1.4. Miscellaneous

QUANTITY TABLE OF GUARDRAILS

SECTION	LEFT												RIGHT											
	From		To		Quantities								From		To		Quantities							
					Lengths of guard rails (m)	Numbers of guard rails (Nos.)		Numbers of guideposts	Type1	Type2	Type3	Type4					Lengths of guardrails	Numbers of guardrails (Nos.)		Numbers of guideposts	Type1	Type2	Type3	Type4
						L=1.8m	L=1.5m	Nos.	m	Nos.	Nos.	Nos.					m	L=1.8m	L=1.5m	Nos.	m	Nos.	Nos.	Nos.
BP																								
	- 0+	60	0+	550	610	157	1		598	1	1		- 0+	20	0+	550	570	147	1		558	1	1	
	0+	870	1+	36	166	46	1		154	1	1		0+	870	1+	36	166	46	1		154	1	1	
													0+	315	0+	317				2.00				
													0+	440	0+	444	4	3						1
													0+	643	0+	647	4	3						1
Large Tra Va bridge																								
	0+	888	0+	988	0			11					0+	480	0+	905				44				
	1+	40	1+	399	359	89	2		351	2			1+	48	1+	399	351	87	2		343	2		
	1+	401	1+	748	347	86	2		339	2			1+	401	1+	748	347	86	2		339	2		
	1+	764	1+	868	104	30	1		92	1	1		1+	764	1+	868	104	30	1		92	1	1	
Small Tra Va bridge																								
	1+	952	2+	54	102	30	1		90	1	1		1+	952	2+	54	102	30	1		90	1	1	
	2+	72	2+	499	427	106	2		419	2			2+	72	2+	499	427	106	2		419	2		
	2+	501	2+	988	487	121	2		479	2			2+	501	2+	912	411	102	2		403	2		
	3+	40	3+	224	184	45	2		176	2			3+	0	3+	220	220	54	2		212	2		
	3+	400	3+	456	56	13	2		48	2			3+	400	3+	468	68	16	2		60	2		
	3+	472	3+	582	110	32	1		98	1	1		3+	480	3+	582	102	30	1		90	1	1	
Tra On bridge																								
	3+	842	3+	948	106	31	1		94	1	1		3+	842	3+	948	106	31	1		94	1	1	
	3+	964	4+	660	696	173	2		688	2			3+	964	4+	336	372	92	2		364	2		
	4+	662	4+	940	278	69	2		270	2			4+	608	4+	940	332	82	2		324	2		
Interchange 1																								
	0+	340	0+	424	0			22					0+	28	0+	152				32				
	0+	298	0+	302	4	3						1	0+	298	0+	302	4	3						1
	0+	60	0+	172	0			29					0+	260	0+	392				34				

	0+	218	0+	222	4	3						1	0+	218	0+	222	4	3						1
	0+	90	0+	218	0			33					0+	278	0+	418				36				
Interchange 2																								
	0+	238	0+	242	4	3						1	0+	238	0+	242	4	3						1
	0+	260	0+	376	0			30					0+	32	0+	156				32				
	0+	298	0+	302	4	3						1	0+	298	0+	302	4	3						1
	0+	100	0+	234	134	33	2		126	2			0+	100	0+	234	134	33	2		126	2		
	0+	466	0+	492	26	6	2		18	2			0+	466	0+	492	26	6	2		18	2		
TOTAL						**1079**	**26**	**125**	**4040**	**26**	**6**	**4**						**996**	**26**	**180**	**3686**	**26**	**6**	**6**

NOTES :

- Type1 : Guard rails installed on road (L=4m, L=3m or L=2m).
- Type2 : Guard rails installed at interupting space (L=4m).
- Type3 : Guard rails installed to link to bridge's hand railing(L=8m).
- Type4 : Guard rails installed at single box culvert (L=4m).
- Total of length of guard rails 8070 m

  Include :
  - + Type 1 : 7726 m
  - + Type 2 : 52 sets
  - + Type 3 : 12 sets
  - + Type 4 : 10 sets

- Total of guardposts (L=1.8m) : 2075 posts
- Total of guardposts (L=1.5m) : 52 posts
- Total of guidepost : 305 posts

- Standard terminal section : 84 Nos.
- Special washer : 52 Nos.
- Rectangle washer : 2075 Nos.
- Nut-bolt-circle washer : 19143 sets
- Concrete 20MPa : 340.32 m3
- Lean concrete 15MPa for bed : 53.175 m3
- Reflector at the top of guardpost : 2127 sets
- Reflector at the top of guidepost : 305 sets
- -Total of excavation : 608 m3
- -Total of back fill : 158 m3

QUANTITY TABLE OF SIGNBOARDS (P1)

Section	Location	Code	Function	Quantities	Remarks	
Vinh Long side	- 0+450	401	Beginning of priority road	1	Right(R) -(Double)	
		235	Beginning of road with median	1		
	-0 +340	203a	Narrower road both sides	1	Left(L)	
	- 0+350	302a	Avoiding obstruction	1	On median	
	- 0+240	402	Ending of priority road	1	Left(L) -(Double)	
		236	Ending of road with median	1		
		202b	Many curves connecting	1	L	
	- 0+200	414a	Direction of province	1	R	
	- 0+100	226	Bicycle crossing	1	R	
	0+000	127	Limited speed	1	R	
	0+040	237a	Merging stream on right	1	L	
	0+240	134	No limited speed	1	L	
	0+520	134	No limited speed	1	R	
	0+540	440	Bridge's name (Large Tra Va)	1	R	
		202b	Many curves connecting	1	L	
		127	Limited speed	1		
	0+880	440	Bridge's name (Large Tra Va)	1	L	
	0+540	207b	Crossing with minor road	1	R	"A" Rampway of Beginning Point Interchange
	0+600	301f	Only going straight and turning right	1	R	
	0+660	301d	Only turning left	1	L	
		102	No entry	1	On median	
		122	Stop	1	Right -(Double)	
		301e	Only turning right	1		
	0+880	207b	Crossing with minor road	1	R	
	0+970	122	Stop	1	Right -(Double)	
		301e	Only turning right	1		
	0+980	414a	Direction of province	1	R	
	1+000	301g	Only going straight and turn left	1	R	
	0+140	208	Intersection with priority road	1	L	"B" Rampway of Beginning Point Interchange
	0+180	226	Bicycle crossing	1	L	
	0+300	410	Turning area	1	L	
	0+440	301f	Only going straight and turning right	1	R	
	0+520	301a	Only going straight	1	R	
	0+610	302a	Avoiding obstruction	1	On median	
	0+660	237b	Merging stream on left	1	Left -(Double)	
		301a	Only going straight	1		
	0+700	302a	Avoiding obstruction	1	On island	
	1+860	440	Bridge's name (Small Tra Va)	1	Right (R)	
	1+960	440	Bridge's name (Small Tra Va)	1	Left (L)	
	2+200	201b	Dangerous bend to the right	1	R	
	2+760	414a	Direction of province	1	R	

QUANTITY TABLE OF SIGNBOARDS (P1)

Section	Location	Code	Function	Quantities	Remarks	
	2+840	226	Bicycle crossing	1	R (Double)	
		202b	Many curves connecting	1		
	3+100	237a	Merging stream on right	1	R	
	3+160	237a	Merging stream on right	1	L	
	3+380	226	Bicycle crossing	1	L (Double)	
		202b	Many curves connecting	1		
	0+040	201a	Dangerous bend to the left	1	R	"A" Rampway of No.54 N.H Interchange
	0+300	201b	Dangerous bend to the right	1	R (Double)	
		226	Bicycle crossing	1		
	0+460	208	Intersection with priority road	1	R	
	0+360	122	Stop	1	R (Double)	"B" Rampway of No.54 N.H Interchange
		208	Intersection with priority road	1		
	0+380	415	Road direction indicator	1	R	
	0+420	415	Road direction indicator	1	On island	
		102	No entry	1	L	
	0+430	102	No entry	1	R	
	0+360	122	Stop	1	R (Double)	"C" Rampway of No.54 N.H Interchange
		208	Intersection with priority road	1		
	0+380	415	Road direction indicator	1	R	
	0+420	415	Road direction indicator	1	On island	
		102	No entry	1	L	
	0+430	102	No entry	1	R	
	0+040	201a	Dangerous bend to the left	1	R	"D" Rampway of No.54 N.H Interchange
	0+300	201b	Dangerous bend to the right	1	R (Double)	
		226	Bicycle crossing	1		
	0+440	208	Intersection with priority road	1	R	
	0+060	415	Road direction indicator	1	L	No.54 N.H Interchange
	0+100	301g	Only going straight and turn left	1	L	
	0+230	440	Bridge's name (No.54 N.H Interchange)	1	R	
	0+380	440	Bridge's name (No.54 N.H Interchange)	1	L	
	0+500	301g	Only going straight and turn left	1	R	
	0+540	415	Road direction indicator	1	R	
	3+440	414a	Direction of province	1	L	
	3+500	201a	Dangerous bend to the left	1	L	
	3+560	440	Bridge's name (Tra On)	1	R	
	3+870	440	Bridge's name (Tra On)	1	L	
	4+160	432	Hotel	1	R	
	4+240	226	Bicycle crossing	1	R	
	4+620	208	Intersection with priority road	1	R	
	4+930	419	Province boundary	1	L	
		440	Bridge's name (Can Tho)	1	R	
Vinh Long side						

Code	Quantities
Code 102:	5
Code 122:	4

Code	Quantities
Code 237a:	3
Code 237b:	1

QUANTITY TABLE OF SIGNBOARDS (P1)

Section	Location	Code	Function	Quantities	Remarks
	Code 123a:	0		Code 301a:	2
	Code 123b:	0		Code 301d:	1
	Code 127:	2		Code 301e:	2
	Code 129:	0		Code 301f:	2
	Code 134:	2		Code 301g:	3
	Code 201a:	3		Code 302a:	3
	Code 201b:	3		Code 401:	1
	Code 202b:	4		Code 402:	1
	Code 203a:	1		Code 410:	1
	Code 207a:	0		Code 414a:	4
	Code 207b:	2		Code 415:	6
	Code 208:	6		Code 419:	1
				Code 432:	1
	Code 226:	7		Code 440:	9
	Code 235:	1		Code 501:	0
	Code 236:	1		Code 502:	0

QUANTITY TABLE OF SIGNPOSTS AND COMPONENTS (P1)

ITEM	UNIT	QUANTITIES	REMARKS	
Type 1	m	197.60	54 posts,L=3800 (for single signboard)	Galvanised steel, 80mm dia.
Type 2	m	54.00	14posts,L=4500 (for double signboard)	Galvanised steel, 80mm dia.
Type 3	m	8.60	2 posts, L1=4550+L2=4050 (for signboard 4.19)	Galvanised steel, 80mm dia.
Type 4	m	26.34	8 posts, L1=4700+L2=4080 (for signboard 4.14a)	Channel steel 100x140x5mm
Steel 1300x50x8mm			=(Total of signboards 414a)*3*1.3=	15.6
Steel 1100x50x8mm			=(Total of signboards 419)*3*1.1=	3.3
Steel 900x50x8mm			=(Total of signboards 415)*1*0.9=	5.4
Steel 480x50x5mm			=((Total of circle signboards)*2+ (Total of triangle signboards)+ (Total of signboards 410)*2+ (Total of signboards 440)*2)*0.48=	23.52
Steel 340x50x5mm			=(Total of signboards 401,402)*1*0.34=	1.36
Steel 280x50x5mm			=(Total of circle signboards)*1*0.28=	7
Nut-bolt-circle washer, 10mm dia., L=100mm			=((Total of circle signboards)*2+ (Total of triangle signboards)*2+ (Total of signboards 401,402,410,432,440)*2+ (Total of signbards 414a,415,419,501,502)*3)=	82
Nut-bolt-circle washer, 6mm dia., L=50mm			=((Total of circle signboards)*4+ (Total of triangle signboards)*4+ (Total of signboards 401,402,410,432,440)*4+ (Total of signbards 414a,419)*12+ (Total of signboards 415,501,502)*2=	200
Concrete 20MPa			=(Total of signposts)*0.4*0.4*1=	12.48

1.5. Appendix

STONE MASONRY FOR SLOP PROTECTION

	Pay Item	Unit	Quantities	Remarks
I	**Stone Masonry for Slop Protection**	sqm		
	Stone Masonry, t=300mm	m3	0.3	
	Blinding aggregate, t=100mm	m3	0.1	
	Geotextile	m2	1	
	ϕ50 PVC pile	lm	0.5	
II	**Footing for stone Masonry for Slop Protection**	lm		
	Stone Masonry	m3	0.36	
	Blinding aggregate	m3	0.08	
	Wood pile	nos	20	

UNIT QUANTITY OF DRAINAGE SYSTEM (1/4)

Pay Item	Unit	Concrete		Re-Bar		Form	Rubber	Excavation	Back Fill	Remarks
		30MPa	20MPa	D6	D8					
		m3	m3	kg	kg	m2	m2	m3	m3	
R.C. Pipe, D-400mm	4m	0.03	-	13.24	17.91			6.60	5.12	SA, IC3,IS1
R.C. Pipe, D-500mm	4m	0.445	-	1.62	41.10			7.08	5.44	SA
Support for D-400mm	1.2m support/ 4m R.C.pile		0.063	1.35	5.43	1.38				SA, IC3,IS1
Support for D-500mm	1.2m support/ 4m R.C.pile		0.12	2.04	6.09	1.63				SA
Joint sealing for D-400mm	1 nos /4m R.C.pile						0.014			SA, IC3,IS1
Joint sealing for D-500mm	1 nos /4m R.C.pile						0.021			SA

UNIT QUANTITY OF DRAINAGE SYSTEM (2/4)

Pay Item	Unit	Stone masonry	Gravel Compacted	Precast Concrete Kerb	Wooden Pile	Concrete		Form	Re-Bar		Excavation	Back Fill	Remarks
					D-80mm	20MPa	15MPa		D8	D10			
		m3	m3	m	m	m3	m3	m2	kg	kg	m3	m3	
U-Shaped side ditch (500*550)	lm	0.78	0.235	-	30	-	-	-	-	-	2.57	1.62	SA
U-Shaped side ditch (500*1000)	lm	1.53	0.29	-	40	-	-	-	-	-	5.19	3.29	SA
U-Shaped side ditch (400x400)	lm	0.43	0.10	-	-	-	-	-	-	-	1.5	0.9	
U-Shaped side ditch (400x400-500)	lm	0.45	0.10	-	-	-	-	-	-	-	1.7	1.1	
U-Shaped side ditch(400x400-750)	lm	0.51	0.10	-	-	-	-	-	-	-	2.0	1.2	
U-Shaped gutter (400*250)	lm	-	0.04	1x2	-	0.04	0.13	2.1	-	-	-	-	
U-Shaped gutter with concrete cover (500*250)	lm	-	0.11456	1.6x2		0.08	0.1984	3.36	12.8	-	-	-	
U-Shaped gutter with concrete cover (400*400)	lm		0.08			0.38				7.59	1.54	0.92	SA

UNIT QUANTITY OF DRAINAGE SYSTEM (3/4)

Per each

Pay Item	Unit	Stone masonry	Gravel Compacted	Wooden Pile D-80mm	Excavation	Back Fill	Remarks
		m3	m3	m	m3	m3	
Out let 1	each	2.20	0.34	56	21.06	11.70	SA
Out let 2	each	4.93	0.66	110	32.29	23.27	SA
Out let 3	each	2.34	0.33	54	11.34	9.65	SA
Out let 4	each	0.89	0.14	24	9.16	8.32	IC3 (C1,C2,C3,C4)

UNIT QUANTITY OF DRAINAGE SYSTEM (4/4)

Pay Item	Unit	Concrete		Form	Re-Bar			Steel Mesh	Channel Steel		Fillet		Stone Masonry	Wooden Pile	Gravel Compacted	Ex-cavation	Back Fill	Remarks
		20MPa	25MPa		D10	D12	D16		L80x50x5	[80x40x4.5	Point	10mm						
		m3	m3	m2	kg	kg	kg	kg	kg	kg	Nos.	m	m3	pile	m3	m3	m3	
Catch Basin Type-A	per each	1.30	0.11	11.05	1.96	13.71	0.63	12.6	15.72	24.68	34	0.64			0.20	19.04	16.55	SA (A1-A7)
Catch Basin Type-B	per each	2.05	0.22	11.90	3.36	23.59	1.26	12.6	29.44	46.54	64	1.28			0.36	29.48	25.75	SA (B1-B8)
Catch Basin Type-C	per each		3.02	29.02	259.4										0.48	24.22	15.87	IC1
Catch Basin Type-D	per each	0.83	0.12	8.33	10.01	6.37	0.63	18.09	11.98	22.98	34	0.64			0.18	11.60	9.87	IS1
Catch Basin Type-E	per each	0.87	0.11	8.61	10.01	6.37	0.63	18.09	11.98	22.98	34	0.64			0.18	11.89	10.11	IC3 (R1-R8,R11-R18, L1-L8,L11-L19)
Catch Basin Type-F	per each			10.32									2.05	49	0.29	18.80	15.57	IC3 (L9,L10,R9,R10)

UNIT QUANTITY OF ISLAND (TOLL GATE)

per each

Pay Item	Unit	Steel (ϕ14)	(Stone 1x2) Concrete grade 200	Cement grout qrade 75 with broken-brick	Sand blanket
		kg	m3	m3	m3
TYPE 1 (29m)	per each	2281.56	21.9	1.7	9.9
TYPE 2 (25m)	per each	2097.94	19.5	1.5	8.9

UNIT QUANTITY OF CONCRETE PAVEMENT (TOLL GATE)

per 1sqm

Pay Item	Unit	Quantity	Remarks
Concrete 30MPa	m3	0.25	
Mixed sand and Bitument	m3	0.03	
Fine aggregate base course	m3	0.17	
Crush aggregate subbase course	m3	0.30	

UNIT QUANTITY OF VEHICLE GUARD RAIL

Pay Item	Unit	Guard Rail Post [-100x140x5, L=1.8m	Standard Terminal Section	Rectangle Washer	Special Washer	Nut-Bolt-Circle Washer	Concrete		Form	Excation	Back Fill	Remarks
							20MPa	15MPa				
		Nos.	Nos.	Nos.	Nos.	Nos.	m3	m3	m2	m3	m3	
Vehicle Guard Rail (TYPE 1)	4m	2	-	1	-	18	0.32	0.05	3.2	0.5	0.130	
Vehicle Guard Rail (TYPE 2)	4m	P1: L=1.8m P2: L=1.5m	1	1	1	18	0.32	0.05	3.2	0.5	0.13	
Vehicle Guard Rail (TYPE 3)	8m	7	1	7	-	63	1.12	0.175	11.2	1.75	0.5	
Vehicle Guard Rail (TYPE 4)	4m	4	2	4	-	36	0.64	0.1	6.4	1	0.3	
Vehicle Guard Rail (TYPE 5)	6m	3	2	3	-	27	0.48	0.075	4.8	0.75	0.2	

UNIT QUANTITY OF WARNING SIGNS (1/2)

Pay Item	Unit	Code and Quantity of Signboard								Concrete		Form	Excavation	Back Fill	Length of signpost	L50x50x8	Remarks
										20MPa	15MPa						
		Code	Quantity	Code	Quantity	Code	Quantity	Code	Quantity	m3	m3	m2	m3	m3	m3	m	
Regulatory and warning signs Type-1	each	102	5	134	2	301e	2	302a	3	3.45	0.37	36.8	18.7	15.25	110.4	11.2	
		122	4	301a	2	301f	2	-	-								
		127	2	301d	1	301g	3	-	-								
Regulatory and warning signs Type-2	each	201a	3	203b	1	226	7	237a	3	3.75	0.40	40.0	20.3	16.55	91.875	19.0	
		201b	3	207b	2	235	1	237b	1								
		202b	4	208	6	236	1	-	-								
Regulatory and warning signs Type-3	each	415	6	410	1	-	-	-	-	2.85	0.30	30.4	15.5	12.65	69.83	17.32	
		401	1	432	1	-	-	-	-								
		402	1	440	9	-	-	-	-								
Regulatory and warning signs Type-4	each	414a	4	-	-	-	-	-	-	2.00	0.30	16.32	9.28	7.28	21.9	18.9	
		419	1	-	-	-	-	-	-								
		-	-	-	-	-	-	-	-								
TOTAL										12.1	1.4	123.5	64	52	294	66.4	

UNIT QUANTITY OF WARNING SIGNS (2/2)

Pay Item	Unit	Concrete		Form	Re-Bar			Excavation	Back Fill	Painting		Reflector mirror (setting at the top of guide post)	Remarks
		20MPa	15MPa		D6	D8	D12			White	Red		
		(m3)	(m3)	(m2)	(kg)	(kg)	(kg)	(m3)	(m3)	(m2)	(m2)	(unit)	
Pre-cast Concrete kilometre Posts	each	0.254	0.036	2.7	-	4.42	8.13	0.8	0.6	0.9	0.42	-	
Guide Posts (Box-Culvert)	each	0.05348	0.1526	1.2	1.3	2.4	-	0.9	0.7	0.432	0.11	1	

