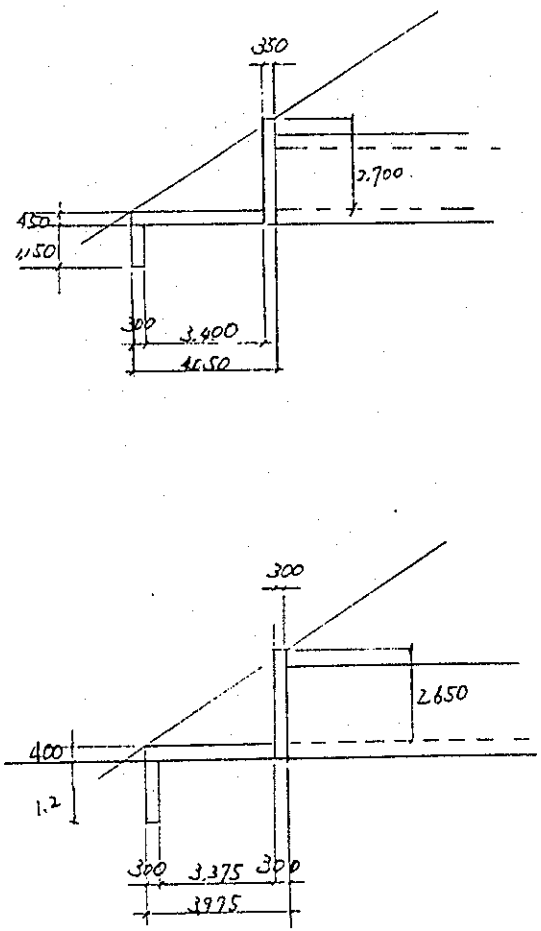
Working Division:

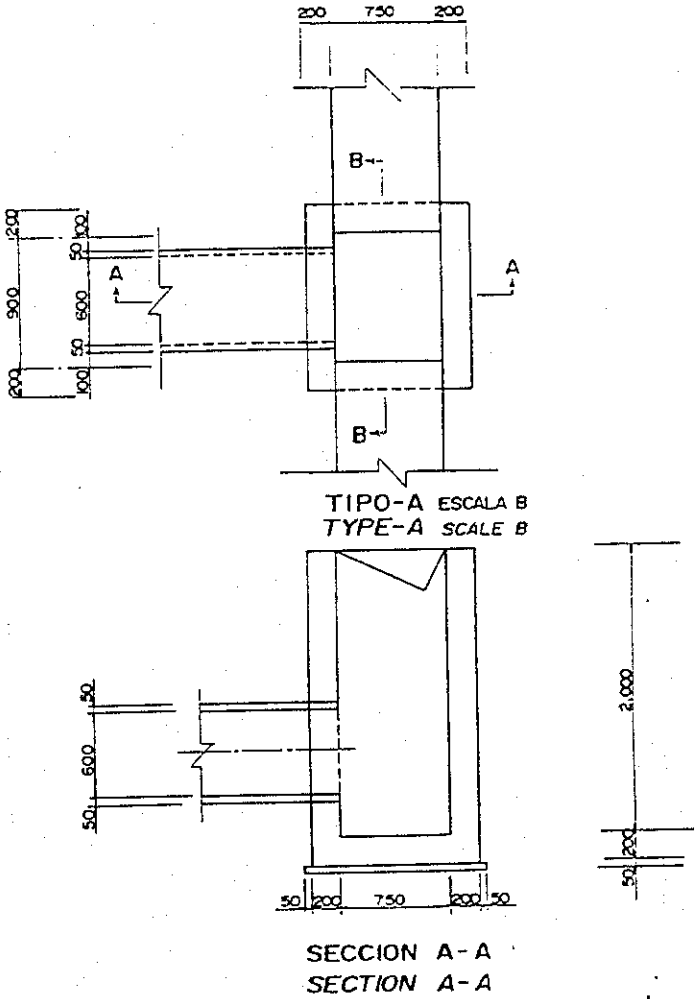
Description	Calculation Details	Unit	Quantity	Remarks
3 / 11	Concrete class H for levelling concrete			
	(Living Wall)			
	5 2.0×2.0m (III)			
	(wall) 0.35×(4.417×2+3.65)×0.1=0.437			
	(slab) 2.7×3.7×0.1=0.999			
	1.436 m³			
	6. 25×2.0m (I)			
	(Living) 0.30×(4.237×2+4.3)×0.1=0.383			
	(slab) 3.1×3.675×0.1=1.139			
	1.522 m³			
	1.522×2×1=3.044	m³	3.044	



9-67

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /11	Concrete class H for levelling concrete			
	(catch basin) per 1 no.			
	1.25 × 1.4 × ~~0.05~~ = ~~0.08~~ m^3			
	0.1 = 0.175			
	0.175 × 33 = 5.775	m^3	5.775	

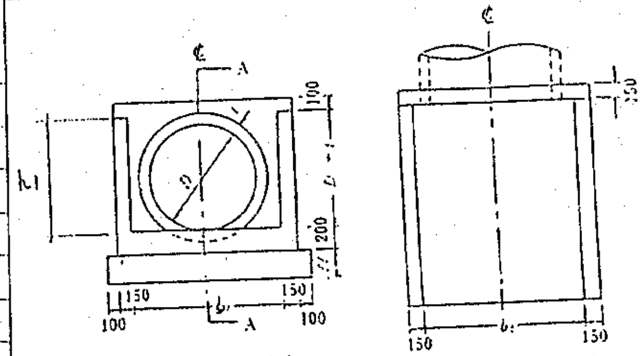


9-43-6

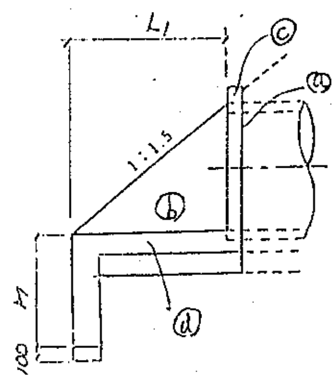
Working Division:

Description	Calculation Details	Unit	Quantity
3 /12	Formwork, El finish for concrete of item 109, 110 and 111		
	(wing wall).		
	1. ϕ 600.		
	ⓐ 1.1m × 0.95m = 1.045 m^2.		
	1.045 − $(0.3+0.05)^2 \pi$ = 0.660 m^2		
	ⓑ (0.15 + 1.125) × 0.65 / 2 × 2 = 0.829 m^2		
	ⓒ 0.15 × 0.1 × 2 = 0.03 m^2.		
	ⓓ 0.2 × (1.1 + 1.125 × 2) + 1.1 × (0.4 + 0.2) = 1.33		
	ⓔ 1.1m × 1.0 m = 1.100 m^2		
	1.100 − $(0.3+0.05)^2 \pi$ = 0.715		
	ⓕ (0.15 + 1.20) × 0.7 × ½ × 2 = 0.945		
	ⓖ 0.15 × 0.1 × 2 = 0.03 m^2		
	ⓗ 0.2 × (1.1 + 1.20 × 2) + 1.1 × (0.4 + 0.2) = 1.36		
	5.899 m^2		
	5.899 × 13 = 76.687		
	3.05 × 33 = 100.650	m^2	177.337

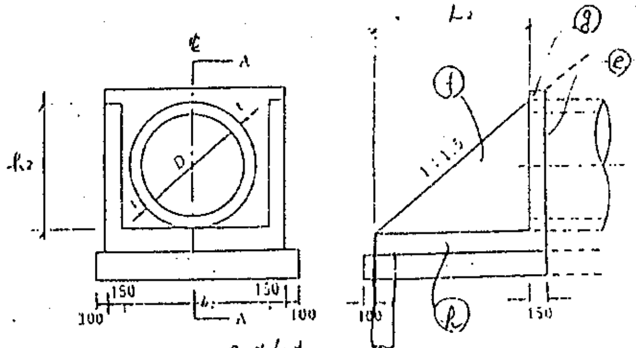
Remarks



Inlet



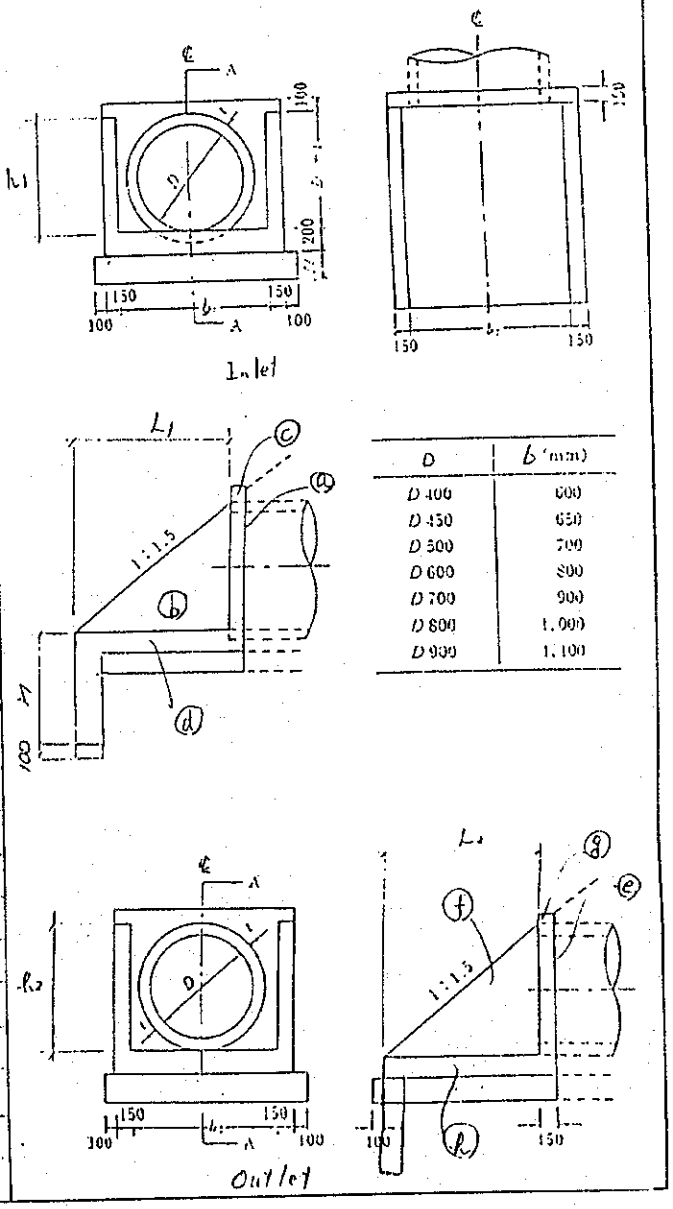
D	b' (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100



Outlet

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 / 12	Formwork FI finish			
	(wing wall)			
	2. Ø800			
	ⓐ 1.3 m × 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 × 2 = 18.202	m²	18.202	



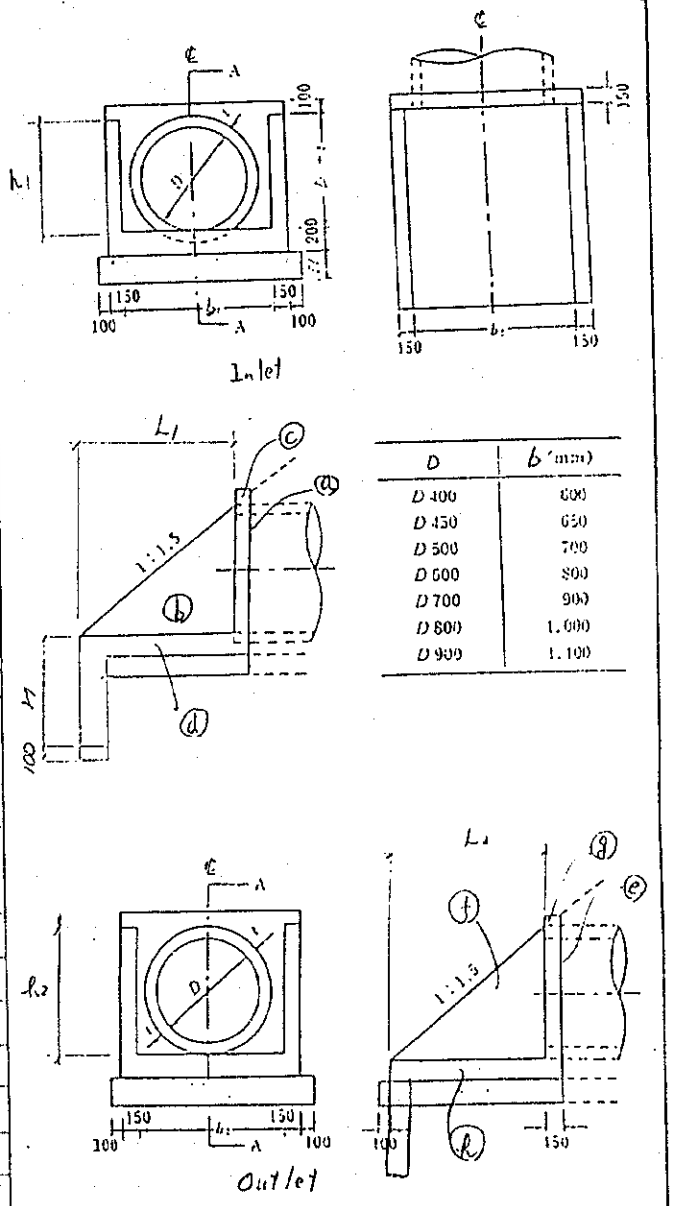
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

9-428

Working Division:

Description	Calculation Details	Unit	Quantity
3 /12	Formwork, Fl finish		
	(wing wall).		
	= B1,000		
	ⓐ 1.5 × 1.382 m = 2.073 m².		
	2.073 − 0.582²π = 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)		
	= 3.907		
	ⓔ 1.5 × 1.464 = 2.196 m²		
	2.196 − 0.582²π = 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 m².		
	13.731 × 1 = 13.731	m²	13.731

Remarks

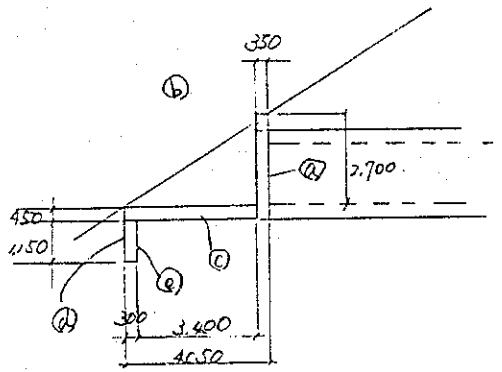


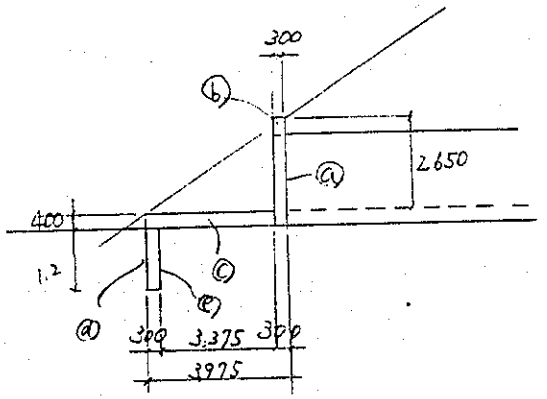
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

6-425

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /12	Formwork FL finish			
	5. 2.0×2.0 (III)			
	ⓐ (11.0+3.65)×2.45×½+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			
	6. 2.5×2.0 (I)			
	ⓐ (11.35+4.3)×2.35×½+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 = 61.138	m²	61.138	

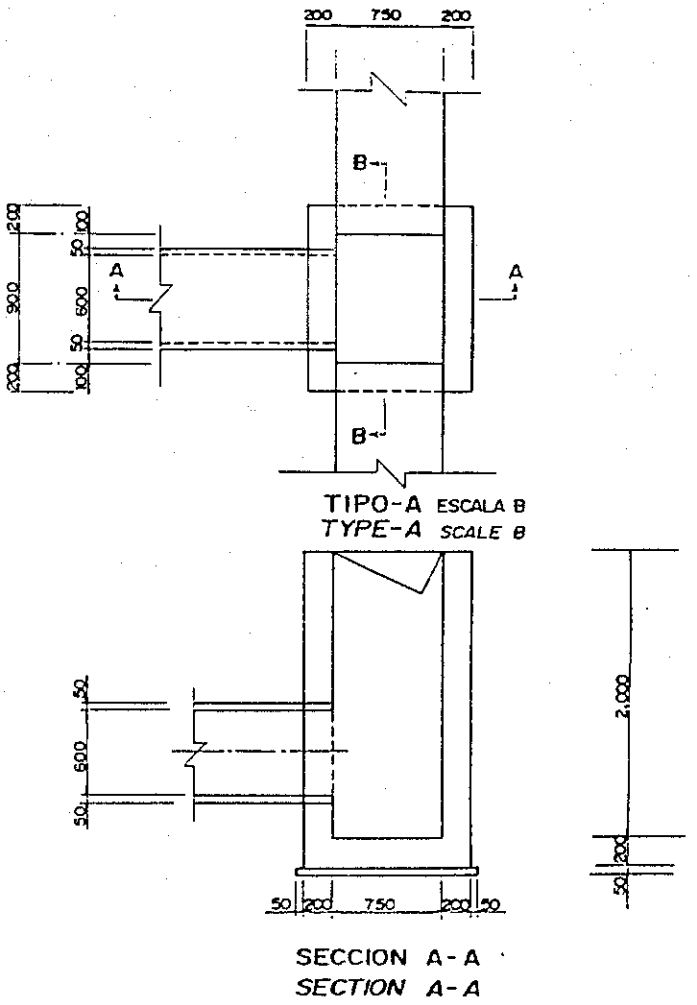




6-4-20

Working Division:

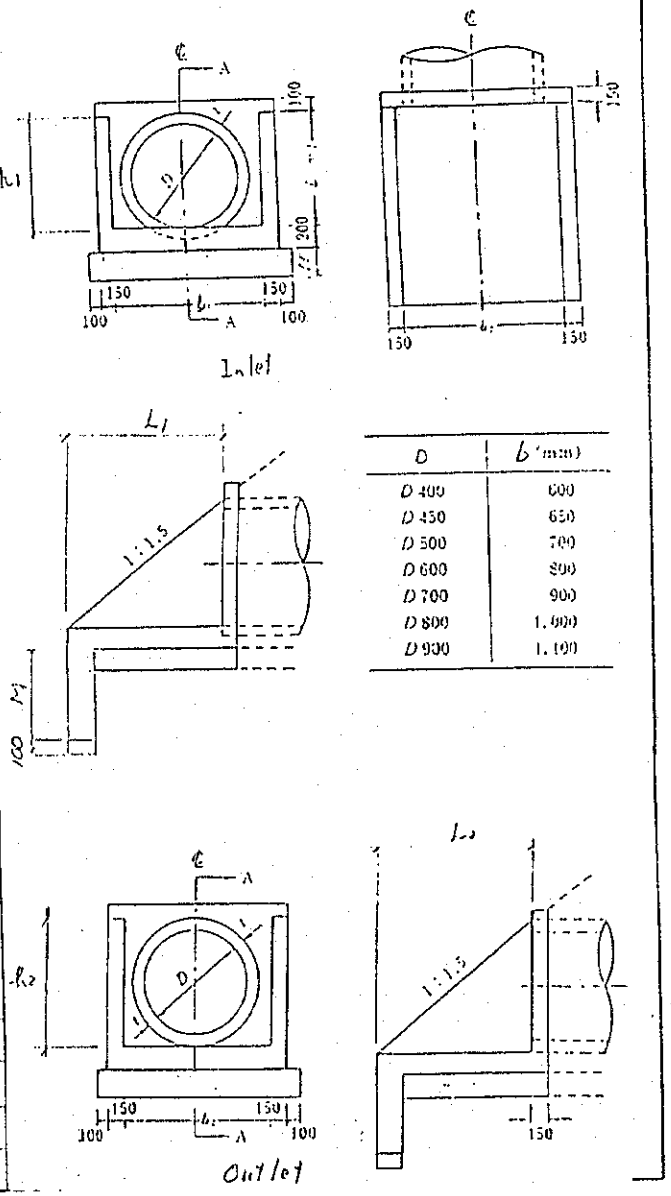
Description	Calculation Details	Unit	Quantity	Remarks
3 12	Formwork El finish			
	(Catch basin)			
	1.15 × 2.2 × 2 = 5.06			
	1.30 × 2.2 × 2 − 0.35π = 5.335			
	10.395 m²			
	10.395 × 33 = 343.035	m²	343.035	



