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

LOCATION : REVETMENT

CALCULATION	RESULT
• CONCRETE (TYPE-C1)	
V = (12.00 + 1.85×2) × 2.20/10.00m = 3.454	3.454 m^3
• GRAVEL BEDDING	
V = (12.00 + 1.85×2) × 0.70/10.00m = 1.099	1.099 m^3
• FORM (H<4.0m)	
A = (12.00 + 1.85×2) × 10.83/10.00m = 17.003	17.003 m^2
• REINFORCING BAR	
W = (12.00 + 1.85×2) × 0.10/10.00m = 0.157	0.157 tf
• JOINT FILLER (t=10, ELASTIC MATERIAL)	
A = 0.220 × 2 places = 0.440	0.440 m^2

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

CALCULATION			RESULT
GABION CYLINDER			
Ø 500			
$V_1 = \pi /4 \times 0.50^2 \times (3.00 + 7.826 + 1.00) \times 6 \times 2$			
	=	27.864	
$V_2 = \pi /4 \times 0.50^2 \times (3.00 + 4.778 + 1.00) \times 10 \times 2$			
	=	34.471	
TOTAL	=	62.335	62.335 m^3
• SOIL FILLING			
$V_1 = (3.00 + 7.826 + 1.00) \times 0.50 \times 3.00 \times 2 - 27.864$			
	=	7.614	
$V_2 = (3.00 + 4.778 + 1.00) \times 0.50 \times 5.00 \times 2 - 34.471$			
	=	9.419	
TOTAL	=	17.033	17.033
GABION MATTRESS			
$A = 0.50 \times 3.00 + 0.50 \times 1.50$	=	2.250 m^2	
$V = 2.25 \times 12.00$	=	27.000	27.000 m^3

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

CALCULATION			RESULT
RUBBLE STONE FILLING			
A = ½ x 1.00 x 0.50 + (0.30 + 1.30) x ½ x 0.50	=	0.650 m^2	
V = 0.65 x 12.00	=	7.800	7.800 m^3
CEMENT MORTAR POINTTING			
A_1 = (7.826 + 0.70) x 3.70 x 2	=	63.092	
A_2 = (7.826 + 5.143) x ½ x 1.20 x 2	=	15.563	
A_3 = 5.143 x 1.60	=	8.229	
A_4 = {(0.525 + 4.778 + 0.70) x 1.70 + (3.967 + 0.70) x 0.65} x 2			
	=	26.477	
A_5 = (3.155 + 0.70) x 2.35 x 2	=	18.119	
TOTAL	=	131.480	131.480 m^2

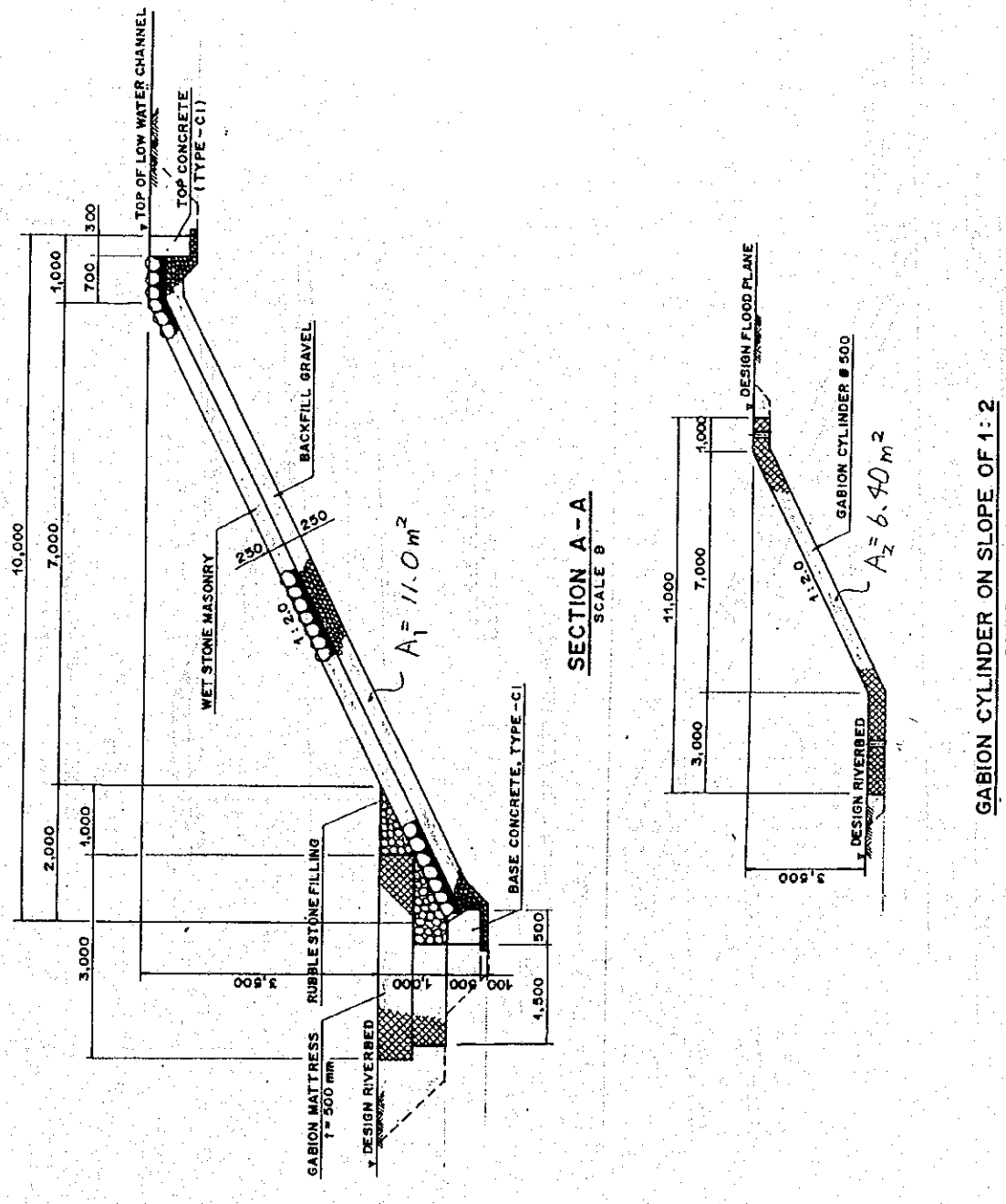
TYPE OF WORK : REVETMENT
LOCATION : DRAINAGE SLUICEWAY AT WF.172R + 15 m

CALCULATION			RESULT
SOLID SODDING			
A = (1.563 + 3.155) x ½ x 4.70 x 2	=	22.175	22.175 m^2
STRUCTURAL EXCAVATION			
A_1 = 11.0 m^2			
V_1 = 11.0 x 12.0	=	132.0	
A_2 = 6.40 m^2			
V_2 = 6.40 x (3.00 + 0.50) x 2	=	44.8	
TOTAL ($V_1 + V_2$)	=	176.8	176.8 m^3
BACKFILL WITH SELECTED SOIL			
A_1 = 0.9 m^2 A_2 = 0.5 m^2 A_3 = 0.60 m^2			
V_1 = (0.9 + 0.5 + 0.6) x 12.0	=	24.0	
A_4 = 0.4 m^2			
V_2 = (0.4 x 3.00 x 2) + (3.00 + 7.826 + 1.00) x 0.4 x 2			
	=	11.9	
TOTAL ($V_1 + V_2$)	=	35.9	35.9 m^3

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

LOCATION : REVETMENT

EXPLANATORY DRAWING

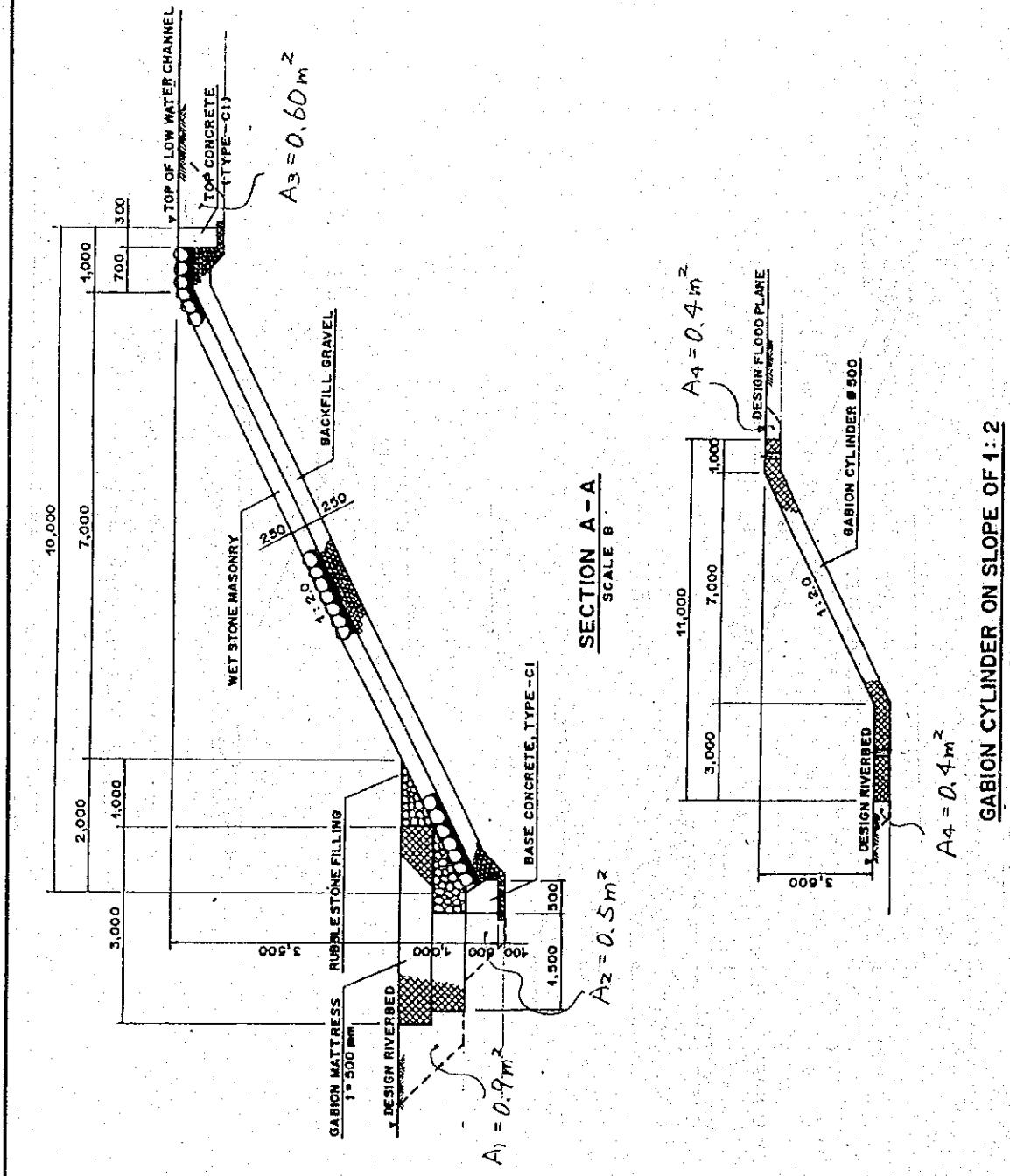


TYPE OF WORK : DRAINAGE SLUICEWAY AT WF. 172 R + 15M

LOCATION : BACKFILL WITH SELECTED SOIL

REVETMENT

EXPLANATORY DRAWING



TYPE OF WORK : DRAINAGE SLUICEWAY AT WA. 172R+15m
LOCATION : PARTITION WALL
: REVETMENT (1/2)

CALCULATION	RESULT
• CONCRETE (TYPE-C1)	
$A_1 = (3.606 + 3.065) \times 1/2 \times 0.866 + (0.489 + 1.00) \times 1/2 \times 0.70 + 1/2 \times 0.961 \times 0.40 - 1/2 \times 0.20^2$	
$= 3.582\ m^2$	
$V_1 = 3.582 \times 0.30 \times 2 = 2.149$	
$A_2 = (2.794 + 3.048) \times 1/2 \times 0.866 + (0.489 + 1.00) \times 1/2 \times 0.70 + 1/2 \times 0.65 \times 0.30$	
$= 3.148\ m^2$	
$V_2 = 3.148 \times 0.30 \times 2 = 1.889$	
TOTAL $(V_1 + V_2) = 4.038$	$4.038\ m^3$
• GRAVEL BEDDING	
$A_3 = (0.50 + 0.70) \times 1/2 \times 0.10 = 0.060\ m^2$	
$V_3 = 0.060 \times (3.065 + 0.489) \times 2 = 0.426$	
$V_4 = 0.060 \times (3.048 + 0.489) \times 2 = 0.424$	
TOTAL $(V_3 + V_4) = 0.850$	$0.850\ m^3$
• FORM ($H < 4.0m$)	
$A_4 = 3.582 \times 2 \times 2 = 14.328$	
$A_5 = 3.148 \times 2 \times 2 = 12.592$	
TOTAL $(A_4 + A_5) = 26.920$	$26.920\ m^2$

DRAINAGE SLUICEWAY AT WF. 172R+15m

TYPE OF WORK : PARTITION WALL

LOCATION : REVETMENT (2/2)

