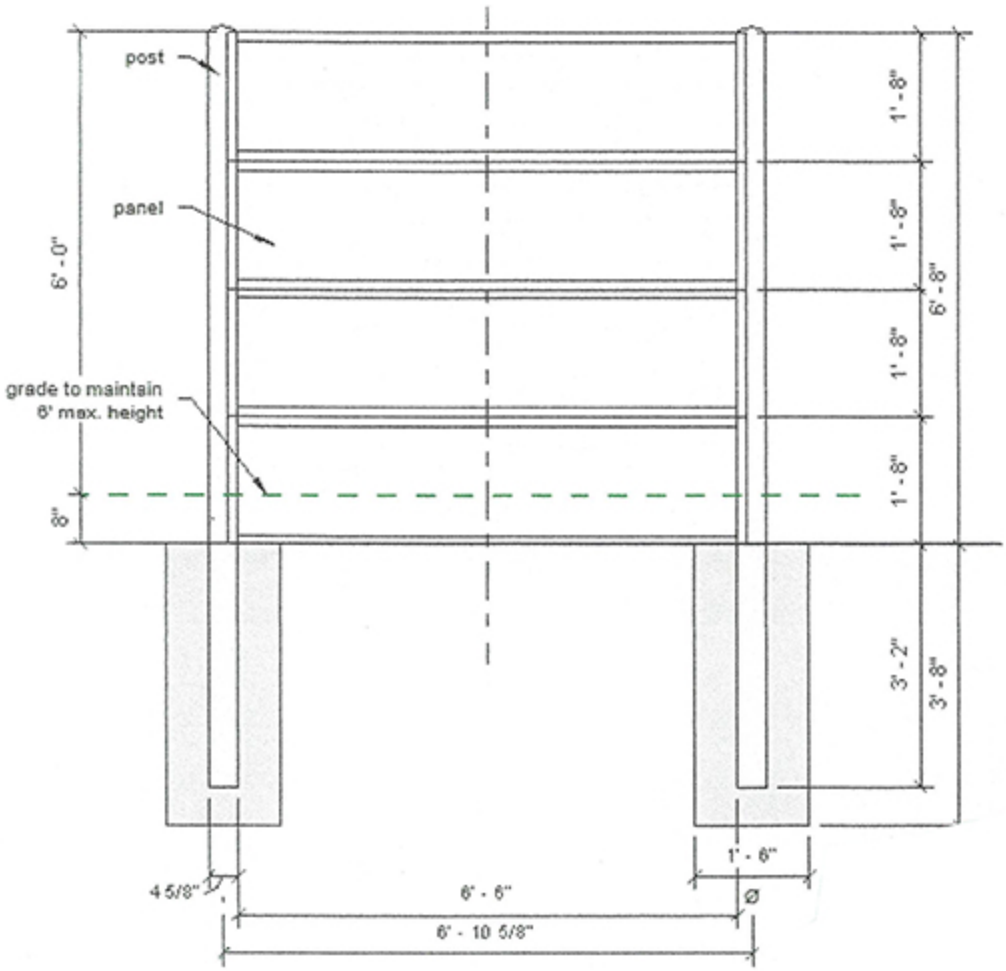
STACKWALL 6'-8"

Basic Wall and Site Characteristics

Spacing between posts $S_p := 6.88 \cdot ft$

Wall Height $W_h := 6.67 \cdot ft$



Seismic Design Force

Risk Category 1, Site Class D - Stiff Soil, Seismic Design Category E

$R := 2.0$ $I := 1.0$

Location
Latitude = 33.99°
Longitude = -117.527°

Mapped Spectral Response Acceleration Parameters:

$S_s := 1.591 \cdot g$ $S_1 := 0.578 \cdot g$

Site Coefficients:

$F_a := 1.2$

Maximum Considered Earthquake Spectral Response Acceleration Parameters:

$S_{MS} := S_s \cdot F_a = 1.909\ g$

Design Spectral Response Acceleration Parameters:

$S_{DS} := \frac{2}{3} \cdot S_{MS} = 1.273\ g$

Mapped Long Period Transition:

$T_L := 8 \cdot sec$

Seismic Coefficient

$C_S := \frac{S_{DS}}{\left(\frac{R}{I}\right)}$ $C_S = 0.636\ g$ Strength

Using ASD

$V := .7 \cdot C_S$ $V = 0.445\ g$

Panel Thickness $T_p := 2 \cdot in$ single panel thickness

Panel Weight $W_t := T_p \cdot 150 \cdot pcf$ $W_t = 25\ psf$

Seismic Unit Force $v := W_t \cdot \frac{V}{g}$ $v = 11.137\ psf$

Using Strength $v_s := \frac{W_t \cdot C_S}{g} = 15.91\ psf$

Wind

Risk Category I, 90 MPH, 3 sec gusts,
Basic Wind Speed Exposure C

$V := 90$ $K_d := .85$ $G := 0.85$ $I := 1.0$ $K_{zt} := 1.0$ $K_z := .85$

$q_z := .00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot psf = 14.982\ psf$

