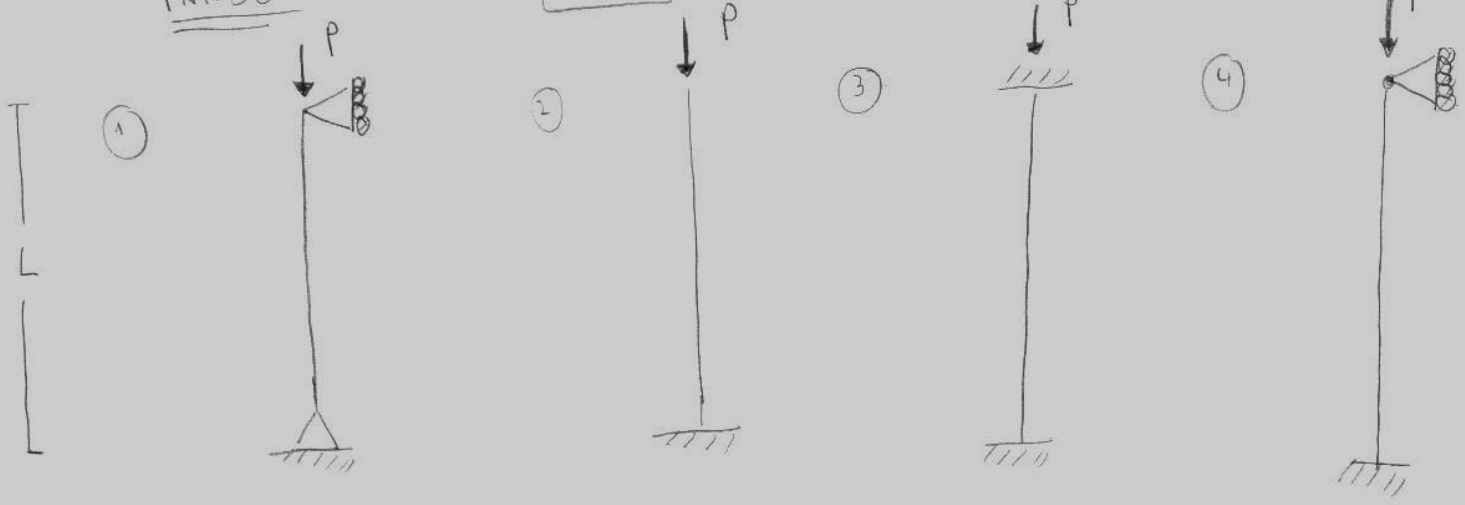
PANDEO

AUX 8



	1	2	3	4
$L_{eq} = KL$	L	$2L$	$\frac{L}{2}$	$0{,}7\,L$
$P_{CR} = \frac{\pi^2 E I}{L_{eq}^2}$	$\frac{\pi^2 E I}{L^2}$	$\frac{\pi^2 E I}{4L^2}$	$\frac{4\pi^2 E I}{L^2}$	$\frac{2{,}046\,\pi E I}{L^2}$

$$\Rightarrow \boxed{\sigma_{CR} = \frac{P_{CR}}{A}} \text{ ESFUERZO CRÍTICO} \quad ; \quad \boxed{r = \sqrt{\frac{I}{A}}} \text{ radio de giro.}$$

$$\Rightarrow \boxed{\sigma_{CR} = \frac{\pi E}{\left(L_{eq}/r\right)^2}}$$

con "relación de Esbeltez".

$$\boxed{\lambda = L_{eq}\sqrt{\frac{A}{I}} = \frac{L_{eq}}{r}}$$

"R_s"

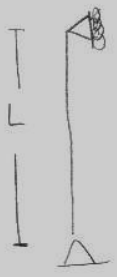
CRITERIO DE DISEÑO

$$\boxed{\sigma_c(FS) = \frac{P}{A}\cdot(FS) \leq \sigma_{CR}} \quad \wedge \quad \boxed{P\cdot(FS) \leq P_{CR}}$$

σ_c: ESFUERZO DE COMPRESIÓN.

F.S FACTOR DE SEGURIDAD. (4,8)

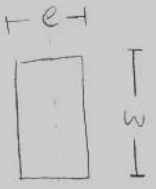
P1] DISEÑE UNA COLUMNA DE ACERO DE SECCIÓN RECTANGULAR ($L = 15\,in$) EN LA CUAL EL ANCHO SEA IGUAL A 3 VECES EL ESPESOR. LA CARGA DE DISEÑO ES DE 5000 lb y el FS es 4.



