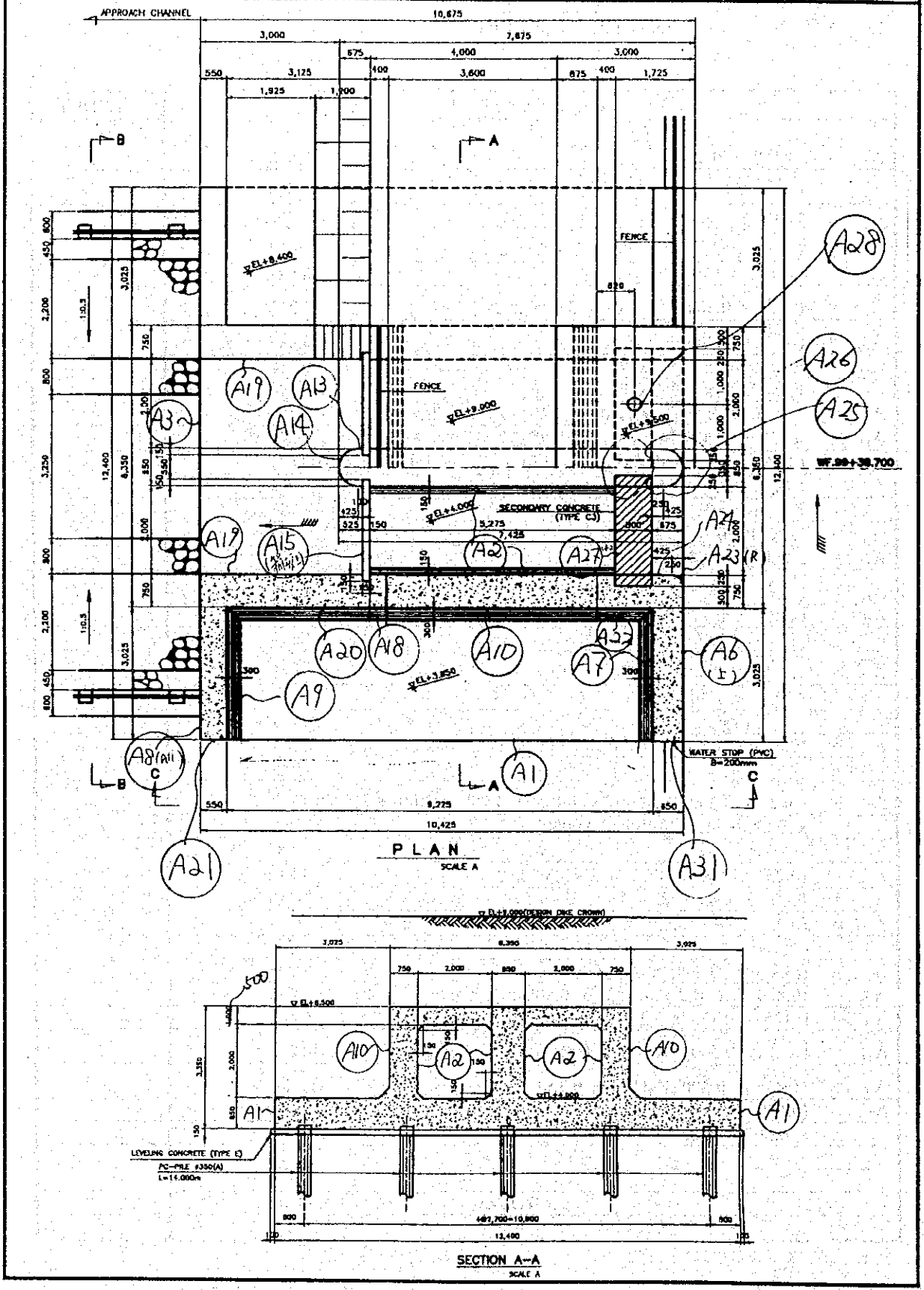
TYPE OF WORK : FORM (H ≥ 4.0 m)

LOCATION : INTAKE WEIR LEFT (1/2)

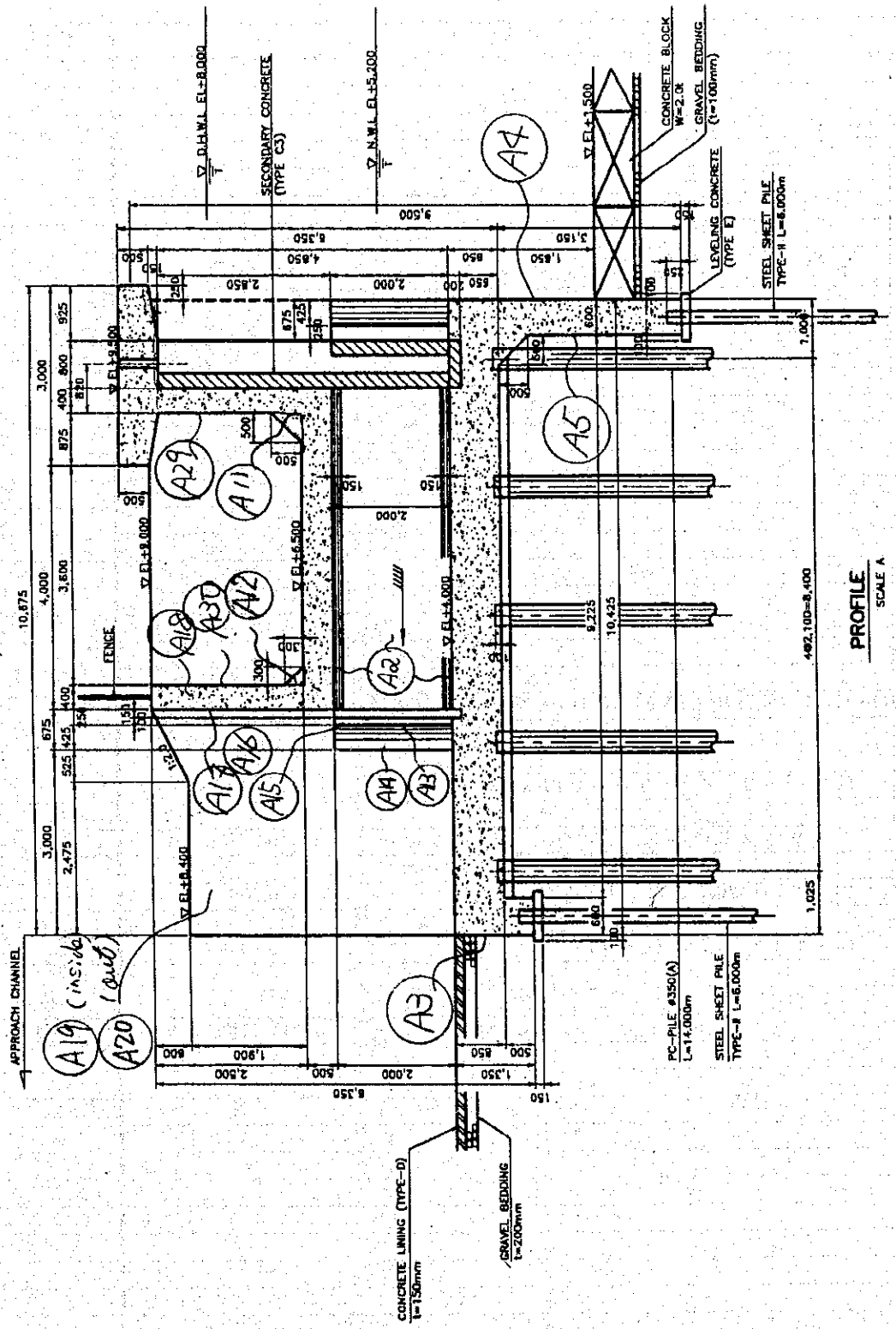
EXPLANATORY DRAWING



TYPE OF WORK : FORM (H≧4.0m)

LOCATION : INTAKE WEIR LEFT (2/2)

EXPLANATORY DRAWING



TYPE OF WORK :
LOCATION : INTAKE WEIR RIGHT

CALCULATION			RESULT
❑ FORM (H < 4.0 m)			❑
A_1 = 0.850 x 8.675 x 2	=	14.748	
A_2 = ($\sqrt{2}$ x 0.200 x 2 + 1.6) x 6.775 x 2 x 4	=	117.380	
A_3 = 1.35 x 11.55	=	15.593	
TOTAL	=	147.721	147.721 m^2
❑ **FORMWORK FOR LEVELLING CONCRETE (H < 4.0 m)**			
A_1 = (10.425 - 0.6 x 2 - 0.5) x 0.15 x 2	=	2.612	
A_2 = ½ x 0.15 x 0.15 x 2	=	0.023	
A_3 = (0.8 x 2 + 20.2 x 2) x 0.15	=	6.300	
A_4 = (0.8 x 2 + 20.2 x 2) x 0.15	=	6.300	
TOTAL	=	15.241	15.241 m^2

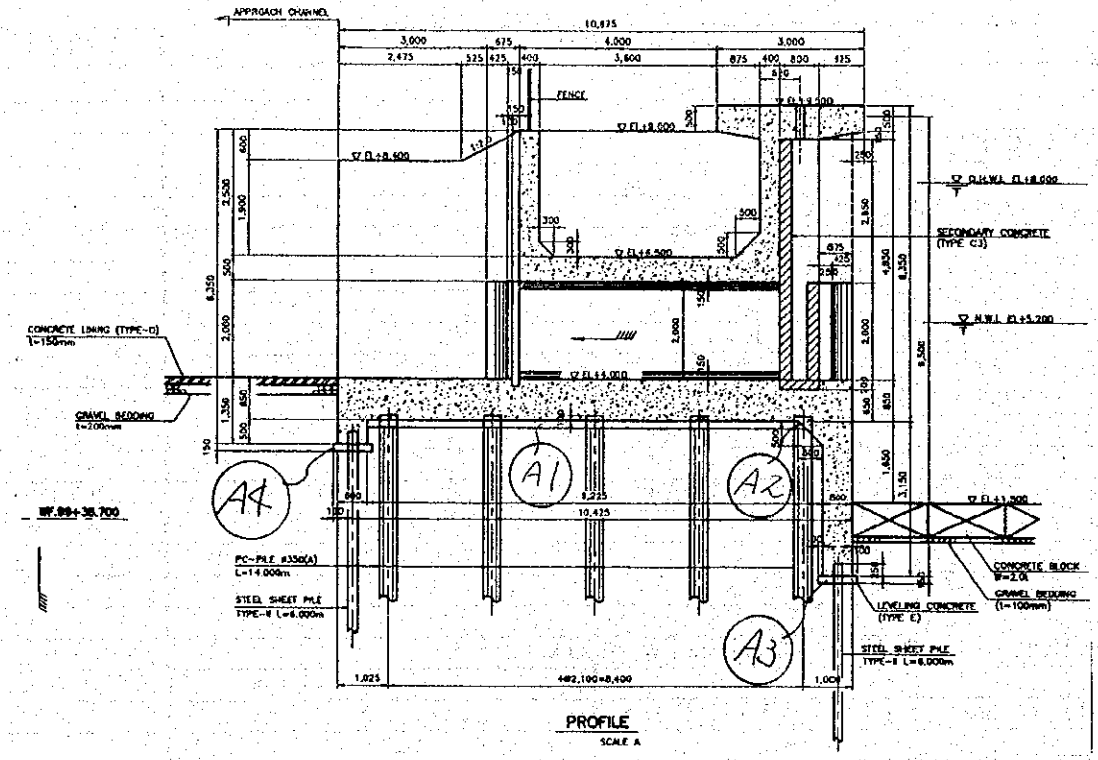
TYPE OF WORK : SECONDARY CONCRETE & ANCHOR BAR
LOCATION : INTAKE WEIR LEFT

CALCULATION				RESULT
(TYPE – C3)				
V_1 = 2.5 x 0.8 x 0.25 x 2		=	1.000	
V_2 = 0.25 x 2.0 x 0.285 x 4		=	0.570	
V_3 = 0.25 x 4.95 x 0.25 x 4		=	1.238	
V_4 = (0.5 x 0.22 + 0.175 x 0.03) x 2.0 x 2		=	0.461	
	TOTAL	=	3.269	3.269 m^3
ANCHOR BAR (D19 , L = 300 mm/Bar, W = 2.23 kgf /m)				
BOTTOM	(5 x 3 + 5 x 2 + 4) x 2	=	58	
TOP	3 x 4 x 2	=	24	
FORMER SIDE	4 x 2 x 2 x 2	=	32	
LATTER SIDE	9 x 2 x 2 x 2	=	72	
n = 186 Bars				
W = 186 Bars x 0.30 x 2.23 kgf/m		=	124.434 kgf	0.124 tf

