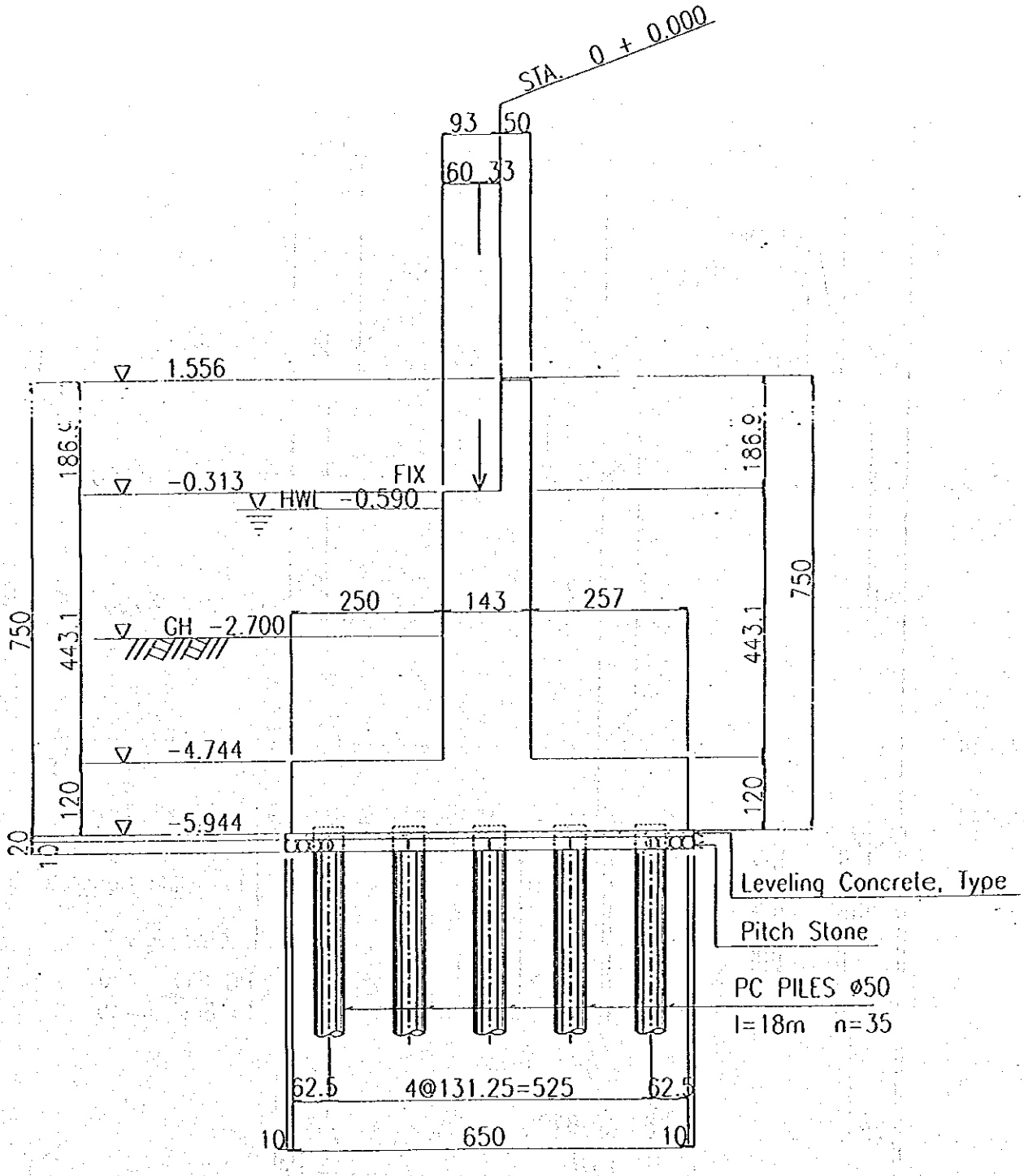
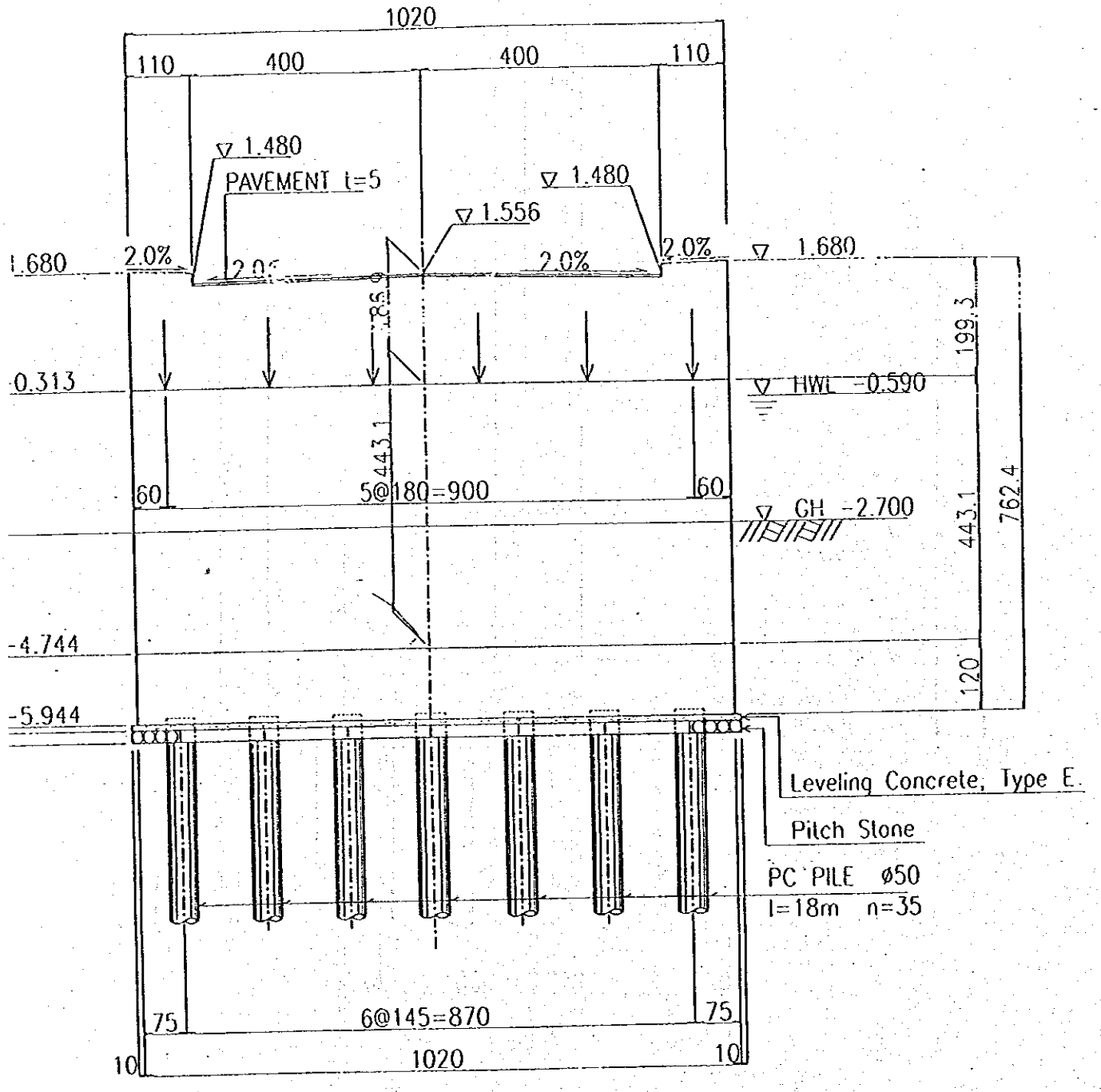
SUBSTRUCTURE QUANTITY CALCULATION

ASIN No.1 BRIDGE



PROFILE

SCALE A



ELEVATION

SCALE A

SUBSTRUCTURE QUANTITY CALCULATION

SUMMARY ASIN1

			A1	A2			TOTAL
STATION							
STRUCTURE EXCAVATION	0-2m	(m^3)	132.6	132.6			265.2
	2-4m	(m^3)	102.1	102.1			204.2
	>4m	(m^3)	0	0			0
	TOTAL	(m^3)	234.7	234.7			469.4
	WATER	(m^3)	374.6	374.6			749.2
	IN RIVER	(m^3)					0
BLINDING STONE		(m^3)	13.94	13.94			27.88
BACK FILE		(m^3)	210.85	210.85			421.7
PC PILE		(m)	630	630			1260
STEEL-PILE		(m)					
CONCRETE	A-2-5						0
	B-1-2	(m^3)					0
	B-1-3	(m^3)					0
	B-1-4	(m^3)					0
	C-1	(m^3)	154.55	154.55			309.1
	E	(m^3)	6.97	6.97			13.94
FORM	TYPE-1	(m^2)	185.292	185.292			370.584
	TYPE-2	(m^2)					0
	TYPE-3	(m^2)					0
	TYPE-4	(m^2)					0
R-BAR		(kg)	9891	9891			19782
REMARK							

PC PILE

			A1	A2			TOTAL
STATION							
ELEVATION	FL	m					
	GH	m					
HEIGHT	HW	m					
	H1	m					
	H2-1	m					
	H2-2	m					
	H3	m					
	Hh	m					
	WT	m					
DIMENSION	A	m					
	B	m					
	D1	m	0.5	0.5			
	DL	m					
NUMBER OF PIER							
PILE	NUMBER	m	35	35			70
	LENGTH	m	18	18			1260

EXCAVATION

			A1	A2			TOTAL
STATION							
A*B		(m^2)					
GH-FL		(m)					
EXCAVATION	0-2m	(m^3)	132.60	132.60			265.20
	2-4m	(m^3)	102.10	102.10			204.20
	>4m	(m^3)	0.00	0.00			0.00
	TOTAL	(m^3)	234.70	234.70			469.40
	WATER	(m^3)	374.60	374.60			749.20
BLINDING STONE		(m^3)	13.94	13.94			27.88
STEEL-PILE		(m)					0

CONCRETE (m^3)

			A1	A2			TOTAL
STATION							
LEVELING	a	(m^2)					
CONCRETE (E)	t	(m)					
	V	(m^3)	6.97	6.97			13.94
FOOTING (C-1)	a1	(m^2)					
	a2	(m^2)					
	h1	(m)	REFER TO ABUTMENT				
	h2	(m)					
	V	(m^3)	154.55	154.55			309.10
COLUMN (B-1-2)	a1	(m^2)					
	a2	(m^2)					
	h1	(m)					
	h2	(m)					
	V	(m^3)					
C-PIER HEAD (B-1-2)							
RC PORTAL							
PC PORTAL							
REMARK							

FORM AREA (m^2)

			A1	A2			TOTAL
STATION							
	a1	(m^2)					
	a2	(m^2)					
	A	(m^2)					0
	D2	(m)					
	D3	(m)					
	h1	(m)					
	h2	(m)					
	a1	(m^2)					
	a2	(m^2)					
	A	(m^2)	185.292	185.292			370.584
C-PIER HEAD	TYPE-1						
	TYPE-4						
RC PORTAL	TYPE-6						
PC PORTAL	TYPE-6						
REMARK							

REINFORCING BAR

		A1	A2				TOTAL
STATION							
FOOTING	(kg)						
COLUMN	(kg)						
C-PIER HEAD	(kg)						
OTHER	(kg)						
TOTAL of STRUCTURE	(kg)	7476	7476				14952
PILE HEAD	(kg)	2415	2415				4830
TOTAL	(kg)	9891	9891				19782
REMARK							

ABUTMENT A-1

CONCRETE (C-1)

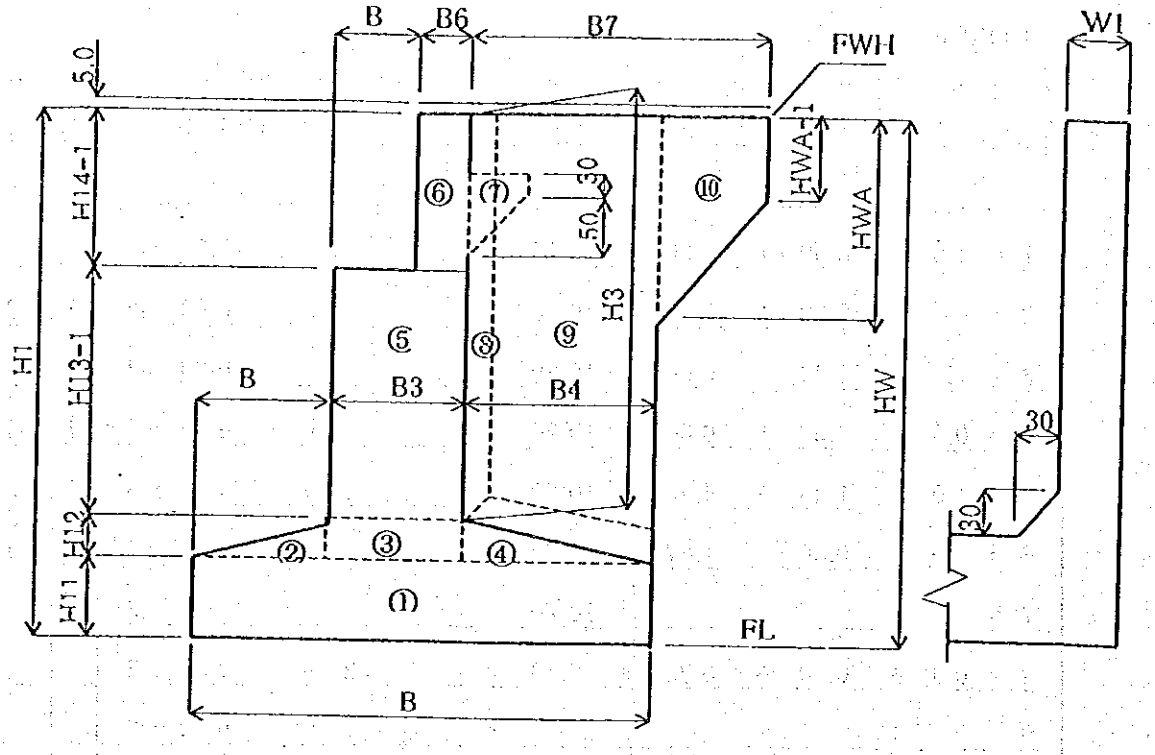
Vn = C * Bn * Hnn * An = VOLUME							ni		
		m		m		m	m3	n	nn	n
1 =	1.0 *	6.50 *	1.20 *	10.20		=	79.56 m3	1	11	1
2 =	0.5 *	2.50 *	0.00 *	10.20		=	0.00 m3	2	12	1
3 =	1.0 *	1.43 *	0.00 *	10.20		=	0.00 m3	3	12	1
4 =	0.5 *	2.57 *	0.00 *	10.20		=	0.00 m3	4	12	1
5 =	1.0 *	1.43 *	4.43 *	10.20		=	64.63 m3	3	13	1
6 =	1.0 *	0.50 *	1.87 *	10.20		=	9.53 m3	6	14	1
7 =				10.20			m3			
8 =	0.5 *	0.30 *	0.30 *	6.30 *		2 =	0.57 m3			
9 =	*	*	*	*		=	0.00 m3			
10 =	*	*	*			=	m3			
11 =	1.0 *	1.10 *	0.23 *	0.50 *		2 =	0.26 m3			
12 =	*	*	*	*		=	0.00 m3			
						V =	154.55 m3			

