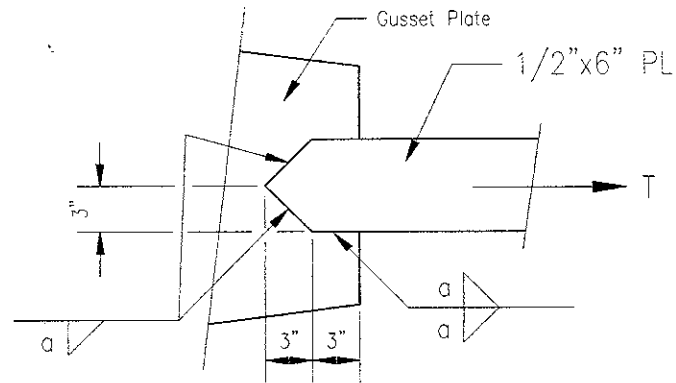**Example Problem 5.3**

Given: The connection shown has
a flat plate tension member
attached to a gusset plate.

The plates are A36 steel.
The electrode is F6.
The weld size a = 3/8"

Wanted:

   a) Determine the weld strength of the connection considering the effect of the angle
      of load to weld axis.

   b) Determine the weld strength of the connection not considering the effect of angle
      of load to weld axis.

   c) Determine the thickness of the gusset plate to prevent shear rupture.

Solution:

a) For $\theta = 0°$

$$F_w = .60\,(1 + 0.5\sin^{1.5}(0))\,60ksi = .6(60ksi) = 36ksi$$

$$A_w = 2(3")\,[.707\,(3/8")] = 1.59\,in^2$$

$$R_{N\,0°} = 36ksi\,(1.59\,in^2) = 57.3^k$$

For $\theta = 45°$

$$F_w = .60\,(1 + 0.5\sin^{1.5}(45°))(60ksi) = .778\,(60ksi) = 46.7\,ksi$$

$$A_w = (2)\sqrt{3^2 + 3^2}\,[.707\,(3/8")] = 2.25\,in^2$$

$$R_{N\,45°} = 46.7ksi\,(2.25\,in^2) = 105.1^k$$

$$\text{TOTAL } R_N = 57.3^k + 105.1^k$$

$$\boxed{\text{TOTAL } R_N = 162.3\,k} \quad \longleftarrow \text{ANSWER (a)}$$

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b)

$$R_N = F_w A_w = .60(60\text{KSI})\left[.707(3/8")(2(3")) + 2\frac{3"}{.707}\right]$$

$$= 36\text{KSI}(3.84\text{ IN}^2)$$

$$\boxed{R_N = 138.3^K} \longleftarrow \text{ ANSWER (b)}$$

c)

$$F_{BM} A_{BM} \geq F_w A_w$$

$$(.6 F_{BM})(t_\ell) \geq (.6 F_{EXX})(.707a)$$

$$t_\ell \geq \frac{F_{EXX}}{F_U}(.707a) = \frac{60\text{KSI}}{58\text{KSI}}(.707)(3/8")$$

$$t_{PL} \geq .274"$$

$$\boxed{\text{USE } t_{PL} = 5/16"} \longleftarrow \text{ ANSWER (c)}$$

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