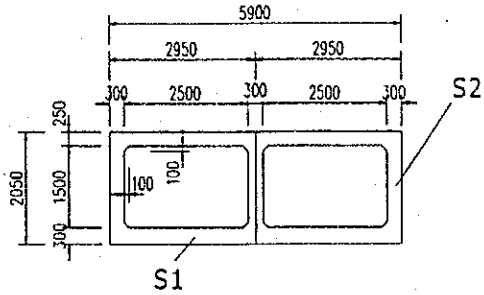
2.5. Box culvert at station 1+300

I	BOX CULVERT STATION 01+300		QUANTITIES
	L	= 13.340 + 13.340 + 0.02 = 26.700	
1	CULVERT		
+	CONCRETE (M3)		
	S1	= 2.950 x 2.050 - 2.500 x 1.500 + 2 x 0.100 x 0.100 =	2.318
	S	= S1 + S2 =	4.635
	VOLUME	= S x (13.340 + 13.340) + 5.900 x 0.200 x 0.300 x 2 =	124.36
		DOUBLE BOX CULVERT	
			
+	FORM		419.90
*	INSIDE FORM (M2)		291.649
	BOX BULWARK	= (1.500 + 2 x 0.100 x (1:SIN45^0 - 1)) x 26.680 x 4 =	168.921
	BOTTOM OF THE BOX	= (2.500 - 0.100 x 2) x 26.680 x 2 =	122.728
*	OUTSIDE FORM (M2)		128.253
	BOX BULWARK	= 2.050 x 2 x 26.680 + 4 x 0.300 x 0.200 =	109.628
	THE END OF CULVERT	= S x 2 + 5.900 x 0.200 x 4 =	13.990
	CENTER	= S =	4.635
+	SCAFFOLDING (M2)	= 2.050 x 2.000 x 26.680 + 4.000 x 0.300 x 0.200 =	109.63
+	SUPPORT		
	AREA (M2)	= 5.900 x 1.500 - S =	4.215
	VOLUME (M3)	= AREA x L =	112.54

BOXCULVERT STATION 1+300
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1 & 2

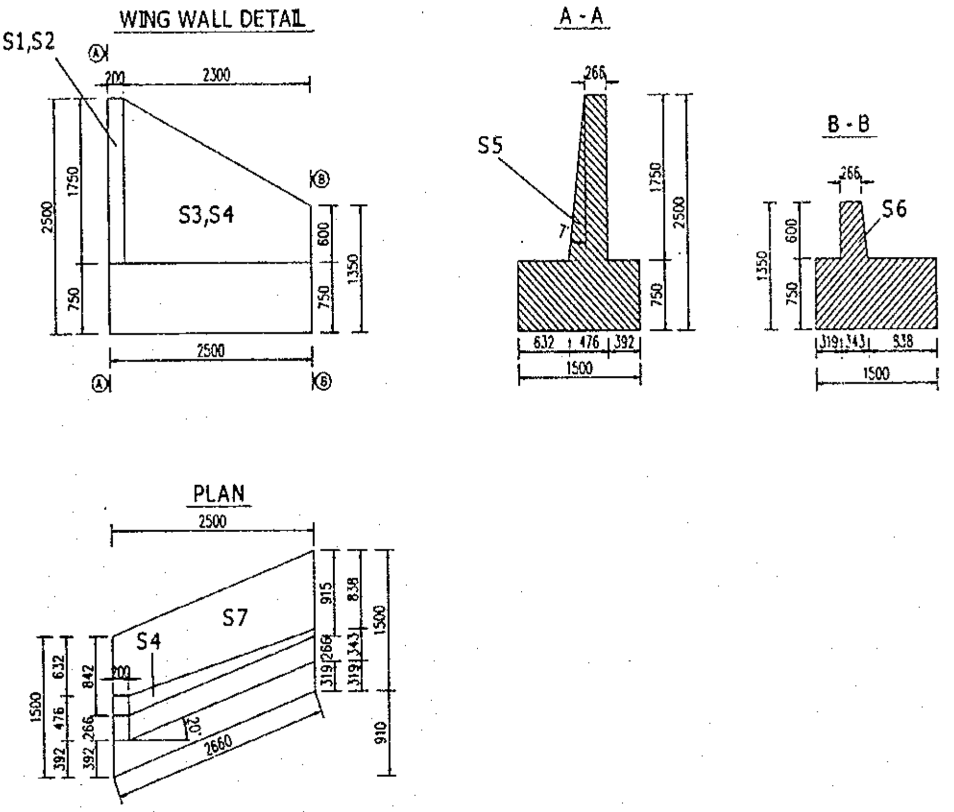
SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	3660	125	14	214	1.208	783.24	946.5
2	2350	250	12	108	0.888	253.80	225.3
3	6270	250	14	108	1.208	677.16	818.3
4	1500	250	14	212	1.208	318.00	384.3
5	1550	125	18	214	1.998	331.70	662.6
6	1970	250	12	216	0.888	425.52	377.8
7	2350	125	12	214	0.888	502.90	446.5
8	1049	250	12	216	0.888	226.58	201.2
9	1120	250	12	216	0.888	241.92	214.8
10	13845	250	12	52	0.888	719.94	639.2
11	13945	250	12	88	0.888	1227.16	1089.5
12	5780	250	12	2	0.888	11.56	10.3
13	1440	250	12	26	0.888	37.44	33.2
14	1180	250	12	320	0.888	377.79	335.4

REINFORCEMENT :	D<=14	5722.1	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	662.6	REINFORCEMENT (KG): 6384.7
REINFORCEMENT :	25<D=32	0.0	CONCRETE (M^3): 62.18

TOTAL FOR SEGMENT 1 & 2

REINFORCEMENT :	D<=14	11444.29	REINFORCEMENT (KG) : 12769.5
REINFORCEMENT :	16=D<=25	1325.195	
REINFORCEMENT :	25<D=32	0	CONCRETE (M^3) : 124.36

2 WINGWALL

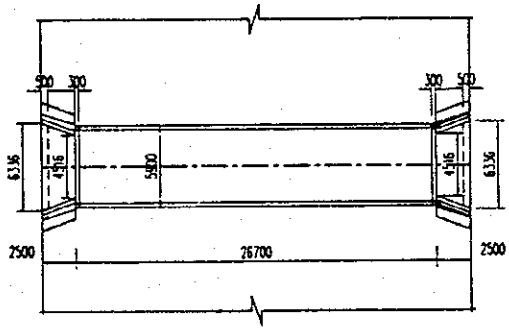


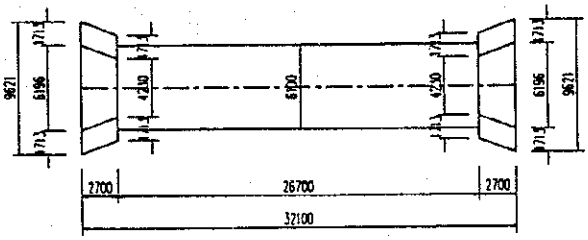
+	CONCRETE (M3)			
	S7	= (1.500 + 1.500) : 2 x 2.500	=	3.750
*	BASE OF THE WINGWALL	= S7 x 0.750	=	2.813
	S5	= (0.476 + 0.266) : 2 x 1.750	=	0.649
	S6	= (0.343 + 0.266) : 2 x 0.600	=	0.183
*	WINGWALL	= 2.500 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=	0.980
	SUM		=	<u>3.79</u>
+	FORM (M2)			<u>13.55</u>
*	BASE OF THE WINGWALL		=	6.240
	BASE OF THE WINGWALL	= (2.660 + 1.500 + 1.5 + 2.660) x 0.750	=	6.240
*	WINGWALL			7.305
	S1+S2	= 0.200 x 1.750 x 2	=	0.700
	S3	= (1.750 + 0.600) x 2.300 : (2 x $COS20^0$)	=	2.876
	S4	= 2.876 : $COS7^0$	=	2.898
	S5	= 0.649	=	0.649
	S6	= 0.183	=	0.183
+	SCAFFOLDING (M2)			<u>15.05</u>
*	BASE OF THE WINGWALL			8.490
	PERIMETER	= 2.660 + 1.000 + 1.500 + 1.000 + 1.500 + 1.000 + 2.66	=	11.320
	AREA	= PERIMETER x 0.750	=	8.490
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	=	6.558

BOX CULVERT STATION 1+300
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	2011	12	15	0.888	30.2	26.8
1b	2060	14	15	1.208	30.9	37.3
2a	2651	12	6	0.888	15.9	14.1
2b	1552	12	12	0.888	18.6	16.5
2c	582	12	15	0.888	8.7	7.8
3	3005	12	2	0.888	6.0	5.3
4	3378	12	16	0.888	54.0	48.0
5a	3824	12	11	0.888	42.1	37.3
5b	1867	12	4	0.888	7.5	6.6
5c	3248	20	11	2.466	35.7	88.1
5d	1291	20	4	2.466	5.2	12.7
6	2444	14	8	1.208	19.6	23.6
7	1814	12	4	0.888	7.3	6.4
8	1814	12	4	0.888	7.3	6.4
9	2554	12	4	0.888	10.2	9.1
10	1304	14	5	1.208	6.5	7.9
11	724	12	9	0.888	6.5	5.8
12	1791	12	1	0.888	1.8	1.6
REINFORCEMENT :		D=<14				260.7 KG
REINFORCEMENT :		14< D<=25				100.8 KG
TOTAL REINFORCEMENT :						361.5 KG

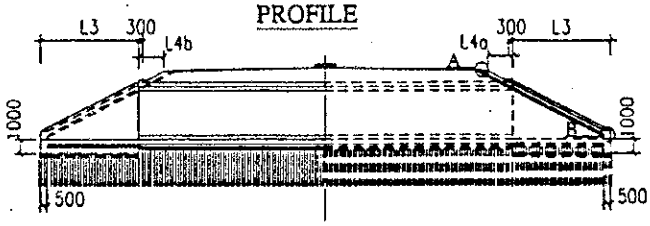
BOX CULVERT FOR DRAINAGE
(STATION 1+300)



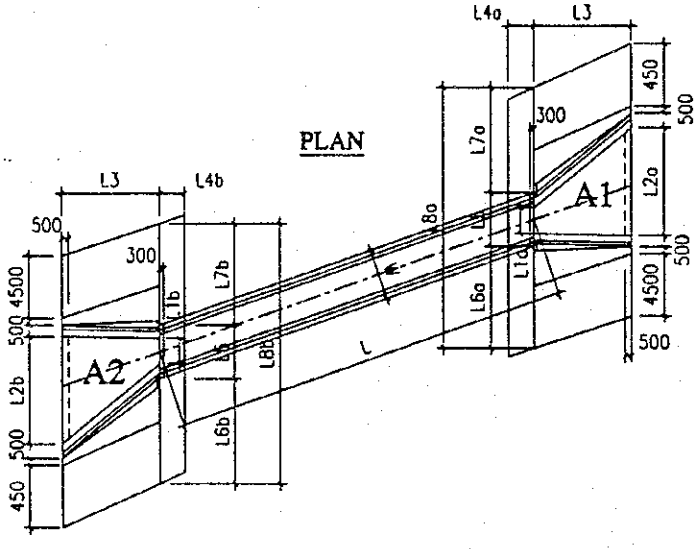


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

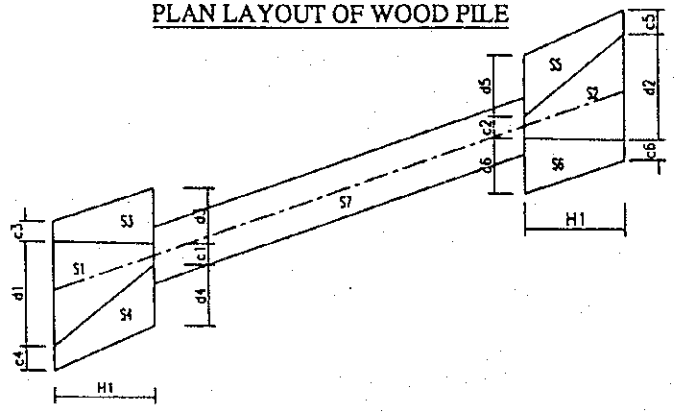
PROFILE



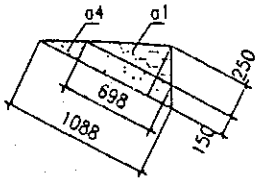
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

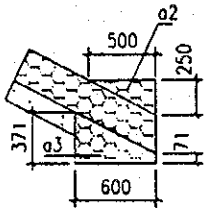


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM1+300

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	4.230	+	6.196	)	x	2.700	:	2	=	14.075	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	4.230	+	6.196	)	x	2.700	:	2	=	14.075	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S7=		(L	x	(W + 0.2)	=							
=		26.700	x	6.100	=		162.870		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	4.516	+	6.336	)	x	2.500	:	2	=	13.565	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	4.516	+	6.336	)	x	2.500	:	2	=	13.565	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45x 0.5	=	
=	(	13.565	+	13.565	)	x 0.3	+	(	6.336	+	6.336	) x 0.45 x 0.5	=	10.99 (m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	26.700	x	6.100	x	0.2	=	32.57	(m3)	

3. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	)	x	0.1	=			
=	(	14.075	+	14.0751	+	4.625	+	4.625	+	4.625	+	4.625	)	x	0.1	=	***4.67***	(m3)	

4. WOOD PILE:

**** L=5M***

W5=	(	S3	+	S4	+	S5	+	S6	+	S7	)	x 25 x 5 :100	=						
=	(	4.625	+	4.625	+	4.625	+	4.625	+	162.870	)	x 25 x 5 :100	=	***226.71***	(100m)				

**** L=3M***

W3=	(	S1	+	S2	+	0	)	x 25 x 3 : 100	=										
=	(	14.075	+	14.0751	+	0.000	)	x 25 x 3 : 100	=	***21.11***	(100m)								

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	S7	) x 0.15 =								
=	(	14.075	+	14.075	+	4.625	+	4.625	+	4.625	+	4.625	+	162.870	) x 0.15 =	***31.43***	(m3)						

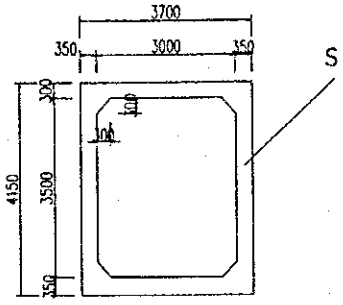
6.FORM

=	(L2a +	L2b)	)	X 0.75	x	2	=			
	(6.336 +	6.336	)	X 0.75	x	2	=	**19.008**	(m2)	

7.SCAFFOLDING

=	(L2a +	L2b)	)	X 0.75	x	2	=			
	(6.336 +	6.336	)	X 0.75	x	2	=	**19.008**	(m2)	

2.6. Box culvert at station 1+560

I	BOX CULVERT STATION 1+560		QUANTITIES
	L	= 13.410 + 13.410 + 0.02 = 26.84	
1	CULVERT		
+	CONCRETE (M3)		
	S	= 4.150 x 3.700 - 3.500 x 3.000 + 2 x 0.300 x 0.300 =	5.035
	VOLUME	= S x (13.410 + 13.410) + 3.700 x 0.200 x 0.300 x 2 =	135.48
		SINGLE BOX CULVERT	
			
+	FORM		506.35
*	INSIDE FORM (M2)		265.439
	BOX BULWARK	= (3.500 + 2 x 0.300 x (1:SIN45^0 - 1)) x 26.820 x 2 =	201.071
	BOTTOM OF THE BOX	= (3.000 - 0.300 x 2) x 26.820 x 1 =	64.368
*	OUTSIDE FORM (M2)		240.911
	BOX BULWARK	= 4.150 x 2 x 26.820 + 4 x 0.300 x 0.200 =	222.846
	THE END OF CULVERT	= S x 2 + 3.700 x 0.200 x 4 =	13.030
	CENTER	= S =	5.035
+	SCAFFOLDING (M2)	= 4.150 x 2.000 x 26.820 + 4.000 x 0.300 x 0.200 =	222.85
+	SUPPORT		
	AREA (M2)	= 4.150 x 3.700 - S =	10.320
	VOLUME (M3)	= AREA x L =	276.99

BOXCULVERT STATION 01+560
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1 & 2

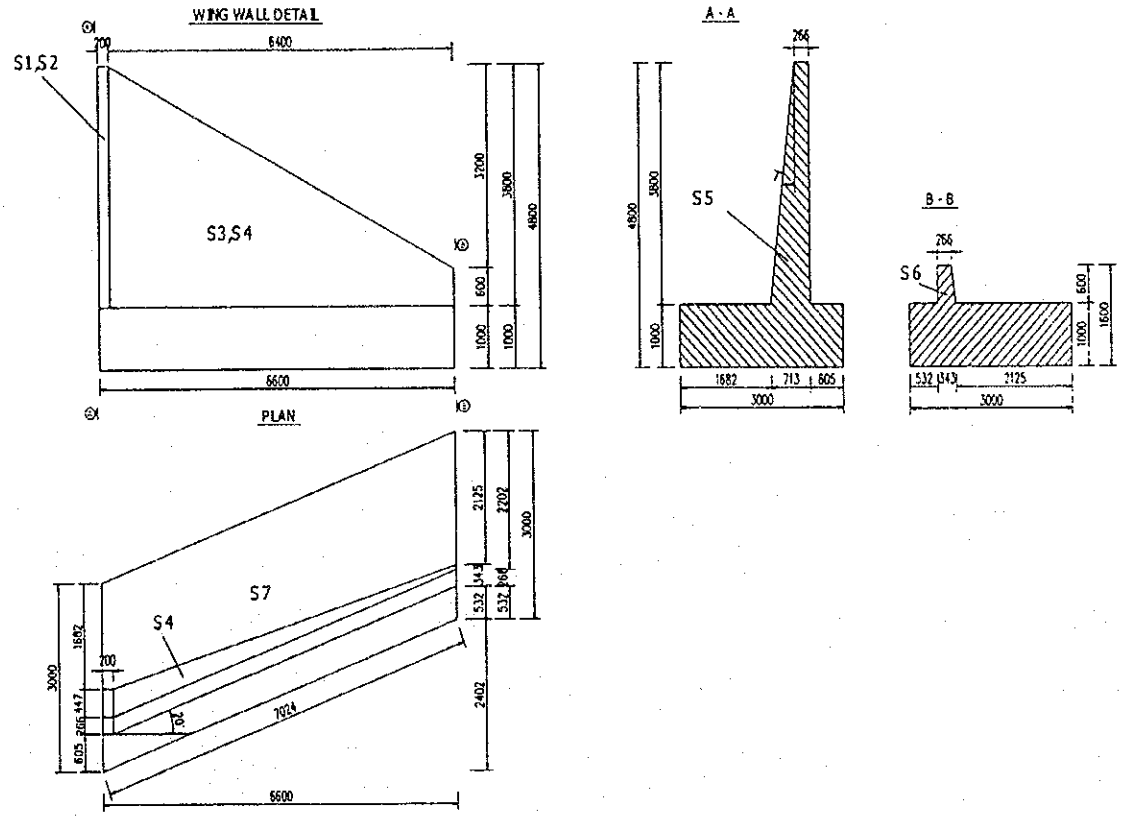
SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	6110	250	14	108	1.208	659.88	797.4
2	4030	250	12	106	0.888	427.18	379.3
3	4289	250	16	53	1.578	227.32	358.8
4	4070	250	14	108	1.208	439.56	531.2
5	2220	250	12	108	0.888	239.76	212.9
6	4401	250	18	53	1.998	233.25	465.9
7	4520	250	14	108	1.208	488.16	589.9
8	1474	250	12	108	0.888	159.15	141.3
9	1544	250	12	108	0.888	166.78	148.1
10	1540	250	12	16	0.888	24.64	21.9
11	3580	180	12	2	0.888	7.16	6.4
12	14015	250	12	32	0.888	448.48	398.2
13	14115	250	12	88	0.888	1242.12	1102.8
14	1280	250	12	161	0.888	206.08	183.0
15	1380	250	12	161	0.888	222.18	197.3

REINFORCEMENT :	D<=14	4709.3	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	824.7	REINFORCEMENT (KG): 5534.1
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 67.74

TOTAL FOR SEGMENT 1 & 2

REINFORCEMENT :	D<=14	9418.691	REINFORCEMENT (KG) : 11068.1
REINFORCEMENT :	16=D<=25	1649.448	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : 135.48

2 WINGWALL

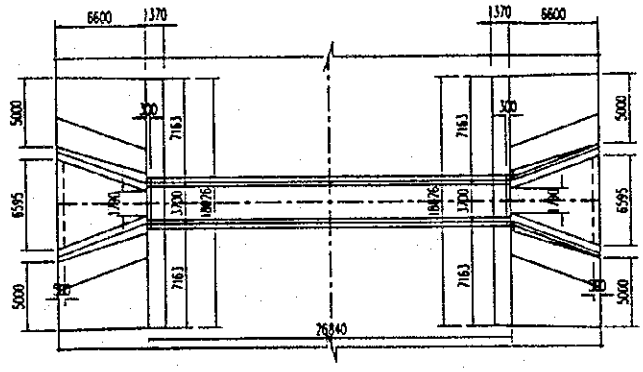


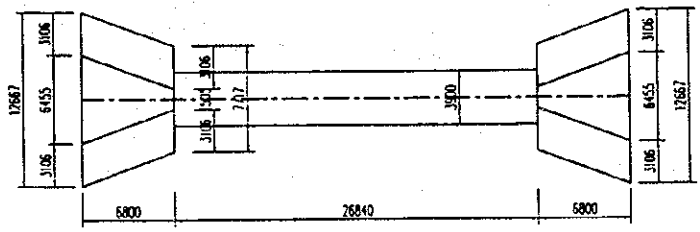
+	CONCRETE (M3)		
	S7	= (3.000 + 3.000) : 2 x 6.600	= 19.800
*	BASE OF THE WINGWALL	= S7 x 1.000	= 19.800
	S5	= (0.713 + 0.266) : 2 x 3.800	= 1.860
	S6	= (0.343 + 0.266) : 2 x 0.600	= 0.183
*	WINGWALL	= 6.600 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 5.777
	SUM		= 25.58
+	FORM (M2)		53.69
*	BASE OF THE WINGWALL		= 20.048
	BASE OF THE WINGWALL	= (7.024 + 3.000 + 3.000 + 7.024) x 1.000	= 20.048
*	WINGWALL		33.641
	S1+S2	= 0.200 x 3.800 x 2	= 1.520
	S3	= (3.800 + 0.600) x 6.400 : (2 x $COS20^0$)	= 14.983
	S4	= 14.983 : $COS7^0$	= 15.095
	S5	= 1.8601	= 1.860
	S6	= 0.183	= 0.183
+	SCAFFOLDING (M2)		53.82
*	BASE OF THE WINGWALL		23.048
	PERIMETER	= 7.024 + 1.000 + 3.000 + 1.000 + 3.000 + 1.000 + 7.024	= 23.048
	AREA	= PERIMETER x 1.000	= 23.048
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	= 30.771

BOX CULVERT STATION 1+560
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3283	12	36	0.888	118.2	104.9
1b	3375	16	36	1.578	121.5	191.8
2a	7100	12	6	0.888	42.6	37.8
2b	4013	12	32	0.888	128.4	114.0
2c	584	12	36	0.888	21.0	18.7
3	7952	12	2	0.888	15.9	14.1
4	7978	12	28	0.888	223.4	198.3
5a	4483	12	29	0.888	130.0	115.4
5b	3273	12	10	0.888	32.7	29.1
5c	3477	22	29	2.984	100.8	300.9
5d	2267	22	10	2.984	22.7	67.6
6	2454	14	48	1.208	117.8	142.3
7	3301	12	4	0.888	13.2	11.7
8	3301	12	6	0.888	19.8	17.6
9	6904	12	6	0.888	41.4	36.8
10	1304	14	13	1.208	17.0	20.5
11	820	12	19	0.888	15.6	13.8
12	3044	12	2	0.888	6.1	5.4
REINFORCEMENT :				D=<14	880.5 KG	
REINFORCEMENT :				14< D<=25	560.3 KG	
TOTAL REINFORCEMENT :					**1440.8** KG	

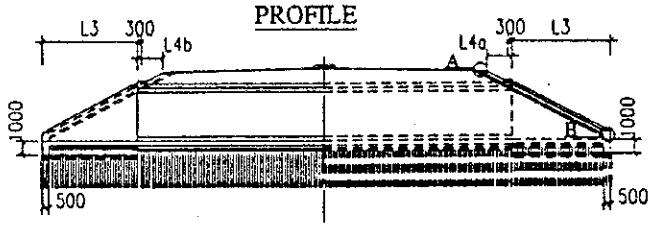
BOX CULVERT FOR DRAINAGE
(STATION 1+560)



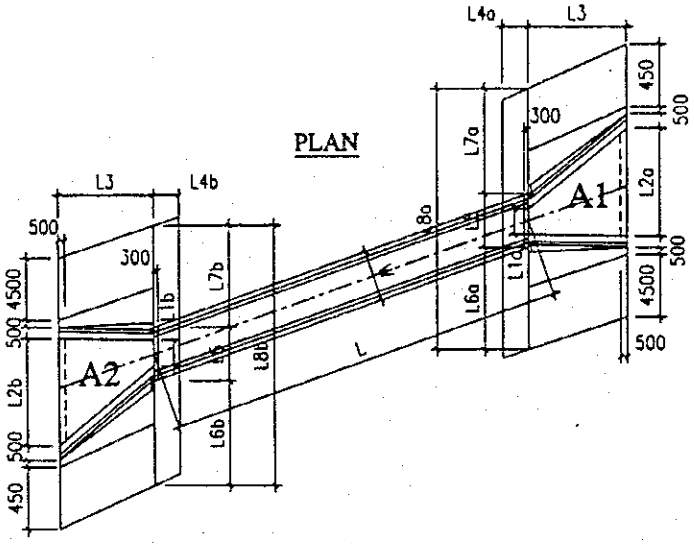


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

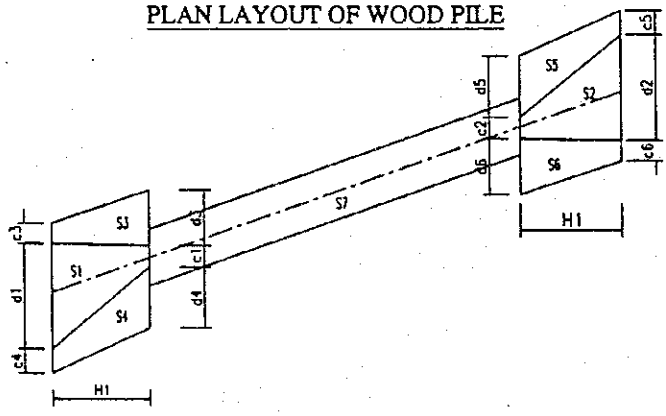
PROFILE



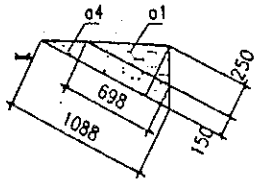
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

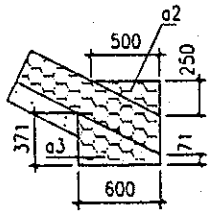


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM1+560

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	1.505	+	6.455	)	x	6.800	:	2	=	27.064	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	1.505	+	6.455	)	x	6.800	:	2	=	27.064	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	3.106	+	3.106	)	x	6.800	:	2	=	21.121	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	3.106	+	3.106	)	x	6.800	:	2	=	21.121	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	3.106	+	3.106	)	x	6.800	:	2	=	21.121	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	3.106	+	3.106	)	x	6.800	:	2	=	21.121	(m2)

S7=	L	x	(W + 0.2)	=			
=	26.840	x	3.900	=	104.676	(m2)	

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	1.790	+	6.595	)	x	6.600	:	2	=	27.671	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	1.790	+	6.595	)	x	6.600	:	2	=	27.671	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.7 x 0.5	=	
=	(	27.671	+	27.671	)	x 0.3	+	(	6.595	+	6.595	) x 0.7 x 0.5	=	**21.22** (m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	26.840	x	3.900	x	0.2	=	**20.94** (m3)

3. LEAN CONCRETE:

= (S1 + S2 + S3 + S4 + S5 + S6) x 0.1 =
= (27.064 + 27.064 + 21.121 + 21.121 + 21.121 + 21.121) x 0.1 = ***13.86*** (m3)

4. WOOD PILE:

** L=5M*

W5= (S3 + S4 + S5 + S6 + S7) x 25 x 5 :100 =
= (21.121 + 21.121 + 21.121 + 21.121 + 104.676) x 25 x 5 :100 = ***236.45*** (100m)

** L=3M*

W3= (S1 + S2 + (0.8 x 4.5 x 4)) x 25 x 3 : 100 =
= (27.064 + 27.064 + 14.400) x 25 x 3 : 100 = ***51.40*** (100m)