6-43

Working Division:

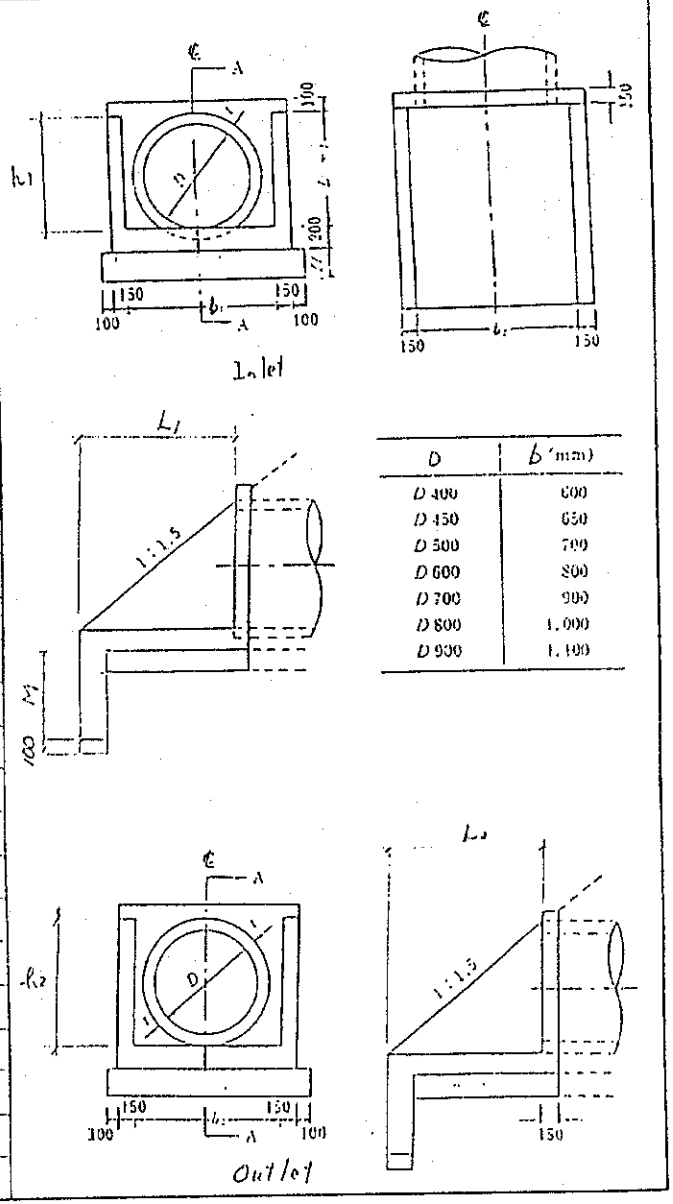
Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork F3 finish			
	(Wing wall)			
	1. ϕ600.			
	ⓐ 0.1×1.1 + 0.8×0.65 − 0.3²π = 0.347 m²			
	ⓑ 0.975×0.65×½×2 = 0.634 m²			
	ⓒ 0.1×1.1 + 0.8×0.70 − 0.3²π = 0.387 m²			
	ⓓ 1.05×0.70×½×2 = 0.735 m²			
	2.103 m²			
	2.103×13 = 27.339			
	1.122×33 = 37.026	m²	64.365	



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 /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			
	3.480×2 = 6.96	m²	6.960	



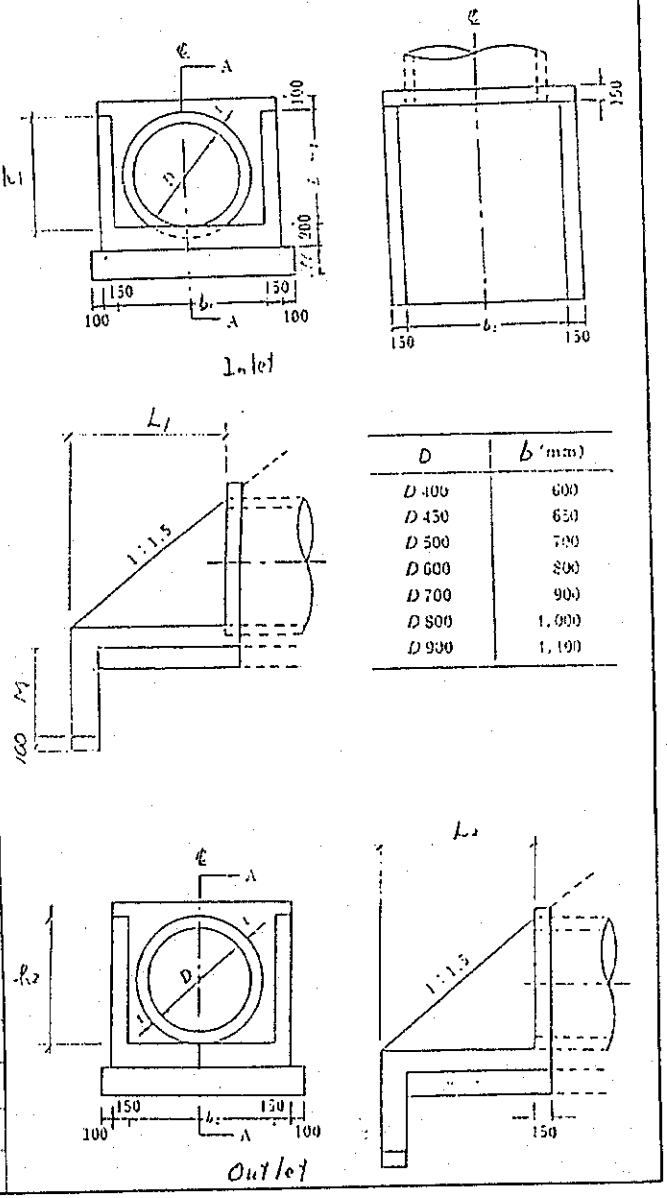
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

6-433

Working Division:

Description	Calculation Details	Unit	Quantity
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 × 1 = 5.212	m²	5.212

Remarks

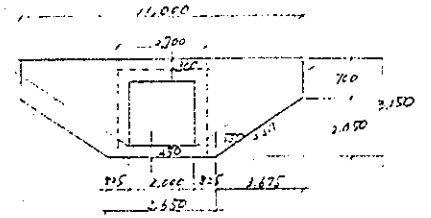


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

カウント-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /13	Formwork F3. finish (Curing wall)			
	5. 2.0×2.0m (III)			
	(11+3.65)×2.45×1/2+0.7×11			
	−2.0² = 21.146 m²			
	6. 2.5×2.0 (I)			
	(11.35+4.3)×2.35×1/2+0.7×11.35			
	−2.5×2.0 = 21.334 m²			
	21.334×2×1 = 42.668	m²	42.668	
	7. 2.5×2.0 (II)			
	(11.5+4.15)×2.4×1/2+0.7×11.5			
	−2.5×2.0 = 21.830 m²			



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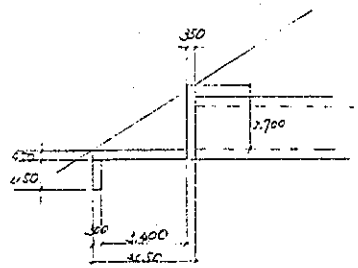

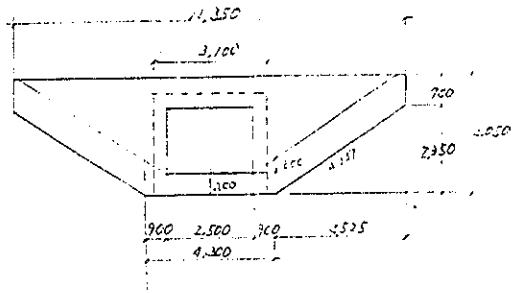

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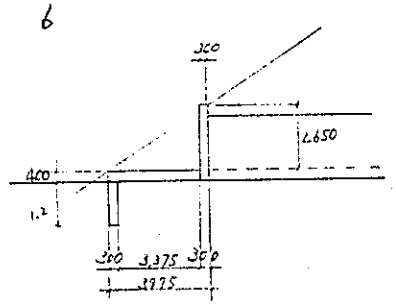
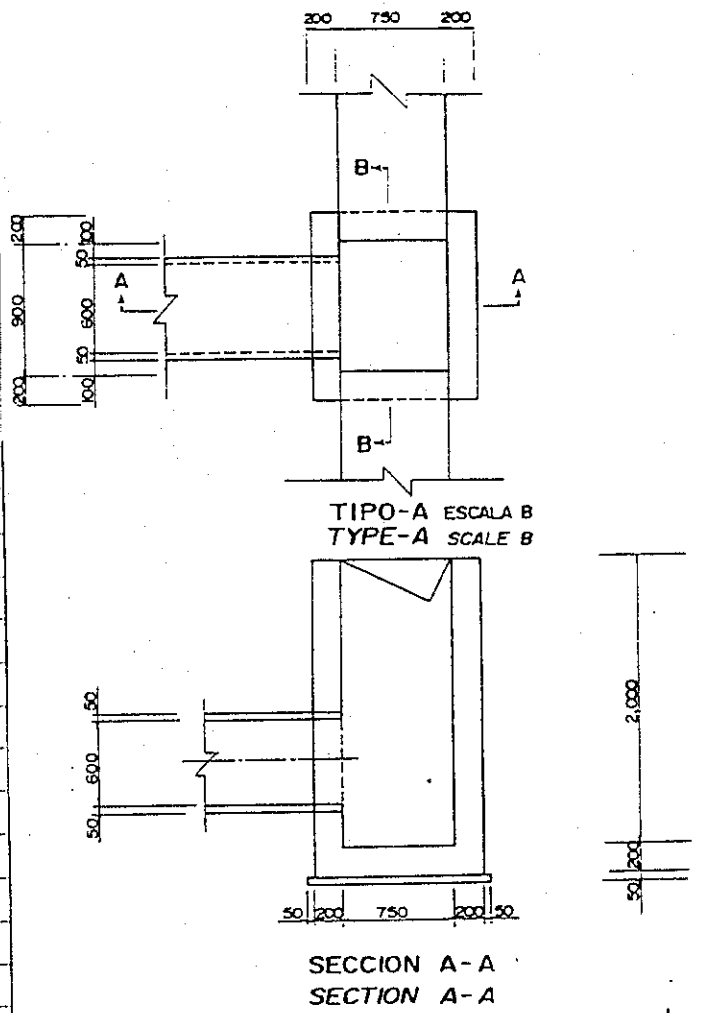


6-435

Working Division:

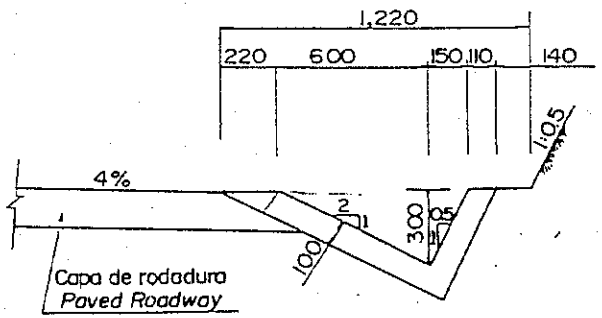
Description	Calculation Details	Unit	Quantity	Remarks
3 1/3	Formwork F3 finish			
	(Catch basin)			
	0.75 × 2.0 × 2 = 3.0			
	0.90 × 2.0 × 2 − 0.35 = 3.317			
	6.317 m².			
	6.317 × 33 = 208.461	m²	208.461	



6-43

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 × 12507.42 m = 12582.464	m^2	12,582.464	



Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
1. 3 1/4	Reinforcing bars for concrete works			
	(wing wall)			
	80kg / 1m³ of concrete volume			
	1. ø600			
	1.237 m³ x 80 = 98.96 kg			
	98.96 x 13 = 1286.48 kg		3319.28	
	0.77 x 80 x 33 = 2032.8			
	2. ø800			
	2.000 m³ x 80 = 160 kg			
	160 x 2 = 320			
	3. ø1,000			
	2.939 m³ x 80 = 235.12 kg			
	235.12 x 1 = 235 12			

6-450

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 (I)			
	12.073 x 80 = 965.84 kg			
	965.84 x 2 x 1 = 1,931.68			
	7 2.5 x 2.0 m (II)			
	13.098 x 80 = 1,047.84 kg			

6-480

Working Division:

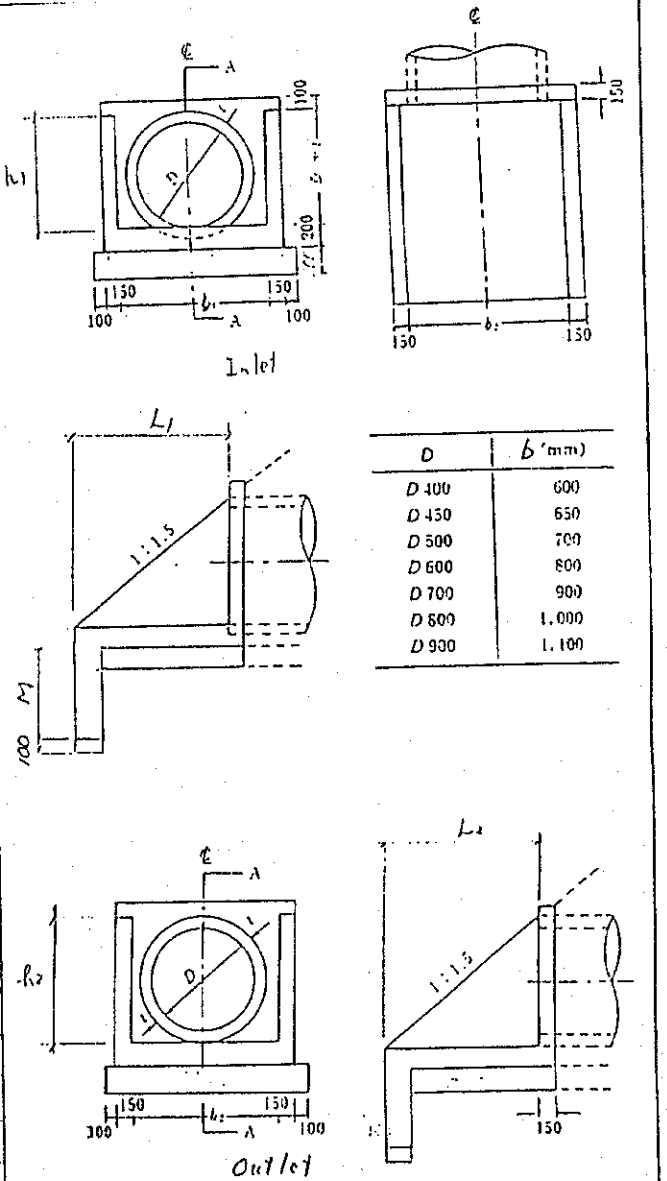
Description	Calculation Details	Unit	Quantity	Remarks
.3 114	Reinforcing bars for concrete works			
	(Catch basin)			
	80 kg/ 1m³ of concrete volume			
	1.862 m³ x 80 kg/m³ = 148.96 m³.			
	148.96 x 33 = 4915.68			

カカ-9

Working Division:

Description	Calculation Details	Unit	Quantity
.3 /15	Gabion mattress, t=500 mm		
	(wing wall part)		
	1. ø600		
	(0.8+0.3)×5.0×0.5 = 2.75 m³		
	2.75×13 = 35.75 ×2 = 71.5		
	2.75×1/5×33 = 18.15	m³	89.65
	2. ø800		
	(1.1+0.3)×5.0×0.5 = 3.25 m³		
	3.25×2×2 = 13.0	m³	13.0
	3. ø1.000		
	(1.2+0.3)×5.0×0.5 = 3.75 m³		
	3.75×2×1 = 7.5	m³	7.5
	4. 1.2×1.2 m		
	(1.434×2+3.3)×5.0×0.5 = 20.42 m³		
	5. 1.5×1.5 m		
	(3.154×2+3.45)×5.0×0.5 = 24.395 m³		

Remarks



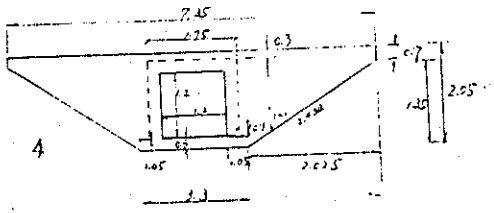
D	b'(mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1.000
D 900	1.100

6-44

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /15	Gabion mattress, t = 500 mm. (Wing wall)			
	6. 2.0×2.0 (I) (4.056×2+3.95)×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			
	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 31.935×2×1 = 63.870	m³	63.870	
	10. 2.5×2.0 (II) (4.417×2+4.15)×5.0×0.5 = 32.46 m³			

4



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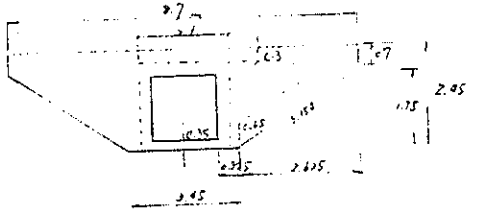

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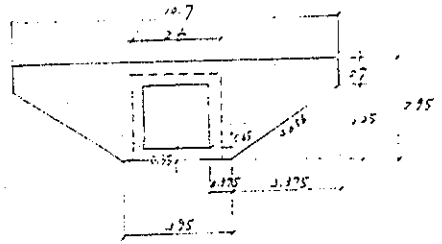

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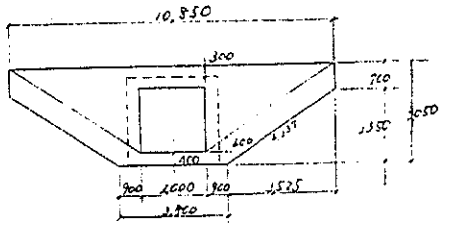

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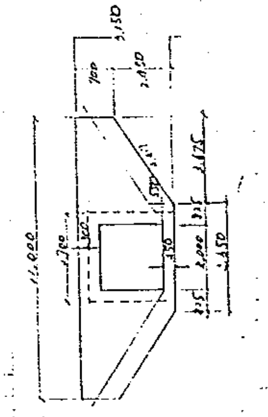

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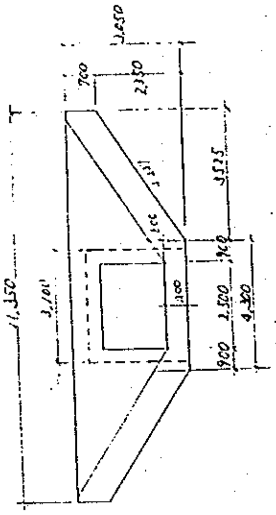

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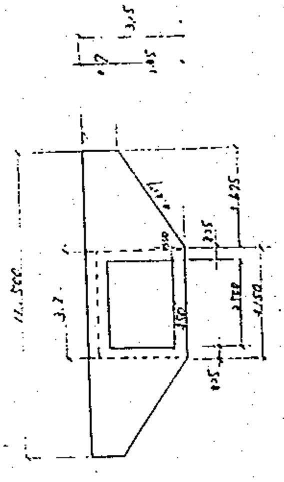

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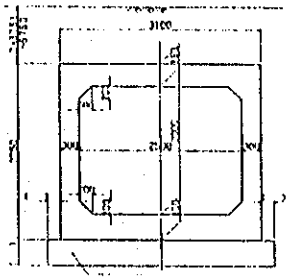
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 1/6	Joint Filler t=10 mm			
	6. 2.5×2.0 (I)			
	3.1×2.75 - 2.5×2 = 3.525			
	3.525×2 = 7.05	m^2	7.05	
	7. 2.5×2.0 (II)			
	3.2×2.85 - 2.5×2 = 4.120 m^2			

