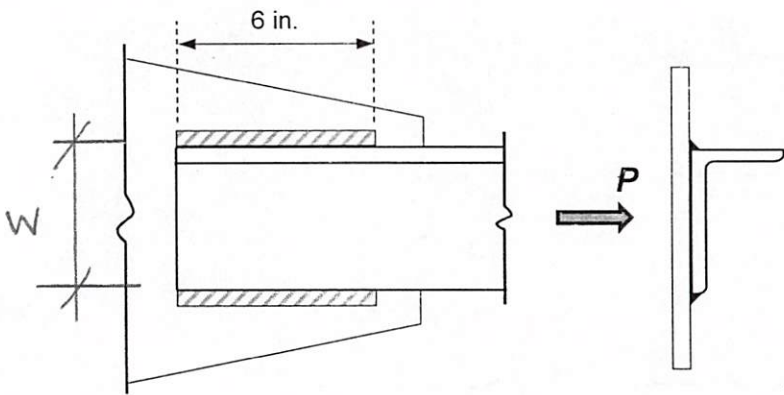


**Classroom Problem 3.3-2:** Compute the maximum acceptable tensile service load on a single angle L5 x 5 x 3/4 of A572 Grade 50 steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ). The angle is welded to a gusset plate. The live load is two times the dead load.



FROM TABLE 1-7 (1-46)  
 $A_g = 6.98 \text{ in}^2$     $\bar{x} = 1.52 \text{ in}$

$$A_n = A_g \quad A_e = U A_n = U A_g$$

$$U = \frac{3l^2}{3l^2 + W^2} \left[ 1 - \frac{\bar{x}}{l} \right]$$

$$= \frac{3(6 \text{ in})^2}{3(6 \text{ in})^2 + (5 \text{ in})^2} \left[ 1 - \frac{1.52 \text{ in}}{6 \text{ in}} \right] = 0.6063$$

YIELDING    $\phi P_n = \phi F_y A_g = 0.90 (50 \text{ ksi}) (6.98 \text{ in}^2) = \underline{314.1 \text{ k}}$

RUPTURE    $\phi P_n = \phi F_u A_e = 0.75 (65 \text{ ksi}) (0.6063) (6.98 \text{ in}^2) = \underline{206.3 \text{ k}} \quad **$

$$\begin{aligned} P_u &= 1.2D + 1.6L \\ &= 1.2D + 1.6(2D) \\ &= 4.4D \end{aligned}$$

$$\begin{aligned} P_u = \phi P_n &\Rightarrow 4.4D = 206.3 \text{ k} & D &= 46.89 \text{ k} \\ & & L &= 93.78 \text{ k} \end{aligned}$$

SERVICE LOAD 140.7 k