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

= (S1 + S2 + S3 + S4 + S5 + S6 + S7 + (0.8 x 4.5 x 4)) x 0.15 =
= (27.064 + 27.064 + 21.121 + 21.121 + 21.121 + 21.121 + 104.676 + (0.8 x 4.5 x 4)) x 0.15 = ***38.65*** (m3)

6. STONE MASONRY

a1= 0.695 x 0.25 x 0.5 = 0.087 (m2)
a2= 0.5 x 0.25 x 0.5 = 0.063 (m2)
a3= (0.071 + 0.371) x 0.5 x 0.6 = 0.133 (m2)
a4= (0.698 + 1.088) x 0.5 x 0.15 = 0.134 (m2)

b1= 0.300 x L5 = 0.300 x 3.700 = 1.110 (m2) (b1 IS AREA OF HEAD WALL)

b2a= (L6a + 5.000) x L3 x 0.5 =
= (7.163 + 5.000) x 6.600 x 0.5 = 40.1379 (m2)

b2b= (L6b + 5.000) x L3 x 0.5 =

= (7.163 + 5.000) x 6.600 x 0.5 = 40.1379 (m2)

b3a= (L7a + 5.000) x L3 x 0.5 =
= (7.163 + 5.000) x 6.600 x 0.5 = 40.1379 (m2)

b3b= (L7b + 5.000) x L3 x 0.5 =
= (7.163 + 5.000) x 6.600 x 0.5 = 40.1379 (m2)

b4a= L8a x L4a = 18.026 x 1.370 = 24.696 (m2)

b4b= L8b x L4b = 18.026 x 1.370 = 24.696 (m2)

b5= 0.6 x 5 x 2 = 6.000 (m2)

V1a= a1 x L8a = 0.087 x 18.026 = 1.566 (m3)

V1b= a1 x L8b = 0.087 x 18.026 = 1.566 (m3)

V2= (a2 + a3) x 5 x 4 = (0.063 + 0.133) x 5 x 4 = 3.902 (m3)

V3a= (b4a - b1 + b2a + b3a) x 0.25 : COS(26.56) =
= (24.696 - 1.110 + 40.1379 + 40.1379) x 0.25 : 0.894 = 29.044 (m3)

V3b= (b4b - b1 + b2b + b3b) x 0.25 : COS(26.56) =
= (24.696 - 1.110 + 40.1379 + 40.1379) x 0.25 : 0.894 = 29.044 (m3)

TOTAL = (V1a + V1b + V2 + V3a + V3b) =
(1.566 + 1.566 + 3.902 + 29.044 + 29.044) = 65.122 (m3)

7. BASE BEDDING:

V4a=		a4	x	L8a			=	0.134	x	18.026			=	2.415	(m3)			
V4b=		a4	x	L8b			=	0.134	x	18.026			=	2.415	(m3)			
V5a=	(	b4a	-	b1	+	b2a	+	b3a	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	24.696	-	1.110	+	40.1379	+	40.1379	-	6.000	)	x	0.15	:	0.894	=	16.420	(m3)
V5b=	(	b4b	-	b1	+	b2b	+	b3b	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	24.696	-	1.110	+	40.1379	+	40.1379	-	6.000	)	x	0.15	:	0.894	=	16.420	(m3)
TOTAL =			(	V4a	+	V4b	+	V5a	+	V5b	)=							
			(	2.415	+	2.415	+	16.420	+	16.420	)=	37.67		:	(m3)			

8. FORM :

=	(L2a	+	L2b)	X 1	x	2	=		
	(6.595	+	6.595	X 1	x	2	=	26.38	(m2)

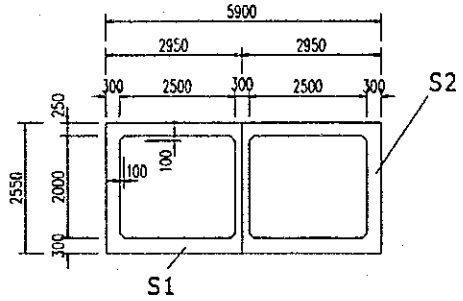
9. SCAFFOLDING :

=	(L2a	+	L2b)	X 1	x	2	=		
	(6.595	+	6.595	X 1	x	2	=	26.38	(m2)

2.7. Box culvert at station 2+150

I	BOX CULVERT STATION 02+150															QUANTITIES
	L	=	13.340	+	13.340	+	0.02	=	26.700							
1	CULVERT															
+	CONCRETE (M3)															
	S1=S2	=	2.950	x	2.550	-	2.500	x	2.000	+	2	x	0.100	x	0.100	= 2.543
	S	=	S1	+	S2											= 5.085
	VOLUME	=	S	x	(13.340	+	13.340)	+	5.900	x	0.200	x	0.300	x	2	= 136.38

DOUBLE BOX CULVERT



+	FORM															503.96
*	INSIDE FORM (M2)															347.677
	BOX BULWARK	=	(2.000	+	2	x	0.100	x	(1:SIN45^0	-	1))	x	26.680	x	4	= 222.281
	BOTTOM OF THE BOX	=	(2.950	-	0.300	x	2)	x	26.680	x	2					= 125.396
*	OUTSIDE FORM (M2)															156.283
	BOX BULWARK	=	2.550	x	2	x	26.680	+	4	x	0.300	x	0.200			= 136.308
	THE END OF CULVERT	=	S	x	2	+	5.900	x	0.200	x	4					= 14.890
	CENTER	=	S													= 5.085
+	SCAFFOLDING (M2)	=	2.550	x	2.000	x	26.680	+	4.000	x	0.300	x	0.200			= 136.31
+	SUPPORT															
	AREA (M2)	=	5.900	x	2.000	-	S									= 6.715
	VOLUME (M3)	=	AREA	x	L											= 179.29

BOXCULVERT STATION 2+150
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1 & 2

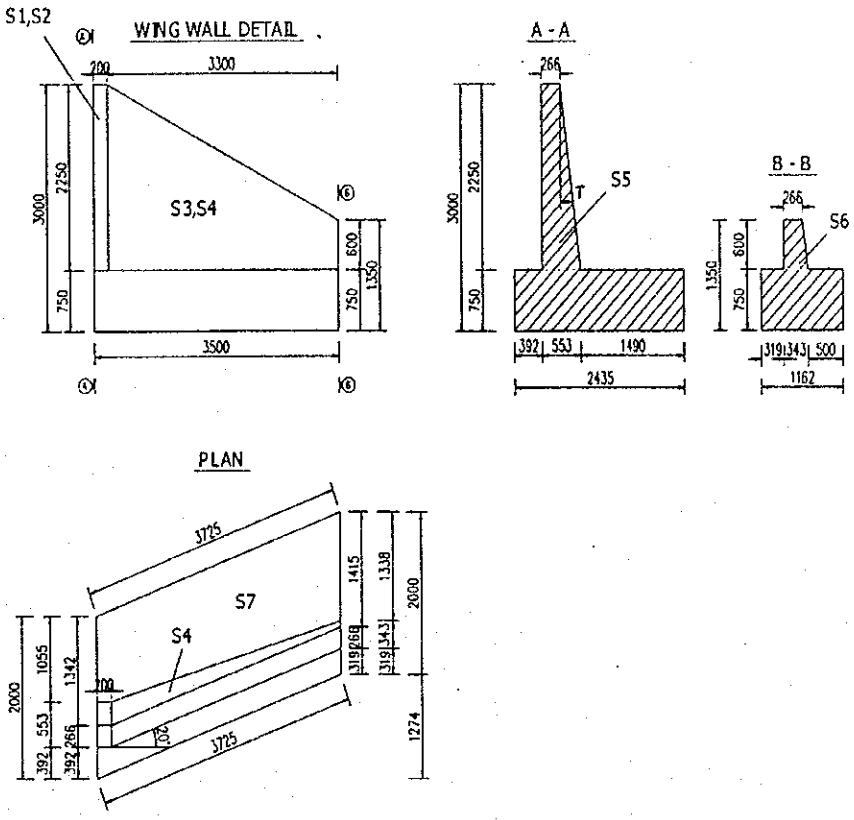
SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	4160	125	14	214	1.208	890.24	1075.8
2	2850	250	12	108	0.888	307.80	273.3
3	6270	250	14	108	1.208	677.16	818.3
4	1500	250	14	212	1.208	318.00	384.3
5	1550	125	18	214	1.998	331.70	662.6
6	1970	250	12	216	0.888	425.52	377.8
7	2850	125	12	214	0.888	609.90	541.5
8	1049	250	12	216	0.888	226.58	201.2
9	1120	250	12	216	0.888	241.92	214.8
10	13845	250	12	52	0.888	719.94	639.2
11	13945	250	12	100	0.888	1394.50	1238.1
12	5780	250	12	2	0.888	11.56	10.3
13	1440	250	12	26	0.888	37.44	33.2
14	1180	250	12	320	0.888	377.79	335.4
15	1280	250	12	320	0.888	409.80	363.8

REINFORCEMENT :	D<=14	**6506.8**	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	**662.6**	REINFORCEMENT (KG): **7169.4**
REINFORCEMENT :	25<D=32		CONCRETE (M^3): **68.19**

TOTAL FOR SEGMENT 1 & 2

REINFORCEMENT :	D<=14	**13013.56**	REINFORCEMENT (KG) : **14338.8**
REINFORCEMENT :	16=D<=25	**1325.195**	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : **136.38**

2 WINGWALL

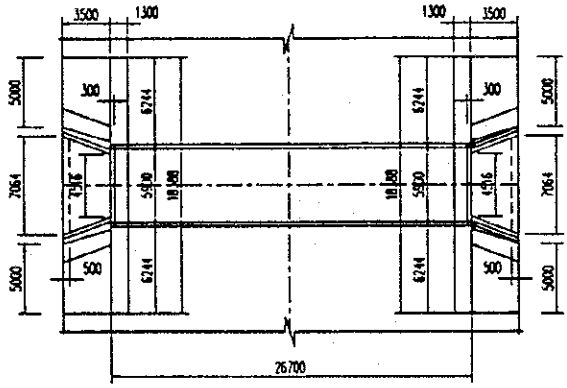


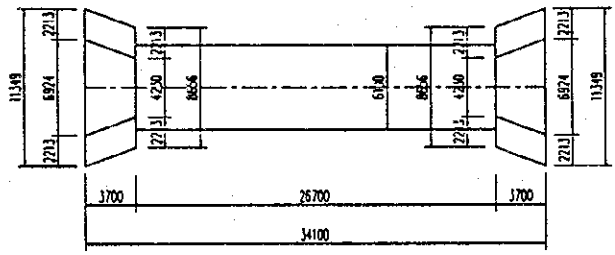
+	CONCRETE (M3)			
	S7	= (2.000 + 2.000) : 2 x 3.500	=	7.000
*	BASE OF A WINGWALL	= S7 x 0.750	=	5.250
	S5	= (0.553 + 0.266) : 2 x 2.250	=	0.921
	S6	= (0.343 + 0.266) : 2 x 0.600	=	0.183
*	WINGWALL	= 3.500 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=	1.767
	SUM		=	7.02
+	FORM (M2)			22.14
*	BASE OF A WINGWALL		=	10.088
	BASE OF A WINGWALL	= (3.000 + 3.725 + 3.725 + 3.000) x 0.750	=	10.088
*	WINGWALL			12.050
	S1+S2	= 0.200 x 2.250 x 2	=	0.900
	S3	= (2.250 + 0.600) x 3.300 : (2 x $COS20^{0}$)	=	5.004
	S4	= 5.004 : $COS7^{0}$	=	5.042
	S5	= 0.921	=	0.921
	S6	= 0.183	=	0.183
+	SCAFFOLDING (M2)			23.15
*	BASE OF WINGWALL			12.338
	PERIMETER	= 3.000 + 1.000 + 3.725 + 1.000 + 3.725 + 1.000 + 3.000	=	16.450
	AREA	= PERIMETER x 0.750	=	12.338
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	=	10.814

BOX CULVERT STATION 2+150
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	2258	12	20	0.888	45.2	40.1
1b	2310	14	20	1.208	46.2	55.8
2a	3723	12	6	0.888	22.3	19.8
2b	2100	12	16	0.888	33.6	29.8
2c	582	12	20	0.888	11.6	10.3
3	4254	12	2	0.888	8.5	7.6
4	4429	12	20	0.888	88.6	78.6
5a	3043	12	15	0.888	45.6	40.5
5b	2150	12	6	0.888	12.9	11.5
5c	2467	20	15	2.466	37.0	91.3
5d	1574	20	6	2.466	9.4	23.3
6	2444	14	16	1.208	39.1	47.3
7	2301	12	4	0.888	9.2	8.2
8	2301	12	4	0.888	9.2	8.2
9	3605	12	4	0.888	14.4	12.8
10	1304	14	8	1.208	10.4	12.6
11	744	12	11	0.888	8.2	7.3
12	2143	12	1	0.888	2.1	1.9
REINFORCEMENT :				D<=14		**392.2** KG
REINFORCEMENT :				14< D<=25		**114.6** KG
TOTAL REINFORCEMENT :						**506.8** KG

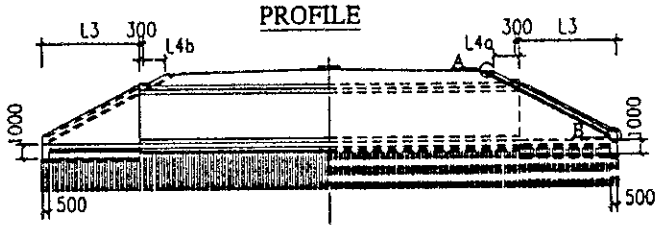
BOX CULVERT FOR DRAINAGE
(STATION 2+150)



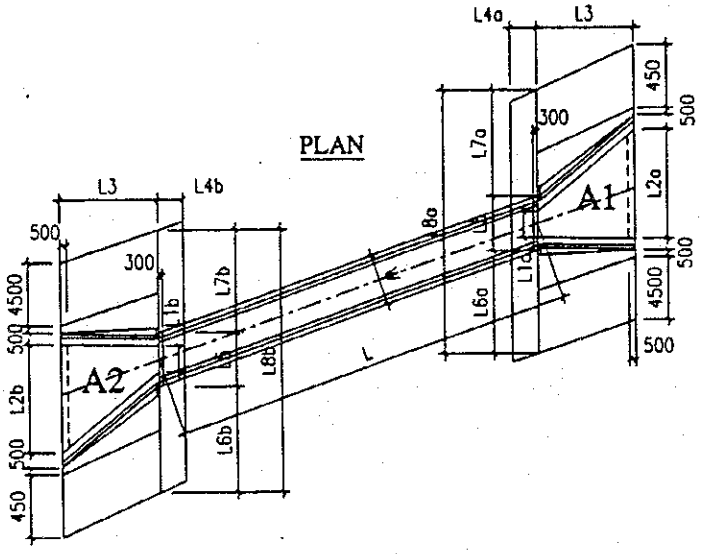


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

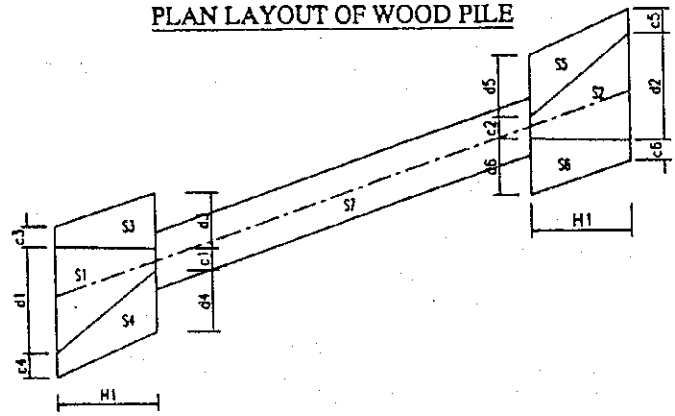
PROFILE



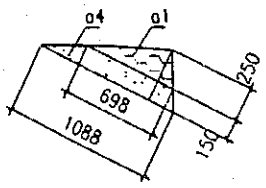
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

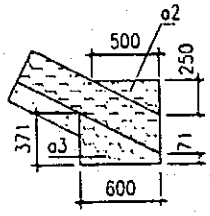


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM2+150

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	4.230	+	6.924	)	x	3.700	:	2	=	20.635	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	4.230	+	6.924	)	x	3.700	:	2	=	20.635	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	2.213	+	2.213	)	x	3.700	:	2	=	8.188	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	2.106	+	2.213	)	x	3.700	:	2	=	7.990	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	2.213	+	2.213	)	x	3.700	:	2	=	8.188	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	2.213	+	2.213	)	x	3.700	:	2	=	8.188	(m2)
S7=		L	x	(W + 0.2)	=							
=		26.700	x	6.100	=		162.870		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	4.516	+	7.064	)	x	3.500	:	2	=	20.265	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	4.516	+	7.064	)	x	3.500	:	2	=	20.265	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45 x 0.5	=		
=	(	20.265	+	20.265	)	x 0.3	+	(	7.064	+	7.064	) x 0.45 x 0.5	=	15.34	(m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	26.700	x	6.100	x	0.2	=	32.57 (m3)

3. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	)	x	0.1	=			
=	(	20.635	+	20.6349	+	8.188	+	7.990	+	8.188	+	8.188	)	x	0.1	=	7.38	(m3)	

4. WOOD PILE:

** L=5M*

W5=	(	S3	+	S4	+	S5	+	S6	+	S7	)	x 25 x 5 :100	=						
=	(	8.188	+	7.990	+	8.188	+	8.188	+	162.870	)	x 25 x 5 :100	=	244.28	(100m)				

** L=3M*

W3=	(	S1	+	S2	+	(0.8 x 4.5 x 4)	)	x 25 x 3 : 100	=										
=	(	20.635	+	20.6349	+	14.400	)	x 25 x 3 : 100	=	41.75	(100m)								

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	S7	+	(0.8 x 4.5 x 4)	) x 0.15 =								
=	(	20.635	+	20.635	+	8.188	+	7.990	+	8.188	+	8.188	+	162.870	+	(0.8 x 4.5 x 4)	) x 0.15 =	37.66	(m3)						

6. STONE MASONRY

a1=		0.695	x	0.25	x		0.5	=		0.087	(m2)														
a2=		0.5	x	0.25	x		0.5	=		0.063	(m2)														
a3=	(	0.071	+	0.371	)	x	0.5	x	0.6	=	0.133	(m2)													
a4=	(	0.698	+	1.088	)	x	0.5	x	0.15	=	0.134	(m2)													

b1=		0.300	x	L5	=	0.300	x		5.900	=		1.770	(m2)	(b1 IS AREA OF HEAD WALL)											

b2a=	(	L6a	+	5.000	)	x	L3	x 0.5	=																
=	(	6.244	+	5.000	)	x	3.500	x 0.5	=	19.677	(m2)														

b2b= (L6b + 5.000) x L3 x 0.5 =
= (6.244 + 5.000) x 3.500 x 0.5 = 19.677 (m2)

b3a= (L7a + 5.000) x L3 x 0.5 =
= (6.244 + 5.000) x 3.500 x 0.5 = 19.677 (m2)

b3b= (L7b + 5.000) x L3 x 0.5 =
= (6.244 + 5.000) x 3.500 x 0.5 = 19.677 (m2)

b4a= L8a x L4a = 18.388 x 1.300 = 23.904 (m2)

b4b= L8b x L4b = 18.388 x 1.300 = 23.904 (m2)

b5= 0.6 x 5 x 2 = 6.000 (m2)

V1a= a1 x L8a = 0.087 x 18.388 = 1.597 (m3)

V1b= a1 x L8b = 0.087 x 18.388 = 1.597 (m3)

V2= (a2 + a3) x 5 x 4 = (0.063 + 0.133) x 5 x 4 = 3.902 (m3)

V3a= (b4a - b1 + b2a + b3a) x 0.25 : COS(26.56) =
= (23.904 - 1.770 + 19.677 + 19.677) x 0.25 : 0.894 = 17.195 (m3)

V3b= (b4b - b1 + b2b + b3b) x 0.25 : COS(26.56) =
= (23.904 - 1.770 + 19.677 + 19.677) x 0.25 : 0.894 = 17.195 (m3)

TOTAL = (V1a + V1b + V2 + V3a + V3b) =
(1.597 + 1.597 + 3.902 + 17.195 + 17.195) = ***41.486*** (m3)

7. BASE BEDDING:

V4a=	a4	x	L8a			=	0.134	x	18.388			=	2.463	(m3)				
V4b=	a4	x	L8b			=	0.134	x	18.388			=	2.463	(m3)				
V5a=	(	b4a	-	b1	+	b2a	+	b3a	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	23.904	-	1.770	+	19.677	+	19.677	-	6.000	)	x	0.15	:	0.894	=	9.310	(m3)
V5b=	(	b4b	-	b1	+	b2b	+	b3b	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	23.904	-	1.770	+	19.677	+	19.677	-	6.000	)	x	0.15	:	0.894	=	9.310	(m3)
TOTAL =		(	V4a	+	V4b	+	V5a	+	V5b	)=								
		(	2.463	+	2.463	+	9.310	+	9.310	)=	23.55		(m3)					

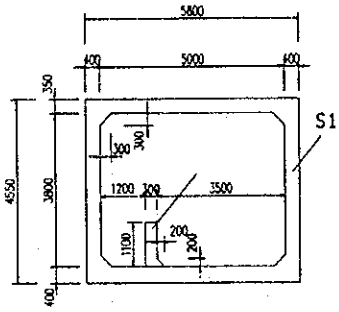
8. FORM :

=	(L2a	+	L2b)	)	X 0.75	x	2	=
	(7.064	+	7.064	)	X 0.75	x	2	= 21.192 (m2)

9. SCAFFOLDING :

=	(L2a	+	L2b)	)	X 0.75	x	2	=
	(7.064	+	7.064	)	X 0.75	x	2	= 21.192 (m2)

2.8. Box culvert at station 2+620

I	BOX CULVERT STATION 02+620		QUANTITIES
	L	= 14.841 + 14.844 + 0.02 = 29.707	
1	CULVERT		
+	CONCRETE (M3)		
	S1	= 5.800 x 4.550 - 5.000 x 3.800 + 2 x 0.300 x 0.300 =	7.570
	S2	= 1.100 x 0.300 + 0.200 x 0.200 : 2 =	0.350
	S	= S1 + S2 =	7.920
	VOLUME	= S x (14.841 + 84.844) + 5.800 x 0.200 x 0.300 x 2 =	235.82
		SINGLE BOX CULVERT 	
+	FORM		706.72
*	INSIDE FORM (M2)		406.135
	BOX BULWARK	= (3.800 + 2 x 0.300 x (1:SIN45^0 - 1)) x 29.687 x 2 =	240.397
	BOTTOM OF THE BOX	= (5.000 - 0.300 x 2) x 29.687 x 1 =	130.623
	RETAINING WALL	= (1.100 + (1:SIN45^0 - 1) x 0.200) x 29.69 =	35.115
*	OUTSIDE FORM (M2)		300.580
	BOX BULWARK	= 4.550 x 2 x 29.687 + 4 x 0.300 x 0.200 =	270.392
	THE END OF BOX	= S x 2 : SIN64^0 + 5.800 x 0.200 x 4 =	22.268
	CENTER	= S =	7.920
+	SCAFFOLDING (M2)	= 4.550 x 2.000 x 29.687 + 4.000 x 0.300 x 0.200 =	270.39
+	SUPPORT		
	AREA (M2)	= 5.800 x 4.550 - S =	18.470
	VOLUME (M3)	= AREA x L =	548.69

BOXCULVERT STATION 2+620
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1 & 2

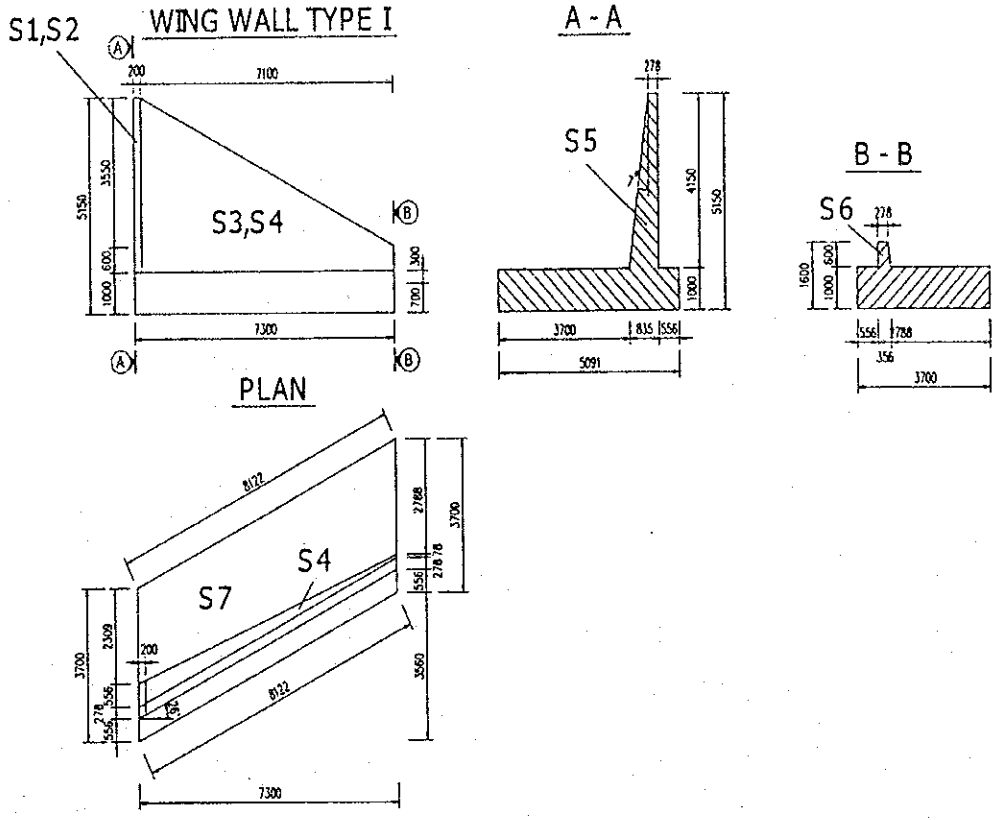
SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1a	7570	250	20	108	2.466	817.56	2016.2
1b	7926	250	20	12	2.466	95.11	234.6
2	4410	250	20	106	2.466	467.46	1152.8
3a	6604	250	22	53	2.984	350.01	1044.4
3b	7194	250	22	11	2.984	79.13	236.1
4a	6360	250	20	108	2.466	686.88	1693.9
4b	6997	250	20	12	2.466	83.96	207.1
5a	3220	250	12	108	0.888	347.76	308.7
5b	3583	250	12	24	0.888	85.99	76.3
6a	6575	250	20	53	2.466	348.50	859.4
6b	7155	250	20	11	2.466	78.71	194.1
7	5004	250	17	120	1.782	600.48	1069.9
8a	1567	250	12	108	0.888	169.23	150.2
8b	1696	250	12	12	0.888	20.35	18.1
9a	1638	250	12	108	0.888	176.87	157.0
9b	1775	250	12	12	0.888	21.30	18.9
10	1560	250	12	24	0.888	37.44	33.2
11	6297	250	12	2	0.888	12.59	11.2
12	3300	250	12	58	0.888	191.40	169.9
13	1355	250	12	58	0.888	78.58	69.8
14	15489	250	12	48	0.888	743.45	660.0
15	14255	250	12	30	0.888	427.64	379.7
16	16923	250	12	30	0.888	507.68	450.7
17	14828	250	12	8	0.888	118.62	105.3
18	15589	250	12	48	0.888	748.25	664.3
19	1410	250	14	237	1.208	334.17	403.8
20	1440	250	12	237	0.888	341.28	303.0

REINFORCEMENT :	D<=14	3980.3	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	8708.7	REINFORCEMENT (KG): 12689.0
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 117.91

TOTAL FOR SEGMENT 1 & 2

REINFORCEMENT :	D<=14	7960.59	REINFORCEMENT (KG) : 25378.0
REINFORCEMENT :	16=D<=25	17417.37	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : 235.82