6



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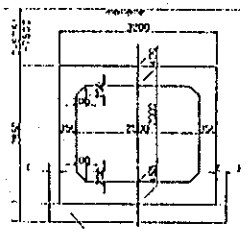


6-54

Working Division: 62. CONGUILLO (II)

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: 6. CONGUILLIO ACCESS ROAD (II)

Description	Calculation Details	Unit	Quantity	Remarks
3	CULVERT AND DRAINAGE WORKS			
101	Open-cut excavation, all classes	m^3	3,775.961	→ 3,776
	1. Pipe culvert 1430.70			
	2 Box culvert 0			
	3 Drain pipe 1397.549			
	4 Catch basin 947.712			
	Total 3775.961			
102	Backfill with selected material	m^3	1454.0	→ 1,454
	1. Pipe culvert 614.32			
	2. Box culvert 0			
	3. Catch basin 839.68			
	Total 1,454			
103	Crushed stone bedding	m^3	283.39	→ 284
	1. Pipe culvert			

6-447

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3	CULVERT AND DRAINAGE WORKS			
104	Reinforced concrete pipe, D. 600 mm Culvert : 839.5 m, For ditch 344.5 m	m	1184.0	→ 1184
105	Reinforced concrete pipe, D. 800 mm	m	89.0	→ 89
106	Reinforced concrete pipe D. 1.000 mm	m	50.80	→ 51
107	P.V.C. perforated drain pipe D. 200 mm	m	5823.120	→ 5824
108	Free drainage material for subdrain	m^3	1214.703	→ 1215
109	Concrete, class E. for pipe culvert and wing walls	m^3	755.888	→ 756.
	1. Pipe culvert 682.26			
	2. Box culvert 0			
	3 Wing wall for pipe culvert 73.628			
	4 Wing wall for box culvert 0			
	Total 755.888			
110	Concrete, class E. for side ditch and catch basin	m^3	1811.170	→ 1812
	1. Side ditch 59.584			
	2. catch basin 1751.586			
	Total 1811.17			

6-446

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3	CULVERT AND DRAINAGE WORKS			
/11	Concrete, class H, for levelling concrete	m^3	16.99	→ 17
	1. Culvert 0			
	2. Wing wall 14.174			
	3. Catch basin 2.816			
	Total 16.99			
/12	Formwork, F1 finish, for concrete of Items /09 and /10	m^2	2553.775	→ 2554
	1. culvert 2070.94			
	2. Wing wall 329.335			
	3. Catch basin 332.640			
	Total 2553.775			
/13	Formwork, F3 finish, for concrete of Items /09 and /10	m^2	14884.778	→ 14885
	1. Culvert 0			
	2. Wing wall 119.858			
	3. Catch basin 202.144			
	4. Drain ditch 14562.776			
	Total 14884.778			

6 of 44

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3.	CULVERT AND DRAINAGE WORKS			
1.4	Reinforcing bars for concrete works	ton	51.5	→ 52
	1 Culvert 40884.72			
	2 Wing wall 5890.24			
	3 Catch basin 4766.72			
	Total 51541.88			
1.5	Gabion mattress, t=500 mm	m^3	217.1	→ 217.
1.6	Joint filler, t=10 mm	m^2	0.0	
1.7	Bituminous coating for contraction joint	m^2	0.0	

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	

64-67

1. Conguillo

		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	439.8	1184.0	0.83	364.48	0.43	189.39	0.14	62.67				0.16	68.74	0.52	228.70	0.00	0.00
	180	45.2		0.93	41.87	0.42	18.79	0.17	7.46				0.26	11.64	1.00	45.20	0.00	0.00
	Fix	699.0		1.09	758.41	0.45	316.30	0.24	167.76				0.62	430.02	2.00	1,398.00	42.98	30,045.82
D=800mm	90	0.0	89.0	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	89.0		1.72	152.92	0.60	53.78	0.31	27.41				1.11	99.09	2.68	238.52	73.53	6,544.17
D=1000mm	90	0.0	50.8	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	50.8		2.22	113.01	0.71	36.07	0.36	18.08				1.43	72.76	3.16	160.53	84.55	4,294.94
Total		1323.8			1,430.70		614.32		283.39	1,184.00	89.00	50.80		682.26		2,070.94		40,884.92

		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

1 CONGUILLO

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+360.00	1.22	23.9%	120.200	114.600	124.000	1 23.400	D=600mm 360	6.000
D-2	0+440.00	2.00	2.5%	123.600	122.765	132.066	2 33.400	D=1000mm 360	7.884
D-3	0+720.00	0.24	2.0%	147.550	147.350	149.325	0 10.000	D=600mm 90	1.275
D-4	0+827.10	2.12	5.0%	151.340	150.030	158.010	1 26.300	D=800mm 360	6.525
D-5	1+287.08	1.44	29.5%	193.050	181.400	197.708	2 39.500	D=600mm 360	9.883
D-6	1+480.70	1.33	23.2%	212.500	206.000	217.070	1 28.000	D=600mm 360	7.220
D-7	1+756.10	1.11	18.9%	228.800	222.000	235.647	2 36.000	D=600mm 360	9.647
D-8	2+158.18	0.67	23.3%	246.700	232.700	255.923	3 60.000	D=600mm 360	15.623
D-9	2+539.16	0.56	42.0%	284.500	277.200	286.522	1 17.400	D=600mm 360	5.072
D-10	2+635.00	0.33	20.8%	293.950	290.500	296.106	1 16.600	D=600mm 90	3.281
D-11	3+188.39	0.56	18.1%	318.800	314.500	323.222	1 23.700	D=600mm 360	5.972
D-12	3+655.00	0.33	2.0%	307.667	307.471	309.273	0 9.800	D=600mm 90	1.104
D-13	3+490.00	0.55	2.0%	295.400	295.218	297.406	0 9.100	D=600mm 90	1.497
D-14	4+446.00	0.22	39.0%	272.100	253.000	274.233	3 49.000	D=600mm 360	11.083
D-15	5+000.00	0.22	36.6%	280.500	265.000	284.056	2 42.300	D=600mm 360	10.706
D-16	5+395.52	0.22	21.2%	261.174	258.000	263.254	0 15.000	D=600mm 90	3.067
D-17	5+520.00	0.22	31.6%	250.100	245.300	252.056	1 15.200	D=600mm 180	3.756
D-18	5+737.12	0.38	14.3%	257.400	252.400	264.094	2 35.000	D=600mm 360	8.594
D-19	5+880.00	0.20	2.0%	250.700	250.478	252.699	0 11.100	D=600mm 90	1.510
D-20	6+560.00	1.11	37.8%	197.000	186.800	199.056	1 27.000	D=600mm 360	6.556
D-21	6+845.84	0.33	1.5%	195.050	194.735	201.222	1 21.000	D=600mm 360	5.730
D-22	7+127.07	0.67	18.0%	164.300	155.600	173.099	3 48.300	D=600mm 360	12.549
D-23	7+320.00	1.33	42.0%	155.150	143.000	156.931	1 28.900	D=600mm 360	7.256
D-24	8+160.00	0.56	4.9%	133.100	131.260	140.806	2 37.600	D=600mm 360	8.026
D-25	8+394.00	0.55	33.3%	119.200	110.900	121.114	1 24.900	D=600mm 360	5.464
D-26	8+600.00	1.33	6.5%	129.600	127.436	137.306	2 33.300	D=800mm 360	7.988
D-27	8+804.66	1.33	11.0%	125.300	119.459	137.259	3 53.100	D=600mm 360	14.279
D-28	8+935.50	0.56	6.6%	132.400	131.480	135.951	0 14.000	D=600mm 90	3.411
D-29	9+083.50	0.57	5.9%	122.130	120.092	131.131	2 34.300	D=600mm 360	9.420
D-30	9+160.00	2.64	8.0%	120.300	117.948	127.306	1 29.400	D=800mm 360	7.382
D-31	9+244.60	0.57	10.0%	119.100	118.330	120.846	0 7.700	D=600mm 90	1.531
Bridge-1	9+503.24		#DIV/0!					#DIV/0!	#DIV/0!
D-32	9+673.20	3.33	5.0%	107.700	106.830	112.626	1 17.400	D=1000mm 360	4.361
D-33	9+809.25	0.11	27.0%	122.800	116.000	126.231	1 25.200	D=600mm 360	6.231
D-34	10+059.97	0.67	12.5%	127.800	121.850	138.505	3 47.600	D=600mm 360	13.080
D-35	10+429.00	0.66	10.0%	129.200	126.880	134.436	1 23.200	D=600mm 360	5.796

		m	no
Ø600	90°	93.3	8
	180°	15.2	1
	360°	69.9	21
Ø800	360°	87.0	3
Ø1,000	360°	50.8	2

側溝延長計算書

LONGITUD DE CUNETAS

CAMINO DE ACCESO: CONGUILLO (MEMBRILLO - CONGUILLO)

0+000 a 11+771.6

	ABSCISAS		IZQUIERDA m	DERECHA m	LONGITUD m
12.5	0+000.00 - 0+020.00	✓	20.00	0.00	20.00
	0+020.00 - 0+090.00		70.00	0.00	70.00
	0+090.00 - 0+130.00		40.00	40.00	80.00
13.0	0+130.00 - 0+200.00		0.00	70.00	70.00
	0+200.00 - 0+360.00		160.00	160.00	320.00
	0+360.00 - 0+440.00	✓✓	0.00	80.00	80.00
	0+450.00 - 0+490.00		0.00	40.00	40.00
	0+490.00 - 0+590.00		100.00	100.00	200.00
	0+590.00 - 0+640.00	✓✓	50.00	0.00	50.00
11.0	0+660.00 - 0+734.00	✓	74.00	0.00	74.00
	0+734.00 - 0+760.00		26.00	0.00	26.00
	0+760.00 - 0+770.00		10.00	10.00	20.00
8.5	0+770.00 - 0+830.00		60.00	0.00	60.00
	0+830.00 - 0+880.00		0.00	50.00	50.00
9.0	0+880.00 - 0+978.58		98.58	98.58	197.16
	0+978.58 - 1+100.00		121.42	0.00	121.42
9.5	1+100.00 - 1+149.63		49.63	0.00	49.63
	1+149.63 - 1+180.00		0.00	30.37	30.37
	1+180.00 - 1+230.00	✓✓	50.00	50.00	100.00
	1+260.00 - 1+280.00	✓	20.00	20.00	40.00
10.5	1+280.00 - 1+340.00		0.00	60.00	60.00
	1+340.00 - 1+460.00	✓	120.00	0.00	120.00
	1+490.00 - 1+520.00		30.00	0.00	30.00
	1+563.45 - 1+580.00	✓	16.55	0.00	16.55
	1+580.00 - 1+617.11		37.11	37.11	74.22
	1+617.11 - 1+713.27	✓	86.16	0.00	86.16
	1+756.10 - 1+890.00	✓	133.90	0.00	133.90
	1+890.00 - 1+959.30	✓	69.30	69.30	138.60
11.5	1+959.30 - 2+075.00		11.57	0.00	11.57
	2+075.00 - 2+100.00		25.00	25.00	50.00
11.5	2+100.00 - 2+240.00	✓	140.00	0.00	140.00
12.0	2+240.00 - 2+320.00	✓	80.00	80.00	160.00
	2+320.00 - 2+440.00		110.00	110.00	220.00
	2+440.00 - 2+520.00		80.00	0.00	80.00
12.0	2+520.00 - 2+539.16	✓	19.16	19.16	38.32

LONGITUD DE CUNETAS

CAMINO DE ACCESO: CONGUILLO (MEMBRILLO - CONGUILLO)

0+000 a 11+771.6

	ABSCISAS		IZQUIERDA m	DERECHA m	LONGITUD m
	2+539.16 - 2+610.79		71.63	0.00	71.63
	2+680.00 - 2+730.00		0.00	50.00	50.00
12.0	2+730.00 - 2+843.89		13.89	13.89	27.78
11.0	2+843.89 - 2+990.00		146.11	0.00	146.11
	2+990.00 - 3+117.53		127.53	127.53	255.06
	3+237.88 - 3+311.41		0.00	73.53	73.53
9.0	3+451.35 - 3+634.97	✓	183.62	183.62	367.24
	3+634.97 - 3+680.00		45.03	0.00	228.65
9.5	3+680.00 - 3+790.00	✓	110.00	110.00	220.00
	3+790.00 - 3+890.00		100.00	0.00	100.00
	3+890.00 - 3+970.00		80.00	80.00	160.00
7.0	4+150.00 - 4+260.00	✓	110.00	110.00	220.00
	4+260.00 - 4+323.10		63.10	0.00	63.10
17.0	4+323.10 - 4+420.00	✓	96.90	96.90	193.80
	4+420.00 - 4+480.00		60.00	0.00	60.00
	4+480.00 - 4+560.00		80.00	80.00	160.00
18.0	4+560.00 - 4+620.00		60.00	0.00	60.00
	4+620.00 - 4+700.00		0.00	80.00	80.00
8.0	4+700.00 - 4+780.00		80.00	80.00	160.00
	4+780.00 - 4+880.00		100.00	0.00	100.00
	4+880.00 - 4+980.00		100.00	100.00	200.00
	4+980.00 - 5+040.00		0.00	60.00	60.00
	5+040.00 - 5+120.00		80.00	80.00	160.00
7.0	5+260.00 - 5+300.00		40.00	0.00	40.00
	5+300.00 - 5+360.00		60.00	60.00	120.00
	5+360.00 - 5+420.00		60.00	0.00	60.00
9.0	5+420.00 - 5+497.85	✓	77.85	77.85	155.70
	5+497.85 - 5+540.00		42.15	0.00	42.15
	5+540.00 - 5+730.00	✓✓	190.00	190.00	380.00
9.5	5+780.00 - 5+870.00	✓	0.00	90.00	90.00
	5+870.00 - 5+900.00		0.00	20.00	20.00
	5+900.00 - 6+000.00		100.00	100.00	200.00
14	6+000.00 - 6+100.00	✓	100.00	0.00	100.00
10 13.0	6+100.00 - 6+360.00	✓	260.00	260.00	520.00

12

6-4-5-5

LONGITUD DE CUNETAS

CAMINO DE ACCESO: CONGUILLO (MEMBRILLO - CONGUILLO)

0+000 a 11+771.6

	ABSCISAS	IZQUIERDA m	DERECHA m	LONGITUD m
	6+360.00 - 6+420.00	0.00	60.00	60.00
8.0	6+420.00 - 6+540.00 ✓	120.00	120.00	240.00
	6+540.00 - 6+560.00	20.00	0.00	20.00
	6+560.00 - 6+630.00	70.00	0.00	70.00
	6+630.00 - 6+690.00	60.00	60.00	120.00
	6+690.00 - 6+720.00	0.00	30.00	30.00
	6+720.00 - 6+740.00	20.00	0.00	20.00
	6+740.00 - 6+845.84	105.84	105.84	211.68
	6+900.00 - 7+000.00	0.00	100.00	100.00
10.5	7+184.00 - 7+320.00	0.00	136.00	136.00
	7+320.00 - 7+340.00	0.00	20.00	20.00
7.0	7+340.00 - 7+380.00	40.00	40.00	80.00
	7+380.00 - 7+600.00	0.00	220.00	220.00
9.0	7+600.00 - 7+800.00	0.00	200.00	200.00
	7+800.00 - 7+920.00	120.00	0.00	120.00
8.0	7+920.00 - 7+980.00	60.00	60.00	120.00
	7+980.00 - 8+000.00	0.00	20.00	20.00
7.5	8+220.00 - 8+390.00	0.00	170.00	170.00
8.0	8+390.00 - 8+580.00	0.00	190.00	190.00
	8+620.00 - 8+780.00	0.00	160.00	160.00
7.0	8+870.00 - 9+000.00	0.00	130.00	130.00
	9+100.00 - 9+160.00	0.00	60.00	60.00
9.5	9+200.00 - 9+220.00	0.00	20.00	20.00
7.0	9+220.00 - 9+240.00	20.00	20.00	40.00
	9+253.67 - 9+481.00 vv	227.33	227.33	454.66
	9+540.00 - 9+673.20 vv	133.20	133.20	266.40
	9+690.00 - 9+800.00	110.00	110.00	220.00
	9+840.00 - 9+920.00	80.00	80.00	160.00
	10+120.00 - 10+270.00	150.00	150.00	300.00
	10+330.00 - 10+380.00	50.00	50.00	100.00
	10+460.00 - 10+700.00	240.00	240.00	480.00
	10+750.00 - 11+000.00	250.00	250.00	500.00
	11+000.00 - 11+051.17	51.17	51.17	102.34

LONGITUD DE CUNETAS CAMINO DE ACCESO: CONGUILLO (MEMBRILLO - CONGUILLO) 0+000 a 11+771.6			
ABSCISAS	IZQUIERDA m	DERECHA m	LONGITUD m
11+051.17 - 11+080.00	0.00	28.83	28.83
11+100.00 - 11+200.00	0.00	100.00	100.00
11+200.00 - 11+300.00	100.00	100.00	200.00
11+300.00 - 11+370.00	0.00	70.00	70.00
11+370.00 - 11+550.00	180.00	180.00	360.00
11+550.00 - 11+740.00	0.00	190.00	190.00
11+740.00 - 11+771.68	31.68	31.68	63.36
		LONG. TOT. (m)	14155.92

total length 14155.92

addition 32 x 10 = 320 14475.92

catch basin 32 nos.

ø600 344.5 m.

