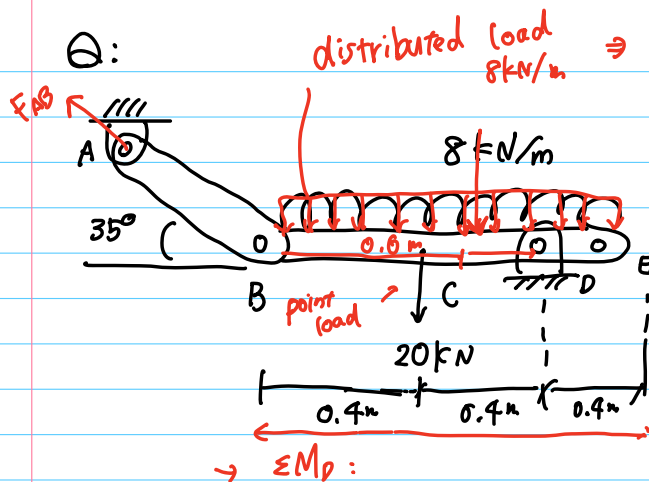




Link AB is to be made of a steel for which the ultimate normal stress is 450 MPa .

Determine the cross-sectional area for AB for which the factor of safety will be 3.50 .

Assume that the link will be adequately reinforced around the pins at A and B.

$$\Sigma M_D : 9.6 \text{ kN} \cdot 0.2 \text{ m} + 20 \text{ kN} \cdot 0.4 \text{ m} - F_{AB} \sin 35^\circ \cdot 0.8 \text{ m} = 0$$

F_{AB}

$F_{AB} \sin 35^\circ$

$P' = 9.6 \text{ kN}$

0.2 m

0.4 m

0.4 m

$P = 20 \text{ kN}$

D_y

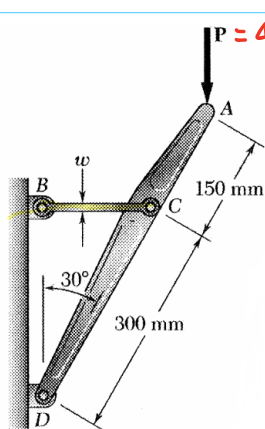
$$F_{AB} = 21.62 \text{ kN} = 21620 \text{ N}$$

$$\sigma_{all} = \frac{\sigma_{ult}}{F.S} = \frac{450 \text{ MPa}}{3.5} = 128.6 \text{ MPa}$$

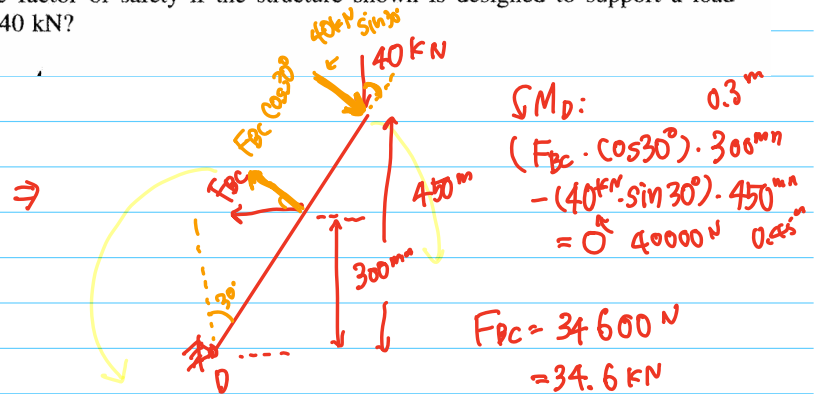
N/mm^2

$$\sigma_{all} = \frac{F_{AB}}{A_{AB}} \Rightarrow A_{AB} =$$

$$128.6 = \frac{21620 \text{ N}}{A_{AB}} \quad A_{AB} = 168.12 = 168.1 \text{ mm}^2$$



1.40 The horizontal link BC is 6 mm thick, has a width $w = 30$ mm, and is made of a steel with a 450-MPa ultimate strength in tension. What is the factor of safety if the structure shown is designed to support a load $P = 40$ kN?



$$F_{BC} = 34600 \text{ N}$$

$$A_{BC} = 6 \text{ mm} \times 30 \text{ mm} = 180 \text{ mm}^2$$

$$\sigma_{all} = \frac{F_{BC}}{A_{BC}} = \sigma_{all} = \frac{\sigma_{ult}}{F.S.}$$

$$\frac{F_{BC}}{A_{BC}} = \frac{\sigma_{ult}}{F.S.} \quad F.S. = \frac{A_{BC} \cdot \sigma_{ult}}{F_{BC}} = \frac{180 \text{ mm}^2 \cdot 450 \text{ MPa}}{34600 \text{ N}} = 2.34$$