UNIT QUANTITY OF TRAFFIC CONTROL UTILITY

Pay Item	Unit	Precast Concrete Kerb		Precast Concrete Barrier	Concrete		Filling Mortar	Sand	Crushed Material	Reflector	Excavation	Back Fill	Remarks
		Type-A	Type-B		20MPa	15MPa		3cm Thick	10cm Thick	100x100x30			
		m	m	m	m3	m3	m3	m3	m3	Nos.	m3	m3	
Concrete Curb Type-A	lm	1	-	-	0.08	0.06	0.0008	-	-	-	0.09	0.02	
Concrete Curb Type-B	lm	-	1	-	0.11	0.1	0.0011	-	-	-	0.12	0.01	
Concrete Barrier Type-A	lm	-	-	1	0.08	0.06	0.0008	-	-	-	0.68	0.54	
Nose of Interchanges	each	26.74			3.48	1.61	0.02	0.81	2.69	14	2.4	0.4	

UNIT QUANTITY OF LANDSCAPING WORKS

Pay Item	Unit	Paving Block 165x200x60	Sand Mixed Cement 2cm	Crushed Material 10cm Thick	Remarks
		m2	m3	m3	
Interlocking Concrete Paving	1sqm	1	0.02	0.01	

Calculation Result of Settlement - Embankment width = 24.1m
Main Way

Segment 1

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	12.05	
	2.0	-	-	2.00	2.00	12.05	
	3.0	-	-	4.00	4.00	10.05	
	4.0	-	-	5.50	5.50	9.05	
	5.0	-	9.50	9.25	4.25	8.05	
	6.0	-	9.50	10.25	5.25	8.05	
	7.0	-	10.30	12.45	6.25	8.05	
	8.0	-	10.30	13.45	7.25	8.05	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.19	-	0.27	0.27	0.38	11.2
	2.0	0.38	-	0.66	0.76	0.92	32.2
	3.0	0.54	-	1.04	1.27	1.44	68.3
	4.0	0.64	-	1.31	1.64	1.80	105.6
	5.0	0.58	1.36	1.88	2.06	2.18	111.4
	6.0	0.61	1.41	2.05	2.30	2.43	131.4
	7.0	0.62	1.41	2.21	2.53	2.64	156.8
	8.0	0.63	1.45	2.37	2.76	2.87	179.3

Segment 3

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	12.05	
	2.0	-	-	2.00	2.00	12.05	
	3.0	-	-	4.00	4.00	10.05	
	4.0	-	-	5.50	5.50	9.05	
	5.0	-	9.10	9.45	4.45	8.05	
	6.0	-	9.10	10.45	5.45	8.05	
	7.0	-	9.90	12.45	6.45	8.05	
	8.0	-	9.90	13.45	7.45	8.05	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.20	-	0.24	0.27	0.41	11.6
	2.0	0.35	-	0.61	0.74	0.95	32.0
	3.0	0.46	-	0.97	1.23	1.44	66.9
	4.0	0.53	-	1.22	1.59	1.77	103.2
	5.0	0.43	1.20	1.76	1.96	2.09	103.4
	6.0	0.43	1.23	1.90	2.17	2.30	120.7
	7.0	0.42	1.23	2.05	2.37	2.49	143.0
	8.0	0.43	1.22	2.16	2.56	2.67	161.1

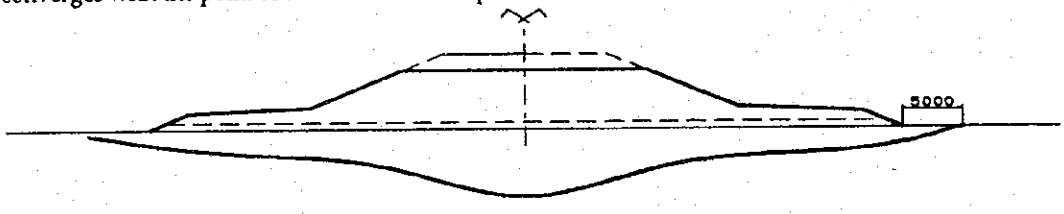
Segment 4

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	12.05	
	2.0	-	-	2.00	2.00	12.05	
	3.0	-	-	4.00	4.00	10.05	
	4.0	-	-	5.50	5.50	9.05	
	5.0	-	9.10	9.45	4.45	8.05	
	6.0	-	9.10	10.45	5.45	8.05	
	7.0	-	9.90	12.45	6.45	8.05	
	8.0	-	9.90	13.45	7.45	8.05	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.12	-	0.18	0.21	0.31	9.2
	2.0	0.19	-	0.45	0.57	0.70	25.5
	3.0	0.24	-	0.71	0.93	1.06	57.0
	4.0	0.27	-	0.89	1.19	1.30	90.8
	5.0	0.22	0.85	1.27	1.43	1.51	73.3
	6.0	0.22	0.86	1.37	1.56	1.64	84.9
	7.0	0.21	0.84	1.45	1.69	1.76	99.3
	8.0	0.21	0.84	1.52	1.79	1.86	111.1

Note: The settlement quantity that was displayed is the value that 20 cm were added as settlement quantity for long time in the final settlement quantity by consolidation. (Toe of Slope was not added 20cm.)

The calculation of the settlement area was calculated on the basis of the assumption that settlement converges with the point of 5 m from toe of slope.



Settlement of embankment height 1 m and 2 m was calculated with the proportional distribution method as below.

$$S_n = (S_{n+1}/S_{n+2})^2 \times S_{n+1}$$

Calculation Result of Settlement - Embankment width = 7.5m
Rampway

Segment 1

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	3.75	
	2.0	-	-	2.00	2.00	3.75	
	3.0	-	-	4.00	4.00	1.75	
	4.0	-	-	5.50	5.50	0.75	
	5.0	-	9.50	9.25	4.25	0.75	
	6.0	-	9.50	10.25	5.25	0.75	
	7.0	-	10.30	12.45	6.25	0.75	
	8.0	-	10.30	13.45	7.25	0.75	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.19	-	0.27	0.27	0.38	5.8
	2.0	0.38	-	0.66	0.76	0.92	18.3
	3.0	0.54	-	1.04	1.27	1.44	45.8
	4.0	0.64	-	1.31	1.64	1.80	77.0
	5.0	0.58	1.36	1.88	2.06	2.18	80.5
	6.0	0.61	1.41	2.05	2.30	2.43	96.8
	7.0	0.62	1.41	2.21	2.53	2.64	119.1
	8.0	0.63	1.45	2.37	2.76	2.87	138.2

Segment 3

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	3.75	
	2.0	-	-	2.00	2.00	3.75	
	3.0	-	-	4.00	4.00	1.75	
	4.0	-	-	5.50	5.50	0.75	
	5.0	-	9.10	9.45	4.45	0.75	
	6.0	-	9.10	10.45	5.45	0.75	
	7.0	-	9.90	12.45	6.45	0.75	
	8.0	-	9.90	13.45	7.45	0.75	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.20	-	0.24	0.27	0.41	6.0
	2.0	0.35	-	0.61	0.74	0.95	18.0
	3.0	0.46	-	0.97	1.23	1.44	44.7
	4.0	0.53	-	1.22	1.59	1.77	75.3
	5.0	0.43	1.20	1.76	1.96	2.09	73.8
	6.0	0.43	1.23	1.90	2.17	2.30	88.0
	7.0	0.42	1.23	2.05	2.37	2.49	107.5
	8.0	0.43	1.22	2.16	2.56	2.67	122.9

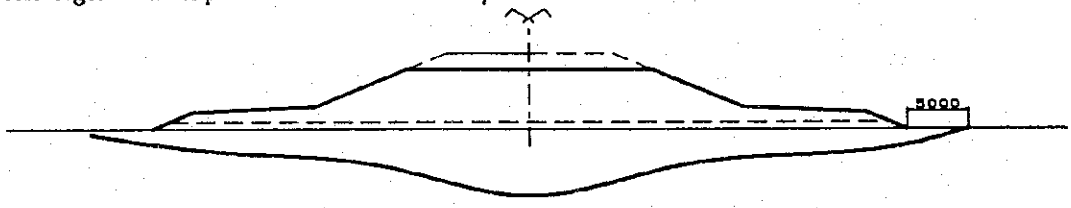
Segment 4

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	3.75	
	2.0	-	-	2.00	2.00	3.75	
	3.0	-	-	4.00	4.00	1.75	
	4.0	-	-	5.50	5.50	0.75	
	5.0	-	9.10	9.45	4.45	0.75	
	6.0	-	9.10	10.45	5.45	0.75	
	7.0	-	9.90	12.45	6.45	0.75	
	8.0	-	9.90	13.45	7.45	0.75	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.12	-	0.18	0.21	0.31	4.9
	2.0	0.19	-	0.45	0.57	0.70	15.0
	3.0	0.24	-	0.71	0.93	1.06	40.5
	4.0	0.27	-	0.89	1.19	1.30	70.1
	5.0	0.22	0.85	1.27	1.43	1.51	51.8
	6.0	0.22	0.86	1.37	1.56	1.64	61.5
	7.0	0.21	0.84	1.45	1.69	1.76	74.1
	8.0	0.21	0.84	1.52	1.79	1.86	84.4

Note: The settlement quantity that was displayed is the value that 20 cm were added as settlement quantity for long time in the final settlement quantity by consolidation. (Toe of Slope was not added 20cm.)

The calculation of the settlement area was calculated on the basis of the assumption that settlement converges with the point of 5 m from toe of slope.



Settlement of embankment height 1 m and 2 m was calculated with the proportional distribution method as below.

$$S_n = (S_{n+1}/S_{n+2})^2 \times S_{n+1}$$

Calculation Result of Settlement - Embankment width = 11.5m
Rampway

Segment 1

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	5.75	
	2.0	-	-	2.00	2.00	5.75	
	3.0	-	-	4.00	4.00	3.75	
	4.0	-	-	5.50	5.50	2.75	
	5.0	-	9.50	9.25	4.25	1.75	
	6.0	-	9.50	10.25	5.25	1.75	
	7.0	-	10.30	12.45	6.25	1.75	
	8.0	-	10.30	13.45	7.25	1.75	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.19	-	0.27	0.27	0.38	7.1
	2.0	0.38	-	0.66	0.76	0.92	21.6
	3.0	0.54	-	1.04	1.27	1.44	51.2
	4.0	0.64	-	1.31	1.64	1.80	83.9
	5.0	0.58	1.36	1.88	2.06	2.18	84.7
	6.0	0.61	1.41	2.05	2.30	2.43	101.6
	7.0	0.62	1.41	2.21	2.53	2.64	124.3
	8.0	0.63	1.45	2.37	2.76	2.87	143.8

Segment 3

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	5.75	
	2.0	-	-	2.00	2.00	5.75	
	3.0	-	-	4.00	4.00	3.75	
	4.0	-	-	5.50	5.50	2.75	
	5.0	-	9.10	9.45	4.45	1.75	
	6.0	-	9.10	10.45	5.45	1.75	
	7.0	-	9.90	12.45	6.45	1.75	
	8.0	-	9.90	13.45	7.45	1.75	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.20	-	0.24	0.27	0.41	7.4
	2.0	0.35	-	0.61	0.74	0.95	21.4
	3.0	0.46	-	0.97	1.23	1.44	50.0
	4.0	0.53	-	1.22	1.59	1.77	82.0
	5.0	0.43	1.20	1.76	1.96	2.09	77.9
	6.0	0.43	1.23	1.90	2.17	2.30	92.5
	7.0	0.42	1.23	2.05	2.37	2.49	112.3
	8.0	0.43	1.22	2.16	2.56	2.67	128.2

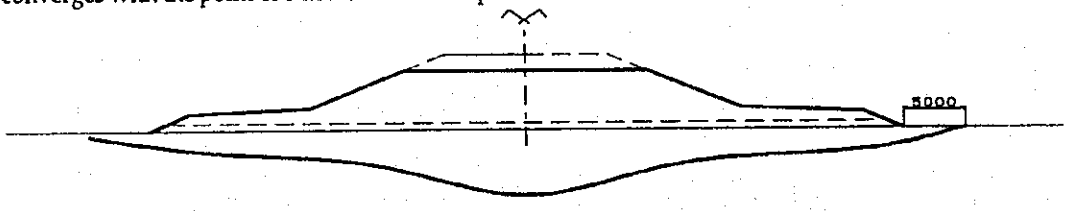
Segment 4

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	5.75	
	2.0	-	-	2.00	2.00	5.75	
	3.0	-	-	4.00	4.00	3.75	
	4.0	-	-	5.50	5.50	2.75	
	5.0	-	9.10	9.45	4.45	1.75	
	6.0	-	9.10	10.45	5.45	1.75	
	7.0	-	9.90	12.45	6.45	1.75	
	8.0	-	9.90	13.45	7.45	1.75	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.12	-	0.18	0.21	0.31	5.9
	2.0	0.19	-	0.45	0.57	0.70	17.5
	3.0	0.24	-	0.71	0.93	1.06	44.5
	4.0	0.27	-	0.89	1.19	1.30	75.1
	5.0	0.22	0.85	1.27	1.43	1.51	54.8
	6.0	0.22	0.86	1.37	1.56	1.64	64.7
	7.0	0.21	0.84	1.45	1.69	1.76	77.6
	8.0	0.21	0.84	1.52	1.79	1.86	88.1

Note: The settlement quantity that was displayed is the value that 20 cm were added as settlement quantity for long time in the final settlement quantity by consolidation. (Toe of Slope was not added 20cm.)

The calculation of the settlement area was calculated on the basis of the assumption that settlement converges with the point of 5 m from toe of slope.



Settlement of embankment height 1 m and 2 m was calculated with the proportional distribution method as below.

$$S_n = (S_{n+1}/S_{n+2})^2 \times S_{n+1}$$

Calculation Result of Settlement - Embankment width = 12.0m
Rampway

Segment 1

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	6.00	
	2.0	-	-	2.00	2.00	6.00	
	3.0	-	-	4.00	4.00	4.00	
	4.0	-	-	5.50	5.50	3.00	
	5.0	-	9.50	9.25	4.25	2.00	
	6.0	-	9.50	10.25	5.25	2.00	
	7.0	-	10.30	12.45	6.25	2.00	
	8.0	-	10.30	13.45	7.25	2.00	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.19	-	0.27	0.27	0.38	7.3
	2.0	0.38	-	0.66	0.76	0.92	22.1
	3.0	0.54	-	1.04	1.27	1.44	51.9
	4.0	0.64	-	1.31	1.64	1.80	84.7
	5.0	0.58	1.36	1.88	2.06	2.18	85.8
	6.0	0.61	1.41	2.05	2.30	2.43	102.8
	7.0	0.62	1.41	2.21	2.53	2.64	125.5
	8.0	0.63	1.45	2.37	2.76	2.87	145.2

Segment 3

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	6.00	
	2.0	-	-	2.00	2.00	6.00	
	3.0	-	-	4.00	4.00	4.00	
	4.0	-	-	5.50	5.50	3.00	
	5.0	-	9.10	9.45	4.45	2.00	
	6.0	-	9.10	10.45	5.45	2.00	
	7.0	-	9.90	12.45	6.45	2.00	
	8.0	-	9.90	13.45	7.45	2.00	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.20	-	0.24	0.27	0.41	7.5
	2.0	0.35	-	0.61	0.74	0.95	21.8
	3.0	0.46	-	0.97	1.23	1.44	50.7
	4.0	0.53	-	1.22	1.59	1.77	82.9
	5.0	0.43	1.20	1.76	1.96	2.09	78.9
	6.0	0.43	1.23	1.90	2.17	2.30	93.6
	7.0	0.42	1.23	2.05	2.37	2.49	113.6
	8.0	0.43	1.22	2.16	2.56	2.67	129.5

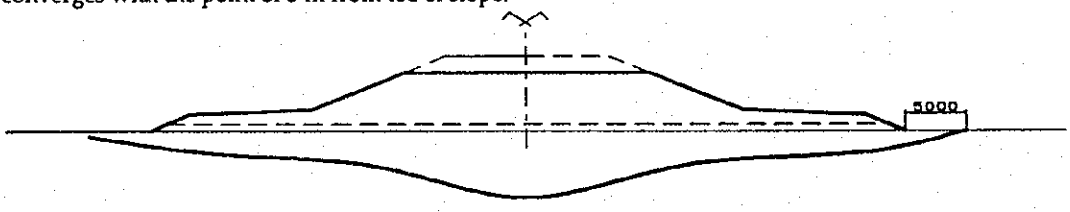
Segment 4

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	6.00	
	2.0	-	-	2.00	2.00	6.00	
	3.0	-	-	4.00	4.00	4.00	
	4.0	-	-	5.50	5.50	3.00	
	5.0	-	9.10	9.45	4.45	2.00	
	6.0	-	9.10	10.45	5.45	2.00	
	7.0	-	9.90	12.45	6.45	2.00	
	8.0	-	9.90	13.45	7.45	2.00	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.12	-	0.18	0.21	0.31	6.0
	2.0	0.19	-	0.45	0.57	0.70	17.9
	3.0	0.24	-	0.71	0.93	1.06	45.0
	4.0	0.27	-	0.89	1.19	1.30	75.7
	5.0	0.22	0.85	1.27	1.43	1.51	55.5
	6.0	0.22	0.86	1.37	1.56	1.64	65.5
	7.0	0.21	0.84	1.45	1.69	1.76	78.5
	8.0	0.21	0.84	1.52	1.79	1.86	89.0

Note: The settlement quantity that was displayed is the value that 20 cm were added as settlement quantity for long time in the final settlement quantity by consolidation. (Toe of Slope was not added 20cm.)

The calculation of the settlement area was calculated on the basis of the assumption that settlement converges with the point of 5 m from toe of slope.



Settlement of embankment height 1 m and 2 m was calculated with the proportional distribution method as below.

$$S_n = (S_{n+1}/S_{n+2})^2 \times S_{n+1}$$

Calculation Result of Settlement - Embankment width = 14.0m
Interchange 2 - Overroad

Segment 1

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	7.00	
	2.0	-	-	2.00	2.00	7.00	
	3.0	-	-	4.00	4.00	5.00	
	4.0	-	-	5.50	5.50	4.00	
	5.0	-	9.50	9.25	4.25	3.00	
	6.0	-	9.50	10.25	5.25	3.00	
	7.0	-	10.30	12.45	6.25	3.00	
	8.0	-	10.30	13.45	7.25	3.00	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.19	-	0.27	0.27	0.38	8.0
	2.0	0.38	-	0.66	0.76	0.92	23.7
	3.0	0.54	-	1.04	1.27	1.44	54.6
	4.0	0.64	-	1.31	1.64	1.80	88.2
	5.0	0.58	1.36	1.88	2.06	2.18	90.0
	6.0	0.61	1.41	2.05	2.30	2.43	107.5
	7.0	0.62	1.41	2.21	2.53	2.64	130.7
	8.0	0.63	1.45	2.37	2.76	2.87	150.8

Segment 3

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	7.00	
	2.0	-	-	2.00	2.00	7.00	
	3.0	-	-	4.00	4.00	5.00	
	4.0	-	-	5.50	5.50	4.00	
	5.0	-	9.10	9.45	4.45	3.00	
	6.0	-	9.10	10.45	5.45	3.00	
	7.0	-	9.90	12.45	6.45	3.00	
	8.0	-	9.90	13.45	7.45	3.00	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.20	-	0.24	0.27	0.41	8.2
	2.0	0.35	-	0.61	0.74	0.95	23.5
	3.0	0.46	-	0.97	1.23	1.44	53.4
	4.0	0.53	-	1.22	1.59	1.77	86.2
	5.0	0.43	1.20	1.76	1.96	2.09	83.0
	6.0	0.43	1.23	1.90	2.17	2.30	98.1
	7.0	0.42	1.23	2.05	2.37	2.49	118.4
	8.0	0.43	1.22	2.16	2.56	2.67	134.7

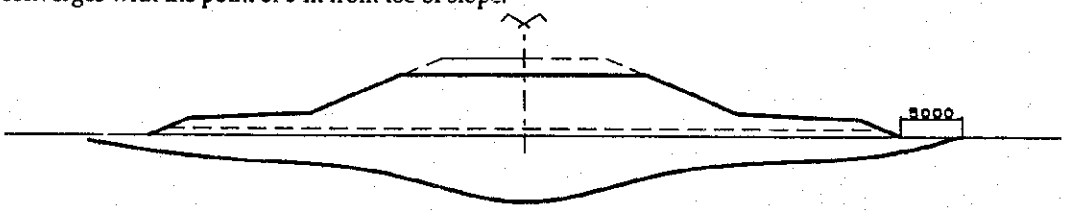
Segment 4

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Remarks
	m	m	m	m	m	m	
Distance of Section	1.0	-	-	1.00	1.00	7.00	
	2.0	-	-	2.00	2.00	7.00	
	3.0	-	-	4.00	4.00	5.00	
	4.0	-	-	5.50	5.50	4.00	
	5.0	-	9.10	9.45	4.45	3.00	
	6.0	-	9.10	10.45	5.45	3.00	
	7.0	-	9.90	12.45	6.45	3.00	
	8.0	-	9.90	13.45	7.45	3.00	

	Height of Embankment	Toe of Slope	Center of Counter Berm	Center of Slope	Shoulder of Slope	Center of Carriage way	Area of Settlement
	m	m	m	m	m	m	m^2
Degree of Settlement	1.0	0.12	-	0.18	0.21	0.31	6.5
	2.0	0.19	-	0.45	0.57	0.70	19.1
	3.0	0.24	-	0.71	0.93	1.06	47.0
	4.0	0.27	-	0.89	1.19	1.30	78.2
	5.0	0.22	0.85	1.27	1.43	1.51	58.4
	6.0	0.22	0.86	1.37	1.56	1.64	68.7
	7.0	0.21	0.84	1.45	1.69	1.76	81.9
	8.0	0.21	0.84	1.52	1.79	1.86	92.7

Note: The settlement quantity that was displayed is the value that 20 cm were added as settlement quantity for long time in the final settlement quantity by consolidation. (Toe of Slope was not added 20cm.)

