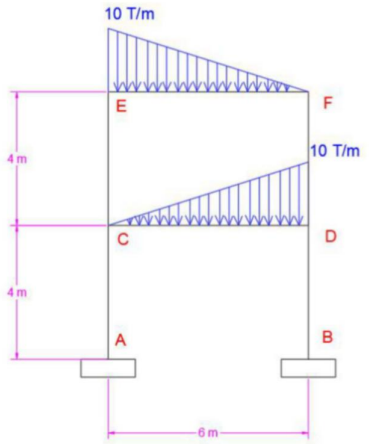
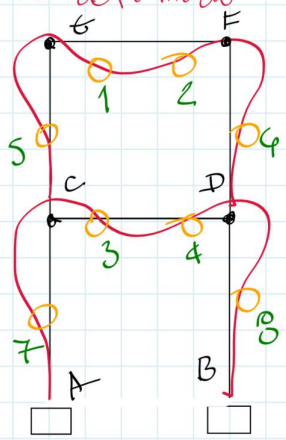
Determine el diagrama de momentos y corte en columnas y vigas del siguiente marco:

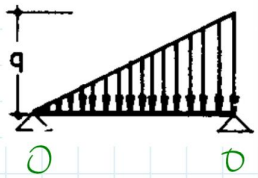


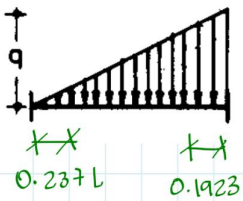
1) Marco deformado



$G = 6$

2) ubicación de los PI



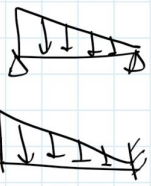


$0.237 * 6 = 1.422m$

$0.1923 * 6 = 1.154m$

$4.846\ m$

E – F



① 0 L

② 0 L

$0.1923L$

$0.09615L$

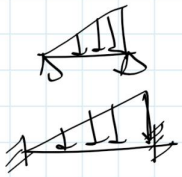
$0.577m$

$0.237L$

$0.1185L$

$0.711m$

C – D



Promedio 1

③ 0 L

④ 0 L

$0.237L$

$0.1185L$

$0.1923L$

$0.09615L$

Promedio 2

$0.237L$

$0.178L$

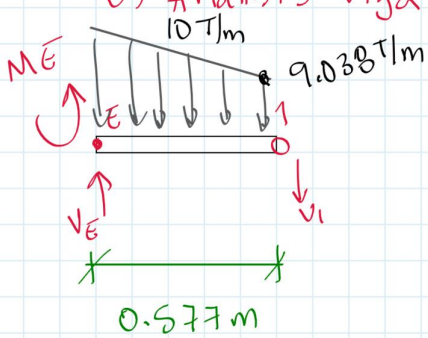
$0.1923L$

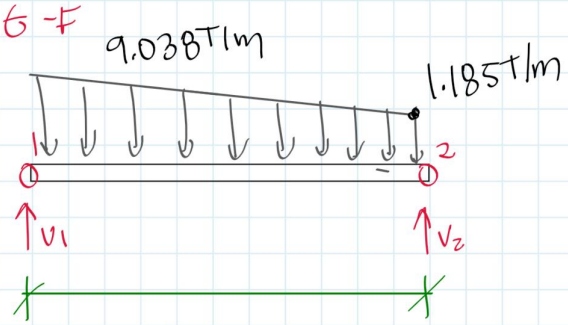
$0.144L$

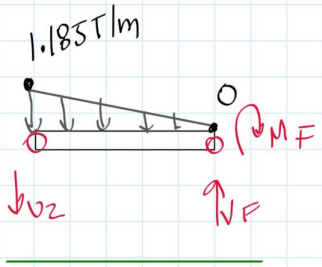
$1.068\ m$

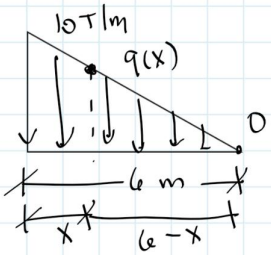
$0.864m$

3) Analisis Viga E-F





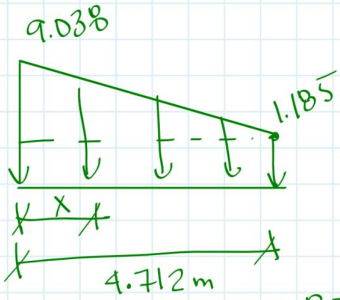


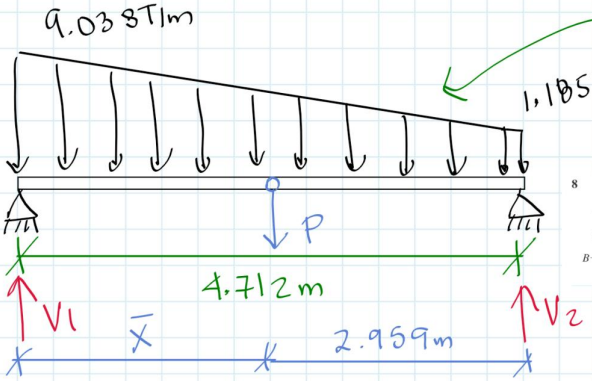


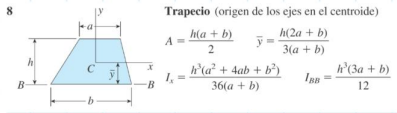
