	75,00	hour	125,00		9.375,00	
i	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-006	Tunnel excavator [Equation = j]	15,00	hour	3.262,22			48.933,25
j	Excavation time including hold-back time	15,00	hour				
#	Band conveyor included in site facility						
Subsum	Excavation cost per 1 m [Equation = sum(MAT); sum(LAB); sum(MAC)]				31.012,23	307.938,21	48.933,25
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				238,56	2.368,76	376,41
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.						
a	Mean rate of excavation rates of all Support Categories [Equation = (B1010101 + B1010201 + B1010301 + B1010401 + B1010501 + B1010601 + B1010701 + B1010801)/8]				552,12	922,90	1.271,44
Sum	Excavation cost per cum [Equation = a]				552,12	922,90	1.271,44
N103	Raise boring						
a	Area of raise boring shaft excavation cross section	28,27	sqm				
b	Drilling capacity	12,50	meter/day				
MAT	Material						
Mat-011	Electricity [Equation = c*d*8]	2.040,00	kWh	7,50	15.300,00		
c	Power of raise boring machine	300,00	kW				
d	Operating grade of raise boring machine	0,85	%/100				
Mat-002	Gasoline for wheel loader	4,00	hour	1.362,20	5.448,80		
LAB	Labour						
#	Assumed 8 working hours per day						
Lab-003	Foreman specialist [Equation = e*8]	8,00	hour	3.429,09		27.432,76	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*8]	48,00	hour	2.465,64		118.350,96	
f	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = p*8]	24,00	hour	177,08		4.250,00	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = h*8]	32,00	hour	125,00		4.000,00	
h	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = i*8]	40,00	hour	125,00		5.000,00	
i	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = j*k]	24,00	hour	1.674,56			40.189,42
j	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
k	Excavation time including hold-back time	24,00	hour				
Mac-060	Raise boring machine [Equation = k]	24,00	hour	1.643,63			39.447,04
k	Excavation time including hold-back time	24,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = j*k]	48,00	hour	1.554,85			74.632,78
j	Number of Tunnel muck transporter (dumper or equivalent)	2,00	pcs				
k	Excavation time including hold-back time	24,00	hour				
Subsum	Excavation cost per working day [Equation = sum(MAT; LAB; MAC)]				20.748,80	159.033,71	154.269,25
Sum	Excavation cost per cum [Equation = subsum/(a*b)]				58,71	449,97	436,49
SCHEDULE - N2 Drilling and Grouting							
N201	Drilling of drainage drilling in the shaft perimeter, diameter 50 mm, length 3 m to 8 m						
Sum	Installation cost of drainage drillings each [Equation = cost for item B201]				104,54	2.120,45	649,58
N202	Drilling of exploratory drilling without core recovery, diameter 50 mm, length up to 20 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B202]				215,62	4.373,43	1.339,76
N203	Drilling of exploratory drilling with core recovery, diameter 76 mm						
N20301	Drilling 0-10 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B20301]				653,40	13.252,81	4.059,87
N20302	Drilling 10-20 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B20302]				980,10	19.879,21	6.089,81
N20303	Drilling 20-30 m						
Sum	Costs of exploratory drillings each [Equation = cost for item B20303]				1.306,80	26.505,62	8.119,75
N204	Strata grouting as defined by the approved drawings the Technical Specifications or directed by the Employer's Representative						
Sum	Costs of strata grouting per cum [Equation = cost for item B204]				4.103,19	2.588,93	-
SCHEDULE - O PRIMARY SUPPORT MEASURES							
SCHEDULE - O1 Bolts & Anchors							
O101	Supply, drilling and installation of frictional rockbolts (Swelllex 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						
a	Frictional bolt length	4,00	meter				
b	Effective drilling rod numbers anchorage	1,30	pcs				
c	Drilling capacity	1,40	m/min				
d	Drill hole cleaning and installation of bolt	15,00	min				
e	Setting up	3,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,34	hour				
MAT	Material						
Mat-013	Frictional bolt (Swelllex or equivalent 200 kN) [Equation = a]	4,00	meter	873,87	3.495,48		
Mat-014	Anchor plate for frictional bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	43,99	kWh	7,50	329,93		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,34	hour	3.429,09		1.154,34	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	2,02	hour	2.465,64		4.980,06	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	1,01	hour	177,08		178,83	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	1,35	hour	125,00		168,32	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	1,68	hour	125,00		210,39	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,34	hour	6.089,81			2.050,01
Sum	Installation costs of frictional bolt l = 4 meter				4.150,73	6.691,94	2.050,01
O10102	Length 6 m						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
a	Frictional bolt length	6,00	meter				
b	Effective drilling rod numbers anchorage	1,30	pcs				
c	Drilling capacity	1,40	m/min				
d	Drill hole cleaning and installation of bolt	15,00	min				
e	Setting up	3,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,35	hour				
MAT	Material						
Mat-013	Frictional bolt (Swelllex or equivalent 200 kN) [Equation = a]	6,00	meter	873,87	5.243,22		
Mat-014	Anchor plate for frictional bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	46,38	kWh	7,50	347,88		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,35	hour	3.429,09		1.217,14	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	2,13	hour	2.465,64		5.251,01	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	1,06	hour	177,08		188,56	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	1,42	hour	125,00		177,47	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	1,77	hour	125,00		221,84	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,35	hour	6.089,81			2.161,55
Sum	Installation costs of frictional bolt l = 6 meter				5.916,42	7.056,03	2.161,55
O10103	Length 9 m						
a	Frictional bolt length	9,00	meter				
b	Effective drilling rod numbers anchorage	1,30	pcs				
c	Drilling capacity	1,40	m/min				
d	Drill hole cleaning and installation of bolt	15,00	min				
e	Setting up	3,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,38	hour				
MAT	Material						
Mat-013	Frictional bolt (Swelllex or equivalent 200 kN) [Equation = a]	9,00	meter	873,87	7.864,83		
Mat-014	Anchor plate for frictional bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	49,97	kWh	7,50	374,81		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*i]	0,38	hour	3.429,09		1.311,35	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*j]	2,29	hour	2.465,64		5.657,44	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*k]	1,15	hour	177,08		203,16	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*l]	1,53	hour	125,00		191,21	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*m]	1,91	hour	125,00		239,01	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,38	hour	6.089,81			2.328,85
Sum	Installation costs of frictional bolt l = 9 meter				8.564,96	7.602,16	2.328,85
O102	Supply, drilling, installation and grouting of grouted rockbolts (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.						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
O10201	Length 6 m						
a	Bolt length	6,00	meter				
b	Effective drilling rod numbers anchorage	1,30	pcs				
c	Drilling capacity	1,50	m/min				
d	Drill hole cleaning and installation of bolt	15,00	min				
e	Setting up	2,50	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,34	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	6,00	meter	221,80	1.330,79		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	44,82	kWh	7,50	336,12		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,06	tonne	7.492,10	449,53		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	0,34	hour	3.429,09		1.176,00	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	2,06	hour	2.465,64		5.073,54	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	1,03	hour	177,08		182,19	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	1,37	hour	125,00		171,47	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	1,71	hour	125,00		214,34	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,34	hour	6.089,81			2.088,49
Sum	Installation costs of SN bolt l = 6 meter				2.441,76	6.817,55	2.088,49
O10202	Length 8 m						
a	Bolt length	8,00	meter				
b	Effective drilling rod numbers anchorage	1,30	pcs				
c	Drilling capacity	1,50	m/min				
d	Drill hole cleaning and installation of bolt	15,00	min				
e	Setting up	2,50	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,36	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	8,00	meter	221,80	1.774,39		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	47,05	kWh	7,50	352,88		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,08	tonne	7.492,10	599,37		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	0,36	hour	3.429,09		1.234,62	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	2,16	hour	2.465,64		5.326,43	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	1,08	hour	177,08		191,27	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	1,44	hour	125,00		180,02	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	1,80	hour	125,00		225,03	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,36	hour	6.089,81			2.192,59

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Installation costs of SN bolt l = 8 meter				3.051,96	7.157,37	2.192,59
SCHEDULE - 02 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						
a	Lining thickness	0,05	meter				
b	Additional thickness due to tolerance of excavation geometry	0,02	meter				
c	Lining perimeter	40,37	meter				
d	Round length	1,80	meter				
e	Estimated shotcreting time	1,67	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	6,10	cum	4.818,64	29.412,69		
Mat-011	Electricity [Equation = g*e*h]	150,11	kWh	7,50	1.125,82		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	1,67	hour	3.429,09		5.719,31	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	10,01	hour	2.465,64		24.674,34	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	5,00	hour	177,08		886,06	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	6,67	hour	125,00		833,94	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	8,34	hour	125,00		1.042,42	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	32,00	hour	1.673,56			53.553,91
n	Shotcrete time including hold back time	32,00	hour				
Subsum	Shotcreting costs per 1,8 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				30.538,50	33.156,07	53.553,91
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				420,26	456,28	736,99
O20102	100 mm thick shotcrete lining in shaft						
a	Lining thickness	0,10	meter				
b	Additional thickness due to tolerance of excavation geometry	0,04	meter				
c	Lining perimeter	40,53	meter				
d	Round length	1,60	meter				
e	Estimated shotcreting time	2,25	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	10,89	cum	4.818,64	52.492,57		
Mat-011	Electricity [Equation = g*e*h]	202,14	kWh	7,50	1.516,08		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	2,25	hour	3.429,09		7.701,91	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	13,48	hour	2.465,64		33.227,75	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	6,74	hour	177,08		1.193,21	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	8,98	hour	125,00		1.123,02	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	11,23	hour	125,00		1.403,78	
m	Number of Mazdoor	5,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	32,00	hour	1.673,56			53.553,91
n	Shotcrete time including hold back time	32,00	hour				
Subsum	Shotcreting costs per 1,6 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				54.008,66	44.649,68	53.553,91
