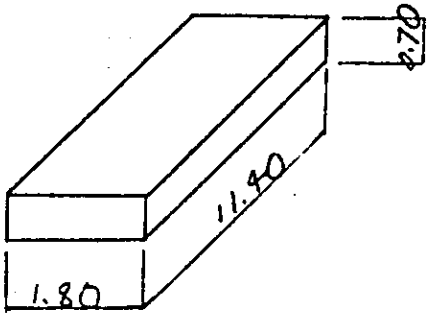
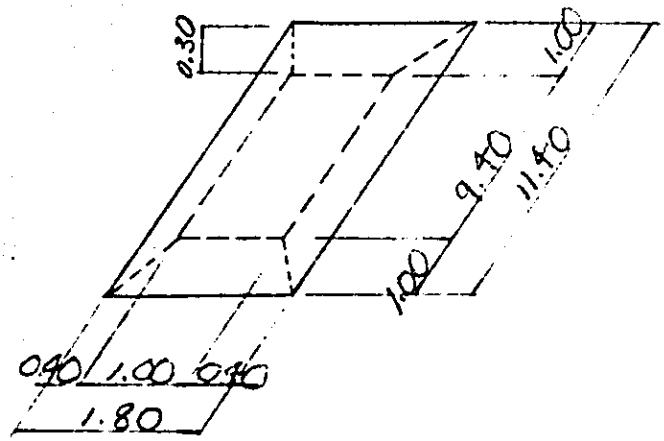
1) CONCRETE VOLUME

1) BEAM



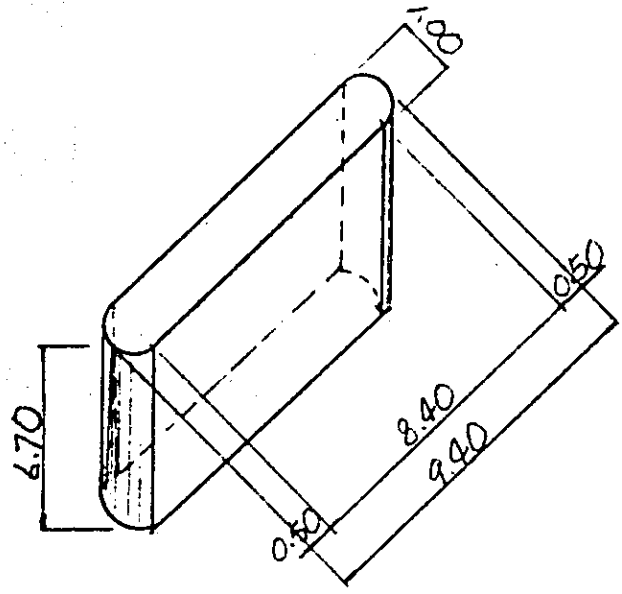
$V_a = 1.80 \times 0.70 \times 11.40 \quad = 14.364\ m^3$



$V_b = \frac{0.30}{6} \times \{ 1.00 \times 9.40 + 1.80 \times 11.40 + (1.00 + 1.80) \cdot (9.40 + 11.40) \} = 4.406\ "$