2 WINGWALL TYPE I

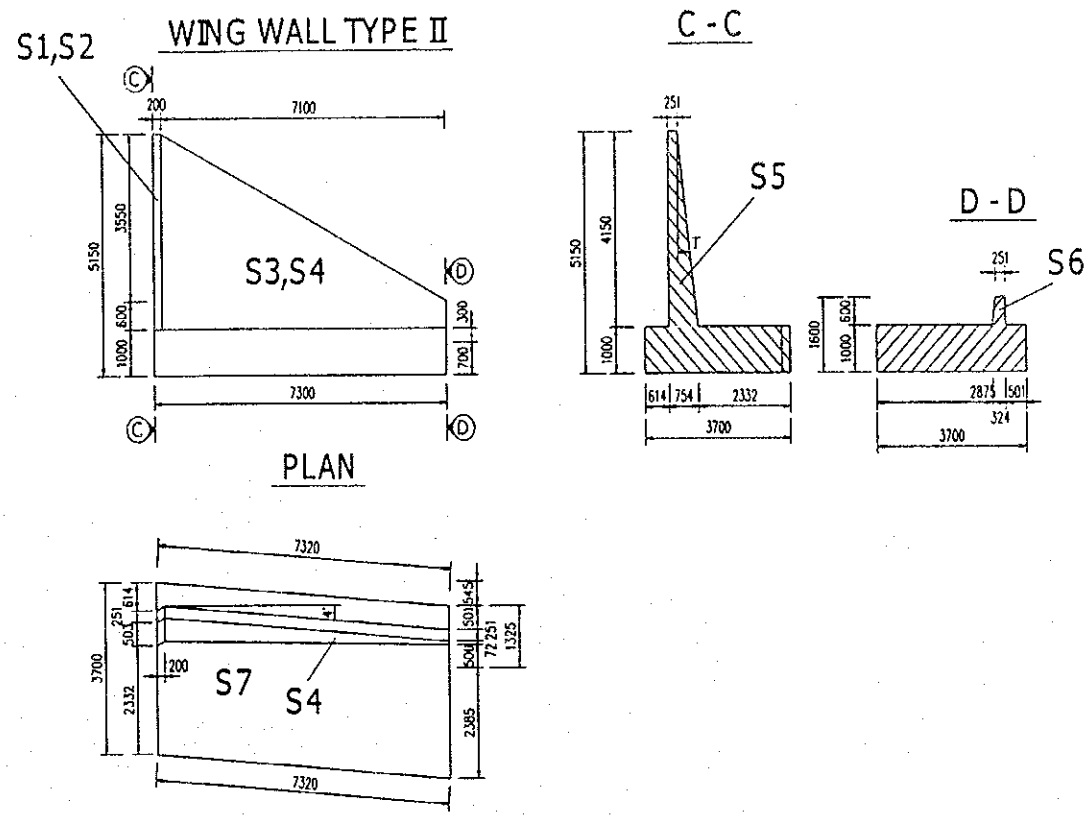


+	CONCRETE (M3)			
	S7	= (3.700 + 3.700) : 2 x 7.300	=	27.010
*	BASE OF THE WINGWALL	= S7 x 1.000	=	27.010
	S5	= (0.835 + 0.278) : 2 x 4.150	=	2.309
	S6	= (0.356 + 0.278) : 2 x 0.600	=	0.190
*	WINGWALL	= 7.300 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=	7.695
	SUM		=	34.71
+	FORM (M2)			65.654
*	BASE OF THE WINGWALL		=	23.644
	BASE OF THE WINGWALL	= (3.700 + 8.122 + 8.122 + 3.700) x 1.000	=	23.644
*	WINGWALL			42.010
	S1+S2	= 0.200 x 4.150 x 2 : $COS26^0$	=	1.847
	S3	= (4.150 + 0.600) x 7.100 : (2 x $COS26^0$)	=	18.761
	S4	= 18.761 : $COS7^0$	=	18.902
	S5	= 2.309	=	2.309
	S6	= 0.190	=	0.190
+	SCAFFOLDING (M2)			64.980
*	BASE OF THE WINGWALL			26.644
	PERIMETER	= 8.122 + 1.000 + 3.700 + 1.000 + 8.122 + 1.000 + 3.7	=	26.644
	AREA	= PERIMETER x 1.000	=	26.644
*	WINGWALL	= S3 x 2 + 0.600 x (0.356 + 1)	=	38.336

BOX CULVERT STATION 2+620
REINFORCEMENT OF WINGWALL TYPE I

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3455	12	42	0.888	145.1	128.8
1b	3554	16	42	1.578	149.3	235.6
2a	8121	12	6	0.888	48.7	43.3
2b	4483	12	36	0.888	161.4	143.3
2c	584	12	42	0.888	24.5	21.8
3	9127	12	2	0.888	18.3	16.2
4	9071	12	34	0.888	308.4	273.8
5a	4990	12	33	0.888	164.7	146.2
5b	3380	12	14	0.888	47.3	42.0
5c	3984	22	33	2.984	131.5	392.3
5d	2374	22	14	2.984	33.2	99.2
6	2944	14	63	1.208	185.5	224.1
7	3995	12	4	0.888	16.0	14.2
8	3995	12	6	0.888	24.0	21.3
9	7997	12	6	0.888	48.0	42.6
10	1034	14	14	1.208	14.5	17.5
11	884	12	21	0.888	18.6	16.5
12	2657	12	3	0.888	8.0	7.1
REINFORCEMENT :			D<=14			**1158.6** KG
REINFORCEMENT :			14< D<=25			727.1 KG
TOTAL REINFORCEMENT :						1885.7 KG

3 WINGWALL TYPE II

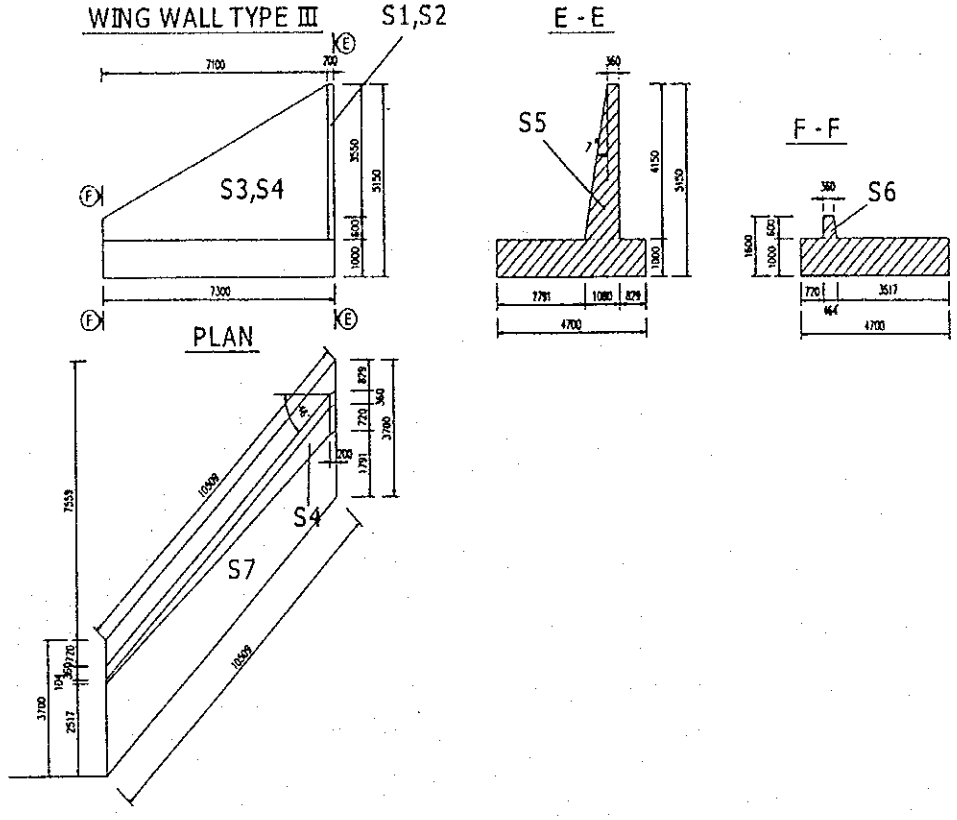


+	CONCRETE (M3)		
	S7	= (3.700 + 3.700) : 2 x 7.300	= 27.010
*	BASE OF THE WINGWALL	= S7 x 1.000	= 27.010
	S5	= (0.754 + 0.251) : 2 x 4.150	= 2.085
	S6	= (0.324 + 0.251) : 2 x 0.600	= 0.173
*	WINGWALL	= 7.300 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 6.954
	SUM		= 33.96
+	FORM (M2)		59.892
*	BASE OF THE WINGWALL		= 22.040
	BASE OF THE WINGWALL	= (7.320 + 3.700 + 3.700 + 7.320) x 1.000	= 22.040
*	WINGWALL		37.852
	S1+S2	= 0.200 x 4.150 x 2	= 1.660
	S3	= (4.150 + 0.600) x 7.100 : (2 x $COS4^0$)	= 16.904
	S4	= 16.904 : $COS7^0$	= 17.031
	S5	= 2.085	= 2.085
	S6	= 0.173	= 0.173
+	SCAFFOLDING (M2)		59.642
*	BASE OF THE WINGWALL		25.040
	PERIMETER	= 3.700 + 1.000 + 7.320 + 1.000 + 3.700 + 1.000 + 7.32	= 25.040
	AREA	= PERIMETER x 1.000	= 25.040
*	WINGWALL	= S3 x 2 + 0.600 x (0.324 + 1)	= 34.602

BOX CULVERT STATION 2+620
REINFORCEMENT OF WINGWALL TYPE II

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3455	12	38	0.888	131.3	116.6
1b	3553	16	38	1.578	135.0	213.1
2a	7367	12	6	0.888	44.2	39.2
2b	3910	12	36	0.888	140.8	125.0
2c	584	12	38	0.888	22.2	19.7
3	8307	12	2	0.888	16.6	14.8
4	8282	12	38	0.888	314.7	279.4
5a	5354	12	35	0.888	187.4	166.4
5b	3618	12	2	0.888	7.2	6.4
5c	4348	22	35	2.984	152.2	454.1
5d	2612	22	2	2.984	5.2	15.6
6	2944	14	69	1.208	203.1	245.5
7	4008	12	4	0.888	16.0	14.2
8	4008	12	6	0.888	24.0	21.4
9	7208	12	6	0.888	43.2	38.4
10	1034	14	14	1.208	14.5	17.5
11	830	12	21	0.888	17.4	15.5
12	3081	12	2	0.888	6.2	5.5
REINFORCEMENT : D=<14					**1125.3** KG	
REINFORCEMENT : 14< D<=25					**682.8** KG	
TOTAL REINFORCEMENT :					**1808.1** KG	

4 WINGWALL TYPE III



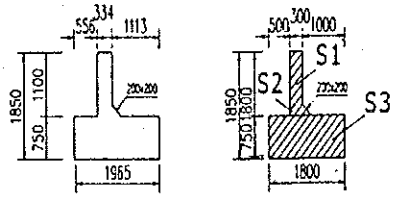
+	CONCRETE (M3)		
	S7	= (4.700 + 4.700) : 2 x 7.300	= 34.310
*	BASE OF THE WINGWALL	= S7 x 1.000	= 34.310
	S5	= (1.080 + 0.360) : 2 x 4.150	= 2.988
	S6	= (0.464 + 0.360) : 2 x 0.600	= 0.247
*	WINGWALL	= 7.300 : 3 x (S5 + S6 + (S5xS6)$^{0.5}$)	= 9.964
	SUM		= <u>44.274</u>
+	FORM (M2)		<u>84.126</u>
*	BASE OF THE WINGWALL		= 30.499
	BASE OF THE WINGWALL	= (4.700 + 10.590 + 10.509 + 4.700) x 1.000	= 30.499
*	WINGWALL		53.627
	S1+S2	= 0.200 x 4.150 x 2	= 1.660
	S3	= (4.150 + 0.600) x 7.100 : (2 x COS46^{0})	= 24.275
	S4	= 24.275 : COS7^{-0}	= 24.457
	S5	= 2.988	= 2.988
	S6	= 0.247	= 0.247
+	SCAFFOLDING (M2)		<u>82.926</u>
*	BASE OF THE WINGWALL		33.499
	PERIMETER	= 4.700 + 1.000 + 10.590 + 1.000 + 10.509 + 1.000 + 4.7	= 33.499
	AREA	= PERIMETER x 1.000	= 33.499
*	WINGWALL	= S3 x 2 + 0.600 x (0.464 + 1)	= 49.427

BOX CULVERT STATION 2+620
REINFORCEMENT OF WINGWALL TYPE III

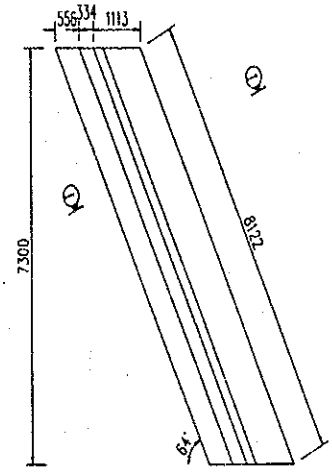
BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3455	12	53	0.888	183.1	162.6
1b	3574	16	53	1.578	189.4	298.9
2a	10479	12	6	0.888	62.9	55.8
2b	5534	12	36	0.888	199.2	176.9
2c	582	12	53	0.888	30.8	27.4
3	11651	12	2	0.888	23.3	20.7
4	11422	12	34	0.888	388.3	344.8
5a	4929	12	35	0.888	172.5	153.2
5b	3424	12	32	0.888	109.6	97.3
5c	3923	22	35	2.984	137.3	409.7
5d	2418	22	32	2.984	77.4	230.8
6	2944	14	84	1.208	247.3	298.8
7	4959	12	4	0.888	19.8	17.6
8	4959	12	6	0.888	29.8	26.4
9	10348	12	6	0.888	62.1	55.1
10	1034	14	14	1.208	14.5	17.5
11	1050	12	21	0.888	22.1	19.6
12	2776	12	4	0.888	11.1	9.9
REINFORCEMENT : D=<14					**1483.5** KG	
REINFORCEMENT : 14< D<=25					**939.5** KG	
TOTAL REINFORCEMENT :					**2423.0** KG	

6 RETAINING WALL

RETAINING WALL I - I



PLAN

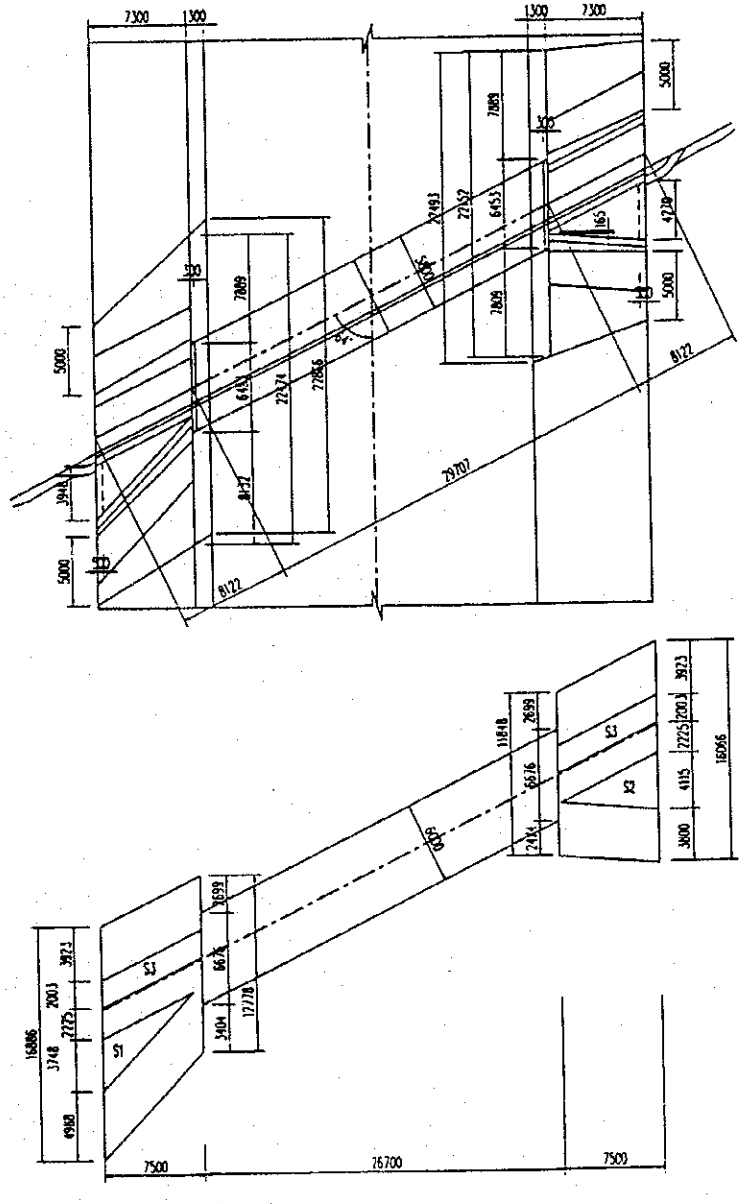


+	CONCRETE (M3)		
	S	= S1 + S2 + S3	1.700
	S1	= 0.300 x (1.100 - 0.200) =	0.270
	S2	= (0.300 + 0.300 + 0.200) x 0.200 : 2.000 =	0.080
	S3	= 0.750 x 1.800 =	1.350
	VOLUME	= S x 8.122 =	13.807
+	FORM (M2)		33.579
	BASE OF RETAINING WALL	= 2.003 x 0.750 + 2 x 0.750 x 8.122 =	13.685
	RETAINING WALL	= (1.100 - 0.200) x 8.122 x 2 + (S1 : COS75^0) =	15.663
	FOOT-RETAINING WALL	= 8.122 x 0.2 : SIN45^0 + (S2 : COS75^0) + 8.122 x 0.2 =	4.231
+	SCAFFOLDING (M2)		48.410
*	BASE OF RETAININGWALL		16.770
	PERIMETER	= 2.003 + 1.000 + 8.122 + 1.000 + 8.122 + 1.000 + 1.113 =	22.360
	AREA	= PERIMETER x 0.750 =	16.770
*	RETAININGWALL	= 2 x 8.122 x 1.800 + 1.800 x (0.334 + 1.000) =	31.640

BOX CULVERT STATION 2+620
REINFORCEMENT OF RETAINING WALL

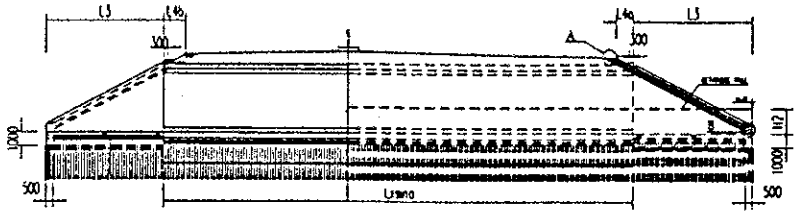
BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1	5484	12	41	0.888	224.8	199.6
2	8233	12	8	0.888	65.9	58.5
3	1402	12	41	0.888	57.5	51.0
4a	2572	12	70	0.888	180.0	159.8
4b	1951	12	16	0.888	31.2	27.7
5	8885	12	16	0.888	142.2	126.2
6	2444	14	30	1.208	73.3	88.6
7	2338	12	8	0.888	18.7	16.6
8	8457	12	4	0.888	33.8	30.0
		REIFORCEMENT		D<=14		**758.1** KG
		REIFORCEMENT		14< D<=25		**0.0** KG
		TOTAL REINFORCEMENT :				**758.1** KG

BOX CULVERT FOR PATH & DRAINAGE
(STATION 2+620)

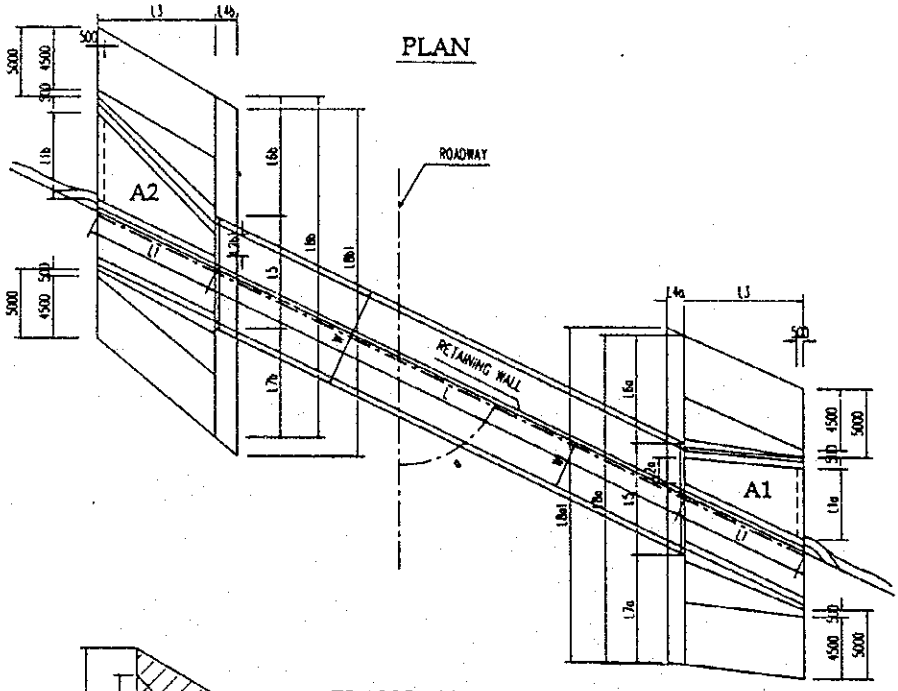


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR PATH & DRAINAGE

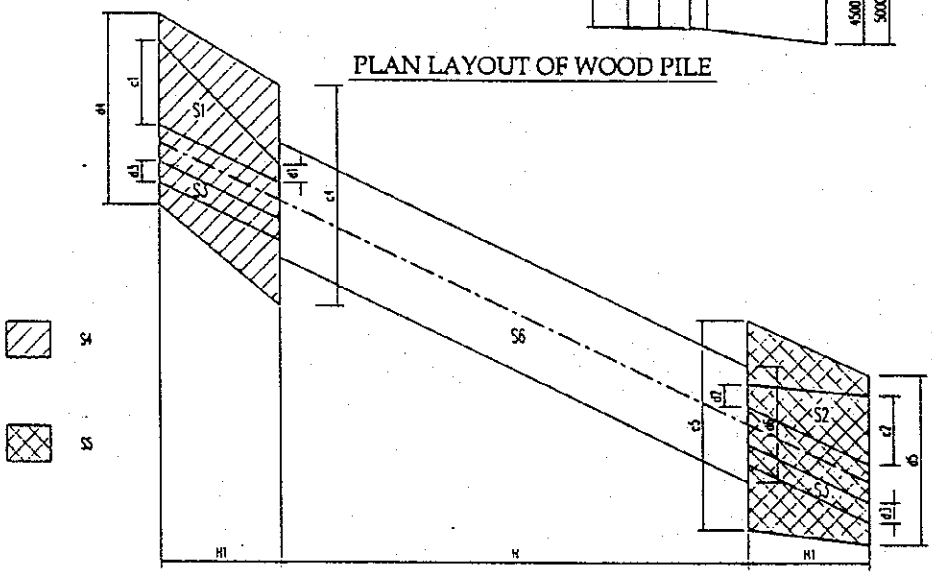
PROFILE



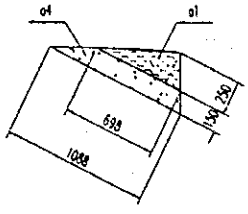
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

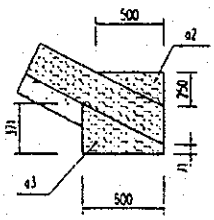


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM 2+620

S1=	(	c1	+	d1	)	x	H1	:	2	=		(m2)									
S1=	(	3.748	+	0.000	)	x	7.500	:	2	=	14.055	(m2)									
S2=	(	c2	+	d2	)	x	H1	:	2	=		(m2)									
S2=	(	4.115	+	0.000	)	x	7.500	:	2	=	15.431	(m2)									
S4=	(	c4	+	d4	)	x	H1	:	2	=		(m2)									
S4=	(	12.778	+	16.886	)	x	7.500	:	2	=	111.240	(m2)									
S5=	(	c5	+	d5	)	x	H1	:	2	=		(m2)									
S5=	(	11.848	+	16.066	)	x	7.500	:	2	=	104.678	(m2)									
S3=		d3	x	H1		=			(m2)												
S3=		2.003	x	7.500		=	15.023		(m2)												
S6=		H	x	d6		=			(m2)												
S6=		26.700	x	6.676		=	178.249		(m2)												

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2.00	=		(m2)									
A1=	(	4.270	+	0.165	)	x	7.300	:	2.00	=	16.188	(m2)									
A2=	(	L1b	+	L2b	)	x	L3	:	2.00	=		(m2)									
A2=	(	3.948	+	0.000	)	x	7.300	:	2.00	=	14.410	(m2)									
A =	(	A1	+	A2	)	x	t	+	(	0.700	x	0.500	) x	(	L1a	+	L1b	) =			
A =	(	16.188	+	14.410	)	x	0.300	+	(	0.700	x	0.500	) x	(	4.270	+	3.948	) =	12.056	(m3)	

2. CONCRETE FOUNDATION OF CULVERT:

F =	L	x	(	w +0.2)	x	0.2 =	29.707	x	6.000	x	0.2	=	35.648	(m3)							

3. LEAN CONRETE:

G =	(	S4	-	S3	+	S5	-	S3	)	x	0.100	=									
G =	(	111.240	-	15.023	+	104.678	-	15.023	)	x	0.100	=	18.587	(m3)							

4. WOOD PILE:

L=5M

W5=	(	S4	+	S5	+	S6	-	S1	-	S2	-	(2 x S3)	) x	(25 x 5 : 100)	=				
W5=	(	111.240	+	104.678	+	178.249	-	14.055	-	15.431	-	30.045	) x	1.250	=	**418.294**	(100m)		

L=3M

W3=	(	S1	+	S2	+	(2 x S3)	+	(0.8 x 4.5 x 4)	) x (25 x 3 : 100)	=				
W3=	(	14.055	+	15.431	+	30.045	+	14.400	) x 0.75	=	55.448	(100m)		

PROTECTION

W31=	(	S7	x	25.000	x	3.000	x	2.0	) :	100.000	=		(100m)	
	(	1.920	x	25.000	x	3.000	x	2.0	) :	100.000	=	2.880	(100m)	
TOTAL =		(	W3	+	W31	)	=	**58.328**	(100m)					

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

K =	(	S4	+	S5	+	S6	+	(0.8 x 4.5 x 4)	) x	0.150	=		
=	(	111.240	+	104.678	+	178.249	+	14.400	) x	0.150	=	61.285	(m3)

PROTECTION

K1=	(	S7	x	0.150	x	2.000	)	=	(m3)
	(	1.920	x	0.150	x	2.000	)	=	0.576 (m3)
TOTAL =		(	K	+	K1	)	=	**61.861**	(m3)

6. STONE MASONRY

a1=		0.698	x	0.250		x	0.500			=	0.087	(m2)
a2=		0.500	x	0.250		x	0.500			=	0.063	(m2)
a3=	(	0.071	+	0.371	)	x	0.500	x	0.600	=	0.133	(m2)
a4=	(	0.698	+	1.088	)	x	0.500	x	0.150	=	0.134	(m2)
b1=		0.300	x	L5	=		(m2)					
b1=		0.300	x	6.453	=	1.936	(m2)					

b2a=	(	L6a	+	5.000	)	x	L3	x	0.500	=		(m2)												
=	(	7.889	+	5.000	)	x	7.300	x	0.500	=	47.045	(m2)												
b2b=	(	L6b	+	5.000	)	x	L3	x	0.500	=		(m2)												
=	(	7.889	+	5.000	)	x	7.300	x	0.500	=	47.045	(m2)												
b3a=	(	L7a	+	5.000	)	x	L3	x	0.500	=		(m2)												
=	(	7.809	+	5.000	)	x	7.300	x	0.500	=	46.753	(m2)												
b3b=	(	L7b	+	5.000	)	x	L3	x	0.500	=		(m2)												
=	(	8.132	+	5.000	)	x	7.300	x	0.500	=	47.932	(m2)												
b4a=	(	L8a	+	L8a1	)	x	L4a	x	0.500	=		(m2)												
	(	22.152	+	22.493	)	x	1.300	x	0.500	=	29.019	(m2)												
b4b=	(	L8b	+	L8b1	)	x	L4b	x	0.500	=		(m2)												
	(	22.474	+	22.866	)	x	1.300	x	0.500	=	29.471	(m2)												
b5=	(	0.600	x	5.000	)	x	2.000			=	6.000	(m2)												
V1a=		a1	x	L8a1		=	0.087	x	22.493	=	1.963	(m3)												
V1b=		a1	x	L8b1		=	0.087	x	22.866	=	1.995	(m3)												
V2=	(	a2	+	a3	)	x	5.000	x	4.000	=		(m3)												
=	(	0.063	+	0.133	)	x	5.000	x	4.000	=	3.902	(m3)												
V3a=	(	b2a	+	b3a	+	b4a	-		b1	)	x	0.250	:	COS(26.565)	=		(m3)							
=	(	47.045	+	46.753	+	29.019	-		1.936	)	x	0.250	:	0.894	=	33.788	(m3)							
V3b=	(	b2b	+	b3b	+	b4b	-		b1	)	x	0.250	:	COS(26.565)	=		(m3)							
=	(	47.045	+	47.932	+	29.471	-		1.936	)	x	0.250	:	0.894	=	34.244	(m3)							
PROTECTION																								
V3c=	(	L9	x	0.600	x	0.600	x	2.0	)	+	(	S8	x	2.00 x 0.25	)	=								
	(	3.240	x	0.600	x	0.600	x	2.0	)	+	(	1.85	x	0.50	)	=	3.256	(m3)						
TOTAL =		(	V1a	+	V1b	+		V2		+	V3a	+	V3b	+	V3c	)	=		(m3)					
		(	1.963	+	1.995	+		3.902		+	33.788	+	34.244	+	3.256	)	=	79.148	(m3)					

