Revised Structural Calculations For:

# Kahan Spec Home

8613 West Mercer Way

Mercer Island, WA 98040


Prepared for: Brandt Design Group

Job #: 01519-2020-15

Date: August 13, 2021

STRUCTURAL ENGINEERING

SEATTLE 2124 Third Ave, Suite 100, Seattle, WA 98121 O 206.443.6212

TACOMA 934 Broadway, Suite 100, Tacoma, WA 98402 O 253.284.9470

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# Criteria Sheet

**Codes:**

| | |
|---|---|
| Structural: | IBC 2015 |
| Loading: | ASCE 7-10 |
| Wood: | NDS 2015 |
| Steel: | AISC 360-10 |
| Concrete: | ACI 318-14 |
| Masonry: | TMS 402/602-13 |

**Project Location:**

| | |
|---|---|
| Street & Number: | 8163 West Mercer Way |
| City: | Mercer Islanc |
| State: | WA |
| ZIP: | 98040 |
| Latitude: | 47.5283 N |
| Longitude: | -122.2325 W |

**Occupancy Category**

Risk Category: II ASCE 7 Table 1.5-1


**Seismic Load Summary:**

| | | | |
|---|---|---|---|
| Analysis Procedure: | Equivalent Lateral Force Procedure | | |
| Lateral System: | Light-frame (wood) Walls Sheathed with Wood Structural Panels Rated for Shear Resistance | | |
| R: | 6.50 | $C_d$= | 4 |
| Base Shear V = | 17 kips | $\Omega_o$= | 2.5 |
| $S_S$= | 1.467 | $S_1$= | 0.558 |
| $S_{DS}$= | 0.98 | $S_{D1}$= | 0.56 |
| $C_s$= | 0.150 | $I_E$= | 1.0 |

**Wind Load Summary:**

| | | | |
|---|---|---|---|
| V= | 110 | $K_{ZT}$= | 1.00 |
| Exposure = | C | | |

**Dead Loads:**

| Roof | | Upper & Main Floor | | Deck | |
|---|---|---|---|---|---|
| Roofing | 2.5 psf | Finish Floor | 1 psf | Tile pavers & mortar | 20 psf |
| 1/2" Sheathing | 1.8 psf | 3/4" Sheathing | 2.7 psf | 3/4" Sheathing | 2.7 psf |
| Trusses @ 24" oc | 2.5 psf | Joists @ 16" oc | 2.2 psf | Joists @ 16" oc | 2.2 psf |
| Misc./Mech. | 1.5 psf | Misc./Mech. | 2 psf | Misc./Mech. | 2 psf |
| Ceiling Finish | 2.8 psf | Ceiling Finish | 2.8 | Ceiling Finish | 2.8 |
| Solar Panels | 4 | | 10.7 psf | | 29.7 psf |
| | 15 psf | Use | 12 psf | Use | 30 psf |
| Use | 15 psf | | | | |

**Live Loads:**

| | | | | | |
|---|---|---|---|---|---|
| Snow | 25 | psf | | | |
| Floor | 40 | psf | Deck | 60 | psf |

**Soils:**

Allowable Bearing 1500 psf


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# Seismic Design

ASCE 7-10 Seismic Analysis  Equivalent Lateral Force Procedure

| Seismic Force Resisting System: Per Table 12.2-1 | System: | Bearing Wall Systems |
|---|---|---|
| | Type: | Light-frame (wood) Walls Sheathed with Wood Structural Panels Rated for Shear Resistance |

| | | |
|---|---|---|
| Seismic Design Cat. | D | |
| Risk Category | II | I, II, or III, or IV per Table 1.5-1 |
| Site Class | D | per soils report (D assumed, without soils report) |
| Diaphragm Flexibility | Flexible | |

| | | |
|---|---|---|
| $\Omega_o$ | 2.5 | |
| $S_S$ | 1.467 g | 2% in 50 yr, Latitude & Longitude lookup |
| $S_1$ | 0.558 g | 2% in 50 yr, Latitude & Longitude lookup |
| $h_n$ | 24.0 ft | |
| R | 6.50 | |
| $I_e$ | 1.0 | Table 1.5-2 |
| $C_d$ | 4 | |
| Ct | 0.02 | Table 12.8-2 |
| x | 0.75 | Table 12.8-2 |
| T | 0.22 sec | Eq. 12.8-7 |
| $T_0$ | 0.11 sec | |
| $T_S$ | 0.57 sec | |
| k | 1.000 | |
| Fa | 1.00 | Table 11.4-1 |
| Fv | 1.50 | Table 11.4-2 |
| $S_{MS}$ | 1.47 g | Eq. 11.4-1 |
| $S_{M1}$ | 0.84 g | Eq. 11.4-2 |
| | | |
| $S_{DS}$ | 0.978 g | Eq. 11.4-3 |
| $S_{D1}$ | 0.558 g | Eq. 11.4-4 |
| | | |
| Cs | ***0.150 Controls*** | Eq. 12.8-2 |
| | 0.396 | Eq. 12.8-3 need not exceed, I < $I_L$ |
| | 0.010 | Eq. 12.8-5 or 12.8-6 minimum |
| | | |
| Cs, design | 0.150 | |
| Bldg. Weight | 112.7 k | |
| | | |
| V = $C_S$W | 17.0 k | Eq. 12.8-1, Strength Level Base Shear |
| V = $C_{Sasd}$W | 11.9 k | Eq. 12.8-1 ASD Base Shear |

$T_a = C_t h_n^x$ Eq. 12.8.7

$S_{MS} = F_a S_S$ Eq. 11.4-1
$S_{M1} = F_v S_1$ Eq. 11.4-2
$S_{DS} = {}^2/_3 S_{MS}$ Eq. 11.4-3
$S_{D1} = {}^2/_3 S_{M1}$ Eq. 11.4-4

$C_S = \frac{S_{DS}}{(R/I_e)}$ Eq. 12.8-2
$C_S = \frac{S_{D1}}{T(R/I_e)}$ Eq. 12.8-3
$C_S = \frac{S_{D1} T_L}{T^2(R/I_e)}$ Eq. 12.8-4
$C_S \geq 0.044 S_{DS} I_e$ Eq. 12.8-5
$C_S \geq 0.01$ Eq. 12.8-5

$C_{VX} = w_x h_x^k / \sum_{i=1}^{n} w_x h_i^k$ Eq. 12.8-12

$F_{px} = {}^{\sum_{i=x}^{n} F_i}/_{\sum_{i=x}^{n} w_i} w_{px}$ Eq. 12.10-1
$F_{px} \geq 0.2 S_{DS} I_e w_{px}$ Eq. 12.10-2
$F_{px} \leq 0.4 S_{DS} I_e w_{px}$ Eq. 12.10-3

**Vertical Distribution** ASD ρ= 1.3

| Level | $h_x$ (ft) | $W_x$ (k) | $h_x^k$ (ft) | $W_x h_x^k$ | Story Shear ASD $C_{vx}$ (%) | Story Shear ASD $F_x$ (k) | Story Shear ASD SV (k) | Diaphragm Force (ρ not included) $F_{px,calc}$ | $F_{px,min}$ | $F_{px,max}$ | $F_{px,design}$ | $\gamma=F_{px}/F_x$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 3 | 24.0 | 50 | 24.0 | 1200 | 0.615 | 9.5 | **9.5** | 7.3 | 6.8 | 13.7 | **7.3** | 0.77 |
| 2 | 12.0 | 63 | 12.0 | 752 | 0.385 | 5.9 | **15.4** | 6.6 | 8.6 | 17.2 | **8.6** | 1.44 |
| Σ | | 112.7 | | 1952 | | **15.4** | | | | | | |

# Wind Design - MWFRS

ASCE 7-10 Chapter 27 - Directional Procedure

| Design Method | ASD |
|---|---|

Wind Coefficients

| Exposure | C | |
|---|---|---|
| V= | 110 | mph |
| $K_d$= | 0.85 | Table 26.6-1 |
| $K_h$= | 0.94 | Table 27.3-1 |
| G= | 0.85 | 26.9.4 |

Location and Building Dimensions

| | | |
|---|---|---|
| Calculate Kzt? | No | |
| Kzt | 1.00 | |
| Roof Type | Gable | |
| Roof Angle - Transverse Dir | 26 | degrees |
| Roof Angle - Long Dir | 26 | degrees |
| Ground to top of roof | 28 | ft |
| Bot of roof to top of roof | 8.5 | ft |
| Mean Roof Height, h | 23.75 | ft |
| Short Plan Dimension | 30 | ft |
| Long Plan Dimension | 60 | ft |
| Parapet ? | No | |
| Ground to top of parapet | | ft |
| Average Parapet Height | | ft |
| Ht of 2nd Level Above Grade | 15 | ft |

| | | |
|---|---|---|
| Velocity Pressure at Mean Roof Height, $q_h$ = | 24.6 | psf |

**Transverse Wind Pressures**

L/B = 0.50 h/L = 0.79

Pressure Coefficients from Figure 27.4-1:

| Bldg Face | $C_p$ |
|---|---|
| Windward Wall | 0.8 |
| Leeward Wall | -0.50 |
| Windward Roof | -0.39 / 0.11 |
| Leeward Roof | -0.60 |

Wall Pressures (Unfactored): ASD

| Ht | $K_z$ | $q_z$ | $P_{ww\ walls}$ | $P_{lwwalls}$ | **$P_{walls}$ (psf)** |
|---|---|---|---|---|---|
| 0-15 | 0.85 | 22.38 | 15.22 | 10.46 | **15.41** |
| 15-20 | 0.9 | 23.70 | 16.11 | 10.46 | **15.95** |
| 20-25 | 0.94 | 24.75 | 16.83 | 10.46 | **16.38** |
| 25-30 | 0.98 | 25.80 | 17.55 | 10.46 | **16.81** |
| 30-40 | 1.04 | 27.38 | 18.62 | 10.46 | **17.45** |
| 41-50 | 1.09 | 28.70 | 19.52 | 10.46 | **17.99** |
| 51-60 | 1.13 | 29.75 | 20.23 | 10.46 | **18.42** |
| 61-70 | 1.17 | 30.81 | 20.95 | 10.46 | **18.85** |
| 71-80 | 1.21 | 31.86 | 21.66 | 10.46 | **19.28** |
| 81-90 | 1.24 | 32.65 | 22.20 | 10.46 | **19.60** |
| 91-100 | 1.26 | 33.18 | 22.56 | 10.46 | **19.81** |

Roof Pressures (Unfactored) ASD

| Windward | | Leeward | **Horiz Proj (psf)** |
|---|---|---|---|
| Max | Min | | |
| 2.2 | -8.1 | -12.6 | **4.80** |

**Longitudinal Wind Pressures**

L/B = 2.00 h/L = 0.40

Pressure Coefficients from Figure 27.4-1:

| Bldg Face | $C_p$ |
|---|---|
| Windward Wall | 0.8 |
| Leeward Wall | -0.30 |
| Windward Roof | -0.25 / 0.24 |
| Leeward Roof | -0.60 |

Wall Pressures (Unfactored): ASD

| Ht | $K_z$ | $q_z$ | $P_{ww\ walls}$ | $P_{lwwalls}$ | **$P_{walls}$ (psf)** |
|---|---|---|---|---|---|
| 0-15 | 0.85 | 22.38 | 15.22 | 6.28 | **12.90** |
| 15-20 | 0.9 | 23.70 | 16.11 | 6.28 | **13.44** |
| 20-25 | 0.94 | 24.75 | 16.83 | 6.28 | **13.86** |
| 25-30 | 0.98 | 25.80 | 17.55 | 6.28 | **14.29** |
| 30-40 | 1.04 | 27.38 | 18.62 | 6.28 | **14.94** |
| 41-50 | 1.09 | 28.70 | 19.52 | 6.28 | **15.48** |
| 51-60 | 1.13 | 29.75 | 20.23 | 6.28 | **15.91** |
| 61-70 | 1.17 | 30.81 | 20.95 | 6.28 | **16.34** |
| 71-80 | 1.21 | 31.86 | 21.66 | 6.28 | **16.77** |
| 81-90 | 1.24 | 32.65 | 22.20 | 6.28 | **17.09** |
| 91-100 | 1.26 | 33.18 | 22.56 | 6.28 | **17.30** |

Roof Pressures (Unfactored) ASD

| Windward | | Leeward | **Horiz Proj (psf)** |
|---|---|---|---|
| Max | Min | | |
| 5.1 | -5.2 | -12.6 | **4.80** |

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# Lateral Design

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Kahan Spec Home
PROJECT Lateral Design

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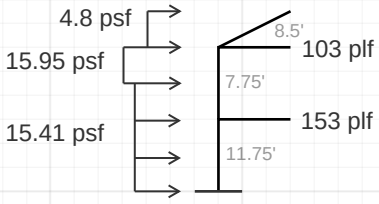
## Lateral Design

### Wind Pressure Distribution




### Seismic Story Shear

9.5+0.3=9.8 k

5.9+0.5=6.4 k

Add stone veneer to seismic weight:

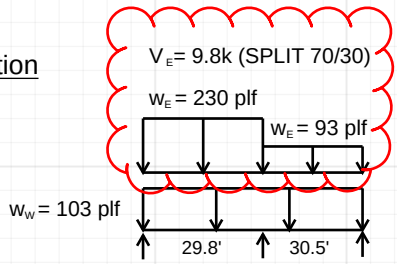
Vs-brick= 0.7*0.15*15psf*200 = 0.3k

Vs-brick= 0.7*0.15*15psf*303 = 0.5k

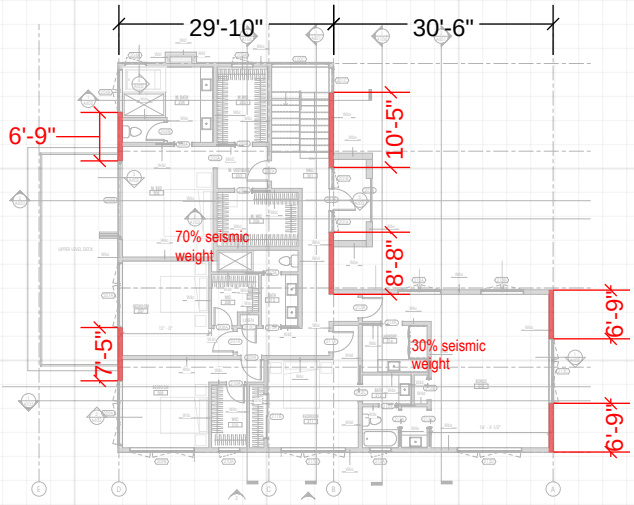
Total Base Shear = 16.2 k

### N-S Direction

#### Roof




| | | | |
|---|---|---|---|
| *V(k) [W/E]* | 1.5/3.4 | 3.1/4.9 | 1.6/1.4 |
| *L(ft) [act/red]* | 14.2 | 19.1 | 13.5 |
| *v(plf)* | 239 | 257 | 119 |
| *SW* | W6 | W6 | W6 |
| *OT(k)* | OT-0.6D =1.4 | OT-0.6D =1.4 | 0.9 |
| *HD* | CS16 | CS16 | CS16 |



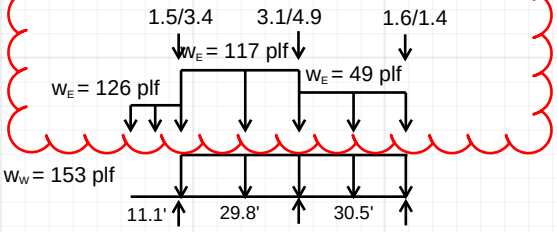

h=7.75'
h/2=3.875'
h/3.5=2.21'

N

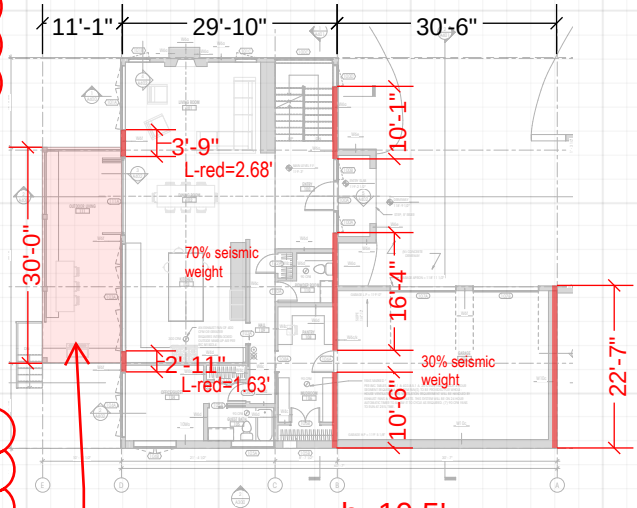
#### Floor

$V_{E(deck)}$ = 1.4k

$V_E$ = 6.4k - deck = 6.4-1.4 = 5.0K (SPLIT 70/30)




| | | | |
|---|---|---|---|
| *V(k) [W/E]* | 3.8/6.6 | 7.7/7.4 | 3.9/2.2 |
| *L(ft) [act/red]* | 6.67/4.31 | 36.9 | full height |
| *v(plf)* | 1531 | 209 | concrete |
| *SW* | 2W2-10-DF | W6 | - |
| *OT(k)* | 10.5 | 2.2 | - |
| *HD* | HDU11 | HDU2 | - |
| *ΣOT(k)* | 11.6 | 3.4 | - |
| *ΣHD* | HDU14 | HDU4 | - |




cantilever deck diaphragm

h=10.5'
h/2=5.25'
h/3.5=3'

N

Deck:
Dead Load = 10psf (typ. wood deck) + 20psf (tile pavers) = 30psf
Seismic weight = 333sf*30psf=9.99k
Veq deck = 1.4k
$w_E$ = 1.4/11.1 = 126plf
M-deck= 7.8kft
M/d = 7.8kft/30ft = 260lbs --> DTT2Z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Kahan Spec Home

PROJECT Lateral Design

04/30/21 DATE

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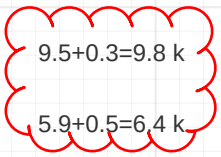
5 SHEET

# Lateral Design

## Wind Pressure Distribution


## Seismic Story Shear




Add brick to seismic weight:

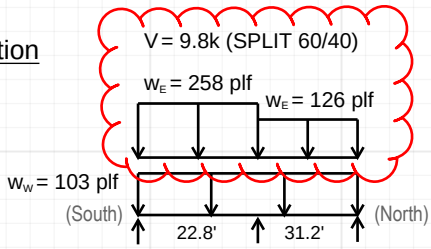
Vs-brick= 0.7*0.15*15psf*200 = 0.3k

Vs-brick= 0.7*0.15*15psf*303 = 0.5k

Total Base Shear = 16.2 k

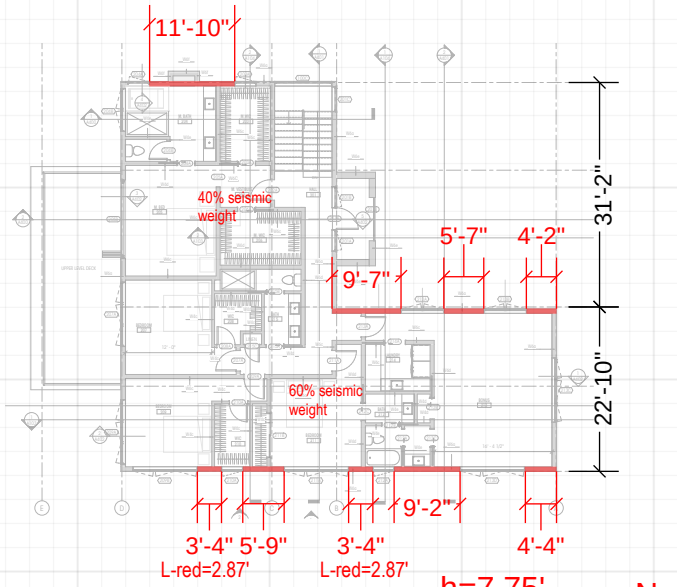
### E-W Direction

#### Roof

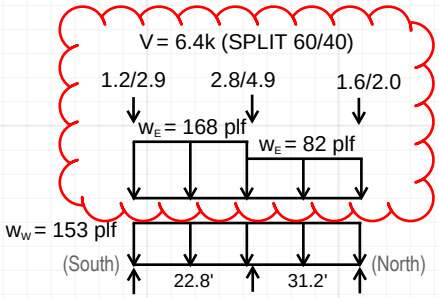



| | | | |
|---|---|---|---|
| *V(k) [W/E]* | 1.2/2.9 | 2.8/4.9 | 1.6/2.0 |
| *L(ft) [act/red]* | 25 | 19.33 | 11.83 |
| *v(plf)* | 116 | 212 | 169 |
| *SW* | W6 | W6 | W6 |
| *OT(k)* | - | 1.6 | 1.7 |
| *HD* | - | CS16 | CS16 |