TYPE OF WORK : FORMWORK FOR LEVELING CONCRETE (H<9.0m)

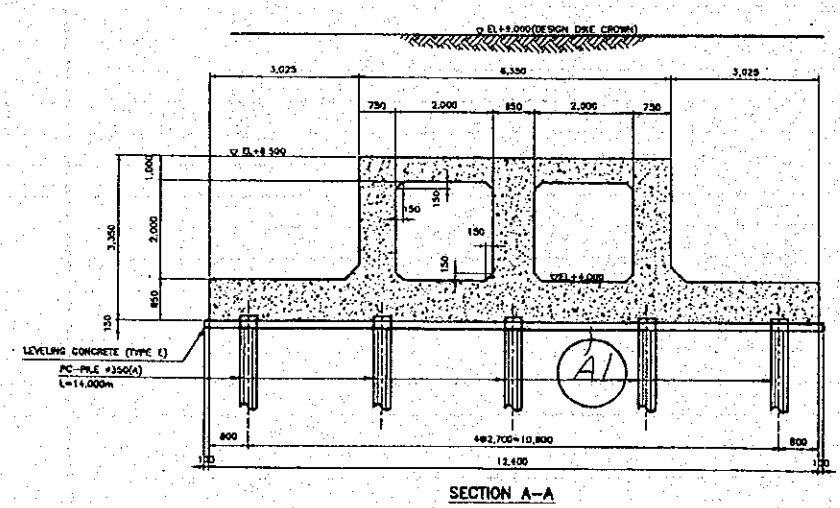
LOCATION : INTAKE WEIR LEFT

EXPLANATORY DRAWING



PROFILE

SCALE A



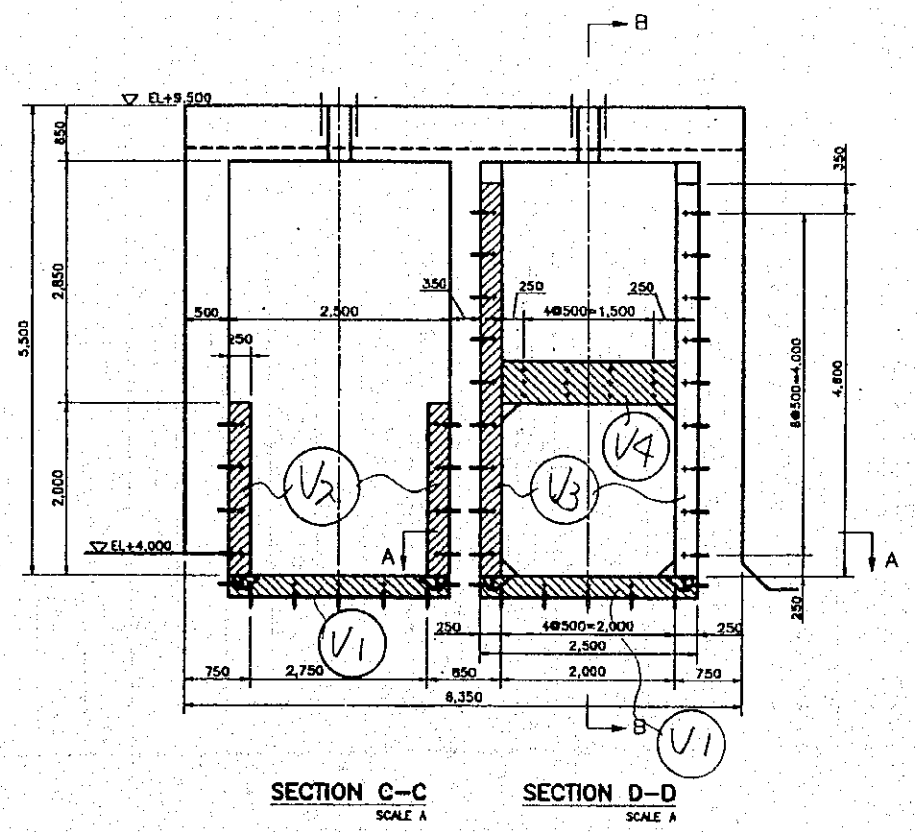
SECTION A-A

SCALE A

TYPE OF WORK : SECONDARY CONCRETE & ANCHOR BAR

LOCATION : INTAKE WEIR LEFT

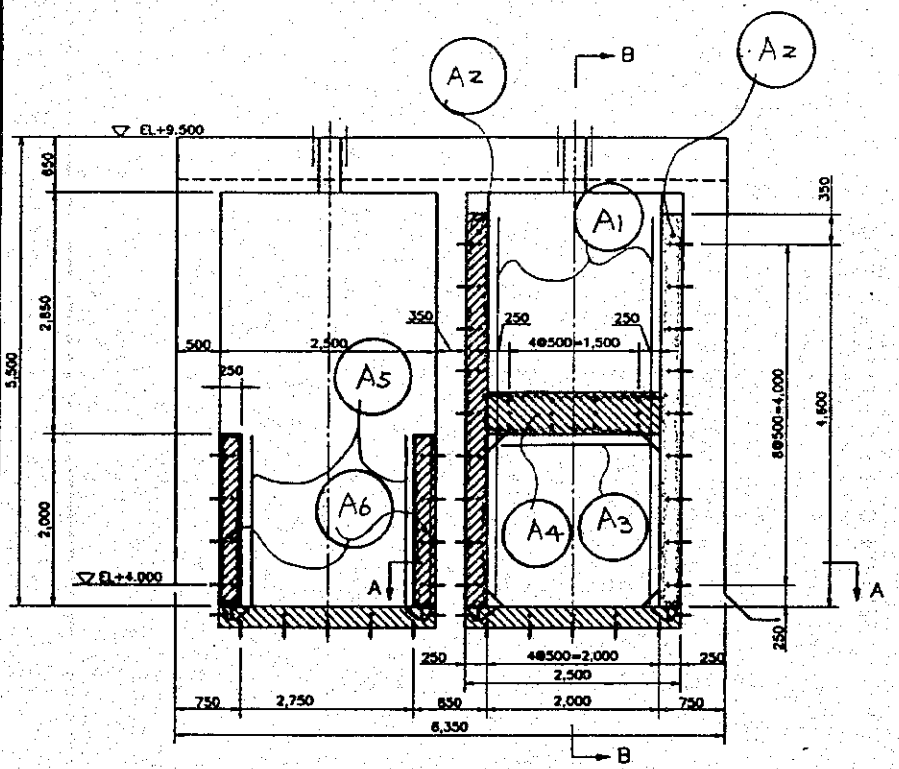
EXPLANATORY DRAWING



SECTION C–C
SCALE A

SECTION D–D
SCALE A

TYPE OF WORK :	FORM FOR SECONDARY CONCRETE
LOCATION :	INTAKE STRUCTURE (LEFT BANK)



SECTION C–C
SCALE A

SECTION D–D
SCALE A

CALCULATION	RESULT
(H ≧ 4.0m)	
$A_1 = 0.25 \times 4.95 \times 2 \times 2 = 4.950$	
$A_2 = 0.25 \times 4.95 \times 2 \times 2 = 4.950$	
$A_3 = 0.25 \times 2.25 \times 2 = 1.125$	
$A_4 = 0.50 \times 2.25 \times 2 = 2.250$	
$A_5 = 0.285 \times 2.00 \times 2 \times 2 = 2.280$	
$A_6 = 0.25 \times 2.00 \times 2 \times 2 = 2.000$	
TOTAL = 17.555	17.555 m^2

