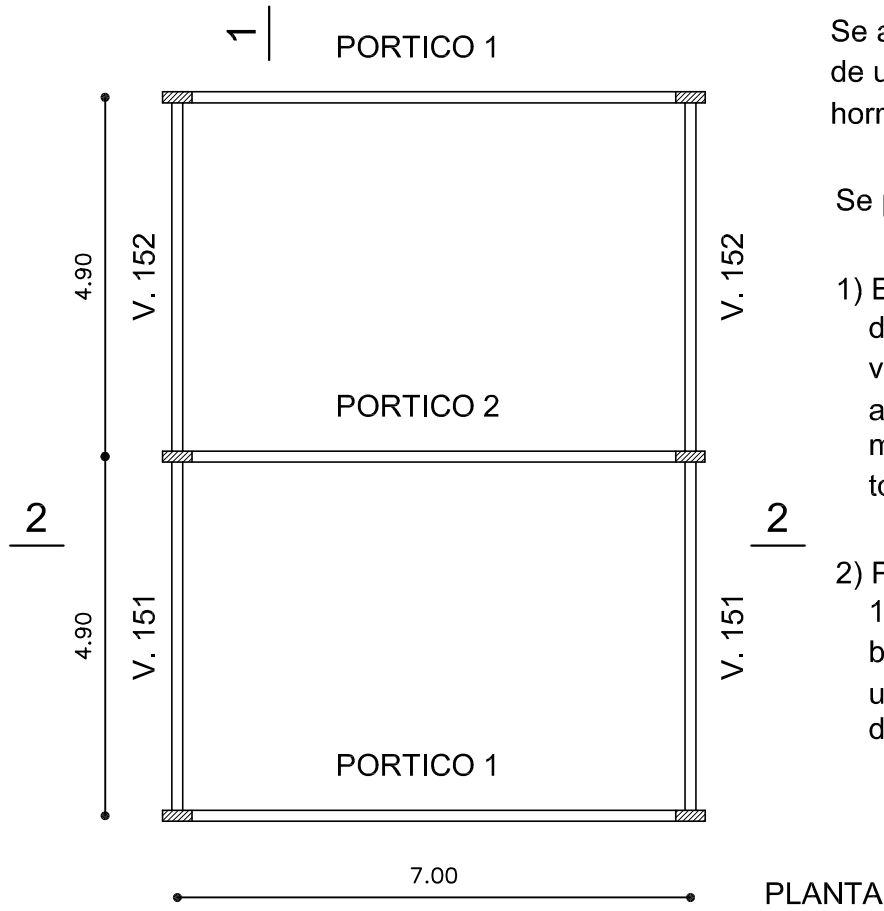


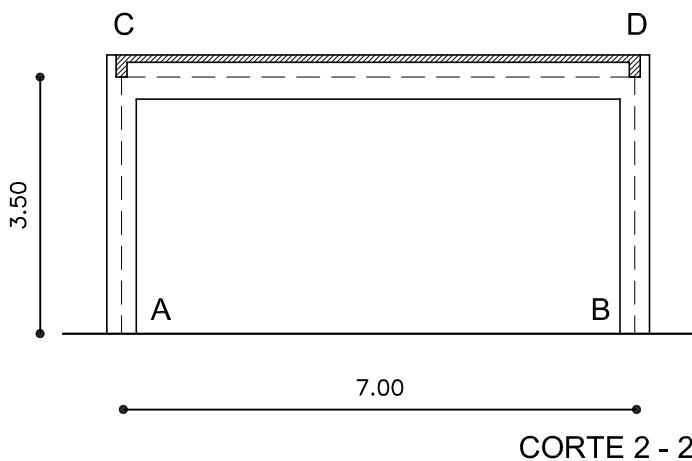
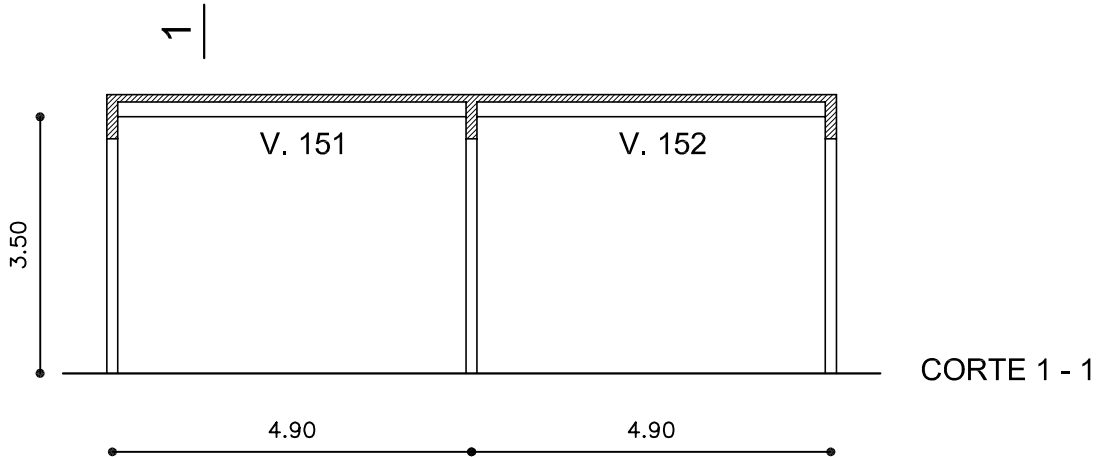
ESTABILIDAD DE LAS CONSTRUCCIONES II
 Parte escrita del examen
 02 / 02 / 04



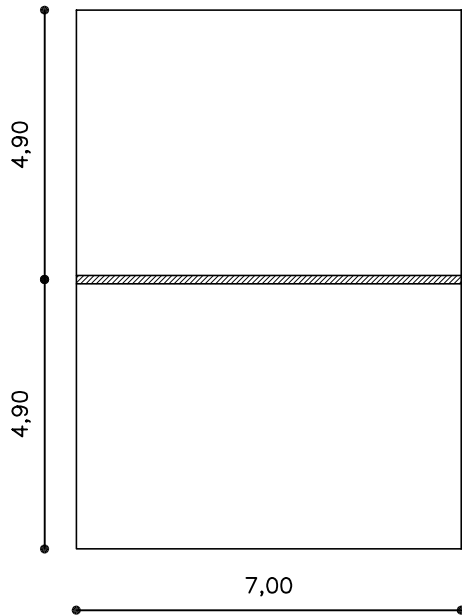
Se adjuntan la planta y dos cortes de una estructura construida en hormigón armado.

Se pide:

- 1) Estudiar las losas, macizas, determinando el mínimo espesor viable e indicando el área de acero necesaria en la sección más comprometida. La carga total a considerar es 650 daN/m^2 .
- 2) Proponer la altura para las vigas 151 - 152, considerando una base de 15 cm y procurando una sección de poco hormigón, demostrando su viabilidad.



- 3) Estudiar el pórtico central (PORTICO 2), con tramos verticales de $15 \times 40 \text{ cm}$ de sección y el tramo horizontal de $15 \times 60 \text{ cm}$. Trazar los diagramas de sollicitaciones, indicar las reacciones en los apoyos y verificar la sección más comprometida del tramo CD (tramo horizontal), proponiendo ajustes en caso de ser necesario.