The calculation of the settlement area was calculated on the basis of the assumption that settlement converges with the point of 5 m from toe of slope.



Settlement of embankment height 1 m and 2 m was calculated with the proportional distribution method as below.

$$S_n = (S_{n+1}/S_{n+2})^2 \times S_{n+1}$$

Height and Area of Removing Surcharge - Embankment width = 24.1m

Main Way

Segment 1

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.13	1.00	24.10	22.10	
4.0	1.50	1.31	1.46	1.17	24.10	25.40	
5.0	2.00	1.68	1.79	1.32	24.10	28.20	
6.0	2.00	1.90	2.02	1.09	24.10	23.90	
7.0	2.00	2.10	2.20	0.90	24.10	20.10	
8.0	2.00	2.31	2.41	0.69	24.10	15.70	

Segment 3

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.17	0.98	24.10	21.70	
4.0	1.50	1.32	1.48	1.15	24.10	25.10	
5.0	2.00	1.61	1.73	1.38	24.10	29.40	
6.0	2.00	1.82	1.94	1.17	24.10	25.50	
7.0	2.00	2.02	2.12	0.98	24.10	21.70	
8.0	2.00	2.21	2.31	0.79	24.10	17.80	

Segment 4

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.66	0.78	1.33	24.10	28.50	
4.0	1.50	0.91	1.01	1.59	24.10	33.30	
5.0	2.00	1.13	1.21	1.88	24.10	38.20	
6.0	2.00	1.26	1.33	1.76	24.10	36.10	
7.0	2.00	1.39	1.45	1.63	24.10	34.00	
8.0	2.00	1.50	1.56	1.52	24.10	32.00	

Height and Area of Removing Surcharge - Embankment width = 7.5m

Rampway

Segment 1

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.13	1.00	7.50	5.50	
4.0	1.50	1.31	1.46	1.17	7.50	6.00	
5.0	2.00	1.68	1.79	1.32	7.50	6.40	
6.0	2.00	1.90	2.02	1.09	7.50	5.80	
7.0	2.00	2.10	2.20	0.90	7.50	5.10	
8.0	2.00	2.31	2.41	0.69	7.50	4.20	

Segment 3

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.17	0.98	7.50	5.40	
4.0	1.50	1.32	1.48	1.15	7.50	6.00	
5.0	2.00	1.61	1.73	1.38	7.50	6.50	
6.0	2.00	1.82	1.94	1.17	7.50	6.00	
7.0	2.00	2.02	2.12	0.98	7.50	5.40	
8.0	2.00	2.21	2.31	0.79	7.50	4.70	

Segment 4

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.66	0.78	1.33	7.50	6.40	
4.0	1.50	0.91	1.01	1.59	7.50	6.90	
5.0	2.00	1.13	1.21	1.88	7.50	7.00	
6.0	2.00	1.26	1.33	1.76	7.50	7.00	
7.0	2.00	1.39	1.45	1.63	7.50	6.90	
8.0	2.00	1.50	1.56	1.52	7.50	6.80	

Height and Area of Removing Surcharge - Embankment width = 11.5m

Rampway

Segment 1

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.13	1.00	11.50	9.50	
4.0	1.50	1.31	1.46	1.17	11.50	10.70	
5.0	2.00	1.68	1.79	1.32	11.50	11.70	
6.0	2.00	1.90	2.02	1.09	11.50	10.20	
7.0	2.00	2.10	2.20	0.90	11.50	8.70	
8.0	2.00	2.31	2.41	0.69	11.50	7.00	

Segment 3

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.17	0.98	11.50	9.30	
4.0	1.50	1.32	1.48	1.15	11.50	10.60	
5.0	2.00	1.61	1.73	1.38	11.50	12.10	
6.0	2.00	1.82	1.94	1.17	11.50	10.70	
7.0	2.00	2.02	2.12	0.98	11.50	9.30	
8.0	2.00	2.21	2.31	0.79	11.50	7.80	

Segment 4

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.66	0.78	1.33	11.50	11.80	
4.0	1.50	0.91	1.01	1.59	11.50	13.20	
5.0	2.00	1.13	1.21	1.88	11.50	14.60	
6.0	2.00	1.26	1.33	1.76	11.50	14.00	
7.0	2.00	1.39	1.45	1.63	11.50	13.40	
8.0	2.00	1.50	1.56	1.52	11.50	12.90	

Height and Area of Removing Surcharge - Embankment width = 12.0m
Rampway

Segment 1

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.13	1.00	12.00	10.00	
4.0	1.50	1.31	1.46	1.17	12.00	11.30	
5.0	2.00	1.68	1.79	1.32	12.00	12.30	
6.0	2.00	1.90	2.02	1.09	12.00	10.70	
7.0	2.00	2.10	2.20	0.90	12.00	9.20	
8.0	2.00	2.31	2.41	0.69	12.00	7.30	

Segment 3

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.17	0.98	12.00	9.80	
4.0	1.50	1.32	1.48	1.15	12.00	11.20	
5.0	2.00	1.61	1.73	1.38	12.00	12.80	
6.0	2.00	1.82	1.94	1.17	12.00	11.30	
7.0	2.00	2.02	2.12	0.98	12.00	9.80	
8.0	2.00	2.21	2.31	0.79	12.00	8.20	

Segment 4

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.66	0.78	1.33	12.00	12.40	
4.0	1.50	0.91	1.01	1.59	12.00	14.00	
5.0	2.00	1.13	1.21	1.88	12.00	15.50	
6.0	2.00	1.26	1.33	1.76	12.00	14.90	
7.0	2.00	1.39	1.45	1.63	12.00	14.20	
8.0	2.00	1.50	1.56	1.52	12.00	13.60	

Height and Area of Removing Surcharge - Embankment width = 14.0m
Interchange 2 - Overroad

Segment 1

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.13	1.00	14.00	12.00	
4.0	1.50	1.31	1.46	1.17	14.00	13.60	
5.0	2.00	1.68	1.79	1.32	14.00	15.00	
6.0	2.00	1.90	2.02	1.09	14.00	12.90	
7.0	2.00	2.10	2.20	0.90	14.00	11.00	
8.0	2.00	2.31	2.41	0.69	14.00	8.70	

Segment 3

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.97	1.17	0.98	14.00	11.80	
4.0	1.50	1.32	1.48	1.15	14.00	13.50	
5.0	2.00	1.61	1.73	1.38	14.00	15.50	
6.0	2.00	1.82	1.94	1.17	14.00	13.60	
7.0	2.00	2.02	2.12	0.98	14.00	11.80	
8.0	2.00	2.21	2.31	0.79	14.00	9.80	

Segment 4

Height of Embankment	Height of Surcharge	Settlement of the time that removes surcharge		Average height of removing surcharge	Width of road surface	Average area of removing surcharge	Remarks
		Shoulder	Center				
m	m	m	m	m	m	m^2	
3.0	1.00	0.66	0.78	1.33	14.00	15.10	
4.0	1.50	0.91	1.01	1.59	14.00	17.20	
5.0	2.00	1.13	1.21	1.88	14.00	19.30	
6.0	2.00	1.26	1.33	1.76	14.00	18.40	
7.0	2.00	1.39	1.45	1.63	14.00	17.50	
8.0	2.00	1.50	1.56	1.52	14.00	16.70	

1.6. Summary

SUMMARY OF QUANTITY

No.	CATEGORY	Name	UNIT	Quantities	Remarks
	2	**Site clearing and Demolition**			
	2 1	**Site clearing and Demolition**			
	2 1 (1)	Site clearing and Demolition (rice field)	m2	335 287	
	2 1 (2)	Removal of Existing Tree (More than 50 trees/100m2)	m2	161 295	
	3	**EARTHWORKS**			
	3 1	**Embankment & Removal Material**			
	3 1 (1)	Sand Blanket (t=700mm)	m2	272 969	
	3 1 (2)	Supply, place, compact & trim sand fill to embankment more than 1.05 m below pavement surface level	m3	755 764	earth work+settlement
	3 1 (3)	Supply, place, compact & trim sand fill to embankment less than 1.05 m below pavement surface level (Sub-grade)	m3	47 222	selected material
	3 1 (4)	Supply, place, compact & trim sand fill to Preloading embankment more than over surface of pavement level	m3	45 533	abutments + culverts
	3 1 (5)	Supply and place sand fill as Surcharge to embankment, more than over surface of pavement level	m3	85 034	
	3 1 (6)	Removal Pr-loading Material	m3	57 912	abutments + culverts
	3 1 (7)	Removal Surcharge Material	m3	64 940	
	3 2	**Soft ground Treatment**			
	3 2 (1)	Prefabricated Vertical Drain (PVD)	m	5 301 697	
	3 2 (2)	Sand Compaction Pile (f=700mm) in selected locations as specified (SCP)	m	15 266	
	3 2 (3)	Establish the measuring instrument for Soft Grand Treatment A (SSP-Surface Settlement Plate)	Each	180	
	3 2 (4)	The measurement for Soft Grand Treatment A (SSP-Surface Settlement Plate)	Day	35 832	
	3 2 (5)	Establish the measuring instrument for Soft Grand Treatment B (AS-Alignment Stakes)	Each	272	
	3 2 (6)	The measurement for Soft Grand Treatment B (AS-Alignment Stakes)	Day	58 112	
	3 2 (7)	Establish the measuring instrument for Soft Grand Treatment C (DSP - Deep Settlement Plate)	Each	5	
	3 2 (8)	The measurement for Soft Grand Treatment C (DPS - Deep Settlement Plate)	Day	1 160	
	3 2 (9)	Establish the measuring instrument for Soft Grand Treatment D (INC - Inclinometer)	Each	10	
	3 2 (10)	The measurement for Soft Grand Treatment D (INC - Inclinometer)	Day	2 320	
	3 2 (11)	Establish the measuring instrument for Soft Grand Treatment E (EP - Electrical Piezometer)	Each	10	
	3 2 (12)	The measurement for Soft Grand Treatment E (EP - Electrical Piezometer)	Day	2 320	

No.	CATEGORY			Name	UNIT	Quantities	Remarks
	3	2	(13)	Establish the measuring instrument for Soft Grand Treatment F (OW - Observation Well)	Each	5	
	3	2	(14)	The measurement for Soft Grand Treatment F (OW - Observation Well)	Day	1 056	
	3	**3**		**Structure Excavation & Backfilling**			
	3	3	(1)	Excavation for structures in any material over the water table	m3		
	3	3	(2)	Excavation for structures in any material below the water table	m3	7 857	abutments +culverts
	3	3	(3)	Backfill to structures	m3	41 978	abutments +culverts
	3	3	(5)	Excavation of any material over the water table other than the structure section	m3	7 271	earth work
	3	3	(6)	Excavation of any material below the water table other than the structure section	m3	11 604	Canal
	4			**Slope protection**			
	4	**1**		**Slope protection**			
	4	1	(1)	Supply, place, compact & trim Cray material fill to side slope.(t=50cm)	m2	105 744	
	4	1	(2)	Trim side slopes by bulldozer	m2	105 744	
	4	1	(3)	Sodding	m2	114 295	slope+median
	4	1	(5)	Stone Masonry for Slop Protection	m2		(see quantity of bridge)
	4	1	(6)	Stone Masonry Slab for slope protection to side berms	m2		
	4	1	(7)	Footing for Stone Masonry for slope protection	m		
	5			**DRAINAGE**			
	5	**1**		**R.C.Pipe**			
	5	1	(1)	R.C. Pipe, D-400mm	m	216	
	5	1	(2)	R.C. Pipe, D-500mm	m	229	
	5	**2**		**Side Ditch**			
	5	2	(1)	U-Shaped gutter with concrete cover (400*400)	m	40	
	5	2	(2)	U-Shaped gutter with concrete cover (500*250)	m	19	
	5	2	(3)	U-Shaped gutter ditch (400*250)	m	7	
	5	2	(4)	U-Shaped side ditch (500*550)	m	65	
	5	2	(5)	U-Shaped side ditch (500*1000)	m	0	
	5	2	(6)	U-Shaped side ditch (400*400)	m	100	
	5	2	(7)	U-Shaped side ditch (400*400-500)	m	50	
	5	2	(8)	U-Shaped side ditch (400*400-750)	m	177	
	5	**3**		**Catch Basin**			
	5	3	(1)	Catch Basin Type A	Each	7	
	5	3	(2)	Catch Basin Type B	Each	8	

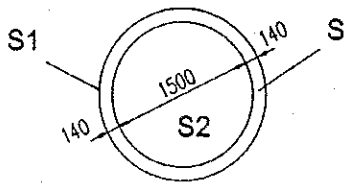
No.	CATEGORY			Name	UNIT	Quantities	Remarks
	5	3	(3)	Catch Basin Type C	Each	1	
	5	3	(4)	Catch Basin Type D	Each		
	5	3	(5)	Catch Basin Type E	Each		
	5	3	(6)	Catch Basin Type F	Each		
	5	3	(7)	Out-let 1	Each	1	
	5	3	(8)	Out-let 2	Each		
	5	3	(9)	Out-let 3	Each	1	
	5	3	(10)	Out-let 4	Each		
	6			**Pavement**			
	6	1		**Base course & Sub-base course**			
	6	1	(1)	Supply, place & compact Subbase course (t=300)	m3	47 665	
	6	1	(2)	Supply, place & compact Base course (t=300mm)	m3	45 745	
	6	2		**Coat**			
	6	2	(1)	Bituminous prime coat (grade MC-70 or RC-250)	m2	153 287	
	6	2	(2)	Bituminous tack coat (grade RC-250)	m2	151 602	
	6	3		**Asphalt concrete**			
	6	3	(1)	Asphalt concrete binder course (t=100mm)	m2	152 116	
	6	3	(3)	Asphalt concrete surface course (t=50mm)	m2	151 176	
	6	4		**Service Road**			
	6	4	(1)	Granular Road (t=150mm)	m3	919	
	8			**Concrete works & precast concrete works**			
	8	5		**Culvert-Pipe**			
	8	5	(1)	Culvert-Pipe, f=1,500mm	m		See quantity of approach road (volume 2 - drainage system)
	8	6		**Culvert-Box**			
	8	6	(1)	Culvert-Box, Type A-s (2.50*1.50)	m		
	8	6	(2)	Culvert-Box, Type A-d (2.50*1.50*2)	m		
	8	6	(3)	Culvert-Box, Type B-d (2.50*2.00*2)	m		
	8	6	(4)	Culvert-Box, Type C-s (3.00*3.20)	m		
	8	6	(5)	Culvert-Box, Type D-s (3.00*3.50)	m		
	8	6	(6)	Culvert-Box, Type E-s (3.00*3.80)	m		
	8	6	(7)	Culvert-Box, Type F-s (5.00*3.80)	m		
	8	6	(8)	Culvert-Box, Type G-s (5.00*4.00)	m		
	8	6	(9)	Culvert-Box, Type H-s (5.00*4.50)	m		
	8	6	(10)	Culvert-Box, Type H-d (5.00*4.50*2)	m		
	8	6	(11)	Culvert-Box, Type I-s (6.50*4.50)	m		

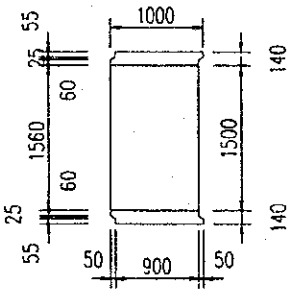
No.	CATEGORY			Name	UNIT	Quantities	Remarks
	13			Electrical services			
	13	1		Electrical services			
	13	1	(1)	Street Lighting Pole, Type-A	Each		(see quantity of lighting system)
	13	1	(2)	Street Lighting Pole, Type-B	Each		
	13	2		Cable for Electric Facility			
	13	2	(1)	Cable, Type-4 (NYFGbY 4C-16mm2)	m		
	13	2	(2)	P.V.C. Conduit, D=50mm	m		
	13	2	(3)	Cable Rack-mounting brackets and deck plate	Each		
	15			Vehicle Guardrail, precast concrete km Posts			
	15	1		Vehicle Guardrail, precast concrete km Posts			
	15	1	(1)	Vehicle guardrail (Type-1)	m	7 726	
	15	1	(2)	Vehicle guardrail (Type-2)	m	208	
	15	1	(3)	Vehicle guardrail (Type-3)	m	96	
	15	1	(4)	Vehicle guardrail (Type-4)	m	40	
	15	1	(5)	Vehicle guardrail (Type-5)	m		
	15	1	(6)	Precast concrete km Posts	Each	5	
	16	1		Traffic Signs			
	16	1	(1)	Regulatory and warning signs, Type-1	Each	25	
	16	1	(2)	Regulatory and warning signs, Type-2	Each	32	
	16	1	(3)	Regulatory and warning signs, Type-3	Each	19	
	16	1	(4)	Regulatory and warning signs, Type-4	Each	6	
	16	1	(6)	Guide Posts (Box-Culvert)	Each	305	
	17	1		Traffic Control Utility			
	17	1	(1)	Road marking	m2	6 031	
	17	1	(2)	Delineator (Top of Guard Rail)	Each	305	
	17	1	(3)	Concrete Curb Type-A	m	11 119	
	17	1	(4)	Concrete Curb Type-B (for Service Area)	m	286	
	17	1	(5)	Concrete Barrier, Type-A (Road section)	m	286	
	17	1	(6)	Concrete Barrier, Type-B (Bridge section)	m		
	17	1	(7)	Nose of Interchange	Each	9	
	18	1		Landscaping Works			
	18	1	(1)	Interlocking Concrete Paving (for Service Area)	m2	1 117	

2. Drainage system

2.1. R.C. pipe culvert at station 0+51.8

I	BOX CULVERT STATION 0+051.8														QUANTITIES
	L = 46.730														
1	CULVERT														
+	CONCRETE (M3)														
	S1	=	PI()	x	D_1^2	:	4	=	PI()	x	1.780	x	1.780	: 4 =	2.488
	S2	=	PI()	x	D_2^2	:	4	=	PI()	x	1.500	x	1.500	: 4	1.767
	S	=	S1	-	S2									=	0.721
	VOLUME	=	S	x	L_{TB}			=	0.721	x	0.950			=	0.685
	SUM	=	0.685	x	48									=	32.89