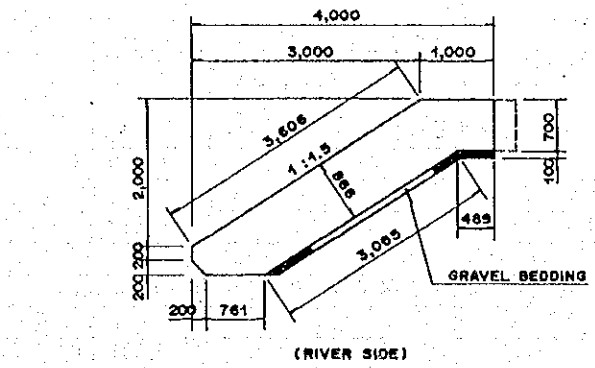
CALCULATION	RESULT
・REINFORCING BAR	
(D13, $w = 1.04$ kgf/m)	
$n_1 = 8$ Bars	
$L_1 = (3.606 + 1.00) - 0.05 \times 2 = 4.506$ m/Bar	
$W_1 = 8$ Bars $\times 4.506 \times 1.04 \times 2 = 74.980$ kgf	
$n_2 = 8$ Bars	
$L_2 = (2.794 + 1.00) - 0.05 \times 2 = 3.694$ m/Bar	
$W_2 = 8$ Bars $\times 3.694 \times 1.04 \times 2 = 61.468$ kgf	
(D10, $w = 0.617$ kgf/m)	
$n_3 = (4.506 \div 0.30) + 1 = 16.02 \fallingdotseq 17$ Bars	
$L_3 = 0.20 \times 2 + 0.766 \times 2 + 15 \times 0.01 = 2.082$ m/Bar	
$W_3 = 17$ Bars $\times 2.082 \times 0.617 \times 2 = 43.676$ kgf	
$n_4 = (3.694 \div 0.30) + 1 = 13.31 \fallingdotseq 14$ Bars	
$L_4 = 2.082$ m/Bar	
$W_4 = 14$ Bars $\times 2.082 \times 0.617 \times 2 = 35.969$ kgf	
TOTAL $(W_1 + W_2 + W_3 + W_4) = 216.093$ kgf	0.216 tf
・JOINT FILLER (t=10, ELASTIC MATERIAL)	
$A_6 = (3.967 + 0.70) \times 0.30 \times 2 = 2.800$	
$A_7 = (3.155 + 0.70) \times 0.30 \times 2 = 2.313$	
TOTAL $(A_6 + A_7) = 5.113$	5.113 m³

DRAINAGE SLUICEWAY AT WF.172R+15m

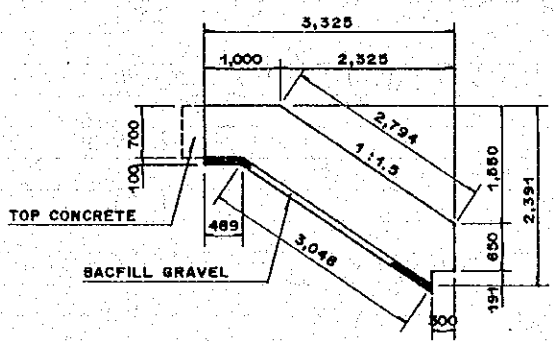
TYPE OF WORK : PARTITION WALL

LOCATION : REVETMENT

EXPLANATORY DRAWING



(RIVER SIDE)



(LAND SIDE)

PROFILE OF PARTITION WALL

SCALE 8

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

CALCULATION			RESULT
END WALL			
• CONCRETE (TYPE – C1)			
A_1 = (10.062 + 9.846) x ½ x 0.60 + (0.70 + 0.558) x ½ x 0.60	=	6.350 m^2	
V_2 = 6.350 x 0.30 x 2	=	3.810	
A_3 = (0.525 + 0.737) x ½ x 0.70 + (4.777 + 0.49) x (0.70 + 0.488) + ½ x 0.70	=	4.201 m^2	
V_2 = 4.201 x 0.30 x 2	=	2.521	
A_3 = (3.155 + 2.965) x ½ x 0.70 + (0.70 + 0.49) x ½ x 0.70	=	2.559 m^2	
V_2 = 2.559 x 0.30 x 2	=	1.535	
TOTAL (V_1 + V_2 + V_3)	=	7.866	7.866 m^3
• GRAVEL BEDDING			
A_4 = (0.40 x 0.10) + (0.10 + 0.30) x ½ x 0.10	=	0.060 m^2	
A_4 = (9.846 + 0.558) x 0.06 x 2	=	1.248	
A_5 = (0.737 + 4.777 + 0.488) x 0.06 x 2	=	0.720	
A_6 = (2.965 + 0.490) x 0.06 x 2	=	0.414	
TOTAL (V_4 + V_5 + V_6)	=	2.382	2.382 m^3
• FORM (H < 4.0 m)			
A_5 = 6.350 x 2 x 2	=	25.400	
A_6 = 4.201 x 2 x 2	=	16.804	
A_7 = 2.559 x 2 x 2	=	10.236	
TOTAL (A_5 + A_6 + A_7)	=	52.440	52.440 m^3

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

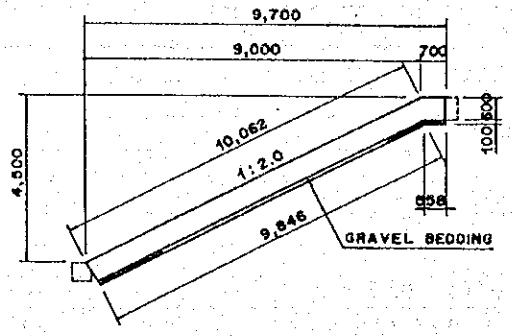
CALCULATION				RESULT
• REINFORCING BAR				
(D 13 , W = 1.04 kgf /m)				
n_1 = 6 Barss				
L_1 = (10.062 + 0.70) - 0.05 x 2		=	10.662 m /Bar	
W_1 = 6 Bars x 10.662 x 1.04 x 2		=	131.062	
n_2 = 6 Barss				
L_2 = (0.525 + 0.70) - 0.05 x 2		=	3.755 m /Bar	
W_2 = 6 Bars x 5.902 x 1.04 x 2		=	73.657	
(D 10 , W = 0.617 kgf /m)				
n_3 = 6 Bars				
L_3 = (3.155 + 0.70) - 0.05 x 2		=	3.755 m/Bar	
W_3 = 6 Bars x 3.755 x 1.04 x 2		=	46.862	
n_4 = (10.662 : 0.30) + 1	= 36.54	≅	37 Bars	
L_4 = 0.20 x 2 + 0.50 x 2 + 15 x 0.01		=	1.550 m /Bar	
W_4 = 37 Bars x 1.55 x 0.617 x 2		=	70.770	
n_5 = (6.002 : 0.30) + 1	= 21.006	≅	22 Bars	
L_5 = 1.550 m /Bar				
W_5 = 32 Bars x 1.55 x 0.617 x 2		=	42.079	
n_6 = (3.755 : 0.30) + 1	= 13.52	≅	14 Bars	
L_6 = 1.550 m /Bar				
W_6 = 14 Bars x 1.55 x 0.617 x 2		=	26.778	
TOTAL ($W_1 + W_2 + W_3 + W_4 + W_5 + W_6$)		=	393 208 kgf	0.393 tf
• JOINT FILTER (t = 10 , ELASTIC MATERIAL)				
A_8 = (10.062 + 0.70) x 0.25 x 2		=	5.381	5.381 m^3

DRAINAGE SLUICEWAY AT WF/72R+15m

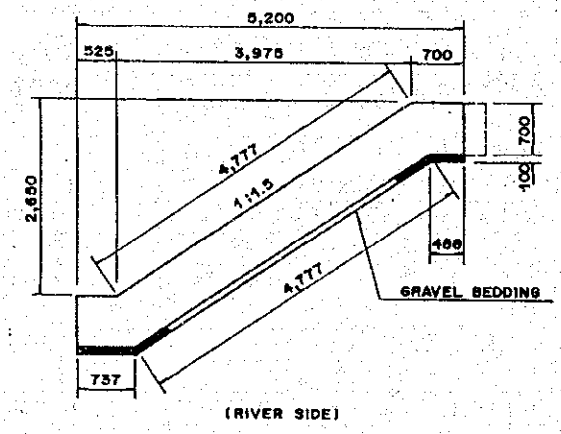
TYPE OF WORK : END WALL

LOCATION : REVETMENT

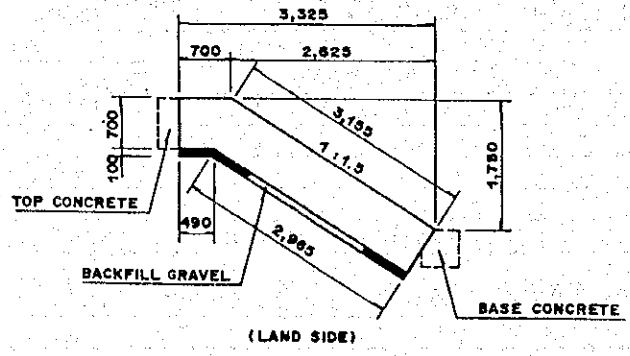
EXPLANATORY DRAWING



PROFILE OF END WALL
SCALE A



(RIVER SIDE)



(LAND SIDE)

PROFILE OF END WALL
SCALE B

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

CALCULATION				RESULT
CONCRETE (TYPE – C1)				
(TYPE – C1)				
Number of concrete cover : n = 110 nos				
V = (0.50 x 1.18 x 0.15)		=	9.735	9.735 m^3
FORM (H < 4.0 m)				
A_1 = (0.50 x 0.15) x 2 x 110		=	16.500	
A_2 = (1.18 x 0.15) x 2 x 110		=	38.940	
	TOTAL	=	55.440	55.440 m^2
REINFORCING BAR				
Number of concrete cover	: n = 110 nos			
(D 13 , W = 1.04 kgf / m)				
W_1 = (4 Bars x 1.12 x 1.04) x 110		=	512.512	
W_2 = (9 Bars x 0.44 x 1.04) x 110		=	453.024	
(∅ 13 , W = 1.04 kgf / m)				
W_3 = (2 Bars x 0.41 x 1.04) x 110		=	93.808	
W_4 = (2 Bars x 0.31 x 1.04) x 110		=	70.928	
TOTAL ($W_1 + W_2 + W_3 + W_4$)		=	1130.272 kgf	1.130 tf

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

CALCULATION			RESULT
WET STONE MASONRY			
A_1 = (0.30 + 0.50) x ½ x 1.70 x 2	=	1.360	
A_2 = 0.25 x 1.00	=	0.250	
A_3 = - (0.10 x 0.15) x 2	=	- 0.030	
TOTAL	=	1.580 m^2	
V_1 = 1.580 x 55.00	=	86.900	
V_2 = (0.30 + 0.50) x ½ x 1.70 x 1.60	=	2.176	
V_3 = - π /4 x 0.74^2 x 0.30 x 4	=	- 0.516	
TOTAL	=	88.560	88.560 m^3
GRAVEL BEDDING			
V = (2.00 + 0.10 x 2) x 0.10 x 55.00	=	12.100	12.100 m^3

TYPE OF WORK : CONNECTING CHANNEL
LOCATION : DRAINAGE SLUICEWAY

CALCULATION			RESULT
STRUCTURAL EXCAVATION			
V_1 = 8.50 x 55.00	=	467.50	
V_2 = (0.50 + 1.55) x ½ x 2.10 x 3.00	=	6.46	
TOTAL	=	473.96	473.96 m^3
MORTAR PLASTERING			
A_1 = 1.30 x 55.00	=	71.500	
A_2 = 1.00 x 55.00	=	55.000	
A_3 = (1.30 x 55.00) - π x 0.74^2 x 4	=	69.780	
A_4 = 1.30 x 1.00	=	1.300	
TOTAL	=	197.580	197.580 m^2

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

CALCULATION			RESULT
BACKFILL WITH SELETED SOIL			
V_1 = 5.20 x 55.00	=	286.00	
V_2 = (0.50 + 1.55) x ½ x 2.10 x 3.00	=	6.46	
TOTAL	=	292.46	292.46 m^3
CONCRETE (TYPE – C1)			
CONCRETE (TYPE – C1)			
A_1 = (2.240 x 0.23 x 0.30) x 4	=	0.618	
A_2 = (0.94 x 0.30 x 0.50 x 2) x 4	=	1.128	
A_3 = (0.35 x 0.60 x 0.50 x 2) x 4	=	0.840	
TOTAL	=	2.586	2.586 m^3
FORM (H < 4.0 m)			
A_1 = {(2.24 x 1.52) - (1.24 x 1.29)} x 4	=	7.221	
A_2 = (0.23 x 2.24) x 4	=	2.061	
A_3 = (0.94 x 0.50) x 2 x 4	=	3.760	
A_4 = (0.35 x 0.50) x 2 x 4	=	1.400	
A_5 = {(1.17 x 0.30) + (0.35 x 0.60)} x 2 x 4	=	4.488	
TOTAL	=	18.930	18.930 m^2

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

CALCULATION			RESULT
CONCRETE (TYPE – D)			
Pipe Length : L = 3.35 m /place (Average)			
CONCRETE (TYPE – D)			
V = {(1.24 x 1.29) - π /4 x 0.74^2} x 3.35 x 4	=	15.672	15.672 m^3
FORM (H < 4.0 m)			
A_1 = (1.29 x 3.35) x 2 x 4	=	34.572	
A_2 = {(1.24 x 1.29) - π /4 x 0.74^2}x 4	=	4.678	
TOTAL	=	39.250	39.250 m^2
GRAVEL BEDDING			
Pipe Length : L = 3.35 m / place (Average)			
V_1 = (1.24 + 0.10 x 2) x 0.10 x (3.35 - 0.70) x 4	=	1.526	
V_2 = (2.24 + 0.10 x 2) x 0.10 x 0.80 x 4	=	0.781	
TOTAL	=	2.307	2.307 m^3

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

CALCULATION				RESULT
REINFORCING BAR				
D13 , (W = 1.04 kgf / m)				
W_1 = 4 Bars x 2.14 x 1.04		=	8.902	
W_2 = 22 Bars x 0.65 x 1.04		=	14.872	
W_3 = 8 Bars x 0.38 x 1.04		=	3.162	
W_4 = 6 Bars x 3.185 x 1.04		=	19.874	
W_5 = 6 Bars x 1.45 x 1.04		=	9.048	
	TOTAL	=	55.858 kgf / place	
W = 55.858 x 4		=	223.432 kgf	0.223 tf
CONCRETE PIPE Ø600				
L = (3.40 + 4.00 + 3.50 + 2.50)	= 13.40	≅	15.00	15.00 m

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

CALCULATION			RESULT
STRUCTURAL EXCAVATION			
Drainage Pipe Length : L = 3.35 m / place (Average)			
V_1 = 6.10 x (3.35 - 0.70) x 4	=	64.66	
V_2 = 5.40 x (0.70 + 0.50) x 4	=	25.92	
TOTAL	=	90.58	90.58 m^3
BACKFILL WITH SELECTED SOIL			
Drainage Pipe Length : L = 3.35 m / place (Average)			
V_1 = 4.40 x (3.35 - 0.70) x 4	=	46.64	
V_2 = 4.60 x 0.50 x 4	=	9.20	
V_3 = 2.20 x 0.70 x 4	=	6.16	
TOTAL	=	62.00	62.00 m^3

5.2 Drainage Outlet

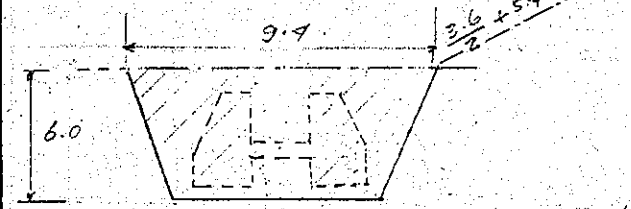
TYPE OF WORK : OUTLET STRUCTURE

LOCATION : WF. 72+22 (R.3A).