LAS PROP. MECÁNICAS DEL MATERIAL SON:

$$\begin{cases} \sigma_{Fluencia} = 75\ Kpsi. \\ E = 30\ Mpsi = 2{,}1\,10^{11}\,(Pa) \end{cases}$$

SOL]



$w = 3e.$

$$\text{luego } I = \frac{1}{12} \cdot we^3$$

$$\boxed{I = \frac{e^4}{4}}$$

$$L_{eq} = 1\,L = 15\ m$$

$$\boxed{L_{eq} = 0{,}4\ (m)}$$

$$P_{cr} = \frac{\pi^2 E I}{L_{eq}^2} \Rightarrow I = \frac{P_{cr} \cdot L_{eq}^2}{\pi E}$$

$$I = \frac{P_{cr} \cdot 1\ (m^2)}{\pi^2 \cdot 2{,}1 \cdot 10^{11}\ (Pa)}$$

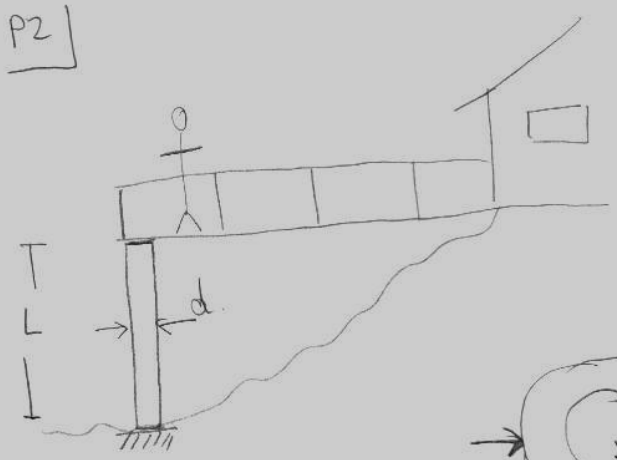
$$\boxed{I = \frac{P_{cr}}{2{,}1 \cdot 10^{11} \cdot \pi^2} \left(\frac{m^4}{N} \right)}$$

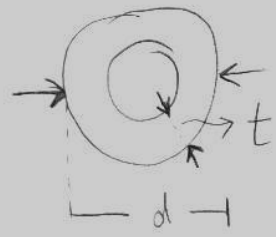
luego criterio diseño $P_{cr} = 4 \cdot P \Rightarrow P_{cr} = 20.000\ lb = 89 \cdot 10^3\ (N)$

$$\Rightarrow \boxed{I = 4{,}294 \cdot 10^{-8}\ (m^4)} \Rightarrow e^4 = 1{,}718\,10^{-7}\ (m^4)$$

$$\Rightarrow \boxed{e = 0{,}02\ m} \wedge \boxed{w = 0{,}06\ m}$$

P2





DATOS

MATERIAL: ALUMINIO.

$E = 72\ (GPa)$

COLUMNA

$L = 3{,}25\ (m)$

$d = 100\ (mm) = 0{,}1\ (m)$.

CARGA DISEÑO

$P = 100\ (kN)$

$FS = 3$

SOL

$$I = I_{\textcircled{\scriptsize}} - I_{\textcircled{\scriptsize}}$$

$$I = \frac{\pi}{64}\left[d^4 - (d-2t)^4\right]$$

$$\Rightarrow \boxed{I = -0{,}785\, t\left[t^3 - 0{,}2\, t^2 + 0{,}015\, t - 5\ 10^{-4}\right]} \quad (1)$$

$$L_{eq} = L$$

$$\boxed{L_{eq} = 3{,}25\ (m)}$$

$$P_{cr} = \frac{\pi^2\, E\, I}{L_{eq}^2}$$

$$\Rightarrow P_{CR} = \frac{2{,}046 \cdot \pi^2 \cdot 72 \cdot 10^9\ (Pa)\ I}{3{,}25\ (m^2)}$$

$$\Rightarrow \boxed{P_{cr} = 1{,}37648 \cdot 10^{11} \cdot I \left(\frac{N}{m^4}\right)}$$

Criterio diseño

$$P_{cr} = (FS) \cdot P$$

$$1{,}37648 \cdot 10^{11} \; I \left(\frac{N}{m^4}\right) = 3 \cdot 100\, 10^3 \; (N)$$

$$\Rightarrow \boxed{I = 2{,}179 \cdot 10^{-6} \; (m^4)} \quad (R).$$

(1) = (2)

$$\Rightarrow 2{,}179 \cdot 10^{-6} = -0{,}785\, t \left[t^3 - 0{,}2t^2 + 0{,}015t - 5\, 10^{-4}\right]$$

$$\Rightarrow 0 = +0{,}785\, t \left[t^3 - 0{,}2t^2 + 0{,}015t - 5 \cdot 10^{-4}\right] + 2{,}179 \cdot 10^{-6}$$

$$\Rightarrow t = \begin{cases} 0{,}093 \; (m). \\ 0{,}007 \; (m). \\ 0{,}05 + 0{,}043\, i \; (m) \\ 0{,}05 - 0{,}043\, i \; (m). \end{cases}$$

$$\Rightarrow t = 0{,}007 \; (m) \Rightarrow \boxed{t = 7 \; mm}$$