

3.2 Main Weir
3.2.1 CENTER PIER

TYPE OF WORK : CONCRETE (TYPE-C1)
LOCATION : GATE PIER (I)

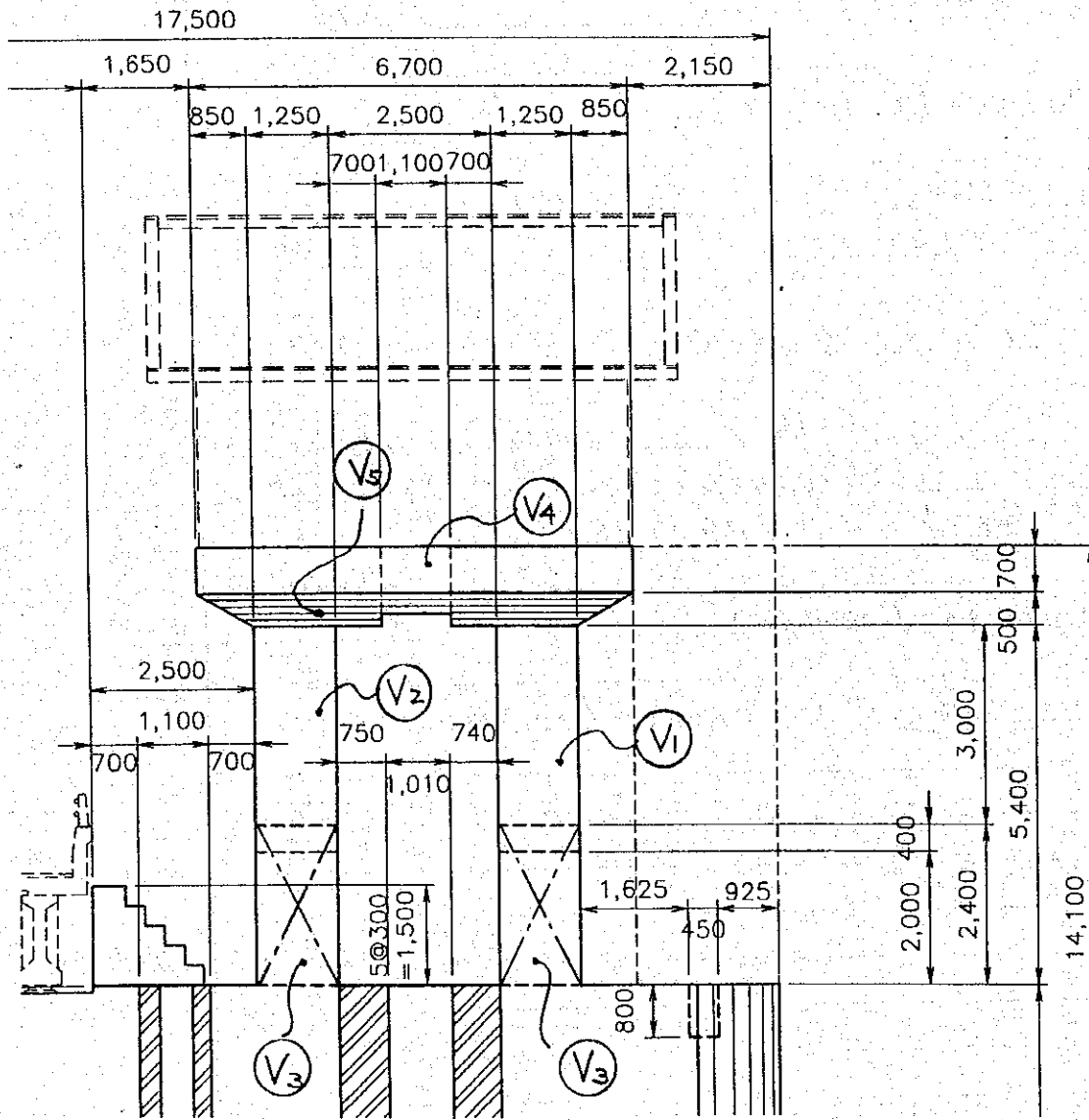
PER 1 PLACE

CALCULATION	RESULT
$V_1 = 5.40 \times 1.25 \times 2.50 = 16.875$	
$V_2 = 5.40 \times 1.25 \times 2.50 = 16.875$	
(Deduction for Gallery)	
$V_3 = - \left(\frac{\pi}{4} \times 0.80^2 \times \frac{1}{2} + 2.00 \times 0.80 \right) \times 1.25 \times 2 = -4.628$	
$V_4 = 6.70 \times 6.70 \times 0.70 = 31.423$	
$V_5 = \left\{ (2.10 \times 0.50 \times \frac{1}{2}) \times 5.00 + (2.10 \times 0.50 \times \frac{1}{2}) \times 0.85 \times \frac{1}{3} \times 2 \right\} \times 2 + \left\{ (0.85 \times 0.50 \times \frac{1}{2}) \times 1.25 + (0.85 \times 0.50 \times \frac{1}{2}) \times 2.10 \times \frac{1}{3} \times 2 \right\} \times 2 + 5.00 \times 1.25 \times 0.50 = 10.096$	
(Deduction for Openings)	
$V_6 = - (1.10 \times 1.01 + 0.30 \times 0.19 + \frac{1}{2} \times 0.80 \times 0.19) \times 1.10 \times 2 = -2.737$	
Total = 67.904	67.904 m ³

TYPE OF WORK : CENTER PIER
 : CONCRETE WORK
 LOCATION : GATE PIER (I)

(1/2)

EXPLANATORY DRAWING



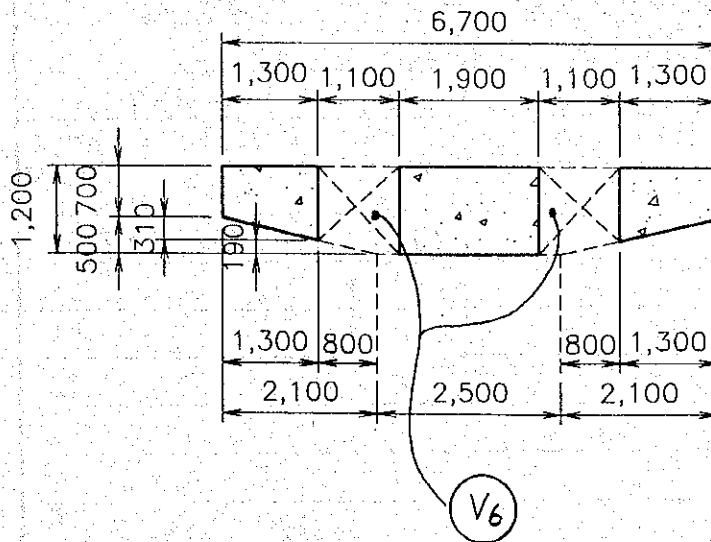
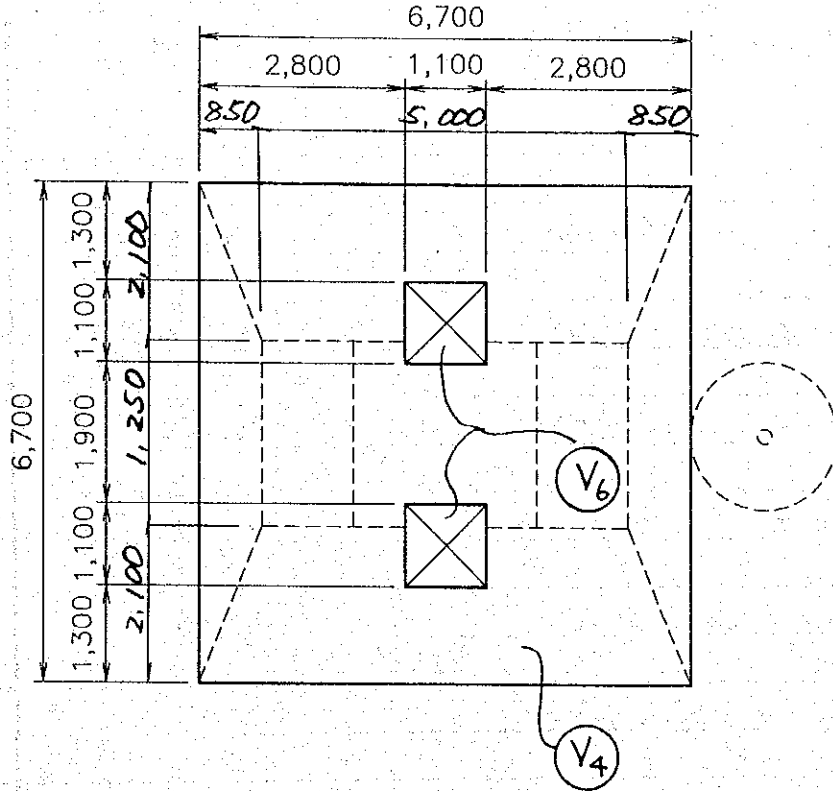
CENTER PIER

TYPE OF WORK : CONCRETE WORK

LOCATION : GATE PIER (I)

(2/2)

