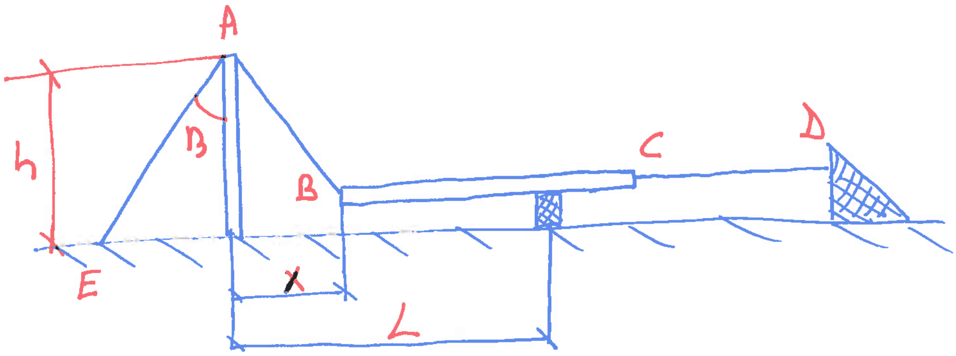
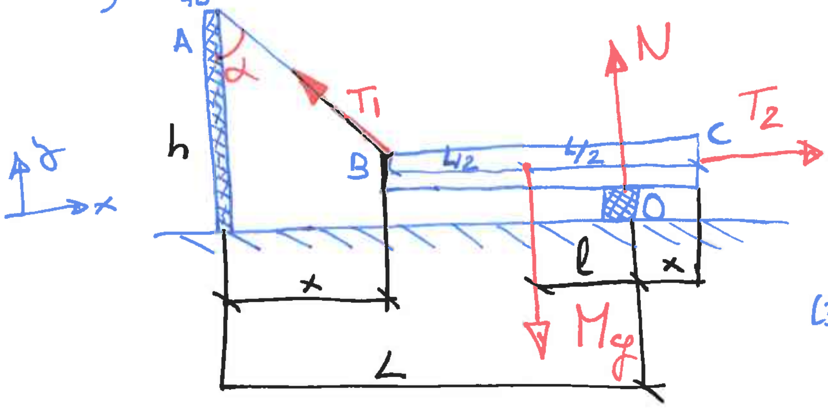
# $P_1$ - El Lanzamiento del Pabellón Puente

cuasistático: $L$, $M$




a) $T_{1_{AB}}$, $T_{2_{CD}}$ ? . $x$




(3) $\overline{AB}^2 = h^2 + x^2$

(4) $\overline{AB} \cdot \cos\alpha = h$

(3)(4) $$\boxed{\cos\alpha = \frac{h}{\sqrt{h^2+x^2}}} \quad (5)$$

(1) $\sum M_O = 0$ ; $T_1 \cos\alpha - Mg\,\ell = 0$

(2) $\ell + x = \frac{L}{2} \Rightarrow \ell = \frac{L}{2} - x = \frac{(L-2x)}{2} \Rightarrow \boxed{(2)\ \ell = \frac{(L-2x)}{2}}$

(1)(2) $T_1 \cos\alpha = Mg\,\frac{(L-2x)}{2} \Rightarrow \boxed{T_1 = \frac{Mg\,(L-2x)}{2\cos\alpha}} =$

$\underset{(5)}{=}$ $$\boxed{\frac{Mg}{2}\,\frac{(L-2x)\left(\sqrt{h^2+x^2}\right)}{h}}$$

$$\sum F_x = 0 ; \quad T_1 . \operatorname{sen}\alpha = T_2 .$$

$$T_2 = \frac{Mg\,(L-2x)}{2\cos\alpha} . \operatorname{sen}\alpha = \frac{Mg\,(L-2x)}{2} . \operatorname{tg}\alpha =$$

$$\boxed{\operatorname{tg}\alpha = \frac{x}{h}} \quad (6) \quad \Rightarrow$$

$$\boxed{T_2 = \frac{Mg\,(L-2x).x}{2h}}$$

**Solución a)**

$$T_1(x) = \frac{Mg}{2h}\,(L-2x)\left(\sqrt{h^2+x^2}\right)$$

$$T_2(x) = \frac{Mg}{2h}\,(Lx-2x^2)$$

b) gráfica $T_2(x)$? $\Big|^{x=0}_{x=\frac{L}{2}}$

$T_2(x)_{m?}$ max?

$$T_2(x) = \frac{Mg}{2h}\left(Lx - 2x^2\right) = \frac{Mg}{2h}\, x\left(L - 2x\right) = 0 \Rightarrow$$

$$\Rightarrow \boxed{\begin{matrix} x = 0 \\ x = \frac{L}{2} \end{matrix} \Rightarrow T_2(x) = 0}$$

