Working Division: 12. SEVERINO ACCESS ROAD (II)

Description	Calculation Details	Unit	Quantity	Remarks
12.3	CULVERT AND DRAINAGE WORKS			
101	Open-cut excavation, all classes	m^3	1625.967	
	1. Pipe culvert 410.53			
	2. Box culvert →(12.2).			
	3. Drain pipe 593.501			
	4. Catch basin 621.936			
	Total 1625.967			
102	Backfill with selected material	m^3	734.72	
	1. Pipe culvert 183.68			
	2. Box culvert →(12.2)			
	3. Catch basin 551.04			
	Total 734.72			
103	Crushed stone bedding	m^3	77.70	
	1. Pipe culvert			

9-138

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3	CULVERT AND DRAINAGE WORKS			
104	Reinforced concrete pipe, D.600 mm Culvert : 157.4 m, For ditch 196.8 m	m	354.2	
105	Reinforced concrete pipe, D.800 mm	m	48.3	
106	Reinforced concrete pipe, D.1.000 mm	m	0	
107	P.V.C. perforated drain pipe D.200 mm	m	2472.920	
108	Free drainage material for subdrain	m^3	515.851	
109	Concrete, class E. for pipe culvert and wing walls	m^3	229.468	
	1. Pipe culvert 167.10			
	2. Box culvert 304.352 → (12.4)			
	3 Wing wall for pipe culvert 23.118			
	4. Wing wall for box culvert 39.25			
	Total 229.468			
110	Concrete, class E. for side ditch and catch basin	m^3	678.764	
	1. Side ditch 639.662			
	2. catch basin 39.102			
	Total 678.764			

8-129

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3	CULVERT AND DRAINAGE WORKS			
/11	Concrete, class H, for levelling concrete	m^3	15.601	
	1. Culvert 24.57 − (12.0)			
	2. Wing wall 11.926			
	3. Catch basin 3.675			
	Total 15.601			
/12	Form work, F1 finish, for concrete of Items /09 and /10	m^2	995.093	
	1. culvert 506.68			
	2. Wing wall 270.118			
	3. Catch basin 218.295			
	Total 995.093			
/13	Formwork, F3 finish, for concrete of Items /09 and /10	m^2	5609.342	
	~~1. Culvert~~			
	2. Wing wall 158.506			
	3 Catch basin 132.651			
	4. Drain ditch 5318.179			
	Total 5609.342			

6-130

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3.	CULVERT AND DRAINAGE WORKS			
14	Reinforcing bars for concrete works	ton	17.0	
	1. Culvert 8891.28			
	2 Wing wall 6687.36			
	3 Catch basin 3218.16			
	Total 41796.8			
15	Gabion mattress, t=500 mm	m^3	183.1	
16	Joint filler, t=10 mm	m^2	0	
17	Bituminous coating for contraction joint	m^2	0	

6-13

Working Division: 12.4 SEVERINO ACCESS ROAD (II)

Description	Calculation Details	Unit	Quantity	Remarks
II.4	CONCRETE WORKS			
103	Concrete class E for box culverts	m^3	304.352	
104	Concrete class H for levelling concrete	m^3	24.570	
106	Formwork F1 finish for concrete item 103/104	m^2	495.54	
108	Formwork F3 finish for concrete item 103	m^2	515.470	
109	Reinforcing bars for concrete works	Ton	23	
110	Joint filler for culvert	m^2	15.670	
112	Bituminous coating for contraction joint	m^2	14.135	

6-182

3 SEVERINO TRAMO 2

Sr. No	St No.	Q m3/s	I	Entrance El m	Exit El m	Road El m	Culvert Length m	Type	Soil Thickness m
D-1	1+313.07	3.22	24.4%	136.800	125.000	145.006	48.300	D=800mm (C)	13.506
D-2	3+048.99	20.00	3.0%	98.750	97.670	101.019	Z 36.000	2000mm x 2000mm (I)	1.309
D-3	3+186.00	13.78	14.0%	96.500	94.800	98.279	O 12.100	1200mm x 1200mm	1.629
D-4	3+487.00	11.20	10.0%	90.100	88.470	94.869	/ 16.300	1200mm x 1200mm	4.584
D-5	3+640.00	2.01	30.0%	85.800	60.000	96.399	85.900	D=600mm (C)	22.899
D-6	3+865.00	0.46	6.5%	96.250	95.113	100.887	17.500	D=600mm (B)	4.606
D-7	3+988.00	1.89	13.6%	86.200	81.900	92.559	31.600	D=600mm (c)	7.909
D-8	4+050.00	35.98	5.8%	82.200	80.300	89.199	Z. 33.000	2000mm x 2000mm (I)	5.949
D-9	4+182.50	0.11	10.0%	94.600	92.350	98.199	22.400	D=600mm (B)	4.124

277.300

Ø600 180 39.9 2

360 117.5 2

J/F Ø800 360 48.3 1

1 1.2x1.2 38.4 2

4. 3.0x3.0 (I) 69.0 2

2 - 133

3. Severino Tramo2

		Length	Pipe Length	Open Cut Excavation (12.3/01)		Backfill (12.3/02)		Crushed Stone Bedding (12.3 /03)		Pipe D=600 (12.3/04)	Pipe D=800 (12.3/05)	Pipe D=1000 (12.3/06)	Concrete Class E (12.3/09)		Form Work F1 (12.3/12)		Reinforced Bar (12.3/14)	
		Unit (m)	Unit (m)	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m)	Unit (m)	Unit (m)	Unit (m3)	Total	Unit (m2)	Total	Unit (kg)	Total
D=600mm	90	196.8	354.2	0.83	163.10	0.43	84.75	0.14	28.04				0.16	30.76	0.52	102.34	0.00	0.00
	180	39.9		0.93	36.96	0.42	16.58	0.17	6.58				0.26	10.28	1.00	39.90	0.00	0.00
	Fix	117.5		1.09	127.49	0.45	53.17	0.24	28.20				0.62	72.29	2.00	235.00	42.98	5,050.62
D=800mm	90	0.0	48.3	1.28	0.00	0.58	0.00	0.17	0.00				0.26	0.00	0.68	0.00	0.00	0.00
	180	0.0		1.48	0.00	0.56	0.00	0.21	0.00				0.46	0.00	1.34	0.00	0.00	0.00
	Fix	48.3		1.72	82.99	0.60	29.18	0.31	14.88				1.11	53.78	2.68	129.44	73.53	3,551.50
D=1000mm	90	0.0	0.0	1.90	0.00	0.73	0.00	0.28	0.00				0.35	0.00	0.76	0.00	0.00	0.00
	180	0.0		2.12	0.00	0.72	0.00	0.33	0.00				0.60	0.00	1.58	0.00	0.00	0.00
	Fix	0.0		2.22	0.00	0.71	0.00	0.36	0.00				1.43	0.00	3.16	0.00	84.55	0.00
Total		402.5			410.53		183.68		77.70	354.20	48.30	0.00		167.10		506.68		8,602.12

		Length	Open Cut Excavation (12.2/07)		Backfill (12.2/06)		Concrete Class E (Item12.4/03)		Concrete Class H (Item12.4/04)		Form Work F1 (Item12.4/06)		Form Work F3 (Item12.4/08)		Reinforced Bar (12.4/09)	
		Unit (m)	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m2)	Total	Unit (m2)	Total	Unit (kg)	Total
1200mm x 1200mm	~9.25	28.4	2.42	68.77	0.77	21.87	1.63	~~68.77~~ 46.292	0.19	5.25	3.60	102.24	3.70	105.03	162.91	4,626.59
1500mm x 1500mm	~9.5	0.0	3.36	0.00	0.96	0.00	2.31	0.00	0.22	0.00	4.30	0.00	4.45	0.00	193.31	0.00
2000mm x 2000mm	~5.75	0.0	4.97	0.00	1.25	0.00	2.94	0.00	0.27	0.00	5.30	0.00	5.95	0.00	232.36	0.00
2000mm x 2000mm	~7.75	0.0	5.18	0.00	1.31	0.00	3.20	0.00	0.27	0.00	5.50	0.00	5.95	0.00	236.02	0.00
2000mm x 2000mm	7.751~	69.0	5.54	382.35	1.37	94.57	3.74	~~382.35~~ 258.06	0.28	19.32	5.70	393.30	5.95	410.44	270.47	18,662.57
2500mm x 2000mm	3.75~5.75	0.0	5.93	0.00	1.31	0.00	3.61	0.00	0.32	0.00	5.50	0.00	6.43	0.00	317.29	0.00
2500mm x 2000mm	5.751~	0.0	6.32	0.00	1.37	0.00	4.20	0.00	0.32	0.00	5.70	0.00	6.43	0.00	331.62	0.00
Total		97.4		451.12		116.45		~~451.12~~ 304.352		24.57		495.54		515.47		23,289.16

Drain Pipe Quantities

Access Road Name	Length (m)	Excavation (m3)		P.V.C Pipe D=200mm (m)		Drainage Material (m3)	
		Per meter	Total		Total	Per meter	Total
Conguillo	5,823.120	0.240	1,397.549		5,823.120	0.209	1,214.703
Severno Tramo1	1,535.870	0.240	368.609		1,535.870	0.209	320.382
Severno Tramo2	2,472.920	0.240	593.501		2,472.920	0.209	515.851
Los Cuyuyes	7,324.030	0.240	1,757.767		7,324.030	0.209	1,527.793
Poza Honda	266.710	0.240	64.010		266.710	0.209	55.636
La Seca	2,035.376	0.240	488.490		2,035.376	0.209	424.579
El Guasmo	786.460	0.240	188.750		786.460	0.209	164.056
Cana Dulce	1,200.560	0.240	288.134		1,200.560	0.209	250.437
Membrillo Outlet	30.000	0.240	7.200		30.000	0.209	6.258
Grand Total			5,154.011		21,475.046		4,479.695

Excavation	V=(0.8+0.4)*0.4/2	=0.24
Free Drainage Material	V=0.24-3.14*0.1^2	=0.21

6-84

LONGITUD DE CUNETAS

CAMINO DE ACCESO: SEVERINO Tramo 2

0+000 a 4+900.78 Km

	ABSCISAS	IZQUIERDA	DERECHA	LONGITUD
15	0+000.00 - 0+018.00	0.00	18.00	18.00
	0+018.00 - 0+062.94	44.94	44.94	89.88
	0+062.94 - 0+146.24	0.00	83.30	83.30
	0+146.24 - 0+240.00	93.76	93.76	187.52
8.0	0+240.00 - 0+420.00	0.00	180.00	180.00
	0+420.00 - 0+453.35	15.35	15.35	30.70
	0+453.35 - 0+500.00	46.65	0.00	46.65
	0+500.00 - 0+700.00	200.00	200.00	400.00
13.0	0+700.00 - 0+830.00	130.00	0.00	130.00
	0+845.00 - 0+881.21	36.21	36.21	72.42
	0+881.21 - 0+961.44	80.23	0.00	80.23
8.0	0+961.44 - 0+980.00	0.00	18.56	18.56
10.0	1+030.00 - 1+055.00	25.00	0.00	25.00
	1+055.00 - 1+100.00	45.00	45.00	90.00
9.0	1+100.00 - 1+145.00	45.00	0.00	45.00
	1+200.00 - 1+260.00	60.00	60.00	120.00
10.0	1+350.00 - 1+400.00	50.00	0.00	50.00
	1+400.00 - 1+490.00	90.00	90.00	180.00
10	1+490.00 - 1+530.00	40.00	0.00	40.00
	1+530.00 - 1+590.00	60.00	60.00	120.00
7.8	1+590.00 - 1+700.00	110.00	0.00	110.00
11	1+700.00 - 1+940.00	240.00	0.00	240.00
7.5	1+940.00 - 2+090.00	150.00	150.00	300.00
8.0	2+090.00 - 2+240.00	0.00	150.00	150.00
10.0	2+240.00 - 2+310.00	70.00	0.00	70.00
8.0	2+390.00 - 2+410.00	20.00	20.00	40.00
	2+410.00 - 2+480.00	70.00	0.00	70.00
	2+480.00 - 2+569.65	89.65	89.65	179.30
10.0	2+569.65 - 2+800.00	0.00	230.35	230.35
7.0	2+800.00 - 2+920.00	0.00	120.00	120.00
	2+920.00 - 2+970.00	50.00	50.00	100.00
	2+970.00 - 3+070.00	0.00	100.00	100.00
	3+110.00 - 3+170.91	60.91	0.00	60.91
	3+180.00 - 3+210.00	30.00	0.00	30.00
7.5	3+210.00 - 3+284.43	74.43	74.43	148.86
	3+284.43 - 3+418.21	133.57	0.00	133.57
	3+418.21 - 3+480.00	61.79	61.79	123.58
25.0	3+670.00 - 3+710.00	40.00	0.00	40.00
/	3+710.00 - 3+815.11	105.11	105.11	210.22
11	3+815.11 - 3+865.00	49.89	0.00	49.89
	3+890.00 - 3+981.64	91.64	0.00	91.64

~~3+890.00 - 3+951.64~~		~~91.64~~	~~0.00~~	~~91.64~~
4+090.00 - 4+180.00		90.00	0.00	90.00
4+216.17 - 4+240.00		23.83	0.00	23.83
4+283.73 - 4+300.00	✓✓	16.27	0.00	16.27
4+300.00 - 4+470.00		0.00	170.00	170.00
4+630.00 - 4+900.78	✓✓	0.00	270.78	270.78
			LONG.TOTAL	5176.46

Total Length 5176.46

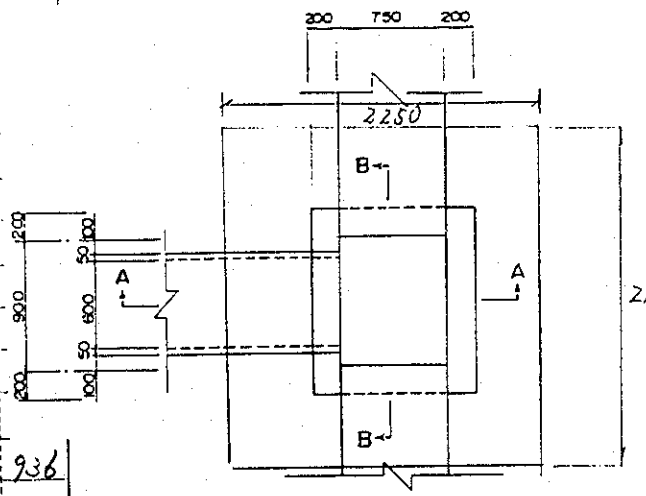
addition 11 x 10 = 110.00 5286.46 m

Catch basin 21 nos

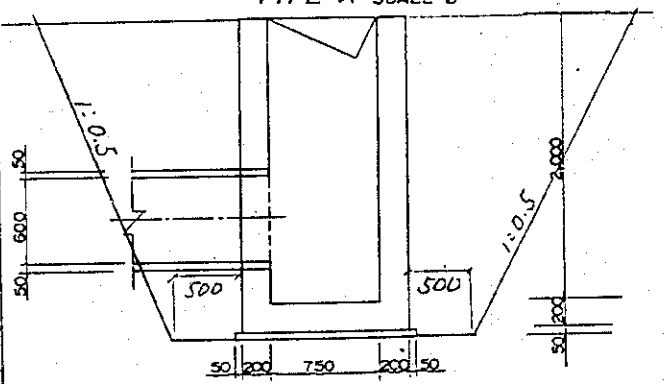
Ø 600 196.8 m

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 101	Open-cut excavation, all classes (Catch basins)			
	2.25 x 2.4 m = 5.4 m²			
	4.5 x 4.65 m = 20.925 m²			
	(5.4 + 20.925) x ½ x 2.25 = 29.616 m³			
	29.616 x 21 mts = 621.936	m³	621.936	



TIPO-A ESCALA B
TYPE-A SCALE B



SECCION A-A
SECTION A-A

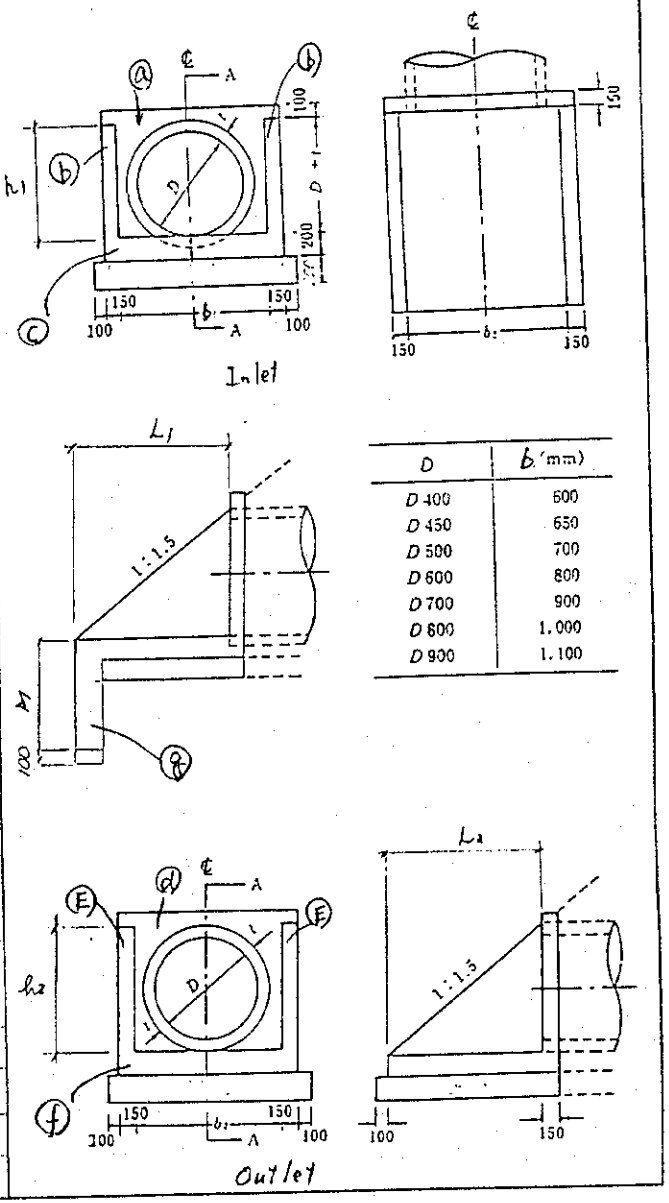
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /02	Backfill with selected material			
	<catch basin>			
	29.616 - 1.15 × 1.3 × 2.2 - 1.25 × 1.4 × 0.05			
	= 26.240			
	26.240 × 21 nos = 551.04	m^3	551.040	

8-130

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E for			
	(wing wall)			
	(pipe type)			
	1. ø600 (h_1 = 650 mm, b = 800 mm)			
	(L_1 = 975 mm, h_2 = 700 mm) L_2 = 1.5 M = 400 mm			
	ⓐ 1.1 × 0.95 × 0.15 m = 0.157 m^3			
	ⓑ 0.975 × 0.65 × 0.15 × ½ × 2 = 0.095 m^3			
	ⓒ 1.1 × 0.975 × 0.2 = 0.215 m^3			
	ⓓ 1.1 × 1.0 × 0.15 m = 0.165 m^3			
	ⓔ 1.05 × 0.7 × ½ × 0.15 × 2 = 0.110 m^3			
	ⓕ 1.1 × 1.05 × 0.2 m = 0.231 m^3			
	ⓖ 0.3 × 0.4 × 1.1 m × 2 = 0.264 m^3			
	1.337 m^3			
	1.337 × 4 = 4.948	m^3	21.118	
	0.77 × 21 = 16.17			

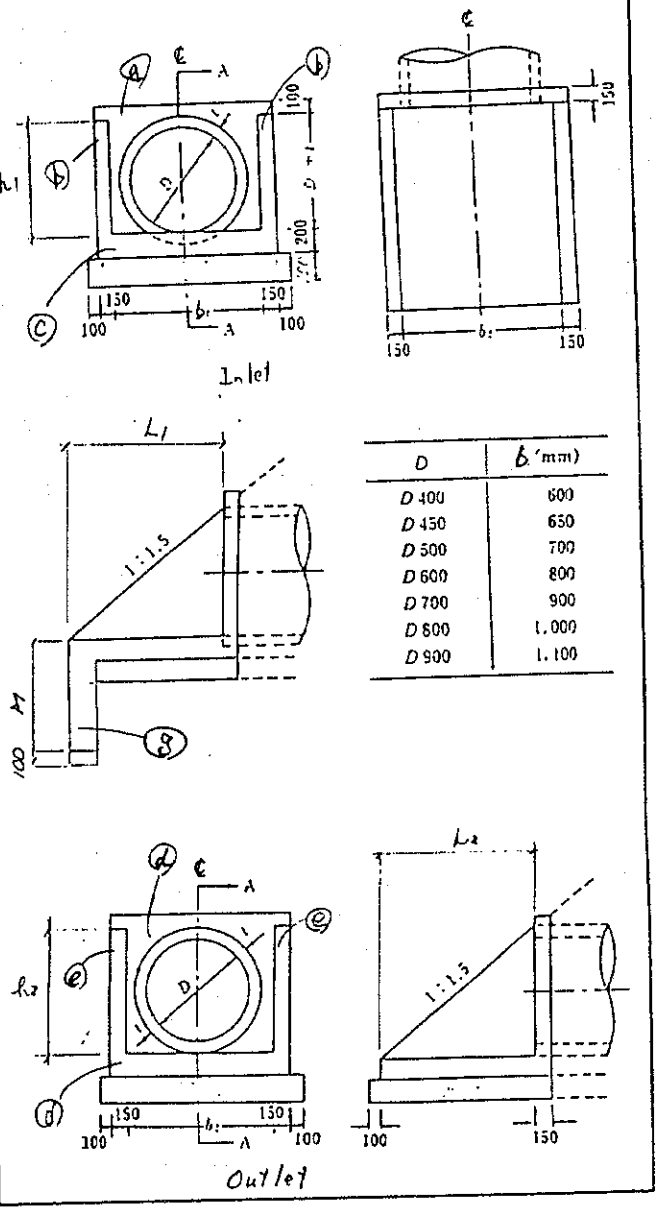


D	b_1 (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1.000
D 900	1.100

6-190

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109.	2. ϕ800. h_1 = 0.866m L_1 = 1.299 m.			
	b = 1.0m, h_2 = 0.932, L_2 = 1.398 m.			
	M = 0.6 m.			
	ⓐ: 1.3 × 1.166 × 0.15 = 0.227 m^3			
	ⓑ: 0.866 × 1.299 × ½ × 0.15 × 2 = 0.169 m^3			
	ⓒ: 1.3 × 1.299 × 0.2 = 0.338 m^3			
	ⓓ: 1.3 × 1.232 × 0.15 = 0.240 m^3			
	ⓔ: 0.932 × 1.398 × ½ × 0.15 × 2 = 0.195 m^3			
	ⓕ: 1.3 × 1.398 × 0.2 = 0.363 m^3			
	ⓖ: 0.3 × 0.6 × 1.3 × 2 = 0.468 m^3			
	2.0 m^3			
	2.0 × 1 = 2.0	m^3	2.0	

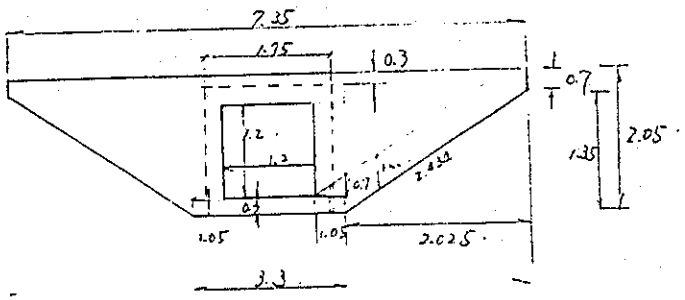


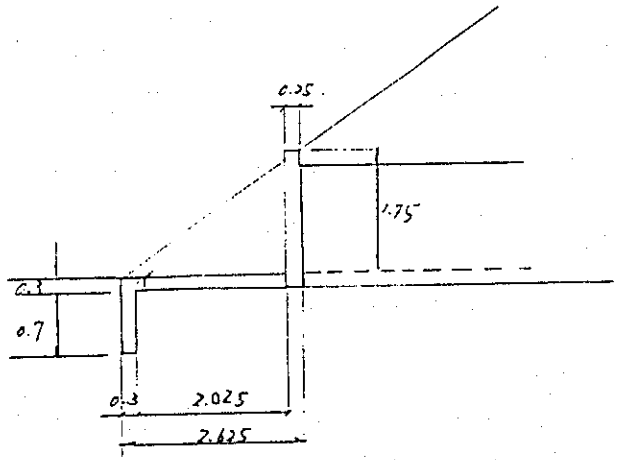
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1.000
D 900	1.100

6-171

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 109	Concrete, class E, for pipe culvert and wing wall.	m^3		
	(wing wall.)			
	1. 1.2 × 1.2 m			
	(wing)			
	$\{(3.3+7.35) \times 1.35 \times \frac{1}{2} + 0.7 \times 7.35 - 1.2 \times 1.2\} \times 0.25 = 2.1723\ m^3$			
	(slab)			
	$1.75 \times 2.325 \times 0.3 = 1.221$			
	$1.75 \times 0.7 \times 0.3 = 0.368$			
	$4.312\ m^3$			
	$4.312 \times 2 \times 2 = 17.248$	m^3	17.248	

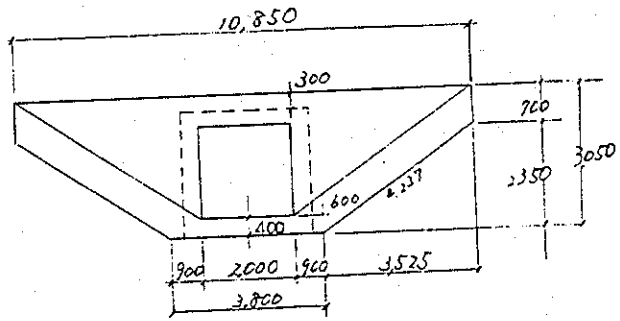


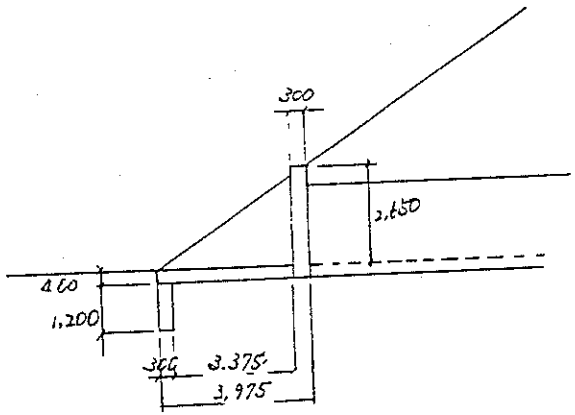


9-142

Working Division:

