

EJEMPLO BASE CON VIGA CANTILEVER

1C-2024

DATOS

	D	L	sumas
N ₁	1125	37,5	150 t
N ₂	150	50	200 t

COLUMNA

75 x 30 cm

c₁ c₂

MATERIALES

$$\sigma_{adm} = 3 \frac{kg}{cm^2} = 30 \frac{t}{m^2} \quad a - 2,50 m$$

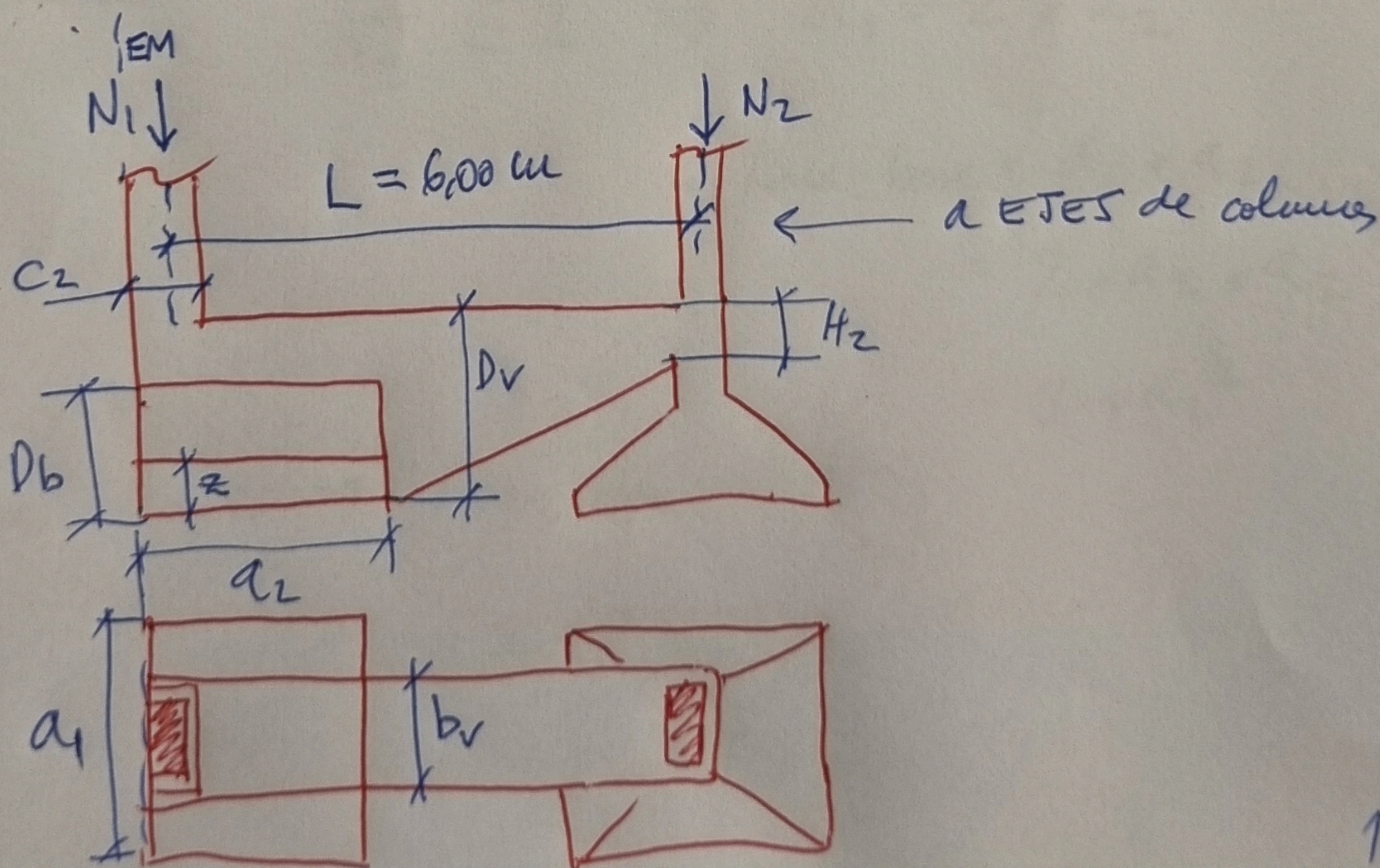
$$H_{30} = 300 \frac{kg}{cm^2}$$

$$AON 420 = 4200 \frac{kg}{cm^2} = 42000 \frac{t}{m^2}$$

COMB CARGAS

$$U_1 = 1,40$$

$$U_2 = 1,20 + 1,6L$$



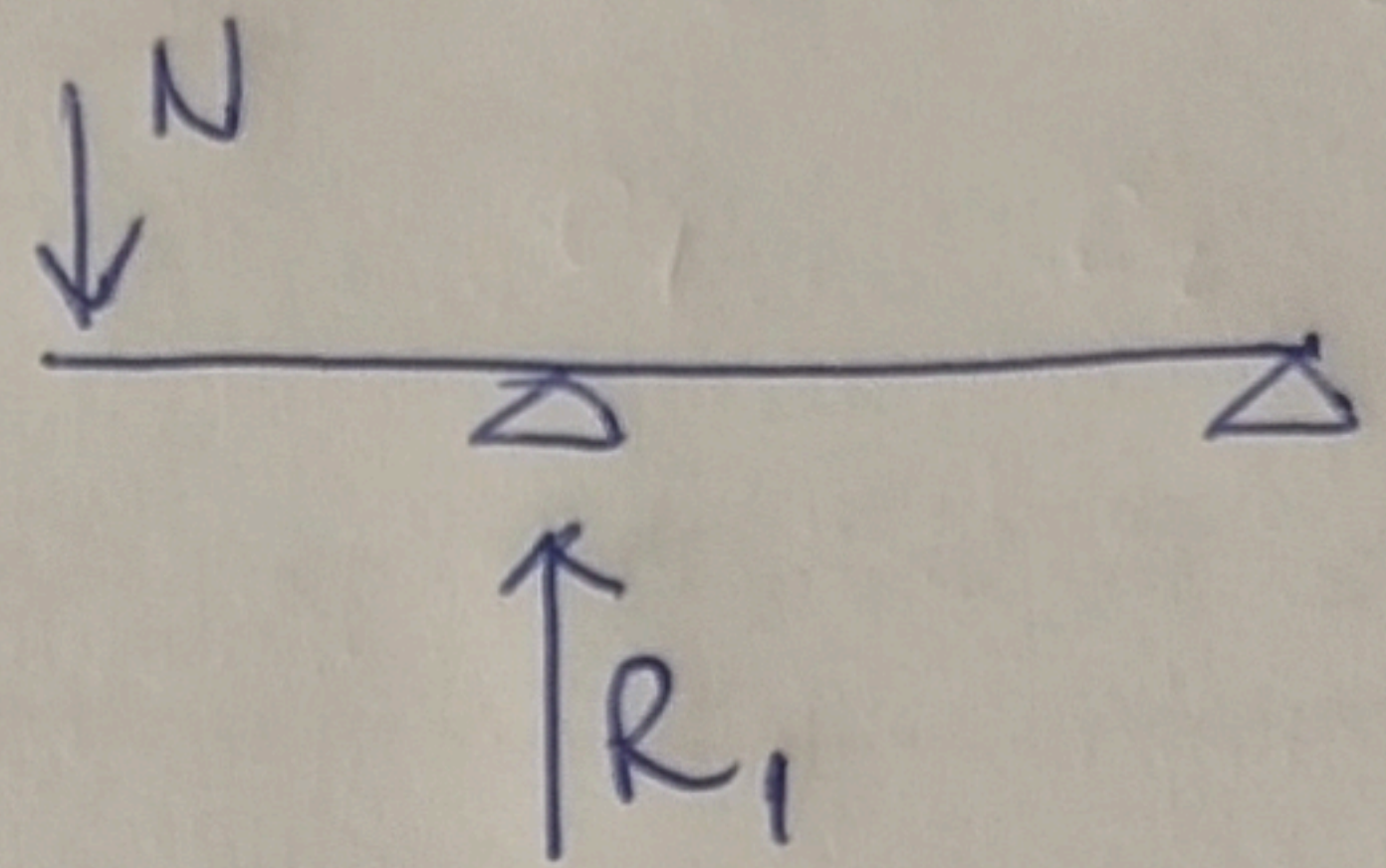
PROCEDIMIENTO DE CALCULO

1. ESTIMACION DE LADOS BASE a_1 y a_2

a) - aproximando R_1

$$R_{1, \text{Aprox}} = 1,3 * N_{1s}$$
$$= 1,3 * 150t$$

$$R_{1, \text{Aprox}} = 195t$$



