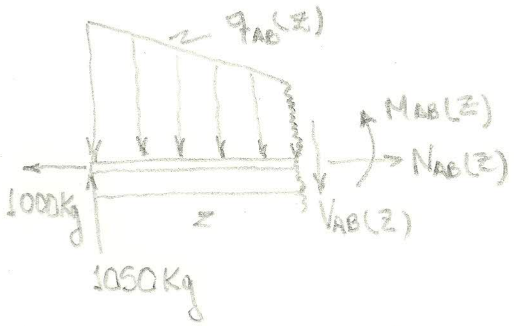
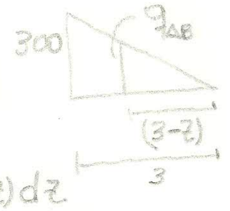
PROBLEMA 1:

1. TRAMO AB:



$N_{AB}(z) = 1000$

$V_{AB}(z) = V_A - \int_0^z q_{AB}(z)\,dz,$



$\frac{q_{AB}}{(3-z)} = \frac{300}{3}$

$q_{AB}(z) = 100(3-z)$

$V_A = 1050$

$V_{AB}(z) = 1050 - \int_0^z 100(3-z)\,dz$

$= 1050 + 50(3-z)^2\Big|_0^z = 1050 + 50\left[(3-z)^2 - 3^2\right]$

$= 1050 + 50(3-z)^2 - 450 = 600 + 50(3-z)^2$

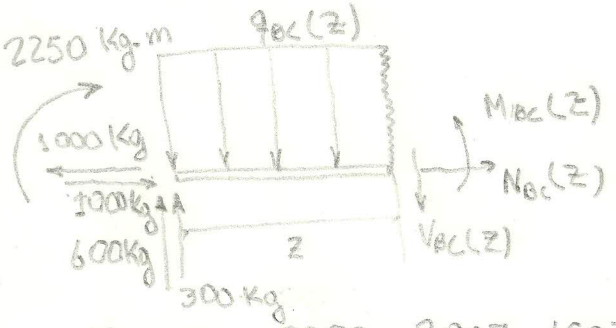
$M_{AB}(z) = M_A + \int_0^z V_{AB}(z)\,dz \;,\; M_A = 0 ; \; M_{AB}(z) = \int_0^z 600 + 50(3-z)^2\,dz$

$M_{AB}(z) = 600z - \frac{50}{3}(3-z)^3\Big|_0^z = 600z - \frac{50}{3}\left[(3-z)^3 - 3^3\right] = 600z - \frac{50}{3}(3-z)^3 + 450$

$N_B = 1000 \text{ Kg} \qquad M_B = M_{AB}(3) = 600(3) + 450 = 1800 + 450 = 2250 \text{ Kg.m}$

$V_B = V_{AB}(3) = 600 \text{ Kg}$

2. TRAMO BC:



$N_{BC}(z) = 0$

$V_{BC}(z) = V_B - \int_0^z q_{BC}(z)\,dz \;,\; V_B = 900 \text{ Kg}$

$V_{BC}(z) = 900 - \int_0^z 300\,dz = 900 - 300z$

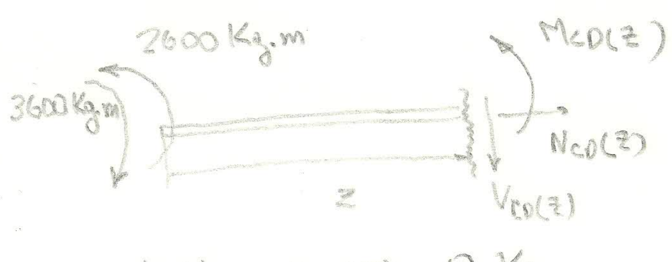
$M_{BC}(z) = M_B + \int_0^z V_{BC}(z)\,dz \;,\; M_B = 2250 \text{ Kg.m}$

$M_{BC}(z) = 2250 + \int_0^z (900 - 300z)\,dz$

$M_{BC}(z) = 2250 + 900z - 150z^2 \;;\; N_C = 0,\; V_C = V_{BC}(3) = 900 - 300(3) = 0$

