4.2 Ground Sill without Head at WF.173

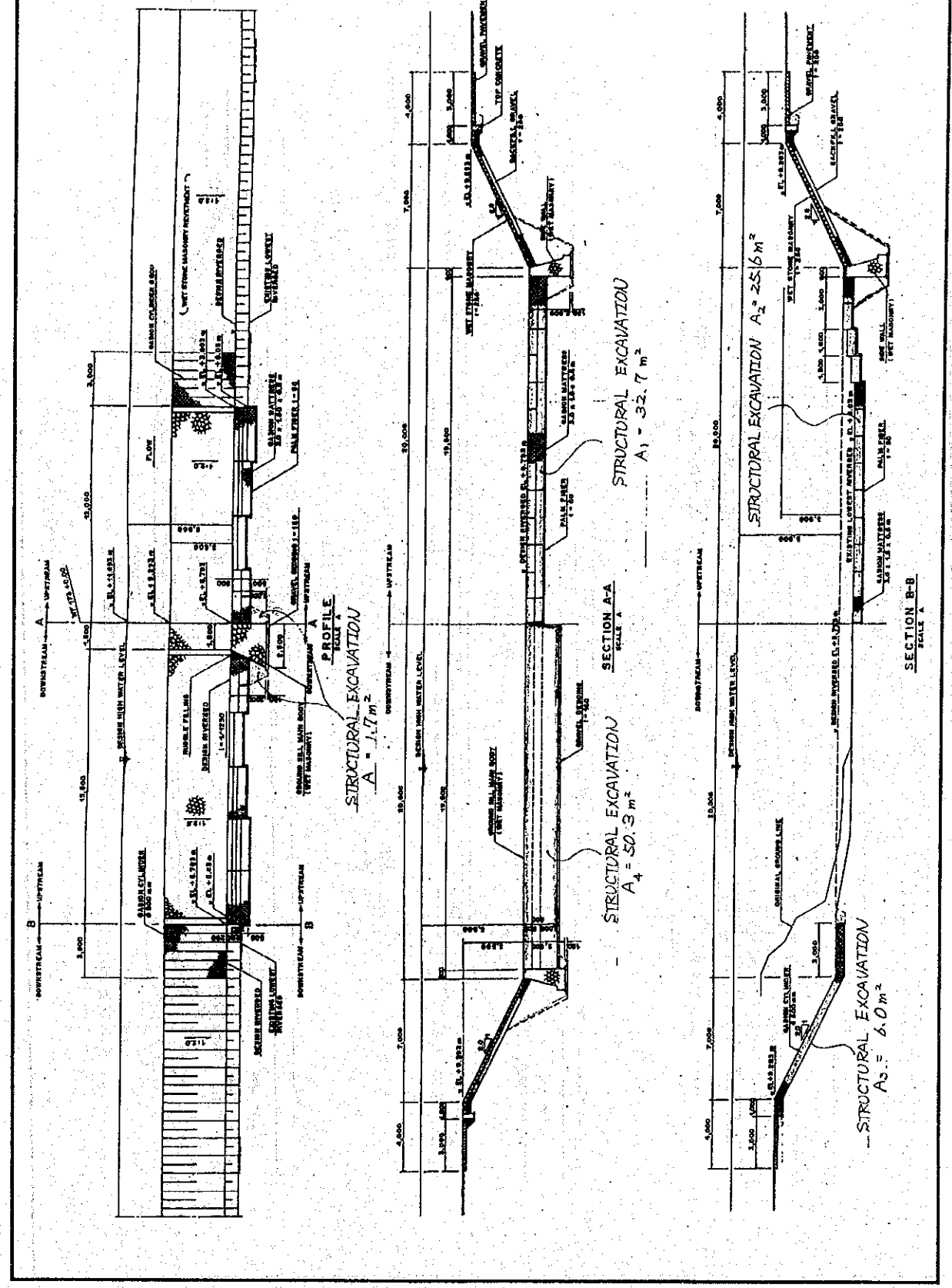
TYPE OF WORK :
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION			RESULT
STRUCTURAL EXCAVATION			
V_1 = 32.70 x (1.50 + 1.50) x 2	=	196.20	
V_2 = 25.6 x (12.50 + 9.00) x 2	=	1100.80	
V_3 = 6.00 x (3.00 + 3.00) x 2	=	72.00	
V_4 = 50.30 x 3.50 x 2	=	352.10	
TOTAL	=	1721.10	1721.10 m^3
BACKFIIL WITH SELECTED SOIL			
V_1 = (6.0 + 0.3) x (1.50 + 1.50) x 2	=	37.80	
V_2 = (7.6 + 0.3) x (12.50 + 9.00) x 2	=	339.70	
V_3 = 0.7 x (3.00 + 3.00) x 2	=	4.20	
V_4 = (4.9 + 0.3) x 3.50 x 2	=	36.40	
V_5 = 1.70 x 39.0	=	66.30	
TOTAL	=	484.40	484.40 m^3

TYPE OF WORK : GROUND SILL WITHOUT HEAD AT WF. 173
: STRUCTURAL EXCAVATION

LOCATION :

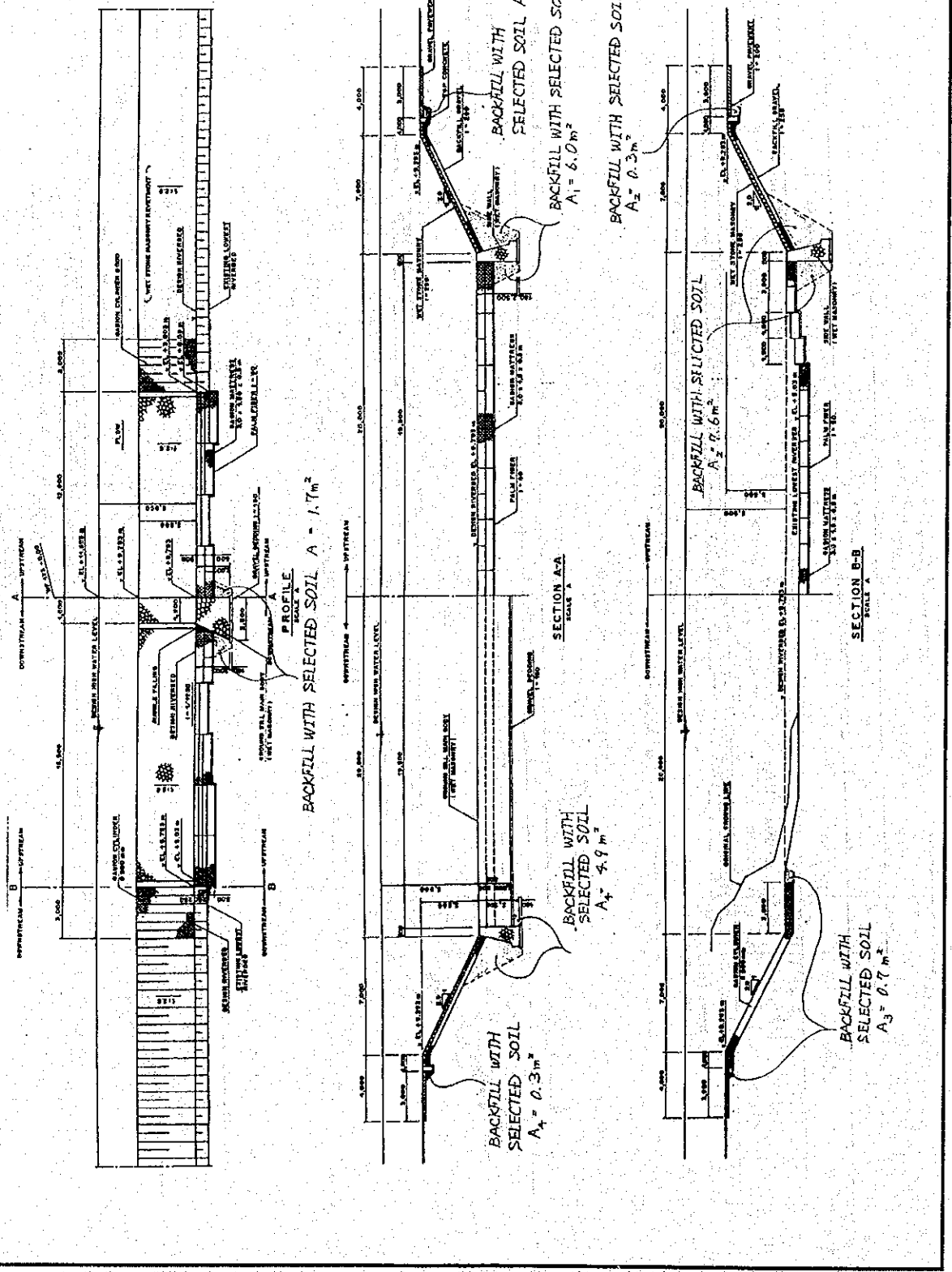
EXPLANATORY DRAWING



TYPE OF WORK : GROUND SILL WITHOUT HEAD AT WA.173
BACKFILL WITH SELECTED SOIL

LOCATION :

