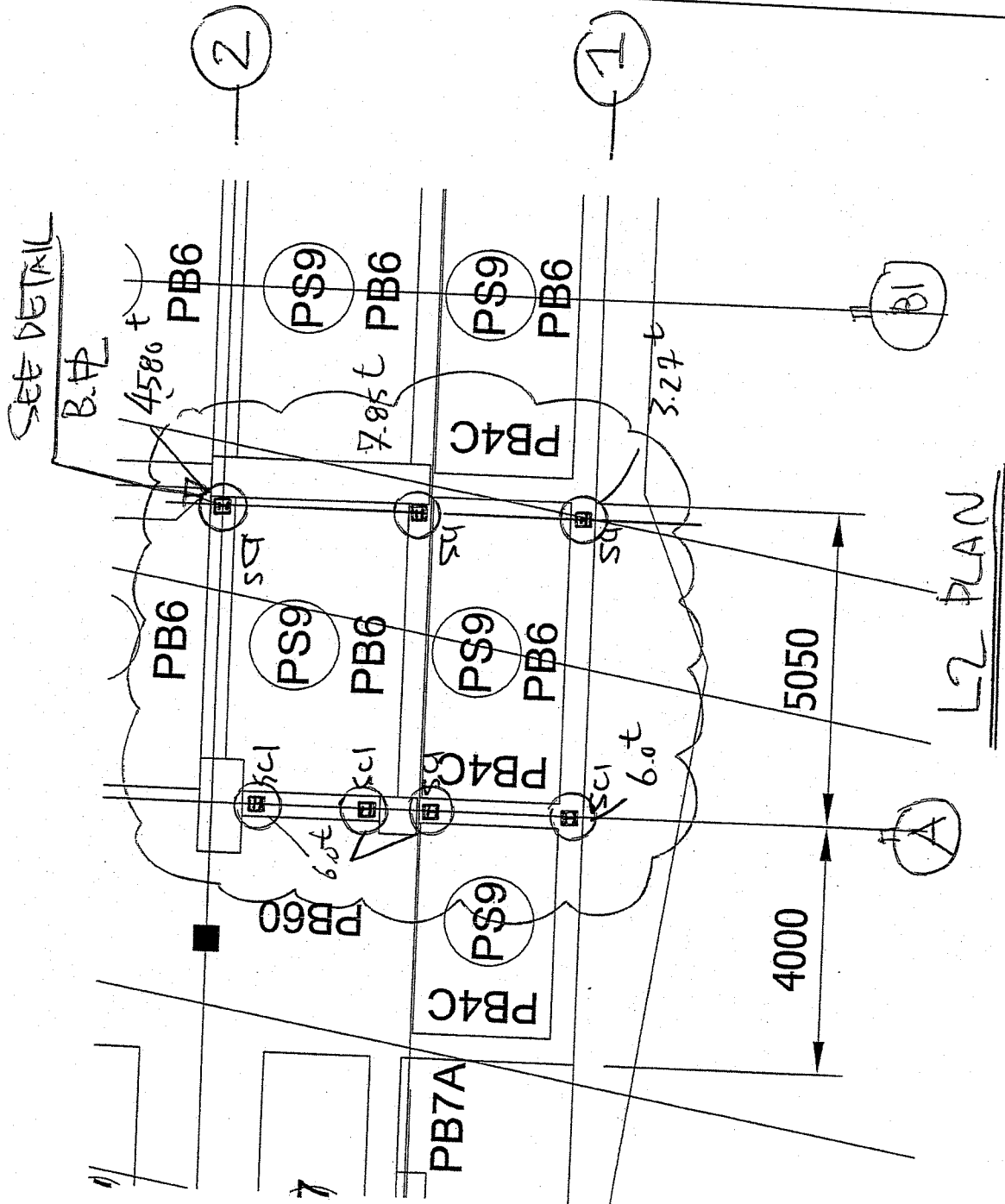
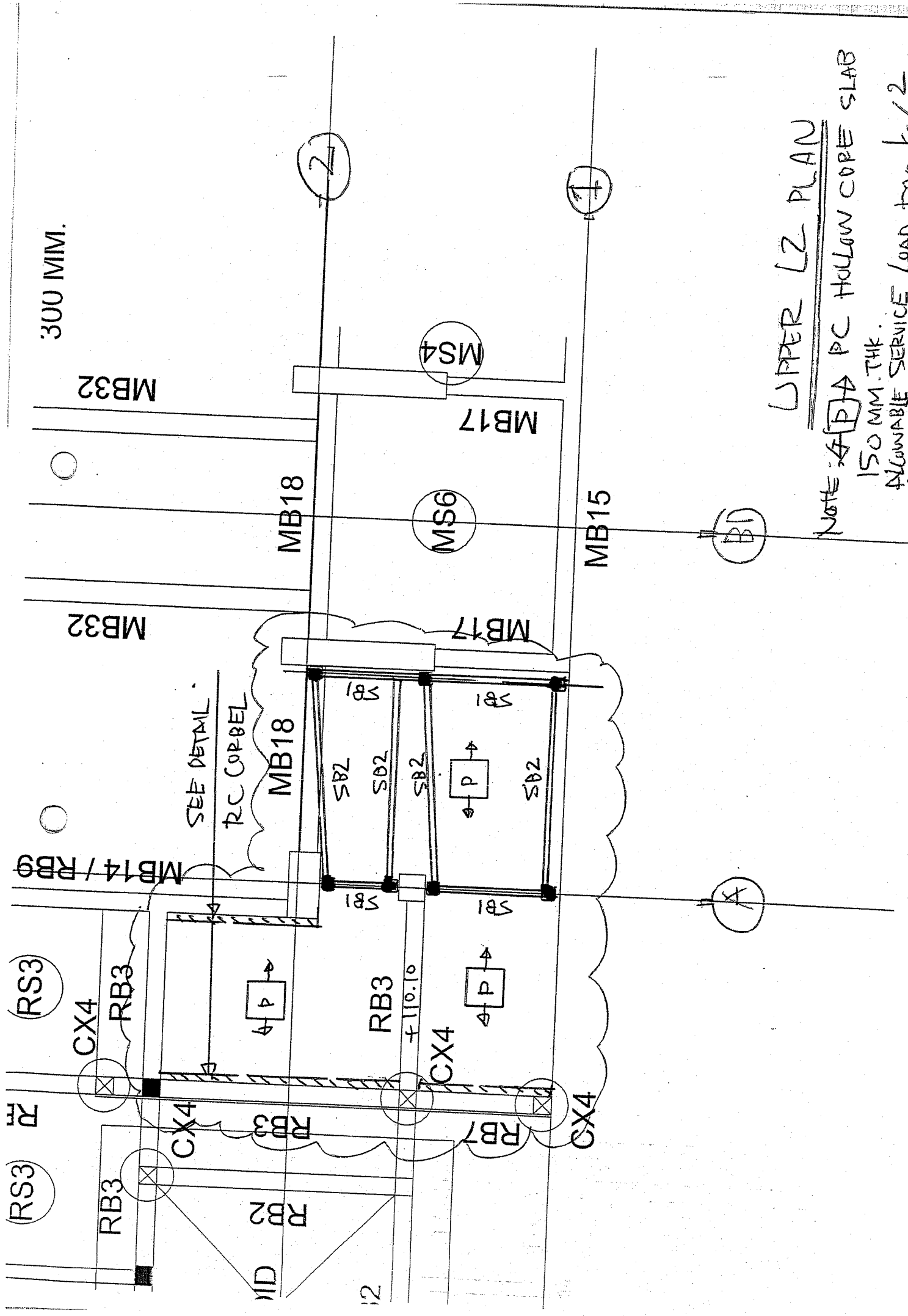


Revised AHU/Fan Room @ Mezzanine #.
Of Coffee Shop Kitchen

24-07-06.