$M_C = M_{BC}(3) = 2250 + 900(3) - 150(3)^2 = 2250 + 2700 - 150(9) = 3600 \text{ Kg.m}$

3. TRAMO CD:



$N_{CD}(z) = 0$

$V_{CD}(z) = 0$

$+\circlearrowleft \sum M_D^z = 0, \quad 3600 - 2600 = M_{CD}(z)$

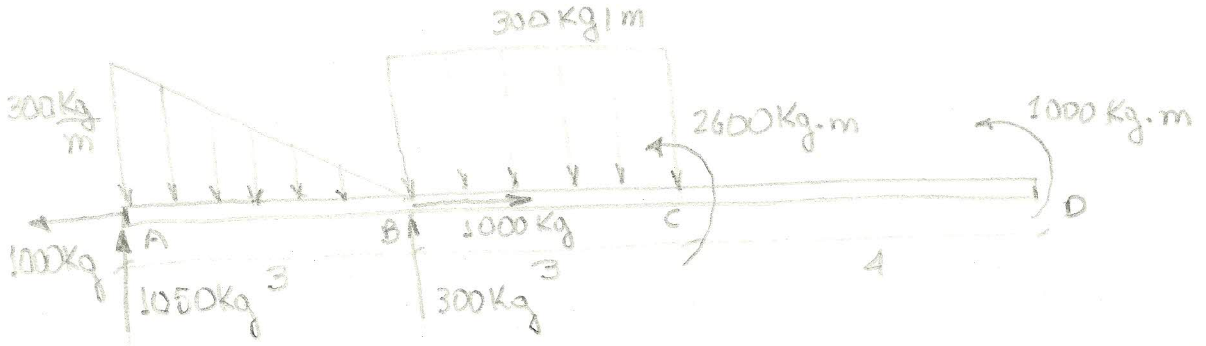
$M_{CD}(z) = 1000 \text{ Kg.m}$

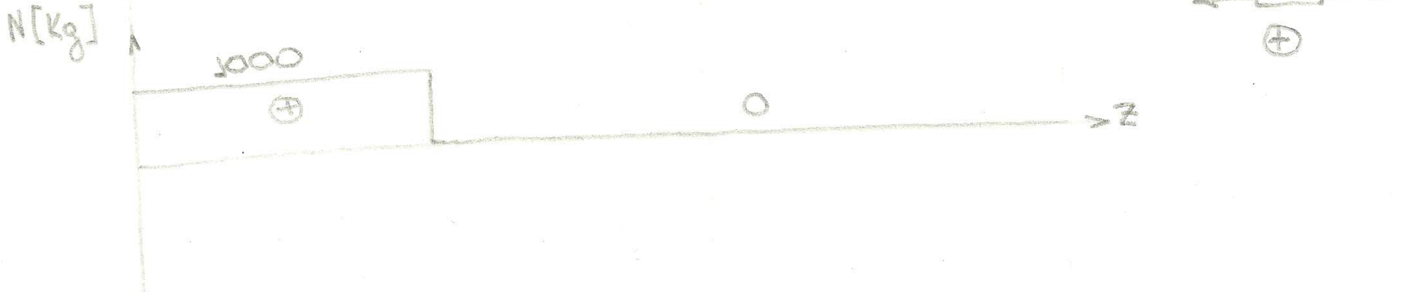
$N_D = N_{CD}(3) = 0 \text{ Kg}$