BEAM TOTAL = $18.772\ m^3$

(2) COLUMN

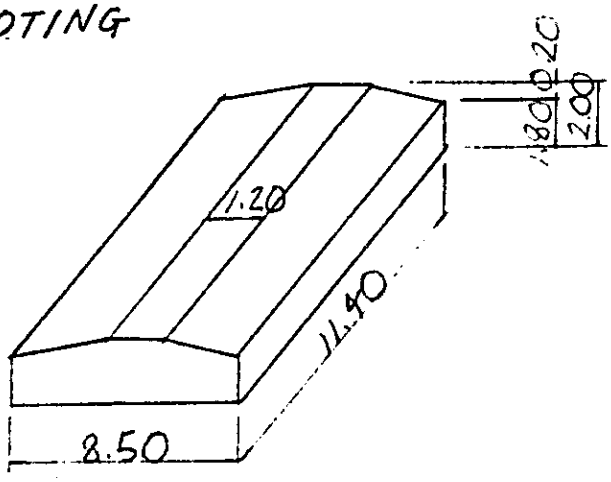


$Va = \frac{1}{4} \times \pi \times 1.00^2 \times 6.70$ = 5.262 m^3

$Vb = 1.00 \times 8.40 \times 6.70$ = 56.280

COLUMN TOTAL = 61.542 m^3

(3) FOOTING



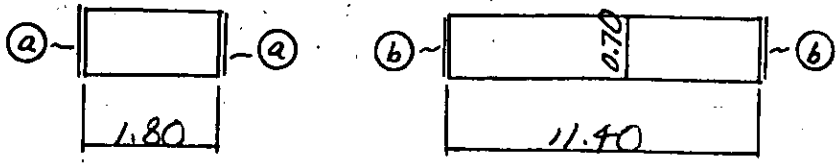
$Va = \frac{1}{2} \times (1.20 + 8.50) \times 0.20 \times 11.40$ = 11.058 m^3

$Vb = 8.50 \times 1.80 \times 11.40$ = 174.420

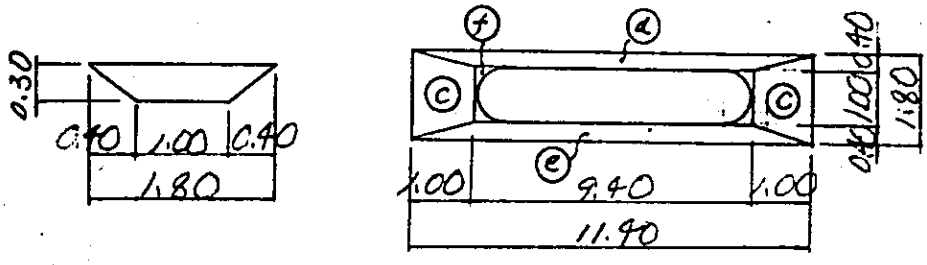
FOOTING TOTAL = 185.478 m^3

2) FORM AREA

(1) BEAM

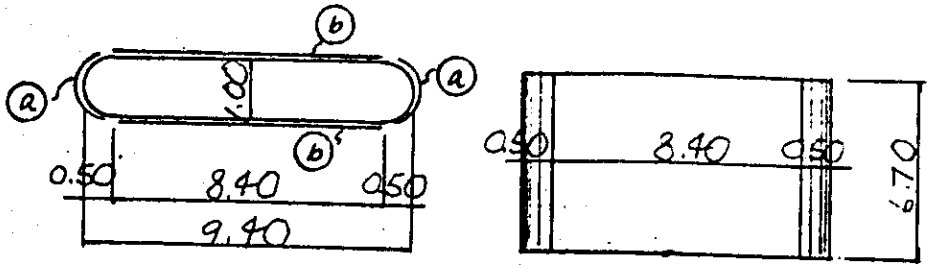


A_a = 0.70 × 11.40 × 2	=	15.960 m²
A_b = 0.70 × 1.80 × 2	=	2.520 "



A_c = ½ × (1.00 + 1.80) · $\sqrt{1.00^2 + 0.30^2}$ × 2	=	2.923 "
A_d = ½ × (9.40 + 11.40) · $\sqrt{0.40^2 + 0.30^2}$	=	5.200 "
A_e = "	=	5.200 "
A_f = (1 − π/4) · 1.00²	=	0.215 "
BEAM TOTAL	=	32.018 m²

(2) COLUMN

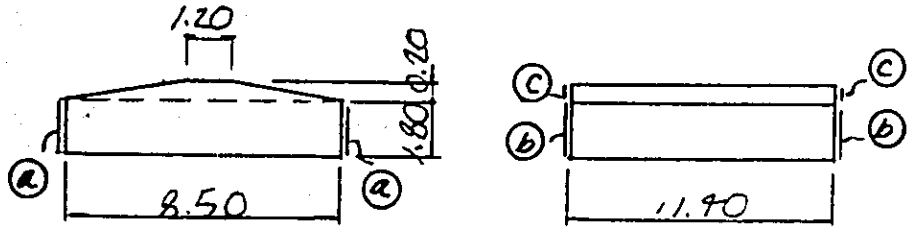


$Aa = \pi \times 1.00 \times 6.70$ = 21.049 m^2

$Ab = 8.40 \times 6.70 \times 2$ = 112.560 "

COLUMN TOTAL = 133.609 m^2

(3) FOOTING



$Aa = 1.80 \times 11.40 \times 2$ = 41.040 m^2

$Ab = 1.80 \times 8.50 \times 2$ = 30.600 "