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				832,91	688,58	825,90
O20103	150 mm thick shotcrete lining in shaft						
a	Lining thickness	0,15	meter				
b	Additional thickness due to tolerance of excavation geometry	0,06	meter				
c	Lining perimeter	40,68	meter				
d	Round length	1,40	meter				
e	Estimated shotcreting time	2,69	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	14,35	cum	4.818,64	69.163,41		
Mat-011	Electricity [Equation = g*e*h]	242,32	kWh	7,50	1.817,41		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	2,69	hour	3.429,09		9.232,70	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	16,15	hour	2.465,64		39.831,89	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	8,08	hour	177,08		1.430,37	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	10,77	hour	125,00		1.346,23	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	13,46	hour	125,00		1.682,79	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	32,00	hour	1.673,56			53.553,91
n	Shotcrete time including hold back time	32,00	hour				
Subsum	Shotcreting costs per 1,4 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				70.980,82	53.523,98	53.553,91
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.246,20	939,72	940,24
O20104	200 mm thick shotcrete lining in shaft						
a	Lining thickness	0,20	meter				
b	Additional thickness due to tolerance of excavation geometry	0,08	meter				
c	Lining perimeter	40,84	meter				
d	Round length	1,20	meter				
e	Estimated shotcreting time	2,75	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	16,47	cum	4.818,64	79.348,92		
Mat-011	Electricity [Equation = g*e*h]	247,62	kWh	7,50	1.857,14		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	2,75	hour	3.429,09		9.434,55	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	16,51	hour	2.465,64		40.702,74	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	8,25	hour	177,08		1.461,64	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	11,01	hour	125,00		1.375,66	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	13,76	hour	125,00		1.719,58	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-004	Spraying manipulator [Equation = n]	32,00	hour	1.673,56			53.553,91
n	Shotcrete time including hold back time	32,00	hour				
Subsum	Shotcreting costs per 1,2 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				81.206,07	54.694,18	53.553,91
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.656,96	1.116,00	1.092,73
O20105	300 mm thick shotcrete lining in shaft						
a	Lining thickness	0,30	meter				
b	Additional thickness due to tolerance of excavation geometry	0,12	meter				
c	Lining perimeter	41,16	meter				
d	Round length	1,00	meter				
e	Estimated shotcreting time	3,23	hours				
f	Rebound	0,20	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	20,74	cum	4.818,64	99.948,73		
Mat-011	Electricity [Equation = g*e*h]	290,32	kWh	7,50	2.177,36		
g	Power of Spraying manipulator	120,00	kW				
h	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = e*i]	3,23	hour	3.429,09		11.061,31	
i	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = e*j]	19,35	hour	2.465,64		47.720,94	
j	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = e*k]	9,68	hour	177,08		1.713,67	
k	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = e*l]	12,90	hour	125,00		1.612,86	
l	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = e*m]	16,13	hour	125,00		2.016,08	
m	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = n]	32,00	hour	1.673,56			53.553,91
n	Shotcrete time including hold back time	32,00	hour				
Subsum	Shotcreting costs per 1 meter round length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				102.126,10	64.124,86	53.553,91
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				2.481,50	1.558,13	1.301,27
O20106	100 mm thick shotcrete lining in cavern						
a	Estimated costs for shotcrete lining main tunnel [Equation = Item C20102]				709,69	465,44	427,75
Sum	Shotcreting cost per sqm [Equation = a]				709,69	465,44	427,75
O20107	200 mm thick shotcrete lining in cavern						
a	Estimated costs for shotcrete lining main tunnel [Equation = Item C20104]				1.638,20	563,55	694,42
Sum	Shotcreting cost per sqm [Equation = a]				1.638,20	563,55	694,42
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						
a	Mean advance rate of all Support Categories with respect of distribution of shaft excavation	1,16	meter				
b	Estimated installation time of one layer wire mesh	0,33	hour				
c	Mean perimeter with respect to support category of installed wire mesh	40,72	meter				
MAT	Material						
Mat-015	Wire mesh (CQS60 or equivalent 3,11 kg/sqm) [Equation = a*c*(1+d)*3,11kg/sqm]	183,775	kg	70,00	12.864,22		
d	Offcuts	0,250	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*e]	0,25	hour	3.429,09		857,27	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f]	1,50	hour	2.465,64		3.698,47	
f	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g]	0,75	hour	177,08		132,81	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*h]	1,00	hour	125,00		125,00	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
h	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*i]	1,25	hour	125,00		156,25	
i	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = j]	16,000	hour	330,59			5.289,42
j	Installation time including holdbacktime of Working platform	16,000	hour				
Subsum	Average installation cost of wire mesh per round [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				12.864,22	4.969,80	5.289,42
Sum	Installation cost of wire mesh per tonne [Equation = subsum/(c*a*3,11kg/sqm)*1000]				87.500,00	33.803,66	35.977,65
O20202	Cavern Construction						
a	Estimated costs for wire mesh installation main tunnel [Equation = Item C205]				87.500,00	40.350,11	10.736,28
Sum	Installation cost of wire mesh per tonne [Equation = a]				87.500,00	40.350,11	10.736,28
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.						
a	Intersections of lattice girder	5,00	pcs				
b	Mean linear weight of lattice girder	14,50	kg/meter				
c	Mean perimeter of installed lattice girder	40,61	meter				
d	Mean installation time	0,50	hour				
MAT	Material						
Mat-016	Lattice girder [Equation = b*c/1000]	0,589	tonne	185.000,00	108.924,25		
Mat-017	Lattice girder connections and footing [Equation = a-1]	4,000	pcs	68,11	272,44		
Mat-011	Electricity [Equation = e*b*c/1000]	323,829	kWh	7,50	2.428,72		
e	Estimated power consumption per tonne	550,000	kWh/tonne				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	0,25	hour	3.429,09		857,27	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	1,50	hour	2.465,64		3.698,47	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	0,75	hour	177,08		132,81	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*i]	1,00	hour	125,00		125,00	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*i]	1,25	hour	125,00		156,25	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-005	Working platform [Equation = k]	16,000	hour	330,59			5.289,42
k	Installation time including holdbacktime of Working platform	16,000	hour				
Subsum	Installation cost of lattice girder per advance [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				111.625,41	4.969,80	5.289,42
Sum	Installation cost of lattice girder per tonne [Equation = subsum/(b*c/1000)]				189.587,72	8.440,85	8.983,70
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						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	19,10	sqm				
c	Thickness of concrete lining	0,40	meter				
d	Estimated construction time per formwork block	2,00	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	243,53	cum	4.818,64	1.173.458,43		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	25,00	kWh	7,50	187,50		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = d*8]	16,00	hour	865,83	13.853,22		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-049	Injection material for tunnel crown injection [Equation = a*b]	238,75	cum	68,11	16.261,26		
Mat-026	Additional material formwork [Equation = a*b]	238,75	cum	72,00	17.190,00		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = d*g*8]	16,00	hour	3.429,09		54.865,52	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*h*8]	112,00	hour	2.465,64		276.152,23	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*i*8]	48,00	hour	177,08		8.500,00	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*j*8]	48,00	hour	125,00		6.000,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*k*8]	64,00	hour	125,00		8.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = l*m]	96,00	hour	777,88			74.676,94
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = d*24]	48,00	hour				
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.220.950,41	353.517,75	74.676,94
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.113,93	1.480,70	312,78
P10102	Ventilation shaft raise boring						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	6,34	sqm				
c	Thickness of concrete lining	0,30	meter				
d	Estimated construction time per formwork block	2,00	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = a*b*(1+e)]	80,84	cum	4.818,64	389.514,47		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	25,00	kWh	7,50	187,50		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = d*8]	16,00	hour	865,83	13.853,22		
Mat-049	Injection material for tunnel crown injection [Equation = a*b]	79,25	cum	68,11	5.397,72		
Mat-026	Additional material formwork [Equation = a*b]	79,25	cum	72,00	5.706,00		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = d*g*8]	16,00	hour	3.429,09		54.865,52	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*h*8]	112,00	hour	2.465,64		276.152,23	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*i*8]	48,00	hour	177,08		8.500,00	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*j*8]	48,00	hour	125,00		6.000,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*k*8]	64,00	hour	125,00		8.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = l*m]	96,00	hour	777,88			74.676,94
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = d*24]	48,00	hour				
Subsum	Concrete cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				414.658,91	353.517,75	74.676,94
Sum	Concrete cost per cum [Equation = subsum/(b*a)]				5.232,29	4.460,79	942,30
P10103	Ventilation cavern - foundation						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	0,75	sqm				
c	Estimated construction time of foundation per formblock	1,25	hour				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = $a*b*(1+d)$]	9,56	cum	4.818,64	46.078,21		
d	Concrete loss	0,02	%/100				
Mat-011	Electricity	15,63	kWh	7,50	117,19		
e	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump	1,25	hour	865,83	1.082,28		
Mat-026	Additional material formwork [Equation = $a*b$]	9,38	cum	72,00	675,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*f*8$]	1,25	hour	3.429,09		4.286,37	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*g*8$]	8,75	hour	2.465,64		21.574,39	
g	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*h*8$]	3,75	hour	177,08		664,06	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $d*i*8$]	3,75	hour	125,00		468,75	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*j*8$]	5,00	hour	125,00		625,00	
j	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Costs for machinery included in cavern vault						
Subsum	Concrete cost per formblock length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				47.952,68	27.618,57	-
Sum	Concrete cost per cum [Equation = $\text{subsum}/(b*a)$]				5.114,95	2.945,98	-
P10104	Ventilation cavern - vault						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	16,93	sqm				
c	Thickness of concrete lining	0,60	meter				
