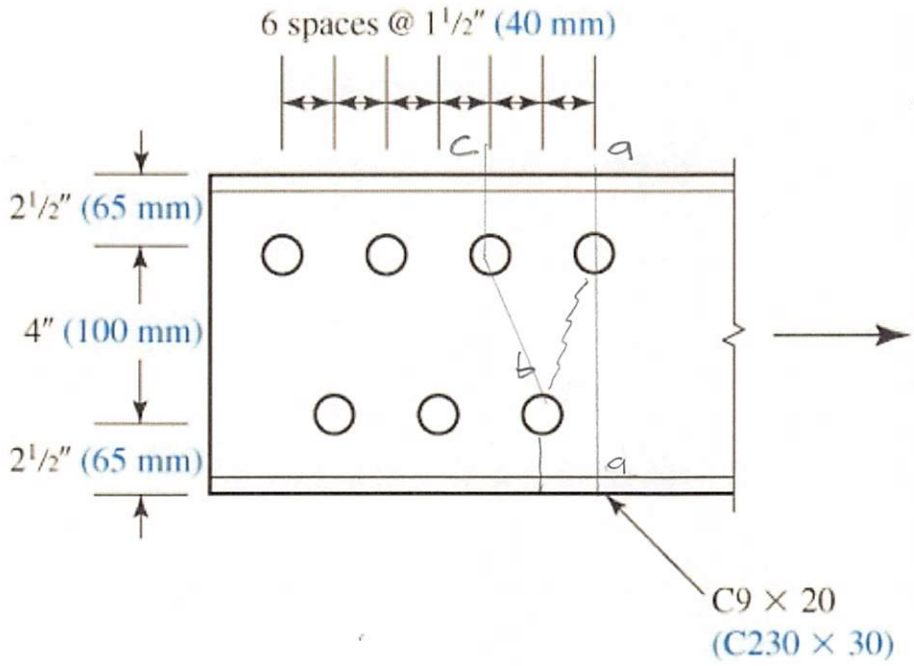
3.4-4 A C9 × 20 (C230 × 30) tension member is connected with $1^1/_8$-inch-diameter (M30) bolts, as shown in Figure P3.4-4. $F_y = 50$ ksi (345 MPa) and $F_u = 70$ ksi (483 MPa). The member is subjected to the following service loads: dead load = 36 kips (160 kN) and live load = 110 kips (490 kN). Determine whether the member has enough strength.

FROM TABLE 1-5 (1-38)

$A_g = 5.87\,in^2$ $\bar{x} = 0.583''$

$t_w = 0.448\,in.$



$d_{Hole} = 1^1/_8'' + 3/16''$

$= 1\,5/16''$

LINE aa $A_n = 5.87\,in^2 - (1\,5/16\,in)(0.448\,in) = \underline{5.282\,in^2}$

LINE ab $A_n = 5.87\,in^2 - (1\,5/16'')(0.448\,in)$

$- (0.448\,in)\left[1\,5/16\,in - \frac{(1.5\,in)^2}{4(4\,in)}\right] = \underline{\underline{4.7287\,in^2}}$ *

LINE cb = LINE ab × 7/6 $\Rightarrow \underline{5.5164\,in^2}$

$U = \left(1 - \frac{\bar{x}}{\ell}\right) = \left(1 - \frac{0.583\,in}{9\,in}\right) = \underline{0.9352}$

3.4-4 | 2/2

LRFD: $P = 1.2D + 1.6L = \underline{219.2^k}$

$0.9 F_y A_g = 0.9(5.87in)(50ksi) = \underline{264.2^k}$

$0.75 F_u A_e = 0.75(70ksi)(0.9352)(4.7287in^2) = \underline{232.2^k}$

$\underline{\text{O.K.}}$

ASD

$0.6 F_y A_g = 0.6(50ksi)(5.87in^2) = \underline{176.1\,k}$

$0.5 F_u A_e = 0.5(70ksi)(0.9352)(4.7287in^2) = \underline{154.8^k}$

$\underline{\text{O.K.}}$

$P = D + L = \underline{146^k}$