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MATERIA: ANALISIS DE ESTRUCTURAS

ACTIVIDAD: ACTIVIDADES

CUATRIMESTRE: 5° CUATRIMESTRE

GRUPO: A

LUGAR Y FECHA: 18/02/2023

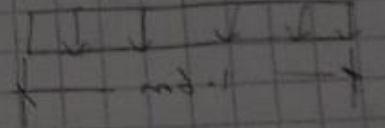
Comitán de Domínguez Chiapas 2023

Revision II continue

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la section de
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Matériau	
Classe de béton	
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$$VCR = 0.70 \times R_b \times b \times d \quad (0.7 \times 20 \times 1000 \times 170 = 238000 \text{ N})$$

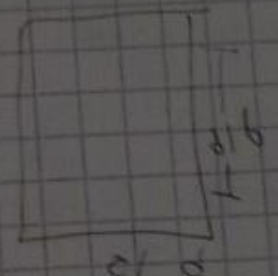


Détails

- $f_c = 20 \text{ MPa}$
- $f_{yk} = 475 \text{ MPa}$
- $b = 1000 \text{ mm}$
- $d = 170 \text{ mm}$
- $v = 4 \text{ MPa}$
- $\sigma_{s, \text{max}} = 180 \text{ MPa}$

$$R_b = k \times R_{ct} = 0.70 \times 20 = 14 \text{ MPa}$$

$$v = \frac{V}{b \times d} = 0.25$$



Classe de béton
C16/20
Classe d'acier
S420
 $\sigma_{s, \text{max}} = 180 \text{ MPa}$

$$V_{cr} = v \times (1.4) \times R_b \times b \times d = 0.25 \times 1.4 \times 14 \times 1000 \times 170 = 637000 \text{ N}$$

$$A_s = \rho_{min} \times b \times d = 0.0025 \times 1000 \times 170 = 425 \text{ mm}^2$$

$$1000000 = \frac{V_{cr}}{A_s} = \frac{637000}{A_s} \Rightarrow A_s = 637 \text{ mm}^2$$

$$V_{cr} = 0.70 \times 20 \times 1000 \times 170 = 238000 \text{ N}$$

100000

0.25

$$0.25 \times (1.4) \times 14 \times 1000 \times 170 = 637000 \text{ N}$$

Constantes

$$F^1C = 200 \text{ kg/cent}^2$$

$$F^2C = 0.8 F^1C \rightarrow 0.8 \cdot 200 \text{ kg/cent}^2 = 160 \text{ kg/cent}^2$$

$$F^3C = 0.85 F^2C = 0.85 \cdot 160 \text{ kg/cent}^2 = 136 \text{ kg/cent}^2$$

$$P_{máx} = \frac{0.75 P^1C}{F_1} \rightarrow \frac{0.75 \sqrt{100 \text{ kg/cent}^2}}{1200 \text{ kg/cent}} = 0.00235$$

$$P_{máx} = 0.75 P_b \rightarrow 0.75 (0.0194) = 0.01455$$

$$P_b = \frac{F^3C}{F_1} = \frac{4800}{1.7 \cdot 6000} \rightarrow \frac{136 \text{ kg/cent}^2}{4,200 \text{ kg/cent}} \cdot \frac{4800}{1200 \text{ kg/cent}^2} = 0.012$$

$$F^1C = 250 \text{ kg/cent}^2$$

$$F^2C = 0.8 F^1C \rightarrow 0.8 \cdot 250 \text{ kg/cent}^2 = 200 \text{ kg/cent}^2$$

$$F^3C = 0.85 F^2C = 0.85 \cdot 200 \text{ kg/cent}^2 = 170 \text{ kg/cent}^2$$

$$P_{máx} = \frac{0.75 P^1C}{F_1} = \frac{0.75 \sqrt{250 \text{ kg/cent}^2}}{1200 \text{ kg/cent}} = 0.00265$$

$$P_{máx} = 0.75 P_b$$

$$P_b = \frac{F^3C}{F_1} = \frac{4800}{1.7 \cdot 6000} = \frac{170 \text{ kg/cent}^2}{4,200 \text{ kg/cent}} \cdot \frac{4800}{1200 \text{ kg/cent}^2} = 0.0194$$

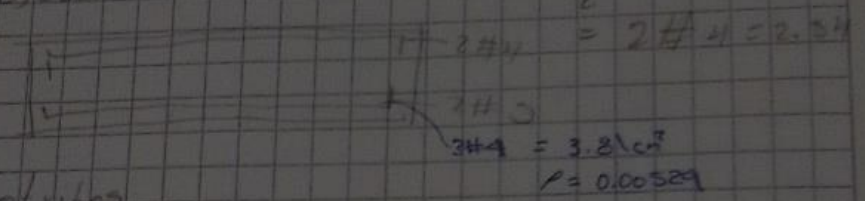
$$P_{máx} = 0.75 P_b (0.0194) = 0.01455$$

