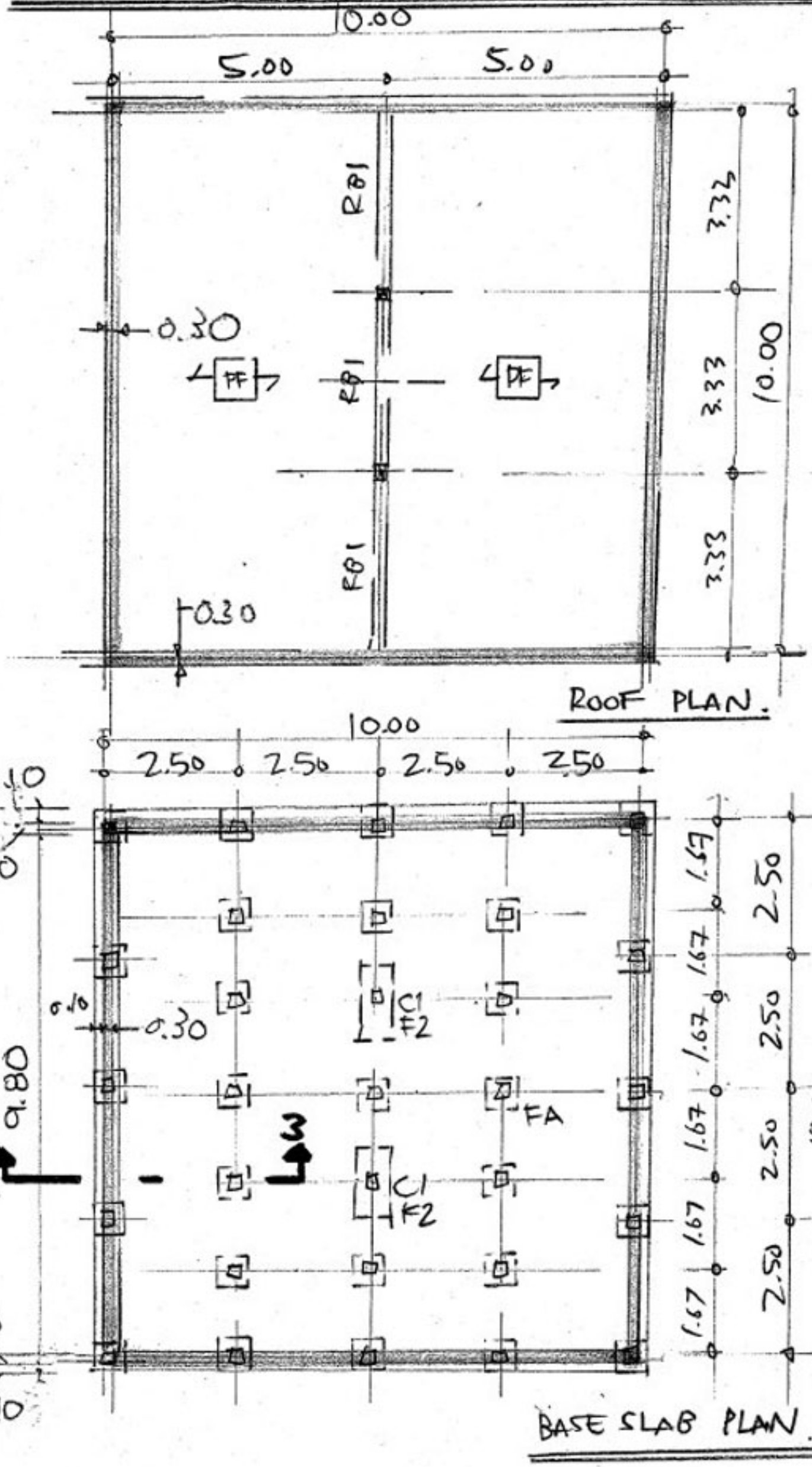
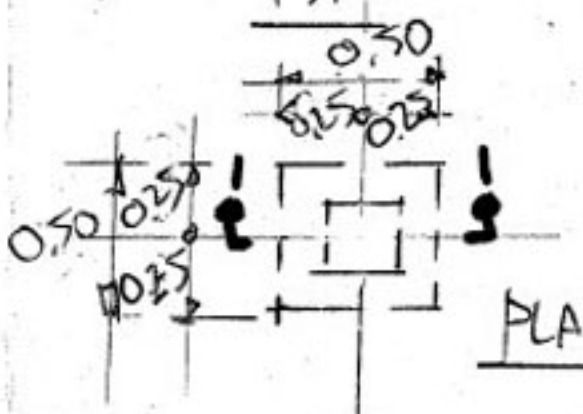
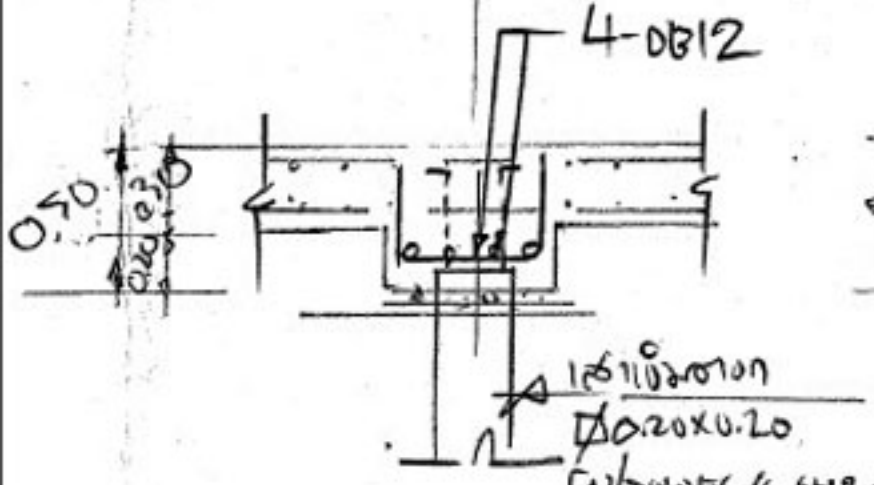
แบบขยายตัวเก็บน้ำ ก.ล.อ. ขนาด 10.00×10.00×2.50 -