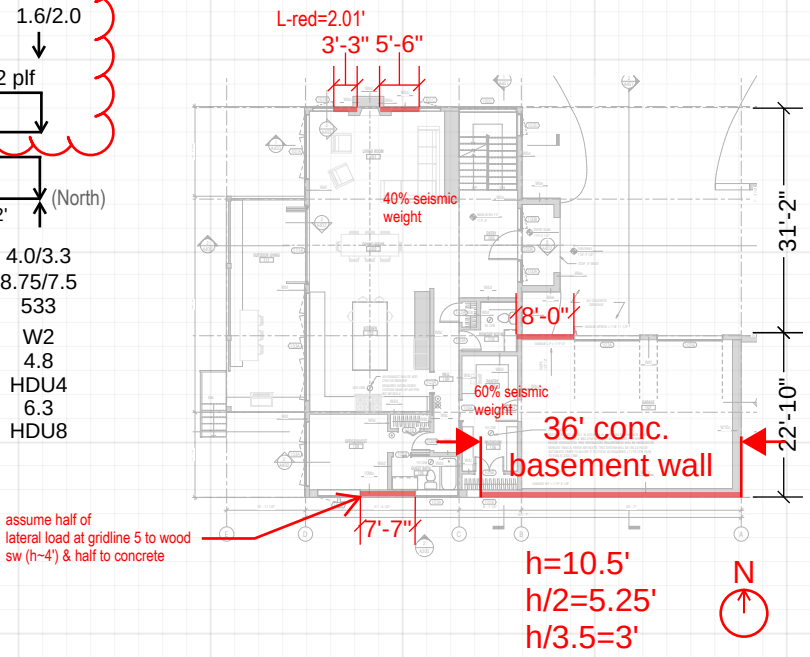
USE FTAO TO REDUCE HDS - SEE ATTACHED SPREADSHEET




#### Floor




| | | | | |
|---|---|---|---|---|
| *V(k) [W/E]* | total | 2.9/4.8 | 6.9/8.1 | 4.0/3.3 |
| | 50% | 1.5/2.4 | | |
| *L(ft) [act/red]* | | 7.5 | 8 | 8.75/7.5 |
| *v(plf)* | | 320 | 1013 | 533 |
| *SW* | | W4 | 2W2 | W2 |
| *OT(k)* | | 1.28 | OT-0.6D =9.8 | 4.8 |
| *HD* | | HDU2 | HDU11 | HDU4 |
| *ΣOT(k)* | | - | 11 | 6.3 |
| *ΣHD* | | - | HDU11 | HDU8 |





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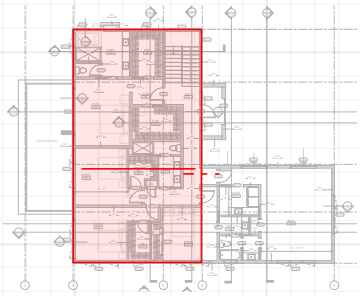
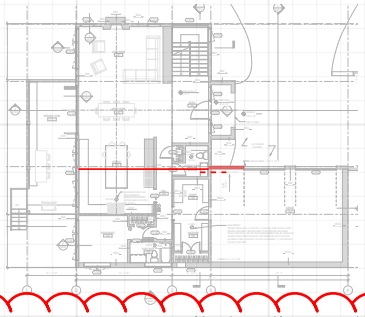
## Lateral Design

### Lateral continuity at roof:

Drag load into middle line of shearwalls:
Awest/Atotal = 70%
Veq=4.1k*.7=2.9k*omega = 7.2k
Provide HDU8

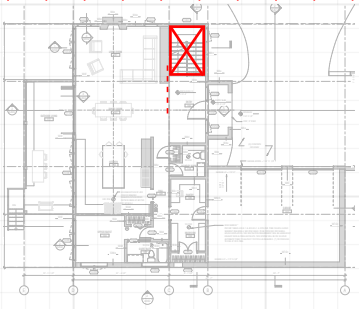


Drag load into shearwall
Awest/Atotal = 75%
Veq=7k*.75=5.3k*omega = 13.1k
Provide HDU14
At steel beam: 13.1k/30ft * 18ft = 7.8k
Provide HDU8



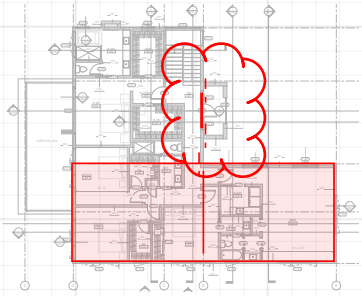
Re-entrant corner at stair opening:
$V_{eq}$=82plf
$M_w$ = 82plf(32ft)$^2$/8 = 10.5kft
M/d = 10.5kft/21ft = 500 lbs
Ω*M/d = 2.5*500lbs = 1250lbs

Provide CS16 strap
Diaphragm capacity = 167plf
1250lbs/167plf=7.5ft = 8ft of strap



Drag load into middle line of shearwalls:
Awest/Atotal = 60%
Veq=4.1k*.6*omega = 6.2k
Provide HDU8 @ intersection

Provide CMST14 @ flush hdr



Check top plate chord force:

$w_w$ = 103 plf

$w_E$ = 0.4*$F_{px}$/32ft
= 0.4*7300lbs/32ft
= 94 plf

$M_E$ = 94plf(32ft)$^2$/8 = 12.0kft
M/d = 12.0kft/30ft = 401lbs
Ω*M/d = 2.5*401lbs = 1003lbs
< 1140lbs (top chord splice)

Note:
No change to drag straps due to change in rho.
Seismic with overstrength controls, therefore rho = 1.0

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SEATTLE
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934 Broadway, Suite 100, Tacoma, WA 98402 | O 253.284.9470
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# Force Transfer Around Openings Calculator

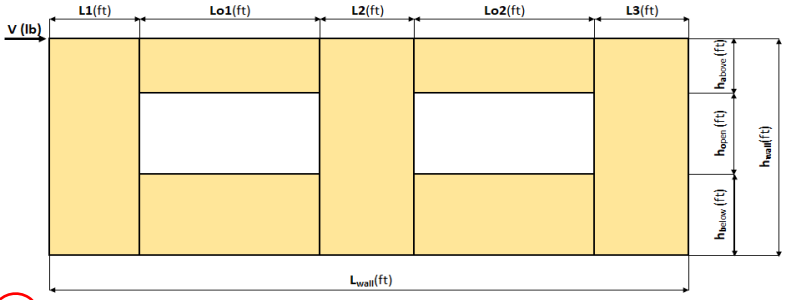
## TWO OPENINGS

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

**Project Information**

| | |
|---|---|
| **Code:** | IBC |
| **Designer:** | HAA |
| **Client:** | Brandt |
| **Project:** | Kahan Spec Home |
| **Wall Line:** | Gridline 3 - Roof |

**Date:** 4/29/2020




**Shear Wall Calculation Variables**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| V | 4900 lbf | | Opening 1 | | Opening 2 | Adj. Factor Method = | 2bs/h |
| L1 | 9.58 ft | ha1 | 0.83 ft | ha2 | 0.83 ft | Wall Pier Aspect Ratio | Adj. Factor |
| L2 | 5.58 ft | ho1 | 5.50 ft | ho2 | 5.50 ft | P1=ho1/L1= 0.57 | N/A |
| L3 | 4.17 ft | hb1 | 1.42 ft | hb2 | 1.42 ft | P2=ho2/L2= 0.99 | N/A |
| $h_{wall}$ | 7.75 ft | Lo1 | 6.00 ft | Lo2 | 6.00 ft | P3=ho3/L3= 1.32 | N/A |
| $L_{wall}$ | 31.33 ft | | | | | | |

**1. Hold-down forces: $H = Vh_{wall}/L_{wall}$** 1212 lbf

**2. Unit shear above + below opening**

| | |
|---|---|
| First opening: va1 = vb1 = H/(ha1+hb1) = | 539 plf |
| Second opening: va2 = vb2 = H/(ha2+hb2) = | 539 plf |

**3. Total boundary force above + below openings**

| | |
|---|---|
| First opening: O1 = va1 x (Lo1) = | 3232 lbf |
| Second opening: O2 = va2 x (Lo2) = | 3232 lbf |

**4. Corner forces**

| | |
|---|---|
| F1 = O1(L1)/(L1+L2) = | 2043 lbf |
| F2 = O1(L2)/(L1+L2) = | 1190 lbf |
| F3 = O2(L2)/(L2+L3) = | 1850 lbf |
| F4 = O2(L3)/(L2+L3) = | 1382 lbf |

**5. Tributary length of openings**

| | |
|---|---|
| T1 = (L1*Lo1)/(L1+L2) = | 3.79 ft |
| T2 = (L2*Lo1)/(L1+L2) = | 2.21 ft |
| T3 = (L2*Lo2)/(L2+L3) = | 3.43 ft |
| T4 = (L3*Lo2)/(L2+L3) = | 2.57 ft |

**6. Unit shear beside opening**

| | |
|---|---|
| V1 = (V/L)(L1+T1)/L1 = | 218 plf |
| V2 = (V/L)(T2+L2+T3)/L2 = | 315 plf |
| V3 = (V/L)(T4+L3)/L3 = | 253 plf |
| Check V1*L1+V2*L2+V3*L3=V? | 4900 lbf **OK** |

**7. Resistance to corner forces**

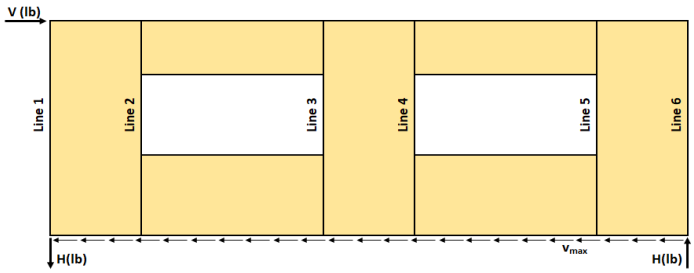
| | |
|---|---|
| R1 = V1*L1 = | 2091 lbf |
| R2 = V2*L2 = | 1755 lbf |
| R3 = V3*L3 = | 1054 lbf |

**8. Difference corner force + resistance**

| | |
|---|---|
| R1-F1 = | 49 lbf |
| R2-F2-F3 = | -1284 lbf |
| R3-F4 = | -329 lbf |

**9. Unit shear in corner zones**

| | |
|---|---|
| vc1 = (R1-F1)/L1 = | 5 plf |
| vc2 = (R2-F2-F3)/L2 = | -230 plf |
| vc3 = (R3-F4)/L3 = | -79 plf |




**Check Summary of Shear Values for Two Openings**

| | | | | |
|---|---|---|---|---|
| Line 1: vc1(ha1+hb1)+V1(ho1)=H? | | 11 | 1201 | 1212 lbf |
| Line 2: va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0? | 1212 | 11 | 1201 | 0 |
| Line 3: vc2(ha1+hb1)+V2(ho1)-va1(ha1+hb1)=0? | -518 | 1730 | 1212 | 0 |
| Line 4: va2(ha2+hb2)-V2(ho2)-vc2(ha2+hb2)=0? | 1212 | 1730 | -518 | 0 |
| Line 5: va2(ha2+hb2)-vc3(ha2+hb2)-V3(ho2)=0? | 1212 | -177 | 1390 | 0 |
| Line 6: vc3(ha2+hb2)+ V3(ho2) = H? | | -177 | 1390 | 1212 lbf |

## Design Summary

| | |
|---|---|
| **Req. Sheathing Capacity** | 539 plf |
| **Req. Strap Force** | 2043 lbf |
| **Req. HD Force** | 1212 lbf |

**4-Term Deflection**

**4-Term Story Drift %**

See Page 2

**3-Term Deflection**

**3-Term Story Drift %**

See Page 3

**Project Information**

| | | | |
|---|---|---|---|
| **Code:** | IBC | **Date:** | 4/29/2020 |
| **Designer:** | HAA | | |
| **Client:** | Brandt | | |
| **Project:** | Kahan Spec Home | | |
| **Wall Line:** | Gridline 3 - Roof | | |

**Shear Wall Deflection Calculation Variables**

| Sheathing: | | Wood End Post Values: | | | Nail Type: | 8d common | (penny weight) |
|---|---|---|---|---|---|---|---|
| Plywood | Sheathing Material | Species: | hem fir | | | | |
| 15/32 | Performance Category | E: | 1.30E+06 | (psi) | | Pier 1 | Pier 3 |
| APA Rated Sheathing | Grade | | Qty | Stud Size | Nail Spacing: | 6 | 6 (in.) |
| | | Dimensions: | 2 | 2x6 | HD Capacity: | 1705 | 1705 (lbf) |
| | Gt Override | A: | 16.5 | (in.$^2$) | HD Deflection: | | (in.) |
| | Ga Overide | A Override: | | (in.$^2$) | | | |

**Four-Term Equation Deflection Check**

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a\frac{h}{b} \qquad \text{(Equation 23-2)}$$

| | Pier 1-L | Pier 1-R | Pier 2-L | Pier 2-R | Pier 3-L | Pier 3-R | |
|---|---|---|---|---|---|---|---|
| Sheathing: | 15/32 | 15/32 | 15/32 | 15/32 | 15/32 | 15/32 | |
| Nail: | 8d common | 8d common | 8d common | 8d common | 8d common | 8d common | |
| $v_{asd}$: | 218 | 218 | 315 | 315 | 253 | 253 | (plf) |
| $v_{strength}$: | 312 | 312 | 449 | 449 | 361 | 361 | (plf) |
| E: | 1.30E+06 | 1.30E+06 | 1.30E+06 | 1.30E+06 | 1.30E+06 | 1.30E+06 | (psi) |
| h: | 7.75 | 6.33 | 6.33 | 6.33 | 6.33 | 7.75 | (ft) |
| A: | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | (in.$^2$) |
| Gt: | 27,000 | 27,000 | 27,000 | 27,000 | 27,000 | 27,000 | (lbf/in.) |
| Nail Spacing: | 6 | 6 | 6 | 6 | 6 | 6 | (in.) |
| Vn: | 156 | 156 | 225 | 225 | 180 | 180 | (plf) |
| e: | 0.0158 | 0.0158 | 0.0476 | 0.0476 | 0.0246 | 0.0246 | (in.) |
| b: | 9.58 | 9.58 | 5.58 | 5.58 | 4.17 | 4.17 | (ft) |
| HD Capacity: | 1705 | 1705 | 1705 | 1705 | 1705 | 1705 | (lbf) |
| HD Defl: | | | | | | | (in.) |

**Check Total Deflection of Wall System**

| Pier 1 (left) | | | | Pier 1 (right) | | | |
|---|---|---|---|---|---|---|---|
| Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 4 HD-1 | Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 4 HD-2 |
| 0.006 | 0.090 | 0.092 | | 0.003 | 0.073 | 0.075 | |
| | | Sum | 0.187 | | | Sum | 0.151 |
| Pier 2 (left) | | | | Pier 2 (right) | | | |
| Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 4 HD-1 | Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 4 HD-2 |
| 0.008 | 0.105 | 0.226 | | 0.008 | 0.105 | 0.226 | |
| | | Sum | 0.339 | | | Sum | 0.339 |
| Pier 3 (left) | | | | Pier 3 (right) | | | |
| Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 4 HD-1 | Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 4 HD-2 |
| 0.008 | 0.085 | 0.117 | | 0.015 | 0.104 | 0.143 | |
| | | Sum | 0.210 | | | Sum | 0.262 |

| Total Defl. | |
|---|---|
| | (in.) |
| | %drift |

**APA Disclaimer**

**Project Information**

| | | | |
|---|---|---|---|
| **Code:** | IBC | **Date:** | 4/29/2020 |
| **Designer:** | HAA | | |
| **Client:** | Brandt | | |
| **Project:** | Kahan Spec Home | | |
| **Wall Line:** | Gridline 3 - Roof | | |

**Three-Term Equation Deflection Check**

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \qquad (4.3\text{-}1)$$

| | Pier 1-L | Pier 1-R | Pier 2-L | Pier 2-R | Pier 3-L | Pier 3-R | |
|---|---|---|---|---|---|---|---|
| Sheathing: | 15/32 | 15/32 | 15/32 | 15/32 | 15/32 | 15/32 | |
| Nail: | 8d common | 8d common | 8d common | 8d common | 8d common | 8d common | |
| $v_{asd}$: | 218 | 218 | 315 | 315 | 253 | 253 | (plf) |
| $v_{strength}$: | 312 | 312 | 449 | 449 | 361 | 361 | (plf) |
| E: | 1.30E+06 | 1.30E+06 | 1.30E+06 | 1.30E+06 | 1.30E+06 | 1.30E+06 | (psi) |
| h: | 7.75 | 6.33 | 6.33 | 6.33 | 6.33 | 7.75 | (ft) |
| A: | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | ($in.^2$) |
| Ga: | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | (kips/in.) |
| b: | 9.58 | 9.58 | 5.58 | 5.58 | 4.17 | 4.17 | (ft) |
| HD Capacity: | 1705 | 1705 | 1705 | 1705 | 1705 | 1705 | (lbf) |
| HD Defl: | | | | | | | (in.) |

**Check Total Deflection of Wall System**

| Pier 1 (left) | | | Pier 1 (right) | | |
|---|---|---|---|---|---|
| Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 1 Bending | Term 2 Shear | Term 3 Fastener |
| 0.006 | 0.242 | | 0.003 | 0.197 | |
| | Sum | 0.247 | | Sum | 0.200 |
| Pier 2 (left) | | | Pier 2 (right) | | |
| Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 1 Bending | Term 2 Shear | Term 3 Fastener |
| 0.008 | 0.284 | | 0.008 | 0.284 | |
| | Sum | 0.292 | | Sum | 0.292 |
| Pier 3 (left) | | | Pier 3 (right) | | |
| Term 1 Bending | Term 2 Shear | Term 3 Fastener | Term 1 Bending | Term 2 Shear | Term 3 Fastener |
| 0.008 | 0.228 | | 0.015 | 0.280 | |
| | Sum | 0.237 | | Sum | 0.295 |

| Total Defl. | |
|---|---|
| | (in.) |
| | %drift |

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4*ASD capacity.

# Gravity Design

SWENSON SAY FAGÉT
ssfengineers.com
SEATTLE
2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
TACOMA
934 Broadway, Suite 100, Tacoma, WA 98402 | O 253.284.9470

# Gravity Design

## Roof Framing

### B1

| | |
|---|---|
| L= 9' | $f_b$= 987 psi |
| w= 600 plf | $f_v$= 81 psi |
| R= 2.7 k | Δ= 0.125" |
| M= 6.1 k-ft | L/861 |

4x12

### B2

| | |
|---|---|
| L= 11' | $f_b$= 1147 psi |
| w= 600 plf | $f_v$= 93 psi |
| R= 3.3 k | Δ= 0.171" |
| M= 9.1 k-ft | L/770 |

GL 3-1/8X13-1/2

### B3

| | |
|---|---|
| L= 18' | $f_b$= 1902 psi |
| w= 460 plf | $f_v$= 283 psi |
| P= 6.9 k (@ 7ft) | Δ= 0.16" |
| R= 6.4 k | L/668 |
| M= 11.9 k-ft | |

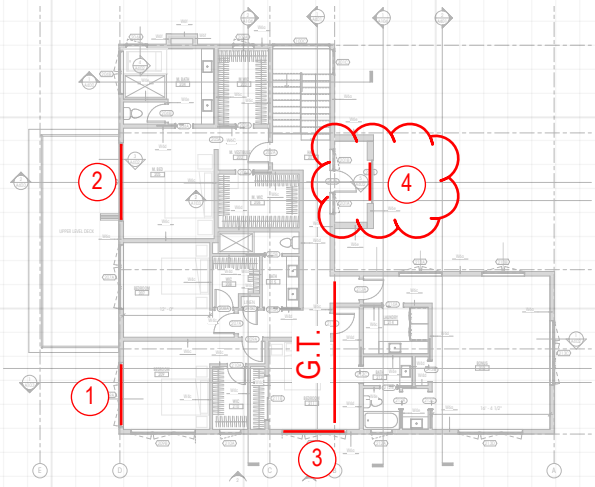
GL 3.125x12

### B4

| | |
|---|---|
| L= 6' | $f_b$= 921 psi |
| w= 188 plf | $f_v$= 58 psi |
| P= 0.8 k (@ 3ft) | Δ= 0.09" |
| R= 1.0 k | L/772 (MEETS L/500 |
| M= 2.0 k-ft | STONE VENEER LIMITS) |

(2)2X8

Key plan





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ssfengineers.com
SEATTLE
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# Gravity Design

## Upper Floor Framing

### B1

L= 23' w= 69 plf Rxn= 0.8 k

14" TJI 360 @ 16" oc

### B2

L= 22.5' $DCR_M$: 0.85
w= 780 plf $DCR_V$: 0.16
R= 8.7 k Δ= 0.65"
M= 49.4 k-ft L/414

W12x26

### B3

L= 30' $DCR_M$= 0.68
w1= 69 plf $DCR_V$= 0.10
w2 = 286 plf Δ= 0.77"
P= 8.7 k (@ 17') L/466
P= 3.0 k (@ 31')
R= 8.74 k
M= 86 k-ft

W12x65

### B4

L= 11' $f_b$= 1238 psi
w= 780 plf $f_v$= 103 psi
R= 4.3 k Δ= 0.21"
M= 11.8 k-ft L/637

LSL 3-1/2x14

### B5

L= 11' $f_b$= 1041 psi
w= 984 plf $f_v$= 87 psi
R= 5.4 k Δ= 0.17"
M= 14.9 k-ft L/758

LVL (3) 1-3/4x14

### B6

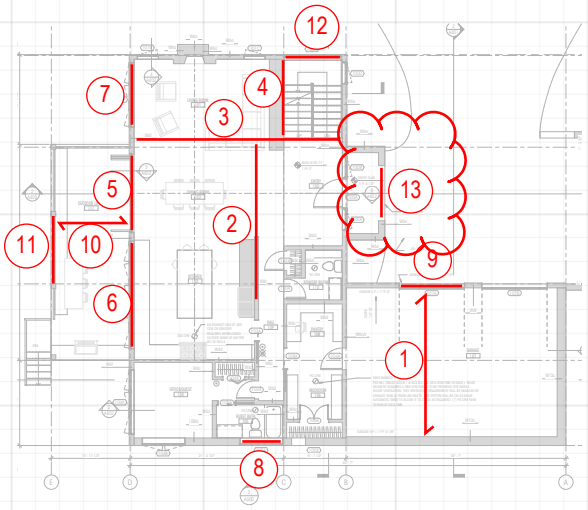
SEE ATTACHED
GL5-1/8x16-1/2

### B7

L= 9' $f_b$= 1083 psi
w1= 546 plf $f_v$= 117 psi
w2 = 1146 plf Δ= 0.12"
P= 1.8 k (@ 6') L/939
R= 5.2 k
M= 10.3 k-ft