$q_s := 0.6 \cdot q_z = 8.989\ psf$ ASD (16-12)

Design

$q := \text{if}\left(q_z > v_s, q_z, v_s\right) = 15.91\ psf$

Typical Panel Loads

Panel height $h_p := 20 \cdot in$

Panel length $l_p := 78 \cdot in$

$w := q \cdot h_p = 26.517\ \frac{lbf}{ft}$

Moment in Panel

$M_u := \frac{w \cdot l_p^{\,2}}{8}$ $M_u = 140.041\ lbf \cdot ft$

Panel Reinforcing

$\phi := .85 \qquad f'_c := 4000 \cdot psi \qquad f_y := 40000 \cdot psi \qquad b := 20 \cdot in \qquad d := 1 \cdot in$

$\omega' := \frac{M_u}{\phi \cdot f'_c \cdot b \cdot d^2} = 0.025 \qquad \omega := \omega' \cdot (1 - .59 \cdot \omega') = 0.024$

$\rho := \omega \cdot \frac{f'_c}{f_y} = 0.002 \qquad \rho_{min} := \text{if}\left(\rho > \frac{200 \cdot psi}{f_y}, \rho, \text{if}\left(\frac{4}{3} \cdot \rho < \frac{200 \cdot psi}{f_y}, \frac{4}{3} \cdot \rho, \frac{200 \cdot psi}{f_y}\right)\right) = 0.003$

Required Reinforcing

$A_s := \rho_{min} \cdot b \cdot d = 0.065\ in^2$

$A_{pro} := \left(\frac{(.25 \cdot in)^2 \cdot \pi}{4}\right) \cdot 3 = 0.147\ in^2$

Use (3) - Ø 1/4" bars horizontal
with Ø 1/4" @ 13" o.c. vertical
Grade 40 bars, f'c = 4000 psi

Post Load

$M_p := S_p \cdot \frac{W_h^2}{2} \cdot q = (2.435 \cdot 10^3)\ lbf \cdot ft$

Post Reinforcing

$\phi := .85 \qquad f'_c := 4000 \cdot psi \qquad f_y := 40000 \cdot psi \qquad b := 4.5 \cdot in \qquad d := 6 \cdot in$

$\omega' := \frac{M_p}{\phi \cdot f'_c \cdot b \cdot d^2} = 0.053 \qquad \omega := \omega' \cdot (1 - .59 \cdot \omega') = 0.051$

$\rho := \omega \cdot \frac{f'_c}{f_y} = 0.005 \qquad \rho_{min} := \text{if}\left(\rho > \frac{200 \cdot psi}{f_y}, \rho, \text{if}\left(\frac{4}{3} \cdot \rho < \frac{200 \cdot psi}{f_y}, \frac{4}{3} \cdot \rho, \frac{200 \cdot psi}{f_y}\right)\right) = 0.005$

Required reinforcing

$A_s := \rho_{min} \cdot b \cdot d = 0.139\ in^2$

$A_{pro} := \left(\frac{(.375 \cdot in)^2 \cdot \pi}{4}\right) \cdot 2 = 0.221\ in^2$

Use 2-#3 vertical each end
Grade 40 bars, f'c=4000 psi

Post Shear

$\rho_w := \rho_{min} = 0.005$

$b_p := 1.625 \cdot in$

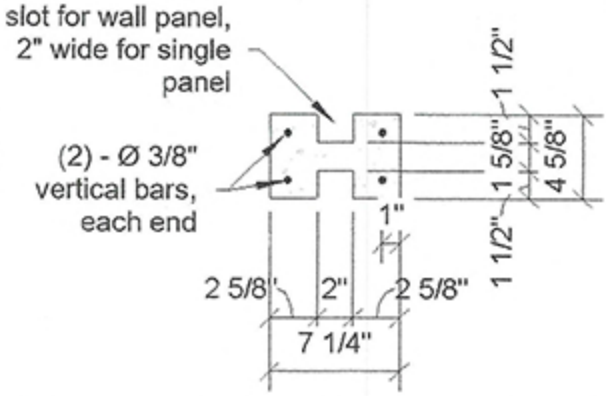
$d_p := 6.25 \cdot in$

$V_p := S_p \cdot W_h \cdot q = 730.104\ lbf$

$v_p := \frac{V_p}{b_p \cdot d_p} = 71.887\ psi$

$V_c := 2 \cdot \sqrt{(f'_c \cdot psi)} \cdot b_p \cdot d_p$

$V_c = (1.285 \cdot 10^3)\ lbf$



Caisson Depth Required

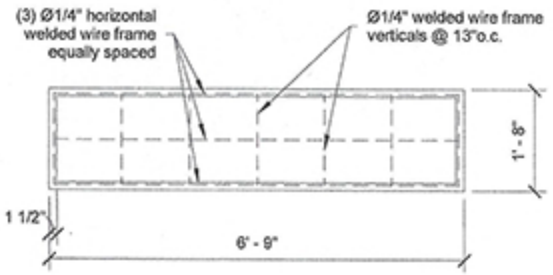
$P := q_s \cdot W_h \cdot S_p \cdot \text{if}(q_s > v_s, .6, .7) = 288.753\ lbf$