TYPE OF WORK : SUPPORTING

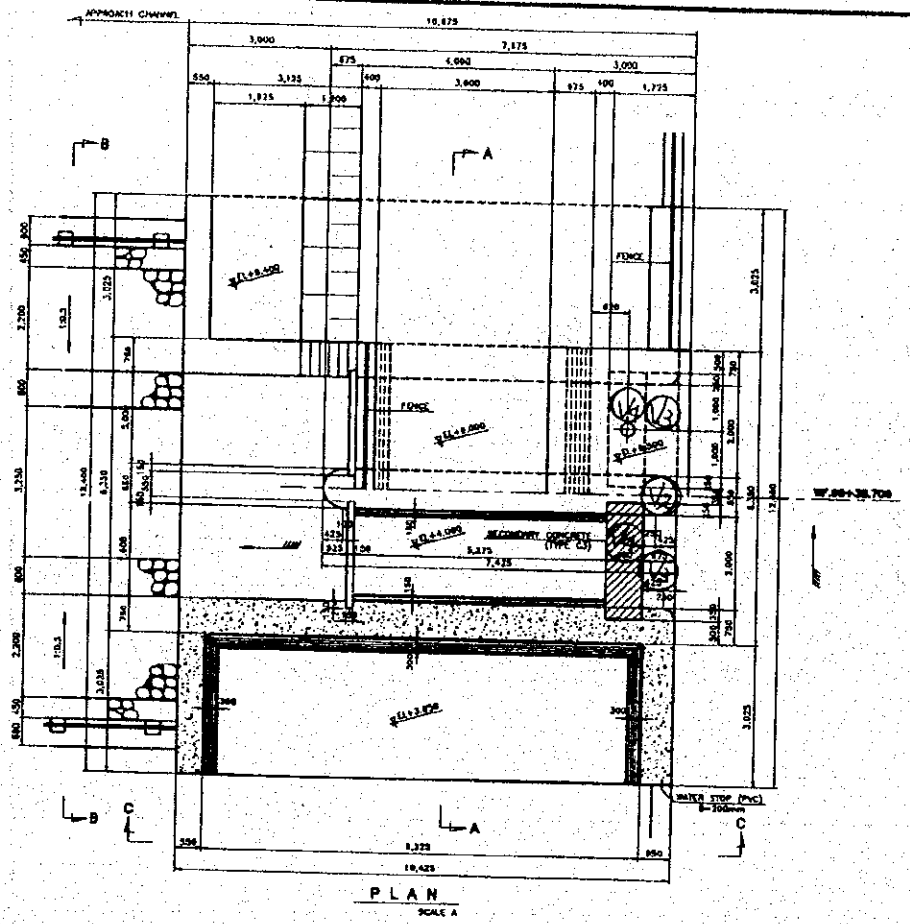
LOCATION : INTAKE WEIR LEFT

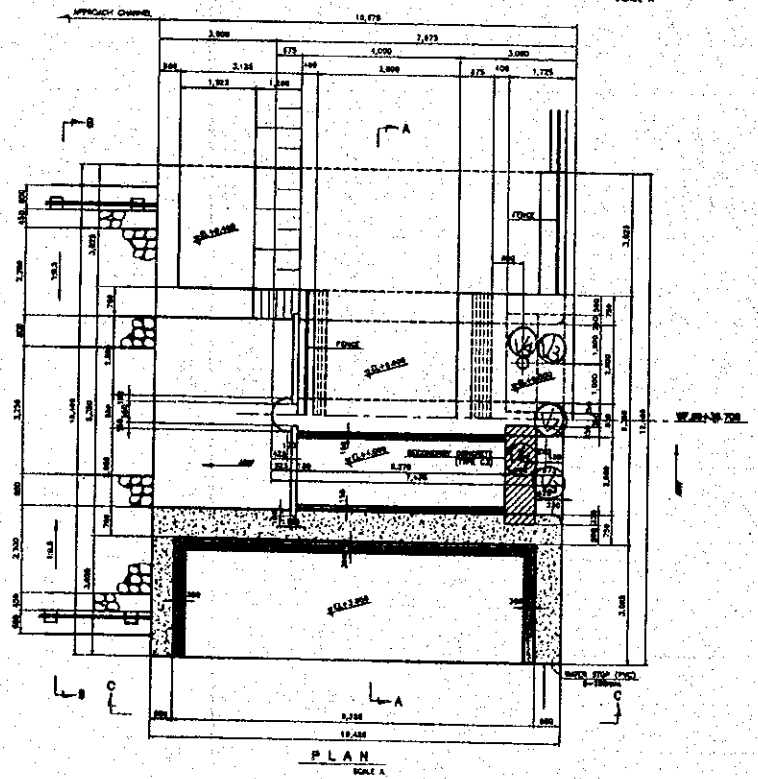
CALCULATION		RESULT
$V_1 = 6.35 \times (0.25^{0} \times 8.85 + \frac{1}{2} \times 0.25 \times (0.15 + 0.109)) =$	14.255	
$V_2 = (0.25^{0} \times 0.85^{0} + 0.425 \times 0.425 \times 3.142 \div 2) \times (2.85^{0} + \frac{1}{3} \times 0.109) = 0.4963 \times 2.8863 =$	1.432	
$V_3 = (0.675 \times 4.85^{0} - 0.4963) \times (4.85^{0} + \frac{1}{3} \times 0.109) =$	13.572	
$V_4 = 0.8^{00} \times 2.5^{00} \times (4.85^{0} + 0.2^{00}) \times 2 =$	20.200	
$V_5 = \{\frac{1}{2} \times (2.^{000} + 1.85^{0}) \times 0.875 + \frac{1}{2} \times (0.375 + 0.875) \times 0.5^{00}\} \times 6.35^{0} =$	12.680	
$V_6 = (2.^{000} \times 2.^{000} - 0.15 \times 0.15 \times \frac{1}{2} \times 4) \times 5.275 \times 2 =$	41.725	
TOTAL	103.864	103.864 m^3
FORM OF TOP SLAB		
$A1(Cont) = 4.850 \times \sqrt{0.925^2 + 0.15^2} =$	4.545	
$A2(Cont) = 2.500 \times 0.8 \times 2 =$	4.000	
$A3(Cont) = 6.350 \times \sqrt{0.875^2 + 0.15^2} =$	5.637	
$A4(Box) = 1.700 \times 5.275 \times 2 =$	17.935	
TOTAL	32.117 m^2	

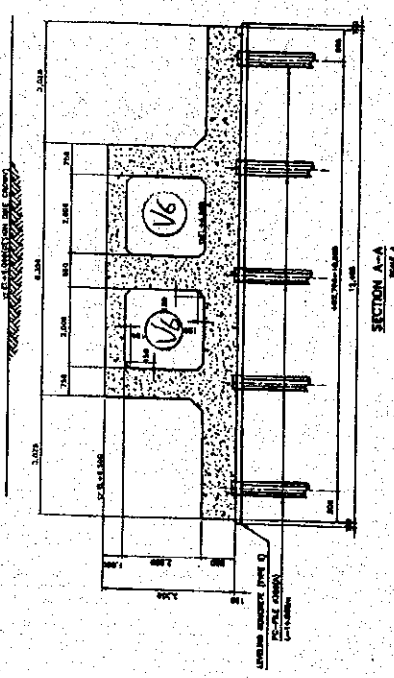
TYPE OF WORK : SUPPORTING

LOCATION : INTAKE WEIR LEFT

EXPLANATORY DRAWING







TYPE OF WORK : SCAFFOLDING

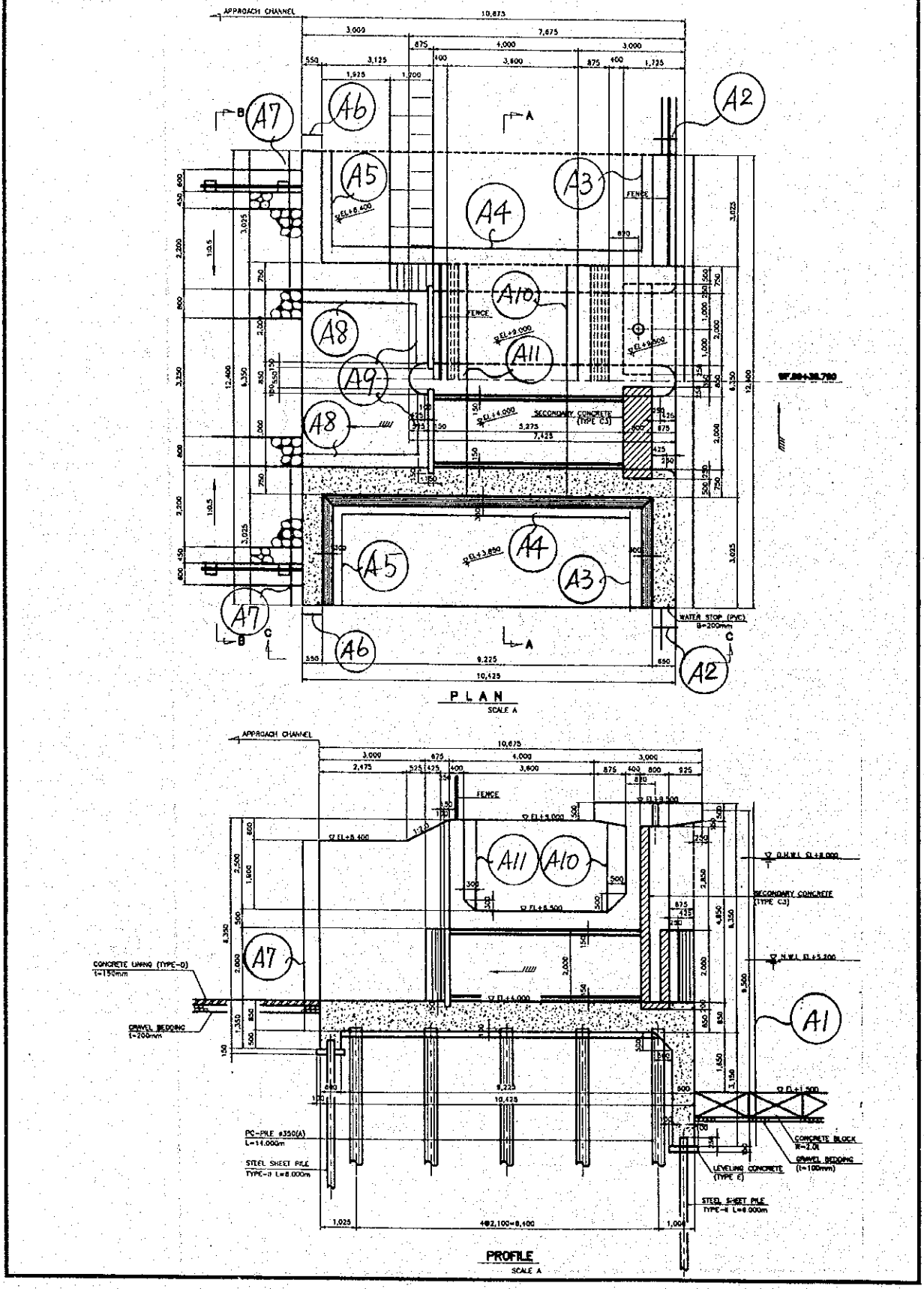
LOCATION : INTAKE WEIR LEFT

CALCULATION		RESULT
$A1 = 9.500 \times 12.400 =$	117.800	
$A2 = 9.000 \times 0.65 \times 2 =$	11.700	
$A3 = 5.000 \times 3.025 \times 2 =$	30.250	
$A4 = \{5.500 \times 2.35 + 2.500 \times 3.600 + 5.000 \times 0.400 + \frac{1}{2} \times (4.400 + 5.000) \times 1.200 + 4.400 \times 1.875\} \times 2 =$	75.630	
$A5 = 4.400 \times 3.025 \times 2 =$	26.620	
$A6 = 5.250 \times 0.600 \times 2 =$	6.300	
$A7 = 5.250 \times 3.775 \times 2 =$	39.638	
$A8 = \{4.400 \times 2.475 + \frac{1}{2} \times (4.4 + 5.000) \times 1.200 \times 2 =$	33.060	
$A9 = 5.000 \times 2.000 \times 2 =$	20.000	
$A10 = 3.000 \times 6.350 =$	19.050	
$A11 = 2.500 \times 6.350 =$	15.875	
TOTAL	395.923	395.923 m^2

TYPE OF WORK : SCAFFOLDING

LOCATION : INTAKE WEIR LEFT

EXPLANATORY DRAWING



TYPE OF WORK : PILE HEAD TREATMENT
LOCATION : INTAKE STUCTURE
: LEFT BANK

CALCULATION	RESULT
PC PILE DIA 350 (A) n = 25 PILES	
LENGTH OF DESIGN : L_1 = 13.30 m/pile	
SPARE PILE LENGTH : L_2 = 1.00 m	
ADOPTED PILE LENGTH : L = 13.30 + 1.00 = 14.30 15.00 m/pile	25 places
JOINTING	
n = 1 place/pile	25 places
PILING	
N VALUE : N = 28 (Average)	
D = 13.30 m/pile	25 places
CONCRETE FILLING (TYPE-C1) n = 25 PILES	
$V = \pi/4 \times 0.22^2 \times 0.55$ = 0.021 m^3/pile	25 places
SUSPENDED FORM	
$A = \pi/4 \times 0.22^2$ = 0.038 m^3/pile	25 places
REINFORCING BAR	
D 13 (W = 1.04 kg/m)	
W_1 = 6 Bars x 0.45 x 1.04 = 2.808	
W_2 = 4 Bars x 0.74 x 1.04 = 3.078	
TOTAL W = 5.886 kg.f/pile	25 places
CUTTING PILE HEAD	
Height of cutting : h = 1.70 m/pile	
$V = \pi/4 \times (0.35^2 - 0.40^2) \times 1.70$ = 0.099 m^3/pile	25 places

3.4 Connecting Walls, Revetment, Riverbed Protection etc.

LEANING WALL

TYPE OF WORK : WET STONE MASONRY

LOCATION : CONNECTING CHANNEL OF SEMARANG RIVER

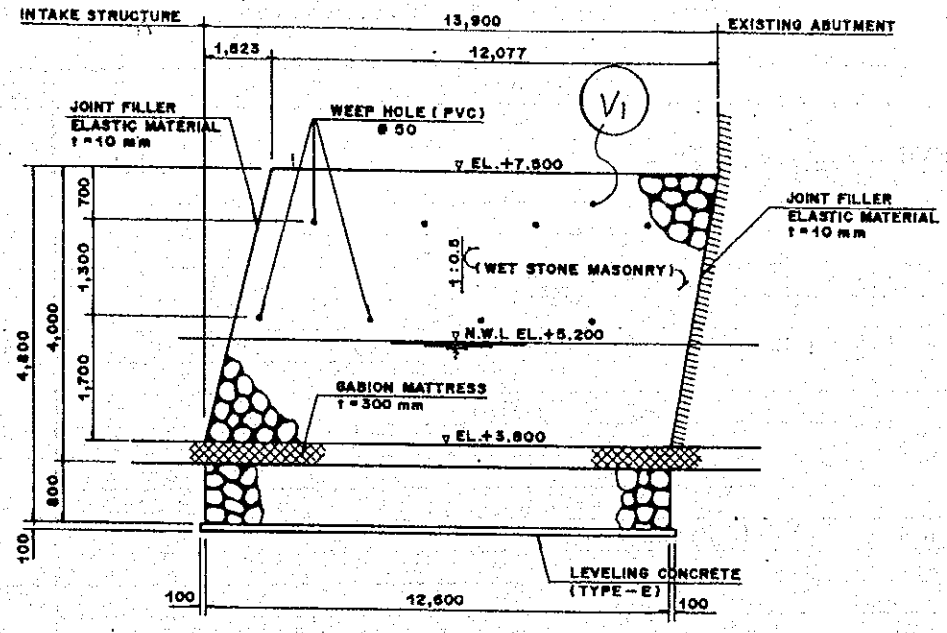
CALCULATION	RESULT
$A = (0.45 + 1.45) \times 1/2 \times 4.00 + 0.80 \times 2.15 = 5.520\ m^2$	
$V_1 = (12.60 + 12.077) \times 1/2 \times 5.52 = 68.109$	
$V_2 = (13.85 + 13.244) \times 1/2 \times 5.52 = 74.779$	
TOTAL = 142.888	142.888 m^3