Diseno

$$\frac{2 \cdot 2 \cdot 1}{2} = 1.62 \quad 2 \# 3 = 1.99 \times 2 = 3.98$$

$$A_0 = 0.00235 \times (20) \times (36)$$

$$\frac{3.98}{(20)(36)} = 0.0035 \quad = \frac{1.692}{2} = 0.846$$



Columnas

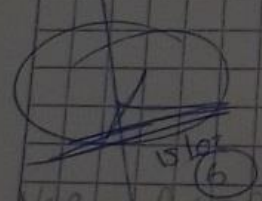
$$\text{Sep. columnas} = \frac{4.80}{4} = 1.2 = 5 = \frac{1.2}{0.75} = 8$$

① Sep. min = $0.2(40) = 0.2 = 20 \text{ cm}$

② $1.04 = 27 + 10\%$

$$\frac{29.7}{112} = 2.43$$

$$= 2.43$$



NCR = $W_0 \cdot R_0 = 3(1.47) = 2.13$

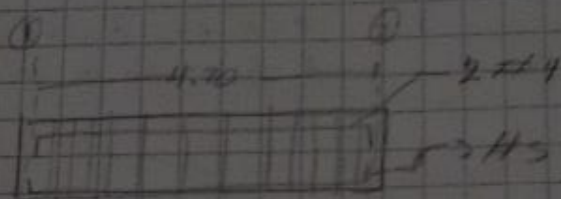
$$= 2.13 \cdot 1.4 = 2.982$$

$$= 0.70 + 0.90 \cdot 20 \cdot 36 = 1.7 + 30(0.0047)$$

$$\sqrt{170} = 1.706$$

③ $1.5 \times (0.80) \times 20 \times 36 = 9.58$

$$\begin{aligned}
 VCR &= L \cdot f_v \cdot h \cdot d \cdot P_{AC} \\
 &= 1.5 \cdot 0.8 \cdot 20 \cdot 31 \cdot 13.0^2 \\
 &= 4.694 \cdot 32 = 9.644 \text{ for } 2 \sqrt{V_{0.5}}
 \end{aligned}$$



$$\begin{aligned}
 \text{CS}^2 @ 15 \\
 \text{CS} @ 20
 \end{aligned}$$

$$\begin{aligned}
 \text{CS} @ 15 \\
 \text{CS} @ 20
 \end{aligned}$$

S cells

$$S_{max} = 0$$

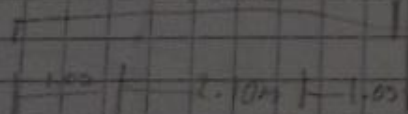
$$= \frac{4.20 \cdot 1.05}{4}$$

$$0.5(0.35) = 0.175$$

$$= 20$$

$$= \frac{1.05}{0.15} = 7$$

$$4.20$$



$$25,000 (1.04) = 26$$

$$\begin{aligned}
 2 \cdot 10 \cdot 20 = 10.5 = 11 \\
 11 \cdot 2 + 2 = 25,000
 \end{aligned}$$

$$\begin{aligned}
 10 \cdot 10 \cdot 20 = 10.5 \\
 2 \cdot 10 = 10.5
 \end{aligned}$$

$$11 \cdot 2 + 2 = 25,000$$

$$25,000 (1.04) = 26$$

$$= 16 + 16 + 21 + 31 + 10 = 1.04$$

$$= 26$$

$$25,000 (1.04) = 26$$

$$+ 10.5 = 28.5$$

$$26 + 10.5 = 28.5$$

$$28.5 \cdot 12m$$

$$28.5 / 120 = 2.38$$

$$= 2.38$$

$$= 3 \text{ Pcs}$$

$$= 3 \text{ Pcs}$$

Diseño

$$A_s = 0.0041 (20)(31) = 2.53 \text{ cm}^2 \quad f = 0.00926$$

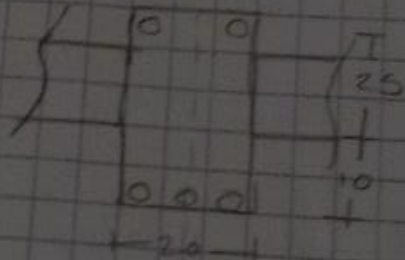
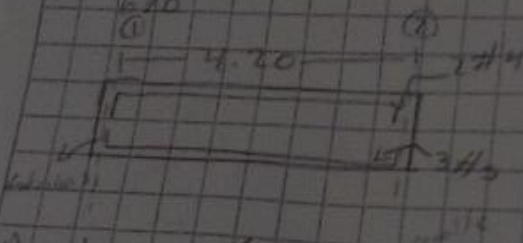
$$\frac{5.72 \text{ cm}^2}{2} = 2.86 \text{ cm}^2 \quad 2\#4 = 5.72 \text{ cm}^2$$

$$\frac{5.72 \text{ cm}^2}{3} = 1.91 \text{ cm}^2 \quad 3\#3 = 5.97 \text{ cm}^2$$