$$p = 650 \text{ daN/m}^2$$

$$\varepsilon = \frac{L_y}{L_x} = \frac{4,90}{7,00} = 0,70$$

$$K = p \cdot L_x \cdot L_y = 650 \cdot 7 \cdot 4,9 = 22295 \text{ daN}$$

TABLA 1 – CASO 2

$$M_{ox} = \frac{22295}{75,10} = 297 \text{ daNm}$$

$$M_{oy} = \frac{22295}{28,17} = 791 \text{ daNm}$$

$$M_{ya} = \frac{22295}{12,53} = 1779 \text{ daNm}$$

$$dt = 0,226 \cdot \sqrt{1,6 \cdot 791} = 8,04 \text{ cm}$$

$$da = 0,174 \cdot \sqrt{1,6 \cdot 1779} = 9,28 \text{ cm}$$

$$h = 9,28 + 1,5 = 10,78 \text{ cm} \longrightarrow \boxed{11 \text{ cm}}$$

Armadura :

$$M_d = 1779 \cdot 1,6 = 2846 \text{ daNm} \quad \mu = \frac{M_d}{b \cdot d^2 \cdot f_{cd}} = \frac{284600}{100 \cdot 9,5^2 \cdot 100} = 0,315$$

Tabla Secciones Rectangulares $\longrightarrow \omega = 0,424$

$$A_{s_1} = \frac{\omega \cdot b \cdot d \cdot f_{cd}}{f_{yd}} = \frac{0,424 \cdot 100 \cdot 9,5 \cdot 100}{3650} = 11,04 \text{ cm}^2$$


Descargas :

TABLA 7 – CASO 2

$$1 - 0,272 \times 22295 = 6064 \text{ daN} \longrightarrow \frac{6064}{7} = 866 \text{ daN/m}$$

$$2 - 0,472 \times 22295 = 10523 \text{ daN} \longrightarrow \frac{10523}{7} = 1503 \text{ daN/m}$$

$$3 \text{ y } 4 - 0,128 \times 22295 = 2854 \text{ daN} \longrightarrow \frac{2854}{4,9} = 582 \text{ daN/m}$$

V. 151 - 152 (15 x 30) 

Peso propio :

$$p.p. = 0,15 \times (0,30 - 0,11) \times 2500 = 71 \text{ daNm}$$

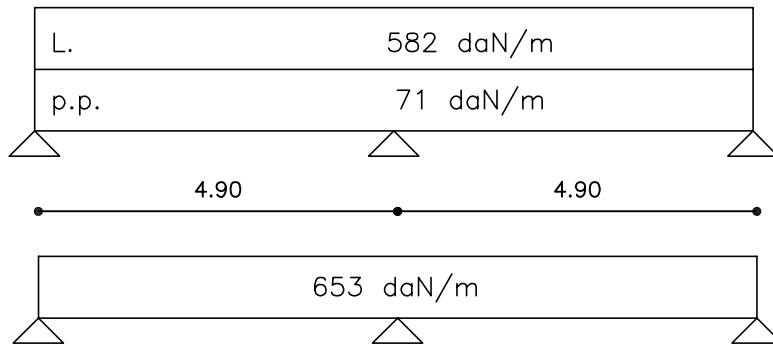
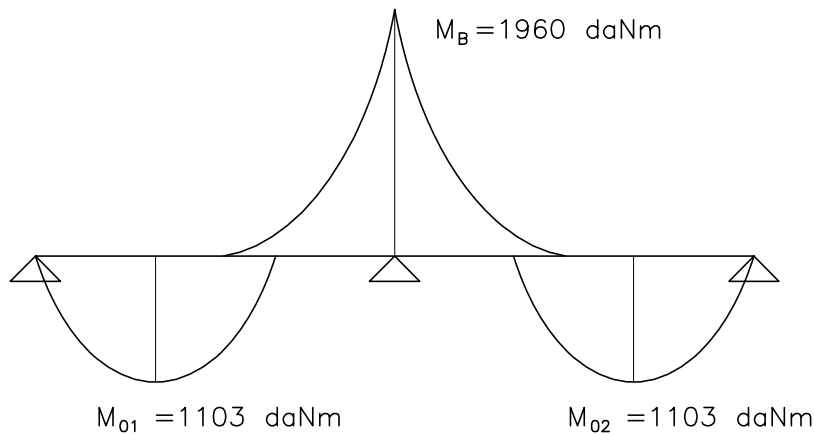