EXPLANATORY DRAWING

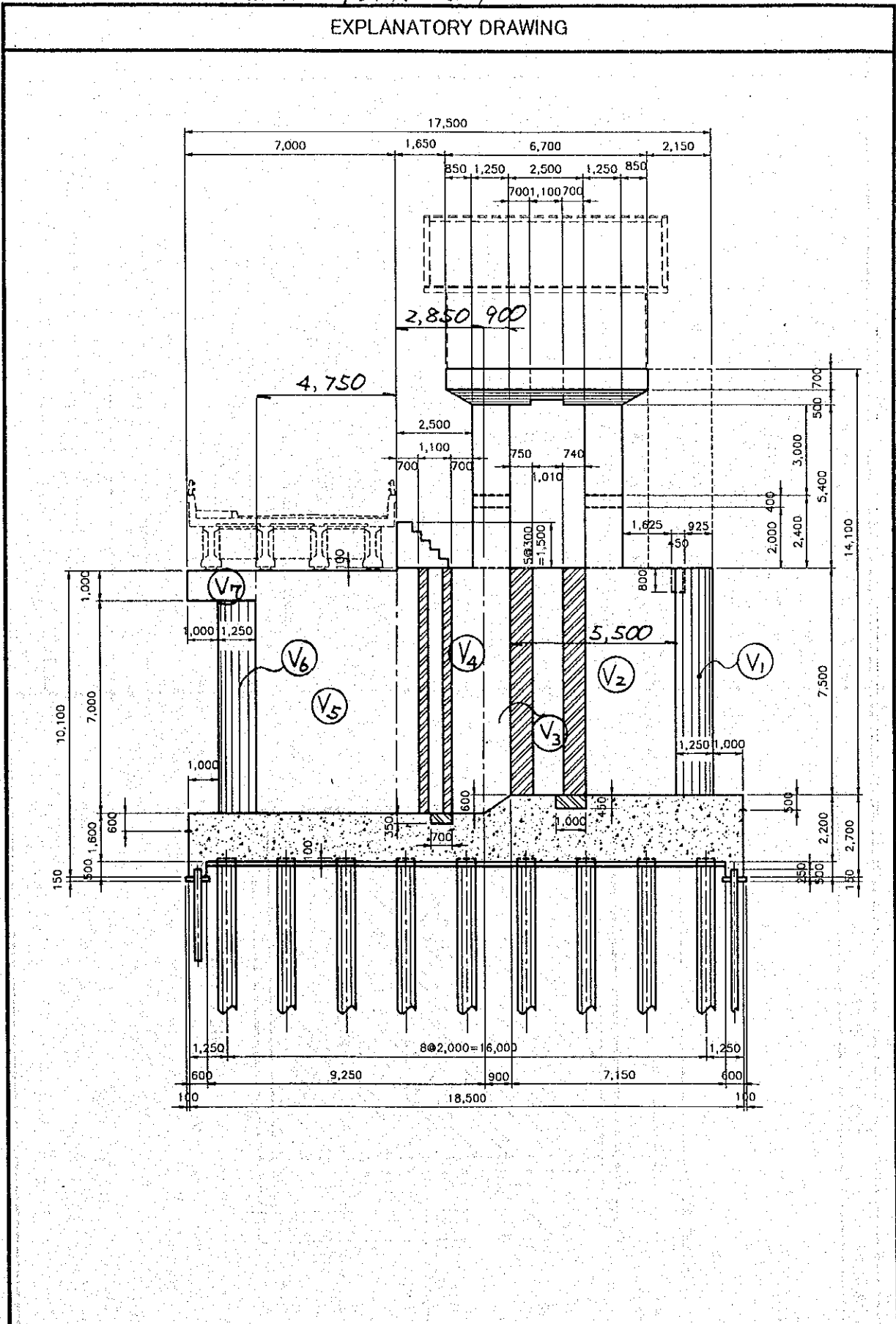


TYPE OF WORK : CENTER PIER
 : CONCRETE (TYPE-C1)
 LOCATION : GATE PIER (II)

CALCULATION	RESULT
$V_1 = \frac{\pi}{4} \times 2.50^2 \times 7.50 \times \frac{1}{2} = 18.408$	
$V_2 = 7.50 \times 5.50 \times 2.50 = 103.125$	
$V_3 = (7.50 + 8.10) \times \frac{1}{2} \times 0.90 \times 2.50 = 17.550$	
$V_4 = 2.85 \times 8.10 \times 2.50 = 57.713$	
$V_5 = 4.75 \times 8.00 \times 2.50 = 95.000$	
$V_6 = \frac{\pi}{4} \times 2.50^2 \times 7.00 \times \frac{1}{2} = 17.181$	
$V_7 = 2.25 \times 1.00 \times 2.50 = 5.625$	
(Deduction for stairs base)	
$V_8 = -(0.45 \times 0.45 \times 0.80) = 0.162$	
(Deduction for Blockout)	
$V_{9-1} = -(2.50 \times 0.60 \times 7.50) \times 2 = -22.500$	
$V_{9-2} = -(1.10 \times 0.35 \times 8.10) \times 2 = -6.237$	
$Total V = 286.027$	$286.027 m^3$

CENTER PIER
 TYPE OF WORK : CONCRETE (TYPE-CI)
 LOCATION : GATE PIER (II)

EXPLANATORY DRAWING



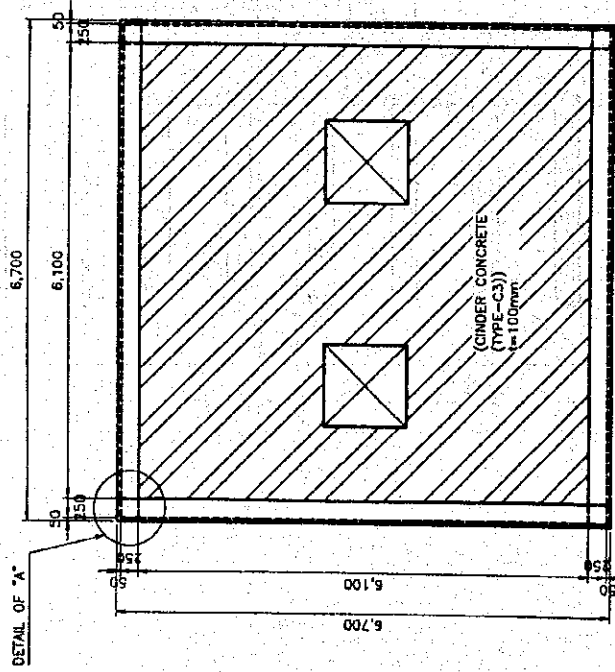
CENTER PIER

TYPE OF WORK :

CINDER CONCRETE

LOCATION :

GATE PIER



TYPE OF WORK :	CALCULATION	RESULT
LOCATION :	(TYPE - C3)	
	$V = 6.10 \times 6.10 \times 0.10 = 3.72$	3.72 m ³
	• FORM (H < 4.0m)	
	$A_1 = 6.10 \times 0.10 \times 4 = 2.440$	
	$A_2 = 1.10 \times 0.10 \times 4 \times 2 = 0.880$	
	TOTAL = 3.320	3.320 m ²

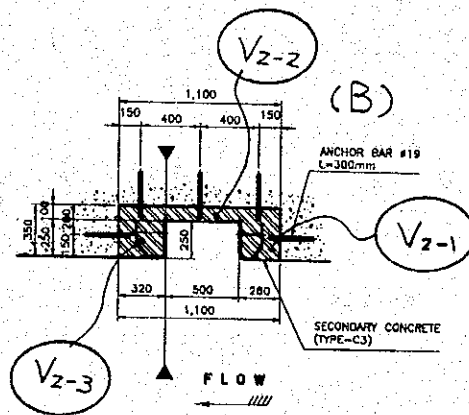
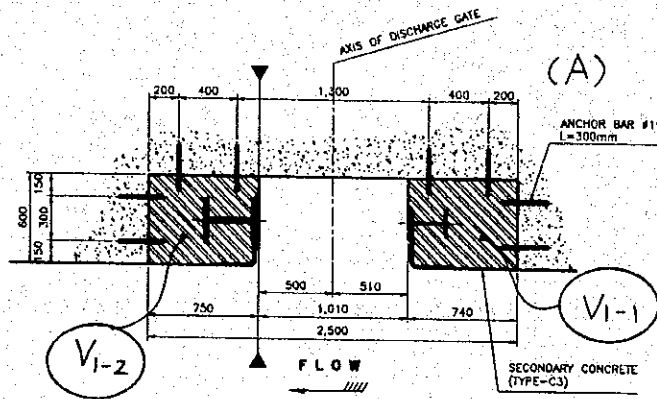
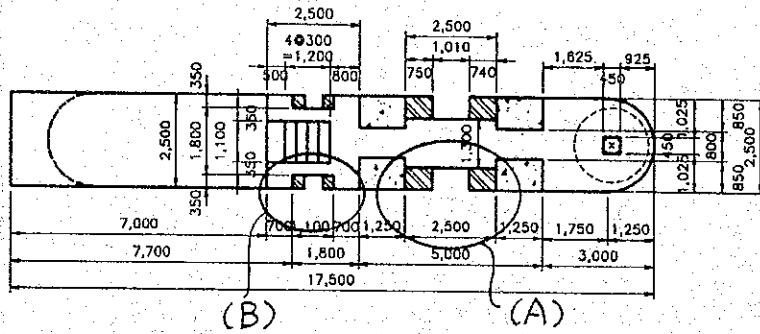
TYPE OF WORK : CENTER PIER
 : SECONDARY CONCRETE
 LOCATION : GATE PIER

CALCULATION	RESULT
(TYPE - C3)	
$V_{1-1} = 0.74 \times 0.60 \times 7.50 \times 2 = 6.660$	
$V_{1-2} = 0.75 \times 0.60 \times 7.50 \times 2 = 6.750$	
$V_{2-1} = 0.28 \times 0.35 \times 8.10 \times 2 = 1.588$	
$V_{2-2} = 0.50 \times 0.10 \times 8.10 \times 2 = 0.810$	
$V_{2-3} = 0.32 \times 0.35 \times 8.10 \times 2 = 1.814$	
$V_3 = 1.50 \times 0.45 \times 0.60 \times 2 = 0.810$	
$V_4 = 2.00 \times 0.45 \times 1.00 \times 2 = 1.800$	
$V_5 = 2.50 \times 0.75 \times 0.45 \times 2 = 1.688$	
$V_6 = 1.50 \times 0.60 \times 0.35 \times 2 = 0.630$	
$V_7 = 1.90 \times 0.70 \times 0.35 \times 2 = 0.931$	
$V_8 = 0.60 \times 1.10 \times 0.35 \times 2 = 0.462$	
$TOTAL = 23.943$	23.943 m^3

