Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	+ 4.3×1.95×2 + 1/2×1.0×π×2.25 − 0.3×0.6			
	×2 − 0.9²×π×1/4×2 = 100.7m²			
	a = 1.0×4×1.0 = 4.0m² (drain pit)			
	Subtotal a5 = 1,058.3 m²			
	Concrete facing wall			
	Inlet channel			
	a = (26.2+16.2)/2 × 5.590 = 118.5m²			
	Mancha Grande outlet			
	a = (10.671+3.171)/2 × 8.385 = 58.0m²			
	Subtotal a6 = 176.5 m²			
	Secondary concrete in inlet shaft			
	a7 = (3.0+8.6+3.0)×3.25 = 47.5m²			
	Total			
	A = 292.5 + 259.3 + 177.8 + 91.5 + 1,058.3			
	+ 176.5 + 47.5 = 2,103.4m²	m²	2,103	
114	Formwork, F3 finish, for concrete			
	of Items 101, 103, 105 and 107			
	Inlet culvert			
	Wing wall			
	a = (1/2×4.1×4.1 + 1/4×0.5×π)×2 = 17.6m²			
	Culvert			
	a = 1/4×0.5×4.5 = 0.6m²			

5-1-1-57

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	$a = \{4.1 \times 2.3 + (0.1 \times 2 + 0.15) \times 4.1 - 1/2 \times 1.306$			
	$\times 0.341\} \times 2 + 0.1 \times 2 \times 4.0 = 22.1 m^2$			
	$a = \{2.795 \times 3.2 + (2.795 + 2.5)/2 \times 0.590$			
	$+ 2.5 \times 0.910\} \times 2 = 25.6 m^2$			
	$a = (0.320 + 1.159 + 3.608 + 0.699 + 0.765)$			
	$\times 4.0 = 26.2 m^2$			
	Subtotal $a_1 = 92.1 m^2$			
	Inlet tunnel (Form, F4 finish)			
	$a = (2.5 \times 2 + 4.0 + 4.0 \times \pi \times 1/2 + 0.5 \times 2)/2$			
	$\times 6.0 = 48.8 m^2$			
	$a = (4.0 \times \pi \times 1/2 + 0.5 \times 2) \times 27.5 = 200.3 m^2$			
	Subtotal $a_2 = 249.1 m^2$			
	Inlet shaft			
	$a = (4.3 \times 2 + 1/2 \times 1.0 \times \pi) \times 3.0$			
	$+ 3.8 \times 3.0 \times 2 - 0.9^2 \times \pi \times 2 = 48.2 m^2$			
	$a = 3.8 \times 4 \times (EL.\ 90.05 - EL.\ 82.45)$			
	$= 115.5 m^2$			
	$a = (2.5 \times 2 + 2.5) \times 1.0 = 7.5 m^2$			
	Subtotal $a_3 = 171.2 m^2$			
	Concrete facing wall			
	Inlet channel			
	$a = 6.505 \times 5.0 \times 2 = 65.1 m^2$			

5-1-154

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	Mancha Grande outlet			
	a= (53.75+50.0)/2 x 8.385 x 2 = 869.9m²			
	a= (8.385+10.607)/2 x 10.0 x 2 = 189.9m²			
	Subtotal a4 = 1,124.9 m²			
	Plug and secondary concrete			
	a = 4.0² x π x 1/8 + 4.0 x 0.5 − 0.9² x π			
	x 1/4 x 2 = 7.0 m²			
	a= (3.8+0.379+1.178+3.071+1.178+0.4)			
	x (EL.93.05 − EL.90.05) x 2 = 60.0 m²			
	a = (1.697 x 0.3 + 1/2 x 1.697 x 0.938)			
	x 4 x 2 = 10.4 m²			
	subtotal a5 = 77.4 m²			
	Total area			
	A = 92.1 + 171.2 + 1,124.9 + 77.4			
	= 1,465.6 m²	m²	1,466	
115	Formwork, F3 finish, for concrete			
	of Item 106			
	Drain ditch and catch basin			
	(Poza Honda inlet)			
	a1 = 0.5 x 2 x (76.0+9.0)			
	+ 0.8 x 4 x 0.8 = 87.6 m²			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	Drain ditch (Mancha Grande outlet)			
	$a_2 = 0.5 \times 2 \times 410.0 = 410.0\ m^2$			
	Total area			
	$A = 87.6 + 410.0 = 497.6\ m^2$	m^2	498	
116	Formwork, F4 finish, for concrete of Item 104			
	Tunnel transition part			
	$a_1 = (2.5 + 2.5 \times 2 + 6.047\ m)/2 \times 10.0\ m$			
	$= 67.7\ m^2$			
	Tunnel			
	$a_2 = 6.047 \times 4{,}074.938 = 24{,}641.2\ m^2$			
	Tunnel outlet part			
	$a_3 = (6.047 + 2.5 \times \pi \times 1/2 + 1.25 \times 2)/2$			
	$\times 10.0 = 62.4\ m^2$			
	Total area			
	$A = 67.7 + 24{,}641.2 + 62.4$			
	$= 24{,}771.3\ m^2$	m^2	24,771	
117	Formwork, F4 finish, for concrete of Item 103			
	$A = (2.5 \times 2 + 4.0 + 4.0 \times \pi \times 1/2 + 0.5 \times 2)/2$			

95-1-56

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	$\times 6.0 + (4.0 \times \pi \times 1/2 + 0.5 \times 2) \times 27.5$			
	$= 249.1 m^2$	m^2	249	
118	Rainforcing bars for concrete works			
	Concrete Works of Item 101			
	Foundation concrete of valves			
	$w = 0.3 m^3 \times 40 kg/m^3 = 12.0 kg$			
	Corner buffer			
	$w = 3.6 m^3 \times 30 kg/m^3 = 108.0 kg$			
	Subtotal $w1 = 120 kg$			
	Concrete Works of Item 102			
	Floor slab			
	$w = (30.2 + 26.9 + 6.2) \times 80 kg/m^3$			
	$= 5,064 kg$			
	Beam			
	$w = (76.9 + 39.1 + 7.3) \times 120 kg/m^3$			
	$= 14,796 kg$			
	Stair			
	$w = 10.8 \times 100 kg/m^3 = 1,080 kg$			
	Subtotal $w2 = 20,940 kg$			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	Concrete Works of Item 103			
	Inlet culvert			
	w = 84.3 x 60 kg/m³ = 5,058 kg			
	Inlet tunnel			
	w = 316.9 x 70 kg/m³ = 22,183 kg			
	Inlet shaft			
	1,938.4 x 60 kg/m³ = 116,304 kg			
	Subtotal w3 = 143,545 kg			
	Concrete Works of Item 104			
	Tunnel inlet and outlet part			
	w = (75.7 + 57.9) x 70 kg/m³ = 9,352 kg			
	Tunnel			
	w = 0			
	Subtotal w4 = 9,352 kg			
	Concrete Works of Item 105			
	Poza Honda inlet			
	w = (21.3 + 35.6) x 30 kg/m³ = 1,707 kg			
	Mancha Grande outlet			
	w = (17.4 + 261.0 + 57.0 + 95.1) x 30 kg/m³			
	= 12,915 kg			
	Subtotal w5 = 14,622 kg			

5-1-1-150

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	Concrete Works of Item /06			
	Drain ditch and catch basin			
	$w6 = 92.7 \times 30\,kg/m^3 = 2,781\,kg$			
	Concrete Works of Item/07			
	Plug and secondary concrete			
	$w7 = 0\,kg$			
	Concrete Works of Items/08 and /09			
	$w8 = 0.\,kg$			
	Total weight			
	$W = 120 + 20,940 + 143,545 + 9,352 + 14,622 + 2,781 = 191,360\,kg$	ton	192	
/19	Shotcrete in tunnel and inlet structure			
	Inlet tunnel			
	$v1 = (1.28^{m^2} + 1.053^{m^2})/2 \times 6.0 + 1.053^{m^2} \times 31.5 + 1.155^{m^2} \times 1.0 = 41.3\,m^3$			
	Inlet shaft			
	$v2 = 8.794\,m^2 \times (EL.112.2 - EL.88.7)$			

5-1-159

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	+6.15×(EL.88.7−EL.81.35)×0.15×2			
	+10.95×(EL.88.7−EL.81.35)×0.15×2			
	−(5.8²×π×1/8+5.8×1.3)×0.15			
	−4.3×4.2×0.15 = 238.5m³			
	Tunnel transition part			
	V3 = 1.25m²×1.0 + (1.13m²+0.967m²)/2			
	×9.0 = 10.7m³			
	Tunnel type II			
	V4 = 0.868m²×474.938 = 412.2m³			
	Tunnel type III			
	V5 = 1.314m²×3,500 = 4,599m³			
	Tunnel type IV			
	V6 = 0.873m²×100 = 87.3m³			
	Tunnel outlet part			
	V7 = 0.967m²×10.0 = 9.7m³			
	Total volume			
	V = 41.3+238.5+10.7+412.2			
	+4,599.0+87.3+9.7 = 5,398.7	m³	5,399	
120	Steel wire mesh for Item 1019			

5-1-160

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	Inlet tunnel			
	a1 = (12.8 + 10.53)/2 × 6.0			
	+ 10.53 × 31.5 + 11.55 × 1.0			
	= 413.2 m²			
	Inlet shaft			
	a2 = 58.629m × 23.5 + 6.15 × 7.35 × 2			
	+ 10.95 × 7.35 × 2 − 5.8² × π × 1/8			
	− 5.8 × 1.3 − 4.3 × 4.2 = 1,590.3 m²			
	Tunnel transition part			
	a3 = 12.5 × 1.0 + (11.3 + 9.67)/2 × 9.0			
	= 106.9 m²			
	Tunnel type II			
	v4 = 8.681 × 474.938 = 4,122.9 m²			
	Tunnel type III			
	v5 = 8.76 × 3,500 = 30,660 m²			
	Tunnel type IV			
	v6 = 8.732 × 100 = 873.2 m²			
	Tunnel outlet part			
	v7 = 9.67 × 10.0 = 96.7 m²			
	Total area			
	A = 37,863.2 m²	m²	37,863	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
121	Shotcrete with wire mesh			
	t = 100 mm			
	A = 1,483 + 3,963 = 5,446	m²	5,446	
122	Shotcrete with wire mesh			
	t = 50 mm			
	A = 148 m²	m²	148	
123	Anchor bars, D25 mm for concrete facing wall			
	Inlet channel			
	N = (65.1 + 118.5)/9.0 = 20 nos			
	l1 = 20 x 3.0 = 60 m			
	Mancha Grande outlet			
	N = (58.0 + 869.9 + 189.9)/9.0 = 124 nos			
	l2 = 124 x 3.0 = 372 m			
	Total length			
	L = 60 + 372 = 432 m	m	432	
124	P.V.C. water stop, type B			
	Inlet tunnel			
	l1 = 4.4 x 2 + 2.9 x 2 + (4.4 x π x 1/2 + 0.7 x 2 + 4.4)			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	$\times 2 + (4.0 \times \pi \times 1/2 + 0.5 \times 2 + 4.0)$			
	$\times 2 = 62.6$ m			
	Inlet shaft			
	$l2 = 2.5 \times 4 \times 2 = 20.0$ m			
	Total length			
	$L = 62.6 + 10.0 = 72.6$ m	m	73	
125	Bituminous coating for contraction joint			
	Inlet tunnel			
	$a1 = 5.0 \times 3.5 - 4.0 \times 2.5$			
	$+ 5.2^2 \times \pi \times 1/8 + 5.2 \times 1.1 - 4.0^2 \times \pi \times 1/8$			
	$- 4.0 \times 0.5 + 5.4^2 \times \pi \times 1/8 + 5.4 \times 1.3$			
	$- 4.0^2 \times \pi \times 1/8 - 4.0 \times 0.5$			
	$= 25.7$ m^2			
	Tunnel transition part and outlet part			
	$a2 = 4.1 \times 4.1 - 2.5 \times 2.5 + (3.7^2 \times \pi$			
	$\times 1/8 + 3.7 \times 1.85 - 3.3173 \times 1.25^2)$			
	$\times 2 = 24.6$ m^2			
	Facing wall			
	Inlet channel			
	$a = \{(1.074 + 0.5)/2 \times 0.5 + 4.1 \times 0.424\} \times 2$			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	+ 5.926 × 0.3 = 6.0 m²			
	Mancha Grande outlet			
	a = (9.503 × 0.3 × 2 + 0.5 × 2.5) × 6			
	= 41.7 m²			
	Subtotal a3 = 47.7 m²			
	Total area			
	A = 25.7 + 24.6 + 47.7 = 98.0 m²	m²	98	
126	P.V.C. pipe D. 50 mm for weephole			
	Facing concrete			
	Inlet channel			
	N1 = 118.5 / 4.0 m² = 30 nos			
	Mancha Grande outlet			
	N2 = {(10.671 + 5.171) / 2 × 6.149} / 4.0 m²			
	= 12 nos			
	N3 = (869.9 + 189.9) × 0.75 / 4.0 = 198 nos			
	L1 = (30 + 12 + 198) × 0.4 = 96 m			
	Shotcrete			
	N = (5.446 + 198) / 4.0 m² = 1398 nos			
	L = 1398 × 0.2 m/no = 279.6 m			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	Total length			
	L = 96 + 279.6 = 375.6 m	m	376	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
8.5	MISCELLANEOUS METAL WORKS			
101	Embedded metal			
	D.16mm anchor bars			
	$N_1 = (2.5 \times 4 \times 2 + 3.0 \times 4 \times 4)/0.5 = 136$ nos			
	$N_2 = (8.6 \times 2 + 3.0 \times 2)/0.5 = 46$ nos			
	$W1 = (136 + 46) \times 0.4 \times 1.56$ kg/m $= 113.6$ kg			
	Joint bar			
	$N = 2.0 \times 4 \times 2/0.3 \times 2 = 106$ nos			
	$W2 = 106 \times 1.0 \times 1.56 = 165.4$ kg			
	Embedded hook			
	$W3 = 0.8 \times 2.984$ kg/m $\times 5$ nos			
	$+ (0.25 \times 0.15 \times 0.01 \times 7,850) \times 5$ nos			
	$= 26.7$ kg			
	Total weight			
	$W = 113.6 + 165.4 + 26.7 = 305.7$ kg	kg	306	
102	Steel pipe handrail			
	$W1 = (2.8 + 1.3) \times 17.0$ kg/m $= 69.7$ kg			
	$W2 = (2.9 \times 4 \times 4 + 3.4 \times 4 \times 2) \times 17.0$			
	$= 1,251.2$ kg			
	Stair			
	$W3 = (14.3 + 14.3 + 3.9) \times 17.0 = 552.5$ kg			
	Total weight			
	$W = 69.7 + 1,251.2 + 552.5 = 1,873.4$	kg	1,874	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
103	Steel ladder			
	W = (EL. 95.5 − EL. 93.05) × 15.0 kg/m			
	× 2 = 73.5 kg	kg	74	
104	Steel step (2.69 kg/no)			
	N = (EL. 93.05 − EL. 90.05)/0.35			
	= 8 nos			
	N = (EL. 93.05 − EL. 82.45)/0.35			
	= 30 nos			
	N = (EL. 93.05 − EL. 89.8)/0.35			
	= 9 nos			
	W = (8×2 + 30×2 + 9) × 2.69			
	= 228.7 kg	kg	229	
105	Steel pipes for water level gauge			
	D. 400 mm			
	w1 = (EL. 96.0 − EL. 89.05) × 77.6 kg/m			
	= 539.3 kg			
	D. 200 mm			
	w2 = 0.35 × 2 × 30.1 kg/m = 21.07 kg			
	Total weight			
	W = 539.3 + 21.07 = 560.4 kg	kg	561	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
106	Grating and hatch cover			
	Hatch cover (2.5 x 2.5 m size)			
	PL - 2,600 x 2,650 x 4.5 : W1 = 243.4			
	H - 150 x 150 x 7 x 10 x 2,650 : W2 = 83.5			
	L - 6 x 75 x 75 x 2,650 x 2 : W3 = 36.3			
	L - 4 x 50 x 50 x 2,600 x 2 : W4 = 15.9			
	L - 4 x 50 x 50 x 2,550 x 4 : W5 = 31.2			
	L - 4 x 50 x 50 x 2,300 x 3 : W6 = 21.1			
	PL - 200 75 x 9 x 2 nos : W7 = 2.1			
	433.5 kg			
	Hatch cover (3.0 m x 3.0 m size)			
	PL - 3,100 x 3,150 x 4.5 : W1 = 344.9			
	H - 150 x 150 x 7 x 10 x 3,150 : W2 = 99.2			
	L - 6 x 75 x 75 x 3,150 x 2 : W3 = 43.2			
	L - 4 x 50 x 50 x 3,100 x 2 : W4 = 19.0			
	L - 4 x 50 x 50 x 2,950 x 4 : W5 = 36.1			
	L - 4 x 50 x 50 x 2,800 x 5 : W6 = 42.8			
	PL - 200 x 75 x 9 x 2 nos : W7 = 2.1			
	587.3 kg			
	Grating (w = 4.3 m)			
	H - 150 x 150 x 7 x 10 x 3,100 x 1 : W1 = 97.7			
	L - 4 x 50 x 50 x 3,100 x 2 nos : W2 = 19.0			
	L - 4 x 50 x 50 x 4,600 : W3 = 14.1			
	PL - 100 x 9 x 4,600 x 2 nos : W4 = 65.0			
	FB - 50 x 5 x 3,100 x 152 nos : W5 = 924.7			
	FB - 70 x 3 x 4,600 x 30 nos : W6 = 65.0			
	1,185.5 kg			

5-1-160

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	Grating (3.0 x 3.0 m)			
	L-4x50x50x3,100x4nos : W1 = 37.9			
	PL-50x9x3,100x2nos : W2 = 21.9			
	PL-50x9x550x2nos : W3 = 3.9			
	FB-50x5x3,100x36nos : W4 = 219.0			
	FB-20x3x550x31nos : W5 = 8.0			
	290.7kg			
	Total weight			
	W = 433.5x2 + 587.3x2			
	+ 1,185.5 + 290.7x2 = 3,808.5kg	kg	3,809	
101	Wire net fence			
	W = 7.0 x 13.0 kg/m = 91 kg	kg	100	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
8.6	CONVERGENCE MEASUREMENT			
101	Measurement of horizontal convergence			
	Required number of measurement point n = 4,095m / (116.91/3) ≒ 105 points			
	Required number of measurement N = 105 × 20 = 2,100 nos	nos	2,100	
102	Measurement of diagonal convergence	nos	2,100	
103	Measurement of roof settlement	nos	2,100	
104	Measurement of invert upheaval	nos	2,100	
105	Stress measurement of rock bolts			
	Required number of measurement point			

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
	n = 4,095/(116.91 x 2) ≒ 18 points			
	Required number of measurement N = 18 x 25 = 450	nos	450	
106	Stress measurement of shotcrete	nos	450	
107	Stress measurement of steel support			
	Required number of measurement point n = 2 points			
	Required number of measurement N = 2 x 20 = 40	nos	40	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
8.9	MISCELLANEOUS			
101	Trash boom			
	$L = 80 \times \pi \times 1/2 \doteqdot 125$ m	m	125	
102	Staff gauge			
	Inclinend length ($\angle = 22.5°$)			
	$L = 18.0 / \tan 22.5° \doteqdot 43.5$ m	L.S.		