TABLA 5.3.1 – pag. 62 – Tablas y Abacos



$$V_{A1} = 0,375 \times 653 \times 4,9 = 1200 \text{ daN}$$

$$V_{B2} = 0,625 \times 653 \times 4,9 = 2000 \text{ daN}$$

$$M_{01} = \frac{653 \times 4,9^2}{14,22} = 1103 \text{ daNm}$$

$$M_B = \frac{653 \times 4,9^2}{8} = 1960 \text{ daNm}$$

Verificación en apoyo :

$$M_d \text{ lim} = 0,332 \times 15 \times 27^2 \times 100 = 3630 \text{ daNm}$$

$$M_d \text{ lim} > M_d \longrightarrow A_{s2} = 0$$

$$M_d = 1960 \times 1,6 = 3136 \text{ daNm} \quad \mu = \frac{M_d}{b \cdot d^2 \cdot f_{cd}} = \frac{313600}{15 \times 27^2 \times 100} = 0,287$$

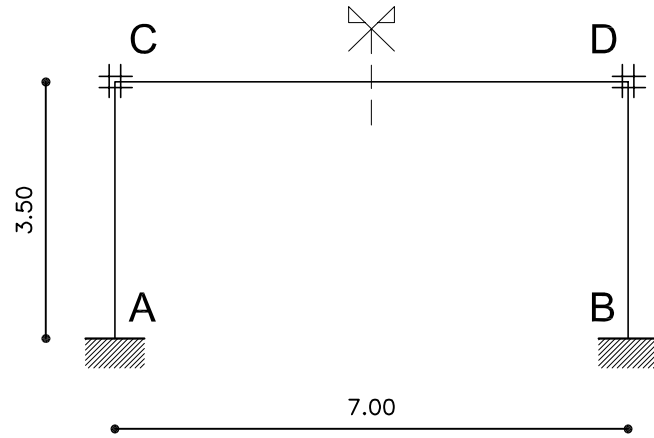
Tabla Secciones Rectangulares $\longrightarrow \omega = 0,369$

$$A_{s1} = \frac{\omega \cdot b \cdot d \cdot f_{cd}}{f_{yd}} = \frac{0,369 \times 15 \times 27 \times 100}{3650} = 4,09 \text{ cm}^2$$

Viabilidad :

$$\rho = \frac{4,09}{15 \times 27} = 0,010 < 0,018$$

PORTICO



Tramos AC - DB :

$$p.p.=0,15 \times 0,40 \times 2500 = 150 \text{ daN/m}$$

Tramo CD :

$$p.p.=0,15 \times 0,49 \times 2500 = 184 \text{ daN/m}$$

$$\text{desc. losas} = 1503 \times 2 = 3006 \text{ daN/m}$$

$$\text{Total} = 3190 \text{ daN/m}$$

Inercias AC - DB :

$$I_1 = \frac{15 \times 40^3}{12} = 80000 \text{ cm}^4$$

Inercia CD :

$$\left. \begin{aligned} \xi &= \frac{15}{81} = 0,185 \\ \xi' &= \frac{11}{60} = 0,183 \end{aligned} \right\} \psi = 0,356$$

$$b_e = 6 \cdot h_f + b_w = 6 \times 11 + 15 = 81 \text{ cm}$$

$$I_2 = \frac{0,356 \times 81 \times 60^3}{12} = 519048 \text{ cm}^4$$

Inercias relativas :

$$I_{r1} = 1$$

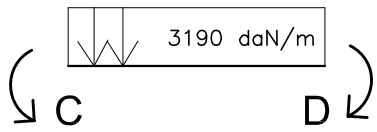
$$I_{r2} = \frac{519048}{80000} = 6,48$$