TYPE OF WORK : CENTER PIER
 : SECONDARY CONCRETE
 LOCATION : GATE PIER

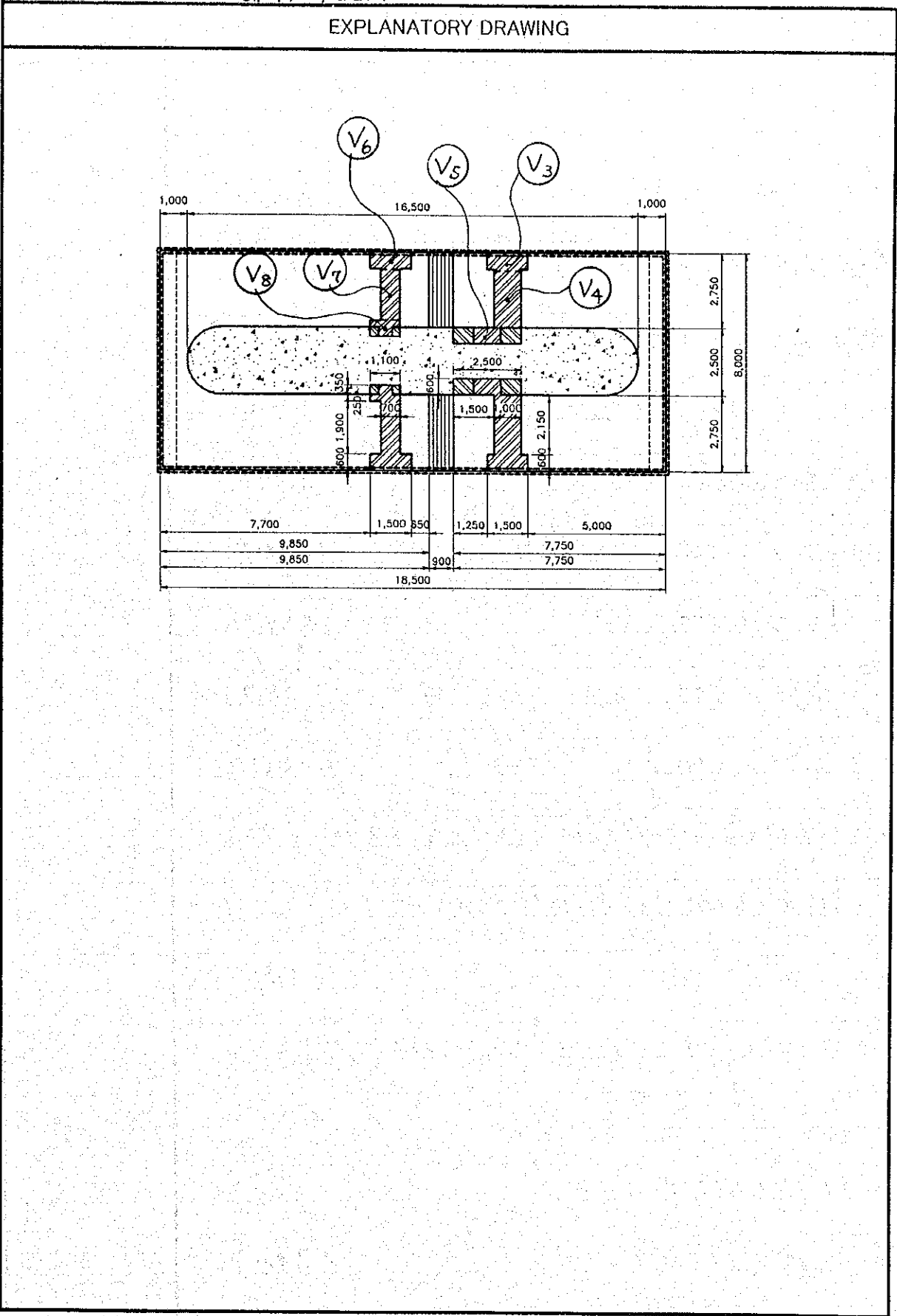
(1/2)

EXPLANATORY DRAWING



TYPE OF WORK : CENTER PIER
: SECONDARY CONCRETE
LOCATION : GATE PIER

(2/2)



TYPE OF WORK : CENTER PIER
 : FORMWORK
 LOCATION : GATE PIER (I)

(1/2)

CALCULATION	RESULT
Quantity condition : $H \cong 4.0m$	
$A_1 = 5.40 \times 2.50 \times 2 \times 2 = 54.000$	
$A_2 = 5.40 \times 1.25 \times 2 \times 2 = 27.000$	
(Deduction for Gallery)	
$A_3 = - (2.00 \times 0.80 + \frac{\pi}{4} \times 0.80^2 \times \frac{1}{2}) \times 2 \times 2 = -7.405$	
$A_4 = \pi \times 0.80 \times \frac{1}{2} \times 1.25 \times 2 = 3.142$	
$A_5 = 2.00 \times 1.25 \times 2 \times 2 = 10.000$	
$A_6 = 6.70 \times 6.70 = 44.890$	
$A_7 = 6.70 \times 0.70 \times 2 = 9.380$	
$A_8 = 6.70 \times 0.70 \times 2 = 9.380$	
$A_9 = \{ (6.70 + 2.50) \times \frac{1}{2} \times \sqrt{(0.85)^2 + (0.50)^2} \} \times 2 = 9.073$	
$A_{10} = \{ (6.70 + 5.00) \times \frac{1}{2} \times \sqrt{(2.10)^2 + (0.50)^2} \} \times 2 = 25.257$	
$A_{11} = 2.50 \times 2.50 = 6.250$	
$A_{12} = \{ (0.30 \times 1.20) \times 2 + (1.20 + 1.01) \times \frac{1}{2} \times 0.80 \times 2 \} \times 2 = 4.976$	
$A_{13} = 1.01 \times 1.10 \times 2 = 2.222$	
$A_{14} = 1.20 \times 1.10 \times 2 = 2.640$	

TYPE OF WORK
LOCATION

CENTER PIER
: FORMWORK
: GATE PIER (I)

(2/2)

CALCULATION	RESULT
(Deduction for Openings)	
$A_{15} = - (1.10 \times 1.10) \times 2 = -2.420$	
$A_{16} = - (0.30 \times 1.10) \times 2 = -0.660$	
$A_{17} = - (1.10 \times 0.80 \times \sqrt{(2.10)^2 + (0.50)^2} \div 2.10) \times 2$	
= -1.809	
$TOTAL = 195.916$	195.916 m ²

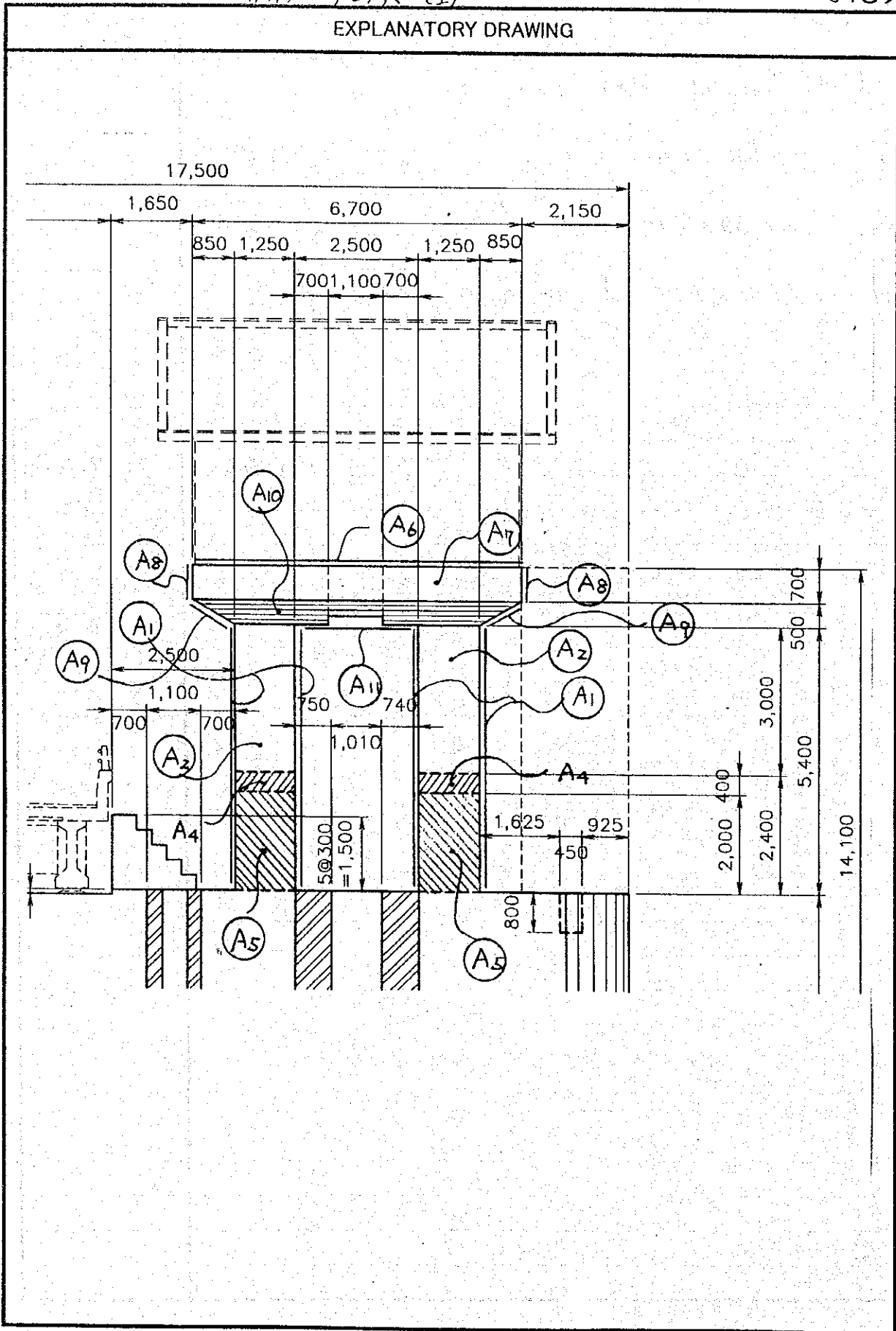
CENTER PIER

TYPE OF WORK : FORMWORK

LOCATION : GATE PIER (I)

(1/3)

