CACULATION SHEET

ASSUMPTIONS :

1. LOAD CASES:

- **LOAD CASE (1) : (DEAD LOAD) + (LIVE LOAD)**

2. PROPERTIES :

- **STEEL USED (FY) = 360 N/mm2**
- **RCC USED (Fuc) = 25 N/ mm2**
- **PCC USED (Fuc) = 15 N/ mm2**
- **Bearing Capacity of soil under footing (q)all = 15 N/ mm2**

3. METHOD OF ANALYSING :

- **Using (SAP2000) Software in structural Analysis**

Design of Slabs

-for solid slab :

Take ts = 15 cm

Own weight = 0.15 x 2.5 =0.375 t/m2

Flooring Cover =0.15 t/m2

Live load =.025 t/m2

Total 0.775 t/m2

-For hollow block slab :

Take t(total) = 30 cm

Own weight = 0.08x2.5 =0.2 t/m2

Ribs =0.15 t/m2

Blocks = 8x0.01 =0.08 t/m2

Flooring Cover =0.15 t/m2

Live load =0.25 t/m2

Total 0.83 t/m2

- We calculate the bending moment . shear forces of all sec.s regarding critical cases (lengths. loads....)
- So . the concrete and schedule of reinforcement .

1. Solid slabs :

- (S1) : Mmax =2.98 mt

  T = 200mm

  As = 11.01 cm2 → (6 Y 16/m +6 Y 12 BOTTOM)

  → (5 Y 12/m BOTH WAY – TOP)

- (S2) : Mmax =2.38 mt

  T= 180 mm

  As= 7.5 cm2 → (6 Y 12/m BOTH WAY - BOTTOM)

  → (6 Y 12/m BOTH WAY – TOP)(AT ¼ OF SPAN)

- (S3) : Mmax =1.51 mt

  T = 150mm

  As = 6.3 cm2 → (6 Y 12/m BOTH WAY) BOTTOM

SCHEDULE OF SLABS

TYPE	THICKNESS	BOTTOM R.F.T		TOP R.F.T(AT ¼ OF SPAN)	
		SHORT	LONG	SHORT	LONG
S1	200mm	Y16@150mm	Y12@150mm	Y12@200mm	Y12@200mm
S2	180mm	Y12@150mm	Y12@150mm	Y12@200mm	Y12@15200mm
S3	150mm	Y12@150mm	Y12@150mm	-	-
S4	150mm	Y10@150mm	Y10@150mm	-	-

2. BEAMS :

- Beam (FB1)

  Mmax = 4.1 mt & Qmax = 5.95 t

  B*T = 200 * 700 mm

  As = 10.06 cm2 → (3Y18 + 2Y18 CUT) BOTTOM

  → (3Y18 + 2Y18 CUT) TOP

  Shear Check :

  Q = Q / B*T = 43.6 N/mm2 < 70 N/mm2

- Beam (FB2) :

  Mmax = 2.51 mt & Qmax = 3.25 t

  B*T = 200 * 650 mm

  As= 4.74 cm2 → (3Y18 + 2Y16 CUT) BOTTOM

  → (3Y18 + 2Y16 CUT) TOP

  Shear Check :

  Q = Q / B*T = 32.5 N/mm2 < 70 N/mm2

- Beam (FB3) :

  Mmax = 2.95 mt & Qmax = 4.02 t

  B*T = 200 * 600 mm

  As = 7.9 cm2 → (3 Y16) BOTTOM +TOP

  Shear Check :

  Q = Q / B*T = 33.5 N/mm2 < 70 N/mm2

- Beam (FB4) :

  Mmax = 1.65 mt & Qmax = 2.08t

  B*T = 200 * 500 mm

  As = 4.02 cm2 → (2Y16 BOTTOM)

  → (2Y16) TOP

  Shear Check :

  Q = Q / B*T = 38 N/mm2 < 70 N/mm

SCHEDULE OF FLOOR BEAMS

TYPE	SIZE	BOTTOM R.F.T		TOP R.F.T		STIRRUPS AT	
		CON	CUT	CON	CUT	SUPPORT	MID.SPAN
FB1	200X700	3Y18	2Y18	3Y18	2Y18	Y8@100	Y8@150
FB2	200X650	3Y18	2Y16	3Y16	2Y16	Y8@100	Y8@150
FB3	200X600	3Y16	-	3Y16	-	Y8@100	Y8@150
FB4	200X500	2Y16	-	2Y16	-	Y8@100	Y8@150
FB5	200X500	2Y16	-	3Y16	-	Y8@100	Y8@150
HB1	1000X200	10Y16	-	10Y16	-	Y8@100	Y8@150
HB2	500X200	5Y16	-	5Y16	-	Y8@100	Y8@150

