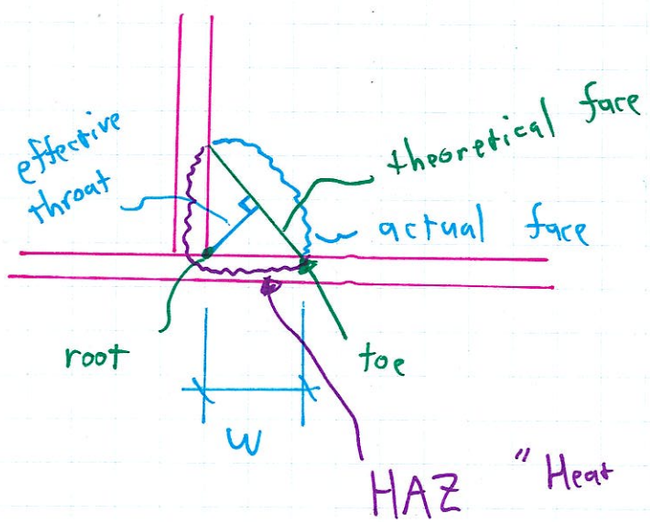
WELDED CONNECTIONS

* KEATING MODULE FOR MORE DETAILS

AISC CHAP J, pg 16.1-116

AWS (American Weld Society) D1.1 "Structural Welding Code" governs expect as noted in J2

FILLETS



root to toe of weld

0.707 w

STRENGTH OF WELD IS DEPENDENT ON

1) BASE MATERIAL $\phi F_{BM} A_{BM}$ (J2-2)

2) WELD $\phi F_w A_w$ (J2-3)

FILLET WELD STRENGTH

WELD SHEAR STRENGTH: $\phi r_n = 0.75 \left(\underbrace{0.707\, w}_{A_w} \times \underbrace{0.6 F_{exx}}_{F_w} \right)$ (per inch of weld)

BASE METAL STRENGTH: $\phi r_n = \min \left[1.0 (0.6 f_y t) ; \; 0.75 (0.6 f_u t) \right]$

* smallest controls

where: w = weld size

F_{exx} = electrode strength CVEN 446 → $F_{exx} = 70$ ksi

F_y, F_u = base metal properties t = thickness of base metal

AISC ALLOWS THE LARGER OF

(i) $R_n = R_{wl} + R_{wt}$

(ii) $R_n = 0.85 R_{wl} + 1.5 R_{wt}$

* use largest

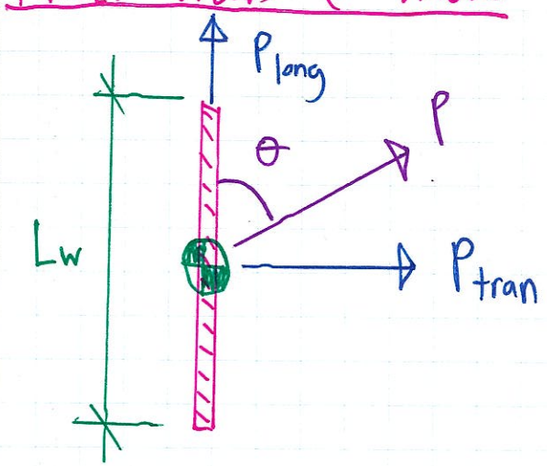
R_{wl} = nom. strength of long. weld

$= 0.6 F_{exx} (0.707 w)(L_{lw})$ "kip"

R_{wt} = nom. strength of tran. weld

$= 0.6 F_{exx} (0.707 w)(L_{tw})$ "kip"