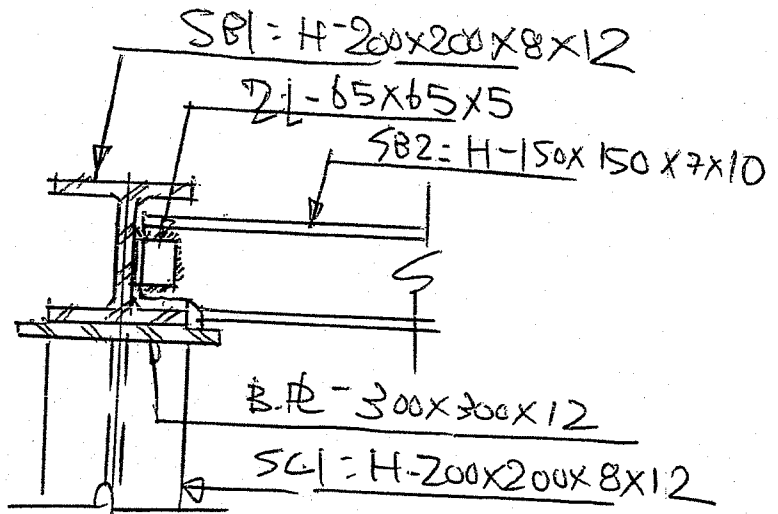


300 MM.

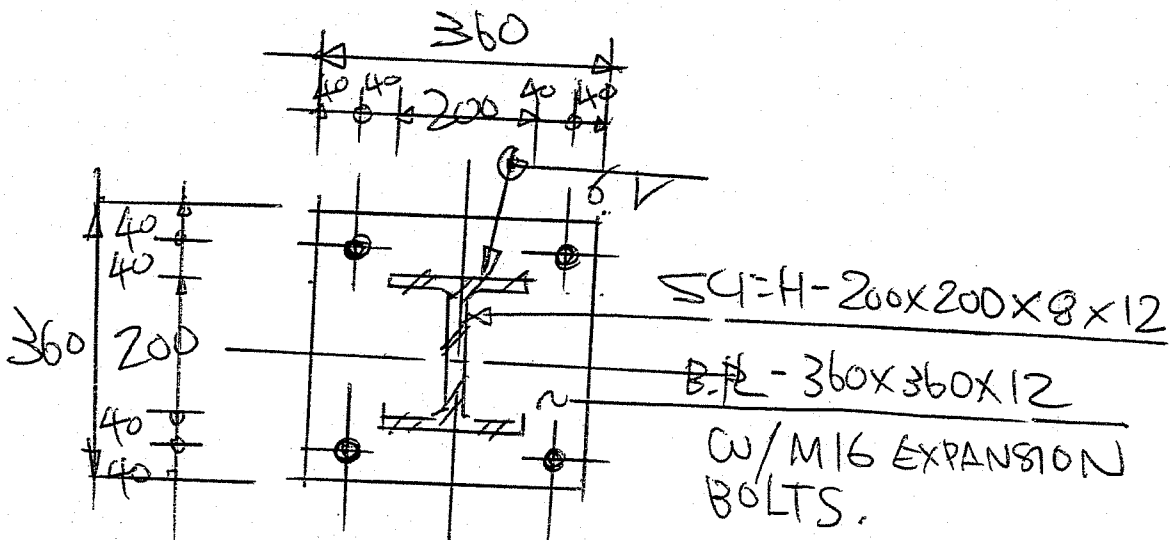
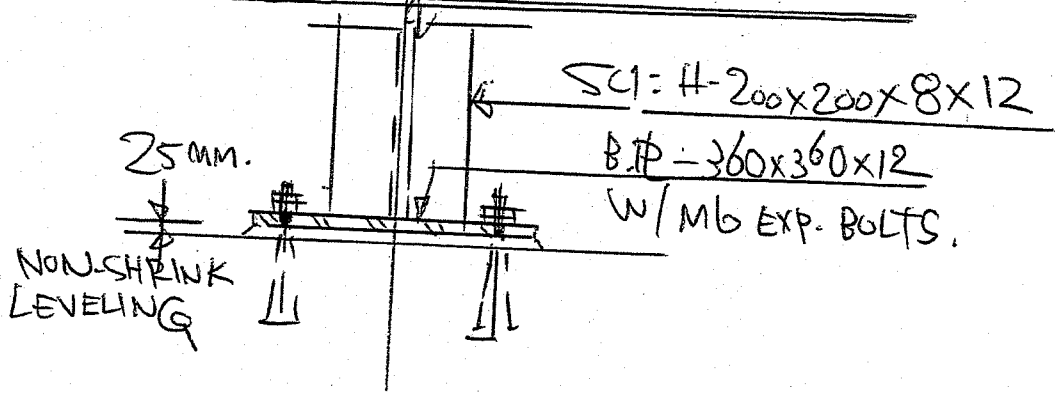
UPPER LZ PLAN
 NOTE: \square PC HOLLOW CORE SLAB
 150 MM THK.
 ALLOWABLE SERVICE LOAD 1500 kg/m²
 DATA APPROXIMATE

