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JOB 18562 Valentin Soldier Pile Wall

SHEET NO. W1 OF

CALCULATED BY DATE

CHECKED BY DATE

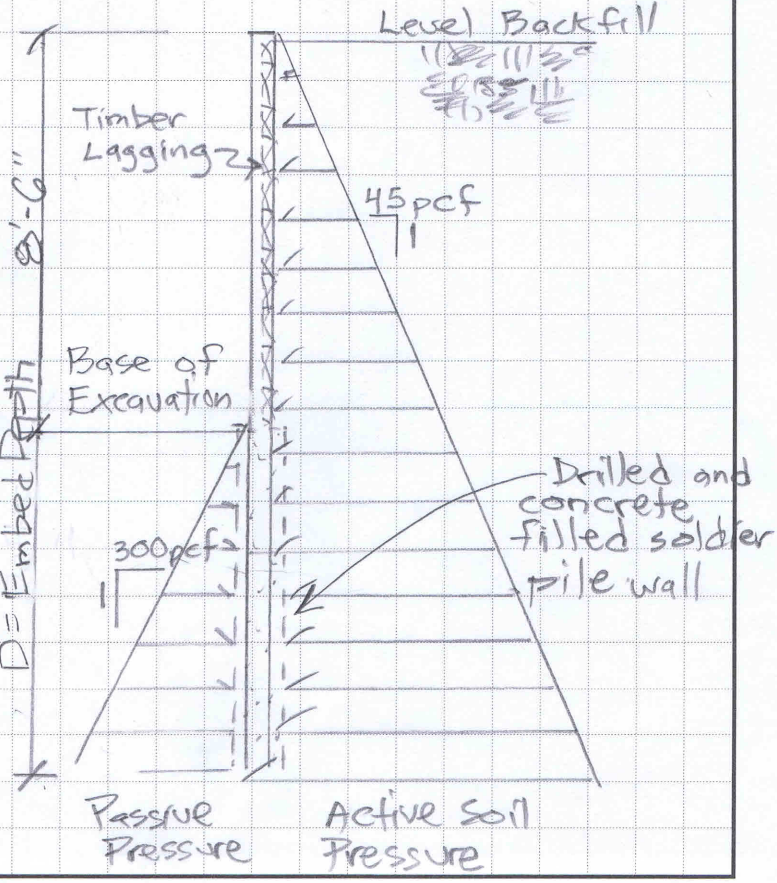
SCALE

Temp Shoring wall

Max wall Height = 33.5' - 23.7' = 9.8' → Use 10'
however, this is corner pile so only load from lagging on one side, next pile is 32.0 - 23.7 = 8.3'
design for 8'-6" wall retain

Reference GeoTech Consultants, Inc, JN 17464

Active soil pressure	= 45 pcf
Soil unit weight	= 130 psf
Passive soil pressure	= 300psf
Backslope surcharge	= 0
Lagging active pressure	= 45 pcf x 50% = 23 pcf



5/27/19

ARNOLD E. FORSMAN
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Sheets W1 of W8

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JOB 18062 Valentine

SHEET NO. W2 OF

CALCULATED BY DATE

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SCALE

Lagging Design

Try P.T. 4x8 max span = "ℓ" for pile spacing > 3 Pile Ø's, q_{active} = 45pcf x 1.5 = 23 pcf

Max soil pressure = 23pcf x 8.5' = 196 psf

For 4x8 flatwise, check w/ (196psf)($\frac{7.5}{12}$) = 123 plf

∴ 8'-4" max lagging span

for site configuration, design for 8'-0" o.c. pile spacing.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY Forsman Engineering May 27, 2019 14:10	PROJECT JN 18062 Valentin Beam lagging	W3

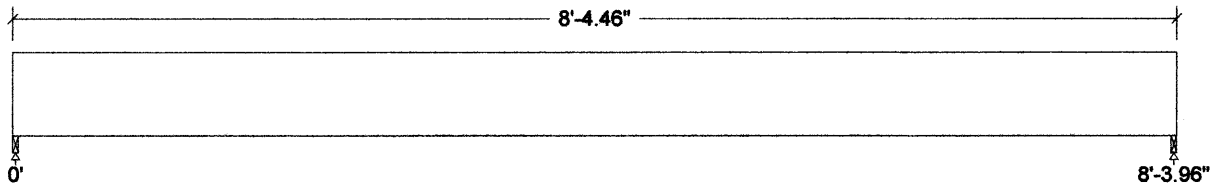
Design Check Calculation Sheet

WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
w soil	Live	Full UDL				123.0		plf
Self-weight	Dead	Full UDL				5.2		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:			
Dead	22		22
Live	515		515
Factored:			
Total	537		537
Bearing:			
Capacity			
Beam	1468		1468
Support	2266		2266
Des ratio			
Beam	0.37		0.37
Support	0.24		0.24
Load comb	#2		#2
Length	0.50*		0.50*
Min req'd	0.50*		0.50*
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