$$\frac{q(x)}{6-x} = \frac{10}{6} \qquad q(x) = (6-x)*\frac{5}{3} = 10 - \frac{5}{3}x$$

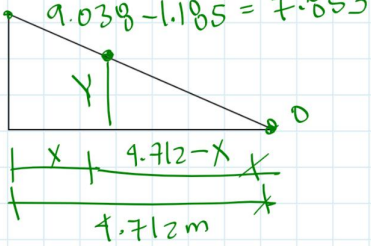
$X = 0.577 \quad q(x) = 9.038\ T/m$

$X = 0.577 + 4.712 = 5.289\ m \quad q(x) = 1.185\ T/m$









$$\frac{Y}{4.712-x} = \frac{7.853}{4.712}$$

$Y = 7.853 - 1.667x$

$w(x) = 7.853 - 1.667x + 1.185$

$w(x) = 9.038 - 1.667x$

$$P = \frac{4.712\,(9.038 + 1.185)}{2} = 24.085\ T$$

$$\bar{x} = \frac{4.712\,(2*1.185 + 9.038)}{3\,(1.185 + 9.038)} = 1.753\ m$$

$\sum M_2 = 0 \quad (+)$

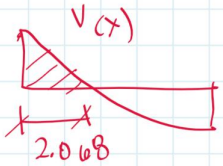
$4.712\,V_1 - 24.085 * 2.959 = 0$

$V_1 = 15.125\ T$

$V_2 = 8.96\ T$

$V(x) = -\int q\,dx$

$V(x) = -\int 9.038 - 1.667x = -9.038x + 0.8335x^2 + c$



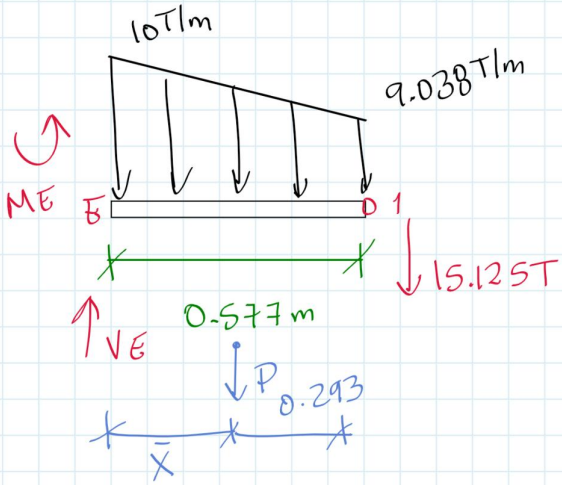
$V(0) = 15.125$

$V(x) = 0.8335x^2 - 9.038x + 15.125$

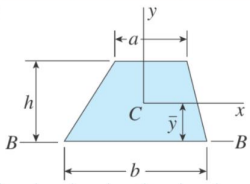
$V(x) = 0 \qquad x = 2.068\ m$

$M(x) = \int V(x)\,dx$

$$M_{Max} = \int_0^{2.068} 0.8335x^2 - 9.038x + 15.125 = 14.41\ T\text{-}m$$



8 **Trapecio** (origen de los ejes en el centroide)