FA

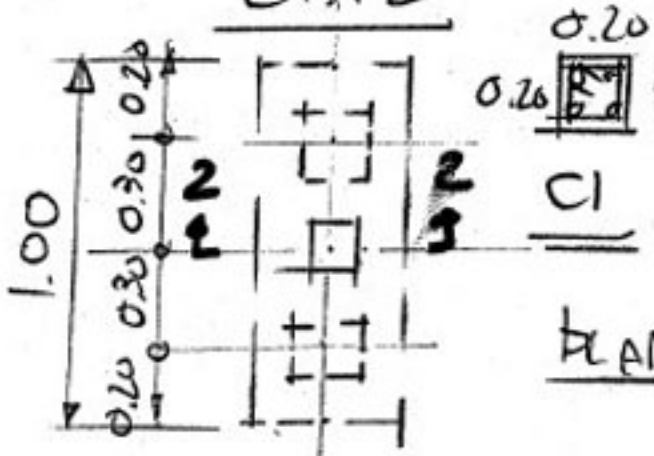


PLAN

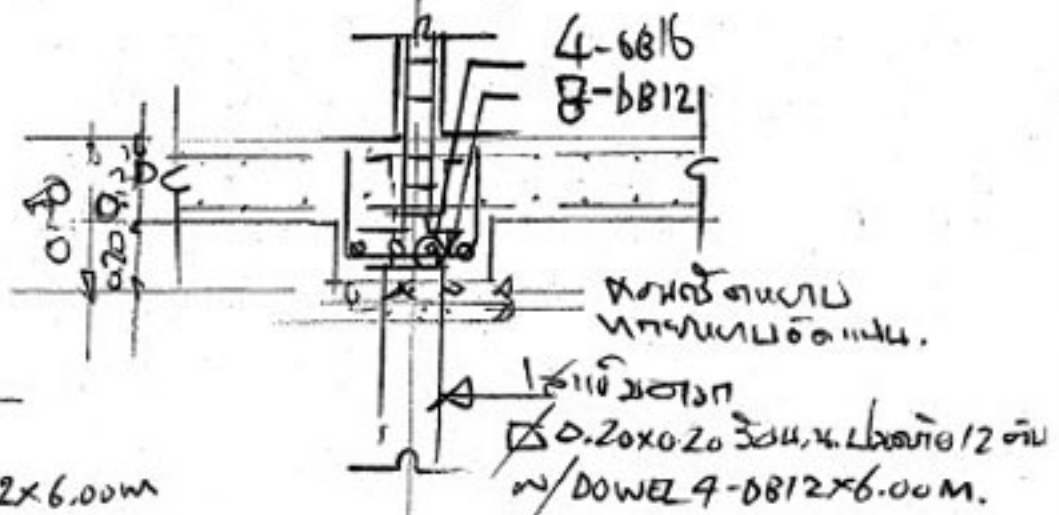


SECTION 1-1