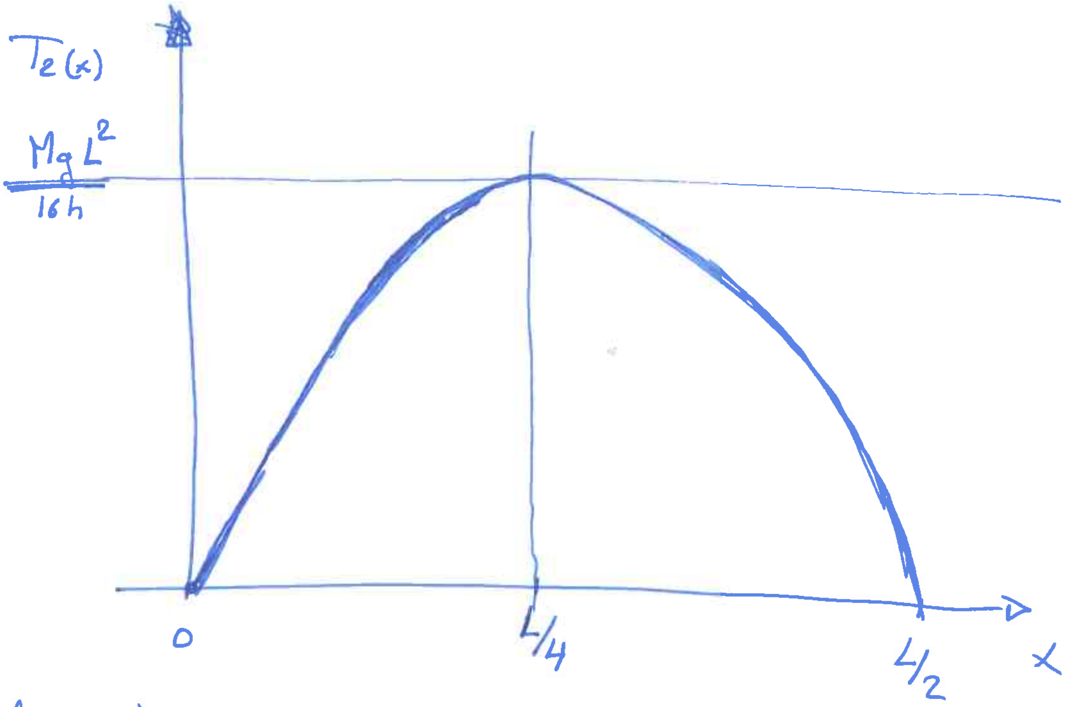
$$T_2'(x) = \frac{Mg}{2h}\left(L - 4x\right) \Rightarrow T_2'(x) = 0 \quad (L - 4x) = 0 \Rightarrow \boxed{x = \frac{L}{4}}$$

$$\boxed{T_2''(x) = \frac{Mg}{2h}(-4) = \frac{-2Mg}{h}}$$

| | $x=0$ | $x=\frac{L}{4}$ | $x=\frac{L}{2}$ |
|---|---|---|---|
| $T_2(x)$ | 0 | $\frac{MgL^2}{16h}$ | 0 |
| $T_2'(x)$ | + | 0 | − |
| $T_2''(x)$ | − | − | − |

$$T_2(x) = \frac{Mg}{2h} \cdot \frac{L}{4}\left(\cancel{L - \frac{2L}{4_2}}\right) = \frac{MgL^2}{16h}$$

$L/2$




Solución b)

$$\boxed{T_{2(x)\,max}\left(x=\frac{L}{4}\right)=\frac{M g}{2h}\cdot\frac{L}{4}\left(L-\frac{2L}{4\cdot 2}\right)=\frac{M g L^2}{16 h}}$$

c) $M = 2'2 \cdot 10^6$ | $T_{2\,max}$ ?

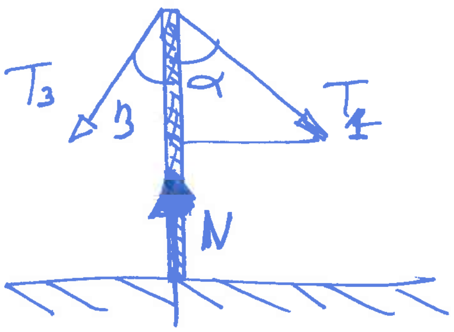
$L = 120\ m.$

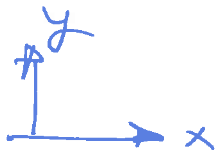
$h = 40\ m.$

$$\boxed{T_{2\,max}}=\frac{2'2\cdot 10^6\cdot 9'81\cdot(120)^2}{16\cdot 40}=\boxed{485.595\ kN}$$

d) $\beta = 30^\circ$

$T_{3\,max\,AC}$? $(T_{2\,max})$




$tg\alpha =$

$$\sum F_x = 0 \qquad T_3 \,\text{sen}\,\beta = T_1 \,\text{sen}\,\alpha$$

$$T_3 = T_1 \cdot \frac{\text{sen}\,\alpha}{\text{sen}\,\beta} = \frac{Mg(L-2x)}{2} \cdot \underbrace{\cancel{\frac{\text{sen}\,\alpha}{\cos\alpha}}}_{tg\alpha\ (6)} \cdot \frac{1}{\text{sen}\,\beta} =$$

$$\boxed{T_3 = \frac{Mg(L-2x)}{2\,\text{sen}\,\beta} \cdot \frac{x}{h} = \frac{Mg(Lx-2x^2)}{2\,\text{sen}\,\beta \cdot h} = \frac{T_2}{\text{sen}\,\beta}}$$

$$T_{3\,max} = \frac{T_{2\,max}}{\text{sen}\,\beta} = \frac{Mg L^2}{16 h \,\text{sen}\,\beta}$$

$$\boxed{T_{3\,max} = \frac{2'2 \cdot 10^6 \cdot 9'81 \cdot 120^2}{16 \cdot 40 \cdot \text{sen}\,30^\circ} = 971.190 \text{ kN}}$$