- **Lay out and concrete dimension**

  $R = 11.5\ m$

  $hole\ radiuce = 3\ m$

  $t = 25\ cm$
- **Load**

  $L.L = 200\ kg/m^2$

  $D.L = .25 * 2.5 = .625\ t/m^2$
- **Straining action**

Load type	Case of loading	Radian moment		Tangential moment	
		Max	Min	Max	Min
All load	Ultimate	3.98	-7.2	1.08	-2.6
All load	Working	2.7	-5	.76	-1.8

Design Radian moment

Section 1

$M_w = 2.7\ m.t$

$b = 100\ cm$

$t = 25\ cm$

Water section

1- Working stage

$$F_{Ct-M} = \frac{6 * M_w}{b * t^2}$$

$$F_{Ct-M} = \frac{2.7 * 10 * 6 * 10^6}{1000 * 250^2} = 2.592\ Mpa$$

$$t_v = t * \left[1 \mp \frac{F_{Ct-N}}{F_{Ct-M}}\right]$$

$$t_v = 250 * \left[1 + \frac{0}{1.67}\right] = 250\ mm \qquad \rightarrow\ \eta = 1.32$$

$$F_{ctr} = .6 * \sqrt{F_{cu}}$$

$$F_{ctr} = .6 * \sqrt{30} = 3.286\ Mpa$$

$$\frac{3.286}{1.32} = 2.48\ <\ F_{Ct-M} \qquad section\ is\ unsafe$$

يجب زيادة تخانة البلاطة لضمان عنم حدوث شروخ فيها

Load type	Case of loading	Radian moment		Tangential moment	
		Max	Min	Max	Min
All load	Ultimate	4.4	−7.74	1.2	−2.98
All load	Working	3	−5.44	.86	−2

$$t = \sqrt{\frac{M_w * 10^6}{.3 * B}}$$

$$t = \sqrt{\frac{2.6 * 10 * 10^6}{.3 * 1000}} = 294.390\ mm\ \cong 280\ mm \xrightarrow{\div 10} 28\ cm$$

Check stress

$$F_{Ct-M} = \frac{6 * M_w}{b * t^2}$$

$$F_{Ct-M} = \frac{3 * 10 * 6 * 10^6}{1000 * 280^2} = 1.98\ Mpa$$

$$t_v = t * \left[1 \mp \frac{F_{Ct-N}}{F_{Ct-M}}\right]$$

$$t_v = 280 * \left[1 + \frac{0}{1.67}\right] = 280\ mm \qquad \rightarrow\ \eta = 1.42$$

$$F_{ctr} = .6 * \sqrt{F_{cu}}$$

$$F_{ctr} = .6 * \sqrt{30} = 3.286\ Mpa$$

$$\frac{3.286}{1.42} = 2.31\ >\ F_{Ct-M} \qquad section\ is\ safe$$

Ultimate stage

Concrete cover

From table 4-13 $d^{\because} = 25\ mm$

$M_u = 4.4\ m.t$

$$d = c_1 \sqrt{\frac{M_u}{F_{cu} * b}}$$

$$28 - 2.5 = c_1 * \sqrt{\frac{4.4 * 10^5}{300 * 100}} \qquad \therefore c_1 = 6.65 \qquad \rightarrow J = 0.826$$

$\beta_{crack} = .75 \qquad form\ coad\ table\ 4-15$

$$A_s = \frac{M_u}{F_y * J * d * \beta_{crack}}$$

$$A_s = \frac{4.4 * 10^5}{3600 * .826 * 25.5 * .75} \qquad A_s = 7.7369\ cm^2$$

Check of minimum area of steel

$$max\ of \quad \begin{cases} A_{s\,min} = 1.3A_s \\ A_{s\,min} = \dfrac{11}{3600} * b * d \\ A_{s\,min} = \dfrac{0.15}{100} * b * d \end{cases}$$

$A_{s\,min} = 3.83\ cm^2$

$A_{s\,min} < A_s \qquad used\ \ A_s = 7.7369\ cm^2 \ \ \rightarrow 7\emptyset 12\ /m$

Design tangential moment

$M_u = 1.2\ \ t.m$

Water section

$1.2 \ll 3\ section\ is\ safe$

$$d = c_1 \sqrt{\frac{M_u}{F_{cu} * b}}$$

$$28 - 2.5 = c_1 * \sqrt{\frac{1.2 * 10^5}{300 * 100}} \qquad \therefore c_1 = 12.75 \qquad \rightarrow J = 0.826$$

$\beta_{crack} = .85 \qquad form\ coad\ table\ 4 - 15$

$$A_s = \frac{M_u}{F_y * J * d * \beta_{crack}}$$

$$A_s = \frac{1.2 * 10^5}{3600 * .826 * 25.5 * .85} \qquad A_s = 1.861\ \ cm^2$$

Check of minimum area of steel

$$max\ of \quad \begin{cases} A_{s\,min} = 1.3A_s \\ A_{s\,min} = \dfrac{11}{3600} * b * d \\ A_{s\,min} = \dfrac{0.15}{100} * b * d \end{cases}$$

$A_{s\,min} = 3.83\ cm^2$

$A_{s\,min} > A_s \qquad used\ A_{s\,min} = 3.83\ cm^2 \rightarrow 5Ø10\ /m$

تخاتو البلاطة اكثر من 16 سم طبقا للكود المصري يجب إضافة شبكة علوية تثمل نسبة 20 % من الحديد الرئسي في كل اتجاه ولا تقل عن في كل اتجاه

$used\ 5Ø8\ \ radin\ and\ tangentaial$

الغي كل قيم المومنت الي مش ليها أي 30 لازمة