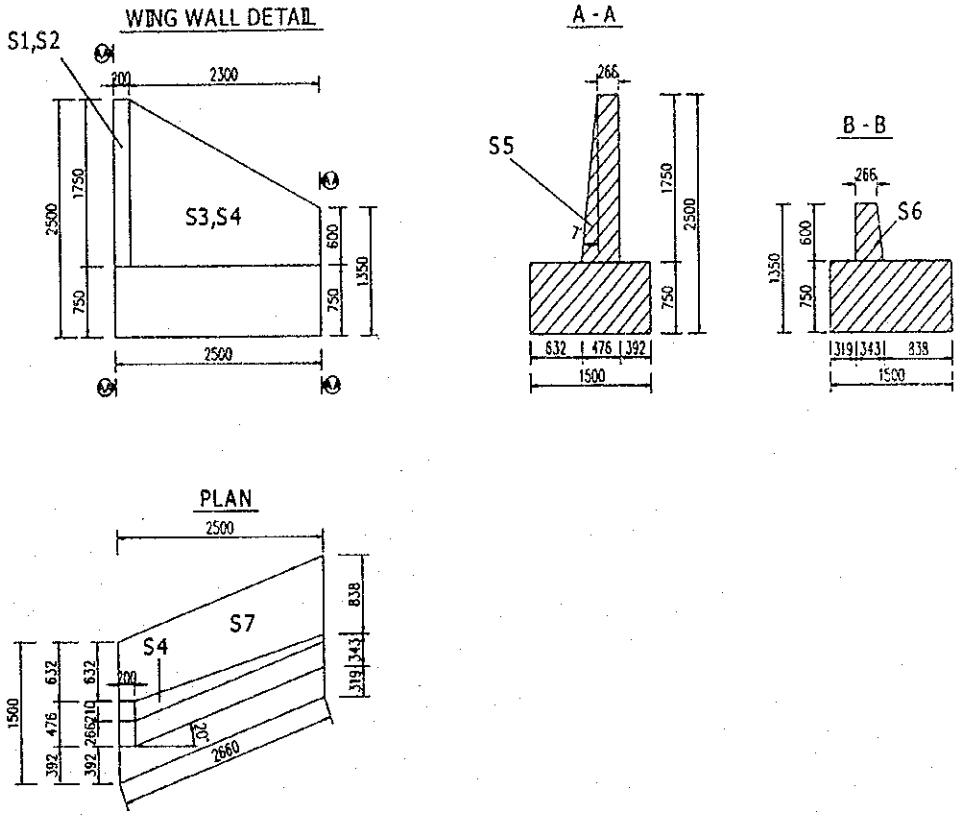


+	FORM (M2)														563.92
-	SEGMENT														11.748
*	INSIDE FORM (M2)	=	3.142	x	1.500	x	1.000							=	4.713
*	OUTSIDE FORM (M2)														7.035
	BOX BULWARK	=	3.142	x	1.78	x	1.000							=	5.593
	THE END OF CULVERT	=	S	x	2									=	1.443
-	CULVERT	=	11.748	x	48									=	563.922

R.C. PIPE CULVERT STATION 0+51.8
QUANTITIES TABLE OF REINFORCEMENT FOR 1 SEGMENT

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	46800	10	1	0.617	46.80	28.85
1b	42100	10	1	0.617	42.10	25.96
2	332	6	80	0.222	26.56	5.90
3	1168	6	40	0.222	46.72	10.37
REINFORCEMENT :				D=<14	**71.1**	KG
REINFORCEMENT :				16=<D<=25	**0.00**	KG
TOTAL	**REINFORCEMENT :**				**71.1**	KG

2 WINGWALL



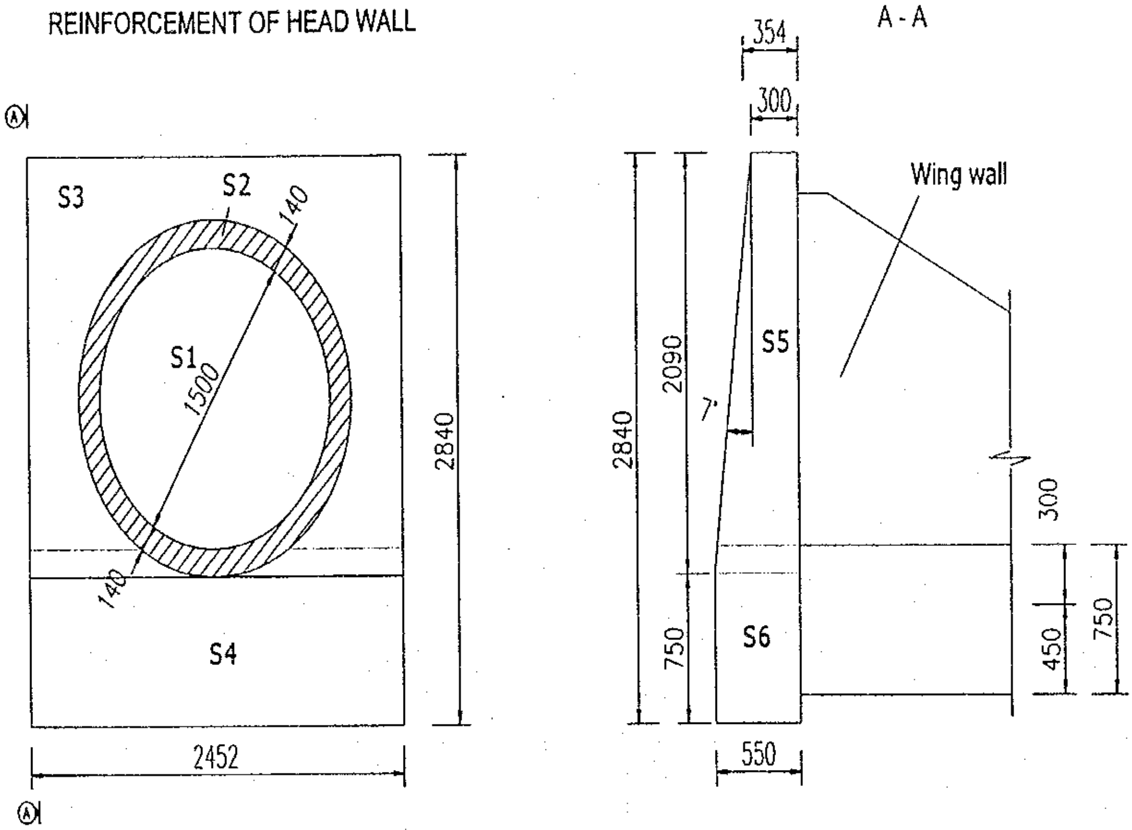
+	CONCRETE (M3)		
	S7	= (1.500 + 1.500) : 2 x 2.500 =	3.750
*	BASE OF THE WINGWALL	= S7 x 0.750 =	2.813
	S5	= (0.476 + 0.266) : 2 x 1.750 =	0.649
	S6	= (0.343 + 0.266) : 2 x 0.600 =	0.183
*	WINGWALL	= 2.500 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$) =	0.980
	SUM	=	3.79
+	FORM (M2)		13.55
*	BASE OF THE WINGWALL	=	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	= 1.500 + 1.000 + 1.500 + 1.000 + 2.660 + 1.000 + 2.660 =	11.320
	AREA	= PERIMETER x 0.750 =	8.490
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1) =	6.558

R.C. PIPE CULVERT STATION 0+51.8
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

3 HEADWALL

REINFORCEMENT OF HEAD WALL



+	CONCRETE (M3)		
	S1+S2	= 3.412 x 1.780 x 1.780 : 4 =	2.488
*	VOLUME I	= (S1 + S2) x (0.550 + 0.354) : 2 =	1.125
	S1+S2+S3	= 2.090 x 2.452 =	5.125
*	VOLUME II	= (S1 + S2 + S3) x (0.550 + 0.300) : 2 : 3 =	0.763
	S1+S2+S3+S4	= 2.452 x 2.840 =	6.964
*	VOLUME	= (S1 + S2 + S3 + S4) x 0.550 =	3.830
	SUM	=	**1.94**
+	FORM (M2)		
	S5	= (0.300 + 0.550) : 2 x 2.090 =	0.888
	S6	= 0.750 x 0.550 =	0.413
	TOTAL FOR 01 HEADWALL	= (S5 + S6) x 2 + S4 x 2 + S3 : COS7^0 + S3 =	11.572
	TOTAL FOR 02 HEADWALL	=	**23.14**
+	SCAFFOLDING (M2) (FOR WHOLE CULVERT)	= 2 x ((S5 + S6) x 2 + 2.452 x 2.840) =	**19.13**

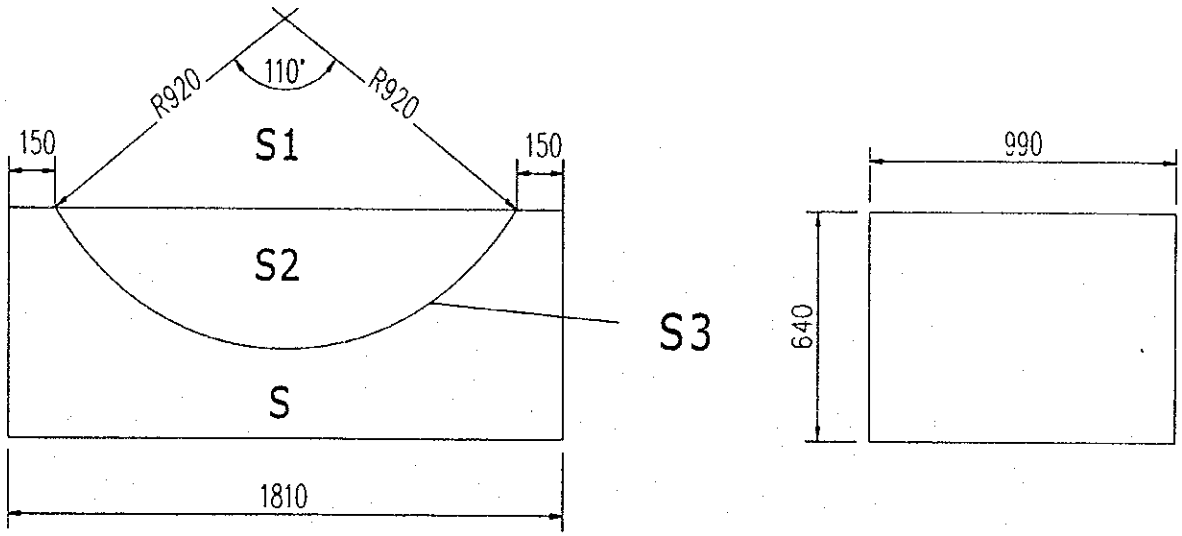
R.C. PIPE CULVERT STATION 0+51.8
REINFORCEMENT OF HEAD WALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1	3180	12	8	0.888	25.4	22.59
2	3197	12	4	0.888	12.8	11.35
3a	1177	8	22	0.395	25.9	10.22
3b	1446	8	8	0.395	11.6	4.56
4	2654	8	13	0.395	34.5	13.61
5a	939	8	9	0.395	8.5	3.33
5b	2076	8	9	0.395	18.7	7.37
TOTAL	REINFORCEMENT :				**73.04** KG	

5 CRADLE

CRADLE R.C.P.C 1.50m DIAMETER

CROSS SECTION

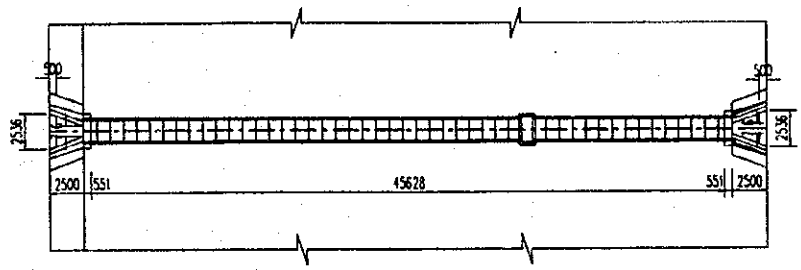


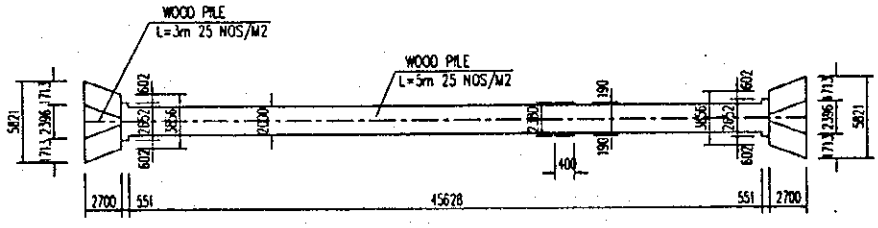
+	CONCRETE (M3)			
	S1	= 0.920 x 0.920 x SIN110^0 : 2	=	0.398
	S2	= 110 x 3.142 : 360 x 0.920 x 0.920 - S1	=	0.414
	S	= 1.81 x 0.64 - S2	=	0.744
	VOLUME	= 0.990 x S	=	0.737
	TOTAL	= VOLUME x L	=	34.42
+	FORM (M2)			142.36
*	BOX BULWORK	= 0.640 x 2 x L = 0.640 x 2 x 46.73	=	59.814
*	S3	= 3.142 x 110 : 180 x 0.920 x L	=	82.549

R.C. PIPE CULVERT STATION 0+51.8
REINFORCEMENT OF CRADLE R.C.P.C

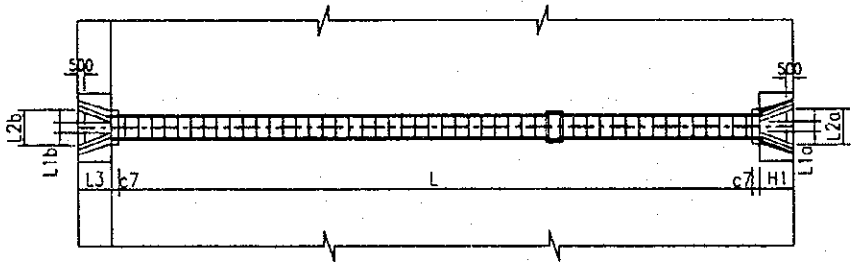
BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1	558	6	12	0.222	6.70	1.49
2	442	6	6	0.222	2.65	0.59
3	1998	8	6	0.395	11.99	4.73
4	1198	6	22	0.222	26.36	5.85
5	3418	8	6	0.395	20.51	8.09
TOTAL	**REINFORCEMENT :**				**20.7**	KG

R.C.PIPE CULVERT FOR DRAINAGE
(STATION 0+51.80)





NOTATIONS FOR QUANTITY CALCULATION OF R.C.P CULVERT FOR DRAINAGE



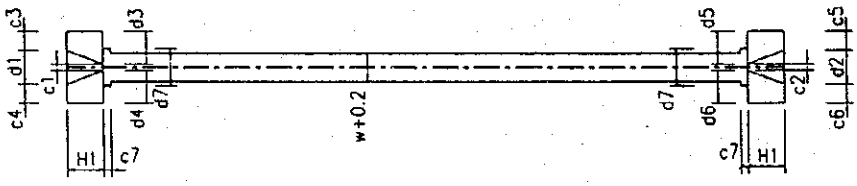


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM0+51.8

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	0.430	+	2.396	)	x	2.700	:	2	=	3.815	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	0.430	+	2.396	)	x	2.700	:	2	=	3.815	(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=	c7	x	d7	=		
=	0.551	x	2.652	=	1.461	(m2)
S8=	(L)	x	(W + 0.2)	=		
=	45.628	x	2.000	=	91.788	(m2)

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=		
=	(	0.716	+	2.536	)	x	2.500	:	2	=	4.065	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2	=		
=	(	0.716	+	2.536	)	x	2.500	:	2	=	4.065	(m2)

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.45 x 0.5	=		
=	(	4.065	+	4.065	)	x 0.3	+	(	2.536	+	2.536	) x 0.45 x 0.5	=	3.58	(m3)

2. LEAN CONCRETE:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	2 x S7	) x 0.1	=			
=	(	3.815	+	3.8151	+	4.625	+	4.625	+	4.625	+	4.625	+	2.9225	) x 0.1	=	2.91	(m3)	

3. WOOD PILE:

** L=5M*

W5=	(	S3	+	S4	+	S5	+	S6	+	2 x S7	+	S8	) x 25 x 5 : 100	=					
=	(	4.625	+	4.625	+	4.625	+	4.625	+	2.923	+	91.788	) x 25 x 5 : 100	=	141.51	(100m)			

** L=3M*

W3=	(	S1	+	S2	+	0	)	x 25 x 3 : 100	=										
=	(	3.815	+	3.8151	+	0.000	)	x 25 x 3 : 100	=	5.72	(100m)								

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

4. SAND BEDDING:

=	(	S1	+	S2	+	S3	+	S4	+	S5	+	S6	+	2 x S7	+	S8	) x 0.15 =		
=	(	3.815	+	3.815	+	4.625	+	4.625	+	4.625	+	4.625	+	2.923	+	91.788	) x 0.15 =	18.13	(m3)

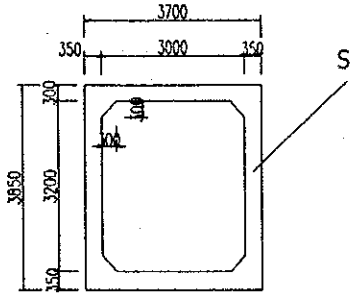
5.FORM

=	(L2a +	L2b)	)	X 0.75	x	2	=		
	(2.536 +	2.536	)	X 0.75	x	2	=	7.608	(m2)

6.SCAFFOLDING

=	(L2a +	L2b)	)	X 0.75	x	2	=		
	(2.536 +	2.536	)	X 0.75	x	2	=	7.608	(m2)

2.2. Box culvert at station 0+183.7

I	BOX CULVERT STATION 0+183.7		QUANTITIES
	L	= 13.340 + 13.340 + 5.765 + 11.280 + 3 x 0.02 = 43.79	
1	CULVERT		
+	CONCRETE (M3)		
	S	= 3.700 x 3.850 - 3.200 x 3.000 + 2 x 0.300 x 0.300 =	4.825
	VOLUME	= S x (L - 0.06) + 3.700 x 0.200 x 0.300 x 4 =	211.86
		SINGLE BOX CULVERT	
			
+	FORM		783.37
*	INSIDE FORM (M2)		406.514
	BOX BULWARK	= (3.200 + 2 x 0.300 x (1:SIN45^0 - 1)) x 43.725 x 2 =	301.574
	BOTTOM OF THE BOX	= (3.000 - 0.300 x 2) x 43.725 x 1 =	104.940
*	OUTSIDE FORM (M2)		376.858
	BOX BULWARK	= 3.850 x 2 x 43.725 + 8 x 0.300 x 0.200 =	337.163
	THE END OF CULVERT	= S x 4 + 3.700 x 0.200 x 8 =	25.220
	CENTER AND JOINT	= S x 3 =	14.475
+	SCAFFOLDING (M2)	= 3.850 x 2.000 x 43.725 + 8.000 x 0.300 x 0.200 =	337.16
+	SUPPORT		
	AREA (M2)	= 3.700 x 3.850 - S =	9.420
	VOLUME (M3)	= AREA x L =	412.45

BOXCULVERT STATION 0+183.7
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	5810	250	14	108	1.208	627.48	758.3
2	3730	250	12	106	0.888	395.38	351.0
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	4331	250	16	53	1.578	229.54	362.3
7	4220	250	14	108	1.208	455.76	550.7
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	13945	250	12	32	0.888	446.24	396.2
13	14045	250	12	84	0.888	1179.78	1047.4
14	1280	250	12	160	0.888	204.80	181.82
15	1380	250	12	160	0.888	220.80	196.03
REINFORCEMENT :	D<=14			4543.1	TOTAL FOR SEGMENT 1 & 2 :		
REINFORCEMENT :	16=D<=25			721.1	REINFORCEMENT (KG):		10528.4
REINFORCEMENT :	25<D=32				CONCRETE (M^3):		129.18

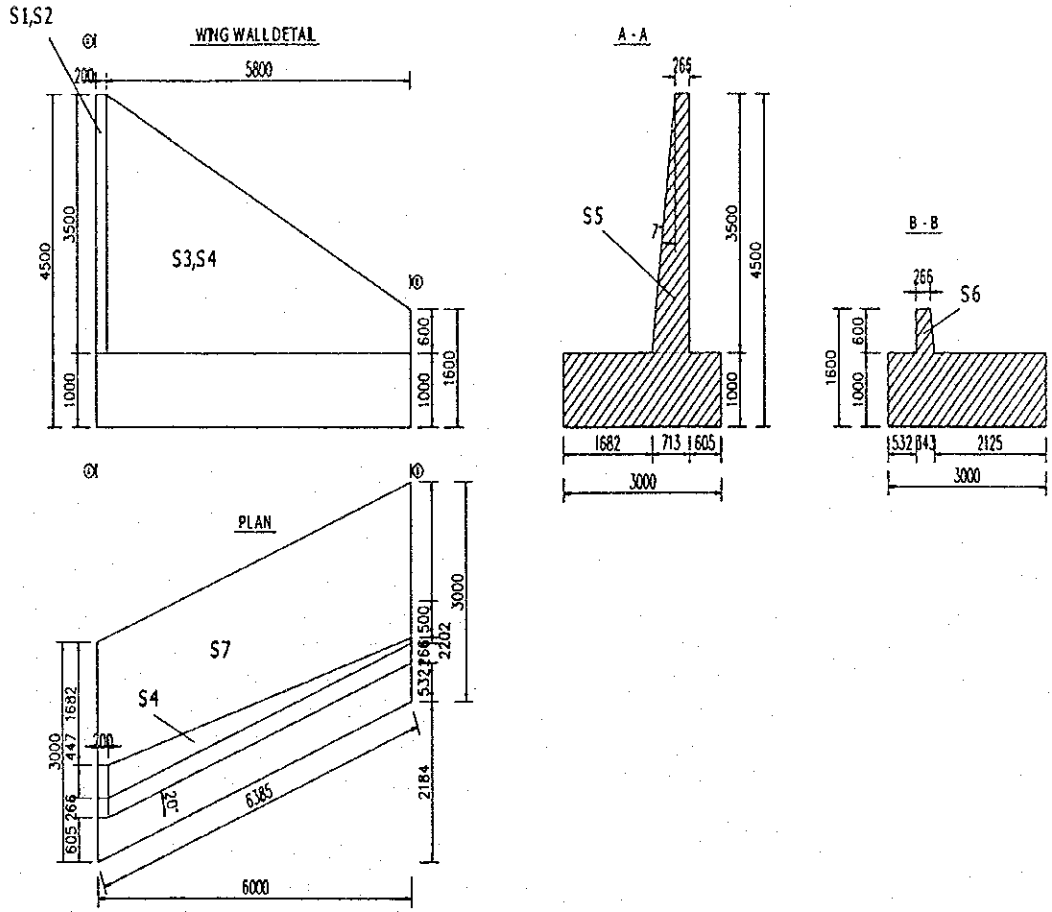
SEGMENT 3

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	5810	250	14	48	1.208	278.88	337.0
2	3730	250	12	46	0.888	171.58	152.3
3	4289	250	16	23	1.578	98.65	155.7
4	4070	250	14	48	1.208	195.36	236.1
5	2220	250	12	48	0.888	106.56	94.6
6	4331	250	16	23	1.578	99.61	157.2
7	4220	250	14	48	1.208	202.56	244.8
8	1474	250	12	48	0.888	70.73	62.8
9	1544	250	12	48	0.888	74.13	65.8
10	1540	250	12	16	0.888	24.64	21.9
11	3580	180	12	2	0.888	7.16	6.4
12	6005	250	12	32	0.888	192.16	170.6
13	6105	250	12	84	0.888	512.82	455.3
14	1280	250	12	69	0.888	88.32	78.4
15	1380	250	12	69	0.888	95.22	84.5
16	2120	250	12	2	0.888	4.24	3.8
REINFORCEMENT :	D<=14			2014.2	TOTAL FOR SEGMENT 3 :		
REINFORCEMENT :	16=D<=25			312.9	REINFORCEMENT (KG):		2327.2
REINFORCEMENT :	25<D=32				CONCRETE (M^3):		28.04