SEE DETAIL.
 RC CORBEL

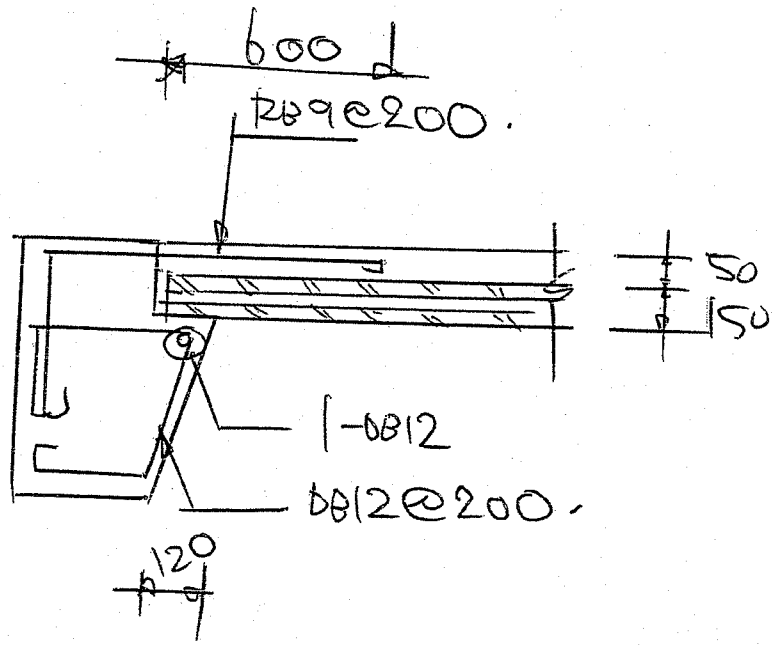
+110.10



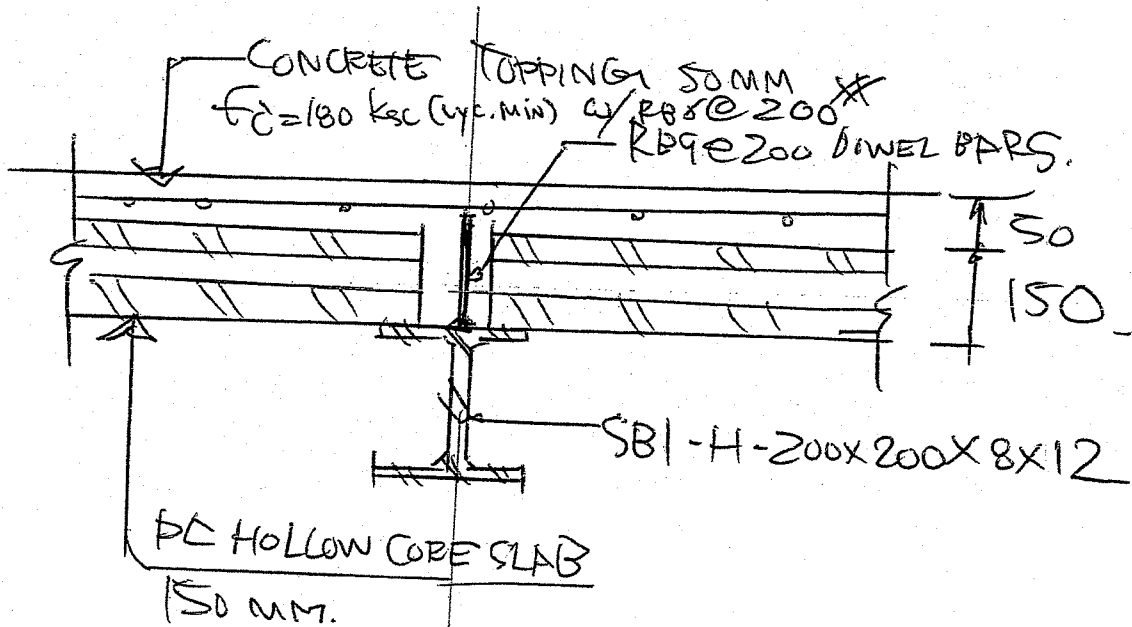
CONNECTION DETAIL BETWEEN SB1 & SB2



DETAIL OF B.P.



DETAIL OF RC CORNER



ALLOWABLE SERVICE LOAD 500 kg/m^2
 & SUPERIMPOSED DEAD LOAD 150 kg/m^2 .

DETAIL OF RC HOLLOW CORE SLAB

CALCULATION SHEET

PROJECT	SCM	JOB ID	
SUBJECT	AHU Room 110.00	DESIGNED	PJ
	PL (E)-B/1(3)	CHECKED	July '06
		PAGE	
		SHEET	

Provided : Hollow core Slab 150 mm +
Topping 50 mm.

Span 5.25 m, $w/b = 3/8$
 $U = 547 \text{ kg/m}^2$ [design 500 kg/m^2]
 $SW = 302 \text{ kg/m}^2$

Steel Beam SB1 = span 2.50 m

$$SW = 50 \text{ kg/m}$$

$$SI = (302 + 500) \times 5.25 = 4210 \text{ kg/m}$$

$$WI = 540 \text{ kg/m}$$

$$wf = \underline{4800 \text{ kg/m}}$$

$$M = \frac{1}{8} \times 4800 \times 2.5^2 = 3750 \text{ kg m}$$

$$Z_{req} = 260 \text{ cm}^3$$

$$I_{req} = \frac{5 \times [2.5 \times 4800] \times 250^3}{384 \times 2 \times 10^6 \times 0.69}$$

$$= 1769 \text{ cm}^4$$

$$V = 6000 \text{ kg}$$

CALCULATION SHEET

PROJECT	JOB ID	
SUBJECT	DESIGNED	PAGE
	CHECKED	SHEET

Steel beam span 3.50 m

$$W = 50 \text{ kg/m}$$

$$W_1 = [302 + 50] \times 3.5 / 2 = 2025$$

$$W_1 = \frac{540}{2} = 270 \text{ kg/m}$$

$$M = \frac{1}{8} \times 2025 \times 3.5^2 = 4006 \text{ kg-m}$$

$$Z_{req} = 278 \text{ cm}^3$$

$$I_{req} = \frac{5 \times [3.5 \times 2025] \times 350}{384 \times 2 \times 10^6 \times 0.97} = 2634 \text{ cm}^4$$

$$V = 4578 \text{ kg}$$

Provide = H-200 X 200 X 8 X 12 X 49.9 kg/m

$$[I_x = 4720 \text{ cm}^4 ; Z_x = 472 \text{ cm}^3]$$

Job Title : SLCM	Date : Jul-06	Subject : Design of Steel Column-Beam	
Designed : PSJ	Date :	Sheet :	Page :
Checked :			

Column No. : C-2

A) Properties of Materials & Parameters

Fy =	2400 ksc
Es =	2.10E+06 ksc
Length, L =	4.80 m
Unbraced Length, Lb =	480 cm
Cb =	1.75
Cmx =	0.85 (Cm = 0.85 for Sidesway and
Cmy =	0.85 0.6-0.4(M1/M2) > 0.4 for Nosway)
Kx =	1.20
Ky =	1.00

C) Loading

P =	6,000 kg
Mx =	0 kg.m
My =	0 kg.m

D) Allowable Compression Force

KxL/rx =	66.82
KyL/ry =	95.62
(KL/r)Max =	95.62
Cc = Sqrt(2π²*Es/Fy) =	131.42
Fa =	(1-(KL/r)²/(2*Cc²))*Fy/(5/3+3(KL/r)/(8*Cc)-(KL/r)³/(8*Cc³))
Fa =	933 ksc
fa = P/A =	94 ksc
fa/Fa =	0.10 < 0.15

E) Check Diagonal Web Buckling (Webs in Flexural Compression)

d/tw =	22.00
λp = 3.76*Sqrt(Es/Fy) =	111.22 > d/tw OK.
λr = 4.50*Sqrt(Es/Fb) =	171.85 > d/tw OK.