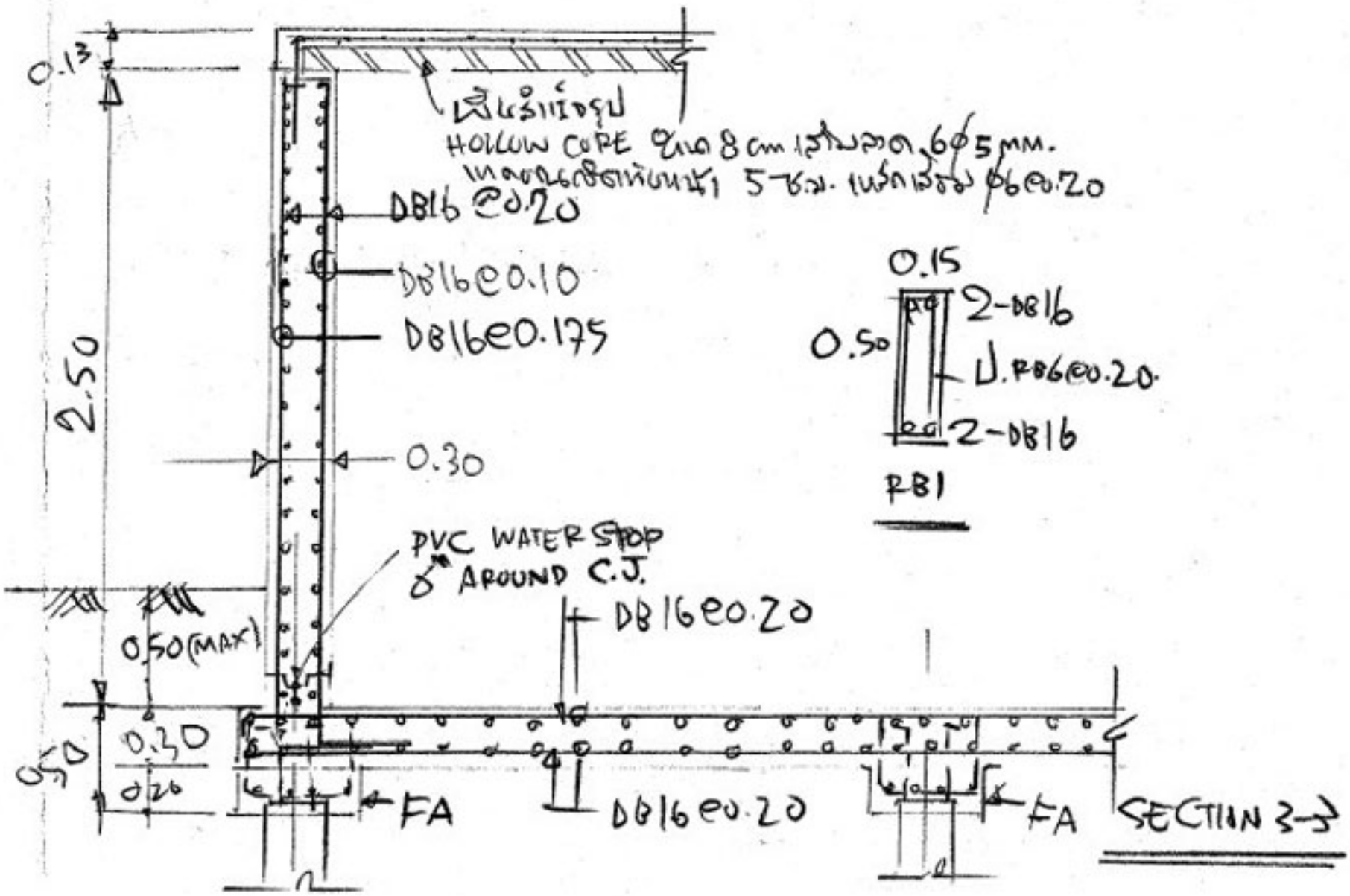
C1 : F2



PLAN



SECTION 2-2



Water Tank = 10.00 × 10.00 × 2.50 m.