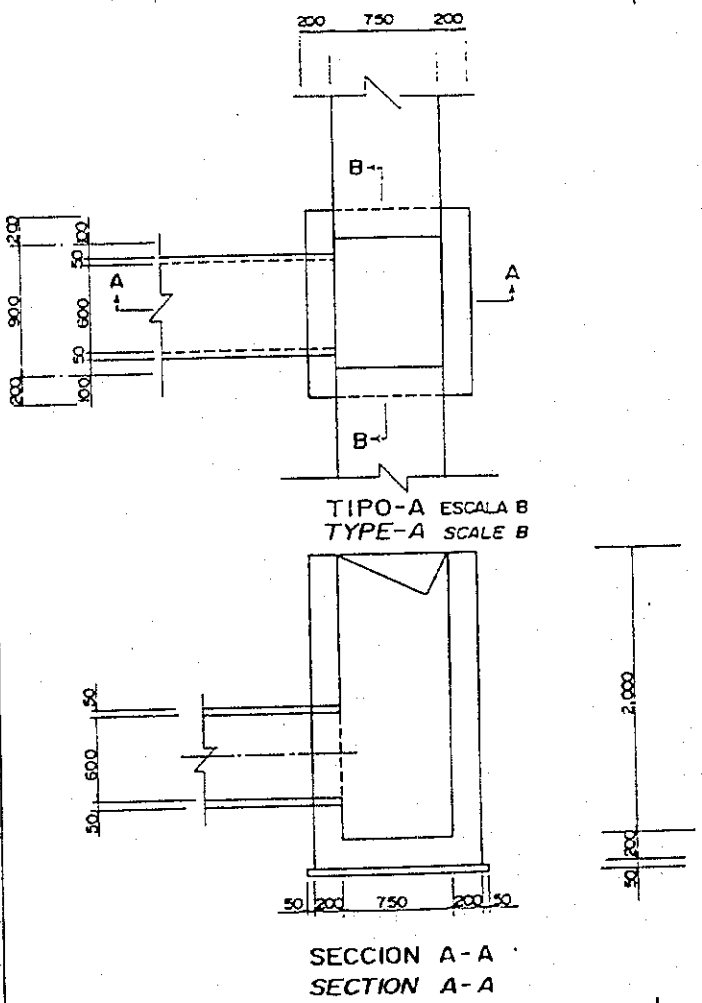
Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E (Wing wall).			
	4. 2.0 × 2.0 (II)			
	<wing>.			
	{(10.85+3.8)×2.35×½+0.7×10.85 − 2.0²}×0.3 = 6.243			
	<slab>			
	2.6×3.675×0.4 = 3.822.			
	0.3×1.20×2.6 = 0.936.			
	11.001 m³			
	11.001 × 2 = 22.002	m³	22.002	





Working Division:

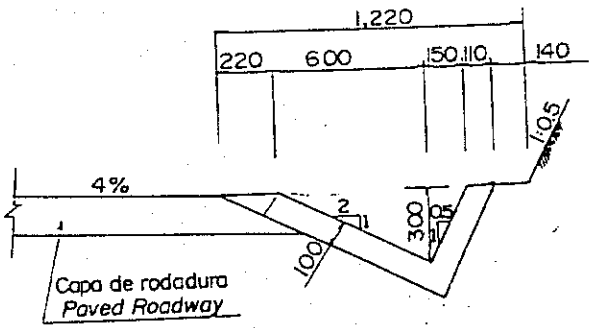
Description	Calculation Details	Unit	Quantity	Remarks
3 .10	Concrete, class F for side ditch and catch basin			
	(catch basin) per 1 no.			
	1.15 × 1.30 × 2.2			
	− 0.75 × 0.9 × 2.0 = 1.939 m³.			
	1.939 − 0.35π × 0.2 = 1.862 m³			
	1.862 × 21 = 39.102	m³	39.102	



Sheet 9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 1.0	Concrete class F. for side ditch and catch basin			
	(Side ditch) per 1 m.			
	1.08 × 0.432 × 1/2			
	− 0.75 × 0.3 × 1/2 = 0.121 m^3			
	0.121 × 5286.46 = 639.662	m^3	639.662	

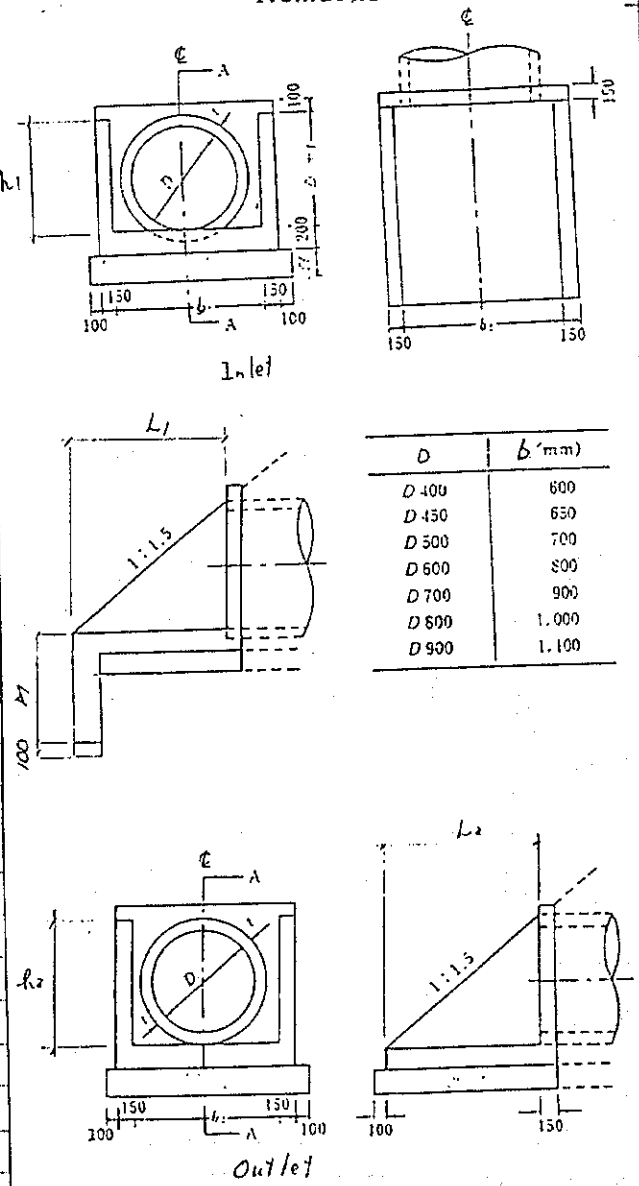


6-184

Working Division:

Description	Calculation Details	Unit	Quantity
3 111	Concrete, class H for Levelling concrete		
	1. Ø600 pipe (wing wall)		
	1.1m × 1.125 × 0.1 = 0.124 m³		
	1.1 × 1.20 × 0.1 = 0.132 m³		
	0.256 m³		
	0.256 × 4 = 1.024	m³	3.796
	0.130 × 21 = 2.772		
	2. Ø800 pipe		
	1.3 × 1.449 × 0.1 = 0.189 m³		
	1.3 × 1.598 × 0.1 = 0.201 m³		
	0.390 m³		
	0.390 × 1 = 0.390	m³	0.390
	3. Ø1,000 pipe		
	1.5 × 1.773 × 0.1 = 0.266 m³		
	1.5 × 1.896 × 0.1 = 0.284 m³		
	0.550 m³		

Remarks

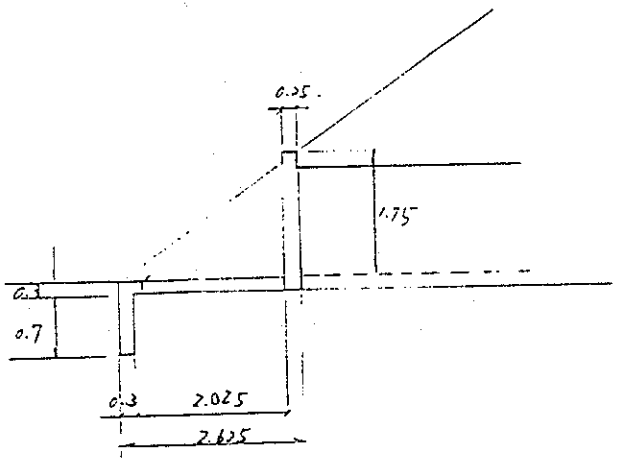


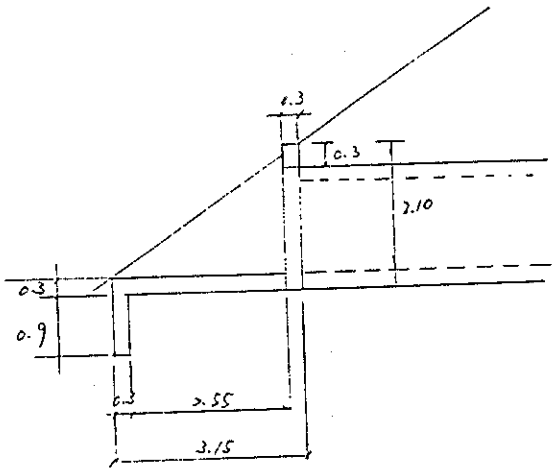
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

6-146

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /11	Concrete class H for levelling concrete (wing wall)			
	1. 1.2×1.2 m			
	(wing) 0.25×(2.434×2+3.31×0.1=0.204			
	(slab) 1.75×2.325×0.1=0.407			
	0.611 m^3			
	0.611×2×2=2.444	m^3	2.444	
	2. 1.5×1.5 m			
	(wing) 0.3×(3.154×2+3.45)×0.1=0.293			
	(slab) 2.1×2.85×0.1=0.599			
	0.892 m^3			

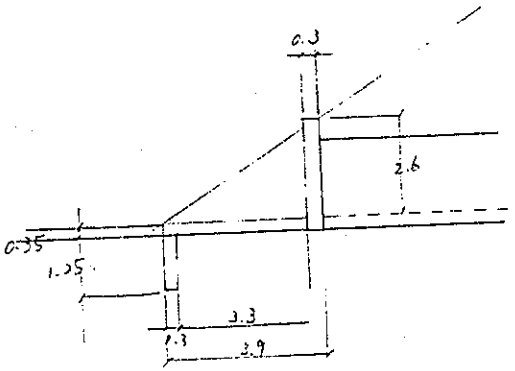


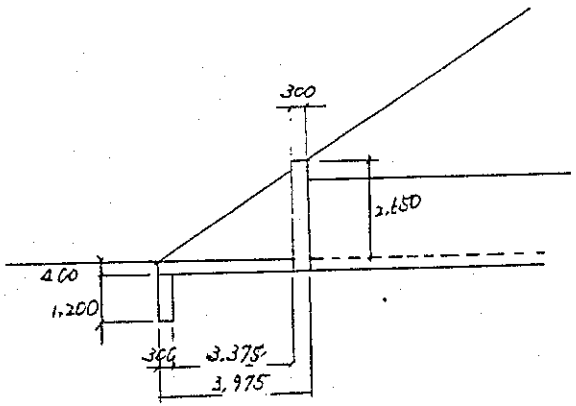


6-47

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /11	Concrete class H for levelling concrete			
	(wing wall)			
	3 2.0 x 2.0 (I)			
	(wing) 0.3 x (4.056 x 2 + 3.95) x 0.1 = 0.362 m³			
	(slab) 2.6 x 3.33 x 0.1 = 0.866			
	1.228 m³			
	4. 2.0 x 2.0 (II)			
	(wing) 0.3 x (4.237 x 2 + 3.80) x 0.1 = 0.368			
	(slab) 2.6 x 3.675 x 0.1 = 0.956			
	1.324 m³			
	1.324 x 2 x 2 = 5.296	m³	5.296	

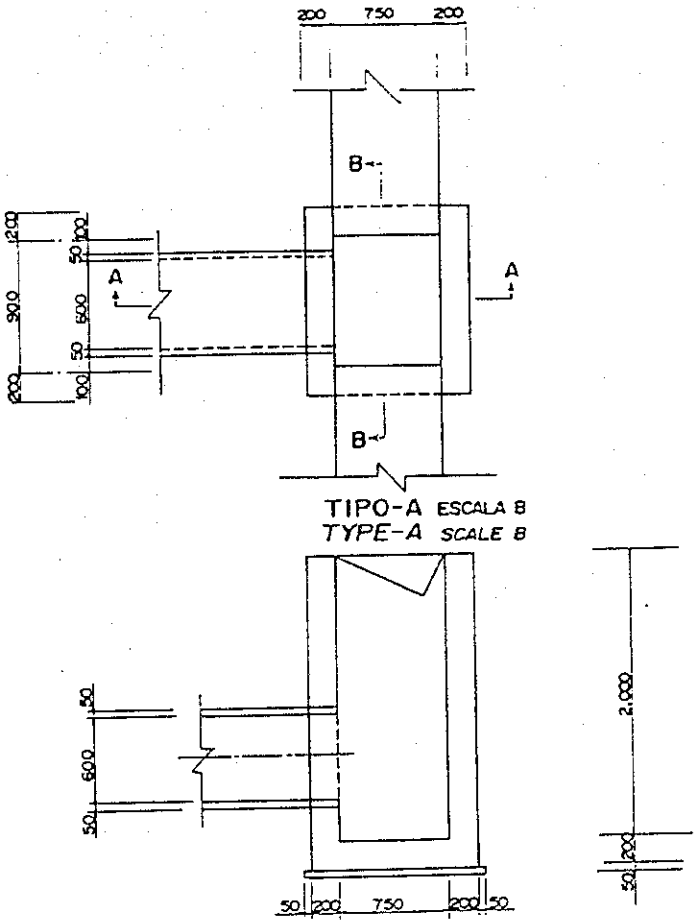




9-19

Working Division:

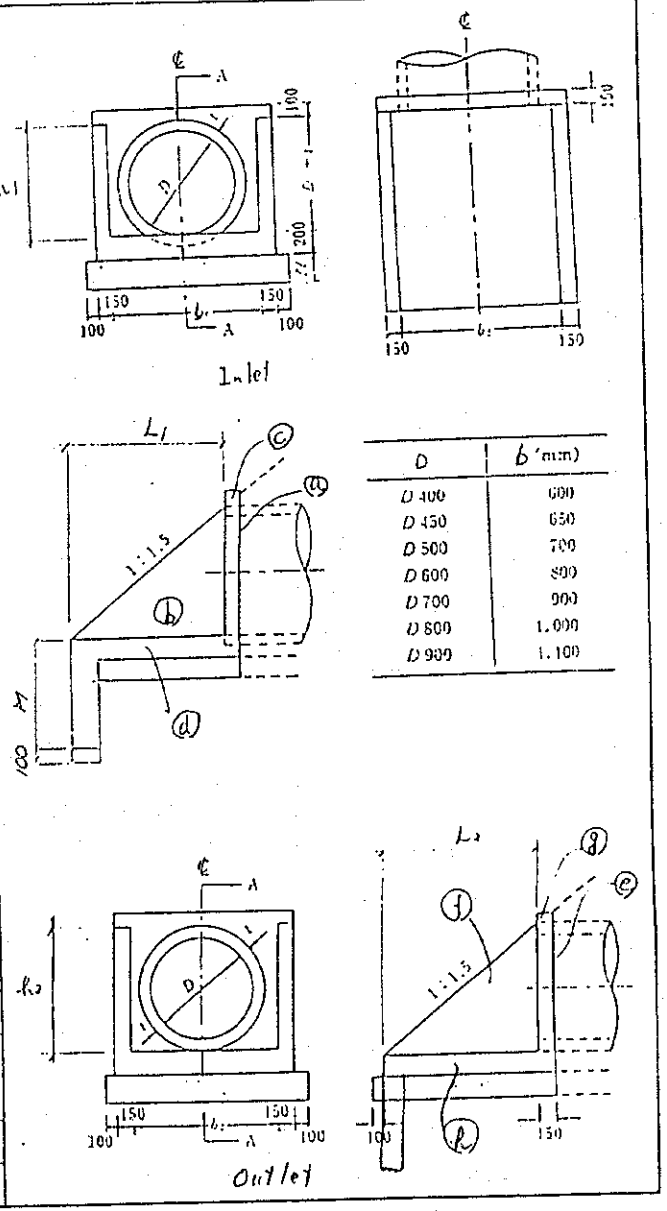
Description	Calculation Details	Unit	Quantity	Remarks
3. 1.11	Concrete class H for levelling concrete			
	(catch basins) per 1 no.			
	1.25 × 1.4 × ~~0.05~~ 0.10 = ~~0.088~~ 0.175 m^3			
	0.175 × 21 nos = 3.675	m^3	3.675	



6-189

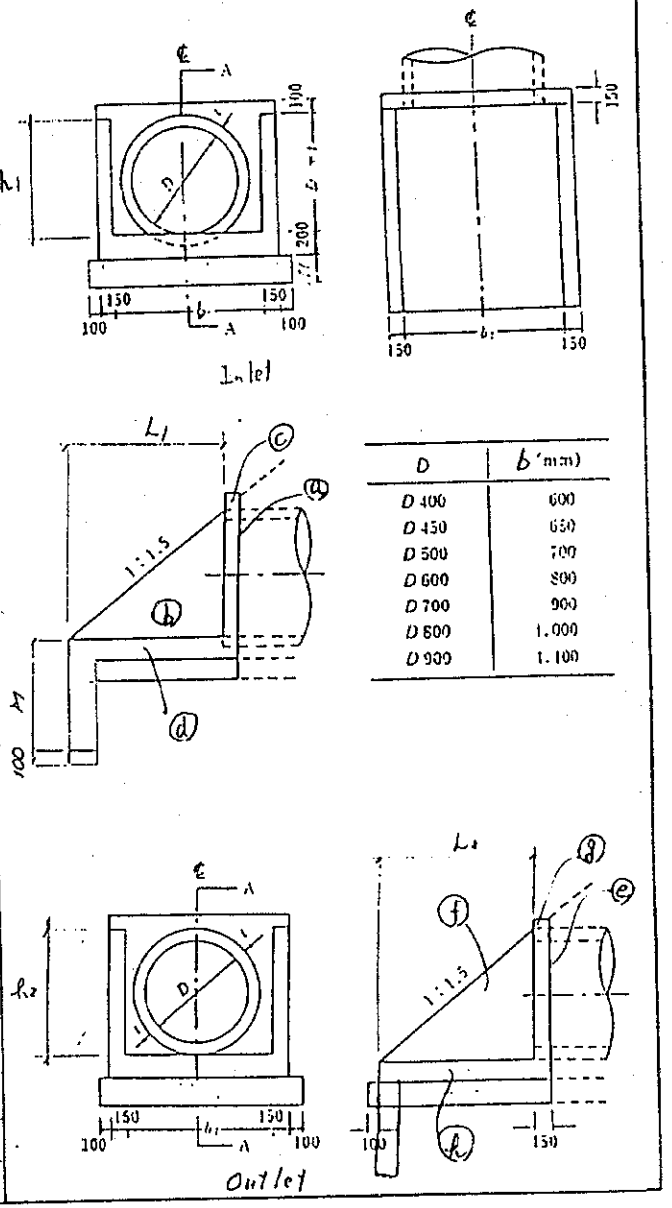
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
13 /12	Formwork, FI finish, for concrete of item 109, 110 and 111			
	(wing wall)			
	1. ϕ600			
	ⓐ 1.1m × 0.95m = 1.045 m²			
	1.045 − (0.3+0.05)²π = 0.660 m²			
	ⓑ (0.15+1.125) × 0.65/2 × 2 = 0.829 m²			
	ⓒ 0.15 × 0.1 × 2 = 0.03 m²			
	ⓓ 0.2 × (1.1 + 1.125 × 2) + 1.1 × (0.4 + 0.2) = 1.33			
	ⓔ 1.1m × 1.0 m = 1.100 m²			
	1.100 − (0.3+0.05)²π = 0.715			
	ⓕ (0.15+1.20) × 0.7 × ½ × 2 = 0.945			
	ⓖ 0.15 × 0.1 × 2 = 0.03 m²			
	ⓗ 0.2 × (1.1 + 1.20 × 2) + 1.1 × (0.4 + 0.2) = 1.36			
	5.899 m²			
	5.899 × 4 = 23.596	m²	87.646	
	3.05 × 21 = 14.050			



Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 / 12	Formwork FI finish			
	(wing wall)			
	2. Ø800			
	ⓐ 1.3m × 1.166 m = 1.516			
	1.516 − (0.466)²π = 0.834 m²			
	ⓑ (0.15+1.449) × 0.866 × ½ × 2 = 1.385 m²			
	ⓒ 0.15×0.1×2 = 0.03			
	ⓓ 0.2×(1.3+1.449×2)+1.3(0.6+0.4) = 2.140			
	ⓔ 1.3 × 1.232 = 1.602			
	1.602 − 0.466²π = 0.920 m²			
	ⓕ (0.15+1.548) × 0.932 × ½ × 2 = 1.583 m²			
	ⓖ 0.15×0.1×2 = 0.03			
	ⓗ 0.2×(1.3+1.548×2)+1.3×(0.6+0.4) = 2.179			
	9.101 m²			
	9.101 × 1 = 9.101	m²	9.101	

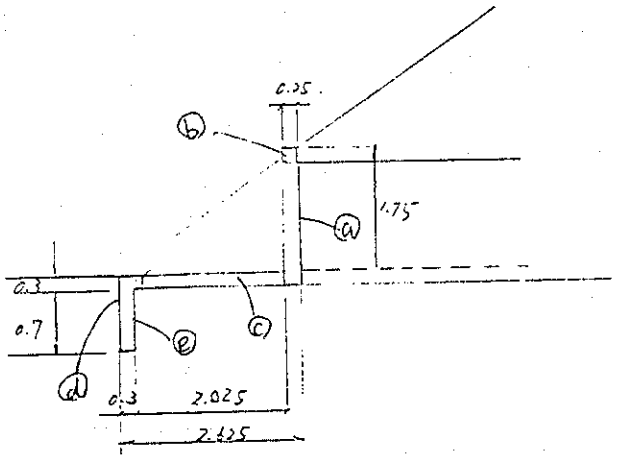


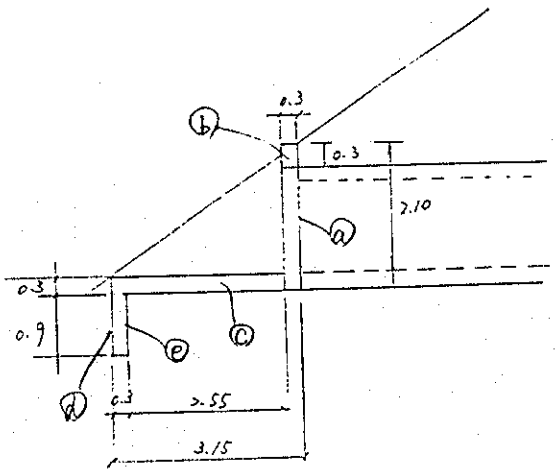
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

1/54-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /12	Formwork FL finish (wing wall)			
	1. 1.2×1.2 m			
	ⓐ (7.35+3.3)×1.35×½ + 0.7×7.35 − 1.80×1.75 = 9.184 m²			
	ⓑ 0.7×0.25×2 = 0.35 m²			
	ⓒ (2.325×1.0 − 2.025×0.7)×2 = 1.815 m²			
	ⓓ 1.0×1.75 = 1.75 m²			
	ⓔ 0.7×1.75 = 1.225 m²			
	14.324 m²			
	14.324×2×2 = 57.296	m²	57.296	
	2. 1.5×1.5 m			
	ⓐ (8.7+3.45)×1.75×½ + 0.7×8.7 − 2.1×2.15 = 12.206 m²			
	ⓑ 0.7×0.3×2 = 0.42 m²			
	ⓒ (2.85×1.2 − 3.55×0.9)×2 = 2.250 m²			
	ⓓ 1.2×2.1 = 2.52 m²			
	ⓔ 0.9×2.1 = 1.89 m²			
	19.286 m²			

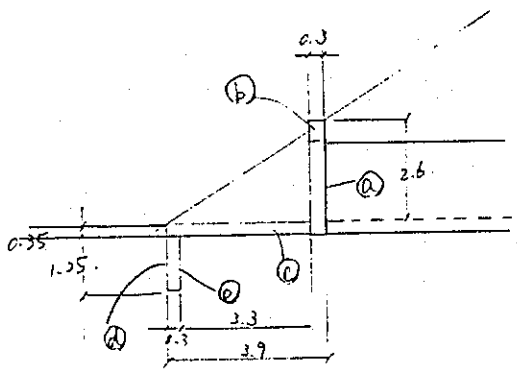


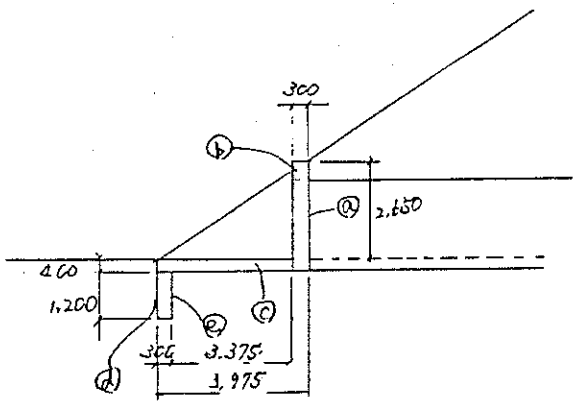


6-42

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /12	Formwork FI finish			
	3. 2.0×2.0 m (I)			
	ⓐ (10.7+3.95)×2.35×½ + 0.7×10.7			
	−2.6×2.68 = 17.081 m²			
	ⓑ 0.7×0.3×2 = 0.42 m²			
	ⓒ (3.6×1.60−3.3×1.25)×2 = 3.270 m²			
	ⓓ 1.60×2.6 = 4.16 m²			
	ⓔ 1.25×2.6 = 3.25 m²			
	28.181 m²			
	4. 2.0×2.0 m (II)			
	ⓐ (10.85+3.8)×2.35×½ + 0.7×10.85			
	−2.6×2.75 = 17.659 m²			
	ⓑ (0.7×0.3×2 = 0.42 m²			
	ⓒ (3.675×1.6−3.375×1.2)×2 = 3.660 m²			
	ⓓ 1.6×2.6 = 4.16 m²			
	ⓔ 1.2×2.6 = 3.12 m²			
	29.019 m²			
	29.019×2×2 = 116.075	m²	116.075	