$$A = \frac{h(a+b)}{2} \qquad \bar{y} = \frac{h(2a+b)}{3(a+b)}$$

$$I_x = \frac{h^3(a^2+4ab+b^2)}{36(a+b)} \qquad I_{BB} = \frac{h^3(3a+b)}{12}$$

$$P = \frac{0.577}{2}(10+9.038) = 5.492\,T$$

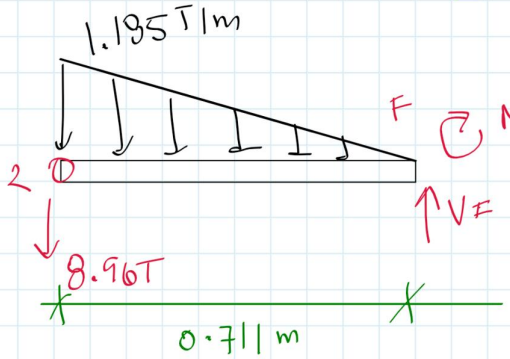
$$\bar{X} = \frac{0.577}{3}\,\frac{(2*9.038+10)}{(9.038+10)} = 0.284\,m$$

$\Sigma F_y = 0 \uparrow +$ $\quad V_E - 15.125 - 5.492 = 0$

$$V_E = 20.617\,T$$

$\Sigma M_1 = 0 \circlearrowleft +$ $\quad 0.577 * 20.617 - M_E - 5.492 * 0.293 = 0$

$$M_E = 10.287\,T-m$$



$\Sigma F_y = 0 \uparrow +$

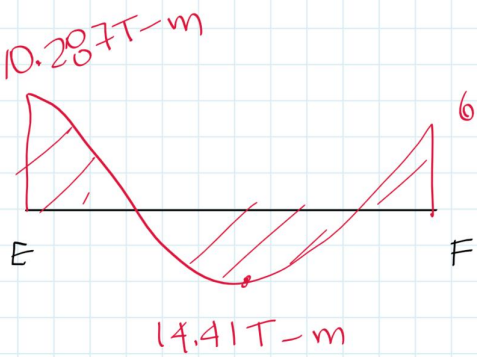
$$V_F - 8.96 - \frac{1}{2} * 1.185 * 0.711 = 0$$

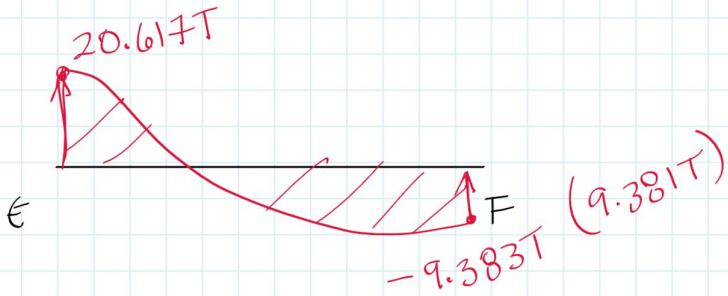
$$V_F = 9.381\,T$$

$\Sigma M_2 = 0 \circlearrowleft +$

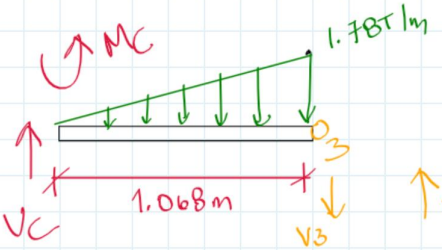
$$M_F - 0.711 * 9.381 + \frac{1}{2} * 1.185 * 0.711 * \frac{0.711}{3} = 0$$

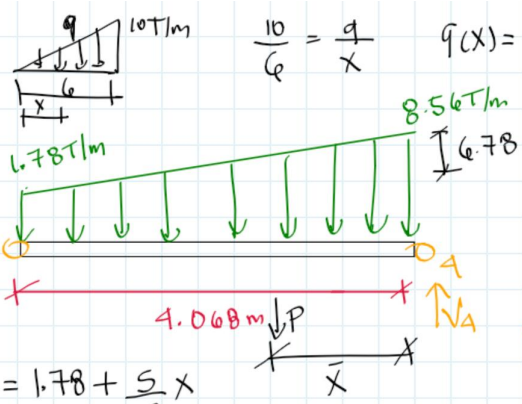
$$M_F = 6.57\,T-m$$



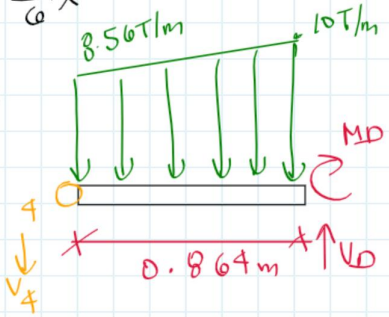


4) Analisis tramo CD



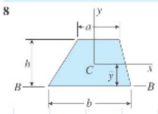


$\frac{10}{6} = \frac{q}{x}$ $\quad q(x) = \frac{10}{6}x$



$w(x) = 1.78 + \frac{5}{3}x$

8 **Trapecio** (origen de los ejes en el centroide)