Weight of Tank

Base Slab : 10.40 × 10.40 × 0.30 × 2.4 = 78 t
Wall : 10 × 4 × 0.30 × 2.50 × 2.4 = 72 t
top slab : 10 × 10 × 0.10 × 2.4 = 24 t = 174 t

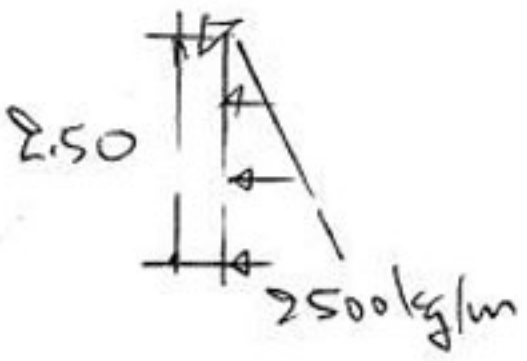
W_1 : 10 × 10 × 2.5 × 1.0 = 124 t
W_2 : 10 × 10 × 0.15 = 15
313 t

Provided PC. Pile Δ 0.20 × 0.20 33 Nos.

Load/Pile = 9.50 t/pile

RC wall tank.

Vertical Reinf.



$M = 0.025 \times 2500 \times 2.50^2$
$= 390$ kg.m/m

$A_s = 0.98$ cm²/m

$A_{st\,min} = 5.40$ " : 08 @ 200 (E.F.)

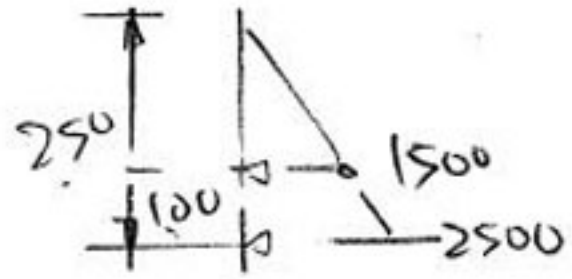
Horizontal Reinf.

$M_{corner} = 0.025 \times 2500 \times 10.0^2$

$= 6,250$ kg.m/m

$M_{mid} = 0.015 \times 2500 \times 10.0^2$

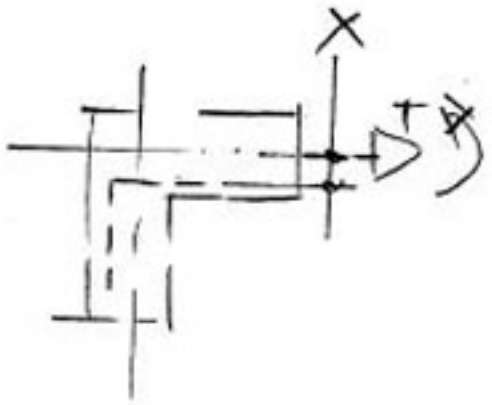
$= 3,750$ kg.m/m



Pull on Wall per Metre height at level 1.m

$P = w(H-1)l/2 = 1000(2.5-1.0)10/2$

$= 7,500$ kg



Design Of Corner Section

$d = 30 - 3.5 = 26.5$ cm

Eff. BM $= M - Tx$

$= 6250 - 7500(0.265 - 0.15)$

$= 5388$ kg.m/m

$A_{st_1} = 13.16$ cm²/m

$A_{st_2} = \frac{I}{f_s} = \frac{2500}{1700} = 4.42$ cm²/m

$A_{st} = 17.50$ cm²/m : 8#16@100 (1F.)