DESING OF RECTANGULAR COLUMN

COLUMN C1

Loading COLUMN Load = 100 ton

Parameters Fco = 250 kg/cm2

Fc = 60 kg/cm2

Fy = 3600 kg/cm2

Percentage of steel = 1.2 %

Height of column = 320 cm

Slender Ratio (h/b) = 16 %

Reduction Factor = .096

Fc = 57.6 kg/cm2

Dimensions Are Required = 1375.85 cm2

Column Width (a)= 20 cm

Column Length (b)= 70 cm

Reinforcemei Area Required = 14.38 cm2

Diameter of Bars = 16 mm

Number of Bars = 10 no

Diameter of Bars for Stirrups = 8 mm

Number of Bars for Stirrups = 7 no

Actual Percent of Reinf = 1.1 %

DESING OF RECTANGULAR COLUMN

COLUMN C2

Loading COLUMN Load = 85 ton

Parameters Fco = 250 kg/cm2

Fc = 60 kg/cm2

Fy = 3600 kg/cm2

Percentage of steel = 1.2 %

Height of column = 320 cm

Slender Ratio (h/b) = 16 %

Reduction Factor = .096

Fc = 57.6 kg/cm2

Dimensions Are Required = 1530.33 cm2

Column Width (a)= 20 cm

Column Length (b)= 60 cm \

Reinforcemei Area Required = 18.38 cm2

Diameter of Bars = 16 mm

Number of Bars = 8 no

Diameter of Bars for Stirrups = 8 mm

Number of Bars for Stirrups = 6 no

Actual Percent of Reinf = 1.1 %

TYPE	SIZE	MAIN R.F.T	LINKS	REMARKS
C1	0.20 X 0.70	10 Y 16	3 Y 8 @ 0.15 c/c	
C2	0.20 X 0.60	8 Y 16	2 Y 8 @ 0.15 c/c	
C3	0.20 X 0.50	6 Y 16	1 Y 8 @ 0.15 c/c	
C4	See Details	6 Y 16	1 Y 8 @ 0.15 c/c	
C5	Dia 0.30	6Y 16	1 Y 8 @ 0.15 c/c	

DESING OF isolated footing F1

Input data :

Ref column Unfactored load = 105.984 t
Design Bearing Capacity (Sbc) = 1.5 Kg/cm2

Dimensions of Column :

a = 200 mm b = 700 mm
Mz = 0.00 KN.m pbz = 0.00 KN/m2
Mx = 00 KN.m pbx = 0.00 KN/m2
Check for Bearing capacity :
Footing area req = 3.75 m2 Provide L = 2.30 m
B = 2.10 m
Area Provided = 3.99 m2 > 3.75 m2 O.K
Sbc (max) = 105.984 KN/m2 < 150.00 O.K
Sbc (min) = 105.984 KN/m2 O.K

Rft . req. In Longitudinal Direction :

Depth req for Oneway Shear : (d from face of col)

Assume D = 600 mm d = 540 mm
Vu = 37.06 Kn pt = 0.32 %
V = 0.07 N/mm2 vc = 0.40 N/mm2
Moment at Critical Section **Safe**
Muxx = 49.63 Kn-m/m Mu / bd2.fck = 0.01 N/mm2
Z = 535.88 mm Ast (req) = 25.9cm2
Ast (req) = 0.05 % < 0.32 SO O.K

Check for punching shear (1.5 d from face of col)

Punching shear Perimeter = 7880 mm vmax = 0.60 N/mm2
Vu= -230.89 Kn < 4.00 N/mm2 OK
V = -0.05 N/mm2 < 0.40N/mm2 SO OK
Final : P t(req) = 0.32 A st (req) = 23.50 cm
Rft req for Punching shear Pt (req) = 0.15
Final Pt req = 0.15 % **Ast(req) = 23.70 cm2** **FOR 1.90m Width**
Ic = 850 mm
3c/4+9d/4 = 1365 mm
Required Y 16 @ 150 mm c/c

4- DESING OF isolated footing F2

Input data :

Ref column Unfactored load = 142 t
Design Bearing Capacity (Sbc) = 1.5 Kg/cm2

Dimensions of Column :

a = 200 mm b = 800 mm
Mz = 0.00 KN.m pbz = 0.00 KN/m2
Mx = 00 KN.m pbx = 0.00 KN/m2
Check for Bearing capacity :
Footing area req = 4.55 m2 Provide L = 2.10 m
B = 1.90 m
Area Provided = 4.83 m2 > 4.55 m2 O.K
Sbc (max) = 127.65 KN/m2 < 150.00 O.K
Sbc (min) = 127.65 KN/m2 O.K