EXPLANATORY DRAWING



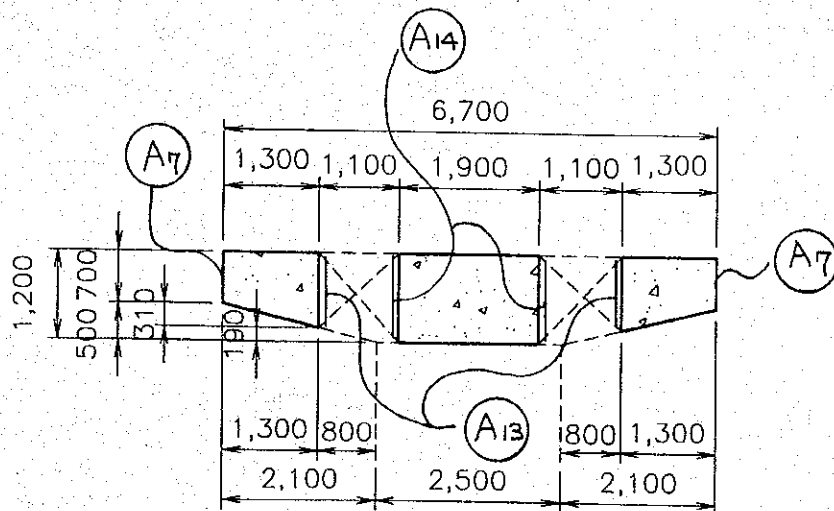
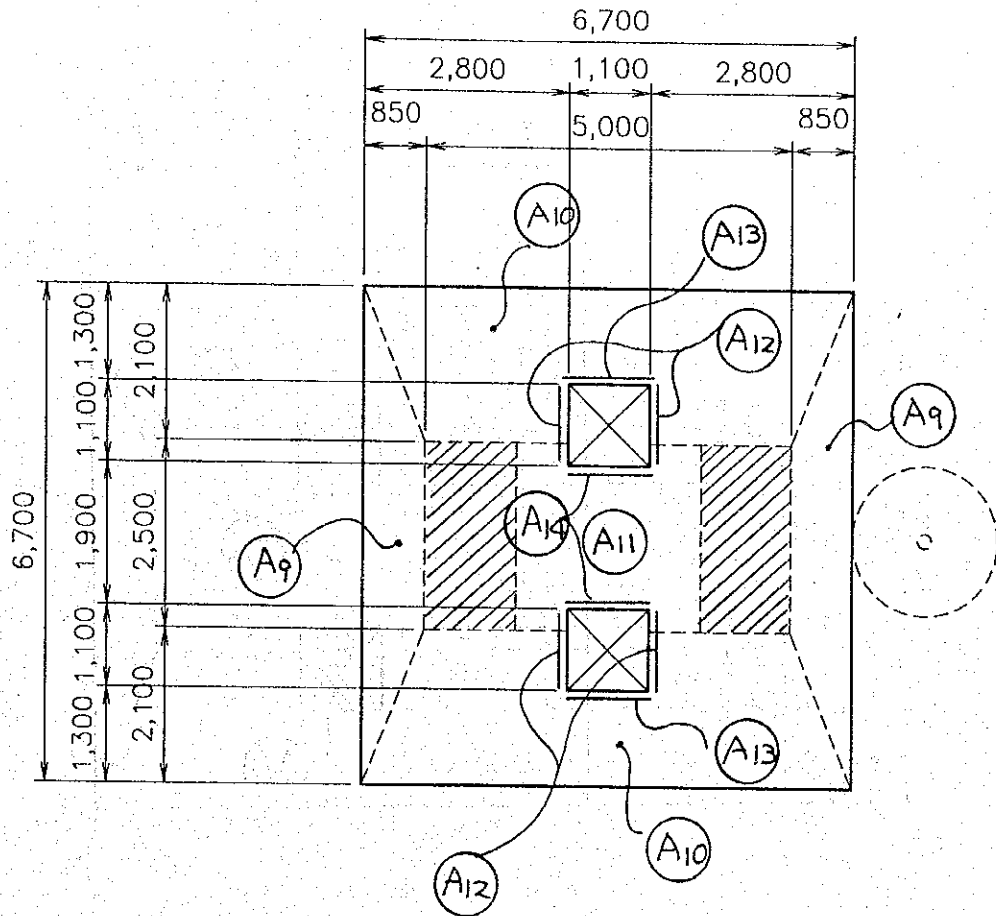
CENTER PIER

TYPE OF WORK : FORMWORK

LOCATION : GATE PIER (I)

(2/3)

EXPLANATORY DRAWING



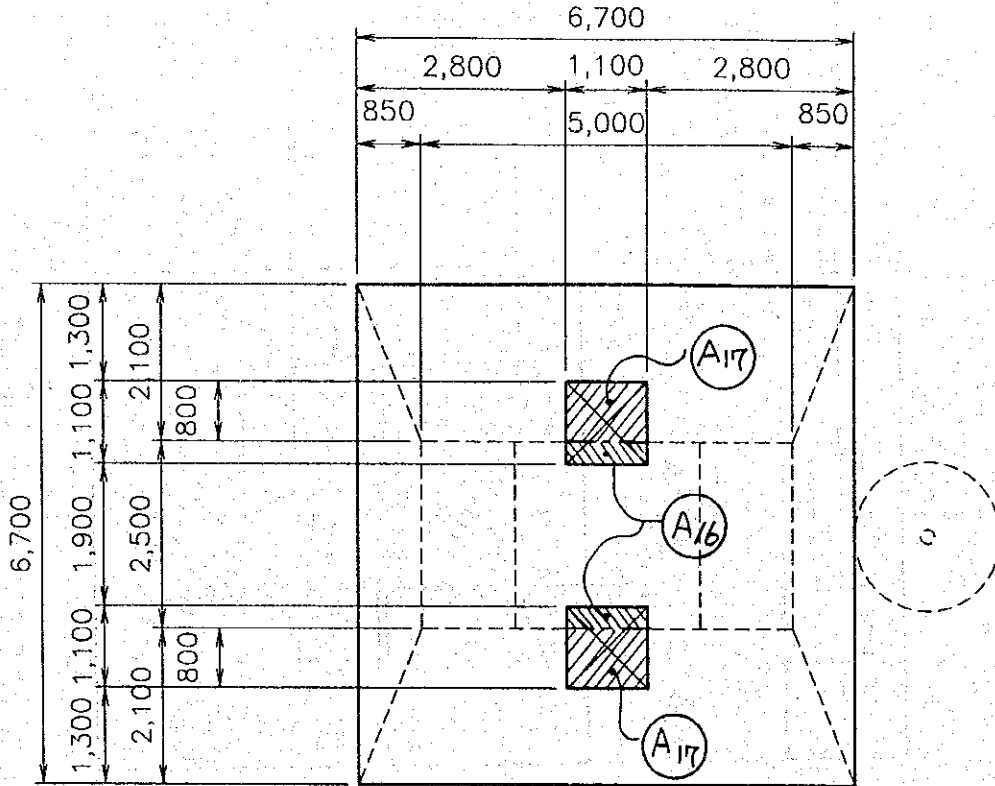
CENTER PIER

TYPE OF WORK : FORMWORK

LOCATION : GATE PIER (I)

(3/3)

EXPLANATORY DRAWING



TYPE OF WORK : CENTER PIER
 : FDRM WORK
 LOCATION : GATE PIER (II)

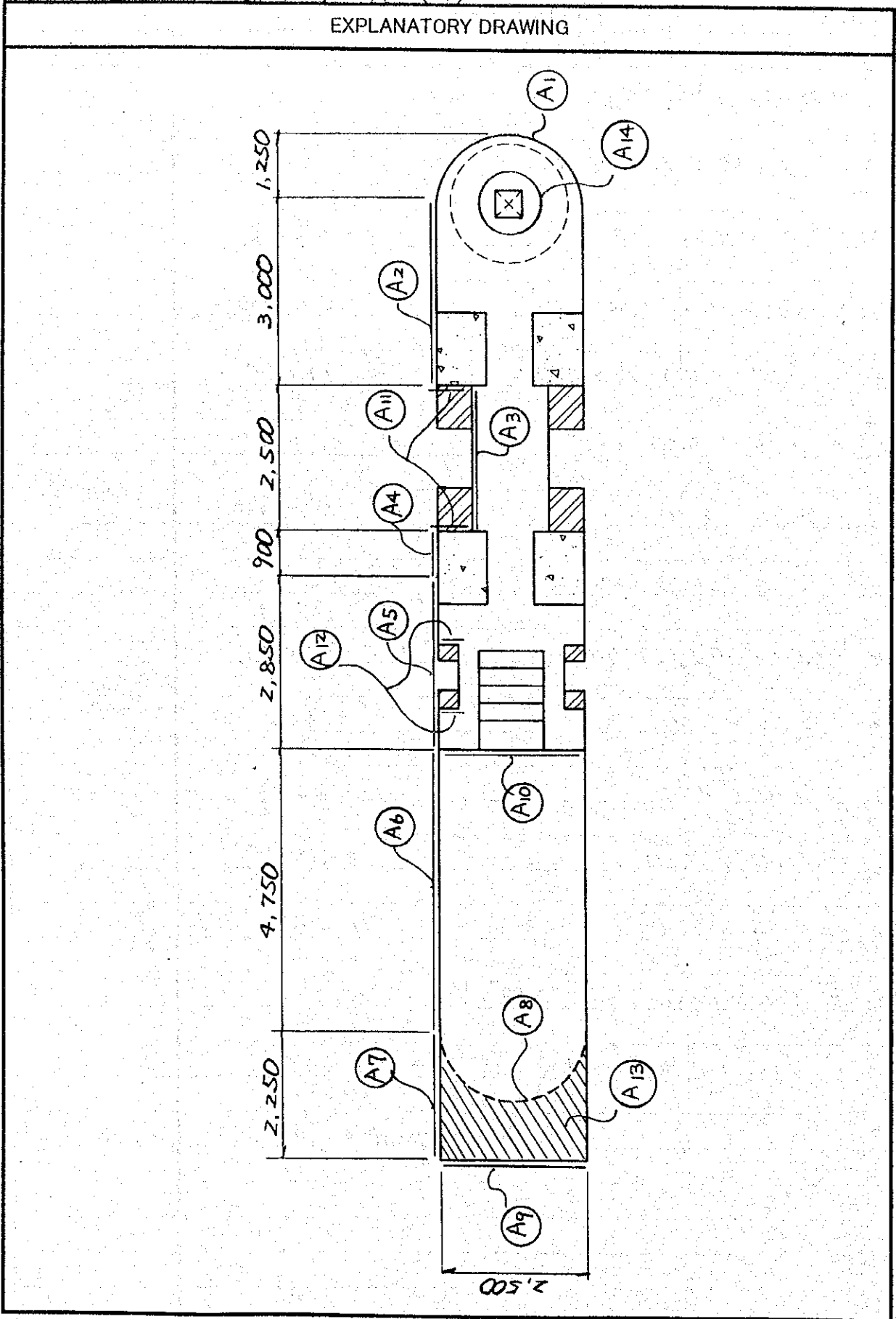
CALCULATION	RESULT
Quantity condition : H = 4.0m	
$A_1 = \pi \times 2.50 \times \frac{1}{2} \times 7.50$	= 29.452
$A_2 = 3.00 \times 7.50 \times 2$	= 45.000
$A_3 = 2.50 \times 7.50 \times 2$	= 37.500
$A_4 = (7.50 + 8.10) \times \frac{1}{2} \times 0.90 \times 2$	= 14.040
$A_5 = 2.85 \times 8.10 \times 2$	= 46.170
$A_6 = 4.75 \times 8.00 \times 2$	= 76.000
$A_7 = 2.25 \times 1.00 \times 2$	= 4.500
$A_8 = \pi \times 2.50 \times \frac{1}{2} \times 7.00$	= 27.489
$A_9 = 2.50 \times 1.00$	= 2.500
$A_{10} = 0.10 \times 2.50$	= 0.250
$A_{11} = 0.60 \times 7.50 \times 2 \times 2$	= 18.000
$A_{12} = 0.35 \times 8.10 \times 2 \times 2$	= 11.340
$A_{13} = (2.25 \times 2.50) - \frac{\pi}{4} \times 2.50^2 \times \frac{1}{2}$	= 3.171
$A_{14} = 0.45 \times 0.80 \times 4$	= 1.440
Total = 316.852	316.852 m ²

CENTER PIER

TYPE OF WORK : FORMWORK

LOCATION : GATE PIER (II)