$Ac = 1/2 \times (1.20 + 8.50) \times 0.20 \times 2$ = 1.940 "

FOOTING TOTAL = 73.580 m^2

3) REINFORCING BAR

	$V\ (m^3)$	$R\ (kg/m^3)$	$W = V \cdot R\ (kg)$
BEAM	18.8	82.971	1559.9
COLUMN	61.5	157.633	9694.4
FOOTING	185.5	65.383	12128.5

BEARING BASE D16 489.6 kg

V —— CONCRETE VOLUME

W —— REINFORCING BAR

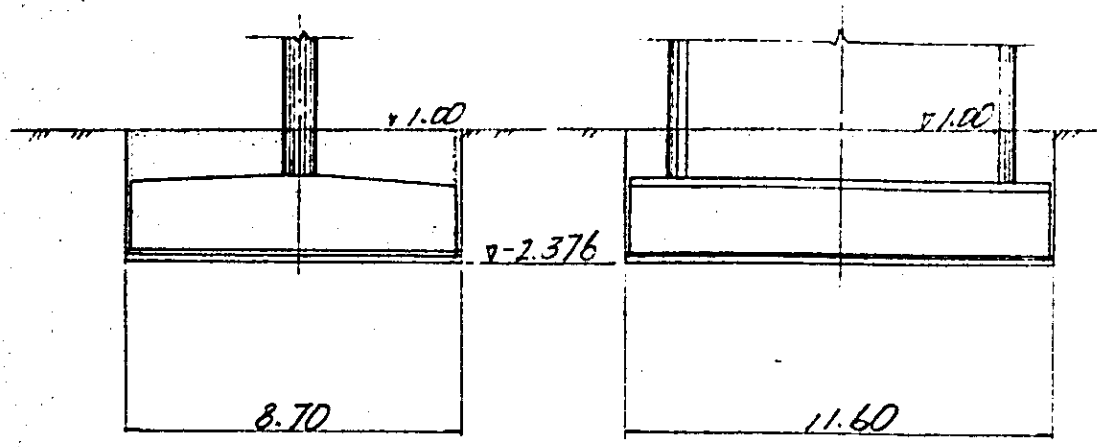
$$R = \frac{\text{REINFORCING BAR OF } P_{40}}{\text{CONCRETE VOLUME OF } P_{40}}$$