Working Division: Poza Honda Work Adit

Description	Calculation Details	Unit	Quantity	Remarks
11.1	EARTH WORKS			o drain ditch
☆ 101	clearing the site for adit portal	m^2	1,570	0.3×0.3 with gravel 19 m without gravel 48 m
☆ 102	Open-cut excavation, in common, for adit portal	m^3	3,688	0.5×0.5 with cover and gravel 63 m without cover with gravel 1.0 m
				o Catch basin 1 no.
☆ 103	Open-cut excavation, in weathered rock, for adit portal	m^3	2,013	o Tunnel
				Type I
☆ 104	Open-cut excavation, in rock for adit portal	m^3	106	Type II
				Type I with lining
105	Underground excavation, all classes, in adit	m^3	3335.315	Type II with lining
				L1 inclined = 83.761 m
106	Trench excavation, all classes, for drain ditch and catch basin	m^3	35.981	L2 level = 86.596 m
	34.566			Horizontal length 167.856 m
	+ 1.415			
	= 35.981			

5-1-173

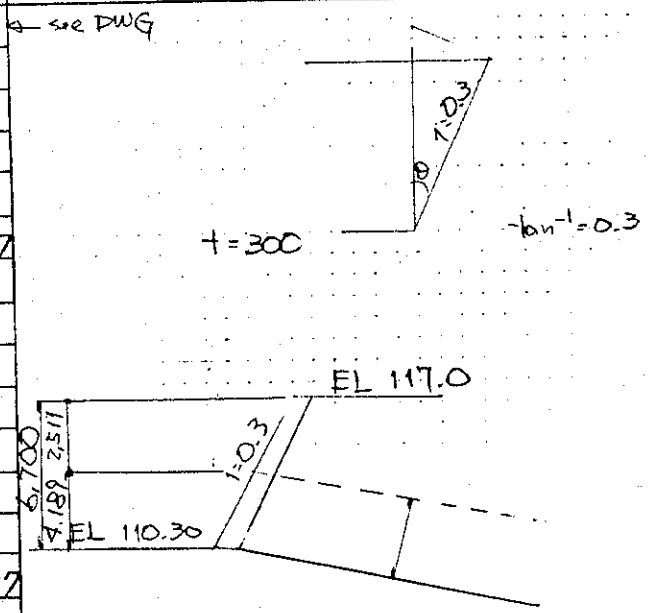
Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
107	Permanent steel support H-125 × 125 mm	Ton	9.282	
108	D.25 mm rock bolts in adit tunnel	m	2428	
109	Backfilling for adit portal	m^3	133.849	
110	Backfilling	m^3	14.184	
	drain dith : 13.670 m^3			
	catch basin : 0.514 m^3			
	Total : 14.184 m^3			
☆ 111	Gravel surfacing	m^3	75	← t=0.1 m
				$13 \times \frac{14+29}{2} + 9 \times \frac{29+25}{2} + \frac{25+20}{2} \times 10$
112	Gravel bedding for drain and catch basin	m^3	1.804	$= 75\ m^3$
	drain ditch : 1.740 m^3			
	catch basin : 0.064 m^3			
	total : 1.804 m^3			
113	Wet rubble masonry	m^3	10.000	

5-1-174

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
☆ 114	Sod facing	m^2	516	← see DWG
2	CONCRETE WORKS			
101	Concrete, class D, for lining concrete of adit tunnel	m^3	609.417	
☆ 102	Concrete, class E, for concrete facing walls ~~and portal structure~~	m^3	48	
103	Concrete, class F, for drain ditch and catch basin drain ditch : 9.875 m^3 catch basin : 0.182 m^3 Total : 10.057 m^3	m^3	10.057	
104	Concrete, class H, for levelling concrete of drain ditch and catch basin drain ditch : 1.386 m^3 catch basin : 0.019 m^3 Total : 1.405 m^3	m^3	1.405	



$$V = \frac{1}{\cos\theta}\{6.7\times(5.0+5.0+2.010+8.0)+2.511\times 8.0\}\times 0.3$$

$$= 48.3\,m^3$$

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
☆ 105	Formwork, F1 finish, for concrete of Item 102	m^2	2.1	$0.3 \times 6.7 \times \frac{1}{\cos\theta} = 2.1\ m^2$
106	Formwork, F1 finish, for concrete of Item 103 drain ditch : 71.840 m^2 catch basin : 1.762 m^2 Total : 73.602 m^2	m^2	73.602	
☆ 107	Formwork, F2 finish, for concrete of Item 102	m^2	161	$A = V/t = 48.3/0.3 = 161$
108	Formwork, F3 finish, for concrete of Item 103 drain ditch : 47.7 m^2 catch basin : 0.65 m^2 Total : 48.35 m^2	m^2	48.350	
109	Formwork, F4 finish, for concrete of Item 101	m^2	890.467	

Working Division:

Description	Calculation Details	Unit	Quantity	Remarks
☆ /10	Reinforcing bars for concrete works	Ton	1.4	48 × 0.03 = 1.4 ton
	Facing concrete 30 kg/m³			
	∴			
/11	Shotcrete in adit tunnel	m³	208.911	
/12	Steel wire mesh for Item /11	m²	1974.440	
☆ /13	Anchor bars. D.25 mm for concrete facing wall	m	54	l = 3,000 1 no/9 m² L = 161/9 × 3.0 = 54 m
☆ /14	P.V.C pipe D.50 mm for weephole	m	38	1 no/4 m² l = 40 cm for concrete facing 1 no/4 m² l = 20 cm for shotcrete 161/4 × 0.4 + 96/4 × 0.2 = 21 m
	Adit portal : 21 m Adit tunnel : 17 m Total : 38 m			
☆ /15	Shotcrete, t = 100 mm	m²	96	← see dwg

5-1-177

Working Division: POZA HONDA WORK ADIT

Section No.	Distance	Excavation common			Excavation W. rock & rock			Remarks
		Sectional Area	Mean	Volume	Sectional Area	Mean	Volume	
	m	m²	m²	m³	m²	m²	m³	
O		0			0			
A	14.8	90	45	1,332	40	20	296	
℄ Work Adit	10.0	111	100.5	1,005	82	61	610	
B	5.0	114	112.5	562.5	128	105	525	
C	10.0	23	68.5	685	5	66.5	665	
O'	9.0	0	11.5	103.5	0	2.5	22.5	
				3,688 m³			2,118.5	95% W.R
							2,119 m³	5% Rock
							W. rock	2,013 m³
		Clearing					rock	106 m³
O		0						
A	14.8	50	25	370				
℄ Work Adit	10.0	58	54	540				
B	5.0	56	57	285				
C	10.0	10	33	330				
O'	9.0	0	5	45				
				1,570 m²				

61.8.

N.K. Form No. 2312

5-1-178

1994/9/20 10:08 AM qty, adit

Type I L= 41.8805 m

Item	Unit	Q'ty
Excavation	16.843 m3	705.393 m3
Concrete	- m3	0.000 m3
Shotcrete	1.076 m3	45.063 m3
Wire mesh	10.76 m2	450.634
Rockbolt	34 m/2.4m	594.000 m
Steel support	- ton/1.2m	0.000 ton
Weephole	- m/2.5m	0.000 m

Type II L= 41.8805 m

Item	Unit	Q'ty
Excavation	17.685 m3	740.657 m3
Concrete	- m3	0.000 m3
Shotcrete	1.369 m3	57.334 m3
Wire mesh	10.952 m2	458.675
Rockbolt	34 m/2.4m	594.000 m
Steel support	0.273 ton/1.2m	9.282 ton
Weephole	- m/2.5m	0.000 m

Type I with concrete L= 86.596 m

Item	Unit	Q'ty
Excavation	21.817 m3	1,889.265 m3
Concrete	5.885 m3	509.617 m3
Form	10.283 m2	890.467
Shotcrete	1.23 m3	106.513 m3
Wire mesh	12.3 m2	1,065.131
Rockbolt	34 m/2.4m	1,240.000 m
Steel support	- ton/1.2m	0.000 ton
Weephole	0.5 m/2.5m	17.000 m

Type II with concrete L= 0 m

Item	Unit	Q'ty
Excavation	22.54 m3	0.000 m3
Concrete	5.885 m3	0.000 m3
Form	10.283 m2	0.000 m2
Shotcrete	1.55 m3	0.000 m3
Wire mesh	10.333 m2	0.000 m2
Rockbolt	34 m/2.4m	0.000 m
Steel support	- ton/1.2m	0.000 ton
Weephole	0.5 m/2.5m	0.000 m

Total

Item	Q'ty
Excavation	3,335.315 m3
Concrete	509.617 m3
Form	890.467 m2
Shotcrete	208.911 m3
Wire mesh	1,974.440 m2
Rockbolt	2,428.000 m
Steel support	9.282 ton
Weephole	17.000 m

Type (0.3x0.3) without gravel

L= 48 m

Item	Unit	Q'ty
Excavation	0.371 m3	17.808 m3
Concrete	0.12 m3	5.760 m3
F1 formwork	0.84 m2	40.320 m2
F3 formwork	0.6 m2	28.800 m2
Leveling conc.	0.018 m3	0.864 m3
Gravel bedding	0 m3	0.000 m3
Backfilling	0.143 m3	6.864 m3

Type (0.3x0.3) with gravel

L= 19 m

Item	Unit	Q'ty
Excavation	0.481 m3	9.139 m3
Concrete	0.12 m3	2.280 m3
F1 formwork	0.84 m2	15.960 m2
F3 formwork	0.6 m2	11.400 m2
Leveling conc.	0.018 m3	0.342 m3
Gravel bedding	0.06 m3	1.140 m3
Backfilling	0.193 m3	3.667 m3

Type (0.5x0.5) without gravel, with cover

L= 0 m

Item	Unit	Q'ty
Excavation	0.878 m3	0.000 m3
Concrete	0.254 m3	0.000 m3
F1 formwork	2.24 m2	0.000 m2
F3 formwork	1 m2	0.000 m2
Leveling conc.	0.024 m3	0.000 m3
Gravel bedding	0 m3	0.000 m3
Backfilling	0.35 m3	0.000 m3

Type (0.5x0.5) with gravel, with cover

L= 6.5 m

Item	Unit	Q'ty
Excavation	1.037 m3	6.741 m3
Concrete	0.254 m3	1.651 m3
F1 formwork	2.24 m2	14.560 m2
F3 formwork	1 m2	6.500 m2
Leveling conc.	0.024 m3	0.156 m3
Gravel bedding	0.08 m3	0.520 m3
Backfilling	0.429 m3	2.789 m3

Type (0.5x0.5) without gravel, without cover

L= 0 m

Item	Unit	Q'ty
Excavation	0.878 m3	0.000 m3
Concrete	0.254 m3	0.000 m3
F1 formwork	2.24 m2	0.000 m2
F3 formwork	1 m2	0.000 m2
Leveling conc.	0.024 m3	0.000 m3
Gravel bedding	0 m3	0.000 m3
Backfilling	0.35 m3	0.000 m3

Type (0.5x0.5) with gravel, without cover

L= 1 m

Item	Unit	Q'ty
Excavation	0.878 m3	0.878 m3
Concrete	0.184 m3	0.184 m3
F1 formwork	1.34 m2	1.340 m2
F3 formwork	1 m2	1.000 m2
Leveling conc.	0.024 m3	0.024 m3
Gravel bedding	0.08 m3	0.080 m3
Backfilling	0.35 m3	0.350 m3

Total

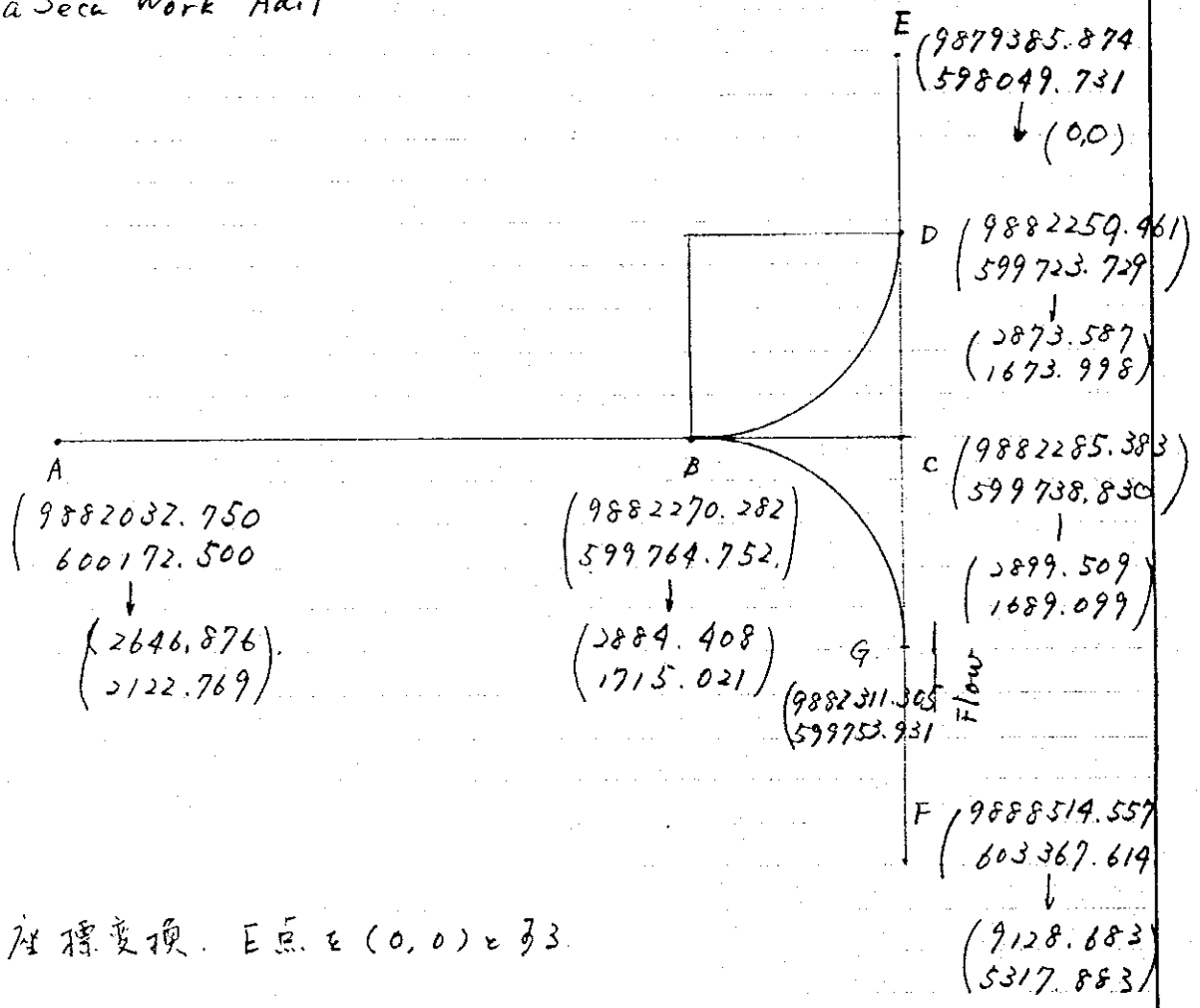
Item	Q'ty
Excavation	34.566 m3
Concrete	9.875 m3
F1 formwork	71.840 m2
F3 formwork	47.700 m2
Leveling conc.	1.386 m3
Gravel bedding	1.740 m3
Backfilling	13.670 m3