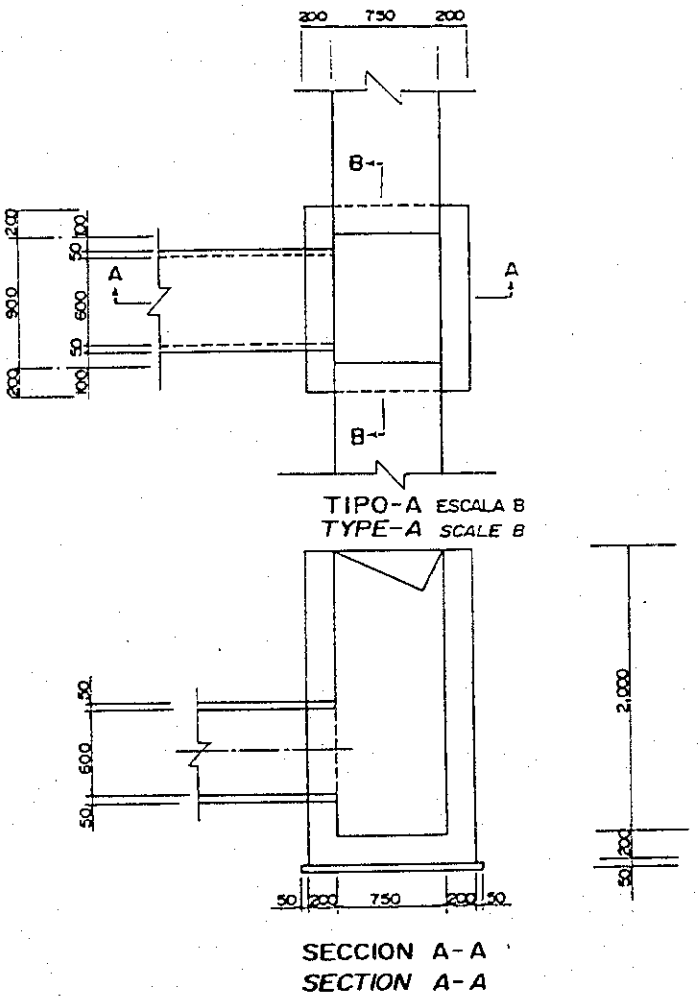




CY-9

Working Division:

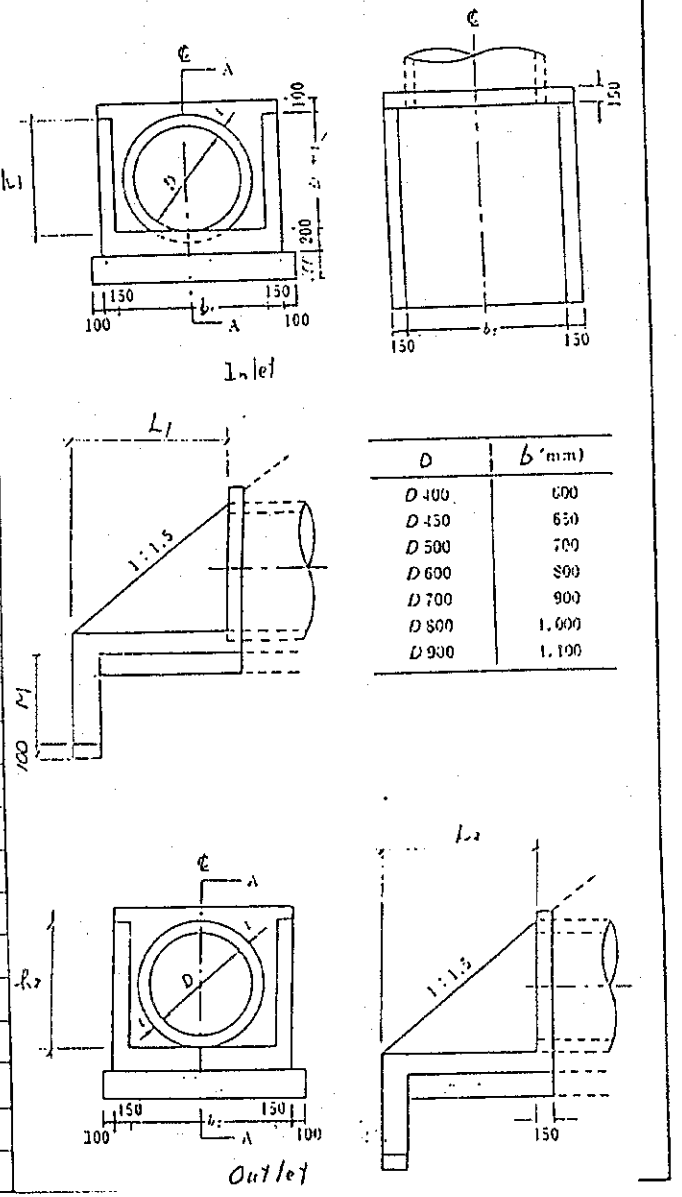
Description	Calculation Details	Unit	Quantity	Remarks
.3 /12	Formwork FI finish			
	(Catch basin)			
	1.15 x 2.2 x 2 = 5.06			
	1.30 x 2.2 x 2 - 0.35 π = 5.335			
	10.395 m²			
	10.395 x 21 = 218.295	m²	218.295	



6-14

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwerk F3 finish			
	(Wing wall)			
	1. ϕ600.			
	ⓐ 0.1×1.1 + 0.8×0.65 − 0.3²π = 0.347 m²			
	ⓑ 0.975×0.65×½×2 = 0.634 m²			
	ⓒ 0.1×1.1 + 0.8×0.70 − 0.3²π = 0.387 m²			
	ⓓ 1.05×0.70×½×2 = 0.735 m²			
	2.103 m²			
	2.103 × 4 = 8.412	m²	31.974	
	1.122 × 21 = 23.562			



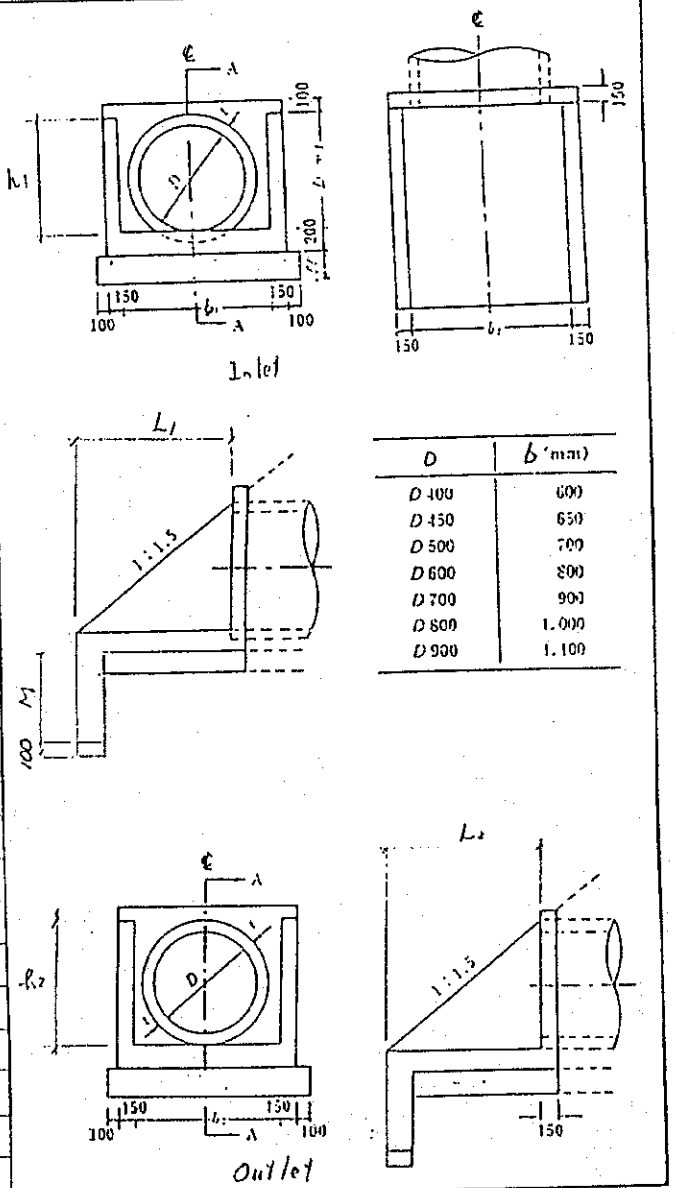
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

FY-9

Working Division:

Description	Calculation Details	Unit	Quantity
.3 /13	Formwork, F3 finish (wing wall)		
	2. ø800		
	ⓐ 0.1×1.3+1.0×0.866 − 0.4²π = 0.493 m²		
	ⓑ 1.299×0.866×½×2 = 1.125 m²		
	ⓒ 0.1×1.3+1.0×0.932 − 0.4²π = 0.559 m²		
	ⓓ 1.398×0.932×½×2 = 1.303 m²		
	3.480 m²		
	3.480×1 = 3.480	m²	3.480

Remarks

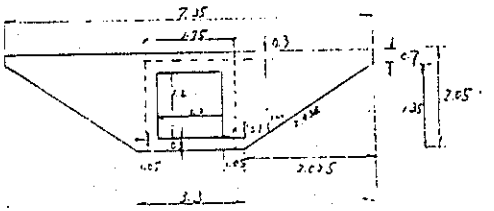


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1.000
D 900	1.100

9N-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork, F3 finish			
	(Wing wall)			
	1. 1.2 × 1.2 m			
	(3.3 + 7.35) × 1.35/2 + 0.7 × 7.35			
	− 1.2 × 1.2 = 10.894 m²			
	10.894 × 2 × 2 = 43.576	m²	43.576	
	2. 1.5 × 1.5 m			
	(3.45 + 8.7) × 1.75/2 + 0.7 × 8.7			
	− 1.5² = 14.471 m²			
	3. 2.0 × 2.0 m (I)			
	(10.7 + 3.95) × 2.25/2 + 0.7 × 10.7			
	− 2.0² = 19.971 m²			
	4. 2.0 m × 2.0 m (II)			
	(10.85 + 3.80) × 2.35/2 + 0.7 × 10.85			
	− 2.0² = 19.869 m²			
	19.869 × 2 × 2 = 79.476	m²	79.476	



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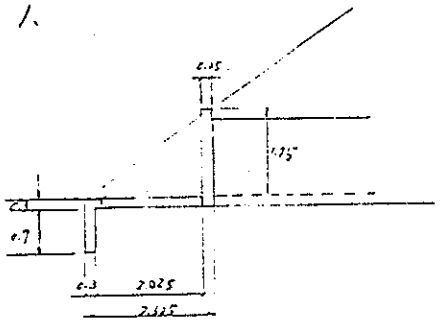

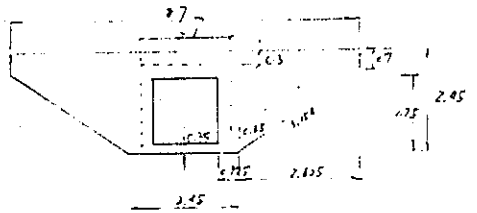

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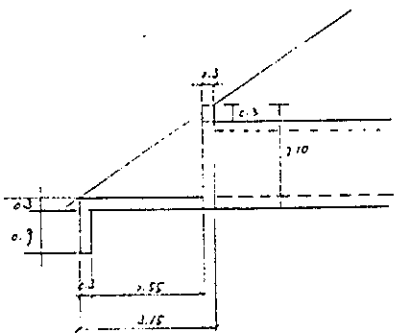
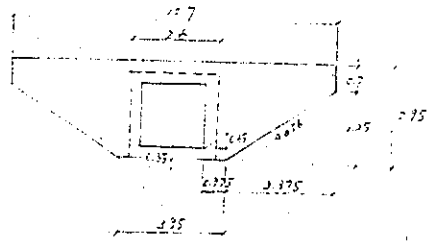


4-1-9



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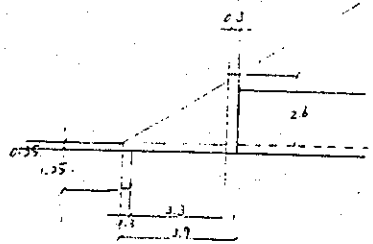

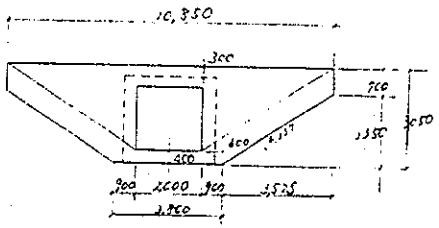

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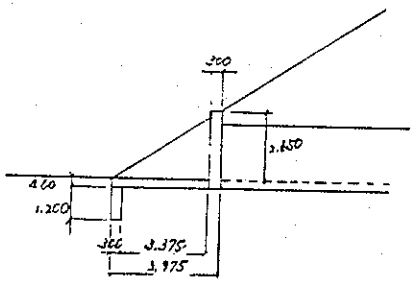
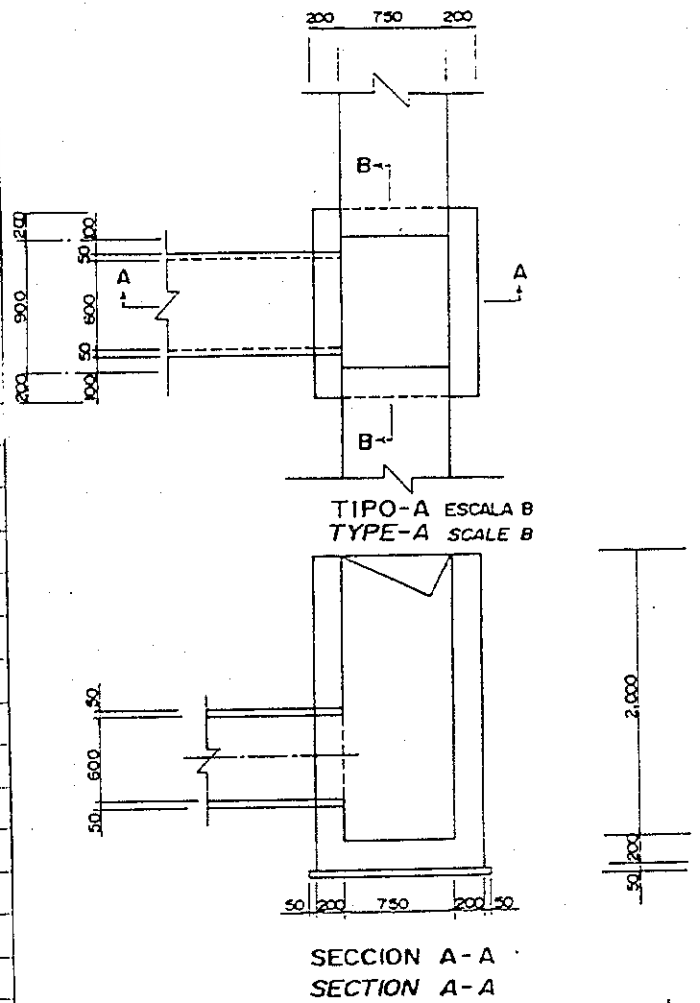


Working Division:

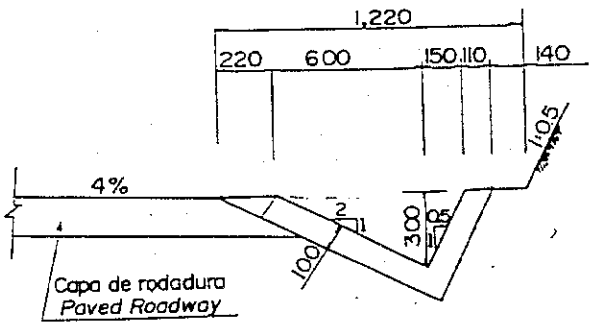
Description	Calculation Details	Unit	Quantity	Remarks
.3 /13	Formwork F3 finish			
	(Catch basin)			
	0.75 x 2.0 x 2 = 3.0			
	0.90 x 2.0 x 2 - 0.30 = 3.317			
	6.317 m².			
	6.317 x 21 = 132.657	m²	132.657	



GV-7

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 113	Formwork, F3 finish for concrete item 109 and 110:			
	(side ditch) per 1m			
	0.671 + 0.335 = 1.006 m^2			
	1.006 × 5286.46m = 5318.179	m^2	5,318.179	



Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
1.3 /14	Reinforcing bars for concrete works			
	(wing wall)			
	80 kg / 1 m^3 of concrete volume			
	1. ø600			
	1.237 m^3 x 80 = 98.96 kg			
	98.76 x 4 = 395.04		1.8	
	0.77 x 80 = 61.6		1188.14	
	61.6 x 21 = 1293.6 "			
	2. ø800			
	2.000 m^3 x 80 = 160 kg			
	160 x 1 = 160			
	3. ø1.000			
	2.939 m^3 x 80 = 235.12 kg			

12-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 114	Reinforcing bars for concrete works (wing wall)			
	80 kg / m^3 of concrete volume			
	1 1.2×1.2 m			
	4.312 × 80 = 329.6 kg			
	329.6 × 2 × 2 = 1318.4			
	2 1.5×1.5 m			
	6.704 × 80 = 536.32 kg			
	3 2.0×2.0 m (I)			
	10.242 × 80 = 819.36 kg			
	4 2.0×2.0 m (II)			
	11.001 × 80 = 880.08 kg			
	880.08 × 2 × 2 = 3520.32			
	5 2.0×2.0 m (III)			
	13.004 × 80 = 1040.32 kg			

6-162

Working Division:

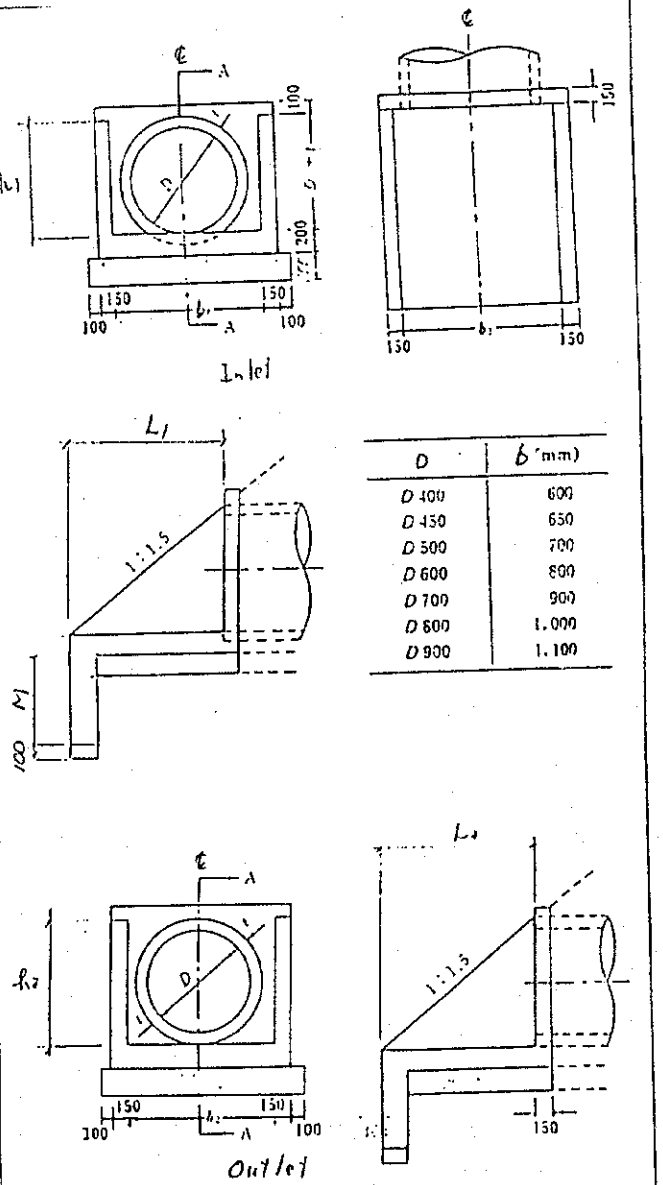
Description	Calculation Details	Unit	Quantity	Remarks
3. 14	Reinforcing bars for concrete works			
	(Catch basin)			
	80 kg/ 1 m³ of concrete volume			
	1.862 m³ x 80 kg/m³ = 148.96 m³.			
	148.96 x 21 = 3128.16	Ton	3 2	

T-163

Working Division:

Description	Calculation Details	Unit	Quantity
.3 /15	Gabion mattress, $t = 500$ mm		
	(wing wall part)		
	1. ϕ600		
	$(0.8 + 0.3) \times 5.0 \times 0.5 = 2.75\ m^3$		
	$2.75 \times 2 \times 4 = 22.0$	m^3	33.55
	$2.75 \times 2 \times 1/5 = 11.55$		
	2. ϕ800		
	$(1.1 + 0.3) \times 5.0 \times 0.5 = 3.75\ m^3$		
	$3.25 \times 2 \times 1 = 6.5$	m^3	6.5
	3. ϕ1,000		
	$(1.2 + 0.3) \times 5.0 \times 0.5 = 3.75\ m^3$		
	4. 1.2 × 1.2 m		
	$(2.434 \times 2 + 3.3) \times 5.0 \times 0.5 = 20.42\ m^3$		
	$20.42 \times 2 \times 2 = 81.68$	m^3	81.68
	5. 1.5 × 1.5 m		
	$(3.154 \times 2 + 3.45) \times 5.0 \times 0.5 = 29.395\ m^3$		

Remarks

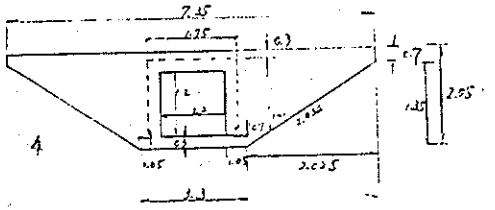


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

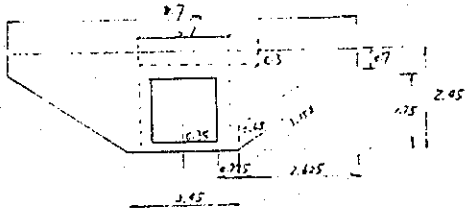
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /15	Gabion mattress, t = 500 mm. (wing wall).			
	6. 2.0 × 2.0 (I)			
	(4.156 × 2 + 3.75) × 5.0 × 0.5 = 30.155 m³.			
	7. 2.0 × 2.0 (II)			
	(4.237 × 2 + 3.8) × 5.0 × 0.5 = 30.685 m³	m³	61.370	
	30.685 × 2 × 1 = 61.370			
	8. 2.0 × 2.0 (III)			
	(4.417 × 2 + 3.65) × 5.0 × 0.5 = 31.21 m³			
	9. 2.5 × 2.0 (I)			
	(4.287 × 2 + 4.3) × 5.0 × 0.5 = 31.935 m³			
	10. 2.5 × 2.0 (II)			
	(4.417 × 2 + 4.15) × 5.0 × 0.5 = 32.46 m³			

4



5.



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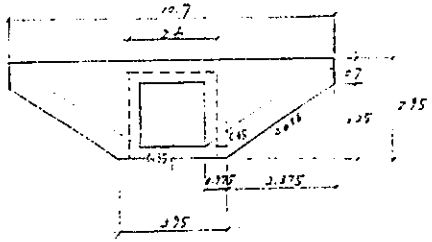

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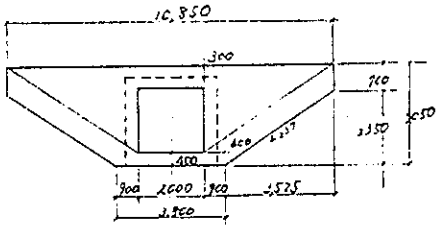
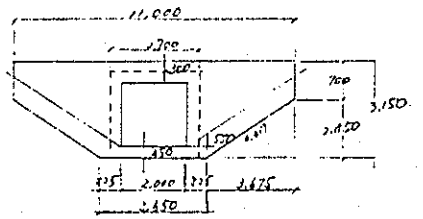


69-9

8.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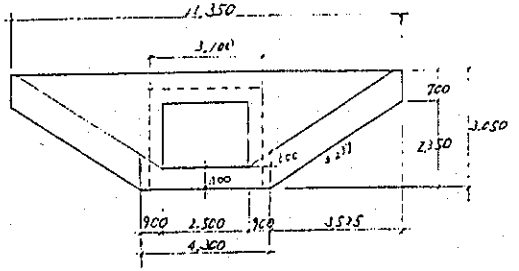
3,150
2,650
700
500
1,500
450
225
2,000
225
2,675
3,450

9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700
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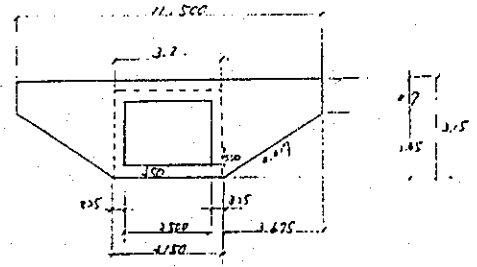
2,350
1,500
1,100
900
2,500
900
3,535
4,300

10


11,500
3,2
3,5
1,85
450
225
225
2,500
3,675
4,150

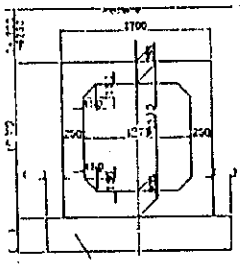
99/-9

Working Division:

Description	Calculation Details	Unit	Quantity
8 16	Joint Filler , t = 10 mm		
4 10	<Culvert>		
	1. 1.2 × 1.2 m		
	1.75 × 1.70 − 1.2 × 1.2 = 1.535 m²		
	1.535 × 2 × 1 = 3.07	m²	3.07
	2. 1.5 × 1.5 m		
	2.1 × 2.15 − 1.5 × 1.5 = 2.265 m²		
	3. 2.0 × 2.0 m (I)		
	2.6 × 2.65 − 2 × 2 = 2.890 m²		
	4. 2.0 × 2.0 m (II)		
	2.6 × 2.75 − 2 × 2 = 3.15 m²	m²	12.60
	3.15 × 2 × 2 = 12.6		
	5. 2.0 × 2.0 m (III)		
	2.7 × 2.85 − 2 × 2 = 3.695 m²		

Remarks

1.