EXPLANATORY DRAWING



TYPE OF WORK : MAIN BODY AND SIDEWALL
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

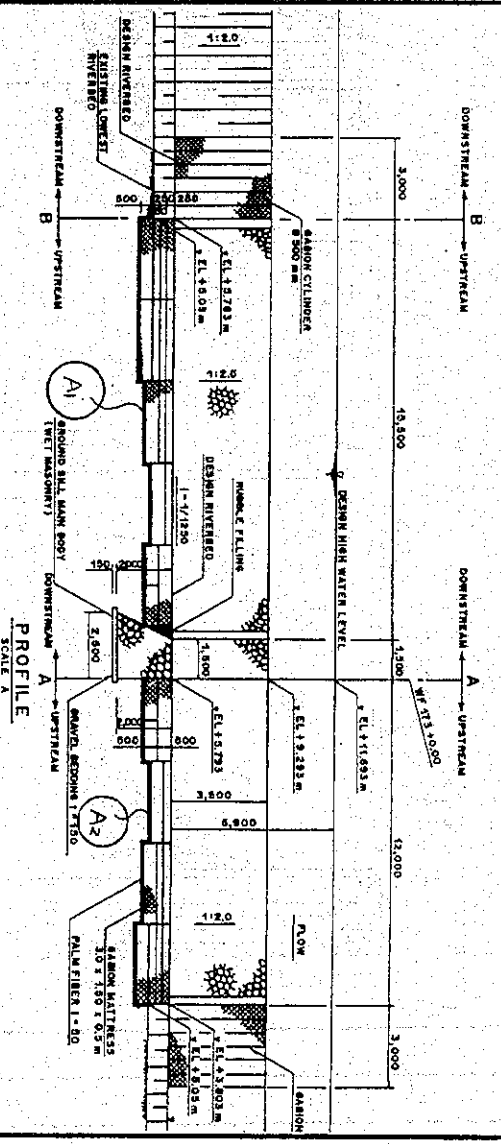
CALCULATION			RESULT
WET STONE MASONRY			
A_1 = (1.50 + 2.50) x ½ x 2.00	=	4.000 m^2	
V_1 = 4.00 x 39.00	=	156.000	
A_2 = (0.50 + 1.00) x ½ x 2.00 + (0.50 x 1.20)	=	2.10 m^2	
V_2 = 2.10 x 29.00 x 2	=	121.800	
TOTAL ($V_1 + V_2$)	=	277.800	277.800 m^3
GRAVEL BEDDING			
A_1 = 1.50 x (2.50 + 0.15 x 2)	=	0.420 m^2	
V_1 = 0.42 x 39.00	=	16.380	
A_2 = 0.15 x (1.20 + 0.15 x 2)	=	0.225 m^2	
V_2 = 0.225 x (29.00 + 0.15 x 2) x 2	=	13.185	
TOTAL ($V_1 + V_2$)	=	29.565	29.565 m^3

TYPE OF WORK : MAIN BODY
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION			RESULT
RUBBLE STONE FILLING			
V = ½ x 1.00 x 0.50 x 39.00	=	9.750	9.750 m^3
JOINT FILTER			
t = 10 , ELASTIC MATERIAL			
A_1 = (1.50 + 2.50) x ½ x 2.00 x 3	=	12.000	
A_2 = {(0.50 + 1.00) x ½ x 2.00 + (0.50 x 1.20) x 2	=	4.200	
TOTAL	=	16.200	16.200 m^2
GABION MATRESS			
t = 500			
V_1 = 40.00 x 6.00 x 0.50	=	120.000	
V_2 = 40.00 x 3.00 x 0.50 x 2	=	120.000	
V_3 = 40.00 x 3.00 x 0.50 x 2	=	120.000	
V_4 = 40.00 x 3.00 x 1.00 x 2	=	240.000	
V_5 = 40.00 x 3.00 x 0.50	=	60.000	
TOTAL	=	660.000	660.000 m^3

GROUND SILL WITHOUT HEAD AT WF. 173

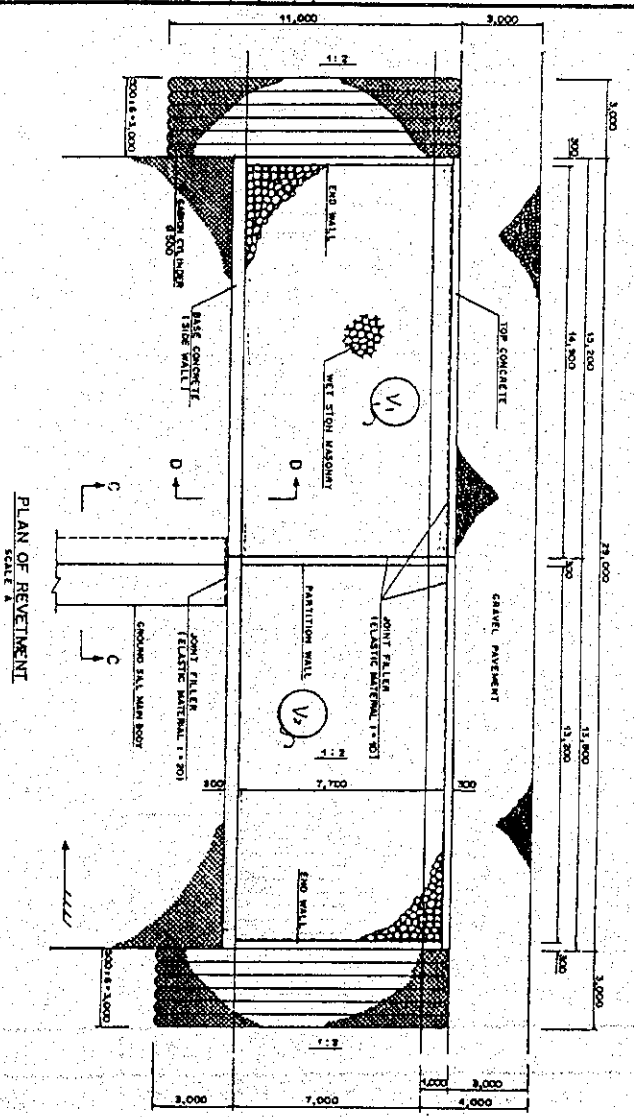
TYPE OF WORK :	PALM FIBER FILTER
LOCATION :	MAIN BODY



CALCULATION	RESULT
$A_1 = 40.00 \times (15.50 + 0.247 + 0.25 + 0.26 + 0.25)$	
$= 660.280$	
$A_2 = 40.00 \times (12.00 + 0.247 + 0.24 + 0.25 + 0.25)$	
$= 519.480$	
TOTAL $= 1179.760$	$1179.760 m^2$

GROUND SILL WITHOUT HEAD AT WF.173

TYPE OF WORK :	WET STONE MASONRY
LOCATION :	REVETMENT



PLAN OF REVETMENT
SCALE A

CALCULATION	RESULT
t = 250	
$V_1 = (7.70 \times 1.118 + 0.70) \times 14.90 \times 0.25 \times 2$	
$= 69.349$	
$V_2 = (7.70 \times 1.118 + 0.70) \times 13.20 \times 0.25 \times 2$	
$= 61.437$	
TOTAL = 130.786	130.786 m³

TYPE OF WORK : REVETMENT
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION				RESULT
GRAVEL BEDDING				
t = 250				
V_1 = (7.70 x 1.118 + 0.70) x 14.90 x 0.25 x 2		=	69.349	
V_2 = (7.70 x 1.118 + 0.70) x 13.20 x 0.25 x 2		=	61.437	
	TOTAL	=	130.786	130.786
CEMENT MORTAR POINTTING				
A_1 = (7.826 + 1.00) x 14.90 x 2		=	263.015	
A_2 = (7.826 + 1.00) x 13.20 x 2		=	233.006	
	TOTAL	=	496.021	496.021 m^2

