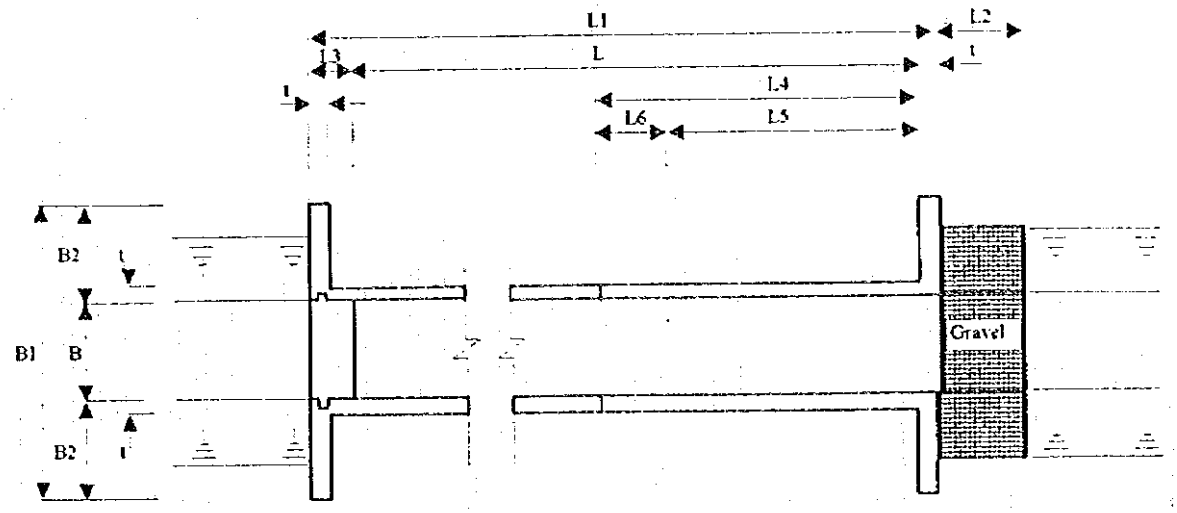
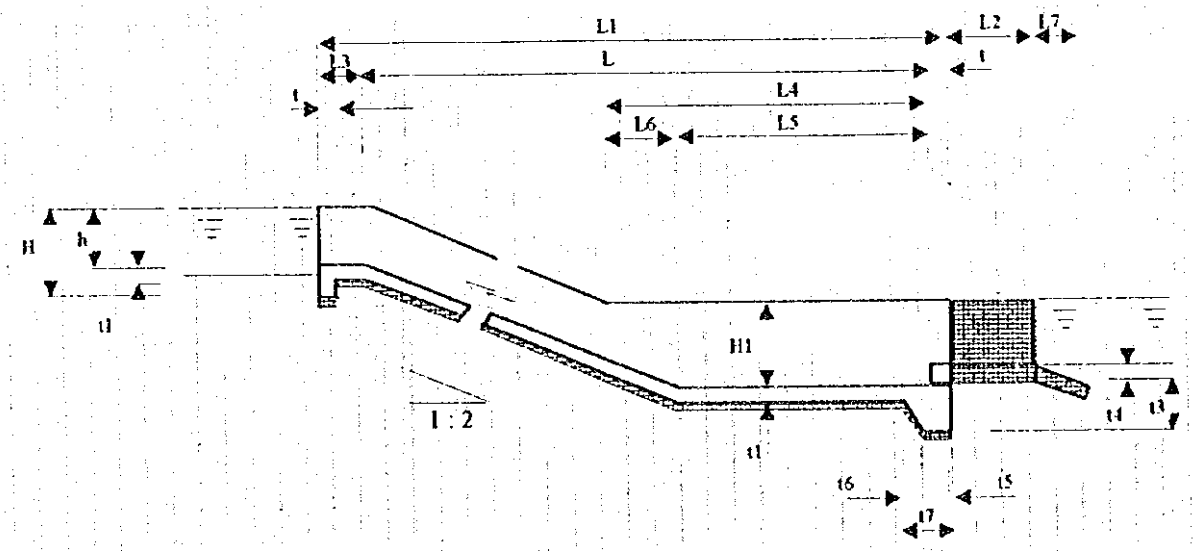
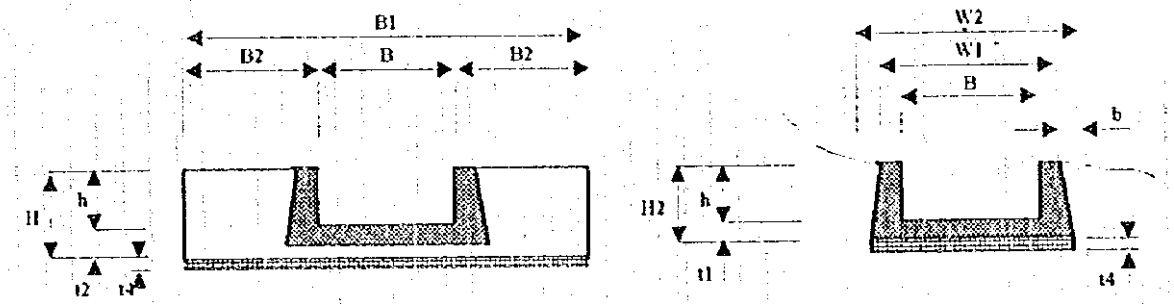
(5) Typical Structure of Chute







Dimensions of Typical Chute (m)

Type Code	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
Maximum Discharge (l/s)	1,104	300	803	467	174	133	392	236	93	216	133	55
B	1.000	0.800	0.500	0.500	0.500	0.400	0.300	0.300	0.300	0.200	0.200	0.200
h	0.500	0.400	0.600	0.500	0.400	0.400	0.600	0.500	0.400	0.600	0.500	0.400
B1	3.600	3.000	2.300	2.100	2.100	1.800	2.100	1.900	1.700	2.000	1.800	1.600
B2	1.300	1.100	0.900	0.800	0.800	0.700	0.900	0.800	0.700	0.900	0.800	0.700
b	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
L	31.200	31.200	31.200	31.200	31.200	31.200	31.200	31.200	31.200	31.200	31.200	31.200
L1	32.000	31.900	32.100	32.000	31.900	31.900	32.100	32.000	31.900	32.100	32.000	31.900
L2	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
L3	0.800	0.700	0.900	0.800	0.700	0.700	0.900	0.800	0.700	0.900	0.800	0.700
L4	9.200	7.800	10.600	9.200	7.800	7.800	10.600	9.200	7.800	10.600	9.200	7.800
L5	6.000	5.000	7.000	6.000	5.000	5.000	7.000	6.000	5.000	7.000	6.000	5.000
L6	3.200	2.800	3.600	3.200	2.800	2.800	3.600	3.200	2.800	3.600	3.200	2.800
L7	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
H	1.100	1.000	1.200	1.100	1.000	1.000	1.200	1.100	1.000	1.200	1.100	1.000
H1	1.600	1.400	1.800	1.600	1.400	1.400	1.800	1.600	1.400	1.800	1.600	1.400
H2	1.100	1.000	1.200	1.100	1.000	1.000	1.200	1.100	1.000	1.200	1.100	1.000
W1	1.600	1.400	1.100	1.100	1.100	1.000	0.900	0.900	0.900	0.800	0.800	0.800
W2	1.800	1.600	1.300	1.300	1.300	1.200	1.100	1.100	1.100	1.000	1.000	1.000
t	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
t1	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
t2	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600
t3	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
t4	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
t5	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
t6	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
t7	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500

Bill of Quantity of Chute (15m Height 1/12)

Chute	Type	C1	Maximum Discharge (l/s)		1,104							
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
1.00	0.50	3.60	1.30	0.10	31.20	32.00	2.00	0.80	9.20	6.00	3.20	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.80	1.60	0.80	1.60	1.80	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	42.303	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	19.278	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.884	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	1.885	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.979	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	1.026	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	66.355	
Backfill	m^3	2.294	b*H2*(L3+(L-L5)*$5^{0.5}$/2-t)
	m^3	1.140	b*(H1+t1)*L5
	m^3	0.104	b*H*B2
	m^3	0.247	b*(H1+t1)*B2
Total	m^3	3.785	
Wet Masonry	m^3	24.918	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	0.728	(t+b/2)*H*B2*2
	m^3	1.729	(t+b/2)*(H1+t1)*B2*2
	m^3	0.486	(t5+t7)/2*(t2-t1)*B1
	m^3	0.435	(H1-t4)*t*B
Total	m^3	28.296	
Gravel	m^3	0.979	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	9.362	t4*W2*(L3+(L-L5)*$5^{0.5}$/2+L5-t)
	m^3	0.432	t4*(t+b)*B1*2
Total	m^3	10.773	
Gravel Surfacing	m^2	5.677	L2*(B+$2^{0.5}$*B2)

Bill of Quantity of Chute (15m Helght 2/12)

Chute	Type	C2	Maximum Discharge (l/s)	300								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.80	0.40	3.00	1.10	0.10	31.20	31.90	2.00	0.70	7.80	5.00	2.80	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.70	1.40	0.70	1.40	1.60	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50
Description	unit	Quantity	Equations									
Excavation	m^3	35.991	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*$5^{0.5}$/2)									
	m^3	13.038	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)									
	m^3	0.671	((((t+b/2)*H+(t+b)*t4)*B2*2									
	m^3	1.441	((((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2									
	m^3	0.813	t4*(L2+L7)*(B+$2^{0.5}$*B2)									
	m^3	0.855	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1									
Total	m^3	52.809										
Backfill	m^3	2.078	b*H2*(L3+(L-L5)*$5^{0.5}$/2-t)									
	m^3	0.850	b*(H1+t1)*L5									
	m^3	0.077	b*H*B2									
	m^3	0.187	b*(H1+t1)*B2									
Total	m^3	3.192										
Wet Masonry	m^3	21.895	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*$5^{0.5}$/2)									
	m^3	0.539	(t+b/2)*H*B2*2									
	m^3	1.309	(t+b/2)*(H1+t1)*B2*2									
	m^3	0.405	(t5+t7)/2*(t2-t1)*B1									
	m^3	0.300	(H1-t4)*t*B									
Total	m^3	24.448										
Gravel	m^3	0.813	t4*(L2+L7)*(B+$2^{0.5}$*B2)									
	m^3	8.326	t4*W2*(L3+(L-L5)*$5^{0.5}$/2+L5-t)									
	m^3	0.360	t4*(t+b)*B1*2									
Total	m^3	9.499										
Gravel Surfacing	m^2	4.711	L2*(B+$2^{0.5}$*B2)									

Bill of Quantity of Chute (15m Height 3/12)

Chute	Type	C3	Maximum Discharge (l/s)	803								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.50	0.60	2.30	0.90	0.10	31.20	32.10	2.00	0.90	30.60	7.00	3.60	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.90	1.80	0.90	1.10	1.30	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	33.967	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	17.192	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.675	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	1.431	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.612	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	0.656	(t2-t1)*(t+((t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	54.532	
Backfill	m^3	2.489	b*H2*(L3+(L-L5)*$5^{0.5}$/2-t)
	m^3	1.470	b*(H1+t1)*L5
	m^3	0.081	b*H*B2
	m^3	0.189	b*(H1+t1)*B2
Total	m^3	4.229	
Wet Masonry	m^3	21.806	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	0.567	(t+b/2)*H*B2*2
	m^3	1.323	(t+b/2)*(H1+t1)*B2*2
	m^3	0.311	(t5+t7)/2*(t2-t1)*B1
	m^3	0.248	(H1-t4)*t*B
Total	m^3	24.254	
Gravel	m^3	0.612	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	6.758	t4*W2*(L3+(L-L5)*$5^{0.5}$/2+L5-t)
	m^3	0.276	t4*(t+b)*B1*2
Total	m^3	7.646	
Gravel Surfacing	m^2	3.546	L2*(B+$2^{0.5}$*B2)

Bill of Quantity of Chute (15m Height 4/12)

Chute	Type	C4	Maximum Discharge (l/s)	467								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.50	0.50	2.10	0.80	0.10	31.20	32.00	2.00	0.80	9.20	6.00	3.20	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.80	1.60	0.80	1.10	1.30	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	32.162	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*5^0.5/2)
	m^3	13.608	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.544	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	1.160	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.563	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	0.599	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	48.635	
Backfill	m^3	2.294	b*H2*(L3+(L-L5)*5^0.5/2-t)
	m^3	1.140	b*(H1+t1)*L5
	m^3	0.064	b*H*B2
	m^3	0.152	b*(H1+t1)*B2
Total	m^3	3.650	
Wet Masonry	m^3	20.572	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*5^0.5/2)
	m^3	0.448	(t+b/2)*H*B2*2
	m^3	1.064	(t+b/2)*(H1+t1)*B2*2
	m^3	0.284	(t5+t7)/2*(t2-t1)*B1
	m^3	0.218	(H1-t4)*t*B
Total	m^3	22.585	
Gravel	m^3	0.563	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	6.762	t4*W2*(L3+(L-L5)*5^0.5/2+L5-t)
	m^3	0.252	t4*(t+b)*B1*2
Total	m^3	7.576	
Gravel Surfacing	m^2	3.263	L2*(B+2^0.5*B2)

Bill of Quantity of Chute (15m Height 5/12)

Chute	Type	C5	Maximum Discharge (l/s)	174								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.50	0.40	2.10	0.80	0.10	31.20	31.90	2.00	0.70	7.80	5.00	2.80	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.70	1.40	0.70	1.10	1.30	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	30.142	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*5^0.5/2)
	m^3	10.415	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.488	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	1.048	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.563	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	0.599	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	43.254	
Backfill	m^3	2.078	b*H2*(L3+(L-L5)*5^0.5/2-t)
	m^3	0.850	b*(H1+t1)*L5
	m^3	0.056	b*H*B2
	m^3	0.136	b*(H1+t1)*B2
Total	m^3	3.120	
Wet Masonry	m^3	19.195	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*5^0.5/2)
	m^3	0.392	(t+b/2)*H*B2*2
	m^3	0.952	(t+b/2)*(H1+t1)*B2*2
	m^3	0.284	(t5+t7)/2*(t2-t1)*B1
	m^3	0.188	(H1-t4)*t*B
Total	m^3	21.010	
Gravel	m^3	0.563	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	6.765	t4*W2*(L3+(L-L5)*5^0.5/2+L5-t)
	m^3	0.252	t4*(t+b)*B1*2
Total	m^3	7.580	
Gravel Surfacing	m^2	3.263	L2*(B+2^0.5*B2)

Bill of Quantity of Chute (15m Height 6/12)

Chute	Type	C6	Maximum Discharge (l/s)	133								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.40	0.40	1.80	0.70	0.10	31.20	31.90	2.00	0.70	7.80	5.00	2.80	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.70	1.40	0.70	1.00	1.20	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	28.193	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*5^0.5/2)
	m^3	9.540	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.427	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	0.917	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.480	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	0.513	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	40.069	
Backfill	m^3	2.078	b*H2*(L3+(L-L5)*5^0.5/2-t)
	m^3	0.850	b*(H1+t1)*L5
	m^3	0.049	b*H*B2
	m^3	0.119	b*(H1+t1)*B2
Total	m^3	3.096	
Wet Masonry	m^3	18.295	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*5^0.5/2)
	m^3	0.343	(t+b/2)*H*B2*2
	m^3	0.833	(t+b/2)*(H1+t1)*B2*2
	m^3	0.243	(t5+t7)/2*(t2-t1)*B1
	m^3	0.150	(H1-t4)*t*B
Total	m^3	19.864	
Gravel	m^3	0.480	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	6.245	t4*W2*(L3+(L-L5)*5^0.5/2+L5-t)
	m^3	0.216	t4*(t+b)*B1*2
Total	m^3	6.940	
Gravel Surfacing	m^2	2.780	L2*(B+2^0.5*B2)

Bill of Quantity of Chute (15m Height 7/12)

Chute	Type	C7	Maximum Discharge (l/s)	392								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.30	0.60	2.10	0.90	0.10	31.20	32.10	2.00	0.90	10.60	7.00	3.60	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.90	1.80	0.90	0.90	1.10	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	29.774	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	14.345	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.675	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	1.431	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.543	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	0.599	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	47.365	
Backfill	m^3	2.489	b*H2*(L3+(L-L5)*$5^{0.5}$/2-t)
	m^3	1.470	b*(H1+t1)*L5
	m^3	0.081	b*H*B2
	m^3	0.189	b*(H1+t1)*B2
Total	m^3	4.229	
Wet Masonry	m^3	20.129	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	0.567	(t+b/2)*H*B2*2
	m^3	1.323	(t+b/2)*(H1+t1)*B2*2
	m^3	0.284	(t5+t7)/2*(t2-t1)*B1
	m^3	0.149	(H1-t4)*t*B
Total	m^3	22.451	
Gravel	m^3	0.543	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	5.718	t4*W2*(L3+(L-L5)*$5^{0.5}$/2+L5-t)
	m^3	0.252	t4*(t+b)*B1*2
Total	m^3	6.513	
Gravel Surfacing	m^2	3.146	L2*(B+$2^{0.5}$*B2)