LSL 3-1/2x14

Key plan




### B7 w/ ΩOT

L= 9' $f_b$= 1922 psi
w1= 546 plf $f_v$= 199 psi
w2 = 1146 plf Δ= 0.19"
P= 5.8 k (@ 6') L/577
R= 7.8 k
M= 18.3 k-ft

LSL 3-1/2x14

### B8

L= 6' $f_b$= 1097 psi
w1= 169 plf $f_v$= 115 psi
w2 = 169 plf Δ= 0.05"
P= 4.3 k (@ 3.75') L/1435
R= 3.2 k
M= 6.7 k-ft

4x12

### B9

L= 9.5' $f_b$= 2494 psi
w= 1058 plf $f_v$= 187 psi
R= 5.0 k Δ= 0.36"
M= 11.9 k-ft L/319

GL 3-1/8x10-1/2

### B10

L= 11.5' $f_b$= 784 psi
w= 125 plf $f_v$= 53 psi
R= 0.7 k Δ= 0.21"
M= 2.1 k-ft L/649

2x12@16"OC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SEATTLE TACOMA
2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
934 Broadway, Suite 100, Tacoma, WA 98402 | O 253.284.9470
ssfengineers.com

## Gravity Design

### Upper Floor (Cont.)

**B11**

| | |
|---|---|
| L= 10' | $f_b$= 848 psi |
| w= 443 plf | $f_v$= 55 psi |
| R= 2.2 k | Δ= 0.17" |
| M= 5.5 k-ft | L/698 |

6x10 DF No.1

**B12**

| | |
|---|---|
| L= 9' | $f_b$= 1063 psi |
| w= 230 plf | $f_v$= 62 psi |
| R= 1.0 k | Δ= 0.27" |
| M= 2.3 k-ft | L/394 |

(2) 2x8

**B13**

| | |
|---|---|
| L= 8' | $f_b$= 816 psi |
| w= 224 plf | $f_v$= 52 psi |
| R= 0.9 k | Δ= 0.17" |
| M= 1.8 k-ft | L/577 (MEETS L/500 STONE VENEER LIMITS) |

(2)2x8

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SEATTLE 2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
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# SINGLE-SPAN BEAM ANALYSIS

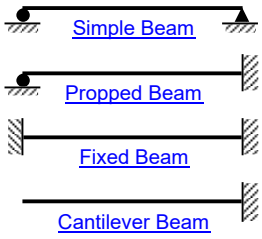
**For Simple, Propped, Fixed, or Cantilever Beams**

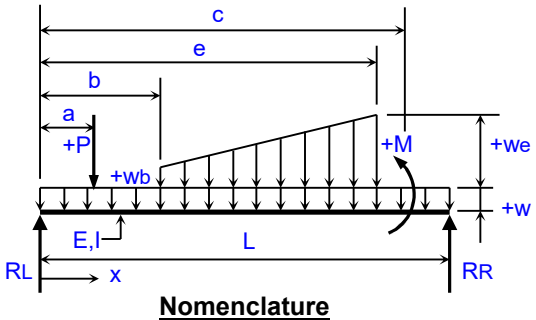
| | | | | | |
|---|---|---|---|---|---|
| Job Name: | Kahan | Subject: | Upper Floor Beam 6 | | |
| Job Number: | 01519-2020-15 | Originator: | haa | Checker: | |

## Input Data:

### Beam Data:

| | | |
|---|---|---|
| Span Type? | Simple | |
| Span, L = | 15.0000 | ft. |
| Modulus, E = | 1800 | ksi |
| Inertia, I = | 1918.512 | in.^4 |




**Nomenclature**

### Beam Loadings:

**Full Uniform:**

w = 0.9836 kips/ft.

| Distributed: | Start b (ft.) | Start wb (kips/ft.) | End e (ft.) | End we (kips/ft.) |
|---|---|---|---|---|
| #1: | 0.0000 | 0.6000 | 2.0000 | 0.6000 |
| #2: | 11.0000 | 0.6000 | 15.0000 | 0.6000 |
| #3: | | | | |
| #4: | | | | |
| #5: | | | | |
| #6: | | | | |
| #7: | | | | |
| #8: | | | | |

| Point Loads: | a (ft.) | P (kips) |
|---|---|---|
| #1: | 2.0000 | 2.70 |
| #2: | 11.0000 | 2.70 |
| #3: | | |
| #4: | | |
| #5: | | |
| #6: | 11.0000 | 0.00 |
| #7: | | |
| #8: | | |
| #9: | | |
| #10: | | |
| #11: | | |
| #12: | | |
| #13: | | |
| #14: | | |
| #15: | | |

| Moments: | c (ft.) | M (ft-kips) |
|---|---|---|
| #1: | | |
| #2: | | |
| #3: | | |
| #4: | | |

## Results:

### Reactions:

| | | | |
|---|---|---|---|
| RL = | 11.877 k | RR = | 11.88 k |
| ML = | N.A. | MR = | N.A. |

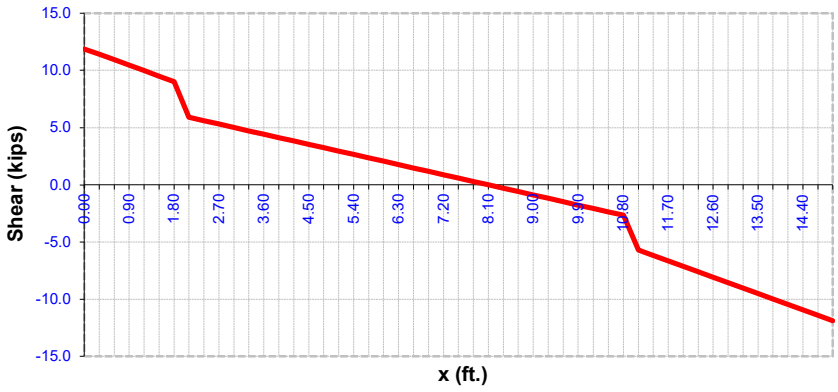
### Maximum Moments:

| | | | |
|---|---|---|---|
| +M(max) = | 38.95 ft-k | @ x = | 8.11 ft. |
| -M(max) = | 0.00 ft-k | @ x = | 0.00 ft. |

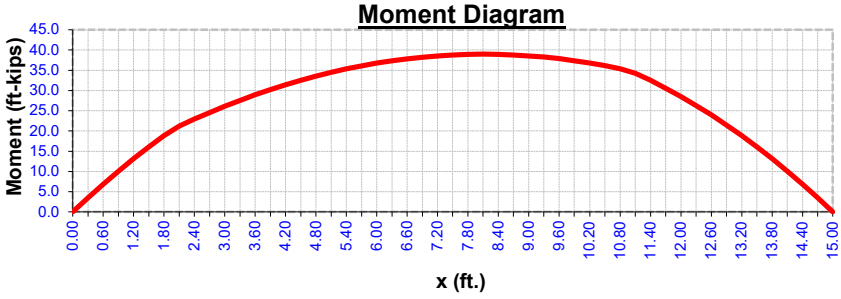
### Maximum Deflections:

| | | | |
|---|---|---|---|
| -Δ(max) = | -0.471 in. | @ x = | 7.59 ft. |
| +Δ(max) = | 0.000 in. | @ x = | 0.00 ft. |
| Δ(ratio) = | L/382 | | |

### Shear Diagram




### Moment Diagram



# SINGLE-SPAN BEAM ANALYSIS

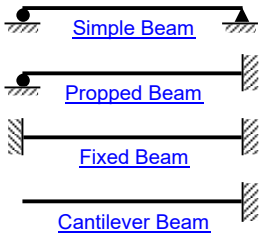
**For Simple, Propped, Fixed, or Cantilever Beams**

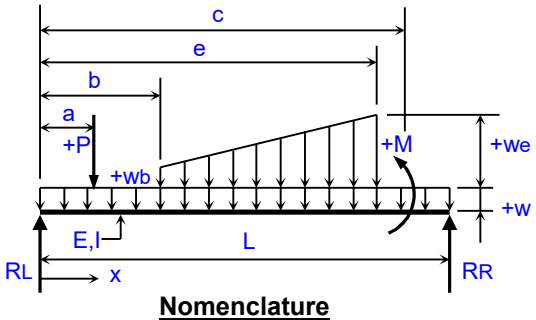
| | | | | | |
|---|---|---|---|---|---|
| Job Name: | Kahan | Subject: | Upper Floor Beam 6 | | |
| Job Number: | 01519-2020-15 | Originator: | haa | Checker: | |

## Input Data:

### Beam Data:

| | | |
|---|---|---|
| Span Type? | Simple | |
| Span, L = | 15.0000 | ft. |
| Modulus, E = | 1800 | ksi |
| Inertia, I = | 1918.512 | in.^4 |




**Nomenclature**

### Beam Loadings:

**Full Uniform:**

w = 0.9836 kips/ft.

| Distributed: | Start b (ft.) | Start Wb (kips/ft.) | End e (ft.) | End We (kips/ft.) |
|---|---|---|---|---|
| #1: | 0.0000 | 0.6000 | 2.0000 | 0.6000 |
| #2: | 11.0000 | 0.6000 | 15.0000 | 0.6000 |
| #3: | | | | |
| #4: | | | | |
| #5: | | | | |
| #6: | | | | |
| #7: | | | | |
| #8: | | | | |

| Point Loads: | a (ft.) | P (kips) |
|---|---|---|
| #1: | 2.0000 | 2.70 |
| #2: | 11.0000 | 2.70 |
| #3: | | |
| #4: | | |
| #5: | | |
| omega*ot = | 11.0000 | 4.00 |
| #7: | | |
| #8: | | |
| #9: | | |
| #10: | | |
| #11: | | |
| #12: | | |
| #13: | | |
| #14: | | |
| #15: | | |

| Moments: | c (ft.) | M (ft-kips) |
|---|---|---|
| #1: | | |
| #2: | | |
| #3: | | |
| #4: | | |

## Results:

### Reactions:

| | | | |
|---|---|---|---|
| RL = | 12.944 k | RR = | 14.81 k |
| ML = | N.A. | MR = | N.A. |

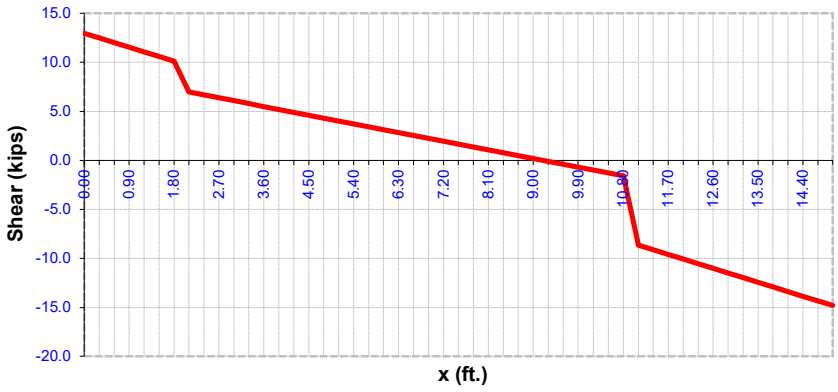
### Maximum Moments:

| | | | |
|---|---|---|---|
| +M(max) = | 48.18 ft-k | @ x = | 9.19 ft. |
| -M(max) = | 0.00 ft-k | @ x = | 0.00 ft. |

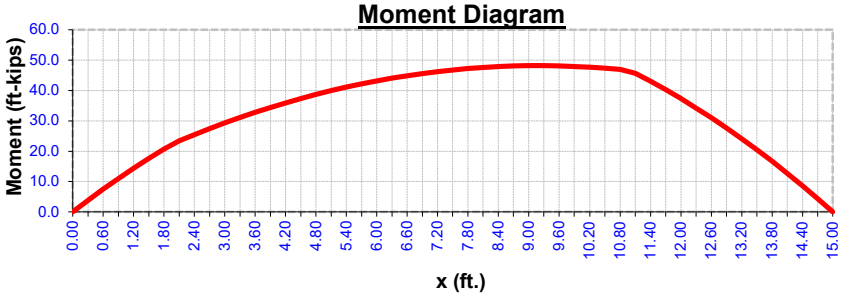
### Maximum Deflections:

| | | | |
|---|---|---|---|
| -Δ(max) = | -0.573 in. | @ x = | 7.73 ft. |
| +Δ(max) = | 0.000 in. | @ x = | 0.00 ft. |
| Δ(ratio) = | L/314 | | |

### Shear Diagram




### Moment Diagram



# Gravity Design

## Main Floor Framing

### B1

L= 12'
w= 286 plf
P= 3.0 k (@ mid-span)
R= 3.1 k
M= 10.3 k-ft

$f_b$= 1078 psi
$f_v$= 86 psi
Δ= 0.17"
L/825

LSL 3-1/2x14

### B2

L= 22.5'
w= 780 plf
R= 8.7 k
M= 49.4 k-ft

$DCR_M$: 0.85
$DCR_V$: 0.16
Δ= 0.65"
L/414

W12x26

### B3

L= 11'
w= 780 plf
R= 4.3 k
M= 11.8 k-ft

$f_b$= 1238 psi
$f_v$= 103 psi
Δ= 0.21"
L/637

LSL 3-1/2x14

### B4

L= 6'
w= 546 plf
R= 1.6 k
M= 2.5 k-ft

$f_b$= 689 psi
$f_v$= 66 psi
Δ= 0.06"
L/1163

(2) 2x10

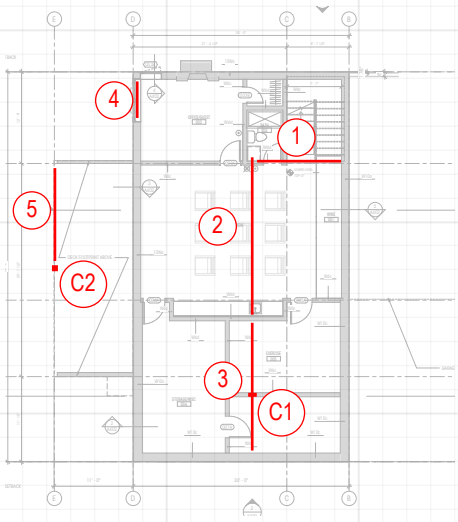
### B5

L= 12'
w= 540 plf
P= 5.5 k (@ 9.25')
R= 7.5 k
M= 18.8 k-ft

$f_b$= 1837 psi
$f_v$= 170 psi
Δ= 0.36"
L/405

GL 5-1/8x12

Key plan

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2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
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## *Column Buckling Calculations*

**NDS 2015**

*Column Geometry Data*

| Hem-Fir #2 Studs | | |
|---|---|---|
| Hem-Fir Plates | | |
| b | 5.5 | in |
| d | 9 | in |
| $Le_1$ | 9.10 | ft |
| $Le_2$ | 9.10 | ft |
| $le_{bending}$ | 8 | ft |

*Column Design Values*

| | | |
|---|---|---|
| $F_b$ | 850 | psi |
| $F_c$ | 1300 | psi |
| E'min | 470 | ksi |
| Fcperp | 405 | psi |
| cb | 1.00 | |

*Column Loading*

| | | |
|---|---|---|
| P | 18566 | lbs |
| $W_1$ | 0 | plf |
| M1 | 0 | ft-lbs |
| $W_2$ | 0 | plf |
| M2 | 0 | ft-lbs |

*Flexural Stress Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.00 |
| Size Factor - $C_F$ | 1.00 |
| Repetitive - $C_r$ | 1.00 |

*Compressive Parallel Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.00 |
| Size Factor - $C_F$ | 1.00 |

*Other Factors*

| Visually Graded Lumber | |
|---|---|
| c | 0.8 |
| Solid Column | |
| Kf | 1 |
| Column: Pinned Pinned | |
| Ke | 1 |

| *Bracing* |
|---|
| No Brace |
| No Brace |

| *Bearing* |
|---|
| *Area* |
| *Increase* |
| No |

*Column Stability Factor Calculation*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $Fce_1$ | 2624 | psi | $Fce_2$ 980 | psi |
| $Fc^*_1$ | 1300 | psi | $Fc^*_2$ 1300 | psi |
| $Fce_1/Fc^*_1$ | 2.019 | | $Fce_2/Fc^*_2$ 0.754 | |
| $Cp_1$ | 0.869 | | $Cp_2$ 0.587 | |

*Beam Stability Factor Calculation*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $Fbe_1$ | 19747 | psi | $Fbe_2$ 42,258 | psi |
| $Fb'_1$ | 850 | psi | $Fb'_2$ 850 | psi |
| $Fbe_1/Fb'_1$ | 23.2 | | $Fbe_2/Fb'_2$ 50 | |
| le | 8.0 | ft | | |
| $CL_1$ | 1.00 | | | |

*Adjusted Allowable Stresses*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $Fc'_1$ | 1129 | psi | $Fc'_2$ 763 | psi |
| $Fb'_1$ | 848 | psi | $Fb'_2$ 850 | psi |

*Imposed Column Stresses*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $fc_1$ | 375 | psi | $fc_2$ 375 | psi |
| $fb_1$ | 0 | psi | $fb_2$ 0 | psi |

| | | |
|---|---|---|
| ***Perpendicular to Grain Stress Check fcp/Fcp =*** | ***375 / 405*** | **OK** |
| ***Slenderness Check le/d*** | **12** | **OK** |
| ***Slenderness Check le/b*** | **20** | **OK** |

(1) $$\left(\frac{f_c}{F_c'}\right)^2+\frac{f_{b1}}{F_{b1}'\left[1-f_c/F_{cE1}\right]}+\frac{f_{b2}}{F_{b2}'\left[1-f_c/F_{cE2}-\left(f_{b1}/F_{bE1}\right)\right]}\le 1.0$$

(2) $$\frac{fc}{F_{cE2}}+\left(\frac{f_{b1}}{F_{bE}}\right)^2<1.0$$

(3) $$\frac{f_c}{F_{c'}},\frac{f_{b1}}{F_{b1}'},\frac{f_{b2}}{F_{b2}'}<1.0$$

| | | |
|---|---|---|
| ***Allowable Stress Interaction Formula*** | **0.49** | **OK** |


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2124 Third Avenue . Suite 100 . Seattle . WA 98121
www.swensonsayfaget.com
*Office:* 206.443.6212
*Fax:* 206.443.4870


Project: C1 - Main Floor Column
*Date:* *11/25/2020*
Project #: 01519-2020-15
Design: haa
Sheet: 18

## *Column Buckling Calculations*

**NDS 2015**

*Column Geometry Data*

| 6X Posts Doug Fir - Larch #1 | | |
|---|---|---|
| Other | | |
| b | 5.5 | in |
| d | 5.5 | in |
| $Le_1$ | 10.50 | ft |
| $Le_2$ | 10.50 | ft |
| $le_{bending}$ | 8 | ft |

*Bracing*

| |
|---|
| No Brace |
| No Brace |

*Column Design Values*

| | | |
|---|---|---|
| $F_b$ | 1200 | psi |
| $F_c$ | 1000 | psi |
| E'min | 580 | ksi |
| Fcperp | 650 | psi |
| cb | 1.00 | |

| *Bearing Area Increase* |
|---|
| No |

*Column Loading*

| | | |
|---|---|---|
| P | 11428 | lbs |
| $W_1$ | 0 | plf |
| M1 | 0 | ft-lbs |
| $W_2$ | 0 | plf |
| M2 | 0 | ft-lbs |

*Flexural Stress Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.00 |
| Size Factor - $C_F$ | 1.00 |
| Repetitive - $C_r$ | 1.00 |

*Compressive Parallel Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.00 |
| Size Factor - $C_F$ | 1.00 |

*Other Factors*

| | |
|---|---|
| Visually Graded Lumber | |
| c | 0.8 |
| Solid Column | |
| Kf | 1 |
| Column: Pinned Pinned | |
| Ke | 1 |

*Column Stability Factor Calculation*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $Fce_1$ | 908 | psi | $Fce_2$ | 908 | psi |
| $Fc^*_1$ | 1000 | psi | $Fc^*_2$ | 1000 | psi |
| $Fce_1/Fc^*_1$ | 0.908 | | $Fce_2/Fc^*_2$ | 0.908 | |
| $Cp_1$ | 0.657 | | $Cp_2$ | 0.657 | |

*Beam Stability Factor Calculation*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $Fbe_1$ | 39875 | psi | $Fbe_2$ | 16,878 | psi |
| $Fb'_1$ | 1200 | psi | $Fb'_2$ | 1200 | psi |
| $Fbe_1/Fb'_1$ | 33.2 | | $Fbe_2/Fb'_2$ | 14 | |
| le | 8.0 | ft | | | |
| $CL_1$ | 1.00 | | | | |

*Adjusted Allowable Stresses*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $Fc'_1$ | 657 | psi | $Fc'_2$ | 657 | psi |
| $Fb'_1$ | 1200 | psi | $Fb'_2$ | 1200 | psi |