$A = \frac{h(a+b)}{2}$ $\quad \bar{y} = \frac{h(2a+b)}{3(a+b)}$

$I_x = \frac{h^3(a^2+4ab+b^2)}{36(a+b)}$ $\quad I_{BB} = \frac{h^3(3a+b)}{12}$

$P = \frac{1}{2} * (1.78 + 8.56) * 4.068 = 21.032T$

$\bar{X} = \frac{4.068}{3} * \frac{(2*1.78+8.56)}{(1.78+8.56)} = 1.589m$

$\Sigma M_4 = 0 \curvearrowleft +$

$4.068 * V_3 - 21.032 * 1.589 = 0 \quad V_3 = 8.215 +$

$V_4 = 12.817T$

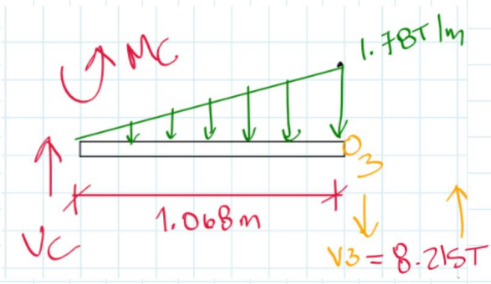
$V(x) = -\int w(x)dx = -\int 1.78 + \frac{5}{6}x = -1.78x - \frac{5}{6}x^2 + C$

$x = 0 \quad V(x) = V_3$

$V(x) = -1.78x - \frac{5}{6}x^2 + 8.215$

$x = 2.248m$

$M_{max} = \int_0^{2.248} -1.78x - \frac{5}{6}x^2 + 8.215 = 10.814T-m$



$\Sigma F_y = 0 \uparrow +$

$-8.215 - \frac{1}{2} * 1.78 * 1.068 + V_3 = 0$

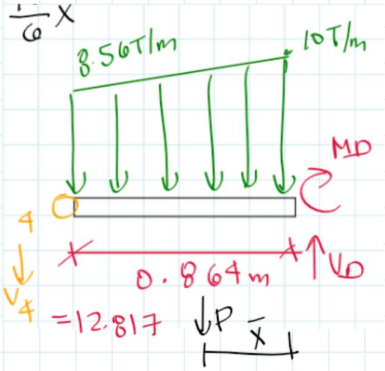
$V_C = 9.166T$

$\Sigma M_3 = 0 \curvearrowleft +$

$-M_C + 9.166 * 1.068 - \frac{1}{2} * 1.78 * 1.068 * \frac{1}{3} * 1.068 = 0$

(P y $\bar{X}$)