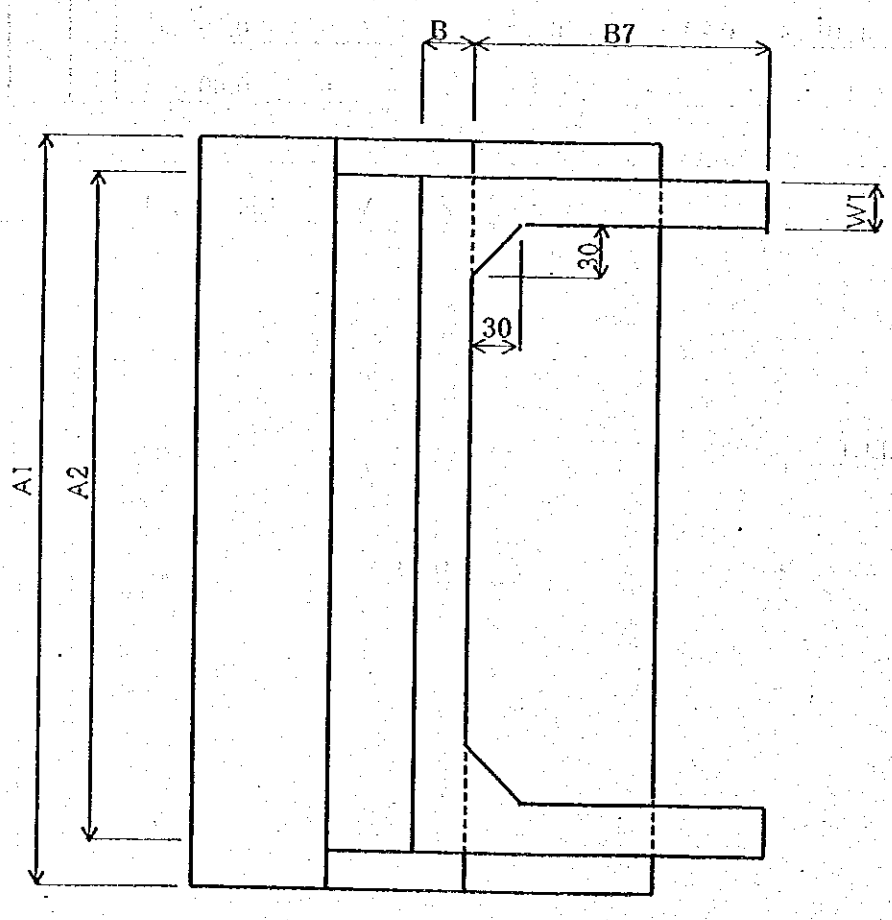
RUBBER SHEET

* * = 0.00 m^2

t =

CONCRETE (C-1)


B
B6
B7
FWH
W1
5.0
H14-1
HWA-1
30
50
HWA
H3
H1
H13-1
B
B3
B4
HW
30
30
H12
H11
FL
B


B
B7
W1
30
30
A1
A2

ABUTMENT A-1

FORM AREA

Vn = C * N * Bn,An * Hnn = VOLUME											ni		
					m		m		m^2		n	nn	n
1	=	1.0	*	2	*	6.50	*	1.20	=	15.60 m^2	1	11	1
	=	1.0	*	2	*	10.20	*	1.20		24.48 m^2	1	11	1
2	=	0.5	*	2	*		*		=	0.00 m^2	2	12	1
3	=	1.0	*	2	*		*		=	0.00 m^2	3	12	1
4	=	0.5	*	2	*		*		=	0.00 m^2	4	12	1
5	=	1.0	*	2	*	1.43	*	4.43	=	12.67 m^2	3	13	1
	=	1.0	*	2	*	10.20	*	4.43	=	90.39 m^2	3	13	1
6	=	1.0	*	2	*	0.50	*	1.87	=	1.87 m^2	6	14	1
	=	1.0	*	2	*	10.20	*	1.87	=	38.13 m^2	6	14	1
7	=		*		*					m^2			
	=		*	0.3	*	1.414	=	0.42					
8	=		*	2	*	0.42	*	2.00	=	1.68 m^2			
9	=		*		*		*		=	0.00 m^2			
10	=		*		*					m^2			
11	=	1.0	*	4	*	0.50	*	0.23	=	0.47 m^2			
12	=		*		*		*		=	0.00 m^2			
									V =	185.29 m^2			

LEVELING CONCRETE (CLASS E)

V = (B1 + 0.20)*(A1 + 0.20)* 0.10

= (6.50 + 0.20)*(10.20 + 0.20)* 0.10 = 6.97 m3

(A-1,A-2 = 13.94 m3)

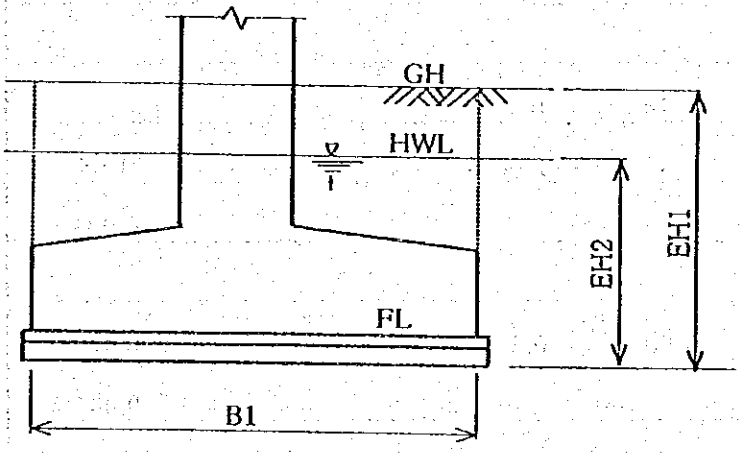
BLINDING STONE

V = (B1 + 0.20)*(A1 + 0.20)* 0.20

= (6.50 + 0.20)*(10.20 + 0.20)* 0.20 = 13.94 m3

(A-1,A-2 = 27.88 m3)

EXCAVATION



EH1=GH-FL+0.3

EH2=HWL-FL+0.3

GH = -2.700

HWL = -0.590

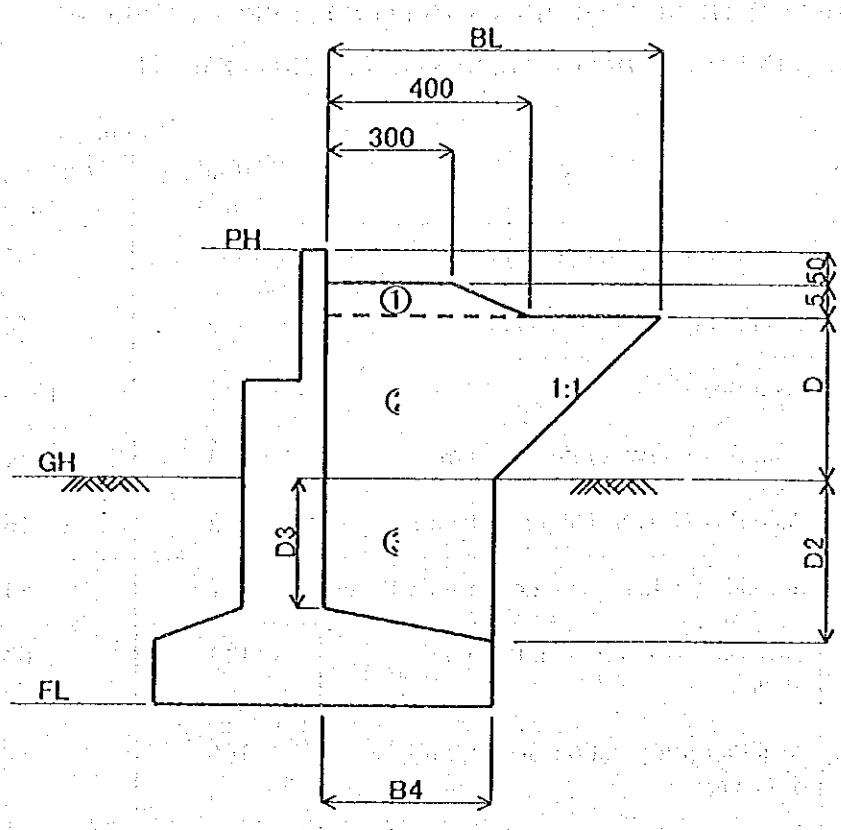
FL = -5.944

EH1 = 3.54

EH2 = 5.65

		B1	A1	Hn	V
1. EXC.<2m	: V1 =	6.50 *	10.20 *	2.00 =	132.6 m^3
2. 2m<EXC.<4m	: V2 =	6.50 *	10.20 *	1.54 =	102.1 m^3
3. EXC.>=4m	: V3 =	6.50 *	10.20 *	0.00 =	0.0 m^3
4. INTO GROUND WATE	: V4 =	6.50 *	10.20 *	5.65 =	374.6 m^3

GRANULAR BACKFILL



A1

V1 = 0.5 *(3.00 + 4.00)* 0.50 * 10.20 = 17.85 m^3

V2 = 0.5 *(B4 + BL)* D1 * A1
= 0.5 *(2.57 + 5.83)* 3.26 * 10.20 = 139.42 m^3

V3 = 0.5 *(D2 + D3)* B4 * A1
= 0.5 *(2.04 + 2.04)* 2.57 * 10.20 = 53.58 m^3

TOTAL = 210.85 m^3

Name of Structure	ASIN No.1 BRIDGE SUB-STRUCTURE, FOR SCAFOLDING AND FORM SUPPORT	Category Calculation	Work Volume	Page	1/2

SUMMARY OF SCAFOLDING AND FORM SUPPORT VOLUME FOR ASIN RIVER DRAINAGE SYSTEM IMPROVEMENT.

No	Structure	Volume	
		Scafolding (m^2)	Form Support (m^3)
1	Asin Pumping Station	1342	941
2	Asin Pumping Station, Gate	732	254
3	Asin Box Culvert	1843	1358
4	Asin Box Culvert Inlet Structure	54	11
5	Asin Box Culvert Outlet Structure	62	16
6	Secondary Channel Outlet on Asin River	-	34
7	Fuel Tank Box for Asin Pumping Station	133	62
8	Asin Pumping Station Bridge, Sub Structure	166	-
9	Asin No.1 Bridge, Sub Structure	293	-
10	Asin No.2 Bridge, Sub Structure	251	-
Total		4876	2676

Name of Structure	ASIN No.1 BRIDGE SUB-STRUCTURE, FOR SCAFOLDING AND FORM SUPPORT	Category Calculation	Work Volume	Page	2/2

1. **Scafolding Area**

   $(2 \times 6.3 \times 10.2) + (2 \times 6.3 \times 1.43) = 146.538\ m^2$

   For both side abutment $= 2 \times 146.538 = 293.076\ m^2$

2. **Form Support Area**

   -

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Concrete Volume	Page	1/5

SUMMARY OF QUANTITIES OF SUPER STRUCTURE

1.	STRUCTURE CONCRETE K400		=	56.805	m^3
2.	STRUCTURE CONCRETE K250		=	55.981	m^3
3.	REINFORCING STEEL		=	21.806	m^3
4.	PC CABLE K1 Ø12.7 7 STRANDS	= 641 kg			
	PC CABLE K2 Ø12.7 12 STRANDS	= 1020 kg			
	PC CABLE K1 Ø12.7 7 STRANDS	= 643 kg			
	PC CABLE MONO STRAND CABLE/FS	= 52 kg			
	TOTAL		=	2,356	kg
5.	BRIDGE RAILLING		=	43.60	m
6.	EXPANSION JOINT		=	17.40	m
7.	BEARING SHOW AND RUBBER SHEET		=	10.00	pieces
8.	PVC DRAINAGE PIPE Ø10 cm		=	10.50	m'
9.	ASPHALT PAVEMENT AC ON TOP OF SLAB		=	12.00	m^3
10.	FORM WORK		=	728.80	m^2

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Concrete Volume	Page	2/5

SUMMARY OF CONCRETE VOLUME

CONCRETE K-400

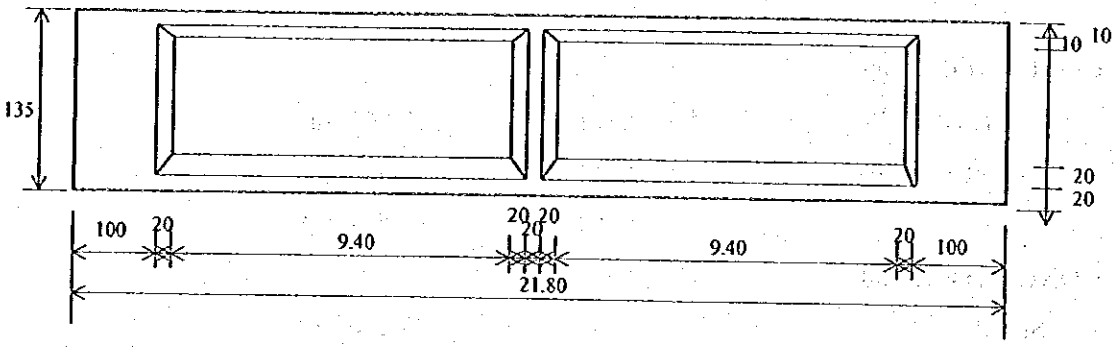
- MAIN GIRDER	= 5 × 10,773		= 53.865 m³
- DIAPRAGHM	= 12 × 0.245		= 2.940 m³
		TOTAL	= 56.805 m³