AP-2

Adit Tunnel

5-1-81

La Seca Work Adit



座標変換. E点を(0, 0)とする

E-F式

$$y = \frac{5317.883}{9128.683} x$$

これと直交する A-C式

$$y = -\frac{9128.683}{5317.883} x + b$$

これが A点を通ることから

$$2122.769 = -\frac{9128.683}{5317.883} \times 2646.876 + b$$

$$\therefore b = 2122.769 + \frac{9128.683}{5317.883} \times 2646.876$$

$$= 6666.399$$

$$\therefore\ y = -\frac{9128.683}{5317.883}x + 6666.399$$

A-C, E-F 式の交点は

$$\frac{5317.883}{9128.683}x = -\frac{9128.683}{5317.883}x + 6666.399$$

$$\frac{5317.883^2 + 9128.683^2}{9128.683 \times 5317.883}x = 6666.399$$

$$x = 6666.399 \times \frac{9128.683 \times 5317.883}{5317.883^2 + 9128.683^2}$$

$$= 2899.509$$

$$\therefore\ y = 1689.099$$

$$\therefore\ C\begin{pmatrix} 2899.509 \\ 1689.099 \end{pmatrix}$$

次に D点の座標

E-F上で C より 30.000 離れた点であるので

$$(2899.509 - x)^2 + \left(1689.099 - \frac{5317.883}{9128.683}x\right)^2 = 900$$

$$D\begin{pmatrix} 2873.587 \\ 1673.998 \end{pmatrix}$$

← 別 Program より

$$B\begin{pmatrix} 2884.408 \\ 1715.021 \end{pmatrix}$$

A-B 距離

$$\sqrt{\{(2646.876-2884.408)^2+(2122.769-1715.021)^2\}}$$

$$=471.890\ m$$

B-D 距離

$$60.000 \times \pi \times 1/4 = 47.124\ m$$

始点より D点までの距離

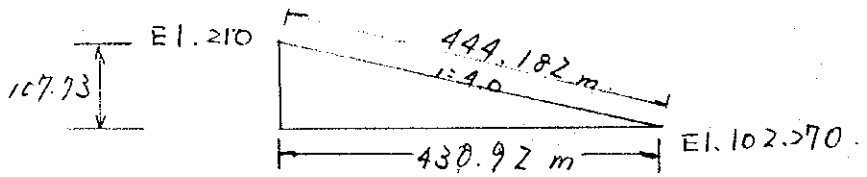
$$436.196+193.732+3225.245=3855.173$$

始点 El. 99.7 m より 1/1,500 勾配で上がってくるので

D点 EL. 102.270

A点 (Work Adit 始点) EL. 210.0 m

1:4 勾配で下がるので



Level になるまでの距離 A点より 430.92 m.
Adit 長さは 444.182 m

よって Work Adit 全長

$$444.182+(471.890-430.920)+\overset{(B-D)}{47.124}$$

$$=532.276\ m$$

A049 50×500

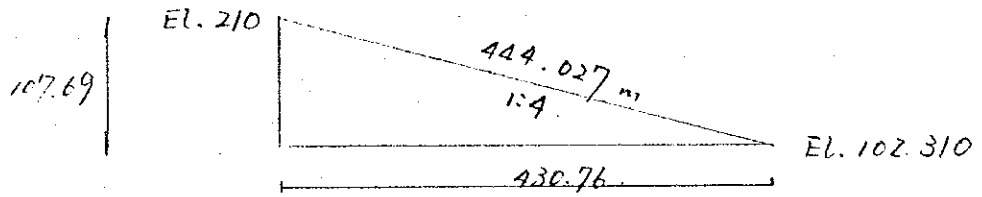
始点より G点までの距離

(D点までの距離) + 60.0m = 3855.173 + 60.0

= 3915.173 m

G点 El は

99.7 + 3915.173 / 1,500 = 102.310 m



Levelになるまでの距離 A点より 430.76 m
Adit 長さ 444.027 m

全長

444.027 + (471.890 − 430.76) + 47.124
= 532.281 m

Typeの振り分け

Type I : 222.014 m

Type II : 222.014 m

Type I with concrete : 88.253 m

Type II with concrete : X

Type I

- Excavation

Rectangular part : $\{(2.000 + 100 \times 2) \times 2\} \times (2000 + 100)$

$= 9.24\ m^3$

Circular part : $2.2^2 \times \pi \times 1/2$

$= 7.603\ m^3$

Total : $9.24 + 7.603 = \underline{16.843\ m^3}$

- Shotcrete

Rec. part : $(0.1 \times 2.0) \times 2$
$= 0.4\ m^3$

Cir. part : $0.1 \times \{(2.15 \times 2) \times \pi \times 1/2\}$
$= 0.676\ m^3$

Total : $1.076\ m^3$

- Rock bolt (per 1.2 m)

9_{nos} : $2.0_m \times 9_{nos} = 18.0\ m$

8_{nos} : $2.0\ m \times 8_{nos} = 16.0\ m$

34.0 m / 2.4 m

- steel wire mesh

$1.076\ m^3 \times 1/0.1\ m = 10.76\ m^2$

Type II.

- Excavation

Rec. part : $\{(2.0 + 0.05 + 0.125 + 0.1) \times 2\} \times (2.0 + 0.1)$
$= 9.555 \ m^3$

Cir part : $2.275^2 \times \pi \times 1/2$
$= 8.130 \ m^3$

Total : $17.685 \ m^3$

- Shotcrete

Rec. part : $0.125 \times 2.0 \times 2 = 0.5 \ m^3$

Cir. part : $(2.275 - 0.125/2) \times 2 \times \pi \times 1/2 \times 0.125$
$= 0.869 \ m^3$

Total : $1.369 \ m^3$

- Rock bolt

9 nos : 18.0 m
8 nos : 16.0 m.

- Steel support.

H125. Rec. part : $2.0 \times 2 = 4.0$
Cir. part : $(2.0 + 0.05 + 0.125/2) \times 2 \times \pi \times 1/2 = 6.637$

Sub Total : $10.637 \ m \times 23.8 \ kg/m = 253.161$

R. $3.203 \times 2 = 6.406$
R $3.768 \times 2 = 7.536$
Bolt $3.12 \times 2 = 6.24$

Grand total = 273.343 kg.

- Steel wire mesh
$1.369 \ m^3 \times 1/0.125 m = 10.952 \ m^2$

Type I with concrete

- Excavation

Rec. part : $\{(2.0+0.3+0.1\times2)\times2\}\times(2.0+0.3+0.1)$
$= 12.0\ m^3$

Cir. part : $2.5^2\times\pi\times1/2 = 9.817\ m^3$

Total : $21.817\ m^3$

- Shotcrete

Rec. part : $0.1\times2.3\times2 = 0.46\ m^3$

Cir. part : $(2.5-0.05)\times2\times\pi\times1/2\times0.1 = 0.770\ m^3$

Total : $1.23\ m^3$

- Steel wire mesh
$1.23\ m^3\times1/0.1m = 12.3\ m^2$

- concrete

Rec part : $0.4\times2.0\times2 = 1.2\ m^3$

$0.4\times(2.4\times2) = 1.92\ m^3$

$3.12\ m^3$

Cir. part : $(2+0.2)\times2\times\pi\times1/2\times0.4 = 2.765\ m^3$

Total : $5.885\ m^3$

- Rock bolt

9nos : 18.0 m
8nos : 16.0 m

weep hole

0.5 m / 2.5m

- Formwork

$2.0m\times2 + 4.0m\times\pi\times1/2 = 10.283\ m^2$

A 049

50×500

Type II. with concrete

- Excavation

Rec. part : $\{(2.0+0.3+0.15+0.1)\times 2\} \times (2.0+0.3+0.1)$

$= 12.24 \ m^3$

Cir. part : $2.55^2 \times \pi \times 1/2 = 10.214$

Total $= 22.454 \ m^3$

- Shotcrete.

Rec. part: $0.15 \times 2.3 \times 2 = 0.69 \ m^3$

Cir. part : $\{(2.55 - 0.15/2) \times 2\} \times \pi \times 1/2 \times 0.15$
$= 0.860 \ m^3$

Total : $1.55 \ m^3$

- steel wire mesh
$1.55 \ m^3 \times 1/0.15 \ m = 10.333 \ m^2$

- Concrete.

Rec. part : $0.4 \times 2 \times 2 = 1.6 \ m^3$
$0.4 \times (2.55 - 0.15) \times 2 = 1.92 \ m^3$
$3.12 \ m^3$

Cir part : $0.4 \times (2.0+0.2) \times 2 \times \pi \times 1/2 = 2.765 \ m^3$

Total : $5.885 \ m^3$

- Rock bolt
9 nos : 18.0 m
8 nos : 16.0 m

- Form work. $10.283 \ m^2$

1994/9/19 10:03 AM La seca qty. adit

Type I L= 222.014 m

Item	Unit	Q'ty
Excavation	16.843 m3	3,739.382 m3
Concrete	- m3	0.000 m3
Shotcrete	1.076 m3	238.887 m3
Wire mesh	10.76 m2	2,388.871
Rockbolt	34 m/2.4m	3,144.000 m
Steel support	- ton/1.2m	0.000 ton
Weephole	- m/2.5m	0.000 m

Type II L= 222.014 m

Item	Unit	Q'ty
Excavation	17.685 m3	3,926.318 m3
Concrete	- m3	0.000 m3
Shotcrete	1.369 m3	303.937 m3
Wire mesh	10.952 m2	2,431.497
Rockbolt	34 m/2.4m	3,144.000 m
Steel support	0.273 ton/1.2m	50.505 ton
Weephole	- m/2.5m	0.000 m

Type I with concrete L= 88.253 m

Item	Unit	Q'ty
Excavation	21.817 m3	1,925.416 m3
Concrete	5.885 m3	519.369 m3
Form	10.283 m2	907.506
Shotcrete	1.23 m3	108.551 m3
Wire mesh	12.3 m2	1,085.512
Rockbolt	34 m/2.4m	1,240.000 m
Steel support	- ton/1.2m	0.000 ton
Weephole	0.5 m/2.5m	17.500 m

Type II with concrete L= 0 m

Item	Unit	Q'ty
Excavation	22.54 m3	0.000 m3
Concrete	5.885 m3	0.000 m3
Form	10.283 m2	0.000 m2
Shotcrete	1.55 m3	0.000 m3
Wire mesh	10.333 m2	0.000 m2
Rockbolt	34 m/2.4m	0.000 m
Steel support	- ton/1.2m	0.000 ton
Weephole	0.5 m/2.5m	0.000 m

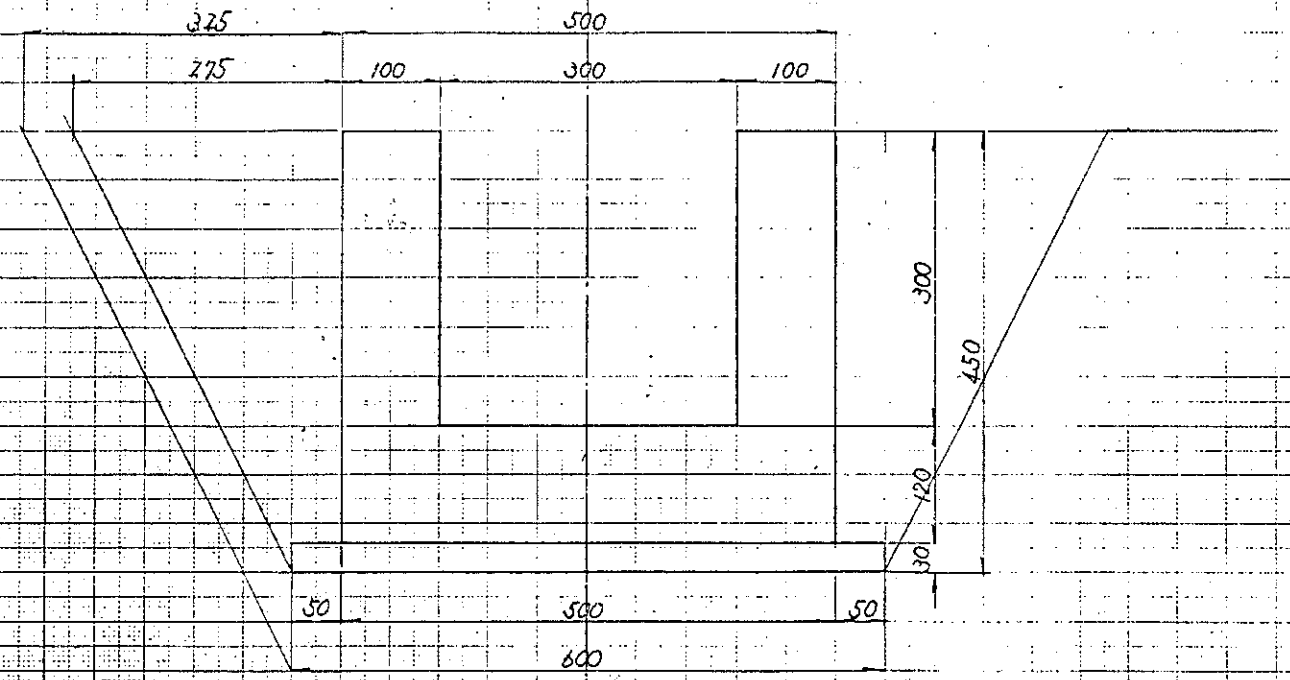
Total

Item	Q'ty
Excavation	9,591.115 m3
Concrete	519.369 m3
Form	907.506 m2
Shotcrete	651.375 m3
Wire mesh	5,905.880 m2
Rockbolt	7,528.000 m
Steel support	50.505 ton
Weephole	17.500 m

AP-3

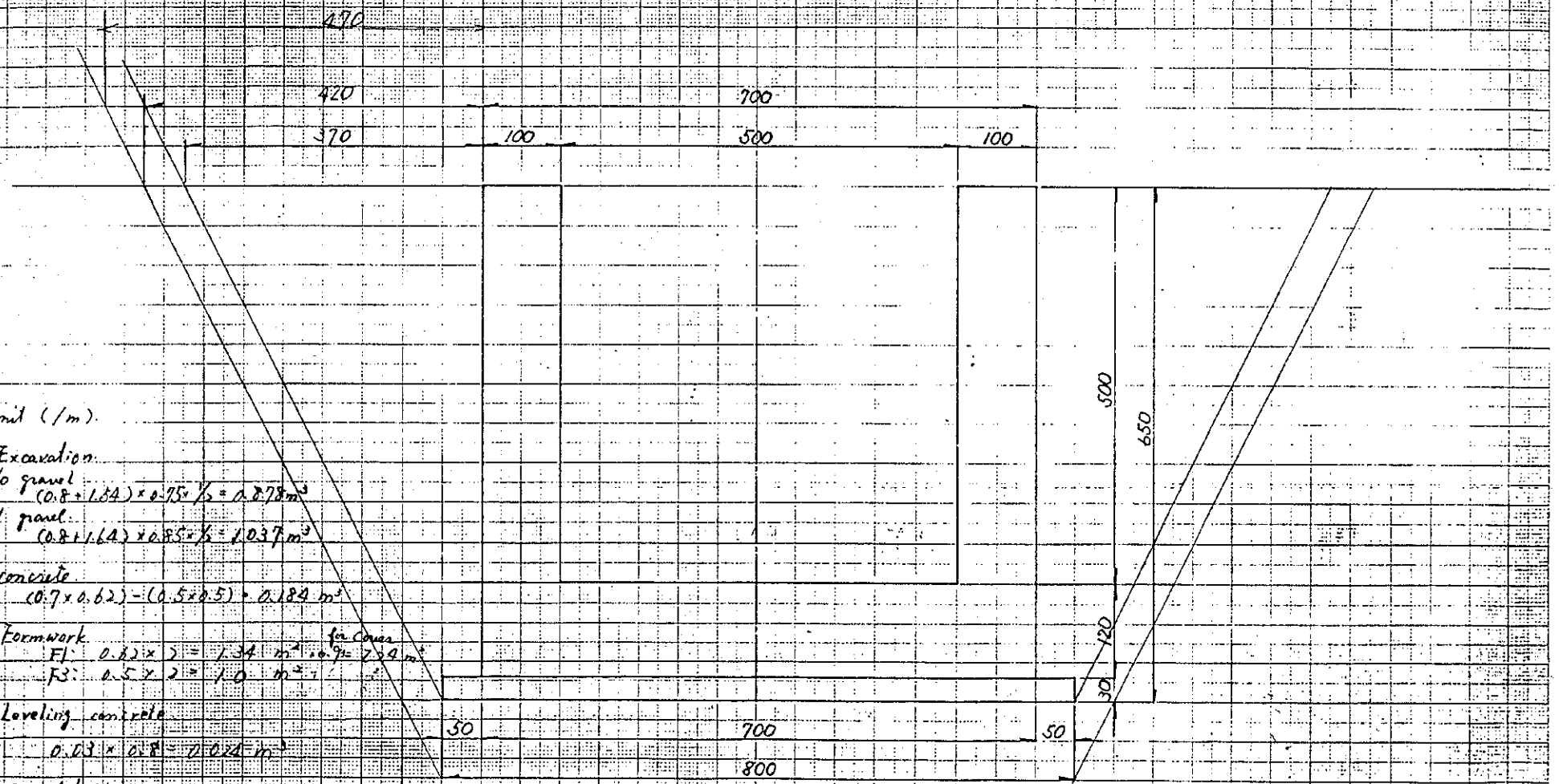
Drain ditch and catch basin

5-1-191



Unit (/m)

1. Excavation
   w/o gravel $(0.6+1.05)\times 0.45\times 1/2 = 0.371\ m^3$
   w/ gravel $(0.6+1.15)\times 0.55\times 1/2 = 0.481\ m^3$
2. Concrete
   $(0.5\times 0.42)-(0.3\times 0.3) = 0.12\ m^3$
3. Formwork
   F1: $0.42\times 2 = 0.84\ m^2$
   F3: $0.3\times 2 = 0.60\ m^2$
4. Leveling concrete
   $0.03\times 0.6 = 0.018\ m^3$
5. Gravel bedding
   $0.1\times 0.6 = 0.06\ m^3$
6. Backfill
   w/o gravel $0.371-0.018-0.42\times 0.5 = 0.143\ m^3$
   w/ gravel $0.481-0.018-0.06-0.42\times 0.5 = 0.193\ m^3$



Unit (/m).