7. BASE BEDDING:

V4a=		a4	x	L8a1			=	0.134	x	22.493						=	3.013	(m3)	
V4a=		a4	x	L8b1			=	0.134	x	22.866						=	3.063	(m3)	
V5a=	(	b2a	+	b3a	+	b4a	-	b1	-	b5	)	x	0.150	:	COS(26.565)	=			
=	(	47.045	+	46.753	+	29.019	-	1.936	-	6.000	)	x	0.150	:	0.894	=	19.267	(m3)	
V5b=	(	b2b	+	b3b	+	b4b	-	b1	-	b5	)	x	0.150	:	COS(26.565)	=			
=	(	47.045	+	47.932	+	29.471	-	1.936	-	6.000	)	x	0.150	:	0.894	=	19.540	(m3)	

PROTECTION

V5c=	(	S8	x	0.150	x	2.000	)	=	(m3)
	(	1.85	x	0.150	x	2.000	)	=	0.554 (m3)

TOTAL =	(	V4a	+	V4b	+	V5a	+	V5b	+	V5c	)	=		(m3)
	(	3.013	+	3.063	+	19.267	+	19.540	+	0.554	)	=	**45.437**	(m3)

8. PATH

a. LATERITE

M =	(	L	+	2 x L1	)	x	W1	x	0.400	=			
	(	29.707	+	16.240	)	x	3.500	x	0.400	=	**64.326**	(m3)	

b. SAND FILL

N =	(	L	+	2 x L1	)	x	W1	x	(	H2	-	0.400	)	=		(m3)	
	(	29.707	+	16.240	)	x	3.500	x	(	1.100	-	0.400	)	=	**112.570**	(m3)	

9. FORM :

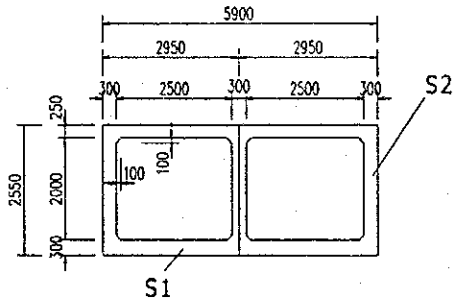
=	(	L1a	+	L1b	)	x	1	x	2	=		
	(	4.270	+	3.948	)	x	1	x	2	=	**16.436**	(m2)

10. SCAFFOLDING :

=	(	L1a	+	L1b	)	x	1	x	2	=		
	(	4.270	+	3.948	)	x	1	x	2	=	**16.436**	(m2)

2.9. Box culvert at station 2+835

I	BOX CULVERT STATION 02+835		QUANTITIES
	L	= 19.360 + 19.495 + 0.02 = 38.875	
1	CULVERT		
+	CONCRETE (M3)		
	S1= S2	= 2.950 x 2.550 - 2.500 x 2.000 + 2 x 0.100 x 0.100 =	2.543
	S	= S1 + S2 =	5.085
	VOLUME	= S x (19.360 + 19.495) + 5.900 x 0.200 x 0.300 x 2 =	198.29
		DOUBLE BOX CULVERT	
+	FORM		724.71
*	INSIDE FORM (M2)		506.334
	BOX BULWARK	= (2.000 + 2 x 0.100 x (1:SIN45^0 - 1)) x 38.855 x 4 =	323.715
	BOTTOM OF THE BOX	= (2.950 - 0.300 x 2) x 38.855 x 2 =	182.619
*	OUTSIDE FORM (M2)		218.376
	BOX BULWARK	= 2.550 x 2 x 38.855 + 4 x 0.300 x 0.200 =	198.401
	THE END OF CULVERT	= S x 2 + 5.900 x 0.200 x 4 =	14.890
	CENTER	= S =	5.085
+	SCAFFOLDING (M2)	= 2.550 x 2.000 x 38.855 + 4.000 x 0.300 x 0.200 =	198.40
+	SUPPORT		
	AREA (M2)	= 5.900 x 2.000 - S =	6.715
	VOLUME (M3)	= AREA x L =	261.05



BOXCULVERT STATION 2+835
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	4160	125	14	310	1.208	1289.60	1558.4
2	2850	250	12	156	0.888	444.60	394.7
3	6270	250	14	156	1.208	978.12	1182.0
4	1500	250	14	308	1.208	462.00	558.3
5	1550	125	18	310	1.998	480.50	959.8
6	1970	250	12	312	0.888	614.64	545.7
7	2850	125	12	310	0.888	883.50	784.4
8	1049	250	12	312	0.888	327.29	290.6
9	1120	250	12	312	0.888	349.44	310.2
10	19865	250	12	52	0.888	1032.98	917.1
11	19965	250	12	100	0.888	1996.50	1772.5
12	5780	250	12	2	0.888	11.56	10.3
13	1440	250	12	26	0.888	37.44	33.2
14	1180	250	12	465	0.888	548.28	486.8
15	1280	250	12	465	0.888	594.74	528.0

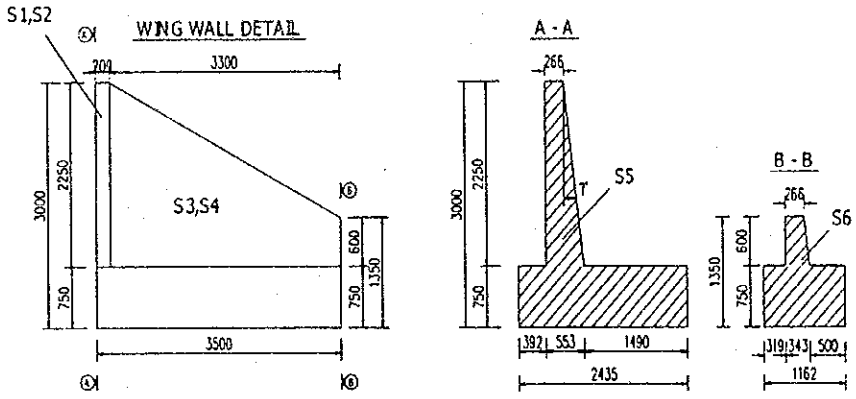
REINFORCEMENT :	D<=14	9372.1	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	959.8	REINFORCEMENT (KG): 10332.0
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 98.80

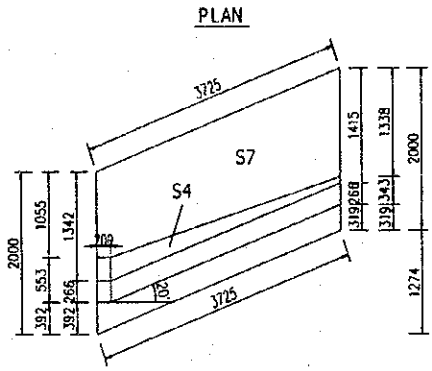
SEGMENT 2

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	4160	125	14	314	1.208	1306.24	1578.5
2	2850	250	12	158	0.888	450.30	399.8
3	6270	250	14	158	1.208	990.66	1197.1
4	1500	250	14	312	1.208	468.00	565.5
5	1550	125	18	314	1.998	486.70	972.2
6	1970	250	12	316	0.888	622.52	552.7
7	2850	125	12	314	0.888	894.90	794.5
8	1049	250	12	316	0.888	331.48	294.3
9	1120	250	12	316	0.888	353.92	314.2
10	20000	250	12	52	0.888	1040.00	923.3
11	20100	250	12	100	0.888	2010.00	1784.5
12	5780	250	12	2	0.888	11.56	10.3
13	1440	250	12	26	0.888	37.44	33.2
14	1180	250	12	468	0.888	552.10	490.2
15	1280	250	12	468	0.888	598.89	531.7

REINFORCEMENT :	D<=14	9469.8	TOTAL FOR SEGMENT 2 :
REINFORCEMENT :	16=D<=25	972.2	REINFORCEMENT (KG): 10442.0
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 99.49
			TOTAL FOR SEGMENT 1 & 2
REINFORCEMENT :	D<=14	18841.9	REINFORCEMENT (KG) : 20774.0
REINFORCEMENT :	16=D<=25	1932.1	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : 198.29

2 WINGWALL



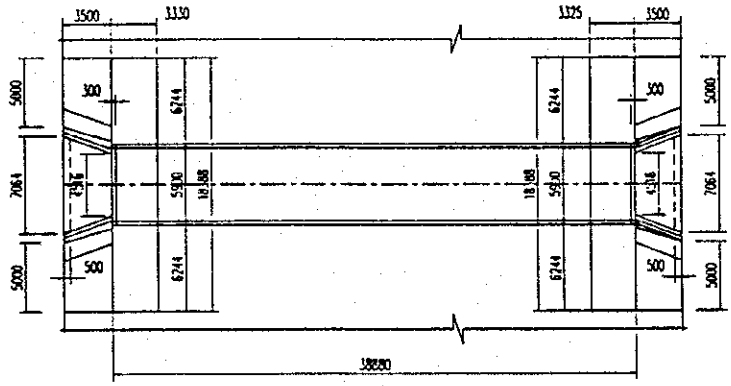


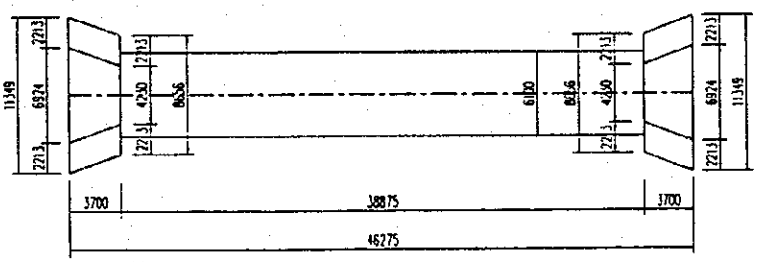
+	CONCRETE (M3)		
	S7	= (2.000 + 2.000) : 2 x 3.500	= 7.000
*	BASE OF A WINGWALL	= S7 x 0.750	= 5.250
	S5	= (0.553 + 0.266) : 2 x 2.250	= 0.921
	S6	= (0.343 + 0.266) : 2 x 0.600	= 0.183
*	WINGWALL	= 3.500 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 1.767
	SUM		= 7.02
+	FORM (M2)		22.138
*	BASE OF A WINGWALL		= 10.088
	BASE OF A WINGWALL	= (3.000 + 3.725 + 3.725 + 3.000) x 0.750	= 10.088
*	WINGWALL		12.050
	S1+S2	= 0.200 x 2.250 x 2	= 0.900
	S3	= (2.250 + 0.600) x 3.300 : (2 x $COS20^0$)	= 5.004
	S4	= 5.004 : $COS7^0$	= 5.042
	S5	= 0.921	= 0.921
	S6	= 0.183	= 0.183
+	SCAFFOLDING (M2)		23.152
*	BASE OF WINGWALL		12.338
	PERIMETER	= 3.000 + 1.000 + 3.725 + 1.000 + 3.725 + 1.000 + 3.000	= 16.450
	AREA	= PERIMETER x 0.750	= 12.338
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	= 10.814

BOX CULVERT STATION 2+835
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	2258	12	20	0.888	45.2	40.1
1b	2310	14	20	1.208	46.2	55.8
2a	3723	12	6	0.888	22.3	19.8
2b	2100	12	16	0.888	33.6	29.8
2c	582	12	20	0.888	11.6	10.3
3	4389	12	2	0.888	8.8	7.8
4	4429	12	20	0.888	88.6	78.6
5a	3043	12	15	0.888	45.6	40.5
5b	2150	12	6	0.888	12.9	11.5
5c	2467	20	15	2.466	37.0	91.3
5d	1574	20	6	2.466	9.4	23.3
6	2444	14	16	1.208	39.1	47.3
7	2301	12	4	0.888	9.2	8.2
8	2301	12	4	0.888	9.2	8.2
9	3605	12	4	0.888	14.4	12.8
10	1304	14	8	1.208	10.4	12.6
11	744	12	11	0.888	8.2	7.3
12	2143	12	1	0.888	2.1	1.9
		REINFORCEMENT :		D<=14		392.5 KG
		REINFORCEMENT :		14< D<=25		114.6 KG
		TOTAL REINFORCEMENT :				507.0 KG

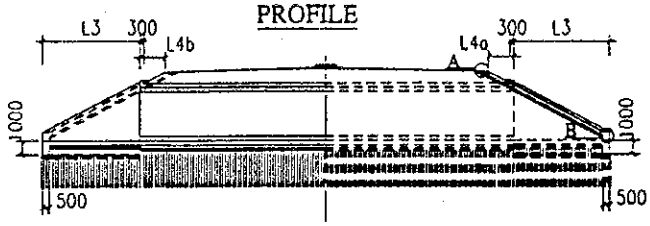
BOX CULVERT FOR DRAINAGE
(STATION 2+835)



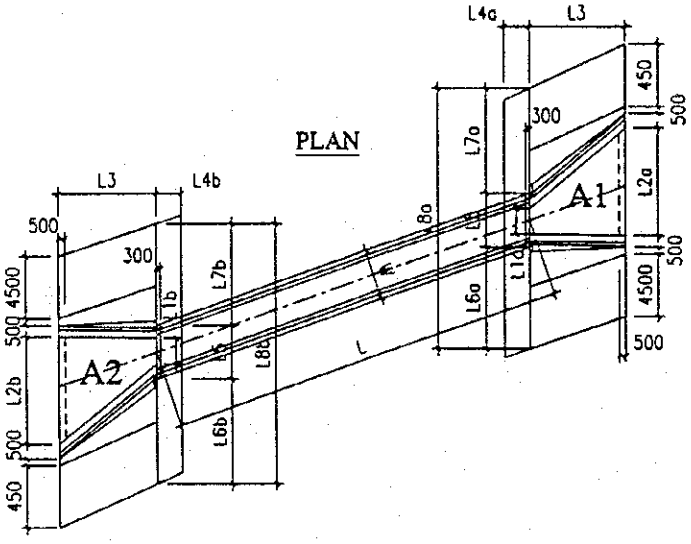


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

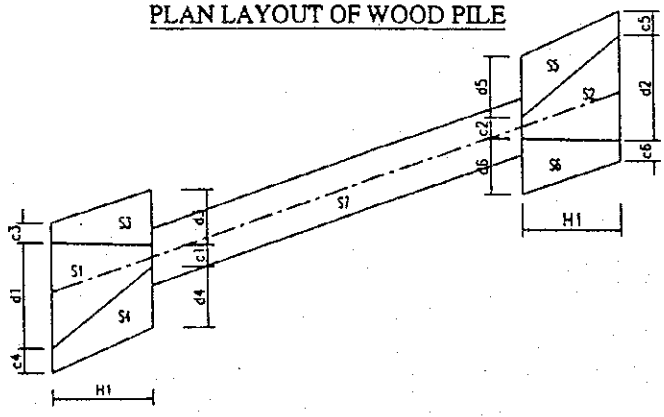
PROFILE



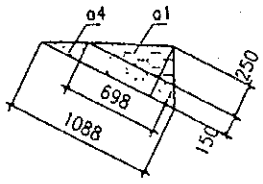
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

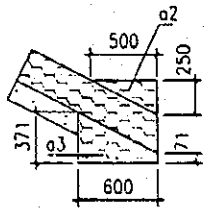


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM2+835

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	4.230	+	6.924	)	x	3.700	:	2	=	20.635	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	4.230	+	6.924	)	x	3.700	:	2	=	20.635	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	2.213	+	2.213	)	x	3.700	:	2	=	8.188	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	2.213	+	2.213	)	x	3.700	:	2	=	8.188	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	2.213	+	2.213	)	x	3.700	:	2	=	8.188	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	2.213	+	2.213	)	x	3.700	:	2	=	8.188	(m2)
S7=		L	x	(W + 0.2)	=							
=		38.875	x	6.100	=		237.138		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	4.516	+	7.064	)	x	3.500	:	2	=	20.265	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	4.516	+	7.064	)	x	3.500	:	2	=	20.265	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45 x 0.5	=	
=	(	20.265	+	20.265	)	x 0.3	+	(	7.064	+	7.064	) x 0.45 x 0.5	=	15.34 (m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	38.875	x	6.100	x	0.2	=	47.43 (m3)

3. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	)	x	0.1	=					
=	(	20.635	+	20.6349	+	8.188	+	8.188	+	8.188	+	8.188	)	x	0.1	=	7.40	(m3)			

4. WOOD PILE:

** L=5M*

W5=	(	S3	+	S4	+	S5	+	S6	+	S7	)	x 25 x 5 :100	=								
=	(	8.188	+	8.188	+	8.188	+	8.188	+	237.138	)	x 25 x 5 :100	=	337.36	(100md)						

** L=3M*

W3=	(	S1	+	S2	+	(0.8 x 4.5 x 4)	)	x 25 x 3 : 100	=												
=	(	20.635	+	20.6349	+	14.400	)	x 25 x 3 : 100	=	41.75	(100md)										

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	S7	+	(0.8 x 4.5 x 4)	) x 0.15 =								
=	(	20.635	+	20.635	+	8.188	+	8.188	+	8.188	+	8.188	+	237.138	+	(0.8 x 4.5 x 4)	) x 0.15 =	48.83	(m3)						

6. STONE MASONRY

a1=		0.695	x	0.25	x		0.5	=		0.087	(m2)										
a2=		0.5	x	0.25	x		0.5	=		0.063	(m2)										
a3=	(	0.071	+	0.371	)	x	0.5	x	0.6	=	0.133	(m2)									
a4=	(	0.698	+	1.088	)	x	0.5	x	0.15	=	0.134	(m2)									

b1=		0.300	x	L5	=	0.300	x		5.900	=		1.770	(m2)	(b1 IS AREA OF HEAD WALL)							

b2a= (L6a + 5.000) x L3 x 0.5 =
= (6.244 + 5.000) x 3.500 x 0.5 = 19.677 (m2)

b2b= (L6b + 5.000) x L3 x 0.5 =
= (6.244 + 5.000) x 3.500 x 0.5 = 19.677 (m2)

b3a= (L7a + 5.000) x L3 x 0.5 =
= (6.244 + 5.000) x 3.500 x 0.5 = 19.677 (m2)

b3b= (L7b + 5.000) x L3 x 0.5 =
= (6.244 + 5.000) x 3.500 x 0.5 = 19.677 (m2)

b4a= L8a x L4a = 18.388 x 3.325 = 61.140 (m2)

b4b= L8b x L4b = 18.388 x 3.330 = 61.232 (m2)

b5= 0.6 x 5 x 2 = 6.000 (m2)

V1a= a1 x L8a = 0.087 x 18.388 = 1.597 (m3)

V1b= a1 x L8b = 0.087 x 18.388 = 1.597 (m3)

V2= (a2 + a3) x 5 x 4 = (0.063 + 0.133) x 5 x 4 = 3.902 (m3)

V3a= (b4a - b1 + b2a + b3a) x 0.25 : COS(26.56) =
= (61.140 - 1.770 + 19.677 + 19.677) x 0.25 : 0.894 = 27.607 (m3)

V3b= (b4b - b1 + b2b + b3b) x 0.25 : COS(26.56) =
= (61.232 - 1.770 + 19.677 + 19.677) x 0.25 : 0.894 = 27.633 (m3)

TOTAL = (V1a + V1b + V2 + V3a + V3b) =
(1.597 + 1.597 + 3.902 + 27.607 + 27.633) = 62.337 (m3)

7. BASE BEDDING:

V4a=		a4	x	L8a			=	0.134	x	18.388			=	2.463	(m3)				
V4b=		a4	x	L8b			=	0.134	x	18.388			=	2.463	(m3)				
V5a=	(	b4a	-	b1	+	b2a	+	b3a	-	b5	)	x	0.15	:	COS(26.56)	=			
=	(	61.140	-	1.770	+	19.677	+	19.677	-	6.000	)	x	0.15	:	0.894	=	15.558	(m3)	
V5b=	(	b4b	-	b1	+	b2b	+	b3b	-	b5	)	x	0.15	:	COS(26.56)	=			
=	(	61.232	-	1.770	+	19.677	+	19.677	-	6.000	)	x	0.15	:	0.894	=	15.573	(m3)	
TOTAL =			(	V4a	+	V4b	+	V5a	+	V5b	)=								
			(	2.463	+	2.463	+	15.558	+	15.573	)=	***36.06***		(m3)					

8. FORM :

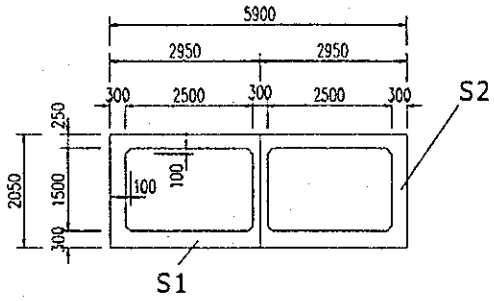
=	(L2a	+	L2b)	)	X 0.75	x	2	=	
	(7.064	+	7.064	)	X 0.75	x	2	=	**21.192** (m2)

9. SCAFFOLDING :

=	(L2a	+	L2b)	)	X 0.75	x	2	=	
	(7.064	+	7.064	)	X 0.75	x	2	=	**21.192** (m2)

2.10. Box culvert at station 3+170

I	BOX CULVERT STATION 03+170		QUANTITIES
	L	= 13.584 + 13.584 + 0.02 = 27.188	
1	CULVERT		
+	CONCRETE (M3)		
	S1=S2	= 2.950 x 2.050 - 2.500 x 1.500 + 2 x 0.100 x 0.100 =	2.318
	S	= S1 + S2 =	4.635
	VOLUME	= S x (13.584 + 13.584) + 5.900 x 0.200 x 0.300 x 2 =	126.64
		DOUBLE BOX CULVERT	
+	FORM (M2)		427.24
*	INSIDE FORM (M2)		296.983
	BOX BULWARK	= (1.500 + 2 x 0.100 x (1:SIN45^0 - 1)) x 27.168 x 4 =	172.011
	BOTTOM OF THE BOX	= (2.500 - 0.100 x 2) x 27.168 x 2 =	124.973
*	OUTSIDE FORM (M2)		130.254
	BOX BULWARK	= 2.050 x 2 x 27.168 + 4 x 0.300 x 0.200 =	111.629
	THE END OF CULVERT	= S x 2 + 5.900 x 0.200 x 4 =	13.990
	CENTER	= S =	4.635
+	SCAFFOLDING (M2)	= 2.050 x 2.000 x 27.168 + 4.000 x 0.300 x 0.200 =	111.63
+	SUPPORT		
	AREA (M2)	= 5.900 x 1.500 - S =	4.215
	VOLUME (M3)	= AREA x L =	114.60



BOXCULVERT STATION 3+170
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1 & 2

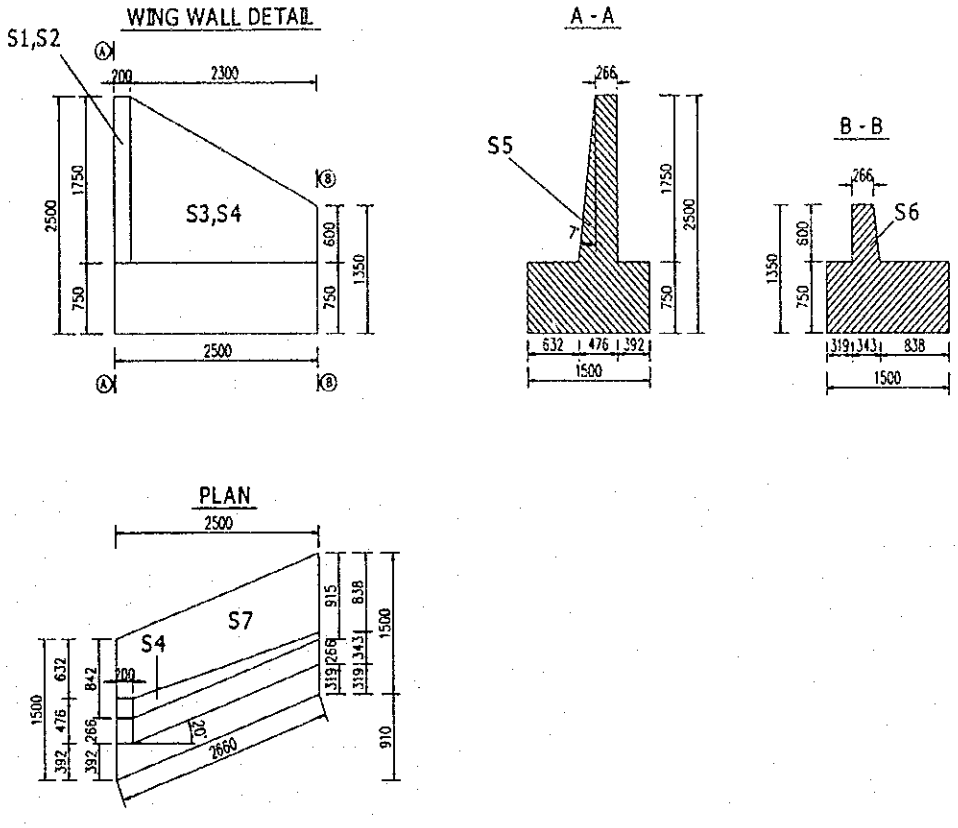
SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	3660	125	14	218	1.208	797.88	964.2
2	2350	250	12	110	0.888	258.50	229.5
3	6270	250	14	110	1.208	689.70	833.4
4	1500	250	14	216	1.208	324.00	391.5
5	1550	125	18	218	1.998	337.90	675.0
6	1970	250	12	220	0.888	433.40	384.8
7	2350	125	12	218	0.888	512.30	454.8
8	1049	250	12	220	0.888	230.78	204.9
9	1120	250	12	220	0.888	246.40	218.8
10	14089	250	12	52	0.888	732.63	650.4
11	14189	250	12	88	0.888	1248.63	1108.6
12	5780	250	12	2	0.888	11.56	10.3
13	1440	250	12	26	0.888	37.44	33.2
14	1180	250	12	326	0.888	384.70	341.5

REINFORCEMENT :	D<=14	5825.9	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	675.0	REINFORCEMENT (KG): 6500.9
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 63.32

TOTAL FOR SEGMENT 1 & 2

REINFORCEMENT :	D<=14	11651.84	REINFORCEMENT (KG) : 13001.8
REINFORCEMENT :	16=D<=25	1349.965	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : 126.64

2 WINGWALL

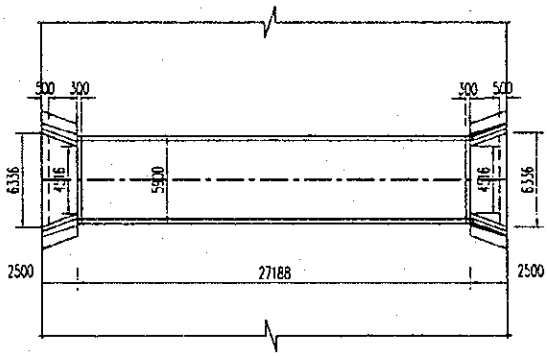


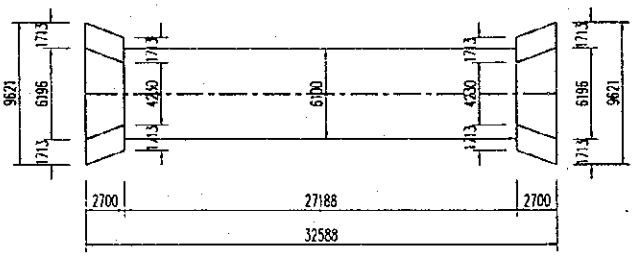
+	CONCRETE (M3)		
	S7	= (1.500 + 1.500) : 2 x 2.500	= 3.750
*	BASE OF THE WINGWALL	= S7 x 0.750	= 2.813
	S5	= (0.476 + 0.266) : 2 x 1.750	= 0.649
	S6	= (0.343 + 0.266) : 2 x 0.600	= 0.183
*	WINGWALL	= 2.500 : 3 x (S5 + S6 + (S5xS6)$^{0.5}$)	= 0.980
	SUM		= 3.79
+	FORM (M2)		13.55
*	BASE OF THE WINGWALL		= 6.240
	BASE OF THE WINGWALL	= (2.660 + 1.500 + 1.5 + 2.660) x 0.750	= 6.240
*	WINGWALL		7.305
	S1+S2	= 0.200 x 1.750 x 2	= 0.700
	S3	= (1.750 + 0.600) x 2.300 : (2 x COS20^0)	= 2.876
	S4	= 2.876 : COS7^0	= 2.898
	S5	= 0.649	= 0.649
	S6	= 0.183	= 0.183
+	SCAFFOLDING (M2)		15.05
*	BASE OF THE WINGWALL		8.490
	PERIMETER	= 2.660 + 1.000 + 1.500 + 1.000 + 1.500 + 1.000 + 2.66	= 11.320
	AREA	= PERIMETER x 0.750	= 8.490
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	= 6.558