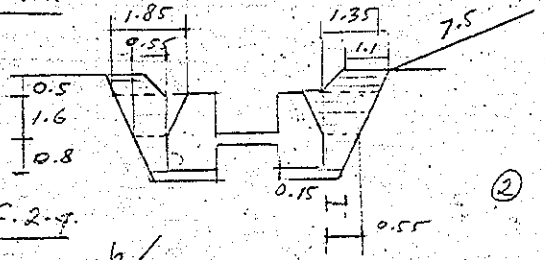
CALCULATION	RESULT
G.2. OUTLET STRUCTURE	
G.2.1. Structural Excavation	288 m^3
G.2.2. Backfill with selected soil	42.188 m^3
G.2.3 log pile, Dia 150 mm, L = 2.0 m	—
G.2.4 Gravel Bedding.	3.753 m^3
G.2.5. Chipping on existing structure.	6.380 m^2
G.2.6. Concrete, type C1 including form work.	0.756 m^3
G.2.7. Deformed Reinforcing Bars.	56.197 kg
G.2.8. Wet stone masonry.	38.280 m^3
G.2.9. Cement mortar Pointing on Riverside Surface of wet stone masonry.	—
G.2... Secondary Concrete	0.260 m^3

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 72+22 (R.3A/)

G.2.1 outlet channel

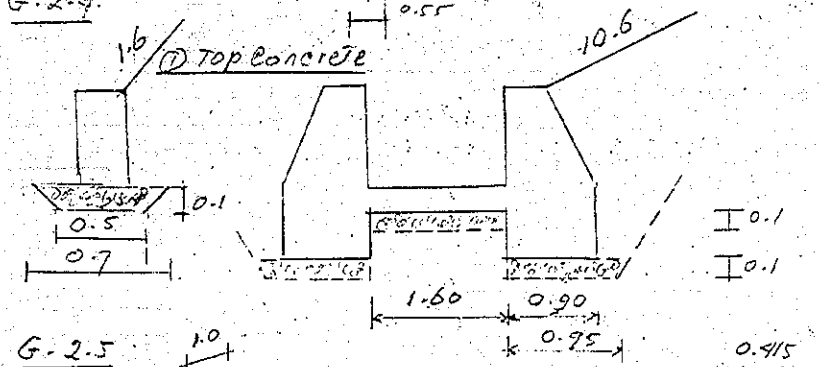


G.2.2 outlet channel

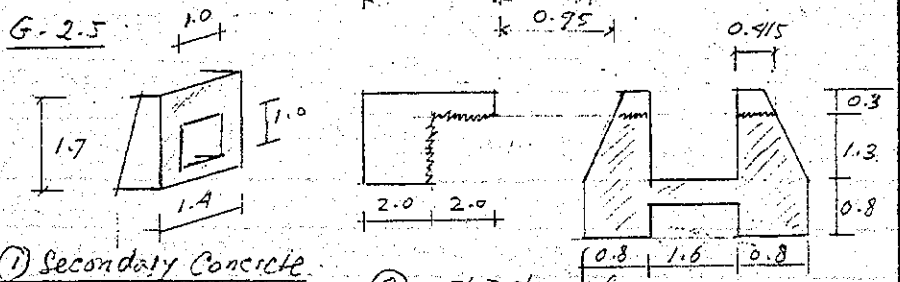


G.2.4

② outlet channel



G.2.5



① Secondary Concrete

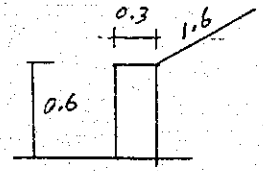
② outlet channel

CALCULATION		RESULT
G.2. OUTLET STRUCTURE		
G.2.1 Structural Excavation.		
$V = \frac{1}{2}(3.40 + 9.40) \times \frac{1}{2} \times 6.0 \times 7.5$	= 288	288 m^3
G.2.2. Backfill with selected soil		
$V = \frac{1}{2}(1.1 + 1.35) \times \frac{1}{2} \times 0.5 \times 7.5 \times 2$	= 9.188	
$\frac{1}{2}(0.55 + 1.85) \times \frac{1}{2} \times 1.6 \times 7.5 \times 2$	= 28.80	
$\frac{1}{2}(0.15 + 0.55) \times \frac{1}{2} \times 0.8 \times 7.5 \times 2$	= 4.20	
TOTAL	42.188	42.188 m^3
G.2.3 Log pile, Dia. 150 mm, L = 2.0 m		
∴ Existing ⟶ NO WORK.		—
G.2.4. Gravel Bedding		
$V_1 = \frac{1}{2}(0.5 + 0.7) \times \frac{1}{2} \times 0.1 \times 1.6$	= 0.096	
$V_2 = \frac{1}{2}(0.90 + 0.95) \times \frac{1}{2} \times 0.1 \times 10.6 \times 2$	= 1.961	
$\frac{1}{2}(0.1 \times 1.6) \times 10.6$	= 1.696	
TOTAL	3.753	3.753 m^3
G.2.5 Chipping on Existing Structure		
$A_1 = \frac{1}{2}(1.4 \times 1.7) - (1.0 \times 1.0) \times \frac{1}{2}$	= 1.380	
$A_2 = \frac{1}{2}(0.415 \times 2.0) \times 2 \times \frac{1}{2}$	= 1.660	
$\frac{1}{2}(0.415 + 0.8) \times \frac{1}{2} \times 1.3 \times \frac{1}{2} \times 2$	= 1.580	
$\frac{1}{2}(0.8 \times 0.8) \times 2 \times \frac{1}{2}$	= 1.280	
$\frac{1}{2}(0.3 \times 1.6) \times \frac{1}{2}$	= 0.480	
TOTAL	= 6.380	6.380 m^2

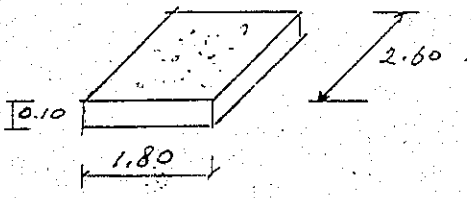
TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF 72+22 (R-3A)

G.2.6

① Top Concrete

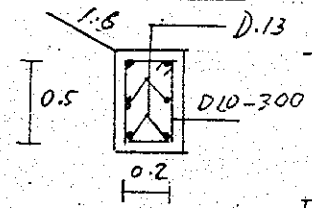


② Foot slab bridge

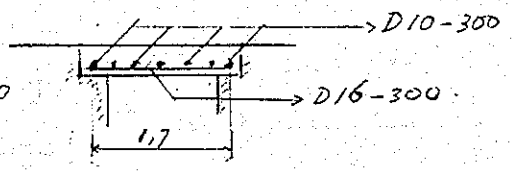


G.2.7

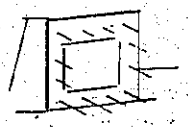
① Top Concrete



② Foot slab bridge

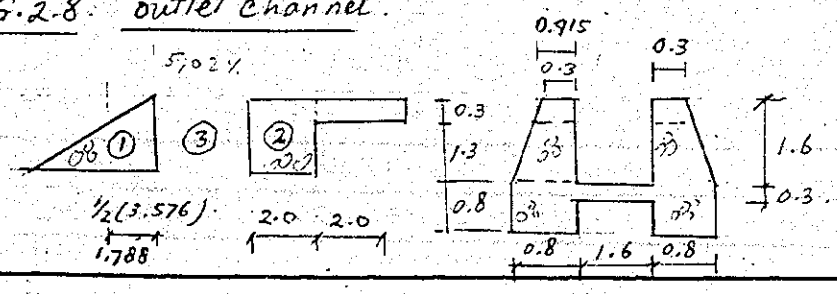


③ Anchor bars



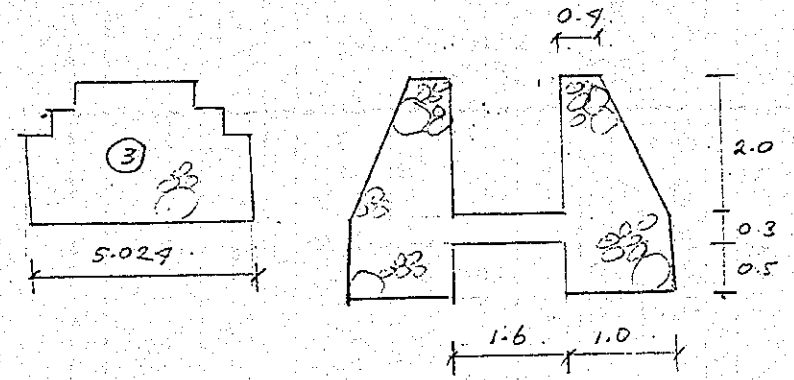
	Top concrete		Foot Slab bridge		Secondary Concrete
	D10	D13	D10	D16	D16
n	6	6	7	9	12
L	1.5	1.6	2.5	1.7	0.3
w	0.617	1.04	0.617	1.58	1.58

G.2.8 outlet channel.

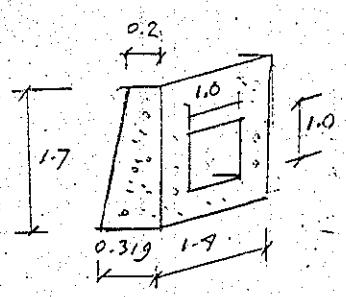


CALCULATION		RESULT
G.2.6 Concrete, type-C1 including formwork.		
$V_1 = \frac{1}{2}(0.3\times0.6)\times1.6\frac{2}{3}$	= 0.288	
$V_2 = \frac{1}{2}(1.80\times2.60)\times0.10\frac{2}{3}$	= 0.468	
TOTAL	0.756	0.756 m^3
G.2.7 Deformed Reinforcing Bars.		
$W_1 = \frac{1}{2}(6\times1.5)\times0.617\frac{2}{3}$	= 5.553.	
$\frac{1}{2}(6\times1.6)\times1.04\frac{2}{3}$	= 9.984.	
W_1	= 15.537	
$W_2 = \frac{1}{2}(7\times2.5)\times0.617\frac{2}{3}$	= 10.798	
$\frac{1}{2}(9\times1.7)\times1.58\frac{2}{3}$	= 24.174.	
W_2	= 34.972	
$W_3 = \frac{1}{2}(12\times0.3)\times1.58\frac{2}{3}$	= 5.688	
TOTAL	56.197.	56.197 kg
G.2.8 Wet stone masonry		
$V_1 = \frac{1}{2}(0.3+0.8)\times\frac{1}{2}\times1.6\frac{2}{3}\times1.788\times2$	= 3.197	
$\frac{1}{2}(0.8\times0.8)\times1.788\frac{2}{3}\times2$	= 2.289	
$\frac{1}{2}(0.3\times1.6)\times1.788\frac{2}{3}$	= 0.858	
V_1	= 6.294	
$V_2 = \frac{1}{2}(0.3+0.415)\times\frac{1}{2}\times0.3\frac{2}{3}\times2.0\times2$	= 0.429	
$\frac{1}{2}(0.3+0.8)\times\frac{1}{2}\times1.6\frac{2}{3}\times2.0\times2$	= 3.520.	
$\frac{1}{2}(0.8\times0.8)\times2.0\frac{2}{3}\times2$	= 2.560	
$\frac{1}{2}(0.3\times1.6)\times2.0\frac{2}{3}$	= 0.960	
V_2	= 7.469.	