b) - calculo area aprox necesaria para despejar a_2

$$\text{Area. aprox} = \frac{R_{1, \text{Aprox}}}{\tau_{\text{adun}}} = \frac{195t}{30 \frac{t}{m^2}} = 6,50 m^2$$

c) - Siendo $\frac{a_1}{a_2} \leq 2 \Rightarrow a_1 = 2 * a_2$

$$\therefore \text{Area. base} = a_1 * a_2$$
$$= 2 * a_2 * a_2$$
$$= 2 * a_2^2$$

$$d) \text{ de b y c } \Rightarrow \text{Area. base} = \frac{R_{1, \text{aprox}}}{\tau_{\text{adun}}}$$
$$2a_2^2 = \frac{R_{1, \text{aprox}}}{\tau_{\text{adun}}}$$
$$a_2 = \sqrt{\frac{R_{1, \text{aprox}}}{2\tau_{\text{adun}}}}$$

$$a_2 = \sqrt{\frac{195t}{2 \times 30 \frac{t}{m^2}}} = 1,80m$$

$$\Rightarrow \text{ADOPTO } a_2 = 1,80m$$

2. REACCIÓN REAL DEL SUELO y CALCULO a_1

$$a) R_{1, \text{real}} = \frac{1,1 \times N_{1\text{serv.}} \times L}{L - \frac{a_2}{2}} = \frac{1,1 \times 150t \times 6m}{6m - \frac{1,80m}{2}}$$

$$R_{1, \text{REAL}} = 194,1t$$

$$b) a_1 = \frac{R_1}{a_2 \times \sigma_{adm}} = \frac{194,1t}{1,80m \times 30 \frac{t}{m^2}} = 3,59m$$

$$\Rightarrow \text{ADOPTO } a_1 = 3,60m$$

$$c) \text{ verifco } \frac{a_1}{a_2} \leq 2 \quad \frac{3,60}{1,80} = 2 \quad \checkmark \text{ OK}$$

d) verifco area necesaria:

$$S_{\text{req. nec}} = \frac{R_{1, \text{real}}}{\sigma_{adm}} = \frac{194,1t}{30 \frac{t}{m^2}} = 6,47m^2$$