Bill of Quantity of Chute (15m Height 8/12)

Chute	Type	C8	Maximum Discharge (l/s)	236								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.30	0.50	1.90	0.80	0.10	31.20	32.00	2.00	0.80	9.20	6.00	3.20	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.80	1.60	0.80	0.90	1.10	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	28.105	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	11.340	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.544	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	1.160	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.494	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	0.542	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	42.185	
Backfill	m^3	2.294	b*H2*(L3+(L-L5)*$5^{0.5}$/2-t)
	m^3	1.140	b*(H1+t1)*L5
	m^3	0.064	b*H*B2
	m^3	0.152	b*(H1+t1)*B2
Total	m^3	3.650	
Wet Masonry	m^3	18.833	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	0.448	(t+b/2)*H*B2*2
	m^3	1.064	(t+b/2)*(H1+t1)*B2*2
	m^3	0.257	(t5+t7)/2*(t2-t1)*B1
	m^3	0.131	(H1-t4)*t*B
Total	m^3	20.732	
Gravel	m^3	0.494	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	5.721	t4*W2*(L3+(L-L5)*$5^{0.5}$/2+L5-t)
	m^3	0.228	t4*(t+b)*B1*2
Total	m^3	6.443	
Gravel Surfacing	m^2	2.863	L2*(B+$2^{0.5}$*B2)

Bill of Quantity of Chute (15m Height 9/12)

Chute	Type	C9	Maximum Discharge (l/s)	93								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.30	0.40	1.70	0.70	0.10	31.20	31.90	2.00	0.70	7.80	5.00	2.80	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.70	1.40	0.70	0.90	1.10	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	26.243	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	8.666	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.427	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	0.917	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.445	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	0.485	(t2-t1)*(t+((t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	37.182	
Backfill	m^3	2.078	b*H2*(L3+(L-L5)*$5^{0.5}$/2-t)
	m^3	0.850	b*(H1+t1)*L5
	m^3	0.049	b*H*B2
	m^3	0.119	b*(H1+t1)*B2
Total	m^3	3.096	
Wet Masonry	m^3	17.396	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*$5^{0.5}$/2)
	m^3	0.343	(t+b/2)*H*B2*2
	m^3	0.833	(t+b/2)*(H1+t1)*B2*2
	m^3	0.230	(t5+t7)/2*(t2-t1)*B1
	m^3	0.113	(H1-t4)*t*B
Total	m^3	18.914	
Gravel	m^3	0.445	t4*(L2+L7)*(B+$2^{0.5}$*B2)
	m^3	5.724	t4*W2*(L3+(L-L5)*$5^{0.5}$/2+L5-t)
	m^3	0.204	t4*(t+b)*B1*2
Total	m^3	6.373	
Gravel Surfacing	m^2	2.580	L2*(B+$2^{0.5}$*B2)

Bill of Quantity of Chute (15m Height 10/12)

Chute	Type	C10	Maximum Discharge (l/s)	216								
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.20	0.60	2.00	0.90	0.10	31.20	32.10	2.00	0.90	10.60	7.00	3.60	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.90	1.80	0.90	0.80	1.00	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50
Description	unit	Quantity	Equations									
Excavation	m^3	27.677	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*5^0.5/2)									
	m^3	12.921	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)									
	m^3	0.675	(((t+b/2)*H+(t+b)*t4)*B2*2									
	m^3	1.431	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2									
	m^3	0.508	t4*(L2+L7)*(B+2^0.5*B2)									
	m^3	0.570	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1									
Total	m^3	43.782										
Backfill	m^3	2.489	b*H2*(L3+(L-L5)*5^0.5/2-t)									
	m^3	1.470	b*(H1+t1)*L5									
	m^3	0.081	b*H*B2									
	m^3	0.189	b*(H1+t1)*B2									
Total	m^3	4.229										
Wet Masonry	m^3	19.290	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*5^0.5/2)									
	m^3	0.567	(t+b/2)*H*B2*2									
	m^3	1.323	(t+b/2)*(H1+t1)*B2*2									
	m^3	0.270	(t5+t7)/2*(t2-t1)*B1									
	m^3	0.099	(H1-t4)*t*B									
Total	m^3	21.549										
Gravel	m^3	0.508	t4*(L2+L7)*(B+2^0.5*B2)									
	m^3	5.198	t4*W2*(L3+(L-L5)*5^0.5/2+L5-t)									
	m^3	0.240	t4*(t+b)*B1*2									
Total	m^3	5.947										
Gravel Surfacing	m^2	2.946	L2*(B+2^0.5*B2)									

Bill of Quantity of Chute (15m Height 11/12)

Chute	Type	C11	Maximum Discharge (l/s)		133						
Dimensions (m)											
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.20	0.50	1.80	0.80	0.10	31.20	32.00	2.00	0.80	9.20	6.00	3.20	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.80	1.60	0.80	0.80	1.00	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	26.077	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*5^0.5/2)
	m^3	10.206	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.544	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	1.160	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.459	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	0.513	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	38.959	
Backfill	m^3	2.294	b*H2*(L3+(L-L5)*5^0.5/2-t)
	m^3	1.140	b*(H1+t1)*L5
	m^3	0.064	b*H*B2
	m^3	0.152	b*(H1+t1)*B2
Total	m^3	3.650	
Wet Masonry	m^3	17.964	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*5^0.5/2)
	m^3	0.448	(t+b/2)*H*B2*2
	m^3	1.064	(t+b/2)*(H1+t1)*B2*2
	m^3	0.243	(t5+t7)/2*(t2-t1)*B1
	m^3	0.087	(H1-t4)*t*B
Total	m^3	19.806	
Gravel	m^3	0.459	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	5.201	t4*W2*(L3+(L-L5)*5^0.5/2+L5-t)
	m^3	0.216	t4*(t+b)*B1*2
Total	m^3	5.876	
Gravel Surfacing	m^2	2.663	L2*(B+2^0.5*B2)

Bill of Quantity of Chute (15m Height 12/12)

Chute	Type	C12	Maximum Discharge (l/s)		55							
Dimensions (m)												
B	h	B1	B2	b	L	L1	L2	L3	L4	L5	L6	L7
0.20	0.40	1.60	0.70	0.10	31.20	31.90	2.00	0.70	7.80	5.00	2.80	0.30
H	H1	H2	W1	W2	t	t1	t2	t3	t4	t5	t6	t7
0.70	1.40	0.70	0.80	1.00	0.30	0.30	0.60	0.30	0.15	0.40	0.10	0.50

Description	unit	Quantity	Equations
Excavation	m^3	24.294	((W2*(H2+t4)-B*h/2))*(L3+(L-L5)*5^0.5/2)
	m^3	7.791	(W1*(H1+t1)-B*H1/2+t4*W2)*(L5+t)
	m^3	0.427	(((t+b/2)*H+(t+b)*t4)*B2*2
	m^3	0.917	(((t+b/2)*(H1+t1)+(t+b)*t4)*B2)*2
	m^3	0.411	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	0.456	(t2-t1)*(t+(t5+t7)/2)*B1+(t+b)*t4*B1
Total	m^3	34.295	
Backfill	m^3	2.078	b*H2*(L3+(L-L5)*5^0.5/2-t)
	m^3	0.850	b*(H1+t1)*L5
	m^3	0.049	b*H*B2
	m^3	0.119	b*(H1+t1)*B2
Total	m^3	3.096	
Wet Masonry	m^3	16.496	((W1+W2)/2*H2-B*h)*(L3+(L-L5)*5^0.5/2)
	m^3	0.343	(t+b/2)*H*B2*2
	m^3	0.833	(t+b/2)*(H1+t1)*B2*2
	m^3	0.216	(t5+t7)/2*(t2-t1)*B1
	m^3	0.075	(H1-t4)*t*B
Total	m^3	17.963	
Gravel	m^3	0.411	t4*(L2+L7)*(B+2^0.5*B2)
	m^3	5.204	t4*W2*(L3+(L-L5)*5^0.5/2+L5-t)
	m^3	0.192	t4*(t+b)*B1*2
Total	m^3	5.806	
Gravel Surfacing	m^2	2.380	L2*(B+2^0.5*B2)

Unit Construction Cost of Chute (1/3, unit : Nu/ 1 m height)

Type	C1		Maximum Discharge (l/s)		1,104
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	66.355	30.61	2,031	
Backfill	m^3	3.785	15.38	58	
Wet Masonry	m^3	28.296	917.08	25,950	
Gravel	m^3	10.773	206.60	2,226	
Gravel Surfacing	m^2	5.677	367.96	2,089	
Others	L.S			6,471	
Transportation	L.S			5,824	
Total				44,648	
fro 1 m Height				2,977	

Type	C2		Maximum Discharge (l/s)		300
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	52.809	30.61	1,616	
Backfill	m^3	3.192	15.38	49	
Wet Masonry	m^3	24.448	917.08	22,420	
Gravel	m^3	9.499	206.60	1,962	
Gravel Surfacing	m^2	4.711	367.96	1,734	
Others	L.S			5,556	
Transportation	L.S			5,001	
Total				38,339	
fro 1 m Height				2,556	

Type	C3		Maximum Discharge (l/s)		803
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	54.532	30.61	1,669	
Backfill	m^3	4.229	15.38	65	
Wet Masonry	m^3	24.254	917.08	22,243	
Gravel	m^3	7.646	206.60	1,580	
Gravel Surfacing	m^2	3.546	367.96	1,305	
Others	L.S			5,372	
Transportation	L.S			4,835	
Total				37,069	
fro 1 m Height				2,471	

Type	C4		Maximum Discharge (l/s)		467
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	48.635	30.61	1,489	
Backfill	m^3	3.650	15.38	56	
Wet Masonry	m^3	22.585	917.08	20,712	
Gravel	m^3	7.576	206.60	1,565	
Gravel Surfacing	m^2	3.263	5.47	18	
Others	L.S			4,768	
Transportation	L.S			4,291	
Total				32,899	
fro 1 m Height				2,193	

Unit Construction Cost of Chute (2/3, unit : Nu/ 1 m height)

Type	C5		Maximum Discharge (l/s)		174
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	43.254	30.61	1,324	
Backfill	m^3	3.120	15.38	48	
Wet Masonry	m^3	21.010	917.08	19,268	
Gravel	m^3	7.580	206.60	1,566	
Gravel Surfacing	m^2	3.263	5.47	18	
Others	L.S			4,445	
Transportation	L.S			4,000	
Total				30,669	
fro 1 m Height				2,045	

Type	C6		Maximum Discharge (l/s)		133
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	40.069	30.61	1,227	
Backfill	m^3	3.096	15.38	48	
Wet Masonry	m^3	19.864	917.08	18,217	
Gravel	m^3	6.940	206.60	1,434	
Gravel Surfacing	m^2	2.780	5.47	15	
Others	L.S			4,188	
Transportation	L.S			3,769	
Total				28,898	
fro 1 m Height				1,927	

Type	C7		Maximum Discharge (l/s)		392
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	47.365	30.61	1,450	
Backfill	m^3	4.229	15.38	65	
Wet Masonry	m^3	22.451	917.08	20,589	
Gravel	m^3	6.513	206.60	1,346	
Gravel Surfacing	m^2	3.146	5.47	17	
Others	L.S			4,693	
Transportation	L.S			4,224	
Total				32,384	
fro 1 m Height				2,159	

Type	C8		Maximum Discharge (l/s)		236
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	42.185	30.61	1,291	
Backfill	m^3	3.650	15.38	56	
Wet Masonry	m^3	20.732	917.08	19,013	
Gravel	m^3	6.443	206.60	1,331	
Gravel Surfacing	m^2	2.863	5.47	16	
Others	L.S			4,341	
Transportation	L.S			3,907	
Total				29,956	
fro 1 m Height				1,997	

Unit Construction Cost of Chute (3/3, unit : Nu/ 1 m height)

Type	C9		Maximum Discharge (l/s)		93
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	37.182	30.61	1,138	
Backfill	m^3	3.096	15.38	48	
Wet Masonry	m^3	18.914	917.08	17,345	
Gravel	m^3	6.373	206.60	1,317	
Gravel Surfacing	m^2	2.580	5.47	14	
Others	L.S			3,972	
Transportation	L.S			3,575	
Total				27,409	
fro 1 m Height				1,827	

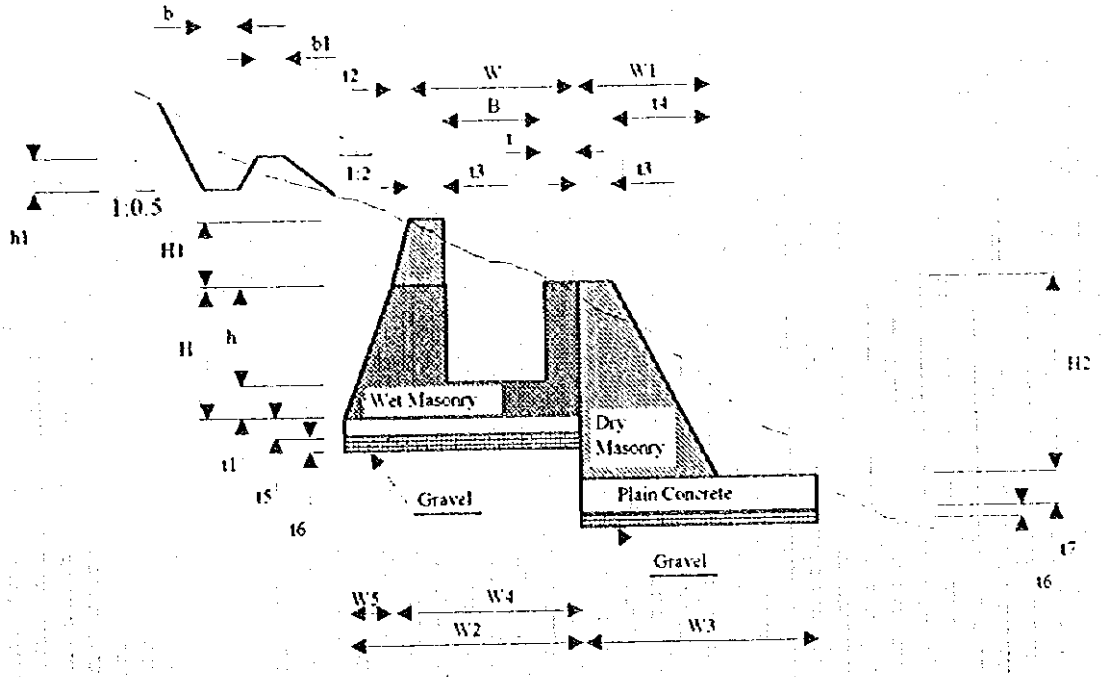
Type	C10		Maximum Discharge (l/s)		216
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	43.782	30.61	1,340	
Backfill	m^3	4.229	15.38	65	
Wet Masonry	m^3	21.549	917.08	19,762	
Gravel	m^3	5.947	206.60	1,229	
Gravel Surfacing	m^2	2.946	5.47	16	
Others	L.S			4,482	
Transportation	L.S			4,034	
Total				30,929	
fro 1 m Height				2,062	

Type	C11		Maximum Discharge (l/s)		133
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	38.959	30.61	1,193	
Backfill	m^3	3.650	15.38	56	
Wet Masonry	m^3	19.806	917.08	18,164	
Gravel	m^3	5.876	206.60	1,214	
Gravel Surfacing	m^2	2.663	5.47	15	
Others	L.S			4,128	
Transportation	L.S			3,715	
Total				28,485	
fro 1 m Height				1,899	