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF 72+22 (R.3A)



G.2.- Secondary Concrete



CALCULATION	RESULT
$V3 = \frac{1}{3}(0.9+1.0)\times\frac{1}{2}\times 2.0\}\times 5.029\times 2 = 14.067$	
$\frac{1}{3}(0.8\times 1.0)\times 5.029\}\times 2 \quad = 8.038$	
$\frac{1}{3}(0.3\times 1.6)\times 5.029\} \quad = 2.412$	
V3 29.517	
TOTAL 38.280	$38.280\ m^3$
G.2.9. Cement Mortar Pointing on Riverside	
Surface of wet stone Masonry.	
No work (Because Existing Revetment) .	
G.2.-. Secondary Concrete.	
$V = \frac{1}{3}(0.2+0.319)\times\frac{1}{2}\times 1.7\}\times 1.9 -$	
$\frac{1}{3}(1.0\times 1.0)\times(0.2+0.319)\times\frac{1}{2}\} \quad = 0.260$	$0.260\ m^3$
Form for type C2	
$A_1 = 1.40\times 1.70 - (1.00\times 1.00) \quad = 1.380$	
$A_2 = (0.20+0.319)\times\frac{1}{2}\times 1.70\times 2 = 0.882$	
$A_3 = 0.26\times 1.00\times 4 \quad = 1.040$	
TOTAL = 3.302	$3.302\ m^2$

TYPE OF WORK : OUTLET STRUCTURES
LOCATION : WF.75R + 3.00

CALCULATION			RESULT
STRUCTURAL EXCAVATION			
A_1 = (7.70 + 8.25) x ½ x 0.55	=	4.386 m^2	
A_2 = (7.70 + 10.272) x ½ x 2.572	=	23.112 m^2	
V_1 = (4.386 + 23.112) x ½ x 4.544	=	62.475	
V_2 = 23.112 x 2.00	=	46.224	
TOTAL	=	108.70	108.70 m^3
BACKFILL WITH SELECTED SOIL			
V_1 = (0.50 + 0.775)) x ½ x 0.55 x 7.700	=	2.700	
V_2 = {(0.50 + 0.775) x ½ x 0.55 x (0.50 + 1.786) x ½ x 2.572} x ½ x 4.044 x 2	=	13.306	
V_3 = (0.50 + 1.786) x ½ x 2.572 x 2.00 x 2	=	11.759	
TOTAL	=	27.77	27.77 m^3

TYPE OF WORK : OUTLET STRUCTURES
LOCATION : WF.74R + 3.00

CALCULATION			RESULT
CONCRETE (TYPE – C1)			
• CONCRETE (TYPE – C1)			
V_1 = 0.25 x 0.40 x 6.70	=	0.670	
V_2 = 4.444 x 0.45 x 6.70	=	13.399	
V_3 = ½ x 4.044 x 2.022 x 0.35 x 2	=	2.862	
V_4 = 2.022 x 0.40 x 0.35 x 2	=	0.566	
TOTAL	=	17.497	17.497 m^3
• FORM (H < 4.0 m)			
A_1 = 0.75 x 6.70 + 0.25 x 6.70 + 0.45 x 6.70	=	9.715	
A_2 = (0.25 x 0.40 + 4.444 x 0.45) x 2	=	4.200	
A_3 = (1/2 x 4.044 x 2.022 + 0.40 x 2.022) x 4	=	19.589	
TOTAL	=	33.504	33.504 m^3
REINFORCING BAR			
• D 16 (W = 1.58 KGF/m)			
W_1 = (2.247 + 0.225) x ½ x 19 Bars x 2 x 2 x 1.58	=	148.419	
W_2 = (0.20 + 4.294) x ½ x 7 Bars x 2 x 2 x 1.58	=	100.513	
W_3 = 6.55 x 40 bars x 1.58	=	413.960	
W_4 = 4.294 x 48 Bars x 1.58	=	325.657	
TOTAL = 988.549 kgf	=	0.989 tf	0.989 tf

TYPE OF WORK : OUTLET STRUCTURES
LOCATION : WF.74R + 3.00

CALCULATION				RESULT
CONCRETE (TYPE – E)				
• CONCRETE (TYPE – E)				
V_1 = 0.10 x 0.60 x 6.90		=	0.414	
V_2 = 0.10 x 4.044 x 6.90		=	2.790	
	TOTAL	=	3.204	3.204 m^3
• FORM (H < 4.0 m)				
A_1 = 0.10 x 6.90 x 3		=	2.070	
A_2 = 0.10 x 4.044 x 2		=	0.809	
	TOTAL	=	2.999	2.999 m^2
LOG PILE				
• Ø 150 mm L = 2.00 m / pile				
L = 2.00 m / pile x 6 piles		=	12.000	12.000 m

TYPE OF WORK : OUTLET STRUCTURES
LOCATION : WF.74R + 3.00

CALCULATION			RESULT
JOINT FILTER			
t = 10 , ELASTIC MATERIAL			
A_1 = 0.45 x 6.70	=	3.015	
A_2 = 0.35 x 2.022 x 2	=	4.430	
TOTAL	=	7.445	7.445 m^2
HOLE WITH NON – SHRINKAGE MORTAR			
• ANCHOR BAR (D 16 , L = 0.60 m / Bar)			
W = 1.58 kgf / m			
N = 20 places			
W = 0.60 m / Bar x 20 x 1.58	=	18.960	18.960 kgf
• NON – SHINKAGE MORTAR			
V = π /4 x 0.03^2 x 0.30 x 20	=	0.004	0.004 m^3

TYPE OF WORK : OUTLET STRUCTURE

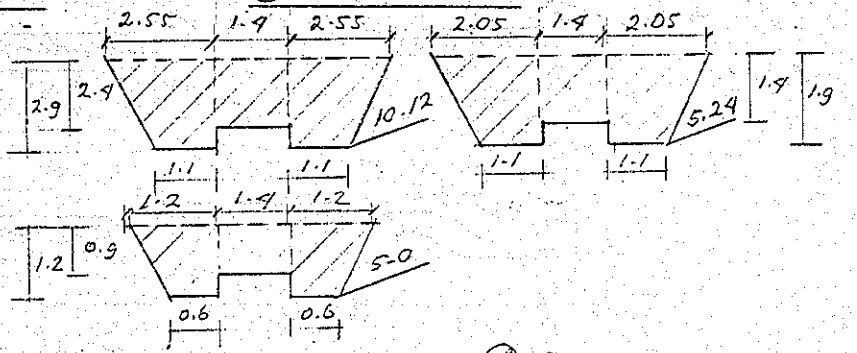
LOCATION : WF. 157 R (RG).

CALCULATION	RESULT
G.2. OUTLET STRUCTURE	
G.2.1 Structural Excavation	262.695 m^3
G.2.2. Backfill With Selected soil.	90.531 m^3
G.2.3. Log Pile, Dia. 150 mm, L = 2.0 m	9.0 m
G.2.4. Gravel Bedding	15.664 m^3
G.2.5 Chipping on Existing structure	9.0 m^2
G.2.6 Concrete, Type - C1 Including Formwork.	11.374 m^3
G.2.7. Deformed Reinforcing Bars.	264.680 kg
G.2.8 Wet stone masonry.	82.891 m^3
G.2.9. Cement Mortar Pointing on Riverside Surface of Wet Stone Masonry.	18.499 m^2
G... Secondary Concrete	0.385 m^3
G... Gabion mattress.	4.500 m^3
G... Gabion Cylinder	35.478 m^3
G... Rubble Stone filling	9.60 m^3

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 157 R (R.9).

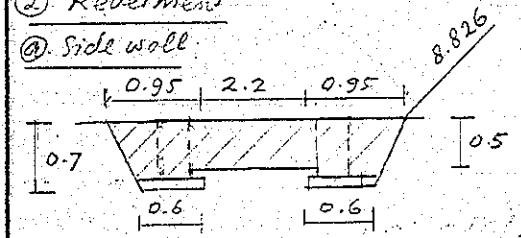
G.2.1

① Outlet Channel

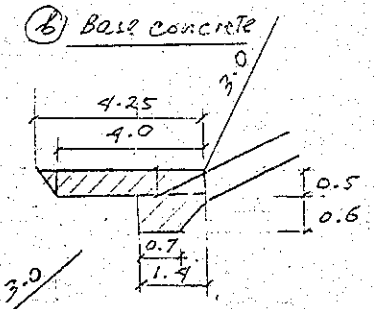


② Revetment

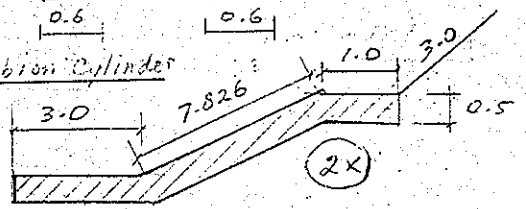
ⓐ Side wall



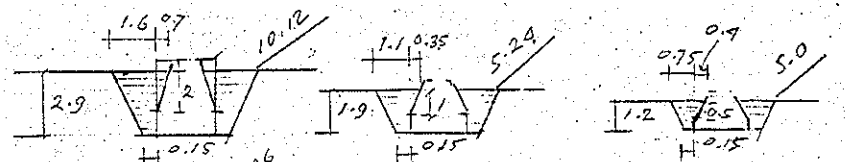
ⓑ Base concrete



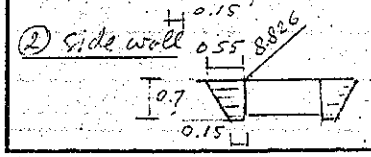
ⓒ Gabion Cylinder



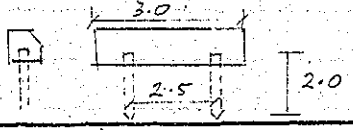
G.2.2 · ① Outlet channel



② Side wall

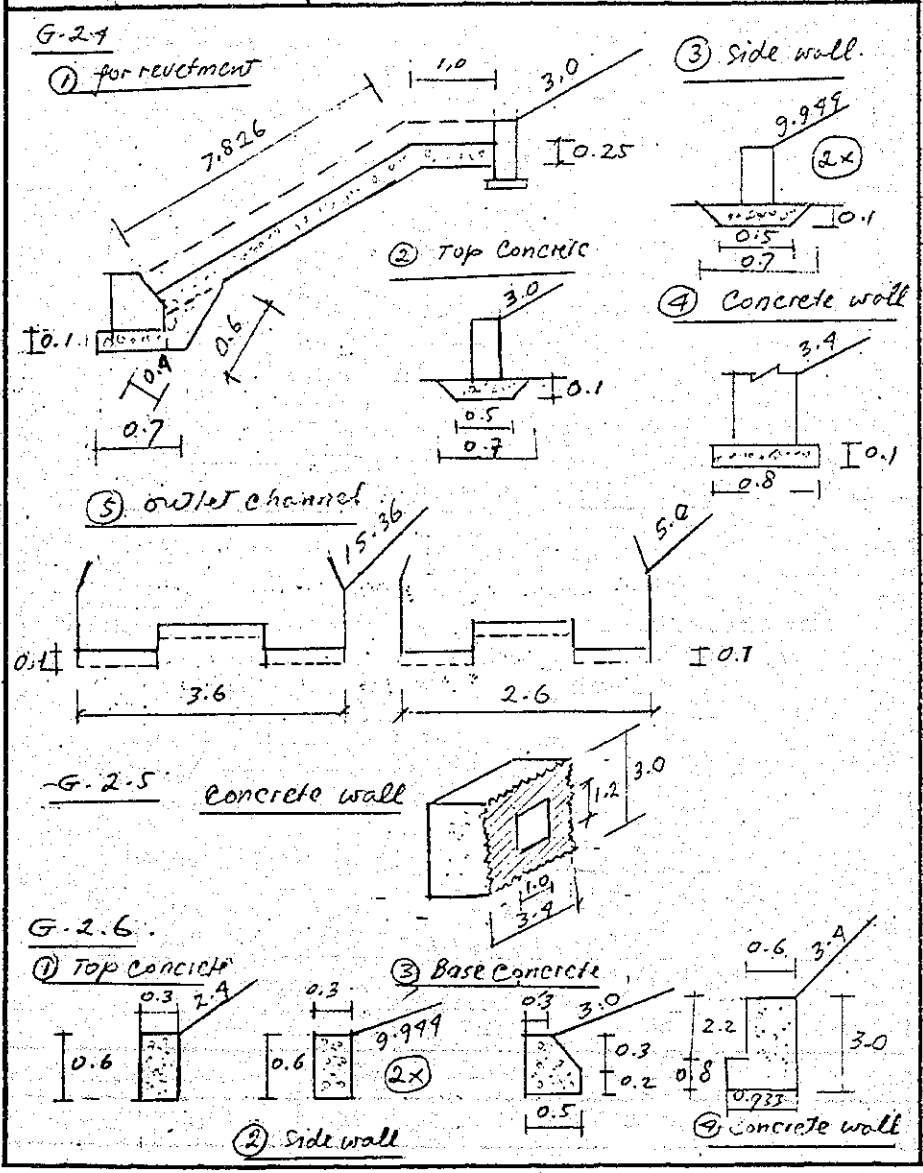


G.2.3



CALCULATION	RESULT
G.2.1 Structural Excavation	
$V_1 = \frac{1}{3}\{(1.1+2.55)\times\frac{1}{2}\times 2.9\}\times 2\times 10.12$ = 107.120	
$\frac{1}{3}\{(1.4\times 2.4)\times 10.12\}$ = 34.003	
$\frac{1}{3}\{(1.1+2.05)\times\frac{1}{2}\times 1.9\}\times 2\times 5.24$ = 31.361	
$\frac{1}{3}\{(1.4\times 1.4)\times 5.24\}$ = 10.270	
$\frac{1}{3}\{(0.6+1.2)\times\frac{1}{2}\times 1.2\}\times 2\times 5.0$ = 10 800	
$\frac{1}{3}\{(1.4\times 0.9)\times 5.0\}$ = 6.300	
V_1 199.854	
$V_2 = \frac{1}{3}\{(0.6+0.95)\times\frac{1}{2}\times 0.7\}\times 2\times 8.826$ = 9.576	
$\frac{1}{3}\{(0.5\times 2.2)\times 8.826\}$ = 9.709	
$\frac{1}{3}\{(4.0+4.25)\times\frac{1}{2}\times 0.5\}\times 3.0$ = 6.188	
$\frac{1}{3}\{(0.7+1.4)\times\frac{1}{2}\times 0.6\}\times 3.0$ = 1,890	
$\frac{1}{3}\{(3.0+7.826+1.0)\times 0.5\}\times 3.0\times 2$ = 35.478	
V_2 62.841	
TOTAL 262.695	262.695 m^3
G.2.2. Backfill with selected soil	
$V_1 = \frac{1}{3}\{(0.15+1.6)\times\frac{1}{2}\times 2.9\}\times 2\times 10.12 + \frac{1}{3}\{(2\times 0.7)\times\frac{1}{2}\times 2\}\times 10.12$ = 65.527	
$\frac{1}{3}\{(0.15+1.1)\times\frac{1}{2}\times 1.9\}\times 2\times 5.24 + \frac{1}{3}\{1\times 0.35\}\times\frac{1}{2}\times 2\}\times 5.24$ = 14.279	
$\frac{1}{3}\{(0.15+0.75)\times\frac{1}{2}\times 1.2\}\times 2\times 5.0 + \frac{1}{3}\{(0.5\times 0.4)\times\frac{1}{2}\times 2\}\times 5.0$ = 6.900	
$V_2 = \frac{1}{3}\{(0.15+0.55)\times\frac{1}{2}\times 0.7\}\times 2\times 8.826$ = 4.325	
TOTAL 90.531	90.531 m^3
G.2.3 Log. Pile, Dia. 150 mm, L = 2.0 m.	
$L = \frac{1}{3}\{2.0\times 2\}$ = 4.0 m	4.0 m

