libro

Actividad grupal

2.9 -

[illegible] .08 in
$T = 500\ lb$
$\sigma_{perm} = 22\ ksi$
$E = 10.1 \times 10^6\ psi$

① $\sigma_{perm} = \frac{P}{A}$

$A = \frac{P}{\sigma_{perm}}$

$\pi r^2 = \frac{P}{\sigma_{perm}} = \frac{500\ lb}{22000\ \pi}$

$r = .085$

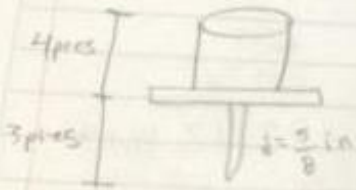
$d = .1701\ in$

② $\delta = \frac{PL}{AE}$ =

$L = \frac{\delta AE}{P} = \frac{(0.8in)(\pi(.085)^2)(10.1 \times 10^6 psi)}{500 lb}$

$L = 36.67\ in$

2.15 -



$A = 1.75\ in^2$

$E = 29 \times 10^6$ psi acero

$E = 10.4 \times 10^6$ psi alum

① $\sigma = E\epsilon$

$\delta = \frac{(15,000)(3ft \cdot 12)}{\left(\pi\left(\frac{.625}{2}\right)^2\right)(29 \times 10^6 psi)}$

② $\delta = \frac{(15,000)(4ft \cdot 12)}{(1.75 in^2)(10.4 \times 10^6 psi)}$ =

$\delta_{BC} = .141619\ in$

$\delta_{BA} = 0.0395\ in$

$\delta = \delta_{BC} + \delta_{BA} = .1811\ in$

2.17

E = 70 GPa

L = 250 mm

d_{out} = 36 mm

d_{in} = 28

Free ~~~ 1.5 mm

E = 105 GPa)

① TUBO:

$\delta_{TUBO} - \delta_{BARRA} = \delta_{total} = \frac{\Delta_{max}}{4}$

$\frac{1.5\,mm}{4} = \delta_{Total}$

$0.375_{mm} = \delta_{Total}$

$$\epsilon = \frac{\delta}{L} = \frac{0.375 \times 10^{-3}\,m}{.250\,m} = 1.5 \times 10^{-3}\,m$$

Tubo

$\sigma = E\epsilon \rightarrow \sigma = (70 \times 10^9)(1.5 \times 10^{-3}\,m)$

$\sigma = 105\,MPa$

$A_1 = \pi\left(\frac{.036}{2}\right)^2 = 1.017 \times 10^{-3}$

$A_2 = \pi\left(\frac{.028}{2}\right)^2 = 6.1575 \times 10^{-4}$

$\sigma = \frac{P}{A} \qquad P = \sigma A \qquad P = 42.13\,KN$

② $\delta_{Tubo} = \frac{PL}{AE} = \frac{(42.13 \times 10^3)(.250)}{(1.017 \times 10^{-3} - 6.1575 \times 10^{-4})(70 \times 10^9\,Pa)}$

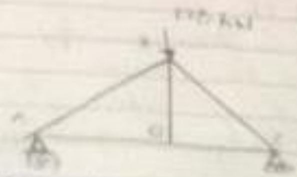
$= 3.7498 \times 10^{-4}\,m$

$\delta_{Total} = \delta_{Tubo} - \delta_{barra} \rightarrow \delta_b = 3.7498 \times 10^{-4} - .$

2.23

E = 200 GPa

AB = 2400 mm²
AD = 1800 mm²

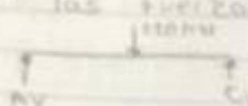


Porque esta es simetrico se hace así.