TRAMO	I	Ir	α	L	χ	χ'	r
1	80000	1	1	3,5	0,286		0,38
2	519048	6,48	1	7,0	0,926	0,463	0,62

↓
Caso de simetría por tramo

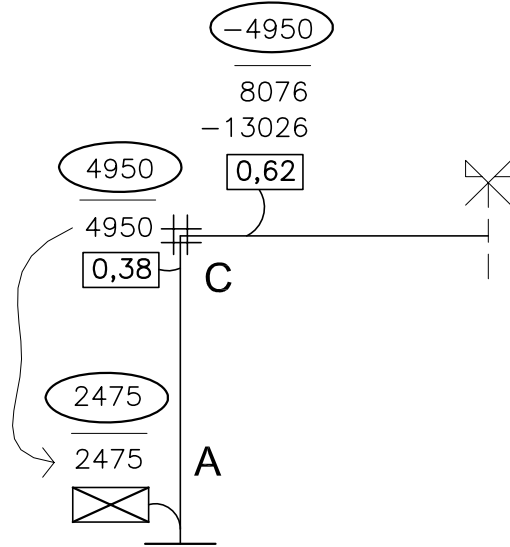
$$\chi' = \chi \cdot (1 - \beta)$$

M.E.P.

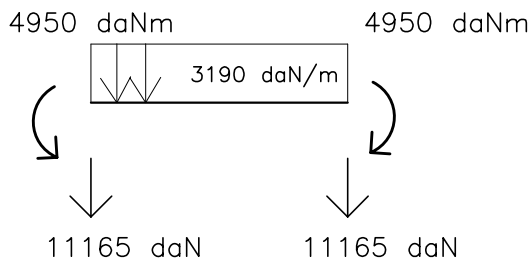


$$M.E.P. = \frac{p \cdot l^2}{12} = \frac{3190 \times 7^2}{12} = 13026 \text{ daNm}$$