d	Estimated construction time per formwork block	10,00	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = $a*b*(1+e)$]	215,91	cum	4.818,64	1.040.384,56		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	125,00	kWh	7,50	937,50		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = $d*8$]	80,00	hour	865,83	69.266,08		
Mat-049	Injection material for tunnel crown injection [Equation = $a*b$]	211,68	cum	68,11	14.417,18		
Mat-026	Additional material formwork [Equation = $a*b$]	211,68	cum	72,00	15.240,60		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = $d*g*8$]	80,00	hour	3.429,09		274.327,58	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*h*8$]	560,00	hour	2.465,64		1.380.761,15	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*i*8$]	240,00	hour	177,08		42.500,00	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $d*j*8$]	240,00	hour	125,00		30.000,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*k*8$]	320,00	hour	125,00		40.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = $l*m$]	480,00	hour	777,88			373.384,70
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = $d*24$]	240,00	hour				
Subsum	Concrete cost per formblock length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				1.140.245,92	1.767.588,73	373.384,70
Sum	Concrete cost per cum [Equation = $\text{subsum}/(b*a)$]				5.386,78	8.350,48	1.763,95
P10105	Ventilation cavern - ventilation ducts						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area	11,27	sqm				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
c	Thickness of concrete lining	0,60	meter				
d	Estimated construction time per formwork block	5,00	days				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = $a*b*(1+e)$]	143,69	cum	4.818,64	692.401,91		
e	Concrete loss	0,02	%/100				
Mat-011	Electricity	62,50	kWh	7,50	468,75		
f	Electricity for light per working hour	12,50	kWh/h				
Mat-050	Gasoline for concrete pump [Equation = $d*8$]	40,00	hour	865,83	34.633,04		
Mat-049	Injection material for tunnel crown injection [Equation = $a*b$]	140,88	cum	68,11	9.595,00		
Mat-026	Additional material formwork [Equation = $a*b$]	140,88	cum	72,00	10.143,00		
LAB	Labour						
#	Concreting workmanship as below, 8 hours per day						
Lab-003	Foreman specialist [Equation = $d*g*8$]	40,00	hour	3.429,09		137.163,79	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*h*8$]	280,00	hour	2.465,64		690.380,58	
h	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*i*8$]	120,00	hour	177,08		21.250,00	
i	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $d*j*8$]	120,00	hour	125,00		15.000,00	
j	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*k*8$]	160,00	hour	125,00		20.000,00	
k	Number of Mazdoor	4,00	pcs				
MAC	Machinery						
#	Cost of formwork is included in site facility costs						
Mac-007	Concrete Pump [Equation = $l*m$]	240,00	hour	777,88			186.692,35
l	Number of concrete pumps per concrete section	2,00	pcs				
m	Concrete time including hold-back time [Equation = $d*24$]	120,00	hour				
Subsum	Concrete cost per formblock length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				747.241,70	883.794,36	186.692,35
Sum	Concrete cost per cum [Equation = $\text{subsum}/(b*a)$]				5.304,29	6.273,61	1.325,23
P10106	Bored Piles						
a	Installation length of bored piles	15,00	meter				
b	Cross sectional of bored pile	0,79	sqm				
c	Estimated construction time per bored pile	2,00	hour				
MAT	Material						
Mat-009	Concrete C25/30 (mixing on site) [Equation = $a*b*(1+d)$]	13,04	cum	4.818,64	62.810,93		
d	Concrete loss	0,10	%/100				
Mat-050	Gasoline for concrete pump [Equation = c]	2,00	hour	865,83	1.731,65		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $c*e$]	2,00	hour	3.429,09		6.858,19	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $c*f$]	14,00	hour	2.465,64		34.519,03	
f	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $c*g$]	6,00	hour	177,08		1.062,50	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $c*h$]	6,00	hour	125,00		750,00	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $c*i$]	8,00	hour	125,00		1.000,00	
i	Number of Mazdoor	4,00	pcs				
Mac-007	Concrete Pump [Equation = $j*k$]	6,00	hour	777,88			4.667,31
j	Number of concrete pumps per concrete section	1,00	pcs				
k	Concrete time including hold-back time [Equation = $24(8/c)$]	6,00	hour				
Subsum	Installation cost per pile [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				64.542,58	44.189,72	4.667,31
Sum	Concrete cost per cum [Equation = $\text{subsum}/(b*a)$]				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						
a	Length of formwork block	12,50	meter				
b	Area of vault cross section	17,10	sqm				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
c	Estimated construction time of foundation per formblock	2,00	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = $a*b*d*(1+e)$]	22,44	tonne	52.000,00	1.167.075,00		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*f*8$]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*g*8$]	64,00	hour	2.465,64		157.801,27	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*h*8$]	32,00	hour	177,08		5.666,67	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $d*i*8$]	48,00	hour	125,00		6.000,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*j*8$]	48,00	hour	125,00		6.000,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				1.167.075,00	175.467,94	-
Sum	Reinforcement cost per tonne [Equation = $\text{subsum}/(b*a)$]				54.600,00	8.209,03	-
P10202	Reinforcement for inner lining of ventilation shaft raise boring						
a	Length of formwork block	12,50	meter				
b	Area of vault cross section	7,44	sqm				
c	Estimated construction time of foundation per formblock	2,00	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = $a*b*d*(1+e)$]	9,77	tonne	52.000,00	507.780,00		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*f*8$]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*g*8$]	64,00	hour	2.465,64		157.801,27	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*h*8$]	32,00	hour	177,08		5.666,67	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $d*i*8$]	48,00	hour	125,00		6.000,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*j*8$]	48,00	hour	125,00		6.000,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				507.780,00	175.467,94	-
Sum	Reinforcement cost per tonne [Equation = $\text{subsum}/(b*a)$]				54.600,00	18.867,52	-
P10203	Reinforcement for inner lining of ventilation cavern - foundation						
a	Length of formwork block	12,50	meter				
b	Area of foundation cross section	0,75	sqm				
c	Estimated construction time of foundation per formblock	0,16	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = $a*b*d*(1+e)$]	0,98	tonne	52.000,00	51.187,50		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $d*f*8$]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $d*g*8$]	5,00	hour	2.465,64		12.328,22	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $d*h*8$]	2,50	hour	177,08		442,71	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $d*i*8$]	3,75	hour	125,00		468,75	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $d*j*8$]	3,75	hour	125,00		468,75	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				51.187,50	13.708,43	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				54.600,00	14.622,33	-
P10204	Reinforcement for inner lining of ventilation cavern - vault						
a	Length of formwork block	12,50	meter				
b	Area of vault cross section	16,93	sqm				
c	Estimated construction time of foundation per formblock	5,00	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = a*b*d*(1+e)]	22,23	tonne	52.000,00	1.155.745,50		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f*8]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	160,00	hour	2.465,64		394.503,19	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	80,00	hour	177,08		14.166,67	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i*8]	120,00	hour	125,00		15.000,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j*8]	120,00	hour	125,00		15.000,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				1.155.745,50	438.669,85	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				54.600,00	20.723,74	-
P10205	Reinforcement for inner lining of ventilation cavern - ventilation ducts						
a	Length of formwork block	12,50	meter				
b	Area of vault cross section	11,27	sqm				
c	Estimated construction time of foundation per formblock	5,00	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = a*b*d*(1+e)]	14,79	tonne	52.000,00	769.177,50		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f*8]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g*8]	160,00	hour	2.465,64		394.503,19	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h*8]	80,00	hour	177,08		14.166,67	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i*8]	120,00	hour	125,00		15.000,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j*8]	120,00	hour	125,00		15.000,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				769.177,50	438.669,85	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				54.600,00	31.138,94	-
P10206	Reinforcement for bored piles						
a	Estimated bored pile length	15,00	meter				
b	Area of vault cross section	11,27	sqm				
c	Estimated installation time reinforcement in bored pile	1,00	hour				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = a*b*d*(1+e)]	17,75	tonne	52.000,00	923.013,00		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	4,00	hour	2.465,64		9.862,58	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	2,00	hour	177,08		354,17	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	3,00	hour	125,00		375,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	3,00	hour	125,00		375,00	
j	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Machinery is included in time dependent costs						
Subsum	Reinforcement cost per formblock length [Equation = sum(MAT); sum(LAB); sum(MAC)]				923.013,00	10.966,75	-
Sum	Reinforcement cost per tonne [Equation = subsum/(b*a)]				54.600,00	648,73	-
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.						
Sum	Costs of 3D monitoring targets each [Equation = cost for item E101]				275,90	-	-
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.						
Sum	Costs of borehole extensimeters each [Equation = cost for item E102]				12.579,49	-	-
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.						
Sum	Costs of load cells each [Equation = cost for item E103]				31.484,50	-	-
Q104	Supply, install, read and maintain of strain gauges for shotcrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of strain gauges each [Equation = cost for item E104]				4.230,90	-	-
Q105	Supply, install, read and maintain of strain gauges for concrete as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of strain gauges each [Equation = cost for item E105]				4.230,90	-	-
Q106	Supply, install, read and maintain of radial pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of radial pressure cells each [Equation = cost for item E106]				31.594,50	-	-
Q107	Supply, install, read and maintain of tangential pressure cells as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of tangential pressure cells each [Equation = cost for item E107]				31.594,50	-	-
Q108	Supply, install, read and maintain of temperature gauges as per approved drawings & Technical Specifications or as directed by Employer's Representative.						
Sum	Costs of temperature gauges each [Equation = cost for item E108]				1.860,90	-	-
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.						
Sum	Costs of sub-base layer per cum [Equation = cost for item F101]				1.300,58	525,56	318,22
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.						
Sum	Costs of dry lean cement concrete base layer per cum [Equation = cost for item F102]				207,20	157,67	43,93
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.						