*Imposed Column Stresses*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $fc_1$ | 378 | psi | $fc_2$ | 378 | psi |
| $fb_1$ | 0 | psi | $fb_2$ | 0 | psi |

| | | |
|---|---|---|
| ***Perpendicular to Grain Stress Check fcp/Fcp =*** | ***378 / 650*** | **OK** |
| ***Slenderness Check le/d*** | **23** | **OK** |
| ***Slenderness Check le/b*** | **23** | **OK** |

(1) $$\left(\frac{f_c}{F_c'}\right)^2+\frac{f_{b1}}{F_{b1}'\left[1-f_c/F_{cE1}\right]}+\frac{f_{b2}}{F_{b2}'\left[1-f_c/F_{cE2}-\left(f_{b1}/F_{bE1}\right)\right]}\le 1.0$$

(2) $$\frac{fc}{F_{cE2}}+\left(\frac{f_{b1}}{F_{bE}}\right)^2<1.0$$

(3) $$\frac{f_c}{F_{c'}},\frac{f_{b1}}{F_{b1}'},\frac{f_{b2}}{F_{b2}'}<1.0$$

| | | |
|---|---|---|
| ***Allowable Stress Interaction Formula*** | **0.58** | **OK** |


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2124 Third Avenue . Suite 100 . Seattle . WA 98121
www.swensonsayfaget.com
*Office:* 206.443.6212
*Fax:* 206.443.4870


Project: C2- Main floor deck post

*Date:* *11/25/2020*

Project #: 01519-2020-15

Design: haa

Sheet: 19

## Gravity Design

### Drilled pier design:

Calculate required depth into hard silt using skin friction (ignore end bearing):
Qallowable = fs-allowable * Asurface

fs-allowable = 900psf

Q-2ft dia = (900psf)(πdh) = 5.7h (klf*ft)

Q-3ft dia = (900psf)(π*3ft*h) = 8.5h (klf*ft)

Weight of pier(assuming 25ft length):
Wt-2ft dia. = 12 k
Wt-3ft dia. = 26.5k

Worst case column load @ basement:
P= 45k+26.5k < 8.5h
h > 8.4 ft
h = 10ft, add weight of pier and recheck:
P= 45k+26.5k+10.6k
h>9.6'

Provide 36"ø w/ 10ft embed into hard silt

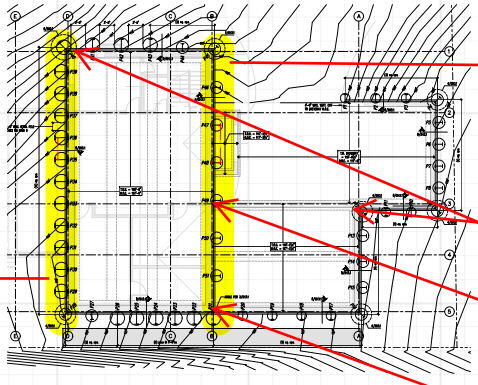
Worst case load (deck/interior pier)
P= 18k+12k < 5.7h
h > 5.3 ft
h = 6ft, add weight of pier and recheck:
P= 18k+12k+2.8k=32.8k
h>5.75'

Provide 24"ø w/ 6ft embed into hard silt

### Size welded headed studs at piles:

5/8"ø x 6" stud shear capacity = 10k

Shoring pile spacing:



S=4'7"
wf=6.2klf
S*wf=28.5k/pile
# of studs required/pile = 28.5/10 = 2.9 -->3studs per pile

S=8'-0"
wf=4.5klf
S*wf/2=36k/pile
# of studs required/pile = 36/10 = 3.6 -->4studs per pile

corner: 30k --> min (3) studs

corner: 38k --> min (4) studs

corner: 45k --> min (5) studs

10ft tall basement walls: provide 5/8"ø x 6" studs at 12" oc

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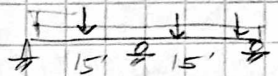
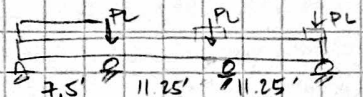
# KAHAN - GRADE BEAM CALC

ASSUME:
$f'_c = 2500$ psi
$f_y = 60$ ksi
$\phi = 0.9$

GARAGE BEAM
i) START w/ $b = 24''$ $h = 12''$
ii) $M_f = 82$ kft
$M_f$ w/ SLOT @ HDW11 = 228 kft




M IS TOO HIGH ... ADD PIER (PWS 5 IS IN ASD...)




$M_f = 31.6$ kft $V_f = 15.6$ k → GOVERNS (SHEAR)

WORST CASE INT. GRADE BEAM = BASEMENT G.B.
$L = 11$, $W_F = 2224$ PLF, $V_F = 12.2$ k $M_= = 33.6$ kft → GOVERNS
iii) ASSUME #5 BARS (3) TOP & BOTT. $\Rightarrow a = 3(0.31)(60\text{ksi})/(0.85(2.5)(24))$
$d = 12'' + 3'' - 0.625''/2 = 8.69''$ $= 1.094$ in
iv) $\phi M_n = \phi A_s F_y (d - a/2) = 0.9((3)(0.31\text{in}^2)(60\text{ksi})(8.69'' - 1.09''/2)$
$= 409$ kin $= 34.1$ kft
$34.1 > 33.6$ ✓OK
v.) $A_{s\max} = 2.69\text{in}^2$
FOR $\phi = 0.9$ $A_s < 7/8\, A_{s\max}$
$0.93 < 2.35$ ✓OK
$A_{s\min} = 0.52 < 0.93$ ✓OK

vi) $\phi V_c = (0.75)2\sqrt{2500\text{psi}}(24)(8.69) = 15.6\text{k} \leq 15.6\text{k} = V_f$ ∴ ADD STIRRUPS
$\phi V_c = V_f$ ∴ PROVIDE $A_{v\min}$ #3 @ 4" oc
very tight → deeper grade beam?
FOR 6" spacing → $d = 12''$ ∴ TRY 24" wide x 15 dp.
(3) #5 TOP & BOTT $\Rightarrow \phi M_n = 46.6$ kft $\geq 33.6$ kft
$\phi V_c = 21 > 15.6$
$< 15.6 \times 2$ ∴ ADD STIRRUPS #3 @ 6" oc

**24" x 15" GR. BM w/ (3) #5 TOP & BOTT & #3 STIRRUPS @ 6" oc**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SEATTLE | 2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
TACOMA | 934 Broadway, Suite 100, Tacoma, WA 98402 | O 253.284.9470
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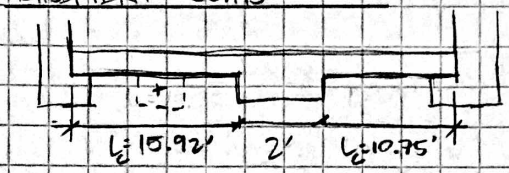
# KAHAN - STRUCTURAL SLAB

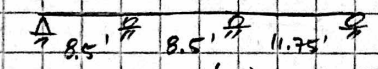
ASSUME:
- ONE WAY SLAB
- NO SUPERIMPOSED DEAD LOAD
- $f'_c = 2500$ psi
- $f_y = 60$ ksi
- TENSION CONTROLLED, $\phi = 0.9$

BASEMENT SLAB




6" slab w/ #5's @ 12" oc Longit.
& #3's @ 16" oc transv.

i) $h_{min}$ (one-end continuous) $= \ell/24 = 17(12)/24 = 8.5"$
9" slab required x NG (AIMING FOR 6")
ADD BRG LINE:




$h_{min} = 11.75'(12)/24 = 5.875"$ => 6" SLAB

ii) SELF WEIGHT = 150PLF(6"/12) = 75 PSF
LIVE LOAD = 40 PSF
$w_f = 1.2(75\text{ PSF}) + 1.6(40\text{ PSF}) = 154$ PSF

iii) $+M_f = +1.9$ k-ft
$-M_f = -2.0$ k-ft

iv) $d = 3"$ (assume centered in slab)

v) $A_{s\,min} = 0.0018(12")(3") = 0.0648$ in²/ft

$$A_{s\,max} = \frac{(0.85 f'_c)\beta_1}{f_y}\left(\frac{3}{7}\right)bd = \frac{0.85(2.5\text{ksi})(0.85)}{60\text{ksi}}\left(\frac{3}{7}\right)(12")(3") = 0.46\text{ in}^2/\text{ft}$$

$$A_{s\,REQD} = \frac{0.85(2.5\text{ksi})(12")}{60\text{ksi}}\left[3" - \sqrt{(3")^2 - \frac{2(2.0\text{k-ft}\times 12"/\text{ft})}{0.9(0.85)(2.5\text{ksi})(12")}}\right] = 0.16\text{ in}^2$$

vi) ASSUME No. 5 bars
$s \le A_b/A_{s_R} \times 12 = 0.31/0.16 \times 12 = 23$ in => #5's @ 12" oc
$s_{max} = \min(3h, 18", s_f) = 12"$ ✓ok

vii) $M_R$, $A_s = 0.31$, $a = 0.729$ = 44 k-in = 3.67 k-ft > 2.0 ✓ok

viii) Transverse reinf. = $A_{s_{req}} = 0.0018bh = 0.1296$ sk 0.2/0.13 = 18.5" #3 @ 16" oc


SWENSON SAY FAGÉT
SEATTLE | 2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
TACOMA | 934 Broadway, Suite 100, Tacoma, WA 98402 | O 253.284.9470
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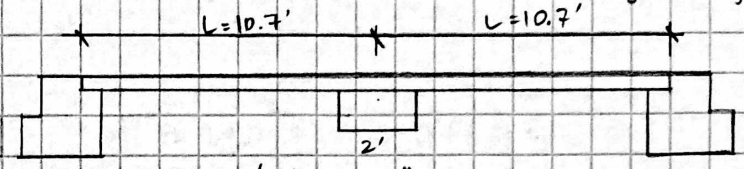
KAHAN - SLAB CONT.

GARAGE SLAB

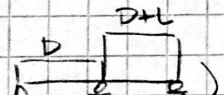
- STILL ASSUME ONE WAY, $f'c = 2.5$ksi, $f_y = 60$ksi, $\phi = 0.9$




i) $h_{min} = 10.7 \times 12/24 = 5.4" \Rightarrow 6"$ SLAB

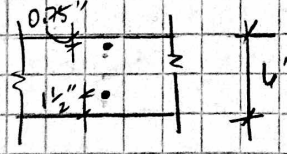
ii) SELF WEIGHT = 75 PSF
LIVE LOAD = 40 PSF
OR P = 3000lbs OVER 4'½"x4'½"
$W_f$ = 154 PSF

iii) MAX MOMENT / SHEAR




$+M_f = 1.42$k-ft (skip loading)
$-M_f = -2.02$k-ft (D+L over full span)
$V_f = 1.03$
OR w/ 8K @ 5.35'
$+M_f = 11.1$k-ft
$-M_f = -6.25$k-ft
$V_f = 5.28$K w/ PL @ 11.2ft

iv) ASSUME (2) ROWS OF STEEL




$C_c = 0.75$ top
$C_c = 1\frac{1}{2}$" bottom

$d = 4.5"$ $d' = 5.25"$
$A_{s\,min} = 0.1$in² $A_{s\,min} = 0.11$ in²
$A_{s\,max} = 0.7$in² $A_{s\,max} = 0.81$in²
TRY #5 @ 6" top = bott $s_{max} = 12"$

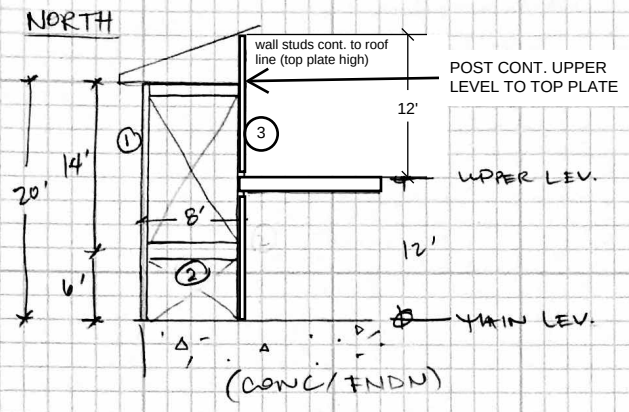
v) $\phi M_n = 10.98$k-ft ≈ 11.1k-ft VOK (1.01% DCR)

vi) Transverse Reinf: same as basement

6" Slab w/ #5 @ 6" OC TOP & BOTT (longit.)
#2 @ 16" OC (Transverse)


SWENSON SAY FAGÉT
SEATTLE 2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
TACOMA 934 Broadway, Suite 100, Tacoma, WA 98402 | O 253.284.9470
ssfengineers.com

# OUT-OF-PLANE WIND @ TALL WINDOWS




DETERMINE C&C WIND LOADING:

EFF. WIND AREA = 20 × 8 = 160 SF

@ WALL ZONE 5:

$P_{W-C\&C} = -17.1$ PSF

③ KING POST
h = 12ft
w= 17.1psf*(8'+16/12)/2=78plf
R= 480lbs -- (1) A35 top and bott
M=1436
6x6 d.f. post

HUC - OUT OF PLANE CHECK
16d COMMON W/ 14GA CONNECTOR: Z = 141LBS
1.6*10*141=2256lbs > 480lbs --> ok

① KING POST DESIGN:

H = 20' P = 1200

W = 17.1 (8/2) = 68.4

R = 684 lbs

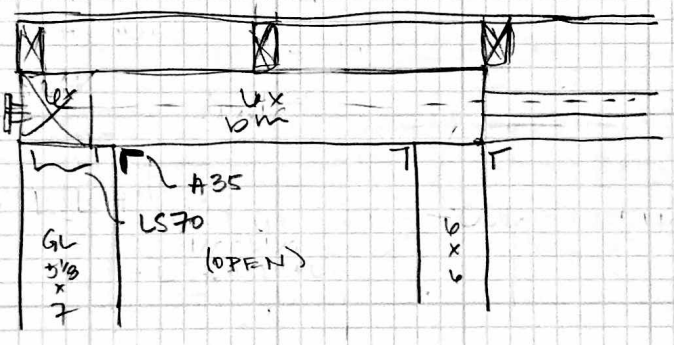
M = 3420 lb-ft

4x8 D.F. POST → USE GL TO REDUCE WARPING

R=684 --> LS70 = 785 lbs (WIND)

PERPENDICULAR DIR., R=17.1*4/2*20/2=342 lbs --> A35 (560lbs wind)

CONN. @ TOP & BOTT OF POST




② WINDOW GIRT

L = 9'

W = 230 (GRAVITY) OR W = 175 (WIND)

R = 1035 R = 788

M = 2329 M = 1772

HSS4x4x1/4 Δ = 0.15 L/720

(2) SDS @ 1/4" PL

= 1.6 × 420 × 2 = 1344 lbs > 1035 ✓ OK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## *Column Buckling Calculations*

**NDS 2015**

*Column Geometry Data*

| Glue-Lam Hem-Fir Plates | | |
|---|---|---|
| b | 5.125 | in |
| d | 6 | in |
| $Le_1$ | 20.00 | ft |
| $Le_2$ | 20.00 | ft |
| $le_{bending}$ | 8 | ft |

*Column Design Values*

| | | |
|---|---|---|
| $F_b$ | 2400 | psi |
| $F_c$ | 1650 | psi |
| E'min | 930 | ksi |
| Fcperp | 405 | psi |
| cb | 1.00 | |

*Column Loading*

| | | |
|---|---|---|
| P | 1200 | lbs |
| $W_1$ | 70 | plf |
| M1 | 3500 | ft-lbs |
| $W_2$ | 0 | plf |
| M2 | 0 | ft-lbs |

*Flexural Stress Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.60 |
| Size Factor - $C_F$ | 1.00 |
| Repetitive - $C_r$ | 1.00 |

*Compressive Parallel Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.60 |
| Size Factor - $C_F$ | 1.00 |

*Other Factors*

| | |
|---|---|
| Visually Graded Lumber | |
| c | 0.8 |
| Solid Column | |
| Kf | 1 |
| Column: Pinned Pinned | |
| Ke | 1 |

| *Bracing* |
|---|
| No Brace |
| No Brace |

| *Bearing* |
|---|
| *Area* |
| *Increase* |
| No |

*Column Stability Factor Calculation*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $Fce_1$ | 478 | psi | $Fce_2$ | 349 psi |
| $Fc^*_1$ | 2640 | psi | $Fc^*_2$ | 2640 psi |
| $Fce_1/Fc^*_1$ | 0.181 | | $Fce_2/Fc^*_2$ | 0.132 |
| $Cp_1$ | 0.174 | | $Cp_2$ | 0.128 |

*Beam Stability Factor Calculation*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $Fbe_1$ | 50890 | psi | $Fbe_2$ | 16,195 psi |
| $Fb'_1$ | 3840 | psi | $Fb'_2$ | 3840 psi |
| $Fbe_1/Fb'_1$ | 13.3 | | $Fbe_2/Fb'_2$ | 4 |
| le | 8.0 | ft | | |
| $CL_1$ | 1.00 | | | |

*Adjusted Allowable Stresses*

| Strong Axis | | | Weak Axis | |
|---|---|---|---|---|
| $Fc'_1$ | 459 | psi | $Fc'_2$ | 339 psi |
| $Fb'_1$ | 3824 | psi | $Fb'_2$ | 3840 psi |

*Imposed Column Stresses*

| Strong Axis | | | Weak Axis | |
|---|---|---|---|---|
| $fc_1$ | 39 | psi | $fc_2$ | 39 psi |
| $fb_1$ | 1366 | psi | $fb_2$ | 0 psi |

| | | |
|---|---|---|
| ***Perpendicular to Grain Stress Check fcp/Fcp =*** | ***39 / 405*** | **OK** |
| ***Slenderness Check le/d*** | **40** | **OK** |
| ***Slenderness Check le/b*** | **47** | **OK** |

(1) $$\left(\frac{f_c}{F_c'}\right)^2+\frac{f_{b1}}{F_{b1}'\left[1-f_c/F_{cE1}\right]}+\frac{f_{b2}}{F_{b2}'\left[1-f_c/F_{cE2}-\left(f_{b1}/F_{bE1}\right)\right]}\le 1.0$$

(2) $$\frac{fc}{F_{cE2}}+\left(\frac{f_{b1}}{F_{bE}}\right)^2<1.0$$

(3) $$\frac{f_c}{F_{c'}},\frac{f_{b1}}{F_{b1}'},\frac{f_{b2}}{F_{b2}'}<1.0$$

| | | |
|---|---|---|
| ***Allowable Stress Interaction Formula*** | **0.40** | **OK** |


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2124 Third Avenue . Suite 100 . Seattle . WA 98121
www.swensonsayfaget.com
*Office:* 206.443.6212
*Fax:* 206.443.4870


Project: King Post @ Gridline B-1 *Date:* 04/30/21

Project #: 01519-2020-15

Design: haa

Sheet: 25

## *Column Buckling Calculations*

**NDS 2015**

*Column Geometry Data*

| LVL | | |
|---|---|---|
| Hem-Fir Plates | | |
| b | 1.75 | in |
| d | 5.5 | in |
| $Le_1$ | 20.00 | ft |
| $Le_2$ | 20.00 | ft |
| $le_{bending}$ | 8 | ft |

*Bracing*

| |
|---|
| Braced |
| No Brace |

*Column Design Values*

| | | |
|---|---|---|
| $F_b$ | 2600 | psi |
| $F_c$ | 2510 | psi |
| E'min | 1016 | ksi |
| Fcperp | 405 | psi |
| cb | 1.00 | |

*Bearing Area Increase*

| |
|---|
| No |

*Column Loading*

| | | |
|---|---|---|
| P | 800 | lbs |
| $W_1$ | 23 | plf |
| M1 | 1167 | ft-lbs |
| $W_2$ | 0 | plf |
| M2 (Braced) | 0 | ft-lbs |

*Flexural Stress Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.60 |
| Size Factor - $C_F$ | 1.00 |
| Repetitive - $C_r$ | 1.00 |

*Compressive Parallel Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.60 |
| Size Factor - $C_F$ | 1.00 |

*Other Factors*

| | |
|---|---|
| Visually Graded Lumber | |
| c | 0.8 |
| Solid Column | |
| Kf | 1 |
| Column: Pinned Pinned | |
| Ke | 1 |

*Column Stability Factor Calculation*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $Fce_1$ | 439 | psi | $Fce_2$ | 71046 | psi |
| $Fc^*_1$ | 4016 | psi | $Fc^*_2$ | 4016 | psi |
| $Fce_1/Fc^*_1$ | 0.109 | | $Fce_2/Fc^*_2$ | 17.691 | |
| $Cp_1$ | 0.107 | | $Cp_2$ | 1.000 | |

*Beam Stability Factor Calculation*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $Fbe_1$ | 7072 | psi | $Fbe_2$ | 1,951,365 | psi |
| $Fb'_1$ | 4160 | psi | $Fb'_2$ | 4160 | psi |
| $Fbe_1/Fb'_1$ | 1.7 | | $Fbe_2/Fb'_2$ | 469 | |
| le | 8.0 | ft | | | |
| $CL_1$ | 1.00 | | | | |

*Adjusted Allowable Stresses*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $Fc'_1$ | 428 | psi | $Fc'_2$ | 4016 | psi |
| $Fb'_1$ | 4160 | psi | $Fb'_2$ | 4160 | psi |

*Imposed Column Stresses*

| Strong Axis | | | Weak Axis | | |
|---|---|---|---|---|---|
| $fc_1$ | 83 | psi | $fc_2$ | 83 | psi |
| $fb_1$ | 1587 | psi | $fb_2$ | 0 | psi |

| | | |
|---|---|---|
| ***Perpendicular to Grain Stress Check fcp/Fcp =*** | ***83 / 405*** | **OK** |
| ***Slenderness Check le/d*** | **44** | **OK** |
| ***Slenderness Check le/b*** | **137** | **OK*** |