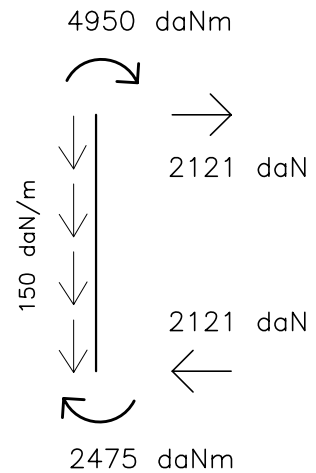
1° CROSS



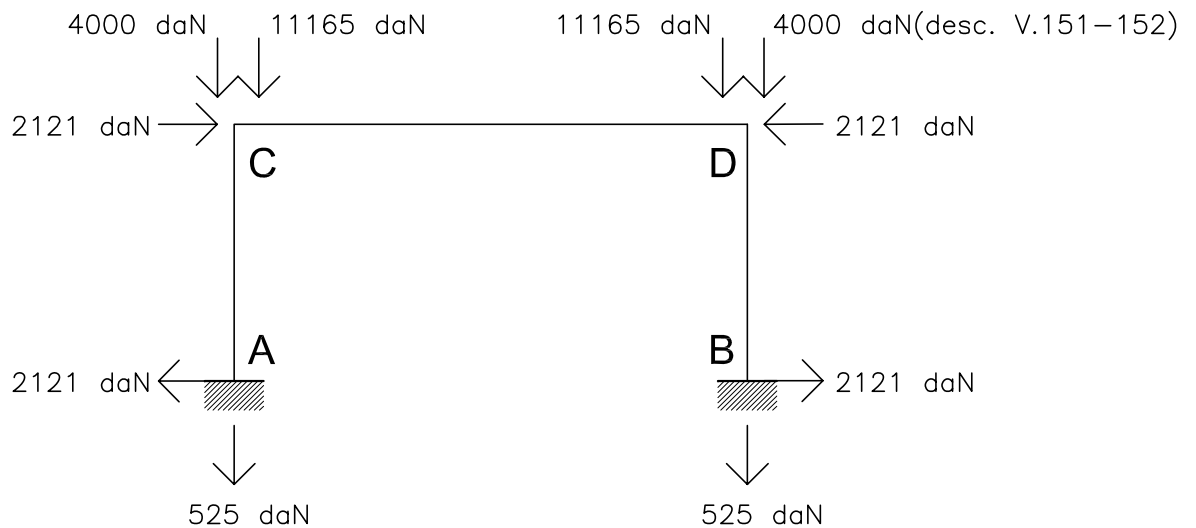
DESCARGAS CD



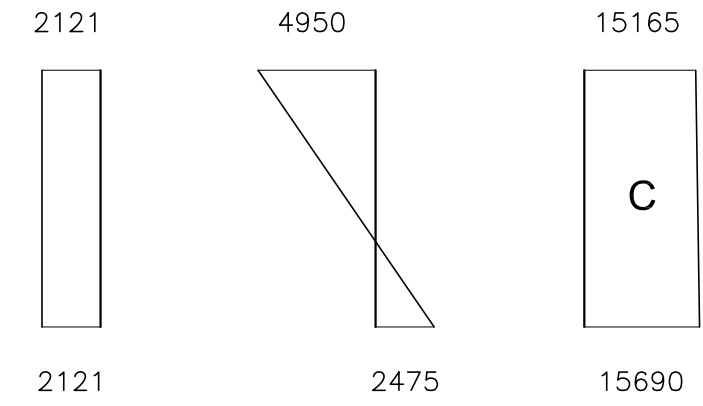
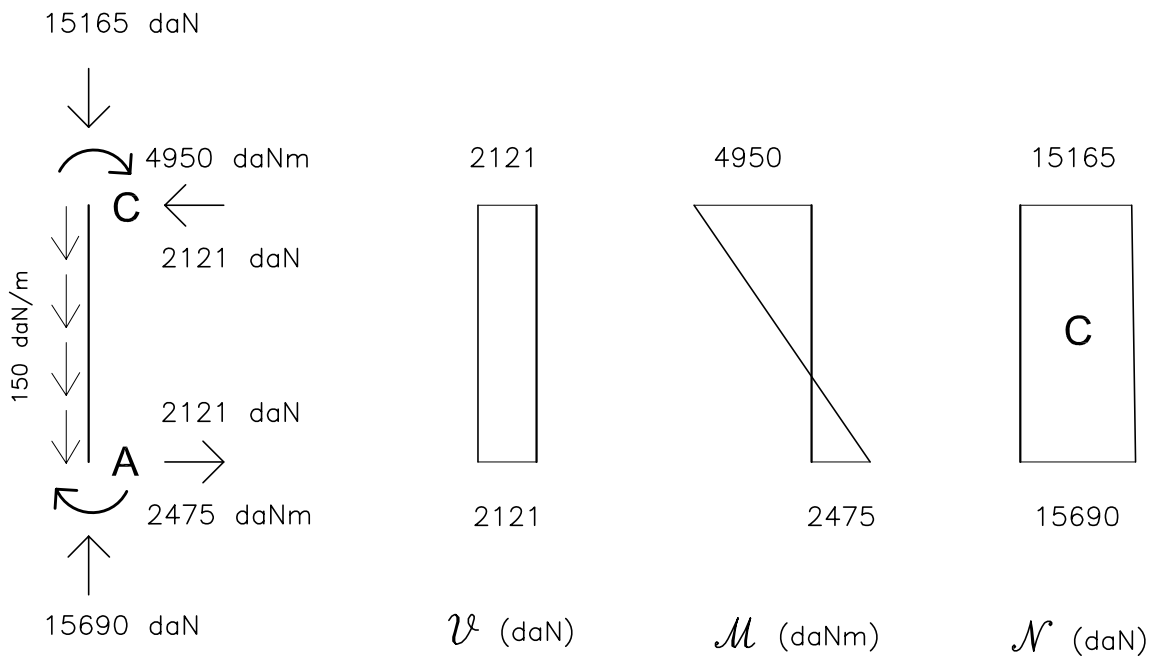