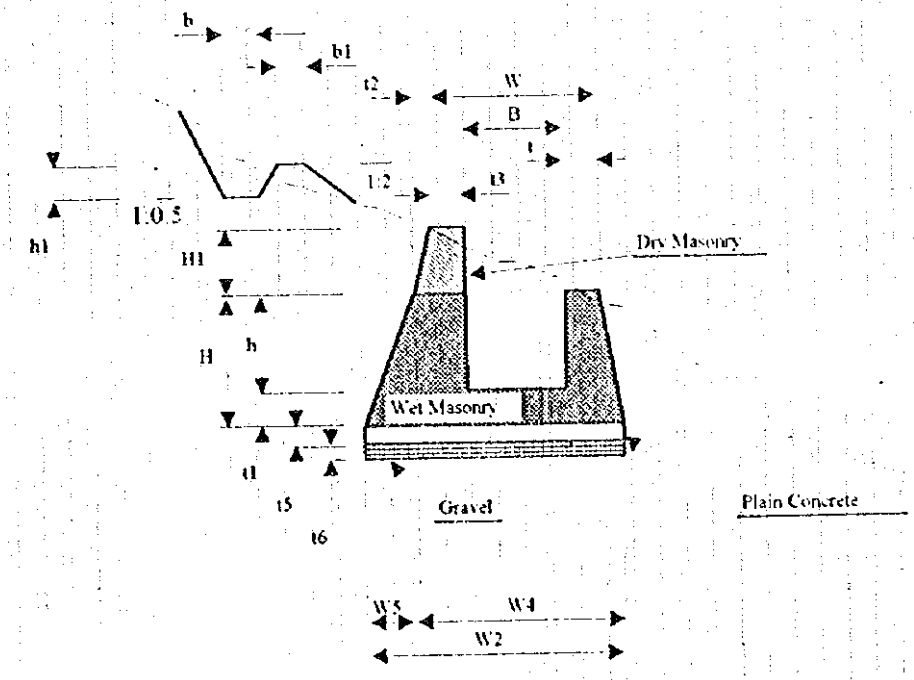
Type	C12		Maximum Discharge (l/s)		55
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	34.295	30.61	1,050	
Backfill	m^3	3.096	15.38	48	
Wet Masonry	m^3	17.963	917.08	16,473	
Gravel	m^3	5.806	206.60	1,200	
Gravel Surfacing	m^2	2.380	5.47	13	
Others	L.S			3,757	
Transportation	L.S			3,381	
Total				25,921	
fro 1 m Height				1,728	

(5) Typical Section of Protection Works (1/2)

Protection Works Type Code PA



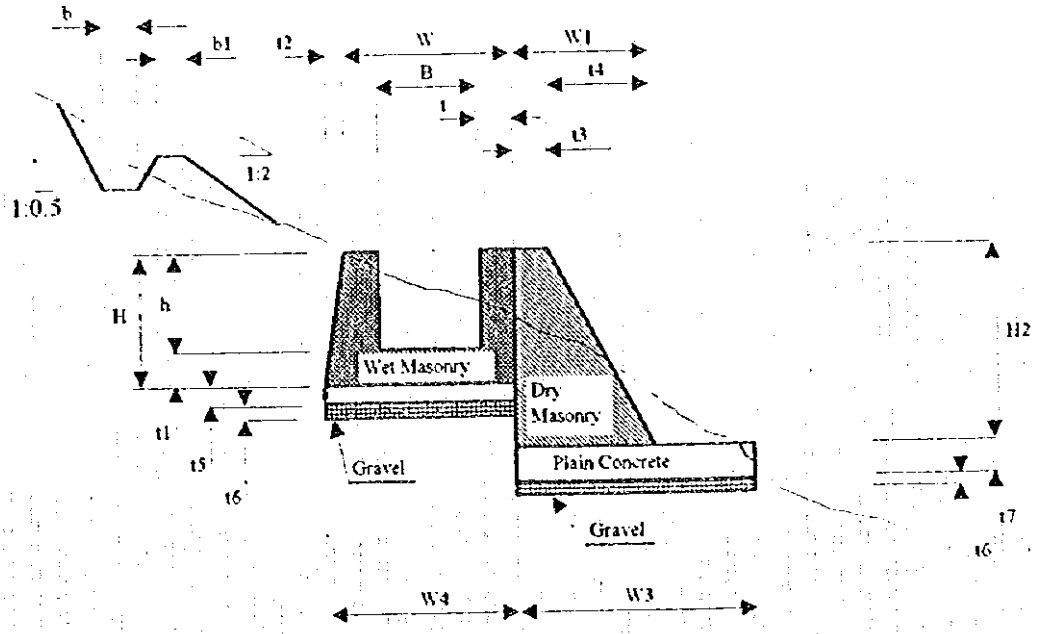
Protection Work Type PB



698

(5) Typical Section of Protection Works (2/2)

Protection Work Type PC



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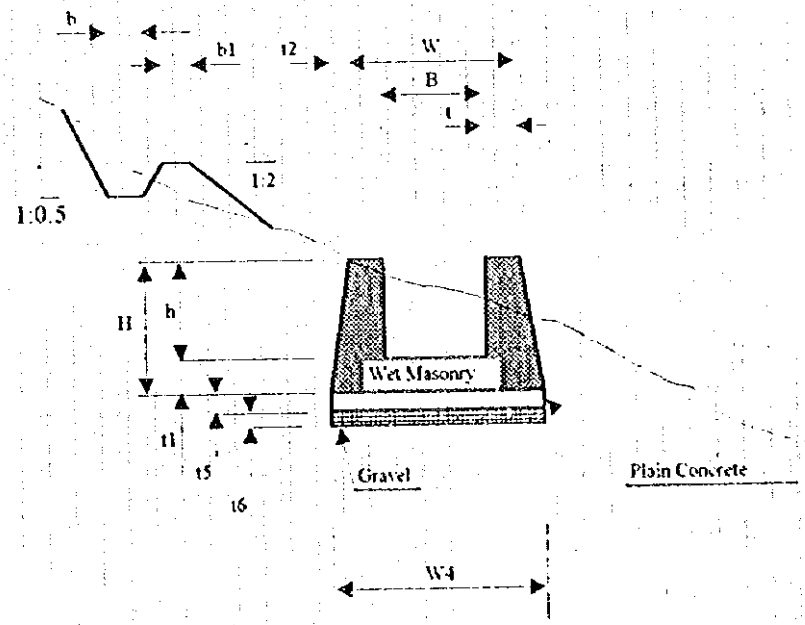


Dimensions of Protection Works

Type PA

Type Code		PA1	Design Discharge			Q=	270	~	540	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
1.00	1.10	1.40	2.00	4.00	1.60	1.10	2.56	4.00	2.28	0.28
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PA2	Design Discharge			Q=	144	~	288	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.80	0.80	1.10	2.00	4.00	1.40	1.10	2.24	4.00	2.02	0.22
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PA3	Design Discharge			Q=	75	~	150	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.70	1.00	2.00	4.00	1.10	1.10	1.90	4.00	1.70	0.20
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PA4	Design Discharge			Q=	60	~	120	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.60	0.90	2.00	4.00	1.10	1.10	1.86	4.00	1.68	0.18
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PA5	Design Discharge			Q=	36	~	72	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.50	0.80	2.00	4.00	1.00	1.10	1.72	4.00	1.56	0.16
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PA6	Design Discharge			Q=	24	~	48	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.40	0.70	2.00	4.00	1.00	1.10	1.68	4.00	1.54	0.14
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PA7	Design Discharge			Q=	27	~	54	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.50	0.80	2.00	4.00	0.90	1.10	1.62	4.00	1.46	0.16
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PA8	Design Discharge			Q=	18	~	36	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.40	0.70	2.00	4.00	0.90	1.10	1.58	4.00	1.44	0.14
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Dimensions of Protection Works

Type PB

Type Code		PB1	Design Discharge			Q=	270	~	540	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
1.00	1.10	1.40	2.00	-	1.60	-	2.56	-	2.28	0.28
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PB2	Design Discharge			Q=	144	~	288	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.80	0.80	1.10	2.00	-	1.40	-	2.24	-	2.02	0.22
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PB3	Design Discharge			Q=	75	~	150	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.70	1.00	2.00	-	1.10	-	1.90	-	1.70	0.20
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PB4	Design Discharge			Q=	60	~	120	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.60	0.90	2.00	-	1.10	-	1.86	-	1.68	0.18
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PB5	Design Discharge			Q=	36	~	72	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.50	0.80	2.00	-	1.00	-	1.72	-	1.56	0.16
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PB6	Design Discharge			Q=	24	~	48	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.40	0.70	2.00	-	1.00	-	1.68	-	1.54	0.14
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PB7	Design Discharge			Q=	27	~	54	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.50	0.80	2.00	-	0.90	-	1.62	-	1.46	0.16
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PB8	Design Discharge			Q=	18	~	36	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.40	0.70	2.00	-	0.90	-	1.58	-	1.44	0.14
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15

Dimensions of Protection Works

Type PC

Type Code		PC1	Design Discharge			Q=	270	~	540	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
1.00	1.10	1.40	2.00	4.00	1.60	1.10	-	4.00	1.70	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PC2	Design Discharge			Q=	144	~	288	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.80	0.80	1.10	2.00	4.00	1.40	1.10	-	4.00	1.50	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PC3	Design Discharge			Q=	75	~	150	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.70	1.00	2.00	4.00	1.10	1.10	-	4.00	1.20	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PC4	Design Discharge			Q=	60	~	120	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.60	0.90	2.00	4.00	1.10	1.10	-	4.00	1.20	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PC5	Design Discharge			Q=	36	~	72	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.50	0.80	2.00	4.00	1.00	1.10	-	4.00	1.10	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PC6	Design Discharge			Q=	24	~	48	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.40	0.70	2.00	4.00	1.00	1.10	-	4.00	1.10	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PC7	Design Discharge			Q=	27	~	54	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.50	0.80	2.00	4.00	0.90	1.10	-	4.00	1.00	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15
Type Code		PC8	Design Discharge			Q=	18	~	36	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.40	0.70	2.00	4.00	0.90	1.10	-	4.00	1.00	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Dimensions of Protection Works

Type PD

Type Code		PD1	Design Discharge			Q=	270	~	540	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
1.00	1.10	1.40	2.00	-	1.60	-	-	-	1.80	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PD2	Design Discharge			Q=	144	~	288	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.80	0.80	1.10	2.00	-	1.40	-	-	-	1.60	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PD3	Design Discharge			Q=	75	~	150	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.70	1.00	2.00	-	1.10	-	-	-	1.30	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PD4	Design Discharge			Q=	60	~	120	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.50	0.60	0.90	2.00	-	1.10	-	-	-	1.30	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PD5	Design Discharge			Q=	36	~	72	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.50	0.80	2.00	-	1.00	-	-	-	1.20	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PD6	Design Discharge			Q=	24	~	48	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.40	0.40	0.70	2.00	-	1.00	-	-	-	1.20	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PD7	Design Discharge			Q=	27	~	54	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.50	0.80	2.00	-	0.90	-	-	-	1.10	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15
Type Code		PD8	Design Discharge			Q=	18	~	36	(l/s)
B	h	H	H1	H2	W	W1	W2	W3	W4	W5
0.30	0.40	0.70	2.00	-	0.90	-	-	-	1.10	-
t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

BQ of Protection Works for 1 m (1/16)

Type	PA1			Q=	270	~	540	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	1.00	1.10	1.40	2.00	4.00	1.60	1.10	2.56	4.00	2.28	0.28
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	6.656	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.550	-h*B/2
Total	m^3	15.340	
Backfill	m^3	1.156	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	2.162	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.256	t5*W2+t7*W3
Gravel	m^3	0.656	t6*(W2+W3)

Type	PA2			Q=	144	~	288	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.80	0.80	1.10	2.00	4.00	1.40	1.10	2.24	4.00	2.02	0.22
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	5.152	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.320	-h*B/2
Total	m^3	14.066	
Backfill	m^3	0.961	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.637	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.224	t5*W2+t7*W3
Gravel	m^3	0.624	t6*(W2+W3)

BQ of Protection Works for 1 m (2/16)

Type		PA3		Q=	75	~	150	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.70	1.00	2.00	4.00	1.10	1.10	1.90	4.00	1.70	0.20
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	4.180	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.175	-h*B/2
Total	m^3	13.239	
Backfill	m^3	0.900	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.400	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.190	t5*W2+t7*W3
Gravel	m^3	0.590	t6*(W2+W3)

Type		PA4		Q=	60	~	120	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.60	0.90	2.00	4.00	1.10	1.10	1.86	4.00	1.68	0.18
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.906	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.150	-h*B/2
Total	m^3	12.990	
Backfill	m^3	0.841	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.257	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.186	t5*W2+t7*W3
Gravel	m^3	0.586	t6*(W2+W3)

BQ of Protection Works for 1 m (3/16)

Type		PA5		Q=	36	~	72	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.50	0.80	2.00	4.00	1.00	1.10	1.72	4.00	1.56	0.16
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.440	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.100	-h*B/2
Total	m^3	12.574	
Backfill	m^3	0.784	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.088	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.172	t5*W2+t7*W3
Gravel	m^3	0.572	t6*(W2+W3)

Type		PA6		Q=	24	~	48	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.40	0.70	2.00	4.00	1.00	1.10	1.68	4.00	1.54	0.14
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.192	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.080	-h*B/2
Total	m^3	12.346	
Backfill	m^3	0.729	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.953	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.168	t5*W2+t7*W3
Gravel	m^3	0.568	t6*(W2+W3)

BQ of Protection Works for 1 m (4/16)

Type		PA7				Q= 27 ~ 54 (l/s)					
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.50	0.80	2.00	4.00	0.90	1.10	1.62	4.00	1.46	0.16
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.240	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.075	-h*B/2
Total	m^3	12.399	
Backfill	m^3	0.784	W5*H/2+(W5+t2/2)*H1
Embanknient	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.058	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.162	t5*W2+t7*W3
Gravel	m^3	0.562	t6*(W2+W3)

Type		PA8				Q= 18 ~ 36 (l/s)					
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.40	0.70	2.00	4.00	0.90	1.10	1.58	4.00	1.44	0.14
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.002	W2*(H+H1/2+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.060	-h*B/2
Total	m^3	12.176	
Backfill	m^3	0.729	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.923	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	4.200	(t3+t2/2)*H1+(t3+W1)/2*H2
Plain Concrete	m^3	2.158	t5*W2+t7*W3
Gravel	m^3	0.558	t6*(W2+W3)

BQ of Protection Works for 1 m (5/16)

Type	PB1			Q=	270	~	540	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	1.00	1.10	1.40	2.00	-	1.60	-	2.56	-	2.28	0.28
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	6.656	W2*(H+H1/2+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.550	-h*B/2
Total	m^3	6.140	
Backfill	m^3	1.156	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	2.162	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	1.200	(t3+t2/2)*H1
Plain Concrete	m^3	0.256	t5*W2
Gravel	m^3	0.256	t6*W2

Type	PB2			Q=	144	~	288	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.80	0.80	1.10	2.00	-	1.40	-	2.24	-	2.02	0.22
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	5.152	W2*(H+H1/2+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.320	-h*B/2
Total	m^3	4.866	
Backfill	m^3	0.961	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.637	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	1.200	(t3+t2/2)*H1
Plain Concrete	m^3	0.224	t5*W2
Gravel	m^3	0.224	t6*W2

BQ of Protection Works for 1 m (6/16)

Type		PB3				Q=	75	~	150	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.70	1.00	2.00	-	1.10	-	1.90	-	1.70	0.20
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	4.180	W2*(H+H1/2+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.175	-h*B/2
Total	m^3	4.039	
Backfill	m^3	0.900	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.400	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	1.200	(t3+t2/2)*H1
Plain Concrete	m^3	0.190	t5*W2
Gravel	m^3	0.190	t6*W2

Type		PB4				Q=	60	~	120	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.60	0.90	2.00	-	1.10	-	1.86	-	1.68	0.18
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.906	W2*(H+H1/2+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.150	-h*B/2
Total	m^3	3.790	
Backfill	m^3	0.841	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.257	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	1.200	(t3+t2/2)*H1
Plain Concrete	m^3	0.186	t5*W2
Gravel	m^3	0.186	t6*W2

BQ of Protection Works for 1 m (7/16)

Type	PB5			Q=	36	~	72	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.50	0.80	2.00	-	1.00	-	1.72	-	1.56	0.16
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.440	W2*(H+H1/2+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.100	-h*B/2
Total	m^3	3.374	
Backfill	m^3	0.784	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.088	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	1.200	(t3+t2/2)*H1
Plain Concrete	m^3	0.172	t5*W2
Gravel	m^3	0.172	t6*W2

Type	PB6			Q=	24	~	48	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.40	0.70	2.00	-	1.00	-	1.68	-	1.54	0.14
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	3.192	W2*(H+H1/2+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.080	-h*B/2
Total	m^3	3.146	
Backfill	m^3	0.729	W5*H/2+(W5+t2/2)*H1
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.953	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2
Dry Masonry	m^3	1.200	(t3+t2/2)*H1
Plain Concrete	m^3	0.168	t5*W2
Gravel	m^3	0.168	t6*W2

BQ of Protection Works for 1 m (8/16)