1. Excavation
w/o gravel
$(0.8+1.54)\times 0.75\times \frac{1}{2} = 0.878\ m^3$
w/ gravel
$(0.8+1.64)\times 0.85\times \frac{1}{2} = 1.037\ m^3$

2. concrete
$(0.7\times 0.62)-(0.5\times 0.5) = 0.184\ m^3$

3. Formwork
F1: $0.62\times 2 = 1.34\ m^2$ for Cover $\times 0.9 = 2.24\ m^2$
F3: $0.5\times 2 = 1.0\ m^2$

4. Leveling concrete
$0.03\times 0.8 = 0.024\ m^3$

5. Gravel bedding
$0.1\times 0.8 = 0.08\ m^3$

6. Cover
$0.1\times 0.7 = 0.07\ m^3$

7. Backfill
w/o gravel $0.878-0.024-0.7\times 0.62-0.1\times 0.7 = 0.35$
w/ gravel $1.037-0.024-0.08-0.7\times 0.62 = 0.1\times 0.7 = 0.429$

5-1-193

Type (0.3x0.3) without gravel

L= 51.8 m

Item	Unit	Q'ty
Excavation	0.371 m3	19.218 m3
Concrete	0.12 m3	6.216 m3
F1 formwork	0.84 m2	43.512 m2
F3 formwork	0.6 m2	31.080 m2
Leveling conc.	0.018 m3	0.932 m3
Gravel bedding	0 m3	0.000 m3
Backfilling	0.143 m3	7.407 m3

Type (0.3x0.3) with gravel

L= 12 m

Item	Unit	Q'ty
Excavation	0.481 m3	5.772 m3
Concrete	0.12 m3	1.440 m3
F1 formwork	0.84 m2	10.080 m2
F3 formwork	0.6 m2	7.200 m2
Leveling conc.	0.018 m3	0.216 m3
Gravel bedding	0.06 m3	0.720 m3
Backfilling	0.193 m3	2.316 m3

Type (0.5x0.5) without gravel, with cover

L= 0 m

Item	Unit	Q'ty
Excavation	0.878 m3	0.000 m3
Concrete	0.254 m3	0.000 m3
F1 formwork	2.24 m2	0.000 m2
F3 formwork	1 m2	0.000 m2
Leveling conc.	0.024 m3	0.000 m3
Gravel bedding	0 m3	0.000 m3
Backfilling	0.35 m3	0.000 m3

Type (0.3x0.3) without gravel, with cover

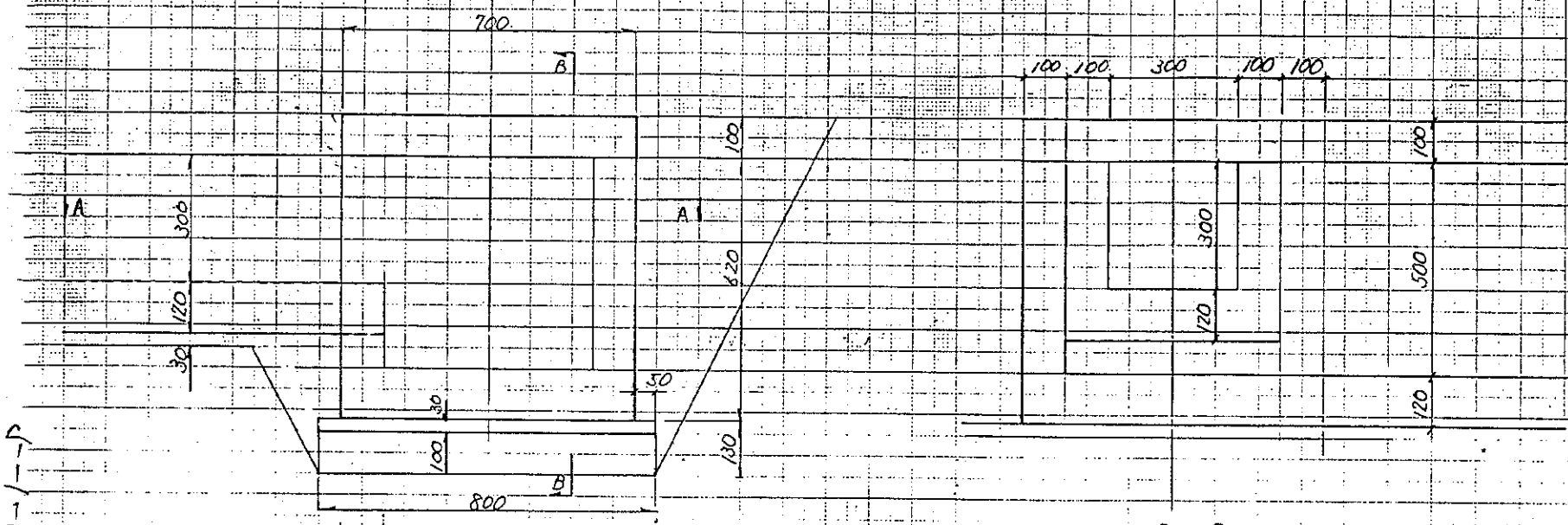
L= 6 m

Item	Unit	Q'ty
Excavation	1.037 m3	6.222 m3
Concrete	0.254 m3	1.524 m3
F1 formwork	2.24 m2	13.440 m2
F3 formwork	1 m2	6.000 m2
Leveling conc.	0.024 m3	0.144 m3
Gravel bedding	0.08 m3	0.480 m3
Backfilling	0.429 m3	2.574 m3

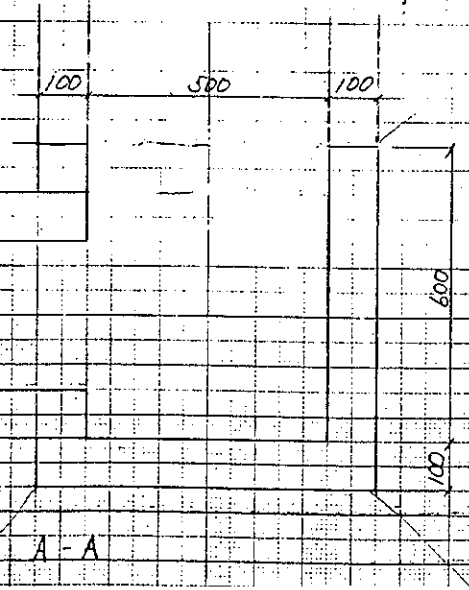
Total

Item	Q'ty
Excavation	31.212 m3
Concrete	9.180 m3
F1 formwork	67.032 m2
F3 formwork	44.280 m2
Leveling conc.	1.292 m3
Gravel bedding	1.200 m3
Backfilling	12.297 m3

5-1-194



B - B



A - A

1. Excavation
$(0.8^2 + 1.64^2) \times 1/2 \times 0.85 = 1.415\ m^3$

2. Concrete
$(0.7^2 \times 0.62) - (0.5^2)$
$- (0.1 \times 0.5 \times 0.42)$
$- (0.1 \times 0.5 \times 0.5)$
$= 0.133\ m^3$

3. Form Work
F1 $= 0.7 \times 0.62 \times 2$
$+ 0.1 \times 0.62 \times 2$
$= 0.992\ m^2$

F3 $0.5 \times 0.5 \times 2$
$+ 0.2 \times 0.5$
$+ 0.1 \times 0.5$
$= 0.65\ m^2$

4. leveling concrete
$0.8 \times 0.8 \times 0.03 = 0.019\ m^3$

5. gravel bedding
$0.8 \times 0.8 \times 0.1 = 0.064\ m^3$

6. Cover
concrete $0.1 \times 0.7 \times 0.7 = 0.049\ m^3$
Form F1 $0.1 \times 0.7 \times 4 + 0.7 \times 0.7$
$= 0.77\ m^2$

7. Back fill
$(1.415 - 0.7^2 \times 0.62 - 0.8^2 \times 0.03$
$- 0.8^2 \times 0.1) \times 1/2$
$= 0.314\ m^3$

5.2 Superestructura

Superstructure

Working Division: Cenguillo Inlet

/

Description	Calculation Details	Unit	Quantity	Remarks
101 Concrete class C	(from sheet 2.)	m^3	44.92	
102 Concrete class H	(")	m^3	4.89	
103 Formwork F_1	(")	m^2	146.06	
104 Formwork F_3	(")	m^2	223.42	
105 Reinforcing bar		Ton	4.56	
106 Hollow concrete block parapet		m^2	12.84	$0.4 \times (12.71 + 19.4) = 12.84$
107 3ply built up roofing		m^2	72.72	$61.88 + 0.4 \times 32.11 = 74.724$
108 Cement mortar on floor	$44.19 - 1.2 \times 3.5$	m^2	39.99	$(8.1 \times 8.1 \times \pi \times \frac{90}{360}) - (8.1 \times 8.1 \times \frac{1}{2}) + (4.85 \times 10.5 \times \frac{1}{2})$ $= 44.19$
109 Base cement mortar.	(see 107)	m^2	81.88	
110. Cement mortar skirting	$h = 100$.	m	34.57	$(8.1 \times 2 \times \pi \times \frac{90}{360}) + (4.85 - 1.6) + (5.4 - 0.9) \times 2 + (10.5 - 0.9)$
111. Cement skirting exterior	$h = 200$	m	27.09	$(8.1 \times 2 \times \pi \times \frac{90}{360}) + (5.45 - 1.6) + (11.1 - 0.9) =$
112 Cement mortar to wall.	(from sheet 2. same area as F_1)	m^2	146.06	

5-2-1

Working Division: Concrete Inlet

Description	Concrete Dimensions			Nos.	Volume m^3	Formwork Dimensions		Nos.	Area F_1 m^2	Area F_3	Remarks
Columns	0.64	0.64	3.4	6	8.35	2.56	3.4	6		52.22	$0.64 \times 4 = 2.56$
											$8.0 \times 2 \times \pi \times \frac{70}{360} = 12.57$
Girders	0.5	0.4	12.57	1	2.51	0.7	12.57	1	8.80	6.29	$0.5 \times 12.57 = 6.29$ $(0.5 \times 1.2) \times 12.57 = 8.80$
	0.5	0.4	18.35		3.67	0.7	18.35	1	12.85	9.18	$(4.25 + 4.8 + 9.3) = 18.35$ $0.5 \times 18.35 = 9.175$
	0.5	0.4	4.8		2.88	1.2	4.8	1	5.76		
											$8.1 \times 2 \times \pi \times \frac{70}{360} = 12.72$
Walls	0.2	12.72	2.9		7.29				36.88	36.88	$12.72 \times 2.9 = 36.888$
Alt	0.2	4.25	2.9		2.47	7.53			7.53	7.53	$(4.25 \times 2.9) - (1.6 \times 2.1 + 1.2 \times 1.2) = 7.525$
② line	0.2	9.3	2.9		5.39	21.24			21.24	21.24	$(9.3 \times 2.9) - (1.6 \times 1.2 \times 2 + 0.9 \times 2.1) = 21.24$
Blue	0.2	4.8	2.9		2.78	12.05		2	24.10		$(4.8 \times 2.9) - (0.9 \times 2.1) = 12.05$
Parapet	0.9	12.71	0.20		2.29	12.71	0.9	2	11.44	11.44	$9.1 \times 2 \times \pi \times \frac{80}{360} = 12.71$
	0.9	19.4	0.20		3.49	19.4	0.9	2	17.46	17.46	$2.3 + 6 + 11.1 = 19.4$
Slab	0.15	61.18			9.18					61.18	$(9.1 \times 9.1 \times \pi \times \frac{80}{360} - 11.7 \times 7.3 \times \frac{1}{2}) + (2.3 + 6) \times 11.1 \times \frac{1}{2}$
											$= 15.11 + 46.07 = 61.18$
					44.92				146.06	223.42	
Concrete Dam H.											
	0.08	61.18			4.89						

5-2-2

Cantidad de Refuerzo, Superestructura Toma Conquillo

Miembro	ϕ	Nº	Nº Elementos	A m	B m	Gancho	L parcial	L total	ϕ peso	Peso Total
- Column										
long. Reinf.	25	8	6	4.5		0.20	4.70	225.6	3.85	868.6
stirrups □	12	30		2×0.55	2×0.55	2×0.12	2.44	439.2	0.89	390.9
stirrups ◇	12	30		2×0.35	2×0.35	2×0.12	1.64	295.2		262.7
- Beams										
curved beam 1	18	6	1	10.6	0.30		10.90	65.4	2.0	130.8
curved beam 2	18	6	1	3.4	0.30		3.70	22.2		44.4
straight beam	18	6		10.90	2×0.30		11.50	69.0		138.0
transversal beam 1	18	6		5.90	2×0.30		6.50	39.0		78.0
transversal beam 2	18	6		5.35	2×0.30		5.95	35.7		71.4
lateral reinforcement	12	2					35.3	70.6	0.89	62.8
stirrups □	10	170		2×0.55	2×0.35	2×0.10	2.0	340.0	0.62	210.8
- Slab 15.1 Kg/m²	10×12	58.4 m²								881.9
- Parapets										
	12	3					31.5	94.5	0.89	84.1
	10	158					2.4	379.2	0.62	235.1
	10	6					31.5	189.0		117.2
										3576.7

5-2-3

Conquillo

Muros

Area :	29.3 × 3.05	=	89.4	m^2
ventanas	1.7 × 1.3 × 2	=	− 4.4	
	1.3 × 1.3	=	− 1.7	
puertas	2 × 1.0 × 2.2	=	− 4.4	
	1.6 × 2.2	=	− 3.5	
			75.4	m^2

$A = 12.4\ Kg/m^2$

5% crossing and Windows

	935.0
	46.7
Total	4558.4 Kg

5-2-4

Summary.

Columns	1522.2
Beams	736.2
Slab	881.9
Parapets	436.4
Walls	981.7
	4558.4 Kg

Working Division: Conguillo Inlet

Description	Calculation Details	Unit	Quantity	Remarks
113. Waterproof cement mortar to parapet.		m^2	30.50	(from sheet 2.) $(12.7'+19.4)\times(0.2+0.35+0.4)$
114. Water proof cement to roof gutter		m^2	7.63	$(9.1'\times 2\times\pi\times\frac{90}{360})\times 0.6 = 7.63$
115. Apply tile (from sheet 2. same area as for Fs formwork except slat)		m^2	162.24	$223.42-61.18 = 162.24$
116. Oil paint metal (from sheet 6)		m^2	45.85	
117. Steel doors and frame (from sheet 6)		m^2	7.1	
	(1)	m^2	8.0	
119. Aluminium windows. (from sheet 6)		m^2	4.32	
120. Aluminium louvers (from sheet 6)		m^2	1.44	

5-2-5

Working Division:

Description	Symbol	Calculation Details: Dimensions		No.	Area	Painting TYPE	Fac.	Area	Glass Dimensions	Area m²	Remarks: TYPE	TYPE	Caulking
Steel doors and louvers											Wire 6"		
	SD-1	0.9	2.1	2	3.78	OP	2.5	9.45					12.0
	SD-2	1.6	2.1	1	3.36	"	2.5	8.4					7.4
	SL-1	1.0	1.0	8	8.0	"	3.5	28.0					32
Aluminum window													
	AW-1	1.8	1.2	2	4.32				1.8 x 1.2 x 2	4.32	4.32		12.0
Aluminum louvers													
	AL-1	1.2	1.2	1	1.44								4.8

5-2-6

Working Division: 8.7. Poza Honda Toilet

Description	Calculation Details	Unit	Quantity	Remarks
101 Concrete class C (from sheet 2		m^3	56.66	
102 Concrete class H (from sheet 2		m^3	4.74	
103 Formwork F1 (from sheet 2)		m^2	133.86	
104 Formwork F2 (from sheet 2)		m^2	214.71	
105 Reinforcing bars (from sheet 5,6)		t	4.3	
106. Block masonry to roof	$1(8.1\times2\times\pi\times\frac{192}{360})+(2.5+5.0+1.0)\times0.2=31.22\times0.2$	m^2	6.25	
107 3-ply built-up asphalt roofing	$59.22+31.22\times0.4=$	m^2	71.71	
108 Cement mortar plaster on floor	$36.84-12\times3.5$	m^2	32.64	$(7.1\times7.1\times\pi\times\frac{100}{360}-7.1\times7.1\times\frac{1}{2})+3.8\times7.5\times\frac{1}{2}=36.84$
109 Base cement mortar (see 107)		m^2	59.22	
110 Cement skirting h=100.		m	30.99	$(7.1\times2\times\pi\times\frac{100}{360})+(3.8-1.6)+3.0+(4.8-0.9)\times2+6.5-0.9$
111 Cement skirting h=200.		m	24.74	$(7.3\times2\times\pi\times\frac{100}{360})+(4.4-1.6)+(10.1-0.9)$

Working Division: _____ 2

Description	Concrete m³					Formwork m²					Remarks
	Dimensions			Nos.	Volume	Dimensions		Nos.	Area F1	Area F3	
Columns	0.64	0.64	3.4	6	8.35	2.56	3.4	6		52.22	0.64 × 4 = 2.56
											7' × 2 × π × 100/360 = 12.39
Girders	0.5	0.4	12.39	1	2.48	0.7	12.39	1	8.67	6.20	0.5 × 12.39 = 6.20 (0.5+0.2) × 12.39 = 8.67
	0.5	0.4	12.5	1	2.50	0.7	12.5	1	8.75	6.25	(3.2+2.4+6.9) = 12.5 0.5 × 12.5 = 6.25
	0.5	0.4	4.2	1	0.84	1.2	4.2	1	5.04		
											7.2 × 2 × π × 100/360 = 12.57
Walls	0.2	12.57	2.9	1	7.29	36.45			36.45	36.45	12.57 × 2.9 = 36.45
A line	0.2	3.2	3.9	1	1.86				4.64	4.64	(3.2 × 2.9) − (1.6 × 2.4 + 1.2 × 1.2) = 4.64
② line	0.2	21.63	2.9		12.55				21.63	21.63	(9.6 × 2.9) − (1.8 × 1.2 × 2 + 0.9 × 2.1) = 21.63
B line	0.15	10.29	2.9		1.54	10.29	×	2	20.58		4.2 × 2.9 − 0.9 × 2.1 = 10.29
Parapet	0.9	12.72	0.20		2.29	12.72	0.9		11.45	11.45	8.1' × 2 × π × 90/360 = 12.72
	0.9	18.5	0.20		3.33	18.5	0.9		16.65	16.65	5.0 + 11.0 + 2.5 = 18.5
											(51.43) (32.81) 18.72 +
Slab	0.15	59.22			8.88					59.22	(8.1' × 8.1' × π × 90/360 − 8.1' × 8.1' × 1/2) + (2.5+5.0) × 10.8 × 1/2
											= 18.72 + 40.5 = 59.22
					51.87				133.86	214.71	
Concrete Class H											
	0.08	59.22			4.74						

Working Division: Poza Honda Inlet

Description	Calculation Details	Unit	Quantity	Remarks
112 Cement mortar plaster to interior walls (from sheet 2 same area as for F1 formwork)		m^2	105.76	8.67+8.75+5.04+36.45+4.64+21.63+20.58
113 Waterproof cement mortar gutter		m^2	7.63	$(8.1 \times 2 \times \pi \times \frac{90}{360}) \times 0.6 = 7.63$
114 Waterproof cement mortar to parapet		m^2	12.09	$(8.1 \times 2 \times \pi \times \frac{90}{360}) \times (0.2 + 0.75 + 0.4)$ 0.95
115 Cement mortar border to handrail		m	4.4	1.2 + 3.2 = 4.4
116 Spray tile on exposed concrete (from sheet 2 same area as for F2 formwork)		m^2	166.92	52.2+6.20+6.25+36.45+4.64+21.63+11.45+16.15 + $(8.1 \times 2 \times \pi \times \frac{1}{4}) \times 0.9$ 11.45
117 Oil paint metal surfaces. (from sheet 4.)		m^2	45.85	(9.45+8.4+28.0)
118 Steel door leaves and louvers (from sheet 4)		m^2	15.14	(3.78+3.36+8.0)
119 Aluminum windows and louvers		m^2	5.76	

Working Division: Poza Honda Inlet

Description	Calculation Details										Remarks			
Symbol	Dimensions		No.	Area	Painting			Glass						
					TYPE	Fac.	Area	Dimensions	Area m²		TYPE	TYPE	Caulking	
Steel doors and frames											Wire 6.8			
SD-1	0.9	2.1	2	3.78	OP	2.5	9.45						12.0	
SD-2	1.6	2.1	1	3.36	OP	2.5	8.4						7.4	
SL-1	1.0	1.0	8	8.10	OP	3.5	28.0						32	
Aluminium window and frames														
AW-1	1.8	1.2	2	4.32				1.8×1.2×2	4.32		4.32		12.0	
AL-1	1.2	1.2	1	1.44									4.8	

5-2-10

Cantidades de Refuerzo Superestructura Tomo Pozo Honda.