F) Allowable Bending Stress

E.1) Allowable Bending Stress about X-Axis

Determining Maximum Unbraced Length, Lc

0.45*bf*Sqrt(Es/Fy), L1 =	266 cm
1.41x10⁹/(D/Af)Fy, L2 =	705 cm
Min(L1,L2), Lc =	266 cm

Allowable Bending Stress for Lb > Lc

Cw=0, Fb' =	843600*Cb/((Lb*D/Af)	=	3,691 > 0.60*Fy = 1,440
j=0, Af+(1/6)Aw =	26.35 cm²		
rt =	5.51 cm		
Lb/rt =	87.11		
Sqrt(717x10⁴*Cb/Fy) =	72.31		
Sqrt(3585x10⁴*Cb/Fy) =	161.68		
Sqrt(7170000*Cb/Fy < Lb/rt < Sqrt(35850000*Cb/Fy)			
Fbx" =	[2/3-Fy*(Lb/rt)²/(107560000*Cb)*Fy	=	1,368 ksc
			1,440 ksc
Max(Fb',Fbx") =			1,440 ksc

Allowable Bending Stress :

Fbx =	1,440 ksc
fbx = Mx/Sx =	0 ksc < Fb OK.

E.2) Allowable Bending Stress about Y-Axis

b/ft =	8.00
λp = 0.38*Sqrt(Es/Fy) =	11.24
λr = 0.56*Sqrt(Es/Fy) =	16.57
b/ft < 0.38*Sqrt(Es/Fy)	
Fby =	0.75*Fy
Fby =	1,584 ksc
fby = My/Sy =	0 ksc

F) Check Interaction Equation

F'ex = 12π²Es/(23*(KxL/rx)²) =	2,422 ksc
F'ey = 12π²Es/(23*(KyL/ry)²) =	1,183 ksc
CASE : fa/Fa > 0.15	
fa/Fa+Cmx*fbx/[(1-fa/F'ex)*Fbx]+Cmy*fby/[(1-fa/F'ey)*Fby] =	0.10 < 1.00 OK.
fa/0.60Fy+fbx/Fbx+fby/Fby =	0.07 < 1.00 OK.
CASE : fa/Fa < 0.15	
fa/Fa+fbx/Fbx+fby/Fby =	0.10 < 1.00 OK.

B) Properties of Section

USE Section :	H-200x200x8x12
Area =	63.53 cm²
D =	20.00 cm
bf =	20.00 cm
tw =	0.80 cm
tf =	1.20 cm
Ix =	4,720 cm⁴
Iy =	1,600 cm⁴
rx =	8.62 cm
ry =	5.02 cm
Sx =	472 cm³
Sy =	160 cm³

Job Title : SLCM (B.P FOR AHU ROOM +110.10 M.	Subject : Design of Base Plate
Designed : PSJ Date : Jul-06	
Checked : Date :	Sheet :
	Page :

A) Properties of Materials

Fy	=	2,400	ksc
Es	=	2.10E+06	ksc
Ultimate Comp. Strength of Concrete, fc'	=	280	ksc

B) Geometry

Steel Column :	bf	=	20.00	cm
	D	=	20.00	cm
Base Plate :	B	=	36.00	cm
	N	=	36.00	cm
RC. Column :	Bc	=	40.00	cm
	Nc	=	40.00	cm

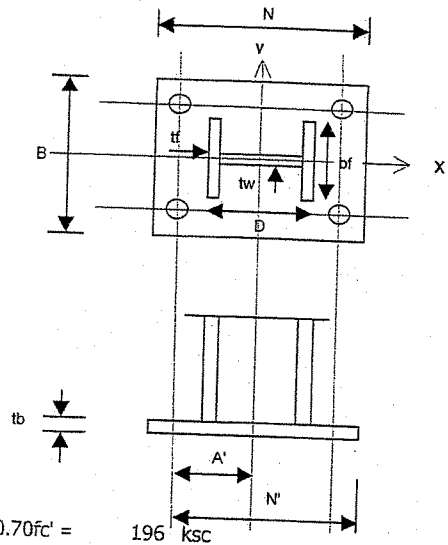
C) Loading

Axial Load, P	=	6,000	kg
Moment, My-y	=	0	kg.m
Moment, Mx-x	=	-	kg.m

E) Determining Thickness of Base Plate

A1=B*N	=	1,296.00	cm ²
A2=Bc*Nc	=	1,600.00	cm ²
Allowable Bearing Stress, Fp = 0.35fc'Sqrt(A2/A1)	=	108.89	ksc

Bearing Stress ;			
f1=[P/A1+6*My-y/BN ² +6*Mx-x/NB ²]	=	4.63	ksc
f2=[P/A1-6*My-y/BN ² -6*Mx-x/NB ²]	=	4.63	ksc
n=(B-0.80bf)/2	=	10.00	cm
m=(N-0.95D)/3	=	8.50	cm
L=Max(n,m)	=	10.00	cm
Mp=0.50*f1*L ²	=	231.55	kg.cm
Fb=0.75*Fy	=	1,800.00	Ksc
tb(req)=Sqrt(6*Mp/Fb)	=	0.88	cm



< 0.70fc' = 196 ksc
 < Fb OK.
 > 0, No Tension in Base Plate

PROVIDE Base Plate : 360 x 360 x 12 mm.

CALCULATION SHEET

PROJECT	SLM	JOB ID	
SUBJECT	Moz AHU Room	DESIGNED	[Signature]
		CHECKED	[Signature]
		PAGE	
		SHEET	