EXPLANATORY DRAWING



TYPE OF WORK : CENTER PIER
 : FORMWORK FOR SECONDARY CONCRETE
 LOCATION : GATE PIER

CALCULATION	RESULT
$(H \geq 4.0m)$	
$A_1 = (0.74 + 0.60) \times 7.50 \times 2 = 20.100$	
$A_2 = (0.75 + 0.60) \times 7.50 \times 2 = 20.250$	
$A_3 = (0.28 + 0.25) \times 8.10 \times 2 = 8.586$	
$A_4 = 0.50 \times 8.10 \times 2 = 8.100$	
$A_5 = (0.32 + 0.25) \times 8.10 \times 2 = 9.234$	
$TOTAL = 66.270 m^2$	$66.270 m^2$

TYPE OF WORK : CENTER PIER
 : SUPPORTING
 LOCATION : GATE PIER (I)

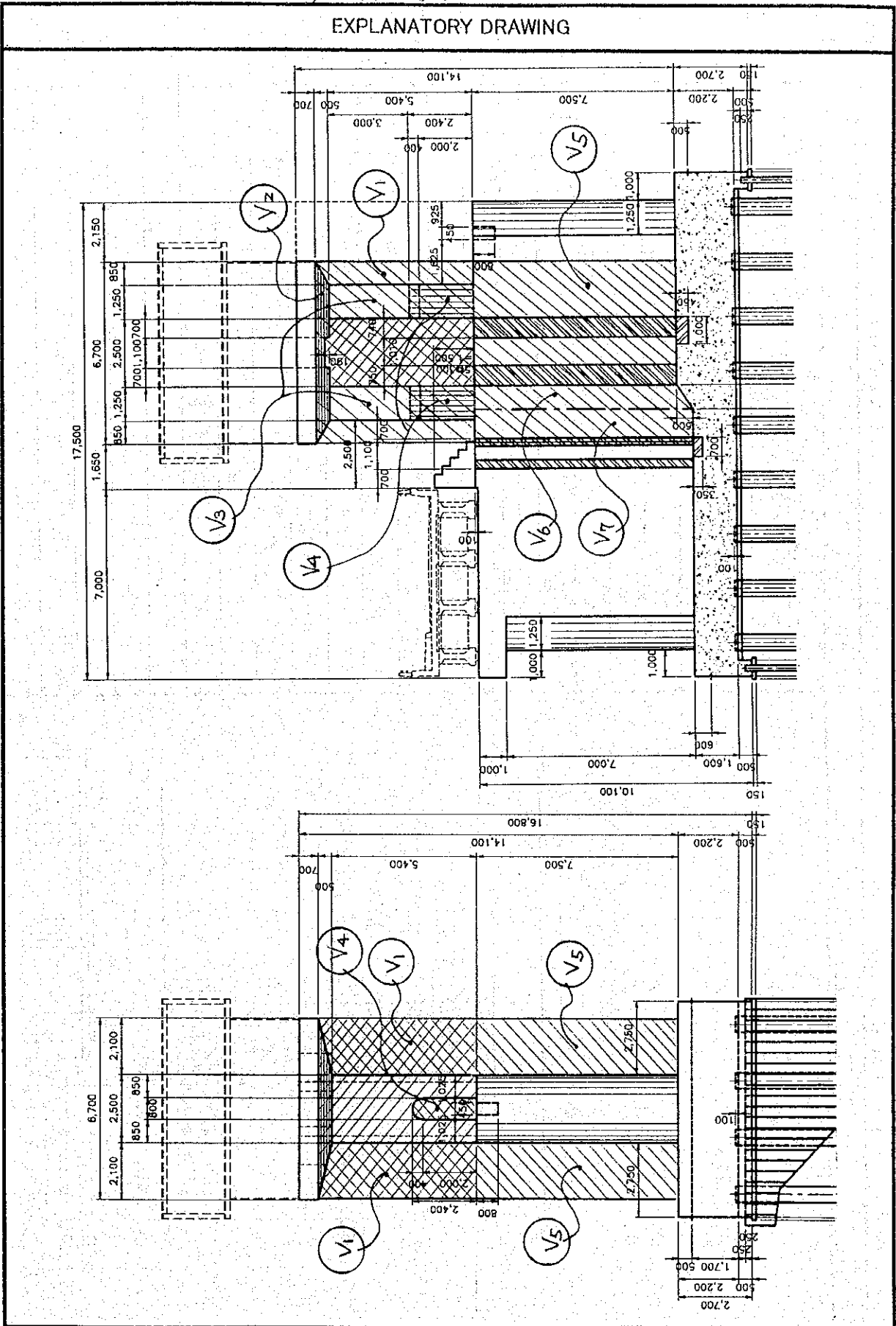
CALCULATION	RESULT
$V_1 = 6.70 \times 6.70 \times 5.90$	$= 269.851$
(Deduction for Gate Stage)	
$V_2 = - \left\{ (2.10 \times 0.50 \times \frac{1}{2}) \times 5.00 + (2.10 \times 0.50 \times \frac{1}{2}) \times 0.85 \times \frac{1}{3} \times 2 \right\} \times 2 + \left\{ (0.85 \times 0.50 \times \frac{1}{2}) \times 1.25 + (0.85 \times 0.50 \times \frac{1}{2}) \times 2.10 \times \frac{1}{3} \times 2 \right\} \times 2 + 5.00 \times 1.25 \times 0.50$	$= -10.096$
(Deduction for Gate Post)	
$V_3 = - (5.40 \times 2.50 \times 1.25) \times 2$	$= -33.750$
$V_4 = (2.00 \times 0.80 + \frac{\pi}{4} \times 0.80^2 \times \frac{1}{2}) \times 1.25 \times 2$	$= 4.628$
$V_5 = 2.10 \times 7.50 \times (2.50 + 1.25 + 0.85) \times 2$	$= 144.900$
$V_6 = (7.50 + 8.10) \times \frac{1}{2} \times 0.90 \times 2.10 \times 2$	$= 29.484$
$V_7 = 8.10 \times 2.10 \times 1.20 \times 2$	$= 40.824$
TOTAL =	440.841 m³

CENTER PIER

TYPE OF WORK : SUPPORTING

LOCATION : GATE PIER (I)

EXPLANATORY DRAWING



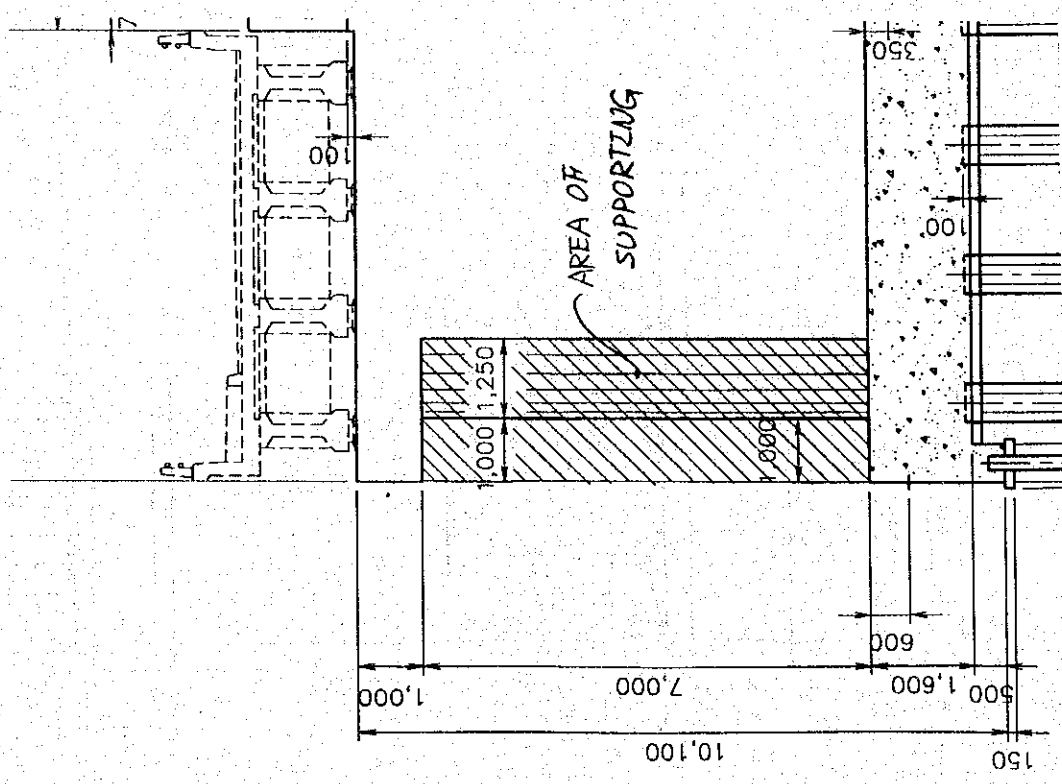
CENTER PIER

SUPPORTING

GATE PIER (II)

TYPE OF WORK :

LOCATION :



RESULT

$$V = \left\{ (2.50 \times 2.25) - \frac{\pi}{4} \times (2.50)^2 \times \frac{1}{2} \right\} \times 7.00$$

$$= 22.194$$

22.194 m³

TYPE OF WORK : CENTER PIER
 : SCAFFOLDING
LOCATION : GATE PIER (I)