BOX CULVERT STATION 3+170
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	2011	12	15	0.888	30.2	26.8
1b	2060	14	15	1.208	30.9	37.3
2a	2651	12	6	0.888	15.9	14.1
2b	1552	12	12	0.888	18.6	16.5
2c	582	12	15	0.888	8.7	7.8
3	3005	12	2	0.888	6.0	5.3
4	3378	12	16	0.888	54.0	48.0
5a	3824	12	11	0.888	42.1	37.3
5b	1867	12	4	0.888	7.5	6.6
5c	3248	20	11	2.466	35.7	88.1
5d	1291	20	4	2.466	5.2	12.7
6	2444	14	8	1.208	19.6	23.6
7	1814	12	4	0.888	7.3	6.4
8	1814	12	4	0.888	7.3	6.4
9	2554	12	4	0.888	10.2	9.1
10	1304	14	5	1.208	6.5	7.9
11	724	12	9	0.888	6.5	5.8
12	1791	12	1	0.888	1.8	1.6
REINFORCEMENT :			D=<14			260.7 KG
REINFORCEMENT :			14< D<=25			100.8 KG
TOTAL REINFORCEMENT :						**361.5** KG

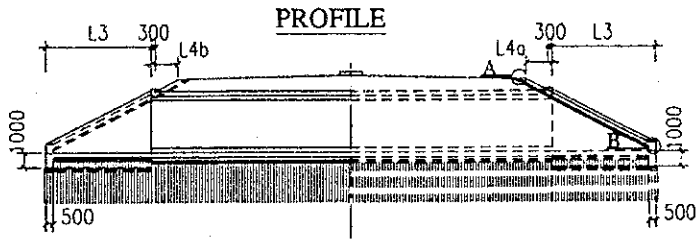
BOX CULVERT FOR DRAINAGE
(STATION 3+170)



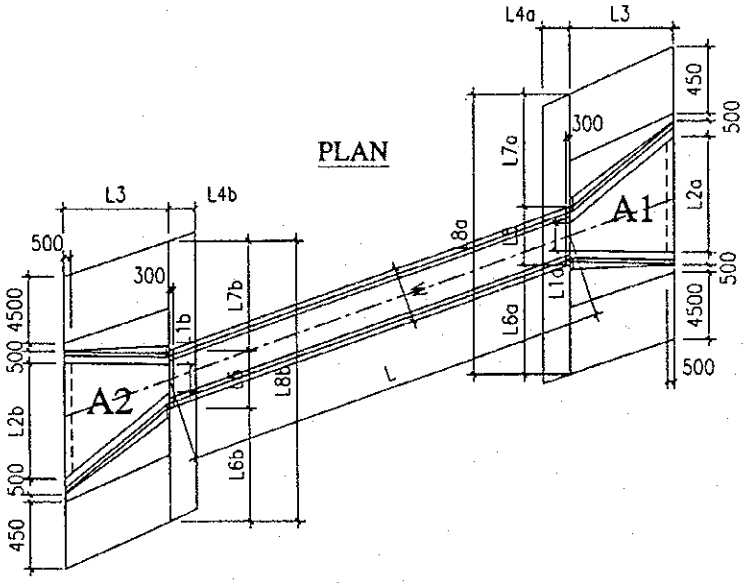


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

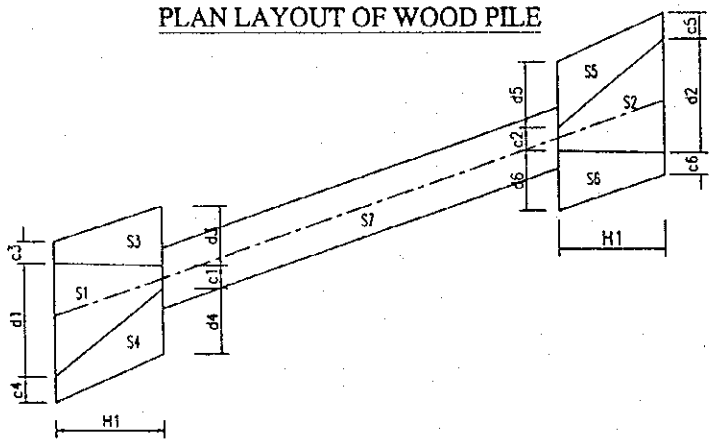
PROFILE



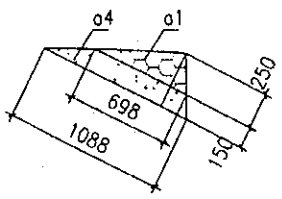
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

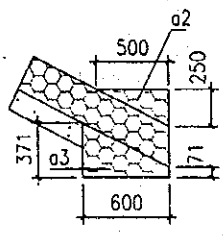


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM3+170

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	4.230	+	6.196	)	x	2.700	:	2	=	14.075	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	4.230	+	6.196	)	x	2.700	:	2	=	14.075	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S7=		L	x	(W + 0.2)	=							
=		27.188	x	6.100	=		165.847		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	4.516	+	6.336	)	x	2.500	:	2	=	13.565	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	4.516	+	6.336	)	x	2.500	:	2	=	13.565	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45 x 0.5	=	
=	(	13.565	+	13.565	)	x 0.3	+	(	6.336	+	6.336	) x 0.45 x 0.5	=	*10.99* (m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	27.188	x	6.100	x	0.2	=	*33.17* (m3)

3. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	)	x	0.1	=			
=	(	14.075	+	14.0751	+	4.625	+	4.625	+	4.625	+	4.625	)	x	0.1	=	4.67	(m3)	

4. WOOD PILE:

** L=5M*

W5=	(	S3	+	S4	+	S5	+	S6	+	S7	)	x 25 x 5 :100	=						
=	(	4.625	+	4.625	+	4.625	+	4.625	+	165.847	)	x 25 x 5 :100	=				230.43	(100m)	

** L=3M*

W3=	(	S1	+	S2	+	0	)	x 25 x 3 : 100	=										
=	(	14.075	+	14.0751	+	0.000	)	x 25 x 3 : 100	=								21.11	(100m)	

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	S7	) x 0.15 =						
=	(	14.075	+	14.075	+	4.625	+	4.625	+	4.625	+	4.625	+	165.847	) x 0.15 =				31.87		
																			(m3)		

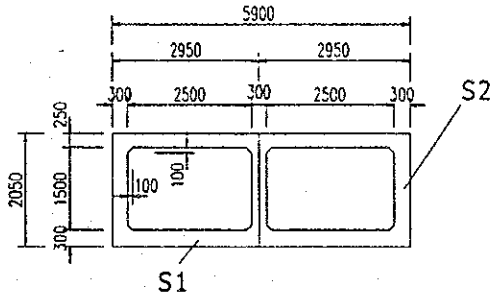
6. FORM

=	(L2a	+	L2b)	X 0.75	x	2	=		
	(6.336	+	6.336	X 0.75	x	2	=	19.008	(m2)

7. SCAFFOLDING

=	(L2a	+	L2b)	X 0.75	x	2	=		
	(6.336	+	6.336	X 0.75	x	2	=	19.008	(m2)

2.11. Box culvert at station 4+125

I	BOX CULVERT STATION 04+125		QUANTITIES
	L	= 14.390 + 14.390 + 0.02 = 28.800	
1	CULVERT		
+	CONCRETE (M3)		
	S1=S2	= 2.950 x 2.050 - 2.500 x 1.500 + 2 x 0.100 x 0.100 =	2.318
	S	= S1 + S2 =	4.635
	VOLUME	= S x (14.390 + 14.390) + 5.900 x 0.200 x 0.300 x 2 =	134.10
		DOUBLE BOX CULVERT	
			
+	FORM (M2)		451.47
*	INSIDE FORM (M2)		314.605
	BOX BULWARK	= (1.500 + 2 x 0.100 x (1:SIN45^0 - 1)) x 28.780 x 4 =	182.217
	BOTTOM OF THE BOX	= (2.500 - 0.100 x 2) x 28.780 x 2 =	132.388
*	OUTSIDE FORM (M2)		136.863
	BOX BULWARK	= 2.050 x 2 x 28.780 + 4 x 0.300 x 0.200 =	118.238
	THE END OF CULVERT	= S x 2 + 5.900 x 0.200 x 4 =	13.990
	CENTER	= S =	4.635
+	SCAFFOLDING (M2)	= 2.050 x 2.000 x 28.780 + 4.000 x 0.300 x 0.200 =	118.24
+	SUPPORT		
	AREA (M2)	= 5.900 x 1.500 - S =	4.215
	VOLUME (M3)	= AREA x L =	121.39

BOXCULVERT STATION 4+125
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1 & 2

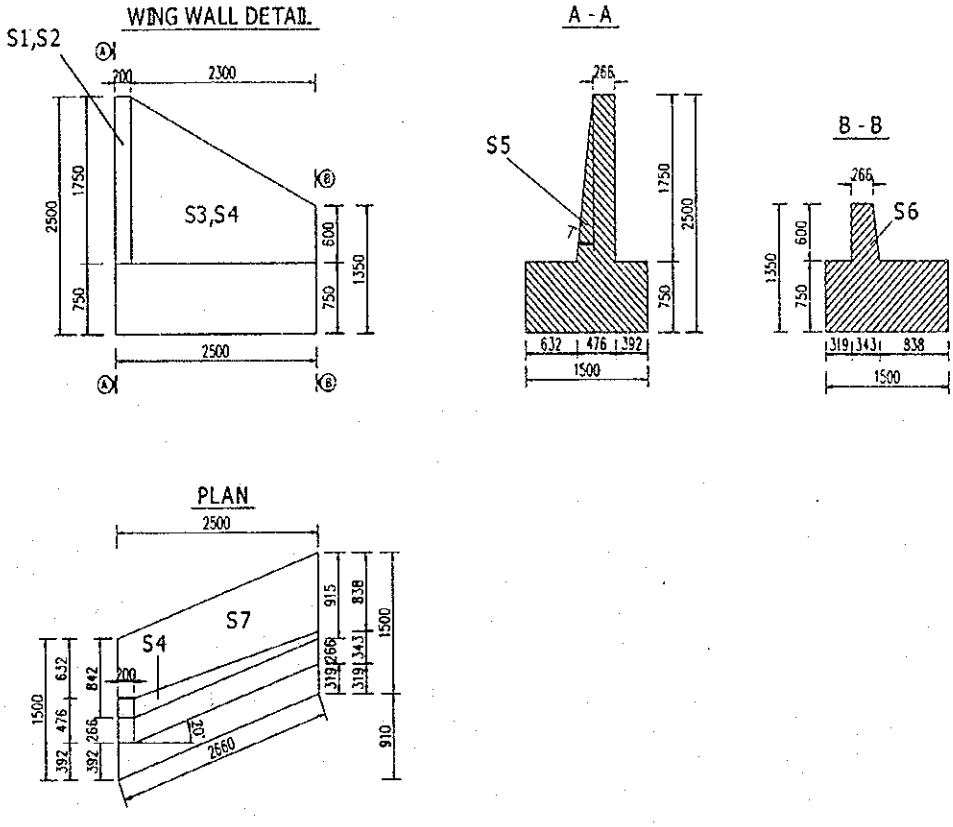
SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	3660	125	14	230	1.208	841.80	1017.2
2	2350	250	12	116	0.888	272.60	242.0
3	6270	250	14	116	1.208	727.32	878.9
4	1500	250	14	228	1.208	342.00	413.3
5	1550	125	18	230	1.998	356.50	712.1
6	1970	250	12	232	0.888	457.04	405.8
7	2350	125	12	230	0.888	540.50	479.9
8	1049	250	12	232	0.888	243.37	216.1
9	1120	250	12	232	0.888	259.84	230.7
10	14895	250	12	52	0.888	774.54	687.6
11	14995	250	12	88	0.888	1319.56	1171.5
12	5780	250	12	2	0.888	11.56	10.3
13	1440	250	12	26	0.888	37.44	33.2
14	1180	250	12	345	0.888	407.52	361.8

REINFORCEMENT :	D<=14	**6148.3**	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	**712.1**	REINFORCEMENT (KG): **6860.4**
REINFORCEMENT :	25<D=32		CONCRETE (M^3): **67.05**

TOTAL FOR SEGMENT 1 & 2

REINFORCEMENT :	D<=14	**12296.6**	REINFORCEMENT (KG) : **13720.9**
REINFORCEMENT :	16=D<=25	**1424.275**	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : **134.10**

2 WINGWALL

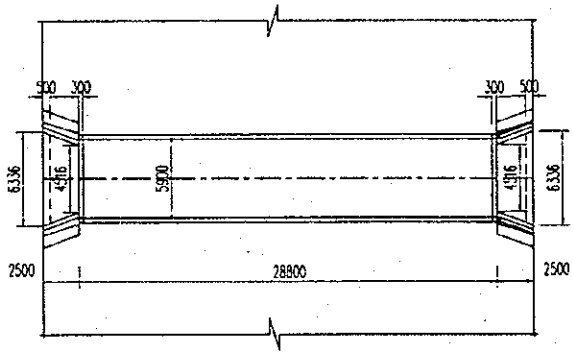


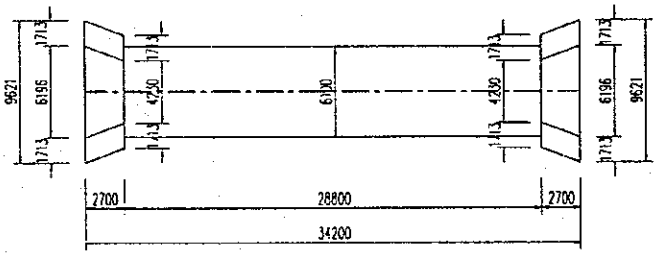
+	CONCRETE (M3)		
	S7	= (1.500 + 1.500) : 2 x 2.500	= 3.750
*	BASE OF THE WINGWALL	= S7 x 0.750	= 2.813
	S5	= (0.476 + 0.266) : 2 x 1.750	= 0.649
	S6	= (0.343 + 0.266) : 2 x 0.600	= 0.183
*	WINGWALL	= 2.500 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 0.980
	SUM		= 3.793
+	FORM (M2)		13.55
*	BASE OF THE WINGWALL		= 6.240
	BASE OF THE WINGWALL	= (2.660 + 1.500 + 1.5 + 2.660) x 0.750	= 6.240
*	WINGWALL		7.305
	S1+S2	= 0.200 x 1.750 x 2	= 0.700
	S3	= (1.750 + 0.600) x 2.300 : (2 x $COS20^0$)	= 2.876
	S4	= 2.876 : $COS7^0$	= 2.898
	S5	= 0.649	= 0.649
	S6	= 0.183	= 0.183
+	SCAFFOLDING (M2)		15.05
*	BASE OF THE WINGWALL		8.490
	PERIMETER	= 2.660 + 1.000 + 1.500 + 1.000 + 1.500 + 1.000 + 2.66	= 11.320
	AREA	= PERIMETER x 0.750	= 8.490
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	= 6.558

BOX CULVERT STATION 4+125
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	2011	12	15	0.888	30.2	26.8
1b	2060	14	15	1.208	30.9	37.3
2a	2651	12	6	0.888	15.9	14.1
2b	1552	12	12	0.888	18.6	16.5
2c	582	12	15	0.888	8.7	7.8
3	3005	12	2	0.888	6.0	5.3
4	3378	12	16	0.888	54.0	48.0
5a	3824	12	11	0.888	42.1	37.3
5b	1867	12	4	0.888	7.5	6.6
5c	3248	20	11	2.466	35.7	88.1
5d	1291	20	4	2.466	5.2	12.7
6	2444	14	8	1.208	19.6	23.6
7	1814	12	4	0.888	7.3	6.4
8	1814	12	4	0.888	7.3	6.4
9	2554	12	4	0.888	10.2	9.1
10	1304	14	5	1.208	6.5	7.9
11	724	12	9	0.888	6.5	5.8
12	1791	12	1	0.888	1.8	1.6
		REINFORCEMENT :		D=<14		260.7 KG
		REINFORCEMENT :		14< D<=25		100.8 KG
		TOTAL REINFORCEMENT :				361.5 KG

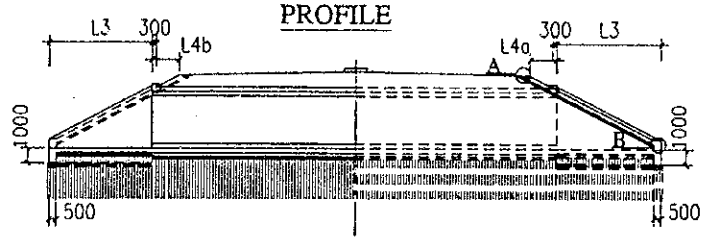
BOX CULVERT FOR DRAINAGE
(STATION 4+125)



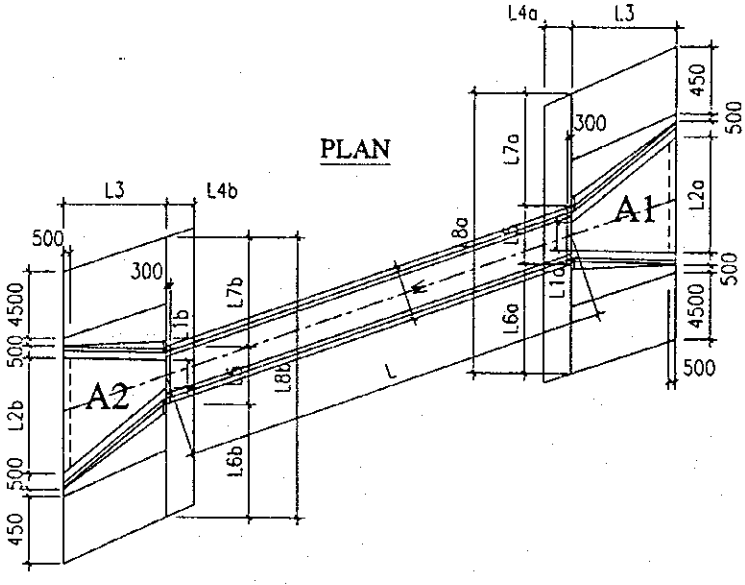


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

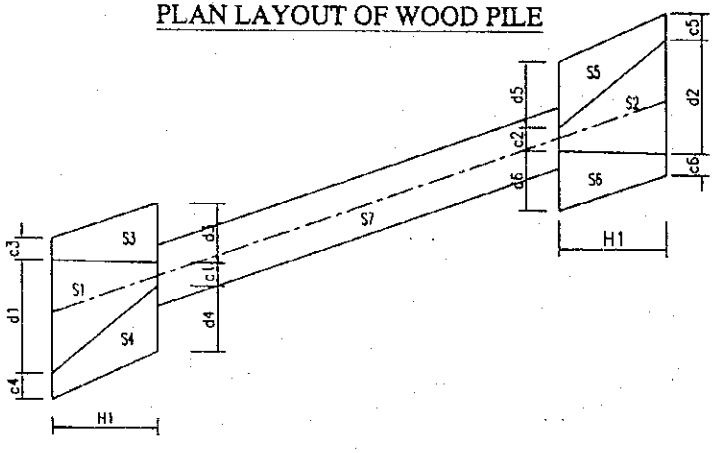
PROFILE



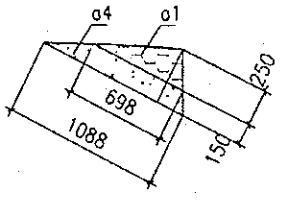
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

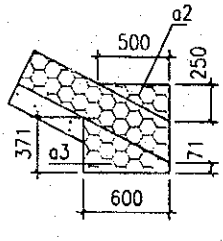


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM4+125

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	4.230	+	6.196	)	x	2.700	:	2	=	14.075	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	4.230	+	6.196	)	x	2.700	:	2	=	14.075	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S7=		L	x	(W + 0.2)	=							
=		28.800	x	6.100	=		175.680		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	4.516	+	6.336	)	x	2.500	:	2	=	13.565	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	4.516	+	6.336	)	x	2.500	:	2	=	13.565	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45 x 0.5	=		
=	(	13.565	+	13.565	)	x 0.3	+	(	6.336	+	6.336	) x 0.45 x 0.5	=	***10.99***	(m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	28.800	x	6.100	x	0.2	=	***35.14*** (m3)

3. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	)	x	0.1	=			
=	(	14.075	+	14.0751	+	4.625	+	4.625	+	4.625	+	4.625	)	x	0.1	=	4.67	(m3)	

4. WOOD PILE:

** L=5M*

W5=	(	S3	+	S4	+	S5	+	S6	+	S7	)	x 25 x 5 :100	=						
=	(	4.625	+	4.625	+	4.625	+	4.625	+	175.680	)	x 25 x 5 :100	=				242.73	(100m)	

** L=3M*

W3=	(	S1	+	S2	+	0	)	x 25 x 3 : 100	=										
=	(	14.075	+	14.0751	+	0.000	)	x 25 x 3 : 100	=								21.11	(100m)	

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	S7	) x 0.15 =								
=	(	14.075	+	14.075	+	4.625	+	4.625	+	4.625	+	4.625	+	175.680	) x 0.15 =							33.35	
																						(m3)	

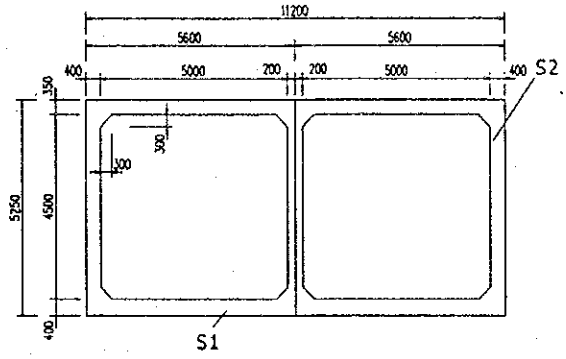
6.FORM

=	(L2a +	L2b)	)	X 0.75	x	2	=		
	(6.336 +	6.336	)	X 0.75	x	2	=	19.008	(m2)

7.SCAFFOLDING

=	(L2a +	L2b)	)	X 0.75	x	2	=		
	(6.336 +	6.336	)	X 0.75	x	2	=	19.008	(m2)

2.12. Box culvert at station 4+318

I	BOX CULVERT STATION 04+318		QUANTITIES
	L	= 13.770 + 23.770 + 0.02 = 37.560	
1	CULVERT		
+	CONCRETE (M3)		
	S1	= 5.250 x 5.600 - 4.500 x 5.000 + 2 x 0.300 x 0.300 =	7.080
	S	= S1 + S2 =	14.160
	VOLUME	= S x (13.770 + 13.770) + 11.200 x 0.200 x 0.300 x 2 =	532.91
	DOUBLE BOX CULVERT		
+	FORM (M2)		1489.24
*	INSIDE FORM (M2)		1043.391
	BOX BULWARK	= (4.500 + 2 x 0.300 x (1:SIN45^0 - 1)) x 37.540 x 4 =	713.039
	BOTTOM OF THE BOX	= (5.000 - 0.300 x 2) x 37.540 x 2 =	330.352
*	OUTSIDE FORM (M2)		445.850
	BOX BULWARK	= 5.250 x 2 x 37.540 + 4 x 0.300 x 0.200 =	394.410
	THE END OF CULVERT	= S x 2 + 11.200 x 0.200 x 4 =	37.280
	CENTER	= S =	14.160
+	SCAFFOLDING (M2)	= 5.250 x 2.000 x 37.540 + 4.000 x 0.300 x 0.200 =	394.41
+	SUPPORT		
	AREA (M2)	= 10.500 x 5.000 - S =	38.340
	VOLUME (M3)	= AREA x L =	1440.05

BOXCULVERT STATION 4+318
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	8270	125	20	382	2.466	3159.14	7790.9
2	5670	250	16	192	1.578	1088.64	1718.2
3	11760	250	20	192	2.466	2257.92	5568.4
4	3000	250	22	380	2.984	1140.00	3401.8
5	2900	125	25	382	3.853	1107.80	4268.7
6	3220	250	12	384	0.888	1236.48	1097.8
7	5740	125	18	192	1.998	1102.08	2201.5
8	1284	250	12	384	0.888	493.06	437.7
9	1355	250	12	384	0.888	520.32	461.9
10	24415	250	12	92	0.888	2246.18	1994.2
11	24515	250	12	200	0.888	4903.00	4352.9
12	11060	250	12	2	0.888	22.12	19.6
13	1560	250	12	46	0.888	71.76	63.7
14	1340	250	12	856	0.888	1146.66	1018.0
15	1440	250	12	856	0.888	1232.24	1094.0

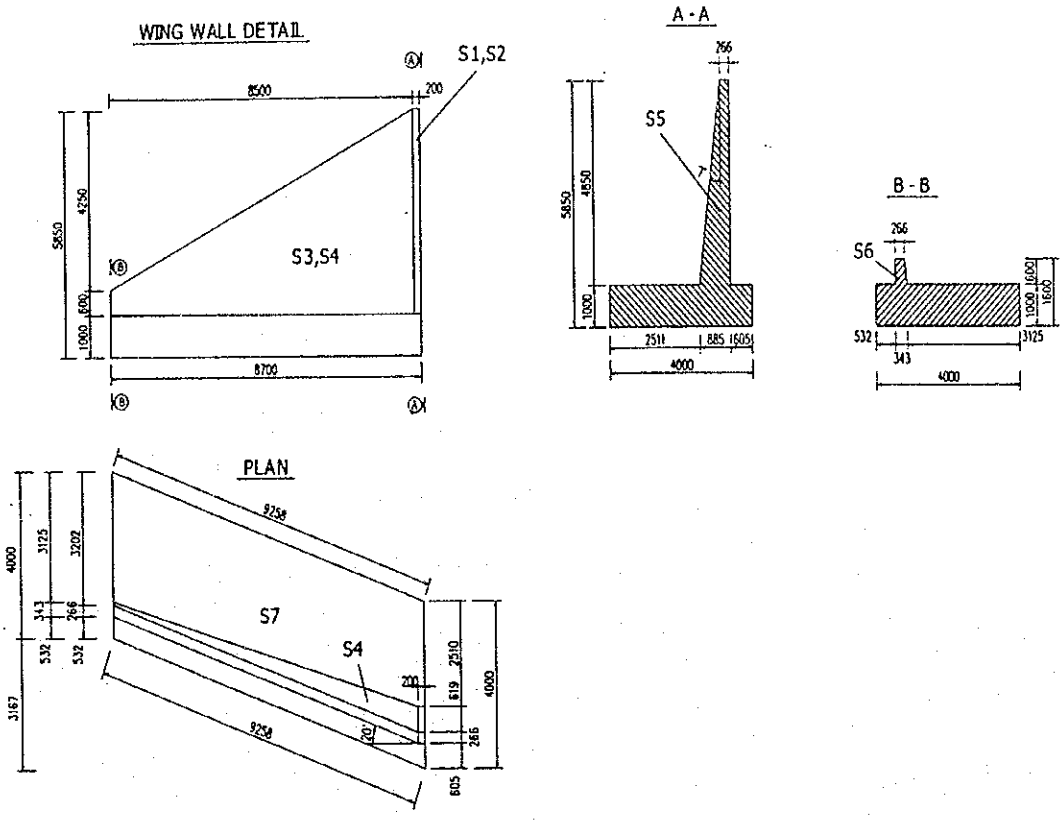
REINFORCEMENT : D<=14	10540.0	TOTAL FOR SEGMENT 1 :	
REINFORCEMENT : 16=D<=25	24949.6	REINFORCEMENT (KG):	35489.5
REINFORCEMENT : 25<D=32		CONCRETE (M^3):	337.26

SEGMENT 2

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	8270	125	22	222	2.984	1835.94	5478.5
2	5670	250	16	112	1.578	635.04	1002.3
3	11760	250	20	112	2.466	1317.12	3248.2
4	3000	250	22	220	2.984	660.00	1969.5
5	2900	125	25	222	3.853	643.80	2480.8
6	3220	250	12	224	0.888	721.28	640.4
7	5740	125	18	112	1.998	642.88	1284.2
8	1284	250	12	224	0.888	287.62	255.3
9	1355	250	12	224	0.888	303.52	269.5
10	14415	250	12	92	0.888	1326.18	1177.4
11	14515	250	12	200	0.888	2903.00	2577.3
12	11060	250	12	2	0.888	22.12	19.6
13	1560	250	12	46	0.888	71.76	63.7
14	1340	250	12	495.72	0.888	664.26	589.7
15	1440	250	12	495.72	0.888	713.84	633.8
16	2086		12	2	0.888	4.17	3.7

REINFORCEMENT : D<=14	6226.7	TOTAL FOR SEGMENT 2 :	
REINFORCEMENT : 16=D<=25	15463.5	REINFORCEMENT (KG):	21690.2
REINFORCEMENT : 25<D=32		CONCRETE (M^3):	195.66
TOTAL FOR SEGMENT 1 & 2			
REINFORCEMENT : D<=14	16766.7	REINFORCEMENT (KG) :	57179.8
REINFORCEMENT : 16=D<=25	40413.1		
REINFORCEMENT : 25<D=32		CONCRETE (M^3) :	532.91