LEANING WALL

TYPE OF WORK : WET STONE MASONRY

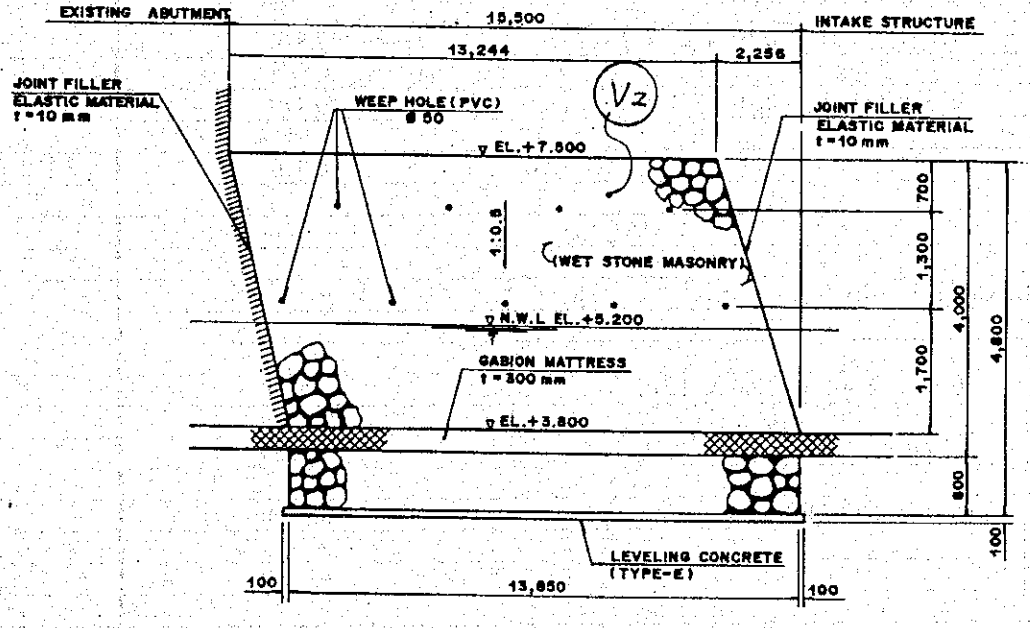
LOCATION : CONNECTING CHANNEL OF SEMARANG RIVER

EXPLANATORY DRAWING



DEVELOPMENT OF LEANING WALL (LEFT SIDE)

SCALE H = A / V = 8



DEVELOPMENT OF LEANING WALL (RIGHT SIDE)

SCALE H = A / V = 8

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF SEMARANG RIVER

CALCULATION			RESULT
❑ LEVELLING CONCRETE			
(TYPE – E)			
V_1 = (2.15 + 0.10 x 2) x 12.60 x 0.10	=	2.961	
V_2 = (2.15 + 0.10 x 2) x 13.85 x 0.10	=	3.255	6.216 m^3
TOTAL	=	6.216	
❑ FORM FOR LEVELLING CONCRETE			
(H < 4.0 m)			
A_1 = 0.10 x (12.60 + 0.10 x 2) x 2	=	2.560	
A_2 = 0.10 x (2.15 + 0.10 x 2) x 2	=	0.470	
A_3 = 0.10 x (13.85 + 0.10 x 2) x 2	=	2.810	
A_4 = 0.10 x (2.15 + 0.10 x 2) x 2	=	0.470	
TOTAL	=	6.310	6.310 m^2
❑ BACKFILL GRAVEL			
A = (0.50 x 2.30) + (1.00 x 1.30)	=	2.450	
V_1 = (12.60 + 12.077) x ½ x 2.45	=	30.229	
V_2 = (13.85 + 13.244) x ½ x 2.45	=	33.190	
TOTAL	=	63.419	63.419 m^3

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF SEMARANG RIVER

CALCULATION			RESULT
❑ BACKFILL WITH SELECTED SOIL			
A = 1.00 x 1.20	=	1.200 m^2	
V_1 = 1.20 x 12.60	=	15.200	
V_2 = 1.20 x 13.85	=	16.620	
TOTAL	=	31.740	31.740 m^3
❑ BACKFILL SOIL			
A = 0.50 x 2.40	=	1.200 m^2	
V_1 = 12.00 + 12.077	=	14.492	
V_2 = 1.20 x 13.244	=	15.893	
TOTAL	=	30.385	30.385 m^3
❑ TOP CONCRETE			
• CONCRETE (TYPE – D)			
V_1 = 0.60 x 0.15 x 12.077	=	1.087	
V_2 = 0.60 x 0.15 x 13.244	=	1.192	
TOTAL	=	2.279	2.279 m^3
• FORM FOR TOP CONCRETE (H < 4.0 m)			
A_1 = 0.15 x 12.077	=	1.812	
A_2 = 0.15 x 13.244	=	1.987	
TOTAL	=	3.799	3.799 m^2

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF SEMARANG RIVER

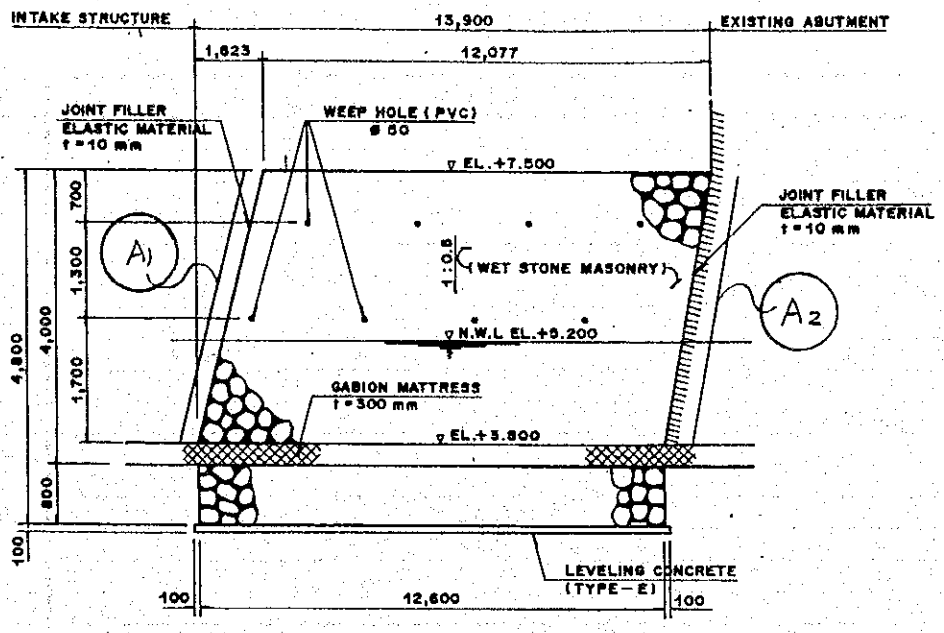
CALCULATION			RESULT
❑ WEEP HOLE			
• PVC PIPE ∅ 50			
Upper Section			
L_1 = 8 pipes x 0.80	=	6.400	
Lower Section			
L_2 = 9 pipes x 1.10	=	9.900	
TOTAL	=	16.300	16.300 m
• FILTER CLOTH			
A = 17 sheets x $(0.20 \times 2 + 0.165 \times 2 + 0.15)^2$	=	13.165	13.165 m^2
❑ SCAFFOLDING			
A_1 = 4.472 x (12.600 + 12.077) x ½	=	55.178	
A_2 = 4.472 x (13.244 + 13.85) x ½	=	60.582	
TOTAL	=	115.760	115.760 m^2
❑ JOINT FILTER			
t = 10, ELASTIC MATERIAL			
A_1 = (0.45 + 1.45) x ½ x 2.00 x 1.222	=	2.322	
(REVISING)			
A_2 = (0.45 + 1.45) x ½ x 2.00 x 1.404	=	2.668	
A_3 = (0.45 + 1.45) x ½ x 2.00 x 1.340	=	2.546	
A_4 = (0.45 + 1.45) x ½ x 2.00 x 1.577	=	2.996	
TOTAL	=	10.532	10.532 m^2

LEANING WALL

TYPE OF WORK : JOINT FILLER

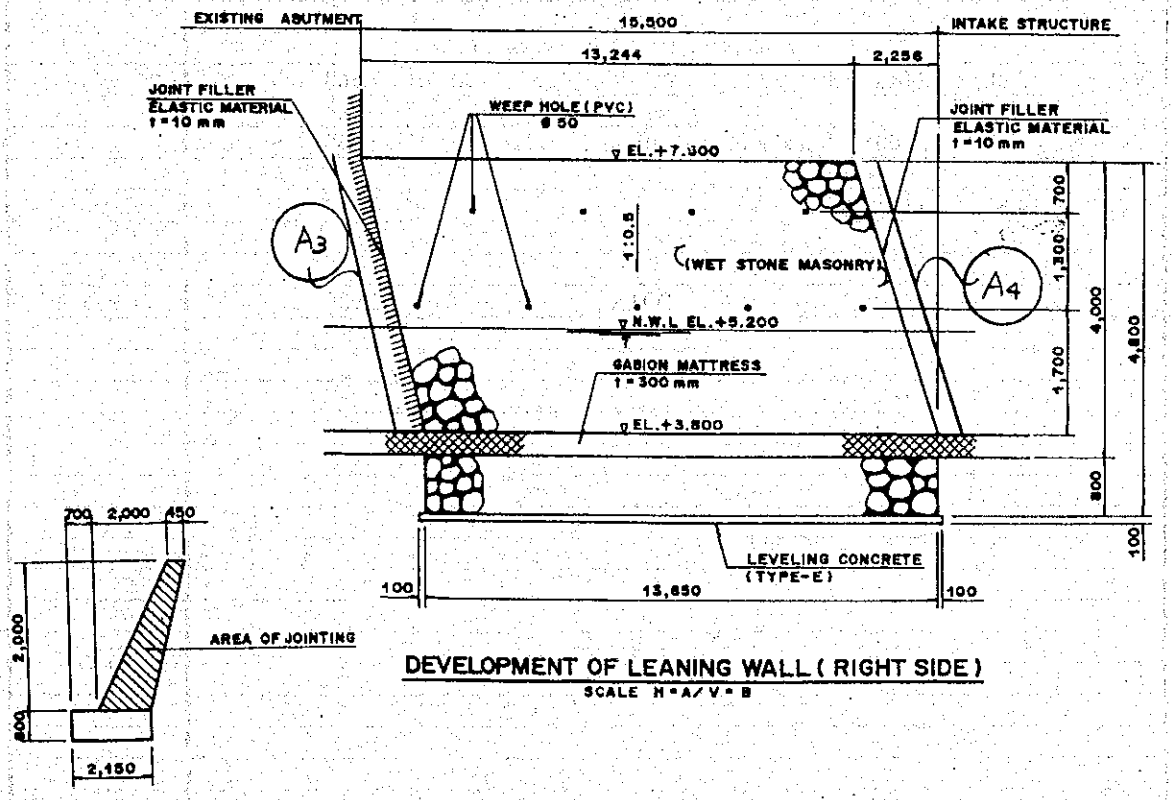
LOCATION : CONNECTING CHANNEL OF SEMARANG RIVER