Miembro.	ϕ	Nº	Nº Elementos	A m	B m	Gancho m	L parcial m	L total m	ϕ peso Kg	Peso total Kg
– Column longit. Reinforcem	25	8	6	4.5		0.20	4.70	225.6	3.85	868.6
Stirrups □	12	30		2×0.55	2×0.55	2×0.12	2.44	439.2	0.89	390.9
stirrups ◇	12	30		2×0.35	2×0.35	2×0.12	1.64	295.2	0.89	262.7
– Beams.										
curved beam 1	18	6	1	10.6	0.30	—	10.90	65.4	2.0	140.6
curved beam 2	18	6	1	3.2	0.30	—	3.50	21.0		42.0
straight beam	18	6	1	9.90	2×0.3	—	10.50	63.0		126.0
transversal beam ①	18	6	1	5.20	2×0.3		5.80	34.8		69.6
transversal beam ②	18	6	1	4.20	2×0.3		4.80	28.8		57.6
lateral reinforcement	12	2					32.30	64.6	0.89	57.5
stirrups □	10	160	1	2×0.55	2×0.35	2×0.10	2.00	320.0	0.62	198.4
– Slab 15.1 Kg/m²	10 y 12	52.1 m²								786.7
– Parapets	12	3	—				30.5	91.5	0.89	81.4
	10	150		2.4			2.40	360	0.62	223.2
	10	6					30.5	183		113.5
										3818.7

5-2-11

Member	Ø	Nº	Nº Elements	D m	B m	Hook m	L parcial	L Total	Ø pure Kg	Peso total
- Muros.										
L h										
Area = 27.3 x 3.05		83.3 m²								
Ventanas 2x1.7x1.3		- 4.4								
1.3 x 1.3		- 1.7								
puerta 2x1.0x2.2		- 4.4								
1.6 x 2.2		- 3.5								
Ap = 12.4 Kg/m²		69.3 m²								859.3
crossings and windows -%										43.0
										4321.0 Kg
Summary.										
Columns.	1522.2 Kg									
Beams.	671.7									
slab	786.7									
parapet	418.1									
walls	902.3									
total	4321.0 Kg									

5.3 Instalaciones

Utility

Working Division: ENTRADA CONGUILLO
Conguillo Inlet (Electrical)

Description	Calculation Details	Unit	Quantity	Remarks
	Acometida CV Cable - 4x22 mm² or 4AWG			
	inclusive con Grupo Diesel 20KVA			
	Main Conductor Cable is included with			
	the Diesel Generator			
Numero Circuito Circuit Number				
CN-1	Este inclusive en Paquete 3			
CN-2	Included in Package 3 (for valve motors)			
CN-3	CV cable - 4x12AWG (3.5mm²) / Φ 3/4"	m	120	
CN-4	"	m	470	
CN-5	2x14 / Φ 1/2" 8+6+1.5+3.5	m	19	
	4x14 / Φ 1/2" 8	m	8	
	3x14 / Φ 1/2" 13+3+3.5+8.5	m	28	
CN-7	2x14 / Φ 1/2" 5+9+21	m	35	
	4x14 / Φ 1/2" 3.5+3.5+1.5+3.5	m	12	
	3x14 / Φ 1/2" 4+5+4.5+8+8+8+9+2+3+3+8.5+3+2.5	m	64	
	5x14 / Φ 3/4"	m	4.5	
CN-8	2x14 / Φ 1/2"	m	33	
	4x14 / Φ 1/2" 5+8+9.5+	m	22.5	
	3x14 / Φ 1/2" 5.5+4+4+3.5+4*3+5.5+2.5+3+1+8.5+1.5+2	m	53	
	5x14 / Φ 3/4" 4.5+1	m	5.5	
CN-9	2x14 / Φ 1/2" 7+12.5+15+6	m	40.5	
	3x14 / Φ 1/2"	m	8.5	
CN-6	2x12 / Φ 1/2" 8+7	m	15	
CN-10	" 34+12+3+13+8+4.5+8.5+2+7.5	m	92.5	

UT 1 w 1

Working Division: ENTRADA CONGUILLO
Conguillo Inlet (Electrical)

Description	Calculation Details	Unit	Quantity	Remarks
Resumen (Summary)				
2x14 AWG / φ1/2"	19 + 35 + 33 + 40.5 = 127.5 ≒ 128	m		
3x14 AWG / φ1/2"	26 + 64 + 53 + 8.5 = 151.5 ≒ 152	m		
4x14 AWG / φ1/2"	8 + 12 + 22.5 = 42.5 ≒ 43	m		
5x14 AWG / φ3/4"	4.5 + 5.5 = 10	m		
2x12 AWG / φ1/2"	15 + 92.5 = 107.5 ≒ 108	m		
CV 4x12 AWG / φ3/4"	12 + 47 = 59	m.		
Conductor (Wiring and Cable)				
TW 14 AWG	(128 x 2 + 152 x 3 + 43 x 4 + 10 x 5) x 1.05	m	980.0	
TW 12 AWG	(108 x 2) x 1.05	m	230.0	
Conduit (Conduit Pipe)				
φ 1/2" or 13 mm	(128 + 152 + 43 + 108) x 1.05	m	453.0	
φ 3/4" or 22 mm	(10 + 59) x 1.05	m	75.0	
CV Cable				
4x12 AWG	(59) x 1.05	m	65.0	
	EL. 90.7 + EL. 82 + EL. 74 + EL. 66.0			
Tumbler Switch	4 + 1 + 1 + 1	set	7	
Three way Switch	1 + 2 + 2 + 1	set	6	
Convenience Outlet: 127V - 20A		set	7	
Malla de Tierra (Grounding Mesh)				
Conductor	Principal (Main Conductor)			
	50 mm² - 1/0 AWG 565 x 1.05	m	600	
Conductor	Conexiones (Connection Conductor)			
	38 mm² - 2 AWG 50 →	m	60	

Working Division: ENTRADA CONGUILLO
Conguillo Inlet (Electrical)

Description	Calculation Details	Unit	Quantity	Remarks
Panel de Alumbrado	(Lighting Panel)	set	1	
Alumbrado				
Tipo-A	(Type A) Fl 40w x 2	set	13	
Tipo B	(Type B) Fl 40w x 1	set	30	
Tipo E	(Type E) Il 60w x 1	set	2	

Calculo de Areas de chapa de ductos del Sistema de Ventilación Conguillo

SECCION	DIMENSIONES	* LONGITUD	PERIMITRO	AREA G. 22	AREA G. 24
V - 1	800 x 800	2.40	3.2	7.68	
1 - 2	800 x 500	9.50	2.6	24.7	
2 - 9	900 x 350	2.00	1.5		3.0
9 - 10	300 x 300	7.00	1.2		8.4
2 - 8	400 x 200	4.20	1.2		5.04
2 - 4	500 x 500	8.00	2.0		16.0
4 - 12	500 x 300	2.00	1.6		3.2
12 - 13	500 x 200	7.00	1.4		9.8
4 - 11	500 x 200	4.20	1.4		5.88
4 - 5	300 x 200	5.00	1.0		5.0
5 - 14	250 x 200	4.20	0.9		3.78
5 - 15	250 x 200	2.00	0.9		1.8
1 - 3	800 x 500	14.00	2.6	36.6	
3 - 17	400 x 350	2.00	1.5		3.0
17 - 18	300 x 300	7.00	1.2		8.4
3 - 16	400 x 200	4.20	1.2		5.04
3 - 6	500 x 500	8.00	2.0		16.0
6 - 20	500 x 300	2.00	1.6		3.2
20 - 21	500 x 200	7.00	1.4		9.8
6 - 19	500 x 200	4.20	1.4		5.88
6 - 7	300 x 200	5.00	1.0		5.0
7 - 22	250 x 200	4.20	0.9		3.78
7 - 23	250 x 200	2.00	0.9		1.80
			SUBTOTAL m^2	68.98	123.7
			PESO Kg	449.7	616

* **Incluidas formas especiales**

Conguillo Ventilation System Duct Sheet Area Calculation

SECTION	SIZE	LENGTH	PERIMITER	AREA G. 22	AREA G. 24
V - 1	800 x 800	2.40	3.2	7.68	
1 - 2	800 x 500	9.50	2.6	24.7	
2 - 9	900 x 350	2.00	1.5		3.0
9 - 10	300 x 300	7.00	1.2		8.4
2 - 8	400 x 200	4.20	1.2		5.04
2 - 4	500 x 500	8.00	2.0		16.0
4 - 12	500 x 300	2.00	1.6		3.2
12 - 13	500 x 200	7.00	1.4		9.8
4 - 11	500 x 200	4.20	1.4		5.88
4 - 5	300 x 200	5.00	1.0		5.0
5 - 14	250 x 200	4.20	0.9		3.78
5 - 15	250 x 200	2.00	0.9		1.8
1 - 3	800 x 500	14.00	2.6	36.6	
3 - 17	400 x 350	2.00	1.5		3.0
17 - 18	300 x 300	7.00	1.2		8.4
3 - 16	400 x 200	4.20	1.2		5.04
3 - 6	500 x 500	8.00	2.0		16.0
6 - 20	500 x 300	2.00	1.6		3.2
20 - 21	500 x 200	7.00	1.4		9.8
6 - 19	500 x 200	4.20	1.4		5.88
6 - 7	300 x 200	5.00	1.0		5.0
7 - 22	250 x 200	4.20	0.9		3.78
7 - 23	250 x 200	2.00	0.9		1.80
		SUBTOTAL	m^2	68.98	123.7
		WEIGTH	Kg	449.7	616

* **Specials forms included**

ENTRADA POZA HONDA

Working Division: Poza Honda Inlet (Electrical)

Description	Calculation Details	Unit	Quantity	Remarks
	Acometida CV cable - 4X22 mm² inclusivo con Grupo Diesel			
	Main Conductor is included with the Diesel Generator			
Numero Circuito / Circuit Number				
CN-1	Este inclusivo en Paquete 3			
CN-2	Included in Package 3			
CN-3	CV cable 4x12 cm to φ 3/4" (3.5mm² or 22mm²)	m	130	
CN-4	" " 23+18	m	41	
CN-5.	2x14/φ1/2" 20+3+4	m	27	
	4x14/φ1/2" 3++2	m	5	
	3x14/φ1/2" 11+8+3.5+10.5	m	33	
CN-7.	2x14/φ1/2" 30+5+4+	m	42.5	
	4x14/φ1/2"	m	3.5	
	3x14/φ1/2" 38+2+2+2+13+3.5+7	m	67.5	
	5x14/φ3/4"	m	5	
CN-8	2x14/φ1/2" 40+8+9-	m	57	
	4x14/φ1/2"	m	1	
	3x14/φ1/2" 39+4+9+3+2	m	57	
	5x14/φ3/4"	m	5	
CN-9	2x14/φ1/2" 8+18+22.5	m	48.5	
CN-6	2x12/φ1/2" 13+3	m	16	
CN-10	2x12/φ1/2" 9+29+14+21+8-7	m	88	

5-5-6

Working Division: ENTRADA POZA HONDA.
Poza Honda Inlet (Electrical).

Description	Calculation Details	Unit	Quantity	Remarks
Resumen				
Summary				
2x14/φ1/2"	27 + 42.5 + 57 + 48.5 = 175.0	m		
3x14/φ1/2"	33 + 67.5 + 57 = 157.5	m		
4x14/φ1/2"	5 + 3.5 + 1 = 9.5	m		
5x14/φ3/4"	10 = 10.0	m		
CV 4/12/φ3/4"	23 + 18 = 54.0	m		
2x12/φ1/2"	18 + 84 = 104	m		
Conductor				
TW 14 AWG	(175x2 + 158x3 + 10x4 + 10x5) x 1.05	m	980.0	
TW 12 AWG	(104x2) x 1.05	m	220.0	
Conduit Pipe				
φ1/2"	(175 + 158 + 10 + 104) x 1.05	m	470.0	
φ3/4	(10 + 54) x 1.05	m	70.0	
CV Cable				
4x12 AWG	(54) x 1.05	m	60.0	
—	EL. 112.5, EL. 104.0, EL 95.5, EL 90.8			
Tumbler Switch	4 + 1 + 1 + 1	Set	7	
Three way Switch	1 + 2 + 2 + 1	Set	6	
Convenience Outlet: 127V – 20A		Set	7	
Malla de Tierra (Grounding Mesh)				
Conductor Principal (Main Conductor)				
50 mm² – 1/0" AWG	(55 + 4.5 + 15x5 + 23x2 + 15 + 7.6x6 + 9x3 + 4x6) x 1.4	m	500	
Conductor Conexiones (Connection Conductor)				
38 mm² – 2AWG	40 →	m	50	

Working Division: ENTRADA POZA HONDA
Poza Honda Inlet (Electrical)

Description	Calculation Details	Unit	Quantity	Remarks
Alumbrado (LIGHTING FIXTURES)				
Tipo A (Type A)	Fl 40W x 2	set	7	
Tipo B-1 (Type B-1)	Fl 40W x 2	set	6	
Tipo B-2	(Type B-2) Fl 40W x 1	set	24	
Tipo F	(Type F) Il 60W x 1	set	2	
Panel de Alumbrado (Lighting Panel)		set	1	

Calculo de Areas de Chpa de ductos de ventilación Poza Honda

SECCION	DIMENSIONES	* LONGITUD	PERIMITRO	AREA G. 22	AREA G. 24
V - 1	800 x 600	3.12	2.8	8.72	
1 - 2	750 x 400	9.80	2.3	22.55	
2 - 9	350 x 300	3.00	1.3		3.9
9 - 10	350 x 200	6.50	1.1		7.15
2 - 8	300 x 200	5.00	1.0		5.0
2 - 4	650 x 300	8.50	1.9		16.15
4 - 12	400 x 300	3.00	1.4		4.2
12 - 13	400 x 200	6.00	1.2		7.2
4 - 11	350 x 200	5.00	1.1		5.5
4 - 5	250 x 150	5.00	0.8		4.0
5 - 14	250 x 150	4.00	0.8		3.2
5 - 15	250 x 150	2.00	0.8		1.6
1 - 3	750 x 400	12.70	2.3	29.15	
3 - 17	350 x 300	3.00	1.3		3.9
17 - 18	350 x 200	6.50	1.1		7.15
3 - 16	300 x 200	5.00	1.0		5.0
3 - 6	650 x 300	8.50	1.9		16.15
6 - 20	400 x 300	3.00	1.4		4.2
20 - 21	400 x 200	6.00	1.2		7.2
6 - 19	350 x 200	5.00	1.1		5.5
6 - 7	250 x 150	5.00	0.8		4.0
7 - 22	250 x 150	4.00	0.8		3.2
7 - 23	250 x 150	2.00	0.8		1.6
		SUBTOTAL	m^2	60.42	1156
		PESO	Kg	394	603

* **Incluidas formas especiales**

5-3-9

Poza Honda Ventilation System Duct Sheet Area Calculation

SECTION	SIZE	LENGTH	PERIMITER	AREA G. 22	AREA G. 24
V - 1	800 x 600	3.12	2.8	8.72	
1 - 2	750 x 400	9.80	2.3	22.55	
2 - 9	350 x 300	3.00	1.3		3.9
9 - 10	350 x 200	6.50	1.1		7.15
2 - 8	300 x 200	5.00	1.0		5.0
2 - 4	650 x 300	8.50	1.9		16.15
4 - 12	400 x 300	3.00	1.4		4.2
12 - 13	400 x 200	6.00	1.2		7.2
4 - 11	350 x 200	5.00	1.1		5.5
4 - 5	250 x 150	5.00	0.8		4.0
5 - 14	250 x 150	4.00	0.8		3.2
5 - 15	250 x 150	2.00	0.8		1.6
1 - 3	750 x 400	12.70	2.3	29.15	
3 - 17	350 x 300	3.00	1.3		3.9
17 - 18	350 x 200	6.50	1.1		7.15
3 - 16	300 x 200	5.00	1.0		5.0
3 - 6	650 x 300	8.50	1.9		16.15
6 - 20	400 x 300	3.00	1.4		4.2
20 - 21	400 x 200	6.00	1.2		7.2
6 - 19	350 x 200	5.00	1.1		5.5
6 - 7	250 x 150	5.00	0.8		4.0
7 - 22	250 x 150	4.00	0.8		3.2
7 - 23	250 x 150	2.00	0.8		1.6
		SUBTOTAL	m^2	60.42	1156
		WEIGTH	Kg	394	603