Design of Mid-span Section

Eff. BM $= 3750 - 7500(0.265 - 0.15)$

$= 2888$ kg.m/m

$A_{st_1} = 7.05$ cm²/m

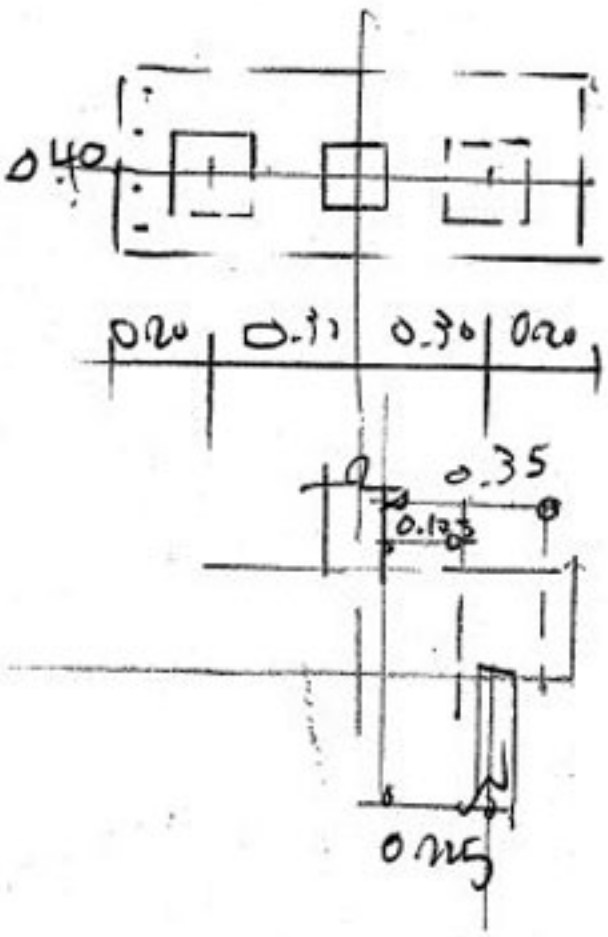
$A_{st_2} = 4.42$ "

$A_{st} = 11.47$ " : 8#16@175 (O.F.)

FZ : Max load on Footing = 24000 kg.

Use 2 : Pile = Ø 20×20

load/pile = 12 t



M = 12000 × 0.225

= 2700 kgm

A_{sf} = 5.0 cm² : 4 ø 16.

$A_{s\,min}$ = 0.0018 × 100 × 40

= 7.2 cm² : 8 ø 12

τ_b =

$\tau_p = \frac{0.7 \times 12000}{40 \times 35} = 5.71$ kg/cm².

Job Title	:	New Factory		Subject : Design of RC. Slab	
Designed	:	PSJ	Date : Sep-15		
Checked			Date :	Sheet :	Page :

Slab No : Slab Tank

A) Properties of Materials

fy	Yield strength of steel	=	4,000	ksc
fs	Allowable strength of steel	=	1,700	ksc
fc'	Ult. compressive strength of concrete	=	210	ksc
	Factor	=	0.375	
fc	Allowable strength of concrete , fc = Factor*fc'	=	79	ksc
k	k = 1/(1+(fs/(n*fc)))	=	0.287	
j	j = 1-k/3	=	0.904	
R	R = 0.50*fc*j*k	=	10.22	ksc

B) Slab Configuration

S	Short span	=	1.67	m
L	Long span	=	2.50	m
C	Provided Pile Dimension	=	0.20	m
t	Thickness, tmin = 0.07 m. (L/36)	=	0.300	m
dc	Concrete cover	=	0.030	m

C) Loading

SW	Self weight	=	720	kg/m^2
DL	Superimposed dead load	=	0	kg/m^2
LL	Live load	=	2,500	kg/m^2
wt	Total load , wt = SW+DL+LL	=	3,220	kg/m^2

D) Bending Reinforcement

D.1) Long Span :

F	F = 1.15-(C/L) >= 1.00	=	1.070	
W	W = wt*S*L+wp*wp*(Dp-t)*2400	=	13,564	kg
Mo	Mo = 0.09*W*L*F*(1-(2*C)/(3*L))^2	=	2,926	kg-m
d	Effective depth	=	0.262	m
MR	Resisting moment , Mr = R*(L/2)*(d*100)^2		8,771	kg-m/m

		% of Mo	M [kg-m]	As/Strip M/(fs*j*d) [cm^2/Strip]	As [cm^2/m]	Reinforcement			
Column Strip	-Mc	50	1,463	3.63	**4.35**	**DB**	**16**	**mm. @**	**0.200 m (T1)**
						(Ast =	**10.05**	cm^2/m)	
	+Mc	28	819	2.03	**2.44**	**DB**	**16**	**mm. @**	**0.200 m (B1)**
						(Ast =	**10.05**	cm^2/m)	
Middle Strip	-Mm	25	732	1.82	**2.18**	**DB**	**16**	**mm. @**	**0.250 m (T1)**
						(Ast =	**8.04**	cm^2/m)	
	+Mm	16	468	1.16	**1.39**	**DB**	**16**	**mm. @**	**0.200 m (B1)**
						(Ast =	**10.05**	cm^2/m)	

