

Woodland Park Baptist Church

RE: S2.4 Connection at AJ-A18

W14x30 (-21kip)

Check strength of tube wall for axial force (shear strength and yielding)

Reference HSS Connections manual pages 6-45 and 6-46

B = width of hollow section face with gusset attached

t = HSS wall thickness, in.

t1 = thickness of gusset plate, in.

N = length of gusset plate, in.

Fy = specified minimum yield stress of the HSS, ksi

Qf = 1.0 for tension in HSS

Qf =  $1 - 0.3(f/F_y) - 0.3(f/F_y)^2$  for compression in HSS

f = magnitude of compression stress

Apply a factor of 0.67 to computed yielding value for ASD.

Apply a factor of 0.40 to computed shear value for ASD.

Column Size = HSS12x12x3/8

$$\text{kip} := 1000 \cdot \text{lb} \quad A_c := 16.0 \cdot \text{in}^2$$

$$f := \frac{(50 \cdot \text{kip} + 30 \cdot \text{kip})}{A_c} \quad B := 12 \cdot \text{in} \quad t := 0.349 \cdot \text{in} \quad t1 := 0.375 \cdot \text{in}$$

$$N := 15 \cdot \text{in} \quad F_y := 46 \cdot \frac{\text{kip}}{\text{in}^2}$$

$$Q_f := 1 - 0.3 \left( \frac{f}{F_y} \right) - 0.3 \left( \frac{f}{F_y} \right)^2$$

$$Q_f = 0.9638$$

Compute allowable load due to yielding of the HSS wall

$$P_y := \frac{(0.67 \cdot F_y \cdot t^2) \cdot \left[ \left( 2 \cdot \frac{N}{B} \right) + 4 \cdot \sqrt{\left( 1 - \frac{t1}{B} \right)} \right] \cdot Q_f}{\left( 1 - \frac{t1}{B} \right)}$$

$$P_y = 24.0416 \cdot \text{kip} \quad \text{Yielding of the HSS wall OK (actual load = 21 kips)}$$

**\*\*\*\*THRU-PLATE NOT REQUIRED\*\*\*\***

$$P_s := 0.4 \cdot F_y \cdot t \cdot N$$

$$P_s = 96.324 \cdot \text{kip} \quad \text{Shear strength of the HSS wall is OK}$$