SEGMENT 4

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	5810	250	14	92	1.208	534.52	645.9
2	3730	250	12	90	0.888	335.70	298.0
3	4289	250	16	45	1.578	193.01	304.6
4	4070	250	14	92	1.208	374.44	452.5
5	2220	250	12	92	0.888	204.24	181.3
6	4331	250	16	45	1.578	194.90	307.6
7	4220	250	14	92	1.208	388.24	469.2
8	1474	250	12	92	0.888	135.57	120.4
9	1544	250	12	92	0.888	142.08	126.1
10	1540	250	12	16	0.888	24.64	21.9
11	3580	180	12	2	0.888	7.16	6.4
12	11520	250	12	32	0.888	368.64	327.3
13	11620	250	12	84	0.888	976.08	866.6
14	1280	250	12	38	0.888	48.64	43.2
15	1380	250	12	135	0.888	186.30	165.4
REINFORCEMENT :	D<=14			3724.1	TOTAL FOR SEGMENT 4 :		
REINFORCEMENT :	16=D<=25			612.2	REINFORCEMENT (KG):		4336.3
REINFORCEMENT :	25<D=32				CONCRETE (M^3):		54.65
TOTAL FOR SEGMENT 1 , 2 , 3 & 4							
REINFORCEMENT :	D<=14			14824.5	REINFORCEMENT (KG) :		17191.9
REINFORCEMENT :	16=D<=25			2367.3			
REINFORCEMENT :	25<D=32				CONCRETE (M^3) :		211.86

2 WINGWALL

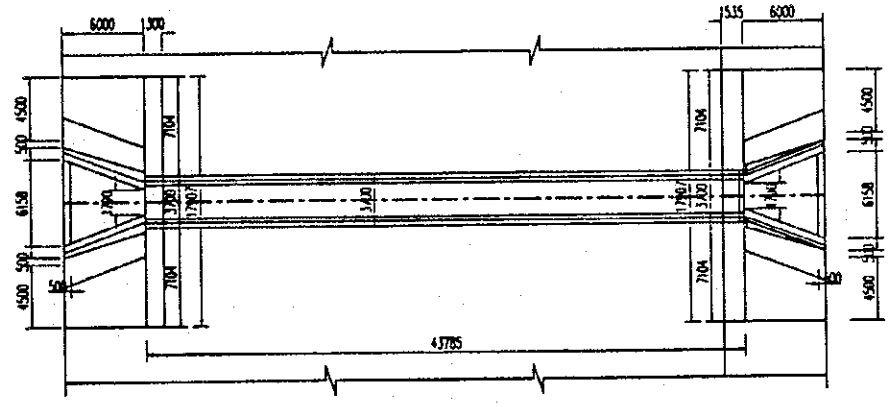


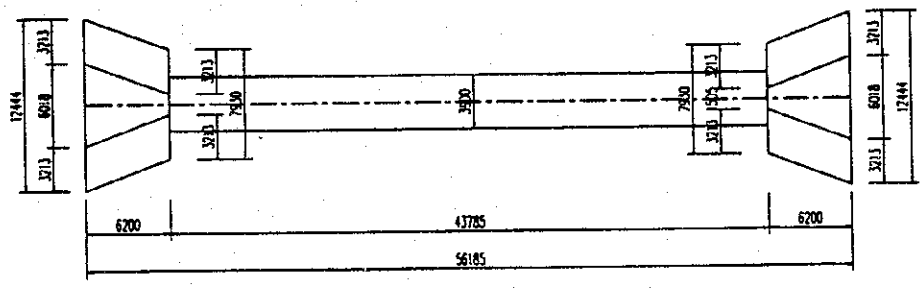
+	CONCRETE (M3)		
	S7	= (3.000 + 3.000) : 2 x 6.000	= 18.000
*	BASE OF THE WINGWALL	= S7 x 1.000	= 18.000
	S5	= (0.713 + 0.266) : 2 x 3.500	= 1.713
	S6	= (0.343 + 0.266) : 2 x 0.600	= 0.183
*	WINGWALL	= 6.000 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	= 4.911
	SUM		= 22.91
+	FORM (M2)		47.47
*	BASE OF THE WINGWALL		= 18.770
	BASE OF THE WINGWALL	= (6.385 + 6.385 + 3.000 + 3.000) x 1.000	= 18.770
*	WINGWALL		28.695
	S1+S2	= 0.200 x 3.500 x 2	= 1.400
	S3	= (3.500 + 0.600) x 5.800 : (2 x $COS20^0$)	= 12.652
	S4	= 12.652 : $COS7^0$	= 12.747
	S5	= 1.713	= 1.713
	S6	= 0.183	= 0.183
+	SCAFFOLDING (M2)		47.88
*	BASE OF THE WINGWALL		21.770
	PERIMETER	= 6.385 + 1.000 + 3.000 + 1.000 + 6.385 + 1.000 + 3.000	= 21.770
	AREA	= PERIMETER x 1.000	= 21.770
*	WINGWALL	= S3 x 2 + 0.600 x (0.343 + 1)	= 26.110

BOX CULVERT STATION 0+183.7
REINFORCEMENT OF WINGWALL

BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3143	12	33	0.888	103.7	92.1
1b	3237	16	33	1.578	106.8	168.6
2a	6771	12	6	0.888	40.6	36.1
2b	3816	12	28	0.888	106.8	94.9
2c	558	12	33	0.888	18.4	16.3
3	7175	12	2	0.888	14.4	12.7
4	7383	12	30	0.888	221.5	196.6
5a	4447	12	27	0.888	120.1	106.6
5b	3035	12	9	0.888	27.3	24.2
5c	3489	22	27	2.984	94.2	281.1
5d	2077	22	9	2.984	18.7	55.8
6	2944	14	49	1.208	144.3	174.3
7	3320	12	4	0.888	13.3	11.8
8	3320	12	6	0.888	19.9	17.7
9	6285	12	6	0.888	37.7	33.5
10	1304	14	12	1.208	15.6	18.9
11	853	12	17	0.888	14.5	12.9
12	2587	12	2	0.888	5.2	4.6
REINFORCEMENT : D=<14						853.2 KG
REINFORCEMENT : 14< D<=25						505.5 KG
TOTAL REINFORCEMENT :						1358.7 KG

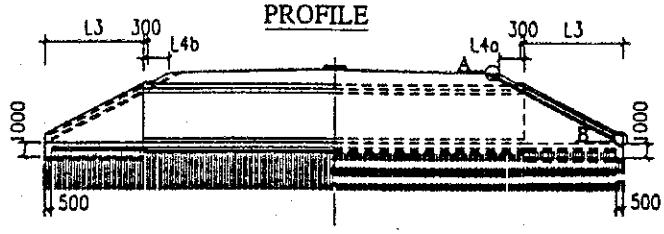
BOX CULVERT FOR DRAINAGE
(STATION 0+183.7)



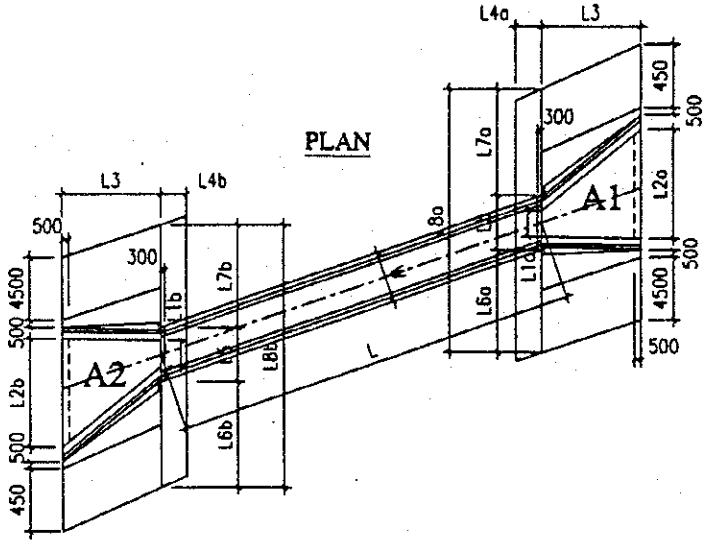


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

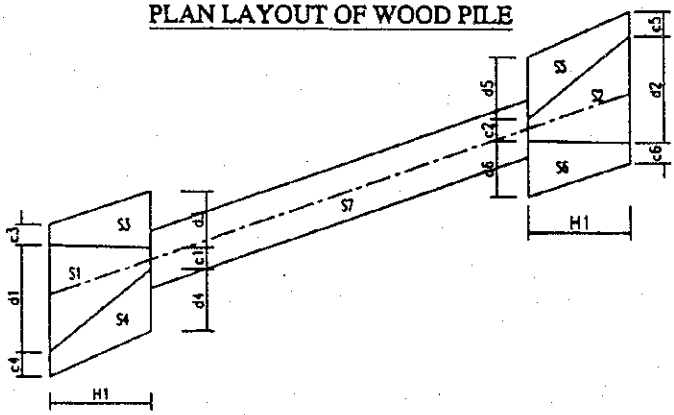
PROFILE



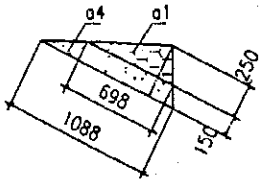
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

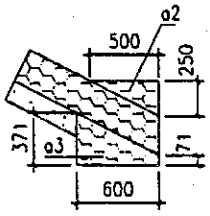


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM0+183.7

S1=	(	c1	+	d1	)	x	H1	:	2	=			
=	(	1.505	+	6.018	)	x	6.200	:	2	=	23.321	(m2)	
S2=	(	c2	+	d2	)	x	H1	:	2	=			
=	(	1.505	+	6.018	)	x	6.200	:	2	=	23.321	(m2)	
S3=	(	c3	+	d3	)	x	H1	:	2	=			
=	(	3.213	+	3.213	)	x	6.200	:	2	=	19.921	(m2)	
S4=	(	c4	+	d4	)	x	H1	:	2	=			
=	(	3.213	+	3.213	)	x	6.200	:	2	=	19.921	(m2)	
S5=	(	c5	+	d5	)	x	H1	:	2	=			
=	(	3.213	+	3.213	)	x	6.200	:	2	=	19.921	(m2)	
S6=	(	c6	+	d6	)	x	H1	:	2	=			
=	(	3.213	+	3.213	)	x	6.200	:	2	=	19.921	(m2)	
S7=		L	x	(W + 0.2)	=								
=		43.785	x	3.900	=		170.762		(m2)				

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=			
=	(	1.790	+	6.158	)	x	6.000	:	2	=	23.844	(m2)	
A2=	(	L1b	+	L2b	)	x	L3	:	2	=			
=	(	1.790	+	6.158	)	x	6.000	:	2	=	23.844	(m2)	

	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.7 x 0.5	=		
=	(	23.844	+	23.844	)	x 0.3	+	(	6.158	+	6.158	) x 0.7 x 0.5	=	<u>18.62</u>	(m3)

2. CONCRETE FOUNDATION OF CULVERT:

L x (W + 0.2) x 0.2 = 43.785 x 3.900 x 0.2 = ***34.15*** (m3)

3. LEAN CONCRETE:

= (S1 + S2 + S3 + S4 + S5 + S6) x 0.1 =
= (23.321 + 23.3213 + 19.921 + 19.921 + 19.921 + 19.921) x 0.1 = ***12.63*** (m3)

4. WOOD PILE:

**** L=5M***

W5= (S3 + S4 + S5 + S6 + S7) x 25 x 5 :100 =
= (19.921 + 19.921 + 19.921 + 19.921 + 170.762) x 25 x 5 :100 = ***313.05*** (100m)

**** L=3M***

W3= (S1 + S2 + (0.8 x 4.5 x 4)) x 25 x 3 : 100 =
= (23.321 + 23.3213 + 14.400) x 25 x 3 : 100 = ***45.78*** (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 =
= (23.321 + 23.321 + 19.921 + 19.921 + 19.921 + 19.921 + 170.762 + (0.8 x 4.5 x 4)) x 0.15 = 46.72 (m3)

6. STONE MASONRY

a1= 0.698 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
= (7.104 + 5.000) x 6.000 x 0.5 = 36.312 (m2)

b2b= (L6b + 5.000) x L3 x 0.5 =
= (7.104 + 5.000) x 6.000 x 0.5 = 36.312 (m2)

b3a= (L7a + 5.000) x L3 x 0.5 =
= (7.104 + 5.000) x 6.000 x 0.5 = 36.312 (m2)

b3b= (L7b + 5.000) x L3 x 0.5 =
= (7.104 + 5.000) x 6.000 x 0.5 = 36.312 (m2)

b4a= L8a x L4a = 17.907 x 1.535 = 27.487 (m2)

b4b= L8b x L4b = 17.907 x 1.300 = 23.279 (m2)

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

V1a= a1 x L8a = 0.087 x 17.907 = 1.562 (m3)

V1b= a1 x L8b = 0.087 x 17.907 = 1.562 (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) =
= (27.487 - 1.110 + 36.312 + 36.312) x 0.25 : 0.894 = 27.685 (m3)

V3b= (b4b - b1 + b2b + b3b) x 0.25 : COS(26.56) =
= (23.279 - 1.110 + 36.312 + 36.312) x 0.25 : 0.894 = 26.508 (m3)

TOTAL = (V1a + V1b + V2 + V3a + V3b) =
(1.562 + 1.562 + 3.902 + 27.685 + 26.508) = ***61.220*** (m3)

7. BASE BEDDING:

V4a=	a4	x	L8a			=	0.134	x	17.907			=	2.399	(m3)					
V4b=	a4	x	L8b			=	0.134	x	17.907			=	2.399	(m3)					
V5a=	(	b4a	-	b1	+	b2a	+	b3a	-	b5	)	x	0.15	:	COS(26.56)	=			
=	(	27.487	-	1.110	+	36.312	+	36.312	-	6.000	)	x	0.15	:	0.894	=	15.604 (m3)		
V5b=	(	b4b	-	b1	+	b2b	+	b3b	-	b5	)	x	0.15	:	COS(26.56)	=			
=	(	23.279	-	1.110	+	36.312	+	36.312	-	6.000	)	x	0.15	:	0.894	=	14.898 (m3)		
TOTAL =		(	V4a	+	V4b	+	V5a	+	V5b	)=									
		(	2.399	+	2.399	+	15.604	+	14.898	)=	***35.30***	(m3)							

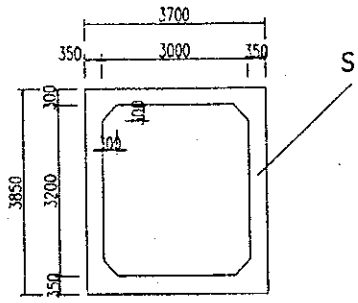
8. FORM :

=	(L2a +	L2b)	)	X 1	x	2	=	
	(6.158 +	6.158	)	X 1	x	2	=	**24.632** (m2)

9. SCAFFOLDING :

=	(L2a +	L2b)	)	X 1	x	2	=	
	(6.158 +	6.158	)	X 1	x	2	=	**24.632** (m2)

2.3. Box culvert at station 0+369.5

I	BOX CULVERT STATION 0+369.5		QUANTITIES
	L	= 16.711 + 16.503 + 8.545 + 10.231 + 3 x 0.02 = 52.05	
1	CULVERT		
+	CONCRETE (M3)		
	S	= 3.700 x 3.850 - 3.200 x 3.000 + 2 x 0.300 x 0.300 =	4.825
	VOLUME	= S x (L - 0.060) + 3.700 x 0.200 x 0.300 x 2 =	251.3
		SINGLE BOX CULVERT	
			
+	FORM		920.65
*	INSIDE FORM (M2)		483.354
	BOX BULWARK	= (3.200 + 2 x 0.300 x (1:SIN45^0 - 1)) x 51.990 x 2 =	358.578
	BOTTOM OF THE BOX	= (3.000 - 0.300 x 2) x 51.990 x 1 =	124.776
*	OUTSIDE FORM (M2)		437.298
	BOX BULWARK	= 3.850 x 2 x 51.990 + 4 x 0.300 x 0.200 =	400.563
	THE END OF CULVERT	= S x 4 + 3.700 x 0.200 x 4 =	22.260
	CENTER AND JOINT	= S x 3 =	14.475
+	SCAFFOLDING (M2)	= 3.850 x 2.000 x 51.990 + 4.000 x 0.300 x 0.200 =	400.56
+	SUPPORT		
	AREA (M2)	= 3.700 x 3.850 - S =	9.420
	VOLUME (M3)	= AREA x L =	490.31

BOXCULVERT STATION 0+369.5
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	5810	250	14	130	1.208	755.30	912.7
1b	5883	250	14	5	1.208	29.42	35.5
2	3730	250	12	128	0.888	477.44	423.9
3a	4289	250	16	64	1.578	274.50	433.3
3b	4402	250	16	4	1.578	17.61	27.8
4a	4070	250	14	130	1.208	529.10	639.4
4b	4196	250	14	5	1.208	20.98	25.4
5a	2220	250	12	130	0.888	288.60	256.2
5b	2298	250	12	10	0.888	22.98	20.4
6a	4331	250	16	64	1.578	277.15	437.4
6b	4442	250	16	4	1.578	17.77	28.0
7	4220	250	14	135	1.208	569.70	688.4
8a	1474	250	12	130	0.888	191.59	170.1
8b	1510	250	12	5	0.888	7.55	6.7
9a	1545	250	12	130	0.888	200.79	178.3
9b	1584	250	12	5	0.888	7.92	7.0
10	1540	250	12	16	0.888	24.64	21.9
11	3706	250	12	2	0.888	7.41	6.6
12	16951	250	12	32	0.888	542.43	481.6
13	16593	250	12	26	0.888	431.42	383.0
14	17509	250	12	26	0.888	455.23	404.2
15	17051	250	12	32	0.888	545.63	484.4
16	1280	250	12	201	0.888	257.28	228.4
17	1380	250	12	201	0.888	277.38	246.3

REINFORCEMENT : D<=14	5620.3	TOTAL FOR SEGMENT 1 :	
REINFORCEMENT : 16=D<=25	926.5	REINFORCEMENT (KG):	6546.9
REINFORCEMENT : 25<D=32		CONCRETE (M^3):	80.86

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	5810	250	14	134	1.208	778.54	940.8
2	3730	250	12	132	0.888	492.36	437.1
3	4289	250	16	66	1.578	283.07	446.8
4	4070	250	14	134	1.208	545.38	659.0
5	2220	250	12	134	0.888	297.48	264.1
6	4331	250	16	66	1.578	285.85	451.2
7	4220	250	14	134	1.208	565.48	683.3
8	1474	250	12	134	0.888	197.46	175.3
9	1544	250	12	134	0.888	206.94	183.7
12	17108	250	12	32	0.888	547.46	486.0
13	17208	250	12	26	0.888	447.41	397.2
14	17208	250	12	26	0.888	447.41	397.2
15	17208	250	12	32	0.888	550.66	488.9
16	1280	250	12	198	0.888	253.44	225.0
17	1380	250	12	198	0.888	273.24	242.6