Lateral Bearing Pressure:	$p := 200 \cdot \frac{psf}{ft}$	Based on Sandy Gravel CL, ML, MH, CH, Table 1806A.2, including increase
Diameter of caisson:	$b := 18 \cdot in$	
Applied Height	$h := \frac{W_h}{2}$	$h = 3.335\ ft$
Assume depth of embedment 44"	$S_1 := p \cdot \frac{3.67}{3} \cdot ft$	$S_1 = 244.667\ psf$

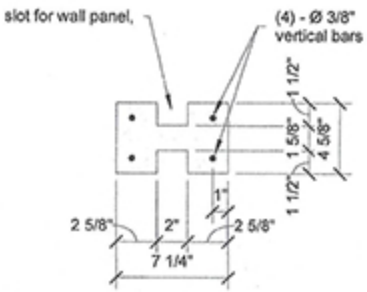
Equation 18-1

$A := \frac{2.34 \cdot P}{S_1 \cdot b}$ $\quad A = 1.841\ ft$

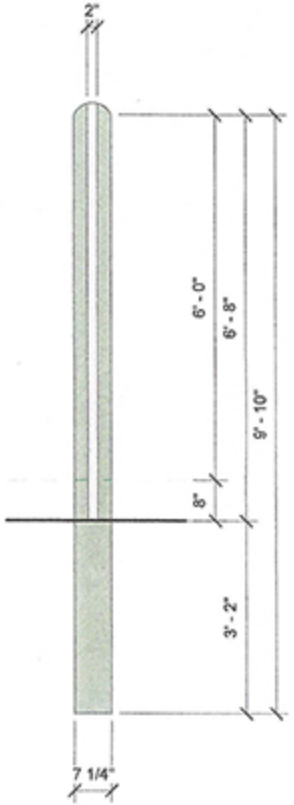
$d := 0.5 \cdot A \cdot \left(1 + \left(1 + \left(\frac{4.36 \cdot h}{A}\right)\right)^{\frac{1}{2}}\right)$ $\quad d = 3.666\ ft$ $\quad$ < 44" depth provided



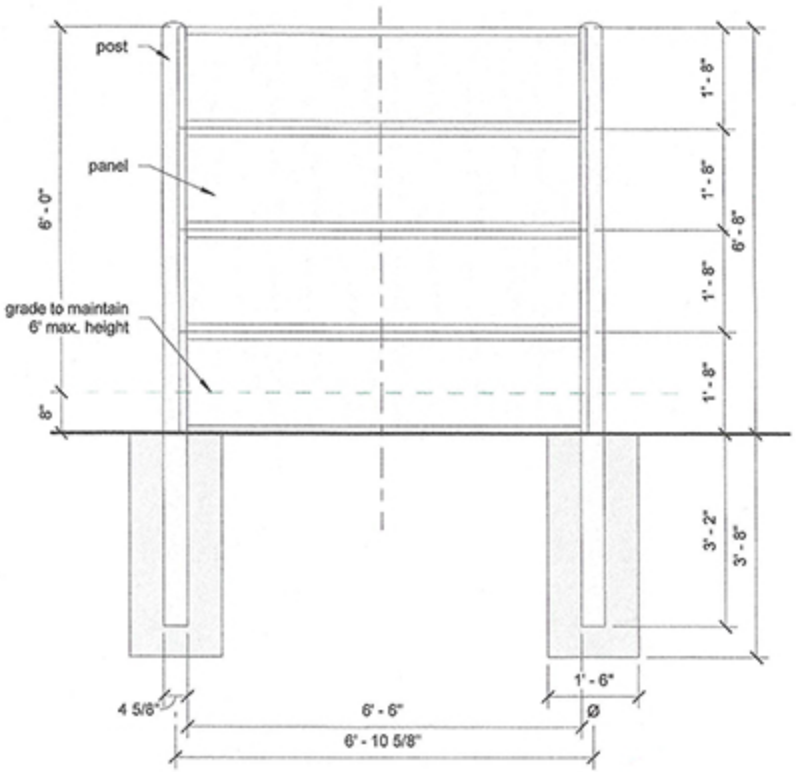
3 Wall Panel
1/2" = 1'-0"



4 Post Section
1 1/2" = 1'-0"



2 Concrete Post
1/2" = 1'-0"



1 Elevation
1/2" = 1'-0"

Stackwall 6'-8"
SCALE: As indicated
SHEET: S.1

STACKWALL