Drain Pipe Quantities

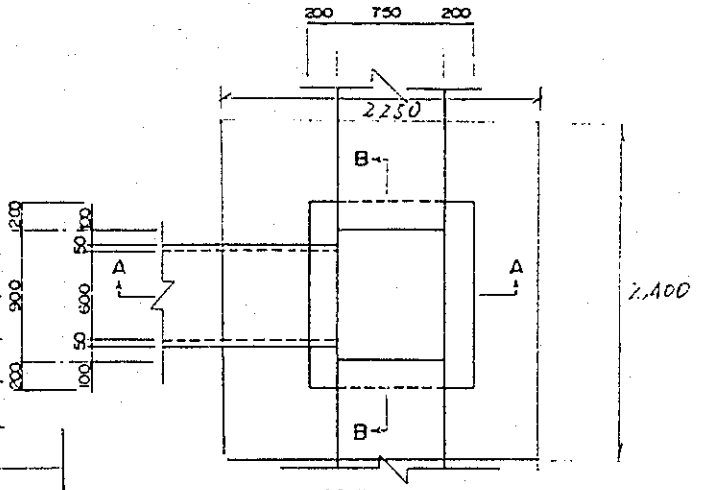
Access Road Name	Length (m)	Excavation (m3)		P.V.C Pipe D=200mm (m)		Drainage Material (m3)	
		Per meter	Total		Total	Per meter	Total
Conguillo	5,823.120	0.240	1,397.549		5,823.120	0.209	1,214.703
Severno Tramo1	1,535.870	0.240	368.609		1,535.870	0.209	320.382
Severno Tramo2	2,472.920	0.240	593.501		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

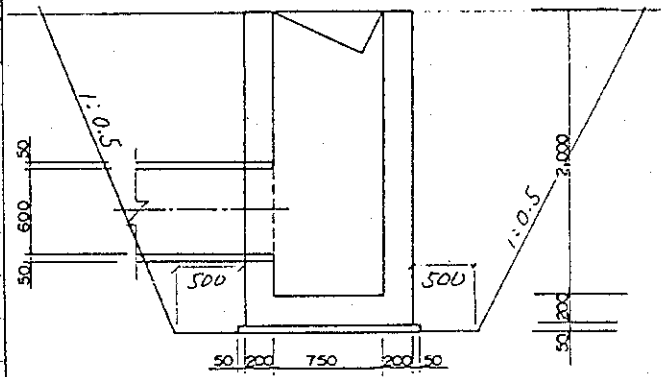
Free Drainage Material V=0.24-3.14*0.1^2 =0.21

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 101	Open-cut excavation, all classes (Catch basin)			
	2.25 × 2.4 m = 5.4 m²			
	4.5 × 4.65 m = 20.925 m²			
	(5.4 + 20.925) × ½ × 2.25 = 29.616 m³			
	29.616 × 32 = 947.712	m³	947.712	



TIPO-A ESCALA B
TYPE-A SCALE B



SECCION A-A
SECTION A-A

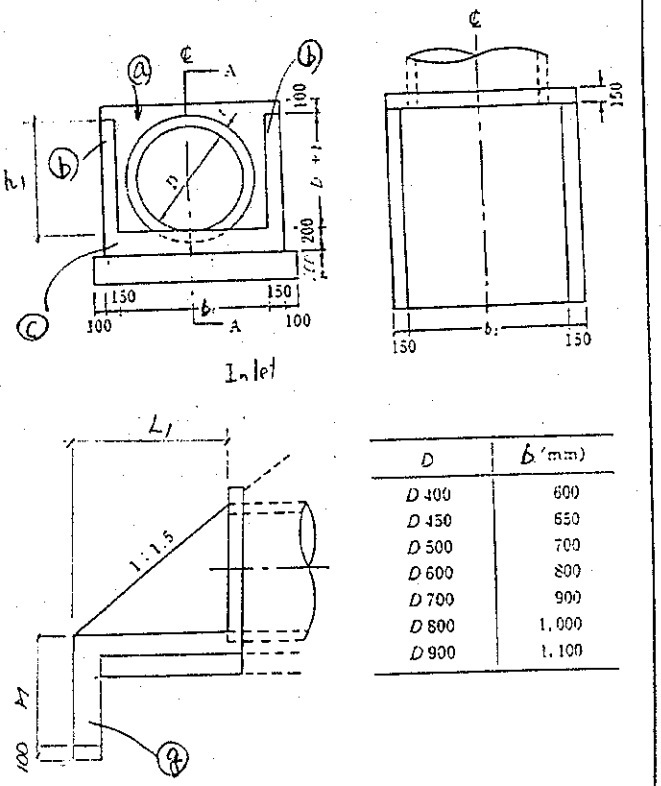
649-9

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 × 32 = 839.68	m^3	839.680	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E for			
	(wing wall)			
	<pipe type>			
	1. ϕ600 (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 = 0.315 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 × 30 = 37.11	m^3	61.75	
	0.77 × 32 = 24.64			

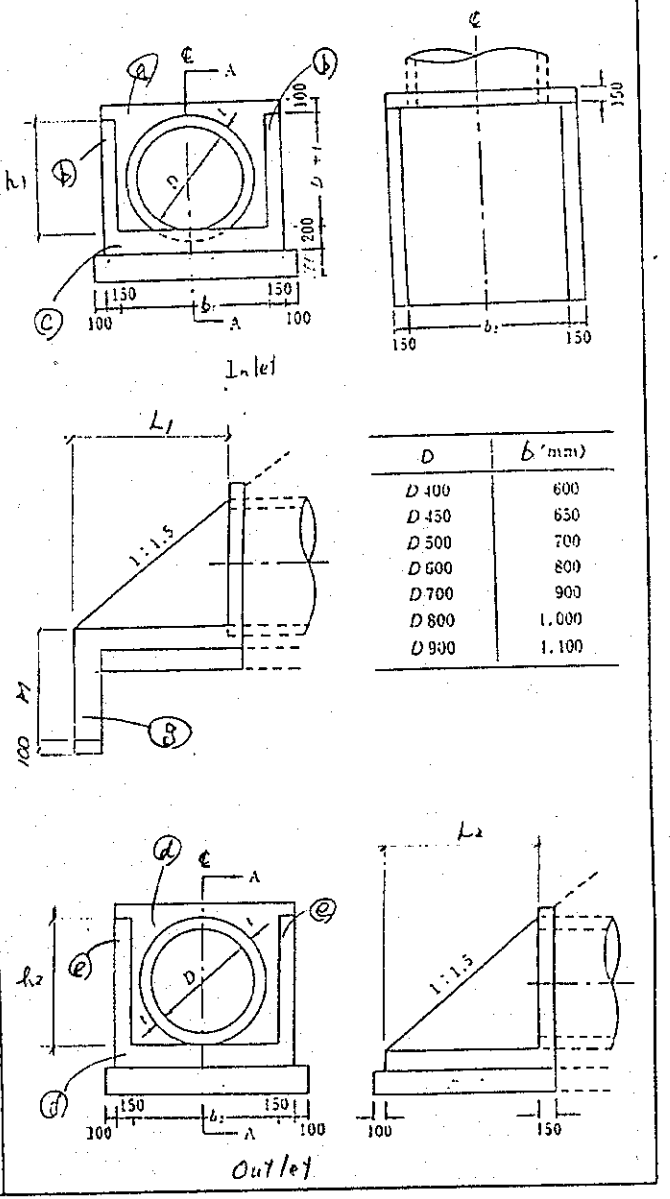


D	b'(mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

(1996-3)

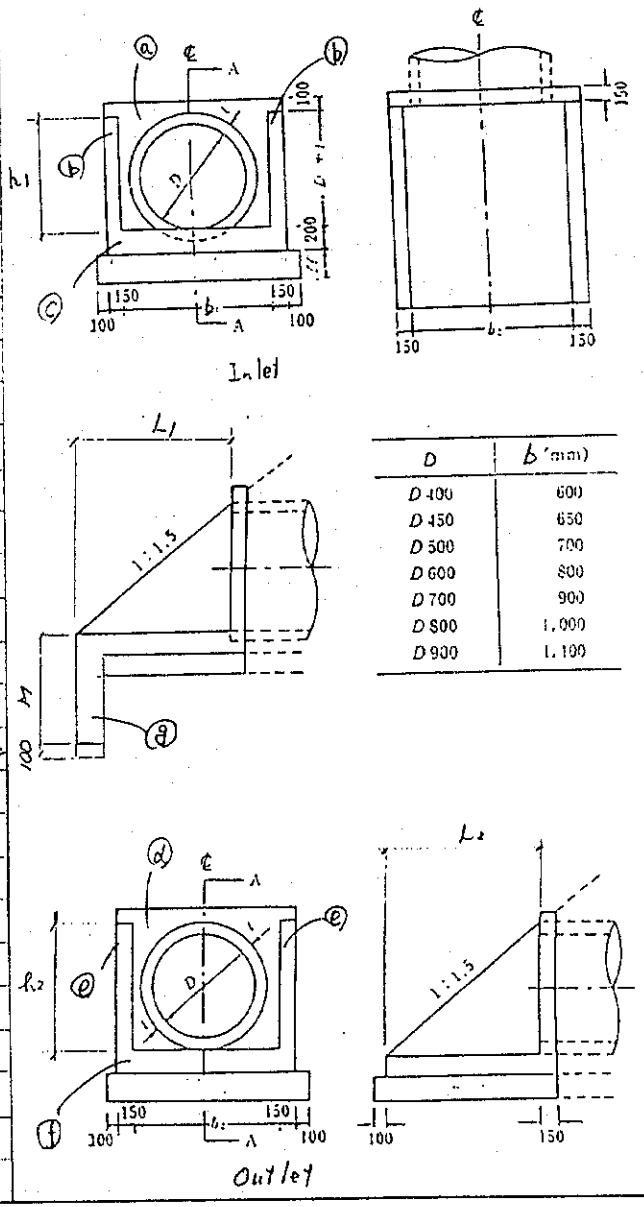
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	2. φ800 h_1 = 0.866 m L_1 = 1.299 m b = 1.0 m, 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 × 3 = 6.0	m^3	6.0	



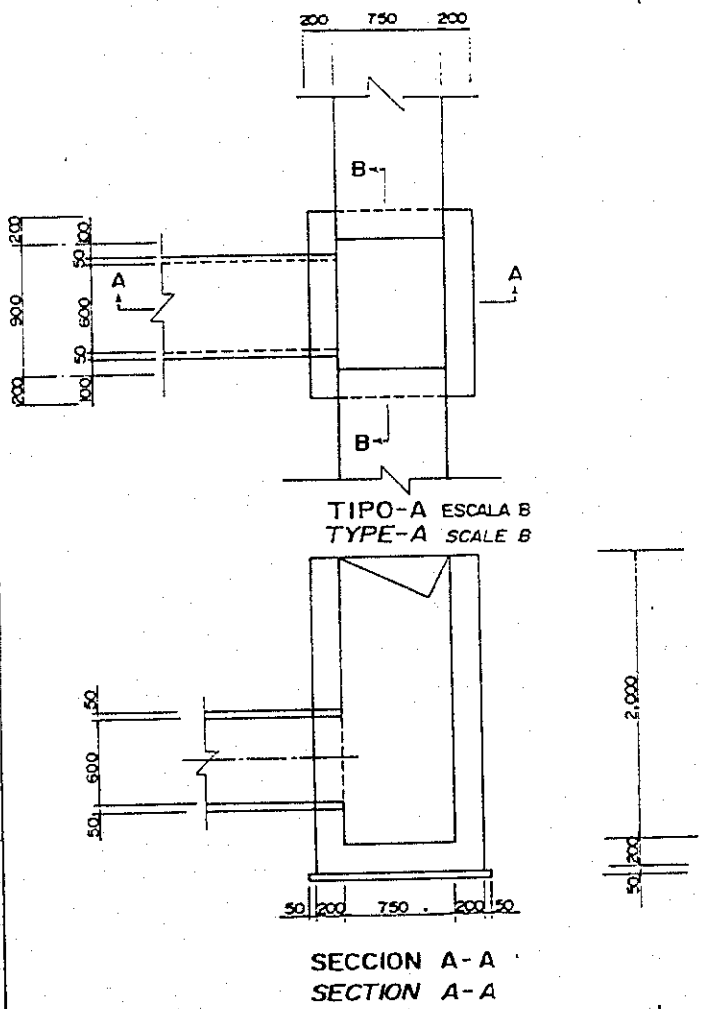
D	b'(mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

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 M = 0.8 m ⓐ: 1.5 × 1.382 × 0.15 = 0.311 m³ ⓑ: 1.082 × 1.623 × ½ × 0.15 × 2 = 0.263 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 × 2 = 5.878	m³	5.878	 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

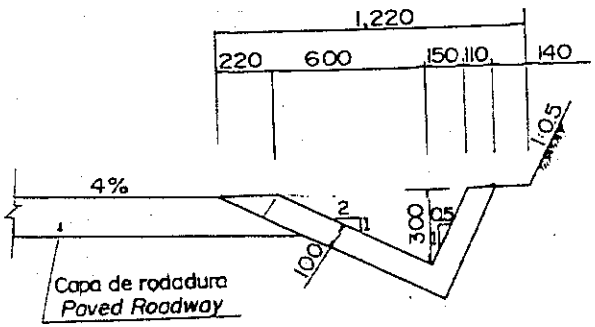
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 1/10	Concrete, class F, for side ditch and catch bran			
	(catch basin). per 1 no.			
	1.15 x 1.30 x 2.2			
	- 0.75 x 0.9 x 2.0 = 1.939 m³.			
	1.939 - 0.35³D x 0.2 = 1.862 m³			
	1.862 x 32 = 59.584	m³	59.584	



Working Division:

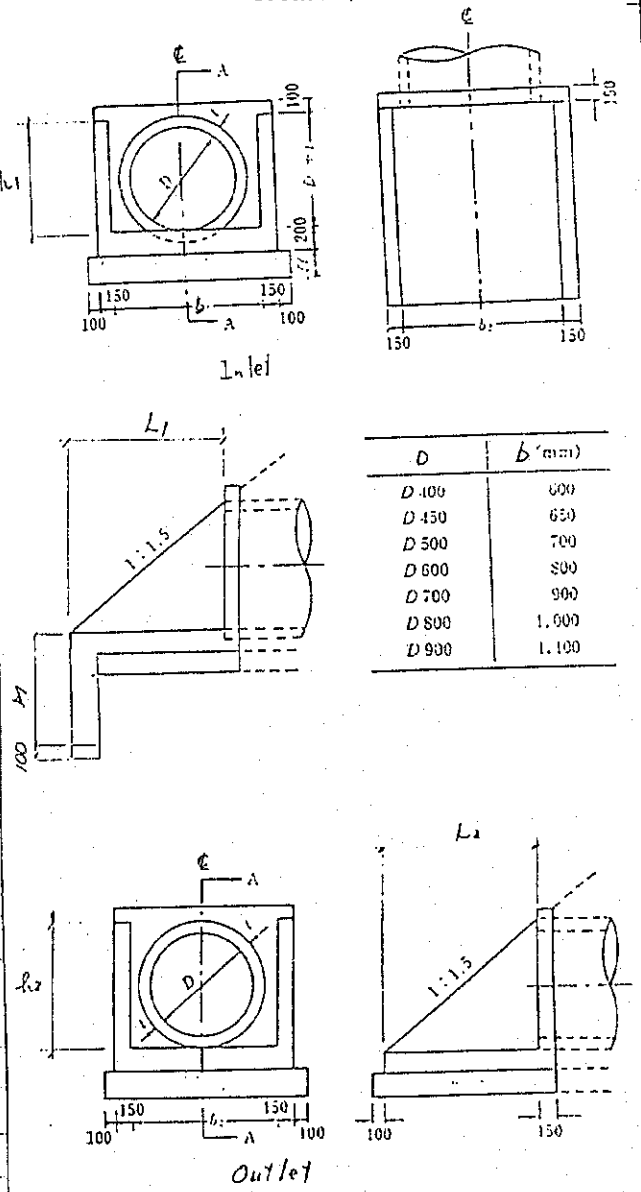
Description	Calculation Details	Unit	Quantity	Remarks
3 1.0	Concrete, class F, for side ditch and catch basin			
	(Side ditch) per 1m			
	$1.08 \times 0.432 \times 1/2$			
	$- 0.75 \times 0.3 \times 1/2 = 0.121\ m^3$			
	$0.121 \times 14475.92 = 1751.586$	m^3	1,751	586



Working Division:

Description	Calculation Details	Unit	Quantity
3 ///	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 × 30 = 7.68	m³	11.904
	0.132 × 32 = 4.224		
	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 × 3 = 1.170	m³	1.170
	3. Ø1,000 pipe		
	1.5 × 1.773 × 0.1 = 0.266 m³		
	1.5 × 1.898 × 0.1 = 0.284 m³		
	0.550 m³		
	0.55 × 2 = 1.10	m³	1.10

Remarks

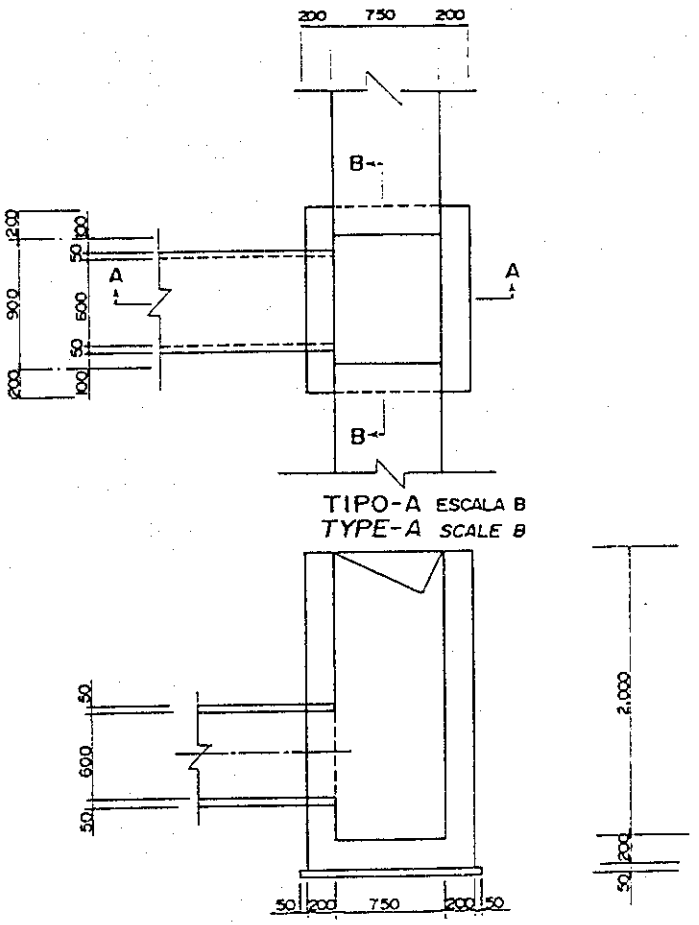


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

997-9

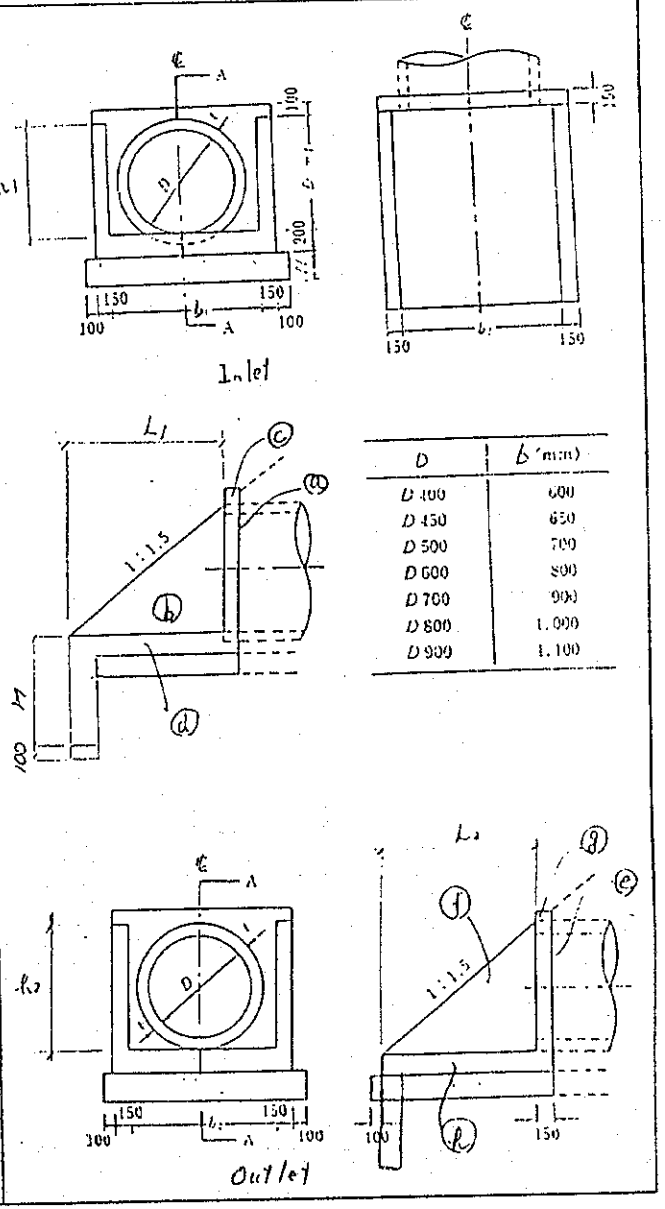
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3. /11.	Concrete class H for levelling concrete			
	(catch basin) per 1 no.			
	$1.25 \times 1.4 \times \cancel{0.05} = \cancel{0.088}$ m^3 $0.1 = 0.175$			
	$0.175 \times 32 = 5.60$	m^3	5.60	



Working Division:

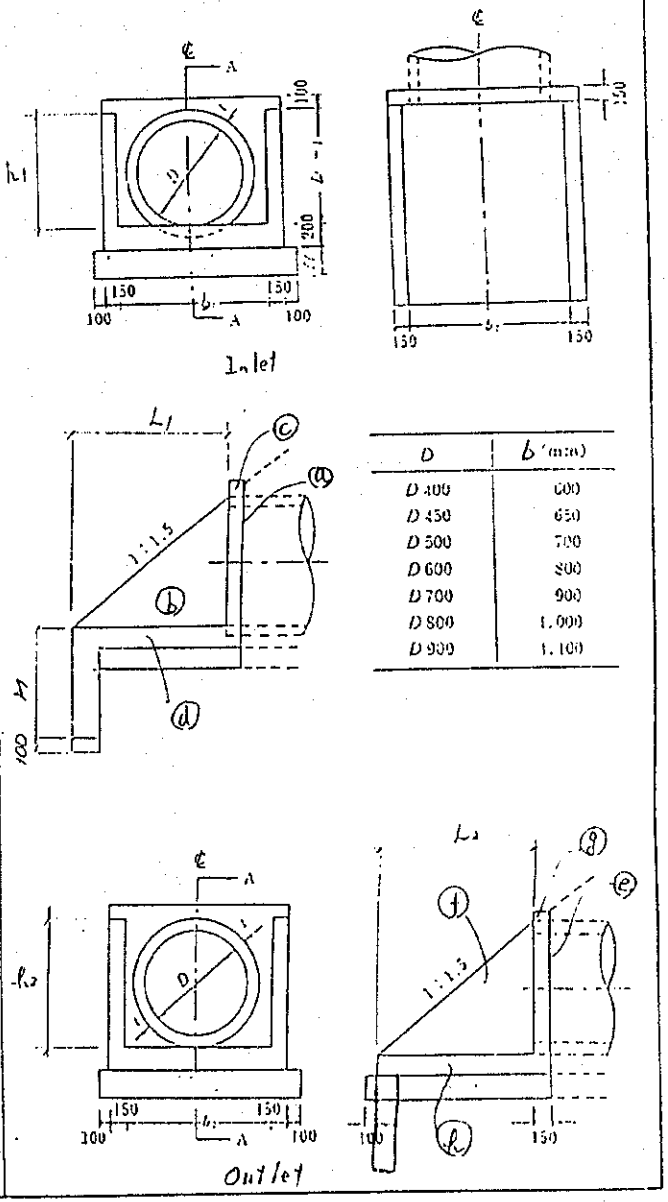
Description	Calculation Details	Unit	Quantity	Remarks
13 /12	Formwork, FI finish for concrete of item 109, 110 and 111			
	(Curing wall)			
	1. ϕ 600.			
	ⓐ 1.1m × 0.95m = 1.045 m²			
	1.045 − (0.3+0.05)²π = 0.660 m²			
	ⓑ (0.15+1.125) × 0.65/2 × 2 = 0.829 m²			
	ⓒ 0.15 × 0.1 × 2 = 0.03 m²			
	ⓓ 0.2 × (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 × 30 = 176.97	m²	= 24.57a	
	305 × 32 = 97.60			



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 / 12	Formwork Fl finish			
	(wing wall)			
	2. Ø800			
	ⓐ 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 × 3 = 27.303	m²	27.303	



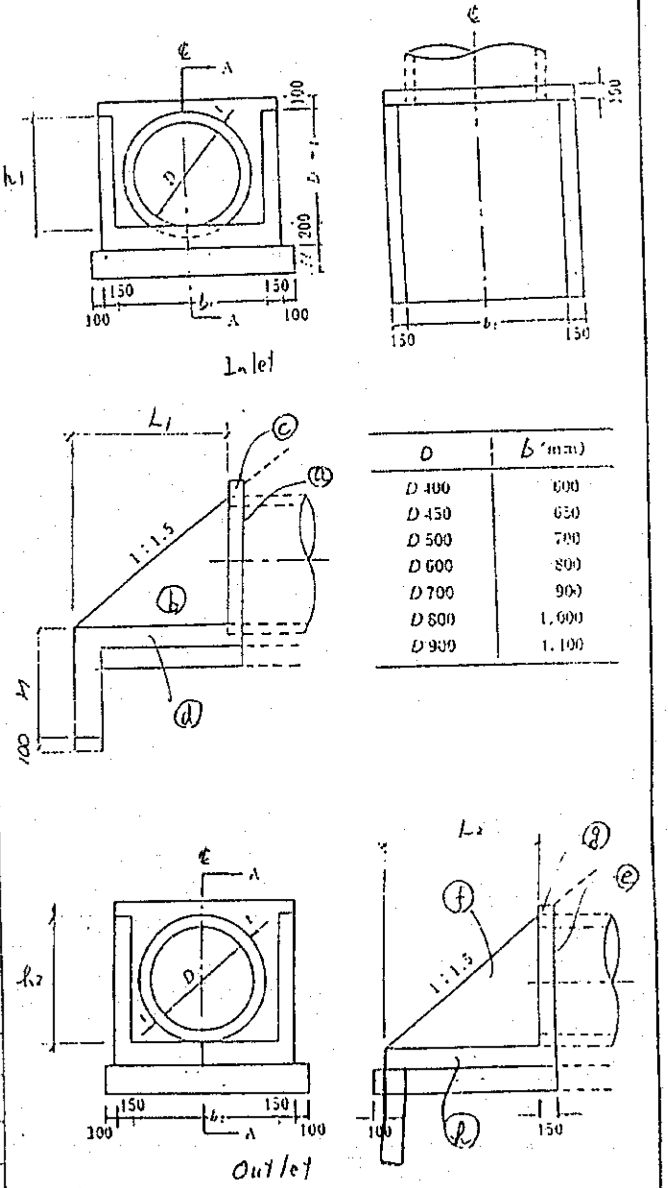
D	b'(mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

69-9

Working Division:

Description	Calculation Details	Unit	Quantity
3 /12	Formwork, Fl finish		
	(wing wall)		
	3 Ø1,000		
	ⓐ 1.5 × 1.382 m = 2.073 m²		
	2.073 − 0.583² π = 1.009 m²		
	ⓑ (0.15 + 1.773) × 1.082 × 1/2 × 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 − 0.582² π = 1.132 m²		
	ⓕ (0.15 + 1.896) × 1.164 × 1/2 × 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 m²		
	13.731 × 2 = 27.462	m²	27.462

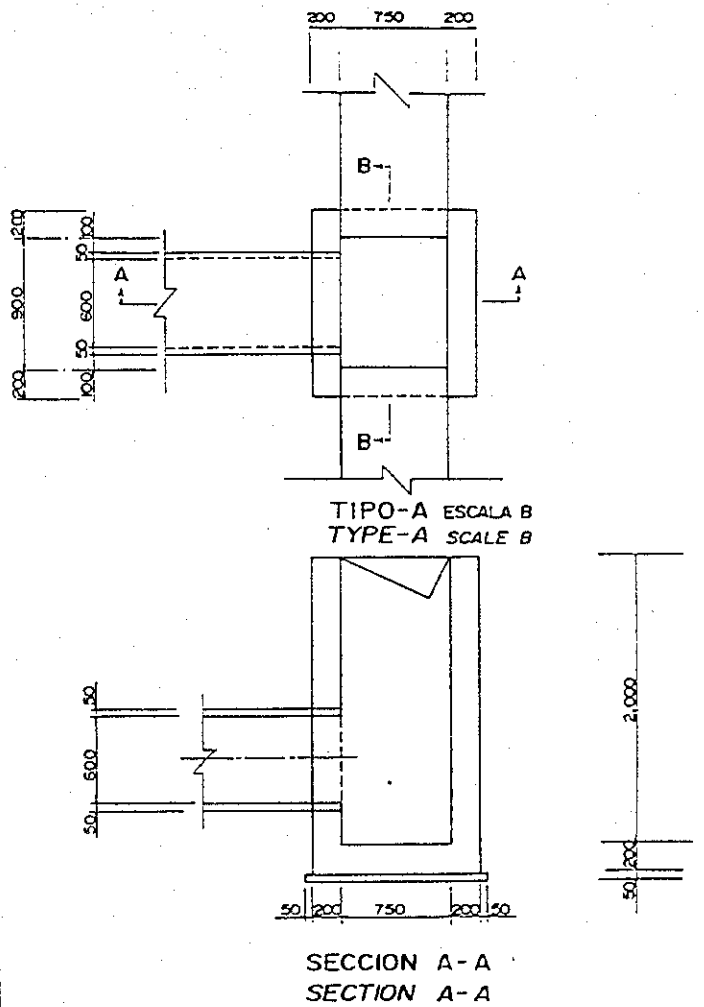
Remarks



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:

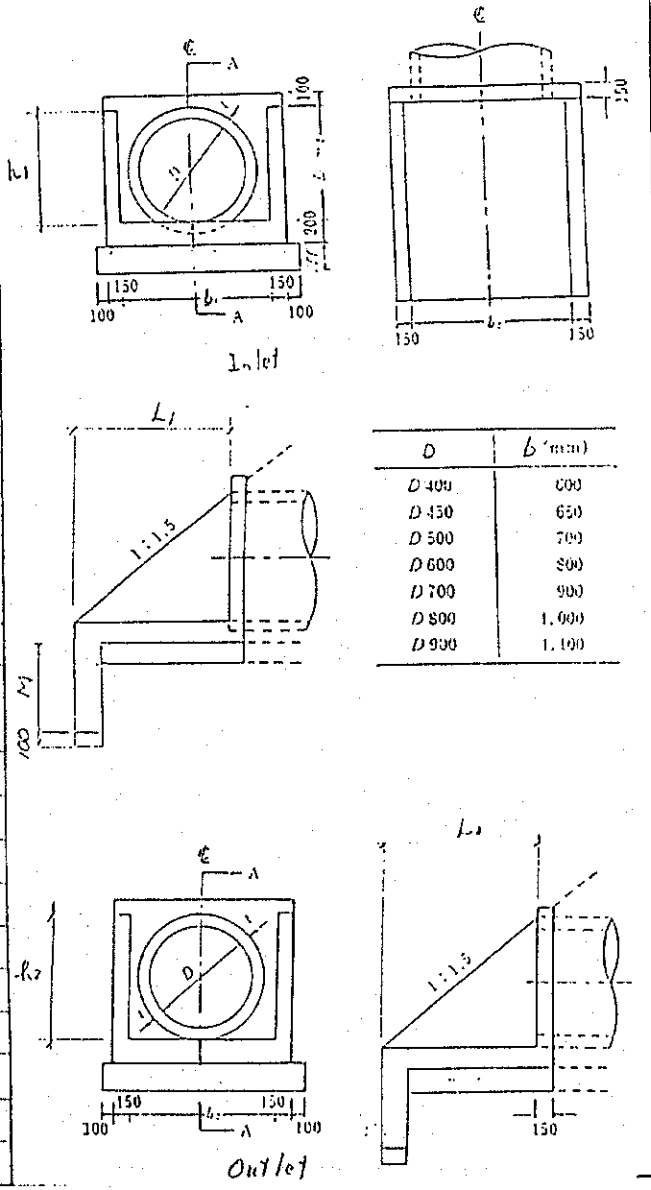
Description	Calculation Details	Unit	Quantity	Remarks
.3 /12	Formwork FL finish			
	(Catch basin)			
	1.15 × 2.2 × 2 = 5.06			
	1.30 × 2.2 × 2 − 0.35π = 5.335			
	10.395 m²			
	10.395 × 32 = 332.64	m²	332 640	



1/43-9

Working Division:

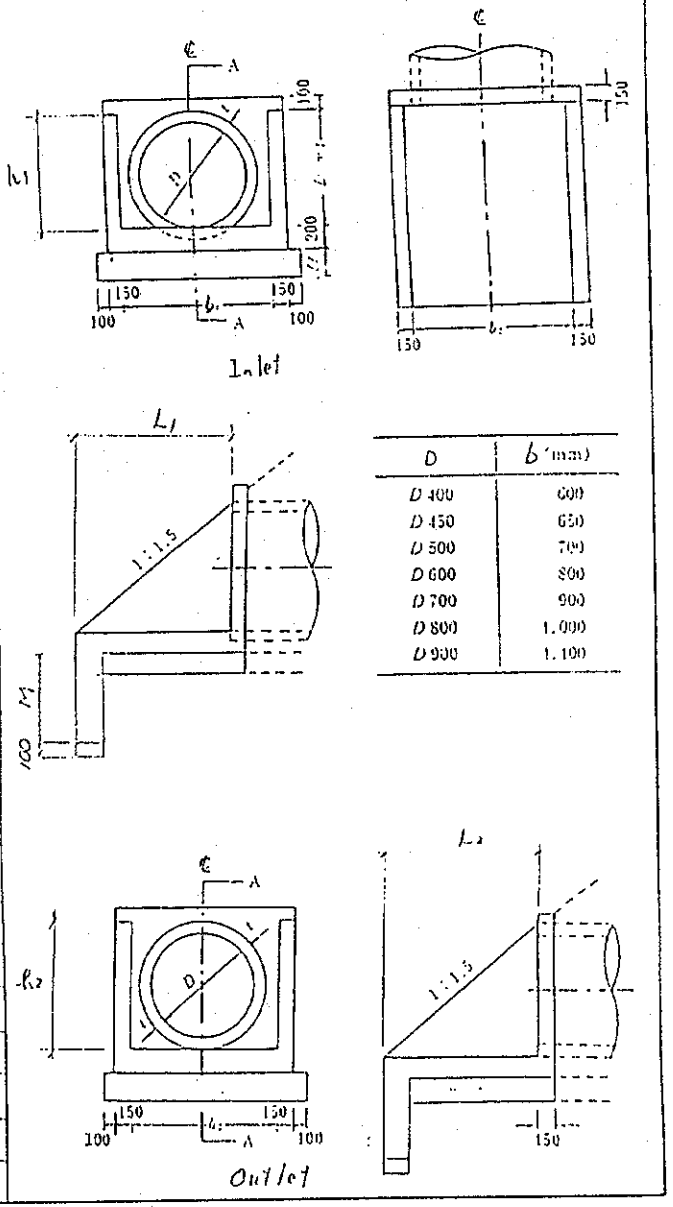
Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork F3 finish			
	(Wing wall)			
	1. ϕ600			
	ⓐ 0.1×1.1 + 0.8×0.65 − 0.3²π = 0.347 m²			
	ⓑ 0.975×0.65×½×2 = 0.634 m²			
	ⓒ 0.1×1.1 + 0.8×0.70 − 0.3²π = 0.387 m²			
	ⓓ 1.05×0.70×½×2 = 0.735 m²			
	2.103 m²			
	2.103 × 30 = 63.09	m²	98.994	
	1.122 × 32 = 35.904			



6-472

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
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			
	3.480×3 = 10.44	m²	10.440	

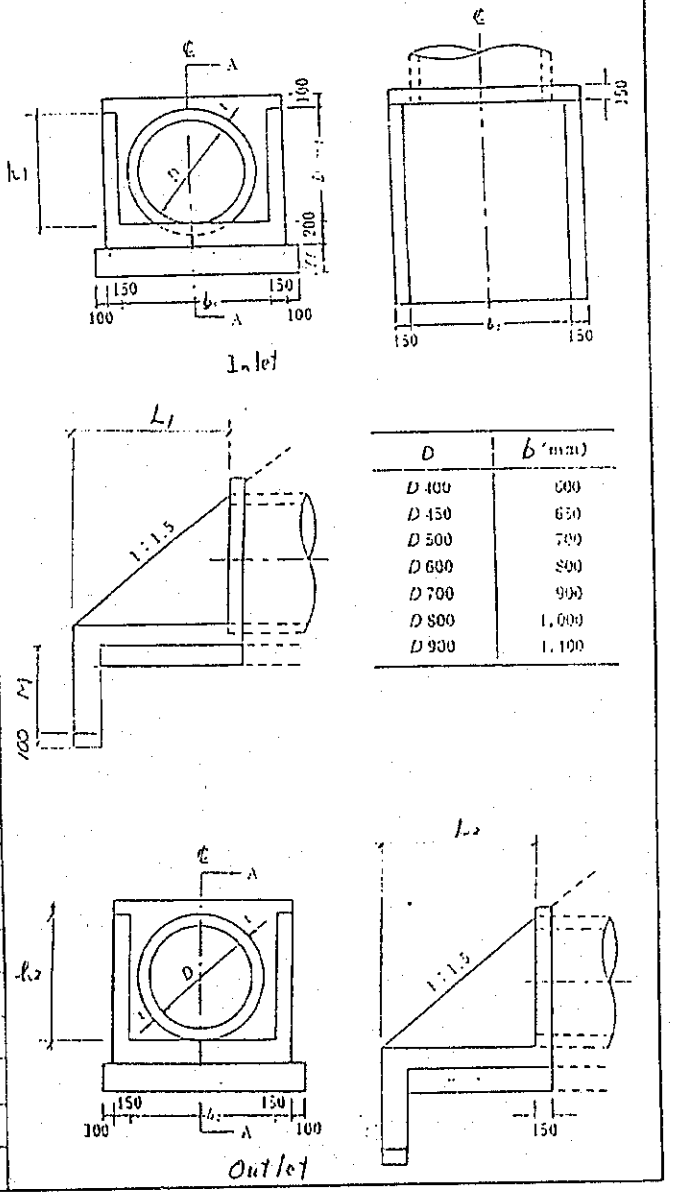


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

C33-7

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
1.3 1.3	Formwork, F3 finish (wing wall)			
	3. Ø1,000			
	ⓐ 0.1×1.5 + 1.082 × 1.2 − 0.5²π = 0.663 m³			
	ⓑ 1.663 × 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 × 2 = 10.424	m²	10.424	

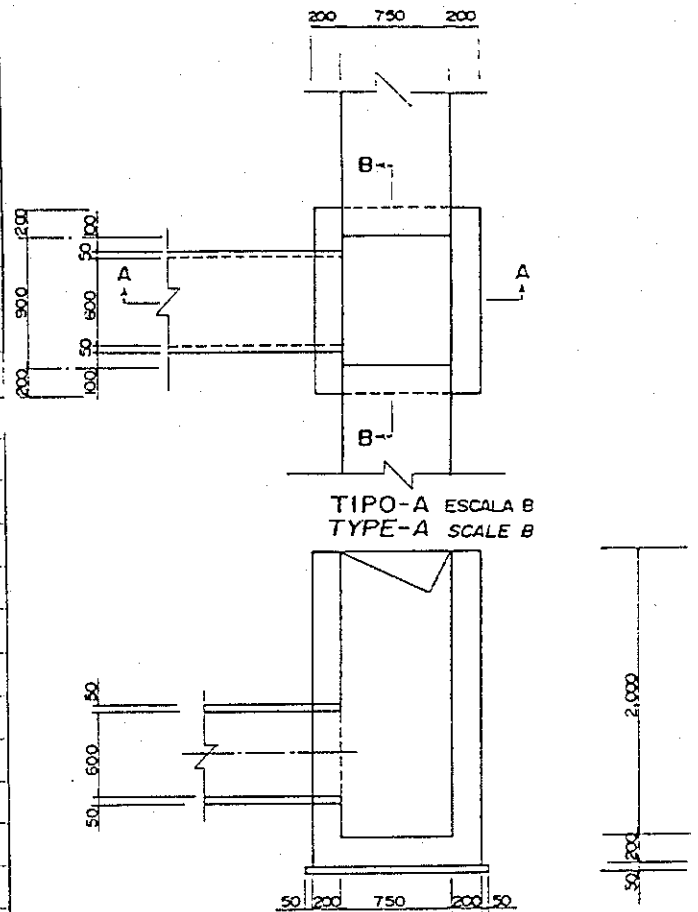


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

ﾌｶｶｰ9

Working Division:

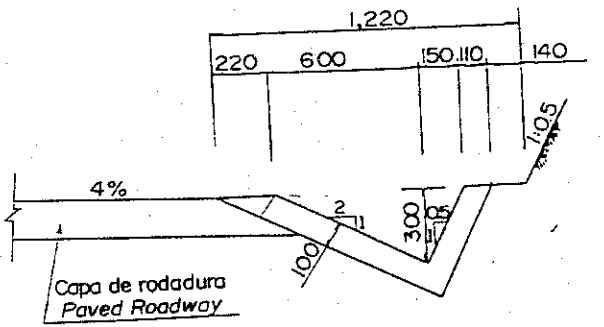
Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork F3 finish			
	(Catch basin)			
	0.75 × 2.0 × 2 = 3.0			
	0.90 × 2.0 × 2 − 0.3π = 3.317			
	6.317 m²			
	6.317 × 32 = 202.144	m²	202 144	



6-454

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 × 14475.92 = 14562.776	m^2	14562.776	



9475-9

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 × 30 = 2968.8			
	0.77 × 80 × 32 = 1971.2			
	2. ø800			
	2.000 m^3 × 80 = 160 kg			
	160 × 3 = 480			
	3. ø1,000			
	2.939 m^3 × 80 = 235.12 kg			
	235.12 × 2 = 470.24			

LL3-7

Working Division:

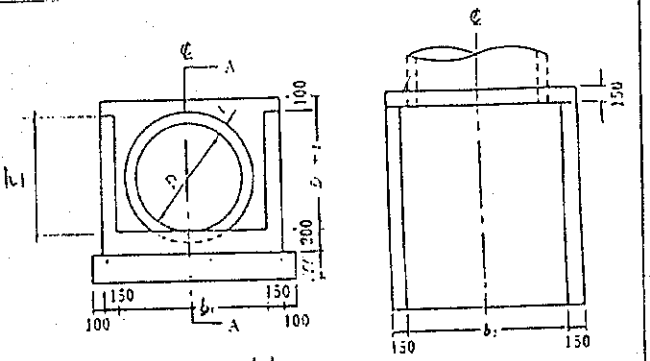
Description	Calculation Details	Unit	Quantity	Remarks
3 14	Reinforcing bars for concrete works			
	(Catch basin)			
	80 kg / 1 m³ of concrete volume			
	1.862 m³ × 80 kg/m³ = 148.96 m³.			
	148.96 × 32 = 4766.72	ton	4.70	

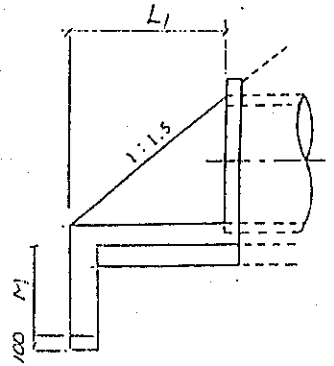
Q4-9

Working Division:

Description	Calculation Details	Unit	Quantity
.3 1/5	Gabion mattress, $t = 500$ mm		
	(wing wall part)		
	1. Ø600		
	$(0.8 + 0.3) \times 5.0 \times 0.5 = 2.75\ m^3$		
	$2.75 \times 2 \times 30 = 165.0$	m^3	182.60
	$2.75 \times 0.2 \times 32 = 17.6$		
	2. Ø800		
	$(1.1 + 0.3) \times 5.0 \times 0.5 = 3.25\ m^3$		
	$3.25 \times 2 \times 3 = 19.5$	m^3	19.5
	3. Ø1,000		
	$(1.2 + 0.3) \times 5.0 \times 0.5 = 3.75\ m^3$		
	$3.75 \times 2 \times 2 = 15.0$	m^3	15.0
	4. 1.2 × 1.2 m		
	$(0.434 \times 2 + 3.3) \times 5.0 \times 0.5 = 20.42\ m^3$		
	5. 1.5 × 1.5 m		
	$(3.154 \times 2 + 3.45) \times 5.0 \times 0.5 = 24.395\ m^3$		

Remarks.