REINFORCEMENT : D<=14	5580.4	TOTAL FOR SEGMENT 2 :	
REINFORCEMENT : 16=D<=25	897.9	REINFORCEMENT (KG):	6478.3
REINFORCEMENT : 25<D=32		CONCRETE (M^3):	79.63

BOXCULVERT STATION 0+369.5
QUANTITIES TABLE OF REINFORCEMENT
SEGMENT 3

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1	5810	250	14	70	1.208412594	406.70	491.5
2	3730	250	12	68	0.888	253.64	225.2
3	4289	250	16	34	1.578	145.83	230.2
4	4070	250	14	70	1.208	284.90	344.3
5	2220	250	12	70	0.888	155.40	138.0
6	4331	250	16	34	1.578	147.25	232.4
7	4220	250	14	70	1.208	295.40	357.0
8	1474	250	12	70	0.888	103.15	91.6
9	1544	250	12	70	0.888	108.10	96.0
12	8785	250	12	32	0.888	281.12	249.6
13	8885	250	12	26	0.888	231.01	205.1
14	8885	250	12	26	0.888	231.01	205.1
15	8885	250	12	32	0.888	284.32	252.4
16	1280	250	12	103	0.888	131.84	117.0
17	1380	250	12	103	0.888	142.14	126.2

REINFORCEMENT :	D<=14	2898.8	TOTAL FOR SEGMENT 3 :
REINFORCEMENT :	16=D<=25	462.6	REINFORCEMENT (KG): 3361.4
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 41.23

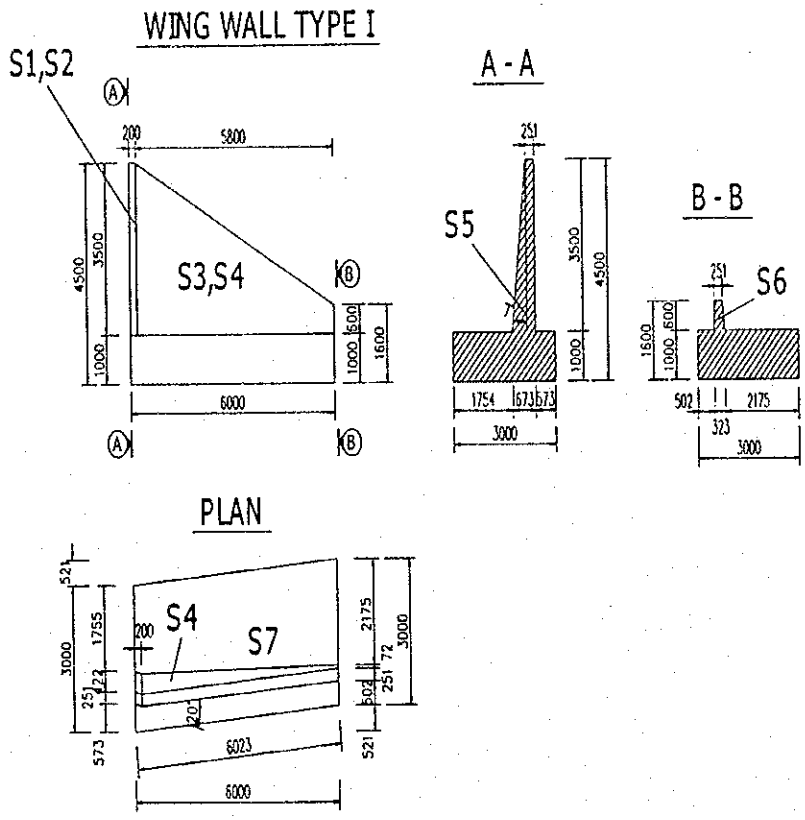
SEGMENT 4

SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1a	5810	250	14	78	1.208	453.18	547.6
1b	5883	250	14	5	1.208	29.42	35.5
2	3730	250	12	76	0.888	283.48	251.7
3a	4289	250	16	38	1.578	162.99	257.2
3b	4402	250	16	4	1.578	17.61	27.8
4a	4070	250	14	78	1.208	317.46	383.6
4b	4196	250	14	5	1.208	20.98	25.4
5a	2220	250	12	78	0.888	173.16	153.7
5b	2298	250	12	10	0.888	22.98	20.4
6a	4331	250	16	38	1.578	164.56	259.7
6b	4442	250	16	4	1.578	17.77	28.0
7	4220	250	14	83	1.208	350.26	423.3
8a	1474	250	12	78	0.888	114.96	102.1
8b	1510	250	12	5	0.888	7.55	6.7
9a	1545	250	12	78	0.888	120.47	107.0
9b	1584	250	12	5	0.888	7.92	7.0
10	1540	250	12	16	0.888	24.64	21.9
11	3706	250	12	2	0.888	7.41	6.6
12	10471	250	12	32	0.888	335.07	297.5
13	10113	250	12	26	0.888	262.94	233.4
14	11029	250	12	26	0.888	286.75	254.6
15	10571	250	12	32	0.888	338.27	300.3
16	1280	250	12	123	0.888	157.44	139.8
17	1380	250	12	123	0.888	169.74	150.7

REINFORCEMENT :	D<=14	3468.7	TOTAL FOR SEGMENT 4 :
REINFORCEMENT :	16=D<=25	572.8	REINFORCEMENT (KG): 4041.5
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 49.59

TOTAL FOR SEGMENT 1 , 2 , 3 & 4			
REINFORCEMENT :	D<=14	17568.3	REINFORCEMENT (KG) : 20428.2
REINFORCEMENT :	16=D<=25	2859.9	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : 251.31

2 WINGWALL TYPE I

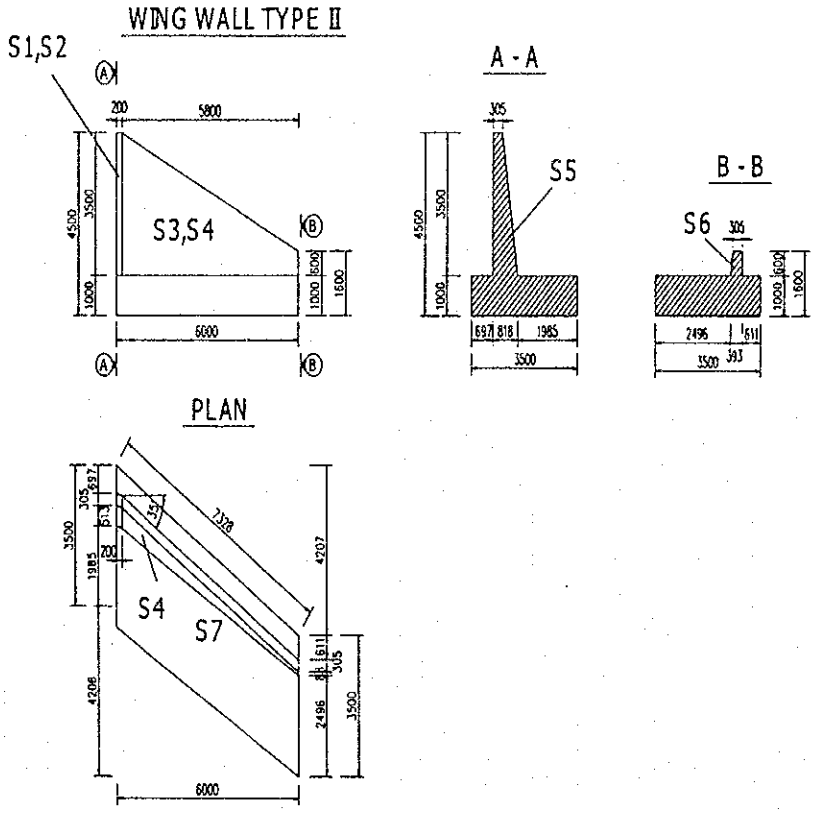


+	CONCRETE (M3)				
	S7	= (3.000 + 3.000) : 2 x 6.000	=		18.000
*	BASE OF THE WINGWALL	= S7 x 1.000	=		18.000
	S5	= (0.673 + 0.251) : 2 x 3.500	=		1.617
	S6	= (0.323 + 0.251) : 2 x 0.600	=		0.172
*	WINGWALL	= 6.000 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=		4.634
	SUM		=		22.63
+	FORM (M2)				46.63
*	BASE OF THE WINGWALL		=		18.046
	BASE OF THE WINGWALL	= (6.023 + 6.023 + 3.000 + 3.000) x 1.000	=		18.046
*	WINGWALL				28.589
	S1+S2	= 0.200 x 3.500 x 2	=		1.400
	S3	= (3.500 + 0.600) x 5.800 : (2 x $COS20^0$)	=		12.652
	S4	= 12.652 : $COS7^0$	=		12.747
	S5	= 1.617	=		1.617
	S6	= 0.172	=		0.172
+	SCAFFOLDING (M2)				47.14
*	BASE OF THE WINGWALL				21.046
	PERIMETER	= 6.023 + 1.000 + 3.000 + 1.000 + 6.023 + 1.000 + 3.000	=		21.046
	AREA	= PERIMETER x 1.000	=		21.046
*	WINGWALL	= S3 x 2 + 0.600 x (0.323 + 1)	=		26.098

BOX CULVERT STATION 0+369.5
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	3148	12	31	0.888	97.6	86.6
1b	3240	16	31	1.578	100.4	158.5
2a	6181	12	6	0.888	37.1	32.9
2b	3507	12	28	0.888	98.2	87.2
2c	558	12	31	0.888	17.3	15.4
3	6794	12	2	0.888	13.6	12.1
4	7008	12	32	0.888	224.3	199.1
5a	4617	12	28	0.888	129.3	114.8
5b	3703	12	2	0.888	7.4	6.6
5c	3659	22	28	2.984	102.5	305.7
5d	2745	22	2	2.984	5.5	16.4
6	2944	14	49	1.208	144.3	174.3
7	3320	12	4	0.888	13.3	11.8
8	3320	12	6	0.888	19.9	17.7
9	5888	12	6	0.888	35.3	31.4
10	1304	14	12	1.208	15.6	18.9
11	787	12	17	0.888	13.4	11.9
12	2361	12	2	0.888	4.7	4.2
REINFORCEMENT :		D=<14			824.7 KG	
REINFORCEMENT :		14< D<=25			480.6 KG	
TOTAL REINFORCEMENT :					**1305.4** KG	

3 WINGWALL TYPE II

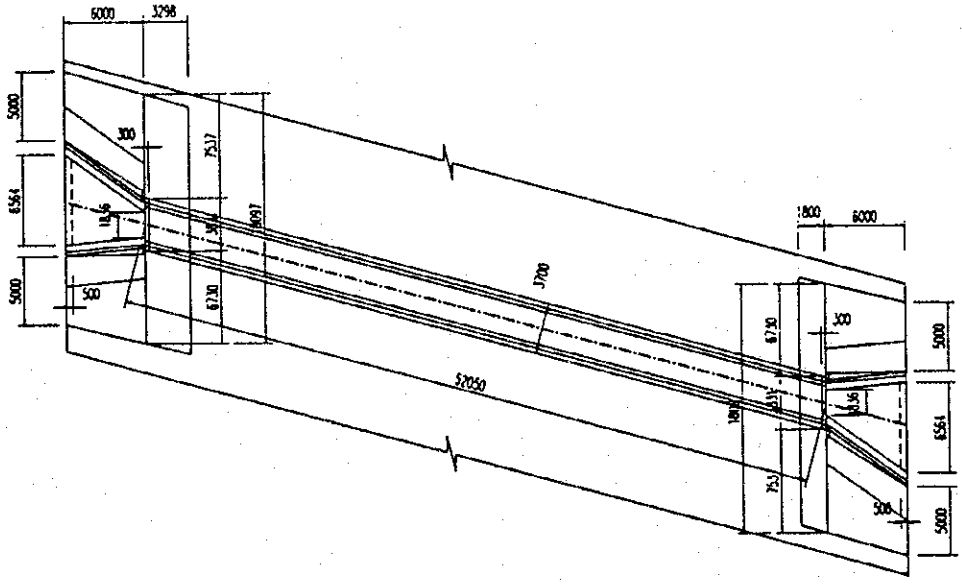


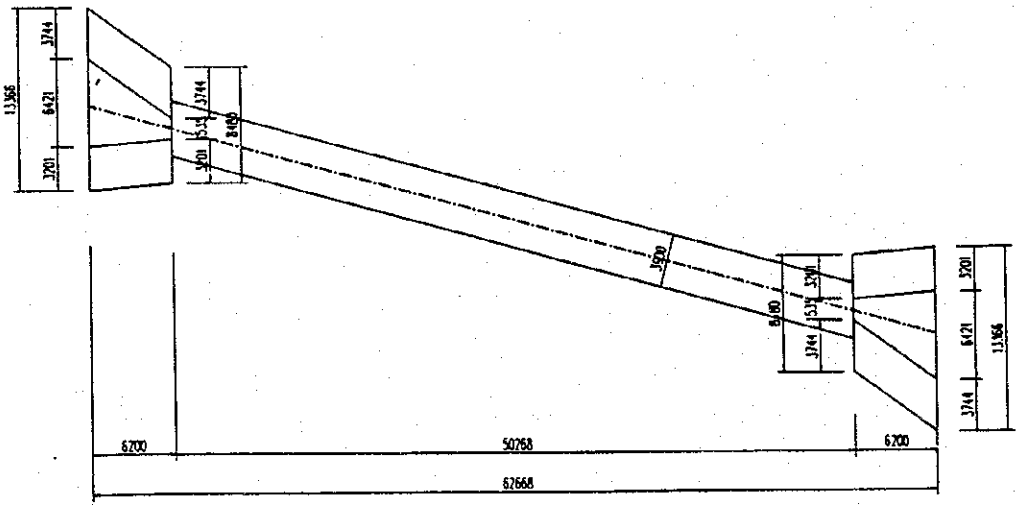
+	CONCRETE (M3)			
	S7	= (3.500 + 3.500) : 2 x 6.000	=	21.000
*	BASE OF THE WINGWALL	= S7 x 1.000	=	21.000
	S5	= (0.818 + 0.305) : 2 x 3.500	=	1.965
	S6	= (0.393 + 0.305) : 2 x 0.600	=	0.209
*	WINGWALL	= 6.000 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=	5.632
	SUM		=	**26.63**
+	FORM (M2)			**49.63**
*	BASE OF THE WINGWALL		=	20.656
	BASE OF THE WINGWALL	= (7.328 + 7.328 + 3.000 + 3.000) x 1.000	=	20.656
*	WINGWALL			28.974
	S1+S2	= 0.200 x 3.500 x 2	=	1.400
	S3	(3.500 + 0.600) x 5.800 : (2 x $COS20^0$)	=	12.652
	S4	12.652 : $COS7^0$	=	12.747
	S5	1.965	=	1.965
	S6	0.209	=	0.209
+	SCAFFOLDING (M2)			**49.80**
*	BASE OF THE WINGWALL			23.656
	PERIMETER	= 7.328 + 1.000 + 3.000 + 1.000 + 7.328 + 1.000 + 3	=	23.656
	AREA	= PERIMETER x 1.000	=	23.656
*	WINGWALL	= S3 x 2 + 0.600 x (0.393 + 1)	=	26.140

BOX CULVERT STATION 0+369.5
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	3152	12	36	0.888	113.5	100.7
1b	3254	16	36	1.578	117.1	184.9
2a	7437	12	6	0.888	44.6	39.6
2b	4206	12	26	0.888	109.3	97.1
2c	558	12	36	0.888	20.1	17.8
3	8160	12	2	0.888	16.3	14.5
4	8289	12	30	0.888	248.7	220.8
5a	4482	12	27	0.888	121.0	107.4
5b	3147	12	17	0.888	53.5	47.5
5c	3524	22	27	2.984	95.1	283.9
5d	2189	22	17	2.984	37.2	111.0
6	2944	14	59	1.208	173.7	209.9
7	3783	12	4	0.888	15.1	13.4
8	3783	12	6	0.888	22.7	20.2
9	7191	12	6	0.888	43.1	38.3
10	1304	14	12	1.208	15.6	18.9
11	891	12	17	0.888	15.1	13.4
12	2295	12	3	0.888	6.9	6.1
REINFORCEMENT : D=<14					965.7 KG	
REINFORCEMENT : 14< D<=25					579.9 KG	
TOTAL REINFORCEMENT :					1545.6 KG	

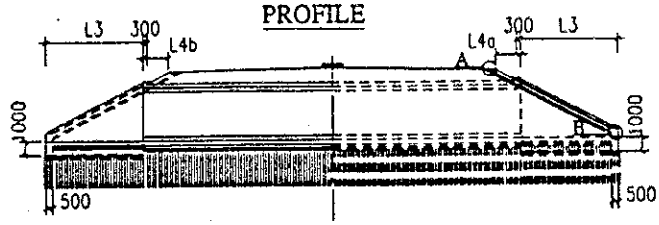
BOX CULVERT FOR DRAINAGE
(STATION 0+369.50)



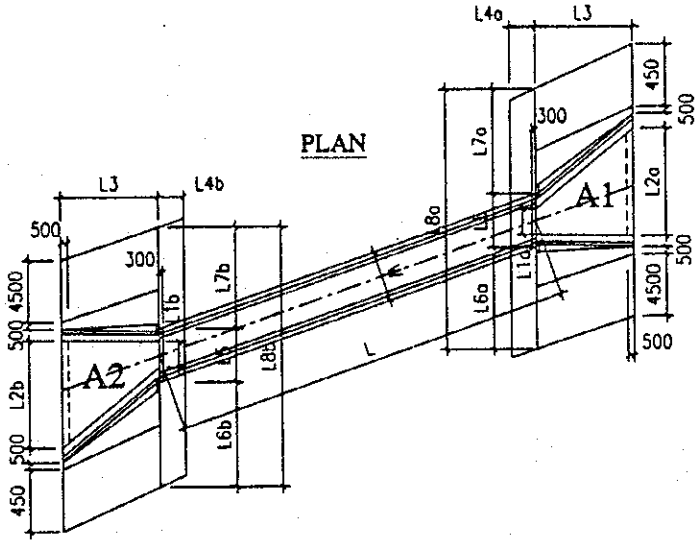


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR DRAINAGE

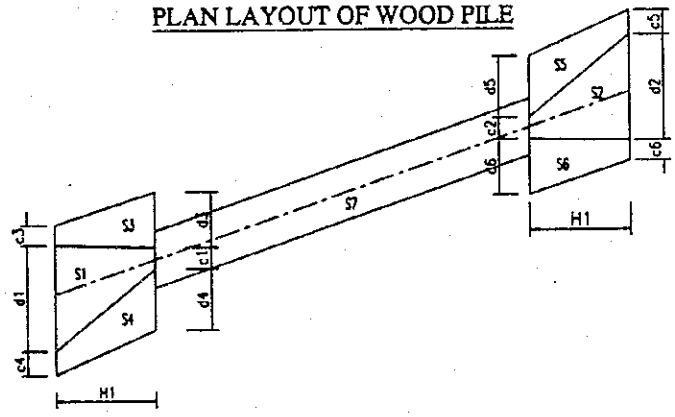
PROFILE



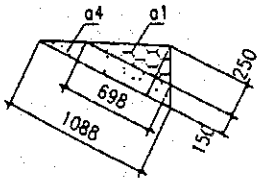
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

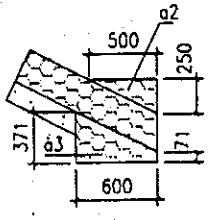


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM0+369.5

S1=	(	c1	+	d1	)	x	H1	:	2	=		
=	(	1.535	+	6.421	)	x	6.200	:	2	=	24.664	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		
=	(	1.667	+	6.421	)	x	6.200	:	2	=	25.073	(m2)
S3=	(	c3	+	d3	)	x	H1	:	2	=		
=	(	3.744	+	3.744	)	x	6.200	:	2	=	23.213	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		
=	(	3.201	+	3.201	)	x	6.200	:	2	=	19.846	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		
=	(	3.744	+	3.744	)	x	6.200	:	2	=	23.213	(m2)
S6=	(	c6	+	d6	)	x	H1	:	2	=		
=	(	3.201	+	3.201	)	x	6.200	:	2	=	19.846	(m2)
S7=		L	x	(W + 0.2)	=							
=		52.050	x	3.900	=		202.995		(m2)			

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2	=					
=	(	1.836	+	6.564	)	x	6.000	:	2	=	25.200	(m2)			
A2=	(	L1b	+	L2b	)	x	L3	:	2	=					
=	(	1.836	+	6.564	)	x	6.000	:	2	=	25.200	(m2)			
	(	A1	+	A2	)	x 0.3	+	(	L2a	+	L2b	) x 0.7 x 0.5	=		
=	(	25.200	+	25.200	)	x 0.3	+	(	6.564	+	6.564	) x 0.7 x 0.5	=	***19.71***	(m3)

