

Prueba 2012.

$L = 10 \text{ m}$

a) $q_L = 14 \text{ kN/m}$

$q_0 = 11 \text{ kN/m}$

$f'_c = 30$

b) $q_L = 28 \text{ kN/m}$ $q_0 = 22 \text{ kN/m}$

$f_r = 3,5$

$f_g = 420$

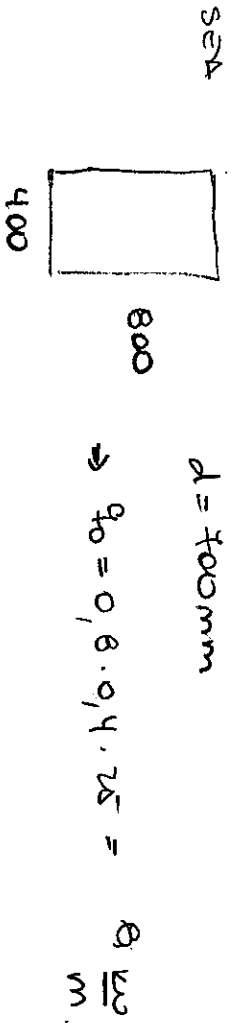
$n = 8$

$f_{ca} = 0,45 f'_c = 13,5 \text{ MPa}$

$f_{sa} = 0,4 \cdot f_g = 168 \text{ MPa}$

a)

a.1) Caso sección Fraseda



$q_{sew} = 14 + 11 + 8 = 33 \frac{\text{kN}}{\text{m}}$

$M_{sew} = \frac{33 \cdot 10^2}{8} = 413 \text{ kN}\cdot\text{m}$

$k = \frac{f_{ca}}{f_{ca} + \frac{f_{sa}}{n}} = \frac{13,5}{13,5 + \frac{168}{8}} \Rightarrow k = 0,39$

$\cdot j = 1 - \frac{k}{3}$
 $j = 0,87$

$\frac{1}{2} b \cdot (kd)^2 - n A_s \cdot (d - kd) = 0$

$\frac{1}{2} \cdot 400 (0,39 \cdot 400)^2 = A_s \Rightarrow A_s = 4364 \text{ mm}^2$
 $8 (400 - 0,39 \cdot 400)$

$$\rightarrow f_s = \frac{M}{As \cdot d} = \frac{413 \cdot 10^6}{4364 \cdot 0,87 \cdot 700} = 155 \text{ MPa} < f_{sa} \checkmark$$

$$\rightarrow f_c = \frac{\sigma \cdot M}{I \cdot j \cdot b \cdot d^2} = \frac{\sigma \cdot 413 \cdot 10^6}{0,39 \cdot 0,87 \cdot 400 \cdot 700^2} = 12,4 < f_{ca} \checkmark$$

$$\text{NORM } \nu = \frac{f_c}{f_c + \frac{f_s}{n}} = \frac{12,4}{12,4 + \frac{155}{8}} = 0,39$$

\Rightarrow VERAMOS SI ESTÁ FUNDADA

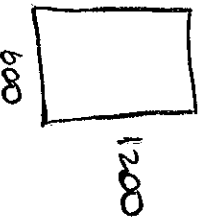
$$f_{cmec} = \frac{6 \cdot M}{b \cdot h^2} = \frac{6 \cdot 413 \cdot 10^6}{400 \cdot 800^2} = 9,68 > f_r \checkmark$$

a.2) Caso Sección NO Fisurada

\Rightarrow LA SECCIÓN DEBE SER MÁS GRUESA QUE LA AUTOMÁTICA.