*Minimum bearing length setting used: 1/2" for end supports

Lumber-soft, Hem-Fir, No.2, 4x8 (3-1/2"x7-1/4")

Supports: All - Timber-soft Beam, D.Fir-L No.2

Total length: 8'-4.46"; Clear span: 8'-3.46"; volume = 1.5 cu.ft.

Lateral support: top= at supports, bottom= at supports; Oblique angle: 90.0 deg;

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion		Analysis Value	Design Value	Unit	Analysis/Design
Shear	x-x	fv = 0	Fv' = 150	psi	fv/Fv' = 0.00
	y-y	fv = 29	Fv' = 150	psi	fv/Fv' = 0.19
Bending(+)	x-x	fb = 0	Fb' = 1090	kip-ft	fb/Fb' = 0.00
	y-y	fb = 902	Fb' = 1160	kip-ft	fb/Fb' = 0.78
Live Defl'n		0.40 = L/252	0.42 = L/240	in	0.95
Total Defl'n		0.42 = L/237	0.56 = L/180	in	0.76

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fvy'	150	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2
Fby'	850	1.00	1.00	1.00	1.000	1.300	1.05	1.00	1.00	1.00	-	2
Fcp'	405	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.3 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2
Emin'	0.47 million		1.00	1.00	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #2  = D+L, V max =    534, V design =    494 lbs
Bending(+): LC #2  = D+L, M =   1112 lbs-ft
Deflection: LC #2  = D+L  (live)
            LC #2  = D+L  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2015
```

CALCULATIONS:

```
Deflection:  EIy =   33.7e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
```

Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

Soldier Pile Design

Using AASHTO methodology, see figure

	Beta	0.0		slope of retained soil not used
	Phi	32		angle of friction not used
	Ka	0.3		active coefficient
	sig1	130.0	pcf	unit weight of soil 1
	active soil	45.0	pcf	Ka*sig1
	Kp	2.3		passive coefficient
	sig2	130.0	pcf	unit weight of soil 2
	passive soi	300.0	pcf	Kp*sig2
	sur	0.0	psf	surcharge
	D	11.0	ft	embedment depth
	H	8.5	ft	retained height
	L	8.0	ft	Pile spacing
	b	1.5	ft	effective pile width (actual pile width or diameter of concrete cast)
	N	2.0		Increase in effective pile width (3 for AASHTO, .08*Phi for CalTran)
	j	1.5		junk dirt, mult of pile dia. before pass. press. begins, usually 1.5
	F.S.	1.2		factor of safety (1.3 suggested by AASHTO)
	Fy	36.0	ksi	Pile yield stress
Active pressure on pile	Pa	3059	lbs/ft	Ka*sig1*H*L
Surcharge on wall	Ps	0	lbs/ft	surcharge*L
Passive at pile tip	Pe	9937	lbs/ft	Kp*sig2*D*(N*b)
Passive below poor surf soil	Pb	2025	lbs/ft	Kp*sig2*(j*b)*(N*b)
	Pr1	12999	lbs	Pa*H/2
	Pr2	0	lbs	Ps*H
	Pr6	2278	lbs	Pb*j*b/2
	Pr5	54854	lbs	Pe*D/2

Determine D (pile embedment depth) by Taking moments about F:

	SumM	214	By iteration, determine pile embedment depth; cell should approach 0.

Design embedment depth

	Ddes	**13.2 ft**	F.S.*D

embed ↓ retain ↗ freeboard ←

Total pile length = 13.2 + 8.5 + Ø

= 21.7 → 22'

Determine depth to plane of zero shear

	x	5.83 ft	x used in lieu of D for shear depth

Pr1+Pr2+Pr6 = Pr5*x^2

Determine moment at plane of zero shear

	M	92753 ft-lbs	Moment at x

Required pile section Sreq **51.5 in^3** M/Fb

For W10x49

d = 10" tf = 9/16"

bf = 10" min hole size = $\sqrt{10^2+10^2}$ = 14.1"

Use 18" Ø

AASHTO Soldier Pile Method