$$R_B = \frac{1725.8}{20.8} = 82.971$$

$$R_C = \frac{9694.4}{61.5} = 157.633$$

$$R_F = \frac{12128.6}{185.5} = 65.383$$

4) EXCAVATION

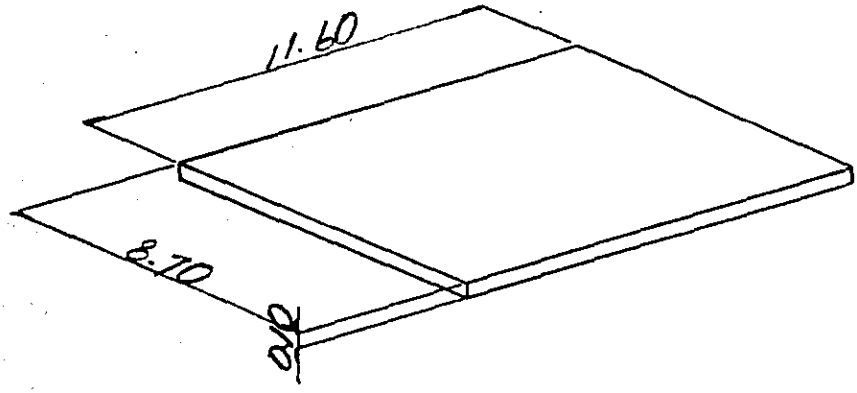


$$Va = 8.70 \times 11.60 \times (1.00 + 2.376) = 340.706\ m^3$$

5) FOUNDATION MORTAR

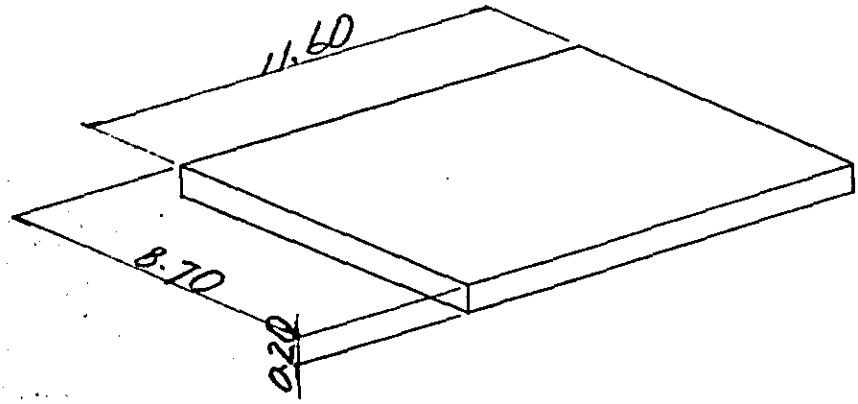
$$Va = \frac{1}{2} \times (0.736 \times 0.536 + 0.70 \times 0.50) \times 0.018 \times 16 = 0.107\ m^3$$

6) LEVELING CONCRETE



$Va = 8.70 \times 11.60 \times 0.10 = 10.092\ m^3$

7) AGGREGATE SUBBASE



$Va = 8.70 \times 11.60 \times 0.20 = 20.184\ m^3$

8) PILE

$\phi = 500$

TYPE-B $13\ m \times 4$

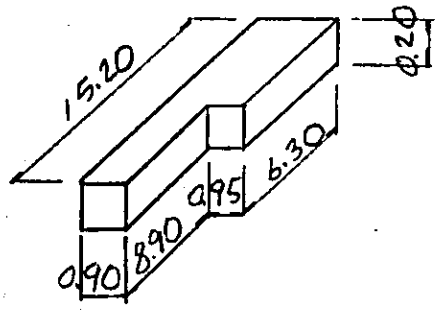
51 PIER : 50

	CONCRETE VOLUME (m^3)	FORM AREA (m^2)	REINFORCING BAR (Kg)	RATIO (Kg/m^3)
BEAM	29.8	48.3	2 542.7	85.3
COLUMN	87.7	170.7	13 022.7	148.5
TOTAL	117.5	219.0	15 565.4	132.5
FOOTING	134.3	62.3	7 660.9	57.0

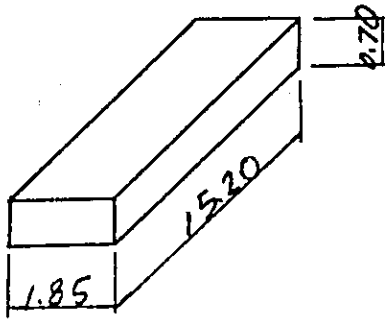
	UNIT	QUANTITY	REMARKS
LEVELING CONCRETE	m^3	8.2	CLASS F
AGGREGATE SUBBASE	m^3	16.4	[illegible] B-3
EXCAVATION	m^3	341.8	
FOUNDATION MORTAR	m^3	0.1	[illegible]
PILE	m x NUMBER	13 x 45	φ500-B

1) CONCRETE VOLUME

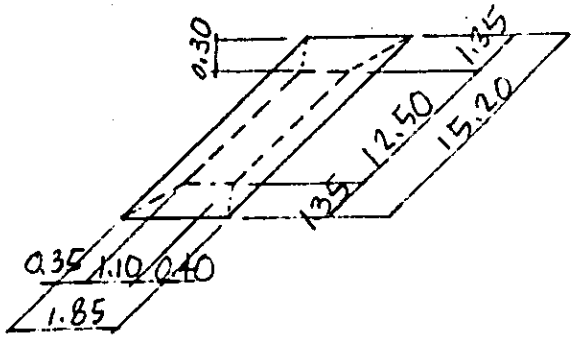
(1) BEAM



$Va = 0.20 \times (0.90 \times 8.90 + 1.85 \times 6.30)$ = 3.933 m³



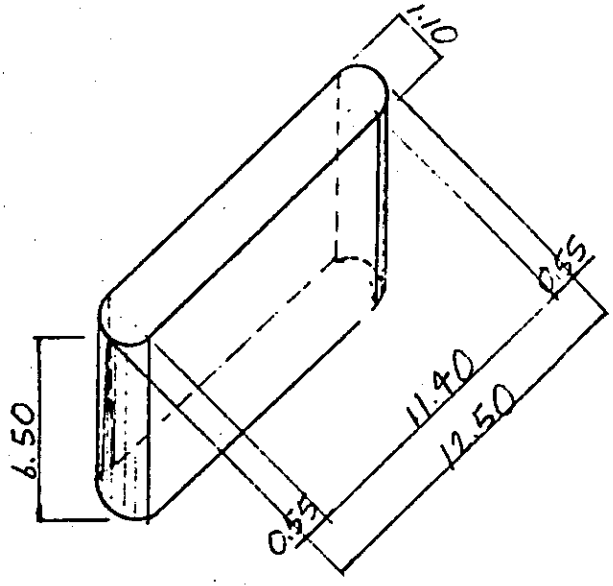
$Vb = 1.85 \times 0.70 \times 15.20$ = 19.684 "