CONCRETE K-250

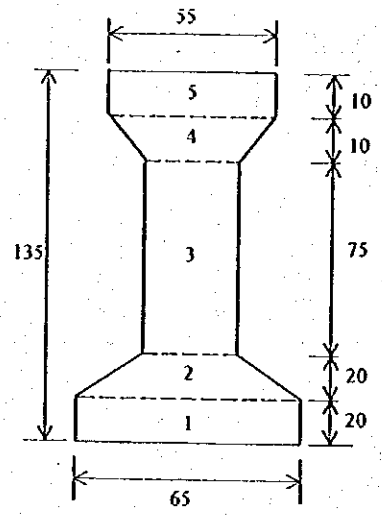
- SLAB			= 42.226 m³
- HANDRAIL			= 5.145 m³
			= 47.371 m³
- PANEL PLATE			= 8.610 m³
		TOTAL	= 55.981 m³

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Concrete Volume	Page	3/5

1. Main Girder K400



Center



Wide $A_1 = 0.65 \times 0.20 = 0.1300\ m^2$

$A_2 = \frac{0.20 + 0.65}{2} \times 0.20 = 0.0850\ m^2$

$A_3 = 0.20 \times 0.75 = 0.1500\ m^2$

$A_4 = \frac{0.55 + 0.20}{2} \times 0.10 = 0.0375\ m^2$

$A_5 = 0.55 \times 0.10 = 0.130\ m^2$

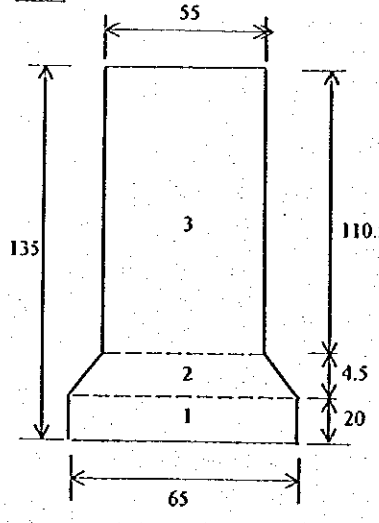
Sub Total $= 0.4575\ m^2$

Length of Center Beam = 18.80 m

Volume : A × L

$V_1 : 0.4575 \times 18.80 = 8.601\ m^3$

End



Wide $A_1 = 0.65 \times 0.20 = 0.130\ m^2$

$A_2 = \frac{0.65 + 0.55}{2} \times 0.045 = 0.027\ m^2$

$A_3 = 0.55 \times 1.105 = 0.108\ m^2$

Sub Total $= 0.765\ m^2$

Volume $= A \times L$

$$2 \times \left((0.765 \times 1) + \times \left(\frac{0.4575 + 0.765}{2} \times 0.20 \right) \right) + (0.765 \times 0.20)$$

$V_2 = 2.172\ m^3$

- Volume Total one beam = $V_1 + V_2$

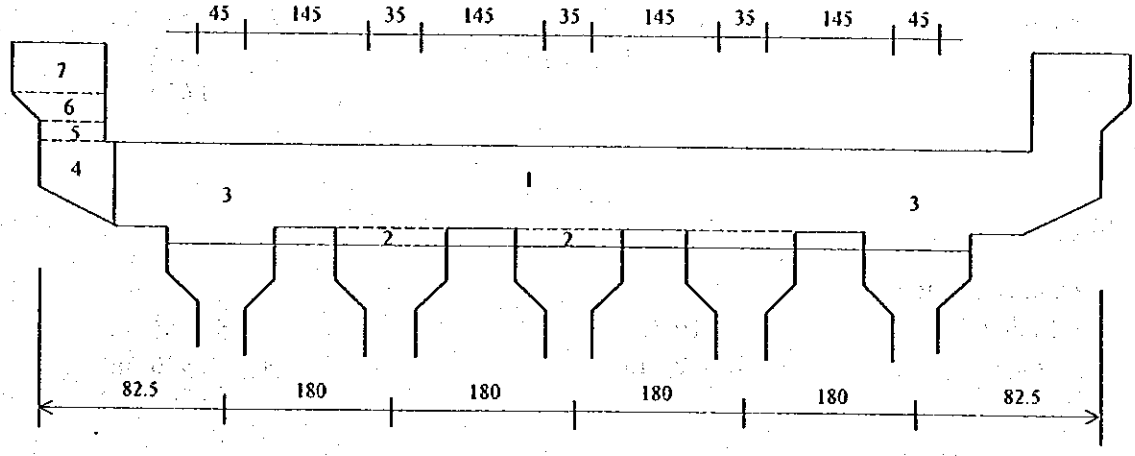
  $V = 8.601 + 2.172 = 10.773\ m^3$

- Total Volume in Bridge

  $\Sigma V = 5 \times 10.773 = 53.865\ m^3$

Name of Structure	ASIN RIVER No.2 B R I D G E	Category Calculation	Concrete Volume	Page	4/5

2. **Slab K250**



Main Slab

(1)	6.85×0.20	=	1.370 m²
(2)	$0.35 \times 0.07 \times 3$	=	0.074 m²
(3)	$0.45 \times 0.27 \times 2$	=	0.243 m²
(4)	$\frac{0.27 + 0.22}{2} \times 0.47 \times 2$	=	0.231 m²
	A_1	=	**1.918 m²**

End Slab

$A_2 = 0.30 \times 0.30 \times 2 = 0.180$ m²

Volume (V) = $1.918 \times (21.8 - 2 \times 0.30) + (0.180 \times 8.69)$

= $40.662 + 1.564 = 42.226$ m³

Handrail

(5)	$0.22 \times 0.10 \times 2$	=	0.044 m²
(6)	$\frac{0.17 \times 0.22}{2} \times 0.40 \times 2$	=	0.156 m²
(7)	$\frac{0.20 + 0.25}{2} \times 0.08 \times 2$	=	0.036 m²
		=	**0.236 m²**

Concrete Volume Handrail :

= $\Sigma A \times L$

= $0.236 \times 21.80 = 5.145$ m³

3. **Cross Beam / Diapraghm K400**

Volume = $0.20 \times 0.98 \times 1.25 = 0.245$ m³

Number of Diapraghm = $4 \times 3 = 12$ pieces

Total volume Cross Beam in Bridge (V_{CB})

$V_{CB} = 12 \times 0.245 = 2.940$ m³

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Concrete Volume	Page	5/5

4. Panel Plate

$1.45 \times 1.00 \times 0.07 = 0.1015$ m³

number = 84 = 84×0.105 = 8.526 m³

= $4 \times 0.2 \times 1.45 \times 1 \times 0.07$ = 0.0812 m³

= 8.610 m³

RESUME :

Concrete K400

- Main Girder = 5×10.773 = 53.865 m³
- Diapraghm = 12×0.245 = 2.940 m³

= 56.805 m³

Concrete K250

- Slab = 42.226 m³
- Handrail = 5.145 m³
- Panel Plate = 8.610 m³

= 55.981 m³

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Reinforcing Volume	Page	1/4

SUMMARY OF REINFORCING BAR VOLUME

-	MAIN GIRDER K400		=	7,154 kg
-	SLAB K250		=	7,622 kg
-	HAND RAIL AND CURB K250		=	5,505 kg
-	PANEL PLATE K250		=	1,235 kg
-	DIAPRAGHM K400		=	290 kg
		TOTAL	=	21,806 kg

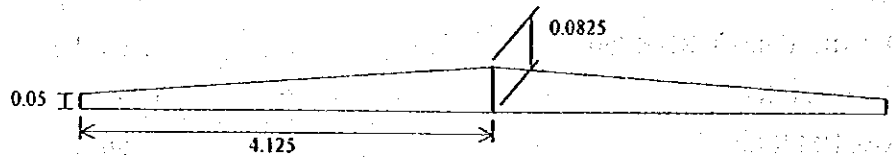
-	PC CABLE K1 Ø12.7 7 STRANDS		=	641 kg
	PC CABLE K2 Ø12.7 12 STRANDS		=	1,020 kg
	PC CABLE K1 Ø12.7 7 STRANDS		=	643 kg
	PC CABLE for DIAPRAGHM Ø12.5		=	52 kg
		TOTAL	=	2,356 kg

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Pavement Volume	Page	1/1

7. Pavement

Span of bridge : 21.80 m

Thick of Asphalt at side : 5 cm (in edge)
: 8.25 cm (in centre)



$$A = \left(\frac{0.0825 + 0.05}{2}\right) \times \frac{8.25}{2} \times 2 = 0.546 \text{ m}^2$$

Volume : $A = 21.80 \times 0.546 = 11.915 \text{ m}^3$
$= 11.915 \times 2.2 = 26.213 \text{ t.m}$

Name of Structure	ASIN RIVER No.2 B R I D G E	Category Calculation	Form Volume	Page	1/6

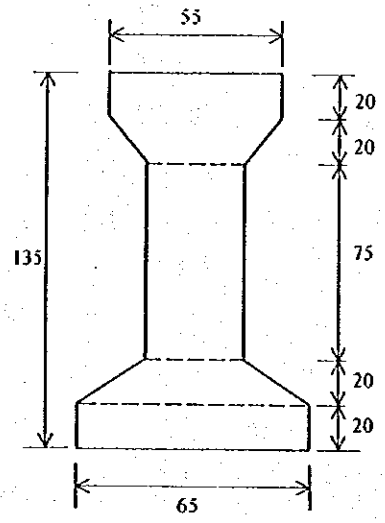
SUMMARY OF BROAD FORM WORK

-	MAIN GIRDER	=	432.51	m²
-	SLAB	=	8.06	m²
-	SIDE WALK	=	81.72	m²
-	PANEL PLATE	=	166.41	m²
-	DIAPRAGHM	=	40.11	m²
	TOTAL	=	728.81	m²

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Form Volume	Page	2/6

1. Main Girder

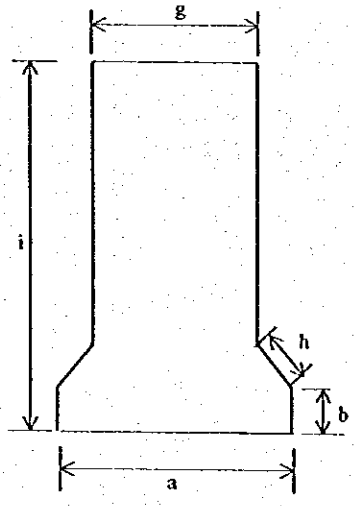
Center Beam



Thick of Plate = 3 cm

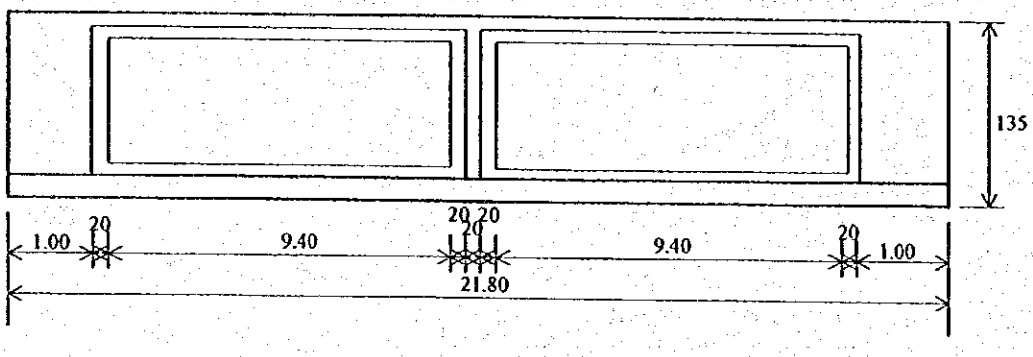
a	=	$65 + \frac{3}{2} \times 2$	=	68 cm
b	=	$20 + \frac{3}{2} \times 2$	=	23 cm
c	=	$35 + \frac{3}{2} \times 2$	=	38 cm
d	=	$75 + \frac{3}{2} \times 2$	=	78 cm
e	=	$12 + \frac{3}{2} \times 2$	=	15 cm
f	=	$10 + \frac{3}{2}$	=	11.5 cm

End Beam



a	=	68 cm		
b	=	23 cm		
h	=	$6.75 + \frac{3}{2} \times 2$	=	9.75 cm
i	=	$110.5 + \frac{3}{2}$	=	112 cm

Length of Beam = 21.80 m



Wide

- Center

$$A_1 = (a + 2b + 2c + 2d + 2e + 2f) \times L$$
$$= (0.68 + 0.46 + 0.76 + 1.56 + 0.30 + 0.23) \times 18.80$$
$$= 3.99 \times 18.80$$
$$= 75.012 \text{ m}^2$$

- End

$$A_2 = (a + 2b + 2h + 2i) \times L$$
$$= (0.68 + 0.46 + 0.76 + 0.195 + 2.24) \times 2.20$$
$$= 3.575 \times 2.20$$
$$= 7.865 \text{ m}^2$$

- Between

$$A_3 = \left[\left(\frac{0.75 + 1.05}{2} \times 0.20 + 2 \times \tfrac{1}{2} \times 0.20 \times 0.20\right) \times 4\right] \times 2$$
$$= (0.18 + 0.04) \times 4 \times 2$$
$$= 1.76 \text{ m}^2$$

Cover End Beam

$$A_4 = \left[(0.68 \times 0.23) + \left(\frac{0.68 + 0.58}{2} \times 0.20\right) + (0.58 \times 1.12)\right] \times 2$$
$$= (0.1564 + 0.126 + 0.6496) \times 2$$
$$= 0.932 \times 2$$
$$= 1.864 \text{ m}^2$$