FILLET WELDS @ ANGLES



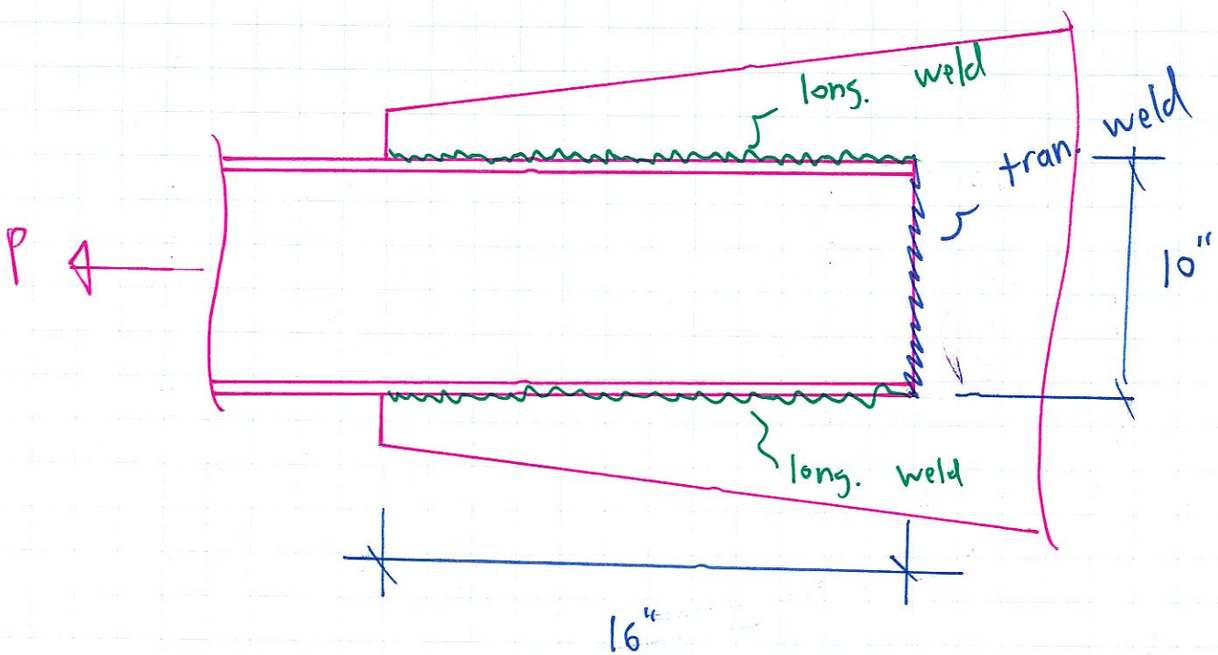
$$F_{nw} = 0.6 F_{exx} (1.0 + 0.5 \sin^{1.5}\theta)$$

$$\phi r_n = 0.75 F_{nw} A_w$$

$A_w = 0.707 w$

EXAMPLE

GIVEN: A MC10X22, A992 Steel, Member welded to $\frac{3}{8}$" gusset, A36 steel, with $\frac{3}{16}$" fillet weld, E70 electrodes.



REQD: Determine the connection capacity, not considering member strength

SOLN:

WELD: $\phi r_n = 0.75(0.707w)(0.6F_{exx}) = 4.176\ ^k/_{in}$ "weld shear strength"

$w = 3/16"$, $F_{exx} = 70\ ksi$

A_w, F_w

BASE METAL: $\phi r_n = \min[1.0(0.6F_y t); 0.75(0.6F_u t)]$

$= \min\left[1.0(0.6)(36^{ksi})(\tfrac{3}{8}"); 0.75(0.6)(58^{ksi})(\tfrac{3}{8}")\right]$

$= 8.1\ ^k/_{in}$

smaller controls $\Rightarrow \phi r_n = 4.176\ ^k/_{in}$ since weld strength controls 2 cases

(i) $\phi R_n = \phi R_{wl} + \phi R_{wt} = 4.176\ ^k/_{in}\left[2\text{ welds}(16") + 10"\right] = 175.4^k$

(ii) $\phi R_n = 0.85\phi R_{wl} + 1.5\phi R_{wt} = 4.176\ ^k/_{in}\left[0.85(2)(16") + 1.5(10")\right] = 176.2^k$

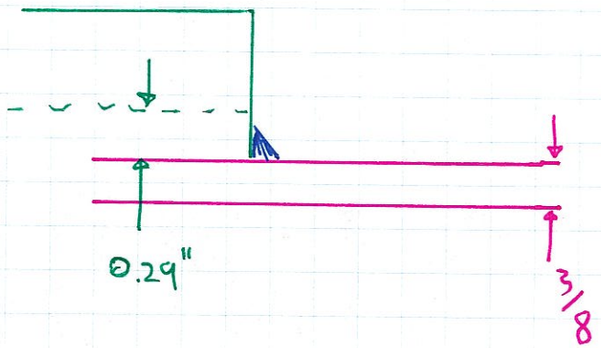
allowed to use larger

CHECK MINIMUM WELD SIZE

Table J2-4, pl6.1-119

web of channel

$t_{min} = \min\left(t_{pL} = \tfrac{3}{8}" = 0.375"; t_w = 0.29"\right)$

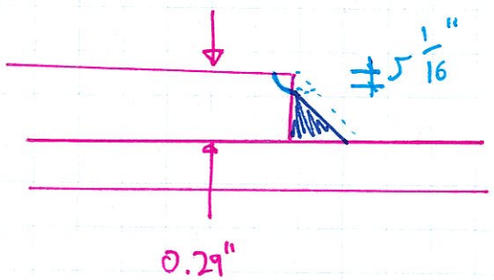


$t_{min} = 0.29" \rightarrow w_{min} = \frac{3}{16}"$ ✓

CHECK MAX WELD SIZE

trans. weld → $t_{web} = 0.29"$

$w_{max} = 0.29" - \frac{1}{16}" = 0.228"$



$w = \frac{3}{16}" = 0.188" \leq w_{max} = 0.228"$ ✓