a	Block length	12,50	meter				
b	Width of pavement	20,00	meter				
c	Thickness of layer	0,25	meter				
d	Estimated construction time per block length	8,00	hour				
MAT	Material						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-010	Concrete C30/37 (mixing on site) for cement concrete pavement [Equation = (a+b+c+d+e)/75] [Equation = a*b*c]	62,50	cum	5.263,74	328.983,49		
Mat-050	Gasoline for concrete pump	16,00	hour	865,83	13.853,22		
Mat-055	Dowel rods and tie bars for concrete pavement	0,31	tonne	57.893,50	18.091,72		
e	Required dowels and tie rods for concrete pavement	0,005	tonne/cum				
Mat-054	Gasoline for paver	8,00	hour	1.731,65	13.853,22		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	8,00	hour	3.429,09		27.432,76	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	48,00	hour	2.465,64		118.350,96	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	16,00	hour	177,08		2.833,33	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	16,00	hour	125,00		2.000,00	
i	Number of Mate	2,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	24,00	hour	125,00		3.000,00	
j	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Supplying Machinery is included in time-dependent costs						
Mac-007	Concrete Pump[Equation = k*d/8]	2,00	day	18.669,23			37.338,47
k	Number of concrete pumps per concrete section	2,00	pcs				
Mac-048	Paver 8.0 m	1,00	day	36.067,65			36.067,65
Mac-049	Joint cutting equipment	1,00	day	2.080,76			2.080,76
Mac-050	Bolt setting equipment	1,00	day	2.489,99			2.489,99
Subsum	Construction cost of concrete pavement per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				374.781,64	153.617,05	77.976,87
Sum	Construction cost of concrete pavement per sqm [Equation = subsum/(a*b)]				1.499,13	614,47	311,91
BILL 4 - CIVIL ENGINEERING PORTAL WEST							
SCHEDULE - S DEWATERING ARRANGEMENT							
SCHEDULE - S1 Temporary Dewatering Arrangement							
S101	Care of water in temporary portal construction site						
a	Estimated pump length	350,00	meter				
MAT	Material						
Mat-057	PE pipe SDR 26 Ø200 mm	350,00	meter	1.775,30	621.355,99		
Mat-011	Electricity [Equation = b*c*d*24*8*e)]	3.810.240,00	kWh	7,50	28.576.800,00		
b	Power of pumps	42,00	kW				
c	Number of pumps	3,00	pcs				
d	Estimated construction time	84,00	month				
e	Estimated pumping time of construction time	0,50	[-]				
LAB	Labour						
#	Labour is included in portal excavation						
MAC	Machinery						
#	Machinery is included in time dependent costs						
Sum	Overall costs of care of water				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						
a	Construction Length	10,00	meter				
b	Estimated construction time	1,00	hour				
MAT	Material						
Mat-033	PVC or PP pipe Ø250mm [Equation = a]	10,00	meter	2.346,39	23.463,90		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	4,00	hour	2.465,64		9.862,58	
d	Number of Skilled NATM Working Man Underground	4,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	3,00	hour	177,08		531,25	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	4,00	hour	125,00		500,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	5,00	hour	125,00		625,00	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per construction length [Equation = sum(MAT); sum(LAB); sum(MAC)]				23.463,90	11.518,83	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				1.877,11	921,51	-
S20102	400 mm internal diameter PVC pipe						
a	Construction Length	10,00	meter				
b	Estimated construction time	1,00	hour				
MAT	Material						
Mat-034	PVC or PP pipe Ø400mm [Equation = a]	10,00	meter	6.409,15	64.091,51		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	4,00	hour	2.465,64		9.862,58	
d	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	3,00	hour	177,08		531,25	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	4,00	hour	125,00		500,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	5,00	hour	125,00		625,00	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per construction length [Equation = sum(MAT); sum(LAB); sum(MAC)]				64.091,51	11.518,83	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				5.127,32	921,51	-
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						
a	Construction Length	10,00	meter				
b	Estimated construction time	1,00	hour				
MAT	Material						
Mat-029	PVC or PP drainage pipe Ø250mm [Equation = a]	10,00	meter	2.288,50	22.884,96		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	4,00	hour	2.465,64		9.862,58	
d	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	3,00	hour	177,08		531,25	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	4,00	hour	125,00		500,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	5,00	hour	125,00		625,00	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of drainage pipe per construction length [Equation = sum(MAT); sum(LAB); sum(MAC)]				22.884,96	11.518,83	-
Sum	Installation cost of drainage pipe per meter [Equation = subsum/a]				1.830,80	921,51	-
S203	Manufacture, supply, and placing of pre-cast concrete slot channel elements as per approved drawings for carriageway drainage						
a	Construction length	2,50	meter				
b	Estimated construction time	0,25	hour				
MAT	Material						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-035	Pre-cast concrete slot channel	2,50	meter	5.632,70	14.081,74		
Mat-036	Pre-cast concrete slot channel cover of steel	2,50	meter	5.435,18	13.587,95		
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*c]	-	hour	3.429,09		-	
c	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	0,75	hour	2.465,64		1.849,23	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	0,50	hour	177,08		88,54	
e	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*f]	0,75	hour	125,00		93,75	
f	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	0,25	hour	125,00		31,25	
g	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of pre-cast slot channel per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				27.669,69	2.062,78	-
Sum	Installation cost of pre-cast slot channel per meter [Equation = subsum/a]				2.213,58	165,02	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	0,44	day				
c	Tunnel perimeter from cut&cover tunnel cross section	12,58	meter				
MAT	Material						
Mat-047	Dimpled sheets [Equation = a*c*(1+d)]	165,11	sqm	323,52	53.417,61		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	10,50	hour	2.465,64		25.889,27	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g*8]	7,00	hour	177,08		1.239,58	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = b*h*8]	10,50	hour	125,00		1.312,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = b*i*8]	3,50	hour	125,00		437,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of dimpled sheet per block length [Equation = sum(MAT); sum(LAB); sum(MAC)]				53.417,61	28.878,85	-
Sum	Installation cost of dimpled sheet per sqm [Equation = subsum/(a*c)]				339,70	183,65	-
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.						
a	Block length	12,50	meter				
b	Estimated construction time	1,31	day				
c	Tunnel perimeter from cut&cover tunnel cross section	12,58	meter				
MAT	Material						
Mat-038	Water proofing membrane [Equation = a*c*(1+d)]	165,11	sqm	357,58	59.040,51		
d	Cut offs	0,05	%/100				
LAB	Labour						
#	Workmanship as laid down below with 8 working hours per day						
Lab-003	Foreman specialist [Equation = b*e*8]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f*8]	31,50	hour	2.465,64		77.667,81	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-019	Mason (1st class) & Skilled [Equation = $b \cdot g \cdot 8$]	21,00	hour	177,08		3.718,75	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $b \cdot h \cdot 8$]	31,50	hour	125,00		3.937,50	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $b \cdot i \cdot 8$]	10,50	hour	125,00		1.312,50	
i	Number of Mazdoor	1,00	pcs				
MAC	Machinery						
#	Machinery is included in time-dependent costs						
Subsum	Installation cost of water proofing per block length [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				59.040,51	86.636,56	-
Sum	Installation cost of water proofing per sqm [Equation = $\text{subsum}/(a \cdot c)$]				375,46	550,95	-
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						
a	Estimated excavation time	0,15	hour				
b	Mean loading capacity of muck transporter	10,00	cum				
c	Mean mucking distance	10,00	km				
d	Mean driving speed muck transporter	30,00	km/hour				
e	Loosening factor of material	1,60	-				
f	Volume of excavation material per loading [Equation = b/e]	6,25	cum				
MAT	Material						
Mat-002	Gasoline for wheel loader	0,15	hour	1.362,20	204,33		
Mat-004	Gasoline for transporter [Equation = $a+c/d \cdot 2$]	0,82	hour	1.375,70	1.123,49		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $a \cdot g$]	0,15	hour	3.429,09		514,36	
g	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $a \cdot h$]	0,30	hour	2.465,64		739,69	
h	Number of Skilled NATM Working Man Underground	2,00	pcs				
MAC	Machinery						
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = $i \cdot j$]	0,15	hour	1.674,56			251,18
i	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
j	Excavation time including hold-back time	0,15	hour				
Mac-059	Truck dumper	0,82	hour	1.232,51			1.006,55
k	Number of Tunnel muck transporter (dumper or equivalent)	1,00	pcs				
l	Excavation time including hold-back time	0,82	hour				
Subsum	Excavation cost per loading [Equation = $\text{sum}(\text{MAT}); \text{sum}(\text{LAB}); \text{sum}(\text{MAC})$]				1.327,82	1.254,06	1.257,73
Sum	Excavation cost per cum [Equation = $\text{subsum}/(a \cdot b)$]				212,45	200,65	201,24
T10102	Rock excavation as per classification of excavation laid down in the Technical Technical Specifications						
a	Estimated excavation material per cycle	67,50	cum				
b	Estimated cycle time	4,00	hour				
c	Estimated mucking time [Equation = $b/3$]	1,32	hour				
d	Estimated d&b time [Equation = $b \cdot 2/3$]	2,64					
e	Mean loading capacity of muck transporter	10,00	cum				
f	Mean mucking distance	10,00	km				
g	Mean driving speed muck transporter	30,00	km/hour				
h	Loosening factor of material	1,60	-				
MAT	Material						
Mat-001	Explosive including detonator and accessories for d&b [Equation = a]	67,50	cum	453,67	30.622,80		
Mat-002	Gasoline for wheel loader	1,32	hour	1.362,20	1.798,10		
Mat-004	Gasoline for transporter [Equation = $a \cdot h/e \cdot 2 \cdot f/g$]	7,20	hour	2.615,08	18.828,60		
Mat-005	Miscellaneous material for tunnel excavation per cum excavation [Equation = a]	67,50	cum	70,00	4.725,00		

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mat-011	Electricity [Equation = m*a]	675,00	kWh	7,50	5.062,50		
m	Estimated electricity per cum excavation	10,00	kWh/cum				
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*n]	4,00	hour	3.429,09		13.716,38	
n	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*o]	24,00	hour	2.465,64		59.175,48	
o	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*p]	12,00	hour	177,08		2.125,00	
p	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = d*q]	16,00	hour	125,00		2.000,00	
q	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = d*r]	20,00	hour	125,00		2.500,00	
r	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = s]	4,00	hour	6.089,81			24.359,24
s	Excavation time including hold-back time [Equation = d+c*0,07]	4,00	hour				
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = t*u]	4,00	hour	1.674,56			6.698,24
t	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
u	Excavation time including hold-back time	4,00	hour				
Mac-003	Tunnel muck transporter (dumper or equivalent) [Equation = v*w]	16,00	hour	1.554,85			24.877,59
v	Number of Tunnel muck transporter (dumper or equivalent)	4,00	pcs				
w	Excavation time including hold-back time	4,00	hour				
Subsum	Excavation cost per cycle [Equation = sum(MAT); sum(LAB); sum(MAC)]				61.037,01	79.516,86	55.935,07
Sum	Excavation cost per cum [Equation = subsum/a]				904,25	1.178,03	828,67
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.						