Type		PB7				Q=	27	~	54	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.50	0.80	2.00	-	0.90	-	1.62	-	1.46	0.16
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Item	Unit	Quantity	Equation								
Excavation	m^3	3.240	W2*(H+H1/2+t5+t6)								
	m^3	0.034	h1*(1+0.5)*b								
	m^3	-0.075	-h*B/2								
Total	m^3	3.199									
Backfill	m^3	0.784	W5*H/2+(W5+t2/2)*H1								
Embankment	m^3	0.011	b1*h1/2								
Wet Masonry	m^3	1.058	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2								
Dry Masonry	m^3	1.200	(t3+t2/2)*H1								
Plain Concrete	m^3	0.162	t5*W2								
Gravel	m^3	0.162	t6*W2								

Type		PB8				Q=	18	~	36	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.40	0.70	2.00	-	0.90	-	1.58	-	1.44	0.14
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.40	0.40	-	0.10	0.10	-	0.15	0.15	0.15
Item	Unit	Quantity	Equation								
Excavation	m^3	3.002	W2*(H+H1/2+t5+t6)								
	m^3	0.034	h1*(1+0.5)*b								
	m^3	-0.060	-h*B/2								
Total	m^3	2.976									
Backfill	m^3	0.729	W5*H/2+(W5+t2/2)*H1								
Embankment	m^3	0.011	b1*h1/2								
Wet Masonry	m^3	0.923	t*h+t1*(B+t)+(t3+t2+W2-B-t)*H/2								
Dry Masonry	m^3	1.200	(t3+t2/2)*H1								
Plain Concrete	m^3	0.158	t5*W2								
Gravel	m^3	0.158	t6*W2								

BQ of Protection Works for 1 m (9/16)

Type	PC1			Q=	270	~	540	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	1.00	1.10	1.40	2.00	4.00	1.60	1.10	-	4.00	1.70	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	2.720	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.550	-h*B/2
Total	m^3	11.404	
Backfill	m^3	0.070	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.210	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.170	t5*W4+t7*W3
Gravel	m^3	0.570	t6*(W4+W3)

Type	PC2			Q=	144	~	288	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.80	0.80	1.10	2.00	4.00	1.40	1.10	-	4.00	1.50	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.950	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.320	-h*B/2
Total	m^3	10.864	
Backfill	m^3	0.055	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.955	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.150	t5*W4+t7*W3
Gravel	m^3	0.550	t6*(W4+W3)

BQ of Protection Works for 1 m (10/16)

Type		PC3				Q=	75	~	150	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.70	1.00	2.00	4.00	1.10	1.10	-	4.00	1.20	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.440	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.175	-h*B/2
Total	m^3	10.499	
Backfill	m^3	0.050	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.800	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.120	t5*W4+t7*W3
Gravel	m^3	0.520	t6*(W4+W3)

Type		PC4				Q=	60	~	120	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.60	0.90	2.00	4.00	1.10	1.10	-	4.00	1.20	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.320	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.150	-h*B/2
Total	m^3	10.404	
Backfill	m^3	0.045	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.735	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.120	t5*W4+t7*W3
Gravel	m^3	0.520	t6*(W4+W3)

BQ of Protection Works for 1 m (11/16)

Type		PC5				Q=	36	~	72	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.50	0.80	2.00	4.00	1.00	1.10	-	4.00	1.10	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.100	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.100	-h*B/2
Total	m^3	10.234	
Backfill	m^3	0.040	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.640	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.110	t5*W4+t7*W3
Gravel	m^3	0.510	t6*(W4+W3)

Type		PC6				Q=	24	~	48	(l/s)	
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.40	0.70	2.00	4.00	1.00	1.10	-	4.00	1.10	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	0.990	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.080	-h*B/2
Total	m^3	10.144	
Backfill	m^3	0.035	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.575	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.110	t5*W4+t7*W3
Gravel	m^3	0.510	t6*(W4+W3)

BQ of Protection Works for 1 m (12/16)

Type	PC7			Q=	27	~	54	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.50	0.80	2.00	4.00	0.90	1.10	-	4.00	1.00	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.000	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.075	-h*B/2
Total	m^3	10.159	
Backfill	m^3	0.040	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.610	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.100	t5*W4+t7*W3
Gravel	m^3	0.500	t6*(W4+W3)

Type	PC8			Q=	18	~	36	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.40	0.70	2.00	4.00	0.90	1.10	-	4.00	1.00	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	0.40	0.80	0.10	0.10	0.50	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	0.900	W4*(H+t5+t6)
	m^3	9.200	W3*(H2+t6+t7)/2
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.060	-h*B/2
Total	m^3	10.074	
Backfill	m^3	0.035	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.545	(W4+W)/2*H-B*h
Dry Masonry	m^3	3.000	(t3+W1)/2*H2
Plain Concrete	m^3	2.100	t5*W4+t7*W3
Gravel	m^3	0.500	t6*(W4+W3)

BQ of Protection Works for 1 m (13/16)

Type	PD1			Q=	270	~	540	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	1.00	1.10	1.40	2.00	-	1.60	-	-	-	1.80	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	2.880	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.550	-h*B/2
Total	m^3	2.364	
Backfill	m^3	0.070	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.280	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.180	t5*W4
Gravel	m^3	0.180	t6*W4

Type	PD2			Q=	144	~	288	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.80	0.80	1.10	2.00	-	1.40	-	-	-	1.60	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	2.080	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.320	-h*B/2
Total	m^3	1.794	
Backfill	m^3	0.055	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	1.010	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.160	t5*W4
Gravel	m^3	0.160	t6*W4

BQ of Protection Works for 1 m (14/16)

Type	PD3			Q=	75	~	150	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.70	1.00	2.00	-	1.10	-	-	-	1.30	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.560	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.175	-h*B/2
Total	m^3	1.419	
Backfill	m^3	0.050	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.850	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.130	t5*W4
Gravel	m^3	0.130	t6*W4

Type	PD4			Q=	60	~	120	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.50	0.60	0.90	2.00	-	1.10	-	-	-	1.30	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.430	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.150	-h*B/2
Total	m^3	1.314	
Backfill	m^3	0.045	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.780	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.130	t5*W4
Gravel	m^3	0.130	t6*W4

BQ of Protection Works for 1 m (15/16)

Type	PD5			Q=	36	~	72	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.50	0.80	2.00	-	1.00	-	-	-	1.20	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.200	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.100	-h*B/2
Total	m^3	1.134	
Backfill	m^3	0.040	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.680	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.120	t5*W4
Gravel	m^3	0.120	t6*W4

Type	PD6			Q=	24	~	48	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.40	0.40	0.70	2.00	-	1.00	-	-	-	1.20	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.080	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.080	-h*B/2
Total	m^3	1.034	
Backfill	m^3	0.035	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.610	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.120	t5*W4
Gravel	m^3	0.120	t6*W4

BQ of Protection Works for 1 m (16/16)

Type	PD7			Q=	24	~	48	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.50	0.80	2.00	-	0.90	-	-	-	1.10	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.100	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.075	-h*B/2
Total	m^3	1.059	
Backfill	m^3	0.040	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.650	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.110	t5*W4
Gravel	m^3	0.110	t6*W4

Type	PD8			Q=	18	~	36	(l/s)			
Dimensions	B	h	H	H1	H2	W	W1	W2	W3	W4	W5
	0.30	0.40	0.70	2.00	-	0.90	-	-	-	1.10	-
	t	t1	t2	t3	t4	t5	t6	t7	h1	b	b1
	0.30	0.30	0.10	-	-	0.10	0.10	-	0.15	0.15	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	0.990	W4*(H+t5+t6)
	m^3	0.034	h1*(1+0.5)*b
	m^3	-0.060	-h*B/2
Total	m^3	0.964	
Backfill	m^3	0.035	H*t2/2
Embankment	m^3	0.011	b1*h1/2
Wet Masonry	m^3	0.580	(W4+W)/2*H-B*h
Plain Concrete	m^3	0.110	t5*W4
Gravel	m^3	0.110	t6*W4

Cost of Protection Works (1/8, unit : Nu./m)

Type	PA1	Q(l/s)=	270	~	540
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	15.340	30.61	470	E-1
Backfill	m3	1.156	15.38	18	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	2.162	917.08	1,983	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.256	1483.75	3,347	C-4
Gravel	m3	0.656	206.60	136	E-9
Others	L.S			1,364	
Transportation	L.S			1,228	
Total				9,413	
Type	**PA2**	**Q(l/s)=**	**144**	**~**	**288**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	14.066	30.61	431	E-1
Backfill	m3	0.961	15.38	15	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.637	917.08	1,501	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.224	1483.75	3,300	C-4
Gravel	m3	0.624	206.60	129	E-9
Others	L.S			1,249	
Transportation	L.S			1,124	
Total				8,616	
Type	**PA3**	**Q(l/s)=**	**75**	**~**	**150**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	13.239	30.61	405	E-1
Backfill	m3	0.900	15.38	14	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.400	917.08	1,284	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.190	1483.75	3,249	C-4
Gravel	m3	0.590	206.60	122	E-9
Others	L.S			1,188	
Transportation	L.S			1,070	
Total				8,201	
Type	**PA4**	**Q(l/s)=**	**60**	**~**	**120**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	12.990	30.61	398	E-1
Backfill	m3	0.841	15.38	13	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.257	917.08	1,153	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.186	1483.75	3,243	C-4
Gravel	m3	0.586	206.60	121	E-9
Others	L.S			1,159	
Transportation	L.S			1,043	
Total				7,998	

Cost of Protection Works (2/8, unit : Nu./m)

Type	PA5	Q(l/s)=	36	~	72
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	12.574	30.61	385	E-1
Backfill	m3	0.784	15.38	12	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.088	917.08	998	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.172	1483.75	3,223	C-4
Gravel	m3	0.572	206.60	118	E-9
Others	L.S			1,121	
Transporation	L.S			1,009	
Total				7,733	
Type	**PA6**	**Q(l/s)=**	**24**	**~**	**48**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	12.346	30.61	378	E-1
Backfill	m3	0.729	15.38	11	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.953	917.08	874	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.168	1483.75	3,217	C-4
Gravel	m3	0.568	206.60	117	E-9
Others	L.S			1,093	
Transportation	L.S			984	
Total				7,542	
Type	**PA7**	**Q(l/s)=**	**27**	**~**	**54**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	12.399	30.61	380	E-1
Backfill	m3	0.784	15.38	12	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.058	917.08	970	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.162	1483.75	3,208	C-4
Gravel	m3	0.562	206.60	116	E-9
Others	L.S			1,111	
Transportation	L.S			1,000	
Total				7,664	
Type	**PA8**	**Q(l/s)=**	**18**	**~**	**36**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	12.176	30.61	373	E-1
Backfill	m3	0.729	15.38	11	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.923	917.08	846	C-6
Dry Masonry	m3	4.200	206.60	868	E-9
Plain Concrete	m3	2.158	1483.75	3,202	C-4
Gravel	m3	0.558	206.60	115	E-9
Others	L.S			1,083	
Transportation	L.S			975	
Total				7,474	

Cost of Protection Works (3/8, unit : Nu./m)

Type	PB1	Q(l/s)=	270	~	540
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	6.140	30.61	188	E-1
Backfill	m3	1.156	15.38	18	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	2.162	917.08	1,983	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.256	1483.75	380	C-4
Gravel	m3	0.256	206.60	53	E-9
Others	L.S			574	
Transportation	L.S			517	
Total				3,960	
Type	PB2	Q(l/s)=	144	~	288
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	4.866	30.61	149	E-1
Backfill	m3	0.961	15.38	15	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.637	917.08	1,501	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.224	1483.75	332	C-4
Gravel	m3	0.224	206.60	46	E-9
Others	L.S			458	
Transportation	L.S			413	
Total				3,163	
Type	PB3	Q(l/s)=	75	~	150
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	4.039	30.61	124	E-1
Backfill	m3	0.900	15.38	14	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.400	917.08	1,284	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.190	1483.75	282	C-4
Gravel	m3	0.190	206.60	39	E-9
Others	L.S			398	
Transportation	L.S			358	
Total				2,747	
Type	PB4	Q(l/s)=	60	~	120
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	3.790	30.61	116	E-1
Backfill	m3	0.841	15.38	13	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.257	917.08	1,153	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.186	1483.75	276	C-4
Gravel	m3	0.186	206.60	38	E-9
Others	L.S			369	
Transportation	L.S			332	
Total				2,545	

Cost of Protection Works (4/8, unit : Nu./m)

Type	PB5	Q(l/s)=	36	~	72
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	3.374	30.61	103	E-1
Backfill	m3	0.784	15.38	12	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.088	917.08	998	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.172	1483.75	255	C-4
Gravel	m3	0.172	206.60	36	E-9
Others	L.S			330	
Transportation	L.S			297	
Total				2,280	
Type	PB6	Q(l/s)=	24	~	48
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	3.146	30.61	96	E-1
Backfill	m3	0.729	15.38	11	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.953	917.08	874	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.168	1483.75	249	C-4
Gravel	m3	0.168	206.60	35	E-9
Others	L.S			303	
Transportation	L.S			272	
Total				2,089	
Type	PB7	Q(l/s)=	27	~	54
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	3.199	30.61	98	E-1
Backfill	m3	0.784	15.38	12	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.058	917.08	970	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.162	1483.75	240	C-4
Gravel	m3	0.162	206.60	33	E-9
Others	L.S			320	
Transportation	L.S			288	
Total				2,211	
Type	PB8	Q(l/s)=	18	~	36
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	2.976	30.61	91	E-1
Backfill	m3	0.729	15.38	11	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.923	917.08	846	C-6
Dry Masonry	m3	1.200	206.60	248	E-9
Plain Concrete	m3	0.158	1483.75	234	C-4
Gravel	m3	0.158	206.60	33	E-9
Others	L.S			293	
Transportation	L.S			264	
Total				2,021	

Cost of Protection Works (5/8, unit : Nu./m)

Type	PC1	Q(l/s)=	270	~	540
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	11.404	30.61	349	E-1
Backfill	m3	0.070	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.210	917.08	1,110	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.170	1483.75	3,220	C-4
Gravel	m3	0.570	206.60	118	E-9
Others	L.S			1,084	
Transportation	L.S			975	
Total				7,476	
Type	**PC2**	**Q(l/s)=**	**144**	**~**	**288**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.864	30.61	333	E-1
Backfill	m3	0.055	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.955	917.08	876	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.150	1483.75	3,190	C-4
Gravel	m3	0.550	206.60	114	E-9
Others	L.S			1,027	
Transportation	L.S			924	
Total				7,084	
Type	**PC3**	**Q(l/s)=**	**75**	**~**	**150**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.499	30.61	321	E-1
Backfill	m3	0.050	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.800	917.08	734	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.120	1483.75	3,146	C-4
Gravel	m3	0.520	206.60	107	E-9
Others	L.S			986	
Transportation	L.S			887	
Total				6,802	
Type	**PC4**	**Q(l/s)=**	**60**	**~**	**120**
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.404	30.61	318	E-1
Backfill	m3	0.045	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.735	917.08	674	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.120	1483.75	3,146	C-4
Gravel	m3	0.520	206.60	107	E-9
Others	L.S			973	
Transportation	L.S			876	
Total				6,716	

Cost of Protection Works (6/8, unit : Nu./m)

Type	PC5	Q(l/s)=	36	~	72
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.234	30.61	313	E-1
Backfill	m3	0.040	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.640	917.08	587	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.110	1483.75	3,131	C-4
Gravel	m3	0.510	206.60	105	E-9
Others	L.S			951	
Transportation	L.S			856	
Total				6,565	

Type	PC6	Q(l/s)=	24	~	48
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.144	30.61	311	E-1
Backfill	m3	0.035	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.575	917.08	527	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.110	1483.75	3,131	C-4
Gravel	m3	0.510	206.60	105	E-9
Others	L.S			939	
Transportation	L.S			845	
Total				6,479	

Type	PC7	Q(l/s)=	27	~	54
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.159	30.61	311	E-1
Backfill	m3	0.040	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.610	917.08	559	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.100	1483.75	3,116	C-4
Gravel	m3	0.500	206.60	103	E-9
Others	L.S			942	
Transportation	L.S			848	
Total				6,500	

Type	PC8	Q(l/s)=	18	~	36
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.074	30.61	308	E-1
Backfill	m3	0.035	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.545	917.08	500	C-6
Dry Masonry	m3	3.000	206.60	620	E-9
Plain Concrete	m3	2.100	1483.75	3,116	C-4
Gravel	m3	0.500	206.60	103	E-9
Others	L.S			930	
Transportation	L.S			837	
Total				6,414	

Cost of Protection Works (7/8, unit : Nu./m)

Type	PD1	Q(l/s)=	270	~	540
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	2.364	30.61	72	E-1
Backfill	m3	0.070	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.280	917.08	1,174	C-6
Plain Concrete	m3	0.180	1483.75	267	C-4
Gravel	m3	0.180	206.60	37	E-9
Others	L.S			310	
Transportation	L.S			279	
Total				2,142	