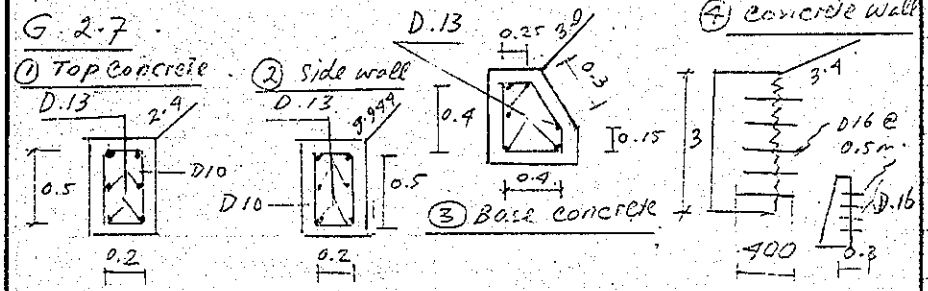
TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 157 R (R.9)



CALCULATION		RESULT
G.2.4. Gravel bedding		
$V1 = \frac{1}{2}(7.826+1.0)\times 0.25 \times 3.0$	= 6.619	
$\frac{1}{2}(0.6\times 0.4)\times \frac{1}{2} \times 3.0$	= 0.360	
$\frac{1}{2}(0.1\times 0.7)\times 3.0$	= 0.210	
V1	= 7.189	
$V2 = \frac{1}{2}(0.5+0.7)\times \frac{1}{2}\times 0.1 \times 3.0$	= 0.180	
$V3 = \frac{1}{2}(0.5+0.7)\times \frac{1}{2}\times 0.1 \times 2\times 9.999$	= 1.193	
$V4 = \frac{1}{2}(0.1\times 0.8)\times 3.40$	= 0.272	
$V5 = \frac{1}{2}(0.1\times 3.6)\times 15.36$	= 5.530	
$\frac{1}{2}(0.1\times 2.6)\times 5.0$	= 1.300	
V5	= 6.830	
TOTAL	15.664	15.664 m^3
G.2.5. chipping on Existing Structure.		
$A = \frac{1}{2}(3.40\times 3.0)-(1.0\times 1.2)$	= 9.0	9.0 m^2
G.2.6 Concrete type-C1 Including Formwork		
$V1 = \frac{1}{2}(0.3\times 0.6)\times 2.4$	= 0.432	
$V2 = \frac{1}{2}(0.3\times 0.6)\times 9.999\times 2$	= 3.580	
$V3 = \frac{1}{2}(0.5+0.3)\times \frac{1}{2}\times 0.3 \times 3.0 +$		
$\frac{1}{2}(0.5\times 0.2)\times 3.0$	= 0.660	
$V4 = \frac{1}{2}(0.6\times 2.2)+(0.8\times 0.933)\times 3.4 -$		
$\frac{1}{2}(1.0\times 1.2)\times 0.27$	= 6.702	
	11.374	11.374 m^3

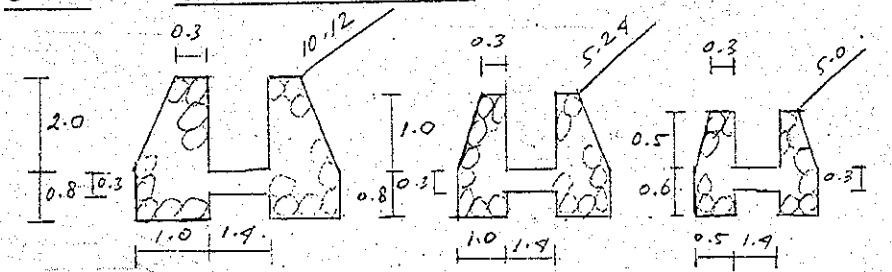
TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 157 R (R.9)

G.2.7

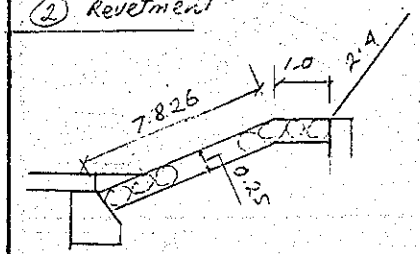


	Top Concrete		Side wall (2×)		Base Concrete		Concrete wall	Secondary concrete
	D10	D13	D10	D13	D10	D13	D16	D.16
w	9	6	34	6	11	6	35	15
L	1.5	2.4	1.5	9.999	1.5	3.0	0.4	0.3
W	0.617	1.04	0.617	1.04	0.617	1.04	1.58	

G.2.8 ① outlet channel.



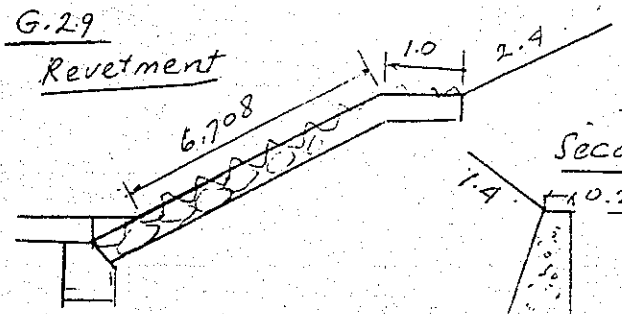
② Revetment



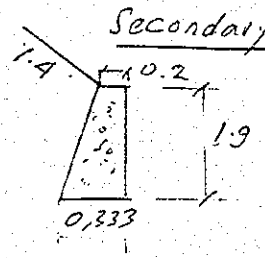
CALCULATION		RESULT
G.2.7. Deformed Reinforcing Bars.		
$W_1 = \frac{1}{2}(9 \times 1.5) \times 0.617$	= 8.330	
$\frac{1}{2}(6 \times 2.4) \times 1.04$	= 14.976	
W_1	= 23.306	
$W_2 = \frac{1}{2}(34 \times 1.5) \times 0.617 \times 2$	= 62.934	
$\frac{1}{2}(6 \times 9.999) \times 1.04 \times 2$	= 124.101	
W_2	= 187.035	
$W_3 = \frac{1}{2}(11 \times 1.5) \times 0.617 + \frac{1}{2}(6 \times 3.0) \times 1.04$	= 28.901	
$W_4 = \frac{1}{2}(29 \times 0.9) \times 1.58$	= 18.328	
$\frac{1}{2}(15 \times 0.3) \times 1.58$	= 7.110	
W_4	25.438	
TOTAL	264.680	264.680 kg
G.2.8 Wet stone masonry		
$V_1 = \frac{1}{2}(1.0 \times 0.8) \times 10.12 \times 2$	= 16.192	
$\frac{1}{2}(0.3 + 1.0) \times \frac{1}{2} \times 2.0 \times 10.12 \times 2$	= 26.312	
$\frac{1}{2}(0.3 \times 1.9) \times 10.12$	= 4.250	
$\frac{1}{2}(1.0 \times 0.8) \times 5.24 \times 2$	= 8.384	
$\frac{1}{2}(0.3 + 1.0) \times \frac{1}{2} \times 1.0 \times 10.12 \times 2$	= 13.156	
$\frac{1}{2}(0.3 \times 1.9) \times 5.24$	= 2.201	
$\frac{1}{2}(0.5 \times 0.6) \times 5.0 \times 2$	= 3.000	
$\frac{1}{2}(0.3 + 0.5) \times \frac{1}{2} \times 0.5 \times 5.0 \times 2$	= 2.000	
$\frac{1}{2}(0.3 \times 1.9) \times 5.0$	= 2.110	
V_1	= 77.595	
$V_2 = \frac{1}{2}(7.826 + 1.0) \times 0.25 \times 2.9$	= 5.296	
TOTAL	82.891	82.891 m³

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF.157 R (R9)

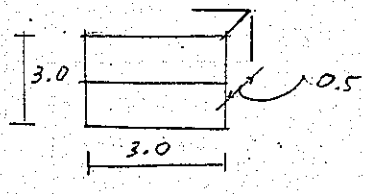
G.2.9 Revetment



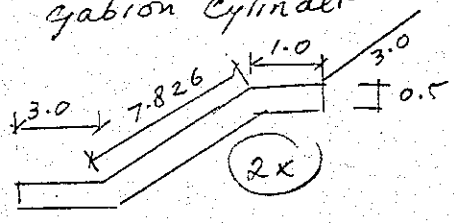
G.2.--- Secondary Concrete



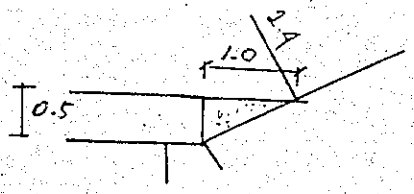
G.2.--- Gabion mattress



G.2.--- Gabion Cylinder



G.--.. Rubble stone Filling



CALCULATION	RESULT
G.2.9 Cement Mortar Pointing on Riverside surface of wet stone masonry.	
$A = \frac{1}{2}\{(6.708+1.0)\times 2.4\} = 18.499$	18.499 m^2
G.2.--- Secondary Concrete.	
$V = \frac{1}{2}\{(0.2+0.333)\times \frac{1}{2}\times 1.9\}\times 1.40 - \frac{1}{2}\{(1.0\times 1.2)\times 0.27\} = 0.385$	0.385 m^3
G.2.-- Gabion mattress	
$V = \frac{1}{2}\{(3.0\times 3.0)\times 0.5\} = 4.500$	4.500 m^3
G.2.--- Gabion Cylinder.	
$V = \frac{1}{2}\{(3.0+7.826+1.0)\times 0.5\}\times 3.0\times 2 = 35.478$	35.478 m^3
G.2.---.. Rubble stone Filling.	
$V = \frac{1}{2}\{(0.5\times 1.00)\times \frac{1}{2}\times 2.40\} = 0.60$	0.60 m^3

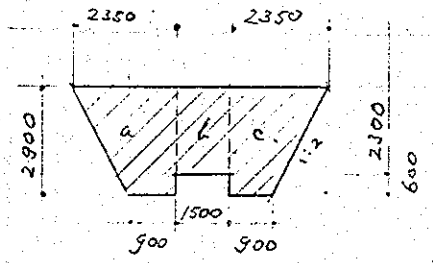
TYPE OF WORK : OUTLET STRUCTURE

LOCATION : R 11 WF 162 + 41,00

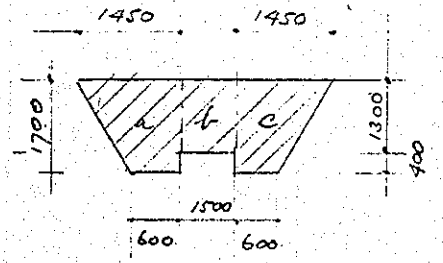
CALCULATION	RESULT
G.2.1 STRUCTURAL EXCAVATION	376,33 m^3
G.2.2 BACKFILL WITH SELECTED SOIL	115,46 m^3
G.2.3 LOG PILE ϕ150 mm L=2,00 m.	4,00 m^1
G.2.4. GRAVEL BEDDING	6,38 m^3
G.2.5 CHIPPING ON EXISTING STRUCTURE	7,00 m^2
G.2.6 CONCRETE, TYPE C-1	9,30 m^3
SECONDARY CONCRETE TYPE C-2	0,34 m^3
G.2.7 DEFORMED REINFORCING BARS	254,00 kg
G.2.8 WET STONE MASONRY	147,34 m^3
G.2.9 CYLINDER GABION ϕ500 mm. (GALVANIZED & PVC COATED)	20,00 m^3
G.2.10. CEMENT MORTAR POINTING ON RIVER SIDE SURFACE	76,50 m^2
G.2.11. RUBBLE STONE FILLING	0,75 m^3

TYPE OF WORK :	OUTLET STRUCTURE.
LOCATION :	R11 WF 162R + 41,00.

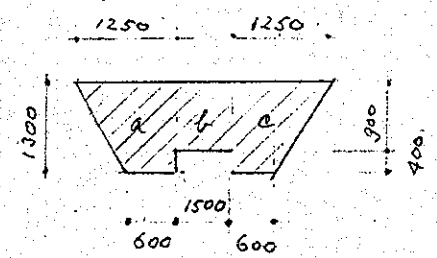
L1



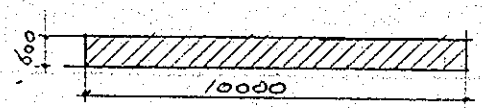
L2



L3.



L4.

