

CIVE 3205
Example C40

Feb 26, 2020

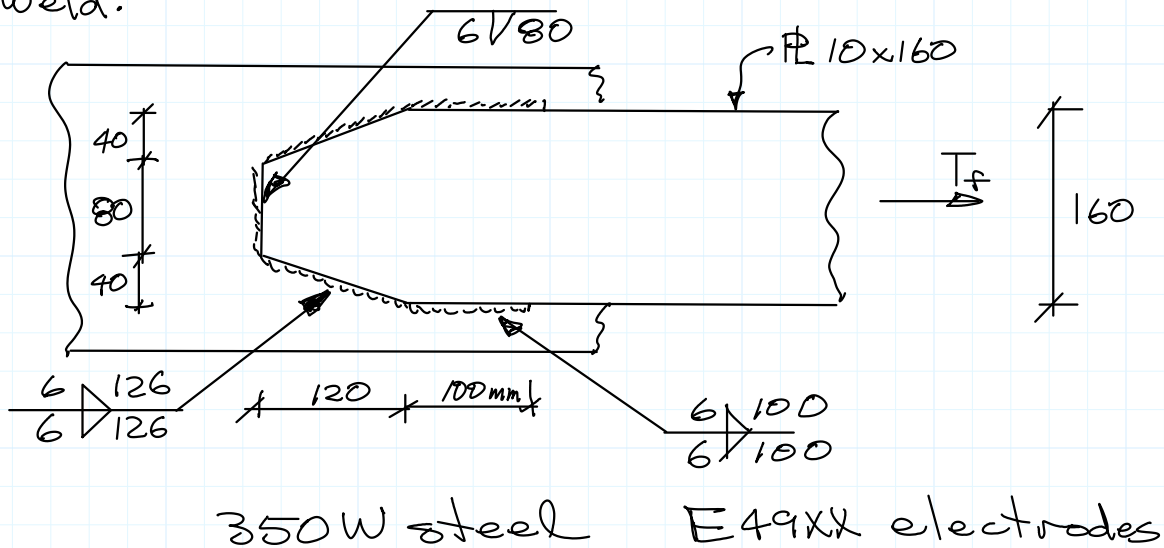
N.M. Holtz

Revisions:

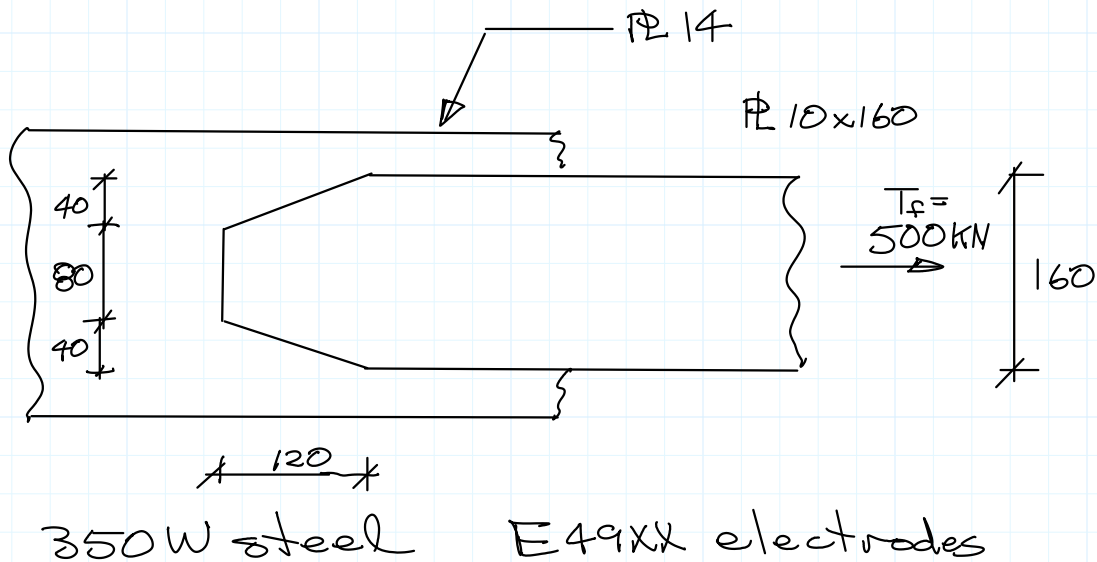
- Feb 26/20: new posting.

Example C40

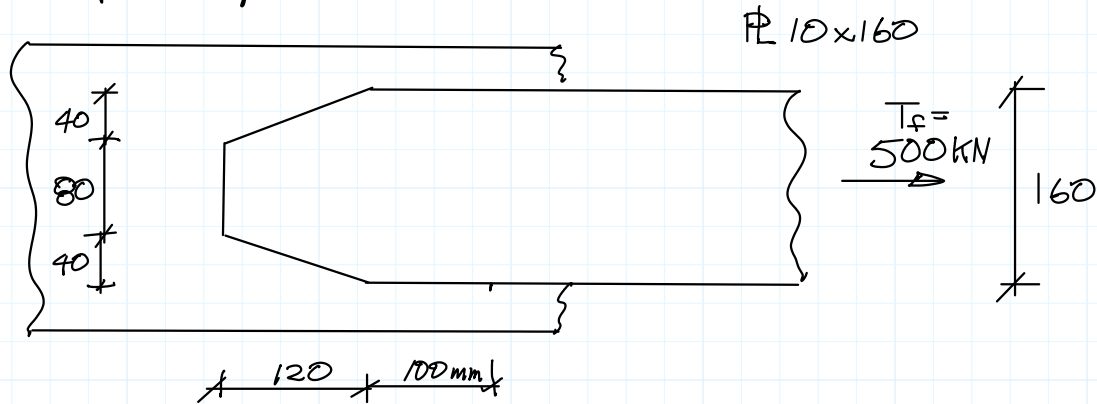
- A) Determine the tensile capacity based only on the weld.



