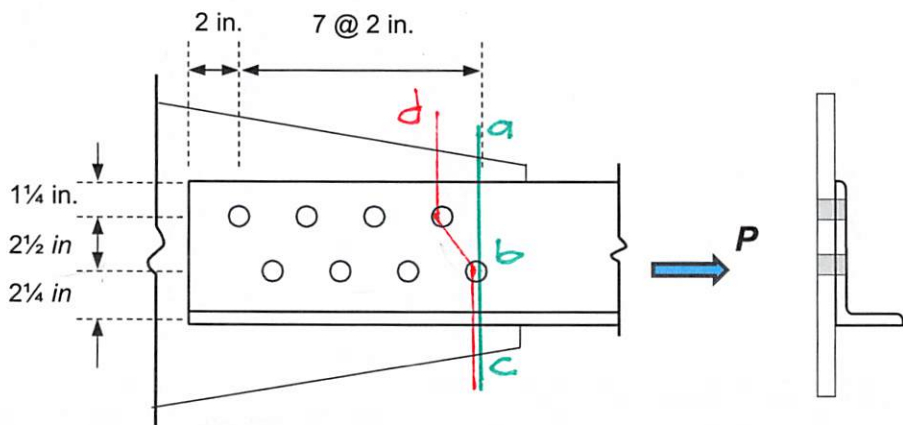


Classroom Problem 3.4-1: Compute the maximum acceptable tensile service load on a single angle **L6 x 4 x 1/2** of **A572 Grade 50** steel ($F_y = 50 \text{ ksi}$, $F_u = 65 \text{ ksi}$). The 6-in. leg contains a double-gage line of staggered 7/8 in.-diameter bolts. The live load is three times the dead load. Neglect of the effects of block shear.



FROM 1-7 (1-4b)

$$A_g = 4.75 \text{ in}^2 \quad \bar{x} = 0.981 \text{ in}$$

$$d_{\text{Hole}} = d_b + 1/8 \text{ in} = 7/8 \text{ in} + 1/8 \text{ in} = 1 \text{ in}$$

YIELDING $\phi_t P_n = \phi_t F_y A_g = 0.90 (50 \text{ ksi}) 4.75 \text{ in}^2 = \underline{213.75 \text{ k}}$

RUPTURE $\phi_t P_n = \phi_t F_u A_e$ $A_e = U A_n$ $A_n = A_g - \text{HOLES}$

line abc

$$A_n = 4.75 \text{ in}^2 - 1 (1 \text{ in}) (1/2 \text{ in}) = 4.25 \text{ in}^2$$

$$U = 1 - \frac{\bar{x}}{l} = 1 - \frac{0.981 \text{ in}}{14 \text{ in}} = 0.9299$$

$$\phi_t P_n = 0.75 (65 \text{ ksi}) (0.9299) 4.25 \text{ in}^2$$

$$= \underline{192.66 \text{ k}}$$

CR PROBLEM 3.4-1 $\frac{5}{4}g$ $\frac{2}{2}$

RUPTURE line d/bc $A_n = A_g - 2(\text{holes}) = 4.75 \text{ in}^2 - 2(1 \text{ in})(\frac{1}{2} \text{ in}) + \frac{(2 \text{ in})^2}{4(2.5 \text{ in})}(\frac{1}{2} \text{ in})$
 $= 3.95 \text{ in}^2$

$$\phi P_n = \phi F_u U A_n = 0.75(65 \text{ ksi})(0.9299)3.95 \text{ in}^2 = \underline{179.06 \text{ k}} \quad * \text{ CONTROL}$$

$$P_u = 1.2D + 1.6L = 1.2D + 1.6(3D) = 6D$$

$$P_u \leq \phi P_n \Rightarrow 6D = 179.06 \text{ k} \quad D = 29.84 \text{ k} \quad L = 89.53 \text{ k}$$

$$\underline{\underline{\text{SERVICE LOAD} = 119.38 \text{ k}}}$$