$$f_{cmec} < f_r \Rightarrow \frac{6 \cdot M}{b \cdot h^2} < 3,5$$

SUPERAMOS \Rightarrow



$$q_0 = 1,2 \cdot 0,6 \cdot 25 = 18 \frac{\text{KN}}{\text{m}}$$

$$q_{SEM} = 43 \frac{\text{KN}}{\text{m}}$$

$$M_{SEM} = 538, \text{ KN} \cdot \text{m}$$

$$f_{cmec} = 3,7 > f_r$$

\Rightarrow + GRANDE

$$\bullet \left. \begin{array}{l} h = 1400 \\ b = 800 \end{array} \right\} q_0 = 18 \frac{\text{KN}}{\text{m}} \rightarrow M_{SEM} = 663 \text{ KN} \cdot \text{m}$$

$$f_r = 531 \quad f_{cmec} = 2,5 < f_r$$

\Rightarrow Vicia 7000 OPTIMA PD ES TUVY 6240SE Y

PESADA.

$$d = 1300$$

$$\frac{1}{2} \cdot b \cdot (k \cdot d)^2 - n \cdot A_s \cdot (d - k \cdot d) = 0$$

$$\frac{\frac{1}{2} \cdot 800 (0,39 \cdot 1300)^2}{8 \cdot (1300 - 0,39 \cdot 1300)} = A_s \Rightarrow A_s = 16207 \text{ mm}^2$$

$$y_{cg} = \frac{\frac{b \cdot h^2}{2} + A_s (n-1) \cdot d}{b h + A_s (n-1)} = \frac{\frac{800 \cdot 1400^2}{2} + 16207 (7) \cdot 1300}{800 \cdot 1400 + 16207 \cdot 7}$$

$$y_{cg} = 755 \text{ mm}$$

$$I_{cg} = \frac{b \cdot h^3}{12} + b h \left(y_{cg} - \frac{h}{2} \right)^2 + (n-1) \cdot A_s (d - y_{cg})^2$$

$$= \frac{800 \cdot 1400^3}{12} + 800 \cdot 1400 \left(755 - \frac{1400}{2} \right)^2 + 7 \cdot 16207 (1300 - 755)^2$$

$$I_{cg} = 7,7 \times 10^{11} \text{ mm}^4$$

$$f_c = \frac{M \cdot y}{I} = \frac{663 \cdot 10^6 \cdot 755}{7,7 \times 10^{11}} = 0,65 < f_{ca}$$

$$f_s = \frac{M \cdot (h-d)}{I} = \frac{663 \cdot 10^6 \cdot (1400 - 755)}{7,7 \times 10^{11}} = 0,55 < f_{sa}$$

Curse zero ES muy grande.

b) b.1) VEHICULO CUANTO AUMENTA LAS TENSIONES CON LA

NIS NA UICA

$$\rightarrow q_{sew} = 28 + 22 + 8 = 58 \frac{kN}{m}$$

$$P_{sew} = 425 kN \cdot m$$

$$\rightarrow \nu = 0,39$$

$$\rightarrow j = 0,87 \quad \int \text{CON TENSIONES ASH.}$$

$$\rightarrow A_s = 4364 \text{ mm}^2$$

$$f_s = \frac{425 \cdot 10^6}{4364 \cdot 0,87 \cdot 900} = 223 > 168.$$

\Rightarrow AUMENTA LA SECCION.

$$\text{sea } h = 1000 \quad \int q_0 = 15 \frac{kN}{m}$$

$$b = 600$$

$$d = 900$$

$$q_{sew} = 28 + 22 + 15 = 65 \frac{kN}{m}$$

$$P_{sew} = 813 kN \cdot m$$

$$A_s = \frac{\frac{1}{2} \cdot 600 \cdot (0,39 \cdot 900)^2}{8 \cdot (600 - 0,39 \cdot 600)} = 12623 \text{ mm}^2$$

$$f_s = \frac{813 \cdot 10^6}{12623 \cdot 0,87 \cdot 900} = 82,3 < f_{sa} \quad \checkmark$$

$$f_c = 813 \cdot 10^6 / (0,39 \cdot 0,87 \cdot 600 \cdot 900^2) = 4,9 < f_{ca} \quad \checkmark$$

\Rightarrow
PUEDO
SER MS
CHICA

b.2) La vita tiene due sensi
A si que no se acaba con

DISCUTO un no FISSATA.