* **Specials forms included**

5-3-10

6. Camino de Acceso

Access Road

Working Division: 12 Severino Access Road

Description	Calculation Details	Unit	Quantity	Remarks
12.1	Earthwork			
101	Clearing			
106	Compaction of original ground			
	A = 6.0 × 5.478 × 0.1 = 3,286.8 m²	m²	3,287	

12.1/01 Clearing

Severino Access Road (1)

Clearing		Total Area	Station
Length (m)	Area (m2)	(m2)	
0.0			0 + 0.000
7.5	47	47	0 + 12.630
25.0	425	425	0 + 38.780
17.0	446	446	0 + 60.000
17.0	340	340	0 + 80.000
21.0	380	380	0 + 100.000
21.0	148	148	0 + 107.050
30.0	671	671	0 + 133.370
15.0	599	599	0 + 160.000
12.0	270	270	0 + 180.000
8.0	108	108	0 + 190.780
12.0	72	72	0 + 198.000
11.0	253	253	0 + 220.000
13.0	342	342	0 + 248.520
13.0	425	425	0 + 281.190
15.0	263	263	0 + 300.000
14.5	295	295	0 + 320.000
14.0	276	276	0 + 339.370
10.0	214	214	0 + 357.170
16.0	297	297	0 + 380.000
17.0	330	330	0 + 400.000
18.0	205	205	0 + 411.723
17.0	670	670	0 + 450.000
16.0	978	978	0 + 509.270
18.5	185	185	0 + 520.000
25.5	440	440	0 + 540.000
16.0	482	482	0 + 563.250
17.5	281	281	0 + 580.000
18.0	142	142	0 + 588.000
16.0	204	204	0 + 600.000
15.5	240	240	0 + 615.230
24.0	687	687	0 + 650.000
23.5	1,188	1,188	0 + 700.000
23.0	1,334	1,334	0 + 757.360
20.0	487	487	0 + 780.000
19.0	390	390	0 + 800.000
13.0	310	310	0 + 819.380
26.0	246	246	0 + 832.000
32.5	527	527	0 + 850.000
35.0	1,758	1,758	0 + 902.000
29.5	578	578	0 + 920.000
23.0	325	325	0 + 940.000
23.5	465	465	0 + 960.000
11.0	345	345	0 + 980.000
8.0	190	190	1 + 0.000
8.0	160	160	1 + 20.000
9.7	177	177	1 + 40.000
8.0	177	177	1 + 60.000
8.3	170	170	1 + 81.620
13.0	196	196	1 + 100.000
10.5	588	588	1 + 150.000
11.0	311	311	1 + 178.930
12.3	245	245	1 + 200.000
10.0	223	223	1 + 220.000
6.5	122	122	1 + 234.790
8.0	442	442	1 + 295.810
11.5	236	236	1 + 320.000
	22,102	22,102	

Clearing		Total Area	Station
Length (m)	Area (m2)	(m2)	
11.5			1 + 320.000
10.5	220	220	1 + 340.000
12.3	183	183	1 + 356.040
14.0	136	136	1 + 366.360
17.0	211	211	1 + 380.000
16.8	338	338	1 + 400.000
15.5	323	323	1 + 420.000
15.8	313	313	1 + 440.000
18.0	338	338	1 + 460.000
16.5	345	345	1 + 480.000
11.3	278	278	1 + 500.000
30.0	413	413	1 + 520.000
17.0	470	470	1 + 540.000
26.0	215	215	1 + 550.000
24.5	758	758	1 + 580.000
24.8	493	493	1 + 600.000
30.0	548	548	1 + 620.000
22.5	525	525	1 + 640.000
27.5	500	500	1 + 660.000
26.0	535	535	1 + 680.000
29.0	536	536	1 + 699.480
18.5	1,200	1,200	1 + 750.000
15.5	497	497	1 + 779.230
11.5	280	280	1 + 800.000
12.0	235	235	1 + 820.000
14.0	260	260	1 + 840.000
19.3	333	333	1 + 860.000
13.0	97	97	1 + 866.000
9.7	386	386	1 + 900.000
13.0	385	385	1 + 933.940
13.5	80	80	1 + 940.000
12.5	260	260	1 + 960.000
11.8	61	61	1 + 965.000
14.5	197	197	1 + 980.000
13.0	312	312	2 + 2.710
12.8	610	610	2 + 50.000
36.3	1,203	1,203	2 + 99.000
39.0	791	791	2 + 120.000
45.0	840	840	2 + 140.000
28.3	806	806	2 + 162.000
13.0	628	628	2 + 192.390
11.5	93	93	2 + 200.000
11.0	563	563	2 + 250.000
9.7	518	518	2 + 300.000
12.5	245	245	2 + 322.100
15.0	246	246	2 + 340.000
21.0	360	360	2 + 360.000
21.0	420	420	2 + 380.000
27.0	180	180	2 + 387.480
21.0	300	300	2 + 400.000
18.0	225	225	2 + 411.560
15.0	139	139	2 + 420.000
26.5	415	415	2 + 440.000
44.5	710	710	2 + 460.000
25.0	695	695	2 + 480.000
14.7	383	383	2 + 499.280
16.0	773	773	2 + 549.620
11.5	143	143	2 + 560.000
17.8	293	293	2 + 580.000
14.0	318	318	2 + 600.000
	24,157	24,157	Sub Total
	46,259	46,259	Total

Clearing		Total Area	Station
Length (m)	Area (m2)	(m2)	
14.0			2 + 600.000
21.5	211	211	2 + 611.890
28.0	458	458	2 + 630.410
9.5	974	974	2 + 682.360
12.0	270	270	2 + 707.500
35.5	1,284	1,284	2 + 761.560
27.5	1,478	1,478	2 + 808.480
23.0	291	291	2 + 820.000
13.5	365	365	2 + 840.000
13.0	93	93	2 + 847.000
15.0	182	182	2 + 860.000
15.0	63	63	2 + 864.180
14.7	390	390	2 + 890.430
8.0	109	109	2 + 900.000
13.0	210	210	2 + 920.000
15.0	287	287	2 + 940.520
10.5	581	581	2 + 986.100
17.5	140	140	2 + 996.300
18.7	71	71	3 + 0.000
21.0	397	397	3 + 20.000
19.5	419	419	3 + 40.710
13.3	328	328	3 + 60.700
17.5	297	297	3 + 80.000
11.5	290	290	3 + 100.000
13.5	142	142	3 + 111.230
13.0	512	512	3 + 150.000
15.0	360	360	3 + 175.690
15.0	65	65	3 + 180.000
16.0	310	310	3 + 200.000
16.0	288	288	3 + 218.000
28.3	443	443	3 + 238.010
34.0	375	375	3 + 250.000
29.0	387	387	3 + 262.330
27.0	495	495	3 + 280.000
24.5	515	515	3 + 300.000
15.0	391	391	3 + 319.840
12.5	39	39	3 + 322.620
19.0	274	274	3 + 340.000
25.5	445	445	3 + 360.000
16.5	280	280	3 + 373.320
19.3	831	831	3 + 419.730
20.0	398	398	3 + 440.000
34.0	540	540	3 + 460.000
16.3	545	545	3 + 481.660
12.0	260	260	3 + 500.000
10.3	568	568	3 + 550.980
11.5	98	98	3 + 560.000
14.6	261	261	3 + 580.000
9.5	241	241	3 + 600.000
10.0	195	195	3 + 620.000
11.5	215	215	3 + 640.000
11.5	230	230	3 + 660.000
13.3	248	248	3 + 680.000
9.0	283	283	3 + 705.390
17.0	803	803	3 + 767.140
21.0	244	244	3 + 780.000
19.0	400	400	3 + 800.000
25.5	445	445	3 + 820.000
28.0	442	442	3 + 836.530
27.0	370	370	3 + 850.000
	22,125	22,125	Sub Total
	68,384	68,384	Total

Clearing		Total Area	Station
Length (m)	Area (m2)	(m2)	
27.0			3 + 850.000
35.0	1,550	1,550	3 + 900.000
33.0	1,700	1,700	3 + 950.000
31.7	1,618	1,618	4 + 0.000
42.0	778	778	4 + 21.100
31.5	1,062	1,062	4 + 50.000
37.0	1,750	1,750	4 + 101.100
23.0	567	567	4 + 120.000
22.0	450	450	4 + 140.000
49.0	710	710	4 + 160.000
67.0	1,160	1,160	4 + 180.000
69.0	322	322	4 + 184.740
60.0	984	984	4 + 200.000
56.5	3,495	3,495	4 + 260.000
59.0	1,040	1,040	4 + 278.000
48.7	1,185	1,185	4 + 300.000
53.5	2,952	2,952	4 + 357.760
			+
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	21,322	21,322	Sub Total
	89,706	89,706	Total

12.1/01 Clearing

Severino Access Road (2)

Clearing Length (m)	Clearing Area (m2)	Total Area (m2)	Station
25.0			0 + 0.000
36.0	549	549	0 + 18.000
35.0	1,595	1,595	0 + 62.940
33.0	580	580	0 + 80.000
33.8	495	495	0 + 95.000
27.0	825	825	0 + 122.500
23.0	594	594	0 + 146.240
22.7	432	432	0 + 165.130
15.5	614	614	0 + 197.280
18.5	765	765	0 + 242.280
17.5	401	401	0 + 264.350
24.5	477	477	0 + 287.280
14.0	481	481	0 + 312.280
9.5	187	187	0 + 328.230
9.0	85	85	0 + 386.420
12.0	351	351	0 + 419.800
11.5	393	393	0 + 453.340
15.0	618	618	0 + 500.000
19.5	880	880	0 + 551.400
14.5	833	833	0 + 600.000
12.2	672	672	0 + 650.350
7.5	241	241	0 + 674.800
14.0	271	271	0 + 700.000
18.5	406	406	0 + 725.000
16.5	451	451	0 + 750.700
10.0	434	434	0 + 783.500
27.0	398	398	0 + 805.100
18.5	560	560	0 + 830.000
16.0	259	259	0 + 845.000
18.0	264	264	0 + 860.520
15.3	344	344	0 + 881.210
13.5	343	343	0 + 905.000
14.0	344	344	0 + 930.000
16.0	352	352	0 + 953.480
15.0	123	123	0 + 961.440
36.0	669	669	0 + 987.660
11.5	623	623	1 + 13.880
8.7	163	163	1 + 30.000
11.0	246	246	1 + 55.000
11.0	190	190	1 + 72.300
15.0	360	360	1 + 100.000
31.0	794	794	1 + 134.540
47.0	429	429	1 + 145.540
10.0	412	412	1 + 160.000
8.0	225	225	1 + 185.000
14.0	246	246	1 + 207.360
14.0	182	182	1 + 220.390
13.0	544	544	1 + 260.650
8.0	131	131	1 + 273.090
41.0	677	677	1 + 300.720
51.5	571	571	1 + 313.070
13.0	492	492	1 + 328.340
14.8	387	387	1 + 356.200
13.3	428	428	1 + 386.650
13.5	383	383	1 + 415.220
14.5	400	400	1 + 443.790
14.5	225	225	1 + 459.310
	25,404	25,404	

Clearing Length (m)	Clearing Area (m2)	Total Area (m2)	Station
14.5			1 + 459.310
8.0	371	371	1 + 492.300
17.3	532	532	1 + 534.320
21.0	144	144	1 + 541.860
16.2	190	190	1 + 552.080
22.0	382	382	1 + 572.070
10.8	378	378	1 + 595.140
16.5	534	534	1 + 634.230
11.0	518	518	1 + 671.800
11.8	630	630	1 + 727.130
10.5	311	311	1 + 755.000
21.5	400	400	1 + 780.000
8.8	379	379	1 + 805.000
10.0	235	235	1 + 830.000
8.5	231	231	1 + 855.000
8.0	206	206	1 + 880.000
9.0	213	213	1 + 905.000
10.0	391	391	1 + 946.210
10.5	614	614	2 + 6.120
18.3	463	463	2 + 38.300
11.0	787	787	2 + 92.000
12.5	642	642	2 + 146.640
12.0	655	655	2 + 200.110
11.0	470	470	2 + 241.020
9.0	177	177	2 + 258.700
8.0	224	224	2 + 285.000
10.5	231	231	2 + 310.000
16.0	398	398	2 + 340.000
14.3	305	305	2 + 360.150
19.5	528	528	2 + 391.390
10.7	501	501	2 + 424.600
10.5	332	332	2 + 455.910
12.0	271	271	2 + 480.000
16.5	631	631	2 + 524.270
11.3	631	631	2 + 569.650
12.0	295	295	2 + 595.000
21.5	419	419	2 + 620.000
23.0	556	556	2 + 645.000
12.5	444	444	2 + 670.000
15.5	251	251	2 + 687.950
13.5	682	682	2 + 735.000
13.5	567	567	2 + 777.000
14.3	342	342	2 + 801.630
12.8	223	223	2 + 818.090
9.3	242	242	2 + 840.000
9.8	191	191	2 + 860.000
11.3	172	172	2 + 876.280
12.0	118	118	2 + 886.390
15.5	545	545	2 + 926.030
10.5	598	598	2 + 972.000
11.5	572	572	3 + 23.970
12.3	298	298	3 + 48.990
11.5	250	250	3 + 70.000
10.0	430	430	3 + 110.000
13.3	229	229	3 + 129.670
7.0	419	419	3 + 170.910
10.5	80	80	3 + 180.000
13.0	71	71	3 + 186.000
10.0	81	81	3 + 193.000
9.5	215	215	3 + 215.000
	22,192	22,192	Sub Total
	47,595	47,595	Total

Clearing Length (m)	Clearing Area (m2)	Total Area (m2)	Station
9.5			3 + 215.000
14.3	298	298	3 + 240.000
13.5	348	348	3 + 265.000
11.0	238	238	3 + 284.430
13.0	499	499	3 + 326.000
12.0	218	218	3 + 343.430
23.5	436	436	3 + 368.000
13.5	929	929	3 + 418.210
15.0	390	390	3 + 445.600
22.3	772	772	3 + 487.000
24.7	682	682	3 + 516.000
60.5	239	239	3 + 521.600
23.3	243	243	3 + 527.400
12.5	390	390	3 + 549.200
13.3	60	60	3 + 553.870
11.3	346	346	3 + 582.000
12.0	297	297	3 + 607.490
39.5	536	536	3 + 628.300
88.5	749	749	3 + 640.000
27.2	694	694	3 + 652.000
24.2	514	514	3 + 672.000
14.0	410	410	3 + 693.360
13.7	312	312	3 + 716.000
13.5	598	598	3 + 760.000
13.0	294	294	3 + 782.210
14.3	449	449	3 + 815.110
8.7	286	286	3 + 840.000
19.5	353	353	3 + 865.000
11.0	381	381	3 + 890.000
13.5	247	247	3 + 910.190
11.0	415	415	3 + 944.030
43.0	1,015	1,015	3 + 981.640
34.3	246	246	3 + 988.000
28.0	218	218	3 + 995.000
13.5	519	519	4 + 20.000
42.5	560	560	4 + 40.000
33.0	378	378	4 + 50.000
34.3	367	367	4 + 60.900
14.5	775	775	4 + 92.660
12.5	396	396	4 + 122.000
17.7	526	526	4 + 156.860
13.5	188	188	4 + 168.930
26.0	268	268	4 + 182.500
15.0	359	359	4 + 200.000
13.5	230	230	4 + 216.170
14.0	328	328	4 + 240.000
19.5	335	335	4 + 260.000
14.5	404	404	4 + 283.740
20.0	284	284	4 + 300.190
16.0	411	411	4 + 323.000
25.3	475	475	4 + 346.000
15.0	480	480	4 + 369.800
11.0	345	345	4 + 396.350
24.5	466	466	4 + 422.590
23.0	1,126	1,126	4 + 470.000
10.0	829	829	4 + 520.230
13.5	279	279	4 + 544.000
9.5	253	253	4 + 566.000
14.0	265	265	4 + 588.580
15.5	611	611	4 + 630.000
	25,557	25,557	Sub Total
	73,152	73,152	Total

Clearing Length (m)	Clearing Area (m2)	Total Area (m2)	Station
15.5			4 + 630.000
17.5	495	495	4 + 660.000
24.0	625	625	4 + 690.100
15.5	630	630	4 + 722.000
9.7	531	531	4 + 764.110
15.5	326	326	4 + 790.000
25.5	410	410	4 + 810.000
33.3	705	705	4 + 833.970
38.0	701	701	4 + 853.630
44.5	1,945	1,945	4 + 900.780
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	6,367	6,367	Sub Total
	79,519	79,519	Total

Quantity Calculation

Access Road Name : Severino Access Road (1)