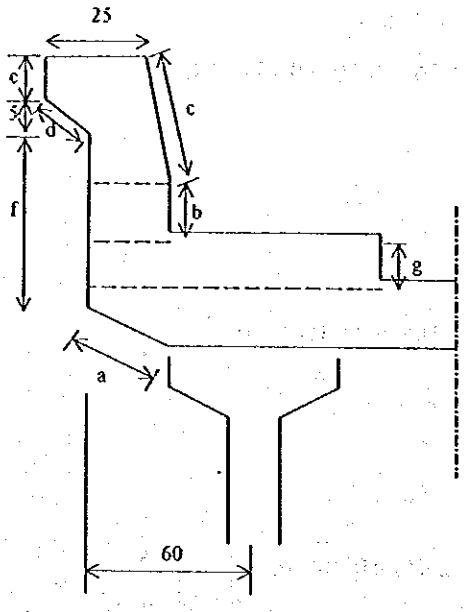
Total Form in Bridge (F_G)

$$F_G = \Sigma A \times 5$$
$$= (75.012 + 7.865 + 1.76 + 1.864) \times 5$$

$$F_G = 86.501 \times 5$$
$$= 432{,}505 \text{ m}^2$$

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Form Volume	Page	4/6

2. Bed Plate and Hand Rail + Side Walk



Thick of Plate = 3 cm

a = $47.27 + \frac{3}{2}$ = 34.38 cm

b = $10 + \frac{3}{2}$ = 11.50 cm

c = $40.31 + \frac{3}{2}$ = 41.81 cm

d = $9.43 + \frac{3}{2} \times 2$ = 12.43 cm

e = $20 + \frac{3}{2}$ = 21.50 cm

f = $72 + \frac{3}{2} \times 2$ = 75.00 cm

g = = 25.00 cm

Handrail + Sidewalk

Length of Beam = 21.80 m

Wide : $A_1 = (a + b + c + d + e + f + g) \times L \times 2$

$= (48.77 + 11.5 + 41.81 + 12.43 + 21.5 + 75 + 25) \times 21.8 \times 2$

$= 811003.6\ cm^2 \sim 81.10\ m^2$

End Cover

Wide : $A_2 = \left[(b \times 0.28) + \left(\frac{0.20 + 0.28}{2} \times 0.40\right) + \left(\frac{0.20 + 0.25}{2} \times 0.11\right)\right] \times 4$

$= 0.153 \times 4$

$= 0.612\ m^2$

Total Area = 81.10 + 0.612 = 81.72 m²

Bed Plate

End Wide : A =

$$[(0.33 \times 6.85) - 2 \times (½ \times 0.47 \times 0.05) + 4 \times (0.30 \times 1.25) + 2(0.30 \times 0.4877)] \times 2$$

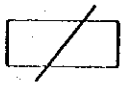
$= 4030 \times 2$

$F_B = 8.060\ m^3$

Panel Plate

Thick of Plate = 3 cm

Thick of Plate = 7 cm

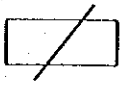


145 x 100

Wide $A_1 = (1.45 \times 1.03) + 4 \times (0.085 \times 1.48) + 2 \times (0.086 \times 1.03)$

$= 1.5244 + 0.2516 + 0.1751$

$= 1.951 \text{ m}^2$



145 x 20

Wide $A_2 = (1.48 \times 0.23) + 2 \times (0.085 \times 1.48) + 2 \times (0.085 \times 0.23)$

$= 0.3404 + 0.2516 + 0.0391$

$= 0.6311 \text{ m}^2$

Total Wide = $(21 \times 1.951) + 0.6311 = 41.602 \text{ m}^2$

Total Wide in Bridge $F_P = 4 \times 41.602 = 166.41 \text{ m}^2$

Cross Beam

Wide : $A = 2 \times (1.25 \times 0.98) + (1.25 \times 0.26) + 4 \times (0.175 \times 0.81)$

$= 2.45 + 0.325 + 0.567$

$= 3.342 \text{ m}^2$

Total Wide = $4 \times 3.342 = 13.368 \text{ m}^2$

Total Wide in Bridge $F_{CB} = 3 \times 13.368 = 40.104 \text{ m}^2$

Name of Structure	ASIN RIVER No.2 BRIDGE	Category Calculation	Approach Road Bridge Volume	Page	1/8

SUMMARY OF QUANTITY APPROACH ROAD OF ASIN RIVER NO.2 BRIDGE

1. Embankment = 16.80 + 5.60 + 0 + 46.144 + 24.624
   + 20.74 + 6.455 + 161.17 + 24.624 + 16.854
   = 405.082 m^3
2. Pavement (Standard by Inspection Road)
   - Aggregate Class A = 149.225 m^3
   - Aggregate Class B = 199.260 m^3
   - Compacted Sand = 59.420 m^3
   - Concrete Block = 996.200 m^3
3. Wet Stone Masonry = 183.348 m^3
4. PVC Weep Hole = 70 holes
5. Pointing = 223.220 m^2

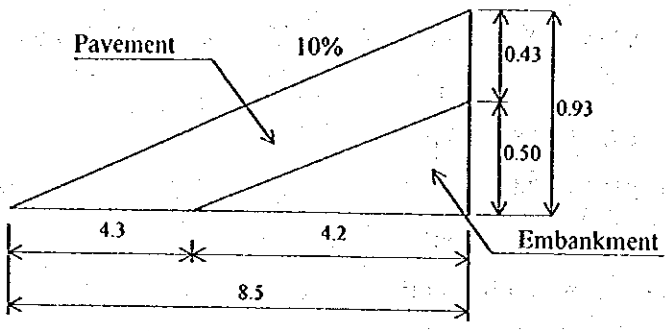
Name of Structure	ASIN RIVER No.2 B R I D G E	Category Calculation	Approach Road Bridge Volume	Page	2/8

RESUME OF QUANTITY

APPROACH ROAD OF ASIN BRIDGE NO.2

1. Embankment : 16.80 + 5.60 + 0 + 46.144 + 62.624 + 14.832 + 4.70 + 54.384 + 9.335 + 18.502 + 14.297 + 15.45 + 30.90 + 34 + 14.68 = 342.248 m^3
2. Pavement :
   - Aggregate Class A = 182.509 m^3
   - Aggregate Class B = 243.35 m^3
   - Compact Sand = 60.441 m^3
   - Concrete Block = 1,138.63 m^2
3. Wet Stone Masonry = 210.36 m^3
4. Pointing = 232.17 m^2
5. PVC Weep Hole Ø50 = 60 nos

(No.1) Area : $16 \times 8.5 = 136\ m^2$



Embankment : $\frac{4.2 \times 0.5}{2} \times 16 = 16.80\ m^2$

Pavement :

Aggregate Class A	=	$8.5 \times 16 \times 0.15 = 20.4\ m^3$
Aggregate Class B	=	$8.5 \times 16 \times 0.20 = 27.20\ m^3$
Compacted Sand	=	$8.5 \times 16 \times 0.06 = 8.16\ m^3$
Concrete Block	=	$8.5 \times 16 = 136\ m^2$
Wet Stone Masonry	=	$11.526\ m^3$
Pointing	=	$19.70\ m^2$
PVC Weep Hole	=	5 holes

(No.2) Area : $7 \times 8 = 56\ m^2$

Embankment : $\frac{4 \times 0.40}{2} \times 7 = 5.60\ m^2$

Pavement :

Aggregate Class A	=	$7 \times 8 \times 0.15 = 8.4\ m^3$
Aggregate Class B	=	$7 \times 8 \times 0.20 = 11.20\ m^3$
Sand	=	$7 \times 8 \times 0.06 = 3.361\ m^3$
Concrete Block	=	$7 \times 8 = 56\ m^2$
Wet Stone Masonry	=	$10.18\ m^3$
PVC Weep Hole	=	5 holes
Pointing	=	$14.58\ m^2$
Palm Fibre	=	$0.018\ m^3$

(No.3) Area : $\frac{11+14}{2} \times 4.5 = 56.25\ m^2$

Embankment : 0

Pavement :

Aggregate Class A = $56.25 \times 0.15 = 8.5\ m^3$

Aggregate Class B = $56.25 \times 0.20 = 11.26\ m^3$

Sand = $56.25 \times 0.06 = 3.37\ m^3$

Concrete Block = $56.25\ m^2$

Pointing = $4.14\ m^2$

Wet Stone Masonry = $5.512\ m^3$

(No.4) Area : $16 \times 7 = 112\ m^2$

Embankment : $112 \times 0.413 = 46.144\ m^2$

Pavement :

Aggregate Class A = $112 \times 0.15 = 16.8\ m^3$

Aggregate Class B = $112 \times 0.20 = 22.4\ m^3$

Sand = $112 \times 0.06 = 6.72\ m^3$

Concrete Block = $112\ m^2$

Wet Stone Masonry = $8.534\ m^3$

Pointing = $9.075\ m^2$

(No.5) Area : $9.5 \times 16 = 152\ m^2$

Embankment : $152 \times 0.412 = 62.624\ m^2$

Pavement :

Aggregate Class A = $152 \times 0.15 = 22.8\ m^3$

Aggregate Class B = $152 \times 0.20 = 30.40\ m^3$

Sand = $152 \times 0.06 = 9.12\ m^3$

Concrete Block = $152\ m^2$

Wet Stone Masonry = 0

(No.6) Area : $\frac{16 \times 4.5}{2} = 36\ m^2$

Embankment : $36 \times 0.412 = 14.832\ m^2$

Pavement :

Aggregate Class A = $36 \times 0.15 = 5.40\ m^3$

Aggregate Class B = $36 \times 0.20 = 7.20\ m^3$

Sand = $36 \times 0.06 = 2.16\ m^3$

Concrete Block = $36\ m^2$

Wet Stone Masonry = $14.75\ m^3$

Pointing = $12.35\ m^2$

PVC Weep Hole = 12 holes

Palm Fibre = $0.043\ m^3$

(No.7) Area : $\frac{4.5 + 2}{2} \times 3.5 = 11.375\ m^2$

Embankment : $11.375 \times 0.412 = 4.7\ m^2$

Pavement :

Aggregate Class A = $11.375 \times 0.15 = 1.71\ m^3$

Aggregate Class B = $11.375 \times 0.20 = 2.275\ m^3$

Sand = $11.375 \times 0.06 = 0.68\ m^3$

Concrete Block = $11.375\ m^2$

Wet Stone Masonry = $8.093\ m^3$

Pointing = $12.35\ m^2$

(No.8) Area : $12 \times 11 = 132\ m^2$

Embankment : $132 \times 0.412 = 54.384\ m^2$

Pavement :

Aggregate Class A = $54.384 \times 0.15 = 19.8\ m^3$

Aggregate Class B = $54.384 \times 0.20 = 26.4\ m^3$

Sand = $54.384 \times 0.06 = 3.263\ m^3$

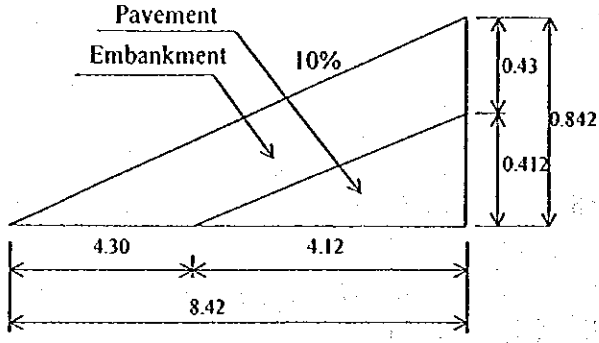
Concrete Block = $54.384\ m^2$

Wet Stone Masonry = $17.08\ m^3$

Pointing = $24.64\ m^2$

Name of Structure	ASIN RIVER No.2 B R I D G E	Category Calculation	Approach Road Bridge Volume	Page	7/8

(No.9) Area : 9 × 11 = 99 m²

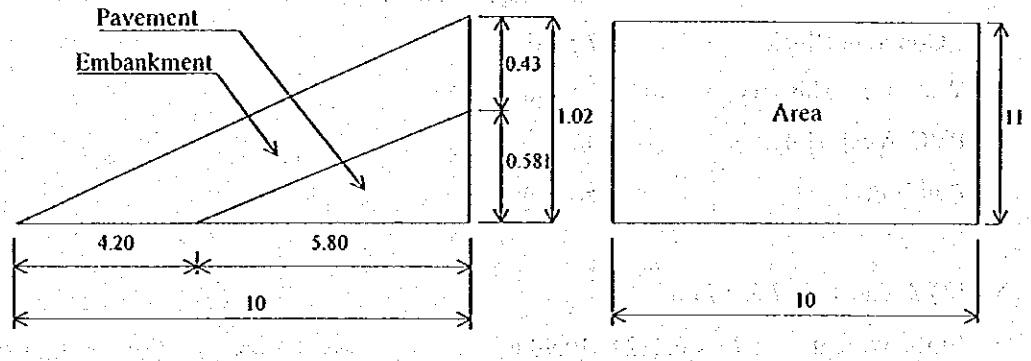


Embankment : $\frac{4.12 \times 0.412}{2} \times 11 = 9.335$ m²

Pavement :

Aggregate Class A	=	99 × 0.15 = 14.85 m³
Aggregate Class B	=	99 × 0.20 = 19.8 m³
Sand	=	99 × 0.06 = 5.94 m³
Concrete Block	=	99 m²
Wet Stone Masonry	=	21.42 m³
PVC Weep Hole	=	5 holes
Pointing	=	11.685 m²

(No.10) Area : 10 × 11 = 110 m²



Embankment : $\frac{5.8 \times 0.58}{2} \times 11 = 18.502$ m²

Pavement :

Aggregate Class A	=	110 × 0.15 = 16.5 m³
Aggregate Class B	=	110 × 0.20 = 22.00 m³
Sand	=	110 × 0.06 = 6.6 m³
Concrete Block	=	110 m²

Wet Stone Masonry = 29.15 m³

PVC Weep Hole = 8 holes

Pointing = 21 m²

(No.11) Area : 10 × 8.5 = 85 m²

Embankment : $\frac{5.8 \times 0.58}{2} \times 8.5 = 14.297$ m²

Pavement :

Aggregate Class A = 85 × 0.15 = 12.75 m³

Aggregate Class B = 85 × 0.20 = 17 m³

Sand = 85 × 0.06 = 5.1 m³

Concrete Block = 85 m²

Wet Stone Masonry = 9.915 m³

PVC Weep Hole = 5 holes

(No.12) Area : 5 × 7.5 = 37.50 m²

Embankment : 37.5 × 0.412 = 15.45 m²

Pavement :

Aggregate Class A = 37.5 × 0.15 = 5.63 m³

Aggregate Class B = 37.5 × 0.20 = 7.50 m³

Sand = 37.5 × 0.06 = 2.25 m³

Concrete Block = 37.5 m²

Wet Stone Masonry = 32.54 m³

PVC Weep Hole = 5 holes

Pointing = 13.75 m²

(No.13) Area : 10 × 7.5 = 75 m²

Embankment : 75 × 0.412 = 30.90 m²

Pavement :