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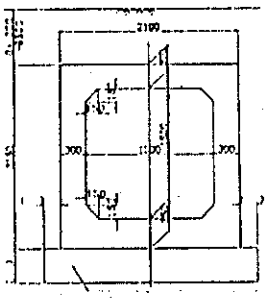

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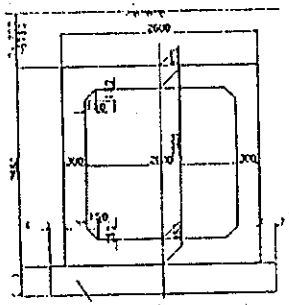

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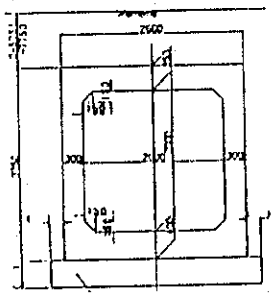

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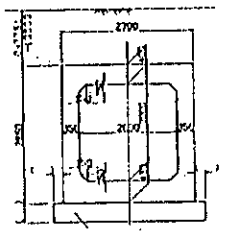
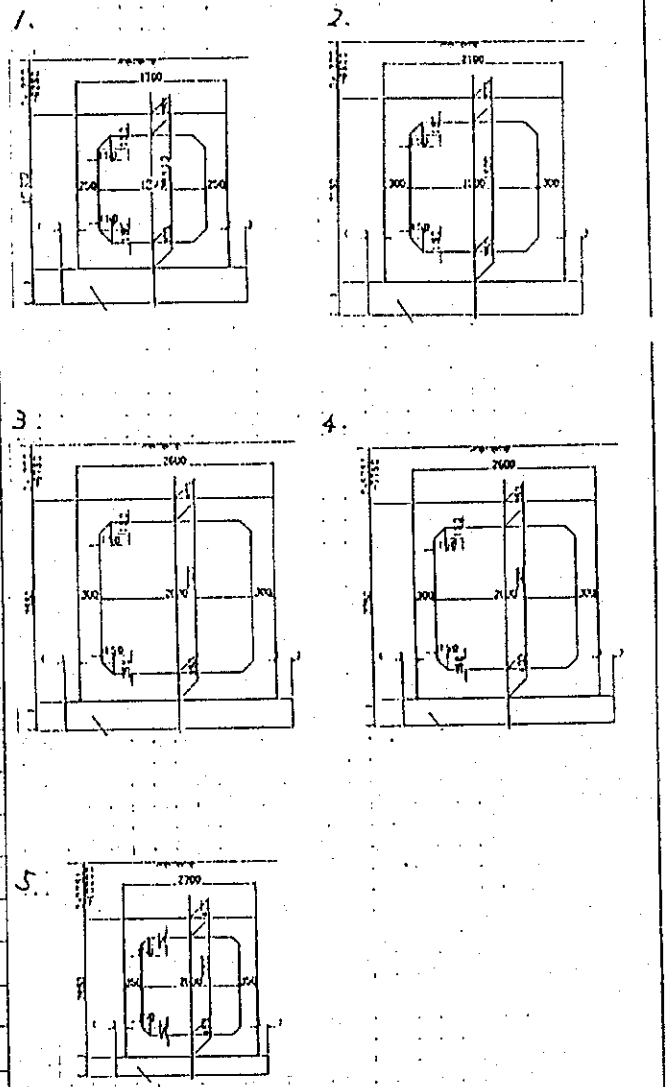


Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 149 4 11	Bituminous coating for contraction joint			
	<Culvert>			
	1. 1.2 × 1.2 m			
	1.75 × 1.70 - 1.2 × 1.2 = 1.535 m²			
	1.535 × 1 = 1.535	m²	1.535	
	2. 1.5 × 1.5 m			
	2.1 × 2.15 - 1.5 × 1.5 = 2.265 m²			
	3. 2.0 × 2.0 m (I)			
	2.6 × 2.65 - 2 × 2 = 2.89 m²			
	4. 2.0 × 2.0 m (II)	m²	12.60	
	2.6 × 2.75 - 2 × 2 = 3.15 m²			
	3.15 × 4 = 12.6			
	5. 2.0 × 2.0 m (III)			
	2.7 × 2.85 - 2 × 2 = 3.695 m²			



099-9

Working Division: 15.2. Las Cuyuyes Access Road.

Description	Calculation Details	Unit	Quantity	Remarks
11.2	Box culverts			
105	Open-cut excavation	m^3	1114.352	
106	Backfill with selected material	m^3	308.357	
107	Free draining backfill	m^3	493.371	
108	Gravel bedding	m^3	34.572	

69-9

Working Division: 15. Los Cuyuyes Access Road

Description	Calculation Details	Unit	Quantity	Remarks
153	CULVERT AND DRAINAGE WORKS			
101	Open-cut excavation, all classes	m^3	9045.39	
	1. Pipe culvert 1374.019			
	2 Box culvert 0			
	3 Drain pipe 5154.011			
	4. Catch basin 2517.360			
	Total 9045.39			
102	Backfill with selected material	m^3	2867.229	
	1. Pipe culvert 136.829			
	2. Box culvert			
	3. Catch basin 2230.400			
	Total 2867.229			
103	Crushed stone bedding	m^3	235.263	
	1. Pipe culvert			

Working Division: 15. Los Cuyuyes Access Road

Description	Calculation Details	Unit	Quantity	Remarks
15.3	CULVERT AND DRAINAGE WORKS			
104	Reinforced concrete pipe, D.600 mm 103.400 + 1021.5 = 1124.9	m	1,124.900	→ 1,125
105	Reinforced concrete pipe, D.800 mm	m	151.600	→ 152
106	Reinforced concrete pipe, D.1,000 mm	m	86.600	→ 87
107	P.V.C. perforated drain pipe D.200 mm	m	21,475.046	→ 21,476
108	Free drainage material for subdrain	m^3	4,479.695	→ 4,480
109	Concrete, class E. for pipe culvert and wing walls	m^3	692.936	
	1. Pipe culvert 423.120			
	2. Box culvert			
	3. Wing wall for pipe culvert 96.154			
	4. Wing wall for box culvert 173.662			
	Total 692.936			
110	Concrete, class F. for side ditch and catch basin	m^3	2,020.445	→ 2,021
	1. Side ditch 1862.175			
	2. catch basin 158.270			
	Total 2020.445			

14.1-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
15.3	CULVERT AND DRAINAGE WORKS			
/11	Concrete, class H, for levelling concrete	m^3	46.668	
	1. Culvert			
	2. Wing wall 39.188			
	3. Catch basin 7.480			
	Total 46.668			
/12	Formwork, F1 finish, for concrete of Items /09 and /10	m^2	2917.014	
	1. culvert 1208.744			
	2. Wing wall 829.695			
	3. Catch basin 883.575			
	Total 2917.014			
/13	Formwork, F3 finish, for concrete of Items /09 and /10	m^2	17017.722	
	1. Culvert			
	2. Wing wall 495.558			
	3 Catch basin 536.945			
	4. Drain ditch 15985.219			
	Total 17017.722.			

6-192

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
B3.	CULVERT AND DRAINAGE WORKS			
1.4	Reinforcing bars for concrete works	~~m³~~ ton	37.4	
	1. Culvert 14.2			
	2. Wing wall 21.9			
	3 Catch basin 1.3			
	Total 37.4			
1.5	Gabion mattress, t=500 mm	m^3	710.960	→ 711
1.6	Joint filler, t=10 mm	m^2		
1.7	Bituminous coating for contraction joint	m^2		

6-123

Working Division: 4

Description	Calculation Details	Unit	Quantity	Remarks
4	CONCRETE WORKS			
103	Concrete class E for box culverts	m^3	739.942	
104	Concrete class H for levelling concrete	m^3	69.144	
106	Formwork F1 finish for concrete item 103.104	m^2	1364.680	
108	Formwork F3 finish for concrete item 103	m^2	1457.102	
109	Reinforcing bars for concrete works	Ton	62	
110	Joint filler for culvert	m^2	34.225	
112	Bituminous coating for contraction joint	m^2	54.370	

X1-9

4 LOS CUYUYES

Sr. No	St No.	Q m3/s	I	Entrance El m	Exit El m	Road El m	Culvert Length m	Type	Soil Thickness m
D-1	0+160.00	0.89	2.0%	109.800	109.430	114.800	18.500	D=800mm 180°	4.385
D-2	0+920.00	3.00	22.3%	125.250	120.000	127.600	23.500	D=800mm 180°	4.175
D-3	1+600.00	7.33	8.0%	119.100	115.740	131.546	42.000	1200mm x 1200mm	12.926
D-4	1+860.00	1.33	6.0%	135.800	134.930	137.400	14.500	D=800mm 90	1.235
D-5	2+260.00	1.00	8.0%	119.550	117.398	126.100	26.900	D=600mm 360	7.026
D-6	2+645.00	1.56	4.5%	119.925	119.556	121.750	8.200	D=800mm 90	1.210
D-7	2+900.00	12.67	12.0%	120.900	115.800	130.600	42.500	1200mm x 1200mm	11.050
D-8	2+960.00	12.67	10.0%	125.750	121.190	135.400	45.600	1500mm x 1500mm	10.430
D-9	4+133.50	39.76	12.0%	123.300	118.296	133.320	41.700	2000mm x 2000mm II	10.522
D-10	4+660.00	10.00	3.0%	125.900	125.660	128.600	8.000	1500mm x 1500mm	1.320
D-11	5+286.41	2.11	2.0%	132.550	132.354	134.664	9.800	D=1000mm 90°	1.212
D-12	6+150.00	2.11	27.3%	147.300	139.300	150.518	29.300	D=600mm 360	6.618
D-13	6+320.00	24.53	1.5%	137.105	137.015	143.209	6.000	2500mm x 2000mm I	4.149
D-14	6+860.00	1.56	8.0%	158.300	156.228	164.413	25.900	D=800mm 360	6.349
D-15	7+105.00	0.67	4.0%	160.600	159.332	167.700	31.700	D=600mm 360	7.134
D-16	7+460.00	6.89	22.3%	161.800	152.900	167.667	40.000	D=1000mm 360	9.317
D-17	7+895.00	1.78	9.0%	171.600	167.820	179.400	42.000	D=800mm 360	8.890
D-18	8+545.00	3.56	7.0%	182.900	181.213	189.975	24.100	D=1000mm 360	6.919
D-19	8+660.00	4.87	10.0%	181.900	180.630	184.800	12.700	D=1000mm 90	2.535
D-20	9+590.00	46.92	10.0%	143.900	141.980	150.469	19.200	2000mm x 2000mm II	5.529
D-21	11+086.69	13.67	7.0%	167.700	167.063	169.536	9.100	1500mm x 1500mm	0.655
D-22	11+230.00	27.44	6.0%	162.950	161.354	171.069	26.600	2000mm x 2000mm II	6.917
D-23	13+596.25	15.10	10.6%	165.600	162.200	171.652	32.000	1500mm x 1500mm	6.252
D-24	14+378.00	6.89	7.2%	124.600	122.000	132.300	36.300	1200mm x 1200mm	7.800
D-25	14+453.00	1.33	2.6%	115.000	114.500	117.100	19.000	D=800mm 90	1.550
D-26	14+584.41	0.68	9.0%	111.900	110.500	115.299	15.500	D=600mm 180	3.499

		(m)	(Und.)
Ø600	360°	87.9	3
	180°	15.5	1
Ø800	90°	41.7	3
	180	42.0	2
	360	67.9	2
Ø1.000	90°	22.5	2
	360°	64.1	2
1.2x1.2		120.8	3
1.5x1.5		94.7	4
2.0x2.0	II	45.8	2
	III	41.7	1
2.5x2.0	I	6	1

4. Los Cuyuyes

		Length	Pipe Length	Open Cut Excavation (12.3/01)		Backfill (12.3/02)		Crushed Stone Bedding (12.3 /03)		Pipe D=600 (12.3/04)	Pipe D=800 (12.3/05)	Pipe D=1000 (12.3/06)	Concrete Class E (12.3/09)		Form Work F1 (12.3/12)		Reinforced Bar (12.3/14)	
		Unit (m)	Unit (m)	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m)	Unit (m)	Unit (m)	Unit (m3)	Total	Unit (m2)	Total	Unit (kg)	Total
D=600mm	90	1,021.500	1,124.900	0.829	846.568	0.431	439.883	0.143	145.564				0.156	159.660	0.520	531.180	0.000	0.000
	180	15.500		0.926	14.357	0.416	6.442	0.165	2.558				0.258	3.993	1.000	15.500	0.000	0.000
	Fix	87.900		1.085	95.372	0.453	39.775	0.240	21.096				0.615	54.076	2.000	175.800	42.984	3,778.294
D=800mm	90	41.700	151.600	1.279	53.343	0.578	24.107	0.173	7.193				0.259	10.788	0.680	28.356	0.000	0.000
	180	42.000		1.484	62.336	0.563	23.650	0.210	8.820				0.459	19.286	1.340	56.280	0.000	0.000
	Fix	67.900		1.718	116.669	0.604	41.027	0.308	20.913				1.113	75.600	2.680	181.972	73.530	4,992.687
D=1000mm	90	22.500	86.600	1.901	42.777	0.730	16.427	0.280	6.300				0.351	7.907	0.760	17.100	0.000	0.000
	180	0.000		2.124	0.000	0.720	0.000	0.330	0.000				0.604	0.000	1.580	0.000	0.000	0.000
	Fix	64.100		2.225	142.597	0.710	45.517	0.356	22.820				1.432	91.810	3.160	202.556	84.546	5,419.399
Total		1,299.000			1,374.019		636.829		235.263	1,124.900	151.600	86.600		423.120		1,208.744		14,190.379

94+79

		Length	Open Cut Excavation (12.2/07)		Backfill (12.2/06)		Concrete Class E (Item12.4/03)		Concrete Class H (Item12.4/04)		Form Work F1 (Item12.4/06)		Form Work F3 (Item12.4/08)		Reinforced Bar (12.4/09)	
		Unit (m)	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m2)	Total	Unit (m2)	Total	Unit (kg)	Total
1200mm x 1200mm	~9.25	120.800	2.422	292.525	0.770	93.035	1.633	~~292.525~~ 197.266	0.185	22.348	3.600	434.880	3.698	446.767	162.908	19,679.286
1500mm x 1500mm	~9.5	94.700	3.360	318.192	0.955	90.439	2.310	~~318.192~~ 218.757	0.220	20.834	4.300	407.210	4.448	421.263	193.308	18,306.268
2000mm x 2000mm	~5.75	0.000	4.966	0.000	1.246	0.000	2.935	0.000	0.270	0.000	5.300	0.000	5.948	0.000	232.364	0.000
2000mm x 2000mm	~7.75	45.800	5.175	237.015	1.308	59.884	3.195	~~237.015~~ 148.33	0.270	12.366	5.500	251.900	5.948	272.437	236.016	10,809.533
2000mm x 2000mm	7.751~	41.700	5.541	231.070	1.371	57.155	3.740	~~231.070~~ 155.988	0.280	11.676	5.700	237.690	5.948	248.048	270.472	11,278.682
2500mm x 2000mm	3.75~5.75	6.000	5.925	35.550	1.308	7.845	3.605	~~35.550~~ 27.63	0.320	1.920	5.500	33.000	6.431	38.587	317.288	1,903.728
2500mm x 2000mm	5.751~	0.000	6.316	0.000	1.371	0.000	4.200	0.000	0.320	0.000	5.700	0.000	6.431	0.000	331.620	0.000
Total		309.000		1,114.352		308.357		~~1,114.352~~ 739.942		69.144		1,364.680		1,427.102		61,977.497

Drain Pipe Quantities

Access Road Name	Length (m)	Excavation (m3)		P.V.C Pipe D=200mm (m)		Drainage Material (m3)	
		Per meter	Total		Total	Per meter	Total
Conguillo	5,823.120	0.240	1,397.549		5,823.120	0.209	1,214.703
Severno Tramo1	1,535.870	0.240	368.609		1,535.870	0.209	320.382
Severno Tramo2	2,472.920	0.240	593.501		2,472.920	0.209	515.851
Los Cuyuyes	7,324.030	0.240	1,757.767		7,324.030	0.209	1,527.793
Poza Honda	266.710	0.240	64.010		266.710	0.209	55.636
La Seca	2,035.376	0.240	488.490		2,035.376	0.209	424.579
El Guasmo	786.460	0.240	188.750		786.460	0.209	164.056
Cana Dulce	1,200.560	0.240	288.134		1,200.560	0.209	250.437
Membrillo Outlet	30.000	0.240	7.200		30.000	0.209	6.258
Grand Total			5,154.011		21,475.046		4,479.695

Excavation	V=(0.8+0.4)*0.4/2	=0.24
Free Drainage Material	V=0.24-3.14*0.1^2	=0.21

LONGITUD DE CUNETAS

CAMINO DE ACCESO: LOS CUYUYES 0+000 a 12+000 Km

		ABSCISAS	IZQUIERDA	DERECHA	LONGITUD
11.5		0+000.00 - 0+100.00	100.00	0.00	100.00
	✓	0+120.00 - 0+160.00	0.00	40.00	40.00
	✓	0+185.00 - 0+230.00	0.00	45.00	45.00
17.0		0+230.00 - 0+320.00	90.00	0.00	90.00
12.0		0+320.00 - 0+450.00	130.00	0.00	130.00
	✓	0+500.00 - 0+530.00	0.00	30.00	30.00
8.0		0+600.00 - 0+800.00	200.00	0.00	200.00
10.5		0+800.00 - 0+880.00	80.00	0.00	80.00
8.0		0+880.00 - 1+100.00	30.00	0.00	30.00
15.5		1+100.00 - 1+300.00	200.00	0.00	200.00
17.0, 9.0		1+300.00 - 1+446.33	146.33	0.00	146.33
	✓	1+503.99 - 1+568.36	0.00	64.37	64.37
20.0	✓	1+600.00 - 1+678.01	78.01	78.01	156.02
		1+678.01 - 1+750.00	71.99	0.00	71.99
	✓	1+750.00 - 1+800.00	50.00	50.00	100.00
10.5		1+800.00 - 1+820.00	20.00	0.00	20.00
12.0		1+888.47 - 2+010.74	112.27	0.00	112.27
13.5, 13.0		2+010.74 - 2+174.63	163.89	0.00	163.89
		2+324.15 - 2+450.00	125.85	0.00	125.85
11.5		2+450.00 - 2+490.00	40.00	0.00	40.00
9.0		2+490.00 - 2+514.26	24.26	24.26	48.52
		2+514.26 - 2+590.00	75.74	0.00	75.74
24.5		2+650.00 - 2+850.00	200.00	0.00	200.00
13		3+042.78 - 3+140.00	95.22	0.00	95.22
14.0	✓	3+140.00 - 3+177.45	37.45	37.45	74.90
	✓	3+177.45 - 3+250.00	0.00	72.55	72.55
27.0		3+250.00 - 3+352.28	102.28	102.28	204.56
		3+352.28 - 3+390.00	37.72	0.00	37.72
10.0	✓	3+390.00 - 3+405.58	15.58	15.58	31.16
		3+405.58 - 3+440.00	34.42	0.00	34.42
28.5	✓	3+440.00 - 3+478.60	38.60	38.60	77.20
		3+478.60 - 3+573.30	0.00	94.70	94.70
9.0		3+573.30 - 3+740.06	166.68	0.00	166.68
27.0		3+803.43 - 3+880.00	76.57	0.00	76.57
	✓	3+950.00 - 3+988.66	38.66	0.00	38.66
8.5	✓	3+988.66 - 4+084.73	98.07	98.07	196.14
		4+180.00 - 4+287.99	107.99	0.00	107.99
27.0		4+287.99 - 4+400.00	112.00	0.00	112.00
12.0		4+400.00 - 4+546.64	146.64	0.00	146.64
	✓	4+546.64 - 4+605.80	0.00	59.16	59.16
10.0	✓	4+639.27 - 4+680.00	20.73	20.73	41.46
13.0		4+690.00 - 4+720.00	30.00	0.00	30.00

Total Length 15,399.38, addition 500 m calculation / 81 nos.

13.5		4+720.00 - 4+880.00	160.00	0.00	160.00
	✓	4+880.00 - 5+021.38	121.38	0.00	121.38
13.0		5+021.38 - 5+050.00	28.62	28.62	57.24
		5+050.00 - 5+200.00	150.00	0.00	150.00
8.0		5+200.00 - 5+400.00	200.00	0.00	200.00
12.5		5+400.00 - 5+540.00	140.00	0.00	140.00
13.0		5+540.00 - 5+560.00	20.00	0.00	20.00
13.0	✓	5+560.00 - 5+580.00	20.00	20.00	40.00
		5+580.00 - 5+700.00	120.00	0.00	120.00
13.0		5+700.00 - 5+800.00	100.00	0.00	100.00
6.0	✓	5+800.00 - 5+900.00	100.00	100.00	200.00
13.0		5+900.00 - 6+100.00	200.00	0.00	200.00
		6+100.00 - 6+150.00	50.00	50.00	100.00
29.5	✓	6+150.00 - 6+250.00	100.00	0.00	100.00
		6+250.00 - 6+300.00	50.00	50.00	100.00
12.0	✓	6+500.00 - 6+540.00	240.00	0.00	240.00
6.0	✓	6+540.00 - 6+560.00	20.00	20.00	40.00
	✓	6+560.00 - 6+800.00	240.00	0.00	240.00
9.5	✓	6+800.00 - 6+860.00	0.00	60.00	60.00
28.5		6+896.46 - 7+000.00	103.54	0.00	103.54
	✓	7+000.00 - 7+075.00	75.00	75.00	150.00
		7+075.00 - 7+100.00	25.00	0.00	25.00
8.5		7+100.00 - 7+240.00	140.00	0.00	140.00
21.0		7+240.00 - 7+274.01	34.01	34.01	68.02
		7+274.01 - 7+290.00	15.99	0	15.99
	✓	7+290.00 - 7+330.00	40	40	80.00
12.0		7+330.00 - 7+359.76	29.76	0	29.76
	✓	7+359.76 - 7+387.64	27.88	27.88	55.76
15.0		7+387.64 - 7+470.00	82.36	0	82.36
35.0		7+470.00 - 7+700.00	230	0	230.00
21.0		7+700.00 - 7+900.00	200	0	200.00
19.0		7+917.45 - 8+000.00	82.55	0	82.55
		8+000.00 - 8+100.00	100	100	200.00
		8+100.00 - 8+220.00	120	0	120.00
13.0	✓	8+220.00 - 8+280.00	60	60	120.00
		8+280.00 - 8+340.00	60	0	60.00
17		8+340.00 - 8+431.40	91.4	0	91.40
8.0	✓	8+431.40 - 8+540.00	0	108.6	108.60
	✓	8+580.00 - 8+640.00	60	60	120.00
12.0		8+640.00 - 8+660.00	0	20	20.00
		8+660.00 - 8+680.00	20	0	20.00
19	✓	8+680.00 - 8+730.00	50	50	100.00
11.0		8+730.00 - 8+800.00	70	0	70.00
8.5		8+800.00 - 8+900.00	100	0	100.00
12.0	✓	8+900.00 - 8+940.95	40.95	40.95	81.90
		8+940.95 - 9+000.00	59.05	0	59.05
	✓	9+000.00 - 9+080.00	80	80	160.00
10.0		9+080.00 - 9+120.00	40	0	40.00

	✓	9+120.00 - 9+250.00	130	130	260.00
8.5		9+250.00 - 9+438.21	188.21	0	188.21
8.5		9+438.21 - 9+548.91	110.7	0	110.70
		9+650.00 - 9+670.00	20	0	20.00
9.0		9+670.00 - 9+900.00	230	0	230.00
12.0		9+900.00 - 9+980.00	80	0	80.00
6.0	✓	9+980.00 - 10+150.00	170	170	340.00
		10+150.00 - 10+250.00	100	0	100.00
6.0	✓	10+250.00 - 10+400.00	150	150	300.00
		10+400.00 - 10+634.01	134.01	0	134.01
6.0		10+634.01 - 10+750.00	215.99	0	215.99
6.0	✓	10+750.00 - 10+780.00	30	30	60.00
		10+780.00 - 11+000.00	220	0	220.00
		11+000.00 - 11+120.00	120	0	120.00
6.0	✓	11+120.00 - 11+230.00	110	100	210.00
6.0	✓	11+230.00 - 11+330.00	100	100	200.00
		11+380.00 - 11+500.00	120	0	120.00
6.0	✓	11+680.00 - 11+720.00	80	80	160.00
		11+720.00 - 11+825.77	105	0	105.00
8	6.0 ✓	11+825.77 - 11+872.65	46	46	92.00
14	9.0	11+872.65 - 12+000.00	127.35	0	127.35
				LONG. TOTAL (	12481.52

Los Cuyuyes

	ø600	Station	Left	Right	Total
*	12.0	12+000.00 ~ 12+160.00	160.00	100.00	260.00
		12+474.00 ~ 12+600.00	126.00	0.00	126.00
*		12+600.00 ~ 12+700.00	0.00	100.00	100.00
	15.0	12+700.00 ~ 12+860.00	160.00	0.00	160.00
		12+860.00 ~ 12+880.00	20.00	0.00	20.00
*	9.5	12+899.00 ~ 12+950.00	0.00	51.00	51.00
	21.0	12+950.00 ~ 13+100.00	0.00	150.00	150.00
		13+100.00 ~ 13+172.65	0.00	72.65	72.65
*		13+220.00 ~ 13+294.07	0.00	74.07	74.07
	15.0	13+294.07 ~ 13+435.90	141.83	0.00	141.83
		13+435.90 ~ 13+539.13	103.23	0.00	103.23
*		13+539.13 ~ 13+580.00	0.00	40.37	40.37
	17.0	13+613.65 ~ 13+800.00	186.35	0.00	186.35
*	6.0	13+800.00 ~ 13+883.72	83.72	74.59	158.31
*		13+883.72 ~ 14+220.00	336.28	303.76	640.04
	10.0	14+220.00 ~ 14+256.95	36.95	0.00	36.95
*		14+256.95 ~ 14+301.00	44.05	44.05	88.10
*		14+301.00 ~ 14+360.00	59.00	59.00	118.00
	5.0	14+419.00 ~ 14+453.00	33.46	0.00	33.46
		14+453.00 ~ 14+479.00	26.00	0.00	26.00
*		14+479.00 ~ 14+560.00	81.00	81.00	162.00
	9.0	14+560.00 ~ 14+640.00	80.00	80.00	160.00
	119.5				2,908.36

10
15

Total length 12481.52 + 2908.36 = 15389.88 m

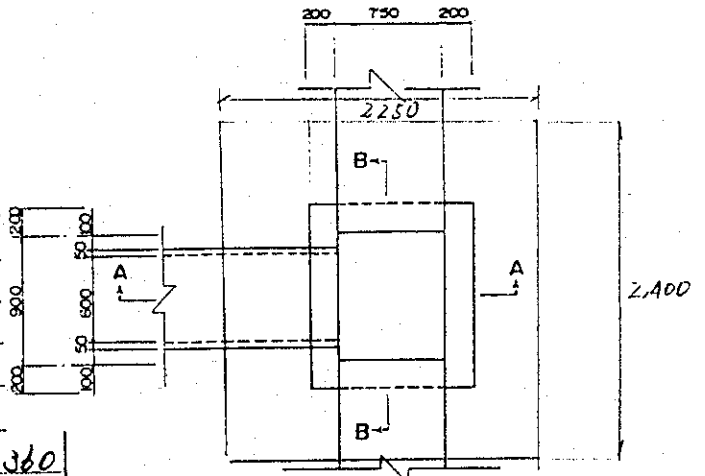
adition 50 nos x 10 m = 500 m 15889.88

catch basin 85 nos

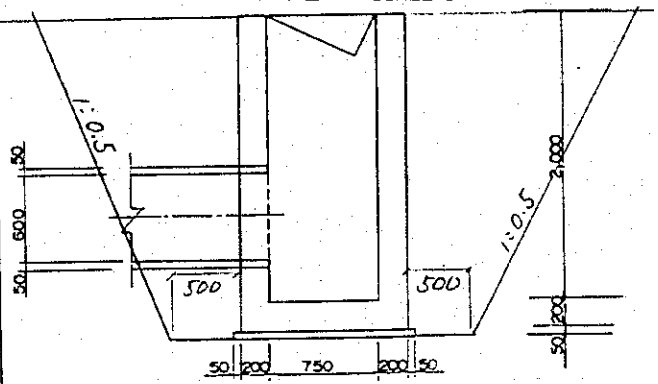
Ø600 pipe 902 + 119.5 = 1021.5 m.