EXPLANATORY DRAWING



DEVELOPMENT OF LEANING WALL (LEFT SIDE)

SCALE H = A / V = B



DEVELOPMENT OF LEANING WALL (RIGHT SIDE)

SCALE H = A / V = B

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF SEMARANG RIVER

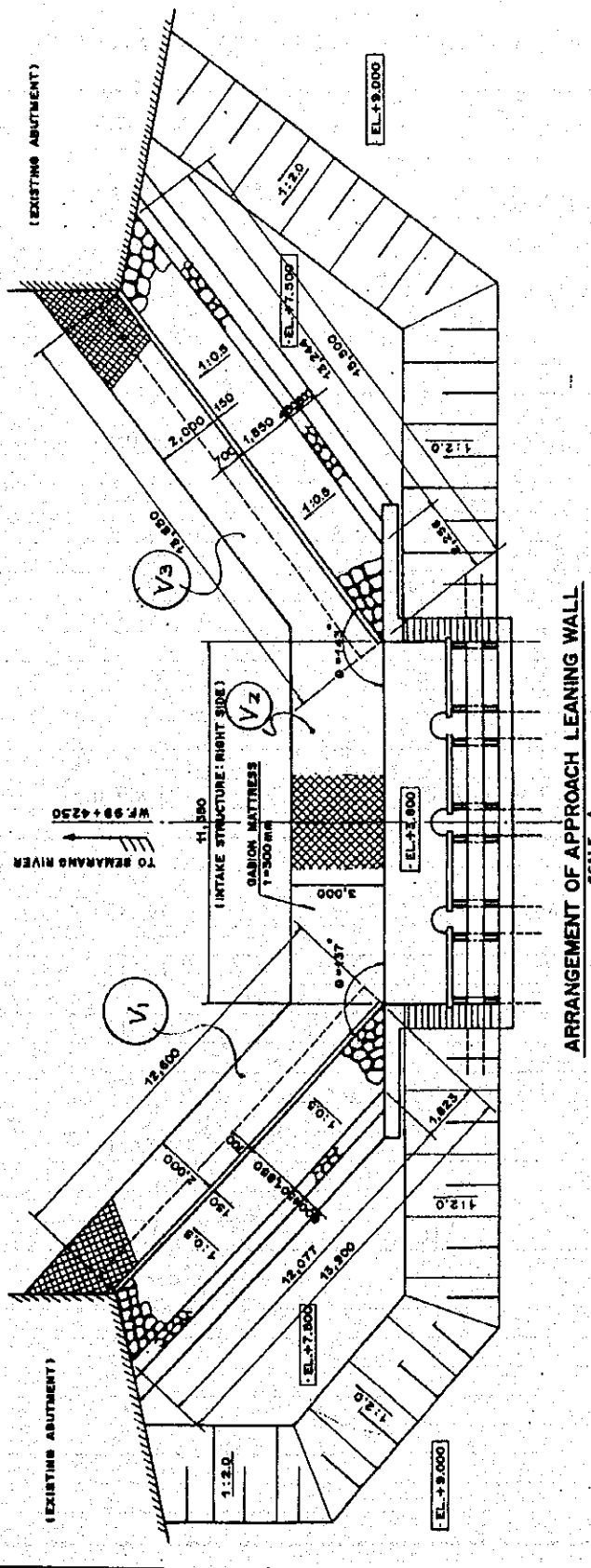
CALCULATION			RESULT
☐ RUBBLE STONE FILLING			
A = ½ x 0.30 x 0.15	=	0.023 m^2	
V_1 = 0.023 x 12.60	=	0.290	
V_2 = 0.023 x 13.85	=	0.319	
TOTAL	=	0.609	0.609 m^3
☐ GABION MATTRESS			
t = 300 (GALVANIZED AND PVC COATED)			
V_1 = 12.60 x 2.00 x 0.30	=	7.560	
V_2 = (11.55 + 12.00) x ½ x 2.00 x 0.30	=	7.065	
V_3 = 13.85 x 2.00 x 0.30	=	8.310	
TOTAL	=	22.935	22.935 m^3

LEANING WALL

TYPE OF WORK : GABION MATTRESS

LOCATION : CONNECTING CHANNEL OF SEMARANG RIVER

EXPLANATORY DRAWING



ARRANGEMENT OF APPROACH LEANING WALL

SCALE A

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF SEMARANG RIVER

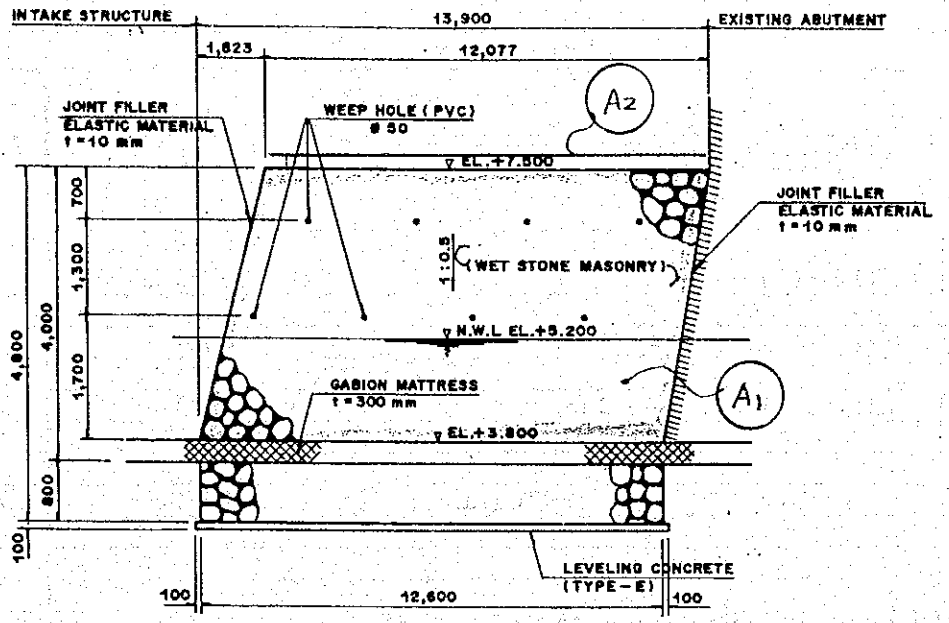
CALCULATION			RESULT
□ CEMENT MORTAR POINTING			
A_1 = (12.60 + 12.077) x ½ x 3.70 x 1.118	=	51.039	
(REVISING)			
A_2 = 0.45 x 12.077	=	5.425	
A_3 = (13.85 + 13.244) x ½ x 3.70 x 1.118	=	56.039	
A_4 = 0.45 x 13.244	=	5.960	
TOTAL	=	118.473	118.473 m^2
□ WET STONE MASONRY			
A = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940 m^2	
V_1 = 5.94 x 4.65	=	27.621	
V_2 = 5.94 x (15.119 + 11.663) x ½	=	79.543	
V_3 = 5.94 x 3.15	=	18.711	
V_4 = 5.94 x 3.15	=	18.711	
V_5 = 5.94 x (0.589 + 4.045) x ½	=	13.763	
V_6 = 5.94 x 4.65	=	27.621	
TOTAL	=	191.910	191.190 m^3

LEANING WALL

TYPE OF WORK : CEMENT MORTAR POINTING

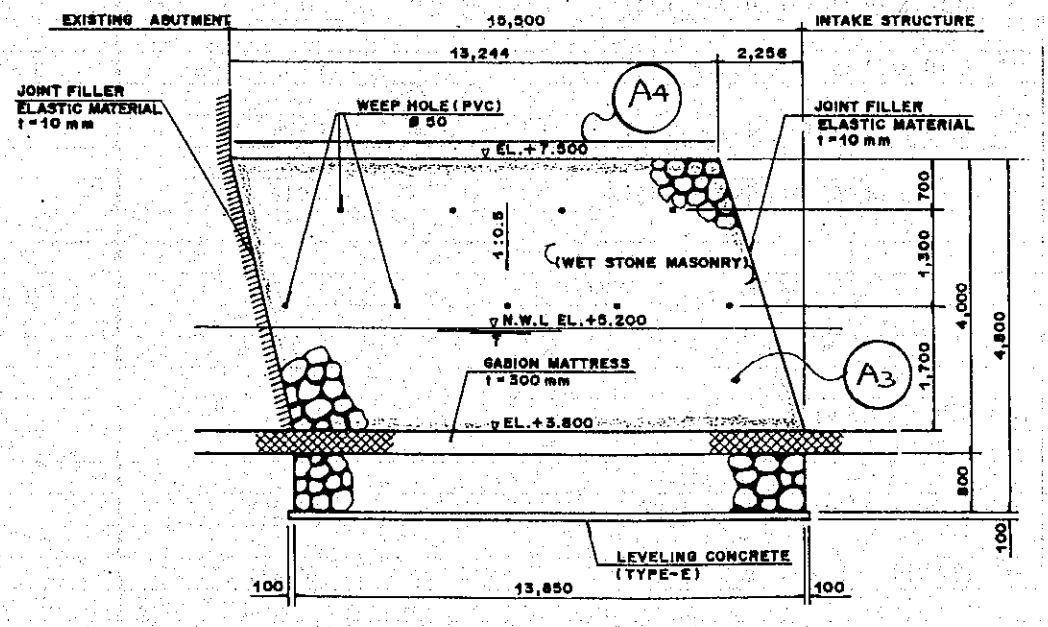
LOCATION : CONNECTING CHANNEL OF SEMARANG RIVER

EXPLANATORY DRAWING



DEVELOPMENT OF LEANING WALL (LEFT SIDE)

SCALE H=A/V=B



DEVELOPMENT OF LEANING WALL (RIGHT SIDE)

SCALE H=A/V=B

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

CALCULATION			RESULT
❑ LEVELLING CONCRETE			
(TYPE – E)			
A = 0.10 x (2.20 + 0.10 x 2)	=	0.240 m^2	
V_1 = 0.24 x (4.65 + 12.134 + 3.15)	=	4.784	
V_2 = 0.24 x (4.65 + 3.574 + 3.15)	=	2.730	
TOTAL	=	7.514	7.514 m^2
❑ FORM FOR LEVELLING CONCRETE			
(H < 4.0 m)			
A_1 = 0.10 x (4.65 + 14.019 + 3.15)	=	2.182	
A_2 = 0.10 x (4.65 + 10.249 + 3.15)	=	1.805	
A_3 = 0.10 x (4.65 + 5.459 + 3.15)	=	1.326	
A_4 = 0.10 x (4.65 + 1.689 + 3.15)	=	0.949	
TOTAL	=	6.262	6.262 m^2
❑ BACKFILL GRAVEL			
A = (2.20 x 0.50) + (2.15 x 1.00)	=	3.250	
V_1 = (22.919 + 19.463) x ½ x 3.25	=	68.871	
V_2 = (11.845 + 8.389) x ½ x 3.25	=	32.880	
TOTAL	=	101.751	101.751 m^3

TYPE OF WORK : LEANING WALL

LOCATION : WET STONE MASONRY : CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