Aggregate Class A = 75 × 0.15 = 11.25 m³

Aggregate Class B = 75 × 0.20 = 15.00 m³

Sand = 75 × 0.06 = 4.5 m³

Concrete Block = 75 m²

Wet Stone Masonry = 12.60 m³

Pointing = 4.75 m²

(No.14) Area : $11 \times 7.5 = 82.5\ m^2$

Embankment : $82.5 \times 0.412 = 34\ m^2$

Pavement :

Aggregate Class A	=	$82.5 \times 0.15 = 12.375\ m^3$
Aggregate Class B	=	$82.5 \times 0.20 = 16.50\ m^3$
Sand	=	$82.5 \times 0.06 = 4.95\ m^3$
Concrete Block	=	$82.5\ m^2$
Wet Stone Masonry	=	$20.04\ m^3$
Pointing	=	$39.95\ m^2$

(No.15) Area : $\frac{15 + 13.5}{2} \times 2.5 = 35.6\ m^2$

Embankment : $35.625 \times 0.412 = 14.68\ m^2$

Pavement :

Aggregate Class A	=	$35.625 \times 0.15 = 5.344\ m^3$
Aggregate Class B	=	$35.625 \times 0.20 = 7.125\ m^3$
Sand	=	$35.625 \times 0.06 = 2.137\ m^3$
Concrete Block	=	$35.625\ m^2$
Wet Stone Masonry	=	$3.95\ m^3$
PVC Weep Hole	=	6 holes ~ 6 m
Pointing	=	$12.5\ m^2$
Palm Fibre	=	$0.22\ m^3$

Name of Structure	ASIN RIVER NO.2 BRIDGE	Category Calculation	Stone Masonry for Approach Road Bridge Volume	Page	1/2

WET STONE MASONRY VOLUME FOR APPROACH BRIDGE

(1) Section B-B

$$\frac{0.5 + 0.80}{2} \times 0.5 + 0.3 \times 2 + 0.3 \times 0.5 = 1.15 \text{ m}^2$$

Section D-D

$$0.5 \times 1.10 + \frac{0.5 + 0.80}{2} \times 0.93 + 0.8 \times 0.8 = 1.562 \text{ m}^2$$

$$\text{Volume} : \frac{1.15 + 1.562}{2} \times 8.50 = \mathbf{11.526 \text{ m}^3}$$

(2) Section B-B

$$\frac{0.5 + 0.80}{2} \times 0.5 + 0.3 \times 2 + 0.3 \times 0.5 = 1.15 \text{ m}^2$$

Section I-I

$$\frac{0.5 + 0.80}{2} \times 0.93 + 0.8 \times 0.8 = 1.245 \text{ m}^2$$

$$\text{Volume} : \frac{1.15 + 1.245}{2} \times 8.50 = \mathbf{10.18 \text{ m}^3}$$

(3) Section I-I

$$1.245 \times 2 = 2.49 \text{ m}^2$$

$$\frac{2.49}{2} \times 4.50 = 5.512 \text{ m}^2$$

(4) Section D-D

$1.562 \times 2.5 = 3.98 \text{ m}^2$

$(1.562 - 0.5 \times 1.10) \times 4.5 = 4.55 \text{ m}^2$

$= 8.534 \text{ m}^3$

(5)

(6) Section B-B = 1.150 m²

Volume : $1.150 \times 12.50 = \mathbf{14.75 \text{ m}^3}$

(7) Section I-I

Volume : $1.245 \times 6.50 = \mathbf{8.093 \text{ m}^2}$

(8) Section I-I

$1.15 \times 5.5 = \mathbf{6.325 \text{ m}^2}$

Name of Structure	ASIN RIVER NO.2 BRIDGE	Category Calculation	Stone Masonry for Approach Road Bridge Volume	Page	2/2

Section E-E

$0.5\times1.1+\frac{0.5+0.8}{2}\times0.93+0.8\times0.8 = 1.562\ m^2$

Volume : $1.562 \times 2.5 = 3.905\ m^3$

$\frac{0.5+0.8}{2}\times0.93+0.8\times0.8 = 1.245 m^3$

Volume : $1.245 \times 5.5 = 6.850\ m^3$

Total Volume in (8) = 6.325 + 6.85 = 17.08 m^3

(9) Section F-F

$\frac{0.5+0.8}{2} \times 0.85 + 0.8 \times 0.8 = 1.193\ m^3$

Volume : $\frac{1.193}{2} \times 8.50 = 5.07\ m^3$

Section A-A

$\frac{1.5+0.8}{2} \times 3.0 + 1.0 \times 1.5 + 0.3 \times 0.3 = 5.04\ m^3$

Volume : $\frac{5.04}{2} \times 8.50 = 21.42\ m^3$

(10) Section A-A

Volume : $\frac{5.04}{2} \times 10.00 = 25.20\ m^2$

Section C-C

$0.3 \times 0.3 + 0.3 \times 1.5 + 0.50 \times 0.50 = 0.79\ m^3$

Volume : $\frac{0.79}{2} \times 10.00 = 3.95\ m^2$

(11) Section G-G

$\frac{0.5+0.8}{2} \times 0.85 + 0.8 \times 0.80 = 1.193\ m^2$

Volume : $\frac{1.193}{2} \times 10.00 = 5.965\ m^3$

Section C-C

Volume : $\frac{0.79}{2} \times 10.00 = 3.950\ m^3$

$= 9.915\ m^3$

Name of Structure	ASIN RIVER NO.2 BRIDGE	Category Calculation	Stone Masonry for Approach Road Bridge Volume	Page	3/2

(12) Section A-A = 5.04 m²

Volume : 5.04 × 5.00 = 25.200 m³

Section F-F = 1.193 m²

Volume : 1.193 × 5.00 = 5.965 m³

0.5 × 1.10 × 2.5 = 1.375 m³

= 32.540 m³

(13) Section A-A

Volume : 5.04 × 2.5 = 12.6 m³

(14) Section G-G = 1.193 m²

Volume : 1.193 × 11.5 = 13.72 m³

Section C-C = 0.79 m²

Volume : 0.79 × 8 = 6.32 m³

= 20.04 m³

(15) Section C-C = 0.79 m²

Volume : 0.79 × 5 = 3.95 m³

Total Stone Masonry :

1.	11.526 m²
2.	10.180 m²
3.	5.512 m²
4.	8.534 m²
5.	0 m²
6.	14.750 m²
7.	8.093 m²
8.	17.080 m²
9.	26.490 m²
10.	29.150 m²
11.	9.915 m²
12.	32.540 m²
13.	12.600 m²
14.	20.040 m²
15.	3.950 m²
	210.360 m²

Name of Structure	ASIN RIVER NO.2 BRIDGE	Category Calculation	Pointing	Page	1/2

POINTING

(1) Section B-B

$\frac{0.5+2}{2} \times 8.5$ = 10.625 m²

Section D-D

(0.93+1.1+0.5+1.1)× 2.5 = 9.075 m²

= 19.700 m²

(2) Section B-B

$\frac{0.5+2}{2} \times 8.5$ = 1.15 m²

Section I-I

$\frac{0.93}{2} \times 8.5$ = 3.933 m²

= 14.580 m²

(3) Section I-I

$\frac{0.93}{2} \times 4.5 = 2.09\ m^2 \times 2 = 4.19\ m^2$

(4) Section D-D

$(0.93 + 1.1 + 0.5 + 1.1) \times 2.5 = 9.075\ m^2$

(5)

(6) Section B-B = $(0.5 + 2) \times 12.5 = 31.25\ m^2$

(7) Section I-I = $1.9 \times 6.5 = 12.35\ m^2$

(8) Section I-I = 1.9 × 5.5 = 10.405 m²

Section E-E

(0.93 + 1.1 + 0.5 + 1.1)× 2.5 = 9.075 m²

0.93 × 5.5 = 5.115 m²

Total Volume in (8) = 24.640 m³

(9) Section F-F

$\frac{0.85}{2} \times 8.5$ = 3.61 m³

Section A-A

$\frac{1.90}{2} \times 8.5$ = 8.075 m³

= 11.685 m²

Name of Structure	ASIN RIVER NO.2 BRIDGE	Category Calculation	Pointing	Page	2/2

(10) Section A-A

$\frac{1.90}{2} \times 10.00$ = 9.50 m²

Section C-C

$\frac{0.3+2}{2} \times 10.00$ = 11.50 m²

= 21.00 m²

(11) Section G-G

$\frac{0.85}{2} \times 10.00$ = 4.15 m²

Section C-C

$\frac{0.3+2}{2} \times 10.00$ = 11.50 m²

= 15.75 m²

(12) Section A-A

1.90×5 = 9.50 m²

Section F-F

0.85×5 = 4.25 m²

= 13.75 m²

(13) Section A-A

Volume : $1.90 \times 2.5 = 4.75$ m³

(14) Section C-C

Volume : $0.5 + 2 \times 8$ = 20.00 m³

Section G-G

Volume : $0.85+1.1+0.5+1.1 \times 2.5$ = 9.30 m²

0.85×9.0 = 7.65 m²

= 36.95 m²

(15) Section C-C

Volume : $0.5 + 2 \times 5 = 12.5$ m³

Name of Structure	ASIN RIVER NO.2 BRIDGE	Category Calculation	Pointing	Page	3/2

Total Pointing :

1.	19.700	m²
2.	14.580	m²
3.	4.190	m²
4.	9.075	m²
5.	0	m²
6.	31.250	m²
7.	12.350	m²
8.	24.640	m²
9.	11.685	m²
10.	21.000	m²
11.	15.750	m²
12.	13.750	m²
13.	4.750	m²
14.	36.950	m²
15.	12.500	m²
	232.170	**m²**

SUBSTRUCTURE QUANTITY CALCULATION

ASIN No.2 BRIDGE

SUBSTRUCTURE QUANTITY CALCULATION

SUMMARY ASIN2

			A1	A2			TOTAL
STATION							
STRUCTURE EXCAVATION	0-2m	(m^3)	115.1	115.1			230.2
	2-4m	(m^3)	84	84			168
	>4m	(m^3)	0	0			0
	TOTAL	(m^3)	199.1	199.1			398.2
	WATER	(m^3)	307.8	307.8			615.6
	IN RIVER	(m^3)					0
BLINDING STONE		(m^3)	12.13	12.13			24.26
BACK FILE		(m^3)	172.44	172.44			344.88
PC PILE		(m)	540	540			1080
STEEL-PILE		(m)					
CONCRETE	A-2-5						0
	B-1-2	(m^3)	0	0			0
	B-1-3	(m^3)					0
	B-1-4	(m^3)					0
	C-1	(m^3)	131.34	131.34			262.68
	E	(m^3)	6.06	6.06			12.12
FORM	TYPE-1	(m^2)	166.047	166.047			332.094
	TYPE-2	(m^2)					0
	TYPE-3	(m^2)					0
	TYPE-4	(m^2)					0
R-BAR		(kg)	7123	7123			14246
REMARK							

PC PILE

			A1	A2			TOTAL
STATION							
ELEVATION	FL	m					
	GH	m					
HEIGHT	HW	m					
	H1	m					
	H2-1	m					
	H2-2	m					
	H3	m					
	Hh	m					
	WT	m					
DIMENSION	A	m					
	B	m					
	D1	m	0.5	0.5			
	DL	m					
NUMBER OF PIER							
PILE	NUMBER	m	30	30			60
	LENGTH	m	18	18			1080

EXCAVATION

			A1	A2			TOTAL
STATION							
A*B		(m^2)					
GH-FL		(m)					
EXCAVATION	0-2m	(m^3)	115.10	115.10			230.20
	2-4m	(m^3)	84.00	84.00			168.00
	>4m	(m^3)	0.00	0.00			0.00
	TOTAL	(m^3)	199.10	199.10			398.20
	WATER	(m^3)	307.80	307.80			615.60
BLINDING STONE		(m^3)	12.13	12.13			24.26
STEEL-PILE		(m)					0

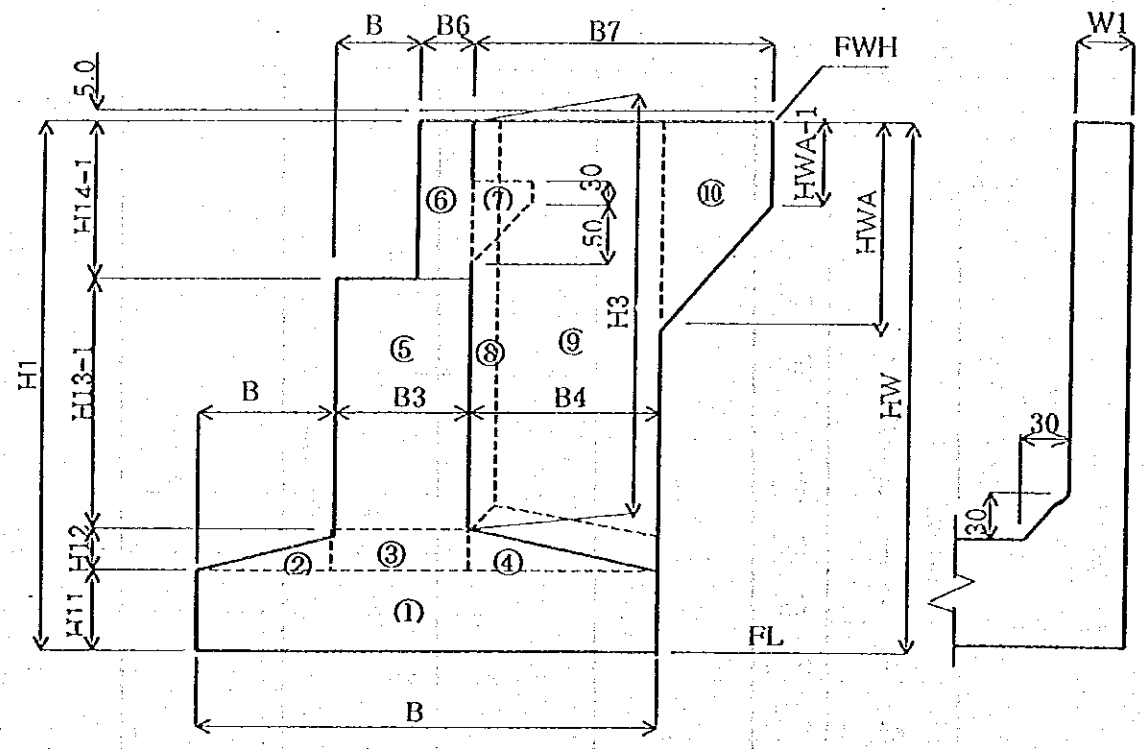
CONCRETE (m^3)