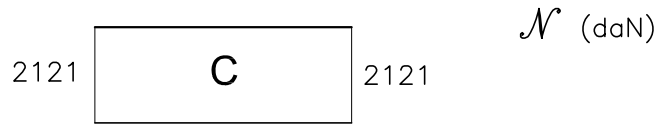
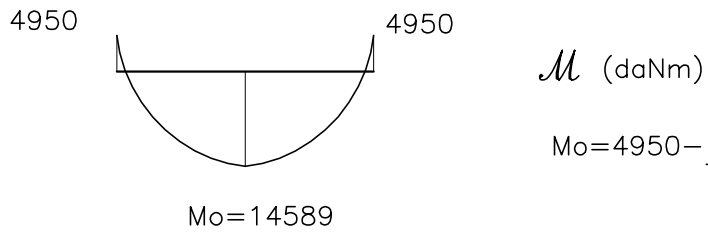
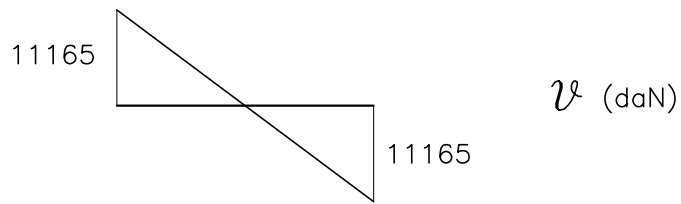
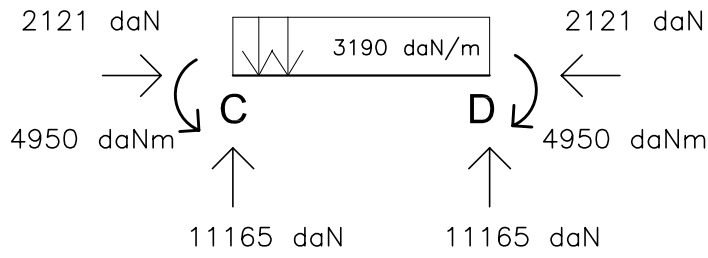
DESCARGAS AC



