$PSF_{llr} := 30 \cdot psf$

$PSF_{llf} := 40 \cdot psf$

$PSF_{dl_wall} := 5 \cdot psf$

$PSF_{dl_ceil} := 2 \cdot psf$

$PSF_{dl_roof} := 3 \cdot psf$

$\gamma_{st} := 490 \cdot pcf$

$t_{floor} := 0.1875 \cdot in$

$L_{fl} := 20 \cdot ft + 8 \cdot in$

$W_{fl} := 10 \cdot ft + 8 \cdot in$

$t_{joist} := 0.25 \cdot in$

$d_{joist} := 6.00 \cdot in$

$L_{joist} := L_{fl}$

$sp_{jst} := 16 \cdot in$

$t_{rdg} := 0.50 \cdot in$

$d_{rdg} := 8.00 \cdot in$

$L_{rdg_beam} := 24.0 \cdot ft$

$L_{rdg} := 23 \cdot ft + 0 \cdot in$

$W_{rdg} := 8 \cdot ft + 0 \cdot in$

$tube46_{dl} := 19.08 \cdot plf$

$tube25_{dl} := 5.61 \cdot plf$

$L_{rftr} := \frac{(184.7 \cdot in)}{2}$

$sp_{rftr} := 24.0 \cdot in$

$t_{top_pl} := 0.50 \cdot in$

$d_{top_pl} := 5.00 \cdot in$

$PSF_{soil} := 2000 \cdot psf$

Ridge Beam Loads:

$A_{rdg} := L_{rdg} \cdot W_{rdg}$ $\quad A_{rdg} = 184.0\,ft^2$

$Ridge_{dl} := t_{rdg} \cdot d_{rdg} \cdot (\gamma_{st})$ $\quad Ridge_{dl} = 13.61\,plf$

$Ridge_{ll} := PSF_{llr} \cdot (W_{rdg})$ $\quad Ridge_{ll} = 240.00\,plf$

$PLF_{rdg} := Ridge_{dl} + Ridge_{ll}$ $\quad PLF_{rdg} = 253.6\,plf$

$R_{rdg} := \frac{(PLF_{rdg} \cdot L_{rdg_beam})}{2}$ $\quad R_{rdg} = 3043.33\,lbf$

Rafter Loads:

$Rafter_{top_pl} := t_{top_pl} \cdot d_{top_pl} \cdot (\gamma_{st})$ $\quad Rafter_{top_pl} = 8.51\,plf$

$Rafter_{dl} := tube25_{dl}$ $\quad Rafter_{dl} = 5.61\,plf$

$Rafter_{ll} := PSF_{llr} \cdot sp_{rftr}$ $\quad Rafter_{ll} = 60.00\,plf$

$PLF_{rftr} := Rafter_{dl} + Rafter_{ll}$ $\quad PLF_{rftr} = 65.6\,plf$

$R_{rftr_dl} := \frac{(Rafter_{dl} \cdot L_{rftr})}{2}$ $\quad R_{rftr_dl} = 21.59\,lbf$

$R_{rftr_conn} := \frac{(PLF_{rftr} \cdot L_{rftr})}{2}$ $\quad R_{rftr_conn} = 252.46\,lbf$

$PLF_{rf_edge_dl} := \left[(PSF_{dl_roof}) \cdot \frac{W_{rdg}}{2} + \left(\frac{R_{rftr_dl}}{sp_{rftr}}\right)\right] + Rafter_{top_pl}$ $\quad PLF_{rf_edge_dl} = 31.30\,plf$

$PLF_{rf_edge_ll} := (PSF_{llr}) \cdot \frac{W_{rdg}}{2}$ $\quad PLF_{rf_edge_ll} = 120.00\,plf$

$PLF_{rf_edge} := PLF_{rf_edge_ll} + PLF_{rf_edge_dl}$ $\quad PLF_{rf_edge} = 151.30\,plf$