Comprobación de f_{max}

$$f = \frac{5.72}{(20)(31)} = 0.00926 \text{ cm}^2 \quad f = \frac{A_s}{(b)(d)}$$

$$\textcircled{1} \quad f = \frac{5.97}{(20)(31)} = 0.00962$$



$$A_s > A_s = f_{max}(b)d$$

$$f = 0.00230 (20)(31) = 1.457 \text{ cm}^2$$

$$\frac{1.457 \text{ cm}^2}{2} = 0.7285 = 2\#4 = 2.54 \text{ cm}^2$$

$$V_u = v(1.4) = 7.578 \text{ (1.4)} = 6.111 \text{ cm}$$

$$\textcircled{2} \quad V = \frac{w(L)}{2}$$

$$= \frac{2.18 \times 4.20}{2}$$

$$= 4.578 \text{ cm}$$

$$V_{CR} = 0.7 \cdot (v_c \cdot b \cdot d) \cdot (0.2 + 30 / \sqrt{f'_c}) \cdot 10^{-3}$$

$$= 0.70 (0.8)(20)(31) (0.2 + 30 / \sqrt{0.00926}) \cdot 10^{-3}$$

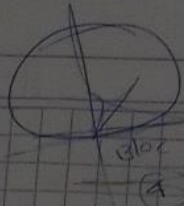
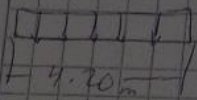
$$= 3.4720 (0.477) = 1.643 \text{ cm}$$

$$= 2.157 \text{ cm}$$

$$= 2.157 \text{ cm} < V_u < V_{CR}$$

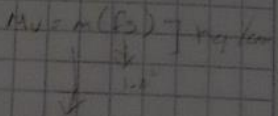
O.K. control

2.18 Hm



- $\gamma = 4200 \text{ kg/cm}^3$
- $E_c = 200 \text{ kg/cm}^2$
- $\rho_{cc} = 160 \text{ kg/cm}^3$
- $\rho_{cc} = 136 \text{ kg/cm}^3$
- $f_{mc} = 0.00335$
- $f_{cc} = 0.001493$

\blacksquare Momento $\frac{1}{2} (2.18 \text{ Hm}) (4.20 \text{ m})^2$
 $M = 4.801 \text{ Hm}^2$



\blacksquare Ton = 1000 kg
 \blacksquare Material = 480.70

\blacksquare $M_u = 4.801 \times 1.7^3 = 276,840.00$

$\textcircled{1}$ $h = \frac{1}{10} = \frac{4.20}{10} = 0.35 \text{ m}$

\blacksquare $0 = 20 \text{ cm}$
 \blacksquare $h = 35 \text{ cm}$
 \blacksquare $x = 46 \text{ cm}$
 \blacksquare $d = h - x = 11 \text{ cm}$

\blacksquare $q = \frac{-276,840 \text{ Ncm}}{0.42 \times 20 \times 31^2 \times 136 \text{ kg/cm}^3}$

$q = 0.7138$

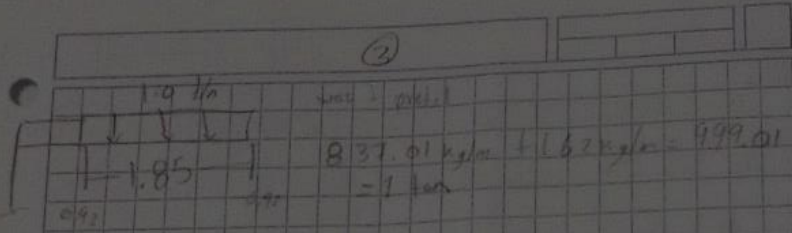
\blacksquare $f = \frac{E_c q (1 + \mu)}{f_c} = \frac{(0.7138 + 1)(136 \text{ kg/cm}^3)}{4200 \text{ kg/cm}^3}$