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
15.3 101	Open-cut excavation, all classes (Catch basin)			
	2.25 x 2.4 m = 5.4 m²			
	4.5 x 4.65 m = 20.925 m²			
	(5.4 + 20.925) x 1/2 x 2.25 = 29.616 m³			
	29.616 x 85 nos = 2,517.36			
		m³	2,517.360	



TIPO-A ESCALA B
TYPE-A SCALE B

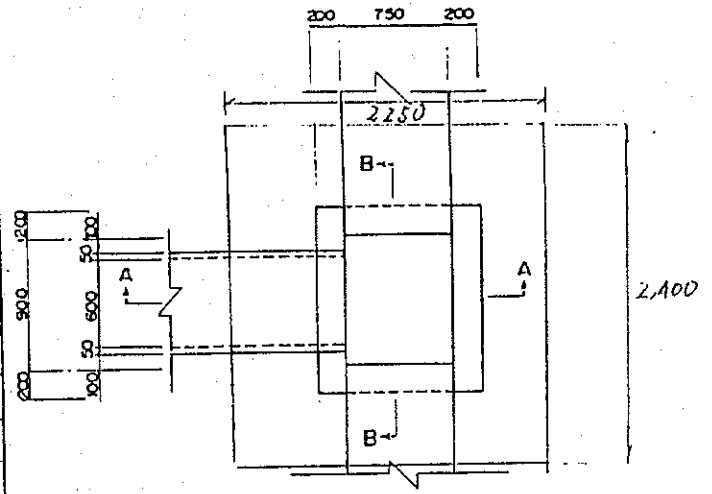


SECCION A-A
SECTION A-A

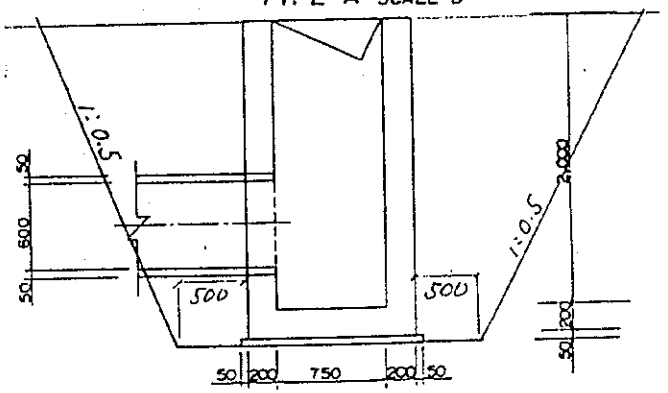
6-182

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 102	Backfill with selected material			
	<catch basin>			
	29.616 - 1.15 × 1.3 × 2.2 - 1.25 × 1.4 × 0.05 = 26.240			
	26.240 × 85 = 2230.4	m^3	2230.400	



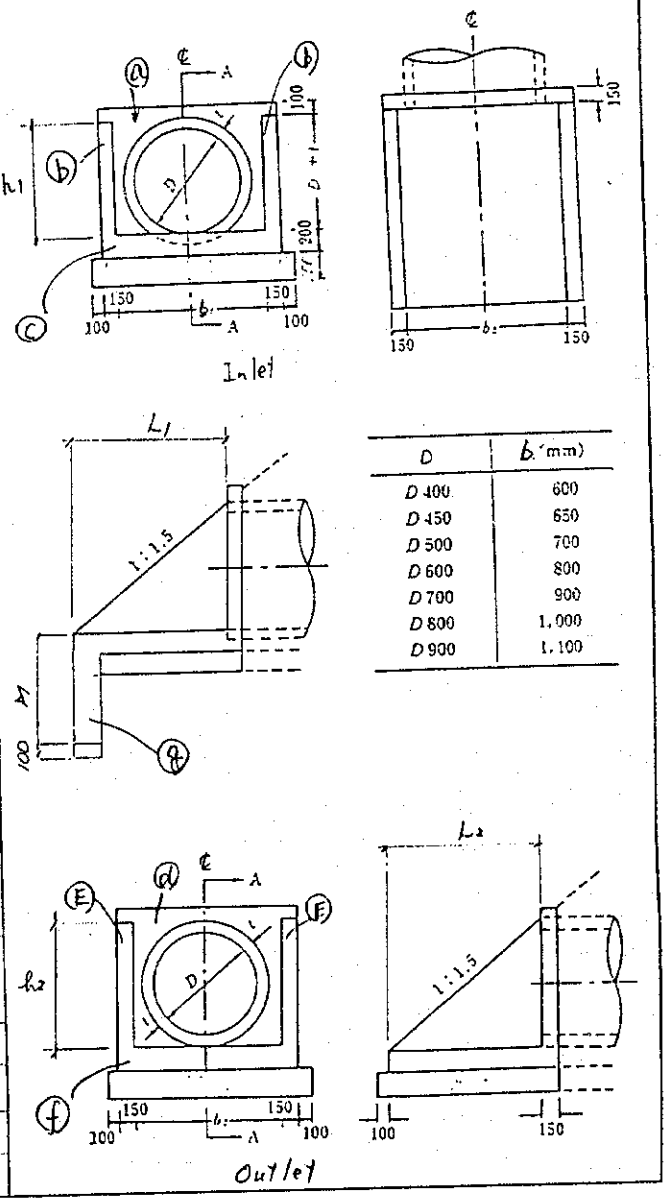
TIPO-A ESCALA B
TYPE-A SCALE B



SECCION A-A
SECTION A-A

Working Division:

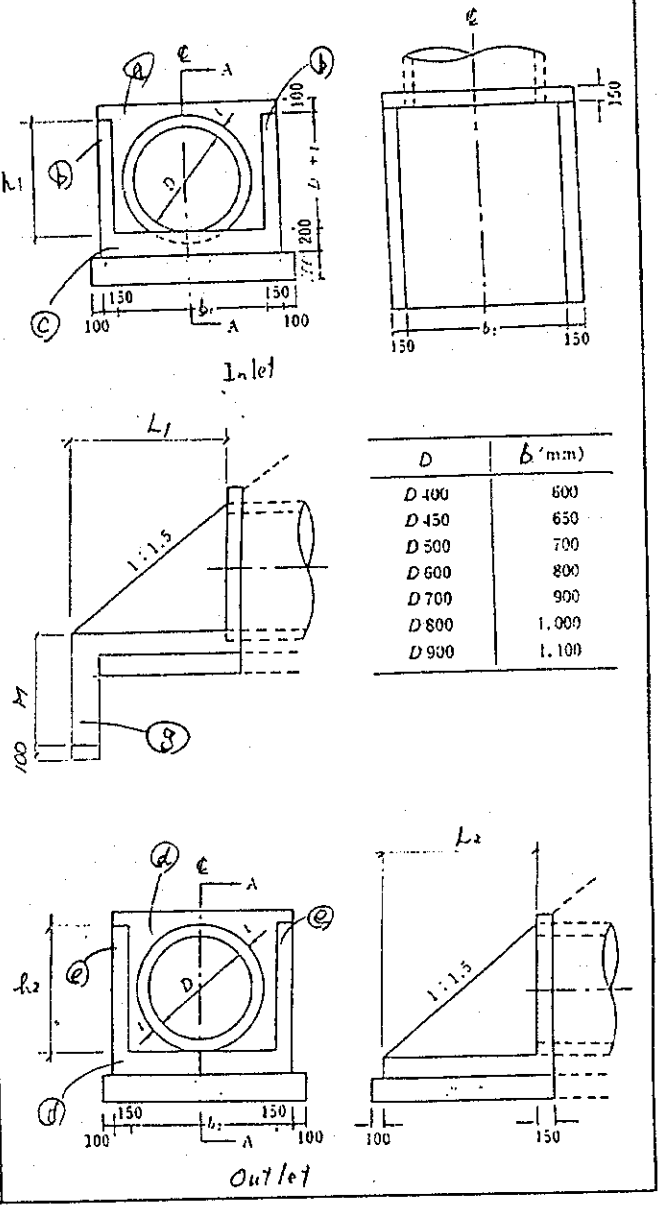
Description	Calculation Details	Unit	Quantity	Remarks
15.3 109	Concrete class E for			
	(wing wall)			
	<pipe type>			
	1. ø600 (h_1 = 650 mm, b = 800 mm) (L_1 = 975 mm, h_2 = 700 mm) L_2 = 1.5 H = 400 mm			
	ⓐ 1.1 × 0.95 × 0.15 m = 0.157 m^3			
	ⓑ 0.975 × 0.65 × 0.15 × ½ × 2 = 0.095 m^3			
	ⓒ 1.7 × 0.975 × 0.2 = 0.215 m^3			
	ⓓ 1.1 × 1.0 × 0.15 m = 0.165 m^3			
	ⓔ 1.05 × 0.7 × ½ × 0.15 × 2 = 0.110 m^3			
	ⓕ 1.1 × 1.05 × 0.2 m = 0.231 m^3			
	ⓖ 0.3 × 0.4 × 1.1 m × 2 = 0.264 m^3			
	1.237 m^3			
	1.237 × 4 m = 4.948 m^3	m^3	70.398	
	0.77 × 85 = 65.45 m^3			



D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

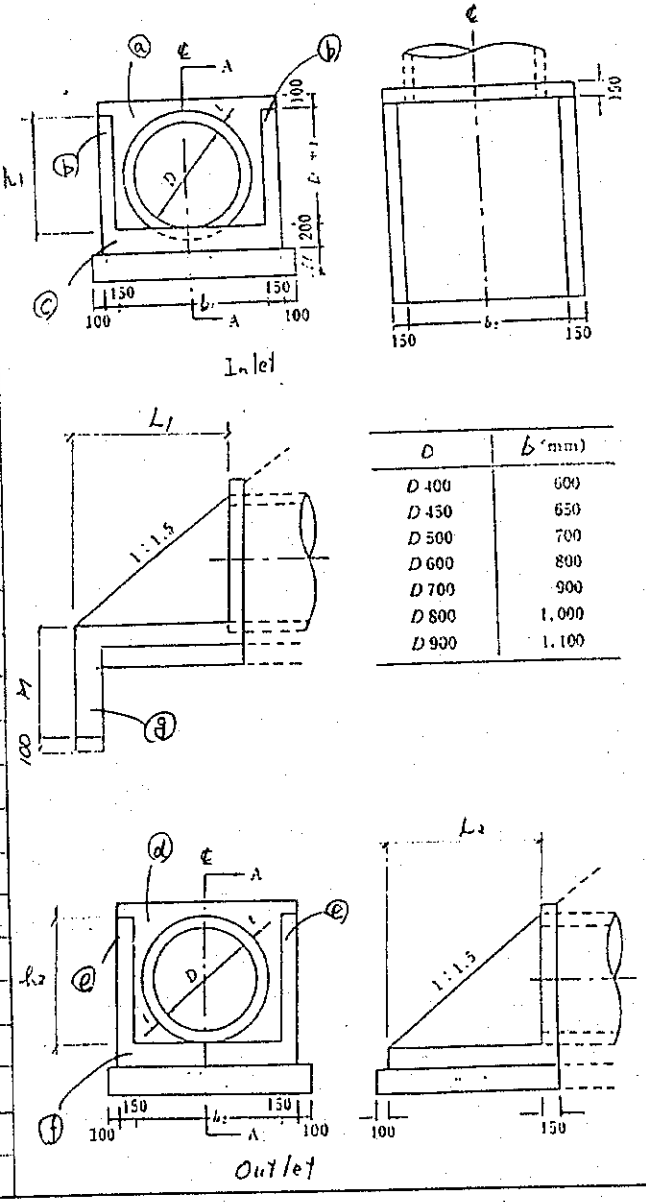
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109.	2. Ø800. $h_1 = 0.866m$ $L_1 = 1.299m$			
	$b = 1.0m$, $h_2 = 0.932$, $L_2 = 1.398m$			
	$M = 0.6m$			
	ⓐ: $1.3 \times 1.166 \times 0.15 = 0.227\ m^3$			
	ⓑ: $0.866 \times 1.299 \times \frac{1}{2} \times 0.15 \times 2 = 0.169\ m^3$			
	ⓒ: $1.3 \times 1.299 \times 0.2 = 0.338\ m^3$			
	ⓓ: $1.3 \times 1.232 \times 0.15 = 0.240\ m^3$			
	ⓔ: $0.932 \times 1.398 \times \frac{1}{2} \times 0.15 \times 2 = 0.195\ m^3$			
	ⓕ: $1.3 \times 1.398 \times 0.2 = 0.363\ m^3$			
	ⓖ: $0.3 \times 0.6 \times 1.3 \times 2 = 0.468\ m^3$			
	$2.0\ m^3$			
	$2.0 \times 7 = 14.0\ m^3$	m^3	14.000	



D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

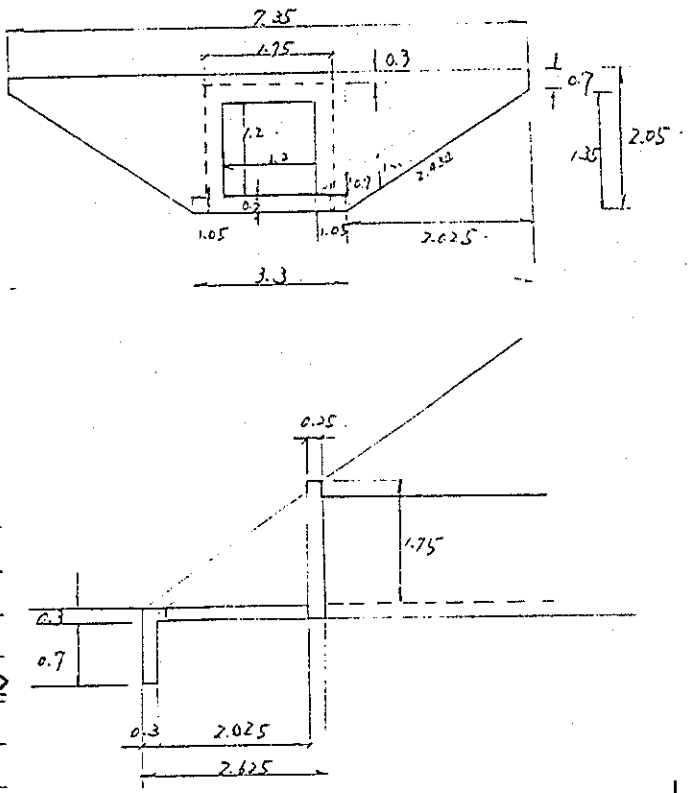
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	3. Ø1,000 wing wall h_1 = 1.082 m L_1 = 1.623 m, b = 1.2 m h_2 = 1.164 m L_2 = 1.746 m H = 0.8 m. ⓐ: 1.5 × 1.382 × 0.15 = 0.311 m³ ⓑ: 1.082 × 1.623 × ½ × 0.15 × 2 = 0.283 m³ ⓒ: 1.5 × 1.623 × 0.2 = 0.487 m³ ⓓ: 1.5 × 1.464 × 0.15 = 0.329 m³ ⓔ: 1.164 × 1.746 × ½ × 0.15 × 2 = 0.305 m³ ⓕ: 1.5 × 1.746 × 0.2 = 0.524 m³ ⓖ: 0.3 × 0.8 × 1.5 × 2 = 0.720 m³ 2.939 m³ 2.939 × 4 wa = 11.756	m³	11.756	 D / b (mm) D 400 — 600 D 450 — 650 D 500 — 700 D 600 — 800 D 700 — 900 D 800 — 1,000 D 900 — 1,100

98-2

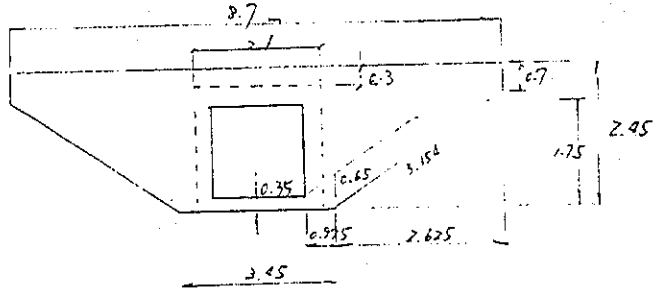
Working Division:

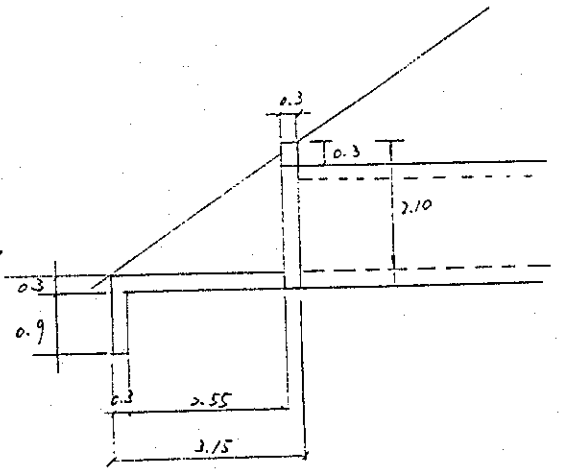
Description	Calculation Details	Unit	Quantity	Remarks
.3 109	Concrete, class E for pipe culvert and wing wall.	m^3		
	(wing wall)			
	1. 1.2 × 1.2 m			
	(wing)			
	$\{(3.3+7.35) \times 1.35 \times \frac{1}{2} + 0.7 \times 7.35 - 1.2 \times 1.2\} \times 0.25 = 2.723\ m^3$			
	(slab)			
	$1.75 \times 2.325 \times 0.3 = 1.221$			
	$1.75 \times 0.7 \times 0.3 = 0.368$			
	$4.312\ m^3$			
	$4.312 \times 6 = 25.872$	m^3	25.872	



Working Division:

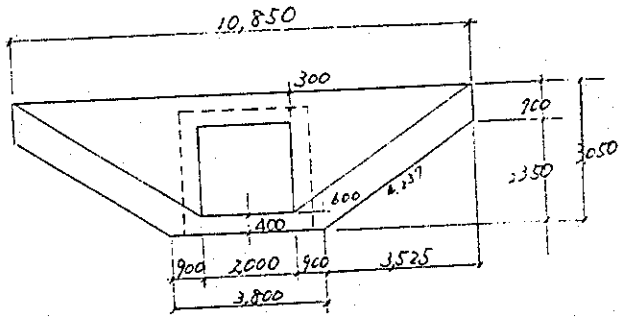
Description	Calculation Details	Unit	Quantity	Remarks
.3 /09	Concrete class E			
	(wing wall)			
	2-1.5 × 1.5 m			
	(wing)			
	$\{(8.7+3.45)\times 1.75\times 1/2 + 0.7\times 8.7 - 1.5^2\} \times 0.3 = 4.341$			
	(slab)			
	$2.85 \times 2.1 \times 0.3 = 1.796$			
	$0.3 \times 0.9 \times 2.1 = 0.567$			
	$6.704\ m^3$			
	$6.704 \times 8 = 53.632$	m^3	53.632	

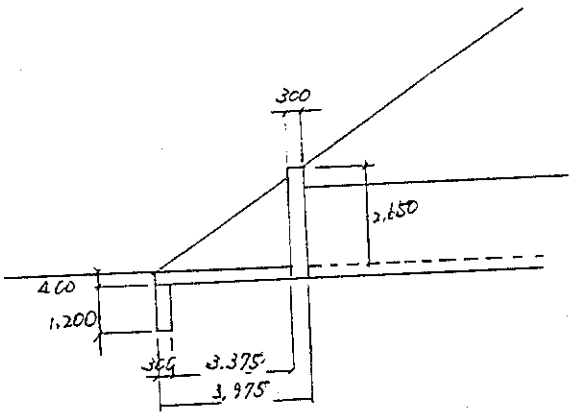




Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E (Wing wall)			
	4. 2.0 × 2.0 (II)			
	(wing)			
	$\{(10.85+3.8)\times 2.35\times \frac{1}{2} + 0.7\times 10.85 - 2.0^2\}\times 0.3 = 6.243$			
	(slab)			
	$2.6\times 3.675\times 0.4 = 3.822$			
	$0.3\times 1.20\times 2.6 = 0.936$			
	$11.001\ m^3$			
	$11.001\times 4 = 44.004$	m^3	44.004	

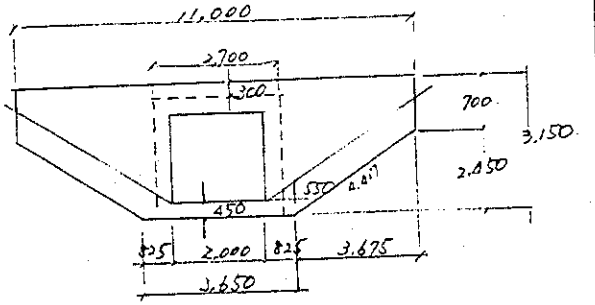


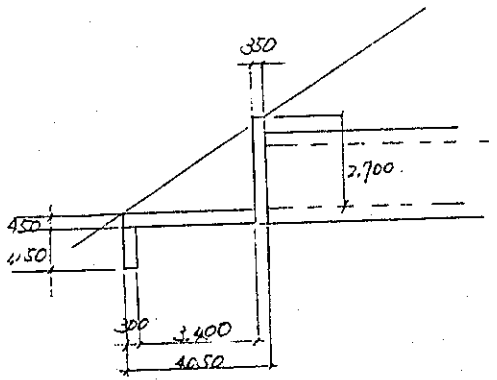


60-09

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E (Wing wall).			
	5. 2.0 × 2.0 (III)			
	<Wing> {(11.0 + 3.65) × 2.45 × ½ + 0.7 × 11.0 − 2.0²} × 0.35 = 7.576 m³			
	<slab> 2.7 × 3.70 × 0.45 = 4.496 0.3 × 1.15 × 2.70 = 0.932			
	13.004 m³			
	13.004 × 2 = 26.008	m³	26.008	

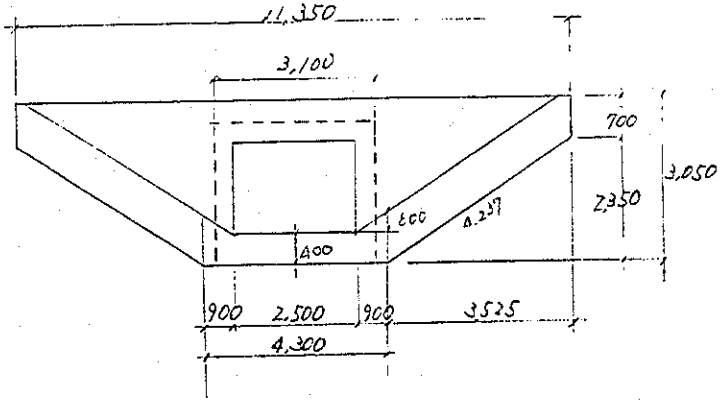


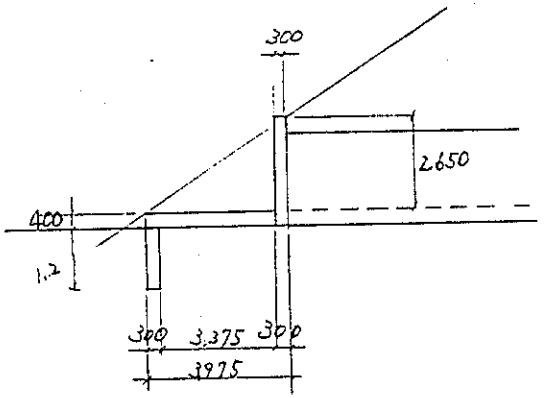


961 - 9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E			
	(Wing wall)			
	b. 2.5×2.0 m (1).			
	(Wing 2)			
	{(11.35+4.3)×2.35×1/2 + 0.7×11.35			
	−2.0×2.5}×0.3			
	= 6.400			
	(slab)			
	3.1×3.675×0.4 = 4.557			
	0.3×1.2×3.1 = 1.116			
	12.073 m²			
	12.073×2 = 24.146	m³	24.146	

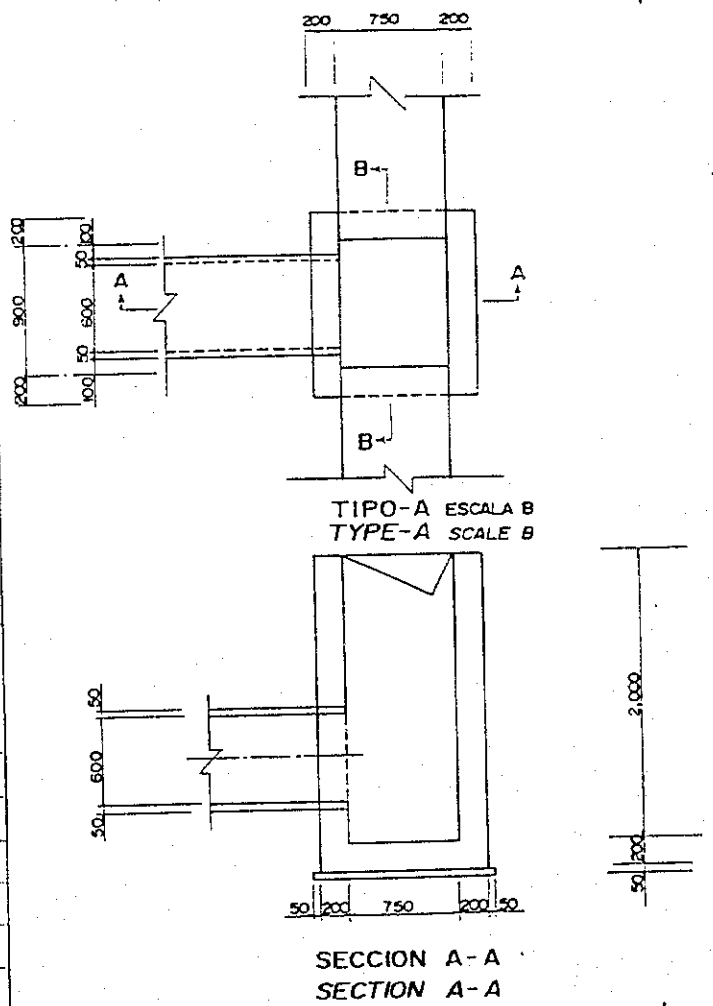




161-9

Working Division:

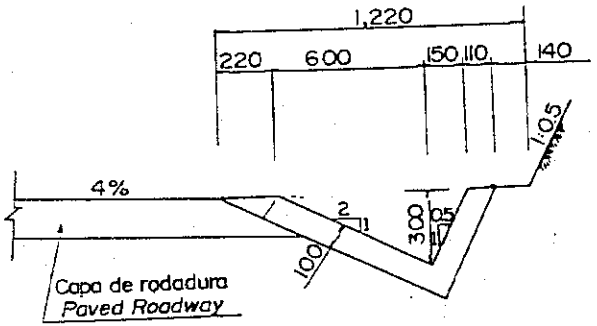
Description	Calculation Details	Unit	Quantity	Remarks
3 .10	Concrete, class F for side ditch and catch basin			
	(catch basin) per 1 no.			
	1.15 x 1.30 x 2.2			
	- 0.75 x 0.9 x 2.0 = 1.939 m^3			
	1.939 - 0.35 m^3 x 0.2 = 1.862 m^3			
	1.862 x 85 = 158.270	m^3	158.270	



6-102

Working Division:

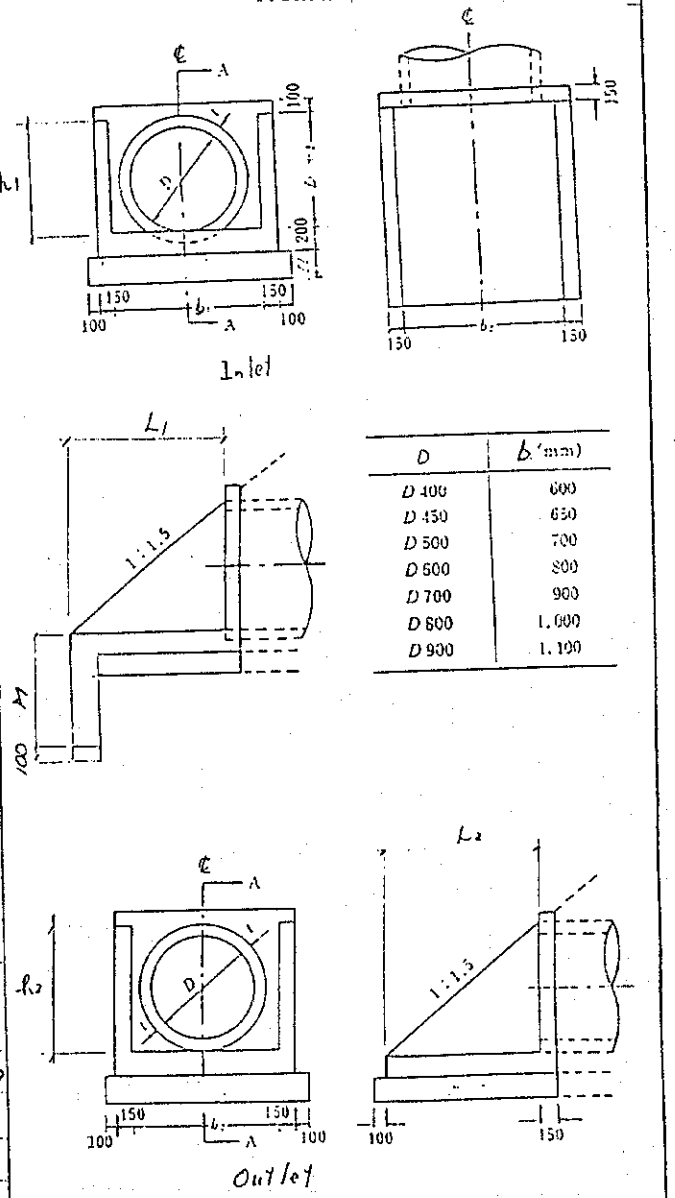
Description	Calculation Details	Unit	Quantity	Remarks
3 110	Concrete, class F. for side ditch and catch basin			
	(Side ditch) per 1m			
	1.08 × 0.432 × 1/2			
	− 0.75 × 0.3 × 1/2 = 0.121 m^3			
	0.121 × 15,389.88 = 1,862.175	m^3	1,862.175	



Working Division:

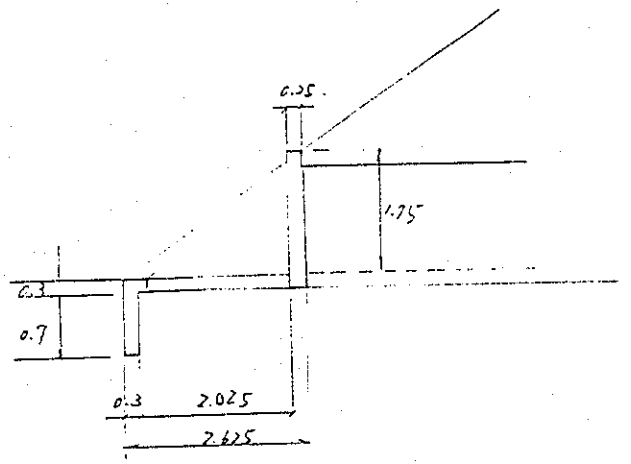
Description	Calculation Details	Unit	Quantity
3 111	Concrete, class H for levelling concrete		
	1. Ø 600 pipe (using wall)		
	1.1m × 1.125 × 0.1 = 0.124 m³		
	1.1 × 1.20 × 0.1 = 0.132 m³		
	0.256 m³		
	0.256 × 4 nos = 1.024	m³	12.244
	0.132 × 85 = 11.22		
	2. Ø 800 pipe		
	1.3 × 1.449 × 0.1 = 0.189 m³		
	1.3 × 1.598 × 0.1 = 0.201 m³		
	0.390 m³		
	0.390 × 7 nos = 2.730	m³	2.730
	3. Ø 1,000 pipe		
	1.5 × 1.773 × 0.1 = 0.266 m³		
	1.5 × 1.896 × 0.1 = 0.284 m³		
	0.550 m³		
	0.550 × 4 nos = 2.200	m³	2.200

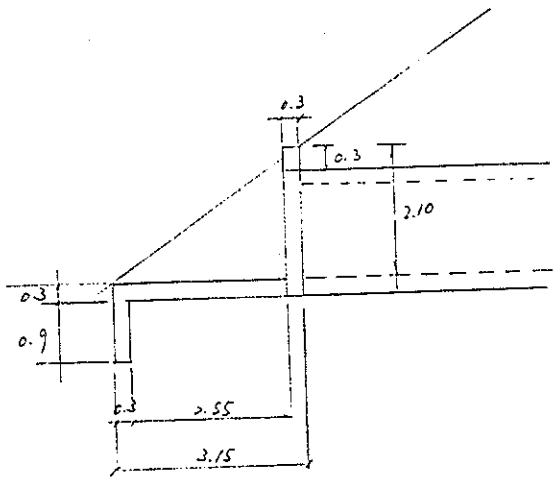
Remarks



Working Division:

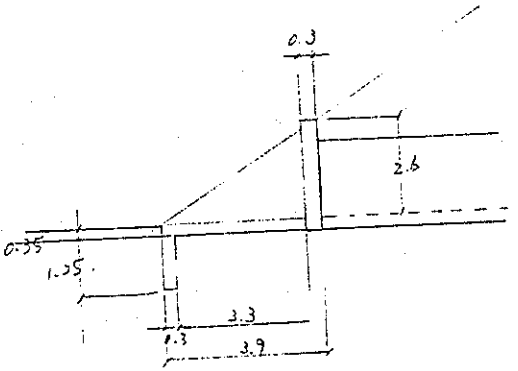
Description	Calculation Details	Unit	Quantity	Remarks
3 /11	Concrete class H for levelling concrete (wing wall)			
	1. 1.2 × 1.2 m			
	(wing) 0.25 × (1.434 × 2 + 3.31) × 0.1 = 0.204			
	(slab) 1.75 × 2.325 × 0.1 = 0.407			
	0.611 m^3			
	0.611 × 2 × 3 = 3.666	m^3	3.666	
	2. 1.5 × 1.5 m			
	(wing) 0.3 × (3.154 × 2 + 3.45) × 0.1 = 0.293			
	(slab) 2.1 × 2.85 × 0.1 = 0.599			
	0.892 m^3			
	0.892 × 2 × 4 = 7.136	m^3	7.136	

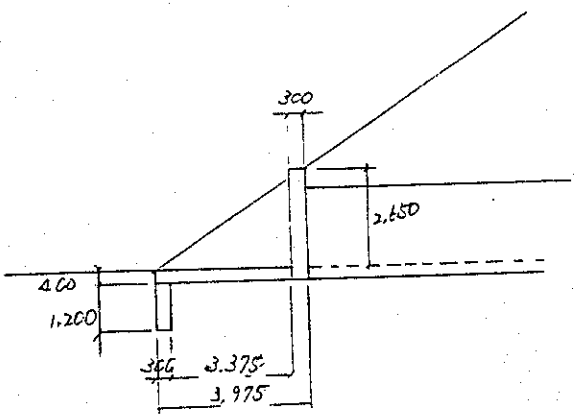




Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /11	Concrete class H for levelling concrete (wing wall)			
	3 2.0 x 2.0 (I)			
	(wing) 0.3 x (4.056 x 2 + 3.95) x 0.1 = 0.362 m³			
	(slab) 2.6 x 3.33 x 0.1 = 0.866			
	1.228 m³			
	NO.			
	4. 2.0 x 2.0 (II)			
	(wing) 0.3 x (4.237 x 2 + 3.80) x 0.1 = 0.368			
	(slab) 2.6 x 3.675 x 0.1 = 0.956			
	1.324 m³			
	1.324 x 2 x 2 = 5.296	m³	5.296	

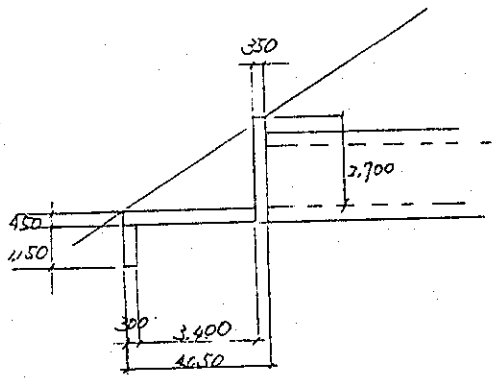


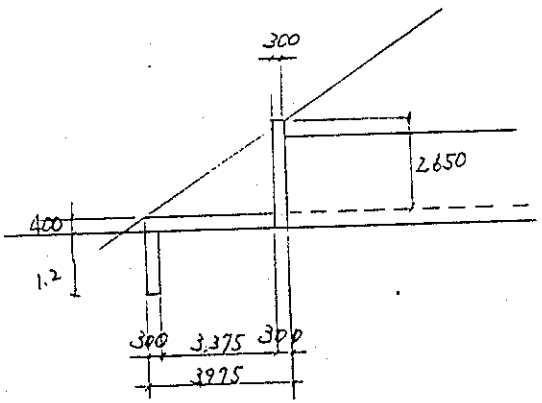


961-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 / 11	Concrete class H for levelling concrete			
	(Wing Wall)			
	5 2.0×2.0m (Ⅲ)			
	(wing) 0.35×(4.417×2+3.65)×0.1 = 0.437			
	(slab) 2.7×3.7×0.1 = 0.999			
	1.436 m³			
	1.436×2×1 = 2.872	m³	2.872	
	6.25×2.0m (Ⅰ)			
	(wing) 0.30×(4.237×2+4.3)×0.1 = 0.383			
	(slab) 3.1×3.675×0.1 = 1.139			
	1.522 m³			
	1.522×2×1 = 3.044	m³	3.044	

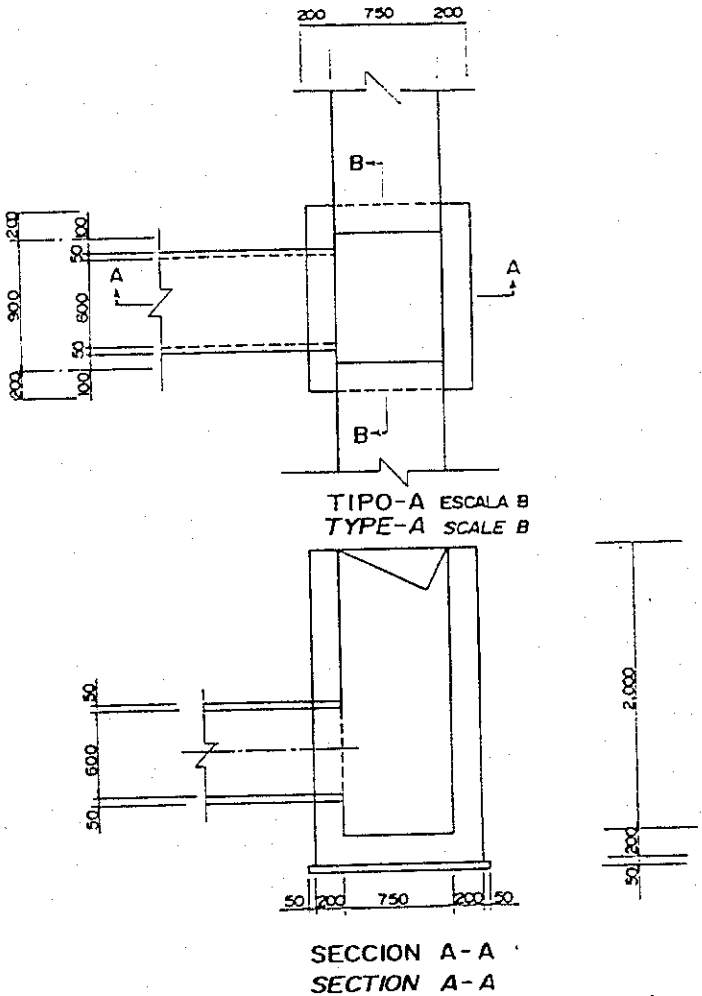




43-9

Working Division:

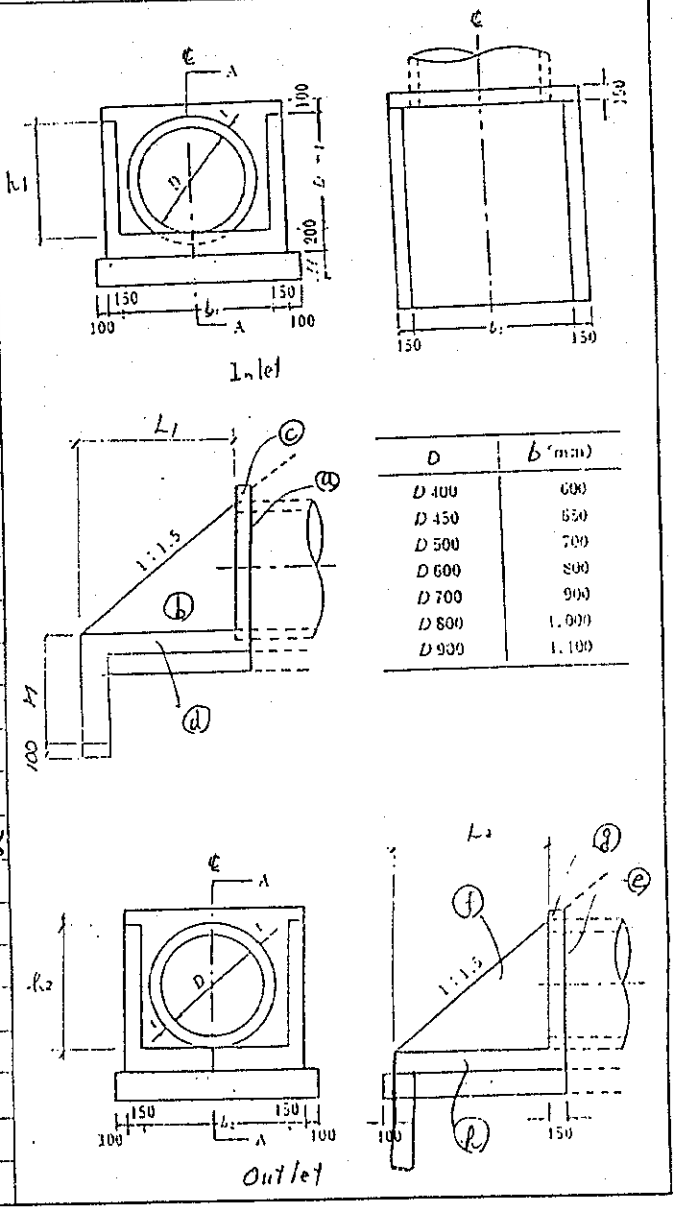
Description	Calculation Details	Unit	Quantity	Remarks
3 /11	Concrete class H for levelling concrete			
	(catch basin) per 1 no.			
	$1.25 \times 1.4 \times 0.05 = 0.088\ m^3$			
	$0.088 \times 85 = 7.48$	m^3	7.480	



83-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
13 /12	Formwerk, El finish for concrete of Item 109, 110 and 111			
	(wing wall).			
	1. ϕ600.			
	ⓐ 1.1m × 0.95m = 1.045 m²			
	1.045 − (0.3+0.05)²π = 0.660 m²			
	ⓑ (0.15+1.125) × 0.65/2 × 2 = 0.829 m²			
	ⓒ 0.15 × 0.1 × 2 = 0.03 m²			
	ⓓ 0.2 × (1.1 + 1.125 × 2) + 1.1 × (0.4 + 0.2) = 1.33			
	ⓔ 1.1m × 1.0 m = 1.100 m²			
	1.100 − (0.3+0.05)²π = 0.715			
	ⓕ (0.15+1.20) × 0.7 × ½ × 2 = 0.945			
	ⓖ 0.15 × 0.1 × 2 = 0.03 m²			
	ⓗ 0.2 × (1.1 + 1.20 × 2) + 1.1 × (0.4 + 0.2) = 1.36			
	5.899 m²			
	5.899 × 4 = 23.596	m³	282.846	
	3.65 × 85 = 259.25			

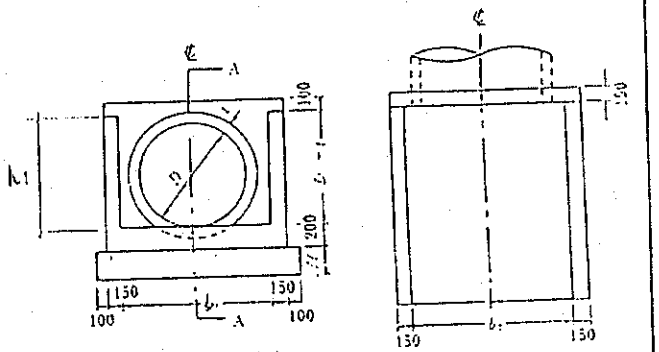


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

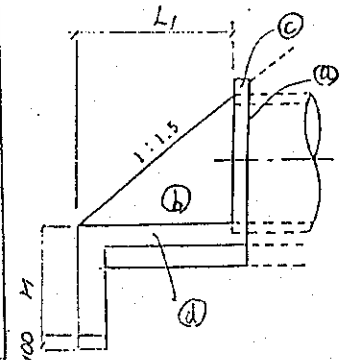
66-19

Working Division:

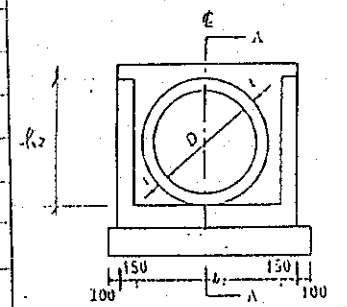
Description	Calculation Details	Unit	Quantity	Remarks
3 / 12	Formwork EI finish			
	(wing wall)			
	2. Φ800			
	ⓐ 1.3m × 1.166m = 1.516			
	1.516 − (0.466)²π = 0.834 m²			
	ⓑ (0.15+1.449) × 0.866 × ½ × 2 = 1.385 m²			
	ⓒ 0.15×0.1×2 = 0.03			
	ⓓ 0.2×(1.3+1.449×2)+1.3(0.6+0.4)			
	= 2.140			
	ⓔ 1.3 × 1.232 = 1.602			
	1.602 − 0.466²π = 0.920 m²			
	ⓕ (0.15+1.548) × 0.932 × ½ × 2 = 1.583 m²			
	ⓖ 0.15×0.1×2 = 0.03			
	ⓗ 0.2×(1.3+1.548×2)+1.3×(0.6+0.4)			
	= 2.179			
	9.101 m²			
	9.101 × 7 = 63.707	m³	63.707	



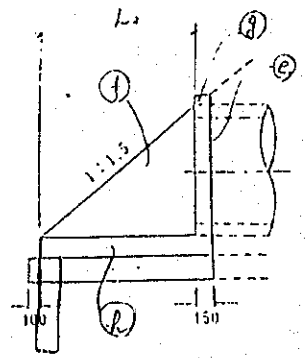
Inlet



D	b' (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100



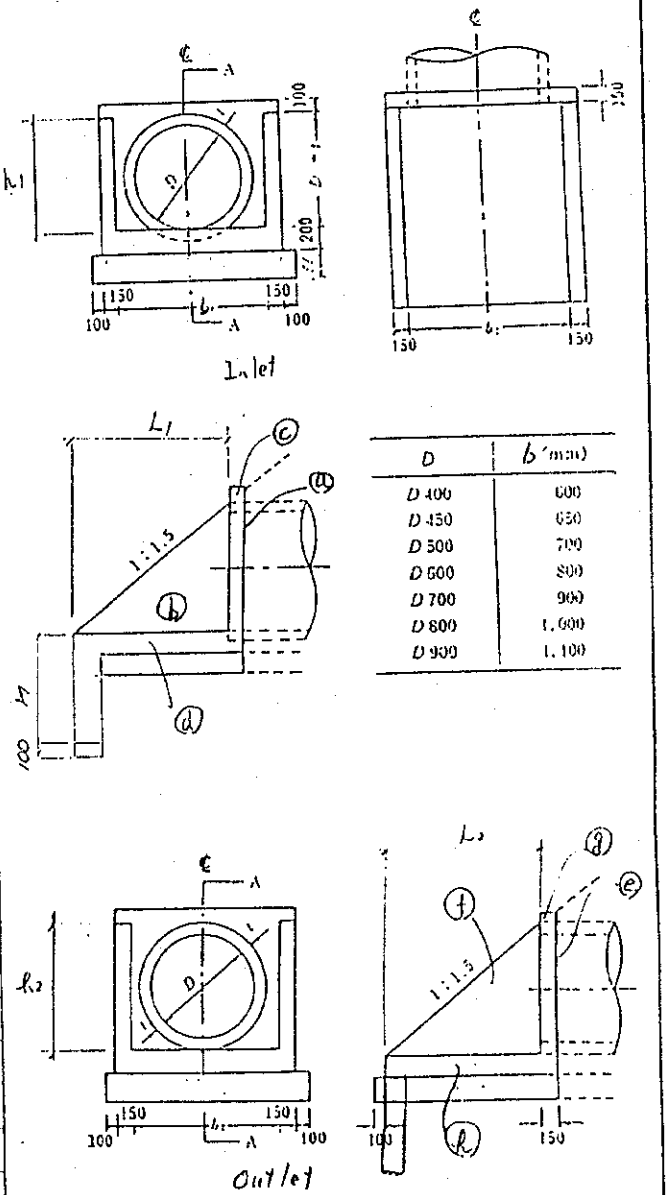
Outlet



Working Division:

Description	Calculation Details	Unit	Quantity
3 /12	Formwork, FI finish		
	(wing wall)		
	3 Ø1,000		
	ⓐ 1.5 × 1.382 m = 2.073 m²		
	2.073 − 0.582 × π = 1.009 m²		
	ⓑ (0.15 + 1.773) × 1.082 × ½ × 2 = 2.081 m²		
	ⓒ 0.15 × 0.1 × 2 = 0.03		
	ⓓ 0.2 × (1.5 + 1.773 × 2) + 1.5 × (0.8 + 0.6)		
	= 3.909		
	ⓔ 1.5 × 1.464 = 2.196 m²		
	2.196 − 0.582 × π = 1.132 m²		
	ⓕ (0.15 + 1.896) × 1.164 × ½ × 2 = 2.382 m²		
	ⓖ 0.15 × 0.1 × 2 = 0.03		
	ⓗ 0.2 × (1.5 + 1.896 × 2) + 1.5 × (0.8 + 0.6)		
	= 3.158		
	13.731 m³		
	13.731 × 4 = 54.924	m³	54.924

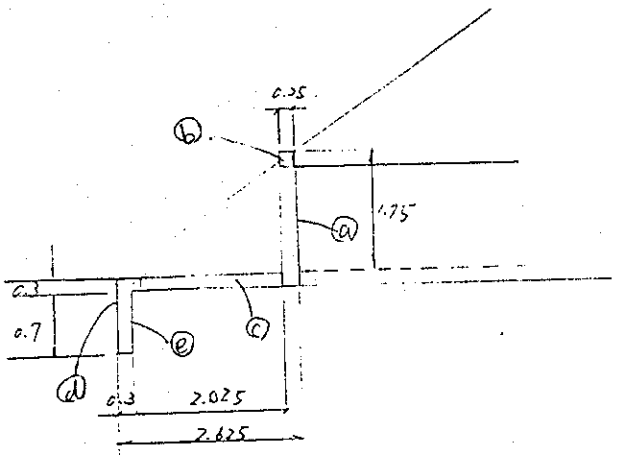
Remarks

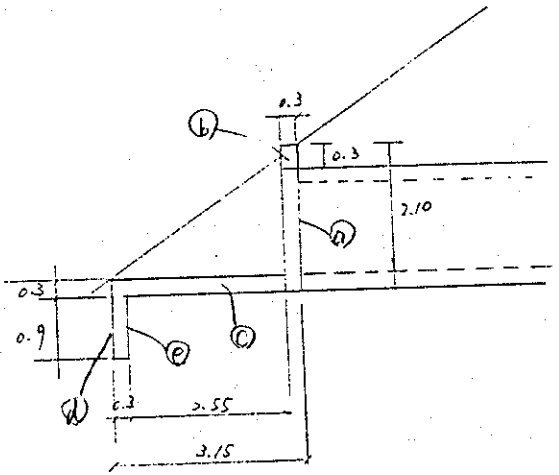


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 1/12	Formwork FI finish (wing wall)			
	1. 1.2×1.2 m			
	ⓐ (7.35+3.3)×1.35×½ + 0.7×7.35 − 1.80×1.75 = 9.184 m²			
	ⓑ 0.7×0.25×2 = 0.35 m²			
	ⓒ (2.325×1.0 − 2.025×0.7)×2 = 1.815 m²			
	ⓓ 1.0×1.75 = 1.75 m²			
	ⓔ 0.7×1.75 = 1.225 m²			
	14.324 m²			
	14.324×2×3 = 85.944	m³	85.944	
	2 1.5×1.5 m			
	ⓐ (8.7+3.45)×1.75×½ + 0.7×8.7 − 2.1×2.15 = 12.206 m²			
	ⓑ 0.7×0.3×2 = 0.42 m²			
	ⓒ (2.85×1.2 − 2.55×0.9)×2 = 2.250 m²			
	ⓓ 1.2×2.1 = 2.52 m²			
	ⓔ 0.9×2.1 = 1.89 m²			
	19.286 m²			
	19.286×2×4 = 154.288	m³	154.288	