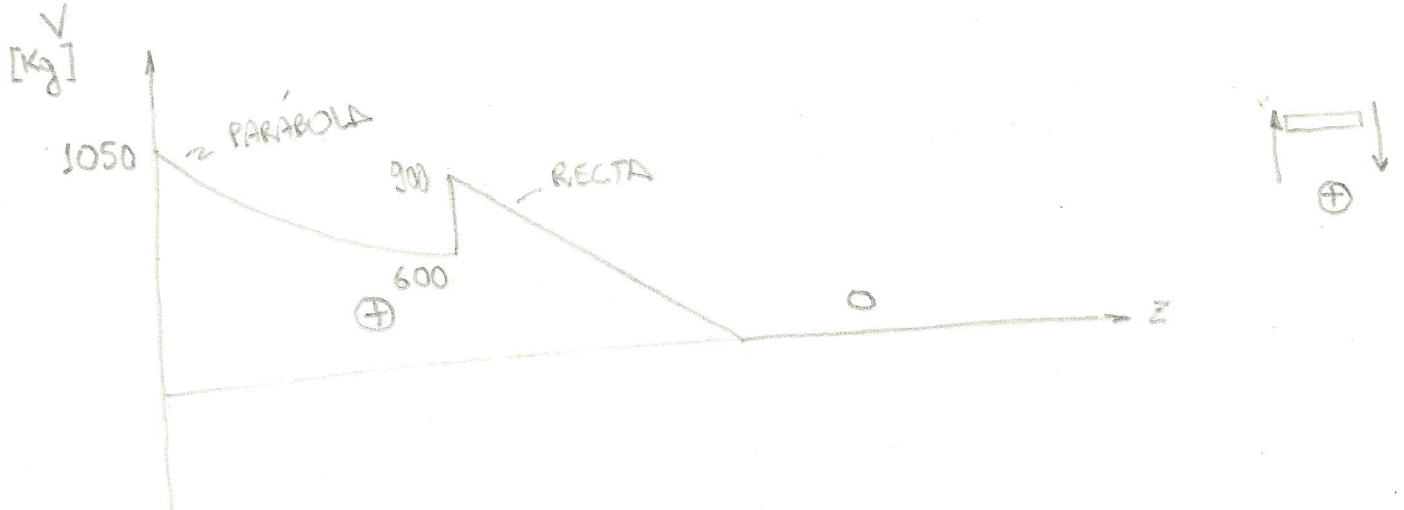
$V_D = V_{CD}(3) = 0 \text{ Kg}$

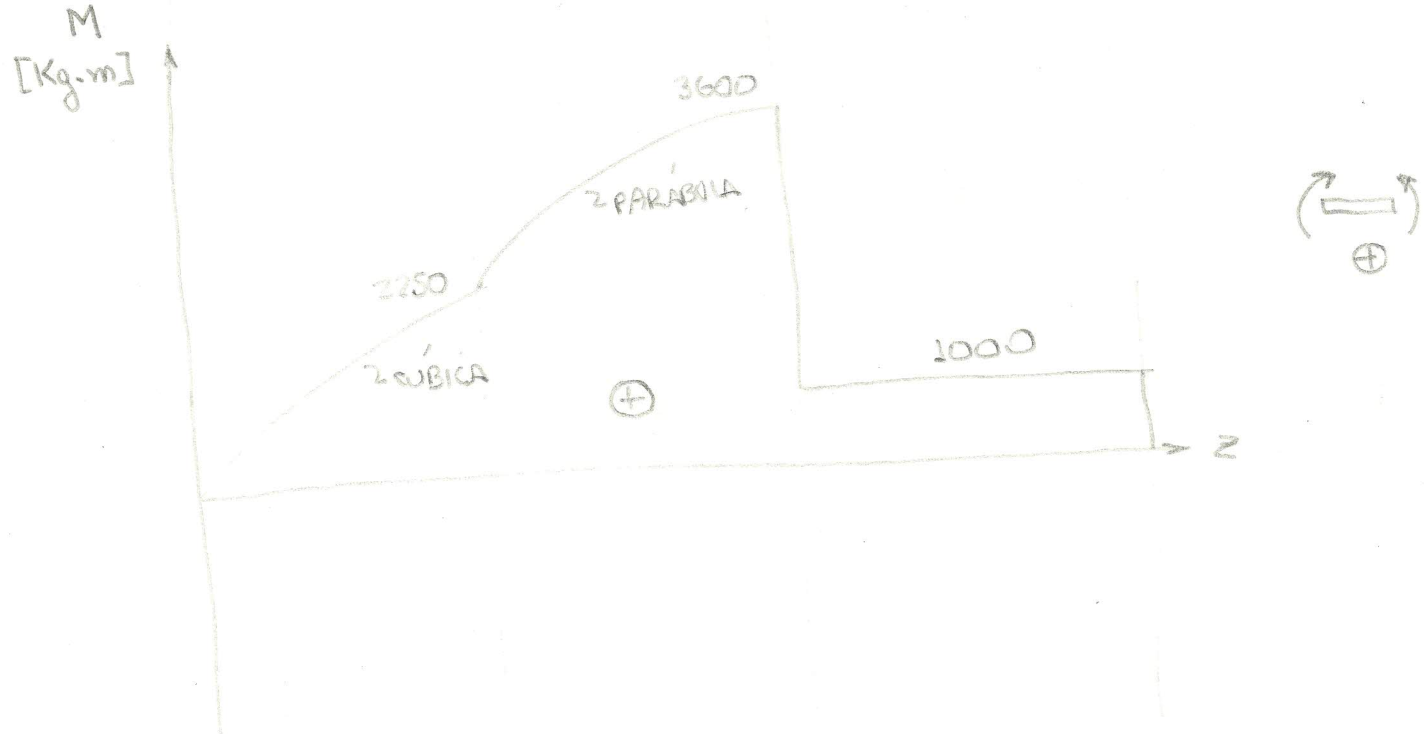
$M_D = M_{CD}(3) = 1000 \text{ Kg.m}$

$\Leftarrow$ (COINCIDE CON CARGAS EN EXTREMO D).


300 Kg/m
300 Kg/m
2600 Kg.m
1000 Kg.m
A
B
C
D
1000 Kg
1000 Kg
1050 Kg
300 Kg
3
3
4

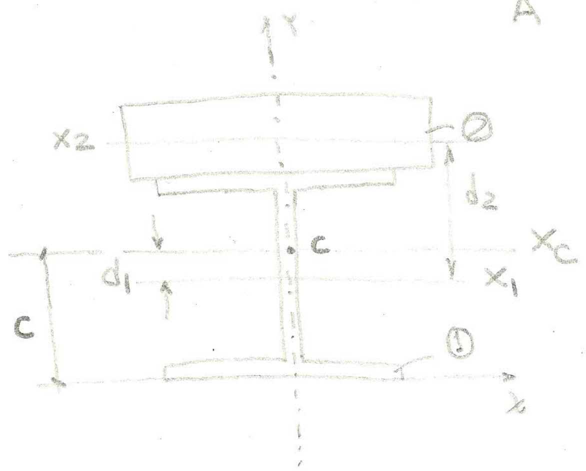

N[Kg]
1000
⊕
0
z
⊕


V
[Kg]
1050
2 PARÁBOLA
900
RECTA
600
⊕
0
z
⊕


M
[Kg.m]
3600
2 PARÁBOLA
2250
2 CÚBICA
⊕
1000
z
⊕

- PUNTOS CRÍTICOS BASADOS EN σ: DE ACUERDO A DIAGRAMAS $N(z)$ Y $M(z)$ LOS PUNTOS DONDE $\sigma = \sigma_{máx}$ PUEDEN SER B o C.

$$\sigma_B = \frac{N_B}{A} + \frac{M_B c}{I_x} \quad y \quad \sigma_c = \frac{M_c c}{I_x}$$



