NAME :- MUJAHID KHAN

TEACHER :- Engr Sir FAWAD AHMED.

DEPT :- MS (T.E).

REG NO :- 15274

SUBJECT :- RCD (Minor Subject).

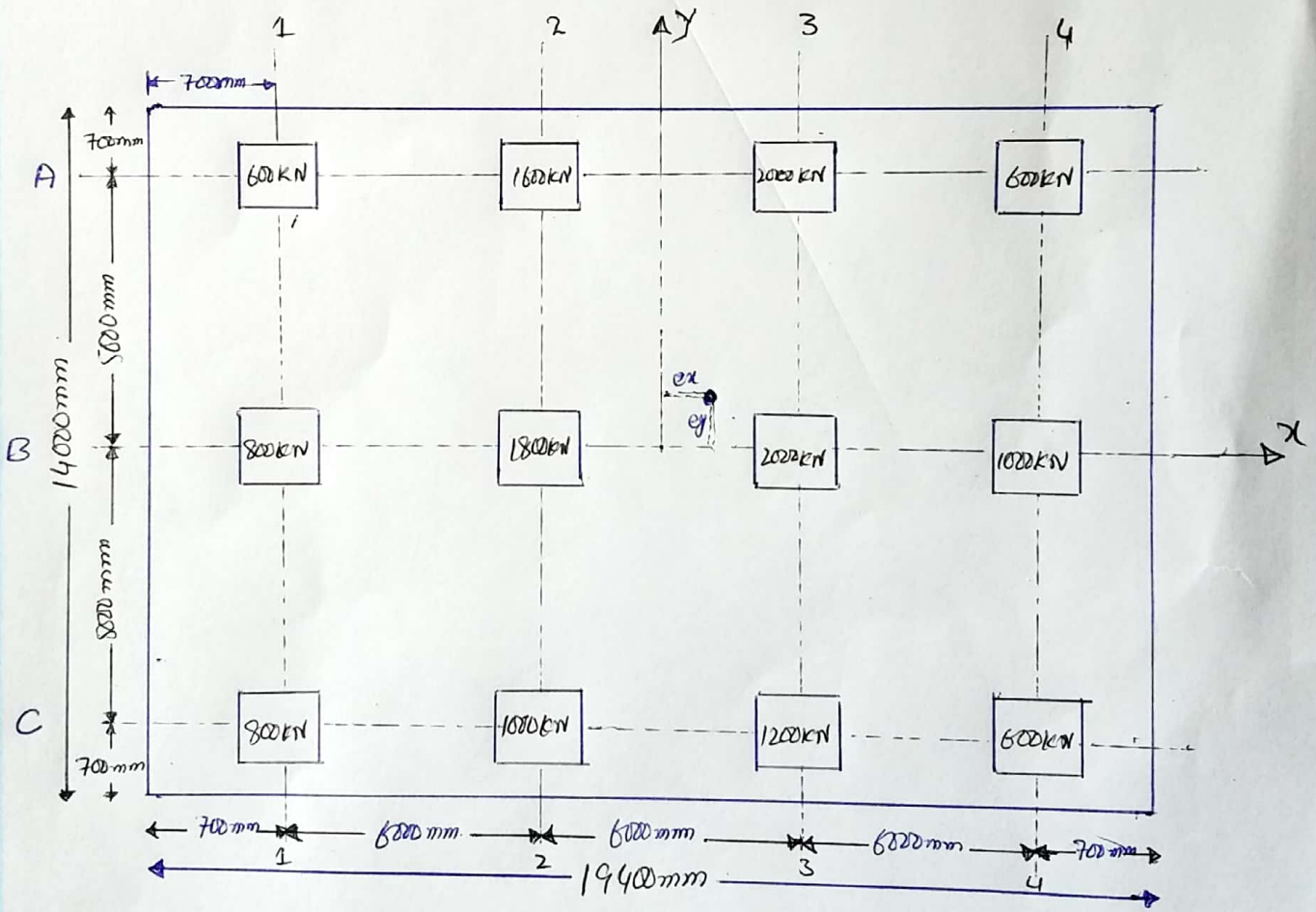
_ . INU PESHAWAR :—

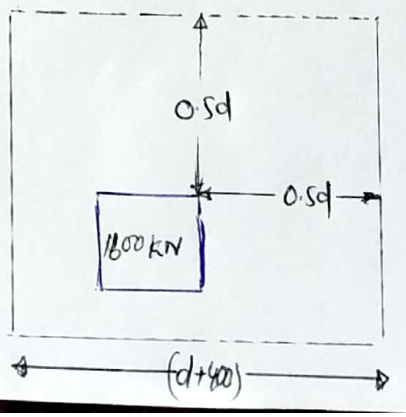
Raft foundation:-

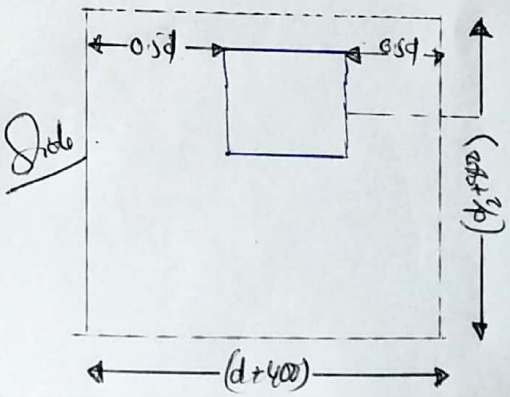
Squre Column : 40 x 40 cm.

ADSP: 80 KN/m³

Assuming 10% as the load of raft & soil above.







Total vertical Load = (600 + 1600 + 2000 + 600 + 800 + 1800 + 2000 + 1000 + 800 + 1000 + 1200 + 600) = 14000 kN

= 14000 kN

Eccentricity along the x-direction is obtained by taking moment of column loads about (1-1) grid.

$$\bar{x} = \frac{[6(1600 + 1800 + 1000) + 12(2000 + 2000 + 1200) + 18(600 + 1000 + 600)]}{14000}$$

$$\boxed{\bar{x} = 9.1714\ m}$$

$$e_x = 9.1714 - (6+3)$$

$$\boxed{e_x = 0.1714\ m}$$

Eccentricity along the "y" Direction.
grid (C-C)

$$\bar{y} = \frac{[5(800 + 1800 + 2000 + 1000) + 10(600 + 1600 + 2000 + 600)]}{14000}$$

$$e_y = 5.4285 - 5$$

$$\boxed{e_y = 0.4285\ m}$$

Now $I_x = \frac{bh^3}{12} = \frac{19.4 \times 11.4^3}{12}$.

$$I_x = 2395.16 m^4.$$

$$I_y = bh^3/12 = \frac{11.4 \times 19.4^3}{12}.$$

$$I_y = 6936.31 m^4$$

$$M_x = Pe_y = 14000 \times 0.4285$$

$$M_x = 6000 KNm.$$

$$M_y = Pe_x = 14000 \times 0.1714$$

$$M_y = 2400 KNm.$$

Soil pressure at Different points is as follow.