Type	PD2	Q(l/s)=	144	~	288
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.794	30.61	55	E-1
Backfill	m3	0.055	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	1.010	917.08	926	C-6
Plain Concrete	m3	0.160	1483.75	237	C-4
Gravel	L.S	0.160	206.60	33	E-9
Others	L.S			251	
Transportation	L.S			226	
Total				1,729	

Type	PD3	Q(l/s)=	75	~	150
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.419	30.61	43	E-1
Backfill	m3	0.050	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.850	917.08	780	C-6
Plain Concrete	m3	0.130	1483.75	193	C-4
Gravel	L.S	0.130	206.60	27	E-9
Others	L.S			209	
Transportation	L.S			188	
Total				1,441	

Type	PD4	Q(l/s)=	60	~	120
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.314	30.61	40	E-1
Backfill	m3	0.045	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.780	917.08	715	C-6
Plain Concrete	m3	0.130	1483.75	193	C-4
Gravel	L.S	0.130	206.60	27	E-9
Others	L.S			195	
Transportation	L.S			176	
Total				1,347	

Cost of Protection Works (8/8, unit : Nu./m)

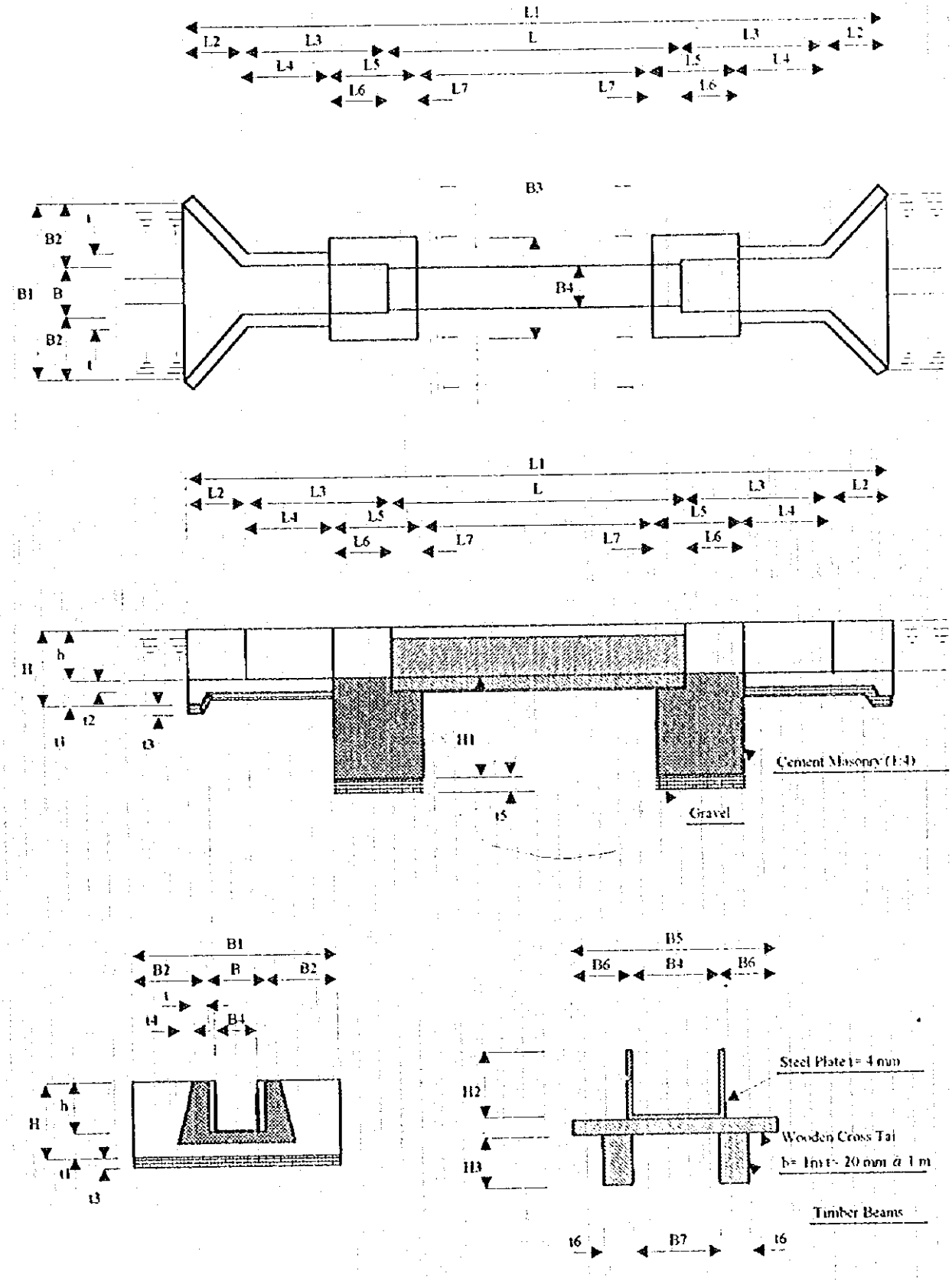
Type	PD5	Q(l/s)=	36	~	72
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.134	30.61	35	E-1
Backfill	m3	0.040	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.680	917.08	624	C-6
Plain Concrete	m3	0.120	1483.75	178	C-4
Gravel	L.S	0.120	206.60	25	E-9
Others	L.S			172	
Transportation	L.S			155	
Total				1,190	

Type	PD6	Q(l/s)=	24	~	48
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.034	30.61	32	E-1
Backfill	m3	0.035	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.610	917.08	559	C-6
Plain Concrete	m3	0.120	1483.75	178	C-4
Gravel	L.S	0.120	206.60	25	E-9
Others	L.S			159	
Transportation	L.S			143	
Total				1,097	

Type	PD7	Q(l/s)=	24	~	48
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	1.059	30.61	32	E-1
Backfill	m3	0.040	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.650	917.08	596	C-6
Plain Concrete	m3	0.110	1483.75	163	C-4
Gravel	L.S	0.110	206.60	23	E-9
Others	L.S			163	
Transportation	L.S			147	
Total				1,125	

Type	PD8	Q(l/s)=	18	~	36
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	0.964	30.61	30	E-1
Backfill	m3	0.035	15.38	1	E-3
Embankment	m3	0.011	34.56	0	E-5
Wet Masonry	m3	0.580	917.08	532	C-6
Plain Concrete	m3	0.110	1483.75	163	C-4
Gravel	L.S	0.110	206.60	23	E-9
Others	L.S			150	
Transportation	L.S			135	
Total				1,033	

(7) Typical Structure of Steel Flume Aqueduct



Dimensions of Steel Flume Aqueduct

Type Code		SFA1		Q=	216	~	540 (l/s)						
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.90	1.00	1.00	3.40	1.20	1.80	1.10	0.10	1.00	6.00	16.00	1.50	3.50	2.00
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.90	1.50	0.40	1.10	1.70	3.00	0.60	0.30	0.60	0.30	0.15	0.10	0.20	0.30
Type Code		SFA2		Q=	105	~	263	(l/s)					
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.70	0.70	0.80	2.50	0.90	1.60	0.90	0.10	0.80	6.00	14.00	1.20	2.80	1.60
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.60	1.20	0.40	0.80	1.40	3.00	0.60	0.30	0.60	0.30	0.15	0.10	0.20	0.30
Type Code		SFA3		Q=	60	~	150	(l/s)					
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.50	0.60	0.60	2.20	0.80	1.40	0.70	0.10	0.60	6.00	12.00	0.90	2.10	1.20
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.30	0.90	0.40	0.70	1.30	3.00	0.50	0.30	0.60	0.30	0.15	0.10	0.20	0.20
Type Code		SFA4		Q=	45	~	113	(l/s)					
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.50	0.50	0.60	1.90	0.70	1.40	0.70	0.10	0.60	6.00	12.00	0.90	2.10	1.20
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.30	0.90	0.40	0.60	1.20	3.00	0.50	0.30	0.60	0.30	0.15	0.10	0.20	0.20
Type Code		SFA5		Q=	30	~	75	(l/s)					
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.50	0.40	0.60	1.60	0.60	1.40	0.70	0.10	0.60	6.00	12.00	0.90	2.10	1.20
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.30	0.90	0.40	0.50	1.10	3.00	0.50	0.30	0.60	0.30	0.15	0.10	0.20	0.20
Type Code		SFA6		Q=	24	~	60	(l/s)					
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.40	0.30	0.50	1.30	0.50	1.30	0.60	0.10	0.50	6.00	11.00	0.75	1.75	1.00
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.15	0.75	0.40	0.40	1.00	3.00	0.40	0.30	0.60	0.30	0.15	0.10	0.20	0.20
Type Code		SFA7		Q=	12	~	30	(l/s)					
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.40	0.30	0.50	1.30	0.50	1.30	0.60	0.10	0.50	6.00	11.00	0.75	1.75	1.00
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.15	0.75	0.40	0.40	1.00	3.00	0.40	0.30	0.60	0.30	0.15	0.10	0.20	0.20

BQ of Steel Flume Aqueduct (1/7)

Type		SFA1				Q=	216	~	540	(l/s)			
Dimensions													
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.90	1.00	1.000	3.40	1.20	1.80	1.10	0.10	1.00	6.00	16.00	1.50	3.50	2.00
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.90	1.50	0.400	1.10	1.70	3.00	0.60	0.30	0.60	0.30	0.15	0.10	0.20	0.30

Item	Unit	Quantity	Equation
Excavation	m^3	20.520	H1*L5*B3*2
	m^3	4.480	(B+2*t)*(h+t2)*L4/2*2
	m^3	6.105	(B1+B)/2*L2*(H+t3)/2*2
Total	m^3	31.105	
Backfill	m^3	0.863	$t4*h*(L4+(B2^2+L2^2)^{0.5})*2$
Cement Masonry	m^3	19.656	(L5*H1-L7*H3)*B3*2
Wet Masonry	m^3	5.120	((B+t*2+t4)*(h+t2)-B*h)*L4*2
	m^3	5.225	$(t+t4)*H*(B2^2+L2^2)^{0.5}*2*2$
	m^3	1.704	t2*(B1+B)/2*L2+(t2+t4/2)*(t1-t2)*B1*2
Total	m^3	12.049	
Gravel	m^3	1.830	t3*(L4*(B+t4)+L2*((B1+B+2*t)/2+t4))*2
	m^3	1.368	t5*L5*B3*2
Total	m^3	3.198	
Steel Plate (t=4)	m^2	17.400	(B4+H2*2)*L
Timber Beam	m^3	2.160	t6*H3*L*2
Wooden Cross Tai (t=20)	m^3	0.660	B5*0.2*1*(L/2)

BQ of Steel Flume Aqueduct (2/7)

Type		SFA2				Q= 105 ~ 263 (l/s)							
Dimensions													
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.70	0.70	0.800	2.50	0.90	1.60	0.90	0.10	0.80	6.00	14.00	1.20	2.80	1.60
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.60	1.20	0.400	0.80	1.40	3.00	0.60	0.30	0.60	0.30	0.15	0.10	0.20	0.30

Item	Unit	Quantity	Equation
Excavation	m^3	15.360	H1*L5*B3*2
	m^3	2.464	(B+2*t)*(h+t2)*L4/2*2
	m^3	3.069	(B1+B)/2*L2*(H+t3)/2*2
Total	m^3	20.893	
Backfill	m^3	0.496	t4*h*(L4+(B2^2+L2^2)$^{0.5}$)*2
Cement Masonry	m^3	14.592	(L5*H1-L7*H3)*B3*2
Wet Masonry	m^3	3.232	((B+t*2+t4)*(h+t2)-B*h)*L4*2
	m^3	3.360	(t+t4)*H*(B2^2+L2^2)$^{0.5}$*2*2
	m^3	1.119	t2*(B1+B)/2*L2+(t2+t4/2)*(t1-t2)*B1*2
Total	m^3	7.711	
Gravel	m^3	1.170	t3*(L4*(B+t4)+L2*((B1+B+2*t)/2+t4))*2
	m^3	1.024	t5*L5*B3*2
Total	m^3	2.194	
Steel Plate (t=4)	m^2	12.600	(B4+H2*2)*L
Timber Beam	m^3	2.160	t6*H3*L*2
Wooden Cross Tai (t=20)	m^3	0.540	B5*0.2*1*(L/2)

BQ of Steel Flume Aqueduct (3/7)

Type			SFA3			Q=	60	~	150	(l/s)			
Dimensions													
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.50	0.60	0.600	2.20	0.80	1.40	0.70	0.10	0.60	6.00	12.00	0.90	2.10	1.20
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.30	0.90	0.400	0.70	1.30	3.00	0.50	0.30	0.60	0.30	0.15	0.10	0.20	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	10.920	H1*L5*B3*2
	m^3	1.440	(B+2*t)*(h+t2)*L4/2*2
	m^3	1.827	(B1+B)/2*L2*(H+t3)/2*2
Total	m^3	14.187	
Backfill	m^3	0.337	t4*h*(L4+(B2^2+L2^2)$^{0.5}$)*2
Cement Masonry	m^3	10.360	(L5*H1-L7*H3)*B3*2
Wet Masonry	m^3	2.112	((B+t*2+t4)*(h+t2)-B*h)*L4*2
	m^3	2.505	(t+t4)*H*(B2^2+L2^2)$^{0.5}$*2*2
	m^3	0.840	t2*(B1+B)/2*L2+(t2+t4/2)*(t1-t2)*B1*2
Total	m^3	5.457	
Gravel	m^3	0.738	t3*(L4*(B+t4)+L2*((B1+B+2*t)/2+t4))*2
	m^3	0.728	t5*L5*B3*2
Total	m^3	1.466	
Steel Plate (t=4)	m^2	10.200	(B4+H2*2)*L
Timber Beam	m^3	1.200	t6*H3*L*2
Wooden Cross Tai (t=20)	m^3	0.420	B5*0.2*1*(L/2)

BQ of Steel Flume Aqueduct (4/7)

Type			SFA4			Q=	45	~	113	(l/s)			
Dimensions													
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.50	0.50	0.600	1.90	0.70	1.40	0.70	0.10	0.60	6.00	12.00	0.90	2.10	1.20
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.30	0.90	0.400	0.60	1.20	3.00	0.50	0.30	0.60	0.30	0.15	0.10	0.20	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	10.920	H1*L5*B3*2
	m^3	1.296	(B+2*t)*(h+t2)*L4/2*2
	m^3	1.519	(B1+B)/2*L2*(H+t3)/2*2
Total	m^3	13.735	
Backfill	m^3	0.281	$t4*h*(L4+(B2^2+L2^2)^{0.5})*2$
Cement Masonry	m^3	10.360	(L5*H1-L7*H3)*B3*2
Wet Masonry	m^3	1.944	((B+(t*2+t4)*(h+t2)-B*h)*L4*2
	m^3	2.189	$(t+t4)*H*(B2^2+L2^2)^{0.5}*2*2$
	m^3	0.737	t2*(B1+B)/2*L2+(t2+t4/2)*(t1-t2)*B1*2
Total	m^3	4.870	
Gravel	m^3	0.698	t3*(L4*(B+t4)+L2*((B1+B+2*t)/2+t4))*2
	m^3	0.728	t5*L5*B3*2
Total	m^3	1.426	
Steel Plate (t=4)	m^2	9.000	(B4+H2*2)*L
Timber Beam	m^3	1.200	t6*H3*L*2
Wooden Cross Tai (t=20)	m^3	0.420	B5*0.2*1*(L/2)

BQ of Steel Flume Aqueduct (5/7)

Type	SFA5			Q=	30	~	75	(l/s)				
Dimensions												
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.50	0.40	0.600	1.60	0.60	1.40	0.70	0.10	0.60	6.00	12.00	0.90	2.10	1.20
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.30	0.90	0.400	0.50	1.10	3.00	0.50	0.30	0.60	0.30	0.15	0.10	0.20	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	10.920	H1*L5*B3*2
	m^3	1.152	(B+2*t)*(h+t2)*L4/2*2
	m^3	1.238	(B1+B)/2*L2*(H+t3)/2*2
Total	m^3	13.310	
Backfill	m^3	0.228	t4*h*(L4+(B2^2+L2^2)$^{0.5}$)*2
Cement Masonry	m^3	10.360	(L5*H1-L7*H3)*B3*2
Wet Masonry	m^3	1.776	((B+t*2+t4)*(h+t2)-B*h)*L4*2
	m^3	1.904	(t+t4)*H*(B2^2+L2^2)$^{0.5}$*2*2
	m^3	0.633	t2*(B1+B)/2*L2+(t2+(t4/2)*(t1-t2)*B1*2
Total	m^3	4.313	
Gravel	m^3	0.657	t3*(L4*(B+t4)+L2*((B1+B+2*t)/2+t4))*2
	m^3	0.728	t5*L5*B3*2
Total	m^3	1.385	
Steel Plate (t=4)	m^2	7.800	(B4+H2*2)*L
Timber Beam	m^3	1.200	t6*H3*L*2
Wooden Cross Tai (t=20)	m^3	0.420	B5*0.2*1*(L/2)