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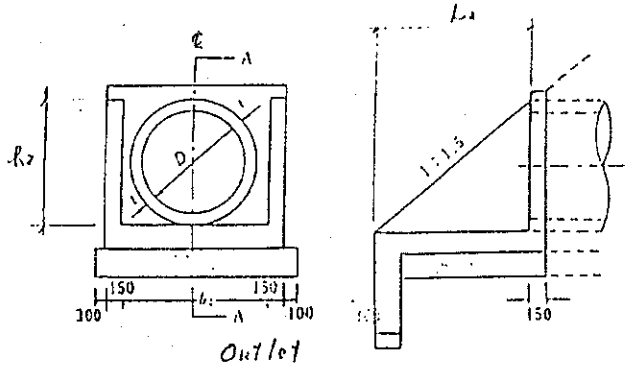
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100



643-9

Working Division: 72. EL GUASMO

Description	Calculation Details	Unit	Quantity	Remarks
11.2	Box culverts			
105	Open-cut excavation	m^3	315.18	
106	Backfill with selected material	m^3	68.39	
107	Free draining backfill	m^3	109.424	
108	Gravel bedding	m^3	7.985	

Working Division: 7. EL GUASMO ACCESS ROAD

Description	Calculation Details	Unit	Quantity	Remarks
3	CULVERT AND DRAINAGE WORKS			
101	Open-cut excavation, all classes	m^3	589.062	
	1. Pipe culvert 193.00			
	2 Box culvert			
	3 Drain pipe 188.750			
	4 Catch basin 207.312			
	Total 589.062			
102	Backfill with selected material	m^3	271.60	
	1. Pipe culvert 87.92			
	2. Box culvert			
	3. Catch basin 183.68			
	Total 271.6			
103	Crushed stone bedding	m^3	36.79	→ 37
	1. Pipe culvert			

6-281

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3	CULVERT AND DRAINAGE WORKS			
104	Reinforced concrete pipe, D.600 mm Culvert : 81.0 m, For ditch 98.0 m	m	179.0	→ 179
105	Reinforced concrete pipe, D.800 mm	m	16.10	→ 16
106	Reinforced concrete pipe D.1,000 mm	m	0.0	→ 0
107	P.V.C. perforated drain pipe D.200 mm	m	786.460	→ 787
108	Free drainage material for subdrain	m^3	164.056	→ 164
109	Concrete, class E. for pipe culvert and wing walls 1. Pipe culvert 72.54 2. Box culvert 3. Wing wall for pipe culvert 11.101 4. Wing wall for box culvert 29.136 Total 97.517	m^3	97.517	
110	Concrete, class F. for side ditch and catch basin 1. Side ditch 265.311 2. catch basin 13.034 Total 278.345	m^3	278.345	→ 279

6-482

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3	CULVERT AND DRAINAGE WORKS			
/11	Concrete, class H, for levelling concrete	m^3	6.616	
	1. Culvert			
	2. Wing wall 5.384			
	3. Catch basin 1.232			
	Total 6.616			
/12	Formwork, F1 finish, for concrete of Items 109 and 110	m^2	417.905	
	1. culvert 234.53			
	2. Wing wall 110.610			
	3. Catch basin 72.765			
	Total 417.905			
/13	Formwork, F3 finish, for concrete of Items 109 and 110	m^2	2311.828	
	1. Culvert			
	2. Wing wall 61.303			
	3. Catch basin 44.219			
	4. Drain ditch 2205.806			
	Total 2311.328			

Working Division: 7. EL GUASMO ACCESS ROAD

Description	Calculation Details	Unit	Quantity	Remarks
7.3	CULVERT AND DRAINAGE WORKS			
1.4	Reinforcing bars for concrete works	ton	7	
	1. Culvert 3039. "			
	2 Wing wall 2983.76			
	3 Catch basin 1042.72			
	Total 7055.48			
1.5	Gabion mattress, t=500 mm	m^3	91.77	— 92
1.6	Joint filler, t=10 mm	m^2		
1.7	Bituminous coating for contraction joint	m^2		

Working Division: 4

Description	Calculation Details	Unit	Quantity	Remarks
H 4	CONCRETE WORKS			
103	Concrete class E for box culverts	m^3	209.58	
104	Concrete class H for levelling concrete	m^3	15.97	
106	Formwork F1 finish for concrete item 103, 104	m^2	284.43	
108	Formwork F3 finish for concrete for item 103	m^2	320.92	
109	Reinforcing bars for concrete works	Ton	17	
110	Joint filler for culvert	m^2	12.36	
112	Bituminous coating for contraction joint	m^2	8.24	

484-9

7 EL GUASMO

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+227.50	0.44	19.0%	143.700	138.000	149.637	30.000	D=600mm 360	8.187
D-2	0+477.00	0.78	28.3%	145.700	137.200	149.416	30.000	D=600mm 360	7.366
D-3	0+856.40	2.33	5.0%	147.300	146.495	151.136	16.100	D=800mm 180	3.438
D-4	1+000.00	0.78	22.4%	160.700	156.000	164.388	21.000	D=600mm 360	5.438
D-5	1+482.62	17.25	1.0%	118.600	118.101	133.646	49.900	2500mm x 2000mm II	13.295

147.000

		(m)	(nos)
ø 600	360	81	3
ø 800	180	16.1	1
2.5x2..	II	49.9	1.

6-406

6. El Guasmo

		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	98.0	179.0	0.83	81.22	0.43	42.20	0.14	13.97				0.16	15.32	0.52	50.96	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	81.0		1.09	87.88	0.45	36.65	0.24	19.44				0.62	49.83	2.00	162.00	42.98	3,481.70
D=800mm	90	0.0	18.1	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	16.1		1.48	23.90	0.56	9.07	0.21	3.38				0.46	7.39	1.34	21.57	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		195.1			193.00		87.92		36.79	179.00	16.10	0.00		72.54		234.53		3,481.70

6-207

		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~	49.9	6.32	315.18	1.37	68.39	4.20	209.58 ~~315.18~~	0.32	15.97	5.70	284.43	6.43	320.92	331.62	16,547.84
Total		49.9		315.18		68.39		~~315.18~~		15.97		284.43		320.92		16,547.84

209.58

LONGITUD DE CUNETAS

CAMINO DE ACCESO: EL GUASMO 0+000 a 1+585.20 Km

	ABSCISAS	IZQUIERDA	DERECHA	LONGITUD
	0+000.00 - 0+005.00 ✓	0.00	0.50	0.50
11.5	0+050.00 - 0+240.00	239.50	0.00	239.50
	0+240.00 - 0+400.00	160.00	0.00	160.00
17.0	0+400.00 - 0+440.00	40.00	40.00	80.00
15.5	0+440.00 - 0+520.00	80.00	0.00	80.00
	0+520.00 - 0+550.00	30.00	30.00	60.00
7.5	0+550.00 - 0+660.00	110.00	110.00	220.00
	0+660.00 - 0+696.53 ✓	36.53	0.00	36.53
	0+696.53 - 0+735.00	38.47	38.47	76.94
	0+735.00 - 0+767.62	32.62	0.00	32.62
7.5	0+767.62 - 0+820.00	52.38	52.38	104.76
	0+820.00 - 0+856.40	36.40	36.40	72.80
	0+856.40 - 0+890.00	33.60	0.00	33.60
	0+890.00 - 1+000.00	110.00	110.00	220.00
	1+000.00 - 1+115.00	115.00	0.00	115.00
	1+115.00 - 1+190.00 ✓	75.00	75.00	150.00
	1+190.00 - 1+240.00	50.00	50.00	100.00
14.0	1+270.00 - 1+370.00	100.00	0.00	100.00
	1+370.00 - 1+400.00	30.00	0.00	30.00
	1+400.00 - 1+440.00 ✓	40.00	40.00	80.00
	1+440.00 - 1+480.00 ✓	0.00	40.00	40.00
25.0	1+530.00 - 1+585.20	55.20	55.20	110.40
			LONG. TOTAL:	2142.65 m

Total length 2142.65

additions 5 x 10 = 50

2192.65 m

catch basin 7 nos

ø 600 98.0 m.

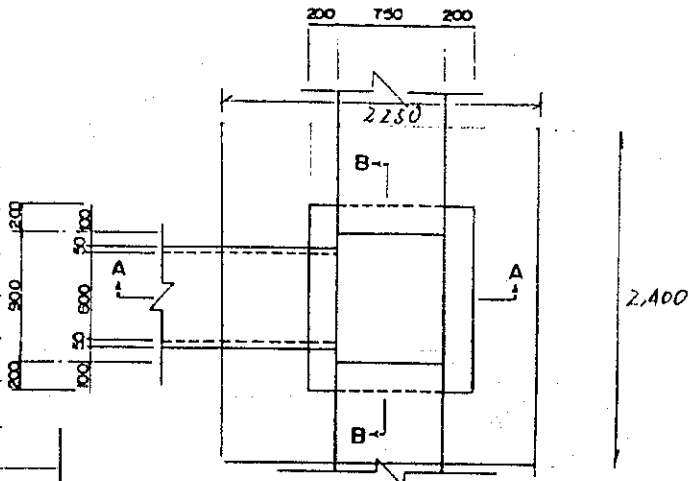
Drain Pipe Quantities

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

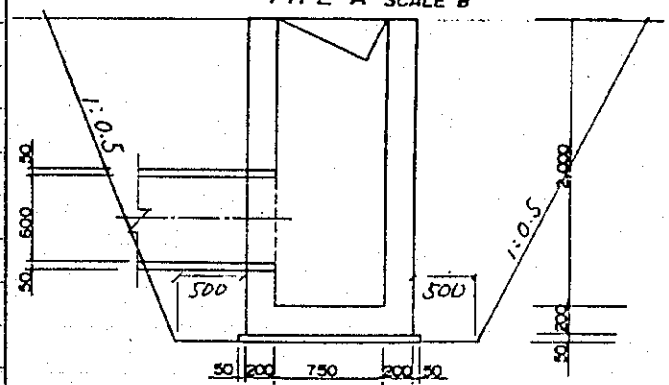
Excavation	V=(0.8+0.4)*0.4/2	=0.24
Free Drainage Material	V=0.24-3.14*0.1^2	=0.21

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 101	Open-cut excavation, all classes (Catch basins)			
	2.25 × 2.4 m = 5.4 m²			
	4.5 × 4.65 m = 20.925 m²			
	(5.4 + 20.925) × 1/2 × 2.25 = 29.616 m³			
	29.616 × 7 mes = 207.312	m³	207.312	



TIPO-A ESCALA B
TYPE-A SCALE B



SECCION A-A
SECTION A-A

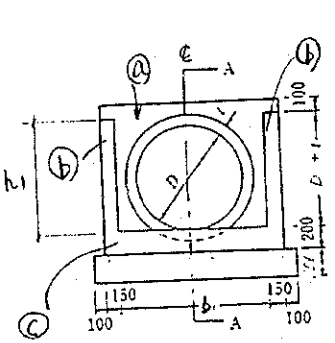
Working Division:

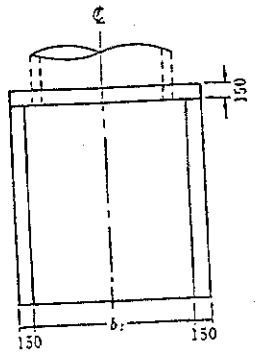
Description	Calculation Details	Unit	Quantity	Remarks
3 102	Backfill with seleeded material.			
	< catch basin >.			
	29.616 - 1.15 × 1.3 × 2.2 - 1.25 × 1.4 × 0.05			
	= 26.240.			
	26.240 × 7 nos = 183.68	m^3	183.680	

163-9

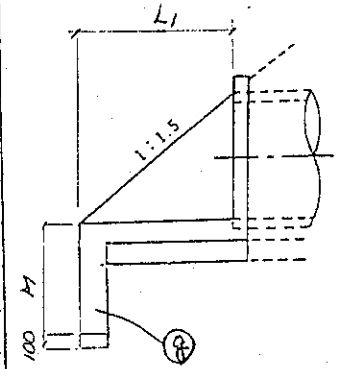
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E for			
	(wing wall)			
	(pipe type)			
	1. ϕ600 (h_1 = 850 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			
	ⓒ 1.7 × 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			
	1.337 m^3			
	1.337 × 3 = 3.711	m^3	9.101	
	0.77 × 7 = 5.39			





Inlet



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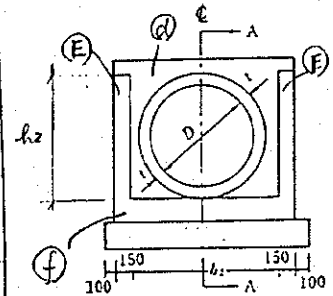
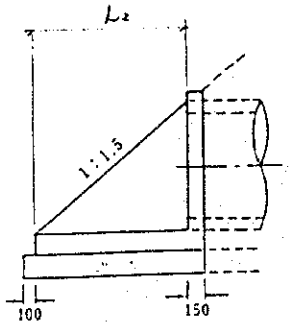
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100



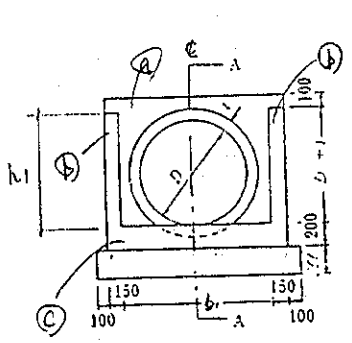


Outlet

6-692

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109.	2. Ø800 : h_1 = 0.866 m, L_1 = 1.299 m b = 1.0 m, 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	



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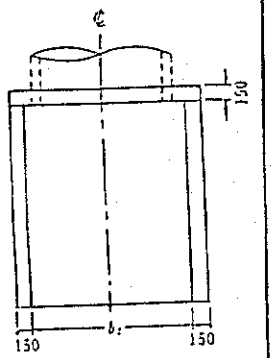
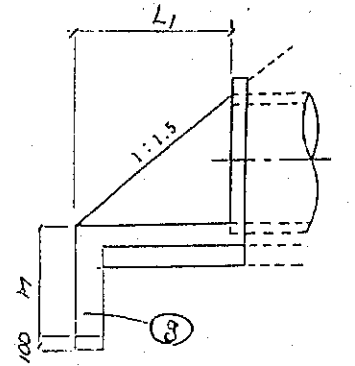
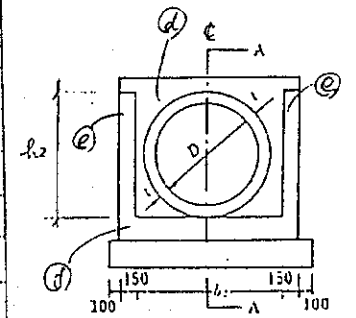
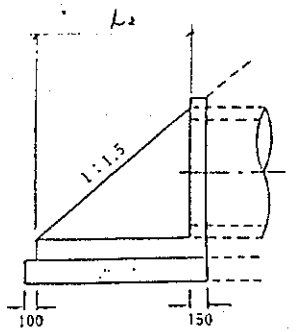




D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1.000
D 900	1.100



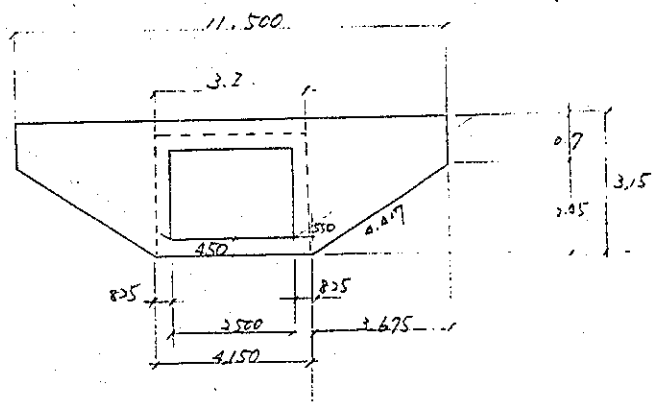
Outlet

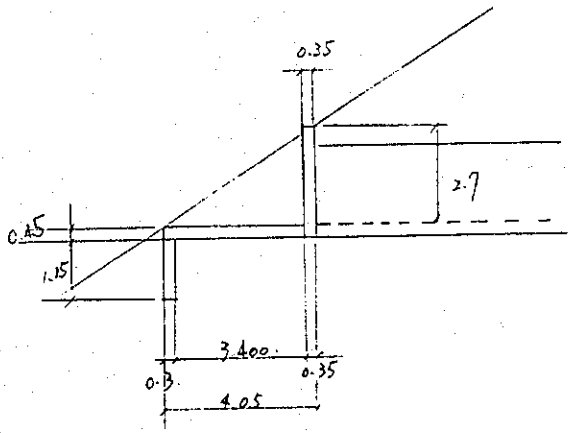


6-ページ

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 109	Concrete class E			
	(Wing wall)			
	7. 2.5m × 2.0m (II)			
	(Wing)			
	$\{(11.5 + 4.15) \times 2.45 \times \frac{1}{2} + 0.7 \times 11.5 - 2.0 \times 2.5\} \times 0.3$			
	$= 6.166$			
	(slab)			
	$3.2 \times 3.7 \times 0.45 = 5.328$			
	$0.3 \times 1.15 \times 3.2 = 1.104$			
	$13.098\ m^3$			
	$13.098 \times 2 \times 1 = 26.196$	m^3	29.196	

