FERRELL ENGINEERING, INC.

Structural & Specialty Design

Project: **Job No.:**

By: DF **Date:** **Page #:** **Rev.:**

Prying at Column Flange Due to Vertical Component of Brace

Column: $W_{col} = 12$ x ColWt = 65 $Fy_{col} = 50ksi$

End Plate Connection

$F_V = 56kips$ $e = \frac{d_c}{2}$ $e = 6.06in$

$M = F_V \cdot e$ $M = 339.36kip \cdot in$

Tension Per Bolt

Bolts = 12 Vertical Gauge $Ga = 4in$ max Spacing $p = 3in$

$\varnothing = 0.75in$ A325-N Bolts $B = 19.4kips$ tension capacity per bolt

$S_X = 42in$ $T_{bolt} = \frac{M}{S_X}$ $T_{bolt} = 8.08kips$ < $B = 19.4kips$

Check Prying on Column Flange

$b_{fc} = 12in$ $t_{wc} = 0.39in$ $t_{fc} = 0.605in$

$b = \frac{Ga - t_{wc}}{2}$ $b = 1.805in$ $a = 1.25 \cdot \varnothing$ $a = 0.938in$

$b' = b - \frac{\varnothing}{2}$ $b' = 1.43in$ $a' = a + \frac{\varnothing}{2}$ $a' = 1.313in$

$d' = \varnothing + 0.0625in$ $d' = 0.812in$ $\delta = 1 - \frac{d'}{p}$ $\delta = 0.729$

$\rho = \frac{b'}{a'}$ $\rho = 1.09$ $T = \min\left(\left(\begin{array}{c} B \\ T_{bolt} \end{array}\right)\right)$ $T = 8.08kips$

$\beta = \frac{1}{\rho}\left(\frac{B}{T} - 1\right)$ $\beta = 1.286$ $\alpha' = \min\left[\left[\begin{array}{c} 1.0 \\ \frac{1}{\delta}\left(\frac{\beta}{1-\beta}\right) \end{array}\right]\right]$ $\alpha' = -6.169$

$\alpha' = if(\beta < 1.0, \alpha', 1.0)$ $\alpha' = 1$

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$$t_{reqd} = \sqrt{\frac{8T \cdot b'}{p \cdot Fy_{col} \cdot (1 + \delta \cdot \alpha')}} \qquad t_{reqd} = 0.597\,in \quad < \quad t_{fc} = 0.605\,in$$

Check Prying on End Plate: $t_{pl} = 0.75in$ Plate thickness $Fy_{pl} = 36ksi$

$t_{pl1} = \frac{1}{2}in$ gusset plate thickness

Vertical Gauge $Ga = 4\,in$ max Spacing $p = 3\,in$

$$b = \frac{Ga - (t_{pl1})}{2} \qquad b = 1.75\,in$$

$$a = 1.25 \cdot Ø \qquad a = 0.938\,in$$

$$b' = b - \frac{Ø}{2} \qquad b' = 1.375\,in \qquad a' = a + \frac{Ø}{2} \qquad a' = 1.313\,in$$

$$d' = Ø + 0.0625in \qquad d' = 0.812\,in \qquad \delta = 1 - \frac{d'}{Ga} \qquad \delta = 0.797$$

$$\rho = \frac{b'}{a'} \qquad \rho = 1.048 \qquad T_b = \min\left(\begin{pmatrix} B \\ T_{bolt} \end{pmatrix}\right) \qquad T_b = 8.08\,kips$$

$$\beta = \frac{1}{\rho}\left(\frac{B}{T} - 1\right) \qquad \beta = 1.337 \qquad \alpha' = \min\left[\begin{bmatrix} 1.0 \\ \frac{1}{\delta}\left(\frac{\beta}{1-\beta}\right) \end{bmatrix}\right] \qquad \alpha' = -4.975$$

$$\alpha' = if(\beta < 1.0, \alpha', 1.0) \qquad \alpha' = 1$$

$$t_{reqd} = \sqrt{\frac{8T_b \cdot b'}{Ga \cdot Fy_{pl} \cdot (1 + \delta \cdot \alpha')}} \qquad t_{reqd} = 0.59\,in \quad < \quad t_{pl} = 0.75\,in$$