a	Construction time	0,33	day				
b	Volume of embankment	125,00	cum				
MAT	Material						
Mat-002	Gasoline for wheel loader	2,64	hour	1.362,20	3.596,21		
Mat-004	Gasoline for transporter [Equation = a*i*8]	10,56	hour	2.615,08	27.615,28		
Mat-052	Gasoline for vibratory soil compactor [Equation = a*8]	2,64	hour	865,83	2.285,78		
LAB	Labour						
Lab-003	Foreman specialist [Equation = a*c*8]	2,64	hour	3.429,09		9.052,81	
c	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = a*d*8]	15,84	hour	2.465,64		39.055,82	
d	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = a*e*8]	7,92	hour	177,08		1.402,50	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = a*f*8]	10,56	hour	125,00		1.320,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = a*g*8]	13,20	hour	125,00		1.650,00	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-002	Tunnel wheel loader (Liebherr LH564 or equivalent) [Equation = h*i]	0,33	day	40.189,42			13.262,51
h	Number of Tunnel wheel loader (Liebherr LH564 or equivalent)	1,00	pcs				
i	Construction time including hold-back time	0,33	day				
Mac-059	Truck dumper [Equation = j*k]	1,32	day	9.860,06			13.015,28
j	Number of Truck dumper	4,00	pcs				
k	Construction time including hold-back time	0,33	day				
Mac-052	Vibratory soil compactor [Equation = l*m]	0,33	day	15.497,30			5.114,11
l	Number of Vibratory soil compactor	1,00	pcs				
m	Construction time including hold-back time	0,33	day				
Subsum	Embankments and backfilling cost per cycle [Equation = sum(MAT); sum(LAB); sum(MAC)]				33.497,27	52.481,13	31.391,89
Sum	Embankments and backfilling costs per cum [Equation = subsum/b]				267,98	419,85	251,14

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
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.						
a	Construction time	0,33	day				
b	Volume of rip-rap layer	25,00	cum				
c	Mean thickness of rip-rap layer	0,50	meter				
Mat-066	Stones >1.5 m	25,00	cum	1.475,28	36.881,97		
Mat-004	Gasoline for transporter [Equation = a*8]	2,64	hour	2.615,08	6.903,82		
LAB	Labour						
Lab-004	Skilled NATM Working Man Underground [Equation = a*d*8]	7,92	hour	2.465,64		19.527,91	
d	Number of Skilled NATM Working Man Underground	3,00	pcs				
MAC	Machinery						
Mac-031	Loader crane	0,33	day	14.284,94			4.714,03
Subsum	Rip-rap layer construction cost per cycle [Equation = sum(MAT); sum(LAB); sum(MAC)]				43.785,79	19.527,91	4.714,03
Sum	Rip-rap layer costs per sqm [Equation = subsum/(b/c)]				875,72	390,56	94,28
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.						
a	Construction time	0,50	day				
b	Length of constructed gabion cage	50,00	meter				
c	Width of constructed gabion cage	1,20	meter				
d	Height of constructed gabion cage	0,60	meter				
Mat-067	Stone Boulder of size of 240 mm at Crusher Plant Equation = a*b*c]	36,00	cum	470,00	16.920,00		
Mat-004	Gasoline for transporter [Equation = a*8]	4,00	hour	2.615,08	10.460,33		
Mat-015	Wire mesh (CQS60 or equivalent 3,11 kg/sqm) [Equation = (b*c+b*d)*2*e]	198,00	sqm	75,79	15.006,26		
e	Cut offs	1,10	%/100				
LAB	Labour						
Lab-004	Skilled NATM Working Man Underground [Equation = a*f*8]	16,00	hour	2.465,64		39.450,32	
f	Number of Skilled NATM Working Man Underground	4,00	pcs				
MAC	Machinery						
Mac-031	Loader crane	0,50	day	14.284,94			7.142,47
Mac-046	Small excavator	0,50	day	5.649,72			2.824,86
#	Welding machine is included in time dependent costs						
Subsum	Gabion cage construction cost per cycle [Equation = sum(MAT); sum(LAB); sum(MAC)]				42.386,60	39.450,32	7.142,47
Sum	Gabion cage construction costs per sqm [Equation = subsum/(b*d)]				508,64	473,40	85,71
T105	Supply and placing of geotextile as filter membrane behind gabion cage						
a	Construction time	0,10	day				
b	Length of constructed gabion cage	50,00	meter				
c	Height of constructed gabion cage	0,60	meter				
Mat-037	Protective felt [Equation = b*c*d]	33,00	sqm	122,79	4.052,18		
d	Cut offs	1,10	%/100				
LAB	Labour						
Lab-004	Skilled NATM Working Man Underground [Equation = a*f*8]	1,60	hour	2.465,64		3.945,03	
e	Number of Skilled NATM Working Man Underground	2,00	pcs				
MAC	Machinery						
#	Machinery is included in time dependent costs						
Subsum	Filter membrane cost per cycle [Equation = sum(MAT); sum(LAB); sum(MAC)]				4.052,18	3.945,03	-
Sum	Filter membrane construction costs per sqm [Equation = subsum/(b*d)]				135,07	131,50	-
SCHEDULE - U PRIMARY SUPPORT MEASURES							
SCHEDULE - U1 Bolts & Anchors							
U101	Supply, drilling, installation and grouting of SN type rockbolts 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						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
a	Bolt length	8,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	1,50	m/min				
d	Drill hole cleaning and installation of bolt	10,00	min				
e	Setting up	2,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,29	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	8,00	meter	221,80	1.774,39		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	37,75	kWh	7,50	283,14		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,08	tonne	7.492,10	599,37		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	0,29	hour	3.429,09		990,63	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	1,73	hour	2.465,64		4.273,78	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	0,87	hour	177,08		153,47	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	1,16	hour	125,00		144,44	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	1,44	hour	125,00		180,56	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,29	hour	6.089,81			1.759,28
Sum	Installation costs of SN bolt l = 8 meter				2.982,22	5.742,88	1.759,28
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						
a	Anchor length	20,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	1,00	m/min				
d	Drill hole cleaning and installation of anchor and prestressing	100,00	min				
e	Setting up	3,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	2,05	hour				
MAT	Material						
Mat-068	Pre-stressed anchors [Equation = a]	20,00	meter	3.441,51	68.830,18		
Mat-069	Anchor plate for pre-stressed anchors	1,00	pcs	650,65	650,65		
Mat-011	Electricity [Equation = g*h*f]	267,89	kWh	7,50	2.009,21		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,20	tonne	7.492,10	1.498,42		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	2,05	hour	3.429,09		7.029,64	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	12,30	hour	2.465,64		30.327,43	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	6,15	hour	177,08		1.089,06	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	8,20	hour	125,00		1.025,00	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	10,25	hour	125,00		1.281,25	

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	2,05	hour	6.089,81			12.484,11
Sum	Installation costs of pre-stressed anchor l = 20 meter				72.988,45	40.752,39	12.484,11
SCHEDULE - S2 Shotcrete & Wire Mesh							
U201	Shotcreting with designed mix cement concrete SpC20/25/II/I1/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.						
U20101	Thickness of 50 mm						
a	Lining thickness	0,05	meter				
b	Additional thickness due to tolerance of excavation geometry	0,02	meter				
c	Construction length	25,00	meter				
d	Round height	3,50	meter				
e	Estimated shotcreting capacity	0,10	cum/min				
f	Rebound	0,15	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	7,04	cum	4.818,64	33.941,27		
Mat-011	Electricity [Equation = Mat-006/(e*60)*h*i]	105,66	kWh	7,50	792,42		
h	Power of Spraying manipulator	120,00	kW				
i	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = Mat-006/(e*60)*j]	1,17	hour	3.429,09		4.025,61	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = Mat-006/(e*60)*k]	7,04	hour	2.465,64		17.367,39	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = Mat-006/(e*60)*l]	3,52	hour	177,08		623,67	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = Mat-006/(e*60)*m]	4,70	hour	125,00		586,98	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = Mat-006/(e*60)*n]	5,87	hour	125,00		733,72	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = o]	3,52	hour	1.673,56			5.894,07
o	Shotcrete time including hold back time [Equation = Mat-006/(e*60)*24/8]	3,52	hour				
Subsum	Shotcreting costs per construction length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				34.733,69	23.337,37	5.894,07
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				396,96	266,71	67,36
U20102	Thickness of 100 mm						
a	Lining thickness	0,10	meter				
b	Additional thickness due to tolerance of excavation geometry	0,04	meter				
c	Construction length	25,00	meter				
d	Round height	3,50	meter				
e	Estimated shotcreting capacity	0,10	cum/min				
f	Rebound	0,15	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	14,09	cum	4.818,64	67.882,54		
Mat-011	Electricity [Equation = Mat-006/(e*60)*h*i]	211,31	kWh	7,50	1.584,84		
h	Power of Spraying manipulator	120,00	kW				
i	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = Mat-006/(e*60)*j]	2,35	hour	3.429,09		8.051,23	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = Mat-006/(e*60)*k]	14,09	hour	2.465,64		34.734,77	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = Mat-006/(e*60)*l]	7,04	hour	177,08		1.247,33	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = Mat-006/(e*60)*m]	9,39	hour	125,00		1.173,96	
m	Number of Mate	4,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Lab-021	Mazdoor [Equation = Mat-006/(e*60)*n]	11,74	hour	125,00		1.467,45	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = o]	7,04	hour	1.673,56			11.788,14
o	Shotcrete time including hold back time [Equation = Mat-006/(e*60)*24/8]	7,04	hour				
Subsum	Shotcreting costs per construction length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				69.467,38	46.674,74	11.788,14
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				793,91	533,43	134,72
U20103	Thickness of 200 mm						
a	Lining thickness	0,20	meter				
b	Additional thickness due to tolerance of excavation geometry	0,08	meter				
c	Construction length	25,00	meter				
d	Round height	3,50	meter				
e	Estimated shotcreting capacity	0,10	cum/min				
f	Rebound	0,15	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = (a+b)*c*d*(1+f)]	28,18	cum	4.818,64	135.765,08		
Mat-011	Electricity [Equation = Mat-006/(e*60)*h*i]	422,63	kWh	7,50	3.169,69		
h	Power of Spraying manipulator	120,00	kW				
i	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = Mat-006/(e*60)*j]	4,70	hour	3.429,09		16.102,46	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = Mat-006/(e*60)*k]	28,18	hour	2.465,64		69.469,55	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = Mat-006/(e*60)*l]	14,09	hour	177,08		2.494,66	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = Mat-006/(e*60)*m]	18,78	hour	125,00		2.347,92	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = Mat-006/(e*60)*n]	23,48	hour	125,00		2.934,90	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-004	Spraying manipulator [Equation = o]	14,09	hour	1.673,56			23.576,27
o	Shotcrete time including hold back time [Equation = Mat-006/(e*60)*24/8]	14,09	hour				
Subsum	Shotcreting costs per construction length [Equation = sum(MAT) + sum(LAB) + sum (MAC)]				138.934,77	93.349,48	23.576,27
Sum	Shotcreting cost per sqm [Equation = Subsum/(c*d)]				1.587,83	1.066,85	269,44
U202	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						
a	Round height	3,50	meter				
b	Estimated shotcreting capacity	0,10	cum/min				
c	Rebound	0,15	%/100				
MAT	Material						
Mat-006	Shotcrete C25/30 (mixing on site) [Equation = 1cum*(1+f)]	1,15	cum	4.818,64	5.541,43		
Mat-011	Electricity [Equation = Mat-006/(b*60)*d*e]	17,25	kWh	7,50	129,38		
d	Power of Spraying manipulator	120,00	kW				
e	Operating grade of Spraying manipulator	0,75	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = Mat-006/(b*60)*f]	0,19	hour	3.429,09		657,24	
f	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = Mat-006/(b*60)*g]	1,15	hour	2.465,64		2.835,49	
g	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = Mat-006/(b*60)*h]	0,58	hour	177,08		101,82	
h	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = Mat-006/(b*60)*i]	0,77	hour	125,00		95,83	
i	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = Mat-006/(b*60)*j]	0,96	hour	125,00		119,79	
j	Number of Mazdoor	5,00	pcs				
MAC	Machinery						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-004	Spraying manipulator [Equation = k]	0,58	hour	1.673,56			962,30
k	Shotcrete time including hold back time [Equation = Mat-006/(b*60)*24/8]	0,58	hour				
Sum	Shotcreting cost per cum [Equation = sum(MAT); sum(LAB); sum(MAC)]				5.670,81	3.810,18	962,30
U203	Sprayed concrete SpC20/25/II/J1/XF3/GK8 as per Technical 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.						