2. CONCRETE FOUNDATION OF CULVERT:

L	x	(W + 0.2)	x	0.2	=	52.050	x	3.900	x	0.2	=	***40.60*** (m3)

3. LEAN CONCRETE:

= (S1 + S2 + S3 + S4 + S5 + S6) x 0.1 =
= (24.664 + 25.0728 + 23.213 + 19.846 + 23.213 + 19.846) x 0.1 = **13.59** (m3)

4. WOOD PILE:

L=5M

W5= (S3 + S4 + S5 + S6 + S7) x 25 x 5 :100 =
= (23.213 + 19.846 + 23.213 + 19.846 + 202.995) x 25 x 5 :100 = **361.39** (100m)

L=3M

W3= (S1 + S2 + (0.8 x 4.5 x 4)) x 25 x 3 : 100 =
= (24.664 + 25.0728 + 14.400) x 25 x 3 : 100 = ***48.10*** (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 =
= (24.664 + 25.073 + 23.213 + 19.846 + 23.213 + 19.846 + 202.995 + (0.8 x 4.5 x 4)) x 0.15 = **52.99** (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 3.831 = 1.149 (m2) (b1 IS AREA OF HEAD WALL)

b2a= (L6a + 5.000) x L3 x 0.5 =
= (7.537 + 5.000) x 6.000 x 0.5 = 37.611 (m2)

b2b= (L6b + 5.000) x L3 x 0.5 =
= (6.730 + 5.000) x 6.000 x 0.5 = 35.19 (m2)

b3a= (L7a + 5.000) x L3 x 0.5 =
= (6.730 + 5.000) x 6.000 x 0.5 = 35.19 (m2)

b3b= (L7b + 5.000) x L3 x 0.5 =
= (7.537 + 5.000) x 6.000 x 0.5 = 37.611 (m2)

b4a= L8a x L4a = 18.097 x 1.800 = 32.575 (m2)

b4b= L8b x L4b = 18.097 x 3.298 = 59.684 (m2)

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

V1a= a1 x L8a = 0.087 x 18.097 = 1.572 (m3)

V1b= a1 x L8b = 0.087 x 18.097 = 1.572 (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) =
= (32.575 - 1.149 + 37.611 + 35.19) x 0.25 : 0.894 = 29.146 (m3)

V3b= (b4b - b1 + b2b + b3b) x 0.25 : COS(26.56) =
= (59.684 - 1.149 + 35.19 + 37.611) x 0.25 : 0.894 = 36.727 (m3)

TOTAL = (V1a + V1b + V2 + V3a + V3b) =
(1.572 + 1.572 + 3.902 + 29.146 + 36.727) = ***72.919*** (m3)

7. BASE BEDDING:

V4a=		a4	x	L8a			=	0.134	x	18.097			=	2.424	(m3)			
V4b=		a4	x	L8b			=	0.134	x	18.097			=	2.424	(m3)			
V5a=	(	b4a	-	b1	+	b2a	+	b3a	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	32.575	-	1.149	+	37.611	+	35.19	-	6.000	)	x	0.15	:	0.894	=	16.481	(m3)
V5b=	(	b4b	-	b1	+	b2b	+	b3b	-	b5	)	x	0.15	:	COS(26.56)	=		
=	(	59.684	-	1.149	+	35.19	+	37.611	-	6.000	)	x	0.15	:	0.894	=	21.029	(m3)
TOTAL =			(	V4a	+	V4b	+	V5a	+	V5b	)=							
			(	2.424	+	2.424	+	16.481	+	21.029	)=	**42.36**		(m3)				

8. FORM

=	(L2a	+	L2b)	)	X 1	x	2	=	
	(6.564	+	6.564	)	X 1	x	2	=	**26.256** (m2)

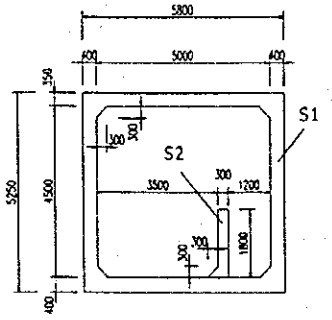
9. SCAFFOLDING

=	(L2a	+	L2b)	)	X 1	x	2	=	
	(6.564	+	6.564	)	X 1	x	2	=	**26.256** (m2)

2.4. Box culvert at station 1+063.2

I	BOX CULVERT STATION 1+063.2			QUANTITIES
	L	= 13.904 + 13.904 + 0.02 = 27.828		
1	CULVERT			
+	CONCRETE (M3)			
	S1	= 5.800 x 5.250 - 5.000 x 4.500 + 2 x 0.300 x 0.300	=	8.130
	S2	= 1.800 x 0.300 + 0.300 x 0.300 : 2	=	0.585
	S	= S1 + S2	=	8.715
	VOLUME	= S x (13.904 + 13.904) + 5.800 x 0.200 x 0.300 x 2	=	243.04

SINGLE BOX CULVERT



+	FORM			734.645
*	INSIDE FORM (M2)			438.826
	BOX BULWARK	= (4.500 + 2 x 0.300 x (1:SIN45^0 - 1)) x 27.808 x 2	=	264.113
	BOTTOM OF THE BOX	= (5.000 - 0.300 x 2) x 27.808 x 1	=	122.355
	RETAINING WALL	= (1.800 + (1:SIN45^0 - 1) x 0.200) x 27.81	=	52.358
*	OUTSIDE FORM (M2)			295.819
	BOX BULWARK	= 4.750 x 2 x 27.808 + 4 x 0.300 x 0.200	=	264.416
	THE END OF CULVERT	= S x 2 : SIN75^0 + 5.800 x 0.200 x 4	=	22.688
	CENTER	= S	=	8.715
+	SCAFFOLDING (M2)	= 4.750 x 2.000 x 27.808 + 4.000 x 0.300 x 0.200	=	264.42
+	SUPPORT			
	AREA (M2)	= 5.800 x 5.250 - S	=	21.735
	VOLUME (M3)	= AREA x L	=	604.84

BOXCULVERT STATION 1+063.2
QUANTITIES TABLE OF REINFORCEMENT
SEGMENT 1 & 2

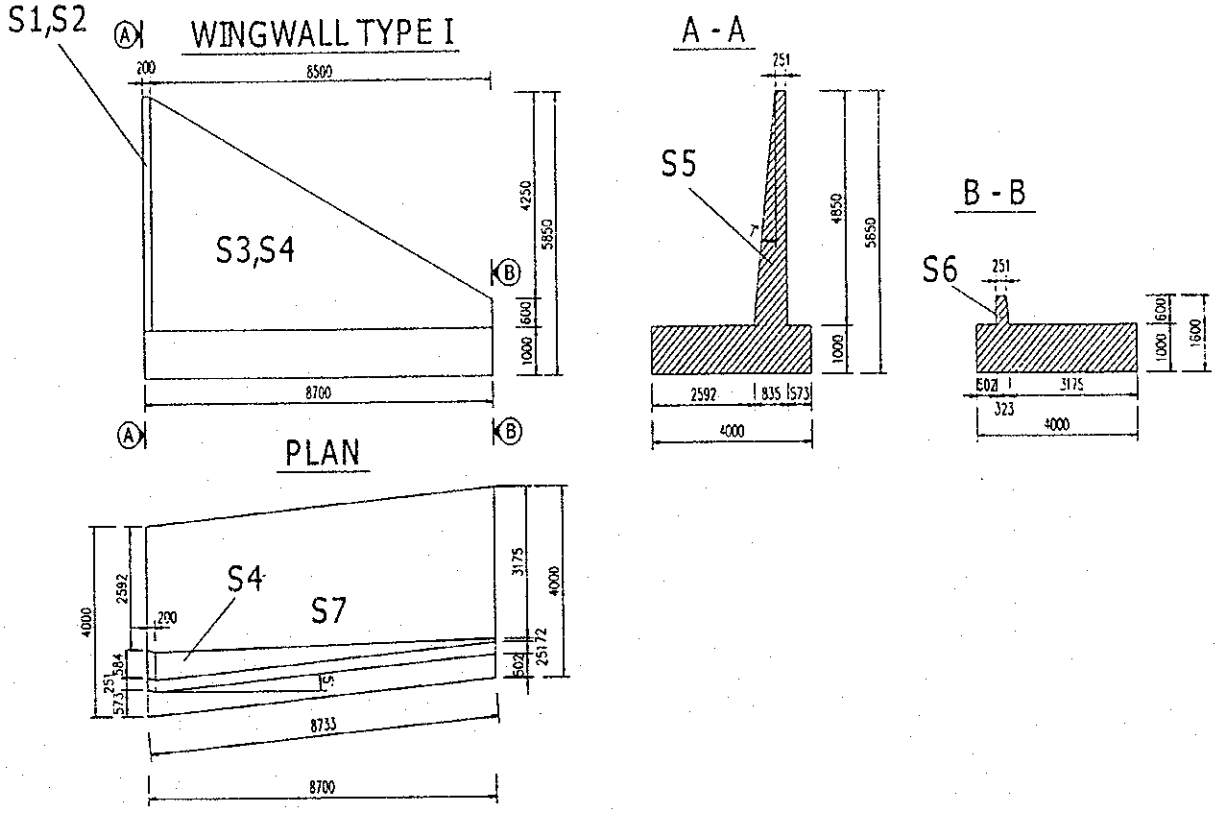
SYMBOL OF BAR	UNIT LENGTH (mm)	SPACE (mm)	DIAMETER (mm)	NUMBER OF BAR	UNIT WEIGHT (kg/m)	TOTAL LENGTH (m)	TOTAL WEIGHT (kg)
1a	8270	250	20	106	2.466	876.62	2161.9
1b	8381	250	20	7	2.466	58.67	144.7
2	5110	250	20	104	2.466	531.44	1310.6
3a	6708	250	25	52	3.853	348.81	1344.1
3b	6892	250	25	6	3.853	41.35	159.3
4a	6360	250	20	106	2.466	674.16	1662.6
4b	6560	250	20	7	2.466	45.92	113.2
5a	3220	250	12	106	0.888	341.32	303.0
5b	3334	250	12	14	0.888	46.68	41.4
6a	6575	250	20	52	2.466	341.92	843.2
6b	6757	250	20	6	2.466	40.54	100.0
7	5670	250	16	113	1.578	640.71	1011.3
8a	1567	250	12	106	0.888	166.10	147.5
8b	1608	250	12	7	0.888	11.26	10.0
9a	1638	250	12	106	0.888	173.59	154.1
9b	1680	250	12	7	0.888	11.76	10.4
10	1560	250	12	24	0.888	37.44	33.2
11	5860	250	12	2	0.888	11.72	10.4
12	4700	250	12	55	0.888	258.50	229.5
13	1496	250	12	55	0.888	82.29	73.1
14	14549	250	12	48	0.888	698.35	620.0
15	13916	250	12	36	0.888	500.98	444.8
16	15382	250	12	36	0.888	553.75	491.6
17	14141	250	12	14	0.888	197.97	175.8
18	14649	250	12	48	0.888	703.15	624.3
19	1410	250	14	222	1.208	313.02	378.3
20	1440	250	12	222	0.888	319.68	283.8

REINFORCEMENT :	D<=14	4031.2	TOTAL FOR SEGMENT 1 :
REINFORCEMENT :	16=D<=25	8850.9	REINFORCEMENT (KG): 12882.1
REINFORCEMENT :	25<D=32		CONCRETE (M^3): 121.52

TOTAL FOR SEGMENT 1 & 2

REINFORCEMENT :	D<=14	8062.382	REINFORCEMENT (KG) : 25764.2
REINFORCEMENT :	16=D<=25	17701.83	
REINFORCEMENT :	25<D=32		CONCRETE (M^3) : 243.04

2 WINGWALL TYPE I

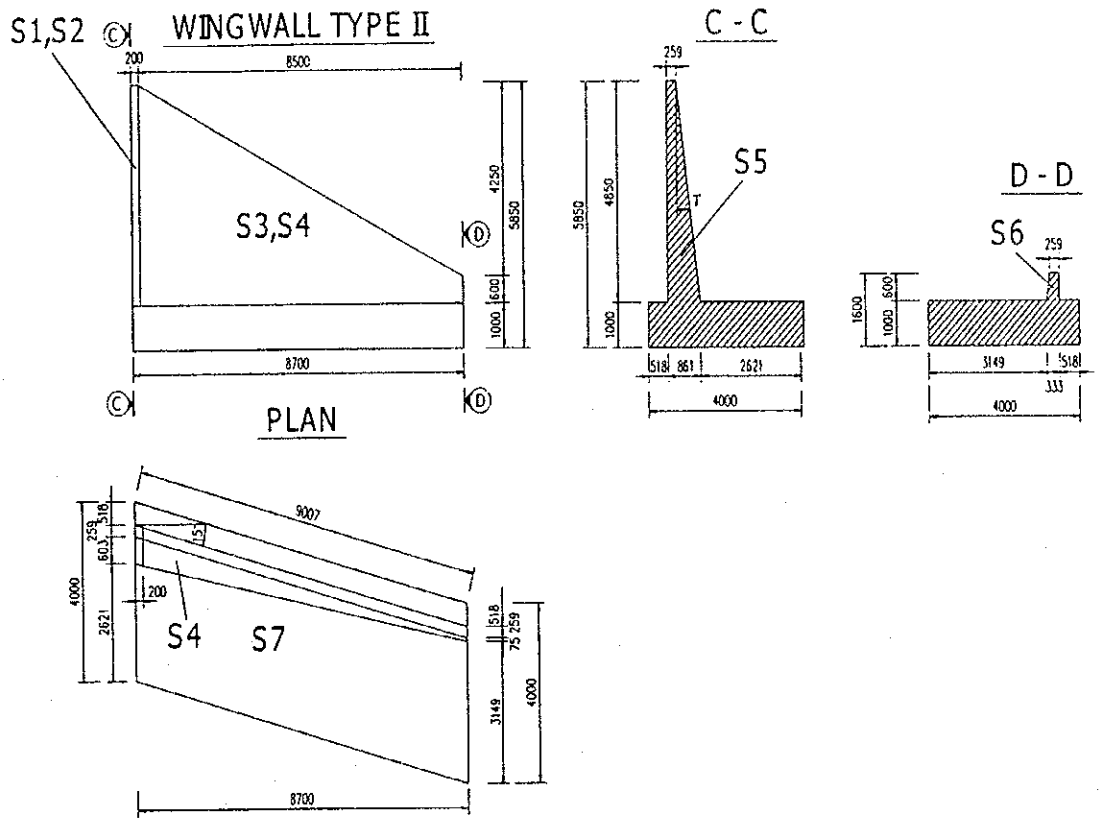


+	CONCRETE (M3)			
	S7	= (4.000 + 4.000) : 2 x 8.700	=	34.800
*	BASE OF THE WINGWALL	= S7 x 1.000	=	34.800
	S5	= (0.835 + 0.251) : 2 x 4.850	=	2.634
	S6	= (0.323 + 0.251) : 2 x 0.600	=	0.172
*	WINGWALL	= 8.700 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=	10.090
	SUM		=	44.89
+	FORM (M2)			77.99
*	BASE OF THE WINGWALL		=	25.466
	BASE OF THE WINGWALL	= (8.733 + 4.000 + 4.000 + 8.733) x 1.000	=	25.466
*	WINGWALL			52.521
	S1+S2	= 0.200 x 4.850 x 2	=	1.940
	S3	= (4.850 + 0.600) x 8.700 : (2 x $COS5^0$)	=	23.798
	S4	= 23.798 : $COS7^0$	=	23.977
	S5	= 2.634	=	2.634
	S6	= 0.172	=	0.172
+	SCAFFOLDING (M2)			76.86
*	BASE OF THE WINGWALL			28.466
	PERIMETER	= 8.733 + 1.000 + 4.000 + 1.000 + 4.000 + 1.000 + 8.733	=	28.466
	AREA	= PERIMETER x 1.000	=	28.466
*	WINGWALL	= S3 x 2 + 0.600 x (0.323 + 1)	=	48.390

BOX CULVERT STATION 1+063.2
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	3818	12	45	0.888	171.8	152.5
1b	3950	18	45	1.998	177.7	355.0
2a	8936	12	6	0.888	53.6	47.6
2b	4967	12	42	0.888	208.6	185.2
2c	571	12	45	0.888	25.7	22.8
3	9846	12	2	0.888	19.7	17.5
4	9719	12	42	0.888	408.2	362.4
5a	5601	12	42	0.888	235.2	208.9
5b	3784	12	2	0.888	7.6	6.7
5c	4643	22	42	2.984	195.0	581.9
5d	2826	22	2	2.984	5.7	16.9
6	2944	14	90	1.208	265.0	320.2
7	4308	12	4	0.888	17.2	15.3
8	4308	12	6	0.888	25.8	22.9
9	8621	12	6	0.888	51.7	45.9
10	1304	14	16	1.208	20.9	25.2
11	901	12	24	0.888	21.6	19.2
12	2863	12	3	0.888	8.6	7.6
REINFORCEMENT : D=<14						1460.0 KG
REINFORCEMENT : 14< D<=25						953.8 KG
TOTAL REINFORCEMENT :						2413.8 KG

3 WINGWALL TYPE II

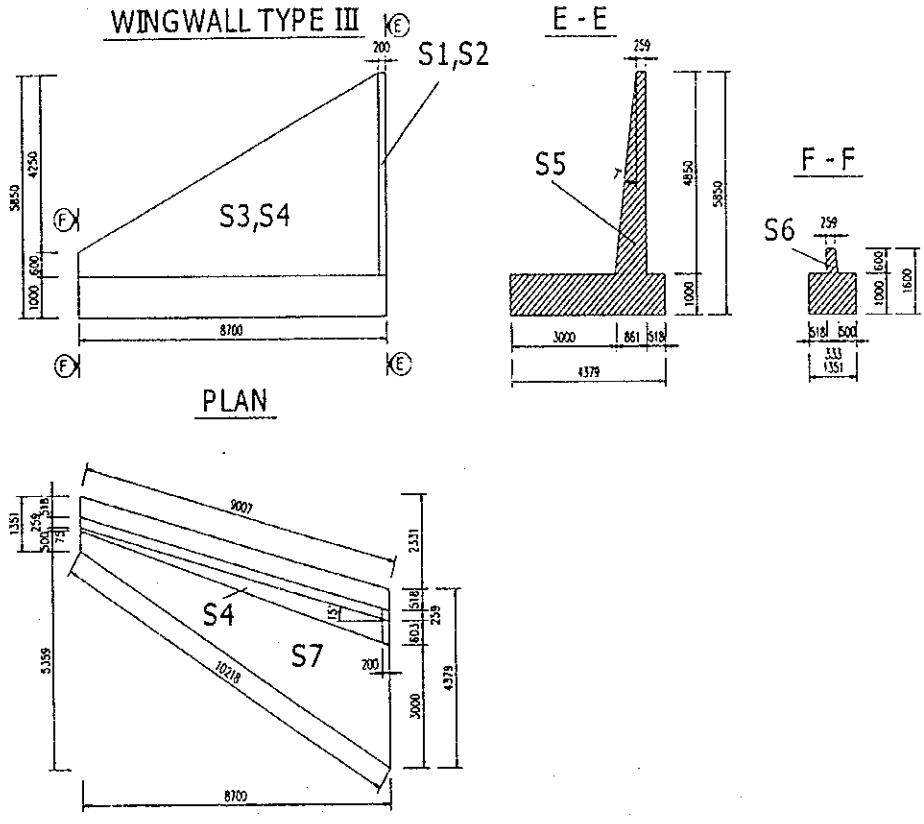


+	CONCRETE (M3)			
	S7	= (4.000 + 4.000) : 2 x 8.700	=	34.800
*	BASE OF THE WINGWALL	= S7 x 1.000	=	34.800
	S5	= (0.874 + 0.259) : 2 x 4.850	=	2.748
	S6	= (0.333 + 0.259) : 2 x 0.600	=	0.178
*	WINGWALL	= 8.700 : 3 x (S5 + S6 + (S5xS6)$^{0.5}$)	=	10.509
	SUM		=	<u>45.31</u>
+	FORM (M2)			<u>79.09</u>
*	BASE OF THE WINGWALL		=	26.014
	BASE OF THE WINGWALL	= (9.007 + 4.000 + 4 + 9.007) x 1.000	=	26.014
*	WINGWALL			53.071
	S1+S2	= 0.200 x 4.850 x 2 : COS15^0	=	2.008
	S3	= (4.850 + 0.600) x 8.500 : (2 x COS15^0)	=	23.979
	S4	= 23.979 : COS7^0	=	24.159
	S5	= 2.7475	=	2.748
	S6	= 0.178	=	0.178
+	SCAFFOLDING (M2)			<u>77.77</u>
*	BASE OF THE WINGWALL			29.014
	PERIMETER	= 9.007 + 1.000 + 4.000 + 1.000 + 4.000 + 1.000 + 9.007	=	29.014
	AREA	= PERIMETER x 1.000	=	29.014
*	WINGWALL	= S3 x 2 + 0.600 x (0.333 + 1)	=	48.757