TYPE OF WORK : REVETMENT
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION			RESULT
TOP CONCRETE			
t = 29.00 m / side			
• CONCRETE (TYPE – C1)			
V = 29.00 x 2 x 1.80 / 10.00 m	=	10.440	10.440 m^3
• GRAVEL BEDDING			
V = 29.00 x 2 x 0.75 / 10.00 m	=	4.350	4.350 m^3
• FORM (H < 4.0 m)			
V = 29.00 x 2 12.18 / 10.00 m	=	70.644	70.644 m^2
• REINFORCING BAR			
W = 29.00 x 2 x 0.094 / 10.00	=	0.545	0.545 tf
• JOINT FILTER			
A = 29.00 x 2 x 2.605 / 10.00	=	15.109	15.109 m^2
GABION CYLINDER			
• GABION CYLINDER (Ø 500)			
L = 3.00 + 7.00 x 1.118 + 1.00	=	11.826	
V = π /4 x 0.50^2 x 11.826 x 6 x 2 x 2	=	55.729	55.729 m^2
• SOIL FILLING			
V = (11.826 x 0.50 x 3.00) x 2 x 2 - 55.729	=	15.227	15.227 m^3

TYPE OF WORK : END WALL (REVETMENT)
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION	RESULT
GRAVEL BEDDING	
A = (0.10 + 0.30) x ½ x 0.20 + (0.40 x 0.10) = 0.080 m^2	
V = 0.080 x (7.818 + 0.558) x 2 x 2 = 2.680	2.680 m^3
CONCRETE (TYPE – C1)	
(TYPE – C1)	
A = (7.826 + 7.818) x ½ x 0.60 + (0.70 + 0.558) x ½ x 0.60 = 5.071 m^2	
V = 5.071 x 0.30 x 2 x 2 = 6.058	6.058 m^3
FORM (H < 4.0 m)	
(H < 4.0 m)	
A = {(7.826 + 7.818) x ½ x 0.60 + (0.70 + 0.588) x ½ x 0.60} x 2 x 2 x 2 = 40.565	40.565 m^2

TYPE OF WORK : END WALL (REVETMENT)
LOCATION : : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION			RESULT
REINFORCING BAR			
• D 13 (W = 1.04 kgf / m)			
n = 6 Bars			
L = (7.826 + 0.70) – 0.05 x 2	=	8.426 m / Bar	
W_1 = 6 Bars x 8.426 x 1.04 x 2 X 2	=	210.313	
• D 10 (W = 0.617 kgf / m)			
n = (8.426 : 0.30) + 1 = 29.09	≅	30 Bars	
L = (0.20 x 2 + 0.50 x 2 + 15 x 0.01)	=	1.550 m / Bar	
W_2 = 30 Bars x 1.55 x 0.617 x 2 x 2	=	114.762	
TOTAL ($W_1 + W_2$)	=	325.075 kgf	0.325 tf
JOINT FILTER			
t = 10 , ELASTIC MATERIAL			
A = (7.826 + 0.70) x 0.25 x 2 x 2	=	8.526	8.526 m^2

TYPE OF WORK : PARTITION WALL (REVETMENT)
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION	RESULT
CONCRETE (TYPE – C1)	
(TYPE – C1)	
A = {(7.826 + 7.819) x ½ x 0.50 + (0.70 + 0.582) x ½ x 0.50} = 4.232 m^2	
V = 4.232 x 0.30 x 2 = 2.539	2.539 m^3
FORM (H < 4.0 m)	
(H < 4.0 m)	
A = {(7.826 + 7.819) x ½ x 0.50 + (0.70 + 0.582) x ½ x 0.50} x 2 x 2 = 16.927	16.927 m^2
GRAVEL BEDDING	
A = (0.50 + 0.70) x ½ x 0.10 = 0.060 m^2	
V = 0.06 x (7.819 + 0.582) x 2 = 1.008	1.008 m^3

TYPE OF WORK : PARTITION WALL (REVETMENT)
LOCATION : GROUNDSILL WITHOUT HEAD AT WF.173

CALCULATION				RESULT
REINFORCING				
• D 13 (W = 1.04 kgf / m)				
n = 6 Bars				
L = (7.826 + 0.70) – 0.05 x 2		=	8.426 m / Bar	
W_1 = 6 Bars x 8.426 x 1.04 x 2		=	105.156	
• D 10 (W = 0.617 kgf / m)				
n = (8.426 : 0.30) + 1	= 29.09	≅	30 Bars	
L = (0.20 x 2 + 0.40 x 2 + 15 x 0.01)		=	1.350 m / Bar	
W_2 = 30 Bars x 1.35 x 0.617 x 2		=	49.977	
TOTAL ($W_1 + W_2$)		=	155.133 kgf	0.155 tf
JOINT FILTER				
t = 10, ELASTIC MATERIAL				
A = (7.826 + 0.70) x 0.25 x 2		=	4.263	4.263 m^2

CHAPTER 5 DRAINAGE SLUICEWAY AND OUTLET WORKS

5.) Drainage Sluiceway at WF. 172R + 15m

TYPE OF WORK : DRAINAGE SLUICEWAY AT WF.172R + 15 m
LOCATION :

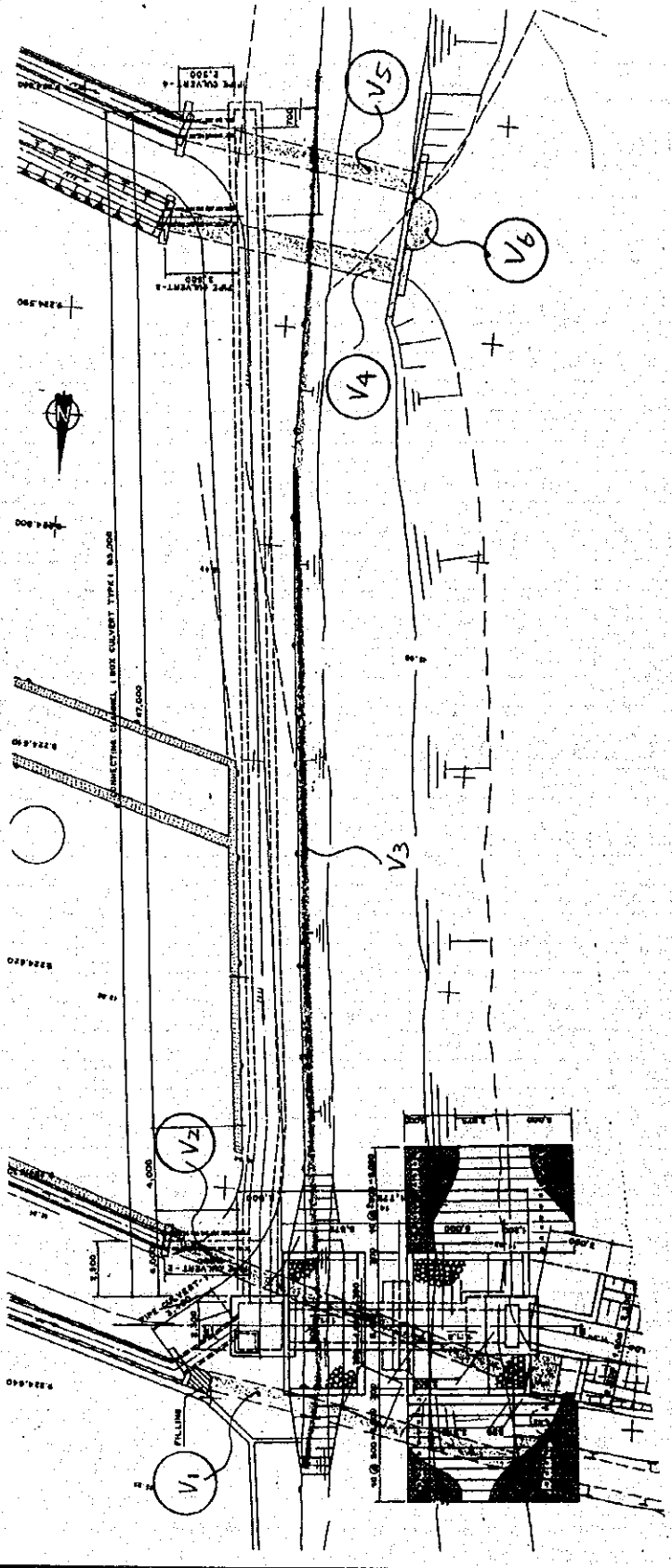
CALCULATION				RESULT
DEMOLITION AND REMOVAL OF EXISTING STRUCTURE				
V_1 =	{(1.70 x 1.80) – (1.10 x 1.10)} x 17.50	=	32.375	
V_2 =	{(1.50 x 1.40) – (0.90 x 0.70)} x 19.50	=	28.665	
V_3 =	(1.00 x 0.50) x 65.00	=	32.500	
V_3 =	{(1.50 x 1.50) – (0.90 x 0.80)} x 11.50	=	17.595	
V_4 =	{(1.70 x 1.50) – (0.90 x 1.00)} x 12.00	=	19.800	
V_5 =	2.00 x 1.00 x 11.00	=	22.000	
	TOTAL	=	152.938	153.0 m^3
CLEARING AND GRUBBING				
A_1 =	5.20 x (18.70 + 3.00)	=	112.840	
A_2 =	3.00 x 16.70	=	50.100	
A_3 =	4.778 x 16.70	=	79.793	
A_4 =	(16.70 x 1.00) + (16.70 + 14.20) x ½ x 3.70	=	73.865	
A_5 =	14.20 x 3.155	=	44.801	
A_6 =	(5.00 + 3.00) x ½ x 5.00	=	20.000	
A_7 =	1.27 x 4.00	=	5.080	
A_8 =	2.00 x 55.00	=	110.00	
A_9 =	1.27 x 3.50	=	4.445	
A_{10} =	1.27 x 2.50	=	3.175	
	TOTAL	=	504.099	504.0 m^2

