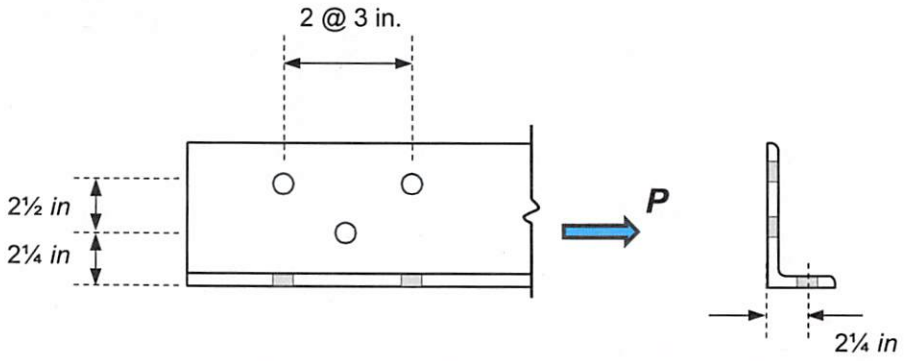
Classroom Problem 3.4-2: Compute the maximum acceptable tensile service load on a single angle **L7 x 4 x ½** of **A572 Grade 50** steel (F_y = 50 *ksi*, F_u = 65 *ksi*). The -7. leg contains a double-gage line of staggered ⅞ *in*.-diameter bolts. The live load is three times the dead load. Assume both legs are connected. Neglect of the effects of block shear.



FROM TABLE 1-7 $A_g = 5.26\,in^2$

$\bar{x} = 0.910\,in$

$d_{HOLE} = \frac{7}{8}\,in + \frac{1}{8}\,in = 1\,in$

YIELDING (D2-1)

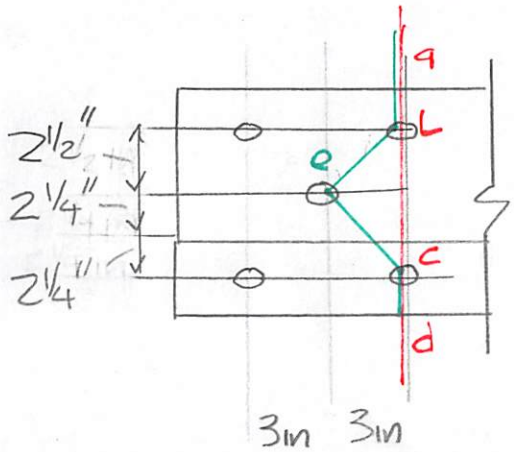
$\phi P_n = \phi F_y A_g = 0.90(50ksi)\,5.26in^2 = \underline{236.7^k}$

RUPTURE (D2-2)

$\phi P_n = \phi F_u A_e \qquad A_e = UA_n \qquad U = 1.0$

line abcd

$A_n = A_g - 2\,Holes = 5.26in^2 - 2(1in)(\frac{1}{2}in) = \underline{4.26in^2}$



$g = 2\frac{1}{4}\,in + 2\frac{1}{4} - \frac{1}{2}in = 4in$

$\phi P_n = 0.75(65ksi)\,1\,(4.26in^2) = \underline{207.7^k}$ * CONTROLS

line abecd

$A_n = A_g - 3\,Holes + 2(s^2/4g)$ be

$= 5.26in^2 - 3(1in)(\frac{1}{2}in) + \frac{(3in)^2}{4(2\frac{1}{2}in)} + \frac{(3in)^2}{4(4in)}$

$= \underline{5.32\,in^2} > 4.26in^2$

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

$$P_U \leq \phi P_n \quad \therefore \quad 6D = 207.7^{k} \Longrightarrow D = 34.62^{k} \quad L = 103.85^{k}$$

TOTAL SERVICE LOAD = $\underline{\underline{138.5^{k}}}$