$Vc = \frac{0.30}{6} \times \{1.10 \times 12.50 + 1.85 \times 15.20 + (1.10 + 1.85) \times (12.50 + 15.20)\}$ = 6.179 "

BEAM TOTAL = 29.796 m³

(2) COLUMN

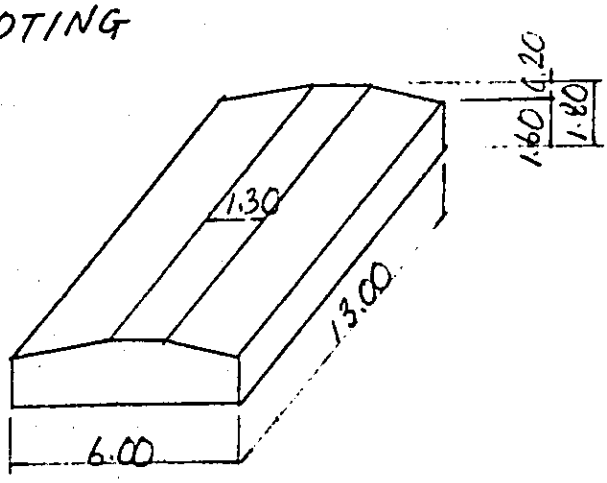


$Va = \frac{1}{4} \times \pi \times 1.10^2 \times 6.50$ = 6.177 m^3

$Vb = 1.10 \times 11.40 \times 6.50$ = 81.510 "

COLUMN TOTAL = 87.687 m^3

(3) FOOTING



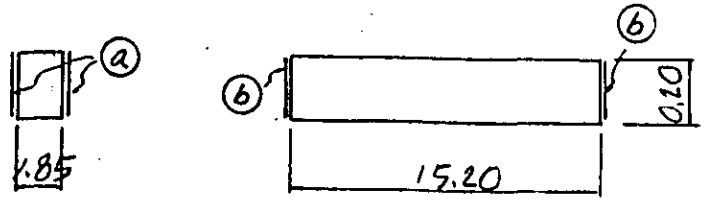
$Va = \frac{1}{2} \times (1.30 + 6.00) \times 0.20 \times 13.00$ = 9.490 m^3

$Vb = 6.00 \times 1.60 \times 13.00$ = 124.800 "

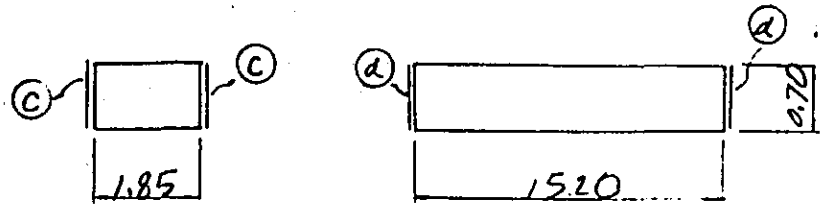
FOOTING TOTAL = 134.290 m^3

2) FORM AREA

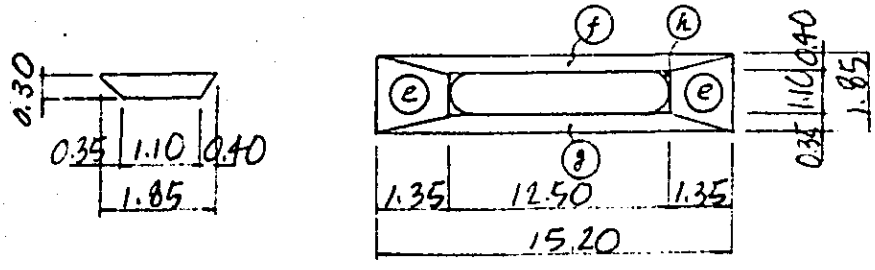
(1) BEAM



$Ae = 0.20 \times 15.20 \times 2$	=	6.080	m²
$Ab = 0.20 \times 1.85 \times 2$	=	0.740	"