Recheck RC Beam L2

$$PBB: 400 \times 700 \text{ dp}$$

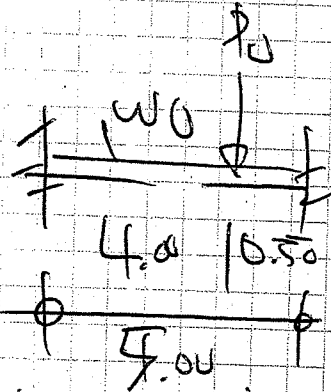
$$Dl = 672 \text{ kg/m}$$

$$S1 = [480 + 1000 + 300] \times 2.75$$

$$= 4895$$

$$= 5567 \text{ kg/m} \quad \rightarrow \quad WU = 10.30 \text{ t/m}$$

$$P_t = 7050 \text{ kg} \quad \rightarrow \quad P_u = 14.55 \text{ t}$$



$$PBB: 400 \times 700 \text{ dp}$$

$$Dl = 672 \text{ kg/m}$$

$$P_t \text{ from steel column} = 6000 \text{ kg}$$

$$P_t \text{ from PBB} = 672 \times 4.525 +$$

$$- [480 + 1000 + 300] \times 4.525$$

$$= 900 \times 4.525$$

$$= 15168 \text{ kg}$$

$$\Sigma P_t = 21,167 \text{ kg}$$

CALCULATION SHEET

PROJECT	JOB ID	
SUBJECT	DESIGNED	PAGE
	CHECKED	SHEET

$$M = 0.5 \times 672 \times 2.7^2$$

$$= 21167 \times 2.7$$

$$= 59600.34 \text{ kg m}$$

$$M_U = 110260 \text{ kg m}$$

$$f_{st} = 60.55 \text{ cm} : \frac{-120828 \text{ (Top) ok!}}{[7392 \text{ cm}]}$$

$$V_U = 22981 \times 1.85$$

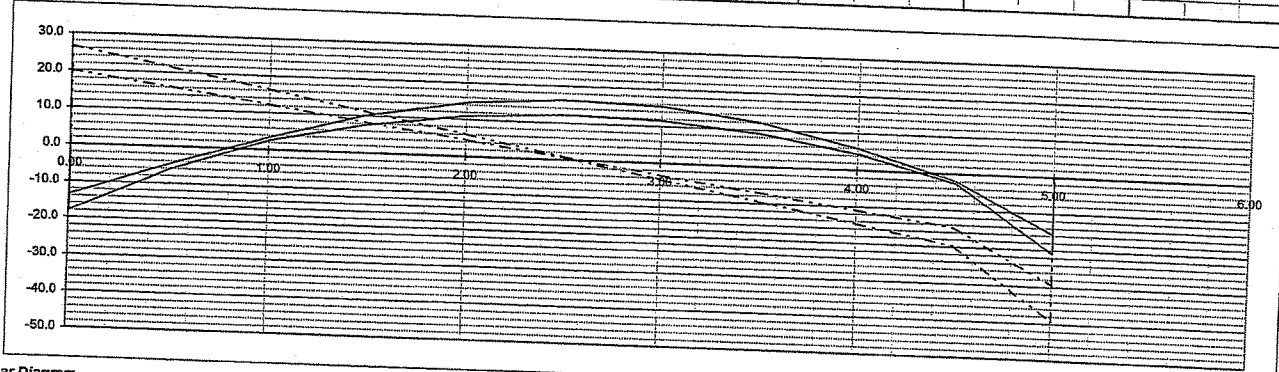
$$= 42516 \text{ kg} \quad \underline{20872 @ 25 \text{ stir ok!}}$$

Beam Ultimate Design PB6A

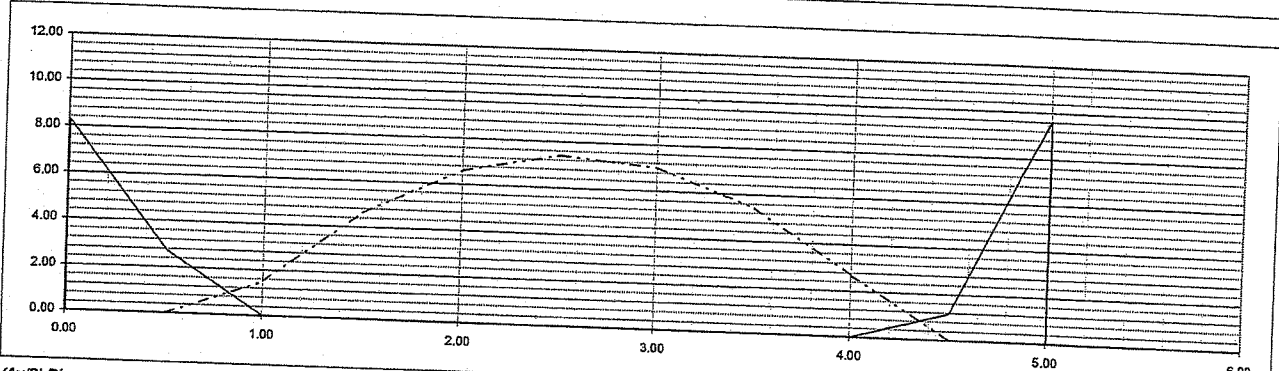
Calculation Sheet

Material		Column		PB6A		PB6A		PB6A		PB6A		PB6A		PB6A	
fc	280	TOP	Height	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
fy	4000	Width	Thick	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
fyst	4000	Bottom	Height	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
		Width	Thick	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
Beam		PB6A		PB6A		PB6A		PB6A		PB6A		PB6A		PB6A	
Length	Width	Thick	0.01	40.00	70.00	5.00	40.00	70.00	0.05	40.00	70.00				
	T.Cov.	C.Cov.		7.50	7.50		7.50	7.50		7.50	7.50				
MWL	A1	B1													
W2	A2	B2				10.3	0	5.00							
W3	A3	B3													
W4	A4	B4													
P1	X1														
P2	X2					14.53	4.5								
P3	X3														
P4	X4														
End Force (Load Combination 1.4DL+1.7LL Or 0.75(1.4DL+1.7LL+1.7WL))															
Moment	Max.	0.0	0.0	0.0	-13.6	-15.8	0.0	0.0							
	Min.	0.0	0.0	0.0	-18.1	-21.0	0.0	0.0							
Shear	Max.	0.0	0.0	0.0	26.6	-29.6	0.0	0.0							
	Min.	0.0	0.0	0.0	20.0	-39.4	0.0	0.0							
Design Moment (M- At Column Face, M+ Not Reduce By Clear Span)															
Moment	Max.	0.0	0.0	0.0	-9.6	16.3	-9.8	0.0							
	Min.	0.0	0.0	0.0	-12.8	0.0	-13.1	0.0							
Main Bar	Top	0.0	0.0	0.0	5.8	0.0	0.0	0.0							
	Bottom	0.0	0.0	0.0	0.0	7.4	0.0	0.0							
Design Shear (At Distance d From Column Face)															
Shear	0.0	Avmin	0.0	17.1	Avmin	-15.4	0.0	Avmin	0.0						
Stirrup	Av/S	0.000	0.035	0.000	0.000	0.035	0.000	0.000	0.035	0.000					
	S.Max.	31.3		31.3		31.3		31.3		31.3					