$$S_{\text{req. adop}} = a_1 \times a_2 = 3,60m \times 1,80m = 6,48m^2$$

OK

3. ESTABILIDAD / VERIF. al LEVANTAMIENTO

$$a) R_0 = \frac{R_{i.\text{real}}}{1,1} = \frac{194,1t}{1,1} = 176,5t$$

b) haciendo sumatoria de fuerzas verticales

$$R_2 = R_0 - N1.\text{serv.}$$
$$= 176,5t - 150t$$

$$R_2 = 26,5t$$

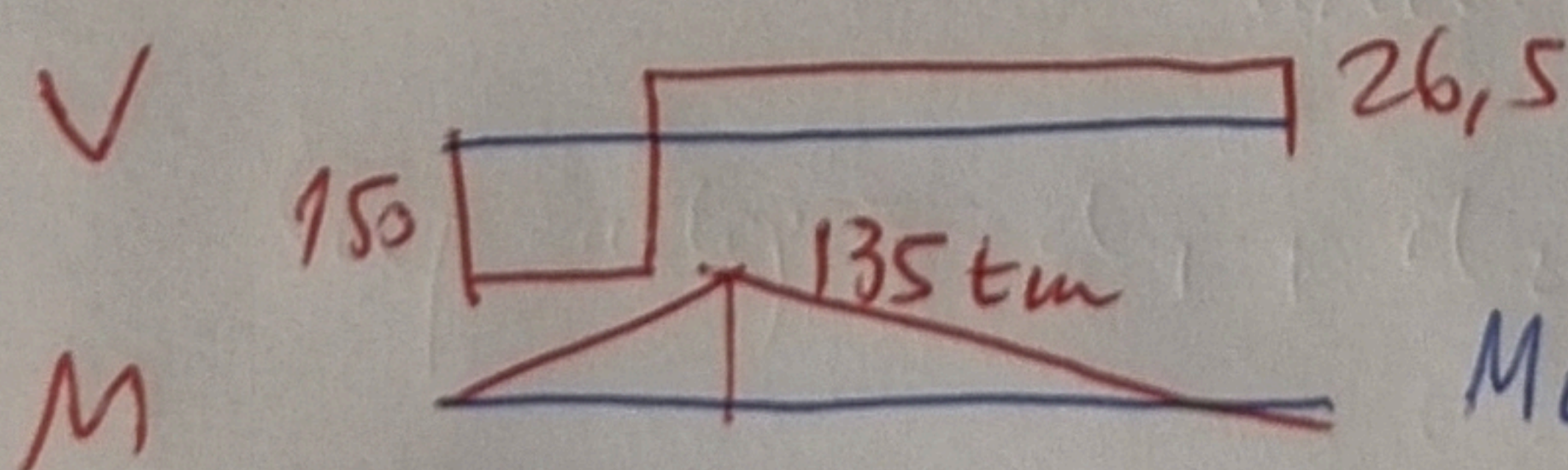
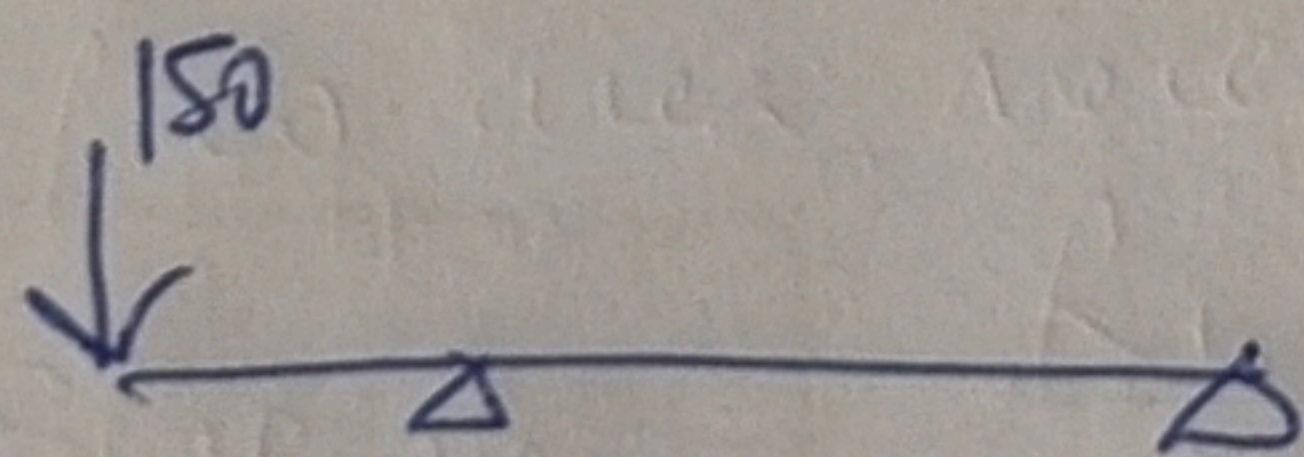
c) LEVANTAMIENTO

$$\gamma * R_2 \leq N2.\text{perm.} \quad \text{con } \gamma = 1,5$$

$$1,5 * 26,5t \leq 150t$$

$$39,75t \leq 150t \quad \checkmark \quad \text{VERIFICA}$$

4. DIAGRAMAS (simplificados)



$$M_{\text{max}} = N1.\text{serv.} * \frac{a_2}{2} = 150 * \frac{1,80}{2} = 135$$

