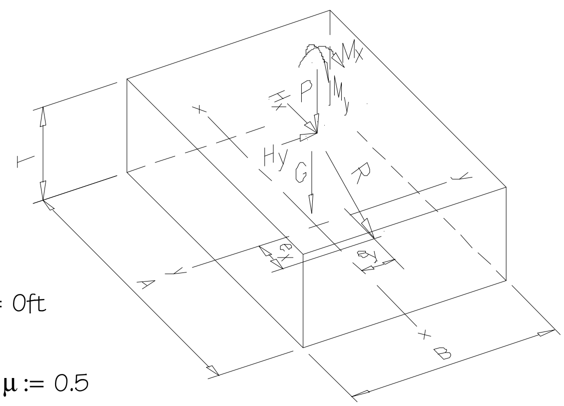
Geometry:

Footing length: $A := 9ft$

Footing width: $B := 9ft$

Footing Thickness: $T := 24in$

Soil Cover: $s_{ov} := 12in$



Soil Properties:

Unit Weight: $\gamma_e := 100pcf$

Bouyancy: $D_w := 0ft$

Soil Spring Constant: $k_s := 100 \cdot kcf$

Friction Factor: $\mu := 0.5$

Loading to the top of the footing:

Vertical Load: $P := 18.632kips$

Lateral Load: $H_x \equiv 0kips$

Lateral Load: $H_y \equiv 0kips$

Distance to H_x: $d_x := 54in$

Distance to Hy: $d_y := 0in$

y-axis moment: $M_{yt} := 71.52k'$

x-axis moment: $M_{xt} := 5.646k'$

Footing Weight: $G := 0 \cdot \gamma_c \cdot A \cdot B \cdot T$ $\qquad G = 0.00\,kips$

Soil Cover: $W_s := 0 \cdot \gamma_e \cdot A \cdot B \cdot s_{ov}$ $\qquad W_s = 0.00\,kips$

Bouyancy Uplift $U_b := \gamma_{h2o} \cdot A \cdot B \cdot D_w$ $\qquad U_b = 0.0\,kips$

Determine Eccentricities in each direction:

Vert. Force: $V := P + G + W_s - U_b$ $\qquad V = 18.6\,kips$

Ave. Pressure: $p := \frac{V}{A \cdot B}$ $\qquad p = 230\,psf$

y-axis Moment: $M_y := H_x \cdot d_x + M_{yt}$ $\qquad M_y = 71.5\,k'$

y-axis resisting: $M_{r.y} := \frac{V \cdot A}{2}$ $\qquad M_{r.y} = 83.8\,k'$

$$e_x := \left(\frac{A}{2} - \frac{M_{r.y} - M_y}{V}\right) - \varepsilon \qquad e_x = 3.84\,ft$$

$A' := 0.5 \cdot A - e_x$ $\qquad A' = 0.66\,ft$

x-axis Moment: $M_x := H_y \cdot d_y + M_{xt}$ $\qquad M_x = 5.6\,k'$

x-axis resisting: $M_{r.x} := \frac{V \cdot B}{2}$ $\qquad M_{r.x} = 83.8\,k'$

$$e_y := \left(\frac{B}{2} - \frac{M_{r.x} - M_x}{V}\right) - \varepsilon \qquad e_y = 0.30\,ft$$

$B' := .5 \cdot B - e_y$ $\qquad B' = 4.20\,ft$

$\frac{e_x}{A} = 0.43$ $\qquad \frac{e_y}{B} = 0.03$ $\qquad \alpha := \frac{e_x}{A} + \frac{e_y}{B}$ $\qquad \alpha = 0.460$

Determine safety factors:

Safety Factor on Sliding: $SF_{sl} := \dfrac{\mu \cdot V}{\sqrt{\left(H_x^2 + H_y^2 + .01kips^2\right)}}$ $\qquad SF_{sl} = 93.16 \qquad if\left(SF_{sl} > .75 \cdot 1.5, OK, NG\right) = "O.K."$

Safety Factor on Overturning: $SF_{ov} := \dfrac{0.5 \cdot V}{\sqrt{\left(\frac{M_x}{B}\right)^2 + \left(\frac{M_y}{A}\right)^2}}$ $\qquad SF_{ov} = 1.17 \qquad if\left(SF_{ov} > .75 \cdot 2, OK, NG\right) = "N.G."$

Determine correct zone:

$$zone := if\left[\alpha < \frac{1}{6}, "V", if\left[\frac{e_y}{B} \le \frac{1}{3}\cdot\left(\frac{1}{2} + \frac{e_x}{A}\right), if\left[\frac{e_x}{A} \le \frac{1}{3}\cdot\left(\frac{1}{2} + \frac{e_y}{B}\right), "IV", "II"\right], if\left[\frac{e_x}{A} \le \frac{1}{3}\cdot\left(\frac{1}{2} + \frac{e_y}{B}\right), "III", "I"\right]\right]\right]$$

zone = "II"

Solve for the maximum bearing pressure:

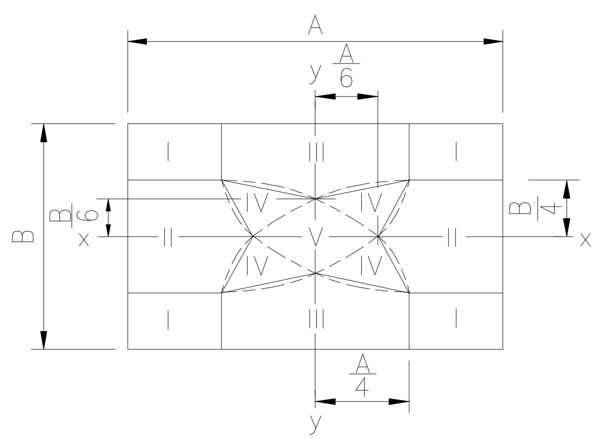
For Contract application, delete this line and all zone calculations which do not apply.

Zone II: If ey/B < 1/4 and ex/A > 1/3(1/2+ey/B):

$$S := \frac{B}{12}\cdot\left[\left(\left|\frac{B}{e_y}\right|\right) + \sqrt{\frac{B^2}{e_y^{\,2}} - 12}\right] \qquad S = 44.55\,ft$$

$$tan := \frac{3}{2}\cdot\frac{A - 2e_x}{S + e_y} \qquad tan = 0.04$$

$$f_2 := \frac{12V}{B \cdot tan}\cdot\frac{B + 2S}{B^2 + 12S^2} \qquad f_2 = 2302\,psf$$



ZONES