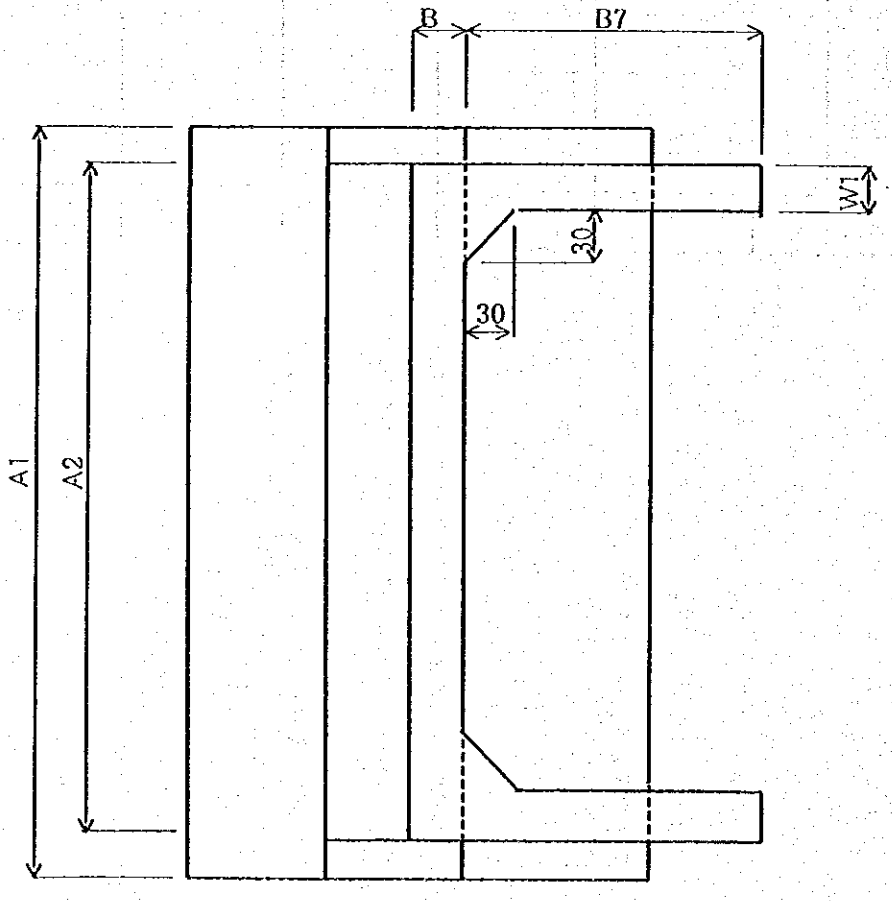
			A1	A2			TOTAL
STATION							
LEVELING	a	(m^2)					
CONCRETE (E)	t	(m)					
	V	(m^3)	6.06	6.06			12.12
FOOTING (C-1)	a1	(m^2)					
	a2	(m^2)					
	h1	(m)	REFER TO ABUTMENT				
	h2	(m)					
	V	(m^3)	131.34	131.34			262.68
COLUMN (B-1-2)	a1	(m^2)					
	a2	(m^2)					
	h1	(m)					
	h2	(m)					
	V	(m^3)					
C-PIER HEAD (B-1-2)							
RC PORTAL							
PC PORTAL							
REMARK			6.06	6.06			

FORM AREA (m^2)

			A1	A2			TOTAL
STATION							
	a1	(m^2)					
	a2	(m^2)					
	A	(m^2)					0
	D2	(m)					
	D3	(m)					
	h1	(m)					
	h2	(m)					
	a1	(m^2)					
	a2	(m^2)					
	A	(m^2)	166.047	166.047			332.094
C-PIER HEAD	TYPE-1						
	TYPE-4						
RC PORTAL	TYPE-6						
PC PORTAL	TYPE-6						
REMARK							

CONCRETE (C-1)


B
B6
B7
FWH
W1
5.0
H14-1
H13-1
H12
H11
H1
H3
HWA-1
HWA
HW
30
50
30
30
B
B3
B4
B
FL
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩


B
B7
W1
30
30
A1
A2

ABUTMENT A-1

CONCRETE (C-1)

Vn	= C	* Bn	* Hnn	* An	= VOLUME	ni		
		m	m	m	m3	n	nn	n
1	= 1.0	* 6.50	* 1.20	* 8.85	= 69.03 m3	1	11	1
2	= 0.5	* 2.50	* 0.00	* 8.85	= 0.00 m3	2	12	1
3	= 1.0	* 1.43	* 0.00	* 8.85	= 0.00 m3	3	12	1
4	= 0.5	* 2.57	* 0.00	* 8.85	= 0.00 m3	4	12	1
5	= 1.0	* 1.43	* 4.22	* 8.85	= 53.46 m3	3	13	1
6	= 1.0	* 0.50	* 1.88	* 8.85	= 8.30 m3	6	14	1
7				8.85	= m3			
8	= 0.5	* 0.30	* 0.30	* 6.10 * 2	= 0.55 m3			
9	=	*	*	* *	= 0.00 m3			
10	=	*	*	*	= m3			
11	=	*	*	* *	= 0.00 m3			
12	=	*	*	* *	= 0.00 m3			
					V = 131.34 m3			

RUBBER SHEET

0.28 * 0.35 * 5 = 0.49 m^2

t = 73 mm

ABUTMENT A-1

FORM AREA

Vn = C * N * Bn,An * Hnn				= VOLUME	ni		
	m		m	m^2	n	nn	n
1 = 1.0 * 2 *	6.50	*	1.20	= 15.60 m^2	1	11	1
= 1.0 * 2 *	8.85	*	1.20	21.24 m^2	1	11	1
2 = 0.5 * 2 *	2.50	*		= 0.00 m^2	2	12	1
3 = 1.0 * 2 *	1.43	*		= 0.00 m^2	3	12	1
4 = 0.5 * 2 *	2.57	*		= 0.00 m^2	4	12	1
5 = 1.0 * 2 *	1.43	*	4.22	= 12.08 m^2	3	13	1
= 1.0 * 2 *	8.85	*	4.22	= 74.77 m^2	3	13	1
6 = 1.0 * 2 *	0.50	*	1.88	= 1.88 m^2	6	14	1
= 1.0 * 2 *	8.85	*	1.88	= 33.21 m^2	6	14	1
7 =				m^2			
= 0.3 *	1.414	=	0.42				
8 = 2 *	0.42	*	2.00	= 1.68 m^2			
9 = 4 *	0.70	*	2.00	= 5.60 m^2			
10 =				m^2			
11 = *		*		= 0.00 m^2			
12 = *		*		= 0.00 m^2			
				V = 166.05 m^2			

LEVELING CONCRETE (CLASS E)

V = (B1 + 0.20)*(A1 + 0.20)* 0.10

= (6.50 + 0.20)*(8.85 + 0.20)* 0.10 = 6.06 m3

(A-1,A-2 = 12.12 m3)

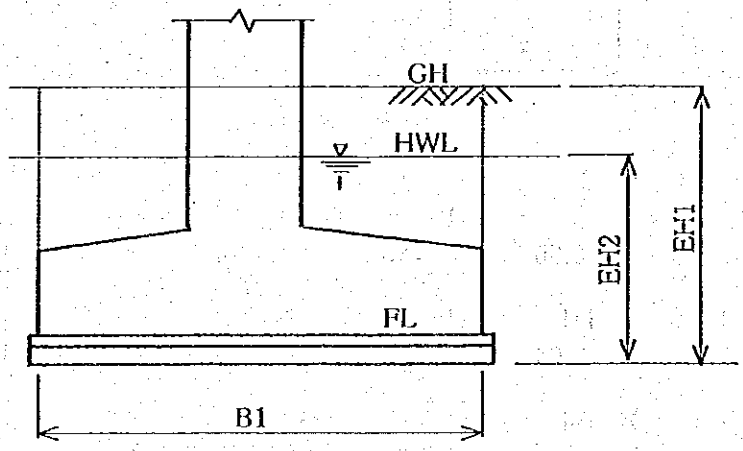
BLINDING STONE

V = (B1 + 0.20)*(A1 + 0.20)* 0.20

= (6.50 + 0.20)*(8.85 + 0.20)* 0.20 = 12.13 m3

(A-1,A-2 = 24.26 m3)

EXCAVATION



EH1=GH-FL+0.3

EH2=HWL-FL+0.3

GH = -2.700

HWL = -0.811

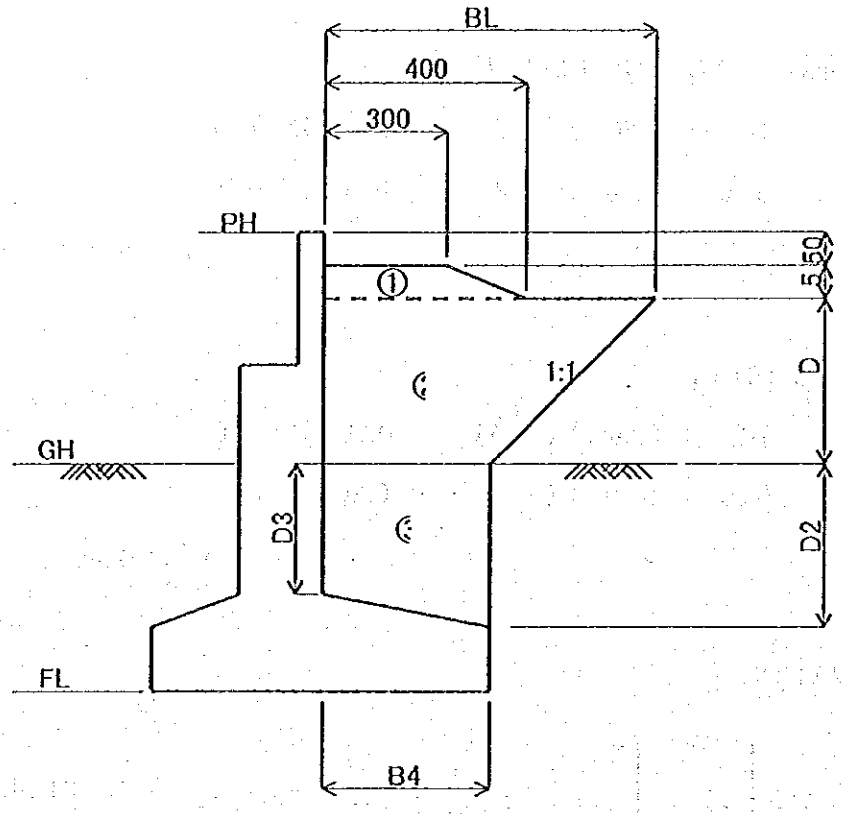
FL = -5.858

EH1 = 3.46

EH2 = 5.35

			B1		A1		Hn		V
1. EXC.<2m	:	V1 =	6.50	*	8.85	*	2.00	=	115.1 m^3
2. 2m<EXC.<4m	:	V2 =	6.50	*	8.85	*	1.46	=	84.0 m^3
3. EXC.>=4m	:	V3 =	6.50	*	8.85	*	0.00	=	0.0 m^3
4. INTO GROUND WATE	:	V4 =	6.50	*	8.85	*	5.35	=	307.8 m^3

GRANULAR BACKFILL



A1

V1 = 0.5 *(3.00 + 4.00)* 0.50 * 8.85 = 15.49 m^3

V2 = 0.5 *(B4 + BL)* D1 * A1
= 0.5 *(2.57 + 5.61)* 3.04 * 8.85 = 110.14 m^3

V3 = 0.5 *(D2 + D3)* B4 * A1
= 0.5 *(2.06 + 2.06)* 2.57 * 8.85 = 46.81 m^3

TOTAL = 172.44 m^3

REINFORCING BAR

		A1	A2				TOTAL
STATION							
FOOTING	(kg)						
COLUMN	(kg)						
C-PIER HEAD	(kg)						
OTHER	(kg)						
TOTAL of STRUCTURE	(kg)	5713	5713				11426
PILE HEAD	(kg)	1410	1410				2820
TOTAL	(kg)	7123	7123				14246
REMARK							

6.06 6.06

Name of Structure	ASIN No.2 BRIDGE SUB-STRUCTURE, FOR SCAFOLDING AND FORM SUPPORT	Category Calculation	Work Volume	Page	1/2

SUMMARY OF SCAFOLDING AND FORM SUPPORT VOLUME
FOR ASIN RIVER DRAINAGE SYSTEM IMPROVEMENT.