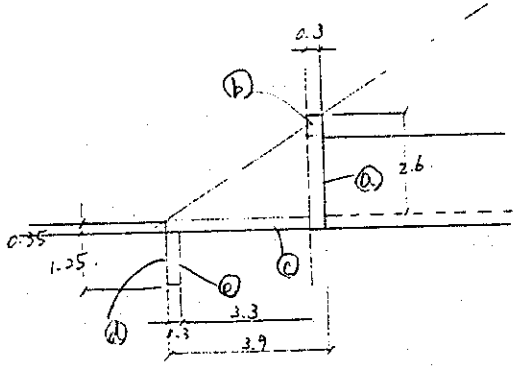


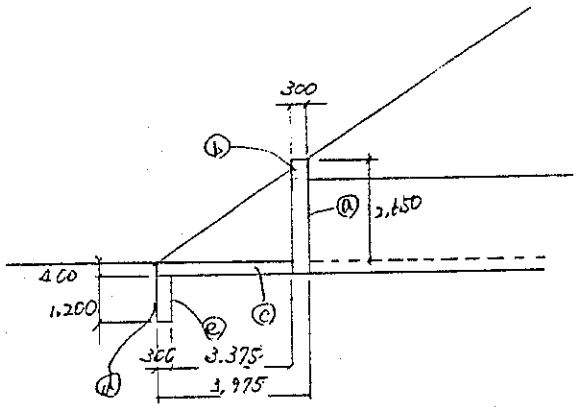


C-202

Working Division:

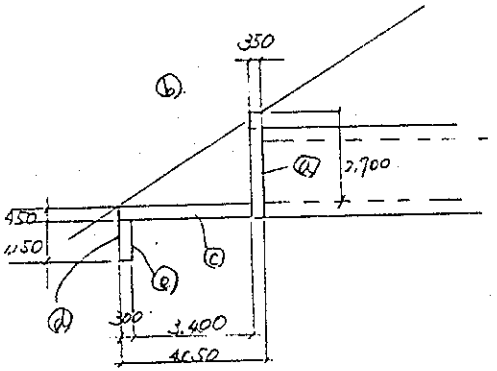
Description	Calculation Details	Unit	Quantity	Remarks
.3 112	Formwork Fl finish			
	3. 2.0×2.0 m (I)			
	ⓐ (10.7+3.95)×2.25×½ + 0.7×10.7			
	−2.6×2.65 = 17.081 m²			
	ⓑ 0.7×0.3×2 = 0.42 m²			
	ⓒ (3.6×1.60 − 3.3×1.25)×2 = 3.270 m²			
	ⓓ 1.60×2.6 = 4.16 m²			
	ⓔ 1.25×2.6 = 3.25 m²			
	28.181 m²			
	×2			
	4. 2.0×2.0 m (II)			
	ⓐ (10.85+3.8)×2.35×½ + 0.7×10.85			
	−2.6×2.75 = 17.659 m²			
	ⓑ (0.7×0.3×2 = 0.42 m²			
	ⓒ (3.675×1.6 − 3.375×1.2)×2 = 3.660 m²			
	ⓓ 1.6×2.6 = 4.16 m²			
	ⓔ 1.2×2.6 = 3.12 m²			
	29.019 m²			
	29.019 × 2 × 2 = 116.076	m³	116.076	

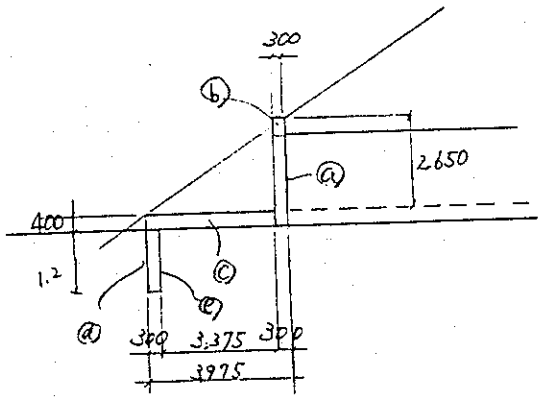




Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /12	Formwork FI finish			
	5. 2.0 × 2.0 (Ⅲ)			
	ⓐ (11.0 + 3.15) × 2.45 × 1/2 + 0.7 × 11.0			
	− 2.7 × 2.85 = 17.951 m²			
	ⓑ 0.7 × 0.35 × 2 = 0.49			
	ⓒ (3.70 × 1.6 − 3.4 × 1.15) × 2 = 4.02			
	ⓓ 1.6 × 2.7 = 4.32			
	ⓔ 1.15 × 2.7 = 3.105			
	29.886 m²			
	29.886 × 2 × 1 = 59.772	m³	59.772	
	6. 2.5 × 2.0 (I)			
	ⓐ (11.35 + 4.3) × 2.35 × 1/2 + 0.7 × 11.35			
	− 3.1 × 2.75 = 17.809			
	ⓑ 0.7 × 0.3 × 2 = 0.42			
	ⓒ (3.675 × 1.6 − 3.375 × 1.2) × 2 = 3.660			
	ⓓ 1.6 × 3.1 = 4.96			
	ⓔ 1.2 × 3.1 = 3.72			
	30.569 m²			
	30.569 × 2 × 1 = 61.138	m³	61.138	

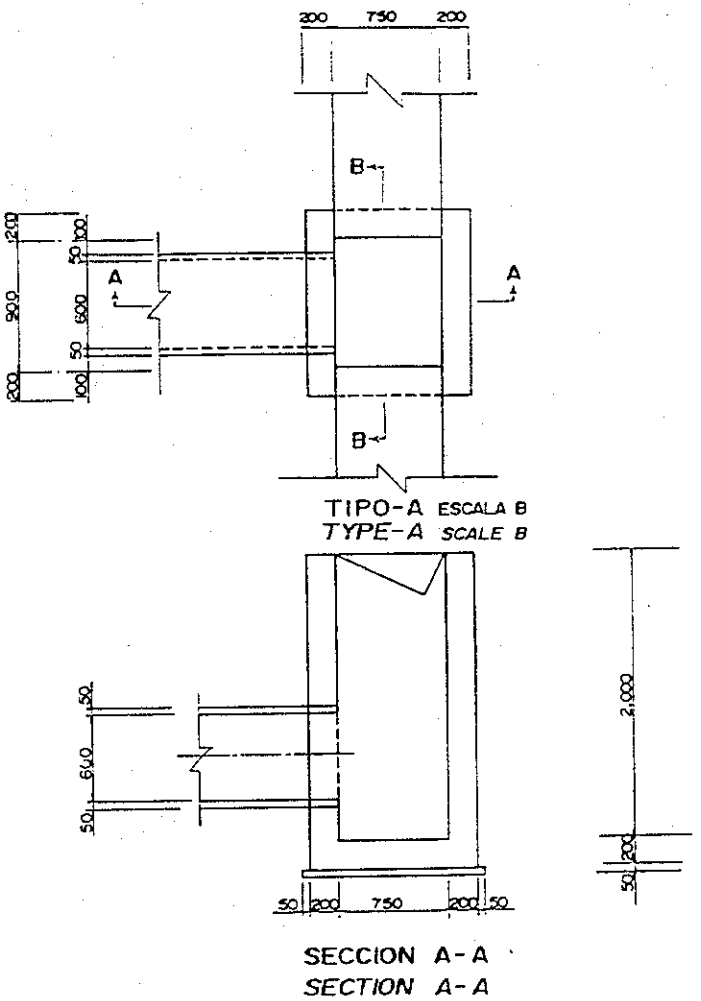




6-204

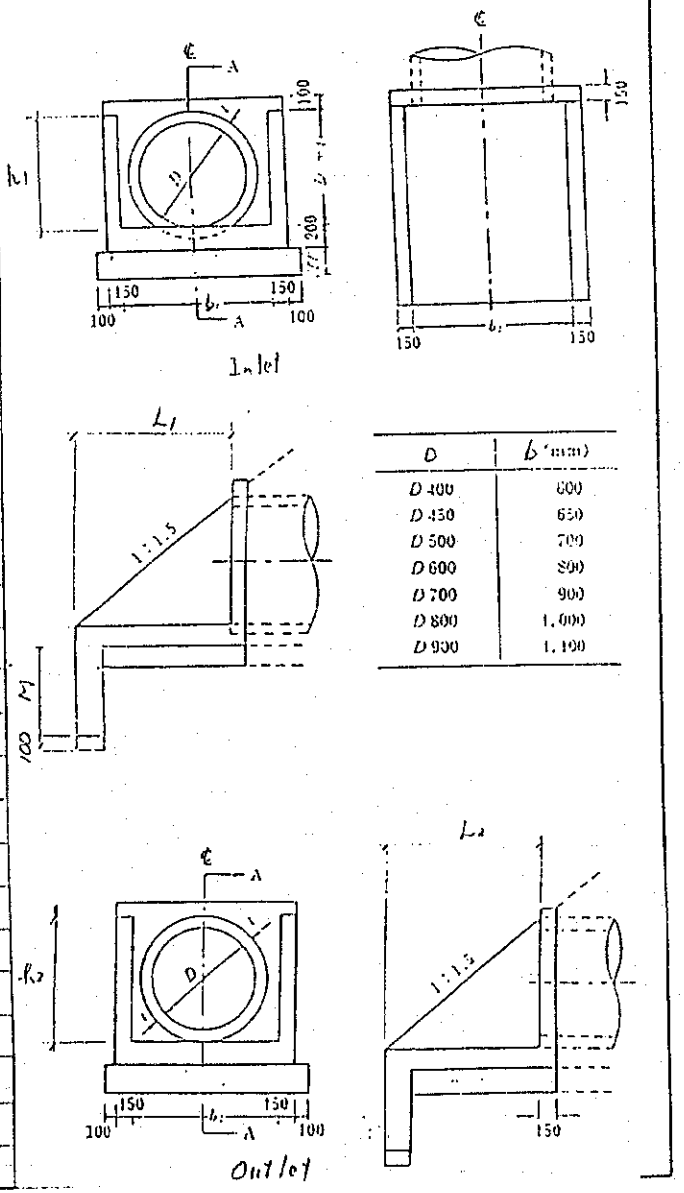
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /12	Formwork FI finish			
	(Catch drain)			
	1.15 x 2.2 x 2 = 5.06			
	1.30 x 2.2 x 2 - 0.35²π = 5.335			
	10.395 m²			
	10.395 x 85 nos = 883.575	m²	883.575	



Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork F3 finish			
	(Wing wall)			
	1. ϕ600			
	ⓐ 0.1×1.1 + 0.8×0.65 − 0.3²π = 0.347 m²			
	ⓑ 0.975×0.65×½×2 = 0.634 m²			
	ⓒ 0.1×1.1 + 0.8×0.70 − 0.3²π = 0.387 m²			
	ⓓ 1.05×0.70×½×2 = 0.735 m²			
	2.103 m²			
	2.103×4 = 8.412	m²	103.782	
	1.122×85 = 95.37			



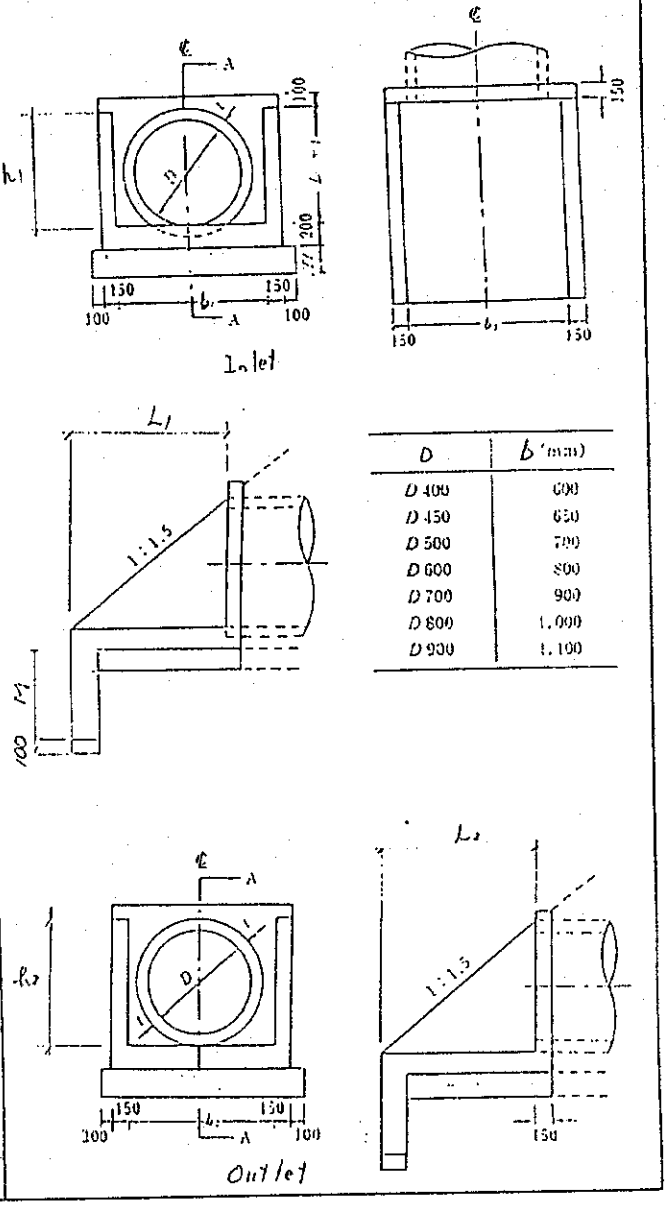
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

9-206

Working Division:

Description	Calculation Details	Unit	Quantity
3 /13	Formwork, F3 finish (curing wall)		
	2 Ø800		
	ⓐ 0.1×1.3 + 1.0×0.866 − 0.4²π = 0.493 m²		
	ⓑ 1.299×0.866×½×2 = 1.125 m²		
	ⓒ 0.1×1.3 + 1.0×0.932 − 0.4²π = 0.559 m²		
	ⓓ 1.398×0.932×½×2 = 1.303 m²		
	3.480 m²		
	3.480 × 7 = 24.360	m²	24.360

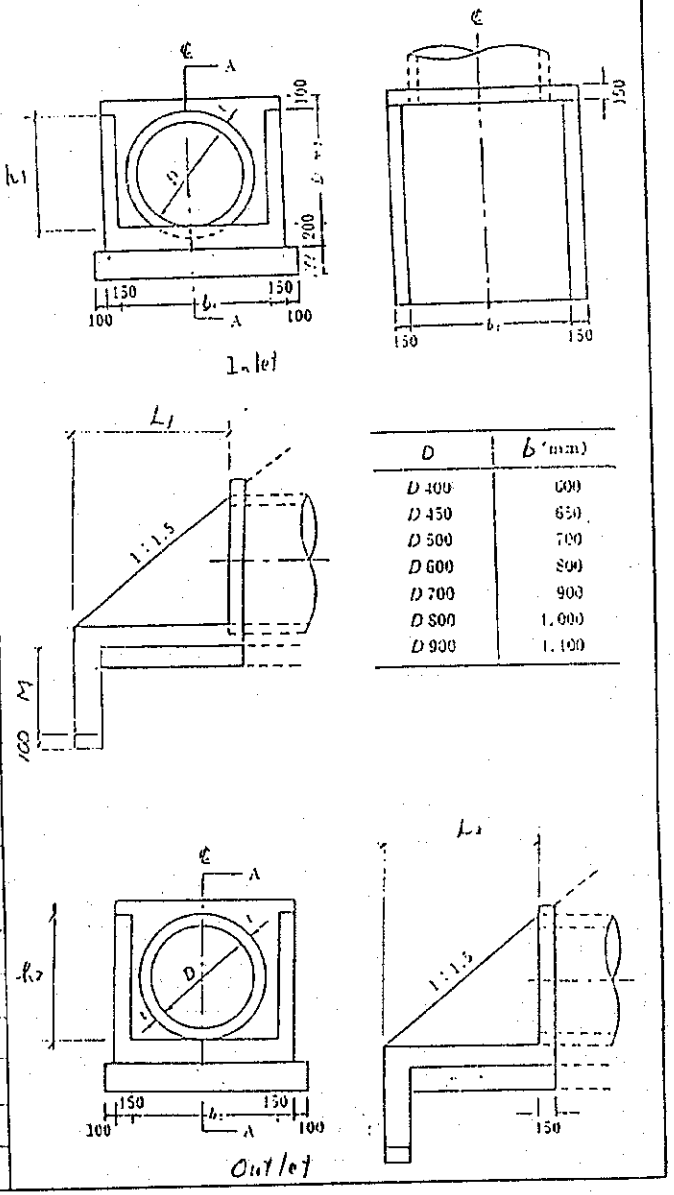
Remarks



D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
1.3 / 13	Formwork, F3 finish (wing wall)			
	3. Ø1,000			
	ⓐ 0.1×1.5 + 1.082×1.2 − 0.5²π = 0.663 m³			
	ⓑ 1.623×1.082×½×2 = 1.756 m³			
	ⓒ 0.1×1.5 + 1.2×1.164 − 0.5²π = 0.761 m³			
	ⓓ 1.746×1.164×½×2 = 2.032 m³			
	5.212 m³			
	5.212×4 = 20.848	m²	20.848	

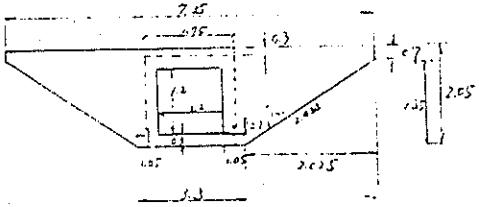


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

8-5-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork, F3 finish (Wing wall)			
	1. 1.2 × 1.2 m			
	(3.3 + 7.35) × 1.35/2 + 0.7 × 7.35 − 1.2 × 1.2 = 10.894 m²			
	10.894 × 6 = 65.364	m²	65.364	
	2. 1.5 × 1.5 m			
	(3.45 + 8.7) × 1.75/2 + 0.7 × 8.7 − 1.5² = 14.471 m²			
	14.471 × 8 = 115.768	m²	115.768	
	3. 2.0 × 2.0 m (I)			
	(10.7 + 3.95) × 2.35/2 + 0.7 × 10.7 − 2.0² = 19.971 m²			
	two			
	4. 2.0 m × 2.0 m (II)			
	(10.85 + 3.80) × 2.35/2 + 0.7 × 10.85 − 2.0² = 19.869 m²			
	19.869 × 4 = 79.476	m²	79.476	



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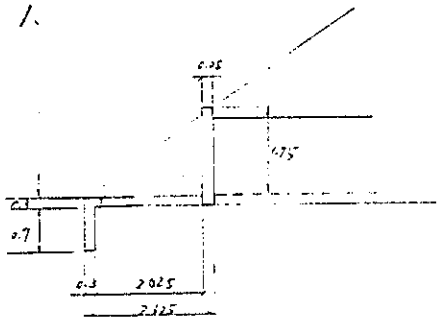

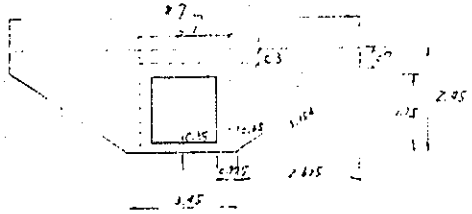

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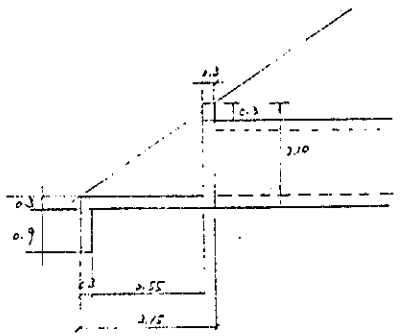
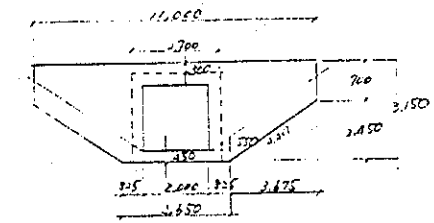


60-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 1/3	Formwork F3. finish (Wing wall()			
	5. 2.0 x 2.0 m (III)			
	(11 + 3.65) x 2.45 x 1/2 + 0.7 x 11			
	- 2.0² = 21.646 m²			
	21.646 x 2 = 43.292	m²	43.292	
	6 2.5 x 2.0 (I)			
	(11.35 + 4.3) x 2.35 x 1/2 + 0.7 x 11.35			
	- 2.5 x 2.0 = 21.334 m²			
	21.334 x 2 = 42.668	m²	42.668	
	7. 2.5 x 2.0 (II)			
	(11.5 + 4.15) x 2.4 x 1/2 + 0.7 x 11.5			
	- 2.5 x 2.0 = 21.830 m²			



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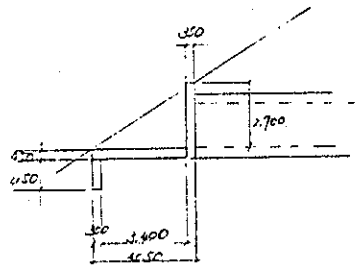

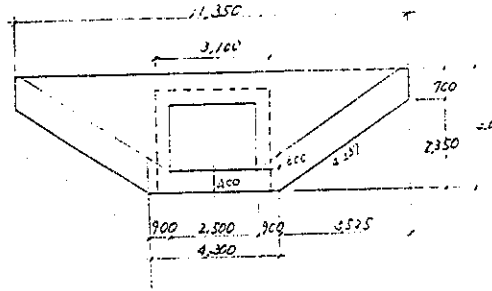

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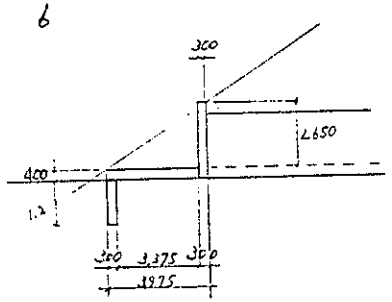
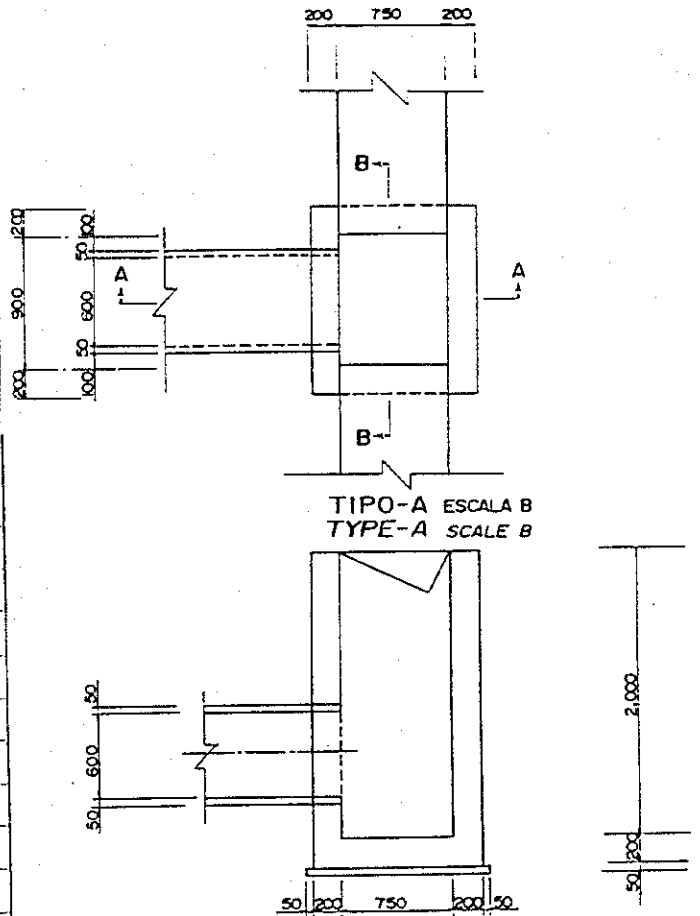


118 - 9

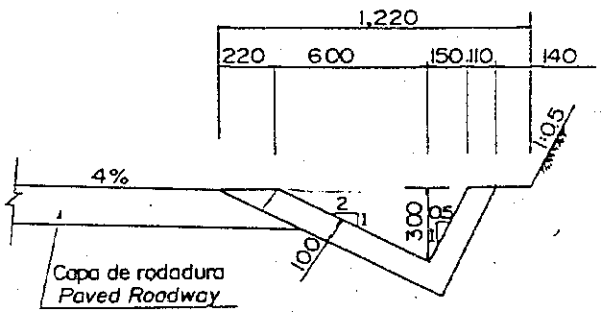
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork F3 finish			
	(Catch basin)			
	0.75 x 2.0 x 2 = 3.0			
	0.90 x 2.0 x 2 - 0.3π = 3.317			
	6.317 m².			
	6.317 x 85 nos = 536.945	m^2	536.945	



Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 113	Formwork, F3 finish for concrete item 109 and 110:			
	(Side ditch). per 1m.			
	0.671 + 0.335 = 1.006 m²			
	1.006 × 15889.88 = 15985.219		15985.219	



Big-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
1. 3 1/4	Reinforcing bars for concrete works			
	(wing wall).			
	80 kg / 1 m^3 of concrete volume			
	1. ø600			
	1.237 m^3 × 80 = 98.96 kg			
	98.96 × 4 = 395.840 //	ton	5.6	
	0.77 × 80 × 85 = 5036 / 563.84			
	2. ø800			
	2.000 m^3 × 80 = 160 kg			
	160 × 7 = 1.12	ton	1.1	
	3. ø1.000			
	2.939 m^3 × 80 = 235.12 kg			
	235.12 × 4 = 940.48	ton	1.0	