$$\sigma = P/A \pm \frac{M_y}{I_y} x \pm \frac{M_x}{I_x} y.$$

$$\sigma = 63.302 \pm \frac{2400}{6936.31} x \pm \frac{6000}{2395.16} y.$$

$$\sigma = 63.158 \pm 1.0269 x \pm 0.4745 y$$

At Corner A-4:-

$$\sigma_{A-4} = 63.1518 + 0.346 \times 5.7 + 2.505 \times 5.7$$

$$\boxed{\sigma_{A-4} = 80.93} \cong \text{BC of Soil } (80 KN/m^2)$$

At Corner C-4:-

$$\sigma_{C-4} = 63.158 + 0.346 \times 9.7 - 2.505 \times 5.7$$

$$\boxed{\sigma_{C-4} = 74.225 KN/m^2.}$$

At Corner A-1:-

$$\sigma_{A-1} = 63.158 - 0.346 \times 9.7 + 2.505 \times 5.7.$$

$$\boxed{\sigma_{A-1} = 52.38 KN/m^2.}$$

At Corner C-1:-

$$\sigma_{C-1} = 63.158 - 0.346 \times 9.7 - 2.505 \times 5.7$$

$$\boxed{\sigma_{C-1} = 45.67 KN/m^2}$$

At Corner B-4:-

$$\sigma_{B-4} = 63.158 + 0.346 \times 9.7$$

$$\boxed{\sigma_{B-4} = 66.658\ kN/m^2}$$

At Corner B-1:-

$$\sigma_{B-1} = 63.158 - 0.346 \times 9.7$$

$$\boxed{\sigma_{B-1} = 59.943\ kN/m^2}$$

In x-Direction, the raft is divided in Three Strips. That is Three equalent beams.

1:→ Beam A-A:-

With 3.2m width & Soil pressure of $80\ kN/m^2$

2:→ Beam B-B:

With 5.0m width & Soil pressure of

$$\left(\frac{80 + 66.65}{2}\right) = 73.321\ kN/m^2$$

3:- Beam C-C:

With 5.0m width & Soil pressure

$$\left(\frac{66.65 + 52.28}{2}\right) = 59.52\ kN/m^2$$

The bending moment is obtaind by using a Co-efficient 1/10 & L as the center to center of Column distance.

$$+M = -M = \frac{WL^2}{10}$$ ACI-13.C.68

For Strip A-A:-

$$M_{max} = \frac{80 \times 6^2}{10} = \boxed{288 KN/m.}$$

For Strip B-B:-

$$M_{mom} = \frac{73.3 \times 6^2}{10} = \boxed{263.95 KN m/m.}$$

For Strip C-C:

$$M_{mem} = \frac{59.52 \times 6^2}{10} = \boxed{214.272 KN m/m}$$

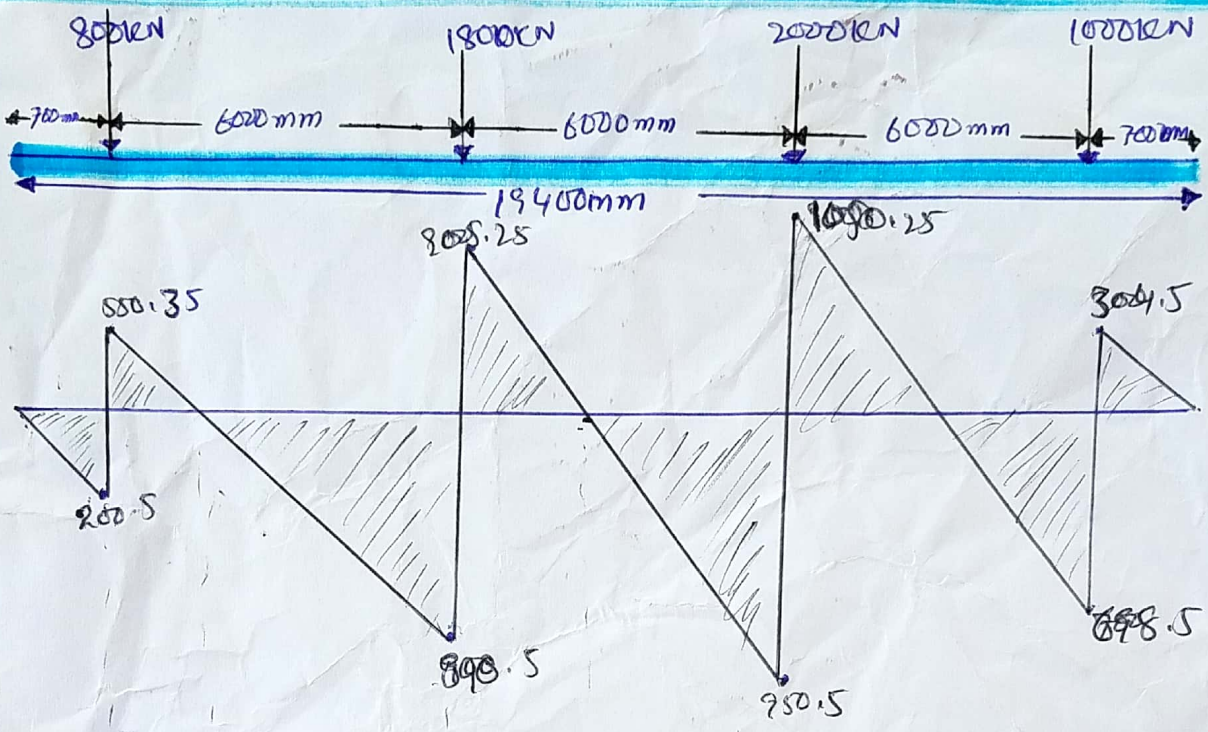
Now

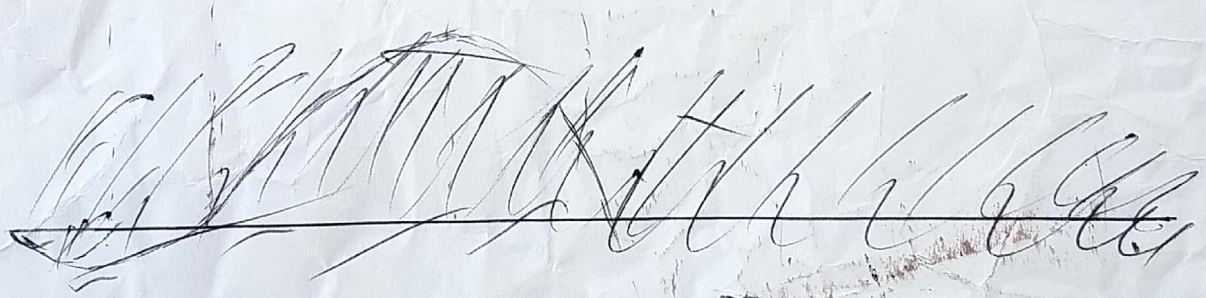
For Any Strip in Y-direction. there are two equivalent beam.

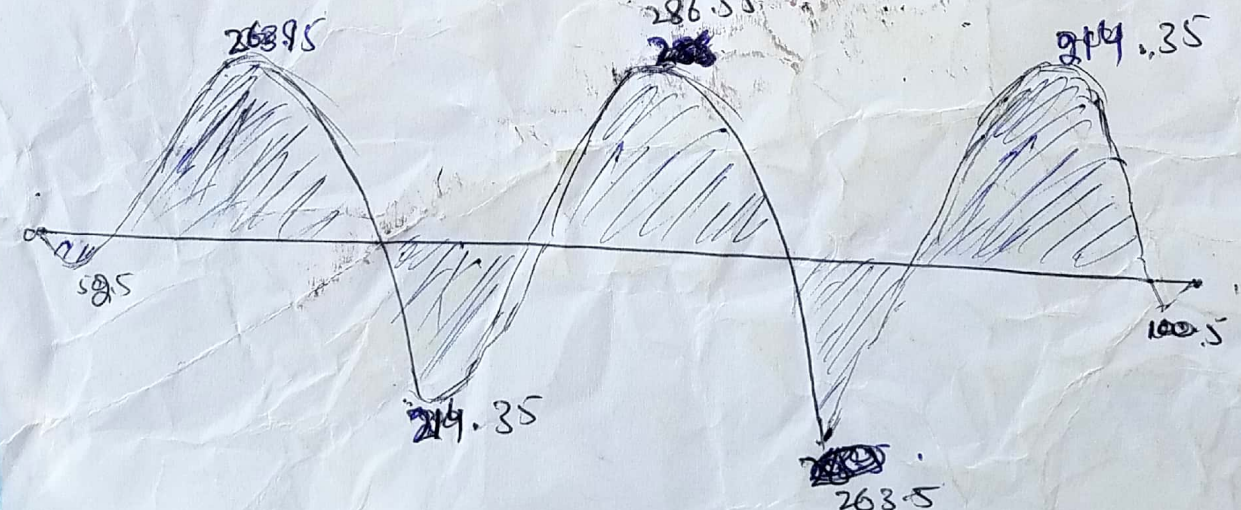
Y-Direction.