Station	Distance (m)	Earthwork: Cut Volume: Common (C=0.90) Sectional Area (m2)	Common Ground Volume (m3)	Common Corrected Volume (m3)	Weathered Rock (C=1.10) Sectional Area (m2)	Weathered Rock Ground Volume (m3)	Weathered Rock Corrected Volume (m3)	Total Corrected Cut Volume A (m3)	Embankment Volume: Embankment Section Sectional Area (m2)	Embankment Volume (m3)	Vary Volume (m3)	Total Embankment Volume B (m3)	Balance A - B (m3)	Accumlated Volume (m3)	Lateral Volume (m3)	Slope Protection: Left Side Slope Length (m)	Left Side Area (m2)	Right Side Slope Length (m)	Right Side Area (m2)	Total Area (m2)	Station
0 + 0.000		0.0			0.0				0.0					0		0.0		0.0			0 + 0.000
0 + 12.630	12.630	9.5	60	54	0.0	0	0	54	0.0	0		0	54	54	0	1.8	11	0.0	0	11	0 + 12.630
0 + 38.780	26.150	0.0	124	112	0.0	0	0	112	95.2	1,245		1,245	-1,133	-1,079	112	0.0	24	12.5	163	187	0 + 38.780
0 + 60.000	21.220	0.0	0	0	0.0	0	0	0	58.2	1,628		1,628	-1,628	-2,707	0	0.0	0	7.5	212	212	0 + 60.000
0 + 80.000	20.000	4.2	42	38	0.0	0	0	38	8.4	666		666	-628	-3,335	38	5.6	56	5.6	131	187	0 + 80.000
0 + 100.000	20.000	13.0	172	155	2.4	24	26	181	4.4	128		128	53	-3,282	128	3.8	114	5.0	106	220	0 + 100.000
0 + 107.050	7.050	8.0	74	67	0.0	8	9	76	5.5	35		35	41	-3,240	35	8.0	49	6.4	40	89	0 + 107.050
0 + 133.370	26.320	11.1	251	226	1.0	13	14	241	10.8	293		293	-53	-3,293	241	5.2	174	16.2	297	471	0 + 133.370
0 + 160.000	26.630	30.0	547	493	6.2	96	105	598	0.0	224		224	374	-2,919	224	4.4	128	2.6	250	378	0 + 160.000
0 + 180.000	20.000	15.8	458	412	0.0	62	68	480	0.0	0		0	480	-2,439	0	3.0	74	0.0	26	100	0 + 180.000
0 + 190.780	10.780	2.4	98	88	0.0	0	0	88	0.0	0		0	88	-2,350	0	0.5	19	0.0	0	19	0 + 190.780
0 + 198.000	7.220	0.0	9	8	0.0	0	0	8	9.0	32		32	-25	-2,375	8	9.0	34	3.0	11	45	0 + 198.000
0 + 220.000	22.000	1.6	18	16	0.0	0	0	16	2.2	123		123	-107	-2,482	16	1.4	114	2.2	57	172	0 + 220.000
0 + 248.520	28.520	3.8	77	69	0.0	0	0	69	1.6	54		54	15	-2,467	54	2.0	48	3.6	83	131	0 + 248.520
0 + 281.190	32.670	17.2	343	309	12.4	203	223	532	0.0	26		26	505	-1,962	26	3.2	85	1.0	75	160	0 + 281.190
0 + 300.000	18.810	20.8	357	322	42.0	512	563	884	0.0	0		0	884	-1,077	0	2.4	53	1.8	26	79	0 + 300.000
0 + 320.000	20.000	21.8	426	383	28.4	704	774	1,158	0.0	0		0	1,158	80	0	2.6	50	2.0	38	88	0 + 320.000
0 + 339.370	19.370	8.6	294	265	0.6	281	309	574	1.0	10		10	564	645	10	3.4	58	3.0	48	107	0 + 339.370
0 + 357.170	17.800	11.2	176	159	0.9	13	15	173	0.0	9		9	164	809	9	2.6	53	0.0	27	80	0 + 357.170
0 + 380.000	22.830	20.4	361	325	22.0	261	288	612	0.0	0		0	612	1,421	0	3.4	68	1.6	18	87	0 + 380.000
0 + 400.000	20.000	23.4	438	394	25.8	478	526	920	0.0	0		0	920	2,341	0	4.0	74	1.8	34	108	0 + 400.000
0 + 411.723	11.723	24.4	280	252	38.2	375	413	665	0.0	0		0	665	3,006	0	3.8	46	1.6	20	66	0 + 411.723
0 + 450.000	38.277	31.2	1,064	958	33.8	1,378	1,516	2,473	0.0	0		0	2,473	5,480	0	4.5	159	1.6	61	220	0 + 450.000
0 + 509.270	59.270	24.8	1,660	1,494	81.4	3,414	3,755	5,249	0.0	0		0	5,249	10,728	0	1.7	184	1.6	95	279	0 + 509.270
0 + 520.000	10.730	29.4	291	262	101.6	982	1,080	1,342	0.0	0		0	1,342	12,070	0	2.6	23	1.6	17	40	0 + 520.000
0 + 540.000	20.000	38.8	682	614	163.4	2,630	2,915	3,529	0.0	0		0	3,529	15,599	0	2.6	52	1.5	31	83	0 + 540.000
0 + 563.250	23.250	22.6	714	642	63.0	2,632	2,895	3,537	0.0	0		0	3,537	19,136	0	2.2	56	1.8	38	94	0 + 563.250
0 + 580.000	16.750	24.4	394	354	55.2	990	1,089	1,443	0.0	0		0	1,443	20,580	0	3.0	44	1.7	29	73	0 + 580.000
0 + 588.000	8.000	14.4	155	140	3.8	236	260	399	1.2	5		5	394	20,974	5	5.0	32	1.3	12	44	0 + 588.000
0 + 600.000	12.000	7.8	133	120	0.3	25	27	147	5.2	38		38	109	21,083	38	4.4	56	1.3	16	72	0 + 600.000
0 + 615.230	15.230	18.6	201	181	24.6	190	209	390	0.0	40		40	350	21,433	40	3.6	61	1.0	18	78	0 + 615.230
0 + 650.000	34.770	20.4	678	610	28.8	928	1,021	1,631	0.0	0		0	1,631	23,064	0	3.6	160	0.0	17	177	0 + 650.000
0 + 700.000	50.000	21.6	1,050	945	27.8	1,415	1,557	2,502	0.0	0		0	2,502	25,565	0	3.6	280	0.0	0	280	0 + 700.000
0 + 757.360	57.360	22.4	1,262	1,136	34.0	1,772	1,950	3,085	0.0	0		0	3,085	28,651	0	5.2	310	0.0	0	310	0 + 757.360
0 + 780.000	22.640	22.0	503	452	22.8	643	707	1,160	0.0	0		0	1,160	29,810	0	8.3	153	0.0	0	153	0 + 780.000
0 + 800.000	20.000	27.0	490	441	60.4	832	915	1,356	0.0	0		0	1,356	31,167	0	4.5	128	1.8	18	146	0 + 800.000
0 + 819.380	19.380	14.6	403	363	5.6	640	703	1,066	0.0	0		0	1,066	32,233	0	2.8	71	0.0	17	88	0 + 819.380
0 + 832.000	12.620	0.0	92	83	0.0	35	39	122	74.6	471		471	-349	31,884	122	0.0	18	18.2	115	133	0 + 832.000
0 + 850.000	18.000	1.2	11	10	0.0	0	0	10	57.4	1,188		1,188	-1,178	30,706	10	2.5	23	23.4	374	397	0 + 850.000
0 + 902.080	52.080	0.0	31	28	0.0	0	0	28	187.6	6,380		6,380	-6,352	24,354	28	0.0	65	24.2	1,240	1,305	0 + 902.080
0 + 920.000	17.920	0.0	0	0	0.0	0	0	0	247.6	3,899		3,899	-3,899	20,455	0	0.0	0	17.4	373	373	0 + 920.000
0 + 940.000	20.000	0.0	0	0	0.0	0	0	0	138.4	3,860		3,860	-3,860	16,595	0	0.0	0	12.4	298	298	0 + 940.000
0 + 960.000	20.000	0.0	0	0	0.0	0	0	0	50.4	1,888		1,888	-1,888	14,707	0	0.0	0	7.0	194	194	0 + 960.000
0 + 980.000	20.000	0.0	0	0	0.0	0	0	0	18.4	688		688	-688	14,019	0	0.0	0	4.0	110	110	0 + 980.000
1 + 0.000	20.000	2.0	20	18	0.0	0	0	18	0.4	188		188	-170	13,849	18	0.8	8	0.3	43	51	1 + 0.000
1 + 20.000	20.000	5.2	72	65	0.0	0	0	65	0.0	4		4	61	13,909	4	1.4	22	0.0	3	25	1 + 20.000
1 + 40.000	20.000	9.2	144	130	0.0	0	0	130	0.0	0		0	130	14,039	0	1.0	24	1.0	10	34	1 + 40.000
1 + 60.000	20.000	0.8	100	90	0.0	0	0	90	0.6	6		6	84	14,123	6	0.2	12	0.3	13	25	1 + 60.000
1 + 81.620	20.810	0.4	12	11	0.0	0	0	11	0.6	12		12	-1	14,122	11	0.0	2	0.2	5	7	1 + 81.620
1 + 100.000	18.380	0.0	4	3	0.0	0	0	3	7.4	74		74	-70	14,052	3	0.0	0	2.2	22	22	1 + 100.000
1 + 150.000	50.000	12.0	300	270	0.0	0	0	270	0.0	185		185	85	14,137	185	2.2	55	1.2	85	140	1 + 150.000
1 + 178.930	28.930	12.1	349	314	0.0	0	0	314	0.0	0		0	314	14,450	0	2.6	69	1.2	35	104	1 + 178.930
1 + 200.000	21.070	20.2	340	306	0.0	0	0	306	0.0	0		0	306	14,757	0	3.4	63	2.4	38	101	1 + 200.000
1 + 220.000	20.000	17.8	380	342	0.0	0	0	342	0.0	0		0	342	15,099	0	0.0	34	2.6	50	84	1 + 220.000
1 + 234.790	14.790	2.6	131	136	0.0	0	0	136	0.0	0		0	136	15,234	0	0.0	0	0.0	19	19	1 + 234.790
1 + 295.810	61.020	10.2	391	351	0.0	0	0	351	0.0	0		0	351	15,586	0	0.0	0	0.0	0	0	1 + 295.810
1 + 320.000	24.190	17.2	331	298	3.4	41	45	343	0.0	0		0	343	15,929	0	0.0	0	0.0	0	0	1 + 320.000
Total	1319.190		17,013	15,312		21,893	24,016	39,328		23,399		23,399	15,929		1,369		3,495		5,061	8,556	

Station	Distance (m)	Earthwork: Cut Volume: Common (C=0.90) Sectional Area (m2)	Common Ground Volume (m3)	Common Corrected Volume (m3)	Weathered Rock (C=1.10) Sectional Area (m2)	Weathered Rock Ground Volume (m3)	Weathered Rock Corrected Volume (m3)	Total Corrected Cut Volume A (m3)	Embankment Volume: Embankment Section Sectional Area (m2)	Embankment Volume (m3)	Vary Volume (m3)	Total Embankment Volume B (m3)	Balance A - B (m3)	Accumulated Volume (m3)	Lateral Volume (m3)	Slope Protection: Left Side Slope Length (m)	Left Side Area (m2)	Right Side Slope Length (m)	Right Side Area (m2)	Total Area (m2)	Station
1 + 320.000		17.2			3.4				0.0					15,929		0.0		0.0			1 + 320.000
1 + 340.000	20.000	17.8	350	315	3.2	66	73	388	0.0	0		0	388	16,317	0	3.4	34	0.0	0	34	1 + 340.000
1 + 356.040	16.040	20.0	303	273	11.4	117	129	402	0.0	0		0	402	16,719	0	3.2	53	0.0	0	53	1 + 356.040
1 + 366.360	10.320	22.8	221	199	17.8	151	166	365	0.0	0		0	365	17,083	0	3.2	33	0.0	0	33	1 + 366.360
1 + 380.000	13.640	30.8	366	329	27.2	307	338	667	0.0	0		0	667	17,750	0	3.4	45	0.0	0	45	1 + 380.000
1 + 400.000	20.000	24.0	548	493	28.0	552	607	1,100	0.0	0		0	1,100	18,850	0	4.2	76	0.0	0	76	1 + 400.000
1 + 420.000	20.000	18.4	424	382	21.2	492	541	923	0.0	0		0	923	19,773	0	4.0	82	0.0	0	82	1 + 420.000
1 + 440.000	20.000	16.4	348	313	21.8	430	473	786	0.0	0		0	786	20,559	0	3.6	76	0.0	0	76	1 + 440.000
1 + 460.000	20.000	36.8	532	479	32.8	746	821	1,299	0.0	0		0	1,299	21,858	0	4.0	76	2.4	24	100	1 + 460.000
1 + 480.000	20.000	34.8	716	644	29.2	820	902	1,546	0.0	0		0	1,546	23,405	0	4.0	80	3.0	54	134	1 + 480.000
1 + 500.000	20.000	11.6	464	418	0.0	292	321	739	0.0	0		0	739	24,144	0	4.0	80	0.0	30	110	1 + 500.000
1 + 520.000	20.000	0.0	116	104	0.0	0	0	104	46.6	466		466	-362	23,782	104	0.0	40	16.8	168	208	1 + 520.000
1 + 540.000	20.000	0.0	0	0	0.0	0	0	0	14.6	612		612	-612	23,170	0	0.0	0	7.4	242	242	1 + 540.000
1 + 550.000	10.000	0.0	0	0	0.0	0	0	0	70.0	423		423	-423	22,747	0	0.0	0	19.0	132	132	1 + 550.000
1 + 580.000	30.000	0.0	0	0	0.0	0	0	0	52.4	1,836		1,836	-1,836	20,911	0	0.0	0	15.6	519	519	1 + 580.000
1 + 600.000	20.000	3.6	36	32	0.0	0	0	32	17.2	696		696	-664	20,247	32	2.2	22	13.8	314	336	1 + 600.000
1 + 620.000	20.000	0.0	36	32	0.0	0	0	32	81.4	986		986	-954	19,294	32	0.0	22	23.8	396	418	1 + 620.000
1 + 640.000	20.000	0.0	0	0	0.0	0	0	0	97.0	1,784		1,784	-1,784	17,510	0	0.0	0	12.6	364	364	1 + 640.000
1 + 660.000	20.000	0.0	0	0	0.0	0	0	0	164.6	2,616		2,616	-2,616	14,894	0	0.0	0	14.2	268	268	1 + 660.000
1 + 680.000	20.000	0.0	0	0	0.0	0	0	0	173.4	3,380		3,380	-3,380	11,514	0	0.0	0	14.4	286	286	1 + 680.000
1 + 699.480	19.480	0.0	0	0	0.0	0	0	0	187.2	3,512		3,512	-3,512	8,002	0	0.0	0	14.2	279	279	1 + 699.480
1 + 750.000	50.520	0.0	0	0	0.0	0	0	0	109.2	7,487		7,487	-7,487	515	0	0.0	0	8.0	561	561	1 + 750.000
1 + 779.230	29.230	0.0	0	0	0.0	0	0	0	60.0	2,473		2,473	-2,473	-1,958	0	0.0	0	5.0	190	190	1 + 779.230
1 + 800.000	20.770	0.0	0	0	0.0	0	0	0	12.4	752		752	-752	-2,710	0	0.0	0	3.0	83	83	1 + 800.000
1 + 820.000	20.000	18.4	184	166	0.0	0	0	166	0.0	124		124	42	-2,669	124	2.6	26	1.0	40	66	1 + 820.000
1 + 840.000	20.000	27.4	458	412	2.8	28	31	443	0.0	0		0	443	-2,226	0	4.2	68	2.2	32	100	1 + 840.000
1 + 860.000	20.000	0.0	274	247	0.0	28	31	277	10.6	106		106	171	-2,054	106	0.0	42	3.0	52	94	1 + 860.000
1 + 866.000	6.000	0.0	0	0	0.0	0	0	0	6.8	52		52	-52	-2,106	0	0.0	0	3.0	18	18	1 + 866.000
1 + 900.000	34.000	9.0	153	138	0.0	0	0	138	0.0	116		116	22	-2,084	116	1.4	24	0.8	65	88	1 + 900.000
1 + 933.940	33.940	23.0	577	519	5.6	95	105	624	0.0	0		0	624	-1,460	0	3.6	85	2.6	58	143	1 + 933.940
1 + 940.000	6.060	26.8	157	141	6.4	36	40	181	0.0	0		0	181	-1,279	0	3.6	22	2.7	16	38	1 + 940.000
1 + 960.000	20.000	21.6	484	436	5.6	120	132	568	0.0	0		0	568	-712	0	3.8	74	0.8	35	109	1 + 960.000
1 + 965.000	5.000	18.2	100	90	0.0	14	15	105	0.0	0		0	105	-607	0	3.2	18	1.4	6	23	1 + 965.000
1 + 980.000	15.000	27.4	342	308	18.0	135	149	456	0.0	0		0	456	-150	0	4.2	56	1.6	23	78	1 + 980.000
2 + 2.710	22.710	15.0	481	433	9.6	313	345	778	0.0	0		0	778	628	0	3.6	89	0.0	18	107	2 + 2.710
2 + 50.000	47.290	20.4	837	753	11.0	487	536	1,289	0.0	0		0	1,289	1,917	0	3.6	170	0.0	0	170	2 + 50.000
2 + 99.000	49.000	0.0	500	450	0.0	270	296	746	120.8	2,960		2,960	-2,213	-297	746	0.0	88	29.6	725	813	2 + 99.000
2 + 120.000	21.000	1.2	13	11	0.0	0	0	11	64.0	1,940		1,940	-1,929	-2,226	11	1.0	11	31.6	643	653	2 + 120.000
2 + 140.000	20.000	1.3	25	23	0.0	0	0	23	50.8	1,148		1,148	-1,126	-3,351	23	1.0	20	37.4	690	710	2 + 140.000
2 + 162.000	22.000	0.0	14	13	0.0	0	0	13	22.8	810		810	-797	-4,148	13	0.0	11	6.0	477	488	2 + 162.000
2 + 192.390	30.390	0.0	0	0	0.0	0	0	0	12.7	539		539	-539	-4,687	0	0.0	0	4.6	161	161	2 + 192.390
2 + 200.000	7.610	0.3	1	1	0.0	0	0	1	9.6	85		85	-84	-4,771	1	0.6	2	3.8	32	34	2 + 200.000
2 + 250.000	50.000	0.0	8	7	0.0	0	0	7	13.0	365		365	-358	-5,329	7	0.0	15	4.0	195	210	2 + 250.000
2 + 300.000	50.000	3.6	90	81	0.0	0	0	81	0.5	338		338	-257	-5,586	81	1.6	40	1.0	125	165	2 + 300.000
2 + 322.100	22.100	0.1	41	37	0.0	0	0	37	7.2	85		85	-48	-5,634	37	0.0	18	5.4	71	88	2 + 322.100
2 + 340.000	17.900	7.8	71	64	0.0	0	0	64	1.8	81		81	-17	-5,651	64	3.8	34	4.8	91	125	2 + 340.000
2 + 360.000	20.000	5.6	134	121	0.0	0	0	121	10.4	122		122	-1	-5,652	121	3.2	70	8.2	130	200	2 + 360.000
2 + 380.000	20.000	0.0	56	50	0.0	0	0	50	34.9	453		453	-403	-6,055	50	0.0	32	8.2	164	196	2 + 380.000
2 + 387.480	7.480	0.0	0	0	0.0	0	0	0	50.4	319		319	-319	-6,374	0	0.0	0	8.0	61	61	2 + 387.480
2 + 400.000	12.520	0.0	0	0	0.0	0	0	0	33.4	525		525	-525	-6,899	0	0.0	0	8.4	103	103	2 + 400.000
2 + 411.560	11.560	0.0	0	0	0.0	0	0	0	14.0	274		274	-274	-7,173	0	0.0	0	4.4	74	74	2 + 411.560
2 + 420.000	8.440	29.4	124	112	7.8	33	36	148	0.0	59		59	89	-7,084	59	4.2	18	3.0	31	49	2 + 420.000
2 + 440.000	20.000	62.0	914	823	124.4	1,322	1,454	2,277	0.0	0		0	2,277	-4,807	0	4.6	88	3.4	64	152	2 + 440.000
2 + 460.000	20.000	142.8	2,048	1,843	446.0	5,704	6,274	8,118	0.0	0		0	8,118	3,311	0	5.0	96	7.6	110	206	2 + 460.000
2 + 480.000	20.000	55.4	1,982	1,784	11.8	4,578	5,036	6,820	0.0	0		0	6,820	10,130	0	3.6	86	3.2	108	194	2 + 480.000
2 + 499.280	19.280	17.6	704	633	12.6	235	259	892	0.0	0		0	892	11,022	0	3.4	67	1.7	47	115	2 + 499.280
2 + 549.620	50.340	18.0	896	806	13.8	664	731	1,537	0.0	0		0	1,537	12,560	0	4.2	191	0.0	43	234	2 + 549.620
2 + 560.000	10.380	3.2	110	99	0.0	72	79	178	2.4	12		12	165	12,725	12	2.2	33	2.4	12	46	2 + 560.000
2 + 580.000	20.000	0.0	32	29	0.0	0	0	29	13.2	156		156	-127	12,598	29	0.0	22	12.2	146	168	2 + 580.000
2 + 600.000	20.000	15.6	156	140	5.6	56	62	202	0.0	132		132	70	12,668	132	4.0	40	0.0	122	162	2 + 600.000
Sub Total	1,280.000		16,424	14,782		18,163	19,980	34,761		38,023		38,023	-3,262		1,900		2,374		8,696	11,070	Sub Total
Total	2,599.190		33,437	30,094		39,996	43,996	74,089		61,422		61,422	12,668		3,270		5,869		13,757	19,625	Total