DRAINAGE SLUICEWAY AT WF. 172R+15M

TYPE OF WORK : DEDOLITION AND REMOVAL OF EXISTING STRUCTURES

LOCATION :

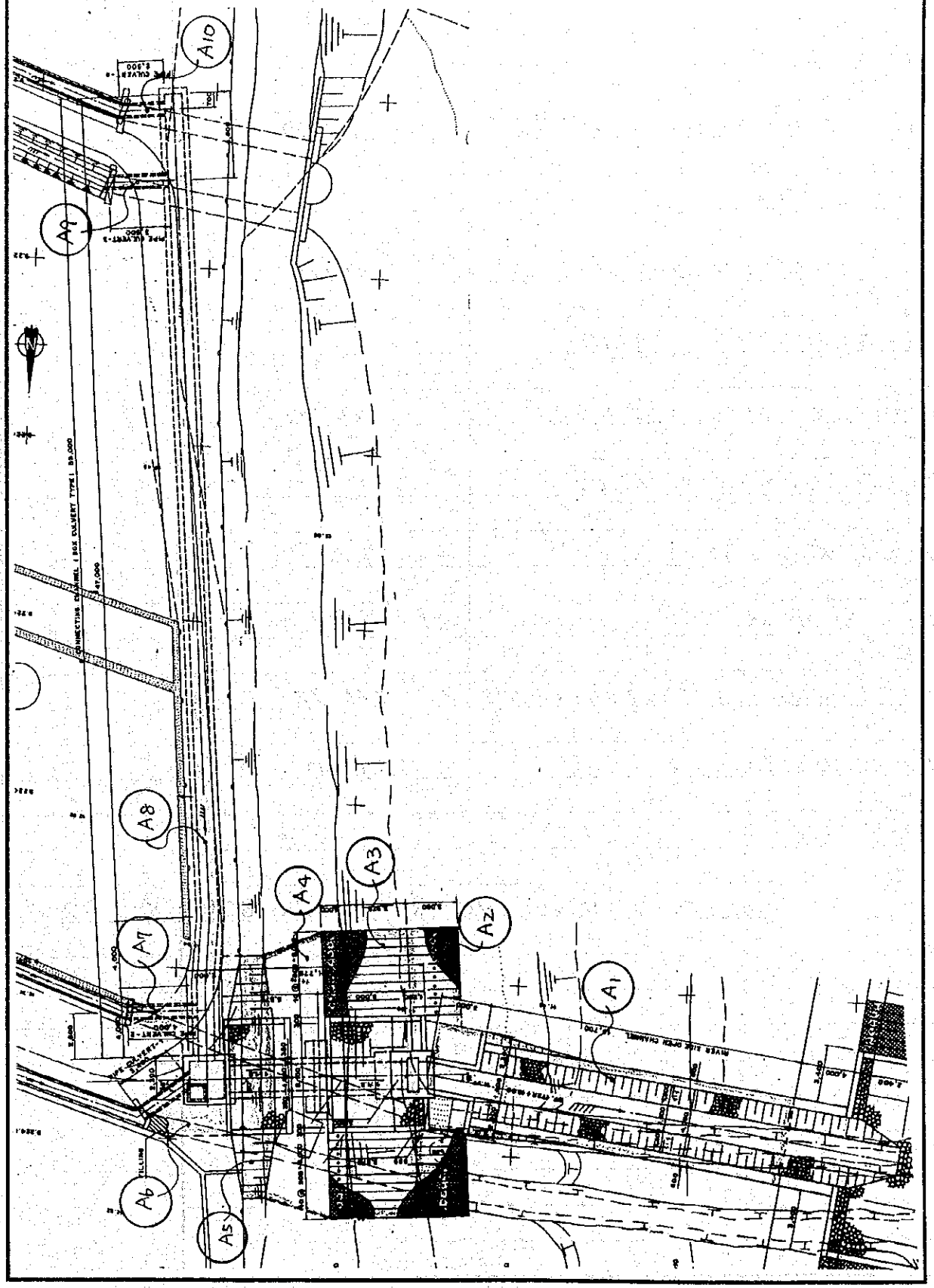
EXPLANATORY DRAWING



TYPE OF WORK : DRAINAGE SLUICEWAY AT WF. 172R + 15M
CLEARING AND GRUBBING

LOCATION :

EXPLANATORY DRAWING



DRAINAGE SLUICEWAY AT WH. 172R+15m

TYPE OF WORK : STRUCTURAL EXCAVATION

LOCATION : MAIN STRUCTURE

CALCULATION		RESULT
$A_1 = 27.60\ m^2$		
$V_1 = 27.60 \times (2.341 + 3.659) \times 1/2$	$= 82.80$	
$A_2 = 26.40\ m^2$		
$V_2 = 26.40 \times (0.50 + 1.00)$	$= 39.60$	
$A_3 = 23.50\ m^2 \times 2 = 47.00$		
$V_3 = (47.00 + 61.00) \times 1/2 \times 4.20$	$= 226.80$	
$A_4 = 30.50\ m^2 \times 2 = 61.00$		
$V_4 = 61.00 \times 1.30$	$= 79.30$	
$A_5 = 31.10\ m^2$		
$V_5 = (23.50 + 31.10) \times 2 \times 1/2 \times 4.775$	$= 260.72$	
$V_6 = 31.10 \times 3.00 \times 2$	$= 186.60$	
TOTAL $(V_1 + V_2 + V_3 + V_4 + V_5 + V_6)$	$= 875.82$	$875.82\ m^3$