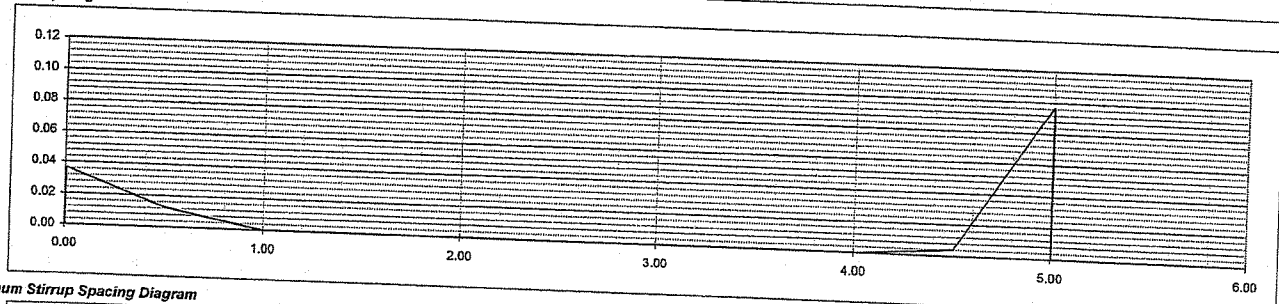
Moment and Shear Diagram



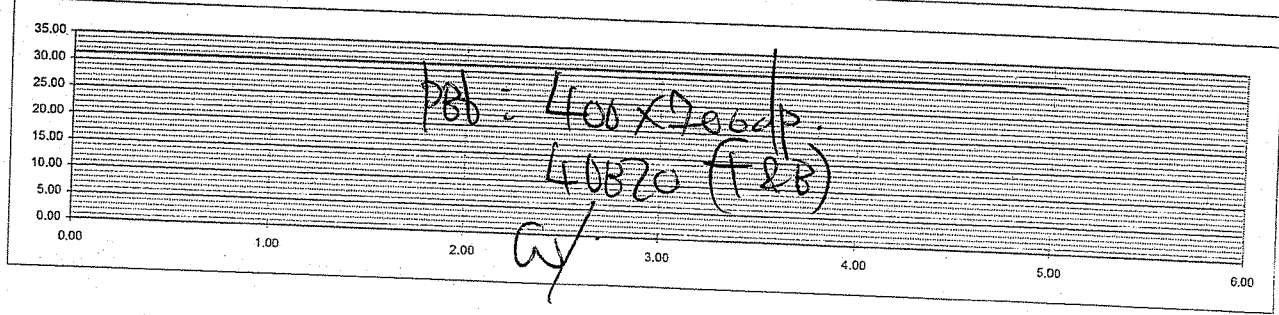
Main Bar Diagram



Stirrup (Av/S) Diagram



Maximum Stirrup Spacing Diagram



PB6 = 400 x 700 dp.
4ØB20 (T & B)
Ay

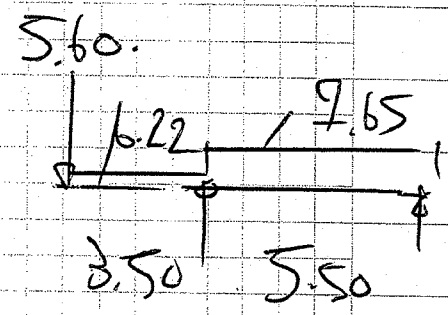
CALCULATION SHEET

PROJECT	SCM	JOB ID	
SUBJECT	Mez AHU Room #110.	DESIGNED	PAGE
		CHECKED	SHEET

Recheck RC Beam RB7-RB3. M/E Transfer #L.

RB7: 400x700

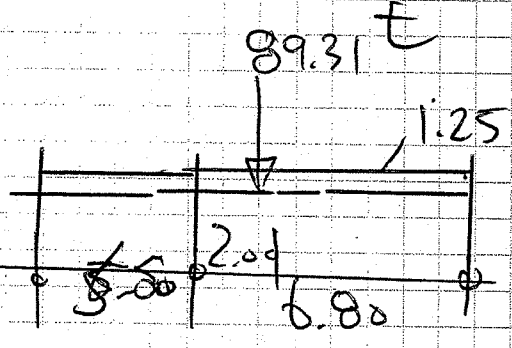
$DL = 672 \text{ kg/m}$ "
 $SL = 2924$ "
 $WL = 540$ "
4136 "
3362