BQ of Steel Flume Aqueduct (6/7)

Type		SFA6			Q=	24	~	60	(l/s)				
Dimensions													
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.40	0.30	0.500	1.30	0.50	1.30	0.60	0.10	0.50	6.00	11.00	0.75	1.75	1.00
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.15	0.75	0.400	0.40	1.00	3.00	0.40	0.30	0.60	0.30	0.15	0.10	0.20	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	8.970	H1*L5*B3*2
	m^3	0.770	(B+2*t)*(h+t2)*L4/2*2
	m^3	0.776	(B1+B)/2*L2*(H+t3)/2*2
Total	m^3	10.516	
Backfill	m^3	0.152	$t4*h*(L4+(B2^2+L2^2)^{0.5})*2$
Cement Masonry	m^3	8.554	(L5*H1-L7*H3)*B3*2
Wet Masonry	m^3	1.280	((B+t*2+t4)*(h+t2)-B*h)*L4*2
	m^3	1.442	$(t+t4)*H*(B2^2+L2^2)^{0.5}*2*2$
	m^3	0.476	(2*(B1+B)/2*L2+(t2+t4/2)*(t1-t2)*B1*2
Total	m^3	3.198	
Gravel	m^3	0.473	t3*(L4*(B+t4)+L2*((B1+B+2*t)/2+t4))*2
	m^3	0.598	t5*L5*B3*2
Total	m^3	1.071	
Steel Plate (t=4)	m^2	6.000	(B4+H2*2)*L
Timber Beam	m^3	0.960	t6*H3*L*2
Wooden Cross Tai (t=20)	m^3	0.360	B5*0.2*1*(L/2)

BQ of Steel Flume Aqueduct (7/7)

Type			SFA7	Q=	12	~	30	(l/s)					
Dimensions													
B4	H2	B	B1	B2	B3	B5	B6	B7	L	L1	L2	L3	L4
0.40	0.30	0.500	1.30	0.50	1.30	0.60	0.10	0.50	6.00	11.00	0.75	1.75	1.00
L5	L6	L7	h	H	H1	H3	t	t1	t2	t3	t4	t5	t6
1.15	0.75	0.400	0.40	1.00	3.00	0.40	0.30	0.60	0.30	0.15	0.10	0.20	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	8.970	H1*L5*B3*2
	m^3	0.770	(B+2*t)*(h+t2)*L4/2*2
	m^3	0.776	(B1+B)/2*L2*(H+t3)/2*2
Total	m^3	10.516	
Backfill	m^3	0.152	t4*h*(L4+(B2^2+L2^2)$^{0.5}$)*2
Cement Masonry	m^3	8.554	(L5*H1-L7*H3)*B3*2
Wet Masonry	m^3	1.280	((B+t*2+t4)*(h+t2)-B*h)*L4*2
	m^3	1.442	(t+t4)*H*(B2^2+L2^2)$^{0.5}$*2*2
	m^3	0.476	t2*(B1+B)/2*L2+(t2+t4/2)*(t1-t2)*B1*2
Total	m^3	3.198	
Gravel	m^3	0.473	t3*(L4*(B+t4)+L2*((B1+B+2*t)/2+t4))*2
	m^3	0.598	t5*L5*B3*2
Total	m^3	1.071	
Steel Plate (t=4)	m^2	6.000	(B4+H2*2)*L
Timber Beam	m^3	0.960	t6*H3*L*2
Wooden Cross Tai (t=20)	m^3	0.360	B5*0.2*1*(L/2)

Construction Cost of Steel Flume Aqueduct (Nu/m)

(1/3)

Type	SFA1	Q(l/s)=	216	~	540
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	31.105	30.61	952	E-1
Backfill	m3	0.863	15.38	13	E-3
Cement Masonry	m3	19.656	818.54	16.089	C-7
Wet Masonry	m3	12.049	917.08	11.050	C-6
Gravel	m3	3.198	206.60	661	E-9
Steel Plate (t=4)	m2	17.400	55.13	959	M-2
Timber Beam	m3	2.160	4512.18	9.746	T-2
Wooden Cross Tai (t=20)	m3	0.660	4626.63	3.054	T-3
Others	L.S			8.505	
Transportation	L.S			7.654	
Total				58.684	
For 1m				9.781	

Type	SFA2	Q(l/s)=	105	~	263
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	20.893	30.61	640	E-1
Backfill	m3	0.496	15.38	8	E-3
Cement Masonry	m3	14.592	818.54	11.944	C-7
Wet Masonry	m3	7.711	917.08	7.072	C-6
Gravel	m3	2.194	206.60	453	E-9
Steel Plate (t=4)	m2	12.600	55.13	695	M-2
Timber Beam	m3	2.160	4512.18	9.746	T-2
Wooden Cross Tai (t=20)	m3	0.540	4626.63	2.498	T-3
Others	L.S			6.611	
Transportation	L.S			5.950	
Total				45.617	
For 1m				7.603	

Type	SFA3	Q(l/s)=	60	~	150
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	14.187	30.61	434	E-1
Backfill	m3	0.337	15.38	5	E-3
Cement Masonry	m3	10.360	818.54	8.480	C-7
Wet Masonry	m3	5.457	917.08	5.004	C-6
Gravel	m3	1.466	206.60	303	E-9
Steel Plate (t=4)	m2	10.200	55.13	562	M-2
Timber Beam	m3	1.200	4512.18	5.415	T-2
Wooden Cross Tai (t=20)	m3	0.420	4626.63	1.943	T-3
Others	L.S			4.429	
Transportation	L.S			3.986	
Total				30.562	
For 1m				5.094	

Construction Cost of Steel Flume Aqueduct (Nu/m)

(2/3)

Type	SFA4	Q(l/s)=	45	~	113
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	13.735	30.61	420	E-1
Backfill	m3	0.281	15.38	4	E-3
Cement Masonry	m3	10.360	818.54	8,480	C-7
Wet Masonry	m3	4.870	917.08	4,466	C-6
Gravel	m3	1.426	206.60	295	E-9
Steel Plate (t=4)	m2	9.000	55.13	496	M-2
Timber Beam	m3	1.200	4512.18	5,415	T-2
Wooden Cross Tai (t=20)	m3	0.420	4626.63	1,943	T-3
Others	L.S			4,304	
Transportation	L.S			3,873	
Total				29,696	
For 1m				4,949	

Type	SFA5	Q(l/s)=	30	~	75
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	13.310	30.61	407	E-1
Backfill	m3	0.228	15.38	4	E-3
Cement Masonry	m3	10.360	818.54	8,480	C-7
Wet Masonry	m3	4.313	917.08	3,955	C-6
Gravel	m3	1.385	206.60	286	E-9
Steel Plate (t=4)	m2	7.800	55.13	430	M-2
Timber Beam	m3	1.200	4512.18	5,415	T-2
Wooden Cross Tai (t=20)	m3	0.420	4626.63	1,943	T-3
Others	L.S			4,184	
Transportation	L.S			3,766	
Total				28,870	
For 1m				4,812	

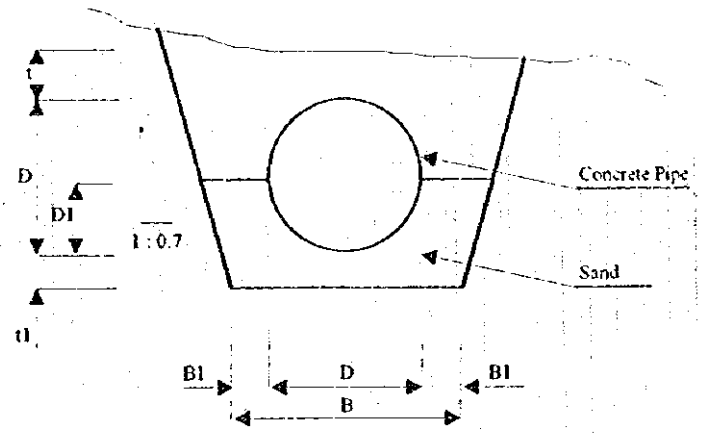
Type	SFA6	Q(l/s)=	24	~	60
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.516	30.61	322	E-1
Backfill	m3	0.152	15.38	2	E-3
Cement Masonry	m3	8.554	818.54	7,002	C-7
Wet Masonry	m3	3.198	917.08	2,933	C-6
Gravel	m3	1.071	206.60	221	E-9
Steel Plate (t=4)	m2	6.000	55.13	331	M-2
Timber Beam	m3	0.960	4512.18	4,332	T-2
Wooden Cross Tai (t=20)	m3	0.360	4626.63	1,666	T-3
Others	L.S			3,362	
Transportation	L.S			3,025	
Total				23,195	
For 1m				3,866	

Construction Cost of Steel Flume Aqueduct (Nu/m)

(3/3)

Type	SFA7	Q(l/s)=	12	~	30
Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m3	10.516	30.61	322	E-1
Backfill	m3	0.152	15.38	2	E-3
Cement Masonry	m3	8.554	818.54	7.002	C-7
Wet Masonry	m3	3.198	917.08	2.933	C-6
Gravel	m3	1.071	206.60	221	E-9
Steel Plate (t=4)	m2	6.000	55.13	331	M-2
Timber Beam	m3	0.960	4512.18	4.332	T-2
Wooden Cross Tai (t=20)	m3	0.360	4626.63	1.666	T-3
Others	L.S			3.362	
Transportation	L.S			3.025	
Total				23.195	
For 1m				3.866	

(8) Typical Section of Pipe Canal Works and Dimensions
(Code PPC)



Dimensions (m)

Type Code	D	D1	B	B1	t	t1	Canal Capacity (l/s)			Remark
PPC1	1.20	0.60	2.20	0.50	0.30	0.30	283	~	566	
PPC2	0.90	0.45	1.90	0.50	0.30	0.20	159	~	319	
PPC3	0.70	0.35	1.70	0.50	0.30	0.20	96	~	193	
PPC4	0.50	0.25	1.50	0.50	0.30	0.20	49	~	98	
PPC5	0.40	0.20	1.40	0.50	0.30	0.20	31	~	63	
PPC6	0.30	0.15	1.30	0.50	0.30	0.15	18	~	35	

BQ of Pipe Canal Works (for 1 m)

Type	PPC1	Q=	283	~	566	(l/s)
Dimensions	D	D1	B	B1	t	t1
	1.20	0.60	2.20	0.50	0.30	0.30

Item	Unit	Quantity	Equation
Excavation	m^3	6.228	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	2.264	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.565	-3.14*D^2/4/2
Total	m^3	1.699	
Backfill	m^3	4.529	Excavation-Sand
Concrete Pipe	m	1	D= 1,200 mm

Type	PPC2	Q=	159	~	319	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.90	0.45	1.90	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	4.032	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.6485	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.318	-3.14*D^2/4/2
Total	m^3	1.330	
Backfill	m^3	2.702	Excavation-Sand
Concrete Pipe	m	1	D= 900 mm

Type	PPC3	Q=	96	~	193	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.70	0.35	1.70	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	3.048	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.4595	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.192	-3.14*D^2/4/2
Total	m^3	1.267	
Backfill	m^3	1.781	Excavation-Sand
Concrete Pipe	m	1	D= 700 mm

BQ of Pipe Canal Works (for 1 m)

Type	PPC4	Q=	49	~	98	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.50	0.25	1.50	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	2.200	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.2705	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.098	$-3.14*D^2/4/2$
Total	m^3	1.172	
Backfill	m^3	1.028	Excavation-Sand
Concrete Pipe	m	1	D= 500 mm

Type	PPC5	Q=	31	~	63	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.40	0.20	1.40	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	1.827	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.176	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.063	$-3.14*D^2/4/2$
Total	m^3	1.113	
Backfill	m^3	0.714	Excavation-Sand
Concrete Pipe	m	1	D= 400 mm

Type	PPC6	Q=	18	~	35	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.30	0.15	1.30	0.50	0.30	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.369	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	0.9815	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.035	$-3.14*D^2/4/2$
Total	m^3	0.946	
Backfill	m^3	0.423	Excavation-Sand
Concrete Pipe	m	1	D= 300 mm

BQ of Pipe Canal Works for 1 m (1/2)

Type	PPC1	Q=	283	~	566	(l/s)

Dimensions	D	D1	B	B1	t	t1
	1.20	0.60	2.20	0.50	0.30	0.30

Item	Unit	Quantity	Equation
Excavation	m^3	6.228	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	2.264	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.565	-3.14*D^2/4/2
Total	m^3	1.699	
Backfill	m^3	4.529	Excavation-Sand
Concrete Pipe	m	1	D= 1,200 mm

Type	PPC2	Q=	159	~	319	(l/s)

Dimensions	D	D1	B	B1	t	t1
	0.90	0.45	1.90	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	4.032	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.6485	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.318	-3.14*D^2/4/2
Total	m^3	1.330	
Backfill	m^3	2.702	Excavation-Sand
Concrete Pipe	m	1	D= 900 mm

Type	PPC3	Q=	96	~	193	(l/s)

Dimensions	D	D1	B	B1	t	t1
	0.70	0.35	1.70	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	3.048	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.4595	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.192	-3.14*D^2/4/2
Total	m^3	1.267	
Backfill	m^3	1.781	Excavation-Sand
Concrete Pipe	m	1	D= 700 mm

BQ of Pipe Canal Works for 1 m (2/2)

Type	PPC4	Q=	49	~	98	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.50	0.25	1.50	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	2.200	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.2705	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.098	-3.14*D^2/4/2
Total	m^3	1.172	
Backfill	m^3	1.028	Excavation-Sand
Concrete Pipe	m	1	D= 500 mm

Type	PPC5	Q=	31	~	63	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.40	0.20	1.40	0.50	0.30	0.20

Item	Unit	Quantity	Equation
Excavation	m^3	1.827	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	1.176	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.063	-3.14*D^2/4/2
Total	m^3	1.113	
Backfill	m^3	0.714	Excavation-Sand
Concrete Pipe	m	1	D= 400 mm

Type	PPC6	Q=	18	~	35	(l/s)
Dimensions	D	D1	B	B1	t	t1
	0.30	0.15	1.30	0.50	0.30	0.15

Item	Unit	Quantity	Equation
Excavation	m^3	1.369	(B+0.7*(D+t+t1))*(D+t+t1)
Sand	m^3	0.9815	(B+0.7*(D1+t1))*(D1+t1)
	m^3	-0.035	-3.14*D^2/4/2
Total	m^3	0.946	
Backfill	m^3	0.423	Excavation-Sand
Concrete Pipe	m	1	D= 300 mm

Unit Cost of Protection Piping Works (1/2, unit : Nu./m)

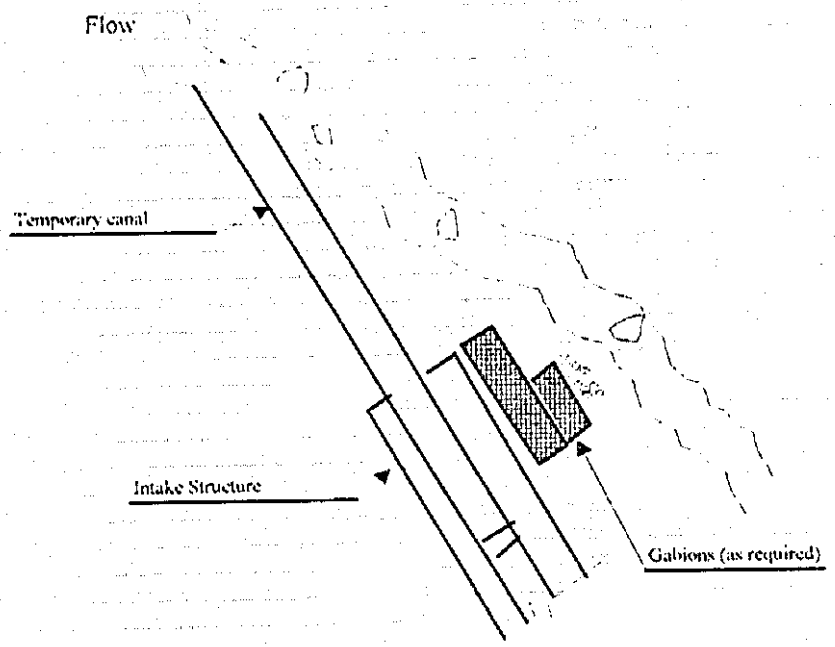
Type	PPC1	Q(l/s)=	283	~	566
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation, manual	m3	6.228	30.61	191	E-1
Sand fill	m3	1.699	61.22	104	E-10
Backfill, manual	m3	4.529	15.38	70	E-3
Cncrete pipe placing (D=1,200)	m	1.000	1685.09	1,685	P-1
Others	L.S			410	
Transportation	L.S			369	
Total				2,828	
Type	**PPC2**	**Q(l/s)=**	**159**	**~**	**319**
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation, manual	m3	4.032	30.61	123	E-1
Sand fill	m3	1.330	61.22	81	E-10
Backfill, manual	m3	2.702	15.38	42	E-3
Concrete pipe placing (D=900)	m	1.000	1136.04	1,136	P-2
Others	L.S			276	
Transportation	L.S			249	
Total				1,908	
Type	**PPC3**	**Q(l/s)=**	**96**	**~**	**193**
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation, manual	m3	3.048	30.61	93	E-1
Sand fill	m3	1.267	61.22	78	E-10
Backfill, manual	m3	1.781	15.38	27	E-3
Concrete pipe placing (D=700)	m	1.000	859.78	860	P-3
Others	L.S			212	
Transportation	L.S			190	
Total				1,460	