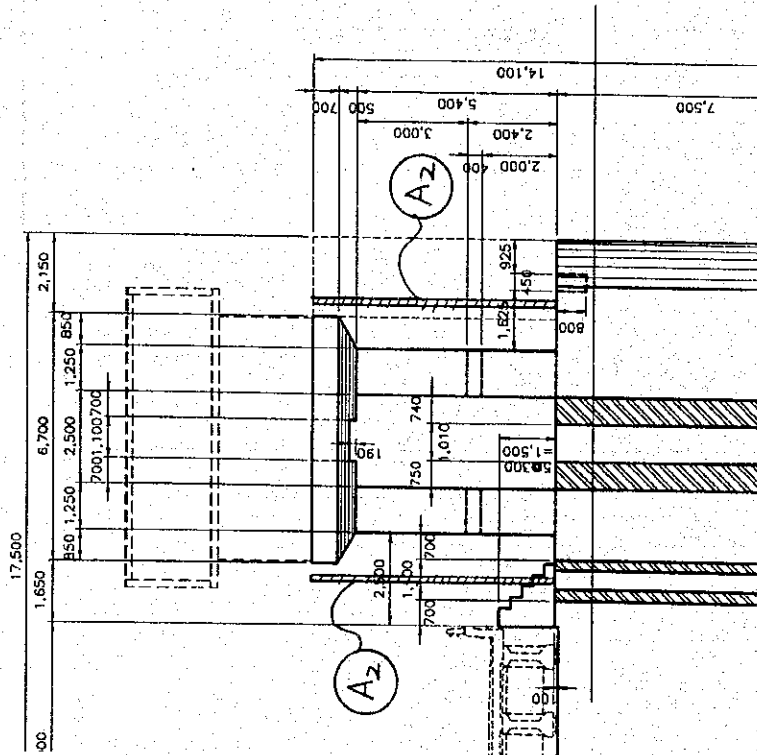
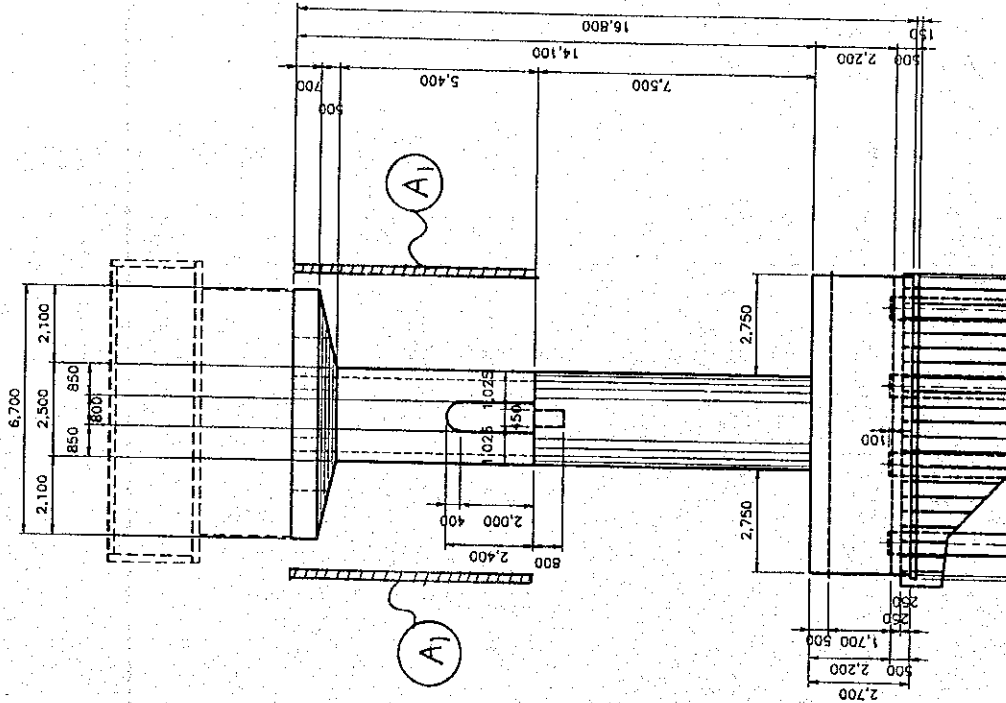
CALCULATION	RESULT
$A_1 = 6.60 \times 6.70 \times 2 = 88.440$	
$A_2 = 6.60 \times 6.70 \times 2 = 88.440$	
$TOTAL = 176.880$	176.880 m^2

CENTER PIER

TYPE OF WORK : SCAFFOLDING

LOCATION : GATE PIER (I)

EXPLANATORY DRAWING



CENTER PIER
TYPE OF WORK : SCAFFOLDING
LOCATION : GATE PIER (II)

CALCULATION	RESULT
$A_1 = \pi \times 2.50 \times \frac{1}{2} \times 7.50$	= 29.452
$A_2 = 5.500 \times 7.50 \times 2$	= 82.500
$A_3 = (7.50 + 8.10) \times \frac{1}{2} \times 0.90 \times 2$	= 14.040
$A_4 = 2.85 \times 8.10 \times 2$	= 46.170
$A_5 = 7.00 \times 8.00 \times 2$	= 112.000
$A_6 = 2.50 \times 8.00$	= 20.000
Total =	304.162
	304.162 m ²

CENTER PIER

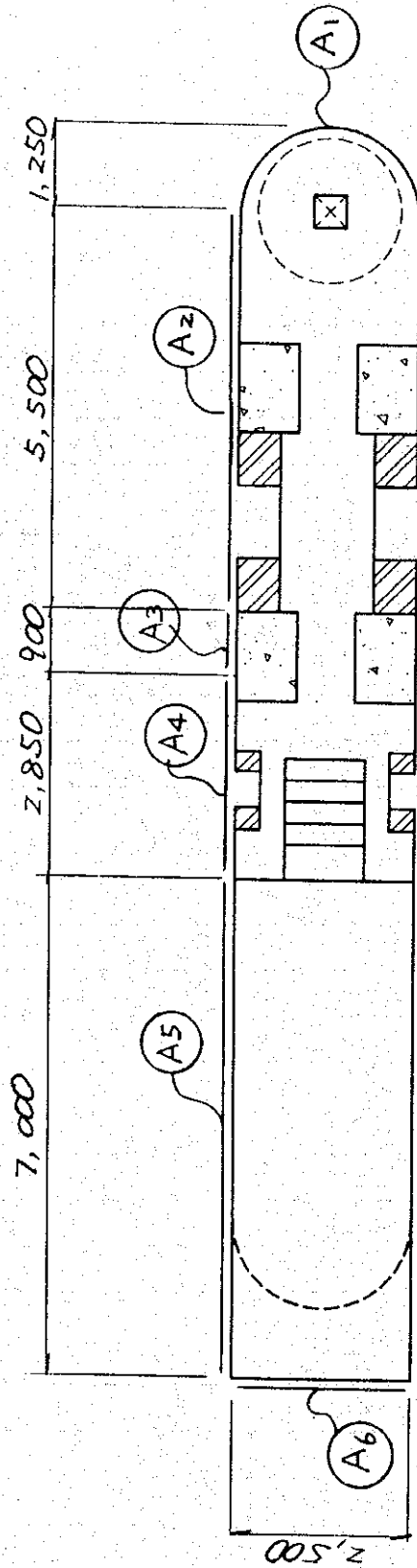
TYPE OF WORK

: SCAFFOLDING

LOCATION

: GATE PIER (II)

EXPLANATORY DRAWING



TYPE OF WORK : CENTER PIER
 : ANCHOR BAR
 LOCATION : GATE PIER

CALCULATION	RESULT
(For Discharge Gate)	
• Pier Section	
$n_1 = 15 \times (4 + 4) \times 2 = 240 \text{ Bars}$	
Ø19 : Unit Weight = 2.23 kg/m	
$W_1 = 240 \times 0.30 \times 2.23 = 160.56 \text{ kg}$	
• Slab Section	
$n_2 = 36 \times 2 = 72 \text{ Bars}$	
Ø19 : Unit Weight = 2.23 kg/m	
$W_2 = 72 \times 0.30 \times 2.23 = 48.168 \text{ kg}$	
(For Temporary Gate)	
• Pier Section	
$n_3 = 16 \times 5 \times 2 = 160 \text{ Bars}$	
Ø19 : Unit Weight = 2.23 kg/m	
$W_3 = 160 \times 0.30 \times 2.23 = 107.040 \text{ kg}$	
• Slab Section	
$n_4 = 24 \times 2 = 48 \text{ Bars}$	
Ø19 : Unit Weight = 2.23 kg/m	
$W_4 = 48 \times 0.30 \times 2.23 = 32.112 \text{ kg}$	0.348 tf

TYPE OF WORK : CENTER PIER
: JOINTING OF CONTROL HOUSE
LOCATION : GATE PIER

CALCULATION	RESULT
• D16 (W = 1.58 kg/m)	
$W_1 = (1.30 + 0.075 \times 2) \times 1 \times 1.58 = 2.29$	
$W_2 = (1.30 + 0.60 + 0.075 \times 2) \times 3 \times 1.58 = 9.717$	
$W = 12.008 \text{ kg/place}$	
$\Sigma W = 12.008 \times 4 \text{ places} = 48.032$	
• D13 (W = 1.04 kg/m)	
$W_3 = 0.85 \times 4 \times 1.04 = 3.536 \text{ kg/place}$	
$\Sigma W = 3.536 \times 4 \text{ places} = 14.144$	
$TOTAL = 62.176 \text{ kg}$	
	0.062 tf

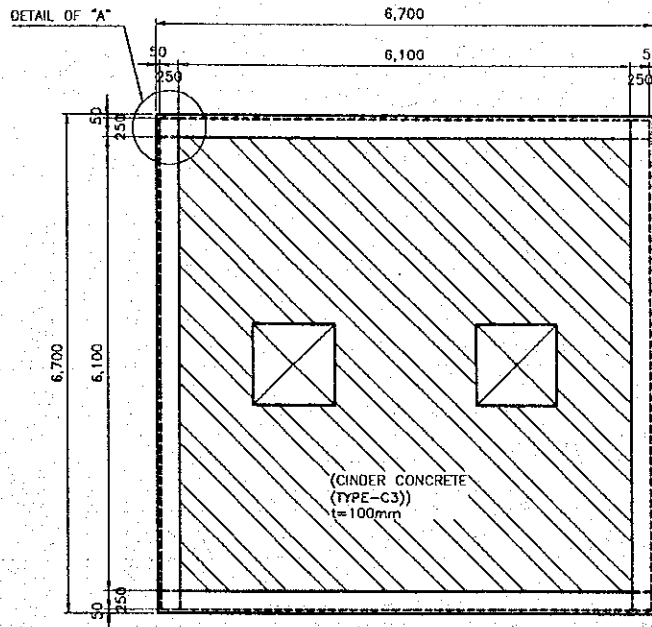
TYPE OF WORK

CENTER PIER

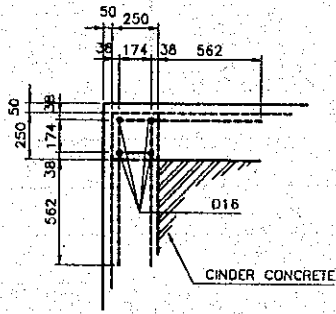
LOCATION

JOINTING OF CONTROL HOUSE
GATE PIER

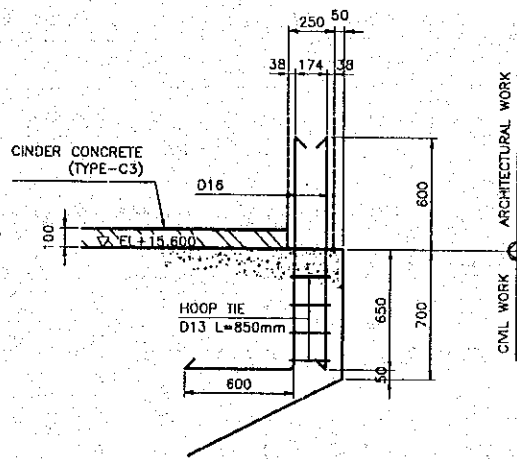
EXPLANATORY DRAWING



(CENTER PIER)