2 WINGWALL

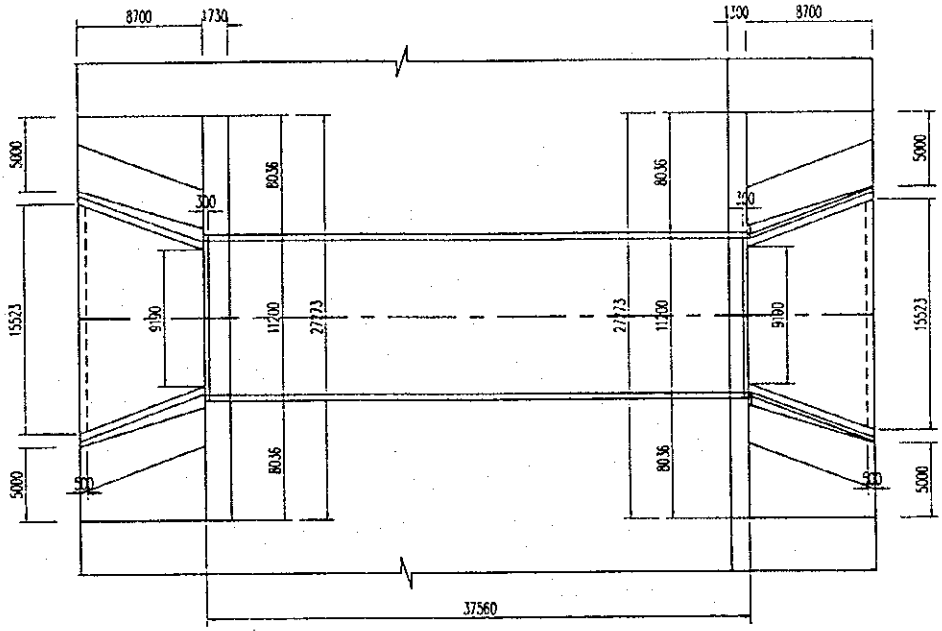


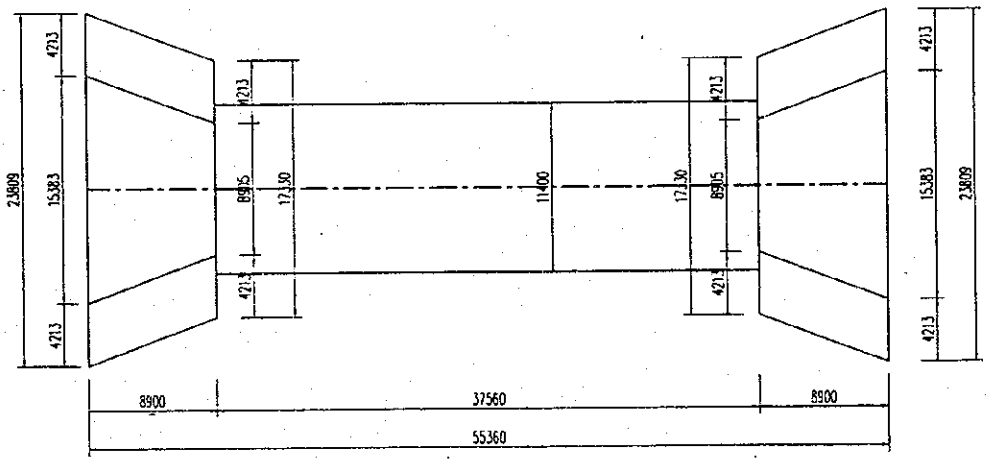
+	CONCRETE (M3)		
	S7	= (4.000 + 4.000) : 2 x 8.700	= 34.800
*	BASE OF THE WINGWALL	= S7 x 1.000	= 34.800
	S5	= (0.885 + 0.266) : 2 x 4.850	= 2.791
	S6	= (0.343 + 0.266) : 2 x 0.600	= 0.183
*	WINGWALL	= 8.700 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 10.695
	SUM		= <u>45.50</u>
+	FORM (M2)		<u>80.913</u>
*	BASE OF THE WINGWALL		= 26.516
	BASE OF THE WINGWALL	= (4.000 + 9.258 + 9.258 + 4.000) x 1.000	= 26.516
*	WINGWALL		54.397
	S1+S2	= 0.200 x 4.850 x 2	= 1.940
	S3	= (4.850 + 0.600) x 8.500 : (2 x $COS20^0$)	= 24.649
	S4	= 24.649 : $COS7^0$	= 24.834
	S5	= 2.791	= 2.791
	S6	= 0.183	= 0.183
+	SCAFFOLDING (M2)		<u>79.620</u>
*	BASE OF THE WINGWALL		29.516
	PERIMETER	= 4.000 + 1.000 + 9.258 + 1.000 + 9.258 + 1.000 + 4	= 29.516
	AREA	= PERIMETER x 1.000	= 29.516
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	= 50.104

BOX CULVERT STATION 4+318
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3808	12	48	0.888	182.8	162.3
1b	3952	18	48	1.998	189.7	378.9
2a	9267	12	6	0.888	55.6	49.4
2b	4914	12	42	0.888	206.4	183.2
2c	582	12	48	0.888	27.9	24.8
3	10213	12	2	0.888	20.4	18.1
4	10213	12	38	0.888	388.1	344.6
5a	5423	12	39	0.888	211.5	187.8
5b	3516	12	12	0.888	42.2	37.5
5c	4417	22	39	2.984	172.3	514.0
5d	2510	22	12	2.984	30.1	89.9
6	2944	14	87	1.208	256.1	309.5
7	4301	12	4	0.888	17.2	15.3
8	4301	12	6	0.888	25.8	22.9
9	9139	12	6	0.888	54.8	48.7
10	1304	14	16	1.208	20.9	25.2
11	906	12	24	0.888	21.7	19.3
12	3177	12	3	0.888	9.5	8.5
REINFORCEMENT : D=<14					**1456.9** KG	
REINFORCEMENT : 14< D<=25					**982.8** KG	
TOTAL REINFORCEMENT :					**2439.7** KG	

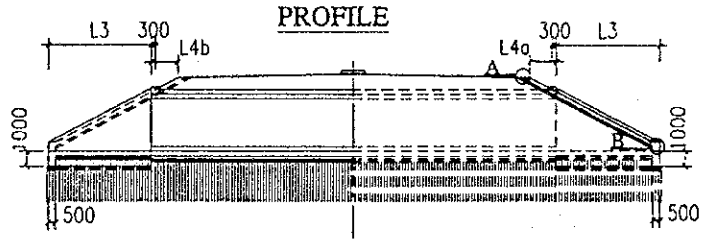
BOX CULVERT FOR DRAINAGE
(STATION 4+318)



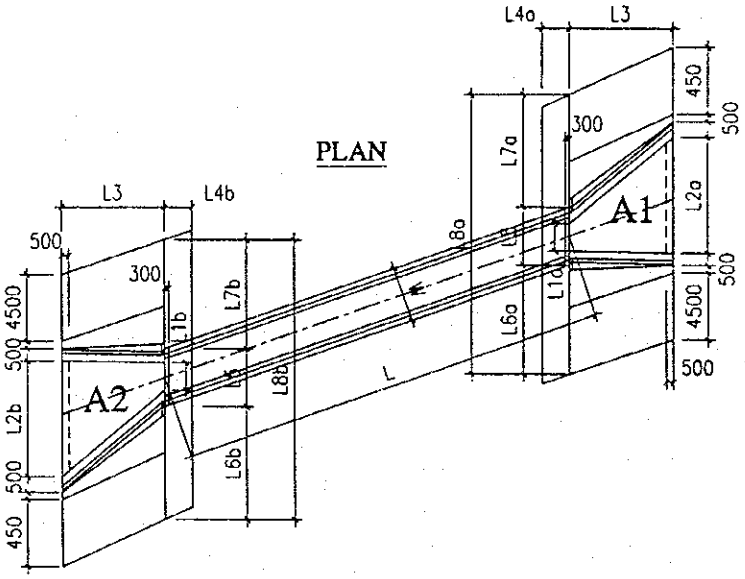


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

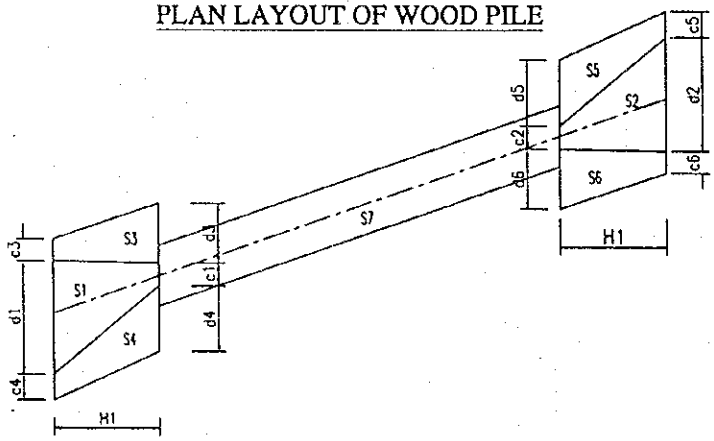
PROFILE



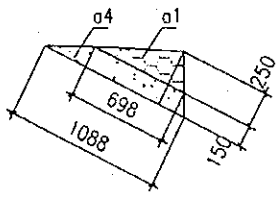
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

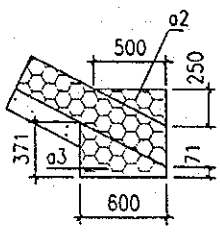


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM4+318

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	8.905	+	15.383	)	x	8.900	:	2	=	108.082	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	8.905	+	15.383	)	x	8.900	:	2	=	108.082	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	4.213	+	4.213	)	x	8.900	:	2	=	37.496	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	4.213	+	4.213	)	x	8.900	:	2	=	37.496	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	4.213	+	4.213	)	x	8.900	:	2	=	37.496	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	4.213	+	4.213	)	x	8.900	:	2	=	37.496	(m2)
S7=		L	x	(W + 0.2)	=							
=		37.56	x	11.400	=		428.184		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	9.190	+	15.523	)	x	8.700	:	2	=	107.502	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	9.190	+	15.523	)	x	8.700	:	2	=	107.502	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.7 x 0.5	=	
=	(	107.502	+	107.502	)	x 0.3	+	(	15.523	+	15.523	) x 0.7 x 0.5	=	75.37 (m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	37.560	x	11.400	x	0.2	=	85.64 (m3)

3. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	)	x	0.1	=			
=	(	108.082	+	108.0816	+	37.496	+	37.496	+	37.496	+	37.496	)	x	0.1	=	***36.61***	(m3)	

4. WOOD PILE:

**** L=5M***

W5=	(	S3	+	S4	+	S5	+	S6	+	S7	)	x 25 x 5 :100	=						
=	(	37.496	+	37.496	+	37.496	+	37.496	+	428.184	)	x 25 x 5 :100	=		722.71	(100m)			

**** L=3M***

W3=	(	S1	+	S2	+	(0.8 x 4.5 x 4)	)	x 25 x 3 : 100	=										
=	(	108.082	+	108.0816	+	14.400	)	x 25 x 3 : 100	=		172.92	(100m)							

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	S7	+	(0.8 x 4.5 x 4)	)	x 0.15 =							
=	(	108.082	+	108.082	+	37.496	+	37.496	+	37.496	+	37.496	+	428.184	+	(0.8 x 4.5 x 4)	)	x 0.15 =	***121.31***	(m3)					

6. STONE MASONRY

a1=		0.695	x	0.25	x		0.5	=		0.087	(m2)								
a2=		0.5	x	0.25	x		0.5	=		0.063	(m2)								
a3=	(	0.071	+	0.371	)	x	0.5	x	0.6	=	0.133	(m2)							
a4=	(	0.698	+	1.088	)	x	0.5	x	0.15	=	0.134	(m2)							

b1=	0.300	x	L5	=	0.300	x	11.200	=	3.360	(m2)	(b1 IS AREA OF HEAD WALL)

b2a= (L6a + 5.000) x L3 x 0.5 =
= (8.036 + 5.000) x 8.700 x 0.5 = 56.7066 (m2)

b2b= (L6b + 5.000) x L3 x 0.5 =
= (8.036 + 5.000) x 8.700 x 0.5 = 56.7066 (m2)

b3a= (L7a + 5.000) x L3 x 0.5 =
= (8.036 + 5.000) x 8.700 x 0.5 = 56.7066 (m2)

b3b= (L7b + 5.000) x L3 x 0.5 =
= (8.036 + 5.000) x 8.700 x 0.5 = 56.7066 (m2)

b4a= L8a x L4a = 27.273 x 1.300 = 35.455 (m2)

b4b= L8b x L4b = 27.273 x 1.730 = 47.182 (m2)

b5= 0.6 x 5 x 2 = 6.000 (m2)

V1a= a1 x L8a = 0.087 x 27.273 = 2.369 (m3)

V1b= a1 x L8b = 0.087 x 27.273 = 2.369 (m3)

V2= (a2 + a3) x 5 x 4 = (0.063 + 0.133) x 5 x 4 = 3.902 (m3)

V3a= (b4a - b1 + b2a + b3a) x 0.25 : COS(26.56) =
= (35.455 - 3.360 + 56.7066 + 56.7066) x 0.25 : 0.894 = 40.690 (m3)

V3b= (b4b - b1 + b2b + b3b) x 0.25 : COS(26.56) =
= (47.182 - 3.360 + 56.7066 + 56.7066) x 0.25 : 0.894 = 43.970 (m3)

TOTAL = (V1a + V1b + V2 + V3a + V3b) =
(2.369 + 2.369 + 3.902 + 40.690 + 43.970) = 93.301 (m3)

6. BASE BEDDING:

V4a=		a4	x	L8a			=	0.134	x	27.273			=	3.653	(m3)			
V4b=		a4	x	L8b			=	0.134	x	27.273			=	3.653	(m3)			
V5a =	(	b4a	-	b1	+	b2a	+	b3a	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	35.455	-	3.360	+	56.7066	+	56.7066	-	6.000	)	x	0.15	:	0.894	=	23.407	(m3)
V5b=	(	b4b	-	b1	+	b2b	+	b3b	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	47.182	-	3.360	+	56.7066	+	56.7066	-	6.000	)	x	0.15	:	0.894	=	25.375	(m3)
TOTAL =			(	V4a	+	V4b	+	V5a	+	V5b	)=							
			(	3.653	+	3.653	+	23.407	+	25.375	)=	***56.09***		(m3)				

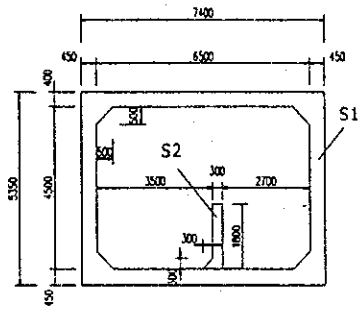
8. FORM :

=	(L2a	+	L2b)	)	X 1	x	2	=	
	(15.523	+	15.523	)	X 1	x	2	=	**62.092** (m2)

9. SCAFFOLDING :

=	(L2a	+	L2b)	)	X 1	x	2	=	
	(15.523	+	15.523	)	X 1	x	2	=	**62.092** (m2)

2.13. Box culvert at station 4+640

I	BOX CULVERT STATION 4+640		QUANTITIES
	L	= 15.123 + 23.493 + 0.02 = 38.636	
1	CULVERT		
+	CONCRETE (M3)		
	S1	= 7.400 x 5.350 - 4.500 x 6.500 + 2 x 0.500 x 0.500 =	10.840
	S2	= 1.800 x 0.300 + 0.300 x 0.300 : 2 =	0.585
	S	= S1 + S2 =	11.425
	VOLUME	= S x (15.123 + 23.493) + 7.400 x 0.200 x 0.300 x 2 =	442.08
		SINGLE BOX CULVERT 	
+	FORM (M2)		1120.67
*	INSIDE FORM (M2)		664.674
	BOX BULWARK	= (4.500 + 2 x 0.500 x (1:SIN45^0 - 1)) x 38.616 x 2 =	379.578
	BOTTOM OF THE BOX	= (6.500 - 0.500 x 2) x 38.616 x 1 =	212.388
	RETAINING WALL	= (1.800 + (1:SIN45^0 - 1) x 0.200) x 38.62 =	72.708
*	OUTSIDE FORM (M2)		455.995
	BOX BULWARK	= 5.350 x 2 x 38.616 + 4 x 0.300 x 0.200 =	413.431
	THE END OF CULVERT	= S x 2 : SIN65^0 + 7.400 x 0.200 x 4 =	31.139
	CENTER OF CULVERT	= S =	11.425
+	SCAFFOLDING (M2)	= 5.350 x 2.000 x 38.616 + 4.000 x 0.300 x 0.200 =	413.43
+	SUPPORT		
	AREA (M2)	= 7.400 x 5.350 - S =	28.165
	VOLUME (M3)	= AREA x L =	1088.18

BOXCULVERT STATION 04+640
QUANTITIES TABLE OF REINFORCEMENT

SEGMENT 1

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1a	9220	250	25	108	3.853	995.8	3837.0
1b	9635	250	25	15	3.853	144.5	556.9
2	5210	250	20	106	2.466	552.3	1362.0
3a	8349	250	25	53	3.853	442.5	1705.2
3b	9045	250	25	14	3.853	126.6	488.0
4a	8134	250	25	108	3.853	878.5	3385.1
4b	8885	250	25	15	3.853	133.3	513.6
5a	3970	250	12	108	0.888	428.8	380.7
5b	4380	250	12	30	0.888	131.4	116.7
6a	8217	250	20	53	2.466	435.5	1074.0
6b	8903	250	20	14	2.466	124.6	307.4
7	5770	250	16	123	1.578	709.7	1120.2
8a	1991	250	12	108	0.888	215.0	190.9
8b	2154	250	12	15	0.888	32.3	28.7
9a	2062	250	12	108	0.888	222.7	197.7
9b	2232	250	12	15	0.888	33.5	29.7
10	1660	250	12	30	0.888	49.8	44.2
11	8011	250	12	2	0.888	16.0	14.2
12	4800	250	12	60	0.888	288.0	255.7
13	1567	250	12	60	0.888	94.0	83.5
14	15868	250	12	60	0.888	952.1	845.2
15	14331	250	12	36	0.888	515.9	458.0
16	17605	250	12	36	0.888	633.8	562.7
17	15481	250	12	14	0.888	216.7	192.4
18	15968	250	12	60	0.888	958.1	850.6
19	1510	250	14	302	1.208	456.0	551.1
20	1540	250	12	302	0.888	465.1	412.9

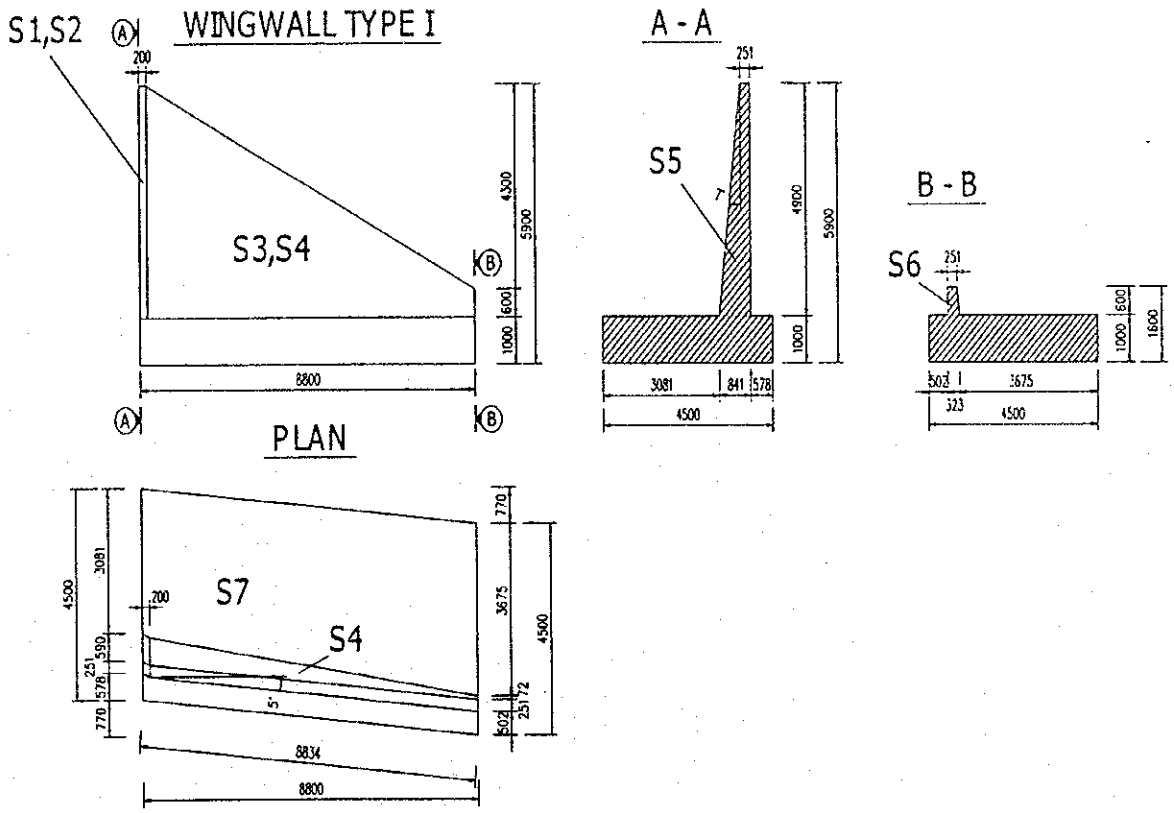
REINFORCEMENT : D<=14	5214.8	TOTAL FOR SEGMENT 1 :	
REINFORCEMENT : 16=D<=25	14349.1	REINFORCEMENT (KG):	19564.0
REINFORCEMENT : 25<D=32	0.0	CONCRETE (M^3):	173.22

SEGMENT 2

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1a	9220	250	25	176	3.853	1622.72	6252.9
1b	9635	250	25	15	3.853	144.52	556.9
2	5210	250	20	174	2.466	906.54	2235.7
3a	8349	250	25	87	3.853	726.40	2799.1
3b	9045	250	25	14	3.853	126.64	488.0
4a	8134	250	25	176	3.853	1431.58	5516.4
4b	8885	250	25	15	3.853	133.28	513.6
5a	3970	250	12	176	0.888	698.72	620.3
5b	4380	250	12	30	0.888	131.40	116.7
6a	8217	250	20	87	2.466	714.86	1763.0
6b	8903	250	20	14	2.466	124.64	307.4
7	5770	250	16	191	1.578	1102.07	1739.4
8a	1991	250	12	176	0.888	350.45	311.1
8b	2154	250	12	15	0.888	32.31	28.7
9a	2062	250	12	176	0.888	362.90	322.2
9b	2232	250	12	15	0.888	33.47	29.7
10	1660	250	12	30	0.888	49.80	44.2
11	8011	250	12	2	0.888	16.02	14.2
12	4800	250	12	94	0.888	451.20	400.6
13	1567	250	12	94	0.888	147.29	130.8
14	23873	250	12	60	0.888	1432.38	1271.7
15	22337	250	12	36	0.888	804.11	713.9
16	25610	250	12	36	0.888	921.94	818.5
17	23487	250	12	14	0.888	328.81	291.9
18	23353	250	12	60	0.888	1401.18	1244.0
19	1510	250	14	470	1.208	709.70	857.6
20	1540	250	12	470	0.888	723.80	642.6

REINFORCEMENT : D<=14	7858.7	TOTAL FOR SEGMENT 2 :	
REINFORCEMENT : 16=D<=25	22172.2	REINFORCEMENT (KG):	30030.9
REINFORCEMENT : 25<D=32	0.0	CONCRETE (M^3):	268.85
TOTAL FOR SEGMENT 1 & 2			
REINFORCEMENT : D<=14	13073.5	REINFORCEMENT (KG) :	49594.9
REINFORCEMENT : 16=D<=25	36521.4		
REINFORCEMENT : 25<D=32	0.0	CONCRETE (M^3) :	442.08

2 WINGWALL TYPE I

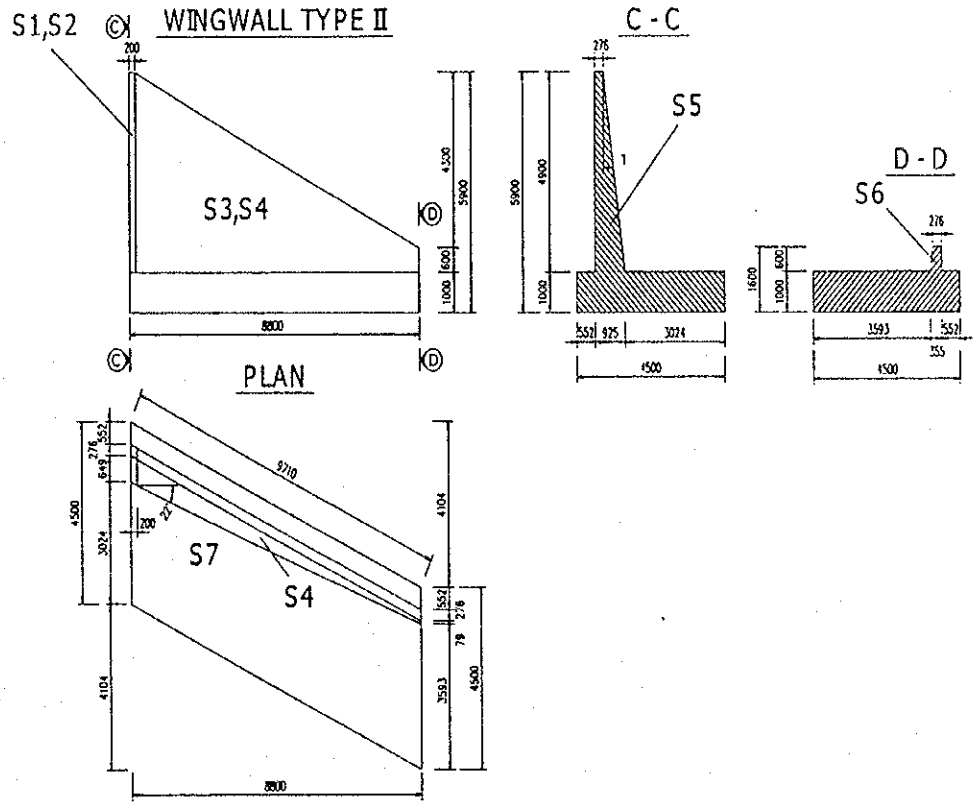


+	CONCRETE (M3)			
	S7	= (4.500 + 4.500) : 2 x 8.800	=	39.600
*	BASE OF THE WINGWALL	= S7 x 1.000	=	39.600
	S5	= (0.841 + 0.251) : 2 x 4.900	=	2.675
	S6	= (0.323 + 0.251) : 2 x 0.600	=	0.172
*	WINGWALL	= 8.800 : 3 x (S5 + S6 + (S5xS6)$^{0.5}$)	=	10.344
	SUM		=	49.94
+	FORM (M2)			73.04
*	BASE OF THE WINGWALL		=	26.668
	BASE OF THE WINGWALL	= (8.834 + 8.834 + 4.500 + 4.500) x 1.000	=	26.668
*	WINGWALL			46.371
	S1+S2	= 0.200 x 4.900 x 2	=	1.960
	S3	= (4.900 + 0.600) x 7.500 : (2 x COS5^{0})	=	20.704
	S4	= 20.704 : COS7^{0}	=	20.859
	S5	= 2.675	=	2.675
	S6	= 0.172	=	0.172
+	SCAFFOLDING (M2)			71.87
*	BASE OF THE WINGWALL			29.668
	PERIMETER	= 4.500 + 1.000 + 8.834 + 1.000 + 4.500 + 1.000 + 8.834	=	29.668
	AREA	= PERIMETER x 1.000	=	29.668
*	WINGWALL	= S3 x 2 + 0.600 x (0.323 + 1)	=	42.201

BOX CULVERT STATION 4+640
REINFORCEMENT OF WINGWALL TYPE I

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3849	12	45	0.888	173.2	153.8
1b	3980	18	45	1.998	179.1	357.8
2a	8963	12	6	0.888	53.8	47.7
2b	4897	12	42	0.888	205.7	182.6
2c	552	12	45	0.888	24.8	22.1
3	9917	12	2	0.888	19.8	17.6
4	9795	12	46	0.888	450.6	400.0
5a	6147	12	42	0.888	258.2	229.2
5b	3888	12	3	0.888	11.7	10.4
5c	5141	22	42	2.984	215.9	644.3
5d	2882	22	3	2.984	8.6	25.8
6	2944	14	112	1.208	329.7	398.4
7	4808	12	4	0.888	19.2	17.1
8	4808	12	6	0.888	28.8	25.6
9	8721	12	6	0.888	52.3	46.5
10	1304	14	16	1.208	20.9	25.2
11	871	12	24	0.888	20.9	18.5
12	2931	12	3	0.888	8.8	7.8
		REINFORCEMENT :		D=<14	1602.5 KG	
		REINFORCEMENT :		14< D<=25	1027.9 KG	
		TOTAL REINFORCEMENT :			2630.4 KG	