Sum	Shotcreting cost per cum [Equation = cost for item U202]				5.670,81	3.810,18	962,30
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 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.						
a	Estimated installation time of one layer wire mesh	1,50	hour				
b	Construction length	25,00	meter				
c	Construction height	3,50	meter				
MAT	Material						
Mat-015	Wire mesh (CQ560 or equivalent 3,11 kg/sqm) [Equation = b*c*(1+d)*3,11kg/sqm]	340,156	kg	70,00	23.810,94		
d	Offcuts	0,250	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = b*e]	1,50	hour	3.429,09		5.143,64	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*f]	9,00	hour	2.465,64		22.190,80	
f	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*g]	4,50	hour	177,08		796,88	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*h]	6,00	hour	125,00		750,00	
h	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*i]	7,50	hour	125,00		937,50	
i	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
#	Truck mounted crane included in time dependent costs						-
Subsum	Average installation cost of wire mesh per construction length [Equation = sum(MAT) + sum(LAB) + sum(MAC)]				23.810,94	29.818,82	-
Sum	Installation cost of wire mesh per tonne [Equation = subsum/(b*c*3,11kg/sqm)*1000]				87.500,00	109.577,66	-
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						
a	Length of cut & cover formwork block	12,50	meter				
b	Cross sectional concrete area in cut & cover tunnel	1,00	sqm				
c	Estimated construction time per formwork block	1,00	hours				
MAT	Material						
Mat-050	Gasoline for concrete pump	1,00	hour	865,83	865,83		
Mat-008	Concrete C12/15 (mixing on site) [Equation = a*b*(1+d)]	12,75	cum	4.103,19	52.315,63		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = c*e]	-	hour	3.429,09		-	
e	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = c*f]	3,00	hour	2.465,64		7.396,93	
f	Number of Skilled NATM Working Man Underground	3,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = c*g]	2,00	hour	177,08		354,17	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = c*h]	3,00	hour	125,00		375,00	
h	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = c*i]	1,00	hour	125,00		125,00	
i	Number of Mazdoor	1,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
MAC	Machinery						
Mac-007	Concrete Pump [Equation = $c*24/8$]	3,00	hour	777,88			2.333,65
Subsum	Concrete cost per formblock length [Equation = $\text{sum}(\text{MAT})$; $\text{sum}(\text{LAB})$; $\text{sum}(\text{MAC})$]				53.181,45	8.251,10	2.333,65
Sum	Concrete cost per cum [Equation = $\text{subsum}/(b*a)$]				4.254,52	660,09	186,69
V10102	Concrete C25/30						
a	Length of cut & cover formwork block	12,50	meter				
b	Cross sectional concrete area in cut & cover tunnel	12,50	sqm				
c	Estimated construction time per formwork block	1,75	day				
MAT	Material						
Mat-050	Gasoline for concrete pump	4,67	hour	865,83	4.040,52		
Mat-009	Concrete C25/30 (mixing on site) [Equation = $a*b*(1+d)$]	159,38	cum	4.818,64	767.970,18		
d	Concrete loss	0,02	%/100				
LAB	Labour						
Lab-003	Foreman specialist [Equation = $c*e*8$]	14,00	hour	3.429,09		48.007,33	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $c*f*8$]	98,00	hour	2.465,64		241.633,20	
f	Number of Skilled NATM Working Man Underground	7,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $c*g*8$]	42,00	hour	177,08		7.437,50	
g	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = $c*h*8$]	-	hour	125,00		-	
h	Number of Mate	-	pcs				
Lab-021	Mazdoor [Equation = $c*i*8$]	42,00	hour	125,00		5.250,00	
i	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
Mac-007	Concrete Pump [Equation = c]	1,75	day	18.669,23			32.671,16
Subsum	Concrete cost per formblock length [Equation = $\text{sum}(\text{MAT})$; $\text{sum}(\text{LAB})$; $\text{sum}(\text{MAC})$]				772.010,70	302.328,03	32.671,16
Sum	Concrete cost per cum [Equation = $\text{subsum}/(b*a)$]				4.940,87	1.934,90	209,10
V102	Reinforcement steel						
a	Length of formwork block	12,50	meter				
b	Cross sectional concrete area in cut & cover tunnel	12,50	sqm				
c	Estimated construction time per formwork block	1,75	day				
MAT	Material						
Mat-027	Reinforcement grade S550 [Equation = $a*b*d*(1+e)$]	16,41	tonne	52.000,00	853.125,00		
d	Estimated reinforcement grade	0,10	tonne/cum				
e	Cut off	0,05	%/100				
Mat-026	Additional material formwork [Equation = $a*b$]	156,25	cum	72,00	11.250,00		
LAB	Labour						
Lab-003	Foreman specialist [Equation = $c*f*8$]	-	hour	3.429,09		-	
f	Number of Foreman specialist	-	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = $c*g*8$]	56,00	hour	2.465,64		138.076,12	
g	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = $c*h*8$]	28,00	hour	177,08		4.958,33	
h	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = $c*i*8$]	42,00	hour	125,00		5.250,00	
i	Number of Mate	3,00	pcs				
Lab-021	Mazdoor [Equation = $c*j*8$]	42,00	hour	125,00		5.250,00	
j	Number of Mazdoor	3,00	pcs				
Subsum	Reinforcement cost per formblock length [Equation = $\text{sum}(\text{MAT})$; $\text{sum}(\text{LAB})$; $\text{sum}(\text{MAC})$]				864.375,00	153.534,45	-
Sum	Reinforcement cost per tonne [Equation = $\text{subsum}/(b*a)$]				52.685,71	9.358,29	-
V103	PVC Water stop serrated with central bulb (225mm wide, 8-11mm thick)						
Sum	Cost for PVC water stop [Equation = cost for item A207]				522,06	182,52	-
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.						
Sum	Cost for granular sub-base layer per cum [Equation = cost for item F101]				1.300,58	525,56	318,22

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
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.						
Sum	Cost for dry lean cement concrete base layer per sqm [Equation = cost for item F102]				207,20	157,67	43,93
W103	Sloping concrete C12/15						
Sum	Cost for sloping concrete C12/15 per cum [Equation = cost for item V10101]				4.254,52	660,09	186,69
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.						
Sum	Cost for concrete pavement per sqm [Equation = cost for item F103]				1.415,77	722,90	366,95
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.						
Sum	Cost for pre-cast footpath elements per meter [Equation = cost for item F104]				1.498,34	1.734,68	112,99
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.						
Sum	Cost for granular sub-base layer per cum [Equation = cost for item F101]				1.300,58	525,56	318,22
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.						
a	Construction length	12,50	meter				
b	Width of pavement	3,00	meter				
c	Thickness of layer	0,10	meter				
d	Estimated construction time per construction length	1,00	hour				
MAT	Material						
Mat-056	Mastic asphalt [Equation = a*b*c]	3,75	cum	5.327,37	19.977,65		
Mat-054	Gasoline for paver	1,50	hour	1.731,65	2.597,48		
LAB	Labour						
Lab-003	Foreman specialist [Equation = d*f]	1,00	hour	3.429,09		3.429,09	
e	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = d*g]	4,00	hour	2.465,64		9.862,58	
f	Number of Skilled NATM Working Man Underground	4,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = d*h]	2,00	hour	177,08		354,17	
g	Number of Mason (1st class) & Skilled	2,00	pcs				
Lab-020	Mate [Equation = d*i]	2,00	hour	125,00		250,00	
h	Number of Mate	2,00	pcs				
Lab-021	Mazdoor [Equation = d*j]	3,00	hour	125,00		375,00	
i	Number of Mazdoor	3,00	pcs				
MAC	Machinery						
#	Supplying Machinery is included in time-dependent costs						
Mac-048	Paver 8.0 m	0,13	day	36.067,65			4.508,46
Subsum	Construction cost of bituminous pavement per construction length [Equation = sum(MAT); sum(LAB); sum(MAC)]				22.575,13	14.270,84	4.508,46
Sum	Construction cost of bituminous pavement per sqm [Equation = subsum/(a*b)]				602,00	380,56	120,23
SCHEDULE - X BUILDINGS							
X101	Construction of buildings						
a	Estimated rate of construction of buildings per sqm	27.000,00	INR/sqm				
MAT	Material						
b	Estimated material costs of overall building construction costs	0,30	%/100	27.000,00	8.100,00		
LAB	Labour						
c	Estimated labour costs of overall building construction costs	0,40	%/100	27.000,00		10.800,00	
MAC	Machinery						
d	Estimated machinery costs of overall building construction costs	0,30	%/100	27.000,00			8.100,00

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Construction cost of buildings per sqm [Equation = sum(MAT; LAB; MAC)]				8.100,00	10.800,00	8.100,00
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						
a	Estimated pump length	500,00	meter				
MAT	Material						
Mat-057	PE pipe SDR 26 Ø200 mm	500,00	meter	1.775,30	887.651,42		
Mat-011	Electricity [Equation = b*c*d*24*30*e]	2.540.160,00	kWh	7,50	19.051.200,00		
b	Power of pumps	42,00	kW				
c	Number of pumps	4,00	pcs				
d	Estimated construction time	84,00	month				
e	Estimated pumping time of construction time	0,25	[-]				
LAB	Labour						
#	Labour is included in portal excavation						
MAC	Machinery						
#	Machinery is included in time dependent costs						
Sum	Overall costs of care of water				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						
Sum	Pipe installation costs per meter [Equation = cost for item S20101]				1.877,11	921,51	-
Y20102	400 mm internal diameter PVC pipe						
Sum	Pipe installation costs per meter [Equation = cost for item S20102]				5.127,32	921,51	-
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						
Sum	Pipe installation costs per meter [Equation = cost for item S20201]				1.830,80	921,51	-
Y203	Manufacture, supply, and placing of pre-cast concrete slot channel elements as per approved drawings for carriageway drainage						
Sum	Pre-cast concrete slot channel installation costs per meter [Equation = cost for item S203]				2.213,58	165,02	-
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.						