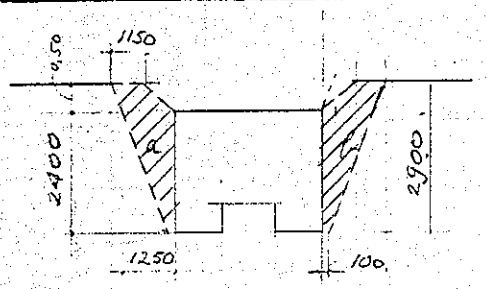


CALCULATION	RESULT
G 2.1 STRUCTURAL EXCAVATION.	
$L_1 = 17,928 + 3,00 + 0,60 = 22,570$ m.	
Vol a. $= (2,35 + 0,90)/2 * 2,90 * 22,570 = 106,36$.	
Vol b : $1,50 * 2,30 * 22,570 = 77,87$	
Vol c = Vol a $= 106,36$.	
$290,59$	
$L_2 = 3,610$ m.	
Vol a $= (1,45 + 0,60)/2 * 1,70 * 3,610 = 6,29$	
Vol b $= 1,50 * 1,30 * 3,610 = 7,04$	
Vol c = Vol a $= 6,29$	
$19,62$	
$L_3 = 4,00$ m.	
Vol a $= (1,25 + 0,60)/2 * 1,30 * 4,00 = 4,81$.	
Vol b $= 0,90 * 1,50 * 4,00 = 5,40$	
Vol c = Vol a $= 4,81$.	
$15,02$.	
$L_4 = 8,50$ m.	
Vol $= (0,60 * 10,00) * 8,50 = 51,00$.	
Total	$376,33$ m³

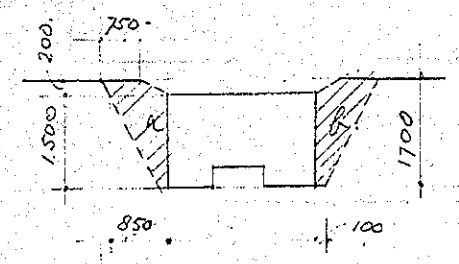
S-97

TYPE OF WORK :	OUTLET STRUCTURE.
LOCATION :	R 11 WF 162R + 41,00

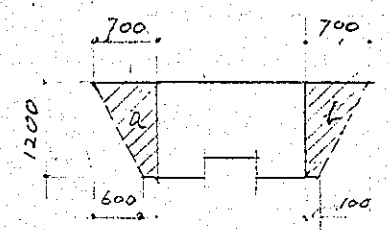
L1.



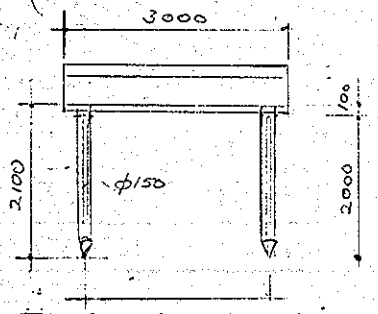
L2.



L3

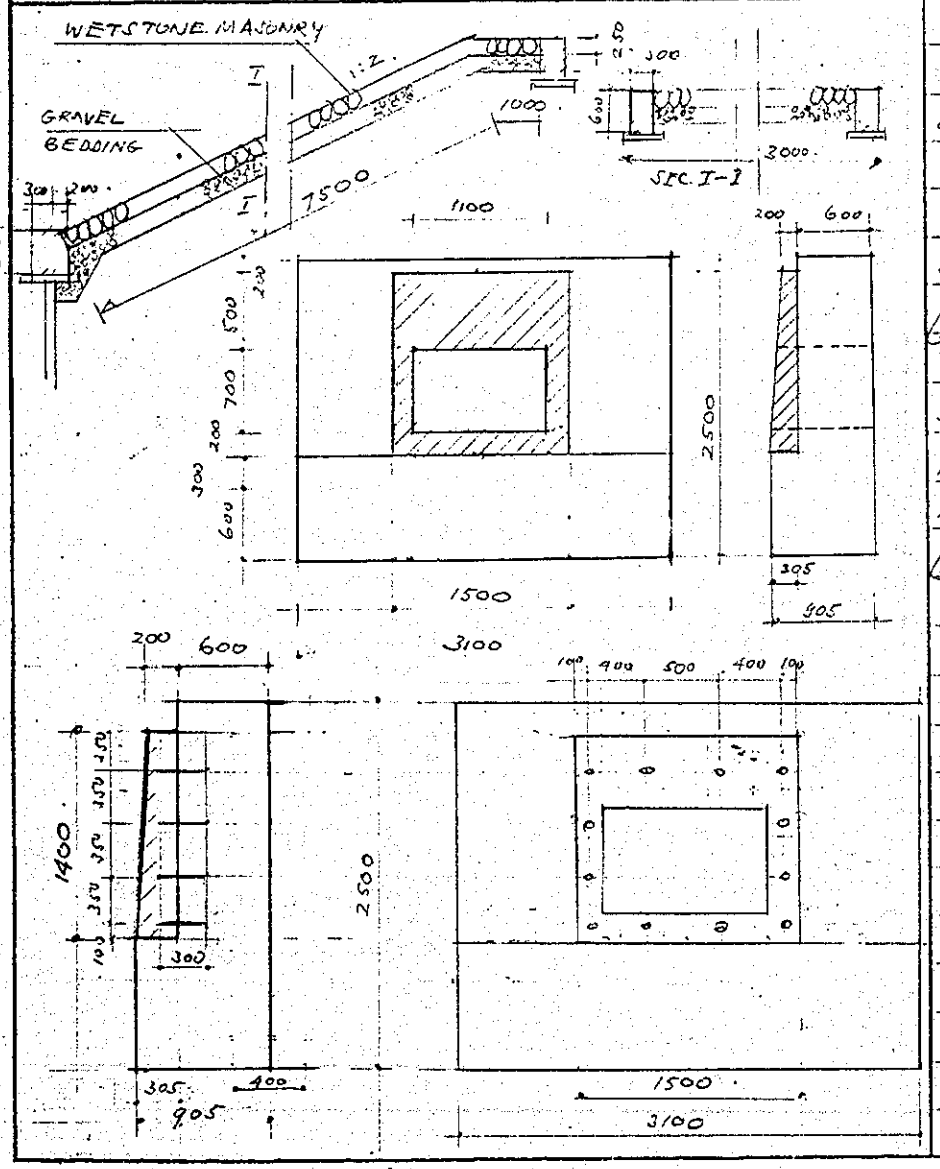


L4



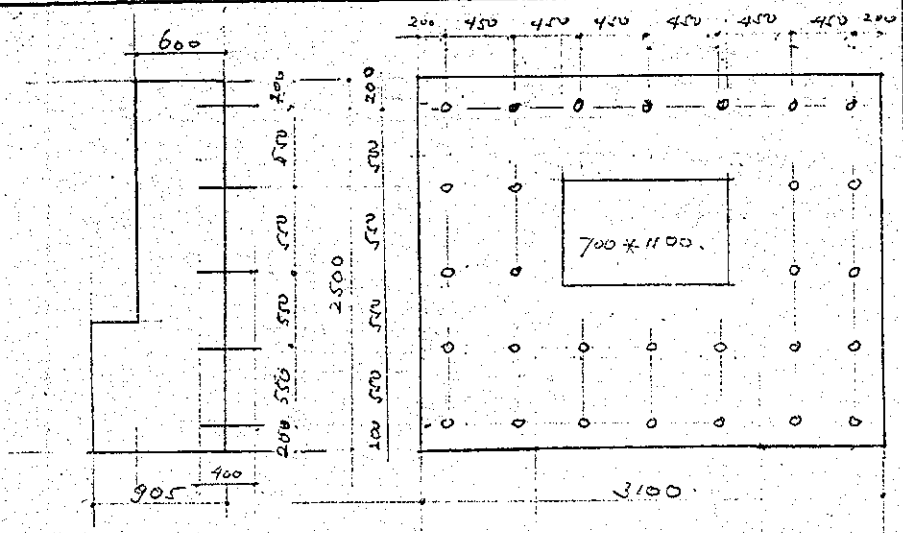
CALCULATION	RESULT
G.2.2. BACKFILL WITH SELECTED SOIL	
$L_1 = 22,570$ m.	
Vol a = [(1,15+1,25)/2 * 0,50 + (1,25+0,10)/2 * 2,40] * 22,570 = 50,11	
Vol b = Vol a = 50,11.	
	100,22.
$L_2 = 3,61$ m.	
Vol a = [(0,75+0,85)/2 * 0,20 + (0,85+0,10)/2 * 1,50] * 3,61 = 3,15.	
Vol b = Vol a = 3,15.	
	6,30.
$L_3 = 4,00$ m	
Vol a = (0,70+0,10)/2 * 1,20 * 4,00 = 1,92.	
Vol b = Vol a = 1,92.	
	3,84.
$L_4 = 8,50$ m	
Vol = (0,60 * 0,50) * 8,50 * 2 = 5,10	
Total	115,46 m³
G.2.3. LOG PILE: ϕ150 mm L = 2,00 m.	
2 * 2,00 =	4,00 m'

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	K 11 WF 162 -41,00.

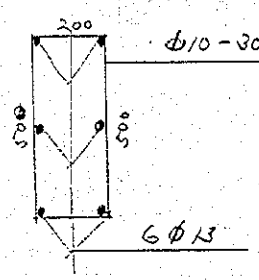


CALCULATION	RESULT
G.2.4 GRAVEL BEDDING	
Vol. of gravel bedding · (7,50 + 1,00) * 0,25 * 3,00	6,38 m³
G.2.5. CHIPPING ON EXISTING STRUCTURE	
(2,50 * 3,10) - (1,10 * 0,70) =	7,00 m²
G.2.6. CONCRETE, TYPE C-1	
((2,50 * 3,10) * 0,60 + (0,90 * 3,10) * 0,305 - (1,10 * 0,70) * 0,60 = 5,04	
SEC. I-I (SIDE WALL) (0,30 * 0,60) * 2 * 8,50 = 3,06	
TOP WALL : (0,30 * 0,60) * 3,00 = 0,54	
BASE WALL :	
((0,30 + 0,50)/2 * 0,30 + (0,20 * 0,50)) * 3,00 = 0,66.	9,30 m³
SECONDARY CONCRETE, TYPE C-2.	
(0,305 + 0,200)/2 * 1,40 * 1,50 - (0,70 * 1,10) * 0,25 =	0,34 m³.
G.2.7. DEFORMED REINFORCING BARS :	
ϕ16 (ANCHORS A) 12 * 0,30 * 1,58 = 15,70	
ϕ16 (ANCHORS B) 29 * 0,40 * 1,58 = 18,35	
ϕ13 (SIDE WALL) 2 * 6 * 9,50 * 1,04 = 118,56	
ϕ13 (TOP WALL) 6 * 3,00 * 1,04 = 18,70	
ϕ13 (BASE WALL) 6 * 3,00 * 1,04 = 18,70	

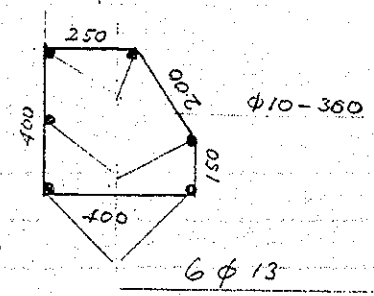
TYPE OF WORK :	
LOCATION :	R 11



SIDE WALL & TOP WALL



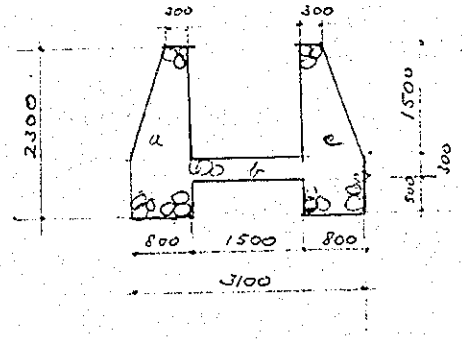
BASE WALL.



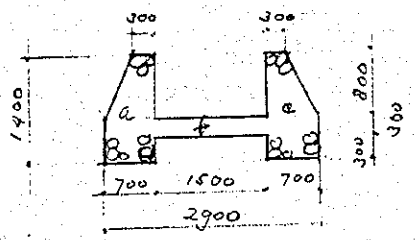
CALCULATION	RESULT
Φ10(SIDE WALL) 2 * 29 * 1.50 * 0.617 = 53.70.	
Φ10(TOP WALL) 11 * 1.50 * 0.617 = 10.20	
Φ10(BASE WALL) 11 * 1.50 * 0.617 = 10.20	
Total	254.00kg

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	R 11 WF 162 R + 41,00

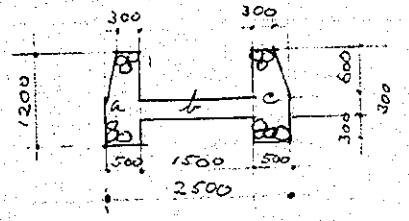
L1



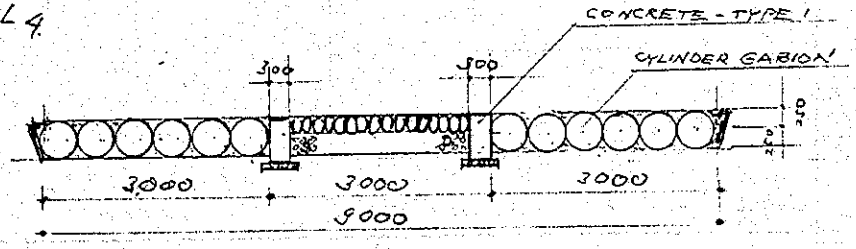
L2.