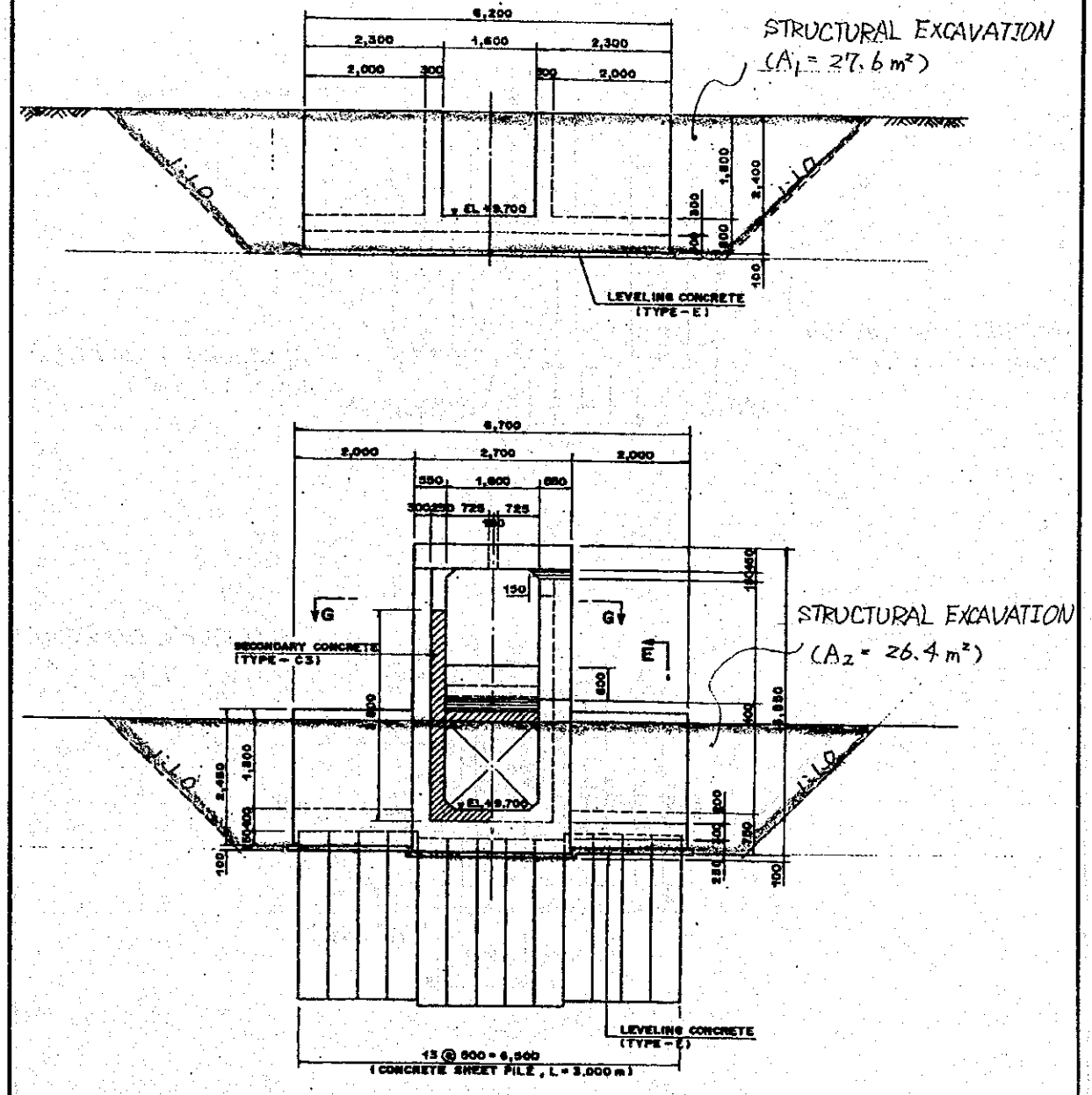
DRAINAGE SLUICEWAY AT WP. 172R + 15m

TYPE OF WORK : STRUCTURAL EXCAVATION

LOCATION : MAIN STRUCTURE

(1/2)

EXPLANATORY DRAWING



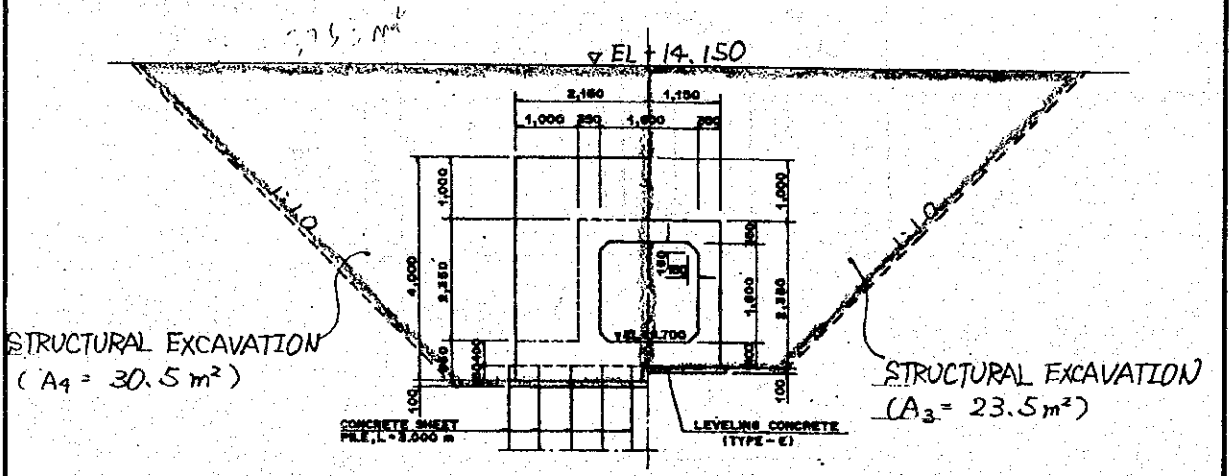
DRAINAGE SLUICEWAY AT WF. 172R + 15m

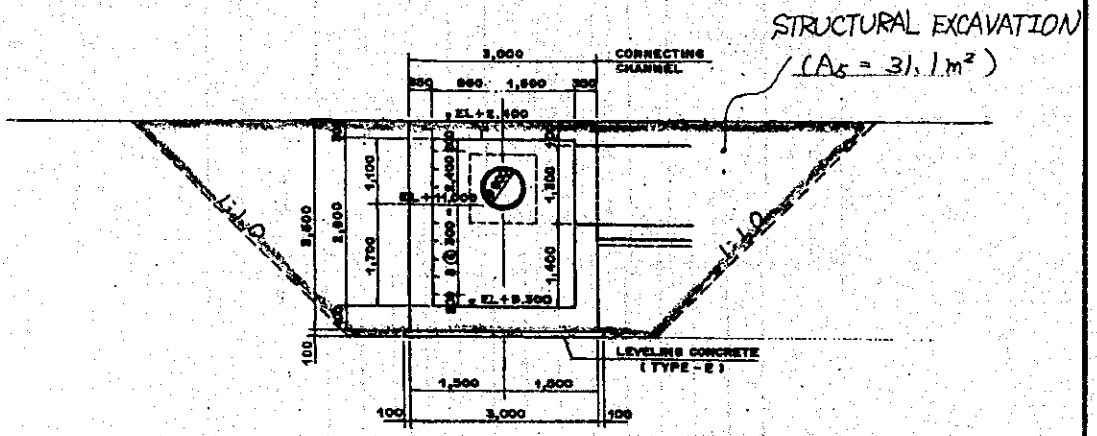
TYPE OF WORK : STRUCTURAL EXCAVATION

LOCATION : MAIN STRUCTURE

(2/2)

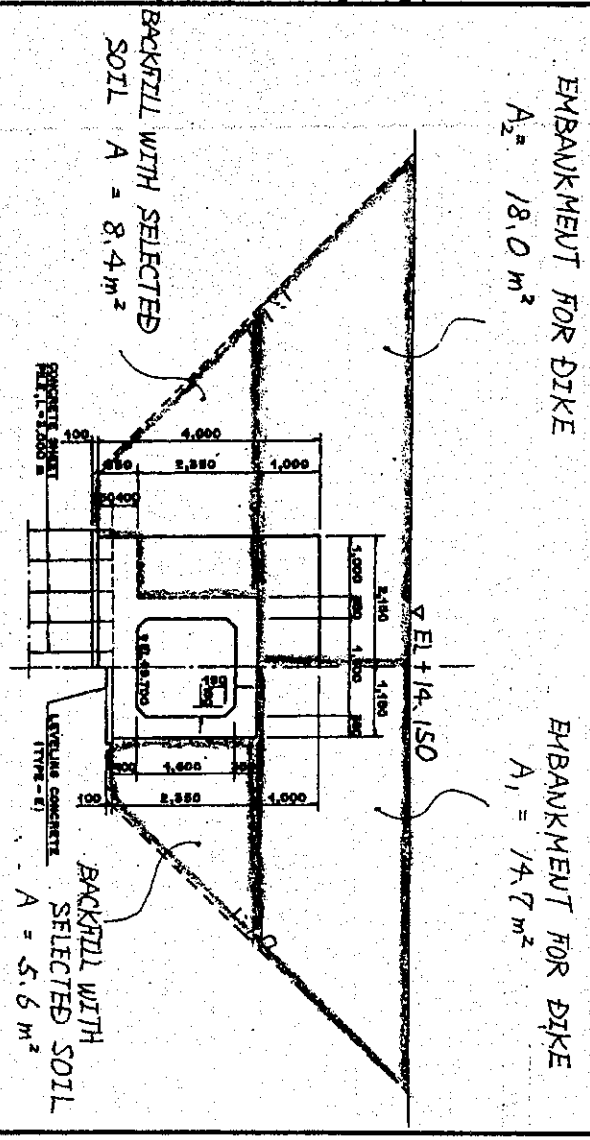
EXPLANATORY DRAWING





DRAINAGE SLUICEWAY AT WF. 172R+15m

TYPE OF WORK :	EMBANKMENT FOR DIKE
LOCATION :	MAIN STRUCTURE



CALCULATION	RESULT
$V_1 = 1/3 \times 14.70 \times 2 \times 3.75 = 36.75$	
$V_2 = 14.70 \times 2 \times 1.30 = 38.22$	
$V_3 = 18.00 \times 2 \times 1.30 = 46.80$	
$V_4 = 14.70 \times 2 \times 1.40 = 41.16$	
$V_5 = 1/3 \times 14.70 \times 2 \times 3.75 = 36.75$	
(Deduction for Revetment)	
$V_6 = -(3.466 + 2.493) \times 6.70 = -39.93$	
(Deduction for Gabion Cylinder)	
$V_7 = -(4.778 + 1.00) \times 0.50 \times 5.00 \times 2 = -28.89$	
TOTAL = 130.86	130.86 m³