$Rafter_{qty} := ceil\left(\frac{L_{rdg}}{sp_{rftr}}\right) - 1$ $\quad Rafter_{qty} = 11$

SAMPLE CALCULATION

Floor Plate Dead Load:

$A_{fl} := W_{fl} \cdot L_{fl}$ $\quad A_{fl} = 220.4\,ft^2$

$PSF_{fl_Pl} := (\gamma_{st}) \cdot t_{floor}$ $\quad PSF_{fl_Pl} = 7.66\,psf$

$P_{fl_Pl} := A_{fl} \cdot (PSF_{fl_Pl})$ [floor plate total load] $\quad P_{fl_Pl} = 1687.8\,lbf$

Floor Joist Loads:

$Joist_{dl} := t_{joist} \cdot d_{joist} \cdot (\gamma_{st})$ $\quad Joist_{dl} = 5.10\,plf$

$Joist_{ll} := PSF_{llf} \cdot sp_{jst}$ $\quad Joist_{ll} = 53.33\,plf$

$PLF_{jst} := Joist_{dl} + Joist_{ll}$ $\quad PLF_{jst} = 58.4\,plf$

$R_{jst} := \frac{(PLF_{jst} \cdot L_{joist})}{2}$ $\quad R_{jst} = 603.85\,lbf$

$PLF_{fl_edge_dl} := \left[(PSF_{fl_Pl}) \cdot \frac{W_{fl}}{2} + \left(\frac{0.5 \cdot Joist_{dl} \cdot L_{joist}}{sp_{jst}}\right)\right] + tube46_{dl}$ $\quad PLF_{fl_edge_dl} = 99.47\,plf$

$PLF_{fl_edge_ll} := (PSF_{llf}) \cdot \frac{W_{fl}}{2}$ $\quad PLF_{fl_edge_ll} = 213.33\,plf$

$PLF_{fl_edge} := PLF_{fl_edge_ll} + PLF_{fl_edge_dl}$ $\quad PLF_{fl_edge} = 312.80\,plf$

$Joist_{qty} := ceil\left(\frac{L_{fl}}{sp_{jst}}\right) - 1$ $\quad Joist_{qty} = 15$

Column Axial Load:

$P_{fl_col} := PLF_{fl_edge} \cdot \left(\frac{L_{fl}}{2}\right)$ $\quad P_{fl_col} = 3232.3\,lbf$

$P_{rf_col_ext} := \left[PLF_{rf_edge} \cdot \left[\left(\frac{1}{2}\right) \cdot \frac{L_{rdg_beam}}{2}\right]\right] + \frac{R_{rdg}}{2}$ $\quad P_{rf_col_ext} = 2429.5\,lbf$

$P_{rf_col_int} := \left(PLF_{rf_edge} \cdot \frac{L_{rdg_beam}}{2}\right)$ $\quad P_{rf_col_int} = 1815.6\,lbf$

$P_{2nd_column} := P_{rf_col_ext} + P_{fl_col}$ $\quad P_{2nd_column} = 5661.8\,lbf$

$P_{1st_column} := P_{rf_col_ext} + 2 \cdot (P_{fl_col})$ $\quad P_{1st_column} = 8894.1\,lbf$

$P_{ftg_column} := P_{rf_col_ext} + 3(P_{fl_col})$ $\quad P_{ftg_column} = 12126.4\,lbf$

Min. Footing Diamter: $PSF_{soil} = 2000\,psf$

$Ftg_dia := \sqrt{\frac{(P_{ftg_column})}{\left(\frac{\pi}{4}\right) \cdot PSF_{soil}}}$ [single column - footing diameter] $\quad Ftg_dia = 2.778\,ft$

$Ftg_dia := \sqrt{\frac{(2 \cdot P_{ftg_column})}{\left(\frac{\pi}{4}\right) \cdot PSF_{soil}}}$ [doubled column - footing diameter] $\quad Ftg_dia = 3.929\,ft$

SAMPLE CALCULATION