L3

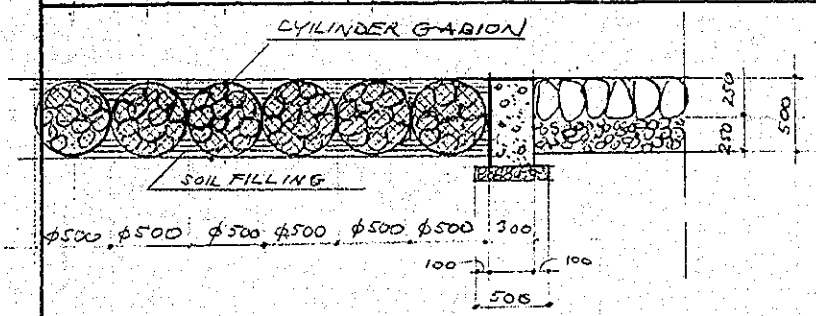


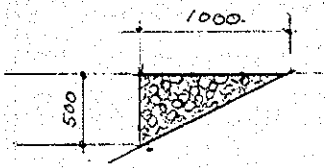
L4



CALCULATION	RESULT
G. 2.8. WETSTONE MASONRY	
$L_1 = 22,570$ m	
Vol a = [(0,30+0,80)/2 * 1,50 + (0,80 * 0,80)] * 22,570	
= 33,07 m³	
Vol b = (1,50 * 0,30) * 22,570 = 10,16 m³	
Vol c = Vol a = 33,07 m³	
76,30 m³	
$L_2 = 3,610$ m.	
Vol a = [(0,30+0,70)/2 * 0,80 + (0,60 * 0,70)] * 3,61.	
= 2,96 m³	
Vol b = (1,50 * 0,30) * 3,61 = 1,62 m³	
Vol c = Vol a. = 2,96 m³	
7,54 m³	
$L_3 = 4,00$ m.	
Vol. a = [(0,30+0,50)/2 * 0,60 + (0,60 * 0,50)] * 4,00 =	
= 2,16 m³	
Vol b = (1,50 * 0,30) * 4,00 = 1,80 m³	
Vol c = Vol a = 2,16 m³	
6,12 m³	
$L_4 = 8,50$ m.	
(0,25 * 2,70) * 8,50 = 57,38	* 147,34 m³

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	R 11 WF 162R + 41,00





RUBBLE STONE FILLING

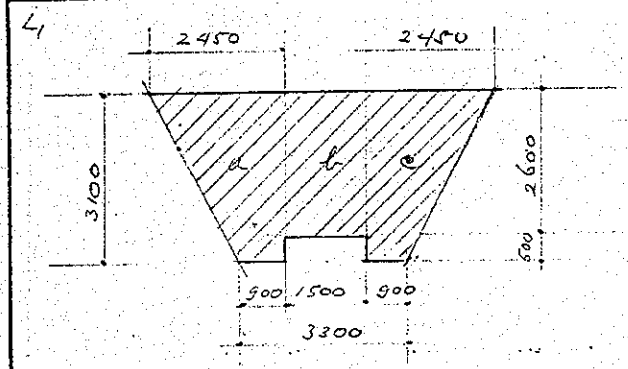
CALCULATION	RESULT
G.2.9 CYLINDER GABION ϕ 500 mm	
(GALVANIZED AND PVC COATED)	
$0,25 * 3,14 * 0,50^2 * 8,50 * 12$:	$20,00 m^3$
G 2.10 CEMENT MORTAR POINTING ON	
RIVERSIDE SURFACE OF WETSTONE	
MASONRY.	
$9,00 * 8,50$	$76,50 m^2$
G 2.11 RUBBLE STONE FILLING.	
$(0,50 * 1,00 // 2 * 3,00$	$0,75 m^3$

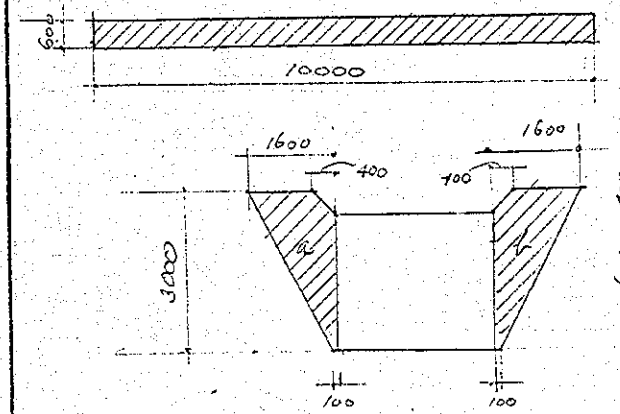
TYPE OF WORK : OUTLET STRUCTURE.

LOCATION : R 12 WF 165 + 9,00

CALCULATION	RESULT
G 2 1 STRUCTURAL EXCAVATION	363,69 m^3
G 2 2 BACKFILL WITH SELECTED SOIL	114,00 m^3
G 2 3. LOG PILE ϕ 150 mm L = 2,00 m.	4,00 m^1
G. 2 4 GRAVEL BEDDING.	6,00 m^3
G. 2.5. CHIPPING ON EXISTING STRUCTURE.	7,10 m^2
G 2 6. CONCRETE, TYPE C-1	9,10 m^3
SECONDARY CONCRETE, TYPE C-2	0,36 m^3
G 2 7 DEFORMED REINFORCING BARS.	246,00 kg
G 2.8. WETSTONE MASONRY.	80,11 m^3
G 2.9 CYLINDER GABION ϕ 500 mm. (GALVANIZED & PVC COATED)	18,60 m^3
G 2.10. CEMENT MORTAR POINTING ON RIVERSIDE SURFACE	72,00 m^2
G 2 11. RUBBLE STONE FILLING	0,75 m^3

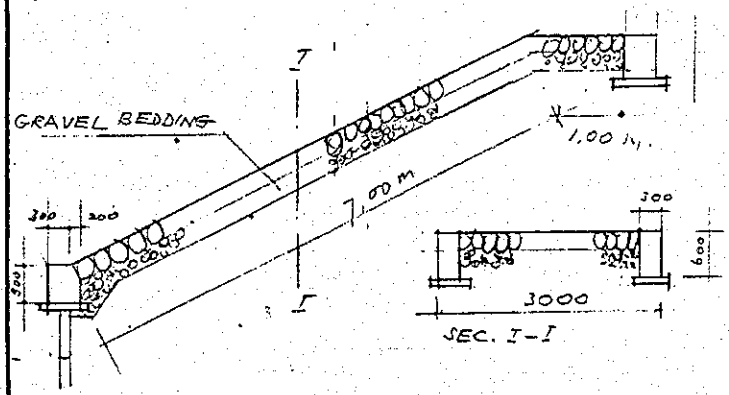
TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	R 12 WF 165 + 9,00

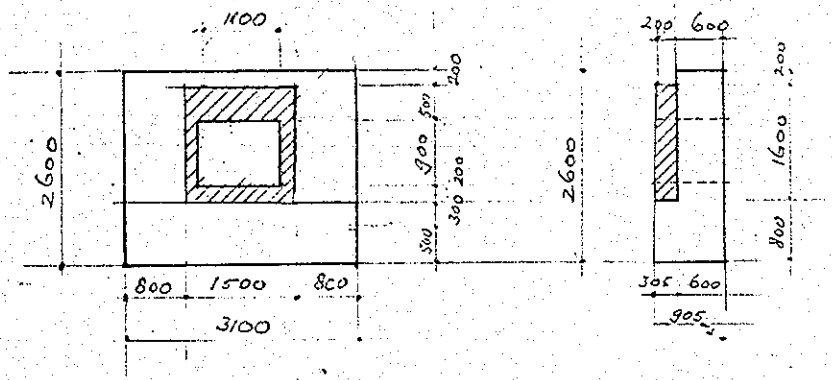




CALCULATION	RESULT
G 2.1 STRUCTURAL EXCAVATION	
$L_1 = 11,60 + 3,00 + 0,60 + 2,90 = 22,10$ m	
Vol a = (2,45 + 0,90)/2 * 3,10 * 22,10 = 114,75	
Vol b = 1,50 * 2,60 * 22,10 = 86,19	
Vol c = Vol a = 114,75	
315,69	
$L_2 = 8,00$ m.	
Vol = (0,60 * 10,00) * 8,00 = 48,00	
Total	363,69 m³
G.2.2. BACKFILL WITH SELECTED SOIL.	
$L_1 = 22,10$ m	
Vol a = ((1,60 + 0,10)/2 * 3,00) − (0,40 * 0,40)/2) * 22,10 = 54,60	
Vol b = Vol a = 54,60	
109,20	
$L_2 = 8,00$ m.	
Vol = (0,60 * 0,50) * 8,00 * 2 = 4,80	
Total	114,00 m³

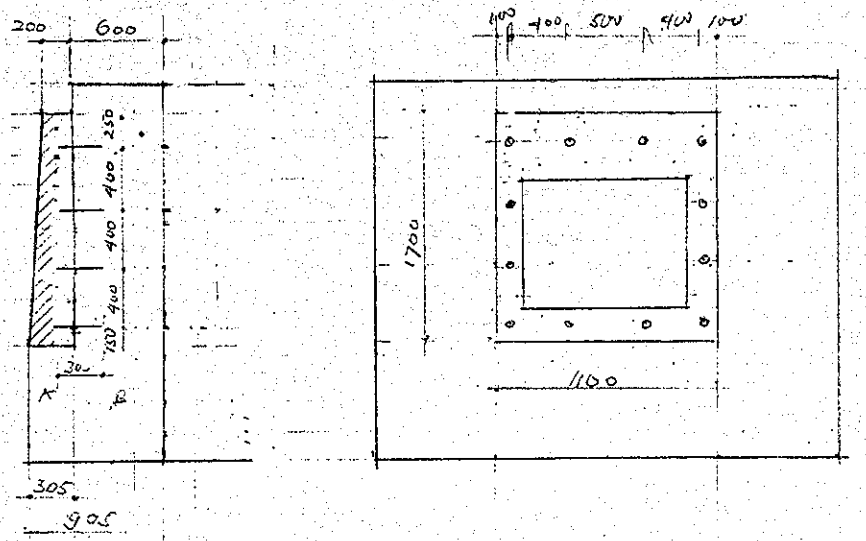
TYPE OF WORK :	OUTLET STRUCTURE.
LOCATION :	R 12.





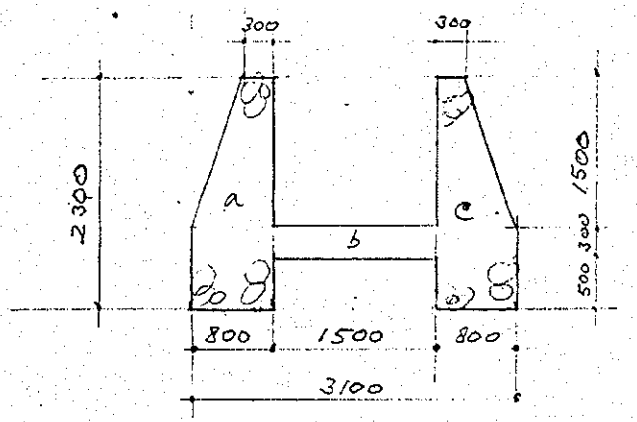
CALCULATION	RESULT
G.2.3. LOGPILE Ø150 mm L = 2.0 m'	
2 * 2,00 m	4,00 m'
G.2.4. GRAVEL BEDDING	
Vol of gravel bedding : (7,00+1,00) * 0,25 * 3,00	6,00 m³
G.2.5. CHIPPING ON EXISTING STRUCTURE.	
(2,60 * 3,10) − (1,10 * 0,90) =	7,10 m²
G.2.6. CONCRETE, TYPE − C 1.	
(2,60 * 3,10) * 0,60 + (0,80 * 3,10) * 0,305 − (1,10 * 0,90) * 0,60 = 5,00	
SIDE WALL (SEC 1-1) (0,30 * 0,60) * 2 * 8,00 = 2,88.	
TOP WALL (0,30 * 0,60) * 3,00 = 0,54.	
BASE WALL	
((0,30 + 0,50)/2 * 0,30 + (0,20 * 0,50)) * 3,00 = 0,66.	
Total	9,10 m³
SECONDART CONCRETE TYPE-C2	
(0,305 + 0,20)/2 * 1,60 * 1,50 − (0,90 * 1,10) * 0,25 =	0,36 m³

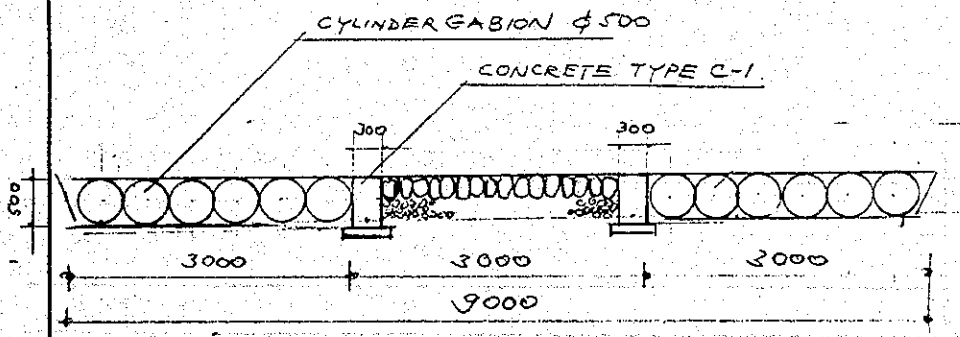
TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	R 12



CALCULATION	RESULT
G. 2.7. DEFORMED REINFORCING BARS	
ϕ16 (ANCHORS A) 12 * 0,30 * 1,58 = 5,70	
ϕ16 (ANCHORS B) : 29 * 0,70 * 1,58 = 18,55	See R11
ϕ13 (SIDE WALL) : 2 * 6 * 9,00 * 1,04 = 112,30	
ϕ13 (TOP WALL) : 6 * 3,00 * 1,04 = 18,70	
ϕ13 (BASE WALL) : 6 * 3,00 * 1,04 = 18,70	
ϕ10 (SIDE WALL) : 2 * 28 * 1,50 * 0,617 = 51,85	
ϕ10 (TOP WALL) : 11 * 1,50 * 0,617 = 10,20	
ϕ10 (BASE WALL) : 11 * 1,50 * 0,617 = 10,20	
total	
Total	246,00 kg

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	R 12





CALCULATION	RESULT
G 2.8 WETSTONE MASONRY	
$L_1 = 22,10$ m.	
$Vol\ a = ((0,30+0,80)/2 * 1,50 + (0,80*0,80)) * 22,10$	
$= 32,38$	
$Vol\ b = (1,50 * 0,30) * 22,10 = 9,95$	
$Vol\ c = Vol\ a = 32,38$	
$74,71$	
L_2	
$(0,25 * 2,70) * 8,00$ m $= 5,40$	
Total	$80,11\ m^3$
G 2.9. CYLINDER GABION ϕ 500 mm.	
(GALVANIZED AND PVC COATED).	
$0,25 * 3,14 * 0,50^2 * 8,00 * 1,2$	$18,60\ m^3$
G.2.10 CEMENT MORTAR POINTING ON	
RIVERSIDE SURFACE OF WET STONE	
MASONRY.	
$9,00 * 8,00 =$	$72,00\ m^2$
G 2.11. RUBBLE STONE FILLING	
$(0,50 * 1,00)/2 * 3,00$	$0,75\ m^3$

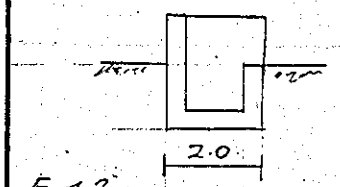
TYPE OF WORK : OUTLET STRUCTURE

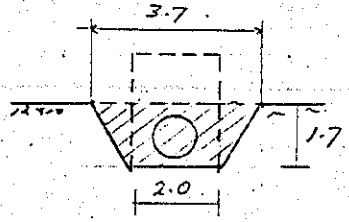
LOCATION : WF. 176 R + 27. (R.18).