BOX CULVERT STATION 1+063.2
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	3818	12	46	0.888	175.6	155.9
1b	3945	18	46	1.998	181.4	362.5
2a	9034	12	6	0.888	54.2	48.1
2b	5122	12	42	0.888	215.1	191.0
2c	590	12	46	0.888	27.1	24.1
3	10139	12	2	0.888	20.3	18.0
4	9989	12	40	0.888	399.6	354.7
5a	5480	12	40	0.888	219.2	194.6
5b	3614	12	8	0.888	28.9	25.7
5c	4522	22	40	2.984	180.9	539.8
5d	2656	22	8	2.984	21.2	63.4
6	2944	14	90	1.208	265.0	320.2
7	4304	12	4	0.888	17.2	15.3
8	4304	12	6	0.888	25.8	22.9
9	8891	12	6	0.888	53.3	47.4
10	1304	14	16	1.208	20.9	25.2
11	926	12	24	0.888	22.2	19.7
12	3251	12	3	0.888	9.8	8.7
REINFORCEMENT : D=<14						1471.5 KG
REINFORCEMENT : 14< D<=25						965.6 KG
TOTAL REINFORCEMENT :						**2437.1** KG

4 WINGWALL TYPE III



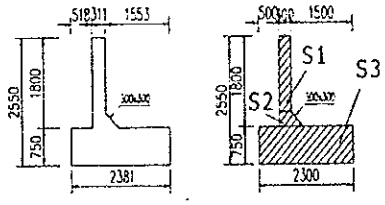
+	CONCRETE (M3)			
	S7	= (4.379 + 1.351) : 2 x 8.700	=	24.926
*	BASE OF THE WINGWALL	= S7 x 1.000	=	24.926
	S5	= (0.861 + 0.259) : 2 x 4.850	=	2.716
	S6	= (0.333 + 0.259) : 2 x 0.600	=	0.178
*	WINGWALL	= 8.700 : 3 x (S5 + S6 + $(S5xS6)^{0.5}$)	=	10.406
	SUM		=	35.33
+	FORM (M2)			77.93
*	BASE OF THE WINGWALL		=	24.955
	BASE OF THE WINGWALL	= (9.007 + 1.351 + 10.218 + 4.379) x 1.000	=	24.955
*	WINGWALL			52.973
	S1+S2	= 0.200 x 4.850 x 2	=	1.940
	S3	= (4.850 + 0.600) x 8.500 : (2 x $COS15^0$)	=	23.980
	S4	= 23.980 : $COS7^{-0}$	=	24.160
	S5	= 2.716	=	2.716
	S6	= 0.178	=	0.178
+	SCAFFOLDING (M2)			76.71
*	BASE OF THE WINGWALL			27.955
	PERIMETER	= 9.007 + 1.000 + 1.351 + 1.000 + 10.218 + 1.000 + 4.379	=	27.955
	AREA	= PERIMETER x 1.000	=	27.955
*	WINGWALL	= S3 x 2 + 0.600 x (0.333 + 1)	=	48.759

BOX CULVERT STATION 1+063.2
REINFORCEMENT OF WINGWALL TYPE III

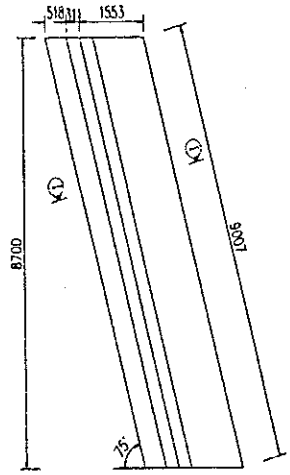
BAR MARK	UNIT LENGTH (MM)	DIAMETER (MM)	NUMBER OF BAR	UNIT WEIGHT (KG/M)	TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
1a	3805	12	52	0.888	197.9	175.7
1b	3947	18	52	1.998	205.2	410.0
2a	10633	12	6	0.888	63.8	56.6
2b	5832	12	42	0.888	244.9	217.5
2c	552	12	52	0.888	28.7	25.5
3	10633	12	2	0.888	21.3	18.9
4	11582	12	40	0.888	463.3	411.3
5a	5466	12	39	0.888	213.2	189.3
5b	3657	12	26	0.888	95.1	84.4
5c	4508	22	39	2.984	175.8	524.6
5d	2699	22	26	2.984	70.2	209.4
6	2944	14	117	1.208	344.4	416.2
7	4983	12	4	0.888	19.9	17.7
8	4983	12	6	0.888	29.9	26.5
9	10484	12	6	0.888	62.9	55.8
10	1304	14	15	1.208	19.6	23.6
11	997	12	24	0.888	23.9	21.2
12	2980	12	4	0.888	11.9	10.6
REINFORCEMENT : D=<14						1750.9 KG
REINFORCEMENT : 14< D<=25						1144.0 KG
TOTAL REINFORCEMENT :						2894.9 KG

5 RETAINING WALL

RETAINING WALL I-I



PLAN

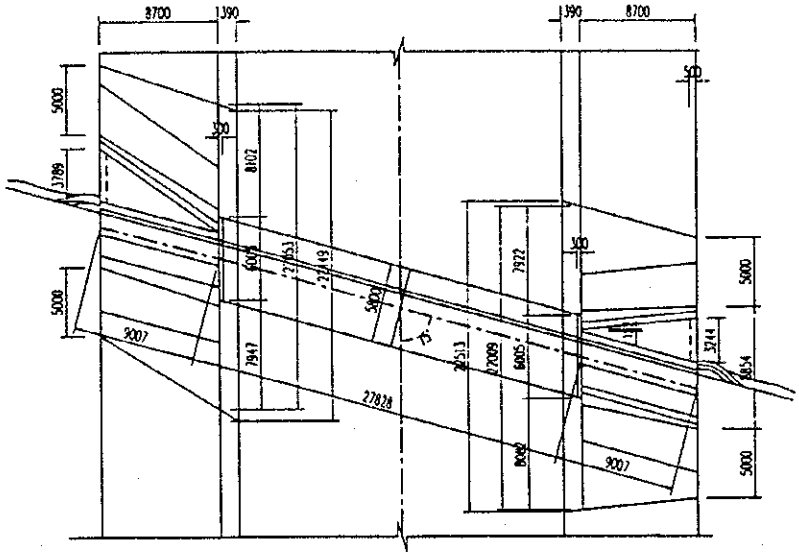


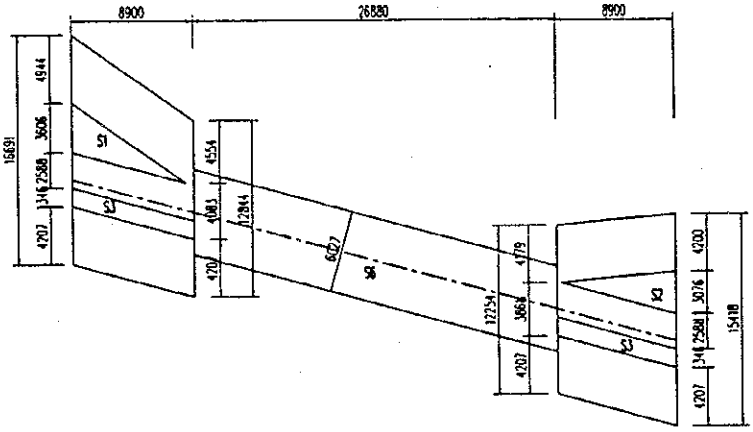
+	CONCRETE (M3)																		
	S	=	S1	+	S2	+	S3												2.310
	S1	=	0.300	x	(1.800	-	0.300)											=	0.450
	S2	=	(0.300	+	0.300	+	0.300)	x	0.300	:	2.000							=	0.135
	S3	=	0.750	x	2.300													=	1.725
	VOLUME	=	S	x	9.007													=	20.81
+	FORM (M2)																		51.10
	BASE OF THE WALL	=	2.381	x	0.750	+	2	x	0.750	x	9.007							=	15.296
	RETAINING WALL	=	(1.800	-	0.300)	x	9.007	x	2	+	(S1	:	$COS75^0$)					=	28.760
	FOOT-RETAINING WALL	=	9.007	x	0.3	:	$SIN45^0$	+	(S2	:	$COS75^0$)	+	9.007	x	0.3			=	7.045
+	SCAFFOLDING (M2)																		53.50
*	BASE OF RETAININGWALL																		18.711
	PERIMETER	=	2.381	+	1.000	+	9.007	+	1.000	+	9.007	+	1.000	+	1.553			=	24.948
	AREA	=	PERIMETER		x		0.750											=	18.711
*	RETAININGWALL	=	2	x	9.007	x	1.800	+	1.800	x	(0.311	+	1.000)					=	34.785

BOX CULVERT STATION 1+063.2
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	45	0.888	246.8	219.1
2	9110	12	14	0.888	127.5	113.2
3	1402	12	45	0.888	63.1	56.0
4a	3072	12	82	0.888	251.9	223.6
4b	2195	12	12	0.888	26.3	23.4
5	9776	12	20	0.888	195.5	173.6
6	2444	14	44	1.208	107.5	129.9
7	2302	12	8	0.888	18.4	16.3
8	8928	12	4	0.888	35.7	31.7
		REIFORCEMENT		D<=14		**987.0** KG
		REIFORCEMENT		14< D<=25		**0.0** KG
		TOTAL REINFORCEMENT :				**987.0** KG

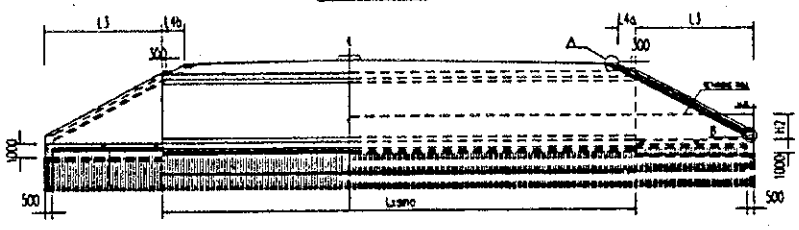
BOX CULVERT FOR PATH & DRAINAGE
(STATION 1+063.2)



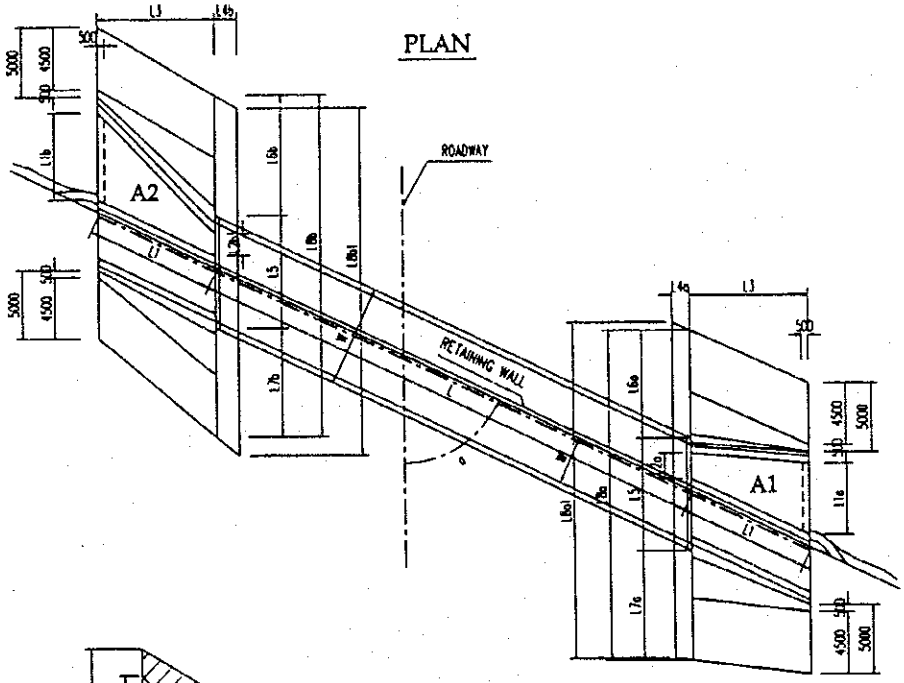


NOTATIONS FOR QUANTITY CALCULATION OF BOX CULVERT FOR PATH & DRAINAGE

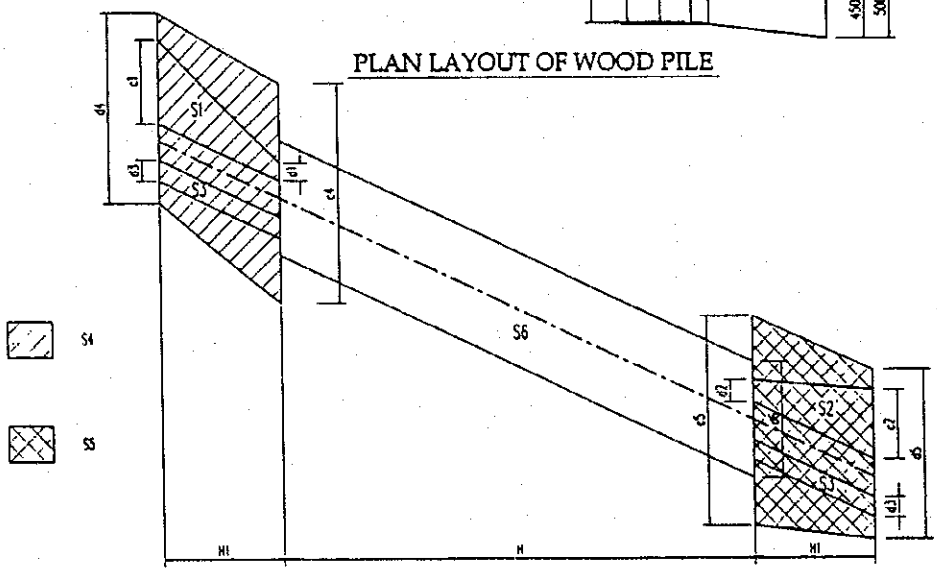
PROFILE



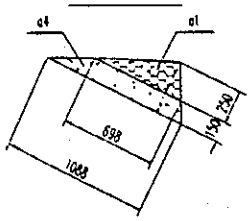
PLAN



PLAN LAYOUT OF WOOD PILE



DETAIL A



DETAIL B

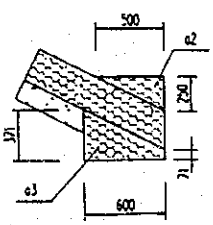


TABLE OF EXPLAINING QUANTITIES OF CULVERT

CULVERT KM1+063.2

S1=	(	c1	+	d1	)	x	H1	:	2	=		(m2)
S1=	(	3.606	+	0.000	)	x	8.900	:	2	=	16.047	(m2)
S2=	(	c2	+	d2	)	x	H1	:	2	=		(m2)
S2=	(	3.076	+	0.000	)	x	8.900	:	2	=	13.688	(m2)
S4=	(	c4	+	d4	)	x	H1	:	2	=		(m2)
S4=	(	12.844	+	16.691	)	x	8.900	:	2	=	131.431	(m2)
S5=	(	c5	+	d5	)	x	H1	:	2	=		(m2)
S5=	(	12.254	+	15.418	)	x	8.900	:	2	=	123.140	(m2)

S3=	d3	x	H1	=		(m2)
S3=	1.346	x	8.900	=	11.979	(m2)
S6=	H	x	d6	=		(m2)
S6=	26.880	x	6.212	=	166.979	(m2)

1. APRON CONCRETE:

A1=	(	L1a	+	L2a	)	x	L3	:	2.00	=		(m2)
A1=	(	3.244	+	0.152	)	x	8.700	:	2.00	=	14.773	(m2)
A2=	(	L1b	+	L2b	)	x	L3	:	2.00	=		(m2)
A2=	(	3.789	+	0.028	)	x	8.700	:	2.00	=	16.604	(m2)

A = (A1 + A2) x t + (0.700 x 0.500) x (L1a + L1b) =

A = (14.773 + 16.604) x 0.300 + (0.700 x 0.500) x (3.244 + 3.789) = **11.875** (m3)

2. CONCRETE FOUNDATION OF CULVERT:

F = L x (w +0.2) x 0.2 = 27.828 x 6.000 x 0.2 = **33.394** (m3)

3. LEAN CONRETE:

G = (S4 - S3 + S5 - S3) x 0.100 =

G = (131.431 - 11.979 + 123.140 - 11.979) x 0.100 = **23.061** (m3)

4. WOOD PILE:

L=5M

W5= (S4 + S5 + S6 - S1 - S2 - (2 x S3)) x (25 x 5 : 100) =

W5= (131.431 + 123.140 + 166.979 - 16.047 - 13.688 - 23.959) x 1.250 = 459.820 (100m)

L=3M

W3= (S1 + S2 + (2 x S3) + (0.8 x 4.5 x 4)) x (25 x 3 : 100) =

W3= (16.047 + 13.688 + 23.959 + 14.400) x 0.75 = 51.070 (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) = 53.950 (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 =

= (131.431 + 123.140 + 166.979 + 14.400) x 0.150 = 65.392 (m3)

PROTECTION

K1= (S7 x 0.150 x 2.000) = (m3)

(1.920 x 0.150 x 2.000) = 0.576 (m3)

TOTAL = (H + H1) = 65.968 (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	6.005	=	1.802	(m2)			

b2a=	(	L6a	+	5.000	)	x	L3	x	0.500	=		(m2)										
=	(	7.922	+	5.000	)	x	8.700	x	0.500	=	56.211	(m2)										
b2b=	(	L6b	+	5.000	)	x	L3	x	0.500	=		(m2)										
=	(	8.102	+	5.000	)	x	8.700	x	0.500	=	56.994	(m2)										
b3a=	(	L7a	+	5.000	)	x	L3	x	0.500	=		(m2)										
=	(	8.082	+	5.000	)	x	8.700	x	0.500	=	56.907	(m2)										
b3b=	(	L7b	+	5.000	)	x	L3	x	0.500	=		(m2)										
=	(	7.947	+	5.000	)	x	8.700	x	0.500	=	56.319	(m2)										
b4a=	(	L8a	+	L8a1	)	x	L4a	x	0.500	=		(m2)										
=	(	22.009	+	22.513	)	x	1.390	x	0.500	=	30.943	(m2)										
b4b=	(	L8b	+	L8b1	)	x	L4b	x	0.500	=		(m2)										
=	(	22.053	+	22.449	)	x	1.390	x	0.500	=	30.929	(m2)										
b5=	(	0.600	x	5.000	)	x	2.000			=	6.000	(m2)										
V1a=	(	a1	x	L8a1	)	=	0.087	x	22.513	=	1.964	(m3)										
V1b=	(	a1	x	L8b1	)	=	0.087	x	22.449	=	1.959	(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)					
=	(	56.211	+	56.907	+	30.943	-		1.802	)	x	0.250	:	0.894	=	39.764	(m3)					
V3b=	(	b2b	+	b3b	+	b4b	-		b1	)	x	0.250	:	COS(26.565)	=		(m3)					
=	(	56.994	+	56.319	+	30.929	-		1.802	)	x	0.250	:	0.894	=	39.815	(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)			
		(	1.964	+	1.959	+		3.902		+	39.764	+	39.815	+	3.526	)	=	90.929	(m3)			

7. BASE BEDDING:

V4a=		a4	x	L8a1			=	0.134	x	22.513						=	3.016	(m3)	
V4a=		a4	x	L8b1			=	0.134	x	22.449						=	3.007	(m3)	
V5a=	(	b2a	+	b3a	+	b4a	-	b1	-	b5	)	x	0.150	:	COS(26.565)		=		
=	(	56.211	+	56.907	+	30.943	-	1.802	-	6.000	)	x	0.150	:	0.894		=	22.852	(m3)
V5b=	(	b2b	+	b3b	+	b4b	-	b1	-	b5	)	x	0.150	:	COS(26.565)		=		
=	(	56.994	+	56.319	+	30.929	-	1.802	-	6.000	)	x	0.150	:	0.894		=	22.882	(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)	
	(	3.016	+	3.007	+	22.852	+	22.882	+	0.716	)	=	52.473	(m3)	

8. PATH

a. LATERITE

M =	(	L	+	2 x L1	)	x	W1	x	0.400	=	
	(	27.828	+	18.014	)	x	3.500	x	0.400	=	64.179 (m3)

b. SAND FILL

N =	(	L	+	2 x L1	)	x	W1	x	(	H2	-	0.400	)	=		(m3)	
	(	27.828	+	18.014	)	x	3.500	x	(	1.800	-	0.400	)	=	224.626	(m3)	

9.FORM :

=	(	L1a	+	L1b	)	x	1	x	2	=	
	(	3.244	+	3.789	)	x	1	x	2	=	14.066 (m2)

10.SCAFFOLDING :

=	(	L1a	+	L1b	)	x	1	x	2	=	
	(	3.244	+	3.789	)	x	1	x	2	=	14.066 (m2)