3 WINGWALL TYPE II

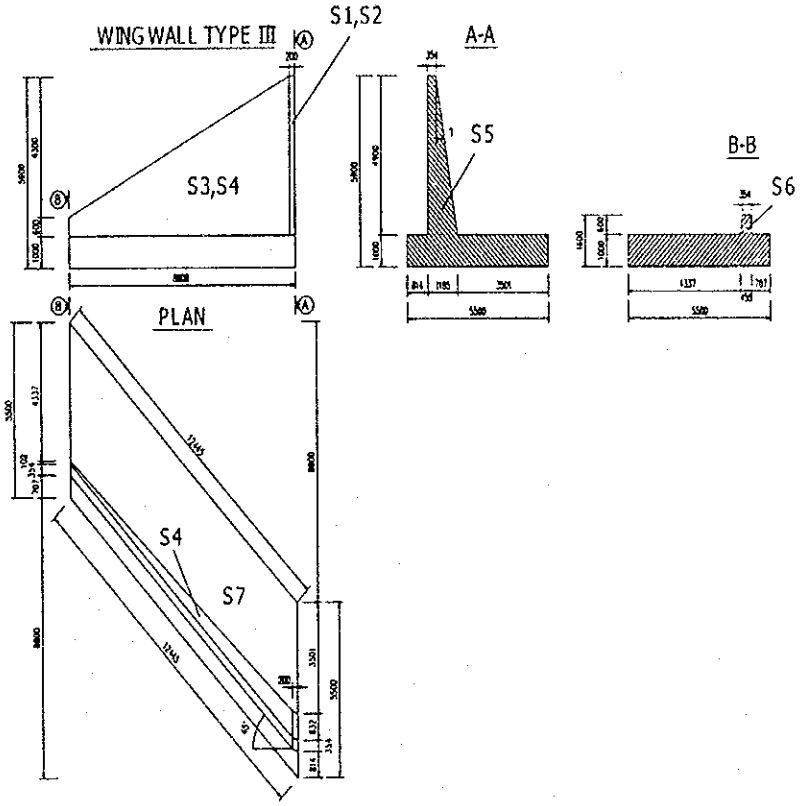


+	CONCRETE (M3)		
	S7	= (4.500 + 4.500) : 2 x 8.800	= 39.600
*	BASE OF THE WINGWALL	= S7 x 1.000	= 39.600
	S5	= (0.925 + 0.276) : 2 x 4.900	= 2.942
	S6	= (0.355 + 0.276) : 2 x 0.600	= 0.189
*	WINGWALL	= 8.800 : 3 x (S5 + S6 + (S5xS6)$^{0.5}$)	= 11.376
	SUM		= 50.98
+	FORM (M2)		84.10
*	BASE OF THE WINGWALL		= 28.420
	BASE OF THE WINGWALL	= (9.710 + 9.710 + 4.500 + 4.500) x 1.000	= 28.420
*	WINGWALL		55.682
	S1+S2	= 0.200 x 4.900 x 2 : COS15^0	= 2.029
	S3	= (4.900 + 0.600) x 8.600 : (2 x COS20^0)	= 25.166
	S4	= 25.166 : COS7^0	= 25.355
	S5	= 2.942	= 2.942
	S6	= 0.189	= 0.189
+	SCAFFOLDING (M2)		82.57
*	BASE OF THE WINGWALL		31.420
	PERIMETER	= 4.500 + 1.000 + 9.710 + 1.000 + 4.500 + 1.000 + 9.71	= 31.420
	AREA	= PERIMETER x 1.000	= 31.420
*	WINGWALL	= S3 x 2 + 0.600 x (0.355 + 1)	= 51.145

BOX CULVERT STATION 4+640
REINFORCEMENT OF WINGWALL TYPE II

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3850	12	49	0.888	188.6	167.5
1b	3986	18	49	1.998	195.3	390.2
2a	9823	12	6	0.888	58.9	52.3
2b	5358	12	42	0.888	225.0	199.8
2c	552	12	49	0.888	27.0	24.0
3	10861	12	2	0.888	21.7	19.3
4	10660	12	42	0.888	447.7	397.5
5a	5742	12	39	0.888	223.9	198.8
5b	3880	12	17	0.888	66.0	58.6
5c	4736	22	39	2.984	184.7	551.2
5d	2874	22	17	2.984	48.8	145.8
6	2944	14	103	1.208	303.2	366.4
7	4796	12	4	0.888	19.2	17.0
8	4796	12	6	0.888	28.8	25.5
9	9586	12	6	0.888	57.5	51.1
10	1304	14	16	1.208	20.9	25.2
11	927	12	24	0.888	22.2	19.7
12	3314	12	3	0.888	9.9	8.8
		REINFORCEMENT :		D=<14		**1631.6** KG
		REINFORCEMENT :		14< D<=25		**1087.1** KG
		TOTAL REINFORCEMENT :				2718.7 KG

4 WINGWALL TYPE III



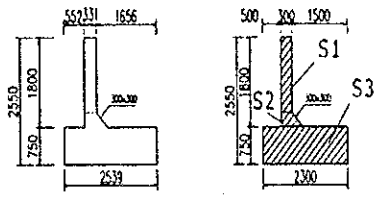
+	CONCRETE (M3)		
	S7	= (5.500 + 5.500) : 2 x 8.800	= 48.400
*	BASE OF THE WINGWALL	= S7 x 1.000	= 48.400
	S5	= (1.185 + 0.354) : 2 x 4.900	= 3.771
	S6	= (0.455 + 0.354) : 2 x 0.600	= 0.243
*	WING WALL	= 8.800 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 14.578
	SUM		= 62.98
+	FORM (M2)		99.01
*	BASE OF THE WINGWALL		= 25.890
	BASE OF THE WINGWALL	= (12.445 + 12.445 + 5.500 + 5.500) x 1.000	= 25.890
*	WING WALL		73.117
	S1+S2	= 0.200 x 4.900 x 2	= 1.960
	S3	= (4.900 + 0.600) x 8.600 : (2 x $COS45^0$)	= 33.446
	S4	= 33.446 : $COS7^{41}$	= 33.697
	S5	= 3.7706	= 3.771
	S6	= 0.2427	= 0.243
+	SCAFFOLDING (M2)		96.66
*	BASE OF THE WINGWALL		28.890
	PERIMETER	= 5.500 + 1.000 + 2.445 + 1.000 + 5.500 + 1.000 + 12.445	= 28.890
	AREA	= PERIMETER x 1.000	= 28.890
*	WINGWALL	= S3 x 2 + 0.600 x (0.455 + 1)	= 67.765

BOX CULVERT STATION 4+640
REINFORCEMENT OF WINGWALL TYPE III

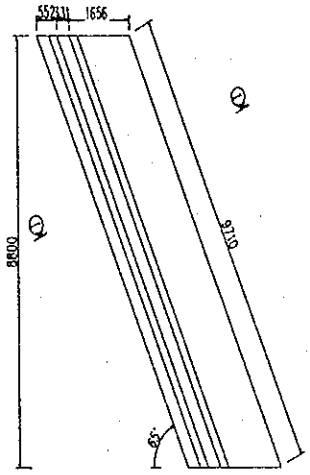
BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3851	12	62	0.888	238.7	211.9
1b	4007	18	62	1.998	248.4	496.2
2a	12873	12	6	0.888	77.2	68.6
2b1	6509	12	40	0.888	260.4	231.2
2b2	11293	12	2	0.888	22.6	20.1
2c	552	12	62	0.888	34.2	30.4
3	14176	12	2	0.888	28.4	25.2
4	13726	12	40	0.888	549.0	487.4
5a	5553	12	42	0.888	233.2	207.1
5b	3808	12	36	0.888	137.1	121.7
5c	4547	22	42	2.984	191.0	569.9
5d	2802	22	36	2.984	100.9	301.0
6	2944	14	145	1.208	426.9	515.8
7	5762	12	4	0.888	23.0	20.5
8	5762	12	6	0.888	34.6	30.7
9	12652	12	6	0.888	75.9	67.4
10	1304	14	16	1.208	20.9	25.2
11	1101	12	24	0.888	26.4	23.4
12	3425	12	4	0.888	13.7	12.2
REINFORCEMENT : D=<14						2098.7 KG
REINFORCEMENT : 14< D<=25						1367.1 KG
TOTAL REINFORCEMENT :						3465.8 KG

6 RETAINING WALL

RETAINING WALL I - I



PLAN

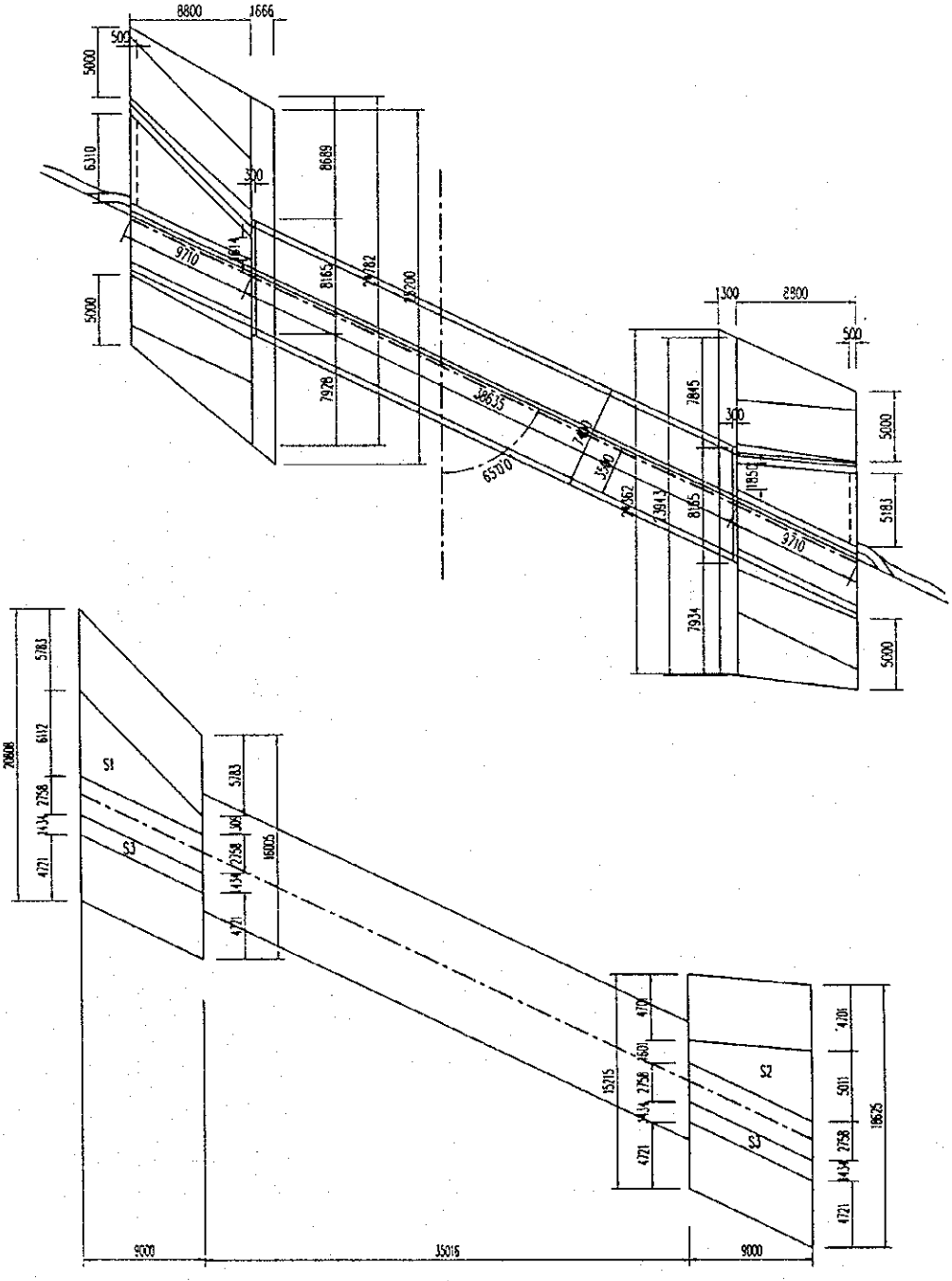


+	CONCRETE (M3)			
	S	= S1 + S2 + S3		2.310
	S1	= 0.300 x (1.800 - 0.300)	=	0.450
	S2	= (0.300 + 0.300 + 0.300) x 0.300 : 2.000	=	0.135
	S3	= 0.750 x 2.300	=	1.725
	VOLUME	= S x 9.710	=	22.43
+	FORM (M2)			54.89
	BASE OF RETAINING WAL	= 2.539 x 0.750 + 2 x 0.750 x 9.710	=	16.469
	RETAINING WALL	= (1.800 - 0.300) x 9.710 x 2 + (S1 : COS75^0)	=	30.869
	FOOT-RETAINING WALL	= 9.71 x 0.3 : SIN45^0 + (S2 : COS75^0) + 9.71 x 0.3	=	7.554
+	SCAFFOLDING (M2)			57.31
*	BASE OF RETAININGWALL			19.961
	PERIMETER	= 2.539 + 1.000 + 9.710 + 1.000 + 9.710 + 1.000 + 1.656	=	26.615
	AREA	= PERIMETER x 0.750	=	19.961
*	RETAININGWALL	= 2 x 9.710 x 1.800 + 1.800 x (0.331 + 1.000)	=	37.352

BOX CULVERT STATION 4+640
REINFORCEMENT OF RETAINING WALL

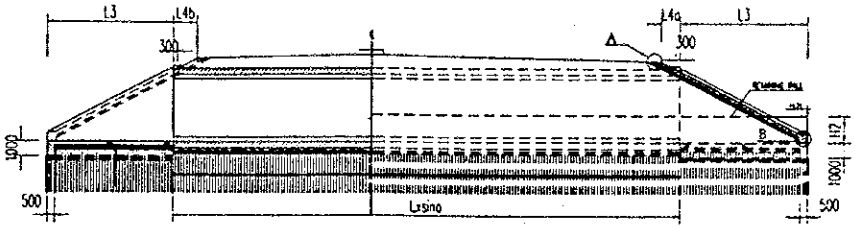
BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1	5484	12	49	0.888	268.7	238.6
2	9110	12	14	0.888	127.5	113.2
3	1402	12	49	0.888	68.7	61.0
4a	3073	12	88	0.888	270.4	240.1
4b	1964	12	16	0.888	31.4	27.9
5	10474	12	20	0.888	209.5	186.0
6	2444	14	48	1.208	117.3	141.8
7	2875	12	8	0.888	23.0	20.4
8	10046	12	4	0.888	40.2	35.7
		REIFORCEMENT		D<=14		**1064.6** KG
		REIFORCEMENT		14< D<=25		**0.0** KG
		TOTAL REINFORCEMENT :				**1064.6** KG

BOX CULVERT FOR PATH & DRAINAGE
(STATION KM 4+640)

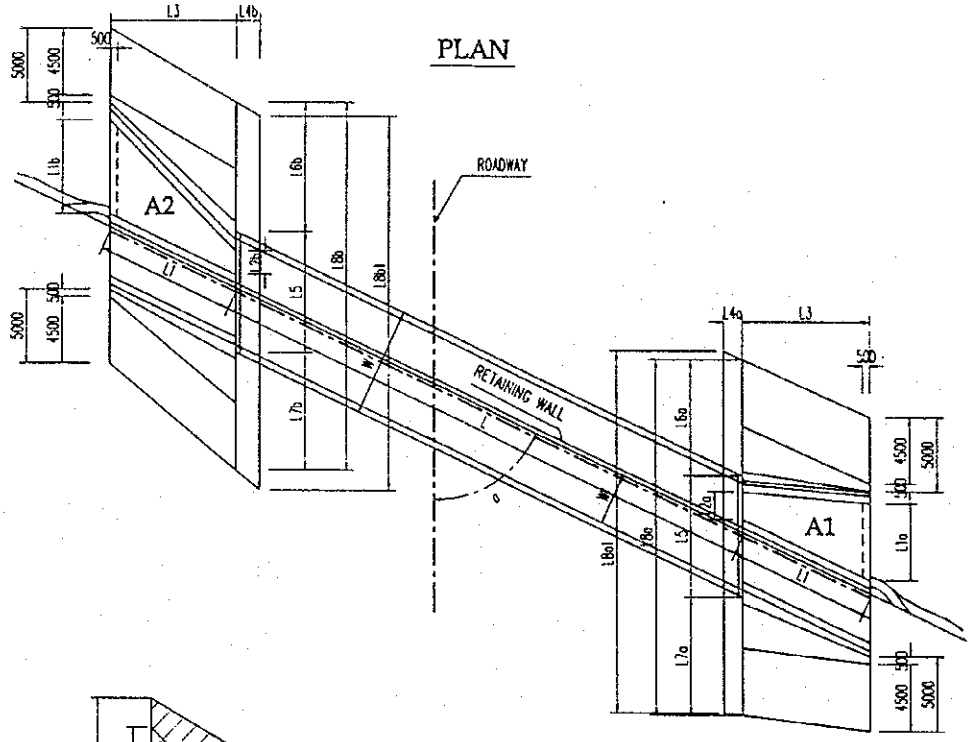


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR PATH & DRAINAGE

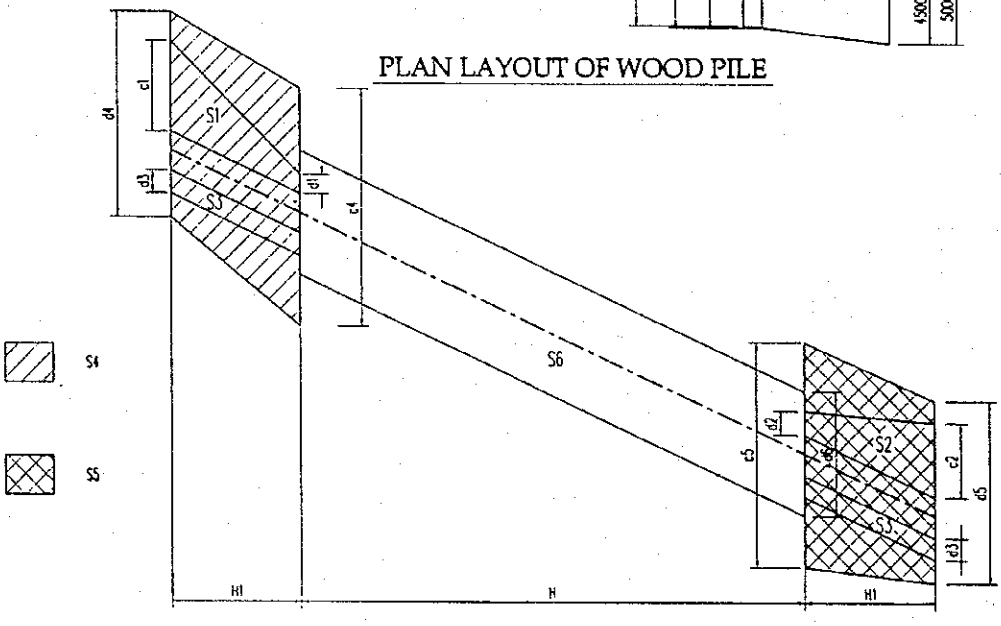
PROFILE



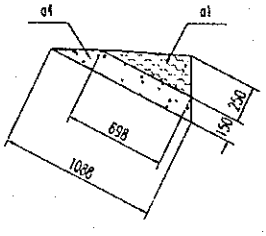
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

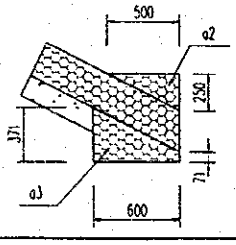


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM 4 + 640

S1=	(	c1	+	d1	)	x	H1	:	2	=		(m2)							
S1=	(	6.112	+	1.309	)	x	9.000	:	2	=	33.395	(m2)							
S2=	(	c2	+	d2	)	x	H1	:	2	=		(m2)							
S2=	(	5.011	+	1.601	)	x	9.000	:	2	=	29.754	(m2)							
S4=	(	c4	+	d4	)	x	H1	:	2	=		(m2)							
S4=	(	16.005	+	20.808	)	x	9.000	:	2	=	165.659	(m2)							
S5=	(	c5	+	d5	)	x	H1	:	2	=		(m2)							
S5=	(	15.215	+	18.625	)	x	9.000	:	2	=	152.280	(m2)							
S3=		d3	x	H1		=			(m2)										
S3=		1.434	x	9.000		=	12.906		(m2)										
S6=		H	x	d6		=			(m2)										
S6=		35.016	x	8.386		=	293.644		(m2)										

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2.00	=		(m2)							
A1=	(	5.183	+	1.850	)	x	8.800	:	2.00	=	30.945	(m2)							
A2=	(	L1b	+	L2b	)	x	L3	:	2.00	=		(m2)							
A2=	(	6.310	+	1.614	)	x	8.800	:	2.00	=	34.866	(m2)							
A =	(	A1	+	A2	)	x	t	+	(	0.700	x	0.500	) x	(	L1a	+	L1b	) =	
A =	(	30.945	+	34.866	)	x	0.300	+	(	0.700	x	0.500	) x	(	5.183	+	6.310	) =	23.766 (m3)

2. CONCRETE FOUNDATION OF CULVERT:

F =	L	x	(	w +0.2)	x	0.2 =	38.635	x	7.600	x	0.2	=	58.725	(m3)

3. LEAN CONRETE:

G =	(	S4	-	S3	+	S5	-	S3	)	x	0.100	=			
G =	(	165.659	-	12.906	+	152.280	-	12.906	)	x	0.100	=	29.213	(m3)	

4. WOOD PILE:

L=5M

W5=	(	S4	+	S5	+	S6	-	S1	-	S2	-	(2 x S3)	) x	(25 x 5 : 100)	=				
W5=	(	165.659	+	152.280	+	293.644	-	33.395	-	29.754	-	25.812	) x	1.250	=	653.278	(100m)		

L=3M

W3=	(	S1	+	S2	+	(2 x S3)	+	(0.8 x 4.5 x 4)	) x (25 x 3 : 100)	=							
W3=	(	33.395	+	29.754	+	25.812	+	14.400	) x 0.75	=	77.520	(100m)					

PROTECTION

W31=	(	S7	x	25.000	x	3.000	x	2.0	) :	100.000	=		(100m)				
	(	1.920	x	25.000	x	3.000	x	2.0	) :	100.000	=	2.880	(100m)				
TOTAL =		(	W3	+	W31	)	=	80.400	(100m)								

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

K =	(	S4	+	S5	+	S6	+	(0.8 x 4.5 x 4)	) x	0.150	=						
=	(	165.659	+	152.280	+	293.644	+	14.400	) x	0.150	=	93.897	(m3)				

PROTECTION

K1=	(	S7	x	0.150	x	2.000	)	=	(m3)								
	(	1.920	x	0.150	x	2.000	)	=	0.576	(m3)							
TOTAL =		(	K	+	K1	)	=	94.473	(m3)								

6. STONE MASONRY

a1=		0.698	x	0.250		x	0.500			=	0.087	(m2)					
a2=		0.500	x	0.250		x	0.500			=	0.063	(m2)					
a3=	(	0.071	+	0.371	)	x	0.500	x	0.600	=	0.133	(m2)					
a4=	(	0.698	+	1.088	)	x	0.500	x	0.150	=	0.134	(m2)					
b1=		0.300	x	L5	=		(m2)										
b1=		0.300	x	8.165	=	2.450	(m2)										

b2a=	(	L6a	+	5.000	)	x	L3	x	0.500	=		(m2)								
=	(	7.845	+	5.000	)	x	8.800	x	0.500	=	56.518	(m2)								
b2b=	(	L6b	+	5.000	)	x	L3	x	0.500	=		(m2)								
=	(	8.689	+	5.000	)	x	8.800	x	0.500	=	60.232	(m2)								
b3a=	(	L7a	+	5.000	)	x	L3	x	0.500	=		(m2)								
=	(	7.934	+	5.000	)	x	8.800	x	0.500	=	56.910	(m2)								
b3b=	(	L7b	+	5.000	)	x	L3	x	0.500	=		(m2)								
=	(	7.928	+	5.000	)	x	8.800	x	0.500	=	56.883	(m2)								
b4a=	(	L8a	+	L8a1	)	x	L4a	x	0.500	=		(m2)								
	(	23.943	+	24.362	)	x	1.300	x	0.500	=	31.398	(m2)								
b4b=	(	L8b	+	L8b1	)	x	L4b	x	0.500	=		(m2)								
	(	24.782	+	25.200	)	x	1.660	x	0.500	=	41.485	(m2)								
b5=	(	0.600	x	5.000	)	x	2.000			=	6.000	(m2)								
V1a=		a1	x	L8a1		=	0.087	x	24.362	=	2.126	(m3)								
V1b=		a1	x	L8b1		=	0.087	x	25.200	=	2.199	(m3)								
V2=	(	a2	+	a3	)	x	5.000	x	4.000	=		(m3)								
=	(	0.063	+	0.133	)	x	5.000	x	4.000	=	3.902	(m3)								
V3a=	(	b2a	+	b3a	+	b4a	-		b1	)	x	0.250	:	COS(26.565)	=		(m3)			
=	(	56.518	+	56.910	+	31.398	-		2.450	)	x	0.250	:	0.894	=	39.797	(m3)			
V3b=	(	b2b	+	b3b	+	b4b	-		b1	)	x	0.250	:	COS(26.565)	=		(m3)			
=	(	60.232	+	56.883	+	41.485	-		2.450	)	x	0.250	:	0.894	=	43.647	(m3)			
PROTECTION																				
V3c=	(	L9	x	0.600	x	0.600	x	2.0	)	+	(	S8	x	2.00 x 0.25	)	=				
	(	3.240	x	0.600	x	0.600	x	2.0	)	+	(	2.39	x	0.50	)	=	3.526	(m3)		
TOTAL =		(	V1a	+	V1b	+		V2		+	V3a	+	V3b	+	V3c	)	=		(m3)	
		(	2.126	+	2.199	+		3.902		+	39.797	+	43.647	+	3.526	)	=	95.195	(m3)	

7. BASE BEDDING:

V4a=		a4	x	L8a1			=	0.134	x	24.362						=	3.263	(m3)	
V4a=		a4	x	L8b1			=	0.134	x	25.200						=	3.376	(m3)	
V5a=	(	b2a	+	b3a	+	b4a	-	b1	-	b5	)	x	0.150	:	COS(26.565)	=			
=	(	56.518	+	56.910	+	31.398	-	2.450	-	6.000	)	x	0.150	:	0.894	=	22.872	(m3)	
V5b=	(	b2b	+	b3b	+	b4b	-	b1	-	b5	)	x	0.150	:	COS(26.565)	=			
=	(	60.232	+	56.883	+	41.485	-	2.450	-	6.000	)	x	0.150	:	0.894	=	25.182	(m3)	

PROTECTION

V5c=	(	S8	x	0.150	x	2.000	)	=	(m3)
	(	2.39	x	0.150	x	2.000	)	=	0.716 (m3)

TOTAL =	(	V4a	+	V4b	+	V5a	+	V5b	+	V5c	)	=		(m3)
	(	3.263	+	3.376	+	22.872	+	25.182	+	0.716	)	=	55.408	(m3)

8. PATH

a. LATERITE

M =	(	L	+	2 x L1	)	x	W1	x	0.400	=			
	(	38.635	+	19.420	)	x	3.500	x	0.400	=	81.277	(m3)	

b. SAND FILL

N =	(	L	+	2 x L1	)	x	W1	x	(	H2	-	0.400	)	=		(m3)
	(	38.635	+	19.420	)	x	3.500	x	(	1.800	-	0.400	)	=	284.470	(m3)

9. FORM :

=	(	L1a	+	L1b	)	x	1	x	2	=		
	(	5.183	+	6.310	)	x	1	x	2	=	22.986	(m2)

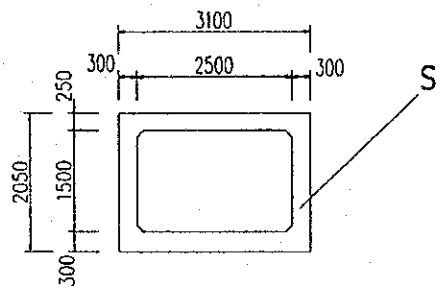
10. SCAFFOLDING :

=	(	L1a	+	L1b	)	x	1	x	2	=		
	(	5.183	+	6.310	)	x	1	x	2	=	22.986	(m2)