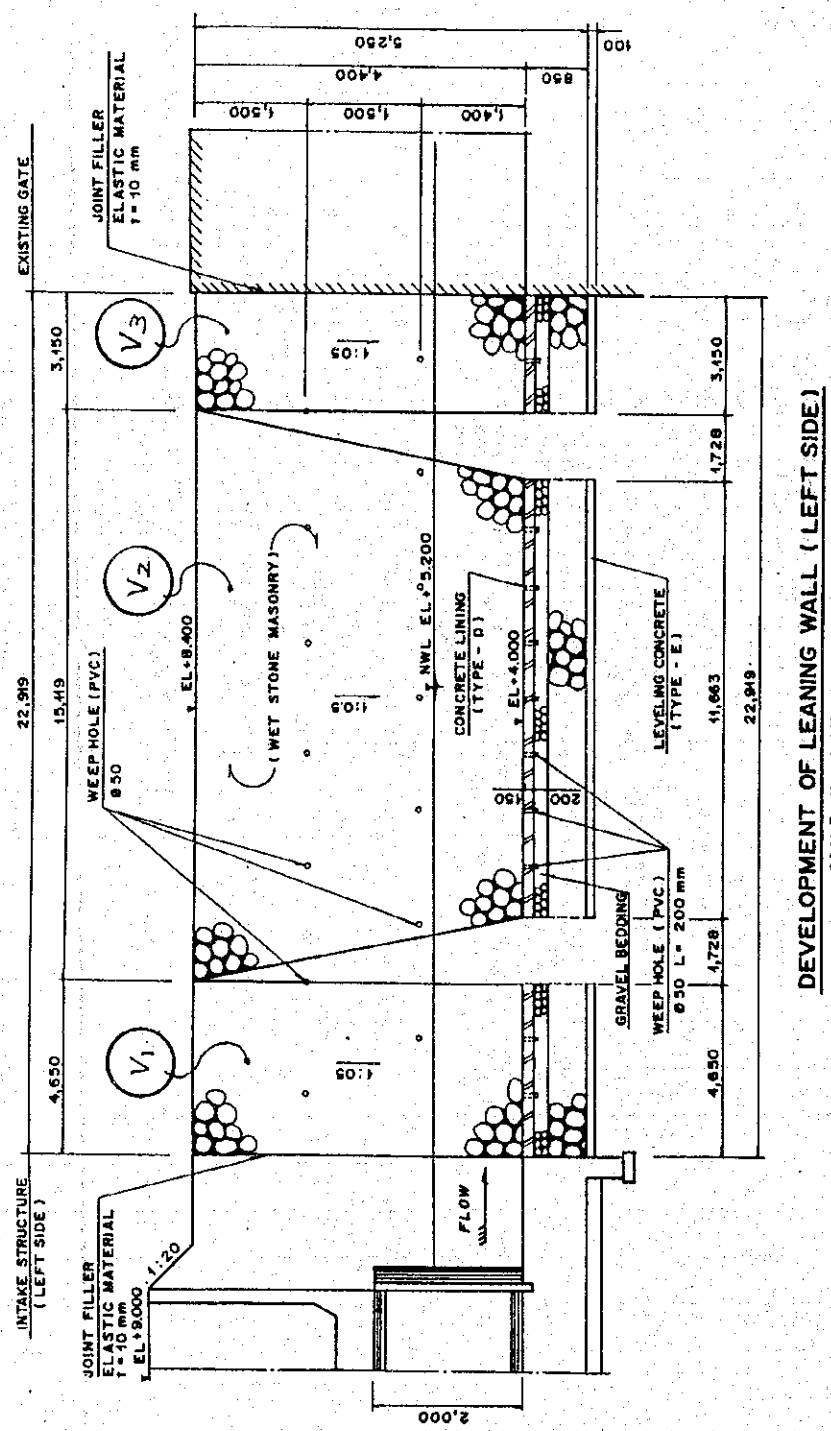
CALCULATION	RESULT
$A = (0.45 + 1.40) \times 1/2 \times 4.40 + (0.85 \times 2.20) = 5.940\ m^2$	
$V_1 = 5.94 \times 4.65 = 27.62$	
$V_2 = 5.94 \times (15.119 + 11.663) \times 1/2 = 79.543$	
$V_3 = 5.94 \times 3.15 = 18.711$	
$V_4 = 5.94 \times 3.15 = 18.711$	
$V_5 = 5.94 \times (0.589 + 4.045) \times 1/2 = 13.763$	
$V_6 = 5.94 \times 4.65 = 27.62$	
TOTAL = 191.910	$191.910\ m^3$

LEANING WALL

TYPE OF WORK : WET STONE MASONRY (1/2)

LOCATION : CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

EXPLANATORY DRAWING



DEVELOPMENT OF LEANING WALL (LEFT SIDE)

SCALE H = A/V = B

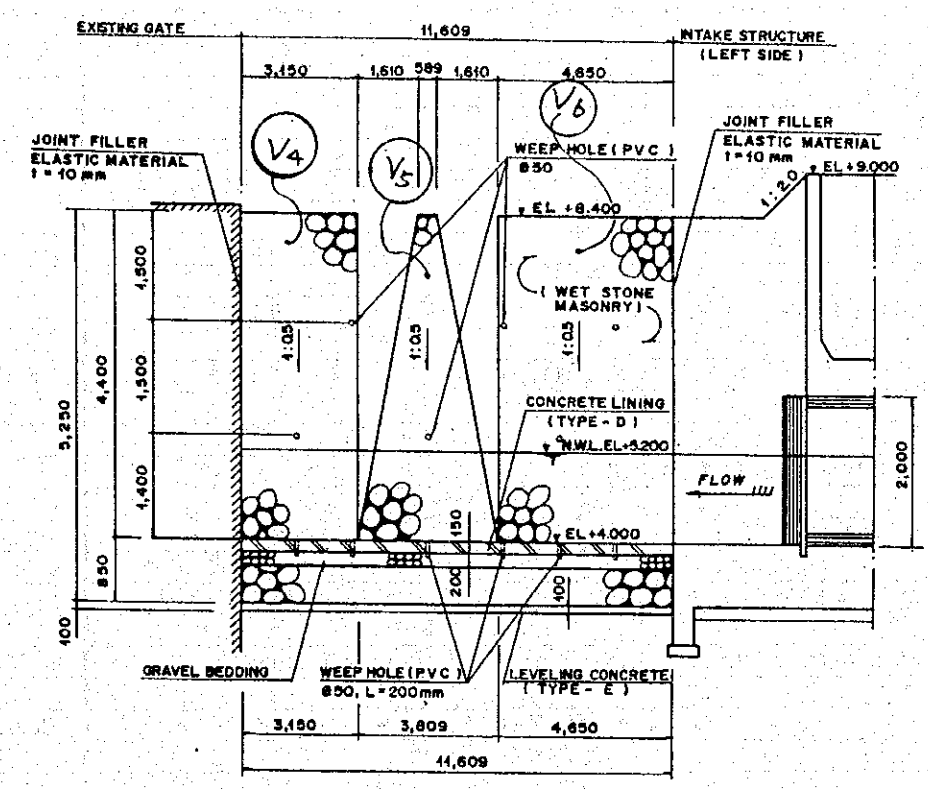
LEANING WALL

(2/2)

TYPE OF WORK : WET STONE MASONRY

LOCATION : CONNECTING CHANNEL OF LEFT IRRIGATION CHANNE

EXPLANATORY DRAWING



DEFELOPENT OF LEANING WALL (RIGH SIDE)

SCALE H = A / V = B

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

CALCULATION			RESULT
❑ BACKFILL SOIL			
(TYPE – E)			
A = (0.50 x 2.35) - 0.08 x 0.15	=	1.163 m^2	
V_1 = 1.163 x 22.919	=	26.655	
V_2 = 1.163 x 8.389	=	9.756	
TOTAL	=	36.411	36.411 m^2
❑ BACKFILL WITH SELECTED SOIL			
A = 0.85 x 1.00	=	0.850 m^2	
V_1 = 0.85 x (4.65 + 11.663 + 3.15)	=	16.544	
V_2 = 0.85 x (4.65 + 4.045 + 3.15)	=	10.068	
TOTAL	=	26.612	26.612 m^2
❑ TOP CONCRETE			
• CONCRETE (TYPE – E)			
A = 0.60 x 0.15	=	0.09 m^2	
V_1 = 0.09 x (4.65 + 15.119 + 3.15)	=	2.063	
V_2 = 0.09 x (4.65 + 0.589 + 3.15)	=	0.755	
TOTAL	=	2.818	2.818 m^3
• FORM FOR TOP CONCRETE (H < 4.0 m)			
A_1 = 0.15 x (4.65 + 15.119 + 3.15)	=	3.438	
A_2 = 0.15 x (4.65 + 0.589 + 3.15)	=	1.258	
TOTAL	=	4.696	4.696 m^2

TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

CALCULATION			RESULT
☐ WEEP HOLE			
• PVC PIPE Ø 50			
Upper Section			
L_1 = 10 pipes x 0.90	=	9.000	
Lower Section			
L_2 = 10 pipes x 1.25	=	12.500	
• FILTER CLOTH			
A = 20 sheets x $(0.20 \times 2 + 0.165 \times 2 + 0.15)^2$	=	15.488	15.488 m^2
☐ SCAFFOLDING			
A_1 = 22.919 + (4.65 + 11.663 + 3.15) x ½ x 4.40 x 1.118			
	=	104.243	
A_2 = 11.845 + (3.15 + 0.589 + 4.65) x ½ x 4.40 x 1.118			
	=	49.768	
TOTAL	=	154.011	154.011 m^2
☐ JOINT FILTER			
t = 10 , ELASTIC MATERIAL			
A_1 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
A_2 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
A_3 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
A_4 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
A_5 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
A_6 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
A_7 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
A_8 = (0.45 + 1.40) x ½ x 4.40 + (0.85 x 2.20)	=	5.940	
TOTAL	=	47.520	47.520 m^2

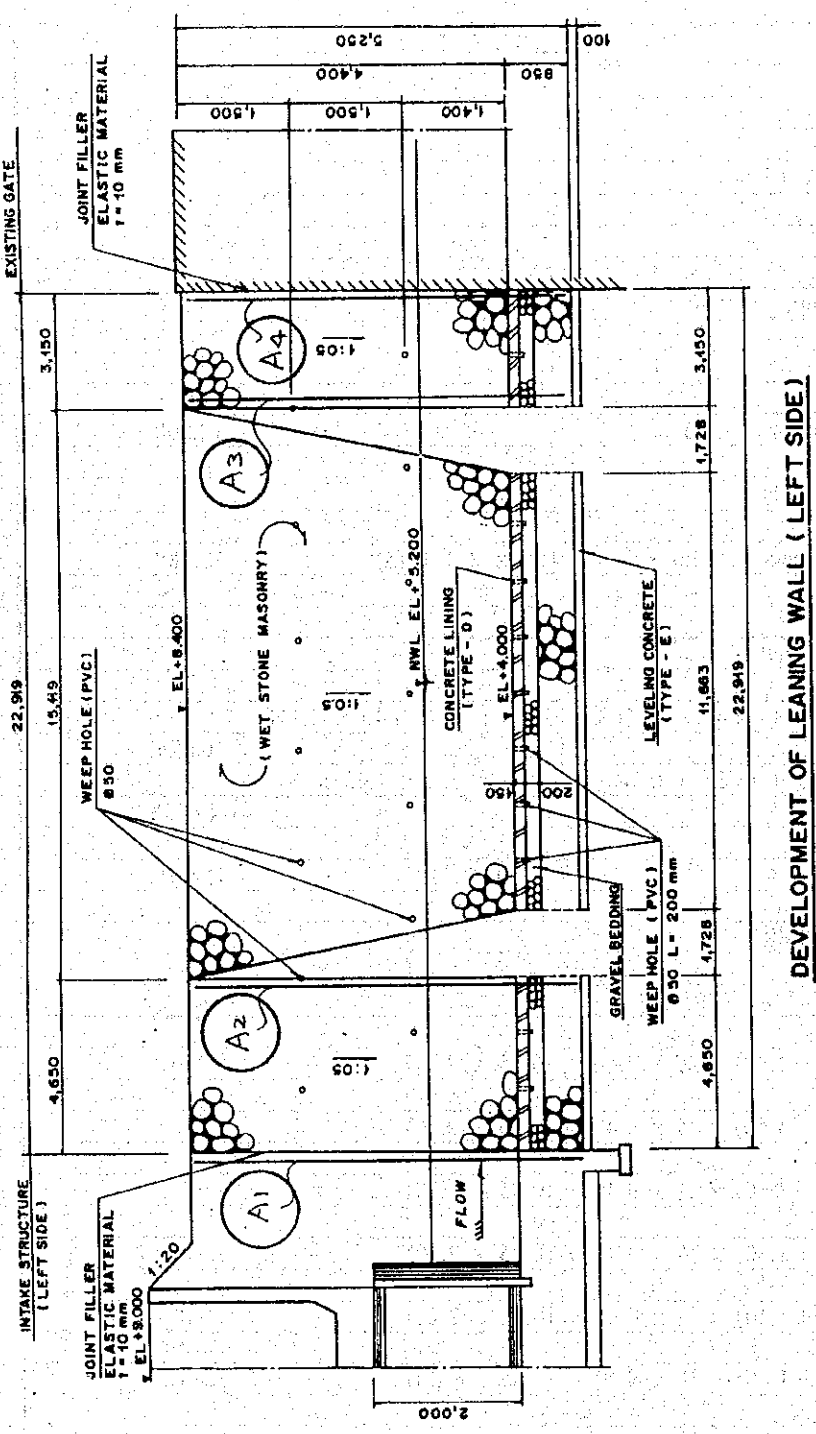
LEANING WALL

TYPE OF WORK : JOINT FILLER

(1/2)