TYPE OF WORK : DRAINAGE SLUICEWAY AT WA. 172R + 15m

LOCATION : BACKFILL WITH SELECTED SOIL : MAIN STRUCTURE

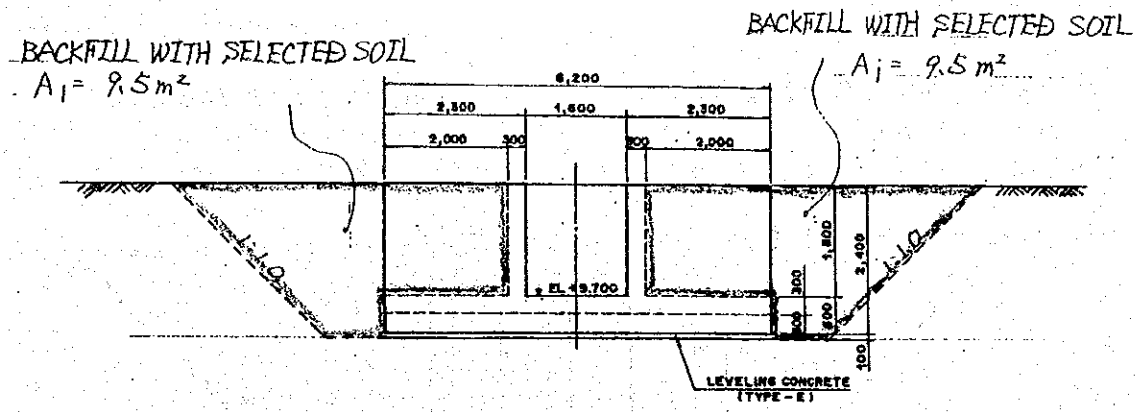
CALCULATION	RESULT
$A_1 = 9.50\ m^2$	
$V_1 = 9.50 \times 2 \times (2.341 + 3.659) \times 1/2 = 57.00$	
$A_2 = 8.30\ m^2$	
$V_2 = 8.30 \times 2 \times (0.50 + 1.00) = 24.90$	
$A_3 = 5.60\ m^2 \times 2 = 11.20$	
$V_3 = (11.20 + 16.80) \times 1/2 \times 4.20 = 58.80$	
$A_4 = 8.40\ m^2 \times 2 = 16.80$	
$V_4 = 16.80 \times 1.30 = 21.84$	
$A_5 = 2.60\ m^2$	
$V_5 = 2.60 \times 3.00 = 7.80$	
$A_6 = 10.0\ m^2$	
$V_6 = (11.20 + 20.00) \times 1/2 \times 4.775 = 74.49$	
$V_7 = 10.00 \times (3.00 + 3.00) = 60.00$	
$TOTAL\ (V_1+V_2+V_3+V_4+V_5+V_6+V_7) = 304.83$	$304.83\ m^3$

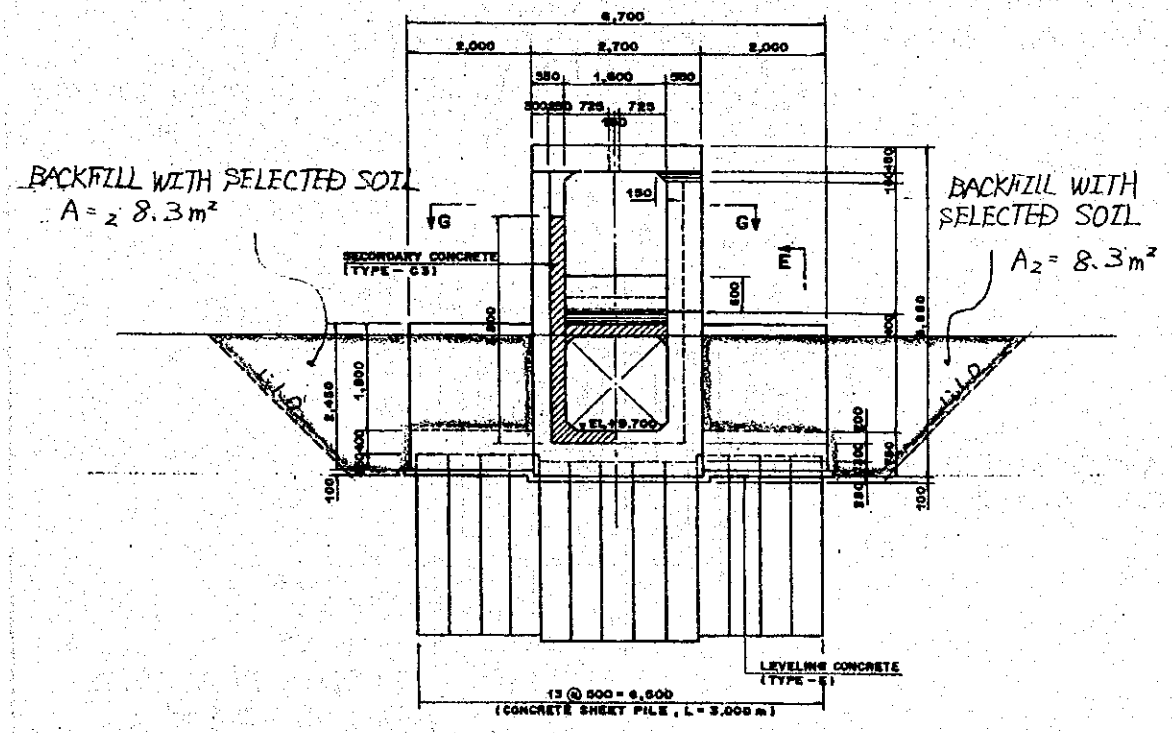
DRAINAGE SLUICEWAY AT WF. 172 R + 15m

TYPE OF WORK : BACKFILL WITH SELECTED SOIL

LOCATION : MAIN STRUCTURE (1/2)

