

TD Les Planchers : Ferrailage

Exercice 1 : Soit un panneau isolé en dalle pleine.

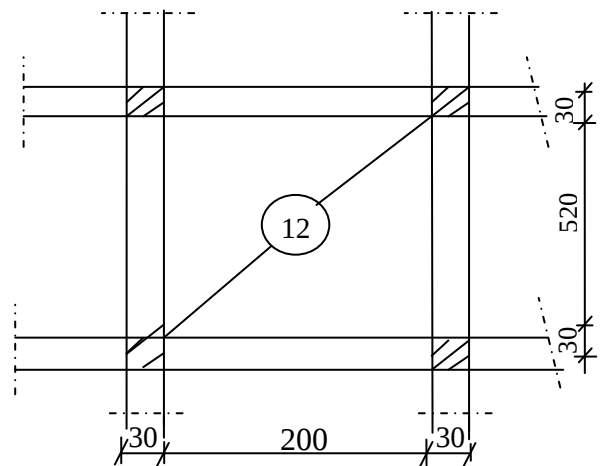
$$Q = 150 \text{ kgf/m}^2$$

$$G = 454 \text{ kgf/m}^2$$

1- Calculer (M) et (T) à (l'E.L.U) et à (l'E.L.S) ?

2- Disposer convenablement les armatures.

(Le ferrailage est supposé choisi)



Solution :

$$\rho = \frac{lx}{ly} = \frac{2}{5,2} = 0,38 < 0,4 \rightarrow \text{dalle portant dans 1 seul sens.}$$

•E.L.U

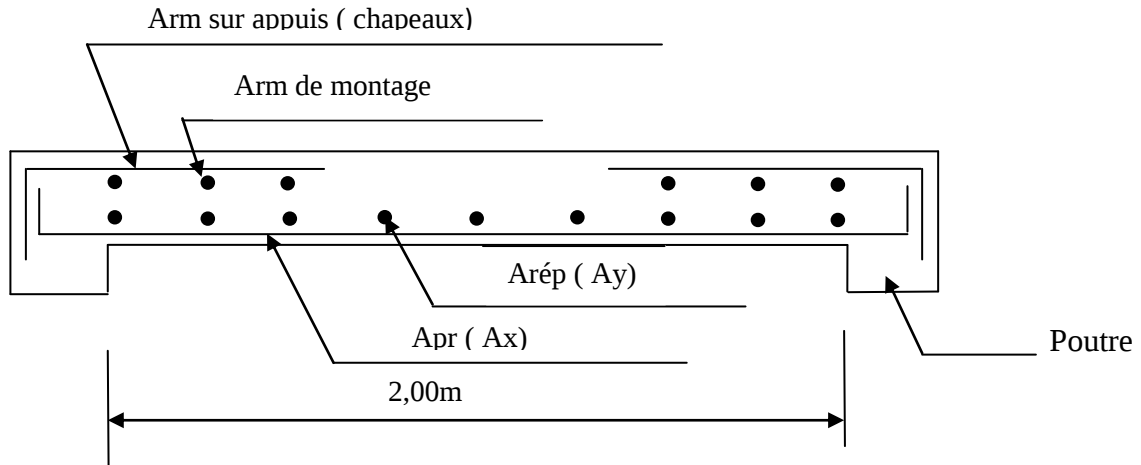
$$q_u = 1,35 (0,454) + 1,5 (0,15) = 0,838 \text{ tf/m}^2$$

$$\left\{ \begin{array}{l} M_o = q_u \cdot \frac{lx^2}{8} = 0,838 \cdot \frac{4}{8} = 0,419 \text{ tf.m} \\ M_t = 0,8 \cdot M_o = 0,8 (0,419) = 0,335 \text{ tf.m} \\ M_a = -0,50 \cdot M_o = -0,50 (0,419) = -0,209 \text{ tf.m} \\ T = q_u \cdot \frac{lx}{2} = 0,838 \cdot \frac{2}{2} = 0,838 \text{ tf.} \end{array} \right.$$