- B) Weld only along angled and parallel sides. Determine size & length of weld req'd.



A) - Capacity



80 mm side: $\Theta = 90^\circ$ $M_w = 1.0$

$$\begin{aligned}
 V_r &= 0.67 \phi_w A_w X_v (1 + 0.5 \sin^{1.5} \Theta) M_w \\
 &= 0.67 \times 0.67 \times 0.707 \times 6 \times 80 \times 490 \\
 &\quad \times (1 + 0.5 \times 1^{1.5}) \times 1.0 \times 10^{-3} \\
 &= 111 \text{ kN}
 \end{aligned}$$

angled sides: $\Theta = \tan^{-1} \frac{40}{120} = 18.4^\circ$

$$M_w = \frac{0.85 + 18.4/600}{0.85 + 90/600} = 0.881$$

$$L = 2\sqrt{40^2 + 120^2} = 253 \text{ mm}$$

$$\begin{aligned}
 V_r &= 0.67 \times 0.67 \times 0.707 \times 6 \times 253 \times 490 \\
 &\quad \times (1 + 0.5 \times (\sin 18.4)^{1.5}) \times 0.88 \times 10^{-3} \\
 &= 226 \text{ kN}
 \end{aligned}$$

parallel sides: $\Theta = 0^\circ$

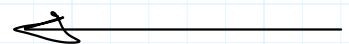
$$M_w = 0.85$$

$$L = 2 \times 100 = 200 \text{ mm}$$

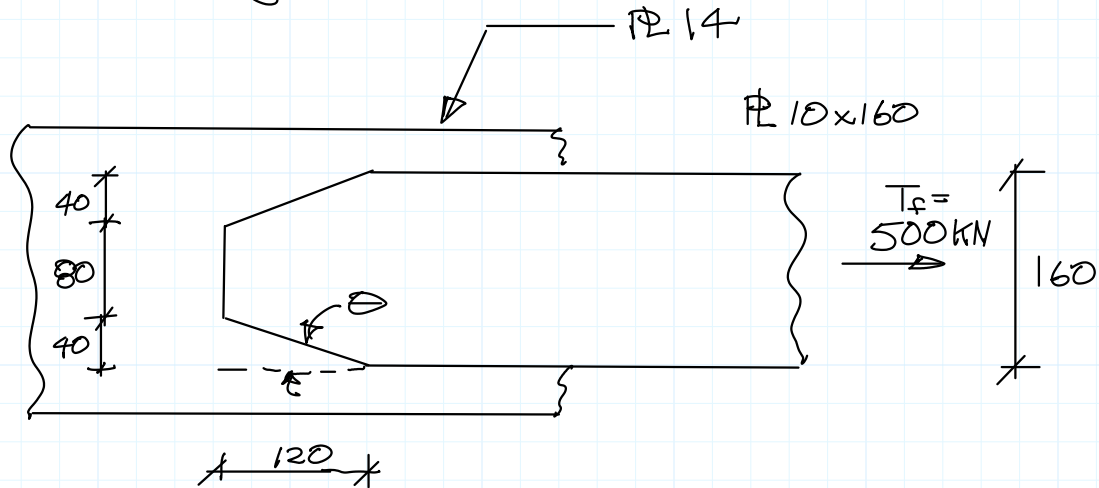
$$\begin{aligned}
 V_r &= 0.67 \times 0.67 \times 0.707 \times 6 \times 200 \times 490 \\
 &\quad \times 1 \times 0.85 \times 10^{-3} \\
 &= 159 \text{ kN}
 \end{aligned}$$

total: $T_r = 111 + 226 + 159$

$$T_r = 496 \text{ kN}$$



B) Design weld:



350W steel E49XX electrodes

$$\left. \begin{array}{l} \text{min weld size} = 6 \text{ mm} \\ \text{max weld size} = 10 - 2 = 8 \text{ mm} \end{array} \right\} \text{ (p 6-172)}$$

Try 6 mm weld

Angled sides:

$$\theta = \tan^{-1} \frac{40}{120} = 18.4^\circ$$

$$M_w = 1$$

$$L = 2\sqrt{40^2 + 120^2} = 253 \text{ mm}$$

$$V_r = 0.67 \phi_w A_w U_v (1 + 0.5 \sin^{1.5} \theta) M_w$$

$$= 0.67 \times 0.67 \times 0.707 \times 6 \times 253 \times 490$$

$$\times (1 + 0.5 (\sin 18.4^\circ)^{1.5}) \times 10^{-3}$$

$$= 257 \text{ kN}$$

Parallel sides:

$$\theta = 0^\circ$$

$$M_w = \frac{0.85 + 0/600}{0.85 + 18.4/600} = 0.965$$

for 1 mm length of 6mm weld @ 0°

$$V_r = 0.67 \times 0.67 \times 0.707 \times 6 \times 1 \times 490$$

$$(1 + 0.5 \sin^{1.5} 0) \times 0.965 \times 10^{-3}$$

$$= 0.900 \text{ kN}$$

length required, ea side

$$= \frac{(500 - 257)}{0.900} \times \frac{1}{2}$$

$$= 135 \text{ mm}$$

Summary