$f = 0.00926$

\blacksquare $\Delta S = f (b) (d)$

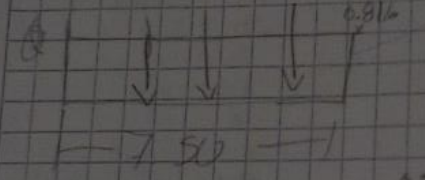
\blacksquare $\Delta S = 0.00926 (40 \text{ cm}) (31 \text{ cm}) = 5.741 \text{ cm}$





$$\frac{1.85(1.85)}{2} + \frac{1.85(1.85)}{2} = 0.92$$

$$0.92 + 0.92 = 1.84$$



$$1.85 \times 1.85 + 1.85 \times 1.85 = 7.82 \text{ ton}$$

$$0.92 \times 7.50 = 6.9 \text{ ton}$$

$$2 = \frac{1}{2} = 3.75 \text{ m}$$

$$1.85 + 3.75 \text{ ton} = 5.6 \text{ ton}$$

$$\sum M_{left} = 1.85 - 1.85 + 5.6 \text{ ton} (3.75) - 1.85 (5.6)$$

$$+ 1.85 (7.5) = 0$$

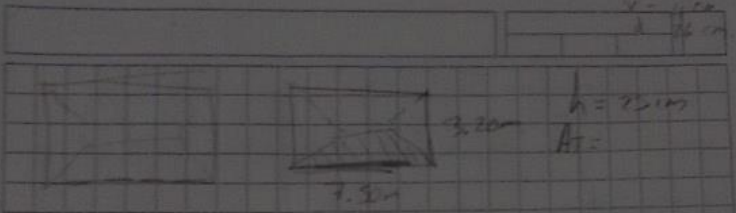
$$-43.21 \text{ ton} + B(7.50 \text{ m}) = 0$$

$$B = \frac{43.21}{7.50}$$

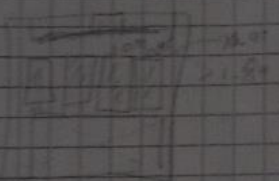
$$B = 5.76 \text{ ton}$$



$b = 15 \text{ cm}$
 $r = 30 \text{ cm}$
 $x = 10 \text{ cm}$
 $d = 20 \text{ cm}$



$7.30 - 3.20 = 4.1$ ① $h = 7.50 - 3.20 = 4.30$

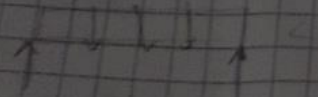


$A = \frac{7.30 + 3.20}{2} \times 2.50 = 9.44 \text{ m}^2$
 $A_{tr} = 9.44 \text{ m}^2 \times 635 \text{ kg/m}^3 = 5994.4 \text{ kg/m}^3$
 $w = \frac{5994.4}{7.50} = 799.22$

② A_{total}
 $w_{tr} = 9.44 \text{ m}^2 \times 635 \text{ kg/m}^3 = 6027.6 \text{ kg/m}^3$
 $w = \frac{6027.6 \text{ kg/m}^3}{7.50 \text{ m}} = 803.68 \text{ kg/m}$

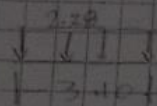
Praktis

$w_{total} = 0.60 \text{ m} \times 270 \text{ kg} = 162 \text{ kg/m}$



...
 ...

$VCR = 0.70 \times 1.5 \times 10 \times (0.2 + 30) \sqrt{f'c}$



$R_{cs} = R_{cs} \frac{2.28}{2} \times 3.10 \text{ m} = 3834$

$\frac{3.10}{12} = 0.25$

$f'c = 250 \text{ kg/cm}^2$

$f_y = 4200 \text{ kg/cm}^2$

$b = 15$

$h = 0.30$

$x = 4 \text{ cm}$

$d = h - x = 21 \text{ cm}$

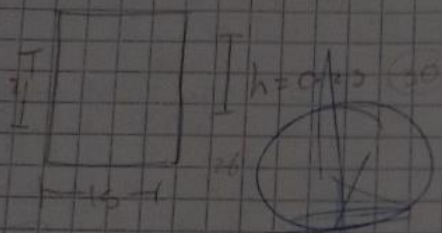
$V_u = 4.9476$

$A_s = 0.74 \text{ cm}^2$

$\rho = 0.0120$

$VCR = 1.7195 \text{ ton}$

$S = 12.30$



0.0120
2

$V_u = V(1.4) = 3.534(1.4) = 4.9476$

$A_s = \rho_{min}(b) d = 0.00235(15)(21 \text{ cm}) = 0.74$

$\rho = \frac{A_s}{b d} = \frac{0.74}{15(21)} = 0.0120$

$VCR = 0.30 \times 0.8 \times 15 \times 21 (0.2 + 30) \sqrt{0.0120}$

$VCR = 1.7195 \text{ ton} < V_u < VCR$

$S = 0.30(h) = 0.30(25) = 12.30$

$VCR = 1.5(0.30)(15) \sqrt{60 \text{ kg/cm}^2}(26)$

$= 4.781.26 \text{ kg/cm}^2 > V_u$

$A_s = 1.5(0.30)(15) \sqrt{60 \text{ kg/cm}^2}(26) = 2914.78$