•E.L.S

$$q_{ser} = 0,454 + 0,15 = 0,604 \text{ tf/m}^2$$

$$\left\{ \begin{array}{l} M_o = 0,604 \cdot \frac{4}{8} = 0,302 \text{ tf.m} \\ M_t = 0,8 \cdot (0,302) = 0,2416 \text{ tf.} \\ M_a = -0,5 \cdot (0,302) = -0,151 \text{ tf.m} \end{array} \right.$$



Exercice 2 :

On conserve les mêmes données et les mêmes questions en prenant $l_x = 3,90\text{m}$?

Solution :

- 1) Plancher à surcharge d'exploitation modérée.

$$\rho = \frac{l_x}{l_y} = \frac{3.9}{5.2} = 0,75 > 0,4 \rightarrow \text{la dalle porte dans deux sens.}$$

E.L.U : $q_u = 0,838 \text{ tf/m}^2$

$$\left. \begin{array}{l} v=0 \\ \rho = 0,75 \end{array} \right\} \xrightarrow{\text{tab}} \left\{ \begin{array}{l} \mu_x = 0,0621 \\ \mu_y = 0,5105 \end{array} \right.$$

$$\left\{ \begin{array}{l} M_{ox} = \mu_x \cdot q_u \cdot (l_x)^2 = 0,0621 \cdot (0,838) \cdot (3,9)^2 = 0,7915 \text{ tf.m} \\ M_{tx} = 0,75 \cdot M_{ox} = 0,75 \cdot (0,7915) = 0,594 \text{ tf.m} \\ M_{ax} = -0,50 \cdot M_{ox} = -0,50 \cdot (0,7915) = -0,396 \text{ tf.m} \end{array} \right.$$

$$\left\{ \begin{array}{l} M_{oy} = \mu_y \cdot (M_{ox}) = 0,5105 \cdot (0,7915) = 0,404 \text{ tf.m} \\ M_{ty} = 0,75 \cdot (M_{oy}) = 0,75 \cdot (0,404) = 0,303 \text{ tf.m} \\ M_{ay} = -0,50 \cdot (M_{oy}) = -0,50 \cdot (0,404) = -0,202 \text{ tf.m} \end{array} \right.$$

$$\left\{ \begin{array}{l} T_x = q_u \cdot \frac{l_x}{2+\rho} = 0,838 \cdot \frac{3.9}{2+0,75} = 1,19 \text{ tf} \\ T_y = q_u \cdot \frac{l_x}{3} = 0,838 \cdot \frac{3.9}{3} = 1,09 \text{ tf} \end{array} \right.$$

E.L.S : $q_{ser} = 0,604 \text{ tf/m}^2$

$$\left. \begin{array}{l} v=0,2 \\ \rho = 0,75 \end{array} \right\} \xrightarrow{\text{tab}} \left\{ \begin{array}{l} \mu_x = 0,0684 \\ \mu_y = 0,6447 \end{array} \right.$$

$$\begin{cases} M_{0x} = \mu_x \cdot q_{ser} \cdot (l_x)^2 = 0,0684 \cdot (0,604) \cdot (3,9)^2 = 0,628 \text{ tf.m} \\ M_{tx} = 0,75 \cdot M_{0x} = 0,75 \cdot (0,628) = 0,471 \text{ tf.m} \\ M_{ax} = -0,50 \cdot M_{0x} = -0,50 (0,628) = -0,314 \text{ tf.m} \end{cases}$$

$$\begin{cases} M_{0y} = \mu_y \cdot (M_{0x}) = 0,6447 \cdot (0,628) = 0,405 \text{ tf.m} \\ M_{ty} = 0,75 \cdot (M_{0y}) = 0,75 \cdot (0,405) = 0,304 \text{ tf.m} \\ M_{ay} = -0,50 \cdot (M_{0y}) = -0,50 (0,405) = -0,2025 \text{ tf.m} \end{cases}$$

2) Schéma de ferrailage :