The figure below represents the soil pressures that may be used for cantilever soldier piles cohesionless soil This figure (excluding surcharge) is an adaptation from the figure titled, Simplified Earth Pressure Distributions for Permanent Flexible Cantilevered Walls with Discrete Vertical Wall Elements, in AASHTO Standard Specifications For Highway Bridges.

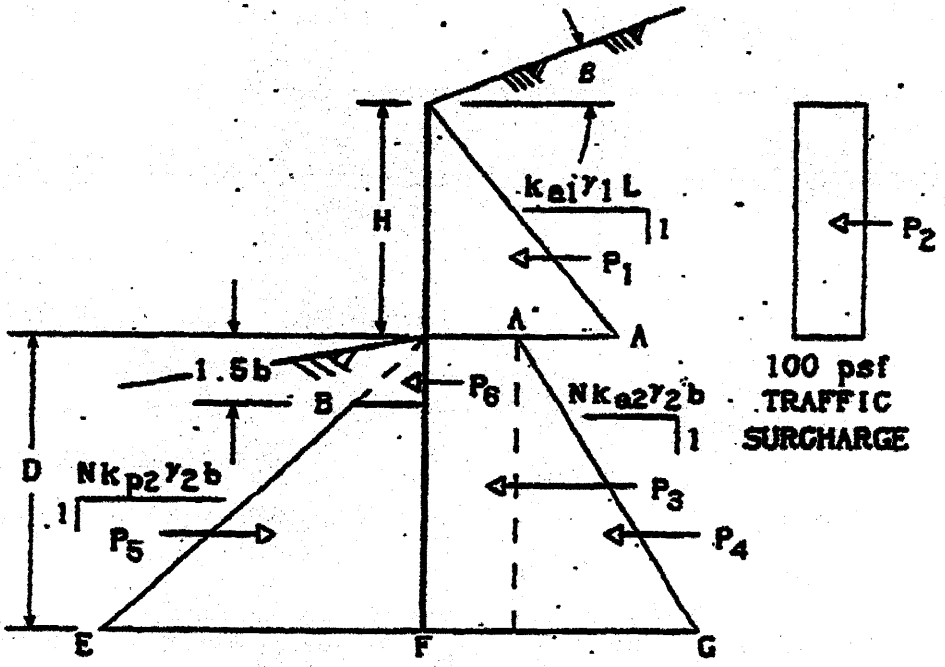


FIGURE 10 - 23

L = Soldier Pile Spacing
N = Increase in effective pile width. AASHTO uses N = 3, (Caltrans uses N = 0.08ϕ). The value of Nb cannot exceed the soldier pile spacing "L" (AASHTO uses L $\leq$ 5b).
b = Effective pile width: pile width or width of drilled hole backfilled with hard rock concrete.

PROJECT USE:

A-minimum safety factor of 50% is to be added to the computed embedment depth (D) for permanent flexible cantilever walls, otherwise 30% should be added for temporary construction.

For temporary construction the forces P_3 and P_4 may be ignored.

GENERAL PRESSURE EQUATIONS:

$P_A = K_{a1}\gamma_1 H(L)$ $\quad P_B = K_{a2}\gamma_2(1.5b)(Nb)$ $\quad Scharg = P_S(L)$

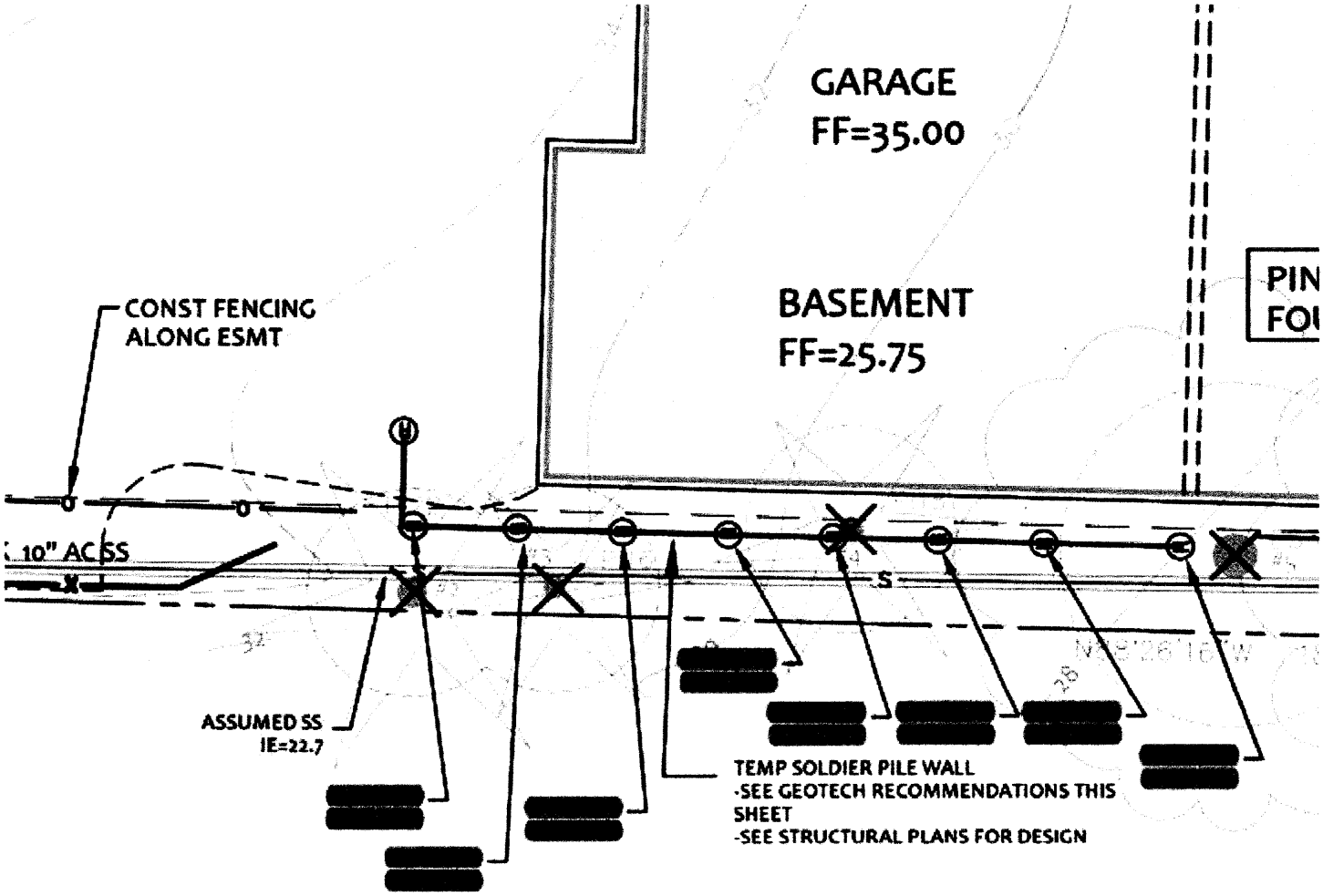
$P_{A'} = K_{a2}\gamma_2 H(Nb)$ $\quad P_G = K_{a2}\gamma_2 D(Nb)$ $\quad P_E = K_{p2}\gamma_2 D(Nb)$

W7/

forsman engineering

From: Duffy Ellis <duffy@cesolutions.us>
Sent: Thursday, May 16, 2019 3:34 PM
To: johan valentin; Marc McGinnis; forsmanengineering@comcast.net
Cc: forsman engineering; mike@aspenhomesnw.com; Helena Kjellander Valentin; Ed Huri; sam@aspenhomesnw.com
Subject: RE: Shoring wall heights

Hopefully this moves ball forward. I just roughed out top and bottom of wall. I assumed you need to over-excavate roughly 2 feet below basement to accomodate grade beam/pile cap?



Space @ to 8'-0" o.c.
W10x49 w/ P.T. 4x8 lagging
Embed 13.2' min
Concrete filled 18" ϕ Holes.

Duffy Ellis, PE

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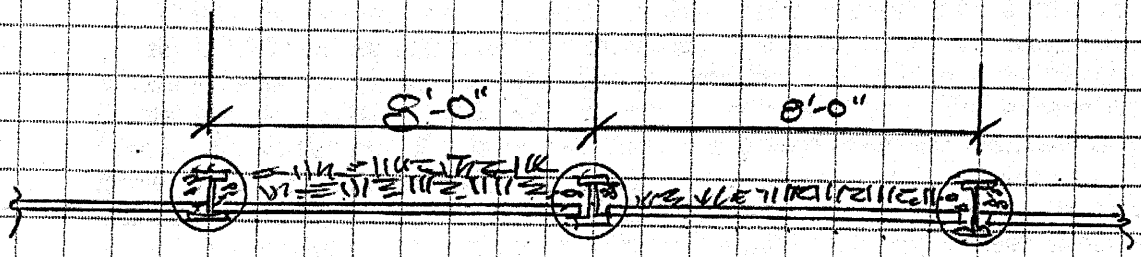
JOB

SHEET NO. W8 OF W8

CALCULATED BY DATE

CHECKED BY DATE

SCALE



18"ø Augered Hole w/
W10x49 positioned
in center of concrete
filled hole