* = Braced

(1) $$\left(\frac{f_c}{F_c'}\right)^2+\frac{f_{b1}}{F_{b1}'\left[1-f_c/F_{cE1}\right]}+\frac{f_{b2}}{F_{b2}'\left[1-f_c/F_{cE2}-\left(f_{b1}/F_{bE1}\right)\right]}\le 1.0$$

(2) $$\frac{fc}{F_{cE2}}+\left(\frac{f_{b1}}{F_{bE}}\right)^2<1.0$$

(3) $$\frac{f_c}{F_{c'}},\frac{f_{b1}}{F_{b1}'},\frac{f_{b2}}{F_{b2}'}<1.0$$

| | | |
|---|---|---|
| ***Allowable Stress Interaction Formula*** | **0.51** | **OK** |


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2124 Third Avenue . Suite 100 . Seattle . WA 98121
www.swensonsayfaget.com
*Office:* 206.443.6212
*Fax:* 206.443.4870


Project: Tall studs at stairwell

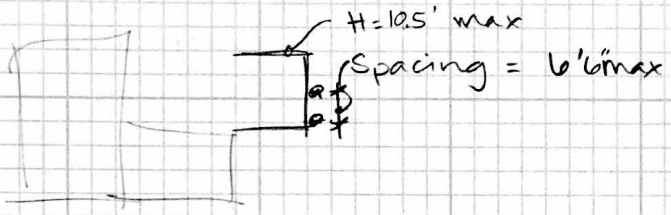
*Date:* 04/30/21

Project #: 01519-2020-15

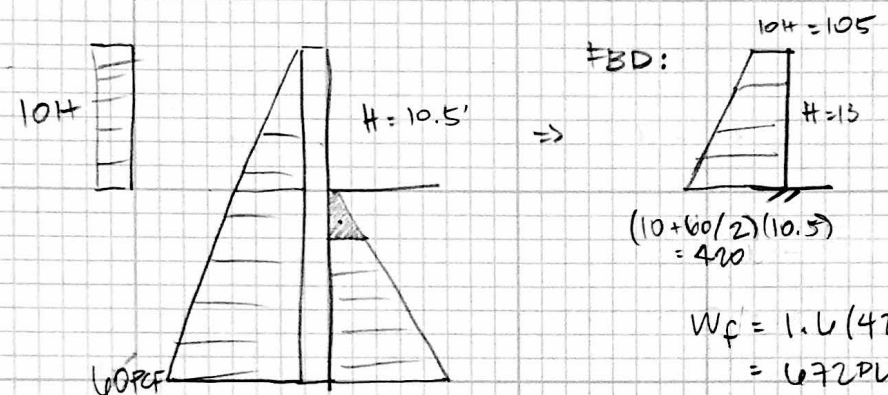
Design: haa

Sheet: 26

CHECK 6" CONC. WALLS @ SITE WALLS

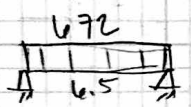



PER 12/SH3.1:




$W_f = 1.6(420\,PSF)(1\,ft\,STRIP)$
$= 672\,PLF$

TYP. 6" CONC. WALL: #4@16" HORIZ. (#4@16" VERT)




$R = 2184$
$M = 3549$

$M = \phi A_S F_y (d - a/2)$ $[a = A_S F_y / 0.85 f'_c b]$
$= 0.9(0.4\,in^2)(60ksi)(3" - \frac{(1.4\,in^2)(60ksi)}{0.85 \cdot 2.5ksi \cdot 12"}/2)$
$= 54.6\,k\text{-}in$
$= 4.6\,k\text{-}ft > 3.5\,k\text{-}ft$ OK

CHECK STUD IN 6" WALL

GRAV = $150(6/12)(10.5\,ft) = 787.5\,PLF \times 6.5/10.5 = 488\,lbs$
LATERAL = $672(6.5) = 4368$
REF SIMPSON ANCHOR DESIGNER [N+V = 73% PASS]

5/8"ϕ x 4½" HEADED STUDS @ 12" oc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SEATTLE TACOMA
2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
934 Broadway, Suite 100, Tacoma, WA 98402 | O 253.284.9470
ssfengineers.com

# KAHAN CHIMNEY - TIE INTO STRUCTURE (LATERAL)

## CHECK WALL STUDS FOR OUT-OF-PLANE LOADS:

### SEISMIC LOAD

2x6 @ 16"oc w/ gyp/ins./siding = 12 PSF

STONE VENEER = 15 PSF

TOTAL = 27 PSF

PER ASCE 7-16; CH12 - 12.11.1

$F_p = 0.4 S_{DS} I_e \times W_t = 0.4(0.98)(1)(27\,PSF) = 10.8\,PSF$

### WIND C&C LOAD:

TRIB AREA @ TALLEST STUDS (UPPER FLR TO ROOF) = 88SF

ZONE 5 - 19 PSF → WIND CONTROLS

### STUD DESIGN:

H = 15'

W = 19 PSF (16"/12") = 25 PLF

P = 27 PSF (16/12)(15') = 525 lbs

2x4 HF @ 16"oc

→ CONTROLS FOR ENTRY STUDS (max h = 12')

Note: see next page for design spreadsheet

RXN = 188 => (2) TOENAILS = 2 x 89 x 1.6 x .83 = 232 VOK

### CHECK RIM OUT-OF-PLANE

ROOF: L = 4' $f_b$ = 39

W = 19 (15/2) = 143 $f_v$ = 19

R = 286 Δ = 0.03

M = 286 L/1882

4x4 FLAT

286 lbs INTO DIAPHRAGM => LTS20 TWIST STRAP = 515 lbs VOK

DIAPHRAGM = 158 PLF ∴ 286/158 = 1.8 ft => CSIL OVER

FLR: L = 4 $f_b$ = 199

W = 238 $f_v$ = 12

R = 475 Δ = .02

M = 475 L/2808

LSL 3½ x 14 FLAT

EXTEND RIM INTO FLR FOR TIE-IN

DIAPHRAGM = 167 plf ∴ 475/167 = 2.8 ft required

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## *Column Buckling Calculations*

**NDS 2015**

*Column Geometry Data*

| Hem-Fir #2 Studs / Hem-Fir Plates | | |
|---|---|---|
| b | 1.5 | in |
| d | 5.5 | in |
| $Le_1$ | 15.00 | ft |
| $Le_2$ | 15.00 | ft |
| $le_{bending}$ | 8 | ft |

*Column Design Values*

| | | |
|---|---|---|
| $F_b$ | 850 | psi |
| $F_c$ | 1300 | psi |
| E'min | 470 | ksi |
| Fcperp | 405 | psi |
| cb | 1.00 | |

*Column Loading*

| | | |
|---|---|---|
| P | 540 | lbs |
| $W_1$ | 25 | plf |
| M1 | 713 | ft-lbs |
| $W_2$ | 0 | plf |
| M2 (Braced) | 0 | ft-lbs |

*Flexural Stress Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.60 |
| Size Factor - $C_F$ | 1.30 |
| Repetitive - $C_r$ | 1.15 |

*Compressive Parallel Adjustment Factors*

| | |
|---|---|
| Roof/EQ / Wind - $C_D$ | 1.60 |
| Size Factor - $C_F$ | 1.10 |

*Other Factors*

| Visually Graded Lumber | |
|---|---|
| c | 0.8 |
| **Solid Column** | |
| Kf | 1 |
| **Column: Pinned Pinned** | |
| Ke | 1 |

| *Bracing* |
|---|
| Braced |
| No Brace |

| *Bearing Area Increase* |
|---|
| No |

*Column Stability Factor Calculation*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $Fce_1$ | 361 | psi | $Fce_2$ | 24146 psi |
| $Fc^*_1$ | 2288 | psi | $Fc^*_2$ | 2288 psi |
| $Fce_1/Fc^*_1$ | 0.158 | | $Fce_2/Fc^*_2$ | 10.553 |
| $Cp_1$ | 0.152 | | $Cp_2$ | 1.000 |

*Beam Stability Factor Calculation*

| | Strong Axis | | Weak Axis | |
|---|---|---|---|---|
| $Fbe_1$ | 2403 | psi | $Fbe_2$ | 1,053,148 psi |
| $Fb'_1$ | 2033 | psi | $Fb'_2$ | 2033 psi |
| $Fbe_1/Fb'_1$ | 1.2 | | $Fbe_2/Fb'_2$ | 518 |
| le | 8.0 | ft | | |
| $CL_1$ | 1.00 | | | |

*Adjusted Allowable Stresses*

| Strong Axis | | | Weak Axis | |
|---|---|---|---|---|
| $Fc'_1$ | 348 | psi | $Fc'_2$ | 2288 psi |
| $Fb'_1$ | 2033 | psi | $Fb'_2$ | 2033 psi |

*Imposed Column Stresses*

| Strong Axis | | | Weak Axis | |
|---|---|---|---|---|
| $fc_1$ | 65 | psi | $fc_2$ | 65 psi |
| $fb_1$ | 1131 | psi | $fb_2$ | 0 psi |

| | | |
|---|---|---|
| ***Perpendicular to Grain Stress Check fcp/Fcp =*** | ***65 / 405*** | **OK** |
| ***Slenderness Check le/d*** | **33** | **OK** |
| ***Slenderness Check le/b*** | **120** | **OK*** |

* = Braced

(1) $$\left(\frac{f_c}{F_c'}\right)^2+\frac{f_{b1}}{F_{b1}'\left[1-f_c/F_{cE1}\right]}+\frac{f_{b2}}{F_{b2}'\left[1-f_c/F_{cE2}-\left(f_{b1}/F_{bE1}\right)\right]}\le 1.0$$

(2) $$\frac{fc}{F_{cE2}}+\left(\frac{f_{b1}}{F_{bE}}\right)^2<1.0$$

(3) $$\frac{f_c}{F_{c'}},\frac{f_{b1}}{F_{b1}'},\frac{f_{b2}}{F_{b2}'}<1.0$$

| | | |
|---|---|---|
| ***Allowable Stress Interaction Formula*** | **0.71** | **OK** |


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2124 Third Avenue . Suite 100 . Seattle . WA 98121
www.swensonsayfaget.com
*Office:* 206.443.6212
*Fax:* 206.443.4870


Project: Tall studs at chimney
*Date:* 8/13/2021
Project #: 01519-2020-15
Design: haa
Sheet: 29

# Shoring Design

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2124 Third Ave, Suite 100, Seattle, WA 98121 | O 206.443.6212
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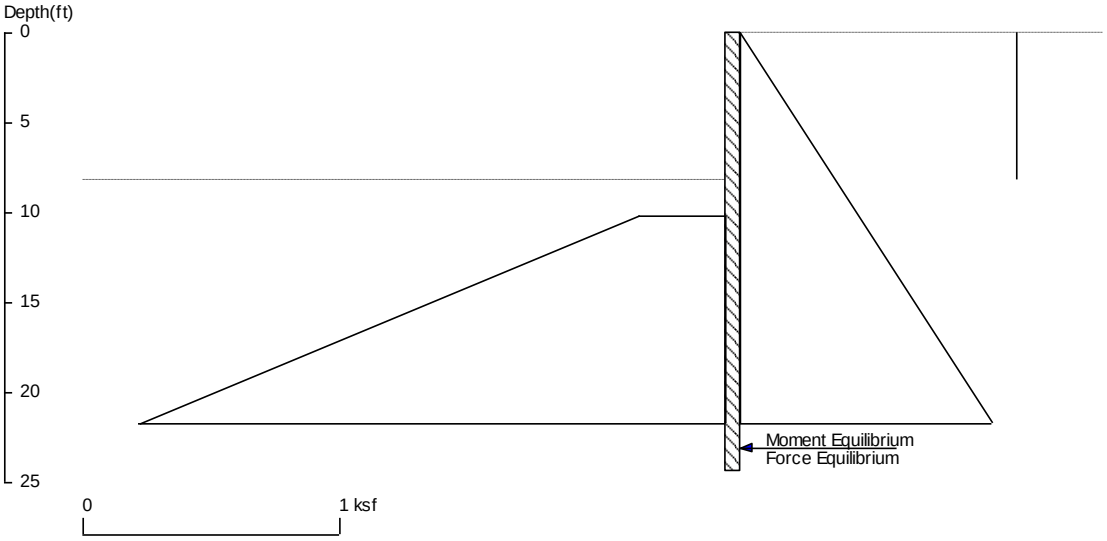
# Kahan Spec Home

## P1 - P3 Permanent Non-Seismic

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P1-P3 perm nonseismic.sh8

Wall Height=8.3 Pile Diameter=2.0 Pile Spacing=6.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=16.19 Min. Pile Length=24.44

MOMENT IN PILE: Max. Moment=87.15 per Pile Spacing=6.3 at Depth=15.75

PILE SELECTION:

Request Min. Section Modulus = 31.7 in3/pile=519.30 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X50 has Section Modulus = 88.9 in3/pile=1456.80 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.24(in) based on E (ksi)=29000.00 and I (in4)/pile=800.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 8.25 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 10.25 | .34 | 60 | 8.797 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 6.33 |
| 2 | 8.25 | 2.00 |

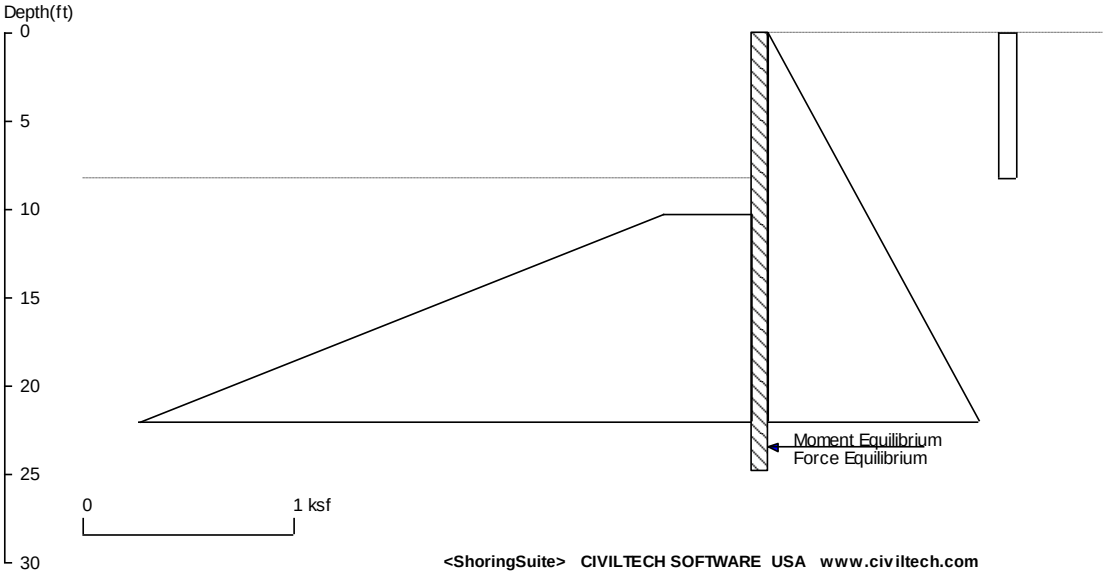
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 8.25 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P1 - P3 Seismic**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P1-P3 seismic.sh8

Wall Height=8.3 Pile Diameter=2.0 Pile Spacing=6.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=16.59 Min. Pile Length=24.84

MOMENT IN PILE: Max. Moment=128.26 per Pile Spacing=6.3 at Depth=15.79

PILE SELECTION:

Request Min. Section Modulus = 46.6 in3/pile=764.30 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X50 has Section Modulus = 88.9 in3/pile=1456.80 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.38(in) based on E (ksi)=29000.00 and I (in4)/pile=800.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | .083 | 8.25 | 0.083 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 10.25 | .42 | 60 | 10.86 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 6.33 |
| 2 | 8.25 | 2.00 |

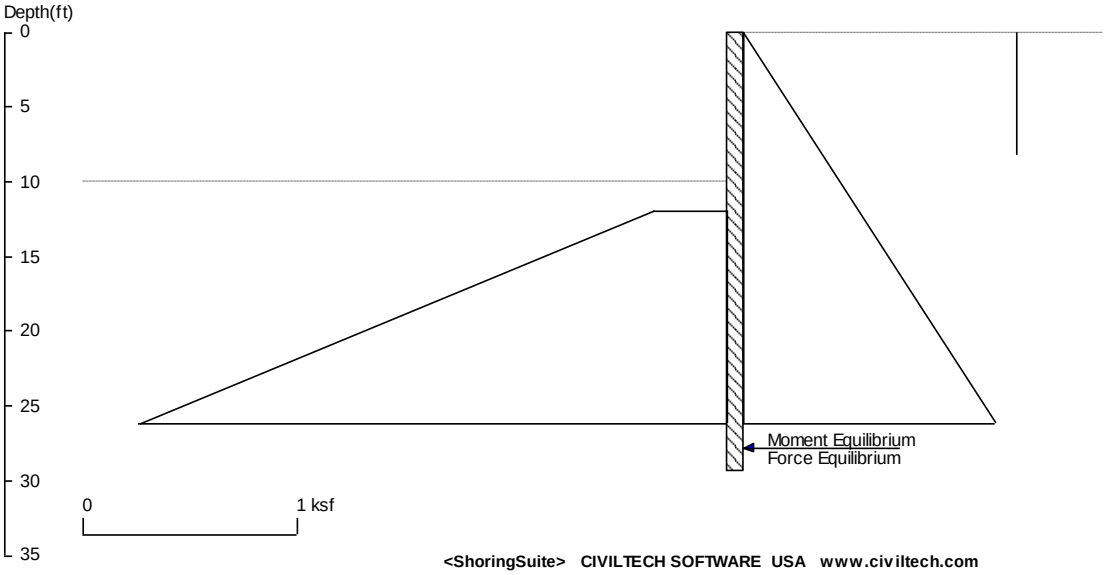
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 8.25 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P1 - P3 temporary**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P1-P3 temp.sh8

Wall Height=10.0 Pile Diameter=2.0 Pile Spacing=6.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=19.40 Min. Pile Length=29.40

MOMENT IN PILE: Max. Moment=150.85 per Pile Spacing=6.3 at Depth=18.95

PILE SELECTION:

Request Min. Section Modulus = 54.9 in3/pile=898.92 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X50 has Section Modulus = 88.9 in3/pile=1456.80 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.60(in) based on E (ksi)=29000.00 and I (in4)/pile=800.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 8.25 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 12 | .34 | 60 | 8.500 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 6.33 |
| 2 | 10.00 | 2.00 |

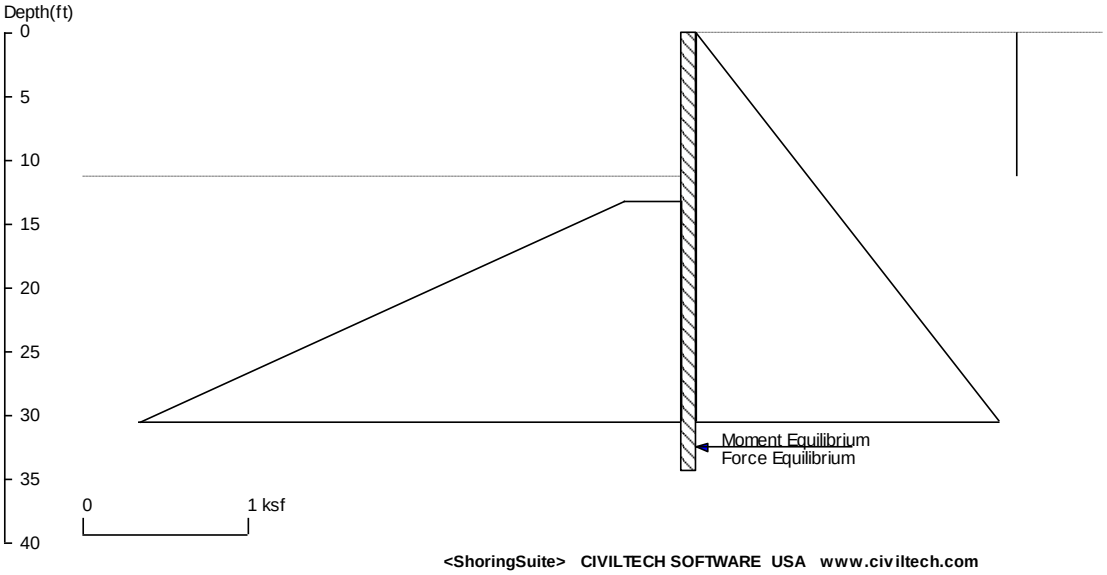
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 10.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P4 - P9 Permanent Non Seismic

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P4-P9 perm nonseismic.sh8

Wall Height=11.3 Pile Diameter=2.5 Pile Spacing=4.5 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=23.14 Min. Pile Length=34.39

MOMENT IN PILE: Max. Moment=232.47 per Pile Spacing=4.5 at Depth=22.25

PILE SELECTION:

Request Min. Section Modulus = 84.5 in3/pile=1385.29 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.60(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 3.600 | .06 |
| * | eq | | | |
| 0 | 0 | 11.25 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 13.25 | .34 | 60 | 8.288 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.50 |
| 2 | 11.25 | 2.50 |