Unit Cost of Protection Piping Works (2/2, unit : Nu./m)

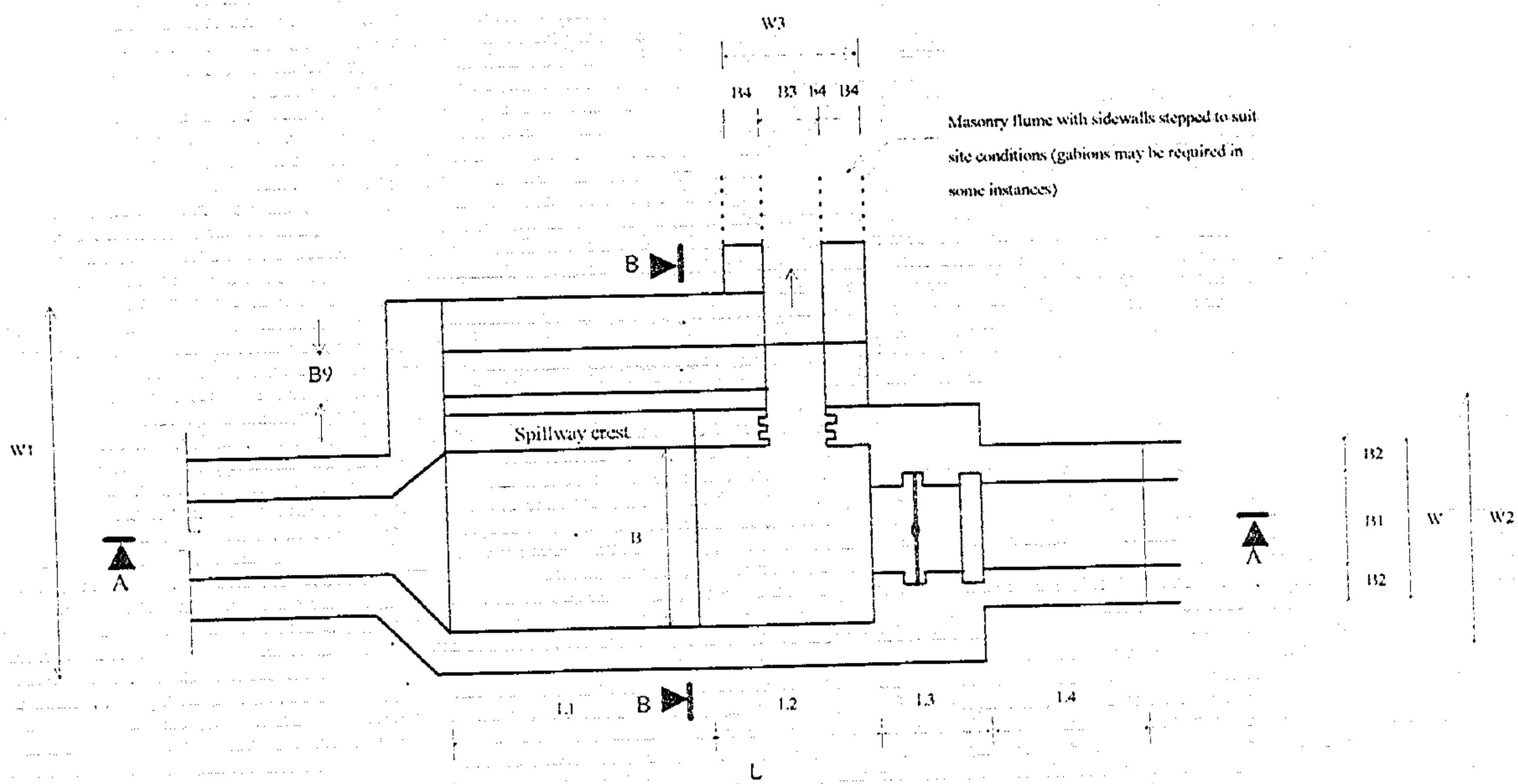
Type	PPC4	Q(l/s)=	49	~	98
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation, manual	m3	2.200	30.61	67	E-1
Sand fill	m3	1.172	61.22	72	E-10
Backfill, manual	m3	1.028	15.38	16	E-3
Concrete pipe placing (D=500)	m	1.000	540.00	540	P-4
Others	L.S			139	
Transportation	L.S			125	
Total				959	
Type	**PPC5**	**Q(l/s)=**	**31**	**~**	**63**
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation, manual	m3	1.827	30.61	56	E-1
Sand fill	m3	1.113	61.22	68	E-10
Backfill, manual	m3	0.714	15.38	11	E-3
Concrete pipe placing (D=400)	m	1.000	436.03	436	P-5
Others	L.S			114	
Transportation	L.S			103	
Total				788	
Type	**PPC6**	**Q(l/s)=**	**18**	**~**	**35**
Item	Unit	Quantity	Unit Price	Amount	Remark
Excavation, manual	m3	1.369	30.61	42	E-1
Sand fill	m3	0.946	61.22	58	E-10
Backfill, manual	m3	0.423	15.38	6	E-3
Concrete pipe placing (D=300)	m	1.000	306.49	306	P-6
Others	L.S			83	
Transportation	L.S			74	
Total				570	

(9) Preliminary Design of New Intake Facilities for Phangyul Canal (1/3)

Schematic Layout of Headworks for Water Resources Improvement of Phangyul Canal (C10)

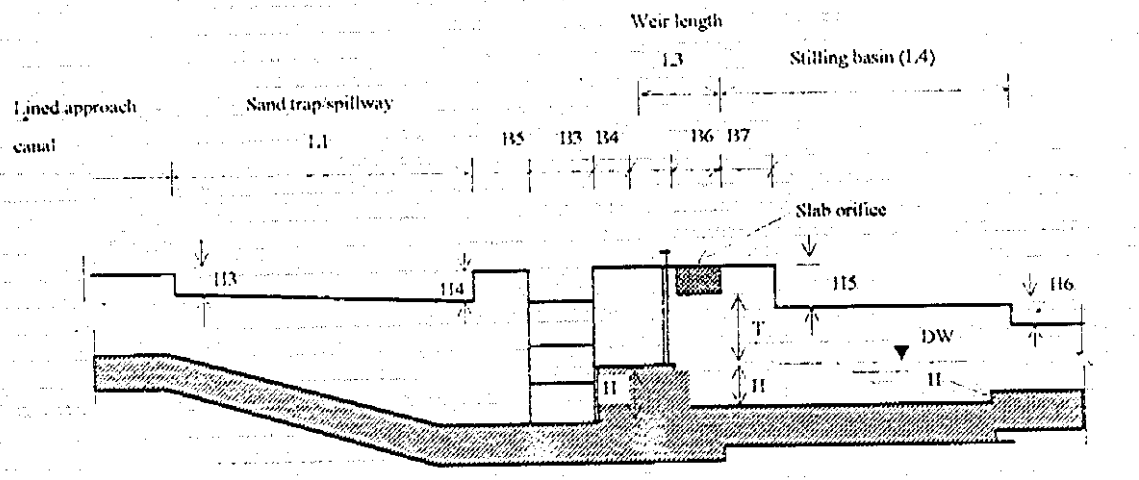


(9) Preliminary Design of New Intake Facilities for Phangyul Canal (2/3)

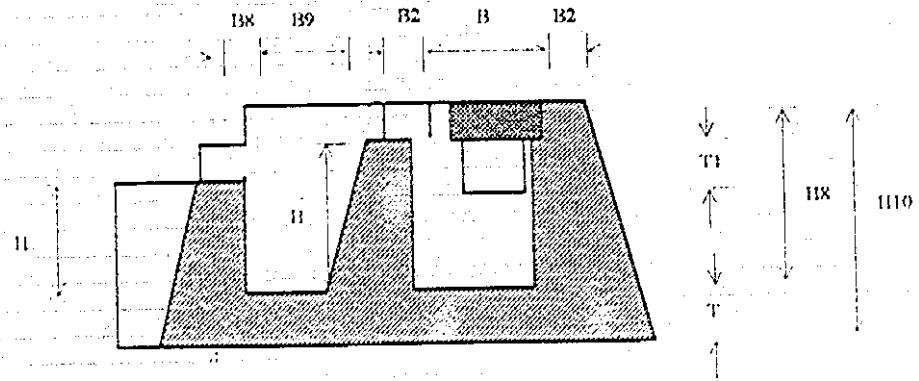


Plan of Structure

(9) Preliminary Design of New Intake Facilities for Phangyul Canal (3/3)



SECTION A-A



RRM 1:4

SECTION B-B

BQ of Intake Works for Water Source Improvement of Phangyul Canal

Design discharge, Q = <35 (l/s)

Dimensions	L1	L2	L3	L4	L	B	B1	B2	W	L5	B5	B3
	2.000	1.000	0.700	2.300	6.300	1.000	0.300	0.300	0.900	2.000	0.400	0.300
	B4	B6.	B7	B8	B9	W1	H	H1	H2	H3	H4	H5
	0.300	0.300	0.500	0.300	0.300	2.200	0.500	0.500	0.300	0.150	0.200	0.200
	H7	T1	H8	H9	T2	H10	B10	B11	W2	W3	T3	
	0.100	0.200	0.900	0.700	0.300	1.200	0.400	0.350	1.600	0.500	0.100	

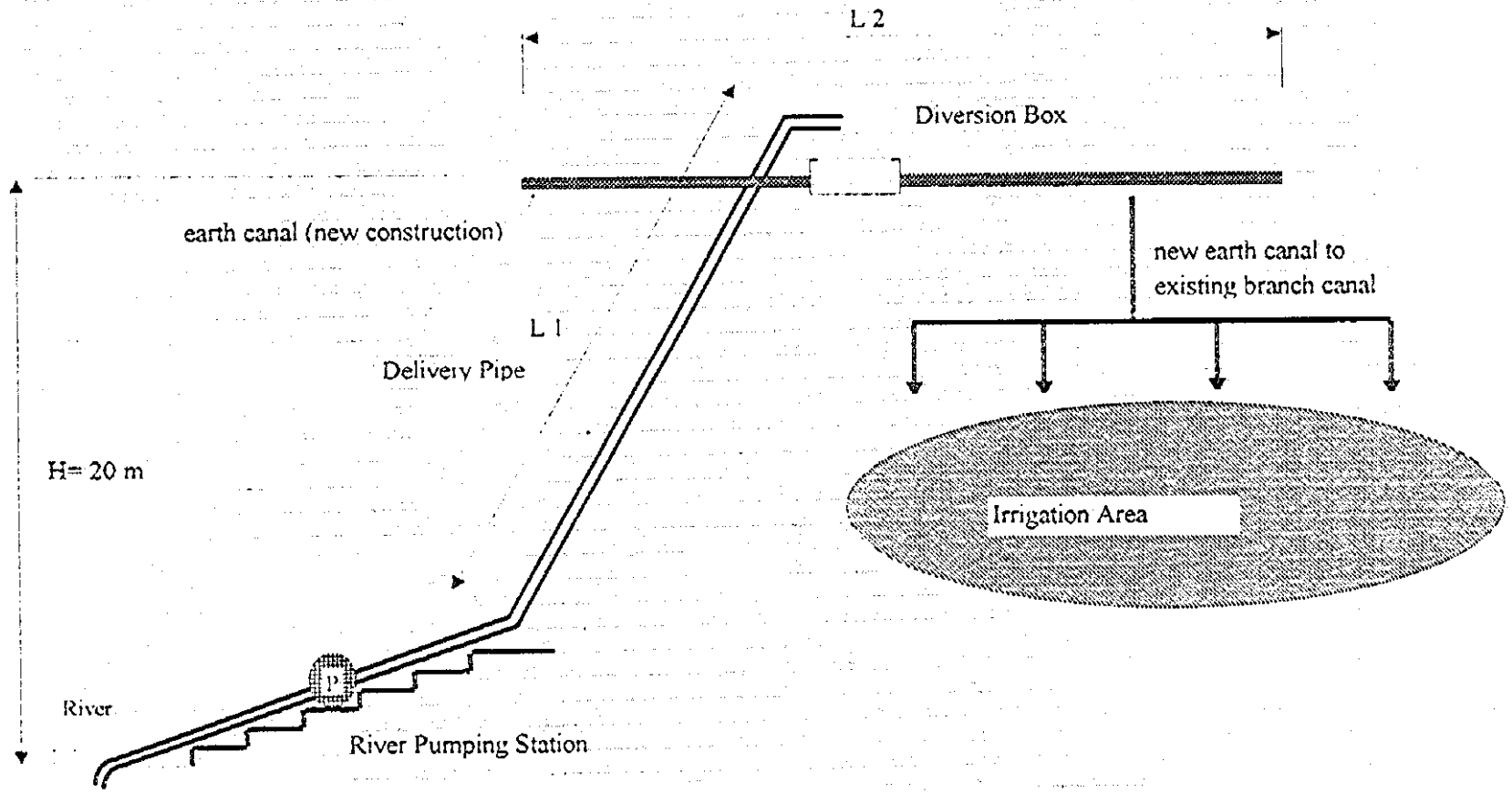
Item	Unit	Quantity	Equation
Excavation	m^3	7.920	W1*(L1+L2)*(H10)
	m^3	1.920	(B+B2*2)*L3*(H10)
	m^3	1.035	(B1+B2*2)*L4*(T1+T2)
	m^3	45	
Total	m^3	55.875	
RRM 1:4	m^3	0.600	B*(L1+L2)*T2
	m^3	0.180	B9*L1*T2
	m^3	0.207	B1*L4*T2
	m^3	1.260	B11*(L1+L2)*H10
	m^3	1.050	B11*(L1+L2)*(H9+T2)
	m^3	0.840	B11*(L1+L2)*(H+T2)
	m^3	0.560	W2*L3*H1
	m^3	3.120	(W2-B1)*(L3+B7)*(H9+T2)*2
	m^3	0.207	B1*L4*T2
	m^3	0.690	(B2*2)*L4*(T1+T2)
Total	m^3	8.714	
RCC 1:2:4	m^3	0.015	B6*W3*T3
Gabion	m^3	112.500	
Intake gate	pcs	1	

Cost Estimation of Intake Works

Description	Unit	Quanti	Unit Price	Amount	Remark
Excavation	m^3	55.88	30.61	1.710	
RRM 1:4	m^3	8.714	818.54	7.133	
RCC 1:2:4	m^3	0.015	1330.73	20	
Intake gate	pcs	1	6750.00	6.750	
Gabion	m^3	112.5	561.76	63.198	
Others	LS			15.762	
Transportatio	LS			11.822	
Total				106.395	

(10) Preliminary Design of River Pump System

Structure of River Pump System (1/3)