No	Structure	Volume	
		Scafolding (m^2)	Form Support (m^3)
1	Asin Pumping Station	1342	941
2	Asin Pumping Station, Gate	732	254
3	Asin Box Culvert	1843	1358
4	Asin Box Culvert Inlet Structure	54	11
5	Asin Box Culvert Outlet Structure	62	16
6	Secondary Channel Outlet on Asin River	-	34
7	Fuel Tank Box for Asin Pumping Station	133	62
8	Asin Pumping Station Bridge, Sub Structure	166	-
9	Asin No.1 Bridge, Sub Structure	293	-
10	Asin No.2 Bridge, Sub Structure	251	-
Total		4876	2676

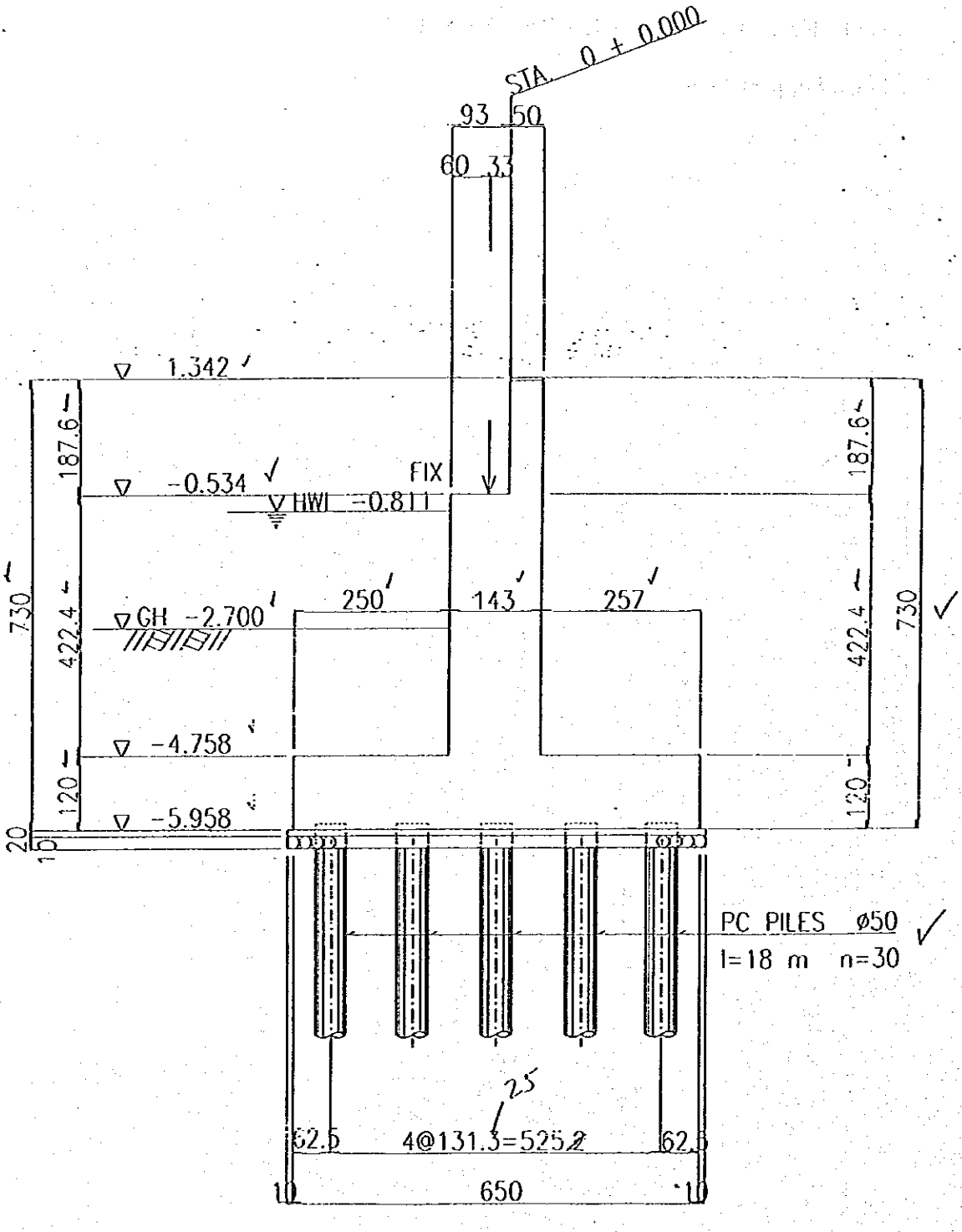
Name of Structure	ASIN No.2 BRIDGE SUB-STRUCTURE, FOR SCAFOLDING AND FORM SUPPORT	Category Calculation	Work Volume	Page	2/2

1. **Scafolding Area**

   $(2 \times 6.1 \times 8.85) + (2 \times 6.1 \times 1.43) = 125.416\ m^2$

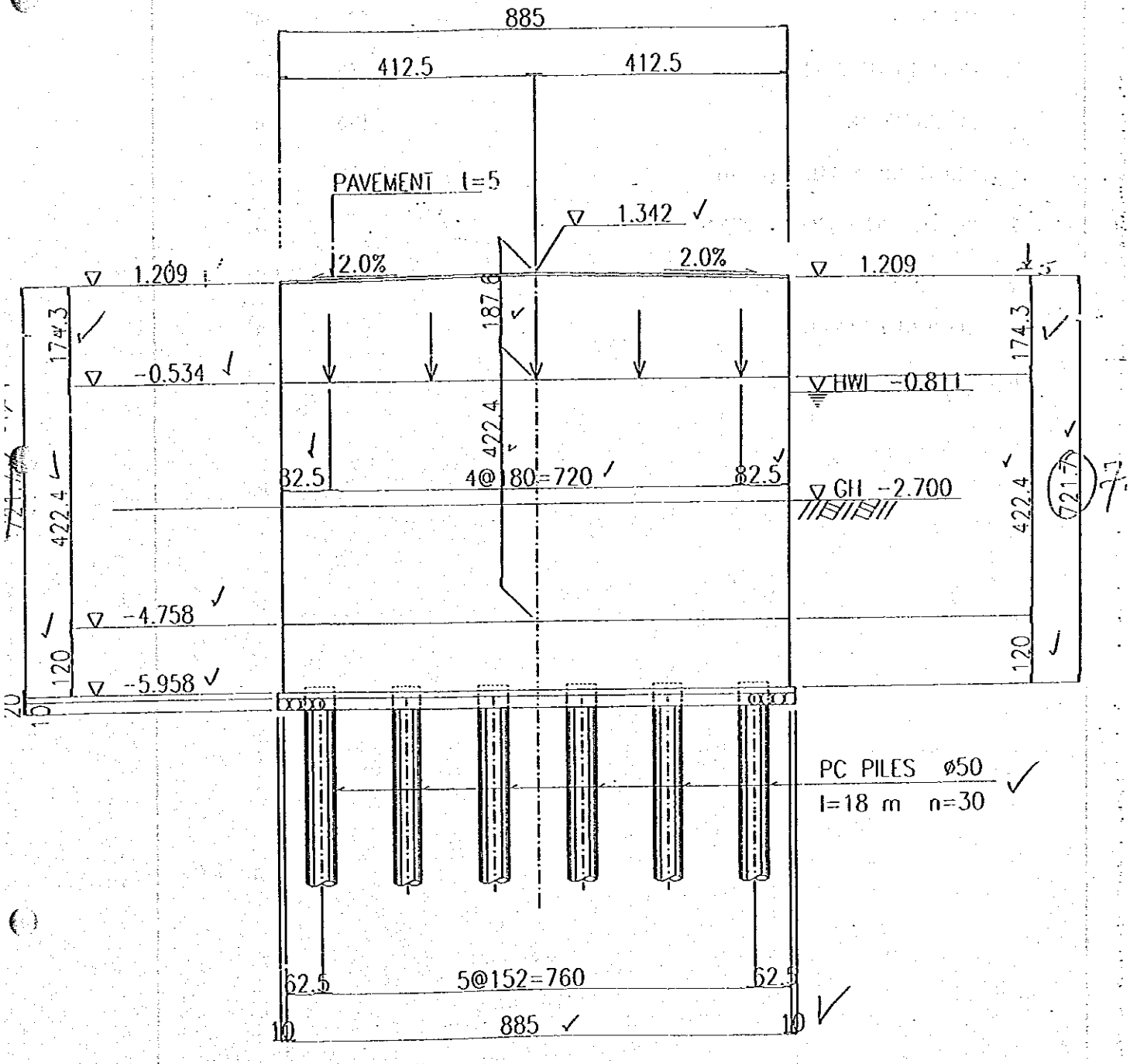
   For both side abutment $= 2 \times 125.416 = 250.832\ m^2$

2. **Form Support Area**



PROFILE

SCALE A



ELEVATION

SCALE A

Name of Structure	WATER SUPPLY PIPE RECONSTRUCTION	Category Calculation	Works Volume	Page	1/4

WATER SUPPLY PIPE RECONSTRUCTION
SUMMARY OF WORK VOLUME

1.	STRUCTURE EXCAVATION	=	561	m^3
2.	BACK FILL	=	524	m^3
3.	CONCRETE, TYPE C1	=	35	m^3
4.	FORM WORK	=	136	m^2
5.	REINFORCING BAR (U 30)	=	3,230	Kg
6.	PIPE CONNECTION WORKS	=	2	(LS)
7.	DEWATERING	=	2	(LS)
8.	CONCRETE TYPE E	=	2	m^3
9.	FORM WORK	=	3	m^2

Name of Structure	WATER SUPPLY PIPE RECONSTRUCTION	Category Calculation	Works Volume	Page	2/4

C.10.1 Coffering and Dewatering

C.10.2 Structural Excavation

$h = 0.7 + 3.3 = 4.00$

$b_1 = 2.30$ m $\quad b_2 = 2.30$ m $\quad A_1 = 2.3 \times 2.3 = 5.29$

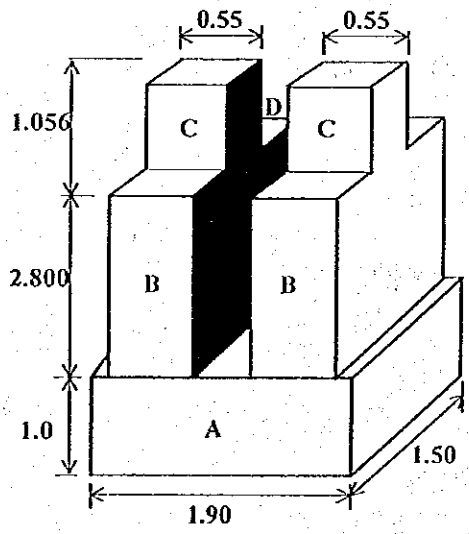
$ba_1 = 10.3$ m $\quad ba_2 = 6.30$ m $\quad A_2 = 10.3 \times 6.3 = 64.90$

$$\text{Volume} = \frac{5.29 + 64.9}{2} \times 4.0 = 140.38 \text{ m}^3$$

Total excavation $= 2 \times 140.38 = 280.76$ m³ (Left + Right)

For two (2) locations : $2 \times 280.76 = 561.52$ m³

C.10.4 Concrete Type C_1 including Form Work



A = 1.9 × 1.9 × 1 = 3.610 m

B = 0.55 × 1.5 × 2.8 × 2 = 4.620 m

C = 0.55 × 0.3 × 1.056 × 2 = 0.340 m

D = 0.40 × 0.30 × 1.054 = 0.126 m

= 8.696 m

Total V = 2 × 8.696 = 17.392 (Left + Right)

For two (2) locations = 2 × 17.39 = 34.78 m³

Form Work = A = 1.9 × 1 × 4 = 7.60 m²

B = (0.55 × 2.8)× 4 + (1.5 × 2.8)× 4 = 22.96 m²

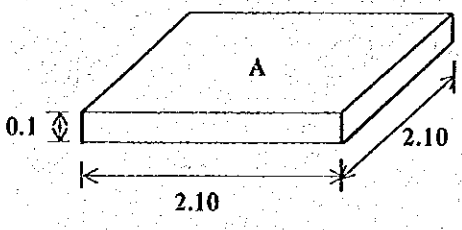
C = (0.55 × 1.056)× 4 + (0.3 × 1.056)× 4 = 3.58 m²

= 34.14 m²

Total Area = 2 × 34.14 = 68.28 m² (Left + Right)

For two (2) locations = 2 × 68.28 = 136.56 m³

C.10.4 Concrete Type C_1 including Form Work



A = 2.10 × 2.10 × 0.1 = 0.441 m³

Total V = 2 × 0.441 = 0.882 (Left + Right)

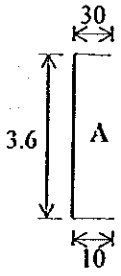
For two (2) locations = 2 × 0.882 = 1.764 m³

Total Area = 2 × 0.84 = 1.68 m² (Left + Right)

For two (2) locations = 2 × 1.68 = 3.36 m³

Name of Structure	WATER SUPPLY PIPE RECONSTRUCTION	Category Calculation	Works Volume	Page	3/4

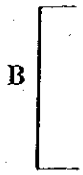
C.10.6 Deformed Reinforcing Bar



26 D 19 Length = 3.6 + 0.4 = 4 m

Weight A = 26 × 4 × 2.23 = 231.92 kg

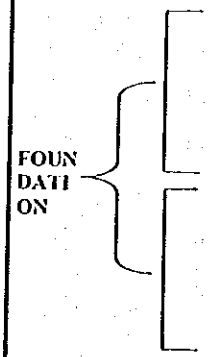
Total weight A = 2 × 231.92 = 463.84 kg



35 D 13 Length = 1.30 m

Weight B = 35 × 1.30 × 1.04 = 47.32 kg

Total weight B = 2 × 231.92 = 463.84 kg

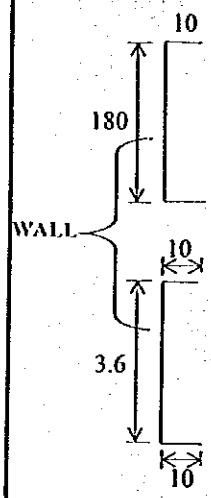


24 D 19 Length = 1.70 m

Total weight B = 24 × 1.70 × 2.23 = 90.98 kg

24 D 19 Length = 1.70 m

Total weight B = 24 × 1.70 × 2.23 = 90.98 kg



6 D 19 Length = 1.90

Weight = 6 × 1.90 × 2.23 = 25.42 kg

Total weight = 2 × 25.42 = 50.84 kg

12 D 13 Length = 0.55 m

Weight = 12 × 0.55 × 1.04 = 6.86 kg

Total weight= 2 × 6.86 = 13.72 kg

Total weight = 486.3 + 97.34 + 90.98 + 90.98 + 50.84 + 13.72 = 807.7 kg

For two (2) foundations = 2 × 807.7 = 1615.4 kg (Left + Right)

For two (2) locations = 2 × 1615.4 = 3230.8 kg

Name of Structure	WATER SUPPLY PIPE RECONSTRUCTION	Category Calculation	Works Volume	Page	4/4

C.10.3 Backfill

Volume = 280.76 – 17.39 = 262.49

For two (2) locations : 262.49 x 2 = 524.98 m³

Name of Structure	TELEPHONE CABLE DUCT RECONSTRUCTION	Category Calculation	Works Volume	Page	1/3

TELEPHONE CABLE DUCT RECONSTRUCTION
SUMMARY OF WORK VOLUME

1.	STRUCTURE EXCAVATION	=	280	m^3
2.	BACK FILLING	=	270	m^3
3.	CONCRETE, TYPE C1	=	9.62	m^3
4.	FORM WORK TYPE C1	=	22	m^2
5.	LEVELING CONCRETE, TYPE E	=	0.88	m^3
6.	REINFORCING BAR, U 30	=	896	Kg
7.	STEEL SHEET PILE (TYPE II)	=	-	
8.	CABLE CONNECTION WORKS	=	1	(LS)
9.	DEWATERING	=	1	(LS)
10.	FORM WALK TYPE E	=	1.68	m^2

Name of Structure	TELEPHONE CABLE DUCT RECONSTRUCTION	Category Calculation	Works Volume	Page	2/3