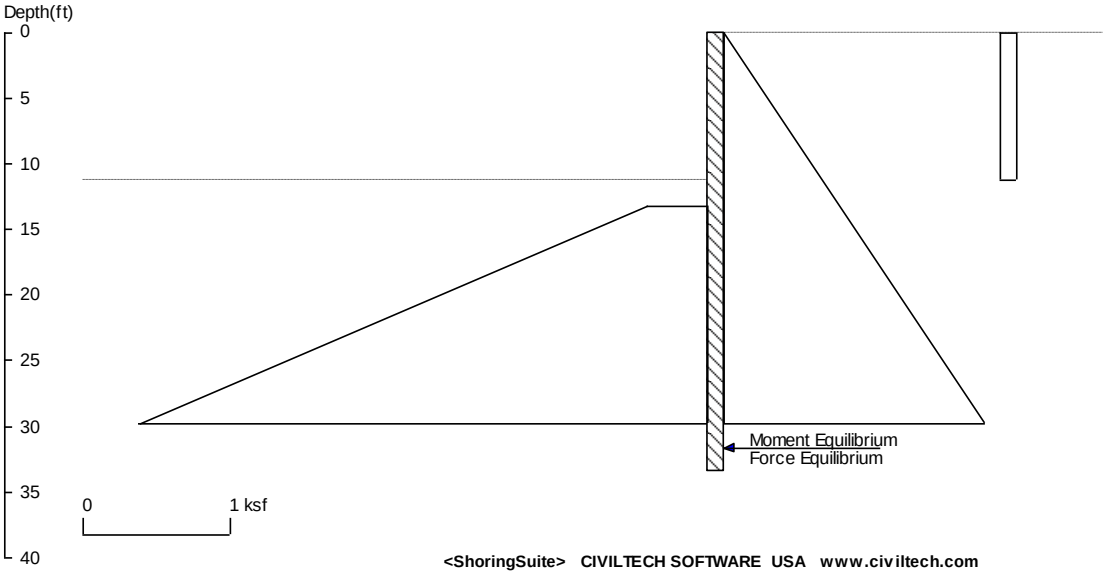
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 11.25 | 4.50 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P4 - P9 Seismic**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P4-P9 seismic.sh8

Wall Height=11.3 Pile Diameter=2.5 Pile Spacing=4.5 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=22.21 Min. Pile Length=33.46

MOMENT IN PILE: Max. Moment=292.83 per Pile Spacing=4.5 at Depth=21.55

PILE SELECTION:

Request Min. Section Modulus = 106.5 in3/pile=1744.96 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.78(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 3.600 | .06 |
| * | eq | | | |
| 0 | .113 | 11.25 | 0.113 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 13.25 | .42 | 60 | 10.23 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.50 |
| 2 | 11.25 | 2.50 |

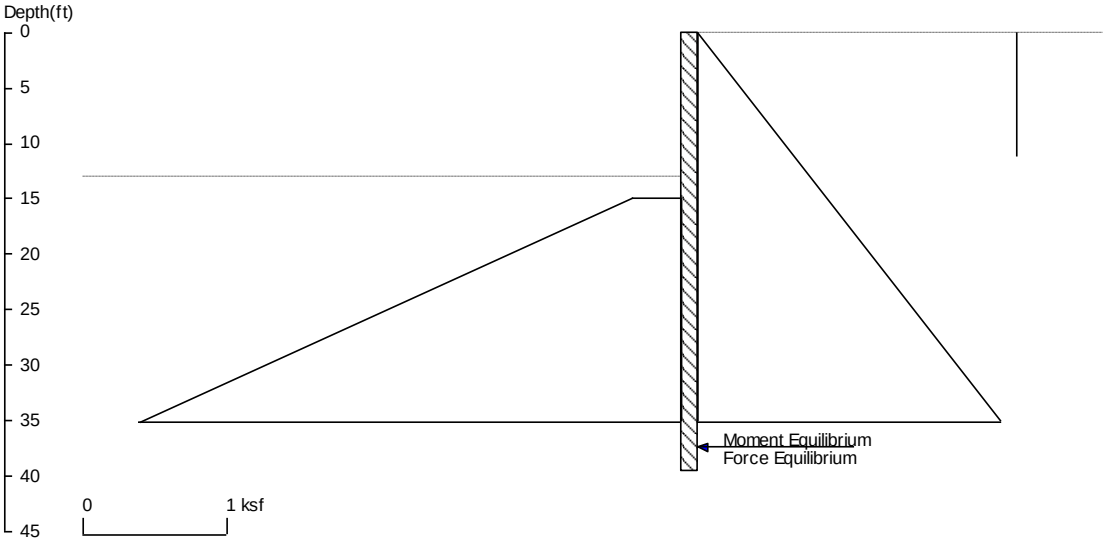
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 11.25 | 4.50 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P4 - P9 Temporary




<ShoringSuite> CIVILTECH SOFTWARE USA www.civiltech.com

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P4-P9 temp.sh8

Wall Height=13.0 Pile Diameter=2.5 Pile Spacing=4.5 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=26.59 Min. Pile Length=39.59

MOMENT IN PILE: Max. Moment=353.33 per Pile Spacing=4.5 at Depth=25.62

PILE SELECTION:

Request Min. Section Modulus = 128.5 in3/pile=2105.43 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 1.21(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 3.600 | .06 |
| * | eq | | | |
| 0 | 0 | 11.25 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 15 | .34 | 60 | 7.990 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.50 |
| 2 | 13.00 | 2.50 |

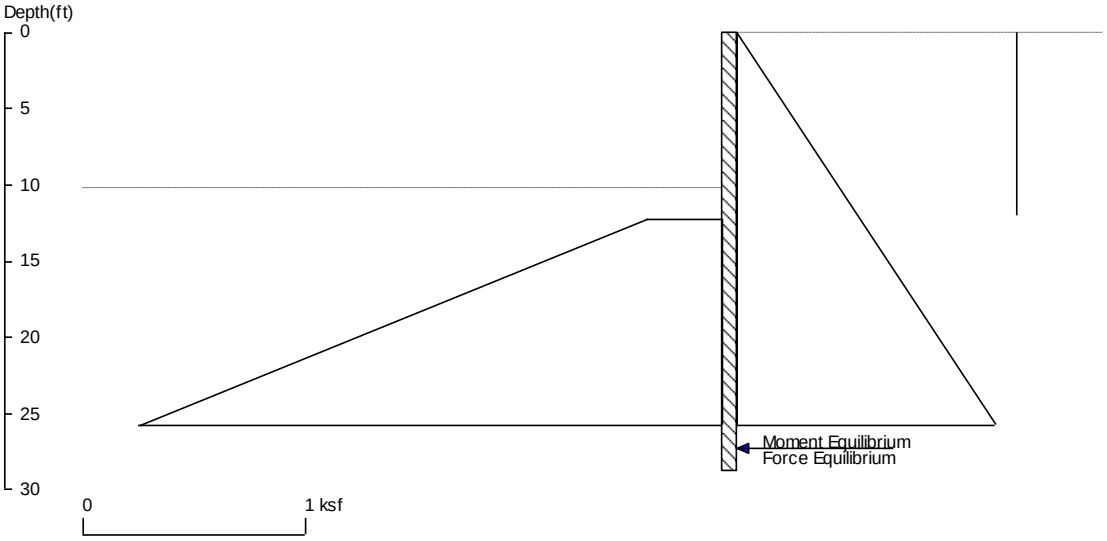
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 13.00 | 4.50 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P10 - P12 permanent nonseismic




<ShoringSuite> CIVILTECH SOFTWARE USA www.civiltech.com

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P10-P12 perm nonseismic.sh8

Wall Height=10.3 Pile Diameter=2.0 Pile Spacing=5.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=18.56 Min. Pile Length=28.81

MOMENT IN PILE: Max. Moment=130.59 per Pile Spacing=5.3 at Depth=18.83

PILE SELECTION:

Request Min. Section Modulus = 47.5 in3/pile=778.15 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X65 has Section Modulus = 117.0 in3/pile=1917.28 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.39(in) based on E (ksi)=29000.00 and I (in4)/pile=1070.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 12 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 12.25 | .34 | 60 | 8.458 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 5.25 |
| 2 | 10.25 | 2.00 |

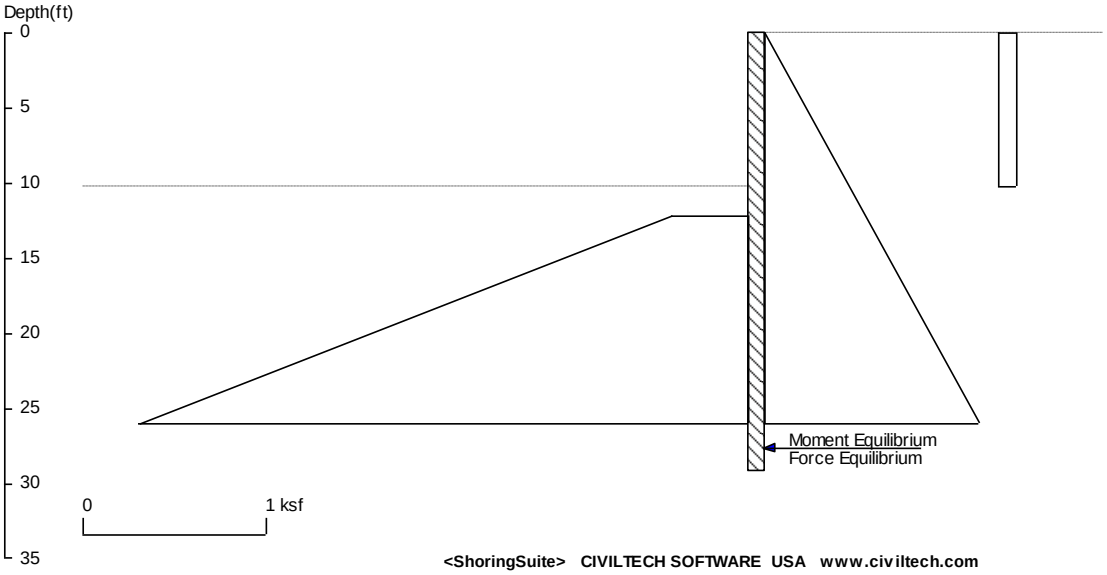
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 10.25 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P10 - P12 seismic**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P10-P12 seismic.sh8

Wall Height=10.3 Pile Diameter=2.0 Pile Spacing=5.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=18.98 Min. Pile Length=29.23
MOMENT IN PILE: Max. Moment=192.02 per Pile Spacing=5.3 at Depth=18.82

PILE SELECTION:
Request Min. Section Modulus = 69.8 in3/pile=1144.25 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W18X65 has Section Modulus = 117.0 in3/pile=1917.28 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 0.61(in) based on E (ksi)=29000.00 and I (in4)/pile=1070.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | .103 | 10.25 | 0.103 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 12.25 | .42 | 60 | 10.44 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 5.25 |
| 2 | 10.25 | 2.00 |

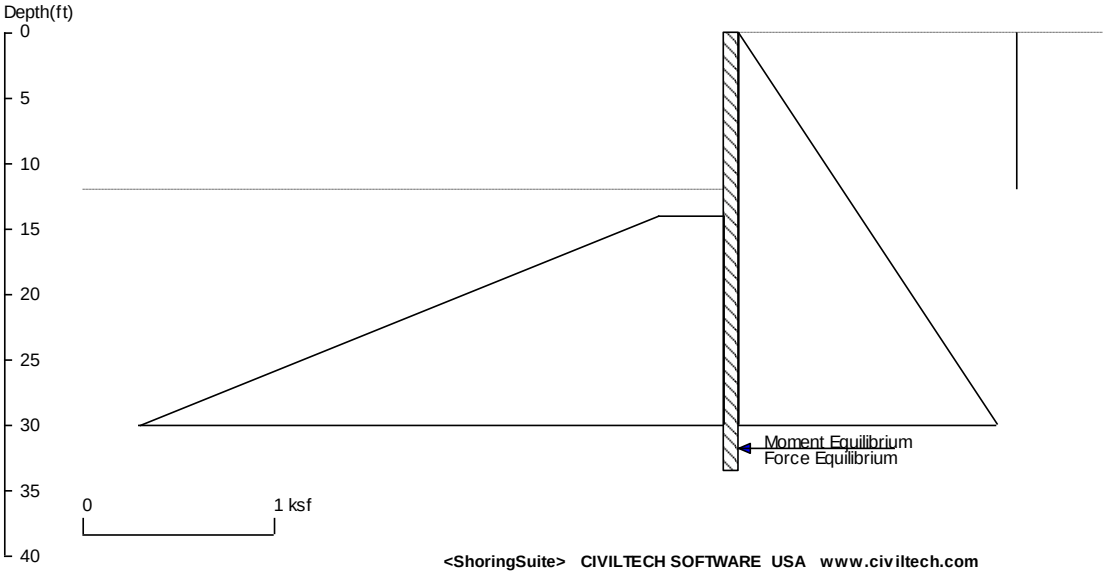
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 10.25 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P10 - P12 temporary**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P10-P12 temp.sh8

Wall Height=12.0 Pile Diameter=2.0 Pile Spacing=5.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=21.57 Min. Pile Length=33.57

MOMENT IN PILE: Max. Moment=205.60 per Pile Spacing=5.3 at Depth=21.94

PILE SELECTION:

Request Min. Section Modulus = 74.8 in3/pile=1225.18 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X65 has Section Modulus = 117.0 in3/pile=1917.28 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.82(in) based on E (ksi)=29000.00 and I (in4)/pile=1070.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 12 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 14 | .34 | 60 | 8.160 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 5.25 |
| 2 | 12.00 | 2.00 |

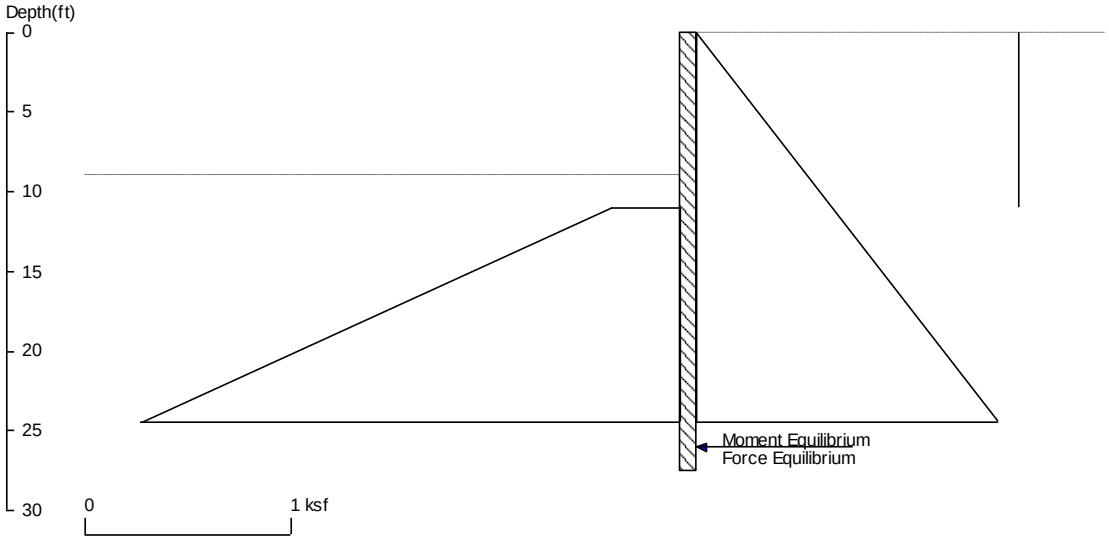
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 12.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P13 - P16 permanent nonseismic

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P13-P16 perm nonseismic.sh8

Wall Height=9.0 Pile Diameter=2.5 Pile Spacing=5.5 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=18.58 Min. Pile Length=27.58

MOMENT IN PILE: Max. Moment=143.17 per Pile Spacing=5.5 at Depth=17.76

PILE SELECTION:

Request Min. Section Modulus = 52.1 in3/pile=853.14 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.24(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 3.600 | .06 |
| * | eq | | | |
| 0 | 0 | 11 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 11 | .34 | 60 | 8.670 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 5.50 |
| 2 | 9.00 | 2.50 |

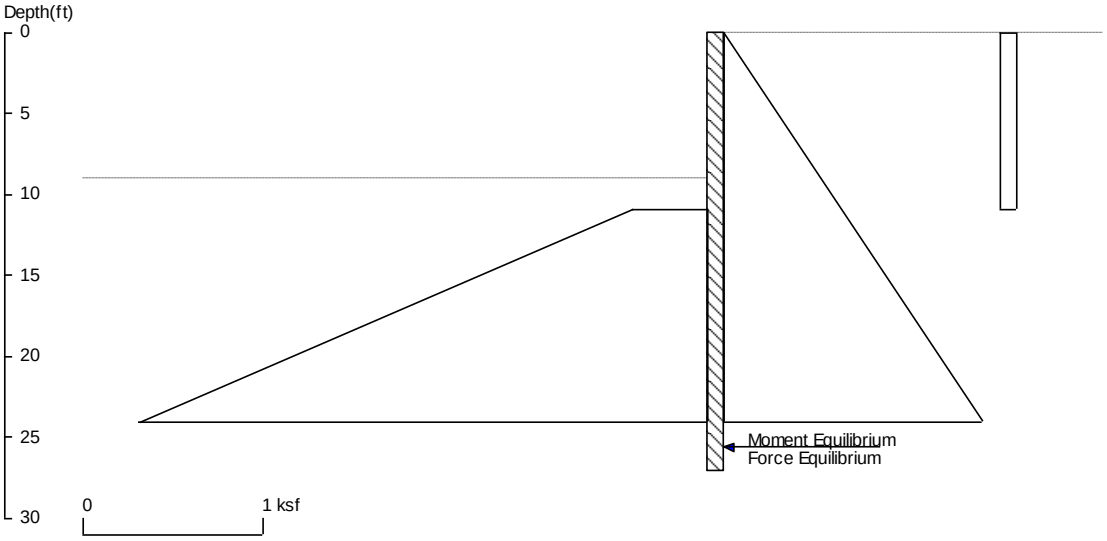
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 9.00 | 5.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P13 - P16 seismic**



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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P13-P16 seismic.sh8

Wall Height=9.0 Pile Diameter=2.5 Pile Spacing=5.5 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=18.16 Min. Pile Length=27.16

MOMENT IN PILE: Max. Moment=186.72 per Pile Spacing=5.5 at Depth=17.40

PILE SELECTION:

Request Min. Section Modulus = 67.9 in3/pile=1112.67 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.33(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 3.600 | .06 |
| * | eq | | | |
| 0 | .09 | 11 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 11 | .42 | 60 | 10.71 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 5.50 |
| 2 | 9.00 | 2.50 |

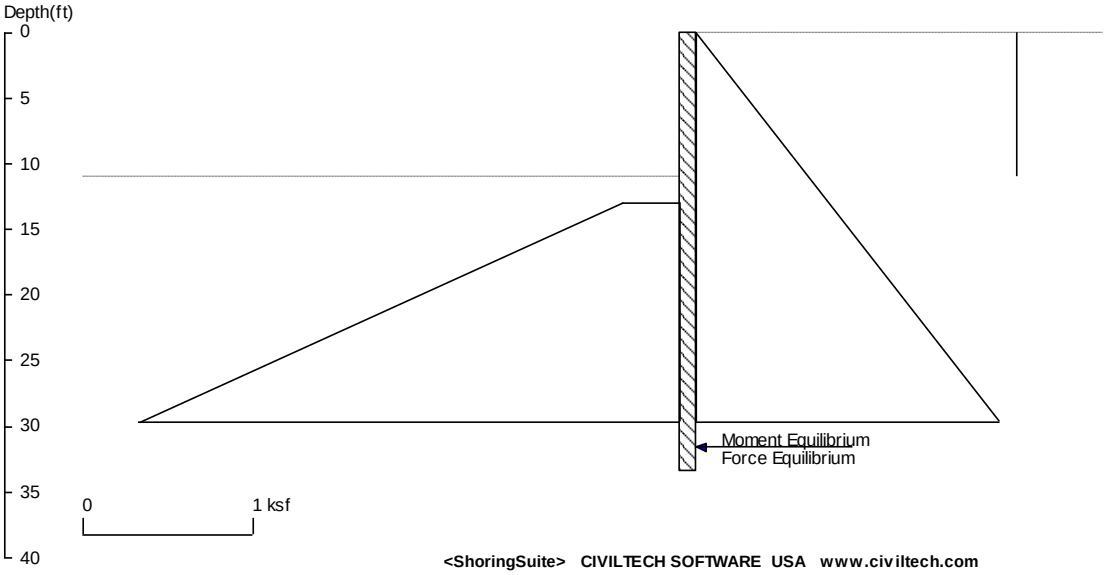
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 9.00 | 5.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P13 - P16 temporary**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P13-P16 temp.sh8

Wall Height=11.0 Pile Diameter=2.5 Pile Spacing=5.5 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=22.47 Min. Pile Length=33.47

MOMENT IN PILE: Max. Moment=254.33 per Pile Spacing=5.5 at Depth=21.56

PILE SELECTION:

Request Min. Section Modulus = 92.5 in3/pile=1515.56 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.63(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 3.600 | .06 |
| * | eq | | | |
| 0 | 0 | 11 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 13 | .34 | 60 | 8.330 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 5.50 |
| 2 | 11.00 | 2.50 |