① saco distancia

$c = \sqrt{4^2 + 2.5^2} = 4.7169$

② calculo las fuerzas en eje



$\Sigma M_C: (228000)(4m) - (8m)(A_y) = 0$

$A_y = 114000\ N$

③ $\frac{4.7169}{sen 90} = \frac{2.5}{sen\theta}$ $\theta = 32.006070°$

$\Sigma F_y = 0$

$114000 + F_{AB} \, sen(32.006070) = 0$

$F_{AB} = \frac{-114000}{sen(32)} = -215.12 KN$

$\delta_{AB} = \frac{PL}{AE} = \frac{(-215120 N)(4.7169 m)}{(2400 \times 10^{-6})(200 \times 10^{9} Pa)} = \boxed{-2.1139 \times 10^{-3} m}$

④ $\Sigma F_x = 0$

$F_{AD} + F_{AB} \cos(32) = 0$

$F_{AD} = 182.43\ KN$

$\delta_{AD} = \frac{(182430 N)(4m)}{(1800 \times 10^{-6})(200 \times 10^{9})} = \boxed{2.027 \times 10^{-3} m}$

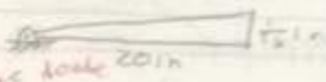
2.26

Alambre: $\frac{3}{32}$

Si no hay carga, $\frac{1}{16}$ entre B y el punto E

$E = 29 \times 10^6$ psi

Donde se podría colocar el bloque para que haya contacto entre B y E



① $\tan = \frac{co}{ca} = \frac{\frac{1}{16}}{20} = 3.125 \times 10^{-3}$

$c = \sqrt{20^2 + \frac{1}{16}^2} = 20$

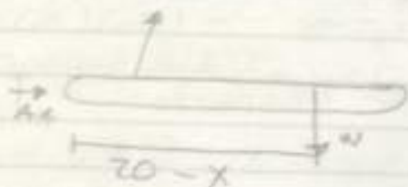
se desplaza → $\delta_c = (4\ in)(3.125 \times 10^{-3}) = .0125$

$\frac{co}{ca} \rightarrow co$

$\delta = \frac{PL}{AE} =$ $P = \frac{\delta AE}{L} = \frac{(.0125)(\pi(\frac{3/32}{2})^2(29 \times 10^6))}{17.5\ in}$

$P = 200.18\ lb$

②



$\Sigma M_A = 0$

$w = mg$

$w = 50\ lb\ (386.08\ \frac{in}{s^2}) = 19304\ lb_f$

$\Sigma M_A = 0$

$(4\ in)(200.18\ lb) - (20 - x)(w) = 0$

$+ (20 - x) = \frac{(4\ in)(200.18\ lb)}{w\ \frac{in}{s^2}\ lb}$

$x = 20 - 0.041417\ in = $ **19.95 in.**

2.28 $E = 70\ GPa$

$A = 10 \times 40$

① $\Sigma M_F = 0$

$-(2F_{ED})(.4m) - (24000)(.250m) = 0$

$-(24000)(.250) = 2F_{ED}(.4)$

$F_{ED} = -7500\ N$

② $\Sigma F_y = 0$

$2F_{ED} + 2F_{FC} - 24kN = 0$ $\quad F_{FC} = 19500\ N$

$\delta_E = \frac{PL}{AE} = \frac{(-7500N)(.3m)}{(1400\times10^{-6})(70\times10^{9}\ Pa)} = -8.035\times10^{-5}\ m$

$\delta_F = \frac{PL}{AE} = \frac{(19500N)(.3m)}{(1400\times10^{-6})(70\times10^{9}\ Pa)} = 2.089\times10^{-4}\ m$

valor absoluto

$\Theta = \frac{|\delta_E| + |\delta_F|}{L_{EF}} = \frac{80.357\times10^{-6} + 208.93\times10^{-6}}{0.400} = 723.23\times$

$\delta_B = \delta_F + L_{FB}\Theta$

$\delta_B = \delta_E + L_{EB}\Theta = 208.93\times10^{-6} + (.250)(723\times10^{-6})$

$\delta_B = 390\ \mu m \downarrow$