$M_C = 9.451\ T-m$



$P = \frac{1}{2}(8.56+10) * 0.864 = 8.018T$

$\bar{X} = \frac{0.864}{3} * \frac{(2*8.56+10)}{(8.56+10)} = 0.421m$

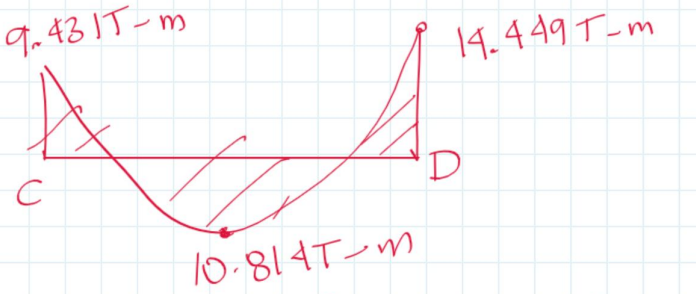
$\Sigma F_y = 0 \uparrow +$

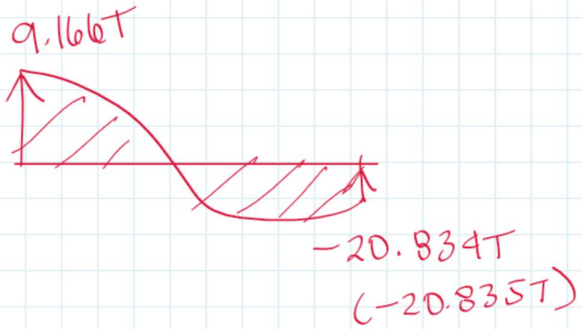
$V_D - 12.817 - 8.018 = 0$

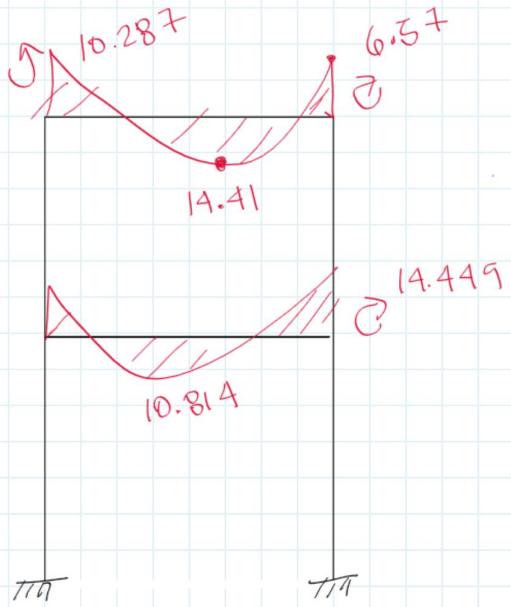
$V_D = 20.835T$

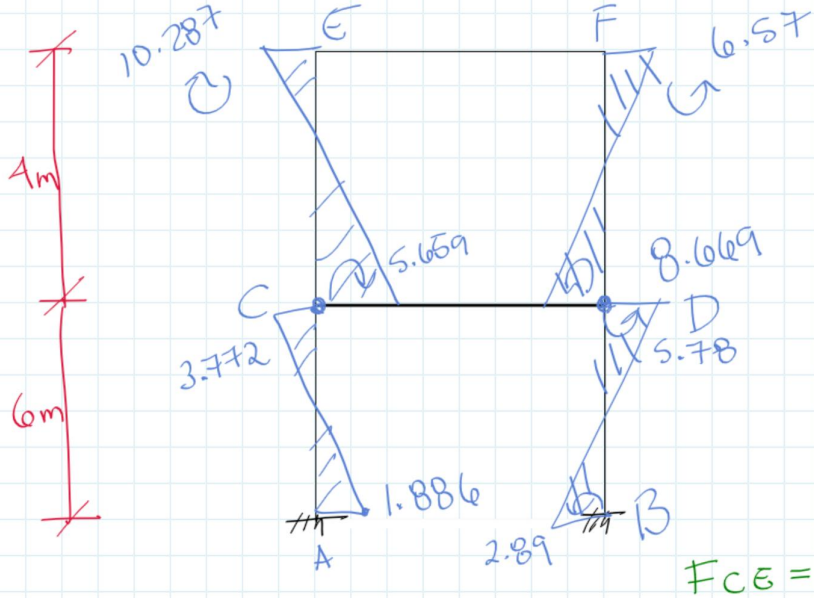
$\Sigma M_D = 0 \curvearrowleft +$

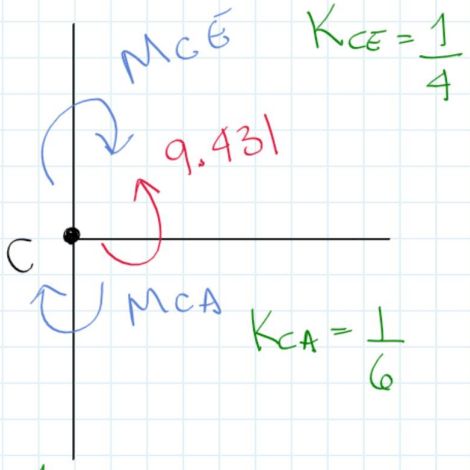
$M_D - 8.018 * 0.421 - 12.817 * 0.864 = 0$











$M_{CE} = 9.431 * 0.60 = 5.659 T\text{-}m$

$M_{CA} = 9.431 * 0.40 = 3.772 T\text{-}m$

$M_{DF} = 14.449 * 0.60 = 8.669 T\text{-}m$

$M_{DB} = 14.449 * 0.40 = 5.78 T\text{-}m$

$$F_{CE} = \frac{\frac{1}{4}}{\frac{1}{4}+\frac{1}{6}} = 0.60$$

$$F_{CA} = \frac{\frac{1}{6}}{\frac{1}{4}+\frac{1}{6}} = 0.40$$