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5. CALCOLO GEOMETRIA BASE

$$a) D_{base} = \frac{a_1 - b_v}{3}$$
$$= \frac{3,60m - 0,85m}{3}$$

$$= 0,92m$$

$$\text{con } b_{v_{min}} = C_1 + 0,1m$$

$$b_{v_{min}} = 0,75 + 0,1$$

$$b_{v_{min}} = 0,85$$

$$b_v = 0,85m \text{ ADOPTO}$$

$$D_{base} = 0,95m \text{ ADOPTO}$$

$$b) h = D_B - r_{ec}$$

$$\text{con } r_{ec} = 0,05m \text{ (minimo)}$$

$$h = 0,95m - 0,05m$$

$$h = 0,90m$$

$$c) z = \max(0,25m; 0,2 D_B)$$

$$= \max(0,25m; 0,2 * 0,95m)$$

$$= \max(0,25; 0,19)$$

$$z = 0,25m \text{ ADOPTO}$$

5.1 FACTORIZO CARGAS

$$-U_1: N_{u1} = 1,4 * 112,5t = 157,5t$$

$$U_2: N_{u2} = 1,2 * 112,5t + 1,6 * 37,5t = 195t$$

5.2 SOLICITACIONES ULTIMAS

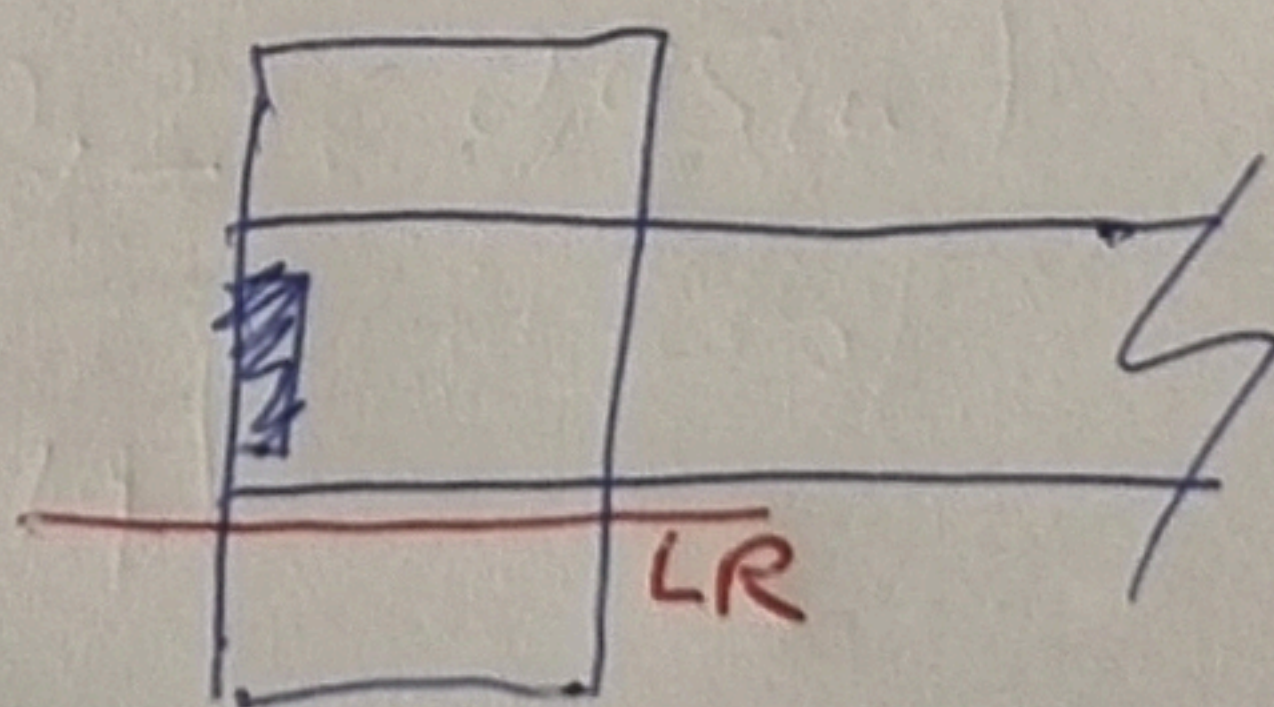
$$a) R_u = \frac{N_{u1} + L}{L - \frac{a_2}{2}} = \frac{195t * 6m}{6m * \frac{1,80m}{2}} = 229,4t$$