Sum	Dimpled sheet installation costs per sqm [Equation = cost for item S204]				339,70	183,65	-
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.						
Sum	Water proofing membrane installation costs per sqm [Equation = cost for item S205]				375,46	550,95	-
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						
Sum	Cost for loose excavation per cum [Equation = cost for item T10101]				212,45	200,65	201,24
Z10102	Rock excavation as per classification of excavation laid down in the Technical Technical Specifications						
Sum	Cost for rock excavation per cum [Equation = cost for item T10102]				904,25	1.178,03	828,67
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.						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Sum	Embankment cost per cum [Equation = cost for item T102]				267,98	419,85	251,14
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.						
Sum	Rip-rap layer cost per sqm [Equation = cost for item T103]				875,72	390,56	94,28
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 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.						
Sum	Gabion cost per sqm [Equation = cost for item T104]				508,64	473,40	85,71
Z105	Supply and placing of geotextile as filter membrane behind gabion cage						
Sum	Filter membrane installation cost per sqm [Equation = cost for item T105]				135,07	131,50	-
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	182,00	each				
a	Bolt length	8,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	0,50	m/min				
d	Drill hole cleaning and installation of bolt	20,00	min				
e	Setting up	4,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,67	hour				
MAT	Material						
Mat-018	Grouted bolt [Equation = a]	8,00	meter	221,80	1.774,39		
Mat-019	Anchor plate for grouted bolt and wear parts	1,00	pcs	325,32	325,32		
Mat-011	Electricity [Equation = g*h*f]	87,12	kWh	7,50	653,40		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,16	tonne	7.492,10	1.198,74		
i	Injection material per linear meter	20,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	0,67	hour	3.429,09		2.286,06	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	4,00	hour	2.465,64		9.862,58	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	2,00	hour	177,08		354,17	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	2,67	hour	125,00		333,33	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	3,33	hour	125,00		416,67	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,67	hour	6.089,81			4.059,87
Sum	Installation costs of SN bolt l = 8 meter				3.951,85	13.252,81	4.059,87
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						
a	Anchor length	20,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	0,50	m/min				
d	Drill hole cleaning and installation of anchor and prestressing	100,00	min				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
e	Setting up	3,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	2,38	hour				
MAT	Material						
Mat-068	Pre-stressed anchors [Equation = a]	20,00	meter	3.441,51	68.830,18		
Mat-069	Anchor plate for pre-stressed anchors	1,00	pcs	650,65	650,65		
Mat-011	Electricity [Equation = g*h*f]	311,45	kWh	7,50	2.335,91		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,20	tonne	7.492,10	1.498,42		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	2,38	hour	3.429,09		8.172,68	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	14,30	hour	2.465,64		35.258,72	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	7,15	hour	177,08		1.266,15	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	9,53	hour	125,00		1.191,67	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	11,92	hour	125,00		1.489,58	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	2,38	hour	6.089,81			14.514,05
Sum	Installation costs of pre-stressed anchor l = 20 meter				73.315,15	47.378,79	14.514,05
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						
a	Anchor length	9,00	meter				
b	Effective drilling rod numbers anchorage	1,00	pcs				
c	Drilling capacity	1,50	m/min				
d	Drill hole cleaning and installation of bolt	10,00	min				
e	Setting up	3,00	min				
f	Estimated installation time [Equation = (a/(b*c)+d+e)/60]	0,32	hour				
MAT	Material						
Mat-068	GFP self-drilling bolts [Equation = a]	9,00	meter	817,76	7.359,85		
Mat-069	Anchor plate for self-drilling bolt and wear parts	1,00	pcs	308,30	308,30		
Mat-011	Electricity [Equation = g*h*f]	41,38	kWh	7,50	310,37		
g	Power of Drilling machine with 2 drilling booms and basket	198,00	kW				
h	Operating grade of Drilling machine with 2 drilling booms and basket	0,66	%/100				
Mat-022	Injection material [Equation = a*i/1000]	0,09	tonne	7.492,10	674,29		
i	Injection material per linear meter	10,00	kg/meter				
LAB	Labour						
Lab-003	Foreman specialist [Equation = f*j]	0,32	hour	3.429,09		1.085,88	
j	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = f*k]	1,90	hour	2.465,64		4.684,73	
k	Number of Skilled NATM Working Man Underground	6,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = f*l]	0,95	hour	177,08		168,23	
l	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = f*m]	1,27	hour	125,00		158,33	
m	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = f*n]	1,58	hour	125,00		197,92	
n	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-001	Drilling machine with 2 drilling booms and basket [Equation = f]	0,32	hour	6.089,81			1.928,44
Sum	Installation grp self-drilling bolts l = 9 meter				8.652,80	6.295,08	1.928,44
SCHEDULE - ZA2 Shotcrete & Wire Mesh							

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
ZA201	Shotcreting with designed mix cement concrete SpC20/25/II/11/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						
Sum	Shotcreting cost per sqm [Equation = cost for item U20101]				396,96	266,71	67,36
ZA20102	Thickness of 100 mm						
Sum	Shotcreting cost per sqm [Equation = cost for item U20102]				793,91	533,43	134,72
ZA20103	Thickness of 200 mm						
Sum	Shotcreting cost per sqm [Equation = cost for item U20103]				1.587,83	1.066,85	269,44
ZA202	Sprayed concrete SpC20/25/II/11/XF3/GK8 as per Technical Technical Specifications & drawings or as directed by Employer's Representative for temporary surface drains						
Sum	Shotcreting cost per cum [Equation = cost for item U202]				5.670,81	3.810,18	962,30
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.						
Sum	Wire mesh cost per tonne [Equation = cost for item U204]				87.500,00	109.577,66	-
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						
Sum	Cost for concrete C12/15 per cum [Equation = cost for item V10101]				4.254,52	660,09	186,69
ZB10102	Concrete C25/30						
Sum	Cost for concrete C25/30 per cum [Equation = cost for item V10102]				4.940,87	1.934,90	209,10
ZB102	Reinforcement steel						
Sum	Cost for reinforcement steel per tonne [Equation = cost for item V102]				52.685,71	9.358,29	-
ZB103	Water stop						
Sum	Cost for water stop per meter [Equation = cost for item A207]				522,06	182,52	-
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.						
Sum	Cost for granular sub-base layer per cum [Equation = cost for item F101]				1.300,58	525,56	318,22
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.						
Sum	Cost for dry lean cement concrete base layer per sqm [Equation = cost for item F102]				207,20	157,67	43,93
ZC103	Sloping concrete C12/15						
Sum	Cost for sloping concrete C12/15 per cum [Equation = cost for item V10101]				4.254,52	660,09	186,69
ZC104	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.						
Sum	Cost for pavement concrete per sqm [Equation = cost for item F103]				1.415,77	722,90	366,95
ZC105	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.						
Sum	Cost for pre-cast footpath elements per meter [Equation = cost for item F104]				1.498,34	1.734,68	112,99
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.						
Sum	Cost for granular sub-base layer per cum [Equation = cost for item F101]				1.300,58	525,56	318,22

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
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.						
Sum	Cost for bituminous pavement layer per sqm [Equation = cost for item W107]				602,00	380,56	120,23
SCHEDULE - ZD BUILDINGS							
ZD101	Construction of buildings						
Sum	Construction cost of buildings per sqm [Equation = cost for item X101]				8.100,00	10.800,00	8.100,00
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.						