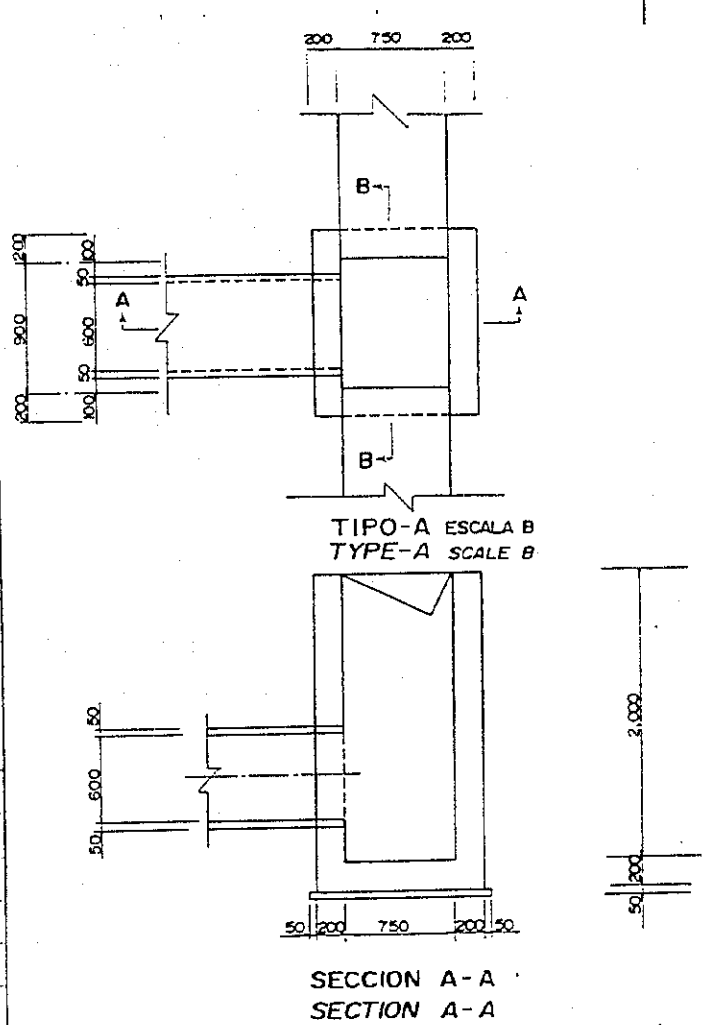




6-49

Working Division:

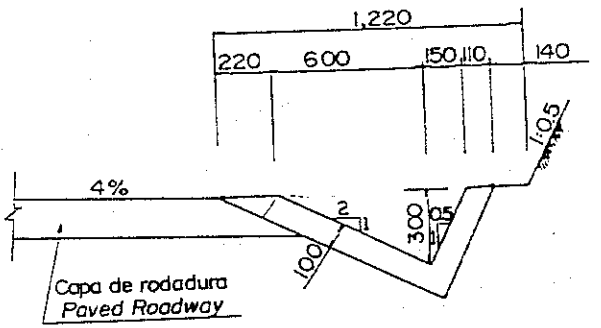
Description	Calculation Details	Unit	Quantity	Remarks
3 1/0	Concrete, class F for side ditch and catch basin			
	(catch basin) per 1 no.			
	1.15 × 1.30 × 2.2			
	− 0.75 × 0.9 × 2.0 = 1.939 m³.			
	1.939 − 0.35²π × 0.2 = 1.862 m³			
	1.862 × 7 = 13.034	m³	13.034	



6-495

Working Division:

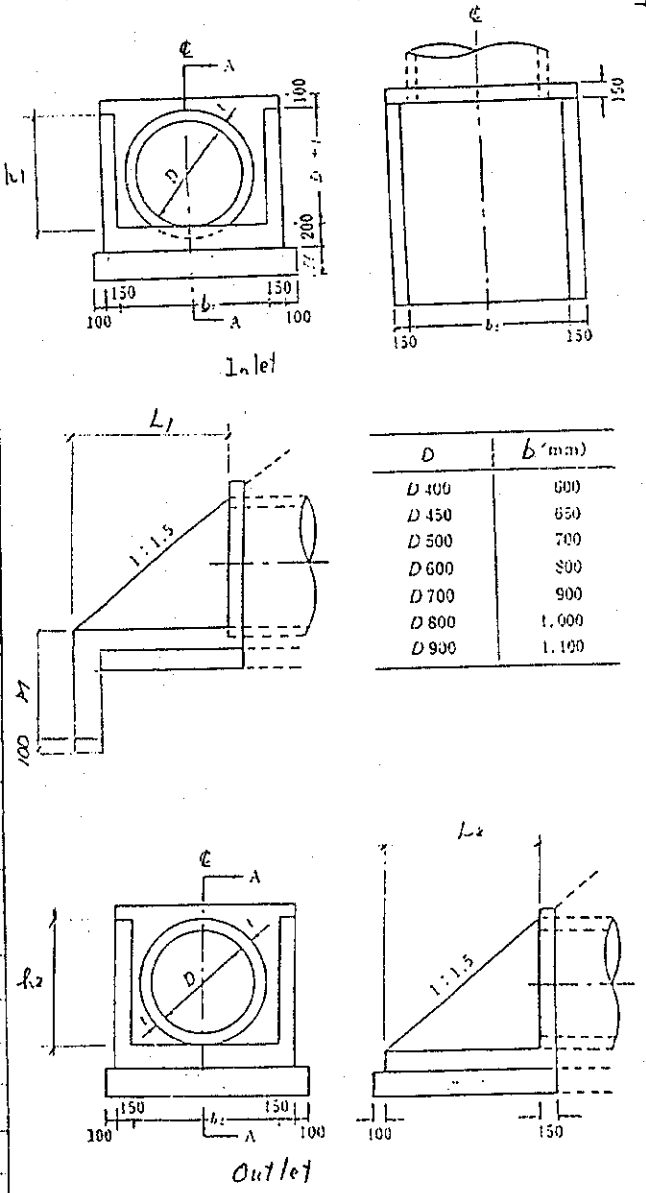
Description	Calculation Details	Unit	Quantity	Remarks
3 110	Concrete, class F. for side ditch and catch basin			
	(Side ditch) per 1 m			
	$1.08 \times 0.432 \times \frac{1}{2}$			
	$- 0.75 \times 0.3 \times \frac{1}{2} = 0.121\ m^3$			
	$0.121 \times 2192.65 = 265.311$	m^3	265.311	



Working Division:

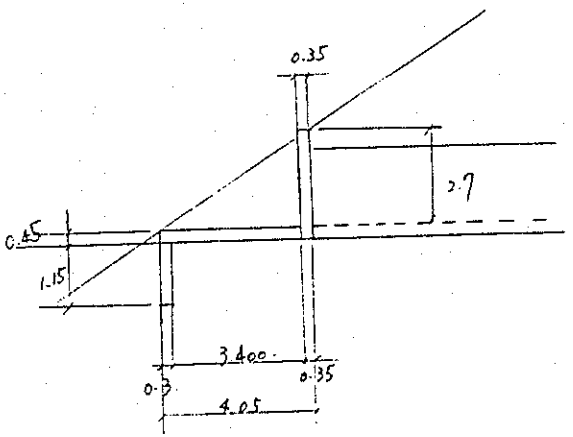
Description	Calculation Details	Unit	Quantity
3 ///	Concrete, class H for levelling concrete		
	1. Ø600 pipe (wing wall)		
	1.1m × 1.125 × 0.1 = 0.124 m³		
	1.1 × 1.20 × 0.1 = 0.132 m³		
	0.256 m³		
	0.256 × 3 = 0.768 0.132 × 7 = 0.924	m³	0.924
	2. Ø800 pipe		
	1.3 × 1.449 × 0.1 = 0.189 m³		
	1.3 × 1.598 × 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



Working Division:

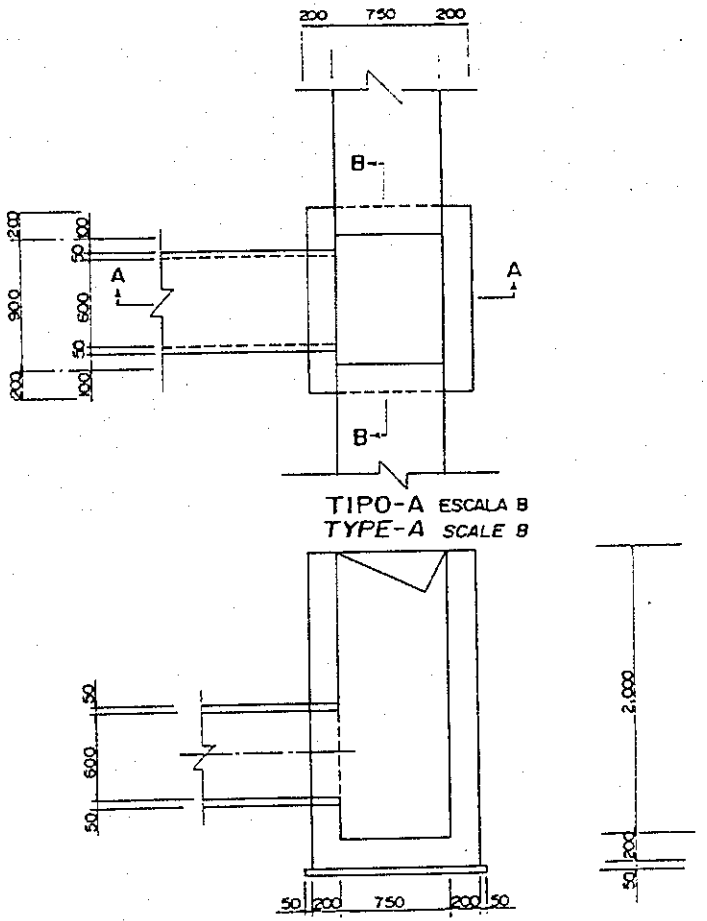
Description	Calculation Details	Unit	Quantity	Remarks
.3 /11	Concrete class H (Wing wall)			
	7. 2.5×2.0 m (II)			
	(Wing) 0.35 × (4.497 × 2 + 4.15) × 0.1 = 0.467			
	(Slab) 3.2 × 3.7 × 0.1 = 1.184			
	1.651 m^3			
	1.651 × 2 × 1 = 3.302	m^3	3.302	



P67-9

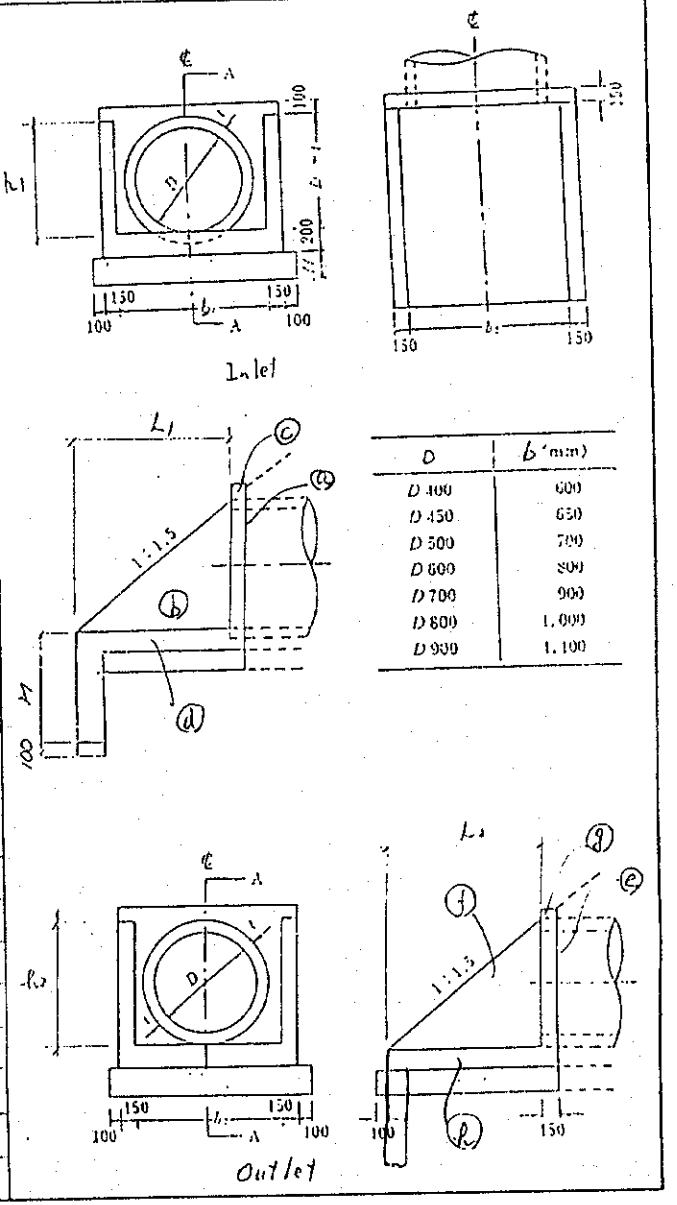
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /11	Concrete class H for levelling concrete			
	(catch basin) per 1 no.			
	1.25 × 1.4 × ~~0.05~~ 0.10 = ~~0.088~~ 0.176 m^3			
	0.176 × 7 nos = 1.232	m^3	1.232	



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) × 0.15/2 × 2 = 0.839 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 × 3 = 17.697	m³	39.047	
	3.05 × 7 = 21.35			

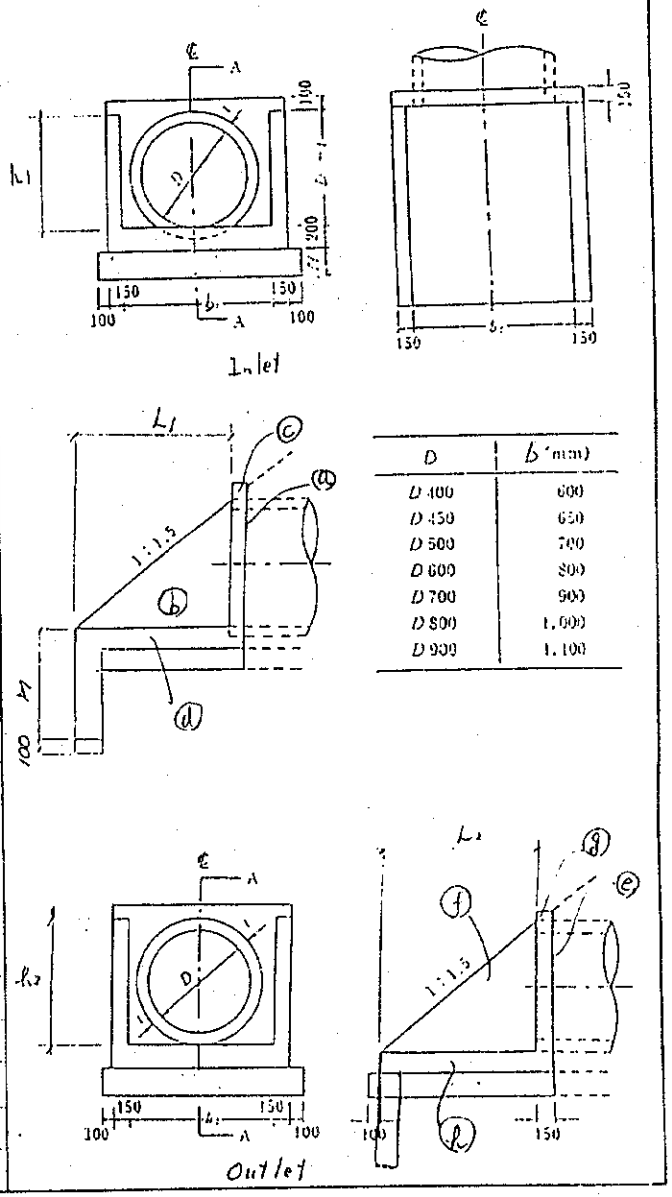


D	b' (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

205-9

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 / 12	Formwork F1 finish			
	(wing wall)			
	2. ϕ800			
	ⓐ 1.3 m × 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	m³	9.101	

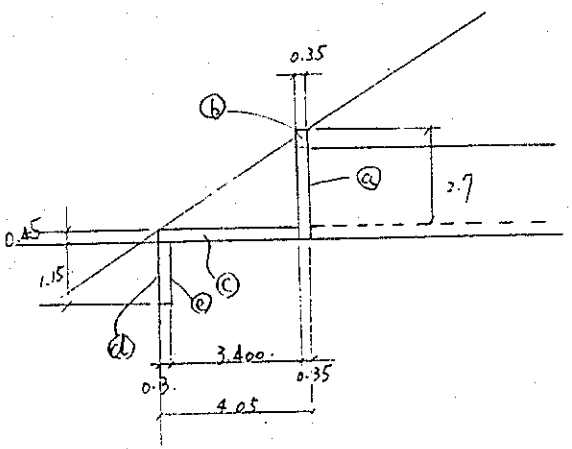


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

(9-7)

Working Division:

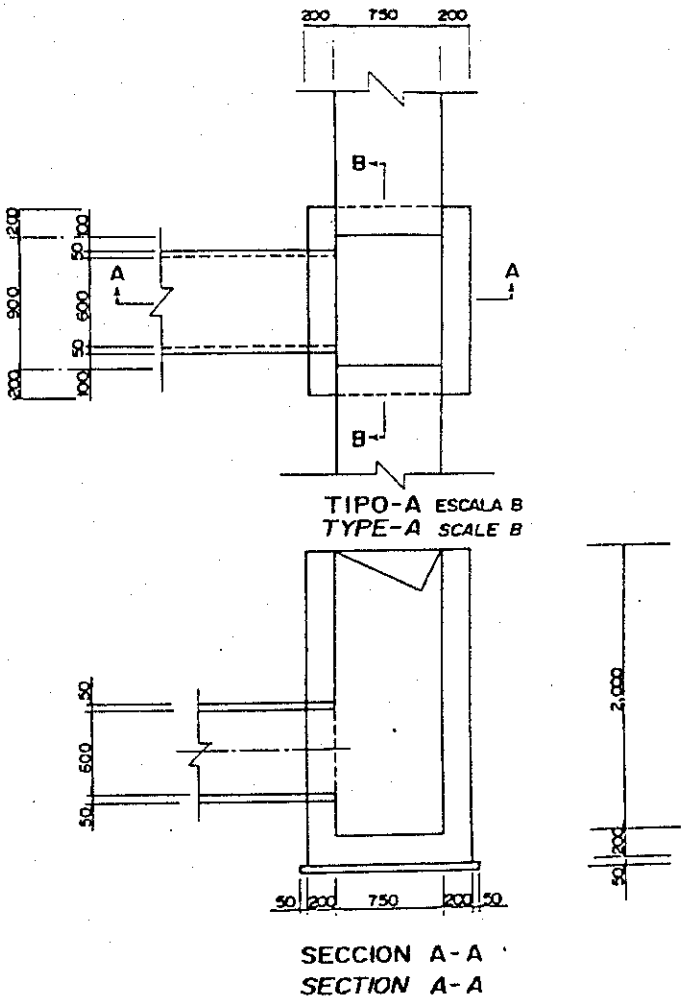
Description	Calculation Details	Unit	Quantity	Remarks
.3 1.12	Formwork FI finish			
	7. 2.5 × 2.0 (II)			
	ⓐ (11.5 + 4.15) × 2.45 × ½ + 0.7 × 11.5			
	− 3.2 × 2.85 = 18.101			
	ⓑ 0.7 × 0.35 × 2 = 0.49			
	ⓒ (3.7 × 1.6 − 3.4 × 1.2) × 2 = 3.68			
	ⓓ 1.6 × 3.2 = 5.12			
	ⓔ 1.2 × 3.2 = 3.84			
	31.231 m²			
	31.231 × 2 × 1 = 62.462	m²	62.462	