CALCULATION	RESULT
F.4. Connecting Channel and Drainage pipe	
F.4.1. Structural Excavation.	9.69 m^3
F.4.2 Backfill with selected soil.	12.89 m^3
F.4.3. Gravel Bedding.	1.00 m^3
F.4.4. Wet stone masonry.	5.824 m^3
F.4.5. Mortar Plastering on Surface of wet stone masonry.	10.840 m^2
F.4.6. Furnishing and Installing Concrete pipe ϕ 600 mm	2.20 m.
F.4.7. Concrete type D. Including Formwork.	1.274 m^3
F.4.8. Concrete type C1 Including Formwork.	—
F.4.9. Deformed Reinforcing Bars.	—

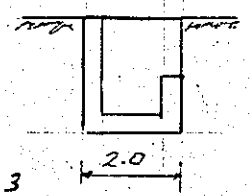
TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 176 R +27. (R.18)

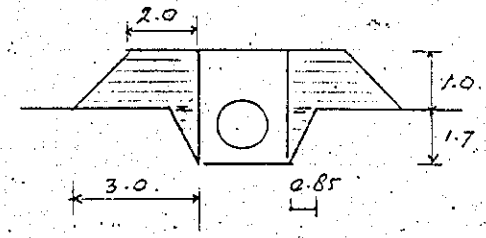
F-4.1



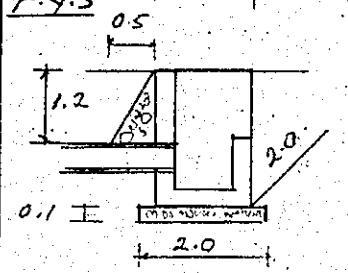


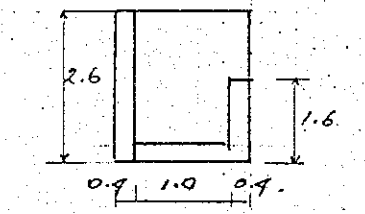
F-4.2

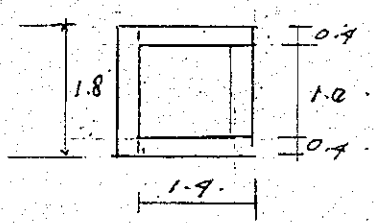




F-4.3



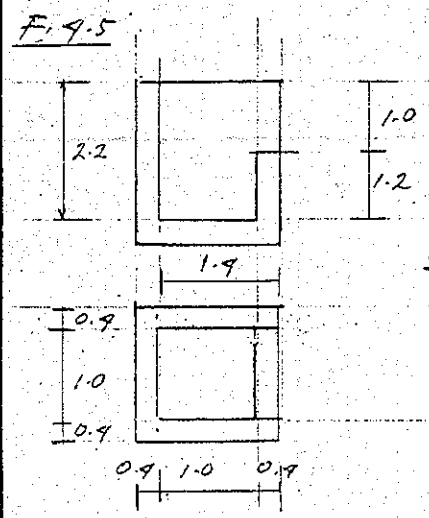




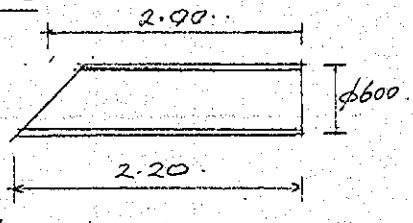
CALCULATION		RESULT
F-4 Connecting channel and Drainage pipe.		
F.4.1. Structural Excavation.		
$V = \{(2.0 + 3.7) \times \frac{1}{2} \times 1.7\} \times 2.0$	$= 9.69$	$9.69\ m^3$
F.4.2. BackFill With selected Soil		
$V = \{(2.0+3.0) \times \frac{1}{2} \times 1.0\} \times 2.0 \times 2$	$= 10.00$	
$\{(0.85 \times 1.7) \times \frac{1}{2} \times 2.0\} \times 2$	$= 2.89$	
TOTAL	12.89.	$12.89\ m^3$
F-4.3. Gravel Bedding		
$V = \{(2.0 \times 2.0) \times 0.1\}$.	$= 0.40$.	
$\{(0.5 \times 1.2) \times \frac{1}{2} \times 2.0\}$.	$= 0.60$	
TOTAL	1.00	$1.00\ m^3$
F-4.4. Wet stone masonry.		
$V = \{(0.4 \times 2.6) \times 1.8\}$.	$= 1.872$.	
$\{(0.4 \times 1.6) \times 1.0\}$.	$= 0.640$	
$\{(0.4 \times 1.4) \times 2.6\} \times 2$.	$= 2.912$	
$\{(1.0 \times 1.0) \times 0.4\}$.	$= 0.400$	
TOTAL	5.829	$5.829\ m^3$

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 176 R + 27 (R. 18)

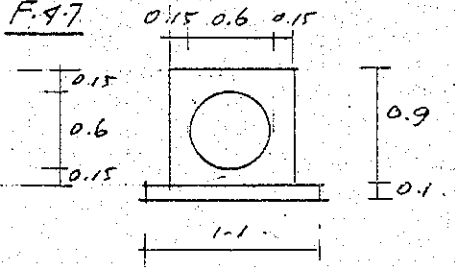
F. 4.5



F. 4.6



F. 4.7



CALCULATION	RESULT
F. 4.5 Mortar Plastering on surface of wet stone masonry	
$A = \frac{1}{2}(1.0 \times 2.2) + (0.9 \times 1.8)\}$ = 2.920	
$\frac{1}{2}(1.0 \times 1.9) + (1.2 \times 1.0) + (0.9 \times 1.9)\} \times 2$ = 6.320	
$\frac{1}{2}(1.2 \times 1.0) + (0.9 \times 1.0)\}$ = 1.600	
TOTAL 10.840	10.840 m²
F. 4.6 Furnishing and Installing Concrete pipe Dia 600 mm	2.20 m
F. 4.7 Concrete type D including Formwork.	
$V = \{(0.9 \times 0.9) - (\frac{22}{7} \times 0.3^2)\} \times 2.00$ = 1.054	
$\{(0.1 \times 1.1) \times 2.00\}$ = 0.220	
TOTAL 1.274	1.274 m³
F. 4.8 Concrete type C1. Including Formwork. — NOTHING —	
F. 4.9 Deformed Reinforcing Bars. — NOTHING —	

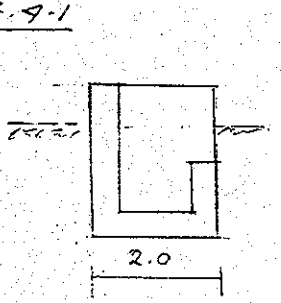
TYPE OF WORK : OUTLET STRUCTURE

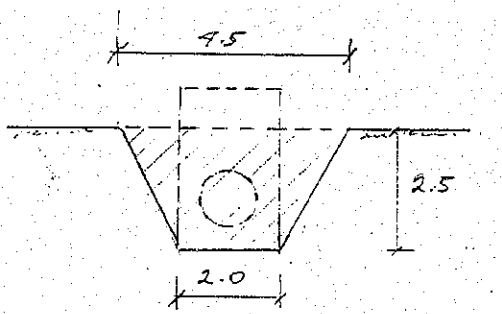
LOCATION : WF.176 R+41 (R.19)

CALCULATION	RESULT
F.4. Connecting Channel and Drainage pipe.	
F.4.1. Structural Excavation	16.25 m^3
F.4.2. BackFill with selected soil.	12.83 m^3
F.4.3. Gravel Bedding.	1.89 m^3
F.4.4. Wet stone masonry.	6.928 m^3
F.4.5. Mortar Plastering on Surface of wet stone Masonry.	13.12 m^2
F.4.6. Furnishing and Installing Concrete pipe dia 600 mm	2.35 m
F.4.7. Concrete type D Including Formwork	1.37 m^3
F.4.8. Concrete type C1 Including Formwork	—
F.4.9. Deformed Reinforcing Bars	—

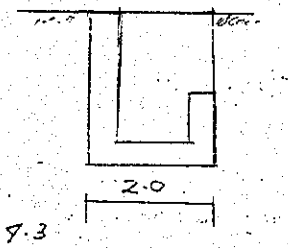
TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 176 R + 91 (R.19)

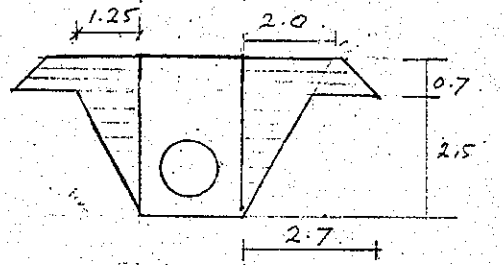
F.4-1



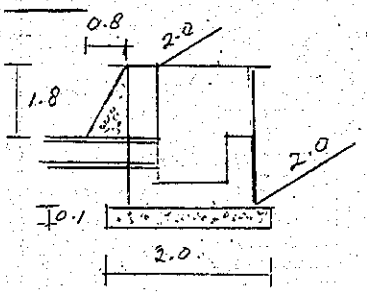


F.4-2

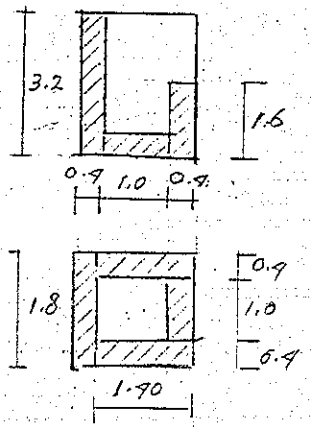




F.4-3



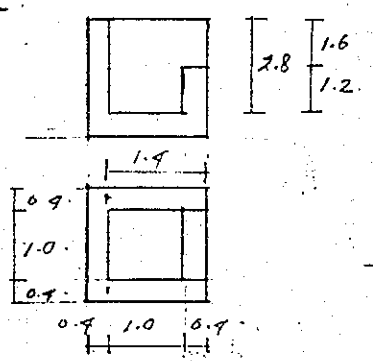
F.4-4



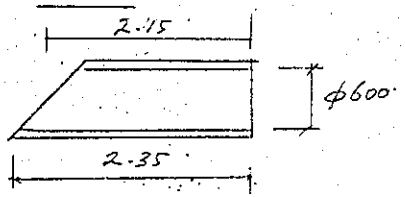
CALCULATION		RESULT
F4. Connecting Channel and Drainage pipe.		
F4-1. Structural Excavation		
$V = \{(2.0 + 4.5) \times \frac{1}{2} \times 2.5\} \times 2.0$	= 16.25	16.25 m^3
F. 4.2 Backfill with selected soil		
$V = \{(2.0 + 2.7) \times \frac{1}{2} \times 0.7\} \times 2.0 \times 2$	= 6.58	-
$\{(1.25 \times 2.5) \times \frac{1}{2} \times 2.0\} \times 2$	= 6.25	
TOTAL	12.83	12.83 m^3
F. 4.3 Gravel Bedding.		
$V = \{(2.0 \times 2.0) \times 0.1\}$	= 0.40	
$\{(0.8 \times 1.8) \times \frac{1}{2} \times 2.0\}$	= 1.44	
TOTAL	1.84	1.84 m^3
F. 4.4 Wet stone masonry		
$V = \{(0.4 \times 3.2) \times 1.8\}$	= 2.304	
$\{(0.4 \times 1.6) \times 1.0\}$	= 0.640	
$\{(0.4 \times 1.4) \times 3.2\frac{1}{2}\} \times 2$	= 3.584	
$\{(1.0 \times 1.0) \times 0.4\}$	= 0.400	
TOTAL	6.928	6.928 m^3

TYPE OF WORK :	OUTLET STRUCTURE
LOCATION :	WF. 176 R + 41 (R. 19)

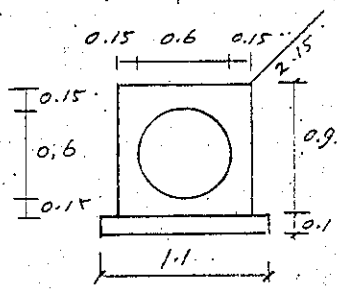
F-4.5



F-4.6



F-4.7



CALCULATION	RESULT
F-4.5 Mortar Plastering on surface of wet - stone masonry.	
$A = \{(1.0 \times 2.8) + (0.9 \times 1.8)\}$ = 3.52	
$\{(1.6 \times 1.9) + (1.2 \times 1.0) + (0.9 \times 1.9)\} \times 2$ = 8.00	
$\{(1.2 \times 1.0) + (0.9 \times 1.0)\}$ = 1.60	
TOTAL = 13.12	13.12 m^2
F-4.6. Furnishing and Installing Concrete pipe	
Dia. 600 mm.	2.35 m
F-4.7. Concrete type D Including Formwork	
$V = \{(0.9 \times 0.9) - (\frac{22}{7} \times 0.3^2)\} \times 2.15$ = 1.133	
$\{(0.1 \times 1.1) \times 2.15\}$ = 0.237	
TOTAL 1.370	1.370 m^3
F-4.8 Concrete type C1 Including Formwork	
- NOTHING -	—
F-4.9. Deformed Reinforcing Bars.	
- NOTHING -	—