D.2) Short Span :

F	F = 1.15-(C/S) >= 1.00	=	1.03	
W	W = wt*S*L+wp*wp*(Dp-t)*2400	=	13,564	kg
Mo	Mo = 0.09*W*S*F*(1-(2*C)/(3*S))^2	=	1,778	kg-m
d	Effective depth	=	0.246	m
MR	Resisting moment , Mr = R*(S/2)*(d*100)^2	=	5,165	kg-m/m

		% of Mo	M [kg-m]	As/Strip M/(fs*j*d) [cm^2/Strip]	As [cm^2/m]	Reinforcement			
Column Strip	-Mc	50	889	2.35	**1.88**	**DB**	**16**	**mm. @**	**0.200 m (T2)**
						(Ast =	**10.05**	cm^2/m)	
	+Mc	28	498	1.32	**1.05**	**DB**	**16**	**mm. @**	**0.200 m (B2)**
						(Ast =	**10.05**	cm^2/m)	
Middle Strip	-Mm	25	445	1.18	**0.94**	**DB**	**16**	**mm. @**	**0.250 m (T2)**
						(Ast =	**8.04**	cm^2/m)	
	+Mm	16	285	0.75	**0.60**	**DB**	**16**	**mm. @**	**0.200 m (B2)**
						(Ast =	**10.05**	cm^2/m)	
Ast(min)	Temp. steel , Ast(min) =0.0018 *b*t				**5.40**	**DB**	**16**	**mm. @**	**0.200 m**
						(Ast =	**10.05**	cm^2/m)	

E) Check shear

E.1) Punching shear

Provided Pretension Pile ***I-0.26x0.26 m.*** Safe load :		:	20	ton	
bp	Pile Dimension	=	0.20	m	
wp	Pile cap width	=	0.50	m,Shall be >	1.05 m
E.1.1) Punching Shear around Pile					
Dp	Depth of Pile	=	50.00	cm	
Critical section is located at a distance d/2 form edge of pile					
Vp	Punching shear, V = wt*S*L-wt*bp*bp	=	13,435	kg	
dp	Pile Cap effective depth	=	26.20	cm	
b1	b = 4*(bp+dp)	=	184.80	cm	
vp	Vp/(b*dp)	=	2.64	ksc	
vc	Allowable shear, vc = 0.53*Sqrt(fc')	=	7.68	ksc > vp OK.	
E.1.2) Punching Shear around Pilecap					
Critical section is located at a distance d/2 form edge of pilecap					
Vp	Punching shear, V = wt*S*L-wt*wp*wp	=	12,759	kg	
d	Effective depth	=	26.20	cm	
b2	b = 4*(wp+d)	=	304.80	cm	
vp	Vp/(b*d)	=	1.60	ksc	
vc	Allowable shear, vc = 0.53*Sqrt(fc')	=	7.68	ksc > vp OK.	

E.2) Wide beam shear

Critical section is located at a distance d form center line of the column					
Vb	Wide beam shear, Vb = wt*(L/2)*((L/2)-d)/(L/2)	=	3,161	kg	
d	effective depth	=	26.2	cm	
b	b = S	=	167	cm	
vb	Vb/(b*d)	=	0.40	cm	
vc	Allowable shear, vc = 0.29*Sqrt(fc')	=	4.20	ksc > vb OK.	

RB1 : 0.15x0.50

DL = 180 kg/m

SL = 1950 "

2130 "

$M = \frac{1}{8} \times 2130 \times 3.35^2$

= 2629 kg-m

A_s = 3.70 cm^2 = 2DB16

V = 3567 kg

V_c = 2685 "

V' = 882 " ∴ RB6@0.20

C1 : 0.15x0.15

N = 2x3567 = 7200 kg

P_c = 8271 kg.

