Question: Situation 1: A rigid bar ABC weighs 10 kNim. The compressive ...

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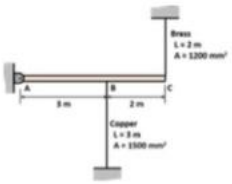
Situation 1: A rigid bar ABC weighs 10 kN/m. The compressive stress of the copper bar is 20 MPa. Answer the following questions:



_____ A. What is the stress of the brass bar? Indicate if it will experience tension (T) or compression (C) (MPa)

_____ B. What is the minimum required diameter of the pin at A assuming that the pin connection is in double shear? Consider the allowable shearing stress of the pin as 15 MPa. Round your answer in a multiple of 5. (mm)

Situation 2: A steel plate 8 mm thick is to be embedded in a horizontal concrete slab and is used to anchor a high-strength vertical cable 12 mm in diameter as shown. The diameter on the hole on the plate is 20 mm. Assuming that P = 10 kN, determine the safest minimum dimensions *a* and *b* as the width of the plate and the depth of embedment, respectively. Consider the following design parameters:

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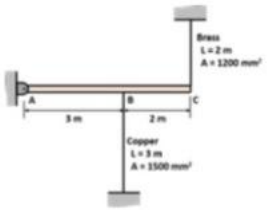

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Expert Answer

Anonymous answered this
153 answers

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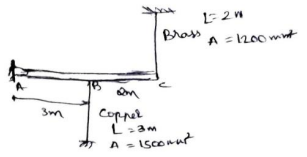
WABC = 10kN/m

Compressive stress in copper bar = 20Mpa



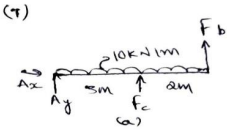
$\sigma_c = \frac{F}{A}$

$\therefore \frac{F}{1500} \Rightarrow F = 1500 \times 20$

$F = 30 \times 10^3 N$

$\boxed{F_c = 30kN}$ Tension (T)

FBD: a



From Equilibrium Equations

$\Sigma F_y = 0.$ $\quad A_y + F_c + F_b = 10 \times 5$

$A_y + F_b = 50 - 30$

$A_y + F_b = 20kN$

$\Rightarrow A_y = 20 - 7$

$\boxed{A_y = 13kN}$

$\Sigma M_A = 0.$

$F_b \times 5 + F_c \times 3 = 10 \times 5 \times \frac{5}{2}$

$F_b \times 5 = 125 - 90 = 35kN$

$\therefore F_b = \frac{35}{5} = 7$

$\boxed{\therefore F_b = 7kN}$ Tension (T)

(b) stress in brass bar $\sigma_b = \frac{F_b}{A_b} = \frac{7 \times 10^3}{1200}$

$\boxed{\sigma_b = 5.83MPa}$ Tensile stress

$R_y = 13000N$

Shear stress at pin A $= \tau_A = 15MPa$

$15 = \frac{R_y}{A} = \frac{13000}{\frac{\pi}{4} D^2 \times 2}$ [Double shear so, Area get twice]

$D^2 = 23.5$

$D \approx 25mm$

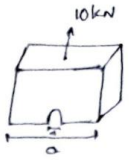
Minimum required diameter of Pin at A = 25 mm

(2) Given that $P = 10kN$, $d_{cable} = 12m$

$d_{hole} = 20mm$, $\sigma_{st} = 250mpa$

$\tau_{allow} = 50Mpa$, $t = 8mm$

* Net Area of plate $= (a - d_h) \times t$



Normal strength $= \frac{\text{Force}}{\text{Area of c/s}}$

$\sigma_{st} = \frac{P}{A} \Rightarrow P = \sigma_{st} \times A$

$\Rightarrow 10 \times 10^3 = 250(a - 20) \times 8$

$\frac{10^3}{25} = a8 - 160 \Rightarrow 40 + 160 = a \times 8$

$\therefore a = \frac{200}{8}$

$\boxed{a = 25mm}$

* Bonding stress $\tau_{allow} = 50Mpa$

$\tau_{allow} = \frac{F}{A}$

$F = \tau_{allow} \times A$

$10 \times 10^3 = 50 \times 10^3 \times (a + 2t) d$

$10 \times 10^3 = 50 \times 10^3 \times (50 + 2 \times 8) \times d$

$bd = \frac{10 \times 10^3}{50 \times 10^3 (66)}$

$\boxed{d = 30.303.03mm}$

$A = \text{Perimeter} \times d$

$= (t + a + t) \times d$

$= (a + 2t)d$

[$\because 1Mpa = 10^3 MPa$]

* $a = 50mm$ $\quad b = 90mm$

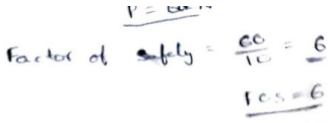
$P_{ult} = \sigma (a - d_h) \times t$

$= 250(50 - 20) \times 8$

$= 250 \times 30 \times 8$

$= 60000N$

$P = 60kN$



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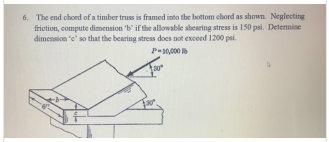
The end chord of a timber truss is framed into the bottom chord as shown. Neglecting friction, comp…



See answer

A water tank, 22 ft in diameter, is made from steel plates that are ½ in. thick. Find the maximum height to which the tank may be filled if the circumferential stress is

See answer

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Q: Situation 2: A steel plate 8 mm thick is to be embedded in a horizontal concrete siab and is used to anchor a high-strength vertical cable 12 mm in diameter as shown. The diameter on the hole on the plate is 20 mm. Assuming that P= 10 kN, determine the safest minimum dimensions a and b as the width of the plate and the depth of embedment respectively. Consider the following design...

A: See answer

Q: please answer 3,4 and 5

A: See answer

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