LOCATION : CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

EXPLANATORY DRAWING



DEVELOPMENT OF LEANING WALL (LEFT SIDE)

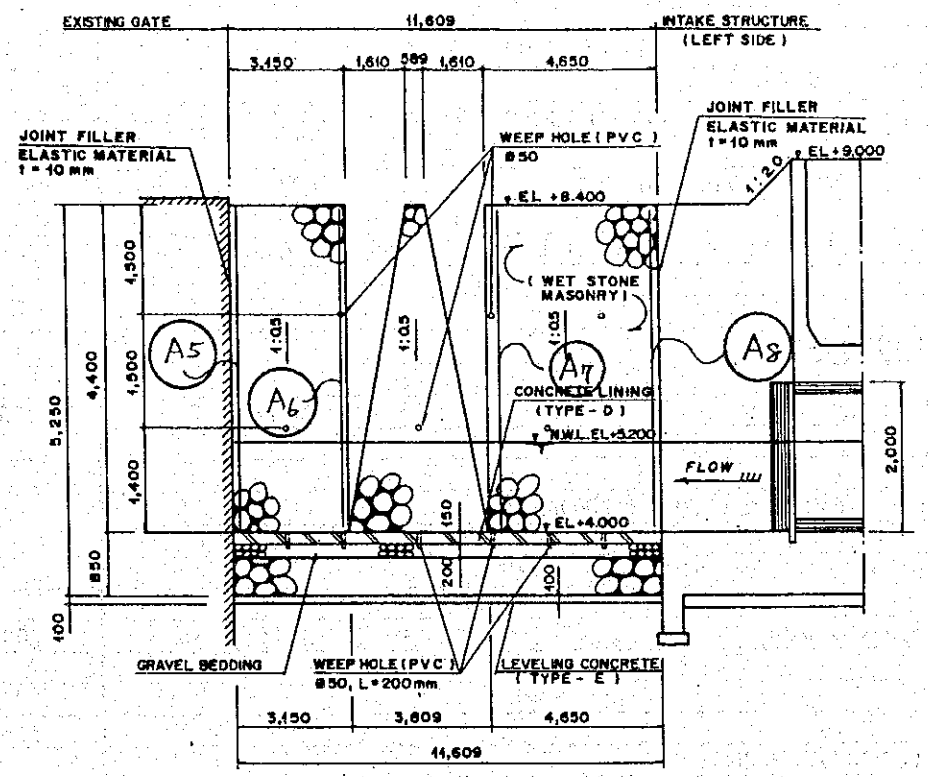
SCALE H • A/V • B

LEANING WALL

TYPE OF WORK : JOINT FILLER (2/2)

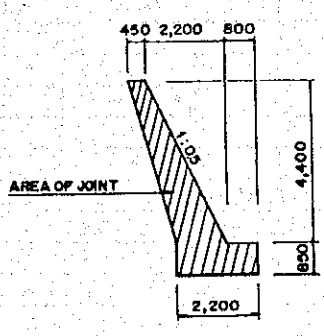
LOCATION : CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

EXPLANATORY DRAWING



DEFELOPENT OF LEANING WALL (RIGH SIDE)

SCALE H = A / V = 8



TYPE OF WORK : LEANING WALL
LOCATION :
: CONNECTING CHANNEL OF LEFT IRRIGATION CHANNEL

CALCULATION			RESULT
❑ CHANNEL BED PROTECTION OF LEFT IRRIGATION CHANNEL			
• CONCRETE LINING (TYPE – D)			
V_1 = 0.15 x 3.25 x (4.65 + 7.854 + 3.15)	=	7.631	7.361 m^2
• GRAVEL BEDDING			
V_2 = 0.20 x 3.25 x (4.65 + 7.854 + 3.15)	=	10.175	10.175 m^3
• WEEP HOLE (PVC PIPE Ø 50 , L = 200 mm)			
n = 16 points			
L = 16 points x 0.20	=	3.200	3.200 m
❑ CEMENT MORTAR POINTING			
A_1 = 4.65 x 4.40 x 1.118	=	22.874	
(REVISING)			
A_2 = (15.119 + 11.663) x ½ x 4.40 x 1.118	=	65.873	
A_3 = 3.15 x 4.40 x 1.118	=	15.495	
A_4 = 22.919 x 0.45	=	10.314	
A_5 = 3.15 x 4.40 x 1.118	=	15.495	
A_6 = (0.589 + 4.045) x ½ x 4.40 x 1.118	=	11.389	
A_7 = 4.65 x 4.40 x 1.118	=	22.874	
A_8 = 3.15 x 0.45	=	1.418	
A_9 = 0.589 x 0.45	=	0.265	
A_{10} = 4.65 x 0.45	=	2.093	
TOTAL	=	168.099	168.099 m^2
❑ GUARD FENCE			
L_1 = (4.65 + 16.061 + 3.15)	=	23.861	
L_2 = (4.65 + 3.15)	=	7.800	
TOTAL	=	31.661	31.661 m

TYPE OF WORK : EARTH RETAINING WALL
: WET STONE MASONRY
LOCATION : WF 97 + 36.32 ~ WF 98 + 31.90

CALCULATION	RESULT

(WET STONE MASONRY)

EARTH RETAINING WALL (WET STONE MASONRY)

STATION NO.	PARTIAL DISTANCE (m)	AREA OF WALL (m^2)	AVERAGE (m^2)	WALL VOLUME (m^3)
WF97R+36.320		6.400		
WF97R+41.320	7.099	6.400	6.400	45.434
WF98R+1.400	12.045	6.400	6.400	77.088
WF98R+11.900	10.540	8.498	7.449	78.512
WF98R+11.900		6.478	7.488	
WF98R+21.900	10.040	8.300	7.389	74.183
WF98R+21.900		6.400	7.350	
WF98R+31.900	10.040	6.400	6.400	64.256
			TOTAL	**339.473**
WF98L+31.900		6.400	3.200	
WF98L+21.900	10.000	8.300	7.350	73.500
WF98L+21.900		6.400	7.350	
WF98L+11.900	10.000	8.498	7.449	74.490
WF98L+11.900		6.478	7.488	
WF98L+1.400	10.500	6.400	6.439	67.607
WF97L+41.320	12.000	6.400	6.400	76.800
WF97L+36.320	7.071	6.400	6.400	45.254
			TOTAL	**337.651**

(Deduction for PC Sheet Pile)

$V_1 = -(0.22 \times 0.25 \times 49.764) = -2.737$

$V_2 = -(0.22 \times 0.25 \times 49.571) = -2.726$

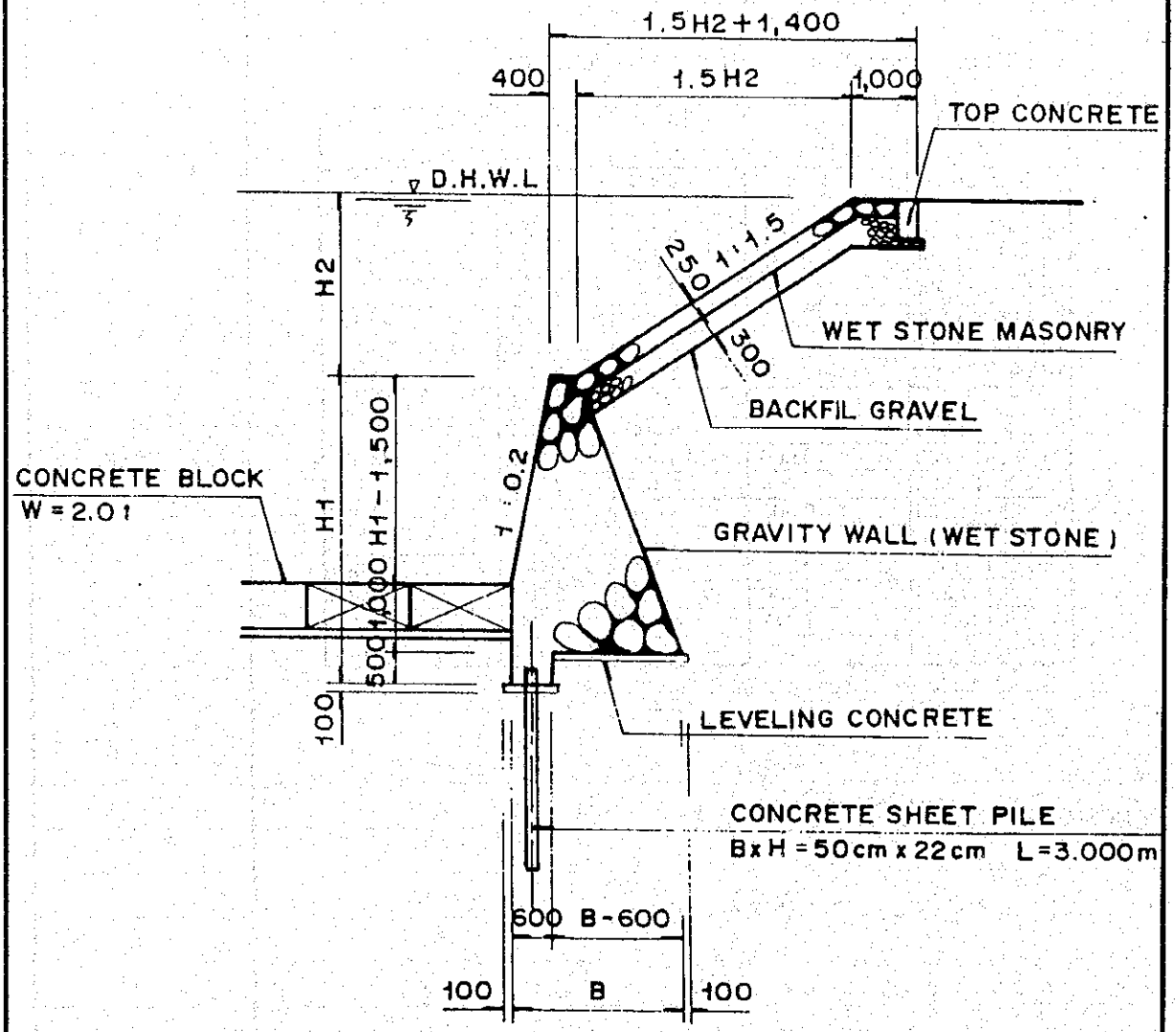
TOTAL = 671.661

671.661 m^3

TYPE OF WORK : EARTH RETAINING WALL
WET STONE MASONRY

LOCATION : WF 97+36.22 ~ WF 98+ 31.90

EXPLANATORY DRAWING



STANDARD CROSS SECTION

SCALE A

TABLE OF DIMENSION

STATION	H1 (m)	H2 (m)	B (m)	REMARK
WF. 97+41,320	4,500	2,669	2,500	
WF. 98+1, 400	4,500	2,675	2,500	
WF. 98+11,900	5,110	2,070	3,000	DOWN STREAM
WF. 98+11,900	4,500	2,070	2,500	UPSTREAM
WF. 98+21,900	5,000	1,579	3,000	DOWN STREAM
WF. 98+21,900	4,500	1,579	2,500	UPSTREAM
WF. 98+31,900	4,500	1,587	2,500	