$P_f = 3030 \text{ kg}$

RB3: 400x700

$DL = 672 \text{ kg}$
 $R_{L1} = 25.45 \text{ t}$
 $R_{L2} = 22.83 \text{ t}$

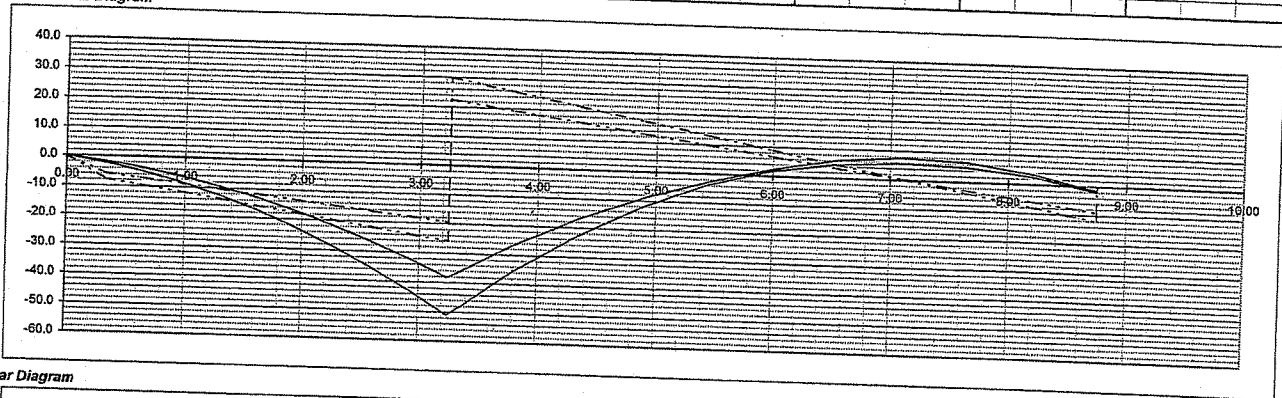


Beam Ultimate Design RB7A

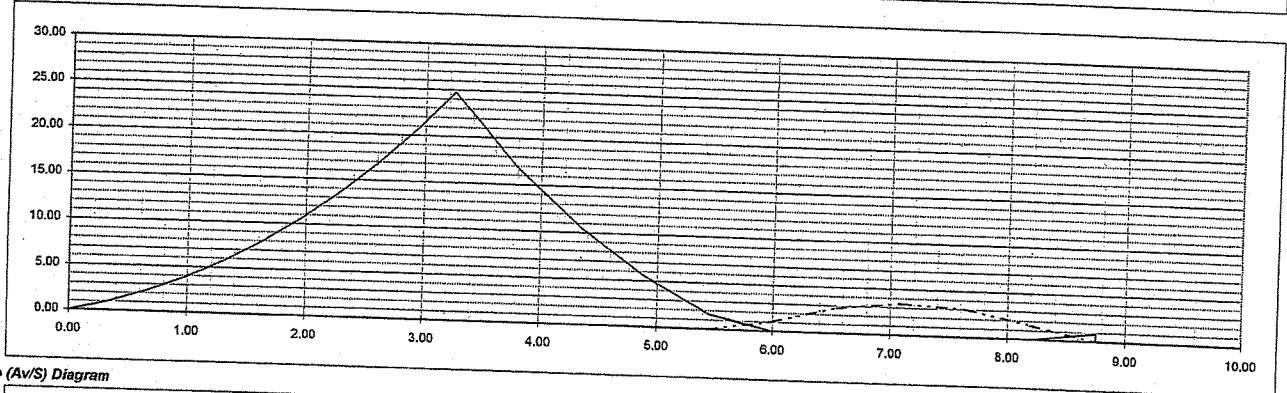
Calculation Sheet

Material		Column											
fc'	280	Top Height											
fy	4000	Width	Thick										
fyst	4000	Bottom Height											
Beam		Width		Thick									
Length	Width	Thick	3.25	40.00	70.00	5.50	40.00	70.00	0.05	40.00	70.00		
T.Cov.	C.Cov.		7.50	7.50									
MWL	MWR												
W1	A1	B1	6.22	0	3.25	7.65	0	5.50					
W2	A2	B2											
W3	A3	B3											
W4	A4	B4											
P1	X1		5.6	0		0	0						
P2	X2												
P3	X3												
P4	X4												
End Force (Load Combination 1.4DL+1.7LL Or 0.75(1.4DL+1.7LL+1.7WL))													
Moment	Max.	0.0	-38.3	-38.3	-1.5	0.0	0.0						
	Min.	0.0	-51.0	-51.0	-2.0	0.0	0.0						
Shear	Max.	0.0	-19.4	30.0	-9.1	0.0	0.0						
	Min.	0.0	-25.8	22.5	-12.1	0.0	0.0						
Design Moment (M- At Column Face, M+ Not Reduce By Clear Span)													
Moment	Max.	0.0	-38.3	-38.3	7.6	0.4	0.0						
	Min.	0.0	-51.0	-51.0	0.0	0.3	0.0						
Main Bar	Top	0.0	0.0	24.7	24.7	0.0	0.0						
	Bottom	0.0	0.0	0.0	0.0	3.4	0.2						
Design Shear (At Distance d From Column Face)													
Shear	0.0	Avmin	-21.9	25.2	Avmin	-5.0	0.0	Avmin	0.0				
Stirrup	Av/S	0.000	0.035	0.015	0.030	0.035	0.000	0.000	0.035	0.000			
	S.Max.	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3			