Rft . req. In Longitudinal Direction :
Depth req for Oneway Shear : (d from face of col)
Assume D = 600 mm d = 540 mm
Vu = 37.06 Kn pt = 0.32 %
V = 0.07 N/mm2 vc = 0.40 N/mm2
Moment at Critical Section **Safe**
Muxx = 49.63 Kn-m/m Mu / bd2.fck = 0.01 N/mm2
Z = 535.88 mm Ast (req) = 25.28 cm2
Ast (req) = 0.05 % < 0.32 SO O.K

Check for punching shear (1.5 d from face of col)
Punching shear Perimeter = 7880 mm vmax = 0.60 N/mm2
Vu= -230.89 Kn < 4.00 N/mm2 OK
V = -0.05 N/mm2 < 0.40N/mm2 SO OK
Final : P t(req) = 0.32 A st (req) = 23.70 cm2
Ic = 750 mm For 1.50 m Wideth
3c/4+9d/4 = 1590 mm
Required Y 16 @ 150 mm c/c

Moment at Critical Section : Muyy =22.06 Kn.m Mu/bd2 fck = .00 N/mm2

Z = 538.18 mm Ast (req) = 21.59 cm2 Pt (req) = 0.02
Oneway shear : Vu = -7.06 Kn V = -0.01 N/mm2 Pt (req) = 0.00
Rft req for Punching shear Pt (req) = 0.15
Final Pt req = 0.15 % **Ast(req) = 23.70 cm2** **FOR 2.10m Width**

Ic = 850 mm

3c/4+9d/4 = 1365 mm

Required Y 16 @ 150 mm c/c

DESING OF isolated footing F3

Input data :

Ref column Unfactored load = 167.2 t

Design Bearing Capacity (Sbc) = 1.50 Kg/cm2

Dimensions of Column :

a = 550 mm b = 700 mm

Mz = 0.00 KN.m pbz = 0.00 KN/m2

Mx = 00 KN.m pbx = 0.00 KN/m2

Check for Bearing capacity :

Footing area req = 5.95 m2 Provide L = 1.90 m

B = 1.70 m

Area provided = 6.11 m2 > 5.95 m2 O.K

Sbc (max) = 134.35 KN/m2 < 150.00 O.K

Sbc (min) = 134.35 KN/m2 O.K

Rft . req. In Longitudinal Direction:

Depth req for Oneway Shear : (d from face of col)

Assume D = 600 mm d = 540 mm

Vu = 37.06 Kn pt = 0.32 %

V = 0.07 N/mm2 vc = 0.40 N/mm2

Moment at Critical Section Safe

Muxx = 49.63 Kn-m/m Mu / bd2.fck = 0.01 N/mm2

Z = 535.88 mm Ast (req) = 284.44 cm2

Ast (req) = 0.05 % < 0.32 SO O.K

Check for punching shear (1.5 d from face of col)

Punching shear Perimeter = 7880 mm vmax = 0.60 N/mm2

Vu= -230.89 Kn < 4.00 N/mm2 OK

V = -0.05 N/mm2 < 0.40N/mm2 SO OK

Final : P t(req) = 0.32 A st (req) = 23.92 cm2

Ic = 750 mm For 1.50 m Wideth

3c/4+9d/4 = 1590 mm

Required Y 16 @ 150 mm c/c

Moment at Critical Section : Muyy =22.06 Kn.m Mu/bd2 fck = .00 N/mm2

Z = 538.18 mm Ast (req) = 25.2cm2 Pt (req) = 0.02

Oneway shear : Vu = -7.06 Kn V = -0.01 N/mm2 Pt (req) = 0.00

Rft req for Punching shear Pt (req) = 0.15

Final Pt req = 0.15 % Ast(req) = 25.28 cm2

Ic = 850 mm

3c/4+9d/4 = 1365 mm

Required Y 16 @ 150 mm c/c

DESING OF isolated footing F4

Input data :

Ref column Unfactored load = 135.50 t

Design Bearing Capacity (Sbc) = 1.5 Kg/cm2

Dimensions of Column :

a = 200 mm b = 120 mm

Mz = 0.00 KN.m pbz = 0.00 KN/m2

Mx = 00 KN.m pbx = 0.00 KN/m2

Check for Bearing capacity :

Footing area req = 6.78 m2 Provide L = 2.40 m

B = 2.40 m

Area Provided = 7.00 m2 > 6.78 m2 O.K

Sbc (max) = 131.33 KN/m2 < 150.00 O.K

Sbc (min) = 131.33 KN/m2 O.K

Rft . req. In Longitudinal Direction :

