

Singe Angle Weld Analysis

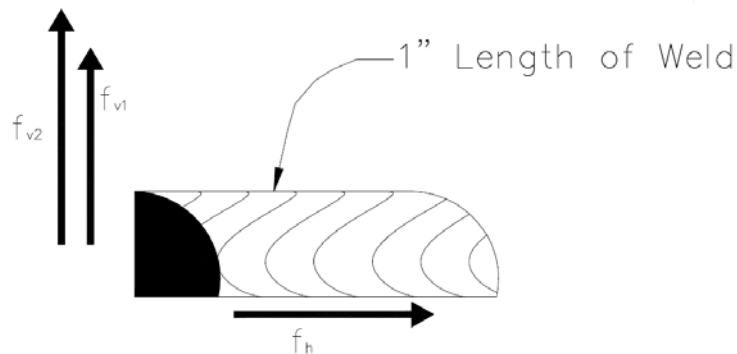
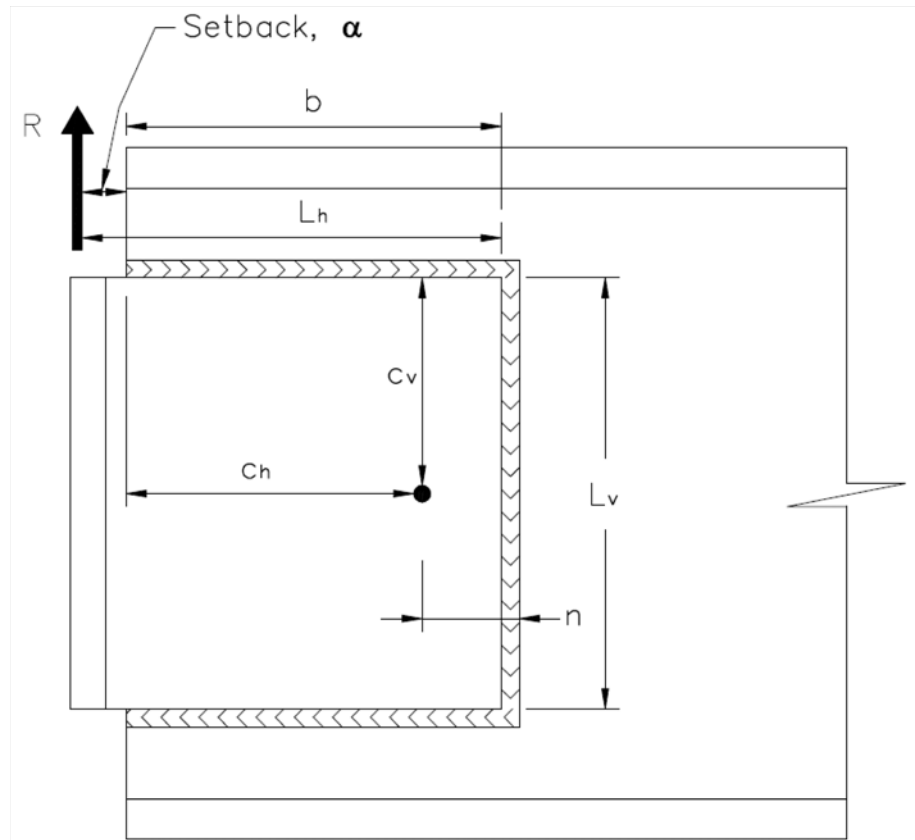
Using Design of Welded Structures by Omer Blodgett copyright 1966 page 5.4-3

