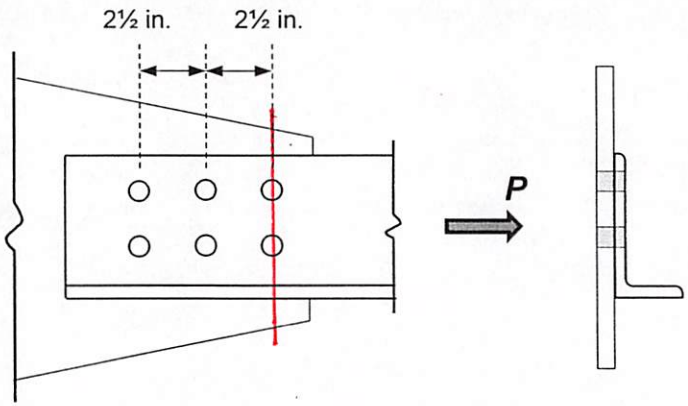
Classroom Problem 3.3-1: Compute the maximum acceptable tensile service load on a single angle **L 5 x 3½ x ½** of **A572 Grade 50** steel (F_y = 50 *ksi*, F_u = 65 *ksi*) that is connected along both legs. The 5-in. leg contains a double-gage line of ½ in.-diameter bolts. The live load is two times the dead load.



FROM TABLE 1-7 (1-46)

$A_g = 4.50\ in^2 \quad \bar{x} = 0.829\ in$

$d_{Hole} = d_b + \frac{1}{8}in = \frac{1}{2}in + \frac{1}{8}in = \frac{5}{8}in$

$A_n = A_g - 2Holes = 4.5in^2 - 2(\frac{5}{8}in)(\frac{1}{2}in) = 3.875in^2$

$A_e = UA_n \qquad U = 1 - \frac{\bar{x}}{\ell} = 1 - \frac{0.829in}{5in} = 0.8342$

$A_e = (0.8342)(3.875in^2) = 3.2325in^2$

YIELDING $\phi_t P_n = 0.90 F_y A_g = 0.90(50ksi)(4.5in^2) = \underline{202.5^k}$

RUPTURE $\phi_t P_n = 0.75 F_u A_e = 0.75(65ksi)3.2325in^2 = \underline{157.59^k}$ **

$P_u = 1.2D + 1.6L$

$= 1.2D + 1.6(2D)$

$= 4.4D$

$P_u = \phi P_n \Rightarrow 4.4D = 157.59^k \qquad D = 35.81^k$

$L = 71.63^k$

TOTAL SERVICE LOAD 107.44^k