47

Station	Distance (m)	Earthwork: Cut Volume: Common (C=0.90) Sectional Area (m2)	Common Ground Volume (m3)	Common Corrected Volume (m3)	Weathered Rock (C=1.10) Sectional Area (m2)	Weathered Rock Ground Volume (m3)	Weathered Rock Corrected Volume (m3)	Total Corrected Cut Volume A (m3)	Embankment Volume: Embankment Section: Sectional Area (m2)	Embankment Volume (m3)	Vary Volume (m3)	Total Embankment Volume B (m3)	Balance A - B (m3)	Accumulated Volume (m3)	Lateral Volume (m3)	Slope Protection: Left Side: Slope Length (m)	Left Side Area (m2)	Right Side: Slope Length (m)	Right Side Area (m2)	Total Area (m2)	Station
2 + 600.000		15.6			5.6				0.0					12,668		4.0		0.0			2 + 600.000
2 + 611.890	11.890	29.2	266	240	70.0	449	494	734	0.0	0		0	734	13,402	0	3.8	46	1.6	10	56	2 + 611.890
2 + 630.410	18.520	48.0	715	643	168.0	2,204	2,424	3,068	0.0	0		0	3,068	16,470	0	4.0	72	1.8	31	104	2 + 630.410
2 + 682.360	51.950	0.3	1,255	1,129	0.0	4,364	4,800	5,929	5.2	135		135	5,794	22,264	135	0.0	104	2.4	109	213	2 + 682.360
2 + 707.500	25.140	20.8	265	239	0.0	0	0	239	0.0	65		65	173	22,437	65	3.8	48	1.3	49	97	2 + 707.500
2 + 761.560	54.060	79.6	2,714	2,442	294.8	7,968	8,765	11,208	0.0	0		0	11,208	33,645	0	5.0	238	2.6	111	349	2 + 761.560
2 + 808.480	46.920	0.0	1,867	1,681	0.0	6,916	7,608	9,288	189.6	4,448		4,448	4,840	38,485	4,448	0.0	117	12.0	343	460	2 + 808.480
2 + 820.000	11.520	0.0	0	0	0.0	0	0	0	53.9	1,403		1,403	-1,403	37,083	0	0.0	0	12.6	142	142	2 + 820.000
2 + 840.000	20.000	19.2	192	173	16.6	166	183	355	0.0	539		539	-184	36,899	355	3.2	32	1.8	144	176	2 + 840.000
2 + 847.000	7.000	16.4	125	112	9.8	92	102	214	0.0	0		0	214	37,113	0	3.2	22	1.8	13	35	2 + 847.000
2 + 860.000	13.000	18.6	228	205	30.6	263	289	494	0.0	0		0	494	37,606	0	3.0	40	1.8	23	64	2 + 860.000
2 + 864.180	4.180	20.8	82	74	36.6	140	154	229	0.0	0		0	229	37,835	0	2.4	11	1.8	8	19	2 + 864.180
2 + 890.430	26.250	15.0	470	423	5.2	549	603	1,026	0.0	0		0	1,026	38,861	0	3.2	74	0.0	24	97	2 + 890.430
2 + 900.000	9.570	4.6	94	84	0.0	25	27	112	0.0	0		0	112	38,973	0	1.6	23	0.0	0	23	2 + 900.000
2 + 920.000	20.000	18.2	228	205	17.2	172	189	394	0.0	0		0	394	39,368	0	2.6	42	1.8	18	60	2 + 920.000
2 + 940.520	20.520	19.6	388	349	31.6	501	551	900	0.0	0		0	900	40,267	0	2.8	55	1.8	37	92	2 + 940.520
2 + 986.100	45.580	0.0	447	402	0.0	720	792	1,194	10.8	246		246	948	41,215	246	0.0	64	2.6	100	164	2 + 986.100
2 + 996.100	10.000	38.4	192	173	41.2	206	227	399	0.0	54		54	345	41,561	54	4.0	20	2.8	27	47	2 + 996.100
3 + 0.000	3.900	41.2	155	140	48.4	175	192	332	0.0	0		0	332	41,893	0	4.2	16	3.2	12	28	3 + 0.000
3 + 20.000	20.000	47.6	888	799	79.2	1,276	1,404	2,203	0.0	0		0	2,203	44,095	0	4.0	82	3.2	64	146	3 + 20.000
3 + 40.710	20.710	42.8	936	842	57.2	1,412	1,554	2,396	0.0	0		0	2,396	46,492	0	4.4	87	3.4	68	155	3 + 40.710
3 + 60.700	19.990	26.6	694	624	1.9	591	650	1,274	0.0	0		0	1,274	47,766	0	4.0	84	3.0	64	148	3 + 60.700
3 + 80.000	19.300	0.0	257	231	0.0	18	20	251	122.4	1,181		1,181	-930	46,836	251	0.0	39	0.0	29	68	3 + 80.000
3 + 100.000	20.000	4.4	44	40	0.0	0	0	40	1.0	1,234		1,234	-1,194	45,641	40	2.6	26	1.6	16	42	3 + 100.000
3 + 111.330	11.330	17.2	122	110	12.0	68	75	185	0.0	6		6	179	45,821	6	1.8	25	3.0	26	51	3 + 111.330
3 + 150.000	38.670	17.2	665	599	15.6	534	587	1,186	0.0	0		0	1,186	47,006	0	0.0	35	2.8	112	147	3 + 150.000
3 + 175.690	25.690	20.2	480	432	9.6	324	356	788	0.0	0		0	788	47,795	0	1.5	19	2.6	69	89	3 + 175.690
3 + 180.000	4.310	17.8	82	74	40.2	107	118	192	0.0	0		0	192	47,986	0	1.0	5	2.6	11	17	3 + 180.000
3 + 200.000	20.000	15.2	330	297	46.0	862	948	1,245	0.0	0		0	1,245	49,232	0	1.0	20	2.2	48	68	3 + 200.000
3 + 218.000	18.000	4.6	178	160	0.0	414	455	616	6.4	58		58	558	49,790	58	1.4	22	4.1	57	78	3 + 218.000
3 + 238.010	20.010	37.6	422	380	197.2	1,973	2,170	2,550	0.0	64		64	2,486	52,276	64	1.6	30	4.1	82	112	3 + 238.010
3 + 250.060	12.050	47.6	513	462	255.6	2,728	3,001	3,463	0.0	0		0	3,463	55,739	0	1.5	19	4.2	50	69	3 + 250.060
3 + 262.330	12.270	41.4	546	491	191.2	2,741	3,015	3,507	0.0	0		0	3,507	59,246	0	1.0	15	2.5	41	56	3 + 262.330
3 + 280.000	17.670	34.0	666	600	140.4	2,930	3,223	3,822	0.0	0		0	3,822	63,068	0	1.5	22	4.9	65	87	3 + 280.000
3 + 300.000	20.000	45.6	796	716	79.0	2,194	2,413	3,130	0.0	0		0	3,130	66,198	0	2.0	35	5.4	103	138	3 + 300.000
3 + 319.810	19.810	26.6	715	644	31.0	1,090	1,199	1,842	0.0	0		0	1,842	68,040	0	2.0	40	3.2	85	125	3 + 319.810
3 + 322.620	2.810	17.6	62	56	3.6	49	53	109	0.0	0		0	109	68,149	0	0.0	3	5.0	12	14	3 + 322.620
3 + 340.000	17.380	31.8	429	386	35.6	341	375	761	0.0	0		0	761	68,910	0	2.0	17	5.2	89	106	3 + 340.000
3 + 360.000	20.000	47.2	790	711	109.6	1,452	1,597	2,308	0.0	0		0	2,308	71,218	0	2.0	40	5.2	104	144	3 + 360.000
3 + 373.320	13.320	27.6	498	448	42.8	1,015	1,116	1,565	0.0	0		0	1,565	72,783	0	2.0	27	3.3	57	83	3 + 373.320
3 + 419.730	46.410	0.0	640	576	0.0	993	1,092	1,669	20.2	469		469	1,200	73,983	469	5.0	162	0.0	77	239	3 + 419.730
3 + 440.000	20.270	0.0	0	0	0.0	0	0	0	45.6	667		667	-667	73,316	0	12.4	176	0.0	0	176	3 + 440.000
3 + 460.000	20.000	0.0	0	0	0.0	0	0	0	158.4	2,040		2,040	-2,040	71,276	0	25.2	376	0.0	0	376	3 + 460.000
3 + 481.660	21.660	0.0	0	0	0.0	0	0	0	52.0	2,279		2,279	-2,279	68,998	0	8.4	364	0.0	0	364	3 + 481.660
3 + 500.000	18.340	0.0	0	0	0.0	0	0	0	19.0	651		651	-651	68,347	0	5.0	123	0.0	0	123	3 + 500.000
3 + 550.980	50.980	0.0	0	0	0.0	0	0	0	11.4	775		775	-775	67,572	0	3.6	219	0.0	0	219	3 + 550.980
3 + 560.000	9.020	0.0	0	0	0.0	0	0	0	24.8	163		163	-163	67,409	0	4.4	36	0.0	0	36	3 + 560.000
3 + 580.000	20.000	0.0	0	0	0.0	0	0	0	69.2	940		940	-940	66,469	0	6.2	106	0.0	0	106	3 + 580.000
3 + 600.000	20.000	0.8	8	7	0.0	0	0	7	1.8	710		710	-703	65,766	7	1.8	80	0.6	6	86	3 + 600.000
3 + 620.000	20.000	1.0	18	16	0.0	0	0	16	4.8	66		66	-50	65,716	16	2.4	42	0.6	12	54	3 + 620.000
3 + 640.000	20.000	0.0	10	9	0.0	0	0	9	15.4	202		202	-193	65,523	9	4.4	68	0.0	6	74	3 + 640.000
3 + 660.000	20.000	0.0	0	0	0.0	0	0	0	18.2	336		336	-336	65,187	0	4.2	86	0.0	0	86	3 + 660.000
3 + 680.000	20.000	0.0	0	0	0.0	0	0	0	53.0	712		712	-712	64,475	0	4.6	88	0.0	0	88	3 + 680.000
3 + 705.390	25.390	2.4	30	27	0.0	0	0	27	0.4	678		678	-650	63,824	27	0.6	66	1.3	17	83	3 + 705.390
3 + 767.140	61.750	16.0	568	511	16.2	500	550	1,061	0.0	12		12	1,049	64,874	12	0.0	19	5.6	213	232	3 + 767.140
3 + 780.000	12.860	18.0	219	197	30.6	301	331	528	0.0	0		0	528	65,401	0	0.0	0	5.0	68	68	3 + 780.000
3 + 800.000	20.000	15.2	332	299	24.6	552	607	906	0.0	0		0	906	66,307	0	0.0	0	4.6	96	96	3 + 800.000
3 + 820.000	20.000	24.2	394	355	53.6	782	860	1,215	0.0	0		0	1,215	67,522	0	1.0	10	6.0	106	116	3 + 820.000
3 + 836.530	16.530	26.6	420	378	102.8	1,293	1,422	1,800	0.0	0		0	1,800	69,322	0	1.0	17	5.6	96	112	3 + 836.530
3 + 850.000	13.470	24.2	342	308	88.2	1,286	1,415	1,723	0.0	0		0	1,723	71,045	0	1.0	13	5.4	74	88	3 + 850.000
Sub Total	1,250.000		22,779	20,501		52,755	58,009	78,509		20,132		20,132	58,377		6,283		3,768		3,222	6,989	Sub Total
Total	3,849.190		56,216	50,594		92,731	102,005	152,599		81,554		81,554	71,045		9,533		9,636		16,978	26,615	Total

9-7

Station	Distance (m)	Earthwork: Cut Volume: Common (C=0.90) Sectional Area (m2)	Common Ground Volume (m3)	Common Corrected Volume (m3)	Weathered Rock (C=1.10) Sectional Area (m2)	Weathered Rock Ground Volume (m3)	Weathered Rock Corrected Volume (m3)	Total Corrected Cut Volume A (m3)	Embankment Volume: Embankment Section Sectional Area (m2)	Embankment Volume (m3)	Vary Volume (m3)	Total Embankment Volume B (m3)	Balance A - B (m3)	Accumulated Volume (m3)	Lateral Volume (m3)	Slope Protection: Left Side Slope Length (m)	Left Side Area (m2)	Right Side Slope Length (m)	Right Side Area (m2)	Total Area (m2)	Station
3 + 850.000		24.2			88.2				0.0					71,045		1.0		5.4			3 + 850.000
3 + 900.000	50.000	32.0	1,405	1,265	121.4	5,240	5,764	7,029	0.0	0		0	7,029	78,073	0	1.0	50	6.2	290	340	3 + 900.000
3 + 950.000	50.000	33.6	1,640	1,476	116.0	5,935	6,529	8,005	0.0	0		0	8,005	86,078	0	1.0	50	6.0	305	355	3 + 950.000
4 + 0.000	50.000	34.6	1,705	1,535	133.2	6,230	6,858	8,388	0.0	0		0	8,388	94,465	0	1.6	65	3.2	230	295	4 + 0.000
4 + 21.100	21.100	42.8	817	735	166.0	3,157	3,472	4,207	0.0	0		0	4,207	98,673	0	1.0	27	4.8	84	112	4 + 21.100
4 + 50.000	28.900	34.0	1,110	999	133.8	4,332	4,765	5,764	0.0	0		0	5,764	104,437	0	1.0	29	2.4	104	133	4 + 50.000
4 + 101.100	51.100	34.6	1,753	1,577	166.8	7,680	8,448	10,026	0.0	0		0	10,026	114,462	0	1.0	51	6.0	215	266	4 + 101.100
4 + 120.000	18.900	52.8	826	743	118.8	2,699	2,969	3,712	0.0	0		0	3,712	118,175	0	3.0	38	2.0	76	113	4 + 120.000
4 + 140.000	20.000	31.6	844	760	29.2	1,480	1,628	2,388	0.0	0		0	2,388	120,562	0	2.8	58	1.4	34	92	4 + 140.000
4 + 160.000	20.000	3.2	348	313	0.0	292	321	634	93.0	930		930	-296	120,267	634	6.3	91	34.9	363	454	4 + 160.000
4 + 180.000	20.000	0.0	32	29	0.0	0	0	29	522.0	6,150		6,150	-6,121	114,145	29	0.0	63	59.4	943	1,006	4 + 180.000
4 + 184.740	4.740	0.0	0	0	0.0	0	0	0	606.6	2,675		2,675	-2,675	111,471	0	0.0	0	60.4	284	284	4 + 184.740
4 + 200.000	15.260	0.0	0	0	0.0	0	0	0	632.0	9,451		9,451	-9,451	102,020	0	0.0	0	54.4	876	876	4 + 200.000
4 + 260.000	60.000	0.0	0	0	0.0	0	0	0	754.8	41,604		41,604	-41,604	60,416	0	0.0	0	38.8	2,796	2,796	4 + 260.000
4 + 278.000	18.000	0.0	0	0	0.0	0	0	0	394.0	10,339		10,339	-10,339	50,077	0	0.0	0	50.0	799	799	4 + 278.000
4 + 300.000	22.000	0.0	0	0	0.0	0	0	0	323.4	7,891		7,891	-7,891	42,186	0	0.0	0	36.0	945	946	4 + 300.000
4 + 357.760	57.760	0.0	0	0	0.0	0	0	0	205.6	15,278		15,278	-15,278	26,908	0	0.0	0	52.4	2,553	2,553	4 + 357.760
Sub Total	307.760		10,479	9,431		37,045	40,749	50,181		94,317		94,317	-44,137		663		522		10,898	11,420	Sub Total
Total	4,356.950		66,695	60,025		129,776	142,754	202,779		175,871		175,871	26,908		10,196		10,158		27,876	38,034	Total