EXPLANATORY DRAWING

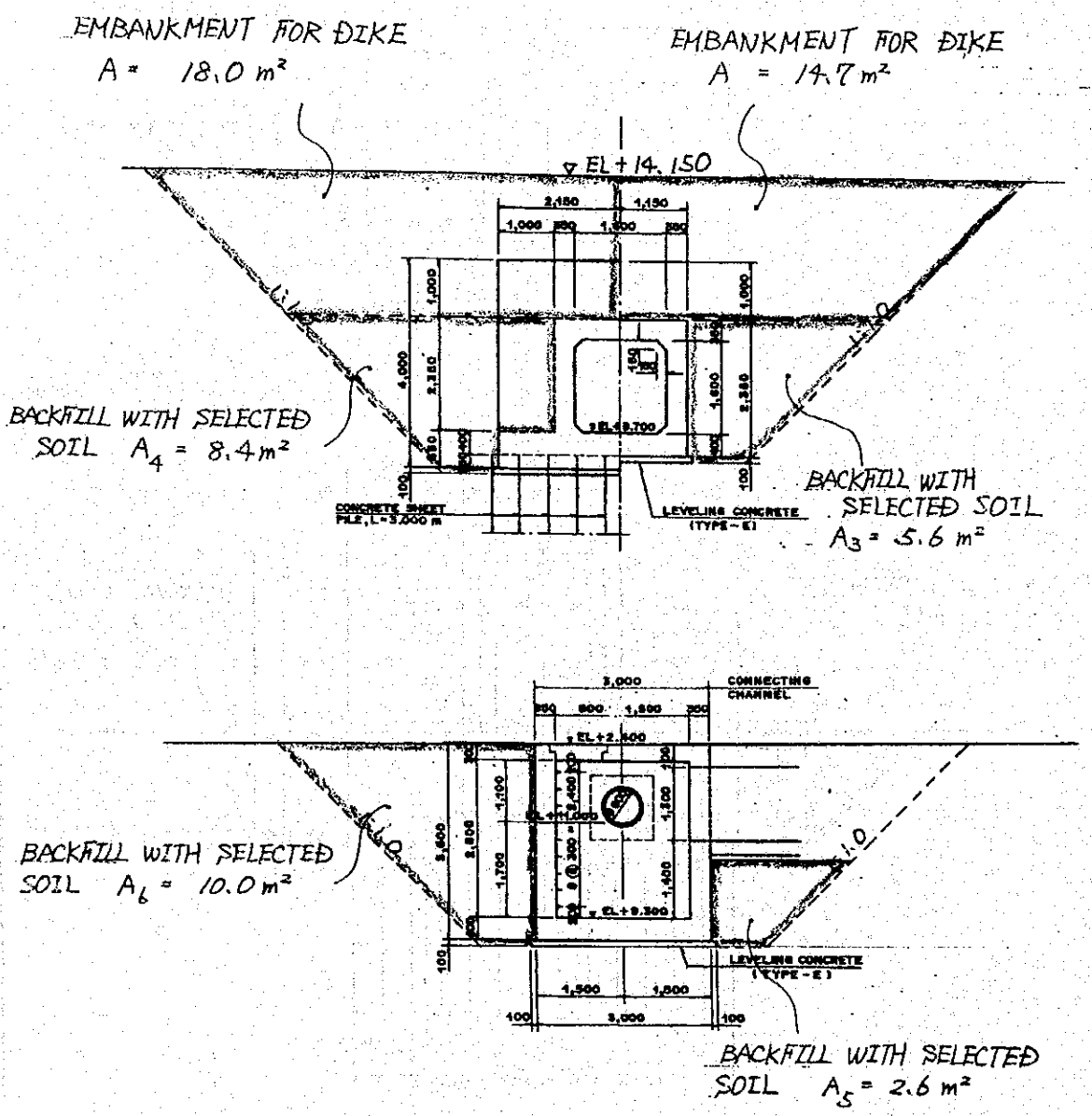




TYPE OF WORK : DRAINAGE SLUICEWAY AT WF.172 R + 15m
BACKFILL WITH SELECTED SOIL

LOCATION : MAIN STRUCTURE (2/2)

EXPLANATORY DRAWING



TYPE OF WORK : DRAINAGE SLUICEWAY AT WF. 172R + 15m CONCRETE (TYPE - C1)

LOCATION : WING WALL

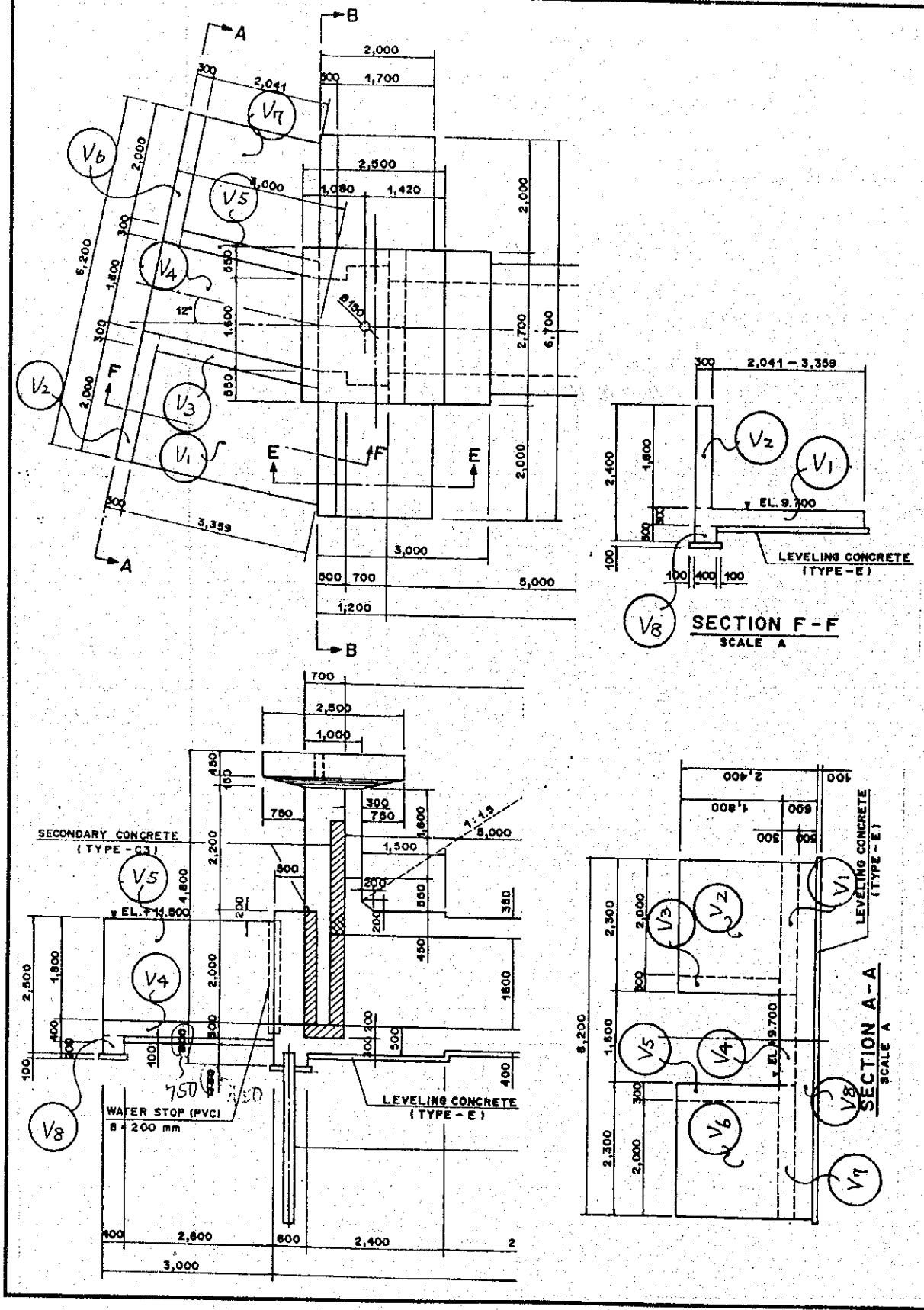
CALCULATION	RESULT
(TYPE-C1)	
$V_1 = (3.659 + 3.170) \times 1/2 \times 2.30 \times 0.30 = 2.356$	
$V_2 = 1.80 \times 0.30 \times 2.30 = 1.242$	
$V_3 = (2.87 + 2.934) \times 1/2 \times 0.30 \times 1.80 = 1.567$	
$V_4 = (3.17 + 2.83) \times 1/2 \times 1.60 \times 0.30 = 1.440$	
$V_5 = (2.53 + 2.466) \times 1/2 \times 0.30 \times 1.80 = 1.349$	
$V_6 = 1.80 \times 0.30 \times 2.30 = 1.242$	
$V_7 = (2.87 + 2.341) \times 1/2 \times 2.30 \times 0.30 = 1.798$	
$V_8 = 0.30 \times 0.40 \times 6.20 = 0.744$	
TOTAL = 11.738	11.738 m^3

DRAINAGE SLUICEWAY AT WF. 172 R + 15m

TYPE OF WORK : CONCRETE (TYPE-C1)

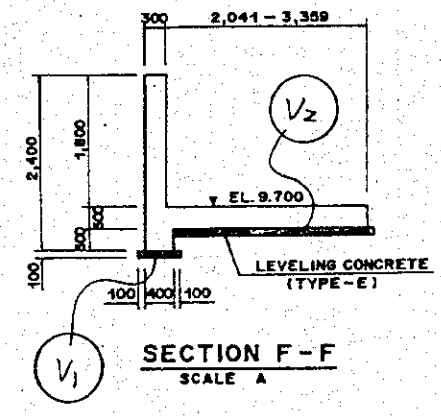
LOCATION : WING WALL

EXPLANATORY DRAWING



DRAINAGE SLUICE WAY AT WF. 172R+15m

TYPE OF WORK :	LEVELING CONCRETE
LOCATION :	WING WALL



SECTION F-F
SCALE A

CALCULATION	RESULT
(TYPE-E)	
$V_1 = 0.60 \times (6.20 + 0.10 \times 2) \times 0.10 = 0.384$	
$V_2 = (3.280 + 1.920) \times 1/2 \times (6.20 + 0.10 \times 2) \times 0.10 = 1.664$	
TOTAL = 2.048	2.048 m^3