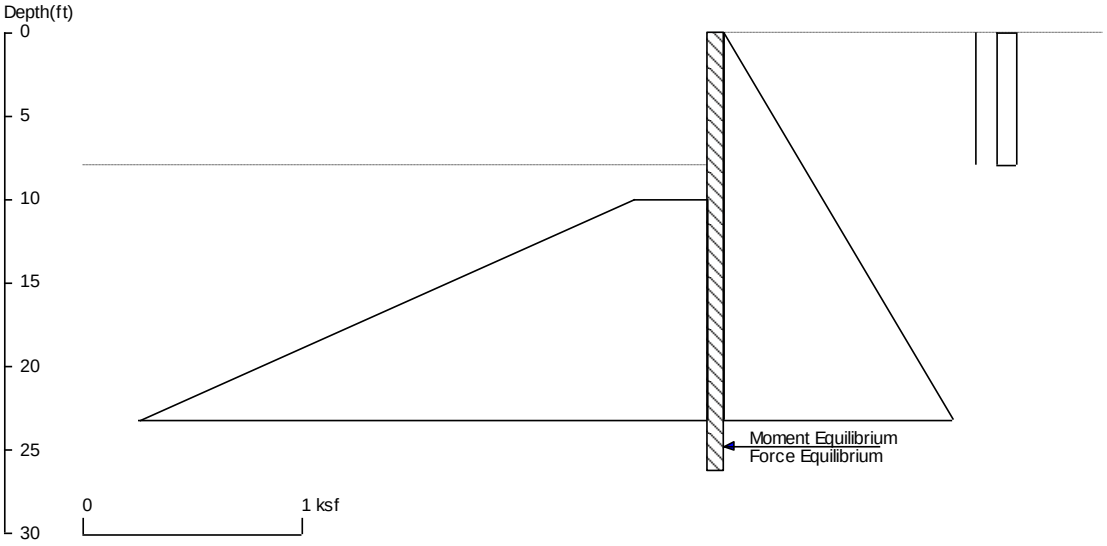
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 11.00 | 5.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P17 - P20 permanent nonseismic

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P17-P20 perm nonseismic.sh8

Wall Height=8.0 Pile Diameter=2.0 Pile Spacing=6.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=18.35 Min. Pile Length=26.35
MOMENT IN PILE: Max. Moment=132.13 per Pile Spacing=6.3 at Depth=16.43

PILE SELECTION:
Request Min. Section Modulus = 48.0 in3/pile=787.35 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W18X65 has Section Modulus = 117.0 in3/pile=1917.28 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 0.30(in) based on E (ksi)=29000.00 and I (in4)/pile=1070.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 8 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 8 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 10 | .34 | 60 | 8.840 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 6.25 |
| 2 | 8.00 | 2.00 |

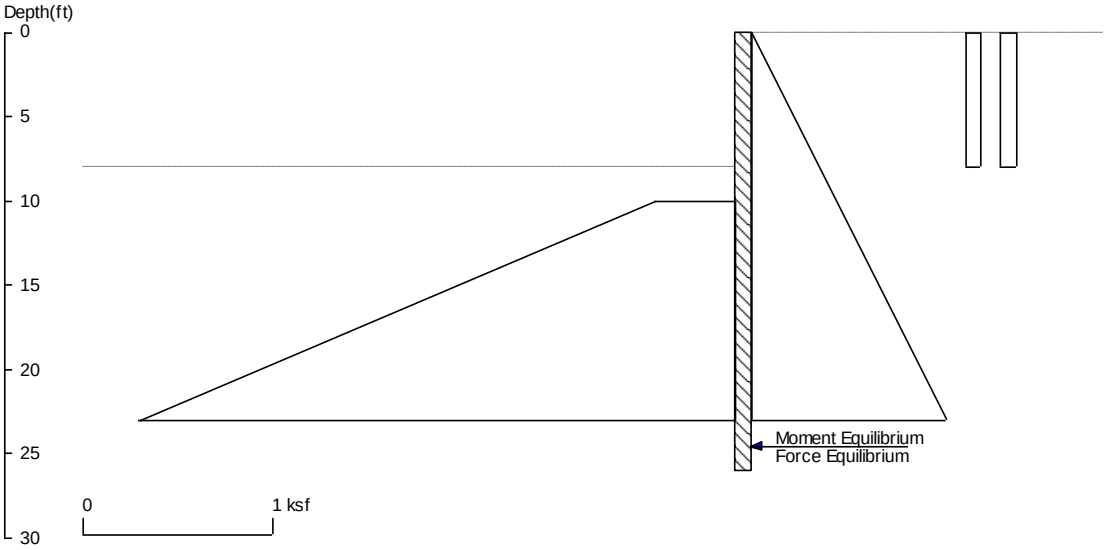
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 8.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P17 - P20 seismic**



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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P17-P20 seismic.sh8

Wall Height=8.0 Pile Diameter=2.0 Pile Spacing=6.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=18.06 Min. Pile Length=26.06

MOMENT IN PILE: Max. Moment=168.32 per Pile Spacing=6.3 at Depth=16.18

PILE SELECTION:

Request Min. Section Modulus = 61.2 in3/pile=1003.02 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X65 has Section Modulus = 117.0 in3/pile=1917.28 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.39(in) based on E (ksi)=29000.00 and I (in4)/pile=1070.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | .08 | 8 | 0.080 | 0 |
| * | traff | | | |
| 0 | .09 | 8 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 10 | .42 | 60 | 10.92 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 6.25 |
| 2 | 8.00 | 2.00 |

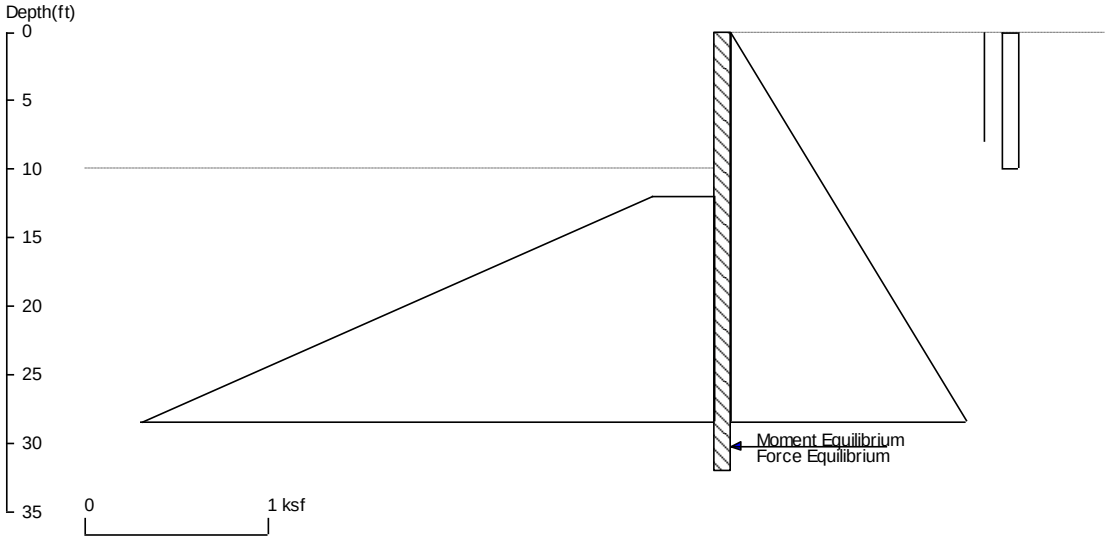
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 8.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P17 - P20 temporary

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P17-P20 temp.sh8

Wall Height=10.0 Pile Diameter=2.0 Pile Spacing=6.3 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=22.08 Min. Pile Length=32.08

MOMENT IN PILE: Max. Moment=230.36 per Pile Spacing=6.3 at Depth=20.10

PILE SELECTION:

Request Min. Section Modulus = 83.8 in3/pile=1372.68 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X65 has Section Modulus = 117.0 in3/pile=1917.28 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.79(in) based on E (ksi)=29000.00 and I (in4)/pile=1070.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 8 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 10 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 12 | .34 | 60 | 8.500 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 6.25 |
| 2 | 10.00 | 2.00 |

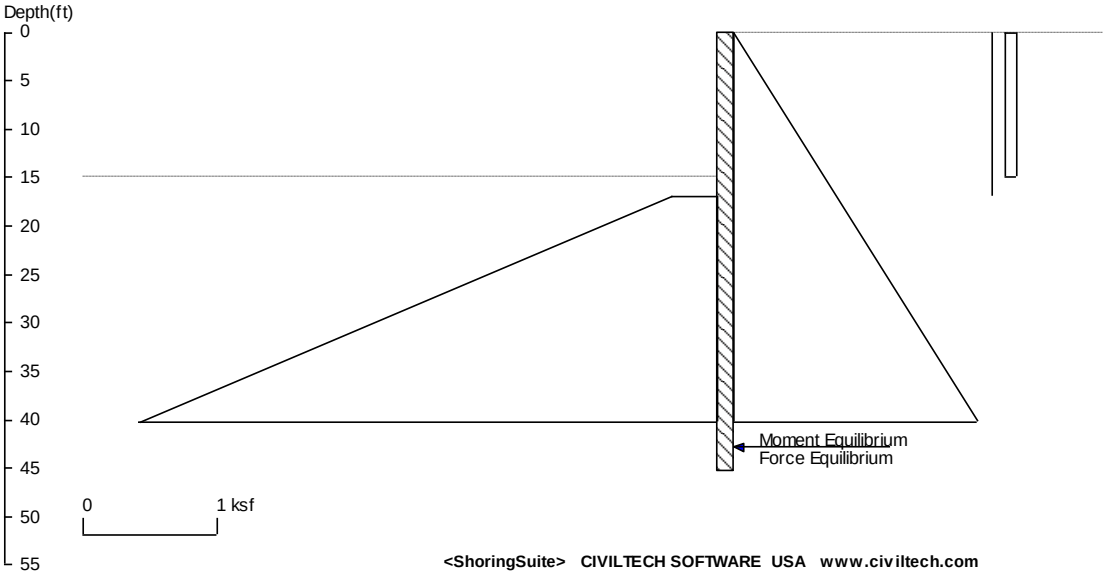
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 10.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P21 - P26 perm nonseismic

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P21-P26 perm nonseismic.sh8

Wall Height=15.0 Pile Diameter=3.0 Pile Spacing=4.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=30.36 Min. Pile Length=45.36
MOMENT IN PILE: Max. Moment=467.61 per Pile Spacing=4.0 at Depth=29.32

PILE SELECTION:
Request Min. Section Modulus = 170.0 in3/pile=2786.47 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W30X124 has Section Modulus = 355.0 in3/pile=5817.39 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 0.62(in) based on E (ksi)=29000.00 and I (in4)/pile=5360.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 17 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 15 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 17 | .34 | 60 | 7.650 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.00 |
| 2 | 15.00 | 3.00 |

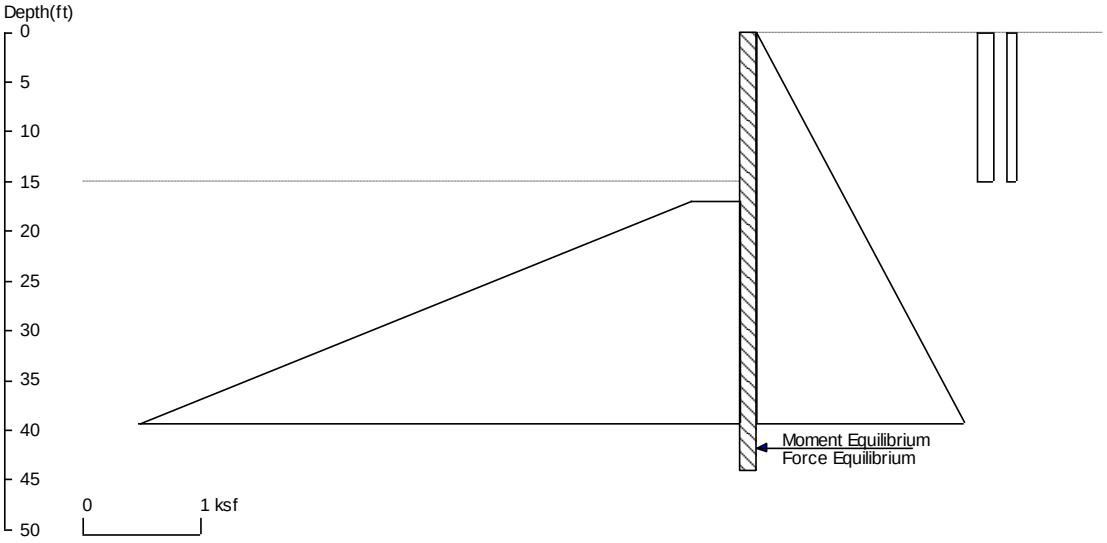
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 15.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P21 - P26 seismic**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P21-P26 seismic.sh8

Wall Height=15.0 Pile Diameter=3.0 Pile Spacing=4.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=29.18 Min. Pile Length=44.18

MOMENT IN PILE: Max. Moment=592.92 per Pile Spacing=4.0 at Depth=28.43

PILE SELECTION:

Request Min. Section Modulus = 215.6 in3/pile=3533.16 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W30X124 has Section Modulus = 355.0 in3/pile=5817.39 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.82(in) based on E (ksi)=29000.00 and I (in4)/pile=5360.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | .15 | 15 | 0.150 | 0 |
| * | traff | | | |
| 0 | .09 | 15 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 17 | .42 | 60 | 9.450 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.00 |
| 2 | 15.00 | 3.00 |

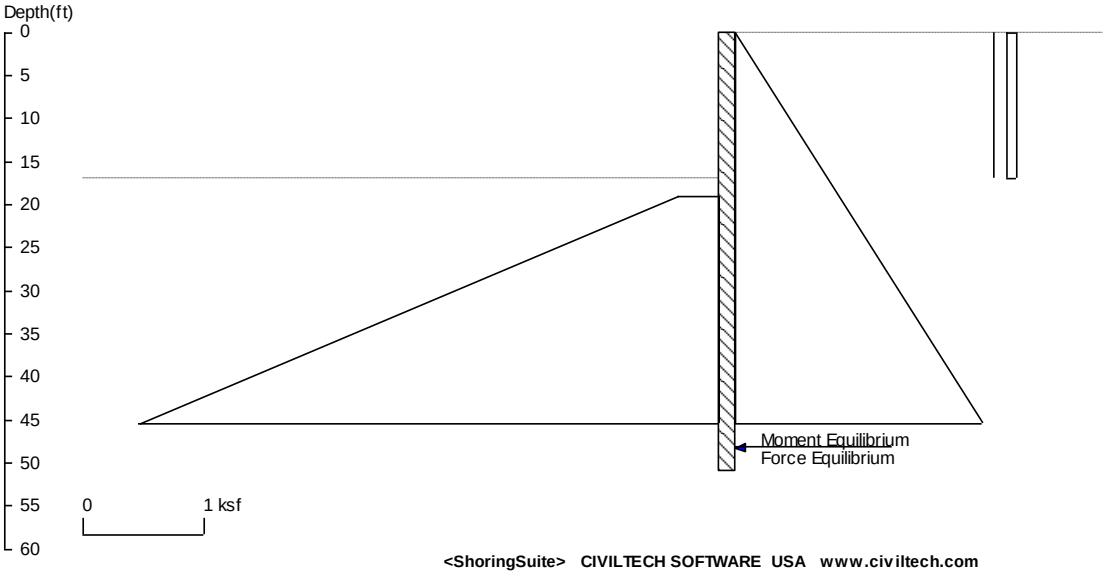
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 15.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P21 - P26 temp**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P21-P26 temp.sh8

Wall Height=17.0 Pile Diameter=3.0 Pile Spacing=4.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=34.02 Min. Pile Length=51.02
MOMENT IN PILE: Max. Moment=655.16 per Pile Spacing=4.0 at Depth=33.09

PILE SELECTION:
Request Min. Section Modulus = 238.2 in3/pile=3904.02 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W30X124 has Section Modulus = 355.0 in3/pile=5817.39 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 1.10(in) based on E (ksi)=29000.00 and I (in4)/pile=5360.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 17 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 17 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 19 | .34 | 60 | 7.310 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.00 |
| 2 | 17.00 | 3.00 |

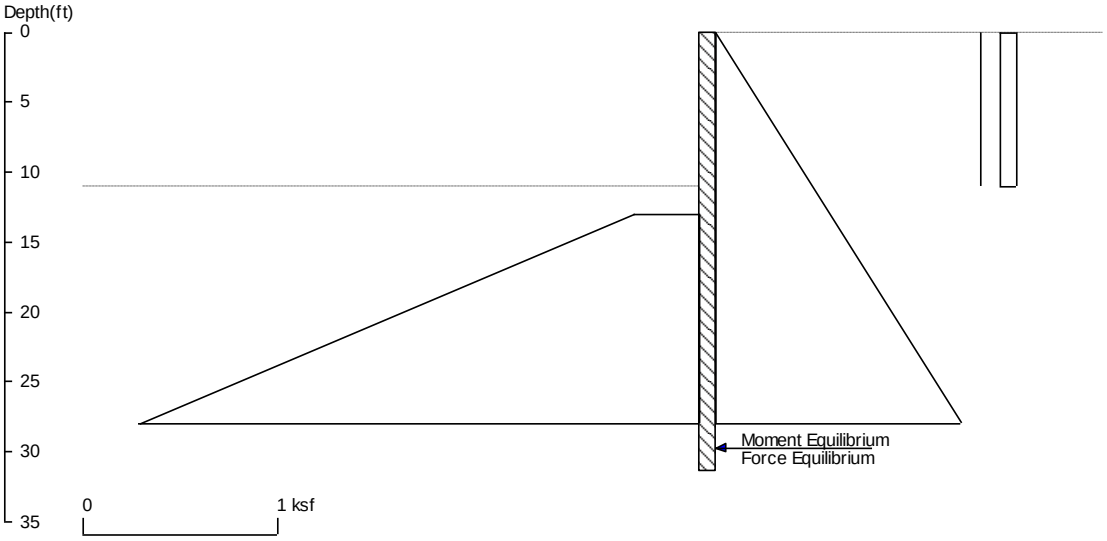
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 17.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P27 - P28 permanent nonseismic




<ShoringSuite> CIVILTECH SOFTWARE USA www.civiltech.com

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P27-P28 perm nonseismic.sh8

Wall Height=11.0 Pile Diameter=2.5 Pile Spacing=4.9 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=20.42 Min. Pile Length=31.42
MOMENT IN PILE: Max. Moment=214.38 per Pile Spacing=4.9 at Depth=20.35

PILE SELECTION:
Request Min. Section Modulus = 78.0 in3/pile=1277.48 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 0.54(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 11 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 11 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 13 | .34 | 60 | 8.330 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.88 |
| 2 | 11.00 | 2.50 |

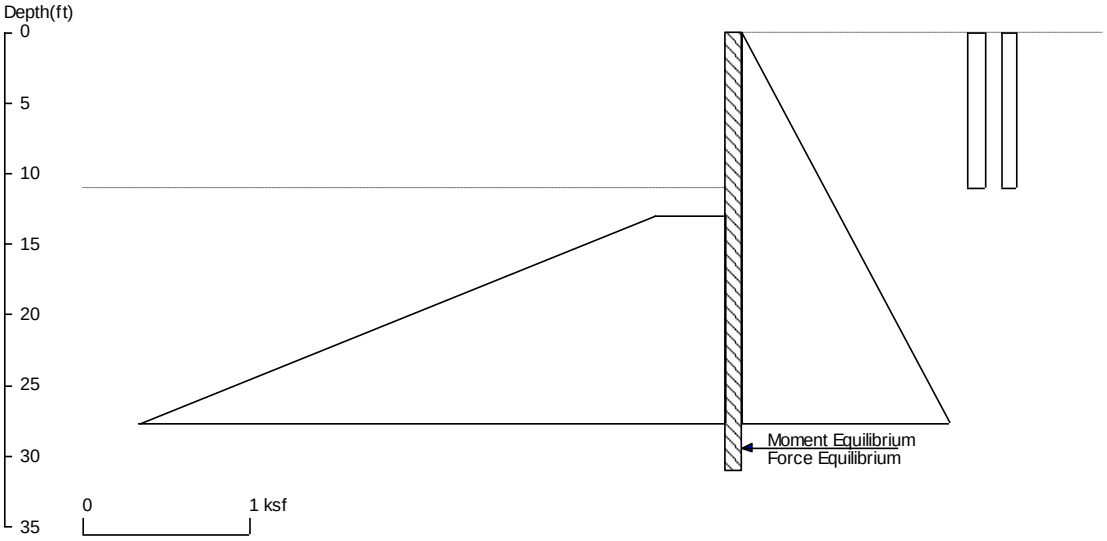
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 11.00 | 4.88 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P27 - P28 seismic**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P27-P28 seismic.sh8

Wall Height=11.0 Pile Diameter=2.5 Pile Spacing=4.9 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=20.11 Min. Pile Length=31.11

MOMENT IN PILE: Max. Moment=278.95 per Pile Spacing=4.9 at Depth=20.04

PILE SELECTION:

Request Min. Section Modulus = 101.4 in3/pile=1662.25 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.73(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | .11 | 11 | 0.110 | 0 |
| * | traff | | | |
| 0 | .09 | 11 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 13 | .42 | 60 | 10.29 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.88 |
| 2 | 11.00 | 2.50 |