- PROPIEDADES GEOMÉTRICAS DE LA SECCIÓN

$$x_c = \frac{x_{c1}A_1 + x_{c2}A_2}{A_1 + A_2}$$

$A_1 = A_{I140} = 18.30\ cm^2$, $A_2 = 7\cdot 3 = 21\ cm^2$

$x_{c1} = 7cm$, $x_{c2} = 14 + 1.5 = 15.5\ cm$

$$x_c = \frac{7(18.3) + 15.5(21)}{18.3 + 21}, \quad x_c = 11.54\ cm$$

$d_1 = 11.54 - 7 = 4.54\,cm$

$d_2 = 15.5 - 11.54 = 3.958\,cm$

$I_{x_1} = 573\ cm^4\ (I_{xI140})$

$$I_{x_2} = \frac{1}{12}h^3\cdot b = \frac{1}{12}(3)^3\cdot 7 = 15.75\ cm^4$$

$$I_{x_{c I140}} = 573 + (4.54)^2(18.3) = 950.52\ cm^4$$

$$I_{x_{c②}} = 15.75 + (3.958)^2(21) = 344.73\ cm^4$$

$$I_x = I_{x_{c I140}} + I_{x_{c②}} = 1295.26\ cm^4$$

$c = 11.542\,cm$

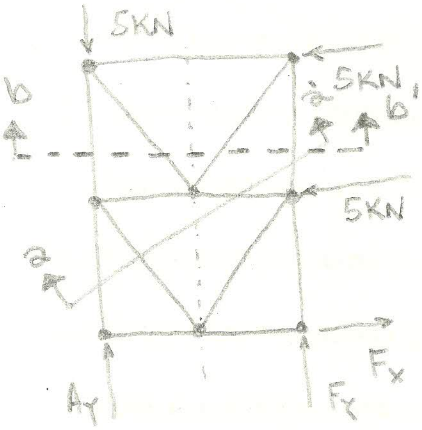
$$\sigma_B = \frac{1000}{(18.3+21)} + \frac{(2250\cdot 100)(11.54)}{(1295.26)} = 2030.4\ Kg/cm^2$$

$$\sigma_c = \frac{(3600\cdot 100)(11.54)}{(1295.26)} = 3207.95\ Kg/cm^2$$

$$\sigma_{MAX} = \sigma_c$$

EN ESTE CASO SUCEDE FALLA YA QUE $\sigma > \sigma_{ADM}$, $\sigma_{ADM} = 1500\,Kg/cm^2$

PROBLEMA 2:



$$\rightarrow \sum F_x^E = 0, \quad F_x = 10\text{ KN}$$

$$\circlearrowleft \sum M_A^E = 0, \quad -5(1) - 5(2) - 2F_Y = 0$$

$$F_Y = -\frac{15}{2}, \quad F_Y = -7.5\text{ KN}$$

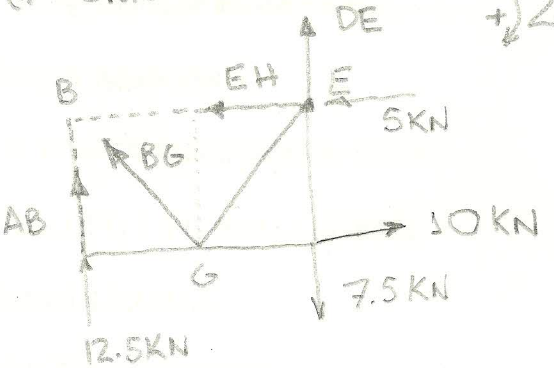
$$\uparrow \sum F_Y^E = 0, \quad A_Y + F_Y = 5, \quad A_Y = 5 - F_Y$$

$$A_Y = 12.5\text{ KN}$$

DCL(1)

MÉTODO DE LAS SECCIONES

(1) CORTE aa':



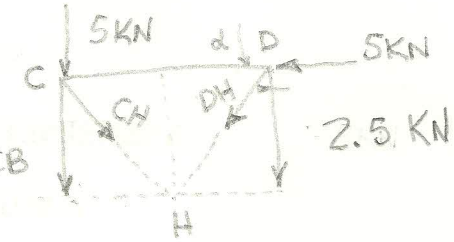
$$\circlearrowleft \sum M_B^E = 0, \quad 7.5(2) - 2DE + 10(1)$$

$$DE = \frac{15-10}{2}$$

$$DE = 2.5\text{ KN} \text{ (T)}$$

(2) CORTE bb':

$\alpha = 45°$



$$\circlearrowleft \sum M_C^E = 0, \quad 2.5(2) + \frac{\sqrt{2}}{2} DH(2) = 0$$

$$DH = -\frac{5}{\sqrt{2}}$$

$$DH = -3.53\text{ KN} \text{ (C)}$$

ESFUERZO EN LA BARRA DH: $\sigma_{DH} = -\dfrac{5/\sqrt{2}}{3 \cdot 10^{-4}} \cdot 10^3$

$$\sigma_{DH} = -\frac{5}{3\sqrt{2}} \cdot 10^7 \text{ Pa}, \quad \boxed{|\sigma_{DH}| = 11.8 \text{ MPa}} \text{ (C)}$$