CAMINOS MATERIALES



DIAGRAMAS



V (daN) M (daNm) N (daN)

VERIFICACIÓN

Tramo CD sometido a preso-flexión (secc. T)

$$M = 14589 \text{ daNm}$$

$$M_d = 23342 \text{ daNm}$$

$$N = 2121 \text{ daN (compr.)}$$

$$N_d = 3394 \text{ daN}$$

$$e_0 = \frac{M_d}{N_d} = \frac{23342}{3394} = 6,88 \text{ m} > 0,30\text{m} \quad \text{gran excentricidad}$$

$$b_e = 12 \cdot h_f + b_w = 12 \times 11 + 15 = 147 \text{ cm}$$

$$M_{ad} = 23342 + 3394 \times 0,54 = 24258 \text{ daNm}$$

$$\mu_{ad} = \frac{2425800}{147 \times 57^2 \times 100} = 0,051$$

TABLA Secciones T – pag. 75

$$\left. \begin{array}{l} \frac{h_f}{d} = \frac{11}{57} = 0,19 \\ \frac{b_e}{b_w} = \frac{147}{15} = 9,8 \end{array} \right\} \omega = 0,054$$

$$AS1 = \frac{0,054 \times 147 \times 57 \times 100}{3650} - \frac{3394}{3650} = 11,47 \text{ cm}^2$$

$$\rho = \frac{11,47}{15 \times 57} = 0,013 \longrightarrow \text{Viable}$$