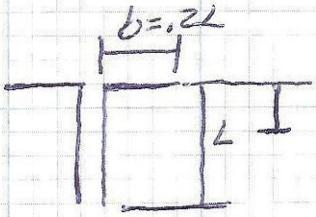
CALCULATE CAPACITY OF WELD - BASED ON ELASTIC ANALYSIS OF WELD




FIND CENTROID

$$\bar{y} = \frac{\Sigma Ay}{\Sigma A} = \frac{(\frac{1}{2}L)(L)+(\frac{1}{2}L)(L)}{2L+2b} = \frac{L^2}{2(L+b)} = \frac{L^2}{2(L+.2L)} = \frac{L^2}{2.4L} = \frac{L}{2.4}$$

REDEFINE b AS .4L & CALC I & S

$$I = b\left(\frac{L^2}{b+2L}\right)^2 + 2\left[\frac{L^3}{12} + L\left(\frac{L}{2} - \frac{L^2}{b+2L}\right)^2\right] \quad \frac{L^2}{b+2L} \rightarrow \frac{L}{2.4}$$

$$I = .4L\left(\frac{L^2}{.4L+2L}\right)^2 + 2\left[\frac{L^3}{12} + L\left(\frac{L}{2} - \frac{L}{2.4}\right)^2\right]$$

$$I = \frac{.4L^3}{5.76} + 2\left[\frac{L^3}{12} + \frac{L^3}{144}\right] = \frac{.4L^3}{5.76} + \frac{L^3}{6} + \frac{L^3}{72} = .25L^3$$

$$S = \frac{.25L^3}{\frac{L}{2.4}} = .6L^2$$

CALCULATE TENSION FORCE PER UNIT LENGTH ON WELD

$$R_T = \frac{M}{S} = \frac{Pe}{.6L^2}$$

CALCULATE SHEAR FORCE PER UNIT LENGTH ON WELD

$$R_V = \frac{P}{2(L+.2L)} = \frac{P}{2.4L}$$

CALCULATE TOTAL FORCE PER UNIT LENGTH ON WELD

$$R = \sqrt{\left(\frac{Pe}{.6L^2}\right)^2 + \left(\frac{P}{2.4L}\right)^2} = \sqrt{\frac{P^2e^2}{.36L^4} + \left(\frac{P}{2.4L}\right)^2}$$

$$= \sqrt{\left(\frac{P}{2.4L}\right)^2\left(\frac{e^2}{.0625L^2}\right) + \left(\frac{P}{2.4L}\right)^2} = \frac{P}{2.4L}\sqrt{\frac{e^2}{(1/16L^2)} + 1} = \frac{P}{2.4L^2}\sqrt{16e^2+L^2}$$

LRFD: $R = \phi R_{nw}$ & $P$ = FACTORED LOAD

ASD: $R = R_w$ & $P$ = SERVICE LOAD

SOLVE FOR $L$ USING QUADRATIC EQUATION

$$2.4RL^2 - P\sqrt{16e^2+L^2} = 0$$

$$5.76R^2L^4 - P^2(16e^2+L^2) = 0$$

$$5.76R^2L^4 - P^216e^2 - P^2L^2 = 0$$

$$L = \sqrt{\frac{-b+\sqrt{b^2-4ac}}{2a}}$$

where $a = 5.76R^2$, $b = -P^2$, $c = -16e^2P^2$

(ASD) $R = .928(CD)$

(LRFD) $R = 1.392(CD)$

NOTE: THIS IS INDEPENDENT OF ASD OR LRFD (R IS ONLY DIFFERENCE)