$$b) \sigma_u = \frac{R_u}{a_1 + a_2} = \frac{229,4t}{3,60m + 1,80m} = 35,4 \frac{t}{m^2}$$

5.3 CALCULO MOMENTO BASE CON L. de R.

$$M_{LR} = \frac{(a_1 - b_v)^2 + \sigma_u * a_2}{8} = \frac{(3,60m - 0,85m)^2 * 35,4 \frac{t}{m^2} + 1,80m * 229,4t}{8}$$

$$M_{LR} = 60,2 \text{ tm}$$



5.4 CALCULO Y ADOPCION DE ARMADURAS

$$A_s = \frac{1,2 * M_{LR}}{0,8 * h * \phi * F_y}$$

con $\phi = 0,9$

$$a) \quad A_{S1} = \frac{1,2 * 60,2 \text{ tm} * (10.000) \xrightarrow{\text{de m}^2 \text{ a cm}^2}}{0,8 * 0,90 \text{ m} + 0,9 * 42.000 \frac{\text{t}}{\text{m}^2}}$$

$$A_{S1} = 26,6 \text{ cm}^2 \quad (\text{total})$$

$$\frac{A_{S1}}{a_2} = \frac{26,6 \text{ cm}^2}{1,80 \text{ m}} = 14,8 \frac{\text{cm}^2}{\text{m}} \quad (A_{S1} \text{ por metro})$$