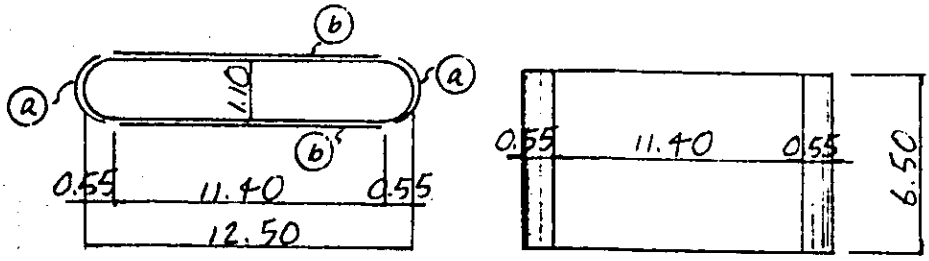


$Ac = 0.70 \times 15.20 \times 2$	=	21.280	"
$Ad = 0.70 \times 1.85 \times 2$	=	2.590	"



$Ae = \frac{1}{2} \times (1.10 + 1.85) \times \sqrt{1.35^2 + 0.30^2} \times 2$ (1.385)	=	4.080	"
$Af = \frac{1}{2} \times (12.50 + 15.20) \times \sqrt{0.40^2 + 0.30^2}$ (0.500)	=	6.925	"
$Ag = \frac{1}{2} \times (12.50 + 15.20) \times \sqrt{0.35^2 + 0.30^2}$ (0.461)	=	6.365	"
$Ah = (1 - \pi/4) \times 1.10^2$	=	0.250	"
BEAM TOTAL	=	48.340	m²

(2) COLUMN

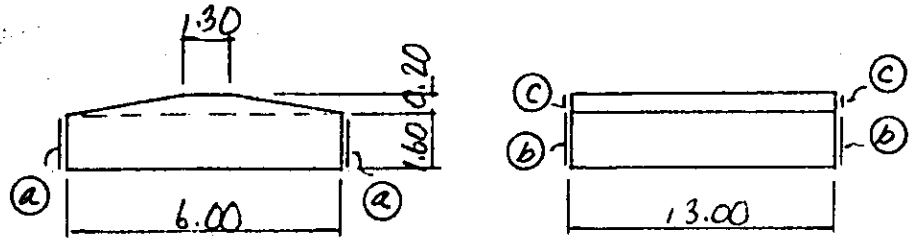


$Aa = \pi \times 1.10 \times 6.50$ = 22.462 m^2

$Ab = 11.40 \times 6.50 \times 2$ = 148.200 "

COLUMN TOTAL = 170.662 m^2

(3) FOOTING



$Aa = 1.60 \times 13.00 \times 2$ = 41.600 m^2

$Ab = 1.60 \times 6.00 \times 2$ = 19.200 "

$Ac = \frac{1}{2} \times (1.30 + 6.00) \times 0.20 \times 2$ = 1.460 "

FOOTING TOTAL = 62.260 m^2

3) REINFORCING BAR

	$V\ (m^3)$	$R\ (kg/m^3)$	$W = V \cdot R\ (kg)$
BEAM	29.8	67.165	2001.5
COLUMN	87.7	148.491	13022.7
FOOTING	134.3	57.043	7660.9