9-25

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 114	Reinforcing bars for concrete works (wing wall)			
	80 kg / m³ of concrete volume			
	1 1.2×1.2 m			
	4.312 × 80 = 329.6 kg			
	329.6 × 2 × 3 = 1977.6	ton	2.0	
	2 1.5×1.5 m			
	6.704 × 80 = 536.32 kg			
	536.32 × 2 × 4 = 4290.56	ton	4.3	
	3 2.0×2.0 m (I)			
	10.242 × 80 = 819.36 kg			
	~~to~~			
	4 2.0×2.0 m (II)			
	11.001 × 80 = 880.08 kg			
	880.08 × 2 × 2 = 3520.32	ton	3.5	
	5 2.0×2.0 m (III)			
	13.004 × 80 = 1040.32 kg	Ton	2.1	
	1040.32 × 2 × 1 =			

6-216

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 1/4	Reinforcing bars for concrete works (Wing wall)			
	6. 2.5 x 2.0 m (1).	Tons	1.9	
	12.073 x 80 = 965.84 kg.			
	965.84 x 2 x 1 = 1931.68			
	7 2.5 x 2.0 m (II).			
	two			

6-1/7

Working Division:

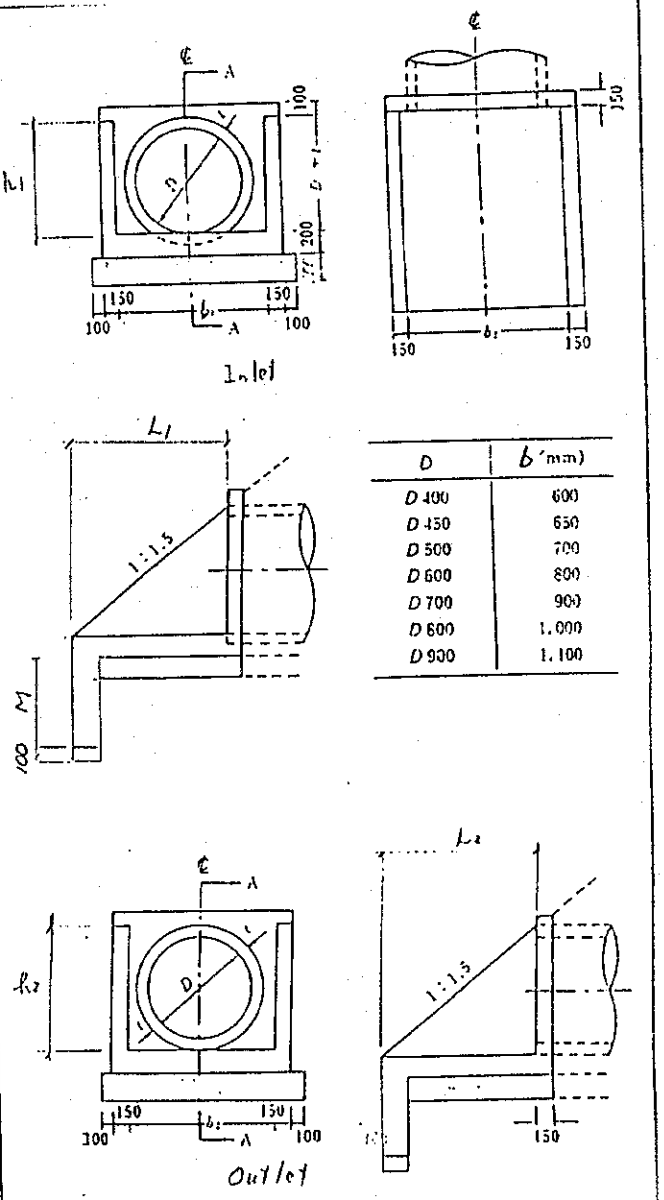
Description	Calculation Details	Unit	Quantity	Remarks
3 /14	Reinforcing bars for concrete works			
	(Catch basin)			
	80 kg per $1m^3$ of concrete volume	ton	1.3	
	$\therefore 1.862\ m^3 \times 80\ kg/m^3 = 148.96\ m^3$ Ton			
	$148.96 \times 85 = 12661.6$			

Q1-9

Working Division:

Description	Calculation Details	Unit	Quantity
.3 /15	Gabion mattress, $t = 500$ mm		
	(wing wall part)		
	1. Ø600		
	$(0.8 + 0.3) \times 5.0 \times 0.5 = 2.75\ m^3$	m^3	18.750
	$2.75 \times 2 \times 4 = 22.0$		
	$2.75 \times 0.2 \times 85 = 46.75$		
	2. Ø800		
	$(1.0 + 0.3) \times 5.0 \times 0.5 = 3.25\ m^3$		
	$3.25 \times 2 \times 7 = 45.5$	m^3	45.500
	3. Ø1,000		
	$(1.2 + 0.3) \times 5.0 \times 0.5 = 3.75\ m^3$	m^3	30.000
	$3.75 \times 2 \times 4 = 30.0$		
	4. 1.2 × 1.2 m		
	$(3.434 \times 2 + 3.3) \times 5.0 \times 0.5 = 20.42\ m^3$	m^3	122.520
	$20.42 \times 2 \times 3 = 122.52$		
	5. 1.5 × 1.5 m		
	$(3.154 \times 2 + 3.45) \times 5.0 \times 0.5 = 24.395\ m^3$	m^3	195.160
	$24.395 \times 2 \times 4 = 195.16$		

Remarks

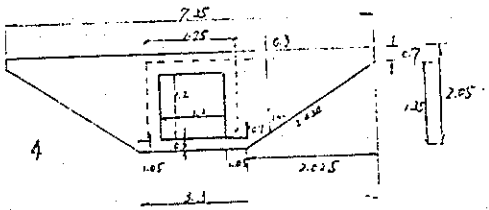


6-1-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /15	Gabion mattress $t = 500$ mm (Wing wall)			
	6. 2.0×2.0 (I) $(4.056 \times 2 + 3.95) \times 5.0 \times 0.5 = 30.155\ m^3$ no			
	7. 2.0×2.0 (II) $(4.237 \times 2 + 3.8) \times 5.0 \times 0.5 = 30.685\ m^3$ $30.685 \times 2 \times 2 = 122.740$	m^3	122.740	
	8. 2.0×2.0 (III) $(4.417 \times 2 + 3.65) \times 5.0 \times 0.5 = 31.21\ m^3$ $31.21 \times 2 \times 1 = 62.42$	m^3	62.420	
	9. 2.5×2.0 (I) $(4.237 \times 2 + 4.3) \times 5.0 \times 0.5 = 31.935\ m^3$ $31.935 \times 2 \times 1 = 63.87$	m^3	63.870	
	10. 2.5×2.0 (II) $(4.417 \times 2 + 4.15) \times 5.0 \times 0.5 = 32.46\ m^3$ no			

4



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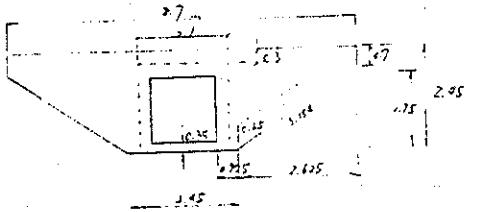

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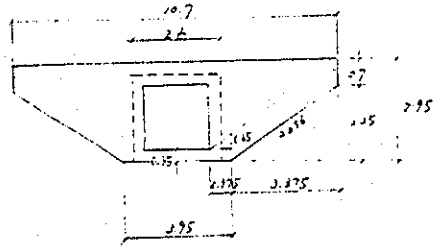

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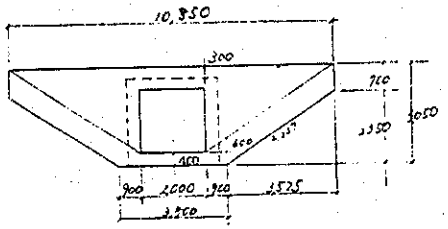

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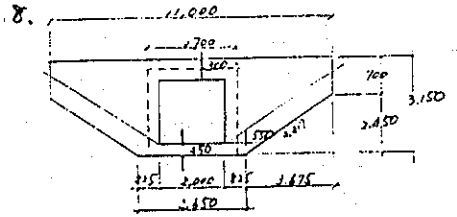
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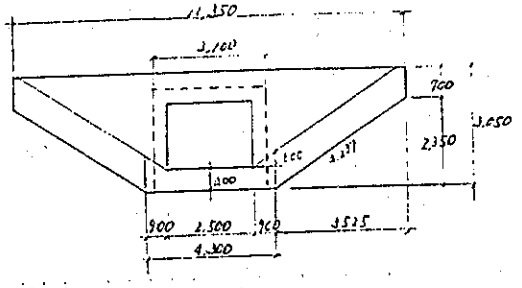
2,450
450
1:1
1:1
225
2,000
225
1,675
4,150

9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2,500
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4525
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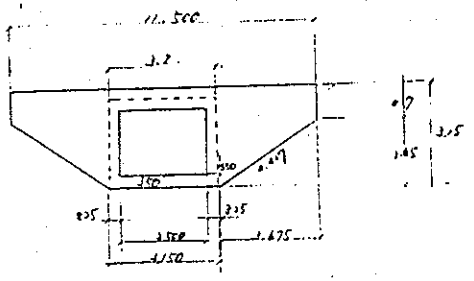
10


11,500
3,2
700
3,15
1,45
1:1
1:1
225
225
3,550
1,675
4,150

1/12-9

Working Division:

Description	Calculation Details	Unit	Quantity
3 116	Joint Filler , t=10 mm		
	<Culvert>		
	1. 1.2×1.2 m		
	1.75×1.70 - 1.2×1.2 = 1.535 m²	m²	9.210
	1.535×6 = 9.21		
	2. 1.5×1.5 m		
	2.1×2.15 - 1.5×1.5 = 2.265 m²	m²	11.325
	2.265×5 = 11.325		
	3. 2.0×2.0 m (I)		
	2.6×2.65 - 2×2 = 2.890 m²		
	wo		
	4. 2.0×2.0 m (II)		
	2.6×2.75 - 2×2 = 3.15 m²	m²	6.30
	3.15×2 = 6.30		
	5. 2.0×2.0 m (III)		
	2.7×2.85 - 2×2 = 3.695 m²	m²	7.39
	3.695×2 = 7.39		

Remarks

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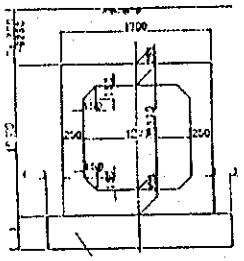

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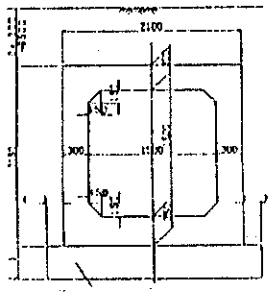

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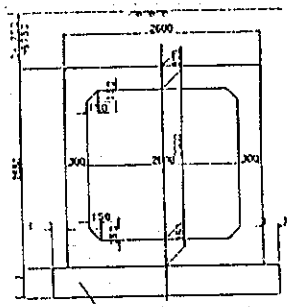

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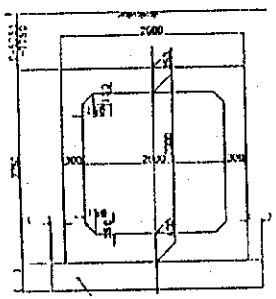

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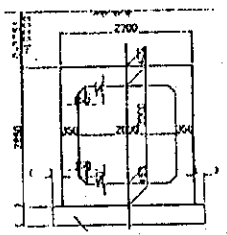
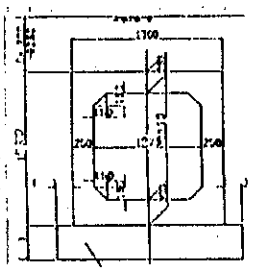


6-222

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 1/7	Bituminous coating for contraction joint			
	< Culvert >			
	1. 1.2 x 1.2 m			
	1.75 x 1.70 - 1.2 x 1.2 = 1.535 m²	m²	9.210	
	1.535 x 6 = 9.210			
	2. 1.5 x 1.5 m			
	2.1 x 2.15 - 1.5 x 1.5 = 2.265 m²	m²	18.120	
	2.265 x 8 = 18.120			
	3. 2.0 x 2.0 m (I)			
	2.6 x 2.65 - 2 x 2 = 2.89 m²			
	na			
	4. 2.0 x 2.0 m (II)			
	2.6 x 2.75 - 2 x 2 = 3.15 m²	m²	12.600	
	3.15 x 4 = 12.6			
	5. 2.0 x 2.0 m (III)			
	2.7 x 2.85 - 2 x 2 = 3.695 m²	m²	7.390	
	3.695 x 2 = 7.390			

1.



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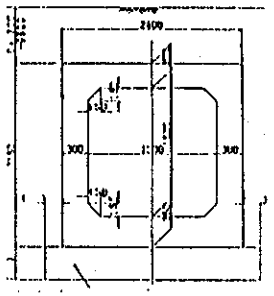

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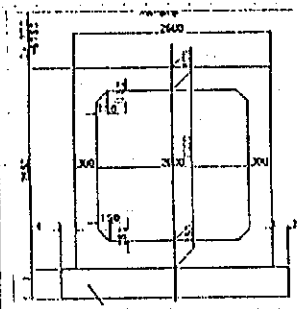

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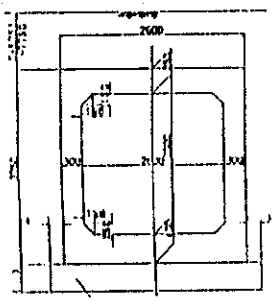

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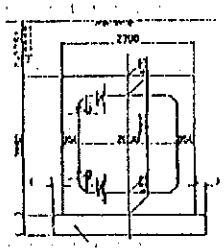
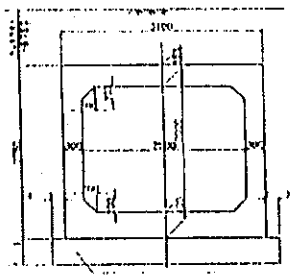
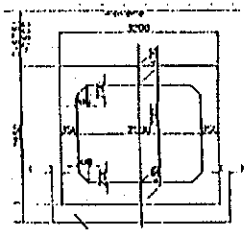


6-223

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 147	6. 2.5 × 2.0 (I)			6. 
	3.1 × 2.75 - 2.5 × 2 = 3.525 m²	m²	7.05	
	3.525 × 2 = 7.05			
	7. 2.5 × 2.0 (II)			7. 
	3.2 × 2.85 - 2.5 × 2 = 4.120 m²			
	100			

6-224

Working Division: 162. POZA HONDA

Description	Calculation Details	Unit	Quantity	Remarks
11.2	Box culverts			
105	Open-cut excavation	m^3	0	
106	Backfill with selected material	m^3	0	
107	Free draining backfill	m^3	0	
108	Gravel bedding	m^3	0	

Working Division: 16. POZA HONDA INLET ACCESS ROAD

Description	Calculation Details	Unit	Quantity	Remarks
16.3	CULVERT AND DRAINAGE WORKS			
101	Open-cut excavation, all classes	m^3	288.288	→ 289
	1. Pipe culvert 135.37			
	2 Box culvert 0			
	3 Drain pipe 64.010			
	4 Catch basin 88.848			
	Total 288.288			
102	Backfill with selected material	m^3	137.85	→ 138
	1. Pipe culvert 59.13			
	2. Box culvert 0			
	3. Catch basin 78.720			
	Total 137.85			
103	Crushed stone bedding	m^3	38.66	→ 39
	1. Pipe culvert			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3	CULVERT AND DRAINAGE WORKS			
104	Reinforced concrete pipe, D.600 mm Culvert : 100.7 m, For ditch 31.5 m	m	132.200	→ 133
105	Reinforced concrete pipe, D.800 mm	m	0	
106	Reinforced concrete pipe. D.1,000 mm	m	0	
107	P.V.C. perforated drain pipe D.200 mm	m	266.710	→ 267
108	Free drainage material for subdrain	m^3	55.636	→ 56
109	Concrete, class E. for pipe culvert and wing walls 1. Pipe culvert 66.87 2. Box culvert 0 3 Wing wall for pipe culvert 6.021 4. Wing wall for box culvert 0 Total 72.891	m^3	72.891	→ 73
110	Concrete, class F. for side ditch and catch basin 1. side ditch 90.024 2. catch basin 5.586 Total	m^3	95.610	→ 96

9-224

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3	CULVERT AND DRAINAGE WORKS			
111	Concrete, class H, for levelling concrete	m^3	1.428	→ 2.
	1. Culvert 0.0			
	2. Wing wall 1.164			
	3. Catch basin 0.264			
	Total 1.428			
112	Form work, F1 finish, for concrete of Items 109 and 110	m^2	275.812	→ 276
	1. culvert 217.78			
	2. Wing wall 26.847			
	3. Catch basin 31.185			
	Total 275.812			
113	Formwork, F3 finish, for concrete of Items 109 and 110	m^2	777.09	→ 777
	1. Culvert 0.0			
	2. Wing wall 9.675			
	3 Catch basin 18.951			
	4. Drain ditch 748.464			
	Total 777.09			

C-228

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3.	CULVERT AND DRAINAGE WORKS			
14	Reinforcing bars for concrete works	ton	5.3 → 6	
	1. Culvert 4328.49			
	2 Wing wall 481.68			
	3 Catch basin 446.88			
	Total 5257.05			
15	Gabion matlress, t=500 mm	m^3	18.15 → 18.	
16	Joint filler, t=10 mm	m^2	0.0	
17	Bituminous coating for contraction joint	m^2	0.0	

6-229

Working Division: 4

Description	Calculation Details	Unit	Quantity	Remarks
H 4	CONCRETE WORKS			
103	Concrete class E for box culverts	m^3	0	
104	Concrete class H for levelling concrete	m^3	0	
106	Formwork F1 finish for concrete item 103.104	m^2	0	
108	Formwork F3 finish for concrete item 103	m^2	0	
109	Reinforcing bars for concrete works	Ton	0	
110	Joint filler for culvert	m^2	0	
112	Bituminous coating for contraction joint	m^2	0	

7220

変更前

5 POZA HONDA INLET

Sr. No	St No.	Q m3/s	I	Entrance El m	Exit El m	Road El m	Culvert Length m	Type		Soil Thickness m
D-1	0+049.50	0.48	8.0%	162.250	159.794	168.287	30.700	D=600mm	360°	6.665
D-2	0+402.00	0.72	5.0%	130.300	128.870	136.840	28.600	D=600mm	360°	6.655
D-3	0+493.91	0.91	5.0%	119.300	117.230	129.398	41.400	D=600mm	360	10.533

100.700

(m) (nos)

D 600 360° 100.7 3

6-23

5. Poza Hoda

		Length	Pipe Length	Open Cut Excavation (12.3/01)		Backfill (12.3/02)		Crushed Stone Bedding (12.3 /03)		Pipe D=600 (12.3/04)	Pipe D=800 (12.3/05)	Pipe D=1000 (12.3/06)	Concrete Class E (12.3/09)		Form Work F1 (12.3/12)		Reinforced Bar (12.3/14)	
		Unit (m)	Unit (m)	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m)	Unit (m)	Unit (m)	Unit (m3)	Total	Unit (m2)	Total	Unit (kg)	Total
D=600mm	90	31.5	132.2	0.83	26.11	0.43	13.56	0.14	4.49				0.16	4.92	0.52	16.38	0.00	0.00
	180	0.0		0.93	0.00	0.42	0.00	0.17	0.00				0.26	0.00	1.00	0.00	0.00	0.00
	Fix	100.7		1.09	109.26	0.45	45.57	0.24	24.17				0.62	61.95	2.00	201.40	42.98	4,328.49
D=800mm	90	0.0	0.0	1.28	0.00	0.58	0.00	0.17	0.00				0.26	0.00	0.68	0.00	0.00	0.00
	180	0.0		1.48	0.00	0.56	0.00	0.21	0.00				0.46	0.00	1.34	0.00	0.00	0.00
	Fix	0.0		1.72	0.00	0.60	0.00	0.31	0.00				1.11	0.00	2.68	0.00	73.53	0.00
D=1000mm	90	0.0	0.0	1.90	0.00	0.73	0.00	0.28	0.00				0.35	0.00	0.76	0.00	0.00	0.00
	180	0.0		2.12	0.00	0.72	0.00	0.33	0.00				0.60	0.00	1.58	0.00	0.00	0.00
	Fix	0.0		2.22	0.00	0.71	0.00	0.36	0.00				1.43	0.00	3.16	0.00	84.55	0.00
Total		132.2			135.37		59.13		28.66	132.20	0.00	0.00		66.87		217.78		4,328.49

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		Length	Open Cut Excavation (12.2/07)		Backfill (12.2/06)		Concrete Class E (Item12.4/03)		Concrete Class H (Item12.4/04)		Form Work F1 (Item12.4/06)		Form Work F3 (Item12.4/08)		Reinforced Bar (12.4/09)	
		Unit (m)	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m3)	Total	Unit (m2)	Total	Unit (m2)	Total	Unit (kg)	Total
1200mm x 1200mm	~9.25	0.0	2.42	0.00	0.77	0.00	1.63	0.00	0.19	0.00	3.60	0.00	3.70	0.00	162.91	0.00
1500mm x 1500mm	~9.5	0.0	3.36	0.00	0.96	0.00	2.31	0.00	0.22	0.00	4.30	0.00	4.45	0.00	193.31	0.00
2000mm x 2000mm	~5.75	0.0	4.97	0.00	1.25	0.00	2.94	0.00	0.27	0.00	5.30	0.00	5.95	0.00	232.36	0.00
2000mm x 2000mm	~7.75	0.0	5.18	0.00	1.31	0.00	3.20	0.00	0.27	0.00	5.50	0.00	5.95	0.00	236.02	0.00
2000mm x 2000mm	7.751~	0.0	5.54	0.00	1.37	0.00	3.74	0.00	0.28	0.00	5.70	0.00	5.95	0.00	270.47	0.00
2500mm x 2000mm	3.75~5.75	0.0	5.93	0.00	1.31	0.00	3.61	0.00	0.32	0.00	5.50	0.00	6.43	0.00	317.29	0.00
2500mm x 2000mm	5.751~	0.0	6.32	0.00	1.37	0.00	4.20	0.00	0.32	0.00	5.70	0.00	6.43	0.00	331.62	0.00
Total		0.0		0.00		0.00		0.00		0.00		0.00		0.00		0.00

LONGITUD DE CUNETAS

CAMINO DE ACCESO: ENTRADA A POZA HOND KMS: 0+000 a 0+592.00 Km

	ABSCISAS		IZQUIERDA	DERECHA	LONGITUD
8.0	0+000.00 - 0+040.00		20.00	20.00	40.00
	0+020.00 - 0+060.00		40.00	0.00	40.00
	0+060.00 - 0+190.00		130.00	130.00	260.00
12.0	0+190.00 - 0+360.00		0.00	170.00	170.00
	0+360.00 - 0+400.00	✓	40.00	0.00	40.00
	0+460.00 - 0+480.00	✓	20.00	0.00	20.00
	0+500.00 - 0+540.00		40.00	0.00	40.00
11.5	0+540.00 - 0+592.00	✓	52.00	52.00	104.00
				LONG. TOTAL:	714.00

Total Length 714.00

Additions 10×3 = 30 — 744.00

Catch basin 3 nos

Ø 600 31.5 m

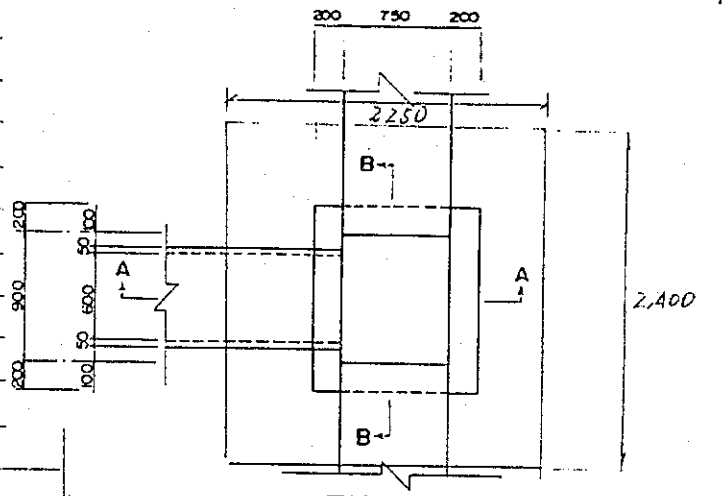
Drain Pipe Quantities

Access Road Name	Length (m)	Excavation (m3)		P.V.C Pipe D=200mm (m)		Drainage Material (m3)	
		Per meter	Total		Total	Per meter	Total
Conguillo	5,823.120	0.240	1,397.549		5,823.120	0.209	1,214.703
Severno Tramo1	1,535.870	0.240	368.609		1,535.870	0.209	320.382
Severno Tramo2	2,472.920	0.240	593.501		2,472.920	0.209	515.851
Los Cuyuyes	7,324.030	0.240	1,757.767		7,324.030	0.209	1,527.793
Poza Honda	266.710	0.240	64.010		266.710	0.209	55.636
La Seca	2,035.376	0.240	488.490		2,035.376	0.209	424.579
El Guasmo	786.460	0.240	188.750		786.460	0.209	164.056
Cana Dulce	1,200.560	0.240	288.134		1,200.560	0.209	250.437
Membrillo Outlet	30.000	0.240	7.200		30.000	0.209	6.258
Grand Total			5,154.011		21,475.046		4,479.695

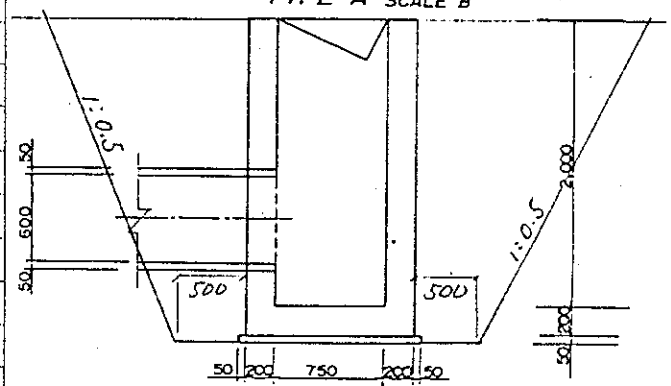
Excavation	V=(0.8+0.4)*0.4/2	=0.24
Free Drainage Material	V=0.24-3.14*0.1^2	=0.21

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 101	Open-cut excavation, all classes (Catch basin).			
	2.25 x 2.4 m = 5.4 m²			
	4.5 x 4.65 m = 20.925 m²			
	(5.4 + 20.925) x 1/2 x 2.25 = 29.616 m³			
	29.616 x 3 = 88.848	m³	88.848	



TIPO-A ESCALA B
TYPE-A SCALE B



SECCION A-A
SECTION A-A

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Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /02	Backfill with selected material			
	< catch basin >			
	29.616 - 1.15 × 1.3 × 2.2 - 1.25 × 1.4 × 0.05			
	= 26.240			
	26.240 × 3 = 78.72	m^3	78.720	