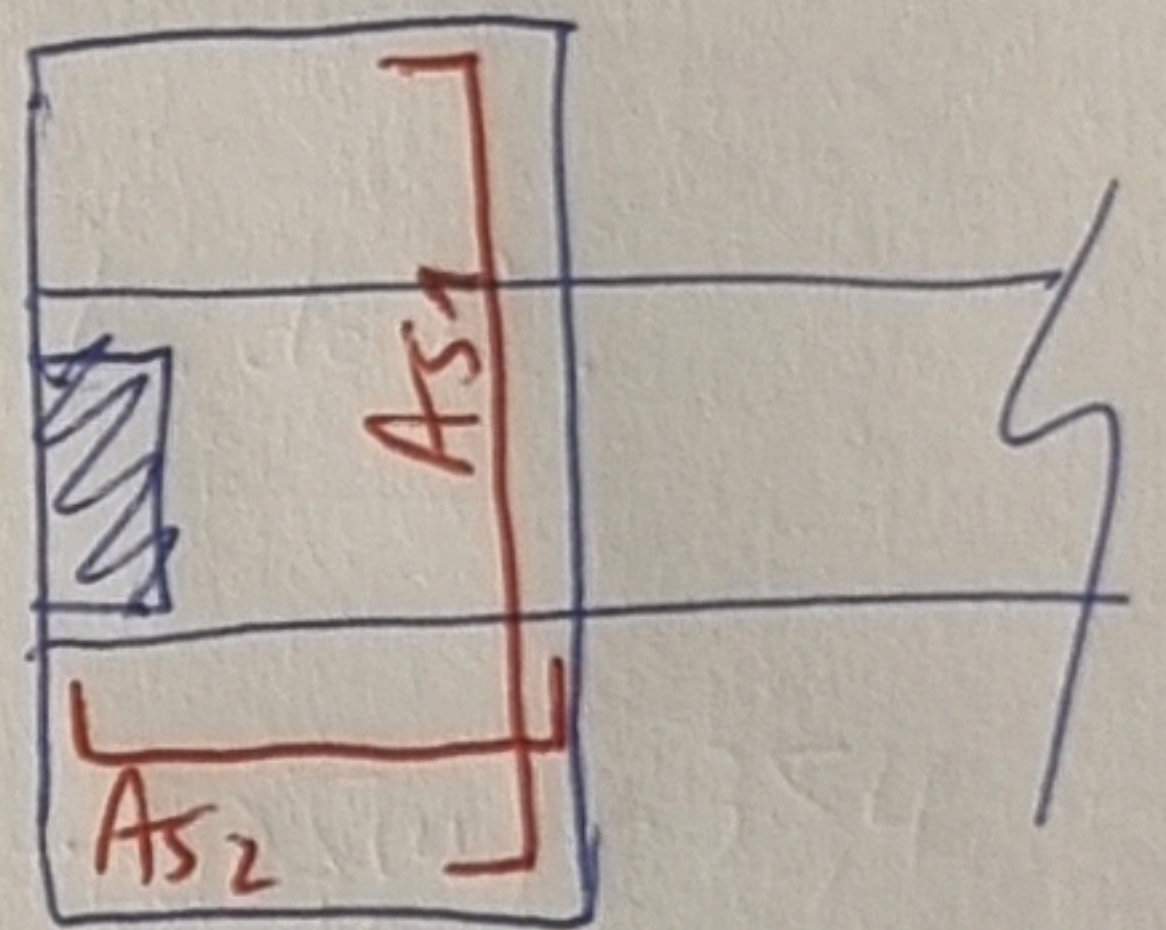
$$\Rightarrow \text{ADOPTO } 14 \phi 16 \text{ c/13 cm}$$

$$14 \phi 16 = 14 * 2,01 \text{ cm}^2 = 28,14 \text{ cm}^2 > A_{S1} \quad \checkmark$$

$$\text{separación} = \frac{a_2 - 2r}{\# \text{ barras} - 1} = \frac{1,80 - 0,1}{14 - 1} = 0,13 \text{ m}$$

$$b) \quad A_{S2} = 0,2 * A_{S1} \\ = 0,2 * 26,6 \text{ cm}^2$$

$$A_{S2} = 5,3 \text{ cm}^2 \quad (\text{total})$$



$$\frac{A_{S2}}{a_1} = \frac{5,3 \text{ cm}^2}{3,60 \text{ m}} = 1,5 \frac{\text{cm}^2}{\text{m}} \quad (A_{S2} \text{ por metro})$$

$$\Rightarrow 7 \phi 10 \text{ c/58 cm} \Rightarrow \text{ADOPTO MINIMA } \phi 10 \text{ c/20 cm}$$

$$7 \phi 10 = 7 * 0,78 \text{ cm}^2 = 5,46 \text{ cm}^2 > A_{S2} \quad \checkmark$$

$$\text{separación} = \frac{a_1 - 2r}{\# \text{ barras} - 1} = \frac{3,60 - 0,1}{7 - 1} = 0,58 \text{ m}$$

6. SECCIÓN DE LA VIGA

$$\begin{aligned} D_{vmin} &= D_{base} + \frac{b_v}{2} \\ &= 0,95 \text{ m} + \frac{0,85 \text{ m}}{2} \\ &= 1,38 \text{ m} \end{aligned}$$

$$D_{vmin} = 1,50 \text{ m}$$

ADOPTO

$$\begin{aligned} \text{Long Mous Corta} &= \frac{a_2}{2} = \frac{1,80}{2} \\ &= 0,9 \leq D_v \end{aligned}$$

7. DIMENSIONAMIENTO ARMADURAS VIGA

7.1 DIAGRAMAS CARACTERÍSTICAS MAJORADOS