BEARING BASE D16 541.2 kg

V —— CONCRETE VOLUME

W —— REINFORCING BAR

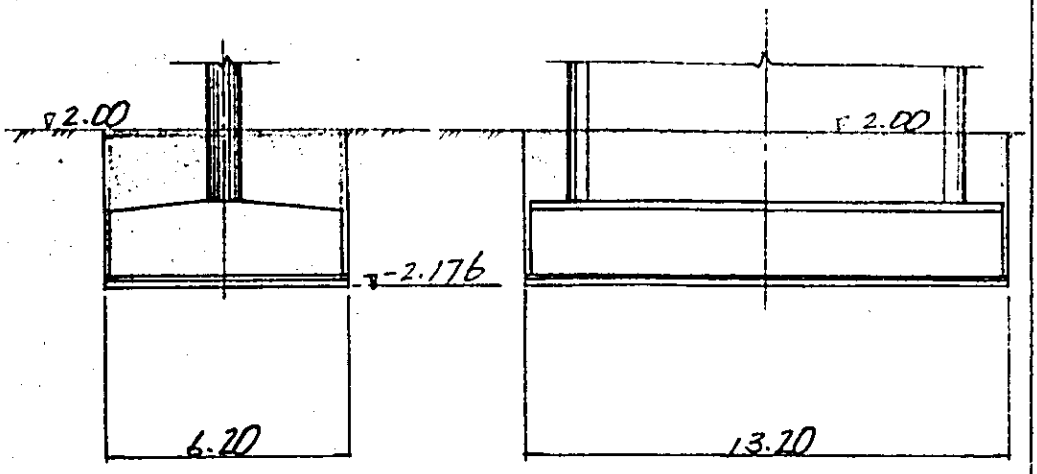
$R = \frac{\text{REINFORCING BAR OF F48}}{\text{CONCRETE VOLUME OF F48}}$

$R_B = \frac{1591.8}{23.7} = 67.165$

$R_C = \frac{11\,775.3}{79.3} = 148.491$

$R_F = \frac{7660.9}{134.3} = 57.043$

4) EXCAVATION



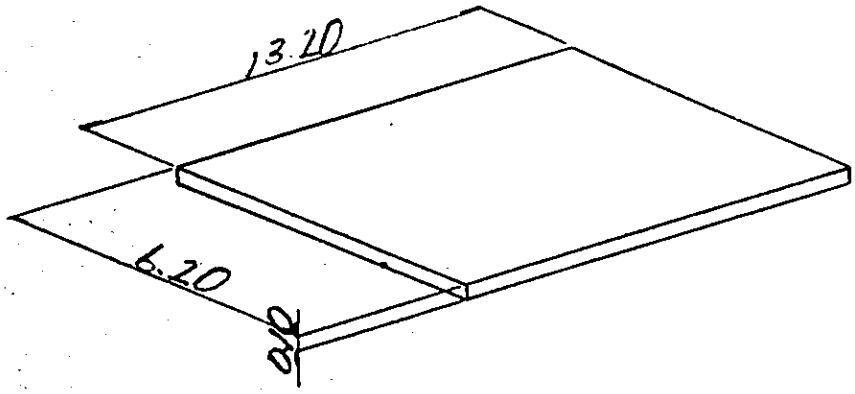
$$Va = 6.20 \times 13.20 \times (2.00 + 2.176) = 341.764\ m^3$$

5) FOUNDATION MORTAR

$$Va = \tfrac{1}{2} \times (0.736 \times 0.536 + 0.70 \times 0.50) \times 0.018 \times 12$$

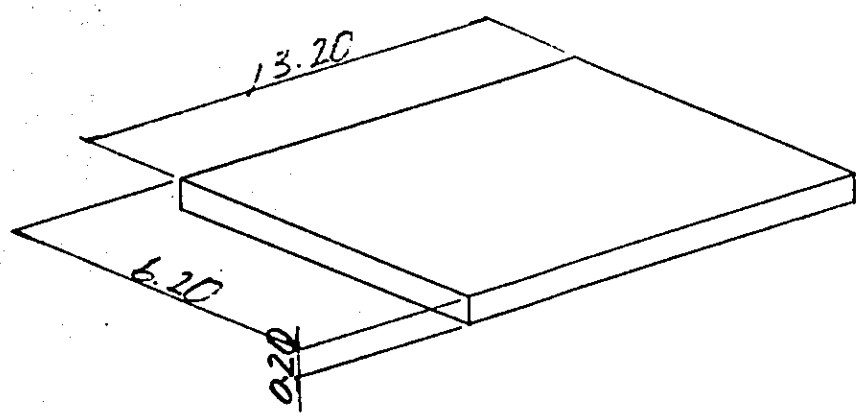
$$+ \tfrac{1}{2} \times (0.736 \times 0.688 + 0.70 \times 0.65) \times 0.018 \times 4 = 0.115\ m^3$$

6) LEVELING CONCRETE



$Va = 6.20 \times 13.20 \times 0.10 = 8.184\ m^3$

7) AGGREGATE SUBBASE



$Va = 6.20 \times 13.20 \times 0.20 = 16.368\ m^3$

8) PILE

$\phi = 500$

TYPE - B $13^{m} \times 45$