TYPE OF WORK : DRAINAGE SLUICEWAY AT WA.172R +15 m FORM

LOCATION : WING WALL

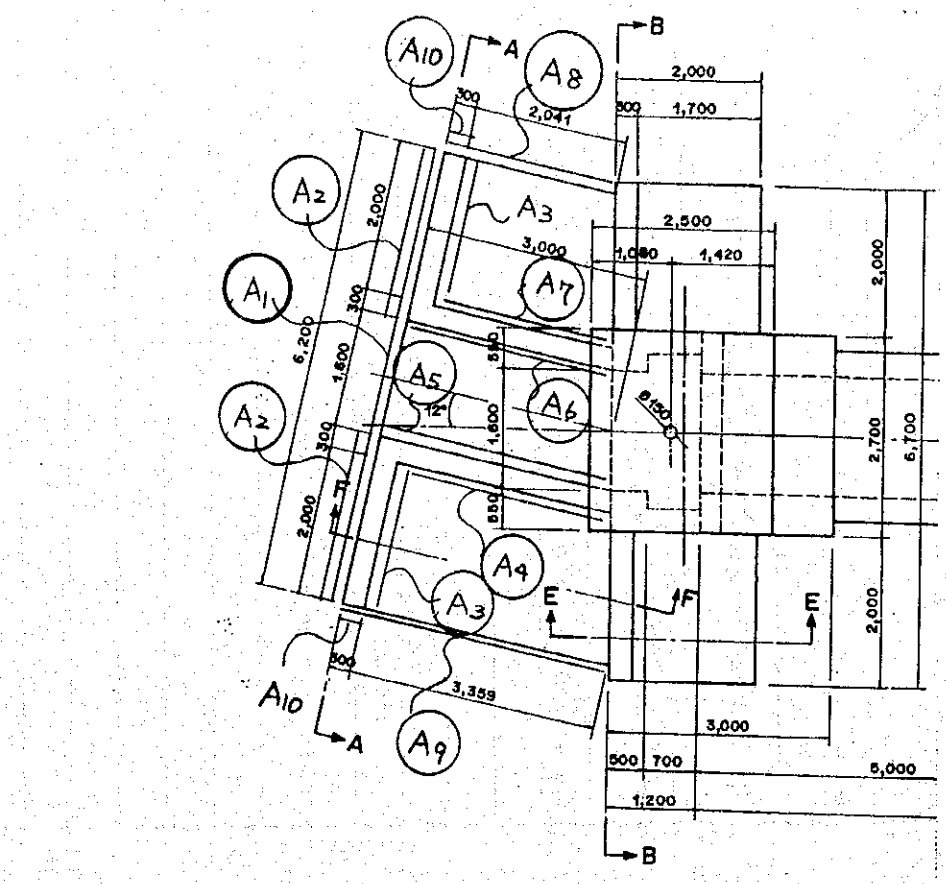
CALCULATION		RESULT
(H < 4.0m)		
$A_1 = 0.60 \times 6.20$	$= 3.720$	
$A_2 = 2.30 \times 1.80 \times 2$	$= 8.280$	
$A_3 = 2.00 \times 1.80 \times 2$	$= 7.200$	
$A_4 = 2.934 \times 1.80$	$= 5.281$	
$A_5 = 3.170 \times 1.80$	$= 5.706$	
$A_6 = 2.830 \times 1.80$	$= 5.094$	
$A_7 = 2.466 \times 1.80$	$= 4.439$	
$A_8 = (2.341 \times 0.30) + (0.30 \times 0.40)$	$= 0.822$	
$A_9 = (3.659 \times 0.30) + (0.30 \times 0.40)$	$= 1.218$	
$A_{10} = 0.30 \times 1.80 \times 2$	$= 1.080$	
$A_{11} = 0.20 \times 6.20$	$= 1.240$	
TOTAL = 44.080		44.080 m^2

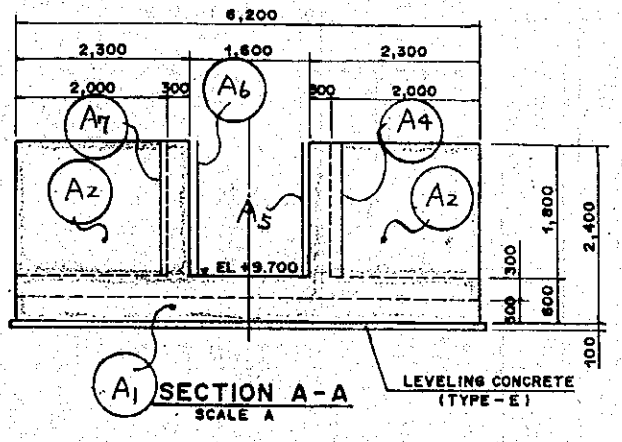
DRAINAGE SLUICEWAY AT WF. 172R + 15m

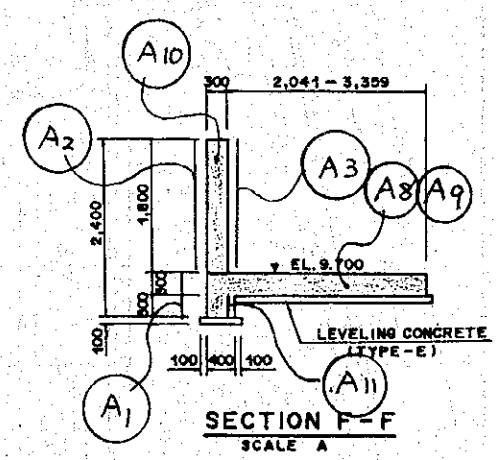
TYPE OF WORK : FORM

LOCATION : WING WALL

EXPLANATORY DRAWING

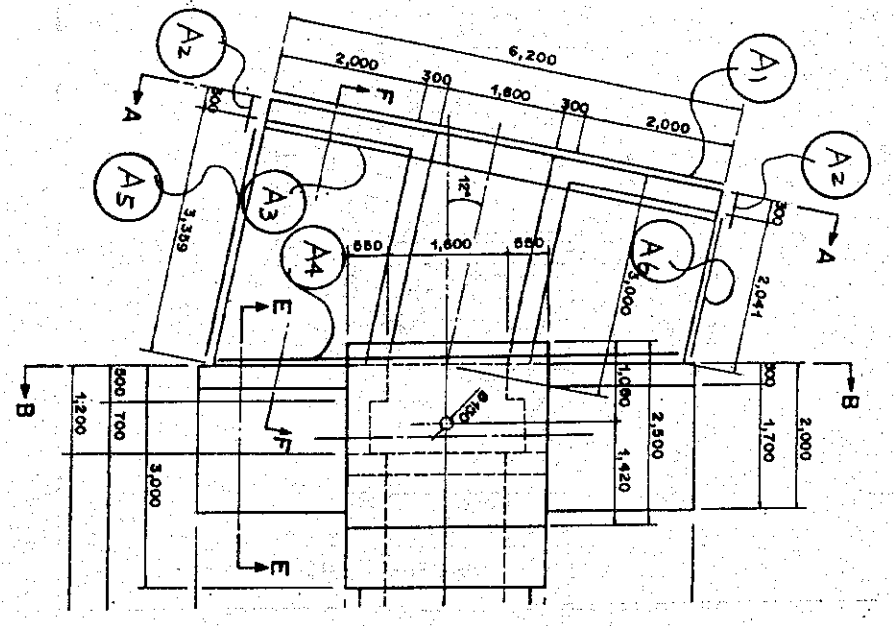


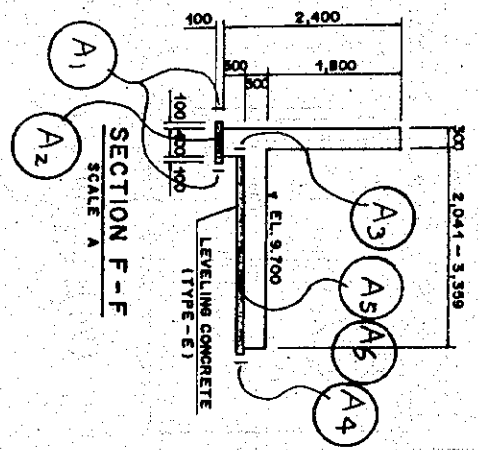




DRAINAGE SLUICEWAY AT WF. 172R+15m

TYPE OF WORK :	FORM FOR LEVELING CONCRETE
LOCATION :	WING WALL





CALCULATION	RESULT
(H < 4.0 m)	
$A_1 = (6.20 + 0.10 \times 2) \times 0.10 \times 2 = 1.280$	
$A_2 = 0.60 \times 0.10 \times 2 = 0.120$	
$A_3 = (6.20 + 0.10 \times 2) \times 0.10 = 0.640$	
$A_4 = (6.339 + 0.10 \times 2) \times 0.10 = 0.654$	
$A_5 = 3.259 \times 0.10 = 0.326$	
$A_7 = 1.941 \times 0.10 = 0.194$	
TOTAL = 3.214	$3.214\ m^2$