DETAIL OF "A"(END POSITION)
SCALE B

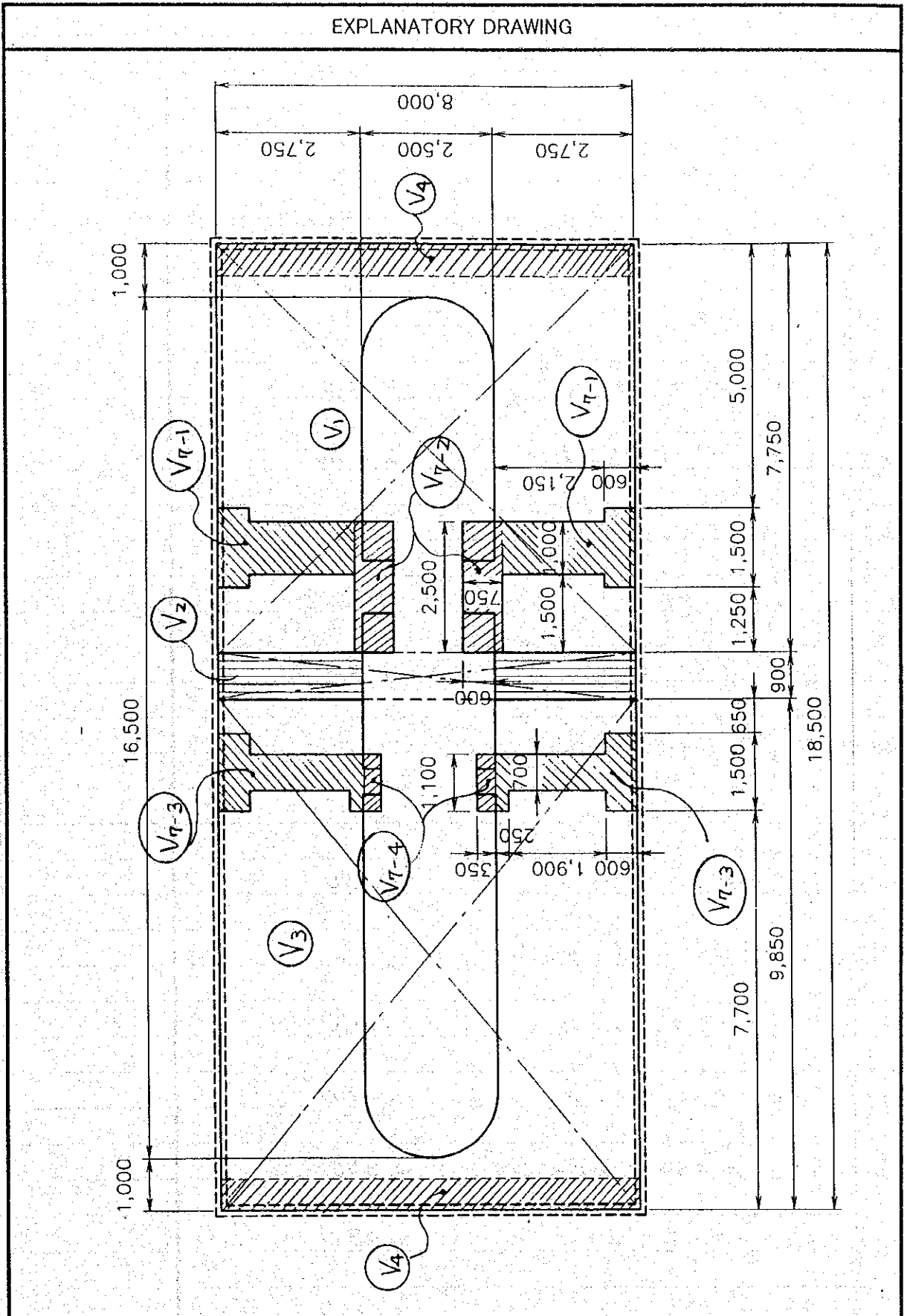


STANDARD CROSS SECTION OF JOINTING
SCALE B

TYPE OF WORK : CENTER PIER
 : CONC (TYPE - C1)
 LOCATION : SLAB

CALCULATION	RESULT
$V_1 = 8.00 \times 7.75 \times 2.20 = 136.400$	
$V_2 = (2.20 + 1.60) \times \frac{1}{2} \times 0.90 \times 8.00 = 13.680$	
$V_3 = 8.00 \times 9.85 \times 1.60 = 126.080$	
$V_4 = 8.00 \times 0.60 \times 0.50 \times 2 = 4.800$	
(Deduction for PC pile)	
$V_5 = -\frac{\pi}{4} \times (0.60)^2 \times 0.10 \times 36 \text{ piles} = -1.018$	
(Deduction for PC sheet pile)	
$V_6 = -8.00 \times 0.22 \times 0.25 = -0.440$	
(Deduction for Blockout)	
$V_{7-1} = -(1.50 \times 0.60 + 2.00 \times 1.00) \times 0.45 \times 2 = -2.610$	
$V_{7-2} = -(1.50 \times 0.60 + 1.90 \times 0.70 + 1.10 \times 0.25) \times 0.35 \times 2 = -1.754$	
$V_{7-3} = -(2.50 \times 0.75 \times 0.45) \times 2 = -1.688$	
$V_{7-4} = -(1.10 \times 0.35 \times 0.35) \times 2 = -0.270$	
	273.180 m³

TYPE OF WORK : CENTER PIER
 : CONCRETE
 LOCATION : SLAB



TYPE OF WORK : CENTER PIER
 : FORMWORK
 LOCATION : SLAB

(1/2)

CALCULATION	RESULT
Quantity condition : (H < 4.0m)	
$A_1 = 2.70 \times 8.00 = 21.600$	
$A_2 = 0.50 \times 8.00 \times 2 = 8.000$	
$A_3 = 2.10 \times 8.00 = 16.800$	
$A_4 = \sqrt{0.60^2 + 0.90^2} \times 8.00 = 8.653$	
$A_{5-1} = 2.20 \times 7.65 \times 2 = 33.660$	
$A_{5-2} = (2.20 + 1.60) \times \frac{1}{2} \times 0.90 \times 2 = 3.420$	
$A_{5-3} = 1.60 \times 9.85 \times 2 = 31.520$	
$A_6 = 0.50 \times 0.60 \times 4 = 1.200$	
(Deduction for Blockout)	
$A_{7-1} = -(0.45 \times 1.00) \times 2 = -0.900$	
$A_{7-2} = -(0.35 \times 0.70) \times 2 = -0.490$	
(Deduction for PC sheet pile)	
$A_8 = -(0.25 \times 0.22) \times 2 = -0.110$	
$A_9 = 0.60 \times 0.45 \times 2 \times 2 = 1.080$	
$A_{10} = 2.15 \times 0.45 \times 2 \times 2 = 3.870$	
$A_{11} = 0.60 \times 0.45 \times 2 \times 2 = 1.080$	
$A_{12} = 1.50 \times 0.45 \times 2 = 1.350$	

CENTER PIER
 TYPE OF WORK : FORMWORK
 LOCATION : SLAB

(2/2)

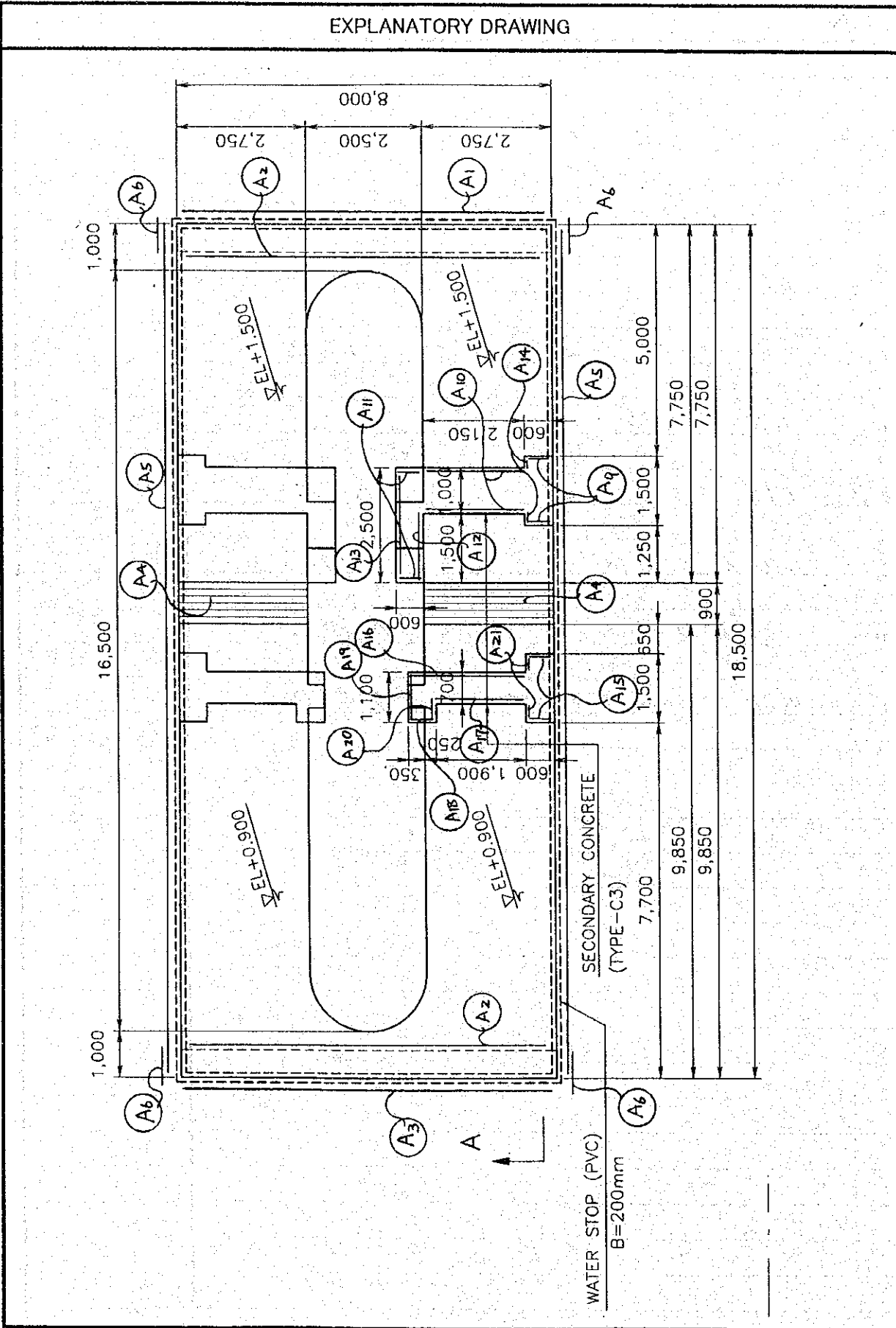
CALCULATION	RESULT
$A_{13} = 2.50 \times 0.45 \times 2 = 2.250$	
$A_{14} = 0.25 \times 0.45 \times 2 \times 2 = 0.450$	
$A_{15} = 0.60 \times 0.35 \times 2 \times 2 = 0.840$	
$A_{16} = 2.25 \times 0.35 \times 2 = 1.575$	
$A_{17} = 1.90 \times 0.35 \times 2 = 1.330$	
$A_{18} = 0.60 \times 0.35 \times 2 = 0.420$	
$A_{19} = 1.10 \times 0.35 \times 2 = 0.770$	
$A_{20} = 0.40 \times 0.35 \times 2 = 0.280$	
$A_{21} = 0.80 \times 0.35 \times 2 = 0.560$	
	139.208 m ²