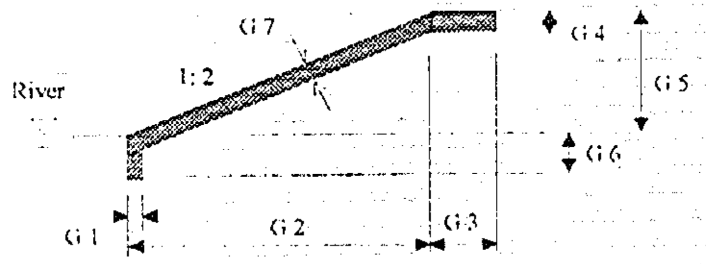


Length (m)	
L1	200
L2	400

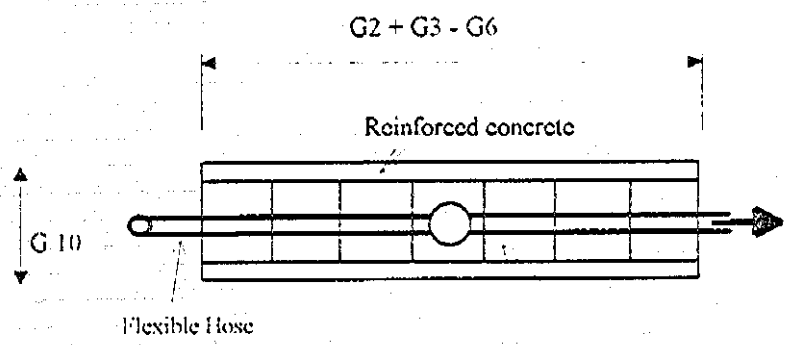
General Idea of River Pump System

(10) Preliminary Design of River Pump System

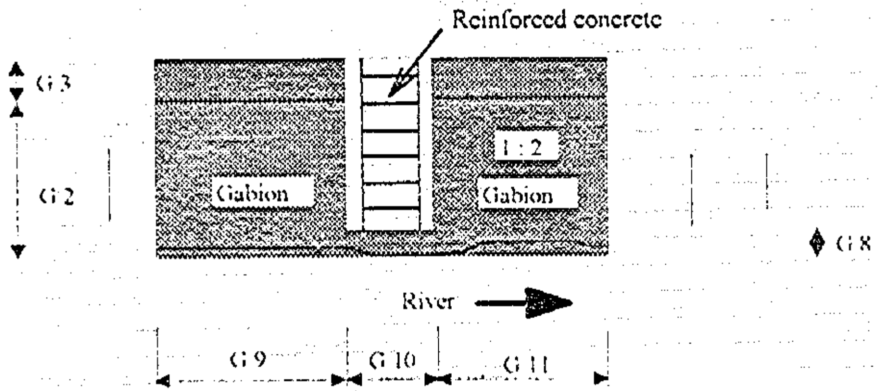
Structure of River Pump System (2/3)



Section of Gabion



Plan of pump setting place



Plan of Gabion work

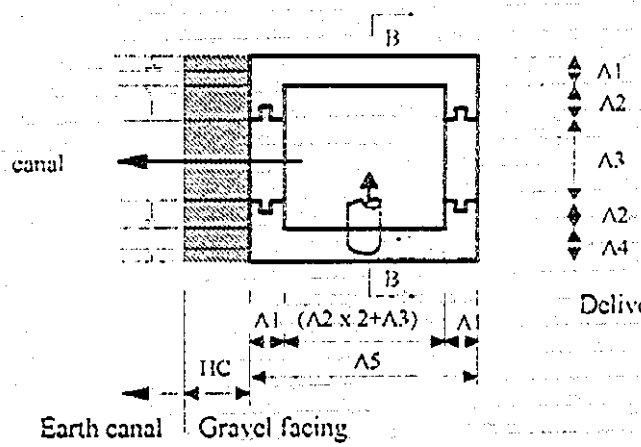
Dimensions of Gabion Works (m)										
G 1	G 2	G 3	G 4	G 5	G 6	G 7	G 8	G 9	G 10	G 11
0.4	10.0	2.0	0.4	5.0	1.0	0.4	1.6	10.0	2.4	10.0

(10) Preliminary Design of River Pump System

Structure of River Pump System (3/3)

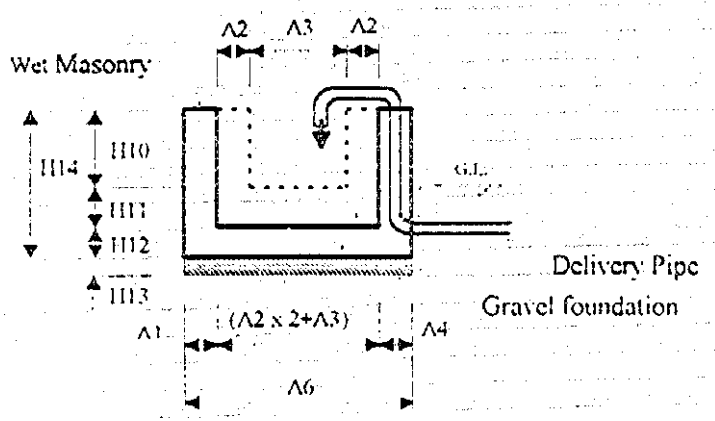
Diversion Box

Plan



Delivery Pipe

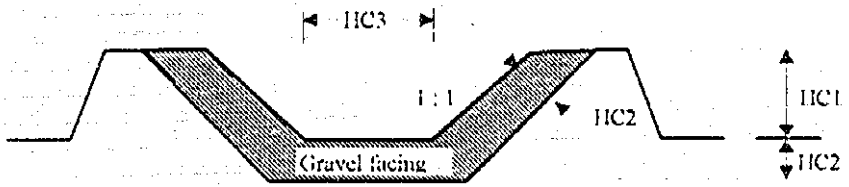
B -B section



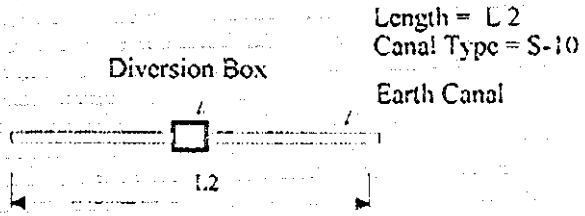
Delivery Pipe

Gravel foundation

Gravel Facing of Earth Canal at Diversion Box



Earth Canal Construction



Dimensions (m)

Diversion Box										
A1	A2	A3	A4	A5	A6	H10	H11	H12	H13	H14
0.30	0.30	0.40	0.40	1.60	1.70	0.50	0.30	0.20	0.10	1.00
Gravel Surfacing				Length of earth canal construction						
HC1	HC2	HC3	HC4	L 2	Canal type					
0.30	0.15	0.40	1.00	400	S-10					

BQ of River Pump System

Description		Unit	Quantity	Equations
Civil Works				
Excavation	(manual)	m3	116.5	G4*(G2-G3-G6)*(G9-G10-G11) (Pump station)
		m3	1.6	A5*A6*(H11-H12-H13) (Diversion Box)
	Total	m3	118.1	
Wet Masonry		m3	1.8	A5*A5*H13+A2*2-A3*A2*2-A3/3H1/-H11-2*A3*A3*H2/- (Diversion Box)
Gravel foundation		m3	2.5	0.1*G10*(G2-G3-G8) (Pump station)
		m3	0.3	A5*A6*H13 (Diversion Box)
	Total	m3	2.8	
Gravel Surfacing		m2	1.0	(HC1*2-HC3)*HC4 (Diversion Box)
Reinforced concrete	(1:2:4)	m3	10.0	0.4*G10*(G2-G3-G8)
	Total	m3	10.0	
Backfill	(manual)	m3	34.9	Volume of Excavation x 30% (Pump station)
Gabion		m3	106.5	(G2*G4-G3*G4-G1*G6)*(G9-G11)-(G4*G8-G1*G6)*G10
Delivery pipe works		m	200.0	L1
Earth canal construction		m	400.0	L2
Power supply facility	(for electric pump)			
Electric facility		unit	1.0	distribution line 100m, sub-station, miscellaneous works
Pumping facilities				
River Pump facility		set	1.0	Volute Pump with motor discharge 15 l sec. total head 20 m

Cost Estimation of River Pump System (1/3)

(1) River Pumping Station (electric pump)

Description	Unit	Quantity	Unit Price	Amount	Remarks
Civil Works					
Excavation (machine)	m3		116.40	0	
Excavation (manual)	m3	118.1	30.61	3.615	
Wet Masonry	m3	1.8	917.08	1.651	
Dry Masonry	m3		313.39	0	
Concrete pipe placing	m3		1.685.09	0	
Backfill (machine)	m3		81.50	0	
Backfill (manual)	m3	34.9	15.38	537	
Sand fill	m3		264.44	0	
Gravel surfacing	m2	1.0	367.96	368	
Gravel foundation	m3	2.5	206.60	516	
Earth canal construction	m	400.0	24.00	9.600	
Delivery pipe works	m	200.0	327.16	65.432	d= 100 mm
Reinforced concrete	m3	10.0	1.330.73	13.286	
Gabion	m3	106.5	561.76	59.825	
Others	L.S			30.966	20% of direct cost
Transportation	L.S			23.225	15% of direct cost
Temporary works for civil works	L.S	1.0		10.451	5% of civil work cost
Sub-total (Civil works & Temporary works)				219.472	for 20 years
(for 1 year)				(10.974)	for 1 year
Electric distribution facility					
Electric facility	unit	1.0	268.000	268.000	
Others	L.S			53.600	20% of direct cost
Transportation	L.S			40.200	15% of direct cost
Sub-total				361.800	for 20 years
(for 1 year)				(18.090)	for 1 year
Pumping facility					
Pump facility (electric)	set	1.0	429.000.00	429.000	
Others	L.S			85.800	20% of direct cost
Transportation	L.S			64.350	15% of direct cost
Sub-total				579.150	for 10 years
(for 1 year)				(57.915)	for 1 year
Total (construction cost)				1.160.422	

Cost Estimation of River Pump System (2/3)

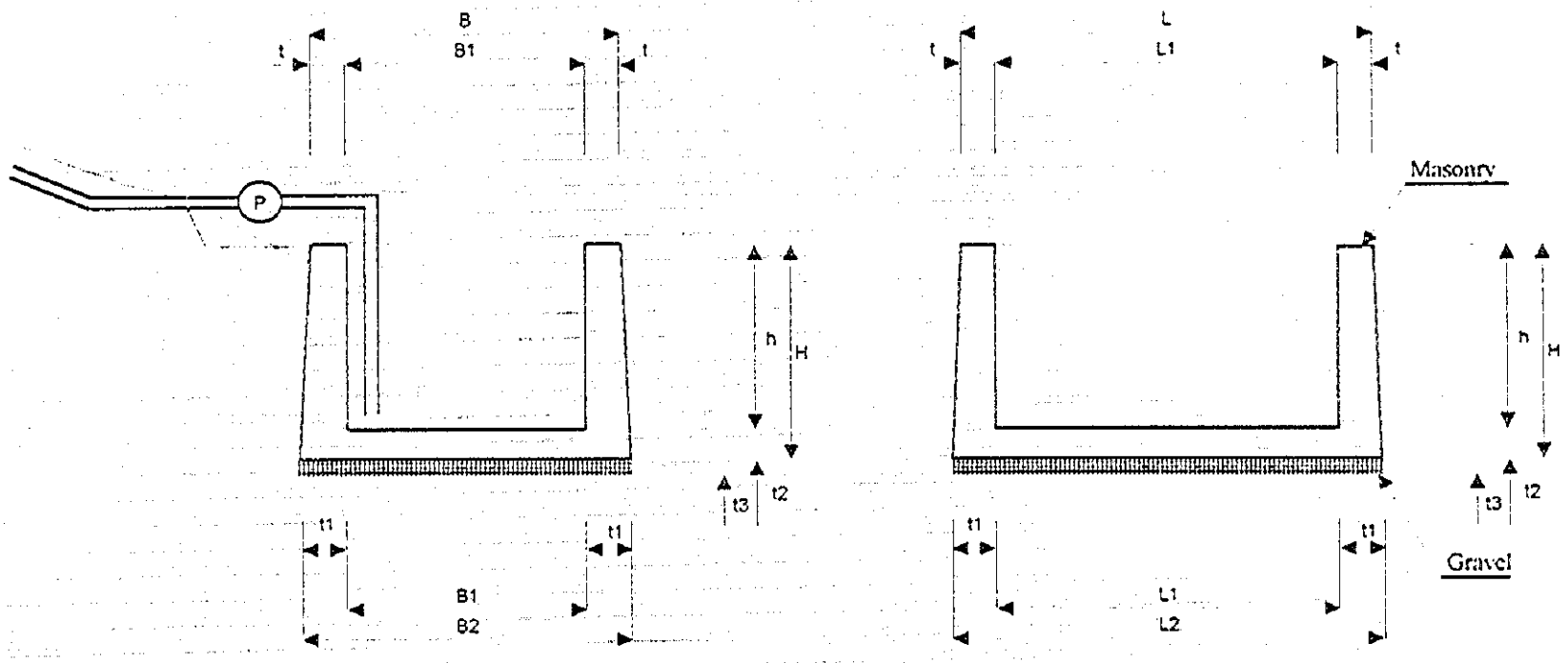
(2) River Pumping Station (diesel engine pump)

Description	Unit	Quantity	Unit Price	Amount	Remarks
Civil Works					
Excavation (machine)	m3		116.40	0	
Excavation (manual)	m3	118.1	30.61	3,615	
Wet Masonry	m3	1.8	917.08	1,651	
Dry Masonry	m3		313.39	0	
Concrete pipe placing	m3		1,685.09	0	
Backfill (machine)	m3		81.50	0	
Backfill (manual)	m3	34.9	15.38	537	
Sand fill	m3		264.44	0	
Gravel surfacing	m2	1.0	367.96	368	
Gravel foundation	m3	2.5	206.60	516	
Earth canal construction	m	400.0	24.00	9,600	
Delivery pipe works	m	200.0	327.16	65,432	d= 100 mm
Reinforced concrete	m3	10.0	1,330.73	13,286	
Gabion	m3	106.5	561.76	59,825	
Others	L.S			30,966	20% of direct cost
Transportation	L.S			23,225	15% of direct cost
Temporary works for civil work	L.S	1.0		10,451	5% of civil work cost
Sub-total (Civil works & Temporary works)				219,472	for 20 years
(for 1 year)				(10,974)	for 1 year
Pumping facility					
Pump facility (diesel)	set	1.0	299,000.00	299,000	
Others	L.S			59,800	20% of direct cost
Transportation	L.S			44,850	15% of direct cost
Sub-total				403,650	for 10 years
(for 1 year)				(40,365)	for 1 year
Total (construction cost)				623,122	

Cost Estimation of River Pump System (3/3)

Description	Unit	Quantity	Unit Price	Amount	Remarks
Annual O/M Cost for River Pump System with Electric Pump					
Electric charge (Q= 11 kWh x 24 hrs x 30 days)	kWh	7,920.0	0.5	3,960	for 1 month use year
Spare parts cost etc. (A= 5% x Pump price)		0.05	130,000	6,500	for 1 year pump
Technical support (1 person for a Sub-area)		1.0	1,200	1,200	for 1 year Sub-area
Annual O/M Cost for River Pump System with Diesel Generator Pump					
Diesel consumption (Q= 11 kWh x 24 hrs x 30 days x 0.3 liter/kWh)	liter	2,376	7.83	18,604	for 1 month use year
Spare parts cost etc. (A= 5% x Pump price)		0.05	130,000	6,500	for 1 year pump
Technical support (1 person for a Sub-area)		1.0	1,200	1,200	for 1 year Sub-area

Structure of Water Tank



Dimensions (m)

L	L1	L2	B	B1	B2	H	h	t	t1	t2	t3
4.60	4.00	4.80	3.60	3.00	3.80	2.30	2.00	0.30	0.40	0.30	0.15

BQ and Unit Cost of Water Tank

Bill of Quantities of Water Tank Works

Irrigation Tank for Pumping System Dimensions (m)											
L	L1	L2	B	B1	B2	H	h	t	t1	t2	t3
4.6	4.0	4.8	3.6	3.0	3.8	2.3	2.0	0.3	0.4	0.3	0.15
Item	Unit	Quantity	Equations								
Excavation	m^3	7.020	B*(H+t3)*3/4								
Backfill	m^3	3.280	(t1-t)*h*(L*2+B*2)								
Masonry	m^3	12.236	(t+t1)/2*H*(2*L+2*B1)								
	m^3	3.600	B1*L1*t2								
Total	m^3	15.836									
Gravel	m^3	2.736	L2*B2*t3								
Piping Work	m	200.000									
Diesel Engine Pump	unit	1.000	Q=15 l/s. lift=20m								

Cost Estimation of Water Tank Work for 1 Unit (unit : Nu.)

Description	Unit	Quantity	Unit Price	Amount	Remark
Excavation	m^3	7.0	30.61	215	
Backfill	m^3	3.3	34.56	113	
Masonry	m^3	15.8	917.08	14,523	
Gravel	m^3	2.7	206.60	565	
Piping Work	m	200.0	327.16	65,432	
Others	L.S			16,170	
Transportation	L.S			14,553	
Sub-total				111,571	for 20 years
(for 1 year)				5,579	
Diesel Engine Pump	L.S	1		299000	for 10 years
(for 1 year)				29,900	
O/M Cost				25,112	for 1 year
Total				60,591	for 1 year