

## Footing for HSS 3x3x1/4 Column Loading - Verification Calculations:

Column Loads from 4x6 column:

$$R_{Dead} := 1.163 \text{ kip} \quad R_{Snow} := 2.5 \text{ kip} \quad R_{Wind} := -1.5 \text{ kip}$$

Footing Dimensions:    Length:     $L := 2 \text{ ft}$     Width:     $W := 2 \text{ ft}$     Thickness:     $T := 12 \text{ in}$

Concrete Unit Weight:     $\rho_{concrete} := 145 \text{ pcf}$

Total column loads including self weight of the footing:

$$Dead := R_{Dead} + W \cdot L \cdot T \cdot \rho_{concrete} = 1.743 \text{ kip} \quad Snow := R_{Snow} = 2.5 \text{ kip}$$

$$Wind := R_{Wind} - 2 \text{ kip} = -3.5 \text{ kip} \quad \text{Add additional 2000 lbs uplift to demonstrate uplift checks}$$

$$P_{asd} := \begin{bmatrix} Dead \\ Dead + Snow \\ Dead + 0.75 \cdot Wind + 0.75 \cdot Snow \\ 0.6 \cdot Dead + 0.6 \cdot Wind \end{bmatrix} = \begin{bmatrix} 1.743 \\ 4.243 \\ 0.993 \\ -1.054 \end{bmatrix} \text{ kip}$$

Footing Soil Capacity:     $\sigma_{soil} := \begin{bmatrix} 1500 \text{ psf} \\ 1500 \text{ psf} \\ 1500 \text{ psf} \\ 1500 \text{ psf} \end{bmatrix} \quad P_{capacity} := \sigma_{soil} \cdot L \cdot W = \begin{bmatrix} 6.000 \\ 6.000 \\ 6.000 \\ 6.000 \end{bmatrix} \text{ kip}$

Check footing loads against soil capacity and uplift:

Dead Load Factors:     $f := \begin{bmatrix} 1.0 \\ 1.0 \\ 1.0 \\ 0.6 \end{bmatrix} \quad \text{Resisting Weight: } W_r := f \cdot \rho_{concrete} \cdot W \cdot L \cdot T = \begin{bmatrix} 0.58 \\ 0.58 \\ 0.58 \\ 0.348 \end{bmatrix} \text{ kip}$

$$\begin{aligned} & i \leftarrow \text{ORIGIN} \dots \text{rows}(P_{asd}) - 1 \\ & check \leftarrow 0 \\ & \text{for } j \in i \\ & \quad \text{if } P_{asd_j} < -1 \cdot W_{r_j} \\ & \quad \quad \quad -1 \cdot P_{asd_j} \\ & \quad \quad check_j \leftarrow \frac{-1 \cdot P_{asd_j}}{f_j \cdot \rho_{concrete} \cdot W \cdot L \cdot T} \\ & \quad \text{else} \\ & \quad \quad P_{asd_j} \\ & \quad \quad check_j \leftarrow \frac{P_{asd_j}}{P_{capacity_j}} \\ & \text{return } check \end{aligned} = \begin{bmatrix} 0.291 \\ 0.707 \\ 0.166 \\ 3.029 \end{bmatrix}$$

**Footing Bearing Analysis:**

Bearing Code Check = 3.03

P = -1.05 kips vs 0.35 kips

For 0.6 Dead + 0.6 Wind