2.14. Box culvert at interchang 2 – ramp "A" – station 0+300

BOX CULVERT AT INTERCHANGE 2 0+300 RAMP A

I	BOX CULVERT STATION L = 0+300 RAMP A 10.120		QUANTITIES
1	CULVERT		
+	CONCRETE (M3)		
	S	= 3.100 x 2.050 - 2.500 x 1.500 + 2 x 0.100 x 0.100 =	2.625
	VOLUME	= S x L + 3.100 x 0.200 x 0.300 x 2 =	26.94
		SINGLE BOX CULVERT	
+	FORM (M2)		104.77
*	INSIDE FORM (M2)		55.313
	BOX BULWARK	= (1.500 + 2 x 0.100 x (1:SIN45^0 - 1)) x 10.120 x 2 =	32.037
	BOTTOM OF THE BOX	= (2.500 - 0.100 x 2) x 10.120 x 1 =	23.276
*	OUTSIDE FORM (M2)		49.462
	BOX BULWARK	= 2.050 x 2 x 10.120 + 4 x 0.300 x 0.200 =	41.732
	THE END OF CULVERT	= S x 2 + 3.100 x 0.200 x 4 =	7.730
+	SCAFFOLDING (M2)	= 2.050 x 2.000 x 10.120 + 4.000 x 0.300 x 0.200 =	41.73
+	SUPPORT		
	AREA (M2)	= 3.100 x 2.050 - S =	3.730
	VOLUME (M3)	= AREA x L =	37.75

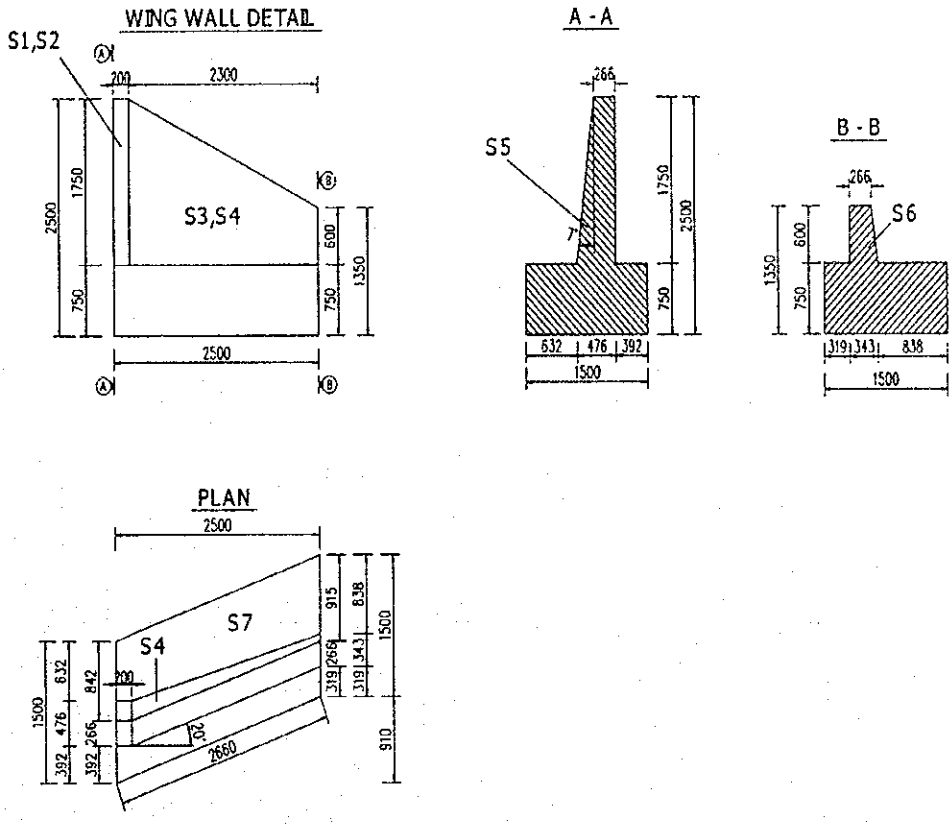


BOXCULVERT AT INTERCHANGE 2-RAMP "A" 0+300
QUANTITIES TABLE OF REINFORCEMENT

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	3660	250	12	82	0.888	300.12	266.5
2	1930	250	12	80	0.888	154.40	137.1
3	3648	250	16	40	1.578	145.92	230.3
4	3400	250	12	82	0.888	278.80	247.5
5	1970	250	12	82	0.888	161.54	143.4
6	5349	250	14	40	1.208	213.96	258.6
7	2350	250	12	82	0.888	192.70	171.1
8	1049	250	12	82	0.888	86.04	76.4
9	1120	250	12	82	0.888	91.84	81.5
10	1440	250	12	28	0.888	40.32	35.8
11	2980	180	12	4	0.888	11.92	10.6
12	10260	250	12	28	0.888	287.28	255.1
13	10360	250	12	52	0.888	538.72	478.3
14	1180	250	12	121	0.888	142.78	126.8
15	1280	250	12	121	0.888	154.88	137.5

REINFORCEMENT : D<=14	2426.0	TOTAL FOR SEGMENT 1 :	
REINFORCEMENT : 16=D<=25	230.3	REINFORCEMENT (KG):	2656.3
REINFORCEMENT : 25<D=32		CONCRETE (M^3):	26.94

2 WINGWALL

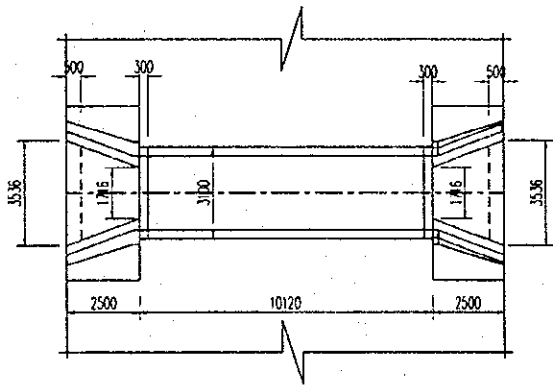


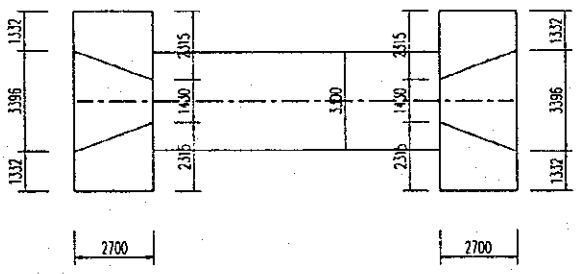
+	CONCRETE (M3)			
	S7	= (1.500 + 1.500) : 2 x 2.500	=	3.750
*	BASE OF THE WINGWALL	= S7 x 0.750	=	2.813
	S5	= (0.476 + 0.266) : 2 x 1.750	=	0.649
	S6	= (0.343 + 0.266) : 2 x 0.600	=	0.183
*	WINGWALL	= 2.500 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=	0.980
	SUM		=	3.79
+	FORM (M2)			13.55
*	BASE OF THE WINGWALL		=	6.240
	BASE OF THE WINGWALL	= (2.660 + 1.500 + 1.5 + 2.660) x 0.750	=	6.240
*	WINGWALL			7.305
	S1+S2	= 0.200 x 1.750 x 2	=	0.700
	S3	= (1.750 + 0.600) x 2.300 : (2 x $COS20^0$)	=	2.876
	S4	= 2.876 : $COS7^0$	=	2.898
	S5	= 0.649	=	0.649
	S6	= 0.183	=	0.183
+	SCAFFOLDING (M2)			15.05
*	BASE OF THE WINGWALL			8.490
	PERIMETER	= 2.660 + 1.000 + 1.500 + 1.000 + 1.500 + 1.000 + 2.66	=	11.320
	AREA	= PERIMETER x 0.750	=	8.490
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	=	6.558

BOX CULVERT AT INTERCHANG 2-RAMP "A" 0+300
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	2011	12	15	0.888	30.2	26.8
1b	2060	14	15	1.208	30.9	37.3
2a	2651	12	6	0.888	15.9	14.1
2b	1552	12	12	0.888	18.6	16.5
2c	582	12	15	0.888	8.7	7.8
3	3005	12	2	0.888	6.0	5.3
4	3378	12	16	0.888	54.0	48.0
5a	3824	12	11	0.888	42.1	37.3
5b	1867	12	4	0.888	7.5	6.6
5c	3248	20	11	2.466	35.7	88.1
5d	1291	20	4	2.466	5.2	12.7
6	2444	14	8	1.208	19.6	23.6
7	1814	12	4	0.888	7.3	6.4
8	1814	12	4	0.888	7.3	6.4
9	2554	12	4	0.888	10.2	9.1
10	1304	14	5	1.208	6.5	7.9
11	724	12	9	0.888	6.5	5.8
12	1791	12	1	0.888	1.8	1.6
REINFORCEMENT :			D=<14			260.7 KG
REINFORCEMENT :			14< D<=25			100.8 KG
TOTAL REINFORCEMENT :						361.5 KG

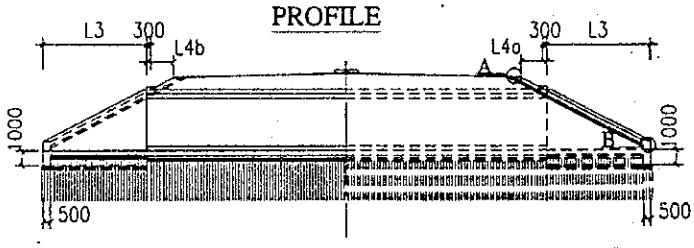
BOX CULVERT FOR DRAINAGE
(STATION 0+300 RAMP "A" INTERCHANGE 2)



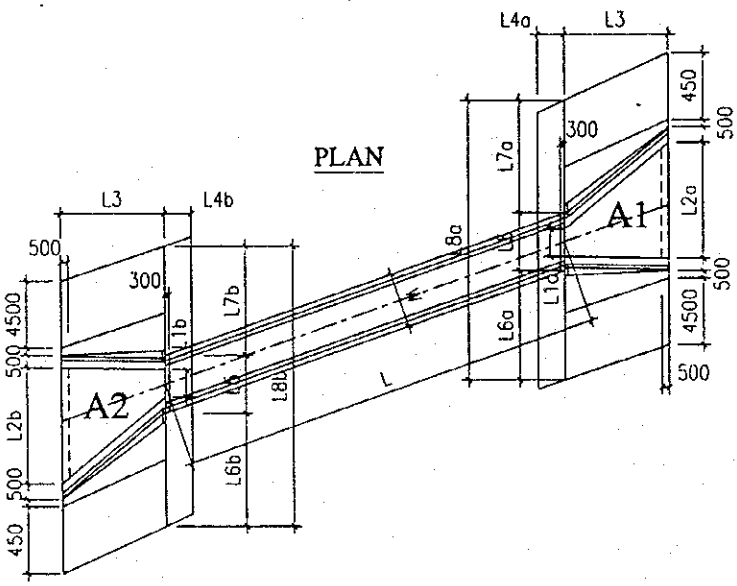


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

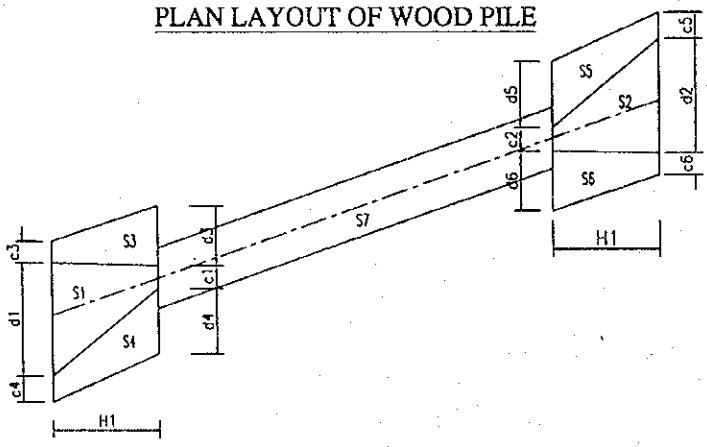
PROFILE



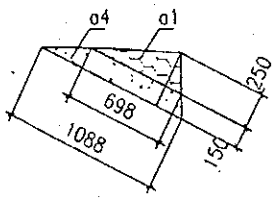
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

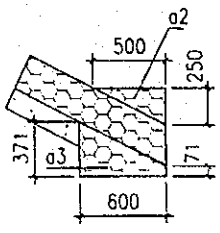


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM0+300 RAMP"A" INTERCHANGE 2

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	1.430	+	3.396	)	x	2.700	:	2	=	6.515	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	1.430	+	3.396	)	x	2.700	:	2	=	6.515	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S7=		L	x	(W + 0.2)	=							
=		10.120	x	3.300	=		33.396		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	1.716	+	3.536	)	x	2.500	:	2	=	6.565	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	1.716	+	3.536	)	x	2.500	:	2	=	6.565	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45 x 0.5	=			
=	(	6.565	+	6.565	)	x 0.3	+	(	3.536	+	3.536	) x 0.45 x 0.5	=	5.53	(m3)	

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	10.120	x	3.300	x	0.2	=	6.68 (m3)

3. LEAN CONCRETE:

= (S1 + S2 + S3 + S4 + S5 + S6) x 0.1 =
= (6.515 + 6.5151 + 4.625 + 4.625 + 4.625 + 4.625) x 0.1 = 3.15 (m3)

4. WOOD PILE:

L=5M
W5= (S3 + S4 + S5 + S6 + S7) x 25 x 5 :100 =
= (4.625 + 4.625 + 4.625 + 4.625 + 33.396) x 25 x 5 :100 = 64.87 (100m)

L=3M
W3= (S1 + S2 + 0) x 25 x 3 : 100 =
= (6.515 + 6.5151 + 0.000) x 25 x 3 : 100 = 9.77 (100m)

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

= (S1 + S2 + S3 + S4 + S5 + S6 + S7) x 0.15 =
= (6.515 + 6.515 + 4.625 + 4.625 + 4.625 + 4.625 + 33.396) x 0.15 = 9.74 (m3)

6. FORM

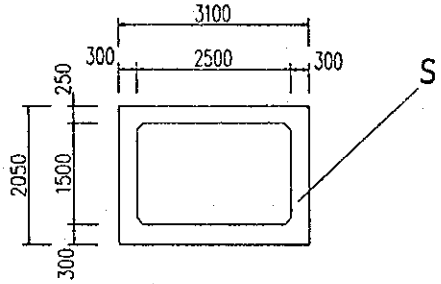
= (L2a + L2b) X 0.75 x 2 =
(3.536 + 3.536) X 0.75 x 2 = **10.608** (m2)

7. SCAFFOLDING

= (L2a + L2b) X 0.75 x 2 =
(3.536 + 3.536) X 0.75 x 2 = **10.608** (m2)

2.15. Box culvert at interchang 2 – ramp "B" – station 0+220

BOX CULVERT AT INTERCHANGE 2 0+220 RAMP B

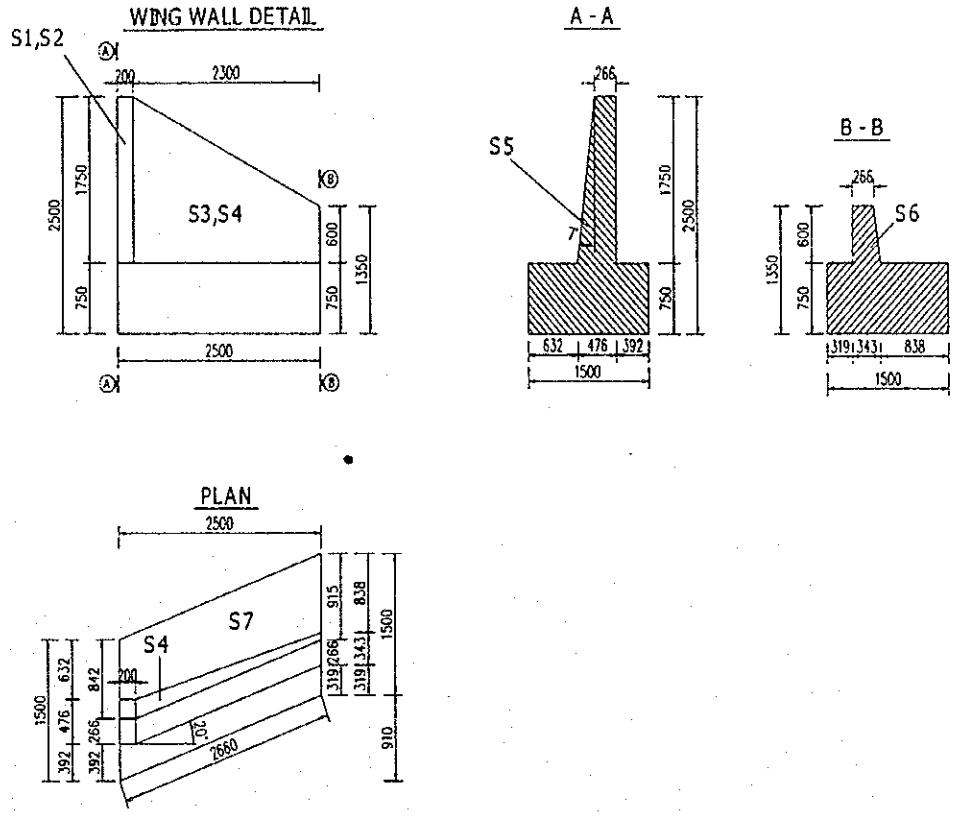
I	BOX CULVERT STATION 0+220 RAMP B L = 10.120		QUANTITIES
1	CULVERT		
+	CONCRETE (M3)		
	S	= 3.100 x 2.050 - 2.500 x 1.500 + 2 x 0.100 x 0.100 =	2.625
	VOLUME	= S x L + 3.100 x 0.200 x 0.300 x 2 =	26.94
	SINGLE BOX CULVERT		
+	FORM (M2)		104.77
*	INSIDE FORM (M2)		55.313
	BOX BULWARK	= (1.500 + 2 x 0.100 x (1:SIN45^0 - 1)) x 10.120 x 2 =	32.037
	BOTTOM OF THE BOX	= (2.500 - 0.100 x 2) x 10.120 x 1 =	23.276
*	OUTSIDE FORM (M2)		49.462
	BOX BULWARK	= 2.050 x 2 x 10.120 + 4 x 0.300 x 0.200 =	41.732
	THE END OF CULVERT	= S x 2 + 3.100 x 0.200 x 4 =	7.730
+	SCAFFOLDING (M2)	= 2.050 x 2.000 x 10.120 + 4.000 x 0.300 x 0.200 =	41.73
+	SUPPORT		
	AREA (M2)	= 3.100 x 2.050 - S =	3.730
	VOLUME (M3)	= AREA x L =	37.75

BOXCULVERT AT INTERCHANGE 2-RAMP "B" 0+220
QUANTITIES TABLE OF REINFORCEMENT

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	3660	250	12	82	0.888	300.12	266.5
2	1930	250	12	80	0.888	154.40	137.1
3	3648	250	16	40	1.578	145.92	230.3
4	3400	250	12	82	0.888	278.80	247.5
5	1970	250	12	82	0.888	161.54	143.4
6	5349	250	14	40	1.208	213.96	258.6
7	2350	250	12	82	0.888	192.70	171.1
8	1049	250	12	82	0.888	86.04	76.4
9	1120	250	12	82	0.888	91.84	81.5
10	1440	250	12	28	0.888	40.32	35.8
11	2980	180	12	4	0.888	11.92	10.6
12	10260	250	12	28	0.888	287.28	255.1
13	10360	250	12	52	0.888	538.72	478.3
14	1180	250	12	121	0.888	142.78	126.8
15	1280	250	12	121	0.888	154.88	137.5

REINFORCEMENT : D<=14	2426.0	TOTAL FOR SEGMENT 1 :	
REINFORCEMENT : 16=D<=25	230.3	REINFORCEMENT (KG):	2656.3
REINFORCEMENT : 25<D=32		CONCRETE (M^3):	26.94

2 WINGWALL

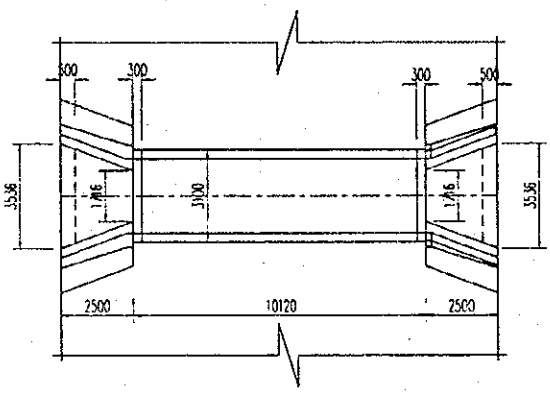


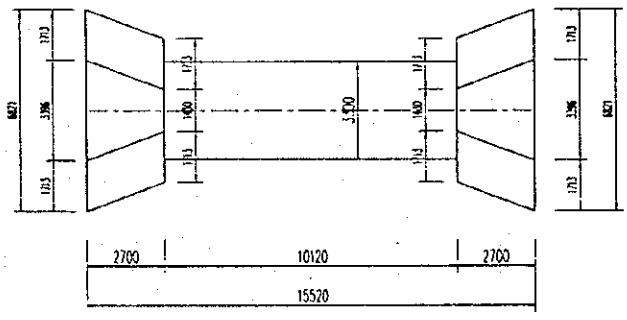
+	CONCRETE (M3)		
	S7	= (1.500 + 1.500) : 2 x 2.500	= 3.750
*	BASE OF THE WINGWALL	= S7 x 0.750	= 2.813
	S5	= (0.476 + 0.266) : 2 x 1.750	= 0.649
	S6	= (0.343 + 0.266) : 2 x 0.600	= 0.183
*	WINGWALL	= 2.500 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 0.980
	SUM		= 3.79
+	FORM (M2)		13.55
*	BASE OF THE WINGWALL		= 6.240
	BASE OF THE WINGWALL	= (2.660 + 1.500 + 1.5 + 2.660) x 0.750	= 6.240
*	WINGWALL		7.305
	S1+S2	= 0.200 x 1.750 x 2	= 0.700
	S3	= (1.750 + 0.600) x 2.300 : (2 x $COS20^{0}$)	= 2.876
	S4	= 2.876 : $COS7^{-0}$	= 2.898
	S5	= 0.649	= 0.649
	S6	= 0.183	= 0.183
+	SCAFFOLDING (M2)		15.05
*	BASE OF THE WINGWALL		8.490
	PERIMETER	= 2.660 + 1.000 + 1.500 + 1.000 + 1.500 + 1.000 + 2.66	= 11.320
	AREA	= PERIMETER x 0.750	= 8.490
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	= 6.558

BOX CULVERT AT INTERCHANG 2-RAMP "B" 0+220
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	2011	12	15	0.888	30.2	26.8
1b	2060	14	15	1.208	30.9	37.3
2a	2651	12	6	0.888	15.9	14.1
2b	1552	12	12	0.888	18.6	16.5
2c	582	12	15	0.888	8.7	7.8
3	3005	12	2	0.888	6.0	5.3
4	3378	12	16	0.888	54.0	48.0
5a	3824	12	11	0.888	42.1	37.3
5b	1867	12	4	0.888	7.5	6.6
5c	3248	20	11	2.466	35.7	88.1
5d	1291	20	4	2.466	5.2	12.7
6	2444	14	8	1.208	19.6	23.6
7	1814	12	4	0.888	7.3	6.4
8	1814	12	4	0.888	7.3	6.4
9	2554	12	4	0.888	10.2	9.1
10	1304	14	5	1.208	6.5	7.9
11	724	12	9	0.888	6.5	5.8
12	1791	12	1	0.888	1.8	1.6
		REINFORCEMENT :		D=<14		260.7 KG
		REINFORCEMENT :		14< D<=25		100.8 KG
		TOTAL REINFORCEMENT :				361.5 KG

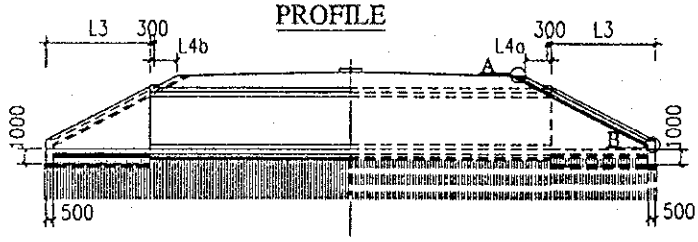
BOX CULVERT FOR DRAINAGE
(STATION 0+220 RAMP "B" INTERCHANGE 2)



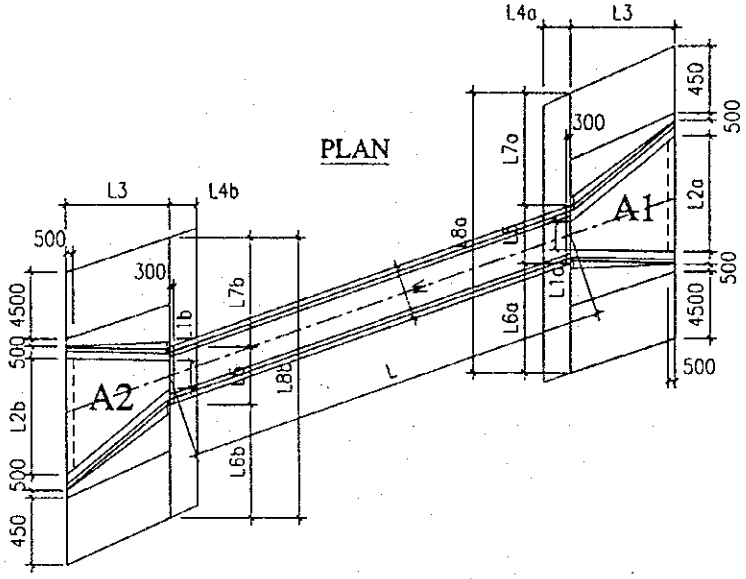


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

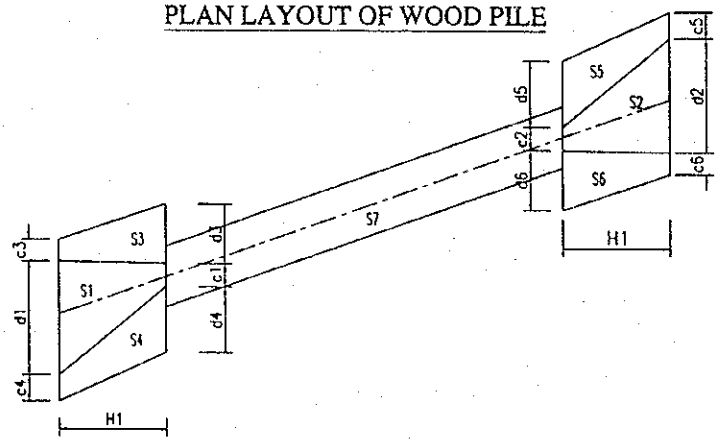
PROFILE



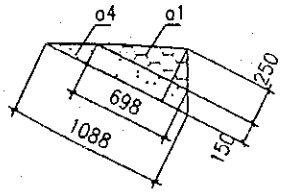
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

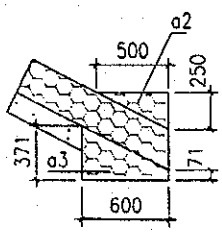


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM0+220 RAMP"B" INTERCHANGE 2

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	1.430	+	3.396	)	x	2.700	:	2	=	6.515	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	1.430	+	3.396	)	x	2.700	:	2	=	6.515	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	1.713	+	1.713	)	x	2.700	:	2	=	4.625	(m2)
S7=		L	x	(W + 0.2)	=							
=		10.120	x	3.300	=		33.396		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	1.716	+	3.536	)	x	2.500	:	2	=	6.565	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	1.716	+	3.536	)	x	2.500	:	2	=	6.565	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45 x 0.5	=		
=	(	6.565	+	6.565	)	x 0.3	+	(	3.536	+	3.536	) x 0.45 x 0.5	=	5.53	(m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	10.120	x	3.300	x	0.2	=	6.68 (m3)

3. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	)	x	0.1	=			
=	(	6.515	+	6.5151	+	4.625	+	4.625	+	4.625	+	4.625	)	x	0.1	=	3.15	(m3)	

4. WOOD PILE:

** L=5M*

W5=	(	S3	+	S4	+	S5	+	S6	+	S7	)	x 25 x 5 :100	=						
=	(	4.625	+	4.625	+	4.625	+	4.625	+	33.396	)	x 25 x 5 :100	=		64.87	(100m)			

** L=3M*

W3=	(	S1	+	S2	+	0	)	x 25 x 3 : 100	=										
=	(	6.515	+	6.5151	+	0.000	)	x 25 x 3 : 100	=		9.77	(100m)							

NOTE: S=0.8 x 4.5 x 4 IS AREA WOOD PILE TOE OF SLOPE

5. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	S7	) x 0.15 =								
=	(	6.515	+	6.515	+	4.625	+	4.625	+	4.625	+	4.625	+	33.396	) x 0.15 =		9.74						
																	(m3)						

6. FORM

=	(L2a	+	L2b)	)	X 0.75	x	2	=															
	(3.536	+	3.536	)	X 0.75	x	2	=	10.608	(m2)													

7. SCAFFOLDING

=	(L2a	+	L2b)	)	X 0.75	x	2	=															
	(3.536	+	3.536	)	X 0.75	x	2	=	10.608	(m2)													