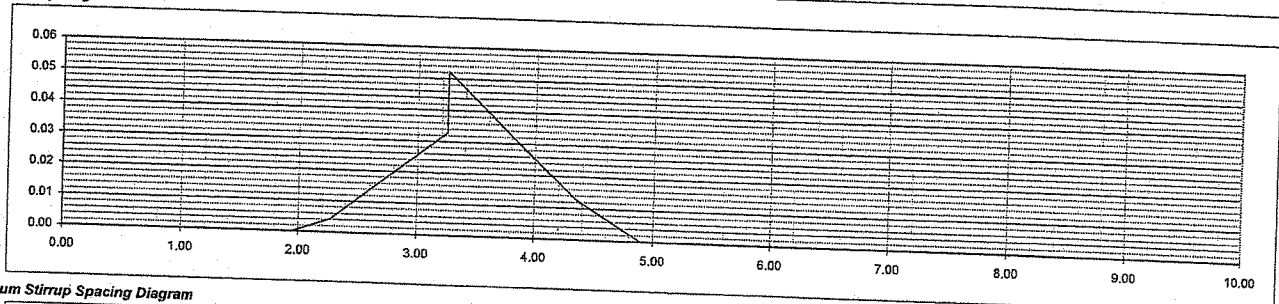
Moment and Shear Diagram



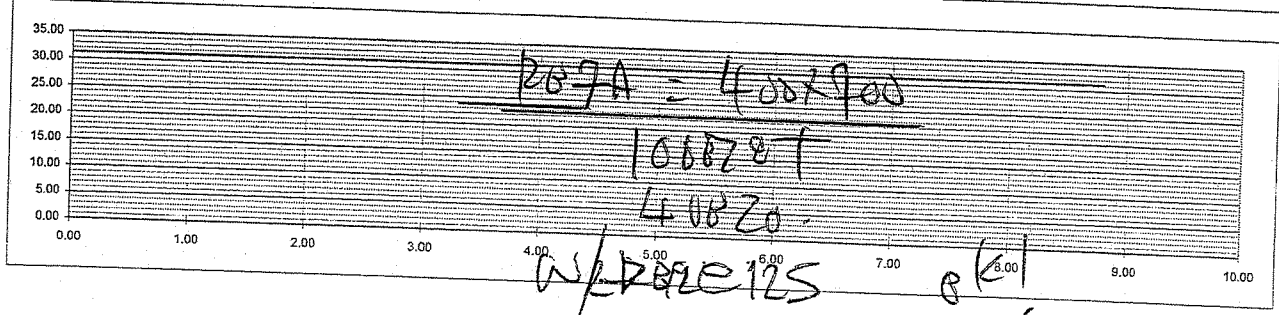
Main Bar Diagram



Stirrup (Av/S) Diagram



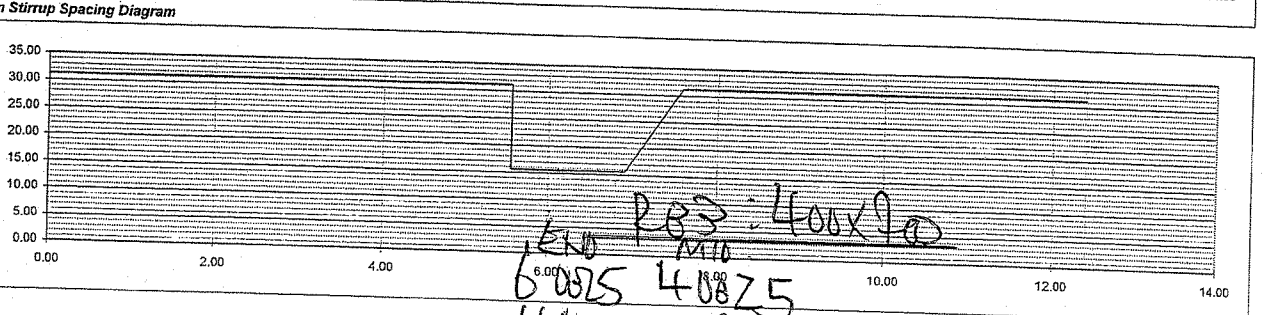
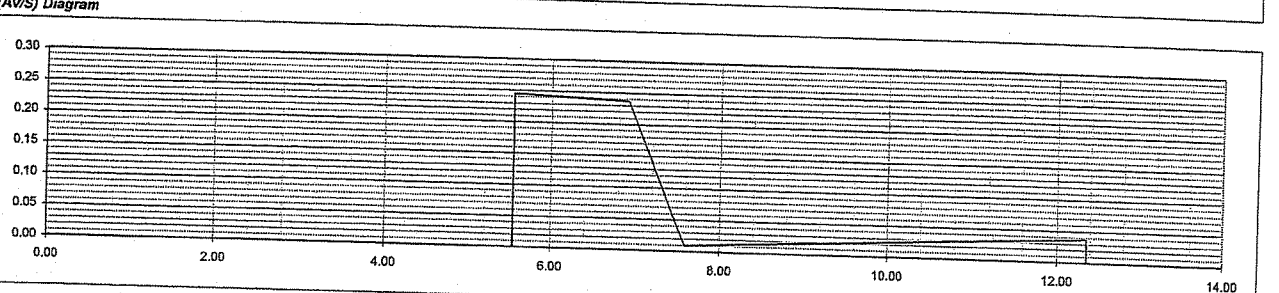
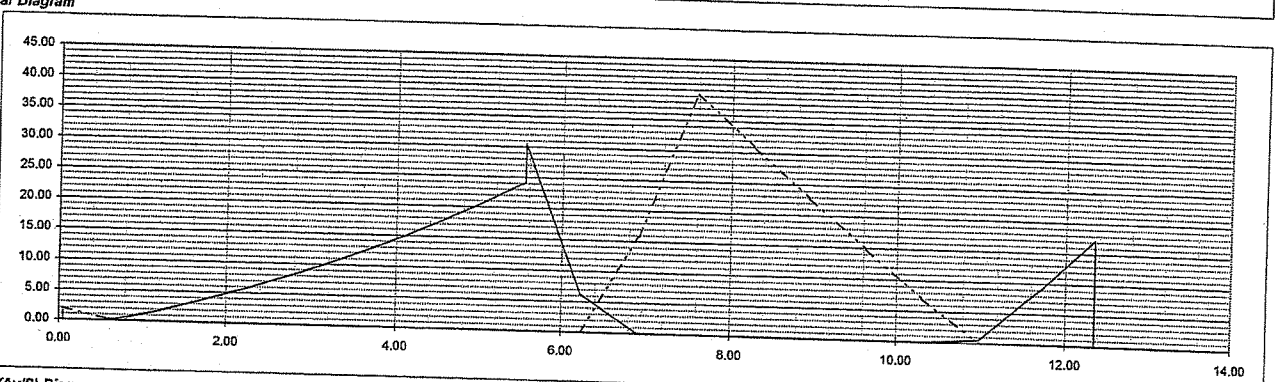
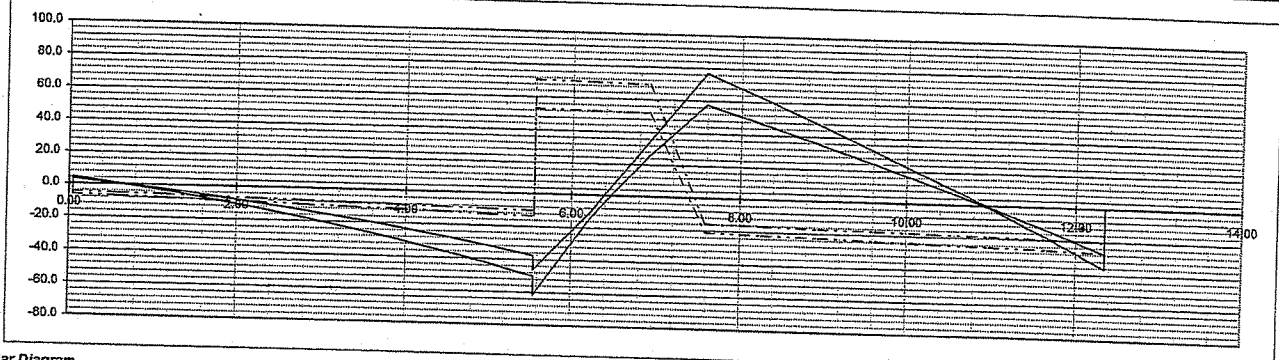
Maximum Stirrup Spacing Diagram



RB7A = 400x900
 1000x20
 400x20
 W/200 @ 125 OK!

Beam Ultimate Design RB3

Material		Column		40.00		40.00		40.00		60.00		60.00		
fc'	280	Top	Height											
fy	4000	Width	Thick											
fyst	4000	Bottom	Height											
Beam		Width	Thick											
Length	Width	Thick	0.05	RB3C	40.00	70.00	5.50	RB3	40.00	70.00	6.80	RB3	40.00	70.00
T.Cov.	C.Cov.			7.50	7.50			7.50	7.50			7.50	7.50	
MWL	MWR													
W1	A1	B1	0	0	0.00		1.25	0	5.50	1.25	0	6.80		
W2	A2	B2												
W3	A3	B3												
W4	A4	B4												
P1	X1		0	0						89.31	2			
P2	X2													
P3	X3													
P4	X4													
End Force (Load Combination 1.4DL+1.7LL Or 0.75(1.4DL+1.7LL+1.7WL))														
Moment	Max.	0.0	0.0	0.0	4.3		-37.4	-46.3		-27.5	0.0	0.0		
	Min.	0.0	0.0	0.0	3.3		-49.9	-61.7		-36.6	0.0	0.0		
Shear	Max.	0.0	0.0	0.0	-4.8		-10.0	71.0		-20.1	0.0	0.0		
	Min.	0.0	0.0	0.0	-6.4		-13.3	53.2		-26.8	0.0	0.0		
Design Moment (M- At Column Face, M+ Not Reduce By Clear Span)														
Moment	Max.	0.0	0.0	0.0	3.5	0.0	-35.1	-39.2	77.8	-23.4	0.0	0.0		
	Min.	0.0	0.0	0.0	2.6	-49.9	-48.1	-52.2	0.0	-31.2	0.0	0.0		
Main Bar	Top	0.0	0.0	0.0	0.0	24.1	23.2	25.4	0.0	14.6	0.0	0.0		
	Bottom	0.0	0.0	0.0	1.6	0.0	0.0	0.0	38.9	0.0	0.0	0.0		
Design Shear (At Distance d From Column Face)														
Shear	Av/S	0.000	0.035	0.000	0.000	0.000	0.035	0.000	0.240	0.035	0.032	0.000	0.035	
	S.Max.	31.3		31.3	31.3		31.3	15.6		31.3	31.3		31.3	



RB3: 400x90
 6.00 25 4.08 25
 4.06 28 7.08 28
 w/ 2/18 20125
 ok!