INPUT

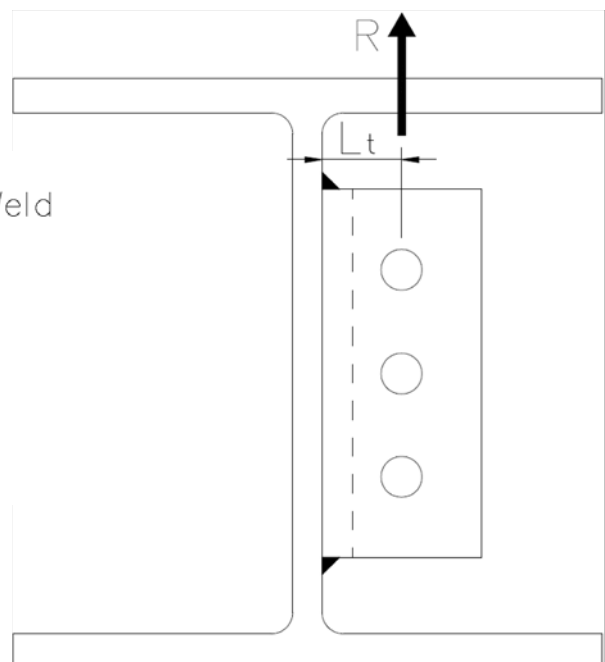
$R := 25.3\text{kip}$ force
 $F_{EXX} := 70\text{ksi}$ weld electrode strength
 $\alpha := 0.75\text{in}$ setback
 $L_h := 4\text{in}$
 $L_v := 8.2\text{in}$
 $L_t := 1.75\text{in}$
 $a := \frac{1}{4}\text{in}$ weld thickness

OUTPUT

$b := L_h - \alpha = 3.25\cdot\text{in}$
 $n := \frac{b^2}{2\cdot b + L_v} = 0.719\cdot\text{in}$
 $c_h := L_h - n - \alpha = 2.531\cdot\text{in}$
 $c_v := \frac{L_v}{2} = 4.1\cdot\text{in}$
 $x := \frac{\sqrt{2}}{2} \cdot a = 0.177\cdot\text{in}$ effective throat thickness



$$J_w := \frac{(2\cdot b + L_v)^3}{12} - \frac{b^2 \cdot (b + L_v)^2}{2\cdot b + L_v} = 170.508\cdot\text{in}^3$$



$$f_h := \frac{R \cdot (L_h - n) \cdot c_v}{J_w} = 1.996 \cdot \frac{\text{kip}}{\text{in}} \quad \text{torsion (horizontal)}$$

$$f_{v1} := \frac{R \cdot (L_h - n) \cdot c_h}{J_w} = 1.233 \cdot \frac{\text{kip}}{\text{in}} \quad \text{twisting (vertical)}$$

$$f_{v2} := \frac{R}{2 \cdot b + L_v} = 1.721 \cdot \frac{\text{kip}}{\text{in}} \quad \text{shear (vertical)}$$

$$f_t := \frac{R \cdot L_t}{L_v \cdot \left(b + \frac{1}{4} L_v\right)} = 1.019 \cdot \frac{\text{kip}}{\text{in}} \quad \text{torsion (out of plane)}$$

$$f_r := \sqrt{f_h^2 + (f_{v1} + f_{v2})^2 + f_t^2} = 3.708 \cdot \frac{\text{kip}}{\text{in}} \quad \text{resultant}$$

$$\sigma_r := \frac{f_r}{x} = 20.974 \cdot \text{ksi} \quad \text{stress on weld}$$

Check

$$\Omega := 2.0 \quad \text{safety factor}$$

$$\sigma_a := \frac{0.6 \cdot F_{EXX}}{\Omega} = 21 \cdot \text{ksi} \quad \text{allowable stress on weld}$$

$$\sigma_r = 20.974 \text{ ksi} < \sigma_a = 21 \text{ ksi} \quad \text{OK!}$$

Using Table 8-8 with $\theta=0^\circ$ in AISC 2010

$$e_x := L_h - n = 3.281 \text{ in} \quad L_h = 4 \text{ in} \quad L_v = 8.2 \text{ in}$$

$$a := \frac{e_x}{L_v} = 0.4 \quad x := \frac{n}{L_v} = 0.088$$

$$D := 4 \quad k := \frac{L_h - \alpha}{L_v} = 0.396$$

$$C_1 := 1$$

$$C := 2.84$$

$$R_n := C \cdot C_1 \cdot D \cdot 8.2 \cdot \text{kip} = 93.152 \text{ kip}$$

$$R_a := \frac{R_n}{2} = 46.576 \text{ kip} \quad \frac{R}{R_a} = 0.543 \quad \frac{\sigma_r}{\sigma_a} = 0.999$$