$$M_{mem} = \frac{80 \times 5^2}{8} = 250 KN m/m.$$

Reg No: 15274 p-(7)







The depth of raft is governed by two-way shear at one of the exterior Columns. If the location of critical shear is not obvious. it may be necessary to check all possible location.

Shear Strength of Concrete.

$$\tau_c = 0.25\sqrt{f_{ck}} = 0.25\sqrt{15}$$

$$\tau_c = 0.97\ N/mm^2$$

For a Corner (say C-1)

Perimeter $b_o = 2\left(\frac{d}{2} + 800\right) = d + 1800$

$$\tau_v = \frac{V_u}{b_o d} = \frac{1.5 \times 800 \times 1000}{(d+1800)\,d}$$

$$\boxed{\tau_v = 0.97}$$

$$= \frac{120000}{(d+1800)\,d} = 0.97$$

$$\Rightarrow \boxed{d^2 + 1800d - 1237113.40 = 0}$$

$$\Rightarrow d = \frac{-1800 \pm \sqrt{1800^2 + 4 \times 1 \times 1237113.40}}{2 \times 1}$$

For Corner Colum (Say A-2)

Perimeter.

$$b_o = 2\left(\frac{d}{2} + 900\right) + (d + 400) = 2d + 2200\,mm$$

$$\tau_v = \frac{V_o}{b_o d} = \frac{1.5 \times 1600 \times 1000}{(2d + 2200)d} = 0.97$$

$$\Rightarrow \boxed{d^2 + 1000d - 1237113.40 = 0}$$

$$\Rightarrow \boxed{d = 690.811\,mm}$$

However, adopt an effective depth of 750mm & overall depth 800mm.

Reinforcent: Consider 1m with Strip in Longitudnal direction.

$$A_t = 0.5 \frac{15}{415}\left[1 - \sqrt{1 - \frac{4.6 \times 288 \times 10^6}{15 \times 1000 \times 780^2}}\right] \times 1000 \times 750$$

$$\boxed{A_t = 1109.51\,mm^2}$$

Use 20mm bar, $A_\phi = 314.51\,mm^2$

Number of bar = $\frac{1109.51}{\pi/4 \times 20^2}$

= 3.531 ≅ 4 bar

Spacing of long Bar = $\frac{1000 \times \pi/4 \times 20^2}{1109.51}$

= 283.152 mm

So

Steel provid 4 – 20mm ϕ bar for Reinforcent @ 260mm c/c at top & bottom in both direction.

Check

A_{min} = 0.12%

= $\frac{0.12}{100} \times 800 \times 1000$

= 960 mm^2/m < 1109.51 mm^2/m

Minimum steel governs in the remy raft.

Check punching shear:

$V_{ED} = 2.37 \times 1109.1 = 2350.7 kN.$

$V_{Ed-red} = V_{Ed} - \Delta V_{Ed}.$

$\Delta V_{ED} = (263.97 \times 2.37) - (25.07 \times 2.484)$

$= 560.1125 kN.$

$V_{ED\,red} = 2350.7 kN - 560.1125 = 1790.5 kN.$

$V_{Ed} = V_{Ed\,red}/ud. = \frac{1790.5 \times 1000}{6320 \times 820}$

$V_{Ed} = 0.413 N/mm^2.$ OK

Shear Resist:

$V_{Rd} = [0.12 \times 2.568 (100 \times 0.00129 \times 30)^{1/3}] \times 2$

$V_{Rd} = 0.5908 N/mm^2.$

$0.413 N/mm^2 < 0.5908 N/mm^2$

OK.