1% A_g : 4-DB12, w/RB6@.15 Tied

Two-way slabs: Rectangular panels: Triangularly-distributed loads

Table 53

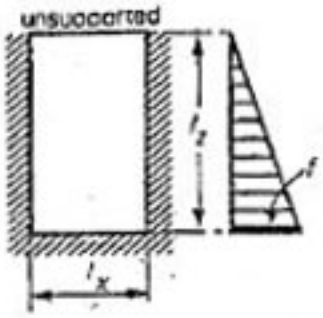
Bending-moment coefficients

$\frac{\text{bending moment}}{ll^2} = 0.20$

Span ratios $\frac{l_x}{l_y}$: 0.3 0.5 1.0 1.5 2.0 2.5 3.0

λ

Case 1.
unsupported along top edge



Curves for this case are applicable only for $\frac{l_x}{l_y}$ < 0.5 > 2.0

λ_2 and λ_3 (max horizontal B.M.)

B.M. coefficients vertical span

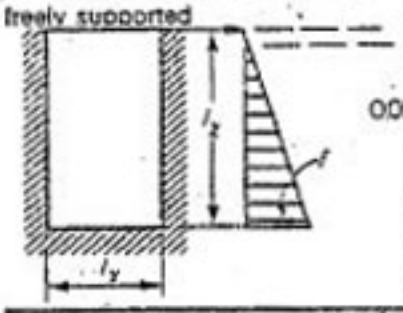
negative B.M. at bottom

negative B.M. at sides

B.M. coefficients horizontal span

positive B.M. at midspan

Case 2.
freely supported along top edge



λ_3 (positive B.M.)

λ_1

λ_2 (negative B.M.)

B.M. coefficients vertical span

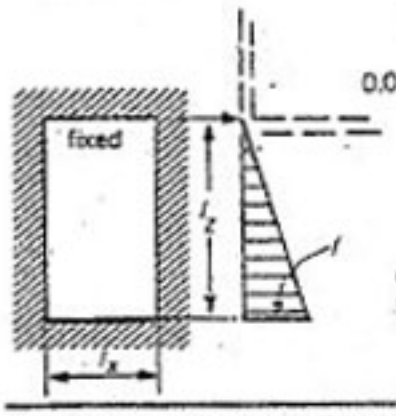
negative B.M. at sides

negative B.M. at bottom

Positive B.M. at $\lambda_1 l_x$

B.M. coefficients horizontal span

Case 3.
Fixed or continuous along top edge



λ_3 (positive B.M.)

λ_2 (negative B.M.)

λ_1

B.M. coefficients vertical span

negative B.M. at sides

positive B.M. at sides

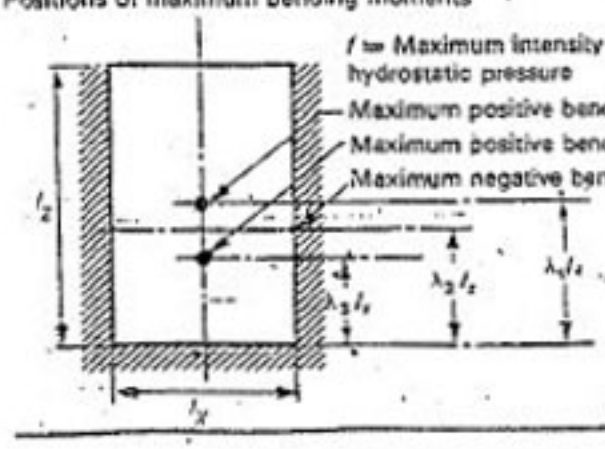
negative B.M. at bottom

Negative B.M. at top and positive B.M. at $\lambda_1 l_x$

B.M. coefficients horizontal span

l_x/l_y

Positions of maximum bending moments



f = Maximum intensity of hydrostatic pressure

Maximum positive bending moment vertical span

Maximum positive bending moment horizontal span

Maximum negative bending moment horizontal span

Notes

Panels fixed or continuous along bottom edge and both vertical sides; condition along top edge as indicated.

Fractions thus '$\frac{1}{24}$' indicate coefficients to which curves are asymptotic or to which coefficients approach as span ratio l_x/l_y approaches zero or infinity.

Vertical span: bending moment = (coefficient) ll_y^2
Horizontal span: bending moment = (coefficient) ll_x^2

Scale on right-hand side is for values of λ_1, λ_2 and λ_3. Ratio of spans = $k = l_x/l_y$.