Depth req for Oneway Shear : (d from face of col)

Assume D = 600 mm d = 540 mm

Vu = 37.06 Kn pt = 0.32 %

V = 0.07 N/mm2 vc = 0.40 N/mm2

Moment at Critical Section **Safe**

Muxx = 49.63 Kn-m/m Mu / bd2.fck = 0.01 N/mm2

Z = 535.88 mm Ast (req) = 30.0 cm2

Ast (req) = 0.05 % < 0.32 SO O.K

Check for punching shear (1.5 d from face of col)

Punching shear Perimeter = 7880 mm vmax = 0.60 N/mm2

Vu= -230.89 Kn < 4.00 N/mm2 OK

V = -0.05 N/mm2 < 0.40N/mm2 SO OK

Final : P t(req) = 0.32 A st (req) = 23.50 cm2

Ic = 750 mm For 1.90 m Wideth

3c/4+9d/4 = 1590 mm

Required Y 16 @ 150 mm c/c

Moment at Critical Section : Muyy =22.06 Kn.m Mu/bd2 fck = .00 N/mm2

Z = 538.18 mm Ast (req) = 22.50 cm2 Pt (req) = 0.02

Oneway shear : Vu = -7.06 Kn V = -0.01 N/mm2 Pt (req) = 0.00

Rft req for Punching shear Pt (req) = 0.15

Final Pt req = 0.15 % Ast(req) = **23.70**

Ic = 850 mm

3c/4+9d/4 = 1365 mm

Required Y 16 @ 150 mm c/c

SCHEDULE OF FOOTINGS

TYPE	SIZE	R.C.C	BOTTOM R.F.T		TOP R.F.T	
			SHORT	LONG	SHORT	CUT
F1	2500X2300X100	2300X2100X600	Y16@150mm	Y16@150mm	-	-
F2	2300X2100X100	2100X1900X600	Y16@150mm	Y16@150mm	-	-
F3	2100X1900X100	1900X1700X600	Y16@150mm	Y16@150mm	-	-
CF1	See DetailsX100	See DetailsX600	Y16@150mm	Y16@150mm	Y16@150mm	Y16@150mm
CF2	4100X2300X100	3900X2100X600	Y16@150mm	Y16@150mm	Y16@150mm	Y16@150mm
CF3	3800X2300X100	3600X2100X600	Y16@150mm	Y16@150mm	Y16@150mm	Y16@150mm

5-Plinth Beams:

- **Plinth Beams (PB1) :**

  Mmax = 2.92 mt & Qmax = 4.05 t

  B*T = 200 * 600 mm

  As = 5.8 cm2 → (3Y16 +2Y16) B +(3Y16+2Y16) T

  Shear Check :

  Q = Q / B*T = 38.6 N/mm2 < 70 N/mm2

- **Plinth Beams (PB2) :**

  Mmax = 2.85 mt & Qmax = 3.00 t

  B*T = 200 * 600 mm

  As = 8.14 cm2 → (3+2Y16) B

→(3Y16) T

Shear Check :

Q = Q / B*T = 32.45 N/mm2 < 70 N/mm2

- **Plinth Beams (PB3) :**

  Mmax = 2 mt & Qmax = 2.25 t

  B*T = 200 * 500 mm

  As = 7.2 cm2 →(3 Y16 B +3 Y16 T)

  Shear Check :

  Q = Q / B*T = 29.5 N/mm2 < 70 N/mm2

- **Plinth Beams (PB4) :**

  Mmax = 1.1 mt & Qmax = 2.95 t

  B*T = 200 * 500 mm

  As = 13.8 cm2 →(2Y16 + 2Y16)t & B

  Shear Check :

Q = Q / B*T = 33.6 N/mm2 < 70 N/mm

SCHEDULE OF PLINTH BEAMS

TYPE	SIZE	BOTTOM R.F.T		TOP R.F.T		STIRRUPS AT	
		CON	CUT	CON	CUT	SUPPORT	MID.SPAN
PB1	200X600	3Y16	2Y16	3Y16	2Y16	Y8@100	Y8@150
PB2	200X600	3Y16	2Y16	2Y16	2 Y 16	Y8@100	Y8@150
PB3	200X500	3Y16	-	3Y16	-	Y8@100	Y8@150
PB4	200X500	3Y16	-	2Y16	-	Y8@100	Y8@150
PB5	200X500	2Y16	-	3Y16	-	Y8@100	Y8@150
PB6	200X500	4Y16	-	4Y16	-	Y8@100	Y8@150