C.11.1 Coffering and Dewatering

C.11.2 Structural Excavation

$h = 0.7 + 3.3 = 4.00$ m

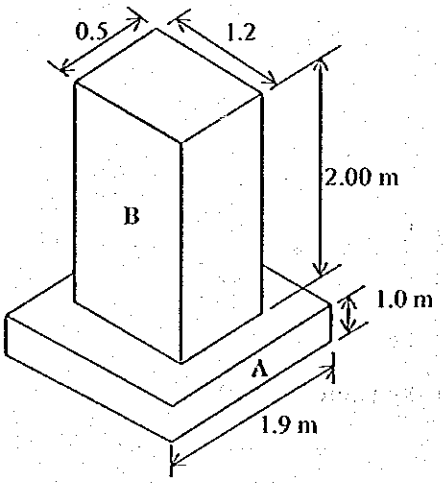
$b_1 = 2.30$ m $\quad b_2 = 2.30$ m $\quad A_1 = 2.3 \times 2.3 = 5.29$

$ba_1 = 10.3$ m $\quad ba_2 = 6.30$ m $\quad A_2 = 10.3 \times 6.3 = 64.90$

$$\text{Volume} = \frac{5.29 + 64.9}{2} \times 4.0 = 140.38 \text{ m}^3$$

Total excavation $= 2 \times 140 = 280$ m³ **(Left + Right)**

C.11.4 Concrete Type C_1 including Form Work



$A = 1.9 \times 1.9 \times 1 = 3.61$ m

$B = 0.5 \times 1.2 \times 2 = 1.20$ m

$= 4.81$ m

Total $V = 2 \times 4.81 = 9.62$ (Left + Right)

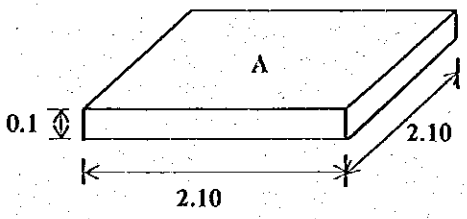
Form Work $= A_F = 1.9 \times 1 \times 4 = 7.60$ m²

Form Work $= B_F = 0.5 \times 2 + 1.2 = 3.40$ m²

Total $= 11.00$ m²

Total Area $= 2 \times 11 = 22$ m² (Left + Right)

C.11.5 Concrete Type E including Form Work



$A = 2.10 \times 2.10 \times 0.1 = 0.441$ m³

Total $V = 2 \times 0.441 = 0.882$ (Left + Right)

Form Work $= 2.1 \times 0.1 \times 4 = 0.84$³

Total Area $= 2 \times 0.84 = 1.68$ m² (Left + Right)

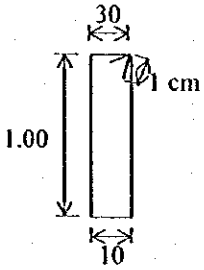
Name of Structure	TELEPHONE CABLE DUCT RECONSTRUCTION	Category Calculation	Works Volume	Page	3/3

C.11.6 Deformed Reinforcing Bar

20 D 19 Length = 3.0 m

Weight A = 20 × 3 × 2.23 = 133 kg

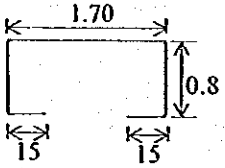
Total weight A = 2 × 133 = 266 kg (Left + Right)



24 D 13 Length = 260 + 14 = 2.74 m

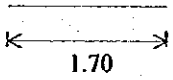
Weight B = 24 × 2.74 × 1.04 = 68.4 kg

Total weight B = 2 × 68.4 = 136.8 kg (Left + Right)



14 D 19 Length = 2.8 m

Weight = 14 × 2.8 × 2.23 = 87.42 kg



14 D 19 Length = 1.7 m

Weight = 14 × 1.7 × 2.23 = 53.07 kg

= 3 × 53.07 = 159.00 kg +

Σ Weight = 87.42 + 159 = 246.42 kg

Total Weight = 2 × 246.42 = 492.84 kg (Left + Right)

Total Deformed Reinforcing Bar :

266 +137 + 493 = 896 kg (Left + Right)

C.11.3 Backfill

Backfill = 280 – 9.62 – 0.88 = 269.5 (Left + Right)

Name of Structure	SECONDARY CHANNEL OUTLET ON ASIN RIVER	Category Calculation	Work Volume	Page	1/8

SECONDARY CHANNEL OUTLET RECONSTRUCTION
SUMMARY OF WORK VOLUME

1.	SOIL EXCAVATION	=	381.61	m^3
2.	LEVELING CONCRETE, TYPE E	=	6.60	m^3
3.	CONCRETE, TYPE C1	=	37.36	m^3
4.	WET COBBLE MASONRY	=	197.20	m^3
5.	GRAVEL FILLING	=	134.80	m^3
6.	REINFORCING STEEL BAR	=	3,139	Kg
7.	GRAVEL BEDDING	=	117.98	m^3
8.	COBBLE STONE	=	0.25	m^3
9.	WEEP HOLE, PVC Ø 50 mm	=	132	Nos
10.	LOG PILE Ø 150, L=3,000	=	189.00	m
11.	POINTING	=	32.55	m^2

Name of Structure	SECONDARY CHANNEL OUTLET ON ASIN RIVER	Category Calculation	Work Volume	Page	2/8

1. Cobble Stone

   (a) For each structure = $1.5 \times 0.15 \times 5 = 1.125$ m³

   (b) For Type A Structure

   - $Bj.G_1 = 2 \times 1.3 \times 0.15 \times 1.9 = 0.741 + 1.125 = 1.886$ m³
   - $HU.G_{15} = 2 \times 0.7 \times 0.15 \times 1.35 = 0.283 + 1.125 = 1.408$ m³
   - $HU.G_{16} = 2 \times 1.05 \times 0.15 \times 2.20 = 0.693 + 1.125 = 1.818$ m³
   - $HU.G_{18} = 2 \times 0.95 \times 0.15 \times 5.40 = 1.539 + 1.125 = 2.664$ m³
   - $HU.G_{13} = 2 \times 0.70 \times 0.15 \times 6.15 = 1.292 + 1.125 = 2.417$ m³

2. Log Pile

   (a) For each structure = $3 + 6 \times 2 = 15$ nos

   (b) For Type A Structure

   - $Bj.G_1 = \frac{1.9}{1.0} + 15 = 3 + 15 = 18$ nos
   - $HU.G_{15} = \frac{1.35}{1.0} + 15 = 3 + 15 = 18$ nos
   - $HU.G_{16} = \frac{2.2}{1.0} + 15 = 4 + 15 = 19$ nos
   - $HU.G_{18} = \frac{5.4}{1.0} + 15 = 7 + 15 = 22$ nos
   - $HU.G_{13} = \frac{6.15}{1.0} + 15 = 7 + 15 = 22$ nos

3. Form Work of Leveling Concrete

   $5 \times (0.1 \times 5 \times 2 + 0.1 \times 5 \times 2) = 10$ m²

4. Pointing

   - $Bj.G_1 = 2 \times 2.0 \times 1.9 = 7.60$
   - $HU.G_{15} = 2 \times 0.55 \times 1.35 = 1.49$
   - $HU.G_{16} = 2 \times 1.20 \times 2.2 = 5.28$
   - $HU.G_{18} = 2 \times 1.0 \times 5.4 = 10.80$
   - $HU.G_{13} = 2 \times 0.6 \times 6.15 = 7.38$

   $= 32.55$ m²

5. **Soil Excavation (Type B)**

$$(El_2 + 2.70 + 1) \times L_2 \times 5$$

6. **Leveling Concrete**

$$0.1 \times 0.7 \times 5 + 0.1 \times 0.5 \times 5 = 0.60 m^3$$

7. **Concrete K_{225}**

– Top concrete	=	$0.3 \times 0.70 \times 5$	=	1.05 m³
– Box concrete	=	$0.2 \times 0.50 \times 5$	=	0.50 m³
		$\frac{0.3 + 0.5}{2} \times 0.3 \times 5$	=	0.60 m³
Volume			=	2.150 m³

– Cover slab = $t_3 \times (W + 2b) \times L_5$

8. **Wet Cobble Masonry**

$$\left(\frac{0.45 + 0.9}{2} \times (El1 + 2.7)\right) \times 5 - (H - W) + \left(\frac{(b + b_1)}{2} \times H \times 2 + H_1 \times B_1 \times 2 + 0.30 \times W\right) \times L_5$$

9. **Gravel Filling**

$$((t_2 \times 2) + (t_2 - 0.43) \times 5) \times 5$$

10. **Reinforcing Steel**

See Bar bending schedule & bar weight.

11. **Gravel Bedding**

$$0.25 \times (El + 2.70 + 2.10 + \sqrt{2^2 + 1^2}) \times 5$$

12. **Boulder Filling**

$$\left(\frac{1 + 0.3}{2} \times 0.6\right) \times 0.6 \times 5$$

13. **Weep Hole**

$2 \times 2 \times 0.90 = 3.60$ m

14. **Wooden Pile**

Ø150, L = 300 ctc = 1.000
4 × 2 = 8 bar

15. **Wooden Pile**

Ø150, L = 300 ctc = 1.000

16. **Road Pavement**

5 × 5 = 25 m²

SUMMARY OF SCAFOLDING AND FORM SUPPORT VOLUME FOR ASIN RIVER DRAINAGE SYSTEM IMPROVEMENT.

No	Structure	Volume	
		Scafolding (m^2)	Form Support (m^3)
1	Asin Pumping Station	1342	941
2	Asin Pumping Station, Gate	732	254
3	Asin Box Culvert	1843	1358
4	Asin Box Culvert Inlet Structure	54	11
5	Asin Box Culvert Outlet Structure	62	16
6	Secondary Channel Outlet on Asin River	-	34
7	Fuel Tank Box for Asin Pumping Station	133	62
8	Asin Pumping Station Bridge, Sub Structure	166	-
9	Asin No.1 Bridge, Sub Structure	293	-
10	Asin No.2 Bridge, Sub Structure	251	-
Total		4876	2676

Name of Structure	SECONDARY CHANNEL OUTLET ON ASIN RIVER FOR SCAFOLDING AND FORM SUPPORT	Category Calculation	Work Volume	Page	8/8

1. Scafolding Area

-

2. Form Support Area

(a)	$Bj.G_1$	= $1.9 \times 3.75 \times 2.0$	=	14.25
(b)	$HU.G_{15}$	= $1.35 \times 0.60 \times 0.55$	=	0.45
(c)	$HU.G_{16}$	= $2.20 \times 2.40 \times 1.20$	=	6.34
(d)	$HU.G_{18}$	= $5.40 \times 2.0 \times 1.0$	=	10.80
(e)	$HU.G_{13}$	= $6.15 \times 0.60 \times 0.6$	=	2.21
	(a)+(b)+(c)+(d)+(e)		=	34.05 m²

3. Form Work

-	$Bj.G_1$	= 3.75×2.0	=	7.50
-	$HU.G_{15}$	= 0.6×0.55	=	0.33
-	$HU.G_{16}$	= 2.4×1.20	=	2.88
-	$HU.G_{18}$	= 2.0×1.0	=	2.00
-	$HU.G_{13}$	= 0.6×0.6	=	0.36
			=	13.07 m²

Name of Structure	TELEPHONE CABLE DUCT RECONSTRUCTION	Category Calculation	Works Volume	Page	1/3

TELEPHONE CABLE DUCT RECONSTRUCTION
SUMMARY OF WORK VOLUME

1.	STRUCTURE EXCAVATION	=	280	m^3
2.	BACK FILLING	=	270	m^3
3.	CONCRETE, TYPE C1	=	9.62	m^3
4.	FORM WORK TYPE C1	=	22	m^2
5.	LEVELING CONCRETE, TYPE E	=	0.88	m^3
6.	REINFORCING BAR, U 30	=	896	Kg
7.	STEEL SHEET PILE (TYPE II)	=	-	
8.	CABLE CONNECTION WORKS	=	1	(LS)
9.	DEWATERING	=	1	(LS)
10.	FORM WALK TYPE E	=	1.68	m^2

Name of Structure	TELEPHONE CABLE DUCT RECONSTRUCTION	Category Calculation	Works Volume	Page	2/3

C.11.1 Coffering and Dewatering

C.11.2 Structural Excavation

h = 0.7 + 3.3 = 4.00 m

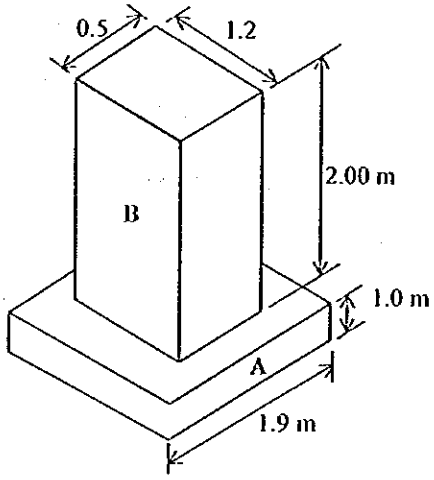
b_1 = 2.30 m b_2 = 2.30 m A_1 = 2.3 × 2.3 = 5.29

ba_1 = 10.3 m ba_2 = 6.30 m A_2 = 10.3 × 6.3 = 64.90

$$\text{Volume} = \frac{5.29 + 64.9}{2} \times 4.0 = 140.38 \text{ m}^3$$

Total excavation = 2 × 140 = 280 m³ (Left + Right)

C.11.4 Concrete Type C_1 including Form Work



A = 1.9 × 1.9 × 1 = 3.61 m

B = 0.5 × 1.2 × 2 = 1.20 m

= 4.81 m

Total V = 2 × 4.81 = 9.62 (Left + Right)

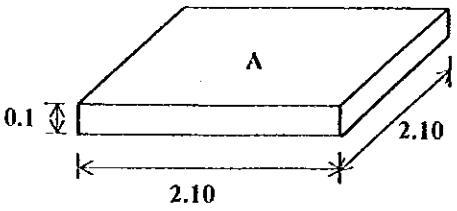
Form Work = A_F = 1.9 × 1 × 4 = 7.60 m²

Form Work = B_F = 0.5 × 2 + 1.2 = 3.40 m²

Total = 11.00 m²

Total Area = 2 × 11 = 22 m² (Left + Right)

C.11.5 Concrete Type E including Form Work



A = 2.10 × 2.10 × 0.1 = 0.441 m³

Total V = 2 × 0.441 = 0.882 (Left + Right)

Form Work = 2.1 × 0.1 × 4 = 0.84³

Total Area = 2 × 0.84 = 1.68 m² (Left + Right)