Sum	Costs of site installation, transport, construction and clearance				44.271.500,00	149.842.000,00	187.302.500,00
S&T-A102	Formwork inner lining						
a	Construction and dismantling of formwork	1,00	lump sump	1.306.463,00		522.585,20	783.877,80
MAT	Material						
Mat-060	Formwork carriage	1,00	pcs	27.973.347,61	27.973.347,61		
LAB	Labour						
b	Erecting time for formwork carriage	60,00	hour				
Lab-003	Foreman specialist [Equation = b*c]	60,00	hour	3.429,09		205.745,68	
c	Number of Foreman specialist	1,00	pcs				
Lab-004	Skilled NATM Working Man Underground [Equation = b*d]	540,00	hour	2.465,64		1.331.448,26	
d	Number of Skilled NATM Working Man Underground	9,00	pcs				
Lab-019	Mason (1st class) & Skilled [Equation = b*e]	180,00	hour	177,08		31.875,00	
e	Number of Mason (1st class) & Skilled	3,00	pcs				
Lab-020	Mate [Equation = b*f]	240,00	hour	125,00		30.000,00	
f	Number of Mate	4,00	pcs				
Lab-021	Mazdoor [Equation = b*g]	300,00	hour	125,00		37.500,00	
g	Number of Mazdoor	5,00	pcs				
MAC	Machinery						
Mac-031	Loader crane						
h	Construction time including hold-back time	7,50	day	14.284,94			107.137,03
Sum	Cost for formwork carriage				27.973.347,61	2.159.154,14	783.877,80
S&T-A103	Formwork ventilation ceiling						
b	Estimated costs formwork ventilation ceiling in per cent of inner lining formwork	0,33	%/100				
Sum	Cost for formwork carriage ventilation ceiling [Equation = cost for item S&T-A102*b]				9.231.204,71	712.520,87	258.679,67
S&T-A104	Temporary ventilation ducts						
MAT	Material						
Mat-061	PVC ventilation duct Ø1800 mm	1,00	meter	2.021,41	2.021,41		
Mat-062	Miscellaneous material for PVC ventilation duct	1,00	meter	129,41	129,41		
LAB	Labour						
#	Labour is included in underground excavation						
MAC	Machinery						
#	Machinery is included in ground excavation						
Sum	Costs for temporary ventilation ducts per meter				2.150,82	-	-
S&T-A105	Temporary lighting						
MAT	Material						
Mat-063	Electronic cable for temporary lighting	1,00	meter	1.362,20	1.362,20		
Mat-064	Halogen lamp 1500 w [Equation = a]	1,67E-02	pcs/meter	6.078,82	101,31		
a	Estimated number of lamps per tunnel meter	1,67E-02	pcs/meter				
Mat-065	Lamps [Equation = a]	6,67E-02	pcs/meter	2.503,04	166,87		
b	Estimated required number of lamps per tunnel meter	6,67E-02	pcs/meter				
LAB	Labour						
#	Labour is included in underground excavation						
MAC	Machinery						
#	Machinery is included in ground excavation						
Sum	Costs for temporary lighting per meter				1.630,38	-	-
S&T-A106	Site Facility Costs						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
a	Estimated Construction Time	84,00	month				
Mac-010	Compressor 24 kW	336,00	month	36.983,73			12.426.533,28
#	Number of Compressor 24 kW	4,00	pcs				
Mac-011	Transformer 630 kVA	336,00	month	49.938,25			16.779.252,67
#	Number of Transformer 630 kVA	4,00	pcs				
Mac-012	Compact concrete mixing plant including aggregate storage	252,00	month	790.545,96			199.217.581,67
#	Number of Compact concrete mixing plant including aggregate storage	3,00	pcs				
Mac-054	Crusher	252,00	month	457.188,38			115.211.470,50
#	Number of Crusher	3,00	pcs				
Mac-019	Van	1.260,00	month	54.862,61			69.126.882,30
#	Number of Van	15,00	pcs				
Mac-023	Foreman container	840,00	month	18.376,08			15.435.905,52
#	Number of Foreman container	10,00	pcs				
Mac-024	Workmanship container	672,00	month	18.893,71			12.696.575,81
#	Number of Workmanship container	8,00	pcs				
Mac-025	Sanitary facility container	672,00	month	34.681,61			23.306.043,26
#	Number of Sanitary facility container	8,00	pcs				
Mac-026	Container for monitoring facilities and workmanship	336,00	month	18.376,08			6.174.362,21
#	Number of Container for monitoring facilities and workmanship	4,00	pcs				
Mac-027	Project manager container	84,00	month	18.376,08			1.543.590,55
#	Number of Project manager container	1,00	pcs				
Mac-028	Storage container	2.688,00	month	13.976,17			37.567.950,34
#	Number of Storage container	32,00	pcs				
Mac-029	Maintenance container	840,00	month	11.769,41			9.886.302,72
#	Number of Maintenance container	10,00	pcs				
Mac-031	Loader crane	588,00	month	428.548,12			251.986.294,56
#	Number of Loader crane	7,00	pcs				
Mac-032	Tank truck	336,00	month	296.796,14			99.723.501,70
#	Number of Tank truck	4,00	pcs				
Mac-033	Tractor 110 kW	168,00	month	171.160,43			28.754.952,24
#	Number of Tractor 110 kW	2,00	pcs				
Mac-034	Portion neutralisation system	336,00	month	98.994,48			33.262.145,11
#	Number of Portion neutralisation system	4,00	pcs				
Mac-035	Transformer station	336,00	month	141.478,09			47.536.638,91
#	Number of Transformer station	4,00	pcs				
Mac-036	Transfer station	336,00	month	183.079,68			61.514.772,48
#	Number of Transfer station	4,00	pcs				
Mac-043	Miscellaneous electronic devices	336,00	month	49.970,60			16.790.123,03
#	Number of Miscellaneous electronic devices	4,00	pcs				
Mac-044	Pump	3.192,00	month	16.258,54			51.897.253,62
#	Number of Pump	38,00	pcs				
Mac-046	Small excavator	504,00	month	168.923,70			85.137.543,59
#	Number of Small excavator	6,00	pcs				
Mac-053	Container 12.2 m ² for accomodation of workmanship	29.400,00	month	10.182,45			299.363.883,00
#	Number of Container 12.2 m ² for accomodation of workmanship	350,00	pcs				
Mac-055	Gantry Crane 20m width, 30t	168,00	month	148.956,57			25.024.703,76
#	Number of Gantry Crane 20m width, 30t	2,00	pcs				
Mac-059	Truck dumper	2.520,00	month	295.801,73			745.420.359,60
#	Number of Truck dumper	30,00	pcs				
Mac-058	Truck mixer	1.680,00	month	469.005,46			787.929.172,80
#	Number of Truck mixer	20,00	pcs				
Mac-041	Breaker 20 kg 2 kW	840,00	month	15.034,60			12.629.065,18
#	Number of Breaker 20 kg 2 kW	10,00	pcs				
Mac-042	Air surge tank	840,00	month	8.192,95			6.882.079,60
#	Number of Air surge tank	10,00	pcs				
Mac-038	Water pump for Swellex construction	1.008,00	month	39.347,15			39.661.924,18
#	Number of Water pump for Swellex construction	12,00	pcs				

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
Mac-039	Ventilation fan 1400 mm 90 kW	840,00	month	70.627,55			59.327.141,94
#	Number of Ventilation fan 1400 mm 90 kW	10,00	pcs				
Mac-040	Silencer for ventilation fan 1400 mm	840,00	month	7.616,74			6.398.062,69
#	Number of Silencer for ventilation fan 1400 mm	10,00	pcs				
Mac-056	Bucket for gantry crane with hydraulic lock, 6 m³	252,00	month	43.590,40			10.984.780,80
#	Number of Bucket for gantry crane with hydraulic lock, 6 m³	3,00	pcs				
Mac-057	Elevator for workmanship 15 persons	168,00	month	203.853,23			34.247.342,64
#	Number of Elevator for workmanship 15 persons	2,00	pcs				
Mac-006	Tunnel excavator	336,00	month	2.348.796,10			789.195.489,18
#	Number of Tunnel excavator	4,00	pcs				
Sum	Site Facility Costs				-	-	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						
a	Estimated costs for miscellaneous site facility, machinery and material not included in time dependent costs and general site facility costs in per cent of estimated overall construction costs	0,11	%/100	45.000.000.000,00	1.980.000.000,00	990.000.000,00	1.980.000.000,00
Sum	Costs for transportation of site facility and all machinery to the site and additional costs for site facility not included in time dependent costs and general site facility costs				1.980.000.000,00	990.000.000,00	1.980.000.000,00
SCHEDULE S&T-B - TIME DEPENDENT COSTS							
S&T-B101	Time dependent costs from commencement of construction to commencement of mined tunnel excavation						
a	Estimated mean time between commencement of construction to commencement of mined tunnel or/and shaft excavation	6,00	month				
MAT	Material						
#	Main material is included in site facility costs						
LAB	Labour						
#	Labour of site facility construction and transportation is included in the site facility costs						
Lab-001	Project Manager Expert	6,00	month	742.399,00		4.454.394,00	
#	Number of Project Manager Expert	1,00	pcs				
Lab-002	Section Leader	24,00	month	643.639,50		15.447.348,00	
#	Number of Section Leader	4,00	pcs				
Lab-006	Skilled unproductive experts	150,00	month	448.272,78		67.240.916,40	
#	Mean number of Skilled unproductive experts	25,00	pcs				
Lab-007	Skilled unproductive personell	180,00	month	427.049,70		76.868.946,00	
#	Mean number of Skilled unproductive personell	30,00	pcs				
MAC	Machinery						
#	Main machinery included in time dependend cost						
Sum	Overall time dependent costs from commencement of construction to commencement of mined tunnel excavation				-	164.011.604,40	-
S&T-B102	Time dependent costs commencement of tunnel excavation to end of concrete works						
a	Mean time between commencement of construction to commencement of mined tunnel or/and shaft excavation	63,00	month				
MAT	Material						
#	Material is included in site facility costs						
LAB	Labour						
#	Labour of site facility construction and transportation is included in the site facility costs						
Lab-001	Project Manager Expert	63,00	month	742.399,00		46.771.137,00	
#	Number of Project Manager Expert	1,00	pcs				
Lab-002	Section Leader	252,00	month	643.639,50		162.197.154,00	
#	Number of Section Leader	4,00	pcs				
Lab-006	Skilled unproductive experts	1.575,00	month	448.272,78		706.029.622,20	
#	Mean number of Skilled unproductive experts	25,00	pcs				
Lab-007	Skilled unproductive personell	1.890,00	month	427.049,70		807.123.933,00	
#	Mean number of Skilled unproductive personell	30,00	pcs				
MAC	Machinery						
Sum	Overall time dependent costs commencement of tunnel excavation to end of concrete works				-	1.722.121.846,20	-
S&T-B103	Time dependent costs end of concrete works to end of construction works						

Item No.	Description of item	Quantity	Unit	Rate Rs	Cost Material Rs	Cost Labour Rs	Cost Machinery Rs
a	Mean time between commencement of construction to commencement of mined tunnel or/and shaft excavation	15,00	month				
MAT	Material						
#	Material is included in site facility costs						
LAB	Labour						
#	Labour of site facility construction and transportation is included in the site facility costs						
Lab-001	Project Manager Expert	15,00	month	742.399,00		11.135.985,00	
#	Number of Project Manager Expert	1,00	pcs				
Lab-002	Section Leader	60,00	month	643.639,50		38.618.370,00	
#	Number of Section Leader	4,00	pcs				
Lab-006	Skilled unproductive experts	375,00	month	448.272,78		168.102.291,00	
#	Mean number of Skilled unproductive experts	25,00	pcs				
Lab-007	Skilled unproductive personell	450,00	month	427.049,70		192.172.365,00	
#	Mean number of Skilled unproductive personell	30,00	pcs				
MAC	Machinery						
Sum	Overall time dependent costs end of concrete works to end of construction works				-	410.029.011,00	-