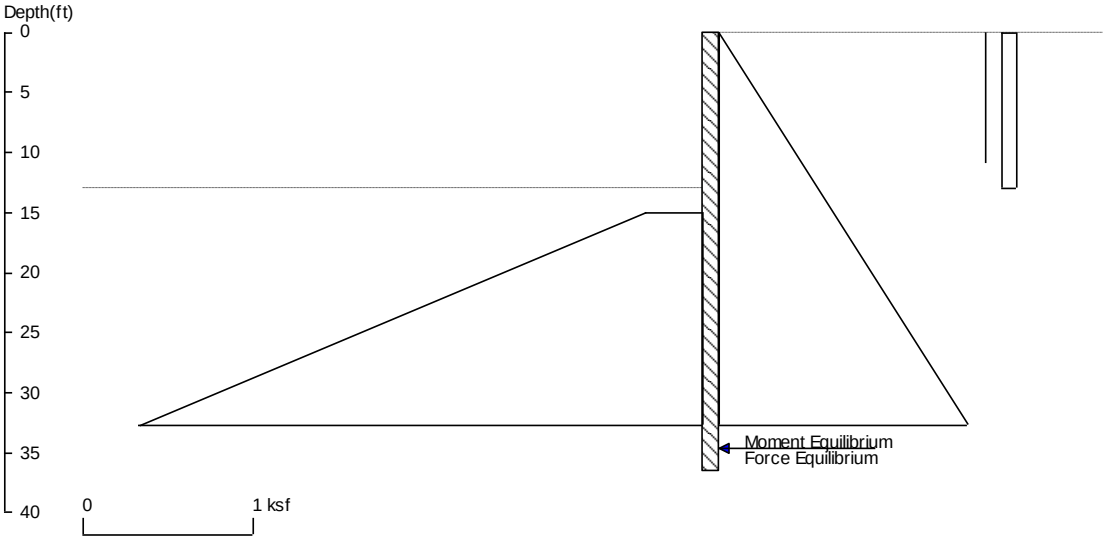
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 11.00 | 4.88 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P27 - P28 temporary**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P27-P28 temp.sh8

Wall Height=13.0 Pile Diameter=2.5 Pile Spacing=4.9 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=23.58 Min. Pile Length=36.58

MOMENT IN PILE: Max. Moment=330.04 per Pile Spacing=4.9 at Depth=23.79

PILE SELECTION:

Request Min. Section Modulus = 120.0 in3/pile=1966.66 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 1.13(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 11 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 13 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 15 | .34 | 60 | 7.990 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.88 |
| 2 | 13.00 | 2.50 |

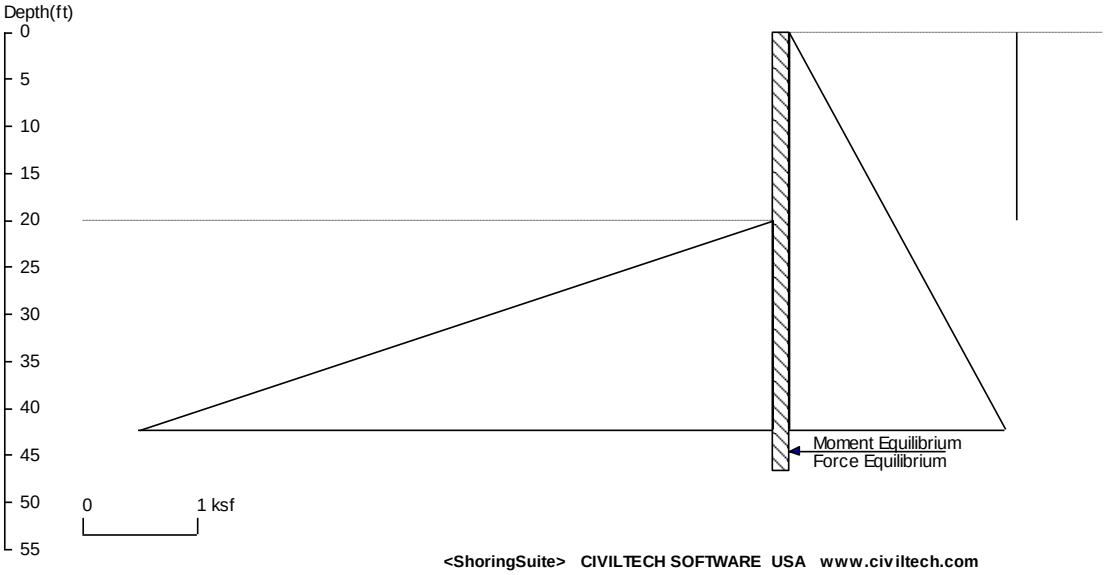
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 13.00 | 4.88 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P29 - P44 permanent nonseismic**




<ShoringSuite> CIVILTECH SOFTWARE USA www.civiltech.com

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P29-P44 perm nonseismic.sh8

Wall Height=20.0 Pile Diameter=3.0 Pile Spacing=4.6 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=26.75 Min. Pile Length=46.75
MOMENT IN PILE: Max. Moment=673.00 per Pile Spacing=4.6 at Depth=32.09

PILE SELECTION:
Request Min. Section Modulus = 244.7 in3/pile=4010.36 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W30X132 has Section Modulus = 380.0 in3/pile=6227.06 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 1.15(in) based on E (ksi)=29000.00 and I (in4)/pile=5770.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 20 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 20 | 0 | 60 | 10.00 | .25 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.58 |
| 2 | 20.00 | 3.00 |

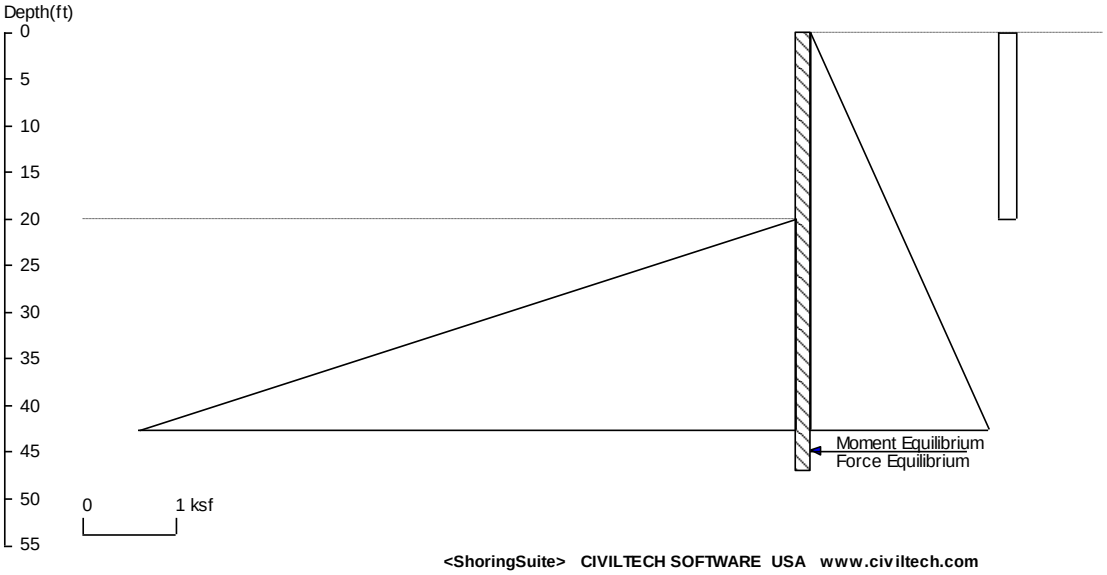
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 20.00 | 4.58 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P29 - P44 seismic**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P29-P44 seismic.sh8

Wall Height=20.0 Pile Diameter=3.0 Pile Spacing=4.6 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=27.09 Min. Pile Length=47.09
MOMENT IN PILE: Max. Moment=992.99 per Pile Spacing=4.6 at Depth=31.88

PILE SELECTION:
Request Min. Section Modulus = 361.1 in3/pile=5917.16 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W30X132 has Section Modulus = 380.0 in3/pile=6227.06 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 1.87(in) based on E (ksi)=29000.00 and I (in4)/pile=5770.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | .2 | 20 | 0.200 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 20 | 0 | 60 | 12.52 | .313 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.58 |
| 2 | 20.00 | 3.00 |

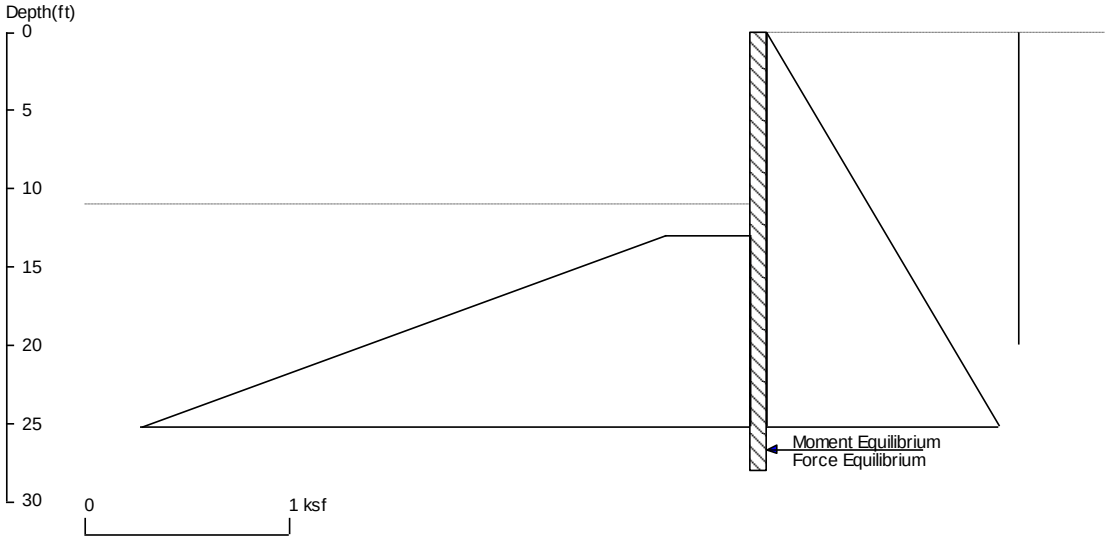
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 20.00 | 4.58 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P29 - P44 temporary**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P29-P44 temp.sh8

Wall Height=11.0 Pile Diameter=3.0 Pile Spacing=4.6 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=17.11 Min. Pile Length=28.11

MOMENT IN PILE: Max. Moment=135.27 per Pile Spacing=4.6 at Depth=18.97

PILE SELECTION:

Request Min. Section Modulus = 49.2 in3/pile=806.04 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W30X132 has Section Modulus = 380.0 in3/pile=6227.06 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.07(in) based on E (ksi)=29000.00 and I (in4)/pile=5770.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 20 | 0.000 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 13 | .42 | 60 | 10.29 | .21 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 4.58 |
| 2 | 11.00 | 3.00 |

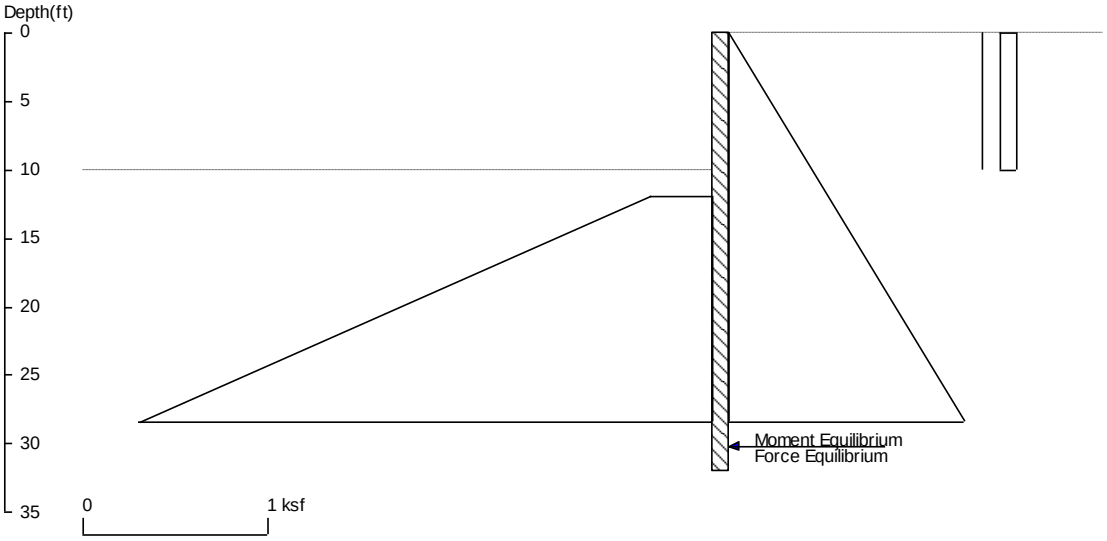
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 11.00 | 4.58 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

## P45 - P52 permanent non-seismic




<ShoringSuite> CIVILTECH SOFTWARE USA www.civiltech.com

Licensed to 4324324234 3424343 Date: 5/4/2021

File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P45-P52 perm nonseismic.sh8

Wall Height=10.0 Pile Diameter=2.5 Pile Spacing=7.8 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=22.02 Min. Pile Length=32.02
MOMENT IN PILE: Max. Moment=285.21 per Pile Spacing=7.8 at Depth=20.09

PILE SELECTION:
Request Min. Section Modulus = 103.7 in3/pile=1699.54 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 0.68(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 10 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 10 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 12 | .34 | 60 | 8.500 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 7.75 |
| 2 | 10.00 | 2.50 |

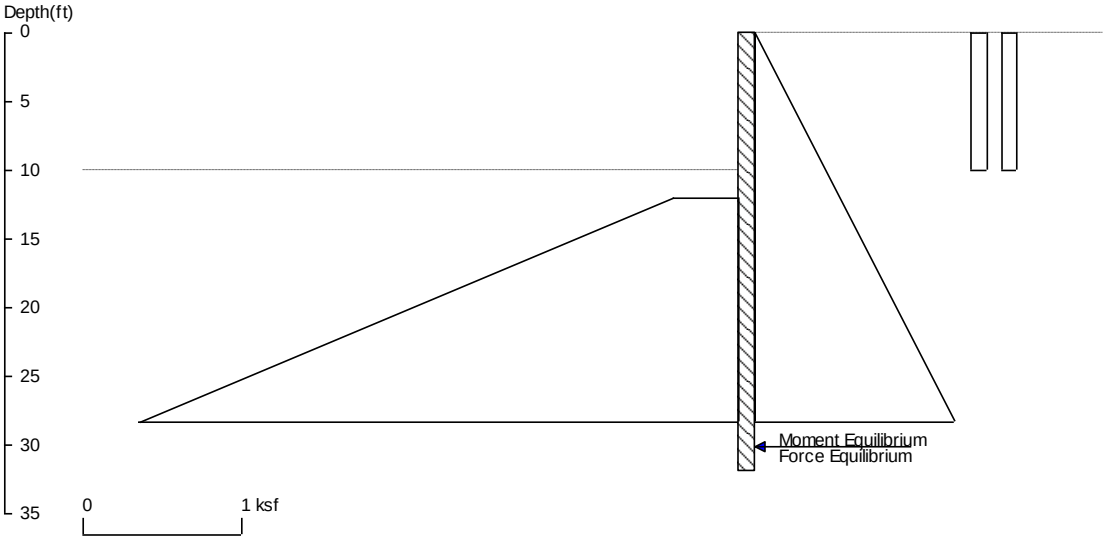
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 10.00 | 5.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P45 - P52 seismic**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P45-P52 seismic.sh8

Wall Height=10.0 Pile Diameter=2.5 Pile Spacing=7.8 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=21.91 Min. Pile Length=31.91
MOMENT IN PILE: Max. Moment=372.96 per Pile Spacing=7.8 at Depth=19.90

PILE SELECTION:
Request Min. Section Modulus = 135.6 in3/pile=2222.43 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 0.92(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | .1 | 10 | 0.100 | 0 |
| * | traff | | | |
| 0 | .09 | 10 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 12 | .417 | 60 | 10.40 | .208 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 7.75 |
| 2 | 10.00 | 2.50 |

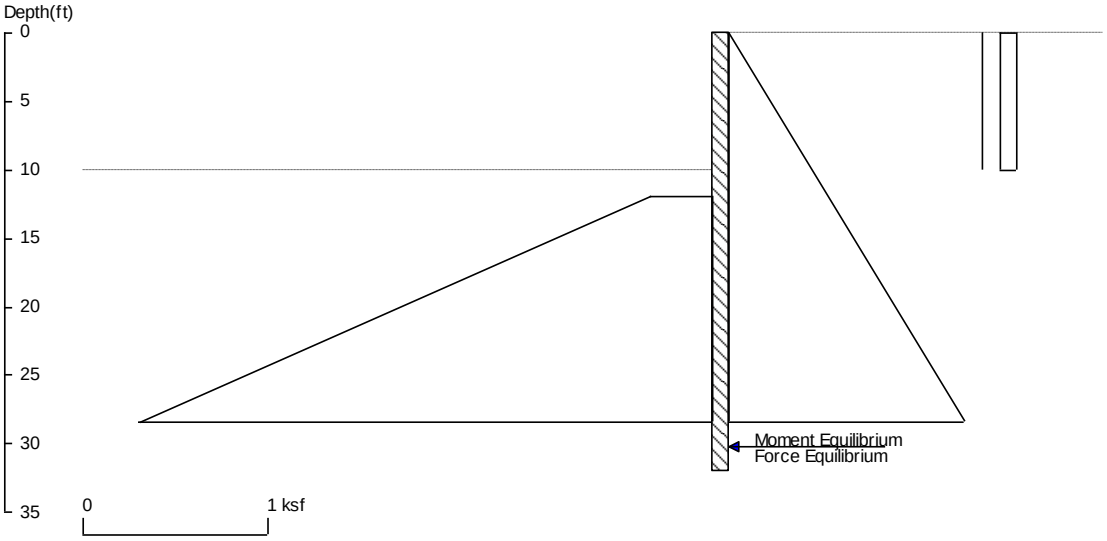
PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 10.00 | 5.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home

**P45 - P52 temporary**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P45-P52 temp.sh8

Wall Height=10.0 Pile Diameter=2.5 Pile Spacing=7.8 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=22.02 Min. Pile Length=32.02

MOMENT IN PILE: Max. Moment=285.21 per Pile Spacing=7.8 at Depth=20.09

PILE SELECTION:

Request Min. Section Modulus = 103.7 in3/pile=1699.54 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

W18X86 has Section Modulus = 166.0 in3/pile=2720.24 cm3/pile. It is greater than Min. Requirements!

Top Deflection = 0.68(in) based on E (ksi)=29000.00 and I (in4)/pile=1530.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |
| * | eq | | | |
| 0 | 0 | 10 | 0.000 | 0 |
| * | traff | | | |
| 0 | .09 | 10 | 0.090 | 0 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 12 | .34 | 60 | 8.500 | .17 |

ACTIVE SPACING:

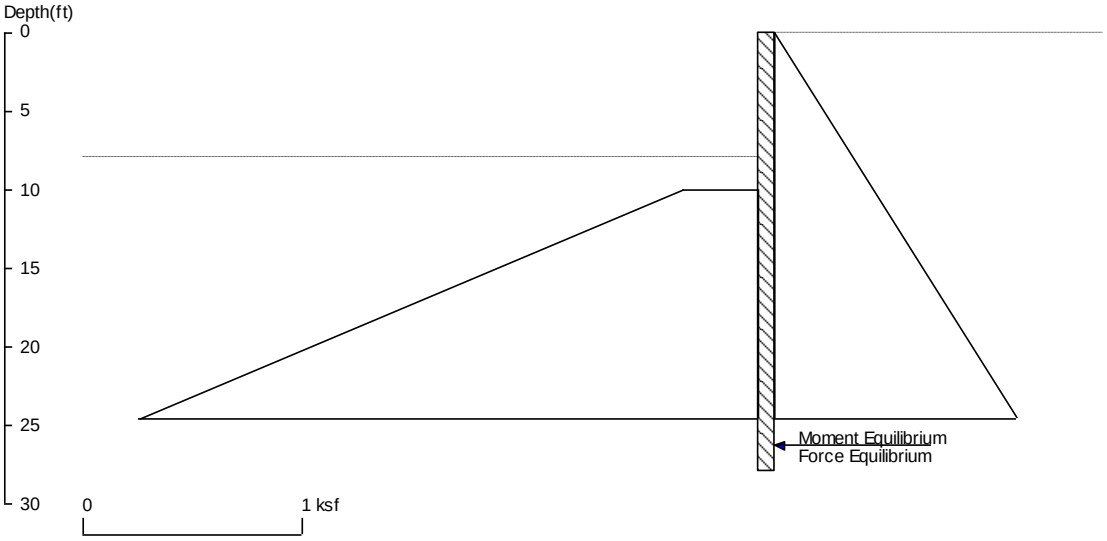
| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 7.75 |
| 2 | 10.00 | 2.50 |

PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 10.00 | 5.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

# Kahan Spec Home
**P52-P53**

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File: K:\2020\01519-2020-15 Kahan Spec Home\Calcs\Shoring\P53-P54 temp.sh8

Wall Height=8.0 Pile Diameter=2.0 Pile Spacing=12.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=19.99 Min. Pile Length=27.99
MOMENT IN PILE: Max. Moment=169.66 per Pile Spacing=12.0 at Depth=17.26

PILE SELECTION:
Request Min. Section Modulus = 61.7 in3/pile=1011.01 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
W18X50 has Section Modulus = 88.9 in3/pile=1456.80 cm3/pile. It is greater than Min. Requirements!
Top Deflection = 0.53(in) based on E (ksi)=29000.00 and I (in4)/pile=800.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 0 | 0 | 60 | 2.700 | .045 |

PASSIVE PRESSURES:

| Z1 | P1 | Z2 | P2 | Slope |
|---|---|---|---|---|
| 10 | .34 | 60 | 8.840 | .17 |

ACTIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 0.00 | 12.00 |
| 2 | 8.00 | 2.00 |

PASSIVE SPACING:

| No. | Z depth | Spacing |
|---|---|---|
| 1 | 8.00 | 4.00 |

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in