TYPE OF WORK : EARTH RETAINING WALL
: SCAFFOLDING

LOCATION : WF. 97 + 36.32 ~ WF. 98 + 31.90

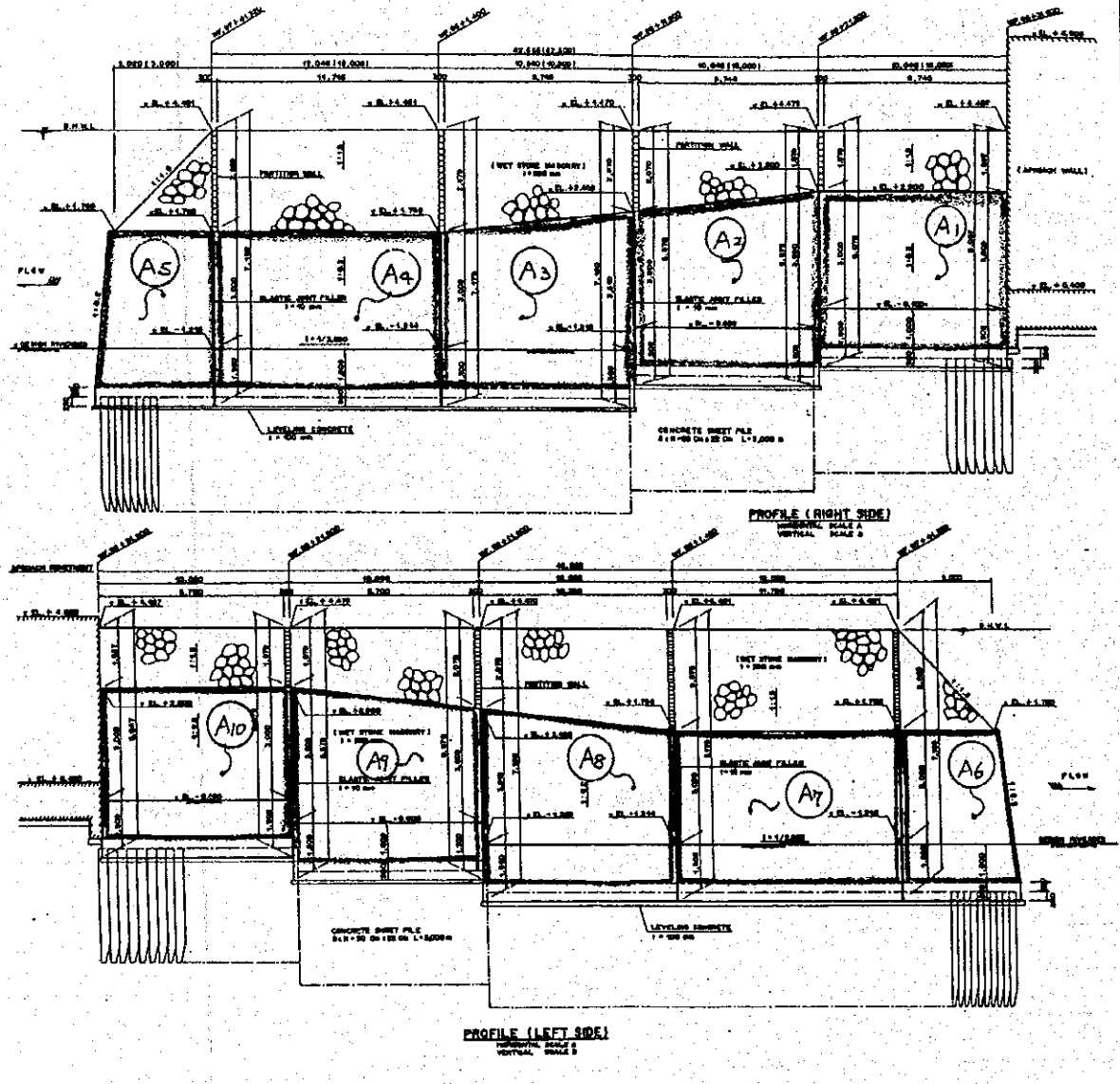
CALCULATION	RESULT
$A_1 = 4.00 \times 10.04 \times 2 = 80.320$	
$A_2 = (4.50 + 4.00) \times 1/2 \times 10.40 \times 2 = 88.400$	
$A_3 = (4.61 + 4.00) \times 1/2 \times 10.54 \times 2 = 90.749$	
$A_4 = 4.00 \times 12.045 \times 2 = 96.360$	
$A_5 = 4.00 \times 7.098 \times 2 = 56.784$	
$A_6 = 4.00 \times 7.07 \times 2 = 56.560$	
$A_7 = 4.00 \times 12.00 \times 2 = 96.000$	
$A_8 = (4.00 + 4.610) \times 1/2 \times 10.50 \times 2 = 90.405$	
$A_9 = (4.00 + 4.50) \times 1/2 \times 10.00 \times 2 = 85.000$	
$A_{10} = 4.00 \times 10.00 \times 2 = 80.000$	
TOTAL = 820.578	820.578 m^2

EARTH RETAINING WALL

TYPE OF WORK : SCAFFOLDING

LOCATION : WF. 97 + 36.32 ~ WF. 98 + 31.90

EXPLANATORY DRAWING



EARTH RETAINING WALL

TYPE OF WORK : LEVELING CONCRETE

LOCATION : WF. 97 + 36.32 ~ WF. 98 + 31.90

CALCULATION	RESULT

(TYPE - E)

LEVELING CONCRETE (TYPE-E)

STATION NO.	PARTIAL DISTANCE (m)	AREA (m^2)	AVERAGE (m^2)	LEVELING CONCRETE VOLUME (m^3)
WF97R+36.320		0.270		
WF97R+41.320	7.099	0.270	0.270	1.917
WF98R+1.400	12.045	0.270	0.270	3.252
WF98R+11.900	10.540	0.320	0.295	3.109
WF98R+11.900		0.270	0.295	
WF98R+21.900	10.040	0.320	0.295	2.962
WF98R+21.900		0.270	0.295	
WF98R+31.900	10.040	0.270	0.270	2.711
			TOTAL	**13.951**
WF98L+31.900		0.270	0.135	
WF98L+21.900	10.000	0.320	0.295	2.950
WF98L+21.900		0.270	0.295	
WF98L+11.900	10.000	0.320	0.295	2.950
WF98L+11.900		0.270	0.295	
WF98L+1.400	10.500	0.270	0.270	2.835
WF97L+41.320	12.000	0.270	0.270	3.240
WF97L+36.320	7.071	0.270	0.270	1.909
			TOTAL	**13.884**

(Deduction for PC Sheet Pile)

$V_1 = -(0.22 \times 0.10 \times 49.764) = -1.095$

$V_2 = -(0.22 \times 0.10 \times 49.571) = -1.091$

TOTAL = 25.649 | 25.649 m^3

EARTH RETAINING WALL

TYPE OF WORK : FORM FOR LEVELING CONCRETE

LOCATION : WF. 97+36.32 ~ WF. 98+31.90

CALCULATION	RESULT
(H < 4.0m)	
(RIGHT BANK)	
$A_1 = (9.74 + 0.10) \times 0.10 \times 4 = 3.936$	
$A_2 = (0.80 \times 0.10) + (1.90 + 0.10) \times 0.10 = 0.280$	
$A_3 = (9.74 + 0.10) \times 0.10 \times 4 = 3.936$	
$A_4 = (0.80 \times 0.10) + (2.40 + 0.10) \times 0.10 = 0.330$	
$A_5 = (29.684 + 0.10) \times 0.10 \times 4 = 11.914$	
$A_6 = (0.80 \times 0.10) + (2.40 + 0.10) \times 0.10 = 0.330$	
(LEFT BANK)	
$A_7 = (9.70 + 0.10) \times 0.10 \times 4 = 3.920$	
$A_8 = (0.80 \times 0.10) + (1.90 + 0.10) \times 0.10 = 0.280$	
$A_9 = (9.70 + 0.10) \times 0.10 \times 4 = 3.920$	
$A_{10} = (0.80 \times 0.10) + (2.40 + 0.10) \times 0.10 = 0.330$	
$A_{11} = (29.571 + 0.10) \times 0.10 \times 4 = 11.868$	
$A_{12} = (0.80 \times 0.10) + (2.40 + 0.10) \times 0.10 = 0.330$	
TOTAL = 41.374	41.374 m^2

TYPE OF WORK : EARTH RETAINING WALL

: JOINT FILLER

LOCATION : WF. 97 + 36.32 ~ WF. 98 + 31.90

CALCULATION	RESULT
t=10 (ELASTIC MATERIAL)	

JOINT FILLER (t = 10, ELASTIC MATERIAL)

STATION NO.	AREA OF WALL (m^2)
WF97R+36.320	
WF97R+41.320	6.400
WF98R+1.400	6.400
WF98R+11.900	8.498
WF98R+11.900	6.478
WF98R+21.900	8.300
WF98R+21.900	6.400
WF98R+31.900	6.400
TOTAL	48.876
WF98L+31.900	
WF98L+21.900	8.300
WF98L+21.900	6.400
WF98L+11.900	8.498
WF98L+11.900	6.478
WF98L+1.400	6.400
WF97L+41.320	6.400
WF97L+36.320	6.400
TOTAL	48.876

TOTAL = 97.752 | 97.752 m^2

EARTH RETAINING WALL

TYPE OF WORK : CEMENT MORTAR POINTING

LOCATION : WF. 97 + 36.32 ~ WF. 98 + 31.90

CALCULATION	RESULT

CEMENT MORTAR POINTING

STATION NO.	PARTIAL DISTANCE (m)	SLOPE LENGTH (m)	AVERAGE (m)	AREA (m^2)
WF97R+36.320		3.059		
WF97R+41.320	7.099	3.059	3.059	21.719
WF98R+1.400	12.045	3.059	3.059	36.851
WF98R+11.900	10.540	3.681	3.370	35.525
WF98R+11.900		3.110		
WF98R+21.900	10.040	3.569	3.340	33.532
WF98R+21.900		3.059		
WF98R+31.900	10.040	3.059	3.059	30.716
			TOTAL	158.343
WF98L+31.900		3.059		
WF98L+21.900	10.000	3.569	3.314	33.144
WF98L+21.900		3.059		
WF98L+11.900	10.000	3.681	3.370	33.705
WF98L+11.900		3.110		
WF98L+1.400	10.500	3.059	3.085	32.392
WF97L+41.320	12.000	3.059	3.059	36.713
WF97L+36.320	7.071	3.059	3.059	21.633
			TOTAL	157.586

TOTAL = 315.929 | 315.929 m^2

TYPE OF WORK : EARTH RETAINING WALL
: SCOUR PROTECTION

LOCATION : WF. 97+36.32 ~ WF. 98+31.90

CALCULATION	RESULT
• PC SHEET PILE (L = 3.00 m/pile)	
B_1 = 42.665 + 7.099 = 49.764 m	
n_1 = 49.764 ÷ 0.50 = 99.53 ≒ 100 piles	
B_2 = 42.500 + 7.071 = 49.571 m	
n_2 = 49.571 ÷ 0.50 = 99.14 ≒ 100 piles	
L = (100+100) piles x 3.00 = 600.00	600.00 m
• PILING	
N Value : N = 32 (Average)	
Necessary pile number : n = 200 piles	
L = 200 piles x 3.00 = 600.00	600.00 m