(1) 42-9

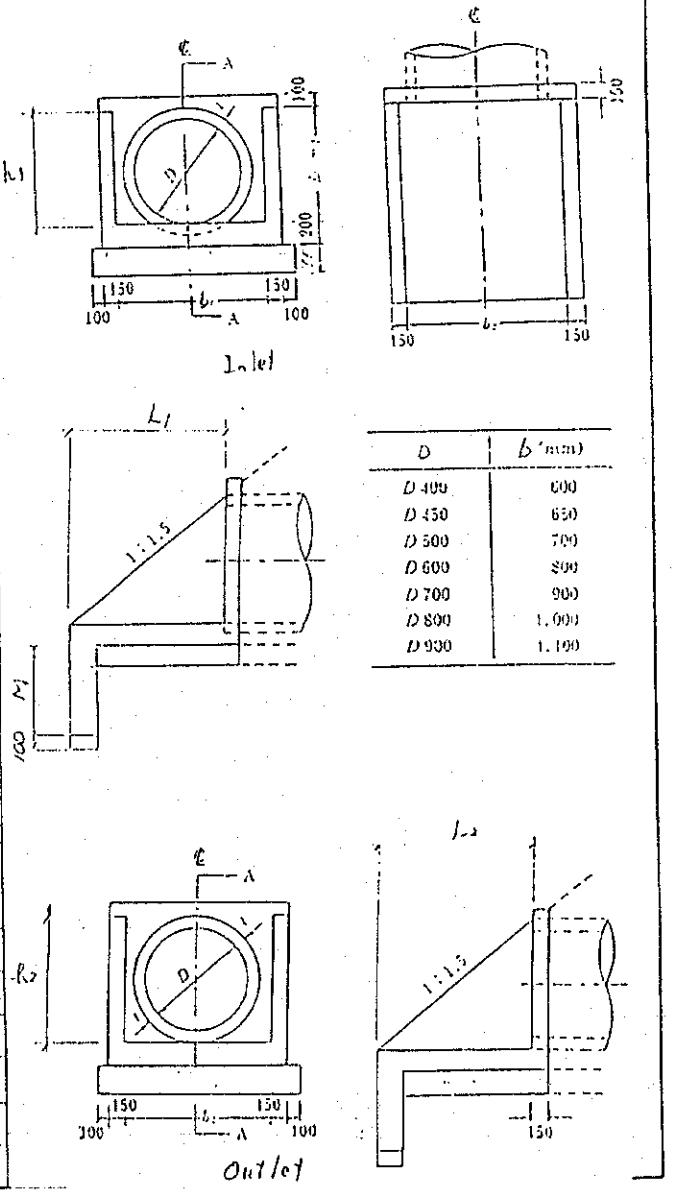
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 12	Formwork FI finish			
	(Catch basin)			
	1.15 × 2.2 × 2 = 5.06			
	1.30 × 2.2 × 2 − 0.35²π = 5.335			
	10.395 m²			
	10.395 × 7 = 72.765 m²	m²	72.765	



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 × 3 = 6.309	m²	14.163	
	1.122 × 7 = 7.859			

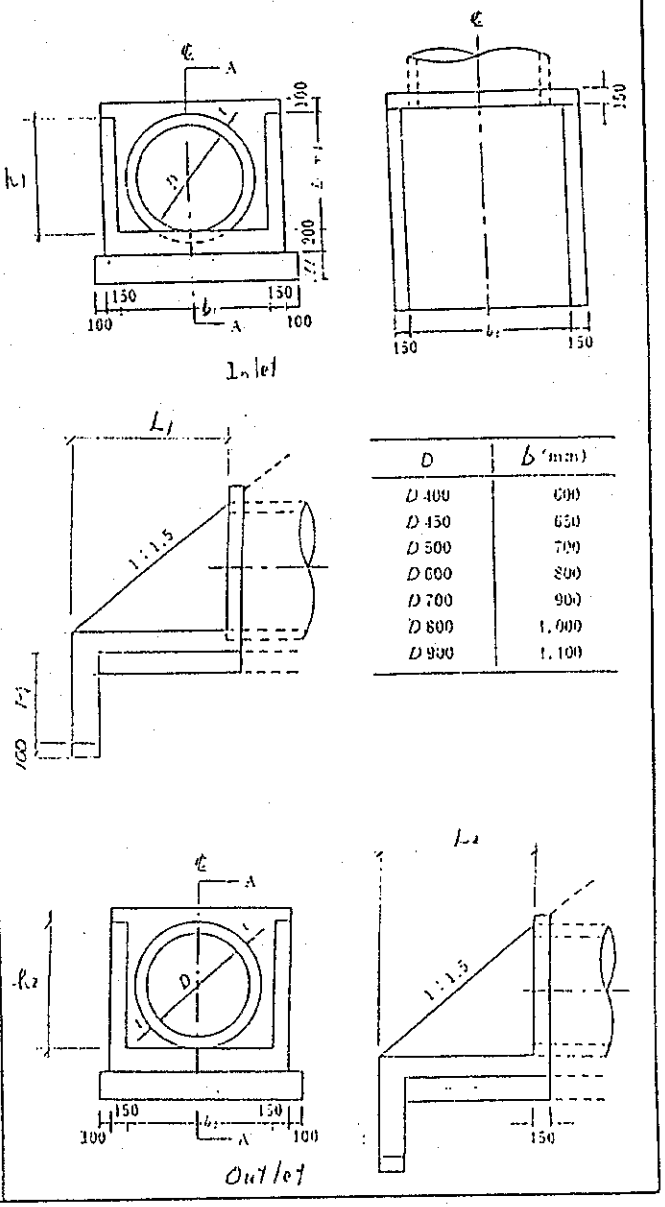


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 930	1,100

F3

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork, F3 finish (curing wall)			
	2 Ø800			
	ⓐ 0.1×1.3+1.0×0.866 − 0.4²π = 0.493 m²			
	ⓑ 1.399×0.866×½×2 = 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	

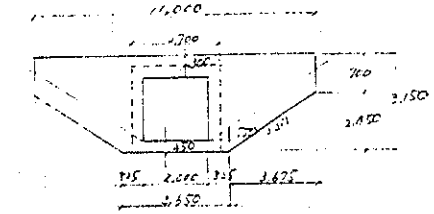


D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

Sag-6

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 1/3	Formwork F3. finish			
	Curing 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			
	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			
	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			
	21.83 x 2 x 1 = 43.66	m²	43.660	



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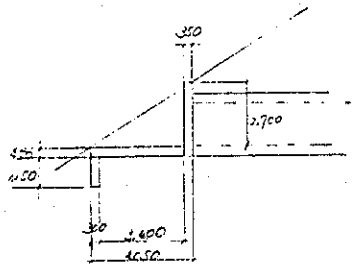

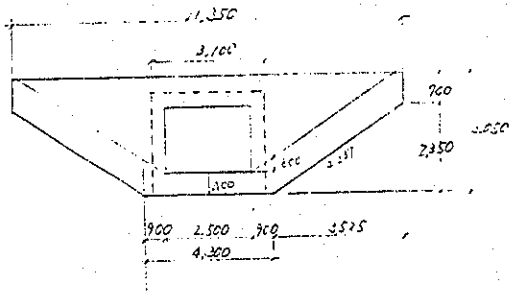

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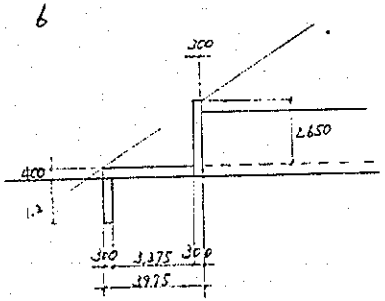

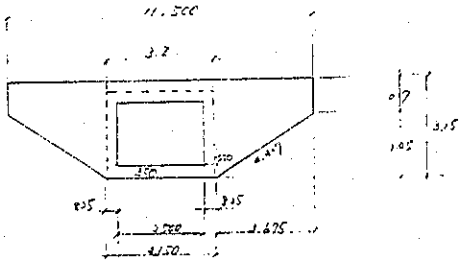

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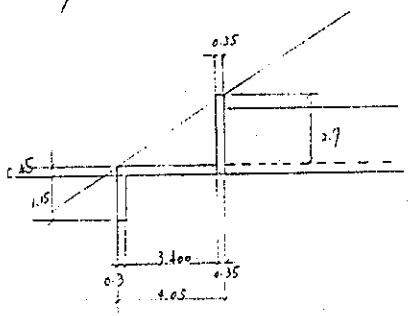
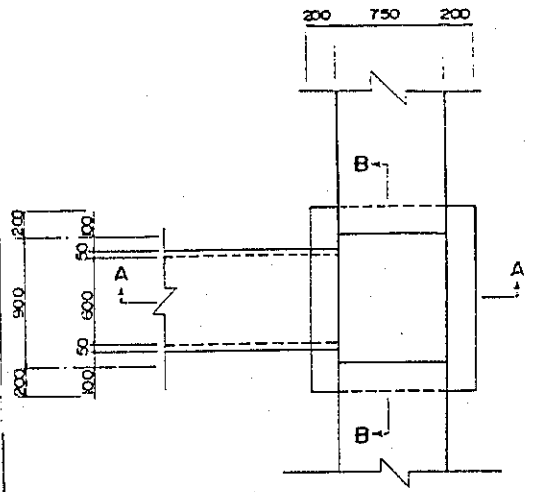


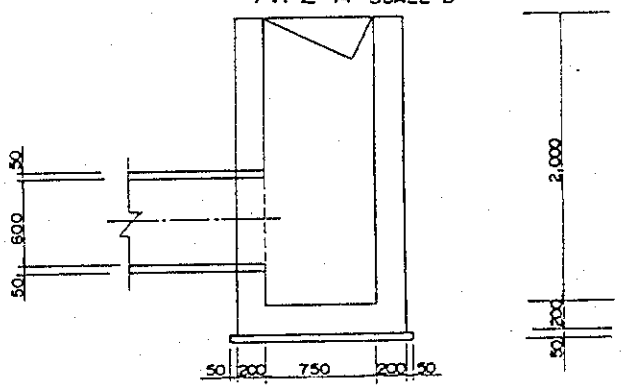
96-506

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork F3 finish			
	(Catch basin)			
	0.75 × 2.0 × 2 = 3.0			
	0.90 × 2.0 × 2 − 0.3[illegible] = 3.317			
	6.317 m².			
	6.317 × 7 = 44.219	m²	44.219	



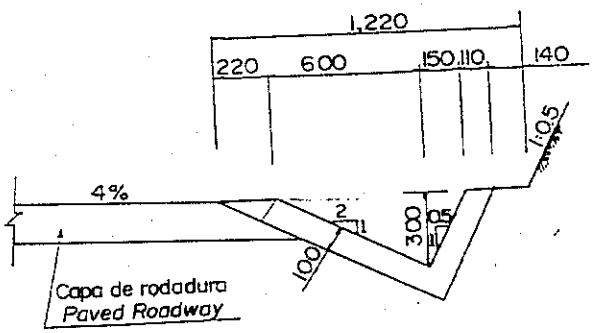
TIPO-A ESCALA B
TYPE-A SCALE B



SECCION A-A
SECTION A-A

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 /13	Formwork F3 finish for concrete item 109 and 110.			
	(Side ditch) per 1m			
	0.671 + 0.335 = 1.006 m^2			
	1.006 × 2192.65 = 2205.806	m^2	2,205.806	



QAP-9

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			
	98.96 x 3 = 296.88			
	0.77 x 80 x 7 = 431.2			
	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			

69-9

Working Division:

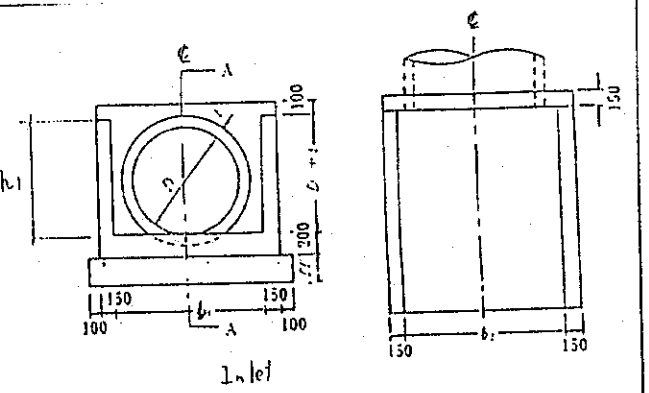
Description	Calculation Details	Unit	Quantity	Remarks
3 1/4	Reinforcing bars for concrete works (Wing wall)			
	6 2.5 x 2.0 m (I)			
	12.073 x 80 = 965.84 kg			
	7 2.5 x 2.0 m (II)			
	13.098 x 80 = 1047.84 kg			
	1047.84 x 2 x 1 = 2095.68			

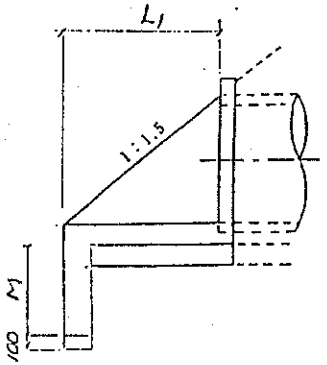
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 114	Reinforcing bars for concrete works			
	(Catch basin)			
	80 kg/ 1m³ of concrete volume			
	1.862 m³ x 80 kg/m³ = 148.96 m³.			
	148.96 × 7 = 1,042.72	ton	1.1	

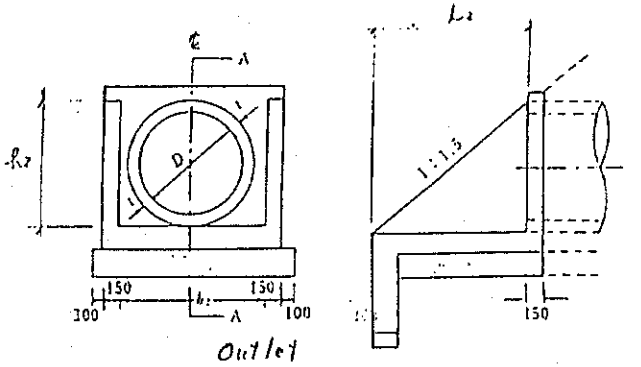
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
3 1/5	Gabion mattress, t = 500 mm			
	(wing wall part)			
	1. ϕ600			
	(0.8 + 0.3) × 5.0 × 0.5 = 2.75 m³			
	2.75 × 2 × 3 = 16.5	m³	20.35	
	2.75 × 0.2 × 7 = 3.85			
	2. ϕ800			
	(1.1 + 0.3) × 5.0 × 0.5 = 3.25 m³			
	3.25 × 2 × 1 = 6.50	m³	6.50	
	3. ϕ1,000			
	(1.2 + 0.3) × 5.0 × 0.5 = 3.75 m³			
	4. 1.2 × 1.2 m			
	(3.434 × 2 + 3.3) × 5.0 × 0.5 = 20.42 m³			
	5. 1.5 × 1.5 m			
	(3.154 × 2 + 3.45) × 5.0 × 0.5 = 24.395 m³			





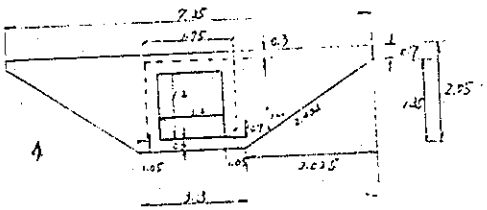
D	b (mm)
D 400	600
D 450	650
D 500	700
D 600	800
D 700	900
D 800	1,000
D 900	1,100

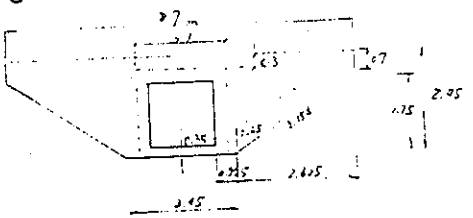


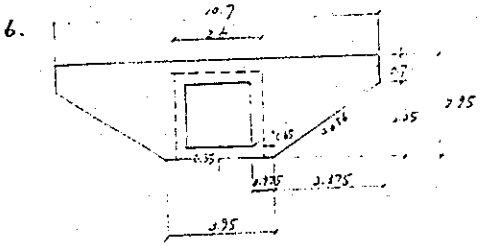
6-512

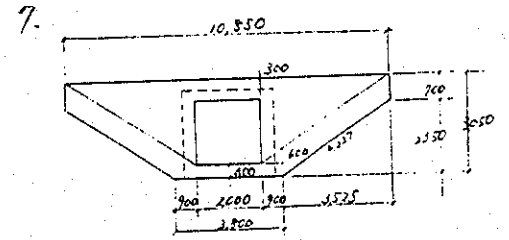
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 /15	Gabion mattress, t = 500 mm (Wing wall)			
	6. 2.0 x 2.0 (I) (4.56 x 2 + 3.95) x 5.0 x 0.5 = 30.155 m³			
	7. 2.0 x 2.0 (II) (4.237 x 2 + 3.8) x 5.0 x 0.5 = 30.685 m³			
	8. 2.0 x 2.0 (III) (4.417 x 2 + 3.65) x 5.0 x 0.5 = 31.21 m³			
	9. 2.5 x 2.0 (I) (4.237 x 2 + 4.3) x 5.0 x 0.5 = 31.935 m³			
	10. 2.5 x 2.0 (II) (4.417 x 2 + 4.15) x 5.0 x 0.5 = 32.46 m³ 32.46 x 2 x 1 = 64.92	m³	64.920	



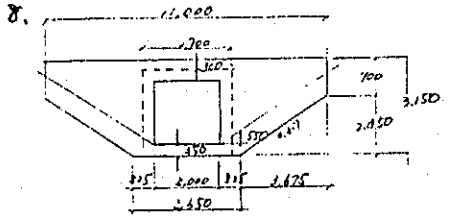




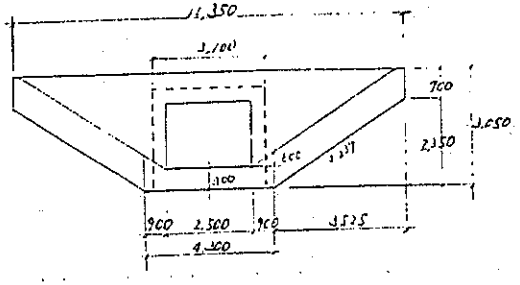


S43-9

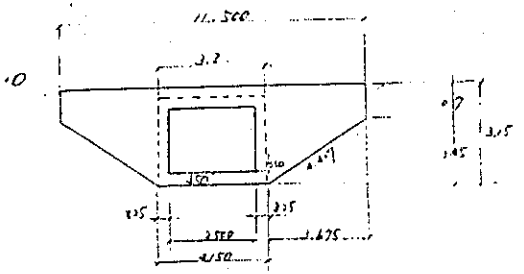
8.


700
3,150
2,450
450
1,500
325
2,000
325
2,675
5,650

9


1,350
700
2,450
2,350
300
900
2,500
900
3,525
4,300

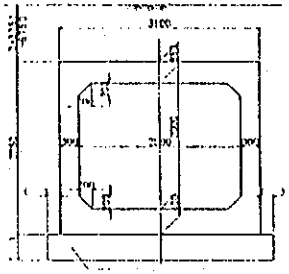
10


3,315
450
325
325
2,500
2,675
5,450

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
.3 116	Joint Filler t=10 mm			
	6 2.5×2.0 (I)			
	3.1×2.75 - 2.5×2 = 3.525			
	7 2.5×2.0 (II)			
	3.2×2.85 - 2.5×2 = 4.120 m²			
	4.120×3 = 12.36	m²	12.36	

6



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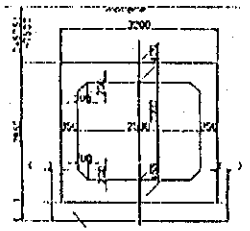
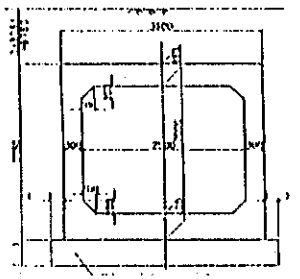
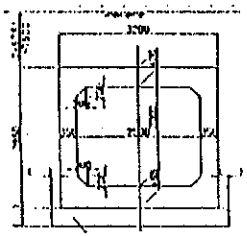


Working Division:

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			
	7 2.5×2.0 (II)			
	3.3×2.85-2.5×2 = 4.120 m²			
	4.12×2 = 8.24	m²	8.24	7. 

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