CENTER PIER

TYPE OF WORK : FORMWORK

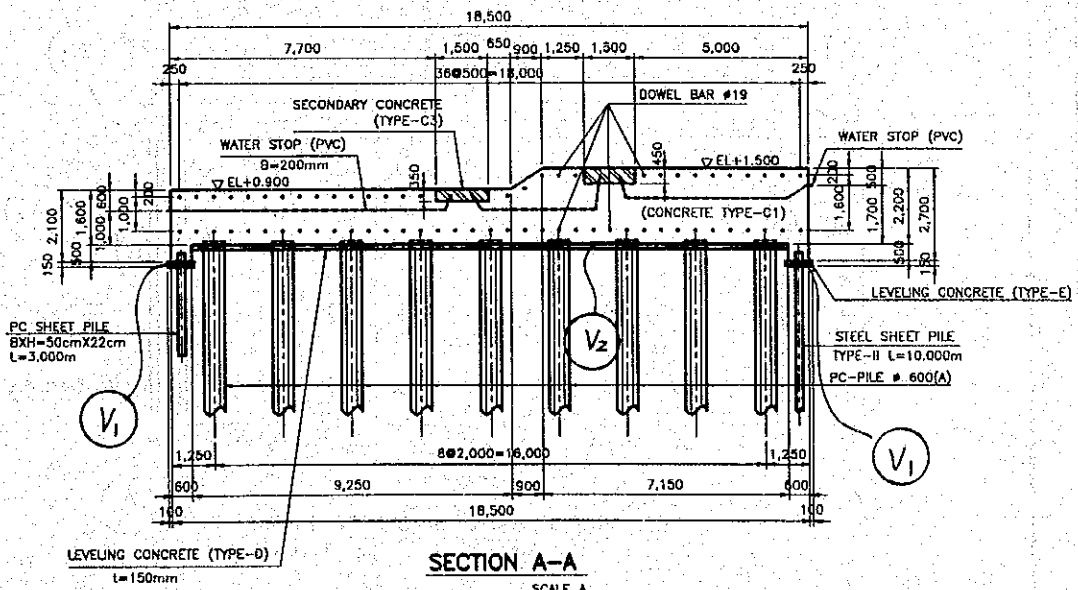
LOCATION : SLAB

EXPLANATORY DRAWING



CENTER PIER

TYPE OF WORK:	LEVELING CONCRETE WORK	CALCULATION	RESULT
LOCATION:	SLAB	(TYPE - E)	
		$V_1 = 0.80 \times 0.15 \times 8.20 \times 2 = 1.968$	
		$V_2 = 17.30 \times 0.15 \times 8.20 = 21.279$	
		$V_3 = -\frac{75}{4} \times (0.6)^2 \times 36 \text{ piles} \times 0.15 = -1.527$	
		(Deduction for PC Sheet Pile)	
		$V_4 = -0.22 \times 0.15 \times 8.20 = -0.271$	
			21.949m ³



SECTION A-A
SCALE A

CENTER PIER

TYPE OF WORK : FORMWORK FOR LEVELING CONC

LOCATION : SLAB

CALCULATION

RESULT

(H < 4.0m)

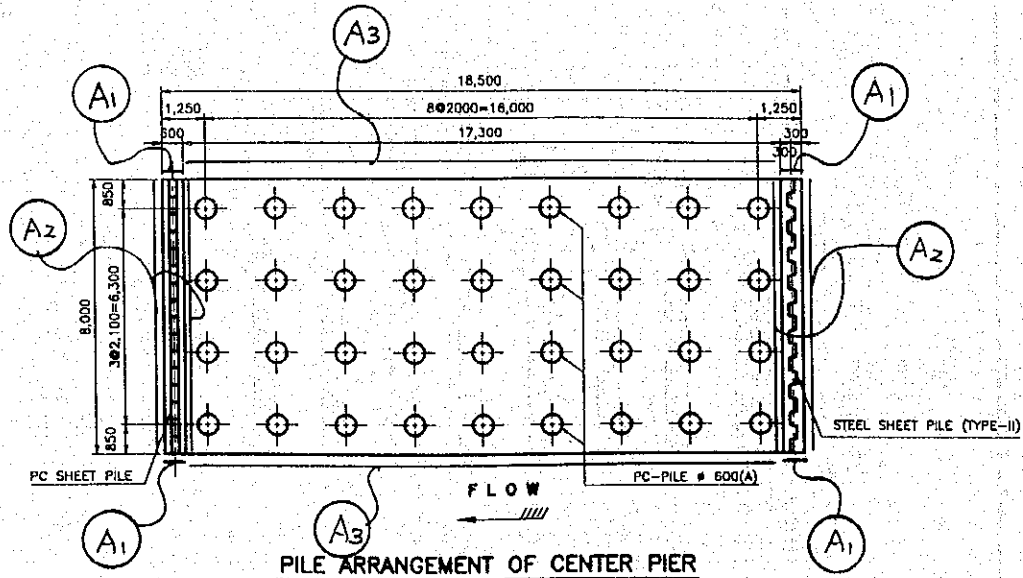
$A_1 = 0.80 \times 0.15 \times 4 = 0.480$

$A_2 = 8.20 \times 0.15 \times 4 = 4.920$

$A_3 = 8.20 \times 0.15 \times 2 = 1.513$

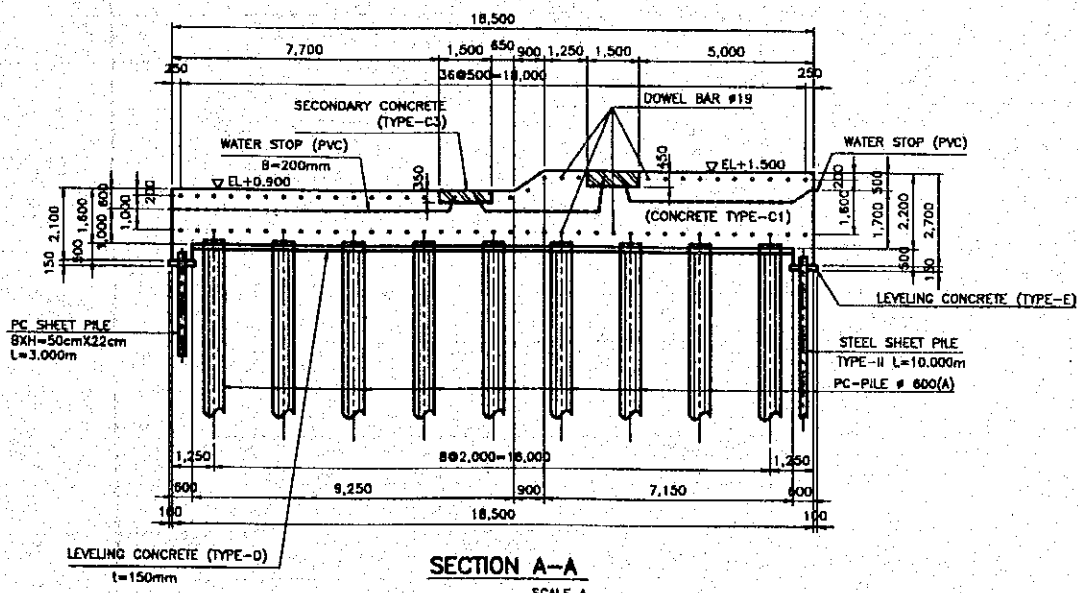
$A_4 = 17.30 \times 0.15 \times 2 = 5.190$

12.103 m²



CENTER PIER

TYPE OF WORK :	WATER STOP	SLAB	RESULT
LOCATION :	<p>WATER STOP : B=200mm</p> <p>L₁ = 19.50 m (Side)</p> <p>L₂ = 8.00 m (Front)</p> <p>L₃ = 8.00 m (Behind)</p> <p>ΣL = 19.50 × 2 + 8.00 + 8.00 = 55.00</p>		



TYPE OF WORK : CENTER PIER
 : DOWEL BAR
 LOCATION : SLAB

CALCULATION	RESULT
Number of Reinforcing Bar ($\phi 19$)	
$n = (16 + 37 + 30) \times 2 = 166 \text{ Bars}$	
$\phi 19$: Unit Weight = 2.23 kg/m	
$W = 166 \times 1.24 \times 2.23 = 459.023 \text{ kgf}$	0.459 tf
PVC - PIPE ($\phi 25$)	
$n = 166 \text{ pipes}$	
$L = 166 \times 0.55 = 91.300$	91.300 m

TYPE OF WORK : PILE HEAD TREATMENT
 LOCATION : CENTER PIER

CALCULATION	RESULT
PC PILE DIA 600 (A) n = 36 PILES	
LENGTH OF DESIGN : $L_1 = 10.30$ m	
SPARE PILE LENGTH : $L_2 = 1.00$ m	
Therefore, ADOPTED PILE LENGTH :	
$L = 10.30 + 1.00 = 11.30$ 12.00 m/pile	36 places
PILING	
N VALUE : $N = 23$ (Average)	
$D = 10.30$ m/pile	36 places
CONCRETE FILLING (TYPE-C1)	
$V = \frac{\pi}{4} \times 0.40^2 \times 1.15 = 0.145$ m ³ /pile	36 places
SUSPENDED FORM	
$A = \frac{\pi}{4} \times 0.40^2 = 0.126$ m ³ /pile	36 places
REINFORCING BAR	
D 16 (W = 1.58 kg/m)	
$W_1 = 8 \text{ Bars} \times 1.65 \times 1.58 = 20.856$	
D 13 (W = 1.04 kg/m)	
$W_2 = 12 \text{ Bars} \times 1.25 \times 1.04 = 15.60$	
TOTAL = 36.456 kg./pile	36 places
CUTTING PILE HEAD	
Height of cutting : $h = 1.70$ m/pile	
$V = \frac{\pi}{4} \times (0.60^2 - 0.40^2) \times 1.70 = 0.267$ m ³ /pile	36 places